Name:
Class:
Date:

Question #1

How does the buying and selling of rainforest animals as pets have a negative effect on the rainforest ecosystem?

A It may reduce the growth of plants in the rainforest.

B It may increase genetic variability among rainforest animals.

C It may increase symbiotic relationships in the rainforest.

D It may lead to the extinction of those rainforest animals.

Question #2

Decaying plants and animals are important to an ecosystem because they

A cause disease in living organisms.

B reduce soil erosion.

C recycle oxygen to the air.

D return nutrients to the soil.

Question #3

Which human activity *most* likely contributes to the solid waste pollution in streams and landfills?

A using natural fertilizers on lawns

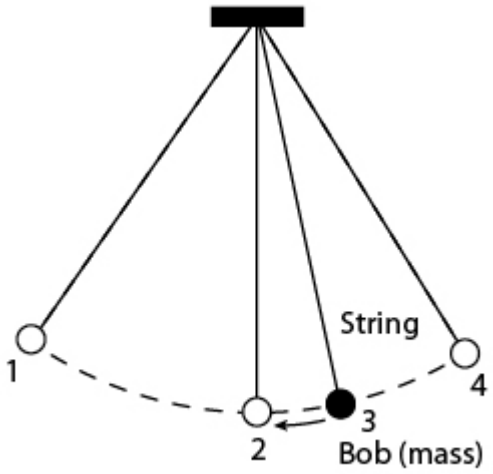
B buying products packaged in disposable containers

C combining leaves and grass clippings with paper products to use in composting

D recycling glass, paper, and aluminum products

Question #4

A student is demonstrating the transformation of kinetic and potential energy in a system using the pendulum shown below.



At which point in this system does the pendulum bob demonstrate minimum potential energy?

A 1

B 2

C 3

D 4

Question #5

Two populations of reef fish live in biological coexistence with each other. Which sentence *best* describes their relationship?

A The species compete with each other.

B One species preys on the other.

C The species ignore each other.

D One species benefits from the other.

Meeting Increasing Global Demands for Copper

1 **Copper is a metal that is prized for its many uses. It is very durable and is easily stretched, molded, and shaped. It also conducts heat and electricity unusually well. Copper is used in many different applications, including building construction, water pipelines, appliances, computers, mobile phones, power lines, and industrial machinery. Our modern way of life would not be possible without it.**

2 **But the way we produce and use copper in these products may need to change. The U.S.Geological Survey estimates that 3.5 billion metric tons of copper exist in copper deposits worldwide. At current usage levels, this would be enough copper to last over 150 years. However, demand for copper is growing. Recent estimates indicate that the world may need to produce as much copper in the next 25 years as has been produced in the history of humanity. Also, copper production has significant negative impacts on the environment. We need to look further at ways to best manage this limited resource.**

Growth Coming from Developing Countries

3 **Over the past thirty years, the rate of copper use in developed parts of the world like the United States and Europe has remained fairly constant. However, world demand for copper continues to increase (figure 1). Developing countries are shifting away from agricultural economies. Countries like India and China are rapidly building new cities and factories, which increases the demand for modern construction materials and consumer electronics. Even slight increases in the use of copper in these countries translates into enormous growth in demand because their populations are so large (figure 2).**

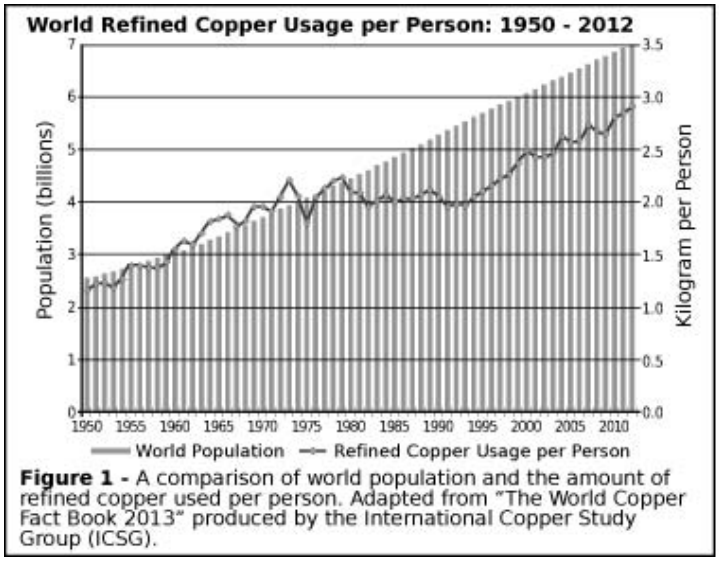


Figure 1 - A comparison of world population and the amount of refined copper used per person. Adapted from "The World Copper Fact Book 2013" produced by the International Copper Study Group (ICSG).

