Seed Plant Study Sheet

I. Chapter 11: Seed Plants

A. Section 1: **Characteristics of seed plants: Tracheophytes that produce seeds**

1. True roots, stems and leaves
2. Roots
   a. **Tap roots** and **fibrous roots**
   b. Regions
      i. Region of **Meristematic Growth**
      ii. Region of **Elongation**
      iii. Region of **maturation**
      iv. Root cap
      v. **Root hair** – outgrowths of epidermal root cells that increase surface area
3. **Stems**:
   a. **Bark / Cork**: protective outer covering
   b. Vascular tissue:
      i. **Phloem**: carries sugars produced during photosynthesis down
      ii. **Cambium**: produces phloem and xylem cells
      iii. **Xylem**: carries water and minerals up:
         - **Sapwood**: active stem xylem that supports and transports
         - **Heartwood**: old xylem that no longer transports water but is utilized for structural support
   c. **Annual rings**: made from xylem cells
      i. Spring growth: rapid w/ large cells and thin walls
      ii. Summer growth: slow w/ small cells and thick walls
4. Leaves
   a. **Cuticle**, Upper and Lower **Epidermis**, **Mesophyll**, **Palisade Layer**, **Spongy layer**, **vein**, **stomata**, **guard cells**
5. Seeds
   a. Seed coat (protection), embryo (baby plant), cotyledon (stored food)

B. Section 2: **Gymnosperms**:

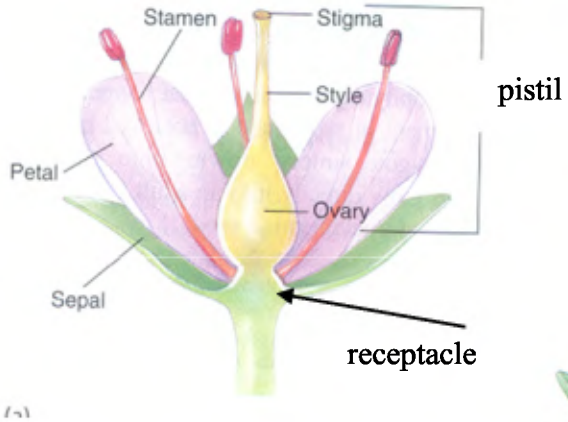
1. Seed producing plants that produce "naked" seeds, seeds not enclosed in a fruit.
2. Most have needle-like leaves (conifers: pines, firs and cedars)
3. Some with "regular" leaves (Ginkgo)
4. Often are cone producers

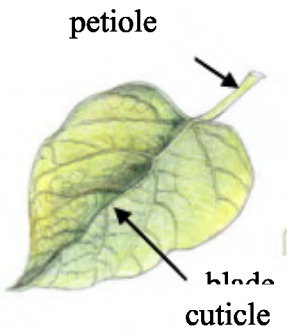
C. Section 3: **Angiosperms**

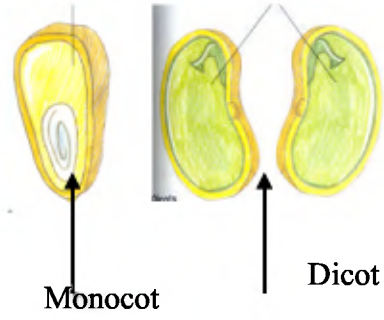
1. Seeds are produced and protected by a fruit of some kind.
2. AKA Flower producing plants
3. Two subclasses of Angiosperms: **Monocotyledons and Dicotyledons**
   a. **Monocots**: Corn, wheat, palms, grasses, orchids, lilies
      i. Leaf veins usually parallel
      ii. Flower parts in multiples of three
      iii. Vascular bundles are scattered in stem
      iv. Usually fibrous roots
      v. One seed cotyledon
   b. **Dicotyledons**: roses, maple, oaks, beans, apples,
      i. Leaf veins branched: Palmate or Pinnate
      ii. Flower –parts in multiples of 4 or 5
      iii. Vascular bundles are arranged in a ring in the stem
      iv. Usually tap root system
      v. Two cotyledons in the seed

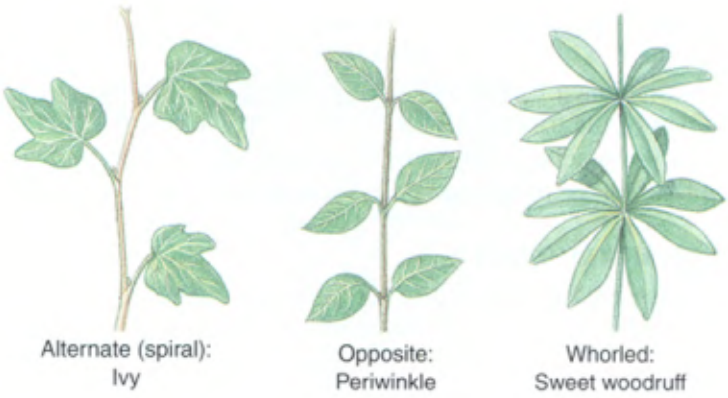
4. Flower structure
    a. **Sepals**: protective leaf-like structures that cover flower while it's a bud
    b. **Petal**: colorful structures used to attract pollinators to the flower
    c. Male Reproductive Structure: **Stamen**
        i. **Filament**: thin stalk that lifts the anthers for easier access by pollinators
        ii. **Anthers**: knob at the top of the filament that produces the male gametes: pollen
    d. Female reproductive structures: **Pistil**
        i. Stigma: sticky top part of pistil where pollen grains attach
        ii. Style: slender tube that connects the stigma with the ovary
        iii. Ovary: hollow structure at base of the pistil contains the ovules
    e. **Receptacle**: base of flower supporting the ovary
5. **Reproduction / Pollination**
    a. Pollen grain (male cell) falls onto the stigma
    b. Each grain sends a tube w/ sperm cell down the style to the ovule and fertilizes the female cells forming a zygote
    c. Pollination occurs by many different means: wind, birds, insects, bats etc.

