Student Name: _____

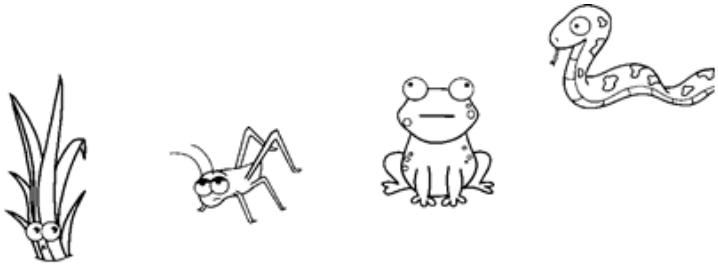
7th Grade Science- Week 3

Complete the following assignments for week 3.

Week	Topic/TEKS	Agenda
3	**Flow of Energy: Food Chains, Webs and Energy Pyramids** 7.5(B) diagram the flow of energy through living systems, including food chains, food webs, and energy pyramids	**1. Video: Food Webs and Energy Pyramids: Bedrocks of Biodiversity** • Watch this video for an introduction to food chains, food webs and energy pyramids. • While you watch, complete the video recap page. • https://youtu.be/-oVavgmveyY • **2. Reading: Energy Flow Through Living Systems** • Read the article. While you read, complete the Linking Literacy: Food Web Organization **3. Practice: CLOZE-ing in on Science** • Use the word bank to complete the paragraph. **4. Math Connection: Energy Flow Through Living Systems** • Analyze the data and complete the questions. **5. Reading in Science: Let's Farm Some Shrimp** • Read and annotate the text and answer the questions. **6. Claim-Evidence-Reasoning** • Read the scenario and complete the CER. **7. Assessment: Energy Flow through Loving Systems** • Complete the assessment.

Amoeba Sisters Video Recap: *Food Chains, Food Webs, and an Introduction to Biodiversity*

1. For the **food chain** on the right, please draw in **three arrows** to represent the correct direction of energy flow. Then use this food chain to answer the below questions.



2. For the **grass**, please circle any of the below alphabetized words in this box that correctly describe this organism.
Note: You will have more than one word circled.

Autotroph
Producer
Decomposer
Secondary Consumer
Heterotroph
Tertiary Consumer
Primary Consumer

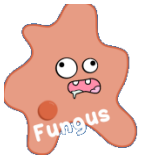
3. For the **frog**, please circle any of the below alphabetized words in this box that correctly describe this organism.
Note: You will have more than one word circled.

Autotroph
Producer
Decomposer
Secondary Consumer
Heterotroph
Tertiary Consumer
Primary Consumer

4. Please arrange the organisms from the food chain into an **energy pyramid**. After drawing your energy pyramid below with the labeled organisms inside, please label it with the following words: **1st trophic level, 2nd trophic level, 3rd trophic level,** and **4th trophic level**.

5. If the grass in this example had 25,000 Kcal of energy, *approximately* how much would you expect of that energy to be stored in trophic level 4? _____**Kcal**

6. **Fungus** is an organism not drawn in the above food chain although it has a very important role. Describe an important role of organisms such as **fungi** and **bacteria**:



_____

_____

_____

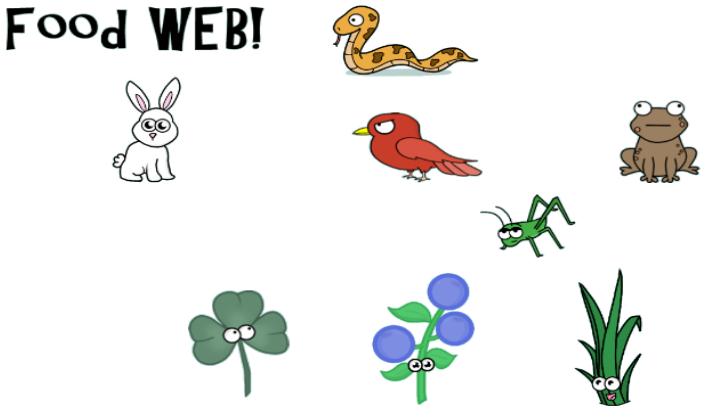
_____

_____

7. Circle any applicable words below that could correctly identify the organism above:

Autotroph
Decomposer
Heterotroph
Producer

8. For the **food web** below, please draw in **arrows** to represent the correct direction of energy flow.



Please use the above food web to determine whether there is an *increase*, *decrease*, or *no change* for each organism type in the chart below based on the given scenario. When filling in the empty boxes, please explain why you determined an increase, decrease, or no change. Two boxes have been filled in for you!

Scenario	Frogs	Grasshoppers	Snakes	Producers
There are types of pathogenic fungi that can attack living amphibians (such as frogs). One of these types of fungi is known as the Chytrid fungus. For each of the following organisms in the table, describe how each organism population might be affected by a Chytrid fungus infestation.	*Decreasing due to infestation of Chytrid fungus, which is harming frog population.*	9.	10.	11.
Grasshoppers can be extreme pests for farmers as they can damage crops. For each of the following organisms in the table, describe how each organism population might be affected by a significant grasshopper population increase such as a visiting locust swarm.	12.	*Increasing due to visiting locust swarm.*	13.	14.

15. Which of the following contributes more to **ecosystem sustainability**: the food web on this page or the food chain on the other page? Explain your answer in terms of **biodiversity**.

Energy Flow Through Living Systems

Reflect

Enter the word “domino” as a search term on the Internet; you can find some amazing domino runs. You can make your own by setting up a series of dominoes in a line. When you push the first domino in line, it falls into the next domino, which falls into the next one, and so on down the line. One push starts a chain reaction that results in the whole trail of dominos falling.

One push, and a trail of dominos falls.

How is a domino trail helpful in describing the movement of energy through living systems?

Energy flows through living systems.
When you push on the domino at the start of a trail, you can see the energy from your push being transmitted from one domino to the next. Your push represents the energy that started the run. This energy moves along the line as each domino topples into the next.

Energy also moves from a starting point through living systems in a one-way direction. This movement is described as a *flow*. The Sun is the major starting point for most of the living things on Earth. A small percentage of organisms uses sulfur compounds from volcanic sea vents deep in the ocean as their source of energy. Instead of using sunlight in photosynthesis, these organisms use chemicals to aid in *chemosynthesis*. They make their own food, just like in photosynthesis.

