

NAME: INDNO:
 CLASS: SIGNATURE:
 ADM.NO..... DATE:.....

Mansingh
Approved



233/3
 CHEMISTRY
 PAPER 3
 PRACTICAL
 AUGUST 2022
 2 ¼ Hours

LONDIANI SUBCOUNTY JOINT MOCK
Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- Write your name and Index Number in the spaces provided above.
- Sign and write date of examination in the spaces provided above.
- Answer all questions in the spaces provided in the question paper.
- All workings must be clearly shown where necessary. Mathematical tables and silent electronic calculators may be used.
- Answer all the questions in English.

For Examiners use only.

Question	Maximum Score	Candidates Score
1	20	20
2	10 10	10
3	8 10	10

*This paper consists of 8 Printed pages.
 Candidates should check the question paper to ensure that all the
 Papers are printed as indicated and no questions are missing.*

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

You are required to determine the:

- Solubility of substance A in water.
- Relative formula mass of substance A.

PROCEDURE!

- Place 200 cm³ of tap water in a 250 ml beaker and keep it for use in step (vi).
- Place **all** of substance A in a dry boiling tube.
- Using a burette, measure 10.0 cm³ of distilled water and add it to the substance A in the boiling tube,
- While stirring the mixture in the boiling tube with a thermometer, warm the mixture using a Bunsen burner, until the temperature rises to 65°C. Stop warming the mixture,
- Allow it to cool while stirring with the thermometer,
- 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
- Continue stirring and record the temperature of the mixture after two minutes, then thereafter record the temperature of the mixture after every one 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)	60	36	30	28	27	27	27	26	25	23

CT: 2
 DP: 1/2
 ACC: 1/2
 Tr: 1
04

↓
 Accuracy

(4 marks)

NOTE:

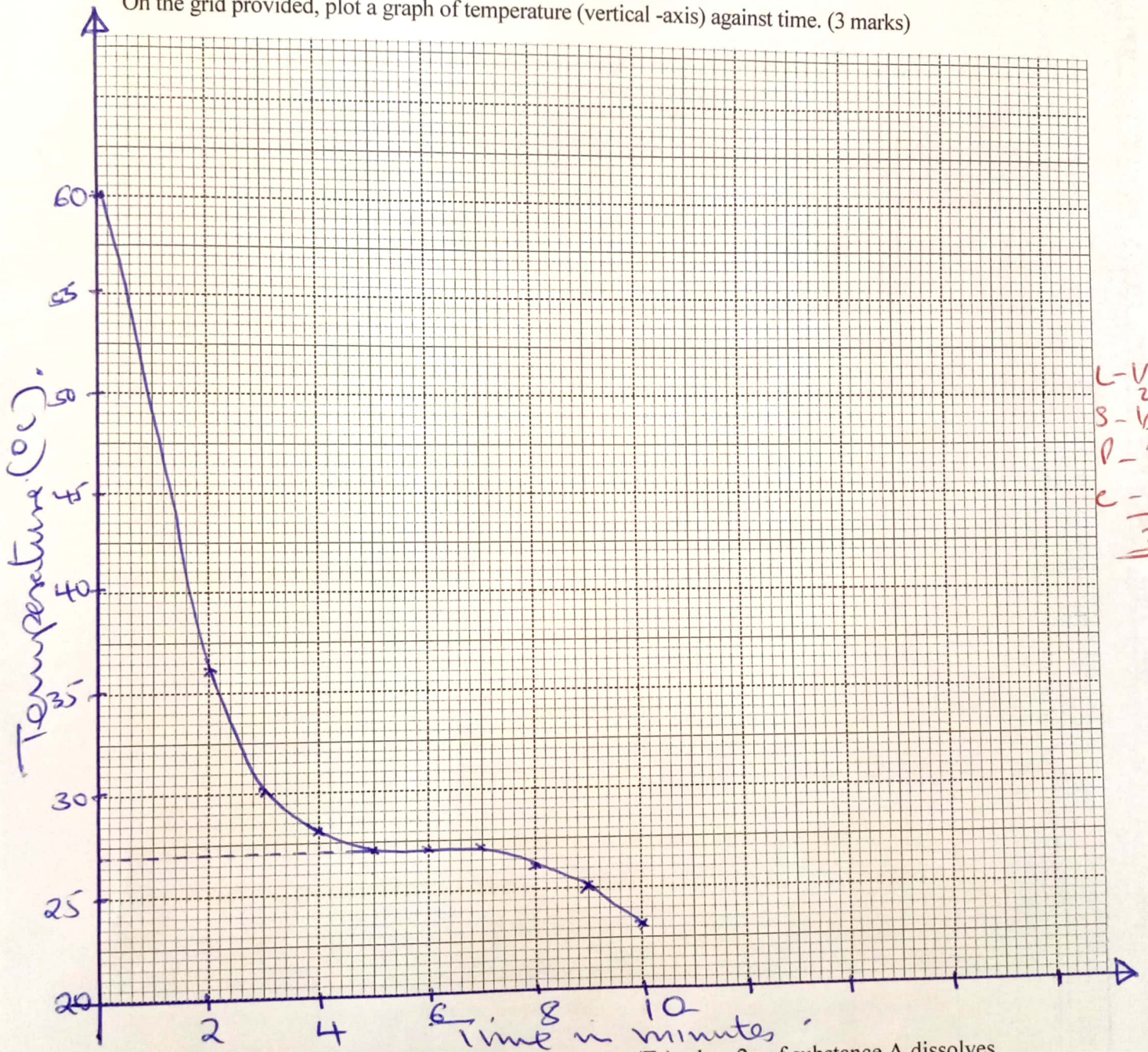
Complete table

- * 8-9 readings - 2 mcs
- * 6-7 readings - 1 1/2 mcs
- * 4-5 readings - 1 mcs
- * 2-3 readings - 1/2 mcs
- * 1 or zero readings - 0 mcs

Decimal place

- whole numbers used throughout OR 1 dp used either '0' or '5' otherwise penalise fully
- trend
- * Continuous drop followed by constant and then continuous drop for 1 mcs
- * Continuous drop followed by constant for 1/2 mcs

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



L - 1/2
 S - 1/2
 P - 1
 C - 1
3

a) Using the graph, determine the temperature (T_s) when 2g of substance A dissolves completely in 10.0cm^3 of distilled water.

27°C ✓ - From correctly drawn graph. 1 mk

b) Calculate the solubility of substance A in grams per 100 g water at temperature, T_s . 2mks

2g → 10cm^3
 → 100cm^3
 $= \frac{100 \times 2}{10} = 20\text{g}/100\text{g H}_2\text{O}$
 (06)

PROCEDURE II

Using a funnel, transfer all the mixture obtained from Procedure I into a 250 ml volumetric flask. Rinse the boiling tube and the thermometer with about 20 cm³ of distilled water and add the rinses into the volumetric flask. Repeat the rinsing two more times. Add about 100 cm³ of distilled water to the volumetric flask. Shake until all the solid dissolves. Add more distilled water to the mark. Label this as solution A. Fill the burette with solution A. Using a pipette and **pipette filler**, place 25.0 cm³ of solution B, into a 250 ml conical flask. Add three (3) drops of the indicator provided and titrate using solution A. Record your readings in **table 2** below. Repeat the titration two more times and complete the table 2

	I	II	III
Final Burette Reading			
Initial burette Reading			
Volume of solution A (cm ³) used.	30.0	30.0	30.0

CF-1
 DP-1
 ACC-1
 P-A-1
 P-A-1
 0.5

4mks

a) Calculate the

i) Average volume of solution A used

1mk

$$\frac{30 + 30 + 30}{3} = 30 \text{ cm}^3$$

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

1mk

$$0.05 \text{ mol} \xrightarrow{1000 \text{ cm}^3} \frac{25 \times 0.05}{1000} = 0.00125 \text{ mol}$$

b) Given that two moles of acid react with one mole of substance A, calculate:

i) Number of moles substance A used.

