Reinforcement and Study Guide
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To the Student

This *Reinforcement and Study Guide* for *Biology: The Dynamics of Life* will help you learn more easily from your textbook. Each textbook chapter has four study guide pages of questions and activities for you to complete as you read the text. The study guide pages are divided into sections that match those in your text. Each BioDigest in your textbook has two study guide pages to complete.

You will find that the directions in the *Reinforcement and Study Guide* are simply stated and easy to follow. Sometimes you will be asked to answer questions. Other times, you will be asked to label a diagram or complete a table. By completing the study guide, you will gain a better understanding of the concepts presented in the text. These sheets also will prove helpful when studying for a test.

Before you begin your work, read the Study Skills section at the back of the book. The Study Skills section will help you

- improve your reading skills.
- improve your vocabulary skills.
- learn from visuals.
- make and understand idea maps.
In your textbook, read about the science of biology.

Answer the following questions.

1. What is the primary focus of all biological studies?

2. What is meant by the statement, “Living things do not exist in isolation”?

In your textbook, read about why biologists study the diversity of life.

For each of the statements below, write true or false.

3. People study biology only if they are planning to become biologists.

4. By studying biology, you can better appreciate the great diversity of species on Earth and the way each species fits into the dynamic pattern of life on the planet.

5. The study of biology includes the investigation of interactions among species.

In your textbook, read about the characteristics of living things.

Complete each statement.

6. To be considered __________________ , something must exhibit all of the __________________ of life.

7. __________________ is another word for “living thing.”

8. Every living thing, from simple, single-celled organisms to complex, multicellular plants and animals, is made up of parts that function together in orderly living __________________ .

Read each of the following statements. If it describes the process of reproduction, write yes. If not, write no.


10. An amoeba divides in half.

11. A bean plant produces seeds in long pods.

12. Pollen grains are released from a flower.

13. A sea star produces a new arm after losing one to a predator.
Circle the letter of the choice that best completes the statement.

14. A species is defined as a group of similar-looking organisms that
   a. undergo similar developmental changes.  b. can interbreed.
   c. can interbreed and produce fertile offspring.  d. reproduce in the same way.

15. Every organism begins life as a(n)
   a. embryo.  b. single cell.  c. nucleus.  d. fertilized egg.

16. A corn plant producing ears of corn is an example of
   a. growth.  b. reproduction.  c. development.  d. all of these.

17. If members of a species fail to reproduce successfully, the species
   a. will eventually become extinct.  b. will not develop normally.
   c. will evolve into a new species.  d. will remain unchanged.

Complete the table below by checking the correct column for each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Stimulus</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. The recess bell ringing at an elementary school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Your mouth watering at the sight of food on a plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. A sudden drop in air temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. A flu virus entering your body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Getting butterflies in your stomach before giving a speech</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Answer the following questions.

23. Explain the concept of homeostasis.

24. What is an adaptation?

25. What is evolution?
In your textbook, read about observing and hypothesizing.

Answer the following questions.

1. What is meant by scientific methods? _______________________________________________________

2. What is a hypothesis? ___________________________________________________________________

3. How is a hypothesis tested? ______________________________________________________________

In your textbook, read about experimenting.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. A procedure that tests a hypothesis by collecting information under controlled conditions</td>
<td>a. dependent variable</td>
</tr>
<tr>
<td>5. In an experiment, the group that is the standard against which results are compared</td>
<td>b. experimental group</td>
</tr>
<tr>
<td>6. In an experiment, the group in which all conditions are kept the same except for the one being tested</td>
<td>c. independent variable</td>
</tr>
<tr>
<td>7. The condition that is tested by the experimenter</td>
<td>d. experiment</td>
</tr>
<tr>
<td>8. The condition being observed or measured in an experiment</td>
<td>e. control group</td>
</tr>
</tbody>
</table>

Use each of the terms below just once to complete the passage.

- experimental results
- experiment(s)
- hypothesis
- laws
- scientific journals
- theory
- valid
- verify

When (9) ____________________________ are reported in (10) ____________________________ , other scientists may try to (11) ____________________________ the results by repeating the (12) ____________________________ . Usually when a(n) (13) ____________________________ is supported by data from several scientists, it is considered (14) ____________________________ . Over time, a hypothesis that is supported by many observations and experiments becomes a (15) ____________________________ . Some well-established facts of nature, such as gravity, are recognized as (16) ____________________________ .
In your textbook, read about kinds of research.

Complete the chart by checking the more correct column for each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Quantitative Research</th>
<th>Qualitative Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Numerical data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Field study of hunting behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Thermometer, balance scale, stopwatch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Testable hypothesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Measurements from controlled laboratory experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Purely observational data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Binoculars, tape recorder, camera</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complete each statement.

8. In order for scientific research to be universally understood, scientists report measurements in the ___________________________ , a modern form of the metric system.

9. This system of measurement is abbreviated __________________________ .

10. This system is a __________________________ system in which measurements are expressed in multiples of __________________________ or __________________________ of a basic unit.

In your textbook, read about science and society.

If the following statement is true, write true. If it is not, rewrite the italicized part to make it true.

11. Ideas about the value of knowledge gained through scientific research come from a society’s social, ethical, and moral concerns. ____________________________________________________

12. Pure science is scientific research carried out primarily to solve a specific environmental problem. ____________________________________________________

13. Technology is the practical application of scientific research to improve human life and the world in which we live. ____________________________________________________

14. A technological solution to a human problem can benefit humans but may also cause a different, possibly serious, problem. ____________________________________________________

15. Scientists have the final say about how the results of scientific discoveries are applied. ____________________________________________________
What is biology?

In your textbook, read about characteristics of life.

Complete the following statements.

Biology is the study of (1) _______________ and the (2) _______________ among them. Biologists use a variety of (3) _______________ methods to study the details of life.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. The basic unit is the cell.</td>
<td>a. development</td>
</tr>
<tr>
<td>5. Maintenance of a stable internal environment</td>
<td>b. growth</td>
</tr>
<tr>
<td>6. Reaction to a change in the environment</td>
<td>c. homeostasis</td>
</tr>
<tr>
<td>7. Cell enlargement and division</td>
<td>d. organization</td>
</tr>
<tr>
<td>8. Changes in an organism that take place over time</td>
<td>e. reproduction</td>
</tr>
<tr>
<td>9. Transmission of heredity information from one generation to the next</td>
<td>f. response to stimulus</td>
</tr>
</tbody>
</table>

Using what you know about characteristics of life, determine if each of the following describes a living or nonliving thing.

10. rust on a bucket  13. lightning
11. an apple on a tree  14. a dinosaur fossil
12. bacteria  15. a wasp
In your textbook, read about scientific methods.

Decide if each of the following statements is true. If it is not, rewrite the italicized part to make it true.

16. Scientific methods include observation, forming a hypothesis, and experiment.

17. A statement that can be tested and presents a possible solution to a question is a law.

18. In a controlled experiment, two groups are tested and all conditions except two are kept the same for both groups.

19. A condition that remains the same for both groups is called the independent variable.

20. A condition that is changed by the experimenter in one group and not the other is called the dependent variable.

21. A scientific experiment can be conducted only in a laboratory.

22. A theory is a law that has been confirmed by many experiments.

Read each of the following statements. If it is a testable hypothesis, write yes. If it is not a testable hypothesis, write no.

23. If a person exercises, his or her pulse rate will increase.

24. Cats make better pets than dogs.

25. When fertilizer is added to soil, plants grow taller.

Identify each of the two italicized items as either an independent or a dependent variable.

26. The number of red blood cells in a mouse’s blood at different levels of iron in its diet

27. The amount of starch formed in a plant leaf for different times of exposure to light
Principles of Ecology

In your textbook, read about what ecology is and about aspects of ecological study. Use each of the terms below just once to complete the passage.

ecology  biotic factors  nonliving environments  atmosphere
humans  organisms  soil  biosphere  abiotic factors

Living organisms in our world are connected to other ________ in a variety of ways. The branch of biology called ________ is the scientific study of interactions between organisms and their ________, including relationships between living and ________ things.

All living things on Earth can be found in the ________, the portion of Earth that supports life. It extends from high in the ________ to the bottom of the oceans. Many different environments can be found in the biosphere. All living organisms found in an environment are called ________. Nonliving parts of an environment are called ________. For example, whales, trees, and ________ are biotic factors. Ocean currents, temperature, and ________ are abiotic factors.

In your textbook, read about levels of organization in ecology.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>________ 11. A group of organisms of one species that interbreed and live in the same place at the same time</td>
<td>a. community</td>
</tr>
<tr>
<td>________ 12. A collection of interacting populations</td>
<td>b. competition</td>
</tr>
<tr>
<td>________ 13. Interacting populations and abiotic factors in a community</td>
<td>c. forest</td>
</tr>
<tr>
<td>________ 14. Increases when resources are scarce</td>
<td>d. population</td>
</tr>
<tr>
<td>________ 15. A terrestrial ecosystem</td>
<td>e. ecosystem</td>
</tr>
</tbody>
</table>
Principles of Ecology, continued

Section 2.1 Organisms and Their Environment

In your textbook, read about organisms in ecosystems.

For each statement below, write true or false.

16. A habitat is the role a species plays in a community.  

17. Habitats may change.  

18. A niche is the place where an organism lives its life.  

19. A habitat can include only one niche.  

20. A species’ niche includes how the species meets its needs for food and shelter.  

21. The centipedes and worms that live under a certain log occupy the same habitat but have different niches.  

22. It is an advantage for two species to share the same niche.  

23. Competition between two species is reduced when the species have different niches.

Complete the table below by writing the kind of relationship described on the left.

<table>
<thead>
<tr>
<th>Description of Relationship</th>
<th>Kind of Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. Organisms of different species live together in a close, permanent relationship.</td>
<td></td>
</tr>
<tr>
<td>25. One species benefits and the other species is neither benefited nor harmed by the relationship.</td>
<td></td>
</tr>
<tr>
<td>26. One species benefits from the relationship at the expense of the other species.</td>
<td></td>
</tr>
<tr>
<td>27. Both species benefit from the relationship.</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about how organisms obtain energy and about matter and energy flow in ecosystems. Answer the questions below. Use the diagram of a food web to answer questions 1–7.

1. How many food chains make up the food web?

2. Which organism is an herbivore?

3. Which organism is an autotroph?

4. Which organism is a third-order heterotroph? To what trophic level does that organism belong?

5. Which organism is an omnivore?

6. Which organisms belong to more than one food chain?

7. Which organism belongs to more than one trophic level?

8. What are decomposers? Where would decomposers appear in this food web?

9. What does a pyramid of energy show about the amount of energy available at different trophic levels of a food chain?

10. Why do different trophic levels have different amounts of energy?
Chapter 2

Principles of Ecology, continued

Section 2.2 Nutrition and Energy Flow

In your textbook, read about cycles in nature.

Circle the letter of the choice that best completes the statement or answers the question.

11. Energy that is lost at each trophic level of an ecosystem is replenished by
   a. heat. b. nutrients. c. sunlight. d. organisms.

12. Besides energy, what moves through the organisms at each trophic level of an ecosystem?
   a. organisms   b. nutrients   c. sunlight   d. cycles

13. Evaporation and condensation a part of the
   a. carbon cycle. b. nitrogen cycle. c. phosphorus cycle. d. water cycle.

14. Plants lose water to the air through
   a. condensation. b. photosynthesis. c. their roots. d. evaporation.

15. Animals lose water when they
   a. breathe in. b. urinate. c. breathe out. d. both b and c.

16. The major process by which water in the atmosphere is returned to the earth is
   a. precipitation. b. evaporation. c. photosynthesis. d. decomposition.

17. Autotrophs and heterotrophs use carbon-containing molecules for energy and for
   a. photosynthesis. b. growth. c. decomposition. d. both a and b.

18. What do plants use in photosynthesis to make carbon-containing molecules?
   a. carbon dioxide b. carbohydrates c. fertilizer d. oxygen

19. Heterotrophs get carbon-containing molecules by
   a. making the molecules themselves. b. feeding on other organisms. c. decaying.

20. When decomposers break down the carbon-containing molecules in dead organisms,
   a. the dead organisms are converted to coal. b. oxygen is released.
      c. carbon dioxide is released. d. carbon dioxide is converted to energy-rich
         carbon-containing molecules.

21. Fertilizers provide plants with
   a. nitrogen. b. carbon. c. water. d. oxygen.

22. Which of the following convert(s) nitrogen from air into a form plants can use?
   a. bacteria b. lightning c. sunlight d. both a and b

23. Plants use nitrogen to make
   a. carbohydrates. b. nitrogen gas. c. amino acids d. both b and c.

24. An animal returns nitrogen to the environment when it
   a. breathes. b. decomposes. c. urinates. d. both b and c.

25. Animals get phosphorus from
   a. the air. b. eating plants. c. water. d. the soil.

26. Phosphorus in the soil comes from
   a. rocks. b. decaying organisms. c. the air. d. both a and b.
Chapter 3
Communities and Biomes

Section 3.1 Communities

In your textbook, read about living in a community.

If the statement is true, write “true” on the line. If it is not true, rewrite the italicized part to make it true.

1. The interactions of abiotic and biotic factors result in conditions that are suitable for some organisms but not for others. _____________________________________________________________________

2. Food availability and temperature can be biotic factors for a particular organism. ___________________

3. A limiting factor is any biotic or abiotic factor that promotes the existence, numbers, reproduction, or distribution of organisms. _____________________________________________________________________

4. At high elevations where the soil is thin, vegetation is limited to large, deep-rooted trees.

5. Factors that limit one population in a community may also have an indirect effect on another population. ___________________

6. Tolerance is the ability of an organism to withstand fluctuations in biotic and abiotic environmental factors. _____________________________________________________________________

7. A population of deer would become larger as conditions move away from optimal toward either extreme of the deer’s range of tolerance. _____________________________________________________________________

8. Different species may have different ranges of tolerance. _____________________________________________________________________

In your textbook, read about succession: changes over time.

Use each of the terms below just once to complete the passage.

climax  primary  decades  succeed
pioneer  succession  species  slows down

The natural changes and replacements that take place in the communities of ecosystems are known as (9) _________________. It can take (10) ________________ or even centuries for one community to (11) ________________ , or replace, another. When new sites of land are formed, as in a lava flow, the first organisms to colonize the new area are (12) ________________ species. This colonization is called (13) ________________ succession. The species inhabiting the area gradually change. Eventually, succession (14) ________________ and the community becomes more stable. Finally, a mature community that undergoes little or no change, called a (15) ________________ community, develops.
For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>__________ 17. Sequence of community changes where soil is formed, allowing small, weedy plants to inhabit the area</td>
<td>a. a severe drought</td>
</tr>
<tr>
<td>__________ 18. Sequence of community changes occurring as a result of a natural disaster, such as a forest fire</td>
<td>b. primary succession</td>
</tr>
<tr>
<td>__________ 19. A stable, mature community with little or no succession occurring</td>
<td>c. amount of plant growth</td>
</tr>
<tr>
<td>__________ 20. An example of a biotic limiting factor affecting a community of organisms</td>
<td>d. secondary succession</td>
</tr>
<tr>
<td>__________ 21. An example of an abiotic limiting factor affecting a community of organisms</td>
<td>e. climax community</td>
</tr>
</tbody>
</table>

The statements below describe the secondary succession that occurred within an area of Yellowstone National Park. Number the events in the order in which they occurred or will occur.

| __________ 22. Grasses, ferns, and pine seedlings inhabited the area. |
| __________ 23. Annual wildflowers grew from the bare soil.           |
| __________ 25. A climax community of lodgepole pines developed.       |
| __________ 26. Bare soil covered the area.                           |
In your textbook, read about aquatic biomes: life in the water.

Complete each statement.

1. A large group of ecosystems sharing the same type of ________________________________ is called a ______________________________.

2. Biomes located in bodies of __________________________, such as oceans, lakes, and rivers, are called __________________________.

3. The water in marine biomes is __________________________.

4. Oceans contain the largest amount of __________________________, or living material, of any biome on Earth. Yet, many of the organisms are so __________________________ that they cannot be seen without magnification.

5. The __________________________ is that part of marine biomes shallow enough to be penetrated by sunlight.

6. Deep-water regions of marine biomes receiving no sunlight make up the __________________________.

Circle the letter of the response that best completes the statement.

7. Many rivers eventually flow into
   a. a lake.       b. a stream.       c. an ocean or a sea.       d. a swamp.

8. The body of water where fresh water from a river mixes with salt water is called
   a. an estuary.       b. a shoreline.       c. a sandbar.       d. a sea.

9. Organisms living in intertidal zones have structural adaptations that protect them from
   a. the dark.       b. sunlight.       c. wave action.       d. temperature.

10. Life is abundant in photic zones because
    a. there are no waves.       b. the water is cold.       c. the water is clean.       d. there are many nutrients.

11. The greatest number of organisms living in the photic zone of a marine biome are
    a. dolphins.       b. plankton.       c. plants.       d. sharks.

12. Fewer organisms live at the bottom of a deep lake than at the top because of the lack of
    a. sunlight.       b. space.       c. niches.       d. bacteria.
In your textbook, read about terrestrial biomes.

Answer the following questions.

13. Which two abiotic factors generally determine the type of climax community that will develop in a particular part of the world?

14. In which terrestrial biome is the ground permanently frozen?

15. What are some adaptations that desert plants have developed?

16. Describe the three layers of a tropical rain forest, including organisms that live in each layer.

Write the name of each major terrestrial biome next to its description.

17. Arid land with sparse, drought-resistant plants, minimal rainfall

18. Largest terrestrial biome that supports small plants and grasses, but few trees

19. Treeless land where ground remains frozen except for top few centimeters

20. Warm, highly humid land that supports many species of organisms; extensive annual rainfall

21. Land with coniferous forests, peat swamps, and long, harsh winters

22. Land populated with broad-leaved hardwood trees that lose their leaves annually
Chapter 4 Population Biology

In your textbook, read about the principles of population growth.

Refer to Graphs A and B below. Answer the following questions.

1. What type of population growth is shown in Graph A? Explain this type of growth.

2. Which graph shows the most likely growth of a squirrel population living in a forest?

3. Which graph shows a population’s growth under ideal conditions?

4. Why don’t populations of organisms grow indefinitely?

5. The number of organisms of one species that an environment can support is called its _________. If the number of organisms in a population is _______ the environment’s carrying capacity, births _______ deaths and the population _______. If the number of organisms rises _______ the carrying capacity of the environment, _______ will exceed _______. This pattern will continue until the population is once again at or _______ the carrying capacity.
Circle the letter of the choice that best completes the statement.

13. The most important factor that determines population growth is the organism’s
   a. social pattern.  
   b. carrying capacity.  
   c. reproductive pattern.  
   d. feeding pattern.

14. Organisms that follow a rapid life-history pattern
   a. have short life spans.  
   b. have small bodies.  
   c. reproduce early.  
   d. all of the above

15. Organisms that follow a slow life-history pattern
   a. have small bodies.  
   b. mature rapidly.  
   c. reproduce slowly.  
   d. all of the above

16. A limiting factor that has an increasing effect as population size increases is
   a. temperature.  
   b. habitat disruption.  
   c. drought.  
   d. competition.

_In your textbook, read about how organism interactions limit population size._

Answer the following.

17. The snowshoe hare is a primary source of food for the Canadian lynx. Explain how the lynx population size changes when the hare population increases.

________________________________________________________________________

18. Explain how the change in the lynx population size affects the hare population.

________________________________________________________________________

19. What is the relationship between the lynx and the hare called?

________________________________________________________________________

20. When does competition decrease the size of a population?

________________________________________________________________________

21. What can cause an organism to exhibit stress, and what symptoms of stress can lead to a decrease in population size?

________________________________________________________________________
In your textbook, read about demographic trends.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

1. Looking at past population trends is a good way to predict the future of human populations.

2. Demography is the study of population health characteristics.

3. Worldwide human populations have decreased exponentially over the past few centuries.

4. Humans are able to increase environmental effects on the human population through controlling disease, eliminating competing organisms, and increasing food production.

5. To tell whether a population is growing, you must know the difference between the birthrate and the death rate.

6. An age structure graph shows the proportions of a population at different age levels.

7. A country with high doubling rate will double in size faster than one with a low doubling rate.

8. Birthrates and death rates of countries around the world are basically the same.

9. If a country has a high death rate, it may also have a high birthrate.

10. If a country has a low death rate and a high birthrate, it will grow slowly, if at all.
For each statement in Column A, write the letter of the item in Column B that completes the statement correctly.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______ 13. Population growth will change if the largest ____________ of a population is in its post-reproductive years.</td>
<td>a. age structure</td>
</tr>
<tr>
<td>_______ 14. The proportions of a population that are at different ____________ make up its age structure.</td>
<td>b. stable</td>
</tr>
<tr>
<td>_______ 15. If you know a population has a large group of individuals in their pre-reproductive years, you would predict that the population’s growth will be ____________ .</td>
<td>c. proportion</td>
</tr>
<tr>
<td>_______ 16. If the proportions of a population at different age levels are fairly equal, the population will be ____________ .</td>
<td>d. fertility</td>
</tr>
<tr>
<td>_______ 17. The population growth of a country depends on its birthrate, death rate, and ____________ rate.</td>
<td>e. rapid</td>
</tr>
<tr>
<td>_______ 18. To make predictions about the growth of a population, demographers must know its ____________ .</td>
<td>f. age levels</td>
</tr>
</tbody>
</table>

Complete each statement using the following choices: world, emigration, immigration, a country’s

19. _______________________ is the movement of humans into a population.

20. _______________________ is the movement of humans from a population.

21. Immigration and emigration of people have no effect on total _______________________ population.

22. Immigration and emigration of people affect _______________________ population growth rates.
In your textbook, read about biological diversity.

Use the terms below just once to complete the passage. You will not use all the terms.

<table>
<thead>
<tr>
<th>nectes</th>
<th>variety</th>
<th>greater</th>
<th>space</th>
<th>species</th>
</tr>
</thead>
<tbody>
<tr>
<td>biological diversity</td>
<td>equator</td>
<td>less</td>
<td>decrease</td>
<td>increase</td>
</tr>
</tbody>
</table>

(1) ______________________ refers to the (2) ______________________ of life in an area. Another word for biological diversity is biodiversity. The simplest measure of biodiversity is the number of (3) ______________________ that live in a certain area. The more species there are, the (4) ______________________ is the biodiversity of the area. Biodiversity on land tends to (5) ______________________ as you move toward the (6) ______________________.

Biodiversity is greater on large islands than on small islands because large islands have more (7) ______________________ and a greater variety of (8) ______________________.

In your textbook, read about the importance of biodiversity.

For each statement below, write true or false.

____________________ 9. Biodiversity provides our world with beauty.

____________________ 10. The loss of a species from an ecosystem usually has no effect because of the presence of other species in the ecosystem.

____________________ 11. Biodiversity decreases the stability of ecosystems because more species are competing with each other.

____________________ 12. Increasing the biodiversity of an ecosystem may result in more niches.

____________________ 13. Diseases are more likely to spread in an ecosystem with high biodiversity than in an ecosystem with low biodiversity.

____________________ 14. A decrease in Earth’s biodiversity may affect people’s diets.

____________________ 15. Preserving diverse plant species may lead to the discovery of new drugs in the future.
In your textbook, read about the loss of biodiversity.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>__________ 16. The number of members of a species is so low that there is a possibility of extinction.</td>
<td>a. passenger pigeon</td>
</tr>
<tr>
<td>__________ 17. This animal is an example of an endangered species.</td>
<td>b. threatened species</td>
</tr>
<tr>
<td>__________ 18. The population of a species begins declining rapidly.</td>
<td>c. black rhinoceros</td>
</tr>
<tr>
<td>__________ 19. This animal is an example of an extinct species.</td>
<td>d. African elephant</td>
</tr>
<tr>
<td>__________ 20. All members of a species have died, so the species no longer exists.</td>
<td>e. extinct species</td>
</tr>
<tr>
<td>__________ 21. This animal is an example of a threatened species.</td>
<td>f. endangered species</td>
</tr>
</tbody>
</table>

In your textbook, read about threats to biodiversity.

Complete the table by checking the most appropriate column for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Habitat Loss</th>
<th>Habitat Fragmentation</th>
<th>Habitat Degradation</th>
</tr>
</thead>
<tbody>
<tr>
<td>22. Animals have no migratory route.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. A rain forest is burned.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. A highway divides a forest.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Acid precipitation leaches nutrients from the soil.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Detergents and other chemicals pollute bodies of water.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Coral is mined for building materials.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. The reduction of the ozone layer causes more ultraviolet radiation to reach Earth’s surface.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Circle the letter of the choice that best completes the statement.

29. When species lose their habitats, they may
   a. lack food.                              b. lack shelter.
   c. be in danger of becoming extinct.      d. all of the above.

30. Habitat fragmentation often leads to
   a. increased species diversity
      within an area.                         b. larger habitats for species.
   c. decreased species diversity
      within an area.                         d. an increased food supply for species.

31. Conditions where the boundaries of two ecosystems meet are called
   a. habitat fragmentation.                 b. edge effect.
   c. habitat loss.                          d. canopy effect.

32. A great source of air pollution is
   a. volcanic eruptions.                    b. forest fires.
   c. burning fossil fuels.                 d. all of the above.

33. Acid precipitation
   a. may decrease biodiversity on land.     b. has no effect on biodiversity.
   c. may increase biodiversity in water.    d. both a and c.

34. The reduction of the ozone layer is caused by
   a. burning fossil fuels.                  b. acid precipitation.
   c. heavy metals.                         d. CFCs.

35. Algal blooms in lakes
   a. are caused by acid precipitation.      b. decrease the amount of oxygen in the lake
   c. clog the gills of fish.                when they decay.
   d. both a and b.

36. When exotic species are introduced into an area, their populations may grow exponentially
   because the species
   a. are large.                             b. are predators.
   c. lack competitors and predators.        d. are small.
In your textbook, read about strategies of conservation biology.

Answer the following questions.

