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Student Lab Safety Form

Student Name: ____________________________

Date: ____________________________

Lab Title: ____________________________

In order to show your teacher that you understand the safety concerns of this lab, the following questions must be answered after the teacher explains the information to you. You must have your teacher initial this form before you can proceed with the lab.

1. How would you describe what you will be doing during this lab?

2. What are the safety concerns associated with this lab (as explained by your teacher)?
   • ____________________________
   • ____________________________
   • ____________________________
   • ____________________________
   • ____________________________
   • ____________________________

3. What additional safety concerns or questions do you have?

Adapted from Gerlovich, et al. (2004). The Total Science Safety System CD, JaKel, Inc.
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# Chapter 1 The Study of Life

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<td>Student Recording Sheet</td>
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</tbody>
</table>
CHAPTER 1 The Study of Life

Diagnostic Test

Before reading Chapter 1, predict answers to questions about the chapter content based on what you already know. Circle the letter of the correct answer, and then explain your reasoning.

1. Emilio’s uncle is a biologist who works in the Algonquin Provincial Park in Canada. Emilio plans to visit his uncle to help him with his job. Which activity should Emilio expect to do while visiting his uncle?
   A. conduct chemical tests for air pollution
   B. design a new campsite for backpackers
   C. observe the behavior of moose herds
   D. participate in a soil survey of the forest
   Explain.

2. Brett enjoys science and is considering science as a career choice. Brett’s science teacher explains some of the methods scientists use to conduct their work. Which does Brett’s teacher discuss?
   A. Scientists are careful not to contradict each other’s results.
   B. Scientists create new theories when they collect new data.
   C. Scientists form a testable explanation to solve a problem.
   D. Scientists only make measurements during experiments.
   Explain.

3. Imena is teaching her younger brother how to build a fire. As the fire sparks and starts to burn the kindling and wood in the fireplace, her brother asks if the fire is alive because it is moving and growing. Imena tells her brother that the fire is not a living thing, and her brother asks what makes something alive. What response does Imena give her brother?

Explain.
Launch Lab

CHAPTER 1

Why is observation important in science?

Scientists use a planned, organized approach to solving problems. A key element of this approach is gathering information through detailed observations. Scientists extend their ability to observe by using scientific tools and techniques.

Procedure

1. Read and complete the lab safety form.
2. Pick an unshelled peanut from the container of peanuts. Carefully observe the peanut using your senses and available tools. Record your observations.
3. Do not change or mark the peanut. Return your peanut to the container.
4. After the peanuts are mixed, locate your peanut based on your recorded observations.

Data and Observations

Analysis

1. List the observations that were the most helpful in identifying your peanut. Which were the least helpful?

2. Classify your observations into groups.

3. Justify why it is important to record detailed observations in this lab. Infer why observations are important in biology.
Is it living or nonliving? In this lab, you will observe several objects to determine if they are living or nonliving.

**Procedure**

1. Read and complete the lab safety form.
2. Create a data table with four columns labeled **Object**, **Prediction**, **Characteristic of Life**, and **Evidence**.
3. Your teacher will provide several objects for observation. List each object in your table. Predict whether each object is living or nonliving.
4. Carefully observe each object. Discuss with your lab partner what characteristics of life it might exhibit.
5. Use the *Characteristics of Living Organisms* table in your textbook to determine whether each object is living or nonliving. List the evidence in your data table.

**Data and Observations**

**Analysis**

1. Compare and contrast your predictions and observations.

2. Explain why it was difficult to classify some objects as living or nonliving.
How does a biologist establish experimental conditions? In a controlled experiment, a biologist develops an experimental procedure designed to investigate a question or problem. By manipulating variables and observing results, a biologist learns about relationships among factors in the experiment.

Procedure
1. Read and complete the lab safety form.
2. Create a data table with the columns labeled Control, Independent Variable, Constants, Hypothesis, and Dependent Variable.
3. Obtain a printed maze. Seated at your desk, have a classmate time how long it takes you to complete the maze. Record this time on the chart. This is the control in the experiment.
4. Choose a way to alter experimental conditions while completing the same maze. Record this as the independent variable.
5. In the column labeled Constants, list factors that will stay the same each time the experiment is completed.
6. Form a hypothesis about how the independent variable will affect the time it takes to complete the maze.
7. After your teacher approves your plan, carry out the experiment. Record the time required to complete the maze as the dependent variable.
8. Repeat steps 3–7 as time allows.
9. Graph the data. Use the graph to analyze the relationship between the independent and dependent variables.

Data and Observations

Analysis
1. Explain the importance of the control in this experiment.

2. Error Analysis By completing the maze more than once, you introduced another variable, which likely affected the time required to complete the maze. Would eliminating this variable solve the problem? Explain.
BioLab

CHAPTER 1
How can you keep cut flowers fresh?

Background: When first cut from the garden, a bouquet of flowers looks healthy and has a pleasant aroma. Over time, the flowers droop and lose their petals. Leaves and stems below the water line begin to decay.

Question: What steps can I take to extend the freshness of cut flowers?

Possible Materials
Choose materials that would be appropriate for this lab. Possible materials include:
- fresh cut flowers
- vases
- water
- scissors

Safety Precautions

Plan and Perform the Experiment
1. Read and complete the lab safety form.
2. Research strategies for extending the life of cut flowers. During your research, look for possible reasons why a specific strategy might be effective.
3. Form a hypothesis based on your research. Remember, the hypothesis must include an independent and dependent variable. It must be possible to test the hypothesis by gathering and analyzing specific data.
4. Design an experiment to test the hypothesis. Identify a control sample. List all factors that will be held constant.
5. Design and construct a data table.
6. Make sure your teacher approves your plan before you proceed.
7. Implement the experimental design. Organize the data you collect using a graph or chart.
8. Cleanup and Disposal Properly dispose of plant material. Wash hands thoroughly after handling plant material. Clean and return all lab equipment to the designated locations.

Data and Observations
Analyze and Conclude

1. **Describe** the strategy tested by your hypothesis. Why did you choose this strategy to examine?

2. **Explain** how you established the control sample.

3. **Interpret Data** What trends or patterns do the data show?

4. **Analyze** What is the relationship between your independent and dependent variables?

5. **Draw Conclusions** Based on your data, describe one way to extend the freshness of cut flowers.

6. **Error Analysis** Critique your experimental design. Is it possible that any other variables were introduced? Explain. How could these variables be controlled?
Have you ever reached to pick up your keys from their usual place and discovered that they were not there? Did you assume that they vanished into thin air, or did you start to hypothesize about where they could possibly be? You probably thought it logical that they were somewhere in the house and began to ask yourself questions about places where they might be. Making an observation (The keys are not here), asking a question (Where could they be?), and forming a hypothesis (Maybe they are in the kitchen) are steps that we commonly use to solve everyday problems. When you look for the keys in the kitchen and find that they are not there, you are gathering data and forming a conclusion. The problem has not been solved, so it is necessary to form another hypothesis that does not include the kitchen. In this problem, your mind took you through a natural process of discovery. Scientists have formalized this process of problem solving into an approach called the scientific method, which includes defining a problem, forming a hypothesis, designing an experiment, gathering data, analyzing the results, formulating a conclusion, and reporting the results.

Part A: Reviewing Scientific Methods Used in Biology

An experiment designed to answer the question “What effect does additional nitrogen have on plant growth?” is described below.

Dr. Lina Reyes set up an experiment in which she planted bean seeds in two groups, A and B. After the seeds germinated, Group A was given an application of fertilizer with additional nitrogen. Group B was grown under identical conditions, except the fertilizer it received contained no additional nitrogen. Dr. Lina Reyes measured the height and mass of the plants for one month. The results are illustrated in Figure 1.

Analyze and Conclude

Respond to each question and statement.

1. Explain Which plants represent the control group? The experimental group?
   Explain.
2. **Identify** the independent and dependent variables of the experiment.

3. **Relate** What experimental conditions did Dr. Lina Reyes need to control?

---

**Part B: Using Scientific Methods to Solve Everyday Questions in Biology**

Some everyday questions in biology are listed below. Are there other biology-related questions that you have? On the lines provided, write two of your own questions. Then choose two questions from the list and propose procedures for finding solutions to the questions by applying scientific methods. Record all your work in your notebook or science journal.

- Why does milk turn sour?
- Why do insects seem to appear suddenly in flour, cornmeal, or fruit?
- Do bay leaves repel cockroaches?
- Why do bananas turn brown?
- Do cats see colors?

**Procedure**

1. Begin by writing down your problem question. For example, if you wanted to know why insects gather around light sources, your problem might be “Why do insects gather around light sources?”

2. Prepare two alternative hypotheses that might explain your observations. Hypotheses are often written in an *if/then* format and must be testable. Therefore, a hypothesis for this problem might be: If insects gather around light sources for warmth, then insects will gather around other warm objects.

3. Write an experimental plan for each hypothesis. Experimental plans should detail the steps you would take to collect the data needed to test your hypothesis. In your experiments, be sure to indicate the dependent and independent variables and the experimental and control groups. For example, the experimental plan might be to use a small space heater for a heat source and place two heaters about 4–5 m apart, with the experimental heater turned on and the control heater turned off. The independent variable is the presence of heat, and the dependent variable is the gathering of insects. Collect data by observing whether insects gather around either of the heaters.

4. For each hypothesis, explain what results should be obtained to confirm the hypothesis. For example, to confirm the hypothesis that insects gather around a light source for warmth, the insects should gather around the turned-on heater only.

---

**CAREERS IN BIOLOGY**

**Horticulture** Visit biologygmh.com for information on horticulturists.

What are the responsibilities of a horticulturist?
Enrichment

CHAPTER 1
Drawing: Using Graphs to Understand Biology

Mathematics provides a number of tools with which to understand the ideas of biology more fully. Graphing is one such tool. You might be familiar with different types of graphs: circle graphs, bar graphs, and line graphs, for example. Each type of graph is best suited to certain types of biological data. For example, changes in a variable (such as the height of a plant) over time are often best described by means of a line graph.

Assess  In this activity, you will learn more about the strengths and weaknesses of using graphs to display biological information. The table on the right provides data on the number of aquatic plants found in a small pond over a period of days. Draw a graph below that reflects these data. To make the graph, you will first need to select appropriate units for the graph’s vertical and horizontal axes.

Utilize  Use the graph you have drawn to answer the following questions.

1. How many plants were likely to have been in the pond on day 15?
2. How many plants would you predict will be in the pond on day 22?
3. How many plants would you predict will be in the pond on day 30?
4. How many plants do you think were in the pond on day 1?

Analyze  Exchange graphs with a partner. Evaluate how well your partner’s graph illustrates the data in the table. What suggestions would you make for improving your partner’s graph?

<table>
<thead>
<tr>
<th>Day</th>
<th>Number of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>14</td>
<td>35</td>
</tr>
<tr>
<td>16</td>
<td>52</td>
</tr>
<tr>
<td>18</td>
<td>87</td>
</tr>
<tr>
<td>20</td>
<td>122</td>
</tr>
</tbody>
</table>
Complete the events chain about methods of science. These terms may be used more than once: accuracy, bias, data, experiment, hypothesis, observation, processing information, sample size.

Scientific inquiry begins with (1) _________________.

Scientific inquiry involves asking questions and (2) _________________.

Before forming a(n) (3) _________________, scientists must make inferences.

Scientists design a(n) (4) _________________, which helps them test their hypothesis, to gather (5) _________________.

When examining their research, scientists must make sure that they have avoided (6) _________________, repeated their trials, and collected data from a large enough (7) _________________.

Before publishing their findings, scientists have their work peer reviewed for originality and (8) _________________.

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In your textbook, read about what biologists do.

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

agricultural bioengineering biologists biotechnology
equatorial living mechanical

Biology is the study of (1) ________________ things and the environment.

People who study biology are called (2) ________________. Biologists who work in (3) ________________ research might study how to make crops grow more efficiently. (4) ________________ biologists work to prevent plants and animals from becoming extinct. Scientists who work in the field of (5) ________________ often research cells, DNA, and living systems to discover new medical treatments, and those who work in (6) ________________ might study living systems in order to design (7) ________________ devices such as artificial limbs.

In your textbook, read about the characteristics of life.

Refer to the diagrams. Respond to each statement.

A. Flame   B. Euglena   C. Fish

8. List any image that depicts a living thing.

________________________________________

9. Explain why any image you did not list does not depict a living thing.

________________________________________

Read each of the following items. If it describes a living thing, write yes. If not, write no.

______ 10. is made of one or more cells

______ 11. cannot respond to its environment

______ 12. requires energy to function
Number the levels of the organization of living things from 1 through 6 to put them in order from simplest to most complex.

13. organs
15. organism
17. organ system
14. cell
16. tissues
18. biosphere

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

20. An amoeba divides in half.
21. A bean plant produces seeds in long pods.
22. Pollen grains are released from a flower.
23. A sea star produces a new arm after losing one to a predator.

For each statement, circle the stimulus and underline the response.

24. Your mouth waters at the sight of food on a plate.
25. There is a sudden drop in air temperature, which gives you goosebumps.
26. You get a fever after a virus enters your body.
27. You get “butterflies” in your stomach before giving a speech.

Refer to the graph. Respond to the following statement.

28. Name the process that the graph represents. Describe this process.
In your textbook, read about the nature of science.

*Complete the table by checking the correct column(s) for each description.*

<table>
<thead>
<tr>
<th>Description</th>
<th>Science</th>
<th>Pseudoscience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Studying genes and inheritance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Forecasting personality by reading bumps on the head</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Observing interactions of organisms in the environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Peers reviewing investigations and experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Telling the future by reading lines on the palms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Forming untestable hypotheses based on nonscientific literature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Forming testable hypotheses based on observations and questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Communicating experimental findings and offering data for peer review</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Complete the graphic organizer below. These terms may be used more than once:*

<table>
<thead>
<tr>
<th>terms</th>
<th>uses (9)</th>
<th>expands scientific (10)</th>
<th>tests (11)</th>
<th>undergoes (12)</th>
<th>challenges accepted (13)</th>
<th>questions (14)</th>
</tr>
</thead>
</table>

*Respond to the following statement.*

15. **Name** two scientific issues that involve ethics.
In your textbook, read about the methods of science.

Match the definition in Column A with the term in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. a procedure that tests a hypothesis by collecting information under controlled conditions</td>
<td>A. constant</td>
</tr>
<tr>
<td>2. in an experiment, the group that is the standard against which results are compared</td>
<td>B. experimental group</td>
</tr>
<tr>
<td>3. in an experiment, the group that is exposed to the factor being tested</td>
<td>C. independent variable</td>
</tr>
<tr>
<td>4. the factor that remains fixed in an experiment</td>
<td>D. experiment</td>
</tr>
<tr>
<td>5. the condition being changed by the scientist</td>
<td>E. control group</td>
</tr>
<tr>
<td>6. the factor that results from or depends on changes to the independent variable</td>
<td>F. dependent variable</td>
</tr>
<tr>
<td>7. information gained from observation</td>
<td>G. hypothesis</td>
</tr>
<tr>
<td>8. a testable explanation of a situation</td>
<td>H. data</td>
</tr>
</tbody>
</table>

In your textbook, read about data gathering.

