

**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, October 19, 2005 a.m.**

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**Instructions**

1. This paper consists of five (5) questions.
2. Answer all questions.
3. All questions carry equal marks.
4. Qualitative Analysis Guidance Pamphlets may be used after a thorough check by the supervisor.
5. Electronic calculators are **not** allowed in the examination room.
6. Cellular phones are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).
8. You may use the following constants.

Atomic Masses: H = 1, C = 12, O = 16, Ag = 108.

1 Faraday = 96500 Coulombs.

1 litre = 1 dm<sup>3</sup> = 1000 cm<sup>3</sup>.

CPB

This paper consists of 4 printed pages.

1. Figure 1 below represents the laboratory preparation of nitrogen from the atmosphere. Study it carefully and answer the questions that follow.

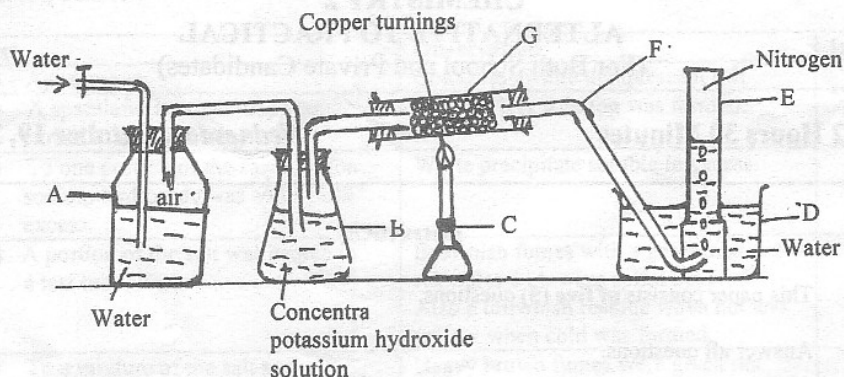


Figure 1

- Write the names of the apparatuses labelled A to G.
  - What is the function of
    - concentrated potassium hydroxide solution?
    - copper turnings?
    - water?
  - What are the chief impurities of nitrogen gas at the end of the experiment?
2. A student titrated 25.00 cm<sup>3</sup> of 0.094 M KOH against oxalic acid (H<sub>2</sub>C<sub>2</sub>O<sub>4</sub>). The burette readings were as tabulated in table 1 below.

Burette readings:

EXPERIMENT	Pilot	1	2	3
Final reading (cm <sup>3</sup> )	23.90	24.40	48.40	22.30
Initial reading (cm <sup>3</sup> )	-	-	-	-
Titre volume (cm <sup>3</sup> )	22.60	22.40	22.40	22.30

Table 1

- Complete the table above.
- Calculate the average titre volume.
- Calculate the concentration of oxalic acid in
  - mol/dm<sup>3</sup>.
  - g/dm<sup>3</sup>.

3. Figure 2 below shows the apparatus assembled by a student to prove that the charge carried by silver ion is + 1 and that carried by an unknown metal Q is + 2, given that the atomic mass of Q is 119 g/mol.

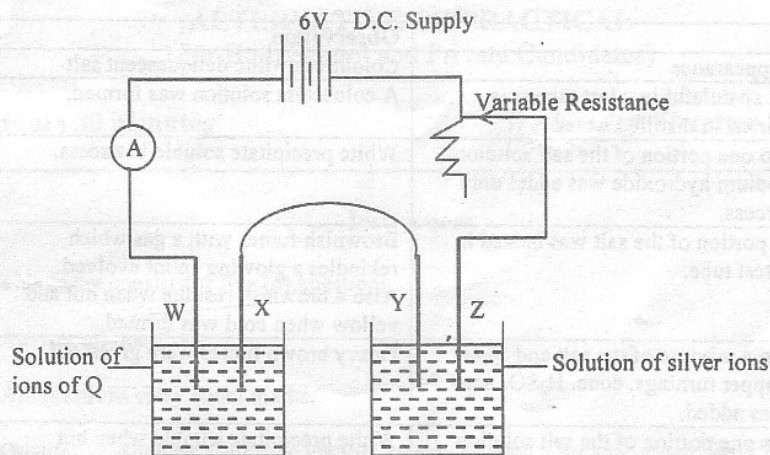


Figure 2

- (a) (i) Why was it necessary to clean the metal electrodes before the experiment started?
- (ii) What is the importance of a variable resistor?
- (iii) At the end of the experiment, electrodes were carefully washed and dried before weighing them. Why was it necessary to wash and dry the electrodes?
- (b) If 193 coulombs of electricity were used during the experiment, show that the charge
- (i) on silver ion is +1 if 0.216 g of silver was deposited
- (ii) on Q ion is +2 if 0.119 g of Q was deposited
- (c) Write an ionic equation for the discharge of  $Q^{2+}$  ions at the cathode.
4. A small flask was connected to a gas syringe by means of a stopper and delivery tube. Zinc granules and excess dilute hydrochloric acid of concentration 0.1M were placed in the flask and quickly stoppered. The readings of the volume of hydrogen gas in the syringe were recorded every 10 seconds as shown in table 2 below.

Time (sec)	0	10	20	30	40	50	60	70	80
Volume (cm <sup>3</sup> )	0	18	30	40	48	53	57	58	58

Table 2

- (a) (i) Plot a graph of volume of hydrogen (in cm<sup>3</sup>) against time (in sec).
- (ii) Why has the volume of hydrogen collected at the 70<sup>th</sup> second remained the same up to the 80<sup>th</sup> second?



(b) What will happen to the rate of production of hydrogen gas if

(i) zinc dust was used instead of zinc granules?

(ii) The concentration of hydrochloric acid was increased?

5. Use the information given under the test and observation columns to complete the inference column in table 3 below.

Test	Observation	Inferences
(a) Appearance	Colourless/white deliquescent salt	
(b) A spatulaful in a test tube was stirred in distilled water.	A colourless solution was formed.	
(c) To one portion of the salt solution sodium hydroxide was added until excess.	White precipitate soluble in excess.	
(d) A portion of the salt was heated in a test tube.	Brownish fumes with a gas which rekindles a glowing splint evolved. Also a brownish residue when hot and yellow when cold was formed.	
(e) To a mixture of the salt and copper turnings, conc. $H_2SO_4$ acid was added.	Heavy brown fumes were given out.	
(f) To one portion of the salt solution dil. HCl was added boiled and then cooled.	White precipitate soluble when hot reappeared on cooling.	
(g) To another portion of salt solution KI solution was added.	Yellow precipitate was formed.	

Table 3

### Conclusion

In the salt the cation was \_\_\_\_\_ and the anion was \_\_\_\_\_.

The molecular formula of the salt is \_\_\_\_\_.