

Name: Stream:

Signature: Date: Comb:

P525/2
CHEMISTRY
Paper 2
(Theory)
April, 2026
2 Hours

GUIDE

MENGO SENIOR SCHOOL
Uganda Advanced Certificate of Education
END OF TERM I ASSESSMENT 2026
S.5 CHEMISTRY
PAPER 2
2 HOURS

INSTRUCTIONS TO CANDIDATES:

- This paper consists of **one compulsory** examination item. Responses to this item are to be written in the spaces provided in the booklet. Use **blue** or **black** ink.
- All working must be clearly shown.
- Mathematical tables and silent non-programmable calculators may be used.
- You are not allowed to use reference books (i.e. textbooks, booklets on qualitative analysis, etc)
- Candidates are advised to carefully read the item, make sure they have all the apparatus and chemicals that they may need and then **plan** appropriately before starting.

For Scorer's Use Only

Basic Code	Weighted Score	Scorer's Initials
A	03	
H	05	
V	05	
P	05	
R	02	
Dp	05	
Dr	05	
I	18	
C/A	02	
Total Weighted Score	50	

Item:

During purification of sugar cane juice, dilute sulphuric acid is added in order to **clarify** the juice to produce a colourless solution.

For effective clarification of the juice, the concentration of the sulphuric acid used must be in the range of 0.04 moles per litre to 0.06 moles per litre.

This is done by titrating a fixed volume of sodium hydroxide solution with sulphuric acid using methyl orange indicator.

The factory manager has invited a chemical supplies company to deliver a ready to use sample of sulphuric acid which is to be used in the factory.

The manager has requested you to establish the molar concentration of the supplied sulphuric acid.

You are provided with the following substances;

- (i) FA1 which is a sample of the delivered sulphuric acid solution.
- (ii) FA2 which is a solution made by dissolving 2.00g of sodium hydroxide pellets to make 500cm³ of solution.
- (iii) Methyl orange indicator.

Task: As a chemistry learner,

(a) Design an experiment to help the factory establish the concentration of the delivered sulphuric acid. Your design should include Aim, hypothesis, variables, risks and mitigations and procedure.

AIM:- To determine the ^{molar} concentration of supplied dilute sulphuric acid by ^{titration} analysis using sodium hydroxide solution with Methyl orange indicator.
A2 = 03 (with both keywords) A1 = 02 (with one keyword) A = 00 (Incorrect).

HYPOTHESIS:- The ^{molar} concentration of sulphuric acid solution ^{supplied} is in the range of 0.04M to 0.06M when titrated with a fixed volume of sodium hydroxide solution using methyl orange indicator.
2H (Relevant with both keywords) = 05 1H = 03 (partially correct with one keyword) 1H = 00 (Incorrect).

VARIABLES:-
Independent: Volume of FA₂ used (NaOH solution) pipetted
Dependent: Volume of FA₁ used (H₂SO₄) from burette
Controlled: • Fixed volume of FA₂ for the different trials
• Number of drops of methyl orange indicator
3V = 05 , 2V = 04 , 1V = 03 V = 00 (no correct variable)

PROCEDURE =

- i) 20.0 cm^3 of FA_2 (NaOH) solution was pipetted into a clean and dry conical flask and then 3 drops of methyl orange indicator were added using a dropper to the solution in the conical flask and solution swirled.
- ii) The burette was filled with FA_1 solution (H_2SO_4) upto the 0.00 cm^3 mark and the initial reading was recorded in the table of results.
- iii) The solution in the conical flask was titrated with FA_1 from the burette until the colour turned from orange to pink (red). Titre values were read and recorded in table of results.
- iv) Procedure (i) - (iii) was repeated twice to obtain consistent titre values and results were recorded in the table.

$$4P_m + 1P_r + 1P_e = 05$$

Risks + Mitigations

- Wounds or pains caused by burns from acid spills. Mitigated by wearing laboratory gloves or coats.
- Wounds from cuts caused by broken pipettes/burettes. Mitigated by wearing gloves & closed shoes.
- Swallowing of solutions during pipetting causing irritations in the mouth. Mitigated by using a pipette sucker.

$$2R_{tm} = 02$$

$$1R_{tm} = 00$$

~~Risk~~ (Mitigation)

(b) Carry out the experiment and record your findings.

