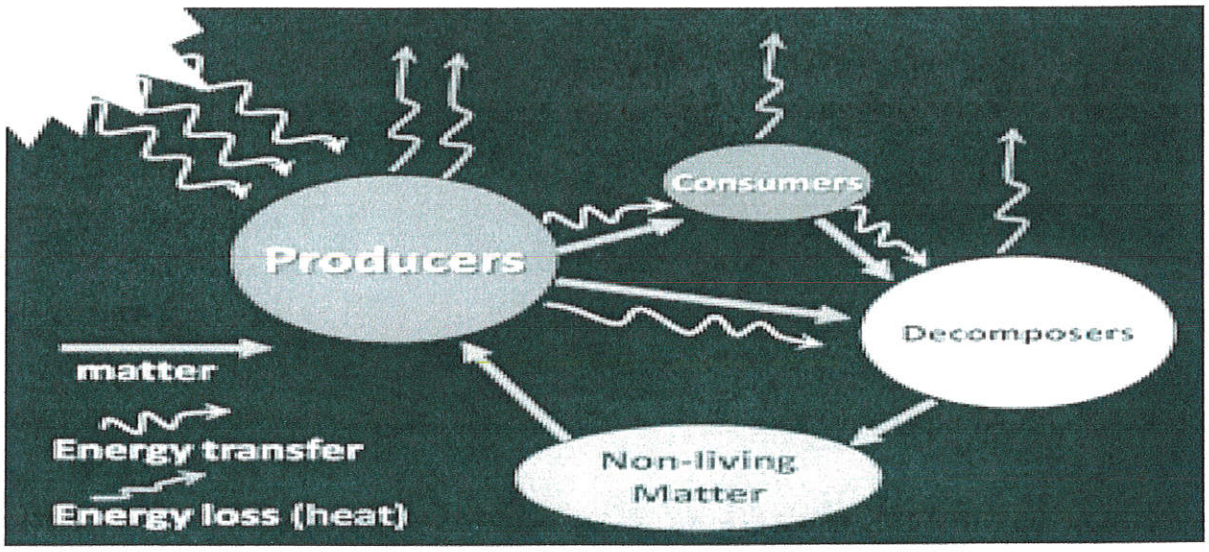
Name: _____

Science Teacher: _____ Period: _____



Matter & Energy in Ecosystems Workbook

Hopewell Middle School

Mrs. Rothenhausler, Mrs. Hinds & Mr. Crellin

Unit 2: Matter and Energy in Ecosystems

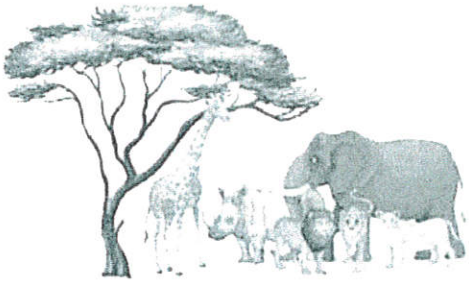
TEKS Analysis

TEKS 7.5A- **recognize** that *radiant energy* from the Sun is transformed into *chemical energy* through the process of photosynthesis.				Essential Questions
In 5th grade you learned about energy flow. Describe how the flow of energy derived from the Sun is used by producers to create their own food.				How is energy from the sun transformed into chemical energy through the process of photosynthesis?
				How does energy flow through living systems?
TEKS 7.5B- **demonstrate** and **explain** the *cycling of matter* within *living systems* such as in the decay of biomass in a compost bin.				**Essential Question**
Describe in your own words what cycling of matter means.			Draw an image representing cycling, using arrows.	How does matter cycle within living systems?
TEKS 7.5C- **diagram** the *flow of energy* through *living systems*, including food chains, food webs, and energy pyramid. (Supporting)				**Essential Question**
Describe how energy flows through producers to consumers and decomposers within a food chain.			Draw an example of a food chain	How does the flow of energy contrast to the cycling of matter in living systems?
TEKS 7.6A- **identify** that *organic compounds* contain carbon and other elements such as hydrogen, oxygen, phosphorus, nitrogen or sulfur.				**Essential Question**
Vocabulary: Compounds Elements Organic	What I **K**now	**W**ant to Know	**L**earned	What elements do organic compounds contain?

biomass:

the total amount of living matter and the remains of dead organisms in an area.

community:



a group of organisms inhabiting the same region and interacting with each other

compost:

A mixture of decayed or decaying organic matter used to fertilize soil

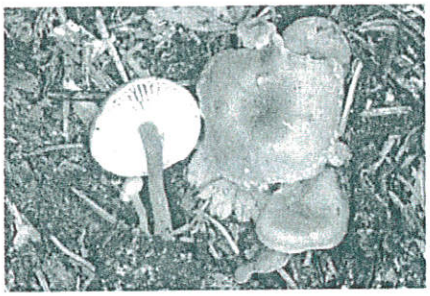
consumer:

organism that obtains energy by feeding on other organisms

decay:

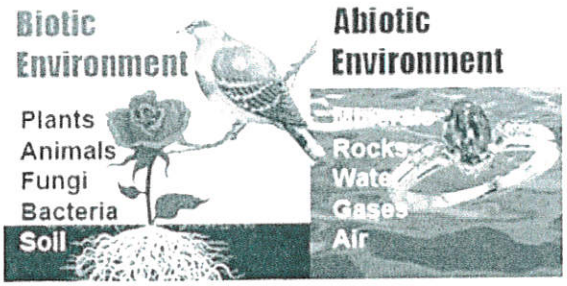
The breaking down or rotting of organic matter through the action of bacteria, fungi, or other organisms

decomposition:



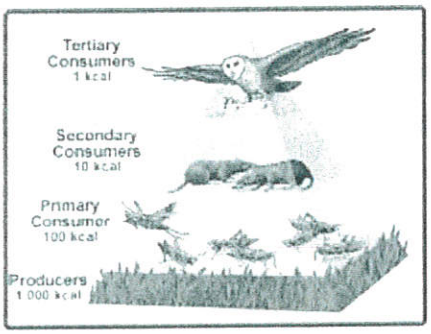
breakdown or decay of organic materials

ecosystem:



a community of organisms and the environment they inhabit.

energy pyramid:

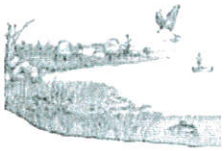


shows amount of energy moved from one feeding level to another in a food web

glucose:

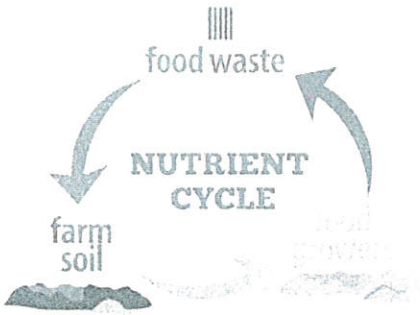
a sugar that is a major source of energy for the body's cells

habitat:



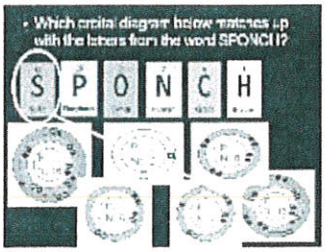
an area that provides an organism with its basic needs for survival

nutrient:



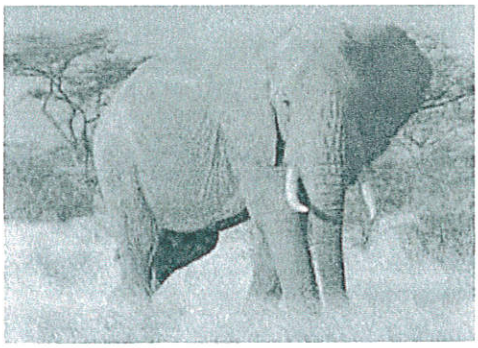
a substance that provides energy or raw materials for the body to grow,repair worn parts, or function properly

organic:



relating to chemical compounds containing carbon

organism:



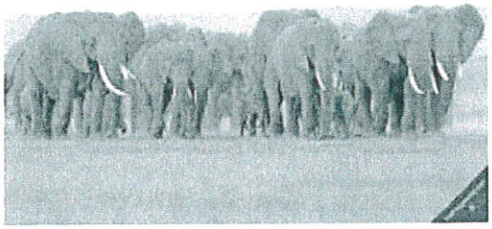
a living thing

photosynthesis:

Photosynthesis

the process by which plants and some other organisms capture light energy and use it to make food from carbon dioxide and water

population:

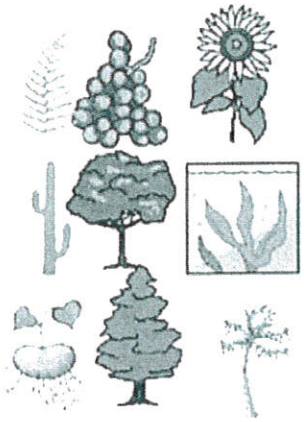


a group of organisms of the same species populating a given area

primary:

first in time, order, or sequence

producer:



an organism that can make its OWN food

scavenger:

a carnivore that feeds on DEAD organisms

species:

group of similar organisms whose members can mate with one another and produce fertile babies

Name_____ Date _____
Science 7-___

Element or Compound

An element is defined as the building block of all matter and it is made up of ONE kind of atom.

Example: Carbon is an element as it is represented by the symbol "C".

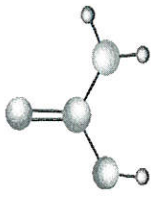
A compound is defined as matter made up of TWO or MORE elements. The elements in a compound are chemically bonded, cannot be separated by physical means and their properties are different from the elements that make it up.