Complete the table by checking the correct column(s) for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantitative Research</th>
<th>Qualitative Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Numerical data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Field study of hunting behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Thermometer, balance scale, stopwatch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Testable hypothesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Measurements from controlled laboratory experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Purely observational data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Binoculars, tape recorder, camera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Calculations, graphs, and charts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Guía de estudio

CAPÍTULO 1
Sección 1: Introducción a la biología

En tu libro de texto, lee acerca de lo que hacen los biólogos.

Usa los siguientes términos sólo una vez para completar el párrafo.

agrícola ambientales bioingeniería biológico biotecnología mecánicos vivos

La biología es el estudio de los seres (1)_________________________ y del ambiente. Las personas que estudian la biología se llaman (2)_________________________. Los biólogos que trabajan en investigación (3)_________________________ podrían estudiar cómo lograr que los cultivos crezcan con mayor eficiencia. Los biólogos (4)_________________________ trabajan para evitar que las plantas y los animales se extingan. Los científicos que trabajan en el campo de la (5)_________________________ a menudo investigan acerca de las células, el ADN y los sistemas vivientes para descubrir nuevos tratamientos médicos, y quienes trabajan en la (6)_________________________ podrían estudiar los sistemas vivientes para diseñar dispositivos (7)_________________________ como son los usados para extremidades artificiales.

En tu libro de texto, lee acerca de las características de la vida.

Consulta los dibujos. Responde a cada afirmación.

8. **Indica** qué dibujo(s) representa(n) un ser vivo.

9. **Explica** porqué el(los) dibujo(s) que indicaste no representa(n) un ser vivo.

Lee cada una de los siguientes elementos. Si describe un ser vivo, escribe «sí». De lo contrario, escribe «no».

______ 10. está formado por una o más células

______ 11. no puede responder a su ambiente

______ 12. necesita energía para funcionar
Guía de estudio, Sección 1: Introducción a la biología  continuación

Enumera los niveles de la organización de los seres vivos del 1 al 6 en el orden del más sencillo al más complejo.

13. órganos  15. organismo  17. sistema de órganos  
14. célula  16. tejidos  18. biósfera

Lee cada una de las siguientes afirmaciones. Si describe un proceso de reproducción, escribe «sí», de lo contrario escribe «no».

19. Aparecen nuevas hojas en un árbol durante la primavera. 
20. Una ameba se divide por la mitad. 
21. Una planta de frijoles produce semillas en vainas largas. 
22. Se liberan los granos de polen de una flor. 
23. Una estrella de mar produce un brazo nuevo después de perder uno contra un depredador.

Para cada afirmación, encierra en un círculo el estímulo y subraya la respuesta.

24. Se te hace agua la boca cuando ves comida en un plato.
25. Hay una caída drástica en la temperatura, lo que te pone la piel erizada.
26. Te da fiebre después de que un virus entra a tu cuerpo.
27. Sientes “mariposas” en el estómago antes de dar un discurso.

Consulta la gráfica. Responde a la siguiente afirmación.

28. Nombra el proceso que la gráfica representa. Describe este proceso.

Para el estímulo "El mecanismo de corrección entra en escena." El proceso es...
En tu libro de texto, lee acerca de la naturaleza de la ciencia.

Completa la tabla marcando la(s) columna(s) correcta(s) para cada descripción.

<table>
<thead>
<tr>
<th>Descripción</th>
<th>Ciencia</th>
<th>Pseudociencia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. El estudio de los genes y los rasgos hereditarios</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. El pronóstico de la personalidad mediante la lectura de protuberancias</td>
<td></td>
<td></td>
</tr>
<tr>
<td>en la cabeza</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. La observación de las interacciones de los organismos en el ambiente</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. la revisión de investigaciones y experimentos por parte de expertos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. La predicción del futuro mediante la lectura de las líneas de las palmas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>de las manos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. La formación de hipótesis comprobables con base en literatura no científica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. La formación de hipótesis con base en observaciones y preguntas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. La comunicación de hallazgos obtenidos en experimentos y de datos para revisión de expertos</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Completa el siguiente organizador gráfico. Los términos se pueden usar más de una vez:

- afirmaciones
- conocimiento
- revisión de expertos
- resultados
- científica
- teorías

Usa la teoría (9) ________________ .

Amplía el (10) ________________ científico.

Pone a prueba las (11) ________________ .

Se somete a una (12) ________________ .

Desafía las (13) ________________ aceptadas.

Cuestiona los (14) ________________ .

Responde a la siguiente afirmación.

15. Nombra dos temas científicos que tienen que ver con la ética.
Guía de estudio

Sección 3: Los métodos de la ciencia

En tu libro de texto, lee acerca de los métodos de la ciencia.

Relaciona el hecho en la columna A con las características en la columna B.

<table>
<thead>
<tr>
<th>Columna A</th>
<th>Columna B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. un procedimiento que prueba una hipótesis al reunir información bajo condiciones controladas</td>
<td>A. constante</td>
</tr>
<tr>
<td>2. en un experimento, el grupo estándar contra el cual se comparan los resultados</td>
<td>B. grupo experimental</td>
</tr>
<tr>
<td>3. en un experimento, el grupo que está expuesto al factor que se está sometiendo a prueba</td>
<td>C. variable independiente</td>
</tr>
<tr>
<td>4. el factor que permanece fijo en un experimento</td>
<td>D. experimento</td>
</tr>
<tr>
<td>5. la condición cambiada por el científico</td>
<td>E. grupo de control</td>
</tr>
<tr>
<td>6. el factor que resulta o que depende de los cambios a la variable independiente</td>
<td>F. variable dependiente</td>
</tr>
<tr>
<td>7. la información adquirida mediante la observación</td>
<td>G. hipótesis</td>
</tr>
<tr>
<td>8. una explicación comprobable de una situación</td>
<td>H. datos</td>
</tr>
</tbody>
</table>

En tu libro de texto, lee acerca de la recolección de datos.

Completa la tabla marcando la(s) columna(s) correcta(s) para cada descripción.

<table>
<thead>
<tr>
<th>Descripción</th>
<th>Investigación cuantitativa</th>
<th>Investigación cualitativa</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Datos numéricos</td>
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<td>10. Estudio de campo del comportamiento de cacería</td>
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<td>11. Termómetro, balanza, cronómetro</td>
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<td>12. Hipótesis comprobable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Las medidas de experimentos de laboratorio controlados</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Datos adquiridos únicamente de la observación</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Binoculares, grabadora, cámara</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Cálculos, gráficas y tablas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section Quick Check

CHAPTER 1

Section 1: Introduction to Biology

After reading the section in your textbook, respond to each statement.

1. List five areas of study in which biologists are involved.

2. State the eight characteristics of living things.

3. Summarize the primary focus of all biological studies.

4. Differentiate between a response to a stimulus and an adaptation.

5. Assess how eating a balanced diet helps maintain homeostasis.
Quick Check

Section 2: The Nature of Science

After reading the section in your textbook, respond to each question and statement.

1. **Recount** the necessity for accurate and detailed record-keeping and the use of the same system of measurements in scientific investigation. How do these standards affect peer review?

2. **Discuss** the validity of research based on standard experimental procedures as opposed to claims that cannot be tested. Justify your inference.

3. **Construct** a logical argument against the use of pseudoscience in the search for knowledge. Base your argument on at least three points.

4. **Consider** the difference between the word *theory* as used in everyday language and a scientific theory.

5. **Decide** what is meant by the statement “Science is not limited to the laboratory.”
Quick Check

After reading the section in your textbook, respond to each statement.

1. Define experiment.

2. Recall types of scientific inquiry that biologists engage in that cannot be completely controlled.

3. Identify the steps in a scientific investigation that must be done before a hypothesis can be formed.

4. Clarify why a scientist can never prove or disprove a hypothesis, but can only test it.

5. Analyze the statement “Even when a hypothesis has not been supported, it is valuable.”
CHAPTER 1 Assessment

Student Recording Sheet

Section 1.1

Vocabulary Review

Replace the underlined phrase with the correct vocabulary term.

1. ____________________  2. ____________________  3. ____________________

Understand Key Concepts

Select the best answer from the choices given, and fill in the corresponding circle.

4. A  B  C  D
   5. A  B  C  D

Constructed Response

6. ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

Think Critically

7. ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

8. ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
Section 1.2

Vocabulary Review

Replace the underlined phrase with the correct vocabulary term.

9. ____________________________
10. ____________________________

Understand Key Concepts

Select the best answer from the choices given, and fill in the corresponding circle.

11. A B C D
12. A B C D

Constructed Response

13. ________________________________________________________
   ________________________________________________________
   ________________________________________________________
   ________________________________________________________
   ________________________________________________________

Think Critically

14. ________________________________________________________
   ________________________________________________________
   ________________________________________________________
   ________________________________________________________
   ________________________________________________________
   ________________________________________________________
CHAPTER 1
Assessment
Student Recording Sheet

Section 1.3
Vocabulary Review

Explain the differences between the vocabulary terms in each pair.

15. 

16. 

17. 

Understand Key Concepts

Select the best answer from the choices given, and fill in the corresponding circle.

18. A B C D

19. A B C D

Constructed Response

20. 

Think Critically

21. Record your answer for question 21 on a separate sheet of paper.

Additional Assessment

22. Writing in Biology Record your answer for question 22 on a separate sheet of paper.

Document-Based Questions

23. 

24. 
CHAPTER 1
Assessment
Student Recording Sheet

Standardized Test Practice

Multiple Choice

Select the best answer from the choices given, and fill in the corresponding circle.

1.  [ ] A  [ ] B  [ ] C  [ ] D

2.  [ ] A  [ ] B  [ ] C  [ ] D

Short Answer

Answer the following question with complete sentences.

3. 


Extended Response

Answer each question with complete sentences.

4. 


5. 


Essay Question

6. Record your answer for question 6 on a separate sheet of paper.
## Table of Contents

### Chapter 2  Principles of Ecology

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</table>
Before reading Chapter 2, predict answers to questions about the chapter content based on what you already know. Circle the letter of the correct answer, and then explain your reasoning.

1. Jason is watching a science fiction movie when he hears one of the characters mention the term **biosphere**. Jason has never heard the term before and decides to look it up in a dictionary. Which would be included in the definition of biosphere?
   
   A. all parts of Earth where life can survive  
   B. regions of Earth where many organisms live  
   C. the inner core, continents, and oceans of Earth  
   D. the living things that inhabit Earth  

   Explain.

2. Mia takes an early morning hike through a forest near her home. She spots white-tailed deer browsing on undergrowth vegetation and a raccoon eating an apple and tuna that were carelessly left behind by another hiker. Mia discovers bright yellow mushrooms growing on a rotting log, and she gazes up at oak trees rising 100 m above the ground. Mia shares her observations with workers at the local nature center. Which would Mia share with the center’s ecologist?

   A. All the organisms spotted during the hike are heterotrophs.  
   B. The oak trees and mushrooms are two types of forest autotrophs.  
   C. The raccoon is an omnivore because it eats plants and animals.  
   D. The white-tailed deer are considered carnivores of forest plants.  

   Explain.

3. Jasmine and several friends watch a thunderstorm roll into the region. As rain pours down on the ground outside, one of Jasmine’s friends asks how the rain gets into the clouds. Another friend asks where the water comes from. Jasmine summarizes the water cycle for her friends. What does Jasmine tell her friends about the water cycle?
Launch Lab

CHAPTER 2

Problems in *Drosophila* World?

What we understand as the world is many smaller worlds combined to form one large world. Within the large world, there are populations of creatures interacting with each other and their environment. In this lab, you will observe an example of a small part of the world.

**Procedure**

1. Read and complete the lab safety form.
2. Prepare a data table to record your observations.
3. Your teacher has prepared a container housing several fruit flies (*Drosophila melanogaster*), with food for the flies in the bottom. Observe how many fruit flies are present.
4. Observe the fruit flies over a period of one week and record any changes.

**Data and Observations**

---

**Analysis**

1. **Summarize** the results of your observations.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. **Evaluate** whether or not this would be a reasonable way to study a real population.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

---

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How is energy passed from organism to organism in an ecosystem? A food chain shows a single path for energy flow in an ecosystem. The overlapping relationships between food chains are shown in a food web.

**Procedure**

1. Read and complete the lab safety form.
2. Use the following information to construct a food web in a meadow ecosystem:
   - Red foxes feed on raccoons, crayfishes, grasshoppers, red clover, meadow voles, and gray squirrels.
   - Red clover is eaten by grasshoppers, muskrats, red foxes, and meadow voles.
   - Meadow voles, gray squirrels, and raccoons all eat parts of the white oak tree.
   - Crayfishes feed on green algae and detritus, and they are eaten by muskrats and red foxes.
   - Raccoons feed on muskrats, meadow voles, gray squirrels, and white oak trees.

**Data and Observations**

**Analysis**

1. **Identify** all of the herbivores, carnivores, omnivores, and detritivores in the food web.

2. **Describe** how the muskrat would be affected if disease kills the white oak trees.
MiniLab

CHAPTER 2
Test for Nitrates

How much nitrate is found in various water sources? One ion containing nitrogen found in water can be easily tested—nitrate. Nitrate is a common form of inorganic nitrogen that is used easily by plants.

Procedure
1. Read and complete the lab safety form.
2. Prepare a data table to record your observations.
3. Obtain the water samples from different sources that are provided by your teacher.
4. Using a nitrate test kit, test the amount of nitrate in each water sample.
5. Dispose of your samples as directed by your teacher.

Data and Observations

Analysis
1. Determine Did the samples contain differing amounts of nitrate? Explain.

2. Identify What types of human activities might increase the amount of nitrate in the water?

3. Infer What problems could a high nitrate level cause considering that nitrates also increase the growth rate of algae in waterways?
Background: Ecologists know that a major key to maintaining not only individual species but also a robust diversity of species is preserving the proper habitat for those species.

Question: What effect does increasing the size of a habitat have on the species diversity within that habitat?

Materials
Choose materials that would be appropriate for this lab.

Safety Precautions
WARNING: Follow all safety rules regarding travel to and from the study site. Be alert on site and avoid contact, if possible, with stinging or biting animals and poisonous plants.

Plan and Perform the Experiment
1. Read and complete the lab safety form.
2. Form a hypothesis that you can test to answer the above question.
3. Record your procedure and list the materials you will use to test your hypothesis.
4. Make sure your experiment allows for the collection of quantitative data, which are data that can be measured.
5. Design and construct appropriate data tables.
6. Make sure your teacher approves your plan before you proceed.
7. Carry out the procedure at an appropriate field site.

Data and Observations
Design Your Own BioLab, Field Investigation: Explore Habitat Size and Species Diversity continued

Analyze and Conclude

1. **Graph Data** Prepare a graph of your data and the combined class data if they are available.

