Name _____ Date _____

CHAPTER
Concept Map

Using Forces

Fill in the concept map below using the information you know about forces.

1. Motion is a change in an object's _____ over time.

↓

2. Speed is a measure of how fast an object's position changes. A measurement of an object's speed and its direction is _____. A change in an object's velocity is _____.

↓

3. A force is a push or a _____ exerted on an object.

↓

4. Newton's laws describe how forces affect _____. These laws include the _____, second, and _____.

↓

5. A force multiplied by the distance over which the force is applied is _____. The ability to do work is _____.

↓

6. Machines can make doing work easier by changing the _____ of a force or the _____ over which the force is applied.

LESSON Outline

Name _____ Date _____

Motion

Use your textbook to help you fill in the blanks.

What is motion?

1. The location of an object is its _____ .
   A change in the position of an object over time is motion.

   Motion has two parts: _____ and

   _____ .

2. Distance can be measured in _____ ,

   _____ , _____ , or

   _____ .

3. To measure direction, you can use a(n)

   _____ and units of _____ .

4. You need a(n) _____ from which to measure position or motion.

What is speed?

5. To calculate speed, divide the _____ by

   the _____ .

6. Units of speed can be _____ or

   _____ .

7. To state the velocity of an object, you need to know the

   object's _____ and its _____ .

Name _____ Date _____

LESSON Outline

What is acceleration?

9. Any change in the velocity of an object is a(n) _____ .

10. If the speed of a car traveling south is increasing 5 m/s every second, its acceleration is _____ .

11. An acceleration can be a change in speed or a change in _____ . Negative acceleration is called _____ .

What is momentum?

12. An object's mass multiplied by its velocity is its _____ .

13. An object with a mass of 1 kg and a velocity of 10 m/s has a momentum of _____ .

14. The more mass an object has, the _____ its inertia.

Critical Thinking

15. Would it be more difficult to stop a truck carrying a heavy load or stop the same truck empty? Explain your answer, using the concepts of inertia and momentum.

