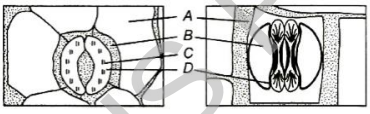
NEET BIOLOGY

ANATOMY OF FLOWERING PLANTS

1. Cambium activity is
   a) More active towards the periphery of stem
   b) More active towards the lateral sides of stem
   c) More active towards the inner side of stem
   d) Same on the both sides
2. Cambium is a type of
   a) Apical meristem
   b) Intercalary meristem
   c) Lateral meristem
   d) Permanent of mature meristem
3. Pith is a central part of the ground tissues generally made up of
   a) Parenchyma b) Collenchyma c) Chlorenchyma d) Sclerenchyma
4. Interfascicular cambium is found
   a) Between pith and vascular bundle b) Between two vascular bundles
   c) In the vascular bundle d) Outside the bundle
5. Meristematic tissue are
   a) Premature having ability of division
   b) Mature does not have ability of division
   c) Premature not having ability of division
   d) Complex differentiating in xylem, phloem and cambium
6. I. The 1° and 2° phloem get gradually crushed due to the continued formation and accumulation of 2° xylem
   II. 1° xylem remains more or less intact in or near the centre
   III. Secondary growth results in an increase in the length of the axis
   Select the correct statements
   a) I and II b) II and III c) I and III d) I, II and III
7. Cork is used as the stopper for bottles, for shock absorption and insulation because of
   a) It is light and compressible b) Non-reactive
   c) Sufficiently resistant to fire d) All of the above
8. Medullary rays are formed by the
   a) Radially placed parenchymatous cells between vascular bundles
   b) Longitudinally placed parenchymatous cells between vascular bundles
   c) Laterally placed parenchymatous cells between vascular bundles
   d) Obliquely placed parenchymatous cells between vascular bundles
9. Identify *A* to *D* in the given diagram and choose the correct option



   a) A-Epidermal cell, B-Guard cell, C-Subsidiary cell, D-Chloroplast
   b) A-Epidermal cell, B-Subsidiary cell, C-Chloroplast, D-Guard cell
   c) A-Epidermal cell, B-Chloroplast, C-Subsidiary cell, D-Guard cell
   d) A-Guard cell, B-Chloroplast, C-Subsidiary cell, D-Epidermal cell

10. The jute fibres anatomically are
    a) Bast fibres b) Cortical fibres c) Xylem fibres d) Pith fibres
11. The merismatic tissue responsible for the cutting of vascular tissue (xylem and phloem) is called
    a) Cork cambium b) Vascular cambium c) Lateral meristem d) Endodermis
12. Secondary phloem of a dicot root is made up of
    I. sieve tube
    II. companion cell
    III. phloem parenchyma
    Select the correct option for given statement
    a) I and II b) II and III c) I and III d) All of these
13. The internal structure of a plant stem is observed. There is a discontinuous ring of angular collenchyma below the epidermis. Type of vascular bundles are of the same type as in the stems of solanaceous plants. Sieve tube elements possess simple sieve plates, identify the plant.
    a) *Helianthus* b) *Cucurbi ta* c) *Zea mays* d) *Hydrilla*
14. The innermost layer of cortex is called
    a) Epidermis b) Casparian strips c) Endodermis d) Pericycle
15. Amphistomatic leaf is
    a) Dicotyledonous leaf b) Monocotyledonous leaf
    c) Both (a) and (b) d) None of these
16. Which is not a characteristic of plant cell walls?
    a) Found only in the sporophyte phase of life cycle
    b) Among other compounds contains compounds built of simple sugars
    c) May contain enzymes that are biologically active
    d) Often contain strengthening polymers
17. The ring arrangement of vascular bundle is the characteristic feature of
    a) Dicot root b) Monocot root c) Monocot stem d) Dicot stem
18. Primary meristem is
    a) Apical meristem b) Intercalary meristem
    c) Root apical meristem and shoot apical meristem d) Both (a) and (b)
19. I. These tissue are found as layers or patches
    II. It consists of cells which are thickened at the corners
    III. It often contains chloroplast
    IV. Intercellular spaces are absent
    V. They provide mechanical support to growing parts of plants
    The above characters are attributed to
    a) Vascular tissue b) Collenchyma
    c) Parenchyma d) Simple sclerenchyma
20. Examples for lateral meristems are
    a) Phellogen and procambium b) Fascicular cambium and procambium
    c) Procambium and dermatogen d) Fascicular cambium and cork cambium
21. Medullary or pith ray is the
    a) Radial strip of parenchyma which is present between vascular bundles
    b) Radial strip of collenchyma which is present between vascular bundles
    c) Radial strip of sclerenchyma which is present between vascular bundles
    d) The another name of stele
22. Which of the function in the given options does not belongs to the monocot root?
    a) Conduction of water from the root hairs to the inner tissue
    b) Storage of food
    c) The outer most layer or layers of the cortex produce protective exodermis in the older roots
    d) Presence of secondary growth

23. Conjoint vascular bundles are common in
    a) Roots b) Stems c) Leaves d) Both (b) and (c)
24. Periderm is produced from
    a) Cork cambium b) Procambium c) Secondary cortex d) Vascular cambium
25. In stem, the xylem is
    a) Exarch b) Mesarch c) Endarch d) All of these
26. Root apical meristem is derived from the
    a) Plumule part of embryo
    b) Scutellum part of embryo
    c) Radical part of embryo
    d) Endosperm part of embryo
27. Which of the following plants shows multiple epidermis?
    a) *Croton* b) *Allium* c) *Nerium* d) *Cucurbita*
28. The growth of root and stem in length with the help of apical meristem is called …A…. Apart from primary growth most dicotyledonous plant exhibit an increase in girth called …B…
    Choose the correct combination of A, B and C in respect to the above paragraph
    a) A-primary growth; B-secondary growth b) A-secondary growth; B-primary growth
    c) A-secondary growth; B-tertiary growth d) A-primary growth; B-tertiary growth
29. Which of the following statement is correct?
    a) Study of the internal structure is called anatomy
    b) Plants have cells as the basic unit cells, are organised into tissues
    c) Tissues are organised into organs
    d) All of the above
30. In monocotyledonous stem, the vascular bundles are
    a) Conjoint and open
    b) Conjoint and closed
    c) Scattered through out the ground tissue
    d) Both (b) and (c)
31. Select the wrong statements
    I. Primary and secondary phloem gets crushed during secondary growth
    II. During secondary growth, primary xylem remains more or less intact
    a) I is correct and II is incorrect b) II is correct and I is incorrect
    c) Both are incorrect d) Both are correct
32. I. Fat
    II. Protein
    III. Sugar
    IV. Salt
    Which of the above is/are present in higher concentration with the meristematic cells?
    a) Only I b) I and II c) Only IV d) III and IV
33. G H Shull observed inbreeding depression in a plant. Miller and Letham isolated a hormone from the immature seeds of that plant. Which of the following characters is not associated with the plant?
    a) Atactostelic condition in stem
    b) Bundle sheath in leaf
    c) Chromosomal number of endospermous cell is 30
    d) Medulla absent in the root
34. The position of protoxylem in leaf is
    a) Adaxial b) Abaxial
    c) Surrounded by metaxylem d) Lateral
35. The inner, darker and harder portion of secondary xylem that cannot conduct water, in an older dicot stem, is called

a) Alburnum b) Bast c) Wood d) Duramen

36. The cells arranged in multiple layers between the epidermis and pericycle is called
a) Pith b) Stele c) Medullary rays d) Cortex

37. Hardness of seed coats is due to the presence of
a) Sclerenchymatous fibres b) Sclereids
c) Bast d) Stone cells

38. Epidermis is derived from
a) Cambium b) Primary xylem c) Secondary xylem d) Protoderm

39. The activity of cambium in plants is under the control of
a) Many physiological factors
b) Many environmental factors
c) Only water availability
d) Both (a) and (b)

40. Bark includes
I. phellogen
II. phellem
III. secondary phloem
IV. secondary xylem
Select the correct combination
a) Only I b) I, II and III c) Only III d) All of these

41. Initiation of lateral roots and vascular cambium during secondary growth organs occurs due to activity of
a) Endodermis b) Pericycle c) Casparian strip d) Periderm

42. I. Sunflower seed
II. A wheat leaf
III. Pea plant
IV. Leaf blade of grass
Bulliform cells are present in which of the above plants?
a) I and II b) II and III c) III and IV d) II and IV

43. I. Vessel, II. Tracheids, III. Companion cells
Which of the following is/are living cells?
a) I and II b) Only III c) II and III d) Only I

44. Vascular bundles, in which xylem and phloem occur as separate bundles are known as
a) Collateral b) Bicollateral c) Radial d) Amphivasal

45. In old trees, the greater part of secondary xylem is dark brown due to the
a) Deposition of inorganic material b) Deposition of organic material
c) Activity of cambium d) Activity of secondary xylem

46. Conjuctive tissue is made up of
a) Parenchymatous cells, *i.e.*, in between the xylem and phloem
b) Sclerenchymatous cells, *i.e.*, in between the xylem and phloem
c) Collenchymatous cells, *i.e.*, in between the xylem and phloem
d) Merismatic cells, *i.e.*, in between the xylem and phloem

47. I. Peripheral vascular bundles are smaller than the centrally located vascular bundles
II. Phloem parenchyma is absent
III. Water parenchyma cavities are present within the vascular bundles
Which of the above characters belong to the monocotyledonous stem?
a) I and II b) II and III
c) III and I d) I, II and III

48. Early wood is formed in dicot plant during
a) Spring season b) Winter season c) Autumn season d) Summer season

49. The meristem which is particularly present in the mature regions of roots and shoots and produce woody axis and appear later than the primary meristem is called
    a) Secondary meristem b) Intercalary meristem
    c) Apical meristem d) Tertiary meristem
50. A monocot stem with secondary growth is
    a) *Lilium* b) *Cocos* c) *Yucca* d) *Asparagus*
51. Vessels are absent in this angiosperm.
    a) *Mangifera* b) *Magnolia* c) *Dillenia* d) *Drimys*
52. Conjoint collateral closed vascular bundle is found in
    a) Monocot stem b) Monocot root c) Dicot stem d) Dicot root
53. Palisade parenchyma is absent in leaves of
    a) *Sorghum* b) Mustard c) Soyabean d) Gram
54. The tunica-corpus theory was proposed by
    a) Hofmeister b) Nagelli c) Strasburger d) Schmidt
55. Alburnum is otherwise known as
    a) Periderm b) Sapwood c) Heartwood d) Bark
56. Roots apical meristem occupies the …A… of roots, while shoot apical meristem occupies the distant most region of the …B… axis
    Complete the above sentence with the correct combination of A and B
    a) A-tip; B-stem b) A-side; B-stem
    c) A-laterally; B-root d) A-tip; B-meristamatic
57. Vascular bundle in the laves of dicots are surrounded by
    a) Epidermis b) Bundle sheath cells c) Pericycle d) Both (a) and (c)
58. Intercalary meristem is a derivative of
    a) Lateral meristem b) Promeristem c) Primary meristem d) Secondary meristem
59. Exchange of gases between the outer atmosphere and internal tissue of the stem takes place by (in dicot stem)
    a) Lenticels b) Stomata c) Hydathodes d) Pneumatophores
60. A nail is driven into the trunk of a 30 years old tree at a point 1 m above the soil level. The tree grows in height at the rate of 0.5m a years. After three years, nail will be
    a) 1 m above the soil b) 1.5 m above the soil
    c) 2 m above the soil d) 2.5 m above the soil
61. Intrafascicular cambium is present in between the
    a) Primary xylem and secondary xylem b) Secondary phloem and primary xylem
    c) Primary xylem and secondary phloem d) Primary xylem and secondary phloem
62. In dicotyledonous roots, the initiation of lateral roots takes place in
    a) Endodermal cells b) Cortical cells c) Epidermal cells d) Pericycle cells
63. The roots of angiosperms show exarch xylem and their stems have endarch bundles. These are continuous throughout the change occurs in
    a) Epicotyl region b) Hypocotyl region c) Upper part of root d) Lower part of stem
64. The stele found in monocot is
    a) Haplostele b) Atactostele c) Dictyostele d) Actinostele
65. Largest number of chloroplast is found in
    a) Palisade tissue b) Spongy tissue c) Transfusion tissue d) Bundle sheath cells
66. Ground tissue includes
    a) All tissues except epidermis and vascular bundles
    b) Epidermis and cortex
    c) All tissues internal to endodermis
    d) All tissues external to endodermis
67. Cambium is present in between

a) Phloem and xylem
b) Permanent mature cells
c) Collenchyma and sclerenchyma
d) Collenchyma and parenchyma

68. All the following statements regarding sieve tube elements are true except
a) Their end walls have perforated sieve plates which become impregnated with lignin at maturity
b) They possess peripheral cytoplasm as well as a large vacuole
c) Distinct proteinaceous inclusions, the P-proteins are seen evenly distributed throughout the lumen
d) Long, slender, tube-like structures arranged in longitudinal series

69. 'Exarch' is the condition of vascular bundles in which
a) Protoxylem lies toward the outside and metaxylem lies inward
b) Metaxylem lies toward the outside and protoxylem lies inward
c) Metaxylem lies toward the lateral side and protoxylem lies inward
d) Protoxylem lies toward the lateral side and metaxylem lies inward

70. Select the correct statements
I. Epidermal call have small amount of cytoplasm and a large vacuole
II. Waxy layer cuticle is absent in roots
III. Root hairs are unicellular, while stem hairs/trichomes are multicellular
IV. Trichomes are branched/unbranched, soft/stiff and secretory or transpiration preventive
V. Guard cells are dum-bell-shaped in dicots and bean-shaped in monocots (*e.g.*, grass)
a) All except I and II
b) All except III
c) All except II and IV
d) All except IV

71. In dicot root, the vascular cambium are
a) Completely secondary in origin
b) Completely primary in origin
c) Secondary as well as primary in origin
d) Does not exist

72. I. Annual rigs are formed as a result of seasonal environmental conditions
II. Tracheids/vessels elements are larger during periods when water is abundant
III. Tracheids/vessels elements have thicker wall during periods of water deprivation
IV. Wood formed in the previous years is darker than newer wood
Select the combination of correct statements from the options given below
a) I and II
b) II and IV
c) I, II and III
d) II, III and IV

73. Select the incorrect statements
I. Excessive loss of water is prevented by epidermis
II. Stomata develop from epidermal tissue
III. Photosynthesis is one of the primary function of leaf ground tissue
a) I and II
b) II and III
c) III and I
d) None of the above

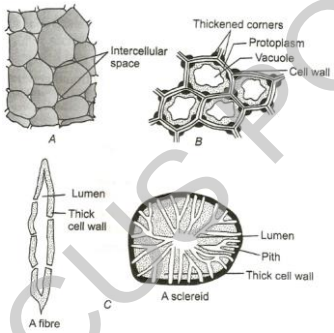
74. Which element of xylem is the characteristic feature of angiosperms?
a) Tracheids
b) Phloem
c) Vessels
d) Xylem fibre

75. As compared to the dicot root, monocotyledon root have
a) More xylem bundles
b) More phloem bundles
c) Less phloem bundles
d) Less xylem bundles

76. The function of a vessel is conduction of
a) Food
b) Water and minerals
c) Hormones
d) All of these

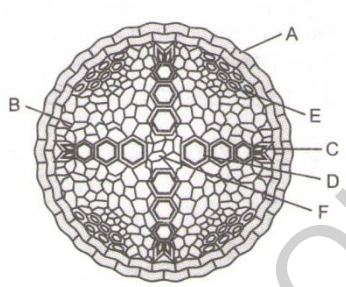
77. Complex tissue includes
a) Collenchyma
b) Apical meristem
c) Conducting tissue
d) Idioblast

78. Identify the types of simple tissue given in the diagram *A*, *B* and C



a) A-Parenchyma, B-Sclerenchyma, C-Collenchyma
b) A-Parenchyma, B-Collenchyma, C-Sclerenchyma
c) A-Sclerenchyma, B-Collenchyma, C-Parenchyma
d) A-Sclerenchyma, B-Parenchyma, C-Collenchyma

79. In the diagram of TS of stele of dicot root, the different parts have been indicated by alphabets, choose the answer in which these alphabets correctly match with the parts they indicate.



a) 1. Endodermis, B- Conjuctive tissue, C- Metaxylem, D- Protoxylem, E- Phloem, F- Pith
b) 1. Endodermis, B- Pith, C- Protoxylem, D- Metaxylem, E- Phloem, F- Conjuctive tissue
c) 1. Pericycle, B- Conjuctive tissue, C- Metaxylem, D- Protoxylem, E- Phloem, F- Pith
d) 1. Endodermis, B- Conjuctive tissue, C- Protoxylem, D- Metaxylem E- Phloem, F- Pith

80. The layer of cells outside the phloem meant for giving rise to the root branches is called
a) Cambium b) Carpus c) Endodermis d) Pericycle

81. Arrange the following plants in ascending order based on the number of xylem strands in their roots.
I. *Trapa* II. *Pisum* III. *Castanea* IV. *Nicotiana*
a) II, IV, III, and I b) III, IV, II, and I c) IV, III, I, and II d) I, IV, II and III

82. 'Quiescent centre theory' was proposed by
a) Nagelli b) Schmidt c) Hanstein d) Clowes

83. In an annual ring, the light coloured part is known as
a) Early wood b) Late wood c) Heartwood d) Sapwood

84. In roots the
a) Protoxylem lies towards the periphery
b) Metaxylem lies towards the pith (centre)
c) Both (a) and (b)
d) Endarch condition is found

85. Epidermis is often covered with a waxy thick layer called
a) Cuticle b) Suberin c) Supporting cell d) All of these

86. I. Protection of internal tissue
II. Prevention of entry of any harmful organism
III. Minimising surface transpiration
IV. Protection against excessive heating up
These are the functions of which of the following?
a) Epidermis b) Cortex c) Hypodermis d) Cuticle

87. In a woody dicotyledonous tree, which of the following parts will mainly consist of primary tissues?
a) Stem and root b) All parts

c) Shoot tips and root tips
d) Flowers, fruits and leaves

88. Old stem on *Combretum* has
a) Inter and intraxylary phloem
b) Inter and extraxylary phloem
c) Intra and extraxylary phloem
d) All of the above

89. Atactostele type of stele is found in
a) Dicot
b) Monocots
c) Both (a) and (b)
d) Only in gymnosperm

90. I. Sieve tube conduct organic food longitudinally
II. Xylem parenchyma cells stores food and help in lateral conduction of sap
Select the correct option
a) I is incorrect, but II is correct
b) II is incorrect, but I is correct
c) I and II are correct
d) I and II are incorrect

91. Growth rings are formed due to activity of
a) Extrastelar cambium b) Intrastelar cambium c) Interstelar cambium d) Both (b) and (c)

92. Water impermeable, waxy material secreted by endodermal cells is called
a) Lignin b) Suberin c) Conjuctive tissue d) Pectin

93. Tyloses are balloon-like ingrowths in vessels developing from the adjoining
a) Fibres through pits on vessel wall
b) Fibres through the general surface of vessel wall
c) Parenchyma through pits on vessel wall
d) Parenchyma through the general surface of vessel wall

94. Select the correct statement from the following
a) The cells of the permanent tissue do not generally divide
b) Permanent tissues having all cells similar in structure and function are called simple tissues
c) Permanent tissues having many different types of cells are called complex tissues
d) All of the above

95. Tissues involved in secondary growth is/are
I. intercalary stem
II. vascular cambium
III. cork cambium
Select the correct options from below
a) I and II b) II and III c) I and III d) I, II and III

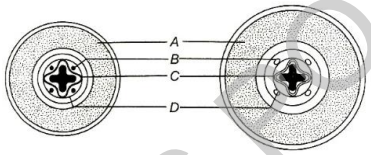
96. Which is a characteristic of dicots?
a) Roots develop from radicle
b) Secondary growth usually absent
c) Floral parts in multiple of three
d) Parallel leaf veins

97. Identify the plant parts whose transverse section shows a clear and prominent pith.
a) Dicot and monocot stems
b) Dicot stem and monocot root
c) Dicot and monocot roots
d) Dicot stem and dicot root

98. A tree grows at the rate of 0.5 m per year. What will be the height of the board fixed at 1.5 m above the base five years ago?
a) 4.0 m b) 3.5 m c) 1.5 m d) 4.5 m

99. Mesophylls of monocotyledon leaf are not differentiated into
a) Palisade tissue
b) Spongy parenchyma
c) Bulliform cells
d) Both (a) and (b)

100. In the given diagram of secondary growth of dicot root, identify *A* to *D* and choose the correct option



a) A-Cortex, B-Primary phloem, C-Cambial ring, D-Protoxylem
b) A-Cortex, B-Primary phloem, C-Cambial ring, D-Pericycle
c) A-Cortex, B-Primary phloem, C-Primary xylem, D-Pericycle
d) A-Cortex, B-Primary phloem, C-Primary xylem, D-Protoxyleme

101. Anatomically fairly old dicotyledonous root is distinguished from the dicotyledonous stem by
a) Absence of secondary xylem
b) Absence of secondary phloem
c) Presence of cortex
d) Position of protoxylem

102. Dendrochronology is
a) Secondary growth
b) Apical growth
c) Seasonal variation
d) Determination of age of tree

103. Vascular tissues in flowering plants develop from
a) Phellogen
b) Plerome
c) Periblem
d) Dermatogen

104. In dicot, leaves, protoxylem elements
a) Face toward the abaxial surface
b) Face toward adaxial side
c) Are surrounded by metaxylem
d) Are scattered in the middle

105. The wood with lower density is ...A... and that of higher density is ...B...
Choose the correct combination of options for A and B
a) A-autumn wood; B-spring wood
b) A-spring wood; B-autumn wood
c) A-autumn wood; B-blate wood
d) A-spring wood; B-early wood

106. The protoxylem and metaxylem in the stem lies towards
a) The pith and root centre, respectively
b) The periphery and root centre, respectively
c) The root centre and periphery of organ, respectively
d) The pith and periphery of organ, respectively

107. Central part of root occupied by parenchymatous (thin or thick walled) cells is called
a) Pith
b) Endodermis
c) Pericycle
d) Meristem

108. The histogens are classified on the basis of
a) Cells they contain
b) Cells they give rise to future tissue
c) Meristematic activity
d) Cell division

109. Which tissue gives rise to secondary growth?
a) Apical meristem
b) Adventitious roots
c) Germinating seed
d) Vascular cambium

110. Generally the silica is deposited on the free sides of
a) Dorsiventral leaves
b) Monocotyledonous leaves
c) Isobilateral leaves
d) Both (b) and (c)

111. Monocot root differ from dicot root because of
a) Radial vascular bundle
b) Large and well-developed pith
c) Polyarch xylem bundle
d) Both (b) and (c)

112. The vascular bundle, where the phloem is surrounded by xylem is known as
a) Amphivasal
b) Bicollateral
c) Amphicribal
d) Radial

113. In rhizome of *Pteridium*, stele, which is composed of two or more than two concentric rings of vascular bundles is called
a) Polycyclic
b) Siphonostele
c) Ectophloic siphonostele
d) Cladosiphonostele

114. Stomatal apparatus consists of

a) Stomatal aperture b) Guard cell c) Subsidiary cells d) All of these

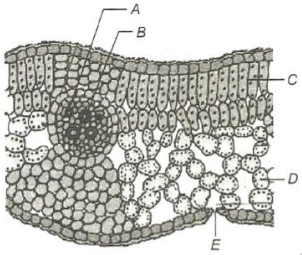
115. The apical meristem of the root is present
a) Only in adventitious root b) In all the roots
c) Only in radicals d) Only in tap roots

116. Among the following attributes of xylem, which are mainly mechanical in function?
a) Xylem fibre b) Xylem parenchyma c) Tracheids d) Vessels

117. The quiescent centre in root meristem serves as a
a) Site for storage of food which is utilized during maturation
b) Reservoir of growth hormones
c) Reserve for replenishment of damaged cells of the meristem
d) Region for absorption of water

118. On the basis of their structure and location, tissue system is of …… in plants
a) 2 types b) 3 types c) 4 types d) 5 types

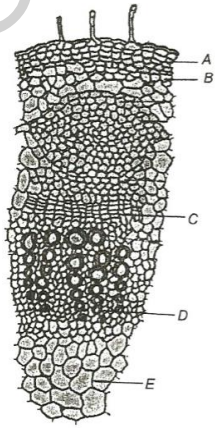
119. In the given TS dicot leaf, identify *A* to *E* and choose the correct option



a) A-Phloem, B-Xylem, C-Palisade mesophyll, D-Spongy mesophyll, E-Stomata
b) A-Phloem, B-Xylem, C-Palisade mesophyll, D-Spongy mesophyll, E-Stomata
c) B-Xylem, A-Phloem, C-Palisade mesophyll, D-Spongy mesophyll, E-Stomata
d) B-Xylem, A-Phloem, C-Palisade mesophyll, D-Spongy mesophyll, E-Hydathodes

120. In the previous question
The diagram I stomata belongs to …A…
The diagram II stomata belongs to …B…
a) A-monocots leaf; B-dicots b) A-dicots leaf; B-monocots
c) A-angiosperm; B-gymnosperm d) A-gymnosperm; B-angiosperm

121. Identify *A* to *E* in the given diagram and choose the correct option



a) A-Collenchyma, B-Sclerenchyma, C-Cambium, D-Protoxylem, E-Pith
b) A-Sclerenchyma, B-Collenchyma, C-Cambium, D-Protoxylem, E-Pith
c) A-Parenchyma, B-Collenchyma, C-Cambium, D-Protoxylem, E-Pith
d) A-Collenchyma, B-Parenchyma, C-Cambium, D-Protoxylem, E-Pith

122. Lateral roots develop from primordia originated by the division of
a) Pericycle cells lying opposite to protoxylem points
b) Pericycle cells lying between two protoxylem points
c) Endodermal cells lying between two protoxylem points

d) Endodermal cells lying opposite to protoxylem points

123. Companion cells in plants are associated with
a) Vessels b) Sperms c) Sieve elements d) Guard cells

124. Science, which deals with the study of ageing is known as
a) Teratology b) Gerontology c) Limnology d) Palaeontology

125. The term leptome is used for
a) Xylem b) Phloem c) Endodermis d) Pericycle

126. Grass elongates after cutting (moving) due to
a) Primary meristem b) Secondary meristem
c) Apical meristem d) Intercalary meristem

127. Which of the following would be in significant amount in xylem sap?
a) Sugar b) Nitrates c) Phosphates d) Water

128. The secondary meristem initiates
a) Basal growth b) Transverse growth c) Radial growth d) Vertical growth

129. Xylem fibres are made up of
a) Sclerenchyma cells with thin walls
b) Sclerenchyma cells with thick wall
c) Parenchyma cells with thin wall
d) Sclerenchyma cells with no obliteration in central lumen

130. Removal of ringwood of tissue outside the vascular cambium from the tree trunk kills it because
a) Water cannot move up
b) Food does not travel down and root become starved
c) Shoot become starved
d) Annual rings are not produced

131. Prickles
I. don't have vascular supply
II. are epidermal in origin
III. help in climbing
Select the right combination of statements from the given options
a) I and II b) II and III c) I and III d) I, II and III

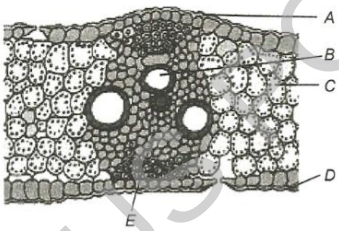
132. Which one of the following is well-developed present in hydrophytes?
a) Aerenchyma b) Collenchyma c) Stomata d) Root system

133. In dicot stem, secondary growth is due to the activity of
a) Apical meristem b) Lateral meristem c) Cork d) Bark

134. The meristem responsible for extra stelar secondary growth in dicot stem is
a) Interfascicular cambium b) Intrafascicular cambium
c) Intercalary meristem d) Phellogen

135. Casparian thickenings are found in the cells of
a) Pericycle of the root b) Endodermis of the root
c) Pericycle of the stem d) Endodermis of the stem

136. In the given TS of monocot leaf, identify *A* to *E*. Choose the correct option



a) A-Abaxial epidermis, B-Xylem, C-Mesophyll, D-Adaxial epidermis, E-Phloem
b) A-Abaxial epidermis, B-Phloem, C-Mesophyll, D-Adaxial epidermis, E-Xylem

c) A-Adaxial epidermis, B-Phloem, C-Mesophyll, D-Abaxial epidermis, E-Xylem
d) A-Adaxial epidermis, B-Xylem, C-Mesophyll, D-Abaxial epidermis, E-Phloem

137. Length of petiole increases due to division of
a) Apical meristem b) Lateral meristem c) Intercalary meristem d) All of these

138. Phytotron is
a) A controlled condition chamber for tissue
b) Leaf culture process
c) Special culture of plants
d) Root culture process

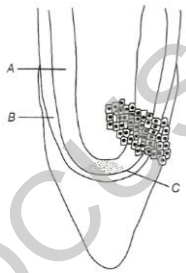
139. The tissue which perpetuates itself by active cell division is
a) Permanent tissue b) Ground tissue c) Meristematic tissue d) Vascular tissue

140. Amphivasal vascular bundle possess
a) Xylem around phloem
b) Phloem around xylem
c) Phloem on both sides of xylem
d) Phloem towards centre and xylem towards periphery

141. Trichomes are epidermal hairs of
a) Primary root b) Primary stem c) Primary leaves d) Secondary root

142. I. Protection of internal tissues
II. Protection leaves from microbes
III. Gaseous exchange
IV. Reduction in the rate of transpiration through epidermal cells due to trichomes
Which of the function of epidermis is/are relevant from the above given statements?
a) Only II b) I and II c) II and III d) I, II, III and IV

143. Identify *A*, *B* and *C* indicated in diagram of root apex given below



a) A-Vascular bundle, B-Epidermis, C-Root apical meristem
b) A-Cortex, B-Epidermis, C-Root apical meristem
c) A-Cortex, B-Protoderm, C-Root apical meristem
d) A-Cortex, B-Epidermis, C-Root apical meristem

144. In flowering plants, the main water transporting elements are
a) Tracheids b) Vessels c) Fibres d) Both (a) and (b)

145. The vertical section of a dorsoventral leaf through the lamina shows three main parts namely, epidermis, …A… and vascular system. The epidermis, which covers the upper surface is …B… and lower surface is covered by …C… of the leaf.
Choose the correct combination of A, B and C
a) A-mesophyll, B-adaxial epidermis, C-abaxial epidermis
b) A-endodermis, B-adaxial epidermis, C-abaxial epidermis
c) A-endodermis, B-abaxial epidermis, C-adaxial epidermis
d) A-mesophyll, B-abaxial epidermis, C-adaxial epidermis

146. I. Epidermis
II. Mesophyll
III. Vascular system
Which of the above component is made up of parenchyma and have chlorphyll?
a) I and II b) Only I c) Only III d) Only II

147. Which of the following is not a part of epidermal tissue system?

a) Companion cells b) Trichomes c) Root hairs d) Guard cells

148. Which of the following statements is true?
a) The collenchyma occurs in layers below the epidermis in monocotyledonous plants
b) Sclerenchyma cells are usually dead and without protoplasts
c) Xylem parenchyma cells are living and thin-walled and their cell walls are made up of lignin
d) The companion cells are specialised sclerenchymatous cells

149. The age of tree by counting annual rings is called
a) Dendrochronology b) Ageing c) Chronology d) Countrology

150. Lignification is associated with
a) Xylem b) Phloem c) Parenchyma d) Chlorenchyma

151. Conducting tissue for the transport of water and minerals from the roots to the stems and leaves is called
a) Xylem b) Phloem c) Parenchyma d) Collenchyma

152. Abaxial surface of the leaf generally bears
a) Less stomata than adaxial epidermis b) More stomata than adaxial epidermis
c) Equal stomata than adaxial epidermis d) Hairs to absorb the minerals

153. Open vascular bundles
a) Have cambium in between the primary and secondary xylem
b) Have cambium in between the primary and secondary phloem
c) Have cambium in between the xylem and phloem
d) Don't have cambium in between xylem and phloem

154. The lacunae in vascular bundle of monocot stem is
a) Amucilage canal b) A large-sized vessel
c) Lysigenous water cavity d) Metaxylem

155. Complementary cells are associated with
a) Lenticels b) Hydathodes c) Rhytidome d) Bark

156. In which of the following, root system is poorly developed?
a) Phaene b) *Hydrilla* c) Halophyte d) Xerophyte

157. Heartwood differs from sapwood in
a) Presence of rays and fibres b) Absence of vessels and parenchyma
c) Having dead and non-conducting elements d) Being susceptible to pests and pathogens

158. The sclerenchyma of the hypodermis in the *Pinus* needle helps in
a) Increasing the absorptive surface of the cell b) Checking transpiration
c) Mechanical support d) Photosynthesis

159. Which one of the following is not a lateral meristem?
a) Intrafascicular cambium b) Interfascicular cambium
c) Phellogen d) Intercalary meristem

160. In dicot stem, vascular bundles are
a) Numerous scattered b) Arranged in a ring
c) Without cambium d) Surrounded by bundle sheath

161. Which of the following statements are true?
I.Uneven thickening of cell well is characteristic of sclerenchyma.
II.Periblem forms the cortex of the stem and the root.
III.Tracheids are the chief water transporting elements in gymnosperms.
IV.Companion cell is devoid of nucleus at maturity.
V.The commercial cork is obtained from *Quercus suber*.
a) I and IV b) II and V c) III and IV d) II, III and V

162. Which of the above following are simple tissues?
I. Parenchyma
II. Collenchyma
III. Sclerenchyma

a) I and II b) II and III c) I and III d) I, II and III

163. Non-articulated laticifers are found in
a) *Nerium* b) *Papaver* c) *Hevea* d) *Achras*

164. I. Epidermal cells
II. Stomata
III. Trichomes
IV. Root hairs
These are the attributes of
a) Epidermal tissue system b) Ground tissue system
c) Fundamental tissue system d) Vascular tissue system

165. The large empty and colourless cells present at intervals on the upper surface of grass leaf are called
a) Bulliform cells b) Palisade parenchyma
c) Spongy parenchyma d) Accessory cells

166. Velamen is found in
a) *Vanda* b) *Rosa* c) *Viscum* d) *Santalum*

167. The functions of sieve tubes are controlled by
a) Cytoplasm of sieve tube cells b) Nucleus of sieve tube cells
c) Nucleus of companion cells d) Cytoplasm of companion cells

168. Which of the following have sunken stomata?
a) *Nerium* b) *Mangifera* c) *Hydrilla* d) *Zea mays*

169. The meristem, in which the cells divide in several planes is
a) Plate meristem b) Rib meristem c) Mass meristem d) Lateral meristem

170. Cambium activity is highest in
a) Autumn b) Spring c) Winter d) Rain

171. During the formation of primary plant body specific regions of apical meristem produces
a) Dermal tissue b) Ground tissue c) Vascular tissue d) All of these

172. Vascular bundle, in which two patches of phloem are present on both sides of xylem is
a) Collateral b) Bicollateral c) Concentric d) Radial

173. Vascular bundle with cambium is called
a) Closed b) Open c) Exarch d) Endarch

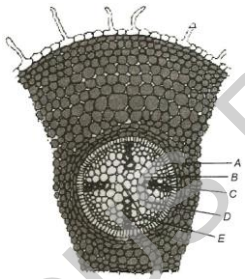
174. Compound sieve plates are found in
a) *Cucurbita* b) *Vitis* c) *Magnolia* d) *Corchorus*

175. From evolutionary point of view, tracheids and sieve cells are more primitive than tracheae and sieve tubes respectively. The angiosperms have
a) Tracheae and sieve tubes b) Tracheids, tracheae and sieve tubes
c) Tracheae, sieve cells and sieve tubes d) Tracheids, tracheae and sieve cells

176. I. Phloem transports the food materials usually from the leaves to other parts of the plant
II. Phloem in the angiosperm is composed of sieve tube elements, companion cells, phloem parenchyma and phloem fibres
Identify which of the following statement is correct and select the correct option
a) I and II are correct b) I and II are incorrect
c) I is correct, but II is incorrect d) II is correct, but I is incorrect

177. The outermost layer of dicotyledonous root is called
a) Cortex b) Epidermis c) Cambium d) Periderm

178. Identify *A* to *E* in the given diagram



a) A-Endodermis, B-Pericycle, C-Protoxylem, D-Metaxylem, E-Pith
b) A-Endodermis, B-Pericycle, C-Protoxylem, D-Pith, E-Metaxylem
c) A-Endodermis, B-Pericycle, C-Pith, D-Protoxylem, E-Metaxylem
d) A-Endodermis, B-Pith, C-Pericycle, D-Protoxylem, E-Metaxylem

179. Choose the wrong statement from the following
a) Axillary/terminal bud develops from apical meristem
b) Merismatic activity occurs at stem apex/root apex
c) Permanent tissues are produced by primary and secondary meristem
d) None of the above

180. I. It is resistant to microorganisms
II. It comprises dead elements
III. It comprises highly lignified cell wall
IV. It is the peripheral part
V. It is dark and tough
Which of the above property doesn't belongs to heart wood?
a) I and II b) Only IV c) Only V d) III and I

181. Tracheids
a) Are the dominant cell types of xylem in angiosperms
b) Are primarily found in mosses and liverworts
c) Are responsible for water conduction and support in many land plants
d) First appeared during Palaeozoic era

182. I. Usually cortex of stem is formed the during secondary growth of the stem
II. It is a couple of layer thick
III. It is made up of thin walled rectangular cells
Select the incorrect statements
a) I and II b) II and III c) I and III d) None of these

183. Jute is mainly composed of
a) Xylem b) Secondary bast fibre c) Phloem d) Cortex

184. Which of the following cells are studied during translocation of solutes?
a) Sieve tube cells b) Companion cells c) Phloem fibre d) Xylem fibre

185. Stelar regions are formed from
a) Periblem b) Plerome c) Dermatogen d) Tunica

186. Casparian strips are present in the …… of the root.
a) Epiblema b) Cortex c) Pericycle d) Endodermis

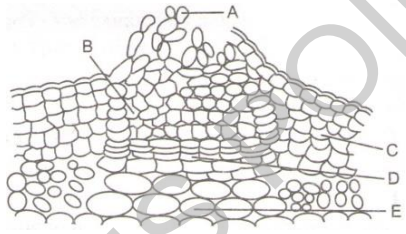
187. Cork cambium gives rise to
a) Phellogen and secondary cortex
b) Phellogen, phelloderm and secondary cortex
c) Cork and phellogen
d) Cork and secondary cortex

188. Simple sieve plate with single perforation is present in
a) *Cucurbita* b) *Prunus* c) *Pyrus* d) *Vitis*

189. Root caps are absent in
a) Mesophytes b) Xerophytes c) Hydrophytes d) Lithophytes

190. Which cells possess chloroplast and regulate the opening and closing of stomata?
a) Cuticle cell b) Stomatal cell c) Guard cell d) Subsidiary cell

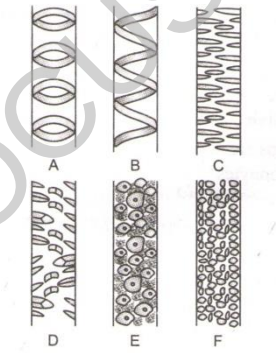
191. Bamboo and grasses elongate by the activity of
a) Secondary meristem b) Lateral meristem c) Apical meristem d) Intercalary meristem
192. At maturity, the sieve plates become impregnated with
a) Cellulose b) Pectin c) Suberin d) Callose
193. Cells of collenchyma have thickened corners due to the deposition of
a) Cellulose b) Hemicellulose c) Pectin d) All of these
194. Complex tissues are
a) Made up of more than one kind of cells
b) Xylem and phloem
c) Both (a) and (b)
d) None of the above
195. In a vascular bundle, if xylem vessels develop in a centripetal fashion, the xylem is likely to be
a) Mesarch b) Centrarch c) Endarch d) Exarch
196. In monocot roots, which type of vascular bundles are found?
a) Collateral, conjoint and closed b) Radial with exarch xylem
c) Bicollateral, conjoint and closed d) Radial with endarch xylem
197. All the tissues on the innerside of the endodermis constitutes together to form
a) Vascular bundle b) Conjuctive tissue c) Pith d) Stele
198. The cork is impervious to water due to
a) Lignin deposition in the cell wall
b) Compactness of cell
c) Suberin deposition in the cell wall
d) All of the above
199. I. Vascular tissue
II. Cork cambium
III. Xylem and phloem elements
IV. Parenchyma and sclerenchyma
Choose the correct combination for heterogenous tissue
a) I and II b) II and IV c) II and III d) Only III
200. Vascular bundle having phloem at the centre encircled by xylem is known as
a) Bicollateral b) Conjoint collateral c) Amphivasal d) Amphicribral
201. In dicotyledonous root, the cortex consists of
a) Sclerenchymatous tissue b) Collenchymatous tissue
c) Parenchymatous tissue d) Endodermis tissue
202. Which of the following is true?
a) Vessels are unicellular and with narrow lumen
b) Vessels are multicellular and with wide lumen
c) Tracheids are unicellular and with wide lumen
d) Tracheids are multicellular and with narrow lumen
203. Choose the correct combination of labelling of a lenticels



a) **A**-Pore, **B-** Secondary cortex, **C-**Cork cambium, **D-** Cork, **E-**Complementary cells
b) **A**-Pore, **B**- Cork cambium, **C-** Cork, **D-** Secondary cortex, **E-** complementary cells
c) **A**-Pore, **B-**Cork, **-** Complementary cells **D-** Cork cambium, **E-** Secondary cortex,
d) **A**-Pore, **B-** Complementary cells , **C-** Cork, **D-** Cork cambium, **E-** Secondary cortex,

204. Meristematic tissue in vascular bundle is
    a) Phellem
    b) Procambium
    c) Interfascicular cambium
    d) Fascicular cambium

205. The following diagrams show the types of secondary thickening in the xylem vessels. Identify the types labelled from A to F. Choose the correct option from those given.



    a) A-Spiral, B-Annular, C-Reticulate, D-Scalariform, E-Pitted with border, F-Pitted, simple
    b) A-Annular, B-Spiral, C-Scalariform, D-Reticulate, E-Pitted with border, F-Pitted, simple
    c) A-Annular, B-Spiral, C-Scalariform, D-Reticulate, E-Pitted, simple, F-Pitted with border
    d) A-Spiral, B-Annular, C-Scalariform, D-Reticulate, E-Pitted with border, F-Pitted, simple

206. P-proteins are associated with
    a) Sieve tube elements
    b) Xylem parenchyma
    c) Trichomes
    d) Tracheids and vessels

207. A bicollateral vascular bundle has the following arrangement of tissues.
    a) Outer phloem → Outer xylem → Middle cambium → Inner xylem →Inner phloem
    b) Outer cambium → Outer phloem → Middle xylem → Inner phloem → Inner cambium
    c) Outer phloem → Outer cambium → Middle xylem → Inner cambium → Inner phloem
    d) Outer xylem → Outer cambium → Middle phloem → Inner cambium → Inner xylem

208. Permanent or mature cells are formed by
    a) Cell division in the primary meristem
    b) Cell division in the secondary meristem
    c) Both (a) and (b)
    d) Specialisation of secondary meristem

209. Intercalary meristem results in
    a) Secondary growth
    b) Primary growth
    c) Apical growth
    d) None of these

210. Mark the correct sequence of layers found in root anatomy.
    a) Epiblema, cortex, endodermis, pericycle
    b) Cortex, epiblema, pericycle, endodermis
    c) Epiblema, cortex, pericycle, endodermis
    d) Cortex, epiblema, endodermis, epidermis

211. In monocot stem, which of the following is absent?
    a) Endodermis
    b) Hypodermis
    c) Cortex
    d) Both (a) and (b)

212. Consider the following statements and choose the correct option.
    I.The thread like cytoplasmic strands, running from one cell to other is known as plasmodesmata.
    II.Xylem and phloem constitute the vascular bundle of the stem.
    III.The first formed xylem elements are described as metaxylem.
    IV.Radial vascular bundles are mainly found in the leaves.
    a) I is true, but II, III and IV are false
    b) II is true, but I, III and IV are false
    c) III is true, but I, II and IV are false
    d) I and II are true, but III and IV are wrong

213. In the leaf, vascular bundles are found in the
    a) Veins
    b) Palisade tissues
    c) Lower epidermis
    d) Upper epidermis

214. The annular and spirally thickened conducting elements generally develop in the protoxylem when the root or stem is

a) maturing b) Elongating c) widening d) Differentiating

215. Damaged sieve tubes are sealed by deposition of
a) Pectin b) Callose c) Suberin d) Lignin

216. Arrange the following in the order of their location from periphery to centre in the entire dicotyledonous plant body.
I. Fusiform cells II. Trichoblasts III. Collocytes IV.Tyloses
a) IV , I, II, III, b) II , III , I, IV c) III , II, I, IV d) I , IV, III, II

217. Cork tissue arises from
a) Periderm b) Phellogen c) Phelloderm d) Phellem

218. As secondary growth proceeds in a dicot stem, the thickness of
a) Sapwood increases
b) Heartwood increases
c) Both sapwood and heartwood increase
d) Both sapwood and heartwood remains the same

219. A mature sieve tube differs from a vessel in
a) Lacking a functional nucleus b) Absence of lignified walls
c) Being nearly dead d) Lacking cytoplasm

220. Cork cambium of dicot originates from
a) Epiblema b) Pericycle
c) Cambium of vascular bundles d) Endodermis

221. Parenchymatous cells are usually present in the
I. pericycle
II. pith
III. medullary rays
IV. primary root
V. secondary root
VI. primary stem
VII. secondary stem
Select the correct combinations from the given options
a) All except I and III b) All except V and VII
c) All except II and IV d) All except VI and III

222. What differentiates leaf of dicots from monocots?
a) Parallel venation
b) Differentiation of palisade and spongy parenchyma
c) Stomata only on upper side
d) Stomata both on upper and lower sides

223. In dicotyledonous root
a) 3 to 6 xylem and phloem patches are found
b) 4 to 8 xylem and phloem patches are found
c) 2 to 4 xylem and phloem patches are found
d) 5 to 6 xylem and phloem patches are found

224. Simple tissues which occurs in layers below the epidermis in dicotyledonous plants are
a) Simple parenchyma b) Complex parenchyma
c) Collenchyma d) Simple tissue

225. Intercalary meristem is found between the
a) Mature tissue b) Apical root meristem
c) Shoot meristem d) Two nodes

226. Maximum number of vascular bundles are present in
a) Monocot stem b) Monocot root c) Dicot stem d) Dicot root

227. Identify A to E in the given TS of dicot stem and choose the correct option



a) A-Hypodermis, B-Chlorenchyma, C-Endodermis, D-Pericycle, E-Medullary rays
b) A-Hypodermis, B-Parenchyma, C-Endodermis, D-Pericycle, E-Medullary rays
c) A-Hypodermis, B-Sclerenchyma, C-Endodermis, D-Pericycle, E-Medullary rays
d) A-Hypodermis, B-Sclerenchyma, C-Endodermis, D-Pericycle, B-Parenchyma

228. In dicot root, the cork cambium is formed with the help of
a) Cortex b) Pericycle c) Epidermis d) Endodermis

229. Quiescent centre is a
a) Weak zone b) Active zone c) Inactive d) Strong base

230. In monocot stem, the hypodermis is
a) Parenchymatous b) Sclerenchymatous
c) Collenchymatous d) Meristematic

231. Bulliform cells are the modification of
a) Abaxial epidermis cell b) Adaxial epidermis cell
c) Mesophyll d) Vascular tissue

232. In dicot stem, secondary xylem lie towards the …A… and secondary phloem lie towards the …B… .
Choose the correct combination of options for A and B
a) A-pith; B-periphery b) A-periphery; B-pith
c) A-periphery; B-laterally d) A-pith; B-laterally

233. In which of the following, the phloem is located only on the outer side of the xylem
a) Open vascular system b) Closed vascular system
c) Conjoint vascular system d) Radial vascular system

234. Which meristem is responsible for the production of secondary tissues?
a) Primary meristem b) Root apical meristem
c) Shoot apical meristem d) Secondary meristem

235. Wood is
a) Primary phloem b) Primary xylem c) Secondary xylem d) Secondary phloem

236. Sclerenchyma mainly provides
a) Storage tissue to the plants
b) Mechanical support to the organs of plants
c) Secretory tissue to the plants
d) Strength to monocot plants, specially their abundance in the layers below the epidermis

237. Bicollateral conjoint vascular bundles have
a) Xylem and phloem, which are arranged in an alternate manner on different radii
b) Xylem and phloem, which are situated at the same radius and it has two groups of phloem along the two sides of xylem (inside and outside)
c) Xylem and phloem in same radius but it has only one group phloem outside the xylem
d) Phloem surrounds the xylem tissues

238. I. Made up of sclerenchymatous cells
II. Generally absent in primary phloem
III. Much elongated and pointed
Given above characters belongs to which of the following?
a) Phloem fibre b) Xylem fibre c) Companion cells d) Sieve cells

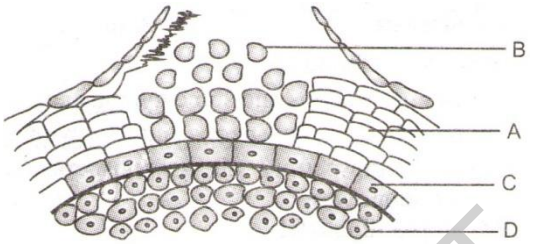
239. I. It is made up of elongated, compactly arranged cells
II. It is usually single layered

III. It is parenchymatous
IV. Large vacuole is present
Which of the above characters belong to the epidermis?
a) All except I b) All except III and IV c) All except II d) All of these

240. I. They may be branched or unbranched and soft or stiff
II. They may be secretory and help in preventing water loss due to transpiration
Which of the above characteristics belongs to trichomes
a) Only I b) Only II c) I and II d) None of these

241. In young stem, the vascular cambium is
a) Single layered b) Bilayered c) Trilayered d) Does not exist

242. In the diagram of lenticel, identify the parts indicated as A, B, C, D



a) A-Phellem, B-Complementary cell, C-Phellogen, D-Phelloderm
b) A-Phellem, B-Complementary cells, C-Phelloderm, D-Periderm
c) A-Complementary cells, B-Phellogen, C-Phelloderm, D-Periderm
d) A-Complementary cells, B-Phellem, C-Periderm, D-Phelloderm

243. Fascicular, interfascicular and extra-stelar cambium together constitutes
a) Ground meristem b) Apical meristem c) Intercalary meristem d) Lateral meristem

244. Secondary phloem remains functional generally
a) For one year b) For less than one year
c) For many years d) As long as plant is alive

245. New protective layers formed after the crushing or breaking of cortical and epidermal layers due to increase in the girth of stem by vascular cambium. These new layers collectively called as
a) Phellogen b) Cork cambium c) Periderm d) Phelloderm

246. Which of the following tissues consist of living cells?
a) Vessels b) Tracheids c) Companion cells d) Sclerenchyma

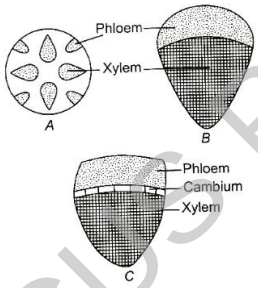
247. In barley stem, vascular bundles are
a) Open and scattered b) Closed and scattered
c) Open and in a ring d) Closed and radial

248. I. Pith is large and well-developed in monocots
II. Monocot root don't undergo any secondary growth
In accordance to the above statements, identify the correct one
a) I is incorrect, but II is correct
b) II is incorrect, but I is correct
c) I and II are incorrect
d) I and II are correct

249. Aerenchyma is helpful in plants by
a) Providing buoyancy in hydrophytes b) Absorption in stilt roots
c) Giving mechanical strength to plants d) Giving flexibility to plants

250. Cells having no power of cell division are formed by
a) Primary meristem b) Fascicular cambium c) Cork cambium d) All of these

251. Identify type of vascular bundle with respect to A, B and C figure



a) A-Conjoint closed, B-Conjoint open, C-Radial
b) A-Radial, B-Conjoint open, C-Conjoint closed
c) A-Radial, B-Conjoint closed, C-Conjoint open
d) A-Conjoint open, B-Conjoint closed, C-Radial

252. Velamen and spongy tissue is found in
a) Breathing roots
b) Parasitic roots
c) Tuberous roots
d) Epiphytic roots

253. In previous question, the given diagram is the TS of
a) Root and belongs to monocot
b) Stem and belongs to monocot
c) Root and belongs to dicot
d) Stem and belongs to dicot

254. I. Youngest secondary phloem is just outside the cambium, while youngest secondary xylem is present inside the cambium
II. Oldest secondary phloem is just inside the primary phloem, while oldest secondary xylem is just above pith
III. Secondary medullary ray passes through both secondary xylem and secondary phloem
Select the incorrect statement from above
a) I and II
b) II and III
c) III and I
d) None of these

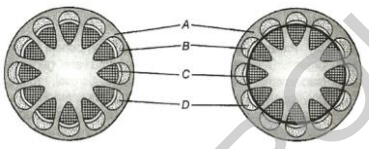
255. Collenchyma is
a) Living and contains protoplasm
b) Dead and hollow
c) Dead and filled with reserve food
d) Living and contains no reserve food

256. The stele is composed of
a) Vascular bundle
b) Pith and vascular bundle
c) Cortex and endodermis
d) Pith and cortex

257. Vascular cambium of dicot root originates from the tissue located just below…A… bundles, a portion of pericycle tissue above the …B… forming a complete continues wavy ring, which later becomes …C…
Choose the correct combination of options for A-C
a) A-xylem, B-protoxylem, C-circular
b) A-phloem, B-protoxylem, C-circular
c) A-phloem, B-metaxylem, C-circular
d) A-xylem, B-metaxylem, C-circular

258. Plant length is increased by
a) Apical meristem
b) Lateral meristem
c) Dermatogen
d) Periblem

259. Given below the diagram of secondary growth in dicot stem (diagrammatic). Identify *A* to *D*



a) A-Cortex, B-Secondary xylem, C-Secondary phloem, D-Vascular cambium
b) A-Cortex, B-Primary phloem, C-Vascular cambium, D-Primary xylem
c) A-Cortex, B-Primary xylem, C-Vascular cambium, D-Primary phloem
d) A-Cortex, B-Primary xylem, C-Vascular cambium, D-Primary phloem

260. Which one of the following is the correct sequence of tissues present in dicot stem during secondary growth?
a) Phellogen, cork, primary cortex, secondary cortex

b) Cork, primary cortex, secondary cortex, phellogen
c) Primary cortex, Secondary cortex, phellogen, cork
d) Secondary cortex, cork, phellogen, primary cortex

261. In dicotyledonous stem, the sequence of tissue from outside to inside is
a) Phellem → Endodermis → Pericycle → Phloem
b) Pericycle → Endodermis → Pericycle → Phloem
c) Xylem → Endodermis → Pericycle → Phloem
d) Stele → Endodermis → Pericycle → Pheloem

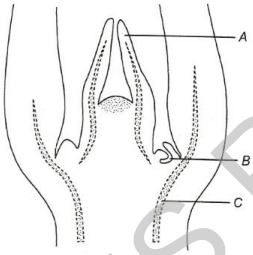
262. In grasses, certain adaxial epidermal cells along the veins modify themselves into large empty, colourless cells called
a) Bulliform cells b) Companion cells c) Guard cells d) Subsidiary cells

263. In grasses, the guard cells are
a) Kidney-shaped b) Sphere-shaped c) Dump-bell-shaped d) Bean-shaped

264. Heart wood and sapwood of dicot plants are respectively, called as
a) Duraman and alburnum b) Alburnum and duraman
c) Alburnum and phellogen d) Duramen and phellogen

265. Interxylary as well as intraxylary phloem is present in
a) *Bignonia* b) *Mirabilis* c) *Strychnos* d) *Achyranthes*

266. Identify *A*, *B* and *C* in the given diagram of shoot apical meritem



a) A-Leaf primordium, B-Axillary bud, C-Vascular bud
b) A-Leaf primordium, B-Axillary bud, C-Vascular tissue
c) A-Shoot primordium, B-Axillary bud, C-Vascular tissue
d) A-Shoot primordium, B-Apical bud, C-Vascular tissue

267. Simple permanent living tissues which are made up of thin-walled similar isodiametric cells are called
a) Parenchyma tissues b) Collenchyma tissues
c) Sclerenchyma tissues d) Meristematic tissues

268. Fusiform initial forms
a) Vascular rays b) Ray parenchyma c) Tracheary elements d) Primary phloem

269. Polyarch condition is found in which of the following?
a) Monocotyledonous stem b) Monocotyledonous leaves
c) Monocotyledonous roots d) Dicotyledonous stem

270. Apical meristems are present at the
a) Tips of roots b) Tips of shoots
c) Lateral sides of roots and shoots d) Both (a) and (b)

271. Plant cells that are photosynthetically active are found in the ...A... layer of leaves and are ...B... . Choose the correct combination of A and B from the below given options
a) A-mesophyll, B-parenchymatous b) A-mesophyll, B-collenchymatous
c) A-mesophyll, B-sclerenchymatous d) A-mesophyll, B-merismatic

272. Which of the following statement is correct?
I. Many organs of aquatic plants floats in water
II. Large air gaps are present in the collenchyma tissue of lotus leaf
a) I is correct, but II is incorrect b) II is correct, but I is incorrect
c) I and II are correct d) I and II are incorrect

273. I. Tracheids
II. Vessels
III. Fibres
IV. Parenchyma
All the above structures are the attributes of
a) Xylem b) Phloem c) Meristem d) Vascular tissue

274. Lamellar collenchyma is seen in the stem of
a) *Cucurbita* b) *Leucas* c) *Sambuscus* d) *Monstera*

275. During secondary growth new meristematic tissues arrising in the cortical region of the stem are called
a) Phellem b) Phelloderm c) Secondary cortex d) Phellogen

276. I. Monocot root
II. Dicot stem
III. Monocot stem and dicot root
IV. Dicot stem and dicot root
V. Dicot root
Which of the above have well-developed pith?
a) I and II b) III and IV c) IV and V d) II and III

277. The cork cambium, cork and secondary cortex are collectively called
a) Phellogen b) Periderm c) Phellem d) Phelloderm

278. Sunken stomata is found in leaves of
a) *Trifolium* b) *Lemna* c) *Nerium* d) *Lilium*

279. A vascular bundle without pith is
a) Protostele b) Siphonostele c) Solenostele d) None of these

280. A leaf primordium grows into adult leaf lamina
a) At first by apical meristem and later largely by marginal meristems
b) By apical meristem
c) By lateral meristem
d) By marginal meristem

281. The vascular cambial ring of dicot stem is
a) Primary in origin
b) Secondary in origin
c) Embryonic in origin
d) Partly primary and partly secondary in origin

282. Mesophyll is a tissue which is present in leaf
a) Between the upper and lower epidermis
b) Below the lower epidermis
c) In between endodermis and pericycle
d) Below the endodermis and upper on the pericycle

283. I. Roots are unicellular
II. Trichomes are multicellular usually
Identify the correct statement and select the correct option
a) I and II are correct
b) I and II are incorrect
c) I is correct, but II is incorrect
d) II is correct, but I is incorrect

284. Narrow bands of parenchymatous tissue which passes through the secondary xylem and phloem radially are called
a) Pith
b) Stele
c) Primary medullary rays
d) Secondary medullary rays

285. Quiescent centre is present in
a) Shoot apex b) Root apex c) Both (a) and (b) d) Meristematic tissue

286. Tyloses an outgrowth from ray or axial parenchyma cell into the lumen of a vessel, which partially or completely blocks the cavity are present in
a) Periderm b) Heartwood c) Sapwood d) Secondary cortex

287. Bark is the non-technical term which refers to
a) A few tissue exterior to the vascular cambium
b) A few tissue interior to the vascular cambium
c) All the tissue interior to the vascular cambium
d) All the tissue exterior to the vascular cambium

288. From the plants given below, select the monocots having secondary growth in their stem
a) Yucca b) Wheat c) Aloe d) Both (a) and (c)

289. Which of the three sub-zones of cortex of dicot stem performs the function of providing mechanical strength to young stem?
a) Hypodermis b) Cortical layers c) Endodermis d) Both (a) and (c)

290. Study the following columns and choose the correct combination.

Tissue	Structural Feature	function
1.Collen-chyma	Cell walls with high water content	Photosy-nthesis in young stems
2.Parenc-hyma	Suberised cell walls	Storage of food
3.Scleren-chyma	Lignified cell walls	Mechani cal strength
4.Digestive glands	Dense cytoplasm	Breaking the substrat e without water

a) I and II b) II and III c) I and IV d) I and III

291. The difference in phloem of gymnosperms and angiosperms is due to
a) Parenchyma b) Sieve cell c) Companion cell d) Fibers

292. The waxy material deposited in the Casparian strip of the endodermis is
a) Pectin b) Suberin c) Cellulose d) Lignin

293. What is/are true about heartwood?
I.It does not help in water conduction.
II.It is also called alburnum.
III.It is dark in colour but very soft.
IV.It has tracheary elements, which are filled with tannin, resin, etc.
a) II, III and IV b) I and IV c) II and IV d) I, II and III

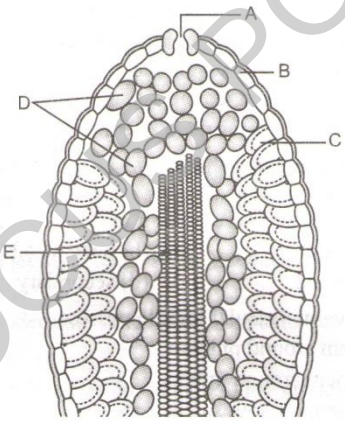
294. Vascular cambium of stem is
a) Partly primary and partly secondary meristem
b) Primary meristem
c) Secondary meristem
d) Intercalary meristem

295. Periderm is made up of
I. cork cambium
II. cork
III. secondary cortex
Select the correct combination of options
a) I and II b) I and III c) II and III d) I, II and III

296. Casparian strip is found in
a) Epidermis b) Pericycle c) Endodermis d) Endothecium

297. I. Peripheral region of the secondary xylem in dicot stem in lighter in colour and known as heart wood
II. It is involved in water and mineral conduction
Select the correct option from below
a) I is correct, but II is incorrect b) I is incorrect, but II is correct
c) I and II are correct d) I and II are incorrect

298. Choose the correct combination of labeling of Hydathode.



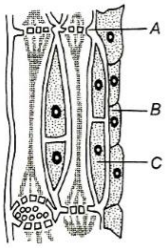
a) A-Guard cells B-Epithem
C-Mesophyll D-Epidermis
E-Vasculature
b) A- Guard cells B- Epidermis
C- Mesophyll D- Epithem
E-Vasculature
c) A-Water pore B-Epidermis
C-Mesophyll D-Epithem
E-Vasculature
d) A-Ostiole B-Epidermis
C-Mesophyll D-Epithem
E-Vasculature

299. Fewer xylary elements that have narrow vessel are found in
a) Autumn wood b) Late wood c) (a) or (b) d) Both (a) and (b)

300. The cells without nuclei are present in
a) Vascular cambium b) Root hair
c) Companion cell d) Members of sieve tube

301. Regulation of flow of fluid both inwardly as well as outwardly is performed by the
a) Pericycle b) Endodermis c) Xylem d) Phloem

302. In the given diagram of phloem tissue, identify *A*, *B* and *C*



a) A-Sieve tube cells, B-Xylem parenchyma, C-Companion cell
b) A-Sieve tube cells, B-Phloem parenchyma, C-Companion cell
c) A-Sieve pore, B-Xylem parenchyma, C- Companion cell
d) A-Sieve pore, B-Phloem parenchyma, C-Companion cell

303. Which type of vascular bundles are found in monocot stem?
a) Collateral, open and endarch b) Radial, open and diarch
c) Radial, open and mesarch d) Collateral, closed and endarch

304. Which of the following is the region of cell division?
a) Root cap b) Meristematic region
c) Root hair zone d) None of these

305. Vascular cambium in roots takes its origin from
a) Pericycle b) Conjunctive parenchyma
c) Both (a) and (b) d) None of the above
306. Meristamatic tissue helps in the
a) Absorption of water b) Growth of plant
c) Absorption of minerals d) Transpiration
307. The phloem of angiosperms differs from that of other vascular plants by the presence of
a) Vessels b) Companion cells c) Tylosoides d) Albuminous cells
308. Growth rings are absent or not sharply demarcated in the trees of
a) Temperate deciduous b) Tropical evergreen
c) Temperate evergreen d) Tropical deciduous
309. Subsidiary cells are the specialised cell in the
a) Vicinity of guard cell b) Vicinity of stomatal cell
c) Absence of stomatal cell d) Absence of guard cell
310. Axillary bud and terminal bud are derived from the activity of
a) Lateral meristem b) Intercalary meristem
c) Apical meristem d) Parenchyma
311. Cortex consists of three sub-zones in dicot stem, they are
I. hypodermis II. cortical layer
III. pericycle IV. endodermis V. epidermis
a) All except I and II b) All except II and III
c) All except IV and V d) All except III and V
312. Vessels differ from tracheids
a) In being living
b) In being derived from a single cell
c) In having vertical row of cells with crosswalls dissolved
d) Because they conduct water
313. Which of the following cells is an epidermal cell containing chloroplast?
a) Hydathode b) Stomata c) Guard cell d) None of these
314. Elongation of epidermal cells which helps in the absorption of water and minerals from the soil are called
a) Trichomes b) Root hairs c) Emergences d) All of these
315. Old dicot roots differ from dicot stem in
a) Absence of cortex b) Absence of primary phloem
c) Absence of vascular bundles d) Presence of xylem
316. This is a specialised tissue found in the mesophyll of *Cycas* and *Pinus* leaves.
a) Spongy tissue b) Palisade tissue c) Conjunctive tissue d) Transfusion tissue
317. Choose the correct statement
a) A group of cell having common origin generally perform common function
b) All of the cells in a plant body are capable of dividing
c) Permanent tissues have all cells same in function but different in structure
d) None of the above
318. Sclerenchyma fibres are
a) Thick-walled b) Elongated c) Pointed cells d) All of these
319. Pericycle is present
I. Just above the phloem
II. on the innerside of endodermis
Select the correct option
a) I is correct, but II is incorrect
b) II is correct, but I is incorrect
c) I and II are correct

d) I and II are incorrect

320. Bicollateral vascular bundles are found in the members of this family
a) Malvaceae b) Fabaceae c) Caesalpiniaceae d) Cucurbitaceae

321. The chief function of sieve tube element is to
a) Conduct minerals
b) Help the plant in forming wood
c) Transport water from roots to leaves
d) Translocate the organic material from source to sink

322. When cut horizontally both spring and autumn wood appear in concentric rings known as
a) Heartwood b) Latewood c) Sapwood d) Annual ring

323. Root cap is not used in water absorption due to
a) Presence of epidermis b) Presence of endodermis
c) Absence of root hairs d) Presence of root hairs

324. Epidermis covered with cuticle, bearing trichomes and few stomata is the characteristic feature of
a) Root b) Dicot stem c) Vascular bundle d) Monocot stem

325. Border parenchyma or bundle sheath is made up of
a) Parenchymatous cell b) Sclerenchymatous cell
c) Chlorenchymatous cell d) All of these

326. Which of the following is not a characteristic feature of bryophytes?
a) Dominant gametophytic generation b) Filamentous rhizoids
c) Amphibious habitat d) Vascular tissues

327. Vascular bundles in monocotyledons are considered closed because
a) Xylem is surrounded all around by phloem b) There are no vessels with perforations
c) A bundle sheath surrounds each bundle d) There is no secondary growth

328. Primary function of epidermis is
a) Photosynthesis b) Protection
c) Conduction of water and solutes d) Mechanical support

329. The number of stomata and epidermal cells in 1 mm^2 leaf area of lower epidermis of the leaves of X, Y and Z plants are given below. Arrange the plants in decreasing order of their stomatal index.

Plant	Number of Stomata	Number of Epidermal Cell
X	30	150
Y	60	240
Z	90	400

a) X, Y, Z b) Y, Z, X c) Z, Y, X d) Y, X, Z

330. In woody trees, the exchange of gases between the outer atmosphere and the internal tissue of the stem takes place through
a) Aerenchyma b) Stomata c) Pneumatophores d) Lenticels

331. Vascular system consists of
I. xylem
II. phloem
III. ground meristem
IV. epidermal meristem
Select the correct combination from the given options
a) I and II b) I, II and III c) I, II and IV d) I, III and IV

332. In dicotyledonous roots, cambium develops in between
a) Xylem and cortex b) Phloem and meristem
c) Xylem and phloem d) Two xylem strands

333. In a dicotyledonous stem, the sequence of tissues from the outside to the inside is
a) Phellem-pericycle-endodermis-phloem b) Phellem-phloem-endodermis-pericycle

c) Phellem-endodermis-pericycle-phloem d) Pericycle-phellem-endodermis-phloem

334. Meristem consists of
a) Undivided cells b) Cells in continuous state of cell divisions
c) Dead cells d) Cells which divide rarely

335. For a critical study of secondary growth in plants, which one of the following pairs is suitable?
a) Sugarcane and sunflower b) Teak and pine
c) Deodar and fern d) Wheat and maiden hair fern

336. Cuticle is secreted from
a) Epidermis b) Endodermis c) Both (a) and (b) d) Hypodermis

337. I. Parenchyma tissue II. Collenchyma tissue
III. Sclerenchyma tissue
Which of the above tissues are found in the ground tissue system?
a) I and II b) II and III c) I and III d) I, II and III

338. In the sieve elements, which one of the following is the most likely function of P-proteins?
a) Deposition of callose on sieve plates b) Providing energy for active translocation
c) Autolytic enzymes d) Sealing mechanism on wounding

339. Example of secondary meristem is
a) Fascicular vascular cambium
b) Interfascicular cambium
c) Cork cambium
d) All of the above

340. Mesophyii is well differentiated into palisade and spongy tissue in
a) Dicot leaves b) Monocot leaves c) Xerophytic stem d) Hydrophytic stem

341. I. Unicellular hair
II. Endodermis with passage cells
III. Pith small and inconspicuous
IV. Radial vascular bundle
V. 2-4 xylem and phloem
VI. Cambium ring develops between xylem and phloem
The above description refers to which of the following?
a) Monocot root b) Dicot root c) Monocot stem d) Dicot stem

342. Vessels are found in
a) All angiosperms and some gymnosperms
b) Most of the angiosperms and few gymnosperms
c) All angiosperms, all gymnosperms and some pteridophytes
d) All pteridophytes

343. The outer walls of guard cells (away from stomatal pore) are …A…. While the inner walls (towards the stomatal pore) are …B… .
Choose the correct combination of A and B
a) A-thick, B-thin b) A-thin, B-thick
c) A-thin, B-also thin d) A-thick, B-also thick

344. Intercellular spaces are found in …A… region. Intercellular spaces are absent in …B… region. Choose the correct option for A and B
a) A-cortex, B-endodermis b) A-endodermis, B-cortex
c) A-endodermis, B-pericycle d) A-cortex, B-pericycle

345. Quiescent centre is found in plants at
a) Root tip b) Cambium c) Shoot tip d) Tip

346. Large number of xylary elements having vessels with wider activity are produced in
a) Spring wood b) Autumn wood c) Early wood d) (a) or (c)

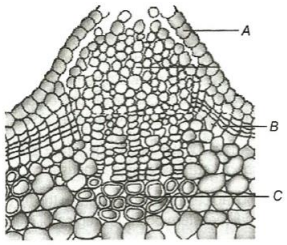
347. I. Long tube-like structure, arranged longitudinally and associated with companion cells

II. End wall perforated in a sieve like manner to form sieve plates
Given above two character belong to which attribute of phloem
a) Sieve tube elements b) Companion cells c) Phloem parenchyma d) Tracheid

348. Xylem tissue is composed of
a) Four same kinds of elements
b) Three same kinds of elements
c) Four different kinds of elements
d) Three different kinds of elements

349. Apical meristem and intercalary meristem are called primary meristem because?
a) They appear early in plant and contributes to the formation of primary plant body
b) They make secondary tissue
c) They make the whole plant body
d) All of the above

350. In the given diagram of lenticel, label A, B, C in the given option



a) A-Epidermis, B-Cork cambium, C-Secondary cortex
b) A-Stomata, B-Cork, Cambium, C-Secondary cortex
c) A-Stomata, B-Cork cambium, C-Endodermis
d) A-Epidermis, B-Cork cambium, C-Endodermis

351. I. Cells are living and thin-walled and their cell walls are made up of cellulose
II. They store food material
III. The radial conduction of water in plants takes place by the help of these tissues
Which of the above feature belongs to the xylem parenchyma?
a) I and II b) II and III c) III and I d) I, II and III

352. The surface area of leaves in monocotyledon plant can be regulated by the help of
a) Mesophyll cells
b) Parenchymatous cell
c) Bulliform cells
d) Guard cell

353. Desert grasses often roll their leaves due to presence of
a) Oily surface b) Bulliform cells c) Spines d) None of these

354. I. Long cyclindrical tube like structure made up of many cells called vessel members, lignified cell wall and large central cavity
II. Devoid of protoplasm
Above characters belong to which of the following plant elements?
a) Tracheids b) Xylem vessel c) Companion cell d) Sieve tube

355. Aerating pores are present at places on the cork cambium. These are called
a) Pneumatophores
b) Hydathodes
c) Lenticels
d) Stomata

356. The age of tree can't be determined by annual rings if the tree belongs to the
a) Temperate evergreen
b) Temperate deciduous
c) Xerophyte condition
d) Tropical forest

357. Meristematic cells contain more of
a) Fats b) Protein c) Sugar d) Salts

358. Tyloses thickenings are seen in
a) Collenchyma
b) Phloem cells
c) Ray parenchyma only
d) Ray parenchyma and xylem cells

359. Vascular tissue in higher plants develop from which of the following?
a) Procambium b) Protoderm c) Phellogen d) Cortex

360. Interfascicular cambium is formed by the joining of
a) Medullary rays to xylem cambium
b) Medullary rays to intrafascicular cambium
c) Medullary rays to lateral fascicular cambium
d) Endodermis to intrafascicular cambium

361. I. Primary tissues of plants add length to the roots and shoots
II. Secondary tissue of plants adds diameter to the roots and shoots
III. Cells of permanent tissue are specialised both structurally and functionally
Which of the above statement is/are true?
a) All except I b) All except II c) All except III d) I, II and III

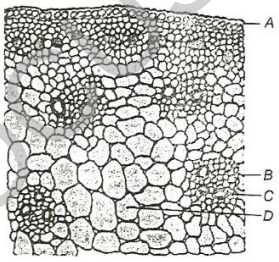
362. The size of vascular bundles on the leaflet depends upon the
I. leaf margin II. leaf petiole
III. leaf size IV. leaf veination
Select the correct combination of options given below
a) I and II b) II and III c) III and IV d) I and IV

363. Interfascicular cambium is a
a) Primary meristematic tissue b) Primordial meristem
c) Type of Protoderm d) Secondary Meristematic tissue

364. Duramen is present in
a) Inner region of secondary wood b) Part of sapwood
c) Outer region of secondary wood d) Region of pericycle

365. Diffused porous woods are characteristic of plants growing in
a) Temperate climate b) Tropics c) Alpine region d) Cold winter regions

366. Identify *A* to *D* in the given diagram and choose the correct option



a) A-Hypodermis, B-Xylem, C-Phloem, D-Ground tissue
b) A-Hypodermis, B-Phloem, C-Xylem, D-Ground tissue
c) A-Endodermis, B-Phloem, C-Xylem, D-Ground tissue
d) A-Endodermis, B-Xylem, C-Phloem, D-Ground tissue

367. Periderm includes
I. Phellem
II. Phellogen
III. Phelloderm
Select the correct option
a) I and II b) II and III c) III and I d) I, II and III

368. Bulliform cells found in
a) Seeds of sunflower b) Leaf of wheat c) Pod of pea d) Tuber of potato

369. Two cross-sections of stem and root appear simple, when viewed by naked eye. But under microscope, they can be differentiated by
a) Exarch condition of root and stem
b) Endarch condition of stem and root
c) Endarch condition of root and exarch condition of stem

d) Endarch condition of stem and exarch condition of root

370. The beneficial use of epidermal layer is
a) Bast fibre b) Mesocarp c) Cotton fibre d) Jute

371. Axillary bud originates from
a) Meristem b) Shoot apical meristem
c) Root apical meristem d) Secondary meristem

372. Palisade parenchyma and spongy parenchyma are found in
a) Epidermis of leaves b) Vascular system of leaves
c) Mesophyll of leaves d) Endodermis of leaves

373. The length of different internodes in a culm of sugarcane is variable because of
a) Shoot apical meristem
b) Position of axillary buds
c) Size of leaf lamina at the node below each internode
d) Intercalary meristem

374. Which of the following cell do not respire?
a) Epidermal cell b) Cork cell c) RBC d) Sieve tube cell

375. Outer most layer of primary plant body is
a) Endodermis b) Epidermis c) Mesodermis d) Pericycle

376. Viral infection is usually absent in
a) Phloem cells b) Xylem cells c) Pith cells d) Apical meristem

377. The most abundant tissues in plants are
a) Meristematic tissues b) Parenchyma tissues
c) Collenchyma tissues d) Sclerenchyma tissues

378. In which of the following organs, growth is sub-apical?
a) Root b) Shoot c) Petiole d) Pedicel

379. Which of the following characters belong to sclerenchyma?
I. Consists of long narrow cells with thick lignified cell walls
II. Having few or numerous pits
III. They are usually dead and without protoplasms
a) I and II b) II and III c) I and III d) I, II and III

380. Amphicribal vascular bundle is vascular bundle in which the
a) Xylem is surrounded by phloem
b) Phloem is surrounded by xylem
c) Phloem is surrounded by xylem laterally
d) Xylem is surrounded by phloem laterally

381. The …A… cells are specialised parenchymatous cells, which are closely associated with sieve tube elements. The sieve tube elements and …B… cell are connected by pit fields presents between their common …C… walls.
Choose the correct combination of A, B and C from the options given below
a) A–companion, B–companion, C–longitudinal
b) A–vessels, B–companion, C–longitudinal
c) A–tracheid, B–companion, C–lateral
d) A–companion, B–companion, C–lateral

382. Exarch and polyarch xylem strands are found in
a) Monocot stem b) Dicot stem c) Monocot root d) Dicot root

383. The chief water conducting elements of xylem in gymnosperms are
a) Vessels b) Fibres c) Transfusion tissue d) Tracheids

384. Choose the incorrect statement
a) Medullary rays connects the pith with pericycle and cortex
b) Medullary rays make intimate contact with the conducting cells of both phloem and xylem

c) Medullary rays help in radial conduction d) None of the above

385. I. Elongated or tube like cell with thick and lignified walls and tapering ends
II. These are dead and without the protoplasm
III. The inner layers of cell walls have thickening which vary in form
The above mentioned characters belong to which of the following plant structure?
a) Tracheids b) Xylem parenchyma c) Companion cells d) Sieve tube element

386. The first formed primary phloem is referred as ...A... The later formed primary phloem is referred as ...B...
Choose the correct combination of A and B
a) A–protoxylem; B–metaxylem b) A–protophloem; B–sieve tube cells
c) A–metaphloem; B–sieve tube cells d) A–protophloem; B–metaphloem

387. Identify the type of plant tissue being represented by the set of statements given below
I. Their cells are isodiametric (they may be spherical, oval, round, etc.)
II. Their cell walls are thin and made up of cellulose
III. They may either be closely packed or have small intercellular spaces
IV. They perform functions like photosynthesis, storage, secretion, etc.
a) Sclerenchyma b) Parenchyma c) Collenchyma d) Meristem

388. Cuticle is absent in which part of plant?
a) Leaves b) Root c) Stem d) Pneumatophores

389. A common structural feature of vessel elements and sieve tube elements is
a) Thick secondary walls b) Pores on lateral walls
c) Presence of P-proteins d) Enucleate condition

390. Velamen tissue is found in
a) Mesophytes b) Epiphytes c) Hydrophytes d) Xerophytes

391. I. Made up of elongated, tapering cylindrical cells which have dense cytoplasm and nucleus
II. Cell wall composed of cellulose
III. Stores food materials
The above mentioned characters belong to which attribute of phloem?
a) Sieve tube elements b) Companion cell
c) Phloem parenchyma d) Phloem fibre

392. Kranz anatomy is found in
a) Dicotyledonous leaves b) Monocotyledonous leaves
c) Both (b) and (d) d) Isobilateral leaves

393. The phloem fibres of which of the following plant is/are used commercially?
I. Jute II. Flax III. Hemp
Select the correct option
a) I and II b) II and III c) III and IV d) I, II and III

394. In any dicot root having secondary growth, the cork is the
a) Outer to endodermis and inner to primary cortex
b) Inner to endodermis and external to primary phloem
c) Inner to endodermis and external to primary xylem
d) Outer to endodermis and external to primary phloem

395. The cells without nuclei are present in
a) Vascular cambium b) Root hair
c) Companion cell d) Members of sieve tube

396. On the basis of variation in form, structure, origin and development, sclerenchyma may be
a) Fibres b) Sclereids c) Either (a) or (b) d) Both (a) and (b)

397. Which statements are correct about guard cells?
I. They are modified ground tissue
II. They are chlorophyllous
III. Its outer wall is thin and inner wall is highly thickened

IV. They regulate stomatal movement for transpiration and gaseous exchange

a) All except I b) All except II c) All except III d) All except IV

398. Fibres associated with phloem are……..fibres.

a) Hard b) Wood c) Surface d) Bast

399. Consider the following statements.

I. In a dicot root, the vascular bundles are collateral and endarch.

II. The innermost layer of cortex in a dicot root is endodermis.

III . In a dicot root, the phloem masses are separated from the xylem by parenchymatous cells that are known as the conjunctive tissue.

a) I is true, but II and III are false b) II is true, but I and III are false

c) I is false, but II and III are true d) III is false, but I and III are true

400. First formed primary xylem elements are called ...A... . Later formed primary xylem elements are called …B... .

A and B in the above statement refers to

a) A–metaxylem; B–protoxylem b) A–protoxylem; B–metaxylem

c) A– protophloem; B–metaphloem d) A–metaphloem; B–protophloem

401. Periderm includes

a) Phellem, phelloderm, plerome b) Phellem, phellogen, dermatogen

c) Phellem, phellogen, phelloderm d) Phellem, phellogen, cortex

402. Gymnosperms lack which of the following structure?

a) Tracheids b) Vessels c) Xylem d) Phloem

403. A branch or a flower develops in the axil of the leaves by the activity of

a) Axillary bud b) Apical bud c) Apical meristem d) Tissue

404. During secondary growth of plants, stem phellogen cuts of cells on both sides. The outer cells gets differentiated into …A… and the inner cells gets differentiated into …B… cortex

Choose the correct combination of A and B with reference to above statement

a) A-cork; B-phellem b) A-secondary cortex; B-phelloderm

c) A-secondary cortex; B-primary cortex d) A-cork/phellem; B-secondary cortex

405. Vascular system includes …A… bundles, which can be seen in the veins and the …B… . The size of vascular bundles are dependent on the size of …C… . The veins vary in thickness in the reticulate venation of the …D… leaves

Choose the correct combination of A to D

a) A-phloem, B-midrib, C-veins, D-dicot b) A-xylem, B-midrib, C-veins, D-dicot

c) A-vascular, B-midrib, C-veins, D-dicot d) A-vascular, B-midrib, C-veins, D-monocot

406. Estimation of the age of the tree is done by

a) Counting the epidermal rings b) Measuring the pith diameter

c) Counting the annual rings d) Counting the late woods only

407. Meristematic cells have

a) Thick cell wall and large intercellular spaces b) Thick cell wall and no intercellular spaces

c) Thin cell wall and large intercellular spaces d) Thin cell wall and no intercellular spaces

408. Which combination of tissues acts together to provide the support to the hypocotyl of a seedling

a) Epidermis and collenchyma b) Xylem and parenchyma

c) Epidermis and parenchyma d) Xylem and phloem fibres

409. Sclereids are commonly found in the

I. fruits wall of nuts

II. pulp of fruit like guava and pear

III. seed coat of legumes

IV. micropile of pea

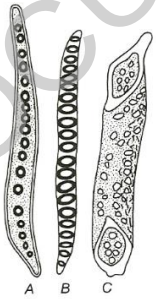
Select the correct combination

a) All except I b) All except II c) All except III d) All except IV

410. The cells of the endodermis are rich in ...A... grains and layer is referred to as ...B... sheath. Select the correct combination of A an B from the options given below
a) A-protein; B-protein
b) A-fat; B-lipid
c) A-starch; B-carbohydrate
d) A-starch; B-starch

411. Identify from the following, a plant tissue in which lignin does not occur in the cell walls?
a) Collenchyma
b) Sclerenchyma fibres
c) Sclereids
d) Xylem tracheae

412. Identify *A*, *B* and *C* the given diagram



a) A-Tracheid, B-Vessels, C-Vessels
b) A-Vessels, B-Tracheid, C-Companion cell
c) A-Companion cell, B-Vessels, C-Tracheid
d) A-Xylem fibre, B-Vessels, C-Vessels

413. Which is true for Meristematic tissue?
a) Their cells have dense cytoplasm and prominent nuclei
b) Their cells are dead with large intercellular spaces
c) These are usually modified for storage
d) Their cells are most primitive, living and without nuclei

414. A tree grows 5 cm per year. What will be the height of a board fixed 10 cm above the base after 10 years?
a) 50 cm
b) 60 cm
c) 10 cm
d) 70 cm

415. I. Found only in sporophytic phase of life cycle
II. May contain enzymes that are biologically active
III. Often contain strengthening polymers
Select the correct option for cell wall
a) All are correct except I
b) All are correct except II
c) All are correct except III
d) All are correct

416. Motor cells are found in
a) Monocot leaf
b) Upper epidermis of monocot leaf
c) Brain
d) Spinal cord

417. Vascular bundle without cambium is called
a) Closed vascular bundle
b) Open vascular bundle
c) Radial vascular bundle
d) Conjoint vascular bundle

418. Specialised regions of plants having active cell division are called
a) Tissues
b) Organs
c) Meristems
d) All of these

419. I. During secondary growth, a complete ring is formed by vascular cambium
II. Interfascicular cambium originates from medullary ray cells
III. Vascular cambium form xylem on the inside and phloem on the outside due to differential action of hormones
Select the correct combination of option
a) I and II are correct
b) II and III are correct
c) I and III are correct
d) I, II and III

420. In the following, how the sapwood is converted into heartwood?

a) By degeneration of protoplast of living cells
b) Tylosis formation
c) By deposition of resins, oils, gums, etc
d) All of the above

421. Sequence of cellular layers from the periphery towards the cortex in an old dicot stem is
a) Epidermis, hypodermis, phellogen, phelloderm
b) Epidermis, phellogen, phellem, epidermis
c) Epidermis, hypodermis, cortex, endodermis
d) Epidermis, phellem, phellogen, phelloderm

422. I. Dicotyledon leaf is also called isobilateral leaf
II. Monocotyledon leaf is also called dorsoventral leaf
Select the correct option from the options given below
a) I and II are correct
b) I is correct, but II is incorrect
c) II is incorrect, but I is correct
d) I and II are incorrect

423. Which of the following statements are not true?
I.Cork cambium is otherwise called phellogen.
II.Cork is otherwise called phellem.
III.Secondary cortex is otherwise called periderm.
IV. Cork cambium, cork and secondary cortex are collectively called phelloderm
a) III and IV
b) I and II
c) II and III
d) II and IV

424. In leaves, the ground tissues consists of
a) Epidermis
b) Vascular tissue
c) Mesophyll cells
d) Medullary rays

425. Phloem conducts food by
a) Perforated sieve plates
b) Bast fibres
c) Xylem parenchyma
d) Xylem fibres

426. Continuous ring of cambium is formed by
a) Intrafascicular cambium
b) Interfascicular cambium
c) Lateral meristem
d) Both (a) and (b)

427. Ground tissue does not include
I. epidermis
II. vascular bundle
III. sclerenchyma
IV. collenchyma
V. parenchyma
Select the right combination from the above given options
a) I and II
b) III and IV
c) I and V
d) I and IV

428. Identify the correct order of the components with reference to their arrangement from outer side to inner side in a woody dicot stem.
I.Secondary cortex
II.Autumn wood
III.Secondary phloem
IV.Phellem
a) II, III, I and IV
b) III, IV, II, and I
c) IV, I, III and II
d) I, II, IV and III

429. In which of the following, there is no differentiation of bark, sapwood and heartwood?
a) Ashok
b) Neem
c) Mango
d) Datepalm

430. …A… are structures present in the epidermis of leaves. They regulate process of transpiration and …B… exchange. It is composed of two bean-shaped cells known as …C… cells.
Choose the correct combination of A, B and C from the following options
a) A–Stomata, B–gaseous, C–guard
b) A–Stomata, B–gaseous, C–subsidiary
c) A–Stomata, B–water, C–subsidiary
d) A–Stomata, B–water, C–guard

NEET BIOLOGY

ANATOMY OF FLOWERING PLANTS

: ANSWER KEY :

1)	c	2)	c	3)	a	4)	b	161)	d	162)	d	163)	a	164)	a
5)	a	6)	a	7)	d	8)	a	165)	a	166)	a	167)	c	168)	a
9)	b	10)	a	11)	b	12)	d	169)	a	170)	b	171)	d	172)	b
13)	b	14)	c	15)	b	16)	a	173)	b	174)	a	175)	b	176)	a
17)	d	18)	d	19)	b	20)	d	177)	b	178)	a	179)	d	180)	b
21)	a	22)	d	23)	d	24)	a	181)	c	182)	a	183)	b	184)	a
25)	d	26)	c	27)	c	28)	a	185)	b	186)	d	187)	d	188)	a
29)	d	30)	d	31)	d	32)	c	189)	c	190)	c	191)	d	192)	d
33)	d	34)	a	35)	d	36)	d	193)	d	194)	c	195)	d	196)	b
37)	d	38)	d	39)	d	40)	b	197)	d	198)	c	199)	d	200)	c
41)	b	42)	d	43)	b	44)	c	201)	c	202)	b	203)	d	204)	d
45)	b	46)	a	47)	d	48)	a	205)	b	206)	a	207)	c	208)	c
49)	c	50)	c	51)	d	52)	a	209)	b	210)	a	211)	a	212)	d
53)	a	54)	d	55)	b	56)	a	213)	a	214)	c	215)	b	216)	b
57)	b	58)	c	59)	a	60)	a	217)	b	218)	c	219)	b	220)	b
61)	c	62)	d	63)	b	64)	b	221)	b	222)	b	223)	c	224)	c
65)	a	66)	a	67)	a	68)	a	225)	a	226)	b	227)	b	228)	b
69)	a	70)	d	71)	a	72)	c	229)	c	230)	b	231)	b	232)	a
73)	d	74)	c	75)	a	76)	b	233)	c	234)	d	235)	c	236)	b
77)	c	78)	b	79)	d	80)	d	237)	b	238)	c	239)	d	240)	a
81)	d	82)	d	83)	a	84)	c	241)	a	242)	a	243)	d	244)	d
85)	a	86)	a	87)	c	88)	b	245)	c	246)	c	247)	b	248)	d
89)	b	90)	c	91)	d	92)	b	249)	a	250)	d	251)	c	252)	d
93)	c	94)	d	95)	b	96)	a	253)	c	254)	d	255)	a	256)	b
97)	b	98)	c	99)	d	100)	b	257)	b	258)	a	259)	b	260)	c
101)	d	102)	d	103)	b	104)	b	261)	a	262)	a	263)	c	264)	a
105)	b	106)	d	107)	a	108)	b	265)	c	266)	b	267)	a	268)	c
109)	d	110)	d	111)	d	112)	a	269)	c	270)	d	271)	a	272)	a
113)	a	114)	d	115)	b	116)	a	273)	a	274)	c	275)	d	276)	a
117)	c	118)	b	119)	c	120)	b	277)	b	278)	c	279)	a	280)	a
121)	d	122)	b	123)	c	124)	b	281)	d	282)	a	283)	a	284)	d
125)	b	126)	d	127)	a	128)	c	285)	b	286)	b	287)	d	288)	d
129)	b	130)	b	131)	b	132)	a	289)	a	290)	d	291)	c	292)	b
133)	b	134)	d	135)	b	136)	d	293)	b	294)	a	295)	d	296)	c
137)	c	138)	a	139)	c	140)	a	297)	d	298)	c	299)	c	300)	d
141)	b	142)	d	143)	c	144)	d	301)	b	302)	d	303)	d	304)	b
145)	a	146)	d	147)	a	148)	b	305)	c	306)	a	307)	b	308)	b
149)	a	150)	a	151)	a	152)	b	309)	a	310)	c	311)	d	312)	c
153)	c	154)	c	155)	a	156)	b	313)	c	314)	b	315)	b	316)	d
157)	c	158)	c	159)	d	160)	b	317)	a	318)	d	319)	c	320)	d

321)	d	322)	d	323)	c	324)	b	381)	a	382)	c	383)	d	384)	d
325)	c	326)	d	327)	d	328)	b	385)	a	386)	d	387)	b	388)	b
329)	b	330)	d	331)	a	332)	c	389)	b	390)	b	391)	a	392)	c
333)	c	334)	b	335)	b	336)	a	393)	d	394)	b	395)	d	396)	c
337)	d	338)	d	339)	a	340)	a	397)	a	398)	d	399)	c	400)	b
341)	b	342)	b	343)	b	344)	a	401)	c	402)	b	403)	c	404)	d
345)	a	346)	d	347)	a	348)	c	405)	c	406)	c	407)	d	408)	a
349)	a	350)	a	351)	d	352)	c	409)	d	410)	d	411)	a	412)	d
353)	b	354)	b	355)	c	356)	d	413)	a	414)	c	415)	b	416)	b
357)	d	358)	d	359)	a	360)	b	417)	a	418)	c	419)	b	420)	d
361)	d	362)	c	363)	d	364)	a	421)	c	422)	d	423)	a	424)	c
365)	b	366)	b	367)	d	368)	b	425)	a	426)	d	427)	a	428)	c
369)	d	370)	c	371)	b	372)	c	429)	d	430)	a				
373)	d	374)	b	375)	b	376)	d								
377)	b	378)	a	379)	d	380)	a								

FOCUS POINT

NEET BIOLOGY

ANATOMY OF FLOWERING PLANTS

: HINTS AND SOLUTIONS :

1 **(c)**
Cambium is generally more active on the inner side than the outer. As a result the amount of secondary xylem produced is more than the secondary phloem and soon form a compact mass

2 **(c)**
Lateral Meristem The meristem occurs on the sides and take part in increasing girth of the plant. Only one type of primary lateral meristem is found in plants. It is intrafascicular cambium. The cambium lies in vascular bundles of dicot and gymnosperm stem in between phloem and xylem

3 **(a)**
The pith or medulla forms the central region of the stem and root. Usually, the pith of dicot stem is largely parenchymatous. It is devoid of chlorophyll in the mature state. The pith is not distinguishable in the mature state. The pith is not distinguishable in monocot stems.

