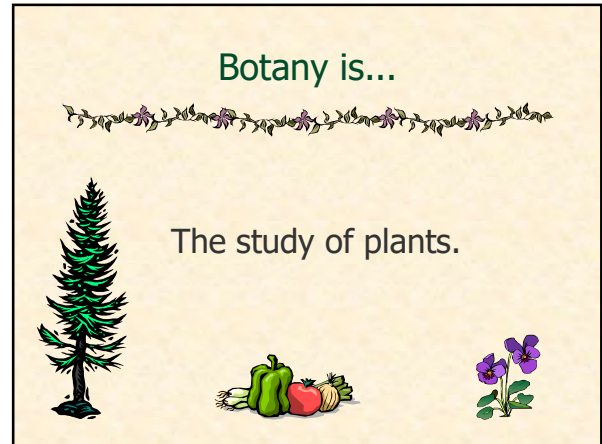


Botany Basics

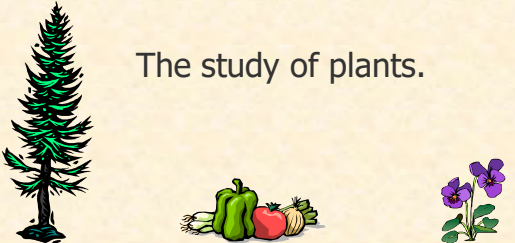
John Punches
Oregon State University

1

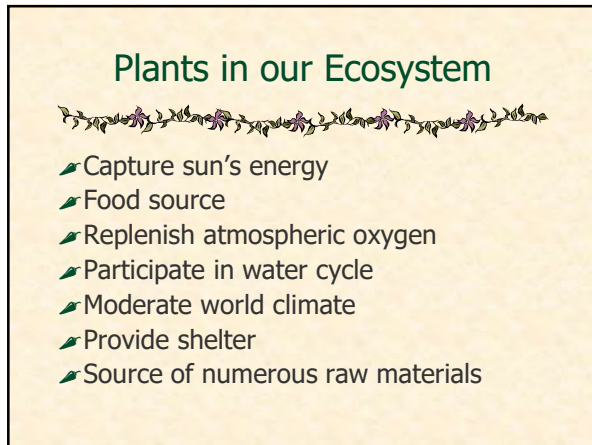


Botany is...

The study of plants.



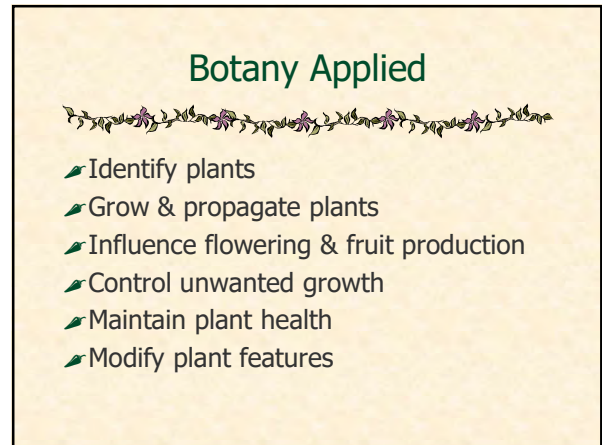
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Plants in our Ecosystem

- Capture sun's energy
- Food source
- Replenish atmospheric oxygen
- Participate in water cycle
- Moderate world climate
- Provide shelter
- Source of numerous raw materials

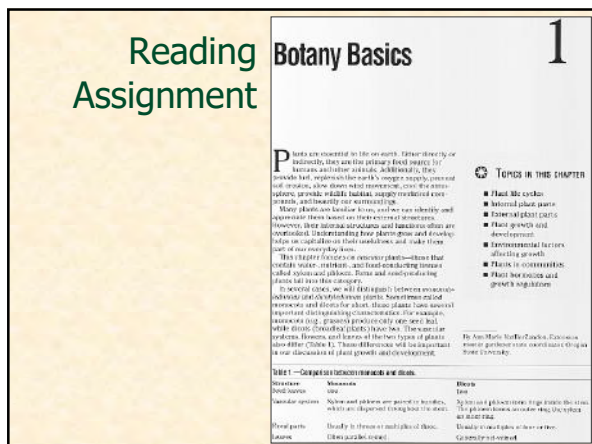
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Botany Applied

- Identify plants
- Grow & propagate plants
- Influence flowering & fruit production
- Control unwanted growth
- Maintain plant health
- Modify plant features

4



Reading Assignment

Botany Basics 1

Plants are essential to life on earth. Either directly or indirectly, they are the primary food source for humans and other animals. Additionally, they provide fuel, replenish the earth's oxygen supply, prevent soil erosion, slow down wind movement, cool the atmosphere, provide wildlife habitat, supply medicinal compounds, and modify our environment.

Many plants are low to the ground, and we can identify and appreciate them based on their external structures. However, their internal structure and function often are sophisticated. Understanding their structure and function helps us appreciate their capabilities and make them part of our everyday lives.

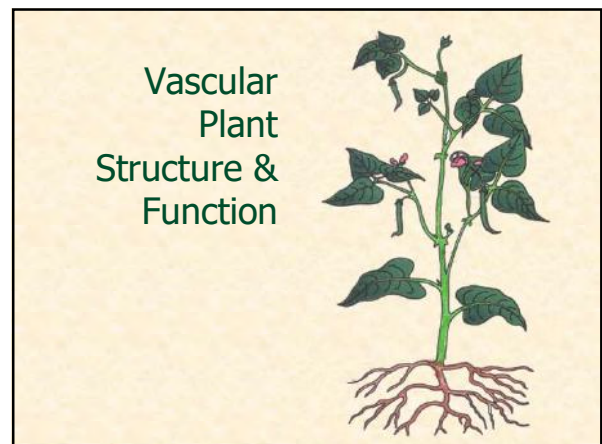
This chapter focuses on vascular plants—those that contain water, nutrients, and food-producing tissues called xylem and phloem. These and secondarying plants are the focus of this chapter.

In several cases, we will distinguish between monocotyledonous and dicotyledonous plants. Some terms and processes are shared for both. Some plants have several important characteristics in common. For example, bananas (a grass) produce only one seed but, while being dicotyledonous, have two. There are far systems. Roots and stems of the two types of plants differ (Table 1). These differences will be discussed in our discussion of plant growth and development.


By Ann Marie Hoffmann, Extension master gardener, and a horticulture degree from Colorado.

