3 Plant Kingdom

Trend Analysis with Important Topics & Sub-Topics

		2020		2019		2018		2017		2016	
Topic	**Sub-Topics**	**Qns.**	**LOD**	**Qns.**	**LOD**	**Qns.**	**LOD**	**Qns.**	**LOD**	**Qns.**	**LOD**
Algae	Chlorophyceae			1	E			1	E		
	Phaeophyceae					1	E	1	E		
	Rhodophyceae	2	E			1	E				
Bryophytes	Reproduction							1	E		
Pteridophytes	Reproduction									1	E
Gymnosperms	Reproduction							1	A	1	E
	Pinus			1	A						
	Cones	1	A								
	Transport System			1	A						
Angiosperms	Double Fertilisation							1	A		
	Female Reproductive parts					1	A				
	Alteration of Generation	1	A								

LOD - Level of Difficulty | **E - Easy** | **A - Average** | **D - Difficult** | **Qns - No. of Questions**

Topic 1: Algae

1. Which of the following pairs is of unicellular algae? ***[2020]***
   (a) *Gelidium and Gracilaria*
   (b) *Anabaena and Volvox*
   (c) *Chlorella and Spirulina*
   (d) *Laminaria and Sargassum*
2. Floridean starch has structure similar to ***[2020]***
   (a) Amylopectin and glycogen
   (b) Mannitol and algin
   (c) Laminarin and cellulose
   (d) Starch and cellulose
3. Which one is wrongly matched? ***[2018]***
   (a) Uniflagellate gametes – Polysiphonia
   (b) Biflagellate zoospores – Brown algae
   (c) Unicellular organism – Chlorella
   (d) Gemma cups – Marchantia
4. After karyogamy followed by meiosis, spores are produced exogenously in ***[2018]***
   (a) Neurospora
   (b) Alternaria
   (c) Saccharomyces
   (d) Agaricus
5. An example of colonial alga is : ***[2017]***
   (a) *Volvox* (b) *Ulothrix*
   (c) *Spirogyra* (d) *Chlorella*
6. Male gametes are flagellated in : ***[2015 RS]***
   (a) *Anabaena*
   (b) *Ectocarpus*
   (c) *Spirogyra*
   (d) *Polysiphonia*

7. Which one of the following statements is wrong? ***[2015 RS]***
   (a) Agar - agar is obtained from *Gelidium* and *Gracilaria*
   (b) *Chlorella* and *Spirulina* are used as space food
   (c) Mannitol is stored food in Rhodophyceae
   (d) Algin and carragen are products of algae
8. Which one of the following shows isogamy with non-flagellated gametes? ***[2014]***
   (a) *Sargassum* (b) *Ectocarpus*
   (c) *Ulothrix* (d) *Spirogyra*
9. Which one of the following is **wrong** about ***Chara***? ***[2014]***
   (a) Upper oogonium and lower round antheridium.
   (b) Globule and nucule present on the same plant.
   (c) Upper antheridium and lower oogonium.
   (d) Globule is male reproductive structure.
10. An alga which can be employed as food for human being is: ***[2014]***
    (a) *Ulothrix* (b) *Chlorella*
    (c) *Spirogyra* (d) *Polysiphonia*
11. Isogamous condition with non-flagellated gametes is found in : ***[NEET 2013]***
    (a) *Spirogyra* (b) *Volvox*
    (c) *Fucus* (d) *Chlamydomonas*
12. Which of the following is not correctly matched for the organism and its cell wall degrading enzyme? ***[NEET 2013]***
    (a) Plant cells-Cellulase
    (b) Algae-Methylase
    (c) Fungi-Chitinase
    (d) Bacteria-Lysozyme
13. Which one of the following is wrongly matched? ***[NEET Kar. 2013]***
    (a) *Nostoc*-Water blooms
    (b) *Spirogyra*-Motile gametes
    (c) *Sargassum*-Chlorophyll *c*
    (d) Basidiomycetes-Puffballs
14. Algae have cell wall made up of: ***[2010]***
    (a) cellulose, galactans and mannans
    (b) hemicellulose, pectins and proteins
    (c) pectins, cellulose and proteins
    (d) cellulose, hemicellulose and pectins
15. Mannitol is the stored food in: ***[2009]***
    (a) *Porphyra* (b) *Fucus*
    (c) *Gracillaria* (d) *Chara*
16. If you are asked to classify the various algae into distinct groups, which of the following characters you should choose? ***[2007]***
    (a) nature of stored food materials in the cell
    (b) structural organization of thallus
    (c) chemical composition of the cell wall
    (d) types of pigments present in the cell.
17. Floridean starch is found in ***[2000]***
    (a) Chlorophyceae (b) Rhodophyceae
    (c) Myxophyceae (d) Cyanophyceae
18. A research student collected certain algae both as and found that its cells contained both chlorophyll a and chlorophyll b as well as phycoerythrin.The alga belongs to ***[2000]***
    (a) Rhodophyceae (b) Bacillariophyceae
    (c) Chlorophyceae (d) Phaeophyceae
19. Columella is a specialised structure found in the sporangium of ***[1999]***
    (a) *Ulothrix* (b) *Rhizopus*
    (c) *Spirogyra* (d) None of these
20. *Ulothrix* can be described as a ***[1998]***
    (a) non-motile colonial alga lacking zoospores
    (b) filamentous alga lacking flagellated reproductive stages
    (c) membranous alga producing zoospores
    (d) filamentous alga with flagellated reproductive stages
21. An alga very rich in protein is ***[1997]***
    (a) *Spirogyra* (b) *Ulothrix*
    (c) *Oscillatoria* (d) *Chlorella*
22. *Ulothrix* filaments produce ***[1997]***
    (a) isogametes (b) anisogametes
    (c) heterogametes (d) basidiospores
23. Brown algae is characterised by the presence of ***[1997]***
    (a) phycocyanin (b) phycoerythrin
    (c) fucoxanthin (d) haematochrome
24. Blue-green algae belong to ***[1996]***
    (a) Eukaryotes (b) Prokaryotes
    (c) Rhodophyceae (d) Chlorophyceae
25. The absence of chlorophyll, in the lowermost cell of *Ulothrix*, shows ***[1995]***
    (a) functional fission
    (b) tissue formation
    (c) cell characteristic
    (d) beginning of labour division
26. Agar is commercially obtained from ***[1995]***
    (a) red algae (b) green algae
    (c) brown algae (d) blue-green algae

27. In Chlorophyceae, sexual reproduction occurs by
(a) Isogamy and anisogamy *[1994]*
(b) Isogamy, anisogamy and oogamy
(c) Oogamy only
(d) Anisogamy and oogamy

28. Which of the following cannot fix nitrogen? *[1994]*
(a) *Nostoc* (b) *Azotobacter*
(c) *Spirogyra* (d) *Anabaena*

29. In *Ulothrix*/*Spirogyra*, reduction division (meiosis) occurs at the time of *[1993]*
(a) gamete formation
(b) zoospore formation
(c) zygospore germination
(d) vegetative reproduction

30. Chloroplast of *Chlamydomonas* is *[1993]*
(a) stellate (b) cup-shaped
(c) collar-shaped (d) spiral

31. Pyrenoids are the centres for formation of
(a) porphyra (b) enzymes *[1993]*
(c) fat (d) starch

32. The product of conjugation in *Spirogyra* or fertilization of *Chlamydomonas* is *[1991]*
(a) zygospore (b) zoospore
(c) oospore (d) carpospore

33. The common mode of sexual reproduction in *Chlamydomonas* is *[1991]*
(a) isogamous (b) anisogamous
(c) oogamous (d) hologamous

34. Sexual reproduction involving fusion of two cells in *Chlamydomonas* is *[1988]*
(a) isogamy (b) homogamy
(c) somatogamy (d) hologamy

Topic 2: Bryophytes

35. Zygotic meiosis is characteristic of: *[2017]*
(a) *Fucus* (b) *Funaria*
(c) *Chlamydomonas* (d) *Marchantia*

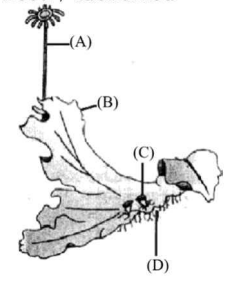
36. Life cycle of *Ectocarpus* and *Fucus* respectively are: *[2017]*
(a) Diplontic, Haplodiplontic
(b) Haplodiplontic, Diplontic
(c) Haplodiplontic, Haplontic
(d) Haplontic, Diplontic

37. Which one is wrong statement ? *[2015 RS]*
(a) *Mucor* has biflagellate zoospores
(b) Haploid endosperm is typical feature of gymnosperms
(c) Brown algae have chlorophyll *a* and *c* and fucoxanthin
(d) Archegonia are found in Bryophyta, Pteridophyta and Gymnosperms.

