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, 11th October 2011 a.m.***

Instructions

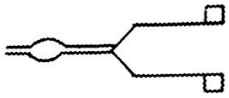
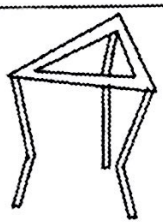
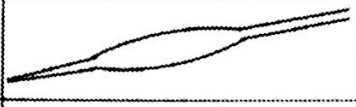
1. This paper consists of **five (5)** questions. Answer **all** the questions.
2. Each question carries **ten (10)** marks.
3. Qualitative Analysis Guidance Pamphlets may be used after a thorough check by the Supervisor.
4. Calculators and cellular phones are **not** allowed in the examination room.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

   Atomic masses: H = 1, C = 12, O = 16, Na = 23, S = 32, Cl = 35.5, Ca = 40.

   1 Faraday = 96500 coulombs.

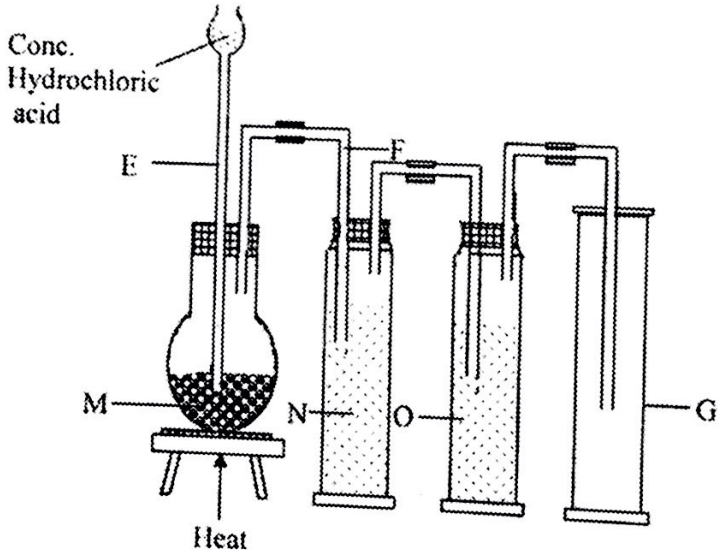
   GMV at s.t.p. = 22.4 dm^3.

1. (a) Give name and one use of each of the following apparatus:

S/n	Apparatus	Name	Uses
(i)			
(ii)			
(iii)			
(iv)			

(4 marks)

(b) The diagram below represents an experimental set up for the laboratory preparation of dry chlorine gas.



(i) Give the name of each apparatus labelled E, F and G.

(ii) Name and state the functions of compounds N and O

(3.5 marks)

(c) (i) Write a balanced chemical equation which represents a reaction between compound M and concentrated hydrochloric acid.

(ii) Explain why the above experiment should be conducted in the fume chamber.

(iii) Why the gas is collected by downward delivery? **(2.5 marks)**

2. In a certain volumetric analysis experiment, 4.9g/dm^3 of sulphuric acid was titrated against 20cm^3 sodium hydroxide solution. The results of the experiment were recorded as shown in Table 1.

Table 1
Burette readings:

Experiment	Pilot	1	2	3	4
Final reading (cm^3)	20.40	40.40	20.00	40.00	20.80
Initial reading (cm^3)					
Volume used (cm^3)	20.40	20.10	20.00	19.90	20.60

Questions:

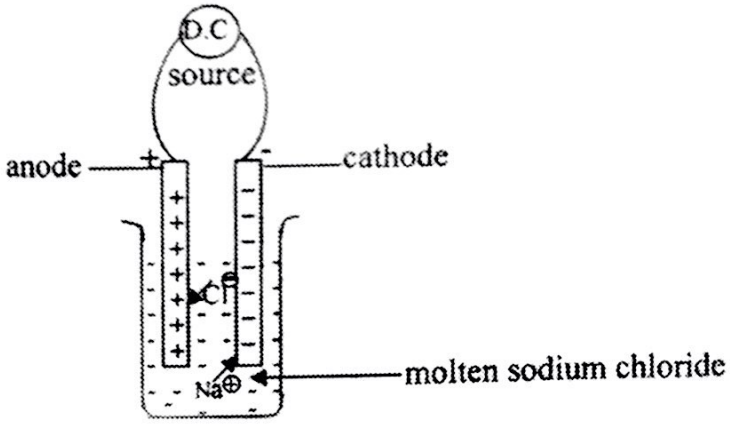
(a) Complete Table 1 by filling in the blank columns. **(2.5 marks)**

(b) (i) Inspect the volume used and identify two readings which had errors.
(ii) Use the correct titre values to find mean titre volume. **(1.5marks)**

(c) Write a balanced chemical equation for the reaction which took place. **(1 mark)**

(d) (i) Calculate molarity of the acid solution.
(ii) Find concentration of base in mol/dm^3 and g/dm^3. **(5 marks)**

3. Consider the following electrolytic cell:



(a) Name the electrode where:
(i) Oxidation occurs.
(ii) Reduction occurs. **(2 marks)**

(b) Write down the half reaction equation occurring at:
(i) Cathode.
(ii) Anode. **(2 marks)**

(c) If a steady current of 100 ampere flows for 20 minutes through a molten sodium chloride (refer the diagram above), calculate:
(i) The mass of sodium metal deposited.
(ii) The volume of chlorine gas liberated at s.t.p. **(6 marks)**

4. 5 grams of calcium carbonate were mixed with 250 cm^3 of 0.125M hydrochloric acid solution. The carbon dioxide evolved was collected, measured and corrected to s.t.p. Measurements were taken after every twenty minutes and the results were recorded as shown in Table 2.

Table 2

Time (min)	0	20	40	60	80
Volume of CO_2	0	180	250	310	340

Questions:

(a) Draw a graph of time against volume of carbon dioxide. **(4 marks)**

(b) Write a balanced chemical equation for the reaction. **(2 marks)**

(c) Calculate mass of calcium carbonate consumed in this process. **(4 marks)**

5. Substance **CA** contains one cation and one anion. Use the information given under the experiment and inference columns in Table 3 to complete the observation column and hence identify substance **CA.**

Table 3

S/n	Experiment	Observation	Inferences
a	Action of heat on solid CA.		Indicate the presence of SO_2 gas. Probably SO_4^{2-}, or SO_3^{2-} may be present. Residue indicates the presence of Zn^{2+}.
b	(i) Dissolution of **CA.**		**CA** indicated as soluble salt. $Cu(NO_3)_2$, $ZnSO_4$, $Fe(NO_3)_2$ may be present.
	(ii) Action of sodium hydroxide on solution of **CA.**		Probably Zn^{2+} or Pb^{2+} may be present.
	(iii) Action of ammonia solution on solution of **CA.**		Zn^{2+} may be present.
	(iv) To a solution of **CA**, dilute HCl is added followed by $BaCl_2$ solution.		SO_4^{2-}, present and confirmed.
	(v) To a solution of CA, potassium ferrocynide solution is added in excess.		Zn^{2+} present and confirmed.

Conclusion: **(7 marks)**

(i) The cation in sample **CA** is _____.

(ii) The anion in the sample **CA** is _____.

(iii) The chemical formula for sample CA is _____.

(3 marks)