Example: Sodium is an element represented by the symbol Na.
Chlorine is an element represented by the symbol Cl.

Sodium Chloride is a COMPOUND represented by the chemical formula NaCl.

Directions: Complete the chart shown below by classifying each substance as an element or a compound. Place an check mark in the appropriate column.

Substance	Element	Compound
Water H_20		
Ozone O_3		
Oxygen O		
Helium He		
Carbon Monoxide CO		
Carbon Dioxide CO_2		
Carbon C		
Hydrogen Peroxide H_2O_2		
Phosphorus P		



Organic Compound or Not

All organic compounds are formed from things that were once living and contain carbon. That is why humans are called "carbon based life forms" in so many sci-fi movies.

Example: $C_{12}H_{22}O_{11}$ is the chemical formula for sugar. Sugar is composed of 3 elements (carbon, hydrogen and oxygen) and it has 45 atoms total. Therefore, sugar is a compound. Because it contains carbon in its chemical makeup, it is also considered an organic compound.

Directions: Complete the chart shown below. Place a check mark in the appropriate column by classifying each substance as a compound or an organic compound.

Chemical Formula	Total # of Elements	Name the Elements	Total # of Atoms	Compound	Organic Compound
H_20 (water)					
CH_4 (methane)					
$C_6H_{12}O_6$ (glucose)					
$C_2H_4O_2$ (vinegar)					
SiO_2 (silicon dioxide)					
HCl (hydrochloric acid)					
$CaCO_3$ (calcium carbonate					
Fe_2O_3 (rust)					

Post Lesson Questions:

1. What distinguishes an element from a compound?

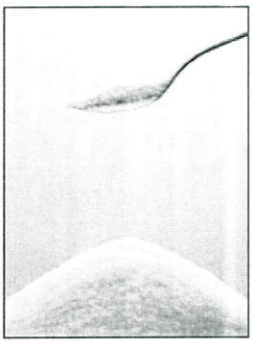
2. What distinguishes a compound from an organic compound?

3. What element HAS to be present in order for a compound to be considered organic?

4. What other elements can also be found in organic compounds? (Hint: Remember CHONPS)

True or False: Everything is composed up of elements. Living things are made mostly of six common elements known as the "elements of life".

reflect



Some people play a trick on April Fool's Day by switching salt for sugar in the sugar bowl. Unsuspecting family members sprinkle the salt onto cereal or in coffee cups, thinking they are adding a sweetener. But, one mouthful later, the trick is revealed.

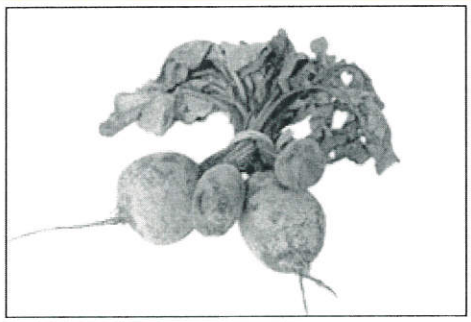
This trick works because sugar and salt look almost the same. One would have to look very closely to tell the difference between the two. So, why do two substances that look so much alike have very different properties?

Organic compounds are different than inorganic compounds. Actually, most properties of sugar and salt differ. Those differences are due to differences in the chemical makeup of each substance. Sugar and salt belong to two different classes of compounds. Sugar is an organic compound, while salt is an inorganic compound.

Organic and inorganic compounds differ in the elements they contain. Their elements differ because they come from different sources. Compare the chemical formulas and origins of sugar and salt as examples.

Common name	sugar	salt
Chemical name	sucrose	sodium chloride
Chemical formula	$C_{12}H_{22}O_{12}$	NaCl
Elements	carbon hydrogen oxygen	sodium chlorine
Origins	sugar beets, sugar cane	seawater, geological salt deposits

Most organic compounds come from living things. (In the next section, you will learn about exceptions to this rule.) Living things are composed primarily of the elements carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur. Living things produce compounds made up mostly of these elements. Other elements can be found in living organisms, but only in very small quantities.

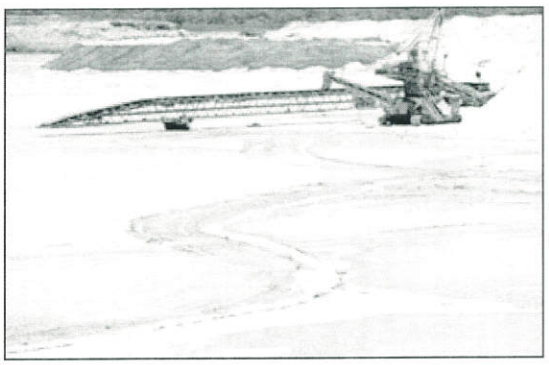


Sugar beets are sources of sucrose, or common sugar.

ORGANIC COMPOUNDS

Sugar is an organic compound. The sugar that you buy in the grocery store is extracted from sugar beets or from sugar cane. These are plants that produce large amounts of sucrose. These plants are easily grown and harvested. The chemical formula of sucrose, $C_{12}H_{22}O_{12}$, reveals that it contains the elements carbon, hydrogen, and oxygen. These are the most abundant elements found in living organisms.

In contrast, salt is an inorganic compound—it does *not* come from living things. Salt contains the elements sodium and chlorine. It is mined from salt deposits buried in the ground. These deposits came from ancient saltwater seas that dried up long ago and became buried in rock. Salt can also be obtained from existing saltwater bodies. These are nonliving places of origin.



Much of the salt we use is mined from salt deposits.

what do you think?

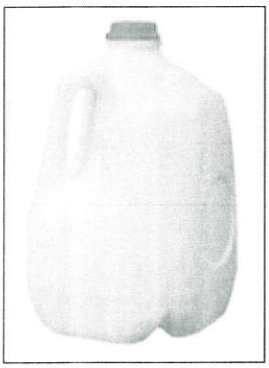
We can measure elements by counting atoms in a compound. Another way of measuring elements is by mass. Suppose we split 100 grams of a substance into its elements. Each element is weighed and its mass is expressed as a percentage of the total mass (100 g). Which of the following would you classify as organic? Which would you classify as inorganic?

	Substance 1	Substance 2	Substance 3	Substance 4
Elemental composition (percentage by mass)	97.5% zinc 2.5% copper	74.8% carbon 25.2% hydrogen	40.0% carbon 53.3% oxygen 6.7% hydrogen	46.7% silicon 53.3% oxygen
Classification				

Organic compounds have important things in common.
A chemical compound is classified as an organic compound based on its composition. All organic compounds contain carbon. Most also contain hydrogen. Other elements commonly found in organic compounds include oxygen, nitrogen, phosphorus, and sulfur.

Long ago, many scientists described organic compounds as having a "vital force." ("Vital" comes from *vita,* the Latin word for life) Because all known organic compounds were isolated from living or once-living organisms, they were thought to have this special quality. People thought that inorganic compounds did not have this vital force.

In 1828, a German chemist, Friedrich Wohler, helped disprove this idea. Wohler made an organic compound in his laboratory. He used inorganic compounds to synthesize an organic compound. No living organism was needed to supply any "vital force." Thus, he showed that an organic substance does not have to come from a living source. Organic compounds can be made artificially under laboratory conditions. However, the organic compounds found in nature *do* come from living things.



Everyday Life: Organic Plastics?
Some familiar materials that you encounter every day consist of organic compounds made in a lab. Many plastics fall into this category. Plastic milk jugs, for example, are composed of a type of organic compound called a polymer. *Polymers* are long chains of molecules made by linking many small units called *monomers* together. The polymer in a milk jug is polyethylene. Polyethylene is made from monomers containing the elements carbon and hydrogen. Polyethylene is considered an organic compound because of its composition.

All living things contain certain organic compounds: carbohydrates, lipids, and proteins.
Even though organisms vary quite a bit in size and appearance, their cells generally contain the same types of organic compounds. A cell from a giraffe, a cell from an oak tree, and a cell from a dust mite all contain the following kinds of organic compounds: carbohydrates, lipids, and proteins. These compounds are found in all living cells. They are universal because they provide the chemical basis for life.

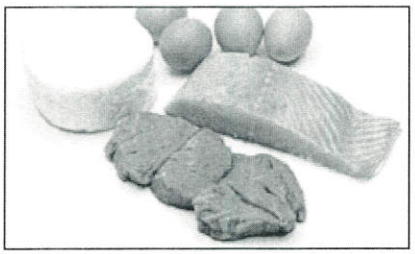
- **Carbohydrates:** Carbohydrates are the group of organic compounds that include sugars such as glucose and sucrose. You have already learned the chemical formula for sucrose: $C_{12}H_{22}O_{12}$. The chemical formula for glucose is $C_6H_{12}O_6$. These molecules contain the elements carbon, hydrogen, and oxygen—generally in a 1:2:1 ratio. The smallest carbohydrate is glyceraldehyde, which has the chemical formula $C_3H_6O_3$.

Carbohydrates can also be quite large because individual sugar molecules can bond together to make huge, branching chains of polymers. Starch, found in potatoes and pasta, is an example of a polymeric carbohydrate.

