CHAPTER 1—THE SCIENCE OF LIFE

MULTIPLE CHOICE

1. Biology is the study of
   a. minerals.    c. the weather.
   b. life.        d. energy.

   ANS: B   DIF: 1   OBJ: 1-1.1

2. All organisms possess DNA. DNA
   a. creates energy for cells.
   b. allows sensitivity to environmental stimuli.
   c. contains information for growth and development.
   d. captures energy from the sun.

   ANS: C   DIF: 1   OBJ: 1-2.1

3. Instructions for traits that are passed from parents to offspring are known as
   a. a species plan.
   b. organ codes.
   c. genes.
   d. natural selections.

   ANS: C   DIF: 1   OBJ: 1-1.3

4. Homeostasis means
   a. a change over long periods of time.
   b. keeping things the same.
   c. rapid change.
   d. the same thing as evolution.

   ANS: B   DIF: 1   OBJ: 1-1.5

5. Ecology
   a. refers to change in species over time.
   b. refers to a delicate internal balance within organisms.
   c. is inconsistent with evolution.
   d. is the study of communities or organisms in relation to their environment.

   ANS: D   DIF: 1   OBJ: 1-2.3

6. Which of the following is not necessarily a characteristic of living things?
   a. homeostasis
   b. metabolism
   c. complexity
   d. reproduction

   ANS: C   DIF: 1   OBJ: 1-1.3

7. The smallest units that can carry on all the functions of life are called
   a. molecules.
   b. cells.
   c. organelles.
   d. species.

   ANS: B   DIF: 1   OBJ: 1-1.4
8. Living things
   a. need energy for life processes.
   b. have the ability to reproduce.
   c. are composed of cells.
   d. All of the above

   ANS: D  DIF: 1  OBJ: 1-1.3

9. All organisms are composed of
   a. diatoms.
   b. cellulose.
   c. cells.
   d. None of the above

   ANS: C  DIF: 1  OBJ: 1-1.4

10. All living things maintain a balance within their cells and the environment through the process of
    a. growth.
    b. development.
    c. homeostasis.
    d. evolution.

    ANS: C  DIF: 1  OBJ: 1-1.5

11. Which of the following is a characteristic of all living things?
    a. movement
    b. photosynthesis
    c. development
    d. cellular organization

    ANS: D  DIF: 1  OBJ: 1-1.4

12. Which of the following is not a partial explanation for our lack of understanding of many of the living
    things on Earth?
    a. Many organisms are microscopic in size and therefore difficult to observe.
    b. Many organisms are so different from other organisms that it is difficult to understand them.
    c. Many organisms live in areas of the world that are difficult to explore.
    d. Tropical rain forests contain many species, and it is difficult to find all of them in these dense forests.

    ANS: B  DIF: 3  OBJ: 1-2.2

13. A scientist noticed that in acidic pond water some salamanders developed with curved spines. This was
    a(n)
    a. hypothesis.
    b. theory.
    c. observation.
    d. control.

    ANS: C  DIF: 1  OBJ: 1-3.1
14. Which example of scientific methodology is incorrect?
   a. observation—a number of people in a certain place dying of a disease outbreak
   b. measurement—a record of the number of people with symptoms of a disease and the number of people who had died from the disease
   c. analysis of data—comparison of the effects of mixing monkey cells with virus-containing blood in test tubes and the effects of mixing liquid from these test tubes with fresh monkey cells
   d. inference making—identification of the Ebola virus as the cause of a disease by taking electron micrographs of substances found in the blood of persons affected with the disease

   ANS: D DIF: 2 OBJ: 1-3.4

15. The English physician Ronald Ross wanted to try to find the cause of malaria. Based on his observations, Dr. Ross suggested that the Anopheles mosquito might spread malaria from person to person. This suggestion was a
   a. prediction. c. theory.
   b. hypothesis. d. scientific “truth.”

