Biology NCERT Class 11 Chapter 3 – Plant Kingdom

1. What is the basis for classification of algae?

Solution:

The presence of pigments that give the traditional colour on algae is the main basis for the classification of algae.

Name of the pigment	Colour imparted	Chlorophyll type
Chlorophyceae	Green	chlorophyll a and chlorophyll b
Phaeophyceae	Brown	chlorophyll a, chlorophyll c, fuxoxanthin
Rhodophyceae	Red	chlorophyll a and chlorophyll d, phycoerythrin

Now, algae are classified on different criteria such as:

(i) Flagellation

(ii) Storage products

(iii) Cellular organization

(iv) Constitution of cell walls

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?

Solution:

The reduction division takes place in the following stages:

(i) Liverworts – meiosis takes place in the spore mother cells of the capsule in sporangium resulting in haploid spore formation

(ii) Moss – meiosis occurs in spore mother cells of spore sacs in the capsule of sporangium.

(iii) Fern – sporangia are endured on sporophylls (fertile leaves). The process of meiosis occurs in spore mother cells of sporangium for the formation of haploid spores.

(iv) Gymnosperm – meiosis occurs in microsporangia located in the microsporophylls, in the microspore mother cells for the formation of haploid pollen grains giving rise to male gametophyte

(iv) Angiosperm – pollen grains that are formed in microspore mother cells leads to the formation of male gametophyte in the anther of the stamen. The megaspore mother cell located in the nucleus of the ovule undergoes meiosis for the formation of haploid megaspore, which eventually forms the female gametophyte.

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

Solution:

Bryophytes, Pteridophytes, and Gymnosperms are the plants that bear archegonia.

The life cycle of Bryophytes

(i) Bryophytes are haploid, and produce gametes. The sexual organs in bryophytes are multicellular.

(ii) The male sex organ is the antheridium, which produces biflagellate anterozoids. Female sexual organs are called archegonium, which produces a single egg.

(iii) Antheridium releases anthrozoids into the water that come in contact with the archegonium.

(iv) An antherozoid fuses with the egg to produce the zygote.

(v) The zygote undergoes reduction division to produce a multicellular body called a sporophyte.

(vi) Sporophytes undergo reduction division to produce haploid spores.

(vii) These spores germinate to produce gametophyte.

4. Mention the ploidy of the following:

protonemal cell 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 monocot, ovum of a liverwort, and zygote of a fern.

Solution:

Cell	Type of Ploidy
Protonemal cell of a moss	Haploid
Primary endosperm nucleus in dicot	Triploid
leaf cell of a moss	Haploid
Prothallus cell of a fern	Haploid

Gemma cell in Marchantia	Haploid
Meristem cell of monocot	Diploid
Ovum of a liverwort	Haploid
Zygote of a fern	Diploid

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

Solution:

Importance of Gymnosperms

(i) Gymnosperms are used as ornamental plants. Some are features in formal gardens – used for bonsai

(ii) Their fibers are used in the preparation of paper pulp

(iii) Turpentine and resins are obtained from confers resin

(iv) Useful oils are extracted from gymnosperms like junipers, pines, hemlock, fir, spruces, and arborvitae

(v) Gymnosperm seeds are used as food products such as bakery items

(vi) Occasionaly used to create silk and other textiles

Importance of Algae

(i) Algae fixes carbon dioxide with the help of photosynthesis

(ii) It increases the level of dissolved oxygen in their immediate environment

(iii) They produce rich compounds that serve as food for aquatic animals

(iv) Marine algae are used as food. For example, Laminaria and Sargassum

(v) Certain algae are used as hydrocolloids

(vi) Agar is used in growing microorganisms and in the preparation of jellies

(vii) Chlorella is used as food by space travellers.

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

Solution:

The reasons for distinguishing angiosperms and gymnosperms are as follows.

(i) In gymnosperms, the ovules are naked but in angiosperms they are enclosed within the ovary.

