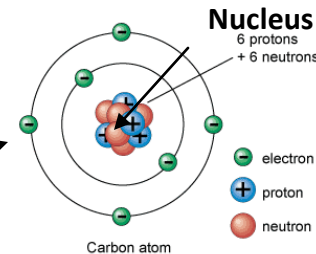


(8.5) The student knows that matter is composed of atoms and has chemical and physical properties: (A) the student will describe the structure of atoms, including masses, charge, locations of protons and neutrons in the nucleus and electrons in the electron cloud.

**Vocab—atom**—the smallest unit of an element, having all the characteristics of that element and consisting of a dense, central, positively charged nucleus ( due to positive protons) surrounded by negatively charged electrons.

**Valence electrons**—are the electrons of an atom that can participate in the formation of chemical bonds with other atoms. They are in the outer shell of the electron cloud.

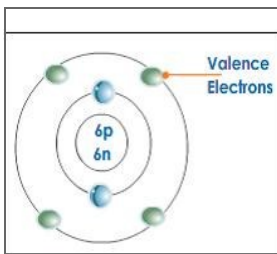
It is these electrons that determine if an element is very reactive like Sodium or Fluorine or NOT so reactive like Neon, a Nobel gas from group 18 or gold [Au].



(B) The student will identify that protons determine an element's identity and valence electrons determine its chemical properties including reactivity. (D) The student will recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts.

**Vocab—The atomic number** = the number of protons. The number of protons determines what the element is. **Each element has a different number of protons.**

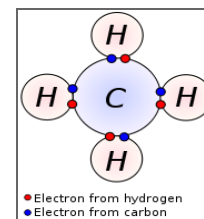
Key	
11	Atomic number
Na	Element symbol
Sodium	Element name
22.99	Average atomic mass



The **atomic mass** is the sum of the number of protons and neutrons in the nucleus.

Most elements react with other elements because they want to have 8 valence electrons in the outermost electron shell or a full valence shell. Total of 2 electrons for H and He

The Carbon atom on the left only has 4 valence electrons.



The carbon on the right bonded with hydrogen so that now it has 8.

**Electrons determine an elements reactivity.**

The new compound that was formed has a chemical formula of CH<sub>4</sub>. It is made from 5 atoms or C + H + H + H + H. It is much easier to simplify this and write the formula as CH<sub>4</sub> with the 4 subscript representing all four hydrogen atoms.

**YOUR TURN—** How many different elements are produced in this reaction?

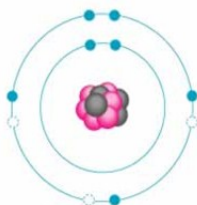
Reactants → Products



There are three elements produced in this reaction. Elements that are produced are called the products.

Can you list them? **K**=potassium, **Cl**=chlorine and **O<sub>2</sub>** or oxygen.

**The student will investigate how evidence of a chemical reaction indicates that a new substance with different properties are formed.** How can you tell if this was a chemical reaction? The signs are: a gas was produced, a significant color change, temperature change, or a new solid (precipitate) appeared that was not there before. In the reaction above, oxygen gas or O<sub>2</sub> was produced. In addition, two substances were formed from one.



**On Your Own—** Which statement best describes the atom on the left?

- A It has 7 Valence electrons in the electron cloud therefore it is the element fluorine.
- B It has 9 electrons in the nucleus therefore it is a Nobel gas.
- C There are 5 valence electrons in the electron cloud therefore this atom would like to gain 3 more electrons.
- D There are 5 valence electrons in the electron cloud therefore this atom is a metal.