   ANS: B DIF: 1 OBJ: 1-3.2

16. The English physician Ronald Ross knew that the parasite Plasmodium was always found in the blood of malaria patients. He thought that if the Anopheles mosquitoes were responsible for spreading malaria, then Plasmodium would be found in the mosquitoes. This idea was a
   a. prediction. c. theory.
   b. hypothesis. d. scientific “truth.”

   ANS: A DIF: 1 OBJ: 1-3.1

17. Scientific hypotheses are most often tested by the process of
   a. communicating. c. experimenting.
   b. inferring. d. analyzing data.

   ANS: C DIF: 1 OBJ: 1-3.1

18. A hypothesis is
   a. a definite answer to a given problem.
   b. a testable possible explanation of an observation.
   c. a proven statement.
   d. a concluding statement.

   ANS: B DIF: 1 OBJ: 1-3.1

19. A unifying explanation for a broad range of observations is a
   a. hypothesis. c. prediction.
   b. theory. d. controlled experiment.

   ANS: B DIF: 1 OBJ: 1-3.5
20. A hypothesis that does not explain an observation
   a. is known as an inaccurate forecast.
   b. often predicts a different observation.
   c. is rejected.
   d. None of the above

   ANS: C          DIF: 1          OBJ: 1-3.2

21. Scientists usually design experiments
   a. with a good idea of the expected experimental results.
   b. based on wild guesses.
   c. in order to develop new laboratory tools.
   d. All of the above

   ANS: A          DIF: 1          OBJ: 1-3.3

22. A scientific theory
   a. is absolutely certain.
   b. is unchangeable.
   c. may be revised as new evidence is presented.
   d. is a controlled experiment.

   ANS: C          DIF: 1          OBJ: 1-3.5

23. The word *theory* used in a scientific sense means
   a. a highly tested, generally accepted principle.
   b. a guess made with very little knowledge to support it.
   c. an absolute scientific certainty.
   d. None of the above

   ANS: A          DIF: 1          OBJ: 1-3.5

24. observation : hypothesis ::
   a. theory : observation
   b. guess : hypothesis
   c. hypothesis : experiment
   d. theory : control

   ANS: C          DIF: 2          OBJ: 1-3.2

25. Which of the following components of a scientific investigation would benefit from communication between scientists?
   a. observing
   b. measuring
   c. analyzing data
   d. All of the above

   ANS: D          DIF: 2          OBJ: 1-3.6

26. Typically, the order in which the steps of the scientific method are applied is
   a. observations, predictions, hypothesis, controlled testing, theory, verification.
   b. predictions, observations, hypothesis, theory, controlled testing, verification.
   c. observations, hypothesis, predictions, controlled testing, theory, verification.
   d. observations, hypothesis, predictions, controlled testing, verification, theory.

   ANS: C          DIF: 1          OBJ: 1-3.1
27. A light microscope that has an objective lens of $10\times$ and an ocular lens of $20\times$ has a magnification of
a. $30\times$.  
c. $300\times$.

b. $200\times$.  
d. $2000\times$.

ANS: B  DIF: 1  OBJ: 1-4.1

28. Which of the following is not a correct association between an SI base unit abbreviation and its base quantity?
a. A—area
b. m—length
c. s—time
d. mol—amount of a substance

ANS: A  DIF: 2  OBJ: 1-4.3

29. Which of the following is not an example of good laboratory practice?
a. working alone in the lab
b. asking permission before using equipment
c. working with a partner in the lab
d. wearing goggles in the lab

ANS: A  DIF: 1  OBJ: 1-4.4

30. Scientists share their research results by
a. publishing in scientific journals.
b. presenting at scientific meetings.
c. avoiding conflicts of interest.
d. Both a and b

ANS: D  DIF: 1  OBJ: 1-3.6

COMPLETION

1. ____________________ is the study of the interaction of organisms with their environment and with each other.

ANS: Ecology  
DIF: 1  OBJ: 1-2.1

2. To function properly, all living things must maintain a constant internal environment through the process of ____________________.