_____

_____

_____

_____

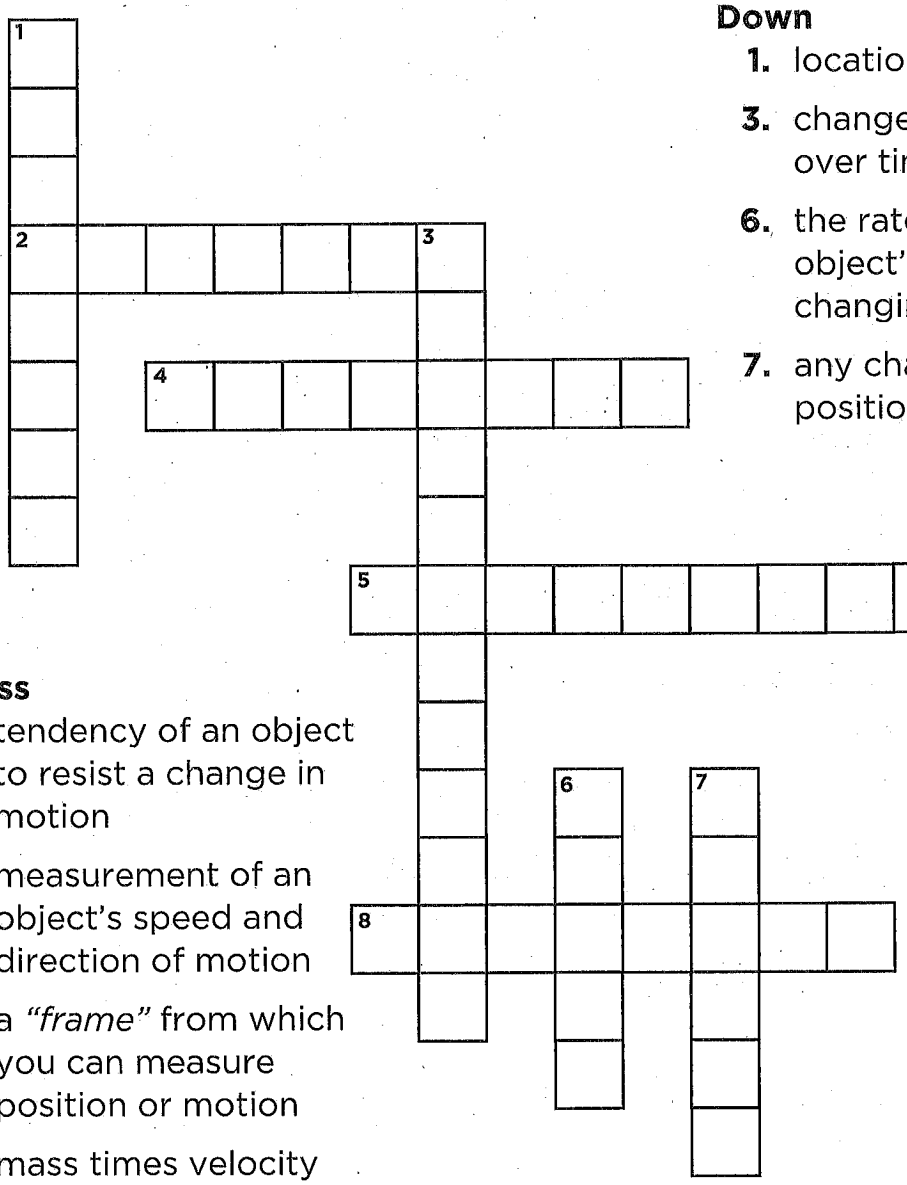
_____

Name _____ Date _____

Motion

Use the words in the word box to finish the puzzle.

acceleration	momentum	position	speed
inertia	motion	reference	velocity



Down

1. location of an object
3. change in velocity over time
6. the rate at which an object's position is changing over time
7. any change in position

Across

2. tendency of an object to resist a change in motion
4. measurement of an object's speed and direction of motion
5. a *"frame"* from which you can measure position or motion
8. mass times velocity

Name _____ Date _____

LESSON
Cloze Activity

Motion

Fill in the blanks.

acceleration	motion	time
momentum	speed	velocity

To describe how an object moves, you need a frame of reference, or a group of objects from which you can measure position. You can then measure the object's _____, or change in position. By dividing the distance an object moved by the _____ it took to move that distance, you describe an object's average _____. If you also measure the direction in which the object moved, you can describe its _____. If you know an object's instantaneous speed at the beginning and end of a time interval, you can describe the object's _____ over that time interval.

An object's mass multiplied by its velocity is its _____. The greater an object's inertia or resistance to a change in its motion, the greater its momentum.

Name _____ Date _____

The Position of Earth and the Sun

Read the Reading in Science feature in your textbook.

Main Idea and Details

Use the table below to record the main idea and details described in the timeline portion of the reading passage in your textbook.

Main Idea	Details
Many throughout history have made discoveries that help us determine how the planets and stars move.	Aristotle developed a model showing the _____ around _____ .
	Ptolemy used Aristotle's model and _____ to predict the way the Sun, the Moon, and planets would appear in the _____ .
	_____ first proposed that the Sun is at the center of the Solar System.
	Galileo's discovery of _____ circling _____ supported Copernicus's theory.
	Einstein explained how _____ works, helping us understand the movement of planets and stars.
	_____ worked on the first 3-D map of the _____ .

Write About It

Main Idea and Details Read the "Write About It" question. Use the text of "The Position of Earth and the Sun" feature to write your answers.

Identifying the Main Idea

The main idea is the central point of the passage. It tells you what the passage is about. Review the graphic organizer to find the main idea of the passage. Write that idea on the lines below.

Identifying Supporting Details

Details are important parts of the passage that support the main idea. Look for the supporting details within the list of scientists that follows the opening paragraphs. Give one detail from the article that supports the main idea. You can choose one supporting detail from your table.

LESSON Outline

Name _____ Date _____

Forces and Motion

Use your textbook to help you fill in the blanks.

What are forces?

1. Units of force are the _____ and the _____ .

2. An arrow can be used to represent the _____ and _____ of a force.

3. Three forces that act on an airplane: _____ , lift, and _____ .

What are gravity and friction?

4. The force that pulls all objects together is called _____ .

5. The amount of friction depends on two factors: the roughness of the _____ of the objects and how much force is required to _____ the two objects together.

6. _____ is created whenever there is friction.

What is Newton's first law?

7. According to the law of inertia, an object at rest tends to _____ , and an object in motion tends to _____ , unless acted upon by an _____ .

Name _____ Date _____

LESSON Outline

What is Newton's second law?

8. According to Newton's second law, an object's acceleration increases as the amount of unbalanced force on it _____ ; an object's acceleration decreases as the object's mass _____ .

