UNIT- 8 – PHYSICAL AND CHEMICAL EQUILIBRIUM

I. Answer in brief (2/3 marks)

1. State Le-Chatelier principle.
2. State law of mass action.
3. When the numerical value of the reaction quotient (Q) is greater than the equilibrium constant (K), in which direction does the reaction proceed to reach equilibrium?
4. If there is no change in concentration, why is the equilibrium state considered dynamic?
5. What is homogeneous and heterogeneous equilibrium?
6. Consider the following reactions,

   a) $H_2(g) + I_2(g) \rightleftharpoons 2\,HI(g)$

   b) $CaCO_3\,(s) \rightleftharpoons CaO\,(s) + CO_2(g)$

   c) $S(s) + 3F_2\,(g) \rightleftharpoons SF_6\,(g)$

   In each of the above reaction find out whether you have to increase (or) decrease the volume to increase the yield of the product.
7. Explain how will you predict the direction of a equilibrium reaction.

II. Answer in a paragraph (5 marks)

1. Derive a general expression for the equilibrium constant KP and KC for the reaction

   $3H_2(g) + N_2(g) \rightleftharpoons 2NH_3(g)$

2. Derive the relation between K_P and K_C.
3. One mole of PCl_5 is heated in one litre closed container. If 0.6 mole of chlorine is found at equilibrium, calculate the value of equilibrium constant.
4. For the reaction $SrCO_3\,(s) \rightleftharpoons SrO\,(s) + CO_2(g)$, the value of equilibrium constant $K_P = 2.2 \times 10^{-4}$ at 1002 K. Calculate K_C for the reaction.
5. Deduce the Vant Hoff equation.
6. The partial pressure of carbon dioxide in the reaction

   $CaCO_3\,(s) \rightleftharpoons CaO\,(s) + CO_2(g)$ is 1.017×10^{-3} atm at 500º C.

   Calculate K_P at 600º C for the reaction. ΔH for the reaction is 181 KJ mol^{-1} and does not change in the given range of temperature.
7. Derive K_p and K_c for the formation equilibrium of HI.
8. Derive K_p and K_c for the dissociation of PCl_5.