

**CONFIDENTIAL**

**INSTRUCTIONS TO SCHOOL**

1. Only the teacher in-charge of the Chemistry practical and the school head should handle this paper.
2. Ensure that information herein does not reach the candidates either directly or indirectly.

In addition to the apparatus and fittings found in the laboratory, each candidate will require the following:

A.

1. 6g of accurately weighed solid A in a stoppered container.
2. About 100cm<sup>3</sup> of solution B
3. One burette
4. One pipette
5. One thermometer
6. One spatula (metallic)
7. Two boiling tubes
8. One 250ml volumetric flask
9. Three 250ml conical flasks
10. Two labels
11. 500ml distilled water
12. One clean glass rod
13. Six test tubes in a test tube rack
14. One test-tube holder
15. One watch glass
16. 250ml beaker half-filled with cold water (room temperature)
17. 6cm<sup>3</sup> of liquid J.
18. Solid sodium hydrogen carbonate (about 1g)

Access to:-

1. Bunsen burner
2. Phenolphthalein indicator supplied with a dropper
3. 1M potassium iodide solution supplied with a dropper.
4. 1M barium chloride solution supplied with a dropper.
5. 2M hydrochloric acid.
6. Acidified potassium dichromate (vi)
7. Acidified potassium Manganate (vii)
8. Bromine water

NB:

1. Solid A = 6g maleic acid accurately weighed
2. solid T = sodium sulphite (about 2g)
3. Dissolve 25g in 200cm<sup>3</sup> of 2M sulphuric (vi) acid and make to 1dm<sup>3</sup> mark to prepare K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>.
4. Liquid J = Absolute ethanol
5. Dissolve 12.5g in 400cm<sup>3</sup> of 2M sulphuric (vi) acid and make to 1dm<sup>3</sup> mark to prepare KMnO<sub>4</sub>.
6. Solution B is prepared by dissolving 8g of sodium hydroxide pellets in 400cm<sup>3</sup> of distilled water and make it to 1dm<sup>3</sup> mark.

.....END.....

NAME..... INDEX NO.....  
Candidates signature:.....  
Date.....

GATUNDU SOUTH SUB COUNTY FORM FOUR 2014 EVALUATION EXAM

233/3  
CHEMISTRY  
PAPER 3  
PRACTICAL  
JULY/AUGUST 2014  
TIME: 2 ¼ HOURS

KENYA CERTIFICATE OF SECONDARY EDUCATION  
CHEMISTRY  
PAPER 3  
2 ¼ HOURS

INSTRUCTIONS

- Answer all the questions in the spaces provided.
- All working must be clearly shown where necessary

FOR EXAMINERS USE ONLY

Question	Maximum score	Candidate's score
1		
2		
3		
Total score	40	

1. You are provided with:

- Solid A – 6g of an organic acid.
- Solution B – 0.2M sodium hydroxide

You are required to determine:

- (i) The solubility of solid A
- (ii) The R.M.M. of solid A.

### PROCEDURE I

- i) Fill the burette with distilled water.
- ii) Place solid A in the boiling tube.
- iii) Transfer  $4\text{cm}^3$  of distilled water from the burette into the boiling tube containing solid A. Heat the mixture while stirring carefully with thermometer until all the solid dissolves.
- iv) Cool the solution by dipping it in the provided beaker containing cold water while stirring with the thermometer. Record the temperature at which crystals start to form in the Table I below.
- v) Add a further  $1\text{cm}^3$  of distilled water from the burette to the mixture. Repeat the procedure (iii) and (iv) above and record the crystallization temperature.

