

Name.....SCHEME.....Adm No.....IndeNo.....Class.....
Signature.....
Date.....

233/3

CHEMISTRY

PAPER 3

(PRACTICAL)

March, 2018

2 ¼ hours

MOKASA EXAMINATION 2018

CHEMISTRY PRACTICAL 233/3

(Kenya Certificate of Secondary Education)

Instructions

- ✓ Write your name, admission number and class in the spaces provided above.
- ✓ Sign and write the date of examination in the spaces provided above.
- ✓ Spend the first 15 minutes of the 2 ¼ hours to read through the paper and make sure you have all the apparatus and chemicals required.
- ✓ Answer **all** the questions in the spaces provided in the question paper.
- ✓ Electronic calculators may be used.
- ✓ All working **must** be clearly shown where necessary.
- ✓ This paper consists of 7 printed pages. Confirm this and that no questions are missing.

For Examiner's Use Only

Question	Maximum Score	Candidate's score
1	20	
2	14	
3	06	
Total	40	

1. You are provided with;
 - Solid A in a boiling tube
 - Solution B, sodium hydroxide
 - 0.1M monobasic acid, solution C.

You are required to;

- i. Determine molarity of solution B,
- ii. Determine the solubility of solid A

Procedure I

- (i) Using a measuring cylinder, place 50cm^3 of solution B into a clean 250ml beaker. Add 100cm^3 of distilled water to the solution and label it as solution D. ± 0.2
- (ii) Fill the burette with solution C
- (iii) Using a pipette filler, place 25cm^3 of solution D into a 250ml conical flask. Add two drops of phenolphthalein indicator.
- (iv) Titrate solution D with solution C and record your results in table 1 below
- (v) Repeat the titration two more times and complete table 1.

Table 1

	I	II	III
Final burette reading	18.9	18.8	19.0
Initial burette reading	0.0	0.0	0.0
Volume of solution C used (cm^3)	18.9	18.8	19.0

- (a) Calculate the average volume of solution C used.

$$\frac{18.9 + 18.8 + 19.0}{3} = 18.9 \text{ cm}^3 \quad (\text{Ans (1a)}) \quad \text{At least 2 dp}$$

- (b) Calculate moles of solution C used in the experiment.

$$\frac{0.1 \times \text{Ans (1a)}}{1000} = \text{Ans (1b)}$$

- (c) Calculate moles of solution D used.

$$\text{Mole ratio } 1:1$$

$$\text{Moles of D} = \text{Ans (1b)}$$

- (d) Calculate molarity of solution D.

$$\frac{\text{Ans (1c)} \times 1000}{25} = \text{Ans (1d)}$$

Molarity
unit is mol dm^{-3} or moles per dm^3
At least 4 dp.

(e) Calculate molarity of solution B. (2mks)

$$\text{Molarity} = \frac{\text{Ans(d)} \times 150 \text{ cm}^3}{50 \text{ cm}^3} \quad \left(\text{Dilution eqn. } C_1 V_1 = C_2 V_2 \right)$$

$$= \text{Ans (e)}$$

Procedure II

- Using measuring cylinder, add 20 cm^3 of distilled water to solid A in the boiling tube. Using a glass rod, stir the mixture thoroughly for about three minutes.
- Filter the mixture obtained into 250 ml volumetric flask and top it to the mark with distilled water. Label the filtrate as solution A.
- Clean the burette and fill it with solution A.
- Using a pipette filler, place 25 cm^3 of solution D into 250 ml conical flask. Add two drops of phenolphthalein indicator.
- Titrate solution D with solution A and record your results in table 2 below.
- Repeat the titration two more times and complete table 2.

