3. Plant kingdom

Question 1. What is the basis of classification of algae?

Answer: The presence or absence of pigments in the algae serves as the main basis of classification of algae:

1. Chlorophyceae is the green algae which contains chlorophyll a and b as the main pigments. The stored food is in the form of starch. They have 2-8 flagella in their body.
2. Phaeophyceae is the brown algae which contains chlorophyll a, c and fucoxanthin. The stored food is in the form of mannitol, laminarin, etc. They have two unequal flagella in the lateral part.
3. Rhodophyceae is the red algae which contains chlorophyll a, d and phycoerythrin. The stored food is in the form of Floridian starch. The flagella is absent.

Question 2. When and where does reduction division take place in the life cycle of a liverwort, a moss, a fern, a gymnosperm and an angiosperm?

Answer:
Liverwort: The main plant body is haploid (gametophytic). The plant body has both male and female sex organs which are capable of producing gametes. The gametes fuse to form the zygote. The zygote develops on a gametophytic plant body to produce a sporophyte. The sporophyte can be differentiated into foot, seta and capsule. Haploid spores are formed as a result of reductional division in the capsule.
Moss: The primary protonema develops into the secondary protonema. The stages are haploid or gametophytic. The secondary protonema has sex organs which produce gametes. The gametes fuse to form the zygote. The zygote forms the sporophyte. The spores are formed because of the reductional division taking place in the sporophyte capsule.
Fern: The plant body is sporophytic. The leaves bear sporangia and the reductional division takes place in the sporangia giving out many spores.
Gymnosperm: The main plant body is sporophytic which bears two types of leaves – microsporophylls and megasporophylls. The reductional division occurs in microsporangia present on the microsporophylls which produces pollen grains and megasporangia present on the megasporophylls.

Angiosperm: The main plant body is sporophytic and has flowers. The male sexual organs in the flower is stamen while the female sexual organ is pistil. The reductional division occurs in stamen and ovary of the pistil.

Question 3. Name three groups of plants that bear archegonia. Briefly describe the life cycle of any of them.

Answer: Archegonium is the female sexual organ that produces female gamete or egg. The archegonium is present in the life cycles of bryophytes, pteridophytes and gymnosperms.
Life cycle of a fern:
Dryopteris is the common fern composed of pinnately compound leaves. The main plant body is sporophytic. The sporangia are present on the lower surfaces of the mature leaves. The sporangium has spore mother cells which undergo meiosis to give rise to haploid spores. The spores on maturing produce heart-shaped gametophyte called prothallus. The prothallus consists of male and female sexual organs known as antheridia and archegonia respectively. Antheridia produces sperms which flows to the archegonia in water. Archegonia produces an egg. The zygote forms the sporophyte and young plants come out from archegonium.

Question 4. Mention the ploidy of the following: protonemal cells of a moss; primary endosperm nucleus in dicot, leaf cell of a moss; prothallus cell of a fern, gemma cell in Marchantia: meristem cell of a monocot, ovum of a liverwort and zygote of a fern.

Answer:
Protonemal cell – Haploid (n)
Primary endosperm nucleus of dicot – Triploid (3n) Leaf cell of moss – Haploid (n)
Prothallus cell of the fern – Haploid (n)
Gemma cell of Marchantia – Haploid (n)
Meristem cell of monocot – Diploid (2n)
Ovum of the liverwort – Haploid (n)
Zygote of a fern – Diploid (2n)

Question 5. Write a note on economic importance of algae and gymnosperms.

Answer: Economic importance of algae:

1. *Gelidium* and *Gracilaria* are used in the manufacturing of agar which can be used in the preparation of jellies, puddings, cream etc.
2. The brown algae are menace for shipping.
3. *Porphyra, Laminaria* and *Sargassum* are used as food.
4. *Chlorella* is used to manufacture antibiotic chlorellin.

Economic importance of Gymnosperms:

(1) Conifers provide soft wood for construction, plywood, paper industry, etc. (2) *Pinus* seeds are edible.
(3) The saw dust of conifers are used in making linoleum and plastics.
(4) Ephedrine drug is obtained from Ephredra used in asthma.

(5) Used in silk industry to create silk and textiles.

Question 6. Both gymnosperms and angiosperms bear seeds, then why are they classified separately?

Answer:
Gymnosperms and angiosperms are seed producing plants having diplontic life cycles.
The seeds of the gymnosperms are naked as they donot have an outer covering of the fruit surrounding them. The angiosperm seeds are enclosed within the fruit and are not naked.
The gymnosperms do not possess an ovary while in angiosperms the ovaries develop into fruits and ovule develops into seeds after fertilisation.

