

Plant Kingdom



After reading this note, you would be able to understand:

- Algae
- Bryophytes
- Pteridophytes
- Gymnosperms
- Angiosperms

➤ **Plant Kingdom**

- Kingdom Plantae includes all the plants.
- They are eukaryotic, multicellular, and autotrophic organisms.
- The plant cell contains a rigid cell wall.
- Plants have chloroplast and chlorophyll pigment, which is required for photosynthesis.

➤ **Characteristics of Kingdom Plantae**

- They are non-motile.
- They make their own food and hence are called autotrophs.
- They reproduce asexually by vegetative propagation or sexually.
- Plants contain photosynthetic pigments called chlorophyll present in the plastids.
- They have different organelles for anchorage, reproduction, support, and photosynthesis.

PLANT CLASSIFICATION KINGDOM

1. Algae
2. Bryophytes
3. Pteridophytes
4. Gymnosperms
5. Angiosperms

1. ALGAE

- Algae are chlorophyll-bearing, simple, thalloid, autotrophic and largely aquatic organisms.
- They occur in a variety of other habitats: moist stones, soils and wood. Some of them also occur in association with fungi (lichen) and animals.
- The algae reproduce by vegetative, asexual and sexual methods.
- Vegetative reproduction is by fragmentation. Each fragment develops into a thallus.
- Asexual reproduction is by the production of different types of spores, the most common being the zoospores.
- Sexual reproduction takes place through fusion of two gametes.
- These gametes can be flagellated and similar in size (as in Ulothrix) or non-flagellated (non-motile) but similar in size (as in Spirogyra). Such reproduction is called isogamous.



➤ **Types of Algae**

There are many types of algae. However, these are some of the more prominent types:

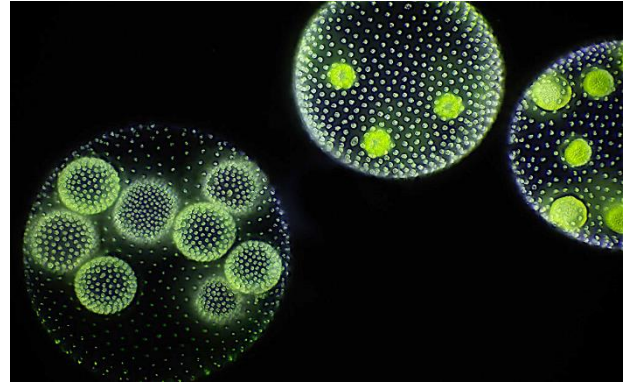
A. Red Algae

- Also called Rhodophyta, it is a distinctive species found in marine as well as freshwater ecosystems.
- The pigments phycocyanin and phycoerythrin are responsible for the characteristic red coloration of the algae.



B. Green Algae

- It is a large, informal grouping of algae having the primary photosynthetic pigments chlorophyll a and b, along with auxiliary pigments such as xanthophylls and beta carotene.
- Higher organisms use green algae to conduct photosynthesis for them.
- Prominent examples of green algae include Spirogyra, Ulothrix, Volvox, etc.



2. BRYOPHYTES

- Bryophytes include the various mosses and liverworts that are found commonly growing in moist shaded areas in the hills.
- Bryophytes are also called amphibians of the plant kingdom because these plants can live in soil but are dependent on water for sexual reproduction.
- They usually occur in damp, humid and shaded localities.
- They lack true roots, stems or leaves. They may possess root-like, leaf-like or stem-like structures. The main plant body of the bryophyte is haploid.
- The sex organs in bryophytes are multicellular.
- The male sex organ is called antheridium. They produce biflagellate antherozoids.
- The female sex organ called archegonium is flask-shaped and produces a single egg.



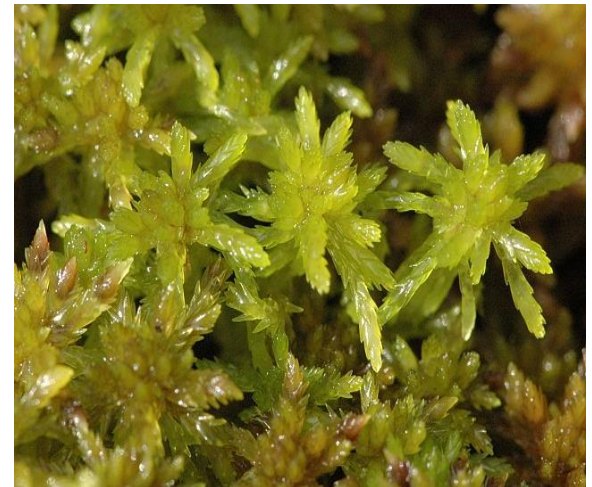
A. Liverworts

- The liverworts grow usually in moist, shady habitats such as banks of streams, marshy ground, damp soil, bark of trees and deep in the woods.
- The plant body of a liverwort is thalloid, e.g., *Marchantia*.
- Asexual reproduction in liverworts takes place by fragmentation of thalli, or by the formation of specialised structures called gemmae.



