Name	Adm.No
Index No/	Class
Candidate's Signature	

KASSU JOINT EXAMINATION TEST

(The Kenya Certificate of Secondary Education)

233/1

CHEMISTRY

Paper 1

(Theory)

September 2021

Time 2 Hours

Instructions to Candidates

- 1. Write your name and index number in the spaces provided above.
- 2. Answer all the questions in the spaces provided.
- 3. All working must be clearly shown.
- 4. Non-programmable silent electronic calculators and KNEC mathematical tables may be used.

For Examiner's Use only

Questions	Maximum score	Candidates score
1 - 25	80	

This paper consists of 12 printed pages. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

ANSWER ALL QUESTIONS

1	st ionization	energy (kJ/m	ole	402	496	520	419
		Metal		A	В	С	D
		ow shows firs ls are in the sa		_		-	d by letters A
a) I	Distinguish b	oetween ioniza	tion ener	gy and elec	tron affini	ty	
	ch solution v nk)	vould react exp	olosively	with Potas	sium meta	1?	
(1m	,						
		can be used as		y for acid in	ndigestion	in the stoma	ch? Explain
(1m	nk)				-		_
 Iden	n htify the solu	tion with the h	ighest co	oncentration	of hydro	kide ions. Ex	plain
	PH Solutio	14.0 E	1.0 F	9.0 G	6.5 H	5.0 I	
_							

3. An element: 1123*M*

	(a)	To which chemical family does it belong?	$(^{1}/_{2}mk)$
	(b)	Write the electron arrangement of the atom.	(¹ / ₂ mk)
	(c)	Draw the structure of its ion.	(1mk)
4.	(a)	Define electrolysis.	(1mk)
(b)	Durin	g the electrolysis of molten aluminium oxide, write the equations at Anode -	the;
			(1mk)
		Cathode -	
			(1mk)

5. In an experiment to determine the percentage purity of Sodium carbonate produced in the Solvay process, 2.15g of the sample reacted with exactly 40.0cm³ of 0.5M Sulphuric(VI)acid. Determine the percentage purity of sodium carbonate in the sample.

6. Y is a product of gaseous reaction which results in an equilibrium mixture being formed. Reactants ← Y

The percentage of \mathbf{Y} in equilibrium at various temperatures and pressure is shown in the following table.

Temperature (°C)	1 atm	100 atm	200 atm
550	0.77	6.70	11.9
650	0.032	3.02	5.71
750	0.016	1.54	2.99
850	0.09	0.87	1.68

a)	Whether production of Y is exothermic or endothermic.	(2mks)

	present.	(2mks
• •		
	State and explain what is observed when moist red flowers are dropped in containing Sulphur (IV) oxide.	a gas ja (3mks
I	A sample of water collected from River Nzoia is suspected to contain chloride ion Describe an experiment that can be carried out to determine the presence of the chlons.	oride
I	Describe an experiment that can be carried out to determine the presence of the chl	oride
I	Describe an experiment that can be carried out to determine the presence of the chl	oride
I	Describe an experiment that can be carried out to determine the presence of the chl	oride
I	Describe an experiment that can be carried out to determine the presence of the chl	oride
I	Describe an experiment that can be carried out to determine the presence of the chl	oride
I	Describe an experiment that can be carried out to determine the presence of the chl	oride
I	Describe an experiment that can be carried out to determine the presence of the chl	oride
I i	Describe an experiment that can be carried out to determine the presence of the chl	oride (2mks

(b)	Explain why a conical flask is the most preferred apparatus for the collection of the distillate.	(1mk)
(c)	Draw the diagram of a graduated conical flask.	(1mk)
	10. In an experiment to determine the proportion of oxygen in air, copper turnings packed in excess in a long combustion tube connected to two syringes of 110cm³ ear volume. At the beginning of the experiment, syringe R contained 110cm³ of air whi syringe M was closed and empty as shown. Copper turnings	ch in
	Syringe M Heat Syring	ge R
	Glass wool	
	was passed over the heated copper slowly and repeatedly until there was no further blume. 97.5cm ³ of air remained in syringe M.	change
(a)	State and explain the observation made in the combustion tube.	(2mks)
(b)	If the volume of air in the combustion tube at the beginning of the experiment was 23.8cm ³ and at the end of the experiment reduced to 10cm ³ , calculate the	

(2mks)

percentage of the active part of air.

