

# 03 Plant Kingdom

**Question:** Match List - I with List - II.

**NEET 2023 Manipur**

	List - I		List - II
(A)	Pteropsida	(I)	Psilotum
(B)	Lycopsida	(II)	Equisetum
(C)	Psilopsida	(III)	Adiantum
(D)	Sphenopsida	(IV)	Selaginella

Choose the correct answer from the options given below :

**A** (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

**B** (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

**C** (A)-(II), (B)-(III), (C)-(IV), (D)-(I)

**D** (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

**Answer: D**

**Explanation**

The question asks for a match between classes of Pteridophytes (List I) and their examples (List II).

Pteridophytes are a group of plants that include ferns and their allies. These plants reproduce via spores rather than seeds. The Pteridophytes are divided into various classes including Pteropsida, Lycopsidea, Psilopsida, and Sphenopsida.

Here's the correct match :

Pteropsida (A) - Adiantum (III). Adiantum (maidenhair fern) is an example of a fern, which falls under the class Pteropsida.

Lycopsidea (B) - Selaginella (IV). Selaginella is an example of clubmoss, which falls under the class Lycopsidea.

Psilopsida (C) - Psilotum (I). Psilotum is an example of whisk ferns, which falls under the class Psilopsida.

Sphenopsida (D) - Equisetum (II). Equisetum is an example of horsetail, which falls under the class Sphenopsida.

So, the correct answer is Option D :

(A)-(III), (B)-(IV), (C)-(I), (D)-(II)

**Question:** Which classes of algae possess pigment fucoxanthin and pigment phycoerythrin, respectively ?

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☒ A Phaeophyceae and Chlorophyceae

☐ B Phaeophyceae and Rhodophyceae

☐ C Chlorophyceae and Rhodophyceae

☐ D Rhodophyceae and Phaeophyceae

**Answer: B**

### **Explanation**

Option B : Phaeophyceae and Rhodophyceae

Explanation :

Phaeophyceae, commonly known as brown algae, owe their characteristic brown or olive color to the pigment fucoxanthin. This is a type of xanthophyll, a class of oxygen-containing carotenoid pigments, that masks the green color of chlorophyll.

Rhodophyceae, commonly known as red algae, are predominantly colored by the pigment r-phycoerythrin. This pigment reflects red light and absorbs blue light, which allows red algae to live at greater depths than many other types of algae because blue light penetrates water deeper than light of longer wavelengths.

These pigments, along with chlorophylls, not only give these algae their distinctive colors but also allow them to perform photosynthesis by capturing light energy at specific wavelengths.

**Question:** Identify the pair of heterosporous pteridophytes among the following :

**NEET 2023**

**A** Selaginella and Salvinia

**B** Psilotum and Salvinia

**C** Equisetum and Salvinia

**D** Lycopodium and Selaginella

**Answer: A**

**Explanation**

Selaginella and Salvinia are heterosporous pteridophytes. They produce two different kinds of spores. Psilotum, Lycopodium and Equisetum are homosporous pteridophytes.

**Question:** Given below are two statements : One labelled as Assertion A and the other labelled as Reason R:

Assertion A : The first stage of gametophyte in the life cycle of moss is protonema stage.

Reason R : Protonema develops directly from spores produced in capsule.

In the light of the above statements, choose the most appropriate answer from options given below:

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☒ A Both A and R are correct but R is NOT the correct explanation of A

☐ B A is correct but R is not correct

☐ C A is not correct but R is correct

☐ D Both A and R are correct and R is the correct explanation of A

**Answer: D**

**Explanation**

The life cycle of mosses consists of two stages: the gametophyte stage and the sporophyte stage.

Assertion A states : "The first stage of the gametophyte in the life cycle of moss is the protonema stage." This statement is correct. After a spore germinates, it

forms a mass of green, branched, one-cell-thick filaments known as the protonema, which is indeed the first stage of the gametophyte generation in mosses.

Reason R states : "Protonema develops directly from spores produced in the capsule." This statement is also correct. The spores are produced in a capsule, which is the sporophyte part of the moss life cycle. When these spores are released and germinate, they grow into the protonema.

Not only are both statements correct, but Reason R provides a correct explanation for Assertion A.

Therefore, the answer is :

Option D : Both A and R are correct and R is the correct explanation of A.

2022

## MCQ (Single Correct Answer)

**Q.1.** Match List-I with List-II :

	List-I		List-II
(a)	Chlamydomonas	(i)	Moss
(b)	Cycas	(ii)	Pteridophyte
(c)	Selaginella	(iii)	Alga
(d)	Sphagnum	(iv)	Gymnosperm

Choose the correct answer from the options given below

**A** (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)

**B** (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

**C** (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

**D** (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

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**Ans. (C)**

### Explanation

Chlamydomonas is a unicellular alga. Cycas is a gymnosperm. Selaginella is a heterosporous pteridophyte and Sphagnum is a moss.

**Q.2.** Read the following statements and identify the characters related to the alga shown in the diagram :



- (a) It is a member of Chlorophyceae
- (b) Food is stored in the form of starch
- (c) It is monoecious plant showing oogonium and antheridium
- (d) Food is stored in the form of laminarin or mannitol
- (e) It shows dominance of pigments Chlorophyll a, c and Fucoxanthin

Choose the correct answer from the options given below :

**A** (c), (d) and (e) only

**B** (a), and (b) only

**C** (a), (b) and (c) only

**D** (a), (c) and (d) only

**NEET 2022 Phase 2**

**Ans. (C).**

## Explanation

Alga shown in the diagram is Chara. It is a member of Chlorophyceae. Food is stored in the form of starch.

Chara is monocious plant showing oogonium and antheridium on the same plant body.

**Q.3.** Hydrocolloid carrageen is obtained from :

**A** Chlorophyceae and Phaeophyceae

**B** Phaeophyceae and Rhodophyceae

**C** Rhodophyceae only

**D** Phaeophyceae only

**NEET 2022 Phase 1**

**Ans. (C)**

## Explanation

Hydrocolloids are water holding substances for e.g. carrageen obtained from red algae (Rhodophyceae).

**Q.4.** Which of the following is incorrectly matched?

**A** Ectocarpus - Fucoxanthin

**B** Ulothrix - Mannitol

**C** Porphyra - Floridian Starch

**D** Volvox - Starch



## NEET 2022 Phase 1

**Ans. (B)**

### Explanation

Ulothrix is a member of Chlorophyceae (green algae), with reserve food material, starch. Mannitol is stored food material of Phaeophyceae (brown algae).

**Q.5.** Match the plant with the kind of life cycle it exhibits:

	List - I		List - II
(a)	Spirogyra	(i)	Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte
(b)	Fern	(ii)	Dominant haploid free-living gametophyte
(c)	Funaria	(iii)	Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
(d)	Cycas	(iv)	Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte

Choose the correct answer from the options given below :

**A** (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

**B** (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

**C** (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

**D** (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

## NEET 2022 Phase 1

**Ans. (B)**

## Explanation

Spirogyra is an alga. It shows haplontic life-cycle.

Fern is pteridophyte. The dominant phase of life-cycle is diploid sporophyte. Its gametophyte is called prothallus.

Funaria is a bryophyte. Its gametophyte is a leafy stage.

Cycas is a gymnosperm. The main plant body in gymnosperm is sporophyte. They have highly reduced gametophyte stage.

## TOPIC 1

### Algae

- 01** Which of the following algae contains mannitol as reserve food material? [NEET 2021]

(a) *Ectocarpus* (b) *Gracilaria*  
(c) *Volvox* (d) *Ulothrix*

**Ans. (a)**

*Ectocarpus* is a cosmopolitan marine brown seaweed. Mannitol is stored as a food reserve in *Ectocarpus*.

Other options can be explained as :

- *Gracilaria* is also a type of red algae that is notable for its economic importance. Reserved food found in *Gracilaria* is in the form of floridean starch, which is similar to amylopectin and glycogen in structure.
- In *Volvox* (green algae), stored food material is starch and the major pigments are chlorophyll a and d. Some may store food as oil droplets.
- *Ulothrix* is a genus of non-branching filamentous green algae, starch molecule is the reserved food.

- 02** Which of the following algae produces carrageen? [NEET 2021]

(a) Green algae  
(b) Brown algae  
(c) Red algae  
(d) Blue-green algae

**Ans. (c)**

Carrageen is a common name give to polysaccharides (carbohydrates) that are extracted from seaweeds like red algae. Carrageen is known for its gelling properties and it is one of the industrial source of carrageenan that is utilised as a stabilizer and thickner of milk products. It can be harmful to immune system, in severe cases it leads to internal bleeding.

