Chapter 2 Plants: From Cells to Systems

What You Will Learn

In this chapter, you will learn how to...

- **explain** how plant cells specialize to form different kinds of plant tissues
- **explain** the links between specialized cells, tissues, organs, and systems in plants
- **describe** how plant organs work together to meet the needs of a plant

Why It Matters

Plants are essential for life on our planet. To protect this critical resource, we must understand how plant tissues, organs, and organ systems are formed, how they function, and how some plants are threatened by diseases.

Skills You Will Use

In this chapter, you will learn how to...

- **examine** and **draw** specialized plant tissues
- **investigate** how some plant tissues and organs work
- **research** a disease that threatens plant tissues and organs

Most of us only think about trees when they are threatened, such as by the forest fire that left this charred log. Yet we depend on trees and other green plants for everything from buildings and furniture to paper and railroad trestles. In fact, we depend on plants for life itself because they supply much of the oxygen we breathe and they form the basis of the food chains found on land and in the sea. In this chapter, you will explore how a fertilized egg in a centimetre-sized seed can become a tiny seedling and then a bean plant, rosebush, or maple tree.

Activity 2-1

Observing Plant Growth

What happens to the cells in a seed as the seed starts to grow?
To find out, you will work on this activity as you study the chapter.

Once soaked, your seed should split easily with your fingers. If not, let it soak another day.

Materials

- seeds of pinto or kidney beans, soaked overnight
- small, clear plastic bag (wash for re-use after completing this activity) or small resealable plastic container
- paper towel
- water
- small container
- soil

Procedure

1. Carefully remove the seed coat from one of the seeds that has soaked overnight. Split it with your fingers, and record what you observe.
2. Moisten a paper towel, and place two or three other bean seeds on top. Fold the paper towel over the seeds, and place it in the plastic container. Observe the seeds each day for five days. Be sure to keep the paper towel moist throughout the experiment. Make a data table to record any changes you see.
3. On the fifth day, remove a bean seed that shows changes. Split it open, and record your observations in your data table.
4. Plant one of the other seedlings in a small container of soil. Add a little water to the soil every day for two weeks, and record what happens each day.

Questions

1. Using your knowledge of cell division, infer what happened to the seeds that were soaked in water overnight.
2. Make a hypothesis to explain the changes you saw after five days.
3. At the end of the chapter, explain what cellular and body processes occurred in the different areas of the seedling that you planted in the soil.

Study Toolkit

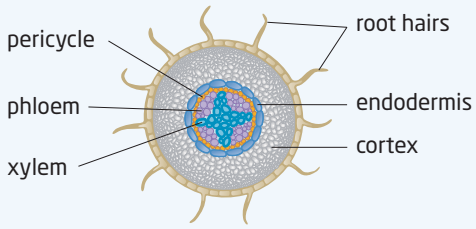
These strategies will help you use this textbook to develop your understanding of science concepts and skills.
To find out more about these and other strategies, refer to the Study Toolkit Overview, which begins on page 560.

Reading Graphic Text

Interpreting Cross Sections

A cross section is a drawing that shows the inside of an object, as though you have sliced it open, either horizontally or vertically through its centre.

To interpret a cross section, first read the title or caption to find out what the cross section represents. Then visualize the object in three dimensions. For example, this cross section shows what you would see if you looked "down" at a root sliced in half horizontally.



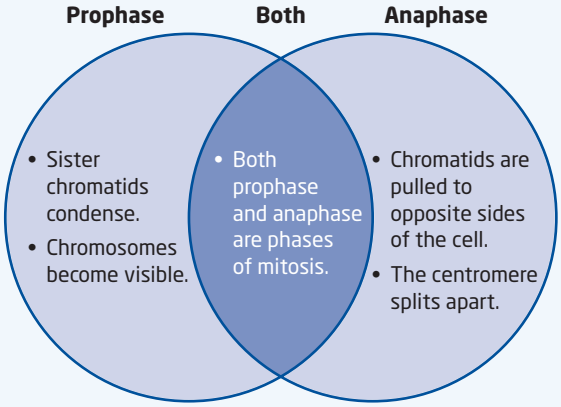
Use the Strategy

Examine **Figure 2.10A** on page 64. Read the caption to find out what object is represented by the cross section. Which labelled parts of the object extend beyond what you can see in the cross section? Explain your reasoning.

Organizing Your Learning

Comparing and Contrasting

Comparing and contrasting helps you identify how concepts are similar and different. A **Venn diagram** can help you organize the information graphically. For example, the Venn diagram below shows similarities and differences between two of the phases of mitosis.



Use the Strategy

Read the captions and labels for **Figure 2.3** on page 58. Make a Venn diagram to show the similarities and differences between xylem cells and phloem cells.

Word Study

Multiple Meanings

A word can have more than one meaning, depending on its context. The table below shows two words that you might have seen in an everyday, non-scientific context.

Use the Strategy

Write the everyday meaning of the word *tissue*. As you read this chapter, note its scientific meaning.

Everyday and Scientific Meanings of Words

Word	Everyday Meaning	Scientific Meaning (Biology)
cell	slang or short for *cellphone*	the smallest unit that can perform the functions of life
plate	a flat dish	a structure that forms between two plant cell nuclei