Name: .... Index No:................................

Signature: .... School ....

545/3
CHEMISTRY
Paper 3
July/Aug. 2023
2 hours

UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Certificate of Education

CHEMISTRY PRACTICAL

Paper 3

2 hours

INSTRUCTIONS TO CANDIDATES:

*Answer **all** questions. Use **blue** or **black** ball point pen. Any work done in pencil will **not** be marked except drawings.*

Record your answers on this question paper on the spaces provided.

Mathematical tables and silent non-programmable calculator may be allowed

Reference books (i.e. text books, booklets and qualitative analysis etc.) should not be used.

*Candidates are not allowed to start working with the apparatus for the first **15 minutes**. This time is to enable candidates read the question paper and make sure they have all the apparatus and chemicals that they may need.*

Q.1	Q.2	Total

Turn Over

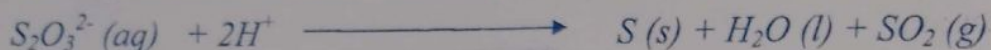1. **You are provided with the following:**

   BA1, which is sodium thiosulphate solution

   BA2, which is hydrochloric acid solution

   You are required to determine the rate of reaction between the acid and sodium thiosulphate

   Theory:

   Thiosulphate reacts with acid according to the following equation

   $$S_2O_3^{2-} \, (aq) \; + 2H^+ \longrightarrow S \, (s) + H_2O \, (l) + SO_2 \, (g)$$

   Procedure

   (a) Mark a cross with a blue pen on a white sheet of paper

   (b) Measure 50 cm³ of **BA1** into a conical flask placed on a white sheet of paper marked with a cross.

   (c) Add 10 cm³ of **BA2** and immediately start the clock, shake the mixture gently.

   (d) Observe the cross through the solution from above the conical flask. Stop the clock and record the time taken for the cross to disappear.

   (e) Pour away the mixture and wash the conical flask.

   (f) Measure 40 cm³ of **BA1** into the conical flask; add 10 cm³ of distilled water followed by 10 cm³ of **BA2**. Immediately start the stop clock and again note the time for the cross to disappear.

   (g) Repeat the experiment (f) using 30 cm³, 20 cm³ and 10 cm³ of BA1 and adding water to make 50 cm³ of the solution followed by addition of 10 cm³ in each case as indicated in the table below.

   Table of results

Volume of **BA1** (cm³)	50	40	30	20	10
Volume of water (cm³)	0	10	20	30	40
Volume of **BA2** (cm³)	10	10	10	10	10
Time (seconds)					

   (10 marks)

   Questions

   (a) Plot a graph of volume of **BA1** (cm³) against time (seconds) (8 marks)
   (Fix a graph paper)

