NAME: …….. CLASS: …… ADM: ……..……

INDEX NO: …….. DATE: ……..

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CHEMISTRY PRACTICAL.
JULY - AUGUST, 2022
Time: 2 ¼ Hours

Kenya Certificate of Secondary Education.

MOKASA II EXAMINATIONS.

Instructions to students:

- *Write your **name, admission number** and **class** in the spaces provided.*
- *Answer **all** questions in the spaces provided*
- *This paper consists of **8 printed** pages.*
- *Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*

Question	Maximum Score	Student's Score
1	22	
2	07	
3	11	
TOTAL	40	

1. You are provided with:

- 60 cm^3 Solution **L,** Hydrochloric acid solution.
- 120 cm^3 of Solution **M** containing 12.6g of a dibasic acid ($H_2C_2O_4 \cdot 2H_2O$) per litre. (Retain part of this solution to be used in question 2.)
- 200 cm^3 of solution **K**, Sodium hydroxide solution.
- 3 pieces of Metal **Z** each 2cm long.

You are required to:

- Standardize sodium hydroxide solution **K.**
- Use the standard solution **K** to determine the concentration of **L.**
- React the hydrochloric acid solution **L** with metal **Z** and determine the mass per unit length of metal **Z**.

Procedure I

Fill the burette with solution **M**. Pipette 25cm^3 of solution **K** into a conical flask. Titrate using phenolphthalein indicator. Record your results in the table below.

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

(3 marks)

a) Calculate the average volume of solution M used. (1 mark)

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……

b) Calculate the concentration of the dibasic solution M in moles per litre. (C=12, H=1, O=16) (1 mark)

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c) Calculate the concentration of the sodium hydroxide in moles per litre. (2 marks)

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Procedure II

Using a **100cm^3** measuring cylinder, measure **90cm^3** of distilled water and place it in a **250cm^3** beaker. Add **10cm^3** of solution **L.** Mix the solution well and label it **W**. Fill the burette with solution **W.** Pipette **25cm^3** of solution **K** into a conical flask and titrate it with **W** using phenolphthalein indicator.

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of W used (cm^3)			

(3 marks)

i) Determine the average volume of W used (1 mark)

……

……

ii) Calculate the concentration of the dilute hydrochloric acid solution W in moles per litre. (2 marks)

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……

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iii) Determine the concentration of the original hydrochloric acid solution L in moles per litre. (1 mark)

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Procedure III

Measure **10cm**^{3} of solution **L** into a boiling tube. Wrap the boiling tube with a tissue paper, measure the temperature of the solution and record it in the table below.

Place one of the 2cm pieces of metal **Z** into the hydrochloric acid solution **L** in the boiling tube. Stir with a thermometer and record the highest temperature attained. Repeat the procedure using the other pieces of metal **Z.**

Pieces of Metal Z	**1st**	**2nd**	**3rd**
Highest Temperature(^{0}C)			
Initial Temperature(^{0}C)			
Change in temperature, DT (^{0}C)			

(2 marks)

(i) Calculate the average change in temperature, DT (^{0}C) (1 mark)

……

……

(ii) Calculate the heat change for the reaction between **Z** and hydrochloric acid. (1 mark)
(c= 4.2 KJ/kg/K).

……

……

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(iii) Given that the heat of the reaction is 440 kJ per mole of Z, calculate the number of moles of Z used in this reaction. (2 marks)

……

……

(iv) Calculate the mass per unit length of metal Z. (**Z = 24**). (2 marks)

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2. You are provided with:

- About 80 cm^3 of acidified potassium manganate (VII), solution **A**
- Solution **M (Retained from question 1).**

You are required to determine the effect of temperature on the reaction between potassium manganate (VII) with oxalic acid.

Procedure

Transfer **10cm^3** of solution **A** into five separate test-tubes in a rack. Label the test-tubes **1,2,3,4,5** respectively. Clean the measuring cylinder and use it to measure **10cm^3** of solution **M** into a clean boiling tube.

