

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

032/2

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

TIME: 2 Hours 30 Minutes

Wednesday November 12, 2003 a.m.

Instructions

1. This paper consists of FIVE (5) questions.
2. Answer ALL questions.
3. Wherever calculations are involved, show clearly all the steps involved.
4. Marks allocated to each question or part thereof are indicated beside the question.
5. Qualitative analysis guide pamphlets are allowed after a thorough check by the supervisor.
6. Cellular phones are **not** allowed in the examination room.
7. Electronic calculators are **not** allowed in the examination room.
8. Write your Examination Number on each page of your answer booklet(s).
9. The following constants may be used:

H = 1, Na = 23, Cl = 35.5, S = 32, O = 16, Cu = 64, Ag = 108, C = 12.

1 litre = 1 dm³ = 1000 cm³

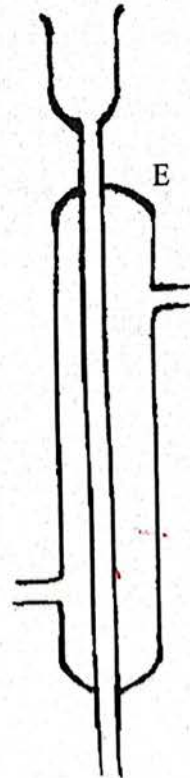
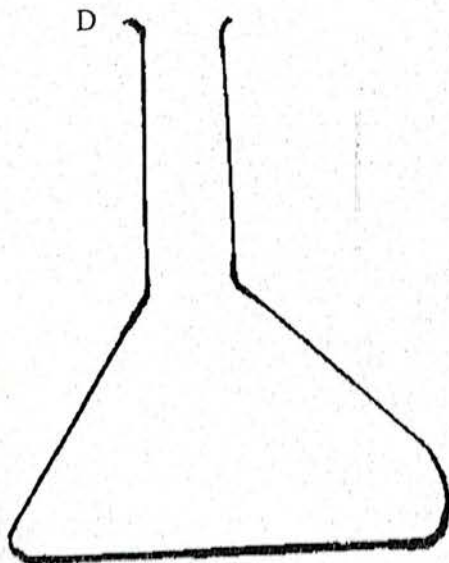
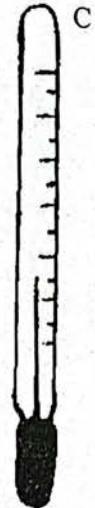
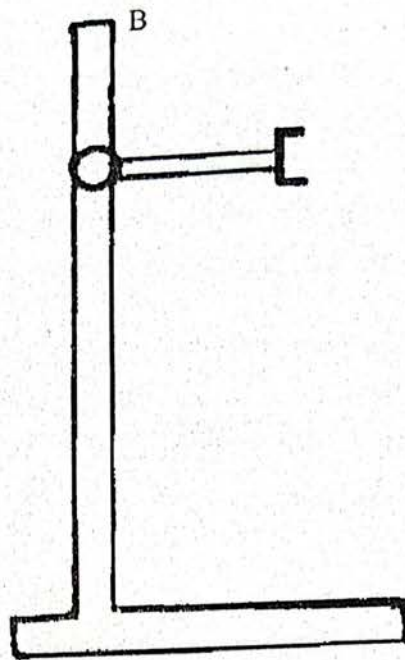
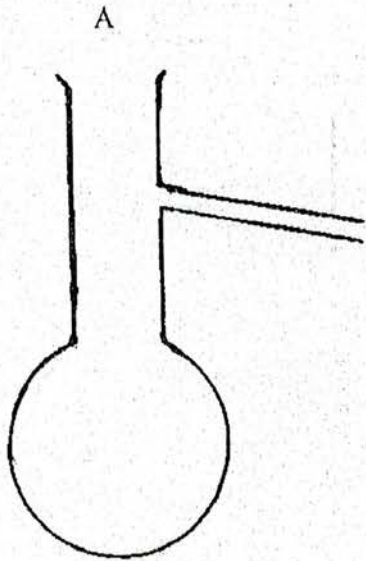
1 Faraday = 96500 coulombs.

This paper consists of 5 printed pages.

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1. Study the diagrams for the pieces of apparatus labeled A, B, C, D and E then answer the questions that follow:



- (a) Draw a diagram to show how the pieces of apparatus above can be connected in a distillation experiment. (05 marks)
- (b) Give the names and uses of the apparatus A, B, C, D and E. (05 marks)
2. 5.2 g of sodium hydroxide contaminated with sodium chloride were dissolved in water and the volume was corrected to 1 litre of the solution T_1 . 25 cm³ of solution T_1 were pipetted into a conical flask and

(a) Table of results:

The volume of solution T_1 pipetted was ---- cm^3 .

(00½ mark)

Burette readings:

Titration number	Pilot	1	2	3
Final reading (cm^3)	27.00	40.05	.	48.00
Initial reading (cm^3)	1.00		1.15	.
Titre volume (cm^3)	.	25.00	25.05	24.95

(i) Complete the table by filling in the missing data.

(ii) The colour change at the end point was from _____ to _____

(iii) Write a balanced chemical equation for the reaction between sodium hydroxide and sulphuric acid.

(iv) Calculate the average titre volume.

