Student Name _____

Teacher Name _____

School _____

System _____

BIOLOGY I

Item Sampler

Tennessee End of Course Assessment
Biology I Form 4

Reporting Category 4:
Flow of Matter and Energy

PEARSON

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Contents

Introduction to Biology I 4
Content of tests 4
Test development 4
Test administration 4
Tips for Taking the Test 5
Preparing for the test 5
Before the test 5
During the test 5
Directions for Using the Item Sampler 6
Biology I Item Sampler 7
Answer Key with Reporting Category and Performance Indicator 20

Introduction to Biology I

Content of tests

The testing program titled the *Tennessee End of Course Assessment* was established to meet the Tennessee mandate for end of course assessments in Tennessee secondary schools. These tests measure the Tennessee State Performance Indicators. Subject areas covered by the end of course assessments include Mathematics, Language Arts, History, and Science.

Test development

For the *Tennessee End of Course Assessment*, a staff of writers – composed of both teachers and professional test developers experienced in each of the content areas – researched and wrote the items. Professional editors and content specialists carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately twice as many items as were needed in the final editions of the tests.

After tryout tests were administered, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including particular items and test directions in operational tests.

Test administration

Tennessee End of Course Assessments are given to students as they near the end of courses that are included in the program. Tests may be given midyear for block schedules or near the end of the school year.

You will have ample time to read and answer each of the questions. The Biology I test has been designed to be administered in one session and is not timed.

Tips for Taking the Test

Preparing for the test

- Review this Tennessee End of Course Item Sampler for Biology I carefully and thoroughly.
- Acquire the Tennessee End of Course Practice Test for Biology I, and take the test several times.
- Become familiar with the correct way to mark answers on the answer sheet.

Before the test

- Get a good night's sleep. To do your best, you need to be rested.

During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. First answer all questions that you are sure about.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Directions for Using the Item Sampler

This Item Sampler for Biology I provides specific information to students and teachers. It contains examples of different item types for each Performance Indicator that may be tested in any given end of course test administration. Performance Indicators have been grouped by Reporting Categories. These Reporting Categories will be used to report information regarding performance on the end of courts test to students, teachers, schools, and systems.

The items in this Item Sampler will not be found in the end of course tests. The number of items in this Item Sampler does not reflect the emphasis of content on the test. In order to identify the emphasis of content, the End of Course Assessment Practice Test for Biology I should be used. The Practice Test gives a better representation of content emphasis across Reporting Categories and Performance Indicators.

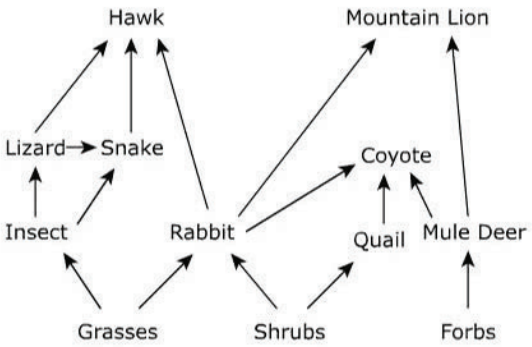
An Answer Key is located in Page 20. Use it to check your answers. Review items that you get wrong.

Reporting Category: Flow of Matter and Energy

Numbers 1 through 26

Performance Indicator: 3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.

1. **The illustration below shows a desert food web.**

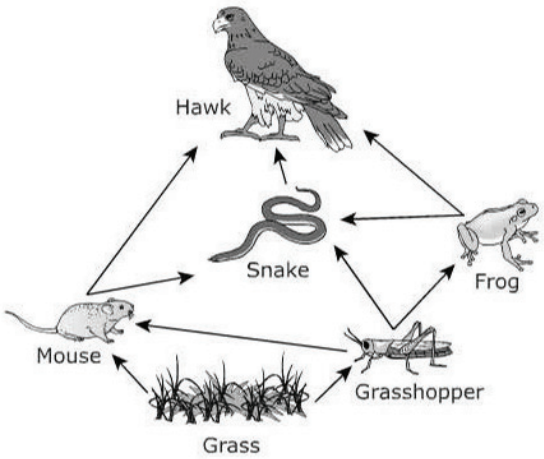


Which animal receives the <u>greatest</u> amount of the original energy found in the producers?

- **A** Quail
- **B** Hawk
- **C** Lizard
- **D** Mountain Lion

Performance Indicator: 3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.

