P525/3 Chemistry Paper 3 July - August 2023 3 1/4 hours



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UGANDA MUSLIM TEACHERS' ASSOCIATION

Name	UMTA JOINT MOCK EXAMINATIONS 2023	
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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				y
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1 You are provided with the following:

FA1, which is sodium thiosulphate solution of unknown concentration.

FA2, which is a solution containing 3.2gl⁻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:

$$Cr_2O_7^{2^-}_{(aq)} + 14H^+_{(aq)} + 6I^-_{(aq)} \longrightarrow 2Cr^{3^+}_{(aq)} + 3I_{2(aq)} + 7H_2O_{(1)}$$

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

$$I_{2 (aq)} + 2S_2O_3^{2-}{}_{(aq)} \longrightarrow 2I^{-}{}_{(aq)} + S_4O_6^{2-}{}_{(aq)}$$

PROCEDURE:

(a) Weigh out accurately 1.0g of **P** and dissolve it in about 20cm³ of 2M sulphuric acid in a beaker. Transfer the solution into a 250cm³ volumetric flask and make it up to the mark with distilled water. Label this solution FA₃.

Results:

Mass of weighing container + P =
$$g = \frac{g}{2 \text{ mark}}$$

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

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

(b) Pippete 25.0 (or 20.0) cm³ of FA3 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 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	$\left(\begin{array}{c} - \text{marks} \right)$
Final burette reading (cm³)		7
Initial burette reading (cm ³)		
Volume of FA3 used (cm ³)		
		1 1)

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

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Page 2 of 9

Average volume of FA1 used		$(2\frac{1}{2} \text{ marks})$
Question:		
Calculate the molarity of FA1 ($K = 39$, $Cr = 52$, O = 16)	$(2\frac{1}{2} \text{ marks})$
(c) Pipette 25.0 (or 20.0cm ³) of FA2 into a cor	nical flask. Add 15cn	n ³ of 0.5M potassium
riodide solution, followed by 15cm ³ of 2M sulpl		
until the solution is pale yellow. Add 5 drops of		
until the end point. Repeat the titration to obtain		
in Table II below.		
Volume of pipette used		cm ³ ($\frac{1}{2}$ mark)
Table II		
Final burette reading (cm³)		
Initial burette reading (cm³)		
Volume of FA1 used (cm ³)		
to been a few and a supplied to the supplied of the supplied to the supplied of the supplied o	salled engine	$(4\frac{1}{2} \text{ marks})$
Average volume of FA1 used		$(2\frac{1}{2} \text{marks})$
Average volume of PAT used		2 7
		27/20
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Question:	1 0 (lar mass of O is 158)
(a) Calculate the number of moles of Q in FA2 that	t reacted (Molar mass of Q is 136)
	$(2\frac{1}{2} \text{ marks})$
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	an make
	1
(b) Calculate the number of moles of iodine liberat	ed by Q that reacted. (2 $\frac{1}{2}$ marks)
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	Ale so quilitie m
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	to a select or believed.
	The southern Waste sheet.
(c) Calculate the mole ratio of Q to iodine, and her	nce the number of moles of iodine that
	(2 marks)
can be liberated by 1 mole of Q.	(2 marks)
a	
6-Ac.	
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• • • • • • • •	
10	
	14
2.	You are provided with substance X which contains two cations and two anions.
2.	Tou the provided with substitute 12 winds
	W 1 identify the enjoys
	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)
	and cations in A. Record your observations in the table below. (54 marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat a spatula endful		" No section of
of X in a dry test tube.		obspector.
The second secon	-	Sime .
(b) Place 2 spatula endful		A THE PLANE
of X in a test tube, add 3		His the High state of the
drops of concentrated		163 (0.5)
sulphuric acid and heat.	1	
(c) Shake two spatula		agen to annual dis
endful of X with about		Selection of the select
5cm ³ of water. Then add		10001
excess sodium hydroxide		fix#M (:
solution and filter. Keep		130,1789
both the filtrate and the		
residue.		

(d) To the filtrate add		····
dilute hydrochloric acid		
until it is just acidic.		/-
Divide the acidic solution		7
into portions		
(i) To the first part of the		
filtrate, add dilute sodium		
hydroxide solution drop-		1.00
wise until in excess.		
(ii) To the second part of		
the filtrate, add dilute	r garage and the second	Verific to the net
ammonia solution drop-		77.7 2.8 2
wise until in excess.	$T = -r_2 \Gamma$	77.11
(iii) To the third part of		
the filtrate, carry out a	,	2 9300
test of your choice to		AS 18000
confirm the cation.		test 7
		1
		<u> </u>
(iv) To the fourth part of		
the filtrate add Iron(III)		, v v n
chloride solution and		1 1,000
warm.		(R.z. 1 - ha - sweets 1
(v) To the fifth part of		p a 2 to
the filtrate, add 2-3 drops		as election for Agency
of barium nitrate solution.		
(e) Wash the residue with		100 2 530
water, add dilute		- H & Le 11
hydrochloric acid drop		The second secon
wise to just dissolve the	1	1
residue. Divide the		The second second
solution into five parts.		

Page 6 of 9

(i) To the first part of	Res	5 .1)
the solution add dilute	60 F 20 F	,
sodium hydroxide		
solution drop wise until in		
excess.	,	
	1	
		181
(ii) To the second part of		2 1 1 1
the solution add dilute		
ammonia solution drop		Vi l'Assa di La di
wise until in excess.		
(iii) Use the third part		.06.5 La -2 V In acc. 1
of the filtrate to carry out		
a test of your own choice		
to confirm one of the		
cations in X.		, <u>Mind</u>
		## 17 TV
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		5.0
		147 C

The cations in X are	and	1
The anions in X are	and	14

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)

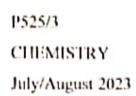
TERCE	OBSERVATIONS	DEDUCTIONS
TEST	OBOLICATION	(***)
(a) Burn a little of T on		1
spatula end.		
		many the standard helps
(b) Add sodium hydroxide		The man
solution to a little of T in		an other other control
a test tube and shake		
well.		enti lo
(c) To a little of T in a test		3 (2 m) B
tube, add about 5cm ³ of		To provide a
water and shake well. Test		1 150 g
the mixture with litmus		
paper. Divide the mixture		1 10
into five parts.		, i -
(i) To the first part, add		
sodium carbonate solution.	,	
1	- , -	The college (
(ii) To the second part, add		
neutral iron (III) chloride	and the same	man server as and?
solutions	,	: d 10a
(iii) To the third part, add		
Brady's reagent		
Blady 3 lougone		-1
iv. To the fourth part, add		
sodium hydroxide solution,		1
	4	
then three drops of		9
concentrated sulphuric acid		
followed by ethanoic acid		
and warm. Pour the mixture		
in cold water.		

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Page 8 of 9

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.	

END



ADVANCE INSTRUCTIONS



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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

CS CamScanner

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 $AI_2(SO_4) + (CH_3COO)_2Cu$ 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

X is $AI_2(SO_4) + (CH_3COO)_2Cu$ in a ratio of 2:1

Q is potassium permanganate

T is citric acid

END