I Name Marking scheme.

Class: ..... Adm no:.....

Date..... venue:.....

Index No..... . . .--

233/3

CHEMISTRY PRACTICAL

PAPER 3

November, 2020

TIME: 2 ¼ HOURS

# MOKASA I JOINT EXAMINATIONS 2020

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

Chemistry 233/3

2 ¼ Hours

**INSTRUCTIONS TO CANDIDATES**

- Write your name and index number in the spaces provided.
- **Sign** and write the date of examination in the spaces provided.
- Answer ***all*** the questions in the spaces provided in the question paper in English.
- You are not allowed to start working with the apparatus for the first 15 minutes of the 2 % 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 you need.
- All working **must** be clearly shown where necessary.
- Mathematical tables and silent electronic calculators may be used
-

| For examiners use only | | |
|---|---|---|
| **Question** | **Maximum Score** | **Candidate's Score** |
| 1 | **22** | 2 |
| **2** | **10** | |
| **3** | **08** | 0 & |
| **TOTAL** | **40** | Uo |

**Question 1**

You are provided with the following reagents:

- **Solution K-** Copper (II) sulphate solution
- **Solid L-** Iron powder
- **Solution M-** Acidified Potassium manganate (VII) solution, containing **0.8g** of Potassium Manganate (VII) in 250cm of the solution.

You are requi to determine the *molar heat of displacement* of copper in red

a solution of its ions by iron metal.

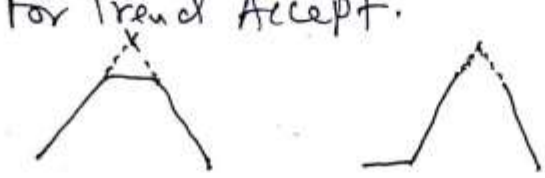
**Procedure I**

- Place 50cm of **Solution K** in a 100cm? plastic beaker using a burette.
- Measure the constant temperature of the solution and record it in the **Table 1** below.
- Add all of the **Solid L** provided at once and start a stop watch immediately.
- Using a thermometer, Stir the mixture **thoroughly and continuously** and record the temperature of the mixture after every **one minute** in the table 1.
- **Retain** the resultant mixture for use in the next **Procedure II.**

