Physical Science Unit 3 Test Study Guide

CHEMICAL BONDING

Some important definitions:

- **Valence Electrons:** the electrons in its outermost shell
- **Ionic Bond:** a bond formed when oppositely charged ions attract. When one atom TRANSFERS electrons to another atom
- **Covalent Bond**: a bond formed when atoms SHARE one or more pairs of electrons to get eight electrons in their valence shell.

Atoms always want to find the easiest way to have 8 electrons in their outer shell. How do they do this…by transferring electrons or by sharing?

For example, if one atom has one spare electron and another atom has 7, it will likely give up its one spare electron so it has a full outer shell and now the other atom will have 8 (a full outer shell)!

CHEMICAL REACTIONS

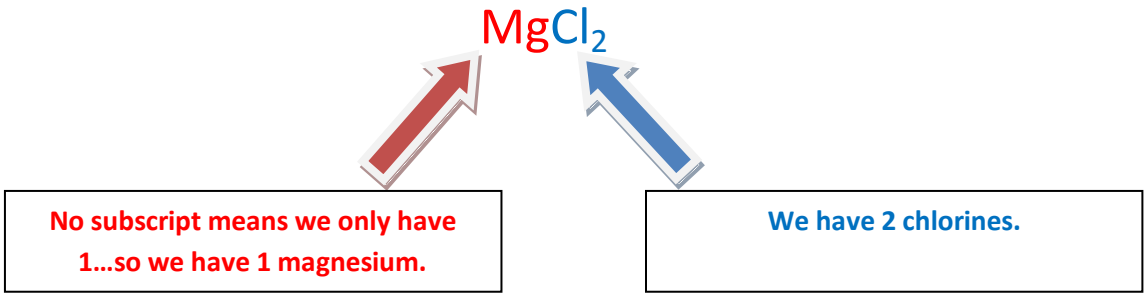
Some important definitions:

- **Reactants:** the starting molecules in a chemical reaction
- **Products:** the molecules that result from a chemical reaction
- **Exothermic Reaction:** a chemical reaction in which energy is released to its surroundings
- **Endothermic Reaction:** a chemical reaction in which energy is absorbed from its surroundings

CHEMICAL FORMULAS

A few important things to remember about chemical formulas…

1. When writing chemical formulas for **ionic bonds**, it is important to remember that they are chemically neutral with a charge of zero. You have to use the periodic table to determine the chemical formula.
2. When writing chemical formulas for **covalent bonds**, you need to use the prefixes to help you (mono-, di-, tri-).
3. If is important to look at the subscript (little) numbers as well as the element abbreviations to help you determine what it is. For example:



If you put that together, this chemical formula represents: MAGNESIUM CHLORIDE.

RATES OF CHEMICAL REACTIONS

Some important facts to remember:

- **Reaction Rate**: how quickly a specific chemical reaction occurs under specific conditions over time**.** Reaction rate is affected by:
  - Temperature
  - Concentration
  - Surface Area
  - **Catalysts:** a substance present during a chemical reaction that speeds up the reaction but is not used up or changed during the reaction

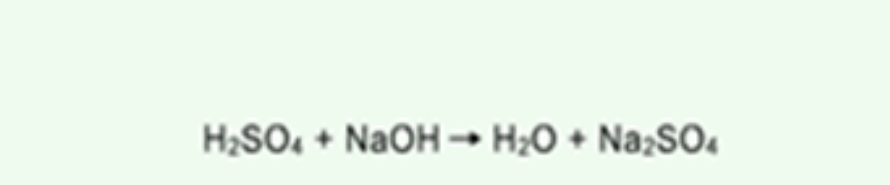
CHEMICAL EQUATIONS

Law of Conservation of Mass:

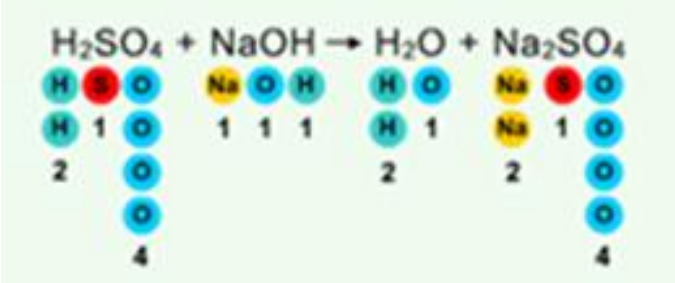
- Mass is conserved in chemical reactions. The mass of substances do not change during chemical reactions.
- In order to follow the Law of Conservation of Mass, we have to BALANCE equations! **The number of each type of atom on the reactant side must equal the number of each type of atom on the product side.**

Balancing Equations:

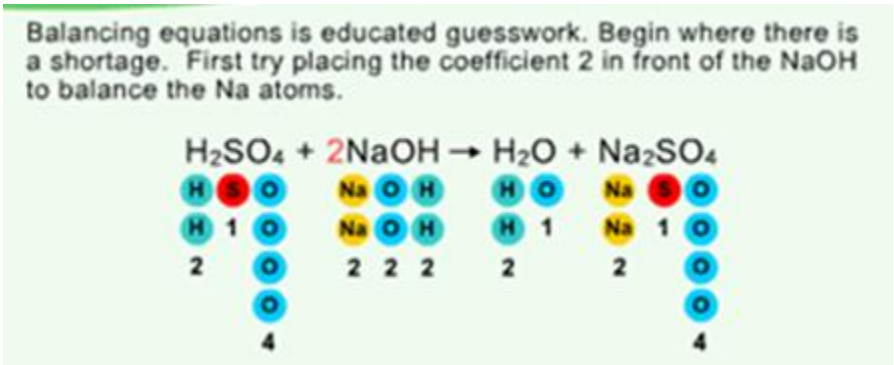
1. Write the chemical equation with correct chemical symbols.