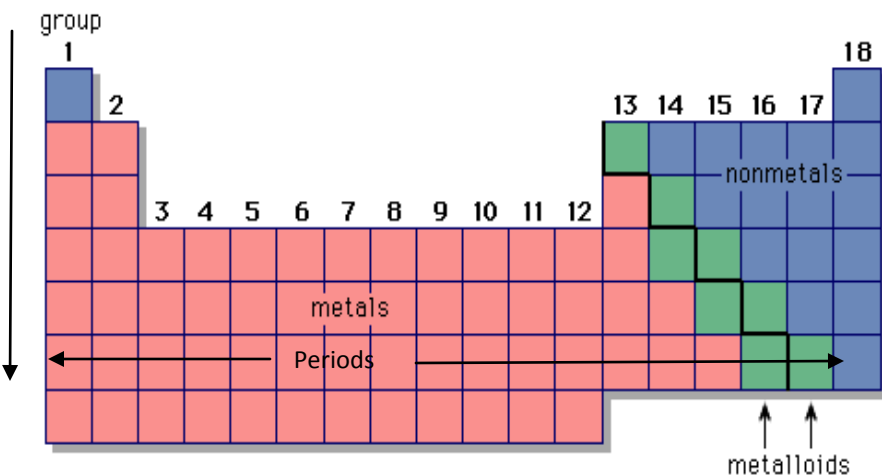
Answer—There are 5 valence electrons. This means it is 3 short of having the 8 electrons that it would like. So, letter

**Category 1 continued....**

(C)The student will interpret the arrangement of the Periodic Table, including groups and periods, to explain how properties are used to classify elements.

**Vocab**— a group on the periodic table is a set of elements with common characteristics. There are 18 groups. The elements in each group have the same number of valence electrons.

A period is a row on the periodic table.



The periodic table is divided into three main sections: metals, metalloids and non-metals.

**Metals** usually have luster or shine, they conduct heat and electricity; and can change shape when hammered or formed into a new shape. This is referred to as the property of malleability. When metals are turned into wire, we call this property ductile.

**Non-metals** are on the right side of the periodic table. They are dull and don't conduct a current. Many of them are gasses.

The group that is along the diagonal and is between the two main groups are called **metalloids**. These elements have properties of both metals and not metals.

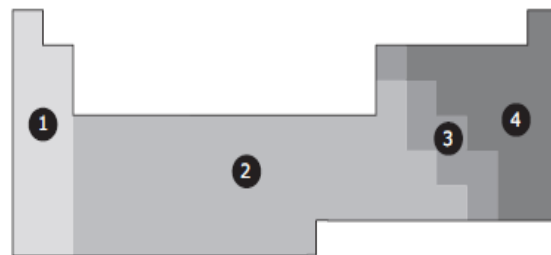
**When elements combine, they form new compounds. Many metal atoms will combine with non-metals. For example a sodium ion (Na<sup>+</sup>) will combine with a chlorine ion (Cl<sup>-</sup>) to form NaCl. Sometimes non-metals combine to make compounds such as H<sub>2</sub>O (water), CO<sub>2</sub> (carbon dioxide), or C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> (sugar).**

**Your Turn**— An element is waxy, has a low melting point and is not used for wiring in homes because it doesn't conduct a current. Which section of the periodic table is the element most likely to be found?

**Step 1**—Identify each section. (1) very reactive metals, (2) metals, (3) metalloids, and (4) non-metals.

**Step 2**—Know the properties of each section.

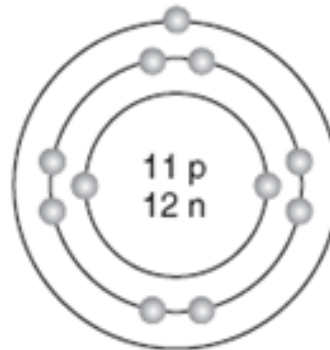
**Step 3**—Choose the one that matches the description best.



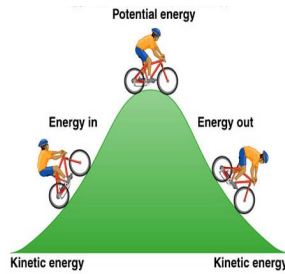
**Answer**—Section 4- The non-metals are NOT metals, melt easily and are not used for electrical wiring in our homes.

**On Your Own**— According to the periodic table, the following element would most likely have the following properties.

- A Shiny, conducts a current, very reactive.
- B A gas that is not very reactive.
- C A substance that conducts a current but is brittle and not malleable.
- D A shiny liquid that conducts a current.