- **Lipids:** Lipids are organic compounds composed mainly of carbon and hydrogen, with small quantities of oxygen. Some lipids also contain phosphorus. Fats and oils are lipids. Fats are lipids that are solid at room temperature. Butter is an example of a fat. Oils are lipids that are liquids at room temperature, like olive oil. Both butter and olive oil contain several different organic compounds. One compound found in olive oil is oleic acid: $C_{18}H_{34}O_2$.
- **Proteins:** Proteins are large molecules. They form when small molecules called amino acids bond together to form a long chain. There are 20 different amino acids found in most proteins. The smallest amino acid is glycine, which has the chemical formula $C_2H_5NO_2$. The largest amino acid is tryptophan, which has the chemical formula $C_{11}H_{12}N2O_2$. These formulas reveal the elements present in proteins: carbon, hydrogen, nitrogen, and oxygen. Sulfur is also present in two of the 20 amino acids, and so this element also tends to be found in proteins. Eggs and meats are good nutritional sources of roteins.

look out!

Some inorganic substances are listed on nutrition labels, too. Living organisms require certain inorganic substances in small quantities to live. For example, iron, magnesium, calcium, sodium, and potassium are essential to good health. Although living organisms are primarily made up of organic substances, they also rely on having trace amounts of inorganic substances for good health.



What do you know?
Suppose a visitor from another planet arrived on Earth. This alien visitor has a special detector that instantly determines the chemical makeup of any substance.

The visitor aimed his detector at five different things to determine their compositions. The results are shown in the table below. Based on the data, how should the alien categorize each substance? Look up any element symbols that you don't know on the Periodic Table of the Elements. Write and explain your answer in the space next to each substance.

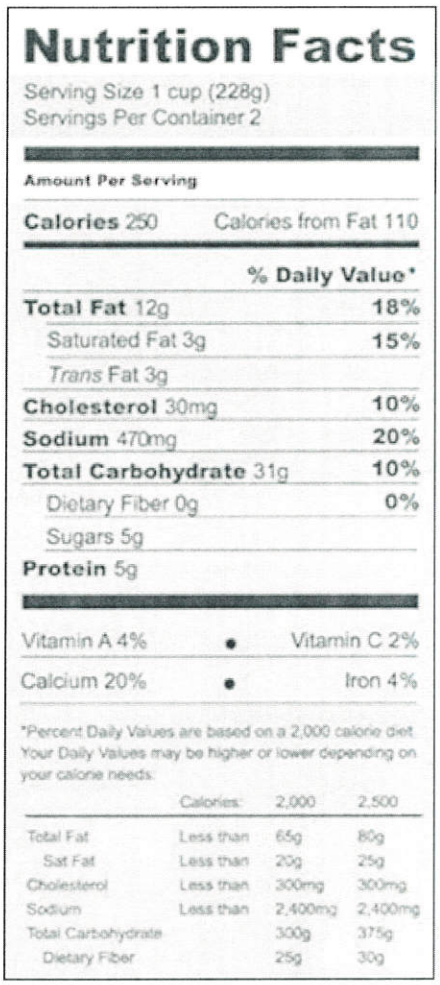
Substance	Chemical Composition (percent by mass)	Compound Category (organic or inorganic?)
A	89.0% O 11.0% H	
B	61.7% C 11.0% N 9.3% O 5.7% H 12.3% Ca, P, S, K, Na, Cl, Mg	
C	84.7% Cu 14.3% Sn	
D	84.7% O 22.9% Si 12.0% Ca 6.7% Fe 4.5% Al 1.2% Na 0.9% Ti, Mn, K	
E	81.6% C 18.4% H	

connecting with your child

Organic Compounds in My Life

Most food packages have nutrition labels. These labels provide information about the food inside. Your child can survey these labels to get a sense of the categories of organic compounds found in foods.

1. Go to your kitchen pantry. Pull out a few packages of food. Have your child locate the nutrition labels on the packages.
2. Your child should make a list of all of the categories of nutrition contents on all of the labels. Pay special attention to different types of fats, carbohydrates, and proteins. If your child does not recognize a category, conduct research together to try to find out more about that category.



Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250 Calories from Fat 110

	% Daily Value*
Total Fat 12g	**18%**
Saturated Fat 3g	**15%**
Trans Fat 3g	
Cholesterol 30mg	**10%**
Sodium 470mg	**20%**
Total Carbohydrate 31g	**10%**
Dietary Fiber 0g	**0%**
Sugars 5g	
Protein 5g	

Vitamin A 4% • Vitamin C 2%

Calcium 20% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

To help students learn more about organic compounds, have them collect a variety of everyday items. Have them try to make their best guess about whether each item is composed of an organic or inorganic compound. Finally, have students conduct online research to check their guesses. Try to keep items as simple as possible to avoid items composed of a mixture of both organic and inorganic materials. Some items that work well include: paper, coins, rubber, glass, wool, cotton, gasoline, wax, porcelain, and cement.

Here are some questions to discuss with your child:

- What do you know about how this substance is made and where the raw materials come from that go into its manufacturing?
- Do the raw materials come from a living source such as a plant, or do they come from a geological source such as clay, metals, or minerals that are mined from the ground?
- If an item cannot be categorized as organic or inorganic through research, what could a chemist do to determine its category?

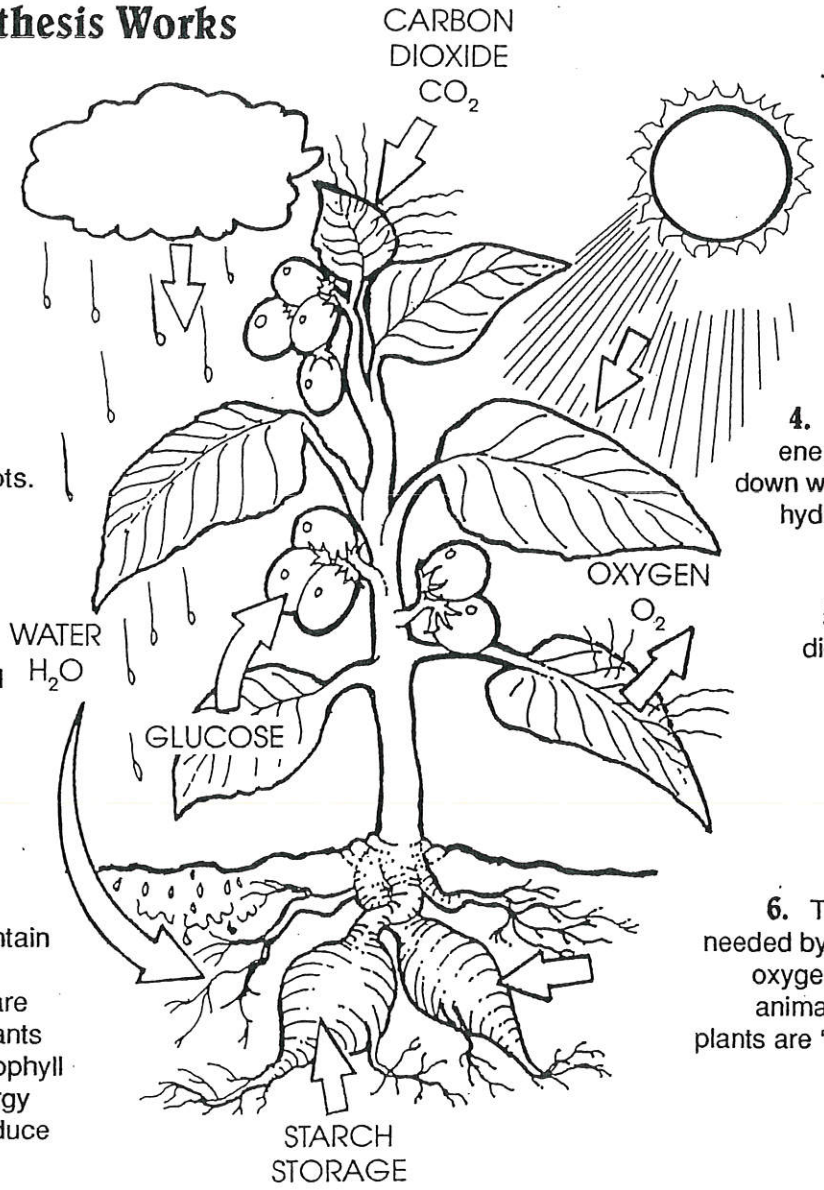
Photosynthesis

When you get tired and hungry, do you feel weak? What do you need to help you get some energy—a sunny day or a sandwich? If you eat something, your energy will usually return. This is true for most animals.

If you were a green plant, you would rather have a sunny day to get energy. Plants get their energy directly from the Sun. With this energy they make their own food.

Green plants produce their own food through a process called **photosynthesis** (foto-**sin**-tha-sis), which means "making things with light." That is exactly what plants do with the sunlight they absorb: they make food, called **glucose**, a sugar.

How Photosynthesis Works



1. Plants take in water and nutrients present in the soil through their roots.

2. Most of the food production takes place in the leaves. This is where green cells called **chloroplasts** are located. Chloroplasts are the "factories" that produce glucose, a sugar.