2. **Analyze** Do any patterns emerge as you analyze your group and/or class data and graphs? Explain.

3. **Conclude** Based on your data, was your initial hypothesis correct?

4. **Error Analysis** Compare your observations and conclusions with your classmates. Did your observations and conclusions match? If not, what could explain the differences? How could you verify your results?

5. **Think Critically** Would you expect the same results if you were to perform this experiment in other types of habitats? Explain.

6. **Think Critically** Would you expect the same results ten years from now? Twenty years from now? Explain.

7. **Think Critically** If you had performed this lab 20 years ago, would your results have been the same? Explain.
A fish tank in a person's home might hold 18 to 75 L of water. It is a mini-ecosystem that might contain fish, snails, and plants. Large aquariums hold much more water. One of the reef environments at the Shedd Aquarium in Chicago holds 1,514,000 L of water. It is a habitat for many different sharks, more than 500 species of fish, and many other living things. Aquariums contain many of the biotic and abiotic factors that interact in an ecosystem.

However, most aquariums are not balanced ecosystems. Water and food need to be added, and after a period of time, most aquariums need to be cleaned. Two conditions must be met for an aquarium ecosystem to be balanced: energy from sunlight must be converted into energy usable by organisms, and organic and inorganic nutrients must be recycled back into the environment. In this activity, you will make a model of a balanced ecosystem by constructing a sealed mini-environment of your own.

**Procedure**

1. Read and complete the lab safety form.
2. Obtain a small, clean glass jar with a lid. Use a marker to write your name on the lid.
3. Spread a 4–5 cm layer of sand on the bottom of the jar.
4. Slowly fill the jar three-fourths full with tap water that has aged at least three days. Allow sand to settle to the bottom of the jar.
5. Carefully plant a live *Elodea* plant in the sand. Gently trim the top of the plant to fit the size of the jar, and make sure the plant is completely submerged.
6. Use a dropper to pick up 7–10 *Daphnia*, and add these to the jar. Add a pinch of *brewer’s yeast* to the jar to serve as a temporary food source for the *Daphnia*.
7. Close the jar and place your mini-environment in a sunny area or near some other light source. You have just constructed a self-sustaining, balanced ecosystem that can last from several months to a year.

**Analyze and Conclude**

Respond to each statement.

1. **Describe** With the addition of a live plant, nutrient-recycling bacteria were also introduced to your mini-environment. Bacteria, as well as yeast, serve as food for *Daphnia*. In your own words, describe why your mini-environment is a balanced ecosystem. Include the terms *consumer*, *producer*, and *decomposer* in your answer.
2. **Illustrate** In the space below, make a labeled diagram that shows how carbon and oxygen are recycled in your mini-environment.

3. **Hypothesize** Ecosystems will remain in equilibrium unless disturbed by external factors. Write a hypothesis about the ecological consequences for each of the following variables.
   
a. A rare disease kills all the *Daphnia* in the mini-environment.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

   b. The mini-environment is placed in a dark part of the room.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

   c. The *Elodea* plant is thoroughly cleansed of all bacteria before being planted.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

4. **Design** an experiment to test how the amount of light affects a mini-environment. List the materials you would use and describe your procedure.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

**CAREERS IN BIOLOGY**

**Marine Biology** Visit biologygmh.com for information on marine biologists. What are the responsibilities of a marine biologist?
Studying the flow of energy in an ecosystem is one way that ecologists learn about the relationships between the different organisms in the ecosystem. Ecologists try to determine how the organisms obtain the energy they need and thereby identify the trophic level of each organism. Most ecosystems are complex, and it is often difficult or impossible to trace all the energy pathways between organisms. Ecologists use models, called food chains and food webs, to help them study the flow of energy in an ecosystem.

**Food Chains**  A simple model of the energy flow in an ecosystem is a food chain. A food chain represents the one-way flow of energy, which starts with an autotroph and moves to heterotrophs. An example of a simple food chain is:

- grass → rabbit → hawk

Arrows represent the direction of the energy flow.

**Food Webs**  More complex and realistic energy flows within ecosystems are modeled by food webs. Because most organisms use more than a single source of food, food webs more closely model the relationships in ecosystems. In the preceding example, rabbits are not the only herbivores that consume grass, and hawks eat other organisms besides rabbits.

**Directions**

In the space below, draw a diagram that shows an example of a food web in a terrestrial ecosystem. The organisms in the ecosystem include the following: fungi, snakes, rabbits, grass, mountain lions, mice, shrubs, seed-eating birds, trees, hawks, bacteria, and deer. Use arrows to represent the flow of energy in this ecosystem. Also indicate the trophic level of each organism: decomposer, autotroph, or heterotroph. Use your text and other resources as references. Be sure to label all the organisms in the food web, as well as their trophic levels.
Complete the Venn diagram about how organisms get energy. These terms may be used more than once: are described by their energy source, carnivores, consumers, detritivores, form the base of all ecological pyramids, herbivores, make organic molecules from inorganic molecules, part of food chains and food webs, producers, some absorb nutrients from dead organisms, some eat other organisms.
In your textbook, read about ecology.

Read each statement. If it describes the study of ecology, write yes. If not, write no.

_____ 1. Ecology is the study of interactions among organisms.

_____ 2. Ecologists mainly study green plants.

_____ 3. Most experiments in ecology are quick and done in a lab.

_____ 4. Models help ecologists control the many variables in their studies.

In your textbook, read about the biosphere and levels of organization.

Match the definition in Column A with the term in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. made up of individual organisms of the same species</td>
<td>A. abiotic factors</td>
</tr>
<tr>
<td>6. all nonliving things in an environment</td>
<td>B. biosphere</td>
</tr>
<tr>
<td>7. made up of the organisms and nonliving things in an area</td>
<td>C. biotic factors</td>
</tr>
<tr>
<td>8. portion of Earth that supports life</td>
<td>D. ecosystem</td>
</tr>
<tr>
<td>9. all living organisms in an environment</td>
<td>E. population</td>
</tr>
</tbody>
</table>

In your textbook, read about the ecosystem interactions and community interactions.

Complete the table by checking the correct column(s) for each interaction.

<table>
<thead>
<tr>
<th>Interaction</th>
<th>Involves Abiotic Factors</th>
<th>Involves Biotic Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Commensalism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Competition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Habitat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Mutualism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Niche</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Predation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about autotrophs and heterotrophs.

Match the definition in Column A with the term in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. get energy by eating other organisms</td>
<td>A. autotrophs</td>
</tr>
<tr>
<td>2. eat both plants and animals</td>
<td>B. carnivores</td>
</tr>
<tr>
<td>3. eat only animals</td>
<td>C. detritivores</td>
</tr>
<tr>
<td>4. collect energy to produce their own food</td>
<td>D. herbivores</td>
</tr>
<tr>
<td>5. eat only plants</td>
<td>E. heterotrophs</td>
</tr>
<tr>
<td>6. eat or break down dead things</td>
<td>F. omnivores</td>
</tr>
</tbody>
</table>

In your textbook, read about models of energy flow.

Label the food chain below to identify each trophic level. Use these choices:

carnivore  herbivore  omnivore  producer

GRASS → GRASSHOPPER → RACCOON → COYOTE

7. __________  8. __________  9. __________  10. __________

Label the ecological pyramid. Use these choices:

primary consumers  producers  secondary consumers

11. ________________

12. ________________

13. __________________

Respond to each statement.

14. Recall the name for the total amount of living matter in each trophic level of an ecological pyramid.

15. Explain why an ecological pyramid is smaller at the top than at the bottom.
In your textbook, read about the water cycle.

Number the steps of the water cycle in the order in which they occur, starting with the collection of water in lakes or oceans.

1. Water is absorbed by plants growing in the soil and used for photosynthesis.
2. Water returns to Earth as rain or snow through the process of precipitation.
3. Through evaporation, water changes from a liquid to a gas that becomes part of the air.
4. Through condensation, water in the air changes from a gas to tiny droplets of liquid.

In your textbook, read about the carbon and oxygen cycles.

Refer to the illustration. Use each of the terms below only once to complete the passage.

- atmosphere
- carbon cycles
- decomposition
- living organisms
- photosynthesis
- respiration
- water

(5) _______________ is a part of all organic compounds, which make up living things.

It (6) _______________ through the environment due to the flow of energy in ecosystems.

The carbon cycle is made of several processes, including (7) _______________, (8) _______________, and (9) _______________. During these processes, carbon moves between its major reservoirs. These major reservoirs include the (10) _______________, the (11) _______________, and (12) _______________.
In your textbook, read about the nitrogen cycle.

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

ammonia    atmosphere    consumers    decay    decomposers
denitrification    nitrogen fixation    plants    proteins    urinate

Nitrogen is a nutrient that organisms need to produce (13) _____________________________.

Plants and animals cannot use the nitrogen that makes up a large percentage of the
(14) _____________________________. The nitrogen is captured and converted into a form that is usable
by plants in a process called (15) _____________________________. Nitrogen enters the food web when
(16) _____________________________ absorb nitrogen compounds from the soil and use them to make
proteins. (17) ___________________________ get nitrogen by eating plants or animals that contain
nitrogen. Nitrogen is returned to the soil when animals (18) _____________________________ or when
organisms die and (19) _____________________________. (20) _____________________________ break
down organic matter found in organisms into (21) _____________________________. This compound is
changed by organisms in the soil into other nitrogen compounds that can be used by plants. Finally, some
soil bacteria convert nitrogen compounds into nitrogen gas, which returns to the atmosphere in a process
called (22) _____________________________.

In your textbook, read about the phosphorus cycle.

Label the diagram of the phosphorus cycle. Use these choices:

long-term cycle    new rock    short-term cycle    soil and groundwater

23. _____________________________
24. _____________________________
25. _____________________________
26. _____________________________
En tu libro de texto, lee acerca de la ecología. Lee cada afirmación. Si describe el estudio de la ecología, escribe «sí». De lo contrario, escribe «no».

1. La ecología es el estudio de las interacciones entre los organismos.  
2. Los ecologistas estudian principalmente las plantas verdes.  
3. La mayoría de los experimentos en ecología son rápidos y se hacen en un laboratorio.  
4. Los modelos ayudan a los ecologistas a controlar las diferentes variables en sus estudios.

En tu libro de texto, lee acerca de la biosfera y los niveles de organización. Relaciona la definición de la columna A con el término de la columna B.

<table>
<thead>
<tr>
<th>Columna A</th>
<th>Columna B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. compuesta de organismos individuales de la misma especie</td>
<td>A. factores abióticos</td>
</tr>
<tr>
<td>6. todas las cosas no vivientes en un ambiente</td>
<td>B. biosfera</td>
</tr>
<tr>
<td>7. compuesto de organismos y cosas no vivientes en un área</td>
<td>C. factores bióticos</td>
</tr>
<tr>
<td>8. porción de la tierra que sostiene a la vida</td>
<td>D. ecosistema</td>
</tr>
<tr>
<td>9. todos los organismos vivos en un ambiente</td>
<td>E. población</td>
</tr>
</tbody>
</table>

En tu libro de texto, lee acerca de las interacciones del ecosistema y las interacciones comunitarias. Completa la tabla marcando la(s) columna(s) correcta(s) para cada interacción.

<table>
<thead>
<tr>
<th>Interacción</th>
<th>Involucra factores abióticos</th>
<th>Involucra factores bióticos</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Comensalismo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Competencia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Hábitat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Mutualismo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Nicho</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Depredación</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Guía de estudio

Sección 2: Flujo de energía en un ecosistema

En tu libro de texto, lee acerca de los autótrofos y heterótrofos.

Relaciona la definición de la columna A con el término de la columna B.

<table>
<thead>
<tr>
<th>Columna A</th>
<th>Columna B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Obtienen energía al comer otros organismos.</td>
<td>A. autótrofos</td>
</tr>
<tr>
<td>2. Comen tanto plantas como animales.</td>
<td>B. carnívoros</td>
</tr>
<tr>
<td>3. Comen sólo animales.</td>
<td>C. detritívoros</td>
</tr>
<tr>
<td>4. Reúnen energía para producir su propio alimento.</td>
<td>D. herbívoros</td>
</tr>
<tr>
<td>5. Sólo comen plantas.</td>
<td>E. heterótrofos</td>
</tr>
<tr>
<td>6. Comen o descomponen cosas muertas.</td>
<td>F. omnívoros</td>
</tr>
</tbody>
</table>

En tu libro de texto, lee acerca de los modelos de flujo de energía.

Identifica la cadena alimenticia a continuación según cada nivel trófico. Usa estas opciones:

- carnívoros
- herbívoros
- omnívoros
- productor

Hierba → Saltamontes → Mapache → Coyote

7. 8. 9. 10.

Identifica la pirámide ecológica. Usa estas opciones:

- consumidores primarios
- consumidores secundarios
- productores


Responde a cada afirmación.

14. Recuerda el nombre de la cantidad total de materia viva en cada nivel trófico de una pirámide ecológica.

15. Explica por qué una pirámide ecológica es más pequeña en la parte superior que en la base.
Guía de estudio

CAPÍTULO 2
Sección 3: El ciclo de la materia

En tu libro de texto, lee acerca del ciclo de agua.

Enumera los pasos del ciclo del agua en el orden en el que ocurren, empezando con la recolección de agua en lagos u océanos.

1. El agua es absorbida por las plantas que crecen en la tierra y es usada para la fotosíntesis.
2. El agua regresa a la tierra en forma de lluvia o nieve por medio del proceso de precipitación.
3. Por medio de la evaporación, el agua cambia de estado líquido a gaseoso que se vuelve parte del aire.
4. Por medio de la condensación, el agua en el aire cambia de un estado gaseoso a gotitas de líquido.

En tu libro de texto, lee acerca de los ciclos del carbono y del oxígeno.

Consulta la ilustración. Usa cada uno de los siguientes términos sólo una vez para completar el párrafo.

agua  descomposición  atmósfera  fotosíntesis  carbono  organismos vivos  ciclo  respiración

El (5) es una parte de todos los compuestos orgánicos que componen todas las cosas vivas. Éste realiza un (6) a través del ambiente debido al flujo de energía en los ecosistemas. El ciclo del carbono está compuesto por varios procesos, incluidas la (7) , la (8) , y la (9) . Durante estos procesos, el carbono se mueve entre sus depósitos principales. Entre estos depósitos principales se cuentan (10) , (11) y (12) .
En tu libro de texto, lee acerca del ciclo del nitrógeno.

Usa cada uno de los siguientes términos sólo una vez para completar el párrafo.

amoniaco atmósfera consumidores denitrificación
descomponen descomponedores fijación de nitrógeno orinan
plantas proteínas

El nitrógeno es un nutriente que los organismos necesitan para producir (13) ________________ . Las plantas y los animales no pueden usar el nitrógeno que constituye un gran porcentaje de la (14) ________________ .

