Introduction to the Plant Kingdom

Early Ancestors

Aquatic to Terrestrial Life

Aquatic Ancestor

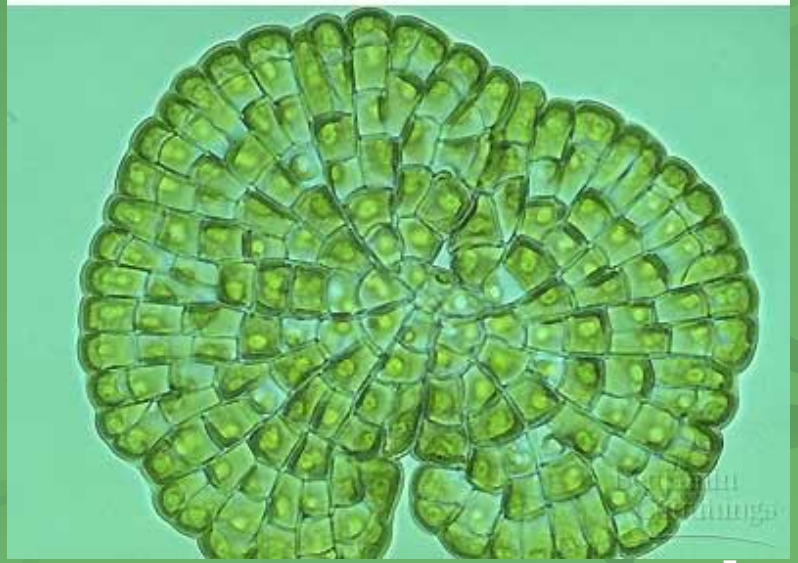
- Closest living species to a possible land plant ancestor
- Group of green algae
- Called Charyophyceans

Chara

Algae & Land Plant Similarities

A. Both contain chlorophylls *a* and *b*
B. Have chloroplasts with stacks of thylakoids
C. Store starch in plastids
D. Cellulose in cell walls
E. Go through Alternation of Generations life Cycle

Aquatic Habitat



Terrestrial Habitat

Living in Aquatic Environments

A. Plants surrounded by water so don't dry out

B. Sperm swims to egg

C. Water supports plant

D. Plants stay in upper surface near light

E. Absorb nutrients from the H_2O

Plant Adaptations to Land

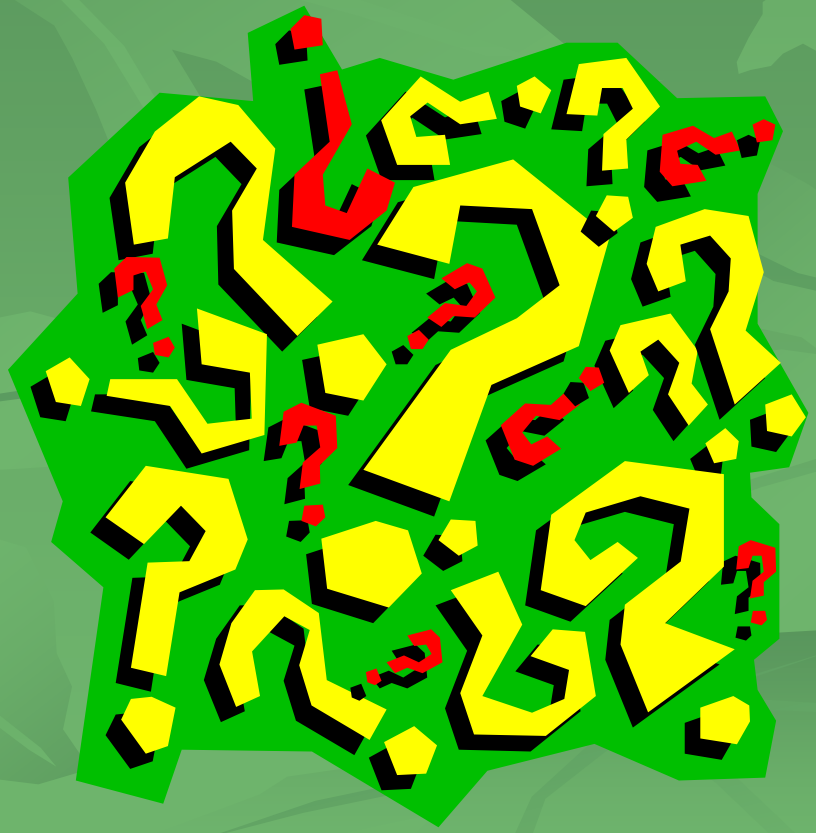
Problems:

- Need minerals
- Gravity
- Increase in Height for Light
- Adaptations for Drier environment
- Reproduction

Solutions:

- Roots absorb H_2O & minerals
- Lignin & cellulose in cell walls
- Vascular Transport System
- Waxy cuticle & stomata with guard cells
- Pollen containing sperm

How Are Plants All Alike?



Plant Characteristics

- **Multicellular**
- **Autotrophic (photosynthesis)**
- **Have Chlorophylls *a* and *b* in thylakoid membranes**
- **Surrounded by cell walls containing cellulose (a polysaccharide carbohydrate)**
- **Store reserve food as amylose (starch)**

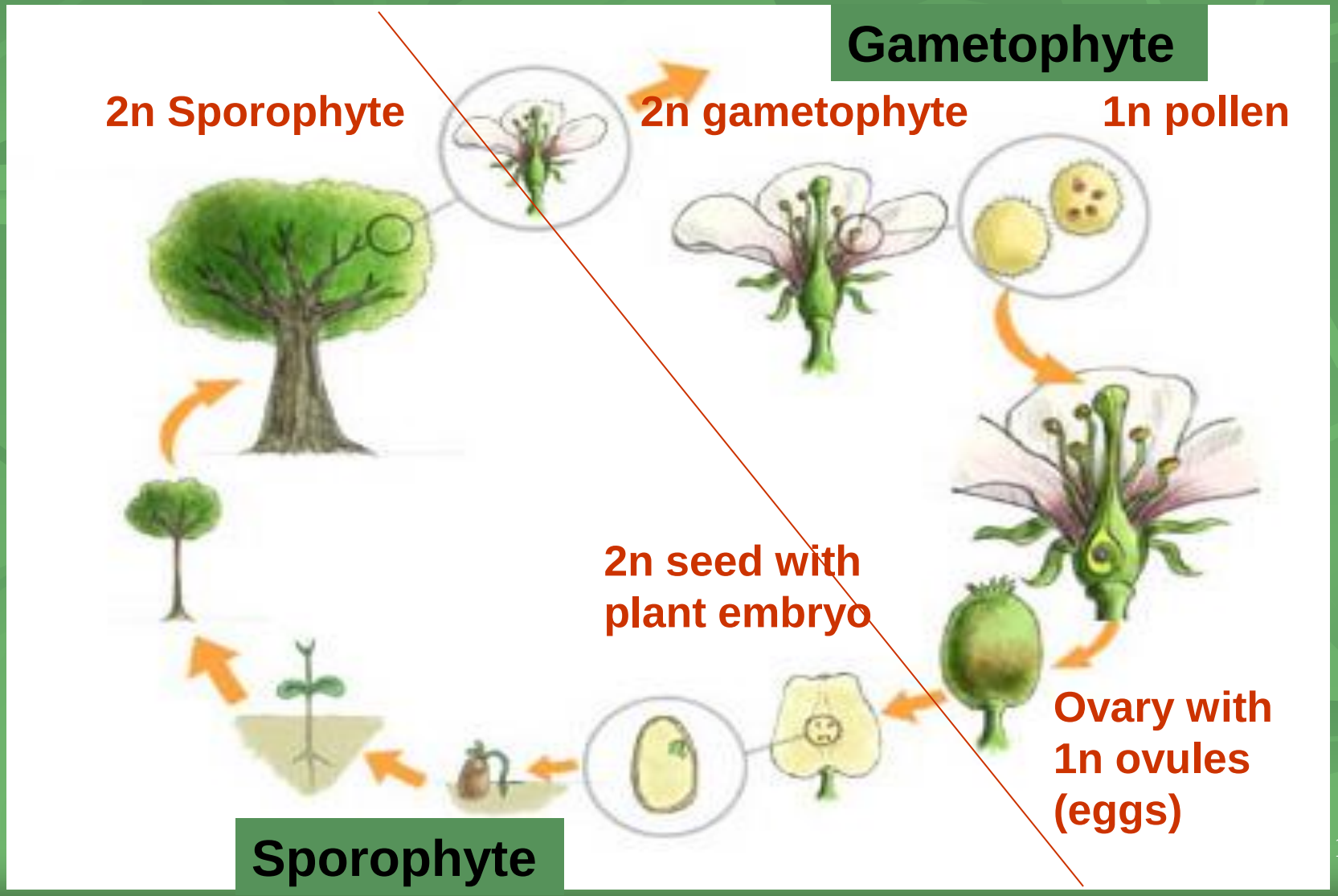
Plant Reproduction

- Alternation of generations life cycle
- Diploid (2n) sporophyte stage
- Haploid (1n) gametophyte stage
- Produce multicellular embryo protected inside multicellular haploid (gametophyte egg sac) tissue

Plant Reproduction

- Diploid (2n) sporophyte stage produces haploid spores by meiosis
- Haploid spores undergo mitosis to produce gametophyte stage
