

## Chemistry Practical Class 11 Studying the shift in equilibrium between $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and chloride ions by changing the concentration of either of the ions Viva Questions with Answers

**Q1. What is the law of mass action?**

**Answer.** A chemical substance's rate of reaction is directly proportional to its molar concentration. The product of the molar concentrations of the reacting substances determines the rate of reaction.

**Q2. Define reversible reaction.**

**Answer.** Reversible reactions are those in which the products formed react back to give the reactant molecules.

**Q3. What is chemical equilibrium?**

**Answer.** Chemical equilibrium occurs in a chemical reaction when the rate of the forward reaction equals the rate of the backward reaction.

**Q4. State the chemical equilibrium law.**

**Answer.** At a given temperature, the product of the molar concentrations of the products divided by the product of the molar concentrations of the reactants, each concentration raised to the power equal to its coefficients, is constant for a reversible reaction in equilibrium. This is known as the equilibrium constant.

**Q5. What is equilibrium shift?**

**Answer.** When a system is stressed, it shifts to offset the stress. This means that if we add reactant, equilibrium shifts to the right, away from the reactant. When we add product, equilibrium shifts to the left, away from the product. When we remove the product, the equilibrium returns, resulting in the production of the product.

**Q6. What effect does the concentration of reactants have on the equilibrium?**

**Answer.** When the concentration of any of the reactants is increased, the equilibrium shifts forward.

**Q7. What will be the effect of increasing the temperature of the reaction mixture at equilibrium?**

**Answer.** It reduces the impact of change on the reaction.

**Q8. What change can result in a shift in equilibrium during a reaction?**

**Answer.** Changes in temperature, concentration, and, in some cases, volume and pressure can disrupt equilibrium; volume and pressure changes will disturb equilibrium if the number of moles of gas on the reactant and product sides of the reaction is different.

**Q9. What causes the colour of the cobalt II solution to change when HCl is added?**

**Answer.** When hydrochloric acid is added, the chloride ions shift the equilibrium position toward blue  $[\text{CoCl}_4]^{2-}$  ions and water. The formation of  $[\text{CoCl}_4]^{2-}$  ions is favoured as the concentration of chloride ions in the solution changes as more chloride ions are added.

**Q10. What happens when  $\text{AgNO}_3$  is added to the mixture?**

**Answer.**  $\text{Cl}^-$  is removed from the solution when  $\text{AgNO}_3$  is added. This causes the equation to shift back to the left, and the solution to turn pink once more.

**Q11. What happens when HCl is added to the mixture?**

**Answer.** When HCl is added, the solution contains more  $\text{Cl}^-$ , causing the equilibrium to shift to the right and the solution to turn blue.

**Q12. Can an aqueous solution of sodium chloride replace concentrated HCl?**

**Answer.** No, because adding concentrated hydrochloric acid raises the concentration of chloride ions, causing the equilibrium to shift to the right.

**Q13. Why should the total volume of the solution in each test tube be kept the same?**

**Answer.** The test tubes are filled with the same amount of solution to study the shift in equilibrium and to determine the exact measurement of the reactants added.

**Q14. What is the colour of  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  ions?**

**Answer.** Pink.

**Q15. What is the formula of the complex ion formed when a solution containing  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  ions is treated with hydrochloric acid?**

**Answer.**  $[\text{CoCl}_4]^{2-}$ .

**Q16. What is the colour of  $[\text{CoCl}_4]^{2-}$  ions?**

**Answer.** Blue.

**Q17. Is the exothermic or endothermic reaction between  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  and  $\text{Cl}^-$ ?**

**Answer.** The reaction  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}(\text{aq}) + 4\text{Cl}^-(\text{aq}) \rightarrow [\text{CoCl}_4]^{2-}(\text{aq}) + 6\text{H}_2\text{O}(\text{l})$  is endothermic. As a result, according to Le Chatelier's principle, as the temperature rises, the equilibrium position shifts to the right, forming more blue complex ions at the expense of pink species.

**Q18. What causes equilibrium to shift to the right?**

**Answer.** When the concentration of a reactant is increased, the equilibrium shifts to the right, resulting in more products. When the concentration of a product increases, the equilibrium shifts to the left, resulting in the production of more reactants.