CBSE Class 11 Biology Chapter 3 Plant Kingdom Notes

Plant kingdom includes algae, bryophytes, pteridophytes, gymnosperms and angiosperms. Algae are chlorophyll-bearing simple, thalloid, autotrophic and largely aquatic organisms. Depending on the type of pigment possessed and the type of stored food, algae are classified into three classes, namely Chlorophyceae, Phaeophyceae and Rhodophyceae. Explore CBSE notes chapter 3 Plant kingdom in detail right here.

Topics Covered in Chapter 3 Plant Kingdom:

- **Algae**
- **Bryophytes**
- **Pteridophytes**
- **Gymnosperms**
- **Angiosperms**
- **Plant Life Cycles and Alternation of Generations**

Algae

- Algae are simple, chlorophyll-bearing, thalloid, autotrophic and largely aquatic (both fresh water and marine) organisms. They are found in various habitats: soils, moist stones, wood and soils. Few form associations with fungi (lichen) and animals
- Reproduction - vegetative, asexual and sexual methods. Asexual reproduction is by the production of different types of spores, commonly the zoospores. Vegetative reproduction is through fragmentation. Sexual reproduction occurs via the fusion of two gametes. These gametes can be flagellated and similar in size (as in Ulothrix) or non-flagellated (non-motile) but alike in size (as in Spirogyra). Such reproduction is called isogamous.
- The algae are divided into three main classes: Chlorophyceae, Phaeophyceae and Rhodophyceae.
- Chlorophyceae -commonly known as green algae, their plant body may be unicellular, colonial or filamentous. They are usually grass green as a result of the dominance of pigments chlorophyll a and b. The pigments are localised in definite chloroplasts. Most of the members have one or more storage bodies called pyrenoids(contain protein based starch) found in the chloroplasts. Vegetative reproduction usually takes place by the formation of different types of spores or fragmentation. Asexual reproduction is by flagellated zoospores produced in zoosporangia. The sexual reproduction depicts variation in the formation and type of sex cells and it may be isogamous, anisogamous or oogamous. Examples: Chlamydomonas, Volvox, Ulothrix, Spirogyra
- Phaeophyceae - commonly known as brown algae, these are found in marine habitats. They range from simple branched, filamentous forms (Ectocarpus) to profusely branched forms as represented by kelps. Brown algae possesses chlorophyll a, c, xanthophylls, carotenoids. Food is stored as complex carbohydrates, which may be in the form of laminarin or mannitol. The vegetative cells have a cellulosic wall usually covered on the outside by a gelatinous coating of algin. In addition to plastids, the protoplast contains a centrally located vacuole and nucleus. The plant body is usually attached to the substratum by a holdfast, and has a stalk, the stipe and the frond(leaf-like photosynthetic organ). Asexual reproduction in most brown algae is by biflagellate zoospores that are pear-shaped and have two unequal laterally attached flagella. Vegetative reproduction takes place by fragmentation. Sexual reproduction may be isogamous,

anisogamous or oogamous. Examples - Ectocarpus, Dictyota, Laminaria, Sargassum and Fucus

- Rhodophyceae - commonly called red algae due to the predominance of the red pigment, r-phycoerythrin in their body. Most of these are marine with greater concentrations found in the warmer areas. They are found in both well-lighted regions close to the surface of water and also at great depths in oceans where relatively little light seeps in. Some of them have complex body organisation. The food is stored as floridean starch which is very similar to amylopectin and glycogen in structure. Reproduce vegetatively by fragmentation. They reproduce sexually by non-motile gametes and asexually by non-motile spores. Sexual reproduction is oogamous following complex post fertilisation developments. Examples : Gelidium, Porphyra, Polysiphonia, Gracilaria

Bryophytes

- Bryophytes are commonly found in moist shaded areas in the hills. They include various mosses and liverworts.
- They are referred to as amphibians of the plant kingdom as they live in soil but depend on water for sexual reproduction.
- Their plant body is more differentiated compared to algae. It is thallus-like and erect attached to the substratum by multicellular or unicellular rhizoids.
- True roots, stem or leaves are absent. However, the may possess root-like or stem-like structures. Their plant body is haploid, producing gametes hence they are called gametophytes
- Male sex organs are called antheridium and the female sex organs are called archegonium. They give rise to a multicellular body known as sporophytes that are attached to the photosynthetic gametophytes, deriving its nourishment from them.
- The bryophytes are divided into liverworts and mosses.

