										Chemistry	paper 1,2 & 3
KII 33/2 CH	RIN I EM	YAC IIST	GA WEST SC RY	HOOL BAS	ED FORN	1 IV EXA	MINATI	ON 2018			
Pap 1.	er a) b)	1 (TI Stat Wh	HEORY) te Le'Chateli en Calcium o	ers principle carbonate is	e heated the	e equilibri	um shov	vn below i	s established	•	(1mk)
			CaCO 3(s)		$CaO_{(s)} + O$	CO _{2(g)}				
		Hov Exp	w would the jolain	position of t	he equilib	rium be a	ffected i	f the press	ure is increas	sed.	(2mks)
2.	R	-(\$	Na and R	k −6($\rightarrow CH_2O$	SO ₃ Na r	epresent tv	wo types of o	cleansing a	igents. i)
		Nar	ne the class of	of cleansing	agent to v	which eac	h belong				(1mk)
			Cleansir	ng agent			Cla	ISS			
		R		JO Na							
		R	0-()	H₂⊖SO₃Na					ts.com		
 3. 4. 5. 	 II) A be K0 If Ca W pr fo a) b) Be 	Giv certa low: CO ₃ 2 g c alcul hen ecipi rmec Wh Col	Which of the a reason for an carbonate $+$ 2HNO $_{3(ac)}$ of the carbon ate the relative a few drops of tate was form l. Write the f ite precipitat ourless solut are chromate	ne of cleans r your answ KCO_3 , reac $\longrightarrow KCO_3$, reac nate reacts cover ate reacts cover of aqueous S ned on addite formula of the ion ograms of di	ing agents er. (NO ₃) _{2(aq} ompletely ass of K (bodium hy tion of mo e substance	C = 12, C C =	M nitric $y_{3} + H_{2}Q_{3}$ m^{3} of 1M $y_{4} = 16$) were add us sodium sible for s of comp	(V) acid ac (V) acid ac (V) I hydrochl led to alum n hydroxic the: pound L ac	use when us ccording to th oric acid. ninium sulph le a colourles dministered t	ne equation ate solution ss solution	(2mks) (2mks) n given (3mks) n, a white was (1mk) (1mk) patient as
	an	ti-re	troviral. Use	to answer the to answer the to the to the the the the the the the the	thè quest	• • X R	• X S	• • X			
		i)	State the c	omponents o	of the anti	-retrovira	l drug.				$(1 \mathrm{mk})$

- ii) On the diagram label:
- a) Solvent front line (2mks)
- b) Base line
- 6. Nitrogen is inert. State two uses of the gas based on this property.
- 7. a) Write an equation for the reaction that takes place where hydrogen peroxide decomposition in presence of Manganese (IV) oxide. (1mk)

(2mks)

(2mks)

- b) Describe a test that can be used to identify oxygen gas.
- 8. The salts A₁, A₂ and A₃ were Zinc chloride, Lead (II) nitrate and Magnesium sulphate.

Substance	Silver nitrate	Barium chloride	Hydrochloric
Salt A ₁	No ppt	White ppt	No ppt
Salt A ₂	White ppt	No ppt	No ppt
Salt A ₃	No ppt	White ppt	White ppt

(3mks)

(1mk)

(1mk)

- Identify
- 9. Study the information in the table below and answer the questions that follow:-

Number of carbon atoms per molecule	Relative molecular mass of hydrocarbon
2	26
3	40 40
4	54

i) Name the class of hydrocarbons that the members shown in the table belong. (1mk)

- ii) Predict the relative molecular mass of the sixth member of this class.
- iii) State the observation made when one member of class mentioned in (i) above is bubbled through bromine water.
- 10. Below is a representation of an electrochemical cell?
 - $Mg_{(s)} / Mg^{2+}_{(aq)} / / Ag^{+}_{(aq)} / Ag_{(s)}$
 - a) What does // represent?
 - b) Given the following

$$Mg^{2+}_{(aq)} + 2e \longrightarrow Mg_{(s)} \qquad E^{\theta} = -2.37V$$

$$Ag^{+}_{(aq)} + 1e \longrightarrow Ag_{(s)} \qquad E^{\theta} = +0.80V$$

Calculate the E.M.F. of the electrochemical cell formed when the two half cells are combined. (2mks)

11. Study the flow chart below and answer the questions that follow.



i) Identify B and C.

