

**Class: XI**  
**Subject: Biology**  
**Topic: Plant kingdom**  
**No. of Questions: 25**

Q1. What is the basis of classification of algae?

Sol. Earlier, the algae were classified on the basis of single visible character, viz., color of algae thalli (e.g., green algae, brown algae, red algae, etc.) Now they are classified on the basis of more than one characters, i.e., (i) color of thalli; (ii) their storage products; (iii) cell wall chemistry; (iv) flagellation and cellular organizations.

Q2. When and where does reduction division take place in the life cycle of a liverwort, a moss, a fern, a gymnosperm and an angiosperm?

Sol. In all the cases i.e., liverwort, moss, fern, gymnosperm and angiosperm, reduction division (meiosis) take place in spore mother cells present in the sporangia of sporophytic generation.

Q3. Name three of plants that bear archegonia. Briefly describe the life cycle of any one of them.

Sol. Archegonia occur in Bryophytes, Pteridophytes and Gymnosperms.

The gametophytic plant body of liver worts is usually dorsiventral, leaf-like and gives the appearance of liver. The common examples of liver worts are Riccia, Marchanti, Peltia, etc.

The most common example of liver worts is Marchantia. The vegetative plant body of Marchantia is a dorsiventral lobed thallus. It is dichotomously branched. The upper surface of thallus is smooth whereas the lower surface bears a large number of unicellular and unbranched rhizoids which penetrate into the soil. Asexual reproduction in Marchantia occurs by the formation of gemmae. The gemmae are multicellular, green and biconvex-lens shaped bodies produced in gemma cups. They detach from gemma cups and germinate to produce new plants. Sexual reproduction occurs by the formation of sex organs borne on special branches. The male 'antheridia' are borne on antheridiophores. They produce flagellated antherozoids or sperms. The female reproductive organs are 'archegonia'. They are borne on special stalked branches called archegoniophores. Each archegonium is differentiated into neck and venter. The egg is enclosed inside the venter. After fertilization, the egg becomes zygote (2N) which grows to produce sporophyte. The sporophyte of bryophytes is called sporogonium. The sporogonium of Marchantia is very small (about bulbous foot, short seta and an oval capsule. Inside the capsule, the diploid spore mother cells divide by meiosis and produce haploid spores which are dispersed by wind.

Q4. Mention the ploidy of the following : protonemal cell of a moss; primary endosperm nucleus in dicots; leaf cell of a moss; prothallus cell of a fern; gemma cell in Marchantia, meristem cell of monocot; ovum of a liverwort and zygote of a fern.

Sol. Protonemal cell of a moss	: Haploid (n)
Primary endosperm nucleus in dicots	: Triploid (3 n)
Leaf cell of a moss	: Haploid (n)
Prothallus cell of a fern	: Haploid (n)
Gemma cell in Marchantia	: Haploid (n)
Meristem cell of monocot	: Diploid (2 n)
Ovum of a liverwort	: Haploid (n)
Zygote of a fern	: Diploid (2 n)

Q5. Write a note on economic importance of algae and gymnosperm.

Sol. Economic importance of algae:

- Many green algae such as Chlorella, Ulva, Caulerpa, Enteromorpha, etc. are used as food. Chlorella, a unicellular green alga, possesses a high quality of food value. It has about 50% protein and 20% lipid and carbohydrates. Ulva is collected and processed as a food product.
- Alginic acid – It is a phycocolloid extracted commercially from giant brown algae or kelps eg. Laminaria, Fucus, Ascophyllum, Macrocystis etc. In India it is obtained from Sargassum. Alginic acid is a polysaccharide containing galuronic and mannuronic acids. It yields alginates of commercial importance. Alginates are used as thickener (in preparation of soap, sauce, cream, printing ink), emulsifier (in ice cream, polish, emulsion paints) and gelling agents in confectionary and dental impression powder.
- Biofoulers - Some brown algae act as biofoulers and get attached to the hulls of ships. Larger sea weeds like Sargassum float in masses get entangled with the submerged parts of the ships and slow down their speed.
- Medicines – Many red algae have medicinal importance and used in the preparation of medicines. For example, extracts of Corallina are used for the treatment of kidney, bladder and lung diseases and for curing worm infections. Polysiphonia has anti-bacterial properties; Agar is used as a laxative and employed for manufacture of pills and ointments, Carrageenin acts as a blood coagulant.

- e) Bromine – A few red algae like Rhodomelia and Polysiphonia are used to obtain Bromine of commercial importance.

