Tissues & Organs

I. Plants have three or four major groups of organs:
   - Roots
   - Stems
   - Leaves
   - Flowers

II. Each organ is composed of tissues.
   - A tissue is a group of cells performing a similar function.

Plant Growth

Meristems – Tissues of plants that add new growth. Regions of actively dividing cells.

Apical – increases length/height (primary)
Lateral – increases girth. (secondary)
Axillary Buds

Brussels sprouts: an example of edible axillary buds

Cauliflower -- a mass of shoot meristems

Lateral Meristems

Produce secondary tissues that increase the girth of roots and stems (= secondary growth).

- Vascular Cambium - Produces tissues that function primarily in support and conduction, i.e., makes transport system.
  
- Cork Cambium - Lies outside vascular cambium just inside the outer bark
  
Preparation for Growth

One cell may experience a different environment from another.

- chemical factors
- physical influence
Types of Tissues

- **Dermal tissue system** – protects plant from water loss.
- **Ground tissue system** – Provides support, stores starch and carries out photosynthesis.
- **Vascular tissue** – Conducts fluids and helps strengthen roots, stems and leaves.

Dermal Tissues

Found in shoot system

I. Cuticle – waxy coating
II. Epidermis – for outer layer
III. Trichomes – Hairs for preventing water loss.
IV. Periderm – outer bark

Ground Tissues

I. **Parenchyma** – pithy core, majority of tissues in roots and shoots. These cells photosynthesize in leaves.
II. **Collenchyma** – Cylinder shaped, hold the plant together. Irregular corners.
III. **Sclerenchyma** – Thick walls, surrounds vascular tissues. Not living when mature.

Tissues Produced By Meristems

Simple Tissues

- **Parenchyma** - Composed of parenchyma cells
  - Parenchyma cells:
    - Thin, pliable walls
    - Usually 14-sided at maturity
    - Living cytoplasm, often containing large vacuoles and various secretions
    - May remain alive a long time
    - Have spaces between them

Collenchyma tissue -

Contains collenchyma cells

- Collenchyma cells:
  - Living cytoplasm
  - May remain alive a long time
  - Cell walls thick, and with uneven thickness due to extra primary wall in cell corners
  - Pliable and strong, thus providing flexible support

Sclerenchyma tissue -

- Thick, tough, secondary walls, normally impregnated with lignin
- Dead at maturity
- Function in support
- Two types: sclereids and fibers
  - Sclereids - Stone Cells
    - Scattered in tissue
    - Cells as long as wide

Tissues Produced By Meristems

Simple Tissues

- Collenchyma tissue -
- Sclerenchyma tissue -
**Vascular Tissue**

I. **Xylem** – water conducting pipes. 
   Wood is mostly xylem

II. **Phloem** – transports sugars & proteins 
   Sap runs through phloem

- Complex plant conducting tissues
  > xylem
  > phloem
  a young corn stem is shown here.

**Tissues Produced By Meristems**
**Complex Tissues**

- Epidermis- Protective layer that is one cell-layer thick covering all plant organs
  - Composed mostly of parenchyma cells, guard cells of stomata, secretory glands and hairs

- Periderm - Replaces epidermis when cork cambium begins producing new tissue
  - Constitutes outer bark.
  - Primarily composed of cork cells
    - Dead at maturity
    - While still alive, cytoplasm secretes suberin (fatty substance) into walls.
      - Makes cork cells waterproof and helps protect phloem
    - Lenticels: Loosely arranged pockets of parenchyma cells formed by cork cambium that protrude through the surface of periderm.
Review

- Organs and Tissues
- Meristematic Tissues
  - Apical Meristems
  - Lateral Meristems
  - Intercalary Meristems
- Tissues Produced by Meristems
  - Simple Tissues
  - Complex Tissues

Vegetative Reproduction

Asexual

I. Natural:
- Runners – e.g. Strawberries
- Tuber – e.g. Potato
- Bulb – e.g. Onion, lily (arise from axillary buds or underground stems).

II. Induced:
- Vegetative propagation – e.g. cuttings
- Tissue Culture Propagation – e.g. orchids
- Somatic embryogenesis – cloning in plants

Sexual Reproduction

Gametophyte: The multicellular, haploid stage in the life cycle of plants.

Sporophyte: The diploid form of a plant that produces, haploid, asexual spores through the process of meiosis – reduction division.