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: 2:30 Hours **Tuesday, 16th October 2012 a.m.**

Instructions

1. This paper consists of **five (5)** questions. Answer **all** the questions.
2. Each question carries **ten (10)** marks.
3. Qualitative Analysis Guidance Pamphlets may be used after a thorough check by the Supervisor.
4. Calculators and cellular phones are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. You may use the following constants:

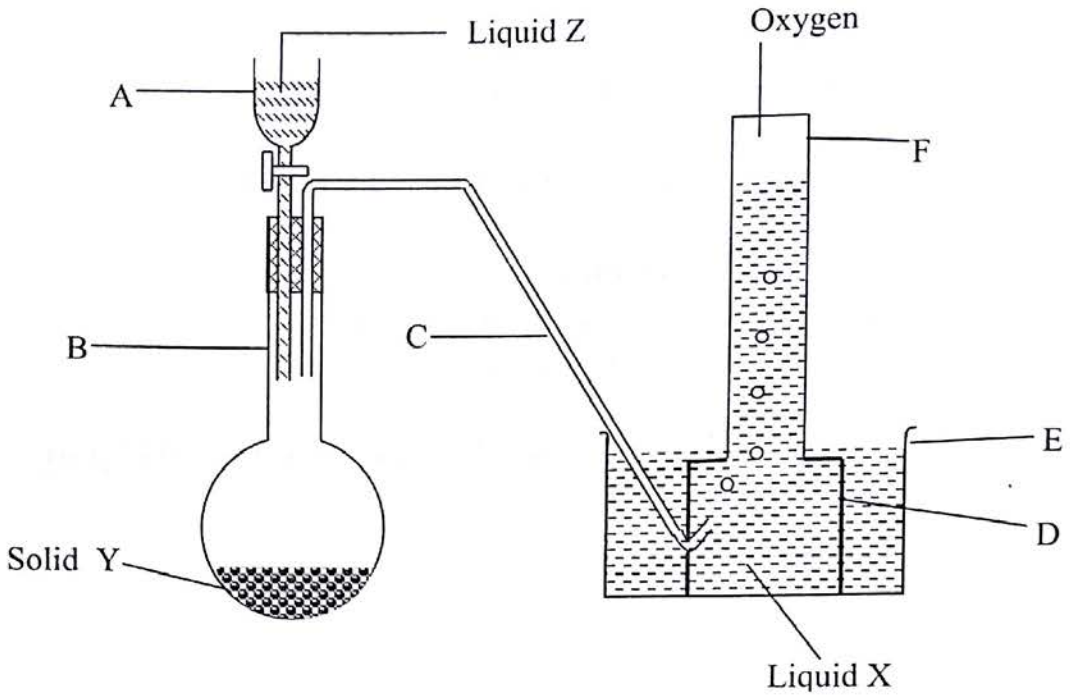
   Atomic masses: H = 1, N = 14, Na = 23, S = 32, Cl = 35.5, Cu = 63.5

   1 Faraday = 96500 coulombs.

   GMV at s.t.p. = 22.4 dm^3.

   1 litre = 1 dm^3 = 1000 cm^3.

1. The diagram below represents the apparatus used in demonstrating the preparation of oxygen gas. Study it very carefully and then answer the questions that follows:



Questions:

(a) (i) Name the parts labelled A, B, C, D, E and F.
(ii) Identify liquids X, Z and solid Y.

(b) (i) Both liquids X, Z and solid Y contain oxygen. Which one can decompose to give out oxygen gas?
(ii) Write a balanced chemical equation for the decomposition of the compound you have named in 1 (b) (i).

(c) What is the name of the method of collecting oxygen gas as shown in the diagram? Give two reasons to support your answer.

In an experiment, solution **R** containing 4 g of pure sodium hydroxide in 1 dm^3 was titrated against solution **Q** containing 5.2 g of impure sulphuric acid in 1 dm^3. Methyl orange indicator was used. The volume of pipette used was 25 cm^3 and the results were recorded in Table 1.

Table 1

Experiment	Pilot	1	2	3
Final reading (cm^3)	25.50		24.50	
Initial reading (cm^3)		25.50		24.50
Volume used (cm^3)	25.00	24.50	24.50	24.50

Questions:

(a) Complete Table 1 by filling the values of the missing volumes.

(b) Write a balanced chemical equation for the reaction at the neutral point.

(c) Showing your procedures clearly, calculate the percentage purity of sulphuric acid.

A student investigated the electrolysis of copper sulphate solution as follows:
Two clean pieces of copper were weighed. One piece was used as positive electrode and the other as negative electrode. After the electrolysis, the pieces of copper were:
(i) Washed with distilled water;
(ii) Washed with propanone (a liquid with a lower boiling point than water);
(iii) Allowed to dry;
(iv) Weighed and the data were tabulated in Table 2.

Table 2

Electrode	Before electrolysis	After electrolysis
Positive electrode	16.41	16.10
Negative electrode	15.46	15.75

Questions

(a) Explain why the electrode would dry faster when washed with propanone instead of water.

(b) What is the change in mass of the electrodes?

(c) The mass lost by the positive electrode should have been equal to the mass gained by the negative electrode. Suggest six reasons why the results were not as expected.

(d) If the electrodes were replaced by platinum, what changes, if any, are observed at the cathode, at the anode, and in the solution?

(e) Describe how electrolysis is used to make pure copper from a lump of impure copper.

4. Mary investigated the rate of reaction between marble ($CaCO_3$) and hydrochloric acid. She used an excess of marble and measured the mass of the flask and contents every half minute for five and half minutes. The results are shown in Table 3.

Table 3

Mass of flask and contents in grams	102.8	102.2	102.5	101.2	100.6	100.2	99.9	99.8	99.5	99.4	99.2	99.2
Time in minutes	0	0.30	1	1.30	2	2.30	3	3.30	4	4.30	5	5.30

Questions

(a) With state symbols, write a balanced equation for reaction between marble and hydrochloric acid.

(b) Plot the graph of mass of flask and contents (grams) against time (minutes).

(c) Why did the mass of the contents in the flask decrease with time?

(d) After how many minutes had all the acid been used?

(e) Mary repeated the experiment at higher temperature. All other variables were kept the same as in the first experiment. The rate of reaction was much faster.

(i) Sketch on the same graph to show the results for this second experiment. Comment on the shapes of the two graphs.

(ii) Why does an increase in temperature increase the rate of reaction? Give three reasons.

5. An unknown sample **N** was analysed and found to contain one cation and anion. Complete Table 4 and identify the cation, anion and write the formula and name of the compound.

Table 4

S/n	Experiment	Observations	Inferences
(a)	Appearance of sample N.		SO_4^{2-} of Fe^{2+} may be present.
(b)	Sample **N** was heated strongly in a dry test tube.		Absence of HCO_3^- or CO_3^{2-}.
(c)	Dilute hydrochloric acid was added to the solid sample **N** in a test tube.		Fe^{2+} present.
(d)	Sample **N** was dissolved in distilled water and divided into three portions.		NO_3^-, SO_4^{2-}, Cl^- may be present.
(e)	To the first portion of the solution, sodium hydroxide solution was added.		Fe^{2+} present.
(f)	To the second portion, dilute hydrochloric acid was added followed by barium chloride.	White precipitate was formed.	
(g)	To the third portion, potassium ferrocyanide solution was added.	Light blue precipitate was formed.	

Conclusion:

(i) The cation in sample **N** is _____ and anion is _____.

(ii) The formula of compound **N** is _____.

(iii) The chemical name of compound **N** is _____.

(iv) With state symbols write a balanced chemical equation taking place at (b).