2. **A grassland food web is shown below.**



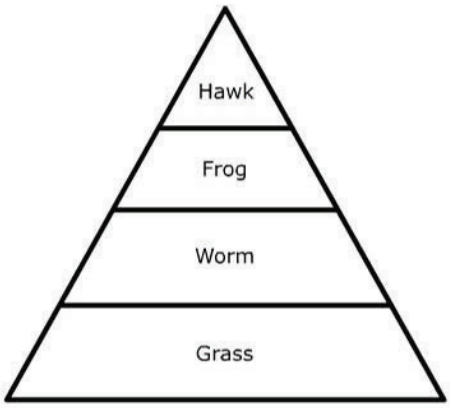
Which animal receives the <u>least</u> amount of energy in the food web?

- **A** Frog
- **B** Hawk
- **C** Mouse
- **D** Snake

Go On ▶

Performance Indicator: 3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.

3. **An energy pyramid is shown below.**



How much of the energy consumed by the worm will likely be available to the frog?

- **A** 0.1%
- **B** 1%
- **C** 10%
- **D** 100%

Performance Indicator: 3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.

4. **A food chain is shown below.**

phytoplankton → zooplankton → lobster → octopus → shark

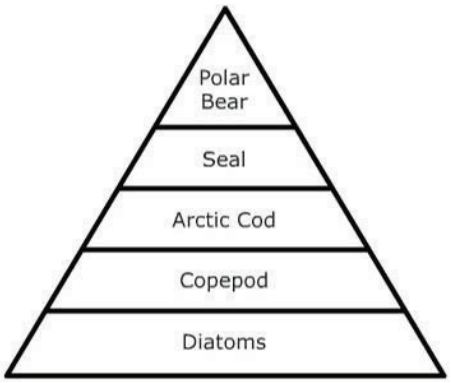
Between which two organisms does energy flow directly?

- **A** phytoplankton and shark
- **B** zooplankton and shark
- **C** lobster and shark
- **D** octopus and shark

Go On ▶

Performance Indicator: 3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.

5. **A marine energy pyramid is shown below.**



Which organism receives the most amount of energy from the producer?

- **A** Arctic Cod
- **B** Polar Bear
- **C** Copepod
- **D** Seal

Performance Indicator: 3210.3.2 Distinguish between aerobic and anaerobic respiration.

6. **Students perform a scientific investigation using several types of bacteria grown in liquid cultures. After incubating the bacterial cultures in test tubes for several days, they observe some of the bacteria growing close to the surface of the liquid and other types of bacteria growing at the bottom of the test tubes. Which cellular process does the bacteria that grow close to the surface of the liquid culture most likely use to produce energy?**

- **A** DNA replication
- **B** DNA transcription
- **C** aerobic respiration
- **D** anaerobic respiration

Go On ▶

Performance Indicator: 3210.3.2 Distinguish between aerobic and anaerobic respiration.

7.

Some bacteria are able to perform aerobic respiration, and others are able to perform anaerobic respiration. Which step of respiration is found in both aerobic and anaerobic respiration?

- **A** glycolysis
- **B** fermentation
- **C** citric acid cycle
- **D** electron transport chain

Performance Indicator: 3210.3.2 Distinguish between aerobic and anaerobic respiration.

8.

Students research two types of prokaryotes that survive in different environments. Prokaryote 1 lives in an environment that enables aerobic respiration, and Prokaryote 2 lives in an environment that only allows anaerobic respiration. Which statement about the two types of prokaryotes is <u>most</u> true?

- **A** Prokaryote 2 could be found living on the surface of human skin.
- **B** Prokaryote 1 could be found living on the bottom of a hot spring.
- **C** Prokaryote 2 requires sunlight to be present for respiration to occur.
- **D** Prokaryote 1 produces more energy during respiration than Prokaryote 2.

Go On ▶

Performance Indicator: 3210.3.2 Distinguish between aerobic and anaerobic respiration.

9.

Energy is produced through the process of cellular respiration in all living organisms. Aerobic respiration occurs through use of oxygen, while anaerobic respiration does not use oxygen. Which statement about anaerobic respiration is correct?

- **A** Anaerobic respiration occurs in the chloroplasts of cells.
- **B** Anaerobic respiration occurs in the mitochondria of cells.
- **C** Anaerobic respiration yields less energy than aerobic respiration.
- **D** Anaerobic respiration is a more efficient process than aerobic respiration.

