

NAME..... ADM. NO.....CLASS.....

233/3
CHEMISTRY
Paper 3
PRACTICAL
DECEMBER 2021
Time: 2¹/₄ hours

Candidate's Signature

Index Number

BUNAMFAN CLUSTER EXAMINATION 2021

Kenya Certificate of Secondary Education

233/3

CHEMISTRY

Paper 3

PRACTICAL

Time: 2¹/₄ hours

Instructions to Candidates

- Write your **Name** and **Index numbers** in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- Answer **ALL** the questions in the spaces provided in the question paper.
- Mathematical tables and silent electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.
- Candidates should check the question paper to ascertain that **all** pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	20	
2	10	
3	10	
TOTAL SCORE	40	

This paper consists of 9 printed pages.

1. You are provided with:

- 6.2 g of an alkanolic acid labelled **solid A** in a boiling tube.
- 2 M sodium hydroxide solution labelled **solution B**.

You are required to:

- i) Determine the solubility of solid A at different temperatures.
- ii) Find the molar mass of the alkanolic acid.

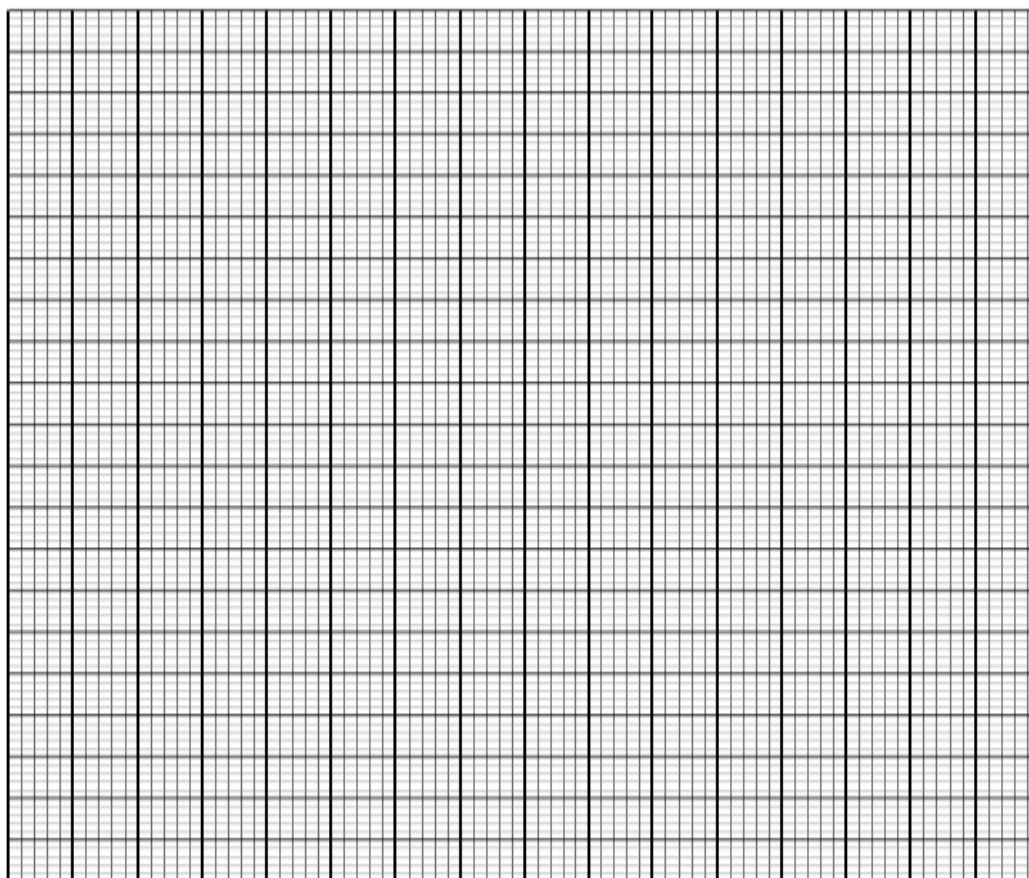
Procedure 1

- i) Using a burette, add 10cm^3 of distilled water to **solid A** in the boiling tube. Heat the mixture while stirring with the thermometer to about $75\text{ }^\circ\text{C}$. When the entire solid had dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid M appear. Record this temperature in table I.
- ii) Using the burette, add 2cm^3 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 crystals of **solid A** appear.
- iii) Repeat procedure (ii) two more times and record the temperatures in table I.
Retain the contents of the boiling tube for use in procedure II.
 - a) i) Complete table I by calculating the solubility of solid A at different temperatures. (6 marks)