El nitrógeno se captura y se convierte en una forma utilizable por las plantas mediante un proceso llamado (15) ________________ . El nitrógeno entra en la red alimenticia cuando las (16) ________________ absorbén compuestos de nitrógeno de la tierra y los usan para producir proteínas. Los (17) ________________ , obtienen nitrógeno al comer plantas o animales que contienen nitrógeno. El nitrógeno regresa a la tierra cuando los animales (18) ________________ o cuando los organismos mueren y se (19) ________________ . Los (20) ________________ transforman en (21) ________________ , la materia orgánica que encuentran en organismos.

A este compuesto, los organismos en el suelo lo convierten en otros compuestos de nitrógeno que las plantas pueden usar. Finalmente, ciertas bacterias del suelo convierten los compuestos de nitrógeno en gas nitrógeno, el cual regresa a la atmósfera mediante un proceso llamado (22) ________________ .

En tu libro de texto, lee acerca del ciclo del fósforo.

Identifica el diagrama del ciclo del fósforo. Usa estas opciones:

ciclo a corto plazo ciclo a largo plazo roca nueva tierra y agua subterráneas

23. ________________
24. ________________
25. ________________
26. ________________
After reading the section in your textbook, respond to each statement.

1. **Recall** what portion of Earth is included in the biosphere.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. **Discuss** how to recognize the predator and the prey in a predation relationship.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. **Indicate** how individuals relate to populations in the organization of the biosphere.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

4. **Compare** and **contrast** mutualism and parasitism.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

5. **Infer** why green plants or algae are good indicators of the distribution of living organisms in an area.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
CHAPTER 2
Section 2: Flow of Energy in an Ecosystem

After reading the section in your textbook, respond to each statement.

1. **State** why detritivores are an important part of the ecosystem.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

2. **Describe** how food chains are related to food webs.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

3. **Differentiate** among herbivores, carnivores, and omnivores.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

4. **Distinguish** ecological pyramids from food webs and food chains.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

5. **Predict** how the removal of an herbivore from a food web could affect the entire community.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
Section Quick Check

CHAPTER 2
Section 3: Cycling of Matter

After reading the section in your textbook, respond to each statement.

1. **State** the function of nitrogen fixation.

2. **Summarize** the long-term cycle of phosphorus.

3. **Determine** why cycles in the biosphere are called biogeochemical cycles.

4. **Describe** the carbon and oxygen cycles that occur among living things.

5. **Appraise** the importance of the role that plants play in the water cycle.
CHAPTER 2 Assessment
Student Recording Sheet

Section 2.1
Vocabulary Review
Write the vocabulary term that makes each sentence true.
1. __________________________
2. __________________________
3. __________________________

Understand Key Concepts
Select the best answer from the choices given, and fill in the corresponding circle.
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D

Constructed Response
9. ____________________________________________
10. ____________________________________________
11. Careers in Biology ____________________________________________

Think Critically
12. ____________________________________________
13. ____________________________________________

Section 2.2
Vocabulary Review
Write a sentence that connects the vocabulary terms in each set.
14. ____________________________________________
### CHAPTER 2 Assessment

**Student Recording Sheet**

15. 

16. 

17. 

#### Understand Key Concepts

*Select the best answer from the choices given, and fill in the corresponding circle.*

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>19.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>20.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>22.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>

#### Constructed Response

23. Record your answer for question 23 on a separate sheet of paper.

24. 

25. 

#### Think Critically

26. Record your answer for question 26 on a separate sheet of paper.

#### Section 2.3 Vocabulary Review

*Write the vocabulary term that makes each sentence true.*

27. 

28. 

29. 

#### Understand Key Concepts

*Select the best answer from the choices given, and fill in the corresponding circle.*

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>30.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>31.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>32.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>33.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>
CHAPTER 2 Assessment Student Recording Sheet

Constructed Response

34. 

35. 

36. 

Think Critically

37. 

38. 

Additional Assessment

39. Writing in Biology Record your answer for question 39 on a separate sheet of paper.

Document-Based Questions

40. Record your answer for question 40 on a separate sheet of paper.

41. 

42. 

Cumulative Review

43. 

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CHAPTER 2
Assessment
Student Recording Sheet

Standardized Test Practice

Multiple Choice
Select the best answer from the choices given, and fill in the corresponding circle.

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D

Short Answer
Answer each question with complete sentences.

10. 

11. 

12. 

13. Record your answer for question 13 on a separate sheet of paper.

14. 

15. 

Extended Response
Answer each question with complete sentences.

16. 

17. Record your answer for question 17 on a separate sheet of paper.

Essay Question
18. Record your answer for question 18 on a separate sheet of paper.
# Table of Contents

## Chapter 3  Communities, Biomes, and Ecosystems

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Before reading Chapter 3, predict answers to questions about the chapter content based on what you already know. Circle the letter of the correct answer, and then explain your reasoning.

1. Emily and her family live in Maine, and they have planned a road trip to travel across Canada and the United States. They travel across Canada through forests of spruce and fir trees until they reach the west coast. Traveling south through temperate rain forests, they reach southern California, where only shrubs grow in dry soil. Heading east, they pass through deserts and eventually reach the deciduous forests of the east coast. They drive northward to home. Which describes Emily’s cross-country trip?
   A. Emily witnessed a series of ecosystem successions such as scrubland to desert.
   B. The family spent their entire trip in the North American biological community.
   C. The trip encompassed a majority of the major terrestrial biomes of Earth.
   D. They traveled through several large ecosystems such as the American desert.

   Explain.

2. Mario and several friends spend a day at the beach. While watching the ocean waves crashing to shore, Mario wonders how much of the world’s water is contained in different types of bodies of water such as oceans, lakes, and rivers. He decides to research the percentage of Earth’s water found in different locations. Which does his research reveal?
   A. Fifty percent of Earth’s water is in oceans and the glaciers at the poles.
   B. Less than 3 percent of Earth’s water is freshwater containing no salt.
   C. Ninety percent of Earth’s water is in lakes, rivers, and groundwater.
   D. The ice caps located at both poles contain 30 percent of Earth’s water.

   Explain.

3. Gamal takes a guided kayak tour of an estuary located near his home. The ecologist leading the trip explains to Gamal’s group what an estuary is and why estuaries are important. What does the ecologist tell the group?
Launch Lab

CHAPTER 3
What is my biological address?

Just as you have a postal address, you also have a biological “address.” As a living organism, you are part of interwoven ecological units that vary in size from as large as the whole biosphere to the place you occupy right now.

Procedure
1. What do the terms community and ecosystem mean to you?
2. Describe the biological community and an ecosystem to which you belong.

Data and Observations

Analysis
1. Compare Did your classmates all identify the same community and ecosystem? How would you describe, in general, the plants and animals in your area to someone from another country?

2. Examine Communities and ecosystems are constantly changing through a process known as succession. What changes do you think your biological community has undergone in the last 100 to 150 years?
How are temperature and latitude related? At the equator the climate is very warm. However, as you change latitude and move north or south from the equator, temperatures also change. This results in different latitudinal climate belts around the world.

Procedure
1. Read and complete the lab safety form.
2. Position a lamp so that it shines directly on the equator of a globe.
3. Predict how the temperature readings will change as you move a thermometer north or south away from the equator.
4. Prepare a data table to record your observations.
5. Use the thermometer to take temperature readings at different latitudes as instructed by your teacher. WARNING: The lamp and bulb will be very hot.
6. Record temperature readings in your data table.

Analysis
1. Model Draw a diagram using your data to model climate belts.

2. Recognize Cause and Effect Why do the temperature readings change as you move north or south of the equator?
MiniLab

CHAPTER 3
Prepare a Scientific Argument

Should an environment be disturbed? One of the greatest challenges we face as a species is balancing the needs of an ever-growing human global population with the needs of wildlife and the quality of the global environment. Imagine this scenario: The county commissioners are considering a proposal to build a road through the local pond and wetlands. This road will provide much-needed access to areas of work and will help boost the economy of a struggling town. This will mean that the pond and surrounding wetlands must be drained and filled. Many people support the proposal, while many people oppose it. How might a compromise be reached?

Procedure

1. Prepare a comparison table in which you can list pros and cons.
2. Identify the pros and cons for draining the pond and building the road, for keeping the pond and not building the road, or for building the road elsewhere.

Data and Observations

Analysis

1. Design a plan to support one course of action. What steps could you take to achieve your goal? Be prepared to share and defend your plan to the rest of the class.

2. Think Critically Why are decisions involving the environment difficult to make?
Design Your Own BioLab

CHAPTER 3
Field Investigation: A Pond in a Jar

Background: Ecologists study parts of the biosphere. Each part is a unit containing many complex interactions between living things, such as food chains and food webs, and the physical environment, the water cycle, and the mineral cycle. Smaller parts of the biosphere, such as communities and ecosystems, are the most practical for ecologists to explore and investigate.

Question: What can we learn from studying a miniaturized biological ecosystem?

Materials
Choose materials that would be appropriate for this lab. Possible materials include:
- glass or clear plastic gallon jars
- pond water
- pond mud
- appropriate cultures and select living organisms

Safety Precautions

WARNING: Use care when handling jars of pond water.

Plan and Perform the Experiment

1. Read and complete the lab safety form.
2. Prepare an observation table as instructed.
4. Decide on a particular aspect of your miniature community to evaluate, and design an appropriate experiment. For example, you might test the effect of sunlight on your ecosystem.
5. Carry out your experiment.

Data and Observations
Analyze and Conclude

1. Explain Why did you conduct your experiment slowly in a step-by-step manner? What might have happened if you poured everything into the jar all at once?

2. Identify Variables What was the independent variable? The dependent variable?

3. Design an Experiment Did your experiment have a control? Explain.

4. Analyze and Conclude Describe how your community differs from a pond community found in nature.

5. Error Analysis How effective was your design? Explain possible sources of errors.
The theory of ecological succession was first developed in 1898 by Henry Chandler Cowles, a University of Chicago graduate student. He proposed the theory in his Ph.D. thesis, which was based on fieldwork he had undertaken in the Indiana Dunes, a region of beaches, sand dunes, bogs, and woods along the south shore of Lake Michigan. Cowles’s thesis, which described the phenomenon of plant succession as one travels from the beach inland, was published in a scientific periodical and established him as the first professional American ecologist. According to the thesis, the relative ages of the different plant communities are a function of distance from the lakeshore.

The Indiana Dunes

Today the Indiana Dunes area is protected as the Indiana Dunes State Park and the Indiana Dunes National Lakeshore. Take an imaginary visit to the area. Set up camp under the cottonwood and pine trees along the back of a large dune. Then climb to the top of the dune where you can view Lake Michigan and see the Chicago skyline in the distance. Walk back through the campground beneath oak and hickory trees to the trailheads from which you can hike through the maple and beech forest.

Along the way, a marker will point you to a trail to the beach. Take this trail over the top of another dune and walk through dunes grass on your way to the sandy lakeshore. Lake Michigan was formed when glaciers retreated at the end of the Ice Age about 10,000 years ago, leaving meltwater, sand, clay, and gravel. Winds picked up sand grains from the beach and blew them inland, creating the dunes. This process continues today.

Analyze and Conclude

Respond to each question and statement.

1. Summarize  What did Henry Cowles propose in his Ph.D. thesis?

2. Explain  How did the Indiana Dunes form?
3. **Systematize** The water level of Lake Michigan was once 18 m higher than it is today, and an original beach level can be identified about 72 km southwest of today’s western shore. As the lake receded, land was exposed and small ponds were left behind where there were depressions in the land. The table below describes four ponds.

<table>
<thead>
<tr>
<th>Pond A</th>
<th>Pond B</th>
<th>Pond C</th>
<th>Pond D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattails, bullrushes, and water lilies grow in the pond. Larvae and insects serve as food for fish, crayfish, frogs, and turtles. Decayed plants and animals form a medium-sized layer of humus over the bottom of the pond.</td>
<td>Plankton growth in the water is rich enough to support animals that entered the pond when it was connected to the lake. Fish make nests on the sandy bottom.</td>
<td>A thin layer of humus covers the bottom of the pond. Branching green algae cover the humus. Fish that build nests on the bare bottom have been replaced by those that lay their eggs on the algae.</td>
<td>The pond is filled with vegetation, and there are no longer any areas of open water. The humus layer has reached the top of the pond in most places. The pond is filled with grasses, and the water evaporates during the summer months.</td>
</tr>
</tbody>
</table>

Place the letters of the ponds in order of succession (1 = youngest; 4 = oldest).

(1) __________ (2) __________ (3) __________ (4) __________

4. **Apply** One of the reasons succession occurs is that many species change the environment in which they live in ways that make it more favorable for others. Give an example of how this happens in a dune, woodland, or pond ecosystem.

________________________________________________________________________
________________________________________________________________________

5. **Suggest** Dunes grass has rootlike rhizomes that form a webbed underground network. Describe two ways in which dunes grass might change a sand dune.

________________________________________________________________________
________________________________________________________________________

6. **Analyze** A man living on the lakeshore feared that the blowing, shifting sand eventually would cover his house. To prevent this from happening, the man researched the area and learned that jack pine trees grew on the tall dunes that did not move. He planted young jack pines on the sand hills close to his house, but his plan did not work. The jack pines died within a month. Why did the jack pines die?

________________________________________________________________________

**CAREERS IN BIOLOGY**

**Restoration Ecology** Visit biologygmh.com for information on restoration ecologists. What are the responsibilities of a restoration ecologist?
Enrichment

CHAPTER 3

Analyze a Problem: Terrestrial Biomes and Aquatic Ecosystems

A terrestrial biome is a large group of ecosystems that are classified primarily by the plant communities found within them. These plant communities are largely a function of climatic conditions, such as precipitation and temperature. Terrestrial biomes are greatly influenced by latitude, elevation above sea level, and other physiographic features, such as mountain ranges, oceans, and other large bodies of water.

Aquatic ecosystems are classified by water depth, flow, distance from shore, salinity, and latitude. Particular plant and animal species are adapted to differing water salinities and water temperatures. Aquatic ecosystems are further classified by water depth and relationship to the coastline.

Select Suppose you are writing an article about a terrestrial biome or an aquatic ecosystem for a science magazine. The table below lists six examples of terrestrial biomes and aquatic ecosystems. Select one of the biomes or ecosystems to research.

Research Once you have selected a biome or ecosystem, research information about it. Concentrate on one location that provides a good example of that biome or ecosystem. Questions to consider while researching include: What are the climatic or water conditions of the biome or ecosystem? What plants and animals characterize the biome or ecosystem? Are there any abiotic or biotic factors, such as pollution, human development, natural disaster, or a key endangered species, that currently affect the location?

Discuss Use your textbook and other reference materials to find information. Discuss your topic and possible answers to your questions with your teacher and classmates.

Write Finally, write an article about the particular location of the biome or ecosystem you selected. Provide answers for any questions you researched and discussed. Be sure to properly cite the sources you used.

