

CHAPTER 2

The Science of Biology

Summary of Key Concepts

Concept 2.1 Discovery science emphasizes inquiry and observation. (pp. 24–29)

Biology is defined as the scientific study of life. Science is a way to answer questions about the natural world. At the heart of science is inquiry—people asking questions about what they observe in nature and actively seeking answers. The questions that drive scientific inquiry are based on *observation*, using the senses to gather information. Recorded observations are called *data*. Through careful observations and data, discovery science describes natural structures and processes. A logical conclusion based on observations is called an *inference*. Inferences are important in science because they help narrow down general questions into specific questions. These specific questions can then be explored further. Scientists put together many specific observations to reach a general conclusion, or *generalization*.

1. What is the difference between an observation and data? _____

2. Compare the terms *inference* and *generalization*. _____

Concept 2.2 Hypothesis-based science is a search for explanations. (pp. 30–36)

Questions about nature usually arise from the observations of discovery science. Hypothesis-based science is a process for testing the possible answers to such questions. It uses the scientific method, which has five steps: observation, question, hypothesis, prediction, and test. The key element is the *hypothesis*, which is a suggested answer to a well-defined scientific question. A hypothesis allows scientists to make certain predictions, which are then tested by making additional observations or by designing experiments. Experiments that test hypotheses generally test the effect of one condition that can differ, called a *variable*. For example, a study of plant growth might test the effect of different amounts of sunlight. An experiment that tests the effect of a single variable is called a *controlled experiment*. To eliminate unwanted variables in a controlled experiment, researchers may divide the subjects into two groups: a control group and an experimental group. Both groups are the same except for the variable being investigated. For example, the plant study would include only a single type of plant, and each plant would receive the same soil, temperature, and amount of water. Organizing data in tables or graphs helps scientists interpret the results of their experiments.

3. How is hypothesis-based science related to discovery science? _____

4. What is the scientific method? _____

5. What is a hypothesis? _____

6. What is the purpose of the control group in a controlled experiment?

Concept 2.3 Understanding science will help you evaluate many issues.
(pp. 37–41)

Did you ever see an advertisement for a product and wonder if you should believe the claims it makes and buy the product? Making everyday decisions such as this requires you to judge the quality of evidence. *Evidence* consists of a collected body of data from observations and experiments. Scientific evidence should be repeatable. Repeating the observations and experiments of others should lead to similar evidence.

Scientific hypotheses should lead to predictions that can be tested. There must be some observation or experiment that could reveal if the hypotheses are false. Even hypotheses that stand up to repeated testing may later be revised or even rejected. Science is limited in the kinds of questions it can help answer. It can only search for natural causes for natural phenomena. Supernatural explanations of natural events are outside the bounds of science, because there is no way to show that they are false.

Theories lead to major scientific advances. A *theory* is a well-tested explanation that makes sense of a great variety of scientific observations. Compared to a hypothesis, a theory is much broader in scope. Theories only become widely accepted in science when they are supported by a large body of evidence. If new evidence that contradicts a theory is uncovered, scientists need to modify or discard the theory.

Models are physical, mental, or mathematical representations of how people understand a process or an idea. They help people explain and evaluate ideas about the natural world.

Communicating findings is important in science. Communication allows scientists to check one another's claims by attempting to repeat experiments. *Technology* and science are related, but their goals and methods are different. The goal of science is to understand nature. The goal of technology is to apply scientific understanding for some specific purpose.

7. What is evidence? _____

8. How does a theory differ from a hypothesis? _____

Name _____ Class _____ Date _____

9. Give an example of a model. _____

10. Contrast the goals of science and technology. _____

Reading Skills Practice

Summarizing information in a graph Use the information provided in the graph in Figure 2-16 on page 35 to describe the effect of snake coloration on attacks by predators.

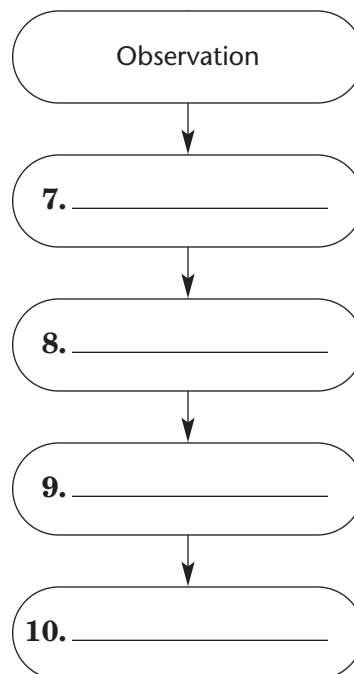
Vocabulary Review and Reinforcement

In 1–6, write the letter of the correct definition on the line next to each term.

- | | |
|--------------------------------|---|
| _____ 1. observation | a. recorded observations |
| _____ 2. data | b. condition that can differ within an experiment |
| _____ 3. generalization | c. use of the senses to gather information |
| _____ 4. hypothesis | d. experiment that tests the effect of a single variable |
| _____ 5. variable | e. general conclusion |
| _____ 6. controlled experiment | f. suggested answer to a well-defined scientific question |

In 7–10, fill in the blanks with the appropriate terms from the chapter.

Scientific Method



In 11–20, write true if the statement is true. If the statement is false, replace the underlined term with a term that makes the statement true.

- _____ 11. In science, evidence consists of a collected body of data from observations and experiments.
- _____ 12. A(n) hypothesis is a well-tested explanation that makes sense of a great variety of scientific observations.
- _____ 13. Theories are physical, mental, or mathematical representations of how people understand a process or an idea.
- _____ 14. The goal of observation is to apply scientific understanding for some specific purpose.
- _____ 15. Hypothesis-based science is a search for explanations.
- _____ 16. Observations recorded as measurements are called qualitative data.
- _____ 17. Discovery science emphasizes inquiry and observation.
- _____ 18. When they use the scientific method, scientists test questions.
- _____ 19. A controlled experiment helps to eliminate the effects of unwanted predictions.
- _____ 20. The statement, “All living things are made of cells,” is an example of a(n) model.

WordWise

Find and circle nine Key Terms from the chapter in the puzzle below. Words may appear horizontally, vertically, or diagonally. Then write each term and its definition on a separate sheet of paper.

g e n e r l d o n s i
o b s e r v a t i o n
v o m c e t t g o t f
a a u o v a a f n h e
r d r m d b d a l e r
i e v i d e n c e o e
a n c l a p l t s r n
n t h a t b i n s y c
l p e c j r l j y r e
e c a t o p l e c a n
t e c h n o l o g y t
z h y p o t h e s i s