SYSTEMATIC BOTANY

STUDY OF THE CLASSIFICATION OF PLANTS

Learning Target:

- Living things can be classified based on structural, embryological, and molecular evidence.
  - Be able to describe the levels of classification.
  - Be able to name organisms using binomial nomenclature.
  - List and give examples for each kingdom based on a 6 kingdom classification system.

I   **Taxonomy** – science of classification

7 groups scientists use to classify things:

+ **Kingdom (animalia)**

+ **Phylum/Division – (chordata)**

+ **Class – (mammalia)**

+ **Order – (primate)**

+ **Family (hominidae)**

+ **Genus – (Homo)**

+ **Species – (sapien) – group of similar organisms that can mate and produce *FERTILE* offspring.**

When writing the scientific name of an organism, we use the genus and species names.

Ex: *Homo sapien*   (human)

       Felis concolor   (cougar)

       Acer species   (all maples)

       Genus name is capitalized

       species name is lower-case.

       Both names are italicized.

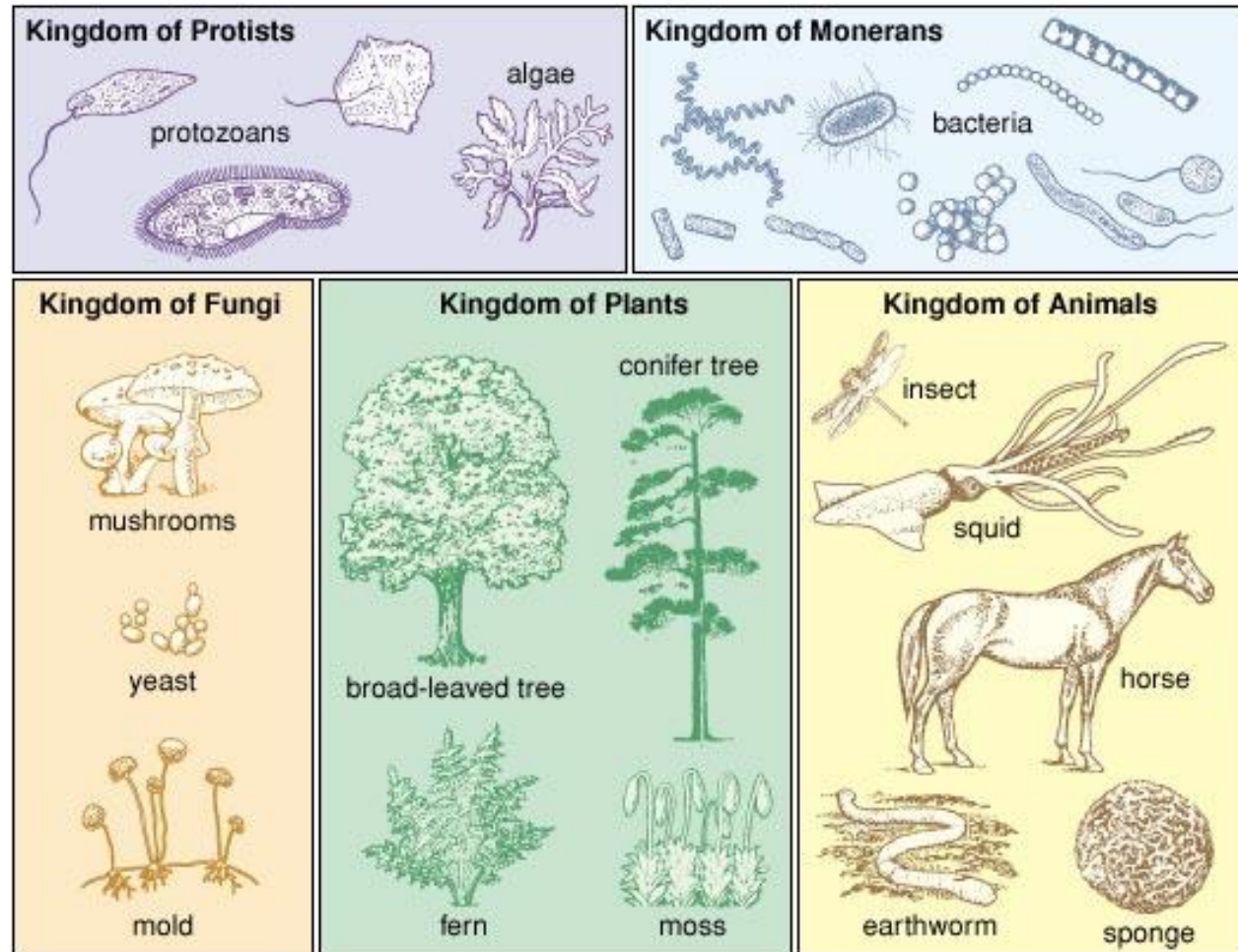   <u>Underline if you can't use italics!</u>