Liverworts

- They are found in moist, shady regions such as marshy ground, banks of streams, damp soil, bark trees and deep in the woods
- Plant body is thalloid (Marchantia). Thallus is dorsiventral. The leafy members have small leaf-like appendages on steam-like structures
- Asexual reproduction is through fragmentation or formation of gemma. During sexual reproduction female and male sex organs are produced on the same or different thalli
- The sporophyte is differentiated into foot, seta and capsule. Post meiosis the spores are produced within the capsule. These spores germinate for the formation of free-living gametophytes

Moses

- Gametophyte has 2 stages - protonema stage and the leafy stage. It consists of slender axes, upright arranged leaves spirally. When they are attached to the soil through branched and multicellular rhizoids, the stage bears the sex organs
- Fragmentation and budding is observed in secondary protonema in the vegetative reproduction while in sexual reproduction, the sex organs are produced at the apex of leafy shoots
- Sporophytes in mosses is more elaborate than that in liverworts. Capsules comprise of spores formed after meiosis. Some examples - Funaria, Sphagnum

Pteridophytes

- Found in damp, cool and shady places. They may also be found in sandy-soil conditions
- They include ferns and horsetails and have medicinal purposes and soil-binders, also frequently grown as ornaments. They are the first terrestrial to possess vascular tissues - xylem and phloem
- Plant body is a sporophyte, differentiated into true root, stem and leaves and possess a well-differentiated vascular tissue. Sporophytes bear sporangia subtended by sporophylls. Sporangia produce spores by meiosis which germinate to produce the prothallus.
- Most of them are homosporous(similar kinds of spores) some others may be heterosporous (macro and microspores)
- The pteridophytes are further classified into four classes: Psilopsida (Psilotum); Lycopsida (Selaginella, Lycopodium), Sphenopsida (Equisetum) and Pteropsida (Dryopteris, Pteris, Adiantum).

