MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education
MOCK EXAMINATIONS 2021

233/3 **CHEMISTRY** **Paper 3**

DECEMBER 2021 – TIME: 2¼ Hours

Name: ……Adm No: ……

Class: ……Candidate's Signature: …….. Date: ……./12/2021.

Instructions to candidates

(a) Write your name, index number in the spaces provided above.

(b) Sign and write the date of the examination in the spaces provided

(c) Answer **ALL** the questions in the spaces provided.

(d) All working **MUST** be clearly shown.

(e) KNEC mathematical tables and silent non-programmable electronic calculators may be used.

(f) This paper consists of 7 printed pages

(g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

FOR EXAMINER'S USE ONLY.

Question	Maximum score	Candidate's score
1	20	
2	12	
3	08	
TOTAL SCORE	40	

1. You are provided with:

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

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

a) Using a pipette, place 25.0cm^3 of **Solution A** in a 250ml volumetric flask. Add distilled water to make up to the mark. Label this as **Solution A$_1$**. Retain THE REMAINING **Solution A** for use in **Procedure II**.

b) Place **Solution B** in a burette. Using a clean pipette, place 25.0cm^3 of **Solution A$_1$**, in a 250ml conical flask. Add 10.0cm^3 of potassium iodide, **Solution C**. Shake well, then add 2.0cm^3 of starch indicator, **Solution E**. Titrate until a blue-black colour appears, and continue titrating until the blue-black colour just disappears. Record your readings in **Table 1** below.

c) Repeat step **b)** two more times and complete **Table 1** below

Table 1

	I	**II**	**III**
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of Solution B used (cm^3)			

(4 Marks)

Calculate the:

i) Average volume of **Solution B** used (1 Mark)

_____

_____

ii) Moles of sodium thiosulphate used (1 Mark)

_____

_____

iii) Concentration in moles per litre of copper (II) ions in **Solution A** given that the number of moles of copper (II) ions in 25.0cm^3 of **Solution A**, are the same as the moles of sodium thiosulphate used. (2 Marks)

_____

_____

PROCEDURE II

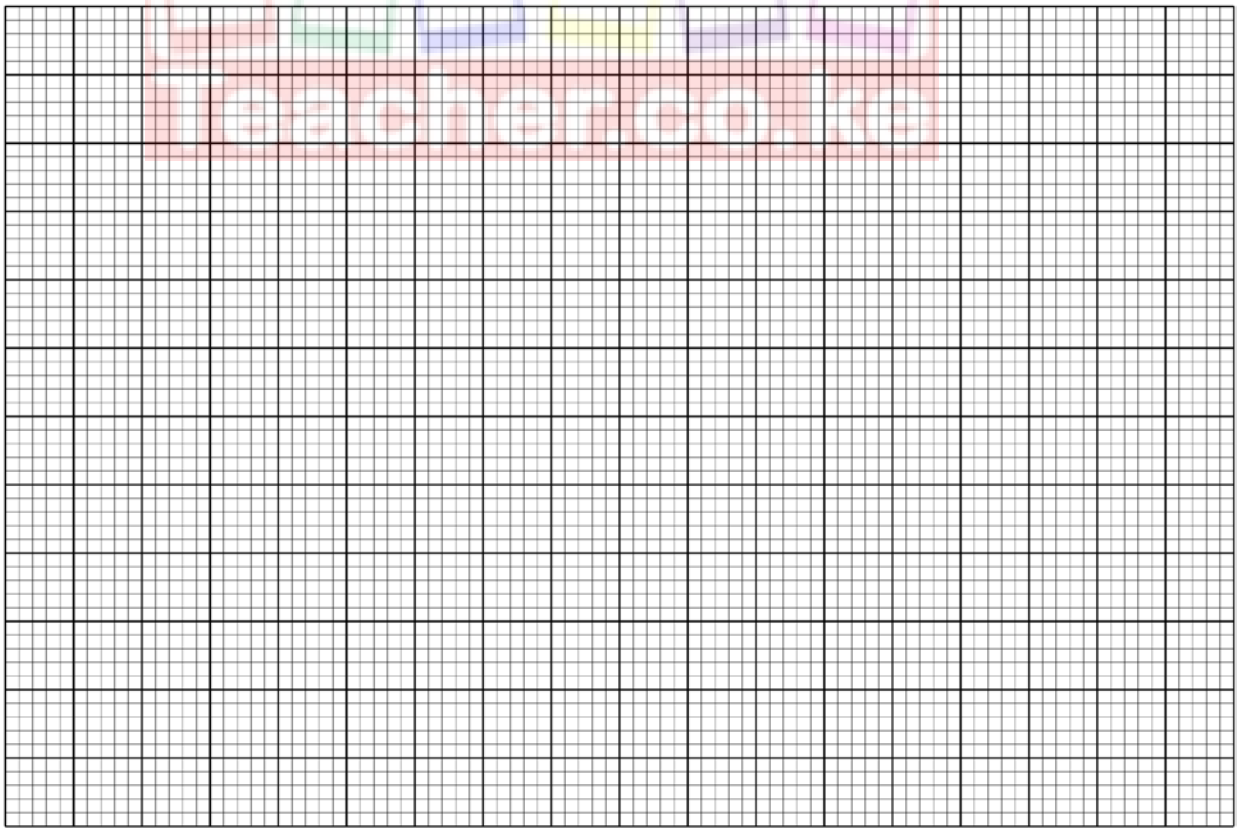
a) Using a clean burette, place 5.0cm^3 of **Solution D** into each of six (6) test-tubes.
b) Using a 100ml measuring cylinder, place 20.0cm^3 of **Solution A** in a 100ml plastic beaker. Measure the temperature of **Solution A** and record it in **Table 2** below.
c) To **Solution A** in a beaker, add sodium hydroxide, **Solution D** from one of the test tubes. Stir the mixture with the thermometer and record it in **Table 2**, the maximum temperature reached. Continue with **step d) IMMEDIATELY**.
d) 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 2**. Continue adding the sodium hydroxide, **Solution D**, from each of the other four test-tubes, stirring the mixture and recording the maximum temperature each time and complete **Table 2**.