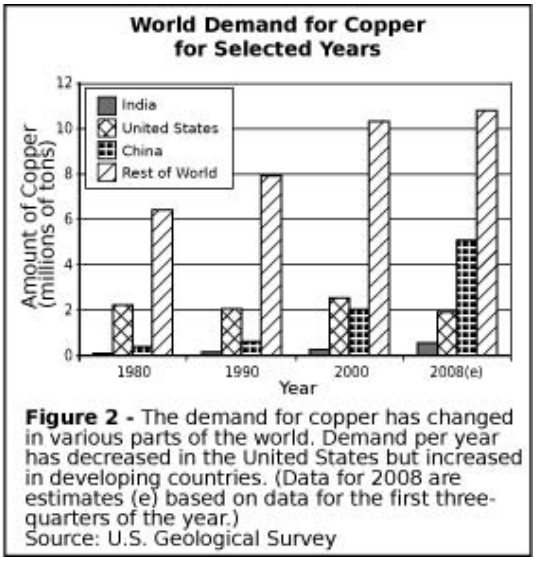


Figure 2 - The demand for copper has changed in various parts of the world. Demand per year has decreased in the United States but increased in developing countries. (Data for 2008 are estimates (e) based on data for the first three-quarters of the year.)
Source: U.S. Geological Survey

The Effect on the Environment

4 **The majority of the world's copper resources are mined from open pit mines. Once the ore is removed from the ground, it is refined to produce pure copper metal. The ore is heated to very high temperatures to extract the copper from the rock. But this process is energy-intensive and results in numerous environmental concerns. The refining process releases both sulfur dioxide and carbon dioxide gases into the air. The mine's waste rock, which is usually rich in sulfides, produces metal-rich acids when it is exposed to air and water. This acid eventually flows into local water sources, raising acidity and metal concentrations to**

dangerous levels. And open pit mines are huge operations that disturb the natural environment. At 2.5 miles wide and 0.5 miles deep, the Bingham Canyon copper mine in Utah is so big that it can be seen from space.

5 **The good news is that awareness of these problems is growing. Countries that produce large amounts of copper resources have increased regulations on the mining and refining industries to limit the gases that are released and to treat runoff. Also, copper producers have developed techniques that produce less waste and less gas and water pollution. Together these changes are decreasing the impact that copper production has on the environment.**

The Potential of Recycling

6 **Copper is among the few materials that do not become weaker or lose their chemical or physical properties in the recycling process. If appropriately managed, recycling could greatly extend the use of our copper resources. Scraps of pure copper can be melted and re-formed. Scrap made of mixed metals can be refined or used in products such as plumbing pipes and roofing materials, which don't require the high electrical performance of pure copper. Recently, new sorting and refining methods have been developed that make it possible to produce more recycled copper.**

7 **Recycling copper also conserves energy. Extracting copper from ore uses 17 barrels of oil per ton of copper. Recycling the same amount of copper uses about 1.7 barrels, or only 10% of the energy. This reduces the amount of energy needed to produce the copper. It also reduces the amount of carbon dioxide released into the atmosphere from burning the oil.**

8 **In 2011, the International Copper Study Group (ICSG) estimated that about 30% of the copper used in industry came from recycled copper. Increased recycling has great potential to provide a "new" source of the metal.**

Implications

9 **Copper is a limited resource, and methods to produce pure copper have significant negative effects on the environment. But the demand for copper will only increase as the world's population and desire for advanced technology grow. Continued improvements in mining and refining methods are important, but recycling copper shows the most promise. Better use of copper resources should make it possible to meet rising demand, while limiting further environmental impact.**

Question #6

The following question has two parts. First, answer Part A. Then, answer Part B.

Part A:

The section of the text titled "The Effect on the Environment" provides information about environmental problems that arise from the extraction of copper from copper deposits. Which solution is MOST likely to minimize this human impact on the environment while still meeting the global demand for limited copper resources?

A find a substitute material that has properties similar to pure copper

B add more environmental rules for copper production

C limit the amount of copper production

D increase the amount of copper that is recycled

Question #7

Part B:

Why is this an effective solution that minimizes this human impact on the environment?

A Limiting the production of copper will either force users to find a substitute that has similar properties or will in some other way cause the demand for copper to stop increasing.

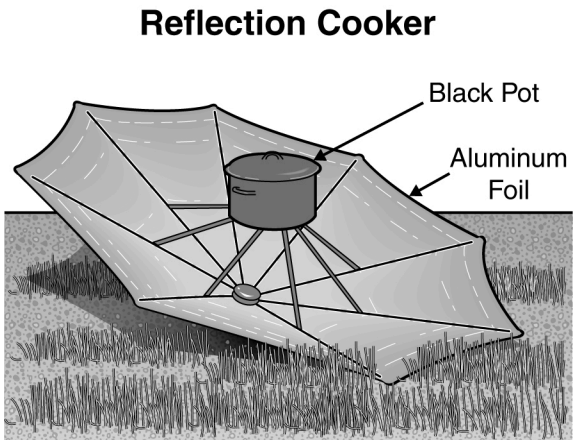
B Substituting recycled copper that comes from mixed metal scrap in applications that require pure copper will reduce the increased demand for pure copper in developing countries.

C If additional environmental regulations are put in place, then the environmental impact of copper mining will be minimized. This will be true even if production increases as the demand for copper increases.

D The more copper that is recycled, the less copper that needs to be mined. Recycling uses less energy and has less of an impact on the environment than extracting copper from ore.

Question #8

A hiker included a reflection cooker and a pot in her backpack.



She was planning to cook her food after hiking on a trail. From which source was she *most* likely trying to capture energy to cook her food?

A the wind

B the Sun

C water

D coal

Question #9

Humans can do many things to impact the environment. Which of these is an example of how humans negatively impact the environment?

A planting more trees

B burning less fossil fuel

C reducing beach erosion

D increasing water runoff

Question #10

Which of these reduces the need for people to use nonrenewable resources?