4 **(b)**
As growth begins, the cells of medullary rays, which lie in between vascular bundles become active and rise to cambial strip called interfascicular cambium constitute cambium.

5 **(a)**
Tissue is a group of cells performing a particular function. Tissue are mainly of two types
(i) **Meristematic tissues** These tissues contain immature and young cells that are much active and capable of showing continuous divisions and redivisions. They may be promeristem, primary meristem, secondary meristem, apical meristem, intercalary meristem and lateral meristem.
(ii) **Permanent tissues** These are made up of mature cells, which have lost the capacity to divide and have attained a permanent shape, size and function, *e.g.,* simple (parenchyma, collenchyma, sclerenchyma), complex (xylem, phloem) and secretory tissue.

6 **(a)**
Secondary growth increases the girth not length of the plant. Length of the plant increases by apical meristem

7 **(d)**
Cork prevents the loss of water by evaporation. It also protects the interior against the entry of harmful microorganisms, mechanical injury and extremes of temperature. Cork is light, compressible, non-reactive and sufficiently resistant to fire. It is used as stopper for bottles, shock absorption and insulation

8 **(a)**
Dicot stem In between the vascular bundles, there are few layers of radially placed parenchymatour cells. These parenchymatous cells are called medullary rays

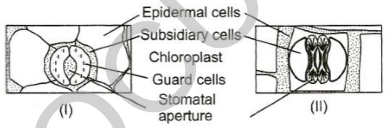
9 **(b)**


Diagram (I) Represents the dicotyledon plant because having bean-shaped guard cells
Diagram (II) Represents the monocotyledon plant because of having dumb-bell shaped guard cells

10 **(a)**
Bast or phloem fibers are present in pericycle (*e.g., Corchorus capsularis* (jute), *Hibiscus cannabinus* (patsan), *Crotalaria juncea* (sunnhemp). These fibres are also known as extraxylary fibers.

11 **(b)**
Vascular Cambium
The meristematic layer that is responsible for cutting off vascular tissues (xylem and phloem) is called vascular cambium. In the young stem. It is present in patches as a single layer between the xylem and phloem. Later, it forms a complete ring

12 **(d)**
The secondary phloem is made up of sieve tubes, companion cells and phloem parenchyma.

Sclerenchyma fibres are rare. The secondary xylem is formed of vessels, tracheids and xylem parenchyma

13 **(b)**
Hypodermis in the stem of *Cucurbita* is made up of angular collenchyma. Hypodermis is two or three-layered or sometimes altogether absent. The vascular bundles are conjoint, open and bicollateral, *i.e.,* phloem is present on both side of xylem.

14 **(c)**
The innermost layer of cortex is called endodermis. It comprises a single layer of barrel-shaped cells without any intercellular spaces. The tangential as well as radial walls of the endodermal cells have a deposition of water impermeable, waxy material called suberin in the form of casparian strips

15 **(b)**
The isobilateral monocot leaves usually do not show a distinction into petiole and lamina. The leaf base is commonly sheathing, that is covering the stem partially or completely. The venation is parallel. Amphistomatic leaf have stomata on both the surface

16 **(a)**
Cell wall in a plant cell is found in both the phases, *i.e.,* sporophytic and gametophytic.

17 **(d)**
The 'ring' arrangement of vascular bundles is a characteristic of dicot stem. Each vascular bundle is conjoint, open and with endarch protoxylem

18 **(d)**
Both apical meristem and intercalary meristem are primary meristems because they appear early in life of plants and contributes to the formation of primary plant body

19 **(b)**
Collenchyma.
The **collenchyma** occurs in layers below the epidermis in dicotyledonous plants. It is found either as a homogenous layer or in patches. It consists of cells which are much thickened at the corners due to the deposition of cellulose, hemicellulose and pectin. Collenchymatous cells may be oval, spherical or polygonal and often contain chloroplasts. These cells assimilate food when they contain chloroplasts. Intercellular spaces are absent. They provide mechanical support to the growing parts of the plant such as young stem and petiole of a leaf

20 **(d)**
Lateral meristems occur laterally in the axis, parallel to the sides of stems and roots. This meristem consists of initials, which divide mainly in one plane (periclinal) and results in increase in the diameter of an organ, *e.g.,* cambium of vascular bundles (fascicular, interfascicular and extrastelar cambium), cork cambium or phellogen.

21 **(a)**
Medullary or pith rays They are the radial strips of parenchyma which are present between adjacent vascular bundles. The medullary rays connects the pith with pericycle and cork

22 **(d)**
Due to the absence of vascular cambium the monocots don't show secondary growth

23 **(d)**
Both (b) and (c).
When xylem and phloem within a vascular bundle are arranged in an alternate manner on different radii, the arrangement is called radial, such as in roots. In conjoint type of vascular bundles, the xylem and phloem are situated at the same radius of vascular bundles. Such vascular bundles are common in stems and leaves. The conjoint vascular bundles usually have the phloem located only on the outer side of xylem

24 **(a)**
The periderm consists of phellem (cork), phellogen (cork cambium) and phelloderm. The Phellogen develops in the epidermis, the cortex, the phloem or the root pericycle and produces phellem towards the outside and phelloderm towards the inside.

25 **(d)**
When the xylem is differentiated from the point of origin towards outside (*i.e.,* periphery of axis), it is known as centrifugal xylem. In such cases as represented by stems, the protoxylem is situated towards inside and the metaxylem towards outside. This type of condition of xylem is called endarch.

26 **(c)**
Root Apical Meristem It is found at the tip of the main root and its branches. In case of tap root system, the root apical meristem is formed from radicle part of the embryo or its derivatives. In

adventitious root, the root apical meristem is produced from the derivatives of shoot apex

27 **(c)**
Usually, epidermis consists of single layer of epidermal cells (*i.e.,* uniseriate). But in case of *Nerium*, multiple epidermis is found with thick-walled epidermal cells.

28 **(a)**
The primary growth in plants occur as a result of activity of the apical meristem, which helps in the elongation of roots with the help of root apical meristem and elongation of stem with shoot apical meristem. Dry growth is exhibited by the presence of vascular cambium

29 **(d)**
Study of internal structure of plants is called anatomy. Plants have cells as the basic unit, cells are organised into tissues and in turn the tissues are organised into organs

30 **(d)**
In monocotyledon, the vascular bundles are scattered throughout the ground tissue. They are conjoint and closed (not having vascular cambium)

31 **(d)**
The primary xylem is in the centre of the stem, while primary phloem is pushed outward and crushed into the cortex by the significant activity of vascular cambium. While the secondary phloem differentiates from the cells that divide towards the outside of the stem

32 **(c)**
In the meristematic cells, there is no reserve food materials like fat, protein and sugar. So, salts or inorganic material have more concentration than any other cells

33 **(d)**
Inbreeding is mating between individuals related by descent or ancestry. Inbreeding depression is the reduction or loss in vigour and fertility as a result of inbreeding. Detailed information on inbreeding in maize was published independently by **East** and **Shull**. Maize is a monocot plant. Bundle sheath in leaf and medulla in roots are present in maize.

34 **(a)**
In the leaf of flowering plants, the phloem is always found towards the lower side (abaxial) and xylem towards the upper (adaxial) side.

35 **(d)**
The inner, darker and harder portion of secondary xylem that cannot conduct water, in an older dicot stem is known as heartwood or duramen, whereas the outer, functional, water conducting, younger secondary xylem constitute the sap-wood or alburnum.

36 **(d)**
The cells arranged in multiple layer between epidermis and pericycle constitutes the cortex (dicot stem)
It consists of three zones
(i) Hypodermis
(ii) Cortical layer
(iii) Endodermis

37 **(d)**
Stone cells provide the hardness to seed coats.

38 **(d)**
Epidermis Epidermis is the outermost protective layer of plant organs. It is usually simple layered but in the leaves of tropical plants (*e. g*., oleander, banyan) and velamen of some roots, the epidermis is more than one layer thickness. The epidermal tissue system is derived from the protoderm

39 **(d)**
Both (a) and (b).
The activity of cambium is under the control of many physiological and environmental factors. In temperate regions, the climatic conditions are not uniform through the year. In the spring season, cambium is very active and produces a large number of xylary elements having vessels with wider cavities. The wood formed during this season is called spring wood or early wood

40 **(b)**
Bark refers to a number of tissue types *viz*., periderm and secondary phloem

41 **(b)**
Next to the endodermis lies a few layers thick-walled parenchymatous cells referred to as pericycle. Initiation of lateral roots and vascular cambium during secondary growth takes place in these cells

42 **(d)**
In the upper epidermis of monocots (*e. g*., wheat, maize, cereals, grasses), there are some large cells found in groups which are known as motor cells or bulliform cells. These cells help in rolling of leaves in dry conditions

43 **(b)**

Companion cells are present between the sieve tubes in the phloem of angiosperms. There are living cells with a large nucleus that controls the activity of non-nucleated sieve tubes

44 **(c)**
The vascular bundles, in which xylem and phloem occur as separate bundles are known as radial vascular bundles, *eg*, root.

45 **(b)**
In old trees, the greater part of secondary xylem is dark brown due to the deposition of organic compounds like tanins, resins, oils, gums, aromatic substances and essential oils in the central or innermost layers of the stem. These substances make it hard, durable and resistant to the attacks of microorganisms and insects. The region comprises dead elements with highly lignified walls and is called heart wood

46 **(a)**
The parenchymatous cells which lies between the xylem and the phloem are called conjuctive tissue

47 **(d)**
I, II and III.
The monocot stem has a sclerenchymatous hypodermis, a large number of scattered vascular bundles, each surrounded by a sclerenchymatous bundle sheath, and a large, conspicuous parenchymatous ground tissue. Vascular bundles are conjoint and closed. Peripheral vascular bundles are generally smaller than the centrally located ones. The phloem parenchyma is absent and water-containing cavities are present within the vascular bundles

48 **(a)**
The activity of cambium is under the control of many physiological and environmental factors. In temperate regions, the climatic conditions are not uniform through the year. In the spring season, cambium is very active and produces a large number of xylary elements having vessels with wider cavities. The wood formed during this season is called spring wood or early wood

49 **(c)**
The meristem that occurs in both roots and shoots and produce the woody axis and appear later than the primary meristem are called the **secondary meristem**

50 **(c)**
Secondary growth is the growth in girth of stem and roots. Anamolous or abnormal secondary growth is found in some monocot stems such as *Yucca, Dracaena, Aloe, Agave*, etc.

51 **(d)**
Vessels are absent in some angiosperms *e.g., Drimys*. This is a homoxylous angiosperm.

52 **(a)**
In monocot stem, vascular bundles are conjoint, collateral and closed.

53 **(a)**
Sorghum (family-Poaceae) is a monocot plant. The leaves of monocot do not contain palisade parenchyma, because the mesophyll of monocot leaf is not differentiated into palisade and spongy parenchyma, all being thin-walled, chlorophyllous and irregularly compactly arranged with fewer intercellular spaces.

54 **(d)**
Schmidt (1924) proposed tunica-corpus theory, which states the presence of two distinct zones in angiospermic shoot apices. The peripheral zone is called tunica and the inner core of cells called corpus surrounded by tunica.

55 **(b)**
Sapwood is also known as alburnum. It is the outerward or peripheral wood of the plant, consisting of living cells and is light in colour and weight. Alburnum represents the functional part of secondary xylem (wood), where tracheids and vessels are not plugged by tyloses and secondary metabolites are not deposited in tracheary elements.

56 **(a)**
The root apical meristem occupies the tip of root, while shoot apical meristem occupies region of stem apex

57 **(b)**
Vascular system includes vascular bundles, which can be seen in the veins and the midrib. The size of the vascular bundles are dependent on the size of the veins. The veins vary in thickness in the reticulate venation of the dicot leaves. The vascular bundles are surrounded by a layer of thick walled bundle sheath cells

58 **(c)**
The meristem, which lies between the regions of permanent tissues is called **intercalary meristem**. Intercalary maristem is a primary meristem.

59 **(a)**
Lenticels.

At certain regions, the phellogen cuts off closely arranged parenchymatous cells on the outer side instead of cork cells. These parenchymatous cells soon rupture the epidermis, forming a lens-shaped openings called lenticels. Lenticels permit the exchange of gases between the outer atmosphere and the internal tissue of the stem. These occur in most woody trees

60 **(a)**
After three years, the nail will be one metre above the soil because plants show only apical growth. Only tip of tree will grow, lower part of tree will remain constant.

61 **(c)**
In dicot stems, the cells of cambium present between primary xylem and primary phloem are intrafascicular cambium. The cells of medullary cells, adjoining these intrafascicular cambium becomes meristematic and form the interfascicular cambium. Thus, a continuous ring of cambium is formed

62 **(d)**
In dicotyledonous roots, initiation of lateral roots and vascular cambium during the secondary growth take place in pericycle cells.

63 **(b)**
Root stem transition occurs in hypocotyl region of axis.

64 **(b)**
Monocots have **atactostele**, in which vascular bundles are arranged into more than one ring and they are usually found at the centre of stem.

65 **(a)**
The leaves of dicot plants are anatomically differentiated into epidermis, mesophyll tissue and vascular bundles. Mesophyll tissue is divided into upper **palisade tissue**, consisting of closely arranged cells with **numerous chloroplasts** and **lower spongy tissue**, which consists of loosely arranged cells separated by large air spaces. The cells of spongy tissue have fewer chloroplasts, hence most of the photosynthesis occur in palisade tissue.

66 **(a)**
All tissues except epidermis and vascular bundles constitute the ground tissue or fundamental tissue. It consists of simple tissues such as parenchyma, collenchyma and sclerencyma. Ground tissue includes cortex, pericycle, medullary rays. In leaves the ground tissue consists of mesophyll.

67 **(a)**
In monocotyledons, the vascular bundles have no cambium present in them. Hence, they don't form secondary tissue and referred to as closed vascular bundles. Generally, monocotyledons have the closed vascular bundles

68 **(a)**
Sieve tubes are elongated tubular conducting channels of phloem. Each sieve tube is formed of several cells called **sieve tube members, sieve tube cells** or **sieve elements.** Sieve tube members are placed end to end. The end walls are generally bulged out. They may be transverse or oblique. They have many small pores or sieve pits. Each sieve pore is lined by a layer of **callose**. Due to the presence of sieve pits. The end walls are commonly called **sieve plates**

69 **(a)**
Exarch It is the condition of vascular bundles in which the protoxylem
(earlier formed xylem) lies toward the outside and metaxylem (later formed xylem) lies toward inward
Endarch It is the condition of vascular bundles in which the protoxylem (earlier formed xylem) lies toward the inner side and metaxylem (later formed xylem) lies outside

70 **(d)**
All except IV.
Epidermal cells are elongated compactly arranged and form continuous layer called epidermis.
Stomata are present in epidermis of leaves and regulate process of transpiration and gaseous exchange. The epidermal hairs, i.e., root hairs, unicellular elongations and trichomes, multicellular elongation of epidermis on root and shoot helps in absorbing water and preventing water loss, respectively.
All of these.
The outside of the epidermis is often covered with waxy thick layer called cuticle, which prevents the loss of water. Cuticle is absent in roots.
In grasses (monocotyledons), the guard cells are dumb-bell shaped and in dicotyledonous (bean, castor, pea), the guard cells are bean or kidney-shaped

71 **(a)**

In dicot root, the vascular cambium is completely secondary in origin. It originates from the tissue located just below the phloem bundles, *i.e.*, portion of pericycle tissue

72 **(c)**
In the formation, the heart wood and sap wood,. it is not necessarily that the wood formed in previous years is darker than newer wood

73 **(d)**
Under extremely dry conditions, the cuticle is reinforce by a layer of wax. This wax checks the excessive loss of water from the epidermal layer
The epidermis of aerial parts usually bears a number or minute pores called stomata. Each stomata performs the gaseous exchange in plants
Ground tissue system of leaves is called mesophyll. Mesophyll is made up of two types of photosynthetic cells, palisade and spongy

74 **(c)**
Vessel is a long cylindrical tube-like structure made up of many cells called vessel members, each with lignified walls and a large central cavity. The vessel cells are also devoid of protoplasm. Vessel members are interconnected through perforations in their common walls. The presence of vessels is a characteristic feature of angiosperms

75 **(a)**
The anatomy of the monocot root is similar to the dicot root in many respects. It has epidermis, cortex, endodermis, pericycle, vascular bundles and pith. As compared to the dicot root, which have fewer xylem bundles, there are usually more than six (polyarch) xylem bundles in the monocot root. Pith is large and well-developed.
Monocotyledonous roots do not undergo any secondary growth

76 **(b)**
Vessels are long, tubular having lignified cell wall and are components of xylem tissue. The cross wall (end wall) at both the ends of vessels, dissolves and form a pipe-like channel.
They functions in ascent of sap in angiosperms.
Conduction of food materials occurs through the sieve tubes, which are cellulosic, thin-walled and are component of phloem tissues.

77 **(c)**
Idioblast (modified parenchyma cells) and collenchyma are simple permanent tissue and apical meristems are simple meristematic tissue.
Conducting tissues (*i.e.,* xylem and phloem) are complex conducting tissue made up of different types of cells.

78 **(b)**
A–parenchyma, B–collenchyma, C–sclerenchyma

79 **(d)**
A-Endodermis B-Conjuctive tissue C-Protoxylem D-Metaxylem E-Phloem F-Pith

80 **(d)**
Pericycle is the external layer of stele. It forms a single layer between endodermis and conducting tissues. The roots or root branches are produced endogenously from the pericycle.

81 **(d)**
Only one xylem strand occurs in the slender root of the hydrophyte *Trapa natans*. In *Nicotiana*, the roots are diarch. In *Pisum*, the root is triarch. In *Castanea*, the root is tetrarch.

82 **(d)**
Clowes proposed quiescent centre theory.

83 **(a)**
Spring wood plus autumn wood of a year constitute annual ring. The spring wood (also called early wood) is light in colour and constitute major part of annual ring. The autumn wood (also called late wood) is darker in colour.
Wood consists of secondary xylem. The central hard, tough and darker region of wood constitutes heart wood while peripheral portion constitutes sap wood. But these are not specified in annual rings.

84 **(c)**
In roots the protoxylem lies towards the periphery and metaxylem lies toward the centre. Such arrangement is called exarch

85 **(a)**
The outside of the epidermis is often covered with waxy thick layer called cuticle, which prevents the loss of water. Cuticle is absent in roots

86 **(a)**
The various function of the epidermis are
(i) Protection of internal tissues
(ii) Prevention of entry of harmful organisms
(iii) Minimising surface transpiration by having thick cuticle
(iv) Exchange of gases through stomata
(v) Protection against excessive heating up and sudden changes in temperature with the help of hair (as in sunflower)

87 **(c)**

In a woody dicotyledonous tree, shoot tips and root tips consist of primary tissues.

88 **(b)**
In *Combretum* and *Entada*, the cambium shows abnormal behavior by cutting phloem on the inner as well as at certain places for a short period and then resumes normal activity.

89 **(b)**
Monocots have atactostele, in which vascular bundles are arranged into more than one ring and they are usually found at the centre of the stem

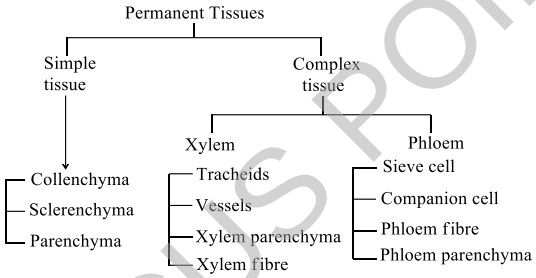
90 **(c)**
Phloem lie towards the pericyclet on the outerside of vascular bundle. Phloem consists of sieve tubes, companion cells, phloem parenchyma and phloem fibres. The companion cells and phloem parenchyma are connected with sieve tubes through pits. They help in lateral flow of organic food. The companion cells also control the functions of the sieve tubes. The sieve tubes conduct organic food longitudinally

91 **(d)**
Intrastelar cambium is the cambium present between xylem and phloem (*i.e.,* within the stele), and the interstelar cambium, is present between steles (vascular bundle) and show growth rings formation.

92 **(b)**
Suberin.
The innermost layer of cortex is called endodermis. It comprises a single layer of barrel-shaped cells without any intercellular spaces. The tangential as well as radial walls of the endodermal cells have a deposition of water impermeable, waxy material called suberin in the form of casparian strips

93 **(c)**
Tyloses are protrusions of the axial and ray parenchyma cells, which enter in tracheary elements.

94 **(d)**
The cell of the permanent tissues do not generally divide further. Permanent tissues having all cells similar in structure and function are called simple tissues. Permanent tissues having different types of cells together are called complex tissues



95 **(b)**
The tissue involved in secondary growth are two lateral meristems
(i) Vascular cambium
(ii) Cork cambium

96 **(a)**
In dicots, flower parts in four or five or multiple of these. They have leaf veins in the form of a net and secondary growth is present.

97 **(b)**
A thin-walled pith is generally present in monocot roots, while in dicot roots, a thin-walled conjunctive tissue is present in between vascular elements. Thin-walled pith is also well marked in dicot stems but absent in monocot stems.

98 **(c)**
The increase in height of a plant is due to apical meristem. Therefore, the height of the board remains same after five years.

99 **(d)**
In dicotyledon leaves, the mesophyll tissue is differentiated into the palisade tissue and spongy parenchyma but in monocot such differentiation is not seen

101 **(d)**
In dicotyledonous root, the condition of xylem is exarch as the protoxylem away from the centre and metaxylem towards the centre. In dicotyledonous stem (*e.g., Cucurbita*), the condition of xylem is endarch as the metaxylem away from the centre and protoxylem towards the centre.

102 **(d)**
Dendrochronology is the branch of Botany that deals with the determination of age of a tree by counting and analyzing the annual growth rings of the tree.

103 **(b)**
In flowering plants, vascular tissues develop from plerome of apical meristem.

104 **(b)**

Generally in leaves of dicots, the protoxylem (newly formed xylem) face towards the adaxial (upper) surface or side

105 **(b)**

A–spring wood, B–autumn wood.

The spring wood is lighter in colour and has a lower density whereas the autumn wood is darker and has higher density. The two kinds of woods that appear as alternate concentric rings, constitutes an annual ring. Annual rings seen in a cutted stem give an estimate of the age of the tree

106 **(d)**

In stems, the protoxylem lies towards the centre (pith) and the metaxylem lies toward the periphery of organ. This type of primary xylem is called endarch

107 **(a)**

The centre of monocot root or dicot root is occupied by pith. It consists of parenchymatous (thin-walled or thick-walled) cells which may be rounded or angular. Intercellular spaces are present in the pith cells. The pith cells stores food. Pith is small or inconspicuous in dicots and large, conspicuous in monocots

108 **(b)**

The histogens are the group of cells, which give rise to future tissues. Major histogens of stem are as follows

2. **Dermatogen** forms external layers like epidermis.

3. **Plerome** forms central core of tissues like pith and vascular bundles.

4. **Periblem** forms the region between central core and epidermis such as endodermis, cortex, etc.

109 **(d)**

Vascular cambium gives rise to secondary growth.

110 **(d)**

Isobilateral leaves or monocotyledons leaves are thickened on the free side, where silica and cutin are deposited. These deposition protects the leaves from herbivores

111 **(d)**

Differentiation between dicot and monocot root

Dicot Root	Monocot Root
1. Cortex is narrow	Cortex is very wide
2. Small inconspicuous pith	Pith is large and generally conspicuous
3. Fewer xylem bundle	More than six (polyarch) xylem bundles
4. Secondary growth is present	Secondary growth is absent

112 **(a)**

In amphivasal vascular bundle, the phloem is surrounded by xylem.

113 **(a)**

The stele composed of two or more than two concentric rings of vascular bundles is called polycyclic, as found in *Pteridium* rhizome.

114 **(d)**

The stomatal aperture, guard cells and the surrounding subsidiary cells are together called stomatal apparatus

115 **(b)**

Apical meristems are primary meristems, which are located in the growing points (roots and shoot apices), as well as buds in the axils of leaves. The various organs increase in length due to activity of apical meristem.

116 **(a)**

Xylem fibres.

Xylem or Wood fibres They are sclerenchymatous fibres associated with xylem. Xylem fibres are mainly mechanical in function.

Xylem fibres have highly thickened walls and obliterate central lumens. These may either be septate or aseptate

117 **(c)**

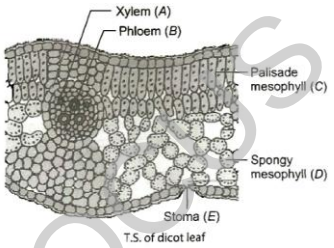
In root meristem, the quiescent centre serves as reserve for replenishment of damaged cells.

118 **(b)**

On the basis of their structure and location, there are three types of tissue systems. These are epidermal tissue system, the ground or fundamental tissue system and vascular or conducting tissue system

119 **(c)**

TS of dicot root. Palisade and spongy mesophyll tissue are the characteristic of dicot leaves



T.S. of dicot leaf

120 **(b)**
In gasses, *i.e.*, monocots, the guard cells are dumb-bell shaped

121 **(d)**
T.S. of dicot root (A-collenchyma, B-parenchyma, C-cambium, D-protoxylem, E-pith)

122 **(b)**
Root is that part of plant body which grow and down into earth. The primary roots develop from radicle and gives secondary and tertiarg roots. Lateral roots develop endogeneously *i.e.,* from pericycle.

123 **(c)**
Companion cell is a thin-walled elongated cell, which is associated with sieve tube. The sieve tube elements lack nucleus, they remain living being dependents upon the adjacent companion cell nucleus.

124 **(b)**
Gerontology is the study of ageing and senescence.

125 **(b)**
The term **leptome** is used for soft-walled conducting part of the phloem; it includes sieve elements, companion cells and parenchyma cells.

126 **(d)**
Intercalary meristem.
The meristem which occurs between mature tissues is known as intercalary meristem. They occurs is grass and regenerate the parts removed by grazing herbivores

127 **(a)**
In plants, xylem conducts the water and minerals. Thus, in xylem sap, sugar would be in significant amount.

128 **(c)**
The secondary meristem initiates radial growth.

129 **(b)**
Xylem or Wood fibres They are sclerenchymatous fibres associated with xylem. Xylem fibres are mainly mechanical in function.
Xylem fibres have highly thickened walls and obliterate central lumens. These may either be septate or aseptate

130 **(b)**
Vascular cambium forms phloem tissue outside. Food synthesised in the leaves move to different parts of the plant through the phloem.

131 **(b)**
Prickles are the example of emergences. These are multicellular epidermal sharp and stiff outgrowth, which do not have vascular supply. They protect the plant from excessive transpiration, grating animals and in some, helps the plant in climbing

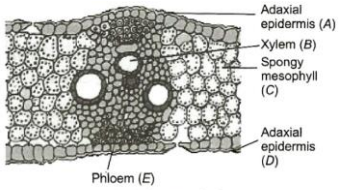
132 **(a)**
The cortex of hydrophytes is well developed. Major portion of it is occupied by well-developed prominent air cavity called **aerenchyma,** which increase buoyancy and allows a rapid gaseous exchange.

133 **(b)**
In a dicot stem, secondary growth occurs due to lateral meristem.

134 **(d)**
Cork cambium or phellogen is a lateral meristem as it is responsible for increase in the thickness of stem. It is secondary in origin and function. It gives rise to secondary tissues like cork and secondary cortex.

135 **(b)**
Endodermis is innermost distinct layer of cortex. The endodermis is uniseriate and almost universally present in the roots. The cells of endodermis are living and characterized by presence of Casparian strips or Casparian bands on their anticlinal walls. The strip is formed during the early ontogeny of the cell and is a part of primary wall. The strip is typically located close to the inner tangential wall. Thin-walled **passage** cells are also found in the endodermal layer, which lie against the protoxylem poles.

136 **(d)**
T.S of monocot leaf. In monocot leaf the adaxial and abaxial both surfaces same and equally receive sunlight



T.S. of monocot leaf

137 **(c)**
The **intercalary meristems** are responsible for localised growth. Perhaps they have been detached from the mother meristem, *e.g.,* meristem present at the base of leaves in many monocots, in the internode of grasses, at the top of peduncles of *Plantago* and *Taraxacum*, etc.

138 **(a)**
Phytotron is a device or chamber, in which plants can be grown under controlled conditions.

139 **(c)**
Meristematic tissue is a group of cells specialized for the production of new cells, *i.e.,* perpetuates itself by active cell division.

140 **(a)**
In amphivasal vascular bundle, phloem is surrounded by xylem, *e.g., Dracaena*.

141 **(b)**
The cells of epidermis bear a number of hairs. The root hairs are unicellular elongations of the epidermal cells and helps to absorb water and minerals from the soil. On the stem the epidermal hairs are called trichomes. The trichomes in the shoot system are usually multicellular. They may be branched or unbranched and soft or stiff. They may even be **secretory**. The trichomes help in preventing water loss due to transpiration

142 **(d)**
The epidermis performs various function like the protection of internal tissue. The stomata in the epidermis helps in gaseous exchange and the trichrome helps in the reduction of transcription rate

144 **(d)**
Both (a) and (b) (tracheid and vessels).
Tracheids are elongated or tube like cells with thick and lignified walls and tapering ends. These are dead and are without protoplasm. The inner layers of the cell walls have thickenings which vary in form. In flowering plants, tracheids and vessels are the main water transporting elements

145 **(a)**
A dorsoventral leaf in its vertical section through union shows three main parts, *i.e.*, epidermis, which covers both upper or adaxial epidermis and lower or abaxial epidermis, among which the lower possesses cuticle mesophyll and vascular bundle

146 **(d)**
Only II.
Mesophyll, which possesses chloroplasts and carry out photosynthesis, is made up of parenchyma

147 **(a)**
Companion cells are characteristic elements of phloem tissue associated with the sieve tubes in the angiosperms. They are absent in pteridophytes and gymnosperms.

148 **(b)**
Sclerenchyma are considered thick-walled lignified supportive tissue characterised by the absence of living protoplast. Their principal function is to provide mechanical support.

149 **(a)**
Dendrochronology is the determination of age of tree by counting annual rings (these rings are formed by activity of cambium in dicot root and stems).

150 **(a)**
Lignification is associated with xylem. The walls of xylem cells are made up of lignin.

151 **(a)**
Xylem is a complex tissue which performs the function of transport of water or sap inside the plant. Simultaneously, it also provides mechanical strength. Xylem is also known as wood. It consist of four types of cells
Tracheids, vessels (both tracheary elements), xylem and phloem

152 **(b)**
The abaxial epidermis generally bears more stomata than the adaxial epidermis. The later may even lack stomata. The tissue between the upper and the lower epidermis is called mesophyll

153 **(c)**
Cambium is present between xylem and phloem. Such vascular bundles because of the presence of cambium, possesses the ability to form secondary xylem and phloem tissue and hence, is called open vascular bundles

154 **(c)**
During primary growth, protoxylem elements are crushed and they form a distinct cavity known as lysigenous water cavity.

155 **(a)**
Loosely arranged cells of a lenticel are called complementary cells.

156 **(b)**
Hydrophytes are those plants that grow in water conditions. Water conduction systems are not well developed in them. So, roots are poorly developed. Roots are required only for anchorage, while halophytes are those plants that grow in high salty or marshy areas. In those plants, root system is very well developed. Roots may be entirely absent in hydrophytes like *Wolffia, Salvinia, Ceratophyllum* or poorly developed in *Hydrilla*.

157 **(c)**

As a result of continued secondary growth in subsequent years, the older part of secondary xylem or wood becomes non-functional as it loses the power of conduction. The cells of this wood are filled with resins or tannins produced by adjacent functional cells. The activities of vessels become blocked by tyloses. Due to these activities, non-functional, secondary xylem becomes hard, durable and blackish in colour, called heartwood.

158 **(c)**

Sclerenchyma cells are thick-walled, lignified and dead at maturity. These provide mechanical support to the *Pinus* needle. Sclerenchyma may be fibrous or sclereid.

159 **(d)**

Intercalary meristems are the portions of apical meristems, which are separated from the apex during the growth of axis and formation of permanent tissues.

160 **(b)**

The characteristic features of vascular bundles of dicot stem are as follows:

5. Vascular bundles are arranged in a ring.
6. They are conjoint, *i.e.,* xylem and phloem are present on the same radius.
7. They are open, *i.e.,* a cambium layer is found between xylem and phloem.
8. They are not surrounded by bundle sheath.
9. The position of protoxylem is towards the centre, *i.e.,* endarch.

161 **(d)**

Sclerenchyma is composed of dead cells. The cell wall is heavily thickened due to deposition of lignin.

According to histogen theory, periblem is the middle dermatogen, which gives rise to cortex of root and stem.

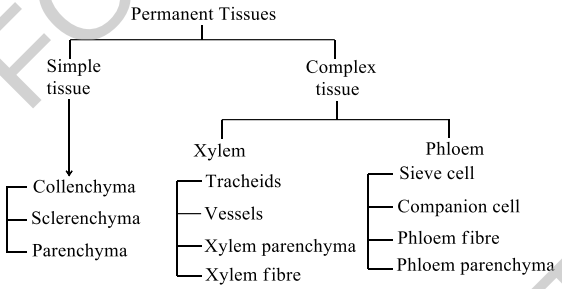
Tracheids are most primitive type of conducting elements in xylem. The xylem of gymnosperms consists of tracheids only. Companion cells are thin-walled elongated cells in phloem. They are living, contain dense protoplasm and large elongated nucleus.

Cork is produced by a number of plants. However, it is commercially obtained from the cork oak tree (*Quercus suber*).

162 **(d)**

I, II and III.

The cell of the permanent tissues do not generally divide further. Permanent tissues having all cells similar in structure and function are called simple tissues. Permanent tissues having different types of cells together are called complex tissues



163 **(a)**

Nerium belongs to family-Apocynaceae (dogbane family). *Nerium* contains latex cells that do not form a network. Thus, called **non-articulate** laticiferous. Family-Urticaceae, Asclepiadaceae, Moraceae, Euphorbiaceae and Apocynaceae bear such type of latex cells.

164 **(a)**

Epidermal cells are elongated compactly arranged and form continuous layer called epidermis. Stomata are present in epidermis of leaves and regulate process of transpiration and gaseous exchange. The epidermal hairs, *i.e.*, root hairs, unicellular elongations and trichomes, multicellular elongation of epidermis on root and shoot helps in absorbing water and preventing water loss, respectively

165 **(a)**

Bulliform cells or **motor cells** specialized large, empty, vacuolated colourless, thin-walled cells present in the upper epidermis of isobilateral leaf of monocots. They function in rolling up of leaves during water stress or xerophytic conditions.

166 **(a)**

Velamen tissue is found in the aerial roots of certain epiphytic orchids (*e.g., Vanda*).

167 **(c)**

Nucleus of companion cells.

Sieve tube elements are long, tube-like structures, arranged longitudinally and are associated with the companion cells. Their end walls are perforated in a sieve-like manner to form the

sieve plates. A mature sieve elements possesses a peripheral cytoplasm and a large vacuole but lacks a nucleus. Functions of sieve tubes are controlled by the nucleus of companion cells

168 **(a)**
Nerium is a xerophytic plant. It has sunken stomata in leaf, which is an adaptive structure in xerophytic plants for reducing the water loss during transpiration. *Nerium* has several layer of epidermis.

169 **(a)**
In plate meristem, the cells divide in several planes and consequently, there is an increase in the area of the organ. It results in the formation of flat structures, *e.g.,* in epidermal growth and leaf formation.

170 **(b)**
The cambium activity is seen in the temperate trees in two seasons of the year. In the spring season, cambium activity is highest as a result more amount of wood is formed due to long duration of favourable period. This type of wood is known as spring wood or early wood. In autumn season, cambium activity is arrested as a result dark-coloured, narrow band of autumn wood or late wood is formed. The two woods jointly constitute the annual rings or growth rings.

171 **(d)**
During the formation of primary plant body, specific regions of apical meristem produce dermal tissue for hardning and vascular tissue for transport and ground tissue

172 **(b)**
Vascular bundle, which possess both xylem and phloem are called conjoint vascular bundle. In bicollateral conjoint vascular bundle, phloem present on both outer and inner side of xylem, *e.g., Cucurbita*.

173 **(b)**
When cambium is present between phloem and xylem tissue of a vascular bundle, the vascular bundle is called open but if cambium is absent, the vascular bundle is called closed.

174 **(a)**
Compound sieve plate consists of several pore regions, which are separated by bars of wall thickening, *e.g., Vitis*.

175 **(b)**
In angiosperms, xylem consists of tracheids, vessels or tracheae, xylem fibres and xylem parenchyma. Tracheae are absent in pteridophytes and gymnosperms. In angiospermic phloem, sieve elements are sieve tubes, while in gymnosperms and pteridophytes sieves cells are found.

176 **(a)**
Phloem transports food material, usually from leaves to other parts of the plant. Phloem in angiosperms is composed of sieve tube elements, companion cells, phloem parenchyma and phloem fibres. Gymnosperms have albuminous cells and sieve cells

177 **(b)**
In dicotyledous root, the outermost layer is epidermis. Many of the epidermal cells protrude in the form of unicellular root hairs which absorb water and minerals and increases the surface area

179 **(d)**
Meristematic activity is characterised by the presence of meristematic tissue which are present at root apex (root apical meristem), shoot apex (shoot apical meristem) between mature tissues, intercalary meristem and in mature regions (lateral meristem)

180 **(b)**
Only V.
In old trees, the greater part of secondary xylem is dark brown due to the deposition of organic compounds like tanins, resins, oils, gums, aromatic substances and essential oils in the central or innermost layers of the stem. These substances make it hard, durable and resistant to the attacks of microorganisms and insects. The region comprises dead elements with highly lignified walls and is called heart wood

181 **(c)**
Tracheids are elongated and their cell walls are usually extensively thickened by deposition of lignin. Water flows from one tracheid to another through unthickened regions (pits) in the cell walls.

182 **(a)**
Cells arranged in multiple layers between epidermis and pericycle constitutes the cortex. *It is divided into three regions*
(i) Hypodermis, few layer of collenchymatous cells

(ii) Cortical layer cells, rounded thin walled parenchymatous cells
(iii) Endodermis

183 **(b)**
Jute fibres occur in long wedge-shaped bundles outside the xylem (*i.e.,* phloem fibres). It is most important of bast fibres and comes second in production only to cotton among natural fibres.

184 **(a)**
Sieve tube cells are studied during the translocation of solutes because they have interconnected lumen. Sieve tubes takes part in the conduction of organic food

185 **(b)**
Vascular tissue, pericycle and pith are stellar regions, and are formed from plerome.

186 **(d)**
Endodermis is the innermost limiting layer of cortex which separates the vascular tissue from cortical cells. In some dicots the endodermal cells bear characteristic thickening on then walls, the Casparian thickenings. The thickenings are restricted to radial and inner tangential walls.

187 **(d)**
Cork cambium or phellogen cells divided perclinically cutting off cells towards the outside and inside. The cells cut off towards the outside become suberised and dead. These are compactly packed in radial rows without intercellular spaces and form cork or phellem. Cork is impervious to water due to suberin and provides protection to underlying tissues. The cells cut off from cork cambium towards inside add to the cortex and are called secondary cortex cells on phelloderm.

188 **(a)**
In phloem, sieve tubes possess the perforated oblique or transverse sieve plates. Sieve plates are called simple when they consists of one region of pores (*e.g., Cucurbita, Nicotiana*) or compound when they consists of several pored regions separated by bars or wall thickenings (*e.g., Vitis*).

189 **(c)**
In hydrophytes, root caps are absent.

190 **(c)**
The guard cells possesses chloroplast and regulate the opening and closing of stomata

191 **(d)**
Intercalary meristematic tissues are intercalated in between the permanent tissues. They may be present either at the base of internodes (*e.g.,* grasses, wheat, etc) or at the base of leaf (*e.g., Pinus*) or at the base of node (*e.g.,* mint). The activity of intercalary meristem also add to the length of plant or its organs.

192 **(d)**
Sieve plates are formed by two adjoining end walls of neighbouring sieve elements of sieve tube of phloem. At maturity, these become impregnated with callose pad, which may be seasonal callose (for only limited unfavourable period) or definitive callose (formed permanently in functionless old sieve tubes).

193 **(d)**
Cullulase, hemicellulose, pectin. *All of the above*
The **collenchyma** occurs in layers below the epidermis in dicotyledonous plants. It is found either as a homogenous layer or in patches. It consists of cells which are much thickened at the corners due to the deposition of cellulose, hemicellulose and pectin. Collenchymatous cells may be oval, spherical or polygonal and often contain chloroplasts. These cells assimilate food when they contain chloroplasts. Intercellular spaces are absent. They provide mechanical support to the growing parts of the plant such as young stem and petiole of a leaf

194 **(c)**
Complete Tissue They are permanent tissue which contains more than one type of cells. All type of cells of a complex tissue work as a unit. The common complex permanent tissues are conducting tissue, xylem and phloem

195 **(d)**
When the protoxylem elements lie at the periphery and metaxylem in the centre, the condition is said to be **exarch**. Here, the direction of development is centripetal, *e.g.,* root.

196 **(b)**
When xylem and phloem groups are located on different radii, the bundles are said to be radial, *e.g.,* root. The protoxylem element lie at the periphery and metaxylem in the centre, this condition is called exarch, *e.g.,* root

197 **(d)**
Stele is the innerside of endodermis, such as pericycle, vascular bundles and pith

198 **(c)**
The cork (phellem) is impervious to water due to suberin deposition in the cell wall

199 **(d)**

Xylem and phloem are called the heterogenous tissues

200 **(c)**
When phloem is surrounded by xylem on all sides, such concentric vascular bundle is called **amphivasal** or **leptocentric**. Such vascular bundle is found in *Dracaena, Yucca, Aloe*, etc.

201 **(c)**
In dicotyledous root, the cortex consists of several layer thin walled parenchyma cells. These parenchyma cells have intercellular space. The inner most layer of the cortex is called **endodermis**. It surrounds the vascular tissue

202 **(b)**
Vessels or tracheae are made up of a row of cells placed one above the other with their intervening walls absent or variously poured. These have wide lumen for conduction of minerals and water. While tracheids are unicellular and have a narrow lumen.

203 **(d)**
A-Pore **B-** Complementary **C-** Cork **D-** Cork cambium **E-** Secondary cortex

204 **(d)**
The cambium present between the xylem and phloem of vascular bundle is called **vascular cambium**. It is a **lateral meristem** that gives rise to secondary xylem and phloem and occurs in the form of a thin strip. Vascular cambium is also called **fascicular cambium**.

206 **(a)**
P-proteins or phloem proteins are found in the phloem, particularly sieve tube elements of the flowering plant, where it may block or hinder translocation through sieve pores.

207 **(c)**
In a bicollateral vascular bundle, the phloem occurs in two groups one outside the xylem and the other inner to it, *i.e.,* two groups of phloem, one on each side of xylem.
So, the correct sequence is
Outer phloem → Outer Cambium → Middle xylem → Inner cambium → Inner phloem

208 **(c)**
Divisions of cells in both primary and secondary meristems results in the formation of new cells, which become structurally and functionally specialised and loose the ability to divide. Such cells are called permanent or mature cells

209 **(b)**
Intercalary meristem is present at the base of internodes, *e.g.,* in grasses (Gramineae) or at the base of leaves, *e.g.,* in *Pinus* or at the base of nodes, *e.g.,* mint.
Intercalary meristem is the part of apical meristem and responsible for increase in length.

210 **(a)**
Anatomically, root is distinguishable into following layers or regions sequentially
Epiblema → Cortex → Endodermis → Pericycle → Vascular system → Pith
Epiblema is the outermost piliferous layer of root tissue.
Cortex is the extrastelar fundamental tissue of the sporophyte.
Endodermis is the most innermost layer of cortex, surrounding the pericycle.
Pericycle is an external layer of stele or the later between endodermis and conducting tissues.

211 **(a)**
Anatomically, the monocot stem is composed of epidermis, hypodermis, ground tissue and vascular bundles.

212 **(d)**
Plasmodesmata are thread-like cytoplasmic strands running from one cell to other and these make connection between adjacent cells.
Each vascular bundle is made up necessarily of xylem and phloem elements and the cambium may or may not be present.
The first differentiated xylem is called protoxylem, whereas those differentiated afterwards are called metaxylem.
Radial vascular bundles are mainly found in the roots. In these, there are separate and alternate strands of phloem and xylem present on different radii.

213 **(a)**
In leaves, the tissues, which constitute the conduction system (*i.e.,* vascular bundles) are situated near or at the centre of the midrib and generally form a ring composed of xylem (towards upper surface) and phloem (towards lower surface). The structure of large veins is more or less similar to that of a midrib. The small veins consist of only of few conducting cells.

214 **(c)**
Vessels or tracheae are made up of a row of cells, placed one above the other, with their intervening

walls absent or variously poured. The walls of vessels are lignified and hard, but not very thick. The cell cavity or the lumen is wide. The thickening may be annular, spiral, scalariform, reticulate and pitted.

215 **(b)**
Damaged sieve tubes are sealed by the deposition of calloses across the sieve plates blocking the sieve pores.

216 **(b)**
The correct sequence of structures in order of their location from periphery to centre in a dicot plant is :
Trichoblasts → Collocytes → Fusiform cells → Tyloses

217 **(b)**
Mature stems of woody plants have a peripheral water proof tissue called cork (phellem). It is a result of the activity of cork cambium (phellogen) during secondary growth. Cork takes the place of epidermis in the stem and roots of older woody plants.

218 **(c)**
In dicot stem, secondary growth results in the increase in thickness of both sapwood and heartwood.

219 **(b)**
A mature sieve tube lacks lignified walls.

220 **(b)**
In dicots, as a result of production of enormous amount of secondary tissues, a pressure is exerted on the peripheral tissue, which are sloughed off. From the outer layer of pericycle, the phellogen (cork cambium) is arise, which cuts off phellem (cork) on the outer side and secondary cortex or phelloderm towards the inner side.

221 **(b)**
Parenchyma cells are usually present in cortex, pericycle, pith and medullary rays, in the primary stems and roots. In leaves, the ground tissue consists of thin-walled chloroplast containing cells and is called mesophyll

222 **(b)**
In dicot leaf, mesophyll tissues are of two types- palisade parenchyma and spongy parenchyma with large intercellular spaces. Whereas in monocot leaf, mesophyll is made up of only spongy parenchyma, which has very small intercellular spaces.

223 **(c)**
There are usually two to four xylem and phloem patches. Later, a cambium ring develops between the xylem and phloem. All tissues on the innerside of the endodermis such as pericycle, vascular bundles and pith constitutes the stele

224 **(c)**
The **collenchyma** occurs in layers below the epidermis in dicotyledonous plants. It is found either as a homogenous layer or in patches. It consists of cells which are much thickened at the corners due to the deposition of cellulose, hemicellulose and pectin. Collenchymatous cells may be oval, spherical or polygonal and often contain chloroplasts. These cells assimilate food when they contain chloroplasts. Intercellular spaces are absent. They provide mechanical support to the growing parts of the plant such as young stem and petiole of a leaf

225 **(a)**
The meristem which occurs between mature tissues is known as intercalary meristem. They occurs is grass and regenerate the parts removed by grazing herbivores

226 **(b)**
In monocot root, the vascular strand has a large number (25-30 in maize) of alternate redial bundles of xylem and phloem.

228 **(b)**
Cork cambium is formed by pericycle in the dicotyledonous roots. It is absent in monocot root that's why secondary growth does not take place in the monocots

229 **(c)**
Quiescent centre concept in concern of root apex organization was proposed by **Clowes** (1961). According to which, a region called quiescent centre is found below the root cap. It is a zone of inactive cells that act as reservoir of cells and used when other meristematic cells are damaged.

230 **(b)**
The monocot stem has a sclerenchymatous hypodermis, a large number of scattered vascular bundles, each surrounded by a sclerenchymatous bundle sheath, and a large, conspicuous parenchymatous ground tissue. Vascular bundles are conjoint and closed. Peripheral vascular bundles are generally smaller than the centrally located ones. The phloem parenchyma is absent and water-containing cavities are present within the vascular bundles

231 **(b)**
In grasses, certain adaxial epidermal cells along the veins modify themselves into large, empty, colourless cells. These are called bulliform cells. When the bulliform cells in the leaves have absorbed water and are turgid, the leaf surface is exposed. When they are flaccid due to water stress, they make the leaves curl inwards to minimise water loss

232 **(a)**
The cambial ring becomes active and begins to cut off new cells, both towards the inner and the outer sides. The cells cut off towards the pith, mature into secondary xylem and the cells towards the periphery mature into secondary phloem

234 **(d)**
Secondary meristem.
The cylindrical meristem, *i.e.*, fasicular vascular cambium, interfascicular cambium and cork cambium are examples of secondary or lateral meristem and are responsible for producing secondary tissue

235 **(c)**
The secondary xylem or wood is distinguishable as spring wood and autumn wood by presence of annual rings. Later on, due to excessive growth, it termed as heartwood and sap wood. Wood is superior to any metal in its availability, cheapness, toughness, strength and elasticity.

236 **(b)**
The sclerenchyma cells are commonly found in the fruit walls of nuts; pulp of fruits like guava, pear and sapota; seed coats of legumes and leaves of tea. Sclerenchyma provides mechanical support to organs

237 **(b)**
In bicollateral vascular bundle, xylem and phloem are present on the same radius and one xylem group is present in between the two phloem groups, *e.g., Cucurbita*.

238 **(c)**
Phloem fibres (bast fibres) are made up of sclerenchymatous cells. These are generally absent in the primary phloem but are found in the secondary phloem. These are much elongated, unbranched and have pointed, needle like apices. The cell wall of phloem fibres is quite thick. At maturity, these fibres lose their protoplasm and become dead. Phloem fibres of jute, flax and hemp are used commercially

239 **(d)**
All of these.
Epidermal cells are elongated compactly arranged and form continuous layer called epidermis. Stomata are present in epidermis of leaves and regulate process of transpiration and gaseous exchange. The epidermal hairs, *i.e.*, root hairs, unicellular elongations and trichomes, multicellular elongation of epidermis on root and shoot helps in absorbing water and preventing water loss, respectively

240 **(a)**
Trichomes are multicellular, branched or unbranched and soft or stiff epidermal hairs of stem of the plant. They may be secretory and help in preventing excessive loss of water

241 **(a)**
Single layered.
Vascular Cambium
The meristematic layer that is responsible for cutting off vascular tissues (xylem and phloem) is called vascular cambium. In the young stem. It is present in patches as a single layer between the xylem and phloem. Later, it forms a complete ring

242 **(a)**
Lenticel is composed of complementary cells, and phelloderm form outside sequencially.

243 **(d)**
Lateral meristem is that meristem, which occur on the sides and helpful in increasing width of stem and root. They divide mainly in one plane (periclinal), **increasing the diameter** of an organ, *e.g.,* cambium (fascicular and interfascicular cambium), extra stellar cambium, cork cambium and marginal meristem of some leaves.

244 **(d)**
Secondary phloem remains functional as long as plant is alive.

245 **(c)**
As the stem continues to increase in girth due to the activity of vascular cambium, the outer cortical and epidermis layers get broken and need to be replaced to provide new protective cell layers. Hence, sooner or later, another meristematic tissue called **cork cambium** or **phellogen** develops, usually in the cortex region, which forms new layers, which is called periderm

246 **(c)**

Companion cells are present between sieve tubes in the phloem of angiosperms. These are the living cells with large nucleus that controls the activity of non-nucleated sieve tubes.

247 **(b)**
The vascular bundles in *Hordeum vulgare* (barley) plant are scattered in ground tissues, many in number and vary in size-smaller towards periphery and bigger towards centre of the ground tissue, oval or rounded in outline, conjoint, collateral and closed.

248 **(d)**
Pith is well developed in the monocots and is small, inconspicuous in dicots
In monocot, is there is no secondary growth due to the absence of vascular cambium between the xylem and phloem. But secondary growth is the characteristic of dicotyledonous plants

249 **(a)**
Parenchyma is most primitive type of permanent tissue. In hydrophytes (aquatic plants), parenchyma develops abundant air spaces and is known as **aerenchyma**. Aerenchyma helps in floatation.

250 **(d)**
Permanent or mature cells don't have the power of division. They are formed by the division of both types of meristems *i.e.*, primary meristem (shoot apical meristem, root apical meristem) and secondary/lateral meristems (fascicular, cork, cambium)

251 **(c)**
A–radial, B–conjoint closed, C–conjoint open
10. Radially arranged vascular tissue found in the dicot root
11. When vascular bundle is present in between xylem and phloem it is called open otherwise close-vascular bundle

252 **(d)**
Velamen and spongy tissues are found in the **epiphytic roots**. These are hygroscopic and absorb water from the atmosphere.

253 **(c)**
Root and belongs to dicot

254 **(d)**
Youngest secondary phloem is just outside the cambium, while youngest xylem is present inside the cambium. Oldest secondary phloem is just inside the primary phloem, while oldest secondary xylem is just above pith secondary rays passes through both

255 **(a)**
Collenchyma is a specialised supporting simple permanent tissue of living cells filled with protoplasm and characteristically possessing unevenly distributed thickenings of cellulose, pectin and hemicellulose on their wall.

256 **(b)**
Stele is composed of pith and vascular bundle. On the basis of orientation of xylem and phloem the vascular bundles of stele are classified as collateral, bicollateral and concentric. Pith is formed of large parenchymatous cells.

257 **(b)**
This is the description of secondary growth in roots

258 **(a)**
Apical meristems are present at the apices of shoots and root of the plants and possess actively dividing cells. These meristems are virus free and are responsible for increase in length and all primary tissues of the plant body originated from them.

260 **(c)**
The correct sequence of tissue from cambium present in dicot stem during secondary growth is primary cortex, secondary cortex, phellogen and cork.

261 **(a)**
In dicotyledonous stem, the sequence of tissue from the outside to the inside is
Phellem → endodermis → pericycle → phloem → xylem

262 **(a)**
In grasses, certain adaxial epidermal cells along the veins modify themselves into large, empty, colourless cells. These cells are called bulliform cells. When the bulliform cells in the leaves have absorbed water and are turgid (called motor cells) the leaf surface is exposed. When they are flaccid due to water stress, they make the leaves curl inwards to minimize water loss.

263 **(c)**
In grasses (monocotyledons), the guard cells are dumb-bell shaped and in dicotyledonous (bean, castor, pea), the guard cells are bean or kidney-shaped

264 **(a)**
Duraman and albrunum

265 **(c)**
In *Strychnos,* both interxylary and intraxylary phloem are present.

267 **(a)**
Parenchyma forms the major component within organs. The cells of the parenchyma are generally isodiametric. They may be spherical, oval, round, polygonal or elongated in shape. Their walls are thin and made up of cellulose. The may either be closely packed or have small intercellular spaces. The parenchyma performs various functions like photosynthesis, storage, secretion, etc.

268 **(c)**
Fusiform initial divided to form secondary phloem on the outer side and secondary xylem on the inner side. With the formation of secondary xylem (tracheary elements) on the inner side, the vascular cambium moves gradually to the outside by adding new cells. This phenomenon is called dilation.

269 **(c)**
Monocotyledonous roots.
The anatomy of the monocot root is similar to the dicot root in many respects. It has epidermis, cortex, endodermis, pericycle, vascular bundles and pith. As compared to the dicot root, which have fewer xylem bundles, there are usually more than six (polyarch) xylem bundles in the monocot root. Pith is large and well-developed.
Monocotyledonous roots do not undergo any secondary growth

270 **(d)**
The meristem which occurs generally at the tip of either roots or shoots are called apical meristem

271 **(a)**
The photosynthetic cells are found in mesophyll and are parenchymatous in nature

272 **(a)**
Many organs of aquatic plant floats in water. The mesophyll between upper and lower epidermis is differentiated into palisade parenchyma and spongy parenchyma. Intercellular spaces are present among the spongy parenchymatus cells

273 **(a)**
Xylem.
Xylem is composed of four types of tissue
(i) **Tracheids** Elongated or tube like cells with thick lignified walls and tapering ends. These are main water transporting elements
(ii) **Vessels** A long cylindrical tube with lignified walls and large central cavity. It is a characteristic feature of angiosperms
(iii) **Xylem fibres** have thickened walls and obliterated central lumen either septate or aseptate
(iv) **Xylem parenchyma** is a thin cellulose and used to store food in the form of starch or fat

274 **(c)**
Schleiden (1839) discovered and coined the term collenchyma. Lamellar collenchyma is characterized by deposition of heavy thickenings in the tangential radial cell walls, *e.g., stems* of *Sambuscus* and *Raphanus*.

275 **(d)**
Phellogen or cork cambium is the meristematic tissue which arises in the cortical region. Phellogen is a couple of layers thick. It is made of narrow, thin-walled and nearly rectangular cells

276 **(a)**
Monocot root and dicot stem have well developed and conspicuous pith (central part of vascular bundles)

277 **(b)**
The periderm is a secondary protective structure and is made up of cork cambium (phellogen), cork (phellem) and secondary cortex (phelloderm).

278 **(c)**
Stomata are adapted for water loss but plants which grow in xeric habitat have sunken type of stomata in their lower epidermis of leaves to minimize the loss of water, *e.g., Nerium*.

279 **(a)**
The stele without pith is **protostele**. The protostele is most primitive stele, which consists of a solid core of xylem surrounded by phloem and pericycle.

280 **(a)**
The leaf primordium has an apical meristem at its tip, which becomes inactive at early stage of development. Further increase in length occurs by intercalary meristem. Simultaneously marginal meristem (cells of margin of leaf axis) divide and redivide to form leaf lamina.

281 **(d)**
The vascular cambial ring of dicot stem is partly primary and partly secondary in origin.

282 **(a)**

Mesophyll, which possesses chloroplasts and carry out photosynthesis, is made up of parenchyma

283 **(a)**
Roots arises as a result of activity of root apical meristem, while trichomes are multicellular extension of epidermis on stem to prevent the loss of extra water from the surface

284 **(d)**
Secondary medullary rays.
The primary xylem is in the centre of the stem, while primary phloem is pushed outward and crushed into the cortex by the significant activity of vascular cambium. While the secondary phloem differentiates from the cells that divide towards the outside of the stem

285 **(b)**
Clowes (1961) by autoradiographic studies of DNA synthesis found a reservior of cells having low DNA, RNA and protein concentration in the **root apex** and named it as **quiescent centre**. These cells do not divide but may become active.

286 **(b)**
Tyloses are found in heartwood. Sometimes, the xylem parenchyma develops balloon-like structure to which penetrates into the adjacent xylem. Vessels, which are called tyloses, blocks the lumen of the xylem.

287 **(d)**
Due to activity of the cork cambium, pressure builds up on the remaining layers, peripheral to phellogen and ultimately these layers die and slough off. Bark is the non-technical term that refers to all tissue exterior to the vascular cambium

288 **(d)**
As mentioned earlier that secondary growth does not takes place in the monocots. But there are some exception like yucca and aloe in which the secondary growth occurs

289 **(a)**
Hypodermis consists of a few layers of collenchymatous cells just below the epidermis, which provides mechanical strength to the young stem. **Cortical layers** below the hypodermis consists of rounded thin-walled parenchymatous cells with conspicuous intercellular spaces

291 **(c)**
The companion cells are found in angiosperms only. In gymnosperms, no companion cell is present but some special parenchyma cells are associated to sieve cells, which are known as 'albuminous cells'.

292 **(b)**
Endodermis is the innermost layer of cortex. A special thick band or strip is present on radial and tangential walls of endodermal cells. This band is called Casparian strip. These band-like thickenings are made of a waxy material, suberin.

293 **(b)**
Heartwood is also called duramen. It represents the central wood of the plant. It is dark in colour and heavier in weight. Living cells are absent. It represents non-functional part of the secondary xylem (wood).

294 **(a)**
Vascular cambium of stem is partly primary and partly secondary meristem.

295 **(d)**
The periderm is the secondary protective structure and is made up of cork cambium (phellogen), cork (phellem) and secondary cortex (phelloderm)

296 **(c)**
Endodermis is the last layer of cortex and is single layered. It is characterized by presence of **Casparian strips.**

297 **(d)**
The peripheral region of secondary xylem, is lighter in colour and is known as the sapwood. It is involved in the conduction of water and minerals from the roots to leaves

298 **(c)**
A-Water pore B-Epidermis
C-Mesophyll D-Epithem
E-Vasculature

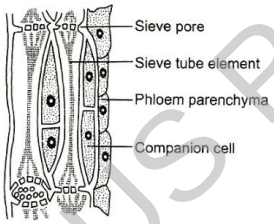
299 **(c)**
The autumn wood or latewood has less active cambium and, thus forms fewer xylem elements

300 **(d)**
The cells of sieve tube do not possess nuclei.

301 **(b)**
The endodermis regulates the flow of fluid both inwardly as well as outwardly by functioning as biological check post of the vascular bundles

302 **(d)**
Phloem tissue have following attributes
(i) Sieve tube
(ii) Phloem parenchyma
(iii) Companion cell

(iv) Phloem fibres



303 **(d)**
In a monocot stem, the vascular bundles are scattered and surrounded by a thick-walled bundle sheath. There vascular burdles are conjoint collateral, closed and endarch.

304 **(b)**
Meristematic region is the region of cell division, which situated below the root cap.

305 **(c)**
In roots, conjuctive parenchyma cells on the lateral sides of phloem bundles and the pericycle cells lying outside the protoxylem ends became meristematic. These give rise to a wavy band of vascular cambium.

306 **(a)**
Both primary and secondary meristems contributes to the growth of plants. Shoot apical meristem and root apical meristem helps the plant to grow in length while the lateral meristem helps the plant to grow in width

307 **(b)**
Companion cells are thin-walled elongated cells connected with sieve tube cells through plasmodesmata, in phloem cells. They are the characteristic of angiosperms, function in controlling metabolic activities of sieve tube cells by nucleus of companion cells.

308 **(b)**
Annual growth rings are present in trees, which grow in regions with contrasting seasonal variations in evergreen tropical forests. There is no distinct change in season so, the growth rings are diffused.

309 **(a)**
Sometimes, a few epidermal cells, in the vicinity of the guard cells become specialised in their shape and size and are known as subsidiary cells

310 **(c)**
It is the shoot apical meristem, which gives rise to lateral buds. The lateral buds, however, remain suppressed due to apical dominance.

311 **(d)**
All except II and IV.

Hypodermis consists of a few layers of collenchymatous cells just below the epidermis, which provides mechanical strength to the young stem. **Cortical layers** below the hypodermis consists of rounded thin-walled parenchymatous cells with conspicuous intercellular spaces

312 **(c)**
Vessels is a composite structure formed by dissolution of end walls of row of vessel elements, while tracheid is an individual cell.

313 **(c)**
Guard cells are the specialized epidermal cells containing chloroplast.

314 **(b)**
Roots have unicellular root hairs, which arises as tubular unbranched outgrowth of the cells of piliferous layers of epiblema (epidermis). They increases the absorptive surface of the roots

315 **(b)**
Cambium gives off secondary phloem towards outer side and secondary xylem towards inner side. In old stage the primary phloem of root is usually crushed, while in dicot stem primary phloem of root is usually crushed, while in dicot stem primary phloem, secondary phloem, cambium, primary xylem and secondary xylem is present.

316 **(d)**
In *Cycas* leaflet, transfusion tissue or hydrostereon are present on each side of the midrib in between the palisade and spongy tissue. Transfusion tissue is made up of horizontally arranged tracheids, which supply water and minerals to palisade and spongy tissue up to margins. Transfusion tissue facilitates lateral conduction of water because there in no lateral veins.
Leaf of *Pinus* also contains transfusion tissue (needle).

317 **(a)**
A group of cells which have a common origin generally perform some function. For *e*. *g*., a meristamatic tissue formed in the body may be either apical or secondary but it continues to divide

319 **(c)**
Pericycle It is few layered thick tissue. It lies inner to the endodermis and outside the vascular strand. The pricycle is made up of both parenchymatous and sclerenchymatous fibres

320 **(d)**
In a bicollateral vascular bundle, the phloem occurs in two groups, one outside the xylem and the other inner to it, *i.e.,* the two groups of phloem one on each side of xylem. These are characteristically found in the stems of members of family-Cucurbitaceae, *e.g., Cucurbita, Luffa*, etc.

321 **(d)**
The chief functions of sieve tube elements is to translocate the organic material from the source to sink.

322 **(d)**
The spring wood is lighter in colour and has a lower density whereas the autumn wood is darker and has higher density. The two kinds of woods that appear as alternate concentric rings, constitutes an annual ring. Annual rings seen in a cutted stem give an estimate of the age of the tree

324 **(b)**
The transverse section of a typical young dicotyledonous stem shows that the epidermis is the outermost protective layer of the stem covered with a thin layer of cuticle. It may bear trichomes and a few stomata

325 **(c)**
Each vascular bundle is surrounded by a sheath of parenchymatous cells called bundle sheath. They are chloren chymatous in nature

326 **(d)**
Bryophytes are simple, small, amphibious (*i.e.,* they require both water and land) plants, but do not have vascular tissue system (atracheata).

327 **(d)**
The vascular bundles containing cambium are said to be **open** but if no cambium develops, they are referred as **closed**. Due to absence of cambium, the secondary growth is not found. In most monocotyledons, closed vascular bundles are found.

328 **(b)**
Generally, the epidermis layer does the function of protection but it modifies to the different structures to give the various structures (like-root hairs, trichomes, stomata etc) to perform the various functions in an organism

329 **(b)**
Stomatal index (SI) $= \frac{S}{S+E} \times 100$

Plant	Number of Stomata (S)	Number of Epidermal Cell (E)	SI
X	30	150	16.6
Y	60	240	20.0
Z	90	400	18.3

So, the arrangement of plants in decreasing order of their stomatal index in Y, Z, X.

330 **(d)**
Lenticels are small pores formed on the surface of stems and roots of higher plants. Lenticels usually arise below the stomata of the original epidermis, where loose packing tissue becomes waterproofed with suberin, leaving large intercellular spaces through which gas exchange can take place.

331 **(a)**
The vascular system consists of complex tissue, the phloem and the xylem. The xylem and phloem together constitutes the vascular bundles

332 **(c)**
The initiation of vascular cambium during secondary growth phase takes place in pericycle which is present in between xylem and phloem

333 **(c)**
In a dicotyledonous stem, the sequence of tissues from the outside to the inside is Phellem → endodermis→ pericycle→ phloem→ xylem.

334 **(b)**
Meristem consists of cells in state of continuous cell division. These cells are most active and show high rate of cell division and metabolism.

335 **(b)**
The increase in diameter or thickness is due to the formation of secondary tissues as a result of the activities of vascular cambium and cork cambium. This secondary growth is characteristic of dicot stem and root.

336 **(a)**
The outer tangential wall of epidermal cells are covered by a fatty substance **cutin** , which forms the **cuticle**. The cuticle is very well developed in xerophytes but absent in hydrophytes. It is secreted by epidermal cells.

337 **(d)**
I, II and III (parenchyma tissue, collenchyma tissue and sclerenchyma tissue).
All tissues except epidermis and vascular bundles constitutes ground tissues. It consists of simple tissue such as parenchyma, collenchyma and sclerenchyma

338 **(d)**
The main function of P-protein is sealing off damaged sieve elements by plugging up sieve plate pores.

339 **(a)**
The cylindrical meristem, *i.e.*, fasicular vascular cambium, interfascicular cambium and cork cambium are examples of secondary or lateral meristem and are responsible for producing secondary tissue

340 **(a)**
Mesophyll tissues occur between the two epidermal layers. In a dicot (dorsiventral) leaf, it is differentiated into palisade and spongy parenchyma. Both of these are rich in chloroplast.

341 **(b)**
Dicot root.
There are usually two to four xylem and phloem patches. Later, a cambium ring develops between the xylem and phloem. All tissues on the innerside of the endodermis such as pericycle, vascular bundles and pith constitutes the stele.
Pith is well developed in the monocots and is small, inconspicuous in dicots.
In monocot, is there is no secondary growth due to the absence of vascular cambium between the xylem and phloem. But secondary growth is the characteristic of dicotyledonous plants

342 **(b)**
Most angiosperms have vessels except a few (*e.g., Drimys, Tetracentron, Trochodendron*). The gymnosperms lack vessels but these are found in the order-Gnetales. Vessels are the constituent of xylem complex tissue. They are composed of row of cells placed one above to other. Transverse wall of these cells is absent due to dissolution.

343 **(b)**
A –thin, B –thick

344 **(a)**
A-cortex, B-endodermins.
In dicotyledous root, the cortex consists of several layer thin walled parenchyma cells. These parenchyma cells have intercellular space. The inner most layer of the cortex is called **endodermis**. It surrounds the vascular tissue.
The innermost layer of cortex is called endodermis. It comprises a single layer of barrel-shaped cells without any intercellular spaces. The tangential as well as radial walls of the endodermal cells have a deposition of water impermeable, waxy material called suberin in the form of casparian strips

345 **(a)**
In many cases of root apices, a cup-like region of cells called quiescent centre is present lying between the root cap and the active meristematic region. The quiescent centre is an inactive region of root apices and is often said as reserve meristem.

346 **(d)**
In winter, the cambium is less active and forms fewer xylary elements that have narrow vessels, and this wood is called autumn wood or late wood

347 **(a)**
Sieve tube elements are long, tube-like structures, arranged longitudinally and are associated with the companion cells. Their end walls are perforated in a sieve-like manner to form the sieve plates. A mature sieve elements possesses a peripheral cytoplasm and a large vacuole but lacks a nucleus. Functions of sieve tubes are controlled by the nucleus of companion cells

348 **(c)**
Xylem is composed of four types of tissue
(i) **Tracheids** Elongated or tube like cells with thick lignified walls and tapering ends. These are main water transporting elements
(ii) **Vessels** A long cylindrical tube with lignified walls and large central cavity. It is a characteristic feature of angiosperms
(iii) **Xylem fibres** have thickened walls and obliterated central lumen either septate or aseptate
(iv) **Xylem parenchyma** is a thin cellulose and used to store food in the form of starch or fat

349 **(a)**
Both apical meristems and intercalary meristems are called primary meristems because they appear early in life of a plant and contributes to the formation of primary plant body

351 **(d)**
Xylem parenchyma cells are living and thin-walled and their cell walls are made up of cellulose. They store food materials in the form of starch or fat and other substances like tannins. The radial conduction of water takes place by the ray parenchymatous cells

352 **(c)**

Bulliform cells in monocotyledons epidermis have bulliform cells, which regulate the surface area of leaves

353 **(b)**
Desert grasses often roll their leaves due to presence of bulliform cells. These are big-sized, thin-walled and large vacuolated cells frequently occur towards the lower epidermis.

354 **(b)**
Xylem vessels are the tube-like structure. The walls of the xylem vessels are lignified. They lack the protoplasm. They are thick and variously-annular, spiral, reticulate, scalariform and pitted. The pitted condition is more common

355 **(c)**
At certain regions, the phellogen cuts off closely arranged parenchymatous cells on the outer side instead of cork cells. These parenchymatous cells soon rupture the epidermis, forming a lens-shaped openings called lenticels. Lenticels permit the exchange of gases between the outer atmosphere and the internal tissue of the stem. These occur in most woody trees

356 **(d)**
If the plants belongs to the tropical forest then the age of tree can't be determined by annual rings because the physiological and environmental factors remains the same throughout the year and due to this, the fluctuation of cambial activity does not take place

357 **(d)**
No reserve food materials like fats, proteins and sugars are present in meristematic cells.

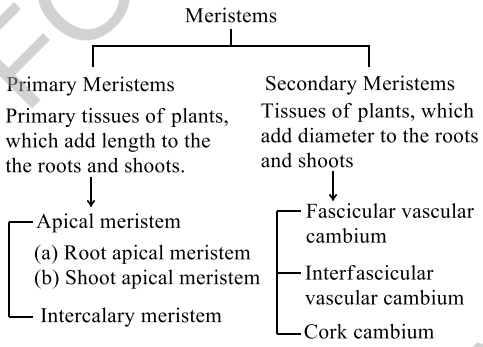
358 **(d)**
Tyloses are balloon-like structures develop from xylem parenchyma. These tyloses block the passage of xylem vessels and ray parenchyma. So, these are also called tracheal plug. These tyloses block the continuity and flow of water, which leads to death of elements of heartwood.

359 **(a)**
The tissue derived from the procambium is called the vascular or fascicular tissue system. It consists of varying number of strands or bundles called the vascular bundles. Each vascular bundle is made up of xylem and phloem necessarily but the cambium may or may not be present.

360 **(b)**
Medullary rays to intrafascicular cambium.

In dicot stems, the cells of cambium present between primary xylem and primary phloem are intrafascicular cambium. The cells of medullary cells, adjoining these intrafascicular cambium becomes meristematic and form the interfascicular cambium. Thus, a continuous ring of cambium is formed

361 **(d)**
Meristems are the specialised regions of active cell division



The division the of both primary and secondary meristems resulted in formation of functionally and structurally specialised cells/tissue which loose their ability to divide and thus are called permanent tissues

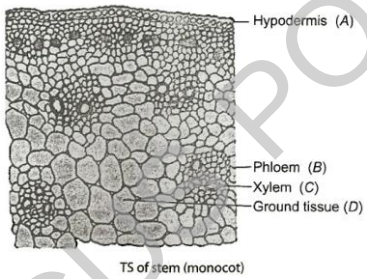
362 **(c)**
The number of vascular bundles in the leaf depends upon the size and venation of leaf

363 **(d)**
Interfascicular cambium is secondary meristem. It originates only at the time of secondary growth between the vascular bundles.

364 **(a)**
After certain years of growth, the xylem elements of the stems of a number of trees develop dark brown colouration, especially in the central or innermost layers. This region comprises dead element with highly lignified walls and is called heartwood or duramen. It is present in inner region of secondary wood.

365 **(b)**
In tropics, there is no sharp distinction between the seasons, hence, there is not much differences in the activity of cambium. In a diffused porous wood, the large-sized vessels are distributed through spring wood and autumn wood, *eg*, *Syzygium cumini*.

366 **(b)**
Scattered vascular bundles is the characteristic of monocot stem



TS of stem (monocot)

367 **(d)**
Phellogen, phellem and phelloderm are collectively known as periderm

368 **(b)**
In the upper epidermis of monocots (*e.g.,* wheat, maize cereals, grasses, etc), there are some large cells, found in groups, which are known as **motor cells** or **bulliform cells**. These cells help in rolling of leaves in dry climate.

369 **(d)**
Characteristic feature of stem is **endarch** condition of xylem tissue. In endarch, protoxylem is present towards the centre of stem, while metaxylem towards the pericycle. Characteristic feature of root is **exarch** condition of xylem tissue. In exarch condition, protoxylem is present towards the pericycle and metaxylem towards the center of the root.

370 **(c)**
Cotton is chiefly composed of epidermal hair of seed. Chemically it is cellulose.

371 **(b)**
During the formation of leaves and elongation of stem, some cells 'left-behind' from shoot apical meristem. These constitute the axillary buds. Such buds are present in the axis of leaves and are capable of forming a branch of flower

373 **(d)**
Intercalary meristem is present away from apical meristem in primary permanent tissue.

374 **(b)**
Cork cells are dead cells and hence, do not respire.

375 **(b)**
Epidermis.
Epidermal cells are elongated compactly arranged and form continuous layer called epidermis. Stomata are present in epidermis of leaves and regulate process of transpiration and gaseous exchange. The epidermal hairs, *i.e.*, root hairs, unicellular elongations and trichomes, multicellular elongation of epidermis on root and shoot helps in absorbing water and preventing water loss, respectively

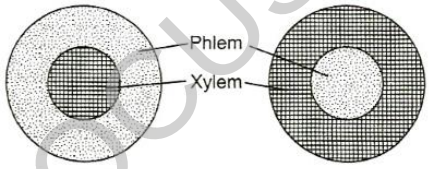
376 **(d)**
The apical meristems are present in the apices of primary and secondary shoots and roots of the plant. The cells of apical meristem are in very active stage of division, have dense cytoplasm, thin cell wall and remain virus free.

377 **(b)**
Parenchyma is the most abundant and common tissue of the plants. Parenchyma forms ground tissue in the non-woody or soft areas of the stem, leaves, roots, flowers, fruit, etc. The typical parenchyma is meant for storage of food. It is modified to performs special functions

378 **(a)**
In root, growth occurs, just behind the apex as there is root cap at apex.

379 **(d)**
Sclerenchyma consists of long, narrow cells with thick and lignified cell walls having a few or numerous pits. They are usually dead and without protoplasts. On the basis of variation in form, structure, origin and development, sclerenchyma may be either fibres or sclereids

380 **(a)**
In amphicribal vascular bundle, the xylem is surrounded by phloem



381 **(a)**
The companion cells are present in association with the sieve tube elements with the help of pit fields present between their walls. The companion cells help in maintaining pressure gradient is sieve tubes

382 **(c)**
In monocot roots, xylem strands are exarch and polyarch.

383 **(d)**
The tracheids are elongated, angular dead cells with hard lignified wide lumen and narrow end walls. The walls of tracheids possess different types of thickenings and the unthickened areas of its wall allow the rapid movement of water from one tracheid to another. Tracheids are the characteristic cell types of xylem tissues in gymnosperms and pteridophytes, where they are chief elements of water conduction.

384 **(d)**
Medullary ray or pith rays They are the radial strips of parenchyma cells present between the adjacent vascular bundles. The medullary rays connects the pith with pericycle and cortex. They ray cells make intimate connection with the conducting cells of both xylem and phloem through pits
The medullary rays help in the radial conduction of food and water. They also transport gases from pith to cortex and *vice-versa*

385 **(a)**
Tracheids are elongated or tube like cells with thick and lignified walls and tapering ends. These are dead and are without protoplasm. The inner layers of the cell walls have thickenings which vary in form. In flowering plants, tracheids and vessels are the main water transporting elements

386 **(d)**
The first formed primary phloem consists of narrow sieve tubes and is referred to as protophloem and later formed primary phloem is referred to as metaxylem

387 **(b)**
Parenchyma.
Parenchyma forms the major component within organs. The cells of the parenchyma are generally isodiametric. They may be spherical, oval, round, polygonal or elongated in shape. Their walls are thin and made up of cellulose. The may either be closely packed or have small intercellular spaces. The parenchyma performs various functions like photosynthesis, storage, secretion, etc.

388 **(b)**
Root.
The outside of the epidermis is often covered with waxy thick layer called cuticle, which prevents the loss of water. Cuticle is absent in roots

389 **(b)**
The wall of both vessel and sieve tube elements are perforated by large opening. Due to these adaptation, the cell to cell contact is possible.
The vessels are nucleated, whereas the sieve tube elements are enucleated.

390 **(b)**
Velamen is a layer of dead cells acting as water-absorbing spongy material found on the outside of aerial roots of **epiphytic** plants.

391 **(a)**
Phloem parenchyma is made up of elongated, tapering cylindrical cells which have dense cytoplasm and nucleus. The cell wall is composed of cellulose and has pits through which plasmodesmatal connections exist between the cells. The phloem parenchyma stores food material and other substances like resins, latex and mucilage. Phloem parenchyma is absent in most of the monocotyledons

392 **(c)**
In maize leaf (monocot), the undifferentiated mesophyll occurs in the concentric layers around the vascular bundles having large centrifugal chloroplasts in its large bundle sheath cells. Such an arrangement is called Kranz anatomy

393 **(d)**
The phloem fibre of jute, flax and hemp are used for commercial purpose because of its characteristic to loose protoplasm and become dead at maturity

394 **(b)**
In dicot root, during the secondary growth, the cork is formed. This cork is inner to the endodermis and external to the primary phloem

396 **(c)**
On the basis of variation in form, structure origin development sclerenchyma may be fibre, *i.e.,* thick the elongated and pointed cells or sclereids, *i.e.*, spherical oval or cylindrical

397 **(a)**
Each stoma is composed of two bean-shaped cells known as **guard cells**. These are modified ground tissue. They have the chlorophylls and performs photosynthesis. The outer walls of guard cells (away from the stomatal pore) are thin and inner wall (toward the stomatal pore) are highly thickened

398 **(d)**
The fibres bound associated with the phloem, pericycle and cortex are referred to as stem, bast or soft fibres. Fibres of this category are derived mostly from the dicotyledonous plant.

399 **(c)**
In a dicot root, the vascular bundles are collateral and exarch. The innermost layer of cortex in roots is endodermis. It is made up of closely packed living cells characterized by presence of Casparian strips.
In vascular bundle of dicot roots, xylem and phloem patches are separated from each other by

intervening thin-walled parenchyma cells called conjunctive or complementary tissue.

400 **(b)**
Primary xylem is of two types. First, formed primary xylem is called protoxylem and later formed is called metaxylem. The position of protoxylem and metaxylem is towards pith and periphery, respectively in case of stem and *vice versa* in roots

401 **(c)**
Periderm includes-phellem, phellogen and phelloderm.

402 **(b)**
Gymnosperm lacks vessels in their xylem tissue. Vessels are also absent in pteridophytes. Their tracheary element comprise only tracheids. Flowering plants possesses, both vessel and tracheids but later are comparatively fewer and moreover vessels are the characteristic features of angiosperms

403 **(c)**
Apical meristem.
During the formation of leaves and elongation of stem, some cells 'left-behind' from shoot apical meristem. These constitute the axillary buds. Such buds are present in the axis of leaves and are capable of forming a branch of flower

404 **(d)**
Phellogen cuts off the cells on both sides and form an outer imprevious layer, cork and an inner parenchymatous layer, phelloderm

405 **(c)**
A–Vascular, B–Midrib, C–Veins, D–Dicot

406 **(c)**
Counting the annual rings.
The spring wood is lighter in colour and has a lower density whereas the autumn wood is darker and has higher density. The two kinds of woods that appear as alternate concentric rings, constitutes an annual ring. Annual rings seen in a cutted stem give an estimate of the age of the tree

407 **(d)**
Meristematic cells have thin cell wall without intercellular spaces.

408 **(a)**
Mechanical strength of hypocotyls of seedling is provided by epidermis and collenchyma tissue.

409 **(d)**
All except IV.
On the basis of variation in form, structure, origin and development, sclerenchyma may be fibres or sclereids. The fibres are thick walled, elongated and pointed cells, generally occurring in groups, in various parts of the plant. The sclereids are spherical oval or cylindrical, highly thickened dead cells with very narrow cavity (lumen). These are commonly found in the fruit wall of nuts, pulp of fruit like guava, pear and sapota, seed coats of legumes and leaves of tea. Sclerenchyma provides the mechanical support to organs

410 **(d)**
The innermost layer of the cortex is called **endodermis**. The cells of the endodermis are rich in starch grains and the layer is referred to as the starch sheath

411 **(a)**
Collenchyma cells are elongated and polygonal with tapering ends, found in outer region of cortex, *e.g.,* angles of stems, midrib of leaves, etc. The cell wall of collenchyma consists of cellulose, pectins and hemicellulose.

412 **(d)**
Tracheids and vessels are the characteristic of xylem vascular bundle and the A, B and C are tracheid, vessels and vessels, respectively

413 **(a)**
Cells of meristematic tissue are living and thin walled. They contain dense protoplasm and conspicuous nuclei and are without intercellular spaces.

414 **(c)**
The increase in the height of plant is due to apical meristem. Therefore, the height of the board remains the same after ten years

415 **(b)**
Cell wall in a plant cell is found in both the phases, *i.e.*, sporophytic and gametophytic phase of life cycle

416 **(b)**
Motor cells or bulliform cells are found in epidermis of monocot leaf, *e.g.,* grasses. Epidermal cells situated in ling furrows are larger with thin flexible walls. These cells help in the rolling of leaves in dry weather.

417 **(a)**
The cambium lies in vascular bundles of dicot and gymnosperm stem in between phloem and xylem

418 **(c)**

Growth in plants in largely restricted to specialised regions of active cell division called meristem. (*Gk meristos*-divide). Plants have different kind of meristems. The meristems, which occur at the tips of roots and shoots and produce primary tissues are called apical meristems

419 **(b)**
During the secondary growth, the continuous ring of cambium is formed by joining of intrafascicular cambium and interfascicular cambium not by vascular cambium. Vascular cambium form xylem on the its inside and phloem on outside due to differential action of for more

420 **(d)**
By the deposition of resins, oils, gums, etc, in the xylem cell wall, 'formation of tylosis' in xylem vessels and by degeneration of protoplast of living cell 'sapwood' is converted into 'heartwood'.

421 **(c)**
Sequence of cellular laters from the periphery towards the cortex in an old dicot stem is epidermis, hypodermis, cortex, endodermis, pericycle and vascular bundles.

422 **(d)**
Dicotyledon leaf is also called dorsiventral leaf. Monocotyledon leaf is also called isobilateral leaf

423 **(a)**
Cork cambium is also called **phellogen**. Cork is also called **phellem**. Secondary cortex is also called **phelloderm**.
Cork cambium, cork and secondary cortex are collectively called **periderm** or secondary ground tissue.