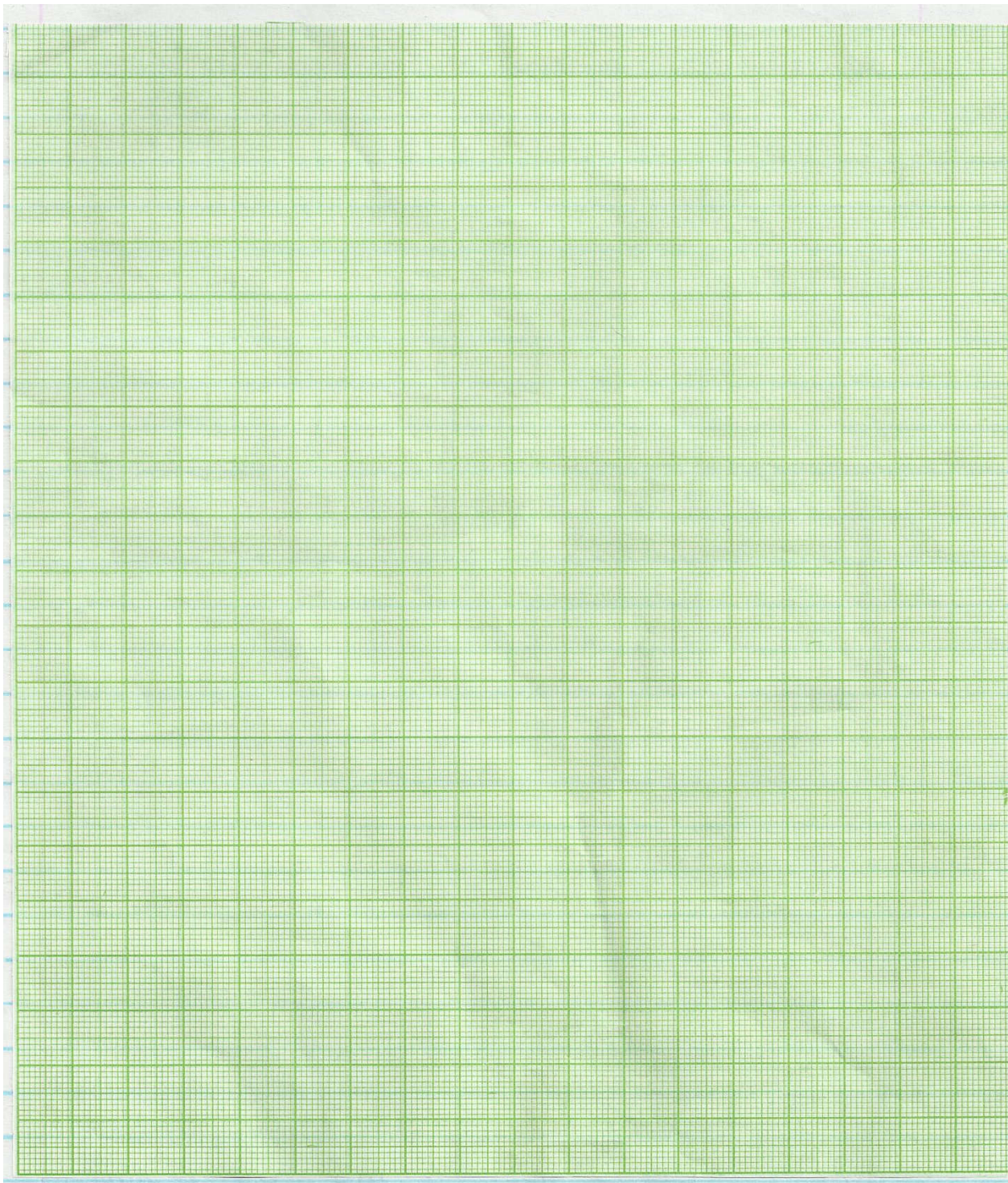
Complete Table I below by adding the volumes of distilled water as indicated.

RETAIN THE CONTENTS OF THE BOILING TUBE FOR USE IN PROCEDURE II

Table I

Volume of distilled water in boiling tube	Crystallization temperature	Solubility of solid A in 100 of water
4		
5		
6		
7		
8		

- a) On the grid provided, plot a graph of solubility of solid A (y-axis) against crystallization temperature. (3 marks)



- b) From the graph, determine
- (i) The solubility of A at 40°C (1 mark)
  
  - (ii) The temperature at which 110g of A dissolve in 100g of water. (1 mark)

PROCEDURE II

- i) Transfer the contents of the boiling tube in procedure I into a clean 250ml volumetric flask. Add distilled water to the mark. Label the resulting solution A.
- ii) Fill the burette with solution A. Pipette 25cm<sup>3</sup> of solution B into a clean 250ml conical flask. Add 3 drops of phenolphthalein indicator.
- iii) Titrate A against B and record your results in table II below.
- iv) Repeat the experiment two more times and complete the table II below.