<table>
<thead>
<tr>
<th>Terrestrial Biome</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desert</td>
<td>Mojave Desert, United States; Sahara, Africa; Gobi Desert, Asia; Kalahari Desert, Africa</td>
</tr>
<tr>
<td>Boreal forest</td>
<td>northern Scandinavia (Sweden and Norway); northern Canada; Alaska; northern Russia</td>
</tr>
<tr>
<td>Tropical rain forest</td>
<td>Indonesia; Amazon Basin, Brazil; Central America (Guatemala, Honduras); Papua, New Guinea</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aquatic Ecosystem</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland</td>
<td>Everglades National Park, Florida; Mississippi River Delta, Louisiana; Chesapeake Bay area, Virginia, Maryland, and Delaware; mangrove areas on Caribbean Islands</td>
</tr>
<tr>
<td>Coral reef</td>
<td>Great Barrier Reef, Australia; South Florida, United States; Fiji, South Pacific; Bahamas, Caribbean Sea</td>
</tr>
<tr>
<td>Deep-ocean hydrothermal vent communities</td>
<td>Galápagos Rift, eastern Pacific Ocean; East Pacific Rise, south of Baja California, Mexico; Juan de Fuca Ridge, west of Washington and Oregon</td>
</tr>
</tbody>
</table>
Complete the network tree about terrestrial biomes. These terms may be used more than once: climate, cool, desert, grassland, temperate, tropical rain forest, tundra.

Terrestrial biomes are determined by

1. [Blank]

and can be

2. [Blank] causing the soil to

3. [Blank] which can be

   - lack permafrost
     - which leads to a
       - boreal forest

   - have permafrost
     - which leads to a
       - temperate forest

4. [Blank] which leads to a

5. [Blank] which can lead to a

6. [Blank] or

7. [Blank]
In your textbook, read about limiting factors.

Complete the table by checking the correct column(s) for each limiting factor.

<table>
<thead>
<tr>
<th>Limiting Factor</th>
<th>Abiotic Factor</th>
<th>Biotic Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Rainfall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Predator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Soil chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Prey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Plant nutrients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Oxygen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Sunlight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Producers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about ecological succession.

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

<table>
<thead>
<tr>
<th>abiotic factors</th>
<th>climax community</th>
<th>ecological succession</th>
</tr>
</thead>
<tbody>
<tr>
<td>ecosystems</td>
<td>fire</td>
<td>lava flow</td>
</tr>
<tr>
<td>pioneer species</td>
<td>primary succession</td>
<td>secondary succession</td>
</tr>
</tbody>
</table>

(11) ________________________ are constantly changing. Both (12) ________________________ and biotic factors change in every ecosystem. One type of ecosystem change, called (13) ________________________, results in one community replacing another over time. This process might begin on bare rock, such as a(n) (14) ________________________. The process begins when (15) ________________________ begin living on the rock. This process is called (16) ________________________. The mature community that eventually forms is called the (17) ________________________. Sometimes that community is destroyed by a(n) (18) ________________________. A new community will replace the destroyed one through the process of (19) ________________________.
In your textbook, read about primary succession.

Number the pictures below in the order in which they occur, showing the changes that take place during primary succession.

20.  

22.  

21.  

23.  

In your textbook, read about secondary succession.

Respond to each statement.

24. Name the material that is present for secondary succession that is not present for primary succession.

25. Cite two reasons why secondary succession is faster than primary succession.

26. Recall the name for the mature community that develops in secondary succession.
In your textbook, read about the effects of latitude and climate.

Complete the table by filling in the missing information.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather</td>
<td>1.</td>
</tr>
<tr>
<td>Climate</td>
<td>2.</td>
</tr>
<tr>
<td>Latitude</td>
<td>3.</td>
</tr>
</tbody>
</table>

In your textbook, read about the major land biomes.

Refer to the figure below and the information in your textbook. Use each of the terms below only once to complete the passage.

<table>
<thead>
<tr>
<th>desert</th>
<th>less</th>
<th>plants</th>
<th>precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>temperature</td>
<td>tropical rain forest</td>
<td>tundra</td>
<td></td>
</tr>
</tbody>
</table>

The biome that receives the most annual precipitation is the (4) ________________________, and the biome that receives the least annual precipitation is the (5) ________________________.

Biomes are classified primarily by the characteristics of their (6) ________________________.

The graph shows two other characteristics of biomes: (7) ________________________ and (8) ________________________.

Based on the diagram, the biome that is most likely to have a permafrost layer is the (9) ________________________.

Open woodlands have (10) ________________________ annual rainfall than temperate forests have.
In your textbook, read about aquatic ecosystems.

Complete the table by filling in the missing information.

<table>
<thead>
<tr>
<th>Type of Aquatic Ecosystem</th>
<th>Description of Aquatic Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>2. where land and water or salt water and freshwater intermingle; includes wetlands and estuaries; does not look like a stream, a pond, or an ocean</td>
</tr>
<tr>
<td></td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>4.</td>
</tr>
</tbody>
</table>

In your textbook, read about lakes and ponds.

Complete the graphic organizer about the zones of lakes and ponds. Use these choices:

- limnetic zone
- littoral zone
- profundal zone

---

5.  :  the area closest to the shore

6.  :  the open water areas that are well lit and dominated by plankton

7.  :  the deepest area of a large lake; cold; low in oxygen
Guía de estudio

En tu libro de texto, lee acerca de los factores limitantes.

Completa la tabla marcando la(s) columna(s) correcta(s) para cada factor limitante.

<table>
<thead>
<tr>
<th>Factor limitante</th>
<th>Factor abiótico</th>
<th>Factor biótico</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Temperatura</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Lluvia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Depredador</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Química del suelo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Presa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Nutrientes de las plantas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Oxígeno</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Luz solar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Clima</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Productores</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

En tu libro de texto, lee acerca de la sucesión ecológica.

Usa cada uno de los siguientes términos sólo una vez para completar el párrafo.

<table>
<thead>
<tr>
<th>comunidad clímax</th>
<th>ecosistemas</th>
<th>especies pioneras</th>
</tr>
</thead>
<tbody>
<tr>
<td>factores abióticos</td>
<td>flujo de lava</td>
<td>incendio</td>
</tr>
<tr>
<td>sucesión ecológica</td>
<td>sucesión primaria</td>
<td>sucesión secundaria</td>
</tr>
</tbody>
</table>

Los (11) ______________ cambian constantemente. Tanto los (12) ______________ como los factores bióticos cambian en todos los ecosistemas.

Un tipo de cambio de ecosistema, llamado (13) ______________, resulta en una comunidad que reemplaza a otra con el tiempo. Este proceso podría empezar con una roca simple, como un (14) ______________. El proceso comienza cuando las (15) ______________ empiezan a vivir en la roca. Este proceso se llama (16) ______________. La comunidad madura que resulta formándose se llama (17) ______________. Algunas veces esa comunidad es destruida por un (18) ______________. Una nueva comunidad reemplazará a la comunidad destruida mediante un proceso de (19) ______________.
En tu libro de texto, lee acerca de la sucesión primaria.

Enumera los dibujos a continuación en el orden en el cual suceden, indicando los cambios que ocurren durante la sucesión primaria.

20. ___________

21. ___________

22. ___________

23. ___________

En tu libro de texto, lee acerca de la sucesión secundaria.

Responde a cada afirmación.

24. **Nombra** el material que está presente en la sucesión secundaria y que no está presente en la sucesión primaria.

25. **Cita** dos razones por las cuales la sucesión secundaria es más rápida que la sucesión primaria.

26. **Recuerda** el nombre de la comunidad madura que se desarrolla en la sucesión secundaria.
En tu libro de texto, lee acerca de los efectos de latitud y clima.

Completa la tabla con la información faltante.

<table>
<thead>
<tr>
<th>Término</th>
<th>Definición</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiempo</td>
<td>1.</td>
</tr>
<tr>
<td>Clima</td>
<td>2.</td>
</tr>
<tr>
<td>Latitud</td>
<td>3.</td>
</tr>
</tbody>
</table>

En tu libro de texto, lee acerca de los biomas terrestres más importantes.

Consulta la siguiente gráfica y la información en tu libro de texto. Usa los siguientes términos sólo una vez para completar el párrafo.

bosque tropical lluvioso desierto menos plantas
precipitación temperatura tundra

El bioma que recibe la mayor precipitación anual es el (4) ________________, y el bioma que recibe la menor precipitación anual es el (5) _________________. Los biomas se clasifican principalmente por las características de sus (6) _________________. La gráfica muestra otras dos características de los biomas: la (7) ________________ y la (8) ________________. Según el diagrama, el bioma que tiene más probabilidad de tener una capa de permafrost es la (9) ________________. Los bosques arbolados abiertos tienen (10) ________________ lluvia anual que los bosques templados.
En tu libro de texto, lee acerca de los ecosistemas acuáticos.

Completa la tabla con la información faltante.

<table>
<thead>
<tr>
<th>Tipo de ecosistema acuático</th>
<th>Descripción del ecosistema acuático</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agua dulce</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>2. donde la tierra y el agua o el agua salada y el agua dulce se mezclan; incluye tierras pantanosas y estuarios; no parece un arroyo, un estanque o un océano</td>
</tr>
<tr>
<td></td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>4.</td>
</tr>
</tbody>
</table>

En tu libro de texto, lee acerca de los lagos y los estanques.

Completa el organizador gráfico sobre las zonas de lagos y estanques. Usa estas opciones:

- **zona limnética**
- **zona litoral**
- **zona profunda**

**Zona de lagos y estanques**

5. **________**: el área más cercana a la costa

6. **________**: las áreas de aguas abiertas que están bien iluminadas y dominadas por plancton

7. **________**: el área más profunda de un lago grande; nivel bajo de oxígeno
Quick Check

Section 1: Community Ecology

After reading the section in your textbook, respond to each statement.

1. **List** five examples of abiotic factors.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

2. **Describe** how soil is created during primary succession.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3. **Clarify** the difference between the ideal range and the range of tolerance.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

4. **Distinguish** between primary succession and secondary succession.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

5. **Suggest** which biotic limiting factor is most important for an animal that lives in a desert.

   __________________________________________________________
   __________________________________________________________
Section Quick Check

CHAPTER 3
Section 2: Terrestrial Biomes

After reading the section in your textbook, respond to each statement.

1. **Name** the three zones of Earth that are based on latitude.

2. **Explain** why biomes do not spread in equal bands that encircle Earth.

3. **Apply** what you know about the tundra to explain how trees can grow in a boreal forest.

4. **Compose** an argument for categorizing mountains and polar regions as terrestrial biomes.

5. **Infer** which zone of Earth is heated the most by the Sun.
Quick Check

Section 3: Aquatic Ecosystems

After reading the section in your textbook, respond to each statement.

1. **Specify** the three main types of aquatic ecosystems.

2. **Identify** why there are fewer species living in rapidly moving freshwater than in slow-moving water.

3. **Analyze** how an area can be both a wetland and an estuary.

4. **Predict** whether seaweeds, which are photosynthetic, would live in the benthic zone of the ocean.

5. **Theorize** how a larger lake and a smaller lake might contain similar numbers of living organisms.
CHAPTER 3
Assessment
Student Recording Sheet

Section 3.1
Vocabulary Review

Choose the correct vocabulary term to complete each sentence.

1. __________________  2. __________________  3. __________________

Understand Key Concepts

Select the best answer from the choices given, and fill in the corresponding circle.

5. A B C D  7. A B C D

Constructed Response

9. Careers in Biology ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

10. ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________

11. ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________

Think Critically

12. ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________

13. ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________

Section 3.2
Vocabulary Review

Write the vocabulary term that best matches each definition.

14. __________________  15. __________________  16. __________________
Assessment

Understand Key Concepts

Select the best answer from the choices given, and fill in the corresponding circle.

17. A B C D
18. A B C D
19. A B C D
20. A B C D
21. A B C D

Constructed Response

22.
23.

Think Critically

24.
25.

Section 3.3

Vocabulary Review

Replace the underlined words with the correct vocabulary terms.

26. ____________ 27. ____________ 28. ____________

Understand Key Concepts

Select the best answer from the choices given, and fill in the corresponding circle.

29. A B C D
30. A B C D
31. A B C D

Constructed Response

32.
33.

Name_________________________ Date__________________ Class__________________
CHAPTER 3
Assessment

34. 

35. 

36. 

Think Critically

35. 

36. 

Additional Assessment

37. Writing in Biology  Record your answer for question 37 on a separate sheet of paper.

Document-Based Questions

38. 

39. 

Cumulative Review

40. 

________________________  ____________________________  ________________________
Name                                      Date                                     Class
CHAPTER 3 Assessment

Student Recording Sheet

CHAPTER 3 Assessment

Standardized Test Practice

Multiple Choice

Select the best answer from the choices given, and fill in the corresponding circle.

1. A B C D  
2. A B C D

3. A B C D  
4. A B C D

5. A B C D  
6. A B C D

7. A B C D  
8. A B C D

Short Answer

Answer each question with complete sentences.

9. Record your answer for question 9 on a separate sheet of paper.

10. 

11. 

12. 

13. 

14. 

15. 

16. 

Extended Response

Answer each question with complete sentences.

17. 

18. 

Essay Question

19. Record your answer for question 19 on a separate sheet of paper.

108 Communities, Biomes, and Ecosystems CHAPTER 3
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## Reproducible Pages

### Chapter 4  Population Ecology

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</thead>
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</tr>
<tr>
<td>Launch Lab</td>
<td>111</td>
</tr>
<tr>
<td>MiniLab</td>
<td>112</td>
</tr>
<tr>
<td>BioLab</td>
<td>113</td>
</tr>
<tr>
<td>Real-World Biology</td>
<td>115</td>
</tr>
<tr>
<td>Enrichment</td>
<td>117</td>
</tr>
<tr>
<td>Concept Mapping</td>
<td>118</td>
</tr>
<tr>
<td>Study Guide (English)</td>
<td>119</td>
</tr>
<tr>
<td>Study Guide (Spanish)</td>
<td>123</td>
</tr>
<tr>
<td>Section Quick Check 1</td>
<td>127</td>
</tr>
<tr>
<td>Section Quick Check 2</td>
<td>128</td>
</tr>
<tr>
<td>Chapter Test A</td>
<td>129</td>
</tr>
<tr>
<td>Chapter Test B</td>
<td>132</td>
</tr>
<tr>
<td>Chapter Test C</td>
<td>135</td>
</tr>
<tr>
<td>Student Recording Sheet</td>
<td>139</td>
</tr>
</tbody>
</table>
Before reading Chapter 4, predict answers to questions about the chapter content based on what you already know. Circle the letter of the correct answer, and then explain your reasoning.

1. While visiting a history museum in Montreal, Danielle observes a graph on display that records the number of lynx and hare trapped in the Hudson Bay area between the years 1845 and 1935. The graph has two different lines for lynx and hares. She notices that the two lines on the graph follow a pattern. Which pattern does she observe?
   A. Both hare and lynx populations remain constant.
   B. Both hare and lynx populations rise and fall together.
   C. The hare population decreases shortly after the number of lynx decreases.
   D. The lynx population decreases shortly after the number of hares decreases.