A recycling paper products

B watering the lawn once a week

C designing cars that are fuel efficient

D using coal to generate electricity

Question #11

Which of the following natural disasters is likely to cause the *most* widespread damage in a coastal ecosystem?

A a landslide

B a tornado

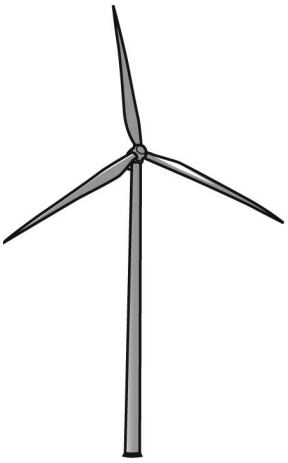
C a tsunami

D an earthquake

Question #12

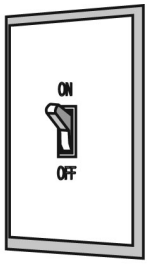
Julie studied how devices can change one type of energy into another. Which device can change mechanical energy into electrical energy?

A



Wind Turbine

B

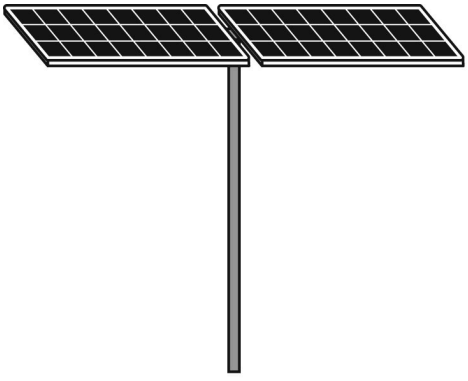


Light Switch

C

Hair Dryer

D



Solar Panel

Question #13

Some power plants release heated water into rivers. This practice adds thermal energy to the river that *most* likely

A increases the amount of nutrients in the river.

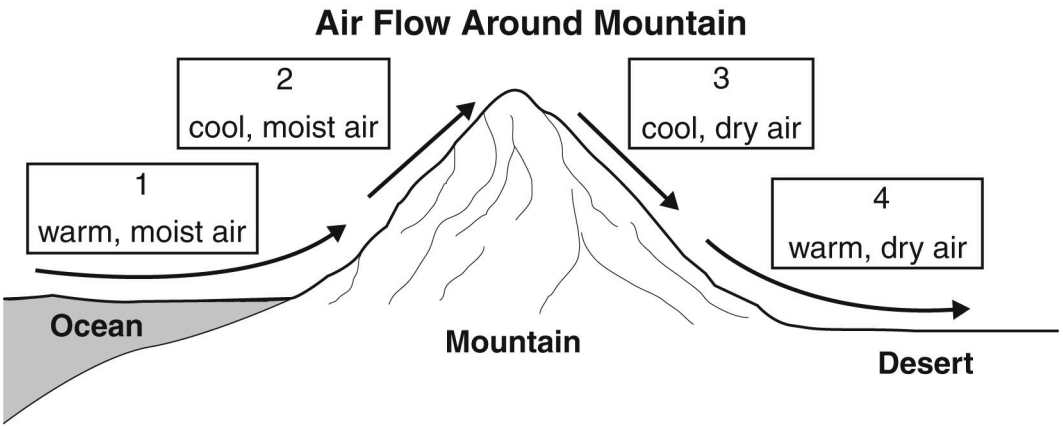
B provides a better environment for native organisms to grow.

C keeps the river at balance with nature.

D threatens the existence of aquatic organisms.

Question #14

Mr. Turner's class is studying the water cycle. Mr. Turner shows the class a diagram of air flow around a mountain.



Based on the diagram, at which point are clouds *most* likely to form?

A 1

B 2

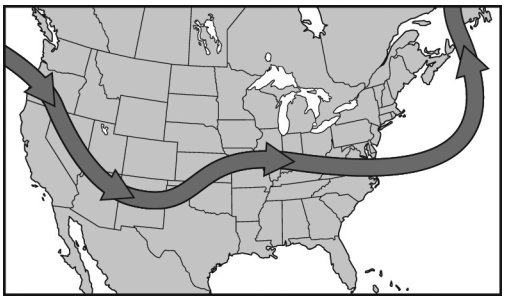
C 3

D 4

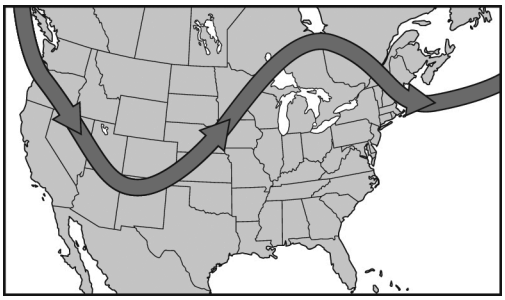
Question #15

Which polar jet stream path would bring unusually warm weather to the Great Lakes region in winter?

