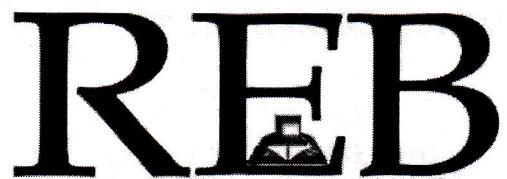


**CHEMISTRY III**

**015**

**21/11/2019      8:30 AM – 10:00 AM**



**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:**

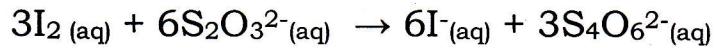
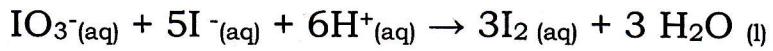
- i) Pour 25 ml of **FA1** which is a 0.06mole/litre solution of KI (potassium iodide) in a conical flask/beaker at room temperature ( $25^{\circ}\text{C}$ ) using a 50 ml measuring cylinder.
- ii) Add 10ml of a 0.2 mole/litre HCl (hydrochloric acid) solution to the KI solution in the conical flask/beaker to acidify it using the measuring cylinder.
- iii) Measure 25 ml of **FA2** which is a 0.01 mole/litre solution of  $\text{KIO}_3$  (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  $\text{Na}_2\text{S}_2\text{O}_3 \cdot x\text{H}_2\text{O}$  (hydrated sodium thiosulphate) using a beaker and a filter funnel.
- v) Titrate (add) 12 ml of  $\text{Na}_2\text{S}_2\text{O}_3 \cdot x\text{H}_2\text{O}$  solution in the resultant acidified red solution of  $\text{KIO}_3$  and KI in the conical flask/beaker.
- vi) Then put 5 drops of starch solution in the red solution of  $\text{KIO}_3$  and KI in the conical flask/beaker.
- vii) Continue the titration of  $\text{Na}_2\text{S}_2\text{O}_3 \cdot x\text{H}_2\text{O}$  until the blue-black colour of starch disappears (solution becomes colourless).
- viii) Record the volume of titrated (used)  $\text{Na}_2\text{S}_2\text{O}_3 \cdot x\text{H}_2\text{O}$  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)**

<b>Experiment</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Final volume of FA3 (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> .xH <sub>2</sub> O) (ml)				
Initial volume of FA3 (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> .xH <sub>2</sub> O) (ml)				
Volume of FA3 (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> .xH <sub>2</sub> O) (ml)				

**Equations of the reactions:****Questions:**

a) Calculate the average volume of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>.xH<sub>2</sub>O used. **(2 marks)**

b) Calculate the number of moles of IO<sub>3</sub><sup>-</sup> 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  $Na_2S_2O_3 \cdot xH_2O$  was dissolved to make 1 litre of solution.

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

(3marks)