

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

132/3B

CHEMISTRY 3B
ACTUAL PRACTICAL B
(For Both School and Private Candidates)

Time: 3:20 Hours

Thursday, 12th May 2016 a.m.

Instructions

1. This paper consists of **three (3)** questions. Answer **all** the questions.
2. Question number **one (1)** carries 20 marks and the other **two (2)**, 15 marks each.
3. Mathematical tables and non programmable calculators may be used.
4. 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, N = 14, O = 16, Mg = 24, S = 32, Na = 23, K = 39, Mn = 55.
 - Molar gas constant = $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$.



1. You are provided with the following:
- A₁: 2.5 g of Na₂CO₃·xH₂O dissolved in 250 cm³ of water,
 - A₂: 0.1 M hydrochloric acid,
 - A₃: Phenolphthalein indicator.

Procedure:

- (i) Put solution A₂ into the burette.
- (ii) Pipette 25 cm³ or 20 cm³ of solution A₁ into a titration flask, add two or three drops of A₃.
- (iii) Titrate the resulting mixture in (ii) against solution A₂ until colour change is observed. Record the titre value.
- (iv) Repeat the steps (i) to (iii) three times and record the results in a tabular form.

Results:

The volume of the burette used was _____ cm³.
The volume of the pipette used was _____ cm³.

Summary:

_____ cm³ of solution A₁ required _____ cm³ of solution A₂ for complete reaction.

Questions:

- (a) Write a balanced equation for the reaction taking place between A₁ and A₂.
- (b) Calculate the concentration of A₁ in mol/dm³ and g/dm³.
- (c) What is the value of water of crystallization x?
- (d) How many moles of water of crystallization have been in the original 2.5 g?

2. You are provided with the following:

C₁: 5 g hydrated ammonium oxalate, (COONH₄)₂·H₂O,
C₂: 5 g anhydrous sodium carbonate,
C₃: distilled water,
Stirrer/glass rod,
Thermometer.

Procedure:

- (i) Record the room temperature.
- (ii) Pour 50 cm³ of C₃ into a dry 100 cm³ beaker containing a stirrer and thermometer.
- (iii) Stir C₃ and record the temperature, T_w.
- (iv) Add 5 g of C₂ into a beaker containing C₃, stir gently until dissolution is complete. Record the temperature of dissolution, T_s.
- (v) Clean a beaker, stirrer and thermometer, and then repeat the experiment using 5 g of C₁ and record T_w and T_s as in (iii) and (iv). Tabulate your results as shown in Table 1.

Table 1: Table of results

Substance	Volume of water (cm ³)	Mass of salt (g)	T _w (°C)	T _s (°C)	ΔT (°C)
Na ₂ CO ₃	50	5			
(COONH ₄) ₂ ·H ₂ O	50	5			

Questions:

- Calculate the molar mass of each salt.
- Calculate the enthalpy change of solution of each salt.
- Calculate the molar enthalpy change of solution of each salt.

3. Sample **G** contains ONE **cation** and **anion**. Use the information given in the experiment column in Table 2 to complete the observations and inferences and hence identify the cation and anion.

Table 2

S/n	Experiment	Observations	Inferences
1	Make a solution of G in water and divide the solution into six portions in the test tubes.		
2	To the first portion add few drops of sodium hydroxide solution then in excess.		
3	To the second portion, add few drops of nitric acid, boil and then add ammonia solution until alkaline.		
4	To the third portion, add few drops of ammonia solution then in excess.		
5	Perform confirmatory test for your deduction.		
6	To the fourth portion, add lead ethanoate.		
7	To the fifth portion, add barium chloride solution.		
8	Perform confirmatory test for your deductions.		

Conclusion

- The cation in sample **G** is _____ and the anion is _____.
- Indicating the colour of reacting species, write molecular equation for reaction of **G** with NaOH solution.