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THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION, 1992

032/2

CHEMISTRY PAPER 2
ALTERNATIVE 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. Where calculations are involved, you are required to show ALL the steps involved.
4. Each question in each section carries a total of ten (10) marks.
5. Remember to write your Index Number on every page of your answer book provided.
6. Write the number of each question you attempt.
7. In your calculations you may use the following atomic masses:

H = 1, C = 12, N = 14, O = 16, Na = 23,
Mg = 24, S = 32, Cl = 35.5, K = 39, Ca = 40.

This paper consists of 6 printed pages.

SECTION A

Answer ALL questions in this section.

1. (a) State the use of each of the following apparatus:
   (i) Glass retort
   (ii) Gas jar
   (iii) Pipette
   (iv) Fractionating column
   (v) Test tube
   (vi) Evaporating dish.

   (b) Draw a diagram to show
   (i) a test-tube rack
   (ii) a fractionating column.

2. An experiment was carried out to find the effect of temperature on the rate of a chemical reaction. In this experiment, 10 cm^3 of 2M sodium thiosulphate were mixed with 10 cm^3 of 2M hydrochloric acid. The time taken for the reaction to go to completion at varying temperatures was recorded as follows.

Temp. °C	Time (s)
10	35
15	27.5
20	23
25	20
30	17
40	15

   (a) Use the above data to plot a graph of time (s) vs temperature (°C).

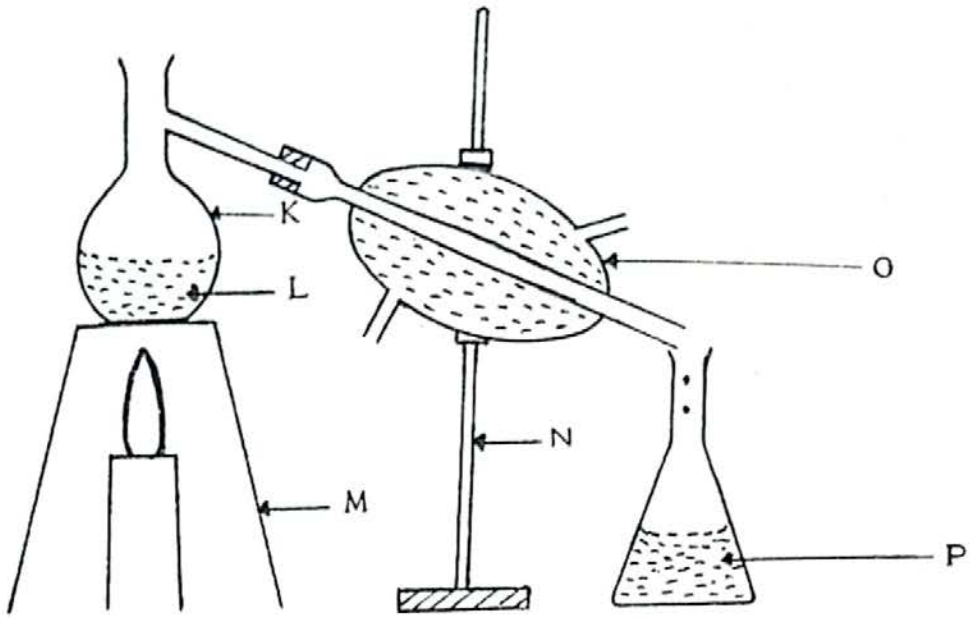
   (b) Use your graph in 1(a) above to explain the effect of temperature on the rate of reaction.

   (c) Give three (3) other factors which can affect the rate of any chemical reaction.

3. (a) Draw a labelled diagram that represents the electrolysis of dilute sulphuric acid.

   (b) Write a summary of the reaction of the electrolysis of dilute sulphuric acid at the
   (i) anode (ii) cathode.

4. A colourless liquid NN, which turns anhydrous copper (II) sulphate blue, was mixed with potassium permanganate crystals and the mixture heated as shown in the diagram below.



(a) (i) Give the names and colours of liquids L and P

(ii) Give the names of the apparatus M, N and O.

(b) Which of the two liquids, L and P, is purer than the other and why?

(c) Suggest the name of the process involved in the set up of the above experiment.

SECTION B

5. The following tests and observations made on sample FE, a mixture of two salts, were recorded as follows.

(a) The appearance of the sample indicated that it contained a mixture of green crystals and white powder.

(b) When FE was dissolved in distilled water, a blue solution was formed and white solid remained at the bottom of the test tube.

(c) By decantation, the blue solution was separated from the undissolved solid.

