



Physical Science

Student Workbook



What Is Physical Science?

Directions Read each statement. Then unscramble the letters in parentheses. Each statement is a clue for the term. Write the term on the line.

1. Physical science that explains how a helium balloon rises
(chisspy) _____
2. The amount of material in a tree
(sams) _____
3. Anything that has mass and takes up space
(tarmet) _____
4. Physical science that explains how acid rain forms
(therycism) _____
5. Study of things around you
(salichpy niecesc) _____
6. What is needed to make things move
(genery) _____

Directions Read the terms. Cross out the term that does not belong. Explain why the term does not belong.

7. organizing, tuning fork, predicting _____
8. technology, chemistry, physics _____
9. balance scale, Bunsen burner, measurements _____
10. matter, computers, microwave ovens _____

Systems of Measurement

Directions The table describes some units of measurement. Each unit has a metric equivalent. Complete the table with the help of a dictionary or other reference tool. The first item is done for you.

Units of Measurement

Unit	Description	Equals (Metric)
1. knot	unit used to measure air and wind speed	about 1.9 kilometers per hour
2. carat	unit of weight for gemstones	
3. hand	unit of length for measuring height of horses	
4. league	unit of distance in measuring land: about 3 miles	
5. light-year	unit of distance equal to the distance light travels through space in one year	
6. furlong	unit of distance in measuring land: 220 yards	
7. pound	unit of weight	
8. fathom	unit of length used to measure the depth of water	
9. cable	unit of length used at sea, equal to 120 fathoms	
10. gallon	unit of liquid volume	
11. span	unit of length, based on the spread of fingers	
12. rod	unit of length for measuring land	
13. ell	unit for measuring cloth	
14. peck	unit of volume used to measure grains and fruit	
15. foot	unit of length	

Adding and Subtracting Metric Units of Length

Directions Add or subtract the numbers in each problem. Then simplify your answer. Write your answer on the line. The first one is done for you.

1.
$$\begin{array}{r} 12 \text{ centimeters } 5 \text{ millimeters} \\ + 5 \text{ centimeters } 3 \text{ millimeters} \\ \hline \end{array}$$
 17 centimeters 8 millimeters

2.
$$\begin{array}{r} 10 \text{ meters } 8 \text{ centimeters} \\ + 9 \text{ meters } 9 \text{ centimeters} \\ \hline \end{array}$$

3.
$$\begin{array}{r} 22 \text{ meters } 4 \text{ centimeters} \\ + 3 \text{ meters } 5 \text{ centimeters} \\ \hline \end{array}$$

4.
$$\begin{array}{r} 20 \text{ meters } 10 \text{ millimeters} \\ + \quad \quad \quad 23 \text{ millimeters} \\ \hline \end{array}$$

5.
$$\begin{array}{r} 10 \text{ centimeters } 5 \text{ millimeters} \\ + 22 \text{ centimeters } 8 \text{ millimeters} \\ \hline \end{array}$$

6.
$$\begin{array}{r} 6 \text{ meters } 2 \text{ centimeters} \\ + 4 \text{ meters} \\ \hline \end{array}$$

7.
$$\begin{array}{r} 23 \text{ millimeters} \\ + 3 \text{ millimeters} \\ \hline \end{array}$$

8.
$$\begin{array}{r} 11 \text{ meters } 9 \text{ millimeters} \\ + 8 \text{ meters } 6 \text{ millimeters} \\ \hline \end{array}$$

9.
$$\begin{array}{r} 39 \text{ meters } 9 \text{ millimeters} \\ - 1 \text{ meter } 6 \text{ millimeters} \\ \hline \end{array}$$

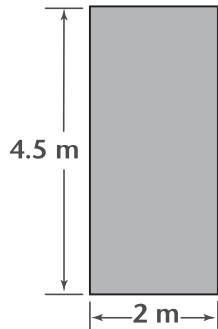
10.
$$\begin{array}{r} 20 \text{ meters } 7 \text{ centimeters} \\ - \quad \quad \quad 5 \text{ centimeters} \\ \hline \end{array}$$

Using Metric Measurements to Find Area

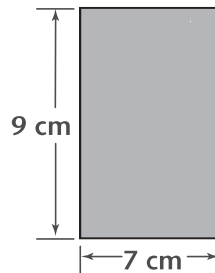
Directions Use the formula to find the area of each figure.

Write your answer on the line. Include the unit in your answer.

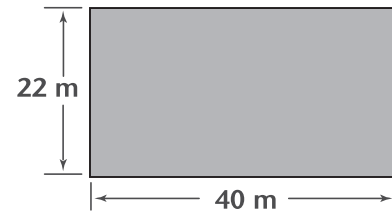
$$\text{area} = \text{length} \times \text{width}$$



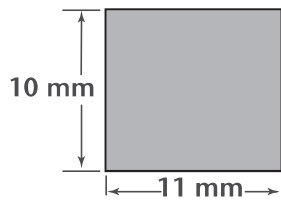
1. _____



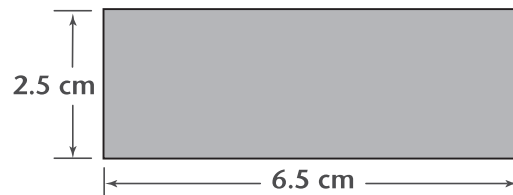
2. _____



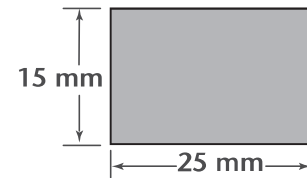
3. _____



4. _____



5. _____



6. _____

Directions Write the missing number on the line. Be sure to include the unit in the answer.

7. $6 \text{ m} \times \underline{\hspace{2cm}} = 48 \text{ m}^2$

12. $35 \text{ m} \times 30 \text{ m} = \underline{\hspace{2cm}}$

8. $12 \text{ cm} \times 18 \text{ cm} = \underline{\hspace{2cm}}$

13. $4 \text{ cm} \times \underline{\hspace{2cm}} = 56 \text{ cm}^2$

9. $14 \text{ mm} \times \underline{\hspace{2cm}} = 1,400 \text{ mm}^2$

14. $20 \text{ cm} \times 20 \text{ cm} = \underline{\hspace{2cm}}$

10. $120 \text{ m} \times 17 \text{ m} = \underline{\hspace{2cm}}$

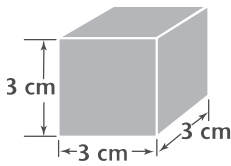
15. $\underline{\hspace{2cm}} \times 70 \text{ m} = 140 \text{ m}^2$

11. $8.5 \text{ mm} \times 3.5 \text{ mm} = \underline{\hspace{2cm}}$

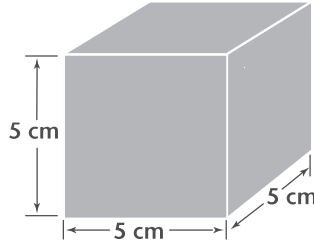
Using Metric Measurements to Find Volume

Directions Use the formula to find the volume of each figure. Write your answer on the line. Include the unit in your answer.

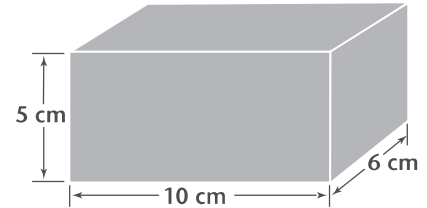
$$\text{volume} = \text{length} \times \text{width} \times \text{height}$$



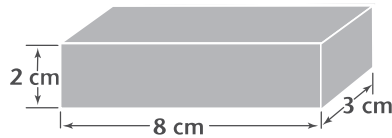
1. _____



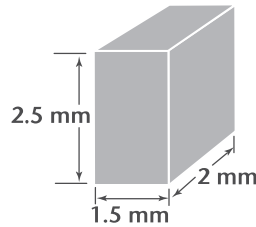
2. _____



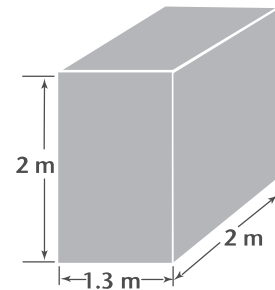
3. _____



4. _____



5. _____



6. _____

Directions Write the volume of each box on the line. Be sure to include the unit in your answer.

7. $10 \text{ m} \times 10 \text{ m} \times 10 \text{ m} =$

12. $40 \text{ cm} \times 15 \text{ cm} \times 10 \text{ cm} =$

8. $1.5 \text{ cm} \times 1.5 \text{ cm} \times 1.5 \text{ cm} =$

13. $1.1 \text{ cm} \times 2 \text{ cm} \times 50 \text{ cm} =$

9. $4 \text{ mm} \times 4 \text{ mm} \times 4 \text{ mm} =$

14. $2 \text{ m} \times 3 \text{ m} \times 2 \text{ m} =$

10. $240 \text{ m} \times 2 \text{ m} \times 150 \text{ m} =$

15. $225 \text{ cm} \times 150 \text{ cm} \times 50 \text{ cm} =$

11. $20 \text{ mm} \times 5 \text{ mm} \times 10 \text{ mm} =$

The Metric System: Terms Review

Directions Match each term in Column A with its meaning in Column B.
Write the correct letter on the line.

Column A

- ___ 1. area
- ___ 2. chemistry
- ___ 3. physical science
- ___ 4. matter
- ___ 5. meterstick
- ___ 6. cubic centimeter
- ___ 7. meter
- ___ 8. centigram
- ___ 9. exponent
- ___ 10. physics
- ___ 11. volume
- ___ 12. metric system
- ___ 13. customary
- ___ 14. unit
- ___ 15. mass

Column B

- A** anything that has mass and takes up space
- B** the study of how energy acts with matter
- C** a known amount used for measuring
- D** the basic unit of length in the metric system
- E** the study of matter and energy
- F** a metric unit that means centimeter \times centimeter \times centimeter
- G** the study of matter and how it changes
- H** a metric unit of measure that is $\frac{1}{100}$ of a gram
- I** ordinary
- J** the amount of space an object takes up
- K** a number that tells how many times another number is a factor
- L** the amount of material an object has
- M** system of measurement used by scientists
- N** a common tool for measuring length in the metric system
- O** the amount of space the surface of an object takes up

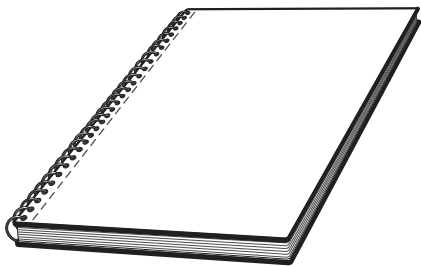
Directions Write the abbreviation of the word in bold on the line.

- ___ 16. There are 1,000 **milliliters** in a liter.
- ___ 17. 1,000 meters is equal to a **kilometer**.
- ___ 18. A **milligram** is $\frac{1}{1,000}$ of a gram.
- ___ 19. A **meter** is equal to about 39 inches.
- ___ 20. A **centigram** is $\frac{1}{100}$ of a gram.
- ___ 21. One **kilogram** is about 2.2 pounds.
- ___ 22. A **millimeter** is $\frac{1}{1,000}$ of a meter.
- ___ 23. The basic unit of mass in the metric system is the **gram**.
- ___ 24. A **liter** is slightly more than a quart.
- ___ 25. A **centimeter** is $\frac{1}{100}$ of a meter.

Properties of Objects

Directions Look at the objects below. On the lines, write properties that describe each object. Estimate each object's size, mass, and volume. Use the chart to help you choose units of measure.

