FORM FOUR CLUSTER KCSE MODEL9

CHEMISTRY PAPER 3 QUESTIONS

1. You are provided with;

   ☐ 1.0M Sodium hydroxide solution labeled R.

   ☐ Solution S, Hydrochloric acid.

   ☐ Magnesium ribbon, solid M.

   ☐ Stop watch.

   ☐ Phenolphthalein indicator.
   You are required to determine the

   ☐ Concentration of hydrochloric acid in moles per litre.

   ☐ Determine the rate of reaction between magnesium and hydrochloric acid at different concentrations.

   Procedure I

   Fill the burette with hydrochloric acid, solution S. Pipette 25.0cm3 of 1.0M sodium hydroxide, solution R into a clean conical flask. Titrate with hydrochloric acid using three drops of phenolphthalein indicator. Record your results in table I below repeat titrations two more times and complete the table.

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

Table I

Calculate the

a) Average volume of solution S.
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b) Moles sodium hydroxide used
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c) Moles of hydrochloric acid, solution S used.
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d) Concentration in moles per litre of hydrochloric acid, solution S.

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Procedure II

i) Place five test tubes in a test tube rack and label them 1,2,3,4 and 5. Using a 10cm3 measuring cylinder, measure out the volume of hydrochloric acid,
solution S as shown in the table II below. Pour into the corresponding test tubes.

ii) Cut out five pieces each exactly 1cm long of Magnesium ribbon, solid M.

iii) Transfer all the solution in Test tube I into a clean 100cm3 beaker. Place one piece of magnesium into the beaker and start a stop watch immediately. Swirl the beaker continuously ensuring that magnesium is always inside the solution. Record the time taken for magnesium to be consumed in table II below.

iv) Wash the beaker and repeat procedure (iii) for each of the solution in test tube 2, 3, 4 and 5 making sure the total volume of solution S and water is 10cm3 and complete the table.

Table II

Test tube number	1	2	3	4	5
Volume of solution S (cm³)	10	9	8	7	6
Volume of water (cm³)	0	1	2	3	4
Time taken (Sec)					
Rate of reaction $\left(1/time\right)^{s^{-1}}$					

a) Plot a graph of rate of reaction $\left(\frac{1}{t}\right)$ y –axis against volume of solution S.

PASTE A GRID

b) Use the graph to determine the time that would be taken for a 1cm length Magnesium ribbon to disappear if the volume of the acid solution F used was 7.5cm³.

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c) In terms of rate, explain the shape of your graph.

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2. a)

i) You are provided with substances W. Carry the tests below and write your Observations and Inferences in the spaces provided. Place one third of solid W in a clean dry test –tube and heat gently then strongly.

Observation	Inferences

ii) Place the remainder of Solid W in a boiling tube. Add about 10cm3 of distilled water and shake well. Divide the contents of the boiling tube into four portions for tests. I –III

Observation	Inferences

I. To the first portion, add 2-3 drops of aqueous sodium hydroxide until in excess.

Observation	Inferences

II. To the 2nd portion, add ammonia solution drop wise until in excess

Observation	Inferences

III. To 3rd portion, add 3 drops of sodium chloride solution

Observation	Inferences

b) You are provided with solid V, Carry out the following tests and record the Observations and inferences in the spaces provided.

i) Place one third of solid V on a clean metallic spatula and ignite it with a Bunsen burner flame.

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Observation	Inferences

ii) Place the remaining amount of Solid V in a boiling tube and add about 10cm3 of distilled water and shake well. Divide the contents of the boiling tube into two portions

I. To the first portion add spatula end full of solid sodium hydrogen carbon provided.

Observation	Inferences

II. T o the second portion, add three drops of acidified potassium manganate (VII)

Observation	Inferences

III. Test the PH of the remaining portion using universal indicator solution provided.

Observation	Inferences