### Name……………………………………………………………….. Class ….…………………

**Index Number ……………………..……… Adm Number………………………**

**233/3**

**CHEMISTRY**

**PAPER 3**

**PRE- MOCK – MARCH 2015**

**TIME: 2**$\frac{1}{4}$**HOURS**

**1. *You are provided with:***

 - 4.5g of solid **P** in a boiling tube

 - Solution **Q**, 0.2M sodium hydroxide

 - Phenophthalein indicator.

 ***You are required to determine:***

 i) The solubility of solid **P** at different temperatures

 ii) The value of **n** in the formula (HX)n• 2H2Oof solid **P.**

**PROCEDURE I**

i) a) Fill the burette with distilled water. Using the burette, add 4.0cm3 of distilled water to solid **P**. in a boiling tube. Heat the mixture in a water bath while stirring with a thermometer to about 700C until all the solid dissolves.

 b) Allow the solution to cool while stirring with the thermometer and note the temperature at which crystals of solid **P** start to appear. Record this temperature in table **1**.

 c) Using the burette, add 2.0cm3 of distilled water to the contents of the boiling tube. Heat the mixture while stirring with the thermometer until all the solid dissolves while in the water bath.

 d) Allow the mixture to cool while stirring and note the temperature at which crystals of solid **P** start to appear.

 e) Repeat the procedure (c) and (d) four more times, heating the solution in a water bath and record the temperature in the table. ***Retain******the contents of the boiling tube for use* *in******procedure II****.*

ii) Complete the table by calculating the solubility of solid **P** at the different temperatures. (the solubility of a substance is the mass of that substance that dissolves in 100cm3(100g) of water at a particular temperature. (6 mks)

**Table I**

|  |  |  |
| --- | --- | --- |
| **Volume of water in the boiling tube (cm3)**  | **Temperature at which crystals of solid P first appear (0C)** | **Solubility of solid P (g/100g) of water** |
| 4 |  |  |
| 6 |  |  |
| 8 |  |  |
| 10 |  |  |
| 12 |  |  |

1. On the grid provided plot a graph of the solubility of solid **P** against temperature.(3mks)

ii) Using your graph determine the temperature at which 100g of solid **P** would dissolve in 100cm3 of water. (1mk)

iii) Determine the solubility of solid **P** at 550C (1mk)

iv) Other than temperatures give two other factors which affect solubility. (2mks)

**PROCEDURE II**

1. Transfer the contents of the boiling tube into a 250ml volumetric flask. Rinse 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 **P**.

Fill the burette with solution **P**. using a pipette and pipette filler place 25.0cm3 of solution **Q** into a conical flask. Titrate solution **Q** with solution **P**. Using phenolphthaline indicator.

**Table II**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **I** | **II** | **III** |
| Final burette reading cm3 |  |  |  |
| Initial burette reading cm3 |  |  |  |
| Volume of solution **P** used cm3 |  |  |  |

 (4mks)

 Calculate the;

i) Average volume of solution **P** used in the experiment. (1mk)

ii) Number of moles of sodium hydroxide used in solution **Q**. (2mks)

iii) Number of moles of solution **P** reacted with the sodium hydroxide given that the relative formula mass of **P**, (HX)n • 2H2O is 126. (3mks)

iv) The number of moles of sodium hydroxide required to react with one mole of **P**. Hence find the value of **n** in the formula (HX) n • 2H2O(3mks)

2 a) You are provided with solid **M** carry out the tests below and record your observations and inferences.

Place a spatula of solid **M** in a boiling tube, add 10 cm3 of distilled water and shake well until all the solid dissolves.

|  |  |
| --- | --- |
| Observations  | Inference  |
|  1mk |  1 mk |

1. To about 1 cm3 of the solution add 2 M sodium hydroxide drop wise until in excess.

|  |  |
| --- | --- |
| Observations  | Inference  |
|  1mk |  1 mk |

1. Place 1cm 3 of the solution in a test tube and add 2 to 3 drops of 2 M sulphuric (VI) acid.

|  |  |
| --- | --- |
| Observations  | Inference  |
|  1mk |  1 mk |

1. To about 1 cm3 of the solution add 4-5 drops of lead (II) nitrate solution.

|  |  |
| --- | --- |
| Observations  | Inference  |
|  1mk |  1 mk |

b) You are provided with solid **N**. Carry out the test in (a) and (b)and fill the table below.

1. Place one third of **N** in a metallic spatula and burn in a non- luminous flame.

|  |  |
| --- | --- |
| Observations  | Inference  |
|  1mk |  1 mk |

1. Dissolve all of the remaining **N** in about 10 cm3 distilled water in a boiling tube.
2. Place 2cm3 of solution in a test tube and add 2 drops of acidified potassium manganate (VII)

|  |  |
| --- | --- |
| Observations  | Inference  |
|  1mk |  1 mk |

1. To 2 cm3 of the solution, add all the solid sodium hydrogen carbonate.

|  |  |
| --- | --- |
| Observations  | Inference  |
|  1mk |  1 mk |