424 **(c)**
Ground tissue system occupies the whole of the interior of plant organs with the exclusion of vascular system. Ground tissue system of leaves is called mesophyll. Mesophyll is made up of two types of photosynthetic cells, palisade and spongy

425 **(a)**
Sieve tubes are cylindrical tube-like cells with perforated cross walls called sieve plates. Sieve tubes are responsible for movement of food material and sealing of pores after wounding.

426 **(d)**
Interfascicular and intrafascicular both cambium join each other and form a continuous ring of cambium for the secondary growth of dicots

427 **(a)**
All tissues except epidermis and vascular bundles constitutes ground tissues. It consists of simple tissue such as parenchyma, collenchyma and sclerenchyma

428 **(c)**
Phellem is a group of tissue formed due to activity of **phellogen** (cork cambium) towards the outer side, while towards the inner side, phellogen cuts another group of cells called phelloderm or secondary cortex. Below secondary cortex is occurred **secondary phloem**, it is formed due to activity of vascular cambium, which cuts secondary xylem towards inner side. This newly formed secondary xylem is called autumn wood.

429 **(d)**
In datepalm (*Phoenix* sp), there is no secondary growth, differentiation of wood into bark, sapwood and heartwood is not present.

430 **(a)**
Stomata are present in the epidermis of leaves. Their main function is regulation of transpiration and gaseous exchange with the help of two bean shaped cells known as guard cells

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NEET BIOLOGY

ANIMAL KINGDOM

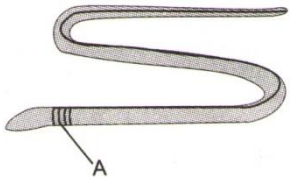
1. The point by which Annelida advanced over Nematoda is
   a) True coelom
   b) Metameric segmentation
   c) Closed circulation
   d) All of the above
2. A transverse section of *Pheretima* taken through the 10th segment is observed in microscope. Which of the following structures can be observed in the section?
   a) Stomach, dorsal blood vessel, ventral blood vessel, supraoesophageal vessel, anterior loops, ring vessel and micronephridia
   b) Stomach, dorsal blood vessel, ventral blood vessel, lateral hearts, ring vessels and pharyngeal nephridia
   c) Intestine, dorsal blood vessel, ventral blood vessel, supraoesophageal vessel and septal nephridia
   d) Stomach, dorsal blood vessel, sub-neural blood vessel and lateral hearts
3. *Sycon* belongs to a group of animals which are best described as
   a) Multicellular with a gastrovascular system
   b) Multicellular having tissue organization, but no body cavity
   c) Unicellular or acellular
   d) Multicellular without any tissue organization
4. In which one of the following the genus name, its two characters and its class/phylum are correctly matched?

Genus	Two characters	Class/phylum
a) *Salamandra* :	(i) A tympanum represents ear (ii) Fertilization is external	Amphibia
b) *Pteropus:*	(i) Skin possesses hair (ii) Oviparous	Mammalia
c) *Aurelia:*	(i) Cnidoblast (ii) Organ level of organization	Coelenterata
d) *Ascaris*:	(i) Body segmented (ii) Males and females distinct	Annelida

5. In forg's heart, there are muscular ridges which consist of fibers called
   a) Purkinje fibres
   b) Myonemes
   c) Telodendria
   d) Columnae carnae
6. Which is not a feature of annelids?
   a) Metameric segmentation
   b) Nephridia
   c) Psedocoelom
   d) Clitellum
7. Which one of the following kinds of animal are triploblastic?
   a) Flatworms
   b) Sponges
   c) Ctenophores
   d) Corals
8. Organ system level of organisation is observed in
   a) Chordates
   b) Annelids
   c) Molluscs
   d) All of these
9. Find the odd example.

a) Sea lily b) Sea fan c) Sea cucumber d) Sea urchin

10. The snake eating snake is
    a) Black cobra b) King cobra c) Rattle snake d) Anaconda
11. Book lungs are respiratory organs in
    a) Scorpion b) Prawn c) Snail d) Cockroach
12. In *Pheretima*, the lateral hearts that connect the supra oesophageal blood vessel with ventral blood vessel are located in which segments?
    a) 7 and 9 b) 18 and 19 c) 14 and 15 d) 12 and 13
13. Sea anemone belongs to phylum
    a) Protozoa b) Porifera c) Coelenterata d) Echinodermata
14. Trochophore is the larva of
    a) *Neopilina* b) *Chiton* c) *Pila* d) All of these
15. In the given diagram, what does 'A' represent?



    a) Heart b) Lateral vessel c) Ventral vessel d) Dorsal vessel
16. Hydroskeleton is not found in
    a) Mollusca b) Echinoderms c) Annelida d) Cnidarian
17. Aschelminthes are usually
    a) Dioecious b) Hermaphrodites c) Metagenic d) Coelomates
18. Development of Mollusca is
    a) With a larvae named trocophore b) Always direct without larval stages
    c) With larvel stage called glochidium d) With larval stage called wriggler
19. Which character is not same in Aves and mammals?
    a) Single systemic arch b) Metanephric kidney
    c) Seven cervical vertebrae d) Homeotherms
20. Study the following features of a fish
    I. It is a crossopterygian fish
    II. It is found in the river Chalumnae
    III. It does not exhibit aestivation
    IV. It is an urecotelic animal
    Which of the above are true to '*Neoceratodus*'
    a) I and II b) II and IV c) I and III d) I and IV
21. In *Pheretima*, septa are absent between which segments?
    a) 3/4 and 9/10 b) 4/5 and 8/9 c) 5/6 and 7/8 d) 7/8 and 6/7
22. In frogs, oviduct is formed by
    a) Wolffian duct b) Metanephric duct c) Mullerian duct d) Bidder's canal
23. The life span of honey bee drone is
    a) 3-4 months b) 1-2 months c) 6-7 months d) 10-12months
24. A group of animals having marsupium is
    a) Nonotremata b) Eutheria c) Metatheria d) Pantotheria
25. What will you look for to identity the sex of the following?
    a) Male frog – a copulatory pad on the first digit of the hind limb
    b) Female cockroach – anul ceri
    c) Male shark – claspers borne on pelvic fins
    d) Female *Ascaris* – sharply curved posterior end
26. The excretory cells, that are found in Platyhelminthes are

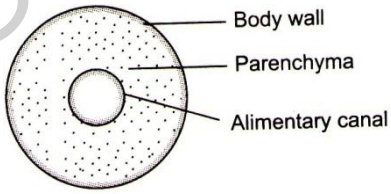
a) Protonephridia b) Flame cells c) Solenocytes d) All of these

27. Ommatidia serve the purpose of photoreception in
a) Humans b) Sunflower c) Cockroach d) Frog

28. *Periplaneta* has no respiratory pigment in its blood because
a) Air is conducted directly to the body tissues b) It has haemocoelom
c) It has anaerobic respiration d) It lacks blood cells in the blood

29. *Wuchereria bancrofti* is a common filarial worm. It belongs to phylum
a) Platyhelminthes b) Nemathelminthes c) Annelida d) Coelenterata

30. The cross-section of the body of an invertebrate is given below. Identify the animal, which has this body plan.



a) Cockroach b) Roundworm c) *Planaria* d) Earthworm

31. In earthworm, the characteristic internal median fold of dorsal wall of the intestine called typhlosole is present in
a) 5 to 9 segments b) 9 to 14 segments c) 26 to 35 segments d) 15 to last segment

32. Which of the following phyla are schizocoela?
a) Annelida, Platyhelminthes and Mollusca
b) Annelida, Arthropoda and Mollusca
c) Platyhelminthes, Aschelminthes and Annelida
d) Aschelminthes, Annelida and Mollusca

33. Columella auris is found in
a) Rabbit b) Frog c) Man d) All of these

34. Which one of the following is not a bird?
a) Magpie b) Albatross c) Himalayan quail d) *Bufo*

35. Which of the following blood vessels in the circulatory system of frog has more oxygenated blood?
a) Pulmocutaneous artery b) Pulmocutaneous vein
c) Pulmonary artery d) Precaval veins

36. Which one of the following feature is common to leech, cockroach and scorpion?
a) Nephridia b) Ventral nerve cord c) Cephalization d) Antennae

37. Which of the following cell types is capable of giving rise to other cell types in sponges?
a) Thesocytes b) Pinacocytes c) Cnidocytes d) Archaeocytes

38. *Necturus* is commonly known as
a) The flying frog b) The mud puppy c) The crested newt d) The toad

39. Which of the following display retrogressive metamorphosis?
a) *Salpa* and *Herdmania* b) *Doliolum* and *Oikopleura*
c) *Pyrosoma* d) All of these

40. Which of the following is true of Aves?
a) They are poikilotherms and have a three chambered heart
b) Tiny pebbles eaten by some birds and are used in crushing
c) They have 10 pairs of cranial nerves
d) All of the above

41. Which one of the following has a biradial symmetry?
a) *Paramecium* b) Jellyfish c) Cockroach d) Sea anemone

42. Mouth part of housefly are
a) Siphoning type b) Sponging type
c) Biting and chewing type d) Piercing and sucking type

43. Zoological name of common Indian krait is
    a) *Bungarus caeruleus* b) *Ophiophagus Hannah*
    c) *Viper russeli* d) *Naja naja*
44. Which of the following animals have a single opening to the outside that serves both as mouth as well as anus?
    a) *Octopus* b) *Asterias* c) *Ascidia* d) *Fasciola*
45. Cellulose digesting zooflagellate found in wood cockroaches is
    a) *Lophomonas* b) *Trichomonas* c) *Trichonympha* d) *Leishmania*
46. Spiracles found in cockroach are
    a) 2 pairs in thorax and 100 pairs in abdomen b) 2 pairs in thorax and 6 pairs in abdomen
    c) 2 pairs in thorax and 8 pairs in abdomen d) 2 pairs in thorax and 4 pairs in abdomen
47. The phylum-Mollusca lack, which one of the following
    a) Visceral hump b) Malpighian tubules c) Gills d) Radula
48. Down feathers are
    a) First feathery covering in birds
    b) Modified filoplumes found near nostrils and eyes
    c) Tail feathers
    d) Wing feathers
49. The number of abdominal segments in male and female cockroach is
    a) 10, 10 b) 9, 10 c) 10, 11 d) 8, 10
50. Petromyzon and myxine belong to class
    a) Gnathostomata b) Cyclostomata c) Urochordata d) Protochordata
51. All mammals without any exception are characterized by
    a) Viviparity and biconcave red blood cell
    b) Extra abdominal testis and four-chambered heart
    c) Heterodont teeth and 12 pairs of cranial nerves
    d) A muscular diaphragm and milk producing glands
52. Which of the following is true about phylum-Platyhelminthes?
    a) They are mostly ectoparasites b) They are mostly free-living
    c) They are mostly commensals d) They are mostly endoparasites
53. Submaxillary glands of rabbit pour their secretions through
    a) Stenson's duct b) Ductus cholidocus c) Wharton's duct d) Naso-palatine duct
54. Which one of the following animals belongs to Cyclostomata?
    a) *Channa* b) *Loris* c) *Dodo* d) *Petromyzon*
55. Reproduction in *Ctenoplana* takes place by
    a) Budding b) Sexual reproduction c) Binary fission d) Multiple fission
56. Mosquito receive air through
    a) Flagellum b) Cilia c) Pedicel d) None of these
57. Note the following words.
    I.Fenestra
    II. Pedical
    III.Lacinia
    IV. Flagellum
    V.Galea
    VI. Mentum
    VII.Palpifer
    VIII. Cardo
    IX.Glossa
    Which of the above found in the first pair of maxillae in case of cockroach?
    a) III, V, VII and VIII b) I, III, V and IX c) I, VI, VII and IX d) II, V, VII and IX

58. *Ornithorhynchus* is an example of
a) Dinosaur b) Monotreme mammal c) Marsupial mammal d) Eutherian mammal
59. The presence of the tube feet is a characteristic feature of the phylum
a) Arthropoda b) Annelida c) Nemathelminthes d) Echinodermata
60. Choose the non-poisonous snake from the given options
a) Krait and cobra snake b) Sea snake and coral snake
c) Viper and rattle snake d) None of the above
61. Syndactyly, prehensile tail and long protrusible tongue are the unique features of
a) Rhesus monkey b) *Archaeopteryx* c) Horse fish d) *Chamaeleon*
62. *Ichthyophis* belongs to class
a) Mammalia b) Reptilia c) Amphibia d) Aves
63. The character of birds without exception is
a) Omnivorous b) Flying wings
c) Beak without teeth d) Lay eggs with calcareous shell
64. The larval stage of a harmful insects, causing a cavity like pathological condition in human subcutaneous tissue, is
a) Naiad b) Nymph c) Maggot d) Wriggler
65. The cavity in the region of diencephalon in the brain of rabbit is called
a) Lateral ventricle b) Third ventricle c) Foramen of monro d) Iter
66. Which one of the following is not a characteristic of phylum-Annelida?
a) Closed circulatory system b) Segmentation
c) Pseudocoelom d) Ventral nerve cord
67. Ammocoetes is
a) Organs that help excrete ammonia in invertebrates b) Animals that have an amniotic sac surrounding the embryo in development stages
c) A larval stage d) None of the above
68. Which one of the following is the true description about an animal concerned?
a) Earthworm – The alimentary canal consists of a sequence of pharynx, oesophagus, stomach, gizzard and intestine
b) Frog – Body is divisible into three regions : head, neck and trund
c) Rat – Left kidney is slightly higher in position than the right one
d) Cockroach – 10 pairs of spiracles (2 pairs on thorax and 8 pairs on abdomen)
69. How many hearts are found in earthworm?
a) 8 (four pairs) b) 2 (one pair) c) 6 (three pairs) d) 12 (six pairs)
70. Which of the following belong to phylum-Annelida?
a) *Hirudinaria, Nereis* and *Wuchereria* b) *Earthworms, Aphrodite* and Pila
c) *Pheretima, Tubifex* and *Nereis* d) *Aplysia, Nereis* and *Dentalium*
71. Which of the following is not a larval form of Mollusca?
a) Pluteus b) Trochophore c) Veliger d) Glochidium
72. In *Leucosolenia,* gametes develop from
a) Amoebocytes b) Archaeocytes c) Choanocytes d) Myocytes
73. The main nitrogenous waste of *Hydra*, is
a) Ammonia only b) Urea only c) Uric acid only d) Both (a) and (c)
74. Nematoblasts are formed by
a) Interstitial cells b) Glands cells c) Mesoepithelial cells d) Nerve cells
75. Which of the following is an insect?
a) Moth b) Mites c) Prawn d) Scorpion
76. The phylum-Annelida is named so because of
a) More organs are placed towards anterior part of the body b) The presence of antenna

c) Anteriorly placed neural system d) The presence of metameres

77. Ecdysone is produced by
a) Prothoracic gland b) Corpora cardiaca c) Corpora allata d) Abdominal gland

78. The feeding organ in phylum-Mollusca is
a) Ctenedia
b) Undulating membrane
c) Sucker
d) Radula

79. Coelom is important because
a) It allows the internal organs to grow
b) It separates the gut from the body will muscles
c) It has evolutionary significance
d) All of the above

80. *Ascaris* is characterized by
a) Absence of true coelom but presence of metamerism
b) Presence of neither true coelom nor metamerism
c) Presence of true coelom and metamerism
d) Presence of true coelom and metamerism (metamerisation)

81. The first phylum to have a complete alimentary canal is
a) Platyhelminthes b) *Ascaris* c) Aschelminthes d) Annelida

82. Exoskeleton of which phylum consists of a chitinous cuticle?
a) Annelida b) Porifera c) Arthropoda d) Echinodermata

83. Waggle dance in honeybees tells about
a) Direction of food source b) Distance of food source
c) Both (a) and (b) d) None of these

84. "Triploblastic, unsegmented, acoelomate exhibiting bilateral symmetry and reproducing both asexually and sexuality, with some parasitic forms".
The above description is the characteristic of phylum
a) Annelida b) Ctenophore c) Cnidaria d) Platyhelminthes

85. Which animals have all developed echolocation system like that of bats?
a) Wild cats b) Beavers c) Primates d) Whales and dolphins

86. The characteristic larva of phylum-Coelenterata is
a) Planula b) Cysticercus c) Rhabditiform d) Wriggler

87. What is common between parrot, *Platypus* and kangaroo?
a) Homeothermy b) Toothless jaws
c) Functional post-anal tail d) Ovoparity

88. The 'bilateral symmetry' refers
a) When the body can be divided into two unequal halves on passing central axis through it
b) To any plane passing through centre, which does not divide the body into equal halves
c) When the body can be divided into identical left and right halves only in one plane
d) Any plane passing through the central axis of the body dividing the organism into two equal halves

89. In which of the following animals, respiration occurs without any respiratory organ?
a) Frog b) Fish c) Cockroach d) Earthworm

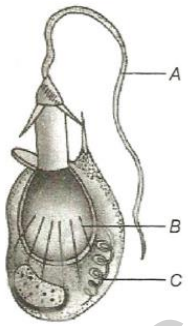
90. The highly degraded organic matter rich in nitrogen and potassium in particular resulting from the activity of earthworms, is called
a) Worm castings b) Vermicompost c) Compost bedding d) Humus

91. Which one of the following abnormalities in the host is associated to *Wuchereria, Plasmodium* and *Fasciola* respectively?
I. Parasitic castration
II. Hyperplasia

III. Febrile paroxysm
IV. Peritonitis
V. Lymphangitis

a) V, III and II b) V, III and I c) II, IV and V d) II, IV and II

92. Trichocyst and nematocysts are meant for
a) Defence b) Nutrition c) Respiration d) Excretion
93. Water vascular system is found in
a) Mollusca b) Arthropoda c) Annelida d) Echinodermata
94. In which of the following, there is syncytial epidermis and longitudinal muscle cells in four bands?
a) Nematodes b) Platyhelminthes c) Annelids d) Echinoderms
95. Phylum-Chordata is divided into sub-phyla namely
a) Vertebrata, Protochordata and Urochordata
b) Urochordata, Gnathochordata and Vertebrata
c) Urochordata, Tunicata and Vertebrata
d) Tunicata, Cephalochordata and Vertebrata
96. Choose the correct options for the following diagram



a) A-Cnidcil, B-Refractile rod, C-Stylet b) A-Thread tube, B-Contractile fibril, C-Lasso
c) A-Stylet, B-Refractile rod, C-Capsule d) A-Cnidocil, B-Spine, C-Thread tube

97. Platyhelminthes are
a) Asymmetrical b) Radially symmetrical
c) Bilaterally symmetrical d) None of these
98. In Arthropoda, head and thorax are often fused to form cephalothorax, but in which one of the following classes, the body is divided into head, thorax and abdomen?
a) Insecta b) Myriapoda
c) Crustacea d) Arachnida and Crustacea
99. Mouth part of mosquito is
a) Sucking and piercing type b) Sponging type
c) Biting and chewing type d) None of the above
100. Which one of the following mammals is not an odd-toed ungulate?
a) Rhinoceros b) Camel c) Zebra d) Horse
101. The excretory organs in prawn are
a) Kidneys b) Malpighian tubules c) Green glands d) Nephridia
102. The dorsal plate of skeleton found on the abdomen of cockroach is called
a) Pleuron b) Sternum c) Tergum d) Vertex
103. Which of the following does not make a nest of its own?
a) Crow b) Parrot c) Cuckoo d) Sparrow
104. Which of the following statements are true (T) and which are false (F)? Choose the correct option
I. Amphibians have metanephric kidneys
II. The skull of mammals is dicondylic
III. Aves copulate by cloacal apposition
IV. Voice is produced in Aves by a syrinx

V. Lepus is gregarious in nature

a) II, IV and V are true, I and III are false
b) II, III and IV are true, I and V are false
c) II and V are true, I, II and V are false
d) I, II and V are true, III and IV are false

105. During its life cycle, *Fasciola hepatica* (liver fluke) infects its intermediate host and primary host at the following larval stages, respectively
a) Metacercaria and cercaria
b) Miracidium and metacercaria
c) Redia and miracidium
d) Cercaria and redia

106. From the following fishes, identify the one with a aglomerular kidney.
a) *Sphyrna* b) *Tilapia* c) *Cirrhinus* d) *Exocoetus*

107. The scientific name of Asian tiger mosquito is
a) *Aedes aegypti* b) *Aedes albopictus* c) *Aedes taeniornynchus* d) *Aedes albolineatus*

108. The response to external stimulus is quicker and more precise in which of the following symmetry?
a) Radial b) Bilateral c) Spherical d) Biradial

109. Unique features of phylum-Ctenophora is
a) Presence of comb plates and comb jellies
b) Presence of comb plates only
c) Presence of tentacles only
d) Alteration of generation only

110. Three types of body cavity are
a) True coelom, pseudocoelom and haemocoel
b) Pseudocoelom, protocoelom and acoelom
c) Acoelom, deuterocoel and homocoel
d) Protocoel, deuterocoel and pseudocoelom

111. Which of the following is a crustacean?
a) Prawn b) Snail c) Sea anemone d) *Hydra*

112. In earthworm, self-fertilization cannot occur due to
a) Protogyny b) Protandry c) Epigyny d) Hypogyny

113. Which one of the following pairs is mismatched?
a) *Pila globosa* – Pearl
b) *Apis indica* – Honey
c) *Kenia lacca* – Lac
d) *Bombyx mori* – Silk

114. Types of salivary glands present in rabbit are
a) One b) Two c) Three d) Four

115. Lateral line sense organs occur in
a) Salamander b) Frog c) Water snake d) *Scoliodon*

116. Dental formula of rabbit is
a) $\frac{2033}{1023}$ b) $\frac{2133}{1023}$ c) $\frac{2023}{1023}$ d) $\frac{1303}{1203}$

117. Amphids are cuticular elevations on ventrolateral lips of *Ascaris*. These are
a) Tangoreceptors b) Tactoreceptors c) Olfactoreceptors d) Chemoreceptors

118. Poison gland in snake is located in
a) Parietal b) Maxilla c) Mandible d) Neck

119. Bioluminescence is seen in phylum
a) Ctenoplana b) Coelenterata c) Ctenophora d) Cnidaria

120. Which one is the real product of honey bee?
a) Bee wax b) Honey c) Propolis d) Pollen

121. Which one of the following is a matching set of phylum and its three examples?
a) Cnidaria – *Bonellia, Physalia, Aurelia*
b) Platyhelminthes – *Planaria, Schistosoma, Enterobius*
c) Mollusca – *Loligo, Teredo , Octopus*
d) Porifera – *Spongilla, Euplectella, Pennatula*

122. Rhabditiform is the larva of
a) *Hydra* b) Platyhelminthes c) *Ascaris* d) Earthworm

123. Which of the following statements are true/false?
I. Poikilothermic animals are also called ectothermic animals
II. Sharks are ovoviviparous animals
III. Coxal glands are excretory organs present in arachnids
IV. Copper containing respiratory pigment is called haemocyanin, it is present in *Pila*
a) All the statements are false
b) All the statements are true
c) I and II are true and III and IV are false
d) I and III are true and II and IV are false

124. Which of the following statements are true/false?
I.In torpedo, the electric organs are capable of generating strong electric shock to paralyze the prey
II.Bony fishes use pectoral, pelvic, dorsal, anal and caudal fins in swimming
III.Amphibian skin is moist and has thick scales
IV.Birds are poikilothermous animals
V.The most unique mammalian characteristic is the presence of milk producing mammary glands by which the young ones are nourished
a) I, II and III are true; IV, V are false
b) I, II and V and true; III and IV are false
c) I, II and III are false; IV and V are true
d) I, II and IV are false; III, and V are true

125. Nematoblasts of *Hydra* are
a) Sensory
b) Complicated
c) With nematocyst apparatus
d) All of the above

126. *Ascaris* has
a) Paired testes and single ovary
b) Paired ovaries and single testis
c) Single ovaries and single testis
d) Paired ovaries and paired testes

127. Ampullae of Lorenzini are present in
a) Fish
b) Lizard
c) Frog
d) Rabbit

128. Which of the following is colourless *Hydra*?
a) *Hydra fusca*
b) *Hydra viridis*
c) *Hydra oligactis*
d) *Hydra vulgaris*

129. In which of the following organisms testes descend into scrotum in breeding season but in non-breeding season goes up?
a) Frog
b) Kangaroo
c) Shrew
d) Bat

130. Correct sequenct in embryonic development of frog is
a) Zygote – Cleavage – Blastula – Gastrula
b) Zygote – Cleavage – Gastrula – Blastula
c) Cleavage – Zygote – Blastula – Gastrula
d) Zygote – Blastula – Cleavage – Gastrula

131. Larva of *Sycon* is
a) Parenchymula
b) Amphiblastula
c) Redia
d) Trochophore

132. Sea horse is
a) A bird
b) A mammal
c) An amphibian
d) A fish

133. Feeding type of animals belonging to phylum-Porifera is
a) Raptorial feeders
b) Suctorial feeders
c) Filter feeders
d) None of these

134. Which worm may go very deep in soil up to 60-90 cm and form vertical and complicated burrows for their movement?
a) Epigenic
b) Endogenic
c) Anecic
d) Geophagic

135. Which of the following animal is called a living fossil?
a) King locust
b) *Limulus*
c) *Bombyx*
d) *Balanoglossus*

136. Which of the following group will be amniotes?
a) *Hermidactylus – Salamander – Manis*
b) *Ornithorhynchus – Struthio – Necturus*
c) *Anguis – Eudynamis – Pteropuss*
d) None of the above

137. The character that differentiates chordate from non-chordate is
a) Triploblastic body organization
b) Heterotrophic mode of nutrition
c) Dorsal tubular nerve cord
d) Sexual reproduction

138. Cavity of coelenterates is called

a) Coelenterons b) Coelom c) Cavity d) None of these

139. Which one of the following pairs of animal comprises 'jawless fishes'?
a) Lampreys and eels b) Mackerals and rohu
c) Lampreys and hag fishes d) Guppies and hag fishes

140. Consider the following four statements (I-IV) about certain desert animals such as kangaroo rat.
I.They have dark colour and high rate of reproduction and excrete solid urine.
II.They do not drink water, breathe at a slow rate to conserve water and have their body covered with thick hairs.
III.They feed on dry seeds and do not require drinking water.
IV.They excrete very concenntated urine and do not use water to regulate body temperature.
Which two of the above statements for such animals are true?
a) III and IV b) II and III c) III and I d) I and II

141. Which of the following nephridia does not found in earthworm?
a) Septal nephridia b) Macronephridia
c) Integumentary nephridia d) Pharyngeal nephridia

142. Some of the statements are given below
I. Porifera to Echinodermata lack a notochord
II. Platyhelminthes display tissue level organisation
III. Mesoglea is present in coelenterates during development
IV. Aschelminthes are coelomates
Choose the correct options
a) I, II, II and IV are True b) I and II are True c) I and III are True d) II and III are True

143. Butterfly belongs to
a) Homoptera b) Procoptera c) Hemiptera d) Lepidoptera

144. Which of the following shows polymorphism?
a) *Physalia* b) *Trypanosoma* c) Termite d) All of these

145. Which one of the following animal has both exoskeletal and endoskeletal structures?
a) Freshwater mussel b) Tortoise c) Frog d) Jelly fish

146. Which of the following are also known as collar cells?
a) Choanocytes b) Pinocytes c) Thesocytes d) Cnidoblast

147. Which of the following does not belong to phylum-Platyhelminthes?
a) *Fasciola* b) *Taenia* c) *Wuchereria* d) *Planaria*

148. True segmentation is also called
a) Metagenesis
b) Metamorphosis
c) Metamerism
d) Metasegmerism

149. Two common characters found in centipede, cockroach and crab are
a) Compound eyes and anal cerci b) Jointed legs and chitinous exoskeleton
c) Green gland and tracheae d) Book lungs and antennae

150. A four chambered heart is not found in
a) Mammals b) Birds c) Snake d) Crocodile

151. The function of typhlosole in earthworm
a) Is to secrete digestive juice
b) Is to slowdown rate of passage of food
c) Increase absorptive area of intestinal epithelium
d) Have no function

152. Which is the smallest known bird?
a) Artic Tern b) Hoopoe c) *Streptopelia* d) Bee humming bird

153. Bidder's canal is found in

a) Testis of frog b) Kidney of frog c) Kidney of mammal d) Ovary of mammal

154. Which sound producing organ is found in bird?
a) Pharynx b) Larynx c) Syrinx d) Trachea

155. Nidology is the study of
a) Cnidarians b) Aschelminthes c) Bird nests d) Mammals

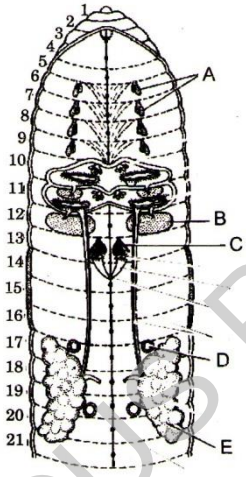
156. The number of segments on the anal cerci of cockroach is
a) 12 b) 15 c) 18 d) 16

157. The organs that assists in sound production in mosquito, is
a) Hairy appendages b) Mouth parts c) Hemielytra d) Halteres

158. Mollusca is
a) Triploblastic, Acoelomate b) Triploblastic, coelomate
c) Diploblastic, Acoelomate d) Diploblastic, coelomate

159. Tube feet is the locomotory organ in
a) Star fish b) Jelly fish c) Silver fish d) Scoliodon

160. In the diagram of the reproductive system of earthworm A, B, C, D and E represents.



a) **A-**Seminal vesicle, **B-**Spermathecae, **C-**Prostate gland, **D-**Ovary, **E-**Accessory gland
b) **A-** Seminal vesicle, **B-** Ovary, **C-** Accessory gland **D-** Spermathecae, **E-** Prostate gland,
c) **A-** Spermathecae, **B-** Seminal vesicle, **C-** Accessory gland **D-** Ovary, **E-** Prostate gland,
d) **A-** Spermathecae, **B-** Seminal vesicle, **C-** Ovary, **D-** Accessory gland **E-** Prostate gland,

161. Solenocytes are associated with
a) Respiration b) Digestion c) Nutrition d) Excretion

162. The study of snakes is called
a) Herpetology b) Ophiology c) Saurology d) Ornithology

163. Among the following which one lay eggs and does not produce young ones directly?
a) *Echidna* b) Kangaroo c) Polcapine d) Whale

164. Egg of cockroach gives rise to
a) Nymph b) Caterpillar c) Larva d) Pupa

165. Choose the correct option
a) Annelida – Exhibit bilateral symmetry, metamerism and coelom
b) Echinodermata – Exhibit tissue level organisation and radial symmetry
c) Arthropoda – Exhibit incomplete digestive system and segmentation
d) Notochord is present on ventral side in vertebrate

166. The animals belonging to phylum-Annelida use the following in locomotion
a) Nephridia and nephridial pores b) Longitudinal and circular muscles
c) Organs of bursa d) Spicules and ostia

167. Choanocyte in an ascon type of canal system, is lined by
a) Porocyte b) Incurrent c) Apopyle d) Spongocoel

168. The zoological name of North Indian hare is

a) *Oryctolagus cuniculus* b) *Lipus ruficaudatus*
c) *Lipus nigricollis* d) *Sorex araneus*

169. Which one of the following is not a characteristic feature of sponges?
a) Cellular level of organization b) Presence of ostia
c) Intracellular digestion d) Body supported by chitin

170. Undifferentiated totipotent cells of sponges, are
a) Archaeocytes b) Porocytes c) Trophocytes d) Myocytes

171. Air bladder occurs in
a) *Torpedo* b) *Anabas* c) *Scoliodon* d) *Elasmobranch*

172. The secondary host of *Taenia saginata* is
a) Cow b) Pig c) Dog d) None of these

173. In echolocation, the animal that produces high frequency sounds is
a) Monkey b) Butterfly c) Squirrel d) Bat

174. Common feature in earthworm and cockroach is
a) Cuticle (exoskeleton) b) Solid and ventral nerve cord
c) Nephridia d) Malpighian tubules

175. Secondary radial symmetry is found in
a) Cnidaria b) Jelly fish c) Echinodermata d) Hemichordata

176. When the body is externally and internally divided into segments, it is called
a) True segmentation b) False segmentation c) Pseudo segmentation d) Asegmentation

177. Abdominal ganglia in cockroach are found in segments
a) 1, 2, 3, 4, 6 and 7 b) 1, 2, 3, 4, 5 and 6 c) 3, 4, 5, 6, 7 and 8 d) 8, 9 and 10

178. Siphonophora is the order in
a) Protozoa b) Cnidaria c) Porifera d) Annelida

179. Which of the following is observed in amphibians?
a) Three chambered heart b) Cold blooded animals
c) Absence of scales d) All of these

180. The excretory organ in cockroach is
a) Malpighian corpuscle b) Malpighian tubules c) Hepatic caecae d) Metanephridia

181. Which of the following is correctly states as it happens in the common cockroach?
a) Oxygen is transported by haemoglobin in blood
b) Nitrogenous excretory product is urea
c) The food is ground by mandibles and gizzard
d) Malpighian tubules are excretory organs projecting out from the colon

182. Connecting link between chordates and non chordates is
a) *Peripatus* b) *Balanoglossus* c) *Sphenodon* d) *Tachyglossus*

183. Canal system is present in phylum
a) Annelida b) Porifera c) Acanthocephala d) Echinodermata

184. Which of the following is not an insect?
a) Locust b) *Lepisma* c) Termites d) Spider

185. Which of the following phyla has no freshwater forms?
a) Echinodermata b) Mollusca c) Chordata d) Porifera

186. One of the characteristic of *Hydra* is
a) Predation b) Matamerism c) Hibernation d) Mimicry

187. Which animals belong to sub-phylum Urochordata?
a) Branchistoma and *Lancelet* b) *Salpa* and *Lancelet*
c) *Ascidia* and *Doliolum* d) *Salpa* and *Amphioxus*

188. In which of the following organisms, self-fertilization is seen?
a) Fish b) Roundworm c) Earthworm d) Liver fluke

189. Metachrosis is an animal's

a) Ability to undergo transformation
b) Ability to change according to season
c) Ability to change colour
d) Ability to stay still for long periods of time

190. Which of the following statements are correct?
I.Venom of cobra is neurotoxic.
II.Venom of sea snake is neurotoxic.
III.Venom of viper is haemotoxic.
a) I, II and III b) I and III c) I and II d) II and III

191. Which one of the following is correctly matched regarding earthworm?
a) Buccal cavity – 1st to 5th segment
b) Stomach – 11th to 12th segment
c) Typhlosole -26th to 95th segment
d) Testes – 10th to 14th segment

192. Which one of the following animals is correctly matched with its one characteristic and the taxon?

Animal	Characteristic	Taxon
a) Millipede	Ventral nerve cord	Arachnida Mammalia
b) Duck-billed platypus	Oviparous	Mammalian
c) Silver fish	Pectoral and pelvic fins	Chordata
d) Sea anemone	Triploblastic	Cnidaria

193. Torsion of visceral mass is seen in animals belonging to class
a) Cephalopoda b) Scaphopoda c) Amphineura d) Gastropoda

194. Which one is not correct?
a) Humans-Ureotelic b) Birds-Uricotelic c) Lizards-Uricotelic d) Whale-Ammonotelic

195. Which of the following animals can successfully reproduce without utilizing the process of mitosis?
a) *Amoeba* b) *Hydra* c) Tapeworm d) *Sycon*

196. Alteration of generation is also called
a) Metamorphosis b) Metastasis c) Metazoan d) Metagenesis

197. Which of the following is the generic name of an extinct ancient lizard bird?
a) *Archaeopteryx* b) *Bulbulcus* c) *Dodo* d) None of the above

198. Choose the correct option with regards to Chondrichthyes
a) Presence of swim bladders that help them to maintain bouyancy
b) These are usually ammoniotelic animals
c) Statement (b) is true, but (a) is false
d) Both statements (a) and (b) are false

199. Members of phylum-Porifera are
a) Exclusively marine animals
b) Exclusively freshwater animals
c) Mostly freshwater animals but few are marine animals
d) Mostly marine animals but few are freshwater animals

200. The anterior V-spot in microfilaria of *Wuchereria* represents
a) Nerve ring
b) Cervical papilla
c) Excretory system
d) Reproductive system

201. The animal that has 19 body segments, 6 pairs of appendages and respires through the trachea is
a) Spider b) Prawn c) Scorpion d) Head louse

202. In the heart of rabbit, the mitral valve is attached to the papillary muscles by
a) Chordae tendinae b) Purkinje fibres c) Columnae carnease d) Bundle of His

203. Body forms present in Cnidarians are
a) Cylindrical and umbrella-shaped
b) Corals and coral reefs
c) Polyp and medusa
d) Cnidoblasts and nematocytes

204. The adhesive pads (soft-pads) present in the legs of cockroach are
a) Galea b) Lacinia c) Glossa d) Plantulae

205. Regeneration in *Hydra* will be faster, if it is cut off from

a) Tentacles b) Hypostome c) Base d) All of these

206. Which of the following statements are true/false?
I. In higher phyla cellular level of organisation is seen
II. Phylum-Platyhelminthes have cellular level of organisation
III. Cellular level of organisation is seen when the cells are not arranged as loose cell aggregates
IV. Molluscs exhibit tissue level of organisation
Choose the correct option of the following
a) I and II are true, but III and IV are false b) All statements are false
c) All statements are true d) III and IV are true, but I and II are false

207. Solenocytes and nephridia are respectively found in
a) Platyhelminthes and Annelida b) Annelida and Nematoda
c) Cnidaria and Mollusca d) Mollusca and Echinodermata

208. Select the correct order of classification of *Rana tigrina* upto genus.
a) Chordate, Craniata, Amphibia, Gnathostomata, *Rana*
b) Chordate, Craniata, Gnathostomata, Amphibia, Rana
c) Chordate, Amphibia, Gnathostomata, Craniata, *tigrina*
d) Chordate, Craniata, Amphibia, Gnathostomata, *tigrina*

209. An animal without anus is
a) *Unio* b) *Pheretima* c) *Fasciola* d) *Periplaneta*

210. Aves are divided into the following sub-classes
a) Neornithes and Anasbrnithes b) Archaeornithes and Anguis
c) Archaeornithes and Neornithes d) Anguis and Anasbrnithes

211. Cnidarias are divided into the following classes
a) Hydrozoa, Desmospongia and Scyphozoa b) Actinozoa, Scyphozoa and Anthozoa
c) Scyphozoa, Anthozoa and Hydrozoa d) None of the above

212. Which of the following is properly matched?
a) Platyhelminthes – Trematoda – *Planaria* b) Echinodermata – Asteroidea – Star fish
c) Arthropoda – Insecta – Spider d) Mollusca – Cephalopoda – *Unio*

213. Correctly matched set of phylum, class and example is
a) Protozoa-Mastigophora-*Entamoeba* b) Mollusca-Bivalvia-*Pinctada*
c) Arthropoda-Diplopoda-*Scolopendra* d) Chordata-Cyclostomata-*Phrynosoma*

214. Which one is harmful insect among the following?
a) *Apis* b) *Pyrilla* c) *Tachardia* d) *Antheraea*

215. Blood vascular system of earthworm is
a) Open type with Hb in RBC b) Open type with Hb in plasma
c) Closed type with Hb in RBC d) Closed type with Hb in plasma

216. Polyp phase is absent in
a) *Hydra* b) *Aurelia* c) *Physalia* d) *Obelia*

217. Platyhelminthes are also called
a) Roundworms b) Flatworms c) Ringworms d) Hookworms

218. Cilia of gills of bivalve molluscs help in
a) Feeding b) Digestion c) Reproduction d) Excretion

219. In rabbit, placenta is formed by
a) Chorio allantoic membrane and yolk sac b) Amnion, chorion and yolk sac
c) Chorio allantoic membrane and endometrium d) Allantois and endometrium

220. Choose the correct statement associated with ovoviviparous condition
a) When the embryo directly derives nourishment from the mother
b) The animals lay egg in a nest especially made for this purpose
c) The eggs are heavily yolked eggs
d) None of the above

221. A sponge harmful to oyster industry is
a) *Cliona* b) *Euspongia* c) *Hyalonema* d) *Spongilla*
222. The arthropods exoskeleton is composed of
a) Several kinds of polysaccharides
b) Layers of proteins and a polysaccharide called chitin
c) Several kind of proteins
d) Single complex protein called arthropodin
223. Nephridia of earthworm are performing same functions as
a) Gills of prawn b) Flame cells of *Planaria*
c) Trachea of insects d) Nematoblasts of *Hydra*
224. Choose the correct option
a) Phylum-Mollusca is the third largest phylum
b) Phylum-Arthropoda is the second largest phylum
c) Phylum-Mollusca is the largest phylum
d) Phylum-Arthropoda is the largest phylum of Animalia
225. If *Hydra* is cut transversely in three equal parts, then
a) All three parts will die b) Regeneration will occur in all the three parts
c) Regeneration will occur only in anterior part d) Regeneration occur only in middle part
226. The centrum of VIII vertebra of frog is
a) Procoelous b) Heterocoelous c) Amphicoelous d) Opisthocoelous
227. The cells that help in excretion in *Fasciola* are called
a) Choanocytes b) Nematocytes c) Nephridia d) Flame cells
228. Food storage in *Leucosolenia* occurs by
a) Ostia b) Osculum c) Thesocytes d) Spongocoel
229. Sperms in *Ascaris* are characterized by one unusual feature, *i.e.,*
a) Long form b) Lack of flagellum
c) Motility d) Ability to induce meiosis in egg
230. Male *Anopheles* does not transmit malarial parasite because
a) It catches fever b) It is too small to carry parasite
c) The parasite is killed in its stomach d) It does not drink blood
231. Characteristic feature of phylum-Echinodermata is
a) Radial symmetry
b) Water vascular system
c) Mantle cavity
d) All of these
232. In housefly, pseudotracheae is found in
a) Haustellum b) Rostrum c) Labellum d) None of these
233. A sagittal section
a) Passes dorsoventrally to the anteroposterior axis of the body
b) A transverse section passing through the middle of the body
c) Passes along the length perpendicular to the dorsoventral axis of the body
d) A vertical section passing through the middle line of the body
234. Insects are different from spiders in which of the following features
a) Presence or absence of wings, number of legs, presence of absence of haemocoel
b) Presence of absence of antennae, number of germ layers, presence or absence of appendages
c) Number of body divisions, number of leg, absence or presence of spinnerels
d) None of the above
235. The movement or locomotion in Aschelminthes is due to
a) Calcareous skeleton b) Siliceous skeleton c) Hydro skeleton d) Exoskeleton
236. Which of the following insect is not of any economic benefit?

a) Silkworm b) Lac insect c) Locust d) Honey bee

237. Age of fishes is also known as
a) Permian era b) Silurian era c) Devonian era d) Ordovician era

238. The skeleton of animals belonging to phylum-Porifera are made up of
a) Spicules b) Spiracles c) Spines d) Spongocytes

239. In *Pheretima*, the red coloured round bodies in 4th, 5th and 6th segment above the alimentary canal are believed to be involved in
a) Reproduction b) Digestion c) Excretion d) Leucocyte production

240. Scales are found in
a) Pisces b) Rabbit c) Human d) Rat

241. Body cavity of adult *Ascaris* is
a) Haemocoel b) Amphicoel c) Pseudocoel d) Schizocoel

242. If a snake is identified to be having large hexagonal vertebral and the dorsal surface and bluish with narrow white streaks, it is
a) *Echis carinata* b) *Bungarus coerulus* c) *Viper russelli* d) *Hemibungarus*

243. In coelomates, the problem of diffusion of food from gut to tissues is solved by
a) The presence of coelomic fluid. b) Churning the food within the body cavity.
c) Developing a circulatory system. d) Developing gut associated glands.

244. The generic name of tusk shell is
a) *Dentalium* b) *Chaetoderma* c) *Chiton* d) *Neopilina*

245. Which statement is incorrect about members of phylum-Porifera?
a) Have cellular level of organisation
b) Have separate sexes
c) Sexual reproduction takes place by gamete formation
d) Have a water canal system

246. Which of the following features are present in chordates?
a) Dorsal heart, presence of post-anal tail and central nervous system in dorsal
b) Ventral heart, presence of post-anal tail and presence of gill slits
c) Dorsal heart, pharynx perforated by gill slits and dorsal ventral system
d) Ventral heart, absence of notochord but presence of post-anal part of the tail

247. Which of the following assists in the locomotion of the organism stated?
a) Epithelium of *Pheretima*
b) Trichocysts of *Paramecium*
c) Pedicellaria of star fish
d) Posterior sucker of *Hirudinaria*

248. The dorsal diverticulum of urethra in male rabbit is
a) Uterus b) Uterus masculinus c) Prepuse d) Vas deferens

249. Which is not correctly matched?
a) Annelida –Enterocoelomate b) Platyhelminthes –Acoelomate
c) Arthropoda – Schizocoelomate d) Nemathelminthes –Pseudocoelomate

250. Fertilized eggs of *Periplanata Americana* are encased in
a) Ootheca b) Cocoon c) Genital chamber d) Phallomere

251. In the life cycle of mosquito, comma-shaped stage is
a) Larval stage b) Pupal stage c) Imago stage d) None of these

252. *Hemicyclops* belongs to the class
a) Cyclostomata b) Ostracodermi c) Gnathostomata d) Pisces

253. Nephridia in *Pheretima* are formed from
a) Mesenchyme b) Endoderm c) Mesoderm d) Ectoderm

254. Leech secretes, which of the following anticoagulants?
a) Hirudin b) Heparin c) Serotonin d) Histamine

255. Which character is found only in mammals?
a) Neck b) Diaphragm c) Optic lobes of brain d) Tail

256. Organ of mastication in cockroach is
a) Labrum b) Labium c) Mandibles d) Maxilla
257. Which of the following blood vessels is the largest in earthworm and possess valves?
a) Dorsal blood vessel b) Sub-neural blood vessel
c) Ventral blood vessel d) Supra oesophageal blood vessels
258. The dioecious animal is
a) Liver fluke b) Hook worm c) Tapeworm d) Earthworm
259. Metameric segmentation is the characteristic of
a) Platyhelminthes and Arthropoda b) Echinodermata and Annelida
c) Annelida and Arthropoda d) Mollusca and Chordata
260. The taste receptors of cockroach are
a) Compounds eyes b) Companiform sensillae
c) Palps of maxillary and labium d) Tactile hairs
261. Which of the following groups includes only arthropods?
a) Prawn, *Schistosoma, Planaria* b) Cockroach, scorpion, prawn
c) *Chiton, Neopilina*, scorpion d) *Chiton*, prawn, cockroach
262. Chitin is a
a) Lipid b) Protein c) Polysaccharide d) Sphingomyelin
263. Pheromone is
a) A product of endocrine gland b) Used for animal communication
c) *m*RNA d) Always protein
264. The velocity of conduction of nerve impulse in frog is
a) 300 ms^{-1} b) Same as of electricity
c) Faster than sound d) 30 ms^{-1}
265. Mark what is incorrect regarding to the phylum-Arthropoda
a) Open type of circulatory system
b) Bilaterally symmetrical, coelomate animals
c) Diploblastic with head, thorax and abdomen
d) Presence of Malpighian tubules and antennae
266. The migrating birds rely on the
a) Anaerobic oxidation of proteins b) Highly efficient aerobic oxidation of fats
c) Anaerobic oxidation of carbohydrates d) All of the above
267. Choose a limbless amphibian from the list given below
a) Salamander b) *Necturus* c) *Ichthyopis* d) All of these
268. Which structure is not related to respiration in frog?
a) Diaphragm b) Skin c) Buccal cavity d) Lungs
269. Which of the following sets of characters are applicable in metamorphosis of tadpole larva of frog and toads?
a) Reabsorption of gills and reabsorption of tail
b) Reabsorption of gills and lengthening of tail
c) Complete development of gills and reabsorption of tail
d) Complex development of gills and lengthening of tail
270. Study the following in *Pheretima*.
I.Dorso intestinal blood vessels
II.External intestinal plexus
III.Internal intestinal plexus
IV.Ventro intestinal blood vessel
Arrange the blood vessels in correct sequence of blood flow from ventral blood vessel to dorsal blood vessel.
The correct sequence is

a) IV → II → I → III b) III → I → II → IV c) II → III → IV → I d) IV → II → III → I

271. The peculiar pungent smell of cockroach is produced by the secretion of
a) Pheromones b) Flame cells c) Abdominal glands d) Cervical glands

272. Metamorphosis in cockroach is regulated by
a) Corpora cardiaca b) Brain c) Thyroid d) Corpora allata

273. Which of the following is a flightless bird?
a) Ostrich b) Emu c) Kiwi d) All of these

274. Gill is monopectinate in
a) *Unio* b) *Chiton* c) *Octopus* d) *Pila*

275. Bioluminescence is well marked in
a) Flatworms b) Ctenophores c) Cnidarians d) Aschelminthes

276. Identify the correct pair of birds with a raft-like keel and lacking preen gland and syrinyx
a) *Tinamus* and *Apteryx* b) *Rhea* and *Dromeous*
c) *Casuarius* and *Struthio* d) *Kiwi* and *Rhea*

277. Sponges are
a) Pelagic b) Free-swimming c) Planktonic d) Sessile

278. Which of the following has exoskeleton of scales and paired copulatory organ penis?
a) Sharks b) Lizards c) Urodela d) Urochordata

279. An acoelomate animal with bilateral symmetry, is
a) *Hydra* b) Liver fluke c) *Physalia* d) *Obelia*

280. All chordates have the following characteristics
a) Bilaterally symmetrical, presence of coelom, triploblastic, closed or open circulatory system
b) Bilaterally symmetrical, presence of coelom, diploblastic or triploblastic
c) Open circulatory system, diploblastic or triploblastic, coelom and bilaterally symmetrical
d) Bilaterally symmetrical, coelom, present, triploblastic with closed circulatory system

281. In *Rattus rattus*, internally cerebral hemisphere are connected by
a) Corpus striatum b) Corpus cardiacum c) Corpus callosum d) Corpus allatum

282. A triploblastic, pseudocoelomate, bilaterally symmetrical human parasite, which is oviparous and the transmission is by contact. It is
a) Filarial worm b) Hook worm c) Palalo worm d) Tape worm

283. *Ascaris* is found in
a) Body cavity b) Lymph nodes c) Tissue d) Alimentary canal

284. Common characteristic of mosquitoes, houseflies and cockroaches are
a) One pair each of wings and halters
b) Three pair of legs and one pair of developed wings
c) Two pair of legs and two compound eyes
d) Compound and simple eyes

285. About how many times does the nymph of the *Periplaneta americana* undergo moulting before becoming an adult?
a) 4 b) 2 c) 17 d) 3

286. Jacobson's organs which are additional olfactory organs are present in
a) Rat b) Snakes c) Man d) All of these

287. Stink gland is found in
a) 4^{th} and 5^{th} terga of cockroach b) 5^{th} and 6^{th} terga of cockroach
c) 5^{th} and 6^{th} sterna of cockroach d) 4^{th} and 5^{th} sterna of cockroach

288. In the 4^{th} , 5^{th} and 6^{th} segments of earthworm, lying above pharyngeal mass and connected with pharyngeal glands are found small, red coloured follicular bodies called
a) Septal glands b) Blood glands c) Salivary glands d) Nephridia

289. Different colours of frog skin are controlled by
a) Hormones b) Melanocytes c) Nervous system d) Both (a) and (c)

290. Which of the following is not true regarding phylum-Coelenterata?
a) They are diploblastic animals
b) They have cellular level of organisation
c) They have nematocyte cells present on the tentacles
d) The gastro-vascular opening is called the hypostome

291. *Hydra* captures the victim by injecting the chemical
a) Kaliotoxin b) Hypnotoxin c) Toxoplasmin d) Sarafotoxin

292. In *Ascaris*, the coelom is
a) Schizocoelom b) Pseudocoelom c) True coelom d) Haemocoelom

293. The feet with toes forming cloven hoof is seen in
a) Horse b) Zebra c) Rhinoceros d) Sheep

294. *Petromyzon* belongs to
a) Agnatha b) Gnathostomata c) Protochordata d) Euchordata

295. The second largest aquatic vertebrate is
a) Blue whale b) Whale shark c) Sea elephant d) Dugongs

296. In insects which feed on nectar, the proboscis is formed by
a) Hypopharynx b) Mandibles c) Glossa d) Labrium

297. In *Hydra*, the beaded processes of sensory cells make synapsis with the process of
a) Nerve cell b) Epithelio-muscular cell
c) Both (a) and (b) d) None of the above

298. In which of the following phyla, while the adult shows radial symmetry, the larva shows bilateral symmetry?
a) Annelida b) Arthropoda c) Mollusca d) Echinodermata

299. Which one of the following is not the characteristic feature of frog?
a) The skin is moist and slimy
b) Each of the fore limbs and hindlimbs end in five digits
c) Hepatic portal and renal portal systems are present
d) Skin, buccal cavity and lungs are the respiratory organs

300. *Trygon* has
a) Two chambered heart b) The males have claspers
c) Presence of gill slits d) All of the above

301. Identify the figure *A* and *B* and choose the correct option



1. Female *Ancylostoma*
2. Female *Ascaris*
3. Male *Taenia*
4. Female *Wuchereria*
5. Male *Ancylostoma*
6. Male *Ascaris*

A B
a) 2 3 b) 4 3 c) 6 2 d) 6 3

302. The larva of *Bombyx mori* is known as
a) Nymph b) Trochophore c) Cocoon d) Caterpillar

303. Mollusc, which does not have ink gland is
a) *Pila* b) *Loligo* c) *Sepia* d) *Octopus*

304. The intermediate host of *Schistosoma* is
a) Snail b) Mosquito c) Housefly d) Sheep
305. One very special feature in the earthworm *Pheretima* is that
a) The typhlosole greatly increases the effective absorption area of the digested food in the intestine
b) The S-shaped setae embedded in the integument are the defensive weapons used against the enemies
c) It has a long dorsal tubular heart
d) Fertilization of eggs occurs inside the body
306. What is left when bath-sponges dries up?
a) Spicules b) Spongin fibres c) Tentacles d) Holdfast
307. Which of the following can regenerate entire alimentary canal?
a) Amphibian b) Fish c) Sea cucumber d) Birds
308. In rabbit, end of a long bone is connected with another by
a) Tendon b) Ligaments c) Muscle d) Cartilage
309. The long bones are hollow and connected by air passage. These are characteristic of
a) Mammalia b) Aves c) Reptilia d) Sponges
310. Choanocytes form the lining of paragastral cavity in
a) Jelly fish b) Sponges c) Helminthes d) Echinoderms
311. In Ophiuroidea, branched arms are seen in
a) *Gorgonocephalus* b) *Clypeaster* c) *Salmacis* d) *Gorgonia*
312. Characteristic of coelenterate is occurrence of
a) Nematocysts b) Polymorphism c) Flame cells d) Choanocytes
313. Mammals evolved from therapsid reptiles in Triassic period. The type of skull in these reptiles is
a) Anapsid skull b) Parapsid skull c) Synapsid skull d) Diapsid skull
314. The level of organisation in Platyhelminthes is
a) Cellular level b) Tissue level
c) Organ level d) Organ-system level
315. If a live earthworm is pricked with a needle on its outer surface without damaging its gut, the fluid that comes out is
a) Excretory fluid b) Coelomic fluid c) Haemolymph d) Slimy mucus
316. The animal with bilateral symmetry in young stage, and radial pentamerous symmetry in the adult stage belongs to the phylum
a) Annelida b) Mollusca c) Cnidaria d) Echinodermata
317. Which of the following snake is non-poisonous?
a) Cobra b) Krait c) Viper d) *Python*
318. Excretory organ in phylum-Hemichordata is
a) Proboscis gland b) Gills c) Collar d) None of these
319. Classification of sponges is primarily based on the
a) Body organization b) Body plan c) Skeleton d) Canal system
320. Select the statement that explain neoteny
a) Neonatal forms are found in mammals b) Larval stages become sexually mature
c) Third larval stage of *Ascaris* shows need any d) None of the above
321. Which of the following is incorrect for Aves?
a) Heart is four chambered and animals are oviparous
b) Presence of air cavities in bones and presence of feathers on the body
c) Digestive tract has additional chambers and animals are homiothermous
d) The forlimbs are not modified into wings
322. Select the phylum that is the largest of the kingdom-Animalia
a) Phylum-Mollusca b) Phylum-Arthropoda c) Phylum-Annelida d) Phylum-Coelenterata
323. What distinguishes an insect from a crustacean?
a) Number of appendages b) Number of eyes

c) Presence of wings d) Arrangement of nerve cord

324. Biramous appendages are present in
a) Insect b) Crustacea c) Onychophora d) Cephalopoda

325. Which one of the following does not have an excretory system?
a) *Myxine* b) *Carcharodon* c) *Balanoglossus* d) *Asterias*

326. Which one of the following groups of three animals each is correctly matched with their one characteristic morphological feature?

	Animal	Morphological Feature
a)	Liver fluke, sea anemone, sea cucumber	Bilateral symmetry
b)	Centipede, prawn, sea urchin	Jointed appendages
c)	Scorpion, spider, cockroach	Ventral solid central nervous system
d)	Cockroach, locust, *Taenia*	Metameric segmentation

327. Metameric segmentation is the main feature of
a) Annelida b) Echinodermata c) Arthropoda d) Coelenterata

328. Which of the following figure shows coelomate condition? Refer to NCERT for figures



a) A b) B c) C d) None of these

329. Which among the following is an Indian monkey?
a) *Ramapithecus* b) *Macaca* c) Gorilla d) *Pongidae*

330. Vivipary is found in
a) Coelenterata b) Protozoa c) Rabbit d) Pisces

331. The number of gills present in osteichthyes is
a) 2 pairs b) 6 pairs c) 5 pairs d) 4 pairs

332. Reptiles are different from amphibians in
a) The skin
b) Structure of the heart
c) Development stages
d) All of these

333. The pseudocoelomate among these is
a) Porifera b) Annelida c) Aschelminthes d) Mollusca

334. Select which of the following is not an insect?
a) *Apis indica* b) *Aranea* c) *Anopheles* d) None of these

335. Which one is not found in testis of frog?
a) Sertoli cell b) Seminiferous tubule c) Germinal cell d) Interstitial cell

336. Asymmetrical animals are
a) *Amoeba* b) *Spongilla* c) *Spongia* d) All of these

337. Which class shows the presence of amnion and chorionic membranes during development?
a) Amphibian b) Osteichthyes c) Reptilia d) Chondrichthyes

338. Body cavity lined by mesoderm is called
a) Coelenteron b) Pseudocoel c) Coelom d) Blastocoels
339. Animals of class-Mammalia have
a) Seven cervical vertebrae b) Seven cranial nerve
c) Single ventricular chamber d) Fourteen cervical vertebrae
340. Order-primata contains
a) Shrew and hedgehog b) Bats and vampire c) Monkeys and man d) Horses and zebra
341. Which one of the following has an open circulatory system?
a) *Pheretima* b) *Periplaneta* c) *Hirudinaria* d) *Octopus*
342. Collar cells are characteristic of
a) Earthworm b) Roundworms c) Coelenterates d) Sponges
343. Which of the following groups of animals have the following feature?
I. Diploblastic
II. Acoelomate
III. Radial symmetry
a) *Planaria, Physalia, Aurelia* b) *Taenia, Fasciola, Wuchereria*
c) *Adamsia, Berore, Meandrina* d) *Fasciola, Sycon*, Sea walnut
344. Which one of the following animals is correctly matched with its particular named taxonomic category?
a) Cuttlefish – Mollusca, a class b) Humans – Primata, the family
c) Housefly – *Musca*, an order d) Tiger – *tigris*, the species
345. Radial symmetry is seen in
a) Echinodermata, Ctenophora and Cnidaria
b) Mollusca, Porifera and Echinodemata
c) Porifera, Annelida and Arthropoda
d) None of the above
346. A detritivorous animal of economic importance is
a) Earthworm b) Giriraja fow c) Caterpillar larva d) Leech
347. The female genital pores of *Pheretima posthuma* located upon the segment
a) 14th b) 16th c) 18th d) 15th
348. Which statement is incorrect about *Pleurobrachia*?
a) They are diploblastic b) They have tissue level organisation
c) They have comb plates d) They are triploblastic
349. Maximum diversity is found in which of the following phylum?
a) Chordata b) Arthropoda c) Protozoa d) Annelida
350. Biradial symmetry and lack of cnidoblasts are the characteristics of
a) Starfish and sea anemone b) *Ctenoplana* and *Beroe*
c) *Aurelia* and *Paramecium* d) *Hydra* and starfish
351. Which parasite is present in seminal vesicle of earthworm?
a) *Monocystis* b) *Nosema* c) *Sarcocystis* d) *Nictotherus*
352. In *Pheretima*, locomotion occurs with the help of
a) Circular muscles b) Longitudinal muscles and setae
c) Circular, longitudinal muscles and setae d) Parapodia
353. In Mollusca, eye is present over a stalk, called
a) Ostracum b) Operculum c) Ommatophores d) Osphradium
354. Choose the correctly matched characters of the phylum
a) Ctenophore – Radial symmetry – Cellular level of organisation – Acoelomate
b) Platyhelminthes – Bilateral symmetry – Organ and organ system level of organisation – Pseudocoelomate
c) Echinodermata – Radial symmetry – Organ system level of organisation – Coelomate
d) Coelenterata – Bilateral symmetry tissue level organisation – acoelomate

355. Mollusc are usually
a) Terrestrial and parasitic b) Aquatic and parasitic
c) Aquatic or terrestrial d) None of these

356. Third moulting in *Ascaris* larva takes place in
a) Lung b) Liver c) Heart d) Intestine

357. Which of the following statements are true/false?
I. Cell aggregate body plan is found in phylum-Platyhelminthes
II. Radial symmetry is the most common symmetry found in animals
III. Pseudocoelom is only found in phylum-Aschelminthes
IV. All triploblastic animals have a true coelom
V. Haemocoel is sometimes observed in animals belonging to phylum-Platyhelminthes
a) I and V are true and II, III and IV are false b) II, III and V are true and I and IV are false
c) I, II and III are true and IV and V are false d) I, II, IV and V are false, only III is true

358. Book lungs and look gills are found in which of the following animals, respectively?
a) Prawns and lobsters b) Cockroaches and cuttle fish
c) *Pila* and crabs d) Scorpion and king crabs

359. In rabbit, foliate papillae are
a) Situated on the margin of tongue b) Situated on the upper surface of tongue
c) Situated at the base of tongue d) Situated at the sides of the base of the tongue

360. Scientific name of starfish is
a) *Echinus* b) *Limulus* c) *Echidna* d) *Asterias*

361. The second layer of epidermis in rat integument is
a) Stratum lucidium b) Stratum germinativum
c) Stratum corneum d) Stratum granulosum

362. Diploblastic animals belong to the phylum
a) Protista
b) Protozoa
c) Coelenterates
d) Platyhelminthes

363. Differentiated embryonic layers are called
I. ectoderm II. Endoderm
III. Mesoderm III. Mesoglea
a) I, II and IV b) I, II and III c) II, III and IV d) I, III and IV

364. The pair of amphibians found in Indian peninsula is
a) *Amphiuma* b) *Tyloto triton and Ichthyophis*
c) *Hyla and Ambystoma* d) *Psittacus and Apteryx*

365. Which set includes pathogenic arthropods?
a) Tse-tse fly, mosquito, flea-plague b) Crab, *Culex*, spider
c) *Anopheles*, *Culex,* cray fish d) Silver fish, house fly, sandfly

366. In which of the following reptiles four chambered heart is present?
a) Lizard b) Snake c) Scorpion d) Crocodile

367. Which of the parts in cockroach are fundamentally similar in structure?
a) Anal styles and labrum b) Maxillae and legs
c) Mandibles and antennae d) Wings and anal cerci

368. The respiratory pigment present in cockroach is
a) Haemoglobin b) Haemocyanin c) Oxyhaemoglobin d) None of these

369. Which of the following animal phyla does not possess a coelom?
a) Platyhelminthes b) Annelida c) Mollusca d) Echinodermata

370. Which of the following hormones regulates growth and metamorphosis in insect?
a) Juvenile hormone b) Brain hormone

c) Ecdysone d) Prothoracicotropic hormone

371. Juvenile hormone is secreted by
a) Thyroid gland b) Thymus gland c) Adrenal gland d) Corpora allata

372. Among the following, colonial insects are
a) Locusts b) Mosquitoes c) White ants d) Bed bug

373. Animals are classified on the basis of their symmetry into….. groups
a) 2 b) 3 c) 4 d) 5

374. Correct order of ear ossicles in rabbit is
a) Incus, stapes, malleus b) Malleus, incus, stapes c) Malleus, stapes, incus d) Incus, malleus, stapes

375. In rabbit, the two fibro-elastic strands of the larynx extend between the
a) Thyroid and arytenoids cartilages b) Thyroid and cricoids cartilages
c) Santorini and thyroid cartilages d) Cricoid and tracheal cartilaginous rings

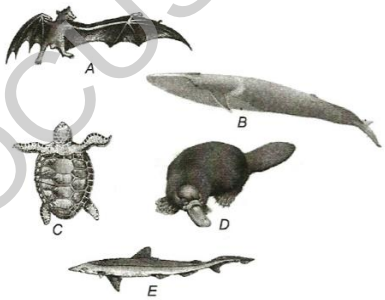
376. Which of the following are true to the prototherians?
I.Pectoral girdle is associated with T-shaped interclavicle.
II.Mammary glands are modified as sebaceous glands.
III.Pelvic girdle possesses epipubic bones.
IV.Vertebrae are with epiphyses.
a) I and III b) I and II c) III and IV d) II and III

377. Branch of zoology dealing with the study of fishes is known as
a) Herpetology b) Ichthyology c) Mammology d) Ornithology

378. Which of the following is a flightless bird?
a) Columba and corvus splendes b) Struthio and penguin
c) Tyto and psittacula d) All of the above

379. Chloragogen cells are present in *Pheretima*. These are specialized for performing function of
a) Nutrition b) Reproduction c) Excretion d) Respiration

380. Which of the following do not belong to class-Mammalia?



a) B and E b) A and C c) E and C d) D and E

381. Radial symmetry is found in
a) Frog b) Starfish c) Humans d) *Pheretima*

382. Which one of the following is the most effective in *Ascaris* infection?
a) Chloroquinine b) *Cinchona* c) *Colchicum* d) Oil of *Chenopodium*

383. Which of the following statements is true?
a) All chordates are vertebrates b) All vertebrates are chordates
c) Invertebrates possess a tubular nerve cord d) Non-chordates have a vertebral column

384. Bilateral symmetry, metameric segmentation, coelom and open circulatory system are the features of
a) Annelida b) Arthropoda c) Mollusca d) Echinodermata

385. The functional kidney of frog tadpole is
a) Archinephros b) Pronephros c) Mesonephros d) Metanephros

386. In *Pheretima*, the number of ring vessels per segment in 12th and 13th segments is
a) 10 pairs b) 11 pairs c) 12 pairs d) 24 pairs

387. Excretory organs in echinoderm is
a) Nephridia b) Green glands c) Flame cells d) None of these

388. Accessory gland associated with the genital organs in female rats are
I.Vestibular bartholin
II.Cowper's gland
III.Ampullary gland
IV.Vesicular gland
a) I and II b) III and II c) IV only d) I only

389. In rabbit, head of epididymis present at the head of the testis is called
a) Vas deferens b) Cauda epididymis c) Gubernaculum d) Caput epididymis

390. Phylum of *Taenia solium* is
a) Aschelminthes b) Annelida c) Platyhelminthes d) Mollusca

391. 'Water-vascular' system is found in
a) Sea-anemone b) Sea-pen c) Sea-cucumber d) Sea-horse

392. Nucleated RBC is present in
a) Man b) Rat c) Frog d) Rabbit

393. Fertilization in earthworm occurs in
a) Cocoon b) Spermathecae c) Coelom d) Seminal vesicles

394. Protandry refers to the
a) Excretory organs present in Arthropoda b) Connecting links between 2 phyla
c) Earlier maturation of male sex organs than female sex organs d) Features in ancient missing links

395. Which of the following groups of animals maintains high and constant body temperature such as mammals?
a) Reptiles b) Amphibians c) Birds d) Fishes

396. Which of the following orders lack canine teeth?
a) Rodentia b) Primates c) Carnivora d) None of these

397. Animals active at night are
a) Diurnal b) Nocturnal c) Parasites d) Nocto-diurnal

398. Which type of kidneys are found in amphibians?
a) Holonephric b) Mesonephric c) Pronephric d) Metanephric

399. A coelom is a
a) Cavity between body well and gut wall b) Body cavity lined by mesoderm
c) Body cavity not lined by mesoderm d) Body cavity lined by endoderm

400. Starfish belongs to phylum
a) Porifera b) Coelenterata c) Echinodermata d) Arthropoda

401. Number of segments found in abdomen of cockroach are
a) 8 b) 10 c) 12 d) 15

402. In cockroach, the first pair of wings are known as
a) Sterna b) Terga c) Integument d) Tegmina

403. Bone marrow is absent in
a) Reptiles b) Amphibians c) Aves d) Mammals

404. In cockroach, larval and nymphal characters are maintained by
a) Ecdysone b) Salivary glands c) Parotid gland d) Juvenile hormone

405. Chondrichthyes is characterized by
a) Placoid scale b) Ventral mouth
c) Ctenoid scale and ventral mouth d) Placoid scale and ventral mouth

406. Taxonomically, which of the following set belongs to Arthropoda?
a) Cattle fish, jelly fish, silver fish b) Bat, pigeon, kite
c) Lobsters, spider, shrimps d) Oyster, otter, *Octopus*

407. Which one of the following is not a characteristic feature of the sub-phylum-Vertebrata?
a) Dorsal tubular nerve cord b) Ventral muscular heart

c) Presence of notochord in the adult d) Presence of kidneys

408. The post anal tail is present in
a) Chordates b) Vertebrates c) Invertebrates d) All of these

409. Natural pearl is
a) A mollusk b) An annelid c) An arthropod d) An echinodermate

410. In frog, chromosome number is reduced to half
a) When 2nd polar body is separated b) When 2nd polar body is divided
c) When 3rd polar body is separated d) When 1st polar body is separated

411. The excretory material of bony fish is
a) Urea b) Protein c) Ammonia d) Amino acid

412. Which of the following is present in phylum-Porifera?
a) Amoebocytes b) Thesocytes c) Choanocytes d) All of these

413. The worker honey bee normally lives for about
a) 10 days b) 15 days c) 30 days d) 90 days

414. The glands present in the skin of frog are
a) Mucous and poisonous b) Sweat and mammary
c) Sweat and sebaceous d) Mucous and sweat

415. Cysticercus stage is found in
a) *Taenia* b) *Plasmodium* c) *Leishmania* d) *Wuchereria*

416. The substance or structure found in the eyes of birds is
a) Keratin b) Nectin c) Pleura d) Pectin

417. Radula is found in
a) *Pila* sp b) *Chiton* sp c) *Lamellidens* sp d) *Pinctada* sp

418. In which animal, diapharagm has no role in respiration?
a) Frog b) Rat c) Camel d) Rabbit

419. Which one of the following phyla is correctly matched with its two general characteristics?
a) Arhropoda – Body divided into head, thorax and abdomen and respiration by tracheae
b) Chordate – Notochord at some stage and separate anal and urinary openings to the outside
c) Echinodermata – Pentamerous radial symmetry and mostly internal fertilization
d) Mollusca – Normally oviparous and development through a trochophore or veliger larva

420. The class name-Reptilia refers to
a) They have scales or scutes presence on the body
b) They shed their skin and undergo moulting
c) They have creeping or crawling mode of locomotion
d) None of the above

421. 'Turbellarians' are free living
a) Nematodes b) Cestodes c) Flatworms d) Trematodes

422. Which of the following belongs to the class-Amphineura?
a) *Chiton* b) *Nautilus* c) *Dentalium* d) *Pinctada*

423. The male cockroach can be identified by the presence of
a) Collaterial gland b) Green gland c) Broad abdomen d) Anal style

424. Which of the following is a catadromous fish?
a) *Hilsa* sp b) *Mystus* sp c) *Anguilla* sp d) *Channa* sp

425. What is the scientific name of pinworm of man?
a) *Trichinella spiralis* b) *Dracunculus medinensis*
c) *Trichuris trichuria* d) *Enterobius vermicularis*

426. *Fasciola hepatica* is a digenetic parasite. Sheep and snail are two hosts. Snail is
a) Intermediate host b) Paratenic host c) Vector host d) Reservoir host

427. The number of trigeminal nerve in frog is
a) 4th b) 5th c) 8th d) 9th

428. Animals are classified on the basis of which of the following features?
I. Coelomic cavity II. Level of organisation
III. Notochord IV. Skeletal structure
a) I and II b) I and III c) I, II and III d) II and IV

429. Pylangium in frog is found in
a) Conus arteriosus b) Sinus venosus c) Atrium d) Ventricle

430. Select the group of animals that have a protostomous plan
a) *Culex, Dugesia, Aurelia* b) *Ancylostoma, Limulus, Physalia*
c) *Apis indica, Loligo, Hirudinaria* d) *Ophiothrix, Rhabdopleura, Antedon*

431. *Hydra* possesses
a) One testis and one ovary b) One testis and many ovaries
c) Many testes and many ovaries d) Many testes and one ovary

432. Which one of the following is an exotic carp species?
a) *Barbus stigma* b) *Cyprinus carpio* c) *Labeo bata* d) *Cirrhinus mrigala*

433. A temporary, ectoparasitic, nocturnal insect with piercing and sucking type of mouth parts is
a) *Pediculus* b) *Cimex* c) *Tachardia* d) *Musca*

434. The unique character of animals belonging to class-Mammalia is
a) Only mammals possesses hair on skin
b) Completely four chambered heart
c) Presence of mammary glands
d) Fertilisation is internal

435. Select the prosimians from the given options
a) Lemurs, monkey and gibbons b) Chimpanzee, monkey and loris
c) Tarsius, lemur and loris d) Chimpanzee, gibbons and orangutan

436. Hormone responsible for metamorphosis in tadpole is
a) Adrenaline b) Thyroxine c) Aldosterone d) Vasopressin

437. Which of the following animals has a true coelom?
a) *Ascaris* b) *Pheretima* c) *Sycon* d) *Taenia solium*

438. Right aortic arch is present in
a) Reptiles only b) Mammals only c) Birds only d) Both (b) and (c)

439. The type of asexual reproduction found in *Hydra* is
a) Multiple fission b) Budding c) Sporulation d) Binary fission

440. Neopallium is found in the brain of
a) Amphibian b) Advanced reptiles c) Mammals d) Both (b) and (c)

441. Insects have
a) 2 pairs of legs b) 3 pairs of legs c) 4 pairs of legs d) 1 pair of legs

442. Which is not in pair in rabbit?
a) Azygous vein b) Hemizygous vein c) Caudal vein d) All of these

443. The golden age of reptiles was
a) Proterozoic era b) Palaeozoic era c) Mesozoic era d) Coenozoic era

444. *Schistosoma* is a parasite found in
a) Testes of frog b) Liver c) Intestine d) Blood

445. Which of the following characters are present in class-Crustacea?
a) Ciphalothorax, gills and appendages b) Head and thorax, gills and appendages
c) Cephalothorax, book gills and appendages d) Head and thorax, book gills and appendages

446. Pseudocoelom is not found in
a) *Ascaris* b) *Ancylostoma* c) *Fasciola* d) None of these

447. The skull of frog is
a) Tricondylic b) Monocondylic c) Dicondylic d) Non-condylic

448. Earthworms have no skeleton, but during burrowing the anterior end becomes turgid and acts as a Hydraulic skeleton. It is due to
a) Coelomic fluid b) Blood c) Gut peristalsis d) Setae

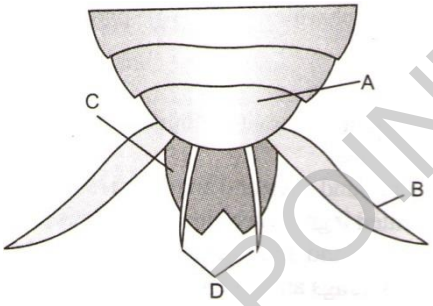
449. *Dugesia* belongs to which class
a) Trematoda b) Cestoda c) Turbellaria d) None of these

450. What is true for *Wuchereria bancrofti*?
a) Absence of an intermediate host b) Male worms are longer than female worms
c) Lives in bile ducts of human beings d) Seen in lymph of humans

451. Identify the group, which includes animals all of which give birth to young ones directly.
a) Dolphin, kangaroo, bat, cat b) *Platypus*, penguin, bat, hippopotamus
c) Shrew, bat, kiwi, cat d) Lion, whale, ostrich, bat

452. Skeletal system in phylum-Arthropoda is
a) Endoskeletal spicules structures b) Endoskeletal siliceous structures
c) Exoskeletal calcareous covering d) Exoskeletal chitinous covering

453. The diagram represents the reproductive organ of male cockroach. Choose the correct combination of labeling



a) A – 8th Sternum, B – Anal cercus, C – 10th tergum, D – Anal styles
b) A – 10th tergum, B – Anal cercus, C – Anal styles, D – Sternum
c) A – Anal styles, B – Anal cercus, C – 10th Tergum D – 8th Sternum
d) A – 8th Sternum, B – Anal cercus, C – 10th Tergum, D – 8th Sternum

454. Coxal glands are excretory organs in
a) Birds b) Scorpions c) Porifers d) Annelids

455. Which of the following requires an invertebrate intermediate host?
VI. Dugesia
VII. Schistosoma
VIII. Echinococcus
IX. Ancylostoma
X. *Wuchereria*
a) III and IV b) II and V c) III and V d) I and IV

456. Each male genital opening of *Pheretima* has separate openings of
a) Two ducts b) Three ducts c) Five ducts d) Four ducts

457. Which insect is useful for us?
a) *Periplaneta* b) *Musca* c) *Bombyx* d) Mosquitoes

458. To which taxonomic group does whale belong to?
a) Fishes b) Reptiles c) Arthropoda d) Mammals

459. Flame cells are excretory organ of
a) *Planaria* b) *Hydra* c) *Hydrilla* d) Cockroach

460. Which of the following is true about hookworms?
a) Fertilisation is external b) Presence of excretory tube and excretory pore
c) Triploblastic and acoelomate animals d) Hermaphrodites

461. Acoustic spots in frog are present in
a) Osseous labyrinth b) Carotid

c) Membranous labyrinth d) All of these

462. Venom of viper affects
a) Nervous system b) Circulatory system c) Respiratory system d) None of these

463. What is common among silver fish, scorpion, crab and honey bee?
a) Compound eyes b) Poion glands c) Jointed appendages d) Metamorphosis

464. The function of clitellum in *Pheretima* is
a) Formation of cocoon b) Secretion of hormone
c) Nutrition of sperm d) Respiration

465. Select the phylum that is neither bilaterally symmetrical nor radially symmetrical nor radially symmetrical
a) Ctenophora b) Coelenterata c) Porifera d) Annelida

466. *Hydra* recognizes its prey by
a) Nematocyst b) Some special organs
c) Chemical stimulus of prey d) Mechanical stimulus of prey

467. Which one has no intermediate host?
a) *Taenia* b) *Ascaris* c) *Fasciola* d) *Plasmodium*

468. Which is true for honeybee?
a) Queen is sterile haploid female b) Workers are diploid males and females
c) Bee hive has four types of bees d) Drones are haploid fertile males

469. Shell of molluscs is derived from
a) Foot b) Mantle c) Ctenidia d) Placoid

470. Rabbit is
a) Carnivore b) Herbivore c) Both (a) and (b) d) Sanguivore

471. Choose the animals that belong to phylum-Echinodermata from the options
a) Sea urchin, cuttle fish and sea lily
b) *Echinus*, sea hare and sea cucumber
c) Antedon, *Ophiura* and *Echinus*
d) *Ophiura*, *Chaetopleura* and *Echinus*

472. The animal's body belonging to phylum-Mollusca is divided into
a) Head, thorax and abdomen b) Head, muscular foot and abdomen
c) Head, thorax and visceral hump d) Head, muscular foot and visceral hump

473. Wriggler is the larva of
a) Mosquito b) Butterfly c) Housefly d) Cockroach

474. Addition of which element in water speed up the metamorphosis in frog tadpole larva?
a) I_2 b) K c) Na d) Cl

475. Phylum that exhibit radial or radial like symmetry are
a) Coelenterates b) Echinoderms c) Ctenophores d) All of these

476. Characteristic symptom of ancylostomiasis is
a) Gastro-intestinal disturbance b) Anaemia
c) Nervous disorders d) All of the above

477. Characteristic cells of *Hydra* are
a) Archaeocytes b) Thesocytes c) Cnidoblasts d) Trophocytes

478. The nitrogeneous metabolic waste in *Hydra* is mostly
a) Ammonia and is removed from whole surface of body
b) Urea and is removed mainly by tentacles
c) Urea and is removed from whole surface of body
d) Uric acid and is removed from whole surface of body

479. The echinoderms are
a) Arborial insects b) Marine animals c) Terrestrial insects d) Freshwater worms

480. List the phyla in the correct order of their placement in classification
I. Chordata II. Annelida

III. Arthropoda IV. Platyhelminthes
V. Ctenophora VI. Aschelminthes
a) VI, I, V, IV, III, II b) II, III, IV, V, VI, I c) V, IV, VI, II, III, I d) III, II, VI, I, V, IV

481. Superposition image formation takes place in cockroach during
a) Bright light b) Diffused light c) Dim light d) None of these

482. Which of the following has enterocoelomate invertebrate?
a) Echinodermata b) Arthropoda c) Annelida d) Mollusca

483. Which of the following is the character of dorsal blood vessel of the earthworm?
a) Collecting in the whole body b) Collecting in first 13 segments
c) Distributing in the whole body d) Distributing in the first 13 segments

484. Which one is correct?
a) Notochord is ectodermal in origin present in some animals
b) Notochord is a mesodermally derived rod like structure formed on the dorsal side in embryonic development in some animals
c) Arthropoda are non-chordates
d) Both (b) and (c)

485. Mammal's heart is
a) Myogenic b) Neurogenic c) Voluntary d) Sympathetic

486. Which of the following organs in earthworm neutralizes human acid present in humus?
a) Typhlosole b) Calciferous glands c) Intestinal caecum d) Gizzard

487. Which one of the following is a matching pair of a body feature and the animal possessing it?
a) Post-anal tail – Octopus
b) Ventral central nervous system – Leech
c) Pharyngeal gill slits absent in embryo – *Chamaeleon*
d) Ventral heart – Scorpion

488. Notochord is
a) Endodermally derived structure, formed on the dorso ventral side
b) Ectodermally derived structure, formed on the dorsal side
c) Mesodermally derived structure, formed on the dorsal side
d) Mesodermally derived structure, formed on the ventral side

489. Some vertebrae in birds fuse to form
a) Sacrum b) Synsacrum c) Coccyx d) None of these

490. Tube-within-tube body plan is found in which animal?
a) *Euspongia* b) *Fasciola* c) *Hydra* d) None of these

491. WBCs of frog are
a) Nucleated amoeboid b) Biconvex c) Concave d) Non-nucleated

492. Animals having a built in thermostat to maintain constant body temperature are known as
a) Biothermic b) Poikilothermic c) Oligothermic d) Homeothermic

493. Which of the following is not a characteristic of snakes?
a) Eggs b) Sternum c) Scales d) Kidney

494. Sea fan belongs to
a) Coelenterata b) Porifera c) Echinodermata d) Mollusca

495. Choanocyte is the characteristic feature of
a) Sponges b) Arthropods c) Annelids d) None of these

496. Features common to the animals belonging to class-Amphibia and class-Reptilia are
a) Presence of scales with internal fertilisation and usually four chambered heart
b) Presence of tympanum, poikilotherms and usually three chambered heart
c) Presence of cloaca, oviparous and external fertilisation
d) Skin is moist

497. Two-chambered heart is a feature of

a) Amphibians b) Fishes c) Reptiles d) Birds

498. Choose the cartilaginous fishes from the following
a) *Catla* and *Sawfish*
b) *Pristis* and *Carcharodon*
c) *Scoliodon* and Hagfish
d) *Trygon* and Lamprey

499. Which of the following is not correctly matched?
a) *Sycon* – Canal system b) Starfish – Radial symmetry
c) *Ascaris* – Flame cell d) Prawn - Haemocoel

500. Which of the following vertebrates show the formation of middle ear (eustachian recess) for the first time?
a) *Exocoetus* b) *Rana* c) *Echis* d) *Hippocampus*

501. The most powerful poison produced by vertebrates is
a) Paratotoxin b) Hypotoxin c) Haemotoxin d) Batrachotoxin

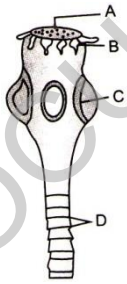
502. What is true about class-Insecta?
a) Two pairs of wings b) One pair of wings
c) Three pairs of jointed legs d) No wings

503. Asymmetry in Gastropoda is due to
a) Torsion b) Coiling c) Twisting d) None of these

504. Choose the respiratory organ that are not present in phylum-Arthropoda
a) Tracheal system b) Gills
c) Water vascular system d) Book lungs

505. The jawless vertebrate is
a) Crocodile b) Loris c) *Hyla* d) *Petromyzon*

506. In the given diagram different parts are indicated by alphabets. Choose the answer, in which these alphabets correctly match with the parts they indicate.



a) A-Rostellum B- Hooks C- Sucker D- Proglottids
b) A-Suctorial mouth B-Hooks C- Sucker D- Segments
c) A-Mouth B-Tentacles C- Sucker D- Segments
d) A-Sucker B- Hairs C- Ring D-Proglottids

507. A list of animals is given below. Identify the animals with open circulatory system and choose the correct answer
I.Ascidia
II.Cockroach
III.Earthworm
IV.Prawn
V.Silverfish
VI.Snail
VII.Squid
a) II, IV and VI b) I, II, IV and VI c) III, IV, V and VII d) II, IV, V and VI

508. Parthenogenesis is a term of
a) Sexual reproduction b) Asexual reproduction
c) Budding d) Regeneration

509. The integument of the frog is always kept moist because

a) It cannot move with dry skin
b) It performs cutaneous respiration
c) It cannot catch food with dry skin
d) It cannot jump better with moist skin

510. What is true about Mollusc?
a) Presence of metameric segmentation
b) Presence of mantle cavity and coelom cavity
c) Presence of tissue level of organisation
d) Presence of chitinous exoskeleton

511. Higher phylum like echinoderms are
a) Triploblastic animals
b) Quadroblastic animals
c) Diploblastic animals
d) Uniblastic animals

512. From the following statements select the wrong one.
a) Millipeds have two pairs of appendages in each segment of the body
b) Prawn has two pairs of antennae
c) Animals belonging to phylum-Porifera are exclusively marine
d) Nematocysts are characteristic of the phylum-Cnidaria

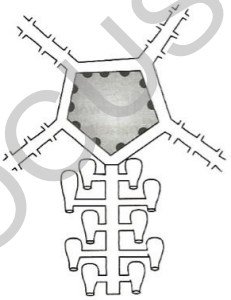
513. The skeleton of corals is composed of
a) Siliceous spicules
b) Calcium sulphate
c) Calcium carbonate
d) Potassium sulphate

514. The type of symmetry belongs to animals is
a) Transverse symmetry
b) Lateral symmetry
c) Bilateral symmetry
d) Oblique symmetry

515. Scientific name of king cobra is
a) *Naja naja*
b) *Bungarus coerulus*
c) *Naja Hannah*
d) *Vipera russelli*

516. Symmetry in Cnidaria is
a) Radial
b) Bilateral
c) Pentamerous
d) Spherical

517. What is missing in the following diagram?



a) Podium and tiedamanns body
b) Madrepori canal and madreporite
c) Madreporite and podial canal
d) None of the above

518. Frog's tadpole is
a) Uricotelic
b) Ureotelic
c) Ammonotelic
d) Aminotelic

519. Sub-class-Prototheria is related with egg laying mammal such as
a) Kangaroo
b) *Echidna*
c) Primate
d) None of these

520. Which of these is referred to as 'Venus flower basket'?
a) *Spongilla*
b) *Sycon*
c) *Euplectella*
d) *Cliona*

521. Identify the aquatic mammal(s) from the following
I.*Balenoptera*
II.*Equus*
III.*Delphinus*
IV.*Pteropus*
V.*Felis*
a) I and III
b) II and IV
c) V only
d) IV and V

522. Which of the following is a viviparous fish?
a) *Exocoetus*
b) *Gambusia*
c) *Clarias*
d) *Labeo*

523. Members of this phylum exhibit adaptations to widely varied environmental conditions. Identify the phylum
a) Porifera b) Coelenterata c) Echinodermata d) Mollusca

524. What is true about *Nereis*, scorpion, cockroach and silver fish?
a) They all have jointed paired appendages
b) They all possess dorsal heart
c) None of them is aquatic
d) They all belong to the same phylum

525. *Salamandra* belongs to sub-class
a) Apoda b) Urodela c) Anura d) None of these

526. Chloragogen cells of earthworms are analogous to vertebrate
a) Lungs b) Liver c) Gut d) Kidneys

527. Which of the following characters is present essentially in chordates?
a) Ventral spinal chord
b) Dorsal heart
c) Pharyngeal gill slits
d) Blood flow in forward direction in ventral blood vessels

528. Which of the following is not absent in Mollusca?
a) Heart b) Pedicellaria c) Ctenidia d) Mantle

529. In Echinodermata, tube feet are related with
a) Locomotion
b) Excretory system
c) Respiratory system
d) Reproductive system

530. The mantle in the phylum-Mollusca is a
a) Calcareous shell
b) Chitinous outer covering
c) Soft spongy layer of skin
d) None of these

531. Select the correct statement.
a) Birds are poikilothermic.
b) Flatworms are coelomic animals.
c) Earthworm is metamerically segmented.
d) Fishes are radially symmetrical.