	Volume of a Liquid	Volume of a Solid	Mass
Measured in	mL (milliliters) L (liters)	cm ³ (cubic centimeters) m ³ (cubic meters)	g (grams) kg (kilograms)
Examples	individual carton of milk is 237 mL water bottle is 500 mL	textbook is 1,500 cm ³	textbook is 1 kg



Object 1



Object 2

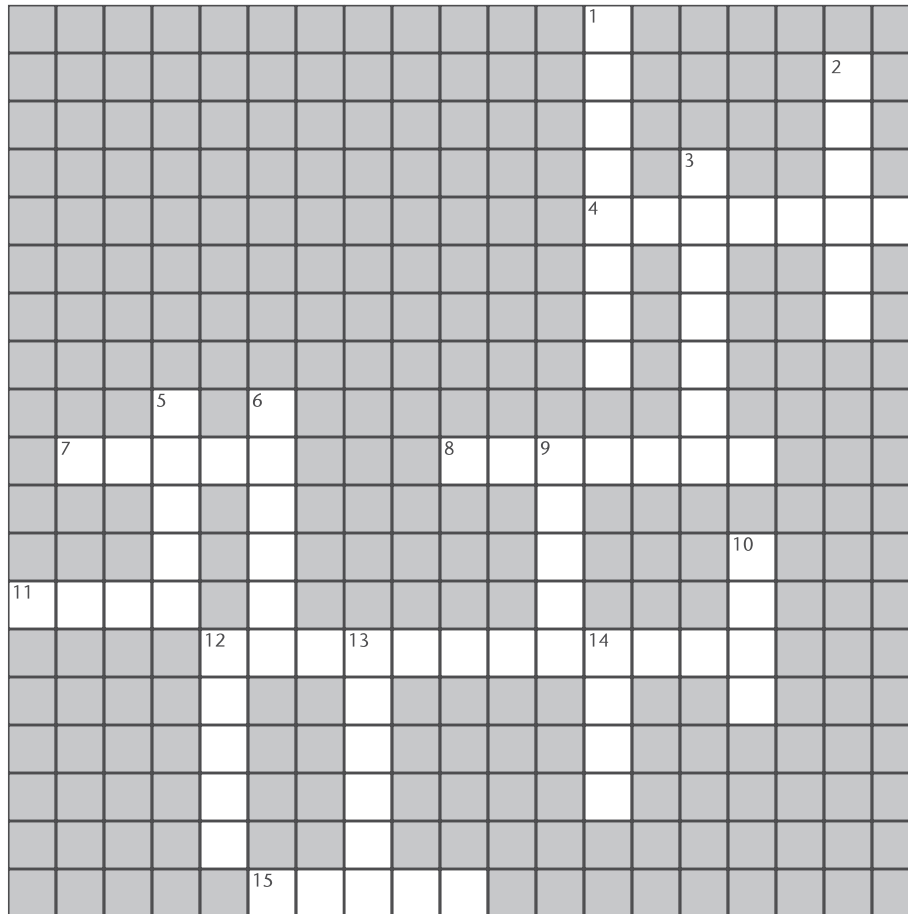


Object 3

Shape	A _____	A _____	A _____
Feel	B _____	B _____	B _____
Size	C _____	C _____	C _____
Mass	D _____	D _____	D _____
Volume	E _____	E _____	E _____

Mass and Weight

Directions Use the clues to complete the crossword puzzle. You may also use your book for help.



Across

4. force that causes objects to be attracted to each other
7. what gravity is
8. planet with a force of gravity 2.54 times that of Earth
11. amount of matter in an object
12. small object used with a balance to determine mass (2 words)
15. planet with a force of gravity 0.894 times that of Earth

Down

1. metric measure of mass for large objects
2. something that has mass
3. instrument used to measure mass
5. 1,000 ____ = 1 kilogram
6. measure of how hard gravity pulls on an object
9. customary unit of weight abbreviated *lb*
10. An astronaut weighs ____ on the moon than on Earth.
12. an instrument used in stores to weigh produce
13. metric unit of weight; 9.8 of these units = 1 kg
14. planet with a moon named Deimos

Measuring the Mass of a Liquid

Directions You want to buy perfume or cologne. How much product is in a bottle? That depends on the mass of the liquid in the bottle. Find the mass of the liquid in each bottle. Then find the cost per gram of the product. Divide the price by the mass of the liquid to find the cost per gram.

EXAMPLE

A bottle has 20 grams of perfume. The bottle of perfume costs \$45.00.

$$\text{Cost per gram} = \frac{\$45.00}{20 \text{ grams}}$$

$$\text{Cost per gram} = \$2.25$$



Name	Mass of Empty Bottle	Mass of Filled Bottle	Mass of Perfume or Cologne	Cost per Gram
Tidal	82 g	125 g	1.	2.
Freesia	55 g	85 g	3.	4.
Daisy	66 g	92 g	5.	6.
Breeze	70 g	150 g	7.	8.
Roma	80 g	130g	9.	10.

11. Which perfume costs the most per gram? _____

12. Which costs the least per gram? _____

13. Which costs more per gram: Tidal or Breeze? _____

14. List the perfumes in order, from most expensive per gram to least expensive.

15. What else besides price would you consider when buying perfume or cologne?

Measuring the Volume of Liquid

Directions Use the terms in the box to complete each sentence. Write your answer on the line. You will use some terms more than once.

bottom	laboratory	scale
cubic centimeter	level	spaces
divide	meniscus	subtract
graduated cylinder	milliliters	volume

1. Liquid volume is measured in cubic centimeters or _____.
2. In the _____, scientists use milliliters to measure the volume of liquid.
3. The largest _____ usually holds one liter of liquid.
4. One milliliter has the same volume as one _____.
5. You read the volume of a liquid by looking at the _____ on a graduated cylinder.

Procedure A: Measure with a Graduated Cylinder

6. Pour liquid into a _____.
7. Place yourself so that your eyes are _____ with the top of liquid.
8. Look at the _____, the curved surface of the liquid.
9. Find the _____ of the curve of the liquid.
10. Read the _____ on the outside of the cylinder at this point.

Procedure B: Read the Scale on a Graduated Cylinder

11. The volume of a liquid is measured in _____.
12. Find out how many mL the _____ on the scale stand for.
13. Now _____ the numbers on any two long lines next to each other.
14. Count the spaces between the long lines and _____ this number into the answer from step 13.
15. This will give you the _____ represented by each line.

Comparing and Contrasting Objects

Directions When you compare things or ideas, you tell how they are alike. When you contrast them, you tell how they are different. Compare and contrast each pair of words.

How They Are Alike	How They Are Different
1. length—volume: _____ _____ _____	_____ _____ _____
2. cube—sphere: _____ _____ _____	_____ _____ _____
3. regular shapes—irregular shapes: _____ _____ _____	_____ _____ _____
4. balance—graduated cylinder: _____ _____ _____	_____ _____ _____
5. liquid mass—liquid volume: _____ _____ _____	_____ _____ _____

Directions Tell how you would measure the volume of each item.
Write *formula* or *displacement of water method* on the line.

- a cement block _____
- a stone _____
- a golf ball _____
- a refrigerator box _____
- a game die _____

The Properties of Matter: Terms Review

Directions Match each term in Column A with its meaning in Column B. Write the correct letter on the line.

Column A

- _____ 1. weight
- _____ 2. newton
- _____ 3. meniscus
- _____ 4. standard mass
- _____ 5. balance
- _____ 6. property
- _____ 7. density
- _____ 8. graduated cylinder
- _____ 9. displacement of water

Column B

- A** a characteristic that helps identify an object
- B** the measure of how hard gravity pulls on an object
- C** an instrument used to measure mass
- D** method of measuring volume of irregularly shaped object
- E** a round cylinder used to measure the volume of a liquid
- F** the curved surface of a liquid
- G** the metric unit of weight
- H** a measure of how tightly matter is packed into a given volume
- I** small object used with a balance to determine mass

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

- 10. Length times width times height equals _____. (lumove)
- 11. Use a _____ to measure mass. (canebla)
- 12. Measure the volume of a liquid using a _____. (dateargud dinecrly)
- 13. Read the bottom of the curve of the _____ in a graduated cylinder. (misscenu)
- 14. A mass of 1 kg has a metric weight of 9.8 _____. (swetonn)
- 15. To measure the volume of a stone, you could use the _____ of water method. (palstendicem)

Identifying Solids, Liquids, and Gases

Directions Each figure below represents a different state of matter. Use the figures to complete the following statements.

1. What are the smallest particles of a substance that have the same properties as the substance?

They are _____.

2. Liquids are best represented by Figure _____.

3. Gases are best represented by Figure _____.

4. Figure _____ shows the state of matter with the greatest density.

5. One state of matter that is not represented by the figures is _____.

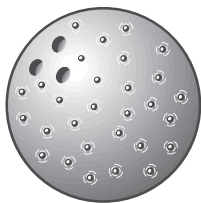


Figure A

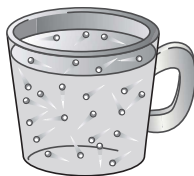


Figure B

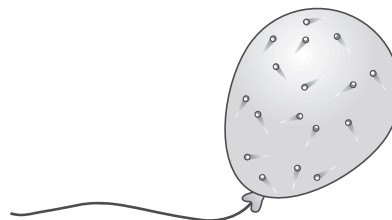


Figure C

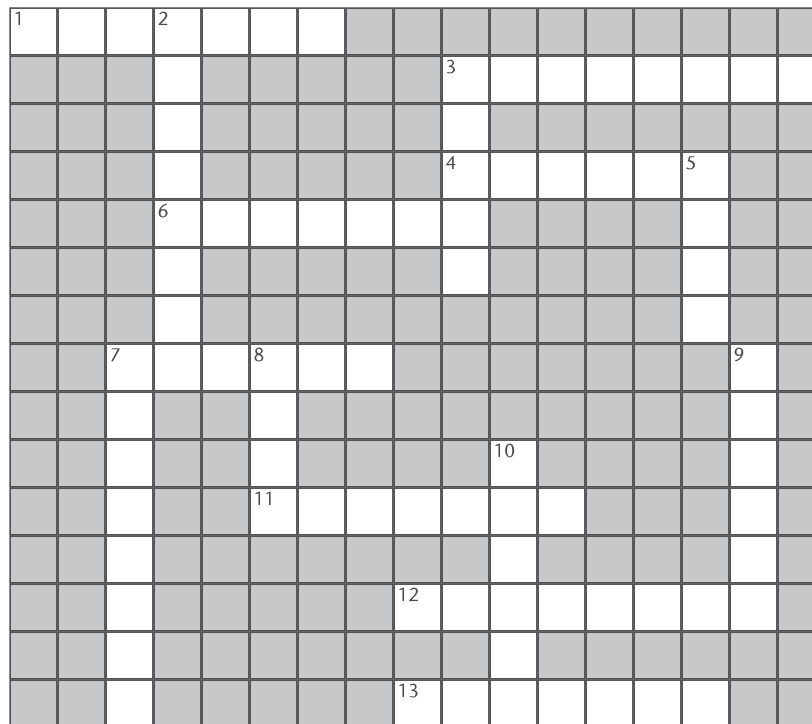
Directions Match each item with the figure that best represents it. Write the letter of the figure on the line.

6. ice cube _____
7. skateboard _____
8. feather _____
9. helium in a balloon _____
10. raindrop _____

11. old ring _____
12. orange juice _____
13. bar of soap _____
14. air _____
15. water vapor from a cooking pot _____

What Are Elements?

Directions Read the clues to complete the crossword puzzle. Each word is related to elements.



Across

1. matter that has only one kind of atom
3. an element used to make soft-drink cans
4. A water molecule contains one of these atoms.
6. an element that keeps bones healthy
7. an element used in some balloons
11. There are 92 of these elements.
12. an element used in fertilizers
13. an element used in thermometers

Down

2. A water _____ is made of three parts.
3. All of these are alike in the same element.
5. an element used in signs
7. There are two of these atoms in a water molecule.
8. one of the elements in steel
9. A pencil point has billions of these atoms.
10. takes up space and has mass



What Are Compounds?

