THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

032/2

CHEMISTRY PAPER 2
ALTERNATIVE TO PRACTICAL
(For Both School and Private Candidates)

TIME: 2½

10 November 1999 A.M.

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INSTRUCTIONS

1. This paper consists of FIVE (5) questions.

2. Answer ALL questions in the answer booklet provided.

3. Wherever calculations are involved, show clearly all the steps involved.

4. The marks allocated to each question or parts thereof are indicated in brackets.

5. Qualitative Analysis guide sheets may be used.

6. Wherever necessary the following constants may be used:
   Atomic masses:

   H = 1, C = 12, O = 16, Na = 23, S = 32, Cl = 35.5, Zn = 51, Cu = 63.5

   Faraday constant = 96,500 Coulombs

This paper consists of 4 printed pages.

1. Study carefully the following diagram which represents a laboratory preparation of a certain gas then answer the following questions below.
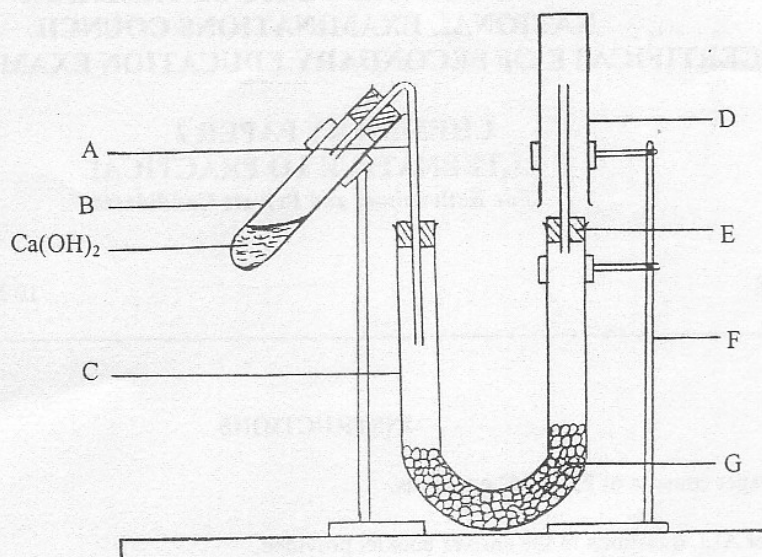
(a) Name the parts labelled A, B, C, D,E and F.

(3 marks)

(b) If the diagram represents laboratory preparation of ammonia, what chemical compound should be reacted with slaked lime in order to produce the gas?

(2 marks)

(c) (i) What is the chemical compound represented by letter G?

(ii) Write a chemical equation which explains the functions of substance G.

(3 marks)

(d) Write ionic equation for the reaction described in (b) above.

(2 marks)

(e) Explain by giving two reasons why the gas is collected as it is shown in the diagram above.

(2 marks)

2. (a) Complete the following table of indicators and their colour changes in different solutions.

INDICATOR	ACID SOLUTION	NEUTRAL SOLUTION	ALKALINE SOLUTION
Litmus	Red	Purple	----------------
Methyl Orange	---------------------	Orange	----------------
Phenolpthalein	---------------------	Pale pink	Red

(2 marks)

(b) Give the names of indicators that are suitable for the following titrations.

TITRATION	INDICATOR
Strong acid against strong base	-----------------
Strong acid against weak base	-----------------
Weak acid against strong base	-----------------

(1 ½ marks)

(c) Why do we put a white tile under a conical flask during titration?

(½ mark)

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(d) What is meant by the following terms which are used in volumetric analysis?
   (i) Molar solution
   (ii) Standard solution

   (1 mark)

(e) $25cm^3$ portion of standard sodium carbonate solution made by dissolving 1.31g of the anhydrous salt in 250 cm^3 of distilled water were titrated with dilute hydrochloric acid until two results within 0.1 cm^3 of one another were obtained. The indicator used was methyl orange. The results were tabulated as follows:

TITRATION	TRIAL	1	2
Final burette reading (cm^3)	25.00	24.60	24.80
Initial burette reading (cm^3)	00	----------	--------------
Volume used (cm^3)	25.00	24.30	24.30

   (i) Complete the table above.

   (1mark)

   (ii) What was the average volume of the acid used?

   (½ marks)

   (iii) Write a balanced chemical equation for the reaction.

   (1 mark)

   (iv) Calculate the concentration of sodium carbonate in g/dm3.

   (1 mark)

   (v) How many moles of sodium carbonate were used in this experiment?

   (1 ½ mark)

3. A solution of copper (II) sulphate was electrolysed using copper electrodes. The cathode electrode was weighed before and after the electrolysis. The experiment was repeated several times using different quantities of electricity and the following data were obtained:

QUANTITY OF ELECTRICITY (c)	MASS OF COPPER DEPOSITED (g)
300	0.099
600	0.198
900	0.297
1200	0.396
1500	0.495
1800	0.594
2000	0.660
1400	0.792

(a) Draw a graph of these results, plotting the quantity of electricity on the x – axis and the mass of copper on the y – axis.

   (5 marks)

(b) From the graph find:-
   (i) the slope
   (ii) the mass deposited by 100 coulombs.

   (4 marks)

4. An experiment was carried out in the laboratory where the following metals were reacted with dilute hydrochloric acid:
Zinc, copper, magnesium, iron, mercury.

(a) Write balanced chemical equations for the reactions described above.

   (5 marks)

(b) Arrange the metals according to increase in reactivity.

(1 mark)

(c) Calculate the weight of hydrochloric acid which will react completely with 0.22g of zinc metal.

(4 marks)

5. (a) Sample M is a simple salt containing one cation and one anion.
Tests were carried out on sample M. The tests and observations made were recorded and entered in the table shown below.
Complete the table and deduce the cation and anion present in M.

TEST	OBSERVATIONS	INFERENCE
(1) Appearance	A white deliquescent solid	
(2) To a spatulaful of M in a boiling tube dilute hydrochloric acid was added and the mixture was warmed.	The solid simply dissolved in the dilute warm acid.	
(3) To another spatulaful of M, concentrated sulphuric acid was added and the mixture was warmed.	A highly acidic gas was evolved. The gas formed white mists with gaseous ammonia	
(4) A solution of M in distilled water was made and was then divided into six portions. (a) To the first portion, aqueous ammonia was gradually added with shaking until it was in excess.	A white precipitate was formed. The precipitate dissolved in excess ammonia.	
(b) To the second portion sulphide gas was bubbled through	A dirt white precipitate was observed.	
(c) To the third portion lead nitrate solution was added.	A white precipitate soluble in hot water was observed.	
(d) To the fourth portion sodium hydrogen carbonate solution was added.	A white precipitate formed and an effervescence of colourless gas which turned lime water milky was observed.	
(e) To the fifth portion sodium carbonate solution was added	A white precipitate was formed	
(f) To the sixth portion potassium chromate solution was added	A yellow precipitate was formed.	

(b) (i) The cation was --------------------------------------- and the anion was -------------------------
   (ii) Write the confirmatory tests for the cation and anion present in M
   (iii) The equation for the reaction in test 4(c) is ---

   (iv) The equation for the reaction in test 4 (d) is --

(5 marks)