PRESEDENT'S OFFICE
REGIONAL ADMINSTRATION 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) $1\text{litre} = 1\text{dm}^3 = 1000\,\text{cm}^3$.
   (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:
   $\text{H} = 1, \text{C} = 12, \text{O} = 16, \text{S} = 32, \text{Mg} = 24, \text{Na} = 23, \text{Cl} = 35.5, \text{K} = 39, \text{Mn} = 55.$

1. You are provided with the following solutions:

MM: A solution made by diluting $12.50\,cm^3$ of given Hydrogen peroxide with $500\,cm^3$ 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 H_2O_2 reacts with permanganate ion according to the equation

$$5H_2O_2 + 2MnO_4^- + 6H^+ \rightarrow Mn^{2+} + 8H_2O + 5O_2$$

Procedure:

(a) Pipette $20\,cm^3 / 25\,cm^3$ of solution **MM** into a conic flask. Add about $20\,cm^3$ of **RR**.

(b) Titrate this mixture with solution PP until a permanganate pink colour is observed.

(c) 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_____cm^3._____cm^3 of solution **MM** needed _____cm^3 of solution **PP** for complete reaction.

Questions:

(a) 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.

(b) Calculate the:

(i) Concentration of H_2O_2 in mol / dm^3.

(ii) Concentration of H_2O_2 in g / dm^3.

(iii) Original concentration of H_2O_2 in g / dm^3.

(iv) Volume strength of Hydrogen peroxide.

2. You are provided with the following

B1 4 g Sodium carbonate decahydrated ($Na_2CO_3 \cdot 10H_2O$).

B2: 2 g of Sodium carbonate (Na_2CO_3).

Thermometer (0-100 ^oC)
Distilled water
Plastic beaker (100 cm^3)

Procedure:

(a) Measure 50 cm³ of distilled water and put into a plastic beaker. Record the temperature of water as **T1**.

(b) Dissolve 4 g of a $Na_2CO_3 \cdot 10H_2O$ and stir using thermometer. Record the temperature of solution as **T2**. Record your results in a tabular form.

(c) Discard the contents of plastic beaker and wash the plastic beaker.

(d) Measure 50 cm³ of distilled water and put into a plastic beaker. Record the temperature of water as **T3**.

(e) 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 $Na_2CO_3 \cdot 10H_2O$				
2 g of Na_2CO_3				

Questions:

(a) Complete the table above.

(b) 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 _____