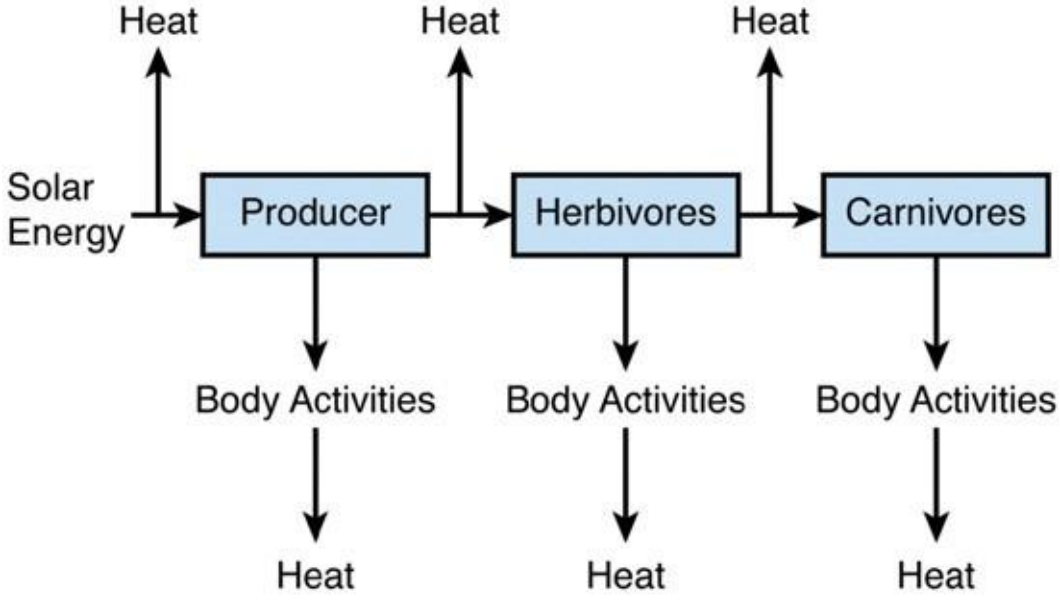
Let’s focus on the major pathway that energy takes on Earth. It begins with light energy from the Sun. Green plants convert solar energy into chemical energy using photosynthesis. Chemical energy refers to the bonds between atoms in molecules like glucose ($C_6H_{12}O_6$). Photosynthetic organisms are known as *producers* because of their role in this type of energy conversion. Producers use energy from the Sun to make their own food. This food is simply a source of energy that organisms can store for later use.

During photosynthesis, green plants use energy from the Sun to convert carbon dioxide and water into sugar molecules.

Each organism on Earth must take in energy from its environment to stay alive. The cells of all living things need constant inputs of energy so they can carry out the metabolic functions necessary to remain alive, grow, and reproduce. Producers provide a source of chemical energy for organisms that eat them. The organisms that use plants as a source of food are known as *herbivores*. Organisms that eat—or *prey on*—herbivores are called *carnivores*.

Reflect

The diagram below shows the overall flow of energy through living things. At each step, the transfer of energy involves a loss of energy in the form of heat and body activities. For example, when you exercise you get hot. The heat you feel in your body results from the energy transfers that happen when you move. When you sweat, your body expends energy to cool itself down.



Look Out!

Energy may be lost in living systems as it flows through them. However, this energy is not lost completely from the universe. All energy within the universe can be accounted for at any time because it remains constant. Energy is never created and never destroyed. Energy is only converted from one form into another. As energy moves between living things, some energy—in the form of heat—is lost. This thermal energy escapes into the environment and is no longer useful to organisms, but it is not destroyed.

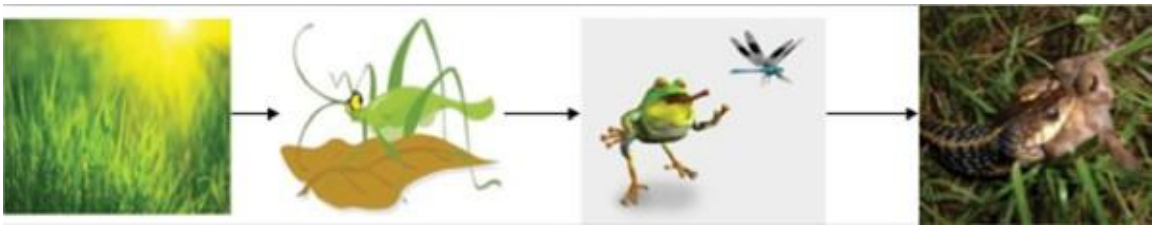
Reflect

A food chain shows how energy flows from one organism to another.
In general, energy flows from the Sun to producers and then to consumers. The path is linear as the energy present in one step is transferred to the next. You can find specific examples of this pathway in an ecosystem.

For example, suppose you observed a grassland ecosystem. There, you would see grass and scattered trees growing in a field. The grass and trees are producers that use sunlight to carry out photosynthesis. Grasshoppers are herbivores that live in grassland ecosystems. They get energy by eating grass and leaves.

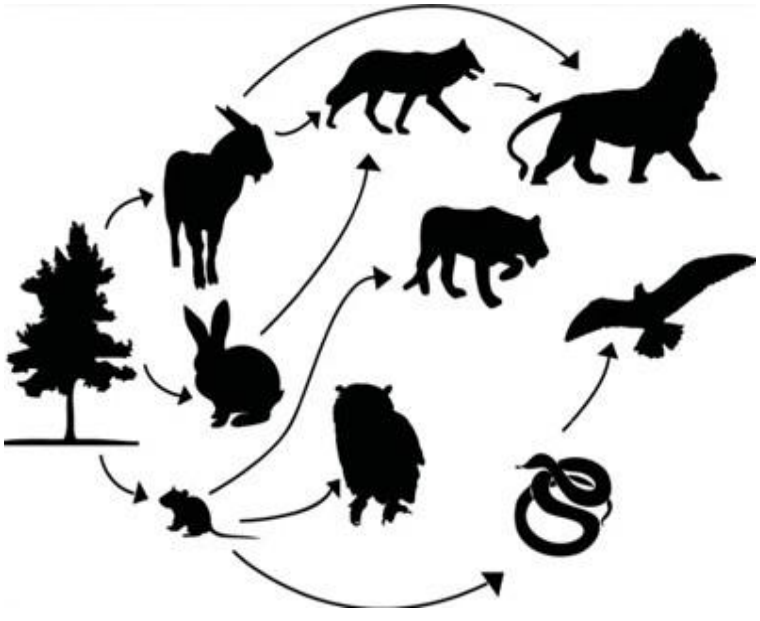
Reflect

Another transfer of energy occurs when a frog preys on a grasshopper. Later, another energy transfer occurs when a snake captures and eats the frog. We can represent the path of energy flow in this scenario using the following flowchart:



A food chain is a specific path of energy transfer within an ecosystem. In this food chain, energy flows from the Sun to grass to a grasshopper to a frog to a snake. What organism could be the next step in this food chain?