38. Which of the following is responsible for peat formation? *[2014]*
(a) *Marchanita* (b) *Riccia*
(c) *Funaria* (d) *Sphagnum*

39. Which one of the following is common to multicellular fungi, filamentous algae and protonema of mosses *[2012]*
(a) Diplontic life cycle
(b) Members of kingdom plantae
(c) Mode of Nutrition
(d) Multiplication by fragmentation

40. Examine the figure given below and select the right option giving all the four parts (a, b, c and d) correctly identified *[2011M]*



(a) (a) Archegoniophore
(b) Female thallus
(c) Gemmacup
(d) Rhizoids
(b) (a) Archegoniophore
(b) Female thallus
(c) Bud
(d) Foot
(c) (a) Seta
(b) Sporophyte
(c) Protonema
(d) Rhizoids
(d) (a) Antheridiophore
(b) Male thallus
(c) Globule
(d) Roots

41. Archegoniophore is present in : *[2011]*
(a) *Marchantia* (b) *Chara*
(c) *Adiantum* (d) *Funaria*

42. Some hyperthermophilic organisms that grow in highly acidic (PH_2) habitats belong to the two groups: *[2010]*
(a) Eubacteria and archaea
(b) Cyanobacteria and diatoms
(c) Protists and mosses
(d) Liverworts and yeasts

43. Spore dissemination in some liverworts is aided by *[2007]*
(a) indusium (b) calyptra
(c) peristome teeth (d) elaters

44. In a moss the sporophyte *[2006]*
(a) produces gametes that give rise to the gametophyte
(b) arises from a spore produced from the gametophyte
(c) manufactures food for itself as well as for the gametophyte
(d) is partially parasitic on the gametophyte

45. Peat Moss is used as a packing material for sending flowers and live plants to distant places because *[2006]*
(a) it is hygroscopic
(b) It reduces transpiration
(c) it serves as a disinfectant
(d) it is easily available

46. Which of the following propagates through leaf- tip? *[2004]*
(a) Walking fern (b) Sproux-leaf plant
(c) *Marchantia* (d) Moss

47. Sexual reproduction in *Spirogyra* is an advanced feature because it shows *[2003]*
(a) physiologically differentiated sex organs
(b) different sizes of motile sex organs
(c) same size of motile sex organs
(d) morphologically different sex organs

48. The antherozoids of *Funaria* are *[1999]*
(a) aciliated (b) flagellated
(c) multiciliated (d) monociliated

49. Bryophytes comprise *[1999]*
(a) sporophyte of longer duration
(b) dominant phase of sporophyte which is parasitic
(c) dominant phase of gametophyte which produces spores
(d) small sporophyte phase and generally parasitic on gametophyte.

50. Which of the following is true about bryophytes? *[1999]*
(a) They possess archegonia
(b) They contain chloroplast
(c) They are thalloid
(d) All of these

51. Bryophytes are dependent on water because *[1998]*
(a) water is essential for fertilization for their homosporous nature
(b) water is essential for their vegetative propagation
(c) the sperms can easily reach upto egg in the archegonium
(d) archegonium has to remain filled with water for fertilization

52. Bryophytes can be separated from algae because they *[1997]*
(a) are thalloid forms
(b) have no conducting tissue
(c) possess archegonia with outer layer of sterile cells
(d) contain chloroplasts in their cells

53. In which one of these the elaters are present along with mature spores in the capsule (to help in spore dispersal)? *[1996]*
(a) *Riccia* (b) *Marchantia*
(c) *Funaria* (d) *Sphagnum*

54. The plant body of moss (*Funaria*) is *[1995]*
(a) completely sporophyte
(b) completely gametophyte
(c) predominantly sporophyte with gametophyte
(d) predominantly gametophyte with sporophyte

55. Unique features of Bryophytes is that they
(a) produce spores *[1994]*
(b) have sporophyte attached to gametophyte
(c) lack roots
(d) lack vascular tissues

56. Protonema occurs in the life cycle of *[1990, 1993]*
(a) *Riccia* (b) *Funaria*
(c) Somatogamy (d) *Spirogyra*

57. Bryophytes are amphibians because *[1991]*
(a) they require a layer of water for carrying out sexual reproduction
(b) they occur in damp places
(c) they are mostly aquatic
(d) all the above

58. Apophysis in the capsule of *Funaria* is *[1990]*
(a) lower part (b) upper part
(c) middle part (d) fertile part

59. Moss peristome takes part in *[1990]*
(a) spore dispersal (b) photosynthesis
(c) protection (d) absorption

60. Sperms of both *Funaria* and *Pteris* were released together near the archegonia of *Pteris*. Only its sperms enter the archegonia as *[1989]*
(a) *Pteris* archegonia repel *Funaria* sperms
(b) *Funaria* sperms get killed by *Pteris* sperms
(c) *Funaria* sperms are less mobile
(d) *Pteris* archegonia release chemical to attract its sperms

Topic 3: Pteridophytes

61. In bryophytes and pteridophytes, transport of male gametes requires *[2016]*
(a) Wind (b) Insects
(c) Birds (d) Water

62. The plant body is thalloid in *[NEET Kar. 2013]*
(a) *Funaria* (b) *Sphagnum*
(c) *Salvinia* (d) *Marchantia*

63. *Selaginella* and *Salvinia* are considered to represent a significant step towards evolution of seed habit because: *[2011M]*
(a) female gametophyte is free and gets dispersed like seeds
(b) female gametophyte lacks archaegonia
(c) megaspores possess endosperm and embryo surrounded by seed coat
(d) embryo develops in female gametophyte which is retained on parent sporophyte.

64. In which one of the following, male and female gametophytes do not have free living independent existence? *[2008]*
(a) *Pteris* (b) *Funaria*
(c) *Polytrichum* (d) *Cedrus*

65. Which one of the following is heterosporous?
(a) *Dryopteris* (b) *Salvinia* *[2008]*
(c) *Adiantum* (d) *Equisetum*

66. In the prothallus of a vascular cryptogam, the antherozoids and eggs mature a different times. As a result *[2007]*
(a) there is high degree of sterility
(b) one can conclude that the plant is apomictic
(c) self-fertilization is prevented
(d) there is no change in success rate of fertilization

67. In Ferns meiosis occurs when *[2000]*
(a) spore germinates
(b) gametes are formed
(c) spores are formed
(d) antheridia and archegonia are formed

68. Dichotomous branching is found in *[1999]*
(a) Fern (b) *Funaria*
(c) *Liverworts* (d) *Marchantia*

69. The "walking" fern is so named because *[1998]*
(a) it is dispersed through the agency of walking animals
(b) it propagates vegetatively by its leaf tips
(c) it knows how to walk by itself
(d) its spores are able to walk

70. Multicellular branched rhizoids and leafy gametophytes are characteristic of *[1997]*
(a) all bryophytes
(b) some bryophytes
(c) all pteridophytes
(d) some peteriodphytes

71. The 'amphibians' of plant kingdom are *[1996]*
(a) unicellular motile algae
(b) multicellular non-motile algae
(c) bryophytes with simple internal organization
(d) pteridophytes with complex internal organization not reaching angiosperm level.