(ii) In Gymnosperms endospore is haploid and produced before fertilization whereas in Angiosperms endosperm is triploid and formed after double fertilization.

(iii) Double fertilization does not occur in gymnosperms, but in angiosperms, double fertilization occurs.

(iv) In gymnosperms, wood is nonporous and in angiosperms wood is porous.

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

Solution:

The phenomenon of producing two different types of spores in the same plant is called heterosporis. The importance of heterospory is as follows:

(i) Heterosporis causes the growth of seeds in gymnosperms and angiosperms.

(ii) It is required in the differentiation of male and female gametophytes.

Examples: Salvinia, Selaginella

8. Explain briefly the following terms with suitable examples:

(i) protonema

(ii) antheridium

(iii) archegonium

(iv) diplontic

(v) sporophyll

(vi) isogamy

Solution:

i) Protonema is the haploid stage in the bryophyte lifecycle where thread-like chain of cells are formed. For example, in mosses, protonema develops directly from a spore.

ii) Antheridium – The male sex organ, producing male gametes in bryophyte and pteridophytes is called antheridium. For example, many fungi and algae have antheridia during their reproductive phases.

iii) Archegonium is a female reproductive organ of bryophytes which is flask-shaped and produces a single egg. Observed in pteridiophytes, gymnosperms and bryophytes, they are jacketed and multicellular, possessing a neck and a swollen venter.

iv) Diplontic – A life cycle in which dominant free living phase is diploid, generating haploid gametes. For example, Sargassum.

v) A leaf which bears sporangia is called a sporophyll, which may be microsporophyll or megasporophyll. These structures combine to form strobini(cones). For example, Pinus.

vi) Isogamy – Sexual reproduction that takes place through fusion of two gametes which can be flagellated and are similar in size, or non-flagellated (non-motile) but similar in size. Such reproduction is called isogamy. For example, Ectocarpus

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

Solution:

Following are the differences:

i)

1. Red algae contain chlorophyll a and chlorophyll d but brown algae contain chlorophyll a and c.

2. In red algae, Phycobilins are present but brown algae do not have phycobilins.

3. If red algae reserve food in the form of floridian starch, it is laminarin in brown algae.

4. Red algae are not flagellated, and brown algae are flagellated.

ii)

1. There is no protonema phase in the liverworts and the life cycle in the moss begins with the protonema

2. If the plant body is dorsoventral in liverworts, the algal plant body is separated into a stem-axis.

iii) Homosporous possesses only one type of spores whereas heterosporous will have morphologically different spores in different sporangia.

iv) Syngamy is the fusion of the male gamete with the ovum whereas triple fusion is the fusion of another male gamete with two polar nuclei.

10. How would you distinguish monocots from dicots?

Solution:

Monocots	Dicots
Have single cotyledon seed	Seeds having two cotyledons
Flowers are trimerous	Flowers are tetramerous or pentamerous
Venation in leaves is parallel	Have reticulate venations in leaves
Vascular bundle is scattered	Vascular bundle are organised in a

	ring
Absence of vascular cambium	Presence of vascular cambium
Primary root replaced by adventitious roots and are short-lived	Primary roots occur in a few cases. Primary root is long-lived

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

Solution:

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

12. Describe the important characteristics of gymnosperms.

Solution:

The main characteristics of gymnosperms are as follows:

(i) In Gymnosperm the ovules are not enclosed by ovary. They are exposed before and after fertilization

(ii) The seeds are naked

(iii) Gymnosperms include medium-sized trees or tall trees and shrubs

(iv) The roots are taproots

(v) The stems are branched or unbranched

(vi) Leaves are simple and compound

(vii) The plant body is separated into roots, stems and leaves and is sporophyte

(viii) They produce two kinds of spores, so they are called heterosporous

(ix) Fertilization takes place in the absence of external water from syphonogamy