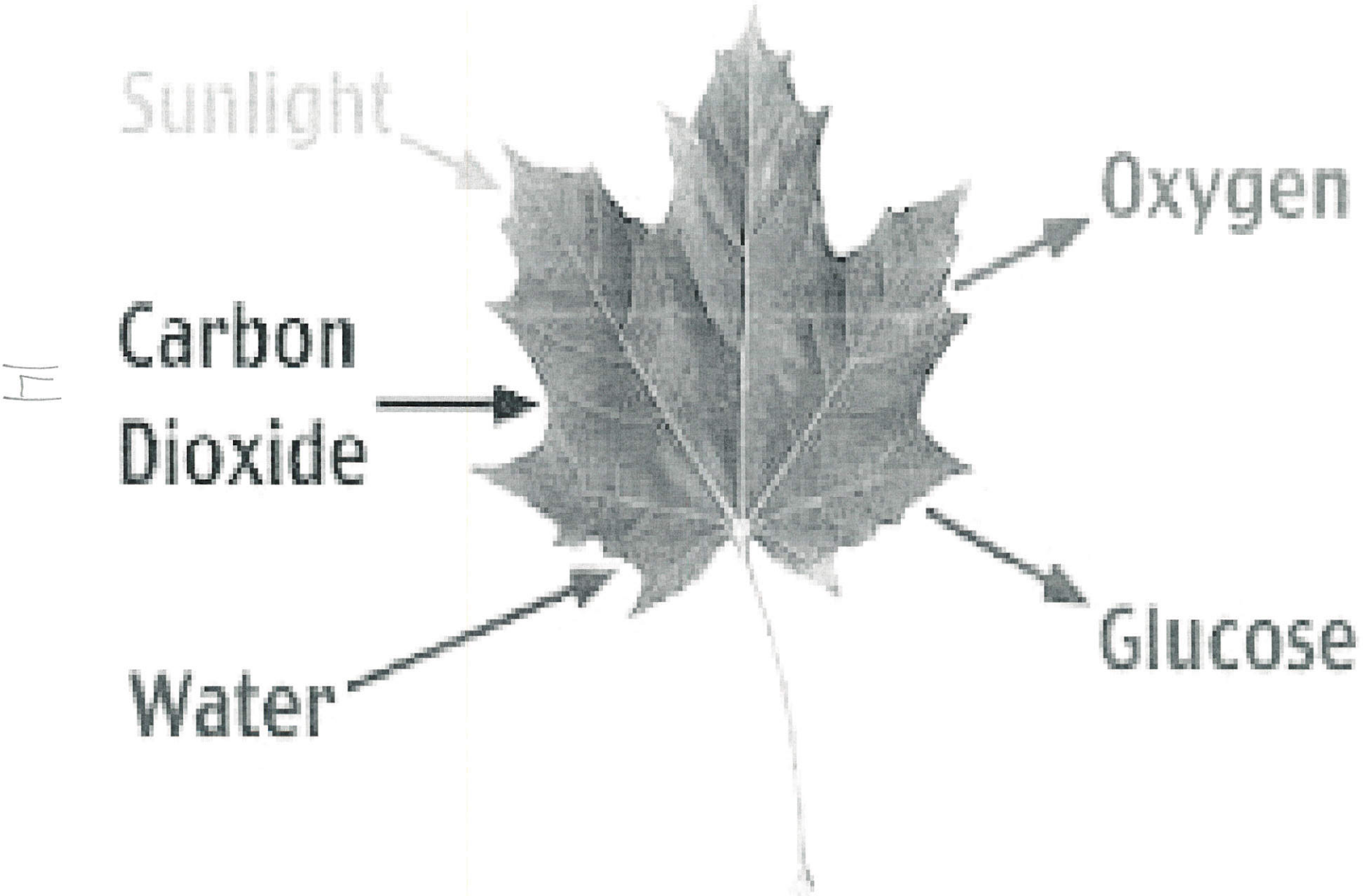
3. The chloroplasts contain chlorophyll molecules. Chlorophyll molecules are green, and they give plants their green color. Chlorophyll traps and uses the energy found in sunlight to produce glucose.

4. The chlorophyll uses this energy from sunlight to break down water molecules (H_2O) into hydrogen and oxygen atoms.

5. The leaf takes carbon dioxide molecules from the air and combines them with the hydrogen atoms taken from water to produce glucose.

6. The oxygen atoms are not needed by the plant. It releases the oxygen into the atmosphere for animals to breathe. In a sense, plants are "oxygen factories" as well as sugar producers.

7. If the plant does not need all of the glucose, it is stored for future use as a **carbohydrate**, or a starch. That is what a potato is—stored starch.


Sunlight
Oxygen
Carbon Dioxide
Glucose
Water

Cereal Color	# of Pieces	Atoms Represented
	18	Oxygen (O)
	12	Hydrogen (H)
	6	Carbon (C)

1. How many molecules (clusters) of water were you able to make? _____
2. How many molecules of carbon dioxide were made? _____
3. Write and complete the following sentence on the bottom of your paper: **The <u>reactants</u> of photosynthesis are...**

_____
_____
_____

4. How many oxygen molecules did you make? _____
5. How many glucose molecules did you make? _____
6. Write and complete the following sentence on your paper: **The <u>products</u> of photosynthesis are...**

_____
_____
_____

7. How many of each kind of atom are in the **reactants?**

Oxygen =

Hydrogen =

Carbon =

8. How many of each kind of atom are in the **products?**

Oxygen=

Hydrogen =

Carbon =

9. How do the total number of reactants and products compare? _____

_____

Name _____ Date _____ Period _____

Energy Flow through an Ecosystem: Food Chains, Food Webs & Energy Pyramids

Organisms that can store chemical energy in glucose, during photosynthesis are called _____. Plants are producers (_____) which use most of the energy they make for _____. Producers use _____ _____ to supply the energy they need to live.

Cellular _____ is the chemical reaction that releases the energy from the glucose _____ compound.

Activity: *Cellular Respirations Chemical Equation-* Circle the organic compound in the balanced chemical equation below, and label it glucose:

$$6\ O_2 + C_6H_{12}O_6 \rightarrow 6\ H_2O + 6\ CO_2 + \text{energy (ATP)}$$

1. What is an organic compound?

   _____

2. How does it compare to the chemical equation of photosynthesis?

The _____ can be passed on to organisms that cannot make their own energy. Organisms that cannot make their own energy are called _____ or heterotrophs. Consumers that eat producers to get energy:

- Are first order (1st) or _____ consumers
- Are _____ (plant-eaters)

Most of the energy the _____ _____ gets from the producer is used by the consumer, about 90%. Some of the energy moves into the _____ as _____. Some energy in the primary consumer is _____ & not _____ to the atmosphere or used by the consumer itself. This energy, about _____% is available for another consumer (predator).

Name _____Date_____Period_____

A consumer that eats another consumer for energy:

Is called a _____ consumer or

_____ consumer.

- May be a _____ or a omnivore
- May be a _____
- May be a scavenger

Activity: Label the pictures in the box as

Carnivore, Herbivore, Scavanger

Most of the energy the secondary consumer gets from the eating the _____consumer is used by the secondary consumer. Some of the energy is lost as _____, but some energy is stored and can be _____ on to another consumer.

Question: About what percentage of energy is used in the organism of the food it consumes? What percentage is stored energy?

Used energy _____% Stored energy _____%

A consumer that eats a consumer that already ate a consumer: Is called a_____ or tertiary consumer.

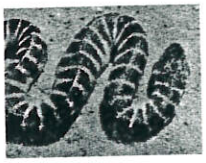
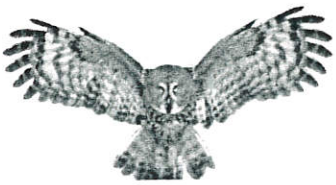
- May be a carnivore or a _____
- May be a predator
- May be a _____.

Consumers that eat producers & other consumers are called omnivores. Omnivores eat _____ and _____.

Consumers that hunt & kill other consumers are called _____. The animals that are hunted & killed are called _____. Consumers that eat other dead consumers are called _____.

Name _____ Date _____ Period _____

The transfer of energy from the sun to producer to primary consumer then to higher order consumers can be shown in a _____ _____. Use the pictures below and develop a food chain.

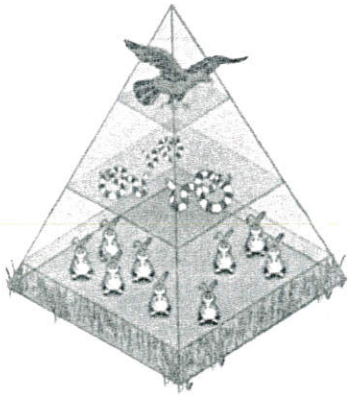





1._____2._____3._____4._____5._____

Food Chains Show Available Energy

Construct your own food chain and show the flow of energy with arrows.