Taxonomists use these groupings to help understand the relationships between living things.

In order to place organisms in a group, scientists use:

      a) Structural similar

      b) Genetics

      c) Evolution

      d) Embryology

II. KINGDOMS

- Animalia
- Plantae
- Fungi
- Monera
  - Eubacteria
  - Archaebacteria
- Protista

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Animalia

- Multicellular
- Eukaryotic
- Heterotrophic
- Most motile
- Exhibit embryonic development

Animalia

- Examples:
  - Lizzard
  - Dog
  - Tiger
  - Lion
  - Human

Plantae

- Multicellular
- Eukaryotic
- Autotrophic (photosynthetic)
- Have cells with cell walls

Plantae

- Examples:
  - Pines
  - Maples
  - Flowers
  - Oaks
  - Ferns

Fungi

- Multicellular
- Eukaryotic
- Made of thin threads called hyphae.
- Heterotrophic
- Cell walls made of chitin.
- Reproduce by spores.

Fungi

- **Examples**:
  - Yeast,
  - Mold,
  - Mushrooms,
  - Bracket fungi
  - Puffball

Mushrooms with white or cream spores

Pleurotus They grow on wood or debris. The stem is either lateral or almost absent

Collybia The gills are very numerous (crowded). The stem is fibrous

Melanoleuca The caps are normally flat with a central umbo. The stem is fibrous

Cantharellus The Chanterelles have gill-like wrinkles rather than gills

Clitocybe The gills run down the stem (decurrent) in most of the species

Tricholoma Brown, grey, white or yellow. Generally thick-fleshed with a stout appearance

Marasmius Mostly small and white with tough flesh. This one is the Fairy Ring Champignon

Armillaria Grows on or near trees, very often in large clumps

Amanita They all have a bag (volva) or a bulb with a rim at the stem base. Most have a ring on the stem

Lepiota & Macrolepiota Usually have rings on the stem and scales on the cap. Some are very large, some small

Russula Very common in woods, often bright colours. The gills and flesh are brittle, the gills white or creamy

Mycena Very small species with thin stems and mainly conical caps. Some exude a liquid on breaking the stem

Lactarius Exude droplets of milky-white or coloured liquid when damaged

Oudemansiella This one has a deep root

Hygrocybe Waxy to the touch, often brightly coloured, growing in grass

Laccaria The main species are very common. The stem is fibrous

Monera

- Archaebacteria (ancient Bacteria)
  - Prokaryotes (no nucleus)
  - Unicellular
  - Strange bacteria that inhabit strange environments (high salt or high temp)
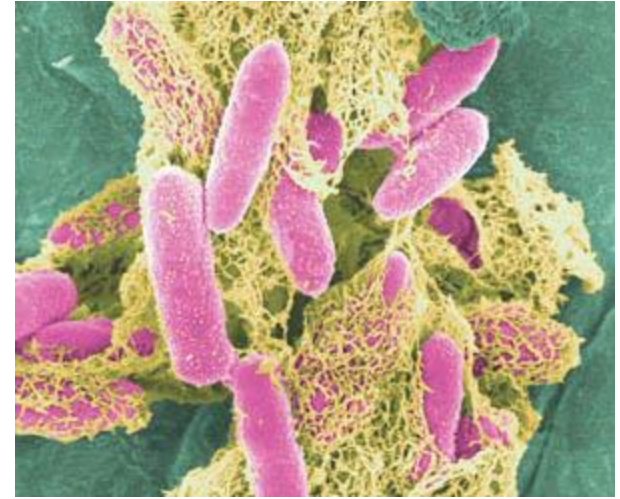
  - Ex:
    - Thermophiles
    - hemophiles

