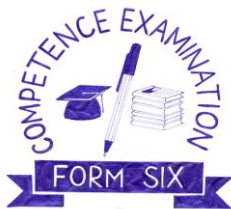


**PRESEDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
FORM SIX COMPETENCE EXAMINATIONS (FOSCE) 2025**



132/3A

CHEMISTRY 3A

Time 3 hours

Thursday 27 February 2025 a.m

Instructions

1. This paper consists of three (3) questions.
2. Answer all questions.
3. Question one (1) carries **twenty (20)** marks and the other two questions carries **fifteen (15)** marks.
4. Mathematical tables and non-programmable calculators may be used.
5. Cellular phones are not allowed in the examination room.
6. Write your **Examination number** on every page of your answer sheet(s) provided
7. For calculations you may use the following constants:
 - (a) Standard temperature = 273 K.
 - (b) Standard pressure = 760 mmHg.
 - (c) 1 litre = $1\text{dm}^3 = 1000\text{cm}^3$.
 - (d) Density of solution = $1\text{g}/\text{cm}^3$
 - (e) Specific heat capacity of water is $4.2\text{Jg}^{-1}\text{K}^{-1}$
 - (f) Atomic masses:
H = 1, C = 12, O = 16, S = 32, Mg = 24, Na = 23, Cl = 35.5, K = 39, Mn = 55.

1. You are provided with the following solutions:

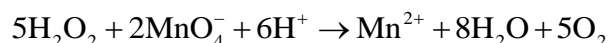
MM: A solution made by diluting 12.50 cm³ of given Hydrogen peroxide with 500 cm³ of distilled water.

PP: A standard solution of 0.02 M potassium permanganate

RR: A 1 Mole of sulphuric acid solution.

Theory:

In acid medium H₂O₂ reacts with permanganate ion according to the equation



Procedure:

- Pipette 20 cm³ / 25 cm³ of solution **MM** into a conic flask. Add about 20 cm³ of **RR**.
- Titrate this mixture with solution **PP** until a permanganate pink colour is observed.
- Repeat this procedure for at least two or three more times and record your titration result in the table below burette reading

Titration number	Pilot	1	2	3
Final reading (cm ³)				
Initial reading (cm ³)				
Titre volume (cm ³)				

Summary:

The volume of pipette use was _____ cm³ . _____ cm³ of solution **MM** needed _____ cm³ of solution **PP** for complete reaction.

Questions:

- Write down half-reaction equation to show oxidation and reduction process taking place when hydrogen peroxide reacts with permanganate ions in excess of the acid.
- Calculate the:
 - Concentration of H₂O₂ in mol / dm³ .
 - Concentration of H₂O₂ in g / dm³ .
 - Original concentration of H₂O₂ in g / dm³ .
 - Volume strength of Hydrogen peroxide.

2. You are provided with the following
B1 4 g Sodium carbonate decahydrated ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$).

B2: 2 g of Sodium carbonate (Na_2CO_3).

Thermometer (0-100 °C)

Distilled water

Plastic beaker (100 cm³)

Procedure:

- Measure 50 cm³ of distilled water and put into a plastic beaker. Record the temperature of water as **T1**.
- Dissolve 4 g of a $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ and stir using thermometer. Record the temperature of solution as **T2**. Record your results in a tabular form.
- Discard the contents of plastic beaker and wash the plastic beaker.
- Measure 50 cm³ of distilled water and put into a plastic beaker. Record the temperature of water as **T3**.
- Dissolve 2g of Na_2CO_3 and stir using thermometer. Record the temperature of solution as **T4**.

Record your results in a tabular form.

Experiment (Salt)	Initial temperature	Final temperature	Temperature change	Molar weight of the sample (Mr)
4 g of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$				
2 g of Na_2CO_3				

Questions:

- Complete the table above.
- Calculate the molar heat change in each experiment.

3. You have been provided with salt T_5 which contain two cations and common anion. Perform the under given experiment to identify the cation and anion in T_5 containing two cation and one anion

S/N	EXPERIMENT	OBSERVATIONS	INFERENCES
1	Heat the salt T_5 in clean dry test tube strongly		
2	To salt T_5 in a test tube add dilute HCl and heat		
3	To salt T_5 in a test tube add concentrated H_2SO_4 and heat		
4	Dissolve salt T_5 in 2 ml of water to resulting solution, and make four portions of this solution		
5	To first portion of solution add NaOH solution till excess and heat		
6	To second portion add NH_4OH solution till excess		
7	To third portion add HNO_3 solution followed by $AgNO_3$ solution		
8	To forth portion add potassium hexacyanoferrate (II) solution		

Conclusion:

The cations are _____ and the anions are _____