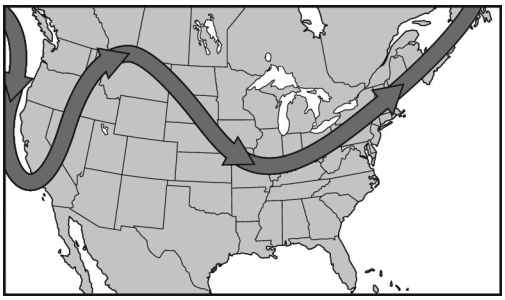
A



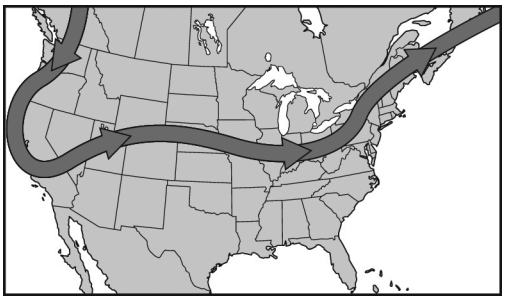
B



C

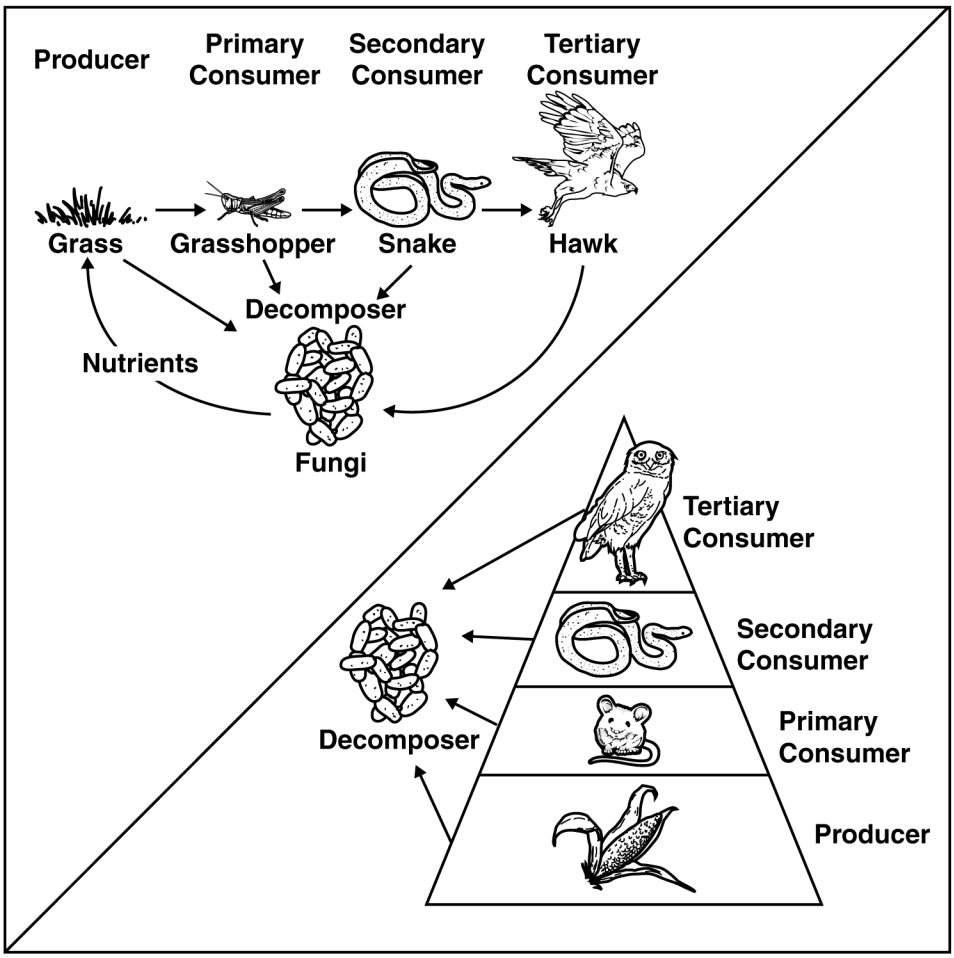


D



Question #16

The diagrams show different ways to represent energy flow.



Although very different, both diagrams are acceptable because

A different energy diagrams require different organization.

B both diagrams show the information accurately.

C the numbers of animals in the diagrams are different.

D the energy levels change between diagrams.

Question #17

In a food chain, energy is passed from one organism to another.

Wheat → Mouse → Snake → Owl

Which organism in this food chain has the *most* available energy?

A wheat

B mouse

C snake

D owl

Question #18

Which material is the *best* heat insulator?

A glass

B metal

C water

D wood

Question #19

A farmer has a steeply sloping pasture that is eroding. Which is the *best* option to stop the immediate erosion of the topsoil?

A Increase the amount of vegetation on the sloping pasture.

B Plant trees and shrubs at the bottom of the sloping pasture.

C Increase the soil thickness by adding five inches of sandy soil.

D Increase the organic content of the topsoil by adding earthworms.

Question #20

After fields of crops are harvested, parts of the plants remain on the ground. For many years, farmers have mixed these plant remains into the soil. Which *most* likely results from this practice?

A More minerals are lost from the field.

B More nutrients in the soil are dissolved.

C The organic matter in the soil increases.

D The number of organisms in the soil decreases.

Question #21

After many decades of being absent from Yellowstone National Park, gray wolves are being reintroduced. As the wolf populations have increased, elk and bison populations are beginning to decrease. Which is another consequence of the reintroduction of wolves that is likely to occur in Yellowstone Park?

A Both elk and bison will become extinct.

B Populations of scavengers will decrease.

C Bears and coyotes will become more numerous.

D Populations of plants consumed by elk and bison will increase.