Table of Results

Volume of pipette used = 20.0 cm^3

Experiment	1	2	3
Final burette reading (cm^3)	19.90	39.80	19.80
Initial burette reading (cm^3)	0.00	20.00	0.00
Volume of FA_1 used (cm^3)	19.90	19.80	19.80

$$D_r = (\text{dps/subtraction/center range}) \pm 3.0 = 05 \quad (16.90 - 22.9) \text{ cm}^3$$

$$D_p = (\text{closed table/units/correct Table}) = 05$$

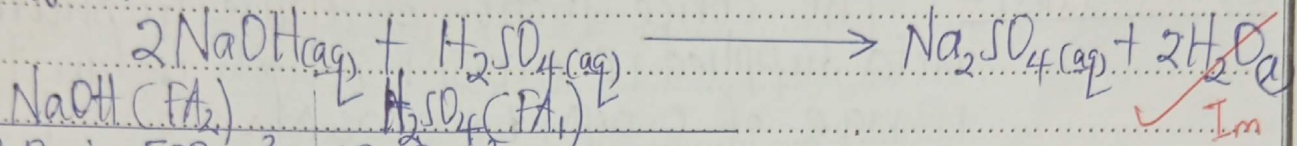
DATA Analysis:

Values used to calculate average volume of FA₁

$$\text{Average volume of FA}_1 = \frac{19.80 \text{ cm}^3 + 19.80 \text{ cm}^3}{2} = 19.80 \text{ cm}^3 \pm 0.5$$

03

Equation



NaOH (FA₂)
2.0g in 500cm³
M = ?
Moles = ?
Mr = ?

H₂SO₄ (FA₁)
19.80cm³
Moles = ?
M = ?

6Im = 06
5Im = 05
4Im = 04

$$\text{Mr of NaOH} = 23 + 16 + 1 = 40 \text{ gmol}^{-1} \text{ or g}$$

40g of NaOH contain 1 mole

$$2.0 \text{ g of NaOH contain } \left(\frac{1 \times 2.0}{40}\right) \text{ moles}$$

$$= 0.05 \text{ moles}$$

500cm³ of FA₂ contain 0.05 moles of NaOH

$$1000 \text{ cm}^3 \text{ of FA}_2 \text{ contain } \left(\frac{0.05 \times 1000}{500}\right) \text{ moles}$$

$$= 0.1 \text{ M or mol dm}^{-3}$$

500cm³ of FA₂ contain 2g of NaOH

$$1000 \text{ cm}^3 \text{ of FA}_2 \text{ contain } \left(\frac{2 \times 1000}{500}\right) \text{ g}$$

$$= 4 \text{ g l}^{-1}$$

40g of NaOH contain 1 mole

$$4 \text{ g l}^{-1} \text{ of NaOH contain } \left(\frac{1 \times 4}{40}\right) \text{ moles}$$

$$= 0.1 \text{ M}$$

06

1000cm³ of FA₂ contain 0.1 moles of NaOH

$$20.0 \text{ cm}^3 \text{ of FA}_2 \text{ contain } \left(\frac{0.1 \times 20.0}{1000}\right) \text{ moles}$$

$$= 0.002 \text{ moles (or } 2 \times 10^{-3} \text{ moles)}$$

2 moles of NaOH reacts with 1 mole of H₂SO₄

$$0.002 \text{ moles of NaOH reacts with } \left(\frac{1}{2} \times 0.002\right) \text{ moles}$$

$$= 0.001 \text{ moles}$$

06

5Im = 06
4Im = 05
2Im = 04

$3I_m + I_a = 03$
 $3I_m \text{ only} = 01$

19.80 cm³ of FA₁ contain 0.001 moles of H₂SO₄
1000 cm³ of FA₁ contain $\left(\frac{0.001 \times 1000}{19.80}\right)$ I_m

Therefore the molar concentration of H₂SO₄ is $\frac{0.05 \text{ Mol dm}^{-3} \text{ or } M}{0.05 M}$ I_m I_a

Conclusion:- The concentration of dilute sulphuric acid supplied is 0.05M which is in the range of 0.04M to 0.06M $c = 01$

Recommendation/Advise:-

The manager should use the supplied sulphuric acid because its molar concentration is within the required range. $P = 01$

END