- 03** Phycoerythrin is the major pigment in [NEET (Oct.) 2020]

(a) red algae  
(b) blue-green algae  
(c) green algae  
(d) brown algae

**Ans. (a)**

Phycoerythrin is the major pigment in red algae or rhodophytes. The photosynthetic pigments in red algae include chlorophyll-*a*, carotenoids and phycobilins. Phycoerythrin belongs to the phycobilins. These pigments are soluble in water.

- 04** Which of the following pairs is of unicellular algae? [NEET (Sep.) 2020]

(a) *Gelidium* and *Gracilaria*  
(b) *Anabaena* and *Volvox*  
(c) *Chlorella* and *Spirulina*  
(d) *Laminaria* and *Sargassum*

**Ans. (c)**

*Chlorella* and *Spirulina* are unicellular algae as they are rich in proteins and hence used as food supplements by space travellers. *Gelidium*, *Gracilaria*, *Laminaria* and *Sargassum* are multicellular. *Volvox* is colonial.

- 05** Which one is wrongly matched? [NEET 2018]

(a) Gemma cups – *Marchantia*  
(b) Biflagellate zoospores – Brown algae  
(c) Uniflagellate gametes – *Polysiphonia*  
(d) Unicellular organism – *Chlorella*

**Ans. (c)**

*Polysiphonia* is a red algae. In it sexual reproduction is of oogamous type. The male sex organ, spermatangium produces non-flagellate male gametes. In **Brown algae**, sexual reproduction varies from isogamy, anisogamy to

oogamy. In isogamy and anisogamy both the gametes are motile while in oogamy only male gametes are motile. These motile gametes have two unequal laterally attached flagella.

**Chlorella** is a unicellular organism. It is green algae belonging to class Chlorophyta. In **Marchantia**, gemma cups are found on its dorsal surface. It contains gammae which help in vegetative propagation.

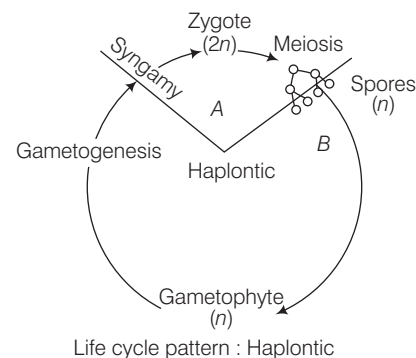
- 06** Zygotic meiosis is characteristic of [NEET 2017]

(a) *Marchantia* (b) *Fucus*  
(c) *Funaria* (d) *Chlamydomonas*

**Ans. (d)**

Zygotic meiosis is represented in the haplontic life cycle of many algae including

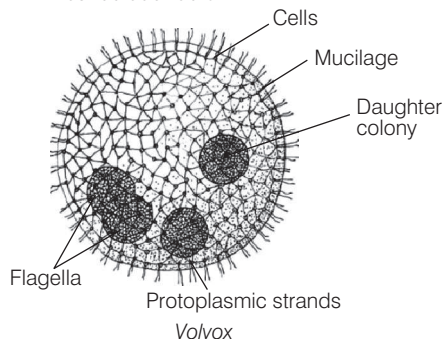
*Chlamydomonas*. In such a life cycle, all cells are haploid except zygote. This is because meiosis occurs in the zygote itself resulting into four haploid cells that give rise to haploid plants.



- 07** An example of colonial alga is [NEET 2017]
- (a) *Chlorella*  
(b) *Volvox*  
(c) *Ulothrix*  
(d) *Spirogyra*

**Ans. (b)**

*Volvox* is a fresh water green hollow ball-like colonial alga. Its colony has a fixed number of cells (500-60000). It is called coenobium.



**08** Which one of the following statements is wrong ?

[NEET 2016, Phase II]

- (a) Algae increase the level of dissolved oxygen in the immediate environment
- (b) Algin is obtained from red algae and carrageenan from brown algae
- (c) Agar-agar is obtained from *Gelidium* and *Gracilaria*
- (d) *Laminaria* and *Sargassum* are used as food

**Ans. (b)**

Algin extracted from brown algae, e.g. *Laminaria*, etc. is a hydrocolloid used in shaving creams, jellies, flameproof plastic, etc. Carrageenan is extracted from red algae like *Chondrus* and used as emulsifier and clearing agent. Thus, only option (b) is incorrect and all other options are correct.

**09** Which one is a wrong statement?

[CBSE AIPMT 2015]

- (a) Archegonia are found in Bryophyta, Pteridophyta and Gymnosperms
- (b) *Mucor* has biflagellate zoospores
- (c) Haploid endosperm is typical feature of gymnosperms
- (d) Brown algae have chlorophyll-*a* and *c*, and fucoxanthin

**Ans. (b)**

All the statements are correct except the statement (b). *Mucor* (fungus) belongs to the class—Zygomycetes. The members of Zygomycetes bear non-motile non-flagellated gametes.

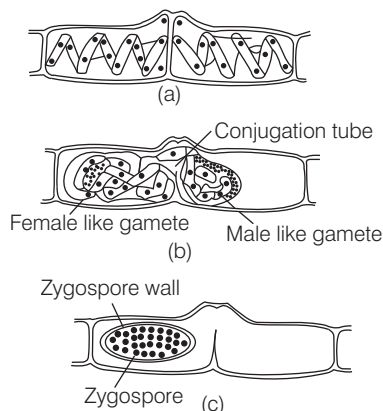
**10** Which one of the following shows isogamy with non-flagellated gametes? [CBSE AIPMT 2014]

- (a) *Sargassum* (b) *Ectocarpus*
- (c) *Ulothrix* (d) *Spirogyra*

**Ans. (d)**

Isogamy with non-flagellated gametes is seen in *Spirogyra*. It can reproduce both by sexual and asexual (vegetative) means.

They reproduce sexually by conjugation in which two non-flagellated morphologically similar but physiologically different gametes (isogamous) fuse together. One filament acts as male gamete and passes through the conjugation tube of another filament which acts as female gamete.



**11** Which one of the following is wrong about *Chara*?

[CBSE AIPMT 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

**Ans. (c)**

Both antheridium and oogonium are the male and the female reproductive structures respectively. They have sterile jackets on their surface. In *Chara* **globule** (antheridium) is present on lower side, while the **nucule** (oogonium) is present on upper side of sterile vegetative (leaf-like) structure.

**12** An alga which can be employed as food for human being is [CBSE AIPMT 2014]

- (a) *Ulothrix*
- (b) *Chlorella*
- (c) *Spirogyra*
- (d) *Polysiphonia*

**Ans. (b)**

*Chlorella* is a potential food source because it is high in protein and other essential nutrients when dried, it contains about 45% protein, 20% fat, 20% carbohydrate, 5% fibre and 10% minerals and vitamins.

**13** Select the wrong statement.

[NEET 2013]

- (a) Isogametes are similar in structure, function and behaviour
- (b) Anisogametes differ either in structure, function and behaviour
- (c) In oomycetes female gamete is smaller and motile, while male gamete is larger and non-motile
- (d) *Chlamydomonas* exhibits both isogamy and anisogamy and *Fucus* shows oogamy

**Ans. (c)**

Statement (c) is wrong as oomycetes include water moulds, white rusts and downy mildews. In these, female gamete is large and non-motile, whereas, male gamete is small and non-motile. Isogametes are found in algae like *Ulothrix*, *Chlamydomonas*, *Spirogyra*, etc. which are similar in structure, function and behaviour. Anisogametes are found in *Chlamydomonas* in which one gamete is larger and non-motile and the other one is motile and smaller.

**Oogamy** is the fusion of non-motile egg with motile sperm. The gametes, differ both morphologically as well as physiologically. It occurs in *Chlamydomonas*, *Fucus*, *Chara*, *Volvox*, etc.

**14** Algae have cell wall made up of [CBSE AIPMT 2010]

- (a) cellulose, galactans and mannans
- (b) hemicellulose, pectins and proteins
- (c) pectins, cellulose and proteins
- (d) cellulose, hemicellulose and pectins

**Ans. (a)**

Algae have cell wall made up of cellulose, galactans and mannans. Like plants, algae have cell walls containing either polysaccharides such as cellulose (a glucan) or a variety of glycoproteins or both.

The inclusion of additional polysaccharide in algal cell walls is used as a feature for algal taxonomy. Mannans form microfibrils in the cell walls of a number of marine green algae including those from the genera *Codium*, *Acetabularia* as well as in the walls of some red algae like *Porphyra*.

**15** Mannitol is the stored food in  
[CBSE AIPMT 2009]

- (a) *Chara* (b) *Porphyra*  
(c) *Fucus* (d) *Gracilaria*

**Ans. (c)**

*Fucus* belongs to class-Phaeophyceae, in which reserve food is found in form of laminarin, mannitol and oil.