Table II

	I	II	III
Final burette reading (cm <sup>3</sup> )			
Initial burette reading (cm <sup>3</sup> )			
Volume of A used (cm <sup>3</sup> )			

(4 marks)

Calculate:

- a) Average volume of A used. (1 mark)
  
- b) (i) The moles of sodium hydroxide solution B used. (1 mark)
  
- (iii) The moles of A used given that the mole ratio of A:B is 1:2 (1 mark)
  
- (iv) The molarity of Acid solution A. (2 marks)
  
- (v) The R.M.M of the acid. (2 marks)

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

a) Place all solid T in a boiling tube. Add about  $6\text{cm}^3$  of distilled water to the solid T and shake the mixture well. Retain the mixture for use in the following tests.

Observation	Inference
(1 mark)	(1 mark)

b) Dip a clean glass rod in the mixture obtained above and burn it on a Bunsen burner flame.

Observation	Inference
(1 mark)	(1 mark)

c) Divide the mixture in the boiling tube into 3 portions.

(i) To the 1<sup>st</sup> portion, add about 3 drops of potassium iodide solution.

Observation	Inference
(1 mark)	(1 mark)

(ii) To the 2<sup>nd</sup> portion, add about  $1\text{cm}^3$  of barium chloride solution. Retain the resulting mixture for use in (iii) below.

Observation	Inference
(1 mark)	(1 mark)

(iii) To the mixture in (ii) above, add about  $4\text{cm}^3$  of dilute hydrochloric acid.

Observation	Inference
(1 mark)	(1 mark)

(iv) To the 3<sup>rd</sup> portion, add about 3 drops of acidified potassium dichromate (VI) solution.

Observation	Inference
(1 mark)	(1 mark)

3. You are provided with liquid J. Use it to carry out the tests below.

a) Place half of liquid J on a watch glass and ignite using a burning splint.

Observation	Inference
(1 mark)	(1 mark)

b) Divide the remaining liquid into 4 equal portions

(i) To the 1<sup>st</sup> portion, add 3 drops of acidified potassium manganate (VII) solution and warm.

Observation	Inference
(1 mark)	(1 mark)

(ii) To the 2<sup>nd</sup> portion, add about 1cm<sup>3</sup> of bromine water.

Observation	Inference
(1 mark)	(1 mark)

(iii) To the 4<sup>th</sup> portion, add solid sodium hydrogen carbonate provided.

Observation	Inference
(1 mark)	(1 mark)

GATUNDU SOUTH SUB COUNTY FORM FOUR 2014 EVALUATION EXAM

233/3

CHEMISTRY

PAPER 3

JULY/AUGUST 2014

**MARKING SCHEME**

QUESTION 1

PROCEDURE 1

Table 1

Complete table – 3 marks (1 mark for temp. reading, 2 marks for calculating solubility).

Decimal (Temperature) – 1 mark (1 or 2 d.p consistently or whole number)

Accuracy - 1 mark (Tied to the school value 1<sup>st</sup> reading only)

Trend - 1 mark (Temp. continuously dropping – 1 mark otherwise penalize fully)

a) Graph

labeling axes – ½ mark

Scale – ½ mark

Plotting – 1 mark

Curve – 1 mark

b) i) Accept correct reading shown from a correctly plotted graph for ½ mark, and correct reading for ½ mark otherwise penalize fully. For correct reading without showing award.

ii) Mark as b(i) above

PROCEDURE 2

Table II

Complete table – 1 mark

Decimal - 1 mark

Accuracy - 1 mark

Principles of averaging – 1 mark (average volume in (a))

