

**STUDY GUIDE - Ch. 35.1 - Plants Have a Hierarchical Organization  
Consisting of Organs, Tissues, and Cells**

NAME: \_\_\_\_\_

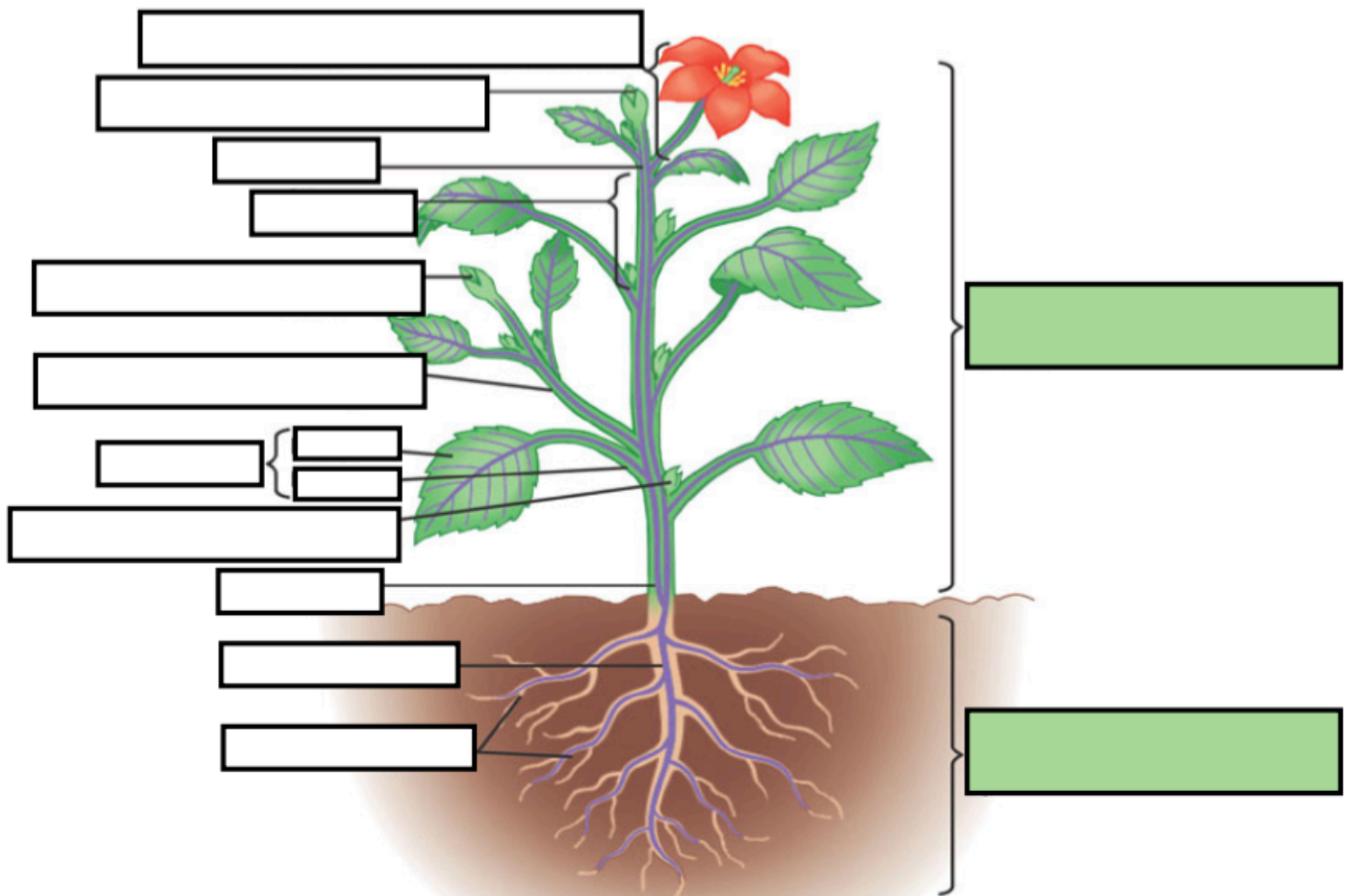
- **PHYSICALLY PRINT OUT** this PDF and **HANDWRITE** (with a black or blue pen) your answers directly on this PDF. Typed or digitally-written work is **not** accepted. Do **not** answer questions on separate paper.
- **Importantly, study guides are NOT GROUP PROJECTS!!!** You, and you alone, are to answer the questions as you **read** your assigned textbook. You are **not** to share answers with other students. You are **not** to copy any answers from any other source, including the internet.
- **Get in the habit of writing LEGIBLY, neatly, and in a medium-sized font.** AP essay readers and I will skip grading anything that cannot be easily read so start perfecting your handwriting, and don't write so large you can't add all the relevant details and key elaborations in the space provided.
- **SCAN** physical documents in color and with good resolution. Then, upload your final work as PDFs to Archie. Avoid uploading dark, shaded, washed-out, sideways, or upside-down scans of homework. Keep completed physical study guides organized in your biology binder to use as future study and review tools.
- **READ FOR UNDERSTANDING** and not merely to complete an assignment. **First**, read a section quickly to get an overview of the topic covered. Then, read it a **second** time slowly, paraphrasing each paragraph **out loud** and analyzing every figure. Finally, read it a **third** time as you answer the study guide questions if assigned and start building your memory. Try to write answers out in your own words, when possible, and try to purposefully and accurately use all new terminology introduced.

1. a. Let's review a term you have seen before. What is a **tissue**?

b. Next, define an **organ**.

2. The **three basic plant organs** are 1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_

3. a. On Figure below, label the **shoot system**, **root system**, and **anatomical parts** of a typical flowering plant.



b. **HOW** does the shoot systems rely of the root system and vice versa?

