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

032/2A

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

TIME: 3 Hours 30 Minutes **2006/10/18 a.m.**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **two (2)** questions including question **number 1.**
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. The following constants may be used:

   Atomic masses:

   H = 1, Cl = 35.5, Na = 23, C = 12, O = 16.

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

This paper consists of 3 printed pages.

1. You are provided with the following:
Solution AA containing 3.65 g of HCl per dm^3 of the solution.
Solution BB containing 7.15 g of hydrated sodium carbonate ($Na_2CO_3 \times H_2O$) in 0.5 dm^3 of the solution.

Methyl orange indicator.

Determine the value of x in $Na_2CO_3.xH_2O$.

Procedure

Put the acid solution AA in the burette. Pipette 20 cm^3 (or 25 cm^3) of solution BB into the titration flask. Add two drops of methyl orange indicator. Titrate solution BB against solution AA from the burette until a colour change is observed. Note the reading of the burette. Repeat the procedure to obtain three more readings.

(a) (i) Record your results in a table as shown below.
Burette readings

Titration	Pilot	1	2	3
Final reading (cm^3)				
Initial reading (cm^3)				
Volume used (cm^3)				

(ii) The volume of pipette used was _____ cm^3.

(iii) Summary:
_____ cm^3 of solution BB required _____ cm^3 of solution AA for complete reaction.

(iv) The colour change at the end point was from _____ to _____.

(v) Write the balanced chemical equation for the reaction between solution AA and BB.

(c) Calculate the
a. concentration of solution AA in moles/dm^3
b. molarity of solution BB
c. determine the value of x in $Na_2CO_3.xH_2O$. **(25 marks)**

2. Sample Q is a pure salt containing one cation and one anion. Carry out carefully the experiments described below. Record all your observations and appropriate inferences. Identify the cation and anion present in sample Q.

Experiment	Observation	Inference
(a) Appearance of sample Q.		
(b) To half a spatula of sample Q in a test tube add concentrated H_2SO_4 and warm.		
(c) To half a spatula of sample Q in a test tube add distilled water and stir then boil.		
(d) Dissolve a spatula full of sample Q in dilute nitric acid. Divide the solution into three portions. To the (i) first portion of the solution add sodium hydroxide solution till excess (ii) second portion of the solution add $NH_{3(aq)}$ till excess (iii) third portion of the solution add $AgNO_3$ solution followed by dil. HNO_3 acid then $NH_{3\,(aq)}$.		

Conclusion

The cation in sample Q is _____ and the anion is _____

Write the molecular formula of sample Q. **(25 marks)**

3. Sample M is a simple salt containing one cation and one anion. Using systematic qualitative analysis procedures carry out tests on sample M and make appropriate observations and inferences to identify the cation and anion in sample M.

Experiment	Observation	Inference

Conclusion

The cation in M is _____ and the anion is _____. **(25 marks)**