

Name .....Adm No. ....

Class..... School.....

233/3

Date.....

**CHEMISTRY**

**Paper 3**

**JUNE 2022**

**Time: 2¼ Hours**

**SUKELLEMO**  
**FORM 4**  
**CHEMISTRY PRACTICAL**

**INSTRUCTIONS**

- \* Write your **name** and the indicated details in the spaces provided on this page.
- \* Answer **ALL** questions in the spaces provided in the question paper.
- \* You are **NOT** allowed to start working with the apparatus for the *first 15 minutes* of the 2¼ 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 may need.
- \* Mathematical tables and silent electronic calculators may be used.
- \* All working must be clearly shown where necessary.

**For Examiner's Use Only**

Question	Maximum score	Candidate's score
1	21	
2	10	
3	9	
<b>Total score</b>	<b>40</b>	

*This paper has 8 printed pages. Candidates should check the question paper to ascertain that **ALL** pages are printed as indicated and that no questions are missing.*

**QUESTION 1****You are provided with:**

- 6.0g of an alkanolic acid labelled **solid P** in a boiling tube.
- 2M sodium hydroxide solution labelled **solution Q**.

***You are required to:***

- Determine the solubility of **solid P** at different temperatures.
- Determine the number of moles of water of crystallization in **solid P**.
- Find the molar mass of the alkanolic acid.

***Procedure I***

i) Using a burette add 10cm<sup>3</sup> of distilled water to the **solid P** in the boiling tube. Heat the mixture while stirring with a thermometer to about 70°C. When the entire solid has dissolved allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of **solid P** first appear. Record this temperature in the Table 1 below.

ii) Using the burette add 2cm<sup>3</sup> of distilled water to the contents of the boiling tube. Warm the mixture, while stirring with the thermometer until all the solid dissolves. Allow the mixture to cool while stirring. Note the temperature at which the crystals of **solid P** first appear.

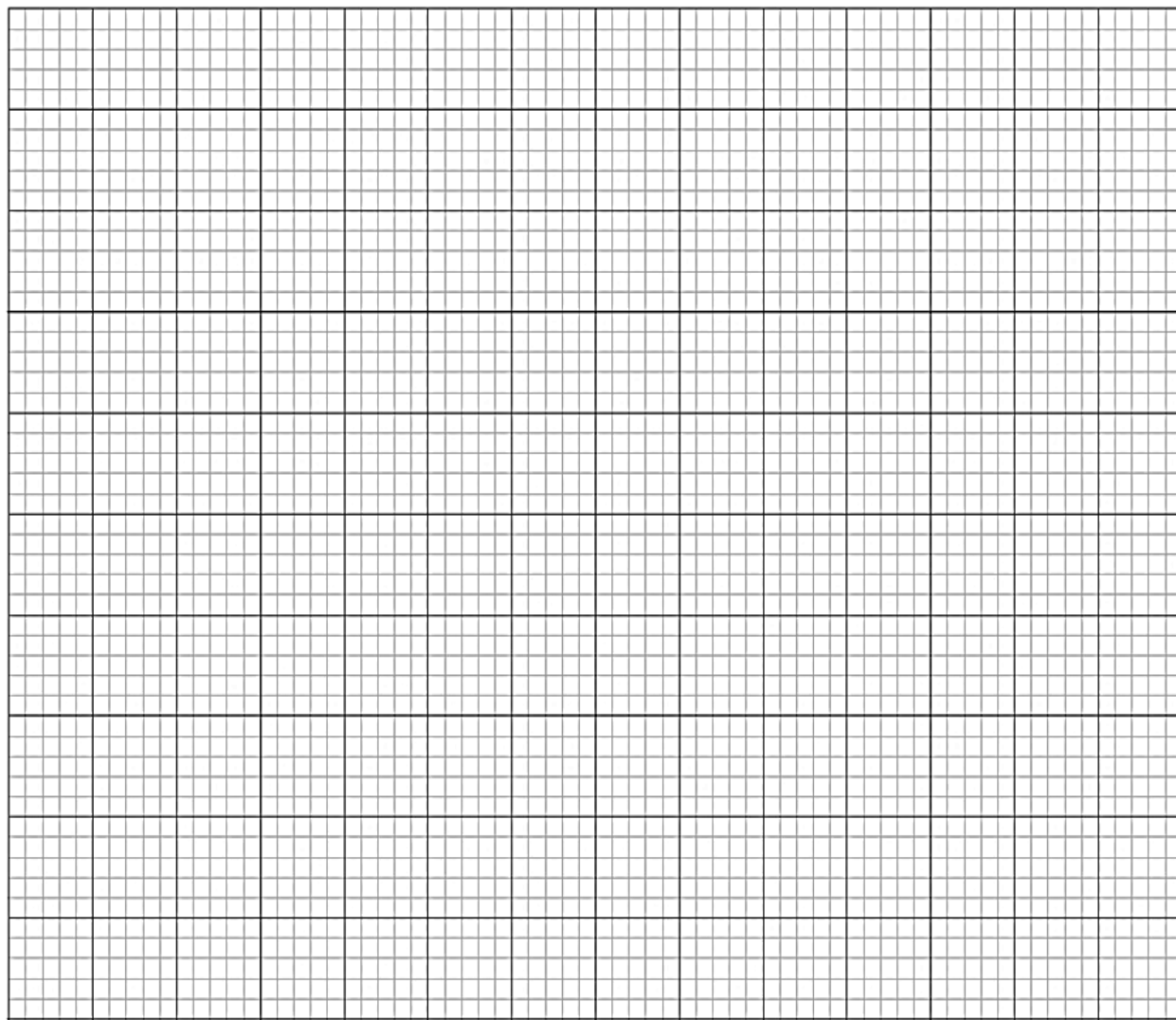
iii) Repeat the procedure (ii) two more times and record the temperatures in Table I. **Retain the contents of the boiling tube for use in procedure II.**