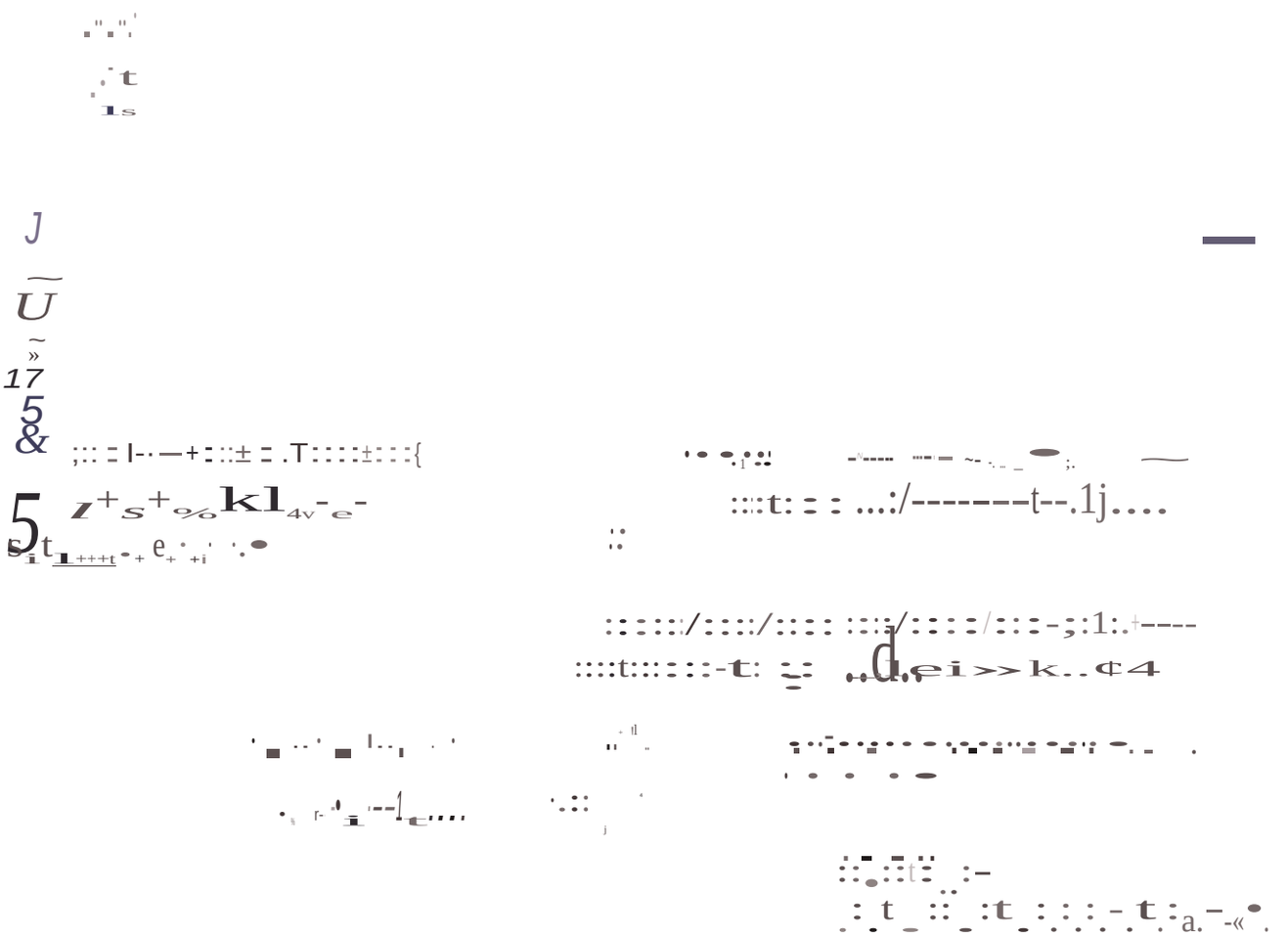
**Table 1**

| Time (Min) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature(C) | 2y0 | 2$ | 24.0 | 250 | 227-0 | 2&.0 | 29-$ | 3\9 | 3¥0 | 30 | 2.r |

For trend Accept.



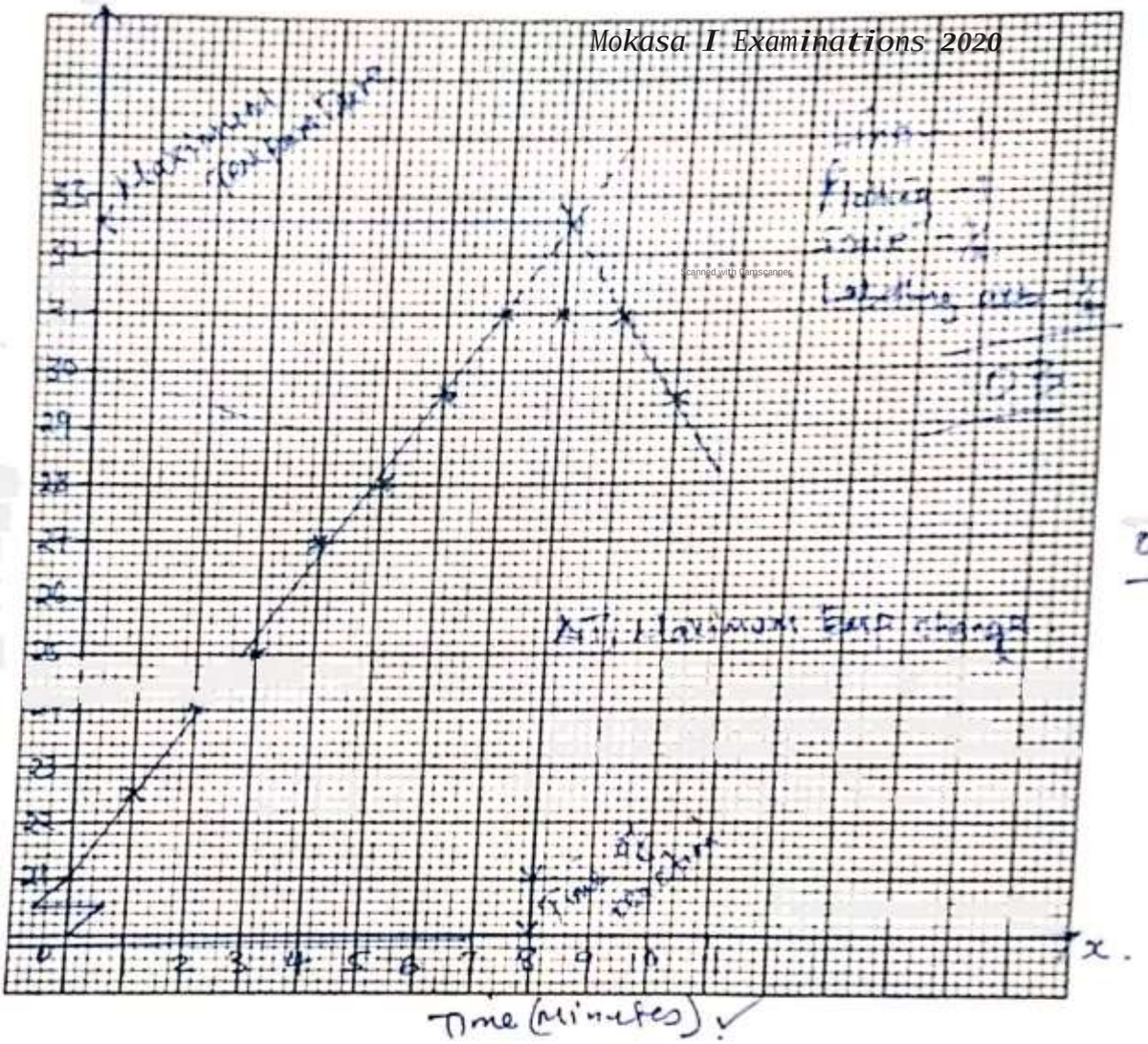
i) Plot a graph of temperature (vertical axis) against time on the grid provided below. (3 marks)



