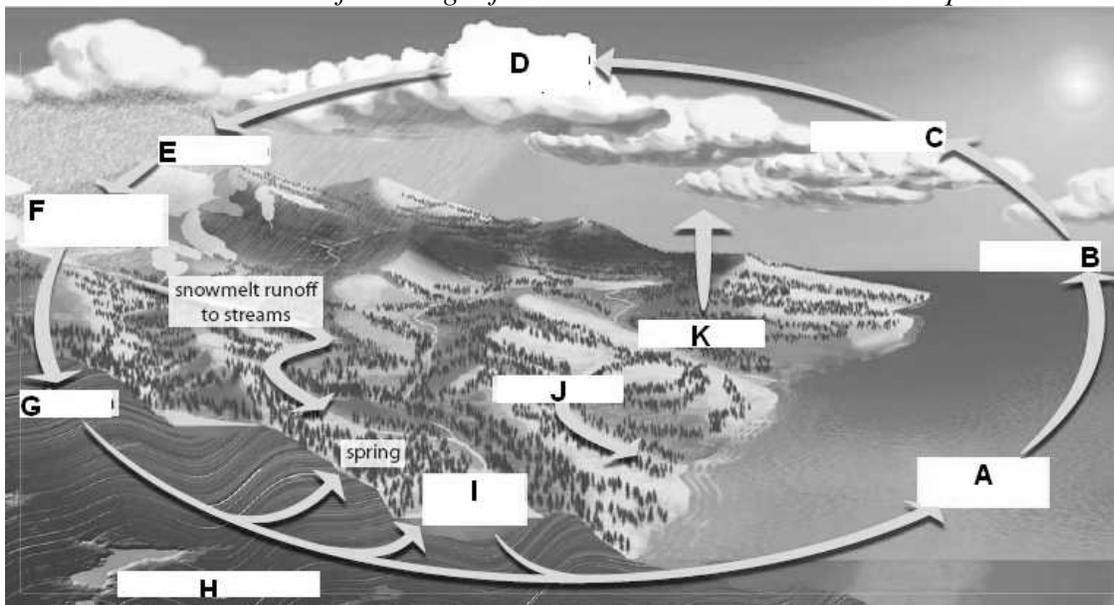


Multiple Choice Questions

- Decide which of the choices best completes the statement or answers the question.
 - Locate that question number on the separate answer sheet provided.
 - Use the procedure described by your teacher to answer each question. For example, “fill in the circle that corresponds to your choice” or “make an X over the letter corresponding to your choice.”
1. Which of the following does NOT describe water?
 - a. Water is considered a universal solvent.
 - b. Water has a relatively high boiling point and melting point.
 - c. Water has special adhesive and cohesive properties.
 - d. Water has a very low heat capacity.

Use the following information to answer the next three questions.



As water cycles through the environment, it can transport many other materials along with it.

2. Water enters Earth's atmosphere through the processes labelled:
 - a. K – transpiration and B – evaporation
 - b. J – surface runoff and G – infiltration
 - c. C – condensation and E – precipitation
 - d. D – water storage in the atmosphere and H – ground water storage

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| ASSESSMENT | <h1>Chapter 2 Test</h1> | BLM 2.4.1 |
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3. The biogeochemical cycle depicted in this illustration is called the
- biological cycle.
 - carbon-oxygen cycle.
 - hydrologic cycle.
 - meteorological cycle.

Use the additional information to answer the next question.

The density of water is greater at 4 °C than it is at 0 °C. The attraction of water molecules to each other is responsible for surface tension. As well, water molecules are attracted to molecules of other substances such as the inner surface of a glass tube or the cell wall of a tree's xylem tissue.

4. The properties of water described above are the result of the
- high melting and boiling points of water.
 - structure of water, which includes its polarity and hydrogen bonds.
 - ionic bonds between hydrogen and oxygen and the non-polar nature of the water molecule.
 - ability of water to transfer large amounts of heat from the equatorial regions to the Poles.
5. Some insects, such as the water strider, can literally walk on water. The property of water that allows the water strider to stay on the surface of the water is termed
- polarity
 - adhesion
 - surface tension
 - specific heat capacity

Use the following information to answer the next two questions.

