Name: _____

Period: _____

Day 18— The Law of Conservation of Mass

How to read chemical reactions:

The 2 is a coefficient. It means there are two Li_3N molecules. → $2Li_3N = Li_3N + Li_3N = Li_6N_2$ ← *So, $2Li_3N$ really means Li_6N_2. We will call this reaction notation.*

The 3 is a subscript ("sub" means under). It means there are three Lithium atoms in each molecule.

BEFORE **Reactants** → AFTER **Products**

$2H_2 + O_2 \xrightarrow{\text{form}} 2H_2O$

$2K_3N + 3CaCrO_4 \rightarrow Ca_3N_2 + 3K_2CrO_4$

1. *Circle* the second reactant. *Underline* the first product.
2. How many potassium atoms on the reactant side?
3. How many oxygen atoms on the product side?

4. Write the following in reaction notation:

   $3Be_2Br$: _____ $2AlCl_3$: _____ $4Fe_2O_3$: _____

5. What coefficient produces the given reaction notation:

   ___$O_2 = O_4$ ___$Li_3N = Li_{12}N_4$ ___$CO_2 = C_3O_6$

During chemical reactions atoms are recombined into different chemicals, but no atoms are gained or lost. Sometimes liquids and solids can react and form invisible gases, but even when you can see the products—they are still there.

Open System

Products can escape.

Before: 54 grams **Mass *seems* to be lost.** *After: 51 grams*

3 grams escaped the open reaction.

The Law of Conservation of Mass states: in any closed reaction the total amount of mass stays the same.

$MgCl_2 + Li_2O \rightarrow MgO + 2LiCl$

35 g 11 g 26 g ? g

Since mass must be conserved, 20 g of LiCl must have been produced in this reaction.

35 + 11 = 26 + ?

46 = 26 + ?

46 – 26 = ?

? = 20

6. A. Is this an open or closed reaction?
   B. Will the mass of his products be greater than, less than, or equal to his reactants?
   C. Why?

$4K + O_2 \rightarrow 2K_2O$

25g + 5 g ? g

7. How much potassium oxide is produced in this reaction?

When balancing chemical reactions remember that subscripts cannot be changed and that coefficients multiply.

$H_2 + O_2 \rightarrow H_2O$ NOT BALANCED (more O's on left)

$H_2 + O_2 \rightarrow \underline{2}H_2O$ ← H_4O_2 Write reaction notation under as you change coefficients.

$2H_2 + O_2 \rightarrow 2H_2O$ BALANCED

H_4 H_4O_2

balanced *balanced*

Treat polyatomic ions (like the CrO_4 below) as a single element unless the ion is broken up on one side.

Unbalanced: $K_3N + Ca(CrO_4) \rightarrow Ca_3N_2 + K_2(CrO_4)$

Balanced: $2K_3N + 3Ca(CrO_4) \rightarrow Ca_3N_2 + 3K_2(CrO_4)$

K_6N_2 $Ca_3(CrO_4)_3$ Ca_3N_2 $K_6(CrO_4)_3$

8. Balance the following reactions:

___ Fe + ___ O_2 → ___ Fe_2O_3

___ NH_3 → ___ N_2 + ___ H_2

___ NH_3 + ___ O_2 → ___ NO + ___ H_2O

___ Mg + ___ $Ag(NO_3)$ → ___ $Mg(NO_3)_2$ + ___ Ag