

Name ..... Index Number .....

233/3  
CHEMISTRY  
Paper 3  
(PRACTICAL)  
Oct./Nov. 2010  
2¼ hours

Candidate's Signature .....

Date .....



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**  
**Kenya Certificate of Secondary Education**  
**CHEMISTRY**  
**Paper 3**  
**(PRACTICAL)**  
2¼ hours

**Instructions to Candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **ALL** the questions in the spaces provided.
- (d) Mathematical tables and electronic calculators may be used.
- (e) All working **MUST** be clearly shown where necessary.
- (f) **This paper consists of 8 printed pages.**
- (g) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

**For Examiner's use only**

| Question           | Maximum score | Candidate's Score |
|--------------------|---------------|-------------------|
| 1                  | 21            |                   |
| 2                  | 19            |                   |
| <b>Total Score</b> | 40            |                   |

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Kenya Certificate of Secondary Education  
CHEMISTRY  
Paper 3

0034

21012

**Turn over**

1 You are provided with:

- acid A labelled solution A;
- 2.0 M sodium hydroxide solution labelled solution B;
- Solution C containing 25.0 g per litre of an alkanolic acid.

You are required to:

- (a) prepare a dilute solution of sodium hydroxide, solution B.
- (b) determine the:
  - (i) molar mass of the alkanolic acid
  - (ii) reaction ratio between sodium hydroxide and acid A.

### Procedure 1

Using a pipette and a **pipette filler**, place 25.0 cm<sup>3</sup> of solution B into a 250.0 ml volumetric flask. Add about 200 cm<sup>3</sup> of distilled water. Shake well. Add more distilled water to make up to the mark. Label this solution D. **Retain the remaining solution B for use in procedure II.**

Fill a burette with solution C. Using a clean pipette and a **pipette filler**, place 25.0 cm<sup>3</sup> of solution D into a 250 ml conical flask. Add two drops of phenolphthalein indicator and titrate with solution C. Record your results in **table 1**. Repeat the titration two more times and complete the table.

| Table 1                                       | I | II | III |
|---|---|----|-----|
| Final burette reading                         |   |    |     |
| Initial burette reading                       |   |    |     |
| Volume of solution C (cm <sup>3</sup> ) added |   |    |     |

(4 marks)

Determine the:

- (i) average volume of solution C used; (1 mark)

.....

- (ii) concentration of solution **D** in moles per litre; (1 mark)

.....  
.....

- (iii) concentration of the alkanolic acid in solution **C** in moles per litre (1 mole of the acid reacts with 3 moles of the base); (1 mark)

.....  
.....

- (iv) molar mass of the alkanolic acid. (1 mark)

.....  
.....

**Procedure II**

Fill a **clean** burette with solution A. Place 5 cm<sup>3</sup> of solution A into a 100 ml beaker. Measure the initial temperature of solution A in the beaker and record it in **table II**. Using a 10 ml or a 100 ml measuring cylinder, measure 25 cm<sup>3</sup> of solution B. Add it to solution A in the beaker and immediately stir the mixture with the thermometer. Record the maximum temperature reached in **table II**. Repeat the experiment with other sets of volumes of solutions A and B and complete the table.