11. Below is a structure of an element X. Use it to answer the questions that follow.	
(a) Name the chemical family to which element X belongs. Give a reason. (2mks)	
(2HK3)	
(b) (i) Define covalent bond.	(1mk)
(ii) Using dots (*) of cross (x) diagram, show bonding in Carbon (II) Oxide.	(1mk)
12. (a) (i) State <i>two</i> allotropes of Carbon.	(1mk)
(ii) Explain the differences in their densities.	(2mks)
(11) Explain the differences in their delisities.	(2111K3)

(b) raw 1	(i) Name the process used for large scale production of Sodium Carb	onate using brine as (1mk)
(ii)	Write the overall chemical equation for the reaction in the carbonator	r. (1mk)
(c)	Name two gases recycled in the above process	(1mk)
 13. N	Name the following compounds using the IUPAC system. (i) CH ₃ CH ₂ CH ₂ CH ₂ C = CH Br CH ₃	(3mks)
	(ii) CH ₃ CH ₂ CH ₂ COOCH ₂ CH ₂ CH ₃	

14. Describe how to prepare Ethane gas starting with soda lime	(3mks)
15. The diagram below shows how chlorine reacts with metals in the laboratory. Sanswer the questions that follow. Dry Chlorine gas Dilute NaOH (aq)	
(a) Name substance Q .	(1mk)

(1mk)

(b) Give a reason why substance Q is not collected in the combustion tube P.

(c) Write chemical equation for the reaction that occurs in the conical flask containing Sodium hydroxide. (1m	k)
16. (a) Water sample is found to contain Mg ²⁺ ,Cl ^{-,} SO ₄ ²⁻ , and Ca ^{2+.} Identify the type of water hardness (1m	k)
(b) Which type of detergent is more suitable with the water sample above. Give a reason (2mk	.s)
	••••
(c) Permanent water hardness cannot be removed by boiling. Explain (1m	k)
17. Starting with lead metal, write procedure on preparation of lead(II) nitrate crystals (3mks)	
	• • • •

18. The following chemical equations show the effects of heat on nitrates. $ 2B(NO_3)_{2(s)} = 2BO_{(s)} + 4NO_{2(g)} + O_{2(g)} $ $ 2ANO_{3(s)} = 2ANO_{2(s)} + O_{2(g)} $ $ 2CNO_{3(s)} = 2C_{(s)} + 2NO_{2(s)} + O_{2(g)} $ a. Arrange elements A, B and C from the most reactive to the least reactive.	(1 ¹ / ₂ mks)
Give one example of element A, B and C.	(1 ¹ / ₂ mks)
19. Copper (II) sulphate crystals, a boiling tube, a test-tube, a beaker and other neces requirements were used in an experiment to determine the type of change that occurr crystals were heated. (a) Draw a labelled diagram to represent the set-up at the end of the first part of the end of	ed when the
(b) After the second part of the experiment was done, state the conclusion that was me the type of change undergone by copper (II) sulphate crystals when heated.	(1mk)
20. (a). Distinguish between chromatography and a chromatogram.	(1mk)

(b) State the role of chromatography in the administration of inter-	national athletics competitions. (1mk)
21. Study the polymer shown below. O O H H	
$H - O - C - (CH_2)_4 - C - N - (CH_2)_6 - N - H$ a) Name the polymer.	(1mk)
b) Identify two monomers that make up the polymer.	(2mks)
c) Give one use of the polymer (1mark)	
22. (a) State Charles law.	(1mk)
(b) A gas occupies 450cm³ at 27°C. What volume would the pressure remains constant?	gas occupy at 177°C if its (2mks)
23. A colourless liquid was suspected to be water. State two ways (i) Purity of the water.	to confirm. (1mk)

	(ii) That the liquid was water.	(2mks)
24.	Use the following information to answer the questions that follow $ \Delta H_{lattice} MgCl_2 = +2489 \; kJ/\; mol $ $ \Delta H_{hydration} Mg^{2+} = -1891 \; kJ/\; mol $ $ \Delta H_{hydration} Cl^- = -384 \; kJ/\; mol $	
	a) Calculate the heat of solution of magnesium chloride.	(2mks)
	b) Draw an energy level diagram for the dissolving of magnesium chloride	(2mks)
	i) A solution of aqueous sodium hydroxide is added to a gas jar of nitrogen (IV) ox ken. State and explain the observation made	(2mks)
ii) '	Write the chemical equation for the reaction above	(1mk)