KINGDOM PLANTAE

General Characteristics

- There are many variations of the kingdom and they all possess chlorophyll A and B thus capable of photosynthesizing i.e. convert sunlight energy into chemical energy and thus are producers of ecosystem.
- They have well developed vegetative bodies and are sometimes differentiated into roots, stems and leaves and also reproductive bodies.
- They are sessile/ limited locomotion which show curvature movements.
- Plants have cellulose cell walls.
- They have prominent large vacuoles in their cells and store carbohydrate in form of starch.
- They are multi-cellular organisms with apical growth and localized growth with indefinite number of parts.
- Their life cycle involves alteration of generation which is more prominent in the lower plants.

CLASSIFICATION OF KINGDOM PLANTAE

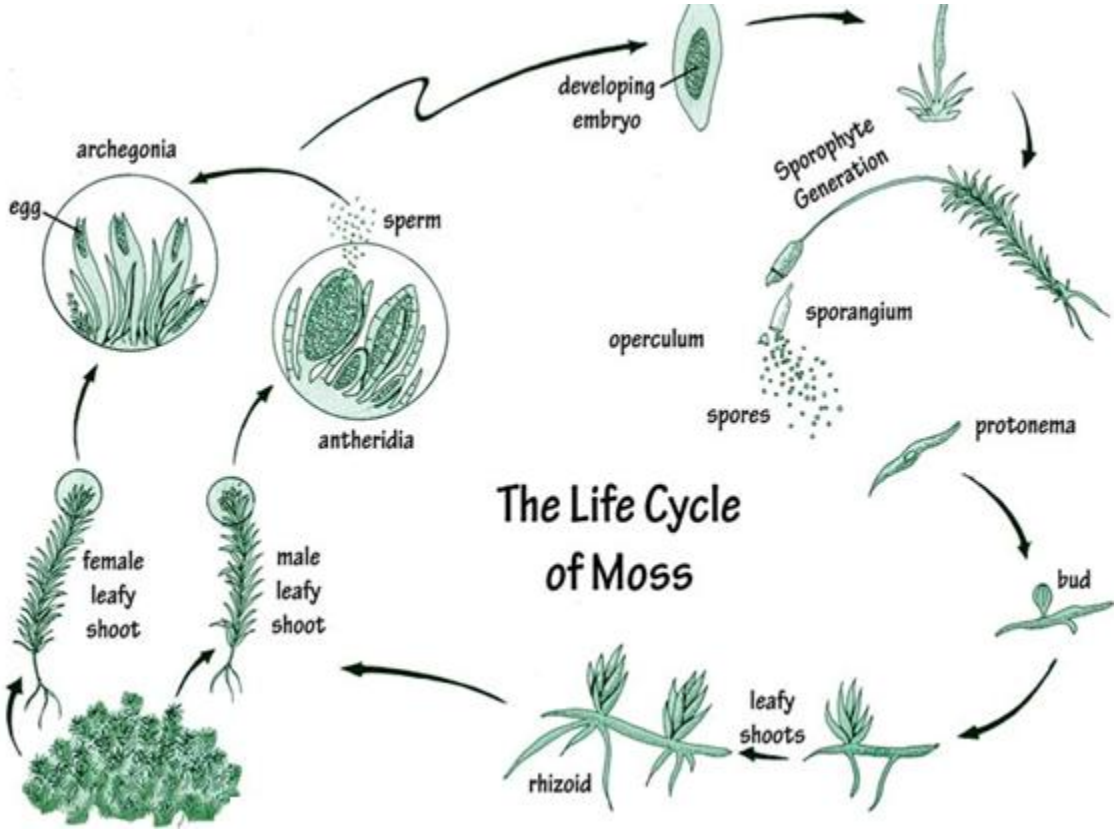
- Bryophyta e.g. musci e.g. funaria
- Filicinophyta (pteridophyta) e.g. dryopterisfilix
- Coniferophyta e.g. pine (pinussylivestris).
- Angiospermophyta. E.g. (flowering plants) class; monocotyledonae, dicotledonae.