1. What is conservation biology?

2. How does the U.S. Endangered Species Act protect biodiversity?

3. How do nature preserves help protect biodiversity?

4. Why is it usually better to preserve one large area of land instead of a few smaller areas of land?

5. Why are habitat corridors used to connect different protected areas?

6. What caused the steady decline of the black-footed ferret population in Wyoming?

7. What efforts were made to increase the size of the black-footed ferret population?

8. How are seed banks useful in protecting biodiversity?

9. What are some problems of keeping endangered animals in captivity before reintroducing them to their original habitats?
Ecology

In your textbook, read about ecosystems.

For each statement below, write true or false.

1. Organisms interact with the nonliving parts of their environments.

2. Relationships between organisms are abiotic factors in ecosystems.

3. In the carbon cycle, animals produce nutrients from carbon dioxide in the atmosphere.

4. Commensalism is a relationship in which one species benefits while the other species is neither helped nor harmed.

5. The temperature and precipitation in a certain land area influence the type of biome that is found there.

In your textbook, read about food for life.

Use the diagram on the right to answer questions 6–10.

6. Describe a food chain using organisms in the pyramid.

7. Which organisms are carnivores?

8. How many trophic levels are included in the pyramid?

9. Which trophic level has the smallest biomass?

10. How does the biomass of the autotrophs compare with the biomass of the herbivores?
In your textbook, read about population size.

Use the terms below to complete the passage. You will not use all the terms.

- carrying capacity
- species
- maximum
- limit
- competition
- linear growth
- minimum
- exceeds
- food
- exponential growth

A population is the number of organisms of one (11) ___________________ that live in a certain area. Under ideal conditions in which there are no factors that (12) ___________________ the size of a population, a population shows (13) ___________________. However, in the environment, the sizes of populations are influenced by various limiting factors, such as the availability of (14) ___________________, water, space, and other resources. As population size increases, (15) ___________________ for the resources increases. The (16) ___________________ size of a population that an environment can support is the environment’s (17) ___________________ for that population. When a population (18) ___________________ the carrying capacity, individuals are unable to meet all their needs and die.

In your textbook, read about succession and biodiversity.

Number the steps of succession below in the order in which they occur.

19. Shade from grasses and shrubs provides protection for tree saplings.
20. Pioneer species and other small plants are unable to grow in the shade and die.
22. A plot of farmland is abandoned.
23. Tree saplings grow and increase the amount of shade in the area.
24. Pioneer species, such as dandelions, take root in the soil.

Answer the following questions.

25. What effect does succession have on the biodiversity of ecosystems?

26. What human actions decrease the biodiversity of ecosystems?
In your textbook, read about elements, atoms, and isotopes.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

1. An element is a substance that can be broken down into simpler substances. ______________

2. On Earth, about 25 elements are essential to living organisms. ______________

3. Only four elements—carbon, hydrogen, oxygen, and nitrogen—make up more than 96 percent of the mass of a human. ______________________________________________________________________

4. Each element is abbreviated by a one- or two-letter formula. ______________________

5. Trace elements, such as iron and magnesium, are present in living things in very large amounts.

6. The properties of elements are determined by the structures of their atoms. ______________________

Label the parts of the atom. Use these choices:

energy level  electron  neutron  proton  nucleus

7. _____________________  8. _____________________  9. _____________________

10. _____________________  11. _____________________

Answer the following questions.

12. What is the maximum number of electrons in each of the following energy levels: first, second, third?

In your textbook, read about compounds and bonding, chemical reactions, and mixtures and solutions.

Write the type of substance described. Use these choices: compound, element.

14. \( \text{H}_2\text{O} \), a liquid that no longer resembles either hydrogen or oxygen gas

15. A substance that can be broken down in a chemical reaction

16. Carbon, the substance represented by the symbol C

Complete the table by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Ionic Bond(s)</th>
<th>Covalent Bond(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Found in the compound ( \text{NaCl} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Increases the stability of atoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Results in the formation of a molecule</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Is formed when atoms share electrons</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fill in the blanks with the correct number of molecules to balance the chemical equation. Then answer the questions.

\[
\text{C}_6\text{H}_12\text{O}_6 + \_ \text{O}_2 \rightarrow \_ \text{CO}_2 + \_ \text{H}_2\text{O}
\]

21. Why must chemical equations always balance?

22. Which number indicates the number of atoms of each element in a molecule of a substance?

23. When is a mixture not a solution?

24. What is the difference between an acid and a base?
Chapter 6

The Chemistry of Life, continued

Section 6.2 Water and Diffusion

In your textbook, read about water and its importance.

For each statement below, write true or false.

______________ 1. In a water molecule, electrons are shared equally between the hydrogen atoms and oxygen atom.

______________ 2. The attraction of opposite charges between hydrogen and oxygen forms a weak oxygen bond.

______________ 3. Because of its polarity, water can move from the roots of a plant up to its leaves.

______________ 4. Water changes temperature easily.

______________ 5. Unlike most substances, water expands when it freezes.

Circle the letter of the choice that best completes the statement.

6. All objects in motion have
   a. potential energy.  b. heat energy.  c. kinetic energy.  d. random energy.

7. The first scientist to observe evidence of the random motion of molecules was

8. The net movement of particles from an area of higher concentration to an area of lower concentration is called
   a. dynamic equilibrium.  b. nonrandom movement.  c. concentration gradient.  d. diffusion.

9. Diffusion occurs because of
   a. nonrandom movement of particles.  b. random movement of particles.  c. a chemical reaction between particles.  d. chemical energy.

10. When a few drops of colored corn syrup are added to a beaker of pure corn syrup, the color will
    a. move from low concentration to high concentration.  b. form a polar bond.  c. start to diffuse.  d. remain on the bottom of the beaker.

11. Diffusion can be accelerated by
    a. decreasing the pressure.  b. increasing the temperature.  c. decreasing the movement of particles.  d. increasing the dynamic equilibrium.

12. When materials pass into and out of a cell at equal rates, there is no net change in concentration inside the cell. The cell is in a state of
    a. dynamic equilibrium.  b. metabolism.  c. imbalance.  d. inertia.

13. The difference in concentration of a substance across space is called
    a. dynamic equilibrium.  b. concentration gradient.  c. diffusion.
In your textbook, read about the role of carbon in organisms.

For each of the following statements about carbon, write true or false.

____________________ 1. Carbon atoms can bond together in straight chains, branched chains, or rings.

____________________ 2. Large molecules containing carbon atoms are called micromolecules.

____________________ 3. Polymers are formed by hydrolysis.

____________________ 4. Cells use carbohydrates for energy.

Write each item below under the correct heading.

| sucrrose | glucose | starch | C₆H₁₂O₆ |
| cellulose | glycogen | fructose | C₁₂H₂₂O₁₁ |

| Monosaccharide | Dissaccharide | Polysaccharide |
| 5. | 8. | 10. |
| 6. | 9. | 11. |
| 7. | | 12. |

Complete the table by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Lipids</th>
<th>Proteins</th>
<th>Nucleic Acids</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Made up of nucleotides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Most consist of three fatty acids bonded to a glycerol molecule</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. DNA and RNA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Contain peptide bonds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Produce proteins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Commonly called fats and oils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Made up of amino acids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Used for long-term energy storage, insulation, and protective coatings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Contain carbon, hydrogen, oxygen, and nitrogen</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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In your textbook, read about the history of the cell theory.

For each statement in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The first scientist to describe living cells as seen through a simple microscope</td>
<td>a. Schleiden</td>
</tr>
<tr>
<td>2. Uses two or more glass lenses to magnify either living cells or prepared slides</td>
<td>b. compound light microscope</td>
</tr>
<tr>
<td>3. A scientist who observed that cork was composed of tiny, hollow boxes that he called cells</td>
<td>c. electron microscope</td>
</tr>
<tr>
<td>4. A scientist who concluded that all plants are composed of cells</td>
<td>d. Schwann</td>
</tr>
<tr>
<td>5. A scientist who concluded that all animals are composed of cells</td>
<td>e. Hooke</td>
</tr>
<tr>
<td>6. The microscope that allowed scientists to view molecules</td>
<td>f. van Leeuwenhoek</td>
</tr>
</tbody>
</table>

In your textbook, read about the two basic cell types.

Complete the table by checking the correct column for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Prokaryotes</th>
<th>Eukaryotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Organisms that have cells lacking internal membrane-bound structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Do not have a nucleus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Are either single-celled or made up of many cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Generally are single-celled organisms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Organisms that have cells containing organelles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about maintaining a balance.

Use each of the terms below just once to complete the passage.

- glucose
- plasma membrane
- homeostasis
- organism
- balance
- selective permeability

Living cells maintain a (1) ____________ by controlling materials that enter and leave. Without this ability, the cell cannot maintain (2) ______________ and will die. The cell must regulate internal concentrations of water, (3) _____________, and other nutrients and must eliminate waste products. Homeostasis in a cell is maintained by the (4) __________________, which allows only certain particles to pass through and keeps other particles out. This property of a membrane is known as (5) __________________. It allows different cells to carry on different activities within the same (6) ____________.

In your textbook, read about the structure of the plasma membrane.

For each statement below, write true or false.

7. The structure and properties of the cell wall allow it to be selective and maintain homeostasis.

8. The plasma membrane is a bilayer of lipid molecules with protein molecules embedded in it.

9. A phospholipid molecule has a nonpolar, water-insoluble head attached to a long polar, soluble tail.

10. The fluid mosaic model describes the plasma membrane as a structure that is liquid and very rigid.

11. Eukaryotic plasma membranes can contain cholesterol, which tends to make the membrane more stable.

12. Transport proteins span the cell membrane, allowing the selectively permeable membrane to regulate which molecules enter and leave a cell.

13. Proteins at the inner surface of the plasma membrane attach the membrane to the cell’s support structure, making the cell rigid.
In your textbook, read about cellular boundaries; nucleus and cell control; assembly, transport, and storage in the cell; and energy transformers.

Complete the table by writing the name of the cell part beside its structure/function. A cell part may be used more than once.

<table>
<thead>
<tr>
<th>Structure/Function</th>
<th>Cell Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A membrane-bound, fluid-filled sac</td>
<td></td>
</tr>
<tr>
<td>2. Closely stacked, flattened membrane sacs</td>
<td></td>
</tr>
<tr>
<td>3. The sites of protein synthesis</td>
<td></td>
</tr>
<tr>
<td>4. A folded membrane that forms a network of interconnected compartments in the cytoplasm</td>
<td></td>
</tr>
<tr>
<td>5. The clear fluid inside the cell</td>
<td></td>
</tr>
<tr>
<td>6. Organelle that manages cell functions in eukaryotic cell</td>
<td></td>
</tr>
<tr>
<td>7. Contains chlorophyll, a green pigment that traps energy from sunlight and gives plants their green color</td>
<td></td>
</tr>
<tr>
<td>8. Digest excess or worn-out cell parts, food particles, and invading viruses or bacteria</td>
<td></td>
</tr>
<tr>
<td>9. Small bumps located on the endoplasm reticulum</td>
<td></td>
</tr>
<tr>
<td>10. Provides temporary storage of food, enzymes, and waste products</td>
<td></td>
</tr>
<tr>
<td>11. Firm, protective structure that gives the cell its shape in plants, fungi, most bacteria, and some protists</td>
<td></td>
</tr>
<tr>
<td>12. Produce a usable form of energy for the cell</td>
<td></td>
</tr>
<tr>
<td>13. Modifies proteins chemically, then repackages them</td>
<td></td>
</tr>
<tr>
<td>14. Contains inner membranes arranged in stacks of membranous sacs called grana</td>
<td></td>
</tr>
<tr>
<td>15. Plant organelles that store starches or lipids or that contain pigments</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about structures for support and locomotion.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

16. Cells have a support structure within the cytoplasm called the cytoskeleton.

17. The exoskeleton is composed of thin, fibrous elements that form a framework for the cell.

18. Microtubules of the cytoskeleton are thin, hollow cylinders made of protein.

19. Cilia and flagella are cell surface structures that are adapted for respiration.

20. Flagella are short, numerous, hairlike projections from the plasma membrane.

21. Flagella are longer and more numerous than cilia.

22. In multicellular organisms, cilia and flagella are the major means of locomotion.

23. In prokaryotic cells, both cilia and flagella are composed of microtubules.

Write titles for each of the generalized diagrams and then label the parts. Use these choices: plant cell, animal cell, plasma membrane, chloroplast, lysosome, large vacuole, cell wall.

24. ____________________ 25. ____________________

26. ____________________ 27. ____________________

28. ____________________ 29. ____________________

30. ____________________
In your textbook, read about osmosis: diffusion of water.

Complete the table by checking the correct column for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Isotonic Solution</th>
<th>Hypotonic Solution</th>
<th>Hypertonic Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Causes a cell to swell</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Doesn’t change the shape of a cell</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Causes osmosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Causes a cell to shrink</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about passive transport and active transport.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Transport protein that provides a tubelike opening in the plasma</td>
<td>a. energy</td>
</tr>
<tr>
<td>membrane through which particles can diffuse</td>
<td>b. facilitated</td>
</tr>
<tr>
<td>6. Is used during active transport but not passive transport</td>
<td>c. endocytosis</td>
</tr>
<tr>
<td></td>
<td>d. passive</td>
</tr>
<tr>
<td>7. Process by which a cell takes in material by forming a vacuole around</td>
<td>e. active</td>
</tr>
<tr>
<td>it</td>
<td>f. exocytosis</td>
</tr>
<tr>
<td>8. Particle movement from an area of higher concentration to an area</td>
<td>g. carrier protein</td>
</tr>
<tr>
<td>of lower concentration</td>
<td>h. channel protein</td>
</tr>
<tr>
<td>9. Process by which a cell expels wastes from a vacuole</td>
<td></td>
</tr>
<tr>
<td>10. A form of passive transport that uses transport proteins</td>
<td></td>
</tr>
<tr>
<td>11. Particle movement from an area of lower concentration to an area</td>
<td></td>
</tr>
<tr>
<td>of higher concentration</td>
<td></td>
</tr>
<tr>
<td>12. Transport protein that changes shape when a particle binds with it</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about cell size limitations.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

1. Most living cells are between 2 and 200 µm in diameter. _______________________________________

2. Diffusion of materials over long distance is fast. _____________________________________________

3. If a cell doesn’t have enough DNA to make all the proteins it needs, the cell cannot live. __________________________

4. As a cell’s size increases, its volume increases much slower than its surface area. ___________________________

5. If a cell’s diameter doubled, the cell would require two times more nutrients and would have two times more wastes to excrete. __________________________________________________________

In your textbook, read about cell reproduction.

Use each of the terms below just once to complete the passage.

nucleus genetic material chromosomes packed identical chromatin vanish cell division

The process by which two cells are produced from one cell is called (6) ________________________ .

The two cells are (7) ________________________ to the original cell. Early biologists observed that just before cell division, several short, stringy structures appeared in the (8) ________________________ .

These structures seemed to (9) ________________________ soon after cell division. These structures, which contain DNA and became darkly colored when stained, are now called (10) ________________________ .

Scientists eventually learned that chromosomes carry (11) ________________________ , which is copied and passed on from generation to generation. Chromosomes normally exist as (12) ________________________ , long strands of DNA wrapped around proteins. However, before a cell divides, the chromatin becomes tightly (13) ________________________ .
In your textbook, read about the cell cycle and interphase.

Complete the table by checking the correct column for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Interphase</th>
<th>Mitosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Nuclear division occurs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Chromosomes are distributed equally to daughter cells.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Protein production is high.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Chromosomes are duplicated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. DNA synthesis occurs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Cytoplasm divides immediately after this period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Mitochondria and other organelles are manufactured.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about the phases of mitosis.

Identify the following phases of mitosis. Use these choices: telophase, metaphase, anaphase, prophase. Then label the diagrams. Use these choices: sister chromatids, centromere, spindle fibers, centrioles.

22. __________________  23. __________________  24. __________________  25. __________________

Answer the question.
30. How does mitosis result in tissues and organs?
In your textbook, read about normal control of the cell cycle and cancer.

Answer the following questions.

1. In what ways do enzymes control the cell cycle?

2. What directs the production of these enzymes?

3. What can cause the cell cycle to become uncontrolled?

4. What can result when the cell cycle becomes uncontrolled?

5. What is the relationship between environmental factors and cancer?

6. What is a tumor? Describe the final stages of cancer.

7. Cancer is the second leading cause of death in the United States. What four types of cancer are the most prevalent?
In your textbook, read about cell energy.

Use each of the terms below just once to complete the passage.

Energy  phosphate  adenine  charged
ATP  chemical bonds  work  ribose

To do biological (1) ______________________, cells require energy. A quick source of energy that cells use is the molecule (2) ______________________. The (3) __________________ in this molecule is stored in its (4) ______________________. ATP is composed of a(n) (5) ______________________ molecule bonded to a(n) (6) ______________________ sugar.

Three (7) ______________________ molecules called (8) ______________________ groups are attached to the sugar.

In your textbook, read about forming and breaking down ATP and the uses of cell energy.

Examine the diagram below. Then answer the questions.

9. How is energy stored and released by ATP?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

10. How do cells use the energy released from ATP?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
In your textbook, read about trapping the sun’s energy.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

1. Photosynthesis is the process plants use to trap the sun’s energy to make glucose.

2. ATP molecules are made during the light-independent reactions of photosynthesis.

3. Carbon dioxide gas is produced during photosynthesis.

4. The light-dependent reactions of photosynthesis take place in the membranes of the thylakoid discs in mitochondria.

5. The thylakoid membranes contain chlorophyll and other pigments that absorb sunlight.

In your textbook, read about the light-dependent reactions of photosynthesis.

Number the following steps of the light-dependent reactions in the order in which they occur.

6. The energy lost by electrons as they pass through the electron transport chain is used to make ATP.

7. The electrons pass from the chlorophyll to an electron transport chain.

8. Sunlight strikes the chlorophyll molecules in the thylakoid membranes.

9. NADP+ molecules change to NADPH as they carry the electrons to the stroma of the chloroplast.

10. The sunlight’s energy is transferred to the chlorophyll’s electrons.

11. The electrons are passed down a second electron transport chain.

Answer the following questions.

12. How are the electrons that are lost by the chlorophyll molecules replaced?

13. How do plants produce oxygen during photosynthesis?
In your textbook, read about the light-independent reactions.

Circle the letter of the choice that best completes the statement or answers the question.

14. The Calvin cycle includes
   a. the light-dependent reactions.
   b. an electron transport chain.
   c. the light-independent reactions.
   d. photolysis.

15. The Calvin cycle takes place in the
   a. mitochondria.
   b. stroma.
   c. nucleus.
   d. thylakoid membrane.

16. What product of the light-dependent reactions is used in the Calvin cycle?
   a. oxygen
   b. carbon dioxide
   c. NADPH
   d. chlorophyll

17. What gas is used in the first step of the Calvin cycle?
   a. oxygen
   b. carbon dioxide
   c. hydrogen
   d. water

18. A carbon atom from carbon dioxide is used to change the five-carbon sugar RuBP into
   a. ATP.
   b. two molecules.
   c. PGA.
   d. a six-carbon sugar.

19. How many molecules of the three-carbon sugar PGA are formed?
   a. two
   b. one
   c. six
   d. three

20. ATP, NADPH, and hydrogen ions are used to convert PGA into
   a. PGAL.
   b. glucose.
   c. RuBP.
   d. carbon dioxide.

21. How many rounds of the Calvin cycle are needed to form one glucose molecule?
   a. one
   b. six
   c. two
   d. three

22. What two molecules leave the Calvin cycle and are combined to form glucose?
   a. RuBP
   b. PGA
   c. PGAL
   d. CO₂

23. Which molecule from the Calvin cycle is used to replenish the five-carbon sugar, RuBP, which is used at the beginning of the cycle?
   a. NADP
   b. CO₂
   c. PGA
   d. PGAL
In your textbook, read about the cellular respiration and fermentation.

Fill in the names of the molecules to complete the glycolysis reaction. Use these choices: 2PGAL, 4ATP, glucose, 2ADP, 2 pyruvic acid, 2NADH + 2H+. Then answer the questions.

Glycolysis

1. 
2. 
3. 
4. 
5. 
6. 

7. What happens to pyruvic acid before entering the citric acid cycle?

8. What happens to the electrons carried by the NADH and FADH₂ molecules produced during the citric acid cycle?

9. During which stages of cellular respiration are ATP molecules formed?

10. Why is oxygen necessary for cellular respiration?

11. How is fermentation different from cellular respiration?

In your textbook, read about comparing photosynthesis and cellular respiration.

Answer the following question.

12. Describe two ways in which cellular respiration is the opposite of photosynthesis.
In your textbook, read about the chemistry of life.

Label the diagram below, using these choices:

atom  electron  molecule  neutron  nucleus  proton

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________

In your textbook, read about eukaryotic cells, prokaryotic cells, and organelles.

Complete each statement.

7. Every cell is surrounded by a plasma ____________________.

8. ____________________ contain membrane-bound structures called organelles within the cell.

9. Organisms having cells without internal membrane-bound structures are called ____________________.

10. The plasma membrane is composed of a ____________________ with embedded proteins.

11. The ____________________ controls cell functions.

12. Ribosomes are organelles found in the cytoplasm that produce ____________________.

13. The ____________________ and Golgi apparatus transport and modify proteins.

14. Plant cells contain ____________________ that capture the sun's light energy so that it can be transformed into usable chemical energy.

15. A network of microfilaments and microtubules attached to the cell membrane give the cell ____________________.

16. ____________________ are long projections from the surface of the plasma membrane and move in a whiplike fashion to propel a cell.
BioDigest

The Life of a Cell, continued

In your textbook, read about diffusion and osmosis.

Answer the following questions.

17. What is diffusion? ____________________________________________________________

18. What is osmosis? ______________________________________________________________

19. What is active transport? ______________________________________________________

In your textbook, read about mitosis.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicated chromosomes condense and mitotic spindles form on the two opposite ends of the cell.</td>
<td>a. anaphase</td>
</tr>
<tr>
<td>Chromosomes slowly separate to opposite ends of cells.</td>
<td>b. interphase</td>
</tr>
<tr>
<td>Chromosomes uncoil, spindle breaks down, and nuclear envelope forms around each set of chromosomes.</td>
<td>c. metaphase</td>
</tr>
<tr>
<td>Cells experience a period of intense metabolic activity prior to mitosis.</td>
<td>d. prophase</td>
</tr>
<tr>
<td>Chromosomes line up in center of cell.</td>
<td>e. telophase</td>
</tr>
</tbody>
</table>

In your textbook, read about energy in a cell.

Decide if each of the following statements is true. If it is not, rewrite the italicized part to make it true.

25. Adenosine triphosphate (ATP) is the most commonly used source of protein in a cell.

26. Light-dependent reactions convert energy into starch through the Calvin cycle.

27. Mitochondrion convert food energy to ATP through a series of chemical reactions.

28. Glycolysis produces a net gain of two ATP for every two molecules of glucose.
In your textbook, read why Mendel succeeded.

Complete each statement.

1. Mendel was the first person to succeed in predicting how traits are ___________________________ from generation to generation.

2. Mendel used ___________________________ plants in his experiments.

3. In peas, both male and female sex cells—___________________________—are in the same flower.

4. ___________________________ occurs when the male gamete fuses with the female gamete.

5. Mendel used the process called ___________________________ when he wanted to breed one plant with another.

6. Mendel carefully ___________________________ his experiments and the peas he used.

7. Mendel studied only one ___________________________ at a time and analyzed his data mathematically.

In your textbook, read about Mendel’s monohybrid crosses.

Refer to the table of pea-plant traits on the right. Then complete the table on the left by filling in the missing information for each cross. The first one is done for you.
In your textbook, read about phenotypes and genotypes and Mendel’s dihybrid crosses.

If the statement is true, write true. If it is not, rewrite the underlined part to make it true.

13. A pea plant with the genotype \( TT \) has the same phenotype as a pea plant with genotype \( tt \). _________

14. When Mendel crossed true-breeding pea plants that had round yellow seeds with true-breeding pea plants that had wrinkled green seeds, some of the offspring had round yellow seeds because round and yellow were the dominant forms of the traits. ___________________________________________

15. When Mendel allowed heterozygous \( F_1 \) plants that had round yellow seed to self-pollinate, he found that some of the \( F_2 \) plants had wrinkled green seeds. ___________________________________________

16. The law of independent assortment states that genes for different traits are inherited independently of each other. _________________________________________________________________________

In your textbook, read about Punnett squares and probability.

The Punnett square below is for a dihybrid cross between pea plants that are heterozygous for seed shape (\( Rr \)) and seed color (\( Yy \)). Complete the Punnett square by recording the expected genotypes of the offspring. Then answer the questions.

<table>
<thead>
<tr>
<th></th>
<th>( RY )</th>
<th>( Ry )</th>
<th>( rY )</th>
<th>( ry )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( RY )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( Ry )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( rY )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ry )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. Use the chart on the previous page to determine the phenotypes of the offspring. Record the phenotypes below the genotypes in the Punnett square. Is an offspring produced by the cross more likely to have wrinkled seeds or round seeds? ___________________________________________

18. What is the probability that an offspring will have wrinkled yellow seeds? _____________________
In your textbook, read about genes, chromosomes, and numbers.

Examine the table. Then answer the questions.

**Chromosome Numbers of Some Common Organisms**

<table>
<thead>
<tr>
<th>Organism</th>
<th>Body Cell $(2n)$</th>
<th>Gamete $(n)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>46</td>
<td>23</td>
</tr>
<tr>
<td>Garden pea</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Fruit fly</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Tomato</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>Dog</td>
<td>78</td>
<td>39</td>
</tr>
<tr>
<td>Chimpanzee</td>
<td>48</td>
<td>24</td>
</tr>
<tr>
<td>Leopard frog</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>Corn</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

1. What is the diploid number of chromosomes in corn?

2. What is the haploid number of chromosomes in corn?

3. Is the chromosome number related to the complexity of the organism?

4. How many pairs of chromosomes do humans have?

5. What process maintains a constant number of chromosomes within a species?

In your textbook, read about the phases of meiosis.

