

**THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
DIPLOMA IN SECONDARY EDUCATION EXAMINATION**

732/2B

**CHEMISTRY 2B
(ACTUAL PRACTICAL B)**

Time: 3 Hours

ANSWERS

Year: 2019

Instructions.

1. This paper consists of **three (3)** questions.
2. Answer **all** questions
3. Question number 1 carries 20 marks and the rest carry 30 marks.
4. Cellular phones are **not** allowed in the examination room.
5. Write your **examination Number** on every page of your answer booklet(s).

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1. You are given:

V1: Nitric acid (unknown concentration)

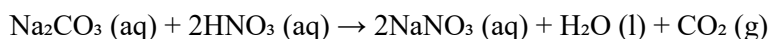
V2: Sodium carbonate, 5.3 g in 500 cm³

Methyl orange indicator

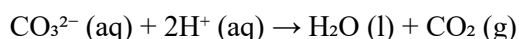
(a) The colour change is **yellow to orange-pink**. Methyl orange changes from yellow in alkaline to orange-pink in acidic solutions.

(b)

Balanced chemical equation:



Ionic equation:



(c)

Molar mass of Na₂CO₃ = 106 g/mol

Moles in 5.3 g = $5.3 \div 106 = \mathbf{0.05 \text{ mol}}$

Volume of solution = 500 cm³ = 0.5 dm³

Concentration = $0.05 \div 0.5 = \mathbf{0.1 \text{ mol/dm}^3}$

(d) Moles of Na₂CO₃ in 25.0 cm³ = $0.1 \times 25 \div 1000 = \mathbf{0.0025 \text{ mol}}$

From equation: 1 mol Na₂CO₃ reacts with 2 mol HNO₃

Moles of HNO₃ = $0.0025 \times 2 = \mathbf{0.005 \text{ mol}}$

(e) Volume of HNO₃ used = 25.0 cm³ = 0.025 dm³

Concentration = $0.005 \div 0.025 = \mathbf{0.2 \text{ mol/dm}^3}$

(f) Moles of HNO₃ in 250 cm³ = $0.2 \times 250 \div 1000 = 0.05 \text{ mol}$

Mass = $0.05 \times 63 = \mathbf{3.15 \text{ g}}$

2. You are given:

- Y1: sodium thiosulphate
- Y2: hydrochloric acid

(a) The mark "O" disappears because **sulfur is formed**, making the solution cloudy and eventually opaque.

(b) Completed table:

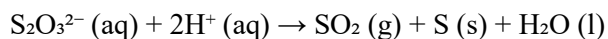
Trial	Y1 (cm ³)	Water (cm ³)	Y2 (cm ³)	Time (s)
1	10	0	10	19
2	8	2	10	25
3	6	4	10	34
4	4	6	10	48
5	2	8	10	71

(c)

Balanced chemical equation:



Ionic equation:



(d) As the concentration of Y1 decreases, **the reaction rate decreases**. This is because fewer thiosulphate ions are available to collide with H^+ ions, slowing down the reaction and increasing the time for cloudiness to form.

(e) Possible errors to avoid:

Delay in starting the stopwatch after mixing solutions

Misjudging the endpoint when the mark disappears (human error in visual judgement)

3. You are given salt F, suspected to be a nitrate of a heavy metal.

(i) Table of observations and inferences:

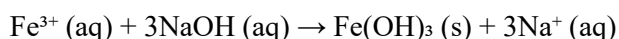
Test	Observation	Inference
Appearance	Greyish-white crystalline solid	Likely heavy metal salt
Heating	Brown fumes evolved	Presence of NO_3^- (nitrate)
NaOH (few drops)	Brown precipitate formed	Fe^{3+} suspected
NaOH (excess)	Precipitate remains	Confirms Fe^{3+}
Ammonia (few drops)	Brown precipitate formed	Confirms Fe^{3+}
Ammonia (excess)	Precipitate remains	Confirms Fe^{3+}
FeSO_4 + conc H_2SO_4 down side of tube	Brown ring at interface	Confirms NO_3^-
BaCl_2 + HCl	No precipitate	No sulfate present

(ii) Cation = Fe^{3+} , Anion = NO_3^-

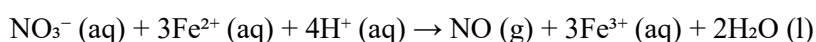
Salt F is **iron(III) nitrate ($\text{Fe}(\text{NO}_3)_3$)**

(iii)

With NaOH:



Brown ring test:



(NO forms brown complex at the interface)

(iv) The **brown ring test** confirms the presence of nitrate ion (NO_3^-) by forming a distinct brown ring when NO gas complexes with Fe^{2+} .