DIVISION BRYOPHYTA

Characteristics

- They have vegetative bodies with no vascular tissues.
- They are terrestrial living in moist, shady organic rich soils.
- The body is thallus or differentiated into simple stems and simple leaves.
- The plants (gametophyte) have rhizoids for anchorage and there are no true roots, stems and leaves while the sporophyte is attached and is partially dependant on the gametophyte for nutrition.
    - They show alteration of generation. This is the occurrence of the phages in the cycle of the organism (plant) whereby a haploid gametophyte producing gametes (sexual phase) alternates with a diploid sporophyte producing spores (asexual phase). In the lower plants i.e. bryophyte the gametophyte phase is dominant over the

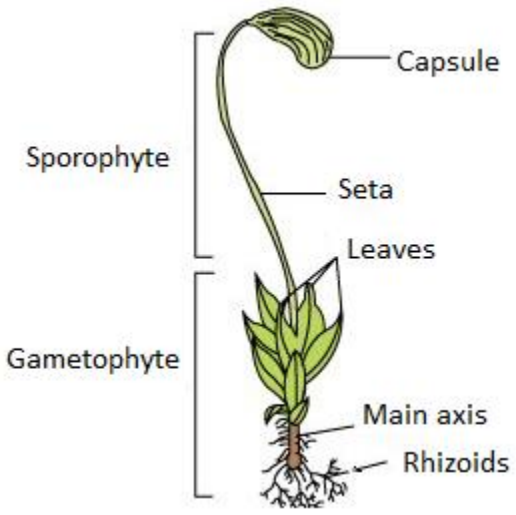
sporophyte phase. Thus the sporophyte is attached to and semi dependant on gametophyte for its nutrition.



Adaptations of funaria to its autotrophic mode of life

- They have chlorophyll (gametophyte is green and the sporophyte) thus can photosynthesize therefore autotrophic mode of nutrition. The gametophyte also has multicellular rhizoids for absorption of water and mineral salts. Also anchores the plant to the soil.
- The reproductive structures i.e. antheridia and archegonia are protected by sterile hair.
- They show alteration of generation in their life cycle so that when one generation is weak it can depend on another one e.g. the sporophyte depends on gametophyte for nutrition and support.
- The plant can exploit both sexual and asexual reproduction
- The capsule of the sporophyte possesperistome and annuls cells which aid in dispersal of the spores. It also has an operculum which acts as a lid covering the capsule.

- The archegonia neck canal cells produce sugary solutions for a chemo tactic response to guide the anthrezoids into the ovum this increases the chances of fertilization.
- The sperms have flagella which aid in swimming through the water to the archegonia.
- The seta serves as upward means of transport of nutrients and water to the capsule.
- Seta is also raised well above the gametophyte so aiding the dispersal of spores by wind. The spores are light and produced by antheridia and are large in number increasing chances of survival.
- The gametes produced by antheridia are in large number thus increasing chances of fertilization.



Moss Plant

DIVISION FILICINOPHYTA

Characteristics.

- Sporophyte has a well developed vegetative body with extensive adventitious roots, underground stem, rhizomes, and large leaves (the fronds)
- The leaves are called fronds because they are relatively larger than the stem and roots.
- The young leaves show circinate fashion**.**
- The sporophyte has a well developed vascular tissue primitive (siphonostele)hence the xylem contains tracheids with no vessels and the phloem has no companion cells.
- The spores are found underneath the leaves in cluster forming the sori.
- They also show alternation of generation with the sporophyte being dominant and gametophyte (pro thallus) short lived. Both Sporophyte and Gametophyte are independent.

Description of dryopterisfilix(fern)

- It is a well developed plant with adventitious roots and stem is a rhizome.
- The leaves are relatively large compared to the other parts and are called fronds.
- The young leaves are rolled with circinate fashions which grow into a frond.
- A fronds consist of the rachis which is sub divided to pinna which in turn holds the pinnule.
- The rachis possessramenta (brown scales) for protection.
- The fronds have spores underneath which are born in clusters called sori and the spores
- The gametophyte is a thin heart shaped pro-thallus which lacks cuticle therefore requires moist conditions to prevent them from drying out. The prothallus possess both the male antheridia which is attached near the rhizoids and the female archegonia which is attached near the notch. The gametes are produced and fertilization occurs giving rise to zygote which develops into sporophyte generation.

External features of sporophyte generation of dryopteris (note from the

the TIE book)

ADAPTATION OF FERN TO MODE OF LIFE

- The sporophyte is well developed with roots for anchorage and for absorption of water and mineral salts.
- Have stems for support and leaves with rachis for upward transport of water and mineral salts.
- They also possess chlorophyll thus can photosynthesize.
- The roots also serve as parenting organ for vegetative propagation.
- The rachis and young leaves possess ramenta for protection from mechanical injury and desiccation.
- They possess cuticle on their leaves to prevent excessive loss of water through transpiration.
- They have mechanical tissue (scterenchyma and collenchyma) for support a conducting tissue (phloem and xylem) for transport.
- The sori are found on the underside of the leaf, this prevents them from direct sunlight thus desiccation. The sori in turn are protected by inducium.
- The leaves are large in size to increase area for absorption of sun light.
- The sporangium has mechanism for dispersing the spores due to the presence of annulus cells and stadium cells.

