CHEMISTRY FORMULAS

① % error $= \left| \frac{\text{Accepted} - \text{Experimental}}{\text{Accepted}} \right| \times 100$

★ % error tells you how "off target" lab results are from the accepted (known) value

★ Low % error = good results

② % yield $= \frac{\text{Experimental}}{\text{Theoretical}} \times 100$

↖ stoichiometry answer

★ High % yield = good results

③ Average Atomic Mass - Must use % abundances

Option 1

1) change % to decimal (move decimal left 2x)
2) multiply decimal by mass
3) add

$(\underset{2x}{\text{نیم}}\%)(\text{mass}) + (\underset{2x}{\text{نیم}}\%)(\text{mass}) + \ldots$

Option 2

$$\frac{(\%)(\text{mass}) + (\%)(\text{mass}) + \ldots}{100}$$

★ with either option, you MUST use % abundances

④ % Composition $= \frac{\text{Part}}{\text{Whole}} \times 100$

- If given chemical formula, then use molar masses

$$\%\ O \text{ in } H_2SO_4 = \frac{\text{Molar Mass of } O_4}{\text{Molar Mass of } H_2SO_4} \times 100$$

- If given lab data, then use experimental masses

⑤ Empirical Formula – reduced subscripts

How to get the subscripts:

1) change % to grams
2) convert grams to moles (Keep at least 4 decimal places)
3) divide by smallest moles
   ↳ whole # answers are the subscripts

Ex)

$$11\%\ H = \frac{11\text{ g H}}{} \left| \frac{1\text{ mol H}}{1.01\text{ g H}} \right. = 10.8910\text{ mol H} / 5.5625 = 2\text{ mol H}$$

$$89\%\ O = \frac{89\text{ g O}}{} \left| \frac{1\text{ mol O}}{16\text{ g O}} \right. = 5.5625\text{ mol O} / 5.5625 = 1\text{ mol O}$$

∴ Empirical = $\boxed{H_2O}$

⑥ Molecular Formula

$$\frac{MM_{Molecular}}{MM_{Empirical}} = \text{"X"} \Rightarrow \text{Multiply empirical subscripts by "X"}$$

⑦ Molarity $= \frac{\text{moles}}{L}$

Ex) $\frac{3 \text{ moles}}{2 \text{ L}} = 1.5 \text{ M}$

⑧ Dilution - decrease concentration by increasing volume (i.e. add H_2O)

$$\underset{\text{Before Dilution}}{M_1 V_1} = \underset{\text{After Dilution}}{M_2 V_2}$$

☆ V_1 and V_2 MUST be same unit (both mL or both L)

⑨ $pH = -\log[H^+]$

⑩ $pOH = -\log[OH^-]$

⑪ $pH + pOH = 14$

⑫ Kelvin $= {}^\circ C + 273$

⑬ Ideal Gas Law

$$\underset{\text{atm}}{P}\underset{\text{L}}{V} = \underset{\text{mol}}{n}\underset{0.0821}{R}\underset{\text{Kelvin}}{T}$$

☆ $R = 0.0821 \frac{L \cdot atm}{mol \cdot K}$

☆ MUST USE the UNITS above

⑭ Other Gas Laws

a) Combined

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

b) Boyle's

$$P_1 V_1 = P_2 V_2$$

c) Lussac's

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

d) Charles'

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

☆ Temperature MUST be in Kelvin

☆ P_1 and P_2 must be same unit

☆ V_1 and V_2 must be same unit

☆ Bath Time Leaves Very Clean People

⑮ Dalton's Law - use for Mixture of gases

$$\underset{\text{Total Pressure}}{P_T} = \underbrace{P_1 + P_2 + P_3 + \ldots}_{\text{Partial Pressures}}$$

⑯ $$\underset{\text{Heat}}{q} = \underset{\text{mass}}{m}\,\underset{\text{specific heat}}{c}\,\underset{\text{change in temp.}}{\Delta T}$$

☆ Keyword: specific heat