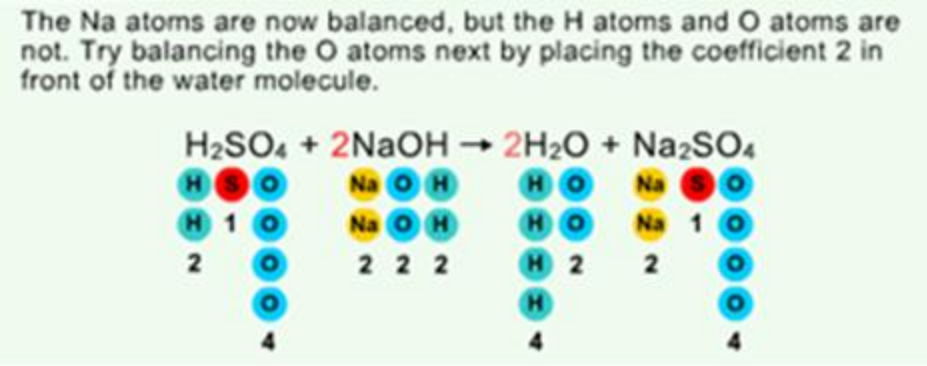


2. Count the number of atoms of each element on each side of the arrow.

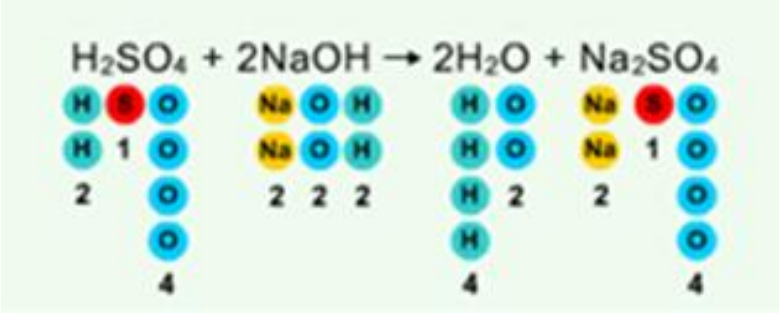


3. Balance using coefficients.





4. Check to see if there are equal amounts of each atom for the reactants and products.



MIXTURES

Some important definitions:

- **Heterogeneous Mixture:** a mixture that has components spread unevenly throughout the mixtures (not uniform in appearance, each part of the mixture contains a combination of different ingredients in different ratios)
    - Examples: tossed salad, trail mix, fruit salad
- **Homogenous Mixture:** a mixture that looks like a single substance, the components are spread evenly throughout (substance is mixed uniformly throughout, each part of the substance contains the same ratio of materials with the same properties)
    - Examples: sugar water, juice, air, carbonated drinks
- **Solution:** a mixture with one or more of the substances dissolved in another is called a solution (a type of homogeneous mixture)
    - Example: sugar water

SEPARATING MIXTURES

Remember, a mixture can be separated into its component parts without a chemical reaction occurring! Here are some examples:

- Separate iron filings from aluminum by using a magnet
- Use a filter to separate sand from water
- If you have a cup of salt water, let the water evaporate and only the salt will be left
- Alcohol and water can be separated by using distillation

SOLUTIONS

Some important definitions:

- **Pure Substance:** made up of one kind of atom or one kind of molecule (ex. Water)
- **Mixture:** a material composed of more than one pure substance
- **Solution:** has at least two components:
    - **Solvent:** what is doing the dissolving (ex. Water)
    - **Solute:** what is being dissolved (ex. Salt)

ACIDS AND BASES

Some important definitions:

- **Acid:** a substance that is characterized by a sour taste and has a pH of **LESS THAN 7**
- **Base:** a substance that has a bitter taste and a slippery feel, and a pH of **MORE THAN 7**

How do they taste?	Do they conduct electricity?	What is the pH level?	What are some other facts?	What are some examples?
				
• Acids have a sour taste. • Bases have a bitter taste.	• Both acids and bases will conduct electricity when in an aqueous solution.	• Acids have a pH less than 7. • Bases have a pH greater than 7. • Water has a pH of 7; it is neither an acid nor a base.	• Acids react with metals to produce hydrogen gas. • Bases are slippery to the touch. • When acids and bases combine, they form salt and water.	**Acids** • hydrochloric acid, HCl • acetic acid, CH_3COOH • boric acid, H_3BO_3 • sulfuric acid, H_2SO_4 **Bases** • ammonia, NH_3 • lye (sodium hydroxide), NaOH • sodium bicarbonate, $NaHCO_3$

The pH scale below might come in handy!