D. Section 4: **Plant Responses and Growth**
1. **Tropisms**: Growth response to or away from a stimuli
    a. **Phototropism**: Plant stems grow toward light, roots grow away from light
    b. **Gravitropism**: Plant stems grow away from the source of gravity (grow up) and roots grow toward the source of gravity (grow down)
    c. **Thigmotropism**: Plant response to touch stimuli (Venus flytrap snaps shuts)
2. **Life spans of Tracheophytes**:
    a. Annuals: complete entire life cycle in one year – i.e. wheat, tomatoes and pansies
    b. Biennials: require two years to complete their entire life cycle i.e. parsley & celery
    c. Perennials: life cycle lasts more than two years – i.e. apple trees, oaks, pines etc.

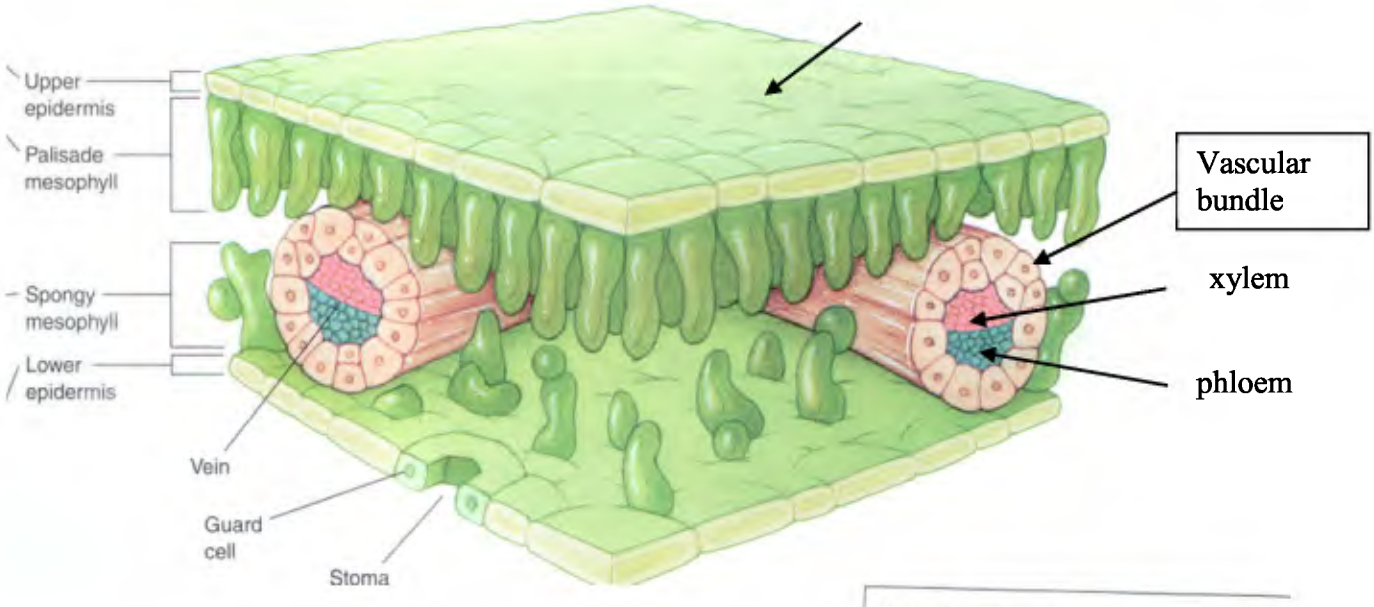


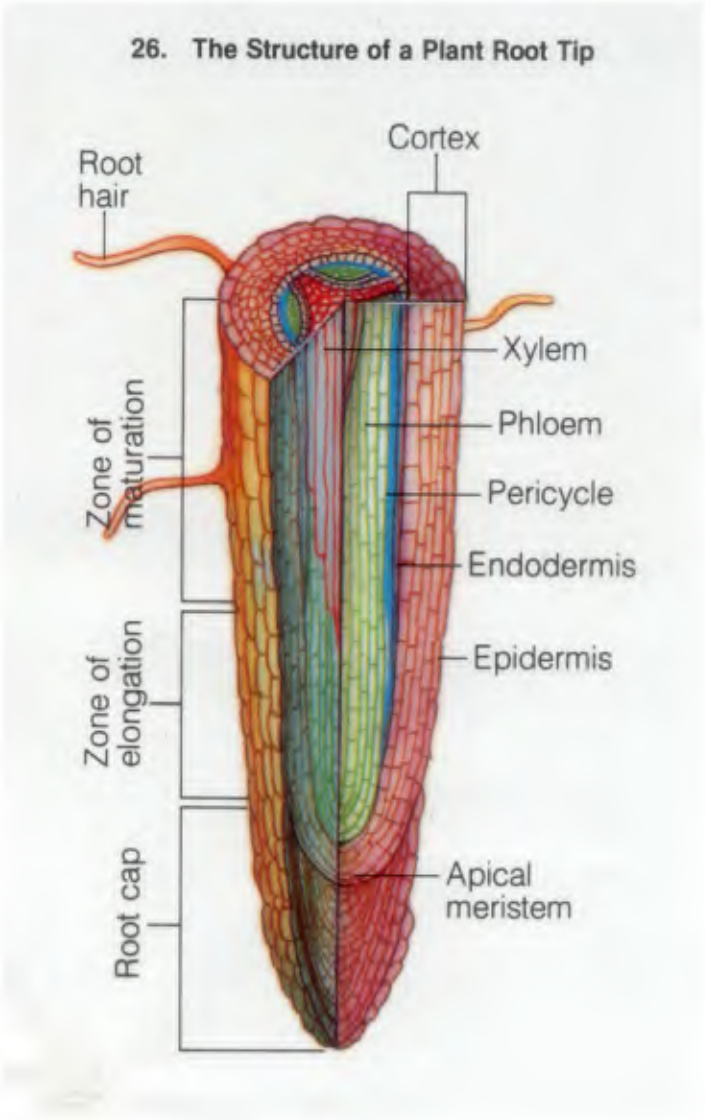


