Model Question Paper

Chemical Equilibrium - II - Part I

12th Standard

Chemistry

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

I.Answer all the questions.

II.Use blue pen only.

Time : 01:30:00 Hrs

Total Marks : 75

Part-A

5 x 1 = 5

1) State of chemical equilibrium is:

(a) dynamic (b) stationery (c) none (d) both

2) If the equilibrium constants of the following reactions are $2A \rightleftharpoons B$ is K_1 and $B \rightleftharpoons 2A$ is K_2, then

(a) $K_1 = 2K_2$ (b) $K_1 = 1/K_2$ (c) $K_2 = (K_1)^2$ (d) $K_1 = 1/K_2^2$

3) In the reversible reaction $2HI \rightleftharpoons H_2 + I_2$, K_p is

(a) greater than K_c (b) less than K_c (c) Equal to K_c (d) Zero

4) In the equilibrium $N_2(g) + 3H_2 \rightleftharpoons 2NH_3$, the maximum yield of ammonia will be obtained with the process having

(a) low pressure and high temperature (b) low pressure and low temperature (c) high temperature and high pressure (d) high pressure and low temperature

5) For the homogeneous gas reaction at 600 K $4NH_{3_{(g)}} + 5O_{2_{(g)}} \rightleftharpoons 4NO_{(g)} + 6H_2O_{(g)}$ the equilibrium constant K_c has the unit

(a) $\left(mol\ dm^{-3}\right)^{-1}$ (b) $\left(mol\ dm^{-3}\right)$ (c) $\left(mol\ dm^{-3}\right)^{10}$ (d) $\left(mol\ dm^{-3}\right)^{-9}$

Part-B

5 x 3 = 15

6) Dissociation of PCI_5 decreases in presence of increase in CI_2 why?

7) Write the equilibrium constant for the following i) $H_2O_{2_{(g)}} \rightleftharpoons H_2O_{(g)} + 1/2O_{2(g)}$ ii) $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$ iii) $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$

8) State Le Chatelier's principle

9) What is equilibrium constant?

10) Why do equilibrium reactions referred to as dynamic equilibrium?

Part-C

6 x 5 = 30

11) Calculate the K_C, When a mixture containing 8.07 moles of H_2 and 9.08 moles of I_2 are reacted at 448°C until 13.38 moles of HI was formed at the equilibrium.

12) Initially, 0.1 moles each of H_2 and I_2 gases and 0.02 moles of HI gas are mixed in a reaction vessel of constant volume at 300K. Predict the direction towards which the reaction proceeds [Kc = 3.5×10^{-2}].

13) Degree of dissociation of PCl_5 at 1 atm and 25°C is 0.2. Calculate the pressure at which PCl_5 is half dissociated at 25°C.

14) Derive the relation $k_p = k_c(RT)^{\Delta n_g}$ for a general chemical equilibrium reaction.

15) State Le Chatelier's principle. Discuss the effect of pressure, concentration and temperature on the following reaction. $N_{2(g)} + 0_{2(g)} \rightleftharpoons 2NO_{(g)}$

16) Derive the expressions for K_c and K_p for decomposition of PCI_5

Part-D

2X10=20

17) a) The equilibrium constant K_C for A(g) ⇌ B(g) is 2.5×10^{-2}. The rate constant of the forward reaction is 0.05 sec^{-1}. Calculate the rate constant of the reverse reaction.

b) In the equilibrium $H_2 + I_2 \rightleftharpoons 2$ HI the number of moles of H_2, I_2 and HI are 1,2,3 moles respectively. Total pressure of the reaction mixture is 60 atm. Calculate the partial pressures of H_2, I_2 and HI in the mixture.

18) a) Discuss the effect of temperature and pressure on the following equilibrium:

$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$ $\triangle$H =+59.0 kJ/mole.

b) Derive the expression for K_c and K_p for the formation of HI..

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