

Equilibrium

- Calculating Concentration - Molarity (M)

$$\text{Molarity (M)} = \frac{\text{\# moles of substance dissolved (n)}}{\text{Volume of the solution in L (V)}}$$

$$M = \frac{n}{V}$$

convert mass to moles

$$1 \text{ mol} = \frac{\text{molar mass (MM)}}{\text{given}} \times 1 \text{ mol}$$

(Ex) Calculate the concentration (M) when 14.61g NaCl are dissolved in .800L of solution.

$$M = \frac{n}{V}$$

$$M = ?$$

$$n = .2500 \text{ mol}$$

$$V = .800 \text{ L}$$

$$\frac{14.61 \text{ g NaCl}}{58.44 \text{ g}} \times 1 \text{ mol} = .2500 \text{ mol}$$

$$\text{Na: } 22.99 \text{ g}$$

$$\text{Cl: } 35.45 \text{ g}$$

$$58.44 \text{ g}$$

$$M = \frac{.2500 \text{ mol}}{.800 \text{ L}} = .313 \text{ mol/L}$$

(Ex) Calculate the concentration (M) when 10.0g of NaOH are dissolved in .500L of solution.

$$M = \frac{n}{V}$$

$$M = ?$$

$$n = .250 \text{ mol}$$

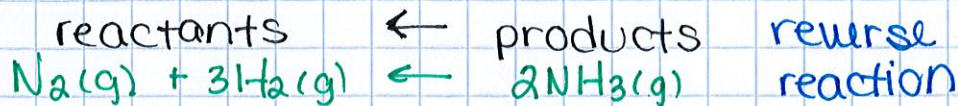
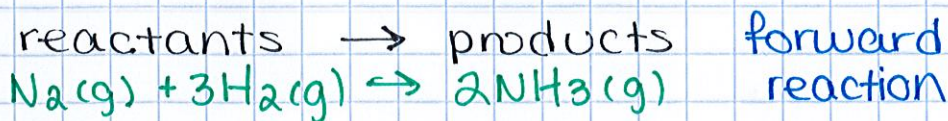
$$V = .500 \text{ L}$$

$$\frac{10.0 \text{ g NaOH}}{40.00 \text{ g}} \times 1 \text{ mol} = .250 \text{ mol}$$

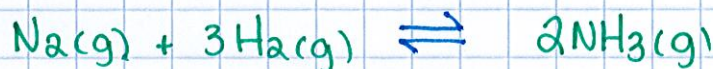
$$M = \frac{.250 \text{ mol}}{.500 \text{ L}} = .500 \text{ mol/L}$$

Chemical Equilibrium

- Some reactions are reversible



You show a reaction is reversible using a DOUBLE ARROW \rightleftharpoons

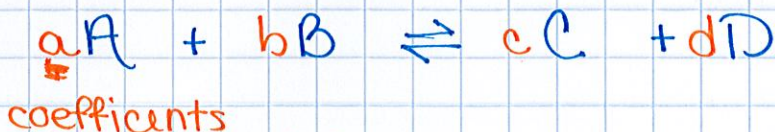


- Equilibrium occurs when...

the rate of the forward reaction EQUALS the rate of the reverse reaction

@ equilibrium...

- the concentration of reactants & products does NOT change
 - the concentration of reactants & products do NOT have to be equal
- Write an Equilibrium Expression



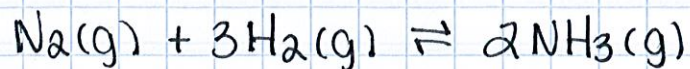
only substances in aqueous or gas state are written in the expression

$$K_{eq} = \frac{[C]^c \cdot [D]^d}{[A]^a \cdot [B]^b}$$

concentration

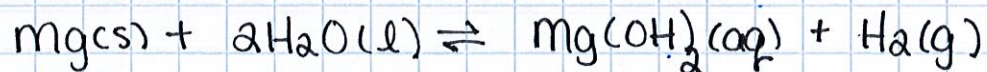
equilibrium constant

Ex) write the equilibrium expression for:



$$K_{\text{eq}} = \frac{[\text{NH}_3]^2}{[\text{N}_2] \cdot [\text{H}_2]^3}$$

Ex) write the equilibrium expression for:



$$K_{\text{eq}} = \frac{[\text{Mg}(\text{OH})_2] \cdot [\text{H}_2]}{1}$$

Ex) write the equilibrium expression for:



$$K_{\text{eq}} = \frac{1}{[\text{Br}_2]}$$