Directions Use the terms in the box to complete each sentence.

1. A _____ is formed when two or more atoms of different elements join together.
2. The compound formed from two atoms of hydrogen and one atom of oxygen is _____.
3. Oxygen and hydrogen are _____, but when combined they form a _____.
4. A compound used for cooking made from sodium and chlorine is _____.
5. Baking soda is a compound made of _____, _____, _____, and oxygen.
6. To find out if a substance is an element or a compound, test it in a _____.
7. A compound used for cooking made of carbon, hydrogen, and oxygen is _____.

carbon
compound
gases
hydrogen
laboratory
liquid
salt
sodium
sugar
water

Directions When you compare and contrast things, you tell how they are alike and how they are different. Answer these questions by comparing and/or contrasting.

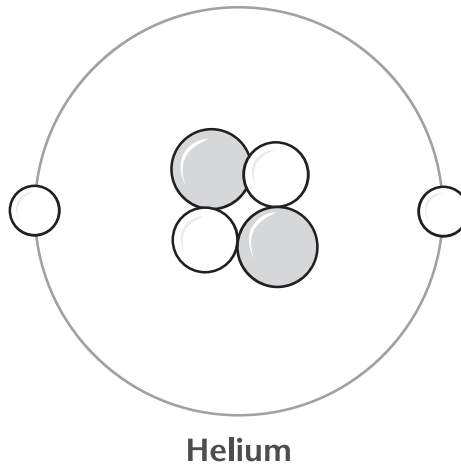
8. How are an element and a compound alike and different?

9. How are water and hydrogen different?

10. How are sugar and baking soda alike?

What Are Atoms Like?

Directions Label the model with letters *e*, *n*, and *p* to show its parts. The letter *e* stands for electron, *n* for neutron, and *p* for proton. Then complete each sentence about the model by writing an answer on the line.



1. The model shows (a, an) _____ of helium.
2. The nucleus consists of _____
and _____.
3. The particles labeled *p* are _____.
4. The particles labeled *e* are _____.
5. The particles labeled *n* are _____.

Directions Complete the chart.

Element	Number of Protons	Number of Electrons
6. lithium	3	
7. boron		5
8. carbon		6
9. oxygen	8	
10. neon	10	

The Structure of Matter: Terms Review

Directions Match each term in Column A with its meaning in Column B. Write the letter on the line.

Column A

- _____ 1. molecule
- _____ 2. electron
- _____ 3. atom
- _____ 4. gas
- _____ 5. neutron
- _____ 6. state of matter
- _____ 7. liquid
- _____ 8. model
- _____ 9. nucleus

Column B

- A** a particle found in the nucleus of an atom
- B** a particle with a negative charge
- C** the form that matter has
- D** the form of matter with no definite shape or volume
- E** the building block of matter
- F** the smallest particle of a substance that has its properties
- G** the form of matter with a definite volume but not definite shape
- H** the central part of an atom
- I** something made to show how something else works

Directions Unscramble the letters in parentheses to make a word that completes each sentence. Write the word on the line.

- 10. A _____ is a substance made of two or more elements combined chemically. (modoncup)
- 11. A _____ is a particle with a positive charge in the nucleus of an atom. (troonp)
- 12. A very hot gas made of charged particles is _____. (amalps)
- 13. The form of matter with a definite shape and volume is a _____. (doils)

Directions Write an answer to each question.

14. How do the mass number and the atomic number of an element differ?

15. How are natural elements different from other elements?

Words from Chemical Symbols

Directions Read the clue in Column A. You can find the answer from the elements in Column B. In Column C, write the symbols for the elements in Column B. The word you form should be the correct answer for the clue. The first one is done for you.

A	B	C
1. A farm animal	cobalt-tungsten	CoW
2. A musical group	barium-neodymium	_____
3. The opposite of <i>lose</i>	tungsten-iodine-nitrogen	_____
4. A building material	bromine-iodine-carbon-potassium	_____
5. Found on a door	potassium-nitrogen-oxygen-boron	_____
6. Used to write on a blackboard	carbon-hydrogen-aluminum-potassium	_____
7. A dog's sound	boron-argon-potassium	_____
8. It's 150 million km away	sulfur-uranium-nitrogen	_____
9. A source of energy	cobalt-aluminum	_____
10. A funny person	chlorine-oxygen-tungsten-nitrogen	_____
11. Used in hockey	plutonium-carbon-potassium	_____
12. Something to run in	radium-cerium	_____
13. A form of money	cobalt-iodine-nitrogen	_____
14. Show of affection	potassium-iodine-sulfur-sulfur	_____
15. Another word for <i>ill</i>	silicon-carbon-potassium	_____
16. An infant	barium-boron-yttrium	_____
17. A narrow street	lanthanum-neon	_____
18. To make better	helium-aluminum	_____
19. King of the beasts	lithium-oxygen-nitrogen	_____
20. A form of precipitation	radium-iodine-nitrogen	_____

Using the Periodic Table

Directions Write the atomic number for the element in each square. Then add the five atomic numbers in each row and in each column. Write the sums. If your atomic numbers are correct, the sums will all be the same.

Fe _____	As _____	Ne _____	Cl _____	Cr _____	Sums _____
Ge _____	Si _____	S _____	V _____	Mn _____	_____
Al _____	P _____	Ti _____	Cu _____	Ga _____	_____
K _____	Sc _____	Ni _____	Zn _____	Mg _____	_____
Ca _____	Co _____	Se _____	Na _____	Ar _____	_____

Sums

Classifying Elements: Terms Review

Directions Match each term in Column A with its meaning in Column B.
Write the correct letter on the line.

Column A

- _____ 1. periodic table
- _____ 2. alloy
- _____ 3. nonmetal
- _____ 4. atomic mass
- _____ 5. deuterium
- _____ 6. isotope
- _____ 7. noble gas
- _____ 8. family
- _____ 9. inert
- _____ 10. metal

Column B

- A** an element that conducts heat and electricity and can be shaped
- B** one of a group of gases that do not react with other substances under ordinary circumstances
- C** a group of elements with similar properties arranged in a column on the periodic table
- D** the average mass of all the isotopes of an element
- E** an arrangement of elements by increasing atomic number
- F** a mixture of two or more metals
- G** one of a group of elements found on the right side of the periodic table, which are not good conductors of heat or electricity
- H** form of an element that has the same number of protons and electrons but a different number of neutrons
- I** a form of hydrogen
- J** lacking the power to move

Directions Unscramble the word in parentheses to complete each sentence.

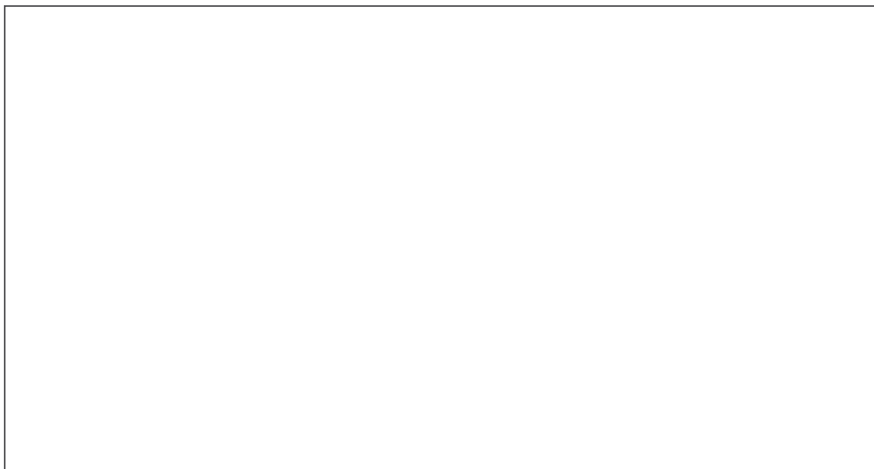
- 11. A(n) _____ is an abbreviation for the name of an element. (mobsly)
- 12. A(n) _____ is one of a group of elements placed on the left side of the periodic table. It is usually shiny and a good conductor of electricity and heat. (altem)
- 13. Under ordinary circumstances, _____ gases will not combine with other substances. (entir)
- 14. The isotope of hydrogen that has one proton and two neutrons is _____. (riimutt)
- 15. H-1, H-2, and H-3 are examples of _____. (stoipoes)

Energy Levels

Directions Write your answers on the lines.

1. How many electrons does the K level of an atom hold? _____
2. How many electrons does the L level of an atom hold? _____
3. How many electrons does the M level of an atom hold? _____
4. How many electrons does the N level of an atom hold? _____
5. What is the total number of electrons the four levels will hold? _____
6. A hydrogen atom has 1 electron. In which level is it? _____
7. A magnesium atom has 12 electrons. To what level are its electrons found? _____
8. A zinc atom has 30 electrons. To what level are its electrons found? _____
9. A nitrogen atom has 7 electrons. To what level are its electrons found? _____
10. A sulfur atom has 16 electrons. To what level are its electrons found? _____
11. A lithium atom has 3 electrons. To what level are its electrons found? _____
12. An iron atom has 26 electrons. To what level are its electrons found? _____
13. A mercury atom has 80 electrons. To what level are its electrons found? _____
14. A zirconium atom has 40 electrons. To what level are its electrons found? _____
15. A californium atom has 98 electrons. To what level are its electrons found? _____

Directions Draw a magnesium atom. Show its energy levels and electrons.



Working with Chemical Formulas

Directions Write the chemical formula for each compound described. You can use the periodic table on pages 100–101 to find the chemical symbols.

1. silver chloride = one atom of silver + one atom of chlorine

2. hydrochloric acid = one atom of hydrogen + one atom of chlorine

3. hydrogen peroxide = two atoms of hydrogen + two atoms of oxygen

4. magnesium carbonate = one atom of magnesium + one atom of carbon + three atoms of oxygen

5. glucose = six atoms of carbon + twelve atoms of hydrogen + six atoms of oxygen

6. lead nitrate = one atom of lead + two nitrate radicals

Directions Complete the table. Write the names of the elements in each compound. Then write the number of atoms in each element.

Compound	Elements	Atoms
7. potassium chloride, KCl		
8. sucrose, C ₁₂ H ₂₂ O ₁₁		
9. ammonium bromide, NH ₄ Br		
10. ammonium carbonate, (NH ₄) ₂ CO ₃		

Matching Chemical Formulas with Chemical Names

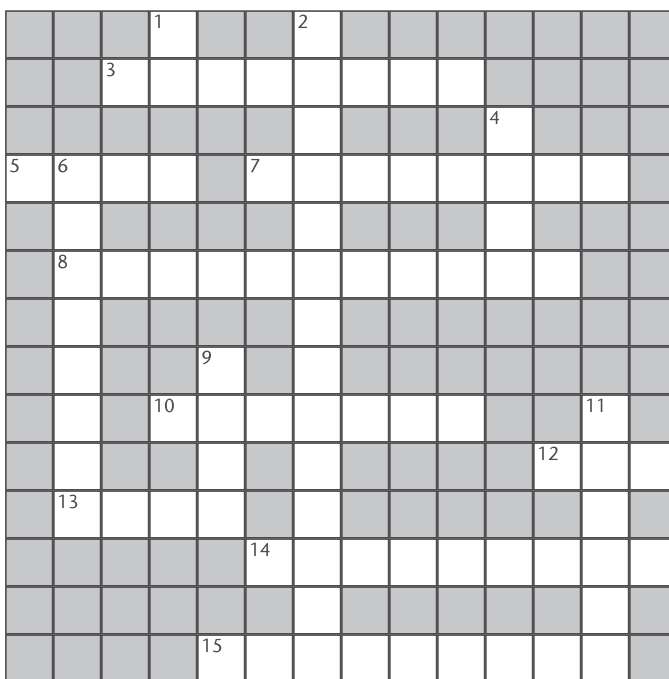
Directions Compounds have a chemical formula and a chemical name.