*Chara* belongs to class-Chlorophyceae, in which reserve food is found in form of starch and oil.

*Porphyra* and *Gracilaria* belongs to class-Rhodophyceae, in which reserve food is found in form of floridean starch and Galactan-SO<sub>4</sub> polymers.

**16** If you are asked to classify the various algae into distinct groups, which of the following characters you should choose?  
[CBSE AIPMT 2007]

- (a) Types of pigments present in the cell  
(b) Nature of stored food materials in the cell  
(c) Structural organisation of thallus  
(d) Chemical composition of the cell wall

**Ans. (a)**

Types of pigments present in the cell of algae is the most important character for classification.

**17** Sexual reproduction in *Spirogyra* is an advanced feature because it shows  
[CBSE AIPMT 2003]

- (a) physiologically differentiated sex organs  
(b) different size of motile sex organs  
(c) same size of motile sex organs  
(d) morphologically different sex organs

**Ans. (a)**

In *Spirogyra*, the sexual reproduction involves the fusion of two morphologically identical isogametes and physiologically dissimilar anisogametes. This is a case of primitive anisogamy. In this the active gamete is known as the male and the passive as the female.

**18** A research student collected certain alga and found that its cells contained both chlorophyll-*a, b, c* and chlorophyll-*d* as well as phycoerythrin. The alga belongs to  
[CBSE AIPMT 2000]

- (a) Rhodophyceae (b) Bacillariophyceae  
(c) Chlorophyceae (d) Phaeophyceae

**Ans. (a)**

Members of Rhodophyceae (red algae) contains Chlorophyll-*a, d*, *r*-phycoerythrin, *r*-phycocyanin,  $\alpha$  and  $\beta$ -carotene pigments.

Members of Chlorophyceae (green algae) contain chlorophyll-*a, b* and  $\beta$ -carotene pigments.

Members of Bacillariophyceae (diatoms) contain chlorophyll-*a, c*,  $\beta$ -carotene,  $\alpha$ -carotene pigments.

Members of Cyanophyceae (cyanobacteria, blue-green algae) contain chlorophyll-*a*, *c*-phycocyanin, *c*-phycoerythrin and  $\beta$ -carotene pigments.

**19** *Ulothrix* can be described as a  
[CBSE AIPMT 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

**Ans. (d)**

*Ulothrix* is a freshwater, filamentous green algae, found in rather cold flowing water. Sexual reproduction in *Ulothrix* is isogamous type, i.e. it takes place between two morphological similar motile, flagellated male and female gametes which come from different filaments.

**20** *Ulothrix* filaments produce  
[CBSE AIPMT 1997]

- (a) isogametes  
(b) anisogametes  
(c) heterogametes  
(d) basidiospores

**Ans. (a)**

*Ulothrix* belongs to green algae. Sexual reproduction in *Ulothrix* takes place by the union of isogametes which are motile, biflagellate, morphologically similar gametes. Approximately 8-32 isogametes are produced from a mother cell. Two gametes come from two different filament, fuse and form a diploid zygote.

**21** Brown algae is characterised by the presence of  
[CBSE AIPMT 1997]

- (a) phycocyanin  
(b) phycoerythrin  
(c) fucoxanthin  
(d) haematochrome

**Ans. (c)**

In addition to chlorophyll-*a*, brown algae possess special carotenoids and fucoxanthin. It is due to the fucoxanthin (brown pigment) that these algae appear brown.

Phycocyanin and phycoerythrin are phycobilins which are found in red algae (phycocyanin-*r*, phycoerythrin-*r*) and blue-green algae (phycocyanin-*c*, phycoerythrin-*c*).

**22** An alga very rich in protein is  
[CBSE AIPMT 1997]

- (a) *Spirogyra*  
(b) *Ulothrix*  
(c) *Oscillatoria*  
(d) *Chlorella*

**Ans. (d)**

Dried *Chlorella pyrenoidosa* contains approximately 50-55% crude protein (more than that in dried beef, soyabean meal and dried yeast).

**23** Blue-green algae belong to  
[CBSE AIPMT 1996]

- (a) eukaryotes  
(b) prokaryotes  
(c) Rhodophyceae  
(d) Chlorophyceae

**Ans. (b)**

Blue-green algae or cyanobacteria are the largest Gram negative, aerobic, photoautotrophic, nitrogen-fixing, simplest chlorophyll containing thallophytes/prokaryotes. They neither have a definite nucleus nor definite plastid with grana. They also lack flagella, chlorophyll-*b*, mesosome, meiosis and membrane bound organelles (except ribosome of 70S type).

**24** Agar is commercially obtained from [CBSE AIPMT 1995]

- (a) red algae (b) green algae  
(c) brown algae (d) blue-green algae

**Ans. (a)**

Agar is a gelatinous, sulphated non-nitrogenous, tasteless, odourless mucopolysaccharide obtained from middle lamella of cell wall of marine red algae like *Gracillaria*, *Gelidium*, *Gigartina*, etc. commonly known as agarophytes. It is used as solidifying agent in the culture medium, as luxative stabiliser or thickener in preparing jams, jellies, creams, ice creams, bakery products and as luxative in drug industry.

**25** The absence of chlorophyll, in the lowermost cell of *Ulothrix*, shows [CBSE AIPMT 1995]

- (a) functional fission  
(b) tissue formation  
(c) cell characteristic  
(d) beginning of labour division

**Ans. (d)**

*Ulothrix* is an advanced alga, with three types of cells—green dome-shaped apical cell, green intercalary cell and basal non-green cell called holdfast. Holdfast or basal cell is for attachment, it has nucleus and cytoplasm, its presence shows the beginning of division of labour.

**26** In Chlorophyceae, sexual reproduction occurs by [CBSE AIPMT 1994]

- (a) isogamy and anisogamy  
(b) isogamy, anisogamy and oogamy  
(c) oogamy only  
(d) anisogamy and oogamy

**Ans. (b)**

In Chlorophyceae, three types of sexual reproduction occurs, i.e. isogamy, anisogamy and oogamy.

Isogamy involves the fusion of those gametes which are similar in size, shape and structure, e.g. *Chlamydomonas debaryana*.

In anisogamy gametes differ morphologically and also behave differently, e.g. *Chlamydomonas braunii*.

In oogamy, fusion between motile and non-motile gametes takes place, e.g. *Chlamydomonas coccifera*.

**27** Which of the following cannot fix nitrogen? [CBSE AIPMT 1994]

- (a) *Nostoc* (b) *Azotobacter*  
(c) *Spirogyra* (d) *Anabaena*

**Ans. (c)**

*Spirogyra* is a free floating, filamentous, green, freshwater alga, popularly called pond silk. It has no role in nitrogen fixation. It forms a green slimy mass on the surface of standing and stagnant water of ponds during spring season, hence also called pond scum.

Whereas, blue-green algae like *Nostoc*, *Anabaena* are the important nitrogen fixing cyanobacteria, so these are used as biofertiliser. *Azotobacter* is the aerobic free living/non-symbiotic nitrogen fixer.

**28** Chloroplast of *Chlamydomonas* is [CBSE AIPMT 1993]

- (a) stellate (b) cup-shaped  
(c) collar-shaped (d) spiral

**Ans. (b)**

In *Chlamydomonas*, chloroplast is single and cup-shaped. Chloroplasts are the pigment (chl-*a* and chl-*b*) containing bodies present in green algae. The green colouration of the members of chlorophyta is due to the presence of excess of chlorophyll in the chloroplasts. The chloroplasts are well defined bodies met within every cell of the members of this class, though number and shape of the chloroplasts varies in different orders of the class.

**29** In *Ulothrix/Spirogyra*, reduction division (meiosis) occurs at the time of [CBSE AIPMT 1993]

- (a) gamete formation  
(b) zoospore formation  
(c) zygospore germination  
(d) vegetative reproduction

**Ans. (c)**

In *Ulothrix/Spirogyra*, meiosis takes place at the time of zygospore germination. It takes place when (+) and (–) plants/filaments results in the formation of diploid zygote (2x). Zygote is tetraflagellated, it secretes a thick wall and becomes non-motile to form diploid zygospore.

Under favourable conditions, zygospore undergoes zygotic meiosis to form motile tetraflagellated zoomeiospores or non-motile aplanomeiospores. Each meiospore (haploid) germinates to new filament of (+)(–) strain.

**30** Pyrenoids are the centres for formation of [CBSE AIPMT 1993]

- (a) porphyrin (b) enzymes  
(c) fat (d) starch

**Ans. (d)**

Pyrenoid is a seat of synthesis and storage of starch present in the chloroplast of algae. A pyrenoid has a core of protein around which starch is deposited as layers.

