MASENO SCHOOL

Kenya Certificate of Secondary Education 2021

CHEMISTRY – Paper 3

DEC. 2021 - 2 hours

THE MASENO SCHOOL MOCK

NAME _____INDEX NO. _____

KENYA CERTIFICATE OF SECONDARY EDUCATION

Instructions to Candidates

1. *Write your **name**, **index number**, **and class** and **admission number** in the spaces provided on this page above.*
2. *Sign and write the date of the practical in the spaces provided on this page above.*
3. *Answer **ALL** questions in the spaces provided in the question paper after each question.*
4. *You are advised to take 15minutes at the beginning to read-through the question-paper very carefully and make sure you have **ALL** the chemicals and apparatus that you may need.*
5. *Mathematical tables and electronic calculators may be used.*
6. *All working must be clearly shown where necessary.*
7. *This paper contains **7** printed pages.*
8. *Candidates should check the question paper to ascertain that **ALL** the pages are printed as indicated and that no questions are missing.*

For Examiners Use Only:

Question	Maximum Score	Candidates Score
1	15.0	
2	11.0	
3	14.0	
TOTAL	40.0	

Q1.You are provided with:

i) Magnesium ribbon, solid FA1.
ii) 0.7 M hydrochloric acid, solution FA2.
iii) 0.05 M sodium hydroxide solution, solution FA3.
iv) Distilled water.
v) Phenolphthalein indicator solution.

You are required to determine the:

i) Number of moles of hydrochloric acid that remain unreacted.
ii) Number of moles of magnesium that reacted.

PROCEDURE I

a) Using a burette, measure 50.0cm^3 of solution FA2 and place it in a 100ml plastic beaker.
b) Put the magnesium ribbon, solid FA1 in the 50.0cm^3 of solution FA2 in the 100ml beaker and allow the reaction to proceed until effervescence stops.

PROCEDURE II

c) Transfer ALL the solution obtained in Procedure I into a 250ml volumetric flask.
d) Top up the solution in the volumetric flask to calibration mark using distilled water. label this as solution FA4.
e) Empty the burette and fill it with solution FA3.
f) Pipette 25.0cm^3 of solution FA4 and place it into an empty 250ml conical flask. Add 3 drops of the phenolphthalein indicator solution and titrate against solution FA3 from the burette. Record the results in Table 1.
g) Repeat the titration of solution FA4 against FA3 two more times in order to complete Table 1.

Table 1.

Titration	1st	2nd	3rd
Final burette reading, cm^3			
Initial burette reading, cm^3			
Volume of solution FA3 used, cm^3			

(4mks)

Average volume of solution FA3 used = _____ cm^3 (1mk)

Calculate the number of moles of:

i) Sodium hydroxide in the average titre volume used. (1mk)

……

……

ii) Hydrochloric acid in 25.0 cm^3 of solution FA4. (2mks)

……

……

……

iii) Hydrochloric acid in 250.0 cm^3 of solution FA4. (2mks)

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iv) Hydrochloric acid in 50.0 cm^3 of solution FA2. (1mk)

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v) Hydrochloric acid that reacted with the magnesium. (2mks)

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……

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vi) Magnesium that reacted. (2mks)

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2. You are provided with:

i). 2.20g of solid **BA11**,
ii). Thermometer.
iii). Distilled water.
iv). 100 ml Glass beaker
v). Boiling tube.

You are required to determine the solubility of compound **BA11** at various temperatures.

Procedure I:

a) Place the whole amount of solid **BA11** supplied to you into a clean, dry boiling tube.

b) Using a burette, add 2.00cm^3 of distilled water into the boiling tube with solid **BA11**.

c) Insert a thermometer into the boiling tube and heat the mixture in the hot water-bath (use the 100ml beaker), while stirring continuously with the thermometer, until the temperature of the mixture is about 80^0C when **ALL** the crystals **JUST** dissolve

d) Remove the boiling tube from the hot water bath and allow the contents to cool slowly while stirring with the thermometer. Note the temperature at which the crystals FIRST form/reappear and record this crystallization temperature, T_c in Table 2

e) Using the same mixture from (d) above, add 1.00cm^3 of distilled water from the burette into the boiling tube containing the mixture and repeat steps (c) and (d) above. Continue in this way until a total volume of water added to the boiling tube is 7.00cm^3. Complete Table 2 by calculating the solubility of compound **BA11** in water at the different temperatures.

Table 2: (4mks)

Total volume of water added (cm^3)	Crystallization Temperature ,T_C(^{o}C)	Solubility of compound **BA11** in water (g/100g of water)
2.00		
3.00		
4.00		
5.00		
6.00		
7.00		

f) On the grid provided plot a graph of solubility of compound BA11 (vertical axis) against temperature. (3mks)

g) Using the graph determine:

I. the temperature at which 100.0g compound **BA11** would dissolve in 100g of water. (1mk)

……

II. solubility of compound **BA11** at 30.0^0C. (1mk)

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h) A solution containing 100g of **BA11** per 100g of water was cooled to 30.0^0C. Determine the mass of crystals formed. (2mks)