Another way of showing the transfer of _____ in an ecosystem is with an ENERGY PYRAMID



- Amount of available energy _____ for higher consumers
- Amount of available energy _____down the food chain
- It takes a larger number of _____ to support a small number of primary consumers
- It takes a large number of _____ consumers to support a small number of secondary consumers

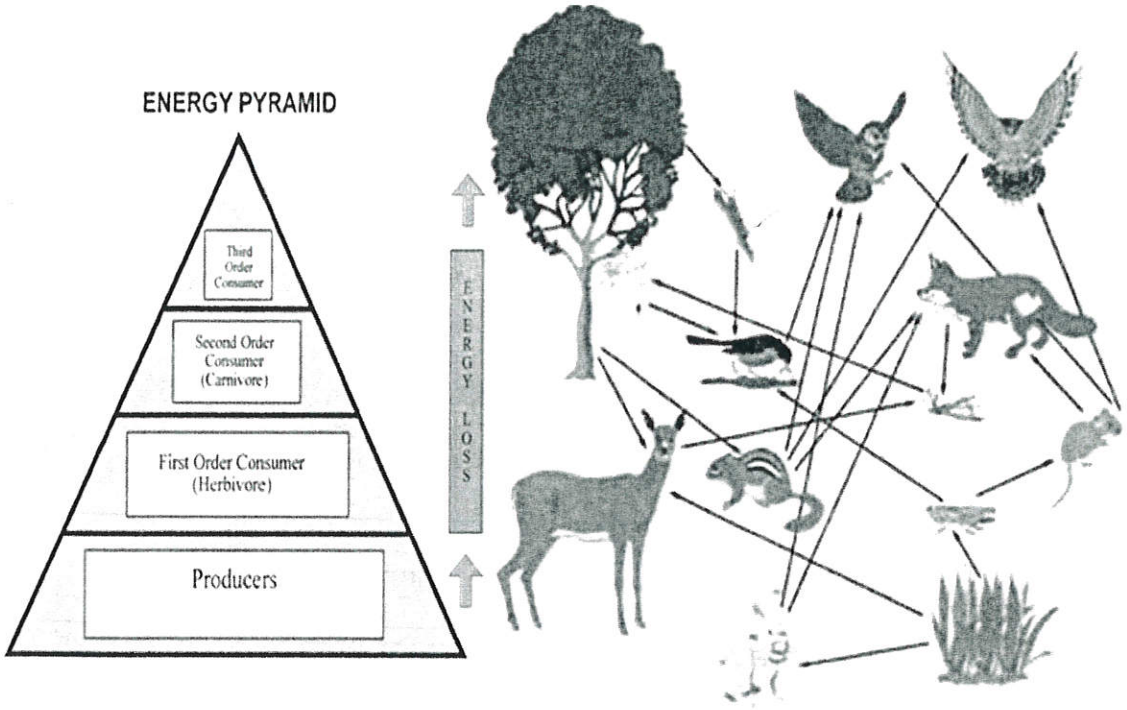
Quick write 60 seconds. Compare contrast food chain vs. Energy pyramid.

_____

_____

_____

Name _____ Date _____ Period _____



Food webs are _____ food chains. They show the

_____

Use the food web above to answer the following questions.	Amount of Energy transfered from Producer?
Which organism belongs at bottom of pyramid? _____	100,000 kcal
Which organism belongs at first order consumer? _____	_____kcal
Which organism belongs at second order consumer? _____	1,000 kcal
Which organism belongs at third order consumer? _____	_____kcal

Closing: Complete your sentence stem summary statement here:

_____

_____

_____

_____

_____

Ecology: Interactions Within the Environment

Name: _____

How do things "work" together to survive in their environments? Ecology is the study of the interactions among organisms and their environments. There are several things that make up an ecosystem. An ecosystem is all of the living and non-living features of an environment. Abiotic factors are those things that are non-living in an environment like air, water, soil and sunlight, and biotic factors are all of the living components such as trees, plants, animals, insects, bacteria, and us! We have many different ecosystems on our planet, too! Large geographic areas with similar climates and ecosystems are called biomes, and they can include such environments like the snowy tundra, the desert, or the very diverse tropical rainforest. Most organisms live in a specific area suited for their needs.

An organism is any single living thing living within an ecosystem, and the place where it obtains the types of food, shelter, moisture and temperature that it needs is called its habitat. Its niche is the unique way that the organism survives within its environment, or it's "job" within the environment. Organisms live in groups called populations within their ecosystem and certain features of that ecosystem can affect how that population lives and thrives. Anything that can limit the size of a population, including living and nonliving features of an ecosystem, is called a limiting factor. An example of a factor that could limit the size of a population might be a hunter or a drought. An ecosystem can only support a certain number of individuals before that system begins to run out of resources. The largest number of individuals of a particular species that an ecosystem can support over time is called its carrying capacity.

All organisms rely on other organisms for energy. The transfer of energy from one organism to another is called the energy flow through the ecosystem. We can trace the path of energy through an ecosystem with an Energy Pyramid. An energy pyramid shows the direction that energy flows and each level on the pyramid is called a trophic level. At the bottom are producers, organisms that can make their own food. Next are consumers, who need to consume food from another source, such as a producer or another consumer. Decomposers return nutrients to the soil by consuming wastes and dead organisms. We can see how organisms rely on each other for energy in food chains and webs. A food chain shows how food energy passes from one organism to the next. Food webs are more complex and show the network of many interconnected food chains. Organisms have special types of interactions with one another. If an animal hunts and kills another animal for food, it is called a predator and is a consumer. The animal that is hunted and caught for food is the prey and is also a consumer; it may be an herbivore, omnivore, or carnivore. A carnivore is a meat eater and can eat herbivores, omnivores, or other carnivores. Herbivores eat producers or plants only, and an omnivore eats both producers (plants) and consumers (other animals).

Some organisms have very close relationships with one another. Symbiosis is any close relationship between different species, and including mutualism, commensalism, and parasitism. Mutualism is when both species benefit from the relationship, like bees pollinating flowers. Commensalism is when one species benefits and the other organism doesn't really get anything out of it. The shark and the remora is an example of this. The remora just hangs around the shark waiting for it to drop food, but the shark doesn't get anything from the remora. Parasitism is when one organism gets helped in the relationship and the other organism is harmed, like fleas on a dog.

Relationships exist among all living things. When one thing is out of balance, it can affect the entire environment. For example, when we spray pesticides on our crops, those chemicals can upset the delicate ecosystem that exists there, causing some populations to soar while others may die out. So the next time you think about throwing trash on the ground or pouring chemicals down your drain, think about who or what you might be affecting!

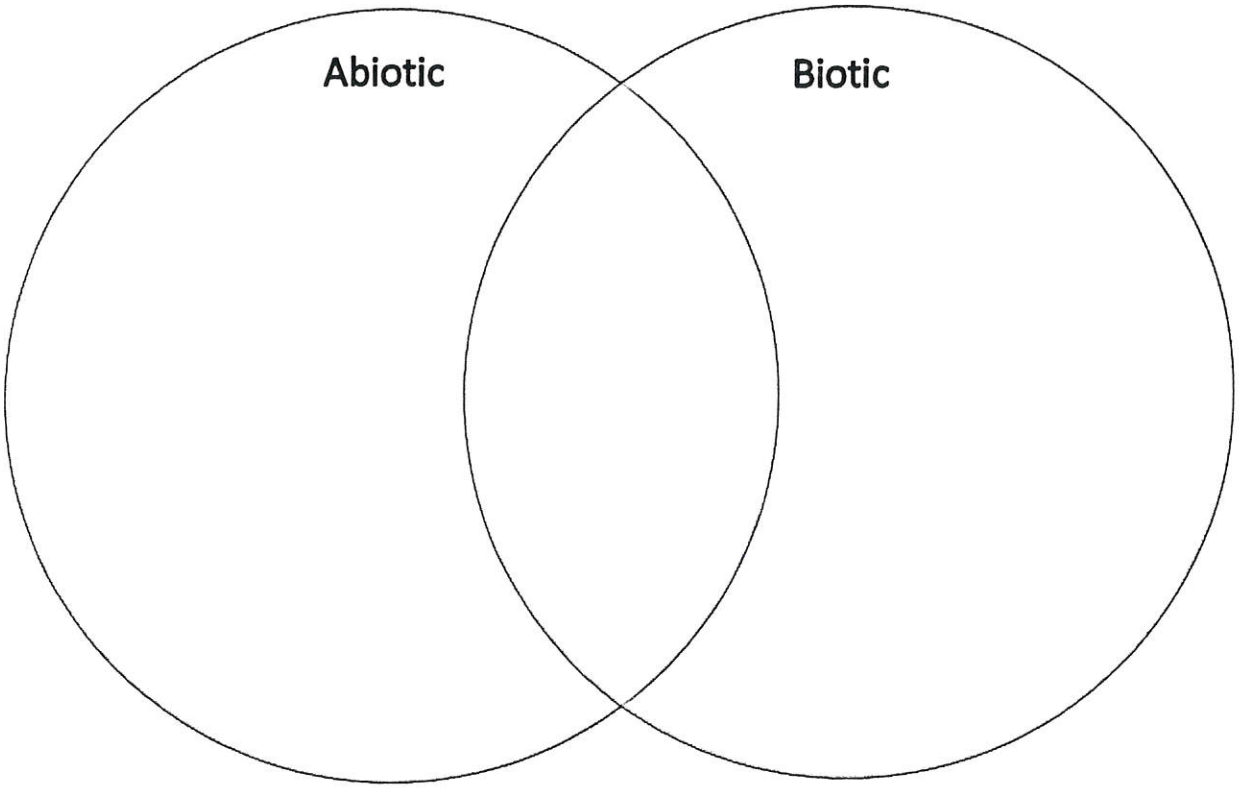
Ecology:
Interactions Within the Environment

Name: _____

Answer the questions below using the reading

1. Based on the definition of Ecology, what do you think the word parts "eco" and "ology" mean?

2. Compare and contrast abiotic and biotic factors using the diagram below.



3. Provide three examples of each:
    a. Abiotic Factor-
    b. Biotic Factor-

4. Write a paragraph explaining how energy flows through an ecosystem using the following terms: Energy Pyramid, Trophic Level, Producer, Primary Consumer, Decomposer, Sun, Secondary Consumer, Tertiary Consumer

Ecology: Interactions Within the Environment

Name: _____

Use the reading to match the vocabulary term with the appropriate definition.