Ground Water in Alberta

For Albertans who depend on groundwater supplies, the quality of water is as important as quantity. Ground water can be unfit for human consumption or for other uses because of contamination. As population, land development, and resource development increase in Alberta, the risk of impacts to water quality also increases.

Some commercial and industrial activities can contaminate ground water. Regulations are in place to reduce the possibility of groundwater contamination occurring. Regulations protect groundwater quality from contamination such as:

- Leaking or malfunctioning septic tanks or cesspools. Faulty sewer systems can add **organic compounds**, synthetic detergent, and **chlorides** (Cl^-) to ground water.
- More important, **nitrates** (NO_3^-) and bacteria that affect human health can be introduced.
- Landfills can leak or leach harmful materials into the water supply. Organic compounds, chlorides, **sulfates** (SO_4^{2-}), and a variety of metal salts could seep from a landfill.

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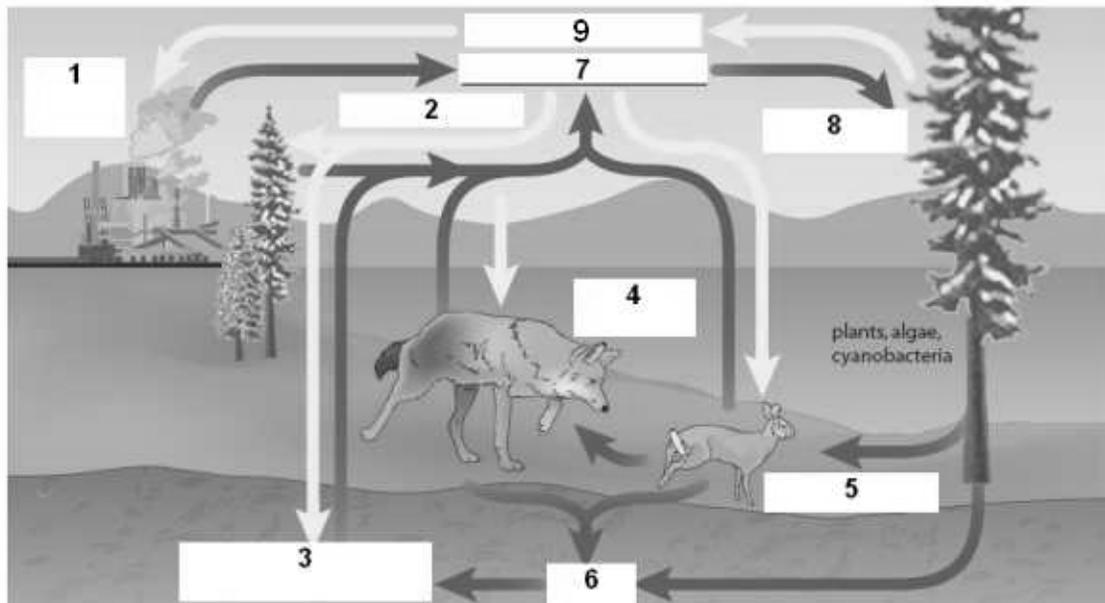
6. Which statement best explains why pollutants easily enter ground water?
- The melting and boiling points of water are high when compared with other liquids that do not have hydrogen bonds.
 - The structure of water, which includes its polarity and hydrogen bonds, enables water to dissolve ionic compounds.
 - The ionic bonds between hydrogen and oxygen and the non-polar nature of the water molecule.
 - Hydrogen bonding causes cohesion, which is responsible for surface tension.
7. Which statement best explains why a community many kilometres away could be affected by a leaking landfill site?
- Water can dissolve a wide range of substances and transport them great distances.
 - Water that is trapped as ground water cannot be used for human activity.
 - Water has special cohesive and adhesive properties.
 - Water is a product of cellular respiration and is required for photosynthesis.
8. Identify the row that provides examples of the rapid cycling of nutrients and slow cycling of nutrients.

| Row | Rapid Cycling | Slow Cycling |
|-----|--|---|
| a. | formation of coal and natural gas | burning coal and natural gas |
| b. | photosynthesis and cellular respiration | erosion of fossil fuels |
| c. | decomposition of recently living organisms | photosynthesis and cellular respiration |
| d. | formation of fossil fuels | burning of coal and natural gas |

9. Which of the following is NOT an example of a nutrient reservoir?
- atmosphere
 - ocean
 - living organisms
 - Sun

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Use the following diagram to answer the next three questions.