Label the diagrams below. Use these choices: Metaphase I, Metaphase II, Interphase, Telophase I, Telophase II, Anaphase I, Anaphase II, Prophase I, Prophase II.
The following statements describe interphase and meiosis I. Identify each phase. Then place them in sequential order using the numbers 1 through 5. Use 1 for the phase that occurs first and 5 for the phase that occurs last.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Name of Phase</th>
<th>Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Homologous chromosomes line up at the equator in pairs.</td>
<td>a.</td>
<td>b.</td>
</tr>
<tr>
<td>16. The cell replicates its chromosomes.</td>
<td>a.</td>
<td>b.</td>
</tr>
<tr>
<td>17. Homologous chromosomes separate and move to opposite ends of the cell.</td>
<td>a.</td>
<td>b.</td>
</tr>
<tr>
<td>18. The spindle forms, and DNA coils up and homologous chromosomes come together in a tetrad; crossing over may occur.</td>
<td>a.</td>
<td>b.</td>
</tr>
<tr>
<td>19. Events occur in the reverse order from the events of prophase I.</td>
<td>a.</td>
<td>b.</td>
</tr>
<tr>
<td>Each cell has only half the genetic information; however, another cell division is needed because each chromosome is still doubled.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about how meiosis provides for genetic variation and about mistakes in meiosis.

For each statement below, write true or false.

20. Reassortment of chromosomes can occur during meiosis by crossing over of nonsister chromatids or by independent segregation of homologous chromosomes.
   - true

21. Genetic recombination is a major source of variation among organisms.
   - true

22. The random segregation of chromosomes during meiosis explains Mendel’s observation that genes for different traits are inherited independently of each other.
   - true

23. Nondisjunction always results in a zygote with an extra chromosome.
   - false

24. Down syndrome is a result of polyploidy.
   - true

25. Mistakes in meiosis can occasionally be beneficial.
   - true
In your textbook, read about what DNA is and the replication of DNA.

Label the diagram. Use these choices: nucleotide, deoxyribose, phosphate group, nitrogenous base, hydrogen bonds, base pair.

1. ________________  
2. ________________  
3. ________________  
4. ________________  
5. ________________  
6. ________________  

Complete each statement.

7. ________________, guanine (G), cytosine (C), and thymine (T) are the four ________________ in DNA.

8. In DNA, ________________ always forms hydrogen bonds with guanine (G).

9. The sequence of ________________ carries the genetic information of an organism.

10. The process of ________________ produces a new copy of an organism’s genetic information, which is passed on to a new cell.

11. The double-coiled shape of DNA is called a ________________.
In your textbook, read about genes and proteins and RNA.

Complete the chart on the three chemical differences between DNA and RNA.

<table>
<thead>
<tr>
<th>Structure</th>
<th>DNA</th>
<th>RNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. strand of nucleotides</td>
<td>a.</td>
<td>b.</td>
</tr>
<tr>
<td>2. sugar</td>
<td>a.</td>
<td>b.</td>
</tr>
<tr>
<td>3. nitrogenous base</td>
<td>a.</td>
<td>b.</td>
</tr>
</tbody>
</table>

In your textbook, read about the genetic code.

Complete each statement.

4. Proteins are made up of __________________________ .

5. There are twenty different types of __________________________ .

6. The message of the DNA code is information for building __________________________ .

7. Each set of three nitrogenous bases that codes for an amino acid is known as a __________________________ .

8. The amino acid __________________________ is represented by the mRNA codon ACA.

9. __________________________ and __________________________ are mRNA codons for phenylalanine.

10. There can be more than one __________________________ for the same amino acid.

11. For any one codon, there can be only one __________________________ .

12. The genetic code is said to be universal because a codon represents the same __________________________ in almost all organisms.

13. __________________________ , __________________________ , and __________________________ are stop codons.

14. __________________________ and __________________________ are amino acids that are each represented by only one codon.
In your textbook, read about transcription from DNA to mRNA.

Complete each statement.

15. Proteins are made in the cytoplasm of a cell, whereas DNA is found only in the __________________________.

16. The process of making RNA from DNA is called __________________________.

17. The process of transcription is similar to the process of DNA __________________________.

18. __________________________ carries information from the DNA in the nucleus out into the cytoplasm of the cell.

19. mRNA carries the information for making proteins to the __________________________.

In your textbook, read about translation from mRNA to protein.

Label the diagram. Use these choices: transfer RNA (tRNA), amino acid, amino acid chain, codon, anticodon, messenger RNA (mRNA), ribosome.

20. __________________________

21. __________________________

22. __________________________

23. __________________________

24. __________________________

25. __________________________

26. __________________________
In your textbook, read about mutation: a change in DNA.

Circle the letter of the choice that best completes the statement.

1. A mutation is any mistake or change in the
   a. cell.                        b. DNA sequence.            c. ribosomes.          d. nucleus.

2. A point mutation is a change in
   a. several bases in mRNA.      b. several bases in tRNA.
   c. a single base pair in DNA.  d. several base pairs in DNA.

3. A mutation in which a single base is added to or deleted from DNA is called
   a. a frame shift mutation.      b. a point mutation.          c. translocation.      d. nondisjunction.

4. Chromosomal mutations are especially common in
   a. humans.                    b. animals.                    c. bacteria.           d. plants.

5. Few chromosome mutations are passed on to the next generation because
   a. the zygote usually dies.    b. the mature organism is sterile.
   c. the mature organism is often incapable of producing offspring.
   d. all of the above.

6. When part of one chromosome breaks off and is added to a different chromosome, the result is a(n)
   a. translocation.              b. insertion.                  c. inversion.          d. deletion.

7. Many chromosome mutations result when chromosomes fail to separate properly during
   a. mitosis.                   b. meiosis.                    c. crossing over.       d. linkage.

8. The failure of homologous chromosomes to separate properly is called
   a. translocation.              b. disjunction.                c. nondisjunction.      d. deletion.

9. Mutations that occur at random are called
   a. spontaneous mutations.     b. nonspontaneous mutations.
   c. nonrandom mutations.       d. environmental mutations.

10. An agent that can cause a change in DNA is called a(n)
    a. zygote.                   b. inversion.                  c. mutagen.             d. mutation.

11. Mutations in body cells can sometimes result in
    a. new species.              b. cancer.                     c. sterile offspring.   d. hybrids.
Chapter 12
Patterns of Heredity and Human Genetics

In your textbook, read about making a pedigree.

Examine the pedigree to the right. Then answer the following questions.

1. Is the trait being studied in the pedigree recessive or dominant? How do you know?

2. Are II-1 and II-2 carriers of the trait? How do you know?

3. What is the probability that II-1 and II-2 will produce an individual with the trait being studied? Draw a Punnett square to show your work.

4. What is the likely genotype of II-4 for the trait being studied in the pedigree?

In your textbook, read about simple recessive heredity and simple dominant heredity.

For each item in Column A, write the letter of the matching item from Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Recessive disorder that results from the absence of an enzyme required to break lipids down</td>
<td>a. cystic fibrosis</td>
</tr>
<tr>
<td>6. Lethal genetic disorder caused by a dominant allele</td>
<td>b. simple dominant traits</td>
</tr>
<tr>
<td>7. Most common genetic disorder among white Americans</td>
<td>c. Tay-Sachs disease</td>
</tr>
<tr>
<td>8. Recessive disorder that results from the absence of an enzyme that converts one amino acid into another one</td>
<td>d. Huntington’s disease</td>
</tr>
<tr>
<td>9. Widow’s peak and hitchhiker’s thumb</td>
<td>e. phenylketonuria</td>
</tr>
</tbody>
</table>
Chapter 12
Patterns of Heredity and Human Genetics, continued

Section 12.2 When Heredity Follows Different Rules

**In your textbook, read about complex patterns of inheritance.**

Answer the following questions.

1. **Complete the Punnett square for a cross between a homozygous red-flowered snapdragon (RR) and a homozygous white-flowered snapdragon (R'R').** Give the genotype and phenotype of the offspring in the F₁ generation.

<table>
<thead>
<tr>
<th>Key</th>
<th>F₁</th>
<th>genotype: __________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR - red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R'R' - white</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR' - pink</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. **When traits are inherited in an incomplete dominance pattern, what is true of the phenotype of the heterozygotes?**

3. **Complete the Punnett square for a cross between two pink-flowered (RR') F₁ plants.** Give the phenotype ratio of the offspring in the F₂ generation.

   F₂  phenotype ratio: ___________________

4. **In what type of inheritance are both alleles expressed equally?**

5. **Complete the Punnett square for a cross between a black chicken (BB) and a white chicken (WW).** Give the phenotype of the offspring in the F₁ generation.

<table>
<thead>
<tr>
<th>Key</th>
<th>F₁</th>
<th>phenotype: __________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB - black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WW - white</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BW - checkered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For each statement below, write true or false.

6. Traits controlled by more than two alleles are said to have multiple alleles.

7. Multiple alleles can be studied only in individuals.

8. In humans, there are 23 pairs of matching homologous chromosomes called autosomes.

9. Two chromosomes called the sex chromosomes determine the sex of an individual.

10. The sex chromosomes of a human male are XX, and the sex chromosomes of a human female are XY.

11. Traits controlled by genes located on sex chromosomes are called sex-linked traits.

12. The first known example of sex-linked inheritance was discovered in pea plants.

In your textbook, read about environmental influences.

Answer the following questions.

13. What characteristics of an organism can affect gene function?


15. What are some environmental factors that can influence gene expression?

16. Give two examples of how an environmental factor can affect the expression of a phenotype.
In your textbook, read about multiple alleles in humans.

Complete the table by filling in the missing information.

<table>
<thead>
<tr>
<th>Genotypes</th>
<th>Human Blood Groups</th>
<th>Phenotypes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $I^A I^A$ or $I^A i$</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>2. $I^B I^B$ or $I^B i$</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>A and B</td>
<td>AB</td>
</tr>
<tr>
<td>4.</td>
<td>none</td>
<td></td>
</tr>
</tbody>
</table>

Complete each statement.

5. Blood groups are a classic example of _____________ inheritance in humans.

6. The alleles _______________ are always both expressed.

7. The alleles $I^A$ and $I^B$ are _______________ , meaning they are always both expressed.

8. $I^A$ and $I^B$ are dominant to _______________ .

9. Blood typing is necessary before a person can receive a _______________ .

10. A child who inherits $I^A$ from his mother and $I^B$ from his father will have type _______________ blood.

11. A child whose parents both have type O blood will have type _______________ blood.

12. If a woman with blood type A has a baby with blood type AB, a man with blood type O _______________ be the father.

13. Blood tests _______________ be used to prove that a certain man is the father of a child.
In your textbook, read about selective breeding and determining genotypes.

Complete each statement.

1. Organisms that are homozygous dominant and those that are ________________ for a trait controlled by Mendelian inheritance have the same phenotype.

2. A ________________ determines whether an organism is heterozygous or homozygous dominant for a trait.

3. Usually the parent with the known genotype is ___________________________ for the trait in question.

4. When two cultivars are crossed, their offspring will be ________________.

Answer the following.

5. A breeder performs a testcross to determine whether an Alaskan malamute is homozygous dominant (DD) or heterozygous (Dd) for a recessive dwarf allele. Half the offspring appear dwarf. What is the genotype of the unknown dog? Complete the Punnett square to verify your answer.

```
<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>DD</td>
<td>Dd</td>
</tr>
<tr>
<td>d</td>
<td>Dd</td>
<td>dd</td>
</tr>
</tbody>
</table>
```

6. What results would be expected if the unknown dog was homozygous dominant (DD)? Complete the Punnett square to verify your answer.

```
<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>DD</td>
<td>Dd</td>
</tr>
<tr>
<td>d</td>
<td>Dd</td>
<td>dd</td>
</tr>
</tbody>
</table>
```
Section 13.2 Recombinant DNA Technology

In your textbook, read about gene engineering.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bacterial proteins that have the ability to cut both strands of the DNA molecule at certain points</td>
<td>a. recombinant DNA</td>
</tr>
<tr>
<td>2. Contain foreign DNA</td>
<td>b. vector</td>
</tr>
<tr>
<td>3. Is made by connecting segments of DNA from different sources</td>
<td>c. restriction enzymes</td>
</tr>
<tr>
<td>4. General term for a carrier used to transfer a foreign DNA fragment into a host cell</td>
<td>d. plasmid</td>
</tr>
<tr>
<td>5. A small ring of DNA found in a bacterial cell</td>
<td>e. transgenic organisms</td>
</tr>
<tr>
<td>6. The procedure for cleaving DNA from an organism into small segments, and inserting the segments into another organism</td>
<td>f. genetic engineering or recombinant DNA technology</td>
</tr>
</tbody>
</table>

Complete the table by checking the correct column for each vector.

<table>
<thead>
<tr>
<th>Vectors</th>
<th>Mechanical</th>
<th>Biological</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Viruses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Micropipette</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Metal bullets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Plasmids</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about applications of DNA technology.

Complete the table by checking the correct column for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Industry</th>
<th>Medicine</th>
<th>Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Recombinant DNA produces molecules to treat diseases.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Engineered bacteria produce indigo dye.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Higher yields of oil from canola</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Corrected human hemophilia gene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Herbicide resistance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Production of cheese and more effective laundry detergents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Production of growth hormone to treat pituitary dwarfism and insulin to treat diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Development of nonallergenic foods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Produce \textit{Bt} toxin from bacterial gene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Recombinant DNA used to make human antibodies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Studying transgenic animals provides understanding of the role that specific genes play</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Transgenic sheep produce a protein that helps lungs inflate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Recombinant DNA techniques that increase enzyme activity, stability, and specificity.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about mapping and sequencing the human genome and applications of the Human Genome Project.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.
1. The human genome consists of approximately 1000 genes located on 46 chromosomes.

2. Scientists have determined the exact chromosomal location of all genes.

3. The genetic map that shows the location of genes on a chromosome is called a pedigree map.

4. Instead of examining actual offspring, scientists examine egg cells to create linkage maps.

5. Gene therapy is being performed on patients suffering from sickle-cell anemia.

6. Electrolysis can be used to separate DNA fragments.

Answer the following questions.
7. What is the Human Genome Project?

8. Why is mapping by linkage data extremely inefficient in humans?

9. What are the three areas of current research that utilize chromosome maps?

10. Why is DNA fingerprinting reliable?
In your textbook, read about simple Mendelian inheritance and meiosis.

Complete each statement.

1. A trait is __________________________ if only one allele is needed for that trait to be expressed. If both alleles are needed for the trait to be expressed, the trait is __________________________.

2. When a \( TT \) tall pea plant is crossed with a \( tt \) short pea plant, there is a 100% probability that all offspring will be __________________________ and have the genotype __________________________.

3. Unlike mitosis, __________________________ produces cells that contain only one copied chromosome of each __________________________.

4. __________________________ and the rearrangement of alleles during __________________________ provide mechanisms for genetic variability.

In your textbook, read about producing physical traits and complex inheritance patterns.

Predict the outcome of the following crosses. Use Punnett squares to support your answers.

5. Homozygous short \( \times \) Homozygous short

6. Heterozygous for purple flowers \( \times \) Heterozygous for purple flowers

7. Heterozygous pink snapdragon \( \times \) Heterozygous pink snapdragon

Sequence the steps in protein synthesis from 1 to 4.

8. Amino acids bond together to form a protein.

9. Sequence of bases in DNA is copied into mRNA.

10. tRNA molecules bring appropriate amino acids to the mRNA on the ribosome.

11. mRNA leaves the cell nucleus.
For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>__________ 12. Results in an mRNA copy of DNA</td>
<td>a. incomplete dominance</td>
</tr>
<tr>
<td>__________ 13. Sequence of three bases in mRNA</td>
<td>b. X-linked trait</td>
</tr>
<tr>
<td>__________ 14. Site of translation</td>
<td>c. ribosome</td>
</tr>
<tr>
<td>__________ 15. Governed by several genes</td>
<td>d. transcription</td>
</tr>
<tr>
<td>__________ 16. Heterozygote has an intermediate phenotype.</td>
<td>e. translation</td>
</tr>
<tr>
<td>__________ 17. Double stranded molecule that stores and transmits</td>
<td>f. codon</td>
</tr>
<tr>
<td>genetic information</td>
<td>g. polygenic inheritance</td>
</tr>
<tr>
<td>__________ 18. More likely to appear in males than in females</td>
<td>h. DNA</td>
</tr>
<tr>
<td>__________ 19. Results in a sequence of amino acids</td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about recombinant DNA technology and gene therapy.

Sequence the steps to making recombinant DNA from 1 to 5.

__________ 20. The plasmid becomes part of a host cell's chromosome.

__________ 21. A DNA fragment is inserted into a plasmid.

__________ 22. The DNA fragment replicates during cell division.

__________ 23. The plasmid enters a host bacterial cell.

__________ 24. A host cell produces a protein that it would not have produced naturally.

Answer the following questions.

25. What is gene therapy?

__________________________________________________________________________

26. What are clones?

__________________________________________________________________________

27. What is a vector? Give two examples of vectors.

__________________________________________________________________________

__________________________________________________________________________
In your textbook, read about the early history of Earth.

For each statement below, write true or false.

1. Earth is thought to have formed about 4.6 billion years ago.  
2. The conditions on primitive Earth were very suitable for life.  
3. Geological events on Earth set up conditions that would play a major role in the evolution of life on Earth.  
4. By the end of the Mesozoic, the continents took on their modern shape.  
5. The first organisms appeared on land between 3.9 and 3.4 billion years ago.

In your textbook, read about a history in the rocks.

For each statement in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. A footprint, trail, or burrow, providing evidence of animal activity</td>
<td>a. petrified fossil</td>
</tr>
<tr>
<td>7. A fossil embedded in tree sap, valuable because the organism is preserved intact</td>
<td>b. imprint</td>
</tr>
<tr>
<td>8. An exact stone copy of an original organism, the hard parts of which have been penetrated and replaced by minerals</td>
<td>c. trace fossil</td>
</tr>
<tr>
<td>9. Any evidence of an organism that lived long ago</td>
<td>d. cast</td>
</tr>
<tr>
<td>10. The fossil of a thin object, such as a leaf or feather, that falls into sediments and leaves an outline when the sediments hardened</td>
<td>e. amber-preserved</td>
</tr>
<tr>
<td>11. An empty space left in rock, showing the exact shape of the organism that was buried and decayed there</td>
<td>f. fossil</td>
</tr>
<tr>
<td>12. An object formed when a mold is filled in by minerals from the surrounding rock</td>
<td>g. mold</td>
</tr>
</tbody>
</table>
In your textbook, read about the age of a fossil.

Answer the following questions.

13. 

Explain how relative dating works.

________________________________________________________________________

14. 

What is the limitation of relative dating?

________________________________________________________________________

15. 

What dating technique is often used by paleontologists to determine the specific age of a fossil?

________________________________________________________________________

16. 

How do scientists use this dating technique to determine the ages of rocks or fossils?

________________________________________________________________________

In your textbook, read about a trip through geologic time.

Complete the table by checking the correct column for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Era</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. The first photosynthetic bacteria form dome-shaped structures called</td>
<td>Pre-Cambrian</td>
</tr>
<tr>
<td>stromatolites.</td>
<td>Paleozoic</td>
</tr>
<tr>
<td>18. Primates evolve and diversify.</td>
<td>Mesozoic</td>
</tr>
<tr>
<td>19. Divided into three periods: Triassic, Jurassic, and Cretaceous</td>
<td>Cenozoic</td>
</tr>
<tr>
<td>20. An explosion of life, characterized by the appearance of many types</td>
<td></td>
</tr>
<tr>
<td>of invertebrates and plant phyla.</td>
<td></td>
</tr>
<tr>
<td>22. Dinosaurs roam Earth, and the ancestors of modern birds evolve.</td>
<td></td>
</tr>
<tr>
<td>23. Flowering plants appear.</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about origins: the early ideas.

Use each of the terms below just once to complete the passage.

- microorganisms
- vital force
- Louis Pasteur
- biogenesis
- nonliving matter
- S-shaped
- disproved
- Francesco Redi
- organisms
- broth
- microscope
- spontaneous generation
- spontaneously
- air

Early scientists believed that life arose from (1) __________________ through a process they called (2) _______________________. In 1668, the Italian physician (3) ______________________ conducted an experiment with flies that (4) ______________________ this idea. At about the same time, biologists began to use an important new research tool, the (5) ______________________. They soon discovered the vast world of (6) ______________________. The number and diversity of these organisms was so great that scientists were led to believe once again that these organisms must have arisen (7) ______________________. By the mid-1800s, however, (8) ______________________ was able to disprove this hypothesis once and for all. He set up an experiment, using flasks with unique (9) ______________________ necks. These flasks allowed (10) ______________________, but no organisms, to come into contact with a broth containing nutrients. If some (11) ______________________ existed, as had been suggested, it would be able to get into the (12) ______________________ through the open neck of the flask. His experiment proved that organisms arise only from other (13) ______________________. This idea, called (14) ______________________, is one of the cornerstones of biology today.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

15. Biogenesis explains how life began on Earth.

16. For life to begin, simple inorganic molecules had to be formed and then organized into complex molecules.

17. Several billion years ago, Earth’s atmosphere had no free methane.
18. Primitive Earth’s atmosphere may have been composed of water vapor, carbon dioxide, and nitrogen.

19. In the early 1900s, Alexander Oparin proposed a widely accepted hypothesis that life began on land.

20. Pasteur hypothesized that many chemical reactions occurring in the atmosphere resulted in the formation of a primordial soup.

21. In 1953, Miller and Urey tested Oparin’s hypothesis by simulating the conditions of modern Earth in the laboratory.

22. Miller and Urey showed that organic compounds, including nucleic acids and sugars, could be formed in the laboratory, just as had been predicted.

23. This “life-in-a-test-tube” experiment of Miller and Urey provides support for some modern hypotheses of biogenesis.

24. Sidney Fox took Miller and Urey’s experiment further and showed how amino acids could cluster to form protocells.

In your textbook, read about the evolution of cells.

Answer the following questions.

25. Describe the likely characteristics of the first organisms on Earth.

26. What is an autotroph? What factors helped them thrive on Earth?

27. What present-day organisms may be similar to the first autotrophs? Why?

28. What change occurred in Earth’s atmosphere after the evolution of photosynthesizing prokaryotes? Why?
In your textbook, read about Charles Darwin and natural selection.

For each statement, write true or false.

1. H.M.S. Beagle, upon which Charles Darwin served as naturalist, set sail on a collecting and mapping expedition in 1831.

2. The environments that Darwin studied exhibited little biological diversity.

3. By careful anatomical study, Darwin found that the many species of plants and animals on the Galápagos Islands were unique and bore no relation to species seen in other parts of the world.

4. The tortoises of the Galápagos Islands are among the largest on Earth.

5. After returning to England, Darwin studied his collections for 10 years.

6. Darwin named the process by which evolution proceeds artificial selection.

You are a naturalist who traveled to the Galápagos Islands. Below are excerpts from field notes. Next to each set of notes, write a heading. Use these choices: Overproduction of Offspring, Natural Selection, Struggle for Existence, Variation.

7. Field Notes
Female finches found on the Galápagos Islands lay enormous numbers of eggs.

8. Field Notes
These finches compete for a particular species of insect that inhabits the small holes found in tree bark.

9. Field Notes
Some finches’ beaks are long, some are short. The finches with long beaks are better adapted to remove the insects from the bark.

10. Field Notes
The finches with the long beaks survive and produce greater numbers of offspring with long beaks.
In your textbook, read about natural selection and adaptations.

Identify the type of structural adaptation that the statement describes. If the statement applies to both, write both. Use these choices: mimicry, camouflage, both.

11. Enable(s) an organism to blend in with its surroundings
12. Provide(s) protection for an organism by copying the appearance of another species
13. The coloration of a flounder that allows the fish to avoid predators
14. Involve(s) changes to the external appearance of an organism
15. A flower that looks like a female bee

In your textbook, read about evidence for evolution.

Complete the chart by checking the kind of evidence described.

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Type of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. A modified structure seen among different groups of descendants</td>
<td>Homologous Structure</td>
</tr>
<tr>
<td>17. In the earliest stages of development, a tail and pharyngeal pouches can be seen in fish, birds, rabbits, and mammals.</td>
<td></td>
</tr>
<tr>
<td>18. Exemplified by forelimbs of bats, penguins, lizards, and monkeys</td>
<td></td>
</tr>
<tr>
<td>19. Eyes in a blind fish</td>
<td></td>
</tr>
<tr>
<td>20. DNA and RNA comparisons may lead to evolutionary trees.</td>
<td></td>
</tr>
<tr>
<td>21. Bird and butterfly wings have same function but different structures</td>
<td></td>
</tr>
<tr>
<td>22. A body structure reduced in original function but may have been used in an ancestor</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about population genetics and evolution.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

1. Adaptations of species are determined by the genes contained in the DNA code. ________________

2. When Charles Mendel developed the theory of natural selection in the 1800s, he did not include a genetic explanation. ________________

3. Natural selection can act upon an individual’s genotype, the external expression of genes. ________________

4. Natural selection operates on an individual over many generations. ________________

5. The entire collection of genes among a population is its gene frequency. ________________

6. If you know the phenotypes of all the organisms in a population, you can calculate the allelic frequency of the population. ________________

7. A population in which frequency of alleles changes from generation to generation is said to be in genetic equilibrium. ________________

8. A population that is in genetic equilibrium is not evolving. ________________

9. Any factor that affects phenotype can change allelic frequencies, thereby disrupting the genetic equilibrium of populations. ________________

10. Many migrations are caused by factors in the environment, such as radiation or chemicals, but others happen by chance. ________________

11. Mutations are important in evolution because they result in genetic changes in the gene pool. ________________

12. Genetic equilibrium is the alteration of allelic frequencies by chance processes. ________________

13. Genetic drift is more likely to occur in large populations. ________________

14. The factor that can significantly change the genetic equilibrium of a population’s gene pool is mutation. ________________

15. The type of natural selection by which one of the extreme forms of a trait is favored is called disruptive selection. ________________
In your textbook, read about the evolution of species.

Complete each statement.

16. __________________ can occur only when either interbreeding or the production of fertile offspring is prevented among members of a population.

17. __________________ occurs when formerly interbreeding organisms are prevented from producing fertile offspring.

18. Polyploid speciation is perhaps the fastest form of speciation because it results in immediate __________________.

19. The hypothesis that species originate through a slow buildup of new adaptations is known as __________________.

20. This hypothesis is supported by evidence from the __________________ record.

21. The hypothesis of __________________ states that speciation may occur rapidly.

In your textbook, read about patterns of evolution.

