KALA FORM 4 TRIAL 2024

Kenya Certificate of Secondary Education

CHEMISTRY PRACTICAL

233/3

CHEMISTRY

Time: 2¼ Hours

JULY 2024

Name: …………………………………. **Admission No:** ……………

Class: …………… **Date:** ……….……………...

School: ……………………..…………………**Signature:** ………………...

Instructions to Candidates

(a) Write your name, admission number, class and school name in the spaces provided above.

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

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

(d) You are not allowed to start working with the apparatus for the first 15 minutes of the 2 hours and 15 minutes. This time is to enable you to read the question paper and make sure you have all chemicals and apparatus that you may need.

(e) KNEC Mathematical tables and electronic calculators may be used for calculations.

(f) All working **MUST** be clearly shown where necessary.

(g) **This paper consists of 5 printed pages.**

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

(i) **Candidates should answer the questions in English.**

FOR EXAMINERS USE ONLY

Question	Maximum score	Candidates score
1	18	
2	13	
3	09	

1. You are provided with:
- 2.0g of substance A
- Solution B,0.05M hydrochloric acid
- Methyl orange indicator

You are required to determine the:

👉 Solubility of substance A in water
👉 Relative formula mass of substance A

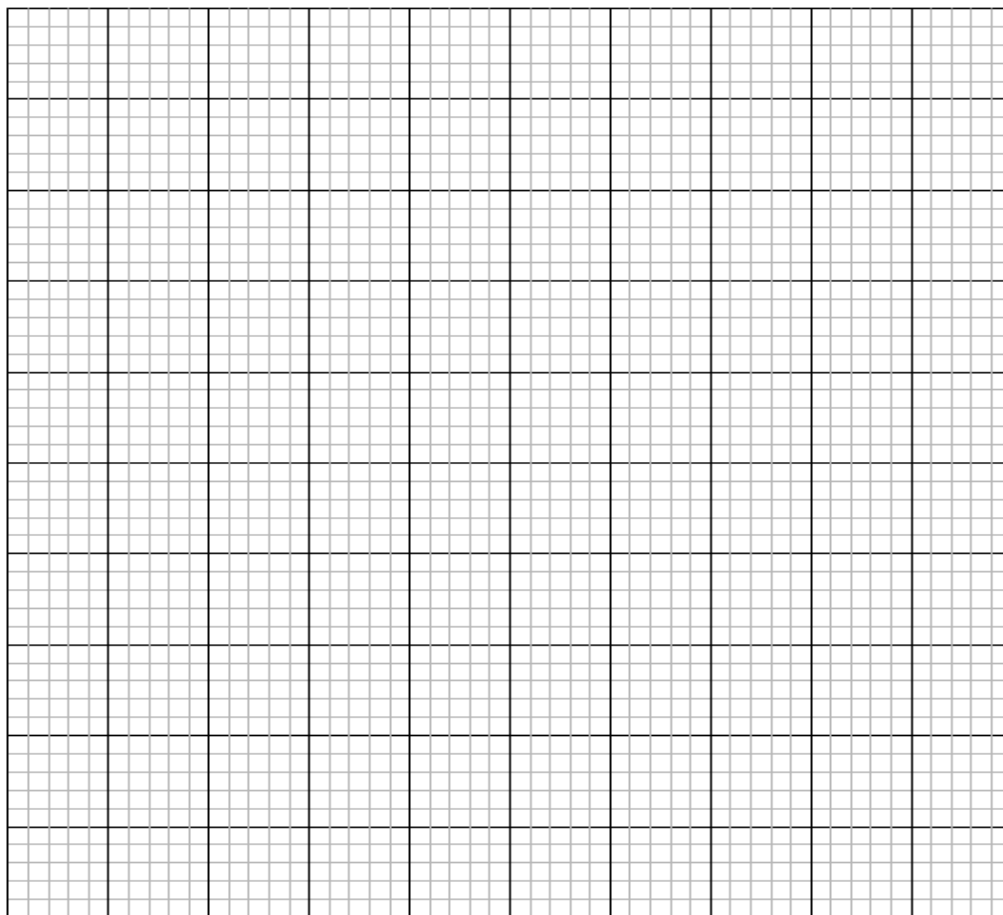**Procedure 1**

(i)   Place 200cm^3 of tap water in a 250ml beaker and keep it for use in step (vi).

(ii)   Place **all** of substance A in a dry boiling tube.