(2mks)

- ii) Write an equation for the reaction that takes place when C reacts with water. (2mks)
- **12.** The date given below was recorded when metal E was completely burnt in air. E is not the actual symbol

of the metal. (R.A.M. E = 56, O = 16.0) Mass of empty crucible and lid = 11.34g Mass of crucible, lid and metal E = 11.452gMass of crucible, lid and metal oxide = 11.500g

(3mks)

(1mk)

(1mk)

(1mk)

(1mk)

(1mk)

(1mk)

(2mks)

(1mk)

	a)	Determine the mass of	
		i) Metal E	$(^{1}/_{2}mk)$
		ii) Oxygen	$(^{1}/_{2}mk)$
	b)	Determine the empirical formula of the metal oxide.	(2mks)
13.	a)	In the extraction of sodium metal, calcium chloride metal is added to the sodium chloride.	
		Explain the role of calcium chloride in the process.	(1mk)
	b)	State two properties of sodium metal that makes it possible for it extracted from it ore.	(2mks)
14.	If it	takes 30 seconds for 100cm ³ of carbon (IV) oxide to diffuse across a porous plate, how long	
	:1	1.441 + 1.50 + 3.6 + 4.50 + 1.45 + 1.66 + 1.66 + 1.45 + 1.66 + 1.45 +	

will it take 150cm³ of nitrogen (IV) oxide to diffuse across the same plate under similar conditions. (C = 12.0, N = 14.0, O = 16.0)

15. Study the information in the table below and answer the questions that follow. The letters do not represent the actual symbols of the element.

Element	Electrical conductivity	Ductility	Action of water
Z	Good	Good	No reaction
Х	Good	Poor	No reaction
W	Good	Good	Reacts

Select an element which

- i) Is likely to be in ground II of the periodic table.
- ii) Could be used to make electric cables.
- iii) Is likely to be graphite.
- 16. The table below gives solubilities of P and R at 0° C and 50° C.

Substance	Solubility g/100g water at				
	$0^{0}C$	N.I.	50^{0} C		
Р	55	wh	75		
R	10	isit	10		

When an aqueous mixture containing 70g of P and 8g in 100g of water at 70° C was cooled to 0° C. Some crystals were crystallised out.

- i) Identify the crystals.
- ii) Determine the mass of crystals crystallised out.
- iii) Name the method used to obtain the crystals.
- 17. The diagram below represents the structure of aluminium chloride molecule.



Ν

- a) Identify the bonds labelled L and N.
- b) How many electrons are used for bonding in the molecules?
- 18. The table below shows the first ionization energies of elements S_1 and S_2 .

Element	Ionisation Energy kJ/mol
S ₁	494
S ₂	418

- a) What is ionization energy?
- b) Which of the two elements is the least reactive? Explain.

(1mk) (2mks)

Chemistry paper 1,2 & 3

(2mks)

(1mk)

 $(1^{1}/_{2} \text{mks})$

 $(^{1}/_{2}mk)$

(1mk)



	g
Silicon – 28	92
Silicon – 29	5
Silicon – 30	3

- a) Calculate the relative atomic mass of silicon.
- b) Identify the most stable isotope of silicon.
- 20. The following data gives pH values of solution I, II, III.

Solutions	pH
Ι	12
II	7
III	2.5

a) Which solutions would produce hydrogen gas with calcium metal? Give a reason.

