



4. Explain three ways that the Periodic Table is useful. (p. 86-87)

5. Summarize the five physical and two chemical properties of Metals on the Periodic Table. (p. 90-91)

6. Describe one characteristic of each of the six groups that Metals are classified by on the Periodic Table (p. 92-95)

2

7. Summarize the properties of Non-Metals on the Periodic Table. (p. 97)

8. Describe one characteristic of each of the six families that contain Non-Metals. (p. 99-102)

9. Explain what happens to an atom during radioactive decay. (p. 107)

10. Identify the types of particles and energy produced from radioactive decay. (p. 109)

11. Describe how radioactive isotopes are useful. (p. 111)

Name \_\_\_\_\_

# HOMOGENEOUS VS. HETEROGENEOUS MATTER

Classify the following substances and mixtures as either homogeneous or heterogeneous.  
Place a  $\checkmark$  in the correct column.

**HOMOGENEOUS**                      **HETEROGENEOUS**

1. flat soda pop

2. cherry vanilla ice cream

3. salad dressing

4. sugar

5. soil

6. aluminum foil

7. black coffee

8. sugar water

9. city air

10. paint

11. alcohol

12. iron

13. beach sand

14. pure air

15. spaghetti sauce

Name \_\_\_\_\_

Date \_\_\_\_\_

EVERYDAY physical science

# Elements, Compounds, and Mixtures

Matter can be identified as an element, a compound, or a mixture. Identify the materials below by placing an E in front of an element, a C in front of a compound, and an M in front of a mixture.

- |                           |                              |
|---------------------------|------------------------------|
| _____ 1. iron             | _____ 22. detergent          |
| _____ 2. dirt             | _____ 23. ink                |
| _____ 3. sodium chloride  | _____ 24. phosphorus         |
| _____ 4. silver           | _____ 25. air                |
| _____ 5. water            | _____ 26. calcium carbonate  |
| _____ 6. fertilizer       | _____ 27. muddy water        |
| _____ 7. milk             | _____ 28. powdered drink mix |
| _____ 8. uranium          | _____ 29. calcium            |
| _____ 9. gold             | _____ 30. concrete           |
| _____ 10. neon            | _____ 31. carbon dioxide     |
| _____ 11. bronze          | _____ 32. blood              |
| _____ 12. seven-bean soup | _____ 33. cake mix           |
| _____ 13. baking soda     | _____ 34. iced tea           |
| _____ 14. bird's nest     | _____ 35. candy bar          |
| _____ 15. baking powder   | _____ 36. lemonade           |
| _____ 16. ocean water     | _____ 37. nitrogen           |
| _____ 17. aluminum        | _____ 38. paper              |
| _____ 18. starch          | _____ 39. chlorine           |
| _____ 19. paint           | _____ 40. carbon             |
| _____ 20. gasoline        | _____ 41. carbonated water   |

**Review and Reinforce**

# Introduction to Atoms

## Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. What three particles are found in an atom?
2. Which two particles are found in an atom's nucleus?
3. Explain why scientists use models to study atoms.
4. Which two particles in an atom are equal in number?
5. How are elements identified in terms of their atoms?
6. What two particles account for almost all of the mass of an atom?

## Building Vocabulary

Fill in the blank to complete each statement.

7. The \_\_\_\_\_ is the very small, dense center of an atom.
8. The positively charged particle of an atom is called a(n) \_\_\_\_\_.
9. A particle with no charge is a(n) \_\_\_\_\_.
10. A(n) \_\_\_\_\_ is the particle of an atom that moves rapidly in the cloudlike region around the nucleus.
11. The \_\_\_\_\_ tells the number of protons in the nucleus of every atom of an element.
12. Atoms of the same element that have the same number of protons but different numbers of neutrons are called \_\_\_\_\_.
13. The sum of protons and neutrons in the nucleus of an atom is the \_\_\_\_\_.
14. Scientists will often use a(n) \_\_\_\_\_, an object that helps explain ideas about the natural world.

Place the outside corner, the corner away from the dotted line, in the corner of your copy machine to copy onto letter-size paper.

**Lesson Quiz**

# Introduction to Atoms

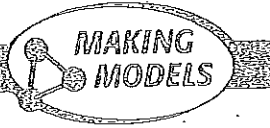
Write the letter of the correct answer on the line at the left.

1. \_\_\_ The positively charged particle in an atom's nucleus is the  
A electron  
B neutron  
C proton  
D isotope
2. \_\_\_ An element's identity can be determined from its  
A atomic number  
B number of neutrons  
C number of isotopes  
D energy levels
3. \_\_\_ The smallest particle an element can be divided into is the  
A electron  
B neutron  
C isotope  
D atom
4. \_\_\_ The model of the atom that described electrons scattered throughout a ball of positive charge was proposed by  
A Niels Bohr  
B Ernest Rutherford  
C J. J. Thomson  
D John Dalton

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

5. \_\_\_\_\_ An element's mass number tells the number of protons in its nucleus.
6. \_\_\_\_\_ Negatively charged particles in an atom are called electrons.
7. \_\_\_\_\_ The cloud model of the atom describes the location of electrons as specific orbits around the nucleus.
8. \_\_\_\_\_ Atoms with the same number of protons but different numbers of neutrons are called isomers.
9. \_\_\_\_\_ The sum of the protons and neutrons in an atom is called the atomic number.
10. \_\_\_\_\_ An object that helps explain ideas about the natural world is called a model.





## Made to Order

Imagine that you are a new employee at the Elements-4-U Company, which custom builds elements. Your job is to construct the atomic nucleus for each element ordered by your clients. You were hired for the position because of your knowledge about what a nucleus is made of and your understanding of how isotopes of an element differ from each other. Now it's time to put that knowledge to work!

### Procedure

1. Use the table below to record your data.

Data Table

	Hydrogen-1	Hydrogen-2	Helium-3	Helium-4	Lithium-7	Beryllium-9	Beryllium-10
No. of protons							
No. of neutrons							
Atomic number							
Mass number							

**MATERIALS**

- 4 protons (white plastic-foam balls, 2-3 cm in diameter)
- 6 neutrons (red plastic-foam balls, 2-3 cm in diameter)
- 20 strong-force connectors (toothpicks)
- periodic table

2. Your first assignment: the nucleus of hydrogen-1. Pick up one proton (a white plastic-foam ball). Congratulations! You have just built a hydrogen-1 nucleus, the simplest nucleus possible.
3. Count the number of protons and neutrons in the nucleus, and fill in the corresponding rows for this element in the table.
4. Determine the atomic number and mass number of the element. Record this information in the table.
5. Draw a picture of your model in the space below.



Handwritten scribbles and marks at the bottom right of the page.

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

Made to Order, continued

6. Hydrogen-2 is an isotope of hydrogen that has one proton and one neutron. Using a strong-force connector, add a neutron to your hydrogen-1 nucleus. (Remember that in a nucleus, the protons and neutrons are held together by the strong force, which is represented in this activity by the toothpicks.) Repeat steps 3-5.
  
7. Helium-3 is an isotope of helium that has two protons and one neutron. Add one proton to your hydrogen-2 nucleus to create a helium-3 nucleus. Each particle should be connected to the other two particles so they make a triangle, not a line. Protons and neutrons always form the smallest arrangement possible because the strong force pulls them together. Repeat steps 3-5.
  
8. For the next part of the lab, you will need to use information from the periodic table of the elements. Look at the periodic table on pp. 744 and 745 of your textbook. For your job, the most important information in the periodic table is the atomic number. You can find the atomic number of any element at the top of its entry on the table. For example, the atomic number of carbon is 6.
  
9. Use the information in the periodic table to build models of the following isotopes of elements: helium-4, lithium-7, beryllium-9, and beryllium-10. Remember to put the protons and neutrons as close together as possible—each particle should attach to at least two others. Repeat steps 3-5 for each isotope.

Made to Order, continued

CHAPTER 11

Analyze the Results

10. What is the relationship between the number of protons and the atomic number?

\_\_\_\_\_  
\_\_\_\_\_

11. If you know the atomic number and the mass number of an isotope, how could you figure out the number of neutrons in its nucleus?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

12. Look up uranium on the periodic table.

a. What is the atomic number of uranium?

\_\_\_\_\_

b. How many neutrons does the isotope uranium-235 have?

\_\_\_\_\_

Communicate Results

13. Compare your model with the models of other groups. How are they similar?

\_\_\_\_\_  
\_\_\_\_\_

How are they different?

\_\_\_\_\_  
\_\_\_\_\_

Going Further

Working with another group, combine your models. Identify the element (and isotope) you have created.

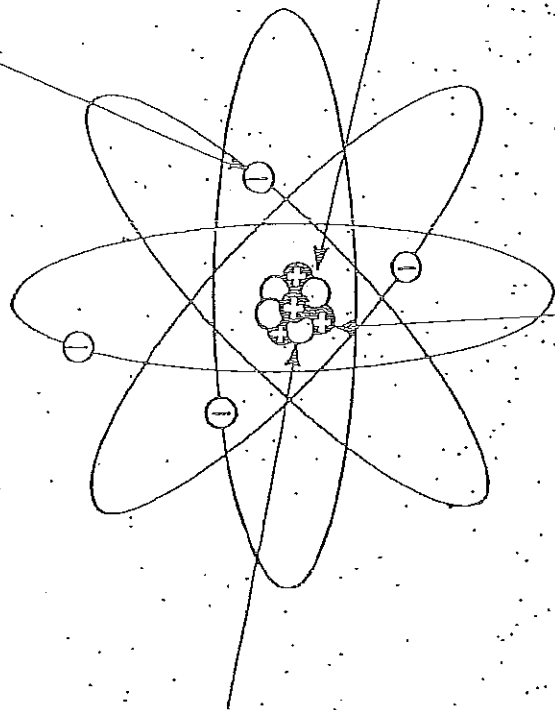
\_\_\_\_\_  
\_\_\_\_\_

# ATOMIC STRUCTURE

An atom is made up of three basic parts: protons, neutrons, and electrons. The protons which have a positive charge (+) and the neutrons which have no charge, form the nucleus in the center of the atom. The electrons which have a

negative charge (-), spin in orbits around the nucleus. Each atom has an equal number of protons and electrons. Because the negative charge of the electrons balances the positive charge of the protons, atoms are neutral.

**ELECTRONS**  
Electrons are very light, negatively charged particles. They circle the nucleus. Most of an atom is empty space!



**NUCLEUS**  
The nucleus is the center of the atom. Most of the mass of the atom is in the nucleus.

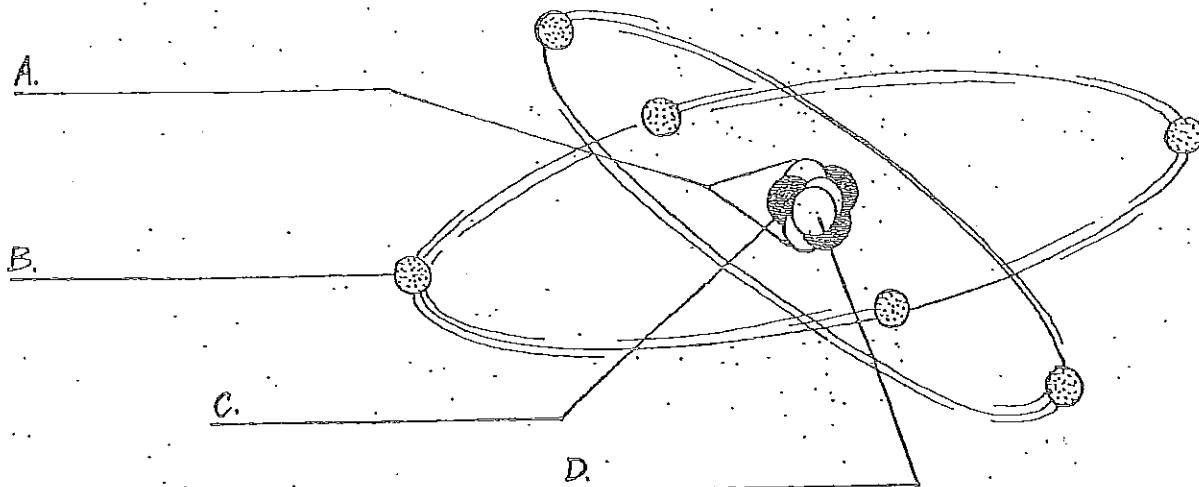
**PROTONS**  
Protons are positively charged particles found in the nucleus. There are an equal number of protons and electrons.

**NEUTRONS**  
Neutrons, also found in the nucleus, have no electrical charge. They are neutral. They have about the same mass as the proton.

# ON THE INSIDE

A Greek philosopher called Democritus, who lived over 2000 years ago, taught people that all things were made of grains which could not be divided. He called these grains *atoms* because in Greek *atom* means *indivisible*. Today, *atom* is the common name for the tiny particles of matter that cannot be further divided (and still be the same substance). If you could look inside an atom, you'd find that it looks like a miniature solar system, with something in the center and other things orbiting around it.

I. Label the parts of this atom (nucleus, protons, electrons, neutrons).



II. Answer these:

- \_\_\_\_\_ 1. the part of the atom that carries no electric charge
- \_\_\_\_\_ 2. the part of the atom that carries a positive charge
- \_\_\_\_\_ 3. the part of the atom that carries a negative charge
- \_\_\_\_\_ 4. the number of electrons that can be held in the first orbit (closest to the nucleus)
- \_\_\_\_\_ 5. the number of electrons that can be held in the second orbit
- \_\_\_\_\_ 6. the number of electrons that can be held in the third orbit
- \_\_\_\_\_ 7. there are the same number of these two particles in an atom
- \_\_\_\_\_ 8. the atomic number is the same as the number of these particles

Draw your own model of an atom with eight protons, eight neutrons, and eight electrons (an oxygen atom).

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

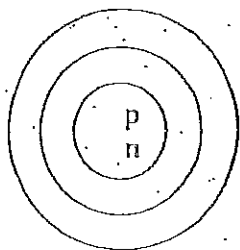
Atoms and Molecules

# Atomic Structure

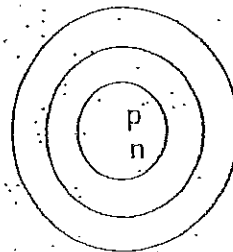
MASTER FORM

Use the information provided for each element to complete the diagrams. Draw the electrons in their proper shells and place the correct numbers in the nucleus to indicate the number of protons and the number of neutrons.

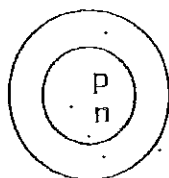
1. Sulfur: atomic number 16  
mass number 32



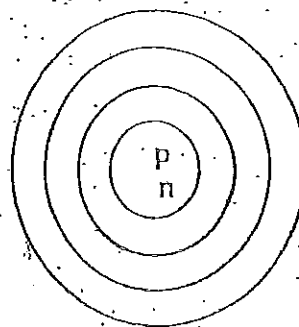
4. Sodium: atomic number 11  
mass number 23



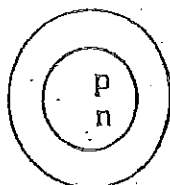
2. Beryllium: atomic number 4  
mass number 9



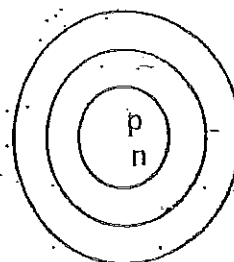
5. Potassium: atomic number 19  
mass number 39



3. Nitrogen: atomic number 7  
mass number 14



6. Argon: atomic number 18  
mass number 40



## Keeping Track of Particles

Each element is made of just one kind of atom. The number of protons in the atoms of an element is unique to that element. The number of protons in an atom is called the atomic number.

The mass of an atom depends on the number of its protons and neutrons. The mass number is the sum of the protons and neutrons in the nucleus. The mass of an electron is so small that it is usually omitted in mass determinations.

### Part A

Use the definitions of atomic number and mass number to help you fill in the blanks on the table below.

Table 4-1

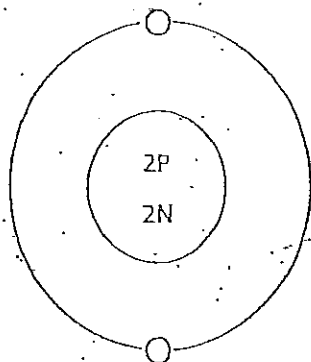
Atomic Data for Selected Elements

Element	Symbol	Number of			Atomic number	Mass number
		protons	neutrons	electrons		
Oxygen	O	8		8		16
Silicon	Si	14	14			28
Aluminum	Al		14	13	13	
Iron	Fe				26	56
Calcium	Ca	20		20		40
Sodium	Na				11	23
Potassium	K	19	20	19		
Magnesium	Mg				12	24
Gold	Au	79				197
Silver	Ag		61	47		

### Part B

Study the diagram of a model of a helium atom below. Use your knowledge of atomic number, mass number, and the model atom to identify and complete the models below.

FIGURE 4-1



Helium atom

Atomic number 2

Mass number 4

## Subatomic Particles: Reviewing the Main Ideas

Complete the following chart:

Particle	Location	Mass (amu)	Charge
Proton			
Electron			
Neutron			

## Find the Missing Numbers

Use your knowledge of atomic number and mass number to fill in the missing numbers:

Element	Atomic #	Mass #	HOW MANY?		
			Protons	Neutrons	Electrons
Iron	26	56			
Sulfur	16	32			
Carbon	6			6	
Fluorine		19	9		
Calcium	20	40			
Nitrogen		14			7
Copper	29			35	
Sodium		23	11		
Mercury		201			80
Silver				61	47



Complete the following tables:

Name of Compound	Compound Formula	Name of Element and Number of Atoms	Total Number of Atoms in Compound
Calcium Carbonate	$\text{CaCO}_3$	Ca-1, C-1, O-3	
Acetic Acid (Vinegar)	$\text{C}_2\text{H}_4\text{O}_2$		
Iron Oxide	$\text{Fe}_2\text{O}_3$		

p. 84-85

Element	Chemical Symbol	Atomic Number	Mass Number	Protons	Neutrons	Electrons
Carbon			14			6
Zinc		30			35	
Krypton			84			36
Calcium	Ca				21	

Draw the circle diagram (Bohr model) of the following atoms or isotopes:

Al-27 (13)

K-39 (19)

Complete the following Tables:

Particle	Location	Mass (amu)	Charge
Proton			
Electron			
Neutron			

Name of Compound	Compound Formula	Name of Element and Number of Atoms	Total Number of Atoms in Compound
Sucrose	$C_{12}H_{22}O_{11}$		
Sulfuric Acid	$H_2SO_4$		
Magnesium Hydroxide	$Mg(OH)_2$		
Sodium Nitrate	$Na_3N$		
Lead Sulfate	$PbSO_4$		

Draw the circle diagram (Bohr Model) of the following atoms or isotopes:

Si-28

B-11

Name \_\_\_\_\_

Date \_\_\_\_\_

EVERYDAY physical science

Fig. 1

# Atomic Masses of Elements

The atomic mass of an element is the sum of the numbers of protons and neutrons in the nucleus of an atom of the element. Use the periodic table on page 59 and the information provided below to identify the elements.

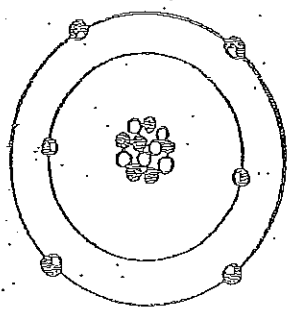
	ATOMIC MASS	NUMBER OF NEUTRONS	NUMBER OF PROTONS	ELEMENT
A.	14	7		
B.	226	138		
C.	12	6		
D.	59	32		
E.	4	2		
F.	7	4		
G.	24	12		
H.	133	78		
I.	16	8		
J.	119	69		
K.	195	117		
L.	238	146		
M.	35	18		
N.	59	31		
O.	108	61		
P.	31	16		

818

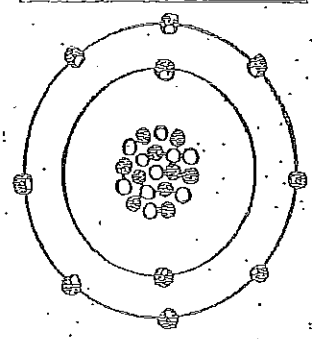
# WHICH ATOM IS WHICH?

Every kind of atom has its own unique look. All the atoms of an element have this same look. Here's a chance for you to look at some atoms and tell what elements they are. Write the name of the element next to each atom. You may need to use the Periodic Table to help you out. (You can find one on page 52 of this book.)

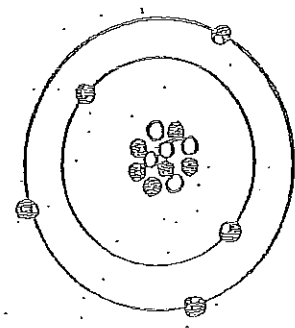
A.



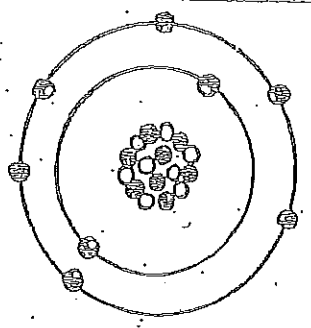
B.



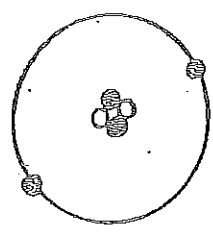
C.



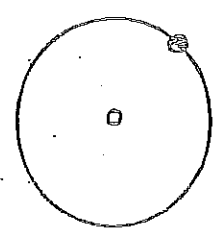
D.



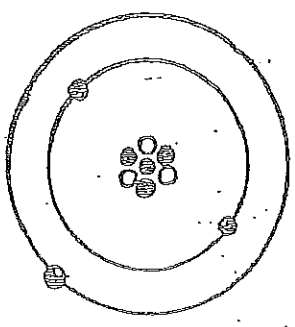
E.



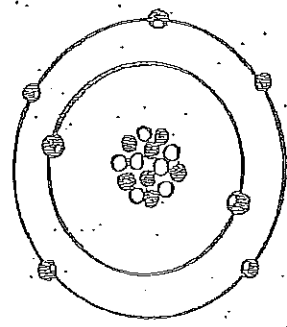
F.



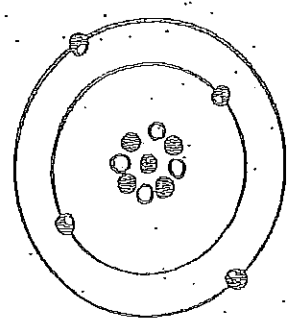
G.



H.



I.



**INQUIRY** Lab A

40 minutes

### Alien Insect Periodic Table

The periodic table classifies elements according to their properties. In this lab, you will model the procedure used to develop the periodic table. Your model will include developing patterns using pictures of alien insects. You will then use your patterns to predict what missing alien insects look like.

#### Ask a Question

How can I arrange objects into patterns by using their properties?

#### Materials

alien insect cards

#### Make Observations

1. Obtain a set of alien insect pictures. Spread them out so you can see all of them.

Observe the pictures with a partner. Look for properties that you might use to organize the pictures.

2. Make a list of properties you might use to group the alien insects. These are properties that a number of insects have in common.

---



---



---

3. Make a list of properties you might use to sequence the insects. These properties change from one insect to the next in a pattern.

---



---



---

4. With your partner, decide which pattern you will use to arrange the alien insects in an organized rectangular block.

All the insects in a vertical column, or group, must be the same in some way. They must also share some feature that changes regularly as you move down the group.

All the aliens in a horizontal row, or period, must be the same in some way and must also share some feature that changes regularly as you move across the period.

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**Lab A continued**

**Analyze and Conclude**

8. **Explain** Could you have predicted the properties of the missing insects without placing the others in a pattern? Why or why not?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. **The Big Idea** How is your arrangement similar to the one developed by Mendeleev for elements? How is it different?

\_\_\_\_\_

\_\_\_\_\_

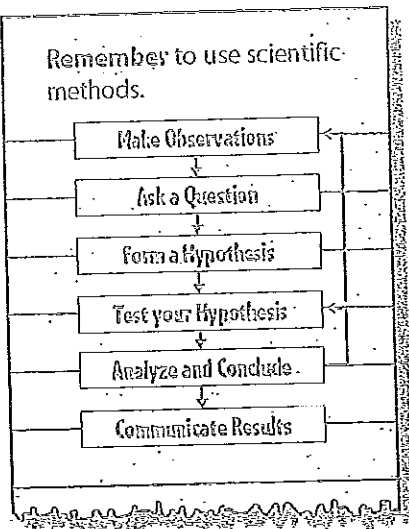
\_\_\_\_\_

10. **Infer** What properties can you predict for one of the missing insects? What do you not know about that insect?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**Communicate Your Results**

Create a slide show presentation that demonstrates, step by step, how you grouped and sequenced your insects and predicted the properties of the missing insects. Show your presentation to students in another class.

**Lab Tips**

- A property is any observable characteristic that you can use to distinguish between objects.
- A pattern is a consistent plan or model used as a guide for understanding or predicting something.

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# ELEMENTS AND THEIR SYMBOLS

Name \_\_\_\_\_

Write the symbols for the following elements.

- |             |       |                |       |
|-------------|-------|----------------|-------|
| 1. oxygen   | _____ | 11. magnesium  | _____ |
| 2. hydrogen | _____ | 12. manganese  | _____ |
| 3. chlorine | _____ | 13. neon       | _____ |
| 4. sodium   | _____ | 14. bromine    | _____ |
| 5. fluorine | _____ | 15. phosphorus | _____ |
| 6. carbon   | _____ | 16. silver     | _____ |
| 7. helium   | _____ | 17. lead       | _____ |
| 8. nitrogen | _____ | 18. iron       | _____ |
| 9. copper   | _____ | 19. calcium    | _____ |
| 10. sulfur  | _____ | 20. potassium  | _____ |

Write the name of the element that corresponds to each of the following symbols.

- |        |       |        |       |
|--------|-------|--------|-------|
| 21. Cu | _____ | 31. Ca | _____ |
| 22. K  | _____ | 32. Ag | _____ |
| 23. C  | _____ | 33. P  | _____ |
| 24. Au | _____ | 34. O  | _____ |
| 25. Zn | _____ | 35. I  | _____ |
| 26. Pb | _____ | 36. Sn | _____ |
| 27. Fe | _____ | 37. H  | _____ |
| 28. Na | _____ | 38. F  | _____ |
| 29. S  | _____ | 39. Ni | _____ |
| 30. Al | _____ | 40. Hg | _____ |

Complete the following chart:

Roman numerals indicate the number of valence electrons for the transitional metals listed.

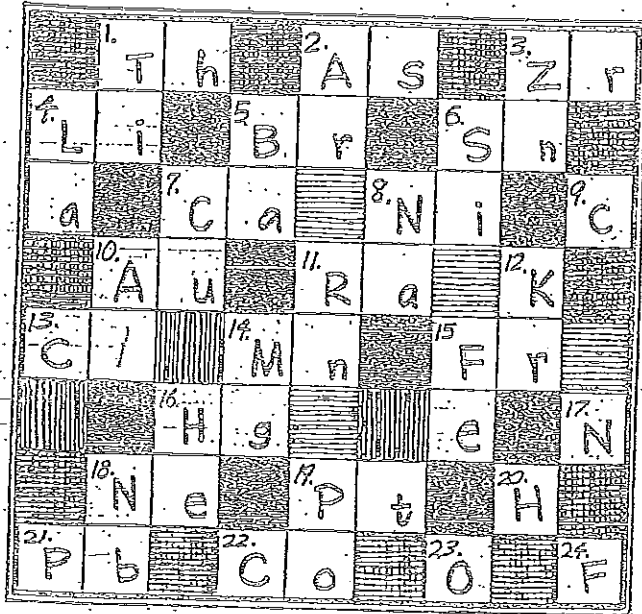
1=I 2=II 3=III 4=IV 5=V 6=VI 7=VII 8=VIII 9=IX 10=X

Element	Chemical Symbol	Atomic Number	Atomic Mass	State of Matter
Lithium				
Mercury				
Krypton				
Carbon				
Tungsten (II)				
Chromium (III)				
Silicon				
Potassium				
Chlorine				
Boron				
Calcium				
Uranium				
Nobelium				
Silver				
Bromine				
Tin (IV)				
Strontium				
Aluminum				
Iodine				
Zinc (I)				



# SIMPLY SYMBOLS

How sharp is your knowledge of the symbols for elements? This puzzle is already solved, using symbols of common elements. The clues (names of the elements) are missing. See how many you can name without looking for help in any resources. Write the element name next to the matching puzzle number.

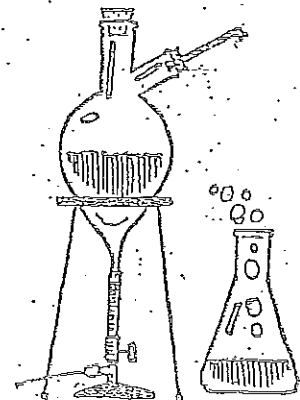


*Down*

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
18. \_\_\_\_\_
19. \_\_\_\_\_

*Across*

- |           |           |
|-----------|-----------|
| 1. _____  | 15. _____ |
| 2. _____  | 16. _____ |
| 3. _____  | 17. _____ |
| 4. _____  | 18. _____ |
| 5. _____  | 19. _____ |
| 6. _____  | 20. _____ |
| 7. _____  | 21. _____ |
| 8. _____  | 22. _____ |
| 9. _____  | 23. _____ |
| 10. _____ | 24. _____ |
| 11. _____ |           |
| 12. _____ |           |
| 13. _____ |           |
| 14. _____ |           |



24

Name \_\_\_\_\_

# FORMING WORDS FROM 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	<u>CoW</u>
2. A person who doesn't tell the truth	lithium-argon	_____
3. The opposite of lose	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. A cow's offspring	carbon-aluminum-fluorine	_____
13. A form of money	cobalt-iodine-nitrogen	_____
14. A symbol of love	potassium-iodine-sulfur-sulfur	_____
15. Another word for ill	silicon-carbon-potassium	_____
16. The Saint who visits on Christmas Eve	nickel-carbon-potassium	_____
17. A form of transportation	calcium-boron	_____
18. To make better	helium-aluminum	_____
King of the beasts	lithium-oxygen-nitrogen	_____
20. A form of precipitation	radium-iodine-nitrogen	_____

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Name \_\_\_\_\_

Date \_\_\_\_\_

EVERYDAY

PHYSICAL SCIENCE

# ELEMENTS AND THEIR ATOMIC NUMBERS

Chemical elements are identified by their atomic numbers. For example, hydrogen (H) is element 1, oxygen (O) is element 8, and uranium (U) is element 92.

Write the symbols for the elements below above their atomic numbers to spell out some statements. Use the periodic table of elements on page 59 to help you.

Example:	H	O	W
	1	8	74

90	53	16		53	16		9	92	7					
6	8	8	19		92	16		20	7	66				
2		8	74	7	16		90	85	"	5	92	16	39	
4	99		20	26	"									
90	85		15	57	39	68		3	19	99		74	85	68
50	8	74	9	57	19	99		27	23	68				
1	53	16		27	85									

Use the periodic table to create your own words and sentences. See if a class member can decode your creations. What is the longest word you can create using the atomic numbers?

210

Name \_\_\_\_\_

Date \_\_\_\_\_

# EVERYDAY PHYSICAL SCIENCE

## ATOMIC NUMBERS OF ELEMENTS

The atomic number of an element is the number of protons in an atom's center. For example, hydrogen has 1 proton, and its atomic number is 1. Use the periodic table on page 59 for this activity.

1. Write the chemical symbols for the elements with atomic numbers of

5 \_\_\_\_\_ 10 \_\_\_\_\_ 15 \_\_\_\_\_

20 \_\_\_\_\_ 25 \_\_\_\_\_ 30 \_\_\_\_\_

2. Write the atomic numbers for five elements whose symbols begin with the letter C.

\_\_\_\_\_

3. What is your age? \_\_\_\_\_

Which element has that atomic number?

\_\_\_\_\_

4. Write the symbols for the elements whose atomic numbers match these descriptions:

a. number of states in the U.S.

\_\_\_\_\_

b. number of planets in the solar system

\_\_\_\_\_

c. number of moons of Earth

\_\_\_\_\_

d. number of years in a decade

\_\_\_\_\_

e. number of centimeters in a meter

\_\_\_\_\_

- f. number of ounces in a pound

\_\_\_\_\_

- g. number of quarts in a gallon

\_\_\_\_\_

- h. number of sides in a pentagon

\_\_\_\_\_

5. Add the atomic numbers of these elements:

U \_\_\_\_\_

C \_\_\_\_\_

Cl \_\_\_\_\_

Au \_\_\_\_\_

+ Al \_\_\_\_\_

Total \_\_\_\_\_

6. Identify the atomic numbers of these metals:

silver \_\_\_\_\_

gold \_\_\_\_\_

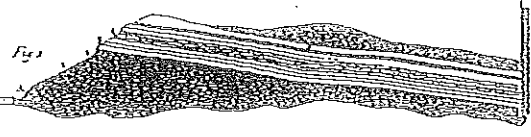
zinc \_\_\_\_\_

copper \_\_\_\_\_

lead \_\_\_\_\_

iron \_\_\_\_\_

chromium \_\_\_\_\_



# Symbols for the Elements

The symbols  $H_2O$  for water and  $CO_2$  for carbon dioxide are often used. Read the riddles below and write the name of the correct element for each to discover the name of the chemist who devised the system in which letter symbols are used for elements. The circled letters will spell out his last name.

1. element named for a university city in California
2. element named for the sixth-largest continent
3. element named for the seventh planet from the sun
4. element with the atomic number 30
5. element named for a country in the Western Hemisphere
6. element named for the inventor of dynamite
7. element named for a university on the west coast of the U.S.
8. element named for a country in western Europe
9. element named for the scientist known for his theory of relativity

Who devised the system for using symbols for the elements?

Jöns Jakob \_\_\_\_\_

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# THE PERIODIC TABLE

A chemical element is any one of the known kinds of basic chemical substances. The periodic table arranges the elements in horizontal rows, called periods, according to their atomic number. Use the periodic table on page 59 and the clues about the elements below to identify the Russian chemist who devised the most common periodic table. The circled letters, when written in order at the bottom of the page, will spell out his name.

Which element . . .

1. has an atomic number of 86? \_\_\_\_\_

2. appears directly above sodium? \_\_\_\_\_

3. appears to the left of neon? \_\_\_\_\_

4. has an atomic number of 7? \_\_\_\_\_

5. appears directly above silver? \_\_\_\_\_

6. has the symbol Fe? \_\_\_\_\_

7. has the symbol K? \_\_\_\_\_

8. appears directly below tin? \_\_\_\_\_

9. appears to the left of copper? \_\_\_\_\_

10. appears directly below barium? \_\_\_\_\_

11. has an atomic number of 53? \_\_\_\_\_

12. appears directly below oxygen? \_\_\_\_\_

13. has an atomic number of 1? \_\_\_\_\_

14. appears directly below phosphorus? \_\_\_\_\_

15. has an atomic number of 23? \_\_\_\_\_

Who was the chemist?

\_\_\_\_\_

EVERYDAY PHYSICAL SCIENCE

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Chapter 3: Element Symbols: Test

**Part II. Formulas:** Below is a list of the chemical formulas of many common compounds. Write the name of the underlined symbol in each formula in the space provided.

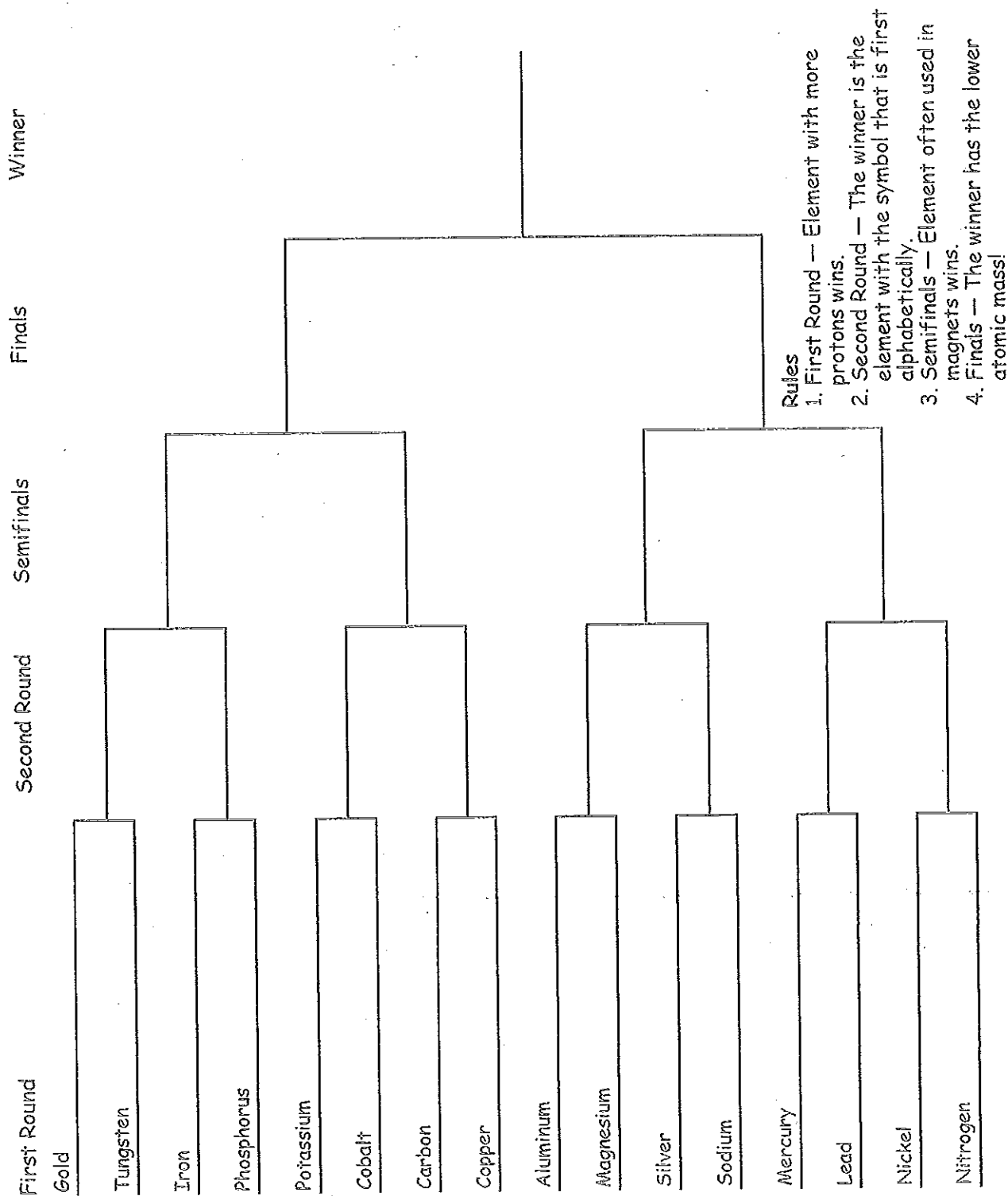
26. Water:  $H_2O$  \_\_\_\_\_
27. Salt:  $NaCl$  \_\_\_\_\_
28. Sulfuric Acid:  $H_2SO_4$  \_\_\_\_\_
29. Quartz:  $SiO_2$  \_\_\_\_\_
30. Rust:  $Fe_2O_3$  \_\_\_\_\_
31. Baking Soda:  $NaHCO_3$  \_\_\_\_\_
32. Photo Developer:  $AgCl$  \_\_\_\_\_
33. Ammonia:  $NH_3$  \_\_\_\_\_
34. Fool's Gold:  $FeS_2$  \_\_\_\_\_
35. Stomach Acid:  $HCl$  \_\_\_\_\_

**Part III. Symbols:** Symbols of elements are used in the sentences below. Write the name of the element for the symbol used in the sentence in the space provided.

36. I is used by campers to purify water. \_\_\_\_\_
37. Mg is used to treat skin rashes. \_\_\_\_\_
38. Some switches contain Hg. \_\_\_\_\_
39. Some glass plates are coated with Au. \_\_\_\_\_
40. Some pots and pans are made of Al. \_\_\_\_\_
41. Wire made of Ni is used in toasters. \_\_\_\_\_
42. Some bowls and plates are made of Sn. \_\_\_\_\_
43. Pb is used to make television screens. \_\_\_\_\_
44. P is used by the body. \_\_\_\_\_
45. Some liquid soaps use K. \_\_\_\_\_
46. Cu is used for paint on ships. \_\_\_\_\_
47. Zn is used to make brass. \_\_\_\_\_
48. Ca is used in building materials. \_\_\_\_\_
49. He is used in bar code scanners. \_\_\_\_\_
50. Some weapons are made from U. \_\_\_\_\_

Name: \_\_\_\_\_

# Sweet 16 Periodic Table Tournament





**Lesson Quiz**

# Metals

Write the letter of the correct answer on the line at the left.

- |   |  |
|---|--|
| <p>1. ___ If a material can easily be drawn into the shape of a wire, it is</p> <ul style="list-style-type: none"><li>A ductile</li><li>B magnetic</li><li>C malleable</li><li>D reactive</li></ul> <p>3. ___ The metals of Group 1 are commonly called the .</p> <ul style="list-style-type: none"><li>A transition metals</li><li>B alkaline earth metals</li><li>C lanthanides</li><li>D alkali metals</li></ul> | <p>2. ___ Which of the following is NOT a characteristic of most metals?</p> <ul style="list-style-type: none"><li>A brittle</li><li>B good conductor</li><li>C ductile</li><li>D malleable</li></ul> <p>4. ___ One metal that is a liquid at room temperature is</p> <ul style="list-style-type: none"><li>A magnesium</li><li>B manganese</li><li>C mercury</li><li>D sodium</li></ul> |
|---|--|

Fill in the blank to complete each statement.

- 5. Gold, which is in Group 11 on the periodic table, is an example of a(n) \_\_\_\_\_ metal.
- 6. The family in the periodic table that contains the most reactive metals is the \_\_\_\_\_ metals.
- 7. \_\_\_\_\_ are devices that move atomic nuclei at extremely high speeds.
- 8. Elements with atomic numbers above 95 are called \_\_\_\_\_ elements.
- 9. Thermal conductivity is the ability of an element to transfer \_\_\_\_\_.
- 10. Reactivity is a(n) \_\_\_\_\_ property of metals.

**Review and Reinforce**

# Metals

## Understanding Main Ideas

Answer the following questions in the spaces provided. Use a separate sheet of paper if you need more room. Use a periodic table for reference.

1. What physical properties are shared by most metals?

---

---

2. Sodium (Na) and calcium (Ca) are in different families of metals. Name the families of metals in which they belong, and describe each family's characteristics.

---

---

3. Would a metal in Group 13 be more or less reactive than a metal in Group 1? Explain.

---

4. In what periods are the lanthanides and actinides? Where are they placed in the periodic table? Why?

---

---

## Building Vocabulary

Fill in the blank to complete each statement.

5. The reaction of a metal with oxygen to form rust is called \_\_\_\_\_.
6. A material that is \_\_\_\_\_ can be hammered into thin sheets and other shapes.
7. The ability to transmit heat or electricity to other objects is called \_\_\_\_\_.
8. A material that is \_\_\_\_\_ can be drawn into a wire.
9. \_\_\_\_\_ is the ease and speed with which an element combines with other substances.

**Review and Reinforce**

# Nonmetals and Metalloids

**Understanding Main Ideas**

Complete the following table. Use a periodic table for reference.

Element	Metal, Metalloid, or Nonmetal	Family Name
Arsenic	metalloid	1.
Sulfur	2.	oxygen family
Tin	metal	3.
Neon	4.	noble gas
Chlorine	nonmetal	5.
Silicon	6.	carbon family

7. Where in the periodic table are the nonmetals located? Where are the metalloids?

**Building Vocabulary**

Fill in the blank to complete each statement.

8. A(n) \_\_\_\_\_ is formed of two atoms.
9. The \_\_\_\_\_ are a family of very reactive elements.
10. A type of element that has some of the properties of metals and some of nonmetals is called a(n) \_\_\_\_\_.
11. The \_\_\_\_\_ are a family of unreactive elements.
12. A(n) \_\_\_\_\_ is a type of element whose physical properties are generally opposite to those of metals.
13. A substance that carries electricity under certain circumstances, but not under other circumstances is called a(n) \_\_\_\_\_.

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Use the binder punch, and write away from the dotted line. Cut out on your copy machine to copy onto letter-size paper.

Lesson Quiz

## Nonmetals and Metalloids

Write the letter of the correct answer on the line at the left.

1. \_\_\_ Which of the following is NOT a property of most nonmetals?
  - A found on the right side of the periodic table
  - B solids tend to be dull and brittle
  - C excellent electric conductivity
  - D many are gases at room temperature
2. \_\_\_ The only nonmetal in Group 14 is
  - A carbon
  - B oxygen
  - C nitrogen
  - D fluorine
3. \_\_\_ Two of the same atoms bonded together is called a(n)
  - A isotope
  - B diatomic molecule
  - C binary atom
  - D semiconductor
4. \_\_\_ The highly reactive nonmetals of Group 17 are called the
  - A noble gases
  - B metalloids
  - C halogens
  - D actinides

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

5. \_\_\_\_\_ Atoms of nonmetals usually lose electrons when they combine with other atoms.
6. \_\_\_\_\_ When two or more atoms bond by sharing electrons, they form a molecule.
7. \_\_\_\_\_ The elements that have some properties of metals and some properties of nonmetals are called halogens.
8. \_\_\_\_\_ Helium has chemical properties so different from those of the other elements that it cannot be placed in any group.
9. \_\_\_\_\_ Substances that can carry electric current under some conditions but not under others are called semiconductors.
10. \_\_\_\_\_ The Group 15 element oxygen is used to make compounds known as fertilizers.

## METALS VS NONMETALS LAB

Identifying substances by their metal or nonmetal properties. Use the textbook as a reference.

List three properties of Metals

---

---

---

List three properties of Nonmetals

---

---

---

Step 1: Place 2 scoops of crystal labeled A in a test tube DO NOT TASTE.

Step 2: Place 2 scoops of crystal labeled B in a test tube DO NOT TASTE.

Step 3: Follow all lab safety rules and light bunsen burner.

Step 4: Using test tube tongs carefully heat the contents of test tube A and record the melting time. Do not heat longer than 2 minutes. IF THE SUBSTANCE MELTS IMMEDIATELY PLACE THE TEST TUBE IN THE SOAPY WATER TUB.

Step 5: Using test tube tongs carefully heat the contents of test tube B and record the melting time. Do not heat longer than 2 minutes. IF THE SUBSTANCE MELTS IMMEDIATELY PLACE THE TEST TUBE IN THE SOAPY WATER TUB.

Step 6: Complete a lab report sheet. Make sure to identify the substances, metal or nonmetal and any other relevant observations in your lab report.

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# Isotopes or Different Elements?

1. For each of the following statements, you are given a pair of elements and important information about each. Use this information to determine if the elements in the pair are isotopes or different elements. Indicate your answer in the space provided.

Element D has 6 protons and 7 neutrons.  
Element F has 7 protons and 7 neutrons.

\_\_\_\_\_

Element J has 27 protons and 32 neutrons.  
Element L has 27 protons and 33 neutrons.

\_\_\_\_\_

Element X has 17 protons and 18 neutrons.  
Element Y has 18 protons and 17 neutrons.

\_\_\_\_\_

Element Q has 56 protons and 81 neutrons.  
Element R has 56 protons and 82 neutrons.

\_\_\_\_\_

2. Element T has an atomic number of 20 and an atomic mass of 40.  
Element Z has an atomic number of 20 and an atomic mass of 41.

\_\_\_\_\_

3. Element W has 8 protons and 8 neutrons.  
Element V has 7 protons and 8 neutrons.

\_\_\_\_\_

7. Element P has an atomic number of 92 and an atomic mass of 238.  
Element S has 92 protons and 143 neutrons.

\_\_\_\_\_

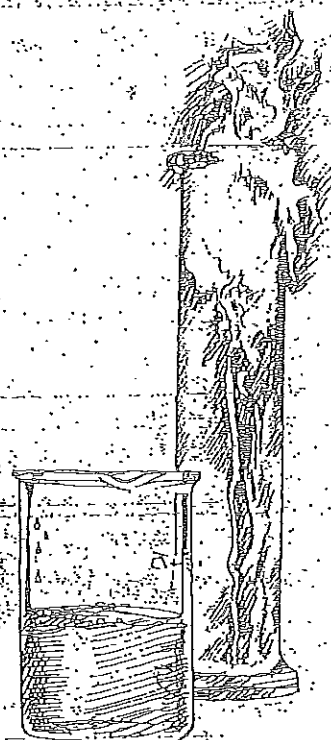
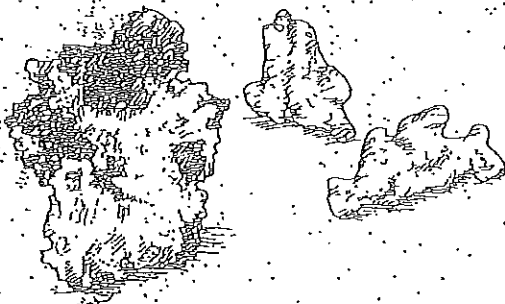
37  
C

## Organization of the Periodic Table: Study Guide to the Organizing the Elements Brochure

**Directions:** Read and study the *Organizing the Elements* brochure. Use the brochure and the periodic table to answer the questions below.

**Part I. Vocabulary You Should Know:** The following is a list of vocabulary words from the brochure that you should know. Match the word to its definition. Use each choice once.

- |   |                   |
|---|-------------------|
| _____ 1. Each horizontal row in the periodic table  | A. Atomic Number  |
| _____ 2. Each vertical column in the periodic table   | B. Family         |
| _____ 3. Elements that give off particles   | C. Metalloids     |
| _____ 4. Elements that are made in laboratories   | D. Metals         |
| _____ 5. Elements that occur somewhere on earth   | E. Natural        |
| _____ 6. Elements that are good conductors of heat and electricity. They can be pounded into shapes or drawn into wires. They have a shiny, metallic luster. They appear on the periodic table to the left of the bold step-shaped line.      | F. Nonmetals      |
| _____ 7. Elements that are poor conductors of heat and electricity. If pounded, they will shatter or get crushed to a powder. They have a dull or earthy luster. They appear to the right of the bold step-shaped line in the periodic table. | G. Period         |
| _____ 8. Elements that have characteristics of both metals and nonmetals. They touch the bold step-shaped line in the periodic table.   | H. Periodic table |
| _____ 9. The number of protons in an atom of an element. The elements are put in this order.  | I. Radioactive    |
| _____ 10. Organizes the elements by their properties  | J. Synthetic      |



# Organization of the Periodic Table: Study Guide to the Organizing the Elements Brochure

**Part II. Gathering Information From the Periodic Table:** Give the following information about each of the elements listed below. Use a copy of the periodic table on page 15.

## Copper

- 11. Atomic Number \_\_\_\_\_
- 12. Symbol \_\_\_\_\_
- 13. Family Number \_\_\_\_\_
- 14. Family Name \_\_\_\_\_
- 15. Solid, Liquid, or Gas \_\_\_\_\_
- 16. Metal, Nonmetal, or Metalloid \_\_\_\_\_
- 17. Natural or Manmade \_\_\_\_\_
- 18. Radioactive or Stable \_\_\_\_\_

## Mercury

- 19. Atomic Number \_\_\_\_\_
- 20. Symbol \_\_\_\_\_
- 21. Family Number \_\_\_\_\_
- 22. Family Name \_\_\_\_\_
- 23. Solid, Liquid, or Gas \_\_\_\_\_
- 24. Metal, Nonmetal, or Metalloid \_\_\_\_\_
- 25. Natural or Manmade \_\_\_\_\_
- 26. Radioactive or Stable \_\_\_\_\_

## Oxygen

- 27. Atomic Number \_\_\_\_\_
- 28. Symbol \_\_\_\_\_
- 29. Family Number \_\_\_\_\_
- 30. Family Name \_\_\_\_\_
- 31. Solid, Liquid, or Gas \_\_\_\_\_
- 32. Metal, Nonmetal, or Metalloid \_\_\_\_\_
- 33. Natural or Manmade \_\_\_\_\_
- 34. Radioactive or Stable \_\_\_\_\_

## Calcium

- 35. Atomic Number \_\_\_\_\_
- 36. Symbol \_\_\_\_\_
- 37. Family Number \_\_\_\_\_
- 38. Family Name \_\_\_\_\_
- 39. Solid, Liquid, or Gas \_\_\_\_\_
- 40. Metal, Nonmetal, or Metalloid \_\_\_\_\_
- 41. Natural or Manmade \_\_\_\_\_
- 42. Radioactive or Stable \_\_\_\_\_

## Uranium

- 43. Atomic Number \_\_\_\_\_
- 44. Symbol \_\_\_\_\_
- 45. Family Number \_\_\_\_\_
- 46. Family Name \_\_\_\_\_
- 47. Solid, Liquid, or Gas \_\_\_\_\_
- 48. Metal, Nonmetal, or Metalloid \_\_\_\_\_
- 49. Natural or Manmade \_\_\_\_\_
- 50. Radioactive or Stable \_\_\_\_\_