The student will demonstrate an understanding of force, motion, and energy and their relationships. 6.8 The student knows force and motion are related to potential and kinetic energy. The student is expected to (A) Compare and contrast potential and kinetic

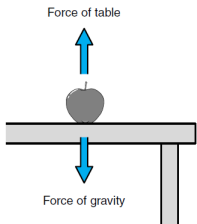


**Vocab—Potential Energy—is the energy stored in an object based on its position. Look at the bike rider at the top of the hill.**

**Kinetic Energy—is the energy an object possesses due to its motion.**

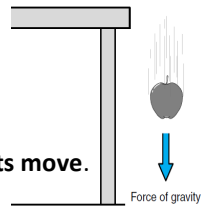
**Compare the bike when moving up the hill or stopped on top of the hill. These are examples of kinetic vs. potential energy.**

**8.6 The student knows that there is a relationship between force, motion and energy. The student is expected to (A) demonstrate and calculate how unbalanced forces change the speed or direction of an**



When the forces are **balanced** an object **does NOT** move.

When the forces are **unbalanced**, objects **move**.



C) the student will investigate and describe applications of Newton’s law of inertia, law of force and acceleration and law of action reaction.

**Newton’s 1st Law=Law of inertia—any object in motion will stay in motion, and any object at rest will stay at rest, until it is acted on by an unbalanced force.**

**Newton’s 2nd Law=Law of force and acceleration—the net force on an object equals the object’s mass multiplied by its acceleration or  $F=ma$ . Basically, a greater force produces a greater acceleration.**

**Newton’s 3rd Law=Law of action-reaction—When one object exerts a force on a second object, the second object exerts an equal but opposite force on the first. Basically, forces come in pairs.**

**Other Important Formulas— Average speed =  $\frac{\text{total distance}}{\text{total time}}$  and Work = (force)(distance)  $W = Fd$**

**Your Turn—A tennis player hits a 0.06 kg tennis ball with a force of 3 Newtons. The ball accelerates at a rate of what?**

**Step 1—**Identify what was given in the problem. A mass was given (0.06 kg) and a force. **Step 2—**Identify a formula that matches.  $F=ma$ .

**Step 3—**What don’t you know? The acceleration, so plug in the numbers and solve.  $F=ma$  or  $3 \text{ N} = (.06\text{kg}) a$   $3\text{N}/.06 \text{ kg} = a$   **$a = 50\text{m/s/s}$**

**On Your own—**

Wearing a seatbelt protects you from effects that are best explained by which of Newton’s laws?

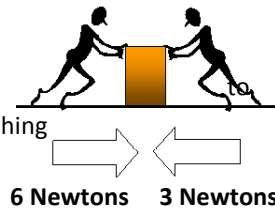


- A the law of action-reaction
- B the law of inertia
- C the law of force and acceleration
- D the law of gravitation

Answer= B—the law of inertia says that you will remain moving even if the car suddenly stops

**On Your own—**

Two workers were having a contest see who was stronger. One was pushing the box to the left with a force of 6 newtons and the other was pushing to the right with a force of 3 newtons. Which of the following best describes the resulting motion of the box?



- A It travels to the right at increasing speed
- B It travels to the right at constant speed
- C It travels to the left and constant speed
- D It travels to the left at increasing speed

letter A



What is the speed of the car if it travels 53 meters in 4 seconds?

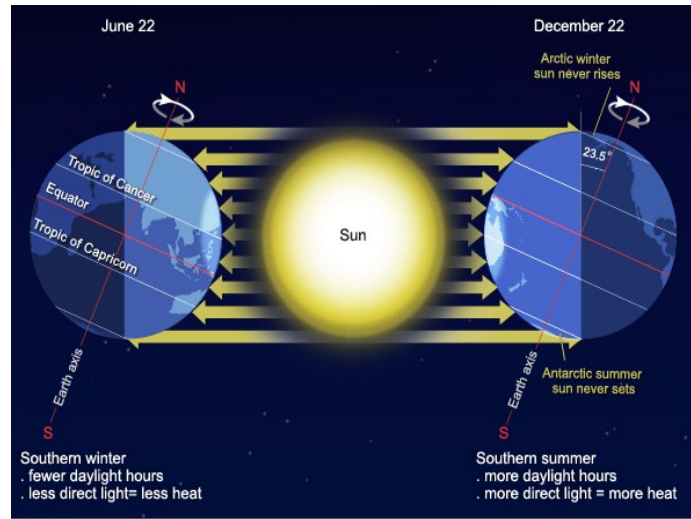
- A 49 m/s
- B 212 m/s
- C 13.25 m/s
- D 53.4 m/s