Draw a line to match each formula in the left column with the correct name in the right column. You can use the periodic table on pages 100–101 to help you with this activity.

Column 1	Column 2
1. NaF	beryllium oxide
2. MgCl ₂	potassium iodide
3. AgBr	silver chloride
4. LiOH	sodium fluoride
5. KCl	silver sulfide
6. LiF	beryllium chloride
7. BeO	lithium chloride
8. KI	gallium arsenide
9. BeCl ₂	strontium chlorate
10. FeCO ₃	lithium hydroxide
11. Ag ₂ S	magnesium chloride
12. Sr(ClO ₃) ₂	silver bromide
13. LiCl	iron carbonate
14. GaAs	potassium chloride
15. AgCl	lithium fluoride

Compounds: Terms Review

Directions Read the clues. Write the answers in the puzzle.



Across

- water freezing into ice: a _____ change
- has sour taste
- examples: OH, SO₄, NO₃
- electrons can fill this up (2 words)
- shorthand for chemical compound: a chemical _____
- an atom that has a charge
- metallic element, symbol is Pb
- small digit, indicates number of atoms
- litmus paper is one

Down

- scale for measuring acids and bases
- contains two elements (2 words)
- has bitter taste
- wood burning to ashes: a _____ change
- attractive force between atoms: a chemical _____
- this metal turns green if exposed to oxygen



Reactions and Solutions

Directions Write the best word for each description on the line.

1. person who tried to change various substances into gold _____
2. chemical change _____
3. part of a solution in which a substance dissolves _____
4. to break apart _____
5. a mixture in which one substance is dissolved in another _____
6. what you must apply to cause some chemical reactions _____
7. combination of substances in which no reaction occurs _____
8. what elements do in a reaction _____
9. the substance that is dissolved in a solution _____
10. what sugar breaks into when it is dissolved in water _____

Directions Write the answer to each question.

11. What is the difference between a mixture and a solution?

12. What is the difference between a solute and a solvent?

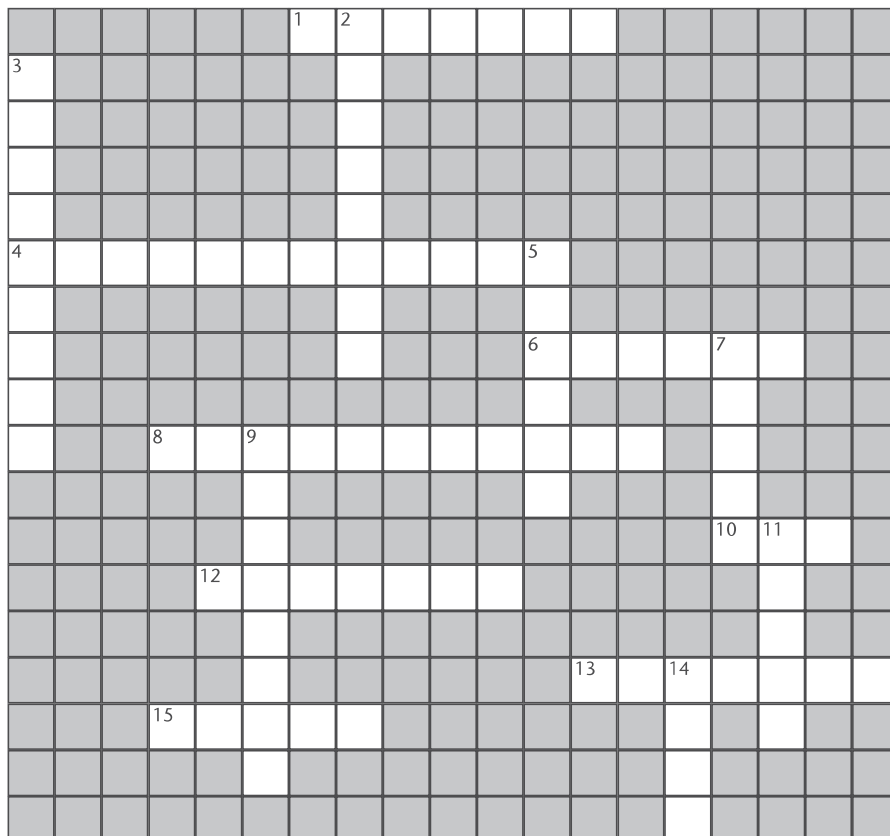
13. What is the difference between a mixture and a chemical reaction?

14. Name an example of a gas dissolved in a liquid.

15. Name an example of a solution with a liquid solute and a solid solvent.

Using Chemical Equations to Show Reactions

Directions Read the clues and complete the puzzle.



Across

- something formed by a reaction
- The law of _____ of matter states that matter cannot be created or destroyed in a chemical change.
- this cannot be created or destroyed in a chemical reaction
- a number before a formula in a chemical equation
- This makes a statement about what happens in a reaction.
- to keep the number of atoms the same on both sides of an equation
- These are found in chemical equations along with chemical formulas and numbers.
- These are rearranged during a reaction.

Down

- shown on the left side of a chemical equation
- In $2\text{H}_2\text{O}$, the number before H_2O tells how many _____.
- A coefficient is one.
- In a balanced equation, the number of atoms on both sides are _____.
- a statement that uses symbols, formulas, and numbers
- a symbol that stands for “yields” or “makes”
- this does not change during a reaction

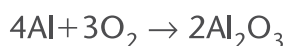


Synthesis and Decomposition Reactions

Directions Look at each chemical equation. On the line, write whether it is a synthesis or a decomposition reaction.



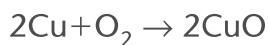
Directions Identify the reactants and product in the following reaction.



9. reactants _____

10. product _____

Directions Use the following chemical equation to answer questions 11–15.



11. What are the reactants? _____

12. What is the product? _____

13. How many atoms of copper are on both sides of the equation? _____

14. How many atoms of oxygen are on both sides of the equation? _____

15. What type of reaction is this? _____

How Matter Changes: Terms Review

Directions Match each term in Column A with its meaning in Column B.

Write the correct letter on the line.

Column A

- _____ 1. dissolve
- _____ 2. mixture
- _____ 3. reactant
- _____ 4. coefficient
- _____ 5. chemical reaction
- _____ 6. chemical equation
- _____ 7. solute
- _____ 8. balance

Column B

- A** a chemical change in which elements are combined or rearranged
- B** to make the number of atoms the same on both sides of a chemical equation
- C** a statement that uses symbols and formulas to describe a chemical reaction
- D** a substance that dissolves in a solution
- E** a substance that changes in a chemical reaction
- F** a number placed before a chemical formula to show the number of molecules
- G** a combination of substances in which there is no reaction
- H** to break apart

Directions Unscramble the word or words in parentheses to complete each sentence below.

- 9. A _____ is a solid that is formed in a reaction and sinks to the bottom of a solution. (tiptreepaic)
- 10. A _____ is the substance in which a solute dissolves. (novlest)
- 11. A _____ is one kind of mixture. (oilsnout)
- 12. The law of _____ of matter states that matter cannot be created or destroyed. (introvosance)
- 13. A _____ is a substance that is formed during a reaction and shown on the right side of a chemical equation. (cupTROD)

Directions Write your answers to these questions on the lines.

14. How do a single-replacement reaction and a double-replacement reaction differ?

15. How do a synthesis reaction and a decomposition reaction differ?



Calculating Speed

EXAMPLE

To calculate average speed, divide the distance traveled by the elapsed time.

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

$$\begin{aligned} \text{distance} &= 550 \text{ miles} \\ \text{elapsed time} &= 10 \text{ hours} \\ \text{average speed} &= 55 \text{ mi/hr} \end{aligned}$$

Directions Calculate the average speed. Write the answer on the line.

- | | | | |
|--|-------|--|-------|
| 1. distance = 120 millimeters
time = 60 seconds | _____ | 6. distance = 12.5 millimeters
time = 0.5 seconds | _____ |
| 2. distance = 400 meters
time = 80 seconds | _____ | 7. distance = 0.045 meters
time = 0.5 seconds | _____ |
| 3. distance = 700 centimeters
time = 35 seconds | _____ | 8. distance = 0.015 millimeters
time = 0.10 seconds | _____ |
| 4. distance = 1,000 meters
time = 100 seconds | _____ | 9. distance = 966 yards
time = 42 seconds | _____ |
| 5. distance = 175 miles
time = 5 hours | _____ | 10. distance = 396 kilometers
time = 6 hours | _____ |

Directions Read each word problem. Write the answer on the line.

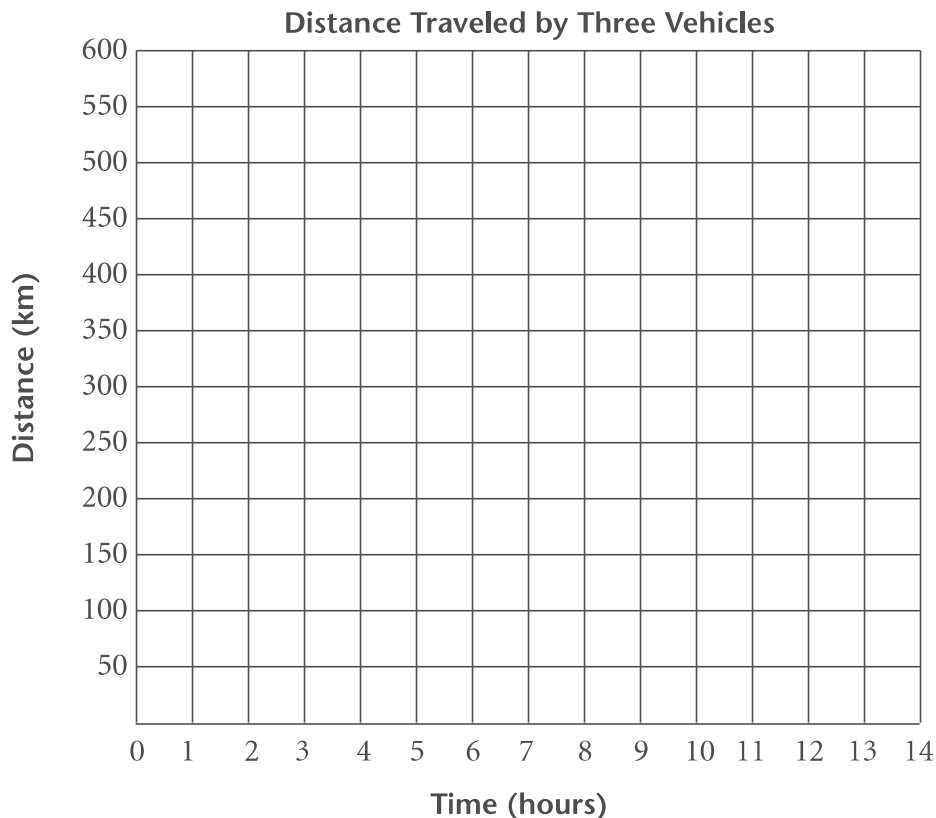
11. If a runner goes 200 meters in 50 seconds, what is her average speed? _____
12. If a train goes 846 miles in 9 hours, what is its average speed? _____
13. A marathon runner can go 6 miles per hour. How long will it take him to run 26 miles? _____
14. An airplane traveled for 5 hours at an average speed of 450 miles per hour. How far did it go? _____
15. A car can average 52 miles per hour. How long will it take to go 416 miles? _____



Using a Graph to Describe Motion

Directions Use the data in the table to complete the graph below. Plot the distance traveled for each of the three vehicles. Then answer the questions.