Performance Indicator: 3210.3.2 Distinguish between aerobic and anaerobic respiration.

10.

A representation of a chemical reaction is shown below.

glucose + oxygen ⟶ carbon dioxide + water + energy

Which process is shown in this representation?

- **A** phagocytosis
- **B** photosynthesis
- **C** aerobic respiration
- **D** anaerobic respiration

Go On ▶

Performance Indicator: 3210.3.2 Distinguish between aerobic and anaerobic respiration.

11. **In gardening, compost piles can be classified as aerobic or anaerobic. The design of the compost pile determines whether the bacteria growing in the compost are aerobic or anaerobic bacteria. Which statement describes a compost pile in which bacteria perform anaerobic respiration?**

- **A** a compost pile that is covered and mixed frequently
- **B** a compost pile that is covered so gases cannot escape
- **C** a compost pile that is uncovered and watered frequently
- **D** a compost pile that is uncovered so light can be absorbed

Performance Indicator: 3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.

12. **Glucose produced during photosynthesis is used during cellular respiration to yield ATP. What is the original source of energy used during photosynthesis that is stored in glucose molecules?**

- **A** carbon dioxide
- **B** oxygen
- **C** heat
- **D** light

Go On ▶

Performance Indicator: 3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.

13.

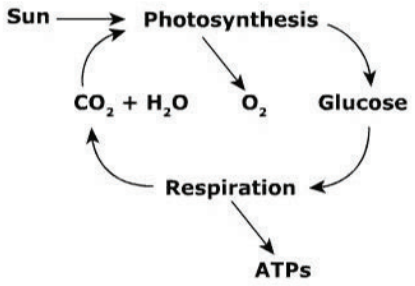
Cellular respiration and photosynthesis both require an energy source. What is the energy source for cellular respiration but not for photosynthesis?

- **A** heat
- **B** light
- **C** chemical potential
- **D** electrical potential

Performance Indicator: 3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.

14.

A diagram of energy transfer for the processes of photosynthesis and cellular respiration is shown below.



Which statement is true about the reactants in photosynthesis and cellular respiration?

- **A** Photosynthesis requires energy; cellular respiration only produces energy.
- **B** Photosynthesis reactants are gases; cellular respiration reactants are solids.
- **C** Photosynthesis requires sunlight and oxygen; cellular respiration requires glucose.
- **D** Photosynthesis reactants are low-energy molecules; cellular respiration reactants are high-energy molecules.

Go On ▶

Performance Indicator: 3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.

15.

Cellular respiration and photosynthesis occur in biological organisms. Which statement is most true about cellular respiration and photosynthesis?

- **A** Cellular respiration requires energy, and photosynthesis does not.
- **B** Cellular respiration and photosynthesis produce the same products.
- **C** Sugar and oxygen are reactants for photosynthesis and cellular respiration.
- **D** ATP is a product of cellular respiration, and starch is a product of photosynthesis.

Performance Indicator: 3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.

16.

Which product of photosynthesis is a reactant for cellular respiration?

- **A** light
- **B** carbon dioxide
- **C** sugar
- **D** ATP

Go On ▶

Performance Indicator: 3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.

17.

Mitochondria and chloroplasts are important energy-related organelles. Below are diagrams of a chloroplast and mitochondrion.

Chloroplast

Mitochondrion

What is a main difference in the processes performed by these organelles?

- **A** Mitochondria derive energy from food; chloroplasts use solar energy to make food.
- **B** Chloroplasts need sunlight to perform cellular respiration; mitochondria do not need sunlight.
- **C** The energy produced by photosynthesis is stored as ATP; energy is stored as starch in cellular respiration.
- **D** Mitochondria perform photosynthesis in the inner membranes; chloroplasts perform respiration in the thylakoid.

Performance Indicator: 3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.

18.

