Norwalk High School Science Department

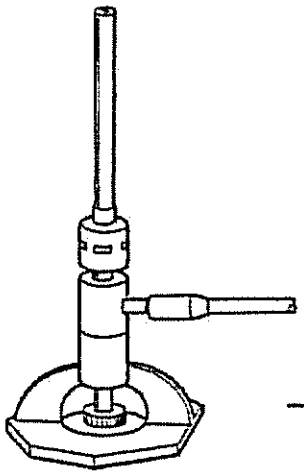
Biology Summer Work

Information	Assignment Specifics
Date Due	First Day of Class for the 2018-19 school year
Estimated time for Completion	5-10 hours
Resources needed to complete assignment	Khan Academy Crash Course from Youtube.com Discovery Education
Assignment Assessment	This assignment may be assessed in multiple ways, including, but not limited to: • Score based on % completion (ie: if a student completes 75% of the packet, the earned score is 75%) • Introductory quiz based on material • Application of material to Common Formative Assessments (CFAs)
Purpose of Assignment	1. Review of foundational content/concepts/skills 2. Exposure of content/concepts/skills that cannot be covered during the school year 3. Review of material to be covered in Biology curriculum
Requirements	The completion of this packet is **required** for **ALL** Norwalk High School students entering **Biology**

Name_____

Laboratory Equipment

Write the name of each lab instrument or piece of equipment.



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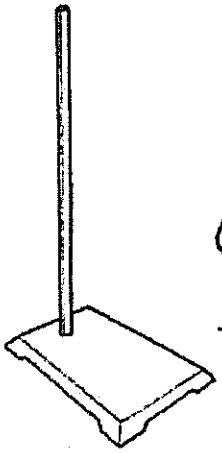

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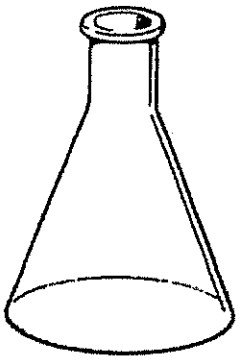

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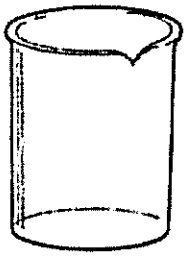

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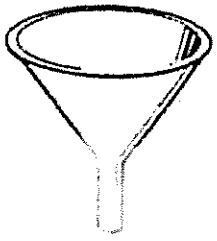

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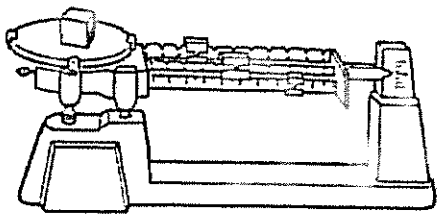


_____

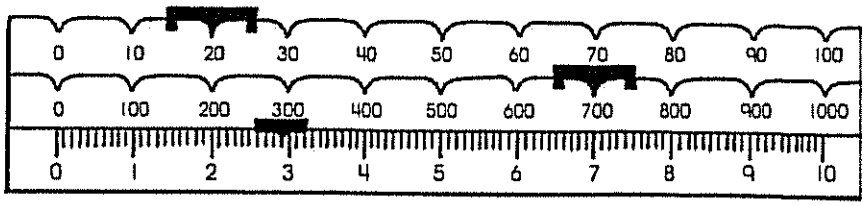
balance	beaker	Bunsen burner
Erlenmeyer flask	funnel	graduated cylinder
ring stand	test tube	test tube clamp
tongs		

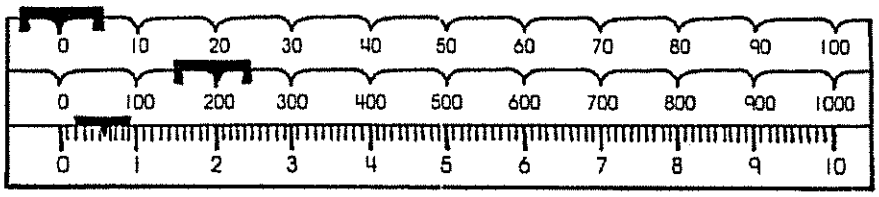
Name_____

Using the Balance

Identify the mass shown on each balance.

_____





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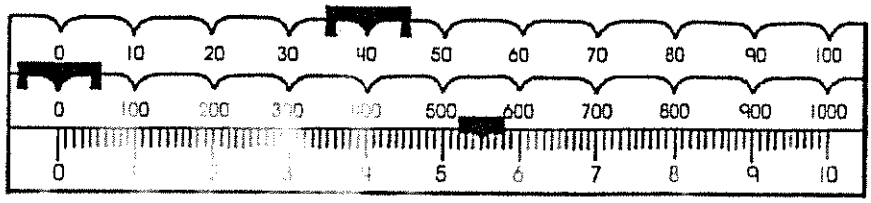

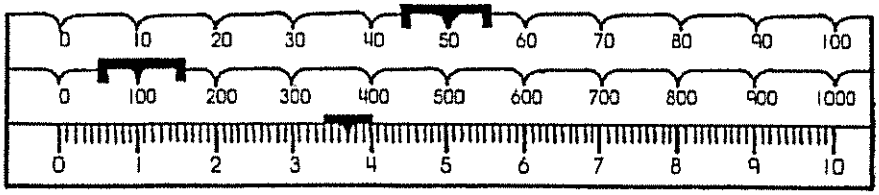

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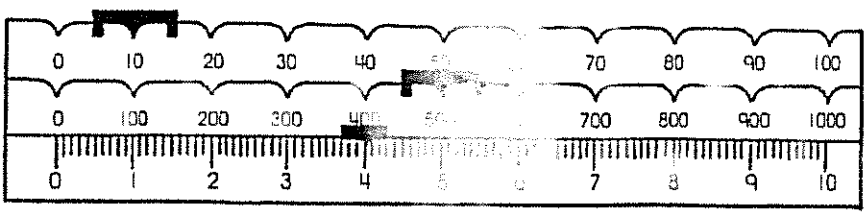
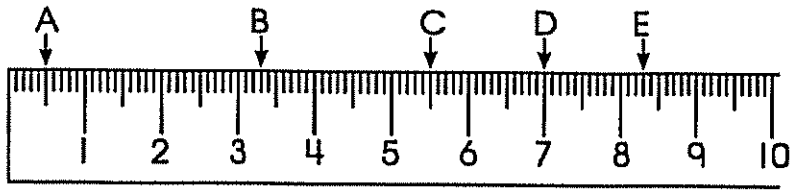


Name_____

Measuring Length

Identify the lengths marked on the centimeter ruler.



	cm	mm
A.	_____	_____
B.	_____	_____
C.	_____	_____
D.	_____	_____
E.	_____	_____

Measure each line with a centimeter ruler.