2
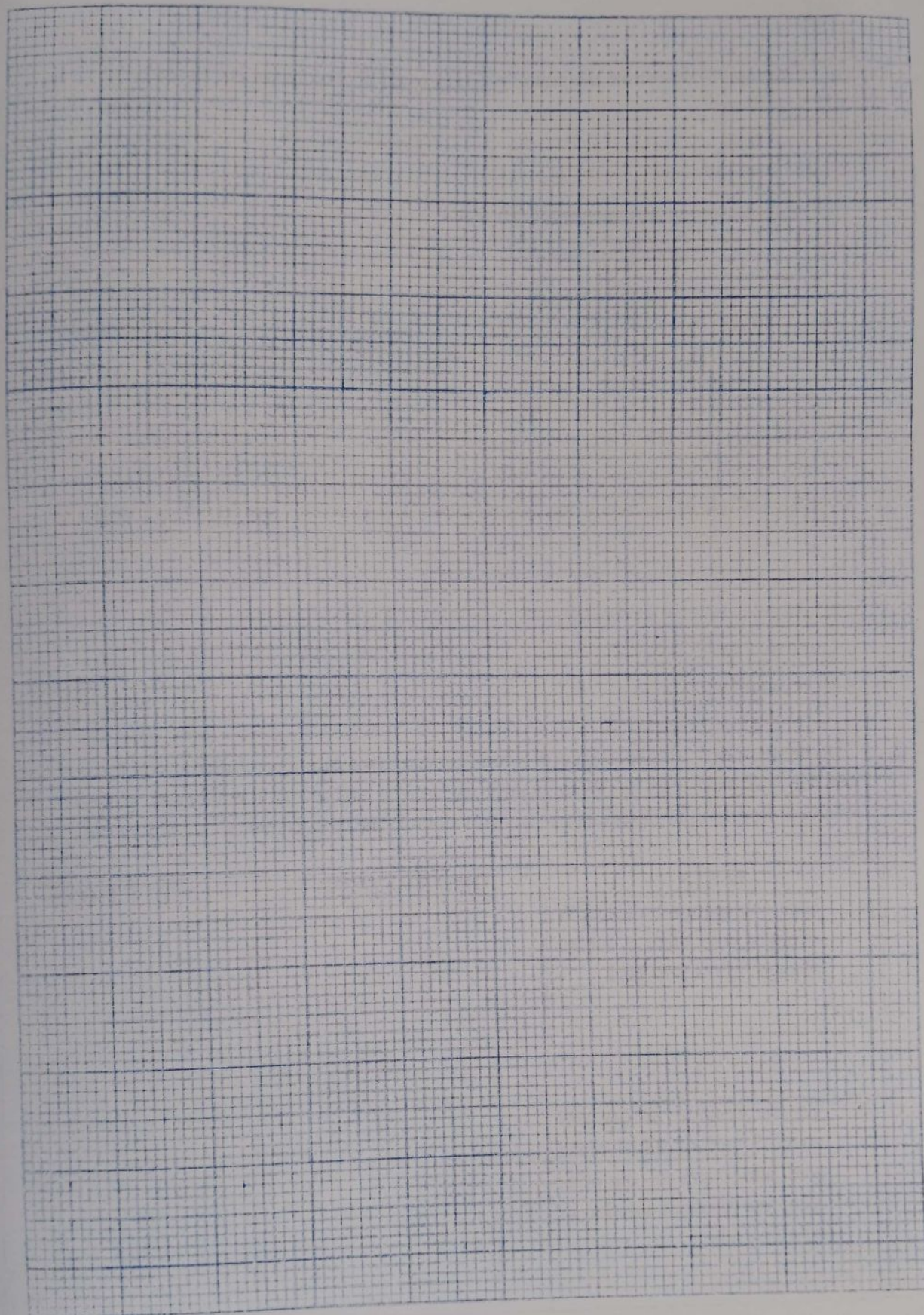
(b) Use the graph to determine the rate of reaction when the volume of BA1 used is;

    (i) $30 \, cm^3$ (3 marks)

....

....

....

....

    (ii) $20 \, cm^3$ (3 marks)

....

....

....

(c) Compare the rate of reaction when the volume of BA1 is $30 \, cm^3$ and $20 \, cm^3$. (1 mark)

....

....

....

....

2. You are provided with substance **W** which contains **two** cations and **one** anion. Carry out the following tests on **W** to identify the cations and anion. Identify any gas(es) evolved. Record your observations and deductions in the table below: (25 marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat **one** spatula endful of **W** strongly until there is further change. Allow it to cool		
(b) To the residue in (a) add about $5 \, cm^3$ of dilute nitric acid and warm to dissolve. Keep the resultant solution in a boiling tube.		

(i) To about 0.5 cm^3 portion from the resultant solution add sodium hydroxide drop wise until in excess		
(ii) To the second 0.5 cm^3 portion add ammonia solution drop wise until in excess		
(iii) To the third 0.5 cm^3 portion add 2-3 drops of potassium iodide solution		
(c) To the remaining solution in (b), in the boiling tube, add ammonia solution drop wise until in excess. Filter and keep the filtrate		
(d) To the filtrate add dilute nitric acid drop wise until the solution is just acidic. Divide the acidic solution into two parts		
(e) (i) To the first part of the acidic solution add sodium hydroxide solution drop wise until in excess		
(ii) To the second part of acidic solution add ammonia solution drop wise until in excess		

(e). (i) Cations in **W**...and ....

    (ii) Anion in **W**:...

END

Each candidate should be provided with the following

2 measuring cylinders

1 conical flask

6 test tubes

1 boiling tube

1 Filter paper

1 Stop clock

1 Thermometer

160 cm^3 of **BA1**

60 cm^3 of **BA2**

2g of **W**

Easy access to common laboratory reagents for identifying cations and anions

BA1 is prepared by dissolving **30g** of **sodium thosulphate** in water to make **1 litre** of solution

BA2 is **0.5M** hydrochloric acid

W is a mixture **of Pb (NO_3)$_2$** and **ZnO** in a ratio of **2:3** respectively