TABLE 1 — CHARACTERISTICS OF MONOCOTYLEDONOUS AND DICOTYLEDONOUS PLANTS		
Stem nodes	Monocots: None	Dicots: Present
Leaf venation	Monocots: Parallel	Dicots: Net-like
Flower parts	Monocots: Usually in threes or multiples of three.	Dicots: Usually in fours or multiples of four.
Root system	Monocots: Fibrous	Dicots: Taproot

5



Vascular Plant Structure & Function



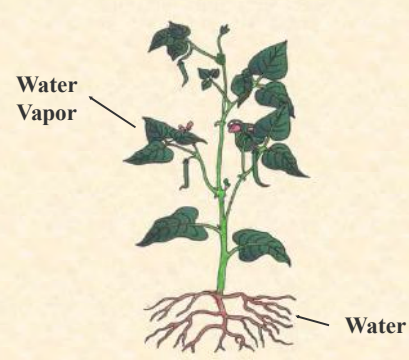
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Plant Life Functions

- Transpiration (water movement)
- Photosynthesis (energy capture)
- Respiration (energy release)
- Tissue Synthesis (growth)
- Maintenance, Storage, Defense

7

Transpiration = water movement



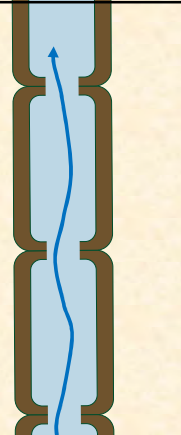
Water Vapor

Water

8


Xylem = plant plumbing

Water is "pulled" through xylem under negative pressure (tension or vacuum)



9

Transpiration in Leaves



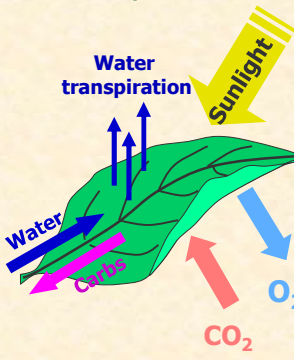
water

water vapor

10

Photosynthesis = food production

- Water + CO₂ are combined to produce simple sugars
- O₂ is a byproduct



Water transpiration

Sunlight

Water

CO₂

O₂

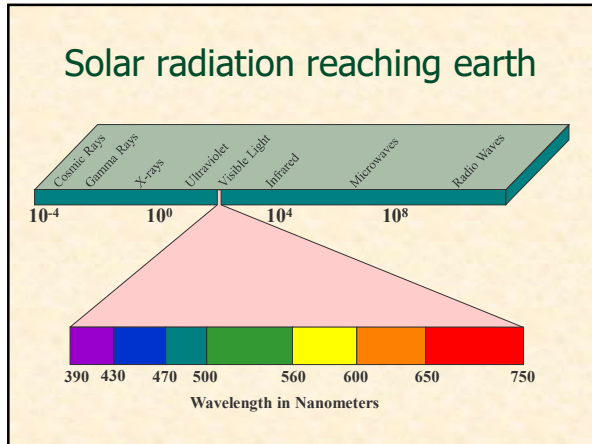
cuticle

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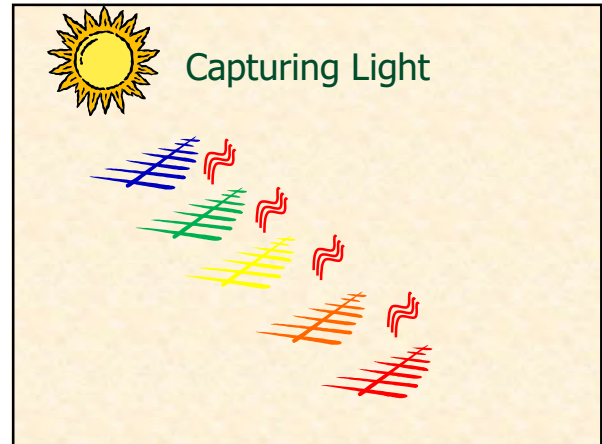
Photosynthesis requires...

- light
- water
- carbon dioxide
- green stuff...

