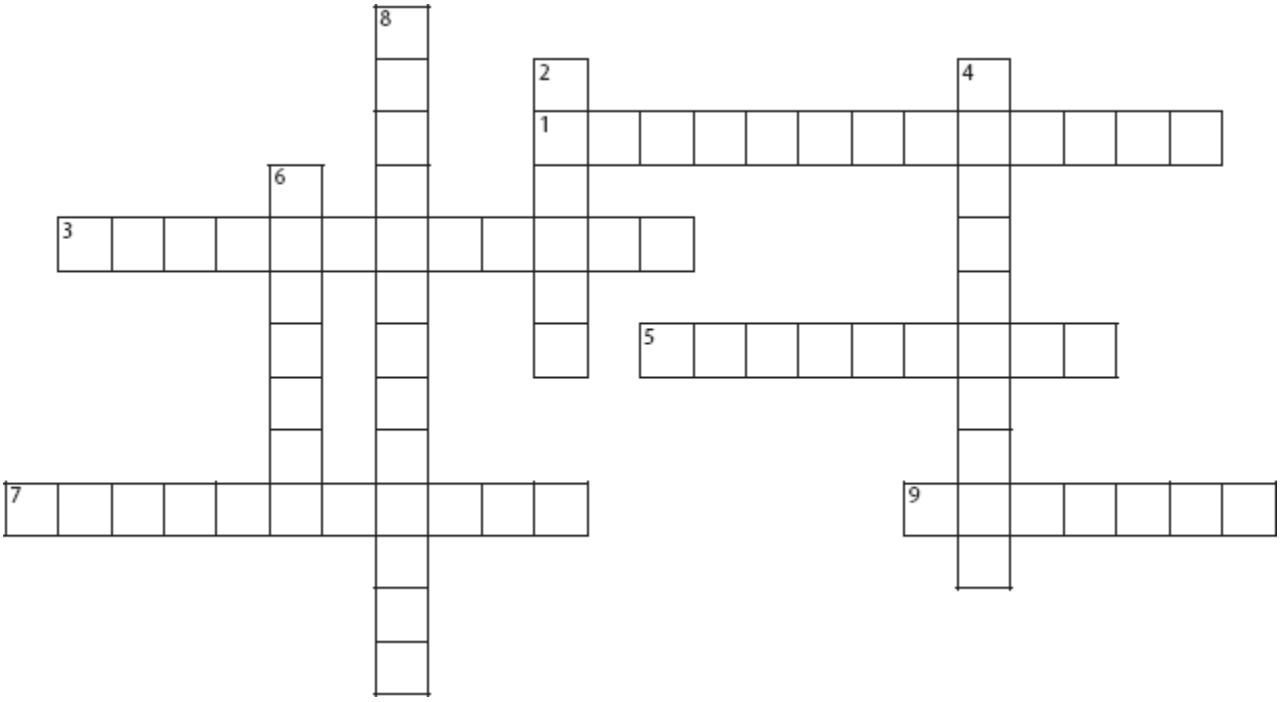
Name _____ Date _____ Teacher _____

Science Summer Assignment

Interactions of Earth Systems

Directions: *Complete the crossword puzzle with the correct terms from the word bank. If an answer has two words, do not leave any spaces.*

climate **condensation** **evaporation** **precipitation** **rock cycle**
transpiration **uplift** **water cycle** **weather**



Across

1. moisture that falls from clouds to Earth's surface

3. process by which a gas changes to a liquid

5. series of processes that transport and continually change rocks into different forms

7. process by which a liquid changes into a gas

9. average weather patterns for a region over a long period of time

Down

2. process that moves large bodies of Earth materials to higher elevations

4. continuous movement of water on, above, and below Earth's surface

6. the state of the atmosphere at a certain time and place

8. process by which plants release water vapor through their leaves

Earth Systems:

Atmosphere

The Troposphere In the bottom layer of the atmosphere, called the troposphere, temperature decreases as you move upward from Earth's surface. Gases flow and swirl in the troposphere, causing weather. Although the troposphere does not extend very far upward, it contains most of the atmosphere's mass.

The Stratosphere Above the troposphere is the stratosphere. Unlike gases in the troposphere, gases in the stratosphere do not swirl around. They are more stable and form flat layers. The stratosphere has a layer of ozone, which is a form of oxygen. This ozone layer protects Earth's surface from harmful radiation from the Sun. It acts like a layer of sunscreen, protecting the biosphere. Because ozone absorbs solar radiation, temperatures increase in the stratosphere.