- Eubacteria (True Bacteria)
  - Prokaryotes (no nucleus)
  - Unicellular
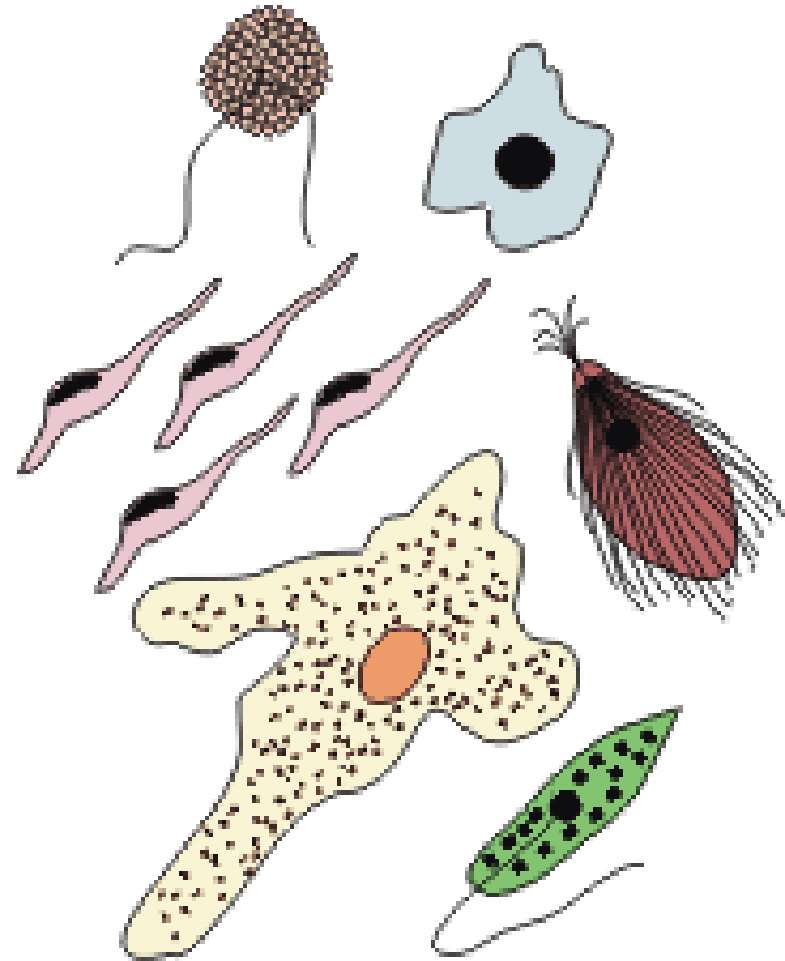 - No organelles

  - Examples:
    - Streptococcus
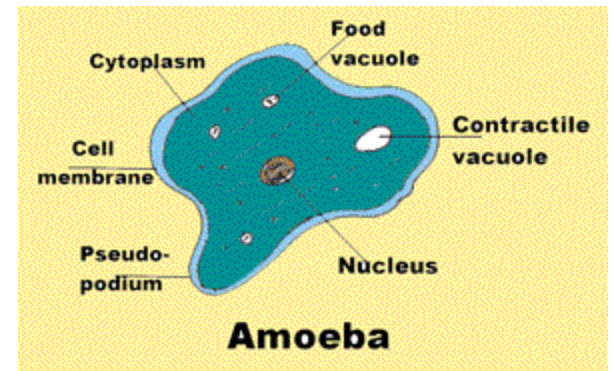   - E. Coli
    - Cyanobacteria