1. _____ - study of the interactions that take place among organisms and their environment
2. _____ - living things within an ecosystem
3. _____ - one of any living thing
4. _____ - place where an organism lives and that provides the types of food, shelter, moisture, and temperature needed for survival
5. _____- chain showing how energy passes from one organism to the next
6. _____ - eat producers
7. _____- any close relationship between species, including mutualism, commensalism, and parasitism.
8. _____ - animal that hunts and kills other animals for food. It is a consumer [carnivore or omnivore]
9. _____ - largest number of individuals of a particular species that an ecosystem can support over time
10. _____ - non-living parts of ecosystem-air/water/soil/sun
11. _____ - all the living organisms that live in an area and the nonliving features of their environment
12. _____ - large geographic areas with similar climates and ecosystems. Includes: Tundra, Desert, Tropical Rainforest, Temperate Rainforest, Grassland, Arctic Tundra, Temperate Deciduous Forest
13. _____ - in an ecosystem, refers to the unique ways an organism survives, obtains food and shelter, and avoids danger
14. _____- anything that can limit the size of a population, including living and nonliving features of an ecosystem, such as predators or drought
15. _____ - show the direction in which energy flows. As the amount of available energy decreases, the pyramid gets smaller. Each layer on a pyramid is called a _____level.
16. _____**through an ecosystem** – The transfer of energy from one organism to another through food webs.
17. _____ - organism that makes its own food, autotroph.
18. _____ - organism that cannot make own food, a heterotroph
19. _____ - consume wastes and dead organisms
20. _____ - complex network of many interconnected food chains and feeding relationships
21. _____ - an animal that is hunted and caught for food. It is a consumer; it may be a herbivore, omnivore, or carnivore.
22. _____ - eat herbivores, omnivores, or other carnivores
23. _____ - eat producers and consumers

Free Response:

24. What are the three types of symbiosis? Using the symbols (+) for positive, (-) for negative, and (0) for neutral, describe what each organism gets out of the relationship for each type of symbiosis.
    a.
    b.
    c.
25. List some limiting factors that might limit the size of a population within its environment?
i.e. increased hunting by man and drought

Ecology: Interactions Within the Environment

Name: _____

5. Food webs and food chains both show how energy transfers in an ecosystem. Explain how they differ from one another.

6. Using the reading, define and give an example of each type of consumer.

Type of consumer	Definition	Example

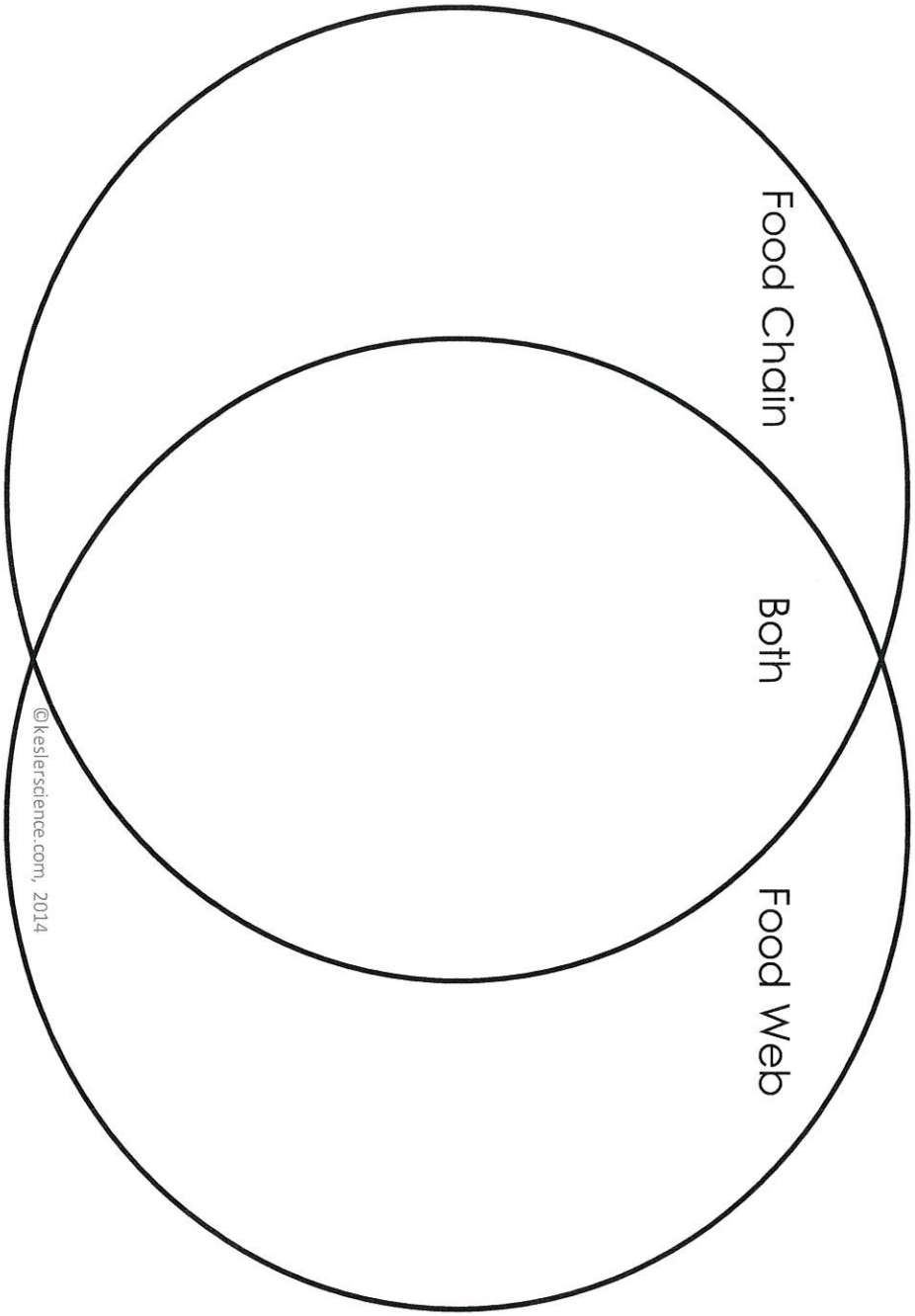
7. Identify the three types of symbiosis. Then, using the symbols (+) for positive, (-) for negative, and (0) for neutral, describe what each organism gets out of each relationship. Provide an example of each type.

Type of Symbiotic Relationship	Definition	Use (+) (-) and (0) to show what each organism gets out of the relationship	Provide an example of each type of symbiosis

8. List some limiting factors that might limit the size of a population within its environment? (for example: increased hunting by man and drought)

9. What are some ways that humans negatively affect the environment?

Food Chain vs. Food Web



Energy Pyramid Directions

1. Using colored pencils shade the first (bottom) level of each pyramid green.

2. Shade the second level of each pyramid yellow.

3. Shade the third level of each pyramid blue.

4. Shade the fourth (top) level of each pyramid red.

5. Label each level of the first pyramid side of the pyramid with the following terms as you move up the pyramid: producer, primary consumer, secondary consumer, tertiary consumer.

6. Label each level of the second pyramid side with the following terms as you move up the pyramid: plants, herbivores, carnivores, top carnivores.

7. Label each level of the third pyramid side with the following terms as your move up the pyramid: autotroph, 1st order heterotroph, 2nd order heterotroph, 3rd order heterotroph.

8. Draw a picture of what might belong in each level:
1st: flowers, trees, grass, algae
2nd: caterpillars, cows, grasshoppers, beetles
3rd: humans, birds, frogs
4th: lions, dogs, snakes

9. Label the fourth side of the pyramid starting at the largest section as you move up: 100% of energy, 10% of energy, 1%of energy, 0.1%of energy.

10. Label the bottom row of the fourth side of the pyramid with 35,000 Kg of biomass. Calculate and label the amount of biomass at each level.

11. Fold your pyramid on the lines radiating from the center and glue it together using the extra flaps.

Answer the following questions using your pyramid:

a. What are three terms used to describe organisms such as trees?

b. What are three terms used to describe organisms such as cows?

c. What are three terms used to describe organisms such as humans?

d. What are three terms used to describe organisms such as lions?

e. What do the organisms in each trophic level eat?

f. Do organisms always stay in the same level? Explain your answer.

g. How much energy transfers from one level to the next?

h. Why does only this much energy transfer to the next level?