- Gametophyte makes gametes (eggs and sperm) by meiosis
- Zygote (2n) produces the new sporophyte

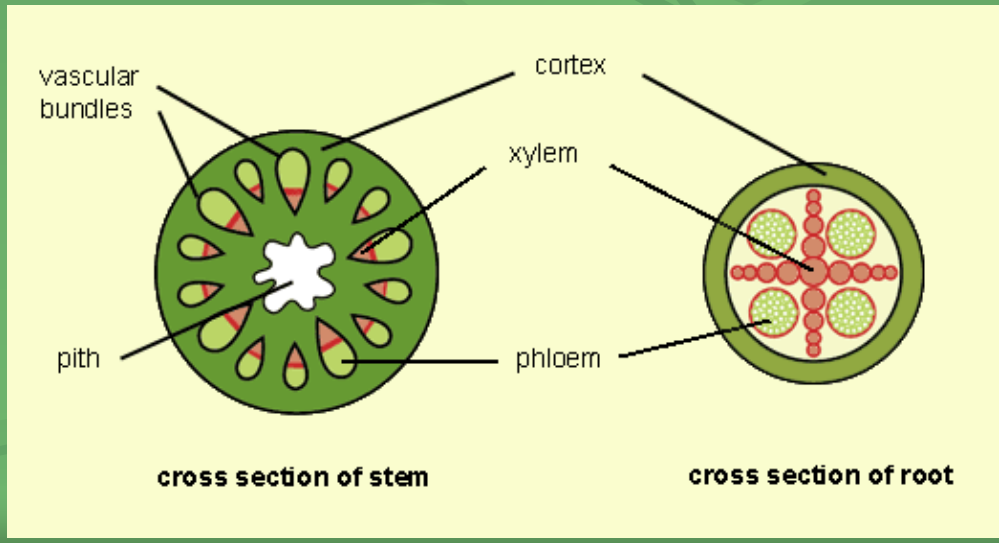
Alternation of Generations



Plant Divisions

Taxonomy

- Plants are divided into two groups
- Based on the presence or absence of an internal transport system for water and dissolved materials
- Called Vascular System



Vascular System

- **Xylem** tissue carries **water** and **minerals** upward from the roots
- **Phloem** tissue carries **sugars** made by photosynthesis from the leaves to where they will be stored or used
- **Sap** is the fluid carried inside the xylem or phloem

Nonvascular Plants

- Do not have vascular tissue for support or conduction of materials
- Called Bryophytes
- Require a constantly moist environment

Moss Gametophytes & Sporophytes

Nonvascular Plants

- Plants can't grow as tall
- Cells must be in direct contact with moisture
- Materials move by diffusion cell-to-cell
- Sperm must swim to egg through water droplets