**31** A plant in which sporophytic generation is represented by zygote is [CBSE AIPMT 1992]

- (a) *Pinus* (b) *Selaginella*  
(c) *Chlamydomonas* (d) *Dryopteris*

**Ans. (c)**

In *Chlamydomonas*, the plant body is haploid, and represents gametophyte. It reproduces asexually through the formation of zoospores and sexually through gametes. Gametes (haploid) fuse to produce diploid zygote, representing the sporophytic generation. The zygote secretes a wall around it to become a resting zygospore (diploid). The zygote and zygospore are the only diploid structure which represents the diplophase.

**32** The product of conjugation in *Spirogyra* or fertilisation of *Chlamydomonas* is [CBSE AIPMT 1991]

- (a) zygospore (b) zoospore  
(c) oospore (d) carpospore

**Ans. (a)**

Zygospore (zygote) is the fusion product of two gametes. It infact, represents the resting stage formed after withdrawal of flagella and formation of a thick wall around the freshly formed zygote. Zygospore is spherical with thick, smooth or stellate wall and contains fats and reserve food materials other than starch. It can resist unfavourable conditions.

In *Chlamydomonas*, zygospore is the resultant of isogamy, anisogamy or oogamy. In *Spirogyra* sexual reproduction occurs through conjugation, which may be scalariform or lateral. The resulting zygote secretes a thick wall called zygospore (having 3 layers thick wall, diploid nucleus and abundant food reserves in the form of oil and starch).

**33** Sexual reproduction involving fusion of two cells in *Chlamydomonas* is [CBSE AIPMT 1988]

- (a) isogamy (b) homogamy  
(c) somatogamy (d) hologamy



**Ans. (d)**

In *Chlamydomonas*, hologamy involves the fusion of two young individuals directly, e.g. *C. snowiae* and isogamy involves fusion of gametes which are similar in size, structure and physiology, e.g. *C. euganetos*.

- 34** *Acetabularia* used in Hammerling's nucleocytoplasmic experiments is [CBSE AIPMT 1988]

- (a) unicellular fungus
- (b) multicellular fungus
- (c) unicellular uninucleate green alga
- (d) unicellular multinucleate green alga

**Ans. (c)**

*Acetabularia* is the largest uninucleated green marine alga popularly called **mermaids wine glass umbrella plant**. It has a cap, stalk and rhizoidal base and nucleus lies in the base. Danish biologist **J Hammerling** (1953) by his grafting experiments involving exchange of nucleus in *Acetabularia* proved the role of nucleus in heredity, growth, morphology, differentiation and morphogenesis.

## TOPIC 2

### Bryophytes

- 35** Gemmae are present in [NEET 2021]

- (a) mosses
- (b) pteridophytes
- (c) some gymnosperms
- (d) some liverworts

**Ans. (d)**

Some liverworts reproduce asexually by fragmentation of thalli or by the formation of gemmae. (green, multicellular asexual buds). The gemmae are held in special organs known as gemma cups and are dispersed by rainfall. Gemmae becomes detached from parent body and germinate to form new individuals.

- 36** Which of the following is responsible for peat formation? [CBSE AIPMT 2014]

- (a) *Marchantia*
- (b) *Riccia*
- (c) *Funaria*
- (d) *Sphagnum*

**Ans. (d)**

Peat is mainly an accumulation of partially decayed vegetation or organic

matter and *Sphagnum* accumulations can store water, since both living and dead plants can hold large quantities of water and living matter (like meat) for long distance transport inside their cells hence, it is responsible for peat formation.

- 37** Which one of the following is common to multicellular fungi, filamentous algae and protonema of mosses? [NEET 2013]

- (a) Diplontic life cycle
- (b) Members of kingdom-Plantae
- (c) Mode of nutrition
- (d) Multiplication by fragmentation

**Ans. (d)**

Multicellular fungi, filamentous algae and protonema of mosses all show multiplication by fragmentation.

- 38** Archegoniophore is present in [CBSE AIPMT 2011]

- (a) *Chara*
- (b) *Adiantum*
- (c) *Funaria*
- (d) *Marchantia*

**Ans. (d)**

In *Marchantia*, a bryophyte, the archegonia (female sex organs) are borne on special branches called **archegoniophore** or female receptacles. Each archegoniophore has rows of archegonia protected by involucre or perichaetium.

- 39** Male and female gametophytes are independent and free-living in [CBSE AIPMT 2010]

- (a) mustard
- (b) castor
- (c) *Pinus*
- (d) *Sphagnum*

**Ans. (d)**

In *Sphagnum*, male and female gametophytes are independent and free living. In bryophytes, the most conspicuous phase in life cycle is the gametophyte. It is independent and concerned with reproduction.

- 40** In the prothallus of a vascular cryptogam, the antherozoids and eggs mature at different times, as a result [CBSE AIPMT 2007]

- (a) there is no change in success rate of fertilisation
- (b) there is high degree of sterility
- (c) one can conclude that the plant is apomictic
- (d) self fertilisation is prevented

**Ans. (d)**

In the prothallus of a vascular cryptogam, the antherozoids and eggs mature at different times. As a result self fertilisation is prevented.

- 41** Spore dissemination in some liverworts is aided by [CBSE AIPMT 2007]

- (a) elaters
- (b) indusium
- (c) calyptra
- (d) peristome teeth

**Ans. (a)**

Elaters are hygroscopic in nature and help in dispersal of spores.

- 42** Peat moss is used as a packing material for sending flowers and live plants to distant places because [CBSE AIPMT 2006]

- (a) it is hygroscopic
- (b) it reduces transpiration
- (c) it serves as a disinfectant
- (d) it is easily available

**Ans. (a)**

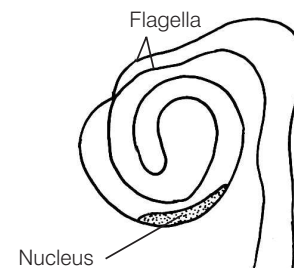
*Sphagnum* is a bryophyte, commonly called as **bog moss** or **peat moss**. It is hygroscopic and possesses a remarkable water holding capacity. Hence, it is used as a packing material in the transportation of flowers, live plants, tubers, bulbs, seedlings, etc. It is also used in seed-beds and in moss-sticks.

- 43** The antherozoids of *Funaria* are [CBSE AIPMT 1999]

- (a) aciliated
- (b) biflagellated
- (c) multiciliated
- (d) monociliated

**Ans. (b)**

The antherozoids of *Funaria* are spirally coiled and bear two equal flagella at anterior end.



Antherozoids (*Funaria*)

**44** Dichotomous branching is found in  
[CBSE AIPMT 1999]

- (a) fern
- (b) *Funaria*
- (c) liverworts
- (d) *Marchantia*

**Ans. (d)**

Though many liverworts are dichotomously branched but some of the leafy liverworts are not. However, *Marchantia* is a liverwort which is dichotomously branched.

**45** Bryophytes comprise  
[CBSE AIPMT 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 generally parasitic on gametophyte

**Ans. (d)**

Bryophyta is a group of thalloid, non-vascular, cryptogams which have gametophytic (haploid phase) as dominant phase. It bears diploid sporophytic phase which takes food from gametophytic phase, thus behaves as parasite on gametophyte.

**46** Which of the following is true about bryophytes?  
[CBSE AIPMT 1999]

- (a) They possess archegonia
- (b) They contain chloroplast
- (c) They are thalloid
- (d) All of the above

**Ans. (d)**

Bryophytes are non-vascular cryptogams, their main plant body is gametophytic (haploid) which is a thalloid structure. It contains chlorophyll for the process of photosynthesis. Thalloid plant body bear archegonia as female sex organs.

**47** Bryophytes are dependent on water because [CBSE AIPMT 1998]

- (a) water is essential for fertilisation for their homosporous nature
- (b) water is essential for their vegetative propagation
- (c) the sperms can easily reach up to egg in the archegonium
- (d) archegonium has to remain filled with water for fertilisation

**Ans. (c)**

The antherozoids (sperms) of bryophytes are flagellated (motile) and need a film of water to swim through for reaching the archegonium. Bryophyta is a group of cryptogams. Main plant body of bryophytes is gametophytic (haploid). It bearing male and female sex organs.

**48** Bryophytes can be separated from algae because they  
[CBSE AIPMT 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

**Ans. (c)**

Archegonia is female sex organ in bryophytes. It is a flask-shaped multicellular organ. It is composed of a cylindrical upper portion called neck with a single layer of sterile cells called Neck Canal Cells (NCC) and a lower swollen sac-like portion called venter. It also has layer or layers of sterile cells. Venter encloses a larger egg cell and a smaller (just above to egg) Venter Canal Cell (VCC).