Table 2

	I	II	III
Final burette reading	20.0	19.9	20.1
Initial burette reading	0.0	0.0	0.0
Volume of solution A used (cm^3)	20.0	19.9	20.1

(a) Calculate the average volume of solution A used. (4mks)

$$\frac{20.0 + 19.9 + 20.1}{3} = 20 \text{ cm}^3 \quad (\text{Ans 2a})$$

(b) Calculate the number of moles of solution D used. (1mk)

$$\frac{\text{Ans(1d)} \times 25}{1000} = \text{Ans (2b)}$$

(c) Calculate the number of moles of solution A used given that 2 moles of solution A requires one mole of solution D for complete neutralization. (1mk)

$$2 \times \text{Ans(b)} = \text{Ans (2c)}$$

(d) Determine the number of moles of solution A in 250 cm^3 (1mk)

$$\frac{250 \text{ cm}^3 \times \text{Ans (2c)}}{\text{Average volume (2a)}}$$

- (e) Determine the solubility of solid A given that the density of the solution formed is 1g/cm^3 and the RFM of A = 126. (2mks)

$$\text{Mass of solution} = 1\text{g/cm}^3 \times 20\text{cm}^3 = 20\text{g}$$

$$\therefore \text{Solubility} = \frac{100 \times 4.5}{20} = 22.5\text{g/100g of H}_2\text{O}$$

2. You are provided with solid E. carry out the tests below. Write your observations and inferences in the spaces provided.
- (a) Place all solid E into a boiling tube and add 10cm^3 of distilled water. Shake the boiling tube and filter into a clean test tube. Keep the residue for test (b). Divide the filtrate into three portions.

Observations

Solid dissolves partially to form a colourless filtrate and white residue

(1mk)

Inferences

Mixture of soluble and insoluble salt

Cu^{2+} , Fe^{2+} , Fe^{3+} absent.

(1mk)

- i. To the first portion, add 2M NaOH drop wise until in excess.

Observations

White precipitate soluble in excess

(1mk)

Inferences

Pb^{2+} , Al^{3+} , Zn^{2+} present

Three mentioned - 1mk
Two " 1/2mk
One " (1mk) 0

- ii. To the second portion, add 2M ammonia solution drop wise until in excess.

Observations	Inferences
white precipitate soluble in excess	Zn^{2+} present
(1 mk)	(1mk)

- iii. To the third portion, add three drops of barium nitrate solution followed by $2cm^3$ of 2M HNO_3 .

Observations	Inference
white precipitate insoluble on addition of Nitric acid	SO_4^{2-} present
(1 mk)	(1mk)

- (b) Place the residue into a clean test-tube. Add about $5cm^3$ of 2 M HNO_3 and shake until all the solid dissolves. Divide the solution into three portions.

- i. To the first portion, add 2M NaOH drop wise until in excess.

Observations	Inferences
white precipitate soluble in excess	Zn^{2+} , Al^{3+} , Pb^{2+} present
(1mk)	(1mk)

ii. To the second portion, add three drops of sodium sulphate solution.

Observations

white precipitate ✓ 1

(1mk)

Inferences

Pb^{2+} present ✓ 1

(1mk)

iii. To the third portion, add three drops of potassium iodide solution.

Observations

yellow precipitate ✓

Reagent: yellow solution

(1mk)

Inferences

Pb^{2+} present ✓ 1

(1mk)

3. You are provided with solid F. Carry out the tests below. Record your observations and inferences in the spaces provided.

(a) Burn half spatula endful of solid F in anon-luminous flame of a Bunsen burner.

Observations

Solid melts and burns with a yellow sooty / smoky flame ✓

(1mk)

Inferences

$C=C$ / $-C\equiv C-$ ✓ 1
present.

A hydrocarbon with a higher C:H content. (1mk)

(b) Transfer the remaining solid F into a clean boiling tube and add about 5cm³ of distilled water. Shake until all the solid dissolves. Divide the solution into two portions.

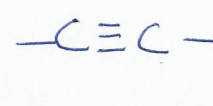
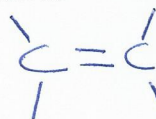
- i. To the first portion add 3 drops of acidified potassium Manganate (VII) solution.

Observations ✓

Purple acidified ~~KMnO₄~~
is decolourised. ~~changes~~ to
Colourless

(1mk)

Inferences



present. ✓ 01

(1mk)

- ii. Test the pH of the second portion using a universal indicator paper.

Observations

pH 4 | 5 | 6 ✓ 01

(1mk)

Inferences

-COOH present ✓ 01
Weakly acidic

(1mk)