KCSE REVEALED 2021

CHEMISTRY

PAPER III

This PDF consists of two sample exams that contains questions that are expected in the national exams 2021

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SAMPLE 1

CHEMISTRY
FORM FOUR PAPER 3 (233/3)
INSTRUCTIONS TO SCHOOL
(CONFIDENTIAL)

In addition to the equipment and fittings found in a chemistry laboratory. Each candidate should be provided with;

1. Solid A 5.0g measured accurately
2. About 80cm^3 of solution B
3. About 0.5g solid C
4. About 10cm^3 of liquid D
5. A thermometer (-10-110^{0}C)
6. A burette
7. A complete retort stand
8. A pipette and a pipette filler
9. 2 conical flasks
10. A 250ml volumetric flask
11. One boiling tube
12. Five (5) test tubes
13. 0.5g sodium hydrogen carbonate
14. Two labels

ACCESS TO:

i)   Means of heating (Tripond stand and wire gauze)
ii) Sodium sulphate solution (NaSO$_4$)
iii) Ammonia solution 2m
iv) 2m Sodium Hydroxide
v)   Lead Nitrate solution
vi) Barium Nitrate solution
vii) Acidified potassium manganite (VII) solution
viii)   Bromine water
ix) Acidified potassium dichromate(VI) solution

NB:i) Solid A is 5.0g of oxalic acid $(COOH)_2 \cdot 2H_2O$

ii) Solution B is $Kmno_4$

iii) Solid C is magnesium chloride $MgCl_2$

iv) Liquid D is absolute ethanol

Preparations

i) Solution B is made by dissolving 20g of solid Kmno4 in $200cm^3$ of 2.0m H_2SO_4 and toping to $1000cm^3$ by distilled water.

ii) Sodium Hydroxide is prepared by dissolving 80g of NaOH pellets in 600cm3 of distilled water and top to $1000cm^3$ with distilled water.

iii) Ammonia solution is prepared by dissolving 150ml of conc ammonia to $600cm^3$ of distilled water then top to the mark.

iv) Barium Nitrate is prepared by dissolving 26g of solid Barium Nitrate in $600cm^3$ of water then topping to $1000cm^3$ with distilled water.

v) Lead nitrate is prepared by dissolving 30g of solid Lead Nitrate in $600cm^3$ of water then topping to $1000cm^3$ with distilled water.

vi) Sodium Sulphate is prepared by dissolving 14.2g of solid sodium sulphate in $600cm^3$ of distilled water then topping up to $1000cm^3$ with distilled water.

vii) Acidified $Kmno_4$ is prepared by dissolving 3.2g of solid $Kmno_4$ in $200cm^3$ of 2.0m H_2SO_4 acid then topping with distilled water to $1000cm^3$.

viii) Acidified $K_2Cr_2O_7$ is prepared by dissolving 25g of solid $K_2Cr_2O_7$ in $200cm^3$ of 2.0m H_2SO_4 then topping to $1000cm^3$ with distilled water.

NAME: _____ ADM NO.:_____

SCHOOL: _____ SIGNATURE: _____

FORM 4
PAPER 3 (233/3)
CHEMISTRY (PRACTICAL)
TIE: 2¼HRS

INSTRUCTIONS

a) Write your name and index number in the spaces provided above.

b) Sign and write the data of the examination.

c) Answer all the questions in the spaces provided.

d) You are not supposed to start working with the apparatus for the first 15 minutes of 2¼ hours allowed for this paper. This time is meant to read through the paper and ensure you have all the chemicals and apparatus require.

e) All working must be clearly shown

f) KNEC mathematical tables and silent electronic calculations may be used.

g) All questions should be answered in English

FOR EXAMINERS USE ONLY

QUESTIONS	MAXIMUM	CANDIDATE'S SCORE
1	21	
2	11	

1

3	08	
TOTAL SCORE	40	

QUESTION 1

You are provided with:

- Solid A 5.0g $(COOH)_2 \cdot xH_2O$
- Solution B 0.13M $KMnO_4$

Task

a) You are supposed to determine the solubility of A at different temperatures.

b) Determine the number of moles of water of crystallization in solid A.

PROCEDURE 1

a) Using a burette, add 4cm3 of distilled water to solid A in a boiling tube.

- Head the mixture while stirring with the thermometer to about 80^0C.
- When the whole solid dissolves, allow the solution to cool while stirring with the thermometer
- Note the temperature at which crystals first appear and record this temperature in the table 1 below.

b) Using aburrete add $2cm^3$ more into the content of the boiling tube and warm until the solid dissolve.

