NAME    _____    INDEX NO.    _____

SCHOOL    _____    SIGNATURE    _____

DATE    _____

**233/3**
**CHEMISTRY**
**PAPER 3**
**(PRACTICAL)**
**TIME: $2\frac{1}{4}$ HOURS**

JULY, 2017

## KITUI COUNTY MOCK
# END OF TERM II FORM FOUR EXAMINATION, 2017
## Kenya Certificate of Secondary Education (K.C.S.E)

**INSTRUCTIONS:**

o Write your name and index number in the spaces provided above.

o Answer **ALL** questions in the spaces provided.

o You are **NOT** allowed to start working with the apparatus for the first 15minutes of the $2\frac{1}{4}$ hours allowed for this paper. This time will enable you read through the question paper and make sure you have all the chemicals and apparatus required.

o Mathematical tables and electronic calculators may be used.

o All working **must be** clearly shown where necessary.

o This paper consists of **8** printed pages

o Candidates should check to ensure that all pages are printed as indicated and no questions are missing

### FOR EXAMINER'S USE ONLY

| QUESTION | MAXIMUM SCORE | CANDIDATE'S SCORE |
|---|---|---|
| 1 | 21 | |
| 2 | 12 | |
| 3 | 07 | |
| **TOTAL SCORE** | **40** | |

1. **You are provided with;**

   - Aqueous hydrochloric acid labeled solution A.

   - Solution B containing 8.0 g per litre of sodium carbonate.

   - An aqueous solution of substance C labeled solution C.

   **You are required to determine the;**

   - Concentration of solution A.

   - Enthalpy of reaction between hydrochloric acid and substance C.

   **Procedure I**

   Using a pipette and pipette filler, place $25.0cm^3$ of solution A into a 250ml, volumetric flask.

   Add distilled water to make $250cm^3$ of solution. Label this solution D.

   Place solution D in a burette. Clean the pipette and use it to place $25.0cm^3$ of solution B into a conical flask. Add 2 drops of methyl orange indicator provided and titrate with solution D. 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 D used ($cm^3$) |  |  |  |

   (4 marks)

   Calculate;

i) Average volume of solution D used. (1 mark)

   _____

   _____

   _____

ii) Concentration of sodium carbonate in solution B.

   (Na = 23.0, O = 16.0, C = 12.0) (1 mark)

   _____

   _____

   _____

   _____

iii)  Concentration of hydrochloric acid in solution D.                                    (2 marks)

_____

_____

_____

_____

_____

_____

iv)  Concentration of hydrochloric acid in solution A.                                    (1 mark)

_____

_____

_____

_____

**Procedure II**

Using a clean burette, place 2 cm$^3$ of solution A into a boiling tube. Take the initial temperature of the solution in the boiling tube and record it in table 2. Using a clean measuring cylinder, measure 14 cm$^3$ of solution C into 100cm$^3$ beaker and add it to a solution A in the boiling tube. Stir the mixture immediately with a thermometer and record in table 2 the highest temperature reached. Repeat the experiment with the other sets of volumes of A and C in the table and complete it.

(Rinse the thermometer and the boiling tube with distilled water after each experiment)

**Table 2**

| Volume of solution A (cm$^3$) | 2 | 4 | 6 | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|---|
| Volume of solution C (cm$^3$) | 14 | 12 | 10 | 8 | 6 | 4 | 2 |
| Initial temperature of solution C (°C) | | | | | | | |
| Highest temperature of solution C (°C) | | | | | | | |
| Change in temperature ΔT (°C) | | | | | | | |

(5 marks)

