

Exercise 1.56 – Other titrations

Q156-01 Calculate the volume of 0.2 mol dm^{-3} potassium iodide needed to react fully with 20cm^3 of 0.1 mol dm^{-3} chlorine solution.

Q156-02 Calculate the volume of 0.2 mol dm^{-3} potassium permanganate solution needed to react fully with 10cm^3 of 0.5 mol dm^{-3} iron II sulphate solution.

Q156-03 Calculate the volume of 0.1 mol dm^{-3} sodium thiosulphate solution needed to completely decolourise a 25cm^3 solution of 0.2 mol dm^{-3} iodine.

Q156-04 Calculate the volume of 0.15 mol dm^{-3} sodium chloride solution needed to completely precipitate the silver ions from a 25cm^3 of 0.05 mol dm^{-3} silver nitrate solution.

Q156-05 Silver ions can be precipitated by thiocyanate ions, SCN^- , using for example, potassium thiocyanate solution. Calculate the volume of 0.02 mol dm^{-3} potassium thiocyanate (KSCN) solution needed to completely precipitate the silver ions from a 10cm^3 of 0.1 mol dm^{-3} silver nitrate solution.

Q156-06 0.767g of a chloride of phosphorus was dissolved in water and the solution made up to 250cm^3 in a volumetric flask. A 25cm^3 aliquot (portion) of this solution required 18.4 cm^3 of a $0.100 \text{ mol dm}^{-3}$ solution of silver nitrate for complete precipitation of the chloride ions. Calculate the empirical formula of the phosphorus chloride. [$A^r \text{ Cl}=35.5$; $\text{P}=31$]

Q156-07 25cm^3 of an unknown iron II sulphate solution required 18.6cm^3 of a 0.02 mol dm^{-3} solution of potassium manganate (VII) for complete reaction. Calculate the molarity of the iron II sulphate.

Q156-08 Hydrogen peroxide reacts with potassium manganate (VII) according to the following equation:



25cm^3 of unknown solution of hydrogen peroxide bought in the pharmacy was diluted to 250cm^3 in a volumetric (graduated) flask and 25cm^3 of this solution titrated against 0.02 mol dm^{-3} potassium manganate (VII) solution in dilute sulphuric acid (to provide the hydrogen ions). 12.1 cm^3 was required to for complete reaction. Calculate the concentration of the original pharmaceutical hydrogen peroxide.

Exercise 1.56 – Other titrations

Q156-09 Calcium ions can be determined by precipitation of the ethandioate according to the equation:



The solid may then be filtered off, washed and ethandioic acid regenerated by the addition of excess sulphuric acid. The amount of ethandioic acid is then found by titration using potassium manganate (VII) according to the equation:



In an experiment to find the concentration of calcium ions 100cm^3 of an unknown calcium hydrogen carbonate solution was reacted with excess sodium ethandioate and the calcium ethandioate precipitate collected, washed and dried. Excess dilute sulphuric acid was added to this precipitate with stirring until it had all dissolved and the solution made up to 250cm^3 with distilled water in a volumetric (graduated) flask. A 25cm^3 portion of this solution required 10.5cm^3 of 0.02mol dm^{-3} potassium manganate (VII) solution for complete reaction. Calculate the concentration of the original calcium hydrogen carbonate solution.

Q156-10 Iodine monochloride is used to find the number of double bonds in an unsaturated organic oils - "the iodine index" - actually quoted as the number of grams of iodine required per 100g of unsaturated oil. 0.127g of an unsaturated oil was treated with 25cm^3 of 0.1mol dm^{-3} iodine monochloride solution. After the reaction reached completion, the unreacted iodine monochloride was treated with potassium iodide solution liberating iodine according to the equation:



The iodine liberated reacted completely with 40cm^3 of 0.1mol dm^{-3} sodium thiosulphate solution. Given that 1 mole of ICl is equivalent to 1 mole of I_2 , calculate the iodine index of the oil.
