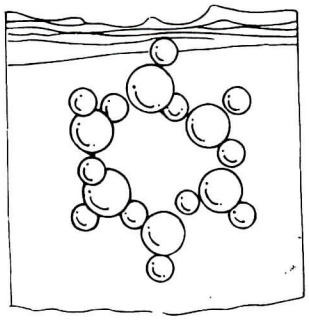
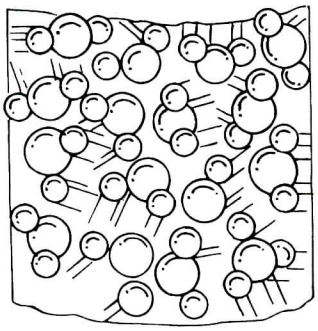
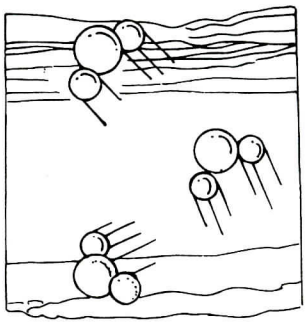
Name _____ Date _____

Three States of Matter

On Earth, matter comes in three common states: solid, liquid, and gas. The state of matter is determined by the strength of the bonds holding its molecules together. Matter can be changed from one state to another through the use of heat. Changes in the three states of matter are physical changes. Classify the phrases in the word box for each state of matter. Some phrases are used more than once.

molecule movement is greatest	has mass	has shape of its own
takes shape of container	has definite volume	has no definite volume
weak bonds between molecules	does not expand	hard to deform
spreads in all directions	expands	takes up space
virtually no bonds between molecules	spreads in direction of gravity	
molecule movement is smallest	strong bonds between molecules	

Solid	Liquid	Gas
		
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

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Name _____ Date _____

Identifying Physical and Chemical Changes

Read each description and classify it as a physical or chemical change.

1. _____ Iron rusts.
2. _____ Sodium hydroxide dissolves in water.
3. _____ A safety match ignites and burns.
4. _____ A cube of ice melts to form a puddle of water.
5. _____ Icicles form at the edge of a roof.
6. _____ Water is heated and changed into steam.
7. _____ Milk goes sour.
8. _____ A chocolate bar melts in the sun.
9. _____ Acid on limestone produces carbon dioxide gas.
10. _____ Vinegar and baking soda react.
11. _____ A tea kettle begins to whistle.
12. _____ Wood and leaves rot to form humus.

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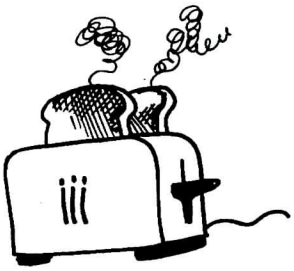
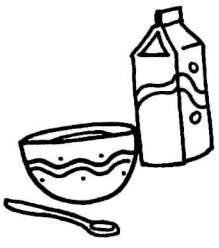
TWO WAYS TO CHANGE

A melting ice sculpture . . . a spectacular bonfire . . . a cake baking in the oven . . . a milkshake in the making . . . an explosion . . . all of these involve changes in matter. Some are physical changes (changes in shape, color, or state) and others are chemical changes (changes involving chemical reactions). Which are which? For each change described below, write **P** for physical change or **C** for chemical change. Be ready to explain your choices.





_____ 1. glass breaking

_____ 2. hammering wood together to build a playhouse

_____ 3. a rusting bicycle

_____ 4. melting butter for popcorn

_____ 5. glassblower creating sculptures out of glass

_____ 6. freezing chocolate-covered bananas

_____ 7. separating sand from gravel

_____ 8. spoiling food

_____ 9. burning toast

_____ 10. making salt water to gargle for a sore throat

_____ 11. mixing lemonade powder into water

_____ 12. cream being whipped

_____ 13. water evaporating from a pond

_____ 14. cutting grass

_____ 15. burning leaves

_____ 16. humidifier putting moisture into the air

_____ 17. corroding metal

_____ 18. bleaching your hair

_____ 19. fireworks exploding

_____ 20. squeezing oranges to get orange juice

_____ 21. frying an egg

_____ 22. pouring milk on your oatmeal

Name _____

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Elements, compounds & mixtures worksheet

Part 1: Fill in the blanks where necessary.

Elements:

- A pure substance containing only one kind of _____.
- An element is always uniform all the way through (homogeneous).
- An element _____ be separated into simpler materials (except during nuclear reactions).
- Over 100 existing elements are listed and classified on the _____.

Compounds:

- A pure substance containing two or more kinds of _____.
- The atoms are _____ combined in some way. Often times (but not always) they come together to form groups of atoms called molecules.
- A compound is always homogeneous (uniform).
- Compounds _____ be separated by physical means. Separating a compound requires a chemical reaction.
- The properties of a compound are usually different than the properties of the elements it contains.

Mixtures:

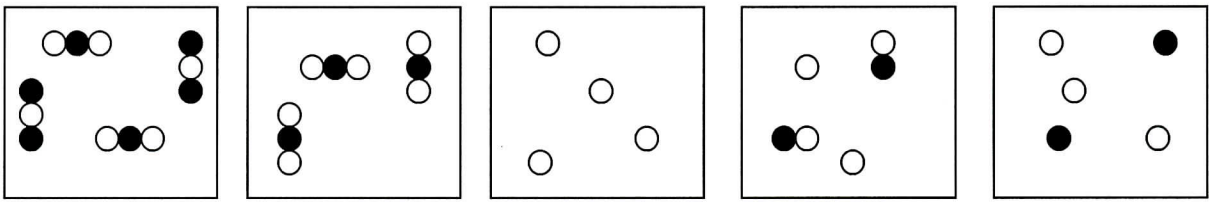
- Two or more _____ or _____ NOT chemically combined.
- No reaction between substances.
- Mixtures can be uniform (called _____) and are known as solutions.
- Mixtures can also be non-uniform (called _____).
- Mixtures can be separated into their components by chemical or physical means.
- The properties of a mixture are similar to the properties of its components.

Part 2: Classify each of the following as elements (E), compounds (C) or Mixtures (M). Write the letter X if it is none of these.

___Diamond (C)	___Sugar ($C_6H_{12}O_6$)	___Milk	___Iron (Fe)
___Air	___Sulfuric Acid (H_2SO_4)	___Gasoline	___Electricity
___Krypton (K)	___Bismuth (Bi)	___Uranium (U)	___Popcorn
___Water (H_2O)	___Alcohol (CH_3OH)	___Pail of Garbage	___A dog
___Ammonia (NH_3)	___Salt (NaCl)	___Energy	___Gold (Au)
___Wood	___Bronze	___Ink	___Pizza
___Dry Ice (CO_2)	___Baking Soda ($NaHCO_3$)	___Titanium (Ti)	___Concrete

ELEMENTS, COMPOUNDS & MIXTURES WORKSHEET

Part 3: Match each diagram with its correct description. Diagrams will be used once.



A **B** **C** **D** **E**

___1. Pure Element – only one type of atom present.

___2. Mixture of two elements – two types of uncombined atoms present.

___3. Pure compound – only one type of compound present.

___4. Mixture of two compounds – two types of compounds present.

___5. Mixture of a compound and an element.

Part 4: Column A lists a substance. In Column B, list whether the substance is an element (E), a compound (C), a Heterogeneous Mixture (HM), or a Solution (S). (Remember a solution is a homogeneous mixture.)

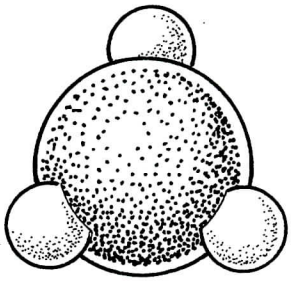
Column A	Column B
1. Summer Sausage	
2. Steam	
3. Salt Water	
4. Pencil lead (Pb)	
5. Dirt	
6. Pepsi	
7. Silver (Ag)	
8. Toothpaste (Na_2HPO_4)	
9. A burrito	
10. Italian Dressing	
11. Chicken Soup	
12. Lemonade	

SUBSTANCES VS. MIXTURES

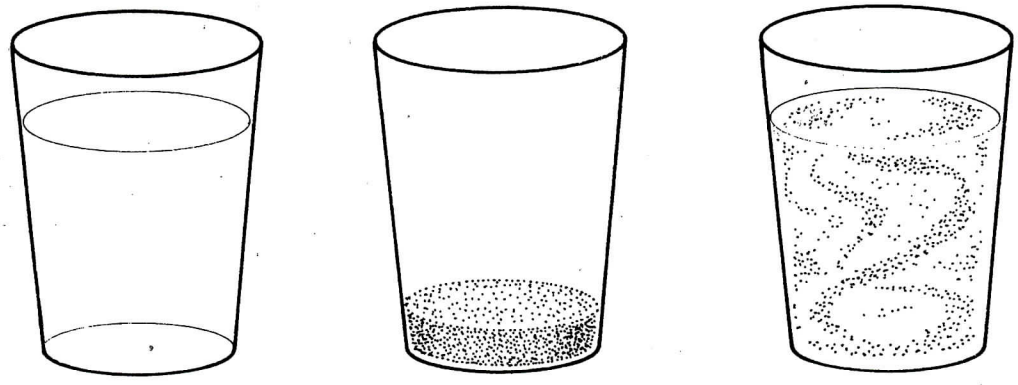
Name _____

A substance is matter for which a chemical formula can be written. Elements and compounds are substances. Mixtures can be in any proportion, and the parts are not chemically bonded.

Classify the following as to whether it is a substance or a mixture by writing S or M in the space provided.



1. sodium _____
2. water _____
3. soil _____
4. coffee _____
5. oxygen _____
6. alcohol _____
7. carbon dioxide _____
8. cake batter _____
9. air _____
10. soup _____
11. iron _____
12. salt water _____
13. ice cream _____
14. nitrogen _____
15. eggs _____
16. blood _____
17. table salt _____
18. nail polish _____
19. milk _____
20. cola _____



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HOMOGENEOUS VS. HETEROGENEOUS MATTER

Name _____

Classify the following substances and mixtures as either homogeneous or heterogeneous. Place a √ 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		

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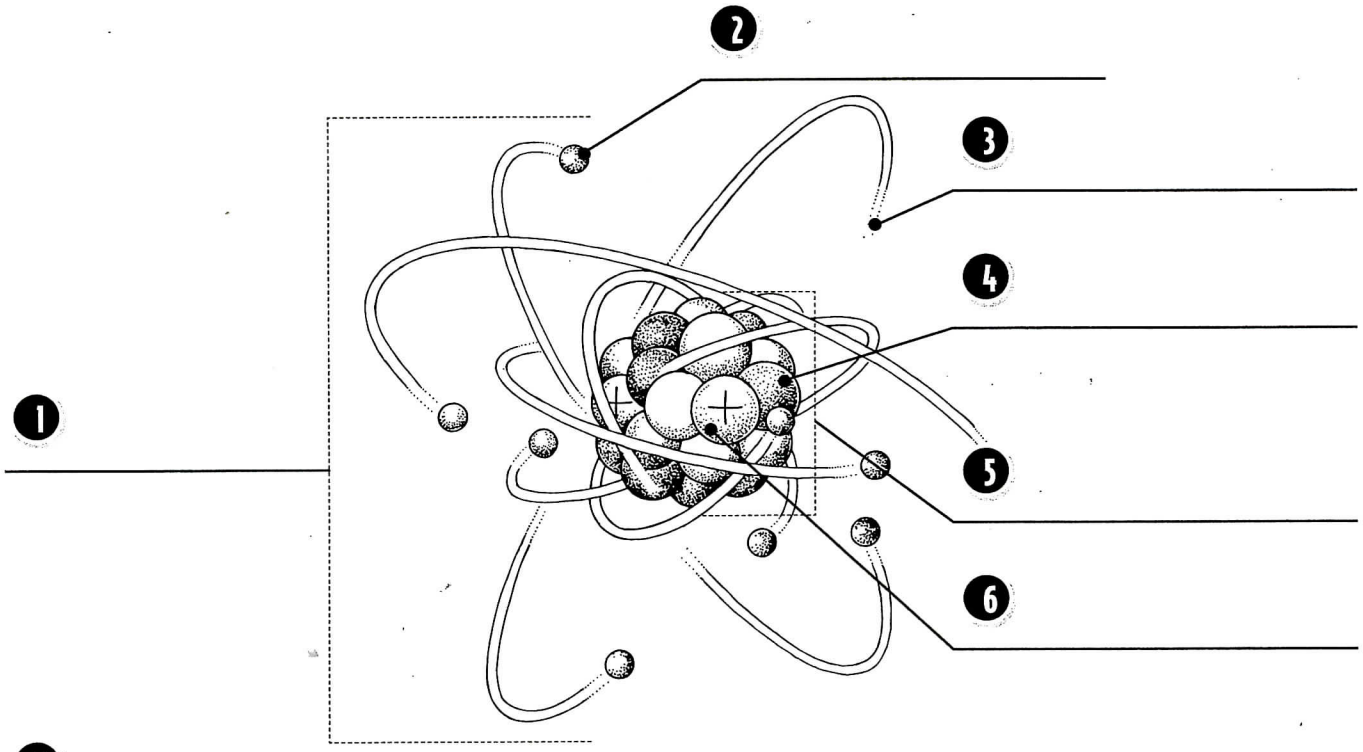
Name _____ Date _____

The Atom

Atoms are the tiny building blocks of matter. All the matter on Earth is made up of various combinations of atoms. Atoms are the smallest particles of an element that still exhibit all the characteristics of that element. Use the terms in the word box to label the diagram of an atom. Then match each term to its definition. Most terms are used twice.

electron	electron orbit	neutron
nucleus	proton	atom



7 _____ This small particle of an atom carries a negative charge.

8 _____ Made up of the protons and neutrons, this part of the atom contains nearly all the mass of the atom.

9 _____ This small particle of an atom carries a neutral charge.

10 _____ This is the area where electrons travel around the nucleus.

11 _____ This is the basic building block of all matter.

12 _____ This small particle of an atom carries a positive charge.

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Name _____ Date _____

Setting the Table

The periodic table is a chart of the chemical elements arranged to show patterns of chemical or physical properties. The elements are arranged on the table based on properties they have in common. Match each term to its definition. You can use the periodic table on page 20 as a reference.

alkali metals	transition	metals
atomic number	alkaline earth metals	naturally
families	noble	periods
rare earth metals		

1. _____ Elements in the middle of the periodic table are known as these kinds of metals.
2. _____ These gases are considered inactive. They do not react with other elements.
3. _____ Most of the elements are considered to be these.
4. _____ These refer to Group I metals.
5. _____ Horizontal rows are called this.
6. _____ The elements are arranged by this.
7. _____ Vertical columns are called groups or this.
8. _____ These refer to Group II metals.
9. _____ For convenience, these are placed at the bottom so the periodic table does not become too wide to be represented in chart form.
10. _____ There are 92 elements, from hydrogen to uranium that occur in this manner.

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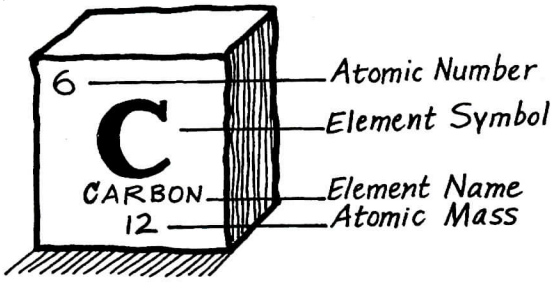
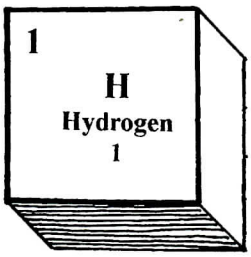
A WORLD-FAMOUS TABLE

There is a table (not one for dinner) that's probably the most famous table of science. (You can find it in your physical science book or on page 52 of this book.) If you learn how to read it, you'll have quick access to important stuff about elements. It's called the Periodic Table (because it's written in rows, called periods). Build your skill at reading the Periodic Table by finding the missing information in the samples below. You can get more practice with the Periodic Table on pages 11, 13, 14, and 15 of this book.



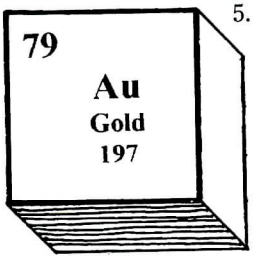
REMEMBER:

atomic mass = protons + neutrons
atomic number = # protons
protons = # electrons



1. a. atomic number _____

b. atomic mass _____

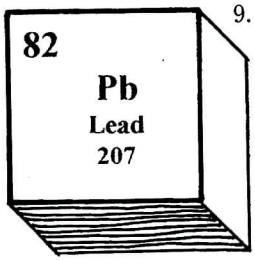


5. a. # electrons _____

b. # protons _____

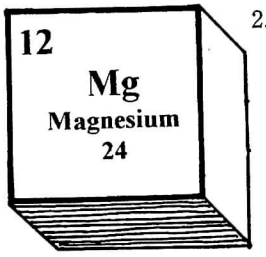
c. atomic number _____

d. name of element _____



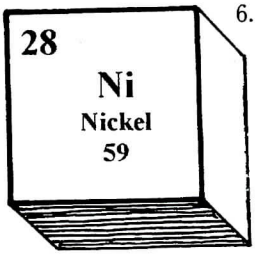
9. a. element name _____

b. # protons _____



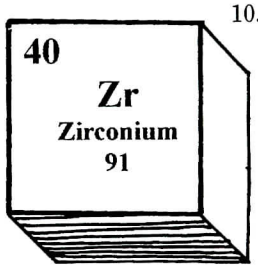
2. a. element name _____

b. atomic number _____



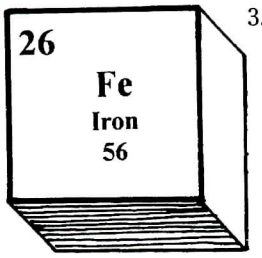
6. a. atomic mass _____

b. element symbol _____



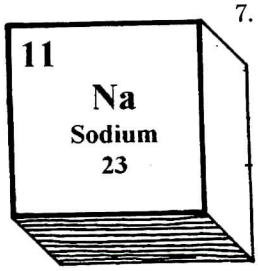
10. a. # electrons _____

b. atomic mass _____



3. a. # protons _____

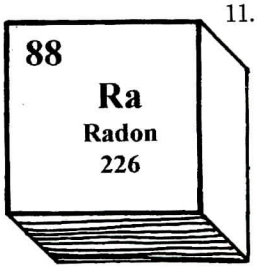
b. element symbol _____



7. a. element symbol _____

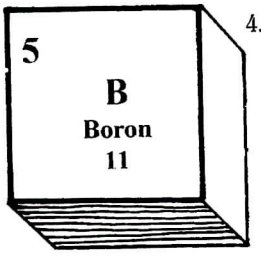
b. # neutrons _____

c. element name _____



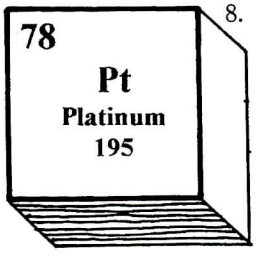
11. a. atomic numbe _____

b. # neutrons _____



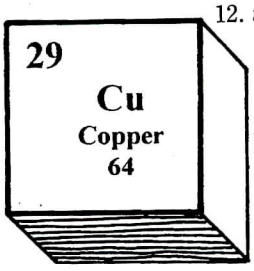
4. a. atomic number _____

b. element name _____



8. a. atomic number _____

b. # neutrons _____



12. a. atomic mass _____

b. # neutrons _____

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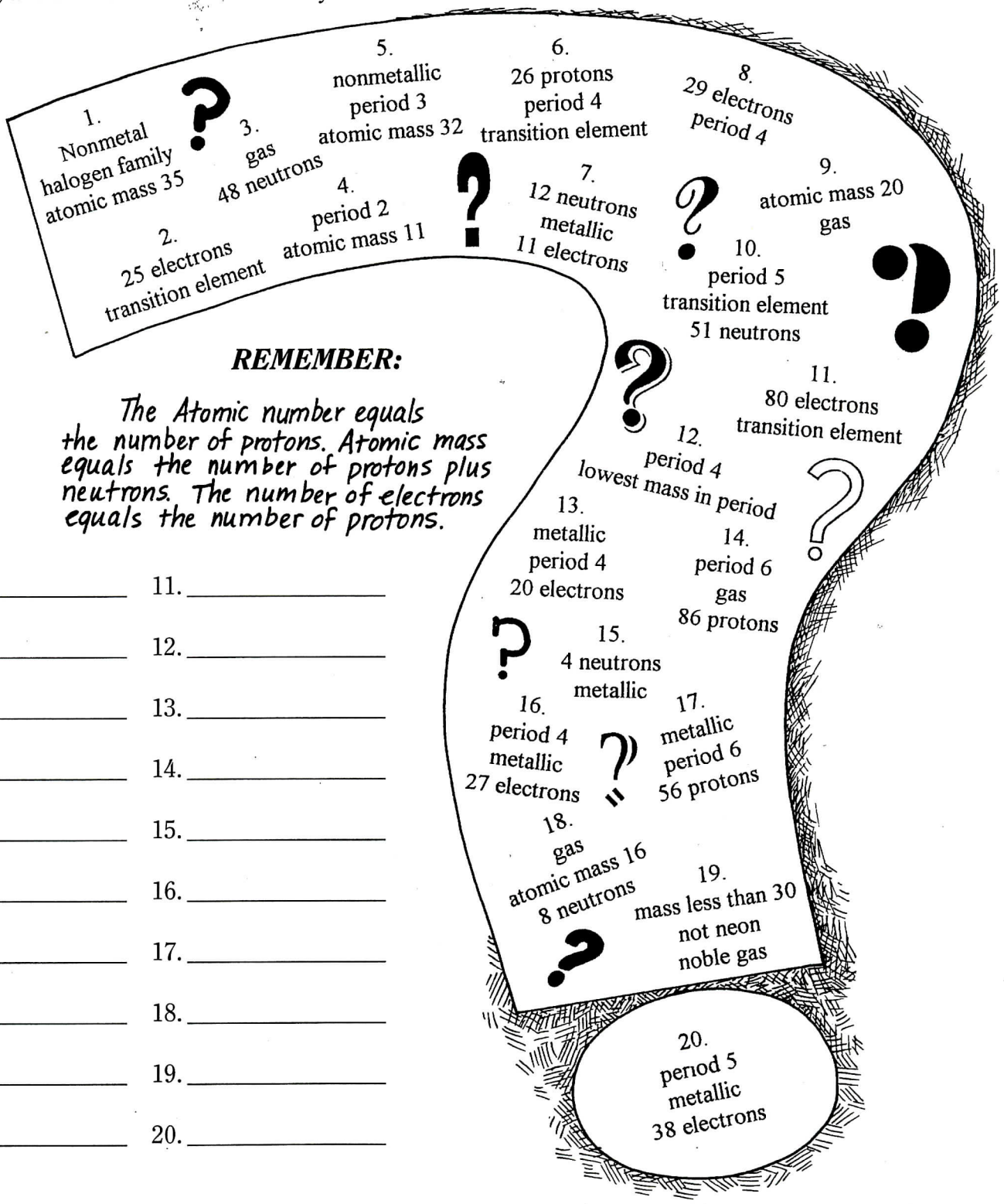
WHO AM I?