- Remove from the flame and allow the solution to cool in air while stirring.
- Record the temperature at which crystal first appear in table 1.
- Repeat procedure (b) 3 more times and complete table 1 below.
- Retain the content of the boiling tube for procedure II

Table 1

Volume of water in the boiling tube (cm^3)	Temperature at which crystals of solid A appear (^0C)	Solubility o solid A g/100g of water
4 6 8		

| 10 | | |
| 12 | | |

I.   a) Draw a graph of solubility of solid A (vertical axis) against temperature   (3mks)

b) From your graph determine the solubility of solid A at 60^0C
(1mk)

PROCEDURE II

a) − Transfer the contents of the boiling tube into a 250ml volumetric flask.

-     Add distilled water up to the mark

-     Label this solution A

b) − Using a clean pipette and a pipette filler, transfer 25ml of solution A into a conical flask.

-     Warm the mixture up to 60^0C

-     Fill a burette with solution B

-     Titrate B against the hot solution A until a permanent pink colour persist

-     Read your results in Table 2 below

c) Repeat (b) 2 more times are record your results in the table 2 below.

TABLE 2

	I	II	III
FINAL BURETTE READING			
INITIAL BURETTE READING			

3

VOLUME OF SOLUTION B USED (CM^3)			

II) a) Calculate the average volume of solution B used   (1mk)

b) Calculate the number of moles of B used   (1mk)

c) Given 2 moles of Kmno₄ react with 5 moles of A, calculate the number of moles of A in 25cm^3 (1mk)

d) Calculate the molarity of A   (1mk)

e) Determine the molar mass of A   (1mk)

f) Determine the value of X   (1mk)

(C=12, O=16 H=1)

QUESTION 2

You are provided with solid C. Use it to carry the test below.

Dissolve the whole of C into 10cm3 of water and divide it into five portions.

a) To the 1st portion add sodium sulphate solution.

Observations	Inferences
(1mk)	(1½mks)

b) To the 2nd portion add Ammonia solution dropwise until in Excess.

Observations	Inferences
1mk)	1mk

c) To the 3rd portion add sodium Hydroxide dropwise until in Excess.

Observations	Inferences
(1mk)	(1mk)

d) To the forth portion add Lead (II) Nitrate solution

Observations	Inferences
(½mk)	(2mks)

e)To the last portion add Barium Nitrate solution

Observations	Inferences
(1mk)	(1mk)

QUESTION 3

You are provided with liquid D use it to carry the test below.

Divide liquid D into four equal portions

a) To the 1st portion add sodium hydrogen carbonate

Observations	Inferences
(1mk)	(1mk)

b) To the 2nd portion add acidified potassium manganite (VII) (KmnO$_4$)

Observations	Inferences

(1mk)	(1mk)

c) To the 3rd portion add Bromine water

Observations	Inferences
(1mk)	(1mk)

d) To the last portion add potassium dichromate(VI0 and wrm.

Observations	Inferences
(1mk)	(1mk)

SAMPLE II
233/3 CHEMISTRY PAPER 3 PRACTICAL
CONFIDENTIAL.

In addition of the apparatus and fittings found in a chemistry laboratory, each candidate will require the following.

1. About **100cm3** of **0.2m** Hydrochloric acid labeled solution **A**.
2. Accurately weighed **2.4g** anhydrous sodium carbonated labeled solid **X**.
3. About **80cm3** of **1M** sodium hydroxide solution labeled solution **B**.
4. About **120cm3** of **0.7 M** sulphuric (vi) acid solution labeled solution **C**.
5. **250 ml** volumetric flask.
6. **100 ml** measuring cylinder
7. Distilled water
8. **250 m**l plastic beaker (empty)
9. **0 − 110⁰C** thermometer.
10. One burette **(0 − 50ml)**
11. One **25.0 ml** pipette.
12. Two conical flasks **(250 ml)**
13. Methyl orange indicator
14. Retort stand
15. Pipette filler
16. A white tile
17. **6** dry test tubes
18. **1** boiling tube
19. One filter funnel
20. **1** label
21. Metallic spatula
22. **1.5 g** of solid **K**
23. **1 g** of solid **P**
24. About **0.5g** sodium hydrogen carbonate
25. Glass rod

Access to
1. Means of heating
2. **2M NaOH** with a dropper
3. **2M** Ammonia solution with a dropper
4. **2M** nitric acid with a dropper
5. **0.09M** Barium nitrate solution
6. Universal indicator with a dropper
7. Standard PH chart

NOTE:
1. Solid **K** is a mixture of $ZnSO_4$ and $(NH_4)_2 SO_4$ in the ratio **1:1**.
2. Solid **P** is oxalic acid.
3. Solution **A** is **0.2M** Hydrochloric acid prepared by dissolving **17.2cm3** of concentrated hydrochloric acid in **1** litre.
4. Solution **B** is **1M** sodium hydroxide prepared by dissolving **40g** in **1** litre.
5. Solution **C** is **0.7M** sulphuric (vi) acid prepared by dissolving **38.5** litres of the acid in a litre of solution.

NAME ……………………………..   INDEX NO. ………..

DATE …………………………….   CLASS ……………..

