ATOMIC ENERGY CENTRAL SCHOOL, No – 4

RAWATBHATA

HANDOUT-MODULE - 2/6

SUBJECT – CHEMISTRY CLASS – XI

UNIT – VII, EQUILIBRIUM

(CHEMICAL EQUILIBRIUM)

**Law of Mass action:** In 1864 Guldberg and Waage were presented this law. It states that: “At a given temperature, the rate of a chemical reactionat any instant is proportional to the product of molar concentration of reactants where the stoichiometric coefficients are raised in the form of power”.

 For a chemical reaction:

A + B $⇌$ C + D

Rate of reaction α [A] [B]

Rate of reaction = k [A] [B] where k is proportionality constant

This law is applicable to write the law of chemical equilibrium.

**Law of Chemical equilibrium:** In a reversible chemical reaction, at equilibrium the rate of forward and backward reactions are same. For a chemical reaction:

 A + B $⇌$ C + D kf [A] [B] = kb [C] [D] at equilibrium $\frac{kb}{kf}=Kc=\frac{\left[C\right][D]}{\left[A\right][B]}$ where Kc is equilibrium constant in term of concentration. This law can also be written in terms of pressure where all the reactants and products are gases, Kp =$ \frac{(pC)(pD)}{(pA)(pB)}$ where Kp is equilibrium constant in terms of pressure.

Kp and Kc are related as follows:

Kp = Kc (RT)∆n where R is universal gas constant Equilibrium constant has no unit because it is ratio of activity

Mass action ratio ‘Q’ predict the direction of reaction

Hence, Mass action ratio Qc = $\frac{\left[C\right][D]}{\left[A\right][B]}$ When Q = K the reaction is at equilibrium When Q > K the reaction proceeds in backward direction and When Q < K the reaction proceeds in forward direction