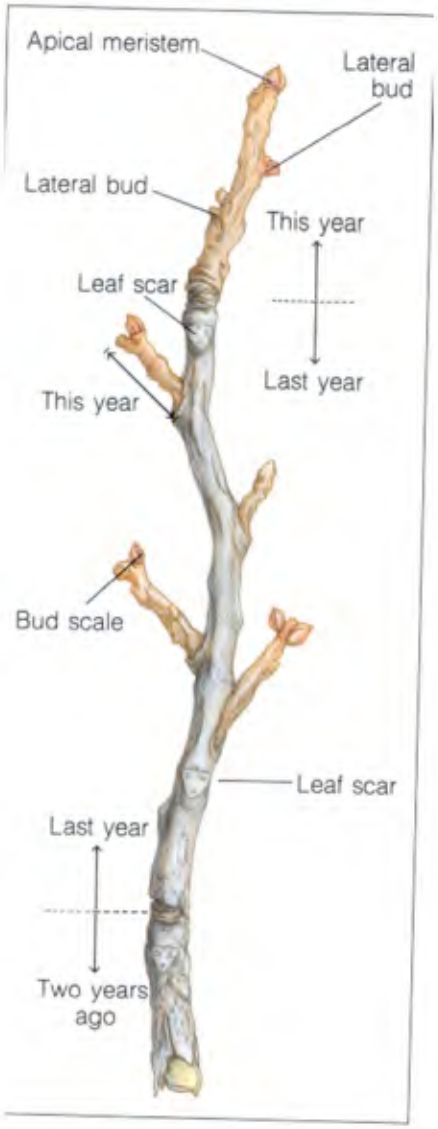




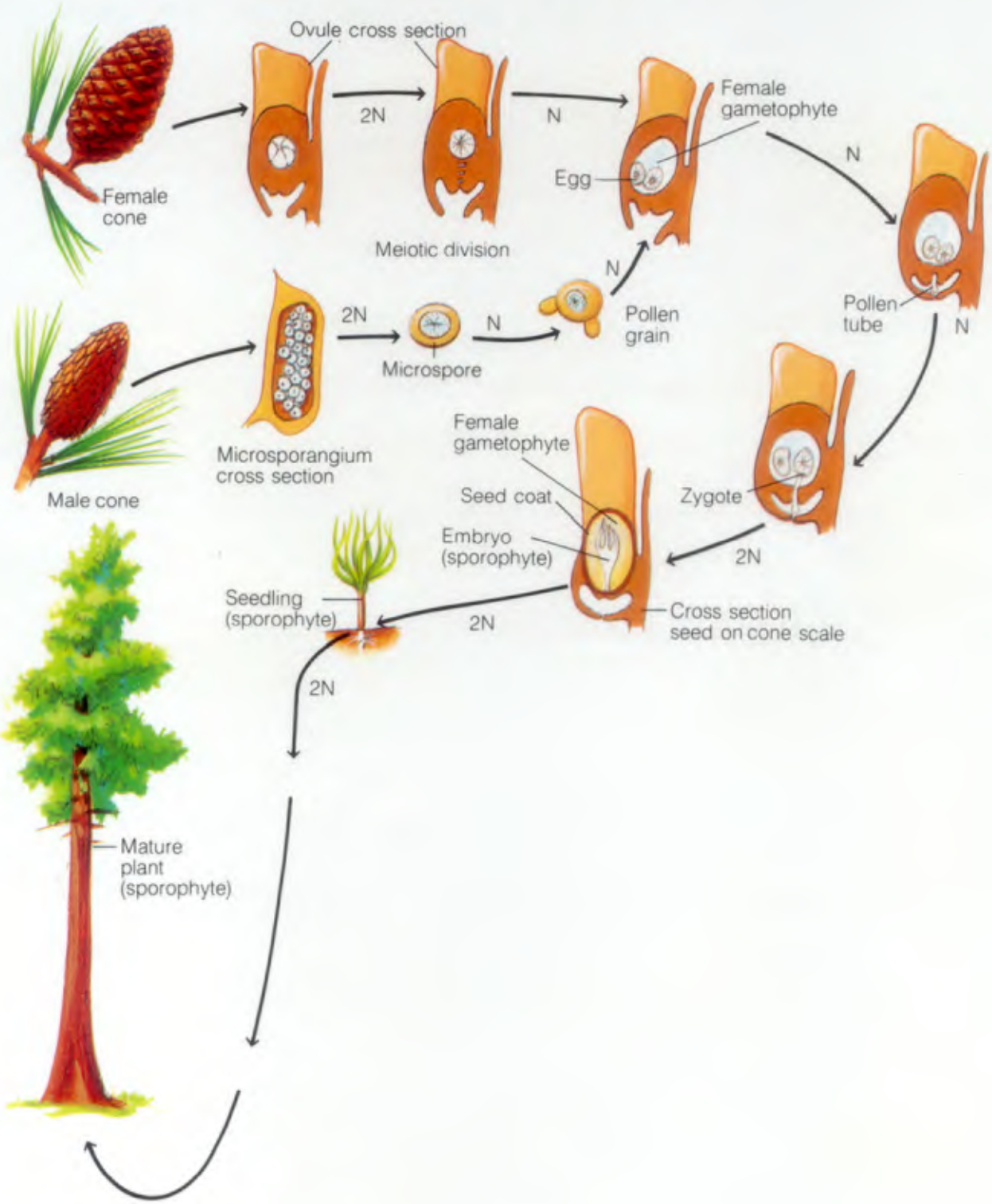
cuticle


Upper epidermis
Palisade mesophyll
Spongy mesophyll
Lower epidermis
Vein
Guard cell
Stoma
Vascular bundle
xylem
phloem

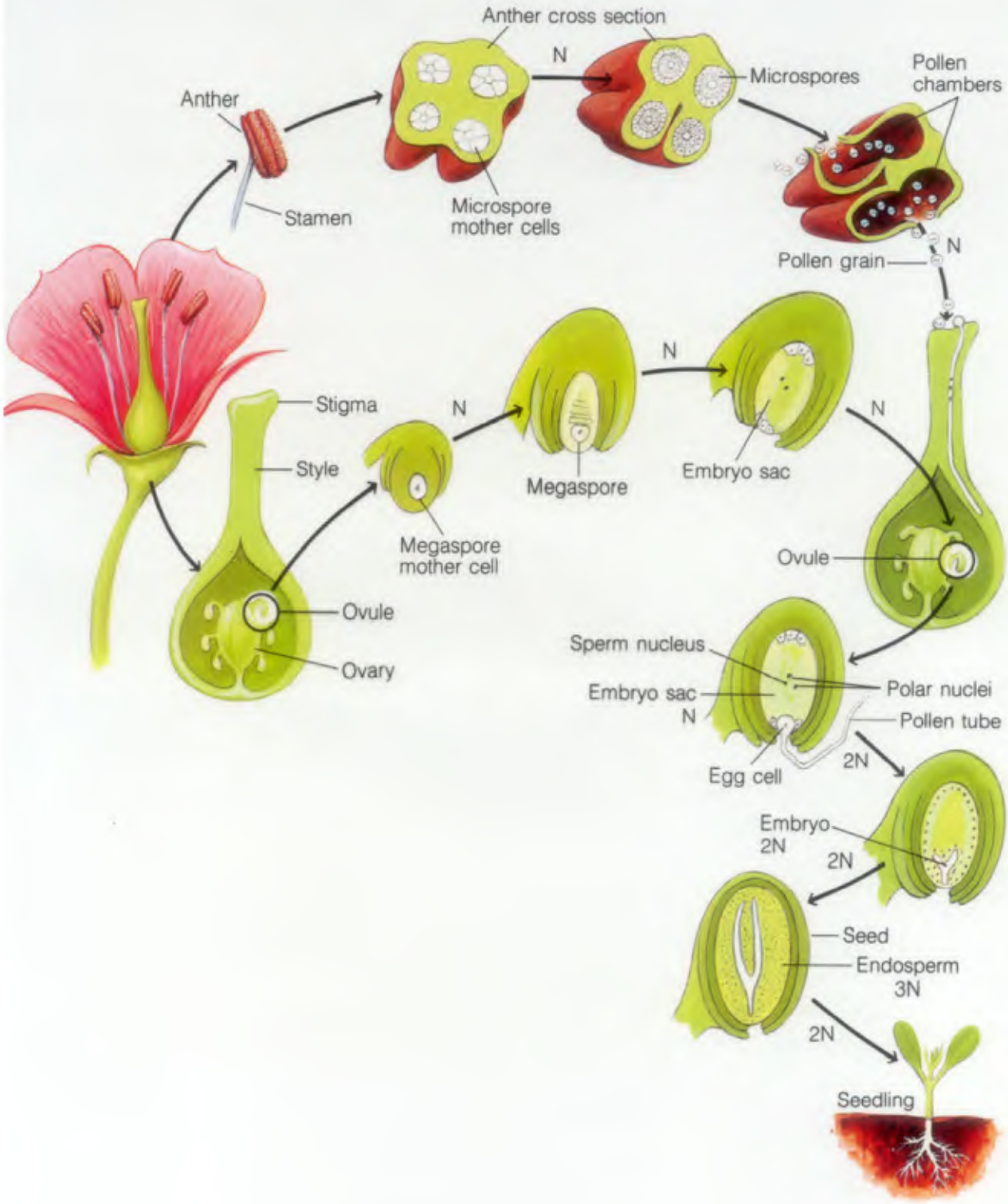

26. The Structure of a Plant Root Tip
Root hair
Cortex
Xylem
Phloem
Pericycle
Endodermis
Epidermis
Apical meristem
Zone of maturation
Zone of elongation
Root cap