KENYA CERTIFICATE OF SECONDARY EDUCATION

CHEMISTRY PAPER 3

(PRACTICAL)

2 ¼ HRS

INSTRUCTIONS TO CANDIDATES

(a) Answer all the questions in the spaces provided in the question paper.

(b) You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hrs allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.

(c) All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY.

QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
1	13	
2	13	
3	14	

D

TOTAL SCORE	40	

You are provided with
- Anhydrous sodium carbonate solid x.
- Distilled water.
- 0.2m Hydrochloric acid solution A.

You are required to determine molar heat of solution of solid x.

PROCEDURE I
i. Place 50.0ml of water in 250ml plastic beaker.
ii. Note the temperature of the water and record it in the table I below.
iii. Add all the solid X provided to the water in the beaker, stir gently with the thermometer and record the final temperature of the solution in the table I below. Keep the resulting solution for procedure 2.

TABLE I

Final temperature (^{0}C)	
Initial temperature (^{0}C)	
Change in temperature (^{0}C)	

(2 mks)

(a) What is the enthalpy change for the reaction? (Assume the density of solution is 1g/cm^3, and specific heat capacity is 4.2 Jg^{-1} K^{-1}).
(2 mks)

PROCEDURE II
Transfer the contents of the beaker into 250ml volumetric flask. Rinse both the beaker and the thermometer with distilled water and ass this water into the solution in the volumetric flask. Add more water to make up to the mark. Label this solution as solution X. fill the burette with solution A. Using a pipette place 25.0ml of solution X into a conical flask. Add 3 drops of methyl orange indicator and titrate with solution A. record your readings in table II below. Repeat the titration two more times and complete the table.

TABLE II

Experiment			
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution A used (cm^3)			

(3 mks)

(b) Calculate average volume of solution A used. (1 mk)

D

(c) the number of moles of solution A used.   (1 mk)

(d) The number of moles of solution X that reacted with the number of moles of solution A in (c) above.
(1 mk)

(e) The number of moles of solid X used in procedure I.   (1 mk)

(f) Molar heat of solution of anhydrous sodium carbonate.   (2 mks)

2. You are provided with:
- A solution of sodium hydroxide labeled B.
- A solution of sulphuric(vi)acid labeled C.

You are required to determine the concentration of the alkali using the following procedure.

PROCEDURE:
(i) Place 40cm^3 of sodium hydroxide solution into a 250 ml plastic beaker.
(ii) Measure 60cm^3 of sulphuric (vi) acid solution.

D

(iii) Determine the temperature of sodium hydroxide solution at half a minute intervals for two minutes and record it in the table below.
(iv) At 2 ½ minutes, place the 60cm^3 of solution C into the plastic beaker while stirring and resume taking the temperature in the 3rd minute.

(v) Complete the table below.

Time in minutes	0	½	1	1 ½	2	2 ½	3	3 ½	4
Temperature in ^{0}C									

Time in minutes	4 ½	5	5 ½	6	6 ½	7
Temperature in ^{0}C						

(3 mks)

(a) Plot a graph of temperature against time.   (3 mks)

(b) From the graph, determine the highest temperature change.   (1 mk)

(c) Determine the heat evolved in this experiment (Density of solution = 1 g/cm^3 specific heat capacity of solution = 4.2 Jg^{-1} K^{-1})
(2 mks)

D

(d) Given that the molar heat of neutralization is 56KJ/mole, determine the number of moles of sodium hydroxide used in the neutralization reaction above.
(2 mks)

(e) Determine the molarity of sodium hydroxide. (2 mks)

3. You are provided with solid K. carry out the following tests and write your observations and inferences in the spaces provided.

	TEST	OBSERVATION	INFERENCE
(a)	Place a spatula full of sample K in a clean dry test tube. Heat gently and then strongly.	(1 mk)	(1 mk)
(b)	Put the remaining solid K in a boiling tube. Add about $8cm^3$ of distilled water. Shake well and divide the solution into 3 portions.		

D

(i)	To the first portion add 3 drops of sodium hydroxide solution and then excess.	(1 mk)	(1 mk)
(ii)	To the second portion add 3 drops of ammonia solution and then excess.	(1 mk)	(1 mk)
(iii)	To the third portion add 3 drops of Barium nitrate followed by 3 drops of nitric acid.	(1 mk)	(1 mk)
(c)	You are provided with solid P. carry out the tests below and record your observations and inferences.		
(i)	Place half spatula of solid P in a non-luminous flame of a Bunsen burner.	(1 mk)	(1 mk)
(ii)	Dissolve the remaining solid in water and divide into two portions		

D

(a)	Add 3 drops of universal indicator to the 1st portion and determine the PH of the solution.	(1 mk)	(1 mk)
(b)	To the 2nd portion add a little sodium hydrogen carbonate	(1 mk)	(1 mk)