Nonvascular Plants

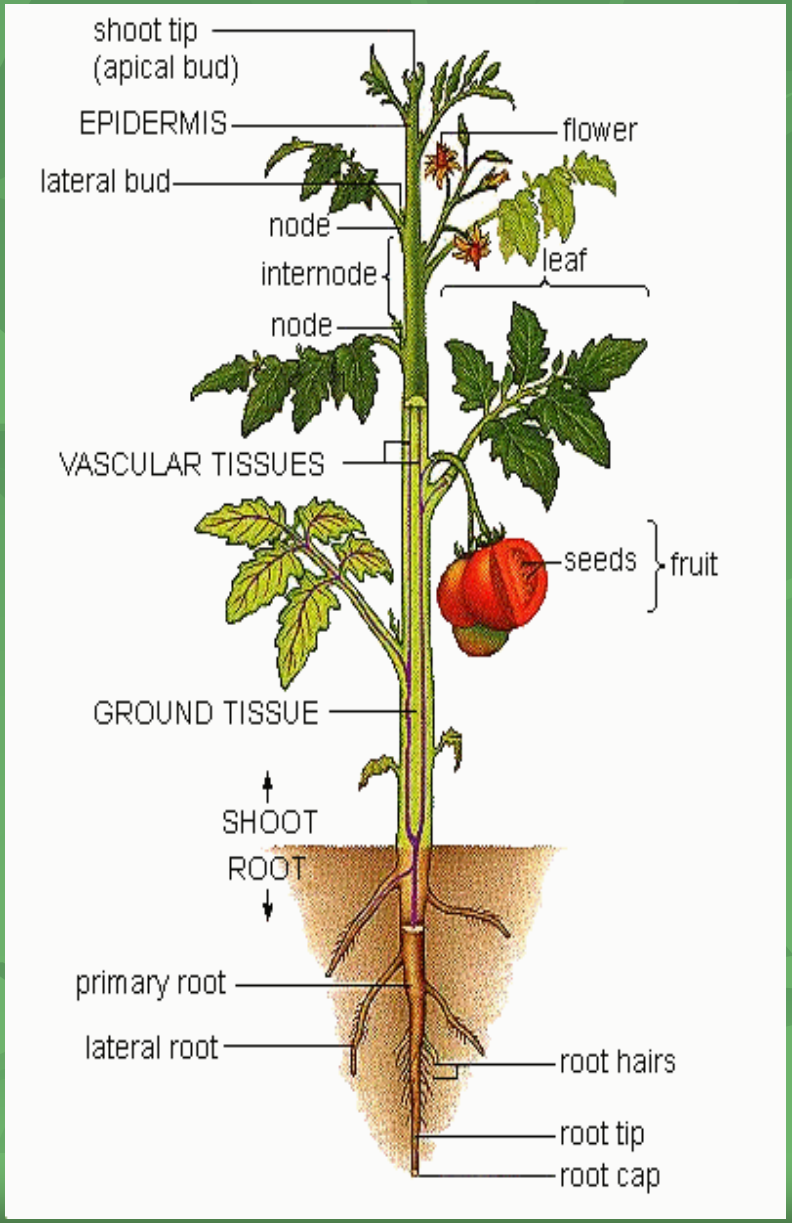
- Includes mosses (Bryophyta), liverworts (Hepatophyta), and hornworts (Antherophyta)

Liverworts

Hornworts

Main Parts of Vascular Plants

- Shoots
  - **-Found above ground**
  - **-Have leaves attached**
  - **- Photosynthetic part of plant**
- Roots
  - -Found below ground
  - -Absorb water & minerals
  - -Anchor the plant

