

PLANT STRUCTURE AND FUNCTION

Read pages 600-602. Re-read and then complete the questions below.

1. PLANT TISSUES

- plant tissues are made up of 3 basic cell types: **Parenchyma**, **Collenchyma** or **Sclerenchyma**
- plant tissues are groups of cells that work **together** for functions such as: absorption, transport, photosynthesis, reproduction and storage

Types of Plant Tissues

1. **Dermal**

- : outer layer of cells
- : provides protection and structure
- : may be involved in photosynthesis & growth of secondary structures

2. **Ground**

- : middle layer
- : provides protection, structure and regeneration

a) Meristematic

- : area of cell division or growth (very small cells)
- : found in growing regions where cell division is rapid
- : found in apical & lateral meristems, vascular & cork cambium

b) Cork

- : inner layer of dead cells
- : structural

c) Cortex

- : ground tissue with a storage function

3. **Vascular Tissue**

- : conductive or transport tissue
- : may provide support (structure)
- : two types --
 - a. Xylem : conduct water and dissolved minerals
 - b. Phloem: conduct food

2. PLANT STRUCTURES

Read pages 600-616. Re-read and then complete the questions below.

General Notes

1. In seed plants, root and shoot tissues begin to form in the **seed**.
2. Lengthwise growth is called **primary** growth.
3. Secondary growth, meanwhile, increases the **girth** of stems and roots.
4. Plant cells divide only in specific regions called **meristems**.

| Types of Meristems | | |
|--------------------|--------------------------------|--|
| Type | Location | Function |
| apical meristems | ends of roots and stems | growth; increases length at tips |
| lateral meristems | sides of roots and stems | Secondary growth; vascular and cortex tissues |

The three major structures of a plant are the roots, stems and leaves.

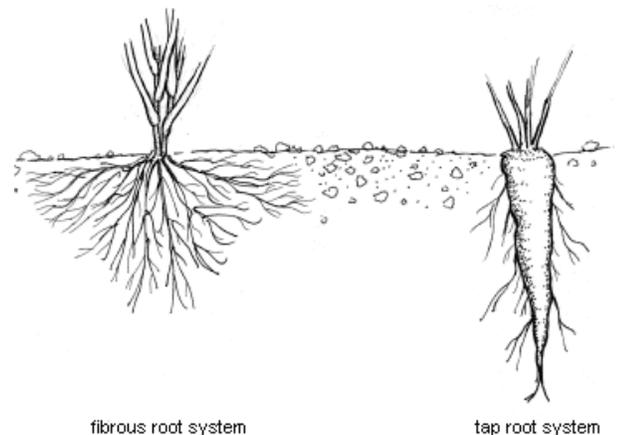
Roots

5. Serve three purposes:

- i) **anchor the plant**
- ii) **absorb water and dissolved minerals**
- iii) **food storage (carrot, radish)**

6. The two types of plant roots are tap and **fibrous**. Of these, the **tap** goes deepest into the soil.

7. Each root has a protective root cap and numerous root hairs which increase the root's **surface area** for adsorption.