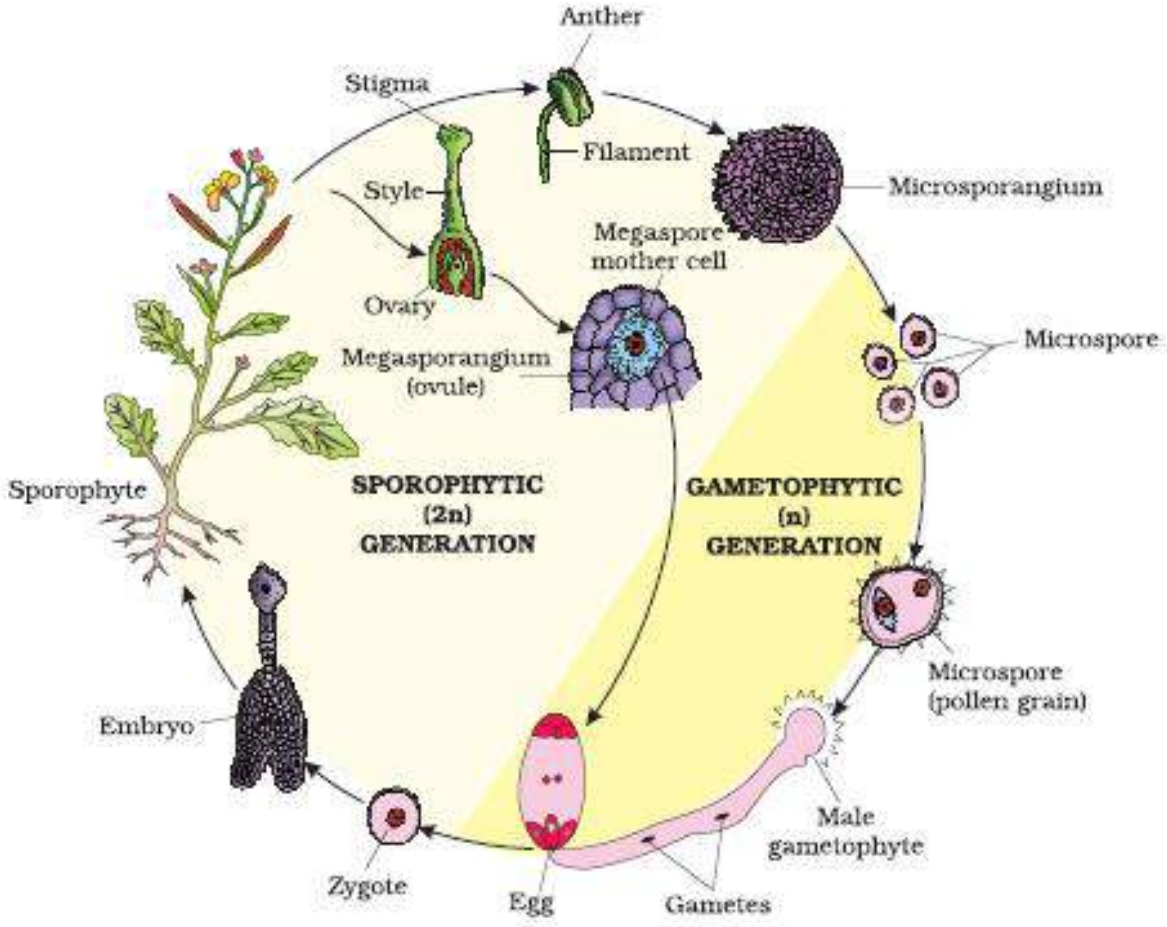
Gymnosperms

- They include medium-sized trees or tall trees & shrubs. Ovules are not enclosed by any ovary wall and remain exposed, before and after fertilization.
- The roots are generally tap roots. Roots in some genera have fungal association in the form of mycorrhiza (Pinus), while in some others (Cycas) small specialised roots called coralloid roots are associated with N2- fixing cyanobacteria.
- The stems are branched (Pinus, Cedrus) or unbranched (Cycas).
- The leaves may be simple or compound. The leaves in gymnosperms are well-adapted to withstand extremes of temperature, humidity and wind. In conifers, the needle-like leaves reduce the surface area. Their thick cuticle and sunken stomata also help to reduce water loss.
- They are heterosporous, strobili bear two kinds of spores microsporophylls and microsporangia
- Unlike earlier forms, in gymnosperms, the male and the female gametophytes do not have an independent free-living existence

Angiosperms

- They occur in a wide range of habitats. In flowering plants or angiosperms, the pollen grains and ovules are developed in specialized structures known as flowers while seeds are enclosed in fruits.
- They render us with fuel, food, medicines and several more commercially important products
- They can be divided into two classes - dicotyledons and monocotyledons. While monocotyledons have a single cotyledonous seed, parallel venation in leaves, trimerous flowers, with three members in each floral whorls, the dicotyledons have two cotyledons with reticulate venation in leaves, tetramerous or pentamerous flowers
- Male sex organ in a flower is stamen consisting of the anther at the tip while female sex organ is the pistil consisting of a swollen ovary at its base consisting of a long slender style and stigma. Ovules are present inside the ovary.
- Each ovule has a megaspore mother cell which undergoes meiosis to form four haploid megaspores. Three of them degenerate and one divide to form the embryo sac. Each embryo-sac has a three-celled egg apparatus – one egg cell and two synergids, three antipodal cells and two polar nuclei. The polar nuclei eventually fuse to produce a diploid secondary nucleus. One of the male gametes fuses with the egg cell (syngamy) to form a zygote. The other male

gamete fuses with the diploid secondary nucleus to produce the triploid primary endosperm nucleus (PEN). Because of the occurrence of two fusions i.e., syngamy and triple fusion, this event is termed as double fertilisation, an event unique to angiosperms. The zygote develops into an embryo (with one or two cotyledons) and the PEN develops into endosperm which provides nourishment to the developing embryo. The synergids and antipodals degenerate after fertilisation. During these events, the ovules form seeds and the ovaries form a fruit. The life cycle of an angiosperm is shown in Figure



Life cycle of an angiosperm

Plant Life Cycles and Alternation of Generations

Plant Life Cycle

There is a great variation observed in the plant life cycle since different plants exhibit different levels of complexity. This is why different generations are dominant in different plants. In algae, the haplontic life cycle is observed where the sporophyte generation is depicted by only one-celled zygote where there are no free-living sporophytes and the dominant phase is marked by the gametophyte.

The diplontic life cycle is observed with a few variations in angiosperms and gymnosperms. The diploid sporophyte in this life cycle is dominant, photosynthetic and marks the independent stage of plants. The gametophyte phase is indicated by a single to a few-celled haploid gametophyte.

Pteridophytes and bryophytes exhibit an intermediate stage known as the haplo-diplontic life cycle where in the stage is multicellular. However, the dominant stage varies. The dominant phase in Bryophytes is the gametophyte and it is the sporophyte stage in Pteridophytes.

Alternation Of Generations

There are two systems of reproduction in plants where each is called generation and are related. Hence, one complete life cycle has two generations which alternate with each other. Thus, it is called alternation of generations. These two generations are known as the sporophyte and the gametophyte generation which is a rotation in between the haploid and diploid stages associated with chromosomes in the cells of plants.

While a haploid cell has one set of chromosomes, there are two sets of chromosomes in a diploid cell. The haploid generation produces plants with diploid cells which creates a generation of haploid plants that in turn gives rise to a generation of diploid plants and the cycle goes on.

Bad genes are removed in the haploid stage whereas the diploid stage enables greater genetic diversity.