   Explain.

2. While visiting the United Nations building in New York City on a school field trip, Carl studies a map of the distribution of the human population around the world and the current population growth rates of the world’s countries. Which does he notice about the information found on the map?
   A. Countries with advanced technology are experiencing rapid growth.
   B. Large countries, such as the United States and Canada, are growing fastest.
   C. Many European countries are experiencing declines in their populations.
   D. The greatest concentration of humans in the world is in South America.

   Explain.

3. Diego learns that the world’s human population experienced an exponential growth from one billion people in 1804 to six billion people in 1999. Diego researches why the human population increased dramatically during this time. What factors does he learn?
Ecologists study populations of living things. They also study how populations interact with each other and with the abiotic factors in the environment. But what exactly is a population? Is a wolf pack a population? Is a single wolf a population?

**Procedure**

1. Read and complete the lab safety form.
2. In your assigned group, brainstorm and predict the meaning of the following terms: *population, population density, natality, mortality, emigration, immigration,* and *carrying capacity.*

**Data and Observations**

**Analysis**

1. **Infer** whether it is possible to have a population of one. Explain your answer.

   ____________________________________________________________

   ____________________________________________________________

   ____________________________________________________________

2. **Analyze** your definitions and determine whether a relationship exists between the terms. Explain.

   ____________________________________________________________

   ____________________________________________________________

   ____________________________________________________________
What factors affect the growth of a human population? Technological advances have resulted in a rapid growth in human population. However, human population growth is not equal in all countries.

**Procedure**

1. The graph shows one factor affecting human population growth. Use the data to predict how this factor will affect the population in each country between now and the year 2050.
2. Brainstorm a list of factors, events, or conditions that affect the growth of human populations in these countries. Predict the effect of each factor on the population growth rate.

**Data and Observations**

**Analysis**

**Think Critically** In your opinion, what factors or groups of factors have the greatest impact on population growth? Justify your answer.
Background: In animal populations, competition is typically studied by examining changes to birth and death rates. Ecologists often study plant competition by comparing the biomass of individual plants in plant populations. In this lab, you will study intraspecific competition—competition among plants of the same species. As with most ecological studies, you will need to collect data for several weeks.

Question: Do plant populations of various densities grow differently due to competition?

Materials
marigold seeds or radish seeds
9-cm plastic pots (6)
clean potting soil
rulers
shallow tray for pots
small garden trowels
masking tape
permanent markers
balance (accurate to 0.1 g)
watering can

Safety Precautions

Procedure
1. Read and complete the lab safety form.
2. Plant seeds in several pots as instructed by your teacher. Your goal should be to have pots with the following densities of plants: 2, 4, 8, 16, 32, and 64.
3. Place the pots in a shallow tray. Continue to keep the soil moist—not drenched—throughout the course of the experiment.
4. After the seeds have sprouted, weed out any extra plants so that you have the correct density.
5. Write a hypothesis about the effect plant density will have on the average biomass of each pot’s population.
6. Construct a data table. Observe the plants once each week for a 5–6 week period. Record your observations.
7. At the end of the experiment, measure the biomass of the plants in each pot by cutting each plant at soil level and quickly weighing all the plants from the same pot together. Record your measurements. Calculate the average per plant biomass of each pot.
8. Clean up and Disposal Wash and return all reusable materials. Wash your hands after watering or working with the plants. Dispose of the plants at the end of the lab as instructed by your teacher.

Data and Observations
Analyse and Conclude

1. Graph Data  Prepare a graph showing the relationship between the average plant biomass and the density of plants. Draw a best-fit line for your data points. What was the effect of plant density on the average biomass of each pot’s population? Does this graph support your hypothesis?

2. Infer  Draw a second graph that compares the total biomass for each population to the number of plants in each population.

3. Think Critically  Based on your results, infer how human population growth is affected by population density.

4. Error Analysis  What sources of error might have affected your results?
Isle Royale is considered by biologists to be a unique setting for the study of population dynamics. It is a 72-km-long, 14-km-wide wilderness island located in the western part of Lake Superior and accessible to visitors only from June through August. The island can be reached only by boat or seaplane, and travel is limited to hiking on land and canoes and boats on water. Most travelers to Isle Royale are hikers and wilderness campers. Because of the island’s isolated location, relatively few species have colonized Isle Royale. On the island, wolves are the only predator of moose (mostly calves and adults over ten years of age), and moose are nearly the only prey of wolves. Moose eat lichens and twigs of woody trees (almost 75 percent balsam fir), shrubs, and aquatic plants. Because the visitor season is short, and there is no hunting of wolves or moose, there is little human impact to complicate this simple terrestrial ecosystem. Another condition that favors Isle Royale as a natural laboratory is the simplification of the growth rate formula. Because there are no wolf or moose immigrations or emigrations, those variables can be eliminated from the growth rate calculations.

Part A: Biotic Distribution

The ecological study of wolves and moose on Isle Royale began in 1958. Data are gathered by aerial survey and by ground study teams. Table 1 shows data gathered in 2004.

<table>
<thead>
<tr>
<th>Territory</th>
<th>Wolves</th>
<th>Moose Carcasses</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Pack</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Chippewa Harbor Pack</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Middle Pack</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Analyze and Conclude

Use Table 1 to respond to each question and statement.

1. Diagram On a sheet of plain paper, draw a rectangle 15 cm long and 3 cm wide to represent the area of Isle Royale at a scale of 1 cm = 5 km. Label the right end of the rectangle East and the left end West. Nine centimeters from the west end, draw a vertical line to mark the border of the Middle Pack territory. Three centimeters from that border, draw a vertical line to represent the border between the Chippewa Harbor Pack territory to the west and the East Pack territory to the east. Outline each of the territories in a different color, and label them. Indicate the number of wolves in each territory with an X for each wolf.

2. Explain What type of spatial distribution do the wolves illustrate? Is the wolf density the same in all territories of the island?

3. Calculate the average number of moose killed by one wolf in each territory.

4. Predict In which territory would you expect to find the most balsam firs? The fewest balsam firs? Explain.
Part B: Population Analysis

Researchers monitor, track, and count wolves and moose, and they collect parts of carcasses and fecal pellets for laboratory analysis. Carcasses provide information about the age, cause of death, and health characteristics of the animals. Biotic and abiotic data describing limiting factors are included in the population analyses.

<table>
<thead>
<tr>
<th>Year</th>
<th>Wolves</th>
<th>Moose</th>
<th>Year</th>
<th>Wolves</th>
<th>Moose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>16</td>
<td>2422</td>
<td>2001</td>
<td>19</td>
<td>900</td>
</tr>
<tr>
<td>1996</td>
<td>22</td>
<td>1163</td>
<td>2002</td>
<td>17</td>
<td>1100</td>
</tr>
<tr>
<td>1997</td>
<td>24</td>
<td>500</td>
<td>2003</td>
<td>19</td>
<td>900</td>
</tr>
<tr>
<td>1998</td>
<td>14</td>
<td>699</td>
<td>2004</td>
<td>29</td>
<td>750</td>
</tr>
<tr>
<td>1999</td>
<td>25</td>
<td>750</td>
<td>2005</td>
<td>30</td>
<td>540</td>
</tr>
<tr>
<td>2000</td>
<td>29</td>
<td>850</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Abiotic</th>
<th>Biotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>severe winters</td>
<td>moose marrow-fat levels low</td>
</tr>
<tr>
<td>snow depth above average</td>
<td>balsam fir sources decreasing</td>
</tr>
<tr>
<td>thaw/freeze created crust on top of snow</td>
<td>wolf population increasing</td>
</tr>
<tr>
<td>springs and autumns warmer than normal</td>
<td>large increase in winter</td>
</tr>
<tr>
<td></td>
<td>moose ticks due to warm springs and autumns</td>
</tr>
<tr>
<td></td>
<td>current moose population predominantly old</td>
</tr>
</tbody>
</table>

Analyze and Conclude

Use Table 2 and Table 3 to respond to each question and statement.

1. **Construct**  On a sheet of graph paper, construct combined line graphs of the moose and wolf populations between 1995 and 2005, using different colors for the wolf and moose data. Use this graph to help you answer questions 2–4.

2. **Infer**  The greatest decline on record in the moose population occurred in 1996 and 1997. Was the limiting factor that probably caused the decline density dependent or density independent? What was the limiting factor? Explain.

3. **Infer**  Look at Table 3. Explain how three of these events are limiting factors that might have contributed to the continuing decline of the moose population.

4. **Judge**  Which of the limiting factors listed in Table 3 is probably an indirect effect of human activity? Explain.

Wildlife Biology  Visit biologygmh.com for information on wildlife biologists. What are the responsibilities of a wildlife biologist?
Enrichment

CHAPTER 4

Group Project: Human Population Controls

The size of human populations can vary considerably, depending on natural factors and decisions made by humans. For example, populations might diminish significantly in nations ravaged by war or epidemics. Or they might increase significantly if governments adopt laws that encourage couples to have more children. In some nations, governments might use demographic information to decide which policies it should adopt. In other nations, the growth or decline in populations seems to be largely a chance event to which governments pay little attention.

In this activity, you will form a group of classmates to advise a national legislature about actions it should take to influence future population patterns. The table below lists population data for six different nations. Choose one nation to study in more detail.

Analyze  Begin by using the data provided to calculate the nation’s population growth rate. Then draw a graph that shows projected changes in population over the next decade, assuming the growth rate remains the same. Talk with other members of your group to decide whether you think the projected trend is desirable or undesirable.

Recommend  Choose any one of the four variables given in the table (number of births, deaths, immigrants, or emigrants) to change. Suggest a mechanism—natural or human-made—by which that change might come about.

For example, you might want to study the effects of decreasing the number of births in the nation by one-quarter. Calculate the new birthrate from the new data, and draw a new graph (but on the same axes as the original graph) to see how the change you made alters your original projections for population growth or decline. Compare your results with those of other groups. Find out how altering one variable or another affects short-term and long-term population changes in the nations being studied.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Births</td>
</tr>
<tr>
<td>A</td>
<td>100,000</td>
<td>4000</td>
</tr>
<tr>
<td>B</td>
<td>100,000</td>
<td>4000</td>
</tr>
<tr>
<td>C</td>
<td>100,000</td>
<td>4000</td>
</tr>
<tr>
<td>D</td>
<td>100,000</td>
<td>4000</td>
</tr>
<tr>
<td>E</td>
<td>100,000</td>
<td>4000</td>
</tr>
<tr>
<td>F</td>
<td>100,000</td>
<td>4000</td>
</tr>
</tbody>
</table>
Complete the network tree about populations. These terms may be used more than once: abiotic, biotic, clumped groups, competition, density, density-dependent factors, density-independent factors, dispersion, drought, growth rate, population-limiting factors, predation, uniform.
In your textbook, read about population characteristics.

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

carrying capacity  density dependent  density independent  growth rate
population density  randomly  spatial distribution

Some characteristics that all populations have include (1) ___________________________,
(2) ___________________________, and (3) ___________________________. Populations tend to
be dispersed (4) ___________________________, uniformly, and in clumps. Populations also tend to
stabilize near the (5) ___________________________ of their environment. Factors that limit populations
are either (6) ___________________________ or (7) ___________________________.

In your textbook, read about population-limiting factors.

Complete the table by checking the correct column(s) for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Density Dependent</th>
<th>Density Independent</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Earthquake-related tsunami</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Intense competition for a food source</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Influenza epidemic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Flooding due to a hurricane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Change in the number of predators</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If the statement is true, write true. If the statement is false, replace the italicized term or
phrase to make it true.


14. Density-independent factors include parasites and disease.

15. On Isle Royale, the population of moose decreased as the population of wolves decreased.

16. Competition can occur within a species or between two different species.
In your textbook, read about population growth rate.

**Figure 1**

- **Size of Population**
- **Time**

**Figure 2**

- **Size of Population**
- **Time**

Refer to Figures 1 and 2. Respond to each statement.

17. **Identify** the type of growth rate demonstrated in Figure 1.

18. **Identify** the type of growth rate demonstrated in Figure 2.

19. **Tell** which type of growth rate comes first.

In your textbook, read about reproductive patterns.

*Identify the following as being either an r-strategist or a k-strategist.*

20. __________________________

21. __________________________

22. __________________________

23. __________________________
In your textbook, read about human population.

Match the definition in Column A with the term in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. when the birthrate equals the death rate</td>
<td>A. demography</td>
</tr>
<tr>
<td>2. the change in a population from high birthrate and death rate to low birthrate and death rate</td>
<td>B. demographic transition</td>
</tr>
<tr>
<td>3. the number of males and females in each of three groups</td>
<td>C. age structure</td>
</tr>
<tr>
<td>4. the study of the size, distribution, density, movement, death rate, and birthrate of a human population</td>
<td>D. zero population growth</td>
</tr>
</tbody>
</table>

**In your textbook, read about human population growth.**

Refer to the figure. Respond to each statement.

5. **Find** the world’s population in A.D. 1000. **Find** the world’s population in A.D. 2000.

6. **State** approximately when the Industrial Revolution began. **Tell** what effect the Industrial Revolution had on the human population on Earth.

7. **Specify** if the human population growth graph up until A.D. 2000 is exponential or logistic.
In your textbook, read about trends in human population growth.

If the statement is true, write true. If the statement is false, replace the italicized word or phrase to make it true.

8. Industrially developed countries generally have high population growth rates.

9. If Honduras were to experience a low birthrate and death rate in the next five years, it would be undergoing a demographic transition.

10. Once the world reaches zero population growth, the age structure will be more balanced.

11. Technology has allowed humans to temporarily increase the carrying capacity of Earth.

12. People in industrially developed countries use a lot fewer resources than people in developing countries.

In your textbook, read about age structure.

Complete the table by checking the correct column(s) for each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Pre-reproductive</th>
<th>Reproductive</th>
<th>Post-reproductive</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. An 11-year-old boy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. A 65-year-old grandmother</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. A 25-year-old man</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. A newborn baby girl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. A 78-year-old man</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. A 32-year-old woman</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
En tu libro de texto, lee acerca de las características de la población.

Usa los siguientes términos sólo una vez para completar el párrafo.

al azar  capacidad de carga  dependientes de la densidad
dependencias de la densidad  distribución espacial  independientes de la densidad
tasa de crecimiento

Entre las características que todas las poblaciones tienen se incluyen la (1) ____________________________, la (2) ____________________________ y la (3) ____________________________. Las poblaciones tienden a dispersarse (4) ____________________________, de forma desigual y en masa. Las poblaciones también tienden a estabilizarse cerca de la (5) ____________________________ de su ambiente. Los factores que limitan las poblaciones son (6) ____________________________ o (7) ____________________________.

En tu libro de texto, lee acerca de los factores que limitan la población.

Completa la tabla marcando la(s) columna(s) correcta(s) para cada descripción.

