# MASENO SCHOOL

## JULY/AUGUST MOCK - 2024

233/3 – CHEMISTRY Paper 3

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**Name …… Admission Number……..**

**Class …… Date ……Signature……**

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**INSTRUCTIONS TO THE CANDIDATES:**

- ***Write your name and index number in the spaces provided***
- ***Sign*** *and write the* ***date*** *of examination in the spaces provided*
- ***Answer all the questions in the spaces provided.***
- *Mathematical tables and electronic calculators may be used.*
- *All working* ***MUST*** *be clearly shown where necessary.*
- *Use the first 15minutes of the 2 ¼ hours to ascertain you have all the chemical and apparatus that you may need.*

**For Examiner's Use Only**

| Question | Maximum score | Candidate's score |
|---|---|---|
| 1 | 19 | |
| 2 | 12 | |
| 3 | 9 | |
| | **40** | |

1. You are provided with.
   - Solid A
   - 2M hydrochloric acid solution B
   - 0.1M sodium hydroxide solution D

   You are required to determine the enthalpy change for the reaction between solid A and one mole of hydrochloric acid.

   **PROCEDURE A**

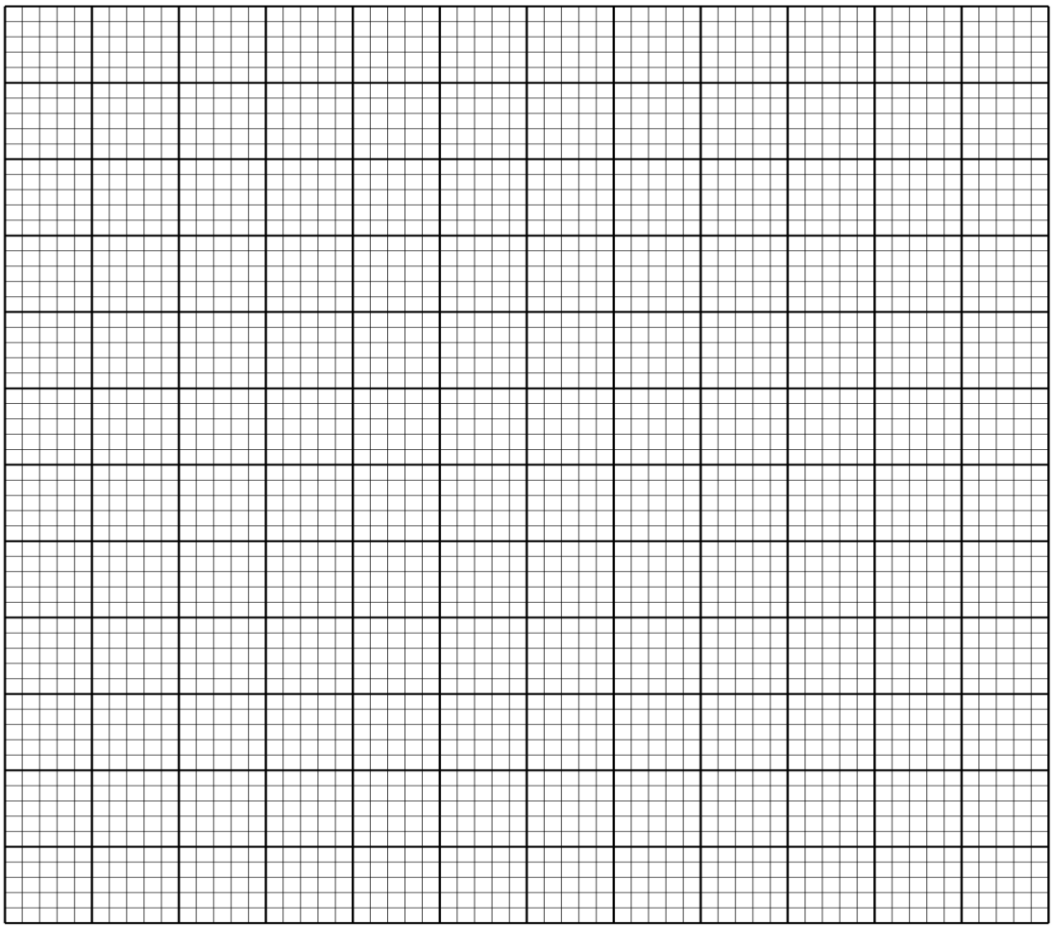
   Using a burette, place 20 $cm^3$ of 2M Hydrochloric acid, solution B in 100ml beaker. Add all solid A to the acid. Stir the mixture gently with the thermometer. Measure the temperature of the mixture after every half a minute and record the values in the table. **RETAIN THE MIXTURE TO BE USED IN PROCEDURE 2**