**49** Multicellular branched rhizoids and leafy gametophytes are characteristics of  
[CBSE AIPMT 1997]

- (a) all bryophytes
- (b) some bryophytes
- (c) all pteridophytes
- (d) some pteridophytes

**Ans. (b)**

In pteridophytes and gymnosperms, gameto-phyte generation is reduced, sporophyte is well-developed. In bryophytes, gametophyte constitutes the main well developed generation but in mosses, (e.g. *Funaria*), it is foliose.

**50** In which one of these the elaters are present along with mature spores in the capsule (to help in spore dispersal)?  
[CBSE AIPMT 1996]

- (a) *Riccia*
- (b) *Marchantia*
- (c) *Funaria*
- (d) *Sphagnum*

**Ans. (b)**

In *Marchantia*, capsule (the part of sporophyte) contains elaters (2n) and spores (n) in tetrads.

Elaters are diploid, spindle shaped hygroscopic elongated structures with 2 spiral bands. They show twisting movement and assist in spore dispersal on maturity.

**51** The plant body of moss (*Funaria*) is  
[CBSE AIPMT 1995, 2006]

- (a) completely sporophyte
- (b) completely gametophyte
- (c) predominantly sporophyte with gametophyte
- (d) predominantly gametophyte with sporophyte

**Ans. (d)**

*Funaria* (green moss) and other bryophytes show alternation of generation with haploid gametophytic (n) and diploid sporophytic phases (2n). Plant body represents the gametophytic phase, which reproduces by producing gametes and on fusion form zygote.

Zygote develops into sporophyte and produces haploid meiospores which on germination form gametophyte. Sporophyte in mosses is differentiated into foot, seta and capsule.

**52** Unique features of bryophytes is that they  
[CBSE AIPMT 1994]

- (a) produce spores
- (b) have sporophyte attached to gametophyte
- (c) lack roots
- (d) lack vascular tissues

**Ans. (b)**

The main plant body of bryophytes is gametophytic which is independent and may be thallose or foliose. The sporophyte is differentiated into foot, seta and capsule and is partially or fully dependent upon the gametophyte.

**53** The plant group that produces spores and embryo but lacks vascular tissues and seeds is  
[CBSE AIPMT 1992]

- (a) Pteridophyta
- (b) Rhodophyta
- (c) Bryophyta
- (d) Phaeophyta

**Ans. (c)**

Bryophytes consist of thalloid body, attached to the substratum by hair-like structures called rhizoids (true roots are absent), these lack vascular tissue (xylem and phloem) and require water at the time of fertilisation. Bryophytes exhibit alternation of generation.



The haploid gametophyte (producing gametes for sexual reproduction) alternates with diploid sporophyte (producing spores for asexual reproduction). Production of large number of spores is for increasing the chances of survival and is an adaptation to land conditions.

- 54** Which one has the largest gametophyte? [CBSE AIPMT 1991]

(a) *Cycas* (b) Angiosperm  
(c) *Selaginella* (d) Moss

**Ans. (d)**

Of the given options, moss has the largest gametophyte. It get reduced in the order as *Selaginella*, *Cycas*, angiosperms. Gametophyte begins with the haploid spore and ends with the formation of haploid gametes.

Gametophyte gives rise to the sporophyte (through sexual reproduction) and sporophyte gives rise to gametophyte. As one moves from thallophyte → bryophyte → pteridophyte → gymnosperms → angiosperms, there is development in the sporophyte and reduction in the gametophyte.

- 55** Bryophytes are amphibians because [CBSE AIPMT 1991, 96]

(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 of the above

**Ans. (a)**

Bryophytes are called amphibians (amphibians of plant kingdom). They are first amongst land plants which occur in damp and shady habitats. As vascular tissues are absent, male gametes require a layer of water for swimming and fertilisation.

- 56** Apophysis in the capsule of *Funaria* is [CBSE AIPMT 1990]

(a) lower part (b) upper part  
(c) middle part (d) fertile part

**Ans. (a)**

Capsule (the body containing spores) of *Funaria* is differentiated into-operculum (cap shaped 2-3 layered thick lid on the top); theca (middle fertile part) and apophysis (sterile, solid basal portion of the capsule having chloroplasts).

- 57** Moss peristome takes part in [CBSE AIPMT 1990]

(a) spore dispersal  
(b) photosynthesis  
(c) protection  
(d) absorption

**Ans. (a)**

Peristome functions in the dispersal of the spores. Peristome constitutes rings of teeth like projections at the rim of the capsule of the mosses. In *Funaria*, peristome are 32 in number, arranged in two rings of 16 each (a) outer exostome and (b) inner endostome.

- 58** Protonema occurs in the life cycle of [CBSE AIPMT 1990, 93]

(a) *Riccia*  
(b) *Funaria*  
(c) *Chlamydomonas*  
(d) *Spirogyra*

**Ans. (b)**

Protonema represents the juvenile stage of moss (*Funaria*). It is much-branched, green filamentous structure formed by the germination of spores, under favourable conditions. The protonema consists of (a) some slender rhizoids (b) a number of aerial green prostrate branches bearing small lateral buds which grow up into new moss gametophores.

- 59** Sperms of both *Funaria* and *Pteris* were released together near the archegonia of *Pteris*. Only *Pteris* sperms enter the archegonia as [CBSE AIPMT 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

**Ans. (d)**

In *Dryopteris* and *Pteris*, when fertilisation occurs, sperms are attracted by the chemical diffusing into the water from the mucilage exuded by the open necks of archegonia of the older prothalli, some of them make their way down the canal to the egg in the venter and only one of these enters the egg to accomplish fertilisation.

## TOPIC 3 Pteridophytes

- 60** In bryophytes and pteridophytes, transport of male gametes requires [NEET 2016, Phase I]

(a) insects (b) birds  
(c) water (d) wind

**Ans. (c)**

In several primitive simple plants-like algae, bryophytes and pteridophytes, water is the medium through which male gametes are transferred to the female reproductive organ or gamete to bring about fertilisation.

- 61** Which one of the following is a correct statement? [NEET 2013]

(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

**Ans. (d)**

Origin of seed habitat can be traced in pteridophytes. Some pteridophytes like *Selaginella* and *Salvinia* are heterosporous as they produce two kinds of spores micro (small) spores and macro (large) spores, which germinate and give rise to male and female gametophyte respectively.

The female gametophyte in these plants are retained on the parent sporophytes for variable periods. The development of the zygote into young embryos takes place within the female gametophyte. This event is the precursor to the seed habit and considered to an important step in evolution.

- 62** Which one of the following is a vascular cryptogam? [CBSE AIPMT 2009]

(a) *Equisetum* (b) *Ginkgo*  
(c) *Marchantia* (d) *Cedrus*

**Ans. (a)**

Pteridophytes are also called vascular cryptogams as these have a well developed vascular system but are non-flowering plants. e.g. *Equisetum*.

**63** In which one of the following, male and female gametophytes don't have free living independent existence? [CBSE AIPMT 2008]

- (a) *Pteris* (b) *Funaria*  
(c) *Polytrichum* (d) *Cedrus*

**Ans. (a)**

In *Pteris* (also *Dryopteris*) the spore germinates to produce the prothallus. The prothallus is a small, green flat, surface loving, thallus-like object. It is monoecious and bears sex organs on the ventral side. The antheridia (male sex organs) arise among the rhizoids towards the posterior side of the prothallus and are emergent. The archegonia develop in central cushion behind the apical notch. In these plants male and female, gametophytes do have free living independent existence.

All species of *Polytrichum* are dioecious. The antheridia and archegonia are borne on different gametophore. The plant body is an erect leafy shoot but is not the entire gametophyte. The leafy shoot arise from protonema (the juvenile stage).

The leafy gametophore of *Funaria* reproduces sexually by formation of antheridia and archegonia. The antheridia are formed at the summit of a relatively small, thin, leafy shoot, which develops first. The female branch arises later as a lateral outgrowth from the base of parent male shoot.

*Cedrus* is a gymnosperm in which main plant body is a sporophyte on which reduced type of gametophytes are formed.

**64** Which one of the following is heterosporous? [CBSE AIPMT 2008]

- (a) *Dryopteris* (b) *Salvinia*  
(c) *Adiantum* (d) *Equisetum*

**Ans. (b)**

From the following *Salvinia* is heterosporous. Heterospory is the production of spores of two different sizes and two different developmental patterns. Small spores are called microspores and larger as megaspore.

Microspores germinate to produce the male gametophyte or microgametophyte that bear male sex organs while, megaspore germinates to form female gametophyte or megagametophyte that bears

archegonia or female sex organs. It is most important evolutionary development in the vascular plants because it has ultimately lead to seed development, e.g. *Selaginella*, *Marselia*, *Salvinia*, *Azolla*, *Isoetes*.

