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

32/2

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

ime: 2:30 Hours **Tuesday, 10th November 2015 a.m.**

Instructions

This paper consists of **five (5)** questions. Answer **all** the questions.

Each question carries **ten (10)** marks.

Qualitative Analysis Guidance Pamphlets may be used after a thorough check by the Supervisor.

Calculators and cellular phones are **not** allowed in the examination room.

Write your **Examination Number** on every page of your answer booklet(s).

You may use the following constants:

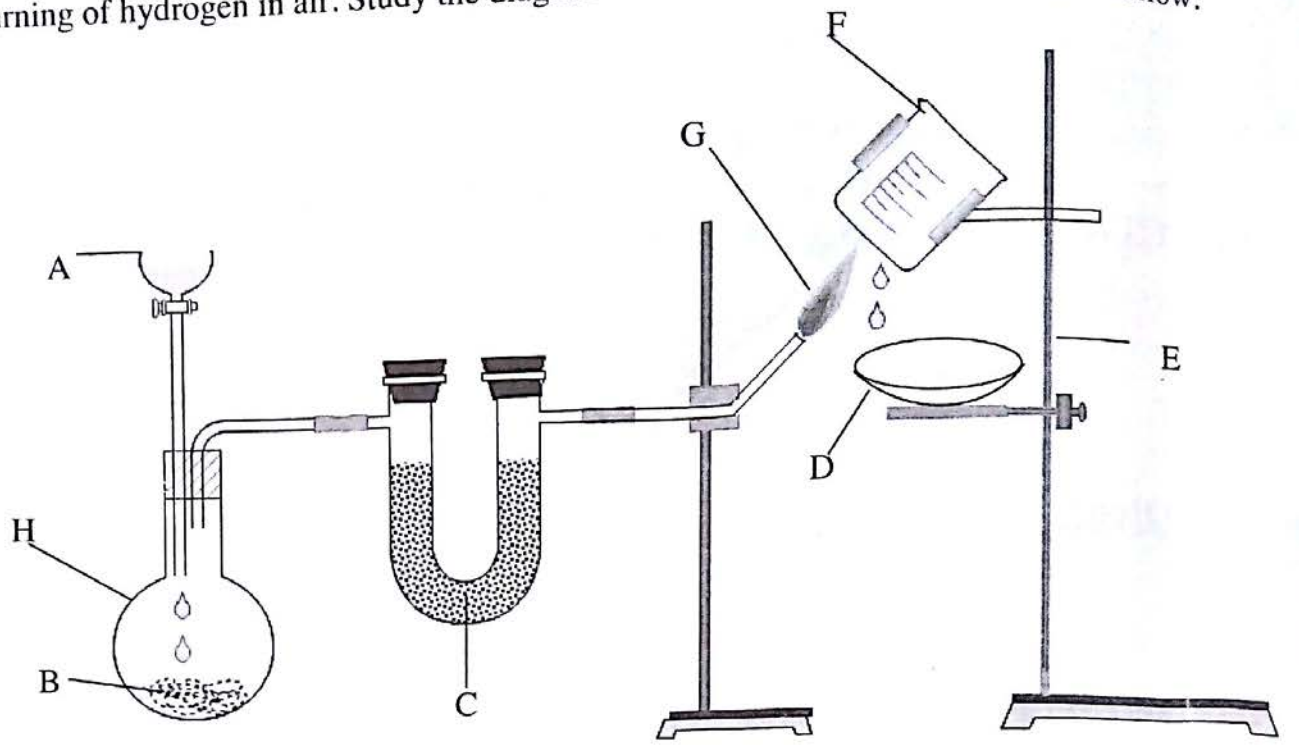
Atomic masses: H = 1, N = 14, O = 16, Na = 23, S = 32, Cl = 35.5, Cu = 64.

1 faraday = 96500 coulombs.

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

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

1. The following diagram represents the experimental set up for demonstrating the preparation and burning of hydrogen in air. Study the diagram and then answer the questions that follow:



Questions:

(a) What do the letters A, B, C, D, E, F G and H represents?

(b) What is the function of compound C?

(c) With state symbols, write a balanced chemical equation which represents the reaction which leads to the production of hydrogen.

(d) Write a balanced chemical equation for the combustion reaction.

2. In a volumetric analysis practical class, solution **MM** of H_2Q acid was made by dissolving 11.25 g of the acid in 1.00 dm^3 and solution **NN** of sodium hydroxide containing 4.92 g/dm^3 were used. The results of the experiment were recorded as follows:

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

Table 1: Burette readings:

Titration	**Pilot**	**1**	**2**	**3**
Final reading (cm^3)	13.00	25.50		12.50
Initial reading (cm^3)	0.00	13.00	25.50	0.00
Volume used (cm^3)			12.50	

Questions:

(a) Complete Table 1 by filling in the blanks.

(b) Write the balanced chemical equation for the reaction between solution **MM** and **NN**.

(c) Showing your procedures clearly, determine the molar mass of H_2Q.

The following results were obtained by a student during the electrolysis of 450 cm^3 aqueous solution of copper (II) sulphate using carbon electrodes.