Question #22

A climax fire ecosystem requires periodic forest fires to maintain stability. Which of these would be the *most* likely result of preventing natural fires from occurring in this ecosystem?

A Pine species would reproduce more rapidly.

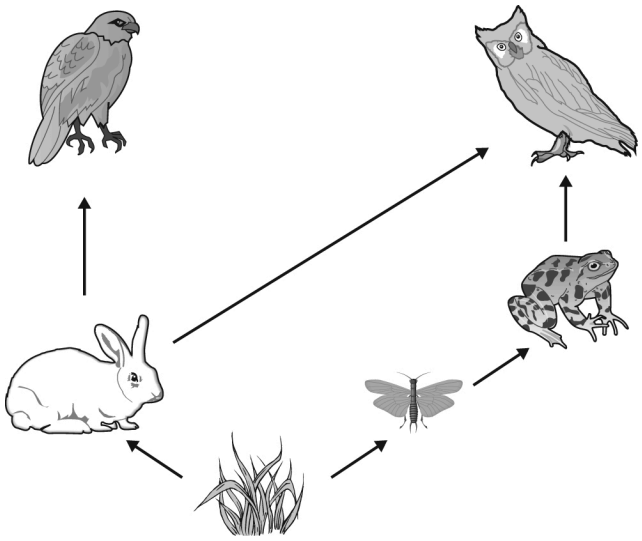
B Broadleaf species would replace pine species.

C Burning areas would be more easily contained.

D Trees would spread into previously unforested areas.

Question #23

A food web is illustrated.



Which organisms in this food web compete for food?

A rabbit and frog

B frog and insect

C insect and owl

D owl and hawk

Question #24

Scientists studying two adjacent ecosystems observe different varieties of organisms in the two areas. All of the following factors would contribute to the populations of organisms being different in these two habitats except-

A climate

B soil type

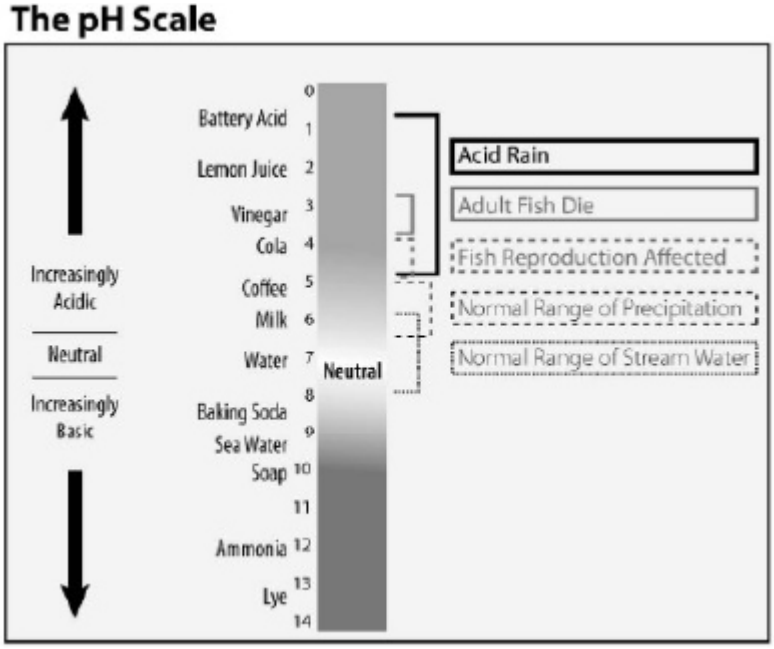
C water resources

D wind

Acid Rain

The following text is taken from an educational guide published by the United States Environmental Protection Agency (EPA) called "Learning About Acid Rain."

1 **Acidic and basic are words that describe opposite extremes of chemicals, just as hot and cold describe opposite extremes in temperature. Mixing acids and bases can cancel out their extreme effects, much like mixing hot and cold water can even out the water temperature. A substance that is neither acidic nor basic is neutral. The pH scale measures the acidic or basic level of a substance. The pH scale ranges from 0 to 14. A pH of 7 is neutral, while a pH less than 7 is acidic and a pH greater than 7 is basic.**