*Dryopteris* is homosporous and 32-64 haploid spores are produced in each sporangium.

*Adiantum* is also homosporous. The spores are the pioneer structures of the gametophytic generation.

**65** Which of the following propagates through leaf-tip? [CBSE AIPMT 2004]

- (a) Walking fern  
(b) Sproux-leaf plant  
(c) *Marchantia*  
(d) Moss

**Ans. (a)**

*Adiantum* is also called walking fern. In *Adiantum* the tips of the leaves, on coming in contact with the soil, give out adventitious roots which, in turn, produce new leaves and develop into new plants.

**66** Which one the following pairs of plants are not seed producers? [CBSE AIPMT 2003]

- (a) *Ficus* and *Chlamydomonas*  
(b) *Punica* and *Pinus*  
(c) Fern and *Funaria*  
(d) *Funaria* and *Ficus*

**Ans. (c)**

Fern is a pteridophyte and *Funaria* is a bryophyte, both these produce spores but not seeds. Phanerogams is a group of plants which produce seeds and flowers. It includes gymnospermic and angiospermic plants. While cryptogams is another group of plants which do not produce seeds and flowers, e.g. algae, fungi, bryophytes and pteridophytes.

**67** In ferns meiosis occurs when [CBSE AIPMT 2000]

- (a) spore germinates  
(b) gametes are formed  
(c) spores are formed  
(d) antheridia and archegonia are formed

**Ans. (c)**

In the ferns sporangium is a diploid structure. It bears diploid spore

mother cells which undergo meiosis and produce haploid spores. Each spore contains an outer thick brown wall called exine and a thin inner wall called intine. Spore is the first cell of gametophyte. On germination, it gives rise to a haploid gametophytic stage.

**68** The 'walking fern' is so named because [CBSE AIPMT 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

**Ans. (b)**

*Adiantum* is called walking fern. The tips of its leaves, on coming in contact with the soil, gives out adventitious roots which in turn produce new leaves and develop into new plants.

**69** A well developed archegonium with neck consisting of 4-6 rows of neck canal cells, characterises [CBSE AIPMT 1995]

- (a) gymnosperms only  
(b) bryophytes and pteridophytes  
(c) pteridophytes and gymnosperms  
(d) gymnosperms and flowering plants

**Ans. (b)**

Archegonium is the flask-shaped female reproductive body of bryophytes and pteridophytes. Archegonium usually consists of a tubular neck and a swollen venter. Neck is made up of 4-6 vertical row of cells and encloses 6-10 neck canal cells in bryophytes and 4 vertical rows in pteridophytes enclosing 1-4 neck canal cells. Venter has 1-2 layer but it is wall-less in pteridophytes.

**70** Which one of the following is not common between *Funaria* and *Selaginella*? [CBSE AIPMT 1992]

- (a) Archegonium  
(b) Embryo  
(c) Flagellate sperms  
(d) Roots

**Ans. (d)**

Roots are not the common structure in *Funaria* and *Selaginella*. *Funaria* (moss) and *Selaginella* (pteridophytes) can be related with the presence of archegonium, embryo, flagellated sperms.

In *Funaria*, the plant is attached to the substratum by means of root-like structures called rhizoids, which are multicellular, branched, have oblique cross wall. In *Selaginella*, special leafless positively geotropic structures called rhizophores arise from the stem at the point of branching. Rhizophore resembles the stem in some characters and roots in other characters and was regarded as *organ-sui-generis* (organ of independent origin).

**71** Pteridophytes differ from mosses/ bryophytes in possessing [CBSE AIPMT 1993]

- (a) independent gametophyte
- (b) well developed vascular system
- (c) archegonia
- (d) flagellate spermatozooids

**Ans. (b)**

Pteridophytes are most primitive vascular flowerless, spore producing cryptogamic land plants, commonly called vascular amphibians/botanical snakes/spore producing seedless tracheophytes. They are first vascular land plants to have independent sporophyte diploid plant body with true root, stem and leaves. In contrast bryophytes, the amphibians of plant kingdom are devoid of true roots, stem and leaves, with no vascular supply but root-like, non-vascular rhizoids, leaf-like and stem-like structures are present.

**72** Evolutionary important character of *Selaginella* is [CBSE AIPMT 1989]

- (a) heterosporous nature
- (b) rhizophore
- (c) strobili
- (d) ligule

**Ans. (a)**

Heterospory; i.e. the production of two different types of spores : larger macrospores and smaller microspores is a character of evolutionary significance in pteridophyte (*Selaginella*) because seed habit (characteristic feature of gymnosperms and angiosperms) and differentiation of spores on the basis of sex is believed to have originated from heterosporous condition.

## TOPIC 4 Gymnosperms

**73** Which of the following statements is incorrect about gymnosperms? [NEET (Oct.) 2020]

- (a) They are heterosporous
- (b) Male and female gametophytes are free living
- (c) Most of them have narrow leaves with thick cuticle
- (d) Their seeds are not covered

**Ans. (b)**

Statement (b) is incorrect. It can be corrected as In gymnosperms, the male and the female gametophyte do not have an independent free-living existence. The male gametophyte remains within the sporangia, retained on the sporophytes and is dependent on sporophyte.

**74** Which one of the following statements is correct? [NEET 2018]

- (a) Horsetails are gymnosperms
- (b) *Selaginella* is heterosporous, while *Salvinia* is homosporous
- (c) Ovules are not enclosed by ovary wall in gymnosperms
- (d) Stems are usually unbranched in both *Cycas* and *Cedrus*.

**Ans. (c)**

In **gymnosperms**, ovules are not enclosed by ovary wall. Seeds do not occur inside a fruit. They are naked.

**Horsetail** is the common name of *Equisetum*.

Pteridophytes like *Selaginella* and *Salvinia* are heterosporous and possess two types of spores, i.e. microspores and megaspores. *Cycas* has an unbranched columnar stem while *Cedrus* possess branched stem.

Therefore, only statement (c) is correct.

**75** Select the correct statement. [NEET 2016, Phase I]

- (a) *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms
- (b) *Sequoia* is one of the tallest trees

(c) The leaves of gymnosperms are not well adapted to extremes of climate

(d) Gymnosperms are both homosporous and heterosporous

**Ans. (b)**

*Sequoia* is one of the tallest tree species, known as red wood tree. It is a gymnospermic plant.

*Salvinia* is an angiosperm, but *Ginkgo* and *Pinus* are gymnosperms.

Gymnosperms are well adapted to extremes of climate and are heterosporous.

**76** Conifers are adapted to tolerate extreme environmental conditions because of [NEET 2016, Phase II]

- (a) broad hardy leaves
- (b) superficial stomata
- (c) thick cuticle
- (d) the presence of vessels

**Ans. (c)**

Conifers are gymnosperms. Their leaves show xerophytic adaptations. The leaves are like needle with thick walled single layered epidermal cells covered with thick cuticle. This enables them to tolerate extreme climatic conditions.

**77** Read the following statements and answer the question which follows them

- I. In liverworts, mosses and ferns gametophytes are free living.
- II. Gymnosperms and some ferns are heterosporous.
- III. Sexual reproduction in *Fucus*, *Volvox* and *Albugo* is oogamous.
- IV. The sporophyte in liverworts is more elaborate than that in mosses.

How many of the above statements are correct? [NEET 2013]

- (a) One
- (b) Two
- (c) Three
- (d) Four

**Ans. (c)**

Statement I, II and III are correct. Statement IV is incorrect and can be corrected as the sporophyte in mosses is more elaborate than in liverworts.

**78** *Cycas* and *Adiantum* resemble each other in having [NEET 2013]

- (a) seeds (b) motile sperms  
(c) cambium (d) vessels

**Ans. (b)**

Multiciliated motile sperms are found in both *Cycas* (gymnosperm) and *Adiantum* or walking fern (pteridophyte).

Seeds and cambium are present in *Cycas* (quite common in gymnosperms) but absent in pteridophytes. Vessels are absent in both.

**79** Gymnosperms are also called soft wood spermatophytes because they lack [CBSE AIPMT 2012]

- (a) cambium  
(b) phloem fibres  
(c) thick-walled tracheids  
(d) xylem fibres

**Ans. (d)**

Gymnosperms lack xylem fibres. Large amount of parenchymatous cells are present with secondary xylem tracheids. So, these are also known as softwood spermatophytes.

