

## Chemistry Practical Class 11 Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing /decreasing the concentration of either of the ions Viva Questions with Answers

**Q1. 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.

**Q2. Describe 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.

**Q3. 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.

**Q4. What happens when potassium ferrocyanide solution is added to a ferric salt solution?**

**Answer.** The Red colour deepens.

**Q5. What will the result of the experiment be?**

**Answer.** Increasing the concentration of either  $\text{Fe}^{3+}$  ion or thiocyanate ion would result in an increase in the concentration of  $\text{Fe}(\text{SCN})^{2+}$  ions.

**Q6. Explain why representing the ionic reaction between ferric and thiocyanate ions as given below-**

$\text{Fe}^{3+}(\text{aq}) + \text{SCN}^{-}(\text{aq}) \rightleftharpoons [\text{Fe}(\text{SCN})]^{2+}(\text{aq})$  is more appropriate in the following form?  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+} + \text{SCN}^{-}(\text{aq}) \rightleftharpoons [\text{Fe}(\text{H}_2\text{O})_5(\text{SCN})]^{2+} + \text{H}_2\text{O}$ .

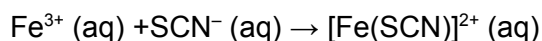
**Answer.** In an aqueous solution,  $\text{Fe}^{3+}$  ions coexist as hexacoordinate ions with water molecules. In the presence of  $\text{SCN}^{-}$  ions, one of the water molecules is replaced as the ligand by  $\text{SCN}^{-}$  ion.

**Q7. What will happen if the temperature of the reaction mixture at equilibrium is raised?**

**Answer.** As the temperature rises, the equilibrium shifts in favour of the endothermic direction.

**Q8. Name the complex formed when thiocyanate ion is added to a ferric salt solution.**

**Answer.** Thiocyanato iron (III) ion. The colour of the complex is blood red.



**Q9. Does the constancy in colour intensity indicate the dynamic nature of equilibrium? Explain your answer with appropriate reasons.**

**Answer.** No, because the colour remains constant even after the reaction reaches equilibrium.

**Q10. What is the equilibrium constant and how does it differ from the rate constant?**

**Answer.** The equilibrium constant is given by

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

The equilibrium constant is independent of the initial concentration of reactants and is a function of temperature but remains constant at a constant temperature.

**Q11. It is always advisable to carry out the present experiment with dilute solutions. Why?**

**Answer.** Diluted solutions are safer to heat and do not cause damage in the lab.

**Q12. What will be the effect of increasing the concentration of ferric ions?**

**Answer.** As the concentration of ferric ions increases, more thiocyanate ions combine with ferric ions to form more  $[\text{Fe}(\text{SCN})]^{2+}$  complex, and thus the colour intensity of red-solution increases. As a result, increasing the concentration of  $\text{Fe}^{3+}$  ions causes the above equilibrium to shift forward.

**Q13. What will be the effect of increasing the concentration of thiocyanate ions?**

**Answer.** More and more thiocyanate is added, resulting in more ferric ions reacting with thiocyanate ions to produce more  $[\text{Fe}(\text{SCN})]^{2+}$  complex. As a result, the red-colour solution's intensity increases. As a result, increasing the concentration of  $\text{SCN}^{-}$  ions causes the above equilibrium to shift forward.

**Q14. What conclusion can you draw from the experiment?**

**Answer.** Increases in the concentration of either of the reactants ( $\text{Fe}^{3+}$  ions or  $\text{SCN}^{-}$  ions) shift the equilibrium forward (towards the right), while decreases in the concentration of any of the reactants shift the equilibrium backward (towards the left).

**Q15. What will be the effect of adding solid potassium chloride to the system at equilibrium?**

**Answer.** The concentration of  $\text{K}^{+}$  ions increases when potassium chloride is added to the red solution. It has an effect on the equilibrium of potassium and thiocyanate ions.

An increase in the concentration of  $\text{K}^{+}$  ions causes the equilibrium to shift backwards. This causes a decrease in the concentration of  $\text{SCN}^{-}$  ions, which shifts the equilibrium backwards.

**Q16. Why boiling tubes of the same size are used in the experiment?**

**Answer.** To get the exact measurement of the solution added for reference.

**Q17. Does temperature effect equilibrium?**

**Answer.** Yes

**Q18. What precautions should be taken while performing the experiment?**

**Answer.** Some precautions that need to be taken while performing the experiment are as follows:

- Use mildly diluted ferric chloride and potassium thiocyanate solutions.
- Keep an eye on the colour of the solutions in the boiling and reference test tubes.
- Use identically sized boiling tubes.