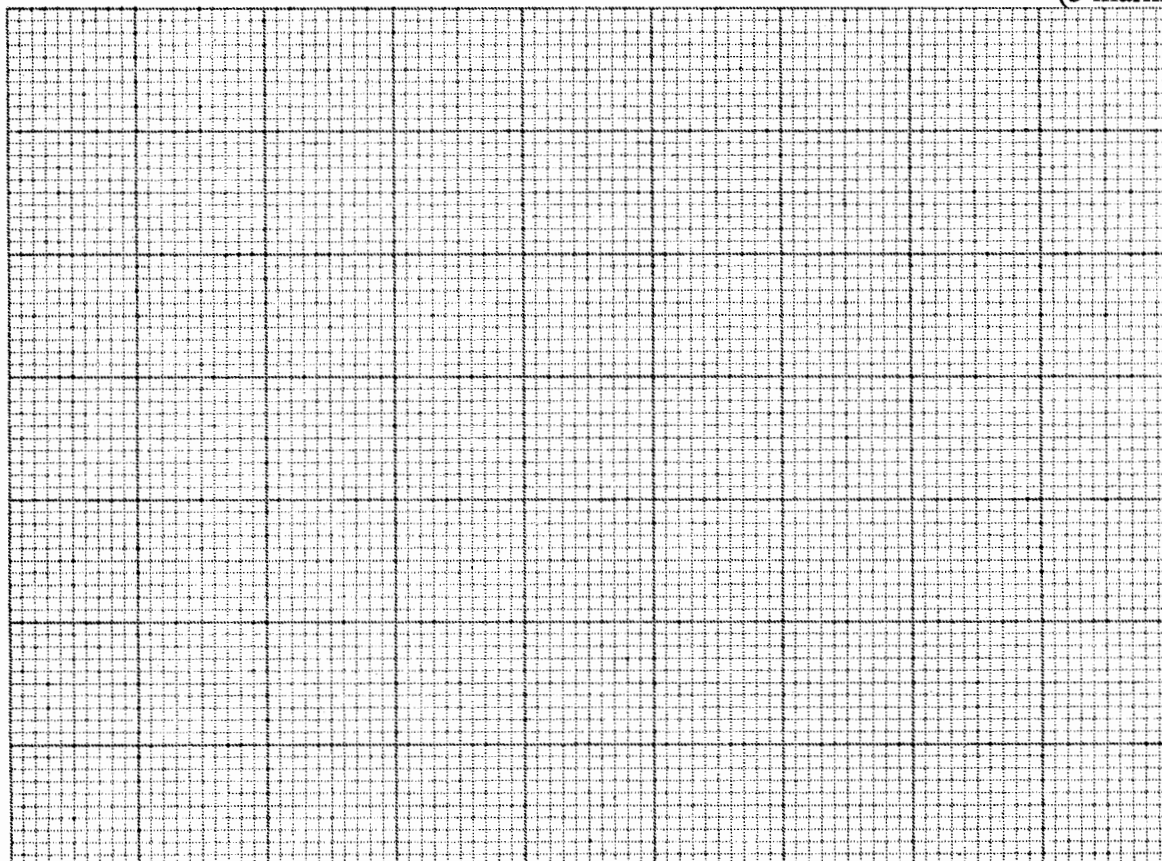
**Table II**

|   |    |    |    |    |    |    |
|---|----|----|----|----|----|----|
| Volume of solution A (cm <sup>3</sup> ) | 5  | 9  | 13 | 17 | 21 | 25 |
| Volume of solution B (cm <sup>3</sup> ) | 25 | 21 | 17 | 13 | 9  | 5  |
| Maximum temperature (°C)                |    |    |    |    |    |    |
| Initial temperature (°C)                |    |    |    |    |    |    |
| Change in temperature, $\Delta T$       |    |    |    |    |    |    |

(6 marks)

- (a) On the grid provided; plot a graph of  $\Delta T$  (Vertical axis) against the volume of solution A.

(3 marks)



- (b) From the graph, determine the volume of solution **A** which gave the maximum change in temperature. (1 mark)

.....

- (c) Determine the volume of solution **B** that reacted with the volume of solution **A** in (b) above. (1 mark)

- (d) Calculate the:

- (i) ratio between the volumes of solutions **A** and **B** that neutralised one another; (1 mark)

.....

.....

- (ii) concentration in moles per litre of the acid in solution **A**.  
(Assume that the volume ratio is the same as the mole ratio). (1 mark)

.....

.....

2 You are provided with solids E, F and G.  
Carry out the tests below and write your observations and inferences in the spaces provided.

(a) Place all of solid E in a boiling tube. Add 20 cm<sup>3</sup> of distilled water and shake until all the solid dissolves. Label this as solution E.

(i) To about 2 cm<sup>3</sup> of solution E in a test-tube, add 4 drops of 2 M sulphuric (VI) acid.

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (2 marks)  |

(ii) To about 2 cm<sup>3</sup> of solution E in a test-tube, add 2 M sodium hydroxide dropwise until in excess.

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (1 mark)   |

(iii) Place one half of solid F in a test-tube. Add 2 cm<sup>3</sup> of distilled water and shake well. Add 4 drops of this solution to about 2 cm<sup>3</sup> of solution E in a test-tube.

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (1 mark)   |

- (iv) To about 2 cm<sup>3</sup> of solution E in a test tube, add 2 drops of aqueous potassium iodide.

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (1 mark)   |

- (b) (i) Using a **metallic** spatula, ignite about one half of solid G in a Bunsen burner flame.

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (1 mark)   |

- (ii) Place the other half of solid G into a boiling tube. Add 15 cm<sup>3</sup> of distilled water and shake well. Label this solution G. Use this solution for the following tests.

- I Place 2 cm<sup>3</sup> of solution G in a test-tube and determine its pH.

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (1 mark)   |

- II To about 2 cm<sup>3</sup> of the solution obtained in (ii) above, add 3 drops of acidified potassium manganate (VII).

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (1 mark)   |

- III To about 2 cm<sup>3</sup> of the solution obtained in (ii) above, add 2 drops of bromine water.

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (1 mark)   |

- (iii) To the remaining solution G in the boiling tube, add the other half of solid F.

| OBSERVATIONS | INFERENCES |
|--------------|------------|
| (1 mark)     | (1 mark)   |

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