What is Newton's third law?

9. When one object pushes on a second object, the second object pushes back on the first object with the same amount of _____ .

10. According to Newton's third law, for every action there is a(n) _____ but _____ reaction.

Critical Thinking

11. Suppose that you are walking down the street. Describe the forces acting on you, and use Newton's laws of motion to describe your motion.

LESSON
Vocabulary

Name _____ Date _____

Forces and Motion

What am I?

Choose a word from the word box below that answers each question.

a. action force	**d.** friction	**g.** unbalanced
b. balanced	**e.** inertia	
c. force	**f.** reaction force	

1. _____ I am the word that scientists use for a push or a pull. What am I?

2. _____ I am the force that sometimes makes sliding difficult. What am I?

3. _____ I am a force whose effect is offset by other forces, so I won't change your motion. What type of force am I?

4. _____ I am a force whose effect is not offset, so I change your motion in some way. What type of force am I?

5. _____ I am the first force in a pair. Whatever I push pushes back on whatever caused me. What am I?

6. _____ I am the second force in a pair. If something gets pushed, I push back. What am I?

7. _____ I am the tendency of an object in motion to stay in motion.

Name _____ Date _____

LESSON
Cloze Activity

Forces and Motion

Fill in the blanks.

accelerate	force	gravity	mass
distance	gravitation	inertia	unbalanced

The motion of any object can be explained using the laws that Newton discovered more than 300 years ago. His universal law of _____ states that objects with more _____ have more force of _____ between them. Objects that are separated by more _____ have less force of gravity between them.

According to Newton's first law, also called the law of _____, an object at rest tends to stay at rest, and an object in motion tends to stay in motion, unless acted upon by a(n) _____ force. The second law can be summed up with the equation F = ma. This equation means that an object accelerates more as the size of the unbalanced _____ on it increases and that more massive objects _____ less for a given force. Newton's third law states that for every action force there is an equal and opposite reaction force.

LESSON Outline

Name _____ Date _____

Work and Energy

Use your textbook to help you fill in the blanks.

What is work?

1. Work done on an object changes the amount of _____ that the object has.

2. Work is equal to the _____ used multiplied by the _____ over which the force was applied.

3. The units of work are _____, or _____.

4. Work occurs when _____ cause an object to accelerate.

5. Total work is the sum of _____ work and _____ work.

6. When you move an object, _____ often performs negative work on it.

What is energy?

7. Energy is measured in units called _____.

8. A stretched spring has _____ energy. A moving object has _____ energy.

9. Doing positive work on an object increases its _____.

10. Thowing a ball increases its _____ energy; lifting a ball increases its _____ energy.

11. Chemical energy, nuclear energy, and magnetic energy are different forms of _____ energy.

12. Heat, electricity, sound, and light are different forms of _____ energy.

How can energy change?