i) On the grid provided, draw a graph of ΔT (vertical axis) against volume of solution A used . (3 marks)
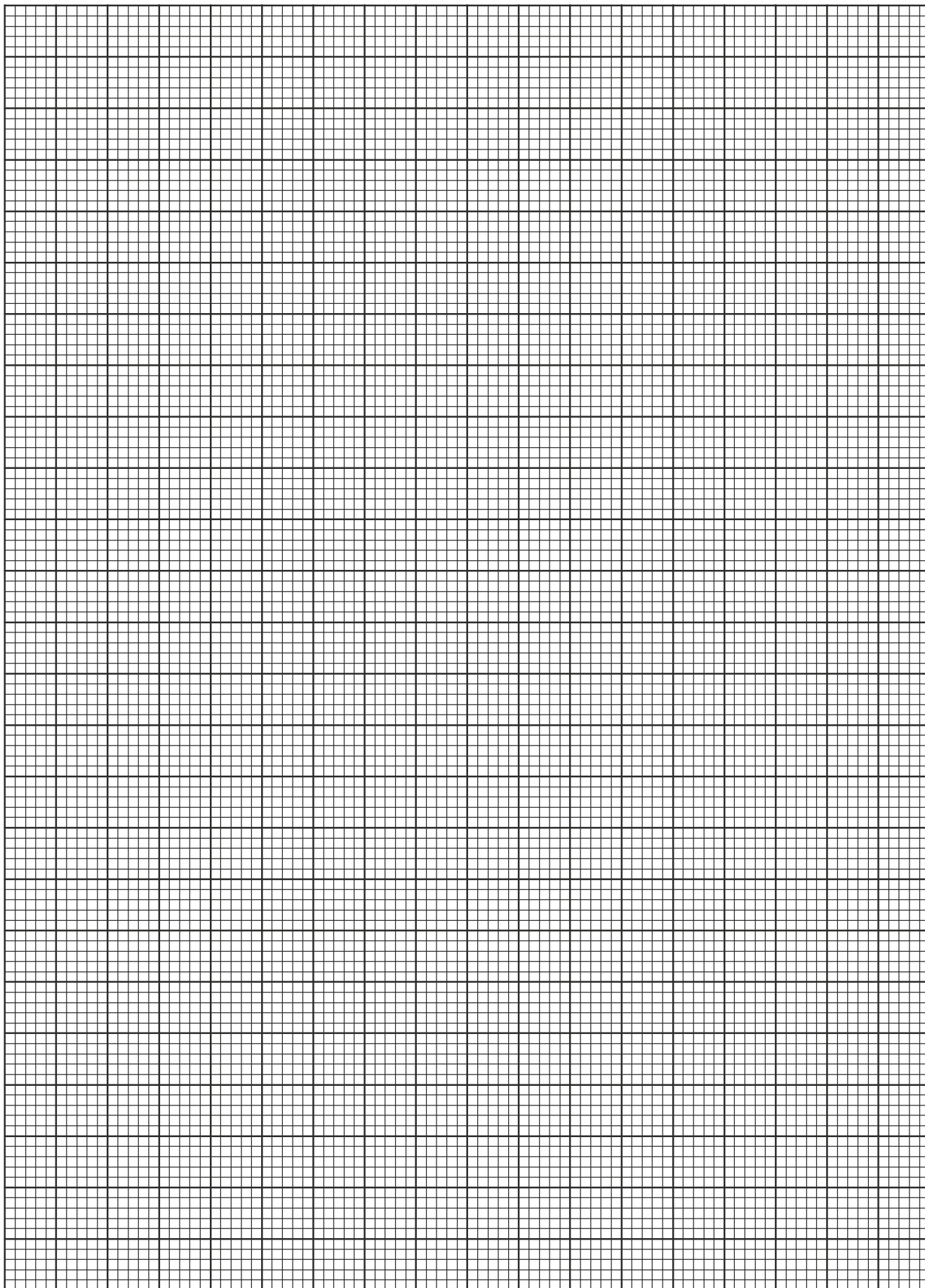
ii) From the graph, determine;

I    The maximum change in temperature.                                                    (½ mark)

_____

_____

_____

II.   The volume of solution A required to completely neutralize solution C.               (½ mark)

_____

_____

_____

iii) Calculate the;

I.    Number of moles of hydrochloric acid required to completely neutralize solution C.    (1 mark)

_____

_____

_____

II.   Molar enthalpy of reaction between hydrochloric acid and substance C (in kilojoules per mole of hydrochloric acid). Assume the specific heat capacity of the solution is 4.2 $Jg^{-1}K^{-1}$ and density of solution is 1.0 $gcm^{-3}$.                                                    (2 marks)

_____

_____

_____

_____

_____

**2.** You are provided with solid Q. Carry out the following tests on Q and record your observations and inferences in the spaces provided.

a) Place a spatula of solid Q into a boiling tube and add 12 cm$^3$ of distilled water.

Shake the mixture thoroughly. Divide the mixture into five portions.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

b) To the first portion, add 5 cm$^3$ of 2M Nitric (V) acid.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

c) To the second portion, add four drops of lead (II) nitrate solution.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

d) To the third portion, add four drops of Barium nitrate solution.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

e) To the fourth portion, add sodium hydroxide solution dropwise until in excess.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

f) To the fifth portion, add ammonia solution dropwise until in excess.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

**3.** You are provided with substance Y.

Carry out the following tests on Y and record your observations and inferences in the spaces provided.

a) Describe the appearance of solid Y. (1 mark)

_____

_____

b) Scoop a little solid Y with a clean metallic spatula and ignite it using non-luminous part of the Bunsen burner flame.

| Observations | Inferences |
|---|---|
| | |
| (1 mark) | (1 mark) |

c) Add about 10 cm$^3$ of distilled water to the remaining solid Y in a boiling tube.

Divide the resulting mixture into 2 portions.

i) To the portion one, add 3 drops of acidified potassium manganate (VII) solution.

| Observations | Inferences |
|---|---|
| | |
| (1 mark) | (1 mark) |

ii) To portion two, add sodium hydrogen carbonate.

| Observations | Inferences |
|---|---|
| | |
| (1 mark) | (1 mark) |