<table>
<thead>
<tr>
<th>Descripción</th>
<th>Dependientes de la densidad</th>
<th>Independientes de la densidad</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Tsunamis relacionados con terremotos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Competencia intensa por una fuente de alimentación</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Influenza epidémica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Inundación por causa de un huracán</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Cambio en el número de depredadores</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Si la afirmación es verdadera, escribe «verdadero». Si la afirmación es falsa, sustituye el término o la frase en cursiva para volverla verdadera.

13. Los factores limitantes de la población evitan que una población aumente de forma indefinida.

14. Los factores independientes de la densidad incluyen los parásitos y las enfermedades.

15. En Isle Royale, la población de alces disminuyó a medida que la población de lobos disminuyó.

16. La competencia puede ocurrir dentro de una especie o entre dos especies diferentes.
En tu libro de texto, lee acerca de la tasa de crecimiento de la población.

![Figura 1](image1)

![Figura 2](image2)

Consulta las Figuras 1 y 2. Responde a cada afirmación.

17. **Identifica** el tipo de tasa de crecimiento demostrado en la Figura 1.

18. **Identifica** el tipo de tasa de crecimiento demostrado en la Figura 2.

19. **Indica** qué tipo de tasa de crecimiento ocurre primero.

En tu libro de texto, lee acerca de los patrones reproductivos.

Identifica a los siguientes como estratega r o estratega k.

20. 

21. 

22. 

23. 

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Guía de estudio

Sección 2: La población humana

En tu libro de texto, lee acerca de la población humana.

Relaciona la definición de la columna A con el término de la columna B.

<table>
<thead>
<tr>
<th>Columna A</th>
<th>Columna B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. cuando la tasa de nacimiento es igual a la tasa de mortalidad</td>
<td>A. demografía</td>
</tr>
<tr>
<td>2. el cambio en una población de una alta tasa de crecimiento y mortalidad</td>
<td>B. transición demográfica</td>
</tr>
<tr>
<td>3. el número de machos y hembras en cada uno de los tres grupos</td>
<td>C. estructura de edad</td>
</tr>
<tr>
<td>4. el estudio del tamaño, la distribución, la densidad, el movimiento, y las tasas de mortalidad y de nacimiento de una población humana</td>
<td>D. crecimiento de población cero</td>
</tr>
</tbody>
</table>

En tu libro de texto, lee acerca del crecimiento de la población humana.

Consulta la figura. Responde a cada afirmación.

5. Encuentra la población del mundo en el año 1000 D.C. Encuentra la población del mundo en el año 2000 D.C.

6. Establece aproximadamente cuándo empezó la Revolución Industrial. Indica qué efecto tuvo la Revolución Industrial en la población humana en la Tierra.

7. Especifica si la gráfica del crecimiento de la población humana hasta el año 2000 D.C. es exponencial o logística.
Guía de estudio, Sección 2: La población humana  continuación

En tu libro de texto, lee acerca de las tendencias en el crecimiento de la población humana.

Si la afirmación es verdadera, escribe «verdadero». Si la afirmación es falsa, substituye el término o la frase en cursiva para volverla verdadera.

8. Los países industrialmente desarrollados generalmente tienen altas tasas de crecimiento de la población.

9. Si Honduras experimentara una baja tasa de nacimiento y de mortalidad en los próximos cinco años, estaría pasando por una transición demográfica.

10. Una vez que el mundo alcance un crecimiento de población cero, la estructura de edad se volverá más equilibrada.

11. La tecnología ha permitido a los humanos aumentar temporalmente la capacidad de carga de la Tierra.

12. Las personas en países industrialmente desarrollados usan muchos menos recursos que las personas en los países en desarrollo.

En tu libro de texto, lee acerca de la estructura de edad.

Completa la tabla marcando la(s) columna(s) correcta(s) para cada ejemplo.

<table>
<thead>
<tr>
<th>Ejemplo</th>
<th>Pre-reproductivo</th>
<th>Reproductivo</th>
<th>Post-reproductivo</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Un niño de 11 años</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Una abuela de 65 años</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Un hombre de 25 años</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Una bebé recién nacida</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Un hombre de 78 años</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Una mujer de 32 años</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section 1: Population Dynamics

After reading the section in your textbook, respond to each question and statement.

1. **List** the characteristics used to describe populations of organisms.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

2. **Describe** a *k*-strategist organism.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

3. There is a drought in an area in which white-tailed deer live. **Classify** the drought as a density-independent factor or a density-dependent factor. **Explain.**

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

4. **Select and Predict** In the case of the drought in the deer habitat in question 3, select a density-dependent factor and predict what effect it will have on the deer population.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

5. **Infer** There is a population of fish in an isolated pond. What is true of the birthrate and the death rate when the pond reaches its carrying capacity? **Explain.**

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
Section 2: Human Population

After reading the section in your textbook, respond to each question and statement.

1. **Define** demography.

2. **Discuss** how technological advances have affected human population growth.

3. **Compare** the population growth rate in industrially developed countries to that in developing countries.

4. **Calculate** During one year, the birthrate in a country is 28 births per 1000 people, and the death rate is six deaths per 1000 people. What is the population growth rate? Show your work.

5. **Assess** why age structure is important in the study of human population growth.
CHAPTER 4 Assessment

Section 4.1

Vocabulary Review

Replace the underlined words with the correct vocabulary terms.

1. 
2. 
3. 

Understand Key Concepts

Select the best answer from the choices given, and fill in the corresponding circle.

4. 
5. 
6. 

7. 
8. 
9. 

10. 
11. 
12. 

Constructed Response

13. 
14. 
15. 

16. 
17. 
18.
CHAPTER 4 
Assessment

Student Recording Sheet

Think Critically

19. 

20. 

21. 

22. 

Section 4.2

Vocabulary Review

Write the vocabulary term that best matches each scenario.

23.  
24.  
25.  

Understand Key Concepts

Select the best answer from the choices given, and fill in the corresponding circle.

26. A B C D  
27. A B C D  
28. A B C D  
29. A B C D  
30. A B C D  

Constructed Response

31. 

32. 

33. 

CHAPTER 4
Assessment

Student Recording Sheet

Think Critically

34. 

35. 

Additional Assessment

36. Writing in Biology Record your answer for question 36 on a separate sheet of paper.

Document-Based Questions

37. 

38. 

Cumulative Review

39. 

40. 

Name ___________________________ Date __________________ Class ____________
Assessment

Student Recording Sheet

CHAPTER 4

Standardized Test Practice

Multiple Choice

Select the best answer from the choices given, and fill in the corresponding circle.

1. A B C D
2. A B C D
3. A B C D

4. A B C D
5. A B C D
6. A B C D

7. A B C D
8. A B C D
9. A B C D

Short Answer

Answer each question with complete sentences.

10. 

11. 

12. 

13. 

14. 

15. 

16. 

Extended Response

Answer each question with complete sentences.

17. 

18. 

Essay Question

19. Record your answer for question 19 on a separate sheet of paper.
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## Chapter 5  Biodiversity and Conservation

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<td>MiniLab (2)</td>
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<td>Section Quick Check 2</td>
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<tr>
<td>Chapter Test A</td>
<td>166</td>
</tr>
<tr>
<td>Chapter Test B</td>
<td>169</td>
</tr>
<tr>
<td>Chapter Test C</td>
<td>172</td>
</tr>
<tr>
<td>Student Recording Sheet</td>
<td>175</td>
</tr>
</tbody>
</table>
Before reading Chapter 5, predict answers to questions about the chapter content based on what you already know. Circle the letter of the correct answer, and then explain your reasoning.

1. While touring a Costa Rican rain forest on vacation, Dana learns that rain forests have the highest biodiversity of any ecosystem on the planet. The guide defines the term biodiversity for the group. Which definition does she give?
   A. number of life layers in the forest
   B. number of organisms in the forest
   C. variety of habitats in the forest
   D. variety of species in the forest
   Explain.

2. Kiah hears about a plan to drain a nearby wetland to build a shopping mall. Kiah’s friend agrees with the plan because she believes the wetland has no economic value. After researching the issue, Kiah responds to her friend’s opinion. Which is Kiah’s response?
   A. Wetlands are beautiful ecosystems, but they have no economic value.
   B. Wetlands breed harmful insects, and they should be drained for better use.
   C. Wetlands have a direct economic value such as providing a food source.
   D. Wetlands have indirect value such as cleaning pollutants from water.
   Explain.

3. Enrique hears about the accelerated global extinction rate due to rain forest deforestation and the destruction of other habitats worldwide. He comes to the conclusion that all extinctions are caused by humans and are harmful to the biosphere. Critique his conclusion.
Some landscapes support more life than others. In this lab, you will infer the relative numbers of species that can be found in each environment.

**Procedure**

1. Read and complete the lab safety form.
2. Choose three locations in your community that are familiar to you, such as a tree, a group of trees, a drainage ditch, a field, a dumpster, a park, or a pond.
3. Rank the locations in descending order, greatest to least, according to the number of species of animals, plants, etc., you think you would find there.

**Data and Observations**

**Analysis**

1. **Define** biodiversity in your own words.

2. **Explain** how you chose to rank the locations in order.

3. **Describe** scientific methods you could use to find out how many species live in each habitat.
What are the threats to natural habitats in your local area? Investigate these threats and brainstorm possible remedies with which you can educate others.

**Procedure**
1. Read and complete the lab safety form.
2. With your lab group, choose one factor that is threatening the biodiversity in your community, and study how it has affected the climax community.
3. Brainstorm ways that this threat could be reversed.
4. Organize this information about threats and possible solutions with your classmates.

**Data and Observations**

**Analysis**
1. **Evaluate** What are the most important pieces of information the public needs to know about this threat?

2. **Infer** Imagine you have implemented one plan to reverse a threat you studied. Now it is 100 years later. What does the ecosystem look like? What changes have occurred? What species are there now?
Minilab

 CHAPTER 5

Survey Leaf Litter Samples

How do we calculate biodiversity? It is not possible to count every organism in the world, which makes calculating biodiversity difficult. Scientists use a sampling technique to do this. They calculate the biodiversity in a certain area and use that number to estimate the biodiversity in similar areas.

Procedure

1. Read and complete the lab safety form.
2. In the leaf litter sample your teacher has provided, count and record the species in a section that are visible to the eye. Look up any unknown species in a field guide.
3. Record your observations in a data table.
4. Calculate the index of diversity (IOD), using this equation (unique species is different species observed; total individual is the total of every individual observed):

\[
IOD = \frac{\text{# of unique species} \times \text{# of samples}}{\text{# of total individuals}}
\]

Data and Observations

Analysis

1. Classify which observed species are native and nonnative to your area.

2. Infer from your survey the effects, if any, the nonnative species have on the native species. Are these nonnative species invasive? How do you know this?

3. Hypothesize whether the IOD has changed in your area over the last 200 years. Explain.
BioLab

CHAPTER 5

Field Investigation: How can surveying a plot of land around your school help you understand the health of your ecosystem?

Background: One of the jobs of a conservation biologist is to survey land and provide an analysis of the health of the ecosystem. Then, if problems are discovered, he or she would propose possible solutions, decide on a course of action, and implement the plan.

Question: How can an ecosystem be restored to its natural state?

Materials
- coat hangers or 1-m stakes (61)
- field notebook
- field guide of area species
  (plant, animal, and fungus)
- colored plastic ribbon (50 m)
- string (600 m)
- pencil

Safety Precautions

WARNING: Use care in observing wildlife; do not disturb the species.

Procedure

1. Read and complete the lab safety form.
2. Determine a site to be studied. Make sure the site owner has given permission to conduct a survey on that site.
3. With four stakes, mark off a 15-m-by-15-m area within that site.
4. Further divide the area into 1-m-by-1-m squares with 57 remaining stakes and string. This will be your sampling area.
5. Using the method used in MiniLab Survey Leaf Litter Samples, survey your site and calculate the index of diversity.
6. Research the history of your area. How has it changed since it was first settled?
7. Research and recommend appropriate methods of care for the plot of land you surveyed in an environmentally responsible manner, perhaps by restoring it to its original state.
8. Make a plan to implement your methods. What limitations might you encounter?
9. If possible, implement part of your plan.

Data and Observations
BioLab, Field Investigation: How can surveying a plot of land around your school help you understand the health of your ecosystem? continued

Analyze and Conclude

1. Predict how your methods of care would impact your plot of land. Why is this important?

________________________________________________________________________

________________________________________________________________________

2. Determine Is there a key species you expect to be affected by your plan?

________________________________________________________________________

3. Analyze What are some possible negative consequences of your plan?

________________________________________________________________________

________________________________________________________________________

4. Defend Is there another possible conservation biology technique that could be used? Explain.

________________________________________________________________________

________________________________________________________________________

5. Calculate What might the index of diversity be if you made the changes you recommended?

________________________________________________________________________

________________________________________________________________________

6. Interpret Was an increase in biodiversity your goal? Why or why not?

________________________________________________________________________

________________________________________________________________________
The soil is an important part of the biodiversity in an ecosystem. Many human activities remove nutrients from soil. It might sound strange, but one of these activities is eating. The foods people eat contain nutrients from soil. People’s bodies use many of the nutrients in the foods, but millions of tons of the food scraps that are left over usually end up in a landfill where garbage is buried. The nutrients in landfills do not get returned to ecosystems.

People can return nutrients to soil by composting, or allowing decomposer organisms to break down food scraps and other plant materials, such as grass clippings and dry leaves. People compost in different ways. For people with little space, composting can be done with worms. This type of composting is called vermicomposting. In this activity, you will observe food scraps in a compost bottle with worms and compare them to food scraps in a compost bottle without worms.

Procedure

1. Read and complete the lab safety form.
2. To make containers for your compost, you will need two clear-plastic 2-L bottles. First, carefully use scissors to cut off the top of each bottle so that it is about 24 cm high. Then carefully use a nail to punch small holes around the top 8 cm of the bottles. See Figure 1.
3. Fill both bottles about one-third full with strips of newspaper. The newspaper will be bedding for the worms.
4. Add about 5 cm of food scraps to both bottles. Use food scraps that are plant materials. Do not use any animal products.
5. Use a plastic spoon to mix the newspaper and food scraps. If the newspaper is not moist, add water and mix.
6. Cut and tape a piece of brown paper bag around each bottle to block out light.
7. Place ten worms on top of the mixture in one of the bottles. Add a layer of about 3 cm of moist strips of newspaper to each bottle. See Figure 2.
8. Label the bottle without worms Control. Tape newspaper over the top of each bottle to form a lid so worms cannot get out. Punch small holes in the lids.
9. Place both bottles in a warm area that does not get much light. Once a week for six weeks, remove the lids and use a plastic spoon to gently move the bedding and observe the food scraps in each bottle. Record your observations in Table 1.
Table 1

<table>
<thead>
<tr>
<th>Age of Compost</th>
<th>Bottle</th>
<th>Odor of Compost</th>
<th>Texture of Compost</th>
<th>Changes in Food Scraps (size, color, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start compost</td>
<td>Worms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 week</td>
<td>Worms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>Worms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 weeks</td>
<td>Worms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 weeks</td>
<td>Worms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 weeks</td>
<td>Worms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 weeks</td>
<td>Worms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analyze and Conclude

Respond to each question.