Apical meristem
Lateral bud
Lateral bud
This year
Leaf scar
Last year
This year
Bud scale
Leaf scar
Last year
Two years ago

27. The Life Cycle of a Gymnosperm



28. The Life Cycle of an Angiosperm



Life Science Chapter 11

SEED PLANTS

Plant Classification

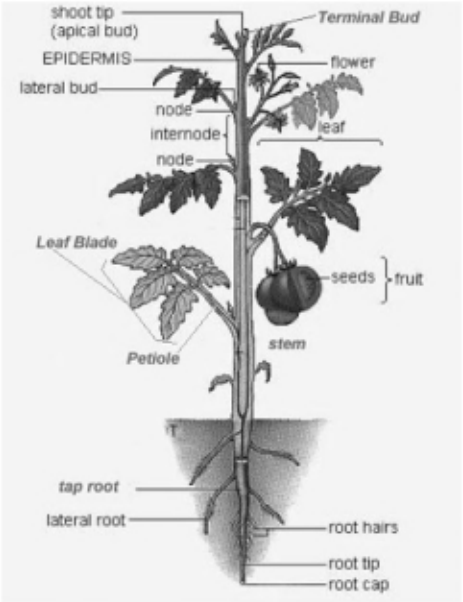
- Kingdom Plantae
  - Phylum: Bryophyta – Mosses, Liverworts & Hornworts
  - Phylum: Tracheophyta –
    - Primitive Spore Producing Vascular plants
      - Ferns, Horsetails & Club "Mosses"
    - Advanced Seed Producing Vascular Plants
      - Class: Gymnospermae
      - Class: Angiospermae
        - Subclass: Monocotyledoneae
        - Subclass: Dicotyledoneae

Advanced Seed Producing

- **Advanced Seed Producing Vascular Plants**
  - **Class: Gymnospermae**
  - **Class: Angiospermae**
    - **Subclass: Monocotyledoneae**
    - **Subclass: Dicotyledoneae**

The Typical Vascular Plant

- Know these terms
  - Stem
  - Tap root
  - Lateral root
  - Leaf blade
  - Petiole
  - Seed
  - Fruit
  - Node
  - Internode
  - Flower
  - Terminal bud
  - Lateral bud



Class - Gymnospermae

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- 2. Most have needle-like leaves (conifers: pines, firs and cedars)
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Class Angiospermae

- Seeds are produced and protected by a fruit of some kind.
- AKA Flower producing plants
- Two subclasses of Angiosperms:
  - **Monocotyledons and Dicotyledons**



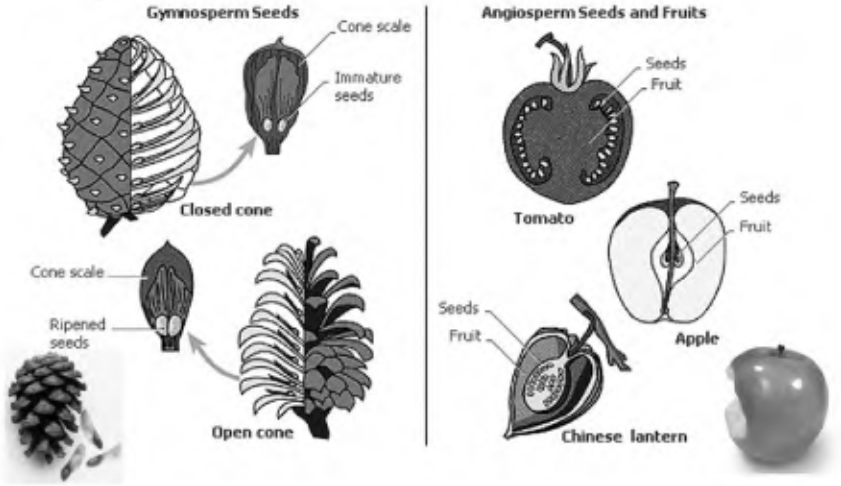




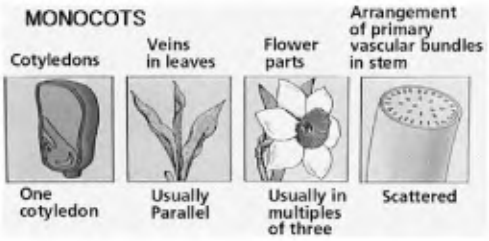


Seed Types

- Gymnospermae – "**naked**" "seed"
- Angiospermae – "**container**" "seed"



Monocot vs. Dicot



- **Monocots: Corn, wheat, palms, grasses, orchids, lilies**
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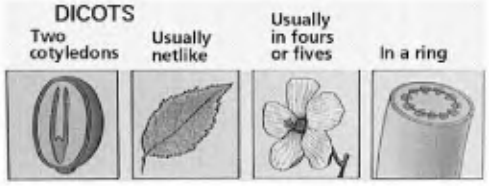
- Usually fibrous root
- One cotyledon