A food web represents the interconnected food chains within an ecosystem.
There are many food chains in any given ecosystem. Any one organism often plays a role in several food chains. All of the food chains, with their many interconnections in an ecosystem, make up a food web. A portion of the food web for the grassland ecosystem discussed above could be diagrammed as follows:



The arrows in a food web indicate the direction of energy transfer. Within one food web are many food chains. For example, you can see in the food web shown above that the mouse is part of three food chains. It eats plants and is eaten by cougars, owls, and snakes.

Reflect

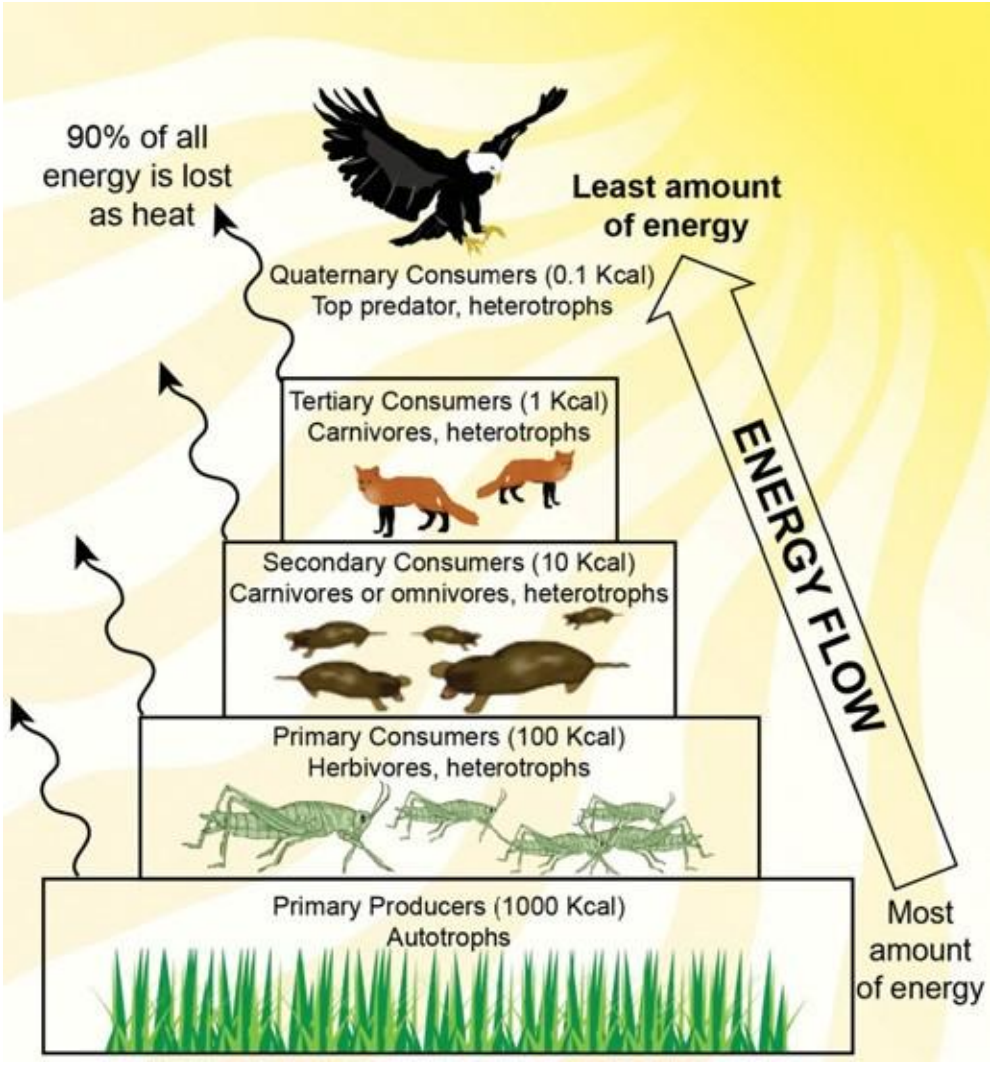
An energy pyramid shows the distribution of energy within an ecosystem.
So far we have looked at ecosystems with an emphasis on the direction of energy flow. We have looked at ecosystems while emphasizing the direction the energy flow, but what do we know about the amount of energy within an ecosystem? How is the amount of energy distributed?

In order to answer these questions, we need to classify and define specific energy levels within an ecosystem. These levels are called *trophic levels*. Producers represent the first trophic level. Producers are sometimes also referred to as *primary producers*. Herbivores, or *primary consumers*, represent the second trophic level. Primary consumers feed on producers. Carnivores, or *secondary consumers*, represent the third trophic level. Secondary consumers feed on primary consumers. *Tertiary consumers* and *quaternary consumers* make up the last two trophic levels. (*Tertiary* means “third level,” and *quaternary* means “fourth level.”) Tertiary consumers feed on secondary consumers. Likewise, quaternary consumers feed on tertiary consumers. (Tertiary and quaternary consumers are also carnivores.)

Earlier, we briefly talked about how the amount of energy changes as it is transferred from one organism to the next. Recall that some energy is given off to the environment as heat during transfers. Because some energy is lost as heat during and between energy transfers, the amount of energy retained in living organisms decreases as you move up through each trophic level. In other words, less energy is available for consumers at each level of the energy pyramid. Specifically, only about 10% of the total energy at one trophic level is passed on to the next higher trophic level. For example, if 1,000 kilocalories of energy are present at the primary producer level, one-tenth of this energy (about 100 kilocalories) is passed to the primary consumers in the next level. Even less energy is available for secondary, tertiary, and quaternary consumers.

The diagram on the next page uses box sizes to represent the amount of energy present at each trophic level. The largest box at the bottom contains the primary producers. The next largest box contains the primary consumers. Secondary consumers are next, followed by tertiary consumers. At the top is the smallest box, representing the quaternary consumers. Altogether the stacked boxes make up a pyramid called an *energy pyramid*. An energy pyramid represents both the distribution of energy and the direction of energy flow within an ecosystem.