1. Describe  What happened to the food scraps in the two bottles? Include how and why they changed.

2. Compare  Over time, both bottles will contain finished compost. Which method of composting is faster?

3. Apply  Based on what you know about soil and landfills, how is composting food scraps helpful to ecosystems?

Soil Conservation  Visit biologygmh.com for information on soil conservation technicians. What are the responsibilities of a soil conservation technician?
The federal government has tried to protect the nation’s biodiversity in a number of ways. One of those ways is the Endangered Species Act, passed by the U.S. Congress in 1973. The act has two main purposes: (1) to list plant and animal species that are endangered or threatened (likely to be endangered in the foreseeable future), and (2) to protect the habitat in which these species live, with the goal of helping them recover.

The Endangered Species Act has always been the subject of much controversy. Some people feel that humans have to give up too much to protect plant and animal species that are not important. Others argue that humans should do everything they can to maintain biodiversity in the world, including protecting endangered and threatened species.

Prepare Controversies over endangered species almost always involve a specific species: bison, grizzly bear, the masked bobwhite, or Arizona agave, for example. Good arguments can be made for and against protecting the species.

In this activity, choose one of the plant or animal species listed in the table below to study in detail. Decide whether you want to argue for or against a program for protecting the species you have selected.

Research Make a list of arguments to support your position. Use your textbook or other library resources to find background information. Consider the role of the species in maintaining biodiversity in its ecological niche. Mention the species’ role as prey or predator in the food web and how its absence would alter the balance of nature in the area in which it lives.

Write Prepare a one- or two-page statement that summarizes your position about protecting the endangered species.

<table>
<thead>
<tr>
<th>Plants</th>
<th>Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona agave (<em>Agave arizonica</em>)</td>
<td>grizzly bear (<em>Ursus arctos horribilis</em>)</td>
</tr>
<tr>
<td></td>
<td>Florida panther (<em>Puma concolor coryi</em>)</td>
</tr>
<tr>
<td>Tennessee purple coneflower (<em>Echinacea tennesseensis</em>)</td>
<td>humpback whale (<em>Megaptera novaeangliae</em>)</td>
</tr>
<tr>
<td></td>
<td>masked bobwhite (<em>Colinus virginianus ridgwayi</em>)</td>
</tr>
<tr>
<td>San Clemente Island Indian paintbrush (<em>Castilleja grisea</em>)</td>
<td>brown pelican (<em>Pelecanus occidentalis</em>)</td>
</tr>
<tr>
<td></td>
<td>white abalone (<em>Haliotis sorenseni</em>)</td>
</tr>
</tbody>
</table>
Complete the network tree about ways that biodiversity can be threatened. These terms may be used more than once: acid precipitation, clearing tropical rain forests, ecosystem, genetic diversity, pollution, species.

Habitats

can be damaged by

- destruction
  - such as
  - 1.
- fragmentation
  - which
- disruption
  - in which the decline of a

1. spread by
2. reduces
3. affects the entire
4. increases
5. edge effects
6. eutrophication
In your textbook, read about biodiversity.

Complete the graphic organizer. These terms may be used more than once: biodiversity, ecosystem, species, variety of ecosystems present, variety of genes in a population.

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

<table>
<thead>
<tr>
<th>biodiversity</th>
<th>drinking water</th>
<th>food crops</th>
<th>genes</th>
</tr>
</thead>
<tbody>
<tr>
<td>medicines</td>
<td>nutrients</td>
<td>food</td>
<td>species</td>
</tr>
</tbody>
</table>

Maintaining (5) __________________________ is important for many reasons. Humans need to preserve the specific (6) __________________________ they use directly. Species that are used indirectly are valuable because they are a source of (7) __________________________ that might be needed in the future, which is important for (8) __________________________. In addition, organisms that are not yet identified might provide (9) __________________________. The indirect benefits of a healthy biosphere include cycling of (10) __________________________ and provision of safe (11) __________________________.
In your textbook, read about threats to biodiversity.

For each statement below, write true or false.

1. The current rate of extinction is decreasing significantly.
2. Island species are especially vulnerable to extinction.
3. Only a few factors threaten biodiversity.
4. The primary cause of extinction is loss of habitat.
5. Introduced species make biodiversity stronger and more stable.

In your textbook, read about acid precipitation.

Refer to the map of the United States and the key. Respond to each statement.

6. Identify the area of the United States that receives the most acid precipitation.

7. Locate your state on the map. Determine how affected your state is by acid precipitation.

8. Define acid precipitation. Explain the problems it causes for the environment.
In your textbook, read about factors that threaten biodiversity.

Complete the table by filling in the missing information.

<table>
<thead>
<tr>
<th>Threat to Biodiversity</th>
<th>Description</th>
<th>Example of a Threatened Species or Organism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overexploitation</td>
<td>9.</td>
<td>bison</td>
</tr>
<tr>
<td>Destruction of habitat</td>
<td>10.</td>
<td>hyacinth macaw</td>
</tr>
<tr>
<td>Disruption of habitat</td>
<td>11.</td>
<td></td>
</tr>
<tr>
<td>Fragmentation of habitat</td>
<td>13.</td>
<td>Florida panther</td>
</tr>
<tr>
<td>Pollution of habitat</td>
<td>14.</td>
<td></td>
</tr>
<tr>
<td>Acid precipitation</td>
<td>16.</td>
<td>Blue Ridge goldenrod</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>17.</td>
<td>water pennywort</td>
</tr>
<tr>
<td>Introduced species</td>
<td>18.</td>
<td>Guam rail</td>
</tr>
</tbody>
</table>
In your textbook, read about natural resources.

Complete the graphic organizer. These terms may be used more than once: animals, fossil fuels, mineral deposits, nonrenewable resources, plants, radioactive uranium, renewable resources, solar energy.

Two Classes of Natural Resources

1. ______________
   replaced faster than they are consumed

2. ______________
   found only in limited amounts

Examples

3. ______________
4. ______________
5. ______________

Examples

6. ______________
7. ______________
8. ______________

In your textbook, read about restoring ecosystems.

Respond to the following statement.

9. Define bioremediation and bioaugmentation. Give one example of each.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Guía de estudio

Sección 1: La biodiversidad

En tu libro de texto, lee acerca de la biodiversidad.

Completa el organizador gráfico. Estos términos se pueden usar más de una vez:
biodiversidad, de ecosistemas, de especies, variedad de ecosistemas presentes, variedad
de genes en una población.

Tres tipos de biodiversidad

- genética
- definida como 1.
- especies en una comunidad biológica
- contribuyen al valor económico, estético y científico de la biodiversidad
- definida como 2.
- definida como 3.
- definida como 4.

Usa cada uno de los siguientes términos sólo una vez para completar el párrafo.

agua de beber biodiversidad cosechas de alimentos especies genes medicinas nutrientes

Mantener la (5) es importante por muchas razones. Los humanos necesitan preservar las (6) específicas que usan directamente. Las especies que se usan indirectamente son valiosas ya que son fuente de (7) que podrían ser necesarios en el futuro, lo que es importante para las (8) . Además, los organismos que aún no se han identificado podrían contribuir con (9) . Los beneficios indirectos de una biosfera saludable incluyen el ciclo de (10) y el suministro de (11) segura.
Guía de estudio

CAPÍTULO 5
Sección 2: Amenazas a la biodiversidad

En tu libro de texto, lee acerca de las amenazas a la biodiversidad.

Para cada afirmación a continuación, escribe «verdadero» o «falso».

1. El ritmo actual de extinción está disminuyendo de forma significativa.
2. Las especies de una isla son especialmente vulnerables a la extinción.
4. La causa principal de extinción es la pérdida del hábitat.
5. Las especies introducidas hacen que la biodiversidad sea más fuerte y más estable.

En tu libro de texto, lee acerca de la precipitación ácida.

Consulta el mapa de los Estados Unidos y la guía. Responde a cada afirmación.

6. Identifica el área de los Estados Unidos que recibe la mayor precipitación ácida.

7. Localiza en el mapa el estado donde tú vives. Determina qué tanto se afecta por la precipitación ácida.

8. Define la «precipitación ácida». Explica los problemas que esto causa al medio ambiente.
En tu libro de texto, lee acerca de los factores que amenazan la biodiversidad.
Completa la tabla con la información faltante.

<table>
<thead>
<tr>
<th>Amenaza a la biodiversidad</th>
<th>Descripción</th>
<th>Ejemplo de una especie o un organismo amenazado</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sobreexplotación</td>
<td>9.</td>
<td>bisonte</td>
</tr>
<tr>
<td>Destrucción de hábitat</td>
<td>10.</td>
<td>guacamayo jacinto</td>
</tr>
<tr>
<td>Interrupción de hábitat</td>
<td>11.</td>
<td>12.</td>
</tr>
<tr>
<td>Fragmentación de hábitat</td>
<td>13.</td>
<td>pantera de la Florida</td>
</tr>
<tr>
<td>Contaminación de hábitat</td>
<td>14.</td>
<td>15.</td>
</tr>
<tr>
<td>Precipitación ácida</td>
<td>16.</td>
<td>vara de oro de las montañas Blue Ridge</td>
</tr>
<tr>
<td>Eutrofización</td>
<td>17.</td>
<td>centella asiática</td>
</tr>
<tr>
<td>Especies introducida</td>
<td>18.</td>
<td>rascón de Guam</td>
</tr>
</tbody>
</table>
Guía de estudio

CAPÍTULO 5
Sección 3: Preservación de la biodiversidad

En tu libro de texto, lee acerca de los recursos naturales.

Completa el organizador gráfico. Estos términos se pueden usar más de una vez: animales, combustibles fósiles, depósitos minerales, energía solar, plantas, recursos no renovables, recursos renovables, uranio radioactivo.

Dos clases de recursos naturales

1. ____________________
   se reemplazan más rápido que se consumen

2. ____________________
   se encuentran únicamente en cantidades limitadas

Ejemplos

3. ____________________
4. ____________________
5. ____________________

Ejemplos

6. ____________________
7. ____________________
8. ____________________

En tu libro de texto, lee acerca de la restauración de los ecosistemas.

Responde a la siguiente afirmación.

9. Define la «bioremediación» y el «bioenriquecimiento». Da un ejemplo de cada uno.

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
Quick Check  
Section 1: Biodiversity

After reading the section in your textbook, respond to each statement.

1. **Cite** three reasons why biodiversity is important.

   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

2. **Explain** why there is ecosystem diversity in the biosphere.

   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

3. **Summarize** how biodiversity is of direct economic value, and give an example.

   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

4. **Use** what you know about genetic diversity and species diversity to decide which is the analysis of a single species and which is the analysis of more than one species. Explain.

   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

5. **Theorize** why species diversity increases as you move geographically from the polar regions to the equator.

   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
After reading the section in your textbook, respond to each statement.

1. **Recall** how overexploitation can lead to extinction of a species.

2. **Define** *biological magnification*.

3. **Describe** how eutrophication can destroy a habitat.

4. **Develop** a plan for reducing the effects of habitat fragmentation.

5. **Criticize** the following practice: Rather than using pesticides, sometimes a new species is introduced to prey on the pests.
Quick Check

Section 3: Conserving Biodiversity

After reading the section in your textbook, respond to each statement.

1. **State** the relationship between an increase in human population growth and the availability of natural resources.

2. **Distinguish** between the two different types of natural resources.

3. **Indicate** what is meant by *sustainable use*. **Demonstrate** how sustainable use works by giving an example.

4. **Assess** the importance of international cooperation for protecting biodiversity.

5. **Conclude** the best way to deal with biodiversity hot spots.
CHAPTER 5
Assessment
Student Recording Sheet

Section 5.1
Vocabulary Review
Replace the italicized words with the correct vocabulary terms.

1.  
2.  
3.  

Understand Key Concepts
Select the best answer from the choices given, and fill in the corresponding circle.

4.  

5.  

6.  

7.  

8.  

Constructed Response

9.  

10.  

11.  

12.  

Think Critically

13.  

14.  

Section 5.2
Vocabulary Review
Write sentences to compare and contrast each pair of terms.

15.  

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CHAPTER 5
Assessment
Student Recording Sheet

16. ____________________________________________

17. ____________________________________________

Understand Key Concepts
Select the best answer from the choices given, and fill in the corresponding circle.

18. [ ] A  [ ] B  [ ] C  [ ] D
19. [ ] A  [ ] B  [ ] C  [ ] D
20. [ ] A  [ ] B  [ ] C  [ ] D
21. [ ] A  [ ] B  [ ] C  [ ] D
22. [ ] A  [ ] B  [ ] C  [ ] D
23. [ ] A  [ ] B  [ ] C  [ ] D
24. [ ] A  [ ] B  [ ] C  [ ] D
25. ____________________________________________

Constructed Response

26. ____________________________________________

Think Critically

27. ____________________________________________

Section 5.3
Vocabulary Review
Write the vocabulary term that best answers each question.

28. ___________________________  30. ___________________________
29. ___________________________  31. ___________________________

Understand Key Concepts
Select the best answer from the choices given, and fill in the corresponding circle.

32. [ ] A  [ ] B  [ ] C  [ ] D
33. [ ] A  [ ] B  [ ] C  [ ] D
34. [ ] A  [ ] B  [ ] C  [ ] D
35. [ ] A  [ ] B  [ ] C  [ ] D

Constructed Response

36. ____________________________________________
CHAPTER 5  
Assessment  
Student Recording Sheet

37. Careers in Biology

Think Critically

38.

39.

Additional Assessment

40. Writing in Biology  Record your answer for question 40 on a separate sheet of paper.

41. Writing in Biology  Record your answer for question 41 on a separate sheet of paper.

Document-Based Questions

42. 

43. 

44. 

Cumulative Review

45. 

46. 

47. 
**CHAPTER 5**

**Assessment**

**Student Recording Sheet**

### Standardized Test Practice

#### Multiple Choice

Select the best answer from the choices given, and fill in the corresponding circle.

1. [ ] A [ ] B [ ] C [ ] D
2. [ ] A [ ] B [ ] C [ ] D
3. [ ] A [ ] B [ ] C [ ] D
4. [ ] A [ ] B [ ] C [ ] D
5. [ ] A [ ] B [ ] C [ ] D
6. [ ] A [ ] B [ ] C [ ] D
7. [ ] A [ ] B [ ] C [ ] D
8. [ ] A [ ] B [ ] C [ ] D

#### Short Answer

Answer each question with complete sentences.

9. 

10. 

11. 

12. 

13. 

14. 

#### Extended Response

Answer each question with complete sentences.

15. 

16. 

#### Essay Question

17. Record your answer for question 17 on a separate sheet of paper.