72. Pteridophytes differ from mosses/bryophytes in possessing *[1993]*
(a) independent gametophyte
(b) well developed vascular system
(c) archegonia
(d) flagellate spermatozoids

73. The plant group that produces spores and embryo but lacks vascular tissues and seeds is *[1992]*
(a) Pteridophyta (b) Rhodophyta
(c) Bryophyta (d) Phaeophyta

74. Which one of the following is not common between *Funaria* and *Selaginella*? *[1992]*
(a) Archegonium (b) Embryo
(c) Flagellate sperms (d) Roots

75. Evolutionary important character of *Selaginella* is *[1989]*
(a) heterosporous nature
(b) rhizophore
(c) strobili
(d) ligule

76. Prothallus (gametophyte) gives rise to fern plant (sporophyte) without fertilization. It is *[1988]*
(a) apospory (b) apogamy
(c) parthenocarpy (d) parthenogenesis

77. Which one of the following is considered important in the development of seed habit?
(a) Heterospory *[2009]*
(b) Haplontic life cycle
(c) Free -living gametophyte
(d) Dependent sporophyte

78. Plants reproducing by spores such as mosses and ferns are grouped under the general term *[2003]*
(a) Thallophytes (b) Cryptogams
(c) Bryophytes (d) Sporophytes

Topic 4: Gymnosperms

79. Strobili or cones are found in *[2020]*
(a) *Pteris* (b) *Marchantia*
(c) *Equisetum* (d) *Salvinia*

80. Pinus seed cannot germinate and establish without fungal association. This is because: *[2019]*
(a) its embryo is immature.
(b) it has obligate association with mycorrhizae.
(c) it has very hard seed coat.
(d) its seeds contain inhibitors that prevent germination.

81. Phloem in gymnosperms lacks: *[2019]*
(a) Albuminous cells and sieve cells
(b) Sieve tubes only
(c) Companion cells only
(d) Both sieve tubes and companion cells

82. Select the wrong statement : *[2018]*
(a) Cell wall is present in members of Fungi and Plantae
(b) Mushrooms belong to Basidiomycetes
(c) Mitochondria are the powerhouse of the cell in all kingdoms except Monera
(d) Pseudopodia are locomotory and feeding structures in Sporozoans

83. Select the mismatch *[2017]*
(a) *Cycas* – Dioecious
(b) *Salvinia* – Heterosporous
(c) *Equisetum* – Homosporous
(d) *Pinus* – Dioecious

84. Select the correct statement: *[2016]*
(a) Gymnosperms are both homosporous and heterosporous
(b) *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms
(c) *Sequoia* is one of the tallest trees
(d) The leaves of gymnosperms are not well adapted to extremes of climate

85. In which of the following gametophyte is not independent free living ? *[2015 RS]*
(a) *Marchantia* (b) *Pteris*
(c) *Pinus* (d) *Funaria*

86. Read the following five statements (A to E) and select the option with all correct statements : *[2015 RS]*
(A) Mosses and Lichens are the first organisms to colonise a bare rock.
(B) *Selaginella* is a homosporous pteridophyte
(C) Coralloid roots in *Cycas* have VAM
(D) Main plant body in bryophytes is gametophytic, whereas in pteridophytes it is sporophytic
(E) In gymnosperms, male and female gametophytes are present within sporangia located on sporophyte
(a) (B), (C) and (D) (b) (a), (D) and (E)
(c) (B), (C) and (E) (d) (a), (C) and (D)

87. Besides paddy fields cyanobacteria are also found inside vegetative part of : *[NEET 2013]*
(a) *Cycas* (b) *Equisetum*
(c) *Psilotum* (d) *Pinus*

88. Read the following statements (A-E) and answer the question which follows them. *[NEET 2013]*
A. In liverworts, mosses and ferns gametophytes are free-living
B. Gymnosperms and some ferns are heterosporous.
C. Sexual reproduction in *Fucus*, *Volvox* and *Albugo* is oogamous
D. The sporophyte in liveworts is more elaborate than that in mosses
E. Both, *Pinus* and *Marchantia* are dioecious
How many of the above statements are correct?
(a) Two (b) Three
(c) Four (d) One

89. What is common in all the three, *Funaria*, *Dryopteris* and *Ginkgo?* *[NEET Kar. 2013]*
(a) Independent sporophyte
(b) Presence of archegonia
(c) Well developed vascular tissues
(d) Independent gametophyte

90. *Cycas* and *Adiantum* resemble each other in having: *[2012]*
(a) Seeds (b) Motile Sperms
(c) Cambium (d) Vessels

91. Which one of the following is a correct statement? *[2012]*
(a) Pteridophyte gametophyte has a protonemal and leafy stage
(b) In gymnosperms female gametophyte is free-living
(c) Antheridiophores and archegoniophores are present in pteridophytes.
(d) Origin of seed habit can be traced in pteridophytes

92. Read the following five statements (A - E) and answer the question. *[2012M]*
(A) In *Equisetum* the female gametophyte is retained on the parent sporophyte.
(B) In *Ginkgo* male gametophyte is not independent.
(C) The sporophyte in *Riccia* is more developed than that in *Polytrichum*.
(D) Sexual reproduction in *Volvox* is isogamous.
(E) The spores of slime molds lack cell walls.
How many of the above statements are correct?
(a) Two (b) Three
(c) Four (d) One

93. Which one of the following pairs is wrongly matched? ***[2012M]***
(a) *Ginkgo* -Archegonia
(b) *Salvinia* - Prothallus
(c) Viroids - RNA
(d) Mustard - Synergids

94. Consider the following four statements whether they are correct or wrong? ***[2011M]***
(A) The sporophyte in liverworts is more elaborate than that in mosses
(B) *Salvinia* is heterosporous
(C) The life cycle in all seed-bearing plants is diplontic
(D) In *Pinus* male and female cones are borne on different trees.
The two wrong statements together are
(a) Statements (A) and (C)
(b) Statements (A) and (D)
(c) Statements (B) and (C)
(d) Statements (A) and (B)

95. The gametophyte is not an independent, free living generation in : ***[2011]***
(a) *Polytrichum* (b) *Adiantum*
(c) *Marchantia* (d) *Pinus*

96. Which one of the following plants is monoecious? ***[2009]***
(a) *Pinus* (b) *Cycas*
(c) Papaya (d) *Marchantia*

97. Which one of the following is a vascular cryptogam? ***[2009]***
(a) *Ginkgo* (b) *Marchantia*
(c) *Cedrus* (d) *Equisetum*

98. Select one of the following pairs of important features distinguishing *Gnetum* from *Cycas* and *Pinus* and showing affinities with angiosperms ***[2008]***
(a) absence of resin duct and leaf venation
(b) presence of vessel elements and absence of archegonia
(c) perianth and two integuments
(d) embryo development and apical meristem

99. Flagellated male gametes are present in all the three of which one of the following sets? ***[2007]***
(a) *Zygnema*, *Saprolegnia* and *Hydrilla*
(b) *Fucus*, *Marsilea* and *Calotropis*
(c) *Riccia*, *Dryopteris* and *Cycas*
(d) *Anthoceros*, *Funaria* and *Spirogyra*

100. In gymnosperms, the pollen chamber represents ***[2007]***
(a) a cavity in the ovule in which pollen grains are stored after pollination
(b) an opening in the megagametophyte through which the pollen tube approaches the egg
(c) the microsporangium in which pollen grains develop
(d) a cell in the pollen grain in which the sperms are formed.