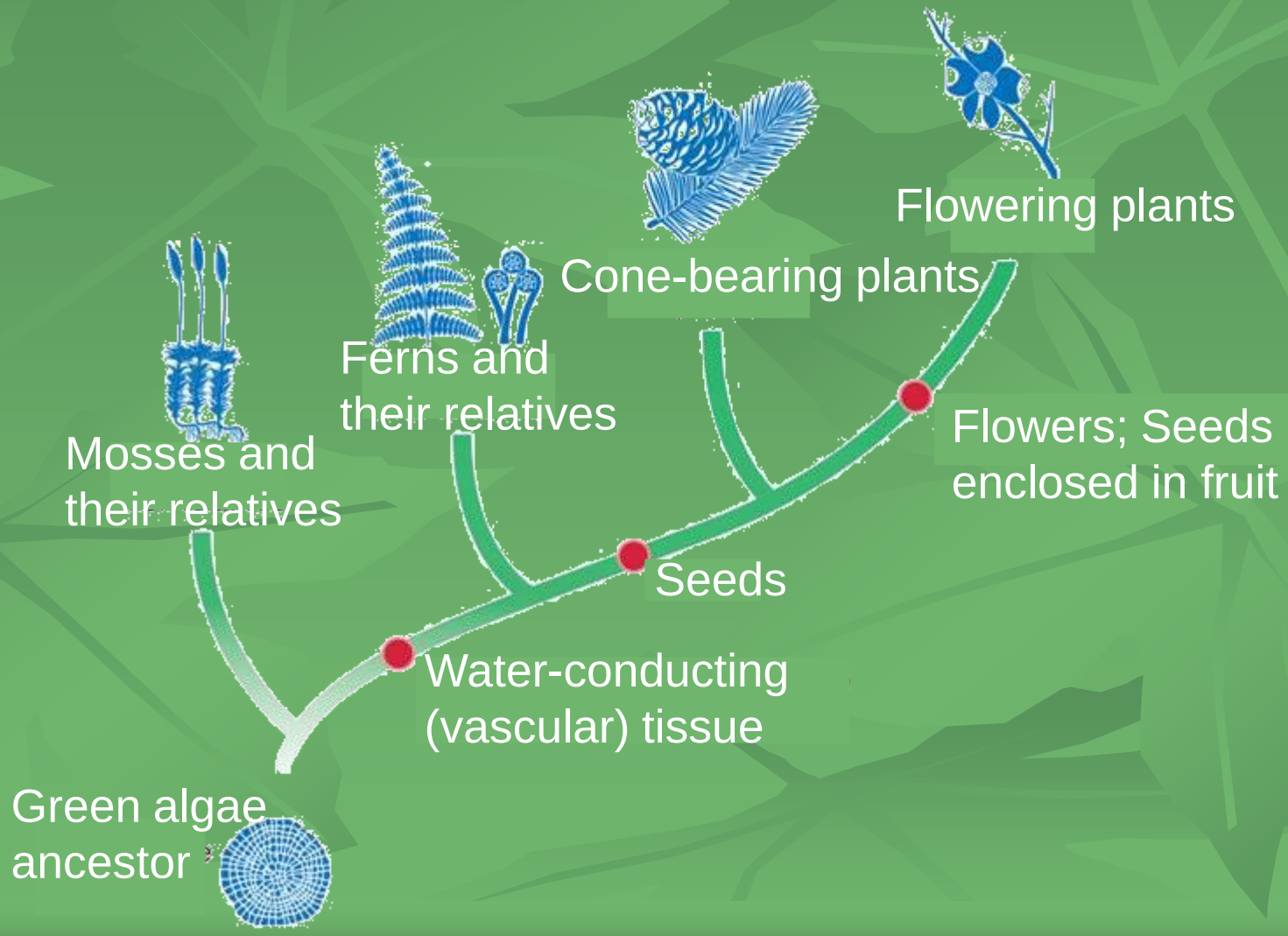


Vascular Plants

- Also called Tracheophytes
- Subdivided into two groups -- Seedless vascular plants and Seed-bearing vascular plants

Club Moss

Evolution of the Plant Kingdom



Seedless Vascular Plants

- Includes club moss (Lycophyta), horsetails (Sphenophyta), whisk ferns (Psilophyta), and ferns (Pterophyta)

Whisk ferns

Horsetails

Seed-Producing Vascular Plants

- Includes two groups – Gymnosperms and Angiosperms
- Gymnosperms have naked seeds in cones
- Angiosperms have flowers that produce seeds to attract pollinators and produce seeds

Gymnosperms

- **Coniferophyta** are known as conifers
  - Includes pine, cedar, spruce, and fir
- **Cycadophyta** – cycads
- **Ginkgophyta** - ginkgo