   **TABLE 1**

| **Time( min)** | **0** | **½** | **1** | **1 1/2** | **2** | **2 ½** | **3** | **3 1/2** | **4** | **4 1/2** | **5** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature ($^o$ c) | | | | | | | | | | | |

(4 marks)

   a. Plot the graph of temperature against time. (3 marks)



b. Using the graph determine the temperature change (1mark)

c. Calculate the heat change for the reaction. (Assume the specific heat capacity of the mixture is 4.2j/kg/k and density of the mixture is 1g/cm$^3$.) (1 mark)

**PROCEDURE B**

Rinse the burette thoroughly and fill it with sodium hydroxide (D). Transfer all the contents of 100ml beaker used in procedure A into 250ml volumetric flask. Add distilled water up to the mark. Label the

solution C. using pipette and pipette filler place 25cm$^3$ of solution C into 250ml conical flask. Add 2 to 3 drops of phenolphthalein indicator and titrate against sodium hydroxide. Record the results in the **table 2**. Repeat **titration two more times** and complete the table 2

| TITRATIONS | **1** | **2** | **3** |
|---|---|---|---|
| Final burette reading (cm$^3$) | | | |
| Initial burette reading (cm$^3$) | | | |
| Volume of solution C used (cm$^3$) | | | |

(4marks)

**i.** Calculate the average volume used (1 mark)

**ii.** Calculate the number of moles of sodium hydroxide used (1 mark)

**iii.** Calculate the number of moles of hydrochloric acid in 25cm$^3$ of solution C. (1 mark)

**iv.** Calculate the number of mole of hydrochloric acid in 250cm$^3$ of solution C. (1 mark)

**v.** Calculate the number of moles of hydrochloric acid in 20cm3 of solution B. (1mark)

**vi.** Calculate the number of moles of hydrochloric acid that reacted with solid A. (1mark)

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

(a)Place all of solid E in a boiling tube. Add about $10cm^3$ of distilled water and shake thoroughly. Filter the mixture into another boiling tube. **Retain** the filtrate for use in test 2(b)below. Dry the residue using pieces of filter paper.

(i)Transfer about half of the dry residue into a dry test tube. Heat the residue strongly and test any gas produced using a burning splint.

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

**(**ii**)**Place the rest of the residue in a dry test tube. Add 4cm$^3$ of 2M hydrochloric acid. Retain the mixture for test (iii)below

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

(iii)To 2cm$^3$ of the solution obtained in (ii) above, add 6cm$^3$ of aqueous ammonia dropwise

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

(b)(i)To 2cm$^3$ of the filtrate obtained in (a)above, add about 3cm3 of aqueous ammonia(excess)

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

(ii)To 2cm$^3$ of the filtrate, add about 2cm$^3$ of 2M hydrochloric acid

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

(i)To 2cm$^3$ of the filtrate, add one or two drops of barium nitrate solution

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

3. You are provided with solid **F**. Carry out the tests in (a) and (b)and write your observations and inferences in the spaces provided. Describe the method used in part (c).

(a)Place about one third of solid G on a boiling tube then add about 3ml of 2M NaOH.

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

(b)Dissolve the remaining solid G in about $10cm^3$ of distilled water in a boiling tube. Use the solution for tests b (i).(ii) and (c).

(i)Place $2cm^3$ of the solution in a test tube and add 2drops of acidified potassium manganate (VII) solution C.

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

ii) To 2cm3 of the solution, add all of solid sodium hydrogen carbonate provided.

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

| | |
|---|---|
| (1 mark) | (1 mark) |

(c)Determine the pH of the solution obtained in (b) above

| Method used | Inferences |
|---|---|
| (2 marks) | (1 mark) |

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