Reflect



This energy pyramid contains several terms you may not recognize. Primary producers are also called *autotrophs*. The prefix *auto-* means "self." (An *autobiography* is a book you write about yourself.) The root *troph* comes from a Greek word meaning "nourishment."
So, an *autotroph* is something that nourishes, or feeds itself, by producing its own food.
All consumers are *heterotrophs*. The prefix *hetero-* means "other."
So, a *heterotroph* is something that feeds itself by eating other things.

Look Out!

Decomposers, such as mushrooms and bacteria, break down the bodies of dead organisms. This recycles matter for future organisms to use. Decomposers do not occupy a specific trophic level of an energy pyramid. Instead, they extract energy from dead organisms throughout the pyramid.

What Do You Think?

Biomass is the mass of matter in living things. Like the quantity of energy in an ecosystem, the quantity of biomass in an ecosystem can be represented as a pyramid. How do you think the specific trophic levels are organized within the biomass pyramid? Do you think biomass increases or decreases as you go from producers to consumers? To help you answer these questions, try to sketch a biomass pyramid.

Everyday life: Where are humans located in an energy pyramid?
Think about the foods you eat. If you are like most people, you eat a variety of foods. These include fruits and vegetables, which came from producers. You may also eat beef, chicken, and fish, which are consumers. People who eat both meat and plant-based foods are *omnivores*. People who eat only plant-based foods call themselves *vegetarians*, and are classified as *herbivores*.

Omnivores move back and forth between several different trophic levels because of the variety of foods they eat. This makes omnivores primary, secondary, tertiary, and quaternary consumers. People who have vegetarian diets occupy only the lowest consumer trophic level because they eat only producers. Vegetarians are only primary consumers.

Try Now

What do you know?
The following images (A, B, and C) show three different organisms. Place each organism in the correct place in the energy pyramid on the next page. Use an arrow to indicate how energy would flow between these organisms. Use additional arrows to indicate where energy might be removed from living organisms as heat.

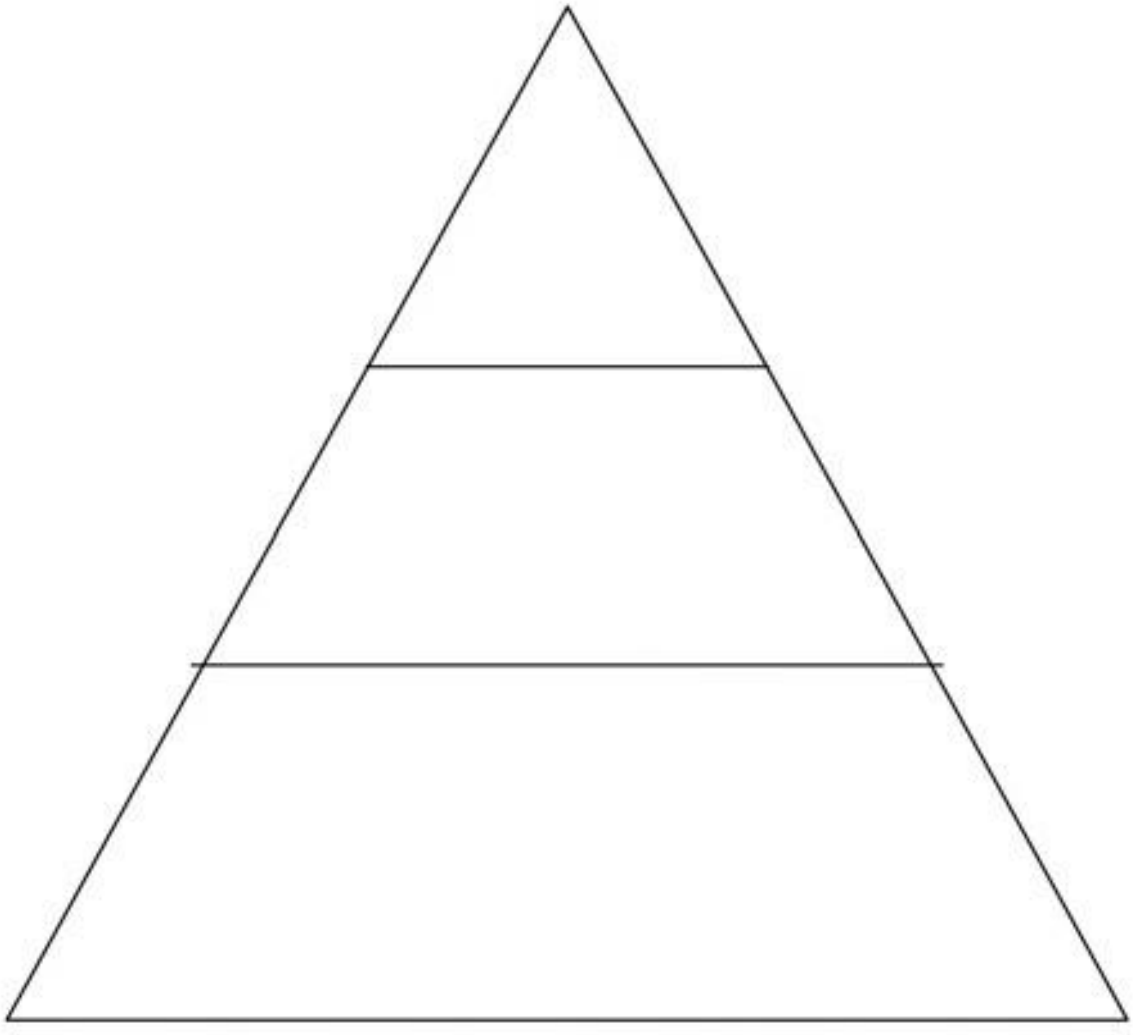
Image A: Deer

Image B: Wolves

Image C: Tree

Try Now

Energy Pyramid



Linking Literacy

Name: _____ Date: _____

Food Web Organization

Fill in the descriptions of each trophic level. At the bottom of the page, note where the energy for the levels come from.

Trophic Level	Features/Description
Decomposers	
Tertiary Consumers	
Secondary Consumers	
Primary Consumers	
Producers	

_____

CLOZE-ing in on Science

Name: _____ Date: _____

INSTRUCTIONS: Use the words in the box below to fill in the blanks based on what you have learned about energy flow through living systems. Words may be used more than once or not used at all.