13. Energy cannot be _____ or _____; it can only _____.

14. Whenever energy is used to do work, energy _____.

15. Kinetic energy is often changed into heat energy by _____.

Critical Thinking

16. Trace the energy changes that occur in a toaster, in a radio, and in a windmill used to generate electricity.

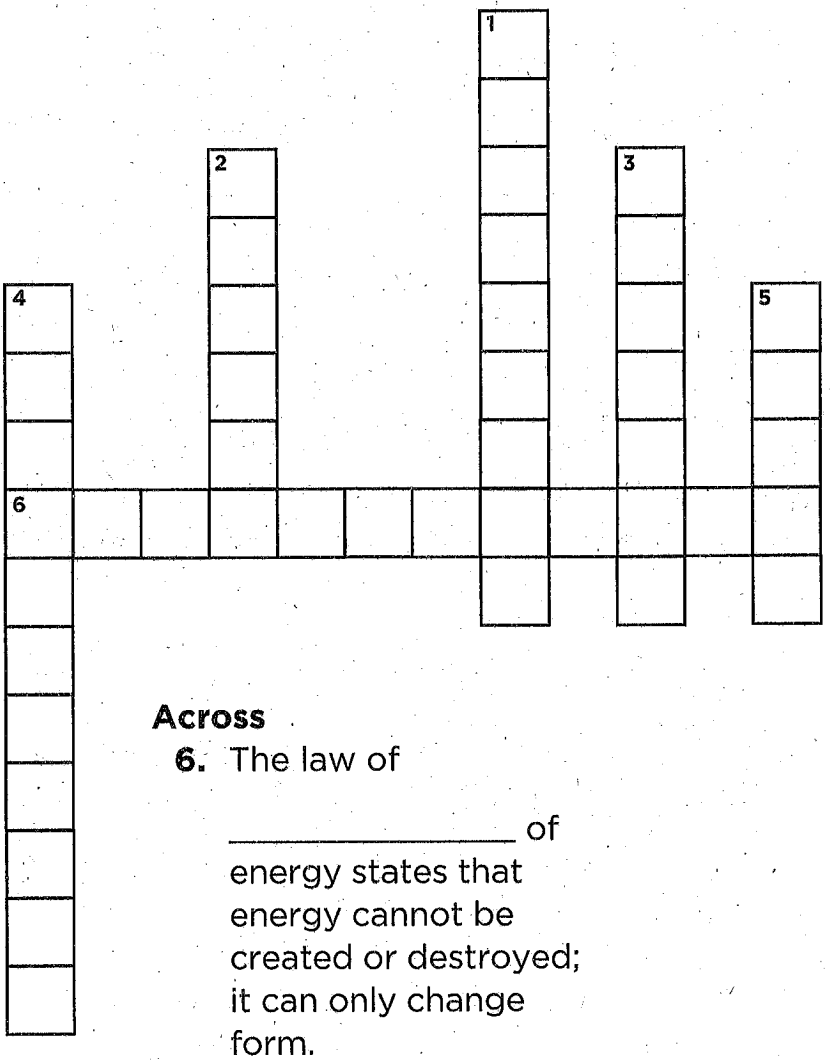
LESSON
Vocabulary

Name _____ Date _____

Work and Energy

Use the words in the word box to finish the puzzle.

chemical	joules	sound
conservation	kinetic	
electricity	potential	



Down

1. Energy that is stored in the position of an object is called _____ energy.
2. Units of work are _____.
3. The energy of a moving object is _____ energy.
4. The kinetic energy of electrons is called _____.
5. The kinetic energy of particles as they move in waves is _____.

Across

6. The law of _____ of energy states that energy cannot be created or destroyed; it can only change form.

Name _____ Date _____

LESSON
Cloze Activity

Work and Energy

Fill in the blanks.

destroyed	friction	positive	sound
electrical	kinetic	potential	work

Work is defined as an unbalanced force acting on an object through a certain distance. The total work done on an object is the sum of the _____ work and the negative work done on it. The force of _____ usually does negative work on a moving object. Energy is defined as the ability to do _____ .

If you lift a ball, you give it _____ energy. If you drop the ball, its potential energy is converted into _____ energy. Different forms of potential energy include chemical, nuclear, magnetic, and _____ energy. Different forms of kinetic energy include electricity, _____ , and light. The law of conservation of energy states that energy cannot be created or _____ . Energy can only change forms.

LESSON Outline

Name _____ Date _____

Simple Machines

Use your textbook to help you fill in the blanks.

What are simple machines?

1. A simple machine can change the _____, _____, or _____ of a force that you apply.

2. When you apply a force to a machine's _____ arm, the machine applies an output force to the load through its _____ arm.

3. The ratio of a machine's output force to the effort applied is called its _____.

What are levers?

4. A lever can either multiply an _____ or multiply _____.

5. A crowbar is a _____ lever—the effort arm and the _____ are on opposite sides of the _____.

6. A wheelbarrow is a _____ lever—the effort force is _____ than the output force, and both are in the same _____.

7. A fishing rod is a _____ lever—its output force is _____ than the effort force, but output distance of the tip of the rod is greater than the effort distance of your hand.

Name _____ Date _____

LESSON
Outline

Which machines are like levers?

8. A wheel and axle is a type of lever in which the axle acts like the _____ and the wheel acts like the _____ of the lever.

9. A wheel and axle with a free-moving cord is called a _____ .

What are inclined planes?

10. An inclined plane that is used to separate two objects is called a(n) _____ . An inclined plane wrapped around a cylinder is a(n) _____ .

11. The farther apart the threads of a screw, the _____ the screw moves when turned, but the _____ effort it takes to turn it.

What are compound machines?

12. Any machine that combines two or more simple machines is a _____ .

13. The more work that a machine does for a given input of energy, the more _____ it is.

14. Efficiency is often expressed as a(n) _____ .

Critical Thinking

15. What types of simple machines are in a wheelbarrow?

_____

_____

LESSON
Vocabulary

Name _____ Date _____

Simple Machines

What am I?