- b) What would be the colour of solution I if a few drops of methyl orange was added?
- c) Which solutions would react with aluminium hydroxide? Give a reason.
- 21. Study the flow chart below and answer the questions that follow:-



- i) Sugar
- ii) Zinc

Chemistry paper 1,2 & 3

23. A radioactive material emitted radiations as shown below. B (-) (1mk) Identify A and B i) Which radiation ii) a) has the lowest ionizing power? (1mk) b) contains helium particles? (1mk) 24. Below are heats of combustion of carbon, hydrogen and ethanol. $\Delta H_{\rm C}$ (carbon) = - 393kJ/mol $\Delta H_{\rm C}$ (hydrogen) = - 268kJ/mol $\Delta H_{\rm C}$ (ethanol) = - 1368kJ/mol Calculate the heat of formation of ethanol. (3mks) 25. A student performed two experiments as shown below. Experiment I; a certain volume of air was passed repeatedly from syringe A to syringe B over heated zinc powder. Experiment II; The same volume of air was passed repeatedly from syringe A to syringe B over heated excess magnesium powder. In which experiment was change in volume of air greater? a) (1mk)Explain your answer in (a) above. b) (2mks) 26. Starting with barium chloride, describe how a pure sample of barium sulphite can be prepared in the Laboratory. (3mks) 27. The set up shown below was used to investigate a property of carbon (IV) oxide gas. Glass tube **Original level** of water Carbon (IV) oxide Porous pof Beaker 1 Beaker 2/ (3mks) State and explain the observation that would be made in glass tube if beaker 2 was filled with air. **28.** The process in which a gas changes directly into a solid is called (1mk)

KIRINYAGA WEST 233/2 CHEMISTRY Paper 2 (THEORY) SECTION A

2.

1. a) The diagram below shows a set-up that was used to prepare oxygen gas and passing it over a burning candle. The experiment was allowed to run for sometime.



3. Use the information below on standard electrode potentials to answer the questions that follow.

Electrode reaction	E^{θ} Volts
$C^{2+}_{(aq)} + 2 e - \sum C_{(s)}$	0.34
$D^{2+}_{(aq)} + 2e- \sum D_{(s)}$	+0.44
$E^+_{(aq)} + e - \sum E_{(s)}$	-2.92
$Fe^{2+}_{(aq)} + 2e- $ $Fe_{(s)}$	-2.71
$G^{2}_{+(aq)} + 2e \longrightarrow G_{(s)}$	-0.14
$^{1}/_{2}H_{2(g)} + e - \longrightarrow H^{-}(aq)$	+2.87
$^{1}/_{2}K_{2(g)} + e - \underset{\frown}{\longrightarrow} K^{-}(aq)$	+1.09
$L^+_{(aq)} + e - \sum^{1/2} L_2$	0.00



ii) Calculate the e.m.f of the cell formed by connecting half cells C and D.

- b) Draw and label a diagram of a cell formed by connecting half cells of E and D. On the diagram indicate the flow of electrons. (3mks)
- c) 100cm³ of 2m sulphuric (VI) acid was electrolyzed using the set up represented by the diagram below.



- Write an equation for the reaction that produces gas L. (1mk) i) (2mks)
- Describe the test for gas K. ii)
- Account for the difference in volume of gases produced at the electrodes. iii) (2mks)
- If 100cm³ of 2m ethanoic acid was used in place of sulphuric acid comment on brightness of the bulb. (2mks) iv)

