HSSC-I Examination
Chemistry Guess Question Paper

Chapter 07 & 09
(CHEMICAL EQUILIBRIUM & CHEMICAL KINETIC)

SECTION – A

Time allowed: 20 minutes **Marks: 17**

Note: Section-A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q.1 Encircle the correct option i.e. A / B / C / D. All parts carry equal marks.

(i) K_p, K_c, K_n and K_x are equilibrium constants in terms of pressure, concentration, moles and mole fraction. These constant can be equal when:
(a) $\Delta n = 0$ (b) $\Delta n = 1$ (c) $\Delta n = 2$ (d) $\Delta n = 3$

(ii) If a reaction does not proceed appreciably in forward direction it shows:
(a) Zero K_c value (b) very large K_p value
(c) very large K_c value (d) very small K_c value

(iii) In the reaction $N_2O_4 \rightleftharpoons 2NO_2$, ΔH= +57.2 kj the equilibrium will be shifted in forward direction by:
(a) increasing the concentration of NO_2 (b) Increasing the temperature
(c) Increasing the pressure (d) decreasing volume

(iv) If $K_{sp} = [M^{+2}]^3 [X^{-3}]^2$, the chemical formula of compound is:
(a) MX_2 (b) M_2X_3 (c) M_3X_2 (d) M_2X_2

(v) For reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$:
(a) $K_c = K_p$ (b) $K_p = K_c RT$ (c) $K_p = K_c (RT)^{-2}$ (d) $K_p = K_c (RT)^{-1}$

(vi) The precipitation occurs if the ionic concentration is:
(a) Less than K_{sp} (b) More than K_{sp} (c) Equal to K_{sp} (d) is present at any moment

(vii) Dissociation of H_2S in water os supposed by the addition of HCl because:
(a) H_2S weaker acid than HCl (b) H_2S is stronger acid than HCl
(c) HCl reacts chemically with H_2S (d) Size of H_2S smaller than HCl

(viii) The Factor that has no effect on equilibrium position:
(a) Temperature (b) Change in Pressure (c) catalyst (d) Both A & C

(ix) The value of K_c at 2000° C for the reaction $2HF \rightleftharpoons H_2 + F_2$:
(a) 10^{-5} (b) 10^{55} (c) 10^{-13} (d) 10^{-3}

(x) The solubility product of AgCl is 2.0×10^{-10} mole. dm^{-6}. The maximum concentration of Ag^+ ion in the solution is:
(a) 2.0×10^{-10} mole. dm^{-3} (b) 1.41×10^{-5} mole. dm^{-3}
(c) 1.0×10^{-10} mole. dm^{-3} (d) 4.0×10^{-10} mole. dm^{-3}

(xi) Dissociation of H_2S in water in water is suppressed by the addition of HCl because:
(a) H_2S weaker acid than HCl (b) H_2S is stronger acid than HCl
(c) HCl reacts chemically with H_2S (d) size of H_2S smaller than HCl

(xii) Which of the following statement is not correct for K_c :
(a) May or may not have unit (b) Depends on equilibrium concentration
(c) Tell extent of reaction (d) Tell us about rate of reaction

(xiii) If we double the conc. of NO in a reaction of NO and H_2 the rate of reaction is quadrupled the order of reaction w.r.t NO:
(a) 2 (b) 6 (c) 4 (d) 8

(xiv) The experimental relationship between rate of reaction and conc. of reactant is called:
(a) Rate law (b) Hess's Law (c) Law of mass action (d) Le-Chatelier Principle

(xv) All of the following factors affect rate of reaction except:
(a) Solvent (b) Catalyst (c) Molecularity (d) Temperature

(xvi) The units of the rate constant for a first order reaction:
(a) sec^{-1} (b) mol. dm^{-3} (c) mol. dm^{-3} sec^{-1} (d) mol^{-1}. dm^{-3}. sec^{-1}

(xvii) The unit of the rate constant is the same as that of the rate of reaction in _____ order reaction:
(a) First (b) Second (c) Third (d) Zero

Time allowed: 2.40 hours **Total Marks: 68**

Note: Answer any eleven parts from Section 'B' and Attempt any two questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 42)

Q.2 Attempt any **Fourteen** parts from the following. All parts carry equal marks.

i. The change of volume disturbs the equilibrium position for some of the gaseous phase reaction, but not the equilibrium constant. Why?