101. Conifers differ from grasses in the ***[2006]***
(a) lack of xylem tracheids
(b) absence of pollen tubes
(c) formation of endosperm before fertilisation
(d) production of seeds from ovules

102. Match items in Column I with those in Column II:

Column I	**Column II**
(A) Peritrichous flagellation	(J) *Ginkgo*
(B) Living fossil	(K) *Macrocystis*
(C) Rhizophore	(L) *Escherichia coli*
(D) Smallest flowering plant	(M) *Selaginella*
(E) Largest perennial alga	(N) *Wolffia*

Select the correct answer from the following:
(a) A-L; B-J; C-M; D-N; E-K; ***[2005]***
(b) A-K; B-J; C-L; D-M; E-N
(c) A-N; B-L; C-K; D-N; E-J;
(d) A-J; B-K; C-N; D-L; E-K

103. Which one of the following is a living fossil?
(a) *Cycas* (b) Moss ***[2003, 04]***
(c) *Saccharomyces* (d) *Spirogyra*

104. Which one of the following pairs of plants are not seed producers? ***[2003]***
(a) *Funaria* and *Pinus*
(b) *Fern* and *Funaria*
(c) *Funaria* and *Ficus*
(d) *Ficus* and *Chlamydomonas*

105. Which one of the following is a living fossil? ***[1996, 97, 2003]***
(a) *Pinus* (b) *Opuntia*
(c) *Ginkgo* (d) *Thuja*

106. *Cycas* has two cotyledons but not included in angiosperms because of ***[2001]***
(a) Naked ovules
(b) Seems like monocot
(c) Circinate ptyxis
(d) Compound leaves

107. In which of the following would you place the plants having vascular tissue lacking seeds? ***[1999, 2000]***
(a) Algae (b) Bryophytes
(c) Pteridophytes (d) Gymnosperms

108. Which one of the following statements about *Cycas* is incorrect? ***[1998]***
(a) It does not have a well-organized female flower
(b) It has circinate vernation
(c) Its xylem is mainly composed of xylem vessels
(d) Its roots contain some blue-green algae.

109. A well developed archegonium with neck consisting of 4-6 rows of neck canal cells, characterises ***[1995]***
(a) Gymnosperms only
(b) Bryophytes and pteridophytes
(c) Pteridophytes and gymnosperms
(d) Gymnosperms and flowering plants

110. The 'wing' of *Pinus* seed is derived from
(a) testa ***[1994]***
(b) testa and tegmen
(c) surface of ovuliferous scale
(d) all the above

111. Which one is the most advanced from evolutionary point of view. ***[1993]***
(a) *Selaginella* (b) *Funaria*
(c) *Chlamydomonas* (d) *Pinus*

112. A plant in which sporophytic generation is represented by zygote ***[1992]***
(a) *Pinus* (b) *Selaginella*
(c) *Chlamydomonas* (d) *Dryopteris*

113. A plant having seeds but lacking flowers and fruits belongs to ***[1992]***
(a) Pteridophytes (b) Mosses
(c) Ferns (d) Gymnosperms

114. In *Pinus*, the pollen grain has 6 chromosomes then in its endosperm will have ***[1992]***
(a) 12 (b) 18
(c) 6 (d) 24

115. Resin and turpentine are obtained from
(a) *Cycas* (b) *Pinus* ***[1992]***
(c) *Cedrus* (d) *Abies*

116. In *Pinus*/gymnosperms, the haploid structure are ***[1989]***
(a) megaspore, endosperm and embryo
(b) megaspore, pollen grain and endosperm
(c) megaspore, integument and root
(d) pollen grain, leaf and root

117. In gymnosperms like *Pinus* and *Cycas*, the endosperm is ***[1988]***
(a) triploid (b) haploid
(c) diploid (d) tetraploid

Topic 5: Angiosperms

118. Double fertilization is exhibited by : ***[2017]***
(a) Algae (b) Fungi
(c) Angiosperms (d) Gymnosperms

119. Male gametophyte in angiosperms produces: ***[2015 RS]***
(a) Single sperm and vegetative cell
(b) Single sperm and two vegetative cells
(c) Three sperms
(d) Two sperms and a vegetative cell

120. In angiosperms, microsporogenesis and megasporogenesis : ***[2015 RS]***
(a) form gametes without further divisions
(b) involve meiosis
(c) occur in ovule
(d) occur in anther

121. In angiosperms, functional megaspore develops into ***[2011M]***
(a) embryo sac (b) ovule
(c) endosperm (d) pollen sac

122. Compared with the gametophytes of the bryophytes the gametophytes of vascular plant are ***[2011]***
(a) smaller but have larger sex organs.
(b) larger but have smaller sex organs.
(c) larger and have larger sex organs.
(d) smaller and have smaller sex organs.

123. Male and female gametophytes are independent and free -living in: ***[2010]***
(a) Mustard (b) Castor
(c) *Pinus* (d) *Sphagnum*

124. Which one of the following has haplontic life cycle? ***[2009]***
(a) *Polytrichum* (b) *Ustilago*
(c) Wheat (d) *Funaria*

125. Which one pair of examples will correctly represent the grouping Spermatophyta according to one of the schemes of classifying plants ? ***[2003]***
(a) *Ginkgo*, *Pisum* (b) *Acacia*, Sugarcane
(c) *Pinus*, *Cycas* (d) *Rhizopus*, *Triticum*

126. Which of the following plants produces seeds but not flowers? ***[2002]***
(a) Maize (b) Mint
(c) Peepal (d) *Pinus*

127. Which of the following is without exception in angiosperms? ***[2002]***
(a) presence of vessels
(b) double fertilisation
(c) secondary growth
(d) autotrophic nutrition

128. The largest ovules, largest male and female gametes and largest plants are found among
(a) angiosperms ***[2000]***
(b) tree ferns and some monocots
(c) gymnosperms
(d) dicotyledonous plants

129. Largest sperms in the plant world are found in
(a) *Pinus* (b) Banyan ***[1998]***
(c) *Cycas* (d) *Thuja*

130. Seed-habit first originated in ***[1996]***
(a) certain ferns (b) certain pines
(c) certain monocots (d) primitive dicots

131. Sunken stomata is the characteristic feature of ***[1995]***
(a) hydrophyte (b) mesophyte
(c) xerophyte (d) halophyte

132. *Pinus* differs from mango in having ***[1993]***
(a) tree habit
(b) green leaves
(c) ovules not enclosed in ovary
(d) wood

133. Turpentine is obtained from ***[1992]***
(a) angiospermous wood
(b) pteridophytes
(c) gymnospermous wood
(d) ferns

134. Which one has the largest gametophyte? ***[1991]***
(a) *Cycas*
(b) Angiosperm
(c) *Selaginella*
(d) Moss

ANSWER KEY

1	(c)	15	(b)	29	(c)	43	(d)	57	(a)	71	(c)	85	(c)	99	(c)	113	(d)	127	(b)
2	(d)	16	(d)	30	(b)	44	(d)	58	(a)	72	(b)	86	(b)	100	(a)	114	(c)	128	(c)
3	(a)	17	(b)	31	(d)	45	(a)	59	(a)	73	(c)	87	(a)	101	(c)	115	(b)	129	(c)
4	(d)	18	(a)	32	(a)	46	(a)	60	(d)	74	(d)	88	(b)	102	(a)	116	(b)	130	(a)
5	(a)	19	(b)	33	(a)	47	(a)	61	(d)	75	(a)	89	(b)	103	(a)	117	(b)	131	(c)
6	(b)	20	(d)	34	(a)	48	(b)	62	(d)	76	(b)	90	(b)	104	(b)	118	(c)	132	(c)
7	(c)	21	(d)	35	(c)	49	(d)	63	(d)	77	(a)	91	(d)	105	(c)	119	(d)	133	(c)
8	(d)	22	(a)	36	(b)	50	(d)	64	(d)	78	(b)	92	(a)	106	(a)	120	(b)	134	(d)
9	(c)	23	(c)	37	(a)	51	(c)	65	(b)	79	(c)	93	(a)	107	(c)	121	(a)		
10	(b)	24	(b)	38	(d)	52	(c)	66	(c)	80	(b)	94	(b)	108	(c)	122	(a)		
11	(a)	25	(d)	39	(a)	53	(b)	67	(c)	81	(d)	95	(d)	109	(b)	123	(d)		
12	(b)	26	(a)	40	(a)	54	(d)	68	(d)	82	(d)	96	(a)	110	(c)	124	(b)		
13	(b)	27	(b)	41	(a)	55	(b)	69	(b)	83	(d)	97	(d)	111	(d)	125	(a)		
14	(a)	28	(c)	42	(a)	56	(b)	70	(b)	84	(c)	98	(b)	112	(c)	126	(d)		

Hints & Solutions

1. (c) *Chlorella* and *Spirulina* are unicellular algae. *Gelidium, Gracilaria*, *Laminaria* and *Sargassum* are multicellular. *Volvox* is colonial.

