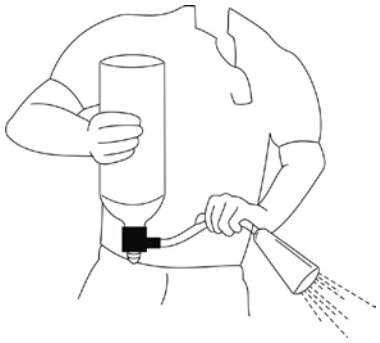
Name _____ Date____ / ____ / _____

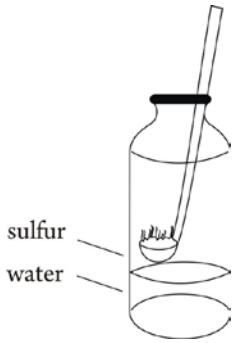
ACIDS, BASES, AND SALTS?

Classify each of the following as an acid, a base or a salt.

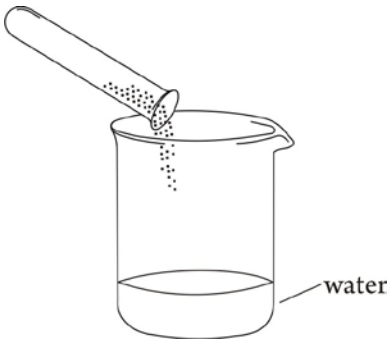
1. KCl _____
2. HF _____
3. HCl _____
4. KOH _____
5. $FeBr_3$ _____
6. $NaNO_3$ _____
7. HNO_3 _____
8. NaCl _____
9. $CaCl_2$ _____
10. NH_4Cl _____
11. NaOH _____
12. Na_2SO_4 _____
13. $Mg(OH)_2$ _____
14. H_3PO_4 _____
15. $HC_2H_3O_2$ _____
16. $CuCl_2$ _____
17. H_2SO_4 _____
18. $Ca(OH)_2$ _____
19. H_2CO_3 _____
20. NH_4OH _____
21. $Al(NO_2)_3$ _____
22. HNO_2 _____
23. H_2S _____
24. HBr _____
25. $Ba(OH)_2$ _____



26. $NaHCO_3$ _____



27. H_2SO_4 _____



28. $NaHCO_3$ _____

Name _____ Date _____ / _____ / _____

ACID, BASE OR SALT

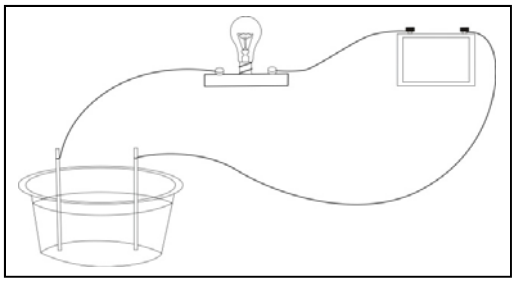
For the compounds listed below classify each as one of the following: acid, base or salt. For the acids and bases, indicate whether they are strong or weak.

	Compound		
1	$Al(NO_3)_2$		
2	$Ba(OH)_2$		
3	$CaCl_2$		
4	$FeBr_3$		
5	H_2CO_3		
6	H_2S		
7	H_2SO_4		
8	H_3PO_4		
9	HBr		
10	HCl		
11	HF		
12	HNO_3		
13	KCl		
14	KOH		
15	$Mg(OH)_2$		
16	Na_2SO_4		
17	$NaNO_3$		
18	NaOH		
19	NH_4Cl		
20	NH_4OH		

Name _____ Date ____ / ____ / ____

CONDUCTORS AND ELECTROLYTES

Pure metals are good conductors of electricity. Aqueous solutions of acids, bases and salts (ionic compounds) are electrolytes and also conduct electricity. Aqueous solutions with covalently bonded solutes form nonelectrolyte solutions and don't conduct electricity well.



Provide labels to indicate whether the substances or solutions below are conductors or nonconductors. The symbol "(aq)" indicates an aqueous solution containing the compound and the symbol "(s)" indicates a salt not in solution.