Table I

Volume of water in the boiling tube (cm³)	Temperature at which crystals of solid A appear (°C)	Solubility of A (g/100g water)
10		
12		
14		
16		

ii) On the grid provided, plot a graph of the solubility of solid A against temperature. (3 marks)



- iii) Using the graph determine the temperature at which 52 g of solid A would dissolve in 100cm³ of water. (1 mark)

Procedure II

- i) Transfer the contents of the boiling tube in procedure I into a 250ml volumetric flask. Rinse both the boiling tube and the thermometer with distilled water and add it to the volumetric flask. Add more distilled water to make up to the mark. Transfer the solution into a 250ml beaker. Label this **solution E**. Rinse the volumetric flask with distilled water ready for use in step (ii).
- ii) Using a measuring cylinder, place 25cm³ of solution B into a 250ml volumetric flask. Add about 200cm³ of distilled water and shake well. Add more distilled water to make up to the mark. Label this **solution F**.
- iii) Fill the burette with **solution E**. Using a pipette and a pipette filter, place 25cm³ of **solution F** into a conical flask. Add 2 – 3 drops of **phenolphthalein indicator** and titrate with **solution E**. Record your results in table II. **Repeat** the procedure (iii) two more times to complete the table.

Table 2

Titration	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of solution E used (cm ³)			

(4 marks)

Determine:

- i) Average volume of solution E used. (1 mark)

- ii) Concentration of solution F in moles per litre (1 mark)

- iii) Number of moles in 25cm³ of solution B (1 mark)

- iv) Moles of alkanolic acid, solution E used (1 mole of acid reacts with 2 moles of base) (1 mark)

- v) Concentration of solution E in moles per litre (1 mark)

- vi) Relative formula mass of the alkanolic acid, solid B. (1 mark)

2. You are provided with solid **E**, carry out the tests below and record your observations and inferences in the spaces provided

- a) Place all the solid **E** provided into a test tube. Add about 6cm³ of distilled water and shake thoroughly. Filter and rinse the residue thoroughly with distilled water. Keep the Residue for use in procedure (c). Divide the filtrate into four portions.
 - i. To the first portion add sodium hydroxide solution dropwise until in excess

Observations	Inferences
(½ mark)	(1 mark)

- ii. To the second position dip a clean glass rod and hold its tip in the non-luminous Bunsen burner flame.

Observations	Inferences
(1 mark)	(1 mark)

- iii. To the third portion add two drops of barium nitrate solution

Observations	Inferences
(1 mark)	(1 mark)

- iv. To the fourth portion add two drops of acidified potassium manganite (VII)

Observations	Inferences
(1 mark)	(1 mark)

b. Put the residue in a boiling tube and add about 5 cm³ of dilute nitric (V) acid provided and shake thoroughly.

Observations	Inferences
(½ mark)	(½ mark)

Divide the solution into two equal portions.

i. To the first portion add sodium hydroxide solution dropwise until in excess

Observations	Inferences
(1 mark)	(1 mark)

ii. To the second portion add two drops of sodium iodide solution.

Observations	Inferences
(½ mark)	(1 mark)

3. You are provided with liquid L in stoppered container. Carry out the tests and record your observations and inferences.

a) Place about 3 drops of liquid L on a watch glass and ignite using a Bunsen burner flame.

Observations	Inferences
(1 mark)	(1 mark)

b) Divide the remaining liquid L into four portions in test tubes.

(i) To the first portion, add about 6cm^3 of distilled water and shake well.

Observations	Inferences
($\frac{1}{2}$ mark)	($\frac{1}{2}$ mark)

(ii) To the second portion, add the sodium hydrogen carbonate solid provided.

Observations	Inferences
($\frac{1}{2}$ mark)	(1 mark)

(iii) To the third portion, add two drops acidified potassium manganite (VII) solution.

Observations	Inferences
(½ mark)	(1 mark)

(iv) To the last portion, add two drops acidified potassium dichromate (VI) solution.

Observations	Inferences
(1 mark)	(1 mark)