Elapsed Time in Hours	Distance Traveled in Kilometers		
	Car	Motorcycle	Train
1	75	25	50
2	150	50	100
3	225	75	150
4	300	100	200
5	375	125	250



1. How would you describe the motion of all three vehicles? _____

2. How far would each vehicle travel in 6 hours at the same speed? _____

Acceleration

EXAMPLE

To calculate acceleration, first subtract the beginning speed from the ending speed to find the change in speed. Then divide the change in speed by the time it takes to make the change.

$$\begin{array}{l}
 \text{beginning speed} = 50 \text{ km/hr} \\
 \text{ending speed} = 65 \text{ km/hr} \\
 \text{elapsed time} = 5 \text{ sec} \\
 \text{acceleration} = 3 \text{ km/hr per sec}
 \end{array}
 \begin{array}{l}
 > \\
 > \\
 > \\
 >
 \end{array}
 \text{Step 1 } 65 \text{ km/hr} - 50 \text{ km/hr} = 15 \text{ km/hr}$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{change in time}} \quad \text{Step 2 } 3 \text{ km/hr per sec} = \frac{15 \text{ km/hr}}{5 \text{ sec}}$$

Directions Calculate the acceleration for each item. Write the answer on the line. Some answers will be negative numbers. A negative number shows deceleration.

Beginning Speed	Ending Speed	Elapsed Time	Acceleration
1. 5 km/hr	55 km/hr	0.5 hr	_____
2. 0 km/hr	60 km/hr	0.2 hr	_____
3. 15 cm/sec	30 cm/sec	0.5 sec	_____
4. 120 mm/sec	250 mm/sec	20 sec	_____
5. 25 km/sec	10 km/sec	3 sec	_____
6. 105 m/min	60 m/min	9 sec	_____
7. 200 cm/sec	170 cm/sec	24 sec	_____
8. 240 km/hr	141 km/hr	33 sec	_____

Directions Write the answer to each question on the line.

9. A bus was going 30 km/hr. Six seconds later, it was going 24 km/hr. What was its acceleration?

10. A bicycle was going 48 meters per minute. Five minutes earlier it was going 40 meters per minute. What was its acceleration?

Motion: Terms Review

Directions Match each term in Column A with its meaning in Column B. Write the correct letter on the line.

Column A

- _____ 1. inertia
- _____ 2. acceleration
- _____ 3. friction
- _____ 4. gravity
- _____ 5. deceleration
- _____ 6. force
- _____ 7. speed
- _____ 8. elapsed time
- _____ 9. motion

Column B

- A** the tendency to resist change in motion
- B** a change in position
- C** the rate at which the position of an object changes
- D** the time that passes between one event and another
- E** the rate of change in velocity
- F** a force that opposes motion
- G** the force of attraction between any two objects that have mass
- H** the rate of slowdown
- I** a push or a pull

Directions Unscramble the word or words in parentheses to complete each sentence.

- 10. The _____ of a moving object tells the direction of motion as well as the speed. (yetlovic)
- 11. A _____ has no acceleration. (cannotts deeps)
- 12. The length of the path between two points is _____. (candetis)
- 13. The law of _____ states that gravity depends on mass and distance. (savenuril tatairoving)

Directions Tell how each pair is alike and different.

14. speed and velocity

15. inertia and friction

What Is Work?

Directions On the line, write the word or words that best complete the sentence.

1. When work is done, an object changes its _____.
2. Work is done when a force moves an object in the _____ of the force that is applied.
3. To measure work, you must _____ the force by the distance through which it acts.
4. Work is measured in newton-meters, or _____.
5. The formula for measuring work is _____.

Directions Use the formula $work = force \times distance$ to find each answer. Give the answer in joules.

6. Julie rolled a 2-kg ball down a ramp 10 meters long.
(Remember, $1 \text{ kg} = 9.8 \text{ newtons}$.) How much work was done? _____
7. Kevin lifted a 10-newton box a distance of 1.5 meters.
How much work did he do? _____
8. A high jumper weighing 700 newtons jumps over a bar 2.0 meters high.
What work does the high jumper do? _____
9. A mountain climber who weighs 900 newtons scales a 100-meter cliff.
How much work does the climber do? _____
10. A parent uses a force of 300 newtons to pull a toddler in a wagon for 400 meters. How much work did the parent do? _____
11. Pushing a lawn mower requires a force of 200 newtons. If 4,000 joules of work is performed, how far has the mower moved? _____
12. A force of 550 newtons was used to move a stone 23 meters.
How much work was done? _____
13. A box was pushed 42 meters, and 13,734 joules of work was done.
How much force was used? _____
14. A pitcher threw a ball of 2 newtons and did 330 joules of work.
How far did she throw the ball? _____
15. A landscape worker attempted to move a 300 kg boulder for 30 minutes but was unable to budge it. How much work did the worker do? _____

Understanding Power

Directions Choose the word or words from the box that best complete each sentence.

force

joules

kilowatts

power

rate

second

watt

watts

1. Power is a measure of the _____ at which you do work.
2. Work measures the amount of _____ used to move an object a certain distance.
3. Work divided by time equals _____.
4. The units of measure for power are _____ per _____, or _____.
5. A _____ is 1 joule of work done in 1 second.
6. Usually, power is measured in _____, or 1,000-watt units.

Directions Use the formula to find each answer.

$$\text{power} = \frac{\text{work}}{\text{time}}$$

7. Alex pushed a stroller 2 blocks in 3 minutes. Then he pushed it 2 more blocks in 2 minutes. When did he use more power?

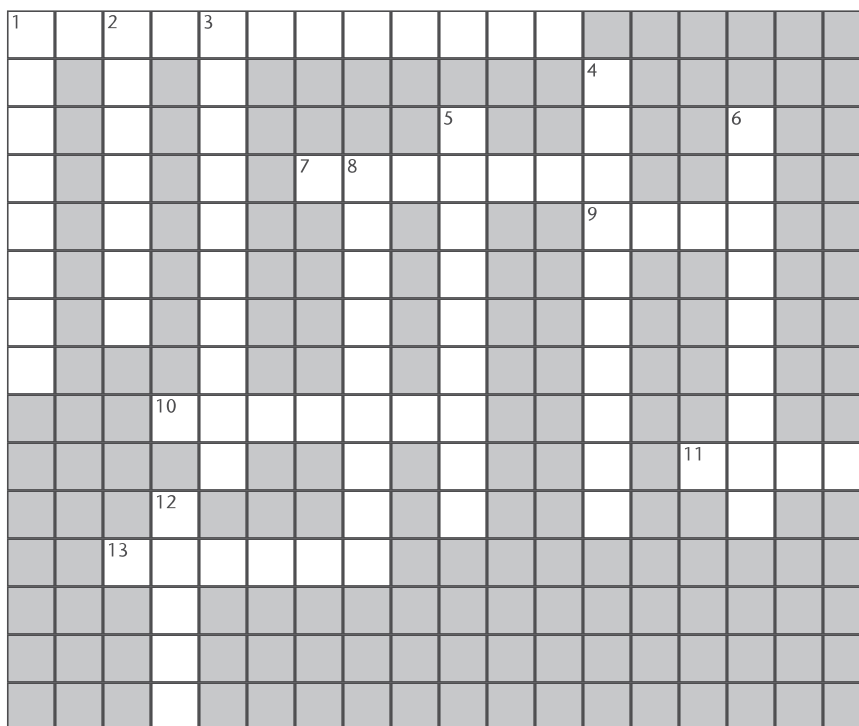
8. How much power would it take to move a chair 5 meters in 15 seconds using a force of 51 newtons?

9. A man can use a snowblower to move snow in 5 minutes. If he moves it with a shovel, it will take 20 minutes. He will use more power with which process?

10. A 600-newton diver dives off a 10-meter platform. If it takes 2 seconds to hit the water, what is the diver's power?

Understanding Energy

Directions Use the clues to complete the puzzle.



Across

- The law of _____ of energy states that energy is neither created nor destroyed.
- energy of motion
- form of energy in matter, associated with movement of particles
- form of energy received from the sun
- the unit used to measure power
- Work is measured in metric units called _____.

Down

- form of energy a battery stores
- form of energy released from the nucleus of an atom
- form of energy that causes electrons to flow
- form of energy in moving objects
- machine for changing mechanical energy to electrical energy
- stored energy
- As an object falls, its kinetic energy _____.
- amount of work done in a given amount of time

Using Levers

Directions Choose the word or words from the Word Bank that best complete each sentence.

Word Bank

effort force

fulcrum

lever

simple machine

1. A _____ is a tool that makes it easier to do work.
2. A _____ is a bar that moves about a fixed point.
3. The fixed point of a lever is its _____.
4. The force applied to a machine by a user is called the _____.

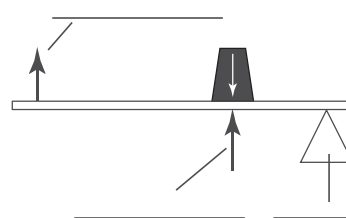
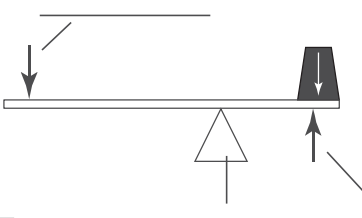
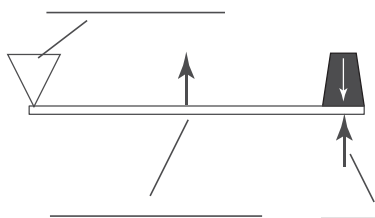
Directions Use words from the box below to identify the type of lever and label its parts.

first-class lever

second-class lever

third-class lever

fulcrum

effort force (F_e)resistance force (F_r)

5. _____

6. _____

7. _____

Directions Use the following information to calculate work input, work output, and efficiency of the lever.

A worker presses on a lever with 250 newtons of force to lift a cart. His end of the lever moves 1.5 meters. The cart has a resistance of 430 newtons and moves 0.5 meter.

8. Work input of the lever: _____
9. Work output of the lever: _____
10. Efficiency of the lever: _____

Mechanical Advantage

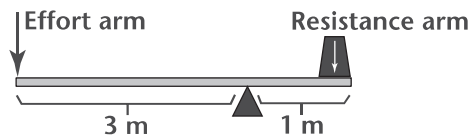
Directions On the line, write the word or words that best complete each sentence.

- The mechanical advantage is the number of times a machine multiplies the _____.
- To increase the mechanical advantage of a lever, move the fulcrum closer to the _____ and farther from the _____.
- The mechanical advantage of a machine is the resistance force _____ by the effort force.

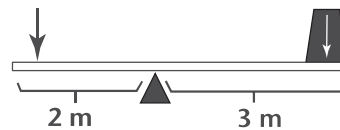
Directions Use the formula below to find the mechanical advantage (MA) of each lever. Then answer the questions.

$$MA = \frac{\text{effort arm}}{\text{resistance arm}}$$

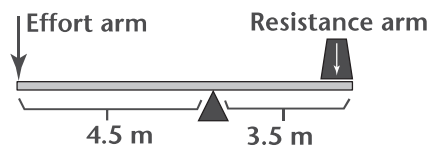
4. MA = _____ Lever A



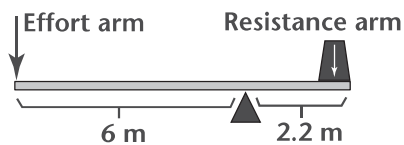
5. MA = _____ Lever B



6. MA = _____ Lever C



7. MA = _____ Lever D



- Write the formula for MA. _____
- How would you increase MA? _____

- What does MA show? _____

Work and Machines: Terms Review

Directions Match each term in Column A with its meaning in Column B. Write the correct letter on the line.