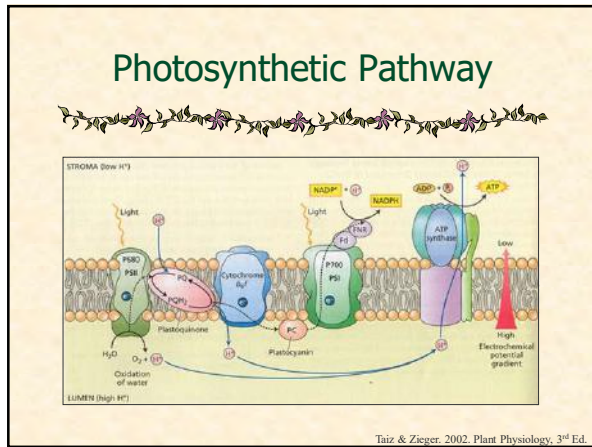
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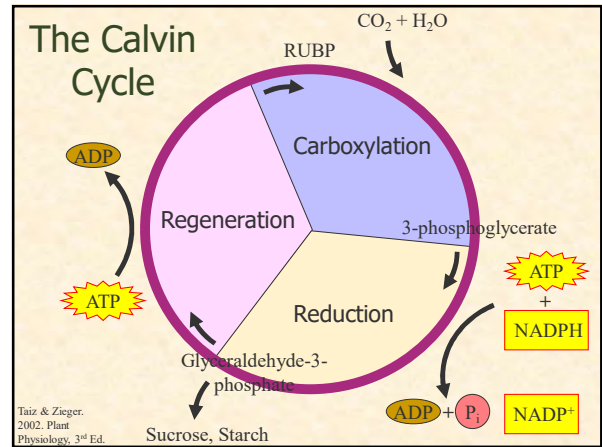
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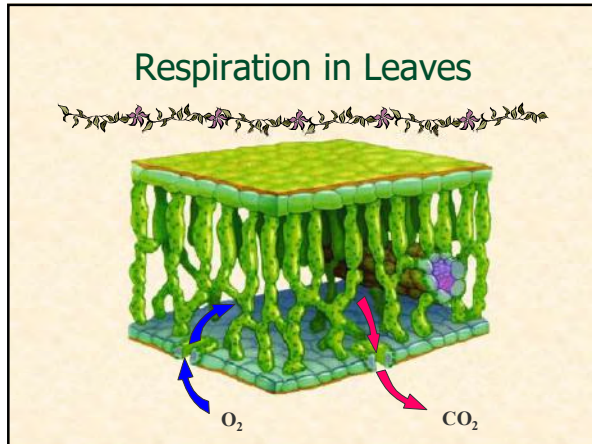
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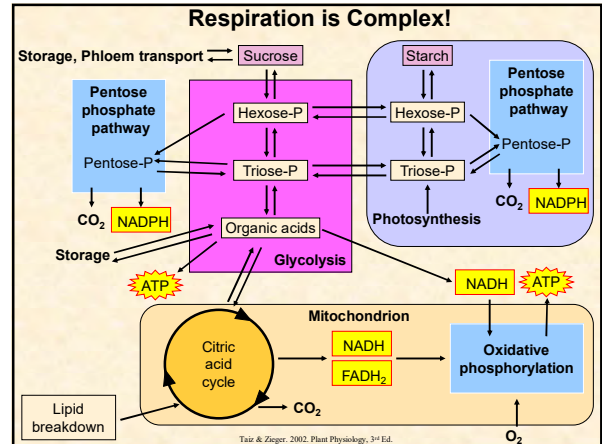
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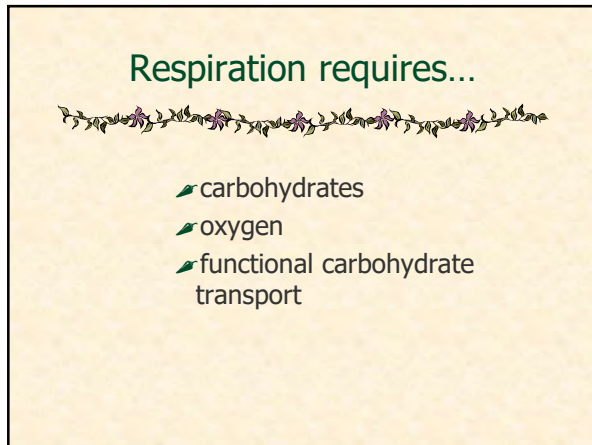
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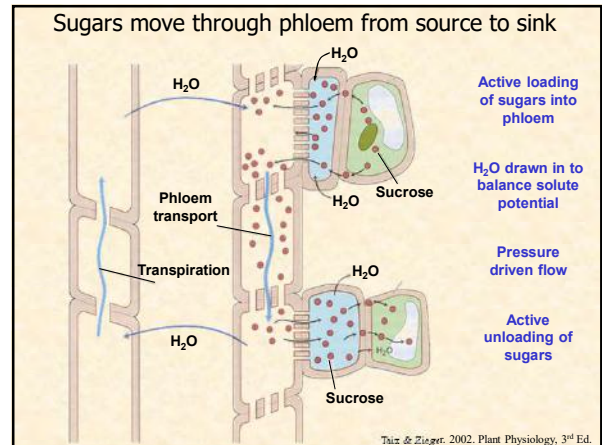
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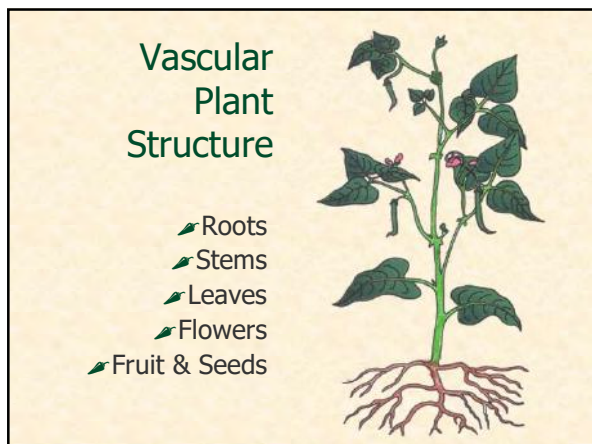
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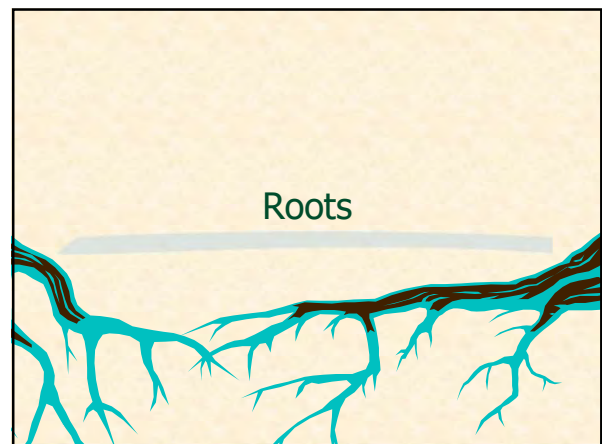
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Root Functions

- Absorb nutrients
- Absorb moisture
- Anchor plant in soil
- Support stem
- Store food
- Propagate vegetatively

25

Root Structure

26

27

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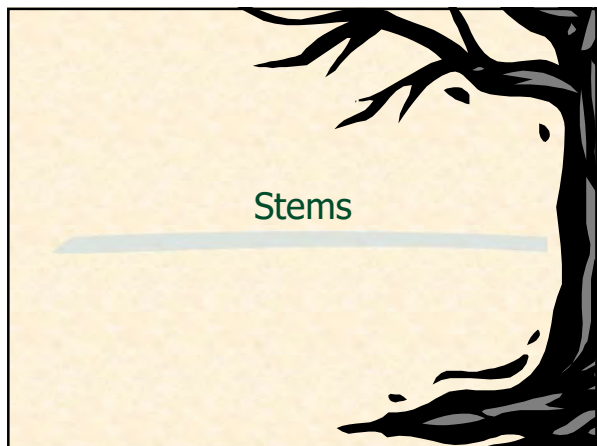
Root Anatomy

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Root Tissues

- Xylem - conduct water & nutrients
- Phloem - carry sugars & starches
- Endodermis - contain vascular tissues
- Cortex - primary tissue surrounding vascular bundle
- Epidermis - outermost layer of plant tissues, protective layer

30

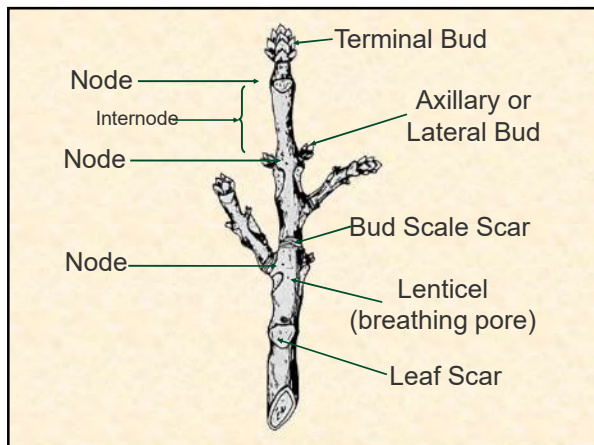


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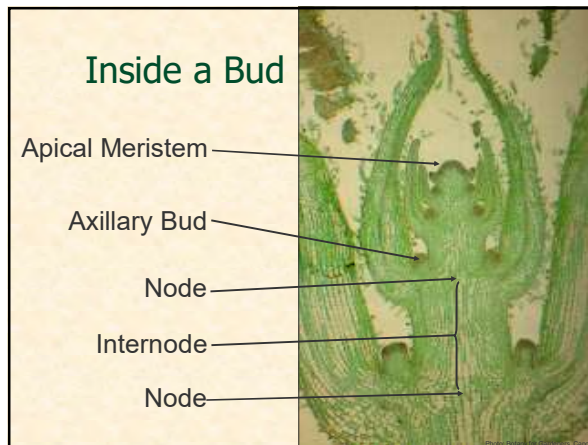
Stem Functions