Importance of dry and wet conditions in the life cycle of mosses and dryopteris

Wet conditions

- The stem is underground and can survive unfavorable conditions such as drought.
- The gametophyte and sporophyte are independent of each other and each can photosynthesize.
- The archegonia produce solutions which attract the anthrezoidschemotactically.
- The anthrezoids have flagella which can help them to swim to the archegonia.

Dry conditions

- Required for dispersal of spores by the wind.
- Required for drying and rupturing of the capsule.
- The gametes develop in protective structures, the antheridia and archegonia in dry conditions.

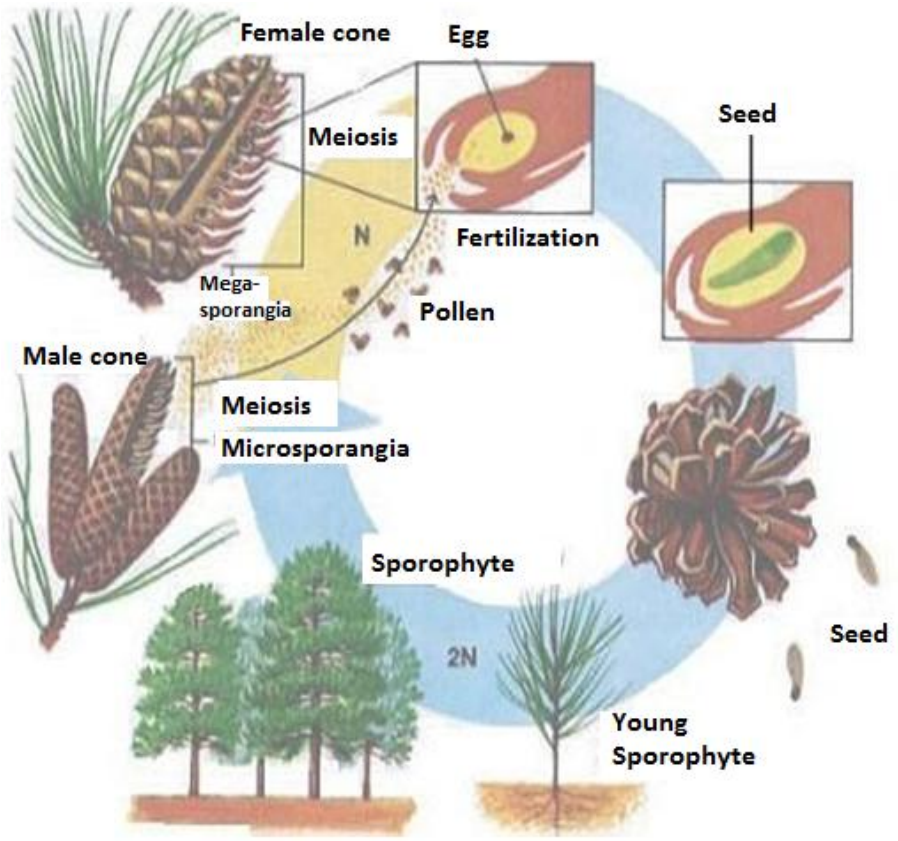
COMPARISON OF MOSSES AND DRYOPTERIS

SIMILARITIES

- Fertilization requires wet conditions because the flagellated anthrezoids have to swim through water to the archegonia.
- They both show alternation of generation with the gametophyte alternating with the sporophyte.
- They all produce spores which require dry conditions for dispersal.
- They both have archegonia and antheridia as reproductive structures.
- Meiosis occurs during spore formation in the spore mother cells contained in the capsule
- They have stomata for gaseous exchange
- The gametophyte has rhizoids for anchorage and absorption.

DIVISION CONIFEROPHYTA

- The leaves are needle –like covered with a waxy cuticle and have sunken stomata.
- The tree is the sporophyte generation and is heterosporous. In spring male and female cones are produced on the same tree. The male cones are rounded and found in clusters behind the apical buds at the bases of new shoots. They develop in the area of scale leaves in place of dwarf shoots. Female cones arise in the axis of scales i.e. at the tip of new strong shoots at some distance from male cones and in a more clustered arrangement. Both cones consist of spirally arranged, closely packed around a central axis.



