

6. Classification of plants



- Kingdom Plantae
- Sub-kingdom: Gymnosperms
- Sub-kingdom: Angiosperms

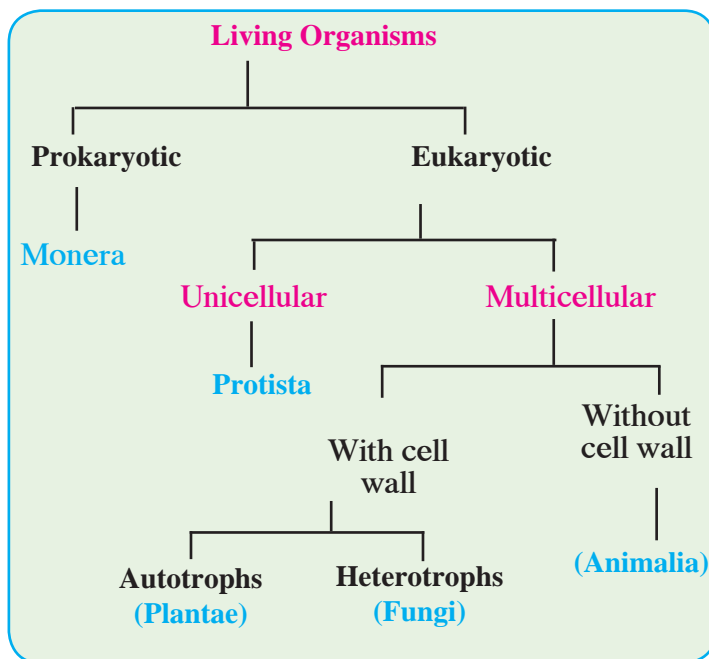


Can you recall?

How have living organisms been classified?

You have already studied the kingdoms Monera, Protista and Fungi of the 'Five Kingdom' classification system proposed by Robert Whittaker (1969) for the study of living organisms.

What are the hidden secrets of the Kingdom plantae which impart this green freshness to our surroundings? Just how much diversity is there in this Kingdom? Let us see!



Kingdom plantae



Can you tell?

Which are the special cell organelles that differentiate plant cells from animal cells?

The group of autotrophic living organisms having eukaryotic cells with cell walls is the group of plants. Plants have become autotrophic as they can perform photosynthesis with the help of chlorophyll. Living organisms of kingdom plantae are the main source of food for all other living organisms.

Basis for classification :

The presence or absence of organs is the first criterion for classification of plants. The presence or absence of separate conducting tissues for conduction of water and food is the next consideration for classification. Do the plants bear seeds? If they do then, whether the seeds are enclosed in a fruit or not is also an important criterion for classification. Finally, plants are grouped depending upon the number of cotyledons in the seeds.

At the higher levels of plant classification, different characteristics are considered for classification, e.g. depending upon the absence or presence of flowers, fruits and seeds, plants are classified as cryptogams or phanerogams. Depending upon whether seeds are enclosed within a fruit or not, phanerogams are classified as gymnosperms and angiosperms. Angiosperms are further classified as monocots or dicots depending upon the number of cotyledons in seeds.

An introduction to scientists

In 1883, Eichler, a botanist, classified the Kingdom Plantae into two subkingdoms. As a result, two subkingdoms, cryptogams and phanerogams were considered for plant classification.

