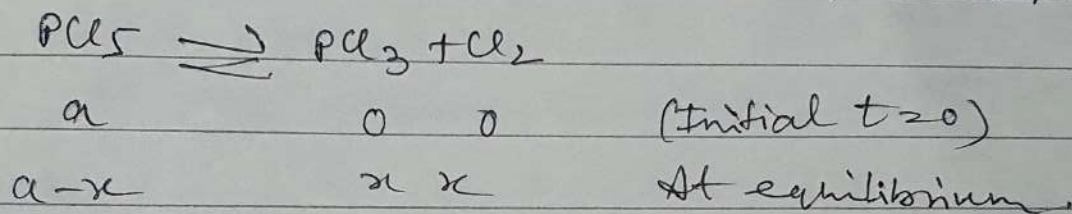


Relation between K_c and no. of moles of reactants:-



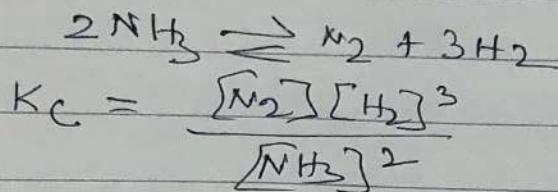
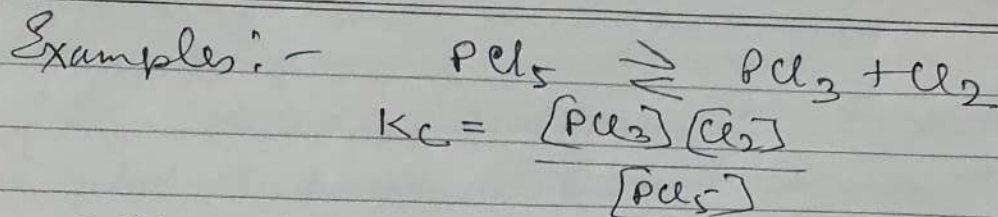
(since one mole of PCl_5 gives 1 mole of PCl_3 and 1 mole of Cl_2 , so x moles of PCl_5 gives x moles of PCl_3 & Cl_2 each.)

$$\therefore \frac{a-x}{V} = \frac{x}{V} + \frac{x}{V}$$

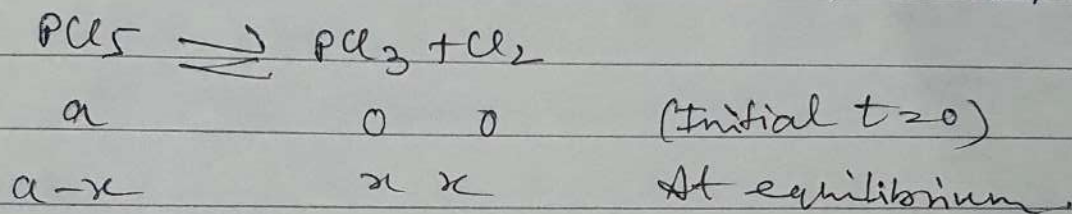
Hence $[\text{PCl}_5]$ at eqm = $\frac{a-x}{V}$

$[\text{PCl}_3]$ at eqm = $\frac{x}{V}$; $[\text{Cl}_2]$ at eqm = $\frac{x}{V}$.

$$\therefore K_c = \frac{[\text{PCl}_3][\text{Cl}_2]}{[\text{PCl}_5]} = \frac{\frac{x}{V} \times \frac{x}{V}}{\frac{a-x}{V}} = \frac{x^2}{(a-x)V}$$



Relation between K_c and no. of moles of reactants:-



(since one mole of PCl_5 gives 1 mole of PCl_3 and 1 mole of Cl_2 , so x moles of PCl_5 gives x moles of PCl_3 & Cl_2 each.)

$$\therefore \frac{a-x}{V} = \frac{x}{V} + \frac{x}{V}$$

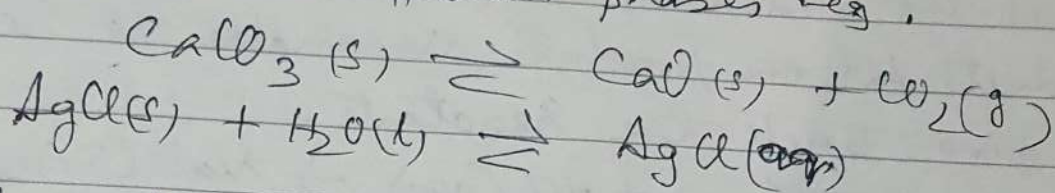
Hence $[\text{PCl}_5]$ at eqm = $\frac{a-x}{V}$

$[\text{PCl}_3]$ at eqm = $\frac{x}{V}$; $[\text{Cl}_2]$ at eqm = $\frac{x}{V}$.

$$\therefore K_c = \frac{[\text{PCl}_3][\text{Cl}_2]}{[\text{PCl}_5]} = \frac{\frac{x}{V} \times \frac{x}{V}}{\frac{a-x}{V}} = \frac{x^2}{(a-x)V}$$

(2)

Heterogeneous Equilibrium — Some reactants and products have different phases, e.g.,



Law of Mass Action — At constant temperature, the rate of a chemical reaction is either directly proportional to the products of the active masses or the partial pressures (for gaseous reactants) of the reacting substances.

$$\text{Active Mass} \rightarrow \frac{\text{Number of moles}}{\text{Volume in litres}}$$

calculate

Active mass of 4 gm. of NaOH dissolved in 250 cc. soln.

$$\text{Mol. wt. of NaOH} = 40$$

$$n_{\text{NaOH}} = \frac{4}{40} = \frac{1}{10} = 0.1 \text{ moles of NaOH}$$

$$V_{\text{litre}} = \frac{250}{1000} = \frac{1}{4} = 0.25$$

$$\text{Active mass} = \frac{0.1}{0.25} = \frac{10}{25} = 0.4$$

For A general equilibrium reaction $aA + bB \rightleftharpoons mC$

$$\text{Equilibrium Constant} \Rightarrow K_c = \frac{[C]^m [D]^n}{[A]^a [B]^b}$$