Chemistry III

015

30/11/ 2017   08.30 AM - 11.30 AM

REB

Rwanda Education Board

ADVANCED LEVEL NATIONAL EXAMINATIONS, 2017

SUBJECT: CHEMISTRY

PAPER III: CHEMISTRY PRACTICAL

COMBINATIONS:
- PHYSICS-CHEMISTRY-MATHEMATICS   (PCM)
- PHYSICS-CHEMISTRY-BIOLOGY   (PCB)
- MATHEMATICS-CHEMISTRY-BIOLOGY   (MCB)
- BIOLOGY-CHEMISTRY-GEOGRAPHY   (BCG)

DURATION: 1Hour 30 minutes

INSTRUCTIONS TO CANDIDATES:

1) Write your names and index number on the **answer booklet cover** as written on your registration form.

2) Do not open this question paper until you are told to do so.

3) This paper consists of **one question**.   **(25marks)**

4) Please read carefully before you start and make sure that you have **all the apparatus and chemicals** that you may need.

5) Answer the question in this paper and record your answers in the spaces provided.

6) Non-programmable scientific calculators may be used.

7) Use only a **blu**e or **blac**k pen.

You are provided with the following:

- **FA₁** which is 0.1 M sodium sulphite Na_2SO_3 solution.
- **FA₂** solution containing hydrated sodium thiosulphate which is $Na_2S_2O_3.nH_2O$ of 24.80 g.dm⁻³ concentration by mass.
- **FA₃** which is 0.1M iodine solution.
- Solid sodium hydrogen carbonate, $NaHCO_3$.
- Starch solution.
  (Atomic mass: S= 32, O= 16, H=1, Na=23)

Theory:

a) SO_3^{2-} are oxidized by iodine to SO_4^{2-}, in the presence of HCO_3^-, according to the equation:

$$SO_3^{2-}(aq) + I_2(aq) + 2HCO_3^-(aq) \rightarrow SO_4^{2-}(aq) + 2I^-(aq) + H_2O(l) + 2CO_2(g)$$

b) Sodium thiosulphate ions $S_2O_3^{2-}$ reduce iodine to iodide ions, forming tetrathionate ions, $S_4O_6^{2-}$.

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

PROCEDURE.

1. Pipette 25.0 cm³ of **FA₃** into a conical flask and add 10cm³ of **FA₂** and 1.0g of solid sodium hydrogen carbonate to the mixture then shake well.
2. Titrate the excess iodine by **FA₁** solution from the burette using starch indicator (five drops).
3. Record your results in the table below:

Volume of the pipette used: ....cm³   **(1mark)**

	Titration1	Titration 2	Titration 3
Final burette readings (cm³)			
Initial burette readings (cm³)			
Volume of FA₁(cm³)			

(6 marks)

The average volume of FA₁ used =   **(1mark)**

YOU ARE REQUIRED TO:

a) Calculate the number of moles of iodine contained in $25.0 \ cm^3$ of 0.1 M iodine solution.   **(2marks)**

b) Calculate the number of moles of sulphite ions that reacted with excess iodine.   **(2marks)**

c) Determine the mole ratio of SO_3^{2-} to I_2.   **(1mark)**

$SO_3^{2-} : I_2 =$

d) Calculate the number of moles of excess iodine that reacted with **FA₁**.   **(2marks)**

e) Calculate the number of moles of iodine that reacted with $S_2O_3^{2-}$.   **(2marks)**

f) Determine the mole ratio of $S_2O_3^{2-}$ to I_2. **(1mark)**

$S_2O_3^{2-} : I_2 =$

g) Calculate the number of moles of $S_2O_3^{2-}$ that reacted with iodine, I_2. **(1mark)**

h) Calculate the molar concentration of **FA₂**: **(2marks)**

i) Calculate the relative molar mass of $Na_2SO_3.nH_2O$, knowing that: **(2marks)**

Molar concentration of **FA₂**= concentration (g/dm^3)/Relative molar mass.

j) Determine the value of **n**: **(2marks)**