



**TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL
FORM SIX INTER ISLAMIC MOCK EXAMINATION**

**CHEMISTRY 3A
(ACTUAL PRACTICAL)**

(For Both School and Private Candidates)

132/3A

TIME: 3:20 Hours

Wednesday, 11th March 2026 a.m.

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question **one (1)** carries **twenty (20)** marks and other two questions carry **fifteen (15)** marks each.
4. Mathematical tables, Qualitative Analysis Guide (QAG) sheet and non-programmable calculators may be used.
5. Communication devices and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).
7. For calculations may use the following constants:
 - Standard temperature $T = 273\text{k}$
 - Standard pressure, $p = 760\text{mmHg}$.
 - $1 \text{ litre} = 1\text{dm}^3 = 1000\text{cm}^3$.
 - Density of solution $\rho = 1\text{g/cm}^3$
 - Specific heat capacity of water, $C = 4.2\text{Jg}^{-1}\text{K}^{-1}$
 - Atomic masses: $\text{H}=1, \text{C}=12, \text{O}=16, \text{N}=14, \text{Na}=23, \text{S}=32, \text{Cl}=35.5, \text{Cu}=64$.

1. You are provided with the following.

X: A solution made when form one student accidentally poured anhydrous sodium carbonate and sodium hydroxide in a container containing distilled water.

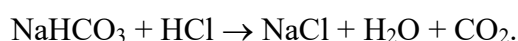
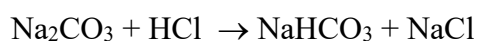
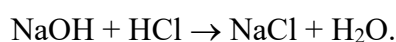
Y: A solution containing 9.125g of pure hydrochloric acid in 0.25dm³ aqueous solution.

MO: Methyl orange indicator

POP: Phenolphthalein indicator

Theory:

Reaction of hydrochloric acid with both sodium carbonate and sodium hydroxide can be represented by the following chemical equations:



Procedures:

1. Pipette 20cm³ or 25cm³ of solution X into a conical flask.
2. Add two or three drops of P.O.P.
3. Titrate this solution against Y until a colour change is observed.
4. Record the first titre value.
5. Add two drops of M.O to the same solution.
6. Continue to titrate until a second colour change is observed.
7. Record the second titre value.
8. Repeat your titration procedure 1 to 7 above three times and record your results in tabular form as shown here below:

Results:

The volume of pipette used was _____ cm³.

The volume of burette used was _____ cm³.

Table of Results:

	TITRATION			
	PILOT	1	2	3
(i) Initial readings (cm ³)				
(ii) Final readings using POP (cm ³)				
(iii) Final readings using MO (cm ³)				
(iv) 1 st titre value (ii)-(i) using POP				
(v) 2 nd titre value (iii)-(ii) using MO				

Summary

_____ cm³ of solution X required _____ cm³ of solution Y when POP was the indicator and _____ cm³ when MO was the indicator.

Questions:

- (a) The colour changes during titration were
- (i) When POP was used: From _____ to _____
- (ii) When MO was used: From _____ to _____
- (b) Indicate the chemical equations which were appropriate to the titre value found when using;
- (i) P.O.P
- (ii) M.O
- (c) Calculate the concentration of;
- (i) Sodium hydroxide in mol/dm³ and g/dm³ is solution X.
- (ii) Sodium carbonate in mol/dm³ and g/dm³ in solution X.
- (d) Calculate the percentage composition by mass of both sodium hydroxide and sodium carbonate in solution X.

2. You are provided with the following:

A₁: Distilled water

A₂: Anhydrous copper (II) sulphate, CuSO₄.

A₃: Copper (II) sulphate pentahydrate; CuSO₄.5H₂O.

Thermometer and stirrer.

Procedures:

- (i) Take stirrer and thermometer put into 100ml beaker. Put this beaker into 250ml beaker and in between the beaker fill the space with an insulating materials like blanket, cotton wool or saw dust.
- (ii) Pour 50cm³ of A₁ into a clean and dry beaker containing stirrer and thermometer.
- (iii) Stir A₁ well and record the temperature as T₁.
- (iv) Put A₂ into a beaker containing A₁. Stir gently until the dissolution is complete. Observe what happens to the temperature during dissolution. Record the highest or lowest temperature of the solution as T₂.
- (v) Clean and dry test tube, stirrer and thermometer. Then repeat the procedure (ii)-(iv) using A₃ instead of A₂ and record your result as follow:

Table 1

Salt	Volume of water (cm ³)	Mass of salt (g)	Initial temperature T ₁ (°C)	Final temperature T ₂ (°C)	Temperature Change, ΔT=T ₂ -T ₁ (°C)	Molecular mass of salt
CuSO ₄						
CuSO ₄ .5H ₂ O						

Questions:

- (a) Find the temperature in each experiment.
- (b) Calculate the enthalpy of solution of each salt.
- (c) Expected values of these two experiments are:

$$\Delta H^\circ \text{ solution (CuSO}_4\text{)} = -66.10\text{kJmol}^{-1}.$$

$$\Delta H^\circ \text{ solution (CuSO}_4\cdot 5\text{H}_2\text{O)} = +11.10\text{KJmol}^{-1}.$$

How do your values compare? Explain.

Given specific heat capacity and density of water are 4.18Jg⁻¹°C⁻¹ and 1g/ml respectively.

3. You are provided with sample Z containing different cations and different anions. Carry out an experiment described in the table below and record your observation, inference and finally identify the two cations and anions present in sample Z.

S/N	Experiment	Observation	Inference
1.	Appearance of sample Z.		
2.	Perform flame test on sample Z.		
3.	Add dilute HCl to the solid sample Z in a dry test tube		
4.	Take a spatula full of sample Z into a boiling test tube and add about 8cm ³ of distilled water. Heat gently the mixture for about one minute while swirling the test tube. Then divide the solution into five portions		
	(i) To the first portion add ammonia solution drop – wise until in excess		
	(ii) To the second portion add lead ethanoate solution followed by dilute HCl		
	(iii) To the third portion add ammonium oxalate followed by NH ₄ OH solution.		
	(iv) To the fourth portion add few drops of CaCl ₂ solution		
	(v) To the fifth portion add potassium hexacyanoferrate (II) solution about two drops		

Conclusion:

- (a) The cations present are _____ and _____
- (b) The anions present in sample Z are _____ and _____
- (c) Sample Z contained salts _____ and _____