NOTES

Chlorella is the most cultivated eukaryotic alga since it is widely used as a health food and feed supplement, as well as in the pharmaceutical and cosmetics industry. It contains proteins, carotenoids, some immuno-stimulators, polysaccharides, vitamins, and minerals.

2. (d) Floridean starch is stored food material in red algae. Its structure is similar to Amylopectin and Glycogen.

NOTES

Floridean starch is a type of a storage glucan found in glaucophytes and in red algae (also known as rhodophytes), in which it is usually the primary sink for fixed carbon from photosynthesis.

3. (a) Polysiphonia is a genus of red algae, where asexual spores and gametes are non-motile or non-flagellated.
4. (d) In Agaricus (a genus of basidiomycetes), basidiospores or meiospores are produced exogenously. Neurospora (a genus of ascomycetes) produces ascospores as meiospores but endogenously inside the ascus). Alternaria (a genus of deuteromycetes) does not produce sexual spores. Saccharomyces (Unicellular ascomycetes) produces ascospores, endogenously.
5. (a) *Volvox* is a motile colonial fresh water green alga. It forms spherical colonies. It was first observed with a light microscope by Van Leeuwenhoek (1700) within the volvocales.

NOTES

Volvox is autotrophs and contributes to oxygen production. They also serve as a food for various aquatic organisms such as microscopic invertebrates called rotifers.

6. (b) Male gametes are flagellated in Ectocarpus belonging to Phaeophyceae. The flagella of male gamete plays an important role in establishing initial sexual contact with the female gamete. However, in Ectocarpus the female gamete too, is flagellated but is different in structure. In Polysiphonia (Rhodophyceae) flagellated gametes are not observed, in *Anabaena* sexual reproduction through gametes is absent while in *Spirogyra* sexual reproduction takes place by conjugation wherein male gamete passes through a tube to the adjacent filament. The male gametes here are non-flagellated and show amoeboid movement.
7. (c) Mannitol or laminarin is the stored food in phaeophyceae (brown algae). Example, *Ectocarpus, fucus, Sargassam* etc.

NOTES

The food is stored as floridean starch in Rhodophyceae which is very similar to amylopectin and glycogen in structure.

8. (d) In *Spirogyra,* sexual reproduction occurs through conjugation. Gametes are non-flagellated, morphologically similar. But physiologically different (isogamy with physiological anisogamy).

NOTES

Conjugation is the biological process by which one bacterium transfers genetic material to another bacterium through direct contact. During conjugation, one bacterium serves as the donor of the genetic material, and the other serves as the recipient. The donor bacterium carries a DNA sequence called the fertility factor, or F-factor.

9. (c) *Chara* belongs to chlorophyceae, is a green alga found attached to bottoms of shallow water of ponds, pools and lakes. Male sex organ is called antheridium. Female sex organ is called oogonium. Oogonium is borne at the top of the four celled filament.
10. (b) *Chlorella* and *Spirullina* are unicellular algae, rich in proteins and are used as food supplements by space travellers.
11. (a) In *Spirogyra,* sexual reproduction occurs through conjugation. Gametes are non-flagellated, morphologically similar. But physiologically different (isogamy with physiological anisogamy). *Volvox* and *Fucus* are examples of oogamous and *Chlamydomonas* contains isogamous flagellated gametes.
12. (b) Algae is a plant and so its cell wall is made up of cellulose. Cellulase enzyme is needed for degradation of its cell wall.

13. (b) Cyanobacteria, e.g., *Nostoc*, grow in such abundance as to form water blooms. *Sargassum* belongs to brown algae which possess chl *a*, *c*, carotenoids, xanthophyll and a characteristic brown pigment, fucoxanthin. Commonly known forms of basidiomycetes are mushrooms, bracket fungi or puffballs. In *Spirogyra* gametes are non-flagellated (non-motile) but similar in size. They show amoeboid movements.
14. (a) Algae possess a definite cell wall containing cellulose, galactans and mannans.
15. (b) Mannitol is a food stored in *Fucus*. *Fucus* is a genus of brown alga in the class Phaeophyceae to be found in the intertidal zones of rocky seashores almost everywhere in the world. Primary chemical constituents of this plant include mucilage, algin, mannitol, beta-carotene, zeaxanthin, iodine, bromine, potassium, volatile oils, and many other minerals.
16. (d) Algae are classified on the basis of types of pigment present in the cell, like Rhodophyceae shows presence of phycoerythrin, chlorophyceae shows presence of phycocyanin etc. Phaeophyceae contains the amount of the xanthophyll pigment such as fucoxanthin.
17. (b) Reserve food in red algae (Rhodophyceae) is floridean starch. In green algae, (Chlorophyceae), reserve food is starch. In brown algae, reserve food is laminarin and mannitol. In cyanophyceae, reserve food is cyanophycean starch.
18. (a) In green algae, the photosynthetic pigments are chlorophyll a & b, carotenes and xanthophylls. In phaeophyceae, the pigments are chlorophyll a, chlorophyll c and carotenes and xanthophylls. Phycoerythrin gives red colour to rhodophyceae.
19. (b) *Ulothrix* is a green alga. *Spirogyra* is a filamentous green alga. In *Rhizopus* the columella bears the spores for asexual reproduction.

NOTES

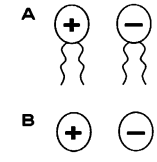
Columella is located on the tip of long erect stalk known as sporangiophore, present in the *Rhizopus*. It supports the Sporangium which has asexual spores. It helps nutrient exchange between the active protoplasm below and the developing spores inside the upper portion of the sporangial head.

20. (d) *Ulothrix* is a genus of filamentous green algae, generally found in fresh and marine water. *Ulothrix* reproduces vegetatively by fragmentation, asexually by non-motile resting spores and motile quadriflagellate spores and sexually by biflagellate gametes.
21. (d) *Chlorella* can be grown to provide human food rich in protein, lipid, carbohydrates, vitamins and minerals.
    Chlorella has been researched as a potential source of food and energy, because of its efficiency of photosynthesis can reach 8%, which is comparable with other highly efficient crops such as sugar cane. It is high in protein and other essential nutrients. When dried, it has about 45 percent protein, 20 percent fat, 20 percent carbohydrate, 5% fibre, and 10 percent minerals and vitamins.
22. (a) Sexual reproduction in *Ulothrix* is isogamous type. Only similar type of gametes called isogametes are produced.
23. (c) Fucoxanthin is a caretenoid pigment present besides chlorophyll in brown algae. Phycoerythrins are accessory photosynthetic pigments along with phycocyanins. They both are water soluble pigments phycobilin. Haematochrome is a red pigment present in hypnospores (non-motile resting spores) of *Chlamydomonas*.
24. (b) Blue green algae or cyanobacteria are prokaryotes. Prokaryotes lack a well defined nucleus surrounded by nuclear membrane. Eukaryotes have well organised nucleus. Rhodophyceae & Chlorophyceae are members of algae which come under eukaryotes.
25. (d) The plant body of *Ulothrix* is divided into three regions-basal cells, apical cells and middle cells. Basal cell is the lower most cell of the filament. It expands and forms a disc shaped structure called holdfast. It is meant for attaching the filaments to the substratum which shows beginning of labour division.
26. (a) The agar is obtained from several members of red algae such as *Gracilaria*, *Gelidium*, *Chondrus* etc. Agar gels are extensively used for growing micro-organisms.
27. (b) In chlorophyceae, sexual reproduction takes place by all the three processes
    1. Isogamy – Fusion of morphologically and physiologically similar gametes.
    2. Anisogamy – Morphologically similar but physiologically dissimilar gametes.
    3. Oogamy – Fusing gametes are dissimilar in all respect.