Question 7. What is heterospory? Briefly comment on its significance. Give two examples.

Answer: Heterospory is the condition in which two types of spores are borne on the same plant. The spores are different in size where the smaller one is known as the microspore while the larger one is known as the megaspore. The microspore develops to form male gametophytes while the megaspore develops to form female gametophyte.

The condition is essential for differentiation of male and female gametes. For example, *Selaginella* and *Salvinia.*

Question 8. Explain briefly the following terms with suitable examples:-

(i) protonema

(ii) antheridium
(iii) archegonium

(iv) diplontic

(v) sporophyll

(vi) isogamy

Answer:

i. Protonema: It is the juvenile, green, autotrophic filament like haploid, independent, gametophytic stage in the life cycle of mosses. It is produced from the germination of spores and gives rise to new gametophytic plants.

ii. Antheridium: The male sex organ encapsulated in bryophytes and pteridophytes. It produces male gametes or antherozoids.

iii. Archegonium: The female sex organs which are encapsulated in bryophytes, pteridophytes and gymnosperms. It produces a female gamete or egg or ovum.

iv. Diplontic: The life cycle where the dominant free living phase is diploid (2n) and produces haploid gametes on meiosis. For example, *Fucus, Sargassum*.

v. Sporophyll: The leaf bearing sporangia or sori. They can be either microsporophyll or megasporophyll. The sporophylls together form cones or strobili. For example, sporophyll of fern; Stamen and carpel of angiosperms.

vi. Isogamy: The sexual reproduction where the fusion of gametes is similar in structure and function, for example, *Ulothrix*, *Ectocarpus*.

Question 9. Differentiate between the following:-

(i) red algae and brown algae

(ii) liverworts and moss

(iii) homosporous and heterosporous pteridophyte

(iv) syngamy and triple fusion

Answer: The differences are as follows:

(i) Red algae are classified under Rhodophyceae whereas the brown algae are classified under Phaeophyceae.

Red algae contain starch as the stored food material while brown algae stores food in the form of mannitol or laminarin
Red algae consists of chlorophyll a and d and phycoerythrin whereas brown algae contains chlorophyll a and c and fucoxanthin.

(ii) Liverworts have unicellular rhizoids whereas mosses have multicellular rhizoids. The scales are present in the liverworts while absent in mosses.
The body of liverworts is thalloid whereas of mosses are foliage with lateral branching.

(iii) Homosporous pteridophytes have spores of the same type but heterosporous have different types of spores.

Homosporous produce bisexual gametophytes whereas heterosporous produce unisexual gametophytes.

(iv) Syngamy is the fusion of male and female gametes whereas triple fusion is the fusion of male gamete with the diploid secondary nucleus in an angiosperm. Syngamy produces diploid zygote whereas triple fusion produces triploid primary endosperm.

Question 10. How would you distinguish monocots from dicots?

Answer:

Monocots	Dicots
Embryo has a single cotyledon.	Embryo has two cotyledons.
Pollen has a single furrow or pore.	Pollen has three furrows or pores.
The leaf veins are majorly parallel.	The leaf veins are majorly reticulated.
Adventitious roots are present.	Roots develop from the radicle.
Secondary growth is absent.	Secondary growth is present.
Stem vascular bundles are scattered.	Stem vascular bundles in a ring.
Vascular cambium is absent.	Vascular cambium is present.

Question 11. **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

Answer:

(a) Chlamydomonas (iii) Algae

(b) Cycas (iv) Gymnosperm

(c) Selaginella (ii)Pteridophyte

(d) Sphagnum (i)Moss

Question 12. **Describe the important characteristics of gymnosperms.**

Answer: The characteristics of gymnosperms:

(1) Gymnosperms are the plants with naked seeds that is the seeds are not enclosed in fruits.

(2) The plant body ranges from medium to tall trees and shrubs.

(3) The root type is tap root. Coralloid roots are present in *Cycas* which are associated with nitrogen fixing bacteria.

(4) The leaves can be simple or compound. They are needle like with thick cuticle and sunken stomata to prevent loss of water.

(5) The stem can be branched or unbranched.

(6) Flowers are absent. Microsporophylls and megaporophylls are arranged to form compact male and female cones.

(7) They are heterosporous and possess two types of spores- megaspores and microspores.

(8) The seeds possess haploid endosperms and remain uncovered.