Adaptations of pinus to its mode of life

- The sporophyte is differentiated into roots which are well developed and grow deep into the soil for anchorage and absorption of underground water.
- The stem is reddish brown in colour and covered by scaly leaves to prevent water loss through transpiration.
- The leaves are needle like to minimize loss of water (as surface area is reduced).
- The leaves are evergreen for photosynthesis.
- The stomata are sunken which reduce water loss through transpiration.
- The leaves have hypodermis below the epidermis which prevent further desiccation.
- They have the conducting tissue, the xylem and phloem, for upward movement of water and mineral salts (xylem) and transport of food (phloem).

- They have developed mechanical tissues (woody stem) i.e. sclerenchyma and collenchyma) which provide mechanical support as the plant has to grow into tall trees.
- The microspores and megaspores have scales which prevent them from water loss.
- The presence of air sacs in the microspores facilitates wind dispersal thus conifers do not need water for fertilization since male gametes are blown by wind to reach the female gametes.
- The microspores develop a resistant wall for protection and they are small and light to be blown by wind.
- They produce a large number of seeds in the cones to increase chance of survival.
- Formation of resin canals that resist entry of fungi and other pathogens when the plant is injured. The resin normally covers up the injured part and the seed bearing habit enables the plant to survive during adverse conditions (unfavorable conditions) as the seeds are protected by the seed coat.
- The stored food in the seed can be used by developing embryo during germination.

PHYLUM ANGIOSPERMOPHYTA

They are common land plants with approximately 335,000 species. ¾ of them are dicots and ¼ of them are monocots. They live in all types of habitats. Some are terrestrial while others are aquatic (fresh water or marine).

They show diversity in morphology from simple grass with no cambium to trees such as baobab tree with cambium which allows development of girth.

GENERAL CHARACTERISTICS

- The sporophyte is well differentiated into roots for anchorage and absorption of water and mineral salts, stem for support and transport and leaves for photosynthesis (i.e. they have chloroplast).
- They show alternation of generation with the sporophyte being dominant over the gametophyte, i.e. the gametophyte is reduced.
- Have well developed vascular tissues which consist of xylem with tracheids and vessels for transport of water and mineral salts and support and the phloem has got companion cells and sieve elements.
- They are heterosporous (microspore/pollen grain and megaspore/embryo)

- Fertilization does not depend on water because the male gamete is connected to the ovum by the pollen tube formed by germination of pollen grain when it lands on the stigma of the same species.

DISTINCTIVE CHARACTERISTICS

- They provide flowers in which megaspores and microspores develop.
- They undergo double fertilization. After fertilization, ovary develops into fruit and the ovules into seeds which are enclosed in the ovary.
- Xylem contains vessels and tracheids and phloem has sieve tubes and companion cells.

The angiosperms are divided into two major groups;

1. Monocotyledonae
2. Dicotelydonae

MAJOR DIFFERENCES BETWEEN MONOCOTYLEDONS AND DICOTYLEDONS

	Class monocotylenae	**Class dicotyledonae**
1. Leaf morphology.	- Parallel venation (veins are parallel). - Elongate. - Identical dorsal and ventral surfaces.	- Reticular venation. (Net like vein pattern). - Lamina (blade) and petiole (leaf stalk). - Dorsal-ventral(dorsal and ventral surfaces differ)
2. Stem anatomy.	- Vascularbundles scattered. - Vascular cambium usually absent,nosecondarygrowth(exceptions occur e.g. palms)	- Ring of vascular bundles.

The structure and function of flowers

Flowers are reproductive structures in flowering plants (angiosperms) whose evolutionary origin are unclear but sometimes regarded as collection of highly specialized leaves. The flowers are commonly referred to simply as organs of sexual reproduction.

Parts of Flower

They are arranged in spiral form in few primitive flowers or in whorls around the upper parts (receptacle) of a flower stalk (pedicel). Some flowers are found as a collection of flowers borne on the same stalk (inflorescence)

Parts

1. **Receptacle**- Is the end of the flower stalk (pedicel) from which the perianth, gynoecium, and androecium arises.
2. **Perianth**- Consists of two whorls of leaf like segments. The whorls are similar in monocoty but different in dicot. The outer whorl is called sepal (Calyx) and inner whorl is petal (corolla)

Calyx- Is the collection of sepals, they are usually green and leaf like structures that encloses and protect the flower buds.

Corolla- Is a collection of petals. In insects pollinated flowers the petals are usually large and brightly coloured to attract insects.

3. **Androecium**- is a collection of stamens forming the male reproductive organ of the flower. This consist of anther and filaments, in anther pollen grain are made. Filaments rises water to the anther.
4. **Gynoecium** (Pistil) is the collection carpels forming the female reproductive organs of the flower. This consists of stigma, style and ovary. Stigma receive pollen grain during pollination, style holds in position stigma and ovary contains one or more ovules.