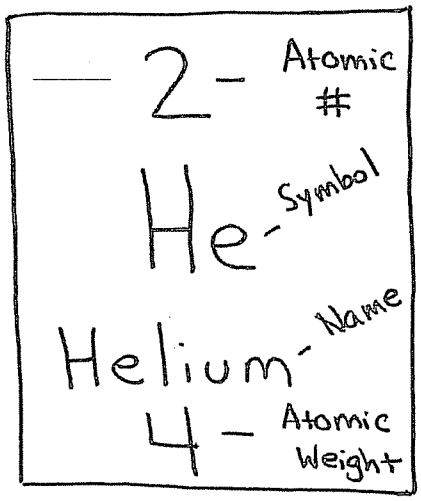
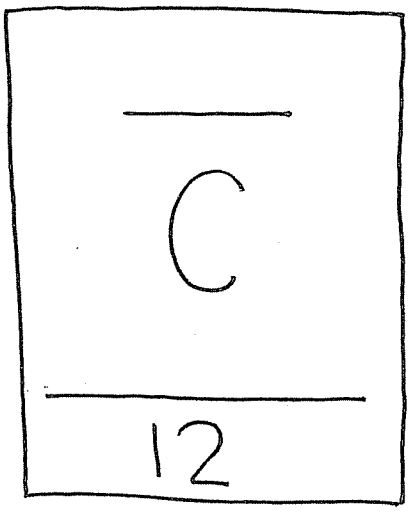
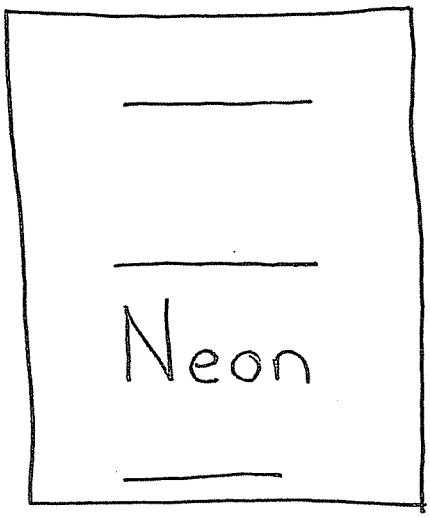
Elements

Name: _____

Directions: Complete the element squares below, and complete the information for each element. Use the hints to help you!







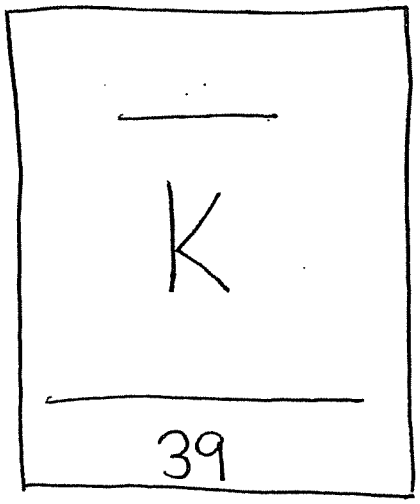
1. Name _____ 1. Name _____ 1. Name _____
2. Atomic Number _____ 2. Atomic Number _____ 2. Atomic Number _____
3. Symbol _____ 3. Symbol _____ 3. Symbol _____
4. Atomic Weight _____ 4. Atomic Weight _____ 4. Atomic Weight _____
5. Number of Protons _____ 5. Number of Protons _____ 5. Number of Protons _____
6. Number of Electrons _____ 6. Number of Electrons _____ 6. Number of Electrons _____
7. Number of Neutrons _____ 7. Number of Neutrons _____ 7. Number of Neutrons _____

Hint To get the number of neutrons: Atomic Weight - Atomic Number

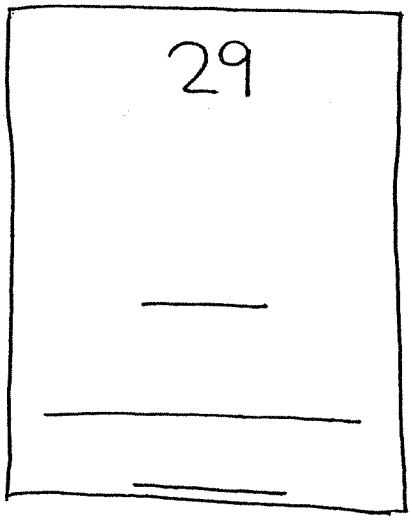
Hint The atomic number equals the number of protons.

Hint Protons equal the number of electrons.

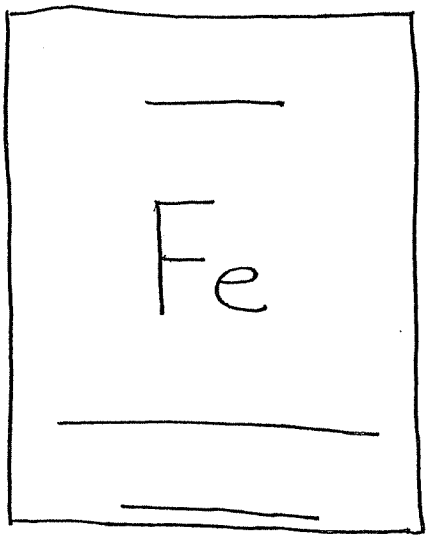
Complete the element squares and the information for each element.



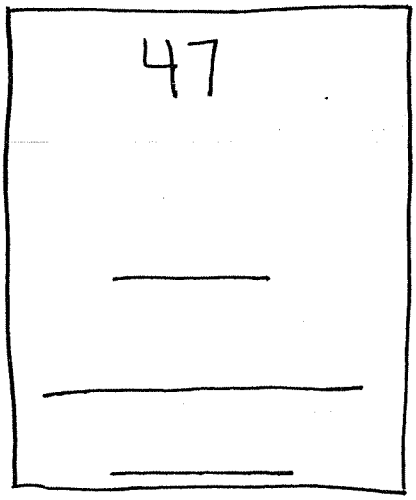
1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



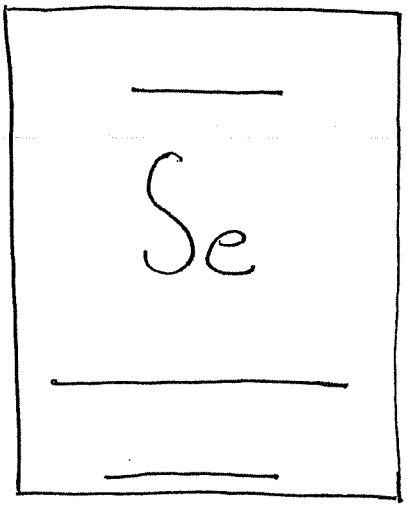
1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



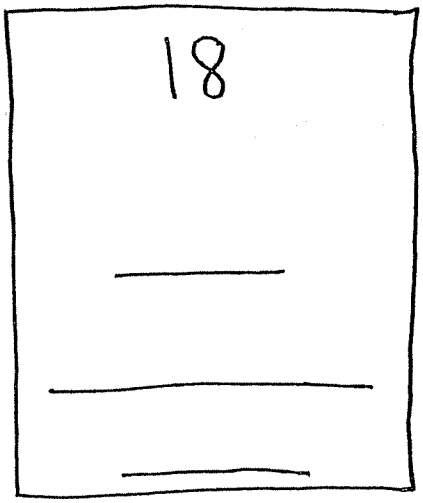
1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____

Chemistry Scope + Sequence

States of Matter 1 day
- What is matter
  ↳ Graphic organizer
- What is matter Lab 3days
  1. - read prompt and discuss how to test
     - write a question
  2. - Test solid, liquid, gas, energy
  3. - Write up findings
  4.
  5. describe states of matter lp
     - Solid - fixed shape fixed volume - orderly
     - Liquid - fixed volume flexible shape touching
     - Gas - flexible volume flexible shape spread out
  6. physical properties
     - color, shape, mass, weight, volume, density, odor, texture hardness
  7. physical Changes
     ↳ Mixtures / seperate mixtures
  8. Atoms
     - shape
     - protons
     - electrons
     - neutrons
  9. Periodic Table of Elements
     ↳ [redacted] elements
     ↳ Families of elements

Chemical Changes
↳ molicules
↳ compounds
↳ Identify # of elements in a compound

Chemical vs. Physical changes

Acids & bases

108
- 47
61

Chemistry major Points

- States of Matter
  - solid
  - Liquid
  - Gas
  - plasma
- properties of States of matter

- physical properties
  - color, mass, weight, volume, density, odor, shape texture, hardness

- atoms
  - neutron ( )
  - proton (+)
  - electron (-)

- Compare / contrast
  - atoms, molicules, elements, compound, mixture

- mixtures
  - seperate using properties

Chemical / physical changes

- Use periodic table to recognize elements
- recognize properties based on physical properties (families)

Identify compounds

Identify # of different elements in chemical formulas

- Compare / contrast acids & bases

PENNY LAB _____

DATE

DIRECTIONS:

1. Glue directions and Lab Writeup into your log.
2. Complete the question section by asking WILL HEAT CHANGE A PENNY?
3. Gather the following materials. penny and magnet
4. Observe the penny as a group and in you log record the properties of your penny. Include appearance, texture, age, state of matter, magnetism, etc.
5. Complete a hypothesis. Begin with WHEN PLACED ON A HOT PLATE, OUR PENNY WILL.....
6. Observe your penny and others on the hot plate.
7. Record what you observed.
8. Write a conclusion about what happened. Begin with THE PENNY ..... BECAUSE.....

PENNY LAB _____

DATE

DIRECTIONS:

1. Glue directions and Lab Writeup into your log.
2. Complete the question section by asking WILL HEAT CHANGE A PENNY?
3. Gather the following materials. penny and magnet
4. Observe the penny as a group and in you log record the properties of your penny. Include appearance, texture, age, state of matter, magnetism, etc.
5. Complete a hypothesis. Begin with WHEN PLACED ON A HOT PLATE, OUR PENNY WILL.....
6. Observe your penny and others on the hot plate.
7. Record what you observed.
8. Write a conclusion about what happened. Begin with THE PENNY ..... BECAUSE.....

★ Properties also include things like

① Appearance / color ~~state of matter~~
smell ← taste
~~Shape~~ 3 ⑧ ability to conduct electricity
② freezing & melting temp.
⑤ ability to combine with other materials
④ State of matter – solid/liquid/gas
⑥ Magnetism ⑦ Plasticity (stretch or bend
Squashed – Break or Bend

Do Penny Lab in Groups
↓
describe properties of penny

NAME: _____ DATE: _____

COMPOUNDS & THEIR FORMULAS

1) Write the names of the elements in each of the following compounds.

a) H_2SO_4 = sulfuric acid _____

b) SiO_2 = sand _____

c) $C_6H_8O_6$ = vitamin C _____

d) HCl = hydrochloric acid _____

e) $C_{20}H_{30}O$ = vitamin A _____

2) Match the following compound formulas to the appropriate descriptor.

_____ O_2	a) compound with most elements
_____ $CuSO_4$	b) contains aluminum and oxygen
_____ Al_2O_3	c) contains iron and oxygen
_____ Cl_2	d) has a total of 45 atoms
_____ $C_{12}H_{22}O_{11}$	e) has two elements and four total atoms
_____ NaCl	f) has equal amounts of each element
_____ Fe_2O_3	g) contains one copper atom
_____ CH_4	h) has only one element
_____ NH_3	i) has four hydrogen atoms
_____ $NaHCO_3$	j) contains two oxygen atoms

3) Explain the difference between the following compounds.

a) water = H_2O and hydrogen peroxide = H_2O_2

_____

_____

_____

b) carbon dioxide = CO_2 and carbon monoxide = CO

_____

_____

_____

Getting Together: An Introduction to Compounds

All matter is made of tiny particles called atoms. Atoms, themselves, are made of even smaller particles called protons, neutrons, and electrons. Sometimes the atoms join together or combine. When the same kinds of atoms join together, they make an element. Remember, an element is matter made of one kind of atom.

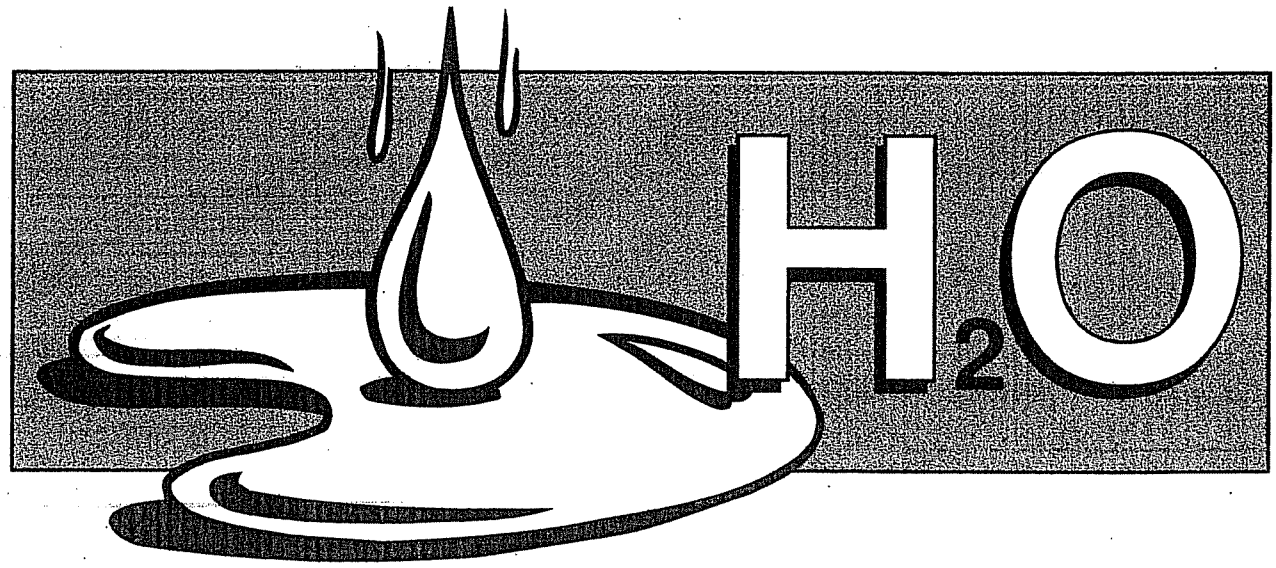
Sometimes different kinds of atoms join together. They form a compound. The atoms join in a process called a chemical reaction. When the atoms join, a new substance is formed that has properties that differ from the properties of the original atoms.

That sounds pretty confusing. Let's take a look at an example to make things a little easier to understand. Hydrogen is a colorless, odorless gas at room temperature. Oxygen is also a colorless, odorless gas at room temperature. When hydrogen and oxygen are combined in a chemical reaction, they form water. Water is a liquid at room temperature. The properties of water are very different from the properties of hydrogen and oxygen. When hydrogen and oxygen combine through a chemical reaction, they form water. Water is a compound. That certainly fits our definition: a compound is a substance formed when two or more kinds of atoms join in a chemical reaction.

Elements can be broken down into smaller parts. The smallest part of an element is an atom. Let's think about an example. Gold is an element. When gold is broken down into smaller and smaller pieces that still have the same properties as gold, it is broken down into gold atoms.

This is not true for a compound. The smallest particle of a compound is a molecule. A molecule is atoms that have been joined in a chemical reaction. If water, a compound, is broken down into smaller and smaller pieces, it will eventually be broken down into a molecule with two atoms of hydrogen and one atom of oxygen. The molecule will still have all the properties of water. So, the smallest part of any compound is a molecule.

A molecule of water can be broken apart into atoms of hydrogen and oxygen, but the atoms will no longer have the same properties as water does. The atoms would then have the properties of hydrogen and oxygen. The properties of oxygen and hydrogen are very different from the properties of water.



Name _____ Date _____

For the Student:

1. What is a compound?

2. How is a compound formed?

3. Name at least one common compound.

4. How does a compound differ from an element?

5. What is the smallest particle of a compound?

6. What happens to the properties of atoms when they are joined through a chemical reaction to form a compound?

7. What, if anything, can a molecule be broken into?

8. Scientists have discovered 109 elements, but they have discovered more than 4 million compounds. Why are there more compounds than elements?

Name _____ Date _____

For the student:

1. What are the four basic states of matter?

_____

_____

2. How is a liquid different from a solid?

_____

_____

3. How is a gas different from a liquid?

_____

_____

4. How is plasma different from a gas?

_____

_____

5. What is the most common state of each of the following examples of matter?

a. gold _____ b. milk _____

c. helium _____ d. silver _____

e. water _____ f. the Sun's surface _____

g. mercury _____ h. lead _____

i. wood _____ j. oxygen _____

k. ink _____ l. gasoline _____

m. carbon monoxide _____ n. hydrochloric acid _____

o. carbon _____ p. dry ice _____

q. hydrogen _____ r. copper _____

s. Proxima Centauri's surface _____

What State Are We In?
(The State of Confusion or the State of Classification)

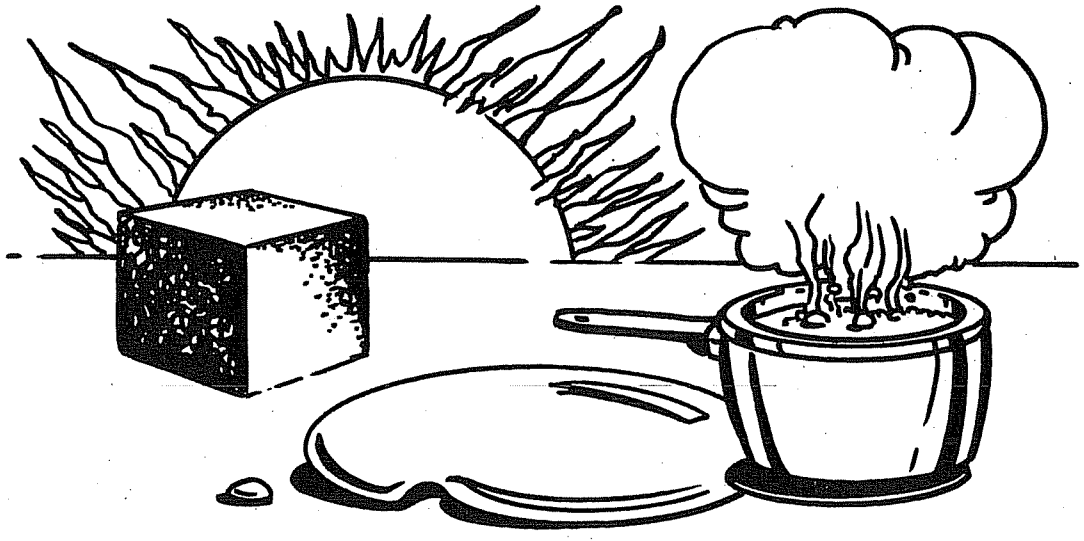
When you understand the definition for matter and you begin to identify the many examples of matter around you, you may notice that the list seems to be never-ending. There are millions of examples around us. In order to be able to study matter better, scientists divide matter into phases or states. Matter can exist in one of four different states: solid, liquid, gas, or plasma. Let's look at some of the properties associated with each state and see if we can find some examples, too.

First, let's define a solid. A solid is matter that has a definite shape and a definite volume. Some good examples of solids are a cube of ice, a wooden pencil, a metal key, and a person!

Liquids are defined differently. Liquids have no definite shape, but they do have a definite volume. Liquids will take on the shape of whatever container they are put into. There will always be the same amount of liquid there, regardless of the size or shape of the container. Try putting 250 milliliters (mL) of water into a glass. The water will take on the shape of the glass. There will be 250 mL of water in the glass. Now, transfer the water to a flat bowl. The water has changed shape to take on the shape of the bowl. There are still 250 mL in the bowl, unless you were sloppy and spilled some of it! If you move the water into a tall, thin vase, the water will change shape again; however, there will still be 250 mL of water. Other common examples of liquid matter include gasoline and rubbing alcohol.

The definition for gases says that they have no definite shape and no definite volume. Gases will expand to fit the container they are put into. Air, hydrogen, and oxygen are all examples of gases.

The final state of matter is known as plasma. Plasma's definition is very similar to the definition of a gas. Plasma has no definite shape, and it has no definite volume. Plasma differs from gas because the particles that make up plasma are electrically charged. The Sun's surface is one example of plasma. Other stars in the universe are also examples of matter in its plasma state.



Matter can be in a solid, liquid, gas, or plasma state.

Name _____ Date _____

For the student:

1. How do scientists define matter?

_____

_____

2. How can you demonstrate that a piece of chalk has mass?

_____

_____

3. How can you demonstrate that helium takes up space?

_____

_____

4. Are you matter? Why or why not?

_____

_____

5. Can you see all kinds of matter?

_____

_____

6. Is light from a fire matter?

_____

_____

7. Does everything that you can see fit the definition for matter?

_____

_____

8. List five things (not already listed in the text) in your classroom that are matter.

_____

_____

What Is Matter? (Everything Is, OK!)

Scientists say that all the objects around you are made of matter. Wow, that's a lot of things! Let's think about your classroom. As you look around, you probably notice doors, windows, walls, a floor, and the ceiling. Those are all examples of matter. Continue looking and you'll find blackboards, bulletin boards, desks, chairs, and lights. These are also kinds of matter. You need paper, pencils, pens, tape, staples, books, chalk, markers, scissors, and rulers to help you do your work. Right again—those are all kinds of matter. Maybe you have some plants, an aquarium, or a classroom pet. Once again, these are examples of matter.

The many kinds of matter found in your classroom are just a small part of all the matter found on Earth. With so many different kinds of matter around us, how can we know what is matter and what is not? We need to have a good definition to help us. Scientists define matter as **anything that takes up space and has mass.**

That's not too tough, as far as definitions go. It should be easy to prove if something takes up space. It's not too tough to prove if something has mass. Let's try some examples.

Is a rock matter? First of all, we have to check and see if a rock takes up space. Can you measure the size of a rock? Try using a ruler or a tape measure to see how long or tall your rock is. If you can measure it, it definitely takes up space! Now, we need to see if a rock has mass. You can use a simple balance scale to see if a rock fits the second requirement of our definition. Simply place the rock on the scale. If the side of the scale with the rock on it moves, it has mass. So, does a rock take up space? Yes. Does a rock have mass? Yes. Since a rock fits both parts of the definition, we can say that a rock is matter.

Let's try another example. Is water matter? It is a little bit harder to measure water all by itself. You can, however, put water in a container. As you can see, the water fills all or part of the container. That sure shows that it takes up space. Now, let's see how we can determine if water has mass. Find two matching containers. Place them both on a balance scale. The scale should stay evenly balanced. Now, place some water in one of the containers. If that side of the balance scale moves down, you have shown that water has mass. Okay, you have figured out that water takes up space and that it has mass. It, too, fits both parts of the definition, so it must be another kind of matter.

A third example to try is air. Get two matching balloons. Fill one of the balloons with air. (An easy way of doing that is by blowing into the balloon, using the air from your own body!) What happens to the balloon as you put air into it? When the balloon changes size and shape, you are showing that air can take up space. Now, get some string and a ruler. Tie a piece of the string to the middle of the ruler. Using two smaller pieces of string, tie an empty balloon to one end of the ruler and the air-filled balloon to the other end. Hold up the entire thing by the free end of the first piece of string. What happens to the ruler? Does the end that is holding the air-filled balloon tip lower than the other end? If it does, you have shown that air has mass. Since you can show that air takes up space and that air has mass, you can say that air is another example of matter.

As you think about the many objects around you—in the classroom, at home, outside—you can try to decide which of them are matter. Remember, matter must fill two requirements. Matter must take up space, and matter must have mass.

These Two Elements Are Now Joined . . . Compounds and Their Formulas

Compounds have been defined as matter formed by two or more elements joined by a chemical reaction. Scientists have developed a set of symbols used to identify the known elements. Compounds can be represented by the combination of two or more symbols. The combination of the symbols is called a formula.

Formulas allow scientists to identify the composition of compounds. Every formula contains the symbols of the elements that make up the compound. Let's take a look at a simple example. Salt is represented by the formula NaCl. Salt is formed when sodium (Na) and chlorine (Cl) combine in a chemical reaction.

Baking soda, or sodium bicarbonate, has a more complicated formula, $NaHCO_3$. Baking soda is formed when sodium (Na), hydrogen (H), carbon (C), and oxygen (O) combine in a chemical reaction. The small number 3 in the formula is called a subscript. A subscript shows the number of atoms of an element in a compound. The subscript always refers to the symbol just before it in the formula. If there is no subscript following a symbol, it means there is only one of that kind of atom in the molecule. Baking soda contains one atom of sodium, one atom of hydrogen, one atom of carbon, and three atoms of oxygen in each of its molecules.

Name _____ Date _____

For the Student:

1. What is a compound?

_____

_____

2. What is the formula of a compound?

_____

_____

3. How is the formula of a compound useful?

_____

_____

4. How can scientists identify the composition of a compound?

_____

_____

5. What does a subscript mean in a formula?

_____

_____

6. What does it mean when a symbol is not followed by a subscript?

_____

_____

7. If salt is NaCl, what atoms does the compound contain?

_____

_____

8. Which of the following is the formula for a compound containing one atom of sodium, one atom of oxygen, and one atom of hydrogen?

a. SOH
b. SoH
c. NaOH
d. NAOH

Test Tube Detective Lab

The purpose of this lab is to use what you observe when two substances are mixed together and have a chemical change to figure out the identity of an unknown substance.

Problem: What are some chemical properties of baking soda, baking powder, cornstarch, and baby powder?

Hypothesis: (Write what you think will happen in each case.)

Baking soda mixed with water: _____
Baking soda mixed with vinegar_____
Baking soda mixed with iodine _____
Baking powder mixed with water _____
Baking powder mixed with vinegar_____
Baking powder mixed with iodine _____
Baby powder mixed with water _____
Baby powder mixed with vinegar _____
Baby powder mixed with iodine _____
Cornstarch mixed with water _____
Cornstarch mixed with vinegar_____
Cornstarch mixed with iodine _____

Safety: Looking at the materials on your table, please draw the safety symbols that you believe needed to be discussed for this lab.

Procedure:

1. Label your test tubes water, vinegar, and iodine using the tape in front of you.
2. Put a small amount of baking powder in each of the three test tubes. (Remember other classes must use this too.)
3. To the first test tube labeled "water," add a few drops of water (w). Observe what happens and record your observations in the data chart.
4. To the second test tube labeled "vinegar," add a few drops of vinegar (v). Again, observe and record your observations in the data chart.
5. Please have one person at your table put on the rubber gloves.
6. To the third test tube labeled "iodine," the person with the gloves on should add a few drops of iodine (I). BE CAREFUL NOT TO TOUCH THE IODINE SOLUTION!!! IT IS POISONOUS AND WILL CAUSE STAINS!!
7. Rinse out the test tubes with water only.

8. Repeat steps 2-7 using baking soda, then cornstarch, and then baby powder in the test tubes.
9. Obtain a sample of an unknown substance from Miss Crawmer. Add vinegar, water and iodine to the substance as you did before. Referring to your observations on your data table, try to identify this unknown powder.
10. Clean up following the directions.

Data Table: Record your observations here!

	Water	Vinegar	Iodine
Baking Powder			
Baking soda			
Cornstarch			
Baby powder			
Unknown			

Clean Up:

There are clean up directions on the walls by the sinks. Please clean only the test tubes. Make sure you return the unknown test tube to Miss Crawmer.

Conclusion Questions: Answer on a separate piece of paper and staple it on to the lab worksheet.

1. Were any of the combinations alike in any ways? Which ones and how?
2. What is the identity of your unknown?
3. How many properties helped you identify it?
4. Were you able to tell what you had by looking at it? What else helped you decide?
5. Were any of your hypotheses correct?

Name _____

Experiment!
Mixtures, Solutions, and Reactions

Objective

To discover what happens when you create mixtures and solutions.

Materials

seven clear plastic cups
tablespoon
teaspoon
stirring rod
water
vegetable oil
sand
sugar
honey
baking soda
vinegar

Procedure

1. In seven separate cups, combine the following:
    a. water and vegetable oil
    b water and sand
    c. one tablespoon each of sand and sugar
    d. water and a small amount of honey (shake)
    e. water and a small amount of sugar
    f. water and a teaspoon of baking soda
    g. water and a tablespoon of vinegar (stir)
2. Observe the mixtures that were created in the seven cups.
3. Add two tablespoons of vinegar to the mixture of water and baking soda.
4. Answer the questions in the conclusion.

Conclusion

1. Which materials formed mixtures and combined with no reaction?

2. Which materials formed solutions, that is, one dissolved into another with no reaction?

3. What is the chemical reaction that takes place to the vinegar, water and baking soda mixture.

Skill: Chemical elements and symbols

Chemical Cohesion

Name_____

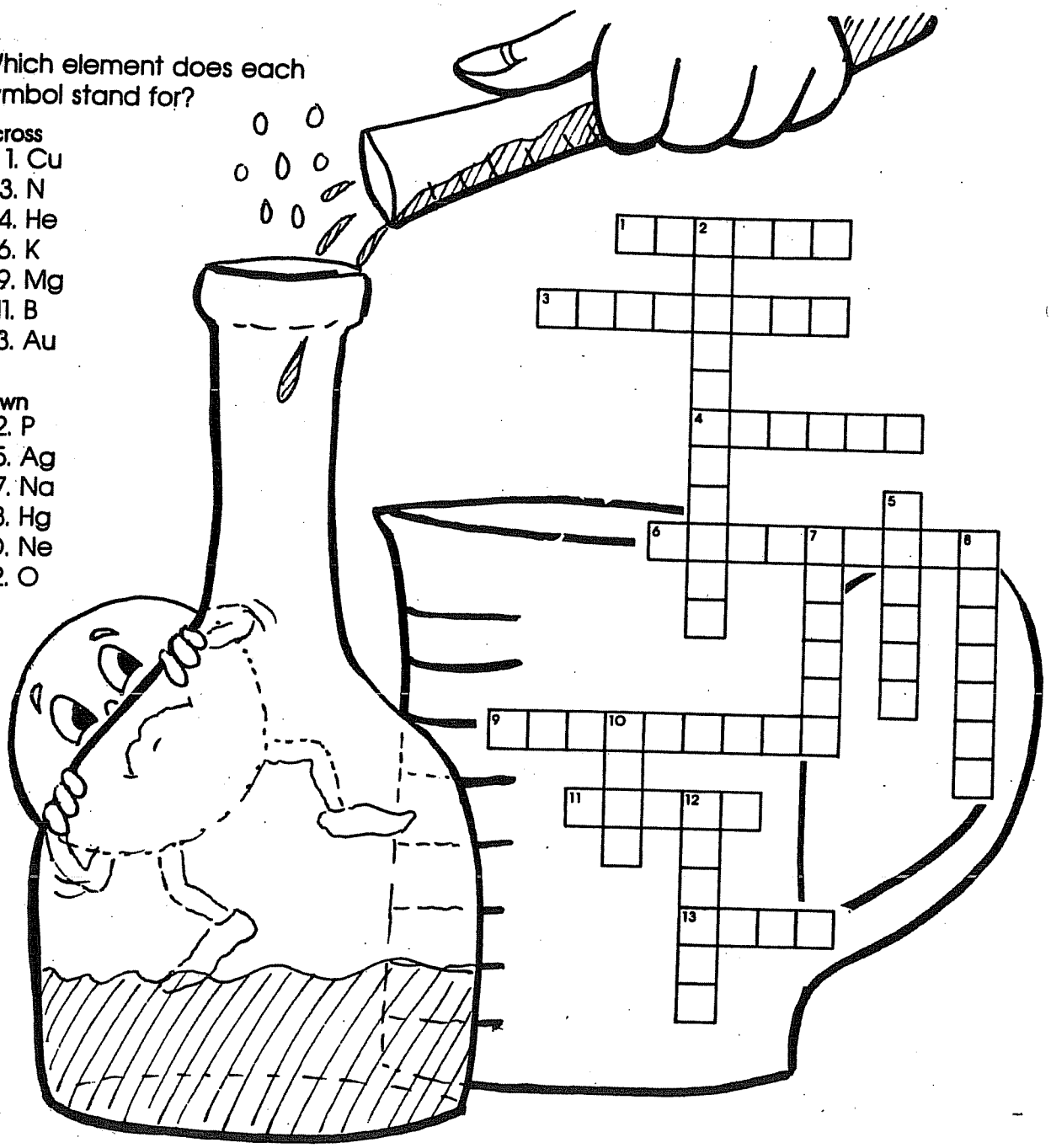
Which element does each symbol stand for?

Across

1. Cu
3. N
4. He
6. K
9. Mg
11. B
13. Au

Down

2. P
5. Ag
7. Na
8. Hg
10. Ne
12. O



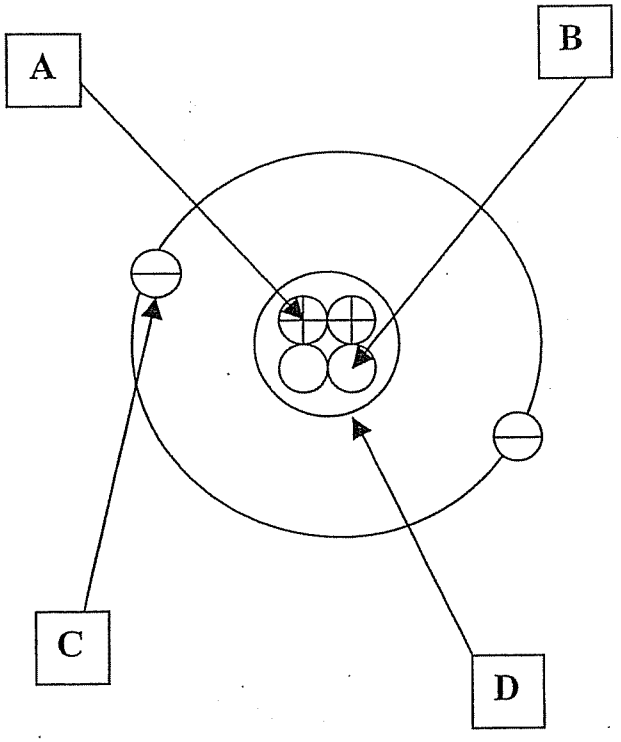
Protons and neutrons are the heavy parts of an atom and their combined weights are called the atomic weight of an element. Electrons are so very light that we say they do not have weight.

Use the table below as a self-check to see if you understand about protons, neutrons and electrons.

ATOMIC PART	WEIGHT		CHARGE			WHERE FOUND	
	Yes	No	Positive	Negative	Neutral	Inside Nucleus	Outside Nucleus
PROTON							
NEUTRON							
ELECTRON							

Figure D

Label the parts of the atom.



A. _____

B. _____

C. _____

D. _____

Name: _____

Atomic Numbers

Use the three elements below to complete the inform for each element. Use the hints on this page to help you!

17	35	79 — Ator Numb
Cl	Br	Au — Symb
Chlorine	Bromine	Gold — Nam
35	80	197 — Atom Weig

1. Name _____
2. Atomic Number ___
3. Symbol _____
4. Atomic Weight ___
5. Number of Protons ___
6. Number of Electrons ___
7. Number of Neutrons ___

1. Name _____
2. Atomic Number ___
3. Symbol _____
4. Atomic Weight ___
5. Number of Protons ___
6. Number of Electrons ___
7. Number of Neutrons ___

1. Name _____
2. Atomic Number ___
3. Symbol _____
4. Atomic Weight ___
5. Number of Protons ___
6. Number of Electrons ___
7. Number of Neutrons ___

Hint To get the number of neutrons: Atomic Weight − Atomic Num

Hint The atomic number equals the number of protons.

Hint Protons equal the number of electrons.

The Elements

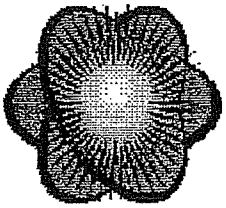


Figure out the common names to these:

"Dihydrogen Oxide"

Tungsten
Ca
Li
He
Cl

"Sodium Chloride"

N
Al
Boron
Si
Ne
Mg
C
Be
Pt

"Sucrose"

Sulfur
Uranium
O
Arsenic
Cr

Answer

PENNY PROPERTIES - Chemistry Lab # 1

DIRECTIONS:

1. Glue the directions into your log.
2. Observe a penny with your group.
3. In your log, list properties of the penny. Include appearance, texture, state of matter, magnetism, age, etc.
4. Hypothesize what you believe will happen to your penny when placed on a hot plate.
5. Observe your penny on the hot plate.
6. Record what you observed happening to the penny and to other pennies.
7. Write your conclusions about what happened.

PENNY PROPERTIES - Chemistry Lab # 1

DIRECTIONS:

1. Glue the directions into your log.
2. Observe a penny with your group.
3. In your log, list properties of the penny. Include appearance, texture, state of matter, magnetism, age, etc.
4. Hypothesize what you believe will happen to your penny when placed on a hot plate.
5. Observe your penny on the hot plate.
6. Record what you observed happening to the penny and to other pennies.
7. Write your conclusions about what happened.

PENNY PROPERTIES - Chemistry Lab # 1

DIRECTIONS:

1. Glue the directions into your log.
2. Observe a penny with your group.
3. In your log, list properties of the penny. Include appearance, texture, state of matter, magnetism, age, etc.
4. Hypothesize what you believe will happen to your penny when placed on a hot plate.
5. Observe your penny on the hot plate.
6. Record what you observed happening to the penny and to other pennies.
7. Write your conclusions about what happened.

Atomic Numbers Quiz

Name_____ Date_____

The number of protons in a stable atom is equal to the number of the atom's electrons.

# of protons = # of electrons

The number of protons in an atom is the same as the atom's **ATOMIC NUMBER.** This number is listed on the Periodic Table of Elements.

Atomic number = # of protons

The number of protons and neutrons combined equal the atom's **ATOMIC MASS** or **ATOMIC WEIGHT**. This number is also listed on the Periodic Table of Elements.

Atomic Weight = # of protons + # of neutrons

The Atomic weight is rounded to the whole number on the Periodic Table of Elements.

You can find out what the element is if you know either the atomic number (which is the same as the number of protons) or the atomic weight (which is the same as the protons *plus* neutrons).

1) This atom has 79 protons.
   What is the atom's atomic weight? _____

   How many electrons does it have? _____

   What is this element and its symbol? _____

2) This atom has 29 protons and 35 neutrons.
   What is the atomic weight of the atom? _____

   How many electrons does it have? _____

   What is this element and its symbol? _____

3) This atom has 14 neutrons. Its atomic weight is 27.
   How many protons does it have? _____

   What is the atomic number of this atom? _____

   What is this element and its symbol? _____

REMEMBER TO WRITE ATOMIC NUMBERS USING WHOLE NUMBERS ONLY!

1) Gold has the atomic number of 79.

What is Gold's atomic weight? _____

How many electrons does Gold have? _____

How many protons does Gold have? _____

2) This element has the atomic number 29.

What is the name of this element? _____

What is the symbol of this element? _____

What is its atomic weight? _____

3) This element has the atomic weight of 27.

What is the name of this element? _____

What is its atomic number? _____

How many protons does it have? _____

How many neutrons does it have? _____

4) This element has 20 protons.

What is the atomic number of this element? _____

What is the element's name? _____

What is the element's atomic weight? _____

How many neutrons does it have? _____

Name _____ Date _____

For the Student:

1. What is a compound?

_____

_____

2. What is the formula of a compound?

_____

_____

3. How is the formula of a compound useful?

_____

_____

4. How can scientists identify the composition of a compound?

_____

_____

5. What does a subscript mean in a formula?

_____

_____

6. What does it mean when a symbol is not followed by a subscript?

_____

_____

7. If salt is NaCl, what atoms does the compound contain?

_____

_____

8. Which of the following is the formula for a compound containing one atom of sodium, one atom of oxygen, and one atom of hydrogen?

a. SOH
b. SoH
c. NaOH
d. NAOH

These Two Elements Are Now Joined . . . Compounds and Their Formulas

Compounds have been defined as matter formed by two or more elements joined by a chemical reaction. Scientists have developed a set of symbols used to identify the known elements. Compounds can be represented by the combination of two or more symbols. The combination of the symbols is called a formula.

Formulas allow scientists to identify the composition of compounds. Every formula contains the symbols of the elements that make up the compound. Let's take a look at a simple example. Salt is represented by the formula NaCl. Salt is formed when sodium (Na) and chlorine (Cl) combine in a chemical reaction.

Baking soda, or sodium bicarbonate, has a more complicated formula, $NaHCO_3$. Baking soda is formed when sodium (Na), hydrogen (H), carbon (C), and oxygen (O) combine in a chemical reaction. The small number 3 in the formula is called a subscript. A subscript shows the number of atoms of an element in a compound. The subscript always refers to the symbol just before it in the formula. If there is no subscript following a symbol, it means there is only one of that kind of atom in the molecule. Baking soda contains one atom of sodium, one atom of hydrogen, one atom of carbon, and three atoms of oxygen in each of its molecules.

Name _____ Date _____

For the student:

1. How do scientists define matter?

_____

_____

2. How can you demonstrate that a piece of chalk has mass?

_____

_____

3. How can you demonstrate that helium takes up space?

_____

_____

4. Are you matter? Why or why not?

_____

_____

5. Can you see all kinds of matter?

_____

_____

6. Is light from a fire matter?

_____

_____

7. Does everything that you can see fit the definition for matter?

_____

_____

8. List five things (not already listed in the text) in your classroom that are matter.

_____

_____

What Is Matter? (Everything Is, OK!)

Scientists say that all the objects around you are made of matter. Wow, that's a lot of things! Let's think about your classroom. As you look around, you probably notice doors, windows, walls, a floor, and the ceiling. Those are all examples of matter. Continue looking and you'll find blackboards, bulletin boards, desks, chairs, and lights. These are also kinds of matter. You need paper, pencils, pens, tape, staples, books, chalk, markers, scissors, and rulers to help you do your work. Right again—those are all kinds of matter. Maybe you have some plants, an aquarium, or a classroom pet. Once again, these are examples of matter.

The many kinds of matter found in your classroom are just a small part of all the matter found on Earth. With so many different kinds of matter around us, how can we know what is matter and what is not? We need to have a good definition to help us. Scientists define matter as **anything that takes up space and has mass.**

That's not too tough, as far as definitions go. It should be easy to prove if something takes up space. It's not too tough to prove if something has mass. Let's try some examples.

Is a rock matter? First of all, we have to check and see if a rock takes up space. Can you measure the size of a rock? Try using a ruler or a tape measure to see how long or tall your rock is. If you can measure it, it definitely takes up space! Now, we need to see if a rock has mass. You can use a simple balance scale to see if a rock fits the second requirement of our definition. Simply place the rock on the scale. If the side of the scale with the rock on it moves, it has mass. So, does a rock take up space? Yes. Does a rock have mass? Yes. Since a rock fits both parts of the definition, we can say that a rock is matter.

Let's try another example. Is water matter? It is a little bit harder to measure water all by itself. You can, however, put water in a container. As you can see, the water fills all or part of the container. That sure shows that it takes up space. Now, let's see how we can determine if water has mass. Find two matching containers. Place them both on a balance scale. The scale should stay evenly balanced. Now, place some water in one of the containers. If that side of the balance scale moves down, you have shown that water has mass. Okay, you have figured out that water takes up space and that it has mass. It, too, fits both parts of the definition, so it must be another kind of matter.

A third example to try is air. Get two matching balloons. Fill one of the balloons with air. (An easy way of doing that is by blowing into the balloon, using the air from your own body!) What happens to the balloon as you put air into it? When the balloon changes size and shape, you are showing that air can take up space. Now, get some string and a ruler. Tie a piece of the string to the middle of the ruler. Using two smaller pieces of string, tie an empty balloon to one end of the ruler and the air-filled balloon to the other end. Hold up the entire thing by the free end of the first piece of string. What happens to the ruler? Does the end that is holding the air-filled balloon tip lower than the other end? If it does, you have shown that air has mass. Since you can show that air takes up space and that air has mass, you can say that air is another example of matter.

As you think about the many objects around you—in the classroom, at home, outside—you can try to decide which of them are matter. Remember, matter must fill two requirements. Matter must take up space, and matter must have mass.

Name _____ Date _____

For the student:

1. What are the four basic states of matter?

_____

_____

2. How is a liquid different from a solid?

_____

_____

3. How is a gas different from a liquid?

_____

_____

4. How is plasma different from a gas?

_____

_____

5. What is the most common state of each of the following examples of matter?

a. gold _____ b. milk _____

c. helium _____ d. silver _____

e. water _____ f. the Sun's surface _____

g. mercury _____ h. lead _____

i. wood _____ j. oxygen _____

k. ink _____ l. gasoline _____

m. carbon monoxide _____ n. hydrochloric acid _____

o. carbon _____ p. dry ice _____

q. hydrogen _____ r. copper _____

s. Proxima Centauri's surface _____

What State Are We In?
(The State of Confusion or the State of Classification)

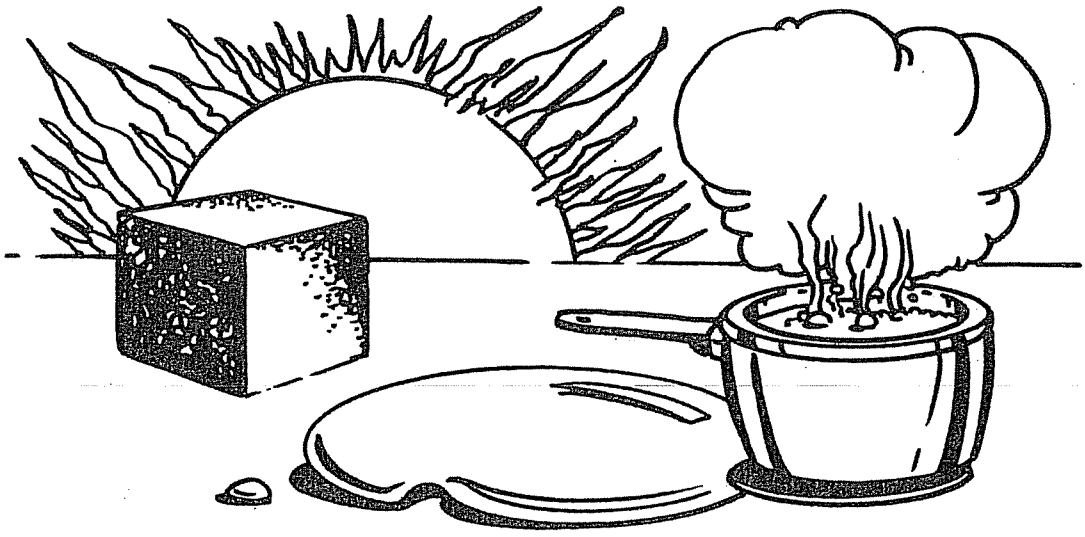
When you understand the definition for matter and you begin to identify the many examples of matter around you, you may notice that the list seems to be never-ending. There are millions of examples around us. In order to be able to study matter better, scientists divide matter into phases or states. Matter can exist in one of four different states: solid, liquid, gas, or plasma. Let's look at some of the properties associated with each state and see if we can find some examples, too.

First, let's define a solid. A solid is matter that has a definite shape and a definite volume. Some good examples of solids are a cube of ice, a wooden pencil, a metal key, and a person!

Liquids are defined differently. Liquids have no definite shape, but they do have a definite volume. Liquids will take on the shape of whatever container they are put into. There will always be the same amount of liquid there, regardless of the size or shape of the container. Try putting 250 milliliters (mL) of water into a glass. The water will take on the shape of the glass. There will be 250 mL of water in the glass. Now, transfer the water to a flat bowl. The water has changed shape to take on the shape of the bowl. There are still 250 mL in the bowl, unless you were sloppy and spilled some of it! If you move the water into a tall, thin vase, the water will change shape again; however, there will still be 250 mL of water. Other common examples of liquid matter include gasoline and rubbing alcohol.

The definition for gases says that they have no definite shape and no definite volume. Gases will expand to fit the container they are put into. Air, hydrogen, and oxygen are all examples of gases.

The final state of matter is known as plasma. Plasma's definition is very similar to the definition of a gas. Plasma has no definite shape, and it has no definite volume. Plasma differs from gas because the particles that make up plasma are electrically charged. The Sun's surface is one example of plasma. Other stars in the universe are also examples of matter in its plasma state.



Matter can be in a solid, liquid, gas, or plasma state.

Name _____ Date _____

For the Student:

1. What is a compound?

2. How is a compound formed?

3. Name at least one common compound.

4. How does a compound differ from an element?

5. What is the smallest particle of a compound?

6. What happens to the properties of atoms when they are joined through a chemical reaction to form a compound?

7. What, if anything, can a molecule be broken into?

8. Scientists have discovered 109 elements, but they have discovered more than 4 million compounds. Why are there more compounds than elements?

Getting Together: An Introduction to Compounds

All matter is made of tiny particles called atoms. Atoms, themselves, are made of even smaller particles called protons, neutrons, and electrons. Sometimes the atoms join together or combine. When the same kinds of atoms join together, they make an element. Remember, an element is matter made of one kind of atom.

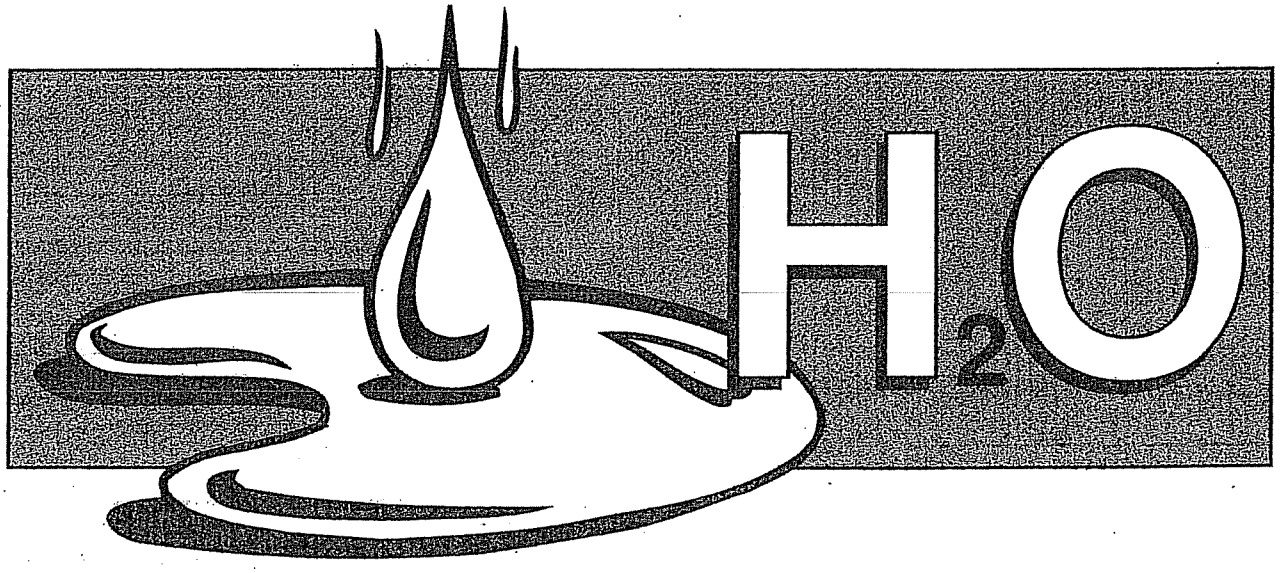
Sometimes different kinds of atoms join together. They form a compound. The atoms join in a process called a chemical reaction. When the atoms join, a new substance is formed that has properties that differ from the properties of the original atoms.

That sounds pretty confusing. Let's take a look at an example to make things a little easier to understand. Hydrogen is a colorless, odorless gas at room temperature. Oxygen is also a colorless, odorless gas at room temperature. When hydrogen and oxygen are combined in a chemical reaction, they form water. Water is a liquid at room temperature. The properties of water are very different from the properties of hydrogen and oxygen. When hydrogen and oxygen combine through a chemical reaction, they form water. Water is a compound. That certainly fits our definition: a compound is a substance formed when two or more kinds of atoms join in a chemical reaction.

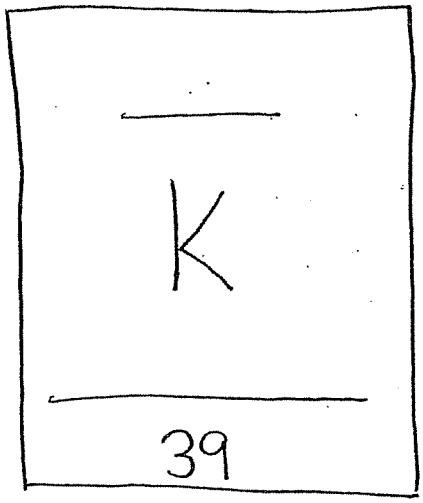
Elements can be broken down into smaller parts. The smallest part of an element is an atom. Let's think about an example. Gold is an element. When gold is broken down into smaller and smaller pieces that still have the same properties as gold, it is broken down into gold atoms.

This is not true for a compound. The smallest particle of a compound is a molecule. A molecule is atoms that have been joined in a chemical reaction. If water, a compound, is broken down into smaller and smaller pieces, it will eventually be broken down into a molecule with two atoms of hydrogen and one atom of oxygen. The molecule will still have all the properties of water. So, the smallest part of any compound is a molecule.

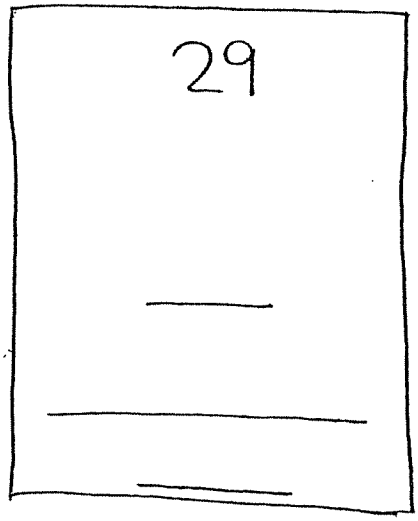
A molecule of water can be broken apart into atoms of hydrogen and oxygen, but the atoms will no longer have the same properties as water does. The atoms would then have the properties of hydrogen and oxygen. The properties of oxygen and hydrogen are very different from the properties of water.



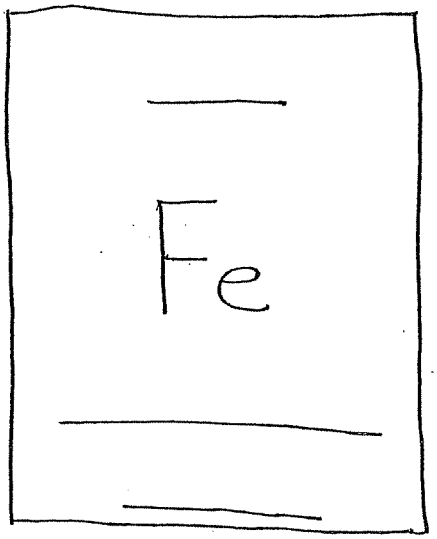
Complete the element squares and the information for each element.



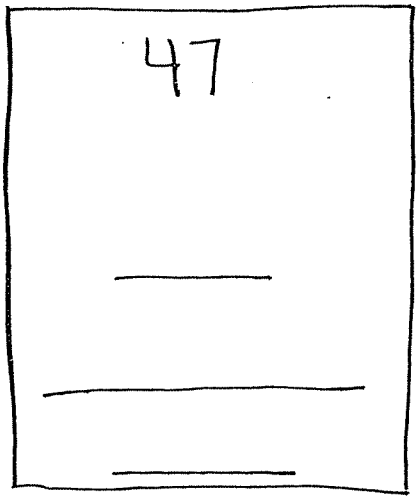
1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



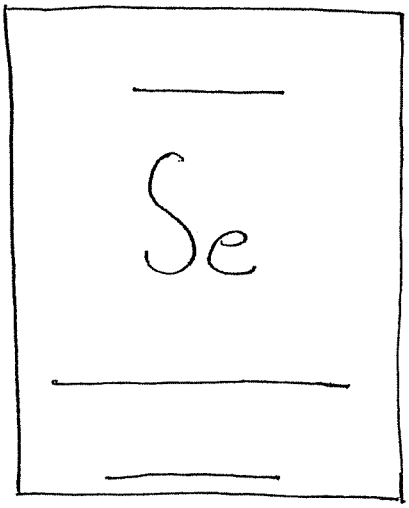
1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



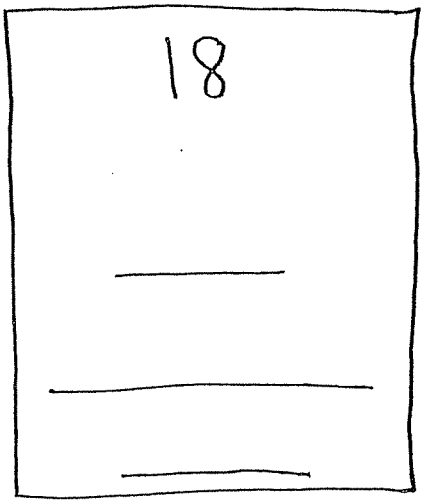
1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____



1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____

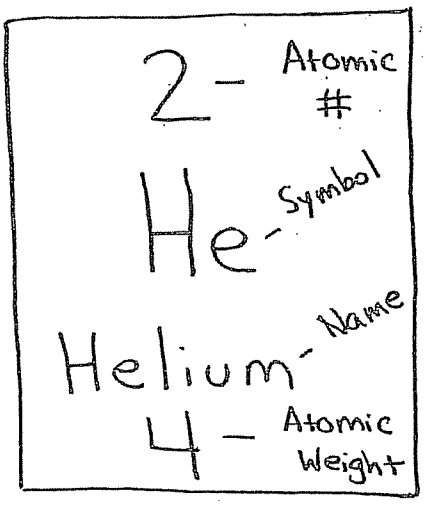


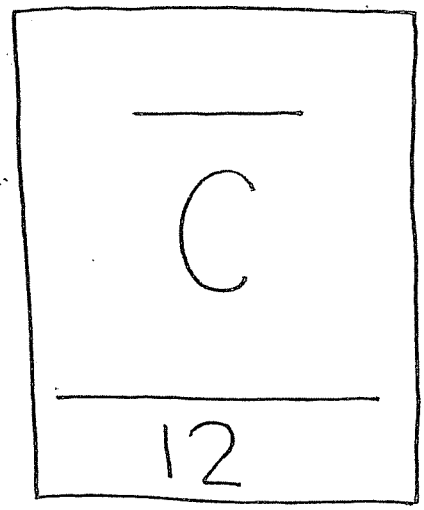
1. Atomic Number _____
2. Atomic Weight _____
3. Number of Protons _____
4. Number of Electrons _____
5. Number of Neutrons _____

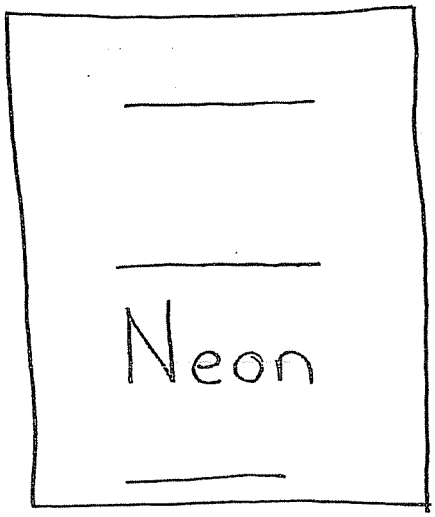
Elements

Name: _____

Directions: Complete the element squares below, and complete the information for each element. Use the hints to help you!







1. Name _____ 1. Name _____ 1. Name _____
2. Atomic Number _____ 2. Atomic Number _____ 2. Atomic Number _____
3. Symbol _____ 3. Symbol _____ 3. Symbol _____
4. Atomic Weight _____ 4. Atomic Weight _____ 4. Atomic Weight _____
5. Number of Protons _____ 5. Number of Protons _____ 5. Number of Protons _____
6. Number of Electrons _____ 6. Number of Electrons _____ 6. Number of Electrons _____
7. Number of Neutrons _____ 7. Number of Neutrons _____ 7. Number of Neutrons _____

Hint To get the number of neutrons: Atomic Weight - Atomic Number

Hint The atomic number equals the number of protons.

Hint Protons equal the number of electrons.

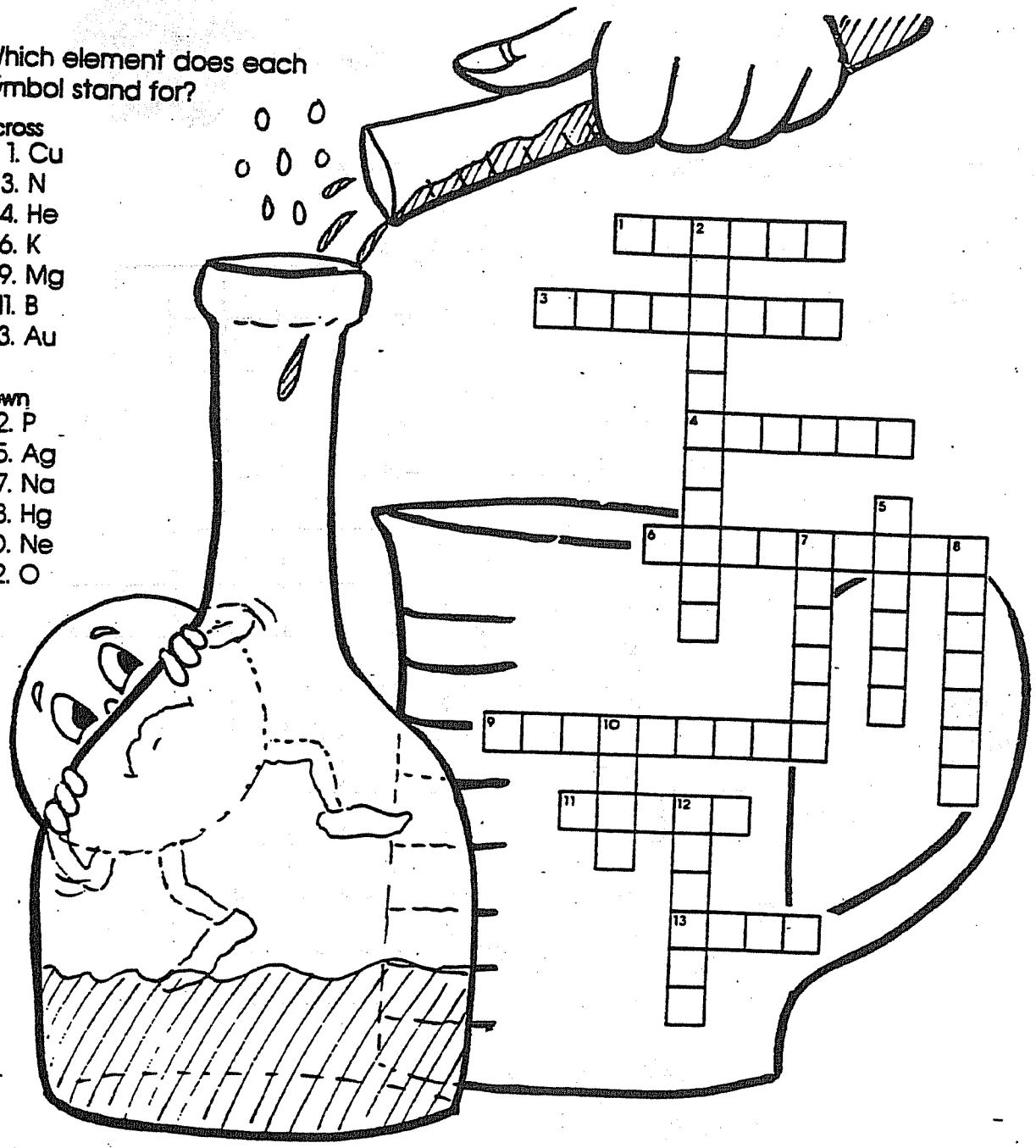
Chemical Cohesion

Name_____

Which element does each symbol stand for?

