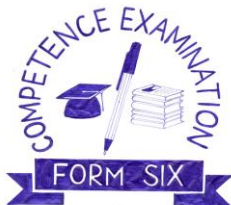


PRESEDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
FORM SIX COMPETENCE EXAMINATIONS (FOSCE) - 2025



132/3B

CHEMISTRY 3B

Time 3 hours

Monday 3RD March 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) 1litre = $1\text{dm}^3 = 1000\text{cm}^3$.
 - (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:

- BB** A solution made by dissolving 0.79 g of KMnO_4 in 0.25dm^3 distilled water
CC A solution made by dissolving 3.15g of oxalic acid crystals $\text{H}_2\text{C}_2\text{O}_4 \cdot \text{XH}_2\text{O}$ in 0.50dm^3 distilled water.
DD A solution of 2M sulphuric acid.
EE A thermometer.

Procedures:

- (a) Pipette 20 cm^3 (or 25cm^3) of **CC** into clean conical flask. Add to it 25cm^3 of **DD** and heat the mixture solution till the solution attains a temperature of about 70°C
(b) Put **BB** into a burette and titrate **BB** against the hot solution containing **CC** and **DD**, till the solution change from colorless to pink.
(c) Repeat the above procedure two or three more times and record the results in a tabular form as shown below

Results:

The volume of the burette used was _____ cm^3 and the volume of the pipette used was _____ cm^3 .

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

Summary:

_____ cm^3 of solution **BB** required _____ cm^3 of **CC** in the presence of **DD** for complete reaction.

Questions:

- (a) (i) Write the half ionic reaction equation for the reduction of MnO_4^- in the presence of acid.
(ii) Write the half ionic equation for the oxidation of $\text{C}_2\text{O}_4^{2-}$.
(iii) Write the overall balanced redox ionic equation
(b) Why was the end point pink in colour?
(c) Calculate the:
(i) Concentration of **BB** in g/dm^3
(ii) Molarity of **BB**
(iii) Concentration of $\text{H}_2\text{C}_2\text{O}_4 \cdot \text{XH}_2\text{O}$ in g/dm^3

- (iv) Molarity of $\text{H}_2\text{C}_2\text{O}_4$.
- (v) Concentration of $\text{H}_2\text{C}_2\text{O}_4$ in gdm^{-3}
- (vi) Value of X in the compound $\text{H}_2\text{C}_2\text{O}_4 \cdot \text{XH}_2\text{O}$
- (vii) Molar mass of $\text{CC}, \text{H}_2\text{C}_2\text{O}_4 \cdot \text{XH}_2\text{O}$

2. You are provided with the following:

J 1.0 M hydrochloric acid solution

K 1cm long magnesium ribbon

L Distilled water

Stirring rod/glass rod

Stop watch

Procedure:

- (a) Cut four pieces each of 1cm long.
- (b) Measure 10 cm^3 of solution J using a measuring cylinder and pour into a 100 cm^3 beaker.
- (c) Drop one piece of **K** (Magnesium ribbon) into the 100 cm^3 beaker containing 10 cm^3 of **J** and immediately start the stop watch.
- (d) Stir gently using a glass rod to make sure that metal, **K** do not stick to the side of the beaker.
- (e) Stop the watch (stop watch) when the magnesium ribbon has just disappeared. Record the time.
- (f) Repeat procedure (b) to (e) three more times using acid 8 cm^3 , 6 cm^3 and 4 cm^3 while topping with distilled water 2 cm^3 , 4 cm^3 and 6 cm^3 respectively as shown in the table below.

EXP	Volume of J (cm^3)	Volume of water (cm^3)	Length of K (cm)	[J] (M)	Time t (sec)	$\frac{1}{t}$
1	10	00	1.00			
2	08	02	1.00			
3	06	04	1.00			
4	04	06	1.00			

Questions

- (a) Copy the table of results and complete it including the value of $\log \frac{1}{t}$ and $\log [J]$.
- (b) Write the balanced chemical reaction between HCl and Magnesium ribbon.

- (c) Draw a graph of $\log \frac{1}{t}$ against $\log [J]$.
- (d) From the graph deduce the order of reaction with respect to J (hydrochloric acid).
3. Sample **M** containing two cations and two anions. Use the information given in the experiment column in table to complete the observations and inferences and hence identify the two cations and two anions in **M**

S/N	Experiment	observations	Inferences
1	Put small amount of M in dry test tube and heat strongly		
2	To the little sample of M in a test tube add concentrated H_2SO_4		
3	Make a stock solution M and divide it into three portions of solution.		
	(i) To the first portion, add small amount of dilute HCl followed by hydrogen sulphide solution or gas		
	(ii) To the second portion, add barium chloride solution followed by dilute hydrochloric acid solution.		
	(iii) To the third portion, add freshly prepared $FeSO_4$ solution followed by concentrated sulphuric acid along the side of the test tube.		
4	Perform flame test of solid sample		
5	To the sample M in a test tube add small amount of NaOH solution then heat. Test the gas evolved.		
6	Perform confirmatory test to identify the second anion		

Questions:

- (a) The cations in sample **M** are _____ and _____.
- (b) The anions in sample **M** are _____ and _____.
- (c) Write the molecular formula of the salts mixed to form sample