Upper Layers Above the stratosphere is the mesosphere. Temperature decreases in this layer, then increases again in the next layer, the thermosphere. The last layer of Earth's atmosphere is the exosphere. The lowest density of gas molecules is in this layer. Beyond the exosphere is outer space

Importance of Earth's Atmosphere The atmosphere contains oxygen, carbon dioxide, and water. These things are necessary for life on Earth. The atmosphere also keeps Earth warm. It traps thermal energy from the Sun that bounces back from Earth's surface. It helps keep temperatures on Earth within a range in which living things can survive. Without the atmosphere, daytime temperatures would be very hot. Nighttime temperatures would be very cold.

Earth's atmosphere also keeps asteroids from hitting the surface. Friction with the atmosphere causes asteroids to burn before they strike the surface. Only the very largest asteroids strike Earth.

In addition, Earth's atmosphere helps protect living things from some of the Sun's harmful rays. The ozone layer within the stratosphere absorbs harmful rays that can damage plant and animal tissues. The

The Hydrosphere

Water is one of the most common and important substances on Earth. The system containing all Earth's water is called the hydrosphere. Most water is stored on Earth's surface, but some is located below the surface or within the atmosphere and biosphere. The hydrosphere contains more than 1.3 billion km3 of water. The amount of water in the hydrosphere does not change. But like the gases in the atmosphere, water in the hydrosphere flows. It moves from one location to another over time. Water also changes state. It is found as a liquid, a solid, and a gas on Earth.

The Cryosphere

The frozen portion of water on Earth's surface is called the cryosphere. About 79 percent of the planet's freshwater is ice. The ice is located in glaciers, as shown above, on high mountains or in ice caps at the North Pole and the South Pole. Water can be stored as ice for thousands of years before melting and becoming liquid water in other reservoirs.

The Geosphere

The last nonliving Earth system is the geosphere. The geosphere is the solid part of Earth. It includes a thin layer of soil and broken rock material along with the underlying layers of rock. The rocks and soil on land and beneath the oceans are part of the geosphere. Materials in the Geo

Biosphere: All living things

Name _____ Date: _____

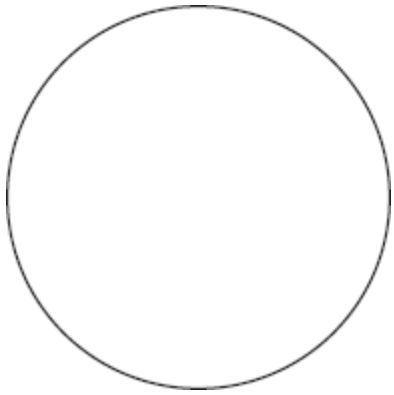
Key Concept Builder

Earth Systems

Key Concept What are the composition and the structure of the atmosphere?

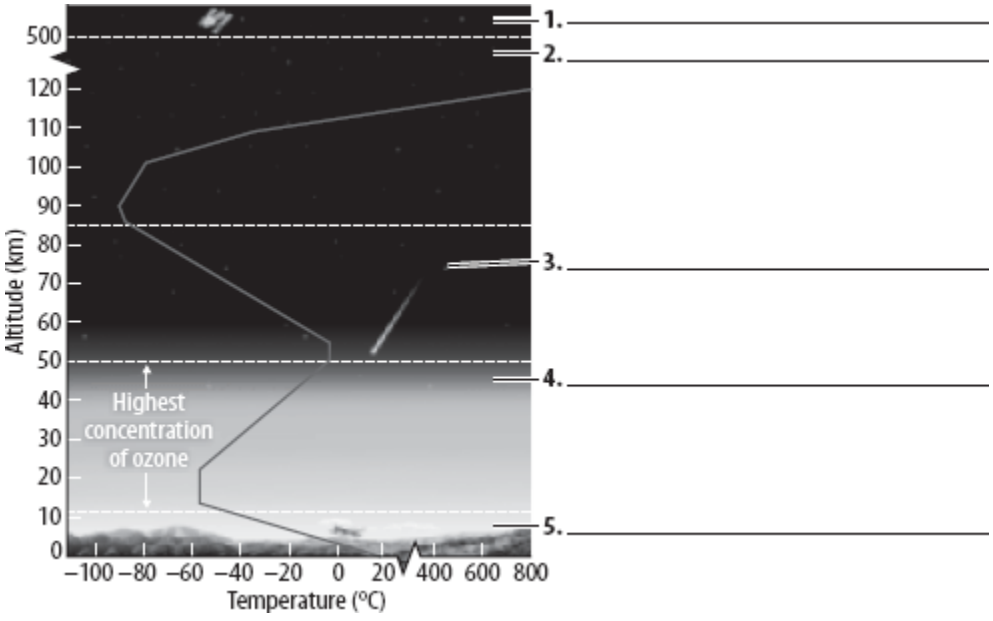
Directions: *Use the table to draw a circle graph showing the composition of gases in the atmosphere.*