Carbon and oxygen cycles

10. Which row best describes the organisms represented by label #3 and identifies the gas that the organisms use and the gas they release?

| Row | Organisms | Gas used | Gas released |
|-----|---------------------|----------------|----------------|
| a. | producers | carbon dioxide | oxygen |
| b. | primary consumers | oxygen | carbon dioxide |
| c. | decomposers | oxygen | carbon dioxide |
| d. | secondary consumers | carbon dioxide | oxygen |

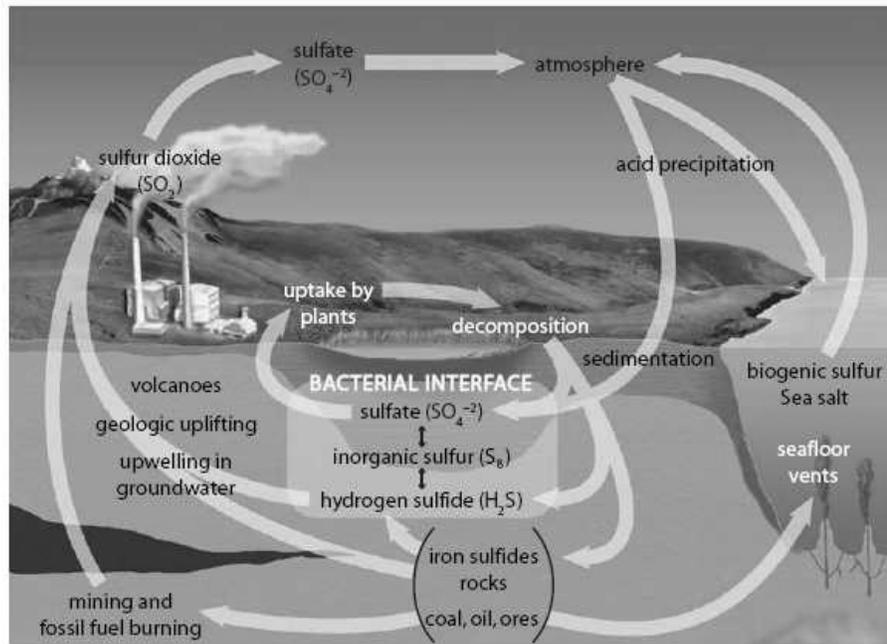
11. Number 9 on the flow chart represents
- oxygen gas that is released by autotrophs and used by living things to release stored chemical energy.
 - oxygen gas that is released by autotrophs but only used by heterotrophs to release stored chemical energy.
 - carbon dioxide gas that is released by heterotrophs and used by all living things to release stored chemical energy.
 - carbon dioxide gas that is released by heterotrophs and used only by heterotrophs to release stored chemical energy.
12. With respect to the carbon and oxygen cycles, three processes represented in this diagram are:
- combustion; weathering; erosion.
 - nitrogen-fixing; denitrification; ammonification.
 - photosynthesis; cellular respiration; combustion of fossil fuels.
 - chemical precipitation; leaching; geological uplifting.

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13. The largest carbon sink is the
- boreal forest.
 - tropical rain forest.
 - grassland.
 - ocean.
14. Plants and algae use sulfur in the form of the sulfate ion, SO_4^{2-} , which
- enables them to take part in chemosynthesis.
 - may or may not be taken up by roots, depending on temperature.
 - is part of the nitrogen cycle.
 - dissolves readily in water.
15. One of the environmental problems associated with the burning of coal to produce electrical energy is
- denitrification of nitrate, releasing nitrogen gas into the atmosphere.
 - acid deposition.
 - chemical precipitation of phosphates in aquatic ecosystems.
 - ammonification.
16. Which of the following activities is related to carbon cycling?
- deforestation
 - burning of fossil fuels
 - agriculture
 - photosynthesis
17. The practice of planting this type of crop can help to restore nitrogen levels in soil.
- denitrifying bacteria
 - legumes
 - wheat and barley
 - canola
18. Most biogeochemical cycles involve the movement of material through land, air, and water. Which of the following biogeochemical cycles does NOT involve all three?
- phosphorous cycle
 - nitrogen cycle
 - carbon cycle
 - oxygen cycle

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Use the following information to answer the next three questions.

