

Model Question Paper
Chemical Equilibrium - II - Part II

12th Standard

Chemistry

Reg.No. :

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I. Answer all the questions.

II. Use blue pen only.

Time : 01:30:00 Hrs

Total Marks : 70

5 x 1 = 5

Part-A

- 1) Two moles of ammonia gas are introduced into a previously evacuated 1.0 dm^3 vessel in which it partially dissociates at high temperature. At equilibrium 1.0 mole of ammonia remains. The equilibrium constant K_c for the dissociation is
(a) $27/16 (\text{mole dm}^{-3})^2$ (b) $27/8 (\text{mole dm}^{-3})^2$ (c) $27/4 (\text{mole dm}^{-3})^2$ (d) None of these
- 2) An equilibrium reaction is endothermic if K_1 and K_2 are the equilibrium constants at T_1 and T_2 temperatures respectively and if T_2 is greater than T_1 then
(a) K_1 is less than K_2 (b) K_1 is greater than K_2 (c) K_1 is equal to K_2 (d) None
- 3) In the Haber process the yield of ammonia is greater
(a) at high pressure (b) at low pressure (c) at high temperature (d) in absence of catalyst
- 4) Forward reaction takes place, when
(a) $Q < K_c$ (b) $Q > K_c$ (c) $Q = K_c$ (d) $K_c \perp Q$
- 5) Presence of moisture in contact process:
(a) activates the catalyst (b) deactivates the catalyst (c) increase the product (d) makes the catalyst porous

Part-B

5 x 3 = 15

- 6) What happens when $\Delta n_g = 0$, $\Delta n_g = -ve$, $\Delta n_g = +ve$ in a gaseous reaction.
- 7) Calculate Δn_g , for the following reactions i) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ ii) $2H_{2O(g)} + 2Cl_{2(g)} \rightleftharpoons 4HCl_{(g)} + O_{2(g)}$
- 8) Find out the unit for $K_c K_p$ for the below given equilibria i) $H_2 + I_2 \rightleftharpoons 2HI$ ii) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ iii) $2SO_2 + O_2 \rightleftharpoons 2SO_3$ iv) $N_2 + 3H_2 \rightleftharpoons 2NH_3$
- 9) What is the effect of addition of catalyst in an equilibrium?
- 10) What is the effect of concentration on equilibrium?

Part-C

6 x 5 = 30

- 11) In 1 litre volume reaction vessel, the equilibrium constant K_c of the reaction $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ is $2 \times 10^{-4} \text{ lit}^{-1}$. What will be the degree of dissociation assuming only a small extent of 1 mole of PCl_5 has dissociated?
- 12) At temperature T_1 , the equilibrium constant of reaction is K_1 . At a higher temperature T_2 , K_2 is 10% of K_1 . Predict whether the equilibrium is endothermic or exothermic.
- 13) At 35°C , the value of K_p for the equilibrium reaction $N_2O_4 \rightleftharpoons 2NO_2$ is 0.3174, Calculate the degree of dissociation when P is 0.2382 atm.
- 14) State Le Chatelier's principle. Discuss the effect of pressure, concentration and temperature on the following reaction $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$.
- 15) The equilibrium constant of the dissociation equilibrium is the reciprocal of the equilibrium constant of the formation equilibrium. Illustrate with a suitable example.
- 16) Discuss the conditions which favour the formation of ammonia by Haber's process

Part-D

2X10=20

- 17) a) For the equilibrium $2NOCl(g) \rightleftharpoons 2NO(g) + Cl_2(g)$ the value of the equilibrium constant K_c is 3.75×10^{-6} at 790°C . Calculate K_p for this equilibrium at the same temperature.
Hint: $K_p = K_c(RT)^{\Delta n_g}$
- b) For the equilibrium $2SO_3(g) \rightleftharpoons SO_2(g) + O_2(g)$, the value of equilibrium constant is 4.8×10^{-3} at 700°C . At equilibrium, if the concentrations of SO_3 and SO_2 are 0.60M and 0.15M respectively. Calculate the concentration of O_2 in the equilibrium mixture.
- 18) a) Apply Le Chatelier principle to Haber's process of manufacture of ammonia.
- b) Apply Le Chatelier's principle to contact process of manufacture of SO_3 .