Composition of the Atmosphere	
Gas	**Percentage in Atmosphere**
Nitrogen	78%
Oxygen	21%
Trace gases	1%



Directions: *Label this graph by writing the correct term from the word bank on each line.*

exosphere **mesosphere** **stratosphere**
thermosphere **troposphere**



Name _____ Date _____ Class _____

Math Skills

Conversions

Fahrenheit (°F) units and Celsius (°C) units are used to measure temperature. The Celsius scale is the standard unit of temperature used in nearly all countries in the world. To convert between Fahrenheit degrees and Celsius degrees, use these equations.

$$C = \frac{(F - \mathbf{32})}{\mathbf{1.8}} \qquad F = (C \times \mathbf{1.8}) + \mathbf{32}$$

The news report says that it is **42**°F outside. What is the temperature in Celsius?

Step 1 Select the correct equation.

$$C = \frac{(F - \mathbf{32})}{\mathbf{1.8}}$$

Step 2 Substitute the given value.

$$C = \frac{(\mathbf{42} - \mathbf{32})}{\mathbf{1.8}}$$

Step 3 Subtract and then divide.

$$C = \frac{\mathbf{10}}{\mathbf{1.8}}$$

$$C = \mathbf{5.6}°$$

Practice

1. The thermometer on the classroom wall reads 20°C. What is the temperature in degrees Fahrenheit?

2. It is 100°F on a summer day in San Antonio, Texas. What is the temperature in degrees Celsius?

3. It is 17°C in San Francisco, California, and 79°F in Cincinnati, Ohio. In which city is the temperature higher?

4. It is -11°C in Detroit, Michigan, and -3°F in Milwaukee, Wisconsin. In which city is the temperature lower?

Name _____ Date _____ Class _____

Challenge

Tracking Temperature

Select a position outside your home where you can comfortably and easily check and record the outside temperature at least twice each day for a week. This will be your checkpoint. A convenient way to check the temperature is with a thermometer that hangs outside a window and can be read from the inside.

Collect and Compare Data

Choose two times during the day when you can record a low temperature and a high temperature. For example, record the temperature when you first get up in the morning, and again when you first come in from school in the afternoon. A sample chart is shown below. Choose a scale for your graph that is appropriate for the time of year.

When you have a week's high and low temperatures in your chart, create a graph to display your data. Plot the lows in one color, and plot the highs in another color.

Temperature Data for Checkpoint: _____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
High							
Low							

Directions: *Respond to each statement on the lines provided.*

1. **Identify** the high and low temperatures for the week using the graph and your data.

_____

2. **Calculate** the average high and average low temperatures for the week. Explain your method.

_____

_____

3. **Explain** how a meteorologist can use data like these to predict temperature changes from day to day and from year to year.

_____

_____

Forms of Energy Summary

- Energy – the ability to cause changes, exert forces or do work. (In other words, energy is the ability to make things happen!)
    - Energy can exist in many forms. It can be stored or expressed actively.
    - Energy can be converted to another form, but can never be created or destroyed.

      (Law of Conservation of Energy)
- Gravitational potential energy – stored energy that is due to an object's position.
    - The higher an object is, the greater its gravitational potential energy.
    - The heavier an object is, the greater its gravitational potential energy.

  $PE = m.g.h$ m=mass, g=gravitational constant, h=height
- Kinetic energy – energy of motion. The faster an object moves, the greater its kinetic energy.
    - The heavier an object is, the greater its kinetic energy.
    - The faster an object goes, the greater its kinetic energy.