Word Bank

energy webs producers chains heat primary tertiary consumers decomposers bottom top molecules secondary use eat food

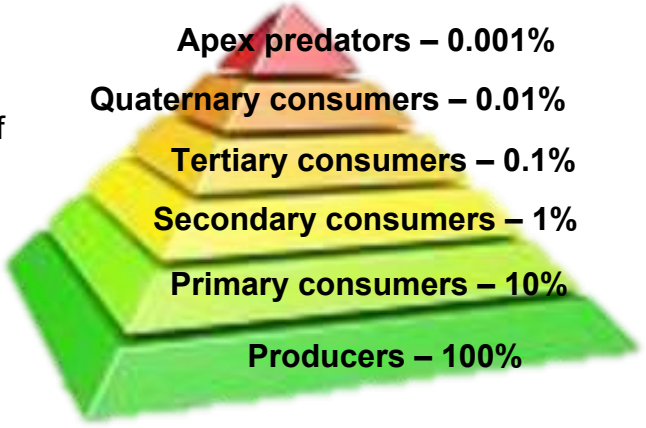
CLOZE 1

The Sun is the ultimate source of _____. _____ transform the energy from the Sun to make food; _____ eat _____ and other _____ to obtain energy. _____ break down plant and animal remains into _____ that producers can _____ for energy. Food _____ demonstrate how energy is transformed as it flows from the Sun to producers to _____ consumers, to _____ consumers, or _____ consumers. An example of a _____ consumer is a carnivore that eats carnivores. Food _____ show the complex relationships of _____ flow through an ecosystem that contains a variety of producers and consumers. _____ pyramids demonstrate how the amount of energy decreases as it flows from the producers at the _____ of the food chain to tertiary consumers at the top of the food chain. As energy flows up the pyramid, some of the energy is transformed into _____.

Math Connections

Name: _____ Date: _____

The food web is a complex system of organisms that depend on other organisms for the energy they need to survive. The number of producers affects each level of consumers in an ecosystem. The energy pyramid to the right shows that approximately 10% of the energy from one level is passed on to the next level.



The International System of Units uses the joule (J) to measure energy and the kilojoule (kJ) to measure food-related energy.

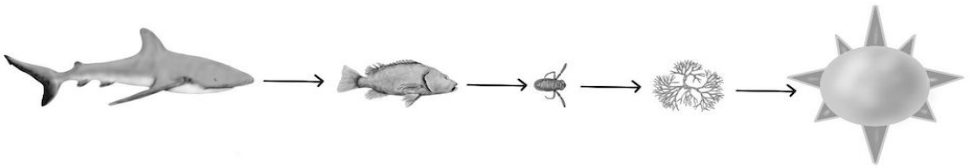
Use this energy pyramid to help you calculate answers to the following questions.

1. A rabbit (primary consumer) is preyed upon and consumed by a fox (secondary consumer). Before being consumed, the rabbit ate leaves and berries containing 20 kJ of energy. How many kilojoules of the energy from the leaves and berries did the fox obtain after eating the rabbit?

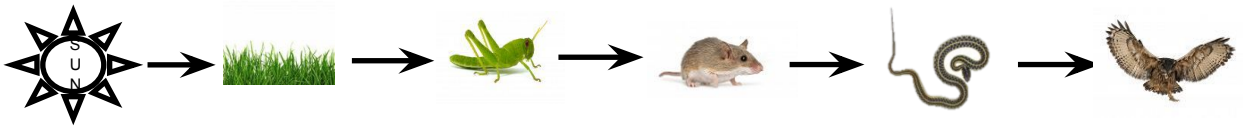
   20kJ x .01 =

2. An owl eats 3 mice. Prior to being eaten, the 3 mice jointly consumed a small block of cheese containing 60 kJ of energy. How many kilojoules of energy from the block of cheese did the owl obtain after consuming the 3 mice?

3. Look at the food chain below. If 45 kJ of energy that the shark consumed from the sea bass was originally from the algae, how many kilojoules of energy did the sea algae consist of?



4. In the food chain below, the owl obtained 0.005 kJ of grass energy after preying upon the snake. How many kilojoules of energy did the grass originally consist of?

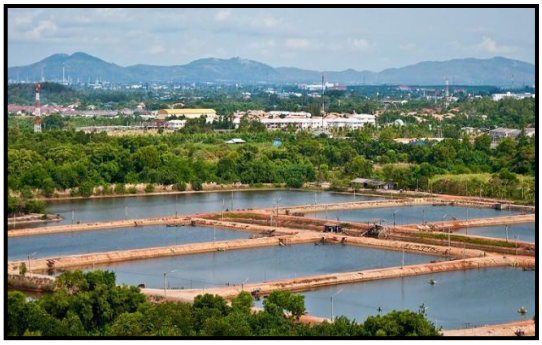


5. Write an expression to describe the amount of energy, x, a tertiary consumer receives from the producer.

Reading Science

Name: _____ Date: _____

Let's Farm Some Shrimp!



1 All living things must eat, and most living things are eaten by bigger things. The way organisms get food is linked in a sort of chain (and sometimes a web). This chain of life is called the food chain.

2 Food chains, food webs, and energy pyramids all explain these eat-or-be-eaten relationships. Meet a farmer named Jacob Adamson. He is an aquaculture technician. That just means he grows shrimp in large outdoor earthen tanks. “Aqua” means “water,” and “culture” means “cultivate” or “grow.” Mr. Adamson must know all about food chains, food webs, and energy pyramids to make his shrimp farm successful.

3 Wild shrimp are close to the bottom of the food chain. Many animals like to eat shrimp. The shrimp must also eat. When they are young, shrimp eat plankton. As they grow bigger, shrimp eat small worms, mollusks, and fish. Mr. Adamson must feed his shrimp the right things to eat so they can grow. He must keep plankton, worms, small mollusks, and small fish for them.

4 Mr. Adamson also must keep predators out of his tanks. In the water, bigger shrimp, fish, and crabs are predators of shrimp. Ocean mammals, land mammals, and many birds also catch and eat shrimp. The pink flamingo gets its pink color from eating shrimp. The flamingo has a beak that can scoop shrimp out of the water. Roseate spoonbills also like to eat shrimp. Small birds wade into the shallows for small young shrimp. Large herons wade into deeper water to catch them. Pelicans scoop shrimp up when shrimp are close to the surface. All of these organisms can get to the outdoor tanks on the farm. Mr. Adamson must know how to protect his shrimp farm. If not, these predators will eat all his profits.

