Note:-
1. All Questions are compulsory.
2. Numbers on the right indicate full marks.

Section A

Q.1 Select and write the correct answer. (4)

1. The relation between pH and pOH is ………. .

   A) pH/pOH = 14   B) 14 – pH = pOH
   C) pH × pOH = 14   D) 14/pOH = pH

2. The solubility product of CaF_2 is ………. .

   A) $[Ca^{2+}][2F^-]$ B) $[Ca^{2+}][2F^-]^2$
   C) $[Ca^{2+}][F^-]^2$ D) $[Ca^{2+}][F^-]$

3. The relation between K_c and K_p for the reaction $A_{(g)} + B_{(g)} \rightleftharpoons C_{(g)} + D_{(g)}$ is

   A) $K_c = 1/K_p$ B) $K_p = K_c^2$
   C) $K_c = \dfrac{1}{\sqrt{K_P}}$ D) $\dfrac{K_p}{K_c} = 1$

4. pH of a solution is 4. Its $[H^+]$ is ………. .

   A) 10^{-2} M   B) $1/10^4$ M
   C) 10^{-6} M   D) 10^4 M

Q.2 Answer the following. (3)

1. Define the Term: Reversible reaction.

2. Write an expression for equilibrium constant with respect to concentration.

3. Write the statement of Le-Chatelier's principle.

Section B
Attempt any Four

Q.3   Hydrogen and Iodine vapours are taken in a closed container. Write the reaction to depict the same and answer the following : **(2)**
1. At first, there is increase in violet colour. Why?
2. After certain time the intensity of violet colour stops give reason.

Q.4   The value of K_c for the dissociation reaction $H_{2(g)} \rightleftharpoons 2\ H_{(g)}$ is 1.2 × 10^{-42} at 500 K. Does the equilibrium mixture contain mainly Hydrogen molecules or Hydrogen atoms? **(2)**

Q.5 (1) If NH_3 is added to the equilibrium system, in which direction will the equilibrium shift to **(2)** consume added NH_3 to reduce the effect of stress?

(2) In this process, out of the reactions (reverse and forward reaction), which reaction will occur to a greater extent?

(3) What will be the effect on yield of NH_3?

Q.6 Cosider the following reaction and answer the following questions : **(2)**

$$N_2O_4(g) \leftrightarrow 2NO_2(g)$$

(1) Write the relation between rate of reactions and number of moles.

(2) Effect of pressure on equilibrium

Q.7 Identify homogenous and heterogeneous equilibrium from the following reactions. **(2)**

(1) $2\,HI_{(g)} \longleftrightarrow H_{2(g)} + I_{2(g)}$

(2) $H_2O_{(l)} \longleftrightarrow H_2O_{(g)}$

(3) $N_{2(g)} + 3H_{2(g)} \longleftrightarrow 2\,NH_{3(g)}$

(4) $C_2H_5OH_{(l)} \longleftrightarrow C_2H_5OH_{(g)}$

Q.8 Write expressions of K_c for following chemical reactions : **(2)**

(1) $2\,SO_{2(g)} + O_{2(g)} \rightleftharpoons 2\,SO_{3(g)}$

(2) $N_2O_{4(g)} \rightleftharpoons 2\,NO_{2(g)}$
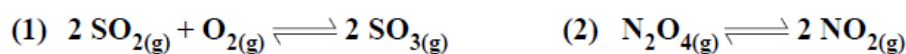
Section C
Attempt any Two

Q.9 Explain dynamic nature of chemical equilibrium with suitable example. **(3)**

Q.10 How does the change of pressure affect the value of equilibrium constant? **(3)**

Q.11 Derive mathematically value of K_p for $A_{(g)} + B_{(g)} \rightleftharpoons C_{(g)} + D_{(g)}$ **(3)**

Section D
Attempt any One

Q.12 State and explain Le Chatelier's principle suitably with reference to **(4)**
(1) Change in temperature   (2) Change in concentration

Q.13 **How are the equilibrium constants of the following pairs of equilibrium reactions** **(4)**
related?

(1)   (a) $CO_{2(g)} + N_{2(g)} \xrightarrow{K_c} CO_{(g)} + N_2O_{(g)}$

(b) $CO_{(g)} + N_2O_{(g)} \xrightarrow{K'_c} CO_{2(g)} + N_{2(g)}$

(2)   (a) $CO_{(g)} + 2H_{2(g)} \xrightarrow{K_p} CH_3OH_{(g)}$

(b) $\frac{1}{2}CO_{(g)} + H_{2(g)} \xrightarrow{K'_p} \frac{1}{2}CH_3OH_{(g)}$