  $KE = \frac{1}{2} mv^2$ m=mass, v=speed of object
- Mechanical Energy – The sum of Kinetic and Potential Energy.

  $ME = KE + GPE$
- Kinetic energy also includes sound and thermal energy:
    - Sound – energy of vibrating materials or air molecules.
    - Thermal energy – energy that comes from the movement of tiny particles. As an object heats up its particles move faster, increasing thermal energy.
- Chemical energy – energy stored in the bonds that hold atoms together (a type of Potential Energy)
- Electrical Energy – energy that results from the movement of charged particles.
- Light Energy or Radiant – a form of *electromagnetic radiation* that is visible to the eye.
    - Other forms of electromagnetic radiation include gamma rays, x-rays, ultraviolet light, infrared radiation, and radio waves.
- Nuclear energy – energy released by changes to the nuclei of atoms.

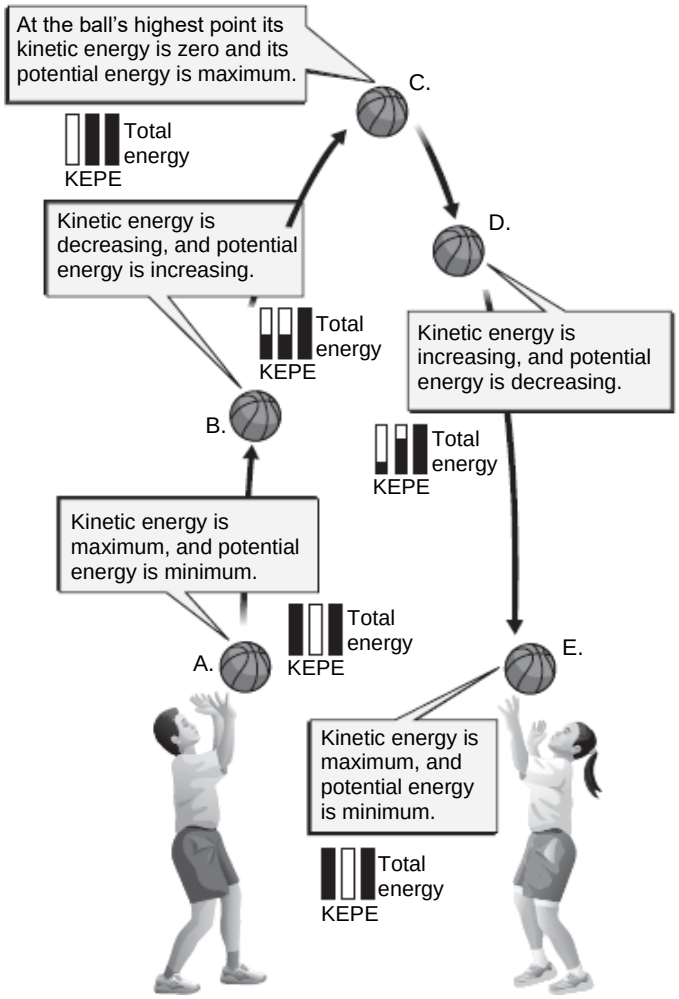
Name _____ Date _____ Class _____

Key Concept Builder

Energy Transformations

Key Concept What is the law of conservation of energy?

Directions: *In the diagram, a ball has just been thrown and is about to be caught. Use the diagram to answer each question. Write the letter of the correct stage on the lines provided. Some stages may be used more than once.*



1. At which stages is kinetic energy at the maximum value? _____ and _____
2. At which stage is the kinetic energy zero? _____
3. Which stage has increasing kinetic energy and decreasing potential energy? _____
4. At which stage is the potential energy at the maximum value? _____
5. At which stages is potential energy at its minimum? _____ and _____
6. Which stage has decreasing kinetic energy and increasing potential energy? _____

Name _____ Date _____ Class _____

Enrichment

Types of Contact Forces

You know that there are two types of forces—contact forces and noncontact forces, such as electricity, magnetism, and gravity. A contact force is the force exerted by one object on another when the objects are touching one another. Scientists sometimes divide contact forces into more specific groups to distinguish how they act. The table shows the various types of contact forces.

Type: Applied Force
Definition: a force that is applied to an object by another object or person
Example: When you pull on a door handle to close the door or push on the door to open it, then you are exerting an applied force on the door. An applied force may not result in motion if the opposing force is greater.
Type: Normal Force
Definition: the support force exerted on an object by another stable force
Example: The force exerted by the table on a book resting on the table is a normal force. If you lean against a wall, then the wall supports you by exerting a normal force on you.