$s=d/t$  so letter C

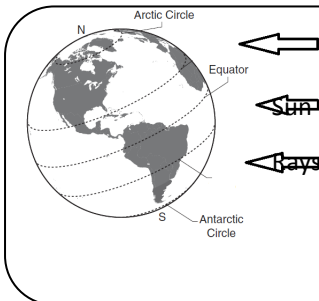
(3) The student knows the effects resulting from cyclical movements of the Sun, Earth, and Moon. The student is expected to (A) model and illustrate how the tilted Earth rotates on its axis, causing day and night and revolves around the Sun causing changes in seasons, and (B) demonstrate and predict the sequence of events in the lunar cycle.

**Vocab— To rotate** means to spin on an axis. **To revolve** means to orbit around another body. The earth rotates each day while revolving around the sun. once per year.

Look at the picture to the right. The earth is tilted about 23 degrees. This means that in the Northern Hemisphere is tilted toward the sun and has a larger amount of direct sunlight during the summer months and less direct sunlight during the winter. The Northern and Southern Hemispheres have opposite seasons.



**On Your Own—Evaluate the diagram to the left. Which of the following statements is true?**



- A When the Earth and Sun are in this position, it is winter in the Northern Hemisphere.
- B When the Earth and Sun are in this position, it is summer in the Northern Hemisphere.
- C When the Earth and Sun are in this position, it is spring in the Northern Hemisphere.
- D When the Earth and Sun are in this position, it is autumn in the Northern Hemisphere.

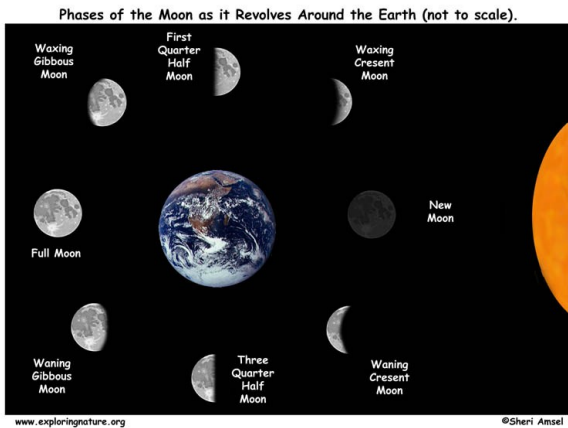
Look at the image. The southern hemisphere is facing the sun. What does that mean? It means it receives more direct sun light. Therefore it is winter in the Northern Hemisphere. Letter A

**Vocab— the Lunar cycle** is the appearance of phases of the Moon as viewed from Earth, as the Moon orbits the Earth about once every 27 days.

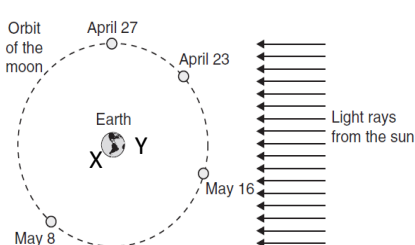
**Waxing**—to increase in size gradually      **Crescent**—having a concave shape (sliver)

**Waning**—to decrease in size gradually      **Gibbous**—more than half

The moon has no natural luminous capabilities. It only reflects light from the sun (like a mirror). The moon phases are displayed in the image to the left. Notice that during the new moon, the moon appears dark. Actually, during a new moon the back side of the moon would be lit, but from Earth, we can't see the back side. The diagram only shows what you would see if the sun and moon were in those positions relative to the Earth. The position of the sun, moon and Earth also affects the earth's ocean and causes changes in the tides.