Economic importance of Gymnosperms:

- a) Ornamental uses – Many gymnospermous plants eg. Cycas revoluta, Thuja, Araucaria, Cryptomeria etc. are usually cultivated in the gardens as ornamental. Leaves of Cycas and Thuja are extensively used in the floral decorations.
- b) Source of wood – Many gymnospermous trees, particularly conifers e.g. Pine, Cedar, Douglas fir, Spruce, Larck, Hemlock, yew etc., are of great importance for their light colored, straight grained and light weighed soft wood. The wood is extensively used as timber as building material, in making furniture, packing cases, match boxes, pencils, railway sleepers, paper fuel and as fuel.
- c) Edible products – Stem and seeds of cycads yield 'sago' starch. Seeds of many cycads and conifers are edible. Seeds of Pinus gerardiana are used as dry fruits, called chilgoza.
- d) Tannins – These are complex phenol substances obtained from the bark of Tsugo candensis (Hemlock).
- e) Essential oils – Many gymnosperms yield essential oils which are used in perfumery and as flavoring agent.

Q6. Both gymnosperms and angiosperms bear seeds. But, then why are they classified separately?

Sol. Gymnosperms and angiosperms are classified separately because of the following reasons:

- a) The ovules of gymnosperms are naked. But in angiosperms, they are enclosed inside the ovary.
- b) In gymnosperms, the wood is non-porous, i.e., the vessels are absent. In angiosperms, the wood is porous, i.e., the vessels are present.
- c) The archegonia are absent in angiosperms whereas they are present in gymnosperms.

Q7. What is heterospory? Briefly comment on its significance. Give two examples.

Sol. Heterospory. Heterospory is the production of two different kinds of spores, i.e., male microspores and female megaspores in two separate sporangia, i.e., microsporangia and megasporangia.

Significance of heterospory is the first step towards seed habit.

Examples: Selaginella and Marsilea.

Q8. Explain briefly the following terms with suitable example:

- (i) Protonema
- (ii) Antheridium
- (iii) Archegonium
- (iv) Diplontic
- (v) Sporophyll
- (vi) Isogamy.

Sol.

- (i) Protonema. The gametophytic plant body of a moss and ferns are called protonema. They are haploid, e.g., Moss and Ferns.
- (ii) Antheridium. Male sex organs of bryophytes and pteridophytes are called antheridia. Each antheridium has a body and a stalk. The body encloses antherozoids covered by jacket. E.g. Marchantia.
- (iii) Archegonium. Female sex organs of bryophytes and pteridophytes are called archegonia. Each archegonium is differentiated into neck, venter and stalk. The egg is enclosed within the venter, e.g., Marchantia.
- (iv) Diplontic. It is a kind of life cycle in which the diploid sporophytic generation is dominant. The gametophytic phase is represented by the single to few called haploid gametophyte. Examples, gymnosperms and angiosperms.
- (v) Sporophyll. The leaf bearing sporangia is called sporophyll, e.g., ferns.
- (vi) Isogamy. It is a kind of sexual fusion in which the two fusing gametes are morphologically and physiologically similar e.g., Chlamydomonas.

Q9. Differentiate between the following:

- (i) Red algae and brown algae
- (ii) Liverworts and moss
- (iii) Homosporous and Heterosporous pteridophytes
- (iv) Syngamy and triple fusion.

Sol.

- (i) Differences between red algae and brown algae.  
Green algae are mostly fresh water, unicellular forms are abundant, thylakoids stacked in groups of 2-20, and chlorophyll a and chlorophyll b are present, fucoxanthin and phycobilins are absent, reserve food material is starch.  
Brown algae are mostly marine, unicellular forms are absent, thylakoids stacked in groups of three, chl a and chl c is present. Fucoxanthin is present but phycobilins are absent. Reserve food material is laminarin.
- (ii) Differences between liverworts and moss.

In liverworts, the gametophytic plant body is dorsiventral, leaf-like and gives the appearance of liver whereas in the gametophytic plant body of moss is differentiated into stem like axis and leaf like lobes. It is radially symmetrical.

(iii) Difference between syngamy and triple fusion.

Syngamy is fusion between egg and male gamete whereas as triple fusion is fusion of male gamete with two polar nuclei in the endosperm of angiosperms.

Q10. Give the major differences between dicotyledons and monocotyledons.

Sol. The main differences between dicotyledons and monocotyledons are given in tabular form :

Dicotyledons	Monocotyledons
1. Plants mainly bear tap roots.	1. Plants mainly bear adventitious roots.
2. Leaves show reticulate venation.	2. Leaves show parallel venation.
3. Flowers are usually tetra or pentamerous.	3. Flowers are usually trimerous.
4. Embryos have two cotyledons.	4. Embryos have one cotyledon.
5. Vascular bundles are arranged in ring in stems.	5. Vascular bundles are scattered in the ground tissue in stems.
6. Vascular bundles are open with cambium.	6. Vascular bundles are closed and without cambium.

Q11. How would you distinguish monocots from dicots?

