HOKAKIRA CLUSTER THREE EXAMINATION 2022

Kenya Certificate of Secondary Education

233/3 CHEMISTRY Paper 3

October 2022 Time: 2¼ Hours

Name: …… **Admission No:** ……

School…… **Stream:**…….……....

Instructions to Candidates

- Write your name, admission number, school and stream in the spaces provided at the top of this page.
- You are not allowed to start working with apparatus for the first 15 minutes of the 2 ¼ hours.
- Answer all questions in the spaces provided in this question paper.
- All your answers must be written in the spaces provided after every question.
- All working MUST be clearly shown where necessary.
- This paper consists of 5 printed pages.
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Question	Maximum score	Candidate's score
1	**20**	
2	**10**	
3	**10**	
TOTAL	**40**	

This paper contains 5 printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no question(s) are missing.

Turn over

Q1. You are provided with:

- Aqueous sulphuric (VI) acid labelled solution **A**
- Solution **B** containing **10.4g per litre** of potassium carbonate
- A clean piece of magnesium ribbon
- Methyl orange indicator

You are required to determine the:

(a) Concentration of solution A

(b) Rate of reaction between magnesium and sulphuric (VI) acid – solution A , at different concentration.

PROCEDURE I:

(i) Using a 50ml measuring cylinder, place 25.0cm^3 of solution **A** into a 250ml volumetric flask. Add distilled water to make 250cm^3 of solution. **Label this solution C**.

(ii) Place solution **C** in a burette.

(iii) Using a pipette, place 25.0cm^3 of solution **B** into a conical flask.

(iv) Add 2 drops of methyl orange indicator provided and titrate with solution **C**.

(v) Record your results in table I below.

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

Table I

Titration	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution **C** used (cm^3)			

(4mks)

(a) Calculate the:

(i) Average volume of solution **C** used. (1mk)

(ii) Concentration of potassium carbonate solution **B** in moles per litre (C = 12.0, O = 16.0, K = 39.0) (1mk)

(iii) Concentration of sulphuric (VI) acid in solution **C** used in moles per litre. (2mks)

(iv) Concentration of sulphuric (VI) acid in solution **A**. (2mks)

PROCEDURE II:

(i) Label five test-tubes 1, 2, 3, 4 and 5.

(ii) Empty the burette and fill it with solution **A**.

(iii) From the burette, place 10cm^3 of solution **A** into test tube number 1. From the same burette, place 9cm^3 of solution **A** into test-tube number 2. Repeat the process for test-tube numbers 3, 4 and 5 as shown in table II below.

(iv) Using a 10ml measuring cylinder, measure 1cm^3 of distilled water and add it to test-tube number 2. Repeat the process for test-tube numbers 3, 4 and 5 as shown below.

(v) Cut out five pieces exactly 1cm long of the magnesium ribbon.

(vi) Transfer all the solution in test-tube number 1 into a clean 100ml beaker provided. Put one piece of the magnesium ribbon into the beaker and immediately start a stop watch

(vii) Swirl the beaker gently to **ensure the magnesium is always inside the solution**

(viii) Record in table II below **time taken in seconds for magnesium ribbon to disappear**.

(ix) Pour away the final contents of the beaker and rinse it with water.

(x) Repeat the procedure from (vi) for each of the remaining test-tube numbers 2, 3, 4 and 5 and complete the table below.

Table II (5mks)

Test tube number	1	2	3	4	5
Volume of solution **A** added (cm^3)	10	9	8	7	6
Volume of distilled water added (cm^3)	0	1	2	3	4
Time taken (seconds)					
Rate of reaction ($^1/_{time}$)					

(i) Plot a graph of volume of solution **A** added (y-axis) against rate of reaction ($^1/_{time}$) (3mks)

(ii) From the graph, determine the time that 1cm long magnesium ribbon would take to react with 5cm^3 of solution **A**. (1mk)

(iii) What is the relationship between the concentration of solution A and the rate of reaction? Explain. (1mk)

Q2. You are provided with solid **X.** You are required to carry out the tests below and write your observations in spaces provided.

a) Describe the appearance of solid **X** (1mk)

……

b) Place **a third** spatulaful of solid **X** in a boiling tube. Add about 10ml of distilled water and shake. Divide the resultant solution into 4 portions.

I. To the first portion, add **four** drops of sodium hydroxide solution.

Observations	**Inferences**
. (1mk)	. . (1mk)

II. To the second portion, add 4 drops of dilute hydrochloric acid.

Observations	**Inferences**
. (2mks)	. . (1mk)

III. To the third portion, add 4 drops of barium nitrate solution.

Observations	**Inferences**
. (1mk)	. . (1mk)

IV. To the fourth portion, add about $1cm^3$ acidified potassium chromate (VI) solution.

Observations	**Inferences**
. (1mk)	. . (1mk)

Q3. You are provided with liquid **Y**. Carry out the tests below and write your observations and inferences in the spaces provided.

i) Take about $1cm^3$ of liquid **Y** into a watch glass. Ignite it using a lit wooden splint.

Observations	**Inferences**
. (1mk)	. . (1mk)

ii) Put the rest of liquid **L** in a boiling tube and add about $10cm^3$ of distilled water. Shake well and divide the solution into three portions

Observations	**Inferences**
. (1mk)	. . (1mk)

iii. To the first portion, add 4 drops of universal indicator solution.

Observations	**Inferences**
. (1mk)	. . (1mk)

iv. To the second portion, add 4 drops of acidified potassium manganate (VII) solution.

Observations	**Inferences**
. (1mk)	. . (1mk)

v. To the third portion, add 5 drops of acidified potassium chromate (VI) solution.

Observations	**Inferences**
. (1mk)	. . (1mk)

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