The study of plants is called botany. Plants are believed to have evolved from green algae. The main plant (land) characteristics are as follows:

1. Common cellular structures:
   - all are eukaryotes
   - multicellular
   - cell wall composed of cellulose
   - chlorophyll contained in chloroplasts
   - produce starch as carbohydrate food reserve
   - central vacuole

2. Photosynthetic organisms: autotrophs / producers
3. Most are stationary.

4. Reproduction occurs through a life cycle called *alternation of generations*. The cycle consists of two generations:

(a) **Sporophyte** generation  
   - reproduces asexually

(b) **Gametophyte** generation  
   - reproduces sexually

- The advantage of alternation of generations is the combined advantage of sexual and asexual reproduction.

Asexual - only one parent needed  
Sexual - produces much genetic variety
Classification of Plants

• There are two major groups of plants. They are classified according to the presence or absence of vascular tissue. Vascular tissue is a special tissue for support and for the transport of materials within the plant. There are two forms of vascular tissue:
  
  • **Xylem**: This transports water and minerals up the stem of the plant into the leaves.
  
  • **Phloem**: This transports glucose produced by the leaves, during photosynthesis, down the stem and into the roots.
The two groups that plants are divided into:

- **1. Bryophytes**: These include mosses, liverworts, and hornworts. These plants do not possess vascular tissue. They are short plants that usually grow in areas that have a good supply of water. The gametophyte generation is dominant.

- **2. Tracheophytes**: These include horsetails, ferns, gymnosperms, and flowering plants. They have well-developed vascular tissue. The sporophyte generation is dominant.
Bryophyte (moss)

Tracheophyte (fern)
Tracheophyte (fern)

Tracheophyte - Gymnosperm (fir tree)
Tracheophyte - Angiosperm (fruit-bearing)

Tracheophyte - Angiosperm (flowering)
Bryophytes (Moss plants)

- (i) Lack vascular tissue. This accounts for the remaining characteristics.
- (ii) Lack true roots, stems, or leaves.
- (iii) Small in size, growing close to the ground (1-5 cm)
- (iv) Restricted to moist environments.
- (v) Transitional group between aquatic and terrestrial plants.
- (vi) Major forms include moss, liverwort, and hornwort.
**Bryophyte Adaptations for Life on Land**

- **1. Water Conservation** - waxy waterproof covering called a cuticle or *cutin* found on leaflets
- **2. Gas Exchange** - pores found on the top of the leaflets
- **3. Internal Transport** - occurs by diffusion, no vascular tissue
- **4. Internal Support** - none
- **5. Water Absorption** - small filaments called *rhizoids*
- **6. Reproduction** - dependent upon water to move sperm to the egg

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**Moss Life Cycle**

![Moss Life Cycle Diagram]
Tracheophytes

(i) Possess vascular tissue (xylem and phloem). This accounts for the remaining characteristics

(ii) Possess true roots, stems, and leaves.

(iii) Large in size, growing well above the ground.

(iv) Not restricted to moist environments; well distributed over the Earth’s surface. Can even exist in areas where water is scarce.

(v) Most complex group of plants.

(vi) Major forms include:
(a) ferns
(b) gymnosperms - produce seeds in cones, 750 species dominant in cold regions and higher altitudes
(c) angiosperms - produce seeds in flowers, 250,000+ species. Most dominant plant because:

Types of Tracheophytes
Reasons for Angiosperm Success:

- (A) animals and insects help pollinate them:
  - (i) presence of brightly colored flowers attracts insects. That is the purpose of the coloration.
  - (ii) presence of nectar to attract insects that aid in pollination.
- (B) seed coat (fruit) protects and nourishes the embryo
- (C) seed dispersal also aided by wind
- (D) fruit covering the seed aids in dispersal. Animals will eat the fruit and drop the seeds, or the seeds will pass through their digestive systems.

Flower & Seed Structure
There are two forms of angiosperms:

- A. Monocots
- B. Dicots

A cotyledon is a seed leaf and is important in seed germination. It is a modified leaf of a seed plant embryo and can help provide nourishment for the developing embryo. It is one of the first leaves to appear during germination.

- A monocot has one cotyledon and a dicot has two.
- Examples: monocots - grasses, corn, tulips, and palms. Dicots - roses, maples, oaks, peanuts, potatoes, etc.
- Most angiosperms are dicots.

Trachoephyte Adaptations for Life on Land

- 1. Water Conservation - cuticle or cutin present on leaves.
- 2. Gas Exchange - pores called stomata found on the bottom of leaves.
- 3. Internal Transport - contains vascular tissue
- 4. Internal Support - vascular tissue
- 5. Water Absorption - system of roots is present
- 6. Reproduction - water is not required for movement of sperm to egg except in the case of ferns. In gymnosperms and angiosperms, sperm is contained inside a pollen grain that is moved by wind and insects.
Gas Exchange

- Stomata are better for gas exchange for the following reasons:
  - (1) No holes in the waterproof covering.
  - (2) In the shaded area of the leaf (less water loss).
  - (3) They won’t become clogged by dust and other materials.