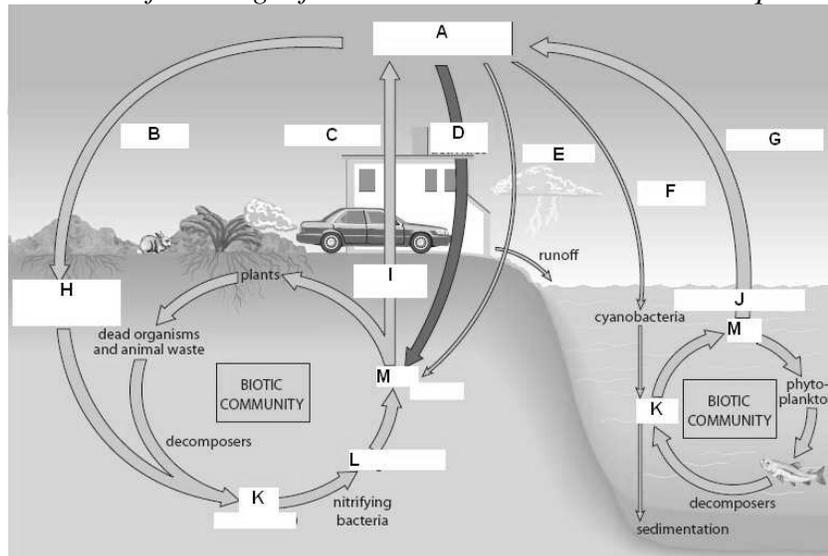


19. Which organisms are essential components of the sulfur cycle?
- algae
 - green plants
 - bacteria
 - fungi
20. Which row best represents both the natural and human sources of sulfur dioxide that contribute to acid precipitation?

| Row | Natural sources | Human sources |
|-----|-------------------|--------------------------------|
| a. | volcanic activity | burning of fossil fuels |
| b. | sea floor vents | agricultural use of fertilizer |
| c. | uptake by plants | burning of fossil fuels |
| d. | biogenic sulfur | agricultural use of fertilizer |

21. Which of the following best explains why most of Alberta is protected from acidic deposition?
- much of the coal mined in Alberta is very low in sulfur
 - the alkaline soils that cover most of Alberta tend to neutralize the effects of acid deposition
 - lightning storms in Alberta convert atmospheric molecular nitrogen to nitrate
 - terrestrial vegetation in northern Alberta is absorbing carbon dioxide at a greater rate than previously thought

Use the following information to answer the next three questions.



Numerical Response Question

- Record your answer on the answer sheet provided.
- If an answer is a value between 0 and 1 (e.g., 0.25), record the 0 before the decimal place.

Components of the nitrogen cycle

1: nitrogen fixation; 2: denitrifying bacteria; 3: nitrate ion; 4: ammonium ion

- Match the components of the nitrogen cycle, as numbered above, to the letters **B** and **F**; **I** and **J**; **M**; and **K** in the illustration above. Record your **four-digit answer** in the numerical response section on the answer sheet.

Components Number: _____
 Illustration Labels: **B & F** **I & J** **M** **K**

Multiple Choice Questions

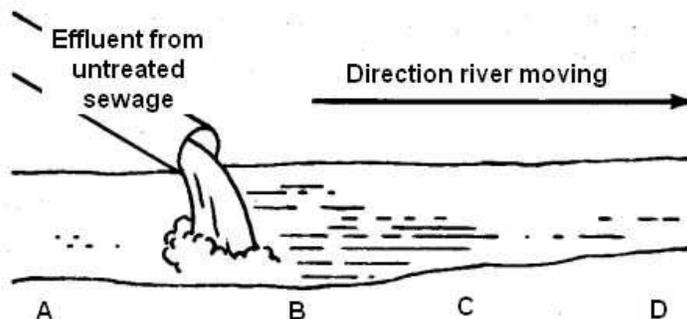
- The nitrogen-fixing organisms in this diagram are represented by the letter
 - A
 - L
 - H
 - D
- The nitrogen cycle involves the movement of atmospheric nitrogen through a series of nitrifying bacteria, which process the nitrogen into forms that can be absorbed and used by other living organisms. Which of the following flow charts best represents the correct order of this process, starting with atmospheric nitrogen and ending with a form of nitrogen that most plants (producers) can use?
 - nitrate → N₂(g) → ammonium → nitrite
 - nitrite → ammonium → N₂(g) → nitrate
 - N₂(g) → ammonium → nitrite → nitrate
 - ammonium → nitrate → nitrite → N₂(g)

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| ASSESSMENT | Chapter 2 Test | BLM 2.4.1 |
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Use the following information to answer the next four questions.