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Plant Responses and Growth

- **Phototropism: Plant stems grow toward light (positive phototropism), roots grow away from light (negative phototropism)**
- **Gravitropism: Plant stems grow away from the source of gravity (grow up)** (negative geotropic)) and roots grow toward the source of gravity (positive geotropic) (grow down)
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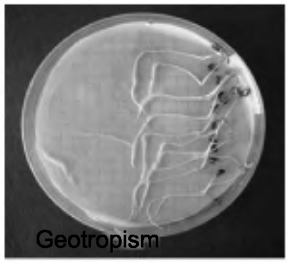
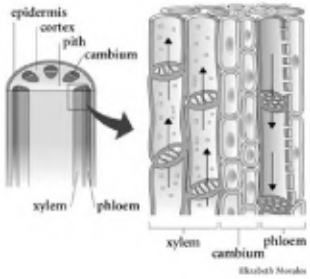
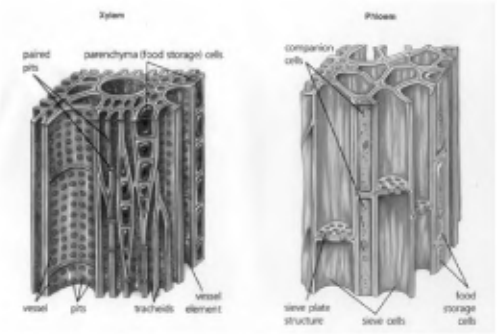


Advanced Seed Producing Vascular Plants

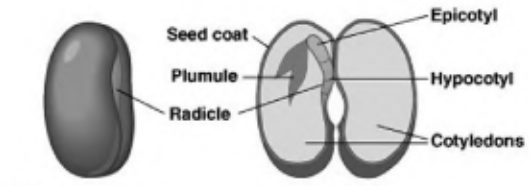
- All seed plants share two characteristics:
  - The have vascular tissue
  - They use seeds to reproduce
- Vascular Tissue: Phloem, Xylem & Cambium
  - **Phloem**: Carries Food Down the plant
  - **Xylem**: carries water & Minerals up the plant
  - **Cambium**: Makes new Phloem & Xylem cells





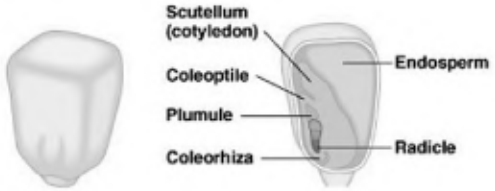
Seeds to Reproduce

- A Seed has 3 parts: embryo, stored food and a protective seed coat



(a) Common bean

Dicotyledon

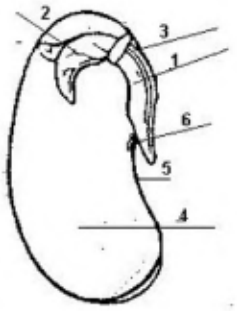


(c) Corn

Monocotyledon

Cotyledon – stored food used by embryo until leaves start photosynthesis
Seed Coat – outside covering that protects the delicate embryo & cotyledons
Micropyle - little pore on the seed coat that allows water in for germination
Plumule – embryonic 1st leaf
Epicotyl – embryonic stem "above" the cotyledon
Hypocotyl – embryonic stem "below" the cotyledon
Radicle – embryonic root
Endosperm – additional food source

"Need-to-Knows" Seed Parts



A) The embryo

1) radicle

2) plumule

3) hypocotyl

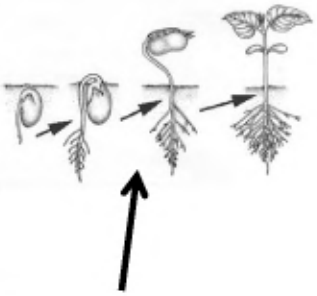
B) The endosperm

4) cotyledon

C) The seed coat

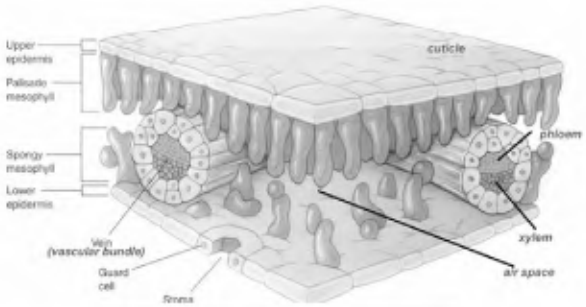
The seed coat (5)

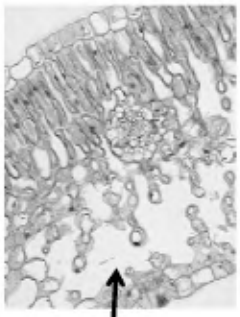
The micropyle (6)

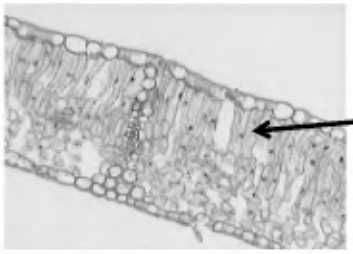


Be able to identify the seed parts as they develop into the embryonic plant

"Need-to-Knows" Leaf Structure





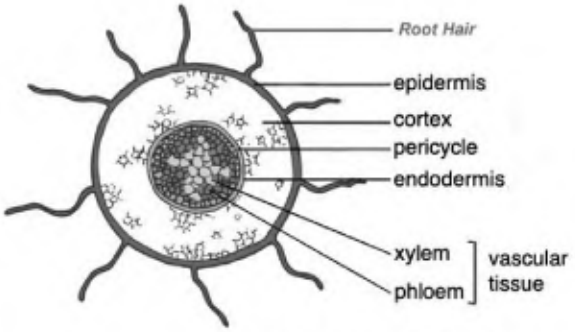


Be able to identify the layers & structures in photos as well as different drawings!