(04 marks)

(b) Calculate

(i) the molarity of the solution of sulphuric acid, T_2

(ii) the molarity of sodium hydroxide in solution T_1

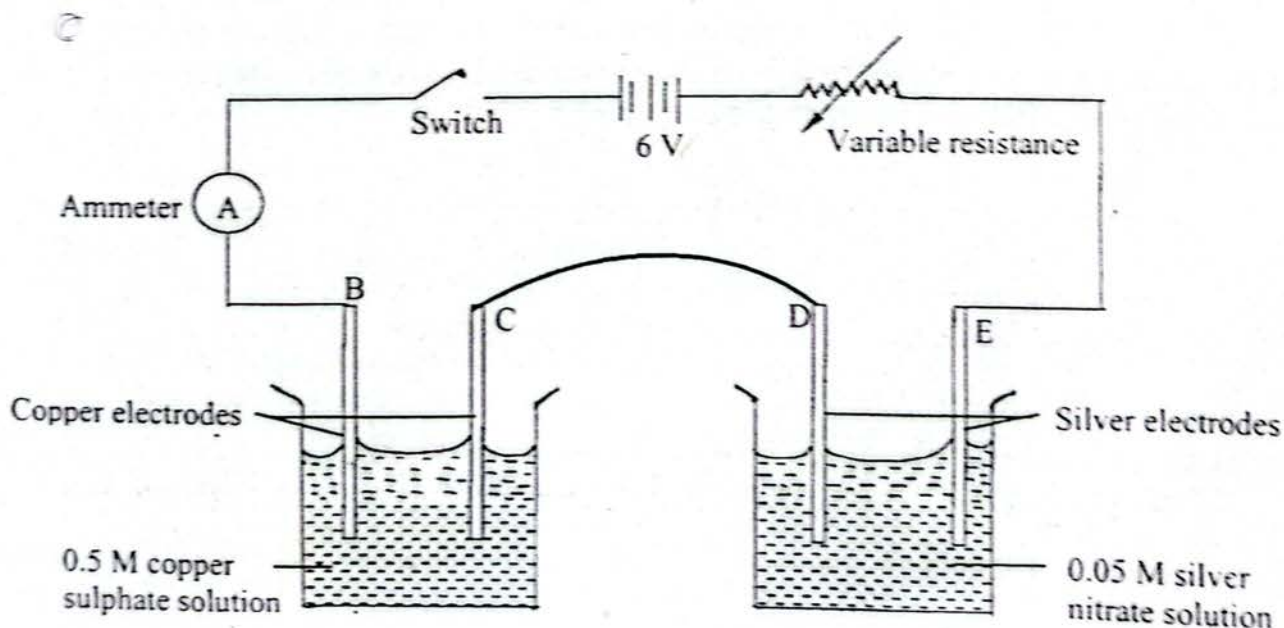
(iii) the concentration in g/dm^3 of sodium hydroxide in solution T_1

(iv) the mass of sodium chloride in the solution T_1

(v) the percentage by mass of sodium chloride which has contaminated the base sodium hydroxide.

(05½ marks)

3. A student of a certain school did an experiment in order to compare the amount of different substances liberated by the same quantity of electricity. The student used copper voltameter and silver voltameter as shown in the diagram below :



(a) Which of the four electrodes labeled B, C, D, E in the diagram above are

- (i) cathodes?
- (ii) anodes?

(02 marks)

(b) By using ionic equations show the chemical reactions which took place at

- (i) the cathode of the copper voltameter
- (ii) the anode of the silver voltameter.

(03 marks)

(c) If a current of 0.45 amperes was allowed to flow through the copper voltameter and silver voltameter for 25 minutes, calculate

- (i) the quantity of electricity in coulombs that passed through the two voltameters
- (ii) the mass of copper deposited
- (iii) the mass of silver deposited.

(05 marks)

4. A small flask was connected to a gas syringe by means of a stopper and delivery tube. 10 cm³ of water, 0.5 g of manganese (IV) oxide and 5 cm³ of hydrogen peroxide were placed in the flask and quickly stoppered. The readings of the volume of oxygen gas in the syringe were recorded every 15 seconds as shown in the table below:

Time, s	0	15	30	45	60	75	90	105
Volume, cm ³	0	27	47	61	69	75	80	80

(a) (i) Plot a graph of volume of oxygen (in cm³) against time (in sec.)

(ii) At what time interval was the reaction very fast?

(iii) Why didn't the volume of oxygen produced increase any further after 90 to 105 seconds?

(06 marks)

(b) (i) What will happen to the rate of decomposition of hydrogen peroxide if the volume of hydrogen peroxide is changed from 5 cm³ to 8 cm³ while the amount of water and manganese (IV) oxide remain constant?

(ii) What is the effect of MnO₂ on the rate of decomposition of hydrogen peroxide?

(04 marks)

5. Use the information given under the test and observation column to complete the inference column and lastly identify the cation and anion present in sample Q.

Test	Observation	Inference
(a) Appearance of sample Q.	A colourless/white deliquescent salt.	
(b) A little of sample Q was heated in a test tube.	A brownish gas accompanied with a gas which rekindles a glowing splint were evolved.	

(c) Distilled water was added to a spatulaful of sample Q in a test tube stirred and the solution was divided into three portions.	A colourless solution was formed.	
(d) To the first portion of the solution of sample Q in a test tube, sodium hydroxide solution was added drop by drop until excess.	White precipitate insoluble in excess of the reagent was formed.	
(e) Ammonium hydroxide solution was added drop by drop until excess to the second portion of the solution of sample Q in a test tube.	White precipitate insoluble in excess of the reagent was formed.	
(f) To a quarter of a spatula of iron(II) sulphate in a test tube a drop of concentrated sulphuric acid was added followed by 1 cm ³ of distilled water then stirred. The solution obtained was added to the third portion of the solution of sample Q obtained in (c) above followed by concentrated sulphuric acid which was added slowly along the sides of the test-tube.	A brownish liquid was formed between the two liquids.	
(g) A little Q on a nichrome wire was burnt in an open bunsen burner flame.	Brick-red coloration was imparted in the bunsen burner flame.	

The anion is _____

The cation is _____

The molecular formular of the salt Q is _____

(10 marks)