

# FAST LEARNER - EQUILLIBRIUM

## EQUILIBRIUM

It may be defined as a condition at which rate of forward reaction becomes equal to rate of backward reaction.

### Law of mass Action

The rate of reaction is directly proportional to the product of active masses of reactants, each raised to the power equal to its coefficient as represented by balanced chemical.

**LAW OF CHEMICAL EQ<sup>m</sup>:** It states that - The ratio of molar concentration of product, each raised to the power equal to its coefficient, and molar concentration of reactant, each raised to the power equal to its coefficient, is constant at constant temperature at eq<sup>m</sup>.

**Le - CHATELIER'S PRINCIPLE:** - It states that - if a system in eq<sup>m</sup> is subjected a change of concentration, temperature or pressure, the eq<sup>m</sup> shifts in direction that tends to undo or cancel the change imposed.

### EFFECT OF CHANGE OF CONCENTRATION:

FORWARD REACTION TAKES PLACE WHEN:

(a) If we increase concentration of reactant (b) Decrease concentration of product.

BACKWARD REACTION TAKES PLACE WHEN:

(a) Decreasing concentration of reactant.  
(b) Increasing concentration of product.

### TEMPERATURE:

(a) Low temperature favours exothermic reactions.  
(b) High temperature favours endothermic reactions.

### PRESSURE:

(a) High pressure shifts reaction towards lesser number of mol.  
(b) Low pressure shifts reaction towards higher number of mol.

### HENRY'S LAW

It may be defined as the mass of a gas dissolved in given mass of a solvent at any temperature is directly proportional to the pressure of the gas above the solvent.

$$m \propto P : m = kP$$

$m$  = mass of gas dissolved,  $P$  = Pressure of the gas above liquid.  
 $k$  = Henry's constant. **Value of  $k$  depend upon nature of gas, nature of liquid and temperature.**

### 1. Why CO<sub>2</sub> gas fizzes out when we open sodawater bottle?

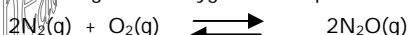
Ans CO<sub>2</sub> gas is filled in soda water bottle at very high pressure. This result in high solubility of CO<sub>2</sub> in the liquid. As we open the bottle, the pressure tends to decrease to the atmospheric pressure, so solubility of CO<sub>2</sub> decrease and dissolved gas escape out in the form of bubbles.

2. Write the relation b/n  $K_p$  &  $K_c$ ?

3. In a reaction b/n hydrogen & iodine, 6.34 mol of H<sub>2</sub> & 4.02 mol of I<sub>2</sub> are found to be in eq<sup>m</sup> with 42.85 mol of HI at 350°C. calculate the eq<sup>m</sup> constant. Ans.=72.042

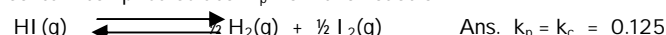
4. 1.5 mole of PCl<sub>5</sub> are heated at constant temperature in a closed vessel of 4 lt. capacity. At the eq<sup>m</sup> point, PCl<sub>5</sub> is 35% dissociated into PCl<sub>3</sub> & Cl<sub>2</sub>. calculate eq<sup>m</sup> constant. Ans.=0.071

5. Reaction b/n nitrogen and oxygen takes place as -



If a mixture of 0.482 mol of N<sub>2</sub> and 0.933 mol of O<sub>2</sub> is placed in a reaction vessel of volume 10 lt. and allowed to form N<sub>2</sub>O at temperature for which  $K_c = 2.0 \times 10^{-37}$ . Determine composition of eq<sup>m</sup> mixture. (NCERT) Ans. [N<sub>2</sub>] = 0.0482, [O<sub>2</sub>] = 0.0933 mol lt<sup>-1</sup>, [N<sub>2</sub>O] =  $6.6 \times 10^{-21}$  mol lt<sup>-1</sup>

6. In the dissociation of HI, 20% HI is dissociated at eq<sup>m</sup> at a certain temp. Calculate  $K_p$  for the reaction -



7. A reaction mixture containing N<sub>2</sub> at 0.50 atm, H<sub>2</sub> at 3.0 atm and NH<sub>3</sub> at 0.50 atm is heated to 450°C. In which direction the reactio - N<sub>2</sub>(g) + 3H<sub>2</sub>(g) → 2NH<sub>3</sub>(g) will go if

$$K_p = 4.28 \times 10^{-5}$$

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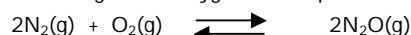
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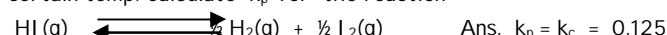
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