Answer the following questions.

22. What happened to the ancestor of the honeycreeper when it left the mainland and encountered the diverse niches of Hawaii?

________________________________________________________________________

23. What is adaptive radiation?

________________________________________________________________________

24. Adaptive radiation is one example of divergent evolution. When does divergent evolution occur?

________________________________________________________________________

________________________________________________________________________

25. When will convergent evolution occur?

________________________________________________________________________
In your textbook, read about the characteristics of a primate.

Complete the chart by checking those structures or functions that are characteristic of primates.

<table>
<thead>
<tr>
<th>Structure/Function</th>
<th>Primate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Round head</td>
<td></td>
</tr>
<tr>
<td>2. Flattened face</td>
<td></td>
</tr>
<tr>
<td>3. Small head</td>
<td></td>
</tr>
<tr>
<td>4. Large relative brain size</td>
<td></td>
</tr>
<tr>
<td>5. Highly developed vision</td>
<td></td>
</tr>
<tr>
<td>6. Poor vision</td>
<td></td>
</tr>
<tr>
<td>7. Binocular vision</td>
<td></td>
</tr>
<tr>
<td>8. Color vision</td>
<td></td>
</tr>
<tr>
<td>9. Color-blind</td>
<td></td>
</tr>
<tr>
<td>10. Vision the dominant sense</td>
<td></td>
</tr>
<tr>
<td>11. Smell the dominant sense</td>
<td></td>
</tr>
<tr>
<td>12. Immobile joints</td>
<td></td>
</tr>
<tr>
<td>13. Flexible shoulder joints</td>
<td></td>
</tr>
<tr>
<td>14. Skeleton adapted for movement among trees</td>
<td></td>
</tr>
<tr>
<td>15. Skeleton adapted for swimming</td>
<td></td>
</tr>
<tr>
<td>16. Hands and feet equipped with claws</td>
<td></td>
</tr>
<tr>
<td>17. Hands and feet equipped with nails</td>
<td></td>
</tr>
<tr>
<td>18. Eyes face to the side</td>
<td></td>
</tr>
<tr>
<td>19. Feet constructed for grasping</td>
<td></td>
</tr>
<tr>
<td>20. Oppposable thumbs</td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about primate origins.

For each statement below, write true or false.

21. Scientists believe that primates evolved about 66,000 years ago.  
22. The earliest primate may have been a strepsirrhinelike animal called *Purgatorius*.  
23. Anthropoids are a group of small-bodied primates.  
24. Strepsirrhines include lemurs and tarsiers.  
25. Strepsirrhines can be found in the tropical forests of South America.
Identify the following pictures. Use these choices: baboon, tarsier, spider monkey. Then on the second line write the group that is represented by the picture. Use these choices: New World monkey, Old World monkey, haplorhine.

26. _______________________ 27. _______________________ 28. _______________________

Answer the following questions.
29. What do similarities among monkeys, apes, and humans indicate about their evolution?

30. According to the fossil record, what were the first modern anthropoids to evolve and about when did they evolve?

31. What is the evolutionary history of primates based on?

32. What may have led to the eventual speciation of baboons and other ground-living monkeys?

33. What does DNA analysis of modern hominoids suggest about their evolutionary history?
In your textbook, read about hominids.

Answer the following questions.

1. What is an australopithecine? __________________________________________________________

2. What fossil skull did Raymond Dart discover in Africa in 1924? _______________________________

3. Why was *A. africanus* unlike any primate fossil skull that Dart had ever seen? __________________

4. What did the position of the foramen magnum indicate to Dart? _______________________________

Label the following skulls. Use these choices: chimpanzee, human, *A. afarensis*

5. ________________________ 6. ________________________ 7. _______________________

For each statement below, write true or false.

8. Much of what scientists know about australopithecines comes from the “Lucy” skeleton.  

9. “Lucy” is 3.5 billion years old.  

10. “Lucy” is classified as *A. africanus*.  

11. *A. afarensis* is the earliest known hominid species.  

12. *A. afarensis* walked on all four legs and had a humanlike brain.  

13. Australopithecines are alive today and can be found in southern Africa and Asia.  

14. Australopithecines probably played a role in the evolution of modern hominids.
In your textbook, read about the emergence of modern humans.

Circle the letter of the choice that best completes the statement or answers the question.

15. The first skull of *Homo habilis* was discovered by
   a. Raymond Dart.
   b. Louis and Mary Leakey.
   c. Donald Johanson.
   d. Gert Terblance.

16. When compared to an australopithecine skull, the *Homo habilis* skull is
   a. more humanlike.
   b. less humanlike.
   c. more apelike.
   d. exactly the same.

17. Which of the following is not true about *Homo habilis*?
   a. They existed between 1.5 and 2 million years ago.
   b. They were the first hominids to make and use tools.
   c. They were probably scavengers of their food.
   d. They gave rise to *A. africanus*.

18. *Homo habilis* means
   a. “handy human.”
   b. “tool-using human.”
   c. “upright human.”
   d. “talking human.”

19. Of the primates below, which has the largest brain?
   a. *Homo habilis*
   b. *Homo erectus*
   c. an ape
   d. an australopithecine

20. Which of the following is not true about *Homo erectus*?
   a. They probably hunted.
   b. They were the first hominids to use fire.
   c. They may have given rise to hominids that resemble modern humans.
   d. They were found only in Africa.

21. *Homo sapiens* includes
   a. Neandertals.
   b. *Homo erectus*
   c. *A. africanus*.
   d. *A. afarensis*.

Determine whether each statement below best describes Neandertals, Cro-Magnons, or both.

____________________ 22. They lived in caves during the ice ages.

____________________ 23. They are identical to modern humans in height, skull, and teeth structure.

____________________ 24. They may have been the first hominids to develop religious views.

____________________ 25. They may have used language.

____________________ 26. They were talented toolmakers and artists.
In your textbook, read about how classification began and about biological classification.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grouping objects or information based on similarities</td>
<td>a. Aristotle</td>
</tr>
<tr>
<td>2. Naming system that gives each organism a two-word name</td>
<td>b. Linnaeus</td>
</tr>
<tr>
<td>3. Developed the first system of classification</td>
<td>c. genus</td>
</tr>
<tr>
<td>4. Branch of biology that groups and names organisms</td>
<td>d. classification</td>
</tr>
<tr>
<td>5. Designed a system of classifying organisms based on their physical and structural similarities</td>
<td>e. taxonomy</td>
</tr>
<tr>
<td>6. Consists of a group of similar species</td>
<td>f. binomial nomenclature</td>
</tr>
</tbody>
</table>

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

7. The scientific name of a species consists of a family name and a descriptive name.

8. The scientific name of modern humans is *Homo sapiens*.

9. *Latin* is the language of scientific names.

10. The scientific names of organisms can be misleading.

11. Taxonomists try to identify the *evolutionary relationships* among organisms.

12. Besides comparing the structures of organisms, taxonomists also compare the organisms’ geographic distribution and *chemical makeup*.

13. Similarities between living species and extinct species *cannot* be used to determine their relationship to each other.

14. Because the bones of some dinosaurs have large internal spaces, some scientists think dinosaurs are more closely related to *amphibians* than to reptiles.

15. Classification can be useful in identifying the *characteristics* of an unknown organism.
Chapter 17
Organizing Life’s Diversity, continued

Section 17.1 Classification

In your textbook, read about how living things are classified.

Examine the table showing the classification of four organisms. Then answer the questions.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Green Frog</th>
<th>Mountain Lion</th>
<th>Domestic Dog</th>
<th>Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom</td>
<td>Animalia</td>
<td>Animalia</td>
<td>Animalia</td>
<td>Animalia</td>
</tr>
<tr>
<td>Phylum</td>
<td>Chordata</td>
<td>Chordata</td>
<td>Chordata</td>
<td>Chordata</td>
</tr>
<tr>
<td>Class</td>
<td>Amphibia</td>
<td>Mammalia</td>
<td>Mammalia</td>
<td>Mammalia</td>
</tr>
<tr>
<td>Order</td>
<td>Anura</td>
<td>Carnivora</td>
<td>Carnivora</td>
<td>Carnivora</td>
</tr>
<tr>
<td>Family</td>
<td>Ranidae</td>
<td>Felidae</td>
<td>Canidae</td>
<td>Hominidae</td>
</tr>
<tr>
<td>Genus</td>
<td>Rana</td>
<td>Felis</td>
<td>Canis</td>
<td>Homo</td>
</tr>
<tr>
<td>Species</td>
<td>Rana clamitans</td>
<td>Felis concolor</td>
<td>Canis familiaris</td>
<td>Homo sapiens</td>
</tr>
</tbody>
</table>

16. Which taxon includes the most specific characteristics? _______________________________________

17. Which taxon includes the broadest characteristics? _______________________________________

18. Which taxon includes more species, an order or a family? ________________________________

19. Which taxon includes only organisms that can successfully interbreed? __________________

20. If two organisms belong to the same family, what other taxonomic groups do the organisms have in common.

21. Which two organisms in the chart are most closely related? Explain.

22. To which taxa do all four organisms belong?

23. Which class does not include animals that have hair or fur? ____________________________

24. What is the order, family, and genus of a human?

25. Using the information in the chart, what can you conclude about the classification taxa of an organism with the scientific name *Rana temporaria*?
In your textbook, read about how evolutionary relationships are determined.

Explain how scientists use each item below to determine the evolutionary relationships among organisms.

1. structural similarities: ________________________________________________________________

2. breeding behavior: __________________________________________________________________

3. geographical distribution: ____________________________________________________________

4. chromosome comparisons: __________________________________________________________

5. biochemistry: _______________________________________________________________________

In your textbook, read about phylogenetic classification: models.

Use the cladogram to answer the questions.

6. What five probable ancestors of the modern bird (robin) are shown on the cladogram?

7. Which dinosaur is probably the most recent common ancestor of Velociraptor and Archaeopteryx?

8. Which traits shown on the cladogram are shared by Archaeopteryx and modern birds?
Use the fanlike phylogenetic diagram to answer the questions.

9. How does the fanlike diagram differ from a cladogram?

10. To which group are sea stars more closely related, arthropods or jellyfishes? _____________________

11. Which group of animals includes the fewest species? _________________________________________

In your textbook, read about the six kingdoms of organisms.

Circle the letter of the choice that best completes the statement or answers the question.

12. Organisms that do not have a nucleus bounded by a membrane are
   a. multicellular.  
   b. eukaryotes.  
   c. protists.  
   d. prokaryotes.

13. Fungi obtain food by
   a. photosynthesis.  
   b. chemosynthesis.  
   c. endocytosis.  
   d. absorbing nutrients from organic materials.

14. Animals are
   a. autotrophs.  
   b. heterotrophs.  
   c. prokaryotes.  
   d. stationary.
In your textbook, read about the geologic time scale.

Complete the table.

<table>
<thead>
<tr>
<th>Era</th>
<th>Time period</th>
<th>Biologic event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4.6 billion–600 million years ago</td>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
<td>600 million–248 million years ago</td>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
<td>248 million–65 million years ago</td>
<td>6.</td>
</tr>
<tr>
<td>7.</td>
<td>65 million years ago–present</td>
<td>8.</td>
</tr>
</tbody>
</table>

In your textbook, read about origin of life theories.

Complete each statement.

9. Spontaneous generation assumes that life arises spontaneously from ____________________________ .

10. Francesco Redi and Louis Pasteur designed ____________________________ to disprove spontaneous generation.

11. The theory of ____________________________ states that life comes only from pre-existing life.

12. Clusters of organic molecules might have formed ____________________________ , which may have evolved into the first true cells.

Order the evolutionary development of the following organisms from 1 to 4.

_________ 13. chemosynthetic prokaryotes  _________ 15. heterotrophic prokaryotes

_________ 14. eukaryotes  _________ 16. oxygen-producing photosynthetic prokaryotes

In your textbook, read about the evidence and mechanics of evolution.

Answer the following questions.

17. What assumption is made in the relative dating of fossils? ____________________________

18. What are homologous structures? ____________________________
For each statement below, write true or false.

______________ 19. Evolution occurs when a population’s genetic equilibrium remains unchanged.

______________ 20. Mutations, genetic drift, and migration may disrupt the genetic equilibrium of populations.

______________ 21. Stabilizing selection favors the survival of a population’s average individuals for a feature.

______________ 22. Disruptive selection occurs when an extreme feature is naturally selected.

______________ 23. Adaptive radiation occurs when species that once were similar to an ancestral species become increasingly distinct due to natural selection pressures.

In your textbook, read about primate evolution.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. Primate adaptation</td>
<td>a. anthropoids</td>
</tr>
<tr>
<td>25. Primate category that includes humans and apes</td>
<td>b. Australopithecines</td>
</tr>
<tr>
<td>26. Characteristic of New World monkeys</td>
<td>c. genus Homo</td>
</tr>
<tr>
<td>27. Appearing in fossil record about 2 million years ago along with stone tools</td>
<td>d. opposable thumb</td>
</tr>
<tr>
<td>28. Possible human ancestors dating from 5 to 8 million years ago</td>
<td>e. prehensile tail</td>
</tr>
</tbody>
</table>

In your textbook, read about organizing life’s diversity.

Look at the taxonomic classification of a bobcat shown below. Answer the questions.

29. What is the largest taxon in this classification system?

28. Possible human ancestors dating from 5 to 8 million years ago

30. What is the scientific name of a bobcat?

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom</td>
<td>Animalia</td>
</tr>
<tr>
<td>Phylum</td>
<td>Chordata</td>
</tr>
<tr>
<td>Class</td>
<td>Mammalia</td>
</tr>
<tr>
<td>Order</td>
<td>Carnivora</td>
</tr>
<tr>
<td>Family</td>
<td>Felidae</td>
</tr>
<tr>
<td>Genus</td>
<td>Lynx</td>
</tr>
<tr>
<td>Species</td>
<td>rufus</td>
</tr>
</tbody>
</table>
In your textbook, read about the characteristics of a virus.

For each item in Column A, write the letter of the matching item in Column B.

**Column A**

1. Genetic material of a virus
2. Where a virus attaches to a host cell
3. Nonliving particle that replicates inside a living cell
4. A virus’s protein coat
5. Interlocks with a molecular shape in a host cell’s plasma membrane
6. Layer that surrounds the capsid of some viruses
7. A virus that infects *E. coli* bacteria
8. A cell in which a virus replicates

**Column B**

a. virus
b. T4 phage
c. DNA or RNA
d. capsid
e. receptor site
f. envelope
g. host
h. attachment protein

In your textbook, read about viral replication cycles.

Complete the table by checking the correct column for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Lytic Cycle</th>
<th>Lysogenic Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Viral genes are expressed immediately after the virus infects the host cell.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Many new viruses are assembled.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. This cycle is preceded by a virus entering a host cell.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Viral DNA is integrated into the host cell’s chromosome.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Viruses are released from the host cell by lysis or exocytosis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Reverse transcriptase is used to make DNA from the RNA of a retrovirus.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. A provirus is replicated along with the host cell’s chromosome.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Use each of the terms below just once to complete the passage.

DNA white blood cells lysogenic
lytic AIDS proviruses

Many disease-causing viruses have both lytic and (16) ______________ cycles. For example, when HIVs infect (17) __________________ , the viruses enter a lysogenic cycle. Their genetic material becomes incorporated into the (18) ______________ of the white blood cells, forming (19) ______________ . When this happens, the white blood cells still function normally, and the person may not appear ill. Eventually, the proviruses enter a (20) ______________ cycle, killing the white blood cells. As a result, the person loses the ability to fight diseases and develops (21) ______________ .

In your textbook, read about viruses and cancer, plant viruses, and the origin of viruses.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

____________________ 22. Some viruses can change normal cells to tumor cells.

____________________ 23. Retroviruses and the papilloma virus, which causes hepatitis B, are examples of tumor viruses.

____________________ 24. All plant viruses cause diseases in plants.

____________________ 25. The first virus ever identified was the plant virus called tobacco mosaic virus.

____________________ 26. The patterns of color in some flowers are caused by tumor viruses.

____________________ 27. Tumor viruses contain genes that are found in normal cells.

____________________ 28. Scientists think viruses originated from their host cells.
In your textbook, read about the diversity of prokaryotes and about the characteristics of bacteria.

Answer the following questions.

1. What are three types of environments in which archaebacteria are found? _______________________

2. In what three ways do eubacteria obtain nutrients? __________________________________________

3. How does a bacterium’s cell wall protect it? ________________________________________________

4. Where is the genetic material of a bacterium found? _________________________________________

5. What structure do some bacteria use to move? ______________________________________________

6. What is the difference between gram-positive bacteria and gram-negative bacteria? ____________

7. What are three different shapes of bacteria? ________________________________________________

8. Describe the three growth patterns of bacteria and state the prefix used to identify each growth pattern.

Identify the type of bacterial reproduction described. Use these choices: binary fission, conjugation.

9. Bacterium with a new genetic makeup is produced.

10. Circular chromosome is copied.

11. Genetic material is transferred through a pilus.

12. Two identical cells are produced.

13. Sexual reproduction occurs.
In your textbook, read about adaptations in bacteria and the importance of bacteria.

Circle the letter of the choice that best completes the statement.

14. Scientists think the first bacteria on Earth were
   a. aerobic.          b. anaerobic.          c. fatal.            d. oxygen-dependent.

15. Bacteria that are obligate anaerobes release energy from food by
   a. cellular respiration.          b. using oxygen.          c. using nitrogen.          d. fermentation.

16. As an endospore, a bacterium
   a. produces toxins          b. dries out.          c. causes diseases          d. is protected

17. Botulism is caused by endospores of *C. botulinum* that have
   a. been killed.          b. produced toxins.          c. germinated.          d. reproduced.

18. Nitrogen is important because all organisms need it to make
   a. proteins.          b. ATP.          c. DNA.          d. all of these.

19. The process by which bacteria use enzymes to convert nitrogen gas into ammonia is called
   a. nitrogenation.          b. atmospheric separation.          c. nitrogen fixation.          d. eutrophication.

20. Bacteria return nutrients to the environment by breaking down
   a. dead organic matter.          b. inorganic materials.          c. enzymes and sugar.          d. nitrogen in legumes.

21. Bacteria are not used to make
   a. vinegar.          b. jams.          c. cheese.          d. yogurt.

22. Bacteria are responsible for the following diseases:
   a. strep throat and tetanus.          b. gonorrhea and syphilis.          c. tuberculosis and diphtheria.          d. all of these.

23. Due to reduced death rates from bacterial diseases and improved sanitation and living conditions, the average person born in the United States today will live to be about
   a. 25 years old.          b. 50 years old.          c. 75 years old.          d. 90 years old.
Protists

Chapter 19

In your textbook, read about what a protist is.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

1. The kingdom Protista is the most diverse of all six kingdoms. ________________________________________________________________________________

2. Protists can be grouped into three general types—animal-like, plantlike, and viruslike. ________________________________________________________________________________

3. All protists are eukaryotes that carry on most of their metabolic processes in membrane-bound organelles. ________________________________________________________________________________

In your textbook, read about the characteristics and diversity of protozoans.

Complete each statement.

4. The __________________________ protists are all unicellular heterotrophs known as protozoans.

5. Amoebas move and change their body shape by forming extensions of their plasma membranes called ____________________________ .

6. Amoebas use ____________________________ to pump out excess water from their cytoplasm.

7. Most amoebas reproduce by ____________________________ in which a parent produces one or more identical offspring by dividing into two cells.

8. One group of protozoans are called ____________________________ because they move by whipping one or more flagella from side to side.

9. A paramecium moves by beating thousands of hairlike ____________________________ .

10. When food supplies are low, paramecia may reproduce by undergoing a form of ____________________________ .

11. Parasitic protozoans called ____________________________ live inside their hosts and may reproduce by means of a spore.

12. Malaria is caused by protozoans of the genus ____________________________ .

13. The insect that is responsible for transmitting malaria-causing protozoans to humans is the ____________________________ .
In your textbook, read about what algae are and about their diversity.

For each item in Column A, write the letter of the item in Column B that completes the statement best.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The characteristic common to all protists is that they are</td>
<td>a. algae</td>
</tr>
<tr>
<td>2. Unicellular protists that are major producers of oxygen in aquatic ecosystems are</td>
<td>b. phyla</td>
</tr>
<tr>
<td>3. Unicellular and multicellular photosynthetic protists are</td>
<td>c. pigments</td>
</tr>
<tr>
<td>4. Most green, red, and brown algae are</td>
<td>d. phytoplankton</td>
</tr>
<tr>
<td>5. Photosynthetic</td>
<td>e. eukaryotic</td>
</tr>
<tr>
<td>6. Algae are classified into six</td>
<td>f. multicellular</td>
</tr>
</tbody>
</table>

Identify the phylum of the alga shown below and label its parts. Use these choices: flagellum, mitochondrion, pellicle, chloroplast, nucleus, eyespot, contractile vacuole, Euglenophyta.

<table>
<thead>
<tr>
<th>Phylum</th>
<th>11.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td></td>
</tr>
</tbody>
</table>
Circle the letter of the choice that best completes the statement.

15. When diatoms that have been reproducing asexually reach about one-fourth of their original size, they
   a. die.
   b. triple in size.
   c. reproduce sexually.
   d. all of these.

16. Dinoflagellates are unicellular algae that
   a. have two flagella.
   b. create red tides.
   c. have thick cellulose plates.
   d. all of these.

17. Red algae are a kind of seaweed having pigments that absorb green, violet, and blue light waves, which allows the algae to
   a. live only in freshwater.
   b. photosynthesize in limited light.
   c. live only in salt water.
   d. both a and b.

18. The air bladders of brown algae allow the algae to
   a. breathe.
   b. reproduce.
   c. float near the water’s surface.
   d. live in salt water.

19. A green alga that forms colonies is
   a. Spirogyra.
   b. Ulva.
   c. Chlamydomonas.
   d. Volvox.

In your textbook, read about alternation of generations.

Use each of the terms below just once to complete the passage.

- diploid
- gametophyte
- alternation of generations
- meiosis
- haploid
- sporophyte
- spores
- zygote

Some algae have a life cycle that has a pattern called (20) ____________________________ .

These algae alternate between a(n) (21) ____________________________ form that is called the
(22) ____________________________ because it produces gametes, and a(n)
(23) ____________________________ form called the (24) ____________________________ . When the haploid gametes fuse, they form a(n) (25) ____________________________ from which the sporophyte develops. Certain cells in the sporophyte undergo (26) ____________________________ to form haploid
(27) ____________________________ that develop into gametophytes.
In your textbook, read about the different kinds of funguslike protists.

Use all the terms in the list below at least once to complete the concept map for funguslike protists.

- cell division
- three phyla
- spores
- cellular slime molds
- plasmodial slime molds
- water molds and mildew
- flagellated reproductive cells

Funguslike protists

obtain energy by

decomposing organic materials

and can be divided into

1. ____________________

which are

2. ____________________
   ____________________

3. ____________________
   ____________________

4. ____________________
   ____________________

5. ____________________
   ____________________

6. ____________________
   ____________________

7. ____________________
   ____________________

In your textbook, read about the origin of protists.

Answer the following question.

8. What does scientific evidence show is the relationship between protists and other groups of organisms?

________________________________________________________________________________

________________________________________________________________________________
Chapter 20  
Fungi

In your textbook, read about the general characteristics of fungi.

Answer the following questions.

1. What are the threadlike filaments in a multicellular fungus called? What do they form?

2. Some hyphae are divided into individual cells by cross walls with pores in them. What are these cross walls called? What purpose do the pores serve?

3. What is one way that fungi are like plants and one way they are unlike plants?

In your textbook, read about adaptations in fungi.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

4. Many fungi are decomposers, which break down organic substances into raw materials that can be used by other organisms. _______________________

5. Fungi use cellular digestion to obtain nutrients. _______________________

6. Hyphae release digestive enzymes that break down molecules in their food source. _______________________

7. Mutualistic fungi are decomposers. _______________________

8. Parasitic fungi grow spores into host cells and absorb the cell’s nutrients. _______________________

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In your textbook, read about reproduction in fungi.

Complete each statement.

9. Fungi reproduce __________________________ by fragmentation, budding, or producing spores.

10. In __________________________, pieces of hyphae grow into new mycelia.

11. The process of a parent cell undergoing mitosis and producing a new individual that pinches off, matures, and separates from the parent is called __________________________.

12. When environmental conditions are right, a __________________________ may germinate and produce a threadlike __________________________ that will grow into a mycelium.

13. Some hyphae grow away from the mycelium to produce a spore-containing structure called a __________________________.

14. In most fungi, the structures that support __________________________ are the only part of the fungus that can be seen.

15. Fungi may produce spores by __________________________ or __________________________.

16. Many adaptations of fungi for survival involve __________________________.

17. __________________________ protect spores and keep them from drying out until they are released.

18. A single puffball may produce a cloud containing as many as __________________________ spores.

19. Producing a large number of spores increases a species’ chances of __________________________.

20. Fungal spores can be dispersed by __________________________, __________________________, and __________________________.
In your textbook, read about zygomycotes.

Order the steps of growth and reproduction in zygomycotes from 1 to 5.

1. Hyphae called rhizoids penetrate the food, anchor the mycelium, and absorb nutrients.
2. An asexual spore germinates on a food source and hyphae begin to grow.
3. Spores are released and another asexual cycle begins.
4. Hyphae called stolons grow across the surface of the food source and form a mycelium.
5. Special hyphae grow upward to form sporangia that are filled with asexual spores.

Use each of the terms below just once to complete the passage.

- yeasts
- conidia
- multicellular
- conidiophores
- yeast cells
- sac fungi
- ascospores
- unicellular
- vaccine
- ascus

Ascomycotes are also called (6) ________________________ because they produce sexual spores, called (7) ________________________, in a saclike structure, called a(n) (8) ________________________ .

During asexual reproduction, ascomycotes produce spores called (9) ________________________ . These asexual spores are produced in chains or clusters at the tips of structures called (10) ________________________, which are elongated hyphae.