(ii) From the graph you have drawn, determine the;

a) highest change in temperature, T (1 mark)

b) time taken for the reaction to Completely occur (1 mark)




03

11

01

8 minutes ✓1

Must be shown on graph.

01

(iii) Calculate the heat change for the reaction. (Take density of the solution to be 1g/cm? and specific heat capacity of the solution to be 4200k3/Kg/K) **(2 marks)**

bH= _ CT·

=50 _ x4a v 'he.( 6
ts6o

= 5vJk' .y'
loco 2436¥).

**Procedure II**

- Swirl the mixture obtained in procedure I above and filter into a 250ml volumetric flask.
- Thoroughly rinse the beaker with 20cm? of distilled water and ensure all the mixture has been transferred onto the filter paper.
- Add 50cm³ of 2M Sulphuric (VI) acid to the filtrate mixture in the volumetric flask.
- Add more distilled water to the solution in the volumetric flask to the mark. Mix the contents thoroughly and label this solution as **Solution N.**
- Fill the burette with **Solution M.**
- Place 25 cm? of **Solution** N into a 250 cm? conical flask using a pipette and a pipette filler.
- Titrate **Solution** N against **Solution** M until the **first permanent pink** colour is seen.
- Record your results in **Table 2** below.
- Repeat the titration **twice** and complete **Table 2.**

**Table 2**

| **Titre** | I | II | III |
|---|---|---|---|
| **Initial burette reading(cm?)** | DO | ! | 20·2 |
| **Final burette reading(cm?)** | 205 | 20·2 | 1D·2 |

CT=J
Ac=-I
b=}%
@ _

05 202 20·(

**Volume of solution M used(cm?)** 2

(i) What is the average volume of **Solution** Mused? (1 mark)

$$\frac{20.2+20.15}{2} = 20.175\ \text{cm}^3$$

✓1 = Ans. (iii) ✓1





$9 \times 4 = 9$ ✓1



| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

(3

(ii) Calculate the molarity of Solution M, KMnO, (1 mark)
(=39, Mn=55, O=16)

(iii) Calculate the number of moles of:
a) Potassium manganate (VII) used, solution M (1 mark)

b) Iron (II) ions in 25cm³ of solution N **(1 mark)**

The equation for the reaction is:

c) Iron (II) ions in the 250cm of solution N **(1 mark)**

(iv) Determine the molar heat of displacement of copper from a solution of its ions by iron metal **(2 marks)**

A

Scanned with CamScanner

$MnO_4^-(aq) + 8H^+(aq) + 5Fe^{2+}(aq) \longrightarrow Mn^{2+}(aq) + 4H_2O(l) + 5Fe^{3+}(aq)$