- Support buds
- Support leaves
- Support flowering/fruitlet structures
- Carry water & minerals
- Carry food (photosynthates)

32



33



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Stem Structure Quiz

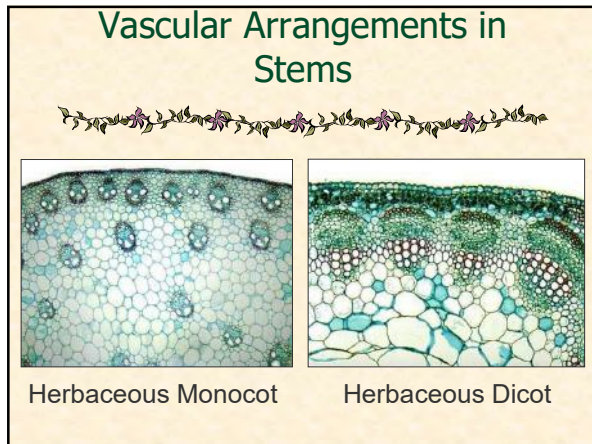
Two photographs of stems. The left one shows a close-up of a green stem with a node and a small bud. The right one shows a stem with several nodes and leaves.

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Herbaceous Stem Anatomy

A diagram showing the internal structure of a herbaceous stem. It features several vascular bundles arranged in a ring. Labels include: Xylem (the inner part of the vascular bundles), Phloem (the outer part of the vascular bundles), and Vascular Bundles (the entire structures).

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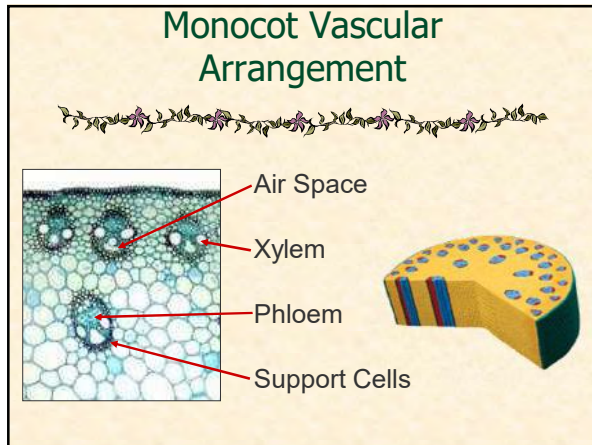


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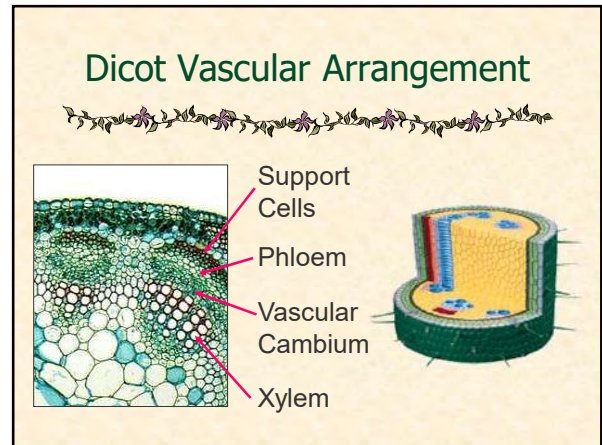
Monocots vs Dicots

Structure	Monocots	Dicots
Seed Leaves	One	Two
Vascular System	Xylem & phloem in bundles, dispersed in stem	Xylem & phloem in rings; xylem inner ring, phloem outer ring
Floral Parts	Usually three or multiples of three	Usually in multiples of four or five
Leaves	Often parallel-veined	Generally net-veined