The g	rid below	represen	ts part of t	the period	dic table.	Study it	and ansv	ver the q	Chemistr uestions tha	y paper 1 t follows
]								
			1	r						
							Δ			
		В		C		D		E		
	F	G								
								Н		
i) a	11 1	1 .	G	• • • •	1	6.2.5	1 .	-		(2, 1)
1) Se ii) W	lect the ele	structure	can form a would the c	n 10n with oxide of C	i a charge i have? Ey	of -2. Exj mlain	plain.			(2mks) (2mks)
iii) Cc	mpare read	ctivity of I	H and E. Ex	xplain.		pium.				(2mks) (2mks)
1.3g of	B reacts co	ompletely	when heate	ed with 1.	21 litres o	f chlorine	e gas at s.t	.p.		, í
(1 mole)	of gas at s	s.t.p. occuj	pies 22.4 lit	tres)	stress on D					(11.)
i) \mathbf{W}^{1} ii) $\mathbf{D}\epsilon$	termine th	e relative	atomic mas	s of B	etween B	and chiof	me gas.	a de la construcción de la const	N	(1 mk) (2 mks)
Explair	how you	would exp	ect the foll	owing to	compare.			.s.		(2000)
I) At	omic radii	of F and C	Ĵ.		-			0 ^{e1}		(1mk)
II) Th	e pH value	es of aqueo	ous solution	1 of oxide	s of B and	l D.		·····	fa atauna a f	(1mk)
a) The optimized sulpl	nagram be nuric (VI) a	now snow acid.	s some pro	cesses tha	it takes pla	ice during	g the maus	striai man	ulacture of	
						NC	SO Y			
			Δi	r		. eer		Conv	erter	
				•		N'II -				
		l aad (l	n J		- A	<u>р</u>	ure dry			ιΨ
Ai	$r \longrightarrow$		') <u>v</u>	F	Purification	on	>	Hea	t	<u> </u>
	L	Sulphic	de	,C						
				er.		Esc	caping			
	Wator			* 0 ^{0×}		gag	es			
	vvalei		\downarrow	P I		V				
		Γ		<u> </u>			←			
		L	.0				2		Chamber (~
		~	2 1							2
		KOL).	\downarrow						Liquid	
		Т	o storage	•						
i) Wi	rite the equ	ation for t	he reaction	in which	sulphur (IV) oxide	gas is pro	oduced.		(1mk)
ii) W	hy is it nec	essary to l	keep the ga	ses pure a	ind dry?					(1mk)
iii) De	scribe the	process th	at takes pla	ice in chai	mber G.					(1mk)
1V) Na	me the gas	ses that eso	capes into t	he enviro	nment.	mt of omo	of the co		lin (iv) abov	(1mk)
v) Sta vi) Gi	ue and exp	son why it	is necessar	ry to use a	nvironme	of $2-3$ atr	or me gas	and not n	i iii (iv) abov	(1mk)
i) Cc	mplete the	table belo	ow to show	the obser	vation ma	de when	concentra	ted sulph	uric acid	(11111)
is	added to th	e substanc	ces shown.					Ĩ		(2mks)
Γ	Substance						Observati	ions		
-	Iron filing	°C								
		, 5								
F	Crystals	f white su	gar							

I) Iron fillings

(1mk)



hydrochloric acid. Calculate the percentage by mass of aluminium present in 0.5g of alloy.

Chemistry paper 1,2 & 3 (3mks)

(Al = 27, Molar gas volume = 2400 cm³).**KIRINYAGA WEST** 233/3 CHEMISTRY Paper 3 (PRACTICAL)

You are provided with: 1.

- Solution K containing 6.0g of NaOH in 750cm³ solution. .
- Dilute acid J made by dissolving 13.9g of $H_2C_2O_4$.XH₂O in 700cm³ of water and diluting the solution to 1 litre.
- Phenolphthalein indicator.

You are required to determine the value of X in H₂C₂O₄.XH₂O

Procedure

Fill the burette with solution K using a pipette and pipette filler, pipette 25cm3 of J into a clean conical flask. Add 2-3 drops of Phenolphthalein indicator. Titrate this solution with solution K from the burette until a permanent pink colour first appears. Fill the result in the table below. Repeat this procedure two more times and complete table 1 below.

Ta

a) b) c) d) e)

f)

<u>ble 1</u>			60	(4 marks
	Titration number	Ι	II	III
	Final burette reading (cm ³)		10 ak	
	Initial burette reading (cm ³)		ASIT	
	Volume of solution K used		, eR	
		<i>k</i>		(4mks)
Determine th	e average volume of K used.			(1mk)
Determine nu	umber of moles of K used.	1. flo		(2mks)
Determine n	umber of moles of solution J used.	and a second		(2mks)
Determine th	ne concentration of J in moles per litre	N. N		(2mks)
The relative f	Formula mass of H ₂ C ₂ O ₄ .XH ₂ O	VISIL		(2mks)
Determine the	e value of X in the $H_2C_2O_4$.XH ₂ O ($H^{=}$	2^{1} , C = 12, O = 16	5)	(2mks)

- 2. You are provided with
- Magnesium ribbon labeled solid C •
- 2.0M Sulphuric (VI) acid labeled solution D.
- A stop watch
- You are required to determine the rate of reaction between Magnesium and Sulphuric (VI) acid at different concentrations.