Cryptogams



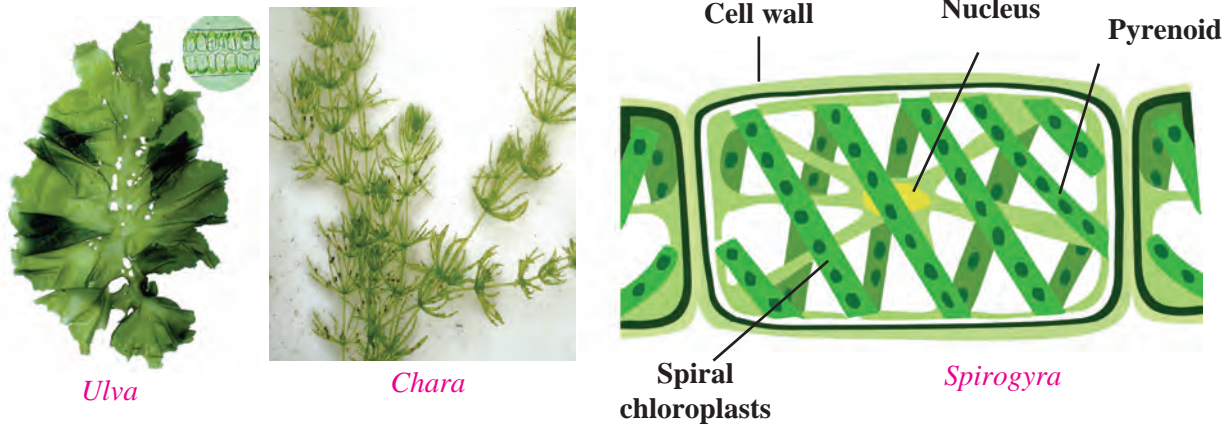
Observe

Search for a pond with greenish water. Collect some of the green fibres from the water. Put the fibres in a Petri dish and wash them clean with water. Put one of the fibres in a drop of water on a glass slide and spread it out straight.

Put a cover-slip over the slide and observe under a compound microscope. Do you see the spirally arranged green thread-like chloroplasts in the cells in that straight fibre? This plant is known as *Spirogyra*.

Division I - Thallophyta

These plants grow mainly in water. This group of plants, which do not have specific parts like root-stem-leaves-flowers but are autotrophic due to the presence of chlorophyll, is called algae. Algae show great diversity. They may be unicellular or multicellular, and microscopic or large. Examples of algae are *Spirogyra*, *Ulothrix*, *Ulva*, *Sargassum*, etc. Some of these are found in fresh water while some are found in saline water. These plants usually have a soft and fibre-like body. Various types of **fungi** like yeasts and moulds which do not have chlorophyll are also included in this group.



6.1 Plants of the Thallophyta division.

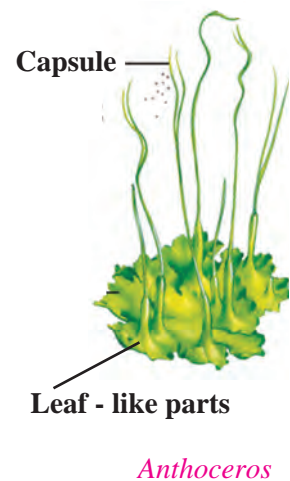
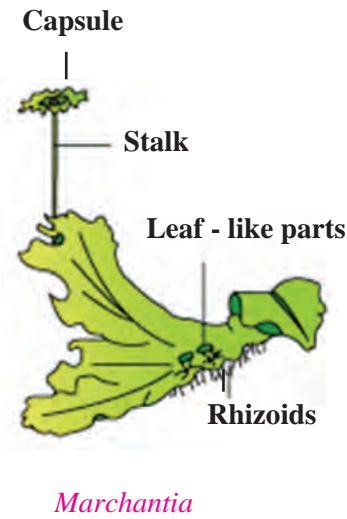
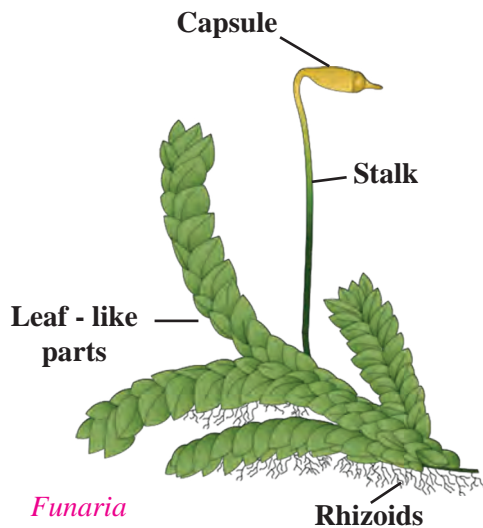
Division II - Bryophyta



Observe and discuss.

You may have seen a lush green soft carpet on old walls, bricks and rocks in the rainy season. Scrape it gently with a small ruler, observe it under a magnifying lens and discuss.

This group of plants is called the ‘amphibians’ of the plant kingdom because they grow in moist soil but need water for reproduction. These plants are thalloid, multicellular and autotrophic. They reproduce by spore formation. The structure of the plant body of bryophytes is flat, ribbon-like long, without true roots, stem and leaves. Instead, they have stem-like or leaf-like parts and root-like rhizoids. They do not have specific tissues for conduction of food and water. Examples are Moss (*Funaria*), *Marchantia*, *Anthoceros*, *Riccia*, etc.



6.2 Plants of the bryophyta division



Observe and discuss.

You may have seen ferns among the ornamental plants in a garden. Take a leaf of a fully grown fern and observe it carefully.

Division III- Pteridophyta

Plants from this group have well-developed roots, stem and leaves and separate tissues for conduction of food and water. But, they do not bear flowers and fruits. They reproduce with the help of spores formed along the back or posterior surface of their leaves. Examples are ferns like *Nephrolepis*, *Marsilea*, *Pteris*, *Adiantum*, *Equisetum*, *Selaginella*, *Lycopodium*, etc.