532. Which stage in the life cycle of *Taenia solium* infects the intermediate host?
a) Hexacanth larva b) Oncosphere c) Cysticercus larva d) Miracidium

533. Choose the false option
a) *Amoeba*-Asymmetrical
b) Coelenterates-Diploblastic, radial symmetry, non-chordates
c) Chordates-*Petromyzon, Ornithorhynchus, Equus*
d) Annelid-Pseudocoelomate

534. Blood of earthworm is
a) Red in colour, due to dissolved haemoglobin in corpuscle
b) Red in colour, due to dissolved haemoglobin in plasma
c) Blue in colour, due to dissolved haemocyanin in plasma
d) Blue in colour, due to dissolved haemocyanin in corpuscles

535. Which bird travels the longest distance each year?
a) Flamingo b) *Bubulcus* c) *Sterna macrura* d) None of these

536. Which of the following sets of derivatives of integumentary structures characterize birds, as glorified reptiles?
a) Scales and claws
b) Syrinx and uropygial gland
c) Claws and uropygial gland
d) Syrinx and scales

537. Which is not correct?
a) Ovaries matured first in earthworm
b) Spermatheca present in 6-9 segments
c) Male genital apertures at 18 segment
d) One pair of ovary in 13 segment

538. Rostellum and hooks are absent in the scolex of
a) *Taenia saginata*
b) *Taenia solium*
c) *Echinococcus granulosus*
d) *Fasciola hepatica*

539. Ink glands are found in
a) Sponge b) Star fish c) *Sepia* d) Jelly fish
540. Which of the following is a monogenetic parasite?
a) *Taenia solium* b) *Ascaris* c) *Fasciola hepatica* d) *Plasmodium vivax*
541. Choose the correct option with reference to *Ascaris*.
a) Hatching of embryos takes place in the stomach due to lytic enzyme
b) Adulthood is reached inside the body of the host in ten days time
c) Development and moulting takes place in the alveoli of lungs
d) Hatching of embryos takes place within ten hours
542. Which type of cells absent in sponges?
a) Trophocytes b) Myocytes c) Archaeocytes d) Cnidocytes
543. Which one of the following statements about all the four of *Spongilla,* leech, dolphin and penguin is correct?
a) Penguin is homeothermic, while the remaining three are poikilothermic
b) Leech is a fresh water form, while all others are marine
c) *Spongilla* has special collar cells called choanocytes, which are not found in the remaining three
d) All are bilaterally symmetrical animals
544. In *Pheretima*, gizzard, buccal cavity, pharynx, oesophagus, pharyngeal nephridia receive the blood from which of the following blood vessel?
a) Supra oesophageal b) Lateral oesophageal c) Dorsal blood d) Subneural
545. Bat belongs to order
a) Chiroptera b) Lagmorpha c) Urodla d) Hymenoptera
546. The Indian salamander is
a) *Siren* b) *Tylototriton* c) *Ambystoma* d) *Necturus*
547. Earthworms are
a) Ureotelic, when plenty of water is available
b) Uricotelic, when plenty of water is available
c) Uricotelic under conditions of water scarcity
d) Ammonotelic when plenty of water is available
548. The notochord is derived from which of the following layers?
a) Ectoderm b) Mesoderm c) Endoderm d) Placoderm
549. Book lungs are respiratory organs in
a) Insects b) Arachnids c) Molluscans d) Echinoderms
550. Which of the following is a harmful social insect?
a) Termite b) *Bombyx mori* c) *Tachardia lacca* d) *Apis indica*
551. Which type of respiratory organs are present in spiders and scorpions?
a) Book lungs b) Gills c) Gill books d) Lungs
552. Spermathecae in *Pheretima* is located in the segments
a) 14 to 18 b) 10 to 13 c) 6 to 10 d) 6 to 9
553. In bony ventebrates, the laying down of none is often preceded by the presence of
a) Chitin b) Starch c) Cartilage d) Platelets
554. The nerve net of *Hydra* lacks
a) Neurons b) Connections
c) Dendrites d) Directions in impulse
555. Spider web is formed by a fluid secreted by its
a) Abdominal gland b) Salivary gland c) Cephalothorax d) None of these
556. Choose the group of parasitic animal
a) *Wuchereria – Pheretima – Nereis*
b) Liverfluke – *Dugesia - Ascaris*
c) *Fasciola – Taenia – Ancylostoma*

d) *Wuchereria – Fasciola – Dugesia*

557. Pneumatic bones are expected to be found in
a) House lizard b) Flying fish c) Pigeon d) Tadpole of frog

558. Maximum life span of dog in year is
a) 5 b) 10 c) 15 d) 20

559. The group of anamniota includes
a) Reptiles and birds
b) Birds and mammals
c) Fishes and amphibians
d) Reptiles and mammals

560. Osteichthyes and Chondrichthyes are similar in which of the following features?
a) Presence of two chambered heart and ctenoid scales
b) Presence of 10 pairs of cranial nerve and absence of neck
c) Presence of opesthonephric kidneys and bony endoskeleton
d) Presence of poison stings and electric organs

561. Medusa is the reproductive organ of
a) *Hydra* b) *Aurelia* c) *Obelia* d) Sea anemone

562. Teeth of rabbit are
a) Thecodont b) Diphyodont c) Heterodont d) All of these

563. Which one of the following pairs of items correctly belongs to the category of organs mentioned against it?
a) Thorns of *Bougainvillea* – Analogous organs and tendrils of *Cucurbita*
b) Nictitating membrane and – Vestigial organs blind spot in human eye
c) Nephridia of earthworm – Excretory organs and Malpighian tubules of cockroach
d) Wings of honey bee and wings of crow – Homologous organs

564. Which one of the following groups of animals is bilaterally symmetrical and triploblastic?
a) Coelenterates (Cnidarians)
b) Aschelminthes (roundworms)
c) Ctenophores
d) Sponges

565. Ovoviviparity is seen in this caecilian
a) *Wuchereria* b) *Typhlonectus* c) *Ichthyophis* d) *Uraeotyphlus*

566. Right lung of rat has four lobes. The left lung has how many lobe/lobes?
a) One b) Two c) Three d) Four

567. The cloaca in frog is a common chamber for the urinary tract, reproductive tract and
a) Alimentary canal
b) Portal system
c) Hepatic portal vessels
d) Notochord

568. Pecten, a comb-like structure is found in the eye of
a) Fishes b) Frogs c) Birds d) Mammals

569. Food of *Hydra* is
a) Aquatic plants
b) Aquatic animals
c) Algae and aquatic animals
d) Some crustaceans

570. Dry skin with scales or scutes without gland is a characteristic of
a) Fishes b) Reptilia c) Amphibia d) Aves

571. Metagenesis in seen in
a) *Hydra* b) *Aurelia* c) *Obelia* d) *Adamsia*

572. Sea mouse belongs to phylum
a) Mollusca b) Cnidaria c) Arthropoda d) Annelida

573. Arms are absent in
a) Sea urchin b) Sea cucumber c) Both (a) and (b) d) None of these

574. Integumentary nephridia are also called
a) Enteronephric
b) Exonephric
c) Sometimes enteronephric and sometimes exonephric
d) Both (a) and (b)

575. Which of the following is wrongly matched?
a) Arthropoda – Cockroach b) Annelida – *Hydra*
c) Echinodermata – Star fish d) Nemathelminthes – *Ascaris*

576. Scorpion belongs to a class to which one of the following also belong?
a) Ticks b) Crabs c) Both (a) and (b) d) Cockroaches

577. Which is common between earthworm, leech and centipede?
a) They have Malpighian tubules b) They are hermaphrodite
c) They have ventral nerve cord d) They have no legs

578. Haemocoel is found in
a) *Hydra* and *Aurelia* b) *Taenia* and *Ascaris*
c) Cockroach and *Pila* d) *Balanoglossus* and *Herdmania*

579. Which one of the following is not a mammalian character?
a) Presence of milk producing gland b) They have two pairs of limbs
c) Skin is unique in possessing hair d) Homodont type of dentition

580. The flightless bird among the following is
a) *Columba* b) *Neophron* c) *Struthio* d) *Corvus*

581. Phylum-Aschelminthes is different from phylum-Platyhelminthes in
a) Symmetry b) Shape of the body
c) Number of germ layers in embryonic stage d) None of the above

582. Which of the following statements is true?
a) All living members of class-Cyclostomata are parasites on some fishes
b) There are about 25,000 species in the class-Osteichthyes
c) *Ciona* belongs to the sub-phylum-Cephalocohordata
d) Arthropods are diploblastic animals

583. In phylum-Porifera opening through which water leaves the spongocoel is called
a) Ostia b) Omadidia c) Osculum d) Choanocytes

584. In which one of the following the genus name, its two characters and its class/phylum are correctly matched?

Genus	Two characters	Class/Phylum
a) *Salamandra*	(i) A tympanum Represents ear (ii) Fertilisation is external	Amphibian
b) *Pteropus*	(i) Skin possesses hair (ii) Oviparous	Mammalia
c) *Aurelia*	(i) Cnidoblast (ii) Organ level of organisation	Coelenterata
d) *Ascaris*	(i) Body segmented (ii) Males and females distinct	Annelida

585. If an earthworm is left in 40% KOH solution for a long time, which part would be left undissolved?
a) Setae b) Spermathecae c) Sand particles d) Circular muscles

586. Select the false statement.
a) In rats, the teeth are heterodont and thecodont
b) In female rats, the urinary and genital apertures are located above anus
c) In female rats, six pairs of nipples are present on the ventral surface of the trunk
d) In rats, 12 pairs of cranial nerves and 33 pairs of spinal nerves are present

587. Which of the following belongs to class-Insecta?
a) *Julus* b) Silver fish c) Lobsters d) Prawn

588. Male and female cockroach are differ due to presence or absence of
a) Anal cerci b) Anal style c) Both 'a' and 'b' d) Anal sitae

589. The internal buds of freshwater sponges are otherwise called.
a) Choanocyte b) Gemmule c) Osculum d) Blastula

590. In honey bee, the drones are

a) Sterile male b) Fertile male c) Fertile female d) Sterile female

591. Excretory organ of spider is
a) Coxal glands b) Flame cells c) Malpighian tubule d) Nephridia

592. In nemathelminthes, the coelom not lined by peritoneum is called
a) Acoelom b) Pseudocoelom c) Enterocoelom d) Haemocoel

593. Which of the following are not members of sub class-Anura?
a) *Hyla, Xenopus* and *Pipa* b) *Rhacophorus* and *Bufo*
c) *Ambystoma* and *lchthyophis* d) *Rana tigerina* and *Alytes*

594. Spermathecae in earthworm is
a) For producing sperm
b) For storage of sperm obtained from male earthworm
c) Both (a) and (b)
d) None of the above

595. Which of the following is not a feature of *Protopterus*?
a) Breathes through lungs b) Walks by fins used as legs
c) Cannabilism d) It gives birth to young ones

596. All mammals without any exception are characterized by
a) Viviparity and biconcave red blood cells
b) Extra-abdominal testes and a four chambered heart
c) Heterodont teeth and 12 pairs of cranial nerves
d) A muscular diaphragm and milk producing glands

597. Which one of the following is a flightless bird?
a) *Passer* b) *Corvus* c) *Aptenodytes* d) *Pavo cristatus*

598. The sclerite, covers the top to the head and the space between the two compound eyes in *Periplaneta*, is
a) Clypeus b) Labrum c) Vertex d) Genae

599. Cross fertilisation is favoured by
a) Neoteny b) Metagenesis c) Protandry d) None of these

600. Complete metamorphosis is found in
a) House-fly and mosquito b) House-fly and cockroach
c) Mosquito and cockroach d) None of the above

601. The herbivorous insect that has piercing and sucking type of mouth parts is
a) *Cimex* b) *Culex* c) *Apis* d) *Tachardia*

602. Ctenophora shows affinities with
a) Cnidaria b) Aschelminthes c) Cephalopoda d) Turbellaria

603. A gradual decrease in the size of the tail during metamorphosis in the life cycle of frog is a good example for
a) Programmed cell death b) Cell necrosis
c) Cell senescence d) Pinocytic activity

604. Ecdysone is secreted from
a) Insect b) Trematoda c) Nematode d) Polychaeta

605. The animal that never performs locomotion is
a) *Ascaris* b) *Leucosolenia* c) Both (a) and (b) d) *Hydra*

606. Salamander can regenerate
a) Tail b) Limbs c) External gills d) All of these

607. Which is a condition that in connected in the both external and internal structures and it is first found in which phylum of the animal kingdom
a) Mutagenesis-Platyhelminthes b) Metagenesis-Coelenterata
c) Appendages-Arthropoda d) Metamerism-Annelida

608. In the pectoral girdle of frog, there is a cup like cavity on each side called
a) Acetabulum b) Sigmoid arc c) Glenoid cavity d) Thoracic cavity

609. In mammals, the secondary palate is formed by the union of
a) Premaxilla, pterygoid and squamosal bones
b) Maxilla, quadrate and palatine bones
c) Premaxilla, maxilla and palatine bones
d) Premaxilla, quadrate and squamosal bones

610. Salivary gland in earthworm is found in
a) Dorsal wall of buccal cavity
b) Ventral wall of buccal cavity
c) Pharyngeal wall
d) None of the above

611. Which of the following is absent in the mouth part of housefly?
a) Labrum b) Epipharynx c) Mandibles d) Maxillary palps

612. Roundworms are different from Platyhelminthes in the following features
a) Roundworms are triploblastic
b) Roundworms have a complete digestive system
c) Roundworms have flame cells
d) All of the above

613. Changes that allow the conversion of larva into adult, is called
a) Metagenesis b) Alternation c) Metamorphosis d) Metastasis

614. In earthworm, the dorsal wall of the intestine from the 26th segment to 95th segment forms a median internal fold called
a) Trochophore b) Typhlosole c) Clitellum d) Trachea

615. Eggs of cockroach are
a) Alecithal b) Microlecithal c) Telolecithal d) Cintrolecithal

616. 3-segmented club shaped maxillary palp is present in
a) Male *Culex* b) Male *Anopheles* c) Female *Culex* d) Female *Anopheles*

617. The radial symmetry is observed in
I.Platyhelminthes
II.Coelenterates
III.Aschelminthes
IV.Annelids
V.Echinoderms
a) II, III and V b) I, II, III and V c) II, III and I d) II and V

618. Which of the following does not belong to the class-Hexactinellida?
a) *Hyalonema* b) *Cliona* c) *Euplectella* d) None of these

619. All flatworms differ from all roundworms in having
a) Triploblastic body
b) Solid mesoderm
c) Bilateral symmetry
d) Metamorphosis in the life history

620. Which brain structure in rabbit is directly related to vision?
a) Corpus albicans
b) Hippocampal lobe
c) Corpus callosum
d) Corpora quadrigemina

621. Which of the following statements are true?
a) Phylum-Porifera-Presence of choanocytes and nematocysts
b) Phylum-Coelentrata-*Meandrina* belongs to this phylum
c) Phylum-Ctenophora-All exhibit bilateral symmetry
d) Phylum-Platyhelminthes-*Wuchereria* belongs to this phylum

622. Class-crustacea differs from Insecta in having
a) Two pairs of antennae
b) Jointed foot
c) Chitinous cuticle
d) None of these

623. Pearls are produced by the animals of phylum
a) Annelida b) Arthropoda c) Mollusca d) Echinodermata

624. Third cleavage of frog's development is
a) Vertical b) Equatorial c) Latitudinal d) None of these

625. Which of the following animals is sanguivorous?

a) *Nereis* b) Tapeworm c) Earthworm d) *Hirudinaria*

626. Spiders belong to class
a) Insect b) Chilopoda c) Diplopoda d) Archinda

627. Temperature changes in the environment affect most of the animals which are
a) Homeothermic b) Aquatic c) Poikilothermic d) Desert living

628. Part of the right lung of rat which is not distinguishable due to passage of post caval through it is
a) Anterior b) Middle c) Posterior d) Post caval

629. In Mollusca, the osphradium has function of
a) Reproduction b) Respiration
c) Testing physical and chemical qualities of food d) Excretion

630. Which is not correct for birds?
a) Exothermic b) Pneumatic bones c) Lung with air sacs d) Amniotes

631. From *Ascaris* egg, first larva hatches out in the
a) Intestine of host b) Stomach of host
c) Outside the body d) Uterus of female *Ascaris*

632. Choose the correct option for *Wuchereria*?
I. Triploblastic with the presence of an excretory pore
II. Presence of a muscular pharynx
III. Males longer than females
IV. Cellular level of organisation
a) II and III are True b) I and IV are True c) I and II are True d) III and IV are True

633. Engulfing of food either in solid or liquid is called
a) Sporozoic nutrition b) Holozoic nutrition
c) Parasitic nutrition d) Saprophytic nutrition

634. When the circulatory system lacks arteries, veins and capillaries, it is called as
a) Closed type b) Mixed type
c) In appropriate information d) Open type

635. Which one of the following exhibits concentric 'tube within tube' plan?
a) Cbidaria b) Annelida c) Platyhelminthes d) Nematode

636. The part of spermatheca of earthworm that acts as store house of spermatozoa is
a) Ampulla b) Diverticulum c) Both (a) and (b) d) None of these

637. Absence of circulatory system in *Hydra* is compensated by
a) Pseudocoelomic fluid b) Gastrovascular cavity
c) Presence of tentacles d) None of these

638. Which one of the following is a matching pair of an animal and a certain phenomenon it exhibits?
a) *Chamaelon* – Mimicry b) *Taenia* – Polymorphism
c) *Pheretima* – Sexual dimorphism d) *Musca* – Complete metamorphosis

639. *Periplaneta Americana* has themoreceptor sensillae on
a) 1st, 2nd and 3rd segments of tarsus of legs b) 3rd, 4th and 5th segments of tarsus of legs
c) Pedicel of antenna d) 15th segment of anal cerci

640. Mark the false statement for the phylum-Annelida
a) They are bilaterally symmetrical coelomate animals
b) They have both monoecious and dioecious animal representatives
c) Excretory system consists of flame cells
d) They do not have asexual reproduction

641. In tissue level of organisation the
a) Cells are arranged as loose cell aggregate
b) Tissues are grouped to form organs
c) Cells performing the same function are arranged into groups
d) Tissues are grouped to form systems

642. Phylum-Ctenophora is divided into following classes
a) Tentaculata and Micropharyngea b) Nuda and Macropharyngea
c) Tentaculata and Nuda d) Nuda and Hormiphora

643. Medusa is the reproductive structure of
a) *Hydra* b) *Obelia* c) Sea anemone d) None of these

644. The limbless amphibian is
a) *Ichthyophis* b) *Hyla* c) *Rana* d) *Salamandra*

645. A single opening of the digestive system is found in
a) Protista b) Ctenophore c) Porifera d) Platyhelminthes

646. Aquatic reptiles are
a) Ammonotelic b) Ureotelic c) Ureotelic in water d) Ureotelic over land

647. In earthworm, gizzard is found, in which of the following segments?
a) 9th segment b) 18th segment c) 13th segment d) 16th segment

648. Phallomerase in male *Periplaneta* arise from
a) 8th and 9th sternum b) 7th sternum c) 8th sternum d) 9th sternum

649. Animal undergoes inactive stage during winter known as
a) Aestivation b) Hibernation c) Adaptation d) Acclimatization

650. Conglobate gland is found in
a) Female cockroach b) Male cockroach c) *Anopheles* mosquito d) *Culex* mosquito

651. Pearl is produced in the bivalve belonging to the genus
a) *Ostraea* b) *Pinctada* c) *Pecten* d) *Lamellidens*

652. Select the correct set of animals of class-Mammalia.
a) Lion, hippopotamus, penguin, bat b) Lion, bat, whale ostrich
c) Hippopotamus, penguin, whale, kangaroo d) Whale, bat, kangaroo, hippopotamus

653. Which is the first class among the tetrapods to shows completely 4-chambered heart?
a) Amphibia b) Reptilian c) Aves d) Mammalia

654. Choose the kind of erythrocyte found in Reptiles
a) Circular – biconvex – nucleated b) Oval – biconcave – denucleated
c) Circular – biconcave – denucleated d) Oval – biconvex – nucleated

655. Gonads of *Obelia* occur
a) On blastocyst b) In hydrula stage
c) In radial canals of medusa d) At bases of tentacles of medusa

656. Cerebral hemispheres of rat are connected by
a) Corpus luteum b) Corpus callosum c) Corpus albicans d) Corpus spongiosum

657. Sub classes for class-Mammalia are
a) Eutheria and Metatheria b) Ornithorhynchus and Pleurorhynchus
c) Hemiechinus and Macropus d) Theria and Prototheria

658. Dermatobiasis in cattle is caused by
a) Maggots of bot fly b) Wriggler of mosquito
c) Nits of lead louse d) Drones of honeybee

659. In frog's heart which of the following is considered as pace-maker?
a) Pylangium b) Synangium c) Sinus venosus d) Truncus arteriosus

660. Proboscis gland in *Balanoglossus* is associated with
a) Digestion b) Respiration c) Circulation d) Excretion

661. Which of the following is common in Annelida and Arthropoda?
a) Basal nerve cord b) Dorsal nerve cord c) Ventral nerve cord d) Anterior nerve cord

662. The poisonous fluid present in nematocyst of *Hydra* is
a) Venom b) Haematin c) Toxin d) Hypnotoxin

663. Asexual reproduction in sponges takes place by
a) Binary fission b) Budding c) Fragmentation d) Encystment

664. Which animal shows coprophagy?
a) Giraffe b) Elephant c) Rabbit d) Snake

665. Which one of the following statements about certain given animals is correct?
a) Roundworms (Aschelminthes) are pseudocoelomates
b) Molluscs are acoelomates
c) Insects are pseudocoelomates
d) Flatworms (Platyhelminthes) are coelomates

666. The location of lymph glands in *Pheretima* is
a) 4th, 5th and 6th segments b) 10th to 20th segments
c) 26th to the last segments d) 13th segments

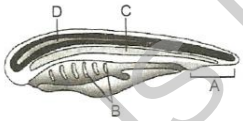
667. The young one of cockroach is called
a) Caterpillar b) Nymph c) Fingerling d) Maggot

668. Which of following has discoidal placenta?
a) Rabbit b) Deer c) Sheep d) Pig

669. Body cavity of *Hydra* is called
a) Haemocoel b) Coelenteron c) Enterocoel d) Pseudocoel

670. Which one of the following features is common in silverfish, scorpion, dragon fly and prawn?
a) Three pairs of legs and segmented body
b) Chitinous cuticle and two pairs of antennae
c) Jointed appendages and chitinous exoskeleton
d) Cephalothorax and tracheae

671. Match the items labelled A, B, C and D in the given diagram with the given characters and choose the correct answer



I. Nerve cord
II. Post-anal part
III. Notochord
IV. Gill Slits

A B C D
a) II IV III I b) I III II IV c) III I IV III d) IV II III I

672. Which of the following is present in the integument of frog but not in mammals?
a) Dermis b) Mucous gland
c) Sweat glands d) Stratum germinativum

673. The canal system is characteristic feature of
a) Helminthes b) Coelenterates c) Sponges d) Echinoderms

674. Which one of the following parasites shows alternation of generation and alternation of host in its life cycle?
a) *Fasciola* b) *Ascaris* c) *Wuchereria* d) Taenia

675. Pancreas is absent in which group of vertebrates?
a) Reptiles b) Cyclostomates c) Birds d) Mammals

676. The nematocysts inject ..... in its prey
a) Coelenteron b) Neurotoxin c) Hypnotoxin d) Hypotoxin

677. Tubular heart of cockroach has how many chambers?
a) 10 b) 13 c) 12 d) 11

678. Non-chordates show
a) Notochord b) Dorsal tubular nerve chord
c) Pharyngeal gill cleft d) Absence of hepatic portal system

679. In earthworms, setae are present in all segments, expect the

a) First and the last segments b) First and the clitellum
c) First segments d) First, clitellum and last segments

680. Canal system in Porifera is not concerned with
a) Respiration b) Nutrition c) Sexual reproduction d) None of the above

681. Preen glands occur on
a) Reptilia b) Aves c) Pisces d) Mammalia

682. Fossil representatives of phylum-Arthropods are called
a) Triplolites b) Tagmalites c) Trilobites d) Archaeopods

683. Study the following features of a fish.
XI. It is a crossopterygian fish.
XII. It is found in the river Chalumnae.
XIII. It does not exhibit aestivation.
XIV. It is an urecotelic animal.
XV. Which of the above are true to '*Neoceratodus'*
a) I and II b) II and IV c) I and III d) I and IV

684. Which of the these statements are wrong?
I.Parapodia are lateral appendages in arthropods used for swimming.
II.Radula in molluscs are structures involved in excretion.
III.Aschelminthes are dioecious.
IV.Echinoderm adults show radial symmetry.
V.Ctenophorans are diploblastic.
a) I and II b) I and III c) I, IV and V d) III and V

685. The Mediterranean type of popular fowls are called
a) White leghorn b) New Hampshire c) Plymouth rock d) Rhode island red

686. In which of the following animals, post anal tail is found?
a) Earthworm b) Lower invertebrate c) Scorpion d) Snake

687. In earthworm, neurons are
a) Motor b) Associated c) Sensory d) All of these

688. Pseudocoelomate animals belong to the phylum
a) Platyhelminthes b) Arthropoda c) Mollusca d) None of these

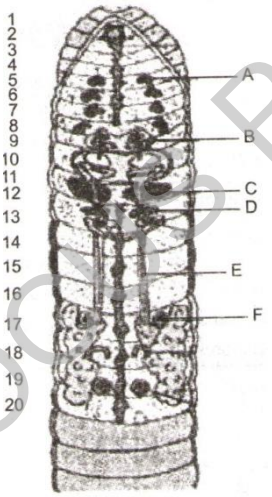
689. Cells that are peculiar to the phylum-Porifera
a) Chimeras b) Chondrocytes c) Dendrocytes d) Choanocytes

690. The number of heart chambers found in cockroach is
a) 4 b) 7 c) 5 d) 13

691. Study the following sentences.
I.It is a terrestrial arthropod.
II.The prosoma bears a pair of chelicerae, a pair of the pedipalps and four pairs of walking legs.
III.The metasoma ends in a telson.
IV.First pair of walking legs are modified as poisonous claws.
Which of the above are true for *Heterometrus*?
a) I and III b) I and II c) I and IV d) III and IV

692. What is common among *Planaria* and *Hydra*?
a) Both belong to phylum-Coelenterata b) Both are diploblastic
c) Both have regenerative capacity d) Both have a water vascular system

693. Choose the correct combination of labeling from the options given.



a) **A-**Testis, **B-**Spermatheca, **C-**Seminal vesicle, **D-**Ovary, **E-**vas deferens, **F-**Accessory gland
b) **A-**Spermatheca, **B-** Testis, **C-** Ovary, **D-** Seminal vesicle, **E-** vas deferens, **F-** Accessory gland
c) **A-** Spermatheca, **B-** Testis, **C-** Seminal vesicle, **D-** Ovary, **E-** vas deferens, **F-** Accessory gland
d) **A-** Spermatheca, **B-** Testis, **C-** Accessory gland, **D-** Ovary, **E-** vas deferens, **F-** Seminal vesicle,

694. Changes that allow the conversion of larva into adult, are called
a) Metagenesis b) Alternation c) Metamorphosis d) Metastasis

695. In cockroach, vision is due to
a) One compound eye b) Two compound eyes
c) Two simple eyes d) Two compound and two simple eyes

696. Which of the following features is not found in Aves
a) Preen glands on tail b) Crop and a gizzard c) Air cavities in bones d) Teeth inside the beak

697. The cockroach of genus-*Blatta* is also called
a) German cockroach b) Australian cockroach
c) Oriental cockroach d) American cockroach

698. Which animal of the following belongs to class-Crustacea?
a) Cockroach b) Cyclops c) Grasshopper d) Mosquito

699. In which segment, the clitellum is present in earthworm?
a) 16 segments b) 17-19 segments c) 14-16 segments d) 5-6 segments

700. Tissue level of organisation is seen in
a) Platyhelminthes b) Chordata c) Arthropoda d) None of these

701. Which of the following animals sows discontinuous distribution?
a) Green muscle b) Bats c) Lung fish d) Pacific salmon

702. Excretion in phylum-Porifera is
a) Ureotelic b) Uricotelic c) Ammoniotelic d) Aminotelic

703. Body of earthworm is divided into how many similar segments, which are called metameres or somites?
a) 60 to 120 b) 100 to 120 c) 80 to 120 d) 120 or more

704. Arthropods are characterized by
a) Jointed appendages b) Open blood vascular system
c) Triploblastic d) All of the above

705. Which of the following respires through gills?
a) Whale b) Turtle c) Frog d) Prawn

706. Annelids have a central nerve cord that is
a) Impermeable to K^+ b) Hollow c) Dorsal d) Ventral

707. Animals that do not belong to class-Crustacea include
a) Lobster and daphnia b) Millipede and Centipede
c) Crab and shrimp d) None of the above

708. Urochordate animals have

a) Notochord that extends from head to tail region
b) Notochord is present throughout larval stages and adult life
c) Notochord present only in adult stages
d) Notochord present only in larval stage

709. Thigmotaxis is not shown by
a) *Paramecium* b) *Amoeba* c) *Ascaris* d) *Hydra*

710. In a copulating pair of earthworm, which two processes take place?
a) External fertilization and cross fertilization
b) Cross fertilization and reciprocal fertilization
c) Internal fertilization and cross fertilization
d) Reciprocal fertilization and internal fertilization

711. The second largest number of species containing phylum in the animal kingdom is
a) Annelida b) Arthropoda c) Mollusca d) Chordata

712. Which of the following statements is false?
a) Male round worm is smaller than female
b) Earthworms are hermaphrodites
c) Echinoderms are protostomous coelomates
d) Human teeth are anatomically comparable to scales of shark

713. Limbless amphibians are called
a) Paddle worms b) Glow worms c) Caecilian worms d) Pin worms

714. Salient feature of Arthropoda is
a) Aquatic and free living
b) Chitinous exoskeleton and jointed appendages
c) Both (a) and (b)
d) None of the above

715. Which of the following are absent in snakes?
a) Pectoral girdle b) Urinary bladder c) Sternum d) All of these

716. Which of the following is not a Porifera
a) *Sycon* b) *Spirulina* c) *Euspongia* d) *Spongilla*

717. Tube-feet are the locomotory organs of
a) Platyhelminthes b) Echinodermata c) Mollusca d) Arthropoda

718. Which one of the following characters is not typical of the class-Mammalia?
a) Seven cervical vertebrae
b) Thecodont dentition
c) Ten pairs of cranial nerves
d) Alveolar lungs

719. In cockroach, which of the following is the principal motor centre?
a) Supraoesophageal ganglia
b) Suboesophageal ganglia
c) Metathoracic ganglia
d) Abdominal ganglia

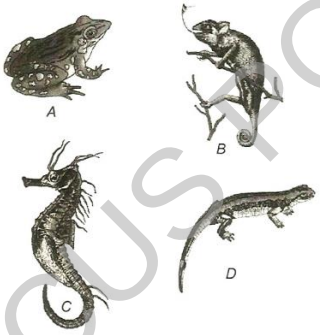
720. Excretory organs in *Taenia* are
a) Flame cells b) Nephridia c) Nephrons d) Kidneys

721. How many eggs are found in egg chamber of female cockroach?
a) 2 b) 4 c) 8 d) 16

722. A dorsal horn is present on the……. of mulberry silk worm (caterpillar).
a) 8th abdominal segment
b) 6th abdominal segment
c) 5th abdominal segment
d) 2nd thoracic segment

723. In *Hydra*, reproduction occurs in favourable conditions by
a) Budding b) Gametes c) Gemmules d) Binary fission

724. Which of the following are amphibians?



a) *A* and *C* b) *B* and *D* c) *C* and *D* d) *A* and *D*

725. Which of the following is an exclusive character of class-Mammalia?
a) Homoiothermy b) Internal fertilization
c) Presence of a 4-chambered heart d) Presence of a muscular diaphragm

726. Skeletal system in echinoderms is
a) Formed by the distension of the water vascular system
b) Calcareous exoskeleton
c) Siliceous endoskeleton
d) None of the above

727. Which one of the following animals possesses high regeneration capacity?
a) *Planaria* b) *Taenia* c) *Salpa* d) *Periplaneta*

728. Veliger larva occurs in phylum
a) Mollusca b) Echinodermata c) Arthropoda d) Cnidaria

729. Tadpole's tail is a/an
a) Excretory organ b) Attachment organ c) Respiratory organ d) Locomotory organ

730. The largest phylum in respect of number of species is
a) Coelenterata b) Arthropoda c) Protozoa d) Porifera

731. Read the following paragraph.
An insect whose mouthparts are biting and chewing type in the larval condition, while they are siphoning type in the adult and this insect gives an economically important substance during yet another stage of its development.
The insect is
a) *Anopheles* b) *Laccifer* c) *Bombyx* d) *Apis*

732. Which of the following statements are true/false?
I. Mollusca possess cellular level of organisation
II. Arthropoda are true coelomates
III. Platyhelminths are pseudocoelomates
IV. Ctenophora have bilateral symmetry
Choose the correct option
a) I and II are True b) Only II are True c) I and IV are True d) II, III and IV are True

733. Which of the following is not a defence evolved by a prey to avoid predators?
a) Ejection of noxious chemicals b) Possession of toxic hairs
c) Mimicry of inedible objects d) Secretion of pheromones

734. The correct sequence of arrangements of segments in the leg of cockroach is
a) Tibia, trochanter, femur, tarsus and coxa b) Trochanter, coxa, tibia, femur and tarsus
c) Coxa, femur, trochanter, tibia and tarsus d) Coxa, trochanter, femur, tibia and tarsus

735. The function of iris in the eyes of frog is to
a) Alter the size of pupil b) Move nictitating membrane
c) Refract light rays d) Move the lens forward and backward

736. Which of the following pairs is correct?
a) Annelida – Polychaeta – leech b) Arthropoda – Crustacea – cockroach

c) Mollusca – Cephalopoda – *Octopus* d) Protozoa – *Hydra*

737. Which one of the following groups of animals is correctly matched with its one characteristic feature without even a single exception?
a) Chordata – possess a mouth provided with an upper and a lower jaw
b) Chondrichthyes – possess cartilaginous endoskeleton
c) Mammalia – give birth to young ones
d) Reptilia – possess 3-chambered heart with one incompletely divided ventricle

738. Chitin as exoskeleton is found in
a) *Periplaneta* b) *Ascaris* c) *Pheretima* d) *Hydra*

739. In *Pheretima*, the glands that help in binding the worms during copulation are
a) Prostate glands b) Albumin glands c) Accessory glands d) Mucous glands

740. Which one of the following animals lay eggs yet the female secretes milk?
a) Bat b) Kangaroo c) *Platypus* d) Ostrich

741. *Taenia solium* derives its energy from the breakdown of
a) Nucleic acids b) Amino acids c) Glycogen d) Glycerol

742. Which statement is incorrect for animals belonging to class of Chondrichthyes?
a) Presence of placoid scales b) Absence of air bladder
c) Presence of cartilaginous endoskeleton d) Notochord is persistent only at larval stage, after that it disappears

743. Pouched mammals are
a) Prototherians b) Metatherians c) Eutherians d) Therians

744. *Ascaris* is
a) A parasite b) An autotroph
c) Facultative autotroph d) Facultative heterotrophy

745. Which one of the following match is incorrect?

	Column I	Column I
a)	Garden lizard	*Hemidactylus flavirisidis*
b)	Mountain lizard	*Varanus*
c)	Worm lizard	*Rhineura*
d)	Collared lizard	*Iguana*

746. The colour of the body in earthworm is brown due to
a) Porphyrin b) Haemoglobin c) Blood d) Haemocyanin

747. Class-Crustacea have the following features
a) Tracheae and Malpighian tubules b) Tracheae and green glands
c) Book gills and coxal glands d) Gills and antennal glands

748. Budding is found in
a) *Sycon* b) *Hydra* c) *Fasciola* d) *Obelia*

749. Which one of the following is not used in organic farming?
a) *Glomus* b) Earthworm c) *Oscillatoria* d) Snail

750. Highest degree of polymorphism is found in
a) Protozoa b) Cnidaria c) Platyhelminthes d) Arthropoda

751. Botryoidal tissue is found in
a) Hirudinea b) Polychaeta c) Oligochaeta d) All of these

752. The sea snakes have
a) Cylindrical tail b) Dry horny scale at tail end
c) Laterally compressed tail d) Dorso-ventrally flattened tail

753. Which one of the following correctly describes the location of some body parts in the earthworm *Pheretima*?
a) Two pairs of accessory glands in 16-18 segments
b) Four pairs of spermathecae in 4-7 segments
c) One pair of ovaries attached at intersegmental septum of 14th and 15th segments
d) Two pairs of testes in 10th and 11th segments

754. *Tachyglossus* is a connecting link between
a) Reptiles and birds
b) Amphibians and reptiles
c) Birds and mammals
d) Reptiles and mammals

755. Radial symmetry is seen in
a) *Hydra* b) *Schistosoma* c) *Taenia* d) *Fasciola*

756. Which of the following phylum or class exhibit the presence of a notochord?
a) Arthropods
b) Echinodermata
c) Chondrichthyes
d) Porifera

757. Which of the following is correctly matched?
a) *Wallago attu* – Cat fish
b) *Tengra* – Carp
c) *Catla catla* – Cat fish
d) Payas – Carp

758. In contrast to annelids, the Platyhelminthes show
a) Radial symmetry
b) Presence of pseudocoel
c) Bilateral symmetry
d) Absence of body cavity

759. In *Pheretima*, the anterior loops carry blood from
a) Commissural blood vessels
b) Ventral blood vessels
c) Supraoesophageal
d) Lateral oesophageal

760. The enteronephric nephridia in *Pheretima* consists which of the following parts given below?
XVI. A nephrostome
XVII. Terminal nephridial duct
XVIII. Septal excretory canal
XIX. Supra intestinal excretory canal
XX. Long thick walled excretory canal
a) II, V b) I, III, IV, V c) III, IV, V d) I, III, IV

761. Blastula of frog has
a) Blastopore b) Blastocoel c) Archenteron d) Gastropore

762. Which of the following is not found in *Hydra*?
a) Epithelio-muscular cells
b) Cnidocyte
c) Choanocyte
d) Nerve cells

763. An egg laying mammal is
a) *Delphinus* b) *Macaca* c) *Ornithorhynchus* d) *Macropus*

764. Which of the following have the highest number of species in nature?
a) Insects b) Birds c) Angiosperms d) Fungi

765. Which of the following is correct for the circulatory system of cockroach?
a) It is present on the dorsal side and it has thirteen units of heart in abdominal region
b) It is present on the ventral side and it has ten abdominal and three thoracic units of heart
c) It is present on the ventral side and it has thirteen units of heart in abdominal region
d) It is present on the dorsal side and it has ten abdominal and three thoracic units of heart

766. Which one is absent in frog?
a) Phrenic nerve b) Renal portal vein c) Both (a) and (b) d) None of these

767. 'Portuguese man of war' is
a) *Obelia* b) *Physalia* c) *Aurelia* d) *Branchiostoma*

NEET BIOLOGY

ANIMAL KINGDOM

: ANSWER KEY :

1)	d	2)	a	3)	d	4)	a	165)	a	166)	b	167)	d	168)	b
5)	d	6)	c	7)	a	8)	d	169)	d	170)	a	171)	b	172)	a
9)	b	10)	b	11)	a	12)	a	173)	d	174)	b	175)	c	176)	a
13)	c	14)	d	15)	d	16)	d	177)	a	178)	b	179)	d	180)	b
17)	a	18)	c	19)	c	20)	c	181)	c	182)	b	183)	b	184)	d
21)	a	22)	c	23)	b	24)	c	185)	a	186)	a	187)	c	188)	d
25)	c	26)	d	27)	c	28)	a	189)	c	190)	a	191)	c	192)	b
29)	b	30)	c	31)	c	32)	b	193)	d	194)	d	195)	d	196)	b
33)	b	34)	d	35)	b	36)	b	197)	a	198)	d	199)	d	200)	c
37)	d	38)	b	39)	d	40)	b	201)	a	202)	a	203)	c	204)	d
41)	d	42)	b	43)	a	44)	d	205)	a	206)	b	207)	a	208)	b
45)	a	46)	c	47)	b	48)	a	209)	c	210)	c	211)	c	212)	b
49)	a	50)	b	51)	c	52)	d	213)	b	214)	b	215)	d	216)	b
53)	c	54)	d	55)	b	56)	d	217)	b	218)	a	219)	c	220)	c
57)	a	58)	b	59)	d	60)	d	221)	a	222)	a	223)	b	224)	d
61)	d	62)	c	63)	c	64)	c	225)	b	226)	c	227)	d	228)	c
65)	b	66)	c	67)	c	68)	d	229)	b	230)	d	231)	b	232)	c
69)	a	70)	c	71)	a	72)	b	233)	d	234)	c	235)	c	236)	c
73)	a	74)	a	75)	a	76)	d	237)	c	238)	a	239)	d	240)	a
77)	a	78)	d	79)	d	80)	b	241)	c	242)	b	243)	c	244)	a
81)	c	82)	c	83)	c	84)	d	245)	b	246)	b	247)	d	248)	b
85)	b	86)	a	87)	a	88)	c	249)	a	250)	a	251)	b	252)	b
89)	d	90)	b	91)	a	92)	a	253)	d	254)	a	255)	b	256)	c
93)	d	94)	a	95)	d	96)	b	257)	a	258)	b	259)	c	260)	c
97)	c	98)	a	99)	a	100)	b	261)	b	262)	c	263)	b	264)	d
101)	c	102)	c	103)	c	104)	b	265)	c	266)	b	267)	c	268)	a
105)	b	106)	d	107)	b	108)	b	269)	a	270)	d	271)	a	272)	d
109)	b	110)	a	111)	a	112)	b	273)	d	274)	d	275)	b	276)	c
113)	a	114)	d	115)	d	116)	a	277)	d	278)	b	279)	b	280)	d
117)	d	118)	b	119)	c	120)	a	281)	c	282)	b	283)	d	284)	b
121)	c	122)	c	123)	b	124)	b	285)	c	286)	d	287)	b	288)	b
125)	a	126)	b	127)	a	128)	d	289)	d	290)	b	291)	b	292)	b
129)	d	130)	a	131)	b	132)	d	293)	d	294)	a	295)	b	296)	c
133)	c	134)	c	135)	b	136)	c	297)	a	298)	d	299)	b	300)	d
137)	c	138)	a	139)	c	140)	a	301)	c	302)	d	303)	a	304)	a
141)	b	142)	c	143)	d	144)	a	305)	a	306)	b	307)	c	308)	b
145)	b	146)	a	147)	c	148)	c	309)	b	310)	b	311)	a	312)	a
149)	b	150)	c	151)	c	152)	d	313)	c	314)	c	315)	b	316)	d
153)	b	154)	c	155)	c	156)	b	317)	d	318)	d	319)	c	320)	b
157)	d	158)	b	159)	a	160)	d	321)	d	322)	b	323)	a	324)	b
161)	d	162)	b	163)	a	164)	a	325)	d	326)	c	327)	a	328)	a

329)	b	330)	c	331)	d	332)	d	529)	a	530)	c	531)	c	532)	b
333)	c	334)	b	335)	d	336)	d	533)	d	534)	b	535)	c	536)	a
337)	c	338)	c	339)	a	340)	c	537)	a	538)	a	539)	c	540)	b
341)	b	342)	d	343)	c	344)	d	541)	c	542)	d	543)	c	544)	c
345)	a	346)	a	347)	a	348)	d	545)	a	546)	b	547)	d	548)	b
349)	b	350)	b	351)	a	352)	c	549)	b	550)	a	551)	a	552)	d
353)	c	354)	c	355)	c	356)	a	553)	c	554)	d	555)	a	556)	c
357)	d	358)	d	359)	d	360)	d	557)	c	558)	d	559)	c	560)	b
361)	a	362)	c	363)	b	364)	b	561)	b	562)	d	563)	c	564)	b
365)	a	366)	d	367)	b	368)	d	565)	b	566)	a	567)	a	568)	c
369)	a	370)	a	371)	d	372)	c	569)	d	570)	b	571)	c	572)	d
373)	a	374)	b	375)	a	376)	a	573)	c	574)	b	575)	b	576)	a
377)	b	378)	b	379)	c	380)	c	577)	c	578)	c	579)	d	580)	c
381)	b	382)	d	383)	b	384)	b	581)	b	582)	b	583)	c	584)	a
385)	b	386)	c	387)	d	388)	d	585)	a	586)	b	587)	b	588)	b
389)	d	390)	c	391)	c	392)	c	589)	b	590)	b	591)	a	592)	b
393)	a	394)	c	395)	c	396)	a	593)	c	594)	b	595)	d	596)	c
397)	b	398)	b	399)	b	400)	c	597)	c	598)	c	599)	c	600)	a
401)	b	402)	d	403)	c	404)	d	601)	d	602)	a	603)	a	604)	a
405)	d	406)	c	407)	c	408)	c	605)	a	606)	c	607)	d	608)	c
409)	a	410)	d	411)	c	412)	d	609)	c	610)	c	611)	c	612)	b
413)	d	414)	a	415)	a	416)	d	613)	c	614)	b	615)	d	616)	b
417)	a	418)	a	419)	a	420)	c	617)	d	618)	b	619)	b	620)	d
421)	c	422)	a	423)	d	424)	c	621)	b	622)	a	623)	c	624)	c
425)	d	426)	a	427)	b	428)	c	625)	d	626)	d	627)	c	628)	d
429)	a	430)	c	431)	d	432)	b	629)	c	630)	a	631)	a	632)	c
433)	b	434)	c	435)	c	436)	b	633)	b	634)	d	635)	b	636)	b
437)	b	438)	c	439)	b	440)	d	637)	b	638)	d	639)	a	640)	c
441)	b	442)	d	443)	c	444)	d	641)	c	642)	c	643)	b	644)	a
445)	a	446)	c	447)	c	448)	a	645)	d	646)	a	647)	a	648)	d
449)	c	450)	d	451)	a	452)	d	649)	b	650)	b	651)	b	652)	d
453)	a	454)	b	455)	b	456)	b	653)	c	654)	d	655)	c	656)	b
457)	c	458)	d	459)	a	460)	b	657)	d	658)	a	659)	c	660)	d
461)	c	462)	b	463)	c	464)	a	661)	c	662)	d	663)	c	664)	c
465)	c	466)	a	467)	b	468)	d	665)	a	666)	c	667)	b	668)	a
469)	b	470)	b	471)	c	472)	d	669)	b	670)	c	671)	a	672)	b
473)	a	474)	a	475)	d	476)	d	673)	c	674)	a	675)	b	676)	c
477)	c	478)	a	479)	b	480)	c	677)	b	678)	d	679)	d	680)	d
481)	d	482)	a	483)	d	484)	d	681)	b	682)	c	683)	c	684)	a
485)	a	486)	b	487)	b	488)	c	685)	a	686)	c	687)	d	688)	d
489)	b	490)	b	491)	a	492)	d	689)	d	690)	d	691)	b	692)	c
493)	b	494)	a	495)	a	496)	b	693)	c	694)	c	695)	b	696)	d
497)	b	498)	b	499)	c	500)	b	697)	c	698)	b	699)	c	700)	d
501)	d	502)	c	503)	c	504)	c	701)	c	702)	c	703)	b	704)	d
505)	d	506)	a	507)	d	508)	b	705)	d	706)	d	707)	b	708)	d
509)	b	510)	b	511)	a	512)	c	709)	c	710)	a	711)	c	712)	c
513)	c	514)	c	515)	c	516)	a	713)	c	714)	b	715)	d	716)	b
517)	b	518)	c	519)	b	520)	c	717)	b	718)	c	719)	b	720)	a
521)	a	522)	b	523)	d	524)	c	721)	d	722)	a	723)	a	724)	d
525)	b	526)	b	527)	c	528)	b	725)	d	726)	d	727)	a	728)	a

729)	**d**	**730)**	**b**	**731)**	**c**	**732)**	**b**	**749)**	**d**	**750)**	**b**	**751)**	**a**	**752)**	**c**
733)	**d**	**734)**	**d**	**735)**	**a**	**736)**	**c**	**753)**	**d**	**754)**	**d**	**755)**	**a**	**756)**	**c**
737)	**b**	**738)**	**a**	**739)**	**c**	**740)**	**c**	**757)**	**a**	**758)**	**d**	**759)**	**d**	**760)**	**a**
741)	**c**	**742)**	**d**	**743)**	**b**	**744)**	**a**	**761)**	**b**	**762)**	**c**	**763)**	**c**	**764)**	**a**
745)	**a**	**746)**	**a**	**747)**	**d**	**748)**	**b**	**765)**	**d**	**766)**	**a**	**767)**	**b**		

NEET BIOLOGY

ANIMAL KINGDOM

: HINTS AND SOLUTIONS :

1 **(d)**
Annelids have true coelom, metameric segmentation and closed circulation.

2 **(a)**
A transverse section of *Pheretima* taken through the 10th segment shows the following structures - stomach, dorsal blood vessel, ventral blood vessel supraoesophageal vessel, anterior loops, ring vessel and micronephridia.

3 **(d)**
Sycon belongs to phylum-Porifera. The porifers are most primitive group of multicellular animals. They have no tissue grade of organization and represent cell aggregated body plan, hence, included in the sub-kingdom-Parazoa.

4 **(a)**
Salamandra (salamander) is a member of class-Amphibia. A tympanum represents the ear.

5 **(d)**
In frog's heart, a number of muscular ridges called columnae carne projected from the wall of ventricle into its cavity, dividing the peripheral part of the cavity into a number of pockets. It prevent suction that would occur with a flat surfaced membrane and thus impairs the heart's ability to pump efficiently.

6 **(c)**
Annelids do not possess pseudocoelom but true coelom.

7 **(a)**
Flatworms (phylum-Platyhelminthes) are triploblastic animals with organs. The cells of the body wall are arranged in three germ layers. Sponges, ctenophores and corals are diploblastic animals.

8 **(d)**
Organ system level of organisation is seen in chordates, annelids and mollusk. *i.e.*, in all phyla from Platyhelminthes on wards

9 **(b)**
Sea fan (*Gorgonia*) belongs to phylum-Coelenterata, whereas sea cucumber (*Cucumaria*), sea urchin (*Echinus*) and sea lily (*Antedon*) belong to phylum-Echinodermata.

10 **(b)**
The king cobra (*Ophiophagus hannah*) is the world's longest venomous snake, which can be measured upto 6.7 metres or 22 feets in length. King cobra is a snake eater and its diet probably consists of other snakes like pythons and even smaller ones of its species.

11 **(a)**
Book lungs are the respiratory organs of scorpions and spiders.

12 **(a)**
The important transverse vessels in first 13 segments are lateral hearts (segments 7 and 9), anterior loops (segments 10 and 11) and lateral oesophageal hearts (setgments 12 and 15).

13 **(c)**
Sea anemone (*Metridium*) belongs to class-Anthozoa of phylum-**Coelenterata**. It inhabiting warm coastal Wales along the North Atlantic and Pacific coasts.

14 **(d)**
Trochophore is ciliated larval stage of polychaetes (*eg, Neries*), molluscs and rotifers. *Neopilina*, *Chiton* and *Pila* belong to phylum-Mollusca.

15 **(d)**
It represent the dorsal blood vessel of earthworm. It is the largest blood vessel. Behind the 13th segment, it is collecting vessel and between 1- 3, it is distributing vessel.

16 **(d)**
Hydroskeleton is found in and Annelids, echinoderms and other invertebrate for respiration

17 **(a)**
Aschelminthes are dioecious with separate sexes and females are usually longer than males

18 **(c)**

Development may be direct or with larval stages called glochidium or veliger

19 **(c)**
Presence of seven cervical vertebrae is characteristic feature of mammals only.

20 **(c)**
Crossopterygian are called lobed fined fishes. *Neoceratodus* (order-Dipnoi) is a crossopterygian fish. It is found in Burnett and Mary rivers of Queen's land, Australia

21 **(a)**
In *Pheretima posthuma* (earthworm), septae are absent between 3/4 and 9/10 segments.

22 **(c)**
Oviducts of frog are independently developed by **Mullerian ducts**.

23 **(b)**
Drones are the male honey bees, developed parthenogenetically and have a life span of about five weeks (or 1-2 months).

24 **(c)**
Metatherians are pouched mammals. The complete development of embryo takes place in abdominal pouch or marsupium.

25 **(c)**
A clasper is a male anatomical structure found in some groups of animals, and used in mating. Male cartilaginous fish like shark have claspers formed from the posterior portion of their pelvic fin which serves as intromittent organs used to channel semen into the female's cloaca during mating.

26 **(d)**
Platyhelminthes (*e.g., Planaria,* liver fluke and tapeworm) possess the simplest tubular excretory system called **protonephridia** flame cells or solenocytis. Excretory material is ammonia in aquatic flatworms.

27 **(c)**
Ommatidium is the basic unit of arthropod compound eye. It comprises a cornea lens, crystalline cone, a group of usually 7-8 retinal cells radially arranged around a central rhabdome. Ommatidia serve the purpose of photoreception.

28 **(a)**
In the blood of *Periplaneta*, there is no respiratory pigment because air is conducted directly to the body tissues.

29 **(b)**
Wuchereria bancrofti (the filarial worm) belongs to phylum-Nemathelminthes.

30 **(c)**
The given cross-section is of *Planaria* (acoelomate), a flatworm. Flatworms are devoid of cavities in between the alimentary canal and body wall, hence are acoelomate.

31 **(c)**
Typhlosolar region in earthworm is from 27 segments onwards and continue upto last 23-25 segments in front of anus. Typhlosole increases the absorptive surface area.

32 **(b)**
When the coelom arises as a result of a split in the mesoderm sheet, it is called schizocoel. In enterocoel, the coelom arises as an outgrowth of the enteron. The pouches pinch off and enlarge until they squeeze out off the blastocoel. Schizocoel is seen in Annelida, Arthropoda, Mollusca and Chordates. Echinodermata are entercoelomates

33 **(b)**
The middle ear of frog consists of only a single rod shaped bone called **columella auris** which extend across the tympanic chamber from tympanic membrane to fenestra ovalis. Columella auris is also present in reptiles and birds. It transmits sound to the inner ear and homologous to the mammalian stapes.

34 **(d)**
Most of the species of true toad belongs to genus *Bufa*.

35 **(b)**
The oxygenated blood from two lungs is collected by right and left pulmonary venis, which unite to from a common pulmonary vein (pulmocutaneous vein) which open directly into the left auricle on the dorsal side.

36 **(b)**
Ventral nerve cord is common to leech (Annelida), cockroach and scorpion (Arthropoda).

37 **(d)**
Archaeocytes are the totipotent cells, which provide great regenerating power to sponges. Sex cells (sperm and ova) arise from undifferentiated archaeocytes.

38 **(b)**
Necturus is also known as mud puppy and belongs to sub-class-Urodela

39 **(d)**
Metamorphosis is a charge from juvenile to adult stage in which larval stage is quite different from adult stage. In retrogressive metamorphosis, the larva possesess advanced characters which are lost during the development and adult is either sedentary or degenerated with primitive characters. All urochordates display retrogressive metamorphosis

40 **(b)**
Aves have two additional chambers to the alimentary canal: the crop and the gizzard. Birds eat tiny pebbles that lodge in the gizzard and help the muscular gizzard in crushing food. Birds have 12 pairs of cranial nerves

41 **(d)**
In **biradial** symmetry, the body can be divided into two similar halves by one or two vertical planes only, *e.g.,* sea anemones. The animals, which show radial and biradial symmetry have oral and aboral sides.

42 **(b)**
The house fly is characterized by one pair of wings, **sponging** and lapping types of mouth parts and short antennae.

43 **(a)**
Zoological name of common Indian krait is *Bungarus caeruleus*. Kraits are highly poisonous snake.

44 **(d)**
Fasciola hepatica (Sheep lever fluke) belongs to phylum-Platyhelminthes. These worms have incomplete alimentary canal, there is a single opening for both digestion and egestion. This is also called as blind sac body plan.

45 **(a)**
Lophomonas is the cellulose digesting zooflagellate found in wood cockroach.

46 **(c)**
Spiracles are 10 in number, out of these 2 pairs are found in thoracic portion, while rest 8 pairs are found in abdominal portion.

47 **(b)**
Phylum-Mollusca lack Malpighian tubules, instead have feather like gills in the mantle cavity that are useful for respiration and excretion

48 **(a)**
Down feathers are found only in newly hatched birds, its the first feathery covering on the body which provide insulation to new hatched ones

49 **(a)**
Abdomen of adult consists of 10 segments, while embryo has 11 segments.

50 **(b)**
Class-Cyclostomata includes round mouthed fish like lampreys (*Petromyzon*) and hags (*Myxine*)

51 **(c)**
In mammals the teeth are heterodont (*i.e.,* consists of incisors, canines, premolar and molars) thecodont (in sockets of jaw bones). The brain has 12 pair of cranial nerves.

52 **(d)**
Most members of phylum-Platyhelminthes are endoparasites characterised by the presence of hooks and suckers for attachment inside the host

53 **(c)**
The submaxillary and submandibular glands of rabbit are the largest salivary glands. They are found near the angles of mandible. Their large duct that is **Wharton's duct** open just behind the lower incisors.

54 **(d)**
Petromyzon belongs to class-Cyclostomata. Cyclostomata are aquatic, marine or freshwater vertebrates.

55 **(b)**
Ctenoplana belongs to phylum-Ctenophora. Reproduction in all the animals belonging to phylum-Ctenophora takes place by sexual reproduction only

57 **(a)**
Maxillae are appendages of 5th head segment and known as first pair of maxillae. The first maxillae of cockroach has biramous structure, with protopodite containing cardo as its basal portion alongwith **stipes** articulated at 90°. Stipes bear a five jointed expedite or maxillary palp towards outside (its basal podomer called **palpifer**) and endopodite towards inside, with two closely placed podomeres celled **galea** and **lacinia.**

58 **(b)**
Ornithorhynchus anatinus (Duck-billed platypus) is a monotreme mammal, which belongs to sub-class-Prototheria (primitive egg laying mammals), order-Monotremata (living prototherians).

59 **(d)**
Echinoderms are characterized by the presence of a well developed water vascular system (a system of water filled canals) which provides *Hydra*ulic power for thousands of tube feet which are sac

like protrusions of body wall used for locomotion, feeding and respiration.

60 **(d)**
All the snakes mentioned are poisonous snakes

61 **(d)**
Chamaeleon belongs to sub-order-Zacertilia includes lizards of order-Squamata. Syndactyly (a condition where two or more digits are fused together); prehensile tail and long protrusible tongue are the unique features of *Chamaeleon*.

62 **(c)**
Ichthyophis is a limbless **amphibian** of 15-22 cm length that lives in burrows in moist soil.

63 **(c)**
Beak or bill of birds is formed due to prolonged growth in jaw bones. Beak of birds never bears teeths, rest three options may become exception in birds.

65 **(b)**
Diencephalon (thalamencephalon) is small and narrow. Its roof consists of anterior choroid plexus and floor consists of hypothalamus. Pineal body is present dorsally and pituitary ventrally upon infundibulum. Its cavity is diocoel or **third ventricle**.

66 **(c)**
Pseudocoelom is the body cavity of Aschelminthes.

67 **(c)**
Ammocoetes is a filter feeding larval stage in animals belonging to class-Cyclostomata

68 **(d)**
The respiratory system of cockroach consists of tracheae, tracheoles and spiracles. In cockroach, 10 pairs of spiracles are present on the lateral side of the body. Two pairs are in thoracic region and remaining eight pairs are in the abdominal region.

69 **(a)**
In each of the segments, 7, 9, 12 and 13 of earthworm, a pair of large, thick, rhythmically contractile vertical vessels celled hearts are present, *i.e.,* four pairs of hearts are present.

70 **(c)**
Pheretima is earthworm, *Tubifex* is blood worm both belong to Class-Oligochaeta. *Nereis* belongs to class-Polychaeta

71 **(a)**
Pluteus is a larval form of Echinodermata.

72 **(b)**
In *Leucosolenia*, **archaeocytes** give rise to the sex cells (ova and sperms) and play an important role in regeneration.

73 **(a)**
Nitrogenous Waste - Example
Ammonia – *Hydra*
Urea – Mammals like rabbit
Uric acid – Reptiles and insects

74 **(a)**
Nematoblasts or cnidoblasts are specialized and modified interstitial cells, which are found in coelenterates, *e.g., Hydra*.

75 **(a)**
Moth is an insect.

76 **(d)**
Phylum-Annelida is so named because the animals belonging to this phylum has the body which/has is marked into distinct segments or metameres

77 **(a)**
The moulting hormone of the prothoracic glands, named ecdyson, was isolated in a crystalline form in 1954 by Butenandt and Karlson. Ecdyson is a steroid hormone, known to trigger moulting it acts on the tissue to promote all the changes characterizing a moult.

78 **(d)**
The feeding organ in phylum-Mollusca is a radula, it is a file like rasping organ. Undulating membranes and suctorial organs are present in ciliated protozoans

79 **(d)**
Coelom allow the internal organ to grow. It separates the gut from body wall muscles

80 **(b)**
Body of *Ascaris* is elongate, cylindrical gradually tapering at both ends. There is no metameric segmentation. In *Ascaris*, between body wall and visceral organs is a spacious fluid filled cavity. This cavity is not true coleom as it is not lined by coelomic epithelium, has no relations with reproductive and excretory organs and develops from blastocoel.

81 **(c)**
Phylum-Platyhelminthes have an incomplete alimentary canal, but the alimentary canal is complete in phylum-Aschelminthes with a mouth and anus. This is the first phylum with a complete alimentary canal

82 **(c)**

Exoskeleton of arthropods has chitinous cuticle that sheds at intervels called ecdysis for growth and development.

84 **(d)**
Phylum-Platyhelminthes (flatworms) are the only forms, with triploblastic, unsegmented, acoelomate and bilateral symmetry. They reproduce both sexually and asexually and also have some parasitic forms, *e.g., Fasciola, Taenia*, etc.

85 **(b)**
Beavers or castor fibre have well developed echolocation system like that of bats.

86 **(a)**
Coelenterata (coelom + enteron) or phylum-Cnidaria shows both sexual and asexual reproduction. The larval stages are **planula** (*Obelia*) and **ephyra** (*Aurelia*).

87 **(a)**
Parrot (birds), platypus and kangaroo (both mammals) are homeothermic animals.

88 **(c)**
In bilateral symmetry the animal body can be divided into identical left and right halves, in only one plane

89 **(d)**
Earthworm respires through general body surface and has no **respiratory organs.**

90 **(b)**
Vermicompost is highly degraded organic matter rich in N_2 and K resulting from activity of earthworm. **Humus** is the decomposed plant material of the soil. A horizon contains high amount of humus.

91 **(a)**
Wuchereria - Lymphangitis
Plasmodium - Febrile paroxysm
Fasciola - Hyperplasia

92 **(a)**
For a long time cnidarians and ctenophores were grouped together in the phylum-Coelenterata because these are similar in general appearance, but now, Ctenophora became a new phylum.

93 **(d)**
The characteristic feature of Echinodermata is the presence of water vascular system, which helps in the process of locomotion. It is a modified part of coelom and consists of madreporite, stone canal, ring canal, radial canal, Tiedeman's bodies, lateral canals and tube-feet.

94 **(a)**
In **nematodes**, syncytial epidermis and longitudinal muscles are in four bands.

95 **(d)**
Phylum-Chordata is divided into three sub-phyla-Urochordata, Cephalochordata and Vertebrata. Urochordata is also called as Tunicata. Urochordata and Cephalochordata are also called as Protochordata

96 **(b)**
A-Thread tube; B-contractile fibril; C-Lasso.
The figure is representing the various component of Cnidoblast or cnidocyte, found in animals of phylum-Coelenterata, Cnidocytes/Cnidoblasts contains stinging capsule, which releases the toxin, thus used in the defense mechanism, by the animals belonging to phylum coelenterate

97 **(c)**
Platyhelminthes are bilaterally symmetrical organisms with organ level body organisation

98 **(a)**
An arthropod body consists of head, thorax and abdomen, but in some cases head and thorax may be fused to form cephalothorax. Class-Insecta have body divided into head, thorax and abdomen.

99 **(a)**
The mouth parts of male mosquitoes are of 'sucking type', while those of female mosquitoes are of piercing and sucking type (of pierce the skin and suck the blood for feeding).

100 **(b)**
Horse, donkey, rhinoceros, zebra, etc are the members of order-Perissodactyla which includes hoofed mammals with unguligrade foot porture and hoof is formed of uneven number of toes (*i.e.,* odd toed ungulates), while camel, llama, cheetal, etc., are the members of order-Artiodactyla which includes the even toed ungulates.

101 **(c)**
Green gland or antennary glands are located in the coxa of antenna in prawn.

102 **(c)**
Tergum is found on the abdomen of cockroach.

103 **(c)**
Cuckoo does not make a nest of its own and lays eggs in the nest of crow to be hatched and the

young to be read. Crows, parrots and sparrow, make their own nest.

104 **(b)**
Amphibians have opisthonephric kidney. *Lepus* is the generic name for hare, it is a solitary animal

105 **(b)**
Fasciola hepatica infects its intermediate host at miracidum stage and its primary host at metacercaria stage.

106 **(d)**
Exocoetus possesses aglomerular kidney.

107 **(b)**
Aedes albopictus is the scientific name of Asian tiger mosquito.

108 **(b)**
In **bilaterally** symmetrical animals, the response to external stimulus is quicker and more precise.

109 **(b)**
Tentaclest are present only in animals belonging to class-Tentaculata, while comb plates are unique features of phylum-Ctenophora

110 **(a)**
Three types of body cavity are true coelom, pseudocoelom and haemocoel. In phylum-Arthropoda and Mollusca a haemocoel is seen, the true coelom is reduced and blood fills the spaces between the viscera

111 **(a)**
Prawn (*Palaemon*) belongs to class-Crustacean of phylum-Arthropoda. *Hydra* and sea anemone are coelenterates snail belongs to class-Gastropoda of phylum-Mollusca.

112 **(b)**
Due to protandry, self-fertilization does not occur in earthworm. In that case, earthworm testis mature earlier than ovaries which lead to cross fertilization between two worms.

113 **(a)**
Pearl is obtained from pearl oyster (*Pinctada vulgaris*), while honey from *Apis indica*, lac from *Kenia lacca* and silk from *Bombyx mori*.

114 **(d)**
In rabbit four salivary glands are present, which are:
1.Sublingual
2.Infra orbital
3.Parotid
4.Sub maxillary

115 **(d)**
In *Scoliodon* (dog fish), a faint lateral line runs along either lateral side of trunk and tail and over the head region. It contains special receptor organ.

116 **(a)**
Dental formula of rabbit is $\frac{2033}{1023} \times 2 = 28$

117 **(d)**
Amphids in *Ascaris* are gustatory sensory or **chemoreceptors**, *i.e.,* these excited by chemical changes.

118 **(b)**
All the poisonous snakes have poison apparatus in their head. Two maxillary teeth are enlarged, grooved or tubular.

119 **(c)**
When living organisms emit light this property is called bioluminescence. This is usually seen in animals belonging to phylum-Ctenophores. *Ctenoplana* belongs to phylum-Ctenophores. Phylum-Coelenterata and Cnidaria do not exhibit bioluminescence

120 **(a)**
Bee wax is a real product of honey bee as it is secreted by hypodermal glands of worker bees. It is used in polishes, churches, modelling and to wax the thread.

121 **(c)**
Loligo, Teredo and *Octopus* are the members of phylum-**Mollusca**.

122 **(c)**
Rhabditiform is the larva of *Ascaris*. It is also called first juvenile stage.

123 **(b)**
Poikilothermic animals are also known as ectothermic animals. Shark are oviparous, animals as they give birth to young ones by laying eggs coxal glands are the excretory organ of members belonging to class-Arachnids the copper containing in respiratory pigment called haempcyanin is present in phylum-Mollusca and Arthropoda but the structure of haemocyanin in these two phylum different and *Pila* belongs to class in- Mollusca

124 **(b)**
Skin in **amphibians** is naked, *i.e.,* scales are absent. Glands are present, which keeps it moist. It functions in respiration besides protection.

Birds (Aves) are **warm blooded** or **homiothermic** or **endothermal** tetrapods as the temperature of the body remain constant as compared to that of surrounding. While, amphibians and reptiles are **cold blooded or poikilothermal** or **ectothermal** tetrapods as the temperature of the body varies according to the surrounding.

125 **(a)**
Nematoblasts (cnidoblasts) are sensory in nature and acts as a organ for offence and defence.

126 **(b)**
Male *Ascaris* is monodelphic (*i.e.,* single testis) and female *Ascaris* is didelphic (*i.e.,* has two ovaries).

127 **(a)**
In *Scoliodon* or dog fish, there are present some pores, the ampullary pores on the upper and lower surface of the head, each of which leads into an ampulla (pl. ampullae) called ampulla of Lorenzini. Through these, the fish receives information of the temperature fluctuations in the surrounding water.

128 **(d)**
Hydra vulgaris is more or less colourless.

129 **(d)**
In seaconally breeding mammals, the testis descend in scrotum only in breeding season. They remain in the abdomen at other time, *e.g.,* bat and otter.

130 **(a)**
Correct sequence in embryonic development of frog is
Zygote – cleavage – blastula - gastrula.

131 **(b)**
Larva of *Sycon* is **amphiblastula**, which has flagella only at one pole.

132 **(d)**
Sea horse (*Hippocampus guttalatus*) is the most peculiar bony fish, which belongs to class-Osteichthyes of group-Agnatha or Pisces.

133 **(c)**
Sponges are filter feeders, also known as suspension feeders. Food particles strained out of the water current

134 **(c)**
Anecic worms may go very deep into soil upto 60-90 cm and form vertical and complicated burrows for their movement, *e.g., Lumbricus terrestris, Aporrectodea lenga*.

135 **(b)**
Limulus or king crab is also called a living fossil

136 **(c)**
Reptilians, birds and mammals are amniotes. Amphibians like salamander and *Necturus* (the mud puppy) are not amniotes. *Angius* is the glass snake (Reptilia), *Eudynamis* is the cuckoo or koel (Aves) and *Pteropus* the large bat or flying fox is a mammal are all amniotes. All amniotes have special embryonic membranes (amnion, chorion, allantois, yolk sac) that surround the embryo during development

137 **(c)**
Chordates possess dorsal, hollow, fluid-filled nerve cord. It is formed by infolding of a mid-dorsal strip of ectoderm and it generally sinks below surface. It lies above the notochord and outside the coelom, it has a hollow canal running from one end to the other. This dorsal tubular nerve cord persists throughout life in most chordates but few degenerates it before maturity. It serves for the integration and coordination of body activities.

138 **(a)**
A gastrovascular cavity is found in Coelenterates called coelenteron.

139 **(c)**
Lampreys and *Myxine* (hag fish) belong to the class-Cyclostomata, group-Agnatha of vertebrata. Agnatha have mouth without jaws, the mouth is ventral, suctorial and circular.

140 **(a)**
Kangaroo rat is a desert rodent. It's body is covered by hairs. Its urine is more than 20 times concentrated as its plasma. This concentrated waste enables it to live in dry or desert environment, where little water is available to drink. Most of its water is metabolically produced from the oxidation of carbohydrates, fats and proteins in the seeds that it eat. The animal remains in cool burrow during day time and the respiratory moisture condensed in nasal passages.

141 **(b)**
Three types of nephridia are found in earthworm according to their location, namely the septal nephridia, pharyngeal nephridia and integumentary nephridia.

142 **(c)**

Platyhelminthes exhibits organ level of organisation. Aschelminthes are pseudocoelomates

143 **(d)**

Order	Example
Lepidoptera	*Butterfly*
Hemiptera	*Cimex* (bed bug)
Homoptera	*Aphis* (aphid)

144 **(a)**
The colony of *Physalia* is a massive type colony, containing many zooids. Among the zooids, a large cup-shaped float is seen, which is bright blue in colour and remains above the sea water normally. On the undersurface of float many gastrozooids, gonozooids and dactylozooids are present. The colony, thus, shows a very high degree of polymorphism (*i.e.,* existence of two distinctly different forms in a species).

145 **(b)**
In tortoise (*Testudo*), class-Reptilia, phylum-Chordata, both exoskeleton and endoskeleton are found.

146 **(a)**
In sponges, **choanocytes** are also known as collar cells.

147 **(c)**
Fasciola or liverfluke, *Planaria* and *Taenia* or tapeworm are examples of animal that belonging to phylum-Platyhelminthes. *Wuchereria* of filiarial worm is an example of phylum-Aschelminthes

148 **(c)**
True segmentation is also called metamerism

149 **(b)**
Crab, centipede and cockroach belongs to phylum-Arthropoda. These have jointed appendages and chitinous exoskeleton.

150 **(c)**
Reptiles like snake, lizard have three and half chambered heart but exceptionally crocodile have four chambered heart.

151 **(c)**
Typhlosolar region is a part of intestine, which runs from 27th segment upto 24 to 25 segments in front of the anus. In this part, the mid-dorsal wall of intestine is thrown into longitudinal fold called **typhlosole**, which increases the absorptive surface of the intestine.

152 **(d)**
The bee humming bird is only 57 mm long. It is the smallest known bird

153 **(b)**
Bidder's canal lies inside the kidney of male frog. Sperm from testes are carried into the Bidder's canal.

154 **(c)**
In human larynx contains vocal cords, the sound producing elastic fibres called voice box. The sound producing organ in birds is syrinx.

155 **(c)**
Nidology is the study of bird nests

156 **(b)**
The 10th tergum of cockroach bears a pair of long tapering **anal cerci**. Each anal cercus is made of 15 segments.

157 **(d)**
In flies and mosquito, metathorax bears a pair of small drumstick shaped or club-shaped processes called **halteres** or balancers.

158 **(b)**
Phylum-Mollusca is the second largest phylum of animals. These are mostly aqutic, triploblastic, coelomate animals with organ system level of organisation.

159 **(a)**
Tube feet are the soft, hollow, extensile and retractile appendages of echinoderms.

160 **(d)**
Earthworm is hermaphrodite. Four pairs spermathecae are located in 6th to 9th segments (one pair in each segment). There are two pairs of testes present in 10th and 11th segment. One pair of ovaries is attached at the inter-segmental septum of the 12th and 13th segments. Two pairs of accessory glands are present one pair each in 17th and 19th segments and a pair of prostate glands in between 17th and 19th segments.

161 **(d)**
Solenocytes or flame cells are the excretory organs of phylum-Platyhelminthes.

163 **(a)**
Echidna belongs to Prototheria group of class-Mammalia. It is oviparous and only female incubates the eggs. Young laps the milk from mammary gland.

164 **(a)**
Ootheca of cockroach contains 16 fertilized eggs. Nymph of cockroach emerge out from ootheca.

165 **(a)**

Echinodermata exhibits organ system level of organisation and radial symmetry. Arthropoda exhibits complete digestive system. Notochord in present on the dorsal side in vertebrates

166 **(b)**
Nephridia are part of the excretory and osmoregulatory system. Organs of bursa are copulatory organs present in male hookworms. Spicules are present in animals belonging to phylum-Porifera. Longitudinal and circular muscles are useful in locomotion in animals of the phylum-Annelida

167 **(d)**
Canal system of *Leucosolenia* is of **ascon** type. It is the simplest type canal system found in sponges, in this ostia, **spongocoel** and osculum together form canal system.

168 **(b)**
The zoological name of North Indian hare is *Lipus ruficaudatus.*

169 **(d)**
The sponges possess an endoskeleton in the form of calcareous spicules, siliceous spicules and sponging fibres.

170 **(a)**
Archaeocytes are undifferentiated embryonic amoebocytes of sponges with blunt pseudopodia and large nucleus. These show totipotency and it can produce other types of cells needed by sponges.

171 **(b)**
Air bladder is present in bony fishes, *e.g., Anabas*, which is respiratory balancing and sound producing organ.

172 **(a)**
Cow and buffalo are secondary hosts for *Taenia saginata*.

173 **(d)**
Bat produces high frequency sounds in echolocation.

174 **(b)**
In earthworm as well as cockroach, a ventral nerve cord extends back along the midventral axis from the sub-pharyngeal ganglion.

175 **(c)**
Secondary radial symmetry is found in phylum-Echinodermata. The members of this phylum are exclusively marine forms, in which the larvae are bilaterally symmetrical but later on, the symmetry of adults usually becomes pentamerous radial.

176 **(a)**
Metamerism or true segmentation is seen when the body is externally and internally divided into segments

177 **(a)**
In cockroach, there are 6 abdominal ganglia. These are found in first 7 abdominal segments 1, 2, 3, 4, 6 and 7. There is no abdominal ganglia in 5^{th} segment.

178 **(b)**
Siphonophora is an order of hydrozoa, a class of marine invertebrates belonging to phylum-Cnidaria.

179 **(d)**
Amphibians are characterised by three-chambered heart they are cold-blooded animals and their skin is moist and generally lack scales

180 **(b)**
Excretory organs of cockroach are **Malpighian tubules**, which open into the alimentary canal at the junction of midgut and hindgut. Free ends of these tubules are closed.

181 **(c)**
In cockroach, mandibles are a pair of hard, strong, large, dark coloured triangular structures which move in horizontal motion and crush food between them. Gizzard or proventriculus has an outer layer of thick circular muscles and thick inner cuticle forming six highly chitinous plate called teeth. The gizzard acts as the grinding chamber and helps in grinding the food particles.

182 **(b)**
Balanoglossus conecting link betweenchordata and non-chordata.
Peripatus is a connecting link between Annelida and Arthroposa.

183 **(b)**
Canal system is found in sponges, which belongs to phylum-Porifera.

184 **(d)**
Spider belongs to Arachnida.

185 **(a)**
Echinoderms are exclusively marine and largely bottom dwellers, enterocoelous coelomate, triploblastic animals.

186 **(a)**
Hydra is exclusively carnivorous and obtained its food as a predator.

187 **(c)**

Animals belonging to sub-Phylum-Urochordata are *Ascidia, Salpa* and *Doliolum*

188 **(d)**
Generally, cross-fertilization takes place in liver fluke (*Fasciola hepatica*), rarely self-fertilization takes place. Fertilization is internal in liver fluke.

189 **(c)**
Certain animals like the *Chamaeleon* are able to change colour, this is known as metachrosis

191 **(c)**
Buccal cavity – 1st to 3rd segment
Stomach – 9th to 14th segment
Typhlosole – 26th to 95th segment
Testis – 10th to segment
Gizzard - 8th segment

192 **(b)**

Animal	Characteristic	Taxon
Duck-billed platypus	Oviparous	Mammalian
Millipede	Oviparous	Arthropoda
Silver fish	Three long terminal cerci	Arthropoda
Sea anemone	Diploblastic	Cnidaria

193 **(d)**
Animals of class-Gastropoda undergo twisting or torsion of the visceral mass during development, leads to a symmetrical embryo becoming an asymmetrical adult

194 **(d)**
Ureotelic animals include man and all other mammals and aquatic mammals like whales. So, whale is ureotelic not ammonotelic.

195 **(d)**
A sexual reproduction in *Sycon* (*Scypha*) is accomplished by **budding**.

196 **(b)**
In bilaterally symmetrical animals, the response to external stimulus is quicker and more precise

197 **(a)**
Archaeornithes is a sub-class of Aves and includes ancient extict birds. Archaeopteryx lithographica was a lizard bird that belongs to this sub-class

198 **(d)**
Chondrichthyes lacks swim bladders, that help them to maintain bouyancy hence must swim constantly to avoid sinking. Chondrichthyes are ureotelic animals. Both statements (a) and (b) are false for Chondrichthyes

199 **(d)**
Poriferans are called pore bearing animals. Mostly they are marine and very few are freshwater. The freshwater sponge is *Spongilla*.

200 **(c)**
V –spot in microfilaria of *Wuchereria* represents rudiment excretory system. Adult *Wuchereria* lives in the human lymph vessels and lymph glands. It causes the disease elephantiasis or filariasis.

201 **(a)**
Spider is the animal that have 19 body segments, 6 pairs of appendages and respires through trachea and book lungs.

202 **(a)**
In the heart of rabbit, the left auriculo-ventricular valve consists of two flaps and is termed as bicuspid or mitral valve. It is attached to the papillary muscles **chordae tendinae**.

203 **(c)**
Polyp and medusa are the two basic body forms present in Cnidarians

204 **(d)**
Plantulae are adhesive pads (soft pads), which are located at each of the tarsus in the legs of cockroach.

205 **(a)**
Hydra has great power of regeneration. Just below the tentacles there is a growth zone where interstitial cells give rise to all other cells of the body. One characteristic feature of regenerating piece in *Hydra* is that it retains polarity. End nearer to mouth develops mouth and tentacles, while the end nearer to base forms a new pedal disc.

206 **(b)**
All statements are false
The correct statement are
(i) In higher phyla organ and organ system level of organisation is seen
(ii) Phylum-Platyhelminthes have organ level of body organisation
(iii) Cellular level of organisation is seen when the cells are arranged as loose cell aggregates
(iv) Molluscs exhibit organ level of body organisation

207 **(a)**
Solenocytes and nephridia are found in Platyhelminthes and annelids respectively. They are excretory in function.

208 **(b)**

The correct order of classification of *Rana tigrina* is :

Phylum – Chordata
Group – Craniata
Division – Gnathostomata
Class – Amphibia
Order – Anura
Genus – *Rana*
Species – *tigrina*

209 **(c)**
Blind sac body plan is exhibited by some eumetazoans like cnidarians (*e.g., Hydra*) and flateworms (*e.g., Fasciola*) in which, the body of animal has a single opening which acts as both mouth and anus.

210 **(c)**
Super-class-Aves is divided into sub-classes *Archaeornithes* and *Neornithes*

211 **(c)**
Phylum-Coelenterata or Cnidaria are divided into class-Scyphozoa, Anthozoa and Hydrozoa. Actinozoa is another name for class-Anthozoa. Class-Desmospongia belongs to phylum-Porifera

212 **(b)**
Star fish (*Asterias*) belongs to class-Asteroidea, sub-phylum-Eleutherozoa, phylum - Echinodermata.

213 **(b)**
Pinctada sp are the bivalve mollusks, commonly known as pearl oysters. These belong to sub-class-Zamellibranchia, class-Bivalvia or pelycipoda, phylum-Mollusca and kingdom-Animalia.

214 **(b)**
Sugarcane leaf hopper, *Pyrilla perpusilla*, is a serious pest of sugarcane. Both nymphs and adults suck the cell sap of succulent leaves of sugarcane by their rostrum.

215 **(d)**
Blood vascular system in earthworm (*Pheretima posthuma*) is closed type (*i.e.,* blood flows in definite blood vessels). The blood is red in colour due to presence of haemoglobin or erythrocruorin dissolved in plasma.

216 **(b)**
Aurelia (jelly fish) belongs to class-Scyphozoa, in which medusoid phase is dominant and polypoid phase is absent.

217 **(b)**
Platyhelminthes are also called flatworms, as they are dorso-ventrally flattened

218 **(a)**
Cilia of gills of bivalve molluscs help in feeding.

219 **(c)**
In rabbit, allantois comes in contact with chorion and their mesodermal layers fuse together and becomes highly vascular. Thus, a compound layer is formed called **allanto-chorion** or **chorio-allantoic**. Its chorionic villi invade the maternal uterine wall (endometrium) forming an allantoic placenta for absorbing nutrients.

220 **(c)**
Ovoviviparous are heavily yolked eggs that develop in the reproductive tract of the mother, without deriving nourishment from her producing egg that are hatched within the body

221 **(a)**
Boring sponges, such as *Cliona*, attach themselves to shells of oysters, clams, branches, etc.

222 **(a)**
Arthropods are the most successful group of animals. Their success is due to unique chitinous cuticle. Exoskeleton is light weight, tough and composed of structural polysaccharide chitin. Exoskeletal is made up of chitin and strengthened with proteins and calcium carbonate occurs on the outside. It usually occurs in the forms of plate called sclerites.

223 **(b)**
Nephridia of earthworm performs same function (excretion) as the flame cells in *Planaria*.

224 **(d)**
Phylum-Arthropoda is the first largest phylum. Phylum-Mollusca is the second largest phylum

225 **(b)**
If a living *Hydra* is cut into two, three or more very small pieces, every piece develops into a new individual.

226 **(c)**
The centrum of 8th vertebrae of frog is amphicoelous, *i.e.,* concave at both ends. Its transverse processes are somewhat narrower, pointed and directed straight outwards. The neural spine is somewhat flattened and directed upwards.

227 **(d)**
Solenocytes or flame cells are the excretory organs of phylum-Platyhelminthes

228 **(c)**

Food storage in *Leucosolenia* occurs by **thesocytes**. Thesocytes with rounded pseudopodia are food laden amoebocytes.

229 **(b)**
Ascaris sperm is without flagellum, tail less, asymmetric and amoeboidal.

230 **(d)**
Female *Anopheles* feeds on blood of man and large animals, while male *Anopheles* sucks juices of flowers and fruits only. Because of their blood-sucking adaptation, female *Anopheles* causes viral, bacterial and protozoan infections.

231 **(b)**
Presence of water vascular system is the most distinctive characteristic of echinoderms

232 **(c)**
The **labellum** in housefly is made of a pair of large oval and fleshly oral lobes, which are transversed by a network of fine grooves or channels called **pseudotracheae**, because of their resemblance to tracheae in appearance.

233 **(d)**
Options (a) and (b) is a transverse section, option (c) is a horizontal section and option (d) is a vertical section or a sagittal section

234 **(c)**
Insects and spiders belong to phylum-Arthropoda. However, insect body is divided into three divisions the head, thorax and abdomen. Spiders have two body divisions the cephalothorax and abdomen. Insects have three pairs of legs and spiders have four pairs of legs. Spinnerets are silk producing present only in spiders. Antennae and wings are absent in spiders

235 **(c)**
Aschelminthes lack a mineralised skeleton. High fluid pressure in the pseudocoelom helps in maintaining the body form, hence called as a hydroskeleton

236 **(c)**
Locust are of no economic importance, instead are gregarious pests that may even destroy crops

237 **(c)**
The Devonian period is known as 'the age of fishes'. It is famous for the thousands of species of fish that developed in Devonian, sea. The Devonian period of Palaeozoic era lasted from 417 million years ago to 354 million years ago.

238 **(a)**
Animals belonging to the phylum-Porifera are supported by spicules or sponging fibres

239 **(d)**
Small red coloured follicular bodies called **blood glands** are found in these segments. These produce white blood corpuscles (leucocytes) and haemoglobin.

240 **(a)**
Scales are found in pisces and reptiles. Scales play an important role in identification and classification of fish species. Types of scales are-placoid, cosmoid, gamoid and cycloid.

241 **(c)**
The animals, in which the mesoderm is present as scattered pouches in between the ectoderm and endoderm, are called pseudocoelomates, *e.g.,* Aschelminthes. *Ascaris* is a member of Aschelminthes and its adult has a body cavity called pseudocoel.

242 **(b)**
Bungarus (kraits) are highly poisonous snakes. Common krait has black or steel grey colour with white arches on the back. Central scales of back are larger and hexagonal.

243 **(c)**
In coelomates, the problem of diffusion of food from gut to tissues is solved by developing a circulatory system. After digestion and absorption, most of the absorbed food materials are passed into paracellular spaces (in between the enterocytes) from where they enter blood capillaries and then transported to tissues.

244 **(a)**
The generic name of tusk shell is *Dentalium*.

245 **(b)**
Sponges are hermaphrodites, *i.e.*, sexes are not separate and sexual reproduction takes place by gamete formation. Both eggs and sperms are produced by the same individual

246 **(b)**
Chordates have a notochord, central nervous system in dorsal with pharynx performed by gill slits and heart is ventral, post anal tail is present

247 **(d)**
Hirudinaria have a posterior sucker for locomotion. Leech creep by looping and swim by undulations of body.

248 **(b)**
The dorsal diverticulum of urethara in male rabbit is uterus musculinus.

250 **(a)**
Genital pouch of *Periplaneta americana* is divisible into genital chamber and oothecal chamber. Ootheca of cockroach is formed of a protein secreted by collateral glands.

251 **(b)**
Pupa of mosquito has a comma-shaped body, consisting of swollen unsegmented cephalothorax (head + thorax) and a stender, depressed 9-segmented abdomen. Pupa is commonly known as tumbler.

252 **(b)**
Hemicyclops belongs to the extinct class-Ostracodermi.

253 **(d)**
In *Pheretima*, nephridia are excretory organs. These are found in all body segments except the first two. These are originated from ectoderm.

254 **(a)**
Leeches secrete anticoagulant 'hirudin' from salivary glands. Hirudin does not allow blood clotting of host.

255 **(b)**
Presence of diaphragm is the characteristic feature of mammals along with mammary gland, pinna, 7-cervical vertebra, etc.

256 **(c)**
Mandibles work in chewing. Abductor and adductor muscles associated with the **mandibles** move in horizontal plane to cut and chew the food particles, these are brought in between the mandibles by the first maxillae.

257 **(a)**
In dorsal blood vessel, blood flows from behind to forward by the rhythmic contraction and they also possess valves, which prevent the backward flow of blood.

258 **(b)**
Hoodworm (*Ancylostoma*) is a dioecious animal.

259 **(c)**
Metameric segmentation is the characteristic of **Annelida** (*e.g.,* earthworm) and **Arthropoda** (*e.g.,* cockroach). Metamerism is body structure having repeated segments. It helps to develops specialization of organs.

260 **(c)**
The taste receptor (gustatoreceptors) are organs of taste. In cockroach, they are mainly confined to the tips of maxillary palps, labial palps, labium and hypopharynx.

261 **(b)**
Cockroach, scorpion and prawn belong to phylum-Arhropoda.

262 **(c)**
Chitin is a polysaccharide.

263 **(b)**
Pheromones are used for animal communication. These are screted from exocrine glands as liquid, transmitted as liquid or gases and smelled or tasted by other animals of the same species.

264 **(d)**
The velocity of conduction of nerve impulse in frog is 30 metre/second.

265 **(c)**
All statements are true except (c). Although body of arthropods is divided into head, thorax and abdomen but arthropods are triploblastic, coelomate animals

267 **(c)**
Ichthyopsis is a limbless amphibian

268 **(a)**
Diaphragm is abrent in frog and is not related to respiration. Frog has developed various types of external respiration to suit its amphibious mode of life. They include cutaneous respiration, buccopharyngeal respiration and pulmonary respiration.