Measuring Dissolved Oxygen

Fish and other organisms are disappearing from the river shown below.



Measuring oxygen—one of the most important dissolved substances in the water—can give the biologist one kind of important evidence about why there may be fewer fish in a river. As you know, most organisms cannot survive without oxygen. The amount of oxygen dissolved in the water of a river depends on several abiotic factors. The abiotic factors include:

- temperature
- flow of the water (slow or turbulent)

Biotic factors also determine the amount of oxygen in the water. Organisms such as snails, fish, insects, bacteria, and fungi consume oxygen dissolved in the water. Where there is a large amount of organic matter, the decomposers multiply and use up most of the available oxygen. The lack of oxygen then kills fish and other organisms that require this vital substance.

The concentration of dissolved oxygen in water is often measured in milligrams per litre (mg/L) or in parts per million (ppm). Most organisms living in water need oxygen levels of about 5 mg/L of water. This means that in every litre of water there must be more than five milligrams of oxygen.

24. Which of the following practices could reduce the amount of nutrients entering the river ecosystem?
- a. Construct a series of canals and wetlands to treat sewage coming out of the cities.
 - b. Treat the sewage with toxic chemicals to kill the organisms that are feeding on the increased nutrients in the water.
 - c. Construct large structures similar to Biosphere 2 that can be closed off for 100 years.
 - d. Treat the sewage by adding more decomposers to break down the extra organic matter entering the river.

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| ASSESSMENT | <h1>Chapter 2 Test</h1> | BLM 2.4.1 |
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25. In this system, phosphate was not removed from the effluent entering the river system. Which row below identifies and describes the ecological problem associated with the effect of phosphates on aquatic ecosystems.

| Row | Identification of the problem | Description |
|-----|-------------------------------|---|
| a. | acid deposition | Acid deposition returns sulfur to oceans, lakes, and soils. Although acid deposition is a natural part of the sulfur cycle, large amounts of acid deposition can damage plants, acidify lakes, and leach nutrients from the soil. |
| b. | disrupting carbon cycle | Human activities influence the slow cycling of carbon in a number of ways. In particular, the dumping of raw sewage into rivers increases the amount of carbon entering aquatic ecosystems. |
| c. | denitrification | The untreated effluent results in an increase in the number of denitrifying bacteria. These bacteria complete the nitrogen cycle by converting nitrite or nitrate back into nitrogen gas. The result is less nitrogen available for producers. |
| d. | algal bloom | The growth of algae in aquatic ecosystems is limited by the amount of available nutrients. The overgrowth of algae produces large amounts of organic matter. As decomposers break down organic matter, they use up the oxygen in the water, resulting in the death of fish and other aquatic organisms. |

26. Which nutrient is most likely responsible for the death of fish and other organisms in this river?
- carbonates
 - nitrites
 - phosphates
 - sulfates

Numerical Response Question

Levels of Dissolved Oxygen

Four samples of water were collected along the stream and the dissolved oxygen concentration was determined at each site. The sampling sites are labelled A, B, C, and D in the diagram. The levels of dissolved oxygen were found to be

1: 8 mg/L 2: 4 mg/L 3: 2.2 mg/L 4: 10 mg/L

2. Match the levels of dissolved oxygen, as numbered above, to the letters A, B, C, and D in the diagram. Record your **four-digit answer** in the numerical response section on the answer sheet.