1. _____

2. _____

3.  _____

4. _____

5.  _____

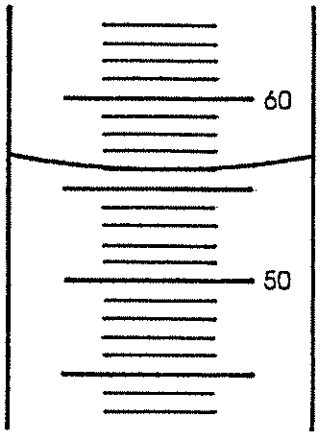
6.  _____

7. _____

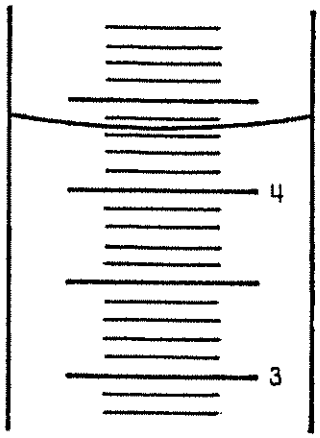
Name_____

Measuring Liquids

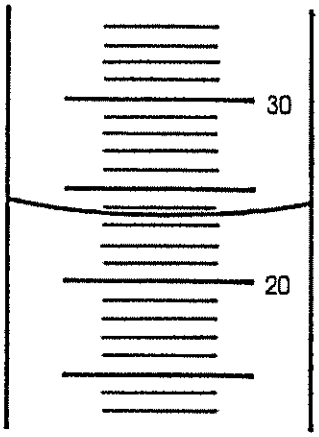
Identify the volume indicated on each graduated cylinder. The unit of volume is mL.



1. _____



4. _____



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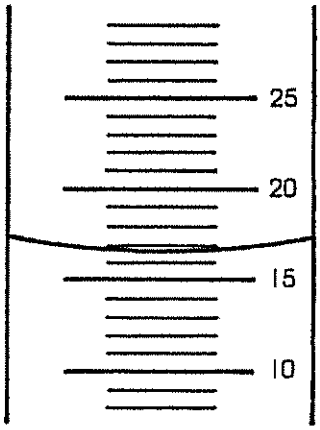
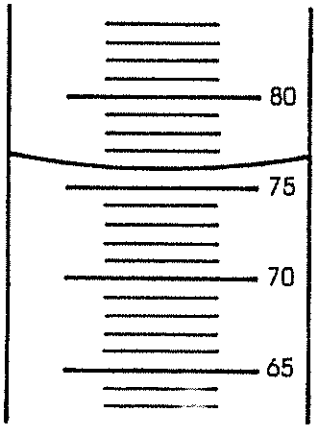


2. _____



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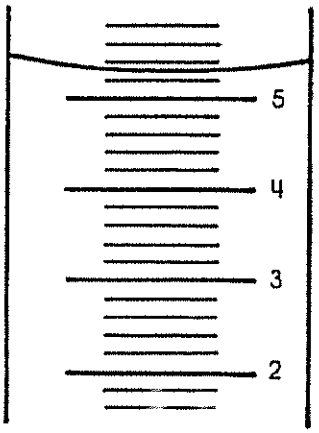
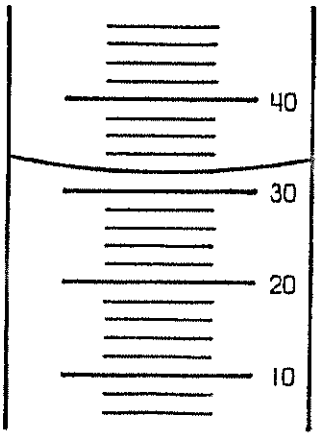
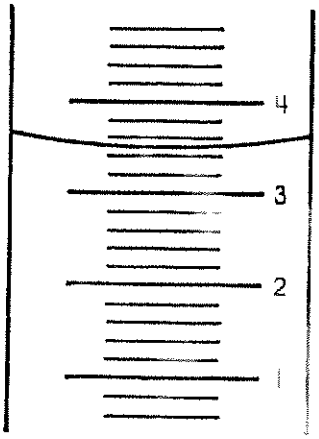


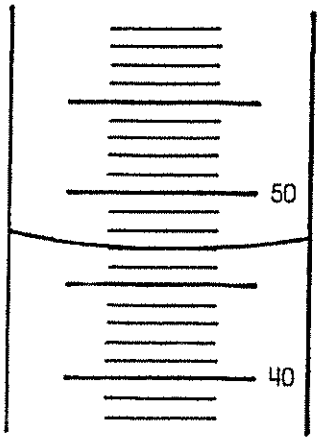
8. _____



3. _____



6. _____



9. _____

Name_____

Metrics and Measurement

Scientists use the metric system of measurement, which is based on the number 10. It is important to be able to convert from one unit to another.

kilo-	hecto-	deca-	Basic Units	deci-	centi-	milli-
(k)	(h)	(da)	gram (g)	(d)	(c)	(m)
1000	100	10	liter (L)	0.1	0.01	0.001
10^3	10^2	10^1	meter (m)	10^{-1}	10^{-2}	10^{-3}

Using the chart above, we can determine how many places to move the decimal point and in what direction by counting the places from one unit to the other.

Example: Convert 5 mL to L.

Answer: To go from milli (m) to the basic unit (liters), count on the above chart three places to the left. Move the decimal point three places to the left and 5 mL becomes 0.005 L.

Convert each measurement.

