

# CHAPTER

# Analytical Chemistry

# 31

1. When  $\text{H}_2\text{S}$  is passed through  $\text{Hg}_2\text{S}$  we get [2002]
  - (a)  $\text{HgS}$  (b)  $\text{HgS} + \text{Hg}_2\text{S}$
  - (c)  $\text{Hg}_2\text{S} + \text{Hg}$  (d) None of these.
2. How do we differentiate between  $\text{Fe}^{3+}$  and  $\text{Cr}^{3+}$  in group III? [2002]
  - (a) by taking excess of  $\text{NH}_4\text{OH}$  solution
  - (b) by increasing  $\text{NH}_4^+$  ion concentration
  - (c) by decreasing  $\text{OH}^-$  ion concentration
  - (d) both (b) and (c)
3. Which one of the following statements is correct? [2003]
  - (a) From a mixed precipitate of  $\text{AgCl}$  and  $\text{AgI}$ , ammonia solution dissolves only  $\text{AgCl}$
  - (b) Ferric ions give a deep green precipitate on adding potassium ferrocyanide solution
  - (c) On boiling a solution having  $\text{K}^+$ ,  $\text{Ca}^{2+}$  and  $\text{HCO}_3^-$  ions we get a precipitate of  $\text{K}_2\text{Ca}(\text{CO}_3)_2$
  - (d) Manganese salts give a violet borax bead test in the reducing flame
4. The compound formed in the positive test for nitrogen with the Lassaigne solution of an organic compound is [2004]
  - (a)  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$  (b)  $\text{Na}_3[\text{Fe}(\text{CN})_6]$
  - (c)  $\text{Fe}(\text{CN})_3$  (d)  $\text{Na}_4[\text{Fe}(\text{CN})_5\text{NOS}]$
5. 29.5 mg of an organic compound containing nitrogen was digested according to Kjeldahl's method and the evolved ammonia was absorbed in 20 mL of 0.1 M  $\text{HCl}$  solution. The excess of the acid required 15 mL of 0.1 M  $\text{NaOH}$  solution for complete neutralization. The percentage of nitrogen in the compound is [2010]
  - (a) 59.0 (b) 47.4
  - (c) 23.7 (d) 29.5
6. For the estimation of nitrogen, 1.4 g of an organic compound was digested by Kjeldahl method and the evolved ammonia was absorbed in 60 mL of  $\frac{M}{10}$  sulphuric acid. The unreacted acid required 20 mL of  $\frac{M}{10}$  sodium hydroxide for complete neutralization. The percentage of nitrogen in the compound is: [2014]
  - (a) 6% (b) 10%
  - (c) 3% (d) 5%

Answer Key													
1	2	3	4	5	6								
(c)	(b)	(a)	(a)	(c)	(b)								

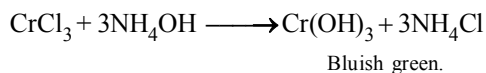
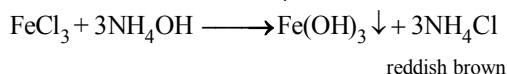
## SOLUTIONS

1. (c) When  $\text{H}_2\text{S}$  is passed through  $\text{Hg}_2\text{S}$  we get a mixture of mercurous sulphide and mercury ( $\text{Hg}_2\text{S} + \text{Hg}$ ).

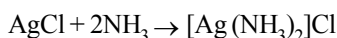
2. (b) When we add  $\text{NH}_4\text{Cl}$ , it suppresses the ionisation of  $\text{NH}_4\text{OH}$  and prevents the precipitation of higher group hydroxide in gp(III).



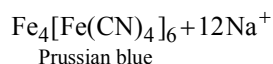
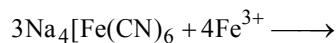
**NOTE** Further ferric chloride and chromium chloride form different colour precipitates with  $\text{NH}_4\text{OH}$ .



3. (a) Between  $\text{AgCl}$  and  $\text{AgI}$ ,  $\text{AgI}$  is less soluble, hence ammonia can dissolve ppt. of  $\text{AgCl}$  only due to formation of complex as given below:



4. (a) Prussian blue  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$  is formed in lassaigne test for nitrogen.



5. (c) Moles of  $\text{HCl}$  taken  $= 20 \times 0.1 \times 10^{-3}$   
 $= 2 \times 10^{-3}$

Moles of  $\text{HCl}$  neutralised by  $\text{NaOH}$  solution  
 $= 15 \times 0.1 \times 10^{-3} = 1.5 \times 10^{-3}$

Moles of  $\text{HCl}$  neutralised by ammonia  
 $= 2 \times 10^{-3} - 1.5 \times 10^{-3}$   
 $= 0.5 \times 10^{-3}$

$$\% \text{ of nitrogen} = \frac{1.4 \times N \times V}{\text{w.t. of Substance}} \times 100$$

$$= \frac{1.4 \times 0.5 \times 10^{-3}}{29.5 \times 10^{-3}} \times 100$$

$$= 23.7\%$$

6. (b)  $\% \text{ of N} = \frac{1.4 \times \text{meq. of acid}}{\text{mass of organic compound}}$

$$\text{meq. of } \text{H}_2\text{SO}_4 = 60 \times \frac{M}{10} \times 2 = 12$$

$$\text{meq. of } \text{NaOH} = 20 \times \frac{M}{10} = 2$$

$$\therefore \text{meq. of acid consumed} = 12 - 2 = 10$$

$$\therefore \% \text{ of N} = \frac{1.4 \times 10}{1.4} = 10\%$$