Level of Dissolved Oxygen: _____

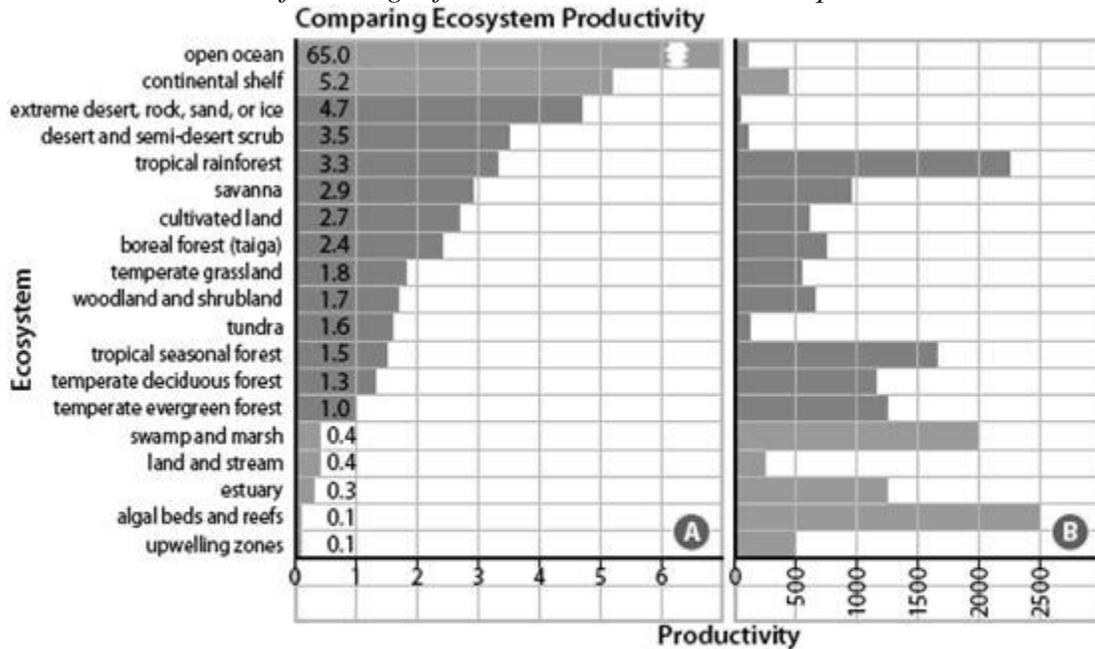
Diagram Letter: **A** **B** **C** **D**

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| ASSESSMENT | <h1>Chapter 2 Test</h1> | BLM 2.4.1 |
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Multiple Choice Questions

27. Which hypothesis is described by the statement, “The biosphere acts like an organism that regulates itself, maintaining environmental conditions within certain limits.”
- First Hypothesis of Thermodynamics
 - Gaia Hypothesis
 - Second Hypothesis of Thermodynamics
 - Homeostatic Hypothesis

Use the following information to answer the next question



Comparing productivity of ecosystems in terms of (A) the percentage of Earth's surface and (B) average net productivity. Net productivity here is the total amount of radiant energy that is transformed to chemical energy by producers, minus the amount used by the producers during cellular respiration.

28. According to this graph, the most productive ecosystems are the
- open oceans.
 - tropical rain forests.
 - temperate grasslands.
 - algal beds and reefs.

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| ASSESSMENT | <h2>Chapter 2 Test</h2> | BLM 2.4.1 |
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29. Which of the following is NOT a variable in determining the productivity of a terrestrial ecosystem?
- the amount of energy recycled in the system
 - number of producers in the ecosystem
 - the amount of light and heat available
 - the amount of rainfall the system receives

Use the following information to answer the next question

Productivity

Productivity is the rate at which organisms produce new biomass. In other words, productivity does not refer to the total mass of all producers in an area at any one time. For example, a forest has a very large biomass. The mass of the vegetation is greater than that of a grassland of equal size. But the productivity of a grassland ecosystem may actually be greater than that of the forest during the growing season.

30. Which statement best explains why a grassland ecosystem could have a higher productivity than that of a forest of equal size?
- Approximately 6 percent of the sunlight that reaches Earth's surface is ultraviolet radiation (UVR). UVR transfers more energy than visible light. As a result, grassland plants can capture more UVR than the trees of a forest. The result is higher productivity in the grassland.
 - Approximately 6 percent of the sunlight that reaches Earth's surface is ultraviolet radiation (UVR). UVR transfers more energy than visible light. As a result, trees can capture more UVR than the plants in a grassland ecosystem. The result is higher productivity in the forest.
 - Animals in a grassland ecosystem are constantly eating the plants and new ones are constantly being produced. Thus, new mass accumulates in a grassland ecosystem at a higher rate than in a forest.
 - Animals in a forest are constantly eating the plants and new ones are constantly being produced. Thus, new mass accumulates in a forest ecosystem at a higher rate than in a grassland.