Phases of the Moon



- Your Turn—**The picture to the left displays the moon orbiting the Earth. An observer is at point X. Which of the following best describes what the moon will look like to the observer?
- A The moon will reflect the maximum light from the sun.
  - B The moon will not reflect any sunlight at all.
  - C The moon will only have a small crescent lit.
  - D The moon will have a large amount of reflected light from the sun.

At position X the moon will appear as a waxing gibbous and will be mostly lit. If the maximum were lit, then it is a full moon. Answer D

When standing at position Y, on which date will one quarter of the moon be lit by the sun?

April 27

When standing at position Y, on which date will the moon have the least amount of light reflected from the

May 16

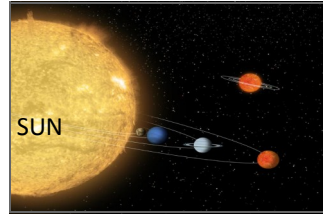
sun?

**Category 3 Continued....**

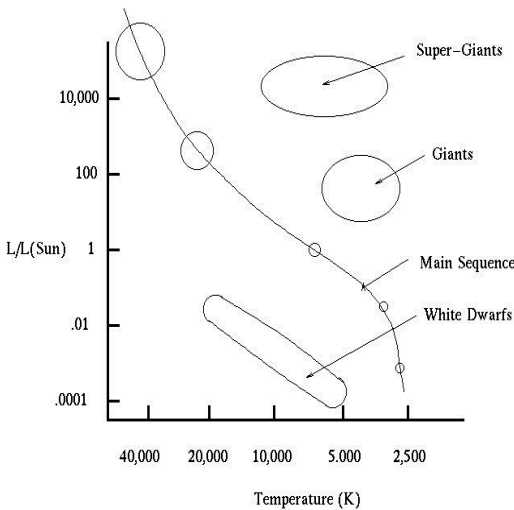


The student is expected to describe components of the universe, including stars, nebulae, and galaxies and use models such as Hertzsprung-Russell diagrams for classification.

**Vocab—Nebulae**—A cloud of gas and dust in outer space, visible in the night sky as luminous patches or areas of darkness. **Galaxy**—A system of millions of stars, along with gas and dust that is held together by gravitational attraction. **Star**—A self-luminous celestial body consisting of gases held together by its own gravity (our sun is just a star that is VERY close compared to other stars). **Hertzsprung-Russell Diagrams (H-R)**—a scatter graph of stars showing the relationship between the stars' brightness, classification and temperature.



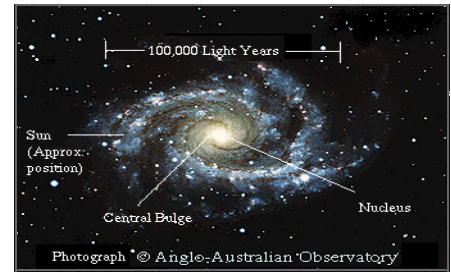
Hertzsprung-Russell Diagram



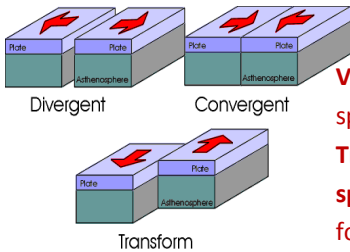
**Your Turn**—Based on the H-R diagram to the left, which of the following statements is true?

- A** If a star has a temperature of 10,000 degrees and a luminosity of 1 it is a White Dwarf star.
  - B** If a star has a luminosity of 100 and a temperature of 20,000 it is a main sequence star.
  - C** If a star has a luminosity of .01 and a temperature of 4000, it is a Giant star.
  - D** If a star has a luminosity of 10,000 and a temperature of 20,000, it is a Super-Giant Star.
- Answer—If you find each value on the x and y axis and connect the two points then a star that has a luminosity of 100 and a temperature of 20000 is a Main Sequence star. Or letter **B**

Our sun is a medium-sized star that is found in the Main Sequence section of the H-R diagram. Our sun is found near the edge of a disc-shaped galaxy.