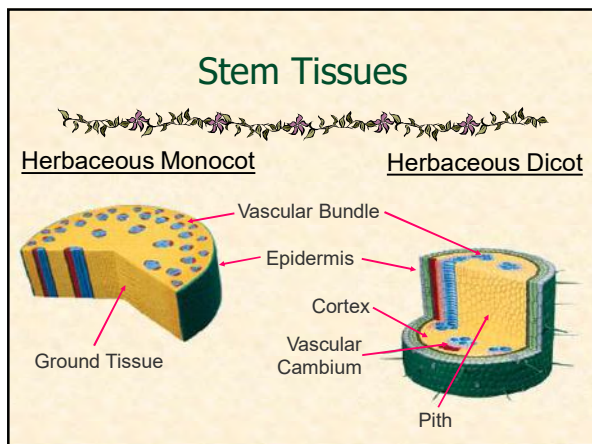
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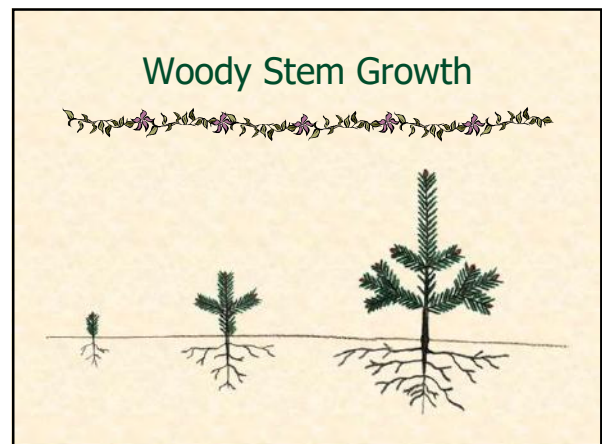
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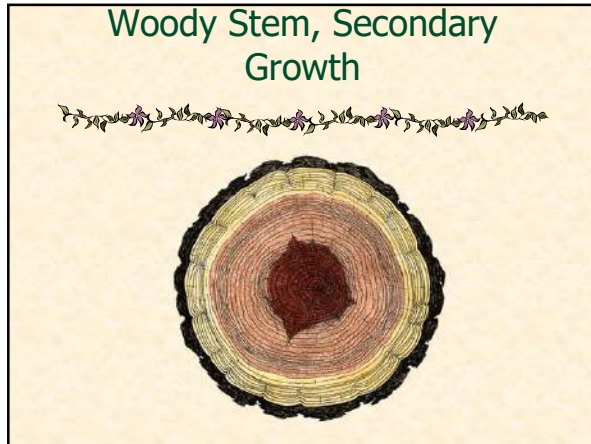
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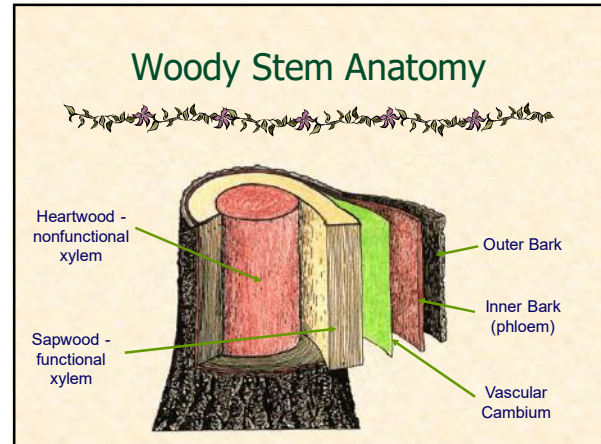
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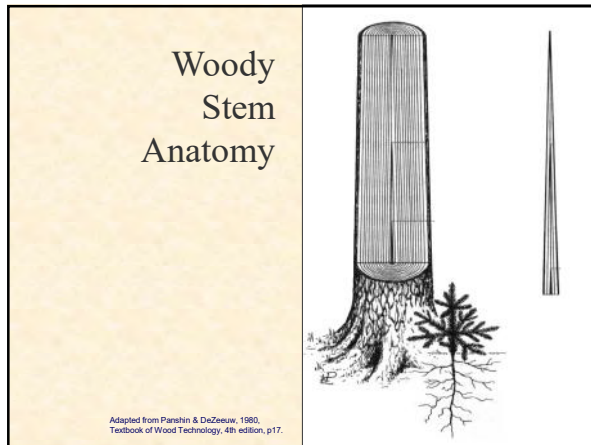
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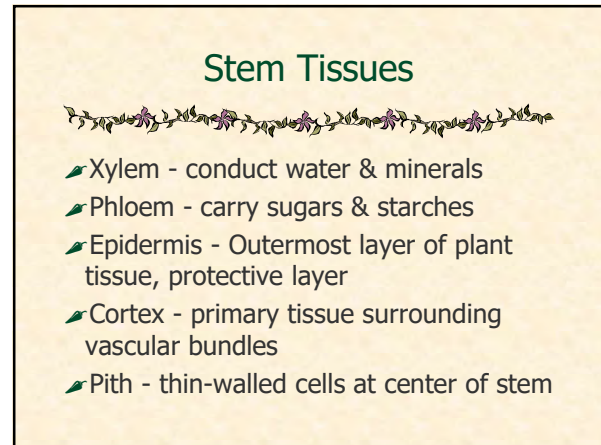
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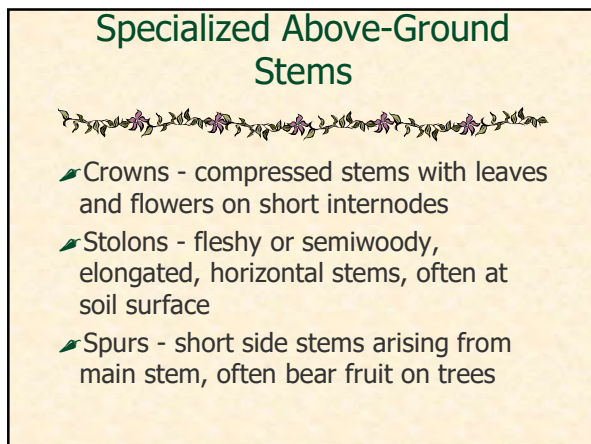
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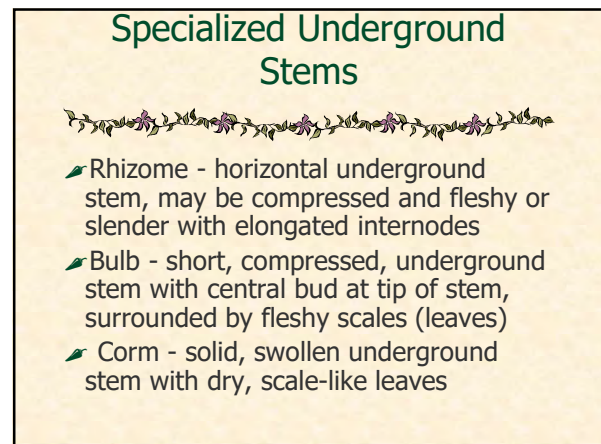
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Specialized Underground Stems

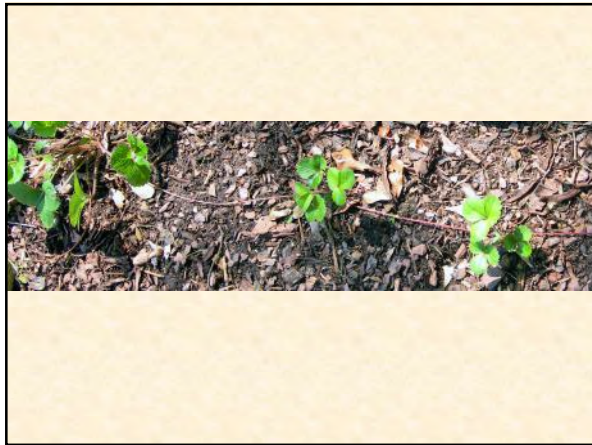


- Tuber - enlarged, short, fleshy underground stem tip
- Tuberos stem - short, flat, enlarged underground stem with buds and shoots at top and fibrous roots at bottom

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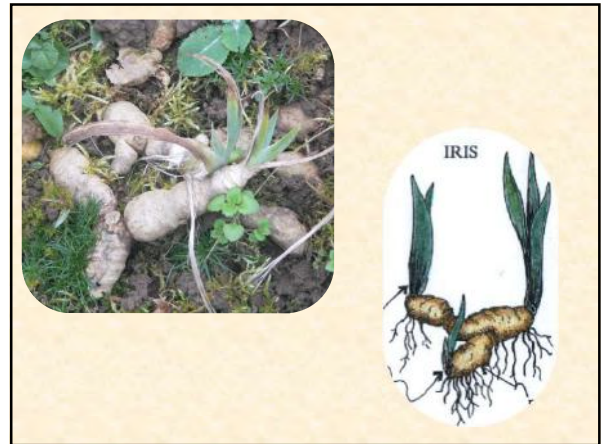
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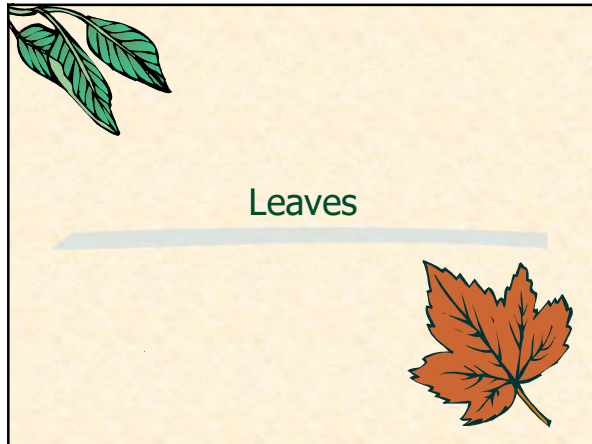


