

NAME: ..... INDEX NO: .....

SCHOOL: ..... ADM NO: .....

## MUSLIM SCHOOLS JOINT EXAMINATIONS (MUSJET)

*Kenya Certificate of Secondary Education (K.C.S.E)*

233/3

CHEMISTRY

PAPER 3

JULY – 2024

TIME: 2 ¼ HRS

Instructions to candidates:

- Answer **all** the questions in the spaces provided.
- Write your **name** and **index number** in the spaces provided above.
- You are not allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you needed.
- Mathematical tables and electronic calculators may be used for calculations.
- All workings **must** be clearly shown where necessary.

For examiner's use only

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	21	
2	9	
3	10	
Total Score	40	

## **QUESTION 1 (20 MARKS)**

You are provided with:

- Solution A, containing copper (II) ions
- Solution B, 0.1M sodium thiosulphate
- Aqueous potassium iodide, solution C
- Starch indicator, solution E

You are required to determine the:

- Concentration of copper (II) ions in solution A.
- Enthalpy change of reaction between copper (II) ions and hydroxide ions.

### **PROCEDURE I**

- Using a pipette and pipette filter, place  $25.0\text{cm}^3$  of solution A in a 250ml volumetric flask. Add distilled water to make up to the mark. Label this as solution A<sub>2</sub>. Retain solution A for use in procedure II.
- Place solution B in a burette. Using a clean pipette and pipette filler, place  $25\text{cm}^3$  of solution A<sub>2</sub> in a 250ml conical flask. Add  $10\text{cm}^3$  of potassium iodide, solution C. Shake well, then add  $2\text{cm}^3$  of starch indicator, solution E.  
Titrate until a blue black colour appears and continue until the blue black colour just disappears (white colour just forms)  
Record your readings in Table I below.
- Repeat step (b) two more times and complete table I

**Table I**

<b>Titration</b>	<b>I</b>	<b>II</b>	<b>III</b>
Final burette reading ( $\text{cm}^3$ )			
Initial burette reading ( $\text{cm}^3$ )			
Volume of solution B used ( $\text{cm}^3$ )			

Calculate:

- The average volume of solution B used. (1mk)  
.....
- Moles of sodium thiosulphate used; (1mk)  
.....

- (iii). Concentration in moles per litre of copper (II) ions in solution A given that the number of moles of copper (II) ions in  $25.0\text{cm}^3$  of solution A<sub>2</sub> are the same as the same as the moles of sodium thiosulphate used. (3mks)

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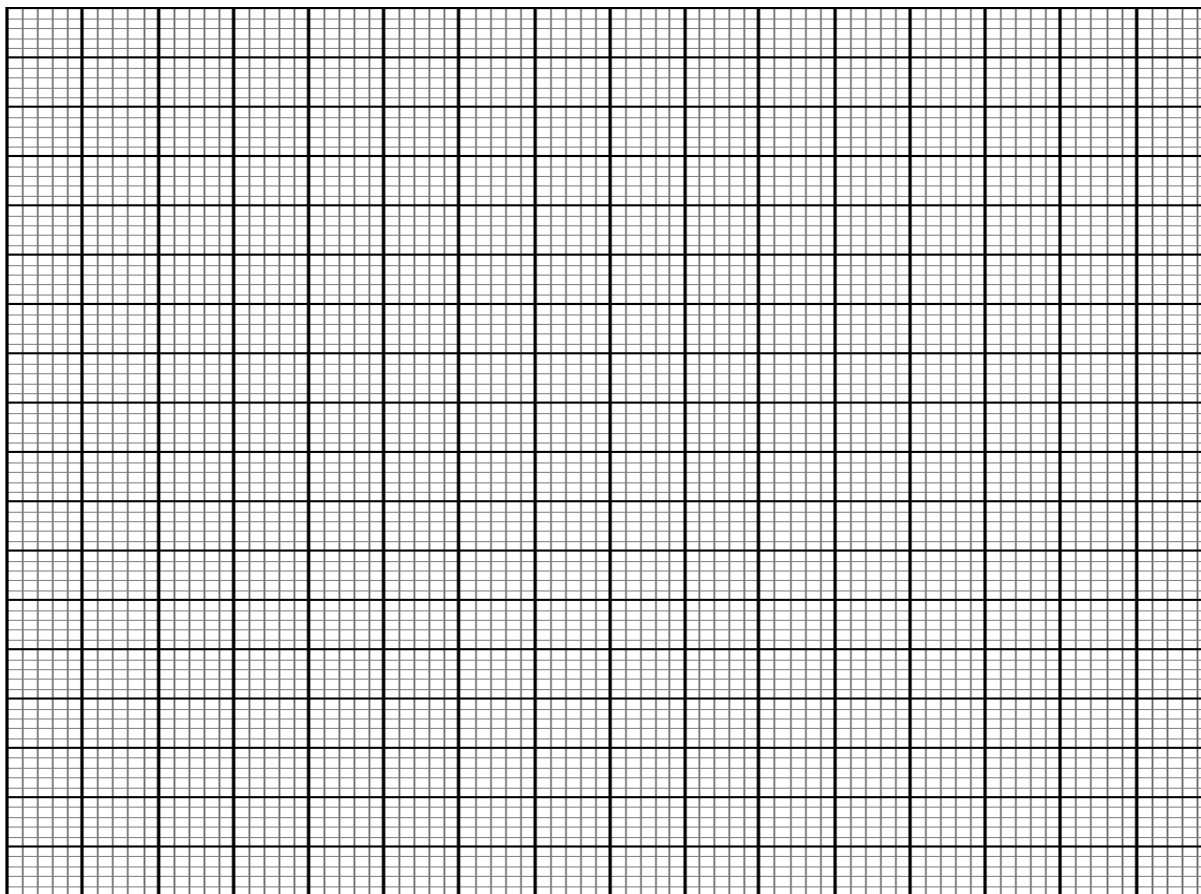
## PROCEDURE II