Cycad

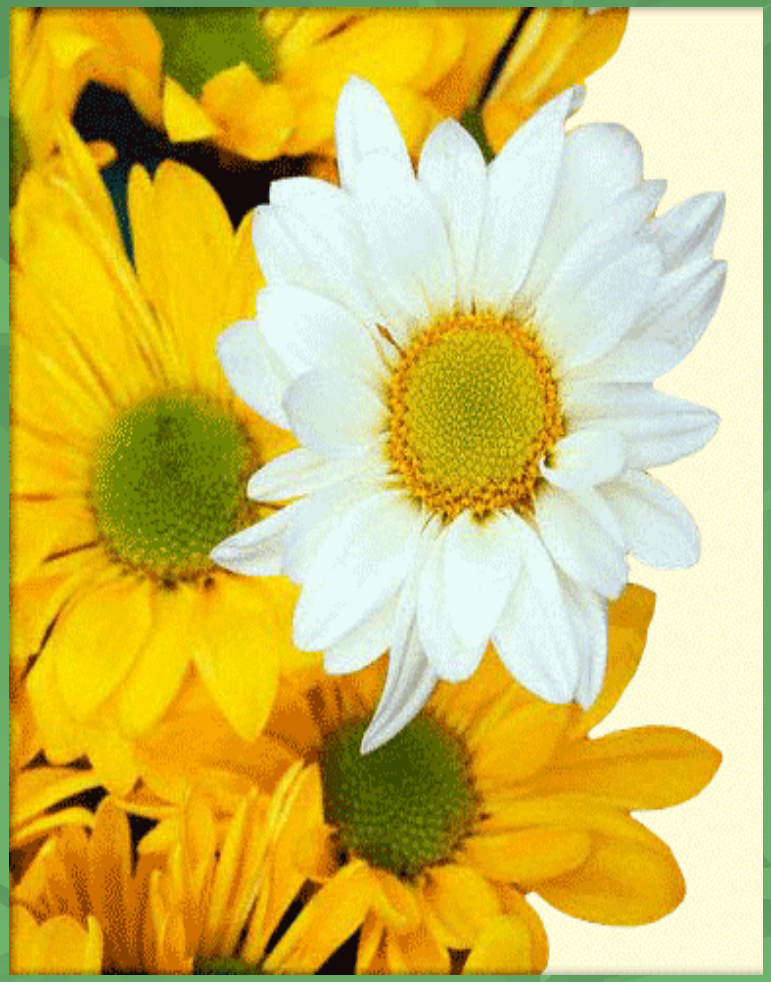
Ginkgo

Gymnosperms

- Contains the oldest living plant – Bristle cone pine
- Contains the tallest living plant – Sequoia or redwood

Angiosperms

- Flowering plants
- Seeds are formed when an egg or ovule is fertilized by pollen in the ovary
- Ovary is within a flower
- Flower contains the male (stamen) and/or female (ovaries) parts of the plant
- Fruits are frequently produced from these ripened ovaries (help disperse seeds)