(i) Sodium carbonate solution was added to the blue solution, then heated. A light blue precipitate was observed. The precipitate turned black on heating and a gas which turned lime water milky was evolved.

(ii) Ammonia solution was added to another portion of the blue solution in (b) above. A blue precipitate was formed which dissolved in excess ammonium hydroxide to form a deep blue solution.

(d) When Manganese (IV) oxide was added to the solid sample FE followed by addition of concentrated sulphuric acid then boiled, a greenish yellow gas which bleached red litmus paper was evolved.

(e) When dilute nitric acid was added to the insoluble portion obtained in (c) above, a clear solution was formed.

(f) Addition of sodium hydroxide to the solution obtained in (e) above, a white precipitate which was insoluble in excess alkali was observed.

(g) Addition of ammonium oxalate solution to another portion of the solution in (e) above, a white precipitate was observed.

(h) Addition of Barium chloride solution to a third portion of the solution in (e) above followed by addition of dilute hydrochloric acid, a white precipitate insoluble in excess of the acid was formed.

(a) From these tests and observations, the cations in sample FE were (i) ..... and (ii) .....

The anions were (i) ..... and (ii) .....

(b) Write the equation for the reaction between sodium carbonate solution and the filtrate obtained in (c) above

(i) before heating

(ii) after heating.

(c) Write the ionic equation for the reactions in (e) and (f) above.

6. (a) Complete the following table:

EXPERIMENT	OBSERVATIONS	INFERENCES
(i) Solid sample OM + heat	Reddish-brown gas which re-lights a glowing splint is evolved. The remaining solid is reddish-brown when hot and yellow when cold.	
(ii) Solution of OM + ammonium hydroxide solution.	White ppt insoluble in excess.	
(iii) Solution of CM + Potassium iodide solution.	Yellow ppt formed.	
(iv) Solution of OM + Iron (II) sulphate solution + conc. H_2SO_4	Brown ring between solution OM and iron (II) sulphate formed.	

(b) From the above tests, observations and your inferences, the cation in sample OM is ..... and the anion is .....

(c) The chemical formula of sample OM is .....

7. Given that sample NP contains one cation and one anion, complete the following table.

EXPERIMENT	OBSERVATIONS	INFERENCES
(a) Appearance of NP		Indicates presence of Fe^{2+} or Cu^{2+}
(b) Solution of NP + sodium hydroxide solution.		Cu^{2+} present
(c) Solution NP + sodium carbonate solution.		Cu^{2+} present
(d) Solution NP + excess ammonia solution.		Cu^{2+} confirmed
(e) Solution NP + silver nitrate solution.		Indicates presence of Cl^-
(f) Solution NP + conc H_2SO_4 + Manganese (IV) oxide + warming.		Cl^- confirmed.

CONCLUSION:

The chemical name and formula of sample NP are ..... (Name) and ..... (chemical formula).

SECTION C

8. 0.12M aqueous nitric acid was titrated against 25.00 cm^3 of aqueous sodium hydroxide. 22.50 cm^3 of the acid reacted completely with 25.00 cm^3 of the base.

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

(b) Sketch and label all the apparatus used in the experiment above

(c) Calculate the

(i) molarity

(ii) concentration of the base in the above reaction.

(d) Suggest the indicator used in the above experiment.

[H = 1, N = 14, O = 16, Na = 23, C = 12]

9. Ando was provided with the following:

WW - A solution of 0.120 M HCl

ZZ - A solution of hydrated sodium carbonate ($Na_2CO_3xH_2O$) containing $14.30\,g/dm^3$.

On titration, by using a $20\,cm^3$ pipette, he obtained the following readings.

Burette readings	Pilot	1	2	3	4
Final volume (cm^3)	18.00	35.90	27.90	45.50	27.60
Initial volume (cm^3)	00.00	18.00	10.20	27.90	10.00
Volume used (cm^3)					

(a) (i) Suggest the indicator used by Ando in his titrations.

(ii) Suggest the colour change at the end point.

(b) (i) Complete the table above

(ii) Calculate the average volume used for complete neutralization of the base by the acid.

(c) Find the value of x in the formula $Na_2CO_3xH_2O$.

[H = 1, C = 12, O = 16, Cl = 35.5, Na = 23] .

10. Given a bottle containing 9M - H_2SO_4,

(a) Calculate the number of

(i) grams of the acid in $1dm^3$

(ii) moles of the acid in $50cm^3$.

(b) (i) If $20cm^3$ of the acid were to be diluted to 1M, how many millilitres of distilled water would be needed?

(ii) What would be the total volume added in b(i) above?

[H = 1, O = 16, S = 32] .