Final Accuracy – 1 mark

Total 5 marks



$$B \text{ (i) } \frac{25 \times 0.2 \sqrt{1/2}}{1000} = 0.005 \text{ moles } \sqrt{1/2}$$

ii) Mole ratio A : B  
 1 : 2  
 ? : 0.005  
 $\sqrt{1/2}$   
 $\frac{1 \times 0.005}{2} = 0.0025 \text{ moles } \sqrt{1/2}$

iii) 0.0025 moles  $\longrightarrow$  average volume ((a) above)  
 $\frac{1000 \times 0.0025 \sqrt{1}}{\text{Average volume}} = \text{correct answer (1)}$

iv) 6g  $\longrightarrow$  250cm<sup>3</sup>  
 ? : 1000cm<sup>3</sup>  
 $\sqrt{1/2}$   
 $\frac{6 \times 1000}{250} = 24g \sqrt{1/2}$

24g = correct answer in b(iii) above  
 ? : 1 mole

$\frac{24 \times 1 \sqrt{1/2}}{\text{Correct answer}} = \text{R.M.M. } \sqrt{1/2}$

NOTE- Penalty/condition

1. Penalize 1/2 mark for wrong units
2. All answers should be given to at least 4 d.p unless for terminating decimals to less than 4 d.p.
3. Penalize 1/2 mark for wrong transfer of values, otherwise penalize fully for strange figures.

QUESTION 2

Observation	Inference
a) Solid dissolves to a colourless solution $\sqrt{1}$	- colour ions absent $\sqrt{1}$
b) Burns with a yellow flame $\sqrt{1/2}$	- Na <sup>+</sup> present $\sqrt{1/2}$
c) (i) No yellow ppt formed $\sqrt{1/2}$	- Pb <sup>2+</sup> absent $\sqrt{1/2}$
(ii) White ppt formed $\sqrt{1}$	SO <sub>4</sub> <sup>2-</sup> , SO <sub>3</sub> <sup>2-</sup> or CO <sub>3</sub> <sup>2-</sup> present $\sqrt{1}$
(iii) White ppt dissolves $\sqrt{1}$	SO <sub>3</sub> <sup>2-</sup> or CO <sub>3</sub> <sup>2-</sup> present $\sqrt{1}$
(iv) Acidified K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> solution changes colour from orange to green $\sqrt{1}$	SO <sub>3</sub> <sup>2-</sup> present or CO <sub>3</sub> <sup>2-</sup> absent $\sqrt{1}$

NB

1. For part C (ii) award,  
 1 mark for 3 ions mentioned  
 1/2 mark for 2 ions mentioned  
 0 mark for 1 ion mentioned

2. Penalize fully for any contradicting ions mentioned in all the inferences
3. For part C (iii) award,
  - 1 mark for 2 ions mentioned
  - ½ mark for 1 ion mentioned

### QUESTION 3

Observation	Inference
a) Burns with blue flame or non-sooty flame/non smoky flame/non-luminous flame ✓ (1)	$\begin{array}{c} \text{I} \quad \text{I} \\ \text{C} = \text{C} \quad \text{or} \quad -\text{C} \equiv \text{C}- \\ \text{I} \quad \text{I} \end{array}$ absent ✓ (1)
b) (i) Acidified KMnO <sub>4</sub> solution changes colour from purple to colourless. ✓ (1)	R – OH present ✓ (1) $\begin{array}{c} \text{I} \quad \text{I} \\ \text{C} = \text{C} \quad \& \quad -\text{C} \equiv \text{C}- \\ \text{I} \quad \text{I} \end{array}$ penalize
(ii) Orange colour of bromine water persists/remains ✓ (1)	$\begin{array}{c} \text{I} \quad \text{I} \\ \text{C} = \text{C} \quad \text{or} \quad -\text{C} \equiv \text{C}- \\ \text{I} \quad \text{I} \end{array}$ Absent ✓ (1)
(iii) No bubbles/no effervescence ✓ (1)	H <sup>+</sup> /-COOH/H <sub>3</sub> O <sup>+</sup> absent ✓ (1)

### NB

1. Penalize fully for any contradictory ion.
2. for b(iii) award,
  - 1 mark for 3 ions mentioned
  - ½ mark for 2 ions mentioned
  - 0 mark for 1 ion mentioned