Name ................................................................... Index No. ...........................................

 School ...............................................................Candidate's signature ...........................

                                                                Date .....................................................

233/3

**CHEMISTRY**
Paper 3

**July/August 2016**

Time 2¼ hours

# NTIMA, NYAKI AND MUNICIPALITY CLUSTER EVALUATION - 2016
## Kenya Certificate of Secondary Education
### CHEMISTRY
### Paper - 233/3 PRACTICAL
### July/August 2016
### 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 | 23 | |
| 2 | 17 | |
| 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 :
Hydrochloric acid solution B
0.1M sodium hydroxide solution C
Phenolphthalein indicator
4 pieces of metal M
Solid Q

You are required to
Determine concentration of solution B
Determine rate of reaction of metal M and hydrochloric acid solution B.
Determine molar heat change : when solid Q is dissolved in water.

Procedure
Using 100cm³ measuring cylinder, place 100cm³ of distilled water in 250ml volumetric flask.
Add 25cm³ of solution B
Shake well and add distilled water up to the mark.
Label this solution D

Fill the burette with solution D
Pipette 25cm³ of solution C into conical flask and add 2 - 3 drops of phenolphthalein indicator. Titrate the solution D with solution C and stop when the indicator just turns colourless and record in the table below.

a)

| | 1 | 2 | 3 |
|---|---|---|---|
| Final burette readings (cm³) | | | |
| Initial burette readings (cm³) | | | |
| Volume of solution D used (cm³) | | | |

Calculate the average volume of solution D.
(1 mark)

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b) Calculate the number of moles of solution C used.
(1 mark)

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c) Calculate the number of moles of solution D that reacted.                              (1 mark)

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d) Work out the concentration of dilute hydrochloric acid, solution D in moles per litre.        (1 mark)

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e) Determine the original concentration of hydrochloric acid solution B.                  (1 mark)

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**PROCEDURE II**
Using 100ml measuring cylinder measure 80cm³ of distilled water and place it in the 250ml plastic beaker.
Measure the temperature of this solution and record in Table 2 below. Add all solid Q into the plastic beaker and stir the mixture.
Note the final temperature and record it in the table.

TABLE 2

| | |
|---|---|
| Final temperature (°C) | |
| Initial temperature (°C) | |
| Temperature change (DT) | |

(3 marks)

a)                                                                                      Calculate the heat change of the reaction.
(specific heat capacity = 4.2 kJ / g/ K, density = 1g / cm³)                           (2 marks)

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b)  Determine the molar enthalpy of solution Q (RMM of Q = 80)                         (2 marks)

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**PROCEDURE III**
Measure 250cm³ of HCl solution B and put in 100cm³ beaker provided.

Add one of the 1cm pieces of metal M to the solution and at the same time start a stop watch or stop clock and record the time taken for the reaction to come to completion. Repeat the above process but use 20cm³ of hydrochloric acid and 5cm³ of water.
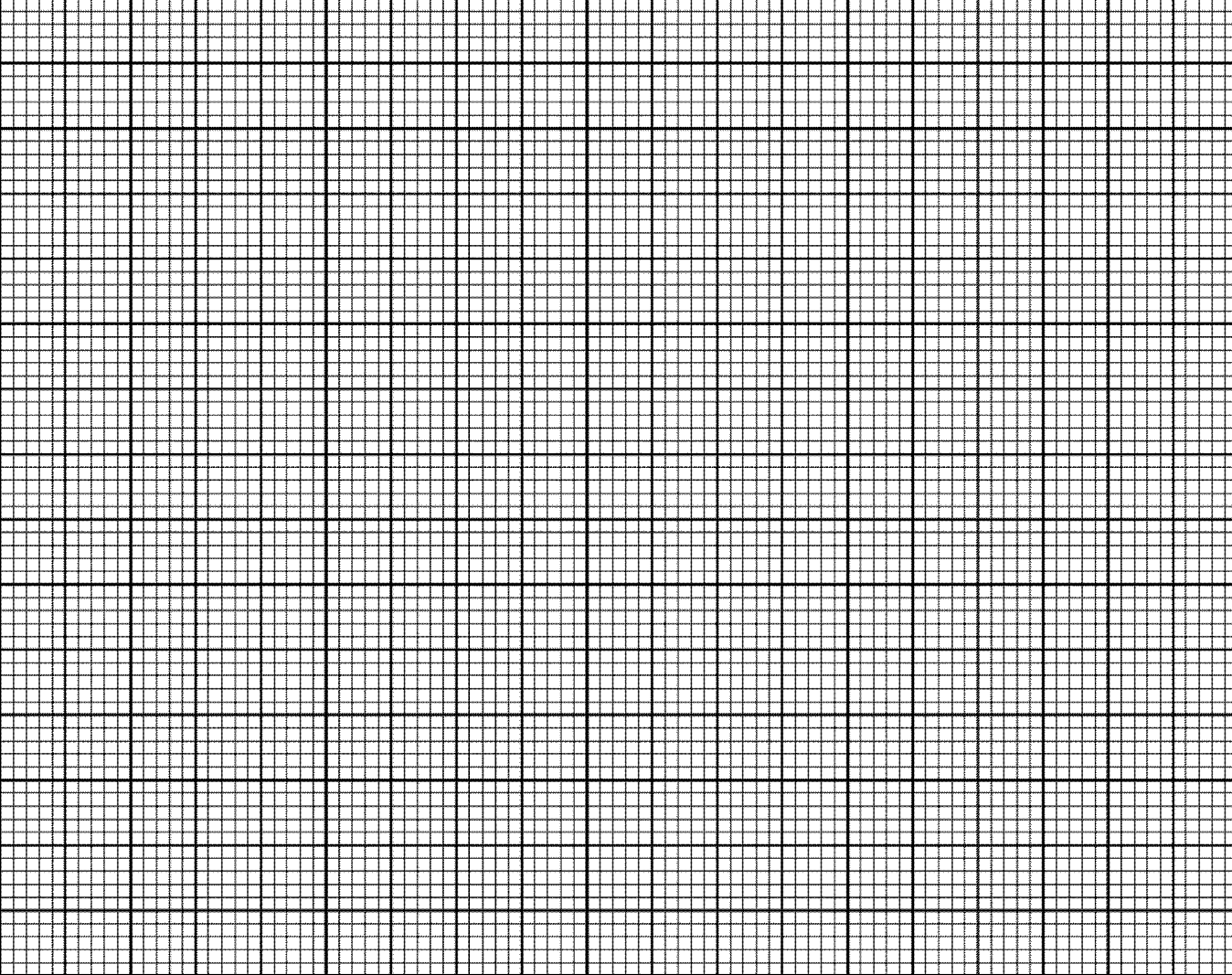Repeat the same process with different volume of water and hydrochloric acid as shown in the table.

