Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Index No. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Candidate’s Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[](https://teacher.co.ke/notes/)

[**SERIES 10 EXAMS**](https://teacher.co.ke/notes/)

**233/3**

**CHEMISTRY**

**PAPER 3**

**PRACTICAL**

**2 ¼ HOURS**

**INSTRUCTIONS TO CANDIDATES**

- Answer all the questions in the spaces provided in this question paper. - You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need. - All working MUST be clearly shown where necessary - Mathematical table may be used. - Electrical calculators may be used.

**FOR EXAMINER’SUSE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| 1 | 22 |  |
| 2 | 12 |  |
| 3 | 6 |  |
| **TOTAL SCORE** | **40** |  |

1. You are provided with:

- 4.5g of solid A in a boiling tube.

- Solution B, 0.06M acidified potassium manganate (VII)

You are required to determine:-

1. The solubility of solid A at different temperature.
2. The number of moles of water of crystallization in solid A.

**Procedure**

1. Using a burette, add 4cm3 of distilled water to solid A in the boiling tube. Heat the mixture while stirring with the thermometer to about 700C. When all the solid has dissolved allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid A first appear. Record this temperature in table I.
2. Using the burette, add 2.0cm3 of distilled water to the contents of the boiling tube. Warm the mixture while stirring with the thermometer until all solid dissolves. Allow the mixture to cool while stirring. Note and record the temperature at which crystals of solid A first appear.
3. Repeat procedure (b) two more times and record the temperatures in the table I. **Retain the** **contents of the boiling tube for use in procedure (e)**
4. (i) Complete table I by calculating the solubility of solid A at different temperatures. The solubility of a substance is the mass of that substance that dissolves in 100cm3 (100g) of water at a particular temperature.

Table I

|  |  |  |
| --- | --- | --- |
| Volume of water in the boiling tube (cm3) | Temperature at which crystals of solid A first appear | Solubility of solid A (g/100g water) |
| 4 |  |  |
| 6 |  |  |
| 8 |  |  |
| 10 |  |  |

( 6 marks )

(ii) On the grid provided, plot a graph of solubility of solid A against temperature ( 3 marks )

(iii) Using your graph

I) Determine the temperature at which 100g of solid A would dissolve in

100cm3 of water. (1 mark )

II) Calculate the mass of solid A that will crystallize out when a hot solution

at 600C cooled to 400C. (1 mark)

(e) (i) Transfer the contents of the boiling tube into 250ml volumetric flask. Rinse both the boiling tube and the thermometer with distilled water and add to the volumetric flask. Add more distilled water to make up to the mark. Label this solution A. Fill burette with solution B. Using a pipette and pipette filler, place 25.0cm3 of solution A into a conical flask. Warm the mixture to about 600C. Titrate the hot solution A with solution B until a permanent pink colour persists. Record your readings in table 2. Repeat the titration two more times and complete table 2.

Table 2

|  |  |  |  |
| --- | --- | --- | --- |
|  | I | II | III |
| Final Burette reading |  |  |  |
| Initial Burette reading |  |  |  |
| Volume of solution B used (cm3) |  |  |  |

(4 marks )

Calculations:-

I) Average volume of solution B used. (1 mark )

II) Number of moles of potassium manganate (VI)) used. (1 mark )

III) Number of moles of A in 25.0cm3 of solution A given that 2 moles of potassium

manganate (VII) react completely with 5 moles of A. (1 mark )

IV) Relative formula mass of A. (2 marks )

(ii) The formula of A has the form D. XH2O. Determine the value of X in the formula given

that the relative formula mass of D is 90 and atomic mass of oxygen and hydrogen

are 16.0 and 1.0g respectively. (2 marks )

2. (a) (i) Place a spatula half-full of solid P in a clean dry test tube. Strongly heat the

test tube – together with its contents. Test for any gases produced.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |

(ii) Repeat the same procedure using solid R.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |

(iii) Place a little of solid G in a dry test tube and heat strongly. Record your

observations and inferences.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |

(h) (i) Place all solid M in a boiling tube. Add distilled water while shaking until the boiling

tube is full.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |

(ii) Obtain two portions of about 2.0cm3 of the resulting mixture above (h(i)

* 1. To the first portion add 2-3 drops of barium nitrate solution.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |

II) To the second portion, add 2-3 drops of barium nitrate solution followed by a

few drops of 2M hydrochloric acid.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |

3. You are provided with liquid S. Carry out the following tests and record your observations

and inferences in the spaces provided.

(i) Place four drops of liquid S on a clean dry watch glass and ignite it.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |

(ii) Place about 2.0cm3 of liquid S in a clean dry test tube, add all sodium

hydrogen carbonate provided.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |

(iii) Place about 2.0cm3 of liquid S in a test tube, add about 1cm3 of acidified

potassium dichromate (VI) and warm the mixture.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| (1 mark ) | ( 1 mark) |