

Name Index No.

School Candidate's signature

Date

233/3

CHEMISTRY

Paper 3

July/August 2014

Time 2¼ hours

WESTLANDS FORM FOUR JOINT EXAMINATION

Kenya Certificate of Secondary Education

CHEMISTRY

Paper - 233/3

July/August 2014

Time: 2¼ hours

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided.
- Answer all the 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 read the question paper and make sure you have all the chemicals and apparatus you may need.
- Mathematical tables and electronic calculators may be used.
- All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

Question	Maximum marks	Candidate's score
1	12	
2	12	
3	16	
Total score	40	

This paper consists of 8 printed pages

Candidates should check the question paper to ensure that all the printed pages are printed as indicated and no questions are missing.

1. You are provided with:

- 0.30g of metal **BA1**
 - 100cm³ of a **1.0M** hydrochloric acid solution, labelled as solution **BA2**
 - 120cm³ of a **0.0954M** sodium hydroxide solution, labelled as solution **BA3**
 - Screened methyl orange indicator solution.
- You are required to determine the Relative atomic mass of metal **BA1**

Procedure

- Using a burette, measure 50.00cm³ of solution **BA2** into a clean 250ml beaker.
- Add the **WHOLE AMOUNT** of **BA1** provided into the beaker containing 50.00cm³ of solution **BA2** and stir well with a glass rod until **ALL** the solid metal reacts completely.
- Transfer the mixture left in the beaker after the reaction into a 250ml volumetric flask. Rinse the beaker as well as the glass rod with distilled water and transfer **ALL** the rinsings into the volumetric flask. Make up the volume of the solution in the volumetric flask upto the calibration mark with distilled water, cover the flask with a stopper, shake well and label as solution **BA4**.
- Fill a clean burette with solution **BA4**.
- Pipette 25.0cm³ of solution **BA3** into a 250ml conical flask, add 3 drops of screened methyl orange indicator solution and titrate against solution **BA4** from the burette. A change in colour of the mixture from green to pink marks the end-point of the titration. Record your results in table 1.
- Repeat the titration **TWO** more times in order to complete **table 1**

TABLE 1

Titration	1st	2nd	3rd
Final burette readings, cm ³			
Initial burette readings, cm ³			
Volume of solution BA4 used, cm ³			

(5 marks)

Average volume of solution **BA4** used =cm³

g) Calculations:

- Calculate the moles of HCl in 50.00cm³ of solution **BA2**.

(1 mark)

.....
.....

- Determine the molar of NaOH in 25.0cm³ of solution **BA3**.

(1 mark)

.....
.....

- Determine the moles of HCl in the average volume of solution **BA4** used in titration.

(1 mark)

- Calculate the moles of HCl left unreacted after the reaction between metal **BA1** and solution **BA2**.

(1 mark)

.....
.....

v) Determine the moles of HCl that reacted with metal **BA1**

(1 mark)

vi) Given that metal **BA1** forms a divalent cation, determine the moles of metal **BA1** reacted with hydrochloric acid.

(1 mark)

vii) Determine the Relative Atomic mass of metal **BA1**

(1 mark)

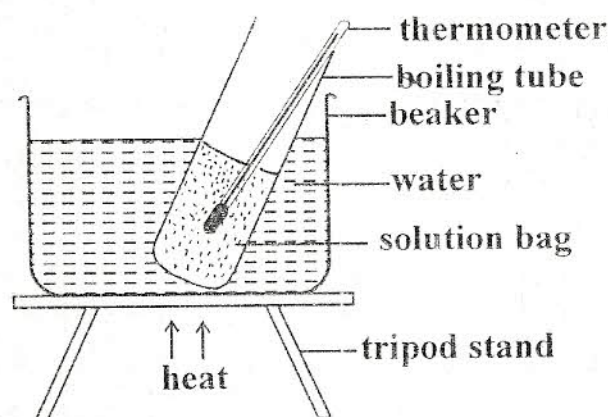
You are provided with:

- i) 2.00g of solid **BA5**
- ii) a thermometer
- iii) distilled water
- iv) a boiling tube

You are required to determine the temperatures at which solutions of known concentrations of compound **BA5** became saturated and then plot a solubility curve.

PROCEDURE

- a) Transfer the whole amount of solid **BA5** supplied to you into a clean and dry boiling tube.
- b) Using a burette, add 5.00cm³ of distilled water into the boiling tube with solid **BA5**
- c) Put the boiling tube into the beaker of hot water bath and warm the boiling tube, whilst continuously stirring the contents with a thermometer, until the crystals of **BA5** JUST dissolve / disappear.
(DO NOT BREAK THE THERMOMETER)

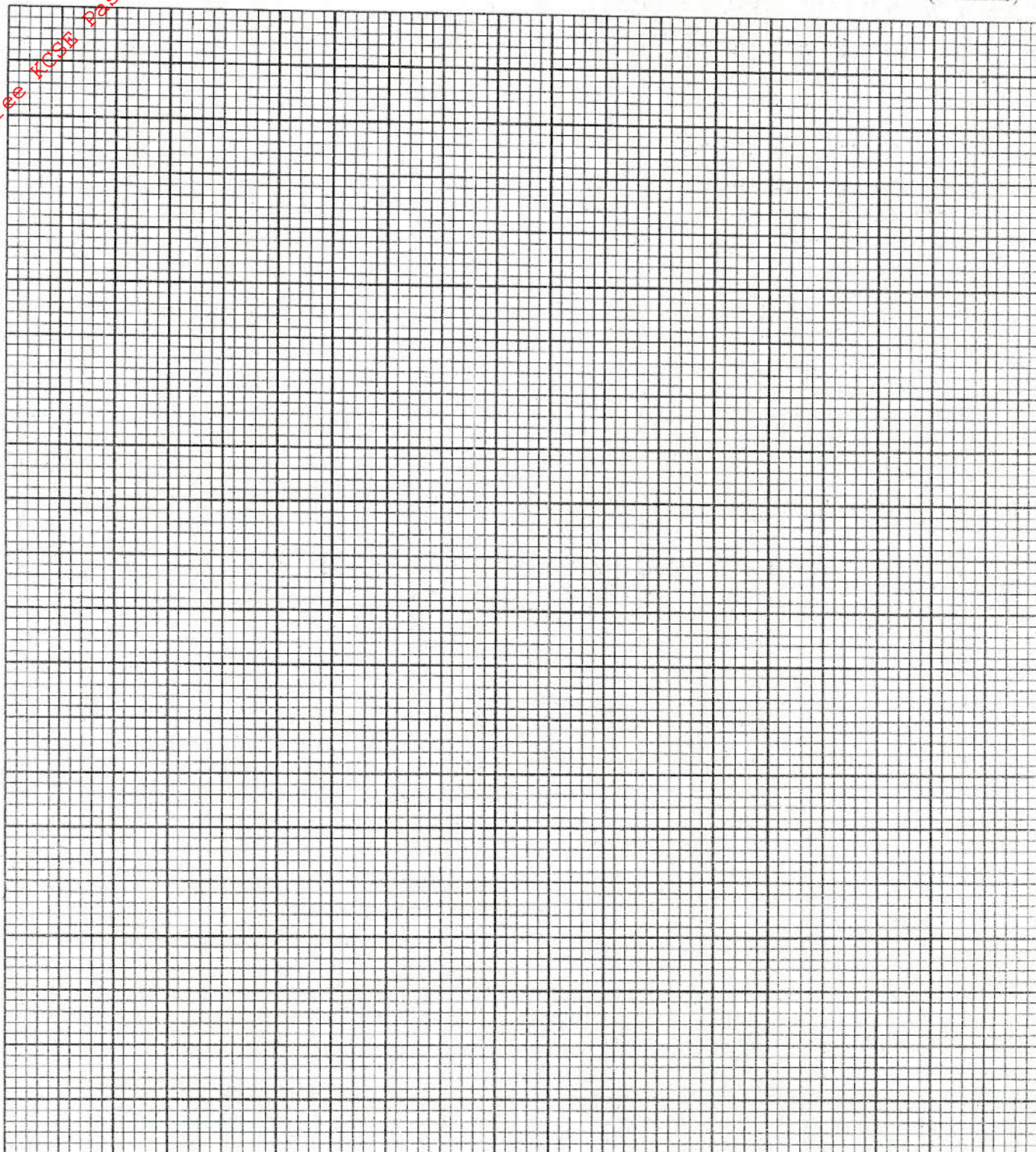


- d) Remove the boiling tube from the hot water bath and allow the contents to cool slowly whilst stirring with the thermometer.
Note the temperatures at which crystals FIRST form / reappear and record this temperature in table 2.
- e) Add a further 2.00cm³ of distilled water from the burette into the boiling tube containing the mixture and repeat steps (c) and (d) above. Continue in this way until a total volume of water added to the boiling tube is 15.00cm³
- f) Complete Table 2 by calculating the solubility of compound **BA5** in water at the different temperatures.

Total volume of water added (cm ³)	Temperature at which crystals first appear (°C)	Solubility of compound BA5 in water (g/100g of water)
5.00		
7.00		
9.00		
11.00		
13.00		
15.00		

(6 marks)

- g) On the grid provided, plot a graph of solubility of compound **BA5** (vertical axis) against Temperature. (3 marks)



iii) To the THIRD portion of the solution, add about 1cm³ of 2M hydrochloric acid solution

Observations	Inferences
(1 mark)	(1 mark)

iv) To the FOURTH portion of the solution, add 5 drops of acidified AgNO₃ solution.

Observations	Inferences
(1 mark)	(1 mark)

v) To the FIFTH portion of the solution, add about 1cm³ of barium nitrate, Ba(NO₃)₂ solution.

Observations	Inferences
(1 mark)	(1 mark)