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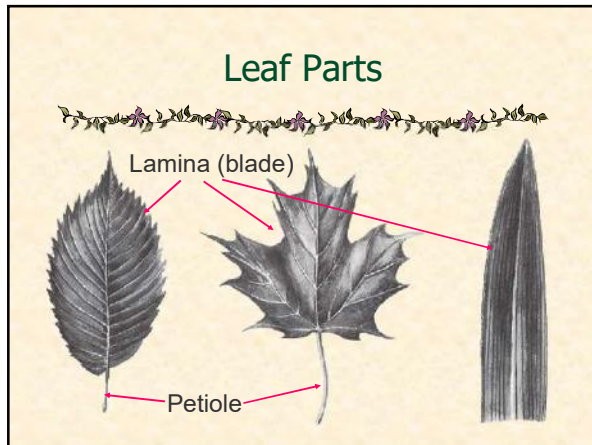


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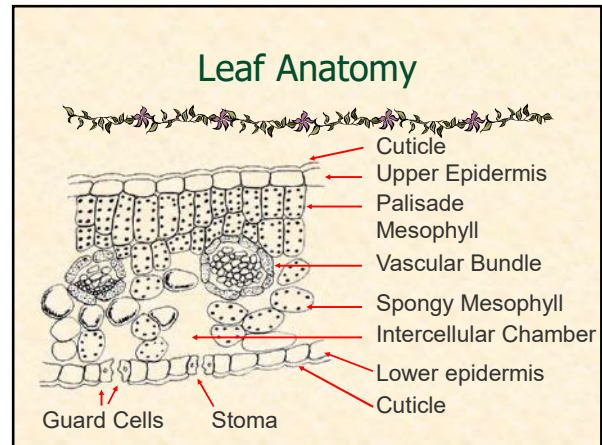
Leaf Functions

- Photosynthesis - use sunlight to make food
- Respiration - use food to make energy
- Transpiration - lose water (as vapor) to atmosphere

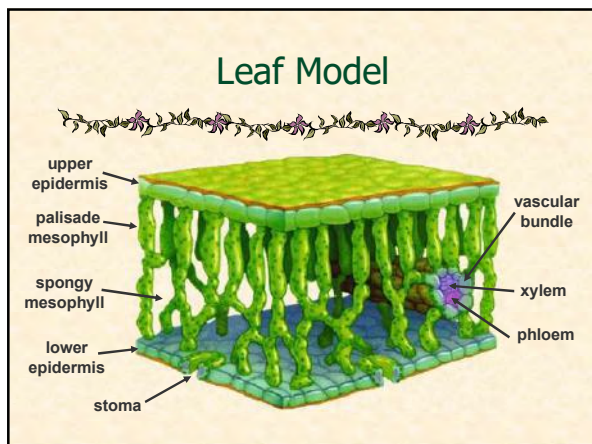
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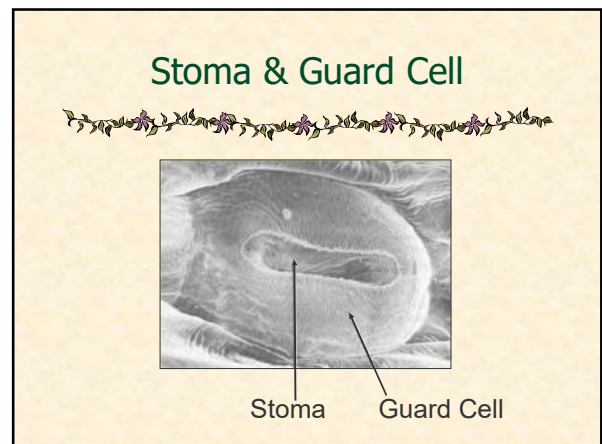
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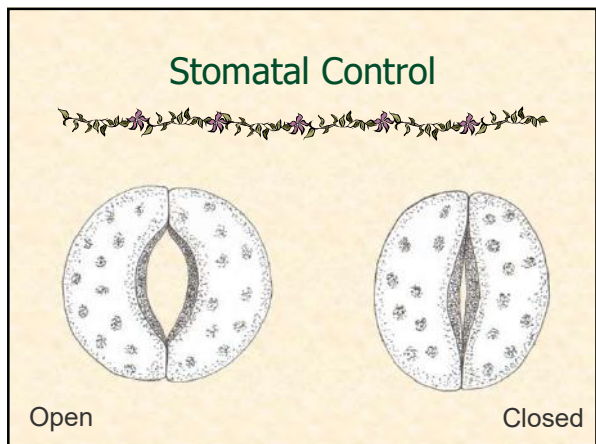
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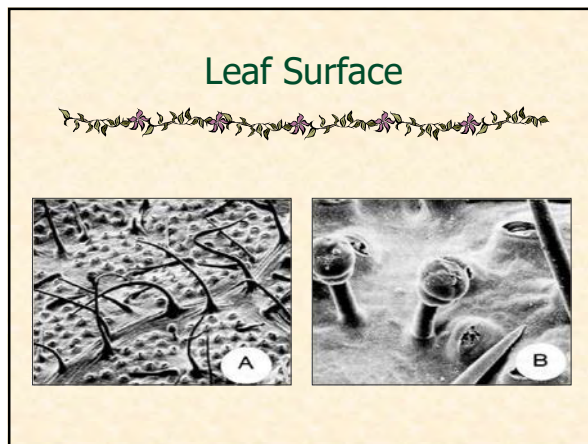
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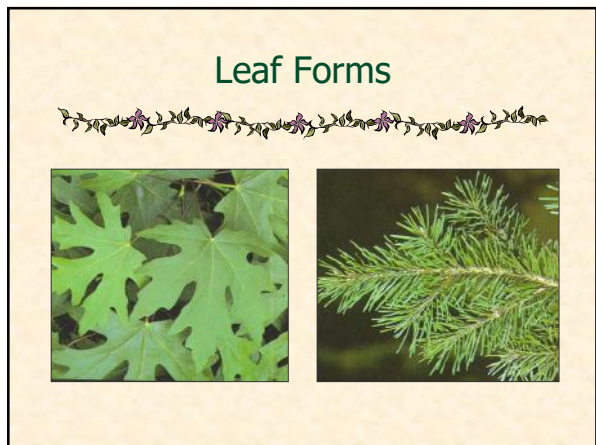
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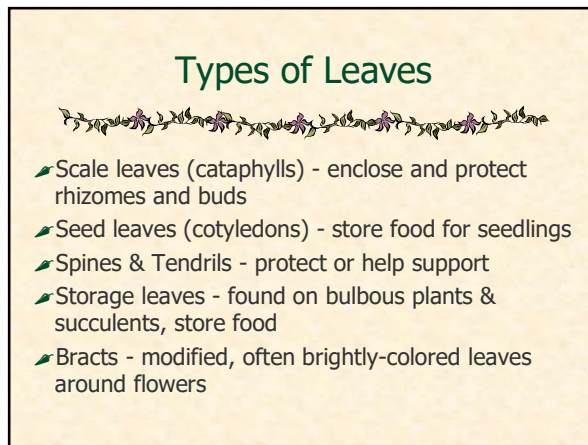
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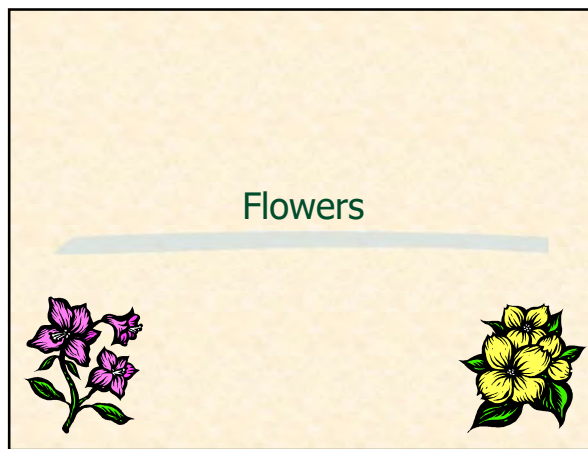
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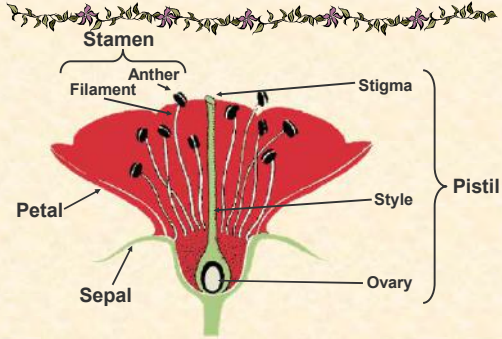
Flower Functions

- Exchange pollen
- Achieve fertilization
- Produce seed

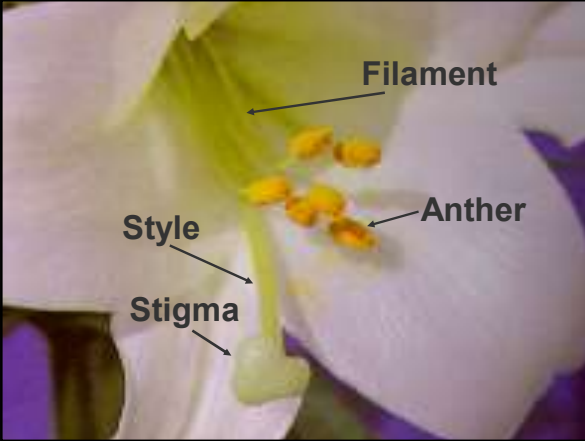


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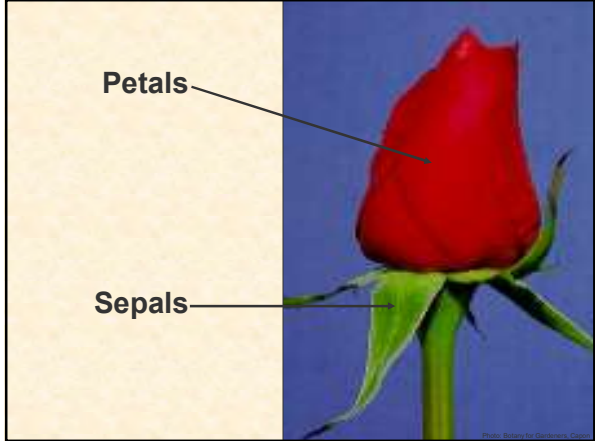
Flower Anatomy



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Flower Types

- Complete
 - all floral organs present (sepals, petals, stamens, pistil)
- Incomplete
 - flower lacks 1 or more of the 4 organs

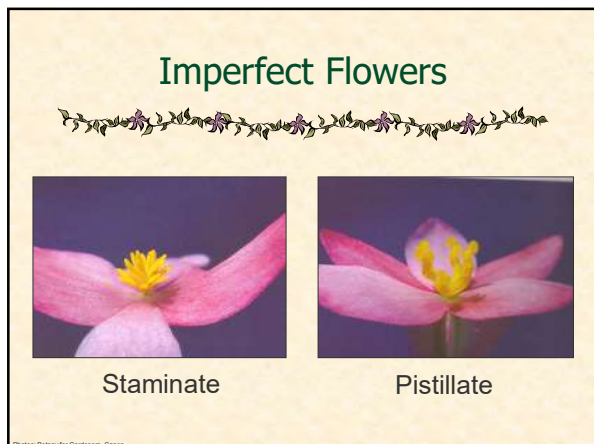
71

Flower Types

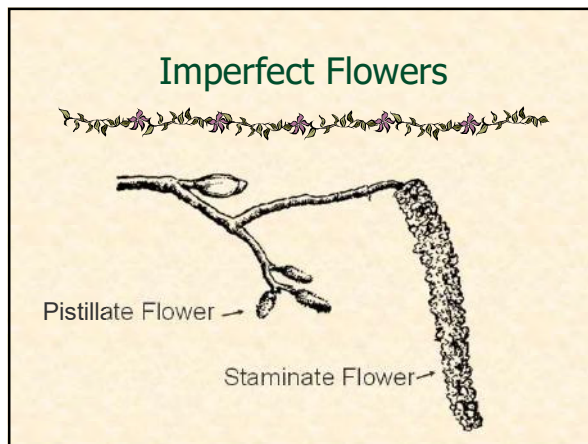
- Perfect - has both stamen (male organs) and pistil (female organ)
- Imperfect - having only one type of organ
 - Staminate - male organ present
 - Pistillate - female organ present

72

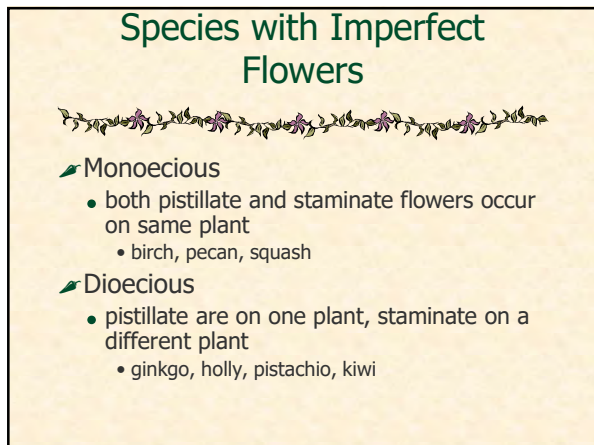




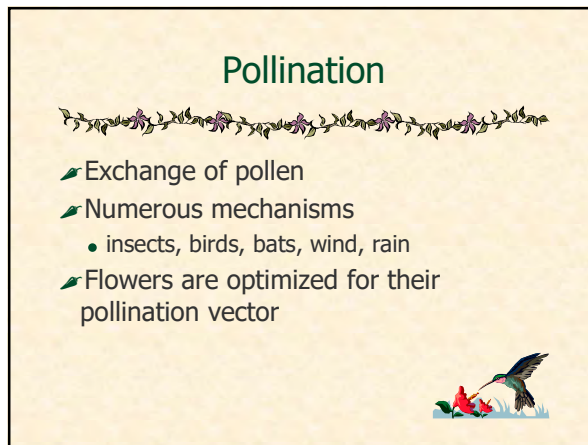
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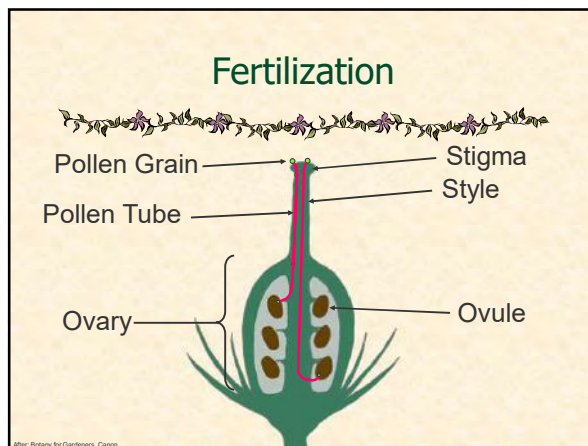
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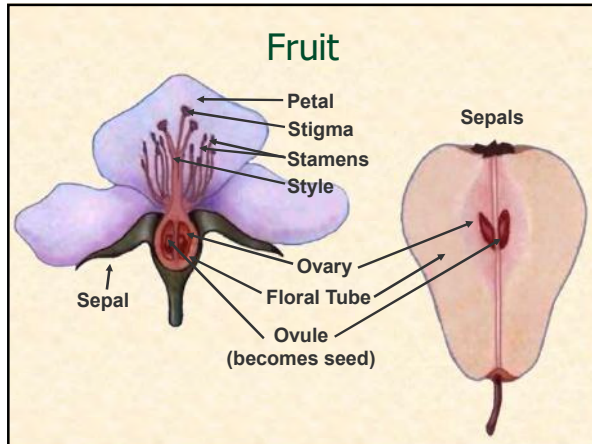
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Types of Fruit

- Simple - develop from one ovary (may have multiple seeds) 🍏 🍒 🍌
- Aggregate - develop from a single flower with multiple ovaries 🍇 🥜
- Multiple - develop from a tight cluster of separate flowers 🍓 🍌

80



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Seed Anatomy

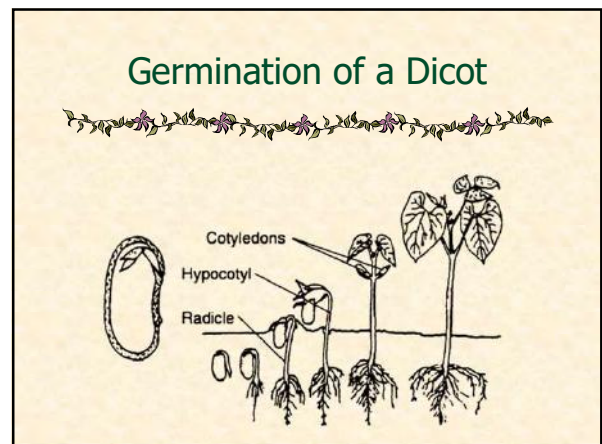
- Embryo - miniature plant in an arrested state of development
- Endosperm - food supply (can be comprised of proteins, carbohydrates, fats)
- Seed coat - hard outer covering that protects from disease and insects; also repels water

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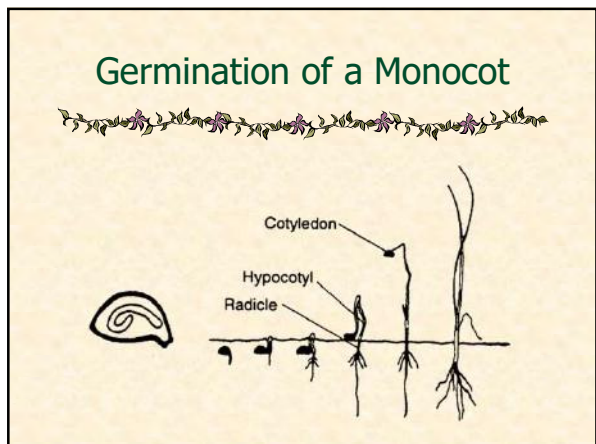
Germination

- Activation of embryo within seed
- Preceded by water penetrating seed coat
- Oxygen, favorable temperature, and (in some species) light required

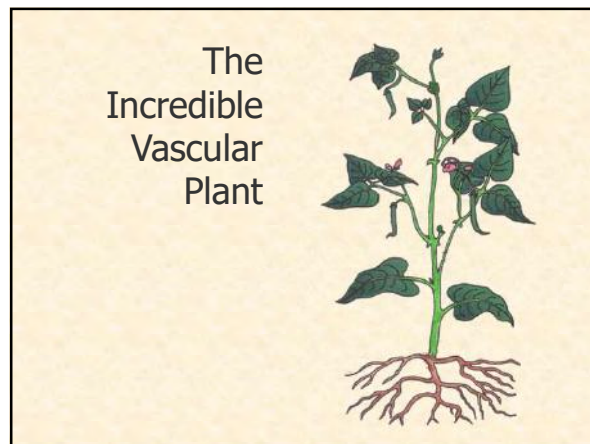
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