B. Mosses

- The predominant stage of the life cycle of a moss is the gametophyte which consists of two stages.
- The first stage is the protonema stage, which develops directly from a spore.
- It is a creeping, green, branched and frequently filamentous stage.
- The second stage is the leafy stage, which develops from the secondary protonema as a lateral bud.
- They consist of upright, slender axes bearing spirally arranged leaves.
- They are attached to the soil through multicellular and branched rhizoids.
- This stage bears the sex organs. Vegetative reproduction in mosses is by fragmentation and budding in the secondary protonema.
- In sexual reproduction, the sex organs antheridia and archegonia are produced at the apex of the leafy shoots.
- Common examples of mosses are *Funaria*, *Polytrichum* and *Sphagnum*



3. PTERIDOPHYTES

- The Pteridophytes include horsetails and ferns.
- Evolutionarily, they are the first terrestrial plants to possess vascular tissues – xylem and phloem.
- The pteridophytes are found in cool, damp, shady places though some may flourish well in sandy-soil conditions.
- In pteridophytes, the main plant body is a sporophyte which is differentiated into true root, stem and leaves.
- These organs possess well-differentiated vascular tissues. The leaves in pteridophyta are small (microphylls) as in Selaginella or large (macrophylls) as in ferns.
- The gametophytes bear male and female sex organs called antheridia and archegonia, respectively.
- Water is required for transfer of antherozoids – the male gametes released from the antheridia, to the mouth of archegonium.



4. GYMNOSPERMS

- The gymnosperms are plants in which the ovules are not enclosed by any ovary wall and remain exposed, both before and after fertilisation.
- The seeds that develop post-fertilisation, are not covered, i.e., are naked.
- The roots are generally tap roots.



- The stems are unbranched (Cycas) or branched (Pinus, Cedrus).
- The leaves may be simple or compound.
- The leaves in gymnosperms are well-adapted to withstand extremes of temperature, humidity and wind.
- Their thick cuticle and sunken stomata also help to reduce water loss.
- The pollen tube carrying the male gametes grows towards archegonia in the ovules and discharge their contents near the mouth of the archegonia.
- Following fertilisation, zygote develops into an embryo and the ovules into seeds. These seeds are not covered.

5. ANGIOSPERMS

- Unlike the gymnosperms where the ovules are naked, in the angiosperms or flowering plants, the pollen grains and ovules are developed in specialized structures called flowers.
- In angiosperms, the seeds are enclosed in fruits.
- They are divided into two classes: the dicotyledons and the monocotyledons
- The dicotyledons are characterized by seeds having two cotyledons, reticulate venations in leaves, and tetramerous or pentamerous flowers, i.e., having four or five members in each floral whorls.
- The monocotyledons on the other hand are characterized by single cotyledon seeds, parallel venation in leaves, and trimerous flowers having three members in each floral whorls.
- The male sex organ in a flower is the stamen.
- The female sex organ in a flower is the pistil.



- Generally, each ovule has a megaspore mother cell that undergoes meiosis to form four haploid megaspores.
- Pollen grain, after dispersal from the anthers, are carried by wind or various other agencies to the stigma of a pistil.
- This is termed as pollination.
- The pollen grains germinate on the stigma and the resulting pollen tubes grow through the tissues of stigma and style and reach the ovule.
- The pollen tubes enter the embryo sac where two male gametes are discharged.
- 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 double fertilization, an event unique to angiosperms.
- The zygote develops into an embryo and the PEN develops into endosperm which provides nourishment to the developing embryo.
- The synergids and antipodals degenerate after fertilization.
- During these events the ovules develop into seeds and the ovaries develop into fruit.

PREVIOUS YEAR QUESTION

1. How are evergreen plants with woody stems having naked seed classified?

- A. Angiosperms
- B. Monocotyledons
- C. Pteridophytes
- D. Gymnosperms

Answer: D

Solution: Characteristics of gymnosperms:

1. They do not produce flowers.
2. Seeds are not formed inside a fruit. They are naked.
3. They develop needle-like leaves.
4. They are perennial or woody, forming trees or bushes. Hence option D is correct.

2. Which one of the following groups is called 'amphibians of plant Kingdom'?

- A. Bryophytes
- B. Thallophytes
- C. Pteridophytes
- D. Gymnosperms

Answer: A

Solution: Bryophytes are small, non-vascular plants, such as mosses, liverworts, and hornworts. They are amphibious in nature and are also called "amphibians of the plant kingdom" because these plants can live in soil but are dependent on water for sexual reproduction. Hence the correct answer is A

ADDITIONAL INFORMATION:

Thallophyte They are usually found in moist or wet places. They are autotrophic in nature. Reserve food is generally starch.

A pteridophyte is a vascular plant (with xylem and phloem) that disperses spores.

Gymnosperms: They do not produce flowers. Seeds are not formed inside a fruit. They are naked. They are found in colder regions where snowfall occurs.

SUMMARY

- Plant kingdom includes algae, bryophytes, pteridophytes, gymnosperms and angiosperms.
- Algae are chlorophyll-bearing simple, thalloid, autotrophic and largely aquatic organisms.
- The bryophytes are divided into liverworts and mosses.
- In pteridophytes the main plant is a sporophyte which is differentiated into true root, stem and leaves.
- The gymnosperms are the plants in which ovules are not enclosed by any ovary wall.
- After fertilisation the seeds remain exposed and therefore these plants are called naked-seeded plants.
- In angiosperms, the male sex organs (stamen) and female sex organs (pistil) are borne in a flower.
- Each stamen consists of a filament and an anther. The anther produces pollen grains (male gametophyte) after meiosis. The pistil consists of an ovary enclosing one to many ovules. Within the ovule is the female gametophyte or embryo sac which contains the egg cell.