Choose a word from the word box below that answers each question.

compound machine	fulcrum	simple machine
efficiency	load	
effort	screw	

1. _____ I am a bicycle, car, or anything else made up of two or more simple machines. What am I?

2. _____ I am the push on a lever or the pull on a pulley. I am any force that you apply to a machine. What am I?

3. _____ I take one force and change it into another force. I can change the direction, strength, or distance of a force. What am I?

4. _____ When the effort arm goes down, the resistance arm goes up, but I don't move. I am the pivot point on a lever. What am I?

5. _____ When you push down on a lever, I am the object moved by the resistance arm. What am I?

6. _____ I can tell you how much you can gain by using a machine. I am the ratio of your input energy to the machine's output work. What am I?

7. _____ I am an inclined plane wrapped around a cylinder. What am I?

Name _____ Date _____

LESSON
Cloze Activity

Simple Machines

Fill in the blanks.

farther	less	longer	simple machine
fulcrum	load	resistance	strength

Simple machines make work easier by changing the distance, direction, or amount of the effort force that you apply. Using an inclined plane, you can raise an object with less effort than if you lifted it directly upward. The _____ the inclined plane, the less effort needed to lift a load. A pulley can change the direction or _____ of the force applied to lift a load. A lever has an effort arm, resistance arm, and _____, or pivot point. When you apply a force on the effort arm, the _____ arm applies a force on the _____. If the effort arm is longer than the resistance arm, you use _____ force to lift a load, but the effort arm moves _____.

Compound machines combine two or more _____. The more work a machine does for a given input of energy, the more efficient the machine is.

Name _____ Date _____

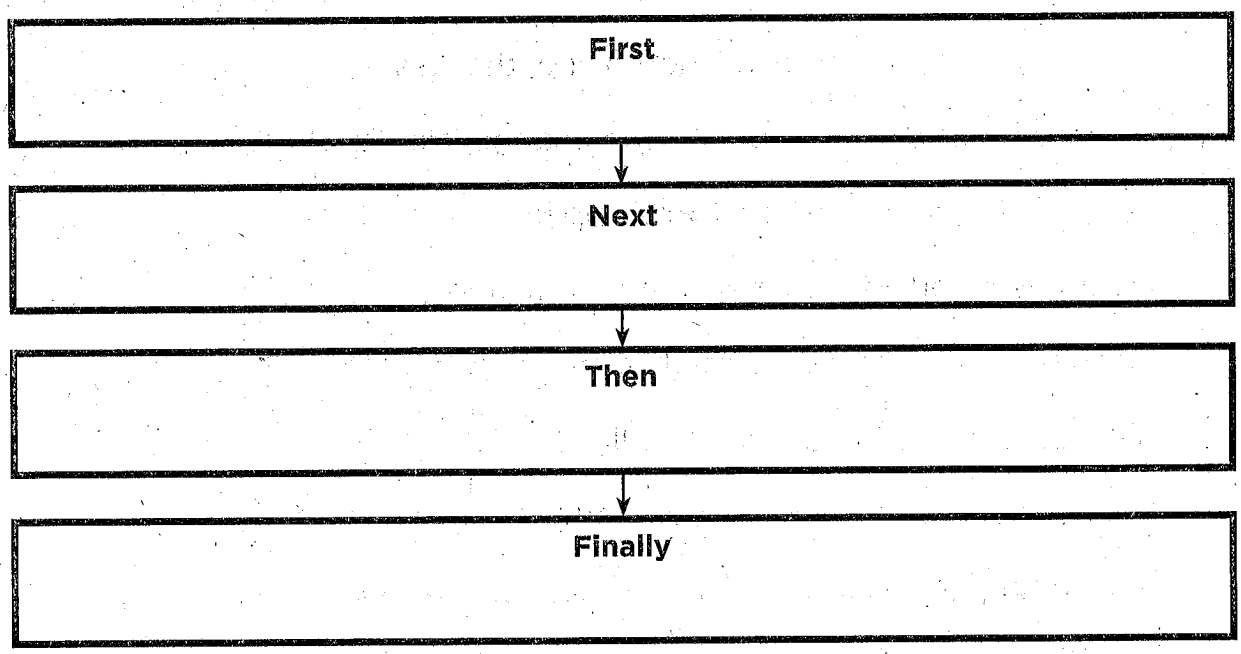
A Humane Mousetrap

Write About It

Do some online research about bird feeders that keep squirrels from stealing the birdseed. Write an explanation of how this kind of bird feeder works by using simple machines. Provide steps for making this device. (You can invent your own.)