Monera

Protista

- Microscopic, unicellular
- Eukaryotic
- May be heterotrophic or autotrophic
- Most reproduce by fission
- Grouped into 3 categories:
  - Animal-like
  - Plant-like
  - Fungus-like

Protista
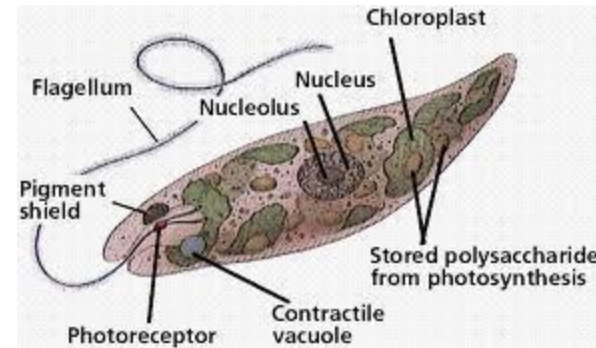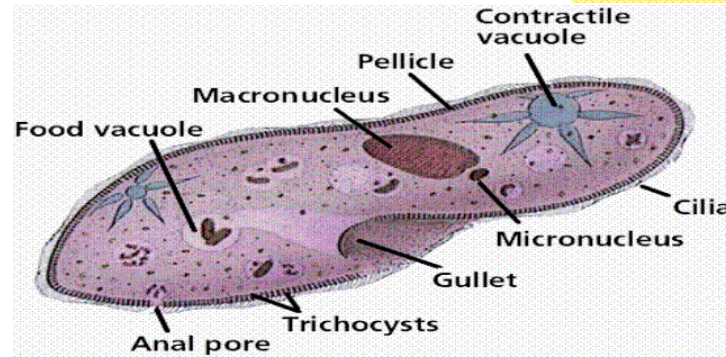
Amoeba

❑ Examples:
   a. Amoeba
   b. Paramecium
   c. Euglena
   d. Stentor

Learning Target

- Living things can be classified based on structural, embryological, and molecular evidence.
  - Describe the distinguishing characteristics of each group of plants.
  - Be able to classify plants into their correct groups.

Plant Classification

- **Objectives:**

- - Describe the basic Divisions of the plant kingdom.

- - Identify mosses and their relatives as seedless nonvascular plants.

- - Identify club mosses and ferns as seedless vascular plants.

- - Describe the characteristics of seed plants, including cone-bearing plants and flowering plants.

III. PLANT CLASSIFICATION

The plant kingdom includes the flowering plants, conifers, ferns, mosses, and certain kinds of algae.

A) Water plants (Algae) – simple, water-dwelling plants.

   1) <u>Green algae</u> – thought to be closely related to land plants.

   2) <u>Red algae</u> – generally large, multicellular ocean plants.

   3) <u>Brown algae</u> – generally large, multicellular ocean plants.

B) Land plants

1) <u>Non-vascular plants</u> – Lack an internal means for water transportation. Grow mainly in moist, shady places.

- Main group is **<u>Bryophyta</u>**: (have no roots or stems)
  - Mosses
  - Liverworts

moss

Close-up of moss with spore-producing structure.
http://www.search.com/reference/Moss

Liverworts

Small picture from:
http://www.erin.utoronto.ca/~w3env100y/
env/ENV100/sci/biodiversity_03.htm

2) <u>Vascular plants</u> – have vascular (conducting) tissues which transport water, minerals, and photosynthetic materials throughout the plants roots, stems and leaves.

Two main groups: nonseed and seed plants.

a) Non-seed plants reproduce with spores

i. Ferns

ii. Horsetails

iii. Ground pines

iv. Club mosses

Fern

Horsetails

Ground pines

Club mosses

b) Seed Plants

i. Gymnosperms – "naked", unprotected seeds (lacking an enclosing fruit)

ii. Angiosperms – enclosed protected seeds. Flowering plants, seeds develop within a fruit.