269 **(a)**
Tadpole larva lives in water, so it has gills and a tail but during metamorphosis gills and tails are reabsorbed.

270 **(d)**
There are five longitudinal blood vessels in *Pheretima*. Ventro-intestinal blood vessels supplies blood to integumentary nephridia. The dorso-intestinal blood vessel receives blood from intestine and a pair of cimmissural vessel.

271 **(a)**
Pheromones are also known as ectohormones. These are secreted upon skin surface and produce characteristic smell by mature female cockroach, which is detected by the antennal chemoreceptors of male.

272 **(d)**
The corpora allata are concerned with the production of moulting and pupating hormones in insects.

273 **(d)**
Flightless birds show discontinuous distribution. They have well developed powerful legs, small

head, rudimentary eyes and wings, *e.g.,* ostrich, emu, kiwi, cassowary, etc.

274 **(d)**
Gill of *Pila* consists of a long ctenidial axis with a single row of a long series of triangular leaflets known as lamellae. Such a gill is called monopectinate.

275 **(b)**
Bioluminescence is the property of a living organism to emit light. It is well marked in ctenophores.

276 **(c)**
Struthio camelus (ostrich) is a gregarious polygamous and omnivorous flightless bird. Oil glands, preen gland are absent. Syrinx is also absent.
Casuarius sp is a flightless bird. The head is beautifully coloured due to presence of helmet like horny casque. The preen gland and syrinx are absent.

277 **(d)**
Sponges are **sessile**, *i.e.,* live permanently attached to rocks or other surfaces.

279 **(b)**
Platyhelminthes are bilaterally symmetrical animals. The body of animal can be divided into two equal halves through only one plane, *e.g.,* liver fluke (*Fasciola hepatica*).

280 **(d)**
All chordates are bilaterally symmetrical, coelomates, triploblastic with closed circulatory system and organ system level of organisation

281 **(c)**
In *Rattus rattus*, there are two large cerebral hemisphere which are smooth internally. These spheres are connected by a bundle of nerve fibre called **corpus callosum**.

282 **(b)**
Hookworm (*Ancylostoma*) is triploblastic bilaterally symmetritical and pseudocoelomate.

283 **(d)**
Ascaris lumbricoides is a common intestinal parasite of man, therefore, it is found in alimentary canal.

284 **(b)**
Cockroach, housefly and mosquito belong to phylum-Arthropoda. In mosquito and housefly, the second pair of wings forms a knob like structure known as 'haltere' or 'balancer'. Its function is to balance the body during flight.

285 **(c)**
The development of *Periplaneta americana* is paurometabolous meaning there is development through nymphal stage. The nymphs look very much like adults. The nymph grows by moulting about 13 times to reach the adult form. The next to last nymphal stage has wing pads but only adult cockroaches have wings.

286 **(d)**
Jacobson's organ are present in all but they are well developed in snakes and lizards. It is an auxillary olfactory sense organ located in the vomer bones, between the nose and the mouth.

287 **(b)**
The posterior region of body of cockroach is called abdomen. The abdomen of adult consists of 10 segments, while embryo has 11 segments. In female cockroach, abdomen is broader than in male. In between sclerites (terga) of 5/6 segments specially in the vicinity of arthrodial membrane, a pair of stink glands are present.

288 **(b)**
Blood glands are located in the 4^{th}, 5^{th} and 6^{th} segments above the pharyngeal mass. These serve for manufacture of blood corpuscles and haemoglobin.

289 **(d)**
Frogs have three types of pigmentations or chromatophores (melanophores, iridophores and xanthophores). These chromatophores are controlled by the frog's central nervous system and hormones.

290 **(b)**
Phylum-Coelenterata or Cnidaria have tissue level of organisation. Cellular level of organisation is only present in phylum-Porifera

291 **(b)**
Nematocysts in *Hydra* discharge and inject poisonous fluid **hypnotoxin**, which paralyses the prey.

292 **(b)**
Pseudocoelom is false coelom, derived from embryonic blastocoel.

293 **(d)**
The feet with toes forming cloven hoof is seen in sheep.

294 **(a)**
Petromyzon (lamprey) belongs to phylum-Chordata, group-Craniata, sub-phylum-Agnatha and order-Petromyzontia.

295 **(b)**
Blue whale is considered as the largest aquatic vertebrate. Whale shark (*Rhincodon typus*) is a show moving, filter feeding, largest living fish species. It is considered as the second largest aquatic vertebrate, which can grow upto 60 feet length and 13.6 tonnes in weight.

296 **(c)**
In the insect which feeds on nectar, the proboscis is formed by glossa.

297 **(a)**
Hydra possess a very primitive type of nervous system with bipolar and multipolar neurons lying above muscular processes forming irregular and discontinuous nerve plexus.

298 **(d)**
Echinoderms are exclusively marine and largely bottom dwellers, enterocoelus coelomate, triploblastic animals. The adult echinoderms have pentamerous radial symmetry derived from an original bilateral symmetry.

299 **(b)**
In frog, the forelimbs have four digits (as thumb is absent in forelimbs), while hindlimbs have five digits.

300 **(d)**
Trygon is also called sting ray and belongs to class-Chondrichthyes. They have two-chambered heart, males have claspers and respiration is by exchange of gases with the water through gills

301 **(c)**
A-Male-*Ascaris*
B-Female-*Ascaris*
Females in phylum-Aschelminthes are longer than male

302 **(d)**
The larva of *Bombyx mori* is known as caterpillar. A fully grown caterpillar has a length of about 7.5 cm. These larvae are voraceous feeder so they have continuous supply of food. Each caterpillar larvae has well developed mandibulate type of mouth parts adapted to feed easily on the mulberry leaves.

303 **(a)**
Ink gland is not found in *Pila*.

304 **(a)**
Schistosoma mansoni is the common human **blood fluke**. It belongs to class-Trematoda of Platyhelminthes. **Blood fluke** is digenetic, primary host is man and secondary or inter mediate host is **snail**.

305 **(a)**
A pair of short and conical intestinal caecae project from the intestine on the 26th segment. The characteristic feature of the intestine between 26-35 segment is the presence of internal median fold of dorsal wall called typhlosole. This increases the effective area of absorption in the intestine

306 **(b)**
Masses of bath sponges are collected and allowed to die and decay. Gradually, the entire living part disintegrates, while the skeleton made up of dense network of fibres composed of sulphur containing flexible collagen like protein (*s*-origin) is left. It is used for scrubbing the body at the time of bath, as well as few mopping and polishing floors, furniture, shoe, etc.

307 **(c)**
Sea cucumber (*Cucumaria*) is an echinoderm that has the capacity to regenerate entire alimentary canal.

308 **(b)**
Ligaments consist of mainly collagen fibres and some elastic fibres. It connects one end of a long bone to another.

309 **(b)**
In Aves, long bones are hollow and connected by air passage.

310 **(b)**
The cavity common to all sponges is spongocoel or paragastric cavity. It is lined by endoderm, which contains a single layer of collared, flagellated cells, called choanocytes. Each cess contains a single nucleus, 1-2 contractile vacuoles, food vacuoles, blepharoplast, rhizoplast and a single basal granule (kinetosome) from which a single, long, whip-like flagellum is originated.

311 **(a)**
The body outline of Ophiuroidea (*e.g., Gorgonocephalus* sp) is similar to the Asteroidea, *i.e.,* ophiuroids have five arms joined to central body disc, *i.e.,* branched arms.

312 **(a)**
Coelenterates have nematocysts as its characteristics feature.

313 **(c)**
The skull of mammals represents a highly modified synapsid pattern. In synapsids, the

temporal region of skull develops a **single opening** bound horizontal along its lower border by a bony connection between jugal and squamosal bones.

314 **(c)**
Organ level of organisation is present in Platyhelminthes. The animals belonging to this phylum are bilaterally symmetrical, triploblastic and acoelomate

315 **(b)**
The body cavity of earthworm is true coelom (schizicoel) as it is formed by the division of mesoderm. The coelom is filled with milky, alkaline coelomic fluid, which contains different types of corpuscles. Thus, if a live earthworm is prickled with a needle on its outer surface, the coelomic fluid will come out.

316 **(d)**
Echinoderms are triploblastic animals with organ system level or organization. Larval forms possess bilateral symmetry, while adults have radial symmetry.

317 **(d)**
Python is a non-poisonous snake.

318 **(d)**
Excretory organ in animals belonging to phylum-Hemichordata is the proboscis gland

319 **(c)**
Sponges are classified on the basis of **skeleton**.

320 **(b)**
Neoteny refers to larval stages becoming sexually mature and able to reproduce

321 **(d)**
Mammary gland is a characteri-stic feature of class-mammalia

322 **(b)**
Phylum-Arthropoda is the largest phylum of the kingdom-Animalia. It includes over 2/3rd of all known species

323 **(a)**
The appendages are mostly biramous in crustaceans, while typically three pairs (hexapoda) in insects.

324 **(b)**
Biramous appendages are present in crustacean (prawn). It consists of a basal protopodite with two rami, an inner endopodite and an outer exopodite.

325 **(d)**
In the members of phylum-Echinodermata like *Asterias* (star fish), *Echinus* (sea urchin), *Antedon* (sea lily), *Cucumaria* (sea cucumber) and *Ophiura* (brittle star) an excretory system is absent.

326 **(c)**
Scorpion, spider and cockroach have ventral solid central nervous system.

327 **(a)**
Metameric segmentation is a feature of Annelida.

328 **(a)**
A true coelom is seen when the body cavity is lined by mesoderm

329 **(b)**
Macaca is an Indian monkey.

330 **(c)**
An animal whose female gives birth to young one is called viviparous and this phenomenon as vivipary, *e.g.,* rabbit, dog, humans, etc.

331 **(d)**
Class-Osteichthyes contains freshwater and marine bony fishes having skin with cycloid, ctenoid scales. The bony fishes possess **four pairs** of gills situated in gill or branchial chambers. Each gill consists of two rows of slender gill filaments.

332 **(d)**
Reptiles are different in their integuments. Amphibians have smooth moist skin, while the reptilian skin is scaly, rough and dry, and is periodically shed off by a process of moulting. The amphibian heart is three-chambered, while the reptilian heart is four-chambered. The amphibian larva usually undergoes metamorphosis unlike reptilian young one

333 **(c)**
Aschelminthes are triploblastic, bilaterally symmetrical, pseudocoelomate (false coelom derived from embryonic blastocoel), unsegmented organisms.

334 **(b)**
(*aranea*) (spider) is an Arachnida and not an insect

335 **(d)**
Interstitial cell are absent in testis of frog.

336 **(d)**
Amoeba and sponges are asymmetrical

338 **(c)**
Coelom is the secondary body cavity which exists between the body wall and the digestive tube and is lined on all sides by mesoderm.

339 **(a)**
The number of cervical vertebrae are seven in almost all mammals including human beings.

340 **(c)**
The order-Primata is divided into three sub-orders:
1.Lemuroidea, *e.g.,* lemur and *Loris*

2.Tarsioidea, *e.g.,* tarsier.

3.Anthropoidea, *e.g.,* monkeys, apes and man.

Shrew and hedgehog belongs to order-Insectivora of class-Mammalia. Horse and Zebra belong to order perissodactyla while bats and vampire belongs to order chiroptera.

341 **(b)**
In open circulatory system, the blood flows in open spaces like lacunae and sinuses and it bathes the cells directly, *eg,* arthropods (cockroach or *Periplaneta*).

342 **(d)**
Collar cells or choanocytes are present only in sponges.

343 **(c)**
Only Coelenterates and Ctenophora and diploblastic acoelomates, with radial symmetry. *Adamsia* is sea anemone, which belong to phylum-Coelenterates and *Meandrina sinuosa* belongs to phylum-Coelenterates. *Berore* is a Ctenophora

344 **(d)**
A group of individual organisms with fundamental similarities is called **species**. One species is distinguished from the other closely related species on the basis of distinct morphological differences. Tiger (*Panthera tigris*) is one of the species of *Panthera*.

345 **(a)**
Only phylum-Coelenterata, Ctenophora and Echinodermata display radial symmetry. Mollusca exhibit bilateral symmetry

346 **(a)**
Detritivores are animals, which feed on decaying organic matter, *e.g.,* earthworm.

347 **(a)**
In *Pheretima posthuma* or common Indian earthworm, female genital pores are present upon 14th segment.

348 **(d)**
Pleurobrachia belongs to phylum-Ctenophora. Ctenophora are diploblastic, with tissue level of organisation and presence of comb plates. Comb plates is characteristic feature of phylum-Ctenophora, *Plurobrachia* are not triploblastic

349 **(b)**
Phylum-Arthropoda is the largest phylum of animal kingdom including about 900,000 species in all habitats, which constitute about 70% of all the known species of animals.

350 **(b)**
Ctenoplana and *Beroe* lack cnidolasts and have biradial symmetry. These belong to phylum-Ctenophora.

351 **(a)**
Monocystis are typically endoparasites of earthworm and occur in their coelom and seminal vesicles.

352 **(c)**
In *Pheretima*, locomotion occurs with the help of circular, longitudinal muscles and setae.

353 **(c)**
In Mollusca, each eye is located upon, stumpy peduncle called **ommatophore**.

354 **(c)**
Ctenophora have radial symmetry with tissue level of organisation, acoelomate animals. Platyhelminthes have bilateral symmetry with organ and organ-system level of organisation but are also acoelomate animals. Characters of echinoderms are true. Coelentrata have bilateral symmetry with tissue level organisation acoelomate animals

355 **(c)**
Mollusca are terrestrial or aquatic, present both in freshwater and marine water

356 **(a)**
The third moulting in *Ascaris* larva takes place in **lung**.

357 **(d)**
Cell aggregate body plan is only found in Porifera. Bilateral symmetry is the most common symmetry found in animals. Pseudocoelom is only found in Aschelminthes. Triploblastic animal like Platyhelminthes lacks a coelom. Haemocoel is present in Mollusca and Arthropoda

358 **(d)**
Book lungs and book-gills are organs for respiration found in scorpion and king crabs, respectively

359 **(d)**

Foliate papillae, persent in rabbit, are located at sides of the base of tongue and are the smallest papillae.

360 **(d)**
Asterias is the scientific (generic) name of starfish.

361 **(a)**
The sequence of layers in the epidermis of vertebrate skin (integument) from uppermost layer to the inner one is
Stratum coneum → stratum lucidium → stratum granulosum → germinative layer → dermis.
Hence, the second layer in the rat integument is stratum lucidium.

362 **(c)**
Poriferans and Coelenterates are diploblastic animals, while all animals in and after Platyhelminthes are triploblastic animals.
Protozoa are single celled animalcules and do not form any germ layers

363 **(b)**
Mesoglea is the undifferentiated layer present in between the ectoderm and endoderm in sponges.
The third germinal layer is a differentiated layer, which is present between the ectoderm and endoderm and is called mesoderm

364 **(b)**
Tyloto triton is a genus of newt known as crocodile newts, out of which *T. verrucosus* (Himalayan crocodile newt) is found in Indian peninsual. *Ichthyophis peninsularis* is a species of caecilian found in India.

365 **(a)**
The mosquito (*Culex*, *Anopheles* and *Aedes*) are pathogenic. The fleas (*Pulex*) is also pathogen, *i.e,* ectoparasites of birds and mammals, feeding on blood and the tse-tse fly is pathogen for sleeping sickness.

366 **(d)**
Crocodiles have a completely four chambered heart similar to the birds and mammals.

367 **(b)**
Maxillae and legs are similar in structure.

368 **(d)**
In cockroach, there is no respiratory pigment. Every tissue of body is in direct communication with atmospheric air for gaseous exchange. For this, a complicated system of air tubes or trachea (tracheal system) is present, which open at surface through spiracles or stigmata.

369 **(a)**
The animals of phylum-Platyhelminthes are triploblastic bilaterally symmetrical, acoelomate and mostly parasitic.

370 **(a)**
Metamorphosis is the phenomenon of passing through different juvenile forms before becoming adult or imago. In insects, the process of growth and metamorphosis is regulated by juvenile hormone which is secreted by the corpora allata (components of retrocerebral complex).

371 **(d)**
Corpora allata is small endocrine gland in the insect head. Juvenile hormone is secreted by this gland, which is responsible for maintenance of larval condition during moulting.

372 **(c)**
While ants are social, colonial and polymorphic insects.

373 **(a)**
On the basis of symmetry animals are classified into radiats and bilateria

374 **(b)**
The middle ear of mammals is a air filled chamber containing a remarkable chain of three tiny bones or ossicles, known as the **malleus** (hammer), **incus** (anvil) and **stapes** (strirrup), named because of their fancied resemblance to these objects.

375 **(a)**
In rabbit, the two fibroelastic strands of the larynx extend between the thyroid and arytenoid cartilages.

376 **(a)**
T-shaped interclavicle in the pectoral girdle is the reptilian character present in prototheria. The pelvic girdle of prototherian possesses epipubic bones.

377 **(b)**
Ichthyology – Study of fishes
Mammalogy – Study of mammals
Herpetology – Study of reptiles and amphibians
Ornithology – Study of birds

378 **(b)**
Struthio is the ostrich, it runs very fast but is a flightless bird, as is also penguin which is adapted for swimming due to its habitat in polar region

379 **(c)**
Chloragogen cells are involved in synthesis and storage of fat and glycogen. Their special function is deamination of excess amino acids and

formation of urea. They also store waste products in yellow granules. So, these are excretory as well as storage cells.

380 **(c)**
A- *Pteropus* or flying fox
B- Balaenoptera or the blue whale
C- Chelone or turtle
D- Ornithorhynchus or platypus
E- *Scoliodon* or dog fish
C and E- These not mammals. C is a reptile and E is a *Chondrichthyes*

381 **(b)**
Starfish shows radial symmetry. It belongs to phylum-Echinodermata.

382 **(d)**
Oil of *Chenopodium*, alcopar, bendex, dewormis, meber, etc, are some of the antihelminthic drugs used to exterminate *Ascaris*.

384 **(b)**
The member of phylum-Arthropoda show bilateral symmetry, three germ layers in body wall, external metamerism, jointed and paired appendages, haemocoel and open type of circulatory system with dorsal heart.

385 **(b)**
Kidney of frog tadpole is **pronephric**; kidney of amphibia is mesonephric, while of birds and mammals is metanephric.

386 **(c)**
In *Pheretima*, the fing vessels are characteristic circular vessels of stomach situated with its muscular coat. There are about 12 vessels per segment.

387 **(d)**
Echinoderms are ammonotelic and nitrogenous waste are excreted *via* gills, bursae, respiratory trees and tube feet

388 **(d)**
Vestibular Bartholin glands are the accessory glands associated with the female reproductive system. The glands are located subcutaneously within the wall of the vaginal opening and secrete lubricating fluid, into the vestibule and vaginal opening during coitus.

389 **(d)**
A compact, somewhat flattened and whitish mass, called epididymis is closely abutted against the dorsal aspect of each testis. In rabbit, head of epididymis present at the head of the testis is called **caput epididymis**, while the smaller posterior enlarged part of epididymis is called cauda epididymis.

390 **(c)**
Taenia solium (tapeworm) belongs to phylum-Platyhelminthes.

391 **(c)**
Echinoderms have water-vascular system (ambulacral system) with tube-feet for locomotion, feeding and respiration, *e.g.,* *Cucumaria* (sea cucumber).

392 **(c)**
Nucleated RBCs are present in frog.

393 **(a)**
Fertilization is external and occurs in cocoon. Cocoon is formed around clitellum.

394 **(c)**
Protandry refers to earlier maturation of male sex organs than female sex organs

396 **(a)**
Order-Rodentia comprises of rodents like rats, squirrels, guinea-pigs, beavers, etc. The animal of this order lack canines and the toothless space in the jaw is termed as diastema. The other two orders have canine teeth. Canines are large in order-Carnivora

397 **(b)**
The animals, which are active at night and rest during the day are called **nocturnal**.

398 **(b)**
Tubules of mesonephric kindney arise in the middle of nephric ridge. The mesonephrose usually becomes functional in the embryo but persists in adults of fishes and Amphibia.

399 **(b)**
Body cavity lined by mesoderm is a coelomic cavity. Coelom is absent in acoelomate animals. When the mesoderm is present as scattered pouches in between ectoderm and endoderm, the animals are called pseudocoelomates

400 **(c)**
Starfish is a member of phylum-Echinodermata.

401 **(b)**
Abdomen of cockroach is divisible into ten segments in adults and 11 in embryo. Each segment has four sclerites.

402 **(d)**
Forewing is modified into the leathery tegmina in cockroach. It is reduced, often serves not so much in flight. Tegmina is a protective cover for the delicate membranous hindwings when at rest.

403 **(c)**
Bone of the birds like ostrich, owl are hollow and known as pneumatic, *i.e.,* bone marrow is absent in bones of birds. This is the adaptation for aerial life of birds.

404 **(d)**
Juvenile hormone is produced by corpora allata in insect, it favours the development of juvenile characteristics.

405 **(d)**
Chondrichthyes is one of the classes of super-class-Pisces, sub-phylum-Vertebrata and phylum-Chrodata. The members of class-Chondrichthyes are marine animals with streamlined body and have cartilaginous endoskeleton. Mouth is located ventrally. The skin is tough, containing minute placoid scales. The teeth are modified placoid scales which are backwardly directed *e.g.,* Dog fish (*Scoliodon*), saw fish (*Pristis*), great white shark (*Carcharodon*), sting ray (*Trygon*), etc.

406 **(c)**
Lobsters, spiders and shrimps all belong to same taxonomic group, *i.e.,* Arthropoda.

407 **(c)**
Notochord is only present in the embryonic stage, it is replaced by **vertebral column** (back bone) in the adult forms.

408 **(c)**
All members of the phylum-Chordata exhibit the following four characteristic features - presence of dorsal nerve cord, the notochord, postanal tail and pharyngeal slits. The post anal tail is a muscular region of the body that extends beyond the anus. It includes skeletal support and musculature that improves the locomotion of many aquatic chordate species.

409 **(a)**
Pearl is produced by certain bivalve Mollusca.

410 **(d)**
In frog, when 1st polar body is separated by meiosis then chromosome number becomes half.

411 **(c)**
The excretory material of bony fishes like *Hippocampus* is ammonia.

412 **(d)**
Choanocytes are flagellated collar cells present in the choanocytic layer. Food particles strained out by water are passed on to amoebocytes and food is stored in thesocytes. Amoebocytes, thesocytes and choanocytes are all present in sponges

413 **(d)**
The queen bee normally lives for about five years. The worker bees live only for about 90 days due to their heavy duty life.

414 **(a)**
The skin of frog is smooth or rough, having mucous and poisonous glands.

415 **(a)**
Cysticercus is the larval form of a tapeworm (*Taenia*), which grows into the adult when eaten by the primary host and consists of a scolex inverted into a larger bladder.

416 **(d)**
Pectin is found in the eyes of birds

417 **(a)**
Pila possesses radula. Radula is a rasping organ of molluscs situated in a sac on the underside of the buccal cavity. It is used for tearing plant material by rubbing it against the hardened surface of the mouth.

418 **(a)**
Diaphragm has no role in the respiration in frog but in mammals it increase the surface area for respiration.

419 **(a)**
Arthropoda is the largest phylum of animal kingdom. Body of Arthropoda is divisible into head, thorax and abdomen, and respiration by tracheoles and spiracles.

420 **(c)**
All animals belonging to this class creep or crawl

421 **(c)**
Turbellaria is a class of phylum-Platyhelminthes. Turbellarians are mostly free living **faltworms**, majorly aquatic (marine), presence of cilia, body unsegmented, mouth ventral, suckers absent with tango-chemo-and photoreceptors, *e.g., Planaria* (*Dugesia*), *Bipalium*, etc.

422 **(a)**
Chiton belongs to class-Amphineura (polyplacothora).

423 **(d)**
Anal styles are paired, thin small unjointed outgrowths, which project backwardly from the sides of the 9th sternum of the male cockroach only. They are sensitive to touch.

424 **(c)**
Catadromous fish spend most of their lives in fresh water, then migrate to the sea to breed. This

type is exemplified by eels of the genus, *Anguilla*, numbering 16 species.

425 **(d)**
The human pinworm is *Enterobius vermicularis*.

426 **(a)**
Snails (*e.g., Limnaea, Planoribs, Bulinus*) are the secondary or intermediate host of *Fasciola hepatica.*

427 **(b)**
Trigeminal nerve or trigeminus is 5th pair of cranial nerves.

428 **(c)**
Animals are classified based on coelomic cavity, level of organisation and presence or absence of notochord

429 **(a)**
Conus arteriosus is a muscular and contractile structure, present in right auricle of frog which consists of **pylangium** (bulbus arteriosus) and **synangium** (ventral aorta).

430 **(c)**
Prostostomous animals are those whose mouth is derived from the blastropore of the embryo and the anus is formed at the opposite end. Animals belonging to phylum-Platyhelminthes, Aschelminthes, Annelida, Mollusca and Arthropoda are prostostomous animals. *Apis, indica*, honey bee belongs to phylum-Arthropoda, *Loligo*, a squid belongs to Mollusca and *Hirudinaria*, a cattle leech belongs to phylum-Annelida. In option (a) *Aurelia* belongs to Coelenterata, In option (b) *Physalia* also belongs to coelenterata and option (d) contains echinoderms

431 **(d)**
There are many testes and single ovary in *Hydra*.

432 **(b)**
The species which are improted in India from other countries are called exotic species. Common carp (*Cyprinus carpia*) is imported from China.

433 **(b)**
Cimex is a temporary, ectoparasitic, nocturnal insect with piercing and sucking types of mouth parts.

434 **(c)**
Mammalia is the only class, which has the presence of mammary glands. It is a unique characteristic among the members of this class but four chamber heart and internal fertilisation found in the members of class-Mammalia as well as Aves

435 **(c)**
Prosimians means the animals which originate before monkeys. These include lemur, loris and tarsius. Apes include gibbon, orangutan, chimpanzee and gorilla

436 **(b)**
The hormone thyroxine is secreted by the thyroid gland. Thyroxine necessarily takes part in the process of metamorphosis in tadpole.

437 **(b)**
The animals, which have true coelom are called **eucoelomates** or coelomates, *e.g.,* annelids, echinoderms and chordates. Among given options, *Pheretima* (annelid) has true coelom (schizocoel; derived by splitting up of embryonic mesoderm). The coelom is filled with milky white alkaline coelomic fluid.

438 **(c)**
Presence of right aortic arch is characteristic to all **birds**.

439 **(b)**
In *Hydra*, the asexual reproduction mainly occurs through external budding in the middle and basal part of the body. The bud initially seen as a protuberance which gradually grows as a diverticulum. Soon, it develops gastrovascular cavity, tentacles, hypostome and mouth. The cavity of bud later on separates off from the parent body. Thus, forming a young *Hydra*.

440 **(d)**
In advance reptiles and all mammals, a new association centre, the neopallium appears in the cerebral cortex.

441 **(b)**
Members of class-Insecta (phylum-Arthropoda) are also known as Hexapoda due to the presence of six legs (3 pairs), located on the thoracic segments. Insects form the largest class of animals.

442 **(d)**
Azygous vein, hemizygous vein and caudal veins are not in pair in rabbit.

443 **(c)**
Mesozoic era – Age of reptiles
Coenozoic era – Age of mammals
Palaeozoic era – Age of fishes

444 **(d)**

Schistosoma is commonly called blood fluke. It is a parasite and found in blood and lives in the hepatic portal system and mesenteric blood vessels of human beings.

445 **(a)**
Class-Crustacea belongs to sub-phylum-Mandibulata of phylum-Arthropoda. In crustaceans, the head often joined with thorax to form cephalothorax, respiration by gills or body surface and appendages typically biramous.

446 **(c)**
Pseudocoelom is not found in *Fasciola*.

447 **(c)**
Skull of frog is triangular in shape. It is decondylic and platybaric due to presence of two occipital condyles and absence of an inter orbital septum. The skull is completely cartilagenous in tadpole stage but becomes mostly bony in the adult frog.

448 **(a)**
The body cavity (coelom) of earthworm is filled with an alkaline, colourless or milky coelomic fluid containing water, salts, some proteins and four types of coelomic corpuscles. During burrowing and locomotion, contraction of septa (which partioned coelom into series of coelomic chambers) increases pressure on coelomic fluid, thus making the anterior body segment turgid and elongated.

449 **(c)**
Dugesia is a genus of *Dugesiid triclad*, common representative of class-Turbellaria

450 **(d)**
Wuchereria bancrofti infection causes filariasis or elephantiasis, *Culex* mosquito is its intermediate host. Female worms are twice as long as the male worms. *Wuchereria* live in lymph vessels and lymph glands

451 **(a)**
Dolphin, kangaroo, bat and cat are mammals, which give birth to young ones directly.

452 **(d)**
Animals of phylum-Arthropoda have an hard, chitinous outer covering, they lack any endoskeletal structures

454 **(b)**
Scorpions have one pair of coxal glands situated near the base of third pair of walking legs.

455 **(b)**
Schistosoma is a blood fluke of the class-Trematoda of phylum-Platyhelminthes. It has a intermediate host, snail. It causes the disease schistosomiasis in humans. *Wauchereria bancrofti* is a nematode. Its intermediate host are the species of *Culex*.

456 **(b)**
Each male genital opening (in 18th segment) of *Pheretima* has separate openings of three ducts (one prosthatic duct and two vasa deferentia, *i.e.,* spermatic duct).

457 **(c)**
Bombyx mori is a silk producing insect, which is reared on mulberry leaves for commercial production of silk.

458 **(d)**
The whales are large marine **mammals**.

459 **(a)**
Flame cells are the specialized hollow excretory or osmo-regulatory structures. These are found in Planarians.

460 **(b)**
Hookworms belongs to phylum-Aschelminthes and have generic name *Ancylostoma*. They have an excretory tube and excretory pore to remove the body waste from body cavity. Fertilisation in this phylum is internal. They are triploblastic pseudocoelomate animals and sexes are usually separate, *i.e.*, dioecious

461 **(c)**
In frog, acoustic spots are present in membranous labyrinth.

462 **(b)**
Snake venom is a complex mixture of organic compounds secreted by poison glands. Venom of *Viper* is haemolytic, so affects circulatory system, while venom of cobra affects nervous system, *i.e.,* neurotoxic in nature.

463 **(c)**
Silverfish, scorpion, crab and honeybee all belongs to phylum-Arthropoda which have jointed appendages as their characteristics feature.

464 **(a)**
The function of clitellum in *Pheretima* is the formation of cocoon.

465 **(c)**
Phylum-Porifera consists of sponges that are considered as asymmetrical. Animals belonging to Phylum-Ctenophora and Coelenterata are radially symmetrical and animals belonging to Annelida are bilaterally symmetrical

466 **(a)**
Nematocysts are the stinging cells of coelenterates so that they are called cnidrians. By using the nematocyst, they paralyze the prey by injecting poison.

467 **(b)**
Ascaris does not have intermediate host. It is a monogenetic parasite.

469 **(b)**
Molluscs are the soft bodied, unsegmented animals covered by a shell. In between the shell and body wall is a covering called **mantle**, which secretes the shell.

470 **(b)**
An animal, which feeds only on plant and plant product is called **herbivore** and this type of feeding habit is called herbivorous, *e.g.,* rabbit, cow, etc.

471 **(c)**
Cuttlefish or *Sepia*, Chaetopleura or chiton and *Aplysea* or sea-hare belong to phylum-Mollusca. *Antedon* or sea lily, *Cucumaria* or sea cucumber, Echinus or sea urchins and *Ophiura* or brittle star belong to phylum-Echinodermata

472 **(d)**
The body of animals belonging to phylum-Arthropoda are divided into head, thorax and abdomen, while animals belonging to phylum-Mollusca are divided into head, muscular foot and visceral hump

473 **(a)**
The aquatic larva of mosquitoes is termed as wriggler as it swims actively in water by wriggling movements.

474 **(a)**
The metamorphosis of frog is controlled by the thyroid hormones that contains **iodine** element. Thus, addition of I_2 element in water speeds up the metamorphosis in frog tadpole.

475 **(d)**
Phylum-Coelenterates, echinoderms and ctenophores are the only phylum which exhibits radial symmetry. However, one must remember that Echinoderms look like radially symmetrical but their original symmetry is bilateral

476 **(d)**
Ancylostomiasis is the condition of infection by *Ancylostoma* hookworms. Humans, who have become infected will show symptoms of intestinal bleeding, abdominal pains, anaemia, severe diarrhoea and malnutrition.

477 **(c)**
Cnidoblasts, stinging cells are unique cells of the phylum-Cnidria. Functions of cnidoblast cells are offence, defence and food capturing.

478 **(a)**
In *Hydra*, the exchange of oxygen and carbon dioxide and the excertion of waste nitrogeneous matter (**chiefly ammonia**) occur directly by diffusion through cell membrane to outside.

479 **(b)**
All existing species of Echinodermata are marine.

480 **(c)**
The correct order of the phyla is Ctenophora, Platyhelminthes, Aschelminthess, Annelida, Arthropoda and Chordata

481 **(d)**
Superposition image formation normally does not take place in cockroach owing to noncontractile pigment sheath separating ommatidia.

482 **(a)**
Enterocoelomate means the members having coelom, in which embryonic stage has communication with the archenteron. It is called enterocoel.

484 **(d)**
All phyla from Porifera to Echinodermata, including phylum-Arthropoda are non-chordates, *i.e.*, lacking notochord

485 **(a)**
Myogenic heart has contraction initiated by a special node of modified heart muscles called sino-atrial node (SA node), *e.g.,* the heart of vertebrates, tunicates and molluscs.

486 **(b)**
Earthworm has a straight alimentary canal representing a tube within tube plan. Wall of stomach contains calciferous glands, the secretion of which neutralized the acidity of soil or humus. Typhlosole is a highly glandular vascular longitudinal ridge increasing the area for absorption of digested food.

487 **(b)**
The nervous system of leech consisting of ventral-central nervous system, peripheral nervous system and sympathetic nervous system.

488 **(c)**

Notochord is derived from mesoderm and formed on the dorsal side, during embryonic development

489 **(b)**
In some birds, a synsacrum is formed by fusion of posterior thoracic lumbar, sacral and anterior caudal vertebrae.

490 **(b)**
Tube-within-tube is a body plan in which two tubes are present, an outer body wall and an inner digestive tract. The body cavity between the two tubes is filled with a fluid. All animals from phylum-Platyhelminthes to Chordates have tube-within-tube body plan and may be either protostomous or deuterostomous

491 **(a)**
WBCs are colourless, nucleated and mostly amoeboid cells of at least five types in amphibia (frog).

492 **(d)**
Homeothermic are the animals having a nearly uniform or constant body temperature. These animals are known as warm blooded animals, *e.g.,* birds, man.

493 **(b)**
Breast bone is known as sternum. It is absent in snakes.

494 **(a)**
Sea fan (*Gorgonia*) belongs to phylum-Coelenterata.

495 **(a)**
Choanocytes (collar cells) are cells with single flagella generating current by which **sponges** draw water through their ostia and capture food particles.

496 **(b)**
Class-Amphibia and class-Reptilia share the following features. Presence of tympanum is seen in both classes, which represents the ear. Animals of both classes are cold-blooded or poikilotherms and usually have a three-chambered heart with the exception of a crocodile

497 **(b)**
Fishes (super class-Pisces) have two chambered heart (one auricle and one ventricle), with very well developed sinus venous and conus arteriosus. However lung fishes have three chambered heart (two auricles and one ventricle).

498 **(b)**
Pristis (sawfish), *Scoliodon* (dogfish), *Trygon, carcharodon* (great white shark) are (cartilaginous) fishes while *myxine* (hagfish), *Petromyzon* (lamprey) are bioless fishes

499 **(c)**
Flame cells are excretory organ of Platyhelminthes. The excretory organ of *Ascaris* is protonephridia.

500 **(b)**
Amphibians (*i.e., Rana*) show the formation of middle ear for the first time.

501 **(d)**
Batrachotoxin is produced by arrow frogs of genus-*Dendrobates*. It is the most powerful nerve poison produced by vertebrates

502 **(c)**
Presence of three pairs of jointed legs is the characteristics feature of class-Insecta of phylum-Arthropoda.

503 **(c)**
Asymmetry n gastropods is due to torsion a characteristic feature that distinguish gastropod from other molluscs.

504 **(c)**
Water vascular system is characteristic of phylum-Echinodermata. Tracheal system, gills, book gills and book lungs are all organs of respiration in animals belonging to phylum-Arthropoda

505 **(d)**
Petromyzon is the jawless vertebrate. It is also known as sea lamprey.

507 **(d)**
Invertebrates having open circulatory system are cockroach, prawn, silverfish, snail, leech, spiders, crabs, *Pila*, etc.

509 **(b)**
In frog, respiration take place through skin, lungs and bucco pharyngea. To perform cutaneous (skin) respiration the skin should be moist due to the presence of mucous secreting glands.

510 **(b)**
Phylum-Mollusca do not have metameric segmentation, they have a calcareous, exoskeleton with organ system level of organisation, but shows the presence of mantle cavity and coelomic cavity during development

511 **(a)**
Phylum-Echinodermata are triploblastic animals i.e., form three germ layers during embryonic

development. Phylum-Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Hemichordata and Chordata includes all triploblastic animals

512 **(c)**
Animals belonging to phylum-Porifera are mostly marine, few fresh water, all aquatic.

513 **(c)**
Skeleton of corals is composed of calcium carbonate. Siliceous spicules and calcareous spicules are present in phylum-Porifera

514 **(c)**
Only two types of symmetry are exhibited by animals, *i.e.*, rest of the animals are asymmetrical, *i.e.*, bilateral and radial

515 **(c)**
Naja hannah is the zoological name of king cobra *Naja naja* is commonly called the Indian cobra or Nag.
Bungarus coerulus - common krait, *Viper ruselli* – viper.

516 **(a)**
Radial symmetry is the characteristic feature of coelenterates and echinoderms. Section of these animals in two or more planes produces halves which are approximately mirror images of each other.
Bilateral symmetry occurs in most metazoans. These have only one plane in which they can be divided into two halves, which are mirror images of each other. In spherical symmetry, the body of the individual can be divided into similar halves by any plane passing through the centre. This type of symmetry is found in *Volvox*, a colonial green algae.

517 **(b)**
Madreporic canal joins the madreporite to the ring ambulacral vessle. Water vascular system is feature, found only in Echinoderms

518 **(c)**
Animals which excrete ammonia as a waste product are called ammonotelic animals and this phenomenon is called ammonotelism, *e.g.,* frog's tadpole, *Ascaris*, leech, etc.

519 **(b)**
Kangaroo are marsupials and *Echidna* is the egg laying mammals, which is placed in Prototheria sub-class of Mammalia.

520 **(c)**
Euplectella is one of the most beautiful glass sponges and commonly called venus flower basket.

521 **(a)**
Balenoptero (blue whale) and *Delphinus* (dolphin) are aquatic mammals.

522 **(b)**
Gambusia is a viviparous teleost fish which feeds on insect larvae, while *Exocoetus, Clarias* and *Labeo* are oviparous.

523 **(d)**
Animals of the phylum-Mollusca exhibit adaptation to various types of environmental conditions, such as aquatic, (both marine as well as freshwater), terrestrial and amphibious.

524 **(c)**
Nereis living in burrows in sand or mud often with clams. Scorpion are abundant in deserts. Cockroaches are found in warmth, dampness and plenty of organic food to devour. *Lepisma* (sliver fish) residing in damp coal places and feeding on starch of starchly matter.

525 **(b)**
Salamandra or the spotted salamander belongs to sub-class-Urodela

526 **(b)**
Chloragogen cells are analogous to liver of vertebrates because chloragogen cells and liver of vertebrates perform same function like glycogen synthesis, urea formation but structurally they are different from each other.

527 **(c)**
Chordates at some time in their life history, exhibit the following three characters:

1. Presence of notochord; notochord is a rod-like structure made up of chordal cells.
2. Presence of dorsal tubular nerve cord.
3. Presence of gill clefts during development.

528 **(b)**
Pedicellariae are small pincer like processes found on the body surfaces of certain echinoderms.

529 **(a)**
Tube feet are locomotory organs of echinoderms consisting of elongated outgrowths of the body wall, able to be protruded or retracted by alteration of fluid pressure in the water vascular

system. In starfish, they are arranged in rows in ambulacral groove.

530 **(c)**
The body of Mollusca is covered by a calcareous shell but the mantle is a soft and spongy layer of skin over the visceral hump

531 **(c)**
Earthworm (*Pheretima posthuma*) has segmented body. It belongs to phylum-Annelida.

532 **(b)**
The six-hooked embryo of *Taenia solium* is called hexacanth. Hexacanth along with all its membranes is called oncosphere. The oncospheres are passed out along with human stools, which is eaten up by the pig (secondary or intermediate host). Thus, oncospheres reach in the intestines of pigs and infect them.

533 **(d)**
Annelids are true coelomates

534 **(b)**
The blood of earthworm contains a red coloured respiratory pigment haemoglobin. It is found in dissolved state in the plasma.

535 **(c)**
Sterna macrura is the Arctic Term. It is a migratory bird that travels 40,000 km from one pole to the other, annually

537 **(a)**
Earthworm, *Pheretima posthuma* is a monoecious (hermaphrodite) animal but in them cross-fertilization takes place, male reproductive organs mature prior to female reproductive organ. This situation is known as protandry.

538 **(a)**
In *Taenia saginata*, scolex is small and rounded like a pin head. It has no rostellum and hooks. Scolex of *T. solium* is with rostellum and armed with hooks.

539 **(c)**
Sepia or cuttle fish is a mollusc, which possesses ink gland. This gland produces ink, which is released to form a small cloud for escaping from the enemy.

540 **(b)**
Ascaris is monogenetic parasite with no intermediate host.

541 **(c)**
Larva of *Ascaris* first inter the host intestine and reaches the liver through portal system and lymph channel, now its reaches to heart and then to lungs. In **lungs**, larva settle down in capillaries of alveoli for sometime and undergoes two moulting one after the other.

542 **(d)**
Cnidocytes or stinging cells are spherical or oval cells found in entire epidermis except that of basal disc and are found only in cnidarians. Archaeocytes, trophocytes and myocytes are found in sponges.

543 **(c)**
Spongilla belongs to phylum-Porfera, in which, choanocytes are the characteristic cells, these are absent in leech, dolphin and penguin.

544 **(c)**
In *Pheretima posthuma*, the dorsal blood vessel is considered as dorsal tubular heart. This blood vessel is a collecting blood vessel behind 13th segment, while in initial 13 segment, it works as the distributing vessel. The blood flows in it from backward to forward.

545 **(a)**
Bat belongs to order - Chiroptera, class - Mammalia.

546 **(b)**
Tylototriton verrucosus or Indian salamander, belongs to order-Urodela.

547 **(d)**
Class – **Oligochaeta** includes terrestrial earthworms and some other species that live in freshwater. Aquatic oligochaetes excrete ammonia, while terrestrial oligochates excrete urea but *Lumbricus* produces both ammonia and urea.

548 **(b)**
Notochord is a mesodermally derived rod-like structure formed on the dorsal side during embryonic development in some animals

549 **(b)**
Arachnids have book lungs as respiratory organs.

550 **(a)**
Termite is a harmful social insect as it destroys wood, paper, leather, clothes and even the plant bodies or crops in the fields. *Bombyx mori* (produces silk), *Tachardia lacca* (produces lac) and *Apis indica* (mainly produces honey and wax) are useful or beneficial insects.

551 **(a)**
In scorpion and spiders, the respiratory organs are **book lungs**.

552 **(d)**

Spermathecae or receptacula seminales are present ventro-laterally, one pair in each segments of 6, 7, 8 and 9 in earthworm. Spermathecae receive sperms from another worm during copulation and store them in their diverticula in *Pheretims* a and in ampullae in other earthworm.

553 **(c)**
The laying down of bones in bony vertebrates is preceded by the presence of **cartilage**.

554 **(d)**
The nerve net of *Hydra* lacks directions in impulse. Never net of *Hydra* is unpolarized so that impulses can pass in all directions (diffuse transmission).

555 **(a)**
Spider is a common arachnid which secretes webs. Spinnerets (spinning argon) produce silken threads for construction of spider web to trap insects. Spider web is formed by a fluid secreted by its **abdominal glands**.

556 **(c)**
Dugesia or *Planaria* is a free living Platyhelminthes, *Pheretima* is earthworm and *Nereis* are both non-parasitic animals. *Fasciola, Taenia* and *Ancylostoma* are all parasitic

557 **(c)**
Bones of Aves (*e.g.,* pigeon) are pneumatic. Pneumatic bones contain air cavities to reduce weight. Pneumatic bones help in aerial mode of life.

558 **(d)**
Maximum life span of dog is 20 years.

559 **(c)**
Amnion is an extra-embryonic membrane that surrounds embryo. The animals which lack amnion are known as anamniotes, *e.g.,* fishes, amphibians. In the amniota group, we have all animals which have extra-embryonic membranes like reptiles, birds and mammals.

560 **(b)**
Animals belonging to class-Chondrichthyes and Osteichthyes have 10 pairs of cranial nerves and absence of neck. Chondrichthyes have a cartilaginous endoskeleton, placoid scales, opisthonephc kidneys and two-chambered heart. Class-Osteichthyes have two chambered heart, optisthonephric kidneys, ctenoid scales and a bony endoskeleton

561 **(b)**
Medusa is the reproductive organ found in *Aurelia* (jelly fish).

562 **(d)**
Teeth of rabbits are:
1.Thecodont; having deep rooted teeth in bony socket as in other mammals.

2.Diphyodont; having two sets of teeth in life time, temporary and permanent teeth as in other mammals.

3.Heterodont; having different types of teeth, *e.g.,* incisors, canines, premolars, molars, *e.g.,* mammals.

563 **(c)**
In annelids like *Nereis*, earthworm, leech, etc, the tubular coiled structures called **nephridia** are excretory organs. In phylum-Arthropoda, insects centipedes, millipedes and arachnides possess Malpighian tubules as their principal excretory organ.

564 **(b)**
Aschelminthes are bilateral symmetrical and triploblastic animals, *e.g., Ascaris*.
Coelenterates are radially symmetrical and diploblastic animals, *e.g., Obelia*.
Ctenophores are biradial symmetrical and diploblastic animals, *e.g., Ctenoplana*.
Sponges are asymmetrical or radially symmetrical and diploblastic animals, *e.g., Sycon.*

565 **(b)**
Caecilians are in order of amphibians that superficially resemble earthworms or snakes. Some caecilians are ovoviviparous which means that the eggs hatch inside the mother and the young live in her until maturity, *e.g., Typhlonectus*. *Typhlonectus* is a fully aquatic caecilian found only in south America.

567 **(a)**
In frog, cloaca is the common chamber for urinary tract, reproductive tract and alimentary canal.

568 **(c)**
Pectin is found in all birds except kiwi. It is a comb-like structure found in the eyes near blindspot and helps in accommodation and nutrition of eye ball.

569 **(d)**
Hydra is carnivorous and feeds upon small animals specially some crustaceans, *e.g., Cyclops, Daphnia.*

570 **(b)**
The skin of **reptiles** is dry, cornified and devoid of glands.

571 **(c)**
Metagenesis is seen in those forms of phylum-Coelenterata that exist in both body forms, *i.e.*, polyp and medusa. Polyps produce through asexual reproduction and medusa also arise through budding form polyps. These are meant for sexual reproduction in *Obelia*, Metagenesis is alternation of generation

572 **(d)**
Aphrodite, a marine polychaete, which is commonly called 'sea mouse', belongs to phylum-Annelida.

573 **(c)**
Arms are absent in the class-Echinoidea (*e.g.,* sea urchins and sand dollars) and holothuroidea (*e.g.,* sea cucumbers).

574 **(b)**
Integumentary nephridia are scattered on the entire inner surface of body wall in all the segments except first two. These are **exonephric**.

575 **(b)**
Hydra belongs to phylum-Coelenterata.

576 **(a)**
Scorpion and ticks belongs to Arachnida **class of phylum**-Arthropoda.

577 **(c)**
Ventral nerve cord possess segmental ganglia. It is common in earthworm, leech and centipede.

578 **(c)**
Haemocoel is a cavity formed by combination of many sinuses and filled with haemolymph, in which the viscera are embedded. This type of body cavity *ie,* haemocoel is present in members of phylum-Arthropoda (like cockroach) and phylum-Mollusca (like *Pila*).

579 **(d)**
In mammals, dentition is of heterodont type. In heterodont, more than one type of teeth are present, like in humans four type of teeth (incisor, canine, premolar and molar) occur.

580 **(c)**
Struthio camelus (true ostrich) is known as flightless bird. It belongs to order-Struthionifirmes, sub-class-Neornithes of class-Aves.

581 **(b)**
Animals of both phylum-Aschelminthes and phylum-Platyhelminthes show bilateral symmetry and are triploblastic, however they greatly differ in their shape of the body. Platyhelminthes are dorsoventrally flattened, while animals of phylum-Aschelminthes are circular in a cross-section of their body

582 **(b)**
'Pisces' is the largest class of vertebrates in number of species. There are about 40,000 species in super class-Pisces including about 25,000 species of the class-Osteichthyes (the freshwater and marine bony fishes).

583 **(c)**
Ostia are the minute pores on the body, through which water enters the central cavity (called the spongocoel) and water exits the spongocoel through the osculum

584 **(a)**
Salamandra (salamander) is a member of class-Amphibia. A *tympanum* represents the ear and fertilisation is external *Ascaris* lacks segmented body, *Pteropus* is viviparous, *Aurelia* have tissue level of organisation

585 **(a)**
Setae are S-shaped rod-like, chitinous structures.

586 **(b)**
In female rats, the urinary and genital apertures are separate but open into vulva through a vaginal orifice (copulatory organ of female rat).

587 **(b)**
Lepisma (silver fish) belongs to class-Insecta.

588 **(b)**

Male Cockroach	Female Cockroach
Body is relatively smaller and more flattened.	Body is relatively larger and thicker.
Abdomen has 9 distinct segments.	Abdomen has only 7 distinct segments.
Hind end of abdomen is somewhat pointed.	Hind end of abdomen is blunt and boat-shaped.
Seventh sternite is undivided.	Seventh sternite is divided.
A pair of anal styles are articulated with 9th abdominal sternite.	**Anal styles are absent**.
Wings are relatively larger; extend	Wings are smaller; extend only up to hind end of body.

somewhat beyond hind end of body.	

589 **(b)**
Gemmules are internal buds containing archaeocytes and are concerned with asexual reproduction in all freshwater sponges and a few marine sponges.

590 **(b)**
Drones are fertile males in a colony of social bees, *i.e.,* honeybee (*Apis* sp). The function of drones is to fertilize the queen of their own or some other colony and they die after mating with the queen bee, as the male reproductive organ explode within the female.

591 **(a)**
Spiders belong to the order-Araneae of class-Arachnida. They have the **coxal glands** as excretory organ.

592 **(b)**
In Aschelminthes (Nemathelminthes), the space between body wall and the alimentary canal represents pseudocoelom because, it is not lined by mesoderm.

593 **(c)**
Ambystoma or the tiger salamander is a urodele and chthyophis belongs to sub-class-Apoda

594 **(b)**
Spermathecae are used to store sperms after copulation.

595 **(d)**
A *Protopterus* is also called as the African lung fish. It breathe through its lungs *via* its mouth. Its paired fins are used as legs to walk in shallow water. It is a carnivore and exhibits cannabilism as protopterus lay eggs. During birth to young one is a characteristic features of mammals

596 **(c)**
All mammals have heterodont teeth and 12 pairs of cranial nerves.

597 **(c)**
Aptenodytes (penguin) is a flightless aquatic bird occurs in flocks in the Antarctic region and some island of South Africa.

598 **(c)**
Head of the cockroach is formed by the fusion of six segments and is covered by six sclerities. The six sclerites that cover the head are two epicranial plates (separated by a Y-shaped suture line called **vertex**), one frons, one clypeus and two genae.

599 **(c)**
Protandry and protogyny is present in bisexual animals, when testes and ovaries do not mature, simultaneously it ensures cross-fertilisation

600 **(a)**
House fly and mosquitoes show complete (holometabolus) metamorphosis. Complete metamorphosis has four stages-egg, larva, pupa and adult.

601 **(d)**
Tachardia is the herbivorous insect that has piercing and sucking type of mouth parts.

602 **(a)**
Trichocysts are sac-like defence organelles in the ectoplasm of *Paramecium*; these discharge straight, tapering rods, which might spear a naked intruder. Nematocysts are large, centrally located sac-like organelles in the cnidocytes of *Hydra* and are filled with poisonous 'hypnotoxin'.

603 **(a)**
Upon metamorphosis, amphibian tadpoles lose there tail through programmed cell death induced by thyroid hormone (T_3). Before transformation, the tail functions as an essential locomotory organ.

604 **(a)**
Ecdysone or prothoracic gland hormone is secreted from prothoracic gland in insects ecdysone controls moulting of nymph.

605 **(a)**
Ascaris never performs locomotion.

606 **(c)**
Salamander can regenerate its tail, limbs and external gills.

607 **(d)**
A condition that is connected with both internal and external structures is true segmentation or metamerism. It first appears in phylum-Annelida

608 **(c)**
Pectoral girdle (shoulder girdle) composed of two similar halves. Which are united midventrally but sparated dorsally. Each half is made up of supra scapula (a calcified cartilage), scapula, coracoids, precoracoid, epicoracoid and paraglenoid cartilage. Posteriorly, scapula forms a deep cup like depressing the **glenoid cavity**.

609 **(c)**
The hard palate is formed from premaxilla, maxilla and palatine bone.

610 **(c)**

In earthworm, pharyngeal wall possesses salivary gland.

611 **(c)**
Mandibles are absent in the mouth parts of housefly. The mouth parts of housefly are sponging type not biting type.

612 **(b)**
Platyhelminthes have an incomplete digestive system but the digestive system is complete in Aschelminthes or roundworms

613 **(c)**
Metamorphosis is a marked structural change that allows the conversion of larva into adult.

614 **(b)**
Typhlosole is a highly glandular, vascular, longitudinal ridge, increasing the area for absorption of digested food.

615 **(d)**
Eggs of cockroach are centrolecithal. In **centrolecithal** eggs, the yolk is localized at the centre.

616 **(b)**
Maxillary palps are 3-segmented and club-shaped in male *Anopheles*, whereas 5-segmented in females *Anopheles*.

617 **(d)**
In radial symmetry, body is in the form of a flat or tall cylinder. Body can be divided into similar halves by more than two planes passing through one main axis. Radial symmetry is found is some sponges and in the *Hydra*s, jellyfish, sea urchins.

618 **(b)**
Cliona is a boring spong, belongs to class-Desmospongiae. *Euplectella* or venus flower basket and *Hyalonema* both being to class-Hexatinellida

619 **(b)**
Flatworms (Platyhelminthes) and roundworms (Aschelminthes) both possess triploblastic body, bilateral symmetry and metamorphosis in the life history. But flat worms differ from all roundworms in having solid mesoderm. The mesodermally derived tissue includes a loose tissue called parenchyma and this tissue includes fills the body space, *i.e.,* space between the body wall and more specialized tissue or organs.

620 **(d)**
The midbrain has two pair of optic tobes called corpora quadrigemina. **Corpora quadrigemina** is related to vision activity.

621 **(b)**
Phylum-Porifera have choanocyte cells but nematocyst is present in cnidoblasts cells and seen in animals that belong to phylum-Coelenterata. All ctenophora's exhibit radial symmetry. *Wuchereria* belongs to phylum-Aschelminthes but *Meandrina* (also called brain coral) belongs to phylum-Coelenterata

622 **(a)**
The main characterstics of class-Crustacea and Insecta are as follows :

Crustacea	Insect
Two pairs of antennae	One pair of antennae
Chitinous cuticle and jointed foot	Two-chitinous cuticle and jointed foot
Prawn, crab	Cockroach, grasshopper

623 **(c)**
Pearl are produced by the animals of phylum Molluca. A pearl is a result of an injury to molluscs. It is secreted by the mantle as a means of protection against some foreign body. Pearl is obtained from *Pinctada vulgaris*.

625 **(d)**
The blood sucking habit is known as **sanguivorous**. It is found in *Hirudinaria* (Indian cattle leech).

626 **(d)**
Spiders belong to class-Arachnida

627 **(c)**
Poikilothermy (cold bloodedness) is a condition of any animal whose body temperature fluctuates considerably with that of its environment.

628 **(d)**
In rat, left lung is smaller and single lobed, while right lung is larger and 3 lobed (it is actually 4 lobed with median and post caval lobe being region through, which post caval passes). The three lobes are anterior, posterior and middle.

629 **(c)**
Osphradium is a sense organ in mollusc which acts as chemoreceptor. It is present at the base of gills, on the ventral surface of posterior adductor muscle. Osphradium is used to test physical and chemical qualities of food.

630 **(a)**

Birds have pneumatic bones, lungs with air sacs and embryonic membranes (*i.e.,* amnion, chorion, yolk sac and allantois).

631 **(a)**
In the intestine of human, the protective covering of ingested eggs are digested and 0.25 to 0.3 mm long juveniles become free in intestine lumen.

632 **(c)**
Statement I and II are true for *Wuchereria* and statements III and IV are false. In *Wuchereria* as for all animals belonging to phylum-Aschelminthes females are longer than males and they have an organ-system level of organisation

633 **(b)**
Holozoic nutrition is the ingestion of food in solid or liquid form.

634 **(d)**
In open type of circulatory system cells and tissues are directly bathed in the blood which is pumped out of the heart. There are no arteries, veins capillaries as found in closed circulatory system

635 **(b)**
In annelids, alimentary canal is straight with anterior mouth and posterior anus. Due to spacious, fluid filled body cavity between body wall and alimentary canal, the body appears like a tube within a tube in section.

636 **(b)**
Spermatheca possess four pairs of flask shaped sac. Each sac possess diverticulum, which is meant for storage of sperm and large ampulla for their nourishment.

637 **(b)**
Hydra shows a central cavity or coelenteron, which is functionally referred as gastrovascular cavity.

638 **(d)**
Complete metamorphosis is found in *Musca*.

639 **(a)**
Periplaneta americana has thermoreceptor sensillae on 1st, 2nd and 3rd segments of tarsus of legs.

640 **(c)**
The excretory system in Annelida consists of nephridia. Flame cells are part of the excretory system of animals belonging to phylum-Platyhelminthes

641 **(c)**
The cells performing the same function are arranged in tussues, thus called as tissue level of organisation

642 **(c)**
Tentaculata and Nuda are the two classes of phylum-Ctenophora. Tentaculata shows the presence of tentacles and nuda lacks tentacles

643 **(b)**
Medusa is the reproductive structure found in *Aurelia* (jelly fish)

644 **(a)**
Ichthyophis belongs to order-Gymnophiona, sub-class-Lissamphibia, class-Amphibia of phylum-Chordata. The member of this order are limbless, blind, elongated worm like, burrowing tropical forms and are known as caecilians or blind worms.

645 **(d)**
Platyhelminthes has a single opening within the body that serves as both mouth and anus

646 **(a)**
Ammonotelic animals excrete ammonia, *e.g.,* aquatic invertebrates, bony fishes, tailed amphibians and aquatic reptiles.

647 **(a)**
Gizzard is a muscular compartment of the alimentary canal, that is specialized for breaking up of food. In earthworm, it is the main grinding organ of alimentary canal and occupies most of the part of 9th segment. Its wall is very thick and hard due to a very thick circular muscle layer. Internally, it is lined by the cuticle.

648 **(d)**
Genital pouch of male cockroach lies at the hind end of abdomen bounded dorsally by 9th and 10th terga and ventrally by 9th sternum.

649 **(b)**
Hibernation is the inactive stage during winter or the dormancy during winter. It is known as winter sleep. During hibernation lung breathing is stopped while skin breathing continues which suffice the need of oxygen.

650 **(b)**
Conglobate gland or phallic gland is found ventrally beneath to utricular gland in the sixth abdominal segment of male cockroach. It is an accessary gland which secretes a alkaline fluid which forms covering of spermatophores during copulation.

651 **(b)**

Pearl is an 'inside out' tiny shell, which is secreted by a bivalve mollusc belonging to the genus-*Pinctada* (*P. vulgaris*).

652 **(d)**
Penguin and ostrich are not mammals, while whale, bat kangaroo, hippopotamus are mammals.

653 **(c)**
Aves is the first class to show completely four-chambered heart

654 **(d)**
Amphibian, Reptilia and Aves show oval-biconvex nucleated erythrocytes. Mammalia have circular biconcave-denucleated erythrocytes

655 **(c)**
Each medusa of *Obelia* bears four gonads situated on the sub-umbrellar surface, one each in the middle of each radial canal.

656 **(b)**
Corpus callosum is a neural connection between two cerebral hemispheres of mammals.

657 **(d)**
Class-Mammalia is divided into sub-class-Theria and Prototheria. Eutheria and Metatheria are infraclass under sub-class-Theria. *Hemiechinus* is the generic name for hedge hog. *Macropus* is the generic name for kangaroo and *Ornithorhynchus* is the generic name for duck-bill platypus

658 **(a)**
Robust botflies, *Dermatobia hominis*, also called the 'berne' 'nuche' or 'forcel' infect cattle, dogs, cats, sheep, rabbit and other animals including man.

659 **(c)**
In the frog is heart, the pace maker is the sinus venosus, an enlarged region between the vena cava and the right atrium. The mammalian SA noade is believed to be an evolutionary remnant of the sinus venosus.

660 **(d)**
In *Balanoglossus* and *Saccoglossus* (Phylum-Hemichordata), excretory organ is proboscis gland.

661 **(c)**
In Arthropoda, ventral nerve cord run along the mid ventral line of the abdomen and in Annelida the ventral nerve cord arises from the sub-pharyngeal ganglia and runs backwards in the mid ventral line to the posterior end of the body.

662 **(d)**
Nematocyst is filled with a poisonous fluid called **hypnotoxin**, which is a mixture of proteins and phenols. Nematocyst is a definite response of *Hydra* for offence, defence, food capture, anchorage and locomotion.

663 **(c)**
Asexual reproduction in sponges takes place by fragmentation, while the sexual reproduction takes place by formation of gametes

664 **(c)**
Coprophagy is the condition (process) when the animal eats its own faecal matter as in rabbits

665 **(a)**
Roundworms (phylum-Aschelminthes) are pseudocoelomates, false coelom is drived from embryonic blastocoel. Flatworms (phylum-Platyhelminthes) are acoelomate animals.

666 **(c)**
In *Pheretima*, lymph glands are present on both sides of dorsal blood vessel from segment 26th and those behind it.

667 **(b)**
The young ones of cockroach are structurally quite like the adults except that these are very small, light coloured and wingless and possess incompletely developed reproductive organs, hence these are called **nymphs**.

668 **(a)**
Discoidal placenta is a character of rat and rabbit. In discoidal placenta villi are strong and form disc like structure.

669 **(b)**
Body cavity of *Hydra* is called **coelenteron**, which serves the purpose of digestion and circulation.

670 **(c)**
Silverfish, scorpion, dragon fly and prawn all belongs to phylum-Arthropoda. Jointed appendages and chitinous exoskeleton are the characteristic features of this phylum.

672 **(b)**
Mucous glands are present in the skin of frog, which secrete mucus that makes the frog's skin slippery and moist and help in cutaneous respiration, *i.e.,* gaseous exchange occurs through skin.

673 **(c)**
Sponges have canal system. Body of sponge is perforated in such a way that it produces a canal system made up of osculum, ostia and gastrovascular cavity. Specialized collar cells are

present in sponges. Beating of flagella of collar cells produce a water current, through which these obtain nutrition, respiration, etc.

674 **(a)**
Fasciola hepatica is a dignetic termatode. It spends its life cycle in two hosts. Sheep (primary host) and the invertebrate host (intermediate host) snail. They have an alternation of generation in their life cycle. This means the egg hatches into a larval form, this larval form reproduces asexually to produce numerous copies of itself. Eventually, these copies change into another larval form, which in time grows into a sexually reproducing adult. This possession of an asexual generation, means that a single egg can produce not just one infectious agent, but may be even tens or hundreds or thousands.

675 **(b)**
Pancreas are absent in cyclostomates, a class of Agnatha.

676 **(c)**
Nematocysts are stinging cells that have a long thread like tube that may either coil around a prey and inject a toxin called hypnotoxin

677 **(b)**
Circulatory system of cockroach is open or lacunar type. Tubular heart of cockroach is situated in pericardial sinus over the dorsal diaphragm. It is longitudinally beaded with 13 chambers perforated by ostia having valves.

678 **(d)**
Presence of hepatic portal system is the characteristic of chordates.

679 **(d)**
In earthworm, in each body segments, except the first, last and clitellum, there are rows of S-shaped setae, embedded in the epidermal pits in the middle of each segments. Their principle role is in locomotion.

680 **(d)**
Canal system in Porifera is concerned with all respiration, nutrition and sexual reproduction.

681 **(b)**
Preen glands are present at the base of tail and seretes oil to keep feathers water proof.

682 **(c)**
Trilobiles are fossil records of Arthropods that are over 600 million yrs old

683 **(c)**
Crossopterygian are called lobed fined fishes. *Neoceratodus* (order-Dipnoi) is a crossopterygian fish. It is found in Burnett and Mary rivers of Queen's land, Australia.

684 **(a)**
Aquatic annelids like *Nereis* possess lateral appendages, parapodia, which help in swimming. In molluscs, the mouth contains a file-like rasping organ for fedding called, radula. Gills present in mantle cavity have respiratory and excretory functions.

686 **(c)**
In snakes, post anal tail is found.

687 **(d)**
Neurons in earthworm are motor, sensory and adjustor (association neurons).

688 **(d)**
Only animals belonging to the phylum-Aschelminthes are pseudocoelomates. Animals belonging to the phylum-Platyhelminthes are acoelomates, while Arthropoda and Mollusca are coelomates

689 **(d)**
Choanocytes or collar cells are flagellated cells characteristic of the phylum-Porifera

690 **(d)**
Heart of cockroach is a pulsatile 13-chambered structure. It is present below the tergal plates middorsaly in the thorax and abdomen. Its inhalant openings are called ostia, which are guarded by valves. This heart is infact, the dorsal blood vessel, which pulsates with the help of external alary muscles. The blood in heart flow uniderectionally from posterior end to the anterior end of the body.

691 **(b)**
Heterometrus is a terrestrial arthropod. Its prosoma bears a pair of chelicerae, a pair of padipalps and four pairs of walking legs.

692 **(c)**
Planaria and *hydra* both possess regenerative capacity

694 **(c)**
Metamorphosis is a marked structural change that allows the conversion of larva into adult.

696 **(d)**
Aves lack teeth but have oil glands called preen glands present in their tail. They have a crop and a gizzard which aids in digestion Bones have air

cavities that leads to reduce weight of the bird and makes flight possible among birds

697 **(c)**
The common species of cockroach found in India is Oriental cockroach (*Blatta orientalis*).

698 **(b)**
Cyclops belongs to class-Crustacea of phylum-Arthropoda.

699 **(c)**
A glandular band called clitellum surrounds 14, 15, 16 segments.

700 **(d)**
Tissue level organisation is seen in phylum-Coelenterata and Ctenophora

701 **(c)**
Lung fishes have discontinuous disrlbution.

702 **(c)**
Excretory system in phylum-Porifera is ammoniotelic, as they excrete out ammonia

703 **(b)**
Soft and naked body of earthworm (*Pheretima posthuma*) is divided into 100-120 similar segments called **metameres** or **somites**.

704 **(d)**
Arthropoda is the largest phylum. Arthropoda are characterized by the following features-bilateral symmetrical body, triploblastic and metamerically segmented, jointed, appendages open circulatory system etc.

705 **(d)**
The respiration in prawn takes place by gills. There are 8 gills inside each gill chamber.

706 **(d)**
Annelids have a central **ventral** nerve cord.

707 **(b)**
Class-Crustacea includes *Daphnia*, crab, prawn, lobster, crab, shrimp and others. Millipede or *Julus* belongs to class-Diplopoda and centipede or scolopendra belongs to class-Chiliopoda

708 **(d)**
In Urochordata, the notochord is present only in larval tail, while in Cephalochordata notochord is present throughout life

709 **(c)**
Ascaris do not show thigmotaxis.

710 **(a)**
In a copulating pair of earthworm, cross-fertilization and external fertilization takes place.

711 **(c)**
Phylum-Arthropoda is the first largest, having most successful invertebrates in terms of number of species (about 900,000). Phylum-Mollusca is the second largest containing more then 100,000 species and probably the most sophisticated in all invertebrates.

712 **(c)**
Deuterostomia are animals, in which clastopore of gastrula becomes the anus of the adult, *e.g.,* Echinodermata and Chordata. Coelom forms by outpocketing or as an outgrowth of gut, *i.e.,* enterocoelous.

713 **(c)**
Caecilian worms are burrowing, limbless, tropical amphibians and worm like appearance belong to the family-Caecillidae, forming the amphibian order-Apoda (or Caecilia or Gymnophiona). These have a grooved skin that gives them a segmented appearance, small eyes, which are weak or blind and have no trace of limbs or pelvis.

714 **(b)**
The phylum-Arthropoda is characrterised by the jointed appendages and chitinous exoskeleton.

715 **(d)**
Snakes lack limbs, hence both pelvic and pectoral girdles are missing. Urinary bladder and the sternum bone are also missing

716 **(b)**
Spirulina is a cyanobacteria and does not belong to phylum-Porifera

717 **(b)**
Tube-feet are the locomotory organs of echinoderms. These are sac-like protrusions of the body wall, used for locomotion, feeding and respiration.

718 **(c)**
Mammals have 12 pairs of cranial nerves.

719 **(b)**
Suboesophageal ganglia is related to the mandibular, maxillary and labial nerves. It is the principal motor centre in cockroach.

720 **(a)**
The excretory system of *Taenia solium* consists of lateral longitudinal canals, secondary canals, capillaries and **flame cells**.

721 **(d)**
A pair of ovary present in 2nd to 6th abdominal segment of cockroach. Each ovary is made up of 8 ovariole, which are full of developing eggs. Thus, 16 eggs are arranged in a linear manner.

722 **(a)**
Caterpillar of silk worm possesses a dorsal horn on the 8th segment of thorax.

723 **(a)**
In *Hydra*, reproduction occurs in favourable conditions by **budding**.

724 **(d)**
A-*Rana* or frog and D-*Salamandra* or salamander, these belong to class-Amphibians

726 **(d)**
The water vascular system in Echinoderms, helps in locomotion together with the tube feet. Echinoderms have an **endoskeleton** made of **calcareous plates** and spines

727 **(a)**
Planaria (*Dugesia*) has remarkable power of regeneration. If an individual is cut transversely into two parts, the anterior fragment will regenerate a new tail and a posterior piece will develop a new head.

728 **(a)**
Velliger larva is found in phylum-Mollusca.

729 **(d)**
Tadpole's tail is a locomotory organ.

730 **(b)**
Arthropoda is the largest phylum of animal kingdom. In respect of number of species (about 9, 00,000).

731 **(c)**
The caterpillar larvae of silkmoth (*Bombyx mori*) are voracious feeder, so they have the continuous supply of food. Each caterpillar larvae has a mandibulate (biting and chewing) type of mouthparts adapted to feed easily on mulberry leaves, while adult has siphoning type of mouthparts. Commercial silk is obtained from the cocoons of *Bombyx mori.*

732 **(b)**
Mollusca bear organ system level of organization Platyhelminths are acoelomate. Ctenophora have radial symmetry. Arthropodrs are true coelomates

733 **(d)**
Pheromones are the chemicals, which when released by an animal in its surrounding, affect the behavior and development of other individuals of the same species and act as a chemical messenger among them. These are meant for sexual attraction, recognition of area and individuals, alarming and communication, aggressiveness, etc but not for a defence mechanism of prey to avoid predator.

734 **(d)**
Leg of cockroach is five segmented. The correct sequenve of arrangements of segments from base are **coxa, trochanter, femur, tibia** and **tarsus**.

735 **(a)**
The smooth muscles found in iris, regulate the amount of light entering the eye ball by varying the size of the pupil.

736 **(c)**
Octopus (devil fish) is a mollusc, belonging to class-Cephalopoda.

737 **(b)**
The members of class-Chondrichthyes are marine animals with streamline body and have cartilaginous endoskeleton.

738 **(a)**
Athick and strong chitinous cuticle covers the whole body of cockroach (*Periplaneta*) as exoskeleton.

739 **(c)**
In *Pheretima*, accessory glands help in binding the worms during copulation.

740 **(c)**
Duck-billed platypus (*Ornithorhynchus anatinus*) is a semi-aquatic prototherian found in Australia and Tasmania. In these, the females lay eggs yet produce milk and possess mammary glands without teats. Milk collects in two abdominal grooves from where the young ones obtain it through lapping.

741 **(c)**
Taenia solium stores food mainly in the form of glycogen. Glycogen content of *T. solium* by net weight is 2.17 per cent.

742 **(d)**
Animals belonging to class-Chondrichthyes are so called because of the presence of cartilaginous endoskeleton. They lack air bladder thus, swim constantly and have placoid scales, notochord is persistant through out the life

743 **(b)**
Pouched mammals have abdominal pouch or marsupium in which young ones live for some times, *e.g.,* **Metatherians**, like kangaroo.

744 **(a)**
Ascaris lumbricoides is a common intestinal parasite of man.

745 **(a)**

Garden lizard—*Calotes*

House lizard—*Hemidactylus*

746 **(a)**
The dark brown colour of skin of earthworm is due to the pigment porphyrin, which comes from chlorophyll in the decaying vegetable matter on which the earthworm feeds.

747 **(d)**
Animals belonging to class-Crustacea breathe through the body surface or gills and excretion takes place through autumnale gland

748 **(b)**
Hydra reproduces asexually by exogenous budding, a type of vegetative propagation and sexually by formation of gametes. *Hydra* reproduces by budding, when plenty of food is available.

749 **(d)**
Except snail, all three are used in organic farming.
Glomus – Endomycorrhiza
Oscillatoria – BGA
Earthworm - Vermicompost

750 **(b)**
Cnidarians are among those very few animals, which show the phenomenon of polymorphism, *i.e.,* occurrence of more than one type of individuals in the same species.

751 **(a)**
In class-Hirudinea, coelom is greatly reduced by the formation of peculiar connective tissue called botryoidal tissue. It is excretory in function.

752 **(c)**
In sea snakes, the tail is laterally compressed. This helps them to swim properly in the water and is also helpful in balancing and changing the direction easily in water, as it acts like a flipper of boat.

753 **(d)**
In earthworm, two pairs of testes are found in 10^{th} and 11^{th} segments, accessory glands in 17^{th} and 19^{th} segments, four pairs of spermathecae from 6^{th} to 9^{th} segment and one pair of ovaries in 13^{th} segment.

754 **(d)**
Tachyglossus aculeatus (= *Echidna aculeate*) or spiny ant eater is a connecting link between reptiles and mammals. Its reptilian characters are presence of cloaca, lay eggs which are reptilian in structure and development, eggs contain enough yolk, and embryonic development is similar to reptiles, while mammalian character includes mammary glands which produce milk and nourish children.

755 **(a)**
Hydra is colourless, carnivourous coelenterate having radial symmetry. *Taenia, Schistosoma* and *Fasciola* are platyhelminthes having triploblastic bilateral symmetry.

756 **(c)**
Class-Chondrichthyes are part of super-class-Pisces that are of the phylum-Chordata. All chordates displays the presence of a notochord during embryonic development

757 **(a)**
Wallago attu (malhi) is a cat fish.

758 **(d)**
The platyhelminthes do not have body cavity.

759 **(d)**
In *Pheretima*, there is a pair of thin walled, non-muscular, loop like blood vessels found in 10^{th} and 11^{th} segments. These vessels are known as anterior loops and carry blood from lateral oesophageal to supra oesophageal vessel.

760 **(a)**
Enteronephric enphridia are so called because these opens into alimentary canal. These occurred as paired tufts on either side of pharynx and oesophagus in the 4^{th}, 5^{th} and 6^{th} segment. It consists of terminal nephridial duct and long thick walled excretory canal.

761 **(b)**
In solid stage morula a cavity is developed known as blastocoel and this stage is known as blastula. Archenteron is a cavity of gastrula and opening of archenteron is known as blastopore.

762 **(c)**
Choanocytes are the characteristic feature of Porifera, *e.g.,* sponges.

763 **(c)**
Ornithorhynchus is an egg laying mammal.

765 **(d)**
Circulatory system of cockroach is open or lacunar type. The blood flows through haemocoelic system. Heart of cockroach is a dorsal, pulsatile 13 chambered (ten abdominal and three thoracic chambers) structure.

766 **(a)**
Three slender branches one each from the ventral rami of third, fourth and fifth cervical nerves on

each side constitute a phrenic nerve to innervate the diaphragm (diaphragm is absent in frog).

767 **(b)**

Physalia (Hydrozoa) is also known as 'Portuguese man of war'. It belongs to phylum-Cnidaria.

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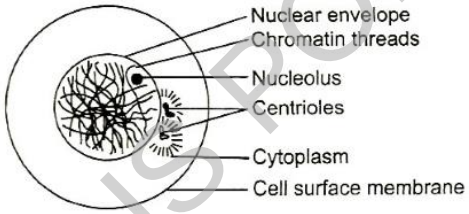
NEET BIOLOGY

CELL CYCLE AND CELL DIVISION

1. The second meiotic division leads to
   a) Separation of sex chromosomes
   b) Fresh DNA synthesis
   c) Separation of chromatids and centromere
   d) Separation of homologous chromosomes
2. In meiosis, chromosome number becomes
   a) Half of its parent chromosome
   b) Same as that of parent chromosome
   c) One fourth of its parent chromosome
   d) None of the above
3. Consider the following statements about plant cytokinesis
   I. It usually occurs by cell plate method
   II. The spindle usually persists during cytokinesis
   III. Cell plate grows centrifugally
   Which of the statements given above are correct?
   a) I and II b) I and III c) II and III d) I, II and III
4. I. ...A... phase corresponds to the interval between mitosis and initiation of DNA replication
   II. In animal cells, during the ...B... phase, DNA replication begins in the nucleus and the centriole duplicates in the cytoplasm
   III. During the ...C... phase, proteins are synthesized for the preparation of mitosis, while cell growth continues
   Identify the blanks (A-C) to complete the given statements (I-III) with reference to NCERT textbook
   a) A-G_2, B-S, C-G_1 b) A-S, B-G_2, C-G_1 c) A-S, B-G_1, C-G_2 d) A-G_1, B-S, C-G_2
5. Select the matched ones.
   I . S-phase - DNA replication
   II. Zygotene - Synapsis
   III. Diplotene - Crossing over
   IV. Meiosis - Both haploid and diploid cells
   V G_2-phase - Quiescent stage
   a) I and II only b) III and IV only c) III and V only d) I,III and V only
6. Which type of cell division helps in regeneration of cells?
   a) Mitosis b) Amitosis c) Meiosis d) Karyokinesis
7. Which of the following statement(s) is/are not correct about meiosis?
   I. Meiosis involves pairing of homologous chromosomes and recombination between them
   II. Two diploid cells are formed at the end of meiosis-II
   III. Meiosis involves two sequential cycles of nuclear and cell division called meiosis-I and meiosis-II, but only a single cycle of DNA replication
   IV. Meiosis-I is initiated after the parental chromosome replication which produce identical sister chromatids at the S-phase
   The correct option is

a) I and III b) II only c) II and III d) I, II, III and IV

8. Choose the correct statements regarding cell cycle
   I. Interphase is called the resting phase
   II. Interphase is the time during which the cell is preparing for division
   III. The interphase is divided into phases, *i.e.*, G_1, S and G_2-phase
   IV. Interphase represents the phase between the two successive M-phases
   The option with correct statements is
   a) I and IV b) II and III c) I and III d) I, II, III and IV
9. Crossing over occurs during
   a) Leptotene b) Diplotene c) Pachytene d) Zygotene
10. During meiosis, the alleles of the parental pair separate or segregated from each other. How many allele(s) is/are then transmitted to a gamete?
    a) Four b) Two c) Six d) One
11. The phragmoplast is organized at the
    a) Beginning of anaphase
    b) End of anaphase
    c) Beginning of telophase
    d) End of telophase
12. The morphology of chromosomes can be studied most easily in
    a) Prophase b) Metaphase c) Anaphase d) Telophase
13. Identify the correct stage of mitosis by viewing the diagram carefully?



    a) Interphase b) Prophase c) Metaphase d) Anaphase
14. The number of chromosomes becomes half in
    a) Anaphase-I b) Anaphase-II c) Telpohase-I d) Telophase-II
15. In which of the following phase of cell cycle, mitotic division got arrested?
    a) G_2-phase b) G_0-phase c) S-phase d) M-phase
16. Which of the following phase of cell cycle is also known as the resting phase?
    a) G_1-phase b) M-phase c) S-phase d) Interphase
17. Differentiated cell remains at which stage?
    a) G_1 b) G_2 c) G_0 d) M
18. The process of cytokinesis refers to the division of
    a) Nucleus b) Chromosomes c) Cytoplasm d) None of these
19. Choose the correct combination of options to select the correct statement for prophase
    I. Chromosomal material condenses to form compact mitotic chromosomes
    II. The assembly of mitotic spindle is initiated by the microtubules
    III. Cells do not show organelles when viewed under the prophase
    IV. The nucleolus or nucleoli degenerate completely
    a) I only b) II and III c) I and II d) All of these
20. Which of the following event distinguishes prophase-I of meiosis from prophase of mitosis?
    a) Nuclear membrane breaks down b) Chromosomes become visible
    c) Homologous chromosomes pair up d) Spindle forms
21. During mitosis, number of chromosomes gets
    a) Change
    b) No change

c) May be change if cell is mature
d) May be change if cell is immature

22. I. Chromosomes cluster at opposite spindle poles their identity is lost as discrete elements
II. Nuclear envelope assembles around the chromosome clusters
III. Nucleolus, Golgi complex and ER reform
Above features indicates which phase of mitosis
a) Anaphase b) Telophase c) Cytokinesis d) S-phase

23. What would be the change in the chromosome number, during S-phase?
a) No change
b) The number of chromosome doubles
c) The number of chromosome doubles only in case of diploid cell
d) The number of chromosome doubles only in case of haploid cell

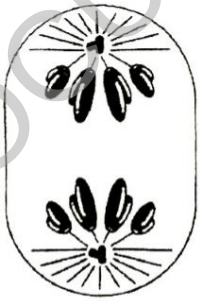
24. Arrange the following events of meiosis in a correct sequence and choose the correct option
I. Terminalisation
II. Crossing over
III. Synapsis
IV. Disjunction of genomes
a) IV, III, II and I b) III, II, I and IV c) II, I, IV and III d) I, IV, III and II

25. What is the approximate percentage duration of cell cycle that comes under interphase in humans?
a) 99% b) 95% c) 25% d) 5%

26. Which of the following stage of meiosis is responsible for deciding genetic constitution of gametes?
a) Metaphase-II b) Anaphase-II c) Metaphase-I d) Anaphase-I

27. …A…. mitotic cell division is only seen in the diploid somatic cells, while the …B… can show mitotic divisions in both haploid and diploid cells.
Identify A and B form the options given below
a) A-Animals; B-plants b) A-Plants; B-animals c) A-Bacterial; B-viruses d) None of these

28. Given diagram indicates which of the following phase of mitosis? Choose the correct option



a) Interphase b) Prophase c) Metaphase d) Anaphase

29. In meiosis, the chromosome number
a) Reduces by half
b) Increase by twice
c) Increase by four times
d) Reduces by one-fourth

30. The phase between two successive M-phase is called
a) S-phase b) G_1-phase c) G_2-phase d) Interphase

31. At the end of meiosis-II, number of haploid cells formed are
a) Two b) Four c) Eight d) None of these

32. The transition between meiosis-I and meiosis-II is
a) Interkinesis b) Cytokinesis c) Diakinesis d) Karyokinesis

33. Synapsis occurs between
a) A male and a female gamete
b) *m*RNA and ribosomes
c) Spindle fibres and centromere
d) Two homologous chromosomes

34. In which stage of cell division, chromosomes are most condensed?
a) Prophase b) Metaphase c) Anaphase d) Telophase
35. Which of the protein is found in spindle fibre?
a) Tubulin b) Albumin c) Mucin d) Haemoglobin
36. Which of the following events occurs during G_1-phase?
a) DNA replication
b) Growth and normal function of cell
c) Mutation
d) Fertilization
37. Select the correct statements regarding S-phase of interphase
I. Occurs between G_1 and G_2
II. DNA replication begins in the nucleus
III. Centrioles duplicate in the cytoplasm
IV. As DNA is doubled, number of chromosomes also doubles
The option with correct statements is
a) IV and III b) I, II, III and IV c) II, III and IV d) I, II and III
38. A material, which arrests cell division, is obtained from
a) *Crocus* b) *Colchicum* c) *Dalbergia* d) *Chrysanthemum*
39. During cell division, sometimes there will be failure of separation of sister chromatids. This event is called
a) Interference b) Complementation c) Non-disjunction d) Coincidence
40. I. The cells that do not divide further, exit G_1-phase to enter an inactive stage called …A… phase of the cell cycle
II. The cells that are in G_2-phase definitely continue with the …B… phase.
Identify A and B to complete the given NCERT statements
a) A-G_0; B-S b) A-S; B-G_0 c) A-M; B-G_0 d) A-G_0; B-M
41. Which type of chromosomes segregate when a cell undergoes meiosis?
a) Homologous chromosomes
b) Non- homologous chromosomes
c) Both (a) and (b)
d) Centric and acentric chromosomes
42. Term 'meiosis' was proposed by
a) Farmer and Moore b) Flemming c) Strasburger d) Darlington
43. Meiosis can be observed in
a) tapetal cells
b) Megaspores
c) Micropores
d) Spore mother cells
44. Crossing over that results in genetic recombination in higher organisms occurs between
a) Sister chromatids of bivalent
b) Non-Sister chromatids of a bivalent
c) Two daughter nuclei
d) Two different bivalents
45. In which of the following stage of the cell cycle, the attachment of spindle fibres to kinetochores of chromosomes occurs?
a) Prophase b) Metaphase c) Anaphase d) Telophase
46. The sequence of events by which a cell duplicates its genome, synthesizes the other constituents of the cell and eventually divides into two daughter cells is termed as
a) Cell division b) Cell cycle c) Cell growth d) Cell duplication
47. In animal cell has, cytokinesis involves
a) The separation of sister chromatids

b) The contraction of the contractile ring of micro filament
c) Depolymerization of kinetochore microtubules
d) A protein kinase that phosphorylaes other enzymes

48. Which is correct for meiotic metaphase-I?
a) Bivalents are arranged at equator
b) Univalents are arranged at equator
c) Non-homologous chromosomes forms pair
d) Spindle fibres are attached at chromomere

49. Crossing over is the exchange of genetic material between
a) Non-sister chromatids of the homologous chromosomes
b) Sister chromatids of the homologous chromosome
c) Chromatids of non-homologous chromosomes
d) The genes those are completely linked

50. Which of the following phase of the cell cycle is not a part of interphase?
a) S b) M c) G_0 d) G_1

51. Colchicine arrests which of the following stage of cell division?
a) Prophase b) Anaphase c) Telophase d) Metaphase

52. Select the correct option with respect to mitosis.
a) Chromatids start moving towards opposite poles in telophase
b) Golgi complex and endoplasmic reticulum are still visible at the end of prophase
c) Chromosomes move to the spindle equator and get aligned along equatorial plate in metaphase
d) Chromatids separate but remains in the centre of the cell in anaphase

53. Small disc-shaped structures at the surface of the centromeres that appear during metaphase are
a) Kinetochores b) Metaphase plate c) Spindle fibres d) Chromatid

54. Cell division can not be stopped in which phase of the cell cycle?
a) G_1-phase b) G_2-phase c) S-phase d) Prophase

55. Meiosis in AaBb will produce gametes
a) AB, aB, Ab, ab b) AB, ab c) Aa, bb d) Aa, Bb

56. The stage between two meiotic division is called
a) Interphase b) Cytokinesis c) Interkinesis d) Karyokinesis

57. If we ignore the effect of crossing over, how many different haploid cells arise by meiosis in a diploid cell having $2n = 12$?
a) 8 b) 16 c) 32 d) 64

58. Which of the following CdKs and cyclins comes under G_1 check point?
a) CdK_4/ Cyclin D b) CdK_6/ Cyclin D c) Both (a) and (b) d) CdK_2/ Cyclin B

59. Crossing over occurs at
a) Single strand stage
b) Two strand stage
c) Four strand stage
d) Eight strand stage

60. Chromosome number can be doubled by using which of the following?
a) Indole acetic acid
b) GA
c) Zeatin
d) Colchicines

61. Dictyotene a is prolonged
a) Leptotene b) Pachytene c) Diplotene d) Zygotene

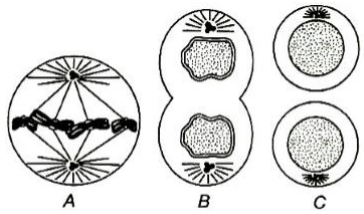
62. Which of the following is unique to mitosis and not a part of meiosis?
a) Homologous chromosomes behave independently
b) Chromatids are separated during anaphase

c) Homologous chromosomes pair and form bivalents
d) Homologous chromosomes crossover

63. Spindle fibre is made up of
a) Humulin
b) Intermediate filament
c) Flagellin
d) Tubulin

64. There are three genes a, b, c with percentage of crossing over between a and b is 20%, b and c is 28% and a and c is 8%. What is the sequence of genes on chromosome?
a) b, a, c b) a, b, c c) a, c, b d) None of these

65. See the diagrams carefully and identify the different stages of mitosis $(A - C)$ by choosing appropriate options given below



a) A-Metaphase; B-Telophase; C-Interphase
b) A-Telophase; B-Metaphase; C-Prophase
c) A-Anaphase; B-Telophase; C-Interphase
d) A-Telophase; B-Anaphase; C-Prophase

66. During which stage of meiosis, do tetrads line up at the equator?
a) Prophase-I b) Telophase-I c) Metaphase-I d) Anaphase-I

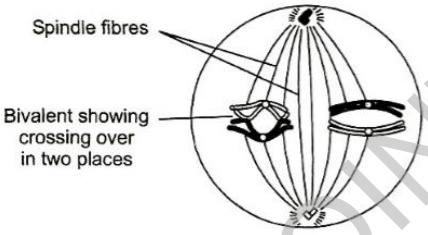
67. The anaphase promoting complex is activated by
a) M cdk cyclin b) G_1 cdk cyclin c) S cdk cyclin d) Transaction factor

68. A cell plate is laid down during
a) Cytokinesis
b) Karyokinesis
c) Interphase
d) None of these

69. During which stage of meiosis, do the sister chromatids begin to move towards the poles?
a) Prophase-I b) Telophase-I c) Anaphase-II d) Anaphase-I

70. In a cell cycle, which structures serves as the site of attachment of spindle fibres?
a) Chromosomes b) Histone c) Chromonemeta d) Kinetochore

71. Identify the diagram and name the phase of meiosis carefully



a) Telophase-I b) Anaphase-I c) Metaphase-I d) Prophase-I

72. Which of the following serves as mitotic spindle poison?
a) Ca^{2+} b) Mg^{2+} c) Tubulin d) Colchicine

73. Chromosomes are visible with chromatids at which phase of mitosis?
a) Interphase b) Prophase c) Metaphase d) Anaphase

74. RNA and proteins are formed in
a) G_1-phase b) G_2-phase c) S-phase d) G_0-phase

75. Give the name of the phases of meiosis, in which

I. the chromosome number is reduced to haploid state
II. the amount of DNA is reduced to haploid state
The correct option is
a) Anaphase-II; anaphase-I
b) Anaphase-I, metaphase-II
c) Anaphase-I, anaphase-II
d) Anaphase-II, metaphase-I

76. What type of cell division takes place in the functional megaspore initially in angiosperms?
a) Homeotypic without cytokinesis
b) Reductional without cytokinesis
c) Somatic followed by cytokinesis
d) Meiotic followed by cytokinesis

77. Which of the following statements are correct for multicellular cell division?
I. Cell division brings about embryonic development and growth
II. It plays a role in repair and maintenance of the body
III. It is important for reproduction
The correct option is
a) Only I b) I and III c) Only II d) I, II and III

78. Meiosis involves two sequential cycles of …A… called meiosis-I and meiosis-II but only a single cycle of …B…
Identify A and B to complete the given statement
a) A-nuclear and cell division, B-DNA replication b) A-cell division, B-DNA replication
c) A-DNA replication, B-cell division d) A-nuclear division, B-DNA replication

79. During, meiosis-I, the bivalent chromosomes clearly appear as tetrads during
a) Diakinesis b) Diplotene c) Leptotene d) Pachytene

80. DNA replicates
a) Twice in each cell cycle
b) Only once in each cell cycle
c) Once in mitotic cell cycle, once in meiotic-I (reductional division) and once in meiotic-II (equational division)
d) None of the above

81. Select the correct sequence of a cell cycle
a) $G_2 \rightarrow M \rightarrow G_1 \rightarrow S$ b) $S \rightarrow G_2 \rightarrow M \rightarrow G_1$
c) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$ d) $M \rightarrow G_1 \rightarrow G_2 \rightarrow M$

82. Which of the following statements are correct for meiosis?
I. Meiosis is a double division. It gives rise to four cells
II. The cells undergoing meiosis may be haploid or diploid
III. No bouquet stage is recorded
IV. Pairing or synapsis of homologous chromosomes takes place during zygotene of prophase-I and continues upto metaphase-I
Option containing correct statement is
a) I only b) I and IV c) II and III d) All of these

83. Mature nerve cells are incapable of cell division. These cell are probably considered in
a) G_2-phase b) S-phase c) Mitosis d) G_0-phase

84. Mitosis or the equational division is usually restricted to …A… cells. However, in some lower plants and in some social insects …B… cells also divide by mitosis.
Choose the correct option for A and B from the given options
A B
a) Haploid; diploid b) Haploid; haploid c) Diploid; diploid d) Diploid; haploid

85. The spindles are formed of

a) Chromosome b) Actin c) Microtubules d) Myosin

86. During mitosis, ER and nucleolus begin to disappear at
a) Late prophase b) Early metaphase c) Late metaphase d) Early prophase

87. The plane of alignment of chromosome at the metaphase stage of cell cycle is referred to as the
a) Prophase plate b) Metaphase plate c) Anaphase plate d) Telophase plate

88. From the following, identify the two correct statements with reference to meiosis
I. Bead-like structures are absent on chromosomes
II. Displacement of chiasmata occurs in diakinesis
III. Separation of two basic sets of chromosomes
IV. No division of centromere
The correct option is
a) II and III b) II and IV c) III and IV d) I and III

89. Consider the following statements about colchicine
I. It is an alkaloid widely used in plant breeding for doubling the chromosome number
II. Colchicine induced polyploidy has been used in raising several varieties of horticulture and agricultural plants
Which of the statements given above is/are correct?
a) Only I b) Only II c) Both I and II d) None of these

90. Separation of linked genes is called
a) Linkage b) Segregation c) Crossing over d) Genetic mutation

91. Sequence of four phases of cell cycle is
a) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$
b) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$
c) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$
d) $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$

92. The division of the cytoplasm is termed as
a) Karyokinesis b) Mitosis c) Cytokinesis d) Meiosis

93. Cell would normally proceed to mitosis without interruption
a) Once it had started the S-period
b) Once it had entered the G_2-phase
c) At anytime during cell division
d) None of the above

94. The two chromatids of a metaphase chromosome represent
a) Replicated chromosomes to be separated at anaphase
b) Homologous chromosomes of a diploid set
c) Non-homologous chromosomes joined at the centromere
d) Maternal and paternal chromosomes joined at the centromere

95. In the process of mitotic division during interphase, chromosome material remains in the form of very loosely coiled threads called
a) Chromosome b) Chromatin c) Chromatid d) Microtubules

96. Which is synthesized in G_1-phase?
a) DNA polymerase b) Histones c) Nucleolar DNA d) Tubulin protein

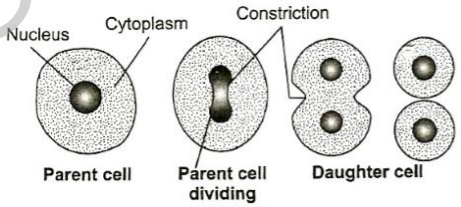
97. Which of the following occurs more than one and less than five in a chromosome?
a) Chromatid b) Chromomere c) Centromere d) Telomere

98. Longest phase of meiosis, is
a) Prophase-I b) Prophase-II c) Anaphase-I d) Metaphase-II

99. Mitotic stages are not observed in
a) *Cosmarium* b) *E. coli* c) *Saccharomyces* d) *Chlorella*

100. Crossing over is also an enzyme mediated process and the enzyme involved is called
a) Ligase b) Polymerase c) Recombinase d) Endonuclease

101. Which one of the following stages corresponds to Mendel's law of independent assortment?
a) Anaphase-II b) Anaphase-I c) Metaphase-I d) Telophase-I
102. Which stages of mitosis is known for occurrence of cytokinesis?
a) Metaphase b) Telophase c) Anaphase d) None of these
103. Characteristic of meiosis is
a) Two nuclear and two chromosome divisions
b) Two nuclear and one chromosome division
c) One nuclear and two chromosome divisions
d) One nuclear and one chromosome division
104. See the diagram carefully and sequentially arrange the steps of amitosis given below?