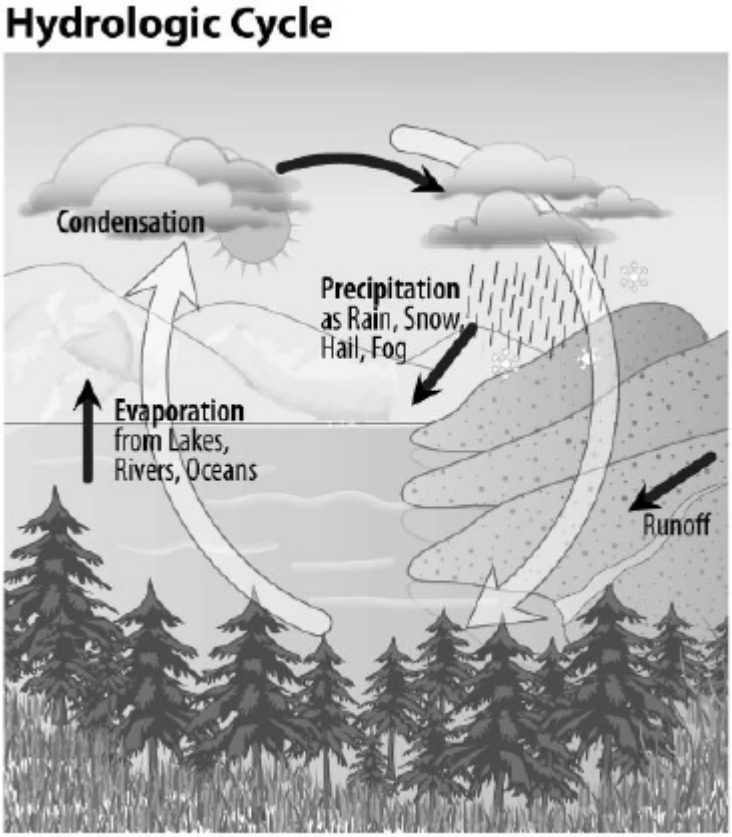


2 **Pure water is neutral. When chemicals are mixed with water, however, the mixture can become either acidic or basic. Examples of acidic substances are vinegar and lemon juice. Laundry detergents and ammonia are examples of basic substances. Chemicals that are very basic or very acidic usually change or alter whatever they meet. Substances that have this property are called reactive. You should be careful with these kinds of chemicals because they can cause severe burns and are often toxic if swallowed. For example, household drain cleaners often contain lye, a very basic chemical that is reactive and can burn you.**

3 **Acid rain is rain that is more acidic than it should be. Acid rain is a complicated problem affecting soil and water chemistry, as well as the life cycles of plants and animals on land and in the water. In addition, weather conditions contribute to air pollution and cause acid rain to spread vast distances.**

4 **Scientists have discovered that air pollution from the burning of fossil fuels is the major cause of acid rain. Power plants and factories burn coal, oil, and natural gas to produce the electricity we need to do all kinds of things, like light our homes. Cars, trucks, and airplanes also run on gasoline, a fossil fuel. When we burn things, they do not disappear. For example, when you burn a log in a campfire, ash is left. But what happened to the rest of the log? Water from the log becomes vapor and enters the air. Burning wood also releases chemicals and particles into the air. The same things happens when we burn fossil fuels. Burning fossil**

fuels sends smoke and fumes into the atmosphere, or the air above the Earth. In the air, these pollutants combine with moisture to form acid rain. The main chemicals in air pollution that create acid rain are sulfur dioxide (SO_2) and nitrogen oxides (NO_X). Acid rain usually forms high in the clouds, where SO_2 and NO_X react with water and oxygen. This forms sulfuric acid in the atmosphere. Sunlight increases the speed of these reactions, and therefore the amount of acid in the atmosphere. Rainwater, snow, fog, and other forms of precipitation then mix with the sulfuric and nitric acids in the air and fall to Earth as acid rain.



5 **Water moves through the air, streams, lakes, oceans, and every living plant and animal in the hydrologic cycle, shown in the image above. In that cycle, water evaporates from the land or sea, and becomes a gas in the atmosphere. Water in the atmosphere then condenses, or becomes liquid again, and forms clouds. Clouds release water back to Earth as rain, sleet, hail, snow, or fog. When water droplets form and fall to Earth, they pick up particles like dust and chemicals that float in the air. Even clean, unpolluted air contains particles such as dust or pollen. Clean air also contains naturally occurring gases such as carbon dioxide (CO_2). The interaction between the water droplets and the CO_2 in the atmosphere gives rain a pH of 5.6, making even clean rain slightly acidic. However, when rain contains pollutants, especially SO_2 and NO_X, rainwater can become very acidic.**

Question #25

Jerry has read the text and makes the following concluding statement.

> **If we were to stop burning fossil fuels and producing pollutants like sulfur dioxide and nitrogen oxides, then rainwater and other types of precipitation would have a neutral pH and would be free of dust and other particles.**

Is Jerry's statement supported by the information given in the text? Give two pieces of evidence from the text that either support his statement or argue against his statement. Explain how the evidence relates to the conclusion he makes.

Question #26

How are nonrenewable energy resources different from renewable energy resources?

A Nonrenewable energy resources are used by people to generate heat.

B Nonrenewable energy resources have a financial cost associated with them.

C Nonrenewable energy resources are not natural resources.

D Nonrenewable energy resources are used at a faster rate than they can be replaced.

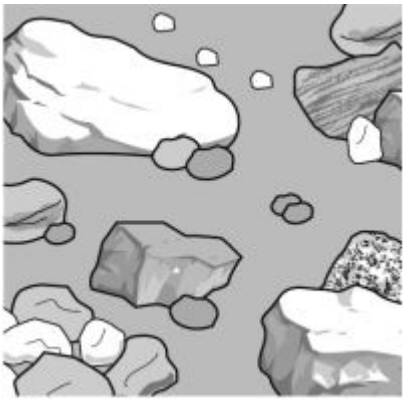
Question #27

Which of the following shows a resource that can be used as a source of *biomass*?