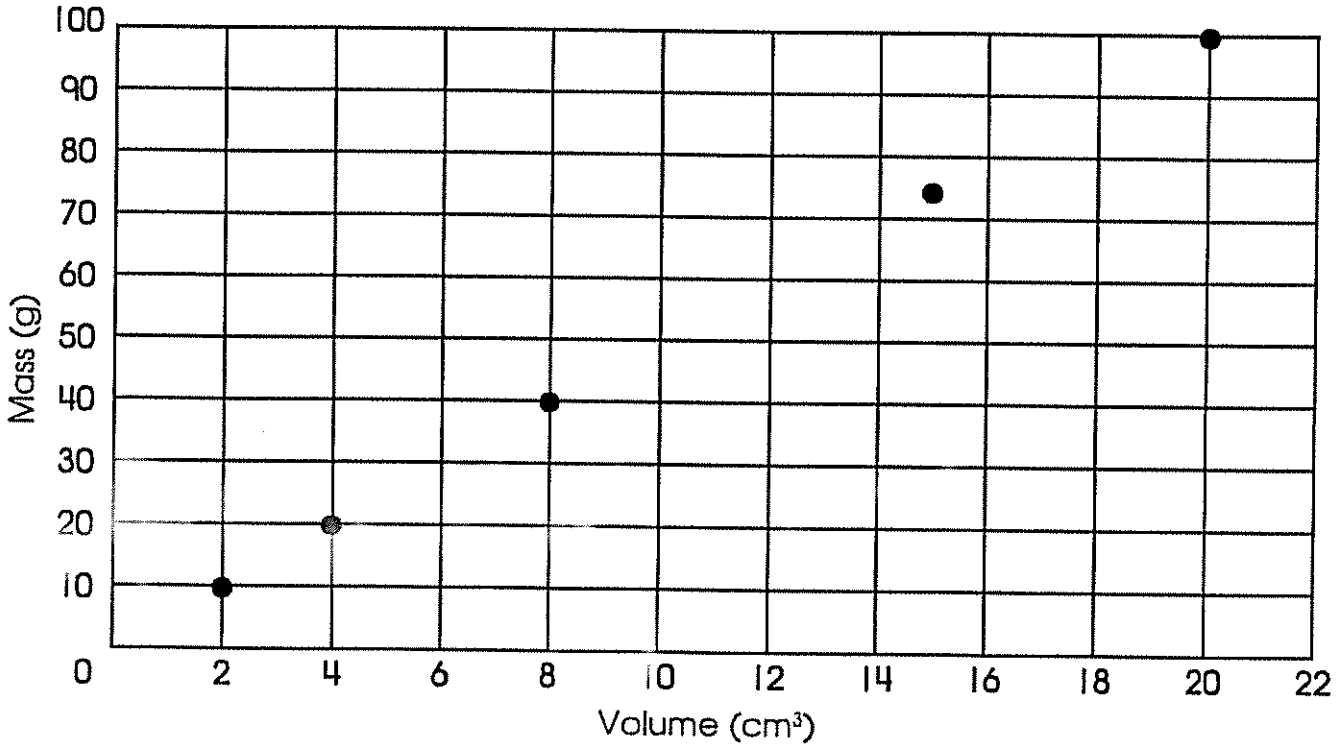
1. 35 mL = _____ dL
2. 950 g = _____ kg
3. 275 mm = _____ cm
4. 1.0 L = _____ kL
5. 1.0 mL = _____ L
6. 4,500 mg = _____ g
7. 25 cm = _____ mm
8. 0.005 kg = _____ dag
9. 0.075 m = _____ cm
10. 15 g = _____ mg

Name_____

Graphing of Data

Graphing is an important tool in science. It enables us to see trends that are not always obvious. Graph the following data and answer the questions below.

Mass of Liquid (g)	Volume of Liquid (cm^3)
20	4
100	20
75	15
40	8
10	2



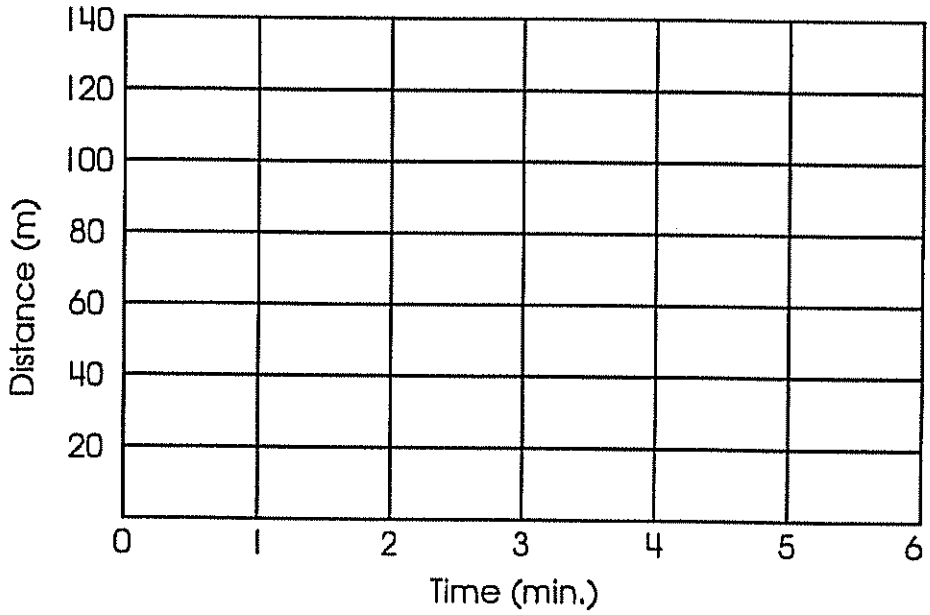
1. As mass increases, what happens to the volume? _____
2. As volume increases, what happens to the mass? _____
3. How many grams of liquid would occupy 12 mL? _____
4. What volume would 90 g of liquid occupy? _____
5. What is the density of the liquid? _____

Name_____

Calculating Average Speed

Graph the following data and answer the questions below.

Time (min.)	Distance (m)
0	0
1	50
2	75
3	90
4	110
5	125



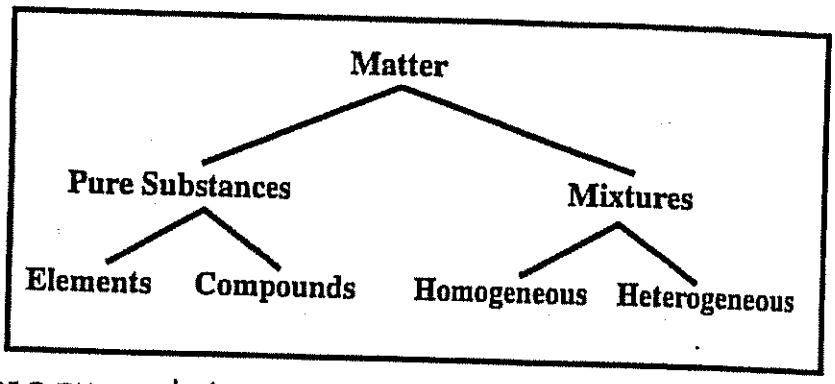
$$\text{average speed} = \frac{\text{total distance}}{\text{total time}}$$

1. What is the average speed after two minutes? _____
2. What is the average speed after three minutes? _____
3. What is the average speed after five minutes? _____
4. What is the average speed between two and four minutes? _____
5. What is the average speed between four and five minutes? _____

Classification of Matter

Matter is defined as something that

- has mass or weight.
- takes up space (has volume).
- exhibits the property of inertia. (If something is at rest, it stays at rest unless a force acts on it.)
- cannot occupy the same space as other matter at the same time.



All matter can be categorized as either a pure substance or a mixture.

Pure Substances

A pure substance has the same composition throughout, and pure substances often occur naturally. Two examples of pure substances are elements and compounds.

- **Elements** cannot be broken down.
- **Compounds** are formed from the chemical combination of two or more elements. These elements cannot be separated by physical means. The properties of a compound are entirely different from the properties of each of the elements that make up the compound.