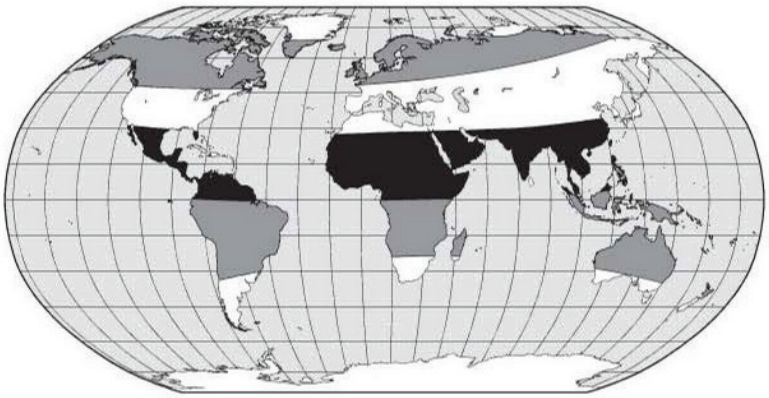
Plants perform gas exchange to provide reactants for both photosynthesis and cellular respiration. Gas exchange takes place through pores on leaves called stomata. When a plant's main metabolic activity switches from photosynthesis to respiration, how does the gas exchange of the stomata change?

- **A** The stomata switch from ensuring the availability of oxygen to ensuring the availability of carbon dioxide.
- **B** The stomata switch from ensuring the availability of carbon dioxide to ensuring the availability of oxygen.
- **C** The stomata stop releasing gases into the environment and begin absorbing gases from the environment.
- **D** The stomata stop absorbing gases from the environment and begin absorbing water vapor from the environment.

Go On ▶

Performance Indicator: 3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.

19. **A recent study has shown that human activities have affected the water cycle and caused rainfall patterns to change as shown in the figure below.**



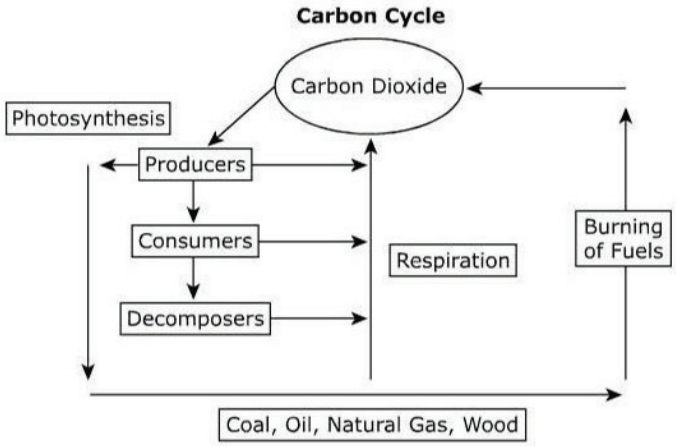
KEY
= precipitation increase
= precipitation decrease

How do these changes in precipitation most likely impact the ecosystems of these areas?

- **A** Areas of decreased precipitation have a decrease in biodiversity.
- **B** Areas of decreased precipitation have an increase in biodiversity.
- **C** Areas of increased precipitation become rain forests.
- **D** Areas of increased precipitation become deserts.

Performance Indicator: 3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.

20. **A representation of the carbon cycle is shown below.**



If the amount of atmospheric carbon dioxide were decreased, what would be the most direct effect on the ecosystem?

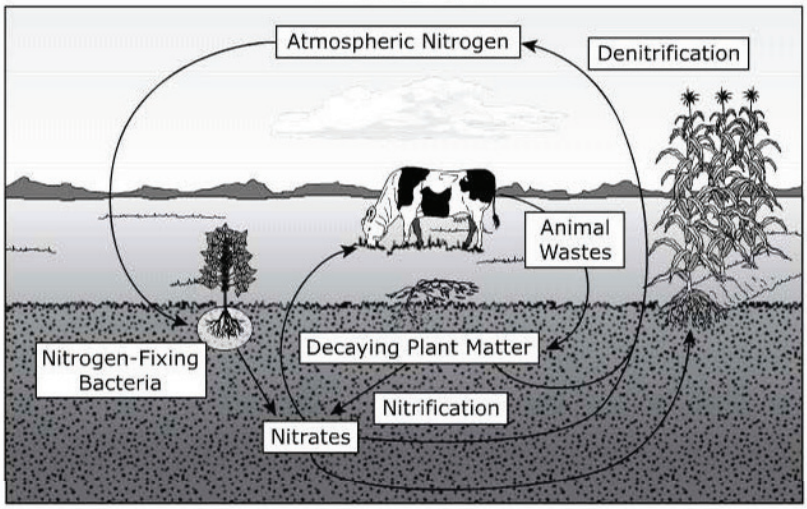
- **A** Decomposers would decrease in number.
- **B** Some consumers would become photosynthetic.
- **C** Producers would have less material for making food.
- **D** Consumers and producers would increase the rate of respiration.