4. a. What are the three roles of plant roots?

1.

2.

3.

5. a. Tall, erect plants, like certain gymnosperms (non-flowering, seed-producing plants like conifers) and tall angiosperms (flowering, seed-producing plants), have a taproot system. What is the difference between the taproot and the lateral roots in their positioning in the taproot systems?

b. What is the difference between the taproot and the lateral roots in their possible relative functions?

6. Other often smaller, or trailing plants have fibrous root systems. How does a fibrous root system differ physically from the taproot system?

7. a. What environmental conditions would have favored the evolution of fibrous root systems in some plants instead of the evolution of a taproot systems?

b. Why is this an adaptation for the plant? *How does help the plant **SURVIVE &, THUS, REPRODUCE!?***

c. What environmental conditions would have favored the evolution of tap root systems in some plants instead of the evolution of a fibrous systems?

d. Why is this an adaptation for the plant? *How does help the plant **SURVIVE &, THUS, REPRODUCE!?***

8. a. This photograph shows the root hairs of a radish. Found towards the tips of roots, what is a root hair?



- b. What is the function of root hairs?

9. Roots usually **cannot** do **photosynthesis**, *the biochemical process by which radiant (solar) energy is converted into chemical energy stored in sugars*. Photosynthesis uses  $\text{CO}_2$  and produces  $\text{O}_2$  as a waste product, this chemistry taking place in the greener cells such as are found in leaves and some modified shoots. **Cells of plants though still have to extract the energy from these sugars to later do work with. The energy is extracted by breaking the sugars down, and storing the chemical energy instead of molecules of ATP, which can deliver the energy to the parts of the cell having to do work (endergonic processes).** *The biochemical process of breaking the energy-rich sugars down to release the chemical energy stored in their chemical bonds* is called cellular respiration and requires  $\text{O}_2$ , while producing  $\text{CO}_2$  as a waste product.

**Green cells of plants that are exposed to sunlight and contain many chloroplasts perform photosynthesis during the day and cellular respiration at night. Cells of plants that are not exposed to sun or are not specialized for that function perform cellular respiration all day and night, getting ahold of sugars as they are transported from the photosynthetic part of the plant or parts where sugars were stored.** To get the  $\text{O}_2$  needed to perform cellular respiration, roots, for example, must have access to oxygen gas from the air. **Oxygen is present in the air pockets in between soil particles** (which is why plants like aerated soil - soil that is not too compacted. Not enough oxygen gas may be present to diffuse into the cells of roots though when these pockets fill up with water for long periods of time (like if the soil water doesn't drain into the deeper bedrock after it rains or if the plant roots are submerged in water as is the case in marshy environments). **If roots can't get enough oxygen gas, they die because they cannot perform cellular respiration and so extract energy from sugars, and so cannot store energy on ATP, and so cannot do the work to stay alive.** Though natural selection, some species of plants have adapted their roots to be able to obtain oxygen gas even if most of the root is found in very wet solid or fully under water, by having part of the root be above ground or above the water level. We see such plants with aerial roots or mangroves with roots that project above the water line in South Florida.



Aerial roots are not the only modification seen in nature. Various roots, modified for different functions, have evolved over time. See. Figure 35.4. What storage root modified to do?

10. What is a plant **stem**?
11. What are three main **functions of stems**?
- 1.
  - 2.
  - 3.
12. Where does **most shoot elongation (growth) occur**?
13. Apical buds are found at the very tip of every branch. Stem cells inside the apical bud divide by mitosis to build new cells that are added to the tip of the branch, causing the branch to elongate. Along the branch, where the leaves connect, you will find axillary or lateral buds. What do **plant use an axillary buds for**?
14. Review Figure.35.5 to learn about the evolutionary modifications that have occurred in some stems of certain plant species.
15. a. The main **function of a leaf** is \_\_\_\_\_.
- b. What are **three additional functions that modified leaves can perform**?
- 1.
  - 2.
  - 3.
16. Review Figure.35.7 to learn about the evolutionary modifications that have occurred in some leaves of certain plant species.

17. **Plants have three types of tissues.** Name the tissues and provide its function.

a. \_\_\_\_\_ Tissue

**Function:**

b. \_\_\_\_\_ Tissue

**Function:**

d. \_\_\_\_\_ Tissue

**Function:**

18. a. What is the plant's **epidermis**?

b. What is the **cuticle**?

c. What is the function of the **cuticle**?

d. Let's apply the knowledge we learned earlier in the course (no, this answer is not in the book). Based on your understanding of the molecular structure of lipids - Ch.5 - (a wax being a large hydrocarbon-like molecule), why would the cuticle work well for preventing dehydration/water loss? *(Think of the properties of lipids and the properties of water as a molecule, and whether water would be attracted to the lipids or not)*

19. The vascular tissue of plants involve the structures that support the transport of materials long distances throughout the body of the plant. What do each of these types of vascular tissues do:

1. **Xylem:**

2. **Phloem:**

20. **Plants have five major types of cells.** Read over Figure 35.10 to learn what makes one different from the next, especially the cells that make up the Xylem and the Phloem.
- a. Describe the structure and features of **Tracheids and vessel elements**. (You should be discussing the following: **shape and purpose** of cells, explain the **meaning of being dead at functional maturity**, **use of lignin in cell walls**, & structure and purpose of **pits**)
- b. Describe the structure and features of **Sieve-Tube elements & Companion Cells**. (You should be discussing the following: **shape and purpose of each of Sieve-Tube**, structure and purpose of **sieve plates**, **Sieve Tube elements being alive but modified at functional maturity**, **role companion cell place**.)