$MnO_4^- : Fe^{2+} = 1:5$

Moles of $Fe^{2+}$ = 5 x Ans. (iii) (a) = Ans. (iii) (b)

eg. = 5 x 0.0004081

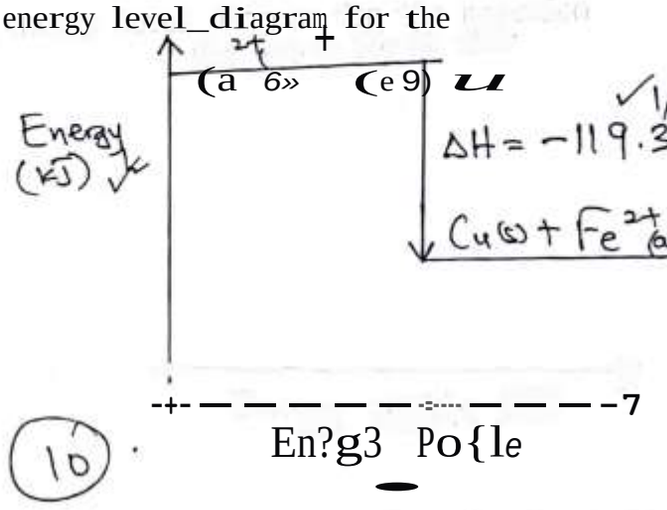
= 0.0020041 Moles

Ans (b) (c)

eg. 0.0020041

= 0.0020041 Moles.

(v) Draw an energy level_diagram for the reaction **(2 marks)**

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**Question 2**

(a) You have been provided with solutions X, Y and Z. Carry out the flame tests for each and indicate the colour of the flames and inferences below.

| Ions | Flame colour | Inference |
|---|---|---|
| X | Purple flame / Yellow flame | |
| | Green flame | |
| y | | Mat |
| Z | | $Ca^{2+}$ |

**(3 marks)**

(b) You are provided with **Solid Q**. Carry out the tests below and Write your observations and inferences in the spaces provided.

| | |
|---|---|
| i) Place all Solid Q in a clean test tube. Add about 8cm³ of distilled water and shake. Divide the solution into 3 portions | |
| Observation | Inference |
| | |

**(1/2 mark)** **(1/2 mark)**

ii) To the first portion add a few drops of Lead (II) nitrate solution and warm

| Observation | Inference |
|---|---|
| wl@he @e@pl hte lsla£( o a«aw 1 | CO,²⁻, SO7• 30 ²° ed'. ✓ 4+, , 3is -l sw± 2 ls:– , Dst \i,,o ]. |

(1 mark) (1 mark) po-a12e fa eack cs.\rat.'cx{

(iii) To the first portion add a few drops of Barium nitrate solution followed by few drops of dilute hydrochlori Observation

| Observation | Inference |
|---|---|
| -White Precipitate ½ Solubl ½ in the acid to form a colourless solution - Effervescence of a colourless gas | $CO_3^{2-}$, $SO_3^{2-}$ ½ Present 01 |

(1 mark) (1 mark)

| | |
|---|---|
| Orange ½ $H^+/K_2Cr_2O_7$ Turns green ½ | $SO_3^{2-}$ Present. ✓1 |

iv) To the third portion add a few drops of acidified potassium dichromate (VI) then warm gently 02

Observat n Inference

(1 mark) (1 mark) sad2e

3. You have been provided with Liquid E.

| | |
|---|---|
| i) Place about 2cm' of the Liquid E in a clean test tube. Add an equal amount of distilled water and shake the mixture. Allow to settle. | |
| Observation | Inference |

(1 mark) (1 mark)

| | |
|---|---|
| ii') Place about 2cm? of the Liquid E in a clean test tube. Add a half spatulaful of sodium hydrogen carbonate. | |
| Observation | Inference |

(1 mark) (1 mark)

| | |
|---|---|
| iii) To about 2cm the Liquid E add 3 drops of acidified potassium dichromate (VI) solution and warm gently | |
| Observation | Inference |

(1 mark) (1 mark)

| | |
|---|---|
| iv)Take a few drops of Liquid Eon a clean and dry metallic spatula and ignite over a non-luminous Bunsen flame | |
| Observation | Inference |

(1 mark) (1 mark)