| TABLE 3 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Metal size in cm | 1cm | 1cm | 1cm | 1cm |
| Volume of HCl (cm³) | 25 | 20 | 15 | 10 |
| Volume of water (cm³) | 0 | 5 | 10 | 15 |
| Total volume (cm³) | 25 | 25 | 25 | 25 |
| Time in second (t) | | | | |
| ¹/t (reciprocal of time) | | | | |

(4 marks)

a)  State the rate factor measured in the reaction.                                    (1 mark)

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b) Plot the graph of the volume of acid against reciprocal of time ($^1/_t$)                    (3 marks)

c) Using the graph determine the time taken if 14cm³ of HCl was used.                    (1 mark)

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2. You are provided with solid X for analysis. Use it as instructed and record observations and inferences.

a) Put all solid X into a boiling tube with about 100cm³ of distilled water and shake. Spare the contents

for use in the part that follow.

b)  Filter the content got in (a) and keep both the residue and filtrate.

| Observations | Inferences |
| --- | --- |
| | |
| (½ mark) | (½ mark) |

c)  Dilute the filtrate into five portions.
   i)  Scoop a little of the 1st portion of filtrate using a clean metallic spatula and burn.

| Observations | Inferences |
| --- | --- |
| | |
| (½ mark) | (½ mark) |

ii)  To 2nd portion add 3 drops of lead (II) nitrate solution.

| Observations | Inferences |
| --- | --- |
| | |
| (½ mark) | (½ mark) |

iii) To 3rd portion add 3 drops of Barium nitrate solution.

| Observations | Inferences |
|---|---|
| | |
| (½ mark) | (½ mark) |

iv) To fourth portion add 3-drops of barium nitrate followed by 1cm³ of dilute nitric (V) acid.

| Observations | Inferences |
|---|---|
| | |
| (½ mark) | (1 mark) |

v) To the 5th portion add 3 drops of acidified potassium manganate (VII) solution.

| Observations | Inferences |
|---|---|
| | |

**d)** To the residue in (b) above add dilute nitric (V) acid dropwise till no further change spare products for parts that follow.
(1 mark)                  (½ mark

| Observations | Inferences |
|---|---|
| | |

**e)** Divide the solution got in (d) above into four portions.
(½ mark)                (½ mark

   i) To the 1st portion add 2 - 3 Drops of NaOH solution till in excess.

| Observations | Inferences |
|---|---|
| | |

ii) To the 2nd portion add 2 - 3 drops of $NH_{3(aq)}$ till in excess.

(½ mark                                               (½ mark

| Observations | Inferences |
|---|---|
| | |

iii) To the 3rd portion add three drops of NaCl solution

(1 mark                                              (1 mark

| Observations | Inferences |
|---|---|
| | |

iv) To the 4th portion add three drops of $KI_{(aq)}$

(1 mark                                              (½ mark

| Observations | Inferences |
|---|---|
| | |

(½ mark                                             (½ mark

| Observations | Inferences |
|---|---|
|  |  |
| (½ mark | (½ mark) |