**80** The gametophyte is not an independent, free living generation in [CBSE AIPMT 2011]

- (a) *Adiantum* (b) *Marchantia*  
(c) *Pinus* (d) *Polytrichum*

**Ans. (c)**

In gymnosperms, (e.g. *Pinus*, *Cycas*, etc.) the male and female gametophytes do not have an independent free-living existence. They remain within the sporangia retained on the sporophytes.

**81** Select one of the following pairs of important features distinguishing *Gnetum* from *Cycas* and *Pinus* and showing affinities with angiosperms [CBSE AIPMT 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

**Ans. (b)**

The presence of vessels in the xylem is an angiospermic character found in *Gnetum* which distinguish it from *Cycas* and *Pinus*.

*Gnetum* resembles angiosperms in many other aspects also like

- (i) The leaves in *Gnetum* have reticulate venation that is an angiospermic character.  
(ii) In *Gnetum* female gametophyte is only partly cellular before fertilisation and becomes completely cellular only after fertilisation. Some of the free nuclei act as eggs as there are no archegonia.

The short apices in *Gnetum* and angiosperms show a distinct tunica and corpus configuration.

The cortex of stem of *Pinus* is traverse by large resin ducts or canals. Each duct or canal is lined by a layer of thin walled parenchymatous glandular secretory cells constituting epithelium. The epithelial cells secrete resin into canal. Resin is the chief source of terpentine.

**82** Flagellated male gametes are present in all the three of which one of the following sets?

[CBSE AIPMT 2007]

- (a) *Anthoceros*, *Funaria* and *Spirogyra*  
(b) *Zygnema*, *Saprolegnia* and *Hydrilla*  
(c) *Fucus*, *Marselia* and *Calotropis*  
(d) *Riccia*, *Dryopteris* and *Cycas*

**Ans. (d)**

Flagellated male gametes are present in *Riccia*, *Dryopteris* and *Cycas*.

**83** In gymnosperms, the pollen chamber represents

[CBSE AIPMT 2007]

- (a) a cell in the pollen grain in which the sperms are formed  
(b) a cavity in the ovule in which pollen grains are stored after pollination  
(c) an opening in the megagametophyte through which the pollen tube approaches the egg  
(d) the microsporangium in which pollen grains develop

**Ans. (b)**

In gymnosperms, the pollen chamber is a cavity in the ovule in which pollen grains are stored after pollination.

**84** Which one of the following is a living fossil?

[CBSE AIPMT 2004, 03]

- (a) *Cycas* (b) Moss  
(c) *Saccharomyces* (d) *Spirogyra*

**Ans. (a)**

The Cycadales is an ancient order of gymnosperms exhibiting several primitive features—now having only a few living representative of once a large group of plants that glorified during the Mesozoic era. Therefore, *Cycas* is called as living fossil.

**85** Which one pair of examples will correctly represent the grouping spermatophyta according to one of the schemes of classifying plants? [CBSE AIPMT 2003]

- (a) *Rhizopus*, *Triticum*  
(b) *Ginkgo*, *Pisum*  
(c) *Acacia*, sugarcane  
(d) *Pinus*, *Cycas*

**Ans. (b)**

*Ginkgo* is a gymnospermic plant so it comes before angiospermic plant, *Pisum* (pea). *Rhizopus* is a fungus and *Triticum* (wheat) is an angiospermic plant.

Option (c) has both angiospermic plants and option (d) has both gymnospermic plants.

**86** Which of the following plants produces seeds but not flowers? [CBSE AIPMT 2002]

- (a) Maize (b) Mint  
(c) Peepal (d) *Pinus*

**Ans. (d)**

*Pinus* is a gymnospermic plant. Ovules of *Pinus* are uncovered which lie on the megasporophyll, hence, these plants do not have flowers. However, it produces seeds (from ovule after fertilisation) like other three plants mentioned, all of which are angiosperms.

**87** *Cycas* has two cotyledons but not included in angiosperms because of [CBSE AIPMT 2001]

- (a) naked ovules  
(b) seems like monocot  
(c) circinate ptyxis  
(d) compound leaves

**Ans. (a)**

Gymnosperms (Gk. *gymnos*-naked; *sperma*-seed e.g. naked seed plants) is a group of phanerogams which have naked ovules, i.e. structure (ovules) that eventually become the seeds after fertilisation and not completely enclosed by the tissues of the parent individual.



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

**Ans. (c)**

*Cycas* with largest antherozoids and ovule and the largest plant *Sequoia* belong to gymnosperms.

Gymnosperm is a group of naked seeded plants, i.e. their ovules are not enclosed by ovary walls. Ovules of gymnosperms are directly borne on the megasporophyll.

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

**Ans. (c)**

Pteridophytes and gymnosperms do have vascular tissues. However, gymnosperms bear seeds while pteridophytes not bear seeds. Algae and bryophytes do not possess vascular tissues.

- 90** Largest sperms in the plant world are found in [CBSE AIPMT 1998]  
(a) *Pinus* (b) Banyan  
(c) *Cycas* (d) *Tsuja*

**Ans. (c)**

*Cycas* is a gymnospermic plant. It has the biggest sperms (antherozoids) and ovules in the plant world.

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

**Ans. (c)**

Statements (c) is incorrect regarding *Cycas* as Vessels are absent from the xylem of all gymnosperms (except Gnetales). *Cycas* belongs to Cycadales (not Gnetales).

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

**Ans. (a)**

The tendency towards seed formation is called seed habit. It was developed in fossil gymnosperm of group Cycadofilicales (pteridosperms), i.e. seed ferns, e.g. *Lyginopteris* which bears characters of cycads and ferns both. Seed habit is shown by few pteridophytes like *Selaginella*, *Marselia*, *Isoetes*, etc. which exhibit heterospory.

- 93** The 'wing' of *Pinus* seed is derived from [CBSE AIPMT 1994]  
(a) testa  
(b) testa and tegmen  
(c) surface of ovuliferous scale  
(d) All of the above

**Ans. (c)**

The wings of seed of *Pinus* is thin, membranous diploid and develops jointly from the basal upper surface (adaxial) of ovuliferous scale and outer layer of integument of the ovule.

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

**Ans. (c)**

Gymnosperms, (e.g. *Pinus*) are commonly called as naked seeded plants since their ovules (which later become seed) are not covered and lie naked on the surfaces of specialised leaves (megasporophylls or ovuliferous scales) arranged into cones.

Thus, gymnosperms are also known as seeded plants without flowers or phanerogams without ovary. In contrast, angiosperms are seed bearing, flowering vascular plants in which seeds are enclosed in fruits, and are called as phanerogams with ovary or seeded flowering plants.

- 95** Which one is the most advanced from evolutionary view point? [CBSE AIPMT 1993]  
(a) *Selaginella*  
(b) *Funaria*  
(c) *Chlamydomonas*  
(d) *Pinus*

**Ans. (d)**

From the evolutionary point of view, the given options can be arranged as *Chlamydomonas*, *Funaria*, *Selaginella*, and *Pinus*.

*Pinus*, i.e. gymnosperms are the most evolved seed bearing phanerogamic vascular sporophytic plants, after angiosperms (most advanced group of plants).

Pteridophytes (e.g. *Selaginella*) are spore bearing non-seeded vascular cryptogams. Algae, bryophytes and pteridophytes resemble each other in dependence on water for fertilisation.

- 96** A plant having seeds but lacking flowers and fruits belongs to [CBSE AIPMT 1992]  
(a) pteridophytes  
(b) mosses  
(c) ferns  
(d) gymnosperms

**Ans. (d)**

Gymnosperms (Gk *Gymno*=naked ; *sperma*=seed) are commonly known as naked seed plants because their ovules (which later become seeds) are not covered and lie naked on the surfaces of specialised leaves called megasporophylls or ovuliferous scales, arranged into cones, flowers are absent; seed may have two, (e.g. *Cycas*) or more (e.g. *Pinus*) cotyledons.

- 97** In *Pinus*, the pollen grain has 6 chromosomes then its endosperm will have the chromosome [CBSE AIPMT 1992]  
(a) 12 (b) 18  
(c) 6 (d) 24

**Ans. (c)**

In gymnosperms (*Pinus*) both the pollen grains and endosperm are haploid structure, formed before fertilisation. If the pollen grain has haploid number of chromosome equal to 6, then its endosperm will also have the same number of chromosome, i.e. 6.

- 98** Resin and terpentine are obtained from [CBSE AIPMT 1992]  
(a) *Cycas* (b) *Pinus*  
(c) *Cedrus* (d) *Abies*

**Ans. (b)**

*Pinus roxburghii* is a source of resin and terpentine, obtained after distillation. Terpentine is utilised in varnishes and paints.

