

CBSE TEST PAPER 03
CLASS XI CHEMISTRY (Equilibrium)

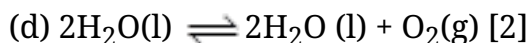
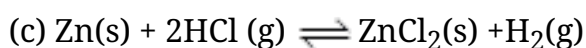
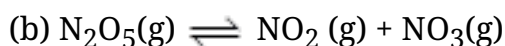
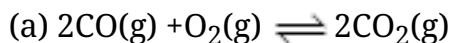
General Instruction:

- All questions are compulsory.
 - Marks are given alongwith their questions.
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1. Give the generalizations concerning the composition of equilibrium mixtures. [3]
2. Define reaction quotient. [1]
3. If $Q_c > K_c$, what would be the type of reaction? [1]
4. What inference you get when $Q_c = K_c$? [1]
5. The value of K_c for the reaction

$2A \rightleftharpoons B + C$ is 2×10^{-3} . At a given time, the composition of the reaction mixture is $[A] = [B] = [C] = 3 \times 10^{-4}$ M. In which direction the reaction will proceed? [2]

6. Write the equilibrium constant expression for each of the following reactions. In each case, indicate which of the reaction is homogeneous or heterogeneous.



7. The dissociation of HI is independent of pressure, while dissociation of PCl_5 depends upon the pressure applied. Why? [2]
8. On what factors does the value of the equilibrium constant of a reaction depend? [2]

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[ANSWERS]

Ans 1. (i) If $K_c > 10^3$, products predominate over reactants i.e; if K_c is very large, the reaction proceeds nearly to completion.

(ii) If $K_c < 10^{-3}$, reactants predominate over products i.e; if K_c is very small, the reaction proceeds rarely.

(iii) If K_c is in the range of 10^{-3} to 10^3 , appreciable concentration of both reactants and products are present.

Ans 2. The reaction quotient, Q is same as equilibrium constant K_c , except that the concentrations in Q_c are not necessarily equilibrium values.

Ans 3. If $Q_c > K_c$, the reaction will proceed in the direction of the reactants (reverse reactions)

Ans 4. If $Q_c = K_c$, the reaction mixture is already at equilibrium.

Ans 5. For the reaction the reaction Q_c is given by

$$Q_c = \frac{[B][C]}{[A]^2}$$

As $[A] = [B] = [C] = 3 \times 10^{-4} \text{M}$

$$Q_c = \frac{(3 \times 10^{-4})(3 \times 10^{-4})}{(3 \times 10^{-4})^2} = 1$$

As $Q_c > K_c$ so the reaction will proceed in the reverse direction.

Ans 6. (a) $K_c = \frac{[CO_2]^2}{[CO]^2 [O_2]}$ (b) $K_c = \frac{[NO_2][NO_3]}{[N_2O_5]}$

(c) $K_c = \frac{[H_2]}{[HCl]^2}$ (d) $K_c = [O_2]$

Homogeneous : a, b

Heterogeneous : c, d

Ans 7. For $2HI \rightleftharpoons H_2 + I_2$

$$K_c = \frac{x^2}{4(1-x)^2}$$

Where x is degree of dissociation



$$K_c = \frac{x^2}{v(1-x)}$$

Where x is degree of dissociation

Since K_c for HI does not have volume terms and thus dissociation of HI is independent of pressure. On the other hand K_c for PCl_5 has volume in denominator and thus an increase in pressure reduces volume. And to have K_c constant, x decrease.

Ans 8. The equilibrium constant of a reaction depends upon

- (i) Temperature
- (ii) Pressure, &
- (iii) Stoichiometry of the reaction