Across
1. Cu
3. N
4. He
6. K
9. Mg
11. B
13. Au

Down
2. P
5. Ag
7. Na
8. Hg
10. Ne
12. O



Word Bank

sodium	potassium	magnesium	hydrogen
helium	neon	oxygen	nitrogen
aluminum	boron	silicon	phosphorous
copper	silver	mercury	gold

The Elements

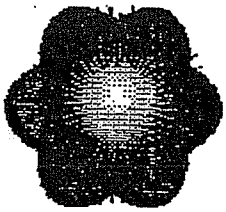
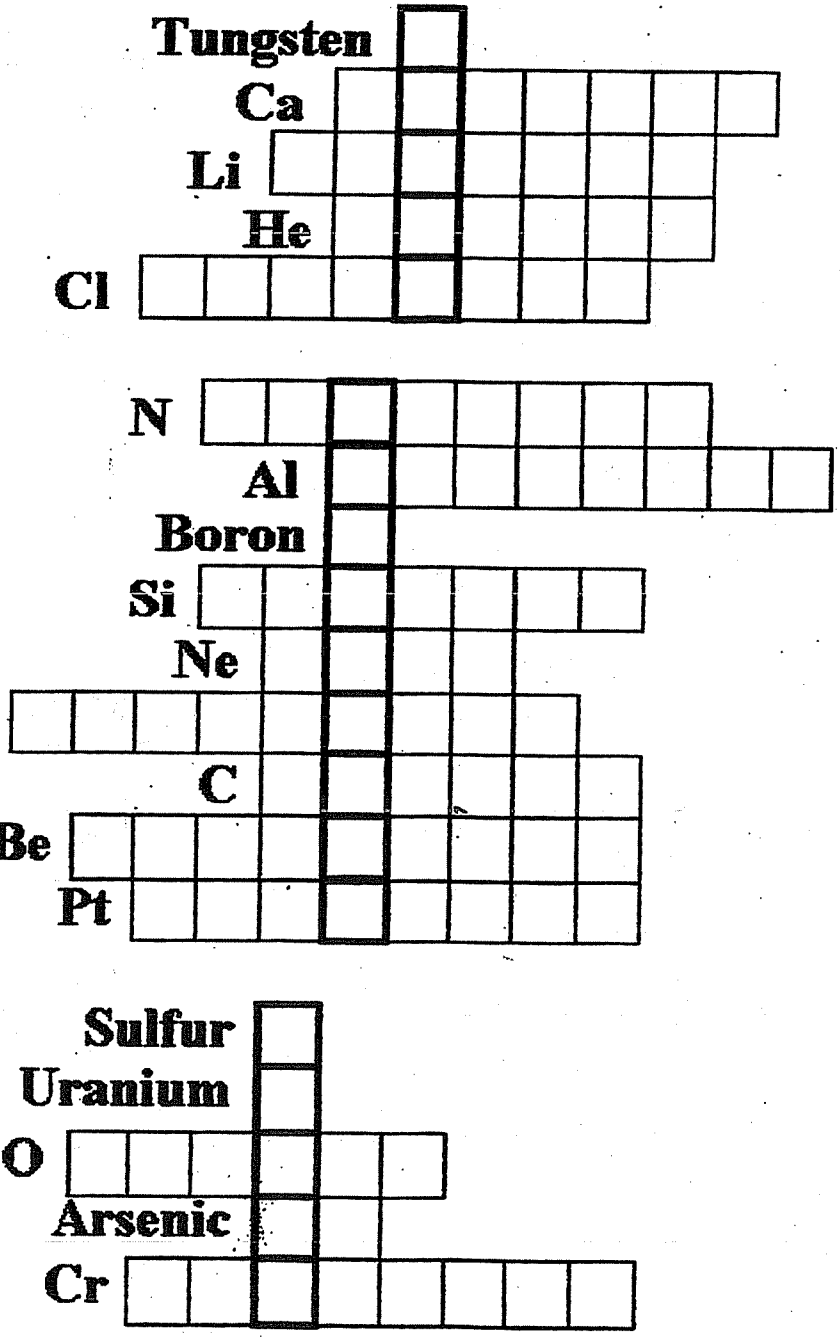


Figure out the common names to these:

"Dihydrogen Oxide"

"Sodium Chloride"

"Sucrose"



Answer

NAME _____ DATE _____ CLASS _____

STUDY GUIDE

Chapter 14

14-3 What Is the Atomic Theory of Matter?

In the spaces, write the word that completes or matches each clue below.

1.					A							
2.					T							
3.					O							
4.					M							
5.					I							
6.					C							
7.					T							
8.					H							
9.					E							
10.					O							
11.					R							
12.					Y							

1. Atoms of carbon have a different _____ than atoms of oxygen.
2. A pure _____ can be an element or a compound.
3. pure substance that can be broken down into two or more pure substances
4. smallest particle of an element
5. Matter is composed of small _____.
6. Two or more atoms combined chemically form a _____.
7. Evidence for a smallest particle comes from chemical _____.
8. A molecule of water contains two atoms of _____.
9. Aluminum is an example of a(n) _____.
10. _____ proposed that different elements would be composed of different atoms.
11. When you take apart table salt, the mass _____ of chlorine to sodium is always 1.54 to 1.
12. A molecule of water contains one atom of _____.

FIND OUT!

When you separate water, there is twice as much hydrogen as oxygen. How do experiments like this demonstrate that there are atoms? _____

Chemical Reactions Demonstrations

	Properties of the Chemicals
Calcium Chloride ($CaCl_2$)	
Baking Soda ($NaHCO_3$)	
Bromothymol Blue Solution	
Calcium Chloride and Blue	
Baking Soda and Blue	
Baking Soda, Calcium Chloride, and Blue	

Conclusion Questions- Answer in complete questions- Use chemistry words

1. What is $CaCl_2$ (Element, Compound, or Mixture)?
2. What is $NaHCO_3$ (Element, Compound, or Mixture)?
3. How did you know that a chemical change took place when the calcium chloride and blue solution combined? Be specific- what did you observe?
4. How did you know that a chemical change took place when the baking soda and blue solution combined? Be specific- what did you observe?
5. What elements are present in $CaCl_2$? How many of each atom?
6. What elements are present in $NaHCO_3$? How many of each atom?

Complete this table: (hint: there will be 3 ✓'s in each row)

ATOMIC PART	WEIGHT		CHARGE			WHERE FOUND	
	Yes	No	Positive	Negative	Neutral	Inside Nucleus	Outside Nucleus
PROTON							
NEUTRON							
ELECTRON							

Use your Periodic Table and find Nitrogen.
Answer these questions about Nitrogen:

1. What is the chemical symbol?_____
2. What is the atomic number?_____
3. What is the atomic weight?_____
4. Is it a metal, nonmetal, or metalloid?_____
5. How many protons are there?_____
6. How many neutrons are there?_____
7. How do you determine the number of neutrons?_____

_____

8. Draw an atom of Argon. Label protons with a ⊕, neutrons with a Ⓝ and electrons with a ⊖. Also label the nucleus & electron cloud.

NAME_____HOUR_____

CHEMISTRY QUIZ

DIRECTIONS: Use the following word bank to fill in the blanks to make a true statement. *Some words may be used more than once.*

solid	element	chemist
liquid	compound	matter
gas	mixture	solution

1. A(n) _____ is found on the Periodic Table.

2. A special mixture is called a(n) _____.

3. Water is a(n)_____ and a(n) _____.

4. Someone who studies matter and its changes is called a _____.

5. Mercury is a(n) _____ and a(n) _____.

6. When two or more elements are combined but keep their own properties and can be separated, it is an example of a(n) _____.

7. When two or more elements are combined to make a new substance, it is an exmple of a(n) _____.

8.Something with a definite mass but an indefinite volume is a(n)_____.

9. Air is a(n)_____ and a(n) _____.

10. Something with a definite mass and a definite volume is a(n) _____.

11. Anything that takes up space and has mass is called _____.

12. Something that has an indefinite mass and an indefinite volume is called a(n) _____.

Name _____

A Tasty Solution

Procedure:

Step 1: Place one piece of candy in your mouth and allow it to dissolve without using your tongue or teeth to help! Record the time it takes for the candy to dissolve in the chart.

Step 2: Place another piece of candy in your mouth and allow it to dissolve using only your tongue to move it around. Record the time it takes for the candy to dissolve in the chart.

Step 3: Place another piece of candy in your mouth and allow it to dissolve using your tongue and teeth. Record the time it takes for the candy to dissolve in the chart.

Piece of Candy	Dissolving Time
1st	
2nd	
3rd	

Analysis/Conclusion:

1. Use your data to create a line graph on the back of this page showing your results. Be sure to label the parts of your graph!

2. In your solution, what was the solute and the solvent?

   Solute = _____ Solvent = _____

3. Identify the solute(s) and solvent in each solution. HINT: A SOLUTE dissolves in a SOLVENT!

Solution	Solute(s)	Solvent
Ocean water		
Kool-Aid		
Antifreeze		
Pepsi		
Lemonade		
Sterling Silver		

4. What liquid is called the "universal solvent"?

5. Which would have the most SOLUTE: a glass of very sweet Kool-Aid or a glass of barely sweet Kool-Aid? Give a reason for your answer.

What to look for . . .	Acid	Base
Red litmus		
Blue litmus		
pH		
taste		
feel		
Baking soda		
metal		
Uses give me a couple everyday uses of . . .		
Other things you found interesting		