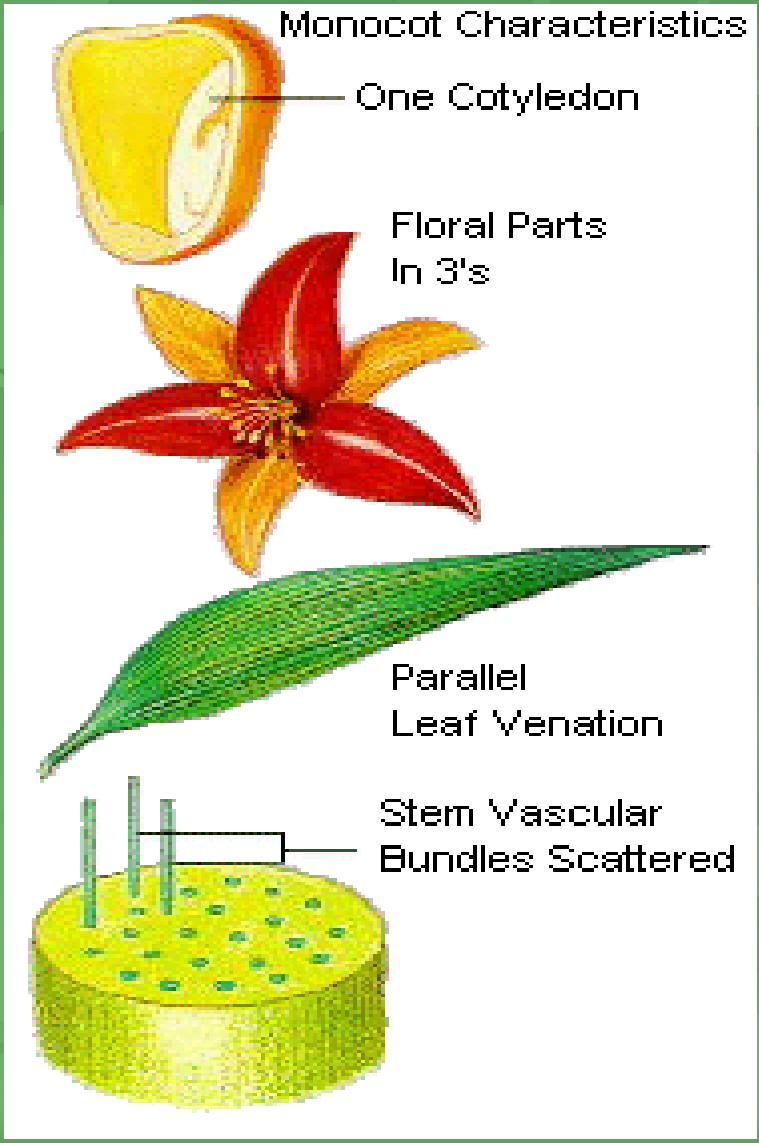


Angiosperms

- Division Anthophyta
- Subdivided into two groups – Monocots and Dicots
- Monocots have a single seed cotyledon
- Dicots have two seed cotyledons