The Gymnosperms…

a) Conifers
b) Cycads
c) Ginko

Conifers (evergreens): have needles, seed and pollen cones. Ex: pine, spruce, cedar, hemlock, juniper, yew, sequoia.

**Cycads** – many extinct, grow in tropical areas, resemble palm trees.

Ginkgos: one remaining species the maidenhair tree. Leaves fan-shaped with a large fleshly seed "fruit". *The seed coat is fleshy and LOOKS like a fruit, but it is not actually a protective ovary wall, so it isn't technically a fruit.*
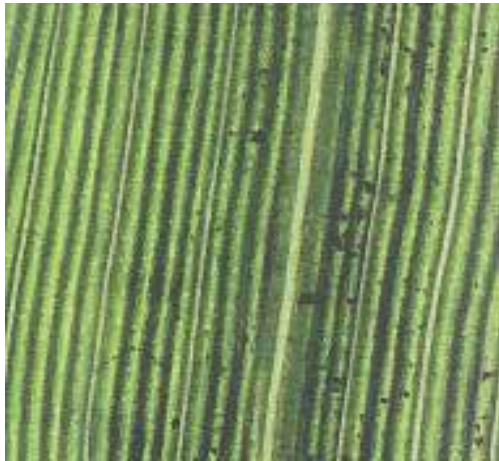
The Angiosperms…

a) Monocotyledons (monocots) have one cotyledon, or seed leaf, in the seed.   Examples: grasses, orchids, lilies, palms

b) Dicotyledons (dicots) have two cotyledons, or seed leaves, in the seed. Examples: shrubs, trees, wildflowers, and herbs
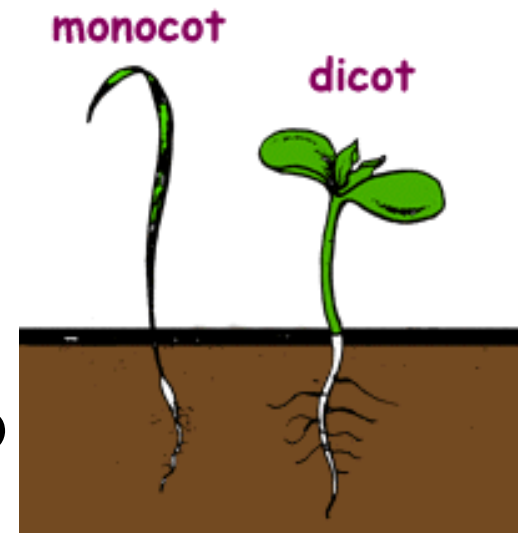
Other ways to tell monocots from dicots…