Column A

- ___ 1. power
- ___ 2. joule
- ___ 3. wheel and axle
- ___ 4. generator
- ___ 5. screw
- ___ 6. energy
- ___ 7. potential energy
- ___ 8. simple machine
- ___ 9. fulcrum
- ___ 10. efficiency
- ___ 11. pulley
- ___ 12. kinetic energy
- ___ 13. work

Column B

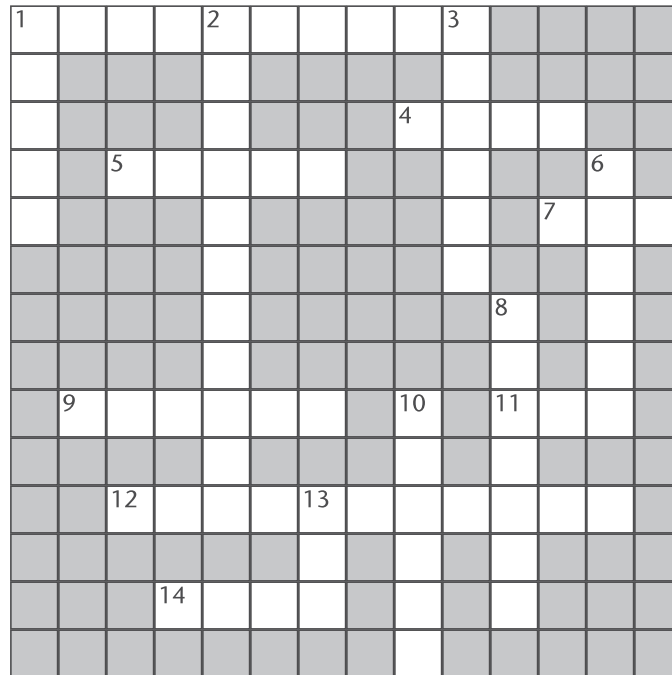
- A** wheel with a rope, chain, or belt around it
- B** fixed point around which a lever turns
- C** the energy of motion
- D** amount of work done in a given time
- E** tool with few parts that makes work easier
- F** the metric unit of work
- G** the ability to do work
- H** the energy of position; stored energy
- I** force \times distance
- J** device that converts mechanical energy to electrical energy
- K** machine made of a wheel attached to a shaft
- L** how well a machine performs; work output/work input
- M** a form of an inclined plane

Directions Unscramble the word or words in parentheses to complete each sentence.

- 14. You measure power in _____, or joules/second. (stwat)
- 15. A bar that rotates on a fulcrum is called a _____. (vreeL)
- 16. The force a machine applies to move an object is called the _____ force. (tressacine)
- 17. The amount of work a person puts into a machine is called the _____. (kwo rpuint)
- 18. The amount of work a machine does against a resistance is called the _____. (krwo puutto)
- 19. The number of times a machine multiplies your effort force is called its _____. (acmehnlaic vnageadta)
- 20. A simple machine made of a ramp is an _____. (diinnelc leapn)

What Is Heat?

Directions Use the clues to complete the crossword puzzle. You may use your book for help.



Across

- a place from which heat energy comes (2 words)
- a form of energy resulting from the motion of particles in matter
- _____ shine because their atoms release nuclear energy.
- _____ gases make a car's engine work.
- the nuclear reaction that occurs when atoms are joined together
- the earth's most important heat source
- the heat source for a toaster
- the size of the particles whose movement creates heat

Down

- Rubbing your _____ together produces heat.
- a machine that uses heated water to operate (2 words)
- Heat is a form of _____.
- Heat results from the _____ of atoms and molecules.
- the reaction that occurs when an atom splits
- the part of a steam engine that changes water to steam
- The first steam engine was used as a _____.



How Heat Affects Matter

Directions Choose the word from the Word Bank that best completes each sentence. You will use one word twice.

Word Bank

evaporates

condensation

expands

contracts

1. Matter generally _____ when you heat it.
2. Water _____ when you boil it.
3. That frost on your window is an example of _____.
4. Water _____ when it becomes ice.
5. When particles in matter move more slowly, the matter usually _____.

Directions Each sentence tells about a process that is occurring. Write the letter of the process that is occurring on the line.

A liquid to solid**B** liquid to gas**C** solid to liquid**D** gas to liquid

- _____ 6. A can of a soft drink in the freezer bursts.
- _____ 7. The bathroom walls are covered with water after your shower.
- _____ 8. The water in the teakettle is bubbling.
- _____ 9. The rain puddle is getting smaller.
- _____ 10. The ice cream is running down the cone.

Directions Complete the following sentences.

11. Cold air cannot hold as much _____ as warm air.
12. Molecules in a _____ move more freely than in a liquid.
13. Bubbles in boiling water are made up of water _____.
14. In the _____ months, a metal bridge is likely to expand.
15. One familiar material that does not contract when it gets colder is _____.

Temperature

Directions Write the correct word for each definition on the line. To check your answers, find each vocabulary word in the puzzle below.

1. a type of energy caused by the motion of molecules _____
2. results from a change at the melting point _____
3. results from a change at the boiling point _____
4. a measure of the average motion of the molecules in a substance _____
5. a device that measures temperature _____
6. the temperature scale on which water boils at 212° _____
7. the temperature scale used for scientific work _____
8. the temperature at which a solid changes to a liquid (2 words) _____
9. what water does at 100°C _____
10. the unit for measuring temperature _____
11. what water does at 32°F _____
12. a substance commonly used in antifreeze _____
13. to change from °F to °C, or vice versa _____
14. what state a substance becomes at freezing point _____
15. a liquid metal sometimes used in thermometers _____

G	B	O	I	L	S	D	L	Q	V	N	P	S	O	E
Y	Z	Q	Q	W	E	R	J	K	K	C	C	L	R	V
H	T	H	K	O	I	B	I	S	E	T	U	U	M	C
N	I	E	E	I	S	L	F	L	A	I	T	R	E	O
B	E	A	I	A	R	N	S	P	A	A	T	R	L	N
I	H	C	G	K	T	I	S	H	R	A	N	H	T	V
Y	N	B	E	L	U	E	E	E	R	G	E	D	I	E
R	E	A	N	S	Z	Y	P	V	S	P	M	I	N	R
U	R	M	P	E	S	M	S	V	Y	C	F	I	G	T
C	H	J	E	G	E	D	O	A	X	U	R	O	P	N
R	A	R	L	T	A	B	L	A	L	C	O	H	O	L
E	F	C	E	G	J	D	I	U	Q	I	L	L	I	U
M	A	F	S	M	Q	C	D	O	X	W	B	A	N	C
T	T	H	E	R	M	O	M	E	T	E	R	T	T	L
A	E	H	W	U	V	F	N	I	L	F	B	V	R	N

How to Measure Heat

Directions Answer the following items.

1. Write two statements that are true about temperature.

A _____

B _____

2. Write two statements that are true about heat.

A _____

B _____

3. Which gives off more heat, a potato heated to 375°F or a 20-lb turkey heated to the same temperature? Explain your answer.

Directions Calculate calories using the formula below. Write your answers on the lines.

$$\text{Heat} = \text{change in temperature} \times \text{mass}$$

How many calories are needed or given off when you . . .

4. heat 1 gram of water 1°C? _____
5. cool 5 grams of water from 12°C to 8°C? _____
6. raise the heat of 3 grams of water 5°C? _____
7. lower the heat of 1 gram of water 25°C? _____
8. warm 12 grams of water from 98°C to 99°C? _____
9. make 2 grams of water 7°C warmer? _____
10. cool 2 grams of water 1°C? _____
11. bring up the temperature of 25 grams of water 1°C? _____
12. bring down the temperature of 2 grams of water from 27°C to 19°C? _____
13. cool 5 grams of water 2°C? _____
14. raise the heat of 20 grams of water 25°C? _____
15. heat 3 grams of water 15°C? _____

Heat: Terms Review

Directions Match each term in Column A with its meaning in Column B. Write the correct letter on the line.

Column A	Column B
___ 1. calorie	A to change from a liquid to a gas
___ 2. temperature	B a form of energy resulting from the motion of particles in matter
___ 3. degree	C temperature at which a solid changes into a liquid
___ 4. Fahrenheit scale	D the reaction occurring when the nucleus of an atom splits
___ 5. evaporate	E a measure of how fast an object's particles are moving
___ 6. melting point	F a device that measures temperature
___ 7. nuclear fission	G the temperature scale in which water freezes at 0°
___ 8. freezing point	H the temperature at which a substance changes to a gas
___ 9. Celsius scale	I a unit of measurement on a temperature scale
___ 10. nuclear fusion	J the reaction occurring when atoms are joined together
___ 11. thermometer	K the temperature scale commonly used in the United States
___ 12. boiling point	L the amount of heat needed to raise the temperature of 1 g of water 1°C
___ 13. contract	M the temperature at which a liquid changes to a solid
___ 14. heat	N to become smaller in size

Directions Unscramble the word in parentheses to complete each sentence.

- The flow of heat energy through matter by molecules bumping into each other is _____. (noitcudonc)
- Copper is an excellent _____ of heat energy. (rotnocduc)
- Energy from the sun reaches us by _____. (idiotrana)
- Warm liquids rise as a result of _____. (nevoncocit)
- A _____ is space without matter. (camuvu)
- A material that does not warm up or cool down quickly is called an _____. (sularotin)

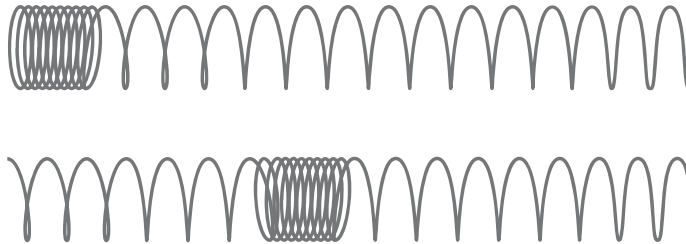
What Is Sound?

Directions Choose the term from the box that completes each sentence.

1. For a sound to occur, matter must _____, or move back and forth.
2. Vibration of an object causes _____ to compress and expand many times.
3. Air moves out in all directions from a vibrating object as a _____.
4. You may not see these waves, but you can hear the resulting _____.
5. Sounds grow fainter over distance because the sound waves become _____ the farther they travel from the vibrating object.

molecules
sound wave
sounds
vibrate
weaker

Directions Look at the figures below. Write a sentence or two that explains how the movement of the wire spring is like sound waves.



Directions Write the answer to the question on the lines.

You toss a stone into water, and ripples spread out from where it hits.
How are these ripples like sound waves?

Different Sounds

Directions Each phrase tells something about intensity or frequency. Write *intensity* or *frequency* beside each phrase.

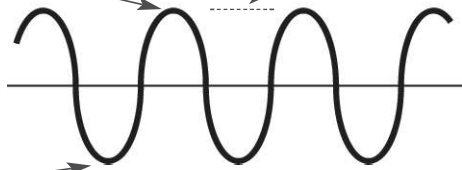
- _____ 1. determines the volume (how loud or soft a sound is)
- _____ 2. determines the pitch (how high or low a sound is)
- _____ 3. measured in Hertz (Hz)
- _____ 4. measured in decibels
- _____ 5. related to amount of energy that sound waves have
- _____ 6. related to number of vibrations per second
(or number of cycles per second)

Directions Choose the word from the box that completes the sentence.

7. The frequency of a sound wave is measured in _____ per second.
8. Sounds above 130 _____ can damage your hearing.
9. Volume is the way your _____ interpret intensity of a sound.
10. How high or low a sound seems is called its _____.
11. Human ears can detect sounds with frequencies ranging from 20 to 20,000 _____.

cycles
decibels
ears
Hertz
pitch

Directions Label the parts of the sound wave using words from the Word Bank.

12. _____
13. _____
- 
14. _____
15. _____

Word Bank

crest
1 cycle
trough
wavelength



How Sound Travels

Directions Write the answer to each question on the line.

1. Why can't sound travel through space? _____

2. Why does sound travel fastest through solids? _____

3. What is an echo? _____

4. How are sonar and ultrasound alike? _____

Directions Use what you know about the speed of sound to answer each question.

5. Lightning flashes in the distance. Seven seconds later, you hear the thunder.
How far away is the storm?

6. You yell into a canyon. You hear the echo in 3 seconds. How long did the sound of
your voice travel before bouncing off a cliff?

7. A ship sends out a sonar signal. The echo is heard after 6 seconds. How long did it take
for the signal to reach the ocean bottom?

Directions Put the kinds of matter in order according to sound's ability to travel through them. List the fastest speed of sound first.

8. Sound travels fastest through _____.
9. Sound travels a little slower through _____.
10. Sound travels even slower through _____.

Kinds of Matter

water
aluminum
warm air

What Is Light?

Directions Choose the word or words from the box that best complete each sentence.

1. The sun is a major source of _____ on Earth.
2. Light is emitted from atoms in energy bundles called _____.
3. Light waves travel fastest through _____.
4. A _____ can separate white light into colors of the _____.
5. Waves that travel at the speed of light are called _____ waves.

electromagnetic
empty space
light
photons
prism
visible spectrum

Directions Write the colors of the visible spectrum in the order they appear. Then complete the sentence.

6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. When white light passes through a prism, it _____

_____.

Directions The electromagnetic waves are listed in order by frequency in the electromagnetic spectrum. Write the names of the missing electromagnetic waves on the lines.

radio waves

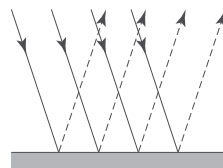
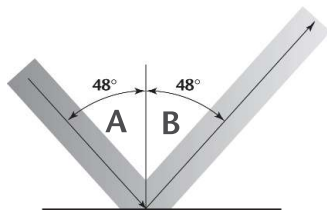
14. _____
infrared rays
visible light
gamma rays
15. _____
ultraviolet rays

How Light Is Reflected

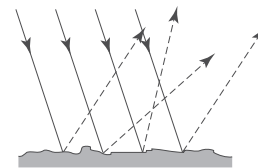
Directions What kind of mirror does each phrase describe? Write *plane mirror*, *concave mirror*, or *convex mirror* on the line.

- _____ 1. flat, smooth surface
- _____ 2. surface curving outward at the middle
- _____ 3. image upside down and larger than real object
- _____ 4. causes light rays to come together in one focal point
- _____ 5. surface like the inside of a spoon
- _____ 6. surface of many rearview mirrors in cars

Directions Study each figure and answer the questions.



Smooth surface



Bumpy surface

7. Why are angles A and B equal in size?

8. Which surface gives a clear image? Explain your answer.

Directions Answer each question.

9. Tell how reflected light waves and reflected sound waves are alike.

10. Tell how a mirror image and a hologram are different.

Sound and Light: Terms Review

Directions Match each term in Column A with its meaning in Column B.

Write the correct letter on the line.

Column A

- _____ 1. photon
- _____ 2. farsighted
- _____ 3. intensity
- _____ 4. plane mirror
- _____ 5. pitch
- _____ 6. nearsighted
- _____ 7. refraction
- _____ 8. light
- _____ 9. reflect
- _____ 10. focal point

Column B

- A** how high or low a sound is; determined by frequency
- B** the bending of light as it passes through a material
- C** to bounce light or sound off a surface
- D** form of energy that can be seen
- E** able to see objects up close clearly
- F** point where reflected light rays come together
- G** a flat, smooth, clear reflecting surface
- H** the strength of a sound, perceived as loudness or softness
- I** tiny bundles of energy that make up light
- J** able to see objects at a distance clearly

Directions Unscramble the word or words in parentheses to complete each sentence.

- 11. A(n) _____ is a sound wave reflected back to its source. (hoec)
- 12. A(n) _____ curves inward in the middle. (venocca rimror)
- 13. White light can be split into the _____. (blisive crumptes)
- 14. In order for sound to occur, matter must _____. (tearbiv)
- 15. The loudness or softness of a sound is its _____. (moveul)
- 16. One _____ measures one back and forth movement of a vibration. (leycc)
- 17. A(n) _____ helps correct nearsightedness. (navecoc snel)
- 18. A(n) _____ curves outward at the middle. (coxven roirmr)
- 19. A(n) _____ is produced by vibrations. (dunso evwa)
- 20. A human ear cannot hear a sound with a _____ of 10 Hz. (queencryf)

How Electricity Flows

Directions Write the correct word or words for each definition on the line.

Then circle the word in the puzzle below.

1. a discharge of electricity from a cloud _____
2. a complete, unbroken path for electric current _____
3. an incomplete path for electric current _____
4. flow of electrons _____
5. Electricity is a form of _____.
6. kind of diagram that uses symbols to show parts of a circuit _____
7. unit that tells how much electric current flows through a wire _____
8. We measure electric _____ in amperes. _____
9. where an electric circuit begins _____
10. kind of electricity caused by a buildup of charge _____

P	B	C	C	S	D	V	I	V	U	K	R	O	U	B	E	E
T	H	P	D	A	E	S	F	D	S	T	A	T	I	C	L	L
N	A	Z	E	N	E	R	G	Y	J	I	A	U	O	Y	E	P
E	R	U	M	I	C	E	A	G	S	L	M	Z	A	Z	C	S
R	A	T	I	E	U	C	N	X	R	V	P	T	O	H	T	C
R	L	A	K	S	Q	I	P	L	F	M	E	I	T	K	R	H
U	L	Y	M	C	N	O	E	X	U	T	R	R	M	A	I	E
C	E	W	W	T	M	P	R	Y	T	N	E	V	F	H	C	M
E	L	E	H	R	P	T	E	O	I	S	K	U	S	P	I	A
P	C	G	V	E	O	P	E	N	C	I	R	C	U	I	T	T
C	I	N	R	U	R	D	N	J	G	H	E	P	N	O	Y	I
L	R	O	O	I	E	Q	T	O	O	C	B	R	N	T	F	C
J	C	L	O	S	E	D	C	I	R	C	U	I	T	H	S	O
A	F	C	P	D	X	I	O	N	S	P	N	T	S	G	P	T
R	Q	L	T	E	C	R	U	O	S	R	E	W	O	P	Y	N
C	N	T	O	R	L	D	H	W	Y	T	R	I	F	D	P	X

Conductors and Insulators

Directions Complete the outline by filling in the details about conductors and insulators.

Conductors and Insulators

A. Parts of an electrical cord

1. Wire: _____
2. Covering: _____

B. Some good electrical conductors

1. _____
2. _____
3. _____
4. _____

C. Some good electrical insulators

1. _____
2. _____
3. _____
4. _____

D. Resistance

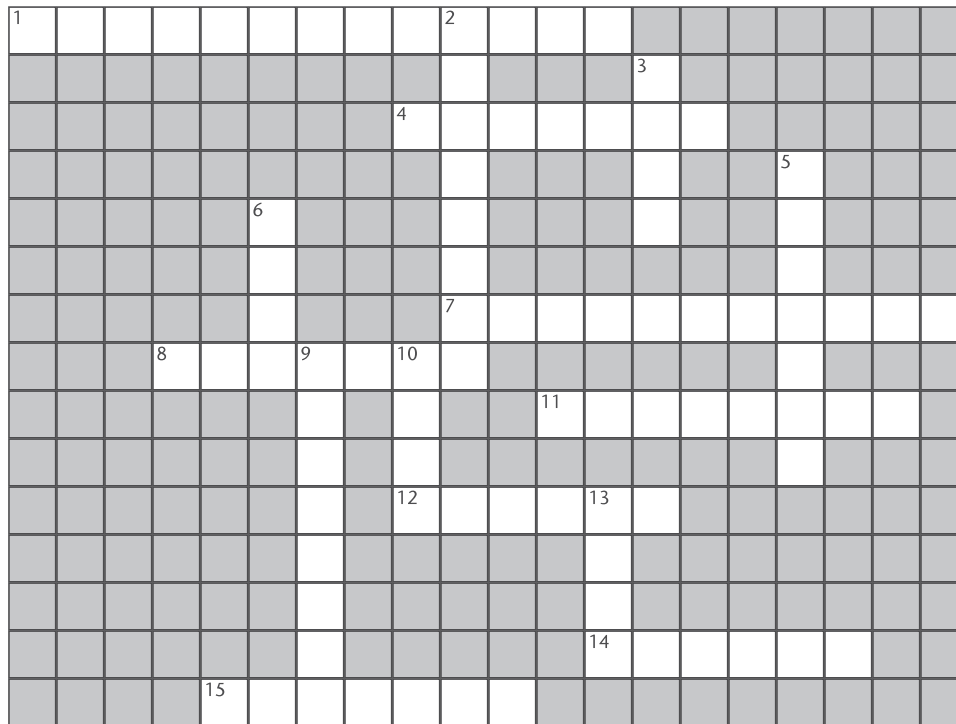
1. Definition: _____
2. Unit used to measure it: _____

E. Three things the resistance of a wire depends on

1. _____
2. _____
3. _____

Some Sources of Electric Current

Directions Read the clues. Then complete the puzzle. Each term is related to sources of electric current.



Across

1. kind of force that keeps current flowing in a circuit
4. kind of battery with a pastelike center (2 words)
7. kind of current that changes direction regularly
8. kind of battery with a liquid center (2 words)
11. kind of acid inside a battery
12. kind of current that flows in one direction
14. The current in our homes changes direction 60 times per _____.
15. energy that a power source gives to electrons in a circuit

Down

2. point where electrons leave or enter a battery cell
3. kind of sign that marks a positive terminal
5. source of voltage that changes chemical energy into electrical energy
6. metric unit that measures electromotive force
9. A battery changes _____ energy into electrical energy.
10. material that battery plates are made of
13. a wet-cell battery is found in most of these big machines

Using Ohm's Law

Directions Use Ohm's law to answer the following questions. The formula for Ohm's law is:

$$\text{current (amperes)} = \frac{\text{electromotive force (volts)}}{\text{resistance (ohms)}}$$

1. How much current does a headlight use with a 12-volt battery if it has a resistance of 3 ohms?

2. How much current flows through a 100-ohm device connected to a 1.5-volt battery?

3. What is the voltage of a 4-amp circuit with a resistance of 3 ohms?

4. What is the resistance of a lightbulb that uses 0.5 amps and 110 volts?

5. What is the resistance of an electric iron that takes 12 amps at 120 volts?

6. What is the current used by a toaster with a resistance of 12 ohms if it uses 120 volts?

7. What is the voltage of a 2-amp circuit with a resistance of 0.75 ohms?

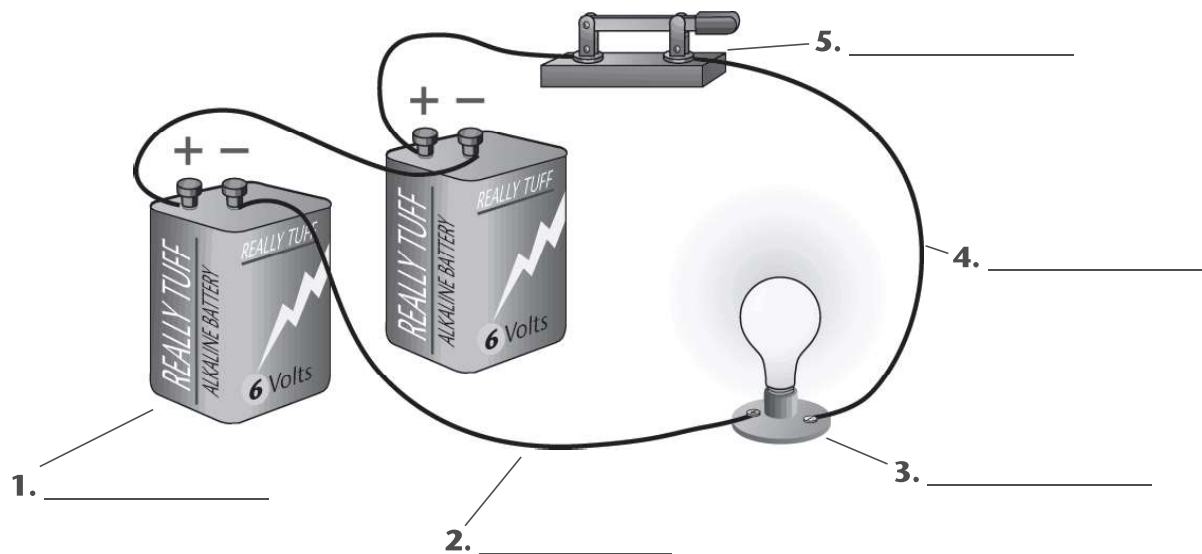
8. What is the voltage of a battery that produces a 1.5-amp current through a resistance of 8 ohms?