These mystery elements are waiting to be identified. The trick is—you'll need the Periodic Table to unmask their identities. Unless you have it memorized, you'll need a copy of the table from your science book or from page 52 of this book. Read the clues about each mystery element, figure out what it is, and then write the name and symbol of the element.



REMEMBER:

The Atomic number equals the number of protons. Atomic mass equals the number of protons plus neutrons. The number of electrons equals the number of protons.

1. _____ 11. _____
2. _____ 12. _____
3. _____ 13. _____
4. _____ 14. _____
5. _____ 15. _____
6. _____ 16. _____
7. _____ 17. _____
8. _____ 18. _____
9. _____ 19. _____
10. _____ 20. _____

Name _____

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Name _____ Date _____

Properties of Metals and Nonmetals

The elements on the periodic table are grouped by metals and nonmetals. Each group has distinct physical and chemical properties. Classify the phrases in the word box to complete the chart.

malleable	lustrous	thallium
gaseous at room temperature	ductile	brittle
forms negative ions	conductor	nonconductor
only forms positive ions	helium	titanium
receives electrons in chemical reactions	covalent bonding	metallic bonding
phosphorus	zinc	boron
selenium	nickel	gold
gives away electrons in chemical reactions	argon	

Properties of Metal Elements	Properties of Nonmetal Elements
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
Examples	**Examples**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

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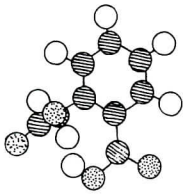
Writing in Code

Chemists use a type of shorthand when they write chemical names. These "codes" use the symbols from the periodic table followed by a subscript number to the right of the symbol that tells how many atoms of the element are present in a molecule. If no number is present, there is only one atom. Use the example to figure out how many atoms are present in each molecule.

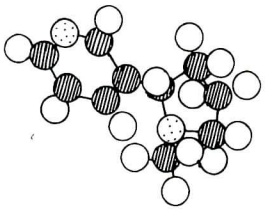
Example



Aspirin: a pain-killing molecule

$C_9H_8O_4$
C = carbon, H = hydrogen, O = oxygen

9 carbon atoms 8 hydrogen atoms
4 oxygen atoms

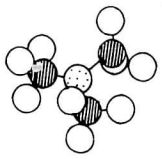
1 

Nicotine: a poisonous molecule

$C_{10}H_{14}N_2$

___ carbon atoms ___ hydrogen atoms

___ nitrogen atoms

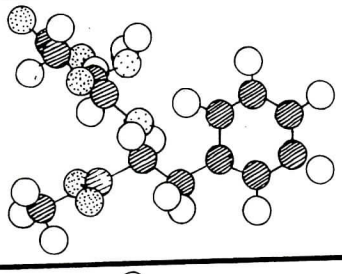
2 

Trimethylamine: a rotten smell molecule

C_3H_9N

___ carbon atoms ___ hydrogen atoms

___ nitrogen atoms

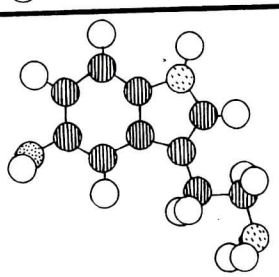
3 

Aspartame: an artificial sweetener

$C_{14}H_8O_5N_2$

___ carbon atoms ___ hydrogen atoms

___ oxygen atoms ___ nitrogen atoms

4 

Serotonin: a brain chemical

$C_{10}H_{12}ON_2$

___ carbon atoms ___ hydrogen atoms

___ oxygen atoms ___ nitrogen atoms

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