Arrangement of veins in the leaves shows whether a plant is a monocot or a dicot

1. Veins in the leaves of monocots are parallel to each other

2. Veins in the leaves of dicots are branching

Both pictures from: www.backyardnature.net

Arrangement of petals shows whether a plant is a monocot or a dicot

1. Monocots have flower parts in multiples of threes

2. Dicots have flower parts in multiples of fours or fives

http://www.bridgewater.edu/~lhill/Monocotordicot.htm

Monocots
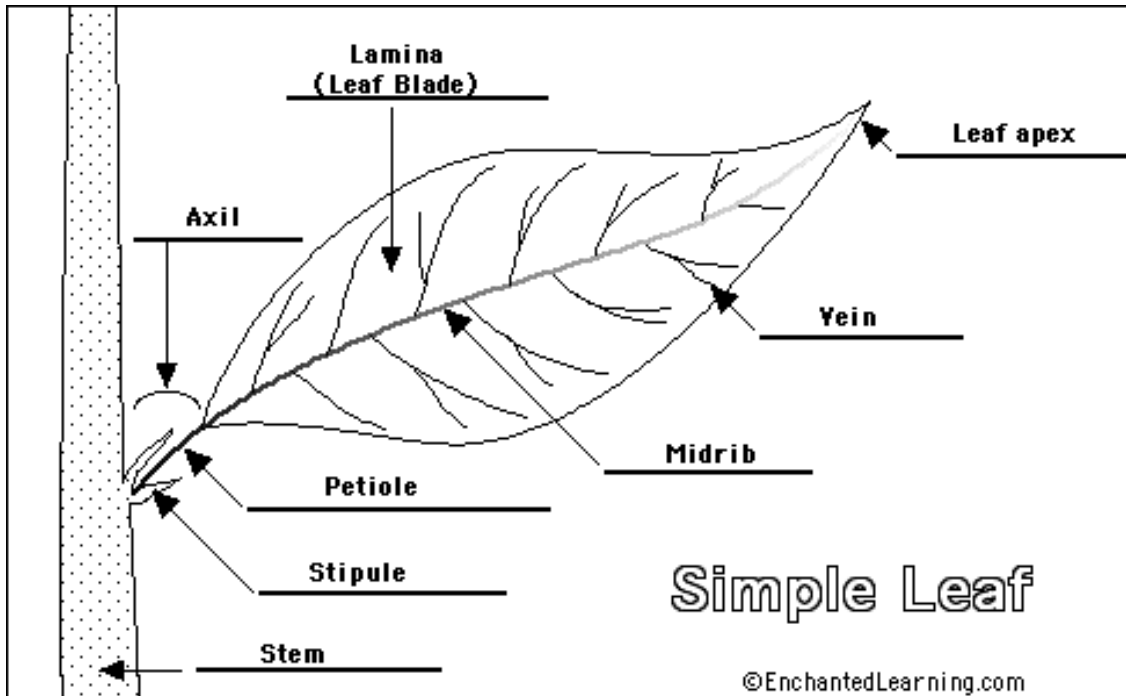
Monocot Leaves

Dicots

Learning Target

- Describe different anatomical patterns that are used to classify plants.

Success Criteria:

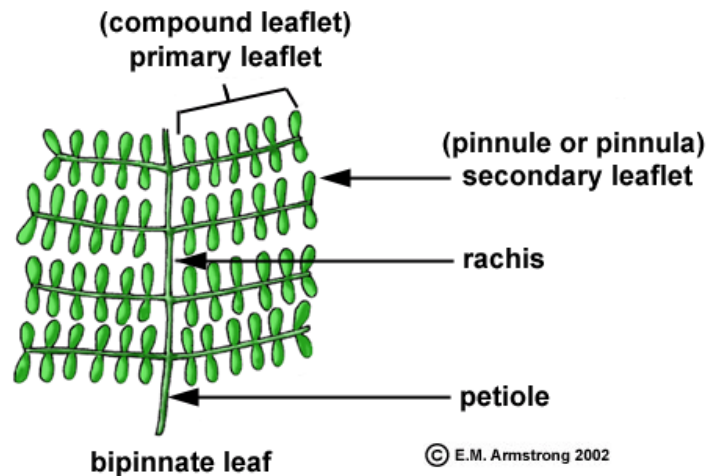- Students will be able to identify plants with each of the anatomic patterns used in classification.

IV. Plant anatomy:

Lamina (Leaf Blade)

Leaf apex

Axil

Vein

Petiole

Midrib

Stipule

Simple Leaf

Stem

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A) Leaf type:
1) SIMPLE – one blade per petiole
2) COMPOUND – more than one blade per petiole

