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(Do not write your School / Centre Name or Number anywhere on this booklet.)

P525/3

CHEMISTRY

Paper 3

(Practical)

Nov./Dec. 2024

31/4 hours



UGANDA NATIONAL EXAMINATIONS BOARD Uganda Advanced Certificate of Education

CHEMISTRY

Paper 3 (Practical)

3 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of three questions.

All questions are compulsory. Use blue or black ink. Any work done in pencil except drawings, will not be marked.

Write your answers in the spaces provided. No additional sheet(s) of paper should be inserted in this booklet.

Mathematical tables and silent non-programmable scientific calculators may be used.

Reference books (i.e. text books, booklets on qualitative analysis etc.) should **not** be used.

You are **not** allowed to start working with the apparatus for the first **15 minutes**. This time is to enable you to read the question paper and make sure you have all the apparatus and chemicals that you require.

	For Examine	ers' Use Only	
Q.1	Q.2	Q.3	Total

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Turn Over



1. You are provided with the following:

FA1, which is approximately 0.1 M sodium thiosulphate solution.

FA2, which is 2 M sulphuric acid.

FA3, which is 10 % potassium iodide solution.

FA4, which is a solution made by dissolving 1.2 g of potassium iodate in 250 cm³ of distilled water.

Solid W, which is impure copper(II) oxide.

Starch solution.

You are required to determine the;

- (i) molarity of FA1.
- (ii) percentage purity of W.

Theory:

In acidic solution, potassium iodate reacts with potassium iodide according to the following equation:

$$IO_3^-(aq) + 5I^-(aq) + 6H^+(aq) \longrightarrow 3I_{2(aq)} + 3H_2O_{(l)}$$

Copper(II) sulphate reacts with potassium iodide solution according to the following equation:

$$2Cu^{2+}_{(aq)} + 4I^{-}_{(aq)} \longrightarrow Cu_2I_{2(s)} + I_{2(aq)}$$

Iodine reacts with sodium thiosulphate solution according to the following equation.

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

PART I

Procedure

Pipette 25.0 cm³ (or 20.0 cm³) of FA4 into a clean conical flask, add 10 cm³ of FA3 followed by 20 cm³ of FA2.

Titrate the resultant solution with FA1 from the burette using starch indicator.

Repeat the above procedure to obtain consistent results.

Record your results in Table 1.

Volume of pipette used cm³ (½ mark)

Table 1

Table 1	Latracit de	destruction of	
Titration Number	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of FA1 used (cm ³)			

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

(a)	(i)	Record the volvolume.	ume of FA1 u	sed for calcula	ating the average $(\frac{1}{2} mark)$
	(ii)	Calculate the av	erage volume o	f FA1 used.	cm ³ (2½ marks)
	· · · · · · · · · · · · · · · · · · ·				cm ³
(b)	Calc	ulate the number	of moles of;		
	(i)	FA4 that reacte $(K = 39, O = 16)$			(02 marks)
11.Y.					
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i ire	eli.				1000
1				Action of the	
		::::::::::::::::::::::::::::::::::::::			
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(11) FA1 that was reacted.	(02 marks)
	Personal and the second
	Managaran da d
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(c) Determine the molarity of FA1.	$(1\frac{1}{2} \text{ marks})$
PART II	
Procedure	A1
Weigh accurately 2.0 g of W and add it to 100 c mixture while stirring to dissolve, cool and transfer to 250 cm ³ volumetric flask and make up the soludistilled water. Label the solution FA5.	IIC ICSUITUITE SOLUTION
Results:	$\sigma(\frac{1}{2} mark)$
Mass of weighing bottle + W	g (1/2 mark)
Mass of empty weighing bottle	g (/2 mark)
Mass of W weighed	g (72 mark)
PART III	
Procedure	in 1 floring add 10 cm ³
Pipette 25.0 cm ³ (or 20.0 cm ³) of FA5 into a clean of FA3 followed by 10 cm ³ of FA2.	
Titrate the liberated iodine with FA1 from the bure	ette using starch indicator.
Repeat the titration to obtain consistent results.	
Record your results in Table 2.	

Titration Number	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)		mee the	mato(1 = .(b) =
Volume of FA1 used (cm ³)	(()) s	COLLEGE SHARE	117
			$(4\frac{1}{2} \text{ marks})$
(a) (i) Record the volume volume.			$(\frac{1}{2} mark)$
(ii) Calculate the averag	ge volume of F	'A1 used.	$(2\frac{1}{2} \text{ marks})$
(i) iodine liberated by I	FA5.		(02 marks)
North (197)			'(n)
(ii) Copper(II) ions in 25	50 cm ³ of FA	5.	(02 marks)
		•••••	

Turn Over

Luvi		Marian Comment	
			••••
(c)	Determine the;	do in W. (02 mark	3)
	(i) mass of pure copper(II) oxid (Cu = 63.5; O = 16)	그는 그 그 맛 그 닭이 없이 걸까지 사람이 많이 떨어.	
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			•
	(ii) percentage purity of W .	(01 mark))
		•••••	••
		••••••••••••••••	
			•

2. You are provided with substance Q which contains two cations and two anions. Carry out the tests in Table 3 to identify the cations and anions present in Q. Identify any gas(es) evolved.

Record your observations and deductions in the table.