1	$C_{12}H_{22}O_{11}$	_____	11	HNO_3	_____
2	C_2H_5OH	_____	12	hydrogen	_____
3	$C_6H_{12}O_6(aq)$	_____	13	$KNO_3(aq)$	_____
4	$Ca(OH)_2(aq)$	_____	14	$KNO_3(s)$	_____
5	CH_3OH	_____	15	magnesium	_____
6	chlorine	_____	16	NaCl(aq)	_____
7	copper	_____	17	NaCl(s)	_____
8	gold	_____	18	$NaNO_3(aq)$	_____
9	H_2SO_4	_____	19	NaOH(aq)	_____
10	HCl(aq)	_____	20	NH_4OH_4	_____

Name _____ Date____ / ____ / _____

ATOMS AND MOLECULES

Circle the letter of the correct answer.

1. A substance made up entirely of a single type of atom is which of the following?
   a. Compound b. Enzyme c. Mixture d. Element
2. The smallest unit of any element is which of the following?
   a. Atom b. Compound c. Molecule d. Enzyme
3. Different elements are chemically bonded together in _____.
   a. Compounds b. Elements c. Mixtures d. Molecules
4. Fluorine is represented by which of the following chemical symbols? _____.
   a. F b. Fe c. Fi d. Fl
5. The compound: $C_6H_{12}O_6$ contains how many atoms of oxygen?
   a. 4 b. 6 c. 12 d. 24
6. Which of the following is a compound?
   a. Oxygen b. Gold c. Sodium Chloride d. Sodium
7. Two or more atoms are bonded together are referred to as a(n) _____.
   a. Atom b. Element c. Mixture d. Molecule
8. When a chemical bond is broken, what is released?
   a. Water b. Energy c. Salt d. Oxygen
9. How many compounds are shown in the chemical equation: $C + O_2 \longrightarrow CO_2$
   a. 1 b. 2 c. 3 d. 4
10. Which of the following terms refers to the smallest part of a compound that has all the properties of that compound?
    a. Atom b. Cell c. Element d. Molecule
11. An atom which has 9 protons, 8 neutrons, and 9 electrons will have an atomic mass of how many amu?
    a. 6 b. 8 c. 9 d. 17
12. An atom with an atomic number of 7 and a mass number of 8 is which element?
    a. H b. N c. O d. P
13. Usually, the atom described in Problem 12 will have how many electrons?
    a. 4 b. 7 c. 8 d. 15
14. An atom of Magnesium has how many protons?
    a. 12 b. 20 c. 24 d. 25
15. When an atom becomes a compound, a _____ forms.
    a. Bond b. Electron c. Neutron d. Oxygen

Name _____ Date _____

Atomic Structure

An atom is composed of protons, neutrons, and electrons. The protons and neutrons are found in the nucleus of the atom. The electrons are found in the electron cloud, which is an area that surrounds the nucleus.

A standard periodic table of elements can provide you with a great deal of insight into the composition of an atom. The atomic number is equal to the number of protons. The mass number is equal to the number of protons and neutrons. In a neutral atom, the number of protons and electrons are equal. When an atom is in a charged state (ion), the charge indicates the imbalance between protons and electrons. Too many electrons produces a negative charge, too few electrons results in a positive charge.

Example:

O^{-2} Mass Number= 16 Atomic Number = 8 8 protons, 8 neutrons (16-8), 10 electrons (8+2)	Explanation: Protons = Atomic Number Neutrons = Mass Number – Atomic Number Electrons = Charge (+/-) Proton Number.

Complete the following chart.

Element or Ion	Atomic Number	Mass Number	# of Protons	# of Neutrons	# of Electrons
Li		7			
Ba^{+2}		137			
Al^{+3}		27			
F-		19			
Br		80			
Ru^{+3}		101			
Cr^{+2}		52			
S^{-2}		32			
Si		28			
C		12			
P^{-3}		31			

Name _____ Date ____ / ____ / ____

NAMING MIXED COMPOUNDS

Provide the names for the compounds shown below.

1	$AlPO_4$	_____
2	$Ca(OH)_2$	_____
3	CaS	_____
4	CCl_4	_____
5	CO_2	_____
6	$CuBr$	_____
7	$CuBr_2$	_____
8	K_2O	_____
9	K_3PO_4	_____
10	Li_2CO_3	_____
11	MgI_2	_____
12	Mn_S	_____
13	N_2O_4	_____
14	Na_2CO_3	_____
15	$NaCl$	_____
16	NH_3	_____
17	NH_4Cl	_____
18	NO_2	_____
19	$PbSO_4$	_____
20	SO_3	_____

QUESTIONS: Elements

Circle the correct answer.

1. A substance composed entirely of one type of atom is called:
   A. a periodic
   B. an allotrope
   C. an element
   D. a noble gas

2. The number of protons that are in an atom is called its:
   A. allotrope
   B. atomic number
   C. family
   D. alkali

3. Which of the following is NOT a state or phase of an element?
   A. solid
   B. liquid
   C. colloid
   D. gas

4. Different states of the same element are called:
   A. periods
   B. allotropes
   C. alkali
   D. noble

5. Groups of elements that have similar properties are called:
   A. families
   B. allotropes
   C. atomic numbers
   D. periods

QUESTIONS: The Periodic Table

1. What is an element?

2. How many elements are there?

3. What is the periodic table?

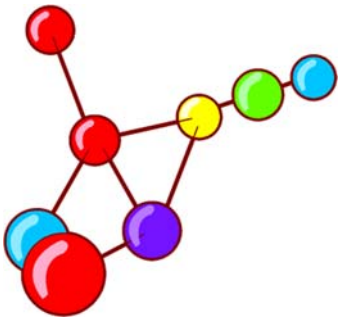
4. What information can you find on the periodic table?

5. Why is the way that the elements are organized on the periodic table significant?

6. What is each horizontal row on the periodic table called?

7. What is each vertical row on the periodic table called?

Binary Compounds



When multiple elements join together with chemical bonds, the result is called a compound. Compounds act like a single substance. The characteristics of compounds are not the same as the characteristics of the elements that comprise them. The smallest unit of a chemical compound that is able to participate in a chemical reaction is called a molecule.

The tendency of any given atom to form a bond depends on how many electrons it has in its outer shell. The number of electrons in an atom's outer shell that are available to participate in the process of chemical bonding are called *valence electrons*. Atoms tend to "like" to have full outer shells, so if the outer shell of an atom is mostly empty, that atom will tend to give up electrons. If the outer shell of an atom is mostly full, it will want to pick up whatever additional electrons it needs in order to have a full outer shell. When the atom of one element donates electrons to another so that both will have a full outer shell, it is called *ionic bonding*. When atoms share electrons so that both will have a full outer shell, it is called *covalent bonding*.

All scientists, all over the world, name compounds in the same way, based on how the molecule is constructed. Molecules with two elements (binary compounds) always have two-word names. If a metal and a nonmetal element form a compound, the metal is named first. If two nonmetals form a compound, the element to the farthest left of the periodic table is named first.

The name of a binary compound is the name of the first element then the name of the second element with the suffix -ide: sodium chloride (NaCl). When there is more than one atom present, a prefix indicating how many atoms there are is added to the name of the element: carbon monoxide (CO), carbon dioxide (CO_2), dinitrogen monoxide (N_2O), etc.

QUESTIONS: Binary Compounds

Circle the correct answer.

1. What is a compound?
   A. when multiple elements join together with chemical bonds
   B. the tendency of atoms to bond
   C. when atoms share electrons so that both have a full outer shell
   D. when the atom of one element donates electrons to another so both will have a full outer shell

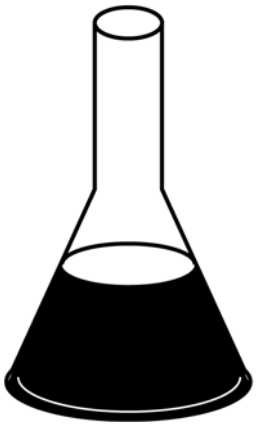
2. The number of electrons in an atom's outer shell that are available to participate in the process of chemical bonding are called:
   A. compounds
   B. valence electrons
   C. ions
   D. binary

3. When the atom of one element donates electrons to another so that both will have a full outer shell, it is called:
   A. ionic bonding
   B. covalent bonding
   C. valence bonding
   D. binary compound

4. All scientists name compounds:
   A. after themselves
   B. in the way that makes sense to them
   C. in the same way, based on how the molecule is constructed
   D. according to how many electrons the compound has

5. Which statement about a molecule made of two elements is NOT correct?
   A. it has a one-word name B. it has a two-word name
   C. a prefix indicates how many of each atom is present
   D. if a metal and a nonmetal element form a compound, the metal is named first

Homogenous Mixtures



A homogenous mixture is a mixture that has the same proportions of its components throughout any given sample.

