Chemical Reactions and Equations

Chemical Reaction → the process by which one or more substances are changed into one or more different substances

H O F Br I N Cl

$2\,H_2 + O_2 \longrightarrow 2\,H_2O$

REACTANTS — PRODUCTS

- the original substances
- what reacts with what

- the resulting substances

* the total mass of the reactants must equal the total mass of the products (Law of Conservation of Mass)

Chemical Equation → something that uses formulas and symbols to represent the relative amounts of the reactants and products of a chemical reaction

formula

$(NH_4)Cr_2O_7\,(s) \longrightarrow N_2\,(g) + Cr_2O_3\,(s) + 4H_2O\,(g)$

word

ammonium dichromate → nitrogen + chromium (III) oxide + water

Evidence of a Chemical Reaction

1. Evolution of heat and light
2. Production of a Gas (bubbles)
3. Formation of a precipitate
   - a solid that is produced as a result of a chemical reaction in solution and that separate from the solution
4. Color change

Characteristics of Chemical Equations

1. The equation must represent known facts
   - all reactants and products must be identified through chemical analysis

2. The equation must contain the correct formulas for the reactants and products

   — HOFBrINCl —

   - diatomics -- H, N, O, F, Cl, Br, I represented H_2 N_2 etc...
   - other elements represented by their chemical symbols (Fe, C, Si, etc..)

3. The law of conservation of mass must be satisfied
   - atoms are neither created nor destroyed in chemical reactions
   - the same # of atoms of each element must appear on each side of the chemical equation
   - Coefficients are added when necessary

B:8

a small whole # that appears in front of a formula in a chemical equation

- represents # of moles of the substance

3 CH_4 4 H_2O

subscripts (small)

Symbols used in Chemical Equations

(s)	- reactants or products in the solid state
(l)	- reactants or products in the liquid state
(g)	- reactants or products in the gaseous state
(aq)	- reactants or products in the aqueous state (dissolved in water)
→	- yields, indicates result of reaction
⇌	- used in place of single arrow to show that a reaction is reversible
Δ or heat →	- reactants are heated
2 atm →	- shows pressure at which reaction is carried out

Word Equations

- an equation where the reactants and products in a chemical reaction are represented by words
- does not give the quantities of reactants or products formed

ex. methane + oxygen → carbon dioxide + water

the arrow is read react to yield or yields

Formula Equations

- represents the reactants and products of a chemical reaction by their symbols and formulas

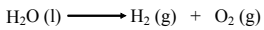
ex. $CH_4\,(g) + O_2\,(g) \longrightarrow CO_2\,(g) + H_2O\,(g)$ (not balanced)

- still does not fulfill the law of conservation of mass

THE EQUATION MUST BE BALANCED

Balancing Chemical Equations

1. Write an equation using the correct formulas for the reactants and products



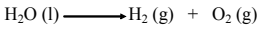
2. Balance the equation according to the law of conservation of mass

- done by trial and error
- Balance different atoms 1 at a time
- Balance H and O after all other elements have been balanced

3. Count atoms to be sure that the equation is balanced

4. Always use coefficients to balance equations

*** NEVER change the subscripts***



reactants	products
H	H
O	O

Balance the Following....