Mixtures

Mixtures are formed when two or more substances (solids, liquids, or gases) are physically combined. The parts of a mixture can by physically separated from one another. All of the substances in a mixture retain their original properties.

There are two kinds of mixtures:

- **Homogeneous Mixture**—The parts of the mixture are evenly distributed.
- **Heterogeneous Mixture**—The parts of the mixture are *not* evenly distributed.

Write *P* or *M* before each of the following to indicate whether it is a pure substance or a mixture.

1. ____ table salt
2. ____ mixed nuts
3. ____ sugar
4. ____ fruit salad
5. ____ aspirin
6. ____ prepared instant coffee

Write *HO* or *HE* before each of the following to indicate whether it is a homogeneous mixture or a heterogeneous mixture.

7. ____ oil & vinegar salad dressing
8. ____ soil
9. ____ seawater
10. ____ mayonnaise
11. ____ bronze
12. ____ soda pop

Acid or Base?

Acids

Acids are compounds that taste sour, conduct electricity, and react with metals to produce hydrogen gas. Acids contain one or more hydrogen ions. An example of a weak acid is acetic acid (vinegar). Sulfuric acid, hydrochloric acid, and nitric acid are all strong acids.

Bases

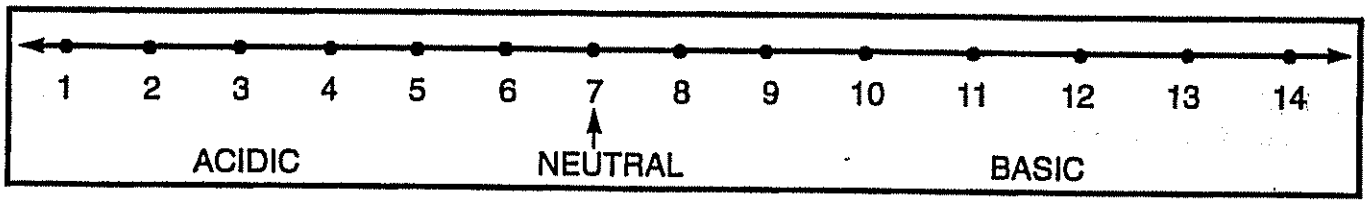
Bases taste bitter, feel slippery, dissolve oils and fats, and contain one or more hydroxide (OH^-) ions. Magnesium hydroxide and calcium hydroxide are weak bases. Sodium hydroxide is a very strong base.

Neutral Substances

If something is not an acid or a base, it is neutral. Pure water, for example, is a neutral substance.

pH

A scale called the pH scale is used to indicate the strength of an acid or a base. On the pH scale, substances with a pH from 0 to less than 7 are acidic. Those with a pH greater than 7 up to 14 are basic. Those with a pH of 7 are neutral.



Indicators

A substance's pH can be measured precisely using a pH meter. Approximate pH can be determined using a chemical indicator. Indicators change color in the presence of acids or bases. Bromothymol blue, phenol red, phenophthalein, and litmus paper are examples of chemical indicators. Litmus is a common indicator made from lichen plants. In acids, blue litmus paper turns red. In bases, red litmus paper turns blue.

Write *A* in the blank if the substance is an acid. Write *B* if it is a base.

1. ____ Human blood has a pH of 7.4.
2. ____ A soft drink has a pH of 3.
3. ____ A tomato has a pH of 4.
4. ____ Milk has a pH of 6.5.
5. ____ Urine has a pH of 6.0.

Match each acid or base with the answer that tells where it can be found.

6. ____ Ascorbic acid helps build strong teeth and bones.
7. ____ Carbonic acid adds fizz to beverages.
8. ____ Acetic acid has a sour taste and a sharp smell.
9. ____ Hydrochloric acid forms naturally in humans, and it aids in digestion.
10. ____ Sodium hydroxide can break down grease and other waste.
11. ____ Sulfuric acid is a strong acid that is highly corrosive.

A. deodorant
B. soft drinks
C. oranges
D. vinegar
E. drain cleaner
F. stomach acid
G. car battery

An Atom: The Smallest Part of Matter
What's It All About?

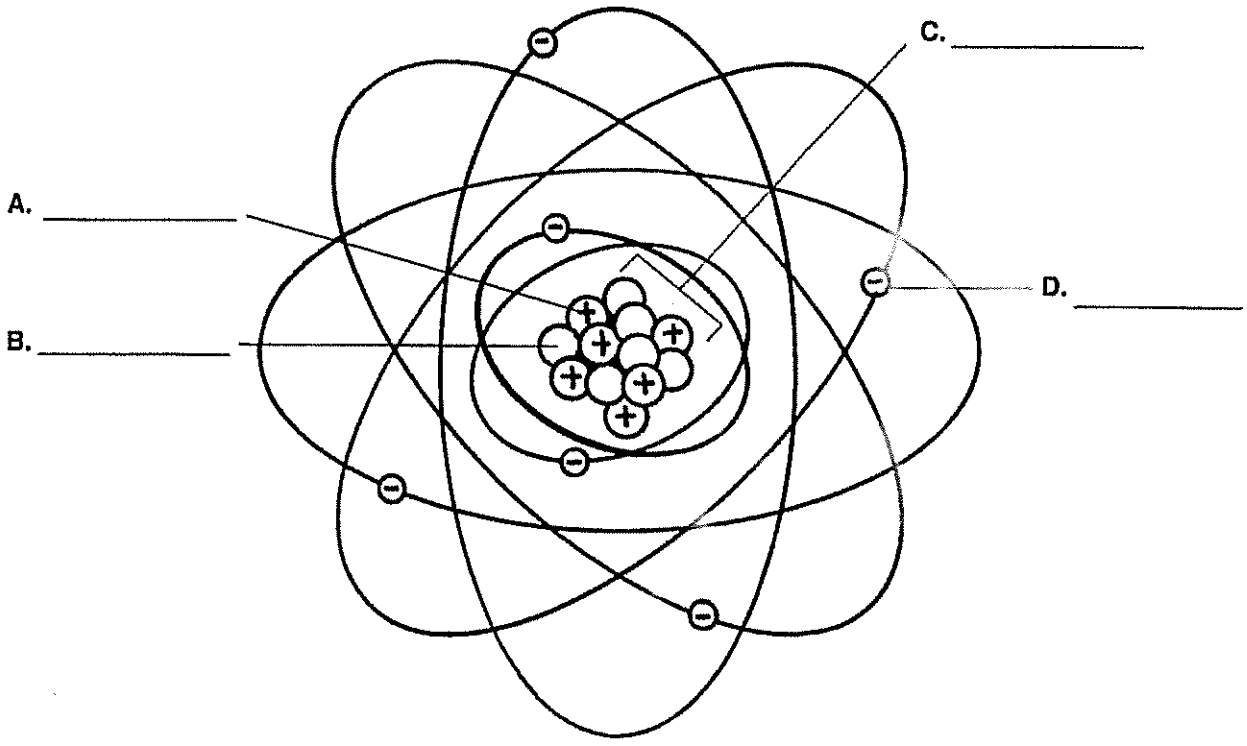
All matter is made of very tiny particles. These particles keep the same characteristics or properties that the matter has. These particles are called atoms. All atoms are about the same size, and they are VERY tiny. An atom is more than one million times smaller than the thickness of a single hair on your head! It would take billions of atoms just to make up the period at the end of this sentence.

