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.

(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 (4mks)

	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. (1mk) ~~(4mks)~~

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

(b) Calculate moles of solution C used in the experiment. (1mk)

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

(c) Calculate moles of solution D used. (1mk)

Mole ratio 1:1

Moles of D = Ans (1b)

(d) Calculate molarity of solution D. (1mk)

$\frac{\text{Ans (1c)} \times 1000}{2.5} = \text{Ans (1d)}$ Molarity

Unit is a must ($moles\ dm^{-3}$ or moles per litre)

Atleast 4 d.p

CT I
PP I
PA I
AC I
FA I

05

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

Molarity = $\frac{\text{Ans (d)} \times 150\,cm^3}{50\,cm^3}$ (Dilution eqn. $C_1V_1 = C_2V_2$)

= Ans (e)

Procedure II

(i) Using measuring cylinder, add $20cm^3$ 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 250ml volumetric flask and top it to the mark with distilled water. Label the filtrate as solution A.

(iii) Clean the burette and fill it with solution A.

(iv) Using a pipette filler, place $25cm^3$ of solution D into 250ml conical flask. Add two drops of phenolphthalein indicator.

(v) Titrate solution D with solution A and record your results in table 2 below.

(vi) Repeat the titration two more times and complete table 2.

Table 2 (4 MKS)

	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. (1mk) ~~(4mks)~~

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

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

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

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

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

.....

.....

.....

(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)

Mass of solution = 1g/cm^3 × 20cm^3 = 20g ✓

∴ Solubility = $\frac{100}{20} \times 4.5$ = 22.5g/100g of H_2O ✓1

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	Inferences
Solid dissolves partially ✓ to form a colourless ✓ filtrate and white residue	Mixture of soluble and insoluble salt ✓.
(1mk)	Cu^{2+}, Fe^{2+}, Fe^{3+} absent ✓. (1mk)

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

Observations	Inferences
White precipitate ✓. soluble ✓. in excess	Pb^{2+}, Al^{3+}, Zn^{2+} present ✓1
(1mk)	Three mentioned – 1mk Two " ½mk One " (1mk) 0

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

Observations	Inferences
White precipitate soluble in excess (1 mk)	Zn^{2+} present. (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 (V) acid (1 mk)	SO_4^{2-} present (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 (1mk)	Zn^{2+}, Al^{3+}, Pb^{2+} present (1mk)

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

Observations	Inferences
White precipitate ✓1 (1mk)	Pb^{2+} present ✓1 (1mk)

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

Observations	Inferences
Yellow precipitate ✓ Reject: Yellow solution (1mk)	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	Inferences
Solid melts and burns with a yellow sooty/smoky flame ✓ (1mk)	$-C=C-$ / $-C\equiv C-$ ✓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 $5cm^3$ 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	Inferences
Purple acidified $KMnO_4$ is decolourised to Colourless (1mk)	$>C=C<$ / $-C\equiv C-$ ✓01 present. (1mk)

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

Observations	Inferences
pH 4/5/6 ✓01 (1mk)	$-COOH$ present ✓01 weakly acidic (1mk)