Getting Ideas

Do some online research on birdfeeders. Then fill in the sequence chart below. Jot down steps for making a birdfeeder that keeps squirrels from stealing the birdseed.



Planning and Organizing

When organizing explanatory writing, it is often best to write the details as they happened. Write the detail that happened first. Then the detail that happened second. Then the detail that happened last. When writing your explanation, make sure you write your steps in the order they happen.

Name _____ Date _____

Writing in Science

Drafting

Write a sentence to begin your explanation. Tell what your birdfeeder does. In other words, tell how it is squirrel-proof.

_____

_____

Now write your explanation. Use a separate piece of paper. Begin with the sentence you just wrote. Tell how the birdfeeder works. Then tell the steps for making it. Write these steps in time order.

Revising and Proofreading

Here is part of Alicia's explanation. Combine each pair of sentences. Use the word in parentheses.

1. Squirrels slide down the pole. It is slippery. (because)

_____

2. Squirrels can't jump onto the top of the feeder. It is too high up. (since)

_____

3. Birds can get at the seeds. There are holes in the mesh. (because)

_____

4. Do not put this feeder under a tree. A squirrel might jump down onto it. (since)

_____

_____

Now revise and proofread your writing. Ask yourself:

- Did I clearly and accurately explain how the birdfeeder works?
- Did I write the steps for making it in order?
- Did I correct all mistakes?

Name _____ Date _____

Using Forces

Choose the letter of the best answer.

1. How fast an object's position is changing over time is the object's
   - **a.** velocity.
   - **b.** acceleration.
   - **c.** speed.
   - **d.** mass.

2. Momentum is calculated by multiplying an object's mass by its
   - **a.** mass.
   - **b.** velocity.
   - **c.** work.
   - **d.** inertia.

3. The force of gravity between two objects
   - **a.** increases with mass and decreases with distance.
   - **b.** increases with distance and decreases with mass.
   - **c.** decreases with mass and increases with distance.
   - **d.** increases with mass and increases with distance.

4. Friction between objects produces
   - **a.** gravity.
   - **b.** load.
   - **c.** inertia.
   - **d.** heat.

5. Newton's second law of motion states that force is equal to mass times
   - **a.** speed.
   - **b.** energy.
   - **c.** velocity.
   - **d.** acceleration.

6. Placing a dish on a higher shelf increases the dish's
   - **a.** inertia.
   - **b.** kinetic energy.
   - **c.** weight.
   - **d.** potential energy.

Choose the letter of the best answer.

7. Work is done when

a. you push against a wall.

b. you lift a book.

c. you stand on the floor.

d. you hold a box.

8. When you do positive work on an object, you

a. decrease the object's energy.

b. keep the object's energy the same.

c. increase the object's energy.

d. may increase or decrease the object's energy.

9. The unit that is used to measure force is the

a. meter.

b. kilogram.

c. Newton.

d. joule.

10. The force that you apply to a simple machine is called the

a. effort.

b. work.

c. load.

d. output.

11. If a machine is 50 percent efficient, how much energy must you apply to lift a 100-Newton weight a distance of 10 meters?

a. 2000 joules

b. 1000 joules

c. 500 joules

d. 100 joules

12. Which of the following is an example of an inclined plane?

a. pulley

b. ramp

c. gear

d. wheel and axle

13. Which of these is a compound machine?

a. wedge

b. screw

c. pair of scissors

d. wheel and axle

CHAPTER
Concept Map

Name _____ Date _____

Using Energy

Fill in the concept map below, using information you know about energy.

	Definition	Example
Heat	Heat is energy that flows because of a difference in _____ .	The energy that flows away from your hand when you hold a _____ drink
Sound	Sound is energy that moves in the form of a _____ that is a series of compressions and _____ .	The energy from a whistle is an example of sound that has a high _____ .
Light	Light is a wave made from electric and _____ energy. Light is also a _____ .	The light from a rainbow is an example of light that is spread out into a _____ .
Electricity	Electricity is energy in the form of moving _____ .	One example of electricity is the movement of _____ that occurs when you touch a door knob.
Magnetism	Magnetism is the ability of one object to _____ or _____ on another object that has the same magnetic property.	Magnetism is shown when two magnets either _____ or _____ each other.