Stems

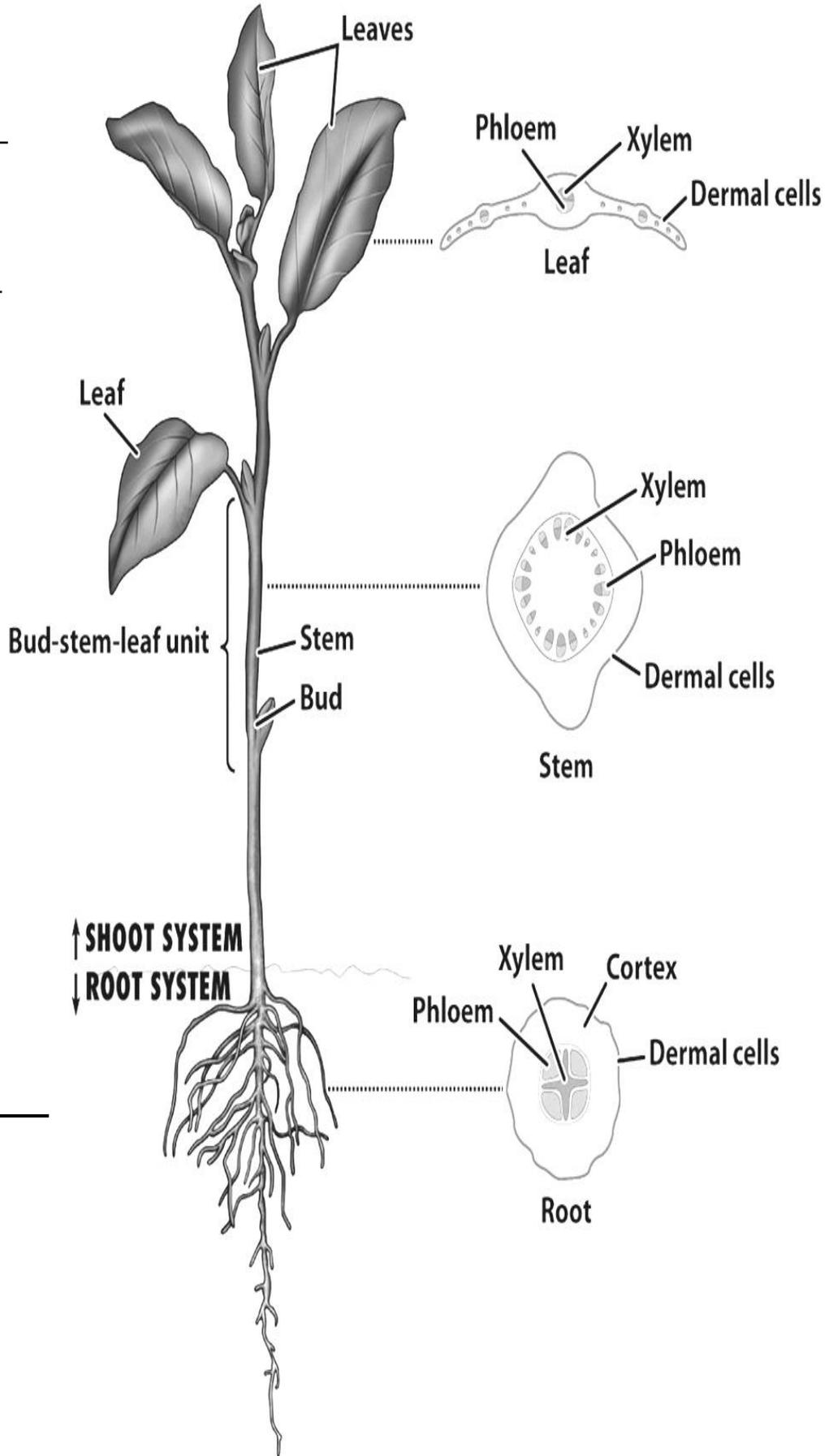
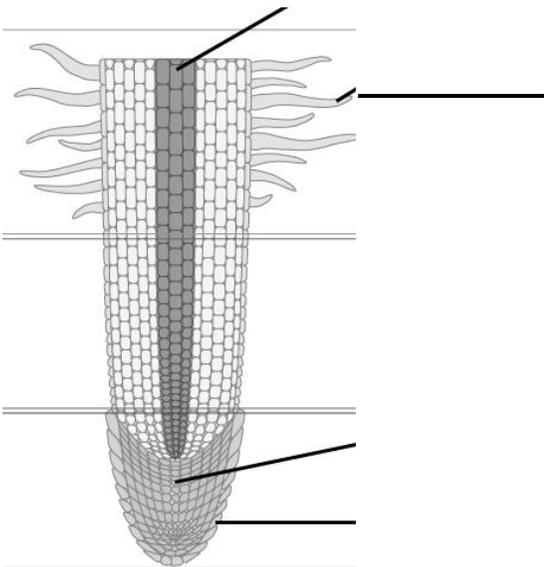
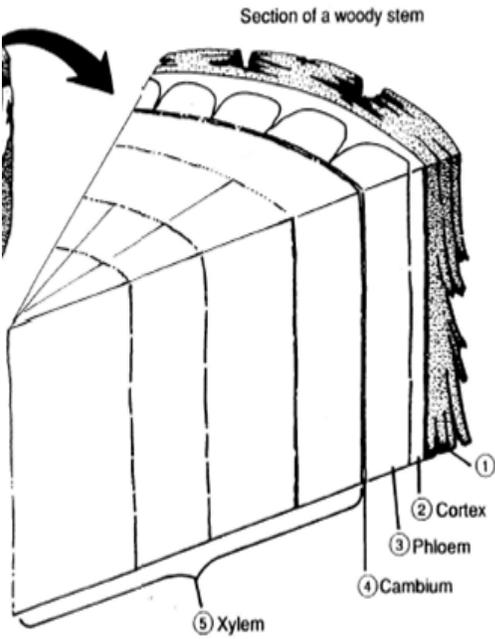
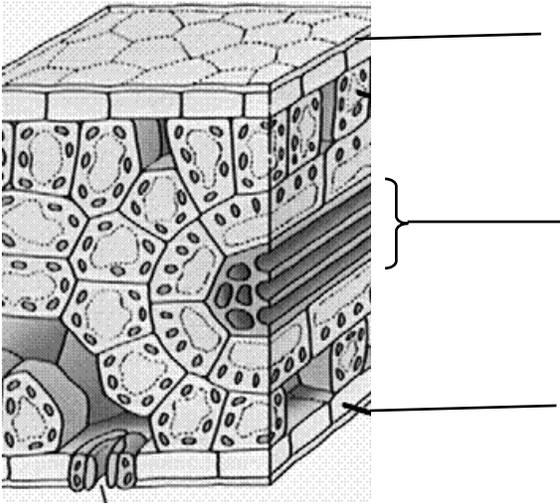
8. Stems and leaves make up the plant shoot system.
9. Serve three purposes:
 - i) provide support
 - ii) transport system between roots and leaves
 - iii) food storage (celery, onion)
10. Stems can also be modified for asexual reproduction, as in potato tubers and strawberry runners.
11. There are two types of plant stems: woody and herbaceous.
12. Woody stems are hard, thick, and rough. In comparison, herbaceous stems are usually soft, & green, in color to carry out photosynthesis.
13. Herbaceous plants are generally short-lived and rely on scattered vascular bundles to support the stem and carry nutrients and water.
14. In woody stems the older xylem cells are called heartwood and provide structure while the younger xylem or sapwood conducts water and minerals.
15. Beneath the bark (cork) and cortex the phloem cells transport glucose.
16. Between the xylem and phloem is a thin layer of cambium which produces new xylem and phloem cells each year.
17. In woody stems, the epidermis is replaced by bark.