- Using a clean burette, place  $5.0\text{cm}^3$  of solution D into each of six (6) test tubes.
- Using a 100ml measuring cylinder, place  $20\text{cm}^3$  of solution A in a 100ml plastic beaker. Measure the temperature of solution A and record in table II below.
- To solution A in the beaker, add sodium hydroxide solution D from one of the test tubes. Stir the mixture with the thermometer and record in table II, the maximum temperature reached. Continue with step (d) immediately.
- Add the sodium hydroxide, solution D from another test tube to the mixture obtained in (c) above, stir and record the maximum temperature reached in table II. Continue adding the sodium hydroxide, solution D from each of the other four test tubes, while stirring the mixture and record the maximum temperature each time in order to complete table II

**Table II**

Titration	0	5	10	15	20	25	30
Volume of sodium hydroxide solution D added ( $\text{cm}^3$ )							
Maximum temperature ( $^{\circ}\text{C}$ )							

- (i) On the provided grid, plot a graph of temperature (y – axis) against volume of sodium hydroxide, solution D added. (3mks)



(ii) Using the graph, determine the:

a) Volume of sodium hydroxide, solution D that reacted completely with  $20\text{cm}^3$  of solution A. (1mk)

.....  
.....

b) Temperature change,  $\Delta T$ , for the reaction; (1mk)

.....  
.....

(iii) Enthalpy change of the reaction per mole of copper (II) ions. (Heat capacity =  $4.2\text{Jg}^{-1}\text{K}^{-1}$ , density of the mixture =  $1.0\text{gcm}^{-3}$ ) (3mks)

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**QUESTION 2 (9 MARKS)**

You are provided with solid J. carry out the tests below and write your observations and inferences in the spaces provided.

- (a). Place all of solid J in a clean dry test tube and heat it strongly until no further change occurs. Test any gases produced with both blue and red litmus papers. Allow the residue to cool and use it for test. (b)

Observations	Inferences
(2mks)	(1mk)

- (b). Add about 10cm<sup>3</sup> of 2M hydrochloric acid to the residue and shake for about three minutes. Keep the mixture for test (c) (i) and C (ii)

Observations	Inferences
(1mk)	(1mk)

- (c). (i) Place about 1cm<sup>3</sup> of the mixture in a test tube and add aqueous ammonia dropwise until in excess.

Observations	Inferences
(1mk)	(1mk)

- (ii) To the rest of the mixture, add all of solid K provided and shake the mixture well.

Observations	Inferences
(1mk)	(1mk)

**QUESTION 3 (10 MARKS)**

You are provided with solid M. carry out the tests below and write your observations and inferences in the spaces provide.

- a. Place about one third of solid M on a metallic spatula and burn it using a Bunsen burner flame.

Observations	Inferences
(1mk)	(1mk)

- b. Place the remaining solid M in a test tube. Add about  $6\text{cm}^3$  of distilled water and shake well. Retain the mixture for use in test ©

Observations	Inferences
(1mk)	(1mk)

- c. (i) To about  $2\text{cm}^3$  of the mixture, add a small amount of solid sodium hydrogencarbonate.

Observations	Inferences
(1mk)	(1mk)

- (ii) To about  $1\text{cm}^3$  of the mixture, add  $1\text{cm}^3$  of acidified potassium dichromate (VI) and warm.

Observations	Inferences
(1mk)	(1mk)

- (iii) To about  $2\text{cm}^3$  of the mixture, add two drops of acidified potassium manganite (VII)

Observations	Inferences
(1mk)	(1mk)