9. What happens to the current in a circuit as the voltage increases?

10. What happens to the current in a circuit as the resistance increases?

Series Circuits

Directions Label the parts of the series circuit. Identify the *power source*, *wire*, *switch*, and *bulb* in the diagram of the series circuit. Draw arrows to show the direction of the electron flow.



Directions Choose an item from the box to complete each sentence.

add	disadvantage	fires	not work	series
circuit breaker	15	fuse	one	voltage

- In a series circuit, electrons flow through _____ path.
- One _____ of a series circuit is that all lights go out if one goes out.
- If another electrical device were added to the circuit shown above, the _____ would be lower in each device.
- To find the voltage of a series circuit, _____ the voltages of the cells.
- If a series circuit had 3 batteries and each had 5 volts, the circuit would have a total of _____ volts.
- The batteries of a flashlight often have a _____ circuit.
- If one battery in a flashlight does not work, the flashlight will _____.
- Fuses and circuit breakers prevent _____.
- A _____ works by melting and breaking a circuit with hot wires.
- A _____ switches off a circuit if it gets too hot.

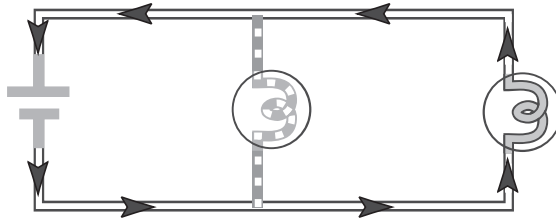
Parallel Circuits

Directions The chart shows how a parallel circuit compares to a series circuit. Read the information, then complete the chart.

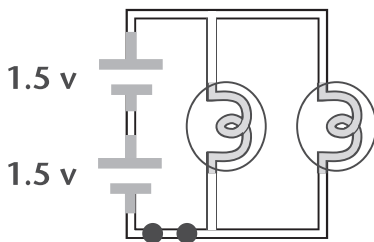
	Series Circuit	Parallel Circuit
1. Number of paths it has	one	
2. Advantages	Batteries in a series deliver more energy in the same amount of time.	
3. Disadvantages	If one light goes out, they all go out.	
4. What happens when electrical devices are added to the circuit?	Voltage is lowered in each device.	
5. What is the total voltage of batteries in the circuit?	total voltages of all the cells	

Directions Tell how many paths are in this parallel circuit.

6. _____

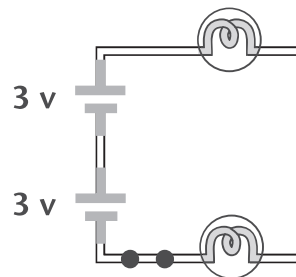


Directions Look at the 2 diagrams. Label one diagram *series circuit* and the other one *parallel circuit*. Then write the total voltage of each circuit.



7. _____

9. Total voltage: _____



8. _____

10. Total voltage: _____

Electricity: Terms Review

Directions Match the terms in Column A with the meanings in Column B.

Write the letter of the answer on the line.

Column A

- ___ 1. open circuit
- ___ 2. dry-cell battery
- ___ 3. direct current
- ___ 4. series circuit
- ___ 5. closed circuit
- ___ 6. wet-cell battery
- ___ 7. parallel circuit
- ___ 8. circuit
- ___ 9. alternating current
- ___ 10. electric power
- ___ 11. schematic diagram
- ___ 12. electricity
- ___ 13. Ohm's law
- ___ 14. electromotive force
- ___ 15. electric current
- ___ 16. static electricity

Column B

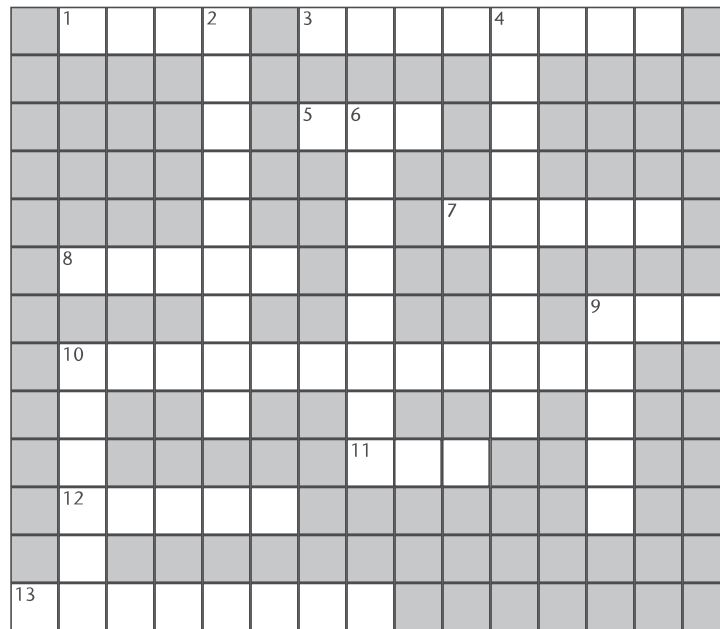
- A** a type of circuit having more than one path for current
- B** a type of electricity that flows in only one direction
- C** electric power source with a liquid center
- D** an unbroken path for electric current
- E** amount of electrical energy used in a certain amount of time
- F** a type of circuit having only one path for current
- G** electric power source with a pastelike center
- H** a type of electricity that continuously changes direction
- I** an incomplete path for electric current
- J** a path for electric current
- K** $\text{current} = \text{voltage} \div \text{resistance}$
- L** buildup of electrical charge
- M** an illustration that uses symbols to show the parts of a circuit
- N** movement of electrons from one place to another
- O** flow of electrons
- P** push that keeps current flowing in an electric circuit

Directions Unscramble the word or words in parentheses to complete each sentence.

- 17. A(n) _____ is a very poor conductor. (salurtion)
- 18. The _____ of a battery is where electrons enter or leave. (rainmelt)
- 19. A(n) _____ is a device that changes chemical energy into electrical energy. (treatby)
- 20. Electricity passes easily through a(n) _____. (trunccodo)

What Are Magnets?

Directions Read the clues. Then complete the puzzle.



Across

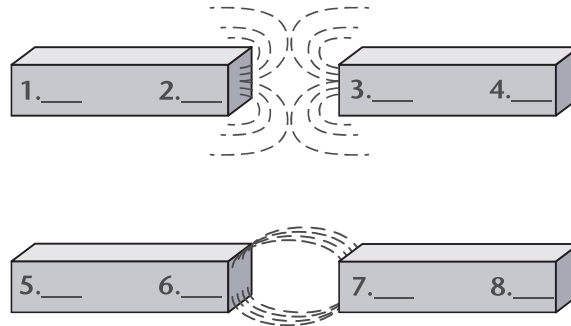
- Opposite poles of a magnet _____ together.
- This magnet is shaped like something you can eat!
- This animal sometimes swallows a magnet for its health.
- Poles of the same type _____ each other.
- the magnetic pole represented by the letter S
- a machine that uses magnetism to view the human body
- the end of a magnet (2 words)
- A magnetic pole is located on each _____ of a bar magnet.
- the magnetic pole represented by the letter N
- The south pole of one magnet _____ the north pole of another.

Down

- also known as *magnetite*
- a magnet shaped like the letter U
- _____ poles attract each other.
- Magnets attract certain kinds of _____, such as iron.
- it comes in several common shapes

Identifying a Magnetic Field

Directions Look at the two pairs of bar magnets. The broken lines represent their lines of force. Beside the numbers 1 through 8, write the letters *N* or *S*, for north pole or south pole. (Hint: There is more than one possible solution.)



Directions Use words from the word box to complete the paragraph.

Earth

field

lights

pole

sun

9. _____ is like a giant magnet. It has a north and a south magnetic **10.** _____. Like a magnet, the earth's magnetic **11.** _____ is strongest at the poles. Electrically charged particles from the **12.** _____ get trapped at the earth's poles. They collide with molecules to create the spectacular northern **13.** _____.

Directions Write your answers to the questions on the lines.

14. Explain how you could use iron filings and a piece of paper to help reveal the effect of a magnetic field.

15. Why does the north pole of a compass point towards the earth's north magnetic pole?

Identifying Magnetism

Directions The figures represent magnetized and nonmagnetized material. Draw lines connecting the names of materials that *cannot* become magnets to Figure A. Draw lines connecting the names of materials that *can* be turned into magnets to Figure B. One is done for you.

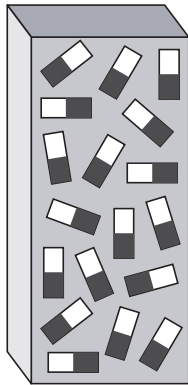


Figure A

1. iron →
2. gold
3. cobalt
4. wood
5. plastic
6. rubber
7. nickel

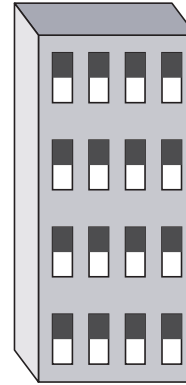


Figure B

Directions Write your answers to the questions on the lines.

8. Are figures A and B realistic illustrations of materials? Explain your answer.

9. How did you know which figure showed a magnetized material?

Directions Write a word or words on each line to complete the story. You may use a word more than once.

As a science project, Miwako showed the class some of the properties of magnetism. First she took a piece of **10.** _____ wire and stroked it several times with one end of a **11.** _____. Then she demonstrated that the wire could pick up paper clips. It had become a **12.** _____ with a north and a south **13.** _____.

Next she cut the wire in half with wire cutters. Guess what she ended up with?

14. _____ **15.** _____!

Magnets and Electromagnetism: Terms Review

Word Bank

alloy magnet	electromagnetism	magnetic field
amplifier	engine	magnetic poles
attract	lines of force	motor
core	maglev train	repel
electromagnet	magnet	superconducting magnets

Directions Choose a term from the Word Bank that matches each definition.

1. an object that will attract certain types of metal _____
2. areas around a magnet in which magnetic forces can act _____
3. the end of a magnet, where magnetic forces are greatest _____
4. lines that show a magnetic field _____
5. the relationship between magnetism and electricity _____
6. a device that converts electrical energy to mechanical energy _____
7. to push apart _____
8. a temporary magnet made by passing an electric current through a wire wrapped around an iron core _____
9. to pull together _____

Directions There are six terms in the Word Bank that you did not use. Use them to complete the following sentences.

10. _____ can produce magnetic fields 200,000 stronger than Earth's.
11. In a home-made electromagnet, a nail can serve as the _____.
12. A(n) _____ uses fuel such as gasoline to produce mechanical energy.
13. A(n) _____ is made of a mixture of metals.
14. A(n) _____ can travel at over 300 miles per hour.
15. You can barely hear an electric guitar without a(n) _____.