Morels and truffles are (11) ________________________ ascomycotes that are edible. Yeasts are (12) ________________________ ascomycotes. (13) ________________________ are used to make beer, wine, and bread. They are also used in genetic research. A(n) (14) ________________________ for the disease hepatitis B is produced from rapidly growing (15) ________________________, which contain spliced human genes.
In your textbook, read about basidiomycotes.

Answer the following questions about the life of a mushroom.

16. What are basidia and where are they found?

17. What happens when mycelia of two different mating strains meet?

18. What does a mycelium with two nuclei in its cells form?

19. What does a diploid cell inside a basidium produce as a result of meiosis?

In your textbook, read about deuteromycotes, the mutualistic relationships of mycorrhizae and lichens, and the origins of fungi.

Write the letter of the item in Column B that best completes each statement in Column A.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.</td>
<td>a.</td>
</tr>
<tr>
<td>21.</td>
<td>b.</td>
</tr>
<tr>
<td>22.</td>
<td>c.</td>
</tr>
<tr>
<td>23.</td>
<td>d.</td>
</tr>
<tr>
<td>24.</td>
<td>e.</td>
</tr>
<tr>
<td>25.</td>
<td>f.</td>
</tr>
<tr>
<td>26.</td>
<td>g.</td>
</tr>
<tr>
<td>27.</td>
<td>h.</td>
</tr>
</tbody>
</table>
In your textbook, read about viruses.

Label the parts of a virus.

1. 
2. 
3. 

Number the following steps of the lytic cycle in the order in which they occur.

4. The viral nucleic acid causes the host cell to produce new virus particles.
5. A virus attaches to the membrane of a host cell.
6. The new virus particles are released from the host cell, killing the cell.
7. The viral nucleic acid enters the host cell.

In your textbook, read about bacteria.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

8. A bacterium is a unicellular eukaryote.
9. Bacteria may be heterotrophs, photosynthetic autotrophs, or chemoautotrophs.
10. Bacteria reproduce asexually by conjugation.
11. Bacteria that are obligate aerobes are killed by oxygen.
12. Archaebacteria often live in extreme environments.
13. Some bacteria fix oxygen.
In your textbook, read about protists.

Write the letter of the item in Column B that best matches the item in Column A.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Can be unicellular, colonial, or multicellular</td>
<td>a. green algae</td>
</tr>
<tr>
<td>15. Parasitic protozoans</td>
<td>b. sporozoans</td>
</tr>
<tr>
<td>16. Causes malaria</td>
<td>c. amoeba</td>
</tr>
<tr>
<td>17. Can be both autotrophic and heterotrophic</td>
<td>d. slime mold</td>
</tr>
<tr>
<td>18. Funguslike protist</td>
<td>e. brown algae</td>
</tr>
<tr>
<td>19. Uses cilia to move</td>
<td>f. <em>Plasmodium</em></td>
</tr>
<tr>
<td>20. Contain carotenoids</td>
<td>g. euglenas</td>
</tr>
<tr>
<td>21. Have hard, armorlike plates</td>
<td>h. <em>Paramecium</em></td>
</tr>
<tr>
<td>22. Kelps</td>
<td>i. dinoflagellates</td>
</tr>
<tr>
<td>23. Uses pseudopodia to move</td>
<td>j. diatoms</td>
</tr>
<tr>
<td>24. Have red and blue pigments</td>
<td>k. red algae</td>
</tr>
</tbody>
</table>

In your textbook, read about fungi.

Answer the following questions.

25. How do fungi obtain nutrients from a food source? ____________________________

26. How do fungi play a role in recycling nutrients on Earth? ________________________

27. What are hyphae? ___________________________________________________________

28. In what structure do club fungi produce sexual spores? __________________________

29. In what structure do sac fungi produce sexual spores? __________________________

30. How do mycorrhizae benefit both the plants and the fungi? ______________________

31. What is a lichen? ___________________________________________________________
In your textbook, read about the origins and adaptations of plants.

For each answer given below, write an appropriate question.

1. Answer: Multicellular eukaryotes having thick cell walls made of cellulose, a protective, waterproof covering, and that can produce its own food in the form of glucose through photosynthesis

   Question: __________________________________________________________________________

2. Answer: The earliest known plant fossils

   Question: __________________________________________________________________________

3. Answer: Protective, waxy layers that cover most fruits, leaves, and stems

   Question: __________________________________________________________________________

4. Answer: The organ of a plant that usually traps light energy for photosynthesis, and is supported by a stem

   Question: __________________________________________________________________________

5. Answer: The organ that anchors a plant, and usually absorbs water and minerals

   Question: __________________________________________________________________________

In your textbook, read about alternation of generations.

Use each of the terms below just once to complete the passage.

- diploid
- generations
- meiosis
- gametes
- haploid
- sporophyte

The lives of all plants consist of two alternating stages, or (6) __________________________ . The gametophyte generation of a plant is responsible for the development of (7) __________________________ . All cells of the gametophyte, including the gametes, are (8) __________________________ . The (9) __________________________ generation is responsible for the production of spores. All cells of the sporophyte are (10) __________________________ . The spores are produced by the sporophyte plant by (11) __________________________ and are, therefore, haploid.
Chapter 21
What is a plant?, continued

Section 21.1 Adapting to Life on Land

In your textbook, read about the origin and adaptations of plants.

Circle the letter of the choice that best completes the statement.

12. The lives of _______ plants include two generations that alternate.
   a. non-seed producing
   b. seed
   c. all
   d. most

13. The generation of a plant responsible for producing gametes is the
   a. alternation of generations.
   b. gametophyte generation.
   c. sporophyte generation.
   d. seed-producing generation.

14. Gametophyte spores are _______ and sporophyte tissue cells are _______.
   a. haploid/diploid.
   b. diploid/haploid.
   c. haploid/haploid.
   d. diploid/diploid.

15. Non-seed plants _______ that grow into gametophytes.
   a. release spores into the environment
   b. retain spores in the parent plant
   c. release seeds into the environment
   d. retain seeds in the parent plant

Answer the following questions.

16. What is the difference between vascular and nonvascular plants?

17. Some land plants produce seeds. What is their function? How do they differ from spores?

18. How do algae and land plants take in substances?
In your textbook, read about non-seed plants.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Leaves that are found on ferns</td>
<td>a. leafy liverworts</td>
</tr>
<tr>
<td>2. Scaly structures that support male or female reproductive structures</td>
<td>b. thallose liverworts</td>
</tr>
<tr>
<td>3. Plants with a broad, flattened body that resembles a lobed leaf</td>
<td>c. fronds</td>
</tr>
<tr>
<td>4. Plants with three flattened rows of thin leaves</td>
<td>d. hornworts</td>
</tr>
<tr>
<td>5. Nonvascular plants that grow in damp, shady habitats and whose sporophytes resemble horns</td>
<td>e. cones</td>
</tr>
</tbody>
</table>

Complete the chart below by marking the appropriate columns for each division of plants.

<table>
<thead>
<tr>
<th>Division</th>
<th>Vascular</th>
<th>Nonvascular</th>
<th>Non-seed Plants</th>
<th>Seeds in Fruits</th>
<th>Seeds not in Fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Hepaticophyta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Anthocerophyta</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>8. Bryophyta</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9. Psilophyta</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Lycophyta</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>11. Arthrophyta</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Pterophyta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Cycadophyta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Gnetophyta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Ginkgophyta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Coniferophyta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Anthophyta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about non-seed plants.

For each answer given below, write an appropriate question.

18. Answer: Vascular plants that have neither roots nor leaves

Question: __________________________________________________________________________

19. Answer: Vascular plants that have hollow, jointed stems surrounded by whorls of scalelike leaves, whose cells contain large deposits of silica

Question: __________________________________________________________________________

20. Answer: Plants that may be the ancestors of all plants

Question: __________________________________________________________________________

21. Answer: Hard-walled reproductive cells found in non-seed plants

Question: __________________________________________________________________________

22. Answer: Nonvascular plants that rely on osmosis and diffusion to transport water and nutrients, although some members have elongated cells that conduct water and sugars

Question: __________________________________________________________________________

In your textbook, read about seed plants.

Use each of the terms below just once to complete the passage.

anthophyta      cycadophyta     gnetophyta
coniferophyta   ginkgophyta

Seed plants are classified into five divisions. Plants from the (23) _________________ division are palmlike trees with scaly trunks and are often mistaken for ferns or small palm trees. There is only one living species in the (24) _________________ division. The members of the (25) _________________ division are the largest, most diverse group of seed plants on Earth and are commonly known as the flowering plants. Three distinct genera make up the plant division called (26) ________________ . Species of the (27) _________________ division can be identified by the characteristics of their needlelike or scaly leaves.
In your textbook, read about nonvascular plant divisions—bryophyta, hepaticophyta, and anthocerophyta.

Complete each statement.

1. Nonvascular plants are successful in habitats with adequate _________________.
2. The _________________ generation is dominant in nonvascular plants.
3. Sperm are produced in male reproductive structures called _________________, and eggs are produced in female reproductive structures called _________________.
4. Mosses have colorless multicellular structures called _________________, which help anchor the stem to the soil.
5. Most liverworts have ___________________________ that helps reduce evaporation of water from the plant’s tissues.
6. Liverworts occur in many environments and include two groups: the _________________ liverworts and the _________________ liverworts.
7. One unique feature of hornworts is the presence of one to several ___________________________ in each cell.
8. The common names for the nonvascular plants in bryophyta, hepaticophyta, and anthocerophyta are _________________, _________________, and _________________.

Circle the letter of the response that best completes the statement.

9. Nonvascular plants are not as common or as widespread as vascular plants because
   a. nonvascular plants are small.
   b. the life functions of nonvascular plants require a close association with water.
   c. nonvascular plants are limited to dry habitats.
   d. none of the above.
10. The life cycle of nonvascular plants includes an alternation of generations between a
    a. diploid sporophyte and a diploid gametophyte.
    b. haploid sporophyte and a haploid gametophyte.
    c. diploid sporophyte and a haploid gametophyte.
    d. haploid sporophyte and a diploid gametophyte.
11. Fossil and genetic evidence suggests that the first land plants were
    a. mosses.
    b. sphagnum moss.
    c. liverworts.
    d. hornworts.
Section 22.2 Non-Seed Vascular Plants

In your textbook, read about the alternation of generations of non-seed vascular plants and lycophyta.

Use each of the terms below just once to complete the passage.

antheridia archegonia egg fertilization
leaves prothallus reproductive cells sperm
sporophyte strobilus zygote

Unlike nonvascular plants, the spore-producing (1) __________________ is the dominant generation in vascular plants. A major advance in vascular plants was the adaptation of (2) __________________ to form structures that protect the developing (3) __________________ . In some non-seed vascular plants, spore-bearing leaves form a compact cluster called a(n) (4) __________________ . Spores are released from this compact cluster. These spores then grow to form the gametophyte, called a(n) (5) __________________ . This structure is relatively small and lives in or on soil. The prothallus then forms (6) __________________ , male reproductive structures, and (7) __________________ , female reproductive structures. (8) __________________ are released from an antheridium and swim through a film of water to the (9) __________________ in an archegonium. (10) __________________ occurs and a large, dominant sporophyte plant develops from the (11) __________________ .

For each statement below, write true or false.

________ 12. The leafy stems of lycophytes resemble clubs, and their reproductive structures are moss shaped.

________ 13. The leaves of lycophytes occur as pairs, whorls, or spirals along the stem.

________ 14. Lycophytes are simple vascular plants with creeping leaves.

________ 15. The club moss is commonly called ground pine because it is evergreen and resembles a miniature pine tree.
In your textbook, read about arthrophyta and pterophyta.

Complete each statement.

16. The hollow-stemmed horsetail appears to be jointed with scalelike ________________ surrounding each joint.

17. The most recognized generation of ferns is the ________________ generation.

18. The ________________ in most ferns is a thin, flat structure.

19. In most ferns, the main stem, called a ________________, is underground. It contains many starch-filled cells for ________________.

20. The leaves of a fern are called ________________ and grow upward from the rhizome.

21. Fronds are often divided into ________________, which are attached to a central rachis.

22. Ferns were the first vascular plants to evolve leaves with branching ________________ of vascular ranchis.

23. The common names for the seedless vascular plants, lycophyta, arthrophyta, and pterophyta are ________________, ________________, and ________________.

Answer the following questions on the lines provided.

24. Why are arthrophytes, or horsetails, sometimes referred to as scouring rushes?

______________________________________________________________________________________________________________________________________________________________

25. Why might you be more familiar with ferns than with club mosses and horsetails?

______________________________________________________________________________________________________________________________________________________________
In your textbook, read about the seed plants—cycadophyta, gingkophyta, gnetophyta, coniferophyta, and anthophyta.

Complete each statement.

1. An __________________ , or young diploid sporophyte, has food-storage organs called __________________.

2. Vascular plants that produce __________________ in cones are sometimes called _________________.

3. Seed plants do not require __________________ for __________________ .

4. The male gametophyte develops inside a structure called a(n) _________________ that includes sperm cells, nutrients, and a protective outer covering.

5. The female gametophyte, which produces the egg cell, is contained within a sporophyte structure called a(n) ________________ .


7. Perennials produce flowers and seeds periodically for _________________.

8. Annual plants live for _________________.

9. ________________ have one seed leaf; ________________ have two seed leaves.

For each statement below, write true or false.

10. Cycads are related to palm trees but their leaves unfurl like fern fronds. __________

11. There is only one species of ginkgo tree alive today. __________

12. Most gnetophytes today are found in the deserts or mountains of Africa, Asia, North America, and Central and South America. __________

13. Most conifers are evergreen plants that lose their needle-like leaves all at once and only grow in nutrient-rich soil. __________

14. Dropping leaves is an adaptation in deciduous plants to reduce water loss when it is less available, such as during winter. __________

15. Anthophytes are unique in that they are the only division of plants that produce fruits. __________
In your textbook, read about plant cells and tissues.

Match the definitions in Column 1 with the terms in describes from Column 2. Place the letter from Column 2 in the spaces under Column 1.

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The most abundant kind of plant cells</td>
<td>a. apical meristem</td>
</tr>
<tr>
<td>2. Long cells with unevenly thickened cell walls. This type of cell wall allows the cells to grow.</td>
<td>b. collenchyma</td>
</tr>
<tr>
<td>3. Cells with walls that are very thick and rigid. At maturity, these cells often die, leaving the cell walls to provide support for the plant.</td>
<td>c. companion cell</td>
</tr>
<tr>
<td>4. Dermal tissue that is composed of flattened parenchyma cells that cover all parts of the plant</td>
<td>d. cork cambium</td>
</tr>
<tr>
<td>5. Openings in the cuticle of the leaf that control the exchange of gases</td>
<td>e. epidermis</td>
</tr>
<tr>
<td>6. Cells that control the opening and closing of the stomata.</td>
<td>f. guard cells</td>
</tr>
<tr>
<td>7. Hairlike projections that extend from the epidermis</td>
<td>g. meristem</td>
</tr>
<tr>
<td>8. Plant tissue composed of tubular cells that transports water and dissolved minerals from the roots to the rest of the plant</td>
<td>h. parenchyma</td>
</tr>
<tr>
<td>9. Tubular cells, with tapered ends, that have cell walls with pits through which water and dissolved minerals flow</td>
<td>i. phloem</td>
</tr>
<tr>
<td>10. Lateral meristem that produces a tough covering for the surface of stems and roots</td>
<td>j. sclerenchyma</td>
</tr>
<tr>
<td>11. Vascular tissue that transport sugars to all parts of the plant</td>
<td>k. sieve tube member</td>
</tr>
<tr>
<td>12. Long, cylindrical cells through which sugars and organic compounds flow</td>
<td>l. stomata</td>
</tr>
<tr>
<td>13. Nucleated cells that help manage the transport of sugars and other organic compounds through the sieve cells of the phloem</td>
<td>m. tracheids</td>
</tr>
<tr>
<td>14. Areas where new cells are produced</td>
<td>n. trichomes</td>
</tr>
<tr>
<td>15. Growth tissue found at or near the tips of roots and stems</td>
<td>o. vascular cambium</td>
</tr>
<tr>
<td>16. Tubular cells that transport water throughout the plant. These cells are wider and shorter than tracheids.</td>
<td>p. vessel element</td>
</tr>
<tr>
<td>17. Lateral meristem that produces new xylem and phloem cells in dicot stems and roots</td>
<td>q. xylem</td>
</tr>
</tbody>
</table>
In your textbook, read about roots and stems.

Label the parts of the dicot root. Use these choices:

- cortex
- phloem
- epidermis
- endodermis
- xylem

**Dicot Root**

1. 
2. 
3. 
4. 
5. 

For each statement below, write **true** or **false**.

6. A root hair is a small extension of an epidermal, or outermost, cell layer of a dicot root.
7. Layers of parenchyma cells make up the cortex of a dicot root and the central pith of a monocot root.
8. Outside the endodermis is a tissue called the pericycle that develops vertical roots.
9. Vascular cambium cells found near the center of a root produce xylem and phloem cells that increase the diameter of the root.
10. Behind the root tip are cell-producing growth tissues called the root cap.
11. The difference between roots and stems lies in the way they transport water.
12. Primary growth in a stem occurs in the apical meristem.
In your textbook, read about stems and leaves.

Circle the letter of the response that best completes the statement.

13. Many wildflowers with soft, green stems are plants that have
   a. woody stems.
   b. herbaceous stems.
   c. woody roots.
   d. all of the above.

14. The functions of a plant’s stem include
   a. transporting sugar.
   b. supporting the plant.
   c. transporting water and minerals.
   d. all of the above.

15. Any portion of the plant that stores sugars is called a
   a. petiole.
   b. mesophyll.
   c. root cap.
   d. sink.

16. The movement of sugars through the phloem is called
   a. photosynthesis.
   b. transpiration.
   c. translocation.
   d. food storage.

In your textbook, read about the leaves of a plant.

Use each of the terms below just once to complete the passage.

stomata  extend  cuticle  transpiration  epidermis
veins    stem    petiole  photosynthesis  mesophyll

There are many parts to a leaf. Grass leaves grow right out of the (17) ________________, but other leaves are connected to the stem by a stalk called the (18) ________________.

The petiole is made of vascular tissues that (19) ________________ up into the leaf to form (20) ________________.

The outer surface of a leaf has a (21) ________________ that covers the epidermis.

Inside the epidermis are two layers of photosynthetic cells that make up the
(22) ________________ . Cells in the palisade layer have many chloroplasts and carry out most of the leaf’s (23) ________________ . Leaves have an (24) ________________ with a waxy cuticle and (25) ________________ help prevent water loss. The loss of water through stomata is called (26) ________________.
Complete each statement.

1. A ___________________________ is a chemical that is produced in one part of an organism and transported to another part, where it causes a physiological change.

2. The group of plant hormones called ___________________________ promote cell elongation. Indoleacetic acid (IAA) is an example of this group of hormones.

3. The group of growth hormones that cause plants to grow taller because, like auxins, they stimulate cell elongation, are called ___________________________.

4. The hormones called ___________________________ are so named because they stimulate cell division by stimulating the production of proteins needed for mitosis.

5. The plant hormone called ___________________________ is a simple, gaseous compound composed of carbon and hydrogen that speeds the ripening of fruits.

6. A plant’s response to an external stimulus that comes from a particular direction is called a ___________________________.

7. A responsive movement of a plant that is not dependent on the direction of the stimulus is called a ___________________________.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

8. A large amount of hormone is needed to make physiological changes in a plant.

9. If gibberellins are applied to the tip of a dwarf plant, it will grow taller.

10. The growth of a plant towards light is caused by an unequal distribution of ethylene in the plant’s stem.

11. If a tropism is negative, the plant grows toward the stimulus.

12. The growth of a plant toward light is called phototropism.

13. Gravitropism is the direction of plant growth in response to gravity.

14. A plant’s response to touch is called cytokinin.
In your textbook, read about alternation of generations and the life cycles of mosses and ferns.

Use each of the terms below just once to complete the following statements.

- diploid
- meiosis
- sporophyte
- dominant
- mitosis
- vegetative reproduction
- egg
- protonema
- sperm
- gametophyte

1. The two phases of the plant life are the __________________________ stage and the __________________________ stage.
2. The cells of the sporophyte are all __________________________.
3. The female gamete is the __________________ , and the male gamete is the _________________.
4. Some plants reproduce asexually by a process called __________________________, in which a new plant is produced from an existing vegetative structure.
5. Mosses belong to one of the few plant divisions in which the gametophyte plant is the __________________________ generation.
6. A small, green filament of moss cells that develops into either a male or female moss gametophyte is known as a(n) __________________________.
7. The moss diploid zygote divides by __________________________ to form a new sporophyte in the form of a stalk and capsule.
8. Spores are produced by __________________________ in the capsule of the moss sporophyte.

Number each description to order the stages from spore release of the life cycle of a fern, from 1 to 7.

_________ 9. A spore germinates and grows into a heart-shaped gametophyte called a prothallus.
_________ 10. After fertilization, the diploid zygote grows into a sporophyte.
_________ 11. As the sporophyte grows, roots and fronds grow out from the rhizome.
_________ 12. Sperm swim through a film of water on the prothallus to reach and fertilize an egg in the archegonium.
_________ 13. In each sporangium, spores are produced by meiosis, and the cycle begins again as the spores are dispersed by the wind.
_________ 14. Sori, or clusters of sporangia, grow on the pinnae.
_________ 15. A sporangium bursts, releasing haploid spores.
Chapter 24
Reproduction in Plants, continued
Section 24.1 Life Cycles of Mosses, Ferns, and Conifers

In your textbook, read about the life cycle of conifers.

Answer the following questions.

1. What is the dominant stage in conifers?

2. What does the adult conifer produce on its branches?

3. What is a megaspore?

4. What are microspores and how are they produced?

5. What do the microspores develop into?

6. What is a micropyle?

7. How does fertilization take place?

8. After fertilization, a zygote develops inside the ovule into an embryo with several cotyledons. What happens to the ovule?

9. What happens to the seeds when the female cone opens and falls to the ground?

10. What will the seedling become?
In your textbook, read about the structure of a flower.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

1. In flowering plants, sexual reproduction takes place in the seed, which has several parts.

2. The structure of a flower includes four kinds of organs: sepals, petals, stamens, and ovaries.

3. Petals are usually colorful, leaflike structures that encircle the flower stem.

4. The male reproductive structure located inside the petals of a flower is a stamen. Sperm-containing pollen is produced in the anther at the tip of the stamen.

5. The female reproductive structure at the center of a flower is the ovary. Eggs are formed in the pistil, which is located in the bottom portion of the ovary.

Label the parts of the flower. Use these choices:

- sepal
- petal
- stigma
- ovule
- anther
- ovary
- filament

6. ____________
7. ____________
8. ____________
9. ____________
10. ____________
11. ____________
12. ____________
In your textbook, read about the life cycle of a flowering plant.

For each item in Column A, write the letter of the matching item from Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Two nuclei in one cell at the center of the embryo sac</td>
<td>a. dormancy</td>
</tr>
<tr>
<td>2. A process in which one sperm fertilizes the egg and the other sperm joins with the central cell</td>
<td>b. double fertilization</td>
</tr>
<tr>
<td>3. Food-storing tissue that develops from the triploid central cell and supports the development of the embryo</td>
<td>c. endosperm</td>
</tr>
<tr>
<td>4. A period of inactivity in which seeds of some plant species remain until conditions are favorable for growth and development</td>
<td>d. germination</td>
</tr>
<tr>
<td>5. The beginning of the development of the embryo into a new plant</td>
<td>e. hypocotyl</td>
</tr>
<tr>
<td>6. This embryonic root is the first part of the embryo to appear from the seed</td>
<td>f. polar nuclei</td>
</tr>
<tr>
<td>7. The portion of the stem near the seed</td>
<td>g. radicle</td>
</tr>
</tbody>
</table>

Answer the following questions.

8. How do anthophytes attract animal pollinators?

9. How do seeds form after fertilization takes place?

10. Name three ways seeds are dispersed.
In your textbook, read about plants.

Study the following diagram of alternation of generations in plants. Then answer the questions.

1. Is the sporophyte generation a haploid or diploid generation? _________________________________
2. Is the gametophyte generation a haploid or diploid generation? ________________________________
3. Is a spore haploid or diploid? ____________________________________________________________
4. Is a gamete haploid or diploid? ___________________________________________________________
5. Does a spore produce a gametophyte without fertilization? ________________________________
6. Does a gamete produce a sporophyte without fertilization? ________________________________
7. Which generation—sporophyte or gametophyte—produces a generation that is diploid? ________________________________

Seed Plants

Explain how these adaptations enable conifers to survive in cold or dry climates.

8. Needles _______________________________________________________________________________
9. Stems ________________________________________________________________________________
10. Flexible leaves and branches ______________________________________________________________
Flowering Plants

Fill in the following blanks to explain the function of a flower.

11. A flower has two major reproductive structures. The _______________ is the _______________ reproductive organ. At the base of the pistil is the _______________, which houses ovules, the female _______________ generation of the plant. In each ovule, female gametes, or _______________, form.

12. The _______________ and anther form the _______________ reproductive organ. The male _______________ generation of the plant is _______________. Within it, the male gametes are formed.

13. When pollination occurs, a _______________ extends from the pollen grain to the ovary, and two _______________ travel down the tube to fertilize the eggs in the ovule.

14. Some flowers are colorful and showy. Others are small and inconspicuous. Explain how these two flower types are adapted to different pollinators.

___________________________________________________________________________________
___________________________________________________________________________________
___________________________________________________________________________________

15. Discuss three ways that seeds may be spread through the environment.

a. _________________________________________________________________________________

b. _________________________________________________________________________________

c. _________________________________________________________________________________
What is an animal?

In your textbook, read about the characteristics of animals.

Answer the following questions.

1. You have just discovered a new organism that you think is an animal. In order to be classified as an animal, what characteristics must it have?

2. What is one important factor that influences how an animal obtains its food?

3. How might an animal be free-moving at one stage in its life and sessile at another? Give an example.

4. How do sessile, aquatic animals get their food?

If the animal described below is a sessile organism, write yes. If it is not, write no.

5. Barnacles attached to a ship’s hull

6. A spider lying in wait in the center of its web

7. Coral larvae drifting in a tropical ocean

8. Sponges growing on the outside of a crab’s shell

Complete each statement.