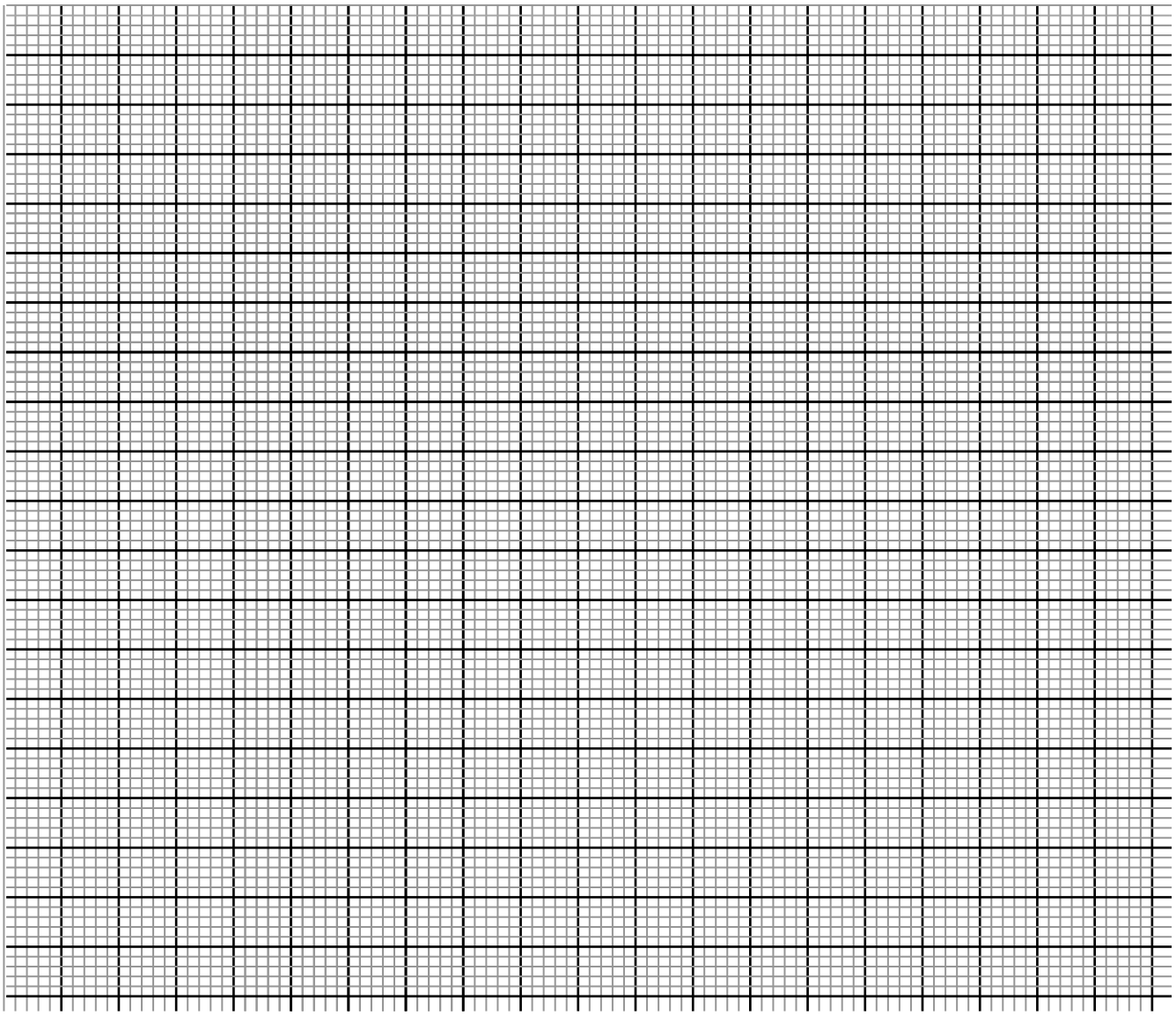
Place the boiling tube in a water bath and heat it to a temperature of **40**^{0}C. **Add the contents of test-tube 1. Start the stop-watch** and shake the mixture thoroughly. Record the time taken for the purple colour of the mixture to decolourise.

Repeat the procedure using solution **A** from test-tubes 2, 3, 4 and 5 at temperatures of **50^{0}C, 60^{0}C, 70^{0}C** and **80^{0}C** respectively. Fill the table below.

Temperature of solution M (^{0}C)	40	50	60	70	80
Time taken for A to decolourise t(secs)					
$^1/_t$ (sec-1)					

(2 marks)

(a) Plot a graph of $\frac{1}{t}$ against temperature on the grid below. (3 marks)



(b) From the graph, determine the time taken for decolourisation of the mixture when the temperature of solution **M** was 65^0C. (1 mark)

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(c) How does the rate of reaction of potassium manganate (VII) with solution M vary with temperature? (1 mark)

……

……

3. You are provided with solids **P** and **Q.** Carry out the tests below and write your observations and inferences in the spaces provided.

(a) Place all solid **P** in a boiling tube. Add about **8cm^3** of distilled water.

(i) Dip a glass rod into the boiling tube containing the solution formed. Place it in a non-luminous flame.

Observation	**Inference**
(1 mark)	($^1/_2$ mark)

(ii) Describe how you can confirm that the solution contains sulphate ions, using barium chloride solution and dilute nitric (V) acid **consecutively**.

Test 1	**Expected Observation**
(1 mark)	($^1/_2$ mark)

Test 2	**Expected Observation**
(1 mark)	($^1/_2$ mark)

(iii) Using a portion of the solution, carry out the tests you described in **(ii)** above.

Observation	**Inference**
(1 mark)	(1 mark)

(iv) Using about 2 cm^3 portion of the solution, add acidified potassium dichromate (VI).

Observation	**Inference**
(1 mark)	($^1/_2$ mark)

(v) Give the possible identity of the anion present in solution of **P.** ($^1/_2$ mark)

……

(b) (i) Scoop a third of solid **Q** using a metallic spatula. Ignite it in a non-luminous flame

Observation	**Inference**
(1 mark)	(1 mark)

(ii) Place the remaining solid **Q** in a boiling tube. Add **8cm^3** of distilled water.. Place about **2cm^3** of the solution in a test-tube. Add 2 -3 drops of acidified Potassium Manganate (VII) and warm.

Observation	**Inference**
($^1/_2$mk)	($^1/_2$mk)

~END~