

NAME.....  
SCHOOL.....  
CANDIDATE'S SIGNATURE.....

INDEX NO...../  
DATE .....

233/3

**CHEMISTRY**

**PAPER 3 (PRACTICAL)**

**TIME: 2 HRS**

**INSTRUCTIONS TO CANDIDATES**

1. Write your **name** and your **index number** in the spaces provided above.
2. **Sign** and **Write** the date of examination
3. Answer **ALL** questions in the spaces provided.
4. **Mathematical tables** and **silent electronic calculators** may be used
5. **All working MUST** be shown clearly where necessary
6. This paper consists of **8 printed pages**
7. 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 | SCORE |
|----------|---------------|-------|
| <b>1</b> | <b>23</b>     |       |
| <b>2</b> | <b>1</b>      |       |
|          | <b>40</b>     |       |

*This paper consists of 8 printed pages.*

*Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing*

# QUESTION 1

1. You are provided with the following:-

- (i) Solid  $S_1$ , which is about 3g of sodium ethanedioate.
- (ii) Solution  $S_2$ , which is 0.02M Potassium manganate (Viii)
- (iii) Solution  $S_3$ , which is 1.0M Sulphuric Acid

You are required to determine the solubility of solid  $S_1$  at room temperature

## PROCEDURE

- (i) Place 3.0g of solid  $S_1$  into a dry 250cm<sup>3</sup> conical flask and add 50.0cm<sup>3</sup> of diluted water from the burette.
- (ii) Stir with a thermometer from a while and record the steady temperature that is reached.
- (iii) Warm the mixture to about 60°C while swirling the flask. Note that all the solid may not dissolve.
- (iv) Cool the flask using tap water until the temperature is about the initial steady temperature.
- (v) Label the solution in the flask  $S_1$ , and leave it to stand for a while
- (vi) Measure the temperature of solution  $S_1$  and record appropriately.
- (vii) Use a dry filter and a dry funnel to filter the solution into a dry conical flask.
- (viii) Measure 25.0cm<sup>3</sup> of the filtrate into a 250cm<sup>3</sup> volumetric flask. Add distilled water to the mark.
- (ix) Mix the solution well and label this solution  $S_4$ .
- (x) Pipette 25.0cm<sup>3</sup> of solution  $S_4$  into a dry clean conical flask
- (xi) Add 20cm<sup>3</sup> of 1.0M Sulphuric Acid using a measuring cylinder
- (xii) Heat the mixture to 70°C and titrate while still hot with solution  $S_2$  to a pale pink end point.]
- (xiii) Record the results in the table below.

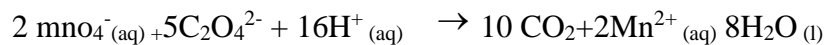
Repeat the procedure in order to obtain concordant titres.

**TABLE 1**

|                         | 1 | 2 | 3 |
|-------------------------|---|---|---|
| Final burette reading   |   |   |   |
| Initial burette reading |   |   |   |
| Titre cm <sup>3</sup>   |   |   |   |

Mean titre = ..... cm<sup>3</sup>

The reaction between the manganate (vii) ions and ethanedioate ions are given by:-



**REQUIRED:-**

(i) Calculate the Number of moles of ethanedioate ions that reacted with manganate (vii) ions in the 25cm<sup>3</sup> of solution S<sub>4</sub>.

(ii) Calculate the number of moles of ethanedioate ions in 25cm<sup>3</sup> of the filtrate.

(iii) Calculate the solubility of sodium ethanedioate,

Na<sub>2</sub>C<sub>2</sub>O<sub>4</sub>, in g/100g water

Na= 23.0, C=12.0, O=16.0

## QUESTION 2:

You are provided with 4.5 g of solid M in a boiling tube. You are required to determine the solubility of solid M at different temperatures.

### PROCEDURE.

1. Using a burette, add 4cm<sup>3</sup> of distilled water to solid M in a boiling tube, Heat the mixture while stirring with thermometer to about 70°C. When the entire solid has dissolved, allow the solution to cool while stirring with thermometer. Note the temperature at which crystals of solid M first appear. Record the temperature in the table below.
2. using the burette add 2cm<sup>3</sup> of distilled water to contents of boiling tube in (1) above. Warm the mixture while stirring with thermometer until all solid dissolves. Allow the mixture to cool while stirring. Note and record the temperature at which crystals first appear.
3. Repeat procedure (2) two more times and record the temperature in the table below.
4. Complete the table by calculating solubility of solid M at different temperatures

| Volume of water in Boiling tube(cm <sup>3</sup> ) | Temperature at which crystals of solid M first appear (°C) | Solubility of solid M in g/100g of H <sub>2</sub> O |
|---|--|---|
| 4   |  |   |
| 6   |  |   |
| 8   |  |   |
| 10  |  |   |

**(6marks)**

- (a) On the grid provided plot graph of the solubility of solid M (y-axis) against temperature (X-axis)

**(4marks)**

- (b) Using your graph determine the temperature at which 100g of solid M would dissolve in 100cm<sup>3</sup> of water

**(2marks)**

(c) State how solubility varies with the temperature

(1mark)

### QUESTION 3

3. You are provided with substance U. You are required to

- Carry out tests on the substance U
- Record all observations and inferences accordingly.

(i) Place a little of substance U in a metallic spatula and ignite it in a Bunsen burner flame.

| OBSERVATION | INFERENCES |
|-------------|------------|
|             |            |

(½ mark)

(½ mark)

(ii) Place a little of substance U in a boiling tube, add distilled water and shake the mixture well, Test the solution with full range pH paper (Universal Indicator paper)

| OBSERVATION | INFERENCES |
|-------------|------------|
|             |            |

|  |  |
|--|--|
|  |  |
|--|--|

**(1 mark)**

**(1 mark)**

**(iii)** Place about 1cm<sup>3</sup> of U in a test-tube. Add ½ spatula end full of sodium hydrogen carbonate

|                    |                   |
|--------------------|-------------------|
| <b>OBSERVATION</b> | <b>INFERENCES</b> |
|--------------------|-------------------|

**(1mark)**

**(1 mark)**

**(iv)** To about 3cm<sup>3</sup> of U in a boiling tube, add acidified potassium dichromate (vi) and warm the mixture

|                    |                   |
|--------------------|-------------------|
| <b>OBSERVATION</b> | <b>INFERENCES</b> |
|--------------------|-------------------|

**(1 mark)**

**(1 mark)**

(v) Repeat the test in (iv) above using acidified potassium Manganate (vii) solution

| <b>OBSERVATION</b> | <b>INFERENCES</b> |
|--------------------|-------------------|
| <b>(1 mark)</b>    | <b>(1 mark)</b>   |

(vi) Add bromine water to about 3cm<sup>3</sup> of a solution for substance U in a boiling tube and warm the mixture.

| <b>OBSERVATION</b> | <b>INFERENCES</b> |
|--------------------|-------------------|
|                    |                   |

|                 |                 |
|-----------------|-----------------|
| <b>(1 mark)</b> | <b>(1 mark)</b> |
|-----------------|-----------------|

- (Vii)** Place about 3cm<sup>3</sup> of solution for substance U in a boiling tube. Add an equal volume of ethanoic acid followed by 2-3 drops of conc. Sulphuric acid (vi) acid and warm the mixture. Add distilled water and smell the mixture

|                    |                   |
|--------------------|-------------------|
| <b>OBSERVATION</b> | <b>INFERENCES</b> |
| <b>(1 mark)</b>    | <b>(1 mark)</b>   |



END