

# Word Equations and Balancing Equations

Video Notes

# **In this lesson, you will:**

- **Use the law of conservation of mass and provide standard rules for writing and balancing equations.**
- **Write and balance equations originally expressed in words.**

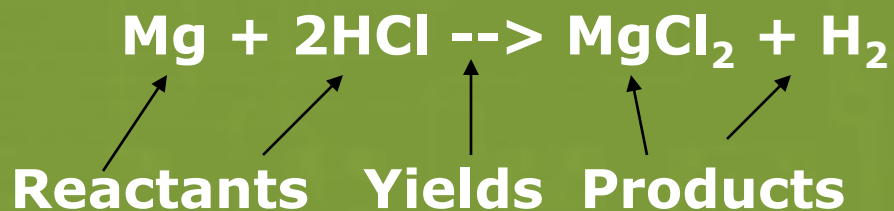
# Equations- Vocab...

Left side- reactants

Right side- products

Arrow between the reactants and products  
means "yields"

Example:



# Equations- Vocabulary



↑  
Coefficients- whole numbers that indicates the relative proportions in the reactants.

↙  
Subscript- indicate the number of atoms of an element present

# Vocabulary again....

## Chemical Equation

- A shorthand way of reporting the details of a chemical reaction.

## Reactants

- The starting substances in a reaction
- Placed on the left side of the equation

## Products

- The substances formed during a chemical reaction
- Placed on the right side of the equation

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- Arrow is read as yields

## Coefficients

- Used to balance equations
- Represents the number of molecules, formula units, or atoms of the substance
- A coefficient of 1 is understood, but not written
- Subscripts can never be changed to balance an equation. The only numbers that can be changed are coefficients.

# Balance an Equation

- Matter is not created or destroyed
- Mass of reactants is equal to the mass of products.
- To balance, you change the coefficients.

## Review:

- Law of Conservation of Mass – Mass is not created or destroyed in a chemical reaction.

**Ex: When you make cookies, the mass of the cookies is equal to the mass of the ingredients you used to make the cookies**

# Balance an equation



The reaction is not balanced because the products show an extra Cl and an extra H

We must use a coefficient of 2 in front of HCl to make the equation balance.

The balanced equation reads:



Another one...  $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$

To make a balanced equation you must add the following coefficients: (remember, you cannot change a subscript!)



You have 4 total atoms of H and 2 total O atoms.

# Balance an equation



C- 3                      C- 1

H- 8                      H- 2

O- 2                      O- 3

Make an element inventory

Draw boxes around each formula in the equation to remind yourself not to change the compound, only the coefficient.



New inventory

C- 3                      C- 3

H- 8                      H - 8

O- 10                    O - 10



# Guidelines for balancing Equations

- **Start by making an element inventory.**
- **Draw boxes around each formula in the equation.**
- **Begin with one molecule or formula unit of the substance containing the most atoms.**
- **Balance polyatomic ions that appear on both sides of the equation as a single unit.**
- **Balance hydrogen and oxygen atoms last**

# Example of Polyatomic ion balancing

- Check out the polyatomic ion that appears on both sides of the equation.



## Element inventory

Cu - 1

Cu- 1

Ag- 1

Ag-1

NO<sub>3</sub>- 1

NO<sub>3</sub> -2

The equation will read this way now.

$\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$  check yourself with another element inventory!

**Sometimes Polyatomic Ions  
don't appear on both reactant  
and product sides.**



**Nitrate ion changes to a nitrite ion....  
So you cannot balance this as single unit!**

**Do your element inventory.**

**The formula should read:**



**Check yourself by doing another element  
inventory.**

# 7 Diatomic Elemental Molecules

**Diatomic- two atoms represent the molecule always...**

**Nitrogen, oxygen, fluorine, chlorine, bromine, iodine, hydrogen**

**Highlight these atoms and they produce a 7 in highlights. Notice you start with element 7 as well... don't forget H!!!**

# Writing chemical equations from word descriptions

Hydrogen and oxygen combine to produce water.



**You must check your coefficients!**

**Don't forget your diatomic elements!**



# Another Word Example

Carbon Disulfide reacts with oxygen to produce carbon dioxide and sulfur dioxide.



Don't forget your oxygen is a diatomic element!

Balance!



# Chemistry Quiz

**CR1. Who is credited with the first atomic theory that is based on experimental evidence?**

- a. Democritus**
- b. Aristotle**
- c. Dalton**
- d. Rutherford**

# Chemistry Quiz

**CR2. In an ionic compound the chemical formula represents:**

- a. One molecule of the compound.**
- b. One formula unit of the compound.**
- c. The simplest ratio of positive to negative ions in the compound.**
- d. Both B and C**



# Chemistry Quiz

1. The starting substances in a chemical reaction are called the \_\_\_\_\_.
- a. products
  - b. yield
  - c. reactants
  - d. coefficients

# Chemistry Quiz

2. An equation is said to be balanced if it follows the Law of Conservation of Mass.
- a. True
  - b. False

# Chemistry Quiz

3. Choose the coefficients which, in order, would correctly balance the following equation:



- a. 1, 1, 1
- b. 2, 1, 1
- c. 2, 2, 1
- d. 2, 2, 2

# Chemistry Quiz

4. When balancing a chemical equation, one is allowed to adjust the \_\_\_\_\_.
- a. formulas of the reactants.
  - b. formulas of the products.
  - c. coefficients
  - d. both a and b

# Chemistry Quiz

5. In a chemical equation, the arrow is read as yields.
- a. True
  - b. False