Table 2

Volume of sodium hydroxide Solution D added (cm^3)	**0**	**5**	**10**	**15**	**20**	**25**
Maximum temperature (^{o}C)						

(4 Marks)

i) On the grid provided, plot a graph of temperature against volume of sodium hydroxide, **Solution D** added (3 Marks)



ii) From the graph, determine:

I) Volume of sodium hydroxide, **Solution D**, that reacted completely with 20.0cm^3 of **Solution A** (2 Marks)

_____

_____

II) The temperature change, Δ**T**, for the reaction (1 Mark)

_____

iii) Enthalpy change of the reaction, per mole of copper (II) ions (2 Marks)

(Heat capacity = 4.2Jg^{-1}K^{-1}, density of the mixture = 1.0g/cm^3)

_____

_____

_____

2. You are provided with **Solid F**. Carry out the following tests and record your observations and inferences in the spaces provided.

a) Place about one third of **Solid F** in a dry test tube. Heat the solid strongly and test any gas with both blue and red litmus paper

Observations	Inferences
(1 Mark)	(1 Mark)

b) Place the remaining amount of **Solid F** in a clean, dry test tube. Add about 15.0cm^3 of distilled water and shake the mixture thoroughly. Divide the mixture into four test tubes, each containing about 2cm^3

Observations	Inferences
(1 Mark)	(1 Mark)

i) To the first portion, add three drops of dilute hydrochloric acid

Observations	Inferences
(1 Mark)	(1 Mark)

ii) To the second portion, add sodium hydroxide solution dropwise until excess.

Observations	Inferences
(1 Mark)	(1 Mark)

iii) To the third portion, add ammonia solution dropwise until excess

Observations	Inferences
(1 Mark)	(1 Mark)

iv) To the fourth portion, add 3 drops of Barium nitrate solution

Observations	Inferences
(1 Mark)	(1 Mark)

3. You are provided with **Solid G**. Carry out the following tests and record your observations and inferences in the spaces provided.

a) Place about one third of **Solid G** on a metallic spatula and burn it in a Bunsen burner flame

Observations	Inferences
(1 Mark)	(1 Mark)

b) Place the remaining amount of **Solid G** in a boiling tube. Add about $10cm^3$ of distilled water and shake. Use the mixture for tests **i)** to **iii)** below.

i) To a $2cm^3$ portion of the mixture in a test tube, add 2 drops of acidified potassium dichromate (VI)

Observations	Inferences
(1 Mark)	(1 Mark)

ii) To another $2cm^3$ portion of the mixture in a test tube, add two or three drops of acidified potassium manganate (VII)

Observations	Inferences
(1 Mark)	(1 Mark)

iii) To another $2cm^3$ portion of the mixture in a test tube, determine the pH using universal indicator solution and chart.

Observations	Inferences
(1 Mark)	(1 Mark)

THIS IS THE LAST PRINTED PAGE