The Typical Vascular Root Xsec "Need-to-Knows"

- Know these terms
  - Root Hair
  - Epidermis
  - Cortex
  - Pericycle
  - Xylem
  - Phloem
  - Cambium (not shown)

  But is located between the Phloem & Xylem
  - Endodermis
  - Vascular Bundle

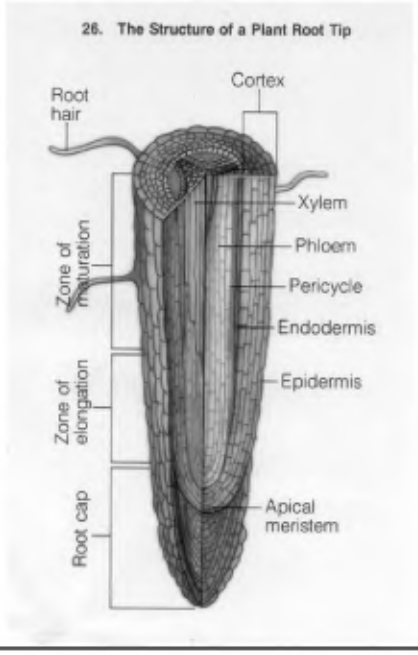


Cross section of a root

The Typical Vascular Root

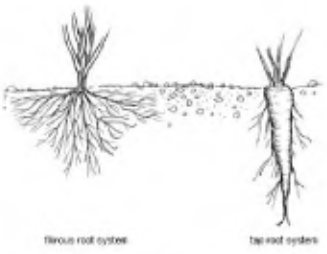
"Need-to-Knows"

- these terms
  - Root Hair
  - Zone of Maturation
  - Zone of Elongation
  - Apical Meristem
  - Root Cap
  - Epidermis
  - Cortex
  - Pericycle
  - Xylem
  - Phloem



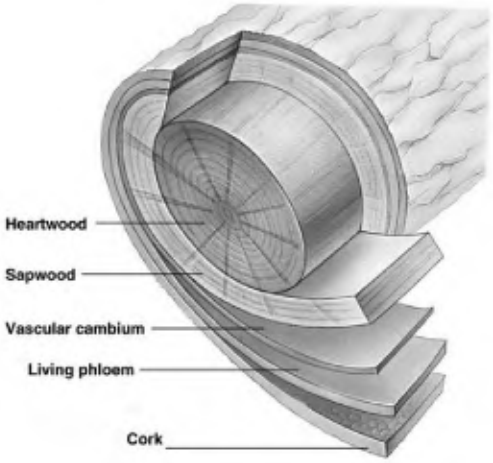
Roots

- **Fibrous Roots-** consist of many relatively thin, highly branched, spreading roots. They intercept water as it filters down through the soil, capturing the nutrients that the water has picked up as it travels through the soil –monocot s have fibrous roots
- **Tap Roots -** on the other hand, consist of one or more large main root with smaller side roots. These head deep into the soil to search for water and nutrients - dicots have tap roots



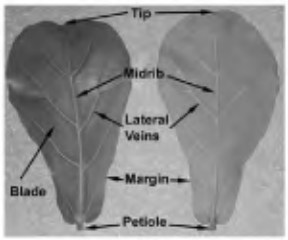
The Typical Vascular Stem

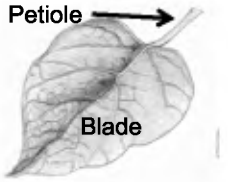
- Know these terms
  - Heartwood- old xylem no longer transports water, used for structural support
  - Sapwood – active xylem, transports water & Minerals
  - Cambium – produces new phloem & xylem
  - Phloem – transports food materials down to the rest of the plant
  - Bark (cork)– dead phloem cells used to protect the delicate vascular cells

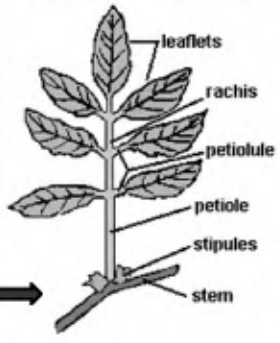


"Need-to-Knows" Leaf Parts

- Blade
- Petiole
- Margin
- Midrib Vein
- Rachis
- Sessile
- Leaflet
- Lobe
- Stipules
- Shapes
- Arrangement
- Venation
- Base







Leaf Margins

- Leaf Margin - **the boundary area extending along the edge of the leaf. There are lots of different types of leaf margins that are important for plant identification.**

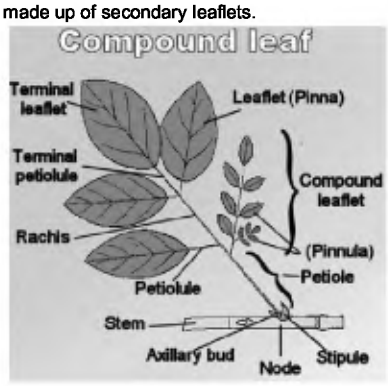
Entire – A leaf margin that has a continuous, unbroken and smooth edge, without teeth, lobes or indentations.