A

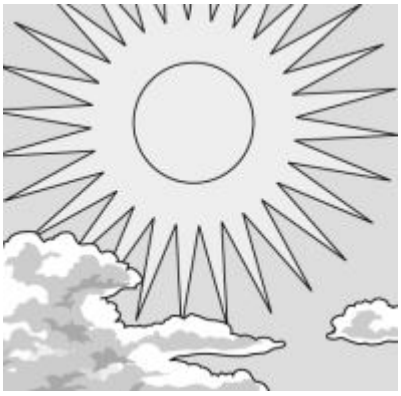
Corn

B



Rocks

C



Sun

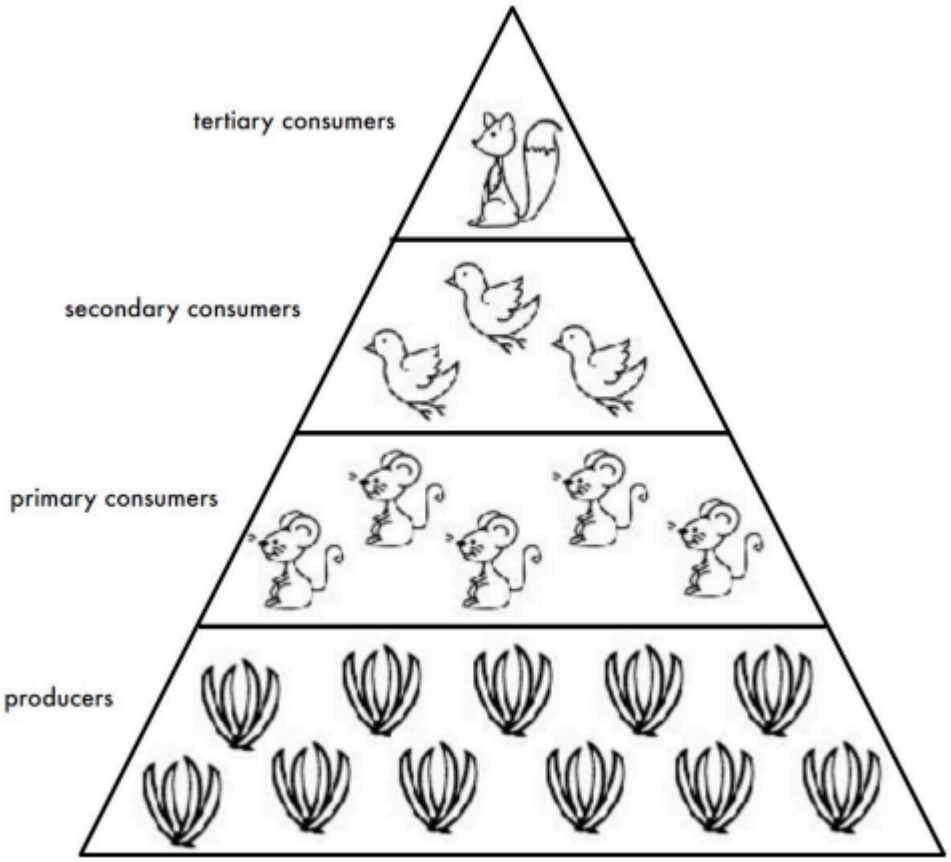
D

Oil

Question #28

Energy Pyramids

The image below is an energy pyramid. Energy pyramids reinforce the idea that both the amount of energy available and the number of organisms decrease as you move up the food chain. Notice that there are lots of plants in the bottom level of the energy pyramid, but only one tertiary consumer at the top of the pyramid.



The energy in the pyramid starts at the bottom with producers. Producers use light energy from the sun to make food through photosynthesis. Since the plants get their energy from the sun, the original energy source for all of the organisms in the pyramid is the sun.

As you move up the pyramid, only ten percent of the energy gets passed on to the next level. For example, if the producers received 100 units of energy, the primary consumers would only receive 10 percent of the same units of energy. Then, the secondary consumers would only receive 1 percent of the energy from the 10 percent of the units of energy that the primary consumers received.

There is a direct relationship between the energy available to organisms at each level of a pyramid and population size. Secondary and tertiary consumers have smaller populations because there is less energy available to them.

According to the passage, which level of the energy pyramid has the *least* amount of energy?