I. The constriction appears in the cytoplasm
II. The nucleus of cell elongates and develops a constriction round its middle
III. The constriction in nucleus gradually deepens and finally cuts the nucleus into two daughter nuclei
IV. The cytoplasmic constriction divides the parent cell into two daughter cells, each with a nucleus
Option containing correct sequence of events is
a) I → III → II → IV b) I → II → III → IV c) II → I → III → IV d) II → III → I → IV
105. The number of mitotic cell divisions required to produce 256 cells from single cell would be
a) 10 b) 12 c) 6 d) 8
106. The second check point in cell cycle occurs at
a) $G_0 - G_1$ b) $G_1 - G_2$ c) G_1 −S d) G_2 −M
107. The M-phase starts with the …A…, corresponding to the separation of daughter chromosomes, known as …B… and usually ends with division of cytoplasm which is known as …C…
Identify A-C to complete the given NCERT statement
a) A-cell division; B-cytokinesis; C-karyokinesis
b) A-nuclear division; B-karyokinesis; C-cytokinesis
c) A-cell division; B-karyokinesis; C-cytokinesis
d) A-nuclear division; B-cytokinesis; C-karyokinesis
108. DNA replication in a cell cycle occurs during
a) G_1-phase b) S-phase c) G_2-phase d) M-phase
109. If the cell has 14 chromosomes at interphase. Than how many chromosomes will the cell have at G_1-phase of cell cycle?
a) 28 b) 14 c) 7 d) 21
110. When parental and maternal chromosomes change their material with each other in cell division, this event is called
a) Bivalent forming b) Crossing over c) Synapsis d) Dyad forming
111. Which of the following stage is responsible for the appearance of Lampbrush chromosomes?
a) Meiotic prophase b) Mitotic prophase c) Mitotic anaphase d) Mitotic metaphase
112. The given figure is the representation of a certain event at a particular stage of a type of cell division. Identify the stage and choose the correct option?



a) Prophase-I during meiosis
b) Prophase-II during meiosis
c) Prophase during meiosis
d) Both prophase and metaphase of mitosis

113. Chiasmata are most appropriately observed in meiosis during
a) Diakinesis b) Diplotene c) Metaphase-II d) Pachytene

114. In which of the following stages, the chromosome is single thin and like long thread?
a) Leptotene b) Zygotene c) Pachytene d) Diakinesis

115. From the following, identify the two correct statements with reference to meiosis
I. Bead like reference to meiosis
II. Displacement of chaismata occurs in diakinesic
III. Separation of two basic sets of chromosomes
IV. No division of centromere
The correct option is
a) II, III b) II, IV c) III, IV d) I, III

116. Which of the following stage of cell cycle is known as quiescent stage?
a) G_1-phase b) S-phase c) G_0-phase d) G_2-phase

117. At which stage of mitosis, chromatids separated and passes to different poles?
a) Prophase
b) Metaphase
c) Anaphase
d) Telophase

118. When dividing cells are examined under a light microscope, chromosomes become visible in
a) Interphase b) S-phase c) Prophase d) G_1-phase

119. Phenomenon of crossing over in diploid organisms is responsible for
a) Linkages between genes
b) Recombination between linked genes
c) Segregation between genes
d) Dominance of gene

120. In G_1-phase of cell cycle, what would be the change in DNA content of the cell?
a) DNA content increases to double
b) DNA content gets reduced
c) Four fold increase of DNA content
d) No change in DNA content

121. What is the approximate duration of cell cycle for a mammalian cell?
a) 90 min b) 24 hrs c) 24 days d) 12 hrs

122. Karyokinesis refers to the division of
a) The cytoplasm
b) The nucleus
c) Cytoplasm and nucleus
d) all constituents of the cell

123. Which of the following statements are correct for cell cycle?
I. Cell cycle is the sequence of events involving growth and division of a cell from the time of its formation to its own division into daughter cells
II. Cell growth (in terms of cytoplasmic increase) is a continuous process
III. DNA synthesis occurs only during one specific stage in the cell cycle
IV. The replicated chromosomes (DNA) are distributed to daughter nuclei during cell division
a) I and III b) I and II c) III and IV d) I, II, III and IV

124. Which of the following statement is true for cells in G_0 stage of cell cycle?
a) Cells in G_0 stage are metabolically more active
b) Cells are metabolically inactive
c) Cells are metabolically active but no longer proliferate in normal condition
d) None of the above

125. In which stage of the first meiotic division, two sister chromatids are formed?
a) Leptotene b) Zygotene c) Pachytene d) Diplotene

126. Synapsis occurs in ……. phase of meiosis.

a) Zygotene
b) Diplotene
c) Pachytene
d) Leptotene

127. Mitosis usually results in the
a) Production of diploid daughter cells
b) Growth of multicellular organisms
c) Cell repair
d) All of the above

128. Which of the following type of cell cycle is known as equational division?
a) Amitosis b) Mitosis c) Meiosis d) None of the above

129. The complete disintegration of nuclear envelope in a cell cycle marks the
a) Start of prophase of mitosis
b) Start of metaphase of mitosis
c) End of anaphase of mitosis
d) Start of telophase of mitosis

130. Chromosomes are arranged along the equator during
a) Prophase b) Metaphase c) Anaphase d) Telophase

131. What is the average duration for mitosis?
a) 3 min 30 min b) 3 hr to 5 hr c) 30 min to 3 hr d) 2 hr to 3 hr

132. Which of the following stage of mitosis follows the S and G_2-phases of interphases?
a) Prophase b) Metaphase c) Anaphase d) Telophase

133. I. Phases of cell cycle are controlled by proteins, …A… and …B…
II. There are two regulatory mechanisms, called …C… which take decision about cell division.
III. The second check point, called …D… is responsible for transition from G_2 to M-phase.
Identify A-D to complete the given statements (I-III)
a) A-cyclins; B-CdKs; C-check points; D-mitotic cyclin
b) A-cyclins; B-check points; C-mitotic cyclin, D-CdKs (Cm)
c) A-mitotic cyclin (Cm), B-CdKs; C-check points, D-Cyclin
d) A-mitotic cyclin (Cm), B-cyclins; C-check points, D-CdKs

134. When synapsis is complete all along the chromosome, the cell is said to have entered a stage called
a) Zygotene b) Pachytene c) Diplotene d) Diakinesis

135. 'XX' is a phase of mitosis, in which the chromatin condenses into discrete chromosomes. During 'XX' phase, nuclear envelope breaks down and spindles forms at opposite ends of the cell
Identify 'XX'
a) Interphase b) Anaphase c) Telophase d) Prophase

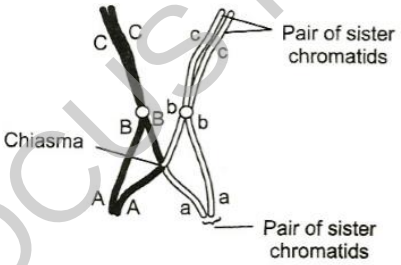
136. Which of the following CdKs and cyclins comes under G_2 check point?
a) CdK_4/ Cyclin B b) CdK_2/ Cyclin B c) CdK_6/ Cyclin B d) CdK_2/ Cyclin D

137. Mitosis is divided into
a) Five stages b) Three stages c) Four stages d) Six stages

138. Which of the following statements (events) is/are true for mitotic telophase?
a) Nucleolus, GB and ER form
b) NM assembles around each chromosomes clusters
c) Arrival of chromosomes cluster at opposite poles and loss of their identity as discrete elements
d) All of the above

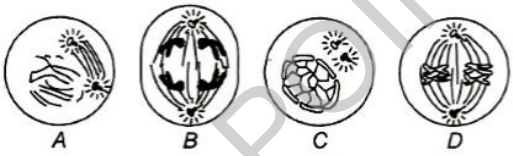
139. Identify A-C in the given statements, and choose the correct option
I. Spindle microtubules that extend from the two poles of a dividing cell are called …A…
II. A centromere connects two identical copies of a single chromosomes. These two copies are called …B…
III. In 'X' phase, the paired chromosomes separate and begin moving to opposite ends of the cell. This 'X' is called …C…
a) A-kinetochore fibres; B-chromatids; C-metaphase
b) A-polar fibres; B-homologous chromosomes; C-Prophase
c) A-polar fibres; B-sister chromatids; C-anaphase
d) A-kinetochore fibres; B-asters; C-anaphase

140. Among the following, which one is longest phase in prophase of meiosis?
a) Leptotene b) Zygotene c) Pachytene d) Diplotene
141. The interphase is divided into three main phases. There phases are
a) G_1-phase, M-phase and G_2-phase
b) M-phase, S-phase and divisional phase
c) Gap 1 phase, synthesis phase and gap 2 phase
d) M-phase G_2-phase and divisional phase
142. In which of the following stages of the cell cycle chromosome number becomes half?
a) Metaphase-I b) Anaphase-I c) Prophase-I d) Metaphase-II
143. What type of plant is formed when colchicines is used in the process of development of *Raphanobrassica*?
a) Triploid b) Haploid c) Autotetraploid d) Allotetraploid
144. The proteins involved in the movement of chromosomes towards the poles during cell division are
a) Actin b) Myosin c) Tubulin d) Elastin
145. Which of the following specie's haploid cell has maximum chromosome counts?
a) *Ophioglossum* b) Cat c) *Allium* d) Dog
146. Which one of the following precedes re-formation of the nuclear envelope during M-phase of the cell cycle?
a) Decondensation from chromosome and reassembly of the nuclear lamina
b) Transcription from chromosomes and reassembly of the nuclear lamina
c) Formation of the contractile ring and formation of the phragmoplast
d) Formation of the contractile ring and transcription from chromosomes
147. Synaptonemal complex is formed during
a) Pachytene b) Zygotene c) Leptotene d) Diplotene
148. Identify the diagram and name the stage of meiosis correctly



a) Pachytene (crossing over) b) Zygotene
c) Leptotene d) Diplotene
149. G_0-phase is
a) Phase after G_2-phase
b) Phase after M-phase, in which daughter cell enters new cell cycle
c) Arrest of cell cycle on the onset of differentiation
d) All of the above
150. During cell division, chromosome attaches with spindles
a) Kinetochore
b) Centrosome
c) Centriole
d) Secondary constriction
151. The spindle microtubules are polar, their orientation is
a) Positive (+) and negative (-) both ends towards the equator
b) Positive (+) ends towards the poles
c) negative (-) ends towards the poles
d) Positive (+) and negative (-) both ends towards the poles
152. The non-sister chromatids twist around and exchange segments with each other during
a) Diplotene b) Diakinesis c) Leptotene d) Pachytene

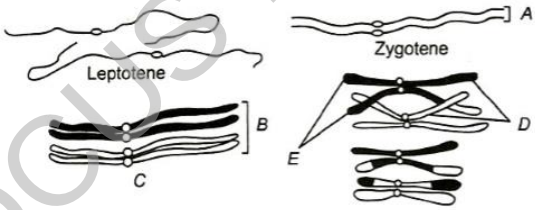
153. Two basic stages of cell cycle are
    a) Interphase and M-phase/divisional phase
    b) Karyokinesis and cytokinesis
    c) Prophase, metaphase, anaphase and telophase
    d) G_1, S and G_2 phases
154. Which of the following statements are correct for G_1-phase?
    I. It is the last substage of interphase
    II. Cell organelles do not increase in number
    III. Both cell and nucleus grow in size
    IV. It synthesizes RNAs, proteins and other biochemical for cell growth and subsequent replication of DNA
    Choose the correct option
    a) I and II b) II and IV c) I and III d) II and III
155. From the following identify the two correct statements with reference to meiosis
    I. Bead-like structures are absent on chromosomes.
    II. Displacement of chiasmata occurs in diakinesis.
    III. Separation of two basic sets of chromosomes.
    IV. No division of centromere.
    a) II,III b) II,IV c) III,IV d) I,III
156. The S-phase of cell cycle is characterized by
    a) Duplication of chromosome
    b) Shortening of chromosome
    c) Duplication of DNA
    d) Duplication of centriole
157. Congression is a phenomenon of
    a) Movement of sister chromatids towards the poles
    b) Pairing of homologous chromosomes
    c) Separation of paired chromosomes
    d) Bringing the chromosomes on equator of spindle apparatus
158. Find the correctly matched pairs and choose the correct option
    I. Leptotene – The chromosomes become invisible
    II. Zygotene – Pairing of homologous chromosomes
    III. Pachytene – Dissolution of the synaptonemal complex takes place
    IV. Diplotene – Bivalent chromosomes appear as tetrads
    V. Diakinesis – Terminalisation of chiasmata takes place
    a) I and II b) II and IV c) II and V d) II and III
159. The number of DNA strands in chromosome at G_2-stage is
    a) One b) Two c) Four d) Eight
160. Meiosis occurs in which of the following cells?
    a) Sperm cells b) Unicellular organisms c) Liver cells d) All of these
161. Identify the following figures $(A - D)$ and choose the correct option



    a) A-Metaphase-II, B-Anaphase-I, C-Prophase-I, D-Anaphase-II
    b) A-Prophase-I, B-Anaphase-I, C-Interphase, D-Metaphase-I
    c) A-Metaphase-I, B-Anaphase-I, C-Prophase-I, D-Anaphase-II
    d) A-Prophase-II, B-Anaphase-I, C-Interphase, D-Metaphase-II
162. During the G_1-phase of cell division
    a) RNA and proteins are synthesized

b) DNA and proteins are synthesized
c) Cell prepares for M-phase
d) Cell undergoes duplication

163. Study the diagram showing meiosis carefully and choose the correct options for $A - E$



a) A −Tetrad, B −Bivalent, C −Zygotene stage, D −Sister chromatids, E −Non-sister chromatids
b) A −Bivalent, B −Tetrad, C −Pachytene stage, D −Crossing over, E −Non-sister chromatids
c) A −Bivalent, B −Tetrad, C −Pachytene stage, D-Non-Sister chromatids, E-Sister chromatids
d) A −Bivalent, B −Tetrad, C −Pachytene stage, D −Sister chromatids, E −Non-Sister chromatids

164. In …A…. phase, there is synthesis of RNAs and proteins that are needed for cell growth and replication of DNA. While it is …B… phase, where synthesis of protein occur that is needed for spindle formation and mitosis to continue.
Identify A and B to complete the given statement
a) A-G; B-S b) A-G_2; B-S c) A-G; B-G_2 d) None of these

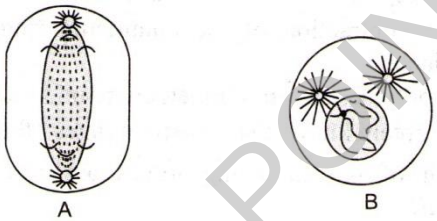
165. Interphase nucleus is enclosed by
a) Non-porous nuclear membrane
b) Porous double nuclear membrane
c) Non-porous double discontinuous nuclear membrane
d) A single porous unit membrane

166. Read the following statements and select the correct option
I. M-phase represents the phase when the actual cell division or mitosis occurs
II. Interphase represents the phase between two successive M-phases
III. In the 24 hrs average duration of cell cycle of a human cell, cell division proper lasts for only about an hour
IV. The M-phase lasts more than 95% of the duration of cell cycle
a) I, II and III b) II and IV c) II, III and IV d) I and IV

167. What change would occur in DNA content, during S-phase?
a) No change
b) The amount of DNA per cell doubles
c) The amount of DNA per cell increase four folds
d) The amount of DNA per cell decreases

168. In meiosis, the daughter cells are not similar to that of parent because of
a) Crossing over b) Synapsis c) Both (a) and (b) d) None of these

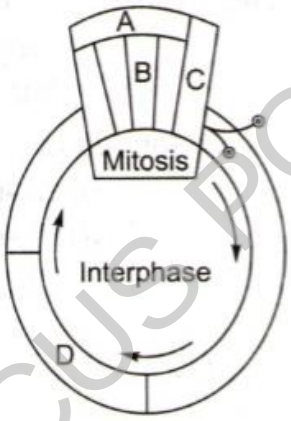
169. Which stages of cell division do the following figures 'A' and 'B' represent respectively?



a) Metaphase - Telophase
b) Telophase - Metaphase
c) Late anaphase - Prophase
d) Prophase - Anaphase

170. During cell cycle, RNA and non-histone proteins are synthesized in
a) S-phase b) G_0-phase c) G_1-phase d) M-phase

171. Alleles of different genes that are on the same chromosome may occasionally separated by a phenomenon known as
    a) Pleiotropy
    b) Epistasis
    c) Continuous variation
    d) Crossing over
172. In meiosis, division is
    a) I reductional and II equational
    b) I equational and II reductional
    c) Both reductional
    d) Both equational
173. Cells in G_0-phase of cell cycle
    a) Exit cell cycle
    b) Enter cell cycle
    c) Suspend cell cycle
    d) Terminate cell cycle
174. Given below is a schematic break-up of the phases/stages of cell cycle



Which one of the following is the correct indication of the stage/phase in the cell cycle?
a) B-Metaphase b) C-Karyokinesis c) D-Synthetic phase d) A-Cytokinesis

175. Choose the correct answer for the statements given below
    I. Protein involved in the shortening and thickening of chromosome fibres
    II. The name of early prophase when elongated chromosomes occur in overlapped condition like a ball of wool without their ends being visible
    III. Each group of astral rays along with its centriole pair
    IV. Name the narrow point which is responsible for attaching two sister chromatids to each other
    a) I-Codensins, II-Aster, III-Spirme stage, IV-Kinetochore
    b) I-Codensins, II-Aster, III-Spirme stage, IV-Centromere
    c) I-Codensins, II-Spirme stage, III-Aster, IV-Centromere
    d) I-Tubulins, II-Spirme stage, III-Amphiaster, IV-Kinetochore
176. If you are provided with root-tips of onion in your class and are asked to count the chromosomes, which of the following stages can you most conveniently look into?
    a) Metaphase b) Telophase c) Anaphase d) Prophase
177. In cell cycle, during which phase chromosomes are arranged at equatorial plate?
    a) Metaphase b) Anaphase c) Telophase d) Prophase
178. Meiosis in a plant occurs when there is a change
    a) From gametophyte to sporophyte
    b) From sporophyte to gametophyte
    c) From gametophyte to gametophyte

d) From sporophyte to sporophyte

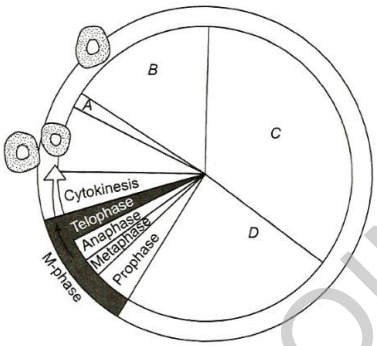
179. When number of chromosomes is already reduced to half in the first reductional division of meiosis, what is the necessity of second meiotic division?
    a) The division is required for the formation of four gametes
    b) Divisions ensures equal distribution of haploid chromosomes
    c) Division ensures equal distribution of genes on chromosomes
    d) Division is required for segregation of replicated chromosomes
180. Select the correct option
    a) Division of the cytoplasm occurs before the division of the nucleus
    b) Division of the nucleus occurs before the division of the cytoplasm
    c) Both the division of the nucleus and cytoplasm occurs at the same time
    d) None of the above
181. During meiotic division, the
    a) Homologous chromosomes are separated
    b) The linkage is disturbed
    c) The homologous chromosomes do not segregate
    d) All of the above
182. Recombination is involved in the process of
    a) Cytokinesis
    b) Spindle formation
    c) Crossing over
    d) Chromosome duplication
183. A diploid living organism develops from zygote by which type of the following repeated cell divisions?
    a) Meiosis b) Amitosis c) Mitosis d) Segmentation
184. Pick out the correct statements.
    I.Synapsis of homologous chromosomes takes place during prophase-I of meiosis.
    II.Division of centromeres takes place during anaphase-I of meiosis.
    III.Spindle fibres disappear completely in telophase of mitosis.
    IV.Nucleoli reappear at telophase-I of meiosis.
    a) I only b) III only c) I and II only d) I, III and IV only
185. An egg cell has 5pico gram of DNA in its nucleus. How much amount of DNA will be, in this animal, at the end of G_2-phase of mitosis?
    a) 2.5pico gram b) 5pico gram c) 5 g d) 20pico gram
186. The term 'meiosis' was given by
    a) Rusk b) Flemming c) Johannsen d) Former and Moore
187. After the separation of centromeres during mitosis, the chromatids move towards opposite poles of the spindle. Name the term used for these chromatids
    a) Daughter chromosomes b) Kinetochores
    c) Half spindles d) Centrosomes
188. In which phase, proteins for spindle fibre are synthesized?
    a) G_1-phase b) G_2-phase c) S-phase d) Anaphase
189. In meiosis-I, a bivalent is an association of
    a) Four chromatids and four centromeres
    b) Two chromatids and two centromeres
    c) Two chromatids and one centromeres
    d) Four chromatids and two centromeres
190. Colchicine arrests spindle at
    a) Anaphase b) Prophase c) Telophase d) Metaphase
191. How many chromosomes will the cell the cell have at G_1, after S and after M-phase respectively, if it has 14 chromosomes at interphase?

a) 14,14,7 b) 14,14,14 c) 7,7,7 d) 7,14,14

192. Chiasmata are formed due to
   a) Crossing over of same part between homologous chromosomes
   b) Crossing over of same part between non-homologous chromosomes
   c) Duplication of homologous and non-homologous chromosomes
   d) Loss of some part of chromosomes

193. Which of the following shows diplotene stage of cell cycle?
   a) Separation of synapsed homologous chromosomes except at the site of cross overs
   b) Degenecation of nucleolus
   c) Chiasmata shift towards cheromosome ends
   d) All of the above

194. Given diagram represents the events occurring in cell cycle. Identify A, B, C and D and select the correct option



A B C D
a) G_0 G_1 S G_2 b) G_1 G_0 S G_2 c) S G_0 G_1 G_2 d) G_1 S G_2 G_0

195. In the somatic cell cycle
   a) In G_1-phase, DNA content is double the amount of DNA present in the original cell
   b) DNA replication takes place in S-phase
   c) A short interphase is followed by a long mitotic phase
   d) G_2-phase follows mitotic phase

196. Which phase comes in between the $G_1$and G_2 phases of cell cycle?
   a) M-phase b) G_0-phase c) S-phase d) Interphase

197. Select the event of cell cycle which shows the importance of synapsis and the formation of chiasmata
   a) An increase in the variation of progeny occurs
   b) The DNA on homologous chromosomes mix
   c) Reciprocal exchange of chromosomal sections occurs
   d) All of the above

198. Mitosis is a process by which eukaryotic cells
   a) Grow
   b) Get specialized in structure
   c) Multiply
   d) Expose the genes

199. Phragmoplast is
   a) Proplasted in cytoplasm of dividing cells
   b) Cell plate formed by vesicles ER and dictyosomes during cytokinesis
   c) Cell plate formed by ER, dictyosomes, secretory vesicles and spindle fibre
   d) None of the above

200. Mitosis is characterized by
   a) Reduction division
   b) Equal division
   c) Both (a) and (b)
   d) Absence of spindle formation

201. Choose the correct sequence of two main events in mitosis
   a) Karyokinesis followed by cytokinesis

b) Cytokinesis followed by karyokinesis
c) Karyokinesis followed by separation of the daughter cells
d) Cytokinesis followed by separation of the daughter cells

202. What is the correct sequence of the steps given here?
Also work out the process depicted in the steps?
V. Homologous chromosomes move toward opposite poles of the cell; chromatids do not separate.
VI. Chromosomes gather together at the two poles of the cell and the nuclear membrances reform.
VII. Homologous chromosomes pair and exchanges segments.
VIII. Homologous chromosomes align on a central plate.
IX. The haploid cells separate completely.
a) The correct sequence is III → IV → I → II → V and the process is meiosis-I
b) The correct sequence is II → I → V → IV → III and the process is mitosis
c) The correct sequence is IV → I → III → II → V and the process is meiosis-I
d) The correct sequence is II → V → IV → I → III and the process is mitosis

203. What is the nature of cells formed at the end of meiosis-II?
a) Haploid b) Diploid c) Tetrad d) None of these

204. Significance of meiosis lies in
a) Reduction of chromosome number to one half
b) Maintaining consistency of chromosome number during sexual reproduction
c) Production of genetic variability
d) All of the above

205. The major event that occurs during the anaphase of mitosis, which brings about the equal distribution of chromosomes is
a) Replication of the genetic material
b) Splitting of the chromatids
c) Splitting of the centromeres
d) Condensation of the chromatin

206. Chiasma shows the sites of
a) Spindle formation b) Synapsis c) Crossing over d) None of these

207. What is the function of centromere?
a) Cell division
b) Cell plate formation
c) Cell differentiation
d) Cell wall formation

208. The cell cycle of yeast takes about
a) 24 hrs b) 60 min c) 30 min d) 90 min

209. What is not seen during mitosis in somatic cells?
a) Spindle fibre
b) Chromosomes movement
c) Disappearance of nucleolus
d) Synapsis

210. In which phase, DNA content will be doubled?
a) Interphase b) Anaphase c) Prophase d) Telophase

211. At which stage of cell cycle colchicine arrests the spindle?
a) Anaphase b) Prophase c) Telophase d) Interphase

212. Arrange the following events of meiosis in the correct sequence.
X. Terminalization
XI. Crossing over
XII. Synapsis
XIII. Disjunction of genomes

The correct sequence is

a) 4, 3, 2, 1 b) 3, 2, 1, 4 c) 2, 1, 4, 3 d) 1, 4, 3, 2

213. Spindle fibre is made up of
   a) Tubulin
   b) Humulin
   c) Intermediate filament
   d) Flagellin
214. Diakinesis is marked by
   a) Terminalisation of chiasmata b) Degeneration of nucleolus
   c) Chiasmata shift towards chromosome ends d) All of the above
215. Cleavage is a unique form of mitotic cell division in which
   a) There is no growth of cells
   b) The nucleus does not participate
   c) No spindle developers to guide the cells
   d) The plasma membranes of daughter cells do not separate
216. In plant cell has 12 chromosomes at the end of mitosis. How many chromosomes would it have in the G_2-phase of its next cell cycle?
   a) 6 b) 8 c) 12 d) 24
217. Meiosis occurs in organism during
   a) Vegetative reproduction b) Sexual reproduction
   c) Both (a) and (b) d) None of these
218. Chromosome reaches their respective poles in which of the following stages of mitosis?
   a) Cytokinesis b) Interphase c) S-phase d) Telophase
219. Replication of centriole occurs during
   a) Interphase b) Prophase c) Late prophase d) Late telophase
220. Genetic recombination is due to
   a) Fertilization and meiosis
   b) Mitosis and meiosis
   c) Fertilization and mitosis
   d) None of these
221. Pick out the correct statements.
   I.Mitosis takes place in the somatic cells and meiosis takes place in the germ cells
   II.During mitosis, the DNA replicates once for one cell division and in meiosis the DNA replicates twice for two cell divisions.
   III.Mitosis and meiosis occur both in sexually and asexually reproducing organisms.
   a) I only b) II only c) III only d) I and II only
222. Chromatid formation takes place in
   a) S-phase b) Metaphase c) G_1-phase d) G_2-phase
223. 56 cells are produced in meiosis where first division is
   a) Equal
   b) Reduction
   c) Mitosis
   d) None of these
224. A cell in post reproductive stage remains in
   a) G_2-phase b) S-phase c) G_1-phase d) M-phase
225. Most cytogenic activities occur during
   a) Interphase b) Telophase c) Prophase d) Anaphase
226. The term, mitosis was coined by
   a) Flemming b) Strasburger c) Remak d) Moore
227. Which of the following character is related with telophase?

a) Formation of nuclear membrane
b) Formation of nucleolus
c) Elongation of chromosome
d) Formation of two daughter nuclei

FOCUS POINT

NEET BIOLOGY

CELL CYCLE AND CELL DIVISION

: ANSWER KEY :

1)	c	2)	a	3)	d	4)	d	117)	c	118)	c	119)	b	120)	d
5)	a	6)	a	7)	b	8)	d	121)	b	122)	b	123)	d	124)	c
9)	c	10)	d	11)	b	12)	b	125)	c	126)	a	127)	a	128)	b
13)	a	14)	a	15)	b	16)	d	129)	b	130)	b	131)	c	132)	a
17)	c	18)	c	19)	d	20)	c	133)	a	134)	b	135)	d	136)	b
21)	b	22)	b	23)	a	24)	b	137)	c	138)	d	139)	c	140)	c
25)	b	26)	d	27)	a	28)	a	141)	c	142)	b	143)	d	144)	c
29)	a	30)	d	31)	b	32)	a	145)	a	146)	a	147)	b	148)	a
33)	d	34)	b	35)	a	36)	b	149)	c	150)	a	151)	c	152)	d
37)	d	38)	b	39)	c	40)	d	153)	a	154)	b	155)	a	156)	c
41)	a	42)	a	43)	d	44)	b	157)	d	158)	c	159)	c	160)	a
45)	b	46)	b	47)	b	48)	a	161)	b	162)	a	163)	a	164)	c
49)	a	50)	b	51)	d	52)	c	165)	b	166)	a	167)	b	168)	a
53)	a	54)	c	55)	a	56)	c	169)	c	170)	c	171)	d	172)	b
57)	d	58)	c	59)	c	60)	d	173)	c	174)	c	175)	c	176)	a
61)	c	62)	a	63)	d	64)	a	177)	a	178)	b	179)	d	180)	b
65)	a	66)	c	67)	a	68)	a	181)	a	182)	c	183)	c	184)	d
69)	d	70)	d	71)	c	72)	d	185)	d	186)	d	187)	a	188)	b
73)	c	74)	b	75)	c	76)	a	189)	d	190)	d	191)	b	192)	a
77)	d	78)	a	79)	d	80)	b	193)	d	194)	a	195)	b	196)	c
81)	c	82)	b	83)	d	84)	d	197)	a	198)	c	199)	b	200)	b
85)	c	86)	d	87)	b	88)	a	201)	a	202)	a	203)	a	204)	d
89)	c	90)	c	91)	a	92)	c	205)	c	206)	c	207)	b	208)	d
93)	a	94)	a	95)	b	96)	a	209)	d	210)	a	211)	a	212)	b
97)	d	98)	a	99)	b	100)	c	213)	a	214)	d	215)	c	216)	c
101)	b	102)	b	103)	b	104)	d	217)	b	218)	d	219)	a	220)	a
105)	d	106)	d	107)	b	108)	b	221)	a	222)	a	223)	b	224)	c
109)	b	110)	a	111)	a	112)	a	225)	a	226)	a	227)	d		
113)	b	114)	a	115)	d	116)	c								

NEET BIOLOGY

CELL CYCLE AND CELL DIVISION

: HINTS AND SOLUTIONS :

1 **(c)**
Meiosis first is allowed by second meiotic division, which is essentially a mitotic division and is referred as mitotic. In anaphase-II of meiosis-II, the chromosome and centromere divide. The sister chromatids separate and move towards opposite pole.

2 **(a)**
In meiosis (meiotic-I), chromosome number becomes half to that of parent chromosome.

3 **(d)**
Plant cytokinesis usually occurs by cell plate method. The spindle usually pesists during cytokinesis. Central part of spindle grows in size and forms an interdigited complex called phragmoplast. Cell plate grows centrifugally

4 **(d)**
A-G_1, B-S, C-G_2.
Post reproductive stage of a cell includes cell growth. The term cell growth is used in the contexts of cell development and cell division. As we are concerned about growth (development) only, it refers to the growth of cell that is to increase in cytoplasmic and organelle volume that is in G_1-phase
S-phase is the sub-phase between G_1-phase and G_2-phase, during which DNA synthesis or replication takes place.
In animal cells, during the S-phase, DNA replication begins in the nucleus and the centriole duplication in the cytoplasm. The amount of DNA per cell doubles in the nucleus. If the initial amount of DNA is denoted as 2C, then it increases to 4C. However, there is no increase in the chromosome number

5 **(a)**
S or **synthetic** phase marks the period during which DNA synthesis or replication takes place. During this phase, the amount of DNA per cell doubles.

The second stage of prophase-I is called zygotene. During this stage, chromosomes start pairing together and this process of association is called **synapsis**. Such paired chromosomes are called **homologous chromosomes**. Synapsis is accompanied by the formation of a complex structure called **synaptonemal complex**.

6 **(a)**
Mitosis is one of the types of cell division, which helps in regeneration. Because it keeps all the somatic cells of an organism genetically similar, so that they are able to regenerate a part or whole of the organism

7 **(b)**
During meiosis, four haploid cells are produced by reductional division from a single diploid cell. Parent cell contains replicated chromosomes, but the daughter cells contains unreplicated chromosomes

8 **(d)**
The interphase, as called the resting phase, is the time during which the cell is preparing for division by undergoing both cell growth and DNA replication.
It is the phase between two successive M-phases
The interphase is divided into three further classes
G_1-phase (Gap 1), S-phase (synthesis) and G_2-phase (Gap 2)

9 **(c)**
Crossing over occurs during **pachytene** or **thick thread** or **pachynema** substage of prophase-I of meiosis. During this stage, an exchange of portions of chromatids between homologous chromosomes occur. At chiasma, the chromatids break rejoin in such a way that sections are exchanged.

10 **(d)**
Out of two alleles present at the same locus of two chromosomes of a homologous pair, one is

transmitted to a gamete as the later receive one chromosome of a homologous pair.

11 **(b)**
In plant cells, cytokinesis occurs by cell plate formation. A number of elements called phragmoplasts are derived from ER and Golgi body. These elements line up at equator during anaphase and later fuse to form cell plate.

12 **(b)**
During metaphase, the nuclear envelope disintegrates and the chromosomes are spread through the cytoplasm of the cell. Condensation of chromosomes is completed and it can be observed under the microscope. At this stage, the morphology as well as the number of chromosomes can be easily studied

13 **(a)**
Interphase has variable duration. During this period, the DNA of chromosomes replicates. Chromosome material is in the form of very loosely coiled threads called chromatin. Centrioles already have replicated

14 **(a)**
During **anaphase-I**, the number of chromosomes become half.

15 **(b)**
G_0-phase.
Some cells that do not divide further, exit G_1-phase and enter an inactive stage called quiescent stage (G_0) of the cell cycle. Cells in this stage remains metabolically active but no longer proliferate unless called on to do so depending on the requirement of the organism

16 **(d)**
The interphase is also called the resting phase. It is the time during which the cell gets prepared for division by undergoing both cell and DNA replication in an orderly manner

17 **(c)**
The cells, which do not divide further, do not proceed beyond the G_1-phase and start undergoing differentiation into specific type are said to be in G_0-phase.

18 **(c)**
Division of **cytoplasm** is called cytokinesis (Gr. *kitos*=cell; **kinesis**=movement).

19 **(d)**
At the end of prophase, several characteristic events can be observed. Chromosomal material condenses to form compact mitotic chromosomes. Two chromatids attach together to form chromosomes
Assembly of mitotic spindle is initiated by, microtubules (proteinaceous components) of the cell cytoplasm. When observed under the microscope cells at the last stage of prophase, do not shows cell organelles like, Golgi complexes, endoplasmic reticulum, nucleolus and the nuclear envelope

20 **(c)**

Prophase-I of Meiosis	**Prophase of Mitosis**
Prophase-I is very long and elaborate, comprising 5 sub-phases	Prophase is relatively very short and simple
Prophase chromosomes appear double from the very start	Prophase-I chromosome do not look double in the beginning
There is no pairing of homologous Chromosomes, hence no chance of crossing over	Homologous chromosomes pair and often undergo crossing over in prophase-I

21 **(b)**
Mitosis was first observed by **Strasburger** and termed by **W Flemming**. During mitosis, chromosome number remain same in the daughter cells. During meiosis (reduction division), the chromosome number reduced to half in the daughter cells.

22 **(b)**
Telophase is the reverse stage of prophase. During this phase, the cytoplasmic viscosity decreases and the two chromosome groups reorganize themselves into nuclei. A nucleae envelope appears outside the nucleoplasm collected in the area of chromatin. Spindle fibres disappear around the poles and Golgi complex and endoplasmic reticulum are reformed

23 **(a)**
During S-phase, there is no increase in the chromosomes number. If the cell has diploid or $2n$ number of chromosomes at G_1, even after S-phase the number of chromosomes remains the same, *i.e., 2n*

24 **(b)**
The correct sequence is
Synapsis → crossing over → terminalisation → disjunction of genomes

25 **(b)**

The interphase takes approximate 75-95% of the entire generation time

26 **(d)**

The paternal and maternal chromosomes of each homologous pair segregates during anaphase-I. Although, both (maternal and paternal) chromosomes of a homologous pair have the genes for the same traits, either chromosome of a pair may carry different alleles of the same genes. Therefore, in anaphase-I, homologous chromosomes introduces genetic variability

27 **(a)**

A-Animals; B-Plants

28 **(a)**

At the onset of anaphase, each chromosome arranged at the metaphase plate is split simultaneously and the two daughter chromatids, now referred to as chromosomes of the future daughter nuclei, begin their migration towards the two opposite poles. As each chromosome moves away from the equatorial plate, the centromere of each chromosome is towards the pole and hence at the leading edge, with the arms of the chromosome trailing behind. *Thus, anaphase stage is chracterised by the following key events*

1. Centromeres split and chromatids separate
2. Chromatids move to opposite poles

29 **(a)**

After meiosis, the chromosomes get reduce by half, producing haploid cells. The sperm and the egg are haploid cells and when they fuse during fertilization, they produce diploid original

30 **(d)**

The phase between two successive M-phases is called interphase.

The M-phase represents the phase when the actual cell division or mitosis occurs and the interphase represents the phase between two successive M-phases. It is significant to note that in the 24 hour average duration of cell cycle of a human cell, cell division proper lasts for only about an hour. The interphase lasts more than 95% of the duration of cell cycle

31 **(b)**

Meiosis start with one diploid containing copies of chromosome, one from mother and one from father. The cell divides twice, producing up to four haploid cells containing one copy of each chromosome

32 **(a)**

Interkinesis is the transition stage between meiosis-I and meiosis-II.

33 **(d)**

In zygotene of prophase-I, homologous chromosomes pair up. This process is called **synapsis**. One chromosome of the pair is from the male parent and other from the female parent.

34 **(b)**

In metaphase, chromosomes are shortest and show maximum condensation. Chromosomes are arranged at equatorial metaphasic plate. Structure, size and number of chromosomes are best studied at metaphase.

35 **(a)**

Microtubules are mainly composed of tubulin protein. These are found only in eukaryotic cellular structures like cilia, flagella, centriole, basal body, spindle fibre, etc.

36 **(b)**

G_1-phase is called as pre-synthetic phase or post-mitotic phase. It is the longest phase of cell cycle. In G_1-phase, a cell has two options:

3. Continues cycle and enters S-phase
4. Stops cell cycle and enters G_0-phase for undergoing differentiation.

37 **(d)**

S-phase is the sub-phase between G_1-phase and G_2-phase, during which DNA synthesis or replication takes place.

In animal cells, during the S-phase, DNA replication begins in the nucleus and the centriole duplication in the cytoplasm. The amount of DNA per cell doubles in the nucleus. If the initial amount of DNA is denoted as 2C, then it increases to 4C. However, there is no increase in the chromosome number

38 **(b)**

Colchicine is an antimitotic drug (alkaloid) which is obtained from *Colchicum* (family-Liliaceae). It binds to one tubulin molecule and prevents its polymerization. The depolymerisation of tubulin result in disappearance of mitotic spindle blocking the cell's mitotic chromosomal division at metaphase and anaphase.

39 **(c)**

Non-disjunction occurs when a pair of homologous chromosomes do not separate in meiosis but migrate to the same pole of the cell, resulting in an even number of chromosomes being present in the daughter cells.

40 **(d)**
A-G_0; B-M

41 **(a)**
Homologous chromosomes segregate when a cell undergoes meiosis.

42 **(a)**
Meiosis is a reductional division, in which the chromosome number is reduced to half. It was proposed by **Farmer** and **Moore**. It is found only in diploid germ cells and is main cause of variations. During meiosis, four daughter cells are formed from one cell.

43 **(d)**
Meiosis is a reductional division, in which chromosome number is reduced to half, *i. e*, haploid. It is generally observed in sex cells, *i. e*., male and female gametes. In bryophyte or pteridophyte, meiosis occurs in generative cells like **spore mother cells**.

44 **(b)**
The process of crossing over takes place in pachytene stage of prophase-I of meiosis-I. In this process, some genes of two non-sister chromatids of a bivalent are exchanged.

45 **(b)**
Metaphase plate is the plane of alignment of the chromosomes at metaphase.
During metaphase, spindle fibres attach to kinetochores of chromosomes.
Chromosome are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles

46 **(b)**
Cell cycle was described by **Howard** and **Pelc** in 1953. The sequence of events by which a cell duplicates its genome, synthesizes the other constituents of the cell and eventually divides into two daughter cells is termed as **cell cycle**

47 **(b)**
In animal cells, cytokinesis involves the contraction of the contractile ring of microfilaments.

48 **(a)**
In meiotic division metaphase-I spindle apparatus starts appearing and bivalents become attached to spindle through centromeres. Bivalents then appear in the form of an equatorial plate due to the movement known as 'congression'.

49 **(a)**
Crossing over is a process that produces new combination of genes by interchanging of segments between nonl-sister chromatids of homologous chromosomes. It occur between homologous chromosomes at four stranded stage during pachytene of prophase-I of meiosis-I.

50 **(b)**
The cell cycle is divided into two basic phases
Interphase and M-phase (mitotic phase).
Interphase further divides into three phases:
G_1-phase, S-phase and G_2-phase

51 **(d)**
Colchicine prevents spindle formation, which occurs during **metaphase** stage of cell division.

53 **(a)**
Kinetochores serve as the sites of attachment of spindle fibres to the chromosomes that are moved into position at the centre of the cell.

54 **(c)**
Cell division cannot be stopped in S-phase. The S-phase is the synthesis phase, in which the cell synthesises a replica of its genome, *i. e*., DNA replication occurs which ultimately result in the duplication of chromosomal material.

55 **(a)**
As a result of meiosis, the gamete of AaBb will be AB, aB, Ab, ab.

56 **(c)**
The stage between two meiotic divisions is called **interkinesis**. It is generally short lived and is followed by prophase-II, a much simpler prophase than prophase-I of meiosis-I.

57 **(d)**
The number of different haploid cells arise by meiosis can be calculated by 2^n where,
n=number of haploid chromosomes.

58 **(c)**
The cell cycle is controlled by enzymes like cyclin dependent kinases (CdKs). CdKs phosphorylate amino acids like serine and threonine which initiates or blocks the activities related to cell cycle. *The other check points involved in cell cycle are*

5. G_1 check point (Enter S or synthesis) is controlled by CdK_4/Cyclin D, CdK_6/Cyclin D

6. G_2 check point (Enter M or maturation promoting factor) by is controlled CdK_2/cyclin B
7. Metaphase check point is controlled by cyclin B degradation

59 **(c)**
During pachytene substage of prophase-I of meiosis, the chromosomes are tetravalent *i. e.*, contain two chromatids with each chromosome arms. Crossing over during this substage, which involves the exchange of segments between the non-sister chromatid of homologues.

60 **(d)**
Colchicine treatment doubles the chromosome number.

61 **(c)**
In oocytes, a special, extremely prolonged form of diplotene occurs, called dictyotene. The primary oocyte undergoes the first three substages of prophase-I (laptotene, zygotene and pachytene) during late foetal life.
The process is then, suspended during diplotene until puberty or thereafter. Therefore, dictyotene, lasts for months or even years. Diplotene is also known as diplonema

62 **(a)**
During mitosis, all the chromosomes behave independently while during meiosis, homologous chromosomes pair up through synapsis and form bivalents in zygotene substage of prophase-I, then in pachytene substage, crossing over occurs between homologous chromosomes and during diplotene substage of prophase-I of meiosis chiasma formation takes place.
During anaphase of both mitosis and meiosis, chromatids are separated and pulled towards opposite poles.

63 **(d)**
Microtubules are hollow, cylindrical structure built from tubulin protein. The mitotic spindle involved in separation of replicated chromosomes during mitosis is assembly of microtubules.

65 **(a)**
A. **Metaphase** Spindle fibres attaches to kinetochores of chromosomes
Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres of both poles
B. **Telophase** Chromosomes cluster at opposite spindle poles and their identify is lost as discrete elements
Nuclear envelope assembles around the chromosome clusters
Nucleolus, Golgi complex and ER reform
C. **Interphase** It is the duration which is a variable depending on the function of cell.
Just before nuclear division, the DNA of chromosome replicates thus, it becomes doubled.
During this phase, chromosome material is in the form of very loosely coiled threads called chromatin

66 **(c)**
During **metaphase-I** of meiosis, tetrads line up at the equator.

67 **(a)**
M cdk cyclin activates anaphase promoting complex.

68 **(a)**
During **cytokinesis** in plant cells spindle fibres do not degenerate and forms phragmoplast and cell plate.

69 **(d)**
During **anaphase-I** of meiosis, the sister chromatids begin to move towards the poles.

70 **(d)**
Small disc-shaped structure at the surface of the centromeres are called kinetochores. These structures serve as the sites of attachment of spindle fibres (formed by the spindle fibres) to the chromosomes that are moved into position at the centre of the cell
Hence, the metaphase is characterized by all the chromosomes coming to lie at the equator with one chromatid of each chromosome connected by its connected by its kinetochore to spindle fibres from one pole and its sister chromatid connected by its kinetochore to spindle fibres from the opposite pole

71 **(c)**
Meiosis-I
(i) The bivalents become arranged around the equator of the spindle, attached by their centromeres
(ii) Each pair of the homologous chromosomes is called bivalent which pair up in the process of synapsis

72 **(d)**
Colchicine serves as mitotic spindle poison.

73 **(c)**
Chromosomes are visible with chromatids at **metaphase** stage of mitosis. It is the best stage to observe the shape, size and number of chromosomes.

74 **(b)**
The main events which take place in **G_1-phase** are:
8. Intensive cellular synthesis,
9. Pooling of nucleotides for synthesis of rRNA.
10. Synthesis of enzymes and ATP storage,
11. Synthesis of NHC protein, carbohydrates, liquids, etc.

75 **(c)**
Anaphase-I, anaphase-II.
In anaphase-I chromosome become half in number. Chromosomes split and move to opposite ends of the cell, both in anaphase-I and anaphase-II. The difference is that in anaphase-I, homologous pairs of chromosomes are split and in anaphase-II, sister chromatids are split

76 **(a)**
Initially, homeotypic cell division takes place in the functional megaspore without cytokinesis.

77 **(d)**
In multicellular organisms, cell division brings about embryonic development and growth and also plays an important role in repair and maintenance of the body and also in reproduction, both asexual and sexual

78 **(a)**
Meiosis involves two sequential cycles of nuclear and cell division called meiosis-I and meiosis-II but only a single cycle of DNA replication

79 **(d)**
During **pachytene** of meiosis-I, the chromosomes become bivalent (tetrad) in the beginning, $i.e$, each chromosome with two chromatids.

80 **(b)**
DNA replicates only once in each cell cycle (S-phase)

81 **(c)**
The cell cycle is divided into two basic phases
(i) Interphase
(ii) M-phase (mitosis phase)
The interphase is further divided into three phases
(i) G_1-phase (gap 1)
(ii) S-phase (synthesis)
(iii) G_2-phase (gap 2)
The correct sequence of a cell cycle is
$G_1 \rightarrow S \rightarrow G_2 \rightarrow M$

82 **(b)**
It is mitosis, in which both diploid and haploid cells undergoes this process.
If a diploid cell undergoes mitosis, it results in two identical diploid cells. $2n \rightarrow n$
If a haploid cell undergoes mitosis, the result is two identical haploid cells ($n \rightarrow n$).
In meiosis however, a diploid cell participates that divides twice to produce four haploid cells

83 **(d)**
Some cells in the adult animals do not appear to exhibit division ($e.g.$, heart cells, and many other cells divide only occasionally $e.g.$, when there is need to replace cells that have been lost due to injury or cell death. These cells that do not divide further and exit G_1-phase to enter an inactive stage called quiescent stage (G_0) of the cell cycle. Cells in this stage remains metabolically active but no longer proliferate

84 **(d)**
A-diploid; B-haploid

85 **(c)**
The spindle are formed of microtubules

86 **(d)**
In mitosis, prophase is the longest phase of karyokinesis. In early prophase, nuclear membrane and nucleolus start disintegrating. Cell cytoskeleton, Golgi complex, ER, etc, also disappear.

87 **(b)**
The plane of alignment of the chromosomes at metaphase is referred to as the **metaphase plat.**
They key features of metaphase are
(i) Spindle fibres attach to kinetochores of chromosomes
(ii) Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles

88 **(a)**
In meiosis-I, displacement of chiasmata takes place in diakinesis and homologous chromosomes segregates during anaphase-I

89 **(c)**
Colchicine is an alkaloid widely used in plant breeding for doubling the chromosome number.

Colchicine is extracted from the corms of *Autumn crocus (Colchicum autumnale)*. The alkaloid does not allow the formation of spindle. Colchicine induced polyploidy has been used in raising several varieties of horticultural and agricultural plants, *e*. *g*., potato

90 **(c)**
Crossing over leads to separation of linked genes and recombination with the genes present on homologous chromosome to form new combinations.

91 **(a)**
The correct sequence of cell cycle phases is $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$.

92 **(c)**
There are two main ways of cell division *i.e.,* mitosis and meiosis. In each case, division of the nucleus, called karyokinesis, occurs before the division of the cytoplasm, termed as cytokinesis

93 **(a)**
Cell would normally proceed to mitosis without interruption once it had started the S-period.

94 **(a)**
The two chromatids of a metaphase chromosome represent replicated chromosomes to be separated at anaphase.

95 **(b)**
During interphase, the chromosome material (DNA of chromosome) replicates and becomes doubled. Chromosome material in the form of very loosely coiled threads is called chromatin

96 **(a)**
G_1-phase is the longest phase of the cell cycle and is also called as presynthetic or post mitotic phase. During it, the synthesis of biochemicals like RNAs, proteins, enzymes (DNA polymerase) for DNA synthesis, amino acids for histone formation, nucleotides and ATP, takes place.

97 **(d)**
Telomeres are the ends of chromosomes. These are required for the individuality of chromosomes. Generally, these are present more than one and less than five in a chromosome.

98 **(a)**
Meiosis is division necessary for the formation of gamates in animals and spores in plants.
Prophase-I is longest phase of meiosis and composed of leptotene, zygotene, pachytene, diplotene and diakinesis.

100 **(c)**
Crossing over is also an enzyme mediated process and the enzyme involved is called recombinase

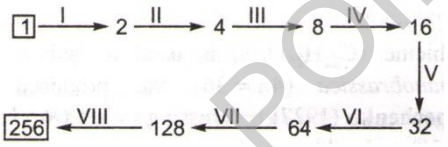
101 **(b)**
Independent Assortment of Chromosomes The paternal and maternal chromosomes of each homologous pairs segregates during anaphase-I independently of the other chromosomes. Anaphase-I is the cytological event that corresponds to Mendel's law of independent assortment.
Although the paternal and maternal chromosomes of a homologous pair have the genes for the same traits, either chromosome of a pair may carry different alleles of the same genes. Therefore, independent assortment of homologous chromosomes in anaphase-I introduces genetic variability

102 **(b)**
Cytokinesis is thought to be the final part of telophase, however, it is a separate process that begins at the same time as telophase.
In telophase, new membranes forms around the daughter nuclei, when chromatids arrive at opposite poles of cell.
The chromosomes disperse and are no longer visible under the light microscope. The spindle fibres disperse and cytokinesis or the partitioning of the cell also begin during their stage

103 **(b)**
In meiosis, nucleus undergoes two divisions (first is reductional and second is equational), while chromosomes divide only once (in anaphase-II).

104 **(d)**
Amitosis is known as direct division. In this method, nuclear envelope remains intact. *The steps involved in amitosis are as follows*
(i) The nucleus of the cell elongates and develops a constriction round its middle
(ii) The constriction in nucleus gradually deepens and finally cuts the nucleus into two daughter nuclei
(iii) The constriction appears in the cytoplasm
(iv) The cytoplasmic constriction divides the parent cell into two daughter cells, each with a nucleus

105 **(d)**
As a result of mitotic division, the number of daughter cells becomes double. Thus, 8 mitotic divisions are required to produce 256 daughter cells from a single cell.



106 **(d)**
The second check point called mitotic cyclin lies between G_2 and M-phase and causes transition from G_2 to M-phase

107 **(b)**
A-Nuclear division; B-Karyokinesis; C-Cytokinesis

108 **(b)**
In the G_1-phase of interphase, the cell is metabolically active and continuously grows but do not replicate its DNA S or synthesis phase marks the period during which DNA synthesis or replication takes place. During this time, the amount of DNA per cell gets double

109 **(b)**
Replication of DNA takes place during S-phase of cell cycle. The number of chromosomes reduced only in meiosis. So, the number remains 14 in G_1-phase

110 **(a)**
Chromosomal crossing over is the exchange of genetic material between homologous chromosomes that results in the recombinant chromosomes. It occurs during prophase-I of meiosis

111 **(a)**
Lampbrush chromosomes are present in growing oocytes, during the diplotene stage of meiotic prophase-I. Chromosomes transform into the Lampbrush form due to an active transcription of many genes

112 **(a)**
Prophase-I is the longest stage in the first division of meiosis and is divided into a number of substages. The chronological sequence is leptotene, zygotene, pachytene, diplotene and diakinesis.
The characteristic phenomenon during pachytene is the exchange of chromosomal segments, *i.e.,* the recombination of gene or crossing over

113 **(b)**
Chiasmata formation is the consequence of crossing over. Each chiasma possesses the site of exchange of material between non-sister chromatids. It is produced by breakage and reunion between any two of the four strands present at each site. Chiasmata are most appropriately observed during **diplotene sub-stage** of **meiosis-I**.

114 **(a)**
Long thin thread-like chromosome lie in unpaired condition in **leptotene** of prophase-I.

115 **(d)**
During meiosis, beads like structures are absent on chromosomes and separation of two basic sets of chromosome occurs

116 **(c)**
Some cells that do not divide further, exit G_1-phase and enter an inactive stage called quiescent stage (G_0) of the cell cycle. Cells in this stage remains metabolically active but no longer proliferate unless called on to do so depending on the requirement of the organism

117 **(c)**
During **anaphase** stage of mitosis, centromere of the chromosome divides and the two chromatids start repelling each other, separate completely to become daughter chromosome and move towards the opposite poles.

118 **(c)**
The S and G_2-phases of interphase are followed by prophase. Prophase is marked by the initiation of condensation of chromosomal material. The chromosomal material become untangled during the process of chromatin condensation. Centriole, now begins to move towards opposite poles of the cell.
Therefore, when dividing cells are examined under a light microscope, in prophase only the chromosomes become visible

119 **(b)**
Recombination of **genes on** the same chromosome is accomplished by crossing over, a process by which parts of homologous chromosomes are interchanged. Crossing over takes place between non-sister chromatids of homologous chromosomes in pachytene stage of meiosis-I.

120 **(d)**
G_1-phase corresponds to the interval between mitosis and initiation of DNA replication. During G_1-phase, the cell is metabolically active and continuously grows but do not replicate its DNA

121 **(b)**
Duration of the cell cycle, *i.e.,* period between two successive cell divisions is called generation time. It depends on the type of cell and external factors such as temperature food and oxygen supplies.

Mammalian (*e*. *g*., human) cell divides once in approximate every 24 hrs

122 **(b)**
There are two main ways of cell division *i.e.,* mitosis and meiosis. In each case, division of the nucleus, called karyokinesis, occurs before the division of the cytoplasm, termed as cytokinesis

123 **(d)**
All the statements are correct

124 **(c)**
During the G_0-phase, cells are metabolically active but no longer proliferate in normal condition

125 **(c)**
In **pachytene** substage of meiosis-I, the paired homologous chromosomes divide into sister chromatids. Thus, each bivalent is composed of four chromatids and known as tetrad.

126 **(a)**
The pairing of homologous chromosomes during **zygotene** is called synapsis, *i*. *e*., the homologous chromosomes, which come from mother and father paired in zygotene.

127 **(a)**
Mitosis usually results in the production of diploid daughter cells with identical genetic complement. The growth of multicellular organisms is due to mitosis. Cell growth results in disturbing the ratio between the nucleus and the cytoplasm. It therefore, becomes essential for the cell to divide to restore the nucleo-cytoplasmic ratio. A very significant contribution of mitosis is cell repair
The cells of the upper layer of the epidermis, cells of the lining of the gut and blood cells are being constantly replaced. Mitotic divisions in the meristematic tissues – the apical and the lateral cambium, result in a continuous growth of plants throughout their life

128 **(b)**
Mitosis divides the parent cell into two identical daughter cells, each with a nucleus having the same amount of DNA, the same number and kind of chromosomes and the same heredity instructions as the parent cell, that's why it is called as the equational division

129 **(b)**
The complete disintegration of the nuclear envelope marks the start of the second phase of mitosis, *i.e.,* metaphase. Hence the chromosomes are spread through the cytoplasm of the cell. By this stage, condensation of chromosomes is completed and they can be observed clearly under the microscope. This then, is the stage of which morphology of chromosomes is most easily studied. At this stage, metaphase chromosomes are made up of two sister chromatids, which are held together by the centromere

130 **(b)**
In plant cells, during metaphase chromosomes line up around the equator of the spindle and attached by their centromere to the spindle fibres (microtubules). In animal cells, during metaphase, smaller chromosomes are usually central in position with larger ones peripheral in position.

131 **(c)**
Mitosis lasts on an average from 30 min to 3 hrs

132 **(a)**
In the S and G_2-phases of interphase, the new DNA molecules formed are not distinct but interwined. Prophase, which is the first stage of mitosis follows the S and G_2-phases of interphase

133 **(a)**
A-Cyclins; B-CdK; C-Check points; D-Mitotic cyclin

134 **(b)**
Synapsis is the pairing of homologous chromosomes during the zygotene stage of meiosis. Each pair is called bivalent. One chromosome of the pair comes from the male parent and other from the female parent. Each member of the pair is of the same length, their centromeres are in the same position and they usually have the same number of genes arranged in the same order. After zygotene stage, cell entered in **pachytene** stage in which the bivalents become spiralled, shortened and thickened.

135 **(d)**
Prophase is generally identified by the initiation of condensation of chromosomal material. The chromosomal material condenses to form chromosomes. The nuclear envelope breaks down and spindles start to assemble at opposite ends of the cell

136 **(b)**
CdK_2/cyclin B.
The cell cycle is controlled by enzymes like cyclin dependent kinases (CdKs). CdKs phosphorylate amino acids like serine and threonine which initiates or blocks the activities related to cell cycle. *The other check points involved in cell cycle are*

12. G_1 check point (Enter S or synthesis) is controlled by CdK_4/Cyclin D, CdK_6/Cyclin D
13. G_2 check point (Enter M or maturation promoting factor) by is controlled CdK_2/cyclin B

Metaphase check point is controlled by cyclin B degradation

137 **(c)**

Mitosis is divided into four stages

A-Prophase, B-Metaphase, C-Anaphase, D-Telophase

138 **(d)**

Telophase is the reverse stage of prophase. During this phase, the cytoplasmic viscosity decreases and the two chromosome groups reorganize themselves into nuclei. A nucleae envelope appears outside the nucleoplasm collected in the area of chromatin. Spindle fibres disappear around the poles and Golgi complex and endoplasmic reticulum are reformed

139 **(c)**

I. Spindle microtubules that extends from the two poles of a dividing cell are called polar fibres
II. A centromere that connects two identical copies of single chromosome. These two copies are called sister chromatids
III. In 'X' phase, the paired chromosomes separate and begin moving to opposite ends of the cell. This 'X' phase is called anaphase

141 **(c)**

Interphase (L. inter-between, Gk, *phasis* – aspects) is a series of changes that takes place in a newly formed cell and its nucleus before it becomes capable of dividing again. It is a period of intense synthesis and growth. The interphase takes approximately 75-95% of the entire generation time. It is further divided into three periods of phases first gap or G_1-phase, synthetic or S-phase and second gap or G_2-phase
Duration of these phases varies in different organisms

142 **(b)**

In anaphase-I chromosome become half in number. Chromosomes split and move to opposite ends of the cell, both in anaphase-I and anaphase-II. The difference is that in anaphase-I, homologous pairs of chromosomes are split and in anaphase-II, sister chromatids are split

143 **(d)**

Colchinine ($C_{22}H_{25}O_6N$) is used to induce polyploidy. *Raphanobrassica* ($4n = 36$) was produced by **G D Karpechenko** (1927) by crossing radish (*Raphanus sativus* $2n = 18$) and cabbage (*Brassica oleracea* $2n = 18$). It is the first **allotetraploid**.

144 **(c)**

The spindle apparatus formed during cell division is composed of microtubules radiating in all directions. The microtubules are chemically composed of **tubulin** protein (α-tubulin, β-tubulin).

145 **(a)**

Ophioglossum is a gene of about 25-30 species. It is a plant. It has the highest chromosome count of any known living organism, with 1260 chromosomes. In haploid stage, 631 chromosomes in number

146 **(a)**

At telophase stage, nuclear membrane vesicles associate with the surface of individual chromosome and fuse to reform the nuclear membranes, which partially enclose cluster of chromosomes before coalescing to reform the complete nuclear envelope. During this process, the nuclear pores reassemble and reassociate to form the nuclear lamina. One of the lamina proteins (lamina-B) remains with the nuclear membrane fragments throughout mitosis and may help nucleate reassembly. After the nucleus reforms, the pores pump in nuclear proteins, the chromosome decondense and RNA synthesis resumes, causing the nucleolus to reappear.

147 **(b)**

In zygotene, a filamentous ladder like nucleoprotein complex called syaptomemal complex is observed between the homologous chromosomes. It forms structural basis for pairing and synapsis of meiotic chromosomes.

148 **(a)**

After completion of synapsis, the cell enters the pachytene stage. Here cell remains for four days. Chromosomes are paired and occurs in synaptonemal complexes. The paired chromosomes or bivalent gets shorten and crossing over takes place

149 **(c)**

After M-phase, daughter cell may enter G_0-phase, which is a stage of arrest of cell cycle, stoppage of cell division and on set of differentiation.

150 **(a)**
During cell division, chromosomes attaches with spindle at **kinetochore**.

151 **(c)**
In a spindle, negative ends of microtubules are towards the poles.

152 **(d)**
Pachytene or **thick thread** or **pachynema** substage is the longest substage of prophase-I of meiosis. It is characterised by the process of crossing over during which the non-sister chromatids twist around and exchange segments with each other by proper breakage and then fusion of broken ends.

153 **(a)**
Cell cycle consists of two basic stages. There is a long undividing stage called I-phase (interphase) and a short-dividing M-phase

154 **(b)**
The last substage of interphase is G_2-phase in G_2-phase, cell organelles increases in number and both cell and nucleus grows in size
G_1-phase, is the first stage of interphase during which cell organelles do not increase in number. Cell grows in size but the growth of nucleus is little. It synthesizes RNAs, proteins and other biochemical for cell growth and subsequent replication of DNA

155 **(a)**
In meiosis-I displacement of chiasmata takes place in diakinesis and homologous chromosomes segregate at anaphase-I.

156 **(c)**
Synthesis phase or S-phase is the phase in cell cycle during which DNA is replicated. The synthesis of histone proteins and RNA also takes place in this phase in this phase and each chromosome has two chromatids.

157 **(d)**
The directed movement of the chromosomes into position at the metaphase plate is termed as **congression**.

158 **(c)**
Leptotene The chromosomes appear as thin long threads and have a beaded appearance due to the presence of chromomeres
Pachytene Dissolution of the synaptonemal complex takes place in zygotene. The characteristic phenomenon during pachytene is the exchange of chromosomal segments, *i.e.,* the recombination of genes or crossing over
Diplotenes Tetrads formation takes place in pachytene stage. In diplotene the paired chromosomes begin to separate but remains united at the points of interchange of chiasma

159 **(c)**
The number of DNA strands in chromosome at G_2-stage of cell cycle is **four** due to the replication of DNA during S-phase.

160 **(a)**
Meiosis reduces chromosome number from diploid ($2n$) to haploid (n). It occurs in germ cells (eggs or sperm)

161 **(b)**
Prophase-I It is more complicated and prolonged as compared to the similar stage of mitosis. In this phase, chromosomes are not distinguishable because they are often seen as heterochromatic (heteropycnotic) bodies
Anaphase-I The homologous chromosomes break their connections and separate out. It is called disjunction
Interphase It is the phase of cell cycle in which the cell spends the majority of its time in preparing itself for cell division. It is the time between two mitotic or meiotic cell cycles
Metaphase-I A chromatic fibrous bipolar spindles are formed in the areas of dividing nuclei. The spindles are arranged in isobilateral or tetrahedral fashion. The chromosomes arrange themselves at equator

162 **(a)**
G_1 is the longest period, which involves preparation for RNA and protein synthesis.

163 **(a)**
Bivalent A pair of homologous chromosomes lying together is called a bivalent.
(i) **Tetrad** In pachytene stage, the chromatids of each synapsed chromosome slightly separate and become visible. The two visible chromatids of a chromosome are referred to as dyad
(ii) A group of four homologous chromatids (two dyads) is called a tetrad
(iii) **Pachytene Stage** Crossing over occurs during pachytene stage
(iv) **Non-sister Chromatids** The two chromatids of two homologous chromosomes (bivalent) are termed non-sister chromatids

(v) **Sister Chromatids** The two chromatids of the same chromosome are called sister chromatids

164 **(c)**

$A - G_1; B - G_2$

166 **(a)**

The M-phase represents the phase when the actual cell division or mitosis occurs and the interphase represents the phase between two successive M-phases. It is significant to note that in the 24 hour average duration of cell cycle of a human cell, cell division proper lasts for only about an hour. The interphase lasts more than 95% of the duration of cell cycle

167 **(b)**

It the initial amount of DNA is denoted as 2C, then it increases to 4C.

In the G_1-phase of interphase, the cell is metabolically active and continuously grows but do not replicate its DNA S or synthesis phase marks the period during which DNA synthesis or replication takes place. During this time, the amount of DNA per cell gets double

168 **(a)**

In meiosis, the daughter cells are not similar to that of parent genetically because of **crossing over**. Crossing over is the mutual exchange of homologous chromosomal regions between non-sister chromatids during the first prophase of meiosis.

169 **(c)**

Late anaphase is characterised by

(i) Centromeres split and chromatids separate

(ii) Chromatids move to opposite poles.

Prophase is characterised by centriole separation.

170 **(c)**

G_2-phase or second gap phase is the gap between DNA synthesis and division. This particular phase is spent in synthesizing molecules other than DNA, which are required for cell division.

171 **(d)**

The reciprocal exchange of chromosomal material between homologous chromosome is termed as **crossing over**.

172 **(b)**

In meiosis-I, division is reductional while II equational.

173 **(c)**

G_0-phase is the arrest phase or suspended phase of the cycle. The cells remain inactive or in a non-dividing resting state during this phase and may remain such for days to years before resuming cell division, *e*. *g*., nerve cells remain in G_0-phase.

174 **(c)**

Cell cycle completes in two steps- Interphase and M-phase. Interphase is completed in three successive phases G_1-phase (post-mitotic phase), S-phase (synthetic phase) and G_2-phase (pre-mitotic or post-synthetic phase). In the given figure, D is representing the S-phase (synthesis phase) of cell cycle.

175 **(c)**

I. The shortening and thickening of chromosome fibres occurs due to the two reason

Coming together of axial proteins and coiling or spiralisation of chromatin fibres. This is assisted by the proteins, called condensins

II. Sometimes, overlapping is shown by the elongated chromosome. Their ends are not visible. Therefore, the chromosomes appears like a ball of wool and this stage is called sprime stage

III. Animal cells generally have two centrosome or centriole pairs lying close together. These two centrides begins to move towards the opposite sides of the microtubules, surrounding each pair of centrioles (diplosome). It look like a star-shaped body called aster

IV. Shortening of chromosome during prophase is must for their equal distribution during anaphase. Each chromosome appears to have two longitudinal threads called chromatids or sister chromatids, attached to each other by means of a narrow point called centromere

176 **(a)**

At **metaphase**, the chromosome are clearly visible as composed to two closely associated halves (chromatids) and the chromosomes have undergone maximum contraction, so these can be counted conveniently.

177 **(a)**

Metaphase in both mitosis and meiosis is characterised by the orientation of chromosomes themselves on the spindle fibres at the equatorial plate.

178 **(b)**

Sporophyte is a diploid generation while gametophyte is haploid. Meiosis cause the

reduction of chromosome number to half, *i. e*., from diploid to haploid.

179 **(d)**
The first meiotic division leads to reduction of chromosome number of half and the second meiotic division to segregate the replicated chromosomes.

180 **(b)**
There are two main ways of cell division *i.e.,* mitosis and meiosis. In each case, division of the nucleus, called karyokinesis, occurs before the division of the cytoplasm, termed as cytokinesis

181 **(a)**
In meiotic cell division, homologous chromosomes pair up during zygotene stage of prophase-I, this phenomena is called synapsis. During anaphase-I, homologous chromosomes of each bivalent start migrating towards opposite pole of the spindle, ultimately each pole receives a haploid group of regregated chromosomes.

182 **(c)**
During pachytene substage of prophase-I of meiosis, the non-sister chromatids of homologues exchange segments between themselves. This exchange of chromatid segments is called **crossing over**, which involves proper breakage and then fusion of broken ends oppositely and hence, results in the recombination.

183 **(c)**
The zygote is formed by the fusion of male and female gametes. The male and female gametes are formed by meiosis in diploid organism. A diploid living organism develops from zygote by repeated **mitotic divisions**.

184 **(d)**
Synapsis of homologous chromosomes takes place during zygotene stage of meiosis-I. Division of centromere takes place during anaphase-II of meiosis.

185 **(d)**
Egg is haploid and has 5 pg (pico gram) DNA. Its animal, which is diploid will be having 10 pg DNA. In S-phase, DNA doubles and therefore, in G_2amount of DNA will be 20 pg.

186 **(d)**
Meiosis occurs in a diploid cell. It is a double division which gives rise to four haploid cells, each having half the number of chromosomes as compared to the parent cell. The term 'meiosis' was coined by **Farmer** and **Moore** in 1905

187 **(a)**
Chromosomes that results from the separation of sister chromatids during cell division are called daughter chromosomes. During anaphase of mitosis, paired chromosomes (sister chromatids) separates to form daughter chromosomes.
Each daughter chromosome migrates to centromere, toward the opposite ends of the cell.
At the end of cell division, two distinct daughter cells are formed from a single cell

188 **(b)**
In G_2-phase of interphase stage of cll cycle, the proteins required for spindle formation are synthesized. In G_1-phase, enzymes required for protein and DNA replication are synthesized.
In S-phase, DNA replication process takes place.
In anaphase, chromosomes split longitudinally at the centromere.

189 **(d)**
Meiosis is a double division, which occurs in a diploid cell (nucleus) and gives rise to four haploid cells (nuclei), each having half the number of chromosomes as compared to the parent cell. In meiosis-I, bivalent is an association of four chromatids and two centromeres.

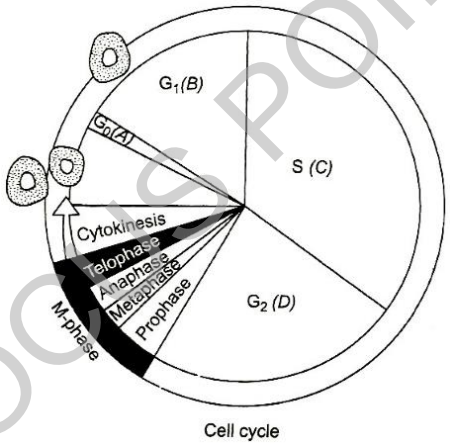
190 **(d)**
Drug colchicines is obtained from*Colchicum autumnale*. It arrests the polymerization of microtubules from tubulin protein, *i. e*., arrests spindle formation at **metaphase**.

191 **(b)**
Replication of DNA takes place at S-phase of cell cycle. The number of chromosomes reduced only in meiosis. So, the number remain 14, 14, and 14 in G_1 after S and after M-phase.

192 **(a)**
During diplotene substage of meiotic division, the force of attraction between homologous chromosomes reduced and later on they move apart.

193 **(d)**
The beginning of diplotene stage is marked by chiasma formation. The chiasma formation is the indication of crossing over and the beginning of separation of chromosomes.
The chiasma formation is associated with the process of terminalisation

194 **(a)**



Cell cycle

A typical eukaryotic cell in a culture divides once in approximately 24 hrs. The duration of cell cycle can vary from organism to organism and also from cell to cell type

196 **(c)**
Interphase of cell cycle is divided into three phases-G_1, S and G_2-phase. The, S-phase comes in between $G_1$and G_2phase.

197 **(a)**
Synapsis is the pairing of homologous chromosomes during meiosis. While autosomes undergoes synapsis during meiosis, sex chromosomes often remain unpaired. A consequence of recombinant synapsis is to increase genetic variability within both the offsprings and population

198 **(c)**
In prokaryotes and unicellular eukaryotic organisms, cell division is a method of multiplication but in multicellular eukaryotic organism, it is a method of growth.

200 **(b)**
M-phase (mitosis) is the most important period of cell cycle. It involves a major recognisation of virtually all components of the cell. Since, the number of chromosomes in the parent and progeny cells is the same, it is also called as equal division

201 **(a)**
There are two main events in mitosis, karyokinesis or duplication of the nucleus, followed by division of the cytoplasm called cytokinesis. This is followed by the separation of the daughter cells

202 **(a)**
III - Prophase
IV - Metaphase
I - Anaphase-I
II - Telophase-I
V - Telophase-II

203 **(a)**
Reduces by half.
Meiosis start with one diploid containing copies of chromosome, one from mother and one from father. The cell divides twice, producing up to four haploid cells containing one copy of each chromosome

205 **(c)**
Anaphase is characterised by **splitting of the centromeres** and separation of chromatids. Chromatids move to opposite poles from the equatorial plates.

206 **(c)**
Chiasma is an attachment of two non-sister chromatids in a bivalent in diplotene stage of prophase-I of meiosis. Each chiasma results in the exchange of genetic material between non-sister chromatids, *i. e.*, **crossing over**.

207 **(b)**
One of the main functions of centromere is the **cell plate formation**.

208 **(d)**
The duration of cell cycle of yeast is 90 min

209 **(d)**
Synapsis is the pairing of homologous chromosomes during zygotene stage of prophase-I of meiotic division-I. These homologous chromosomes come from mother and father.

210 **(a)**
DNA content becomes double in interphase. Interphase is divided into G_1, S and G_2 -phase. Out of which in S-phase, the cell synthesizes a replica of its genome, *i. e.*, DNA replication occurs during this phase, which ultimately results in the duplication of chromosomal material.

211 **(a)**
Colchicine is an antimitotic drug (alkaloid) which is obtained from *Colchicum* (family-Lilliaceae). It binds to one tubulin molecule and prevents its polymerization. The depolymerisation of tubulin results in disappearance of mitotic spindle, blocking the cells mitotic chromosomal division of metaphase and anaphase

212 **(b)**
The correct sequence is:
Synapsis→Crossing over→Terminalization→ Disjunction of genomes

213 **(a)**

'Tubulin' is a cytoskeletal globular protein that polymerizes to form **microtubules**. During cell division, the microtubules radiate from each end of the cell and form a basket like arrangement (the spindle), which helps in the movement of chromosomes to poles.

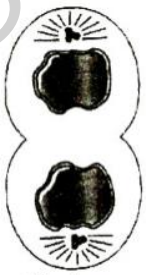
214 **(d)**
Diakinesis is the final stage of the prophase in meiosis. It is characterized by shortening and thickening of the paired chromosomes, formation of the spindle fibres, disappearance of the nucleolus and degeneration of the nuclear membrane

215 **(c)**
In cleavage, there is no spindle develops to guide the chromosomal movement.

216 **(c)**
In G_2-phase chromosome number remains same, so the right answer is 12 chromosomes.

217 **(b)**
Meiosis occurs in organisms during sexual reproduction

218 **(d)**
At the beginning of the final stage of mitosis, *i.e.,* telophase, the chromosomes that have reached their respective poles, decondense and lose their individuality. The individual chromosomes can no longer be seen and chromatin material tends to collect in a mass in the two poles (Fig.). *This is the stage which shows the following key events*



Telophase

219 **(a)**
Interphase has three phases-G_1, S and G_2. Replication of centriole occurs during G_1-phase of interphase. DNA replication takes place in S-phase of interphase.

220 **(a)**
Genetic recombination occurs due to **fertilization** and **meiosis** crossing over.

221 **(a)**
During mitosis, DNA replicates once for one cell division and in meiosis also the DNA replicates once for two cell divisions so, the chromosome number becomes half in meiosis.
Mitosis occurs in both sexually and asexually reproducing organisms, while meiosis occurs only in sexually reproducing organisms.

222 **(a)**
Interphase of cell cycle is composed of G_1-phase, G_2-phase and S-phase. During S-phase, DNA replicates in semi conservative manner so, each chromosome is formed of two chromatids joined at centromere.

223 **(b)**
Meiosis is a special type of division in which the chromosomes duplicate only once but cell divides twice. So, one parent cell produces 4 daughter cells. It is found in diploid germ cells. The first division in meiosis is reduction or heterotypic.

224 **(c)**
Post reproductive stage of a cell includes cell growth. The term cell growth is used in the contexts of cell development and cell division. As we are concerned about growth (development) only, it refers to the growth of cell that is to increase in cytoplasmic and organelle volume that is in G_1-phase

225 **(a)**
Interphase is the period between the end of one cell division to the beginning of next cell division. During this phase, the cell is metabolically very active and prepares itself for the next division.

226 **(a)**
The term 'mitosis' was coined by **Flemming**

227 **(d)**
During telophase, the chromatids have reached the poles of the cell, uncoil and lengthen to form chromatin again. The spindle fibres disintegrate and centriole replicate. Nucleoli and nuclear envelope reappear and hence, two daughter nuclei are formed at each pole.

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NEET BIOLOGY

DIGESTION AND ABSORPTION

1. The richest sources of vitamin-B_{12} are
   a) Goat's liver and *spirulina* b) Chocolate and green gram
   c) Rice and hen's egg d) Carrot and chicken's breast
2. The contraction of gall bladder is due to
   a) Gastrin b) Cholecystokinin c) Secretin d) Kinase
3. In infant, the process of defecation occurs by
   a) Reflex action without voluntary control
   b) Reflex action with voluntary control
   c) Voluntary relaxation of external an sphincter
   d) Involuntary relaxation of internal and sphincter
4. Deficiency of tocopherol in the human body causes which condition?
   a) Beri-beri b) Pellagra c) Infertikity d) Scurvy
5. Brunner's glands are located in
   a) Oesophagus b) Intestine c) Stomach d) Duodenum
6. Which is the correct chronological order for food processing in human beings?
   a) Ingestion of food → Digestion → Absorption → Assimilation → Egestion (Undigested)
   b) Ingestion → Assimilation → Digestion → Absorption → Egestion
   c) Ingestion → Digestion → Absorption → Egestion → Assimilation
   d) Digestion → Ingestion → Assimilation → Absorption → Egestion
7. Riboflavin is
   a) Vitamin-B_{12} b) Vitamin-B_2 c) Vitamin-C d) Vitamin-D
8. The stored food in animals is called
   a) Cellulose b) Starch c) Glucose d) Glycogen
9. Consider the following statements.
   I. The anti-pellagra vitamin is nicotinamide present in milk, yeast, meat and leafy vegetables.
   II. Crypts of Leiberkuhn are present in the liver.
   III. Steapsin is the pancreatic amylase.
   a) I and II correct b) II and III correct c) I and III incorrect d) II and III incorrect
10. Which of the following vitamins is water soluble as well as an antioxidant?
    a) Vitamin-B_1 b) Vitamin-A c) Vitamin-D d) Vitamin-C
11. Hydrochloic acid (HCl) is secreted by which of the following cells of stomach?
    a) Chief cells b) Parietal cells (oxyntic cells)
    c) Peptic cells d) Goblet cells
12. What are the narrow extensions of the pulp cavity?
    a) Pulp b) Dentine c) Root canals d) Periodontal ligament
13. Read thoroughly the following statements concerning with the assimilation of food. Identify true and false statements and choose the correct option from the given codes
    I. Conversion of amino acid into glucose and then into fat is irreversible reaction
    II. During the conversion of amino acids into glucose, amino group of amino acids is removed
    III. Excess of amino acids are converted into glucose and fats and thus are stored
    IV. Excess of simple sugars are stored in the liver and muscle cells. The process is known as glycogenolysis

V. Process of gluconeogenesis occurs in the kidney and striped muscles

a) I, II, IV and V true while III is false
b) I, II, III and V are true while IV is false
c) I, II, III and IV are false while V is true
d) I, II and III are false while IV and V are true

14. Why the eyes of the patients turns yellow during jaundice?
a) Due to the deposition of bile pigments
b) Due to the ejection of stomach content through mouth
c) Due to the stomach malfunctioning
d) Due to the excessive vomiting

15. Which one of the following is a fat-soluble vitamin and its related deficiency disease?
a) Ascorbic acid - Scurvy
b) Retional - Xerophthalmia
c) Cobalamin - Beri-beri
d) Calciferol - Pellagra

16. Secretin and cholecystokinin are secreted by
a) Brunner's gland found in duodenum
b) Paneth cells present in duodenum
c) Goblet cells present through out the epithelium of the stomach
d) Oxyntic cells present on the side walls of the gastric glands

17. Deficiency of Vitamin-B_{12} causes
a) Cheilosis
b) Thalassemia
c) Beri-beri
d) Pernicious anaemia

18. In human beings, digestion of carbohydrates starts from the mouth. How much percentage of it is digested in the mouth?
a) 10-20%
b) 25-30%
c) 60%-75%
d) About 85%

19. Which one is a fat soluble vitamin?
a) Vitamin-H
b) Vitamin-C
c) Vitamin-B
d) Vitamin-D

20. Bacteria $E, coli$ are found in which part of the alimentary canal?
a) Caecum
b) Rectum
c) Colon
d) All of these

21. During starvation, what will be sequence of ending of food stuffs?
a) Carbohydrate-fat-protein
b) Carbohydrate-protein-fat
c) Fat-protein-carbohydrate
d) Fat-carbohydrate-protein

22. The islets of Langerhans are found in
a) Pancreas
b) Stomach
c) Liver
d) Alimentary canal

23. Which is the hardest material of the human body?
a) Dentine
b) Enamel
c) Teeth
d) Bone

24. Characteristic of mammalian liver is
a) Kupffer's cells and leucocytes
b) Leucocytes and canaliculae
c) Glisson's capsules and Kupffer's cells
d) Glisson's capsule and leucocytes

25. Least peristalsis occurs in
a) Rectum
b) Stomach
c) Oesophagus
d) Duodenum

26. Digestive enzymes are
a) Hydrolases
b) Oxidoreductases
c) Transferases
d) Lyases

27. Scurvy is caused due to deficiency of vitamin
a) B
b) A
c) E
d) C

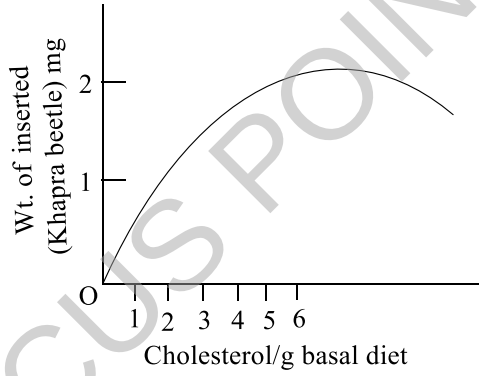
28. Duodenum has characteristic Brunner's gland, which secrete two hormones called
a) Kinase, oestrogen
b) Secretin, cholecystokinin
c) Prolactin, parathormone
d) Oestradiol, progesterone

29. The lacteals are found in
a) Salivary glands
b) Villi
c) Spleen
d) Mammary glands

30. The pH value at which pepsin becomes inactive is
a) Below pH 2
b) Below pH 5
c) Above pH 3
d) Above pH 5

31. Intestional lymphangiectasia is characterised by
a) Dilated intestinal lacteals
b) Contracted intestinal lacteals
c) Descreased number of peneth cells
d) Increased number of peneth cells

32. Deficiency of cyanocobalamine causes
    a) Pernicious anaemia b) Pellagra c) Ketomalacia d) Ariboflavinosis
33. Which combination is responsible to increase the cholesterol level of the blood?
    a) Saturated fats and proteins b) Unsaturated fats and proteins
    c) Both saturated and unsaturated fats d) Saturates fats and polyunsaturated fatty acids
34. FAD is a coenzyme derived from
    a) Riboflavin b) Vitamin-B_{12} c) Thiamine d) Niacin
35. What name would you suggest for a thoroughly mixed food the with gastric juices by the churning movements of muscular stomach wall?
    a) Bolus b) Chyme
    c) Either bolus or chyme d) None of these
36. Which of the following is the constituent of pancreatic juices?
    a) Sodium bicarbonate and three proenzymes
    b) Potassium bicarbonate and three proenzymes
    c) Sodium bicarbonate and five proenzymes
    d) Potassium bicarbonate and five proenzymes
37. In an experiment, freshly hatched larvae of an insect (Khapra beetle) were reared on a basal diet (complete diet without cholesterol) with increasing amounts of cholesterol. Results obtained are shown in given the graph.