Serrate -A leaf margin forming a row of small sharp outward projections pointing toward the apex of the leaf resembling the teeth of a saw.

Lobe - having some type of indentation toward the midrib that can vary in profundity and shape (rounded or pointed) and the incisions go **less** than halfway to the midrib.

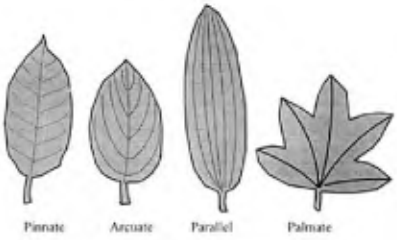
Undulate – wavy (up & down rippled surface.

Compound Leaf – Exaggerated form of a lobed leaf where the lobes extend all the way to the mid rib. A double compound leaf is one in which each leaflet of a compound leaf is also made up of secondary leaflets.



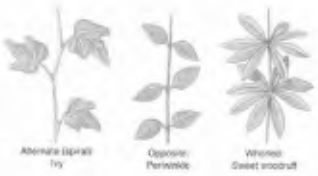
Leaf Venation

- Parallel, Pinnate, Palmate or Arcuate



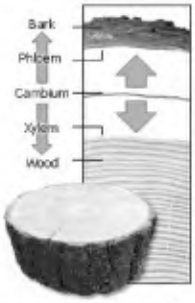
Leaf Arrangement

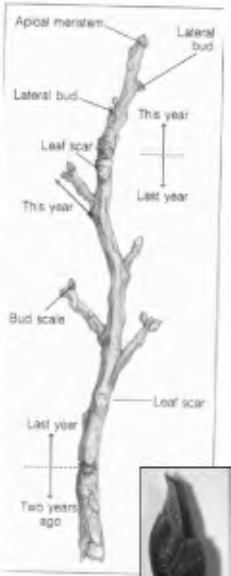
- Leaf arrangement is determined by the number of leaves found at each node.
  - **Alternate** - I n alternate arrangement there is only one leaf per node, usually alternating from one side of the stem to an other as on moves from node to node.
  - **Opposite** - In opposite leaf arrangement there are two leaves per node. Leaves are usually located on opposite sides of the node.
  - **Whorled** - Whorled leaf arrangement has three or more leaves per node which are arranged (whorled) around the node.
  - **Rosette** – Similar to whorled but leaves are arranged at the base of the plant

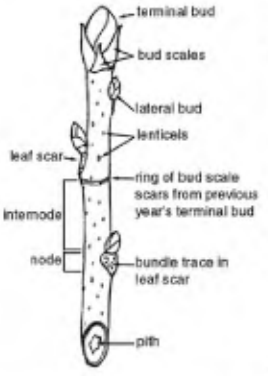


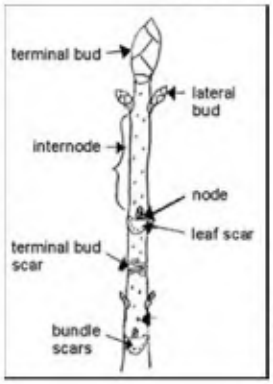
Stems & Twigs

Be able to identify these structures:
Terminal bud, Lateral bud, bud scales, node, internode, lenticles, leaf scar, year's growth ring



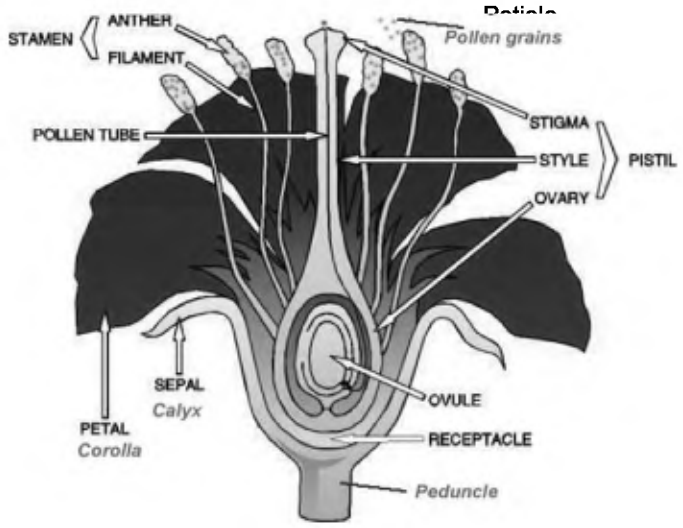






"Need-to-Knows" Flower Parts

- A. Petal
- B. Corolla
- C. Sepal
- D. Calyx
- E. Peduncle
- F. Stamen
- G. Anther
- H. Filament
- I. Pistil
- J. Stigma
- K. Style
- L. Ovary
- M. Ovule
- N. Receptacle
- O. Pollen
- P. Pollen tube



"Need-to-Knows" Flower Parts