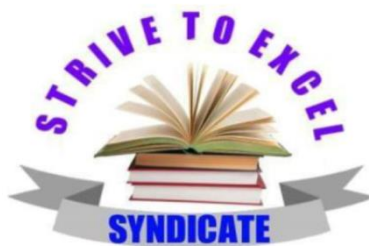


THE UNITED REPUBLIC OF TANZANIA  
PRESIDENT'S OFFICE  
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT



FORM SIX SPECIAL SCHOOLS SYNDICATE JOINT EXAMINATION

132/3B

CHEMISTRY-3B

Time: 3:20 Hrs

Friday 23-March-2023 AM

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**Instructions**

1. This paper consists of three (3) questions.
2. Answer **all** questions.
3. Question number **one (1)** carries 20 marks and the other **two (2)**, carry 15 marks each.
4. Qualitative Analysis Guide (QAG) sheet authorized by NECTA may be used.
5. Mathematical table and non – programmable calculators may be used.
6. Cellular phones are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet provided.
8. For your calculations the following constants may be used;

Atomic masses: H = 1, C =12, N = 14, O =16, Na = 23, S = 32, K = 39, Mn = 55, Fe = 56

1. You are provided with the following solutions:

**Z:** 0.40 M pentahydrate sodium thiosulphate

**Q:** 0.032 M impure potassium iodate

**W:** 10% potassium iodide solution

**X:** 1M sulphuric acid

**Y:** starch solution.

#### Procedure

- i. Measure 80 cm<sup>3</sup> of solution **Z** and put into a clean 250 cm<sup>3</sup> beaker.
- ii. Measure 80 cm<sup>3</sup> of distilled water and pour into a beaker containing solution **Z**.
- iii. Swirl the mixture for 5 seconds and label it **ZW**.
- iv. Put solution **ZW** into the burette and take initial reading.
- v. Measure 25 cm<sup>3</sup> of solution **Q** by using measuring cylinder and put into a clean 250 cm<sup>3</sup> conical flask.
- vi. Measure 20 cm<sup>3</sup> of solution **W** by using measuring cylinder and pour into a conical flask containing solution **Q**.
- vii. Measure 25 cm<sup>3</sup> of solution **X** by using measuring cylinder and pour into a conical flask containing mixture of solution **Q** and **W**.
- viii. Swirl the mixture for 5 seconds and titrate the mixture against solution **ZW**.
- ix. When the solution turn pale yellow add 2 cm<sup>3</sup> of starch indicator.
- x. Continue with titration until blue black color turn to colorless
- xi. Repeat procedure (i) to (x) three times and tabulate your results.

#### Questions

- a) Calculate the percentage purity of potassium iodate.
- b) Explain the role of potassium iodate in this experiment.
- c) What will happen if sulphuric acid is not used in this experiment?

2. You are provided with the following solutions:

**O:** 0.10 M oxalic acid contained in 0.5 M sulphuric acid.

**P:** 0.02 M potassium permanganate.

#### Procedure

- (i) Measure 5 cm<sup>3</sup> of solution **O** and put into boiling test tube.

- (ii) To another boiling test tube put 5 cm<sup>3</sup> of solution **P**.  
 (iii) Boil solution **O** and **P** up 50 °C.  
 (iv) Mix the two solutions into small glass beaker of 100 cm<sup>3</sup> and immediately start stop watch.  
 (v) Record the time taken for complete discharge of purple colour.  
 (vi) Repeat experiment as shown in the following table.

S/N	Volume of solution <b>P</b> cm <sup>3</sup>	Volume of solution <b>O</b> cm <sup>3</sup>	Temperature °C	Time in seconds
1	5	5	50	
2	5	5	60	
3	5	5	70	
4	5	5	80	

### Questions

- a) Graphically determine the activation energy.  
 b) Write overall redox equation by using half equation method.  
 c) State the role of potassium permanganate and oxalic acid in this experiment.
3. You are provided with sample **N** which shares a common cation and two anions. Carry out the experiments described in the table below. Record your observations and make appropriate inferences and finally identify the cation and anions present in sample **N**.

S/n	Experiments	Observation	Inference
(a)	Appearance of sample <b>N</b> .		
(b)	Heat a small portion of sample <b>N</b> in a dry test tube.		
(c)	Perform a flame test.		
(d)	Add concentrated H <sub>2</sub> SO <sub>4</sub> to a small portion of sample <b>N</b> . If no reaction, warm the contents gently.		
(e)	Dissolve some amount of sample <b>N</b> in distilled water.		
(f)	Divide the resulting solution in (e) into four portions		
	(i) To the 1 <sup>st</sup> portion, add aqueous NaOH dropwise until in excess.		
	(ii) To the 2 <sup>nd</sup> portion, add aqueous NH <sub>3</sub> until in excess.		
	(iii) To the 3 <sup>rd</sup> portion, add aqueous AgNO <sub>3</sub> followed by dilute HCl.		
	(iv) To the 4 <sup>th</sup> portion, add copper turnings followed by concentrated H <sub>2</sub> SO <sub>4</sub> then		

	warm.		
	(v) To the 5 <sup>th</sup> portion, add potassium hexacyanoferrate(II) solution.		

**Conclusion**

- (i) The cation in sample **N** is \_\_\_\_\_
- (ii) The anions in sample **N** are \_\_\_\_\_ and \_\_\_\_\_