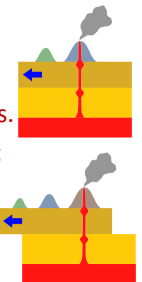


Space is so vast that distances are measured in light years (the amount of time it takes light to travel in one year). A light year is about 10 trillion kilometers.



The student is expected to relate plate tectonic to the formation of crustal features.

**Vocab—Divergent**—to move apart. This crustal feature is observed in ocean ridges and sea floor spreading. **Convergent**—to move together. This feature is observed in ocean trenches and island arcs. **Transform**—move in opposite directions. This is observed along fault lines such as in California. **Hot spots**—fixed places within the upper layer of crust where rocks melt to generate magma. These are found in the deep ocean floor and may rise enough to form islands. See the picture to the right.



The student is expected to interpret **topographic maps** and satellite views to identify land and **erosional features** and predict how these features may be reshaped by weathering.

**Vocab—Topographic map**—a two dimensional representation of a 3-D land surface. **Erosional features**—erosion occurs where the forces of nature move soil and rock through water, wind, ice, gravity and the action of plants

**Your Turn**— According to the map to the right, what is in between the two hills?

- A** Nothing, the two hilltops merge.
- B** A small valley.
- C** A very large flat plain.
- D** A major body of water.

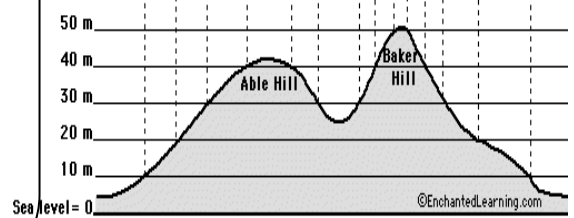
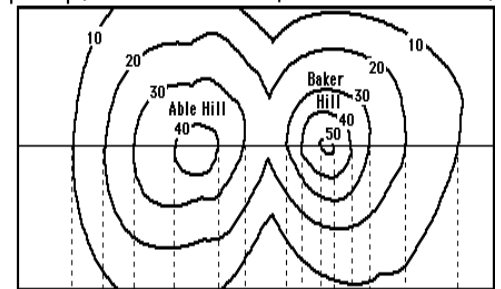
**How much higher is Baker Hill than Able Hill?**

- A** about 40 m
- B** about 30 m
- C** about 20 m
- D** about 10 m

Answer— according to the map there is a small valley in between the two hills.

According to the map, Baker hill is about 50 m higher and Able hill is about 40 m high therefore the difference between 40 and 50 m is 10. Letter **D**

Topographic Map (with contour lines that show points that are on the same level)



The two hills seen from the side, with elevations marked and dotted lines pointing to the corresponding contour lines.

The student is expected to describe producer/consumer, predator/prey, and parasite/host relationships as they occur in food webs within marine, freshwater and terrestrial ecosystems.

**Your Turn—** Look at the diagram to the right. **How many producer/consumer pairs do you see?**

Plants and phytoplankton are producers and the grasshopper and the zooplankton are the consumers. **Two pairs.**

**How many predator/prey relationships are there in the diagram?** Hawk/snake, snake/mouse, mouse/grasshopper, Orca/large fish, large fish/smaller fish, small fish/Zooplankton. **Six pairs.**

**How many parasite/host relationships are shown in the diagram?** None.

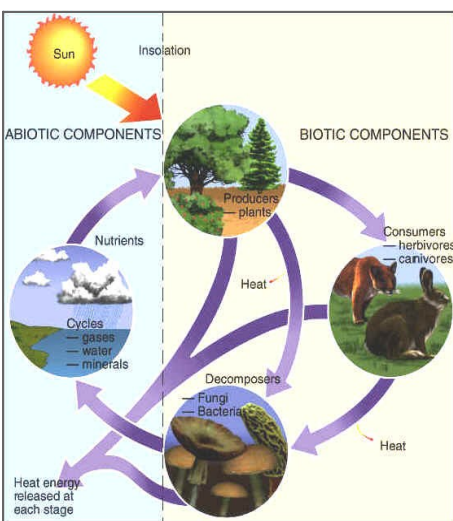
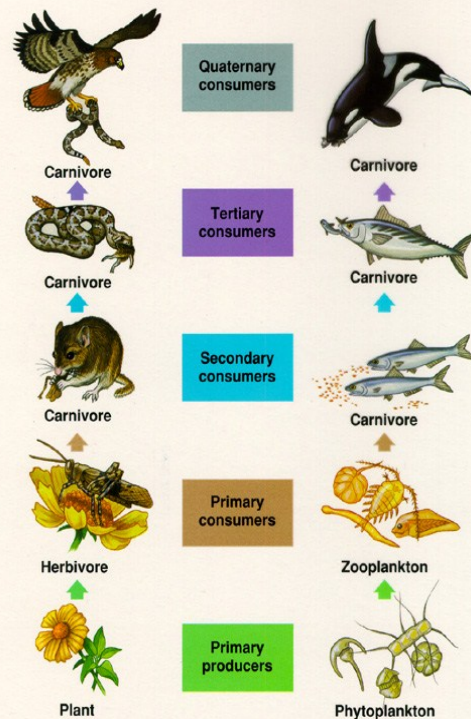
Example of parasite/host would be fleas on the mouse, barnacles on the whale, tapeworms in a human or aphids on a plant.

**On your own—**Mistletoe is a plant that attaches to some trees in North Central Texas. The mistletoe will slow the growth of the tree, since it uses some of the tree's water and nutrients.

Which pair of terms best describes the relationship between the mistletoe and the tree?

**A** predator/prey **B** parasite/host **C** consumer/producer **D** herbivore/carnivore

Letter B



The student will investigate how organisms and populations in an ecosystem depend on and may compete for **biotic** and **abiotic factors** such as quantity of light, water, range of temperatures or soil composition and the students will explore how short and long term environmental changes affect organisms and traits in subsequent populations.

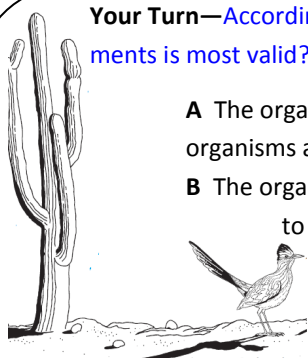
**Autotrophs—**can make their own food from light or chemical energy. **Plants are autotrophs.**

**Vocab—Biotic factors—**are related to life or living factors such as plants, animals, fungi, protist and bacteria.

**Abiotic Factors—**are non living factors in an environment such as habitat, weather, sunlight, oxygen or other important elements.

Biotic and Abiotic factors combine to make an ecosystem which is a community of living and nonliving things. If a single factor is changed in an ecosystem due to human intervention of a natural event, the whole system can be altered.

**Your Turn—**According to the picture, which of the following statements is most valid?



- A** The organisms in this ecosystem show a variety of organisms and species.
- B** The organisms in this ecosystem do not need to compete for abiotic factors.
- C** The organisms in this ecosystem have a reduced amount of the abiotic factor of water.
- D** The organisms in this ecosystem have plentiful rain and are not short any of the abiotic factors.

Answer—the ecosystem is a desert. There are few plants except for the large cactus therefore, water is in short supply. The answer is C.

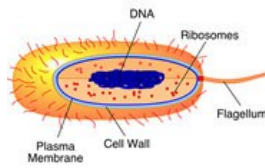
**On your own—**At one time large herds of Bison roamed across the US. Brown-headed cowbirds followed the Bison and captured the insects that scattered as the bison walked through the grass. Many of the Bison were killed by early American hunters. Which of the following is the most correct statement about what might occur?



- A** The grasses would no longer grow and a desert would soon form.
- B** The cowbird population would grow due to fewer Bison.
- C** The Bison would adapt and become better at avoiding hunters.
- D** The cowbird population would diminish due to the difficulties in finding insects to eat without the Bison.

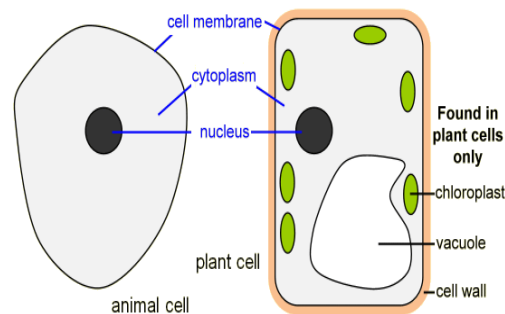
## Category 4 Continued....

### Types of Cells



**Eukaryotic Cells**—are more advanced, larger and varied. These type cells are found in organisms such as plants, animals, and protist.

The cell has four main parts: the cell membrane, cytoplasm, the nucleus, and membrane bound organelles.



**Prokaryotic Cells** are simple, small cells, that don't have a membrane around the nucleus. These types of cells lack organelles.

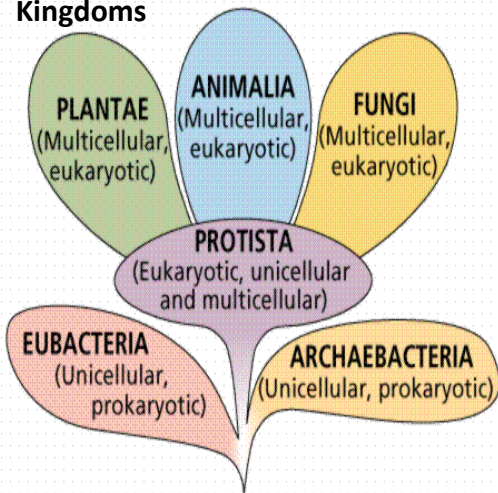
Bacteria are a form of Prokaryotic cells.

	Cell Part	Function
	<b>Mitochondria</b>	Energy center or "powerhouse" of the cell. Turns food into useable energy (ATP)
	<b>Vacuole</b>	Stores water or other substances, plant cells contain a large central vacuole.
	<b>Chloroplast</b>	Uses sunlight to create food, photosynthesis (only found in plant cells)
	<b>Cell membrane</b>	outer boundary of the cell
	<b>Cell Wall</b>	Provides additional support (plant and bacteria cells)
	<b>Nucleus</b>	A membrane bound organelle that contains the genetic material which will govern the traits of the individual

### Body Systems

SYSTEMS	ORGANS	FUNCTIONS
respiratory	lungs, nasal passages, bronchi, pharynx, trachea, diaphragm, bronchial tubes	intake of oxygen and removal of carbon dioxide from body
nervous	spinal cord, brain, nerves, skin, eyes, ears, tongue, nose	control of body activities and the reaction to stimuli
digestive	stomach, liver, teeth, tongue, pancreas, intestine, esophagus	break down of food and absorption for use as energy
excretory	kidneys, bladder ureters, skin	controls water and salt balance
endocrine	pituitary gland, adrenal gland, thyroid gland, gonads	production of hormones and body regulation
skeletal and muscular	bones, muscles	protection and movement
circulatory	blood, blood vessels, heart, lymph	transport of nutrients, metabolic wastes, water, salts, and disease fighting cells
integumentary	skin	protection of body from injury and bacteria, maintenance of tissue moisture, holds receptors for stimuli response, body heat regulation

### Kingdoms



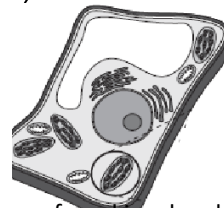
#### Your Turn—Members of the kingdom

*Animalia* would be best describes as...

- A unicellular, prokaryotic, heterotrophic.
- B unicellular, eukaryotic, autotrophic.
- C multicellular, eukaryotic, heterotrophic.
- D Multicellular, eukaryotic, autotrophic.

Animals are multicellular and have cells that contain membrane bound organelles. They are also heterotrophs and must obtain their food from eating other organisms. So, letter C.

#### On Your



The cell to the left would most likely be found in an organism that had which of the following characterizes?

- A A unicellular prokaryote found in a harsh environment.
- B A Eukaryotic, unicellular cell that moves about in aquatic environments.
- C A multicellular eukaryotic cell that is an autotroph.
- D A reproductive cell found in a complex, multicellular, heterotroph.