28. (c) *Spirogyra* is a member of green algae which cannot fix atmospheric nitrogen. Only *Nostoc* and *Anabaena* (Blue green algae) and *Azotobacter* (bacteria) can fix nitrogen.
29. (c) Plant body of *Ulothrix* and *Spirogyra* is gametophyte (haploid), they produce zoogametes(n) which fuse to form zygospore (2n) diploid, which is a resting spore. Under favourable condition zygospore undergoes reductional division or meiosis to produce zoospores which give rise to new plant.
30. (b) Shape and number of chloroplast in different members of algae is different
    Chlamydomonas – cup shaped, 1/cell
    Zygnema – Stellate, 2/cell
    Spirogyra – Spiral, 1/ cell
    Ulothrix – Collar shaped, 1/cell
31. (d) Pyrenoids are the subcellular microcompartments found in chloroplast of many algae. Pyrenoids are the centres for the formation of starch. It is a seat of synthesis and storage of starch present in the chloroplast of algae.

NOTES A pyrenoid has a core of protein around which starch is deposited as layers.

32. (a) In both the members of green algae, *Spirogyra* and *Chlamydomonas*, gametes fuse to form zygote which develops into a thick walled resting zygospore. Zoospore is asexual spore while oospore is sexual spore. Carpospore is a diploid spore produced by red algae.
33. (a) In *Chlamydomonas*, sexual reproduction takes place through :
    1. Isogamy : Fusion of two similar gametes.
    2. Anisogamy : Fusion between morphologically similar but physiologically different gametes.
    3. Oogamy : Fusion between two dissimilar gametes.
    4. Hologamy : Fusion of two young cells. Most common mode is isogamy.
34. (a) Isogamy refers to a form of sexual reproduction involving gametes of the same size. Since both gametes look alike, they cannot be classified as "male" or "female." Instead, organisms undergoing isogamy are said to have different mating types, most commonly noted as "+" and "–" strains. Fertilisation occurs when "+" and "–" strain gametes fuse to form a zygote. There are several types of isogamy. Both gametes may be flagellated and thus motile. This type mating occurs in algae such as *Chlamydomonas*.



    A. Isogamy of motile cells
    B. Isogamy of non-motile cells
35. (c) *Chlamydomonas* has haplontic life cycle hence shows zygotic meiosis.
36. (b) *Ectocarpus* exhibits haplodiplontic life cycle while *Fucus* has diplontic life cycle.
37. (a) The spores are non-motile in *Mucor*.
38. (d) *Sphagnum,* a moss, provides peat that has long been used as fuel. It has the capacity to retain water for long periods and as such used to cover the plant roots during transportation.
39. (a) Vegetative reproduction in mosses is by fragmentation and budding in the secondary proteonema. In sexual reproduction, the sex organs antheridia and archegonia are produced at the apex of the leafy shoots. So, Multiplication by fragmentation takes place in the multicellular fungi, filamentous algae and protonema of mosses.
40. (a) The main plant body of the bryophyte is haploid. It produces gametes, hence is called a gametophyte. The sex organs in bryophytes are multicellular. The male sex organ is called antheridium. They produce biflagellate antherozoids. The female sex organ called archegonium is flask-shaped and produces a single egg. A sexual reproduction in liverworts takes place by fragmentation of thalli, or by the formation of specialised structures called gemmae (sing. gemma).

NOTES Gemmae are green, multicellular, asexual buds, which develop in small receptacles called gemma cups located on the thalli. The gemmae become detached from the parent body and germinate to form new individuals. During sexual reproduction, male and female sex organs are produced either on the same or on different thalli. The sporophyte is differentiated into a foot, seta and capsule. After meiosis, spores are produced within the capsule. These spores germinate to form free-living gametophytes.

41. (a) Archegoniophore is the female sex organ of bryophytes (*Marchantia*) and pteridophytes. Its neck region is made up of 4-6 vertical rows of cells.
42. (a) Hyperthermophilic organism that grow in highly acidic habitats belong to eubacteria and archae groups.
43. (d) Elater is an elongated, spirally thickened, water-attracting cell in the capsule of a liverwort, derived from sporogenous tissue and assist in spore dispersal.
    In mosses calyptra is a structure initially present around sporophyte then break later. It is developed from ventral wall after fertilization. It provides protective covering to the developing sporogonium.
    Peristome teeth are found in the capsule of moss. These are present below operculum and are hygroscopic in nature.
44. (d) In moss, main plant body is gametophyte while sporophyte is meant for spore dispersal mainly. Hence it is called that the sporophyte is partially parasitic on gametophyte.
45. (a) Peat moss is used wherever we require to retain water for a long because peat mosses are hygroscopic in nature and they absorb the moisture from the atmosphere and this moisture keep the living materials and flowers fresh for a long time.
46. (a) In mosses, vegetative propagation occurs by fragmentation. *Marchantia* is a liverwort in which propagation also occurs by fragmentation. Walking fern *Adiantum* propagates through leaf tip.
47. (a) Sexual reproduction in *Spirogyra* occurs by conjugation involving union of two gametes. The fusing gametes are similar but one is more active and passes onto the other cell. This differentiation of gametes is called physiological anisogamy.
48. (b) Antherozoids of *Funaria* bear two flagella at anterior end and is spirally coiled.
49. (d) In bryophytes, the dominant and independent living phase of the life cycle is gametophyte. Sporophyte is always attached and dependent upon the gametophytic plant body for water supply, fixation, and part or whole nutrient requirement.
50. (d) Bryophytes are non-vascular embryophytes characterised by the presence of an independent gametophyte and a parasitic sporophyte. Plant body is either thalloid or foliose. Archegonium is the flask shaped female sex organ. They bear chloroplast.
51. (c) Bryophytes require a thin film of water on the surface of their substratum during sexual reproduction for the following reasons:
    (i) Dehiscence of antheridia requires absorption of water from outside.
    (ii) Dehiscence of archegonium.
    (iii) Swimming of sperms to reach the archegonia.
52. (c) Archegonium is the flask shaped female sex organ in bryophytes while algae have non-jacketed sex organs (gametangia).
53. (b) In *Marchantia,* capsule elaters are present which help in dispersal of spores.
54. (d) The gametophytic generation represents the dominant phase in the life cycle of bryophytes. The sporophyte phase is dependent on the gametophyte. That is why, the plant body of *Funaria* is predominantly gametophyte with sporophyte.
55. (b) In bryophytes, the plant body is gametophyte. Sporophyte remains attached to the gametophyte and produces spores. Sporophyte is dependent on gametophyte.
56. (b) In *Funaria*, the spore germinates to form a green multicellular structure called as protonema which later on develops into gametophyte.

Presence of protonema is a characteristic feature of mosses.

57. (a) Bryophytes are amphibians because they complete their vegetative phase on land but water is necessary for their reproductive phase.
58. (a) Capsule of *Funaria* is differentiated into:
    (1) Operculum – upper part - forms lid
    (2) Theca – Middle – fertile part
    (3) Apophysis – lower part -photosynthetic

Apophysis is basal portion of capsule in continuation with seta. The outer layer of apophysis is epidermis which has stomata for gaseous exchange. In capsule of *Funaria* stomata are present only in apophysis.

59. (a) Peristomes is a ring of tooth like structure around. These are in two rows and helps in the dispersal of the spores due to hygroscopic nature.
60. (d) Archegonia of a particular species recognises antherozoids (sperms) of the same species through release of chemical. In *Pteris*, archegonia produces malic acid which attracts sperms of *Pteris* only for fertilization.

61. (d) Bryophytes neither have pollen nor flowers and rely on water to carry the male gametes (sperm) to the female gametes (eggs). The antherozoids (male gametes of pteridophytes) are armed with hair-like or whip-like cilia or flagellae and are able to swim through water; they do not travel great distances and are only released when free water is available.
62. (d) The plant body of a liverwort is haploid (n), gametophytic, small, dorsoventrally flattened, thallose, dichotomously branched fixed by unicellular and unbranched rhizoids, *e.g.*, *Marchantia.*
63. (d) *Selaginella* and *Salvinia* are advanced pteridophytes.
64. (d) Male and female gametophytes of *Cedrus* do not have free living independent existence. *Cedrus* belongs to conifer.
65. (b) *Salvinia* is an heterosporous aquatic fern with both annual and perennial species. The heterosporous have two types of spores, microspores and megaspores.
66. (c) In the prothallus of a vascular cryptogams the antherozoids and eggs mature at different times which result in failure of self-fertilisation.
67. (c) Gametic meiosis is found in all animals. In sporic meiosis the sporophyte produces sporangia where as meiosis occurs producing haploid spores.
68. (d) In mosses, branching is lateral but extra-axillary (*Funaria*). *Marchantia* is a dorsiventral dichotomously branched thalloid liverwort. In *Sphagnum* branching is profuse.
69. (b) Vegetative reproduction occurs in ferns by fragmentation of rhizome and growth of adventitious buds. In *Adiantum caudatum* the adventitious buds occur at the leaf tips.