Type: Friction Force
Definition: a force exerted by a surface as an object moves, or attempts to move, across it
Example: If you slide a box across the floor, then the floor exerts a force first to keep the box from sliding and then, after it begins to move, to keep the box from sliding easily.
Type: Air Resistance Force
Definition: a type of frictional force that acts on objects as they travel through the air
Example: When you move, the force of air resistance acts on you. Air resistance has the greatest effect when objects move at a high speed, such as downhill skiing or parachuting.
Type: Tension Force
Definition: the force transmitted through a string, rope, or wire that is pulled tight by forces acting from opposite ends
Example: An electric power line stretched between two poles exerts a tension force on both poles.
Type: Elastic Force or Spring Force
Definition: the force exerted by a compressed or stretched object on any attached object
Example: When you stretch a rubber band, the band exerts a force on both your hands.

Applying Critical-Thinking Skills

Directions: *Answer each question or respond to each statement.*

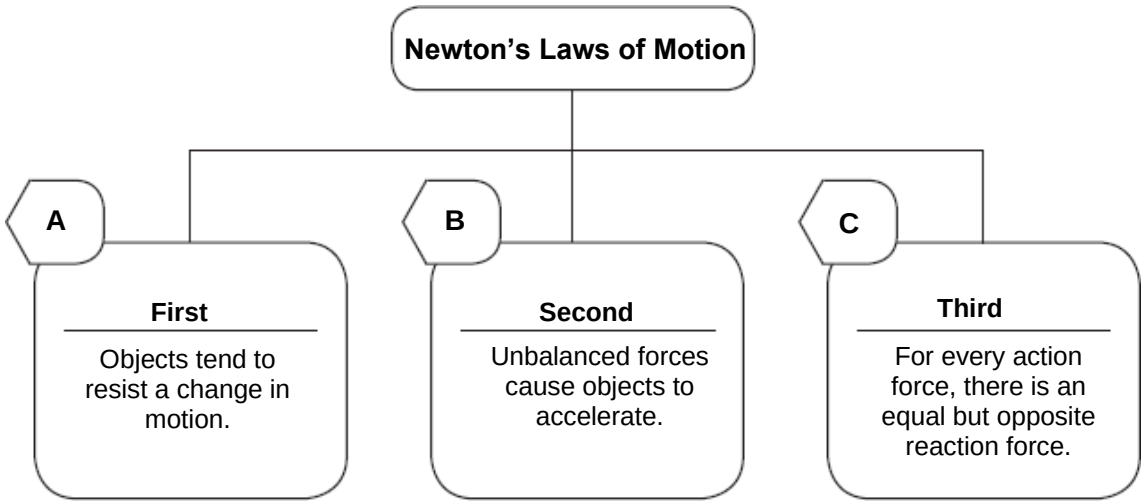
1. **Contrast** How is an applied force different from a normal force?
2. **Hypothesize** Why does the force of air resistance affect the motion of a person traveling at high speed more than a person walking across the room?
3. **Distinguish** Which types of contact forces are acting in each of the following cases? List all the forces acting on all the objects in each scenario provided below.
   - **a.** You step on a scale to measure your weight.
   - **b.** You hold a bow and pull back on a bowstring just before shooting an arrow.
   - **c.** You tie a string to the leg of a chair and use the string to pull the chair across the floor.

Name _____ Date _____ Class _____

Content Practice A

Newton's Laws of Motion

Directions: *On the line before each situation, write the letter of the law that describes it correctly. Some laws will be used more than once.*



_____ **1.** A car travels down a highway at a constant speed.

_____ **2.** A ball bounces off a wall.

_____ **3.** A sailboat moves faster as the wind gets stronger.

_____ **4.** The car slows down when the driver applies the brakes.

_____ **5.** Books inside a car move forward as the car comes to a quick stop.

_____ **6.** Water shoots downward as a toy rocket flies upward.

Name _____ Date _____ Class _____

Content Practice A

The Structure of the Solar System

Earth	**inner planets**	**Jupiter**	**Mars**
Mercury	**Neptune**	**outer planets**	**Saturn**
Sun	**Uranus**	**Venus**	

Directions: *Label this diagram by writing the correct term from the word bank on each line.*