Procedure:

Place five test tubes in a test tube rack and label then 1, 2, 3, 4 and 5. Using a 10cm³ measuring cylinder, measure out the volume of 2.0M Sulphuric (VI) acid solution D as shown in the table 2. Pour into the corresponding test tubes. To each test tube, add the volume of water as shown in table 2. Cut out five pieces of Magnesium ribbon, solid C each exactly 1cm long. Transfer all the solution in test tube 1 into a 100cm³ beaker. Place one piece of magnesium into the beaker and start a stop watch immediately. Swirl the beaker continuously ensuring that the magnesium is always inside the solution. Record the time taken for magnesium to disappear in table 2 below. Wash the beaker and repeat procedure above for each of the solution in test tube 2, 3, 4 and 5 and complete table 2.

Table 2

Test tube number	1	2	3	4	5
Volume of solution D (cm ³)	10	9	8	7	6
Volume of water (cm ³)	0	1	2	3	4

Chemistry paper 1,2 & 3

Time taken (Sec)			
Rate of reaction (1/time)S ⁻¹			

	(5mks)
a) Plot a graph of rate of reaction of $(\frac{1}{t})$ (y-axis) against volume of solution D.	(3mks)
b) Use the graph to determine the time that would be taken for a 1cm length magnesium ribbon to	
disappear if the volume of the acid solution D used was 8.5cm ³ .	(1mk)
c) In terms of rates of reactions, explain the shape of your graph.	(1mk)

- 3. a) You are provided with:
- Solution P •
- Acidified potassium manganite (VII) •
- Sodium hydrogen carbonate •
- Acidified potassium dichromate (VI) •
- Bromine water •

Solid P was suspected to be a saturated alkanol. From the reagents provided, select and describe four tests that could be carried out consecutively to confirm if solid P is a saturated alkanol. Write the tests and the expected observations in the spaces provided.

Test1

Observ	vations	Expect	ed Observations		
		414	set cset		
	(1mk)	. www.		(1mk)	
Test 2	is	C .			
	Observations		Expected Observations		
	(¹ / ₂ mk)				$(^{1}/_{2}mk)$
Test 3	nore				
	Observations		Expected Observations		
	·				
		(1mk)			(1mk)
Test 4					

Observations	Expected Observations
(1mk)	(1mk)

b) Carry out the tests described in (a) using solid P and record the observations and inferences in the spaces provided.

Test 1

Observations	Inferences
(1mk)	(1mk)

Test 2

Observations	Inferences
(1mk)	(1mk)

Test 3

Observations	Inferences	
(1mk		(1mk)

Test 4

Observations	Inferences	
	CON CONTRACTOR	
	(1 mk)	
	Nero	(1mk)
	nn	
	; Git.	
	ers'	

Kirinyaga West SCHOOL BASED FORM 4 EXAMINATION 2018 CHEMISTRY PAPER 3 233/3 CONFIDENTIAL

Instructions to schools:

The information contained in this paper is to enable the teacher in charge of chemistry to make preparation for the chemistry practical examination.

In addition to the chemicals and apparatus found in a chemistry laboratory, each candidate will require the following:

- 1. 50ml burette
- 2. 25ml pipette
- 3. Clamp and stand
- 4. Pipette filler
- 5. 2 Conical flask
- 6. White tile
- 7. Filter funnel
- 8. 120cm³ solution K, 0.2M NaOH
- 9. 100cm³ solution J, 0.11M Oxalic acid
- 10. Six test tubes
- 11. 5 labels
- 12. Test tube rack
- 13. A stop watch
- 14. 10cm3 measuring cylinder

- 15. 500ml distilled water
- 16. 100cm3 glass beaker
- 17. 7cm Magnesium ribbon, solid C
- 18. About 50cm3 of solution D (2.0M Sulphuric (VI) acid)
- 19. 12cm3 Maleic acid, Solution P
- 20. Solid Sodium hydrogen carbonate (approximate) 0.5g
- 21. Ruler

Access to:

- 1. Phenolphthalein indicator with a dropper
- 2. Bromine water with a dropper
- 3. Acidified potassium manganite (VII) with a dropper.
- 4. Acidified potassium dichromate (VI) with a dropper.

NB:

- