Cover Letter

District Learning Assignments

Science

Teacher: Mrs. Peltz

Student and Parent Office Hours: Email and or Cyber High Chat: M-F, 10:00 am to 12:00 pm

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Zoom meeting will be set individually as needed

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Directions:

Each packet has an assignment sheet

- Complete assigned work for each class per assignment sheet
- Make sure to put your name and student ID on each page
- Use any available resources
- The Worksheets will be graded
- Score of at least 60% required to earn full credit for each packet

Packets are due 5/8/2020; (will email time and place to drop them off)

The next packet will be picked up at the same time and place as the drop off.

Environmental Science

Assignments: April 20 – 2

Monday
Read pp: 9, 11-12

Tuesday
Write the definition for half the vocabulary words on page 11, than write it in a sentence.

Wednesday
Finish writing the definition for ½ rest of the vocabulary words on page 11, than write it in a sentence.

Thursday
Read pp 13
Do Activities: 1 and 2

Friday
Read pp: 19 -21
Do Activity 3

Assignments: April 27 – May 1

Monday
Read pp: 44 – 46
Do Activity 15

Tuesday
Write the definition for half the vocabulary words on page 44, than write it in a sentence.

Wednesday
Finish writing the definition for ½ rest of the vocabulary words on page 44, than write it in a sentence

Thursday
Read pp: 47 – 48
Make 2 of your own food webs on another piece of paper. Do not forget to draw the lines and label your web.

Friday
Do Activity 16

UNIT INTRODUCTION

Prehistoric people needed to know the laws of nature in order to remain alive. They had to know which plants and berries they could safely eat, and where they could find food. It was necessary to know where the water was pure; where and when the largest fish could be caught; and where and when animals could be hunted or trapped to provide the best food, clothing, bedding, fuel, and bow strings. Early people had to understand the effects of weather and changing seasons on food supply and shelter; necessity forced them to gain knowledge of ecology. The same laws of nature apply to people today. As civilization has grown complex, people have gained control of natural resources. It appears that human beings are set apart from the rest of the world of nature. As the human population of the world has increased, people's relationship to the rest of the natural world has changed.

Modern people have to learn how to keep air, water, and soil free of harmful materials, such as insecticides, waste, and radioactive materials. People must learn how to keep soil from eroding and how to keep it fertile. By studying nature's population problems and how nature makes use of the sun's energy, the answer may be found to the great problem of feeding the ever-increasing human population.

You are the key in helping maintain and preserve our natural resources. Hopefully, this course will teach you concepts that will help you better understand various food chains and life cycles of which you are a part.

This course will help you explore the science of **Ecology** and to understand what happens in the natural world. It will help you explore your natural home and enjoy finding, understanding, and respecting the give and take among all living things.

Remember that you can study **Environmental Science** in a classroom or outdoors. The units in this course are designed to allow you to complete each one independently.

CHAPTER 1: CARBON – THE BUILDING BLOCK OF LIFE

Preview

Key Ideas

An understanding of chemistry is necessary to understand life. Carbon is the building block of life. Most of the materials necessary for life are composed of smaller components.

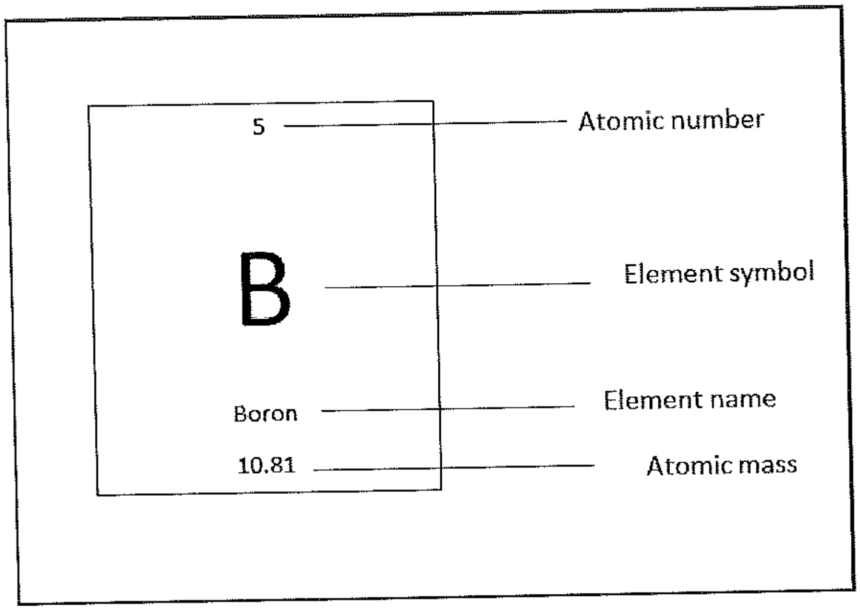
Key Vocabulary

amino acid
atomic number
atom
biomolecule
biosphere
carbohydrate
deoxyribonucleic acid
electron
element
hydrocarbon
inorganic molecule
lipid
neutron
nucleic acid
organic molecule
periodic table
protein
proton
ribonucleic acid

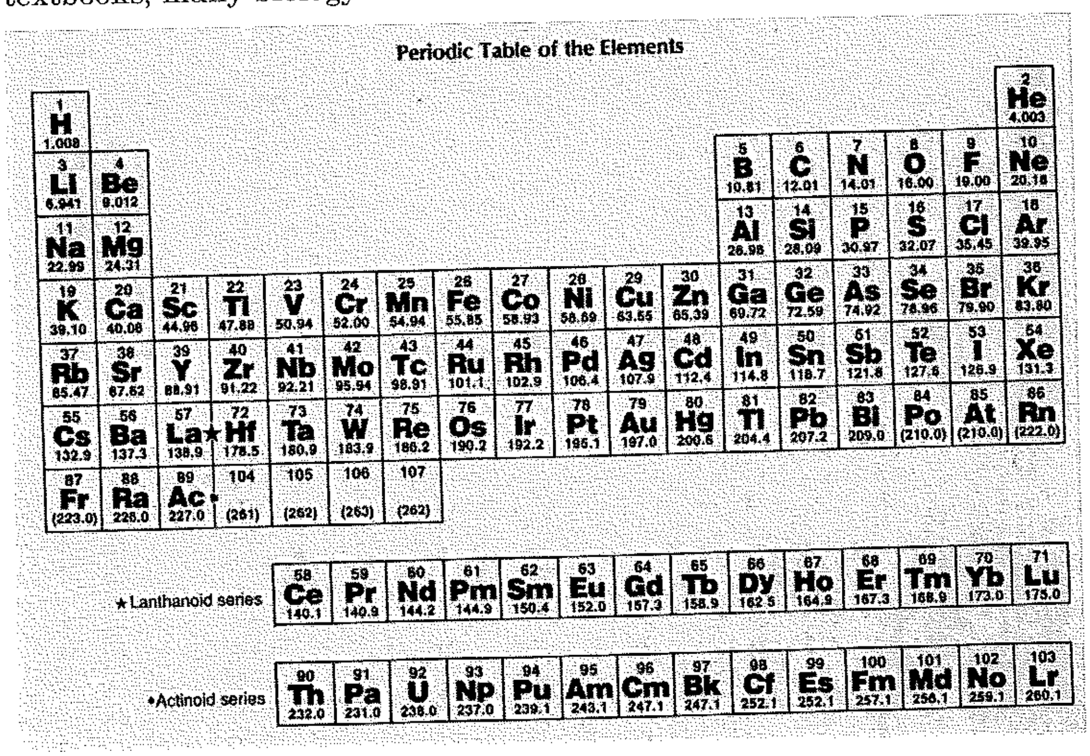
A Review of Chemistry

An ***element*** is a pure substance that cannot be broken into any other substance by normal chemical or physical methods. Gold is an element, as is sulfur, oxygen, and titanium. Elements are made of ***atoms***. Atoms are the basic particles that make up elements. The element titanium is made of atoms of titanium and that is all. The element titanium has different properties than the element sulfur because they have different atoms.

Atoms consist of three parts – ***protons, neutrons,*** and ***electrons***. The neutrons and protons are found in the nucleus of an atom. The nucleus is very dense: 99.9% of the mass of an atom is in the nucleus. If the nucleus was the size of a pencil eraser, it would weigh 300 million tons. A proton carries the positive electrical charge of the nucleus. The number of protons in the nucleus of an atom is unique to each element. It is the atomic ***number*** of the element. Elements are arranged on a ***periodic table*** by order of their atomic number. Protons and neutrons have nearly equal mass. Neutrons make up the rest of the weight of the nucleus. On the periodic table, the atomic mass is shown under the symbol for the element as seen in this example.



The entire periodic table is shown below. This diagram can be found in chemistry textbooks, many biology and environmental science references, and on the Internet.



Surrounding the nucleus at a relatively great distance are the ***electrons***. To get an idea of how great the distance is, imagine that the nucleus is about the size of a golf ball. The electron would be a fly circling the nucleus at a distance of 1.5 miles! The electrons carry a negative charge whose size equals that of a proton. Electrons are important because chemical reactions involve only the electrons, not the nucleus.

Of the 109 known elements, only about 20 play an essential role in life. Whether compared by weight or by numbers of atoms, four elements stand out as the most abundant in living organisms. They are carbon (C), hydrogen (H), oxygen (O), and nitrogen (N). Close behind are the elements calcium (Ca), phosphorus (P), chlorine (Cl), and sulfur (S).

ACTIVITY 1: Web Connection

Directions: Explore scientific sites on the Internet and read about the periodic table and elements. (If you do not have access to the Internet, please contact your school librarian to secure books, magazines, or newspaper articles to research the periodic table and elements.) Use the information to answer the questions below.

1. The scientist attributed with developing the first periodic table is:

   A. James Watson.
   B. Charles Darwin.
   C. Dmitri Mendeleev.
   D. H.G.J. Moseley.

2. The modern periodic table is arranged in order of increasing:

   A. atomic number.
   B. atomic mass.
   C. electron configuration.
   D. diameter.

3. The atomic number of an element is equal to the number of:

   A. protons.
   B. neutrons.
   C. electrons.
   D. nuclei.

4. The atomic mass of an element is equal to the number of

   A. protons.
   B. electrons.
   C. protons and neutrons.
   D. protons and electrons.

5. The right-hand side of the periodic table, which includes elements such as fluorine, krypton, and xenon, represents which type of element?

   A. metals
   B. metalloids
   C. nonmetals
   D. radioactive elements

6. When was the element Meitnerium discovered?

   A. 1654
   B. 1809
   C. 1982
   D. 2003

7. Which of the following metals is a liquid at room temperature?

   A. bromine
   B. mercury
   C. gallium
   D. hydrogen

8. Which of the following is a distinctive property of uranium?

   A. Uranium is a liquid metal.
   B. Uranium is radioactive.
   C. Uranium is a semimetal.
   D. Uranium is only manufactured in the lab.

9. Which of the following gases can build up in the lower level of structures and cause health problems?

   A. silicon
   B. arsenic
   C. radon
   D. zinc

10. Which of the following elements is most abundant in Earth's crust?

   A. carbon
   B. nitrogen
   C. oxygen
   D. silicon

ACTIVITY 2: The "Big Four" Elements in Life

Directions: Follow the steps below that will familiarize you with the periodic table and the properties of carbon, hydrogen, oxygen, and nitrogen.

1. Look at the **periodic table** and write down the atomic number and weight of each element. The number and weight of Carbon is an example.

Element	Symbol	Atomic Number	Atomic Weight
Carbon	C	6	12
Hydrogen	H	____	____
Oxygen	O	____	____
Nitrogen	N	____	____
Calcium	Ca	____	____
Phosphorus	P	____	____
Chlorine	Cl	____	____
Sulfur	S	____	____

2. Look at the table below. This table is based on the numbers of atoms found in plants, in Earth's crust, the oceans, and the atmosphere. Study the table and answer the questions that follow.

Element	**abundance in plants**	**abundance in Earth's crust**	**abundance in water**	**abundance in atmosphere**
hydrogen	49.8%	2.9%	66%	---
oxygen	24.9%	60.4%	33%	21%
carbon	24.9%	0.16%	0.0014%	0.03%
nitrogen	0.27%	----	----	78.3%

1. Where is **hydrogen** most abundant?

   A. plants
   B. Earth's crust
   C. water
   D. air

2. Where is **oxygen** most abundant?

   A. plants
   B. Earth's crust
   C. water
   D. air

3. Where is **carbon** most abundant?

   A. plants
   B. Earth's crust
   C. water
   D. air

4. Where is **nitrogen** most abundant?

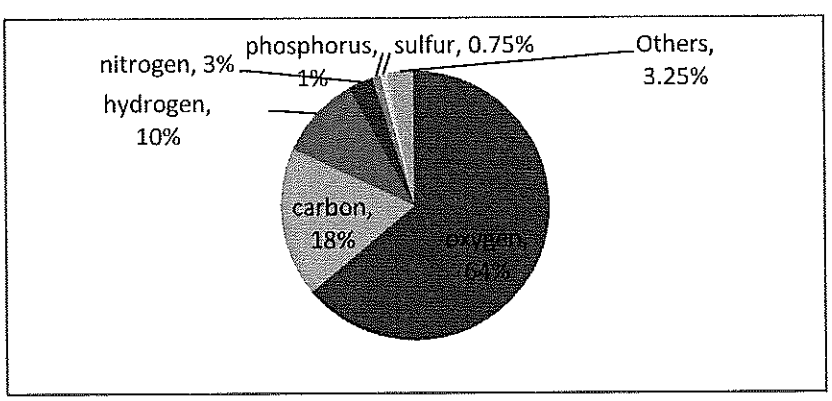
   A. plants
   B. Earth's crust
   C. water
   D. air

Biomolecules

Water is necessary for life. But carbon is also a necessary ingredient in living organisms. Most of the cells in an organism are carbon-based. These cells are called ***biomolecules.*** They are composed of carbon atoms bonded together with other elements. It is the unique structure and bonding of a carbon molecule that makes it so vital to life as we know it.

Carbon has four electrons in its highest energy level. This energy level can actually hold eight electrons. This means that the carbon atom can bond from up to four bonds with other atoms. Molecules that have carbon as their backbone are called ***organic molecules.*** But of course, not all molecules have a carbon backbone. Some are familiar to you. Water (H_2O), oxygen (O_2), and ammonia (NH_3) do not contain carbon, and yet are necessary for life. These are the ***inorganic molecules***.

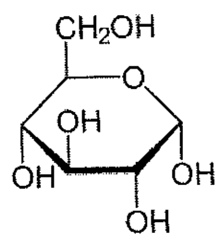
Carbon molecules that bond with hydrogen form ***hydrocarbons***. Many hydrocarbons are common fuels. Methane (CH_4) is natural gas, which is used to heat homes. Your body also uses hydrocarbons to store energy. Living things are composed of different elements. The following chart shows the approximate distribution of these elements within cells. These elements combine to form the chemicals necessary for life.



Macromolecules and Life

These organic compounds, called macromolecules, are necessary for the cells in an organism, and therefore the organism as a whole, to function properly. This chapter covers four of these organic compounds.

- **Carbohydrates:** Carbohydrates are made of carbon, hydrogen, and oxygen. Sugar and starch are carbohydrates. Carbohydrates such as glucose, fructose, or sucrose usually have a ring-shaped structure comprised of carbon, hydrogen, and oxygen atoms. Plants store the sugar they produce as starch.

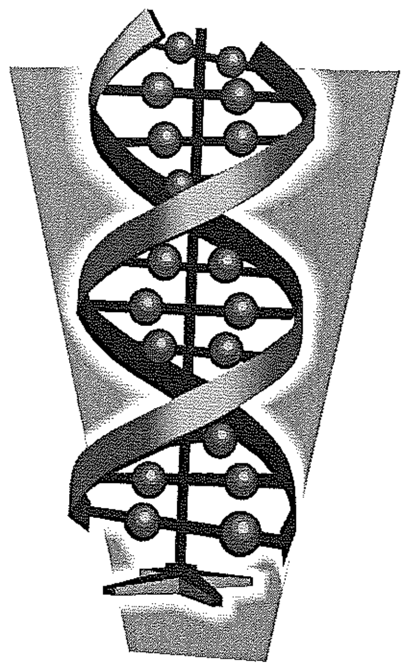


Glucose ($C_6H_{12}O_6$)

- **Lipids:** Lipids are also made of carbon, hydrogen, and oxygen. But they are typically arranged in long chains, rather than in rings. Lipids are fats. Unsaturated fats are liquid at room temperature and usually derived from plants. Examples include corn oil and olive oil. Saturated fats are solid at room temperature and include most animal fats. Butter and lard are saturated fats. Lipids are a good source of stored energy for cells.

- **Proteins:** Proteins are made of carbon, hydrogen, oxygen, and nitrogen. Some proteins also contain sulfur. Proteins are made of smaller units called ***amino acids***. There are usually 20 amino acids that arrange themselves in different orders to form all the proteins needed for cell functions. Proteins are vital to cells – working to build the parts of cells, transporting materials, and controlling chemical reactions that occur.

- **Nucleic Acids:** The nucleic acids are ***deoxyribonucleic acid (DNA)*** and ***ribonucleic acid (RNA)***. These large molecules are made of *nucleotides* – repeating units of a sugar made of five carbon atoms, a phosphate group (made of phosphate and oxygen), and a nitrogenous base (containing carbon, hydrogen, oxygen, and nitrogen). Nucleic acids contain a cell's genetic information. This genetic information determines a person's characteristics, such as hair color, eye color, and height and predispositions to certain illnesses.



ACTIVITY 3: Check Your Understanding

Directions: Match the term in column B with the description in column A.

Column A	Column B
_____1. composed of long chains of carbon and hydrogen atoms	A. inorganic molecules
_____2. provide genetic information for a cell	B. organic molecules
_____3. includes sugars and starches	C. carbon
_____4. contain carbon and hydrogen	D. amino acids
_____5. H_2O, NH_3, and O_2, for example	E. lipids
_____6. forms four bonds	F. nucleic acids
_____7. building blocks of proteins	G. carbohydrates

ACTIVITY 4: Try This

Directions: Obtain a food carton, such as cereal, pasta, with a nutritional label on the side. Use that information to answer the following questions.

1. What is one example of a lipid in this food?

____

____

2. What is one example of a carbohydrate found in this food?

____

____

3. How much protein is in one serving of this food?

____

____

CHAPTER 3: LIFE WITHIN AN ECOSYSTEM

Preview

Key Ideas
Ecosystems consist of living things and nonliving things; the living things produce food, consume food, or decompose.

Key Vocabulary

carnivores	omnivores
consumers	primary consumer
decomposers	producers
energy pyramid	quaternary consumer
food chain	secondary consumer
food web	tertiary consumers
herbivores	trophic level

Energy Within an Ecosystem

The biotic factors in an ecosystem need energy for life – for growth, for movement, and for reproduction. The means by which these organisms get their energy is what makes life on Earth so unique.

- Some organisms are ***producers***. Producers make their own energy. Producers, such as plants, use energy from the Sun to make organic compounds.
- Other organisms are ***consumers***. Consumers eat plants (or other consumers) to get their energy. Grasshoppers, tigers, sharks, and humans are all consumers. These organisms are unable to make their own energy.
- A third group of organisms, the ***decomposers***, breaks down wastes and dead organisms. Decomposers include organisms such as fungi, earthworms, and bacteria.

In other words, some energy enters an ecosystem in the form of sunlight. Producers convert this sunlight to energy. The consumers then eat producers to get their own energy. After a producer or a consumer dies, the decomposer uses the waste as a source of energy. In this way, energy moves in and out of an ecosystem.

Energy may pass through an ecosystem but chemicals remain in an ecosystem. Chemicals can be used repeatedly within an ecosystem – they cycle within.

A Food Chain

Organisms eat and are eaten within an ecosystem. This is how energy and chemicals move through the ecosystem. A ***food chain*** is a simple diagram which shows how energy moves through an ecosystem. Each step in a food chain is called a ***trophic level*** (deeding level).

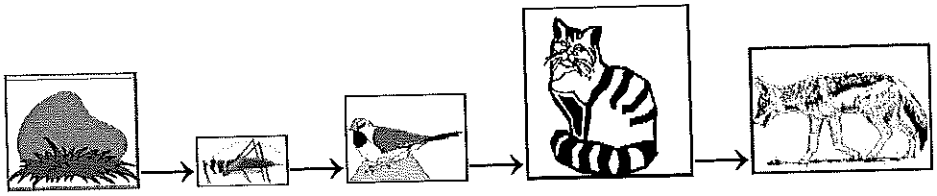
The first level in a food chain is the producer. These plants convert sunlight into energy. Consumers eat plants.

- A consumer that feeds directly on producers is called ***a primary consumer.*** Consumers also eat primary consumers.
- The organisms that eat primary consumers are called ***secondary consumers.***
- The pattern continues as ***tertiary consumers*** (or third-level consumers) eat the secondary consumers.
- Some ecosystems are large enough to support ***quaternary consumers*** (fourth-level consumers) that eat the tertiary consumers.

As these organisms produce waste and die, decomposers consume their bodies and waste products.

Here is an example: The simple food chain below shows how the energy flows from the producer (the grass) to the primary consumer (the grasshopper), to the secondary consumer (the bird), to the tertiary consumer (the cat), and finally to the quaternary consumer (the coyote). The decomposers (fungi and bacteria) then utilize the waste.

grass → grasshopper → bird → cat → coyote → fungi and bacteria

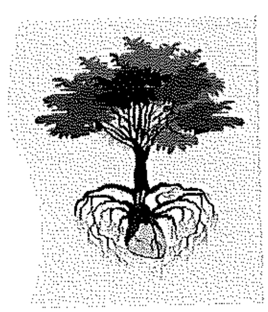


Consumers often have specific names, depending upon what they eat. Primary consumers that eat only plants are known as ***herbivores***. Consumers that eat only meat are ***carnivores***. And some consumers eat both plants and animals. These are called ***omnivores.***

ACTIVITY 15: Try This

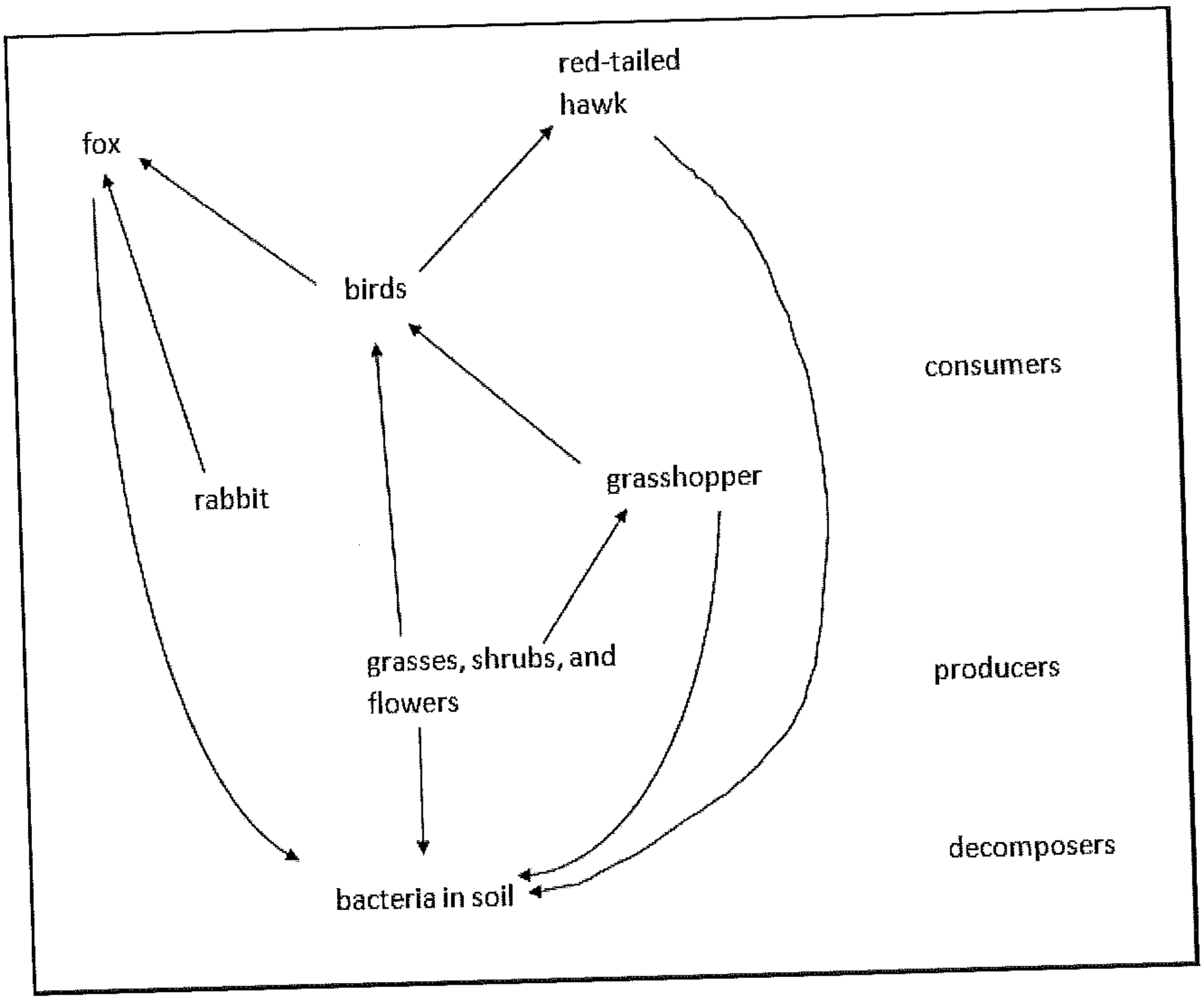
Directions: Fill in the blanks in the sentences below.

1. A field mouse eats only grass. Its tropic level is __________. The mouse only eats grasses and plants so it is a(n) ___________.
2. A snake might eat the field mouse. Its tropic level is ___________. This snake's diet consists of small animals like mice. Therefore, it is a(n) _______________.
3. A hawk might eat the snake, which ate the field mouse. Its trophic level is_________. Hawks only eat small animals like snakes or fish or other birds. Hawks are a(n) ___________.
4. A black bear has a varied diet. It might eat fish, berries, bees, bird eggs, or honey. The black bear is a (n) ___________.



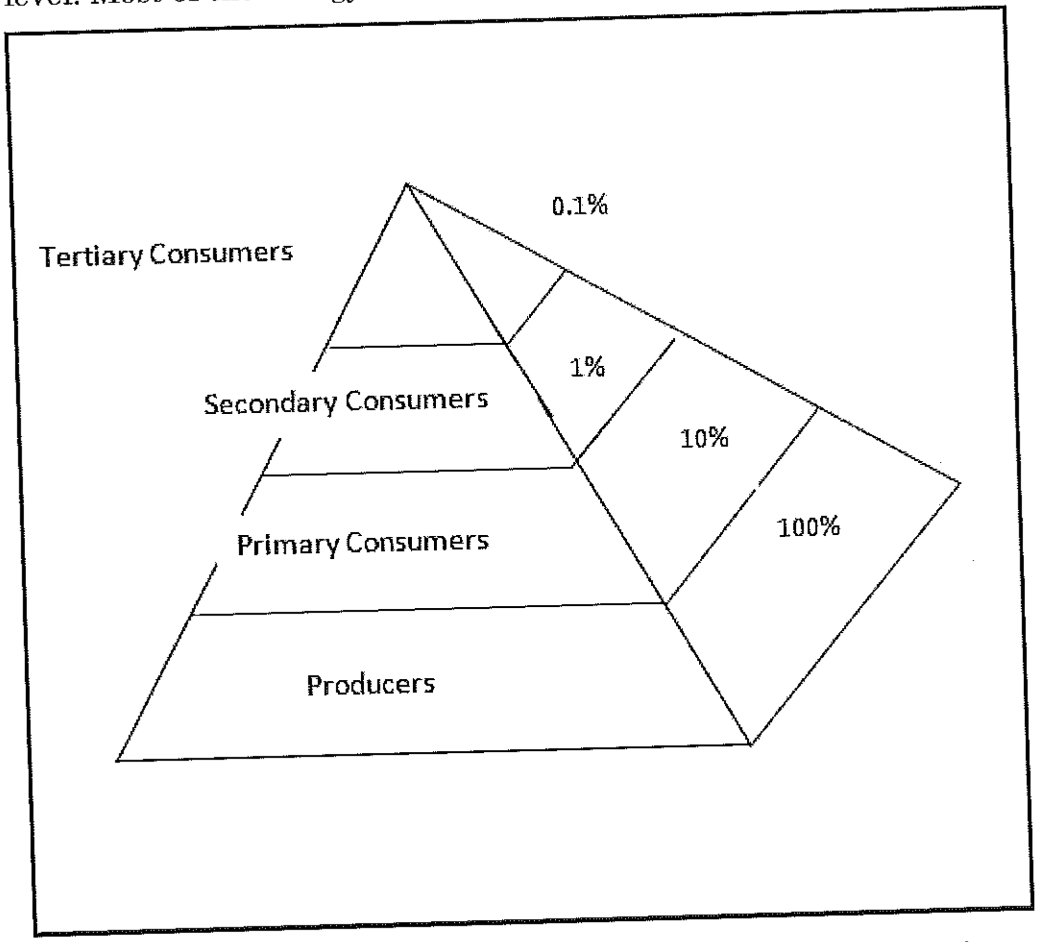
A Food Web

In a real ecosystem, the feeding relationships among organisms are not that neat. For example, a bird may eat grasshoppers, worms, or insects. A consumer may be a primary consumer, secondary consumer, or even a tertiary consumer depending on the available food. A more accurate way of displaying the feeding relationships within an ecosystem is with a ***food web***. Food webs show some of the interconnected food chains in an ecosystem.



Energy Pyramids

An ***energy pyramid*** shows the loss of energy from one trophic level to the next. Generally speaking, only about 10% of the energy available at one trophic level is available for use at the next trophic level. In other words, not all of the energy that is available in a flower is actually converted to biomass at the primary consumer level. Most of the energy is lost as heat.



Suppose there were 10,000 kcal of energy available at the primary producer level where the grasses are. The grasshopper that eats the grass uses only 1,000 kcal of that energy. The other 9,000 kcal is lost to the environment as heat. When the secondary consumer, the bird, eats the grasshopper, only about 10% (100 kcal) of the energy is used by the bird. Again, the rest is lost as heat. And finally, when the fox eats the bird, it only gets about 10% (10 kcal) of that energy. This helps explain why most ecosystems only have three or four trophic levels. A top consumer, such as a lion or a hawk, has few if any natural predators. The energy stored in the top consumers is just not enough to feed another trophic level.

ACTIVITY 16: Try This

Directions: Study the examples of a simple pond and pine forest ecosystem below. Then answer the questions that follow.

Simple Ecosystems. All ecosystems, including the two shown here, are composed of at least four different parts. These are as follows:

Chemicals. Organic and inorganic substances such as oxygen, calcium, phosphorus, salts, etc. Small parts of these nutrients are ready for use right away. A larger part is held back, especially in the sediments at the bottom of the pond.

Procures are organisms capable of making their own food:

- Tiny floating plants, called plankton, live all through the pond as far down as the sunlight reaches. They are the pond's food factory.
- Plants rooted in shallow water or large floating plants that provide food and shelter for many different animals.

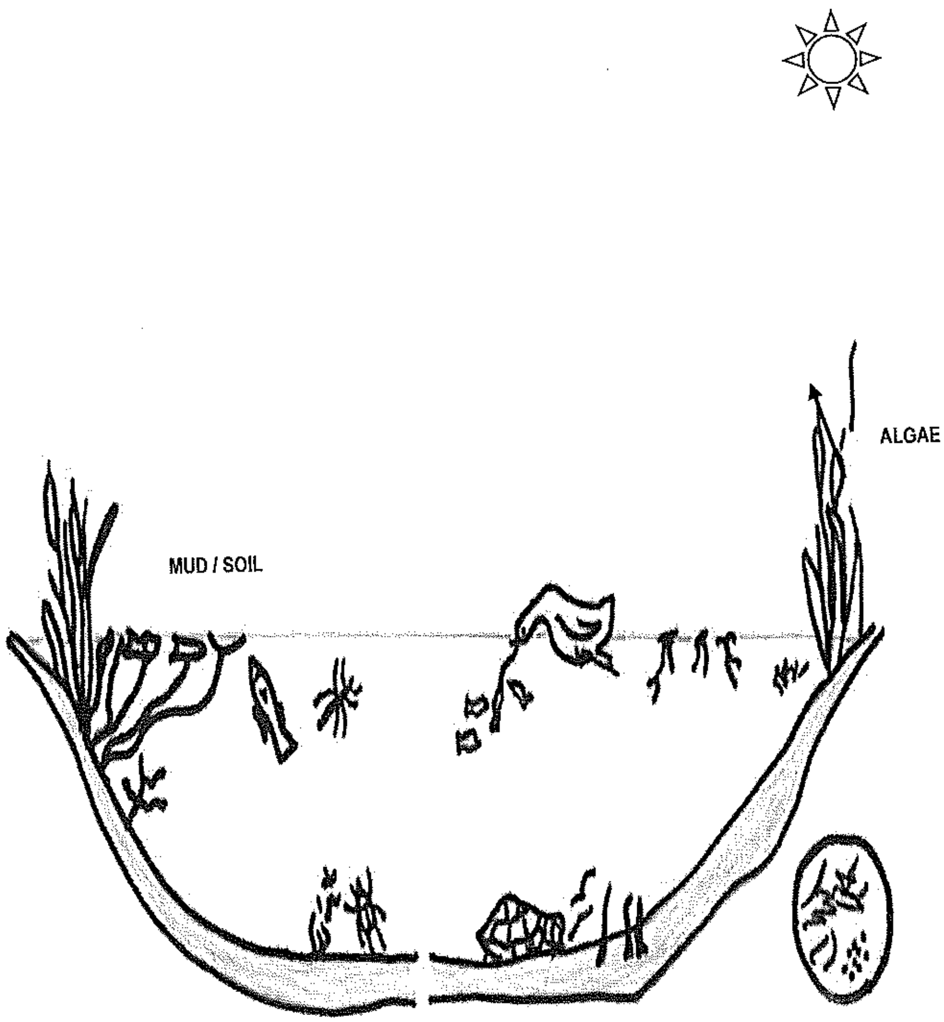
Consumers are organisms unable to make their own food:

- Primary consumers (herbivores) feed directly on green plants or algae.
- Secondary consumers feed on the primary consumers.

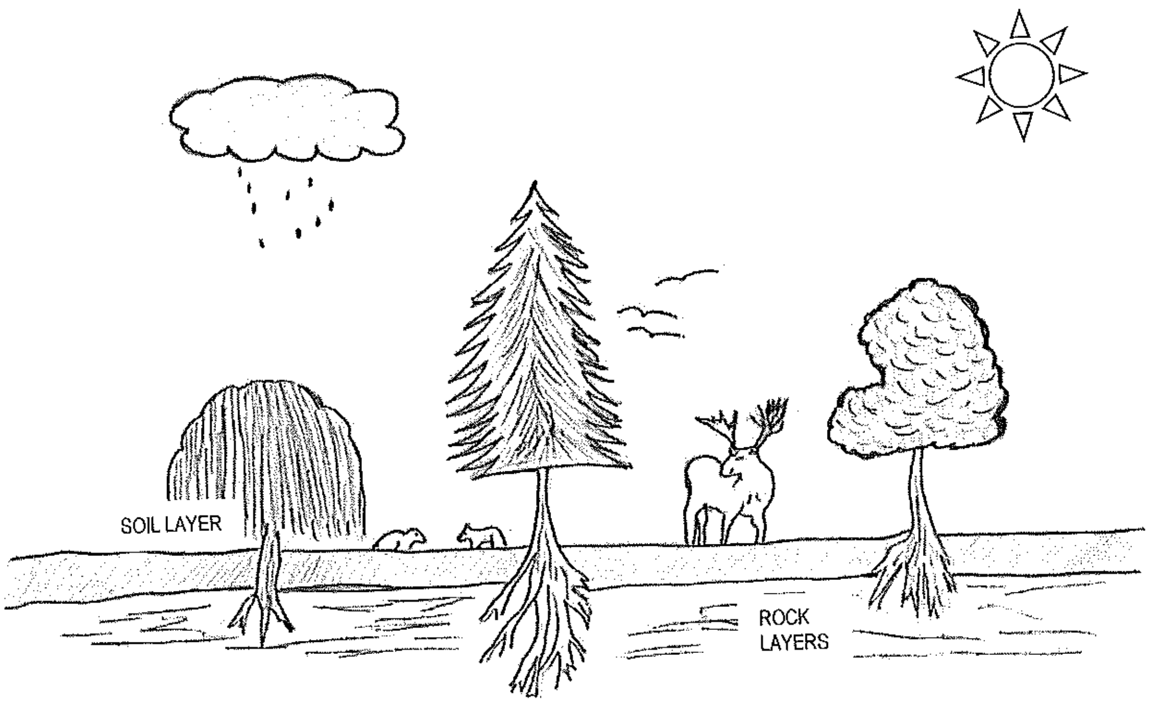
Decomposers feed on dead or decaying material

- Includes bacteria and fungi.
- Decomposers release chemical substances that are reused by other organisms.

Simple Pond Ecosystem



Pine Forest Ecosystem



1. What is the primary source of energy for all ecosystems?

   A. soil
   B. decomposers
   C. the Sun
   D. producers

2. List three abiotic factors in each ecosystem.

   pond: ____________ ____________ ____________

   forest: ____________ ____________ ____________

3. What is the food source for the bacteria and fungi?

   A. producers
   B. consumers
   C. dead organic material
   D. oxygen

4. Which of the following is the only living organism able to make its own food?

   A. bacteria
   B. fungus
   C. plants
   D. worms

5. Define producer and give an example from the forest ecosystem.

____

____

____

____

6. Define a primary consumer and give an example from the pond ecosystem.

____

____

____

____