5 While all of these animals like shrimp, most aquaculture shrimp are eaten by people. Mr. Adamson will sometimes take shrimp home to his family. Everybody likes shrimp—from the wild or from a farm. That appetite is what makes a food chain.

Reading Science

1 Where are people in the shrimp food chain?

A close to the very bottom

B about in the middle

C close to the top

D at the very top

2 What is the main point of the reading?

A Shrimp are part of nature's food chain.

B Shrimp have very specialized diets and will not eat a variety of foods.

C Aquaculture is not a profitable business.

D Few birds or other animals eat shrimp.

3 Which of the following statements is true about aquaculture?

A An aquaculturist can throw some young shrimp in a pond, and they will take care of themselves.

B It means "cultivating small acreages of land."

C An aquaculturist must tend to the tanks carefully to make sure predators do not eat the shrimp.

D The tanks are large aquariums built in warehouses.

Reading Science

4 The main point of paragraph 4 is that -

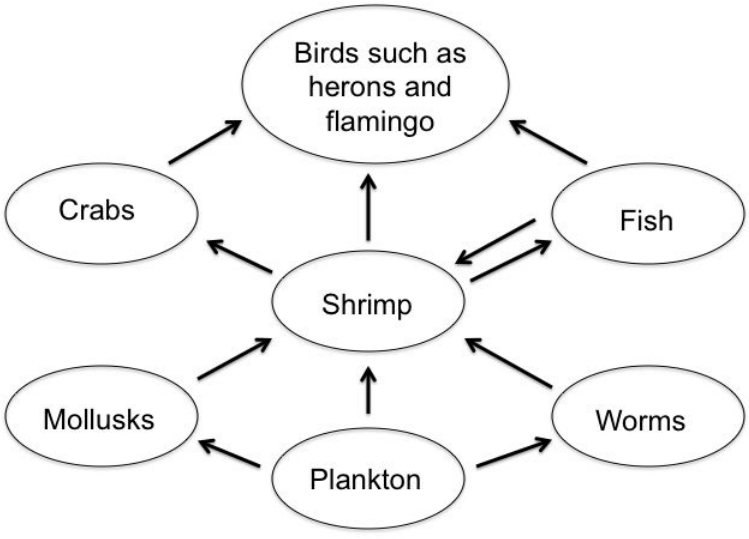
A wild shrimp are close to the bottom of the food chain

B Mr. Adamson needs to keep predators out of his tanks

C Mr. Adamson is an aquaculture technician

D most aquaculture shrimp are eaten by people

5 Examine the diagram of the food web described in this passage. Using arrows, how would you label the direction of energy flow through this web?



A starting at the edges and flowing toward the shrimp

B starting at the shrimp and flowing outward

C starting at the plankton and flowing upward

D starting at the birds and flowing downward

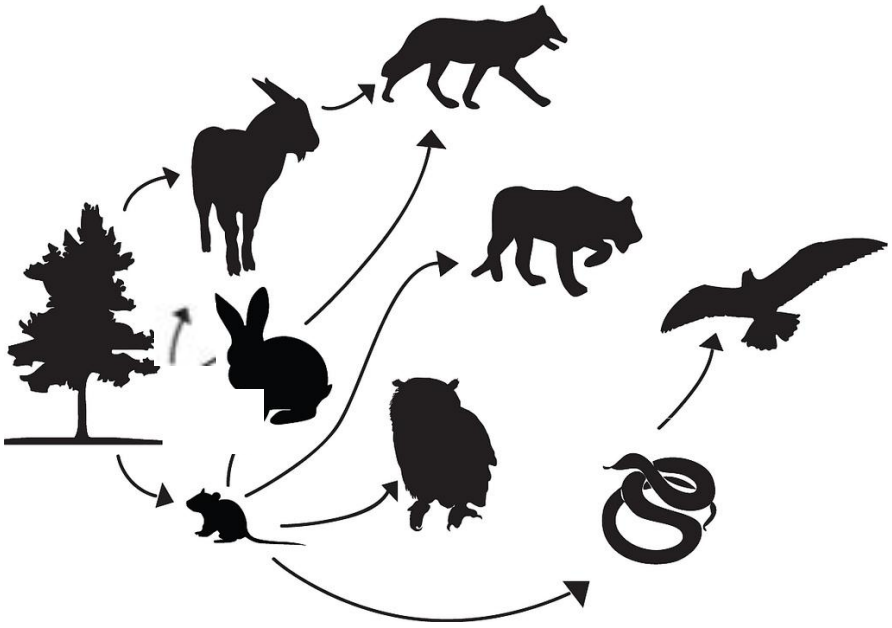
Claim-Evidence-Reasoning

Name: _____ Date: _____

Scenario

All organisms are made of molecules. All molecules are recycled throughout the food webs found in ecosystems. The image provided depicts a food web of a healthy ecosystem. There is a deadly virus that has spread to nearby ecosystems, and it immediately infected all the trees within those ecosystems. Scientists are afraid that this virus could infect the entire tree population within the ecosystem and could possibly lead to their extinction within this ecosystem.

External Data



Prompt:
Write a scientific explanation that describes how the flow of matter and energy in the ecosystem will be affected if the entire tree population is infected by the lethal virus.

Claim:

Evidence:

Reasoning:

Rebuttal:

Claim-Evidence-Reasoning

Energy Flow Through Living Systems CER

Rubric for Writing a Scientific Explanation

Points Awarded	2	1	0
Claim	Claim is complete and accurate.	Claim is incomplete or inaccurate.	Student does not make a claim or does not answer the question.
Evidence	Evidence cites data and patterns within the data and uses labels accurately.	Evidence cites data from the data source but not within the context of the prompt.	There is no evidence, or changes are cited but do not use data from the data source.
Reasoning	Student cites the scientifically accurate reason using correct vocabulary, connects the reason to the claim, and shows accurate understanding of the concept.	Student cites a reason, but it is inaccurate or does not support the claim. Reasoning does not use scientific terminology or uses it inaccurately.	There is no reasoning, or student relies on a restatement of the claim.
Rebuttal	Rebuttal provides reasons for different data or outliers in the data, offers relevant real-world cases, or suggests other uses for the findings.	Rebuttal is not connected to the data, or it is not accurate.	Student does not offer a rebuttal.