9. Digestion in a sponge takes place in ____________________________, while digestion in a more complex animal like a tiger takes place in a(n) _____________________________.

10. Some of the food you had for breakfast has been stored as ____________________________ or ____________________________, ready to be used if it’s a long time until your next meal.
Chapter 25 What is an animal?, continued

Section 25.1 Typical Animal Characteristics

In your textbook, read about the development of animals.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

11. Most animals develop from a single, fertilized egg called a blastula. _____________________________

12. A zygote divides by a process known as cleavage. _____________________________________________

13. The blastula is a solid ball of cells. ___________________________________________________________

Label the parts of the gastrula shown here. Use these choices:

- ectoderm
- endoderm
- mesoderm
- opening in gastrula

14. _____________________________

15. _____________________________

16. _____________________________

17. _____________________________

Complete the chart by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Endoderm</th>
<th>Ectoderm</th>
<th>Mesoderm</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Gives rise to digestive tract</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Continues to grow and divide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Lines the inner surface of gastrula</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Gives rise to muscles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Develops into skin and nervous tissue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Forms from cells that break off endoderm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about kinds of symmetry in animals.

Circle the letter of the choice that best completes the statement or answers the question.

1. Different kinds of symmetry make it possible for animals to
   a. grow very large.
   b. survive when cut into pieces.
   c. move and find food in different ways.
   d. live a long time.

2. The irregularly shaped body of a sponge is an example of
   a. asymmetry.
   b. gastrulation.
   c. symmetry.
   d. balance.

3. A sponge’s body has how many layers of cells?
   a. one
   b. two
   c. three
   d. four

4. The embryonic development of a sponge does not include which of the following?
   a. formation of endoderm
   b. formation of mesoderm
   c. a gastrula stage
   d. a, b, and c

5. If you divided a radially symmetrical animal along any plane through its central axis, you would end up with
   a. roughly equal halves.
   b. front and back halves.
   c. top and bottom halves.
   d. three pieces.

6. Which of the following animals is not radially symmetrical?
   a. a hydra
   b. a sea urchin
   c. a spider
   d. a sea star

7. An organism with bilateral symmetry can be divided lengthwise into right and left halves that are
   a. asymmetrical.
   b. similar.
   c. made up of two cell layers.
   d. flattened.

Identify each of the following body parts as being either dorsal or ventral on the animal’s body.

8. the navel of a killer whale
9. the sail fin on an iguana
10. the back of your neck
11. the mouth of a shark
12. the pouch of a kangaroo
In your textbook, read about bilateral symmetry and body plans.

Answer the following questions.

13. In what ways was the development of a body cavity, or coelom, an advantage for bilaterally symmetrical animals?

14. Describe an acoelomate animal’s body plan.

15. How do nutrients get to the cells in a flatworm’s solid, acoelomate body?

Use each of the terms below just once to complete the passage.

- coelom
- completely double internal organs
- mesoderm
- partly pseudocoelom

A roundworm has a (16) ______________ , a fluid-filled body cavity that is (17) ______________ lined with (18) ______________ . Coelomate animals have a (19) ______________ , a body cavity that is (20) ______________ surrounded by mesoderm and in which complex (21) ______________ are suspended by (22) ______________ layers of mesoderm tissue.

In your textbook, read about animal protection and support.

For each statement below, write true or false.

23. During the course of evolution, animal body plans have decreased in complexity.

24. An exoskeleton provides protection and support on the outside of an animal’s body, as well as a place for muscle attachment.

25. An endoskeleton is a support framework housed within the body, a protective enclosure for internal organs, and a brace for muscles to pull against.

26. An invertebrate is an animal with a backbone.
Answer the following questions.

1. How does the name *Porifera* relate to the structure of a sponge?

2. How do sponges obtain food from their environment?

3. Describe a sponge’s body plan.

Complete the table by writing a cell type or structure in sponges that fits each description.

<table>
<thead>
<tr>
<th>Type of Cell or Structure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>Aid in reproduction and nutrient transport</td>
</tr>
<tr>
<td></td>
<td>Help produce spicules</td>
</tr>
<tr>
<td>5.</td>
<td>Form the outside surface of body</td>
</tr>
<tr>
<td></td>
<td>Contract to close pores</td>
</tr>
<tr>
<td>6.</td>
<td>Line interior of sponge’s body</td>
</tr>
<tr>
<td></td>
<td>Use flagella to draw water through pores</td>
</tr>
<tr>
<td>7.</td>
<td>Found in jellylike substance between layers</td>
</tr>
<tr>
<td></td>
<td>Make up sponge’s support system</td>
</tr>
</tbody>
</table>

Use each of the terms below just once to complete the passage.

- external buds
- eggs
- hermaphroditic
- internal fertilization
- larvae
- sexual
- sperm

Sponges sometimes reproduce asexually by forming (8) ________________ . Being (9) ________________ , a sponge can also produce both (10) ________________ and sperm. During (11) ________________ reproduction, (12) ________________ from one sponge fertilize the eggs of another. Fertilization can be external, but (13) ________________ is more common.

Free-swimming (14) ________________ settle and develop into sessile adults.
In your textbook, read about cnidarians.

Identify each of the following descriptions as either the polyp or medusa form of a cnidarian.

1. Reef-building corals on the Great Barrier Reef
2. A. Aurelia, the moon jellyfish
3. Deep sea anemones with meter-long tentacles
4. The asexual phase in a jellyfish’s life cycle

Answer the following questions.

5. Nematocysts are characteristic of cnidarians. How does a nematocyst work?

6. Compare and contrast how food is digested in a sponge and in a cnidarian.

7. How does a nerve net function?

Order the following steps in the life cycle of a jellyfish from A to F, beginning with the release of eggs and sperm.

8. A polyp grows and buds repeatedly.
9. External fertilization takes place in the sea.
10. A zygote develops into a blastula, which develops into a larva.
11. Male and female medusae release sperm and eggs, respectively.
12. A cilia-covered larva settles onto a surface.
13. A tiny medusa breaks free from its sessile parent and drifts away.
Chapter 26

Sponges, Cnidarians, Flatworms, and Roundworms, continued

Section 26.3 Flatworms

In your textbook, read about flatworms.

For each statement below, write true or false.

1. Flatworms are bilaterally symmetrical and have a clearly defined head.

2. Adult planarians can focus well enough with their eyespots to form images of objects in their environment.

3. Flame cells play an important role in maintaining water balance in planaria.

4. A planarian uses its pharynx to locate food.

5. Planarians reproduce sexually by producing encapsulated zygotes that hatch into free-swimming larvae.

In part C of the illustration below, draw in what you think will happen to the two halves of the cut planarian. Then, answer the question.

6. 7. How is regeneration adaptive for survival in planarians?

Complete the table by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Planarian</th>
<th>Tapeworm</th>
<th>Fluke</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Lives parasitically within a host</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Body made up of proglottids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Body is thin and solid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Free-living in aquatic environments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Attaches to host’s intestine with scolex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Extends a pharynx to suck up food</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. May live in host’s blood vessels</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about roundworms.

Answer the following questions.

1. What impact do parasitic roundworms have on other organisms?

2. List three ways in which roundworms differ from flatworms.

3. What accounts for the characteristic wriggling movement of roundworms?

4. What are four of the most common parasitic roundworms that infect humans?


6. What parts of plants are most commonly susceptible to parasitic roundworms?

Below are two medical reports. After reading each report, give a preliminary diagnosis of what you think might be causing the problem.

7. **MEDICAL REPORT**
   Patient is an active 5-year-old girl. Complains about a constant itching around the anal area, especially at night.
   Preliminary Diagnosis:

8. **MEDICAL REPORT**
   Patient is a 29-year-old female Peace Corps volunteer. Lived with remote tribe whose primary food is pigs. Complains of muscle pain.
   Preliminary Diagnosis:
In your textbook, read about what a mollusk is.

The phylum *Mollusca* is a very diverse group of animals. Complete the table by checking the correct column for each characteristic.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Exhibited In:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Mollusks</td>
</tr>
<tr>
<td>1. Possess a hard, external shell</td>
<td></td>
</tr>
<tr>
<td>2. Bilaterally symmetrical</td>
<td></td>
</tr>
<tr>
<td>3. Have a mantle</td>
<td></td>
</tr>
<tr>
<td>4. Live on land</td>
<td></td>
</tr>
<tr>
<td>5. Digestive tract has two openings.</td>
<td></td>
</tr>
<tr>
<td>6. Inhabit aquatic environments</td>
<td></td>
</tr>
<tr>
<td>7. Share similar developmental patterns</td>
<td></td>
</tr>
<tr>
<td>8. Are slow-moving</td>
<td></td>
</tr>
<tr>
<td>9. Have a coelom</td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about diversity of mollusks.

Identify each mollusk shown below. Write the name of the class to which it belongs and briefly describe where it lives.

10. [Image of a snail]

11. [Image of a clam]

12. [Image of an octopus]

_________________________ ___________________________ ___________________________
_________________________ ___________________________ ___________________________
_________________________ ___________________________ ___________________________
_________________________ ___________________________ ___________________________

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In your textbook, read about a mollusk’s body systems and the diversity of mollusks.

Complete each statement.

13. Gastropods have either a(n) __________ shell or __________ shell.

14. Most mollusks have a(n) __________ circulatory system in which blood flows through __________ into open __________ around tissues and organs.

15. Most mollusks use __________ for respiration, while a garden slug uses a primitive __________ for gas exchange.

16. __________ are involved in removing wastes from a mollusk’s body.

17. Fertilization in most aquatic mollusks takes place __________.

For each statement below, write true or false.

18. All shelled gastropods are predators.

19. When a snail is disturbed, it pulls its body inside its shell for protection.

20. Without a shell, terrestrial slugs and sea slugs (nudibranchs) have no protection against predators.

21. The two shells of bivalve mollusks are held together by the mantle.

Determine whether each of the statements below best describes bivalves, gastropods, or both.

22. Nearly all feed by filtering particles from the water around them.

23. Most have a large muscular foot.

24. They use a radula for feeding.

25. Water flows through their bodies via well-developed incurrent and excurrent siphons.
In your textbook, read about cephalopods.

Answer the following questions.

26. Describe the “head-foot” region of a cephalopod.

27. What would you expect to find on the interior surfaces of a squid’s many arms?

28. How does the intelligence of an octopus compare to that of a clam?

Using what you know about the three major classes of mollusks, complete the chart below by checking the correct column(s) for each characteristic.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Type of Mollusk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gastropods</td>
</tr>
<tr>
<td>29. Intelligent, with a well-developed nervous system</td>
<td></td>
</tr>
<tr>
<td>30. Have no distinct head</td>
<td></td>
</tr>
<tr>
<td>31. Have an open circulatory system</td>
<td></td>
</tr>
<tr>
<td>32. External shells present in some species</td>
<td></td>
</tr>
<tr>
<td>33. All species are carnivorous predators.</td>
<td></td>
</tr>
<tr>
<td>34. Use a radula in feeding</td>
<td></td>
</tr>
<tr>
<td>35. All use gills for both respiration and food collection</td>
<td></td>
</tr>
<tr>
<td>36. Bite prey with a beak</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about segmented worms, including the Inside Story about earthworms.

Use each of the terms below just once to complete the passage:

- Annelida
- bristleworms
- earthworms
- muscles
- parapodia
- segments
- setae

Members of the phylum **(1)** ______________ all have bodies made up of multiple **(2)** ______________. Each segment has its own **(3)** ______________ that function to lengthen and shorten the worm’s body. When present, bristlelike **(4)** ______________ act as anchors while the worm is moving along. In **(5)** ______________, each segment has a pair of **(6)** ______________.

The most familiar annelids are probably **(7)** ______________.

**If the statement is true, write true. If it is not, rewrite the italicized part to make it true.**

8. Earthworms have a *mouth with tiny teeth* in which food particles are ground up before entering the digestive tract. _____________________________________________________________________

9. Blood is pumped throughout an earthworm’s closed circulatory system by *an elongated, four-chambered heart*. ___________________________________________________________________

10. Some body segments in annelids are *specialized for reproduction*. ________________________________

Below are the field notes of a biologist studying several newly collected annelid worms. Write the type of annelid—earthworm, bristleworm, or leech—being described.

11. Collected in rain forest of Papua, New Guinea; very active; flattened, with 32 body segments; has suckers on the ends of its body; no setae

   Type of annelid: ________________________________

12. Found crawling over corals on a reef; contains only eggs; no male reproductive organs; well-developed parapodia

   Type of annelid: ________________________________

13. Uncovered in top layer of moist soil; body has minute setae on ventral surface of each segment; hermaphroditic

   Type of annelid: ________________________________
Chapter 28 Arthropods

Section 28.1 Characteristics of Arthropods

In your textbook, read about what an arthropod is and exoskeletons.

Answer the following questions.

1. What is the most distinguishing arthropod characteristic?

2. Explain the advantage of having appendages with joints.

3. List three functions of an arthropod exoskeleton.

In your textbook, read about molting, segmentation, and gas exchange.

Complete each statement.

4. Prior to molting, a new exoskeleton forms in the old one.

5. Many arthropods have three distinct body sections: a(n) , a(n) , and a(n) .

6. In arthropods that have a , the head and thorax are fused.

Complete the table by checking the correct column to indicate the respiratory structure you would expect to find in each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Type of Respiratory Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Book Lungs</td>
</tr>
<tr>
<td>7. freshwater crayfish</td>
<td></td>
</tr>
<tr>
<td>8. tarantula</td>
<td></td>
</tr>
<tr>
<td>9. hissing cockroach</td>
<td></td>
</tr>
<tr>
<td>10. swallowtail butterfly</td>
<td></td>
</tr>
</tbody>
</table>
Section 28.1 Characteristics of Arthropods

In your textbook, read about arthropods’ senses, body systems, and reproduction.

Identify the following as characteristics of either simple or compound eyes.

11. have multiple lenses
12. well-adapted for detecting slight movements
13. have a single, focusing-type lens
14. produce an image made up of thousands of parts

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

15. Animals produce pheromones, or low frequency sounds, that affect the behavior of others.

16. In many arthropods, large, fused ganglia act as nervous system control centers for the entire body.

17. Arthropods have an open circulatory system, in which blood leaves vessels and comes in direct contact with body tissues.

18. Respiration occurs in arthropods via the Malpighian tubules.

19. During parthenogenesis, fertilized eggs develop into offspring.

Section 28.2 Diversity of Arthropods

In your textbook, read about arthropod origins.

Answer the following questions.

20. What are the major reasons for the widespread success of arthropods?

21. From what animal group did arthropods probably evolve?

22. List three adaptations that have evolved in arthropods.
In your textbook, read about arachnids.

Circle the letter of the response that best completes the statement.

1. An animal that is not a member of the class Arachnida is
   a. a spider.  
   b. a deer tick.  
   c. a walking stick.  
   d. a dust mite.

2. In spiders, chelicerae are highly modified appendages that are adapted for
   a. holding food and injecting poison.  
   b. spinning silk and weaving webs.  
   c. chewing food.  
   d. mating and reproduction.

3. The appendages of a spider that function as sense organs are
   a. its chelicerae.  
   b. its pedipalps.  
   c. its legs.  
   d. its spinnerets.

4. After catching their prey and injecting it with poison, spiders
   a. eat the prey whole.  
   b. lay their eggs in the prey.  
   c. chew the prey into small pieces.  
   d. suck up the prey’s contents, which have been liquified with enzymes.

5. In ticks and mites, the head, thorax, and abdomen
   a. are absent.  
   b. are well-defined.  
   c. are fused into one section.  
   d. are all the same size.

6. The fact that horseshoe crabs have remained relatively unchanged for 500 million years indicates that
   a. natural selection has not taken place.  
   b. they must reproduce by parthenogenesis.  
   c. they have very little genetic diversity.  
   d. their environment has changed very little.

In your textbook, read about crustaceans, centipedes, and millipedes.

Determine if each statement is true or false.

7. Having compound eyes on movable stalks is an advantage for aquatic crustaceans whose potential predators could attack from almost any direction.

8. The legs of most crustaceans are unspecialized and used only for walking.

9. You might be more likely to see pill bugs moving around out in the open on a rainy day than on a sunny one.

10. Both centipedes and millipedes have book lungs for gas exchange.
**Arthropods, continued**

**Section 28.2 The Diversity of Arthropods**

*In your textbook, read about insects.*

Using the choices below, label the diagram of a honeybee.

- antennae
- compound eye
- legs
- mandibles
- spiracles
- wings

11. ____________________  
12. ____________________  
13. ____________________  
14. ____________________  
15. ____________________  
16. ____________________

Complete the table by checking the correct column for each statement.

<table>
<thead>
<tr>
<th>Description</th>
<th>Type of Metamorphosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Insect begins life as a fertilized egg.</td>
<td></td>
</tr>
<tr>
<td>18. Larva hatches from an egg.</td>
<td></td>
</tr>
<tr>
<td>19. Nymph repeatedly molts and increases in size.</td>
<td></td>
</tr>
<tr>
<td>20. Nymph hatches from an egg.</td>
<td></td>
</tr>
<tr>
<td>21. Pupa undergoes changes while encased in cocoon.</td>
<td></td>
</tr>
<tr>
<td>22. Adults and young usually eat the same food.</td>
<td></td>
</tr>
<tr>
<td>23. Adults are the only sexually mature form.</td>
<td></td>
</tr>
</tbody>
</table>
**Chapter 29**

**Echinoderms and Invertebrate Chordates**

**Section 29.1  Echinoderms**

In your textbook, read about echinoderms’ internal skeleton, radial symmetry, and the water vascular system.

**Answer the following questions.**

1. Describe the “spiny skin” that is a characteristic of echinoderms.

   ____________________________________________________________________________

2. In what way is being radially symmetrical an advantage for adult echinoderms?

   ____________________________________________________________________________

   ____________________________________________________________________________

   ____________________________________________________________________________

   ____________________________________________________________________________

   ____________________________________________________________________________

   ____________________________________________________________________________

   ____________________________________________________________________________

**For each item in Column A, write the letter of the matching item in Column B.**

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Has a flattened, immovable endoskeleton made up of fused plates</td>
<td>a. brittle star</td>
</tr>
<tr>
<td>4. Has thin, flexible rays made up of small, overlapping, calcified plates</td>
<td>b. sea star</td>
</tr>
<tr>
<td>5. Has a flexible endoskeleton divided into rather long, tapering rays</td>
<td>c. sand dollar</td>
</tr>
<tr>
<td>6. Has tiny, calcified plates embedded in fleshy skin</td>
<td>d. sea lily</td>
</tr>
<tr>
<td>7. Has feathery, branching rays made up of tiny, calcified plates</td>
<td>e. sea cucumber</td>
</tr>
</tbody>
</table>

**Complete the following sentences.**

8. Tube feet are part of an echinoderm’s __________________ _________________ ________________ , which is involved not only in locomotion, but also in __________________ __________________ , _________________ , and food collecting.

9. In a sea star, water enters and exits the water vascular system through a structure called the _________________ , a sievelike, disc-shaped opening on the _________________ side of the body.
In your textbook, read about sea star structure, echinoderm larvae, nutrition, nervous systems, and origins.

Label this drawing of a sea star and of a cross section of one of its rays. Use these choices:

- ampulla
- eyepot
- madreporite
- pedicellariae
- tube foot

Identify each of the following as describing either larva or an adult echinoderm.

- free-swimming
- bilaterally symmetrical
- radially symmetrical
- moves with tube feet

Determine if each of the following statements is true or false.

- If a sea urchin population underwent a population explosion, you might expect to see a rapid decline in the amount of algal life in the area.
- Sea stars and brittle stars both eat suspended organic particles.
- Most echinoderms have highly developed sense organs.
- The fact that echinoderms have deuterostome development is strong evidence that they are most closely related to chordates.
In your textbook, read about the diversity of echinoderms.

Answer the following questions.

23. List the six classes of living echinoderms and the types of animals in each class.

Complete the table by checking the column(s) that best fit(s) each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Asteroidea</th>
<th>Ophiuroidea</th>
<th>Echinoidea</th>
<th>Holothuroidea</th>
<th>Crinoidea</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. Have multiple rays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. May rupture and release internal organs when threatened</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Some members of the class are sessile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Burrow into rock or sand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Use mucus-coated tentacles for feeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Some members of the class can actively swim from place to place</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Use rays, not tube feet, for locomotion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. The most inflexible type of echinoderm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Use long, feathery arms to trap food particles drifting past</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Eat bivalves and other small animals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about invertebrate chordates.

Complete the following sentences.

1. At some time in their life, all chordates possess a _______________ , a dorsal hollow _______________ _______________ , _________________ _________________ , and a postanal tail.
2. During your early development, your notochord became your _________________ , and your pharyngeal pouches disappeared.
3. The _________________ _________________ is derived from the _________________ portion of the dorsal nerve cord, whereas the _________________ is derived from the anterior portion.
4. At some time during their lives, all chordates have a muscular _________________ .

In your textbook, read about tunicates and lancelets.

Trace the path of water through a tunicate, starting with water entering the animal's body, by numbering the following statements from 1 to 5.

5. Water leaves the pharynx region.
6. Water passes through the gill slits, which filter food out of the water.
7. Water is drawn into the body through the incurrent siphon.
8. Water passes out of the body via the excurrent siphon.
9. Water enters the pharynx, where the gill slits are located.

Complete the table by checking the correct column(s) for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Tunicates</th>
<th>Lancelets</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Only larval forms have a tail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Are filter feeders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Retain all chordate traits throughout life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Blood flow is continually reversed in the adult body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Capable of actively swimming as adults</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about invertebrates.

Study the definitions on the next page and write the terms in the appropriate spaces in the crossword puzzle below. All terms are important in the BioDigest.
ACROSS
1. In an animal with ________ symmetry, the right and left sides are mirrors of each other.
7. An echinoderm has an inner skeleton; its ________ covering is called the epidermis.
9. Bivalves, gastropods, and cephalopods are ________ .
10. Some echinoderms have long ________ that are used for locomotion.
12. The ________ have radial symmetry and a water vascular system.
16. Because arthropods have ________, fossil arthropods are frequently found.
19. ________ such as planaria have no body cavity.
21. In earthworms, internal ________ are suspended from the mesoderm.
22. In some invertebrates, an exoskeleton offers ________ and support for internal tissues.
25. A(n) ________ belongs to the phylum Cnidaria.
26. Sponges have a(n) ________ body shape.
27. In earthworms and other segmented worms, each ________ has its own muscles.
28. Some segments in chordates have been modified into stacked layers called (2 words) ________ .
29. In arthropods like grasshoppers, a set of jointed appendages called antennae are adapted to give the insect acute ________ .

DOWN
1. The mouthparts of an arthropod may be adapted for such things as chewing, lapping, or ________ .
2. Echinoderms ________ have bilateral symmetry, while adults have radial symmetry.
3. ________ go through metamorphosis during their life cycles.
4. A dorsal nerve ________ is a hollow, fluid-filled canal lying above the notochord.
5. Setae, or small bristles, help earthworms with ________ .
6. Mesoderm differentiates into ________, circulatory vessels, and reproductive organs.
8. Echinoderms have a supporting ________, which is inside of the body instead of outside.
11. The ________ of a mollusk such as a clam is secreted by the mantle.
13. A(n) ________ functions as a watery skeleton against which muscles can work.
14. Many ________ are parasitic, such as plant-parasitic nematodes.
15. Arthropods are characterized by having a wide variety of ________ for feeding.
17. The ________ of a cnidarian is found in a highly specialized stinging cell.
18. ________ are made up of two cell layers and have only one body opening.
20. Special ________ feet enable sea stars to move from place to place.
22. Water enters a sponge through ________ .
23. A jellyfish, a(n) ________, and an anemone are types of cnidarians.
24. Bivalves acquire food by filtering water through their ________ .
26. A radula is a tonguelike organ used by snails to scrape ________ from surfaces.
In your textbook, read about what is a fish.

Complete each statement.

1. All vertebrates are in the phylum _________________, and fish, amphibians, reptiles, birds, and mammals are in the subphylum _________________.

2. Vertebrates are bilaterally symmetrical, coelomate animals with endoskeletons, closed ______________ systems, complex ______________, and efficient ______________ systems.

3. If you compared the number of fish species to the number of all other vertebrate species combined, there would be more species of ________________.

Complete the table below to compare the three different kinds of fishes.

<table>
<thead>
<tr>
<th>Class</th>
<th>Kind of Fish</th>
<th>Jaws?</th>
<th>Skeleton</th>
<th>Fertilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. ____________</td>
<td>Lamprey and Hagfish</td>
<td>5. ___</td>
<td>6. ______</td>
<td>7. ______</td>
</tr>
<tr>
<td>Chondrichthyes</td>
<td>8. ________________</td>
<td>9. ___</td>
<td>Cartilage</td>
<td>10. ________________</td>
</tr>
<tr>
<td>11. ____________</td>
<td>12. ________________</td>
<td>Yes</td>
<td>13. ______</td>
<td>External and Internal</td>
</tr>
</tbody>
</table>

Answer the following questions.

14. How does a fish breathe through its gills?

15. What two adaptations of cartilaginous and bony fishes help them to locate food?
In your textbook, read about bony fishes.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

16. While spawning, a female bony fish may lay millions of eggs to be fertilized externally by the male, but only a few will survive. ____________________________________________________________________

17. The development of bone was an important event in the evolution of vertebrates because it eventually allowed them to move onto land and support their body weight. _______________________________

18. The backbone, comprised of separate gills, was a major evolutionary event for fishes because it provided support as well as flexibility, which helped to propel them through the water. _______________

19. The swim bladder, an organ found in bony fishes, allows fishes to control their depth in water.

In your textbook, read about origins of fishes.

Examine the phylogenetic tree below. Then answer the question that follows.

20. Which group of fishes do you think are most closely related to ancestral amphibians? Why?

__________________________________________________________________________

__________________________________________________________________________
In your textbook, read about what is an amphibian.

Answer the following questions.