Go On ▶

Performance Indicator: 3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.

21. **A representation of the nitrogen cycle is shown in the diagram below.**

Nitrogen Cycle



If nitrogen fixation by bacteria were to decrease, what direct effect would this have on the ecosystem?

- **A** Consumers would not have a reactant for respiration.
- **B** Producers would not have a reactant for photosynthesis.
- **C** Plants could not make proteins because of a lack of ammonia in the soil.
- **D** Animal growth would be limited from availability of ammonia in the soil.

Performance Indicator: 3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.

22. **The burning of forests and fossil fuels releases carbon into the carbon cycle. How could this impact an ecosystem?**

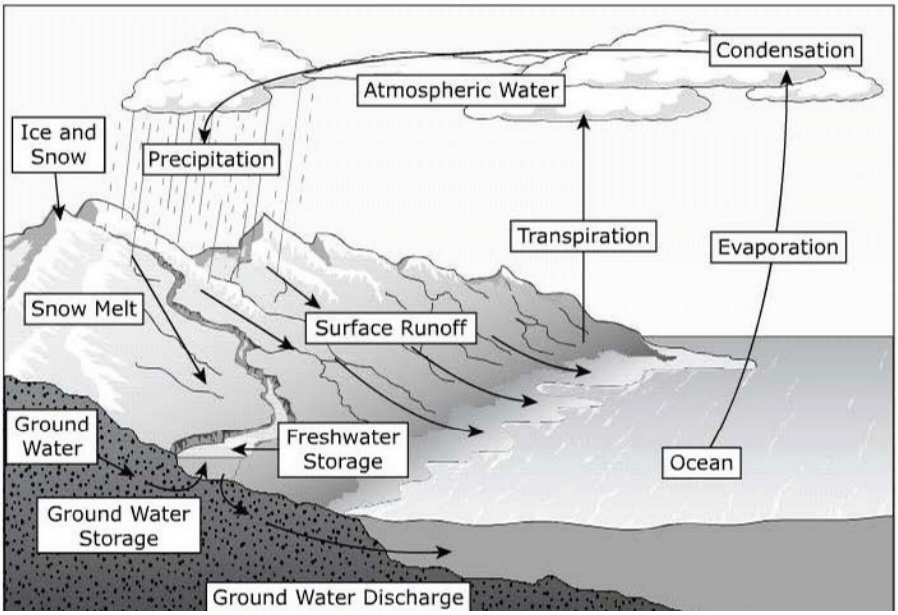
- **A** The amount of organic carbon in the soil could increase.
- **B** The amount of carbon dioxide dissolved in water could increase.
- **C** The amount of organic carbon in the atmosphere could decrease.
- **D** The amount of carbon dioxide available for photosynthesis could decrease.

Go On ▶

Performance Indicator: 3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.

23. **Scientific evidence supports the reports that average global temperatures are increasing. If global temperatures continue to rise, the water cycle will be impacted. The figure below shows the water cycle.**

Water Cycle



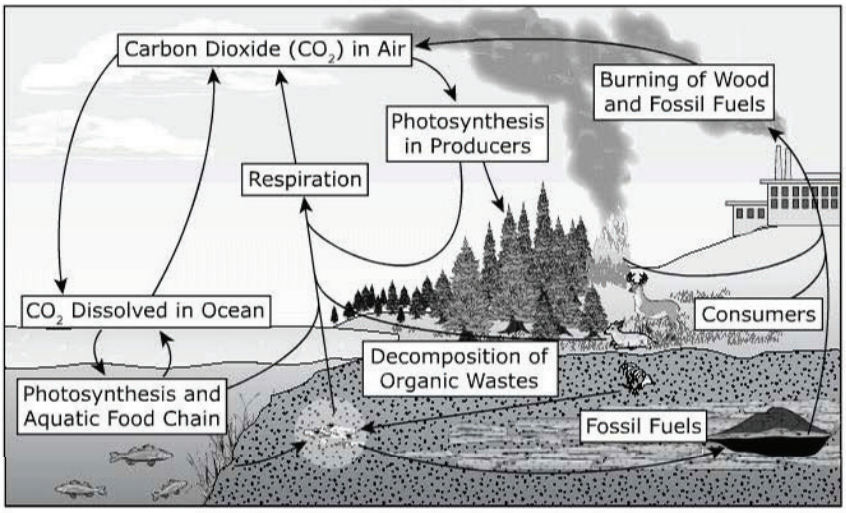
Which statement best describes how increased global temperatures would affect a marine ecosystem?

- **A** Sea levels would decrease and lead to a lack of habitat for coastal communities.
- **B** An increase in sea levels would damage the coral reefs and lead to a decrease in biodiversity.
- **C** The drop in sea levels would increase the number of fish and marine mammals closer to the coast lines.
- **D** There would be no change because the ocean communities are able to compensate and adapt to changes in water level.

Performance Indicator: 3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.

24. **Scientists monitoring gases in the atmosphere have measured increases in carbon dioxide. The carbon cycle is shown in the diagram below.**

Carbon Cycle



Which two processes would cause an increase in carbon dioxide?

- **A** respiration and the burning of fossil fuels
- **B** photosynthesis and the burning of fossil fuels
- **C** respiration and the dissolving of carbon dioxide
- **D** photosynthesis and the decomposition of wastes

Go On ▶

Performance Indicator: 3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.

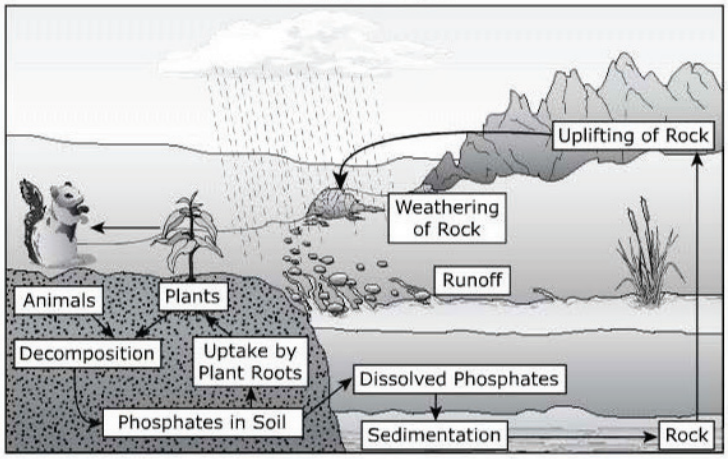
25. **People routinely use fertilizer containing nitrogen on their lawns and flower beds, while farmers use fertilizer to increase crop production. How does using fertilizer produce changes in the nitrogen cycle that impact the ecosystem?**

- **A** The increase in nitrogen available in the surface water allows for increased nitrogen uptake by plants.
- **B** The amount of nitrogen added to the atmosphere by denitrification from wetlands decreases.
- **C** The microbes found in the soil become less active due to a lack of nitrogen.
- **D** The immobilization of nitrogen in groundwater decreases.

Performance Indicator: 3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.

26. **The phosphorus cycle is shown in the diagram below.**

Phosphorus Cycle



Which process <u>most</u> increases the amount of phosphorus available for use in the ecosystem?

- **A** Weathering of Rock
- **B** Sedimentation
- **C** Uptake by Plant Roots
- **D** Dissolved Phosphates

Reporting Category 4: Flow of Matter and Energy		
Item Number	**Correct Answer**	**Performance Indicator**
1	A	3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.
2	B	3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.
3	C	3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.
4	D	3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.
5	C	3210.3.1 Interpret a diagram that illustrates energy flow in an ecosystem.
6	C	3210.3.2 Distinguish between aerobic and anaerobic respiration.
7	A	3210.3.2 Distinguish between aerobic and anaerobic respiration.
8	D	3210.3.2 Distinguish between aerobic and anaerobic respiration.
9	C	3210.3.2 Distinguish between aerobic and anaerobic respiration.
10	C	3210.3.2 Distinguish between aerobic and anaerobic respiration.
11	B	3210.3.2 Distinguish between aerobic and anaerobic respiration.
12	D	3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.
13	C	3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.
14	D	3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.
15	D	3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.

16	C	3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.
17	A	3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.
18	B	3210.3.3 Compare and contrast photosynthesis and cellular respiration in terms of energy transformation.
19	A	3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.
20	C	3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.
21	C	3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.
22	B	3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.
23	B	3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.
24	A	3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.
25	A	3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.
26	A	3210.3.4 Predict how changes in a biogeochemical cycle can affect an ecosystem.