ii. What will be the effect on the position of equilibrium on the following system if:

(a) Temperature is increased (b) Chlorine is added

$$PCl_{5\,(g)} \rightleftharpoons PCl_{2\,(g)} \qquad \Delta H = 90\ kJ\ mol^{-1}$$

iii. Acetic acid dissolves in water and gives proton to water, but when dissolved in H_2SO_4 it accepts protons. Discuss the role of acetic acid in both cases.

iv. 50 cm^3 of 0.001 M NaOH is mixed with 150 cm^3 of 0.01 M $MgCl_2$ will $Mg(OH)_2$ precipitate? K_{sp} for $Mg(OH)_2$ is 2×10^{-11}.

v. What is a precipitation reaction? How will you Predict the formation of precipitates when two solutions are two solutions are mixed together?

vi. Predict the effect of change in Pressure and temperature on the chemical equilibrium in the given reaction.

$$N_{2\,(g)} + 3H_{2\,(g)} \rightleftharpoons 2\,NH_3$$

vii. If 0.350 moles of SO_3 is placed in a 1.00 dm^3 flask and allowed to come to equilibrium at high temperature, 0.207 mole of SO_3 remains. Calculate K_c for the reaction.

$$2SO_{3\,(g)} \rightleftharpoons 2SO_{2\,(g)} + O_{2\,(g)}$$

viii. When 60 g of acetic acid (CH_3COOH) acid and 46 g of ethyl alcohol (C_2H_5 OH) are heated, an equilibrium mixture containing 12 g water (H_2O) and 58.7 g of ethyl ($CH_3COOC_2H_5$) are formed. Find K_c for the reaction.

ix. At 100^{o} C, 0.1 mole of N_2O_4 is heated in a one dm^3 flask. At equilibrium, concentration of NO_2 was found to be 0.12 moles. Calculate K_c for the reaction.

x. Consider the following gas phase reaction:
$SO_{2\,(g)}$ + $Cl_{2\,(g)}$ ----------> $SO_2\,Cl_{2(g)}$ + Heat
Describe four changes that would derive the equilibrium to left.

xi. What is the Arrhenius equation? How this equation describes the effect of increase in temperature on the rate constant & rate of a reaction?

xii. Differentiate between homogenous and heterogeneous catalysis giving one example of each.

xiii. What is the effect of catalyst on the following:
(a). Average rate of reaction. (b). Instantaneous rate of reaction.
(c). Order of reaction.

xiv. How the mechanism of a chemical reaction can help to point out the rate-determining step?

xv. What is the effect of catalyst on the following:
(a). The rate reaction.
(b) The energy of activation.
(c). The equilibrium position of a reversible reaction.

xvi. What is Pseudo First reaction? Also gives its examples

xvii. Define Enzyme? Give two examples in which enzymes acts as catalyst.

xviii. Differentiate between average & instantaneous rate of reaction.

xix. Evaluate that increase in collision energy by increasing the temperature can improve the collision frequency.

xx. What is the Arrhenius equation? How this equation described the effect of increase in temperature on the rate constant and rate of a reaction?

SECTION – C (Marks 26)

Attempt any **Two** Questions from the following.

Q3. (a) What is Le-Chatelier Principle? Describe three major steps which could be taken in order to get maximum yield of NH_3 in Haber's Process.

(b) A solution is prepared by mixing 50 cm^3 of 5×10^{-3} M NaCl with 50 cm^3 of 2×10^{-2}M, $Pb(NO_3)_2$. Will a precipitate of $PbCl_2$ form? K_{sp} for $PbCl_2$ is 1.7×10^{-5}.

Q4. (a). State & Explain Common Ion Effects with the help of examples.

(b). Consider the following reaction:

$$N_{2\,(g)} + O_{2\,(g)} \rightleftharpoons 2NO_{(g)} \qquad K_c = 0.1 \text{ at } 2000^o\,C$$

If original concentration of N_2 and O_2 were 0.1 M each, Calculate the concentration of NO at equilibrium.

Q5. (a) Explain collision theory of reaction rates with reference to activation energy, formation of activated complex and enthalpy changes in a chemical reaction.

(b). For reaction $NO_{2\,(g)} + CO_{2\,(g)} \text{ ----------> } NO_{(g)} + CO_{2\,(g)}$

$$\text{Rate} = k\,[NO_2]^2$$

What information do you get from this about rate determining step?

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