1. What three orders make up the class Amphibia?

2. Why do amphibian eggs need to be laid in water?

3. Where does an amphibian heart pump oxygen-rich blood, and where does it pump oxygen-poor blood?

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>__________ 4. Adult frogs and toads have legs, lungs, and</td>
<td>a. two-chambered</td>
</tr>
<tr>
<td>a ________ heart.</td>
<td></td>
</tr>
<tr>
<td>__________ 5. Tadpoles have gills, fins, and a ________ heart.</td>
<td>b. three-chambered</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>__________ 6. Amphibians are ________ , animals</td>
<td>c. skin</td>
</tr>
<tr>
<td>whose body temperature changes with the temperature of their</td>
<td></td>
</tr>
<tr>
<td>surroundings.</td>
<td></td>
</tr>
<tr>
<td>__________ 7. Fertilized amphibian eggs hatch into ________</td>
<td>d. tadpoles</td>
</tr>
<tr>
<td>during the aquatic phase of their life.</td>
<td></td>
</tr>
<tr>
<td>__________ 8. Some salamanders have no lungs and</td>
<td>e. ectotherms</td>
</tr>
<tr>
<td>breathe through their ________.</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about the characteristics and diversity of amphibians.

Circle the letter of the response that best completes the statement.

9. Early amphibians needed large amounts of food and oxygen to
   a. walk on land.  
   b. breathe on land.  
   c. become dormant in cold weather.  
   d. all of these.

10. In many amphibians, the most important organ for gas exchange is the
    a. blood.  
    b. skin.  
    c. lungs.  
    d. circulatory system.

11. Many frogs and toads use ________ as a defense against predators.
    a. toxins
    b. electricity
    c. sharp claws
    d. all of these

12. Frogs and toads have sound-producing bands of tissues in their throat called
    a. tongues.  
    b. vocal cords.  
    c. vocal tissue.  
    d. none of these.

13. Salamanders are unlike frogs and toads because they have
    a. long, slender bodies.  
    b. tails.  
    c. necks.  
    d. all of these.

14. Caecilians are amphibians that have no
    a. eyes.  
    b. skin.  
    c. limbs.  
    d. heart.

In your textbook, read about the origins of amphibians.

For each statement below, write true or false.

15. Ancestral amphibians appeared on Earth about the same time as ancestral fishes.

16. Amphibians probably evolved from tetrapods during the Paleozoic Era.

17. Because the climate was hot and dry when amphibians first appeared on Earth, they had to stay near water.

18. Like present-day salamanders, early amphibians probably had legs set at right angles to the body.

19. Because amphibians were a transitional group, they never were the dominant vertebrates on land.
In your textbook, read about what is a reptile and the amniotic egg.

Complete the following table about reptilian adaptations and their advantages by writing in the missing information in each case.

<table>
<thead>
<tr>
<th>Adaptation</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>In crocodilians, oxygenated and deoxygenated blood kept separate; higher level of energy production</td>
</tr>
<tr>
<td>2. Thick, scaly skin</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Water not necessary for fertilization</td>
</tr>
<tr>
<td>4. Legs positioned for walking and running on land</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Water not necessary for reproduction; young not overly vulnerable to aquatic predators; prevents injury or dehydration of embryo</td>
</tr>
<tr>
<td>6.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
</tr>
</tbody>
</table>

Label the diagram below, using these choices:

albumen  allantois  amnion  chorion  embryo  shell  yolk sac

6. __________
7. __________
8. __________
9. __________
10. __________
11. __________
12. __________
In your textbook, read about the diversity of reptiles and the origins of reptiles.

Complete the chart by checking the correct column(s) for each characteristic.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Snakes</th>
<th>Lizards</th>
<th>Turtles</th>
<th>Crocodiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Guard their nests against predators</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>14. Possess shells</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>15. Use tongue and Jacobsen’s organ for smelling</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>16. Kill prey by drowning it</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>17. Lack limbs</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>18. Have vertebrae and ribs fused to a carapace</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>19. Some change color dramatically</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>20. Lack teeth</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>21. Some inject venom with fangs</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>22. Some are aquatic</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>23. Are primarily insect eaters</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>24. Include marine species that migrate</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

Complete each sentence.

25. During the Mesozoic Era, _________________ were the most abundant land vertebrates.

26. Snakes and lizards are descended from early _________________ _________________, which in turn were descended from _________________.

27. _________________ are probably the modern, living descendants of some type of dinosaur.
In your textbook, read about **what is a bird**.

**Answer the following questions.**

1. From what type of animal are birds thought to have evolved?

2. List three physical features of birds that link them to reptilian ancestors.

3. Besides making flight possible, what other functions do feathers serve?

4. By what process are old feathers replaced?

In your textbook, read about **how birds are adapted for flight**.

**If the statement is true, write true. If it is not, rewrite the italicized part to make it true.**

5. A bird’s sternum is the **point of attachment for its flight muscles**.

6. Being endothermic, birds have a body temperature that **fluctuates with environmental temperature**.

7. Because of its energy requirements, you might expect a bird to eat less than a reptile of comparable size.

8. Hollow bones is an adaptation that makes birds **more efficient predators**.

9. Birds grind up their food in a muscular **gizzard**.

10. The air inside a bird’s lungs always has a fairly high **carbon dioxide** content, which makes for efficient gas exchange.

11. For a bird such as a goose or a duck, down feathers are the key to its superior **waterproofing**.
In your textbook, read about the diversity of birds.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. long beak that is used for dipping into flowers to obtain nectar</td>
<td>a. owl</td>
</tr>
<tr>
<td>13. wings and feet modified for swimming; body surrounded with a thick layer of insulating fat</td>
<td>b. pelican</td>
</tr>
<tr>
<td>14. short, stout beak that is adapted to cracking seeds</td>
<td>c. hummingbird</td>
</tr>
<tr>
<td>15. feathered legs and feet that make it easier to walk in the snow</td>
<td>d. penguin</td>
</tr>
<tr>
<td>16. huge beak with a pouch that is used as a net for capturing fish</td>
<td>e. ptarmigan</td>
</tr>
<tr>
<td>17. large eyes, an acute sense of hearing, and sharp claws; adapted for nocturnal predation</td>
<td>f. goldfinch</td>
</tr>
</tbody>
</table>

In your textbook, read about the origins of birds.

Complete each statement.

18. The fossil record of birds is incomplete because bird skeletons are ___________ and ___________.

19. Unlike modern birds, ___________ had ___________, a long ____________, and ___________ ___________ ___________ ___________.

20. Scientists hypothesize that ___________ used its feathers for ___________, ___________, or ___________ ___________ ___________, rather than for flight.
**Mammals**

In your textbook, read about what is a mammal, and mammalian hair.

**Answer the following questions.**

1. Why are mammals able to live in almost every possible environment on Earth?

2. How do sweat glands help regulate body temperature?

**Complete the table by checking the column that best fits each example.**

<table>
<thead>
<tr>
<th>Example</th>
<th>Serves As:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Camouflage</td>
</tr>
<tr>
<td>3. The striped fur of a tiger</td>
<td></td>
</tr>
<tr>
<td>4. The sharp quills of a porcupine</td>
<td></td>
</tr>
<tr>
<td>5. A skunk’s black-and-white striped fur</td>
<td></td>
</tr>
<tr>
<td>6. The white winter coat of an arctic hare</td>
<td></td>
</tr>
<tr>
<td>7. The white hair patch on a pronghorn</td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about how mammals nurse their young, and about respiration and circulation.

**Complete each statement.**

8. Female mammals feed their young with milk produced by __________________ ________________ .

9. In addition to milk and sweat, the glands of mammals produce __________________ , __________________ , and __________________ .

10. The milk of mammals is rich in __________________ , sugars, __________________ , minerals, and __________________ .

11. A mammal’s muscular __________________ expands the ____________ ______________ bring air into the lungs with each breath.

12. Like birds, mammals have __________________ hearts in which __________________ ____________ is kept entirely separate from __________________ ________________ .
Chapter 32: Mammals, continued

Section 32.1 Mammal Characteristics

In your textbook, read about mammalian teeth, limbs, and learning.

Determine if the statement is true or false.

13. The size and shape of a mammal’s teeth can give valuable clues about its diet.
14. Plant-eaters such as horses and cows have well-developed canine teeth for piercing food.
15. The teeth of mammals are generally more uniform than the teeth of fishes and reptiles.
16. By chewing their cud and then swallowing it, some mammals help bacteria break down the cellulose in their food.
17. Mammalian limbs are adapted for a variety of methods of food gathering.
18. Moles use their opposable thumbs to grasp objects.
19. One reason mammals are successful is that they guard their young and teach them survival skills.
20. Complex nervous systems and highly developed brains make it possible for many kinds of mammals to learn.

Circle the letter of the response that best completes the statement.

21. Premolars and molars are used for
   a. shearing.  b. crushing.  c. grinding.  d. all of these.
22. Cud chewing is an adaptation found in
   a. bears and other omnivores.  b. tigers and other carnivores.  d. all of these.
23. The limbs of antelopes are characterized by
   a. greatly elongated finger bones.  b. strong, slender bones.  d. none of these.
24. Chimpanzees are intelligent enough to
   a. use tools.  b. use sign language.  d. all of these.
In your textbook, read about placental mammals, mammals with a pouch, and egg-laying mammals.

Answer the following questions.

1. What is a placental mammal?

2. What is the relationship between body size and gestation period in placental mammals?

3. Why are most marsupials found only in and around Australia?

4. What characteristic sets monotremes apart from all other mammals?

Complete the table by checking the correct column(s) for each characteristic.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Type of Mammal</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Give birth to young</td>
<td>Placental</td>
</tr>
<tr>
<td>6. Young nourished by a placenta during the entire development period</td>
<td>Marsupial</td>
</tr>
<tr>
<td>7. Have a permanent pouch on abdomen</td>
<td>Monotreme</td>
</tr>
<tr>
<td>8. Produce milk in mammary glands</td>
<td></td>
</tr>
<tr>
<td>9. Lay eggs</td>
<td></td>
</tr>
<tr>
<td>10. Include echidnas and duck-billed platypuses</td>
<td></td>
</tr>
<tr>
<td>11. Have hair</td>
<td></td>
</tr>
<tr>
<td>12. Comprise about 95 percent of all mammals</td>
<td></td>
</tr>
<tr>
<td>13. Exhibit parental care</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about the origins of mammals.

Use each of the terms below just once to complete the passage.

climate  dinosaurs  insect-eating  mammals  Pangaea  reptiles  therapsids

Roughly 200 million years ago, the first (14) ____________ began roaming Earth. Most were small (15) ____________ descendants of (16) ________________, animals that had characteristics in common with both mammals and (17) _____________. The breakup of (18) _____________, the sudden disappearance of the (19) ________________, and a changing (20) _______________ provided early mammals with new food sources and habitats.

Examine the phylogenetic tree below. Then answer the question that follows.

21. What group of animals is represented by the letter A above? ________________________________
In your textbook, read about what behavior is, inherited behavior, automatic responses to stimuli, and instinctive behavior.

Answer the following questions.

1. What is meant by animal behavior?

2. How is behavior adaptive?

3. Explain the relationship between innate behaviors and genetics.

4. What is an instinct?

Identify each of the following as being either a reflex or an instinct.

5. You leap up after sitting down in shorts on a hot car seat.

6. A sea turtle returns to the beach where she was hatched, in order to lay her eggs.

7. A giant clam closes its shell when a shadow falls across it.


In your textbook, read about courtship behavior and territoriality.

Determine if the following statements are true or false.

9. Courtship behavior is something only male animals can instinctively perform.

10. Courtship behavior is adaptive because it ensures that members of the same species can recognize each other and mate.

11. A territory is a physical space that one animal defends against all other species of animals.

12. Setting up territories reduces conflicts between members of the same species.
In your textbook, read about aggressive behavior, submission, and behavior resulting from internal and external cues.

Below are excerpts from the field notebook of a behavioral biologist. Identify the behavioral phenomenon being described in each case.

13. Field Notes
A large male baboon stares at another male and then suddenly “yawns” to reveal his long, sharp fangs.

Behavior Exhibited:

14. Field Notes
When a herd of elephants arrives at a waterhole, the oldest female drinks first, followed by three females with calves, and finally a young male.

Behavior Exhibited:

15. Field Notes
After fighting briefly with an older pack member, a young wolf stops fighting and rolls onto her back with her tail tucked between her legs and her eyes averted.

Behavior Exhibited:

16. Field Notes
Large numbers of monarch butterflies fly south to roost in the winter.

Behavior Exhibited:

Complete the following sentences.

17. The type of dominance hierarchy formed by chickens is called a(n) ______________ ____________ .

18. A cycle of behavior that occurs roughly every 24 hours is known as a(n) ______________ ________________ .

19. Some animals use the positions of the ______________ ______________ to navigate. Others may use ______________ clues or Earth’s ______________ ________________ .

20. ______________ is similar to hibernation, in that metabolic activity ______________ in response to internal and external cues.
In your textbook, read about learned behavior.

Answer the following questions.

1. What is learned behavior?

2. What is a major advantage of being able to learn?

Complete the table by checking the correct column for each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Type of Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. A dog catching a disk</td>
<td>Learned</td>
</tr>
<tr>
<td>4. A dog scent-marking a tree with urine</td>
<td>Innate</td>
</tr>
<tr>
<td>5. A parrot saying “Polly want a cracker”</td>
<td>Learned</td>
</tr>
<tr>
<td>6. A young lioness stalking prey with her mother</td>
<td>Innate</td>
</tr>
<tr>
<td>7. A woodchuck going underground to hibernate</td>
<td>Learned</td>
</tr>
</tbody>
</table>

In your textbook, read about habituation, imprinting, and learning by trial and error.

For each item in Column A, write the letter of the matching item in Column B.

Column A                                                                 Column B

8. You stay with relatives who have a clock that chimes every hour. The first two nights, the chimes keep you awake, but after that you no longer notice them.  
   a. imprinting

9. A boy receives a day-old duckling as gift. It soon follows the boy wherever he goes.  
   b. trial-and-error learning

10. A young woman takes up archery. At first, her arrows don’t hit the target, but after a week of practice, she is hitting the bull’s eye fifty percent of the time. 
    c. habituation
In your textbook, read about conditioning and insight.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

11. Learning by repeating something over and over is known as conditioning. _________________________

12. In Pavlov's conditioning experiments, the *innate reflex of salivating* was the stimulus that the dogs learned to associate with food. __________________________________________________________

13. Once conditioned, Pavlov's dogs would salivate at the sound of the bell *even when no food was present*. __________________________________________________________

14. A child figuring out how to use a chair to reach a cookie jar is an example of *trial and error*. __________________________________________________________

15. Insight is learning in which an animal uses *previous experience* to respond to a new situation. __________________________________________________________

In your textbook, read about the role of communication.

Use each of the terms below just once to complete the passage.

<table>
<thead>
<tr>
<th>behavior</th>
<th>communication</th>
<th>information</th>
<th>innate</th>
<th>language</th>
</tr>
</thead>
<tbody>
<tr>
<td>meanings</td>
<td>odors</td>
<td>pheromones</td>
<td>sounds</td>
<td>symbols</td>
</tr>
</tbody>
</table>

Through various forms of (16) _____________________, animals exchange (17) _____________________ that affects their (18) _____________________. Animals can communicate with visual signals, by touching each other, and by producing (19) _____________________, some of which can be heard over great distances. Communicating with (20) _____________________ is another strategy; (21) _____________________ are species-specific odor chemicals that can have a powerful effect on behavior. Some types of communication involve both (22) _____________________ and learned behavior. Human (23) _____________________ has evolved as a way of communicating with written and spoken (24) _____________________ that have specific (25) _____________________.

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In your textbook, read about fishes, amphibians, reptiles, birds, and mammals.

**FISHES**

Complete the chart by checking the correct column(s) for each characteristic of fishes.

<table>
<thead>
<tr>
<th>Adaptation</th>
<th>Jawless</th>
<th>Cartilaginous</th>
<th>Bony</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Jaws</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Gills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Lateral line system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Paired fins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Skeleton made of cartilage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Swim bladder</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**AMPHIBIANS**

Complete the following sentences.

7. Amphibians are ________________ , animals that have variable body temperatures and obtain heat from external sources. These vertebrates also carry out gas exchange through their ________________ . Most amphibians live on ________________ but reproduce in ________________ . Almost all amphibians go through ________________ , a radical change between the form of the young and the form of the adult.

**REPTILES**

Complete the table by describing the advantages that reptiles have because of certain adaptations. List one advantage for each adaptation.

<table>
<thead>
<tr>
<th>Adaptation</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Scaly skin</td>
<td></td>
</tr>
<tr>
<td>9. Amniotic egg</td>
<td></td>
</tr>
</tbody>
</table>
BIRDS

Flight affects almost every system in birds. Explain the flight adaptations in each system listed here.

<table>
<thead>
<tr>
<th>System</th>
<th>Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Bones</td>
<td></td>
</tr>
<tr>
<td>11. Respiration</td>
<td></td>
</tr>
<tr>
<td>12. Body covering</td>
<td></td>
</tr>
<tr>
<td>13. Legs</td>
<td></td>
</tr>
<tr>
<td>14. Wings</td>
<td></td>
</tr>
</tbody>
</table>

MAMMALS

Various adaptations of mammals serve certain functions. In the space provided, write the letter of the adaptations that perform the function. Any letter may be used more than once.

<table>
<thead>
<tr>
<th>Function</th>
<th>Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. protection from low temperatures</td>
<td>a. hair</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>16. protection from high temperatures</td>
<td>b. sweat glands</td>
</tr>
<tr>
<td></td>
<td>c. four-chambered heart</td>
</tr>
<tr>
<td>17. feeding young</td>
<td>d. diaphragm</td>
</tr>
<tr>
<td></td>
<td>e. canine teeth</td>
</tr>
<tr>
<td>18. stabbing or holding food</td>
<td>f. mammary glands</td>
</tr>
<tr>
<td></td>
<td>g. small ears</td>
</tr>
<tr>
<td>19. grinding or chewing food</td>
<td>h. body fat</td>
</tr>
<tr>
<td></td>
<td>i. molars and premolars</td>
</tr>
<tr>
<td>20. providing large amounts of oxygen</td>
<td>j. hibernation</td>
</tr>
<tr>
<td></td>
<td>k. estivation</td>
</tr>
</tbody>
</table>
Protection, Support, and Locomotion

Chapter 34

Section 34.1 Skin: The Body’s Protection

In your textbook, read about the structure and function of the skin.

Complete the table by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Epidermis</th>
<th>Dermis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The outermost layer of skin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Contains connective tissue, glands, and muscles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The thicker, inner layer of skin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Partly composed of dead, keratin-containing cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Contains pigmented cells that protect against the sun’s rays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Hair follicles grow out of this layer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Site of continual mitotic cell divisions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Richly supplied with blood vessels and nerves</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Answer the following questions.

9. Describe the change that takes place in your skin when you are exposed to ultraviolet light.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

10. How does skin help regulate body temperature?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

11. List three other functions of skin.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
In your textbook, read about the structure of the skeletal system and joints.

Identify the following as being part of the axial or appendicular skeleton.

1. the tarsals, metatarsals, and phalanges in your foot
2. the seven vertebrae in your neck
3. your rib cage
4. the bones in your shoulder
5. your lower jaw
6. the humerus in your arm

For each answer below, write an appropriate question.

7. Answer: They are bands of connective tissue that attach muscles to bones.
   Question: ________________________________________________

8. Answer: Fluid-filled sacs that reduce friction between bones in a joint.
   Question: ________________________________________________

9. Answer: They connect bones to other bones.
   Question: ________________________________________________

10. Answer: One allows the bones to move back and forth; the other allows the bones to rotate.
   Question: ______________________________________________

In your textbook, read about the formation of bone and bone growth.

Complete each sentence.

11. In a human embryo’s skeleton, ____________ is gradually replaced by ____________ except in a few places like the tip of the ____________.

12. Some cells in cartilage are stimulated to become _____________. They secrete a substance in which ____________ ____________ and other minerals are deposited.

13. Your bones increase in length near their ____________.

14. Even after you reach your full adult height, the bone-forming cells in your body will still be involved in ____________ and ____________.
Chapter 34
Protection, Support, and Locomotion, continued

In your textbook, read about compact and spongy bone and skeletal system functions.

Answer the following questions.

15. If you cut through to the center of a large leg bone, what bone components (in order, from the outside in) would you encounter?

16. How do blood vessels and nerves reach individual bone cells in compact bone?

17. What role does bone marrow play in the functioning of your circulatory system?

18. In what way is the skeleton a storehouse?

In your textbook, read about growth, mineral storage, and injury and disease in bone.

Determine if the statement is true or false.

19. Once you have finished growing, your bones no longer change.

20. Calcium is both deposited in and removed from bones.

21. Calcium removed from bone is rapidly excreted in the urine as an unnecessary body waste.

22. As a person ages, his or her bone density usually decreases.

23. Because bones in an adult’s skeleton are harder than children’s bones, adults are less likely to break a bone in a fall.

24. Osteoporosis is most common in older women because they rarely include milk in their diet.
In your textbook, read about three types of muscles and skeletal muscle contraction.

Complete the table by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Type of Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. under voluntary control</td>
<td>Smooth</td>
</tr>
<tr>
<td>2. striated</td>
<td>Skeletal</td>
</tr>
<tr>
<td>3. slow, prolonged contractions</td>
<td>Cardiac</td>
</tr>
<tr>
<td>4. attached to bones</td>
<td></td>
</tr>
<tr>
<td>5. found only in the heart</td>
<td></td>
</tr>
<tr>
<td>6. not under voluntary control</td>
<td></td>
</tr>
<tr>
<td>7. lines cavities and surrounds organs</td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about muscle strength and exercise.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

8. Muscle strength depends on *the number of fibers in a muscle*.

9. When oxygen is limited, *aerobic respiration* becomes a muscle’s primary source for ATP.

10. During lactic acid fermentation, *oxygen* builds up in muscle cells.

11. A drop in the amount of lactic acid in the bloodstream indicates that muscular activity has decreased.
In your textbook, read about the functions of the digestive tract, the mouth, and the stomach.

Complete each statement.

1. The entire process of digestion involves first __________________________ food, then __________________________ it into simpler compounds, then __________________________ nutrients for use by body cells, and, finally, __________________________ wastes.

2. By chewing your food, you __________________________ its surface area.

3. Various enzymes play a role in __________________________ digestion, while the action of teeth, tongue, and muscles are involved in __________________________ digestion.

4. In your mouth, the enzyme __________________ is released from __________________ glands to begin the chemical breakdown of __________________________ .

5. Your __________________________ are adapted for cutting food, while your __________________________ are best suited for grinding food.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

6. During swallowing, the epiglottis covers the esophagus to prevent choking.

   __________________________

7. Food is moved through the digestive tract by rhythmic waves of voluntary muscle contractions called peristalsis.

   __________________________

8. The churning actions of the stomach help mix the food with pancreatic juices.

   __________________________

9. Pepsin is a protein-digesting enzyme that only works in an acidic environment.

   __________________________

10. The stomach releases its contents into the small intestine suddenly, all at once.
In your textbook, read about the small intestine and the large intestine.

Answer the following questions.

11. What role do the enzymes secreted by the pancreas play in the digestive process?

12. Explain the relationship between the liver, the gallbladder, and bile.

13. Once in the small intestine, what happens to
   a. digested food?

   b. indigestible materials?

Complete the table by checking the correct column(s) for each function.

<table>
<thead>
<tr>
<th>Function</th>
<th>Small Intestine</th>
<th>Large Intestine</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Water is absorbed through walls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Digestion is essentially completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Vitamin K is produced.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Nutrients are absorbed by villi.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Contents are moved by peristalsis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Indigestible material is collected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Bile and pancreatic juices are added.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about carbohydrates, fats, and proteins.

Complete the table by checking the correct column(s) for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Carbohydrates</th>
<th>Fats</th>
<th>Proteins</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. the most energy-rich nutrients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. sugars, starches, and cellulose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. broken down into amino acids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. part of a nutritious, balanced diet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. normally used for building muscle, but can be used for energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. broken down into glucose, fructose, and other simple sugars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. used to insulate the body from cold</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about minerals and vitamins, water, and metabolism and calories.

Complete each statement.

8. ___________________________ are inorganic substances that help to build tissue or take part in chemical reactions in the body.

9. Unlike minerals, ___________________________ are organic nutrients that help to regulate body processes.

10. The two major vitamin groups are the ___________________________ and the ___________________________ vitamins.

11. The energy content of food is measured in ___________________________ , each of which is equal to ___________________________ calories.

12. Despite the claims of many fad diets, the only way to lose weight is to __________________________ more calories than you __________________________ .
Complete each statement.

1. Internal control of the body is handled by the ___________________________ system and the ___________________________ system.

2. Most endocrine glands are controlled by the action of the ___________________________ , or master gland.

3. A(n) ___________________________ is a chemical released in one part of the body that affects another part.

4. The amount of hormone released by an endocrine gland is determined by the body's ___________________________ for that hormone at a given time.

5. A ___________________________ system is one in which hormones are fed back to inhibit the original signal.

6. When your body is dehydrated, the pituitary releases ADH hormone, which reduces the amount of ___________________________ in your urine.

7. When you have just eaten and your blood glucose levels are high, your pancreas releases the hormone ___________________________ , which signals the liver to take in glucose, thereby lowering blood glucose levels.

In your textbook, read about hormone action, adrenal hormones and stress, and other hormones.

For each item in column A, write the letter of the matching item from Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>a. steroid hormones</td>
</tr>
<tr>
<td>9.</td>
<td>b. glucocorticoids and aldosterone</td>
</tr>
<tr>
<td>10.</td>
<td>c. calcitonin and parathyroid hormone</td>
</tr>
<tr>
<td>11.</td>
<td>d. epinephrine and norepinephrine</td>
</tr>
<tr>
<td>12.</td>
<td>e. amino acid hormones</td>
</tr>
<tr>
<td>13.</td>
<td>f. thyroxine</td>
</tr>
</tbody>
</table>
In your textbook, read about neurons—basic units of the nervous system.

Complete the table by filling in the missing information in each case.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>carry impulses toward the brain and spinal cord</td>
</tr>
<tr>
<td>2. dendrites</td>
<td></td>
</tr>
<tr>
<td>3. motor neurons</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>transmit impulses within the brain and spinal cord</td>
</tr>
<tr>
<td>5.</td>
<td>carry impulses away from neuron cell bodies</td>
</tr>
</tbody>
</table>

Order the steps in impulse transmission from 1 to 7.