Different types of compound leaves…

(compound leaflet)
primary leaflet

(pinnule or pinnula)
secondary leaflet

rachis

petiole

bipinnate leaf

© E.M. Armstrong 2002

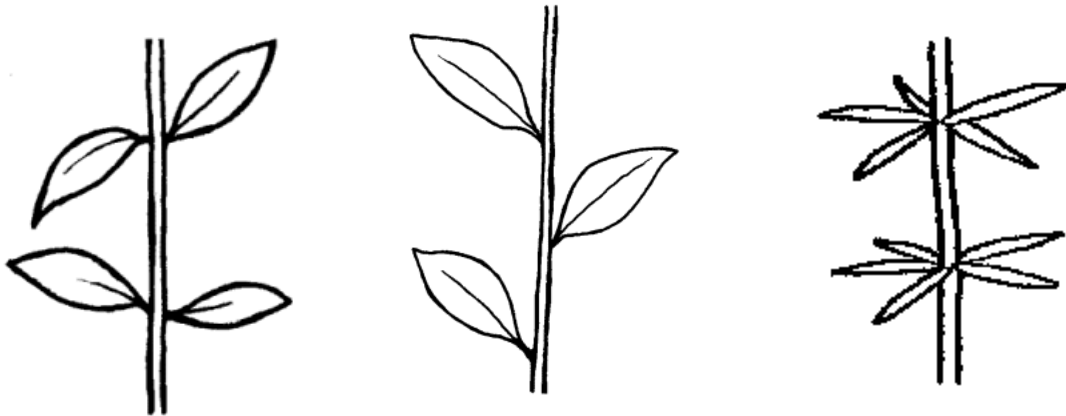(left to right)

a. Pinnate

b. Bipinnate

c. Palmate

B) LEAF ARRANGEMENTS: How the leaves are attached to the stem.
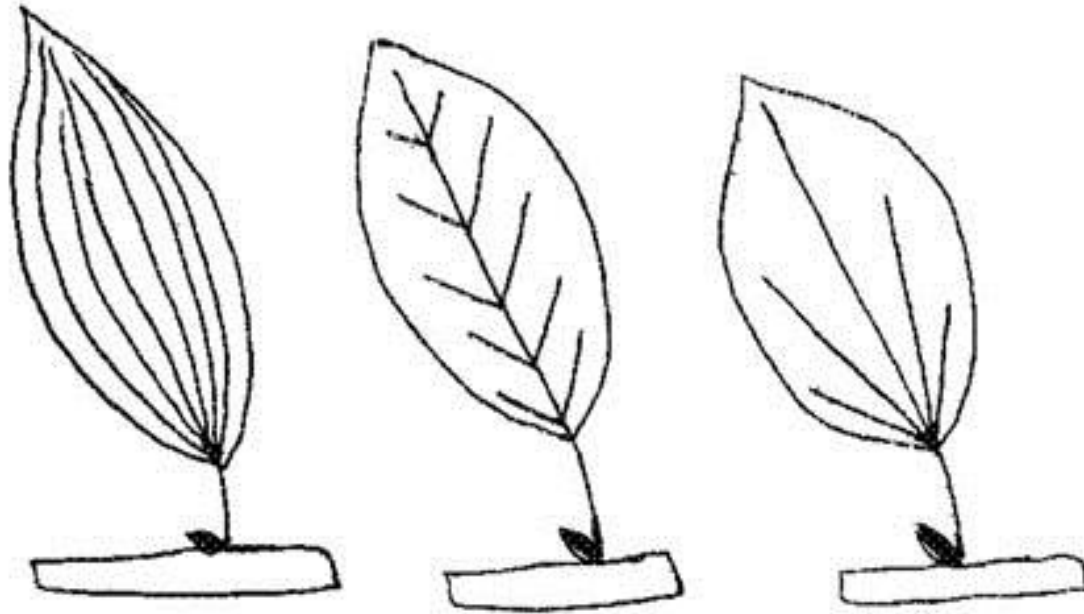
(left to right)

1) Opposite

2) Alternate

3) Whorled

C) LEAF VEINATIONS: How the veins are arranged on a leaf.

(left to right)

1) Parallel

2) Pinnate

3) Palmate

D) Leaf margins (the edge of the leaf)

(from top to bottom)

1. Entire (smooth – no teeth or indentations).

2. Serrated (teeth)

3. Lobed (indentations in the sides of the leaf)

(these aren't all the possible leaf margins!)