A producer

B primary consumers

C secondary consumers

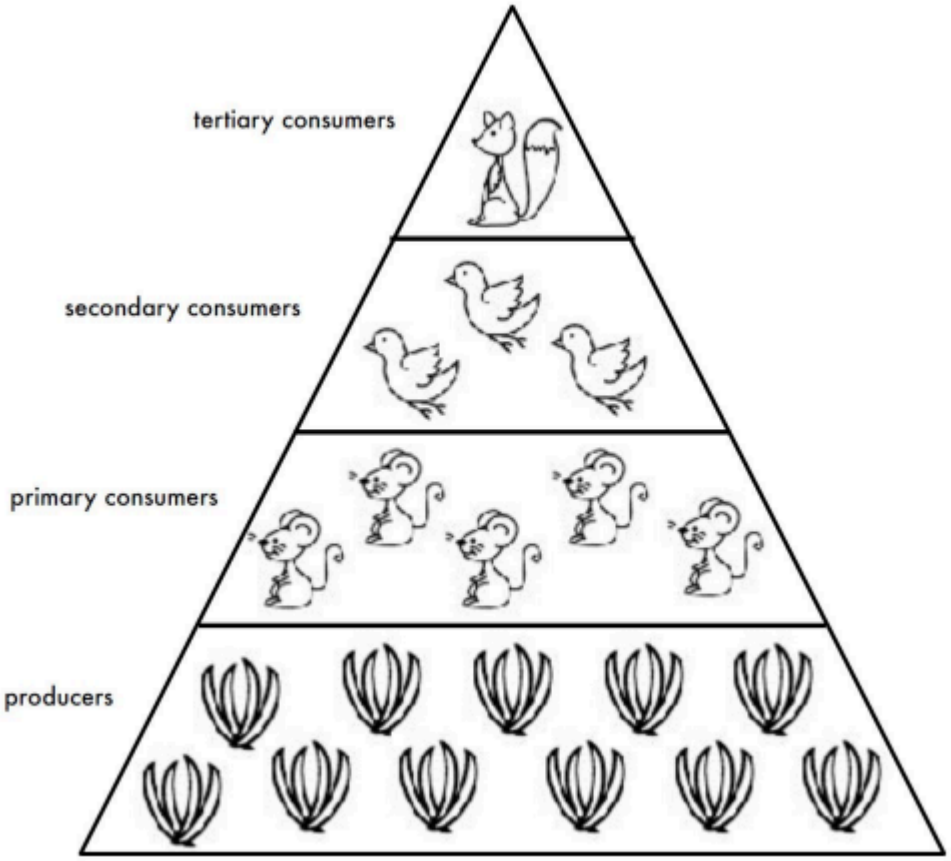
D tertiary consumers

Question #29

USE THE PASSAGE AND THE IMAGE TO ANSWER THE QUESTION BELOW.

Energy Pyramids

The image below is an energy pyramid. Energy pyramids reinforce the idea that both the amount of energy available and the number of organisms decrease as you move up the food chain. Notice that there are lots of plants in the bottom level of the energy pyramid, but only one tertiary consumer at the top of the pyramid.



The energy in the pyramid starts at the bottom with producers. Producers use light energy from the sun to make food through photosynthesis. Since the plants get their energy from the sun, the original energy source for all of the organisms in the pyramid is the sun.

As you move up the pyramid, only ten percent of the energy gets passed on to the next level. For example, if the producers received 100 units of energy, the primary consumers would only receive 10 percent of the same units of energy. Then, the secondary consumers would only receive 1 percent of the energy from the 10 percent of the units of energy that the primary consumers received.

There is a direct relationship between the energy available to organisms at each level of a pyramid and population size. Secondary and tertiary consumers have smaller populations because there is less energy available to them.

According to the passage, what is the *original source* of energy for the tertiary consumer in the energy pyramid?

A plants

B sun

C secondary consumers

D tertiary consumers

Question #30

USE THE PASSAGE AND THE IMAGE TO ANSWER THE QUESTION BELOW.

Energy Pyramids

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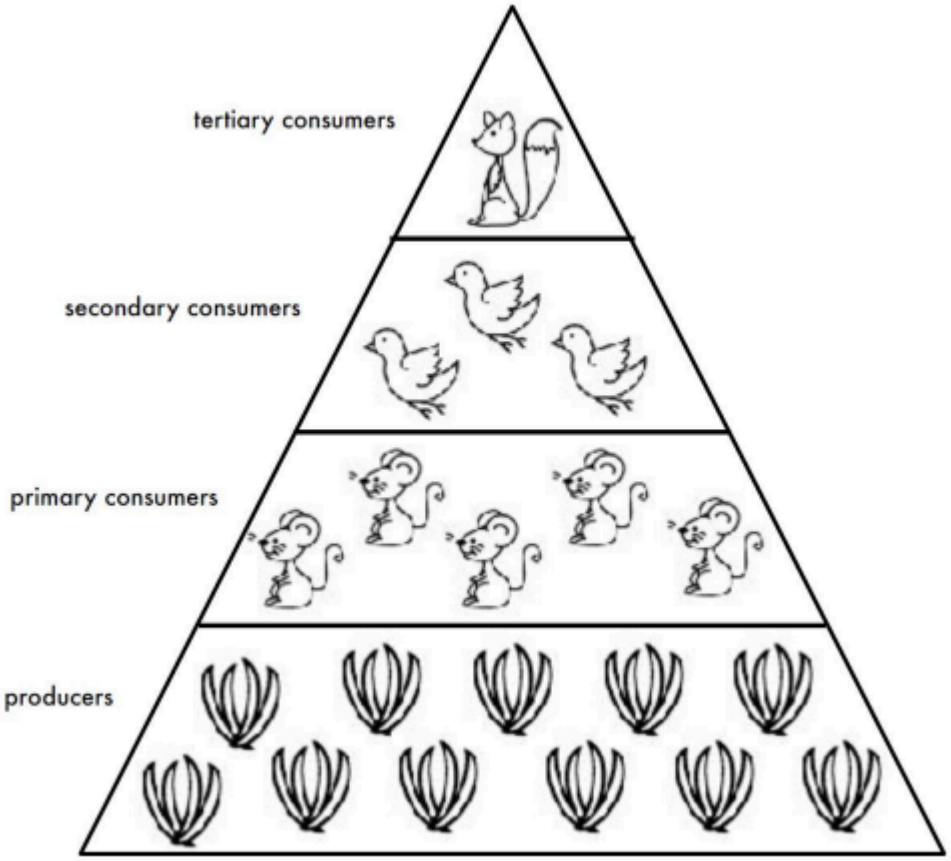

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There is a direct relationship between the energy available to organisms at each level of a pyramid and population size. Secondary and tertiary consumers have smaller populations because there is less energy available to them.

According to the passage, which level of the energy pyramid will have the largest population size?

A secondary consumers

B tertiary consumers

C producers

D primary consumers