ANS: homeostasis  
DIF: 1  OBJ: 1-1.5

3. An educated guess, or a(n) ____________________, may be tested by experimentation.

ANS: hypothesis  
DIF: 1  OBJ: 1-3.2
4. Stating in advance the result that may be obtained from testing a hypothesis is called ________________.

ANS: predicting
prediction

DIF: 1          OBJ: 1-3.1

5. A unifying explanation for a broad range of observations is a ________________.

ANS: theory

DIF: 1          OBJ: 1-3.5

6. A ________________ experiment is one in which the condition suspected to cause the effect is compared to the same situation without the suspected condition.

ANS: controlled

DIF: 1          OBJ: 1-3.3

7. The base unit for length in the Système International d’Unités (International System of Units) is the ________________.

ANS: meter

8. A ________________ electron microscope passes a beam of electrons over a specimen’s surface, whereas a ________________ electron microscope passes a beam of electrons through a thin slice of a specimen.

ANS: scanning, transmission

DIF: 1          OBJ: 1-4.2
PROBLEM

1. Some scientists conducted an experiment in which they evaluated various measurements of human health in people who drank at least one cup of coffee a day. They found no significant differences in these health indicators between the subjects who drank only one cup of coffee a day and those who drank as many as 20 cups a day. They concluded that coffee has no adverse effects on human health. Write your answers to the following in the spaces below.
   a. What were the independent and dependent variables in this experiment?
   b. Was this a controlled experiment? If so, what were the control and experimental groups?
   c. Do you agree with the conclusion the scientists drew from their results? Why or why not?

ANS:
   a. The independent variable was the number of cups of coffee a subject drank each day; the dependent variables were the indicators of human health measured.
   b. This was not a controlled experiment because there was no group of subjects who drank zero cups of coffee a day.
   c. Students should disagree with the scientists’ conclusion because this was not a controlled experiment (there could be something harmful in coffee that would be effective when only one cup of coffee was consumed each day).

DIF: 3 OBJ: 1-3.4

ESSAY

1. Briefly discuss some of the major themes in biology that we will examine this year. Write your answer in the space below.

ANS:
Major themes are the diversity and unity of life, the interdependence of organisms, and the evolution of life. Diversity and unity refers to the many different kinds of organisms that share similar characteristics even though the organisms themselves are so different. Interdependence refers to ecology and the interaction of organisms with each other and the environment. Evolution refers to changes in species over time.

DIF: 2 OBJ: 1-2.1

2. Name five characteristics that are considered distinct properties of all living things. Write your answer in the space below.

ANS:
Possible answers include the following: All living things are composed of one or more cells and have a hierarchy of organization. All living things respond to stimuli. All living things maintain a constant internal environment (homeostasis). All living things carry out metabolic reactions that involve the use of energy. All living things grow. All living things reproduce and pass on genetic information to offspring. Populations of living things change over time.

DIF: 2 OBJ: 1-1.3
3. Toads that live in hot, dry regions bury themselves in the soil during the day. How might this be important to the toad? Write your answer in the space below.

ANS:
Toads must maintain a constant internal environment (homeostasis) in order to function properly. Burying themselves in the soil is an adaptation that keeps their body temperature from rising too high and keeps their bodies from drying out.

DIF: 2 OBJ: 1-2.4

4. The results of an experiment do not support the hypothesis that the experiment was designed to test. Was the experiment a waste of time? Explain. Write your answer in the space below.

ANS:
No, the experiment was not a waste of time. A scientist works by systematically showing that certain hypotheses are not valid when they are not consistent with the results of experiments. The results of experiments are used to evaluate alternative hypotheses. An experiment can be successful if it shows that one or more of the alternative hypotheses are inconsistent with observations.

DIF: 2 OBJ: 1-3.2

5. Why is it important to study biology even if you are not planning a career in biology? Write your answer in the space below.

ANS:
By studying biology, you can make informed decisions that impact both you and the society in which you live. Decisions about your health, your food supply, and your environment are only some of these issues.

DIF: 2 OBJ: 1-1.2