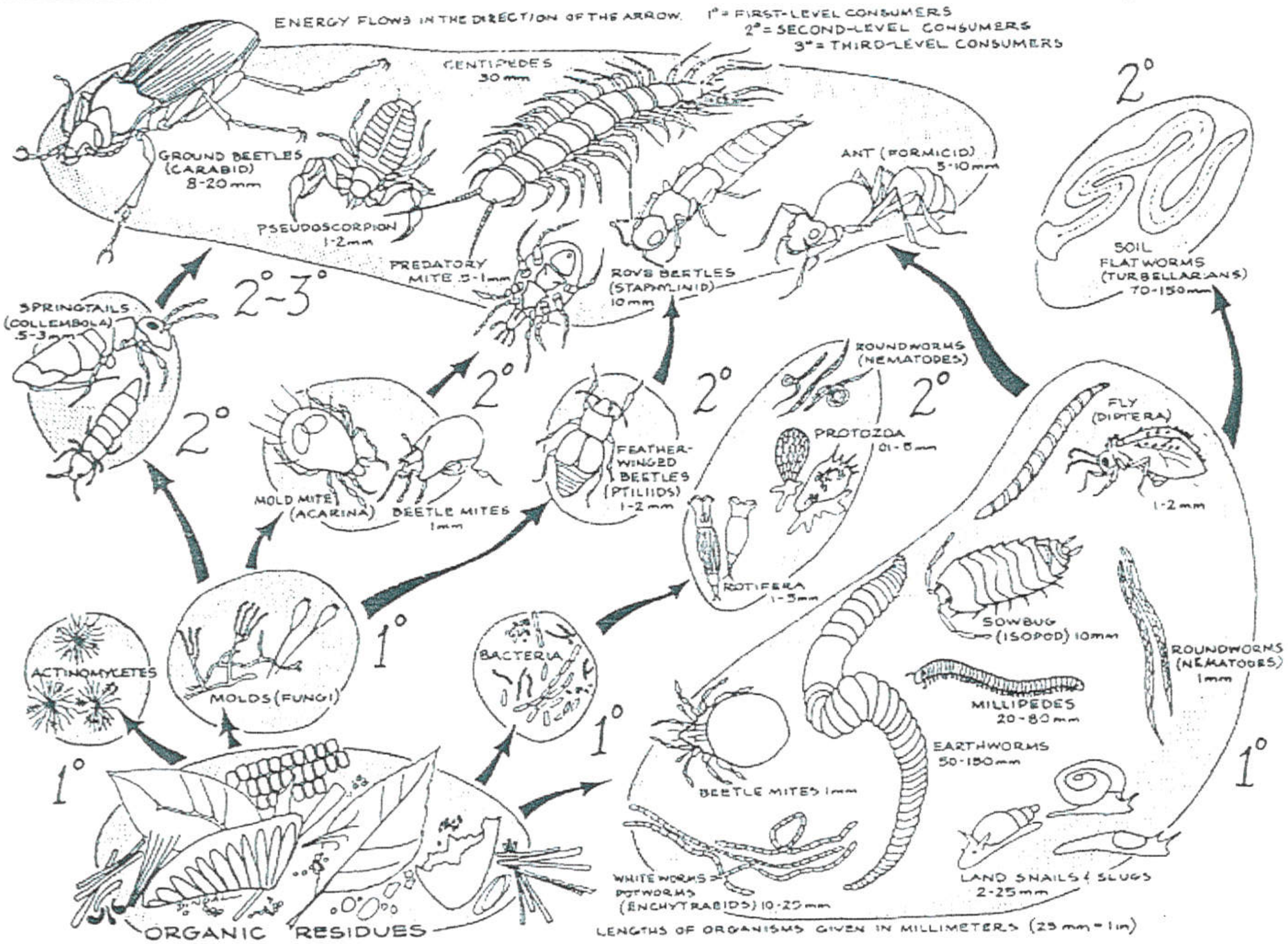
i. What happens to the energy that does not transfer to the next level?

j. 34 Kg is about the mass of a middle school student. What inferences can you make about yourself using the pyramid?

k. Why is it more ecologically friendly to eat a salad than a steak?

Name________________________________

Food Web of the Compost Pile



Many types of organisms in a worm bin break down organic materials to simpler forms that can be recycled into other kinds of living tissue. A food web shows relationships between organisms, based upon who eats whom. Dead organic materials are first eaten by organisms like molds and bacteria. These are known as first-level (1°) consumers. Earthworms, beetle mites, sowbugs, enchytraeids, and flies also consume waste directly. First-level consumers are eaten by second-level (2°) consumers such as springtails, mold mites, and protozoa. Third-level (3°) consumers are flesh-eaters, or predators, which eat 1° and 2° consumers. Predators in a worm bin might include centipedes, rove beetles, ants, and predatory mites.

Wormformation

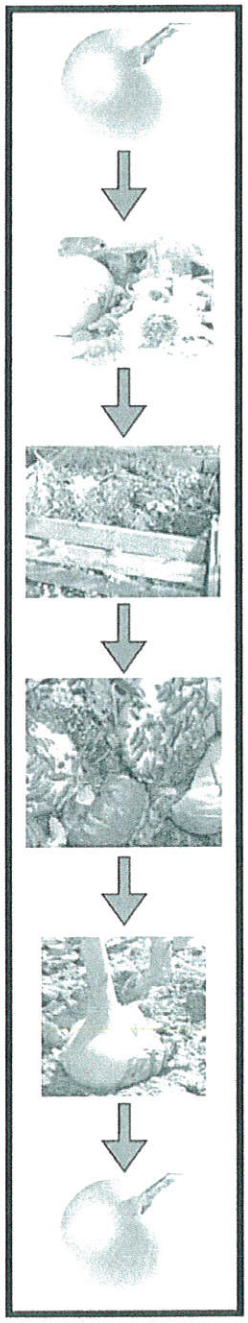
Source: *Worms Eat Our Garbage*
Adapted with permission from Dr. Daniel Dindal.
(See Related Resources for more information.)

Name: _____ Date: _____ Per: ____

READING SCIENCE!

The Life Cycle of an Environmentally-Friendly Onion

Lexile 900L



1 Everybody loves fresh, healthy vegetables, and everybody wants the environment to stay healthy. One way people can help the environment is to compost the food they don't eat and other living matter they don't use. Just because living matter dies does not mean that it cannot be put back into the cycle of matter.

2 Compost occurs when water, air, and bacteria break down material that had been alive. Material that comes from living organisms is called organic matter. Compost piles at home often start out with unused food, yard material such as dead leaves or grass clippings, and maybe some animal manure.

3 Let's say you had hamburgers for lunch one day. You like onions on your burgers. You cut an onion, being careful to cut the top and bottom off, and peel back the tough outer layers of onion skin. You can put these parts of the onion you don't use into a compost bin in the back yard. Other organic material is already "cooking" there. The bin can be plastic, wood, or just a pile in the yard. The fresh discarded onion attracts insects and worms. The onion also attracts tiny bacteria and other microorganisms that like to eat what you don't. You would not want to eat that onion now!

4 A compost pile needs plenty of material, air, and water. Then the microorganisms can start to break down the material, producing heat and energy. This is where the term "cooking the compost" comes from. You will want to keep the pile moist. You must also stir it occasionally so that the material in the outer layers spends some time in the middle. Most of the decomposing action occurs in the middle of the pile. The more water, air, and organic material you put in the pile, the better your compost gets.

5 After a few weeks, the parts of the onion you didn't eat are a nice, mushy goo. It has been broken down and released as energy by other living organisms. Your compost pile is now ready to be used in your garden. It is full of nutrients and mulch which will help keep your garden vegetables healthy as they grow.

6 Your onion has taken an extraordinary journey around the cycle of matter. It began as a nice, round vegetable on the table. It changed from scraps in the compost bin, to a pile of mushy brown material, to wonderful nutrients for your garden. Never underestimate the power of an onion!

1 Which of the following components is NOT necessary for successful composting?

A Air

B Moisture

C Plastic composting bins

D Bacteria

2 What is the main point of the reading?

A Oxygen is the most important component of a composting process

B Compost can only be made of vegetables

C Onions are the only vegetables that can be recycled

D Living matter can live, die, and be broken down, producing a cycle of matter

3 Which of the following statements is true about compost?

A Compost can only be made of vegetables

B Compost starts with material bought at a garden center store

C Compost starts at home with unused food and yard material

D Compost material is not good for a home garden

4 Which animals are essential for good composting?

A Spiders

B Insects and worms

C Dogs

D Cattle

5 "Cooking the compost" means —

A letting the microbes decompose matter, producing energy.

B preparing vegetables for a meal.

C spending energy preparing a compost bed.

D burning papers to produce ash for the compost pile.

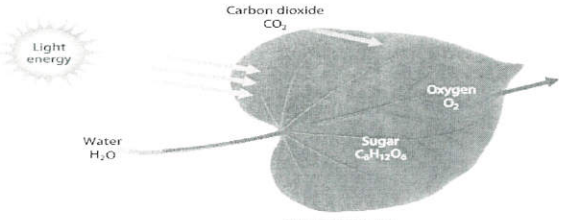
Name: _____ **Matter and Energy in Ecosystems**

Organic Compounds (7.6A)- Identify that organic compounds contain

1. **Carbon & Hydrogen** must be present for a compound to be organic. Can contain other elements such as oxygen, sulfur, phosphorus, and nitrogen (SPONCH)
2. **Examples:** H_2O (not organic)—no carbon
   NH_3OH (not organic)—no carbon
   $C_6H_{12}O_6$ (organic)-- contains carbon & hydrogen
3. Sugars are organic and contain carbon, hydrogen and oxygen!

Photosynthesis: (7.5A)

Recognize that radiant energy from the Sun is transformed into chemical energy through the process of photosynthesis.



Photosynthesis

Carbon dioxide + Water $\xrightarrow{\text{Light energy}}$ Sugar + Oxygen

$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light energy}} C_6H_{12}O_6 + 6O_2$

Composting: Cycling of Matter (7.5 B)- Demonstrate and explain the cycling of matter within living systems such as in the decay of biomass in a compost bin.

1. Our ADI investigation where we put soil, worms, leaves, coffee grounds, orange peels, etc. into a baggie and we added water, put holes in the bag and monitored for 2 weeks demonstrates? **COMPOSTING and the cycling of matter in living systems.**
2. **Decomposers**—break down dead or decaying organisms. **They allow plants to obtain the nutrients needed for growth and life processes**. (Remember the nitrogen cycle video with the plant, rabbit and the rabbit feces.)
3. What happens to the biomass (total amount of living matter and remains of dead organisms in an area) during composting? **Remember the matter is cycled** (recycled) back into the simpler substances (nitrogen for example) that the plants can use!!! (Remember Mrs. Hinds and the circle for cycling of matter)

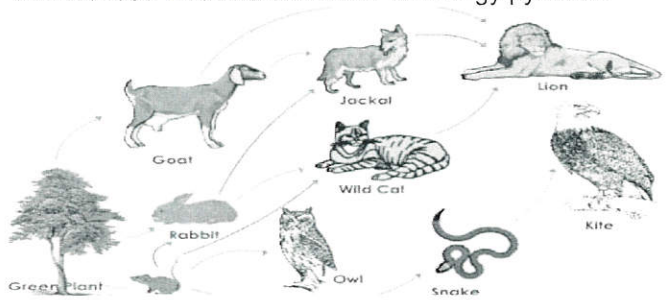
Energy FLOWS within an Ecosystem (7.5C)- Diagram the flow of energy through living systems, including food chains, food webs, and energy pyramids.

1. REMEMBER ENERGY DOES NOT CYCLE within a living system. Energy FLOWS!!! Energy may be lost as heat. (Energy cannot travel back to the sun therefore it DOES NOT CYCLE.)
2. Food chains—energy flows and begins with the sun and photosynthesis in a plant

plant/producer → herbivore/primary consumer → carnivore/omnivore/secondary consumer → carnivore/tertiary consumer

(Scavengers will eat the dead organisms and Decomposers will break down the dead organism and CYCLE the matter back into the system…they DO NOT CYCLE THE ENERGY)

3. *Food webs show the feeding relationship in an ecosystem. Energy pyramids show the transfer of energy. Remember as you move up the pyramid the amount of available energy decreases. (only 10% of the energy moves up the pyramids or down the food chain and 90% of the energy is used for life processes of the organism!*
4. Use the food web and convert to an energy pyramid!



TEKS	Unit 2: Matter and Energy in Ecosystems DCA Analysis	Test Question (Shade # if correct)				My %	Class Mastery %	HMS Mastery %	My Unit Mastery Overall
7.5A	I can **recognize** that *radiant energy* from the Sun is transformed into *chemical energy* through the process of photosynthesis.								%
7.5B	I can **demonstrate** and **explain** the *cycling of matter* within *living systems* such as in the decay of biomass in a compost bin.								
7.5C	I can **diagram** the *flow of energy* through *living systems*, including food chains, food webs, and energy pyramid. (Supporting)								
7.6A	I can **identify** that *organic compounds* contain carbon and other elements such as hydrogen, oxygen, phosphorus, nitrogen or sulfur.								

Assigned: ☐ Enrichment ☐ Intervention

Date _____ Report to _____

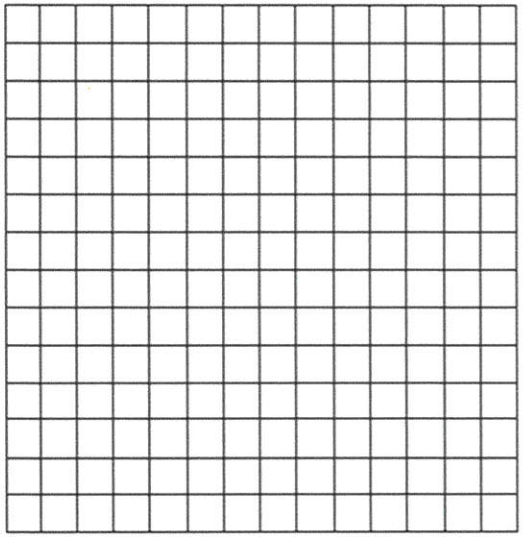
Answer the following Questions

1. Rate your confidence level on content knowledge: 10- High to 0- Low

   Before Test _____ After Test_____
2. After analyzing your test data, what concept(s) did you identify as challenging?

3. What resource or activity would or did assist you in understanding the concept(s) that challenged you?

Create a data table and graph using results from the Unit Test Analysis above. The data can be demonstrated in various ways. Select data you want emphasized. (Remember: TAILS and DRY MIX)

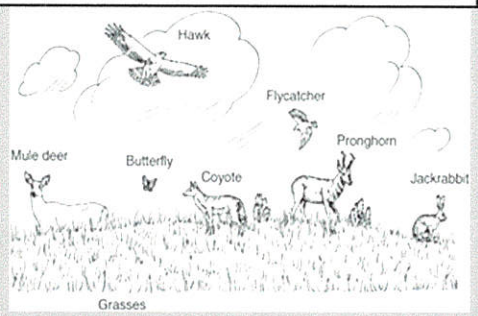
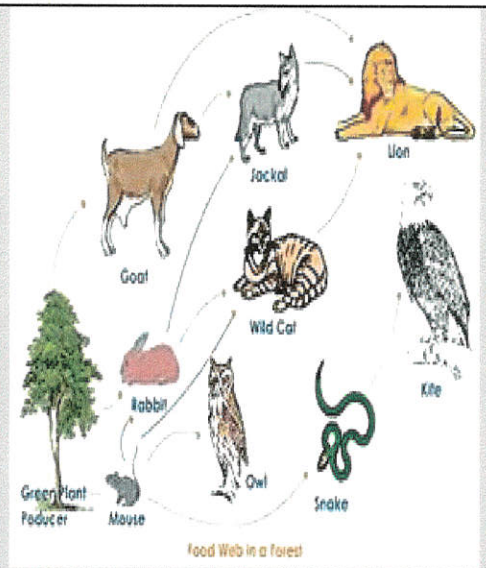


Student Organizer

	√	Homework/To Do List:
		Unit Menu: Choose 3 of the following activities below for credit
		Gizmos
		Daily Work Sheet
		Quizlet

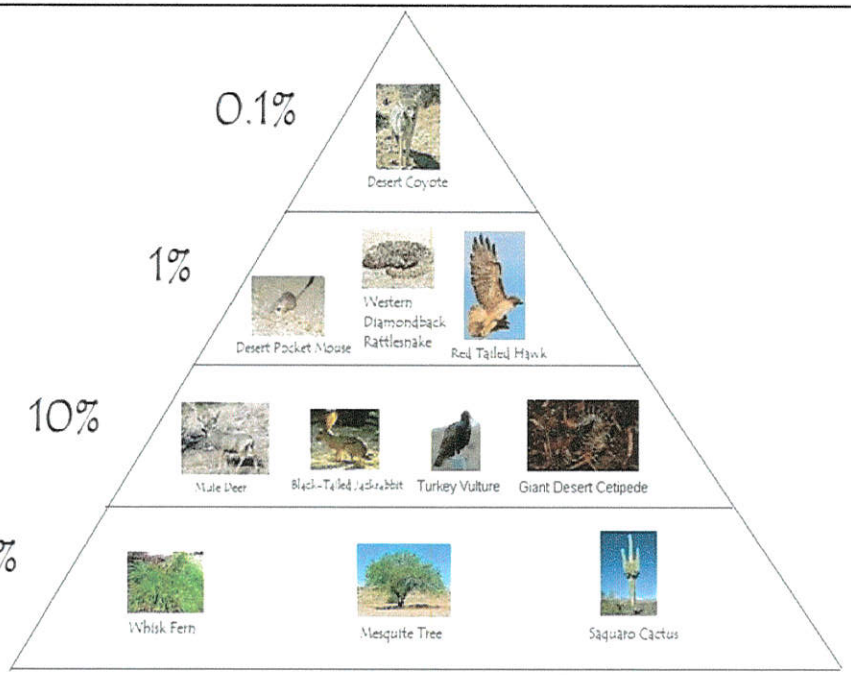
Special Reminders

Daily Work-Matter and Energy in an Ecosystem

	1	2	3	4
Monday	Which statement is correct? A. Matter cycles through an ecosystem. Energy does not. B. Neither matter nor energy cycles through an ecosystem. C. Both matter and energy cycle through an ecosystem. D. Energy cycles through an ecosystem. Matter does not.	The process of Photosynthesis converts radiant energy from the sun into what form of energy? _____	Which of the following chemical formulas is considered an organic compound? A. H_2O B. $C_6H_{12}O6$ C. NaCl D. H_2SO_4	$C_6H_{12}O_6$ (glucose) How many elements are found in glucose? _____ How many atoms? _____ Organic or Inorganic? _____
Tuesday	How might you be able to tell whether a substance is organic or inorganic just by looking at its chemical formula? _____ _____ _____ _____ _____ _____	Write the chemical equation for photosynthesis. Reactants: _____ Products: _____		Describe composting. _____ _____ _____ _____ Name 3 items that are useful in a compost pile. _____ _____ _____
Wednesday	 A grassland community is pictured above. Grasses are considered- a. Secondary consumers b. Primary consumers c. Decomposer d. Producer		Create an energy pyramid for the food web on the left. Also, determine which organism would have the most total energy available and the least total energy available. Most Energy_____ Least Energy_____	

83

Thursday



Label the energy pyramid to the left. Remember to include: consumers, tertiary consumers, secondary consumers, and producers.

Where do the producers get their energy?

_____

Which consumers get the most amount of their energy from the whisk fern, mesquite tree, and saguaro cactus?

_____

_____

_____

Which consumers get the most amount of their energy from the deer, rabbit, vulture and centipede?

_____

_____

_____

Which animal is the top of the energy pyramid?

_____

Friday

What is the difference between a food chain and a food web?

_____

_____

_____

_____

_____

What is an energy pyramid?

_____

_____

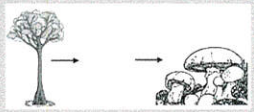
_____

_____

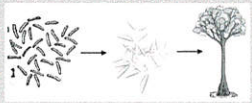
_____

Which diagram correctly demonstrates the flow of energy in a living system?

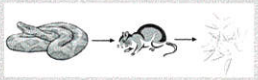
a.



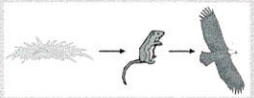
b.



c.



d.



Name the main elements that can be found in organic compounds:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Remember SPONCH

Notes or Questions:

_____

_____

_____

_____