

P525/3
Chemistry
Paper 3
July - August 2023
3 ¼ hours



UGANDA MUSLIM TEACHERS' ASSOCIATION

UMTA JOINT MOCK EXAMINATIONS 2023

Name

Centre/Index No. Signature

UGANDA ADVANCED CERTIFICATE OF EDUCATION

Chemistry

Paper 3

3 hours 15 Minutes

INSTRUCTIONS TO CANDIDATES:

- *This paper consists of three compulsory questions.*
- *All questions must be answered in the spaces provided.*
- *Mathematical tables (3 – figure tables) and silent non-programmable scientific electronic calculators may be used.*
- *Candidates are advised to read through the paper and cross check with the apparatus and chemicals provided in the first fifteen minutes.*

For Examiners' use only			
Q. 1	Q. 2	Q. 3	Total

1 You are provided with the following:

FA1, which is sodium thiosulphate solution of unknown concentration.

FA2, which is a solution containing 3.2g l^{-1} of oxidising agent Q

Solid, P which is potassium dichromate (VI).

You are required to:

- Standardize FA1 using P
- Determine number of moles of iodine that can be produced by 1 mole of Q

Under acidic condition, iodide ions react with dichromate (VI) ions according to the following equations:



Thiosulphate (VI) ions react with iodine according to the equation:



PROCEDURE:

(a) Weigh out accurately 1.0g of P and dissolve it in about 20cm^3 of 2M sulphuric acid in a beaker. Transfer the solution into a 250cm^3 volumetric flask and make it up to the mark with distilled water. Label this solution FA3.

Results:

Mass of weighing container + P =g ($\frac{1}{2}$ mark)

Mass of weighing container =g ($\frac{1}{2}$ mark)

Mass of Y =g ($\frac{1}{2}$ mark)

(b) Pipette 25.0 (or 20.0) cm^3 of FA3 into a conical flask. Add 15cm^3 of 0.5M potassium iodide solution, followed by 15cm^3 of 2M sulphuric acid. Titrate the mixture with FA1 until the solution is pale yellow. Add 5 drops of starch indicator and continue the titration until the dark blue solution turns green.

Repeat the titration to obtain consistent titre values.

Record your results in Table I below

Volume of pipette used cm^3 ($\frac{1}{2}$ marks)

Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of FA3 used (cm^3)			

($4\frac{1}{2}$ marks)

Average volume of FA1 used

(2 $\frac{1}{2}$ marks)

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Question:

Calculate the molarity of FA1 (K = 39, Cr = 52, O = 16)

(2 $\frac{1}{2}$ marks)

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(c) Pipette 25.0 (or 20.0cm³) of FA2 into a conical flask. Add 15cm³ of 0.5M potassium iodide solution, followed by 15cm³ of 2M sulphuric acid. Titrate the mixture with FA1 until the solution is pale yellow. Add 5 drops of starch indicator and continue the titration until the end point. Repeat the titration to obtain consistent titre values. Record your results in Table II below.

Volume of pipette used.....cm³ ($\frac{1}{2}$ mark)

Table II

Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of FA1 used (cm ³)			

(4 $\frac{1}{2}$ marks)

Average volume of FA1 used

(2 $\frac{1}{2}$ marks)

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Question:

(a) Calculate the number of moles of Q in FA2 that reacted (Molar mass of Q is 158)

(2 $\frac{1}{2}$ marks)

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(b) Calculate the number of moles of iodine liberated by Q that reacted. (2 $\frac{1}{2}$ marks)

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(c) Calculate the mole ratio of Q to iodine, and hence the number of moles of iodine that can be liberated by 1 mole of Q. (2 marks)

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2. You are provided with substance **X** which contains two cations and **two** anions. You are required to carry out the following tests on **X** and identify the anions and cations in **X**. Record your observations in the table below. (34 marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat a spatula endful of X in a dry test tube.		
(b) Place 2 spatula endful of X in a test tube, add 3 drops of concentrated sulphuric acid and heat.		
(c) Shake two spatula endful of X with about 5cm ³ of water. Then add excess sodium hydroxide solution and filter. Keep both the filtrate and the residue.		

(d) To the filtrate add dilute hydrochloric acid until it is just acidic. Divide the acidic solution into portions		
(i) To the first part of the filtrate, add dilute sodium hydroxide solution drop-wise until in excess.		
(ii) To the second part of the filtrate, add dilute ammonia solution drop-wise until in excess.		
(iii) To the third part of the filtrate, carry out a test of your choice to confirm the cation.		
(iv) To the fourth part of the filtrate add Iron(III) chloride solution and warm.		
(v) To the fifth part of the filtrate, add 2-3 drops of barium nitrate solution.		
(e) Wash the residue with water, add dilute hydrochloric acid drop wise to just dissolve the residue. Divide the solution into five parts.		

(i) To the first part of the solution add dilute sodium hydroxide solution drop wise until in excess.		
(ii) To the second part of the solution add dilute ammonia solution drop wise until in excess.		
(iii) Use the third part of the filtrate to carry out a test of your own choice to confirm one of the cations in X.		

The cations in X are..... and

The anions in X areand

3. You are provided with an organic compound **T**. You are required to identify the nature of compound **T**. Carry out the following tests on the compound and record your observations and deductions in the table below. (20 marks)

TEST	OBSERVATIONS	DEDUCTIONS
(a) Burn a little of T on spatula end.		
(b) Add sodium hydroxide solution to a little of T in a test tube and shake well.		
(c) To a little of T in a test tube, add about 5cm ³ of water and shake well. Test the mixture with litmus paper. Divide the mixture into five parts.		
(i) To the first part, add sodium carbonate solution.		
(ii) To the second part, add neutral iron (III) chloride solutions.		
(iii) To the third part, add Brady's reagent		
iv. To the fourth part, add sodium hydroxide solution, then three drops of concentrated sulphuric acid followed by ethanoic acid and warm. Pour the mixture in cold water.		

v. To the fifth part, add an equal volume of ethanol and then three drops of concentrated sulphuric acid and warm. Pour the mixture in cold water.		
vi. To the sixth part, add acidified potassium manganate (VII) solution and heat. Then add Brady's reagent		
iii) To the seventh part, add Lucas reagent		

Comment on the nature of T.

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END

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CHEMISTRY

July/August 2023

ADVANCE INSTRUCTIONS



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UMTA JOINT MOCK EXAMINATIONS – 2023

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Chemistry 3

CONFIDENTIAL

INSTRUCTIONS FOR PREPARING APPARATUS AND CHEMICALS.

In addition to the fittings and substances ordinarily contained in a chemistry laboratory, each candidate will require:

1 Pipette 25,0 Or 20,0ml

1 Measuring cylinder 50 Or 100ml

2 Conical flasks

1 Empty beaker

Solid **P** which potassium dichromate (VI)

100ml of **FA1**

120ml of **FA2**

1.2g of **P**

3.0g of **X**

8 Test tubes in rack

FA1 is 0.1M Sodium thiosulphate

FA2 is 3.16g/l of **Q**

X is $\text{Al}_2(\text{SO}_4)_3 + (\text{CH}_3\text{COO})_2\text{Cu}$ in a ratio of 2:1

Q is potassium permanganate

T is citric acid

END

Solid **P** which potassium dichromate (VI)

100ml of **FA1**

120ml of **FA2**

1.2g of **P**

3.0g of **X**

8 Test tubes in rack

FA1 is 0.1M Sodium thiosulphate

FA2 is 3.16g/l of **Q**

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Q is potassium permanganate

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END