Assessment: Energy Flow Through Living Systems

1 Which of the following characteristics is shared by both primary and secondary consumers?

A Uses the Sun's radiant energy to produce food.

B The first step in any food chain diagram.

C Eats only plants to gain needed energy.

D Gains energy by eating other living things.

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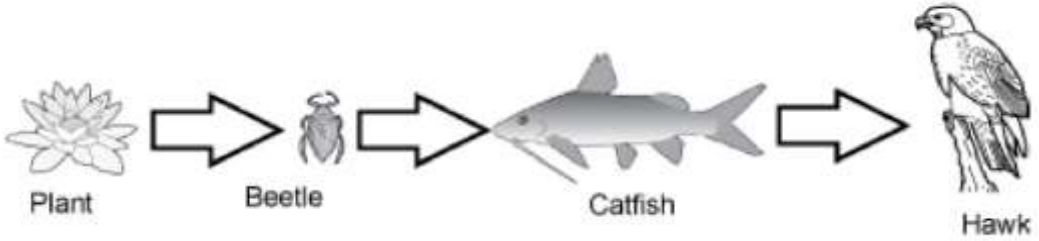
2 A diagram of a pond food chain is provided.



Which of the following could possibly increase the total amount of energy the catfish population receives within its food chain?

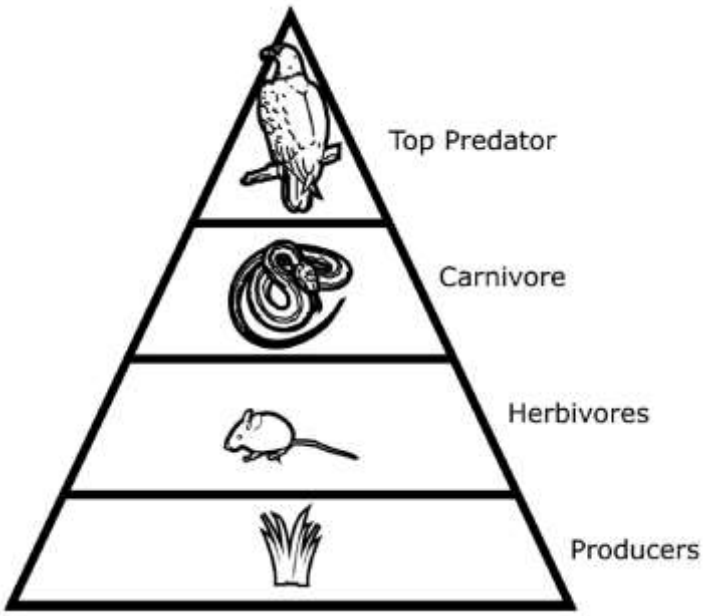
A An increase in the number of beetles.

B An increase in the number of hawks.

C A decrease in the number of plants.

D A decrease in the number of hawks.

An energy pyramid is shown. Use it to answer questions 3 and 4.



3 At which level of the energy pyramid would most of the biomass be found?

A Top Predator

B Carnivore

C Herbivores

D Producers

4 Which portion of the diagram represents the level with the most available energy?

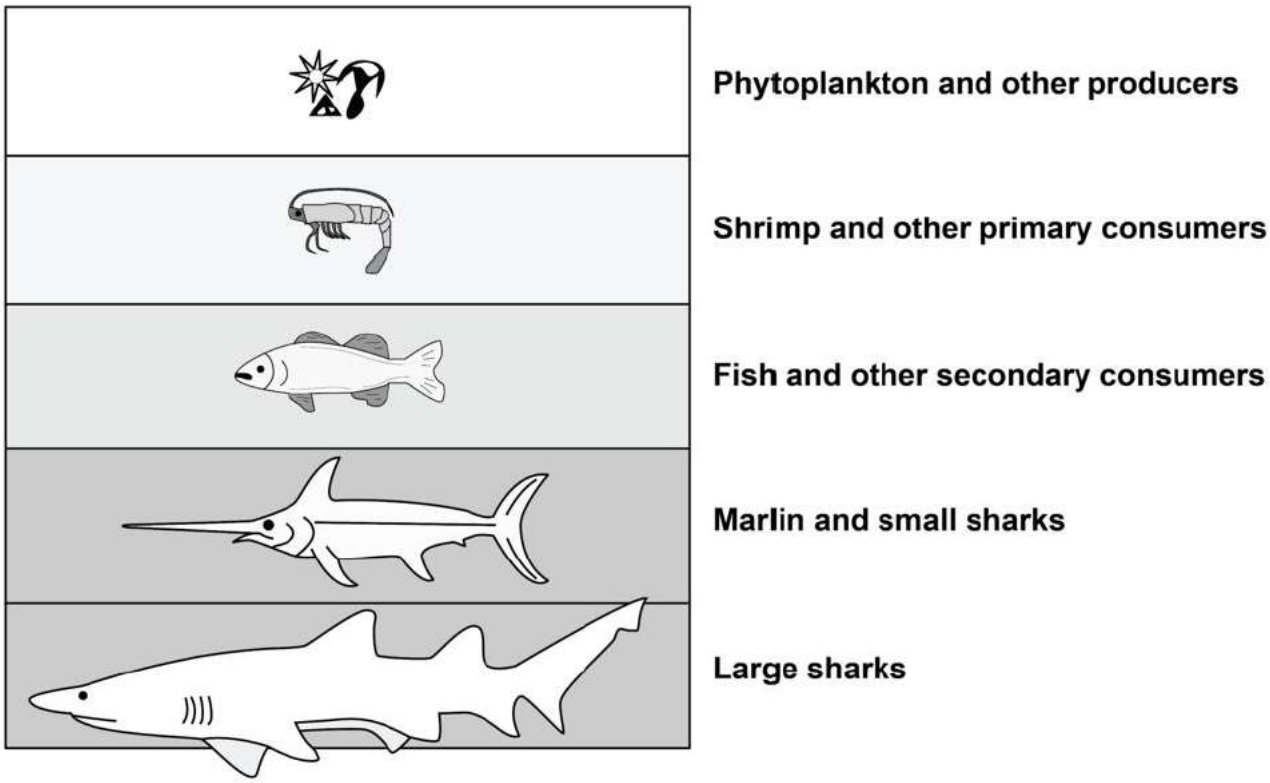
A Producers

B Herbivores

C Carnivores

D Top Predators

5 A diagram of a marine food chain is provided.



Which of the organisms in the food chain transforms energy from the Sun into food?