1mk

$$\text{Moles of A} = \left(\frac{1}{2} \times 0.00125 \right) = 0.000625 \text{ mol}$$

ii) Concentration of solution A in moles per litre

1mk

$$0.000625 \text{ mol} \xrightarrow{30 \text{ cm}^3} \frac{1000 \times 0.000625}{30} = 0.02083 \text{ M}$$

iii) Concentration of solution A in g per litre:

$$2 \text{ g} \xrightarrow{250 \text{ cm}^3} \frac{1000 \times 2}{250} = 8 \text{ g/l}$$

4

09

iv) Relative formula mass of substance A

1mk

$$RFM = \frac{8}{0.02083} = 384.01$$

I

2. You are provided with solid E. Carry out the following tests and write your observations and inferences in the spaces provided.

a) Describe solid E.

(1mk)

- white crystalline solid

I

b) Place about one-half of solid E in a dry test-tube. Heat it strongly and test any gas produced

Using hydrochloric acid, solution B on a glass rod.

Observations

Inferences

* white fumes around
* colourless liquid formed
at cooler parts of test tube
* white residue

Nitrate present
hydrated solid present
(need to confirm (absent))

c) Place the rest of solid E in a boiling tube. Add about 10cm³ of distilled water. Shake well and use 2cm³ portions for each of the tests below.

(i) To one portion, add aqueous ammonia dropwise until in excess

Observations

Inferences

- white ppt, insoluble in excess.

Mg²⁺, Al³⁺, Pb²⁺ present

(1 mark)

(1 mark)

(iv) To about 2cm^3 of liquid L add about 2cm^3 of liquid P provided followed by 6 drops of 2M sulphuric(VI) acid and warm.

Observations	Inferences
pleasant fruity smell. ✓ (1mk)	2COOH ✓ present in P. OR Ester formed. (1mk)

2

Confidential joint mock August 2022

Each candidate to be provided with the following.

1. Solid A –measure accurately 2.0g of anhydrous sodium hydrogen carbonate.
2. 100cm³ of solution B- 0.05M hydrochloric acid.
3. Methyl orange indicator.
4. Accessible to 500cm³ of distilled water.
5. 50ml burette.
6. 25ml pipette with a pipette filler.
7. 2-250ml conical flasks.
8. -10°C-110°C thermometer.
9. Source of heat.
10. Test tube holder.
11. Stop clock / stop watch.
12. 250ml volumetric flask.
13. A funnel.
14. A means of labelling.
15. A boiling tube.
16. 6 test tubes in a test tube rack.
17. About 0.5g of solid E - ammonium aluminium sulphate.
18. About 10cm³ of liquid L- absolute ethanol.
19. About 0.2g of sodium hydrogen carbonate.
20. A stirring rod.
21. 10cm³ measuring cylinder.

Accessible to the following.

1. 2M hydrochloric acid.
2. 2M ammonia solution-with dropper.
3. Acidified potassium manganate(VII) with a dropper.
4. 1% bromine water. With a dropper.
5. Liquid P - Glacial ethanoic acid.
6. 0.5 M lead(II)nitrate solution with a dropper.

(ii) To a second portion, add about 1cm^3 of hydrochloric acid.

Observations
 - No white ppt.
 - No bubbles / no fizzing sound / no effervescence.
 (1 mark)

Inferences
 Mg^{2+} , Al^{3+} present
 SO_3^{2-} , CO_3^{2-} , HCO_3^- absent
 (2 marks)

(iii) To a third portion, add two drops of aqueous lead (II) Nitrate and heat the mixture to boiling.

Observations
 - White ppt formed.
 (1 mark)

Inferences
 CO_3^{2-} present
 (1 mark)

10

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

(a) To 2cm^3 of liquid L add 2cm^3 of distilled water.

Observations	Inferences
- Dissolves to form a colourless solution. (1 mk)	Polar compound present. (1 mk)

(i) To 2cm³ of liquid L, add 3 drops of bromine water.

Observations	Inferences
- yellow colour of bromine water persist (1 mk)	$\overset{\vee}{\text{C}=\text{C}}$ / $\text{C}\equiv\text{C}$ absent (1 mk)

(ii) To about 2cm³ of liquid L, add small amount of sodium hydrogen carbonate.

Observations	Inferences
No bubbles / No fizzing sound / No effervescence (1 mk)	H^+ / H_3O^+ absent (1mk)

(iii) To about 2cm³ of liquid L, add 2 drops of acidified potassium manganate (VII) solution then warm.

Observations	Inferences
Purple H^+ / KMnO_4 changes to colourless / decolourises (1mk)	R-OH present (1mk)