One type of homogenous mixture is called a solution. In a solution, one substance (the solute) dissolves completely into another (the solvent). Sugar water is a solution. The sugar (the solute) and the water (the solvent) can be easily separated and both retain their individual properties. But when it is in solution form, the sugar is evenly distributed in the water and the individual substances cannot be seen. A solution is created when the solute dissolves into the solvent.

When two liquids form a solution when mixed, they are referred to as "miscible." If two liquids don't form a solution when mixed, they are "immiscible." Alcohol and water are miscible liquids. Oil and water are immiscible liquids.

Another kind of homogenous mixture is can alloy. An alloy is a mixture of two elements which, when combined, have the characteristic of a metal. One of the elements in an alloy is always a metal. For example, steel is an alloy of iron (a metal) and carbon (a non-metal).

Most homogenous mixtures can be separated again, although the process can be complex and involve multiple phases. Some of the different processes used to separate homogenous solutions are distillation, sublimation, adsorption, crystallization, and chromatography. As an example of a homogenous mixture that is regularly separated, after being pumped out of the ground, crude oil goes through many rounds of fractional distillation to be separated into different products like gasoline, jet fuel, propane, and heating oil. Fractional distillation is a complex version of distillation used to separate substances that have similar boiling points.

QUESTIONS: Homogenous Mixtures

Circle the correct answer.

1. What is a homogenous mixture?
   A. a mixture in which the components are distributed evenly
   B. a mixture in which the components are not distributed evenly
   C. a substance that dissolves completely in another
   D. a substance into which another substance is dissolved

2. What is a solvent?
   A. a mixture in which the components are distributed evenly
   B. a mixture in which the components are not distributed evenly
   C. a substance that dissolves completely in another
   D. a substance into which another substance is dissolved

3. A mixture of two elements which, when combined, have the characteristic of a metal is called:
   A. a homogenous mixture
   B. a solution
   C. miscible
   D. an alloy

4. Most homogenous mixtures:
   A. can easily be separated again
   B. can be separated again, but it may involve multi-phased or complex processes
   C. can be separated using distillation
   D. cannot be separated again

5. Which of the following is NOT a process for separating homogenous mixtures?
   A. crystallization
   B. distillation
   C. sublimation
   D. solution

Solutions

A mixture results when two substances are combined, but not combined chemically. Because no chemical reaction has occurred, mixtures can be easily separated, the original components retain their individual properties, and the proportion of the component substances can vary. One type of homogenous mixture is called a solution. Saltwater is a solution. The salt (the solute) and the water (the solvent) can be easily separated and both retain their individual properties. But as a solution, salt is evenly distributed in the water and the individual substances are not detectable.

In a solution, one substance dissolves completely into another, and each substance has a name based on its role in the mixture. The substance that is dissolved is called the solute. The substance in which the other substance dissolves is called the solvent. When a substance dissolves, its larger molecules break down into much smaller groups of molecules, or even into individual molecules, when it comes into contact with the solvent.

A solution has identifiable characteristics. The substances in a solution are completely uniform (homogenous) throughout. The substances in a solution do not separate or settle over time. The solute is too small to be separated using filtration. You cannot distinguish the solute and the solvent just by looking at a solution. Finally, a solution will not scatter a beam of light.

The amount of solute that can be dissolved in a liter of solvent is known as the solute's solubility. What this means is that only so much of one substance can be dissolved in another substance. When no more solute can be dissolved, the solution is said to be saturated. The amount of solute there is relative to the amount of solvent is known as the concentration of the solution. The more solute there is, the more concentrated the solution. When there is only a small amount of solvent, the solution is described as diluted.

QUESTIONS: Solutions

1. What is a solution?

2. What are the characteristics of a mixture?

3. What is a solute?

4. What is a solvent?

5. What are the five identifiable characteristics of a solution?

6. What is solubility?