B. You are provided with a sample of substance **BA7**. You are required to carry out the following experiments and write your observations and inferences in the spaces provided.

- a) Using a clean metallic spatula, take about half a spatula-endful of **BA7** and ignite in a non-luminous Bunsen burner flames.

Observations	Inferences
(1 mark)	(½ mark)

- b) Place the rest of solid **BA7** into a clean boiling tube, add about 5cm³ of distilled water and shake well to dissolve. Use about 1cm³ portions of the solution for the tests outlined below

- i) Using about 1 cm³ of the solution **BA7** and the universal indicator solution provided, determine the pH of the solution of **BA7**.

Observations	Inferences

- ii) To the SECOND portion of the solution of **BA7**, add 3 drops of acidified potassium manganate (VII) solution.

Observations	Inferences

iii) To the THIRD portion of the solution of BA7, add anhydrous potassium dichromate (VI) solution and warm.

Observations
(½ mark)

iv) To the FOURTH portion of the solution of BA7, add

Observations

iii) To the THIRD portion of the solution of BA7, add anhydrous potassium dichromate (VI) solution and warm.

Observations
(½ mark)

iv) To the FOURTH portion of the solution of BA7, add

Observations

iii) To the THIRD portion of the solution of BA7, add an equal volume of 10% potassium dichromate (VI) solution and warm.

Observations
(½ mark)

iv) To the FOURTH portion of the solution of BA7, add an equal volume of 10% potassium dichromate (VI) solution and warm.

Observations

iii) To the THIRD portion of the solution of BA7, add an equal volume of 10% potassium dichromate (VI) solution and warm.

Observations
(½ mark)

iv) To the FOURTH portion of the solution of BA7, add an equal volume of 10% potassium dichromate (VI) solution and warm.

Observations