NOTES Adiantum is also called the walking fern because of its ability to form new ferns whenever the leaf tip happens to come in contact with soil.

70. (b) In pteridophytes, the gametophyte is independent living, small thalloid structure called prothallus. In pteridophytes, the primary roots are replaced by adventitious roots. Whereas in bryophytes, the gametophyte is leafy.
71. (c) Bryophytes are terrestial plants but they require a thin film of water on the surface of their substratum during sexual reproduction, hence they are called amphibians of the plant kingdom.
72. (b) Well developed vascular system is present in the members of Pteridophytes but absent in mosses as the plant body is sporophyte which is distinguished into true root, stem and leaves. Independent gametophyte, archegonia flagellate spermatozoids are present in moss and pteridophyte both.
73. (c) Bryophytes are the plants which produces spores and embryo but no vascular tissues are present, although primitive type of conducting tissues are present in the form of hadrome and leptome.
    - Rhodophytes & phaeophytes are algae producing spores, but no embryo & vascular tissue.
    - Pteridophytes have spores, embryo and true vascular tissues.
74. (d) *Funaria*, is a moss (Bryophyte) that possesses archegonium, embryo, flagellated sperms. These are also present in *Selaginella* (Pteridophyte) but it also has roots which are absent in *Funaria*.
75. (a) Presence of two types of spores microspores and megaspores (heterospory) is the evolutionary characteristic feature in the life cycle of *Selaginella*.
76. (b) When prothallus of a fern gives rise to sporophyte directly from somatic cell without forming gametes it is apogamy. Such type of sporophyte is haploid in nature.
    Development of gametophyte directly from sporophyte without meiosis and without forming spores, is apospory.
77. (a) Heterospory is considered important in the development of seed habit. Heterospory was evolved from isospory independently by several plant groups in the Devonian period as part of the process of evolution of the timing of sex differentiation. Heterosporic plants produce small spores called microspores which either germinate to become male gametophytes or have reduced male gametophytes packaged within them, and similarly larger spores called megaspores that germinate into female gametophytes, or which have female gametophytes packaged within them.

NOTES Heterospory is the production of spores of two different sizes and sexes by the sporophytes of land plants.

78. (b) The plants which reproduce by spores and do not produce seeds are called cryptogams. The term cryptogams is made of 2 Greek words *i.e.* Kryptos (hidden) + gamos (marriage). These include Bryophytes (mosses) and Pteridophytes (ferns).
79. (c) Strobili or cones are found in *Equisetum*. Strobili or **cones** are the dense and compact structure **present** on non flowering plants. They contain sporangia and perform function of protecting spores from wild animals and harsh conditions of environment.

NOTES Equisetum is the only living genus in *Equisetaceae*, a family of vascular plants that reproduce by spores rather than seeds.

80. (b) Fungus associated with roots of *Pinus* increases minerals and water absorption for the plant by increasing surface area and in turn fungus gets food from plant. Therefore, mycorrhizal association is obligatory for *Pinus* seed germination.
81. (d) Phloem, a complex tissue, is found in highly organised plants ("higher plants") and characterised by the possession of certain specialised cells, the sieve elements, and which functions as the major channel of rapid conduction of sugars over fairly long distances in the plant body. In addition to sieve elements, it always contains parenchyma cells, usually of more than one type, and frequently includes sclerenchyma cells.
Phloem in gymnosperms lacks both sieve tube and companion cells.
82. (d) Pseudopodia are locomotory structures in sarcodines (amoeboid).
83. (d) Pinus is monoecious plant comprising of both male and female cones on same plant.
84. (c) *Sequoia semepervirans* is one of the tallest trees.
85. (c) *Pinus* belongs to gymnosperms in which male and female gametophytes do not have an independent free living existence. They remain within the sporangia which are of two types — microsporangia and megasporangia.
86. (b) *Selaginella* is a heterosporus pteridophyte containing micro & megaspores. In *Cycas,* corolloid root has the cyanobacteria - *Anabaena*.
87. (a) In *Cycas* specialised root called coralloid roots are associated with N_2 – fixing cyanobacteria either *Nostoc* or *Anabaena*. Coralloid roots lie near the soil surface. They are irregular and often dichotomously branched. Root hair and root cap are absent in these roots.
88. (b) Statement (a), (B) and (C) are correct. In liverworts and ferns gametophytes are free living while in fern, sporophytes are free living. Gymnosperms and genera like *Selaginella* and *Salvinia* are heterosporous. The sporophyte in mosses are more elaborate than that of liverworts, *Pinus* is monoecious and heterosporous. *Marchantia* is dioecious.
89. (b) The female sex organ archegonium is formed in bryophytes (*Funaria),* pteridophytes (*Dryopteris*) and gymnosperms (*Ginkgo*).
90. (b) *Cycas* (a gymnosperm) and *Adiantum* a pteridophyte, known as Maiden hair fern resemble each other in having motile sperm. Seeds, cambium are common in gymnosperms and absent in pteridophytes.

NOTES True vessels are absent in both pteridophytes and gymnospems.

91. (d) (1) Gametophyte of bryophytes bears protonemal & leafy stage.
(2) In gymnosperm female gametophyte is not free living.
(3) Antheridiophores and archegoniophores are present in *Marchantia* which is a bryophyte.
(4) Origin of seed habit started in pteridophyte *Selaginaella*.
92. (a) Statement (a) and (B) are correct
Riccia is a liverwort in which simplest sporophyte consists of capsule only while *Polytrichum* is a moss in which sporophyte consists of foot, seta & capsule. *Volvox* is a fresh water green colonial alga. Reproduction is both sexual and asexual. Sexual reproduction is oogamous.

NOTES Slime molds are also called consumer decomposer protists. They possess characters of plants (cellulosic cell wall), animals (phagotrophic nutrition) and fungi (spores). They represents a connecting link between animal and fungi. They are also known as Myxomycota.

93. (a) Archegonia are not formed in *Ginkgo*.
94. (b) Statements (a) and (D) are wrong.
(a) Sporophyte is more developed in mosses rather than liverwort.

(D) *Pinus* is monoecious in which male & female cones are borne on different branches.

95. (d) Unlike bryophytes and pteridophytes, in gymnosperms the male and female gametophytes do not have an independent free-living existence. They remain within the sporangia retained on the sporophytes.

96. (a) *Pinus* plant is monoecious i.e. both male and female cone are present in same plant but on different branches. *Pinus*, with over 100 species, is the largest genus of conifers and the most widespread genus of trees in the Northern Hemisphere.

NOTES *Pinus* are also extensively planted in temperate regions of the Southern Hemisphere. Pines have a relatively rich fossil record.

97. (d) *Equisetum* is a vascular cryptogam. *Equisetum* is the only living genus in the Equisetaceae, a family of vascular plants that reproduce by spores rather than seeds. They are commonly known as horse tails.

NOTES *Equisetum* is a "living fossil," as it is the only known genus of the entire class Equisetopsida.

98. (b) The important features distinguishing *Gnetum* from *Cycas* and *Pinus* and showing affinities with angiosperms are presence of vessel elements and absence of archegonia.

99. (c) The male gametes of bryophytes are biflagellate and those of pteridophytes are multiflagellate, except *Selaginella* having biflagellates gametes. The male gametes of gymnosperms are non-motile except those of *Cycas* having multiciliate gametes.

