Model Question Paper

Chemical Equilibrium - II - Part III

12th Standard

Chemistry

Reg.No. : | | | | | | |

I.Answer all the questions.

II.Use blue pen only.

Time : 01:30:00 Hrs

Total Marks : 70

Part-A

5 x 1 = 5

1) The degree of dissociation, x of PCI_5 at a given temperature is

(a) inversely proportional to pressure (b) directly proportional to pressure (c) inversely proportional to square root of pressure (d) independent of pressure

2) In which of the following equilibrium $K_P < K_C$

(a) $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$ (b) $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ (c) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ (d) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

3) When equilibrium is attained

(a) [reactants] = [products] (b) $K_C = K_P$ (c) $R_f = R_r$ (d) reaction will be stopped

4) For the equilibrium $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ the unit for K_P

(a) atm (b) atm^{-1} (c) atm^2 (d) no unit

5) In an endothermic reversible reaction proceeding with increase in volume which of the following favours forward reaction?

(a) decrease of pressure and decrease of temperature (b) increase of pressure and increase of temperature (c) decrease of pressure and increase of temperature

(d) increase of pressure and decrease of temparature

Part-B

5 x 3 = 15

6) Mention the important uses of ammonia.

7) Give the K_p and K_c values for the formation of HI

8) What is the effect of pressure on the equilibrium $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

9) State the optimum conditions to obtain maximum yield of NH_3 in Haber's process.

10) State the optimum conditions to obtain maximum yield of SO_3 in contact process.

Part-C

6 x 5 = 30

11) How much PCl5 must be added to one litre volume reaction vessel at 250°C in order to obtain a concentration of 0.1 mole of Cl_2, K_C for $PCl5_{\ 5} \rightleftharpoons Cl_5 + Cl_2$ is 0.0414 mol dm^{-3} at 250°C.

12) At 540K, the equilibrium constant Kp for PCl_5 dissociation equilibrium at 1.0 atm is 1.77 atm. Calculate equilibrium constant in molar concentration (Kc) at same temperature and pressure

13) 1 mole of N_2O_4 is taken in a 5 litre flask and allowed to attain the equilibrium $N_2O_4 \rightleftharpoons 2No_2$. At equilibrium 0.5 mol of NO_2 has formed. Calculate K_c for this equilibrium.

14) 0.1 mol dm^{-3} of H_2 , 0.2 mol dm^{-3} of I_2 and 0.2 mol dm^{-3} of HI are taken in a flask and allowed to attain the equilibrium $H_2 + I_2 \rightleftharpoons 2HI$. When equilibrium is established the K_C value is found to be 1 x 10^2 . Predict whether the reaction has taken place in the forward direction or backward direction for the attainment of equilibrium.

15) 2 mole of SO_2 and 2 mole of O_2 are taken in a flask and allowed to attain the equilibrium $2SO_2 + O_2 \rightleftharpoons 2SO_3$. At equilibrium 1 mole of SO_3 is formed. Calculate the total number o moles present at equilibrium.

16) Derive the expression for K_c and K_p for decomposition of PCl_5 .

Part-D

2X10=20

17) a) In an equilibrium the rate constant of the forward reaction and equilibrium constant are given as 2.5X10^{-2} and 4X10^2 respectively. Calculate the rate constant for the reverse reaction.

b) Equal number of moles of H_2 and I_2 are taken in a flask and allowed to attain the equilibrium $H_2 + I_2 \rightleftharpoons 2HI$. At equilibrium 20% of hydrogen get reacted. Calculate K_c for this equilibrium.

	H_2	I_2	HI
Number of moles taken initially	1	1	___
Number of moles reacted at equilibrium (20% of 1 = 0.2)	0.2	0.2	___

18) a) Derive the values of K_p and K_c for the synthesis of hydrogen iodide.

b) Derive the relationship between K_p and K_c

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