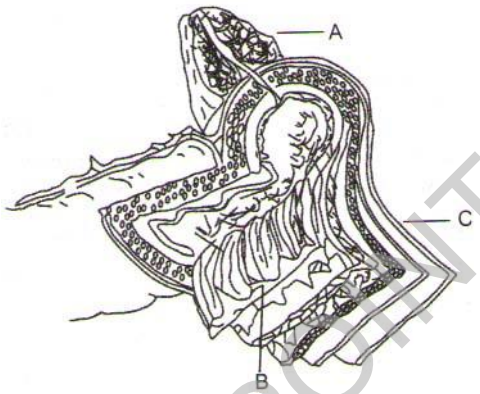
    The graph indicates
    a) Cholesterol is an essential dietary requirement of Khapra beetle
    b) Growth of Khapra beetle is directly proportional to cholesterol concentration
    c) Cholesterol concentration of 2 µg/g diet is the optimum level
    d) Growth of Khapra beetle is inhibited when cholesterol concentration exceeds 2µg/g diet
38. Which one serves as a passage for both food and air?
    a) Larynx b) Pharynx c) Gullet d) Glottis
39. Which of the following animal exhibits diphyodont dentition?
    a) Snakes b) Crocodiles c) Horse d) Elephant
40. Choose an incorrect statement regarding the functions of large intestine
    a) Large intestine absorbs the products of bacterial digestion
    b) Absorption of electrolytes, water and some amino acids occur mainly in the stomach
    c) Mucous lubricates faecal matter
    d) Feces are temporarily stored in the rectum
41. Generally, new born babies shows a symptoms of a mild form of jaundice which is known as
    a) Prehepatic jaundice b) Hepatic jaundice
    c) Neonatal jaundice d) Physiological jaundice
42. Which one of the following combination of vitamins are synthesised by bacteria?
    a) Vitamin-B_{12} and K b) Vitamin-B_1 and B c) Vitamin-B and B_{12} d) Vitamin-K and D
43. The best source of vitamin-B_1 is
    a) Whole Wheat bread b) Cod liver oil

c) Egg d) Curd

44. Which one of the following statements is/are correct?
I. Frenulum is the fold by which tongue is attached to the floor of mouth or oral cavity
II. Lower surface of the tongue has little projection which bears taste buds
III. Pharynx is the common passage for food and air
IV. Sphincter of oddi guards and regulates the opening of stomach into duodenum
V. Colon has 3 parts an ascending, a transverse and a descending part and the later opens into the rectum
a) I, II and III are correct b) IV and V are correct c) I, II, III, IV and V d) I, III and V are correct

45. Wisdom teeth in human is
a) 3^{rd} molar and 4 in number b) 3^{rd} molar and 2 in number
c) 2^{nd} molar and 4 in number d) 2^{nd} molar and 2 in number

46. Which one of the correct option for labels A, B and C in the given diagram?



a) A-Liver, B-Mucosa, C-Peritoneum b) A-Liver, B-Circular muscle layer, C-Serosa
c) A-Pancreas, B-Mucosa, C- Peritoneum d) A-Pancreas B- Submucosa, C- Serosa

47. What is the medium of human saliva?
a) Acidic b) Basic c) Neutral d) Highly acidic

48. Small projections found on the upper surface of tongue are called
a) Frenulus b) Taste buds c) Sulcus terminals d) Papillae

49. The Digestive enzyme that is not found in human pancreatic juice is
a) Nucleotidase b) Nuclease c) Trypsin d) Lipase

50. Which one of the following enzymetic reaction is incorrect?
a) Nucleic acids $\xrightarrow{\text{Nucleotidase}}$ Nitrogen bases + Pentose sugar
b) Fat (Emulsified) $\xrightarrow[\text{Pancreatic}]{\text{Lipase}}$ Fatty acids + Diglycerids
c) Starch $\xrightarrow[\text{Pancreatic}]{\alpha \text{ amylase}}$ Maltose + Isomaltose + α-dextrias
d) Proteins $\xrightarrow{\text{Pepsin}}$ Peptones + Proteose

51. Bile salts act as activator of which enzyme?
a) Pepsinogen b) Trypsinogen c) Lipase d) Pancreatic amylase

52. Sphincter of Oddi guards
a) Hepato-pancreatic duct b) Common bile duct
c) Pancreatic duct d) Cystic duct

53. Stomach located on the upper left portion of abdominal cavity has three parts, a ...A... portion into which the oesophagus open, a ...B... region and a ...C... portion, which opens into small intestine.
Identify A, B and C to complete the given NCERT statement and choose the correct option accordingly
a) A-cardiac, B-fundic, C-pyloric b) A-fundic, B-cardiac, C-pyloric
c) A-pyloric, B-cardiac, C-fundic d) A-pyloric, B-fundic, C-cardiac

54. The opening of the common bile duct is guarded by sphincter?
a) Pyloric b) Ileo-caecal c) Oddi d) Muscularis mucosa

55. Which part of small intestine opens into large intestine?
a) Colon b) Jejunum c) Ileum d) Duodenum

56. Which one of the following pairs is not correctly matched?
    a) Vitamin-B_{12}- Pernicious anaemia
    b) Vitamin-B_6- Loss of appetite
    c) Vitamin-B_1- Beri-beri
    d) Vitamin-B_2- Pellagra
57. In human teeth, which helps in cutting?
    a) Canine b) Incisor c) Molar d) Premolar
58. Medium, in which pepsin is active?
    a) Neutral b) Alkaline c) Acidic d) Isotonic
59. Glisson's capsules are found, in which organ of mammals?
    a) Stomach b) Kidney c) Testis d) Liver
60. What is the process of food passage from buccal cavity to the site of water and mineral absorption
    a) Mouth → Buccal cavity → Pharynx → Oesophagus → Duodenum → Stomach → lleum → Large intestine
    b) Mouth → Buccal cavity → Pharynx → Oesophagus → Stomach → Duodenum → lleum → Caecum → Rectun
    c) Mouth → Buccal cavity → Pharynx → Larynx → Stomach → Small intestine → Large intestine
    d) Mouth to buccal cavity → Pharynx → Food pipe → Stomach → Large intestine → Small intestine
61. Examination of blood of a person suspected of having anaemia, shows large, immature, nucleated erythrocytes without haemoglobin. Supplementing his diet with which of the following is likely to alleviate his symptoms?
    a) Thiamine
    b) Folic acid and cobalamin
    c) Riboflavin
    d) Iron compounds
62. What do you mean by dental formula?
    a) An arrangement of teeth in mouth in the order of I, C, PM, M
    b) An arrangement of teeth in each half of the upper and lower jaw in the order of I, C, PM, M
    c) An arrangement of teeth in upper jaw in the order to I, C, PM, M
    d) An arrangement of teeth in the lower jaw in the order to I, C, PM, M
63. Improper balance diet may cause
    a) Self-poisoning
    b) Scarcity of moisture in eyes
    c) Feeble muscles
    d) All of the above
64. Which of the following metals is present in vitamin-B_{12}?
    a) Cobalt b) Copper c) Zinc d) Magnesium
65. If pancreas is removed, the compound, which remains undigested is
    a) Carbohydrates b) Fats c) Proteins d) All of these
66. Cattle fed with spoilt hay to sweet clover, which contains dicumarol
    a) Are healthier due to a good diet
    b) Catch infections easily
    c) May suffer vitamin-K deficiency and prolonged bleeding
    d) May suffer from beri-beri due to deficiency of vitamin–B
67. Crypts of Leiberkuhn are involved in
    a) Secretion of succus entericus
    b) Secretion of rennin
    c) Secretion of ptyalin
    d) Digestion of food
68. Ptyalin is inactivated by a component of gastric juice known as
    a) Pepsin b) Mucus c) Rennin d) HCl
69. Which combination is not correctly matched?
    a) Vitamin-K – Faulty in blood clotting
    b) Vitamin-C – Pyorrhoea, crack on mouth corner
    c) Vitamin-B_2 – Beri-beri
    d) Vitamin-A – Night blindness
70. How many deciduous teeth are present in human?
    a) 22 b) 24 c) 20 d) 18
71. Crypts of Leiberkuhn are present in
    a) Small intestine b) Liver c) Stomach d) Colon
72. Study thoroughly the following statement and identify which of the following is/are correct and incorrect?
    I. Bile salt present in bile is responsible to emulsify the fats in small intestine

II. Bicarbonates of sodium, potassium, glycocholate and faurocholate of sodium are bile salts
III. The pH of hepatic bile is 8.6, while pH of gall bladder is 7.6 or 7.5
IV. The flow of bile from liver takes place through hepatic duct, common bile duct, -hepatopancreatic ampulla and finally to the first part of small intestine
V. Gall bladder in rat and horse does not store bile
Choose the correct option
a) I, III and IV are incorrect, while II and V are correct
b) Al statement are correct
c) Statement II and V are incorrect while, I, III and IV are correct
d) All statement are incorrect

73. Read the following statements thoroughly and identify wheather they are true and false. Choose the right option accordingly
I. Bile is produced and stored in the liver and gall bladder, respectively
II. Common bile duct is the fusion of all the right and left hepatic ducts
III. Hepato-pancreatic duct opens into the proximal part of the small intestine
IV. Pancreas consists of two parts, exocrine and endocrine, which secretes insulin and glucagon hormone and pancreatic juices containing enzymes, respectively
V. Pepsinogen, a secretion of chief cells is activated by hydrochloric acid
VI. Peptides are converted into dipeptides with the action of carboxypeptidase
a) All statements are true
b) All statement are false
c) Statement I, III, IV and V are true while II and VI are false
d) Statement I, III, V and VI are true while III and IV are false

74. The digestion of starch by amylase is completed in the
a) Mouth b) Oesophagus c) Stomach d) Duodenum

75. Which of the following fatty acids is not synthesized in the human body?
a) Glycerol b) Cholesterol c) Linoleic acid d) Both (a) and (b)

76. In horses, rabbits, hares, the cellulose gets digested in the
a) Caecum b) Stomach c) Appendix d) Rumen

77. Pepsinogen (inactive form) is converted into active form of enzyme pepsin with the help of which of the following compound?
a) Proenzyme b) Hydrochloric acid c) Electrolyte d) Bicarbonates

78. Poison glands of snake are modified
a) Sebaceous glands b) Ceruminous glands c) Salivary glands d) Endocrine glands

79. In the Absence of enterokinase, the digestion of ……. would be affected in our intestine.
a) Maltose b) Amino acid c) Albumin d) Starch

80. Vitamin-B_1, responsible for normal working of human being, can be best obtained from
a) Green vegetables and fruits b) Meat and lentils
c) Whole wheat flour and its derivatives d) All of the above

81. Small finger-like projection, which produce numerous microscopic projections are supplied with a network of
a) Blood capillaries and lacteal b) Blood capillaries only
c) Lacteal only d) A large lymphoid vessel and valves

82. Vitamin –K deficiency causes
a) Scurvy b) Xerophthalmia c) Bleeding d) Osteomalacia

83. The largest variety of digestive enzymes is found in
a) Carnivores b) Herbivores c) Omnivores d) Parasites

84. Pylorus is present between
a) Small and large intestine b) Pancreas and small intestine
c) Oesophagus and stomach d) Stomach and duodenum

85. Identify the type of gastrointestinal hormone based on the functions given below
I. Stimulates the crypts of Lieberkuhn
II. Inhibits the secretion of glucagon by alpha cells
III. Stimulates Brunner's glands to release mucus
Chooses the correct option accordingly

a)	b)	c)	d)
I-Gastrin	I-Duocrinin	II-Duocrinin	I-Enterokinin
II-Duocrinin	II-Cholecystokinin	II-Cholecystokinin	II-Somatostatin
III-Enterokinin	III-Enterokinin	III-Villikinin	III-Duocrinin

86. Go through the following statements regarding *Oryctolagus* and select the correct option
I. Denition is heterodont
II. Canines are absent
III. Herbivorous and diastema is present
IV. Incisors are chisel like and poorly developed
V. The dental formula is 2033/1023
a) I, II and III are true, while IV and V are false
b) III and II and V are true while I and IV are false
c) I, III and V are true while II and IV are false
d) All the above are correct

87. Acetylcholinesterase enzyme splits acetylcholine into
a) Acetone and choline
b) Acetic acid and choline
c) Aspartic acid and acetylcholine
d) Amino acid and choline

88. Emulsification of fat will not occur in absence of
a) Lipase b) Bile pigments c) Bile salts d) Pancreatic juice

89. Which of the following animals eats its prey?
a) Leech b) Starfish c) *Sepia* d) Both (b) and (c)

90. Aggregates of lymphoid tissue present in the distal portion of the small intestine are known as
a) Villi b) Peyer's patches c) Rugae d) Choroid plexux

91. In the wall of alimentary canal, what is the actual sequence from outer to inner?
a) Serosa, longitudinal muscle, mucosa, submucosa
b) Mucosa, serosa, longitudinal muscle
c) Serosa, longitudinal muscle, circular muscle, submucosa, mucosa
d) Serosa, longitudinal muscle, submucosa, mucosa

92. Diastema refers to
a) Gap between the teeth
b) Gap between tongue and teeth
c) Ciliary cells on alimentary wall
d) Cell lining along pharynx

93. Which of the following is regarded as the source of instant energy?
a) Fats
b) Carbohydrates and fats
c) Carbohydrates only
d) Minerals and vitamins

94. Enterokinase converts
a) Trypsinogen to trypsin
b) Pepsinogen to pepsin
c) Chymotrypsin to pepsinogen
d) Pepsin to chymotrypsin

95. Which of the following are required in minimum amount by human?
a) Iron, iodine, carbon, manganese, copper, oxygen
b) Iron, iodine, manganese, copper, zinc, fluorine
c) Iron, iodine, manganese, zinc, hydrogen
d) Nitrogen, oxygen, zinc, fluorine

96. Which one of the following is vestigial organ of human?
a) Hair b) Intestine c) Wisdom teeth d) Muscle of glottis

97. Lysozyme, one of the constituent of the saliva of human being acts like
a) Antibacterial agent b) Zymogen c) Amylase d) Lipase

98. Which teeth of human are shovel-shaped and used for nibbling, cutting and tearing?
a) Canines b) Premolars c) Molars d) Incisors

99. Success entericus is

a) Intestinal juice b) Gastric juice c) Bile juice d) Salivary juice

100. During prolonged hunger strike, what is the correct chronological sequence of ending the food stuff?
a) Protein-fat-carbohydrate b) Carbohydrate-protein-fat
c) Fat-proteins-carbohydrate d) Carbohydrate-fat-proteins

101. Which one of the following pair of simple sugar absorption occurs most rapidly in the jejunum and stomach?
a) Glucose and fructose b) Glucose and galactose
c) Fructose and galactose d) All of the above

102. Succus entericus is secreted by
a) Goblets cells b) Crypt of Lieberkuhn c) Islets of lengerhans d) Paneth cells

103. Consider the following statement regarding digestion and absorption in mammals. Identify wheather they are true or false and select the correct option accordingly
I. Both Kuffer's cells and glisson's capsule are the characteristic of mammalian liver
II. IN dentition, thecodont means that teeth are embedded in the socket of jaw bones
III. There are three pair of salivary glands in human beings, out of them parotid, situated beneath the tongue are the smallest salivary gland
IV. Zymogen (inactive form of enzymes) are not the secretions of peptic cells
a) All statement are true b) All statement are false
c) I and II are true while III and IV are false d) III and IV are true while I and II are false

104. Digestion and distribution of nutrients both functions are performed by
a) Blastocoels
b) Coelom
c) Spongocoel
d)

105. Camel in its hump, stores
a) Water for emergency b) Fat for emergency
c) Both fat and water for emergency d) Fat and proteins as reserve food for emergency

106. What is the pH of human saliva?
a) 7.0 b) 7.5 c) 6.8 d) 6.0

107. Bile is composed of bile salts and bile pigments which are
a) Sodium glycocholate taurocholate and bilirubin, biliverdin, respectively
b) Bilirubin, biliverdin and sodium glycocholate taurocholate, respectively
c) Sodium glycocholate, taurocholate and bilirubin, respectively
d) Sodium glycocholate, taurocholate and biliverdin, respectively

108. Which one of the following four secretions is correctly matched with its source, target and nature of action?

a)

Secretion	Source	Target	Action
Gastrin	Stomach lining	Oxyntic cells	Production of HCl
Enterokinase	Duodenum	Gall bladder	Release of bile juice

b)

Inhibin	Sertoli cells	Hypothalamus	Inhibition of secretion of gonadotrop-in releasing hormone
Atrial Natriuretic Factor	Sinu Atrial Node M-cells of atria	Juxtaglomeru-lar apparatus	Inhibition of release of renin

109. Pellagra is caused due to deficiency of

a) Niacin b) Pantothenic acid c) Tocopherol d) Cyanocobalamin

110. Osteomalacia is due to deficiency of
a) Vitamin-A b) Vitamin-C c) Vitamin-E d) Vitamin-D

111. What is the dental formula of human being?
a) $\frac{2123}{2123}$ b) $\frac{2123}{2213}$ c) $\frac{2114}{2114}$ d) $\frac{2122}{2122}$

112. Lactose intolerance in adults is related to
a) Wheat indigestion b) Mushroom indigestion
c) Milk indigestion d) Barley indigestion

113. Secretion of pancreatic juice is stimulated by
a) Gastrin b) Secretin c) Enterogasterone d) Enterokinase

114. Which one is correct regarding the number of teeth and dental formula with reference to a child of age between 4 to 6 years?
a) $\frac{212}{212} \times 2 = 20$ b) $\frac{212}{213} \times 2 = 24$ c) $\frac{2103}{2103} \times 2 = 24$ d) $\frac{2103}{2003} \times 2 = 22$

115. Which of the following represent bile salts?
a) Haemoglobin and biliverdin b) Bilirubin and biliverdin
c) Bilirubin and haemoglobin d) Sodium glycocholate and taurocholate

116. Which is not a disorder of the digestive system?
a) Jaundice b) Diarrhea c) Emphysema d) Constipation

117. What is the composition of bile?
a) Bile pigments and bile salts b) Bile pigments and cholesterol
c) Cholesterol and phospholipids d) All of the above

118. Which one of the following is antioxidant vitamin?
a) C, E and A b) B_1 and B_4 c) A, D and E d) B_3 and B_5

119. Maximum percentage of lipoprotein is in
a) Chylomicron b) HDL c) Arthritis d) None of these

120. Enzyme sucrose hydrolyses sucrose into
a) Glucose and galactose b) Glucose and fructose
c) Two molecule of glucose d) Two molecule of fructose

121. Which part of digestive system is affected in celiac disease?
a) Large intestine b) Small intestine c) Stomach d) Duodenum

122. Which of the following cells produce HCl?
a) β–cells b) α-cells c) Oxyntic cells d) Chief cells

123. What is the another name of gastro-oesophageal sphincter?
a) Pyloric sphincter b) Gastro-duodenal sphincter
c) Cardiac sphincter d) Sphincter of oddi

124. Deficiency of which essential amino acid leads to deregulation of blood sugar?
a) Isoleucine b) Valine c) Threonine d) Phenylalanine

125. The essential vitamin for blood coagulation is
a) Vitamin-B_6 b) Vitamin-A c) Vitamin-K d) Vitamin-E

126. What is the main site of amino acids absorption in human's small intestine?
a) Duodenum b) Jejunum c) Ileum d) Both (a) and (b)

127. Which of the following represents all proteolytic enzymes?
a) Erepsin, trypsin, pepsin b) Cholecystokinin, pepsin, gastrin
c) Lipase, ducrinin, trypsin d) Enterocrinin, gastrin, erepsin

128. Which of the following is a protein-energy malnutrition related disorder?
a) Kwashiorkor b) Marasmus c) Both (a) and (b) d) Xerophthalmia

129. Identify, wheather the given nutrients are absorbed by the active transport, simple diffusion or facilitated transport

I. Glucose
II. Fructose
III. Vitamin-K
IV. Amino acids
Choose the correct option accordingly
a) I-Active transport
II-Active transport
III- Facilited
IV-Simple diffusion
b) I- Facilited transport
II-Simple diffusion
III-Active transport
IV-Active transport
c) I-Active transport
II- Facilited transport
III-Simple diffusion
II-Active transport
d) I-Simple transport
II-Simple transport
III-Facilited transport
IV-Active transport

130. Crypts of Leiberkuhn are example for
a) Simple tubular gland b) Coiled tubular gland
c) Compound alveolar gland d) Compound tubular gland

131. Carnassial teeth are modified for
a) Crushing b) Tearing c) Grinding d) Cutting

132. Hardest part in animal body is
a) Bone b) Hair c) Dentine d) Enamel

133. By which process, glucose and amino acids are absorbed in the small intestine?
a) Active transport b) Passive transport c) Osmosis d) Selective absorption

134. The true stomach in ruminants, Where most of digestion takes place is
a) Rumen b) Omasum c) Reticulum d) Abomasum

135. The layer of cells that secretes enamel of tooth is
a) Dentoblast b) Ameloblast c) Osteoblast d) Odontoblast

136. Which one of the following elements is essential for the life of animal and not for plants?
a) Calcium b) Iodine c) Phosphorus d) Potassium

137. The amount of bile released is proportional to the amount of
a) Fat in meal b) Protein in meal c) Carbohydrate in meal d) All of these

138. Pancreatic secretion and gall bladder contraction are stimulated by
a) Gastrin b) Enterocrinin c) Enterogasterone d) Cholecystokinin

139. What are the trace components of our food?
a) Fatty acids b) Minerals and vitamins
c) Monosaccharides d) Amino acids

140. The beri-beri is a paralytic disease caused by the deficiency of vitamin-B_1 (thiamine). It was discovered by
a) Funk b) G E Foxon c) Eijkman d) Stanley

141. Which of the following is not a source of Vitamin-A?
a) Carrot b) Mango c) Apple d) Yeast

142. 'Digestion' word means
a) Burning of food b) Oxidation of food c) Hydrolysis of food d) Breakdown of food

143. What is the major site for the conversion of proteins into free amino acids?

a) Spleen b) Liver c) Intestine d) Kidney

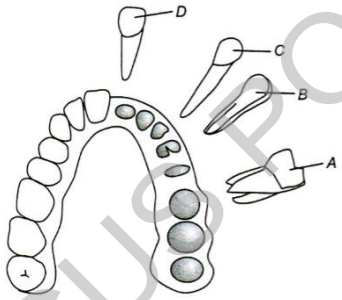
144. Digestion of protein is completed in
a) Stomach b) Duodenum c) Ileum d) Both (b) and (c)

145. What do you mean by the process of digestion?
a) Conversion of complex substances into simpler form
b) Absorption of monomers by the body
c) Conversion of monomers into polymers
d) Absorption of water and food

146. The pH of the digestive juices within the human small intestine is between 7.5 and 8.5. This environment is slightly
a) Basic b) Acidic c) Neutral d) None of these

147. Which one of the following statements is true regarding digestion and absorption of food in humans?
a) Oxyntic cells in our stomach secrete the proenzyme pepsinogen
b) Fructose and amino acids are absorbed through intestinal mucosa with the help of carrier ions like Na^+
c) Chylomicrons are small lipoprotein particles that are transported from intestine into blood capillaries
d) About 60% of starch is hydrolysed by salivary amylase in our mouth

148. The given schematic diagram diepicts heterodont teeth and its thecodont arrangement. Find the correct labelling for *A-D* from the options given below



a) A-Incisor, B-Canine, C-Premolar, D-Molar
b) A-Molar, B-Premolar, C-Canine, D-Incisor
c) A-Incisors, B-Premolar, C-Canine, D-Molar
d) A-Molar, B-Premolar, C-Incisor, D-Canine

149. Which of the following is not a function of liver?
a) Production of bile
b) Production of insulin
c) Glycogen storage
d) Detoxification

150. Choose the incorrect statement regarding human digestive system with reference to a normal person
a) Human saliva is slightly acidic
b) In human being, four pair of salivary gland secretes saliva
c) The quantity of saliva in adult man may be-1 to 1.5 L day
d) Enzyme amylase present in saliva is responsible for the break down of starch into simple sugar

151. What type of teeths are absent in rabbit?
a) Molars b) Premolars c) Canines d) Incisors

152. Which one is correctly matched?
a) Vitamin-E - Thiamine
b) Vitamin-D - Riboflavin
c) Vitamin-B_1 - Tocopherol
d) Vitamin –B_{12}- Cyanocobalamin

153. Nutritional disorder, keratomalacia is caused by the deficiency of vitamin
a) Calciferol b) Retinol c) Nicotinamide d) Biotin

154. How many human teeth appear twice during the life span of an individual?
a) 16 b) 32 c) 22 d) 20

155. What is the correct dental formula of rat?
a) $I\frac{2}{2}C\frac{1}{1}PM\frac{2}{2}M\frac{3}{3}$ b) $I\frac{2}{1}C\frac{1}{1}PM\frac{2}{2}M\frac{3}{3}$ c) $I\frac{1}{2}C\frac{2}{1}PM\frac{2}{2}M\frac{3}{3}$ d) $I\frac{1}{1},C\frac{0}{0},PM\frac{0}{0},M\frac{3}{3}$

156. Secretin and cholecystokinin are digestive hormones. They are secreted in

a) Oesophagus b) Ileum c) Duodenum d) Pyloric

157. The cells, which destroy worn out white and red blood cells, bacteria and micro-organisms passing from the liver are
a) β-cells b) T- cells c) Kupffer's cells d) Oxytocin cells

158. Go through the following statements regarding starch digestion. Separate true and false statements and select the correct option accordingly
I. Digestion of starch starts from the mouth
II. Around 30% of the starch is digested in the stomach
III. Digestion of food requires the action of pancreatic juices
IV. Digestion of food is completed in the longest part of the alimentary canal
a) All are true
b) I, III and IV are true while II is false
c) II and III are false while III and I are true
d) II and, IV are false while III and I are true

159. Which of the following secretions gets mixed with the food (hydrolysed) in the small intestine?
a) Bile, pancreatic juices and intestinal juices
b) Pancreatic juices, intestinal juices and gastric juices
c) Gastric juices, intestinal juices and biles
d) Bile, gastric juices and salivary uices

160. The absorption of glycerol, fatty acids and monoglycerides takes place by the
a) Lymph vessels within the villi
b) Wall of the stomach
c) Colon
d) Capillaries within the villi

161. Reserve flow of food in the stomach of rabbit is prevented by
a) Pyloric sphincter b) Ileo-caecal valve c) Cardiac sphincter d) Uvula

162. Graveyard for RBCs is
a) Liver b) Spleen c) Kidney d) Lymph glands

163. Go through the following statement regarding the physiology of digestion and identify wheather they are true or false
Choose an appropriate option from the codes given below
I. Largest variety of hydrolases are present in omnivores, while the herbivores, generally lack digestive enzymes
II. Digestive enzymes are of four types namely, amylase, proteinases, lipases and nucleases
III. Proteinases are also known as proteases which are released in the active form because the proteins, either cellular or extracellular, all are hydrolysed by them in the absence of food
IV. Hydrolases and cholecystokinin are secreted by the exocrine part of pancreas
a) All statement are true
b) All statement are false
c) Statements III and IV are true while I and II are false
d) Statements I and II are true while III and IV are false

164. Pellagra is caused by deficiency of
a) Pyridoxine b) Niacin c) Folic acid d) Biotin

165. Drowsiness after a heavy meal occurs due to
a) Increased blood pressure in the brain
b) Decreased pulse rate
c) Reduced blood pressure in the brain
d) Increased pulse rate

166. The mucosal layer in the stomach form irregular folds known as
a) Villi
b) Lumen
c) Rugae
d) Crypts of Lieberkuhn

167. Where the liver is located in human body?
a) In abdominal cavity just above diaphragm
b) In thoracic cavity
c) Above the thoracic cavity
d) In abdominal cavity, just below the diaphragm

168. Enterogasterone is
a) Hormone secreted by gastric mucosa
b) Enzyme secreted by mucosa

c) Hormone secreted by duodenal mucosa d) Secreted by endocrine gland related to digestion

169. Bile salts help in
a) Emulsification b) Mastication c) Absorption d) Alkalination

170. Which vitamin is the most important one digestive health?
a) Vitamin-A b) Vitamin-D c) Vitamin-E d) Vitamin-B

171. Facilated transport, facilitates the absorption of
a) Fructose b) Amino acid c) Glucose d) Both (a) and (b)

172. Maximum absorption of water occurs in
a) Colon b) Rectum c) Large intestine d) Small intestine

173. Which one of the following disorders and characteristic is correctly matched?
a) Cystic fibrosis – Production of thick mucus that clogs airways
b) Sickle cell anaemia - Brain deterioration beginning at months of age
c) Achondroplasia - Extra fingers or toes
d) Huntington's disease - Skeletal, eye and cardiovascular defects

174. Which of the following has the highest pH?
a) Gastric juice
b) Bile
c) Pancreatic juice
d) Secretions of the intestinal glands

175. The following statements are based on the digestion and absorption of food. Select the correct and incorrect statements and choose an option accordingly from the codes given below
I. Active absorption of monosaccharides in the stomach and jejunum is carried out by facilitated transport
II. Most of the amino acids (above 95%) are absorbed in the duodenum and jejunum parts of the small intestine
III. Food is digested completely before absorption and is used by the body tissues
IV. Absorption of water from the small intestine is concerned with the absorption of salts and digested food in order to maintain an osmotic balance with the blood
a) I, II, IV and V are correct, while III is incorrect
b) I, II, III are correct, while IV and V are incorrect
c) III, IV and V are correct, while I, II are incorrect
d) IV and V are correctly, while I, II, III are incorrect

176. The gastric juice contains
a) Trypsin, pepsin, lipase b) Pepsin, lipase, rennin
c) Pepsin, amylase, trypsin d) Trypsin, pepsin, rennin

177. Compound saccular glands are
a) Intestinal glands b) Salivary glands c) Gastric glands d) Endocrine glands

178. Alcohol is present, in which of the following?
a) Vitamin-D b) Vitamin-B_2 c) Vitamin-B_5 d) Vitamin –C

179. Which of the following enzyme is not a component of human saliva?
a) α-amylase b) Lysozyme c) Lipase d) None of the above

180. Which enzyme is present in human saliva?
a) Ptylin b) Pepsin c) Enterokinase d) Maltase

181. Which of the following scales are similar to mammalian teeth?
a) Cycloid b) Placoid c) Ganoid d) Cninoid

182. Read the statement A and B.
A. In human, small intestine is the longest protein of the alimentary canal.
B. Absorption of digested food requires a very large surface area.

Identify the correct choice on the two statements.

a) Statement A is correct, B is wrong
b) Statement A and B are both correct
c) Both the statements are wrong
d) Statement B is correct, A is wrong

183. Among mammals, a significant role in the digestion of milk is played by
a) Rennin b) Invertase c) Amylase d) Intestinal bacteria

184. Fats are emulsified by the bile juice because it contains
a) Enzyme b) Esterase c) Bile salt d) Bile pigment

185. Note the following
I. Dentition is heterodont.
II. Canines are poorly developed.
III. Incisors are chisel-like poorly developed.
IV. Herbivorous and diastema is present.
V. The dental formula is I 2/1, C 0/0, Pm 3/2, M 3/3
Which of the above are true for *Oryctolagus*?
a) I, II and IV b) I, IV and V c) I, II, IV and V d) III, IV and V

186. Which of the following is not a cause of indigestion?
a) Over eating b) Anxiety c) Over sleeping d) Food poisioning

187. Which one of the following is the correct matching of the site of action on the given substrate enzyme action upon it and the end-product?
a) Duodenum – Triglycerides $\xrightarrow[\text{Monoglycerides}]{\text{Trypsin}}$
b) Small intestine – Starch $\xrightarrow[\text{Disaccharide(maltose)}]{\alpha-\text{Amylase}}$
c) Small intestine – Proteins $\xrightarrow[\text{Amino acids}]{\text{Pepsin}}$
d) Stomach – Fats $\xrightarrow{\text{Lipase}}$ Micelles

188. During intake of food, what prevents the entry of food into the glottis (opening of wind pipe)?
a) Glottis itself prevents into the entry of food glottis
b) Food entry is prevented by air present in wind pipe
c) Food entry into glottis is prevented by annular rings of pharynx
d) Food entry is prevented by epiglottis into the glottis

189. Which one of the following sugar is most rapidly absorbed in the human gut?
a) Glucose b) Fructose c) Galactose d) Sucrose

190. Which is a symbiont inside human intestine?
a) *Streptococcus pneumo* b) *Neisseria meningitis* c) *E. coli* d) *Treponema pallidum*

191. Which is the inactive form of enzyme, pepsin?
a) Pepsinogen b) Protease c) Trypsin d) Peptones

192. The deficiency of a vitamin, which causes keratomalacia is
a) Vitamin-K b) Vitamin-D c) Vitamin-A d) Vitamin-E

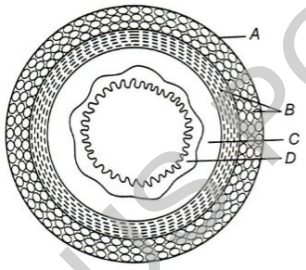
193. Animals consuming only plant materials are referred as
a) Herbivorous b) Carnivorous c) Omnivorous d) Insectivorous

194. Substrate for the enzyme amylase is
a) Nucleic acids b) Protein c) Starch d) Fat

195. Vitamin-D is synthesized in skin by the action of sunlight on
a) Cholesterol b) 7-hydroxy cholesterol
c) Cephalin cholesterol d) All of the above

196. Common bile duct is formed by the fusion of
a) Pancreatic duct and cystic duct b) Pancreatic duct and hepatic duct
c) Pancreatic duct, hepatic duct and cystic duct d) Hepatic duct and cystic duct

197. Given below the diagram of the transverse section of alimentary canal. Label it correctly and choose the correct option accordingly



a) A-Muscularis; B-Serosa; C-Submucosa; D-Mucosa
b) A-Muscularis; B-Serosa; C-Mucosa; D-Submucosa
c) A-Serosa; B-Muscularis; C-Mucosa; D-Submucosa
d) A-Serosa; B-Muscularis; C-Submucosa; D-Mucosa

198. Vitamin necessary for normal functioning of liver, clotting of blood and preventing haemorrhage is
a) Tocopherol b) Phylloquinone c) Cyanocobalamin d) Riboflavin

199. Absorption of fat occurs through the process of
a) Active transport b) Passive transport c) Osmosis d) Simple diffusion

200. Which is not used up in human body?
a) Calcium b) Phosphorus c) Zinc d) Barium

201. The inflammation of intestinal tract is due to the infection of which microorganism?
a) Bacteria b) Virus c) Fungus d) Both (a) and (b)

202. Which of the following enzymes digests protein in stomach?
a) Trypsin b) Pepsin c) Erepsin d) None of these

203. A young infant may be feeding entirely on mother's milk, which is white in colour but the stools, which the infant passes out is quite yellowish. This yellow colour is due to
a) Intestinal juice b) Bile pigments passed through bile juice
c) Undigested milk protein casein d) Pancreatic juice poured into duodenum

204. Go through the following statements regarding digestion and absorption is humans. Identify the incorrect statements and choose a correct option accordingly
a) If breast feeding is replaced by less nutritive food lacking protein and calories, the infant (below 14 eqn) are likely to suffer from marasmus and kwashiorkor
b) Bile salts of bile juice activates enzyme lipase
c) Lipase present in the pancreatic juices is the principal enzyme for digestion of fat
d) Medulla oblongata of hind brain control reflex action of vomiting

205. What are the various type of secretions that are mixed with the food to facilitate the digestion of food in the intestine?
a) Bile salts, bile pigment and gastric juices
b) Bile, pancreatic juices and intestinal juices
c) Bile, chymotrypsinogen and trypsinogen
d) Bile salts, bile pigments and succus enterics

206. Trypsinogen is converted into active trypsin by the action of
a) Cholecystokinin b) Enterocrinin c) Enterokinase d) Secretin

207. Which of the following does not match?
a) Pancreas- Glisson's capsule b) Antigen- Antibody
c) Thyroid- Goitre d) Enzyme- Substrate

208. Which of the following is involved in the catalysis of link reaction during aerobic respiration?
a) Vitamin-A b) Vitamin-B_1 c) Vitamin-B_6 d) Vitamin-K

209. In human, teeth are
a) Homodont and polyphyodont b) Heterodont and polyphyodont
c) Homodont and diphyodont d) Heterodont and diphyodont

210. FAD, coenzyme is derived from
a) Vitamin-B_1 b) Vitamin-B_3 c) Vitamin-B_2 d) Cyanocobalamin

211. Which of the following is/are the major components of food?
a) Proteins b) Cereals
c) Fats and it derivatives d) All of these

212. The pH of the digestive juices varies in human intestine. What does it means?
a) Medium is slightly acidic b) Medium is slightly basic
c) Medium varies from acidic to basic d) Neither basic nor acidic

213. In human body, the role of bile salts in digestion is to
a) Act as coenzymes during the digestion of carbohydrates b) Emulsify fats and facilitate their absorption
c) Aid in the break-up of proteins into amino acids and their absorption d) Stimulate the pancreas to release its enzymes

214. When breast feeding is replaced by less nutritive food low in proteins and calories; the infants below the age of one year are likely to suffer from
a) Marasmus b) Rickets c) Kwashiorkor d) Pellagra

215. Read the following statements regarding the digestive system and select the correct statement
a) Oesophagus passes through neck, thorax and diaphragm and open into stomach
b) Stomach is located in the upper right portion of the abdominal cavity
c) Stomach, a J-shaped organ is the longest organ of alimentary canal
d) Caecum, a small blind sac is a part of small intestine and host symbiotic bacteria

216. Which part of the small intestine absorb iron, calcium and amino acids?
a) Duodenum b) Jejunum c) Ileum d) Both (a) and (b)

217. Which of the following is called as a detritivore?
a) An animal feeding on decaying organic matter b) An animal feeding on a plant
c) A plant feeding on an animal d) An animal feeding on another animal

218. Bile salts help in
a) Digestion of fat b) Digestion and absorption of fat
c) Digestion of protein d) Digestion of protein and fat

219. Go through the following statements regarding the absorption of nutrients. Identify wheather they are true or false then choose the correct option accordingly
I. Absorption of monosaccharides, alcohol, some water and medicines like asprin occurs in the stomach
II. Fatty acids cannot be absorbed directly
III. Glycerol can reach into the blood and lymph directly
IV. Maximum absorption of water (90%) takes place in the small intestine
V. Large intestine and mouth are not the site of absorption
a) I, II and IV are true while III and V are false
b) I, II, III are true while IV and V are false
c) II, III and IV are false while I and V are true
d) I and II are false while III, IV and V are true

220. Inadequate protein intake leads to kwashiorkor. The subsequent oedema is most closely related to inadequate synthesis of which protein?
a) Gamma globulin b) Glucagon c) Insulin d) Albumin

221. What will happen if the secretion of parietal cells of gastric glands is blocked with an inhibitor?
a) Gastric juice will be deficient in chymosin b) Gastric juice will be deficient in pepsinogen
c) In the absence of HCl secretion, inactive pepsinogen is not converted into the active enzyme pepsin d) Enterokinase will not be released from the duodenal mucosa and so trypsinogen is not converted to trypsin

222. The intestinal tract infections are not caused by which of the following organism?
a) Tapeworm b) Roundworm c) Lactobacilli d) Hookworm

223. In the process of digestion and absorption, the peristalsis movement in alimentary canal from oesophagus to rectum is produced by

a) Unstriped muscle of muscular coat
b) Visceral peritoneum
c) Meissner's plexus of submucosa
d) Epithelium layer of mucosa

224. Which combination is mismatched?
a) Vitamin- D-Rickets
b) Thiamine- Beri-beri
c) Vitamin-K-Sterility
d) Niacin-Pellagra

225. Curdling of milk in small intestine takes place due to
a) Trypsin
b) Rennin
c) Ptyalin
d) Chymotrypsin

226. Pepsinogen is secreted by
a) Chief cells
b) Oxyntic cells
c) Mast cells
d) Parietal cells

227. Kupffer's cells are present in
a) Liver
b) Small intestine
c) Pancreas
d) Thyroid gland

228. Why the stool of a breast feeding baby is quite yellowish in colour?
a) Due to undigested milk proteins
b) Due to pouring of pancreatic juices into the duodenum
c) Due to the bile pigment of bile juices
d) Due to the enzymes present in saccus entricus

229. Food is masticated with the help of which part of teeth?
a) Enamel
b) Root
c) Dentine
d) None of these

230. Maltose gives rise to two molecules of
a) Fructose
b) Lactose
c) Glucose
d) Sucrose

231. Lipids, Which can be found in oil based salad dressings and ice cream, during digestion are splitted into
a) Fatty acids and glycerol
b) Glycerol and amino acids
c) Glucose and fatty acids
d) Glucose and amino acids

232. Human dental formula is
a) $I\frac{2}{2}\ C\frac{1}{1}Pm\frac{2}{2}\ M\frac{3}{3}$
b) $I\frac{2}{1}\ C\frac{1}{2}Pm\frac{2}{2}\ M\frac{3}{3}$
c) $I\frac{1}{2}\ C\frac{2}{1}Pm\frac{2}{2}\ M\frac{3}{3}$
d) $I\frac{1}{1}\ C\frac{2}{2}Pm\frac{2}{2}\ M\frac{3}{3}$

233. Chief cells of gastric glands are
a) Simple tubular
b) Coiled tubular
c) Branched tubular
d) Compound tubular

234. Which one of the following vitamin is water soluble as well as have antioxidant property?
a) Vitamin-C
b) Vitamin B_1
c) Vitamin-P
d) Vitamin-B_9

235. Thiamine (B_1) deficiency results in
a) Wernicke's syndrome
b) Korsakoff's syndrome
c) Osteonecrosis
d) Tunnel vision

236. Which is the correct sequence of 4 layers of alimentary canal from periphery to centre?
a) Muscularis → Serosa → Mucosa → Submucosa
b) Serosa → Mucosa → Muscularis → Submucosa
c) Serosa → Muscularis → Submucosa → Mucosa
d) Serosa → Mucosa → Submucosa → Muscularis

237. Which part of our body secretes the hormone secretin?
a) Ileum
b) Stomach
c) Duodenum
d) Oesophagus

238. Which of the following does not play a role in blood coagulation?
a) Vitamin-K
b) Vitamin-D
c) Calcium ions
d) Fibrinogen

239. Which of the following is an organic molecule needed by the body in small amounts?
a) Protein
b) Zinc
c) Vitamin-C
d) Monosaccharide

240. In human beings, digestion of proteins, fats and carbohydrates starts from which of the following parts of the alimentary canal?
a) Stomach, intestine and mouth, respectively
b) Only from stomach
c) Intestine, stomach and mouth, respectively
d) Only from intestine

241. Continuous bleeding from an injured part of body is due to deficiency of
a) Vitamin-A
b) Vitamin-B
c) Vitamin-K
d) Vitamin-E

242. Which one of the following pairs of food components in humans reaches the stomach totally undigested?

a) Protein and starch b) Starch and fat c) Fat and cellulose d) Starch and cellulose

243. Which enzymes are responsible to convert the end product of partially hydrolysed food into simple absorbable forms?
a) Enzymes of succus entericus
b) Proteolytic enzyme of pancreatic juice
c) Enzyme of gastric juice
d) All of the above

244. The process of digestion starts from
a) Stomach b) Oesophagus c) Mouth d) Intestine

245. The process by which absorbed food are utilised by the tissues in the living being for energy, growth and maintenance is termed as
a) Absorption
b) Assimilation
c) Catabolism
d) Digestion and absorption

246. Opening of oesophagus into 'J'-shaped, bag-like structure is regulated by
a) Pyloric sphincter
b) Sphincter of oddi
c) Ileocaceal sphincter
d) Gastro oesophageal sphincter

247. Which of the following part in cow's stomach is specialized for microbial digestion of plant material?
a) Rumen b) Reticulum c) Abomasum d) Both (a) and (b)

248. Which of the following processes will be affected by the absence of enterokinase?
a) Lipid → Fatty acid + Glycerol
b) Dipeptides → Amino acid
c) Proteases → Dipeptide
d) Amylase → Maltose

249. A large lymph vessel present in the villus of small intestine is called
a) Crypts b) Lacteal c) Peyer's patches d) Valve of kerkring

250. Most abundant mineral of animal body is
a) Iron b) Sodium c) Potassium d) Calcium

251. Taste buds are present on
a) Small projection found on the upper surface of tongue
b) Small projection found on the lower surface of tongue
c) On both the surface of tongue
d) Behind the tongue

252. The malnutrition disease in man is
a) Cri-du-chat syndrome
b) Klinefelter's syndrome
c) Potbelly syndrome
d) Edward's syndrome

253. As you know that HCl is highly acidic (1.5 to 2.0 pH) in the stomach, however, the epithelium of the mucosa remains unaffected/undissolved. Why?
a) Mucous continues to lubricate the inner lining
b) Bicarbonates present in the gastric juices protect the linings
c) Both (a) and (b)
d) None of the above

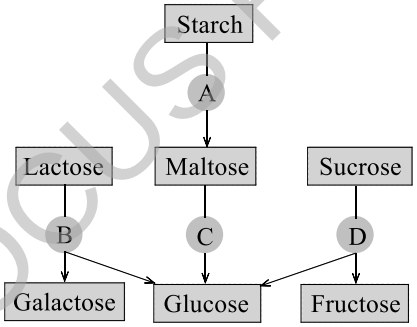
254. Digestion of starch starts from the mouth, whereas …A… is the size of digestion mainly for …B….. Choose the correct combination of options to complete the given statement
a) A-stomach; B-protein
b) A-stomach; B-starch
c) A-small intestine; B-protein
d) A-small intestine; B-starch

255. The fat soluble vitamin is
a) B b) C c) K d) H

256. The main function of lacteals in the human small intestine is the absorption of
a) Glucose and vitamins
b) Amino acids and glucose
c) Water and vitamins
d) Fatty acids and glycerol

257. What is frenulum?
a) It is the fold by which tongue is attached to the floor of oral cavity
b) It is an adenoid which is present on pharyngeal wall
c) It is a tonsil like structure on the lateral wall of palate
d) It is a V-shaped furrow which divides the surface of tongue

258. The following is a scheme showing the fate of carbohydrates during digestion in the human alimentary canal. Identify the enzymes acting at stages indicated as A, B, C and D. Choose the correct option from those given.

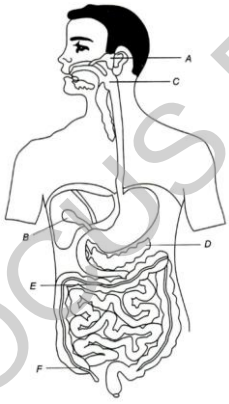


a) A-Amylase, B-Maltase, C- Lactase, D-Invertase
b) A-Amylase, B- Maltase, C-Invertase, D-Latcase
c) A-Amylase, B-Invertase, C-Maltase, D-Lactase
d) A-Amylase, B-Lactase , C- Maltase , D- Invertase

259. Deamination occurs in
a) Kidney b) Liver c) Nephron d) Both (a) and (b)

260. Vitamin-D is produced in human body in
a) Muscles b) Nerves c) Skin d) Bone-marrow

261. The diagram given below depicts the digestive system in humans. Label it from A to F and choose the correct option accordingly



a) A-Parotid gland, B-Liver, C-Larynx, D-Pancreas, E-Transverse colon, F-Caecum
b) A-Parotid gland, B-Gall bladder, C-Pharynx, D-Pancreas, E-Transverse colon, F-Caecum
c) A-Parotid gland, B-Liver, C-Pharynx, D-Pancreas, E-Ascending colon, F-Caecum
d) A-Parotid gland, B-Gall bladder, C-Thymus, D-Pancreas, E-Ascending colon, F-Caecum

262. Chymotrypsin is produced by
a) Liver b) Pancreas c) Stomach d) Duodenum

263. Dental formula of rabbit is
a) $I\frac{2}{1}\ C\frac{0}{0}\ Pm\frac{3}{2}\ M\frac{3}{3}$ b) $I\frac{1}{2}\ C\frac{0}{2}\ Pm\frac{2}{0}\ M\frac{3}{3}$ c) $I\frac{1}{2}\ C\frac{0}{2}\ Pm\frac{3}{0}\ Pm\frac{3}{3}$ d) $I\frac{2}{2}\ C\frac{1}{1}\ Pm\frac{2}{2}\ M\frac{3}{3}$

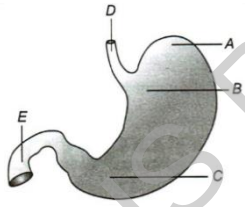
264. Vitamin-B_{12} is available to ruminants by
a) Plants b) Microorganisms in caecum
c) Animals d) All of the above

265. Which of the following enzymes carries out the initial step in the digestion of milk in humans?
a) Rennin b) Lipase c) Trypsin d) Pepsin

266. Process of absorption of nutrients is carried out by
a) Passive transport b) Facilitated transport c) Active transport d) All of the above

267. Part of bile juice useful in digestion is
a) Bile salt b) Bile pigment c) Bile matrix d) All of these

268. Bile helps in the digestion of fat through
a) Emulsification b) Alkalinity c) Forming micelles d) All of these
269. Which hormone is also known as Gastric Inhibitory Peptide (GIP)
a) Enterokinase b) Enterogastrone
c) Cholecystokinin d) Vasoactive intestinal Peptide (VIP)
270. Salivary amylase is also known as
a) Ptyalin b) Gastrin c) Glyoxylase d) Pepsin
271. Choose true and false statements regarding the digestive glands of humans
I. It is a compound gland as it posseses both exocrine and endocrine parts
II. Exocrine parts secretes alkaline pancreatic juices
III. Endocrine part secretes hormones like insulin and glucagon
IV. They are surrounded by glisson's capsule
V. Secretion of these gland's forms gastric juices
Pick the correct option accordingly
a) I, II, III are true while IV and V are false b) I, II, III are false while IV and V are true
c) All statement are true d) All statement are false
272. The deficiency of this vitamin is known to cause abortion in early pregnancy of rat?
a) Retinol b) Calciferol c) Tocopherol d) Naphthoquinone
273. Starch is converted to maltose by the action of
a) Invertase b) Amylase c) Sucrose d) Maltase
274. What is the correct labelling of diagram given below? Choose the correct option accordingly



a) A-Fundic portion, B-Cardiac region, C-Pyloric region, D-Food pipe, E-Wind pipe
b) A-Fundus, B-Pyloric region, C-Cardiac region, D-Oesophagus, E-Duodenum
c) A-Fundic region, B-Cardiac region, C-Pyloric region, D-Oesophagus, E-Duodenum
d) A-Cardiac region, B-Pyloric region, C-Fundic region, D-Oesophagus, E-Duodenum
275. Go through the following statements regarding the disorders of the digestive system. Choose the correct statements and select appropriate option from the codes given below
I. Indigestion is caused by the poor supply of digestive enzyme, overeating, anxiety and a lot of junk food
II. Constipation, an irregular movement of bowl is caused due to poor habits, fiberless diet, emotional stress and certain drugs
III. Indigestion can be caused by milk of magnesia
IV. Ejection of stomach content is controlled by hypothalamus of prosencephalon
a) All statements are correct b) All statements are incorrect
c) I and II statements are correct d) III and IV statements are correct
276. Which of the following is a correct dental formula for the child falling under age group 5 to 6 yr?
a) I 2/2, C 1/1, Pm 2/2, M 0/0 b) I 2/2, C 1/1, Pm 2/2, M 3/3
c) I 1/1, C 2/2, Pm 2/2, M 3/3 d) I 2/2, C 2/2, Pm 1/1, M 3/3
277. Kupffer's cells are
a) Phagocytic b) Non-phagocytic c) Myosin d) Fibrin
278. In which of the following secretions, the enzymes, like maltase, isomaltase, sucrase, lactase, enterokinase, aminopeptidase, dipeptidase, nucleosidases, nucleotidases and α-dextrinase are present?
a) Pancreatic juices b) Intestinal juices c) Gastric juices d) Both (a) and (b)
279. Liver of man is
a) Bilobed b) Three-lobed c) Four-lobed d) Five-lobed
280. By which process, the end products of milk sugar in small intestine are absorbed?

a) Passive transport b) Active transport c) Facilitated transport d) Osmosis

281. Success entericus is secreted by
a) Crypts of Leiberkuhn b) Brunner's glands c) Both (a) and (b) d) None of these

282. The gastrointestinal functions like, secretion and motility is controlled by which system?
a) Intrinsic neural system b) Extrinsic neural system
c) Both (a) and (b) d) None of the above

283. Complete the equation.
Nucleic acids $\xrightarrow{\text{Nucleases}}$ Nucleotides $\rightarrow \cdots \ldots \ldots$
a) Monoglycerides b) Diglycerides c) Disaccharides d) Nucleosides

284. Pulp cavity of teeth is lined by
a) Odontoblast b) Chondroblast c) Osteoblast d) Amyloblast

285. What is gastroporesis?
a) Inflammation of the lining of the stomach
b) Stomach content flows back up into the oesophagus
c) Delayed movement of food from the stomach to the small intestine
d) Bleeding in the digestive tract

286. The gastric juices contain
a) Trypsin, rennin, pepsin b) Pepsin, trypsin, amylase
c) Pepsin, rennin, carbohydrates d) Pepsin, lipase, rennin

287. The sphincter of Oddi found in man, guards the
a) Pancreatic duct b) Hepatopancreatic duct
c) Bile duct d) Cystic duct

288. Which of the following is the largest gland in an adult man?
a) Thymus b) Liver c) Thyriod d) Pancreas

289. Go through the following statements regarding the absorption of fats. Find correct and incorrect statements and choose an option accordingly from the codes given below.
I. Micelles and chylomicron are concerned with the absorption of fats
II. Chylomicrons are water soluble dropelets of fat which contains triglycerides, sterol and phospholipids
III. Micelles are water soluble droplets of fatty acids and glycerols which are formed by the action of bile pigments on fats and glycerol
IV. Chylomicron, protein coated small vesicles are released from the intestinal cells into the blood stream by lacteals
a) II and IV are correct while I and III are incorrect b) I, III and IV are correct, while II is incorrect
c) I, II and IV are correct while III is incorrect d) IV and I are correct while II and III are incorrect

290. Wilson's disease is associated with the abnormal metabolism of
a) Iron b) Potassium c) Iodine d) Copper

291. Rennin is secreted in which part of alimentary canal?
a) Stomach b) Kidney c) Duodenum d) Small intestine

292. Cud chewing animals are known as
a) Frugivorous b) Sanguivorous c) Ruminants d) Cannibals

293. Which component of gastric juices inactivates salivary amylase?
a) Mucous b) Rennin c) CCl d) Pepsin

294. The abnormal frequent movement of the bowl and increased liquidity of the faeces is called
a) Vomiting b) Indigestion c) Constipation d) Diarrhoea

295. Gastrointestinal hormones secretion and cholecystokinin secreted by duodenum is responsible for the stimulation and contraction of
a) Pancreas and gall bladder b) Liver, gall bladder and pancreas
c) Gall bladder and cells of gastric glands d) Salivary glands and gall bladder

296. Which combination of vitamin and respective disease is not correct?
a) Vitamin B_2 – Pellagra b) Vitamin B_{12} – Pernecious anaemia

c) Vitamin B_5 – Dermatitis
d) Vitamin-E – Infertility

297. Which of the following can be absorbed by hepatic caeca?
a) Glucose and amino acid
b) Glucose and lipid
c) Lipid
d) Glucose

298. The process of resynthesis of food materials from simpler food molecules is called
a) Biosynthesis
b) Catabolism
c) Absorption
d) Assimilation

299. The accumulation of faeces in the rectum and distension of the rectal wall initiates the feeling of defecation due to
a) Defecation reflex
b) Deamination
c) Irregular movement of bowl
d) None of the above

300. Pepsin is inactivated at pH
a) Below 3
b) Below 2
c) Above 5
d) Above 3

301. Which form of fats is absorbed into the intestinal cells?
a) Micelles
b) Chylomicrons
c) Fatty acids
d) Both (a) and (b)

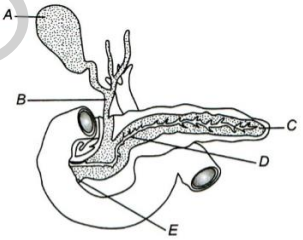
302. The type of dentition found in human being is
a) Polyphyodont, thecodont
b) Diphyodont and thecodont
c) Diphyodont and acrodont
d) Diphyodont and homodont

303. Which one of the following equation match correctly with the action of enzymes on the given substrate and regarding the end product of the reaction?
a) Stomach $\longrightarrow$ Fats $\xrightarrow{\text{Lipase}}$ Micelles
b) Small intestine $\longrightarrow$ Protein $\xrightarrow{\text{Pepsin}}$ Amino acid
c) Small intestine $\longrightarrow$ Starch $\xrightarrow{\text{amylase}}$ Disaccharides
d) Duodenum $\longrightarrow$ Triglycerides $\xrightarrow{\text{Trypsin}}$ Monoglycerides

304. Bile juice is stored in which organ of human body?
a) Gall bladder
b) Liver
c) Kidney
d) Pancreas

305. Secretin hormone is secreted from
a) Stomach and stimulates gastric gland
b) Duodenum and stimulates liver
c) Thyroid and stimulates thyroid gland
d) Duodenum and stimulates pancreas

306. The given below diagram represents a duct system of pancreas, liver and gall bladder. Label the diagram from A to C



a) A-Gall bladder, B-Common bile duct, C-Hepato pancreatic duct, D-Pancreas, E-Pancreatic duct
b) A-Gall bladder, B-Bile duct, C-Hepato pancreatic duct, D-Pancreatic duct, E-Pancreas
c) A-Gall bladder, B-Bile duct, C-Pancreatic duct, D-Pancreas, E-Hepato pancreatic duct
d) A-Gall bladder, B-Common bile duct, C-Pancreas, D-Pancreatic duct, E-Hepato pancreatic duct

307. Hydrolysis of milk sugar gives rise to
a) Two molecules of lactose
b) Two molecules of glucose
c) One molecule of glucose and one molecule of fructose
d) One molecule of glucose and one molecule of galactose

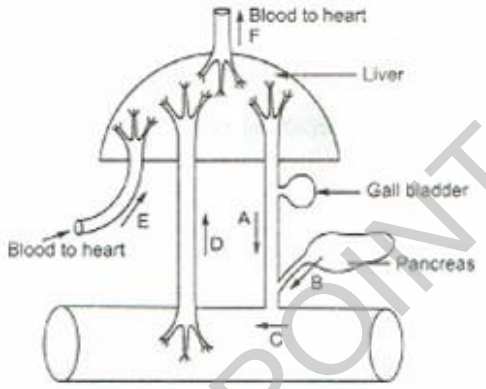
308. Proportion of which of the following should be increased in diet improve strength and growth of bones?
a) Vitamin-D, Ca^{2+} and vitamin-K
b) Vitamin-D, Ca^{2+} and iodine
c) Vitamin-D, Ca^{2+} and vitamin-A
d) Vitamin-A, Ca^{2+} and Zn^{2+}

309. The juice containing sodium glycocholate is released under the influence of
a) Secretin
b) Cholecystokinin
c) Enterogasterone
d) Enterocrinin

310. Which is the largest gland of human body?
a) Gastric gland b) Pancreas c) Liver d) Salivary gland

311. Seggregate the following statements into true and false category. Choose the right answer from the codes given below
I. Mucosal epithelium has goblet cells which secrete mucous and helps in lubrication
II. Mucosa forms gastric glands in the stomach and crypts in between the bases of villi in intestine
III. Cells lining the villi has brush border or microvilli
IV. All the four basic layers in the wall of gut never shows modification in different parts of the alimentary canal
a) All the statements are correct b) I, II and III are true while IV is false
c) I, II and III are false while IV is true d) I, IV and false, while II and III are true

312. The diagram below shows how things get to and from the liver. They are labeled as A, B, C, D, E and F. Which one of the following labellings is the correct one?



a) A is the hepatic portal vein and E is the hepatic vein
b) C is the intestine and F is the hepatic portal vein
c) D is the hepatic portal vein and F is hepatic vein
d) B is the pancreatic artery and E is the hepatic artery

313. Which of the following is/are essential fatty acids for man?
a) Arachidonic acid b) Linolenic acid c) Linoleic acid d) All of these

314. Chloragen cells help in
a) Respiration b) Reproduction c) Circulation d) Nutrition

315. What is the function of buccal cavity?
a) Mastication of food b) Digestion of fats c) Both (a) and (b) d) None of the above

316. Carboxypeptidase is an enzyme secreted by
a) Salivary gland b) Stomach c) Gall bladder d) Pancreas

317. In which of the following organ, putrefying bacteria are present?
a) Intestine b) Colon c) Stomach d) Liver

318. For how much duration, food is stored in the stomach?
a) 3-4 hours b) 2-4 hours
c) 4-5 hours d) More than 5 hours but less than 6 hours

319. If for some reason our goblet cells are non-functional, this will adversely affect
a) Production of somatostatin
b) Secretion of sebum from the sebaceous glands
c) Maturation of sperms
d) Smooth movement of food downwards the intestine

320. Wisdom teeth are
a) Last molars b) Last premolars c) Incisors d) Canines

321. By which process, absorption of galactose, electrolytes, like Na^+ and K^+ and some amino acids takes place?
a) Active process b) Passive process c) Simple diffusions d) Osmosis

322. Angiotensinogen is a protein produced and secreted by

a) Macula densa cells
b) Endothelial cells (cells lining the blood vessels)
c) Liver cells
d) Juxtaglomerular (JG) cells

323. Both the crown and root of a tooth is covered by a layer of bony hard substance called
a) Enamel b) Dentine c) Bony socket d) Cement

324. A balanced diet lacks
a) Nucleic acid and enzyme
b) Fats and carbohydrates
c) Proteins and vitamins
d) Minerals and electrolytes

325. Brown colour of the stool is due to the presence of stercobilinogen and stercobilin, which are the derivatives of
a) Bilirubin b) Biliverdin c) Bile salt d) Bile pigment

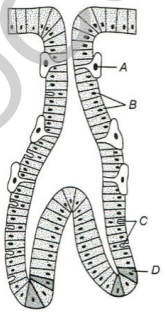
326. These absorption of water, alcohol and monosaccharides occur in
a) Gastric mucosa
b) Mucosa of ileum
c) Intestinal mucosa
d) Through out epithelium of stomach

327. The form, in which the synthesised fats are liberated from the intestinal wall into the lymph present in the lymphatic capillaries is
a) Micelles b) Chylomicrons c) Fatty acids d) Both (a) and (b)

328. Which one of the following inhibits the coagulation of blood in the human circulatory system?
a) Silver affinity cells of gastric epithelium
b) Liver, situated in the upper right side of abdominal cavity
c) Delta (δ) cells of endocrine part of the pancreas
d) Brunner' gland, present in the duodenum of intestine

329. Sphincter of oddi found in human being guards
a) Opening of ampula into duodenum
b) Opening of hepatic ducts before joining the cystic duct
c) Opening of stomach into duodenum
d) Opening of cystic duct into pancreatic duct

330. The given below diagram represents the gastric glands. Label it from A to D and choose the correct option accordingly

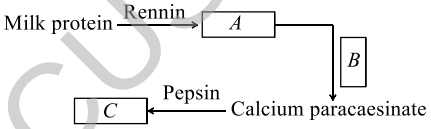


a) A-Oxyntic cell, B-Chief cell, C-Mucous cell, D-Argentaffin cell
b) A-Argentaffin cell, B-Oxyntic cell, C-Mucous cell, D-Chief cell
c) A-G cell, B-Chief cell, C-Mucous cell, D-Argentaffin cell
d) A-Oxyntic cell, B-G cell, C-Mucous cell, D-Chief cell

331. The innermost layer of human alimentary canal forms numerous finger-like projections in the small intestine which are known as
a) Villi b) Rugae c) Peyer's patches d) Both (a) and (b)

332. The major site of protein breakdown to form free amino acids is in the environment of
a) Kidney b) Spleen c) Liver d) Bone-marrow

333. Complete the given equation and choose the correct option accordingly



a) A-Caesin, B-Ca^{2+}, C-Peptones
b) A-Ca^{2+}, B-Peptones, C-Caesin

c) A-Paracaesin, B-Ca^{2+}, C-Peptones
d) A-Ca^{2+}, B-Paracaesin, C-Peptones

334. In the homeostatic control of blood sugar level, which organs function respectively as modulator and effector?
a) Liver and islets of Langerhans
b) Hypothalamus and liver
c) Hypothalamus and islets of Langerhans
d) Islets of Langerhans and hypothalamus

335. Symbiotic bacteria present in the colon of large intestine produce
a) Cyanocobalamin b) Riboflavin c) Thiamine d) All of these

336. Major site of absorption of nutrients in human beings is
a) Stomach b) Small intestine c) Large intestine d) Both (a) and (b)

337. Bile secretion is proportional to the concentration of
a) Protein b) Fat c) Carbohydrate d) None of these

338. In which part of the small intestine, starch is digested
a) Duodenum b) Jejunum c) Ileum d) All of these

339. Find out the correctly matched pair.
a) Pepsinogen - Zymogenic cells
b) HCl - Goblet cells
c) Mucus - Oxyntic cells
d) Pancreatic juice - Salivary glands

340. In which layer of the wall of alimentary canal, secretory glands are present?
a) Serosa b) Mucosa c) Muscularis d) Submucosa

341. Consider the following statements regarding the digestion and absorption of food in human and identify the correct and incorrect statement
I. Antipellagra vitamin is nicotinamide which is present in milk, yeast, meat, leafy vegetable and whole grains
II. Deficiency of vitamin thiamine causes loss of appetite, muscle depreciation, fatigue and mental confusion
III. Prolonged deficiency of tocopherol reduces reproductive capacity in human being
IV. Gastrovascular cavity performs, *i.e.*, both function digestion and distribution of nutrients
Choose the correct option accordingly
a) All statements are incorrect
b) All statements are correct
c) I and II are correct only
d) I and II are incorrect only

342. What do you mean by the absorption of food?
a) It is a process by which the end products of the digestion passes through the intestinal mucosa into blood or lymph
b) It is a process of transportation of digestive food from the human alimentary canal to blood and lymph
c) It is a process to utilise the absorbed food substances
d) Absorption is a process by which nutrients are absorbed from the large intestine into the blood and lymph through its mucous membrane

343. Name that part of small intestine in which the pyloric region of stomach opens
a) Duodenum b) Ileum c) Jejunum d) None of the above

344. Secretion of gastric juice is controlled by
a) Gastrin b) Cholecystokinin c) Enterogastrin d) None of these

345. How many salivary glands are present in human being?
a) 6 b) 10 c) 8 d) 12

346. Which one is not a part of large intestine?
a) Rectum b) Caecum c) Ileum d) Colon

347. The lactase hydrolyses lactose into
a) Glucose
b) Glucose and galactose
c) Fructose
d) Glucose and fructose

348. What is cholecystokinin?
a) Enzyme
b) Bile-pigment
c) Gastro- intestinal hormone
d) Lipid

349. Identify wheather the given statements are true or false in the context of deficiency of essential amino acids and choose the correct option accordingly
I. Incomplete break down of proteins in the digestive system
II. Deregulation of mood and sleep
III. Increased production of sulphur
IV. Decreased amount of niacin
a) I – True
II – True
III – False
IV – True
b) I – True
II – True
III – True
IV - False
c) I – False
II – True
III – True
IV - False
d) I – True
II – False
III – False
IV – True

350. Which of the following symptoms is related to the deficiency of antioxidant vitamins?
a) Retrolental fibroplasia
b) Truncal and limb atoxia
c) Scurvy
d) All of these

351. Which one is not associated with the secretion of saliva in human being?
a) Paratoids glands
b) Sublinguals glands
c) Zymogenic cells
d) Sub-maxillary glands

352. In intestine, food materials are absorbed through
a) Villi
b) Subtentacular cells
c) Sub-mucosa
d) Gastric glands

353. Chymotrypsinogen, trypsinogen and nucleases along with amylases and lipases are
a) Inactive forms of enzyme in gastric juices
b) Active enzymes of intestinal juices
c) Inactive enzymes of pancreatic juices
d) Active enzymes of intestinal juices

354. Choose the most appropriate option to describe the composition of human saliva
a) Amylase, hydrolase
b) Electrolytes amylase/ptylin, lysozymes and mucous
c) Amylase/ptylin, mucous
d) Ptylin only

355. Production of glucose from amino acids, fatty acids and glycerol is called
a) Glycogenesis
b) Gluconeogenesis
c) Glycogenolysis
d) Glycolysis

356. With reference to a normal human being, which one of the following statements is not correct?
a) Human saliva is slightly alkaline
b) An adult human may secrete 1 to 1.5 litres of saliva per day
c) Saliva is secreted by six pairs of salivary glands in human beings
d) The salivary enzyme (ptyalin) breaks down cooked starch into maltose

357. Which vitamin should not be stored?
a) Calciferol
b) Retinol
c) Niacin
d) Ascorbic acid

358. Which of the following match is correct?
a) Rennin – Protein
b) Trypsin – Starch
c) Invertase – Sucrose
d) Amylase – Lactose

359. Which one of the following amino acids is an essential part of human diet?
a) Glycine
b) Phenylalanine
c) Serine
d) Aspartic acid

360. Sacculus rotundus is a dilated part at posterior end of
a) Ileum
b) Oesophagus
c) Ilium
d) Colon

361. Which of the following is absorbed from undigested food in the large intestine?
a) Water and vitamins
b) Water and product of bacterial digestion
c) Water and salt
d) Water and alcohols

362. Which one of the following sequence is in correct order?
a) Descending portal colon → Rectum → Anus
b) Colon → Anus → Rectum
c) Stomach → Jejunum → Duodenum
d) Ileum → Colon → Caecum

363. Which enzyme is responsible for the digestion of milk in infants?
a) Pepsin b) Trypsin
c) Rennin d) Various proteolytic enzyme

364. Which one statement is incorrect regarding the process of digestion and absorption in humans?
a) Small intestine is the major site for the absorption of all nutrients
b) Around 40% of the total absorption of nutrients takes place in the proximal part of the small intestine
c) Drugs, alcohols, little water and salt are absorbed in the stomach through the mucous membrane
d) Large intestine is the site of absorption for water and products of bacterial digestion

365. Deficiency of which vitamin causes type 1 and type 2 diabetes?
a) Vitamin-B b) Vitamin-A c) Vitamin-D d) Vitamin-K

366. Which of the following is a water soluble vitamin?
a) Vitamin-A b) Vitamin-B c) Vitamin-D d) Vitamin-E

367. Which one of the following pairs of the kinds of cells and their secretion are correctly matches?
a) Oxyntic cells - A secretion with pH Between 2.0 And 3.0
b) Alpha cells of islets of Langerhans - Secretion that decreases blood sugar level
c) Kupffer's cells - A digestive enzyme that hydrolyses nucleic acids
d) Sebaceous glands - A secretion that evaporates for cooling

368. Digestion is accomplished by
a) Mechanical and chemical processes b) Chemical processes only
c) Mechanical processes only d) None of the above

369. Argentaffin may arise in
a) Pancreas b) Bile duct
c) Gastro-intestinal tract d) None of these

370. Prolonged deficiency of thiamine in human diet may lead to
a) Pellagra b) Beri-beri c) Anaemia d) Haemorrhage

371. Which action of digestive enzyme is/are correct regarding its site of action, substrate and the end product?

	Enzyme	Site of Action	Sub strate	End product
i	Rennin	Calf's stomach	Casein	Ca Paracaesinate
ii	Pepsin	Human's stomach	Proteins	Two or more molecule of a mino acid
iii	Nuclease	Small intestine	Nucleosides	Nucleosides and - iPO_4
iv	Entero - kinase	Small intestine	Trypsi nogen	Trypsin

a) All actions are correct b) Actions I, II and III are correct
c) Action I, II and IV are correct d) Only action III is correct

372. Continued consumption of a diet rich in butter, red meat and eggs for a long period may lead to
a) Vitamin-A toxicity b) Kidney stones
c) Hypercholesterolemia d) Urine laden with ketone bodies

373. Which one is a disorder of overnutrition?
a) Kidney and gall bladder stone
b) Scurvy and osteomalacia
c) Hypercholesterolemia and fluorosis
d) Vitamin-A toxicity and urine laden with ketone bodies

374. The epithelial cells lining the stomach of vertebrates is protected from damage by HCl because
a) Hydrochloric acid is too dilute
b) The epithelial cells are resistant to the action of HCl
c) HCl is neutralized by alkaline gastric juice
d) The epithelial cells are covered with a mucous secretion

375. In rabbit, the digestion of cellulose takes place in
a) Colon b) Ileum c) Caecum d) Secretin

376. Read carefully the following statements regarding the absorption of nutrients. Find the incorrect statements and choose the correct option from the given below codes
I. Absorption of carbohydrates takes place in the stomach and jejunum part of intestine
II. The water soluble end products of food can reach the blood and lymph directly
III. Large intestine and buccal cavity do not functions as the site of absorption
IV. Large intestine is the site of absorption of about 90% of the total water present in the hydrolysed food
Codes
a) I, III and IV are incorrect
b) I, II and IV are incorrect
c) I and II are incorrect
d) III and IV are incorrect

377. Which of the following is correct chronological order for enzyme activity of some enzymes taking part in protein digestion?
a) Pepsin → Trypsin → Peptidase
b) Pepsin → Peptidase→ Trypsin
c) Trypsin → Pepsin→ Peptidase
d) Peptidase→ Trypsin→ Pepsin

378. Vitamin-C is present as
a) Oxalic acid b) Glutamic acid c) Ascorbic acid d) Citric acid

379. Deficiency of which vitamin, causes loss of appetite, mental confusion, fatigue and muscle depreciation?
a) Vitamin-K b) Vitamin-C c) Thiamine d) Riboflavin

380. Treatment with alloxan destroys
a) STH cells
b) Alpha cells of islets of Langerhans
c) Beta cells of islets of Langerhans
d) Cells of Leydig

381. Which one is not true about vitamins?
a) Vitamins are organic catalysts
b) Vitamins are indispensable for life
c) Vitamins act as a source of energy
d) Tocopherol is anti-sterility vitamin

382. Enzyme present in saliva is
a) Maltase b) Ptyalin c) Sucrase d) Invertase

383. Which of the following is true for vitamin-C?
a) Also called as ascorbic acid
b) Also called as fumaric acid
c) Obtained from citrus fruits
d) Both (a) and (c)

384. The back flow of faecal matter in the large intestine is prevented by the presence of
a) Epiglottis
b) Sphincter of Oddi
c) Ileo-caecal valve
d) Pyloric sphincter

385. Elephant tusks are
a) Molars b) Canines c) Incisors d) Premolars

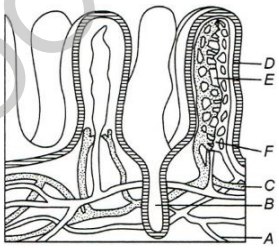
386. Which of the following best describes the process of nutrition?
a) A process to obtain necessary energy and growth substances
b) A process to obtain energy from foods
c) A process to supply the necessary nutritive elements to body

d) A sum total of processes which provides the necessary nutritive element for growth, maintenance and to meet the need of energy

387. Name the process by which swallowed food is conveyed to pharynx and oesophagus respectively
a) Deglutition b) Peristalsis c) Ingestion d) Succus entricus

388. The vitamin, synthesized by bacteria is
a) B b) D c) K d) E

389. Label the given diagram of transverse section of mucosa of small intestine showing small finger like projections. Choose the correct option accordingly



a) A-Vein, B-Crypt, C-Artery, D-Villi, E-Lacteal, F-Capillaries
b) A-Artery, B-Crypt, C-Vein, D-Villi, E-Capillaries, F-Lacteal
c) A-Vein, B-Artery, C-Crypt, D-Villi, E-Capillaries, F-Lacteal
d) A-Villi, B-Lacteal, C-Capillaries, D-Artery, E-Crypt, F-Vein

390. Which of the following molecule can be digested by pancreatic juices?
a) Fat, protein and nucleic acids b) Carbohydrates and proteins
c) Carbohydrates and fats d) All of the above

NEET BIOLOGY

DIGESTION AND ABSORPTION

: ANSWER KEY :

1)	a	2)	b	3)	a	4)	c	165)	c	166)	c	167)	d	168)	c
5)	d	6)	a	7)	b	8)	d	169)	a	170)	d	171)	d	172)	a
9)	d	10)	d	11)	b	12)	c	173)	a	174)	c	175)	a	176)	b
13)	b	14)	a	15)	b	16)	a	177)	b	178)	a	179)	d	180)	a
17)	d	18)	b	19)	d	20)	c	181)	b	182)	b	183)	a	184)	c
21)	a	22)	a	23)	b	24)	c	185)	b	186)	c	187)	b	188)	d
25)	c	26)	a	27)	d	28)	b	189)	c	190)	c	191)	a	192)	c
29)	b	30)	b	31)	a	32)	a	193)	a	194)	c	195)	b	196)	d
33)	c	34)	a	35)	b	36)	a	197)	d	198)	b	199)	d	200)	d
37)	a	38)	b	39)	c	40)	b	201)	d	202)	b	203)	b	204)	a
41)	c	42)	a	43)	a	44)	d	205)	b	206)	c	207)	a	208)	b
45)	a	46)	d	47)	a	48)	d	209)	d	210)	c	211)	d	212)	b
49)	a	50)	a	51)	c	52)	a	213)	b	214)	a	215)	a	216)	a
53)	a	54)	c	55)	c	56)	d	217)	a	218)	b	219)	a	220)	d
57)	b	58)	c	59)	d	60)	b	221)	c	222)	c	223)	a	224)	c
61)	d	62)	b	63)	d	64)	a	225)	b	226)	a	227)	a	228)	c
65)	d	66)	c	67)	a	68)	d	229)	a	230)	c	231)	a	232)	a
69)	c	70)	c	71)	a	72)	c	233)	b	234)	a	235)	a	236)	c
73)	d	74)	d	75)	c	76)	a	237)	c	238)	b	239)	c	240)	a
77)	b	78)	c	79)	c	80)	d	241)	c	242)	c	243)	a	244)	c
81)	a	82)	c	83)	c	84)	d	245)	b	246)	d	247)	d	248)	c
85)	d	86)	c	87)	b	88)	c	249)	b	250)	d	251)	a	252)	c
89)	d	90)	b	91)	c	92)	a	253)	c	254)	a	255)	c	256)	d
93)	c	94)	a	95)	b	96)	c	257)	a	258)	d	259)	b	260)	c
97)	a	98)	a	99)	a	100)	d	261)	b	262)	b	263)	a	264)	b
101)	b	102)	b	103)	c	104)	d	265)	d	266)	d	267)	a	268)	d
105)	b	106)	c	107)	a	108)	d	269)	b	270)	a	271)	a	272)	c
109)	a	110)	d	111)	a	112)	c	273)	b	274)	c	275)	c	276)	a
113)	b	114)	a	115)	d	116)	c	277)	a	278)	b	279)	c	280)	b
117)	d	118)	a	119)	a	120)	b	281)	a	282)	a	283)	d	284)	a
121)	b	122)	c	123)	c	124)	a	285)	c	286)	b	287)	b	288)	b
125)	c	126)	d	127)	a	128)	c	289)	b	290)	d	291)	a	292)	c
129)	c	130)	a	131)	d	132)	d	293)	c	294)	d	295)	d	296)	a
133)	a	134)	d	135)	b	136)	b	297)	a	298)	a	299)	a	300)	c
137)	a	138)	d	139)	b	140)	c	301)	a	302)	b	303)	c	304)	a
141)	d	142)	c	143)	c	144)	d	305)	d	306)	d	307)	d	308)	c
145)	a	146)	a	147)	c	148)	b	309)	b	310)	c	311)	b	312)	c
149)	b	150)	b	151)	c	152)	d	313)	d	314)	d	315)	a	316)	d
153)	b	154)	d	155)	d	156)	c	317)	a	318)	c	319)	d	320)	a
157)	c	158)	b	159)	a	160)	a	321)	a	322)	c	323)	a	324)	a
161)	c	162)	b	163)	d	164)	b	325)	a	326)	a	327)	d	328)	b

FOCUS POINT

329)	**a**	**330)**	**a**	**331)**	**a**	**332)**	**c**	**365)**	**c**	**366)**	**b**	**367)**	**a**	**368)**	**a**
333)	**c**	**334)**	**a**	**335)**	**d**	**336)**	**b**	**369)**	**c**	**370)**	**b**	**371)**	**c**	**372)**	**c**
337)	**b**	**338)**	**a**	**339)**	**a**	**340)**	**b**	**373)**	**c**	**374)**	**d**	**375)**	**c**	**376)**	**d**
341)	**a**	**342)**	**a**	**343)**	**a**	**344)**	**a**	**377)**	**d**	**378)**	**c**	**379)**	**c**	**380)**	**c**
345)	**a**	**346)**	**c**	**347)**	**b**	**348)**	**c**	**381)**	**c**	**382)**	**b**	**383)**	**d**	**384)**	**d**
349)	**a**	**350)**	**a**	**351)**	**c**	**352)**	**a**	**385)**	**c**	**386)**	**d**	**387)**	**d**	**388)**	**c**
353)	**c**	**354)**	**b**	**355)**	**b**	**356)**	**c**	**389)**	**a**	**390)**	**d**				
357)	**d**	**358)**	**c**	**359)**	**b**	**360)**	**a**								
361)	**b**	**362)**	**a**	**363)**	**c**	**364)**	**b**								

NEET BIOLOGY

DIGESTION AND ABSORPTION

: HINTS AND SOLUTIONS :

1 **(a)**
Vitamin-B_{12} (cyanocobalamin) is only vitamin not found in vegetable. It is present in animal protein such as meat, liver, fish, etc. Recently, it has been considered that the alge *Spirulina* (single cell protein or SCP) also contains this vitamin.

2 **(b)**
Cholecystokinin, a hormone secreted from intestine causes contraction of gall bladder to release bile into duodenum.

3 **(a)**
In infants, defecation is not under voluntary control and it takes place by reflex actions, *i.e.,* process of defecation occur by the reflex action without the voluntary control of external anal sphincter. Both involuntary and voluntary muscles are directed by brain

4 **(c)**
Vitamin-E or tocopherol is obtained from green leafy vegetables, seed oils, milk, cheese, butter, egg, etc. It is an antisterility factor and is antioxidative for membrane lipids, skin (reduces keratinization) and hair, reduces atherosclerosis and inhibits oxidation of vitamin-A and unsaturated fatty acids. Its deficiency causes erythrocyte break down (anaemia) muscular dystrophy (cramps), miscarriage and reduced fertility.

5 **(d)**
Brunner's glands are simple, branched tubular glands presents in the submucosal layer of duodenum. Brunner's glands open in crypts of Leiberkuhn. The goblet cells of Brunner's glands secrete mucus, which helps in lubricating the food and separate the solid particles of food.

6 **(a)**
The correct chronological order of food processing in human beings is
Ingestion (Taking food) → Digestion → Absorption → Egestion (Undigested) → Assimilation

7 **(b)**
Vitamin-B_2 is riboflavin.

8 **(d)**
Glycogen is the reserve food in animals that's why, it is also called animal starch.

9 **(d)**
In **small intestine**, the wall of duodenum contains crypts of Leiberkuhn (intestinal glands) and Brunner's glands (duodenal glands). The intestinal juice or **succus entericus** is secreted by **crypts of Leiberkuhn**.
Pancreatic juice contains trypsin, for digesting protein and pancreatic amylase (amylopsin) for breakdown of starch and pancreatic lipase (steapsin) acting upon emulsified fats.

10 **(d)**
Vitamin-B complex and vitamin-C are water soluble, while vitamin-A, D, E and K are fat soluble. Vitamin –C (ascorbic acid) has antioxidant property. The rich source of vitamin-C are citrus fruits.

11 **(b)**
Oxyntic or **parietal cells** are located upon the surface of the gastric glands and secrete hydrochloric acid.

12 **(c)**
Human tooth consists of enamel, dentine, cement, periodontal ligament and pulp cavity. Pulp cavity is enclosed by dentine. Narrow extension of the pulp cavity, which runs through the root of the tooth is known as root canals

13 **(b)**
Liver, the largest digestive gland of the body performs various function. The synthesis of glucose or glycogen from non-carbohydrate sources such as amino acids, glycerol, etc, is called gluconeogenesis. The process takes place when glycogen supply in the liver is exhausted. Gluconeogenesis involves the conversion of excess of glucose into glycogen by liver with the

help insulin hormone. Glycogenolysis involves the conversion of glycogen into glucose

14 **(a)**
Due to the deposition of bile pigments, the eyes of patients turns down to be yellow during jaundice

15 **(b)**
The disease xerophthalmia is caused due to deficiency of fat soluble vitamin-A (retinol). Calciferol or vitamin-D is also fat soluble but its deficiency disease are rickets, osteomalacia and dental caries. Pellagra is caused due to niacin (vitamin-B_3) deficiency.

16 **(a)**
Duodenum of small intestine possesses Brunner's gland, which secretes large amount of mucous and bicarbonates, which in turn, proteins, the duodenal mucosa and neutralises the acidic chyme. It also secretes two hormones, secretin and cholecystokinin. However, secretin is secreted by duodenal wall and cholecystokinin is secreted by the epithelium of small intestine

17 **(d)**
Cyanocobalamin or vitamin-B_{12} is obtained from milk, egg, liver, fish and also synthesized by some colon bacteria. The deficiency (hypovitaminosis) of vitamin-B_{12} or cyanocobalamine causes pernicious anaemia, demyelination of never fibres and glossitis (inflammation of tongue).

18 **(b)**
In human being, digestion process starts from the mouth, continues in stomach and is completed in small intestine of the gut. About 25-30% of carbohydrates (polysaccaridess) are digested or converted into disaccharides (maltose) in the buccal cavity. Rest of the digestion of carbohydrates is completed in small intestine of human alimentary canal

19 **(d)**
Vitamins are necessary for normal cell functioning. These can be grouped into two categories water soluble (vitamin-B complex and and-C) and fat soluble (vitamin-A, D, E and K)

20 **(c)**
E. coli lives in the colon part of large intestine of humans. The cells of *E. coli* produce bacteriocin proteins. This bacteria is symbiont of human intestine and produce vitamins which are absorbed by the wall of colon

21 **(a)**
During starvation, *i. e.*, when food requirement of body is not fulfilled by ingested food, reserve carbohydrates is used up first by the boy and after carbohydrates, fat is used as energy source and at last when both carbohydrates and fats are completely consumed, proteins are used as energy sources. Proteins are used as last because proteins are main structural component of body.

22 **(a)**
The 'islets of Langerhans' are the clusters of cells of the endocrine portion of pancreas. These contain four types of cells (i) Alpha cells (32-38%) secreting glucagon (ii) Beta cells (60-70%) secreting insulin, (iii) Delta cells secreting somatostatin and (iv) F-cells secreting pancreatic polypeptide hormone to control somatostatin.

23 **(b)**
A tooth consists of three region, *i.e.,* crown, neck and root. The exposed part, crown is surrounded by the hardest material of the body. This hardest material is enamel which is the secretion of cells of ameloblast

24 **(c)**
Liver is the largest exocrine gland. Each liver lobe is formed of hexagonal lobules surrounded by a comective tissue sheath called Glisson's capsule. Kupffer's cells of liver act as phagocytes.