Because atoms are so small, scientists have never really been able to see them. Using very powerful microscopes, scientists have been able to see evidence of atoms and how they behave. From these observations, they have developed a model of what they believe atoms look like. The most recent model is known as the Electron Cloud Model.

According to this model, all atoms have the same basic parts: protons, neutrons, and electrons. The protons are positively-charged particles. Neutrons are particles that have no electric charge, and electrons are negatively-charged particles. Protons and neutrons are found in the center of the atom in a core called the nucleus. Electrons are found in a cloud that continually moves around the nucleus.

Even though they are the smallest part of all matter, atoms must fit our definition of matter. Scientists have found that atoms do have mass. Most of the mass of an atom is formed by the protons and neutrons, so most of the mass is found in the atom's nucleus. Atoms also take up space. Most of the space of the atom is taken up by the electron cloud that circles the nucleus.

Label the diagram below:



Name _____ Date _____

For the student:

1. What is the smallest part of all matter?

2. Why haven't scientists been able to study atoms directly?

3. What is the current model of an atom called?

4. What are the three basic parts of an atom?

5. What electrical charges do these parts have?

6. Where are the basic parts found?

7. Where is most of the mass of an atom found?

8. What part of the atom takes up most of its space?

Name_____

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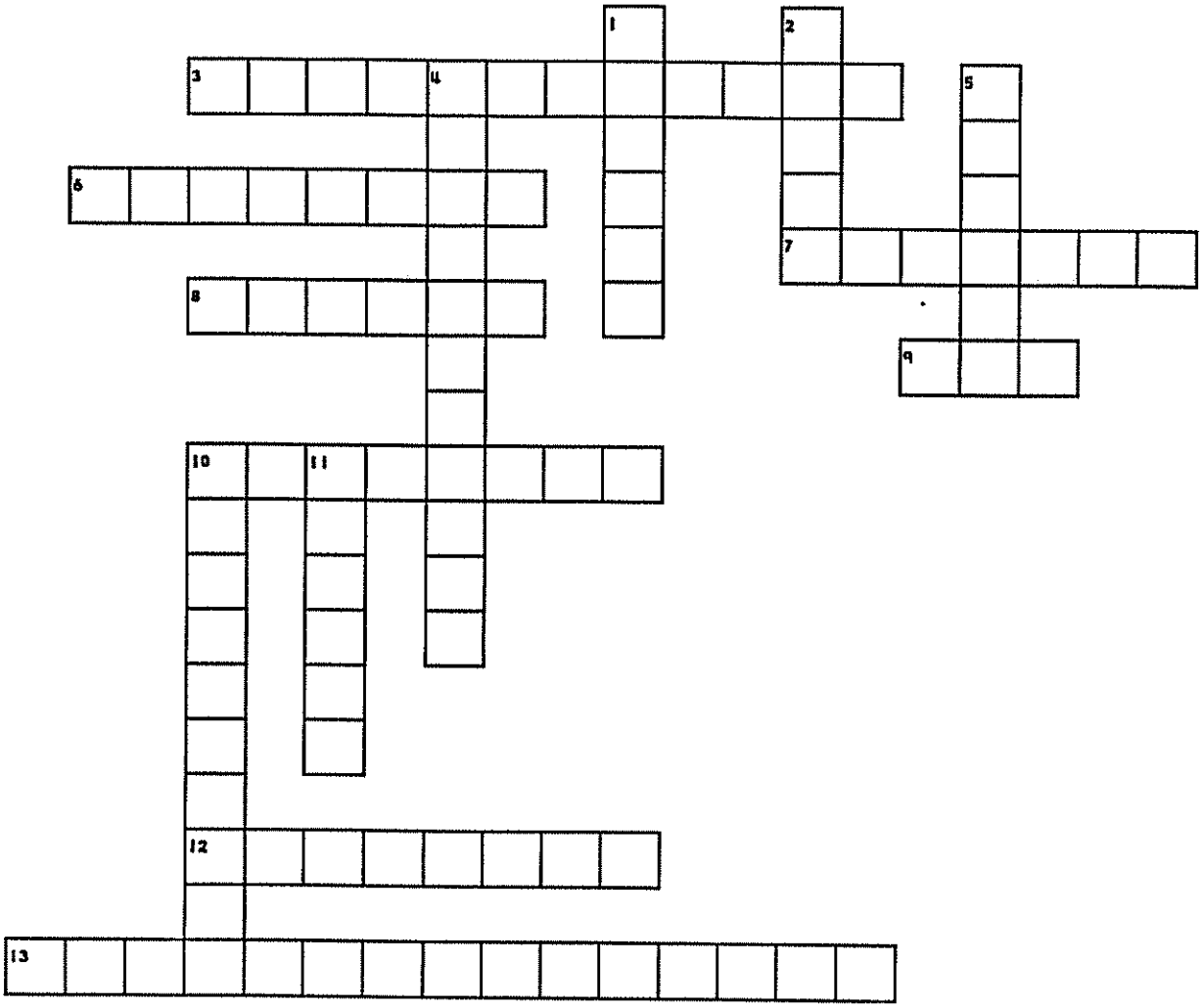
States of Matter Crossword



Across

3. Change of a gas to a liquid
6. This type of property can be observed without destroying the substance.
7. Mass of a substance divided by unit volume
8. Physical change of a solid to a liquid at the melting point
9. State of matter having no definite volume or shape
10. Homogeneous mixture
12. This type of change produces a new substance.
13. Change of a liquid to a solid