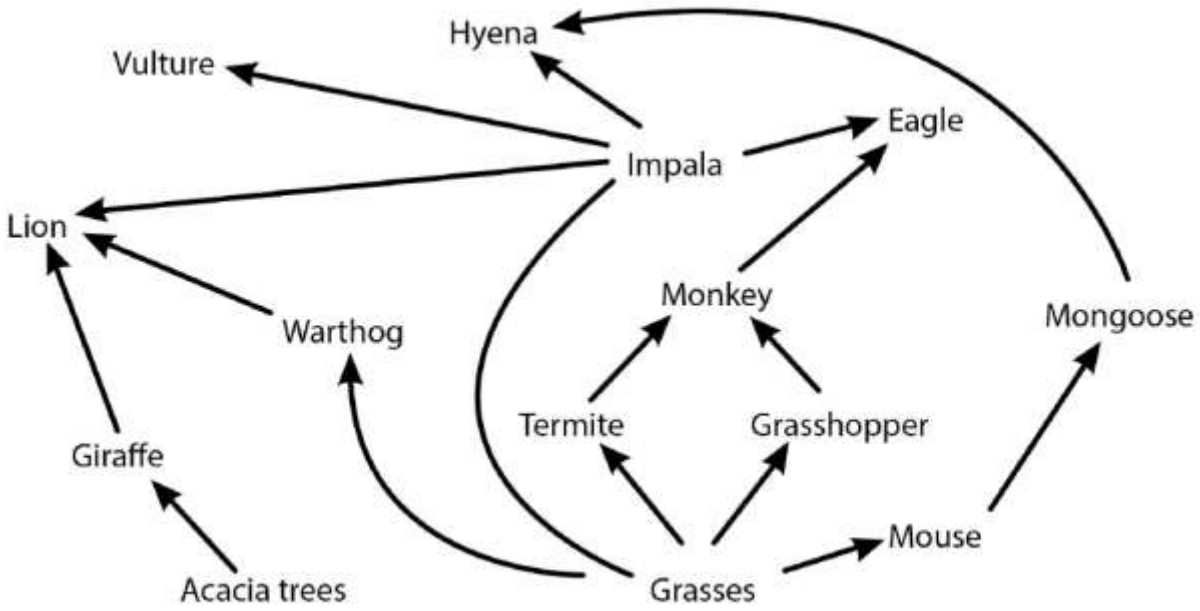
A Large Sharks

B Marlin

C Shrimp

D Phytoplankton

6 A diagram is provided.



Which of the following correctly shows one path that energy would flow through this ecosystem?

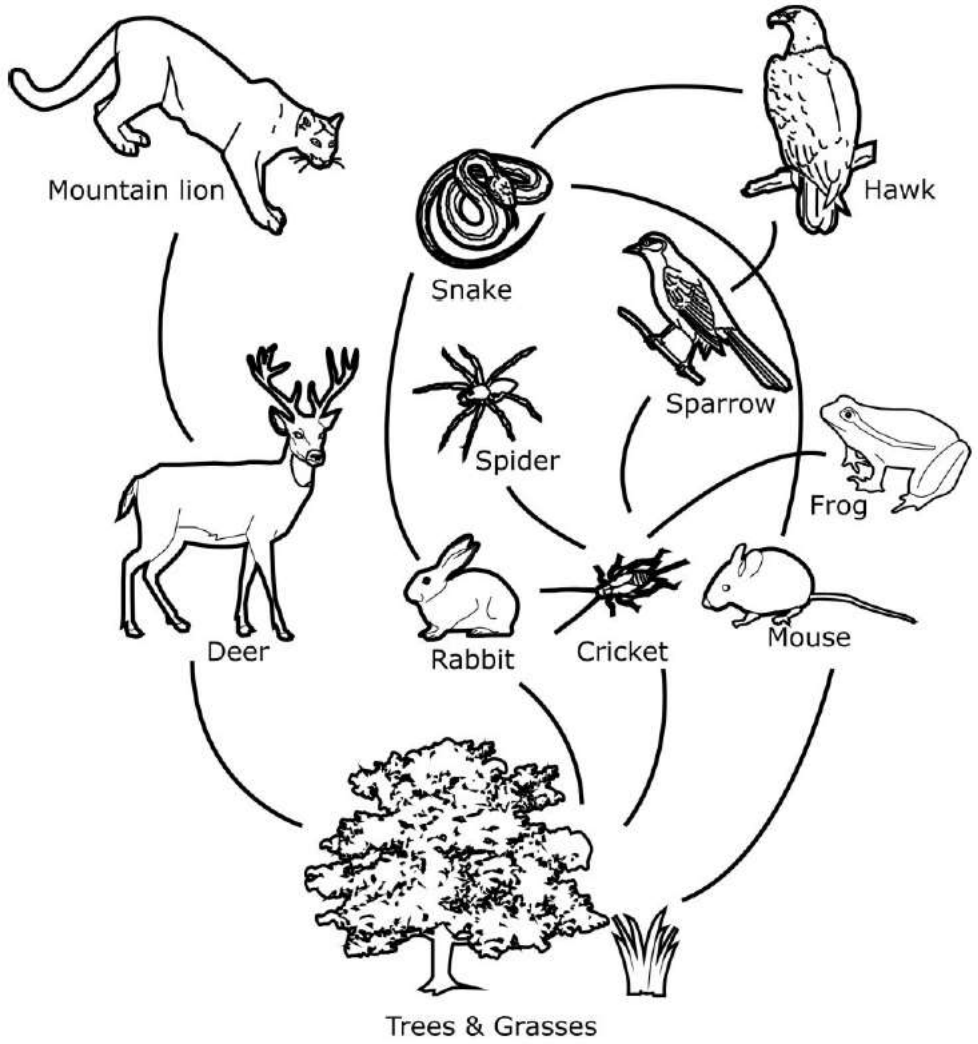
A Grasses → Termite→ Monkey→ Eagle

B Hyena → Mongoose → Mouse → Grasses

C Grasses → Termite→ Grasshopper → Monkey

D Acacia trees → Giraffe → Lion → Vulture

7 A diagram of a prairie food web is provided.



A reduction in deer population will have the effect in the amount of energy this ecosystem is able to provide for which of the following organisms?

A Rabbit

B Mountain lion

C Mouse

D Hawk