THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION, NOVEMBER 1994

032/2

CHEMISTRY PAPER 2

ALTERNATIVE TO PRACTICAL

(For Both School and Private Candidates)

TIME: 3 Hours.

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1. This paper consists of sections A, B and C.
2. Answer ALL questions in each of the sections A, B, and C.
3. Wherever calculations are involved, SHOW CLEARLY all the steps required.
4. Remember to write your Index Number on every page of your answer book provided.
5. You may use the following:

   H = 1, C = 12, N = 14, O = 16, Cl = 35.5, Na = 23.

This paper consists of 6 printed pages.

SECTION A

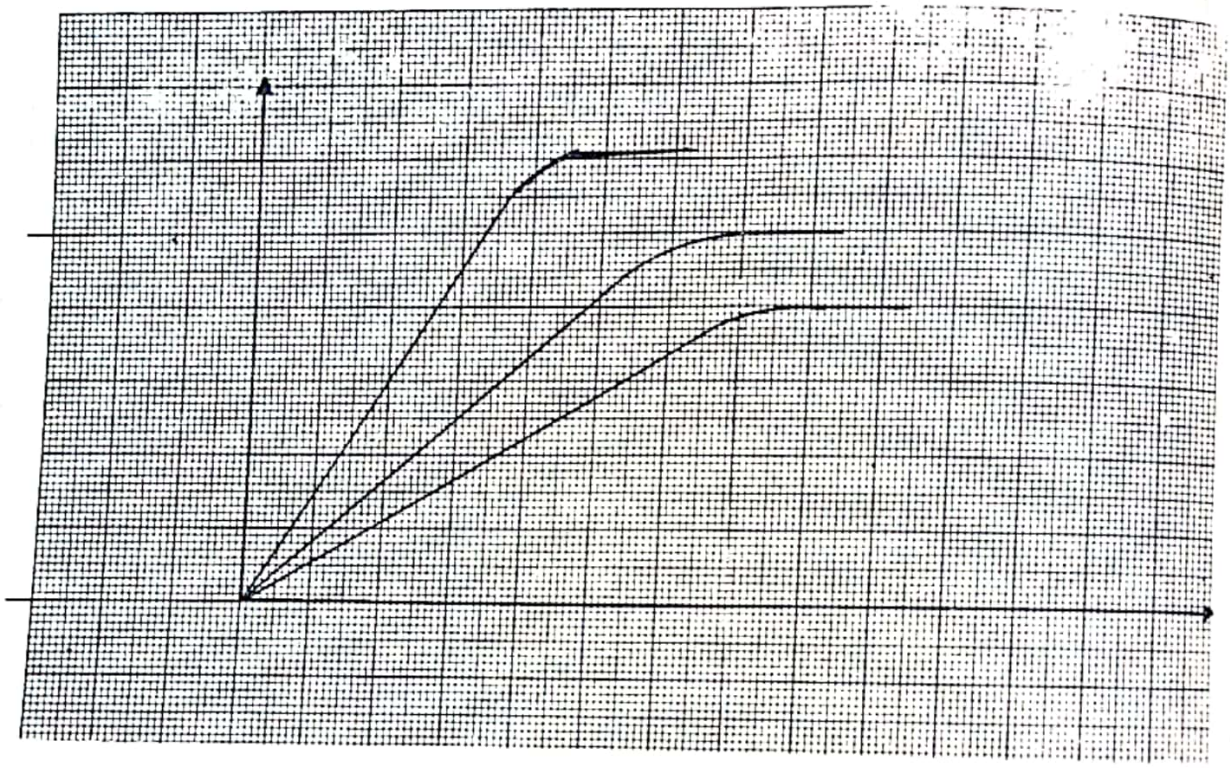
Answer ALL questions in this section.

1. The plots below show the reaction rates between dilute hydrochloric acid and

   (i) Magnesium ribbon

   (ii) Magnesium turnings

   (iii) Powdered magnesium.



(a) Copy the sketch of the graphs and

   (i) label the axes

   (ii) label the graphs using letters

   R for magnesium ribbon

   T for magnesium turnings, and

   P for powdered magnesium.

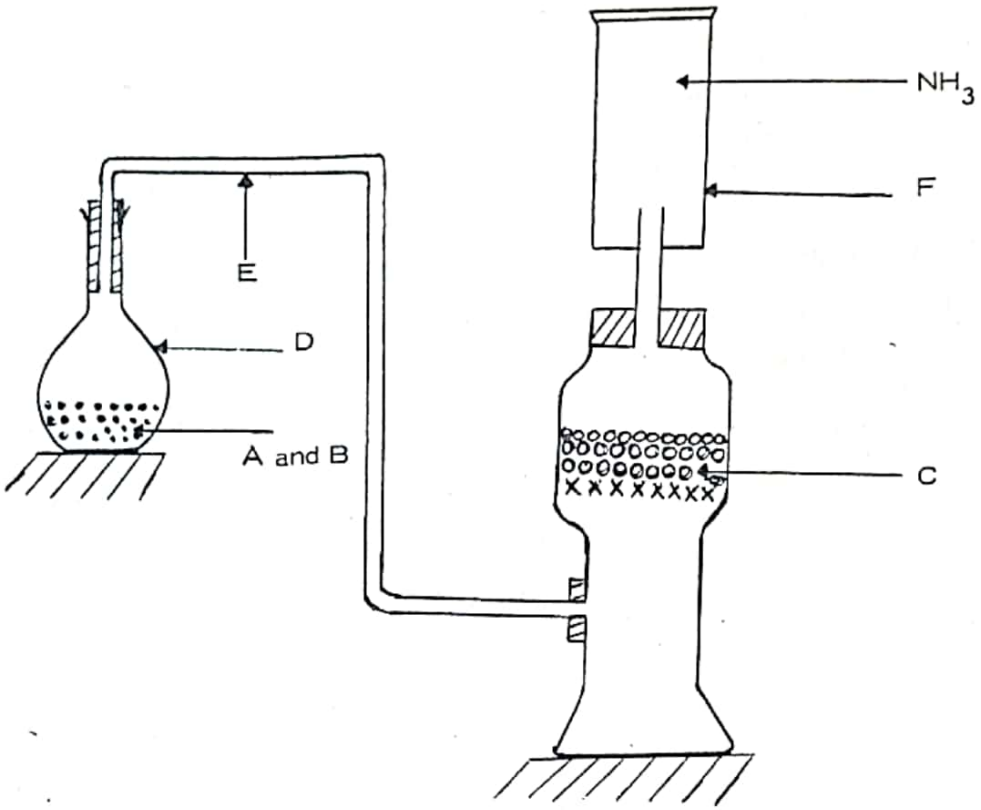
(b) Account for the differences in the reaction rates shown by the three graphs.