These plants reproduce asexually by spore-formation and sexually by zygote formation. They have a well-developed conducting system.



Use your brain power !

What is the similarity between the plants of the groups Thallophyta, Bryophyta and Pteridophyta irrespective of differences in their body structure?

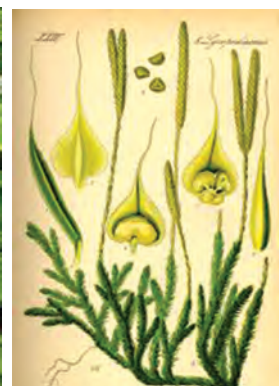


Sporangia in sori on leaflet

Selaginella



Lycopodium



6.3 Plants of the pteridophyta division

All these plants reproduce by spore formation. They are called cryptogams as their reproductive organs cannot be seen. (cryptos: hidden, gams: reproductive organs).

Phanerogams

Plants which have special structures for reproduction and produce seeds are called phanerogams. In these plants, after the process of reproduction, seeds are formed which contain the embryo and stored food. During germination of the seed, the stored food is used for the initial growth of the embryo. Depending upon whether seeds are enclosed in a fruit or not, phanerogams are classified into gymnosperms and angiosperms.

Division I - (Gymnosperms)

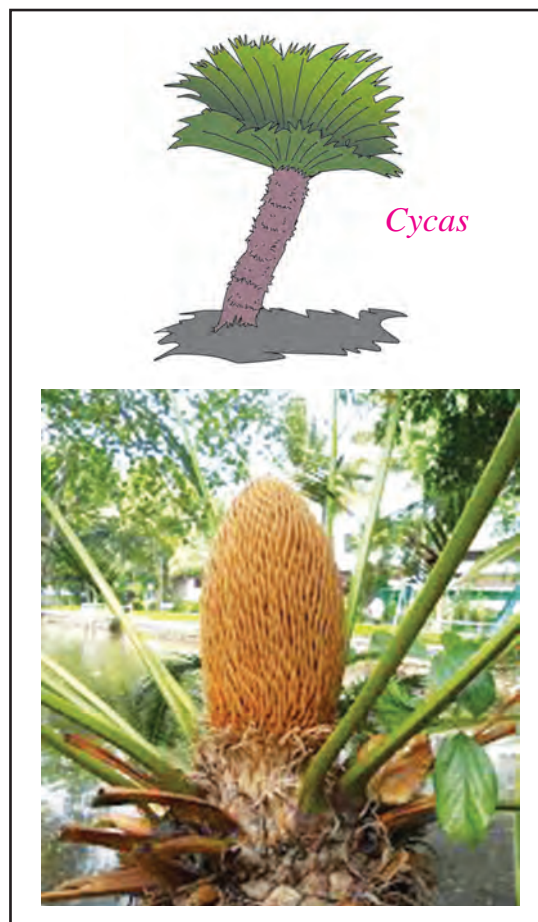


Observe

Observe all garden plants like *Cycas*, Christmas tree, *Hibiscus*, lily, etc. and compare them. Note the similarities and differences among them. Which differences did you notice between gymnosperms and angiosperms?

Gymnosperms are mostly evergreen, perennial and woody. Their stems are without branches. The leaves form a crown. These plants bear male and female flowers on different sporophylls of the same plant. Seeds of these plants do not have natural coverings, i.e. these plants do not form fruits and are therefore called gymnosperms. (gymnos: naked, sperms: seeds).

Examples *Cycas*, *Picea* (Christmas tree), *Thuja* (Morpankhi), *Pinus* (Deodar), etc.



6.4 Gymnosperms

Division II- Angiosperms



Try this

Soak the seeds of corn, beans, groundnut, tamarind, mango, wheat, etc. in water for 8 to 10 hrs. After they are soaked, check each seed to see whether it divides into two equal halves or not and categorize them accordingly.

The flowers these plants bear are their reproductive organs. Flowers develop into fruits and seeds are formed within fruits. Thus, these seeds are covered; hence, they are called angiosperms (angios: cover, sperms: seeds).

The plants whose seeds can be divided into two equal halves or dicotyledons are called dicotyledonous plants and those whose seeds cannot be divided into equal parts are called monocotyledonous plants.

