CBSE TEST PAPER 04

CLASS XI CHEMISTRY (Equilibrium)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

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1. State Le chatelier's principle. [1]
2. Can a catalyst change the position of equilibrium in a reaction? [1]
3. What is the effect of reducing the volume on the system described below?
2C(s) + O_2 (g) $\rightleftharpoons$2CO(g) [1]
4. Why the addition of inert gas does does not change the equilibrium? [2]
5. What happens when temperature increases for a reaction? [1]
6. The equilibrium constant of a reaction increases with rise in temperature. Is the reaction exo – or endothermic? [2]
7. Can a catalyst change the position of equilibrium in a reaction? [1]
8. If Qc < Kc, when we continuously remove the product, what would be the direction of the reaction? [1]
9. Using Le – chatelier principle, predict the effect of
(a) decreasing the temperature
(b) increasing the temperature
in each of the following equilibrium systems:
(i) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + \Delta$
(ii) $N_2(g) + O_2(g) + \Delta \rightleftharpoons 2NO(g)$ [2]
10. (i) In the reaction equilibrium
A + B $\rightleftharpoons$C +D,
What will happen to the concentrations of A, B and D if concentration of C is increased.
(ii) what will happen if concentration of A is increased? [2]

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[ANSWERS]

Ans 1. It states that a change in any of the factors that determine the equilibrium conditions of a system will cause the system to change in such a manner so as to reduce or to counteract the effect of the change.

Ans 2. No, a catalyst cannot change the position of equilibrium in a chemical reaction. A catalyst, however, affects the rate of reaction.

Ans 3. The forward reaction is accompanied by increase in volume. Hence according to Chatelier's principle, reducing the volume will shift the equilibrium in the forward direction.

Ans 4. It is because the addition of an inert gas at constant volume does not change the partial pressures or the molar concentrations of the substance involved in the reaction.

Ans 5. The equilibrium constant for an exothermic reaction $(\Delta H - ve)$ decreases as the temperature increases.

Ans 6. The equilibrium constant increases with a rise in temperature. Therefore, the reaction is endothermic.

Ans 7. No, a catalyst cannot change the position of equilibrium in a chemical reaction. A catalyst affects the rate of reaction.

Ans 8. Continuous removal of a product maintains Qc at a value less than Kc and reaction continues to move in the forward direction.

Ans 9. (i) For an exothermic reaction increase in temperature shifts the equilibrium to the left and decrease in temperature shifts it to the left.

(ii) For an endothermic reaction increase in temperature shifts the equilibrium to the right and decrease in temperature shifts it to the right.

Ans 10. (i) For an equilibrium reaction
A + B $\rightleftharpoons$ C + D

$$Kc = \frac{[C][D]}{[A][B]}$$

If the concentration of a product is increased, the concentration of other components changes in such a way that the conc of C decreases and vice – versa.
If the conc of C is increased the conc of D will decrease and those of A and B will increase simultaneously so that the numerical value of Kc is the same and vice – versa. The equilibrium shifts to the left.

(ii) If the conc of A is increase, conc of B will decrease and those of C and D will increase simultaneously so that the numerical value of Kc is the same and vice – versa. The equilibrium shifts to the right.