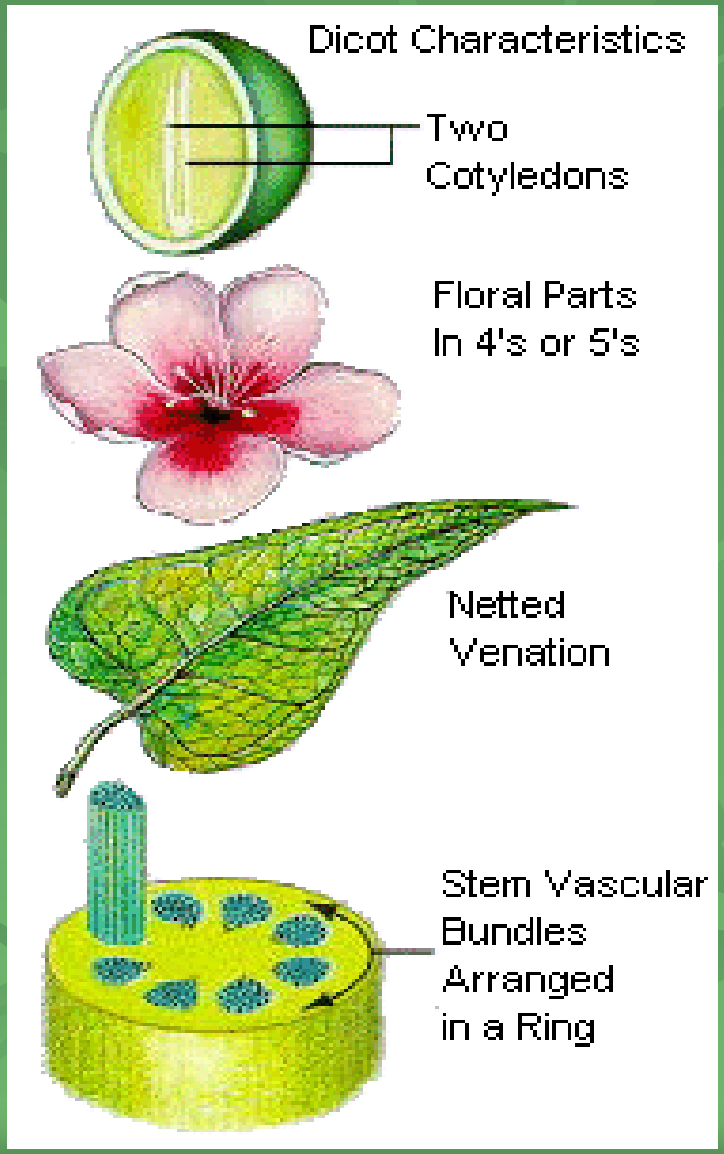
Monocots

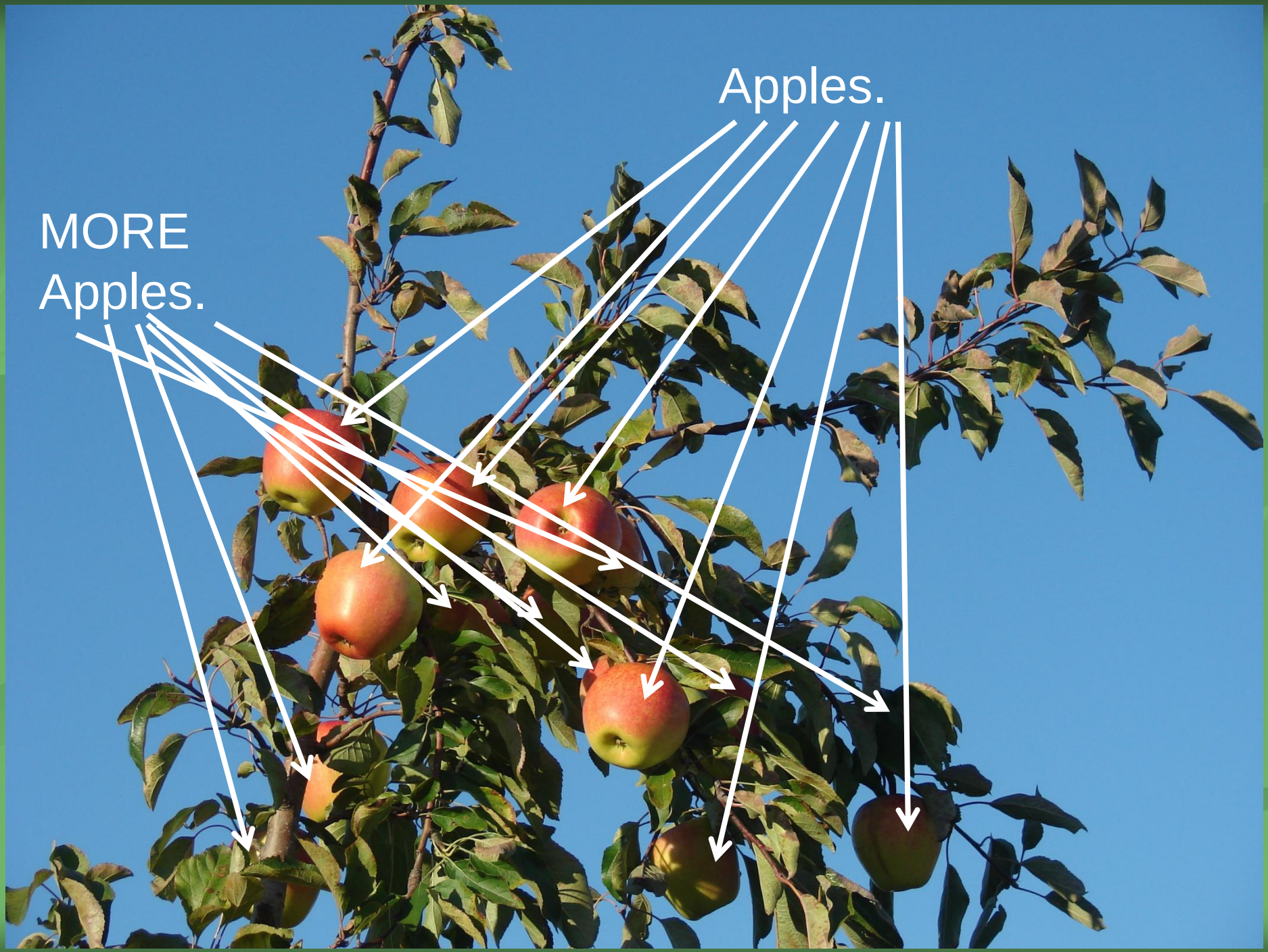
- **Parallel** venation in leaves
- Flower parts in **multiples of 3**
- Vascular tissue **scattered** in cross section of stem



Dicots

- **Net venation** in leaves
- Flower parts in **multiples of 4 or 5**
- Vascular tissue **in rings** in cross section of stem




Apples.
MORE
Apples.