Leaves

18. Serve two purposes:
 - i) photosynthesis
 - ii) food storage
19. Leaves have a network of veins that contain the vascular tissue, which continues the xylem and phloem from the stem.

20. The leaf epidermis is covered by a cuticle and pierced by tiny pores called stomata, which allow the exchange of water vapour and gases.
21. Each stoma is bounded by a pair of guard cells which, based on the levels of water and carbon dioxide, determine the opening and closing of the stoma.
22. Between the upper and lower epidermis is a photosynthetic layer called the mesophyll. This layer consists of the palisade layer on the upper side and the spongy mesophyll layer on the lower side.
23. The palisade layer contains the chloroplasts and this is where photosynthesis occurs.
24. Use the textbook to help you label the longitudinal section of a root, section of a woody stem and cross-section of a leaf on the attached handout.

PLANT STRUCTURE



3. PLANT RESPONSES AND GROWTH

Read pages 638-641. Re-read and then complete the following table.

25. Hormones

= **chemical messengers** produced by a plant which affect how the plant grows, develops and responds to stimuli

- there are 4 general classes of hormones: **auxins, cytokinins, gibberellins, & ethylene**

| Hormone | Where Found in Plant | Major Functions |
|---------------------|---|--|
| Auxins | Embryo of seed, young leaves, meristems of apical buds | Stimulates cell elongation in apical meristems; stimulates fruit development; causes root growth on cuttings |
| Cytokinin | Synthesized in roots & seeds then transported to other organs | Stimulates cell division, involved in growth of side branches, delay aging of plant organs |
| Ethylene | Tissues of ripening fruits | Stimulates fruit ripening |
| Gibberellins | Meristems of apical buds and roots, young leaves, embryo | Responsible for rapid growth such as germination, shoot elongation, bolting of flower stalks |

26. Tropism

= a plant's growth response toward or away from an environmental **stimulus**

: If a plant grows **towards** the stimulus, it shows a **positive** tropism.

: If a plant grows **away** from the stimulus, it shows a **negative** tropism.

- they are unidirectional and cannot be **reversed**

- Four important stimuli that plants show growth responses for are: touch
light, gravity, water

1. **Phototropism** = plants that exhibit a response towards light

ie. Leaves or stems grow towards light

2. **Thigmotropism** = plants that show a response to touch

ie. Vines wrap around objects & 'climb' a trellis

3. **Gravitropism** = when plants show a response to gravity.

- a.k.a. geotropism

le. Roots growing downward is a positive response

le. Stems growing upward is negative response

4. **Hydrotropism** = plant response to water

le. Roots will grow towards a water source

27. Nastic Responses

= are rapid **reversible** plant responses to a stimulus that do not involve **hormones**

- are also known as **turgor movements** as the change in turgor (water) pressure within plant cells is responsible for these responses, not hormones

- are **adaptations** that help plants survive in their environment

le. **Day Lilies** open their flowers in response to an increase in light intensity

Venus Fly Trap closes in response to touch

28. Seasonal Changes

1. **Photoperiodism** = plant response to seasonal changes in length of **day & night**

le. Short-day Plants flower when nights are longer

Long-day Plants flower when days are longer than critical length

2. **Dormancy** = a period when an organism's growth or activity **decreases**

- This helps plants survive freezing temperatures and lack of liquid water.

Read pages 603-606. Re-read and then complete the questions below.

29. How are transpiration and cohesion / adhesion involved in the movement of water through the xylem of a plant?

- cohesion : the attraction of water molecules for one another

= water will form a droplet

: for this reason, water will adhere to the side of a tube

: the thinner the tube, the higher the level of water

- because xylem and phloem tissues are tubes, water is moved from the roots to the leaves by this cohesion and the vacuum or “pull” (osmosis) caused by transpiration (the loss of water to the atmosphere through the stomata in leaves)

30. Describe how nutrients are moved through the phloem according to the pressure-flow model.

- sugars produced in sources such as leaves are delivered to growing parts of the plant and areas that do not produce sugar (called sinks) via the the phloem through the process of translocation

- high concentration of sugar in the cells where they are produced causes osmosis to occur

- as water diffuses into the cells it creates pressure (turgor) which forces the sugar to move into the sieve tubes of the phloem to be transported to areas where there is less sugar

Read pages 638-641. Re-read and then complete the attached worksheet.