Answer Key

Chemical Reactions and Reaction Stoichiometry

Identify the reactants and products;

Reactants Products

$Fe + Cl_2 \longrightarrow FeCl_3$

$FeBr_3 + H_2SO_4 \longrightarrow Fe_2(SO_4)_3 + HBr$

Reactants Products

What is the Law of Conservation of Mass?

Mass is neither created nor destroyed; only changed

What do subscripts and coefficients tell us?

Subscript: Part of the chemical formula + tells how many atoms
↳ If changes → new substance made

Coefficient: Indicate # of molecules Ex: $2O_2$

2 oxygen atoms per molecule; 4 total atoms

Balance the following chemical equations:

$2\ HgO_{(s)} \longrightarrow 2\ Hg_{(l)} + O_{2\,(g)}$

Hg = 2 | Hg = 2
O = 2 | O = 2

$C_2H_4 + 3\ O_2 \longrightarrow 2\ CO_2 + 2\ H_2O$

C = 2 | C = 2
H = 4 | H = 4
O = 6 | O = 6

$2\ Fe + 3\ H_2SO_4 \longrightarrow Fe_2(SO_4)_3 + 3\ H_2$

Fe = 2 | Fe = 2
H = 6 | H = 6
SO_4 = 3 | SO_4 = 3

Identify the types of reactions:

A B AB
$N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$ Combination / Synthesis

C A B
$2KClO_3(s) \longrightarrow 2KCl(s) + 3O_2(g)$ Decomposition / Analysis

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$ Complete combustion

Formula: Fuel + O_2 → CO_2 + H_2O

$4CH_4 + 7O_2 \longrightarrow 2CO + 2CO_2 + 8H_2O$ Incomplete combustion

Formula: Fuel + O_2 → CO + H_2O

sometimes CO_2

Calculate the molecular weight of the following compounds:

↳ formula weight or molar mass

$C_6H_{12}O_6$

C: $6 \times 12.011_g = 72.066_g$

H: $12 \times 1.008_g = 12.096_g$

O: $6 \times 15.999_g = +\ 95.994_g$

$180.156_g \sim \boxed{180.2_g}$

$Ca_3(PO_4)_2$

Ca: $3 \times 40.078_g = 120.234_g$

P: ~~3 ×~~ $2 \times 30.974_g = 61.948_g$

O: $8 \times 15.999_g = +\ 127.992_g$

$310.174_g \sim \boxed{310.17_g}$

Write the formula for percent composition:

$\frac{\text{part}}{\text{whole}} \times 100$

$$\%\ \text{Element} = \frac{(\#\ \text{of atoms})(\text{atomic weight})}{\text{formula weight of the compound}} \times 100$$

Calculate percent composition of carbon, hydrogen, and oxygen:

$C_6H_{12}O_6$

$$\%\ C = \frac{6 \times 12.011_g}{180.156_g} \times 100 = 40.002\%$$

$$\%\ H = \frac{12 \times 1.008_g}{180.156_g} \times 100 = 6.714\%$$

$$\%\ O = \frac{6 \times 15.999_g}{180.156_g} \times 100 = 53.284\%$$

$\Big\rangle$ 100%

What is a mole?

A counting term to count atoms

1 mol = amount of particles found in 12g of C-12

How many moles of NaCl are in 735 grams of NaCl? g NaCl → moles NaCl

$$\frac{735\text{g NaCl}}{58.443\text{g NaCl}} \left| \frac{1\text{ mol NaCl}}{} \right. = 12.6\text{ mol NaCl}$$

MW NaCl = 58.443g

How many grams is 0.168mol of $KMnO_4$? mol $KMnO_4$ → g $KMnO_4$

$$\frac{0.168\text{ mol } KMnO_4}{1\text{ mol } KMnO_4} \left| \frac{158.032\text{g } KMnO_4}{} \right. = 26.5\text{g } KMnO_4$$

MW $KMnO_4$ = 158.032g

How many grams of CO_2 will form from 2.7 moles of propane? moles propane → g CO_2

MW CO_2 = 44.009g

propane = C_3H_8

$$\underline{1}\ C_3H_8 + \underline{5}\ O_2 \longrightarrow \underline{3}\ CO_2 + \underline{4}\ H_2O$$

C = 3
H = 8
O = 2 10

C = 1 3
H = 1 8
O = 6 1 10

$$\frac{2.7\text{ moles propane}}{1\text{ mol propane}} \left| \frac{3\text{ mol } CO_2}{1\text{ mol } CO_2} \right| \frac{44.009\text{g } CO_2}{} = 356.4729$$

~ 360

$3.6 \times 10^2\text{g } CO_2$