Practice exam questions for Chapter 2: Volumetric analysis (Paper saver version)

Question 1 (Bursary 2000 Question 8)

Redox titrations

0.0412 g of oxalic acid dihydrate is dissolved in 25.00 mL water. If 24.36 mL of a potassium permanganate solution is required to reach the equivalence point in the titration of the dissolved oxalic acid, what is the concentration of the potassium permanganate? $M(H_2C_2O_4.2H_2O) = 126$ g mol^{-1}

The balanced equation for the reaction is:

$$5H_2C_2O_4(aq) + 6H^+(aq) + 2MnO_4^-(aq) \rightarrow 10CO_2(g) + 2Mn^{2+}(aq) + 8H_2O(l)$$ A M E

Question 2 (Bursary 2002 Question 9)

Hypochlorite solution

A dentist uses a 2% hypochlorite solution to clean out a root canal after drilling and before the filling is inserted. The following procedure was used to determine the concentration of an unknown hypochlorite solution.

The original solution was diluted by taking 25 mL and diluting to 250 mL. 20 mL samples of the diluted solution were reacted with an excess of iodide ions. The amount of iodine produced was determined by titration with standard sodium thiosulfate solution. The balanced equations for the reactions occurring are shown below:

$$OCl^-(aq) + 2I^-(aq) + 2H^+(aq) \rightarrow I_2(aq) + Cl^-(aq) + H_2O(l)$$

$$I_2(aq) + 2S_2O_3^{2-}(aq) \rightarrow S_4O_6^{2-}(aq) + 2I^-(aq)$$

The average volume of 0.100 mol L^{-1} thiosulfate solution used to reach equivalence point was 9.25 mL.

Starch indicator was used for the titration.

a What colour change occurs at the end point of the titration? A

b Calculate the concentration of the OCl^- in the **undiluted** solution. A M E

c Observations of students carrying out the titration experiment are recorded in the table below.

Complete the table by marking the procedure as correct (✓) or incorrect (✗). Give a reason for each decision (✓or ✗). A M

Procedure	**Correct (✓) or Incorrect (✗)**	**Reason**
The burette was washed out with sodium thiosulfate solution before filling up for the titration.		
The conical flask into which the hypochlorite samples were pipetted was first washed out with hypochlorite solution.		
The hypochlorite solution was diluted by adding 25 mL to 250 mL of distilled water in a volumetric flask.		