(iii) Using a burette, measure 10.0cm^3 of distilled water and add it to the substance A in the boiling tube

(iv)   While stirring the mixture in a boiling tube with the thermometer, warm the mixture using a Bunsen burner, until the thermometer rises to 65°C. Stop warming the mixture.

(v)   Allow it to cool while stirring with the thermometer.

(vi)   When the temperature drops to 60°C, start the stop watch/clock. Place the boiling tube in the beaker with tap water prepared in step (i) above.

(vii) Continue stirring and record the temperature of mixture after two minutes, then thereafter record the temperature of the mixture after every minute interval and complete **Table 1**. Retain the mixture with the thermometer inside for use in procedure II below

Table 1

Time (minutes)	0	2	3	4	5	6	7	8	9	10
Temperature, °C										

(a) On the grid provided, plot a graph of temperature (vertical axis) against time.   (3 marks)

(b) Using the graph, determine the temperature (Ts) when 2.0g of substance A dissolves completely in 10.0cm³ of distilled water. (1 mark)

(c) Calculate the solubility of substance A in grams per 100g at temperature, Ts. (1 mark)

Procedure 2

Using a funnel, transfer all the mixture obtained from **Procedure 1** into a 250ml volumetric flask. Rinse the boiling tube and the thermometer with about $20cm^3$ of distilled water and add the rinses into the volumetric flask. Repeat the rinsing two more times. Add about $100cm^3$ of distilled to the volumetric flask. Shake until all the solid dissolves. Add more distilled water to the mark. Label this as solution as solution A. Fill the burette with solution A. Using a pipette and pipette filler, place $25.0 \ cm^3$ of solution B, into 250ml conical flask. Add three (3) drops of methyl orange indicator provided and titrate using solution A. Record your readings in **Table 2**, below. Repeat the titration two times and complete the table.   (3 marks)

Table 2	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution A (cm^3) used			

(d) Calculate the:
  (i) Average volume of solution A used.   (1 mark)

  (ii) Number of moles of hydrochloric acid, solution B used.   (1 mark)

(e) Given that two moles of acid react with one of substance A, calculate the:
  (i) Number of moles of substance A used.   (1 mark)

  (ii) Concentration of solution A in moles per litre.   (1 mark)

(iii) Concentration of solution A in g per litre. (1 mark)

(iv) Relative formula mass of substance A. (1 mark)

2. You are provided with 10cm³ of solution C in a boiling tube . Solution C contains two cations and one anion. Carry out the tests below and record your observations and inferences in the spaces provided.

(a) Add 15cm³ of 2M aqueous sodium hydroxide to all of solution C provided. Shake well. Filter the mixture into a conical flask. Retain both the filtrate and the residue.

Observations	Inferences
(1 mark)	(1 mark)

(b) To about 2cm³ of the filtrate, add 2M nitric (V) acid dropwise until in excess . Retain the mixture.

Observations	Inferences
(1 mark)	

(c) Divide the mixture in (b) above into two portions.

(i) To the first portion, add aqueous sodium hydroxide dropwise until in excess.

Observations	Inferences
(1 mark)	(1 mark)

(ii) To the second portion add aqueous ammonia dropwise until in excess

Observations	Inferences
	(1 mark)

(1 mark)	

(d) To 2 cm^3 of the filtrate, add 3 drops of 2M hydrochloric acid.

Observations	Inferences
(1 mark)	(1 mark)

(e) To the 2 cm^3 of the filtrate, add 3 drops of barium chloride.

Observations	Inferences
(1 mark)	(1 mark)

(f) To the residue, add about 5cm^3 of dilute nitric v acid and allow it to filter into a test-tube. To 2cm^3 of this filtrate, add aqueous ammonia dropwise until in excess.

Observations	Inferences
(1 mark)	(1 mark)

3. You are provided with liquid D. Carry out the tests below write your observations and inferences in the spaces provided.

(a) Place 2 drops in a watch glass and ignite.

Observations	Inferences

(1 mark)	(1 mark)

(b) Place 2cm³ of D in a test-tube and add 2cm³ of distilled water.

Observations	Inferences
(1 mark)	(1 mark)

(c) Place 2cm³ of D in a test-tube and add NaHCO₃.

Observations	Inferences
(1 mark)	(1 mark)

(d) Place 2cm³ of D in a test-tube and add 2-3 drops of acidified $K_2Cr_2O_7$ and warm. Keep the solution for use in part (e)

Observations	Inferences
(1 mark)	(1 mark)

(e) To the solution obtained in (d) above .add NaHCO₃

Observations	Inferences
(½mark)	((½mark)