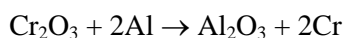


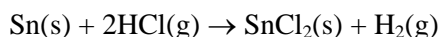
Core Worksheet 2 – Chapter 1

- 1** Chromium can be produced by the reduction of chromium(III) oxide with aluminium:



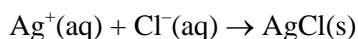
- a** What mass of aluminium is required for exact reaction with 20.0 kg of Cr_2O_3 ? [3]
- b** What mass of chromium is produced when 1.00 kg of chromium(III) oxide reacts with excess aluminium? [3]

- 2** Tin(II) chloride may be prepared by passing hydrogen chloride gas over heated tin:



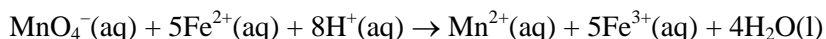
When 5.00 g of tin is reacted with excess hydrogen chloride, 7.46 g of SnCl_2 is obtained. What is the percentage yield of SnCl_2 ? [3]

- 3** When silver nitrate is reacted with solutions containing chloride ions, insoluble silver chloride is precipitated:



- a** What mass of silver chloride is precipitated when 20.0 cm³ of 0.100 mol dm⁻³ sodium chloride solution is reacted with excess silver nitrate solution? [3]
- b** What mass of silver chloride is precipitated when 25.0 cm³ of 0.0600 mol dm⁻³ silver nitrate solution is added to 20.0 cm³ of 0.100 mol dm⁻³ sodium chloride solution? [5]
- c** What mass of silver chloride is precipitated when 30.0 cm³ of 0.0800 mol dm⁻³ silver nitrate solution is added to 20.0 cm³ of 0.0800 mol dm⁻³ $\text{CaCl}_2(\text{aq})$? [6]
- d** 0.0100 mol of a metal chloride (MCl_x) is dissolved in water then reacted with excess silver nitrate solution. The mass of silver chloride precipitated was 4.30 g. Determine the value of x . [2]
- e** 1.45 g of a mixture of sodium chloride and potassium chloride is dissolved in water and made up to a total volume of 250.0 cm³. Excess 0.100 mol dm⁻³ silver nitrate solution is added to 25.00 cm³ of this solution. 0.325 g of AgCl is precipitated. Determine the percentage NaCl and KCl in the original mixture. [6]

- 4** Potassium manganate(VII) may be used to determine the concentration of iron(II) (Fe^{2+}) ions in solution. The ionic equation for the reaction is:



- a** A solution of iron(II) ammonium sulfate is made up by dissolving 9.10 g of $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ in dilute sulfuric acid and making up the total volume to 250.0 cm³. 25.00 cm³ of this solution is titrated against a solution of potassium manganate(VII). An average of 21.50 cm³ of potassium manganate(VII) solution was required for complete reaction. Work out the concentration of the potassium manganate(VII) solution. [4]

- b** 1.21 g of iron wire is heated with sulfuric acid to convert the iron to $\text{Fe}^{2+}(\text{aq})$. The solution is transferred to a volumetric flask and made up to a total volume of 250.0 cm^3 . 25.00 cm^3 of this solution is titrated against $0.02000 \text{ mol dm}^{-3}$ potassium manganate(VII) solution. 21.30 cm^3 of potassium manganate(VII) is required for exact reaction. Determine the percentage iron in the iron wire. [5]
- c** 5.00 g of hydrated iron(II) sulfate ($\text{FeSO}_4 \cdot x\text{H}_2\text{O}$) is dissolved in dilute sulfuric acid and made up to a total volume of 250.0 cm^3 . 25.00 cm^3 of this solution is titrated against $0.0200 \text{ mol dm}^{-3}$ potassium manganate(VII). 22.30 cm^3 of potassium manganate(VII) was required for complete reaction. Determine the number of moles of water of crystallisation in $\text{FeSO}_4 \cdot x\text{H}_2\text{O}$. [8]
- 5** Back titration is a technique in which excess of a reagent is added and the amount of reagent left over determined by titration.
- 2.20 g of impure calcium carbonate was reacted with 50.0 cm^3 of 2.00 mol dm^{-3} hydrochloric acid (excess). The solid impurities were filtered off and the remaining solution made up to a total volume of 250.0 cm^3 using distilled water. 25.00 cm^3 of this solution was titrated against $0.240 \text{ mol dm}^{-3}$ sodium hydroxide solution and required 24.10 cm^3 for neutralisation.
- Determine the percentage purity of the calcium carbonate. [8]