

## CHEMISTRY PAPER 3

## Question 1

(20marks)

*You are provided with;*

- Solid **A** in a boiling tube
- Solution **B**, sodium hydroxide
- 0.125M.monobasic acid, solution **C**

*You are required to;*

- Determine molarity of solution **B**
- Determine solubility of solid **A**

**Procedure I**

- Using a measuring cylinder ,place  $50\text{cm}^3$  of solution **B** into an empty 250ml beaker. Add  $100\text{cm}^3$  of distilled water to the solution. Labe this solution as solution **D**.
- Fill the burette with solution **C**
- Using pipette filler, place  $25\text{cm}^3$  of solution d into a 250ml conical flask. Add two drops of phenolphathatlein indicator.
- Titrate solution **D** with solution **C**
- Record your results in table 1 . repeat the titration two more times and complete table 1.

	I	II	III
Final burette reading ( $\text{cm}^3$ )			
Initial burette reading ( $\text{cm}^3$ )			
Volume of solution <b>C</b> used ( $\text{cm}^3$ )			

(4mks)

- (i) Calculate average volume of solution **C** used.

(1mk)

- Calculate moles of solution **C** used in the experiment.

(1mk)

- Calculate moles of solution **D** used.

(1mk)

- Calculate molarity of solution **D**

(1mk)

- Calculate molarity of solution **B**.

(2mks)

## Procedure II

- (i) Using measuring cylinder add  $20\text{cm}^3$  of distilled water to solid **A** in the boiling tube. Using a glass rod, stir the mixture thoroughly for about three minutes.
- (ii) Filter the mixture obtained into a dry 250ml volumetric flask. Label the filtrate solution **A**.
- (iii) Clean the burette and fill it with solution **A**.
- (iv) Using a pipette and pipette filler, place  $25\text{cm}^3$  of solution **D** into a 250ml conical flask. Add two drops of phenolphthalein indicator.
- (v) Titrate solution **D** with solution **A**. record your results in table 2
- (vi) Repeat the titration two more times and complete table 2.

Table 2

	I	II	III
Final burette reading ( $\text{cm}^3$ )			
Initial burette reading ( $\text{cm}^3$ )			
Volume of solution A used ( $\text{cm}^3$ )			

(4mks)

(b) Calculate;

- (i) Average volume of solution **A** used (1mk)
- (ii) Moles of solution **D** used (1mk)
- (iii) Moles of solution **A** used given that 2 moles of solution A requires 1 mole of solution **D** for complete neutralization (1mk)
- (iv) Solubility of solid A given that density of the solution formed is  $1\text{g}/\text{cm}^3$  and RFM of **A** = 126. (2mks)

2 You are provided with solid **D**. perform the following test and write the observations and inferences.

- (a) Place solid **D** into a boiling tube and add  $10\text{cm}^3$  of distilled water. Shake the boiling tube and filter. Keep the residue for test (b). Divide the filtrate into four portions.

Observation	Inferences
(1mk)	(1mk)

- (i) To the first portion, add sodium hydroxide dropwise until in excess.

Observation	Inferences

(1mk)	(1mk)
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(ii) To the second portion, add ammonia solution dropwise until in excess.

Observation	Inferences
(1mk)	(1mk)

(iii) To the third portion, add a few drops of Lead(II) nitrate solution

Observation	Inferences
( ½ mk)	( ½ mk)

(iv) To the fourth portion, add a few drops of barium nitration solution followed by dilute nitric (v) acid.

Observation	Inferences
( 1 mk)	( 1mk)

(b) Place the residue into test tube and add 10cm<sup>3</sup> of dilute nitric (v) acid and shake until the solid dissolves.

Observation	Inferences
( ½ mk)	( ½ mk)

(i) To the first portion, add sodium hydroxide dropwise until in excess.

Observation	Inferences
( 1 mk)	( 1mk)

(ii) To the second portion, add ammonia solution dropwise until in excess.

Observation	Inferences
( 1 mk)	( 1mk)

(iii) To the third portion, add a few drops of sodium sulphate solution.

Observation	Inferences
( ½ mk)	( ½ mk)

3. You are provided with solid L . Carry out the tests below and record your observation and inferences in the space provided.

(a) Heat half spatula of solid L in a non-luminous flame of a Bunsen burner.

Observation	Inferences
( 1 mk)	( 1mk)

(b) Add 5cm<sup>3</sup> of distilled to the remaining solid L and shake well. Divide the solution into two portions.  
(i) To the first portion, add a few drops of acidified potassium manganate (VII) and warm

Observation	Inferences
( 1 mk)	( 1mk)

(ii) To the second portion, add a quarter spatula and fill of sodium hydrogen carbonate.

Observation	Inferences
( 1 mk)	( 1mk)