CHEMISTRY III

015

21/11/2019 8:30 AM – 10:00 AM

REB
Rwanda Education Board

ADVANCED LEVEL NATIONAL EXAMINATIONS, 2019

SUBJECT: CHEMISTRY

PAPER III: PRACTICAL

COMBINATIONS:

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

DURATION: 1 hour 30 minutes

INSTRUCTIONS:

1) Write your names and index number on the answer booklet as written on your registration form and **DO NOT** write your names and index number on additional answer sheets of paper if provided.
2) Please read carefully before you start and make sure that you have all the apparatus and chemicals that you may need.
3) This paper consists of **one question**.
4) Answer the question in this paper and record your answers in the spaces provided.
5) Non-programmable scientific calculators may be used.
6) Use only a **blue** or **black** pen.

PRACTICAL: IODOMETRY TITRATION.

*(Reaction of **thiosulphate ions** with **iodine** produced from the oxidation of **iodide ions** by **iodate ions** in HCl acid).*

PROCEDURE:

i) Pour 25 ml of **FA1** which is a 0.06mole/litre solution of KI (potassium iodide) in a conical flask/beaker at room temperature (25^0 C) using a 50 ml measuring cylinder.

ii) Add 10ml of a 0.2 mole/litre HCl (hydrochloric acid) solution to the KI solution in the conical flask/beaker to acidify it using the measuring cylinder.

iii) iii) Measure 25 ml of **FA2** which is a 0.01 mole/litre solution of KIO_3 (potassium iodate) using a pipette then add it to the acidified KI solution in the conical flask/beaker.

iv) Fill the burette (fixed on the retort stand) with the solution of **FA3** which is $Na_2S_2O_3.xH_2O$ (hydrated sodium thiosulphate) using a beaker and a filter funnel.

v) Titrate (add)12 ml of $Na_2S_2O_3.xH_2O$ solution in the resultant acidified red solution of KIO_3 and KI in the conical flask/beaker.

vi) Then put 5 drops of starch solution in the red solution of KIO_3 and KI in the conical flask/beaker.

vii) Continue the titration of $Na_2S_2O_3.xH_2O$ until the blue-black colour of starch disappears (solution becomes colourless).

viii) Record the volume of titrated (used) $Na_2S_2O_3.xH_2O$ solution in the table of results on page 3.

ix) Repeat the experiment **procedures i) to viii) 3 times** to get consistent results.

TABLE OF RESULTS No volume found **(12 marks)**

Experiment	**1**	**2**	**3**	**4**
Final volume of FA3 ($Na_2S_2O_3.xH_2O$) (ml)				
Initial volume of FA3 ($Na_2S_2O_3.xH_2O$) (ml)				
Volume of FA3 ($Na_2S_2O_3.xH_2O$) (ml)				

Equations of the reactions:

$$IO_3^-{}_{(aq)} + 5I^-{}_{(aq)} + 6H^+{}_{(aq)} \rightarrow 3I_{2\,(aq)} + 3\,H_2O_{\,(l)}$$

$$3I_{2\,(aq)} + 6S_2O_3^{2-}{}_{(aq)} \rightarrow 6I^-{}_{(aq)} + 3S_4O_6^{2-}{}_{(aq)}$$

Questions:

a) Calculate the average volume of $Na_2S_2O_3.xH_2O$ used. **(2 marks)**

b) Calculate the number of moles of IO_3^- in 25 ml of the solution. **(2 marks)**

c) Determine the number of moles of I_2 produced from the reaction. **(2 marks)**

d) Calculate the number of moles of $S_2O_3^{2-}$ that reacted with the I_2 (iodine) produced. **(2 marks)**

e) Calculate the molarity of $S_2O_3^{2-}$. **(2 marks)**

f) Determine the value of **x** (number of moles of water of crystallization) in the formula **if 12.4 g of $Na_2S_2O_3.xH_2O$ was dissolved to make 1 litre of solution.**

(Atomic mass: Na = 23, S=32, O=16, H=1) **(3marks)**