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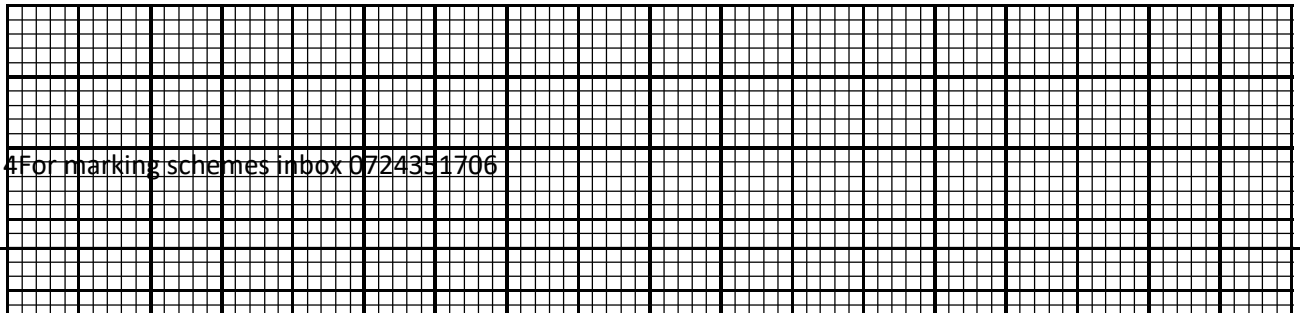

3. You are provided with solids FA5, FA6 and FA7. Carry out the following tests and write your observations and interferences in the spaces provided.

a) Place all of solid FA5 in the boiling tube. Add about 10 cm^3 of distilled water and shake until all the solid dissolves. Label this as Solution FA5.

i). To about 2 cm^3 of Solution FA5 in a test tube, add 2M sodium hydroxide solution drop wise until in excess.

OBSERVATION	INFERENCES
(1mk)	(1mk)

ii). To about 2 cm^3 of Solution FA5 in a test tube, add 2M ammonium hydroxide solution drop wise until in excess.

OBSERVATION	INFERENCES
(1mk)	(1mk)

iii) To about 2 cm^3 of Solution FA5 in the test tube, add 4 drops of 2M sulphuric (VI) acid.

OBSERVATION	INFERENCES
(1mk)	(1mk)

iv) To about 2 cm^3 of solution FA5 in a test tube, add 2 drops of potassium iodide solution.

OBSERVATION	INFERENCES
(1mk)	(1mk)

b). Place solid FA7 into boiling tube. Add about 10cm^3 of distilled water and shake well. Label this as solution FA7 .Use this solution for the following tests.

i) Place about 2cm^3 of solution FA7 in a test tube and place the universal indicator paper provided into the solution hence determine its pH.

OBSERVATION	INFERENCES

(1mk)	(1mk)

ii). To about $2cm^3$ of solution FA7 made in (ii) above, add 3 drops of acidified potassium manganate (vii) solution.

OBSERVATION	INFERENCES
(1mk)	(1mk)

iii). To the remaining solution FA7 in the boiling tube, add the other half of solid FA6.

OBSERVATION	INFERENCES
(1mk)	(1mk)

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QUSTION 1

1. *Solid FA1, 3cm length of magnesium ribbon.*

2. *60 cm^3 of solution FA2 - 0.7M HCl.*
3. *80 cm^3 of solution FA3 - 0.05M NaOH.*
4. *1 Burette .*
5. *One 25ml pipette.*
6. *One 100ml plastic beaker.*
7. *One wash bottle with distilled water.*

QUESTION 2

i) 2.20g of solid **BA11**, (Oxalic acid)
ii) Thermometer.
iii) Distilled water.
iv) 100 ml Glass beaker
v) Boiling tube.

QUESTION 3

1. *0.5g of solid FA5 - Pb $(NO_3)_2$.*
2. *0.1g of solid FA7 - maleic acid.*
3. *0.5g of solid FA6- Na_2CO_3.*
4. *Test tube – rack + 6 test tubes +1 boiling tube.*
5. *One metallic spatula.*
6. *Universal indicator paper*

Access to:

a) *Phenolphthalein indicator.*
b) *0.5 M KI.*
c) *Acidified $KMnO_4$.*
d) *Universal indicator solution +pH chart (full range).*
e) *2M H_2SO_4.*
f) *2M NaOH.*
g) *2M NH_4OH*
h) *Bunsen burner.*

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<u>REQUIREMENTS</u>
QUSTION 1

8. *Solid FA1, magnesium ribbon.*
9. *60 cm^3 of solution FA2 - 0.7M HCl.*
10. *80 cm^3 of solution FA3 - 0.05M NaOH.*
11. *1 Burette .*
12. *One 25ml pipette.*
13. *One 100ml plastic beaker.*
14. *One wash bottle with distilled water.*

QUESTION 2

1. *Thermometer.*
2. *2.20g of oxalic acid solid **BA11**,*
3. *Distilled water.*
4. *100 ml Glass beaker*
5. *Boiling tube.*

QUESTION 3

7. *0.5g of solid FA5*
8. *0.1g of solid FA7*
9. *0.5g of solid FA6*
10. *Test tube – rack + 6 test tubes +1 boiling tube.*
11. *One metallic spatula.*
12. *Universal indicator paper*

Access to:

i) *Phenolphthalein indicator.*
j) *0.5 M KI.*
k) *Acidified $KMnO_4$.*
l) *Universal indicator solution +pH chart (full range).*
m) *2M H_2SO_4.*
n) *2M NaOH.*
o) *2M NH_4OH*
p) *Bunsen burner.*