**99** In *Pinus*/gymnosperms, the haploid structure are  
[CBSE AIPMT 1989]

- (a) megaspore, endosperm and embryo
- (b) megaspore, pollen grain and endosperm
- (c) megaspore, integument and root
- (d) pollen grain, leaf and root

**Ans. (b)**

In gymnosperms, the megaspore (haploid) is first cell of female gametophyte and undergoes repeated divisions to form a multicellular female gametophyte, which because of abundant food reserves, serves as endosperm. So, being produced before fertilisation, endosperm is haploid in gymnosperms.

Microspores or pollen grains are the first cell of the male gametophyte and are haploid in nature.

**100** In *Pinus/Cycas*/gymnosperms, the endosperm is [CBSE AIPMT 1988]  
(a) triploid (b) haploid  
(c) diploid (d) tetraploid

**Ans. (b)**

In gymnosperms, e.g. *Pinus*, *Cycas*, endosperm develops before fertilisation and is haploid in nature. In angiosperms, endosperm is triploid (3n) and formed after double fertilisation.

## TOPIC 5 Angiosperms

**101** Male and female gametophytes do not have an independent free-living existence in [NEET (Oct.) 2020]

- (a) pteridophytes (b) algae
- (c) angiosperms (d) bryophytes

**Ans. (c)**

Male and female gametophyte do not have an independent free-living existence in gymnosperms and angiosperms. In them they remain within the sporangia retained on the sporophytes. The pollen grain is released from the microsporangium and are carried in air currents and come in contact with the opening of the ovules borne on megasporophylls. The pollen tube carrying the male gametes grows towards archegonia in the ovules and discharge their contents near the mouth of the archegonia.

**102** Which is the most common type of embryo sac in angiosperms? [NEET (Odisha) 2019]

- (a) Tetrasporic with one mitotic stage of divisions
- (b) Monosporic with three sequential mitotic divisions
- (c) Monosporic with two sequential mitotic divisions
- (d) Bisporic with two sequential mitotic divisions

**Ans. (b)**

The most common type of female gametophyte (embryo sac) in angiosperms is the monosporic embryo sac in which the embryo sac develops from a single functional megaspore (n) while the other three megaspores degenerate. The functional megaspore undergoes three sequential mitotic divisions and gives rise to 8-nucleate and 7-celled mature embryo sac.

**103** Male gametophyte with least number of cells is present in [CBSE AIPMT 2014]

- (a) *Pteris*
- (b) *Funaria*
- (c) *Lilium*
- (d) *Pinus*

**Ans. (c)**

*Lilium* (angiosperm) possesses the male gametophyte with least number of cells.

The number of cells in male gametophyte shows the pattern of reduction from bryophytes to angiosperms. In angiosperms, it is reduced to about 2-3 celled and called as pollen grains.

The number of cells in male gametophyte decreases in the following order

*Funaria* > *Pteris* > *Pinus* > *Lilium*

**104** Compared with the gametophytes of the bryophytes, the gametophytes of vascular plants tends to be [CBSE AIPMT 2011]

- (a) larger but to have smaller sex organs
- (b) larger and to have large sex organs
- (c) smaller and to have smaller sex organs
- (d) smaller but to have larger sex organs

**Ans. (c)**

As we proceed from thallophyta to angiosperms, there is gradual reduction in gametophyte with reduced size of sex organs. From thallophyta to angiosperms, there is progressive elaboration of sporophytes.

Phase	Thallo- phyta	Bryop- hyta	Pterido- phyta	Gymno- sperms	Angio- sperms
Gameto- phyte (%)	90	75	50	25	10
Sporop- hyte (%)	10	25	50	75	90

**105** Conifers differ from grasses in the [CBSE AIPMT 2006]

- (a) lack of xylem tracheids
- (b) absence of pollen tubes
- (c) formation of endosperm before fertilisation
- (d) production of seeds from ovules

**Ans. (c)**

The conifers (gymnosperm) differ from the grasses (angiosperm) in the formation of **endosperm before fertilisation**. Infact, in gymnosperms, the endosperm is a haploid tissue as it formed before fertilisation, while in angiosperms, endosperm is formed after fertilisation as a result of triple fusion or double fertilisation, thus, it is a triploid tissue.

In both conifers and grasses seeds are produced from ovules.

Xylem tracheids are present in both conifers and grasses.

Pollen tubes are also formed in both conifers and grasses.

**106** Angiosperms have dominated the land flora primarily because of their [CBSE AIPMT 2004]

- (a) power of adaptability in diverse habitat
- (b) property of producing large number of seeds
- (c) nature of some pollination
- (d) domestication by man

**Ans. (a)**

Angiosperms are well adapted to terrestrial life and occur in diverse habitats like cold tundra to hot tropical and even desert areas. They also thrive well in aquatic habitat. Hence, they being the most successful, to have dominated the land flora.

**107** Which of the following is without exception in angiosperms? [CBSE AIPMT 2002]

- (a) Presence of vessels
- (b) Double fertilisation
- (c) Secondary growth
- (d) Autotrophic nutrition

**Ans. (b)**

A few plants, (e.g. *Rafflesia*) are parasitic. Some angiosperm genera are vesselless. Secondary growth does not take place in a large variety of angiosperms. However, double fertilisation is met with amongst all angiosperms.

In this one male gamete fuses with egg nucleus ( $n$ ). This is known as syngamy and the second male gamete fuses with the secondary nucleus or polar nuclei ( $2n$ ). This is known as triple fusion. Together these syngamy and triple fusion is known as double fertilisation.

## TOPIC 6

### Plant Life Cycle and Alternation of Generations

**108** Match items in column I with those in column II.

Column I	Column II
A. Peritrichous flagellation	1. <i>Ginkgo</i>
B. Living fossil	2. <i>Macrocystis</i>
C. Rhizophore	3. <i>Escherichia coli</i>
D. Smallest flowering plant	4. <i>Selaginella</i>
E. Largest perennial alga	5. <i>Wolffia</i>

Select the correct answer from the following.

[CBSE AIPMT 2005]

- |               |               |
|---------------|---------------|
| A B C D E     | A B C D E     |
| (a) 3 1 4 5 2 | (b) 2 1 3 4 5 |
| (c) 5 3 2 5 1 | (d) 1 2 5 3 2 |

**Ans. (a)**

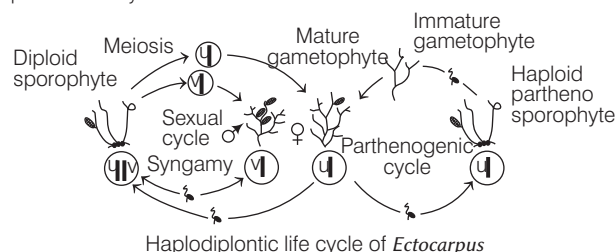
Column I	Column II
A. Peritrichous flagella (flagella all over the body)	1. <i>Escherichia coli</i> (a bacterium)
B. Living fossil	2. <i>Ginkgo biloba</i> (maiden hair tree)
C. Rhizophore (a form of aerial adventitious roots)	3. <i>Selaginella</i> (a pteridophyte)
D. Smallest flowering plant	4. <i>Wolffia</i>
E. Largest perennial algae	5. <i>Macrocystis</i>

**109** Life cycle of *Ectocarpus* and *Fucus* respectively are [NEET 2017]

- (a) Haplontic, Diplontic
- (b) Diplontic, Haplodiplontic
- (c) Haplodiplontic, Diplontic
- (d) Haplodiplontic, Haplontic

**Ans. (c)**

*Ectocarpus* and *Fucus* respectively show haplodiplontic and diplontic life cycle.



**Concept Enhancer** In *Ectocarpus* sporic meiosis occurs and haploid biflagellate meiozoospores are formed. They germinate to produce gametophytic thalli. The gametophytes liberate gametes, which fuse to form diploid zygote, which gives rise to a diploid plant.

**110** Metagenesis refers to [CBSE AIPMT 2015]

- (a) the presence of different morphic forms
- (b) alternation of generation between asexual and sexual phases of an organism
- (c) occurrence of a drastic change in form during post-embryonic development
- (d) the presence of a segmented body and parthenogenetic mode of reproduction

**Ans. (b)**

Metagenesis in an organism refers to the reproduction characterised by the alteration of a sexual generation and a generation that reproduces asexually, i.e. alteration of generations.

**111** Which one of the following is considered important in the development of seed habit? [CBSE AIPMT 2009]

- (a) Dependent sporophyte
- (b) Heterospory
- (c) Haplontic life cycle
- (d) Free-living gametophyte

**Ans. (b)**

Heterospory is the production of spores of two different sizes and of two different developmental patterns. It is the most important evolutionary development in the vascular plants because it has ultimately lead to seed development, which is seen in, *Selaginella*, *Salvinia*, *Azolla*, etc.