**TABLE I**

<b>Volume of water in the boiling tube (cm<sup>3</sup>)</b>	<b>Temperature at which crystals of solid P first appear (°C)</b>	<b>Solubility of Solid P (g/100gH<sub>2</sub>O)</b>

a) i) Complete **Table 1** by calculating the solubility of **solid P** at different temperatures (6 mks)

ii) On the grid provided, plot a graph of the solubility of solid P (vertical axis) against temperature. (3 mks)



iii) Using the graph determine the temperature at which 55g of solid P would dissolve in  $100\text{cm}^3$  of water. (1 mk)

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**Procedure II**

i) Transfer the contents of the boiling tube in **Procedure I** into a 250 ml volumetric flask. *Rinse both the boiling tube and the thermometer with distilled water and add to the volumetric flask.* Add more distilled water to make up to the mark. Transfer the solution to a 250 ml beaker, Label this **solution R**. Wash the volumetric flask then rinse it with distilled water ready for use in Step(ii).

ii) Using a measuring cylinder place 25.0 cm<sup>3</sup> of solution Q into a 250 ml volumetric flask. Add about 200cm<sup>3</sup> of distilled water. Shake well. Add more distilled water to the make up to the mark. Label this **solution T**.

iii) Fill a burette with **solution R**. Using a pipette and pipette filler, place 25 cm<sup>3</sup> of **solution T** into a 250 ml conical flask. Add 2-3 drops of phenolphthalein indicator and titrate with **solution R**. Record your results in table II. Repeat the titration two more times and complete the table.

**TABLE II**

<b>Titre</b>	<b>1</b>	<b>2</b>	<b>3</b>
Final burette reading (cm <sup>3</sup> )			
Initial burette reading (cm <sup>3</sup> )			
Volume of solution <b>R</b> used (cm <sup>3</sup> )			

(4 marks)

**DETERMINE:**

a) The average volume of **solution R** used (1 mk)

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b) The concentration of **solution T** in moles per litre. (1 mk)

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c) The concentration of alkanolic acid **solution R** in moles per litre (1 mole of acid reacts with 2 moles of the base) (2 mks)

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d) The relative formula mass of the alkanolic acid, **solid P** (2 mks)

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e) The formula of **P** has the form **M.xH<sub>2</sub>O**. Determine the value of **x** in the formula. (The relative formula mass of M is 90; O=16;H = 1) ( 1mk)

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## QUESTION 2

You are provided with **solid Y**. Use it to carry out the tests indicated below and record your observations and inferences in the spaces provided.

- a) Put half a spatula of **solid Y** in a boiling tube. Add about 5 cm<sup>3</sup> of distilled water and shake. Divide the resultant mixture into four portions of 1 cm<sup>3</sup> each.

Observations	Inferences
(1 mk)	(1 mk)

- i) To the first portion add aqueous sodium hydroxide dropwise till in excess.

Observations	Inferences
(1 mk)	(1 mk)

- ii) to the second portion add aqueous ammonia dropwise till in excess

Observations	Inferences
(1 mk)	(1 mk)

- iii) To the third portion add lead (II) nitrate solution and warm.

Observations	Inferences
(1 mk)	(1 mk)

iv) To the fourth portion add dilute nitric (V) acid followed by Barium nitrate solution.

Observations	Inferences
(1 mk)	(1 mk)

### QUESTION 3

You are provided with **solid M** and **solid F**.

Carry out the tests below and write the observations and inference in the spaces below:

a) Using a metallic spatula, ignite about one half of **solid M** in a Bunsen burner flame.

Observations	Inferences
(1 mk)	(1 mk)

b) Place the other half of **solid M** in a boiling tube. Add  $15\text{cm}^3$  of distilled water and shake well. Label this **solution M**. Use this solution for the following tests.

i) Place  $2\text{cm}^3$  of **solution M** in test tube and determine pH.

Observations	Inferences
( ½ mk)	( ½ mk)

ii) To about  $2\text{cm}^3$  of the **solution M** obtained in (b) above add 3 drops of acidified potassium manganate (VII)

Observations	Inferences
(1 mk)	(1 mk)

iii) To about 2 cm<sup>3</sup> of the **solution M** obtained in (b) above add 2 drops of bromine water.

Observations	Inferences
( 1 mk)	( 1 mk)

iv) To the remaining **solution M** in the boiling tube, add half of **solid N**

Observations	Inferences
( 1 mk)	( 1 mk)