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 10, 2004 a.m.

Instructions

1. This paper consists of five (5) questions.

2. Answer all questions.

3. All questions carry equal marks.

4. Whenever calculations are involved, show clearly all the steps involved.

5. Qualitative analysis guidance pamphlets may be used after a thorough check by the supervisor.

6. Electronic calculators are **not** allowed in the examination room.

7. Cellular phones are **not** allowed in the examination room.

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

9. For your calculations you may use the following:

    Atomic masses

    $H = 1, O = 16, C = 12, K = 39, Cu = 64$.

    Faraday constant $= 96,500$ C.

    Molar Volume of a gas $= 22.4$ dm^3 at s.t.p.

This paper consists of   4   printed pages.

1. Figure 1 below represents an experimental set up of the laboratory preparation of dry chlorine.
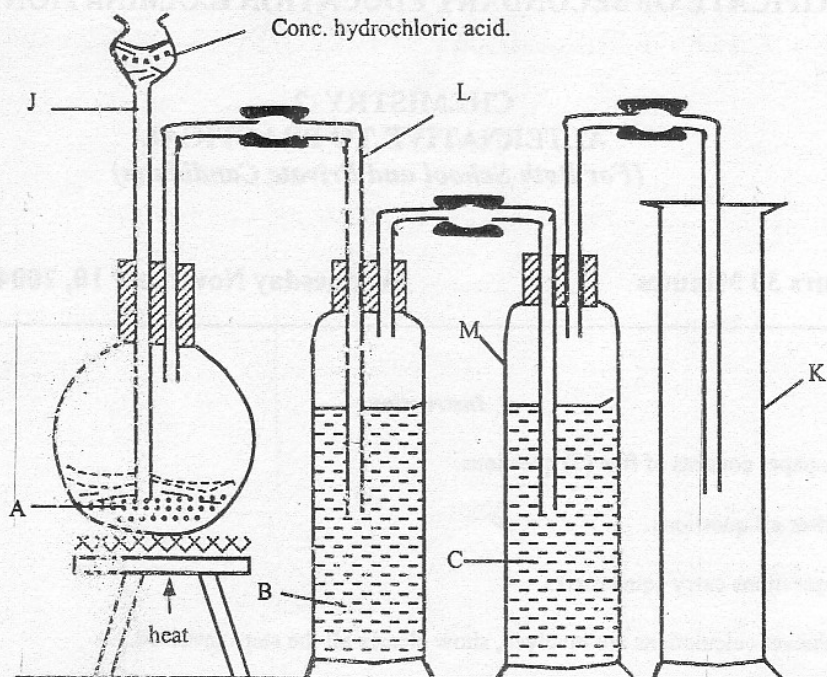

Fig. 1

(a) Give the names of the apparatuses labelled J, K, L and M. (2 marks)

(b) (i) Name compounds A, B and C. (3 marks)

(ii) Write a balanced chemical equation which represents the reaction between compounds A and conc. hydrochloric acid. (1 mark)

(c) Explain the function of B and C in the preparation of chlorine gas. (2 marks)

(d) Describe one chemical test by which you could confirm that the gas in the jar is chlorine. (2 marks)

2. In an experiment, titration of a 0.094 M potassium hydroxide (KOH) solution and sulphuric acid (H_2SO_4) gave the results shown in table 1 below.

Table 1

EXPERIMENT	PILOT	1	2	3
Final reading (cm^3)	23.60	46.00	23.10	45.40
Initial reading (cm^3)	01.00	23.60	00.70	23.10
Titre volume (cm^3)				

The volume of the pipette used was 25 cm^3.

(a) (i) Complete the table above. (1½ marks)
(ii) Calculate the mean titre of this experiment. (½ mark)

(b) Write a balanced chemical equation for the reaction. (1½ marks)

(c) Calculate the concentration of sulphuric acid in

(i) moles per dm^3 (3 marks)
(ii) g per dm^3. (3 marks)

(d) If the indicator used in this experiment was methyl orange, the colour change at the end point was from _____ to _____. (½ marks)

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3. The diagram below (Figure 2) represents a copper voltameter used for the electrolysis of aqueous copper sulphate where copper plates were used as electrodes. Study the diagram carefully and answer the questions that follow.
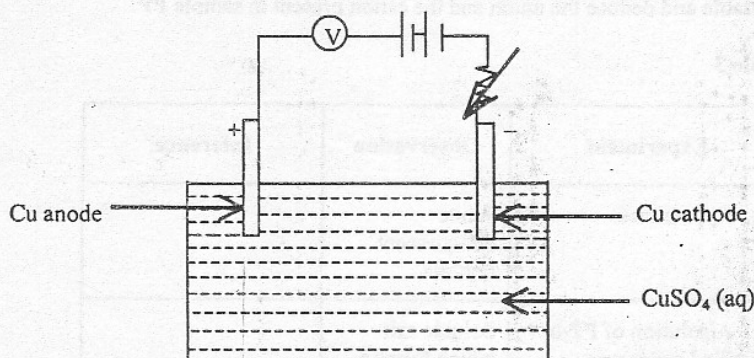

Fig. 2

(a) By using ionic equations, show the chemical reactions that took place at the

   (i)   cathode.

   (ii) anode.   (2 marks)

(b) If 0.05 F were used during electrolysis, calculate the mass of the substance discharged at the cathode.   (4 marks)

(c) What will happen to the colour of the electrolyte as electrolysis continues?   (2 marks)

(d) What changes in mass will occur at the copper anode as electrolysis continues?   (2 marks)

4. The rate of production of a certain gas from the decomposition of potassium chlorate ($KClO_3$) was studied in a certain school laboratory by heating different masses of potassium chlorate. The results of the experiment were tabulated as shown in table 2 below.

Table 2

Mass of $KClO_3$ (g)	0.060	0.121	0.153	0.186	0.244	0.309
Rate of production of the gas cm^3/min.	18	35	45	56	71	92

(a) How does the rate of production of the gas vary with mass?   (2 marks)

(b) What will happen to the rate of production of the gas if potassium chlorate was mixed with manganese dioxide and heated together? Give reasons for your answer.   (4 marks)

(c) Write a balanced chemical equation for the reaction of the decomposition of potassium chlorate when heated together with manganese dioxide.   (2 marks)

(d) What is the name of the gas produced during the decomposition of potassium chlorate?   (1 mark)

(e) What is the test of the gas in the laboratory?   (1 mark)

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5. Sample **PP** is a simple salt containing one cation and one anion. The tests performed on sample **PP** and the observations made were recorded in the table as shown below (Table 3). Complete the table and deduce the anion and the cation present in sample **PP**.

Table 3

Experiment	Observation	Inference
1. Appearance.	White deliquescent crystals.	
2. A solution of **PP** in distilled water was prepared.	Soluble salt which forms a colourless solution.	
3. To one portion of the solution of **PP** from (2) above, dil HNO₃ was added followed by AgNO₃ solution, then ammonia soln.	White curdy ppt formed which was soluble in ammonia solution.	
4. Flame test.	A brick-red flame was observed.	

(8 marks)

Conclusion

The cation was _____ and the anion was _____ (2 marks)