100. (a) In gymnosperms, the pollen chamber represents a cavity in the ovule in which pollen grains are stored after pollination within the pollen chamber, the generative cell nucleus divides to form two genetic nuclei and the tube cells elongates results in the formation of pollen tube, the pollen tube penetrates the female gametophyte and the sperm nuclei and then it pass through the tube. So, one of the sperm nuclei get fused with the egg results in the formation of zygote (diploid).

101. (c) Conifers (Gymnosperms) differ from grasses (angiosperms) because in gymnosperms the female gametophyte is actually endosperm which is made before fertilisation. While in grasses endosperm is a tissue formed by the fertilisation of second male gamete to polar nuclei. Moreover in gymnosperms the endosperm is a haploid tissue while in angiosperms it is triploid.

102. (a) Peritrichous flagellation : Flagella all around, e.g. *Escherichia coli*.
Living fossil : Organisms which have undergone very little change since they first evolved, e.g. *Ginkgo*.
Rhizophore : Rhizophores are present in *Selaginella* which is a colourless, leafless, positively geotropic, elongated structure.
Smallest flowering plant : *Wolffia*.
Largest perennial alga : *Macrocystis*.

103. (a) *Cycas revoluta* a native of China and Japan is commonly known as "Tesso" or Sago palm. It is also called living fossil due to its primitive characters.

104. (b) Pteridophytes (fern) and bryophytes (*Funaria*) are seedless plants. Gymnosperms (pines) and angiosperms (*Ficus*) are seed bearing plants.

105. (c) Ginkgophyta is an ancient group, of which the sole living representative or living fossil is *Ginkgo biloba* or Maiden hair tree. It is native of South China.

106. (a) In *Cycas* (gymnosperm) the seed does not occur inside a fruit but lies naked or exposed on the surface of megasporophyll.

107. (c) Pteridophytes are primitive seedless vascular plants. Bryophytes are non vascular embryophytes. Gymnosperms are seed plants in which conducting part of xylem consists of tracheids.

NOTES Algae are non-vascular photosynthetic aquatics forming accessory spores for asexual reproduction.

108. (c) In *Cycas*, conducting part of xylem consists of tracheids.

109. (b) Archegonia is the female sex organ of bryophytes and pteridophytes. Its neck region is made up of 4-6 vertical rows of cells.

110. (c) The ovule matures into seed and is provided with wings. The upper surface of ovuliferous scale forms the membranous wings of the seed which helps in dispersal of the seed. The time taken from cone formation to seed dispersal is about two years in *Pinus*.

111. (d) *Pinus* is a conifer, a member of gymnosperm has well developed conducting tissue and presence of seed, whereas *Selaginella* is a member of pteridophyte (heterospory), *Funaria* is a moss, *Chlamydomonas* is an alga.
112. (c) The plant body of *Chlamydomonas* is gametophyte (haploid). It reproduces asexually by zoospore formation and sexually by gametes. Gametes are isogametes which fuse to produce diploid zygote which is the only structure representing sporophytic generation. In *Pinus* main plant body is sporophyte and it is the case with *Selaginella* and *Dryopteris*.
113. (d) Gymnosperms are vascular land plants having naked ovules *i.e.*, ovules are not enclosed in a ovary hence, flower is absent. Ovules after fertilisation produce naked seeds. Pteridophytes (ferns) and mosses do not produce seed.
114. (c) Pollen grains are haploid (n). If haploid no. of chromosomes are 6 then endosperm will also have 6 chromosomes as it is formed before fertilisation and is haploid.
115. (b) *Pinus* species → Resins and turpentine
Cedrus → Timber for railway sleepers
Abies → Paper, Canada balsam.
Cycas → Ornamental plant
116. (b) *Pinus* and in all other gymnosperms endosperm produced before fertilization and is haploid. Megaspore and pollen grain are initial structures of female gametophyte and male gametophyte respectively hence, they are haploid.
117. (b) In gymnosperms like *Cycas*/*Pinus*, endosperms of female gametophyte is haploid and formed before fertilisation.
In angiosperms, endosperm is triploid and develops after fertilisation.
118. (c) Double fertilisation is a unique feature exhibited only by angiosperms. It involves both syngamy and triple fusion.
119. (d) Two sperms and a vegetative cell are produced by male gametophyte in angiosperms.
120. (b) In meiosis, the number of chromosomes are reduced by half producing haploid daughter cells. The microspore mother cell and the megaspore mother cell undergo meiosis to produce haploid microspore and megaspore respectively.
121. (a) During megagametogenesis functional megaspore (mostly chalazal) gives rise to embryo sac. This is the mature female gametophyte generation.
122. (a) The gametophyte of bryophytes are smaller but have large sex organs.
123. (d) *Sphagnum* is a bryophyte in which male and female gametophytes are independent and free living. In *Pinus* (a gymnosperm), mustard and castor (angiosperms), the main plant body is sporophytic. Gametophyte is highly reduced and is completely dependent on sporophyte.
124. (b) *Ustilago* has a haplontic life cycle. This is a simplest and most primitive type of life cycle. The other pattern of life-cycle have originated from this type. This type is found in all chlorophyceae. In such cases, the somatic phase (plant) is haploid (gametophyte) while the diploid phase (sporophyte) is represented by zygote. During germination the zygote (2n) divides meiotically producing haploid (n) zoospores, which develop into individual plant. Here, the unicellular or filamentous gametophyte (n) alternates with one-celled zygote or sporophyte (2n).

NOTES

The haploid filamentous plants are known as haplonts which reproduce asexually by zoospores or aplanospores producing the individuals like parents.

125. (a) Spermatophytes are the seed plants. They are the plants bearing seeds containing a dormant embryo. It includes gymnosperms and angiosperms. *Ginkgo* belongs to group gymnosperms and *Pisum* belongs to group angiosperms.
126. (d) Maize, mint and peepal are flowering plants or angiosperms but *Pinus* is a gymnosperm in which seeds are produced but flowers are not produced or seeds are not enclosed in flowers.
127. (b) Vesselless angiosperms are *Wintera*, *Trochodendron* etc. Secondary growth is absent in some angiosperms. Angiospermic plants are autotrophic in nutrition. But some angiosperms are heterotrophic in nutrition. The 4 special modes of nutrition and their examples include:
(i) Saprophytic : e.g. *Neottia, Monotropa.*
(ii) Symbiotic – e.g. Mycorrhiza-between fungus and roots of higher plants.

(iii) Parasitic – *Cuscuta*.
(iv) Insectivorous plant – *Nepenthes*.
Double fertilisation is characteristic of all angiosperms.

128. (c) Egg of *Cycas* (Gymnosperms) and its nucleus are the largest in the plant kingdom. The sperms of *Cycas* are also the largest in the plant kingdom.
129. (c) The sperms of *Cycas* are the largest in the plant kingdom reaching a size of 300 mm. Egg of *Cycas* and its nucleus are also the largest in the plant kingdom.
130. (a) Seed habit originated in Cycadophiles or pteridosperms.
131. (c) Sunken stomata is the characteristic feature of xerophytes which help in reducing loss of water from leaf surface. These type of stomata are found in *Oleander* or *pine*.
132. (c) *Pinus* is a member of gymnosperm in which ovules are not enclosed in the ovary *i.e.* naked seed, whereas mango is a typical angiosperm whose ovules are enclosed in ovary *i.e.*, presence of fruit.
133. (c) Turpentine is extracted from the wood (xylem) of *Pinus* (Gymnosperm).
Turpentine is a fluid obtained by the complex distillation of resin obtained from trees, mainly various species of pine (*Pinus*). It is composed of terpenes, mainly the monoterpenes, alpha-pinene and beta-pinene.

NOTES

Turpentine oil is obtained by boiling resin at 155 degrees Celsius in large tubs. It has a potent odour that is similar to that of nail polish remover.

134. (d) As one moves from thallophyta → Bryophyta → Pteriodophyta → Gymnosperm → Angiosperms, there is reduction in the gametophyte and elaboration of sporophyte.
Hence, moss has largest gametophyte. Moss → *Selaginella* → *Cycas* → Angiosperm → Reduction in Gametophyte.