(c) Suggest the possible title for the graphs.

2. In each case, state the reason(s) for installing, in the chemistry laboratory, the following:

   (a) Fire extinguisher
   (b) Fume chamber
   (c) A bucket of sand
   (d) First aid kit
   (e) Chemical balances.

3. The diagram below is a set up apparatus for the preparation of ammonia gas in the laboratory. Study the diagram carefully and then answer the questions that follow.



   (a) Name substances labelled A, B and C.
   (b) Name the apparatus labelled D, E and F
   (c) What is the role of substance A?
   (d) Why is the gas collected as shown in the diagram?
   (e) What is the name of the method of collecting gases in this way?
   (f) Write a balanced chemical equation for the reaction taking place in apparatus D.

SECTION B

Answer ALL questions in this section.

4. Angela brought substance TT to your chemistry laboratory for identification.

(a) The appearance of TT showed that it was a pale green crystalline substance.

(b) When TT was heated strongly, two gases UU and VV were evolved and a residue, WW was left in the test tube.

(c) Gas UU decolourised potassium permanganate solution.

(d) Substance TT was dissolved in distilled water to form a stock solution.

(i) A portion of the stock solution reacted with sodium hydroxide solution to form a dark green precipitate which turned brown on standing.

(ii) Another portion of the stock solution reacted with potassium ferrocyanide solution to give a light blue precipitate.

(iii) A third portion of the stock solution reacted with barium chloride solution to give a thick white precipitate which was insoluble in dilute hydrochloric acid.

Use the information given above to answer the following questions.

(a) What was the colour of the stock solution in (d) above ?

(b) Identify substance TT, gases UU and VV and residue WW.

(c) In each case, write a balanced chemical equation taking place in (b), d(i) and d(iii) above.

(d) Write a balanced chemical equation for the reaction between UU and hydrogen sulphide.

5. Use the information given under the Test and Inference columns to complete the OBSERVATION column.

TEST	OBSERVATION	INFERENCES
(a) Solid sample PP was heated in a dry test tube.		Indicates the presence of Pb^{2+} and NO_3^- may be present.
(b) Solid sample PP was dissolved in distilled water to form a stock solution.		Indicates the absence of insoluble CO_3^{2-}, Cl^- and SO_4^{2-}
(i) To one portion of the stock solution, freshly prepared ferrous sulphate solution was added followed by addition of conc. H_2SO_4 along the side of the test tube.		NO_3^- present and confirmed.
(ii) To another portion of the stock solution, sodium carbonate solution was added and then followed by dilute nitric acid.		Pb^{2+} present.
(iii) To another portion of the stock solution, potassium iodide solution was added, then heated and then cooled.		Pb^{2+} confirmed.

SECTION C

Answer ALL questions in this section.

6. You were provided with

AA: A solution containing 3.00 g of acetic acid (CH_3COOH) per 0.50 dm^3 of solution, and

BB: A solution containing 1.10g of impure sodium hydrogen carbonate ($NaHCO_3$) per 0.25 dm^3 of solution.

Upon titration, 25cm^3 of solution BB required 12cm^3 of solution AA for complete neutralization. Use this information to

(a) Write a balanced chemical equation for the neutralization reaction between solutions AA and BB.

(b) Calculate

(i) the molarity of the acid solution AA.

(ii) the molarity of the base solution BB.

(iii) the concentration of sodium hydrogen carbonate ($NaHCO_3$) in solution BB in g/dm^3.

(iv) the concentration of impurities in solution BB in g/dm^3.

7. In a volumetric analysis practical class, solution MM of sulphuric acid was made by dissolving 5.20g of the acid in 1.00dm^3 and solution NN of sodium hydroxide containing 4.00g/dm^3 was used.

The results of the experiment were recorded as follows:

The volume of the pipette used was 25cm^3 whereas solution MM was in the burette.

BURETTE READINGS:

	PILOT	1	2	3
Final volume (cm^3)	25.80	45.40	43.90	41.00
Initial volume (cm^3)	0.00	20.00	18.40	15.30
Titre value (cm^3)				

(a) (i) Complete the table above by calculating the titre value for each column.

(ii) Determine the mean titre value.

(b) Write a balanced chemical equation for the neutralization reaction.

(c) Find the percentage purity of the acid.