Sol.

Plant Part	Monocots	Dicots
Root system	Primary tap root is short-lived and replaced by adventitious roots.	Primary tap root is long-lived. Adventitious roots also occur in some cases.
Stem	Vascular bundles are scattered. Vascular cambium is absent.	Vascular bundles are arranged in a ring. Vascular cambium is present.
Leaves	Mostly show parallel venation patterns.	Mostly show reticular venation patterns.
Floral parts	The number of flower parts mostly in threes (trimerous)	The number of flower parts mostly in fours or fives (tetra or pentamerous).
Cotyledons	One	Two (seldom 1, 3, 4)

Q12. Match the following (Column I with column II)

Column I	Column II
(a) Chlamydomonas	(i) Moss
(b) Cycas	(ii) Pteridophyte
(c) Selaginella	(iii) Algae
(d) Sphagnum	(iv) Gymnosperm

Sol.

(a) (iii); (b) (iv) ; (c) (ii) ; d (i)

Q13. Describe the important characteristics of gymnosperms.

Sol. a) The living gymnosperms are widely distributed in the cold climate where snow, rather than rain is the source of water. The only native gymnosperms that thrive in warmer areas are the cycads.

b) Living gymnosperms are perennials, xerophytic, evergreen, arboreal, woody plants. They grow as woody trees, bushy shrubs or rarely as climbers (e.g. Gnetales). None of them are herbs or annuals.

c) The plant body is sporophyte and differentiated into stem, roots and leaves.

d) Plant possesses vascular tissues that are xylem and phloem. They are arranged in vascular bundles. The vascular bundles of stem are conjoint, collateral and open. Secondary growth occurs and annual rings are distinct in most of the gymnosperms.

e) Gymnosperms are heterosporous, that is produces two different kinds of spores – the male microspores and the female megaspores. The spores are borne inside the sporangia.

Q14. Give one example each of the following:

- (i) A red alga that grows in fresh water habitats.
- (ii) A liverwort.
- (iii) A pteridophyte commonly called the walking fern.
- (iv) A gymnosperm which is considered as a living fossil.

Sol.

- (i) Batrachospermum
- (ii) Marchantia

- (iii) Adiantum
- (iv) Cycas

Q15. Name any three series belonging to class: Monocotyledous in Benthan and Hooker's system of classification.

Sol. Microspermae, Epigynae and Coronarieae

Q16. Name the different pigments found in Algae

Sol. Chlorophyll a, Chlorophyll b, Chlorophyll c, Chlorophyll d, Carotenoids, Xanthophylls, Phycoerythrins and phycocyanins.

Q17. What are rhizoids and what is their function?

Sol. Rhizoids are unicellular or multicellular outgrowths of gametophytes. They perform the functions of root i.e., absorb water and minerals and anchor the plant to the substratum.

Q18. Which group of plants is responsible for maximum fixation of carbon dioxide on earth? Explain how they increase the level of dissolved oxygen in their immediate environment.

Sol. Algae fix at least half of the total carbon dioxide fixation on earth by the process of photosynthesis. They are mostly aquatic and occur in fresh water as well as marine habitats. They release oxygen into the environment and consume carbon dioxide in the process of photosynthesis. Thus, they increase the level of dissolved oxygen in the water bodies.

Q19. Name the four divisions of seedless vascular plants and give one example of each. Which plant is considered as earliest vascular land plant?

Sol. Divisions of seedless vascular plants and their examples are – (i) psilophyta, e.g., Rhynia and Psilotum; (ii) lycophyta, e.g., Lycopodium; (iii) sphenophyta, e.g., Equisetum; (iv) filicophyta, e.g., Dryopteris. Cooksonia is considered as an earliest vascular land plant discovered from Mid. Silurian of Ireland.

Q20. Name the first angiosperm and give its approximate age.

Sol. Archaeofructus liaoningensis is considered as first angiosperms discovered from lower part of the upper Jurassic/lower cretaceous vixian formation of China (124.6 million years old).

Q21. Which one of the following is heterosporous?

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

Sol. (d)

Q22. Yellow green pigment is found in

- a) Xanthophyta
- b) Chlorophyta
- c) Phaeophyta
- d) Rhodophyta

Sol. (a)

Q23. The gametophyte is not an independent free living generation in

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

Sol. (d)

Q24. Identify the pair that exhibits cercinate venation

- a) Nephrolepsis and Cycas
- b) Riccia and Nephrolepsis
- c) Psilotum and Riccia
- d) Equisetum and Selaginella

Sol. (a)

Q25. Which one of the following pairs is wrongly matched?

- a) Ginkgo – Archegonia
- b) Salvinia – Prothallus
- c) Viroids – RNA
- d) Mustard – Synergids

Sol. (b)

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