Table 2

Volume of oxygen gas liberated at STP (dm^3)	Number of coulombs passed
0.92	2,000
1.84	4,000
2.76	6,000
3.68	8,000
4.60	10,000
5.52	12,000

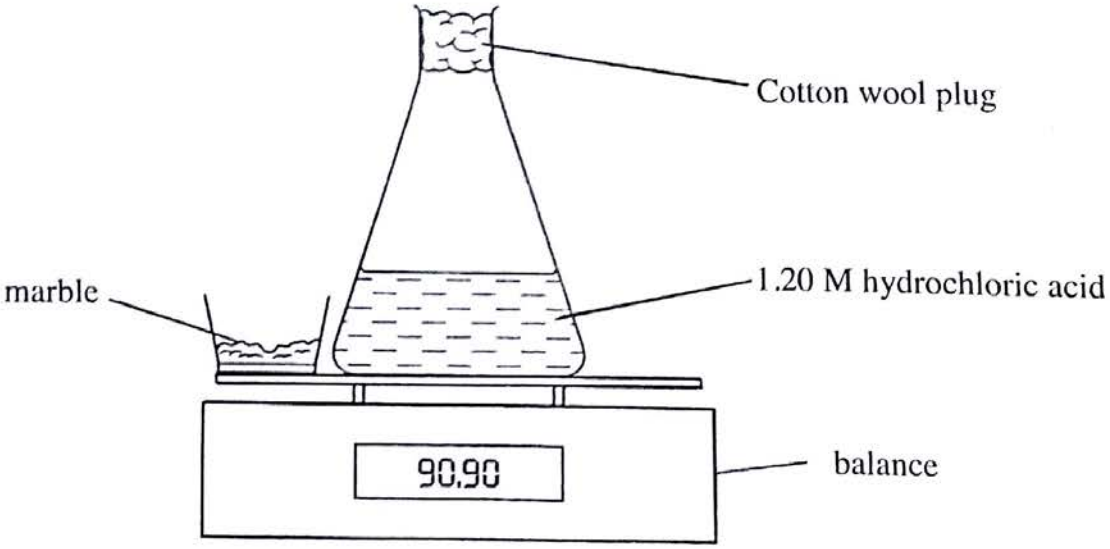
Questions:

(a) Write the ionic equation to represent the reaction at the electrodes.

(b) (i) Plot the graph of volume of oxygen gas (y-axis) against the number of coulombs passed (x-axis).
(ii) Explain the shape of the graph obtained in 3 (b) (i).
(iii) From the graph deduce the volume of oxygen gas liberated by 500 coulombs.

(c) Suggest two ways for checking the reliability of the experimental results.

The set apparatus below shows the experimental determination of the loss in mass during the reaction between 20.0 g of marble ($CaCO_3$) pieces (in excess) and 30.0 cm^3 of 1.2 M hydrochloric acid.



The marble was added to the acid and the mass was recorded every 30 seconds. The experiment was repeated using the same mass of marble but finely powdered. The volume and concentration of the hydrochloric acid were the same. The results of the two experiments were recorded as shown in Table 3.

Table 3

Time/s	Experiment 1		Experiment 2	
	Mass/g	Total loss in mass/g	Mass/g	Total loss in mass/g
0	90.90	0.00	90.90	0.00
30	90.62	0.28	90.42	0.48
60	90.42	0.48	90.23	0.67
90	90.27		90.14	
120	90.17		90.10	
150	90.10		90.10	
180	90.10		90.10	

Questions:

(a) Complete Table 3 by calculating the total loss in mass for both experiments.

(b) Explain why the following results were obtained in this experiment:
(i) The decrease in mass of the contents in the flask during the reaction.
(ii) The last two results in the first experiment and the last three in the second experiment were the same.

(c) On the same axes, plot the graphs of total loss in mass against time for the two experiments.

(d) Use your graphs to determine:
(i) The loss in mass in the first experiment after 75 seconds.
(ii) The mass left in the second experiment after 45 seconds.

(e) Compare the two curves and deduce the effect of using powdered marble in the second experiment.

Table 4 shows the tests a student did on compound **P**. Complete the table by adding the inference for test (a), the observations for (b) (i), (b) (ii), (c) and the test and observation for (d).

Table 4

S/n	Experiment	Observations	Inferences
(a)	**P** was dissolved in water and the resulting solution was divided into three parts.	A colourless solution was formed	
(b)	(i) To the first part aqueous sodium hydroxide was added until a change was seen.		Ca^{2+}, Zn^{2+} and Pb^{2+} may be present.
	(ii) An excess of aqueous sodium hydroxide was added to the mixture from (b) (i).		Ca^{2+} may be present
(c)	To the second part aqueous ammonia was added followed by ammonium oxalate.		Ca^{2+} confirmed
(d)			Cl^- present and confirmed.

Conclusion:

(i) The chemical name of sample **P** is _____.

(ii) The chemical formula of compound **P** is _____.

(iii) With state symbols, write a balanced chemical equation taking place at (b) (i) and the corresponding ionic equation.