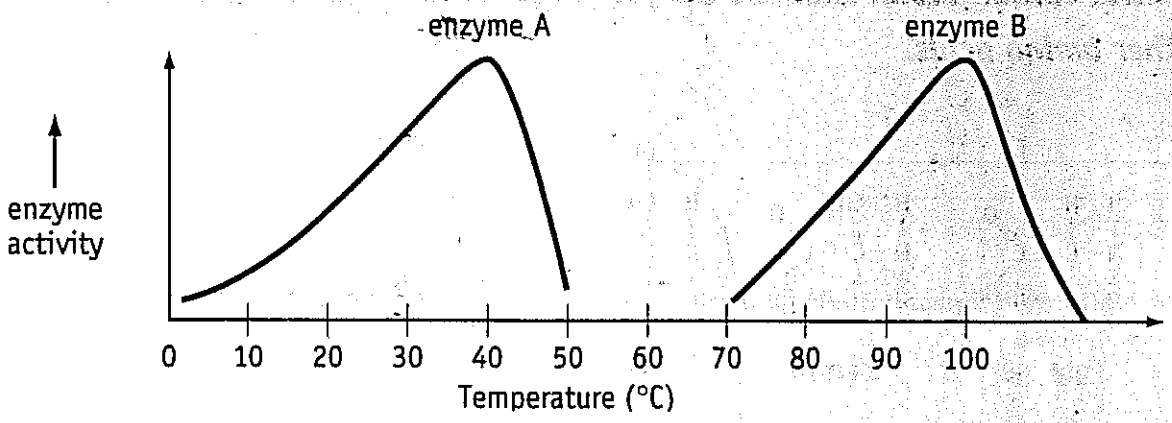
Down

1. Anything that has mass and takes up space
2. State in which atoms or molecules are very close together and are regularly arranged
4. Change of a liquid to a gas
5. This state of matter consists of electrically charged particles.
10. Elements and compounds
11. State of matter having a definite volume but no definite shape

NAME _____ DATE _____

UNIT 2 Enzymes

Enzymes are essential for the functioning of any cell. A single organism may have thousands of different enzymes. Each enzyme is designed to speed up a particular chemical reaction. To function properly, enzymes must operate under certain conditions. For example, an enzyme functions best at a particular temperature. Examine the following graph which shows how two different enzymes, A and B, function at various temperatures. Then use the graph to answer the questions that follow.



1. What is the optimal temperature for enzyme A? _____

2. What is the optimal temperature for enzyme B? _____

3. Which enzyme is likely to be found in an organism that lives in the boiling waters of a deep sea thermal vent? Explain the reason for your choice.

_____

_____

4. Which has the greater effect on enzyme activity—decreasing the temperature or increasing the temperature? Explain the reason for your choice. _____

_____

_____

NAME _____ DATE _____

UNIT 2 Respiration

The process of anaerobic respiration can be shown by the following chemical equations.

lactic acid fermentation: $C_6H_{12}O_6 \rightarrow 2C_3H_6O_3 + 2ATP$

alcoholic fermentation: $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + 2ATP$

The process of aerobic respiration can be shown by the following chemical equation.

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + energy$$

1. What is the chemical formula for lactic acid? _____

2. What is the chemical formula for ethyl alcohol? _____

3. Rewrite the equation for aerobic respiration so that it shows the energy produced in terms of ATP molecules. _____

Scientists have calculated that one glucose molecule releases 686 kilocalories of energy when it reacts completely with oxygen. Scientists have also calculated that 12 kilocalories of energy are required to make one ATP molecule. The efficiency of respiration can be calculated by using the following equation.

$$\text{efficiency of respiration} = \frac{\text{energy required to make ATP}}{\text{energy released by glucose}}$$

4. Calculate the efficiency of anaerobic respiration. Be sure to take into account the number of ATP molecules that are made.

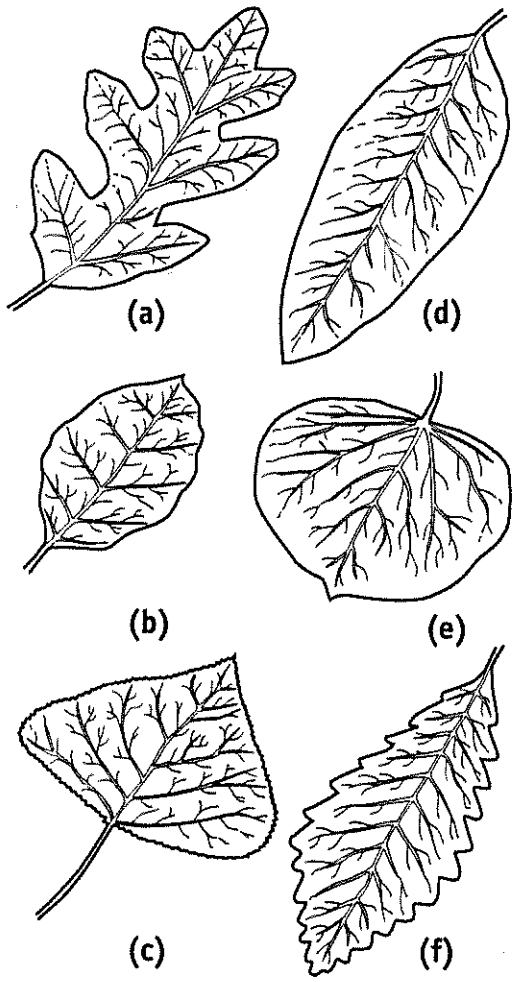
5. Calculate the efficiency of aerobic respiration. Again be sure to take into account the number of ATP molecules that are made.

NAME _____ DATE _____

UNIT 5 Classification: Dichotomous Keys

Trying to identify an organism can be a difficult task. You could try to compare the organism to those described in a classification system. However, this process can very time consuming. People often use a dichotomous key to identify an organism or other object such as a mineral. A dichotomous key uses pairs of contrasting descriptive statements to lead to the identification of an organism.

Use the dichotomous key provided to identify the six leaves below. Begin with paired descriptions 1a and 1b and follow the instructions. Proceed through the key until you have identified each leaf.



Dichotomous Key for Identifying Common Leaves

1a. If the edge of the leaf has no teeth, or lobes, go to 2 in the key.

1b. If the edge of the leaf has teeth, or lobes, go to 3 in the key.

2a. If the leaf has slightly wavy edges, it is a shingle oak.

2b. If the leaf has smooth edges, go to 4 in the key.

3a. If the leaf edge is toothed, it is a Lombardy poplar.

3b. If the leaf edge has lobes, go to 5 in the key.

4a. If the leaf is heart-shaped with veins branching from the base, it is a redbud.

4b. If the leaf is not heart-shaped, it is a live oak.

5a. If the leaf edge has a few large lobes, it is an English oak.

5b. If the leaf edge has many small lobes, it is a chestnut oak.

(a) _____

(b) _____

(c) _____

(d) _____

(e) _____

(f) _____

NAME _____ DATE _____

UNIT 6 Biomes

The table below lists the characteristics of the seven major biomes. Use the information in this table to answer the questions that follow.

Biome	Average yearly temperature range	Average yearly precipitation	Soil	Vegetation
Tundra	−26°C to 12°C	< 25 cm	moist, thin topsoil over permafrost; nutrient-poor; slightly acidic	mosses, lichens, dwarf woody plants
Taiga	−10°C to 14°C	35–75 cm	low in nutrients; highly acidic	needle-leafed evergreen trees
Temperate deciduous forest	6°C to 28°C	75–125 cm	moist; moderate nutrient levels	broad-leafed trees and shrubs
Temperate grassland	0°C to 25°C	25–75 cm	deep layer of topsoil; very rich in nutrients	dense, tall grasses in moist areas; short clumped grasses in drier areas
Desert	7°C to 38°C	< 25 cm	dry, often sandy; nutrient-poor	succulent plants and scattered grasses
Savanna	16°C to 34°C	75–150 cm	dry, thin topsoil; porous, low in nutrients	tall grasses, scattered trees
Tropical rain forest	20°C to 34°C	200–400 cm	moist; thin topsoil; low in nutrients	broad-leafed evergreen trees and shrubs

1. Which three biomes get the warmest?

_____

2. Which two biomes are the driest?

_____

3. Which biome has the least fluctuation in average yearly temperature?

_____

NAME DATE

Biomes (cont'd.)

4. Which biome has the greatest fluctuation in average yearly temperature?

5. What do a tundra and a tropical rain forest have in common?

6. What do a tundra and a desert have in common?

7. In which biomes does the average yearly temperature range not drop below freezing?

8. Compared to a taiga, which biome receives about twice the amount of yearly precipitation?

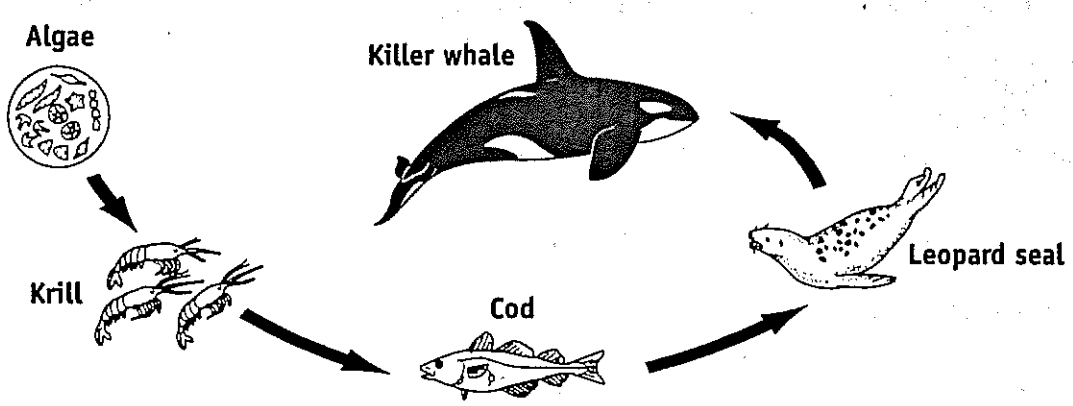
9. Explain why the grasses grow dense and tall in a temperate grassland.

10. What do a temperate deciduous forest and a tropical rain forest have in common so that broad-leafed trees grow in both biomes?

NAME _____ DATE _____

UNIT 6 A Food Chain

Examine the following food chain. Each arrow points to the organism that consumes the other organism. For example, cod eat krill. Use the information contained in the food chain illustration to answer the questions that follow.



1. How many links make up this food chain? _____

2. Which organisms are the producers? _____

3. Which organism would be present in the smallest number? _____

4. Identify the herbivore(s) in this food chain. _____

5. Identify the carnivore(s) in this food chain. _____

6. Does this food chain contain any omnivores? Explain your answer.

_____

7. Predict what would happen to the krill population if the number of cod were significantly decreased because of fishing. Explain your answer.

_____

8. Would the decrease in the cod population affect the algae populations? Why or why not?

_____

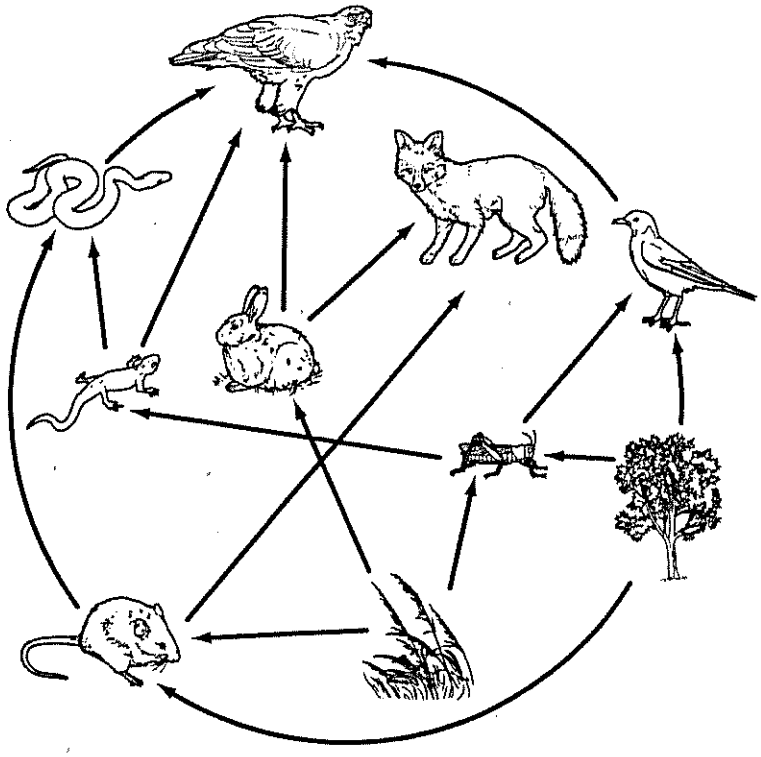
9. Explain how a decrease in the cod population would affect higher levels in this food chain.

_____

NAME _____ DATE _____

UNIT 6 A Food Web

Examine the following diagram of a food web to answer the questions that follow.



1. Identify one food chain that is part of this food web.

_____

2. Identify the producers.

_____

3. Identify the herbivores.

_____

4. Which organisms are found at the top level in this food web?

_____

NAME _____ DATE _____

UNIT 6 A Food Web (cont'd.)

5. What role does the bird play?

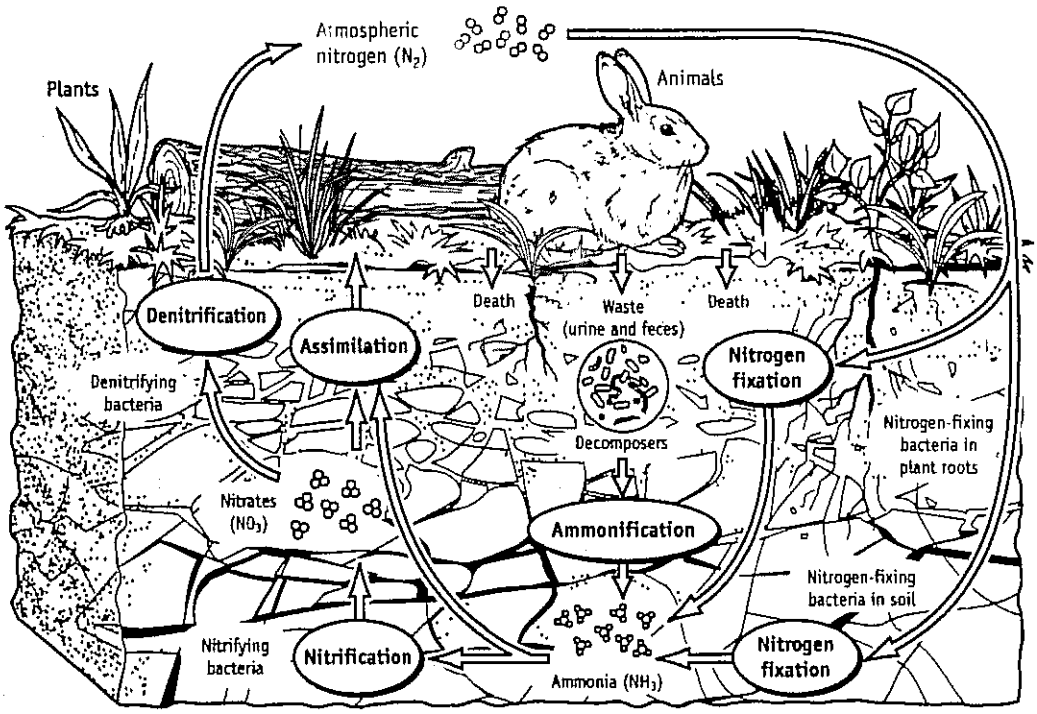
6. Suppose the rabbit population was removed from this food web. Explain how this would affect the remaining organisms.

7. Assume that the snake population suddenly starts to increase. What might have happened in this food web to cause such a change?

NAME _____ DATE _____

UNIT 6 The Nitrogen Cycle

Use the following diagram of the nitrogen cycle to complete the passage below.

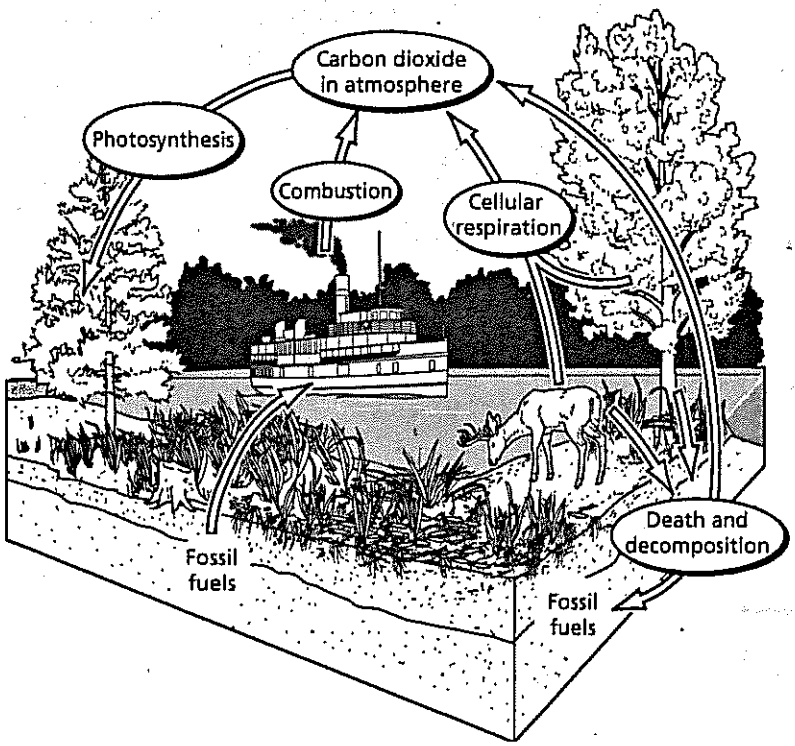


Nitrogen is cycled through an ecosystem by both plants and (1) _____. Decomposers break down dead organisms and their waste products to release (2) _____ in a process called (3) _____. Organisms called nitrifying bacteria convert this (4) _____ into (5) _____ in a process called (6) _____. These (7) _____ can then be used by plants to make amino acids. The process of converting nitrogen in the atmosphere to ammonia is called (8) _____. This process is carried out by bacteria that live in (9) _____ and in (10) _____. Plants can absorb both (11) _____ and (12) _____ from the soil, but animals cannot. Animals obtain (13) _____ by eating plants and other organisms and then digesting the proteins they contain.

NAME _____ DATE _____

UNIT 6 The Carbon Cycle

Use the following diagram of the carbon cycle to answer the questions that follow.



1. Identify the three processes that release carbon dioxide into the atmosphere.

_____

2. Identify the process that removes carbon dioxide from the atmosphere.

_____

3. Identify the process that has recently disrupted the balance that once existed in the carbon cycle.

_____

4. Explain how the cutting down of trees affects the carbon dioxide cycle.

_____

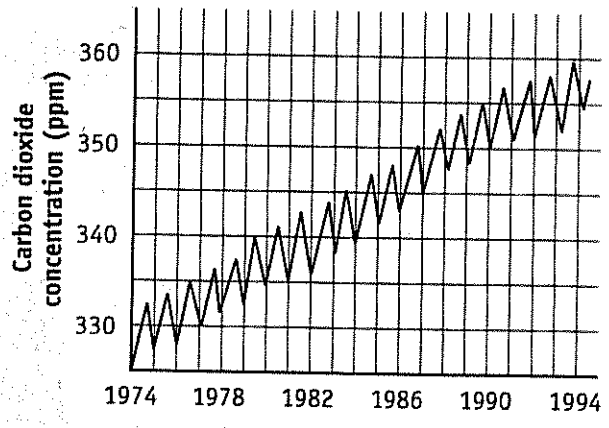
5. What do plants do with the carbon dioxide they remove from the atmosphere?

_____

NAME _____ DATE _____

UNIT 6 Global Warming

The following graph shows the changes in carbon dioxide concentration in the atmosphere for a twenty-year period, from 1974 to 1994. Use the information shown on this graph to answer the questions that follow.



1. What general conclusion can you make from this graph?

2. The carbon dioxide concentrations fluctuate each year. They tend to drop each spring and summer. Explain why this happens.

3. In contrast, the carbon dioxide concentration tends to rise each fall. Explain why this happens.

4. Based on the graph, draw another graph to predict how Earth's average temperature changed over this twenty-year period.