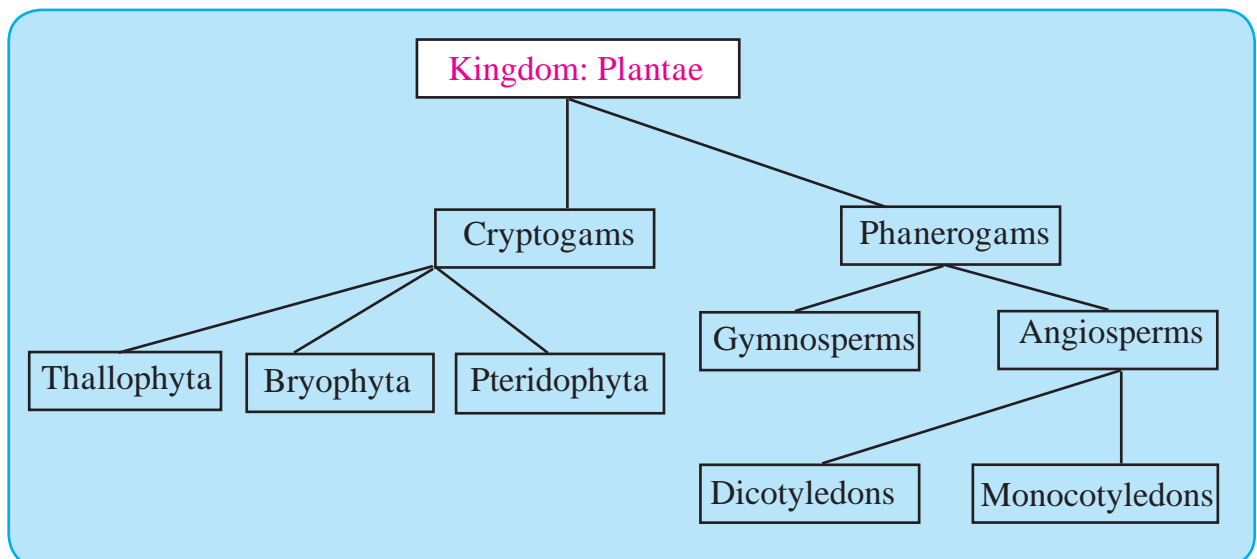


Observe and verify

	Dicotyledonous plants	Monocotyledonous
Seed	Two cotyledons	Single cotyledon
Root	Well developed, primary root (Tap root)	Fibrous roots
Stem	Strong, hard. Ex. Banyan tree	Hollow, Ex. Bamboo False, Ex. Banana Disc-like, Ex. Onion.
Leaf	Reticulate venation	Parallel venation
Flower	Flowers with 4 or 5 parts or in their multiples (tetramerous or pentamerous)	Flowers with 3 parts or in multiples of three (trimerous).



6.4 Mustard and Maize



Using ICT:

1. Sketch the diagrams of the plants mentioned in the lesson with the help of the drawing software in the computer.
2. Using those sketches, prepare a power point presentation about plant classification and present it in the class.

Exercises



1. Match the proper terms from columns A and C with the description in column B.

'A'	'B'	'C'
Thallophyta	Seeds are formed in fruits.	Fern
Bryophyta	No natural covering on seeds.	Cycas
Pteridophyta	These plants mainly grow in water.	Tamarind
Gymnosperms	These plants need water for reproduction.	Moss
Angiosperms	Tissues are present for conduction of water and food	Algae

2. Complete the sentences by filling in the blanks and explain those statements.

(angiosperms, gymnosperms, spore, bryophyta, thallophyta, zygote)

- a. plants have soft and fibre-like body.
- b. is called the 'amphibian' of the plant kingdom.
- c. In pteridophytes, asexual reproduction occurs by formation and sexual reproduction occurs byformation.
- d. Male and female flowers ofare borne on different sporophylls of the same plant.

3. Answer the following questions in your own words.

- a. Write the characteristics of subkingdom Phanerogams.
- b. Distinguish between monocots and dicots.
- c. Write a paragraph in your own words about the ornamental plants called ferns.
- d. Sketch, label and describe the *Spirogyra*.

e. Write the characteristics of the plants belonging to division Bryophyta.

4. Sketch and label the figures of the following plants and explain them into brief.

Marchantia, Funaria, Fern, Spirogyra.

5. Collect a monocot and dicot plant available in your area. Observe the plants carefully and describe them in scientific language.

6. Which criteria are used for the classification of plants? Explain with reasons.

Project :

- a. Collect more information about plant classification from the internet, prepare a talk of about 5 to 7 minutes on that topic and present it in school during assembly.
- b. Prepare an album of monocot and dicot seeds and display it in the classroom.
- c. Collect photographs of 5 plants each of the Thallophyta, Bryophyta and Pteridophyta divisions and write a description of each.

