Plant Kingdom

3 Chapter

NCERT Exercise

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

Ans: The main basis of the classification of algae is the presence or absence of pigments. The classification is as follows:

- Chlorophyceae**:** In-class Chlorophyceae chlorophyll a and b both are present and impart a green color. Chlorophyceae are also called 'blue-green algae.

- Phaeophyceae**:** In-class Phaeophyceae chlorophyll a and c and fucoxanthin are present. Fucoxanthin imparts brown color. Phaeophyceae are also called 'brown algae'.

- Rhodophyceae**:** In-class Rhodophyceae chlorophyll a and d and phycoerythrin are present. Phycoerythrin imparts red color. Rhodophyceae is also called 'red algae'.

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?

Ans: In liverwort, moss, and fern, during sexual reproduction, the sporophytic phase of the plant produces haploid spores after meiosis which happens in the spore mother cells. While in gymnosperm and angiosperm, meiosis takes place in the anthers and ovary during the formation of pollen grains and ovules.

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

Ans: Bryophytes, Pteridophytes, and Gymnosperms are the three groups of plants that bear archegonia. The life cycle of gymnosperms involves:

- Reproduction: The gymnosperms are heterosporous produces haploid microspores and megaspores. The micro and megaspores are produced within sporangia that are borne on sporophylls. The spores are arranged spirally along an axis to form lax or compact strobili or cones.

- Male gamete: The microsporangia or male strobili are strobili bearing microsporophylls and microsporangia. The microspores develop into a male gametophytic generation which is highly reduced and is confined to a limited number of cells. This reduced gametophyte is called a pollen grain which develops within the microsporangia.

- Female gamete: The microsporangia or female strobili are the cones bearing megasporophylls with ovules or megasporangia. The male or female cones or strobili can be borne on the same tree as in Pinus or, of needle-like on the different trees as in Cycas. From one of the cells of the nucellus, the megaspore mother cell is differentiated. The nucellus is protected by envelopes and the composite structure that is called an ovule. The ovules are borne on megasporophylls which may get clustered to form the female cones. To form four megaspores the megaspore mother cell divides meiotically. Within the megasporangium or nucellus, one of the megaspores is enclosed and develops into a multicellular female gametophyte that bears two or more archegonia or female sex organs. Within the megasporangium, the multicellular female gametophyte is also retained.

- Fertilization: The pollen grain is released from the microsporangium, and is carried through air currents, and comes in contact with the opening of the ovules develops on megasporophylls. In the ovules, the pollen tube carrying the male gametes grows towards archegonia, and near the mouth of the archegonia, they discharge their contents. The zygote develops into an embryo and the ovules into seeds after completing fertilization.

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 ferm; gemma cell in Marchantia; meristem cell of monocot, ovum of a liverwort, and zygote of a fern.

Ans: The related ploidy is as follows:

- Protonemal cell of a moss – Haploid
- Primary endosperm nucleus in a dicot – Triploid
- Leaf cell of a moss – Haploid
- Prothallus of a fern – Haploid
- Gemma cell in Marchantia – Haploid
- Meristem cell of a monocot – Diploid
- Ovum of a liverwort – Haploid
- Zygote of a fern – Diploid

5. Write a note on the economic importance of algae and gymnosperms.
Ans: The note is as follows:

- Economic importance of algae: In a variety of ways the algae is useful to mankind. They perform half of the total carbon dioxide fixation on earth by photosynthesis, acting as the primary producers in aquatic habitats. Chlorella and Spirulina are rich in proteins. They are used as food supplements as many species of marine algae such as Porphyra, Sargassum, and Laminaria are edible. In the preparation of jellies and ice cream agar is used. It is obtained from Gelidium and Gracilaria. In chocolates, paints, and toothpaste the carrageenan is used as an emulsifier. It is obtained from the red algae. Many red algae are used in treating worm infections eg. Corallina.
- Economic importance of gymnosperms: Gymnospermous plants are widely used as ornamentals. Many conifers such as pine, cedar, etc., are sources of softwood used in construction and packing. It has medicinal uses also as an anticancer drug Taxol is obtained from Taxus. For the treatment of asthma and bronchitis, many species of Ephedra are used which produces ephedrine. The seeds of Pinus gerardiana are edible. For manufacturing sealing waxes and water-proof paints, the resins are used commercially. Turpentine a type of resin is obtained from various species of Pinus.

6. Both gymnosperms and angiosperms bear seeds, then why are they classified separately?
Ans: Both gymnosperms and angiosperms bear seeds, but they are classified separately because the seeds of gymnosperms are naked i.e., they lack any kind of covering around them, while angiosperms are covered mostly by fruits. The presence or lack of coverage leads to very different methods of dispersion and fertilization process.

