What is botany?

- The biological science of plants
- The plant life of a particular area
The Cell

Figure 1.2 A typical plant cell.
1. Cell wall
2. Cell (plasma) membrane
3. Chloroplast
4. Mitochondrion
5. Vacuole
6. Microfilament
7. Cytoplasm
8. Golgi apparatus (dictyosome)
9. Nuclear pore
10. Nuclear membrane (envelope)
11. Nucleolus
12. Chromatin
13. Rough endoplasmic reticulum
14. Vesicle
15. Smooth endoplasmic reticulum

Tissues

- Groups of similar cells that perform specific functions
  - Meristematic tissue
    - Apical
    - Lateral
    - Secondary (vascular cambium; cork cambium)
  - Dermal tissue
    - Epidermis
    - Cuticle
    - Stomata
    - Lenticels
  - Ground tissue
    - Parenchyma
    - Collenchyma
    - Sclerosis
  - Vascular tissue
    - Xylem (Tracheids and vessel elements)
    - Phloem (Sieve tube elements and companion cells)
Organs

- Two or more tissue systems that carry out specific functions together
  - Roots
  - Stems
  - Leaves
  - Flowers
Roots

- Root cap
- Meristematic region
- Elongation region
- Maturation region
Roots

Fibrous root system (grass)
Taproot (shrub)
Modified taproot (carrot)
Prop roots (corn)
Aerial roots (orchid)

Terminology

Figure 9.1 Anatomy of a typical dicot.

Leaves

Leaves of Angiosperms

Parallel venation

Entire

Serrate

Simple

Pinnately compound

Pinnately lobed

Petiole

Petiole

Pinnately compound

Undulate

Complexity

Arrangement on stems

Stem

Stem

Alternate

Opposite

Whorled

Venation

Margins

Complexity

Stems

- Herbaceous
- Woody
  - Bark
  - Wood
Stems

Respiration

Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) + 6$\text{O}_2$ $\rightarrow$ 6$\text{H}_2\text{O}$ + 6$\text{CO}_2$ + 36$\text{ATP}$ + Heat
Photosynthesis

Sunlight → Captured by leaves (ATP) → CO₂ → Glucose
Transpiration

Outside air $\Psi_w = -95.2$

Leaf $\Psi_w = -0.8$

Xylem $\Psi_w = -0.7$

Soil $\Psi_w = -0.3$

Root $\Psi_w = -0.5$
Plant allies

- Bacteria
- Algae and slime molds
- Fungi
  - Fungi, yeasts, molds, mushrooms, rusts, lichens
- Bryophytes
  - Liverworts and mosses
- Ferns
Gymnosperms

A plant class (Gymnospermae) having exposed seeds

- Cycads
- Gingko
- Conifers
Conifers

Flowering Plants

- Angiosperms
  - Dicotyledon
  - Moncotyledon
Dicotyledons

- Two cotyledons
- Flower parts often in fours or fives, or multiples of four or five
- Leaf veins form a net pattern
- Pollen grains often have three pores or slits
- Vascular bundles arranged in a ring

Monocotyledons

- One cotyledon
- Flower parts usually in threes or multiples of three
- Leaf veins parallel
- Pollen grains often have one pore
- Vascular bundles scattered

Flowers

Terminology

- Complete flower
- Incomplete flower
- Perfect flower
- Imperfect flower
  - Staminate or pistallate
  - Monoecious
  - Dioecious
Diagram showing the process of pollination.

Figure 9.65 Structures of the flower and fruit of an angiosperm, the pear. The pear fruit develops from the floral tube (fused perianth) as well as the ovary.
Seeds, Fruits, and Seed Germination of Angiosperms

Figure 9.75 Several types of fruit.

Factors affecting plant growth

- Abiotic (nonliving)
  - Light
  - Temperature
  - Water
    - Xerophytes
    - Hydrophytes
    - Mesophytes
  - Soil
Factors affecting plant growth

- Biotic (living)
  - People
  - Animals
  - Fungi
  - Bacteria
  - Insects