25 **(c)**
peristalsis is always towards anus. This is called 'Law of gut' The peristalsis is minimum in oesophagus and maximum in duodenum (12 per min). There is no peristalsis in rectum.

26 **(a)**
Digestive enzymes are hydrolases.

27 **(d)**
Scurvy disease is caused due to deficiency of **vitamin-C.** The disease is characterized by spongy and bleeding gums, loose and falling teeth, fragility of blood vessels, bones and nervous breakdown.

28 **(b)**
Brunner's glands secrete large amount of mucus and bicarbonates to protect duodenal mucosa and to neutralize the acidic chyme. It also secretes two hormones :
(i) Secretin (ii) Cholecystokinin (CCK)

29 **(b)**

Lacteals are found in villi. These are many intestinal lymph vessels that absorb fat from digested food.

30 **(b)**
Pepsin remains active below pH 5 and became inactive at pH 5. Proteins are hydrolysed by pepsin. The optimum pH of pepsin is about 2, so it is more active in acidic medium of gastric juices. However, it remains inactivated in the basic medium, *i.e.,* above pH-7

31 **(a)**
Lacteals absorbs fatty acids and glycerol in the small intestine of human. Fatty acids and glycerol are insoluble in water so, they cannot be absorbed in blood stream directly. They are first broken down into small, water soluble droplets with the action of bile salts called micelles. The later are absorbed by the intestinal cells where these are resynthesised in the endoplasmic reticulum and are transferred in form of smaller fat droplets – chylomicrons through lacteals. Due to the dilation of intestinal lacteals lymph gets, lost into the lumen of small intestinal, which results into lymphopenia, hypoproteinemia, etc.

32 **(a)**
Cyanocobalamine or simply cobalamine (vitamin-B_{12}) deficiency causes pernicious anaemia. Vitamin-B_{12} is required for RBCs maturation. DNA synthesis, myelin formation, etc. It acts as a co-enzyme. Its sources are fish liver, egg and milk white. It can be best obtained from *Spirulina* alga (SCP) and mutton. It is the only vitamin, which is not found in vegetables

33 **(c)**
Fats can be classified as saturated and unsaturated fats. Plant lipids contains unsaturated fatty acids, while animal lipids have saturated fatty acids. Excess intake of both saturated and unsaturated fats is responsible for increasing blood cholesterol level. So, excess of fats particularly, saturated fats should not be taken by old person and patients of heart disease and high blood pressure

34 **(a)**
Flavin adenine dinucleotide (FAD) is a coenzyme derived from riboflavin or vitamin-B_2

35 **(b)**
When food in the form of bolus reaches into the stomach by involuntary movement of muscular coat from oesophagus, it mixes thoroughly with the gastric juices present in the stomach. This thoroughly mixed food is called chyme

36 **(a)**
Pancreas is a yellowish, leaf like mixed gland which is located posterior to the stomach in abdominal cavity. It is composed of two parts namely, an exocrine part and an endocrine part. The exocrine part secretes a slightly alkaline juice, which is known as pancreatic juice. This pancreatic juice contains trypsinogen, chymotripsinogen, and carboxypeptidase (proenzyme) and sodium bicarbonate. Pancreatic lipase, pancreatic-amylase, DNase and RNase are also present in little amount in gastric juices

37 **(a)**
The graph indicates that cholesterol is an essential dietary requirement of Khapra beetle because weigh of insect larva increases with the increase in amount of cholesterol and weight becomes static at 6 µg cholesterol/g basal diet. If the growth rate would have been directly proportional to the cholesterol concentration then the graph would have been straight line.

38 **(b)**
Throat (pharynx) can be divided into three parts, *i.e.,* nasopharynx, oropharynx and laryngopharynx. The later part loads into the oesophagus behind and into the larynx (middle portion), which is a common passage for both food and air

39 **(c)**
Horse.
Elephant, snakes and crocodile exhibits polyphyodont dentition

40 **(b)**
About 90% of the total water is absorbed in the small intestine, while balance 10% are absorbed in the stomach and large intestine. Large intestine also absorbs some minerals, drugs and products of bacterial digestion like amino acids and vitamins B-complex and vitamin-K. It secretes mucous which, lubricate faeces and facilitate its flow into the rectum, where it is stored temporarily.
Electrolytes and amino acids are absorbed in the duodenum and jejunum

41 **(c)**
Physiological jaundice is the mild form of jaundice, which occurs due to the elevation of unconjugated bilirubin concentration during the

first week of newborn children. It disappear as the liver matures. Neonatal jaundice is the severe form of jaundice

42 **(a)**
Colon part of the large intestine contains some bacteria. Some of them are symbiotic in nature. These bacteria feeds on undigested matter. This bacteria (*E. coli*) in turn produce vitamin-B_{12}, vitamin-K along with vitamin-B_1 and B_2

43 **(a)**
Vitamin-B_1 (thiamine) is found in whole wheat bread. Its deficiency causes beri-beri.

44 **(d)**
The upper surface of tongue has small projections called papillae. These papillae can be divided into four types: circumvallale or vallale papillae, fungiform papialle, filiform papillae and foleate papillae. Out of four, filiform papillae lacks taste buds, while rest all three have taste buds. Opening of stomach into duodenum is guarded by pyloric sphincter, while oddi sphincter guards the opening of hepatic ampulla into duodenum

45 **(a)**
One half of each jaw has four different types of teeth (i) two incisors (ii) one canine (iii) two premolars (iv) three molars. Last (*i. e.*, third) molars are called wisdom teeth thus, these are totally four in number.

46 **(d)**
Pancreas is single endodermal flat leaf-like yellowish, heterocrine gland present between ascending and descending limb of duodenum. **Serosa** is the outermost covering of human intestine. It is followed by submucosa and mucosa.

47 **(a)**
Saliva - the secretion of salivary glands in human constitutes a mixture of water and salts or electrolytes. It's medium is slightly acidic with the pH 6.8. Saliva also contains antibacterial agent, lysozyme

48 **(d)**
Sulcus terminals (an inverted V shape furrow) divides the upper surface of furrow into buccal part and pharyngeal part. This upper surface of tongue has several small projections. These projection are termed as papillae

49 **(a)**
Nucleotidase enzyme is secreted by **intestinal juice** or **succus entericus**. It hydrolyses nucleotides into nucleosides and phosphate.

50 **(a)**
Digestion of nucleic acids takes place in the small intestine. The enzyme present in pancreatic and intestinal juices acts on nucleic acids as follows

$$\text{RNA} \xrightarrow[\text{Pancreatic juice}]{\text{RNase}} \text{Ribonucleotides}$$

$$\text{Ribonucleotides (Nucleotides)} \xrightarrow{\text{Nucleotidases}} \text{Nucleosides} + \text{IPO}_4$$

$$\text{Nucleosides} \xrightarrow{\text{Nucleosidases}} \text{Nitrogenous base} + \text{Pentose sugar}$$

51 **(c)**
Fats are broken down by lipases with the help of bile into di- and monoglycerides.

$$\text{Fats} \xrightarrow[\text{Bile}]{\text{Lipases}} \text{Diglycerides} \rightarrow \text{Monoglycerides}$$

52 **(a)**
The rights and left hepatic duct join to form the common hepatic duct which joins the cystic duct arises from gall bladder. The cystic duct and common hepatic duct join to form bile duct which after joining the main pancreatic duct forms hepatopancreatic ampulla. The ampulla opens into duodenum. The opening is guarded by sphincter of Oddi?

53 **(a)**
Stomach is located in the upper left part of the abdominal cavity. It has three parts, a **cardiac portion**; a **fundic portion** and a **pyloric portion**, which opens into the proximal part of small intestine

54 **(c)**
The opening of the common bile duct is guarded by sphincter of Oddi.

55 **(c)**
Small intestine of alimentary canal consists of region/part namely duodenum, colon, rectum. Duodenum (proximal part) is some what C-shaped. The middle jejunum is coiled part and the distal or lower part, ileum is highly coiled. The later part opens into the first part of, large intestine (caecum)

56 **(d)**
Pellagra is caused due to deficiency of vitamin-B_3 (niacin or nicotinic acid). Deficiency of vitamin – B_{12} (cyanocobalamin) causes pernicious anaemia. Deficiency of vitamin-B_6 (pyridoxine) causes loss

of appetite. Deficiency of Vitamin-B_2(thiamine) causes beri-beri.

57 **(b)**
Incisors are located anteriorly. Incisors are chisel-shaped and possess sharp cutting end and, therefore, specialized for cutting.

58 **(c)**
Pepsin is a proteolytic enzyme, secreted by chief cells or peptic cells of gastric glands in the form of pepsinogen. It acts in highly acidic medium (pH = 2).

59 **(d)**
Glisson's capsule is formed by a layer of connective tissue surrounding the liver and ensheathing hepatic artery portal vein and bile ducts within the liver. It was so named after the biologist **Francis Glisson** (1597-1677)

60 **(b)**
The correct sequence of food processing, in human being is
Mouth → Buccal cavity → Pharynx → Oesophagus → Stomach → Duodenum → lleum → Caecum → Rectum → Elimination

61 **(d)**
Anaemia refers to any condition in which there is an abnormally low haemoglobin concentration and/or blood cell count. The most common cause is deficiency of iron, which is an essential element of haemoglobin molecule. Thus, the iron compounds in the diet will help to alleviate the symptoms of anaemia.

62 **(b)**
The dentition in human being is diphyodont, heterodont and thecodont. Permanent teeth of mammals are arranged systematically in each jaw. Dental formula provides half of the total number of teeth. Therefore, dental formula is the arrangement of teeth in each half of the upper and lower jaw in the order of incisors, canines, premolars and molars

63 **(d)**
Balance diet possesses the major component it of the food in requisite proportion, which is required for the maintenance of health, activity, growth and development. Therefore, it must contain carbohydrates (60-70%), fats (15-25%), proteins (10-15%), vitamins, minerals electrolytes, etc.

64 **(a)**
Vitamin-B_{12} or cyanocobalamin is a dark red-cooloured cobalt based vitamin having porphyrin ring in its structure.

65 **(d)**
Carbohydrates, fats and proteins will remain undigested on removal of pancreas.

66 **(c)**
Dicumarol is a natural anticoagulant. Its anticoagulant property was discovered, when cattles who consumed improperly cured 'sweet clover hay' was suffered by 'sweet clover diseases' In this disease, cattle suffer by vitamin-K deficiency, which resulted into prolonged bleeding or even fatal haemorrhage.

67 **(a)**
The intestinal juice or succus entericus is secreted by crypts of Leiberkuhn.

68 **(d)**
Saliva contains a starch splitting enzyme ptyalin (α amylase). HCl of gastric juice inactivated the ptyalin in stomach.

69 **(c)**
Vitamin-K (phylloquinone) deficiency causes bleeding disease or haemorrhage, *i.e.,* inability in blood clotting. Vitamin-C (ascorbic acid) deficiency causes scurvy. Scurvy is characterised by spongy and bleeding gums, loose and falling teeth, fragility of blood vessels, bones and nervous breakdown

70 **(c)**
In majority of the mammal including human being, the number of teeth is fixed and are produced in two sets, *i.e.*, milk or deciduous teeth and permanent teeth. Milk teeth in human includes 8 incisors, 4 canines and 8 molars. Dental formula of a child below 7 years of age is $\frac{212}{212} \times 2 = 20$

71 **(a)**
Crypts of Leiberkuhn or intestinal glands are present in the duodenum and ileum (parts of small intestine) only. These are formed by the folding of lamina propria and secrete succus entericus, *i. e*., intestinal juice.

72 **(c)**
Bile is secreted by hepatic cells. It passes through hepatic ducts and then stored and concentrated in a thin muscular sac. Gall bladder the pH of hepatic bile is 8.6, while the pH of gall bladder is 7.6 or 7.5

The salts present in bile juice are responsible for emulsification of fats in small intestine. These salts are mainly, salts of taurocholic acid and glycocholic acid. Horse and rats donot have gall bladder

73 **(d)**

When common hepatic duct (left and right hepatic ducts) joins the cystic duct of gall bladder, the formation of bile duct or common bile duct takes place. This bile duct downward posteriorly joins the main pancreatic duct to form the hepatopancreatic duct.

Pancreas is a mixed gland. Its exocrine part secretes pancreatic juices, while insulin and glucagon are secreted by the endocrine parts

74 **(d)**

The pancreatic juice contains starch digesting enzyme, called pancreatic **α -amylase**, which converts starch into maltose, isomaltose and α -dextrins. Digestion of starch completed in duodenum with the help of intestinal juice.

75 **(c)**

Carbohydrates and proteins used as diet are stored within the body in the form of fat (lipid). Oxidation of lipids, produce fatty acids and glycerol. **Linoleic acid** is a fatty acid, which is not synthesized by the human body and we take it from the food directly.

76 **(a)**

Caecum is a small, pouch-like structure, which ends into a tubular structure called vermiform appendix. In rabbit, caecum is concerned with digestion of cellulose and conduction of food.

77 **(b)**

Proenzymes (inactive form of enzyme) or zymogens are secreted by chief cells or zymogenic cells of gastric glands. These proenzymes are secreted by peptic cells and are activated by HCl secreted by oxyntic or parietal cells of gastric glands

78 **(c)**

Poison glands of snake are modified salivary glands.

79 **(c)**

In the intestine, enterokinase converts inactive protein into active protein. Albumin is a protein, hence, in the absence of enterokinase, the digestion of albumin would be affected in our intestine.

80 **(d)**

Vitamin-B_1, thiamine is responsible for normal working of human being. The best source of vitamin-B_1 is whole wheat bread and its derivative.

Besides these source, it can also be obtained from yeast, peanuts beans and lean meat. A prolonged deficiency of vitamin-B_1 in diet may leads to paralytic disease beri-beri

81 **(a)**

Small finger-like projections responsible for the increase of surface area for absorption of food are prominent in small intestine of human gut. These small projections are better known as villi, which are supplied with a network of blood capillaries and a large lymph vessel called the lacteal

82 **(c)**

Deficiency Disease	Vitamin
Bleeding	K
Scurvy	C
Xerophthalmia	A
Osteomalacia	D

83 **(c)**

Omnivores have maximum variety of enzymes because they can feed like both herbivores and carnivores.

84 **(d)**

The stomach is anatomically distinguished into three parts --- (i) fundus, (ii) body (iii) pyloric part or antrum.

The antrum leads into the intestine through a pyloric orifice (*i. e*., pylorus). Thus, pylorus is present between stomach and duodenum (part of the small intestine connecting the stomach to the ileum).

85 **(d)**

I – Enterokinin, II – Somatostatin, III – Duocrinin

86 **(c)**

Rabbit or *Oryctolagus cuniculus* best represents the class-Mammalia. Dentition in majority of the mammals is heterodont (*i.e.,* dissimilar teeth). In humans, canine is pointed in each maxillary of upper jaw and each dentary of lower jaw, while in rabbit and other herbivores canines are absent. Hence, some part of the gums between the teeth remains teethless, *i.e*., gap is found between incisors and PM. Dental formula of rabbit is

$$I\frac{2}{1}C\frac{0}{0}PM\frac{3}{2}M\frac{3}{3}\times 2 = 28$$

87 **(b)**

Acetylcholinesterase enzyme splits acetylcholine into acetic acid and choline.

88 **(c)**
Bile is secreted from liver and contains bile pigments and bile salts (sodium taurocholate and sodium glycocholate). Emulsification of fat will not take place in absence of bile salts.

89 **(d)**
Starfish and *Sepia* eat their preys. Leech is sanguivorous, which feeds on blood.

90 **(b)**
In the wall of small intestine, lymphatic tissues are present called Peyer's patches. These are groups of lymph nodules that are most numerous in the ileum. They produce lymphocytes.
Rugae are prominant folds found in empty stomach. Maceus membrane of small intestine is grown into many finger-like projections known as villi.

91 **(c)**
The wall of alimentary canal is made up of four basic layers. First of all, there is serosa, which is a thin membranous covering around oesophagus. Then, there is muscle layer-outer layer of longitudinal muscles and inner layer of circular muscles. Last, there is submucosa, which contains a few oesophageal glands. Then comes mucosa, which has several layers of flattened cells.

92 **(a)**
Diastema is the gap in the teeth along the jawbone. In herbivores, the diastema separates the incisors from the premolars resulting in an elongation of the jaw and aiding in feeding.

93 **(c)**
Digestion of carbohydrates starts from the mouth. In mouth (buccal cavity), 30% of starch is converted into maltose (disaccharide). Diet of food containing carbohydrates, is required by the body as carbohydrate is the source of instant energy

94 **(a)**
Enzyme enterokinase converts trypsinogen into trypsin.

95 **(b)**
Fe, I, Mn, Cu, Zn and fluorine are required in minimum amount by human.

96 **(c)**
Vestigial organs are present in reduced form and are of no use to the animal, in which they are present. Man has 180 vestigial organs, *e. g.*, nictitating membrane, vermiform appendix, wisdom tooth, muscle of pinna and forehead, mammary glands in male, etc.

97 **(a)**
Fluid secreted by salivary gland is known as saliva. Saliva is chemically a mixture of water, electrolyte (salts) of sodium potassium chloride and bicarbonates, salivary amylase (ptylin) and lysozyme. Lysozyme acts as an antibacterial agent

98 **(a)**
Canines are dagger-shaped or shovel-shaped and lie behind the incisors. These are used for cutting and tearing.
Incisors are sharp, pointed, chisel-shaped and used for cutting. Premolars and molars are specialized for erushing and grinding the food.

99 **(a)**
The secretion of intestinal gland is called **intestinal juice** or **success entericus.**

100 **(d)**
During prolonged hunger strike or starvation of food the reserve food (carbohydrates) is used up first by the body. Fats are used as second source of energy after carbohydrates. At last, when both carbohydrates and fats are used completely, proteins are used as a source of energy. Proteins are used at last because they are the main structural components of body

101 **(b)**
Food is absorbed in its simple forms. The simpler forms are formed by the hydrolysis of food in different parts of alimentary canal. Most of the carbohydrates are absorbed as monosaccharides. Monosaccharides like, glucose and galactose (end product of milk sugar) are absorbed in the duodenum and jejunum by active process. The two monosaccharides with glucose are absorbed most rapidly, *i.e.*, galactose is absorbed first with glucose

102 **(b)**
Succus entricus or intestinal juices are the secretion of intestinal glands. Brunner's glands in the intestine opens into crypts of lieberkuhn, which secretes enzymes and mucous. Basically, succus entricus is considered as the secretion of crypt of Lieberkuhn

103 **(c)**
There are three pair of salivary gland in human being sublingual, submandibular and parotid. The parotid glands are the largest and are located near the ears. Submandibular or submaxillary

gland are medium sized, while sublingual glands are the smallest, which is situated beneath the tongue. Zymogens or proenzyme are secreted by the secretion of zymogenetic cells or peptic cells or chief cells

104 **(d)**

Column I	Column II
Goblet cells	Mucus
Lysozyme	Antibacterial agent
Saliva	Sublingual gland
Oxyntic cells	Hydrochloric acid

105 **(b)**

The hump of camel has stored fats. Camel can live 4 to 5 days without food and water. The energy is provided by the fat stored in the hump. Camel is thus called ship of desert.

106 **(c)**

pH value of saliva is 6.8. Hence, it is slightly acidic in medium. It is composed of water and salts of sodium, potassium, chlorides and bicarbonates. Saliva also contains an antibacterial agent, lysozyme

107 **(a)**

Bile is secreted by liver. It is a complex watery fluid containing bile salts (Na glycocholate and Na-taurocholate) bile pigments (bilirubin and bilivirdin), cholesterol, mucin, lecithin and fats. It acts on the fats and emulsify them into simple forms; mono or diglycerides by the action of lipase

108 **(d)**

Atrial Natriuretic Factor (ANF) is secreted by walls of cardiac atrium. It inhibits rennin secretion and affects juxtaglomerular apparatus.

109 **(a)**

Pellagra is a vitamin deficiency disease most commonly caused by a chronic lack of niacin (vitamin-B_3) in the diet. It may also result from alternations in protein metabolism in disorders such as carcinoid syndrome. A deficiency of the amino acid lysin can lead to a deficiency of niacin as well.

110 **(d)**

Deficiency of calciferol or vitamin-D causes rickets in children and osteomalacia in adults. This causes weak soft bones, skeletal distortions and poor muscle development.

111 **(a)**

Dental formula provides half of total number of teeth in a jaw bone

Dental formula of human is $1\frac{2}{2}C\frac{1}{1}PM\frac{2}{2}M\frac{3}{3}$

112 **(c)**

Milk is regarded as one of the main component of balanced diet. It contains, water, protein casein, calcium and a little amount of lipid. Lactose in tolerance is the inability of certain individuals to digest lactose the sugar found in milk, due to the deficiency of the enzyme lactose in the intestine

113 **(b)**

The secretion of pancreatic juice is stimulated by both **secretin** and **cholecystokinin** (CCK).

114 **(a)**

Dentition in human is diphyodont, heterodont and teeth are arranged in socket of jaw bone, *i.e.*, thecodont. Diphyodont means that teeth appears in two set during their life. A set of milky or temporary or deciduous teeth, which are replaced by permanent teeth between 6-12 of age. These milky teeth in human child includes 8 incisors, 4 canines and 8 molars (PM are absent). So, the dental formula of a child between the age of 4-6 years is $I\frac{2}{2}\ C\frac{1}{1}\ PM\frac{0}{0}\ M\frac{2}{2} \times 2 = 20$

115 **(d)**

The liver secretes bile, which stored in gall bladder. Bile contains some bile salts like sodium carbonate, sodium glycocholate, sodium taurocholate, which helps in the digestion of fats in the small intestine by bringing about emulsification of fat (*i.e.*, conversion of large fat droplets into small ones).

116 **(c)**

Jaundice, diarrhea and constipation are digestive system disorders, while emphysema is a respiratory disorder. It is an inflation or abnormal distension of the bronchioles of the lungs. Its major causes are smoking or inhalation of toxic substances

117 **(d)**

Bile is secreted by liver and stored in gall bladder. Bile is a watery fluid, having bile salts, bile pigments and sodium bicarbonate, cholesterol, mucin, lecithin fats, etc. It is mixed with the food in intestine along with the pancreatic and intestinal juices

118 **(a)**

Vitamin-C, E and β -carotene (provitamin-A) are called antioxidant vitamins, as their inactive

oxygen free radicals are highly reactive particles that carry an unpaired electron.

119 **(a)**
Maximum percentage of lipoprotein is found in chylomicron. Lipoproteins transport lipids in the blood, carry triglycerides and cholesterol to tissues and remove excess cholesterol from the blood.

120 **(b)**
Sucrose is hydrolysed into one molecule of glucose and one molecule of fructose by sucrase or invertase enzyme

$$\text{Sucrose} \xrightarrow{\text{Sucrase}} \text{Glucose} + \text{Fructose}$$

121 **(b)**
Celiac disease is a digestive disorder that damages the small intestine and interferes with absorption of nutrients from food

122 **(c)**
Oxyntic cells are present in pits within the wall of vertebrate stomach. Their function is to secrete hydrochloric acid, giving the gastric fluid a pH of about 2.0 HCl converts proenzyme prorennin and pepsinogen into active rennin and pepsin respectively.

123 **(c)**
Gastro-oesophageal sphincter is also called as cardiac sphincter as it is present at the cardiac part of stomach, which in turn lies near the heart. Actually, cardiac sphincter is not a true valve but functions as sphincter

124 **(a)**
Twenty types of amino acids are found in proteins. These amino acids are synthesised by almost all the plants. While animals are not able to synthesise all amino acids. However, several amino acids (about 10) are synthesised by the animals through transformation or transamination. Those amino acid, which are essential component of our diet but are not synthesised inside the body, can be called as essential amino acids. These are taken in diet. Those amino acids which are synthesised by the body are termed as non-essential amino acids. Deficiency of isoleucine causes deregulation of blood sugar

125 **(c)**
Vitamin-K is also called anti-haemorrhagic vitamin or coagulation factor. It is necessary for the formation of prothrombin in the liver of human beings which is essential for blood coagulation. Vitamin-K also affects the formation of other blood clotting proteins.

126 **(d)**
Absorption of amino acids occur by the active and facilitated transport. But major absorption takes place by the active transport. Absorption of amino acids occur mainly in duodenum and jejunum and parts of the small intestine. Here, about 97 – 98% of amino acids are absorbed

127 **(a)**
Erepsin, trypsin and pepsin are proteolytic enzymes.

$$\text{Polypeptides} + \text{Oligopeptides} \xrightarrow[\text{Amino peptidase}]{\text{Erepsin}} \text{Amino acids}$$

$$\text{Trypsinogen} \xrightarrow[\text{Autocatalysis}]{\text{Trypsin}} \text{Trypsin}$$

$$\text{Proteins} + \text{Peptones} \xrightarrow{\text{Pepsin}} \text{Polypeptides} + \text{Oligopeptides}$$

128 **(c)**
Some of the important deficiency disease/disorder are night blindness, xeropthalamia, anaemia, goitre and PEM. The later protein energy malnutrition disorder are the most common in young children below 8 years. It is of two types, kwashiorkor and marasmus. Kwashiorkor is observed in children of age group between 1-8 years and is caused by the deficiency of both carbohydrates and proteins, while marasmus is commonly seen in the children of age below two years and is caused by deficiency of proteins only

129 **(c)**
Fat soluble vitamins are absorbed *via* simple diffusion. Amino acids are absorbed by active transport and few are absorbed by facilitated transport. Glucose and galactose are absorbed by the active transport and fructose is absorbed by facilitated transport

130 **(a)**
In the intestine at the bases of villi, the epithelium dips into lamina propria and form simple tubular glands or crypts of Leiberkuhn that secrete intestinal juice.

131 **(d)**
Carnassial teeth are found in carnivorous mammals. These are cutting teeth. Carnassial teeth are the last premolar in upper jaw and first molar in lower jaw in carnivorous animals. These have flattened cups with sharp cutting edges.

132 **(d)**
The hardest part in the animal body is enamel found on the upper layer of teeth.

133 **(a)**
Majority of the carbohydrates are absorbed as monosaccharides in the stomach and middle part of the small intestine (jejunum). Glucose and amino acids are absorbed by active transport. Glucose is absorbed in the stomach and jejunum, while around 95 – 98% amino acids are absorbed in the duodenum and jejunum

134 **(d)**
In ruminants (*e. g.*, cow, goat and camal) the stomach is four chambered as follows:
(a) Rumen (cellulose is digested)

(b) Reticulum (cellulose is digested)

(c) Omasum (absorb water)

(d) Abomasum (true stomach)

Gastric gland are found only in abomasum for the secretion of gastric juice. Abomasum is responsible for protein digestion, from their the food passes to small intestine for further digestion.

135 **(b)**
Enamel is the hardest part of human body. It covers the dentine in the crown. There are two types of cells, which are dentine forming **odontoblasts** and **enamel forming ameloblasts.**

136 **(b)**
Iodine is essential for the life of animals. It is required for the formation of thyroxine hormone, which controls **basal metabolic rate** (BMR). This hormone stimulates protein synthesis and therefore, promote growth of body tissues.

137 **(a)**
Bile is synthesized in liver and stored in gall bladder. Bile helps in emulsification of fats. Bile is release in duodenum. So, amount of bile is released in proportional to the amount of fat in meal.

138 **(d)**
Cholecystokinin- pancreozymine hormone is secreted by the epithelium of entire small intestine. It stimulates the gall bladder to release bile and pancreas to secrete and release digestive enzymes in the pancreatic juice.

139 **(b)**
Nutrients are the chemical constituents of food, which are the primary requirement of life. These can be grouped into two types: macronutrient which include carbohydrate, fats and proteins and micronutrient or trace nutrient, which are required in small amount by the body

140 **(c)**
Beri-beri is a disease caused due to deficiency of vitamin-B_1. Its symptoms include anorexia, retarded growth, degeneration of bones and muscles, fatigue and even paralysis and cardiovascular disease. Vitamin-B_1 and the disease beri-beri were discovered by **Eijkman** in 1897.

141 **(d)**
Yeast is the source of vitamin-B_1, not vitamin –A.

142 **(c)**
Digestion is the process, in which non-diffusible food is converted into diffusible food with the helps of digestive enzymes. Digestion is mainly carried out by the process of hydrolysis using water molecules for the cleavage. So, digestive enzymes are hydrolases.

143 **(c)**
The major site of protein break down into absorbable form, *i.e.,* amino acids takes place in the small intestine. The process of conversion of the end products of food is carried out with the help of bile and intestinal juices

144 **(d)**
Digestion of protein starts in stomach and completed in small intestine. Duodenum is the main digesting part of alimentary canal, while ileum is related with absorptive function.

145 **(a)**
Digestion involves both mechanical and bio-chemical processing of food. Basically, it is the break down of complex organic substances of food like carbohydrates, proteins and fats (macronutrients) into simple, soluble inorganic substances. So, it can be defined as the conversion of insoluble polymer of food into their soluble monomers

146 **(a)**
pH refers to the relative concentration of H^+ ions in a solution. Low pH values indicate high concentrations of H^+ ions (acids) and high pH values indicate low concentrations basic.

147 **(c)**

Chylomicrons are lipoprotein particles synthesized by intestinal epithelial cells and consisting mainly of triglycerides. Chylomicrons are the form, in which dietary fat is transported in the circulatory system.

148 **(b)**
A-Molar, B-Premolar, C-Canine, D-Incisor. Incisors teeth have chisel like edge thus, also called as cutting teeth, while canines are pointed and lies behind the cutting teeth. They are used for cutting and tearing. Premolar and molars are called check teeth. They are broad and are used to crush the food. Third molar of human being is called wisdom teeth

149 **(b)**
Insulin is a hormone, produced by β-cells of islets of Langerhans of pancreas.

150 **(b)**
There are three pair of salivary glands in human being namely, paratoid glands, sublingual glands and submaxillary glands. All of the three pairs of glands secretes saliva into buccal cavity through their ducts. About 1000-1500 mL of saliva is secreted per day by an adult person

151 **(c)**
Dental formula of rabbit is $\frac{2033}{1023} \times 2 = 28$. Canines are absent in rabbit.

152 **(d)**
Vitamin-B_{12} (Cyanocobalamin) is required for RBCs maturation, DNA synthesis, myelin formation. It acts as coenzyme. Its deficiency causes pernicious anaemia. Best source of vitamin-B_{12} are fish, liver, eggs, milk, colon bacteria.

153 **(b)**
Retinol, is a chemical name of vitamin-A. Deficiency of vitamin-A in diet causes night blindness and xerophthalmia. The later may lead to advanced stage, which is characterised by keratinised cornea

154 **(d)**
In human, 20 teeth (incisor, canine, premolar) are diphyodont, *i. e*., grow twice in life and 12 teeth (molars) are monophyodont, *i. e*., grow once in life.

155 **(d)**
Dental formula is the number of teeth one half of upper jaw divided by teeth one half of lower jaws. Rat dental formula $\frac{1003}{1003} = 16$

156 **(c)**
Secretin and cholecystokinin (CCK) are two main gastrointestinal (GI) hormones secreted in duodenum of alimentary canal. CCK stimulates gall bladder contraction and thus increases the flow of bile salts into the intestine. While, secretin stimulates the release of an alkaline pancreatic fluid that neutralizes stomach acid as it enters the intestine.

157 **(c)**
Kupffer's cells of liver are phagocytic cells, which destroy worn out white and red blood corpuscles, bacteria and micro-organisms passing from the liver.

158 **(b)**
Process of digestion starts in the mouth, continues in stomach and is completed in small intestine. In buccal cavity or oral cavity, the digestion of carbohydrates gets started and 30% of polysaccharides present in the food gets converted into disaccharides (maltose). Rest 70% of carbohydrates the completely digested in the small intestine

159 **(a)**
Bile is secreted by liver. Pancreatic juices, secretion of exocrine part of pancreas and succus entricus are secreted by goblet cells of mucosa along with the brush border cells of mucosa. These secretions gets mixed with the partially hydrolysed food in the small intestine

160 **(a)**
Fatty acids, glycerol and monoglycerides are in soluble in water so they cannot reach the blood stream directly. In intestinal lumen, they first incorporated into small, spherical, water soluble micelles and then into chylomicrons (very small fat molecules). Chylomicrons release from intestinal cells into the lymph present in the lymph vessels (lacteals) within the villi.

161 **(c)**
Reverse flow of food from stomach to oesophagus of rabbit (mammal) is prevented by **cardiac sphincter.** Through pyloric sphincter chyme is transferred to the intestine.

162 **(b)**
Old non-functional RBCs are destroyed in spleen, liver and bone marrow. The most important site or RBCs disposal is spleen, so it is called as then graveyard.

163 **(d)**

Protein hydrolysing enzymes are called peptidases or proteases. A majority of protein hydrolases are secreted in inactive forms called proenzymes as their active forms can digest cellular or extracellular proteins of individuals itself. Hydrolases secretin and cholecystokinin are secreted by the duodenum of intestine and epithelium of the entire small intestine, respectively

164 **(b)**
Niacin or nicotinamide (nicotinic acid) is also called anti-pellagra vitamin. Its deficiency causes pellagra in which skin becomes scaly and pigmented. Deficiency of pyridoxine (Vit-B_6) causes anaemia, neuritic pain, convulsions, skin lesions, etc. Deficiency of folic acid causes megaloblastic or macrocytic anaemia, while deficiency of biotin (vitamin-B_4 or vitamin-H) causes dermatitis and anorexia.

165 **(c)**
After heavy meal, blood pressure in the brain gets decreased, which causes drowsiness

166 **(c)**
The innermost layer lining the lumen of the alimentary canal is the mucosa. The mucosa layer forms irregular folds in the stomach, known as rugae. Rugae disappear when the stomach is distended with food. Loss of the rugal are one of the earliest sign of stomach cancer.

167 **(d)**
Liver is the largest gland of body and is situated in the upper right side of the abdominal cavity just below the diaphragm. It is divided into two main lobes, which are separated by a falciparum ligament

168 **(c)**
Enterogasterone (gastric inhibitory peptide) is secreted by the duodenal epithelium. It inhibits gastric secretion and motality. It slows gastric contraction hence, called gastric inhibitory peptide.

169 **(a)**
Liver secretes bile which is a complex watery fluid containing bile salts (Na-taurocholate and Na-glycocholate), bile pigments (biliverdin and bilirubin), cholesterol, mucin, lecithin and fats, etc. It breaks and emulsifies the fat.

170 **(d)**
Cod and shark liver oil is a good source of vitamins like retinol and calciferol. Vitamins and minerals are micronutrient and provide no energy but their deficiency causes specific disease or abnormalities or so they protect the human body and can be considered as protective nutrients. Vitamin-B is water soluble hence, it is more beneficial than A, D, E which are fat soluble

171 **(d)**
Monosaccharides are absorbed in the stomach and middle part of the small intestine (jejunum). Glucose and galactose are absorbed by the active transport while, monosaccharides (fructose and amino acids) absorption takes place by facilitated transport

172 **(a)**
Colon is sac-like structure, in which water absorption from digested food takes place.

173 **(a)**
(a) Cystic fibrosis – Production of thick mucus that clogs airways
(b) Sickle cell anaemia - Defective haemoglobin in RBCs, effect on oxygen transport, tendency to form clots in vessels
(c) Achondroplasia- Dwarfism
(d) Huntington's disease - Progressive deterioration of brain cells

174 **(c)**

Digestive juice	Source	pH Range
Gastric juice	Gastric glands	1. 3.5
Bile	Liver	7.7
Pancreatic juice	Pancreas	7.5 - 8.3
Intestinal juice	Intestinal glands	7.5 - 8.0

175 **(a)**
Process of digestion is completed in the small intestine of alimentary canal. Majority of the substances and nutrient are also absorbed by the walls of the this part of alimentary canal. Undigested and unabsorbed food is passed to the large intestine, where balance water and product of bacterial digestion are absorbed from the food and rest of the matter is excreted through the anus

176 **(b)**
Gastric juice contains water (99%), mucus, inorganic salts, Castle's intrinsic factor, HCl (0.5%

conc) and enzymes prorennin, pepsinogen and gastric lipase

177 **(b)**
Compound saccular glands are salivary glands.

178 **(a)**
Vitamin-D has alcohol group in it, *i.e.*, having formula $C_{27}H_{43}OH$.

179 **(d)**
α-amylase, lysozyme and lipase are the potent enzymes present in human saliva.
α-amylase (ptylin) breaks down starch into simpler sugars. Lipase helps in the initiation of fat digestion and lysozymes has antibacterial effects

180 **(a)**
Secretion of salivary glands is known as saliva. This secretion is rich in hydrolases. The salivary secretion of parotid glands secretes much of salivary amylase or ptylin

181 **(b)**
Placoid scales are similar to mammalian teeth. It is characteristic feature of elasmobranch fishes only, each placoid scale consists of a backwardly directed spine arising from a rounded basal plate embedded in dermis.

182 **(b)**
In human, small intestine is the longest portion in the alimentary canal. The absorption of digested food mainly occurs in small intestine. Absorption requires a very large surface area, which is provided by numerous intestinal villi.

183 **(a)**
The enzyme rennin coagulates casein, the soluble protein of the milk, into insoluble calcium salt of casein, which is then digested by the pepsin

184 **(c)**
Bile juice is secreted by liver and stored in the gall bladder. Bile contains bile salts such as sodium glycocholate, taurocholate, ect. Bile acts as a super detergent. It combines with fats to from microscopic droplets called **micelles** in a process known as **emulsification**.

185 **(b)**
Oryctolagus cuniculus (rabbit) is a good representative of class-mammalia. Dentituion in all the mammals are heterodont (*i.e.*, dissimilar teeth). Canine is one, pointed in each maxillary of upper jaw and each dentary of lowar jaw. In rabbit and other herbivorous mammals, canines are absent. Hence, some parts of gums between incisors and other teeth remain teethless and called diastema.
Rabbit possesses three pairs of wall developed, sharp, chisel like incisors, two pairs in the premaxillaries of upper jaw and one pair in denteries of lowar jaw. Dental formula of rabbit is :

$$I\frac{2}{1}, C\frac{0}{0}, Pm\frac{3}{2}, M\frac{3}{3} \times 2 = 28$$

186 **(c)**
Indigestion is caused by the inadequate enzyme secretion, anxiety, food poisioning, overeating, etc.

187 **(b)**
The pancreatic juice contains α-**amylase**, Which converts starch into maltose, isomaltose and α-dextrins in small intestine.

$$\text{Starch} \xrightarrow{\alpha-\text{amylase}} \text{Maltose (disaccharide)}$$

188 **(d)**
The lower part of pharynx leads into the food pipe behind and to voice box infront of it. Opening of pharynx to larynx is called **glottis**, which has a leaf like cartilaginous flap called epiglottis. During swallowing of food, epiglottis prevents the entry of food into glottis

189 **(c)**
As carbohydrates are absorbed in the form of monosaccharides, the most rapidly transportable and absorbable monosaccharides is galactose

190 **(c)**
E. coli lives in large intestine of human. The cells of *E. coli* produce bacteriocin proteins.

191 **(a)**
Pepsinogen is the inactive form of enzyme pepsin. Pepsinogen is secreted by peptic or chief cell of gastric gland and is activated by HCl acid – a secretion of parietal cells of gastric glands

$$\text{Pepsinogen} \xrightarrow{\text{HCl}} \text{Pepsin}$$

192 **(c)**
The deficiency of vitamin-A causes keratomalacia. It is the advanced stage of xerophthalmia in which the cornea becomes keratinized.

193 **(a)**
The animals, which consume only plant materials are called **herbivorous**, *e.g.*, cow, rabbit, etc.

194 **(c)**
The amylase enzyme converts the starch into maltose and isomaltose.

$$\text{Starch} \xrightarrow{\text{Amylase}} \text{Maltose} + \text{Isomaltose}$$

195 **(b)**
Vitamin-D is a steroid, which is synthesized from cholesterol. Vitamin-D_2 is formed from plant sterol, ergosterol, which occurs in yeast and other fungi in the presence of ultraviolet light. Vitamin-D_3 formed from animal sterol, 7- dehydroxy cholesterol, which occurs in animal skin. Its synthesis also needs ultraviolet light.

196 **(d)**
The right and left hepatocyte ducts combine to form common hepatic duct and this common hepatic duct joins to the duct arising from gall bladder (cystic duct) and forms common bile duct. When the later joins to pancreatic duct, and the combination is called as hepatopancreatic duct or ampulla, which opens up into the duodenum

197 **(d)**
Correct label is A-serosa, B-muscularis, C-submucosa, D-mucosa

198 **(b)**
Vitamin-K or phylloquinone is essential for normal functioning of liver, clotting of blood and preventing haemorrhage . Haemorrhage is characterized by deficiency of prothrombin in blood and also deficiency of factor VII, IX and X which are essential for blood coagulation.

199 **(d)**
Absorption of fats and fat soluble vitamins are carried out by the simple process of diffusion. Being insoluble in water, fatty acids and glycerol cannot reach the blood stream directly. They are first broken down into water soluble droplets called micelles with the help of bile salts. From micelles, fatty acids, glycerol and vitamins (fat soluble) are absorbed into intestinal the cells by diffusion. Here, they are resynthesised in ER and are changed into small fat molecules called chylomicrons, which are the released from intestinal cells into the blood stream

200 **(d)**
Barium is not used in human body.

201 **(d)**
The inflammation of the intestinal tract is the most common ailement due to the bacterial or viral infectons

202 **(b)**
Protein digesting enzymes are known as proteases. Rennin and pepsin are protein digesting enzymes of gastric juice, secreted from stomach.

203 **(b)**
The stools, which the infant passes out is quite yellowish due to bile pigments passed through bile juice.

204 **(a)**
If breast feeding is replaced by less nutritive food, the infants are likely to suffer with marasmus diseases only. Prolonged starvation causes marasmus due to generalised wasting of body because of both energy and protein deficiency. The disease is characterised by lean body, depressed eyes and wrinkled skin

205 **(b)**
The secretion of hepatocytes of liver, pancreas and intestine itself gets mixed with food in small intestine and facilitates the digestion of food in small intestine

206 **(c)**
Trypsin and chymotrypsin are proteolytic endopeptidases. They secreted in inactive forms trypsinogen and chymotrypsinogen. The enterokinase secreted by intestine converted inactive trypsinogen to trypsin.

207 **(a)**
Pancreas is a mixed gland, *i*. *e*., pancreas secreted hormones and enzymes both. **Glisson's capsule** is present in liver.

208 **(b)**
In aerobic respiration, glycolysis is linked with Krebs' cycle through acetyl Co-A because pyruvic acid first converted into acetyl Co-A and acetyl Co-A is enters in the Krebs' cycle. The formation of acetyl Co-A is involved with some cofactors like Mg^{2+} ions, thiamine pyrophosphate (Vit $-$ B_1), NAD^+, Co $-$ A and lipoic acid.

209 **(d)**
In human, teeth are thecodont, heterodont and diphyodont. Thecodont means that teeths are present in bony sockets. When teeth are different in structures and functions, called heterodont, *e*. *g*., metatherian and eutherian mammals. When teeth develop during life in two successive sets, this condition is known as diphyodont, *e*. *g*., mammals.

210 **(c)**

Flavin Adenine Dinucleotide (FAD) is a co-enzyme derived from riboflavin or vitamin-B_2. Co-enzyme take part in group transfer reactions. This co-enzyme requires two apoenzyme, one for picking up the group and second for transferring the group

211 **(d)**
Food is one of the basic need of the living being that is taken to get necessary element, which in turn are helpful for growth and maintenance. Carbohydrates, proteins and fats constitutes the major components of food

212 **(b)**
The pH value of the substances refers to the relative concentration of H^+-ions in a solution. Low pH value indicates high concentration of H^+-ions (acids) and high pH value means the low concentrations of H^+ ions

213 **(b)**
Bile secreted by liver is an alkaline, yellowish green, juice which has no enzyme. It contains of water, sodium bicarbonates, bile pigments (bilirubin and biliverdin) and two bile salts (sodium glycocholates and sodium taurocholate). Fats are finally emulsified in small intestine by the action of bile salts.

214 **(a)**
Prolonged starvation causes **marasmus** due to a generalized wasting of body because of both energy and protein deficiency. The body becomes lean and weak, eyes depressed and skin wrinkled.
Kwashiorkor is a disease caused by continued deficiency of proteins in diet although energy intake may be adequate.
Rickets (in children) occurs due to deficiency of vitamin-D.
Pellagra occurs due to deficiency of nicotinamide (vitamin-B_3).

215 **(a)**
Stomach is located in the upper left portion of abdominal cavity. It is a J-shaped structure and is the widest organ or alimentary canal or human gut. Caecum, a small blind sac host symbiotic microbes and it is a part of large intestine. Oesophagus is a thin, long tube, which extends posteriorly, passing through the neck, thorax and diaphragm and leads to stomach

216 **(a)**
Majority of the electrolytes are absorbed actively into the blood stream throughout the entire small intestine. Amino acids are absorbed in duodenum and jejunum, while calcium and are absorbed in the duodenum of the small intestine

217 **(a)**
Detritus is particulate organic matter release in the process of decomposition of dead organisms or dead part of organism. An animal feeding on decaying organic matter or detritus is called detritivorous.

218 **(b)**
Bile probably contains no digestive enzyme but contains inorganic salts. They neutralize the HCl, imparting alkalinity to chyme and inactivating gastric pepsin. Here, the fat is emulsified, which facilitates easy action of lipases of pancreatic juice upon the fat. The bile salts also help in absorption of fatty acid, monoglycerides, cholesterol and other lipids from chyme.

219 **(a)**
Fats and fat soluble vitamins are absorbed by passive transport or simple diffusion. Being insoluble in water, the molecules of fatty acid and glycerol cannot reach into the blood stream directly. Hence, they are broken down (emulsified) by the salts of bile into small water soluble droplets called micelles. These micelles (an aggregate of fatty acids, glycerol, sterol and vitamins) are absorbed into intestine by diffusion. In intestine, they are again synthesised in endoplasmic reticulum and are converted into small fat droplets called chylomicrons. These chylomicrons are released from the intestinal cells in the blood stream through lacteals

220 **(d)**
Kwashiorkor, a disease of protein malnutrition, causes low levels of blood proteins (serum albumins), which cause poor return of tissues through capillaries. It leads t the swelling of tissues through increase of its tissue fluid which results into oedema.

221 **(c)**
The oxyntic cells or parietal cells of the gastric glands secrete HCl. This HCl converts pepsinogen and prorennin to pepsin and rennin respectively.

222 **(c)**
The intestinal tract infection is not caused by lactobacelli. This microbe is used in probiotic drinks and food

223 **(a)**

In the process of digestion and absorption, masticated food (bolus) enters into oesophagus and is pushed further into the stomach by involuntary muscle movements. This involuntary muscle movement is responsible for food transfer from food pipe to rectum and is called peristalsis. The muscular coat of alimentary (II^{nd} from outside and III^{rd} from lumen) is composed of outer longitudinal and inner circular muscle fibres.

Both muscle fibres of muscularis (unstriped or smooth) are responsible for peristalsis. Between these two muscle fibres of muscular coat, a network of nerve fibre is present, which is known as plexus of auerbach, (controls peristalsis)

224 **(c)**

Deficiency of vitamin –D causes rickets in children and osteomalacia in adults, thiamine (Vitamin-B_1) deficiency causes beri-beri in human and polyneuritis in animals, vitamin-K (phylloquinone) deficiency causes bleeding disease or haemorrhages, reduced fertility or sterility is caused by vitamin-E (tocopherol) deficiency and pellagra is due to niacin or nicotinamide deficiency.

225 **(b)**

Rennin enzyme is secreted only in mammals as an inactive proenzyme called **prorennin.** HCl activates it into active rennin. It changes the soluble **casein** protein of milk into insoluble, semifluid **calcium paracaseinate**. This change is termed curdling of milk.

226 **(a)**

Chief cells of stomach secrete proenzymes pepsinogen and prorennin.

227 **(a)**

Kupffer's cells are the phagocytic cells present over the lining of sinusoids (spaces between the hepatic cords) in liver.

228 **(c)**

Bile juices contain bile salts and bile pigments. The stool of a breast feeding baby is quite yellowish due to the presence of bile pigments, which passes through the bile juice

229 **(a)**

Enamel, the hardest material of the body surrounds the crown of tooth. It is helpful in the mastication of food. Tooth is composed of a hard substance called dentine. Dentine is formed by the odontoblast cells

230 **(c)**

Maltose is a disaccharide that gives two molecules of glucose on hydrolysis. It is found during germination of starchy seeds. It is produced commercially from starch by a starch hydrolyzing enzyme diastase.

231 **(a)**

All lipid digestion takes place in the small intestine. Fatty acids and glycerol are the digestion products of lipids.

232 **(a)**

Dental formula is the number of teeth one half of upper jaw divided by teeth of one half of lower jaw. Human dental formula is $I\frac{2}{2}\ C\frac{1}{1}\ Pm\frac{2}{2}\ M\frac{3}{3}$.

233 **(b)**

Chief cells of gastric gland of stomach are simple coiled tubular.

234 **(a)**

Vitamin-C, B complex, P and H are water soluble vitamins. Disease scurvy is caused due to deficiency of ascorbic acids. Vitamin-C (ascorbic acid) has antioxidant property. The rich source of vitamin-C are citrus fruits, *e. g.*, amla, lemon, orange, mausmi, etc.

235 **(a)**

Thiamine (B_1) deficiency is common in alcoholics. It leads to decreased mental function, double vision and reduced muscular contraction and the resulting disorder is known as Wernicke's syndrome.

236 **(c)**

The wall of human gut consists of four basic layers. From periphery (outer) to centre (towards the lumen) they are, serosa or visceral peritonium → muscularis or muscular coat → submucosa → mucous membrane or mucosa

237 **(c)**

Secretin is secreted by duodenum, part of small intestine. It stimulates the flow of pancreatic juice and controls volume of pancreatic juice including water and electrolytes. Argentaphilic cells of pyloric part of stomach, secrete gastrin hormone. Gastrin hormone increase gastric secretion.

238 **(b)**

Vitamin-D has no role in blood coagulation. Vitamin-D involves in Ca^{2+} metabolism.

239 **(c)**

Vitamin-C is a water soluble Vitamin needed to be taken into the body in small amount.

240 **(a)**
In human beings, process of digestion starts from the mouth. In oral cavity, polysaccharides are converted into disaccharides (maltose) with the action of salivary amylase. Major site of protein digestion is stomach, fats are digested in the small intestine

241 **(c)**
Vitamin –K is required for clotting process; it is required for the formation of prothrombin in liver, the deficiency of which leads to severe bleeding disorders. Deficiency of vitamin-A causes night blindness, xerophthalmia, keratomalacia, retarded growth. Deficiency of vitamin-B causes beri-beri disease. Deficiency of vitamin-E causes sterility.

242 **(c)**
In Humans, starch is digested in buccopharyngeal cavity. Cellulose is not digested in the humans because cellulose contains$\beta-1$, 4-linkage and vertebrates themselves do not possess any enzyme capable of hydrolyzing $\beta-1$, 4-linkages. Protein is digested in stomach and fat in small intestine. Thus, in the given options, fat and cellulose reach totally undigested in the stomach of humans.

243 **(a)**
Intestinal juices or succus entericus is the combined secretion of goblet cells of mucosa (mucous) along with the secretion of brush border cells of mucosa. It is rich in variety of enzymes like maltase, lipase, dipeptidase and nucleosidases etc. Partially hydrolysed proteins entering in the intestine from the stomach are converted into dipeptides (two amino acid) by pancreatic juices. Proteins and polysaccharides are converted into disaccharides by amylase present in pancreatic juice. Fats are broken down into diglycerides or monoglycerides by the action of lipase and with help of bile juices. The enzyme present in succus entricus acts on these end products and convert them into simple absorbable forms

$$\text{Proteins} \xrightarrow{\text{Trypsin}} \text{Dipeptides} \xrightarrow[(\text{Intestinal juice})]{\text{Dipeptiase}} \text{Amino acids}$$

244 **(c)**
Process of digestion starts from mouth. When a piece of bread is ingested for sometimes, polysaccharides of the food gets converted into disaccharides. So, sweetness is realised. Around 30% of the starch is converted into disaccharides in buccal cavity

245 **(b)**
Assimilation can be defined as "a process of absorbed food nutrients utilisation by the tissues in living beings for energy, growth and maintenance". When nutrients from the food are absorbed, they are transferred into the blood circulation and from the blood, these nutrients are transported to different body cells and tissues, where these nutrients become an integral part of the living protoplasm and provides energy, stimulate growth and repair injured tissues of the body. The whole process can be termed as assimilation

246 **(d)**
Oesophagus (food pipe), epiglottis, is a 25 cm long muscular tube, which transfers masticated food from pharynx to stomach. A sphincter lies at the opening between oesophagus and stomach. This sphincter is called as gastro-oesophageal sphincter and the opening of oesophagus into stomach is regulated by this sphincter

247 **(d)**
Rumen and reticulum are specialized for microbial digestion of plant material. Omasum is specialized for absorbing water from enormous amount of saliva. Water is used for microbial digestion.

248 **(c)**
Enterokinase or enteropeptidase is secreted by crypts of Leibrekuhn in the duodenum. It is a serine protease enzyme. When food enters into the duodenum, enterokinase converts proenzyme trypsinogen into trypsin, which indirectly activating a number of pancreatic digestive enzyme. It also activates other proteases in the pancreatic juice. Thus, absence of enterokinase affects the conversion of proteases intosmall peptides.

249 **(b)**
The villi increases the surface of absorption for food in small intestine. Each villus is covered with an epithelium and contains abundant blood capillaries and lymph vessels called lacteal

250 **(d)**
Most abundant mineral element of animal body is calcium, the main constituent of teeth and bones.

251 **(a)**

The upper surface of the tongue bear four type of papillae or small projections namely, valate papillae, filiform papillae, fungiform papillae and foliate papillae. Out of them, filiform papillae lacks taste buds but rest of them bear it

252 **(c)**

Potbelly syndrome is a malnutrition disease in man, while Cri du chat syndrome, Klinefelter's syndrome and Edward's syndrome are genetic diseases.

253 **(c)**

Goblet cells are present throughout, the epithelium of mucosa, which secret mucous and continuously lubricate the inner most layer. It protects the stomach wall along with bicarbonates of gastric juices, against HCl action and protein digesting enzymes

254 **(a)**

Digestion of starch (polysaccharides) starts from the mouth, whereas stomach is the main site of protein digestion. About 30% of starch converts into maltose in oral cavity

255 **(c)**

Vitamins are necessary for normal cell functioning. These can be grouped in water soluble (vitamin-B-complex and C) and fat soluble (vitamin-A, D, E and K).

256 **(d)**

Lacteals absorb fatty acids and glycerol in the small intestine of human.

257 **(a)**

Oral cavity or buccal cavity consists of a number of teeth and a tongue. The later lies partially in pharynx. This muscular organ is attached to the floor of oral cavity by a median fold of mucous membrane called frenulum

258 **(d)**

$$\text{Starch} \xrightarrow{\text{Amylase}} \text{Maltose} + \text{Isomaltose} + \text{limit dextrins}$$

Lactose

$$\text{Milk sugar} \xrightarrow[\beta-\text{galactosidase}]{\text{Lactase}} \text{Glucose} + \text{Galactose}$$

$$\text{Maltose} \xrightarrow[\alpha-\text{glucosidase}]{\text{Maltase}} \text{Glucose} + \text{Glucose}$$

Sucrose

$$\text{Cane sugar} \xrightarrow[\beta-\text{fructosidase}]{\text{Sucrase/invertase}} \text{Glucose} + \text{Fructose}$$

259 **(b)**

Deamination is the removal of an amino group ($-NH_2$) from a compound. It occurs in liver and important for protein metabolism especially their degradation.

260 **(c)**

Vitamin-D is a fat soluble vitamin found in fish liver oils and also produced in the skin when subjected to ultraviolet rays from sunlight.

261 **(b)**

A – Parotid gland, B – Gall bladder, C – Pharynx, D – Pancreas, E – Transverse colon, F – Caecum

262 **(b)**

Chymotrypsin is produced by pancreas, which is a mixed gland. It secretes hormones as well as digestive juices. Chymotrypsin is used to carry out partial hydrolysis of protein (polypeptide). Chymotrypsin is formed from inactive chymotrypsinogen.

263 **(a)**

Dental formula of rabbit is

$$I\frac{2}{1}, C\frac{0}{0}, Pm\frac{3}{2}, M\frac{3}{3}$$

264 **(b)**

Vitamin-$B_{12}$is not found in plants. However, it is considered that *Spirulina* (an algae) contain B_{12}. Vitamin-B_{12} is synthesized by intestinal bacteria, which in fact are main source of vitamin-B_{12}. Many micro-organisms (bacteria) of the stomach of ruminant mammals also synthesize large quantities of vitamin-B_{12}.

265 **(d)**

In humans, milk protein digesting enzyme in stomach is pepsin. In calves it is rennin. It is also present in small amount in human infants but not adults. Pepsin acts on water soluble caseinogen (milk protein) to form soluble casein. This combines with calcium salts to form insoluble calcium paracaseinate, which gets readily digested enzymatically.

266 **(d)**

Absorption of differents nutrients from the food is carried out by the simple diffusion, osmosis, facilitated transport and by active transport, *i.e.,* absorption of nutrients is carried out by passive, active diffusion and facilitated transport

267 **(a)**

The liver secreted **bile** (pH7.7) which is stored in gall bladder. The bile salts (sodium bicarbonate, sodium glycocholate, sodium taurocholate) help

in digestion of fats in the small intestine by bringing about their emulsification. **Bile pigments** (bilirubin and biliverdin) are excretory products.

268 **(d)**
Bile contains no digestive enzymes, yet it plays an important role in fat digestion. It intensifies the 'mixing contractions' of intestinal wall. The organic salts of bile reduce the surface tension of fat globules and suspend them in water of digestive juice. It is emulsification of fats. It facilitates easy action of pancreatic juice on fats. They also help in formation of micelles, which help to transport of all end-products of fat digestion from intestinal lumen to absorptive cells. The inorganic bile salts import alkalinity to chyme and inactivate gastric pepsin.

269 **(b)**
Enterogastrone, a gastrointestinal hormone regulates the digestive secretion along with the other hormones gastrin, secretin, cholecystokinin, etc. Enterogastrone slows down the gastric contraction. Therefore, it is also called as Gastro Inhibitory Peptide (GIP)

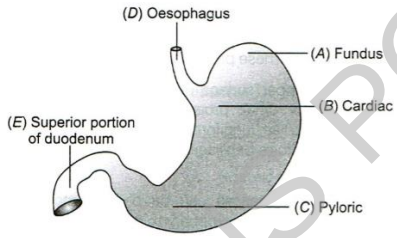
270 **(a)**
Salivary glands of human secrete about 1 to 1.5 L of saliva daily, which contains enzyme ptyalin or salivary amylase. It is a carbohydrate splitting enzyme and splits carbohydrates of food into maltose. In human, 30 to 40% food carbohydrates are converted into maltose by ptyalin.

271 **(a)**
Kuffer cells and Glisson's capsule are the characteristic features of mammalian liver. Glisson's capsule is composed of thin connective tissue, which covers each lobule of the liver. Crypt of Leiberkuhn and Brunner's gland are intestinal glands, which are formed by the epithelium of small intestine. Secretions of intestinal gland are commonly known as intestinal juices or succus entricus

272 **(c)**
Tocopherol or vitamin-E or anti-sterilitic factor or beauty vitamin can be obtained from green leafy vegetables, seed oils. Deficiency of vitamin-E leads to reversible sterility in female and male.

273 **(b)**
Amylase converts starch into maltose.

274 **(c)**
A-Fundic region; B-Cardic region; C-Pyloric region



275 **(c)**
Constipation or difficult defecation is characterised by decreased motility of intestine. It is treated by mild laxatives like milk of magnesia, which induce defecation. Ejection of stomach content through oesophagus, pharynx and out of the mouth is controlled by vomit centre in medulla oblongata of hindbrain

276 **(a)**
The dental formula of child (5-6 yr) is
$I\frac{2}{2}, C\frac{1}{1}, Pm\frac{2}{2}, M\frac{0}{0} \times 2 = 20$
In the age of 5 to 6 years, molars are absent, which start appearing at the age of 6 years.

277 **(a)**
Kupffer's cells of liver engulf disease causing microorganisms, dead cells and foreign matter.

278 **(b)**
The secretion of goblet cells of mucosa (mucous) along with the secretion of brush boder cells of mucosa in the intestine constitutes intestinal juices or succus entricus. Theses intestinal juices are rich in enzymes like maltase, dipeptidase, nucleosidaes, sucrase, lactase, enterokinase, aminopeptidase and nuceotidase. The enzymes present in the intestinal juices acts upon the end products of the food, which are then converted into simple absorbable forms

279 **(c)**
The liver of the man is divided into four lobes, the **right**, the **left**, **caudate** and **quadrate** lobes.

280 **(b)**
End product of milk sugar (lactose) are glucose and galactose. The absorption of all carbohydrates takes place in the stomach and middle part of the small intestine. Glucose and galactose are absorbed by active transport

281 **(a)**
Crypts of Leiberkuhn or intestinal glands are present in the duodenum and ileum (parts of small intestine only). The secretion of intestinal glands is called intestinal juice or succus entericus. It contains many enzymes-maltase, isomaltase, sucrase, lactase, α-dextrinase,

enterokinase, aminopeptidase, dipeptidase, nucleotidases, nucleosidases and intestinal lipase.

282 **(a)**
Activities of gastrointestinal tract are regulated by neural system and hormones. The gastrointestinal tract is innervated by intrinsic as well as extrinsic nerves

283 **(d)**
Nucleases in the pancreatic juice act on nucleic acids to form nucleotides and further nucleosides.

284 **(a)**
Pulp cavity is lined by a single layer of branched, dentine secreting cells called odontoblasts.

285 **(c)**
Gastroporesis, also called delayed gastric emptying, is a disorder that slows or stops the movement of food from the stomach to the small intestine

286 **(b)**
Gastric juices are the secretion of gastric glands and contains water (98.8%), mucous, inorganic salts, HCl (0.5% conc) and proenzyme pepsinogen, prorennin etc. Gastric amylase and gastric lipase are also present in little amount

287 **(b)**
In liver, right and left hepatic ducts join to form a common hepatic duct which joins the duct of gall bladder (cystic duct), forming a common bile duct or ductus choledocus. The later opens into the proximal part of duodenum through a valvular pore guarded by sphincter called sphincter of Oddi.

288 **(b)**
Liver is endodermal in origin and is the largest gland in human body. It is the busiest and largest chemical factory in the body.

289 **(b)**
Absorption of fats and fat soluble vitamins takes place by simple diffusion. Fats and fats soluble vitamins like A, D, E, K cannot reach into the blood directly, due to insolubility in water. So, they are first incorporated into small, spherical water soluble droplets called micelles by the action of bile salts (Na-glycocholate and Na-taurocholate). Micelles (an aggregate of fat soluble vitamins, glycerides and cholesterol) are absorbed by intestinal cells, where they are again synthesised in the endoplasmic reticulum and are released from the intestinal cells into the blood stream through lacteals

290 **(d)**
Wilson's disease is a manifestation of abnormal copper metabolism in man. It is characterized by abnormally large accumulation of copper in the liver, brain and urine.

291 **(a)**
The rennin is present in proenzyme form (prorennin) in the gastric juice secreted by gastric glands of stomach. The HCl present in the gastric juice converts prorennin into rennin, which acts on casein (milk protein) and converts it into calcium paracaseinate. Rennin is present in infants and absent in adults.

292 **(c)**
Cud chewing animals are called ruminants because grazed food is swallowed into the rumen (a chamber of stomach) and mixed with mucus, undergoing partial and anaerobic digestion of cellulose by a symbiotic bacteria.

293 **(c)**
Saliva contains a starch splitting enzyme, ptylin (α-amylases). HCl of gastric juice inactivates ptylin present in the stomach. Ptylin or salivary amylase present in the saliva acts on the polysaccharides of food and around 30% of polysaccharides are converted into disaccharides (maltose)

$$\text{Starch} \xrightarrow{\text{amylase}} \text{Maltose}$$

294 **(d)**
The abnormal and frequent movements of bowl and increase in the frequency, volume, fluid content or liquidity of faeces is called diarrhea. Frequent diarrhea can result in the loss of water (dehydration) and salts or electrolyte imbalance

295 **(d)**
Secretin and cholecystokinin are the two main gastrointestinal hormones secreted in the duodenum of alimentary canal. Cholecystokinin stimulates gall bladder contraction and hence flow of bile salts is increased into the intestine, while secretin stimulates the release of an alkaline pancreatic fluid, which in turn, neutralises stomach acid

296 **(a)**
Vitamin-B_2 (Riboflavin) is also known as yellow enzyme. It is helpful in RBC_S production. Its deficiency may lead to chelosis disease, while disease pellagra is caused by nicotoinic acid or nicotinamide or niacin (vitamin-B_3) deficiency

297 **(a)**

Hepatic caeca is a pouch-like diverticula, which helps in digestion and absorption of glucose.

298 **(a)**

Process of resynthesis of food materials from simpler food molecules is called **biosynthesis**. Absorption is the process by which digested nutrients are absorbed through the wall of gut into blood, while conversion of absorbed food into active cytoplasm within the cell is called assimilation.

299 **(a)**

Colon is the site of water absorption from undigested and unabsorbed food (faeces). When the pallet of faeces from the sigmoid portion of colon enters into the rectum, distension of the rectal wall initiate the feeling for defecation. It is due to **defecation reflex**. The defecation reflex induces peristalsis movement in the sigmoid portion of the colon and rectum, which forces faecal matter towards the egestion pore

300 **(c)**

Pepsin is inactivated at pH above 5. Pepsin is a proteolytic or protein splitting enzyme. The optimum pH of pepsin is about 2 and the enzyme, therefore, works well in the highly acidic gastric juice, while it is inactivated in the near basic medium.

301 **(a)**

Digestion of fat starts in the small intestine. Here, bile salts of bile juices emulsify the fats. Triglycerides (emulsified) are incorporated into the small, spherical water soluble, droplets of glycerides, fat soluble vitamins and sterol, which are called micelles. The later are absorbed in the endoplasmic intestinal cells and are resynthesised in the reticulum to form smaller fat droplets called chylomicrons. These chylomicrons are released from intestinal cells to lymph and from lymph and are they transported into the blood stream through lacteals

302 **(b)**

Oral cavity or mouth consist of a number of teeth and a muscular tongue. Teeth are embedded in a socket of jaw bone, this type of attachment is thecodont. Majority of the mammals have two set of teeth during their life, *i.e.*, diphyodont. Temporary or deciduous teeth (20 in number) are replaced by permanent teeth. An adult human has 32 teeth, *i.e.*, 16 in each jaw. These are of four different types (heterodont) namely incisors (I), canines (C), premolar (PM) and molars (M). The dentition in human being is diphyodont, heterodont and thecodont

303 **(c)**

α-amylase is found in pancreatic juices. Enzyme amylase converts starch into disaccharides, like maltose, isomaltose and dexrins in the small intestine.

$$\text{Starch} \xrightarrow{\text{Amylase}} \text{Maltose (disaccharides)}$$

Equation (a) is incorrect as stomach do not contains any fat emulsifying agent

In equation (b) is incorrect as proteins are converted to dipeptides, *i.e.,* two amino acids by the enzymes trypsin and equation (d) triglycerides are converted to diglycerides and fatty acids by lipase enzyme

304 **(a)**

Bile juice or simply bile is produced by hepatocytes of liver. Bile is collected in interlobular bile duct by bile canals or Hering's canals. The later are joined by bile capillaries, which receives bile from hepatocytes. Bile from hepatic duct is stored in gall bladder, which is a pear shaped structure and is attached to the posterior surface of the liver

305 **(d)**

Secretin hormone is secreted from the duodenum mucosa, it stimulates pancreas.

306 **(d)**

A – Gall bladder, B – Common bile duct, C – Pancreas, D – Pancreatic duct, E – Hepatopancreatic duct

307 **(d)**

Enzyme lactose hydrolyses milk sugar (lactose) into glucose and galactose

$$\text{Lactose} \xrightarrow{\text{Lactase}} \text{Glucose} + \text{Galactose}$$

308 **(c)**

Vitamin-D affects normal growth of body and formation of teeth and bones by depositing essential minerals in them. Vitamin–A is essential for maintenance of epithelial cells and bones. There is correlation between Vitamin-A and tooth development. Calcium is essential for formation of bone and teeth.

309 **(b)**

Bile juice is yellowish-green or greenish-blue alkaline (pH-7.7) fluid. It contains about 90% water, 60% bile salts, 3% bile pigments, etc. The common bile salts are sodium chloride, sodium

bicarbonate, sodium glycocholate and sodium taurocholate. **Cholecystokinin** directly stimulates contraction of gall bladder and bile flow starts.

310 **(c)**
Liver is the largest gland of human body and in most of mammals body, second largest gland in pancreas. Liver is situated in the upper right side of abdominal cavity. It is a bilobed structure and is heavier in males than females

311 **(b)**
Four basic layer of human alimentary canal exhibits modification in different parts of alimentary canal. Mucosa, the innermost lining of gut secretes mucous to lubricate the inner lining of the gut and it composed of lamina proporia, muscularis mucosa and the epithelium, which forms gastric gland in stomach, and villi and intestinal gland in small intestine

312 **(c)**
D is the hepatic portal vein and F is the hepatic vein

313 **(d)**
Linoleic, linolenic and arachidonic acid are unsaturated essential fatty acids for man.

314 **(d)**
Chloragen cells help in glycogen synthesis and storing the reserve food material. So, these cells are related with nutrition.

315 **(a)**
Digestion, is accomplished by both chemical and mechanical processes. Mastication of food is done with teeth and tongue. Mastication is facilitated by saliva- (secretion of salivary glands). Swallowing of masticated food is also facilitated by oral cavity. Fat digestion do not occurs in buccal cavity

316 **(d)**
Carboxypeptidase is an enzyme secreted by pancreas. It breaks larger peptides into smaller peptides.

317 **(a)**
The bacteria are found in the intestine, which in fact are the main source of vitamin-B_{12} as this vitamin is not found in plants. Few micro-organisms of the rumen of stomach of ruminant mammals also synthesize large quantity of vitamin-B_{12}.

318 **(c)**
The food is masticated by teeth and tongue in the buccal cavity with the help of saliva. Masticated food is swallowed with the help of buccal cavity. This masticated food (in the form of bolus) is pushed into pharynx and then into the food pipe. Food pipe transfers the food into cardiac part of stomach. In stomach food is stored for 4-5 hours. Some of the digestive processes takes place in the stomach. Stomach is the main site of protein digestion

319 **(d)**
Goblet cells are present in the columnar epithelium of the mammalian intestine and secrete mucin, a mucoprotein that forms mucus when in solution. If Goblet cells become non-functional, this will adversely affect smooth movement of food downwards the intestine due to absence of mucin.

320 **(a)**
The third molar teeth appear very late and are called wisdom teeth.

321 **(a)**
Absorption of monosaccharides like glucose and galactose occurs by active transport. They are absorbed in the stomach and jejunum. Amino acid are absorbed in the duodenum and jejunum by active transport. While most of the ions (electrolyte), like Na, K, Mg, Fe, PO_4 are also actively absorbed throughout the small intestine

322 **(c)**
Angiotensinogen is a plasma protein produced and secreted by the liver cells. Rennin secreted from juxtaglomerular cells acts enzymatically on angiotensinogen to release 10 amino acid peptide angiotensin-I.

323 **(a)**
Each teeth is distinguishable into crown, neck and root. The crown is covered over by a thick layer of enamel, which is bluish white and hardest substance in body. The remaining part of tooth is covered by a thin layer of yellowish bone like cement. Beneath the enamel and cement, the main part of a tooth is formed of a thick layer of less hard and somewhat elastic **dentine.**

324 **(a)**
A balanced diet possesses all the essential components of the food in proper requisite proportion, which is required for maintenance, growth and development of body tissues. Therefore, it include carbohydrates (50-70%), fats (15-25% and proteins 10-15%) with micronutrients mineral and vitamins. It lacks

nucleic acids and enzymes as these are produced inside the body. However, essential amino acids are taken with diet

325 **(a)**
Faeces represents solid waste. It contains 3/4 water and $\frac{1}{4}$ solid matter. Brown colour of faeces is due to, stercobilinogen and stereobilin, which are formed from bilirubin by the action bacteria. This bacterial action is also responsible for the odour of faeces

326 **(a)**
Most of the simple sugars (monosaccharides) are absorbed in the stomach and jejunum through the mucosa layer. Around 90% of the water is absorbed in the small intestine through innermost layer cells into the blood capillaries in villi. Alcohol is lipid soluble, its absorption starts in the stomach. However, its absorption is much greater in the small intestine than stomach. Alcohol is absorbed more rapidly in duodenum

327 **(d)**
Chylomicrons concerned with the absorption of fats are produced in the epithelial cells of small intestine. They are aggregates of triglycerides, cholesterol and phospholipids protein, coated in small vesicles. Chylomicrons are small fat droplets, which are released from small intestinal epithelium cells into the lymph and from the lymph to blood stream through lacteals

328 **(b)**
Liver is the largest gland of body which lies in the upper right side of the abdominal cavity. Liver performs a lot of functions like, bile production, deamination glycogenesis, glycogenolysis, glucogneogenesis, detoxification, etc. Secretion of heparin is also one of the function of liver. Heparin is an anticoagulant

329 **(a)**
The rights and left hepatic duct joins to form the common hepatic duct, which joins the cystic duct arising from gall bladder. The cystic duct and common hepatic duct joins to form common bile duct, which after joining the main pancreatic duct forms, hepatopancreatic ampulla. The ampulla opens into duodenum. This opening is guarded by sphincter of Oddi

330 **(a)**
A-Oxyntic cells, B-Chief cells, C-Mucous cells, D-Argentaffin cells

331 **(a)**
Mucosa lines the lumen of alimentary canal. These innermost layers forms irregular folds in the stomach, which are called rugae. Villi, the small finger like projections are also formed by mucosa in small intestine. The cells lining the villi produce numerous microscopic projections called microvilli. The later give a brush boarder appearance. The villi in small intestine increasing the surface area for the absorption of food

332 **(c)**
The major site of protein breakdown to form free amino acids is in the small intestine in presence of bile.

333 **(c)**
Milk protein (Casein) $\xrightarrow{\text{Rennin}}$ (A) Paracaesin $\xrightarrow{Ca^{2+}(B)}$ calcium paracaseinate $\xrightarrow{\text{Pepsin}}$ Peptones (C)
Enzyme rennin is prominent in the stomach of infants, while both pepsin and rennin are absent in invertebrates

334 **(a)**
Liver and islets of Langerhans function as modulator and effector in the homeostatic control of blood sugar level.

335 **(d)**
Vitamin-K (naphthoquinone) is an essential cofactor is involved in the synthesis of prothrombin in the liver cells which is essential for blood clotting, prevention of haemorrhage and excessive bleeding in wounds. This vitamin is synthesised by colon bacterium hence, a dietary source is not usually necessary. Besides vitamin-K, some vitamin like vitamin-B_{12}, vitamin-B_1, vitamin-B_2 are also produced by the symbiotic bacteria (*E. coli*) in the large intestine of human beings

336 **(b)**
Small intestine is the major site of digestion and absorption. About 90% of food is digested completely in the duodenum of small intestine. Rest 10% is digested in the middle portion of the small intestine, while the distal part, ileum is the major site of absorption. About 90% of all absorption of nutrients takes place in the small intestine, while the rest occurs in stomach and large intestine

337 **(b)**

The liver produces and secretes 250 to 1500 mL of bile per day. The major constituents of bile are bilirubin, biliverdin, bile salts, cholesterol and phospholipids. The bile salts play a very important role in the digestion of fats. The bile salts, which are partly water and partly lipid-soluble, emulsify the fat particles and as a result, the fat- drops acquired a greater surface area.

338 **(a)**
Polysaccharides (starch) gets partly digested in the buccal cavity and stomach and gets digested completely in the small intestine, by the action of various enzymes. Starch is digested in the proximal part of the small intestine (duodenum)

339 **(a)**

Pepsinogen	- Zymogenic cells
HCl	- Oxyntic cells
Mucus	- Goblet cells
Pancreatic juice	- Acinar cells
Ptyalin	- Salivary glands

340 **(b)**
Lamina propria, the middle layer of mucosa of alimentary canal consists of loose connective tissue, blood vessels, glands and some lymphoid tissue. This layer contains all the glands of alimentary canal expect the Brunner's glands of duodenum.

341 **(a)**
Vitamin-B_3 (niacin) is known as antipellagra vitamin. Its deficiency causes the alternation in protein metabolism disorder such as carcinoid syndrome. Vitamin-B_1 deficiency causes loss of appetite, muscle depreciation, mental confusion and may leads to paralytic, disease beri-beri. Vitamin-E deficiency causes sterility. Digestion and distribution of nutrients occurs in the gastrovascular cavity

342 **(a)**
The end product of digestion are absorbed through the intestinal mucosa into the blood. Therefore, absorption, can be defined as a process of transportation of nutrients from the alimentary canal to the blood or lymph (circulatory system) through mucous membrane

343 **(a)**
Stomach it is a J-shaped structure of alimentary canal and consists of three parts. Cardiac portion, fundic portion and pyloric portion. The last part, *i.e.,* three pyloric portion opens into the proximal part of small intestine (duodenum)

344 **(a)**
Gastrin hormone is secreted by mammalian stomach and duodenal mucosae in response to proteins and alcohol. This hormone stimulates gastric glands to secrete large amount of gastric juice. However, its over- secretion may cause gastric ulcers.

345 **(a)**
There are three pair of salivary glands in human beings, a pair of **parotid glands**, largest salivary gland which are located near the ears. A pair of **sublingual glands** (smallest glands) which are located beneath tongue. a pair of submaxillary or submandibular gland which are situated at the angles of lower jaw

346 **(c)**
Large intestine can be divided into three parts for descriptive purposes like caecum, rectum and colon, lleum is a greatly coiled part of small intestine and it opens into large intestine

347 **(b)**
The enzyme lactase hydrolyses lactose (disaccharide) into glucose and galactose.

$$\text{Lactose} \xrightarrow{\text{Lactase}} \text{Glucose} + \text{Galactose}.$$

348 **(c)**
Cholecystokinin (a hormone) is secreted by duodenum in response to presence of food. It stimulates flow of pancreatic enzymes and contraction of gall bladder.

349 **(a)**
There are twenty amino acids and amides in the proteins. Plants are capable of synthesising all the proteins and amino acids. In animals several amino acids (10 number) are formed through transamination or transformation. Those amino acids, which cannot be synthesised by animals are considered as essential amino acids. So, they must be taken in diet. Some of these are leucine, isoleucine, valine, tryptophan, phenylalanine, lysine, methionine and threanine. Tryptophan deficiency cause mood and sleep deregulation. Having a deficiency in lysine can lead to niacin deficiency and lack of methionine leads to decreased production of sulphur in body

350 **(a)**
Vitamins-CE and provitamin-A (β-carotene) are known as antioxidant vitamins because their inactive oxygen free radicals are highly reactive particles

351 **(c)**

There are three pair of salivary gland in human being. They are, a pair of parotids gland, a pair of sublingual glands and a pair of submaxillary gland. Zymogen cell are one type of gastic glands secretes zymogens or proenzyme – pepsinogen and prorennin along with, a small amount of gastric lipase and amylase

352 **(a)**

The innermost layer lining the lumen of the alimentary canal is the mucosa. This layer forms irregular folds (rugae) in the stomach and small finger-like folding called villi in the small intestine. The cells lining the villi produce numerous microscopic projections, called microvilli giving a brush border appearance. These villi increase the surface area for absorption of food materials.

353 **(c)**

Exocrine part of pancreas secretes alkaline pancreatic juices (pH 8.44) which are rich in bicarbonates of sodium and three proenzymes (inactive form), chymotrypsinogen, trypsinogen and nucleases along with amylases and lipases

354 **(b)**

The secretion of salivary glands is called saliva. Medium of saliva is slightly acidic. The quantity of saliva in an adult is 1000-1500mL/day.

Chemically, saliva is a mixture of water and electrolytes ($Na^+, K^+ Cl^-, HCO_3$). Some enzymes, salivary amylase and lysozyme, (an anti-bacterial agent) are also found in saliva

355 **(b)**

The synthesis of glucose from non-carbohydrate sources, such as amino acids, proteins, fatty acids, glycerol, etc is called **gluconeogenesis**. This occurs when the glycogen supply in the liver is exhausted.

Glycogenesis involves the conversion of glucose to glycogen, while glycogenolysis involves conversion of glycogen to glucose.

356 **(c)**

There are three pairs of salivary glands in man which secrete saliva into the oral cavity through ducts. About 1000-1500 mL of saliva is secreted per day.

357 **(d)**

Vitamin-C (ascorbic) is heat labile water soluble vitamin having virucidal property and its excess amount is excreted in urine.

358 **(c)**

Sucrose – a disaccharides give rise two molecules monosaccharides with the action of an enzyme invertase or sucrose

$$\text{Sucrose} \xrightarrow{\text{Invertase}} \text{Glucose} + \text{Fructose}/$$

Amylase hydrolyses polysaccharide (starch) into disaccharide rennin, which specifically function over milk protein, while trypsin function in protein hydrolysis and yields dipeptides

359 **(b)**

For human beings, eight amino acids are essential: leucine, isoleucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine.

360 **(a)**

The distal end of ileum is expanded to form a small dilated spherical sac called **sacculus rotundus** in rabbit.

361 **(b)**

Large intestine is the site of absorption for water left in the undigested food product of bacterial digestion like vitamin-B complex, vitamin-K (phylloquinone) and amino acids. They absorbed in the caecum of large intestine

362 **(a)**

Digestive system in mammals comprises an alimentary canal and concerned digestive glands. Human gut or alimentary canal consists of mouth → buccal cavity → pharynx → oesophagus (food pipes) → stomach → small intestine (duodenum → jejunum and → lleum) → large intestine (caecum → colon → rectum). The large part of large intestine terminate into 2-3 cm long anal canal and its opening is called anus. So, the correct chronological order is descending part of colon → rectum → anus

363 **(c)**

Porennin is secreted in the young ones of mammals *i.e.,* it is prominent in infants. HCl secreted by parietal cell activates the inactive form of enzymes. Rennin enzyme is responsible for the digestion of milk protein in infants

$$\text{Porennin} \xrightarrow{\text{HCl}} \text{Rennin}$$

$$\text{Casein} \xrightarrow{\text{Rennin}} \text{Paracaesin Ca} \rightarrow \text{Ca Paracaseinate}$$

364 **(b)**

About 90% of all absorption of nutrients occurs in entire small intestine. Duodenum (proximal part of intestine) is the major site of digestion, while amino acids are absorbed in this small intestine part (95 – 98%)

365 **(c)**

Vitamin-D is a sterol derivative, which is synthesised from cholesterol. Vitamin-D_2 is formed from plant sterol-ergosterol, which occurs in yeast and some other fungi, in the presence of UV light. Vitamin- D_3 is synthesised from animal sterol-7 hydroxy cholesterol, which occurs in animals. Its synthesis also requires UV light. Deficiency of vitamin-D causes type I and type II diabetes in humans

366 **(b)**

Water soluble vitamins include vitamin-B complex and vitamin –C. These are mostly found in whole grain cereals and legumes, leafy green vegetables, fruits, meat and dairy products.

367 **(a)**

Oxyntic cells occur in the wall of stomach. These secrete hydrochloric acid that forms part of the gastric juice and helps in the maintaining pH between 2 to 3.

368 **(a)**

Process of digestion is carried out both mechanically and chemically. Mastication of food and swallowing the masticated food are the two major mechanical functions of buccal cavity. Food is masticated and partly digested by salivary amylase which in the form of bolus is transferred to pharynx and then to oesophagus by deglutition and finally, it reaches into the stomach for chemical actions

369 **(c)**

Argentaffin is a type of **cell tumour**, which may arise in gastrointestinal tract. These tumours secrete serotonin and may produce the carcinoid syndrome.

370 **(b)**

Prolonged deficiency of thiamine (vitamin-B_1) in human diet may cause beri-beri disease. It is characterized by muscle weakness, retarded growth, weak heart beat and even heart failure.

371 **(c)**

Digestion of nucleic acids takes place in the small intestine. *These are digested in small intestine by the enzymes present in intestinal and pancreatic juices like*

$$\text{DNA} \xrightarrow[\text{Pancreatic juice}]{\text{DNase (deoxyribonucleaes)}} \text{Deoxyribonucleotides}$$

$$\text{Deoxyribonucleotides} \xrightarrow[\text{Intestinal Juice}]{\text{Nucleotidases}} \text{Nucleosides} + iPO_4$$

$$\text{Nucleosides} \xrightarrow[\text{Intestinal juice}]{\text{Nucleosidases}} \text{Purine/Pyrimidine} + \text{5-C sugar (Pentose)}$$

(Pentose)

372 **(c)**

Excessive intake of saturated fats like butter, ghee, vegetable oils, red meat and eggs in diet give rise to increase in blood cholesterol level, *i. e*., hypercholesterolemia. Symptoms of this disease are rise in blood pressure and cardiac disorders.

373 **(c)**

Excessive intake of food like ghee, butter red meat and eggs in diet gives rise to increase in the blood sugar level, *i.e.,* hypercholesterolemis. It is characterised by high blood pressure and causes cardiac disorder. Fluorosis is caused by excessive intake of fluorine. Symptom of this disease are molted teeth

374 **(d)**

Mucous neck or goblet cells secrete mucus. It protects stomach wall against HCl action and protein digesting enzymes.

375 **(c)**

Cellulose is digested by bacteria and protozoans in large intestine of herbivorous mammals. In rabbits, fermentation and absorption of cellulose is not complete in a single passage. So, these animals eat their faeces (coprophagy).

376 **(d)**

Large intestine and buccal cavity are the site of absorption. In buccal cavity or oral cavity, certain drugs are absorbed when they comes in contact of mucosa and lower side of the tongue, while large intestine is the site of water, mineral and drugs absorption

377 **(d)**

Proteins are made up of amino acids. In stomach, the proteins are broken down into peptones and large peptides by **pepsin** or in small intestine, the proteins are broken down into large peptides by **trypsin** and the peptides into amino acids by **peptidases**.

378 **(c)**

Vitamin-C is an important sugar acid. It is present in the form of ascorbic acid in sour fruits like lemon, orange, amla, etc.

379 **(c)**

Thiamine or vitamin-B_1 or anti-neuritic or anti beri-beri vitamin is a water soluble vitamin. The sources of thiamine are wheat flour, egg, meat,

liver, yeast, ect. The deficiency of it causes beri-beri, polyneuritis and cardiovascular atrophy. The symptoms of disease are loss of appetite and weight, retarded growth , muscular dystrophy, heart enlargement, ect.

380 **(c)**
Treatment with alloxan and streptozoin destroys beta cells of islets of Langerhans. Both alloxan and streptozoin produce diabetic state.

381 **(c)**
Vitamins are the compounds of different complexity, which do not provide energy but control energy yielding reactions (metabolic activities) of our body. These actually work as organic catalysts or various cofactors for the enzymes of our body. Thus, these are essential or indispensible but required in very small quantities.

382 **(b)**
Enzyme ptyalin is present is saliva. It acts on some polysaccharides and convert them into disaccharide maltose.

383 **(d)**
Vitamin-C (ascorbic acid) is obtained from citrus fruits, *e*. *g*., lemon, orange, amla, guave, etc. Vitamin-C helps in the formation of normal collagen, bone matrix, tooth dentine and other extracellular materials. It is essential for the formation and growth of connective tissues, cartilages, bones, teeth, etc.

384 **(d)**

Column I	**Column II**
Goblet cells	Mucus
Lysozyme	Antibacterial agent
Saliva	Sublingual gland
Oxyntic cells	Hydrochloric acid

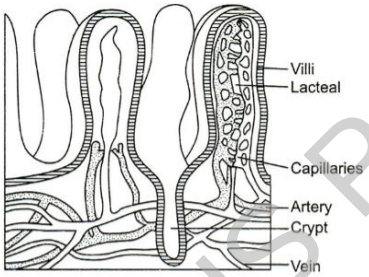
385 **(c)**
The tusks of an elephant are its second upper incisors. Tusks grows continuously.

386 **(d)**
Food or diet is composed of necessary nutrients, which provides the basic requirements of life, *i.e.,* energy and raw materials. So, nutrition can be defined as "the sum total of process which provides necessary nutritive elements for growth, maintenance and for meeting their energy need"

387 **(d)**
The bolus is conveyed into the pharynx and then into the oesophagus by swallowing or deglutition. Succus entricus is the secretion of goblet cells, which is also known as intestinal juices. Bolus contain masticated food particles

388 **(c)**
Vitamin –K (naphthoquinone) is an essential cofactor involved in synthesis of prothrombin in liver cells, which is in turn essential for blood clotting, prevention of haemorrhage and excessive bleeding in wounds. This vitamin is synthesized by colon bacterium hence, a dietary source is not usually necessary.

389 **(a)**



By a transverse section of mucosa of small intestine, villi can be observed along with capillaries, artery and crypt of Leiberkuhn. The four basic layers of alimentary canal shows modification in different parts of alimentary canal

390 **(d)**
Pancreatic juices can hydrolase carbohydrates, fats, proteins and nucleic acids

$$\text{Starch} \xrightarrow[\text{amylase}]{\text{Pancreatic}} \text{Maltose} + \text{Isomaltose} + \text{Dextrins}$$

$$\text{Peptones} \xrightarrow{\text{Chymotrypsin}} \text{Dipeptides}$$

$$\text{Emulsified fat} \xrightarrow[\text{lipase}]{\text{Pancreatic}} \text{Fatty acids} + \text{Diglycerides}$$

$$\text{DNA} \xrightarrow{\text{DNase}} \text{Deoxyribonucleotides}$$

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