7. What is heterospory? Briefly comment on its significance. Give two examples.
Ans: A phenomenon in which two kinds of spores are produced by the same plant is known as heterospory. These spores also differ in size. The smaller ones are called microspores and the bigger ones are called megaspores. The male gametophytes are produced by microspores and female gametophytes are produced by megaspores. Thus, it is considered a crucial step in evolution as it is a precursor to the seed habit. In gymnosperms and angiosperms this ultimately led to the development of seed.

8. Explain briefly the following terms with suitable examples:

(i) Protonema

Ans: It is the first stage in the life cycle of moss and is developing directly from the spore. This stage consists of creeping, green, branched, and often filamentous structures.

(ii) Antheridium

Ans: In bryophytes and pteridophytes these are the male sex organ which is surrounded by a jacket of sterile cells. The sperm mother cells are enclosed by antheridium, which gives rise to the male gametes.

(iii) Archegonium

Ans: Archegonium is the female sex organ present in bryophytes, pteridophytes, and gymnosperms. Generally, in bryophytes and pteridophytes, a swollen venter and a tubular neck contain the female gamete called the egg.

(iv) Diplontic

Ans: For the life cycles of seed-bearing plants in gymnosperms and angiosperms the term diplontic is used The diploid sporophyte is dominant, photosynthetic, and independent in seed-bearing plants. A single-celled (or a few celled) structure represents the gametophyte.

(v) Sporophyll

Ans: The sporophytic plant body bears sporangia in pteridophytes. These sporangia are subtended by sporophylls which are leaf-like appendages. Microsporophylls and megasporophylls are found in gymnosperms, which bear microspores and megaspores respectively.

(vi) Isogamy

Ans: A type of sexual reproduction which involves the fusion of morphologically similar gametes is known as isogamy. This indicates that the gametes are of the same size, but perform different functions. In Spirogyra this type of reproduction is commonly observed.

9. Differentiate between the following:

Ans: The differences are given below:

(i) Red algae and Brown algae

Ans:

Red algae	Brown algae
Red algae are grouped under the class Rhodophyceae.	Brown algae are grouped under the class Phaeophyceae.
They contain Floridian starch as stored food.	They contain Mannitol or Laminarin as stored food.
They contain the photosynthetic pigments chlorophyll a and d, and phycoerythrin.	They contain the photosynthetic pigments chlorophyll a and c, and fucoxanthin.
Their cell walls are composed of cellulose, pectin, and phycocolloids.	Their cell walls are composed of cellulose and algin.
Flagella are absent.	Flagella are present.

(ii) Liverworts and Moss
Ans:

Liverworts	Moss
Red algae are grouped under the class Rhodophyceae.	Brown algae are grouped under the class Phaeophyceae.
As stored food they contain Floridian starch.	As stored food they contain Mannitol or Laminarin.
The photosynthetic pigments chlorophyll a and d, and phycoerythrin is present.	Thee photosynthetic pigments chlorophyll a and c, and fucoxanthin is present.
Their cell walls are composed of cellulose, pectin, and phycocolloids.	Their cell walls are composed of cellulose and algin.
Flagella are absent.	Flagella are present.

(iii) Homosporous and Heterosporous pteridophyte
Ans:

Homosporous pteridophyte	Heterosporous pteridophyte
They bear the same types of spores.	Ther bear two different kinds of spores microspores and megaspores.
They produce bisexual gametophytes.	They produce unisexual gametophytes.

10. 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**

Ans: The correct match of column I is represented in column II.

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

11. Describe the important characteristics of gymnosperms.

Ans: The important characteristics of gymnosperms are:

- The seeds of gymnosperm plants are not enclosed in fruits.
- The plant body ranges from medium size to tall trees and also shrubs. The giant redwood tree Sequoia is one of the tallest trees in our world.

- The gymnosperm's root system consists of taproots. The coralloid roots present in Cycas are related to nitrogen fixing cyanobacteria.
- The stems are often branched as we can see in Pinus and Cedrus or unbranched as seen in Cycas.
- The leaves can be simple as observed in Pinus or compound as observed in pinnate in Cycas. The needle-like leaves with a thick cuticle are present along with sunken stomata. These stomata help in preventing water loss.
- Gymnosperms are heterosporous and bear two kinds of spores namely microspores and megaspores.
- Flowers are absent but compact male and female cones are present which are formed due to the specific arrangement of microsporophylls and megasporophylls
- Pollination mostly occurs through wind and through micropyle the pollen grains reach the pollen chamber of the ovule.
- The male and female gametophytes are hooked into the sporophyte.
- The seeds contain haploid endosperms and the covering of the megasporangium turns into a diploid seed shell.