(30 marks)

Table 3

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat a spatula end-ful of Q in a dry test tube strongly until there is no further change.		non feding that (
		o distributed and self. If
		Test:
(b) To three spatula end-fuls of Q in a boiling tube, add about 8 cm ³ of distilled water and shake thoroughly. Filter, keep both the filtrate and the residue. Divide the filtrate into seven portions.	Live of the same o	distriction of the possible company of the possible co
(i) To the first portion, add dilute sodium hydroxide solution drop-wise until in excess.		of the Atria set of the Atria set of the Atria seconds to a second

	TESTS	ORCEDAL	
(ii)	To the second portion,	OBSERVATIONS	DEDUCTIONS
	aud ullute ammonia	Devices of the Vine All	- CHONS
	solution drop-wise until in		Property of the sound of the
	excess.		edo muy him of a
	and the second s		t older
	DEBUCTION		
	The second secon	11.50 (16.50)	21531
		to ful-to	lo chutone a roll in
		VC	
		orafsi	
(iii)	To the third portion, add		a ovinsila asrinad
	2-3 drops of dilute		
	sulphuric acid.		
(iv)	Use the founth		
(11)	Use the fourth portion to carry out a test of your		
	own choice to confirm one		
	of the cations in O		
	of the cations in Q . Test:		
	rest.		
		in-bas	
		bba .odg	
		siffica	
			winds bon mule
		theat of	thereagels bills
(v)	To the fifth portion, add	ed: ba	s omitted set died
(1)	copper turnings followed		blesidae
	by 3-4 drops of		Dride the filmal
	concentrated sulphuric		Adomod sows
	acid and warm.		
	acid and warm.		
			To the thest portigi
	To the sixth portion add	the state of the s	die ar sodium byt
vi)	To the sixth portion, add		a fre-goth northly
	3-4 drops of lead(II)		-75000
	nitrate and heat.		
			and the second second second

TESTS	OBSERVATIONS	DEDUCTIONS
(vii) To the seventh portion, add 3-4 drops of silver nitrate solution followed by ammonia solution drop-wise until in excess.	tons and deductions in the	Record concessions Faids 4 From Street Consequence and consequence Cons
(c) Wash the residue with water and dissolve it in about 5 cm ³ of dilute hydrochloric acid. Divide the solution into four portions.		s ni X to no 20 of the de bhs ade to
(i) To the first portion, add dilute sodium hydroxide solution drop-wise until in excess.		water, shake and test fac mixture with increase paper. Or inte- ine variant northire
(ii) To the second portion, add dilute ammonia solution drop-wise until in excess.		
(iii) To the third portion add ammonium oxalate solution.		no ten a villad oi e bûs e vive e dût s left des de de left e vive e de de vive
(iv) To the fourth portion, add half a spatula of solid ammonium chloride and shake to dissolve. Then add 3-4 drops of disodium hydrogen phosphate solution followed by dilute ammonia solution drop-wise until in excess.	n	To the second portion of the markure, red 2.3

(d)	(-/	The cations in Q areand
	···>	The anions in Q areand
	(11)	Turn Over

You are provided with substance Z which is an organic compound. Carry out 3. the tests in Table 4 to determine the nature of Z.

Record your observations and deductions in the table.

(20 marks)

Table 4

	TESTS	OBSERVATIONS	DEDUCTIONS
(a)	Burn a small amount of Z on a spatula end or on a porcelain dish.		
(b)	To 0.5 cm ³ of Z in a test tube, add about an equal volume of water, shake and test the mixture with litmus paper. Divide the resultant mixture		ret e e viet eu ol ju kat e e viet eu ol ju kat e e e e e e e e kat e e e e e e e e e e e e e e e e e e e
	into three portions.		Arga baaray oili ali i (amoro, a a bha agairigh a a gaire a a a
(i)	To the first portion of the mixture, add a half a spatula end-ful of sodium carbonate.		
(ii)	To the second portion of the mixture, add 2-3 drops of neutral iron(III) chloride solution.	Ga	

	TESTS	OBSERVATIONS		DEDUCTIONS
(iii)	To the third portion of the mixture, add 2 cm ³ of 2,4-dinitro phenylhydrazine solution (Brady's reagent). Shake and leave to stand.		10 d	Bed to the track Boxolan chrysdayd Boxolan chrysdayd Boxolan chrysdayd Boxolan chrysdayd Boxolan chrysdayd Boxolan chrysland Boxolan chrysl
(c)	To 0.5 cm ³ of Z , add 1-2 drops of acidified potassium dichromate solution.		0.00	tupio pet so specifica
(d)	To 0.5 cm ³ of Z , add about an equal volume of ethanoic acid followed by 2-3 drops of concentrated sulphuric acid and heat the mixture.		THE ISSUED	
(e)	To 3 cm ³ of silver nitrate solution in a clean test tube, add 3 drops of sodium hydroxide solution then dilute ammonia solution drop-wise until the precipitate just dissolves, finally add 3 drops of Z and warm gently while shaking.			

TESTS	7.541 - 45 A	OBSERVATIONS	DEDUCTIONS
(f) To 0.5 cm ³ 2 cm ³ of so hydroxide s followed by iodine drop until in exc Warm the r and leave it	odium solution y aqueous o-wise ess. mixture		takon darieta e (f.c.). John prodziela e (f.c.). Perendo-4-3 ier into 5. Lankin Leiftgreini. Lankin Leiftgreini. Lankin darieta. John Romani.
			b to skipp on 1995

(g)	Describe the nature of Z .	
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		 • • • • • • • • • • • • • • • • • • • •
	••••••	