6. A wave of depolarization moves down the neuron.

7. The Na⁺/K⁺ pump takes over again, pumping sodium ions out across the membrane, and pumping potassium ions in.

8. Sodium channels in the neural membrane open.


10. As the wave of depolarization passes, sodium channels close and potassium channels open.

11. The neuron returns to a resting state.

12. Sodium ions flow into the neuron, causing the inside of the neuron to become positively charged.
In your textbook, read about the central nervous system and the peripheral nervous system.

Label the diagram of the brain to show the cerebrum, cerebellum, and brain stem.

Write the name of the part labeled above that matches each description in the table.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Includes the medulla and pons</td>
<td></td>
</tr>
<tr>
<td>17. Controls conscious activities and movement</td>
<td></td>
</tr>
<tr>
<td>18. Important for keeping your balance</td>
<td></td>
</tr>
<tr>
<td>19. If damaged, heart rate might be affected</td>
<td></td>
</tr>
<tr>
<td>20. If damaged, memory might be affected</td>
<td></td>
</tr>
<tr>
<td>21. Ensures that movements are coordinated</td>
<td></td>
</tr>
</tbody>
</table>

Complete the table by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Autonomic Nervous System Division</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sympathetic</td>
</tr>
<tr>
<td>22. Controls internal activities when the body is at rest</td>
<td></td>
</tr>
<tr>
<td>23. Increases breathing rate</td>
<td></td>
</tr>
<tr>
<td>24. Tenses muscles</td>
<td></td>
</tr>
<tr>
<td>25. Slows heart rate down</td>
<td></td>
</tr>
<tr>
<td>26. Activates fight or flight response</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about sensing chemicals and sensing light.

Determine if each statement is true or false.

1. Impulses coming from sensory receptors in your nose and mouth are interpreted as odors and tastes by the cerebrum.

2. The senses of taste and smell are closely linked.

3. The lens in the eye controls the amount of light that strikes the retina.

4. On a bright sunny day, the cones in your eyes play a greater role in your sense of sight than the rods.

5. Only the left hemisphere of the brain is involved in the sense of sight.

6. When you are looking at an object, each of your eyes sees the object from the same perspective.

7. The retina contains two types of light receptor cells.

In your textbook, read about sensing mechanical stimulation.

Circle the letter of the response that best completes each statement.

8. Sound waves are converted into nerve impulses inside the
   a. ear canal.  
   b. cochlea.  
   c. malleus.  
   d. optic nerve.

9. If the semicircular canals in one of your ears were damaged, you might
   a. lose your ability to hear low-frequency sounds.  
   b. lose your ability to coordinate your neck muscles.  
   c. lose your sense of balance.  
   d. lose your sense of rhythm.

10. The malleus, incus, and stapes are found in the
    a. outer ear.  
    b. eardrum.  
    c. middle ear.  
    d. inner ear.

11. Your senses of hearing and touch both depend on nerve impulses being generated by
    a. electrical stimulation.  
    b. sound waves.  
    c. a change in temperature.  
    d. mechanical stimulation.

12. In the skin of your fingertips, you might expect to find receptors for
    a. touch.  
    b. pressure.  
    c. pain.  
    d. all of these.
In your textbook, read about how drugs act on the body, their medicinal uses, and abuse of drugs.

Answer the following questions.

1. Distinguish between a drug and a medicine.

2. What is a narcotic?

3. Compare the effect of a stimulant on the CNS with the effect of a depressant.

4. What is an addiction?

5. How does a person’s body develop a tolerance for a drug?

In your textbook, read about the classes of commonly abused drugs.

Complete the table by checking the correct column for each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Stimulant</th>
<th>Depressant</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Drugs that cause an increase in heart rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Alcohol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Nicotine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Caffeine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Barbiturates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Drugs that cause vasoconstriction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Opiates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Hallucinogens</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Respiration, Circulation, and Excretion

In your textbook, read about air passageways and lungs.

Circle the letter of the choice that best completes the statement or answers the question.

1. During the process of respiration,
   a. oxygen is delivered to body cells.
   b. carbon dioxide is expelled from the body.
   c. oxygen is used in cells to produce ATP.
   d. all of these.

2. When you swallow, your epiglottis momentarily covers the top of the trachea so that
   a. you can swallow more easily.
   b. you can breathe more easily.
   c. you don't get food in your air passages.
   d. you can cough up foreign matter.

3. The cilia that line your trachea and bronchi
   a. produce dirt-trapping mucus.
   b. help in the exchange of oxygen and CO₂.
   c. move mucus and dirt upward.
   d. only beat when you inhale.

4. The first branches off the trachea are called
   a. bronchioles.
   b. bronchi.
   c. arterioles.
   d. alveoli.

5. Inside the alveoli, carbon dioxide and oxygen
   a. are exchanged between air and blood.
   b. are transported along microscopic tubules.
   c. are produced inside cells.
   d. are exchanged for other gases.

6. Which is the correct sequence for the path of oxygen through the respiratory system?
   a. nasal passages, bronchi, trachea, bronchioles, cells, blood, alveoli
   b. cells, blood, alveoli, bronchioles, bronchi, trachea, nasal passages
   c. nasal passages, blood, alveoli, bronchi, cells, trachea, bronchioles
   d. nasal passages, trachea, bronchi, bronchioles, alveoli, blood, cells

In your textbook, read about the mechanics of breathing and the control of respiration.

For each statement below, write true or false.

7. Homeostasis in respiration is controlled by the cerebrum.

8. As you exhale, the bronchioles in the lungs release most of their air.

9. When you inhale, the muscles between your ribs contract.

10. Relaxation of the diaphragm causes a slight vacuum in the lungs.

11. Air rushes into the lungs because the air pressure outside the body is greater than the air pressure inside the lungs.

12. Relaxation of the diaphragm causes it to flatten.
In your textbook, read about your blood, ABO blood types, and blood vessels.

Answer the following questions.

1. What cells and substances would you expect to find suspended or dissolved in plasma?

2. How is carbon dioxide transported in blood?

Complete the table below by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Red Blood Cells</th>
<th>White Blood Cells</th>
<th>Platelets</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Contain hemoglobin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Fight infection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Lack a nucleus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Help clot blood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Transport oxygen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Comparatively large and nucleated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For each statement below, write true or false.

9. Your blood type can be changed with a blood transfusion.

10. Different blood types result from different antibodies being present on the membranes of red blood cells.

11. If you have type B blood, then you have anti-A antibodies in your plasma.

12. Risks involving incompatible Rh factors are greatest for a woman’s first child.
In your textbook, read about your heart, blood’s path through the heart, and inside your heart.

Label the parts of the human heart in the diagram below. Use these choices:

- aorta
- pulmonary veins
- left atrium
- right atrium
- left ventricle
- right ventricle
- pulmonary arteries

13. __________________________
14. __________________________
15. __________________________
16. __________________________
17. __________________________
18. __________________________

20. Where does blood go from the pulmonary veins? From the right ventricle? From the left ventricle?

21. What prevents blood from mixing between atria and ventricles?

22. The surge of blood through an artery is called the cardiac output. _______________________________

23. The pacemaker initiates heartbeats by generating electrical impulses. _______________________________

24. An electrocardiogram is a record of the strength of each heartbeat. _______________________________

25. The atrioventricular node, along with sensory cells in arteries near the heart, regulates the pacemaker.

26. Diastolic pressure occurs when the heart’s ventricles contract. _______________________________
Chapter 37

Respiration, Circulation, and Excretion, continued

Section 37.3 The Urinary System

In your textbook, read about kidneys, nephrons, and the formation of urine.

Answer the following questions.

1. What is the major function of kidneys?

2. What role does the bladder play in the urinary system?

3. What are nephrons?

Order the following steps in the filtration of blood from 1 to 7.

4. From the Bowman’s capsule, fluid flows through a U-shaped tubule.
5. Under high pressure, blood flows into capillaries that make up the glomerulus.
6. After being stored in the bladder, urine exits the body via the urethra.
7. Fluid moves from the end of the nephron’s tubule to the ureter.
8. Blood enters the nephron from a branch of the renal artery.
9. Water, glucose, amino acids, and ions are reabsorbed into the blood.
10. Water, glucose, amino acids, wastes, and other substances move from glomerular capillaries into a Bowman’s capsule.

In your textbook, read about the urinary system and homeostasis.

Complete each statement.

11. __________________ and __________________ are two toxic nitrogenous wastes that your kidneys constantly remove from your bloodstream.

12. The kidneys also help regulate the blood’s ___________________ and ___________________ , and ___________________.

13. Individuals with diabetes have excess levels of ___________________ in their blood.
In your textbook, read about human male anatomy and hormonal control.

Answer the following questions.

1. What are the primary functions of the male reproductive system?

2. How does the location of the scrotum affect sperm?

3. How many sperm can the average mature male produce in one day?

Order the steps in the formation and transportation of sperm from 1 to 6.

4. Mature sperm enter the vas deferens.

5. Newly formed haploid sperm cells pass through a series of coiled ducts to the epididymis.

6. Sperm leave the body via the urethra.

7. Sperm mature in the epididymis.

8. Cells lining tubules in the testes undergo meiosis.

9. Sperm travel along the ejaculatory ducts and into the urethra.

Complete each sentence.

10. When a young man’s voice “changes,” he is probably entering __________________________, a time when he will develop other secondary __________________________ ____________________________.

11. A hormone released by the __________________________ gland to release __________________________ - __________________________ and __________________________ hormones.

12. FSH regulates __________________________ production, while LH controls the production of the steroid hormone __________________________ by the testes.
In your textbook, read about human female anatomy and puberty in females.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

13. When an egg cell is released from an ovary, it moves down the oviduct by gravity.

14. As is the case in human males, a woman’s hypothalamus produces FSH and LH.

15. FSH stimulates follicle development and the release of estrogen from the ovary.

16. In females, luteinizing hormone (LH) is responsible for the development of the secondary sex characteristics.

17. Long before a woman is born, cells in her ovaries that are destined to become future eggs undergo several mitotic divisions.

In your textbook, read about the menstrual cycle.

Complete the table by checking the correct column for each event.

<table>
<thead>
<tr>
<th>Event</th>
<th>Flow</th>
<th>Follicular</th>
<th>Luteal</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. LH stimulates the corpus luteum to develop from a ruptured follicle.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Estrogen levels are at their peak.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. A cell inside a follicle resumes meiotic divisions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Progesterone levels are at their peak.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. The uterine lining is shed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. LH levels rise abruptly.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Ovulation occurs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. The uterine lining becomes engorged with blood, fat, and tissue fluid.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. FSH begins to rise.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about fertilization and implantation, and embryonic membranes.

Use each of the terms below just once to complete the passage.

amnion   blastocyst   chorion   chorionic villi   embryo
implants   oviduct   placenta   umbilical cord   zygote

Usually in the upper part of a(n) (1) __________________________, an egg and one sperm unite to form a(n) (2) __________________________. This single cell divides repeatedly to form a(n) (3) __________________________, which (4) __________________________ in the uterine wall. Part of the blastocyst becomes the (5) __________________________, which is surrounded by a fluid-filled, membranous sac called the (6) __________________________. The embryo is connected to the wall of the uterus by its (7) __________________________. The amniotic sac is enclosed by the (8) __________________________, which later forms the (9) __________________________. Nutrients and oxygen from the mother and wastes from the embryo are exchanged in the (10) __________________________.

In your textbook, read about fetal development and genetic counseling.

Complete the table by checking the correct column for each event or example.

<table>
<thead>
<tr>
<th>Event/Example</th>
<th>Trimester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First</td>
</tr>
<tr>
<td>11. Fetus can survive outside the uterus with medical assistance.</td>
<td></td>
</tr>
<tr>
<td>12. Fetus weighs more than 3000 grams.</td>
<td></td>
</tr>
<tr>
<td>13. Embryo is most vulnerable to outside influences.</td>
<td></td>
</tr>
<tr>
<td>14. Embryo becomes a fetus.</td>
<td></td>
</tr>
<tr>
<td>15. Fetus can use its muscles to move spontaneously.</td>
<td></td>
</tr>
<tr>
<td>16. Fetus becomes oriented head-down.</td>
<td></td>
</tr>
<tr>
<td>17. Gender of fetus can be determined.</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about birth.

Answer the following questions.

1. What are the three stages of birth? _______________________________________________________

2. Describe the action of oxytocin. __________________________________________________________

3. After the placenta is expelled from a woman’s body, what effect do continued uterine contractions have? ________________________________________________________________________________

In your textbook, read about growth and aging.

Complete each sentence.

4. Your growth rate, as well as the type of growth you undergo, varies with both your ______________ and your ______________.

5. ______________ __________________________ __________________________, abbreviated ______________, regulates growth.

6. hGH exerts its effects primarily on ______________ and on ______________ __________________________.

7. LGH works by increasing __________________________ and __________________________.

Complete the table by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Example</th>
<th>Childhood</th>
<th>Adolescence</th>
<th>Adulthood</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Your growth rate continues at a steady rate.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Lines develop on your face, especially around your eyes and mouth.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. You reach maximum physical stature.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. You begin to reason.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. You may have a sudden growth spurt.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 39 Immunity from Disease

Section 39.1 The Nature of Disease

In your textbook, read about what an infectious disease is, determining what causes a disease, and the spread of infectious diseases.

Answer the following questions.

1. Why is a disease like osteoarthritis not considered an infectious disease?

2. What is meant by Koch’s postulates?

3. In terms of disease, what is a reservoir?

Complete the table by writing in the method of transmission for each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Method of Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. While exploring a cave, a person breathes in fungal spores that cause a lung infection.</td>
<td></td>
</tr>
<tr>
<td>5. A person contracts Rocky Mountain spotted fever after being bitten by a tick.</td>
<td></td>
</tr>
<tr>
<td>6. After having unprotected sex, a person contracts syphilis.</td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about what causes the symptoms of a disease, patterns of disease, and treating diseases.

For each statement below, write true or false.

7. The toxin produced by a particular microorganism might be far more destructive than the direct damage the microbe does to its host cells.

8. Endemic diseases often disappear in a population, only to resurface unexpectedly many years later.

9. If you catch the flu during an influenza epidemic, your best hope of recovery is to take antibiotics.

10. It is important for researchers to try to discover new antibiotics because many types of bacteria are becoming resistant to the ones now being used.
In your textbook, read about the innate immune system.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

1. Healthy skin is a good defense against the invasion of pathogens because it is free of bacteria.

2. In your trachea, saliva traps microbes and prevents them from entering your lungs.

3. Macrophages migrate into the bloodstream when the body is challenged by a pathogen.

4. Phagocytes at the site of an infection or inflammation destroy pathogens by surrounding and engulfing them.

5. The third method of defense against infection is the consumption of pathogens by neutrophils.

6. Interferon is produced by cells infected by pathogenic bacteria.

In your textbook, read about acquired immunity.

Circle the letter of the choice that best completes the statement.

7. The human lymphatic system is important in
   a. filtering pathogens from lymph.
   b. keeping body fluids constant.
   c. resistance to disease.
   d. all of the above.

8. Tissue fluid is found
   a. in lymph vessels.
   b. in the bloodstream.
   c. around body cells.
   d. in lymph ducts.

9. The main function of lymph nodes is to
   a. store red blood cells.
   b. filter lymph.
   c. filter excess fluid.
   d. trigger an immune response.

10. A reservoir for lymphocytes that can be transformed into specific disease-fighting cells is the
    a. thymus gland.
    b. thyroid gland.
    c. pituitary gland.
    d. pancreas.
In your textbook, read about antibody immunity and cellular immunity.

Complete each sentence.

11. ___________________________ is the building up of a ___________________________ to a specific pathogen.

12. Two types of immunity that involve different kinds of cells and cellular actions are ___________________________ immunity and ___________________________ immunity.

13. The presence of foreign ___________________________ in the body triggers the production of ___________________________ by plasma cells.

14. A ___________________________ is a lymphocyte that, when activated by a ___________________________, becomes a plasma cell and produces ___________________________.

15. Cellular immunity involves several different types of ___________________________ cells.

16. A ___________________________ releases enzymes directly into the ___________________________.

Complete the table by checking the correct columns for each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Type of Immunity</th>
<th>Cellular</th>
<th>Antibody</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Involves the protection of antibodies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Simulated by antigens in the body</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Clones of killer T cells produced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Memory cells produced so the body can respond quickly to a second attack</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Key role played by antigen-antibody complex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. T cells destroyed by pathogens directly</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 39

Immunity from Disease, continued

Section 39.2 Defense Against Infectious Diseases

In your textbook, read about passive and active immunity to infectious diseases.

Answer the following questions.

23. Distinguish between active and passive immunity.

24. In what two ways can passive immunity develop?

25. What is a vaccine?

In your textbook, read about AIDS and the immune system.

For each statement below, write true or false.

26. The virus that causes AIDS—Human Immunodeficiency Virus—is well-named because it attacks the immune system.

27. HIV can be transmitted by air.

28. A child born to a woman who is infected with HIV is at risk for being infected, too.

29. HIV destroys a person’s resistance to disease by attacking and destroying memory T cells.

30. In a blood sample from an HIV-positive person, you would expect to find most of the viruses existing free in the blood, rather than being hidden inside cells.

31. If a person is infected with HIV, he or she will usually develop AIDS within about a year.

32. The cause of death for a person with AIDS usually is some type of infection that the body’s weakened immune system can no longer fight off.

33. The majority of untreated persons infected with HIV will develop AIDS.
In your textbook, read about skin, bones, and muscles.

Skin has four functions: (1) ______________________ , (2) ______________________
____________________ , (3) ______________________ , and (4) ______________________
____________________ . These functions help maintain homeostasis in the body.

Complete the table to describe the role of bones.

<table>
<thead>
<tr>
<th>Support for</th>
<th>5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place for</td>
<td>6.</td>
</tr>
<tr>
<td>Protects</td>
<td>7.</td>
</tr>
<tr>
<td>Manufacture of</td>
<td>8.</td>
</tr>
<tr>
<td>Storehouse of</td>
<td>9.</td>
</tr>
</tbody>
</table>

This diagram shows the various steps involved in the respiratory process. In the space provided, describe the steps as indicated.

Step 1: Oxygen enters the lungs when you inhale.

Step 2: (10) ______________________

Step 3: Oxygen passes from blood to the cells.

Step 4: (11) ______________________

Step 5: (12) ______________________

Step 6: (13) ______________________

Step 7: Carbon dioxide leaves the lungs when you exhale.

Step 2: (10) ______________________

Step 3: Oxygen passes from blood to the cells.

Step 4: (11) ______________________

Step 5: (12) ______________________

Step 6: (13) ______________________

Step 7: Carbon dioxide leaves the lungs when you exhale.
In your textbook, read about reproductive, endocrine, and lymphatic systems.

14. The endocrine system is a communication system; its messages are hormones. They are produced by ________________ and travel in the __________________________ to ________________. There they ________________.

15. The structures of the male reproductive system—the scrotum, __________________________, epididymis, seminal vesicles, __________________________, bulbo urethral gland, urethra, and __________________________—are involved in __________________________ and maintaining sperm cells and __________________________ into the female reproductive tract.

16. The structures of the female reproductive system—the __________________________, oviduct, __________________________, and vagina—produce and maintain __________________________, receive and transport __________________________, and support the development of the __________________________.

Explain how these systems of the body interact with each other.

17. Skeletal system ——— Circulatory system ——— Muscular system

18. Digestive system ——— Circulatory system ——— Urinary system

19. Endocrine system ——— Reproductive system

20. Respiratory System ——— Circulatory system ——— Cell ——— Circulatory system ——— Urinary and Respiratory systems

21. Circulatory system ——— Lymphatic system
A. Improve Your Reading Skills
Active readers are good readers.

Active readers
• get ready before they read.
• use skills that help them when they read.
• review to remember after they read.

Here’s what you can do to become an active reader!

Before You Read

Get Ready to Read
• Find a quiet time and place to read—library, study hall, home.
• Don’t read when you’re tired.
• Don’t read when you’re hungry.
• Wait until you have finished a section before you take a break.

Scan
• Quickly scan the material so you will know what it is about.
• Look at pictures and read the captions, titles, headings, and words in bold print.

Write
• Write notes about what you see when you scan.
• Write questions about what you see.
• Write topics you want to find out about when you read.
• Write a preview outline from the section topics.

As You Read
• Find the main idea of each section or paragraph—this is usually in the first sentence.
• Study the pictures, maps, graphs, and tables, and think about the information in them.
• Write down the main ideas and other notes about what you read.
• After you read the whole section, reread the parts you didn’t understand.
Study Skills

After You Read
• Review your outline or the notes you wrote while you were reading.
• If you still have questions, ask a classmate or your teacher for help.
• Write important facts or ideas on flash cards.
• Review your flash cards to help you remember what you’ve read.

B. Improve Your Vocabulary Skills
Active readers learn the meanings of new words.

Active readers
• recognize clues to help find the meaning.
• look for familiar words and word parts in new words.
• use a dictionary often.
• practice new words so they can remember new meanings.

Here’s how you can improve your vocabulary!

When You See a New Word

Scan
• Read the sentence and look for clues about the meaning of the word. These are called context clues.
• Look for pictures or visuals that contain the word.

In the following table, you can find different kinds of context clues that you can use to help you figure out the meanings of new words.
## Study Skills

### Search for Context Clues

<table>
<thead>
<tr>
<th><strong>Comparison and contrast</strong></th>
<th>The runner started the race with energy and excitement, but as she crossed the finish line, the <em>fatigue</em> and strain showed on her face.</th>
<th>This sentence contrasts the word <em>fatigue</em> with energy and compares it to strain. This tells you that someone who is fatigued is strained and has no energy.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition and description</strong></td>
<td>Elena is a <em>biologist</em>, a scientist who studies living things.</td>
<td>The sentence describes a <em>biologist</em> as someone who studies living things.</td>
</tr>
<tr>
<td><strong>Synonyms</strong></td>
<td>Carl is very <em>dependable</em>. His teachers and his parents know that he is reliable and can be trusted.</td>
<td>The word <em>dependable</em> is described by the synonyms <em>reliable</em> and <em>trusted</em>.</td>
</tr>
<tr>
<td><strong>Tone and setting</strong></td>
<td>An air of <em>jubilation</em> surrounded the members of the science team as they received their medals for first place in the national competition.</td>
<td>The setting of the sentence and the action describe a situation that is positive and full of celebration.</td>
</tr>
<tr>
<td><strong>A series of clues</strong></td>
<td>The ocelot, jaguar, and mountain lion are all <em>endangered</em> species.</td>
<td>The animals that are mentioned are all rare. This tells you something about the word <em>endangered</em>.</td>
</tr>
<tr>
<td><strong>Cause and effect</strong></td>
<td>The student group was known for its <em>boisterous</em> meetings, so the principal asked extra teachers to monitor the meeting and keep order.</td>
<td><em>Boisterous</em> describes the meetings and tells you that something needs extra supervision.</td>
</tr>
</tbody>
</table>
Study Skills

Break It Down

• Find the root word.
• Write it and ask questions about its meaning.
• Find the affix—the part in front of or after the root word.
• Write it down and use a dictionary to look up its meaning.

public•ize

In this table, you can see how to break words into their roots and affixes.

<table>
<thead>
<tr>
<th>Word</th>
<th>Root</th>
<th>Affix and Meaning</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>imperfect</td>
<td>perfect</td>
<td>im- (not)</td>
<td>not perfect</td>
</tr>
<tr>
<td>semicircle</td>
<td>circle</td>
<td>semi- (half)</td>
<td>half of a circle</td>
</tr>
<tr>
<td>teacher</td>
<td>teach</td>
<td>-er (one who)</td>
<td>one who teaches</td>
</tr>
<tr>
<td>backward</td>
<td>back</td>
<td>-ward (in the direction of)</td>
<td>to the back</td>
</tr>
<tr>
<td>publicize</td>
<td>public</td>
<td>-ize (make)</td>
<td>make public</td>
</tr>
</tbody>
</table>

Remember New Words

• Say the word aloud.
• Write another sentence using the word.
• Make flash cards that include the word and its meaning.
• Review your flash cards to help you remember the meanings of the new words.
C. Learn From Visuals

Tables, graphs, photographs, diagrams, and maps are called visuals. Good readers use all kinds of visuals to help them learn.

Active readers
- find the purpose for the visual they see.
- find information in the visual.
- connect the information they find to what they are studying.

Here’s how you can improve your skill in learning from visuals.

**When You First Look at a Visual**

**Scan**
- Look at the visual.
- Decide its purpose. Why is it there?
- Find the title.
- Read the caption.

**Write**
- Write the purpose of the visual. Why is it there?
- Write the key information.
- Write the title of the visual.
- Write the main idea or message.
Study Skills

As You Study the Visual

Graphs

Graphs are pictures of related information. A graph tells you something about a specific situation. There are many kinds of graphs. One of the most common is the bar graph.

![Bar Graph](image)

A bar graph helps you compare similar information about different items. The separate items being measured are shown as rectangles side by side on the graph.

Diagrams

A diagram is a drawing that has labels on it. It can show how something works or what the parts are called.

![Diagram of an Amoeba](image)

A diagram often gives the names of the parts of something, like this diagram of an amoeba. Science books often have many diagrams.
Study Skills

Tables

Tables organize words and numbers for easier reading. They have a title, columns (up and down), and rows (side to side). In this table, the columns show the innings, and the rows show the points each team scored.

<table>
<thead>
<tr>
<th>Inning</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Team</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Blue Team</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

Maps

Maps give all kinds of different information. Some examples are location, direction, and land features. They can have words, symbols, numbers, lines, and colors.

Coal Fields of the United States

Figure 6.11
Coal is the most abundant fossil fuel on Earth. The coal deposits of the United States are mainly bituminous coal, which is preferred for electric power generation.
Study Skills

D. Make Chapter and Section Idea Maps

Active readers organize the information they read.

Active readers
- divide the information into smaller units.
- put the information in a logical order.

Starting Out

Scan and Write
- Scan the chapter for main topics and subheadings—in your biology textbook, red headings are main topics and blue headings are subtopics.
- Scan for boldface key terms.
- Scan for any visuals.
- Write the information in some kind of graphic map.

Here's an example of one kind of idea map.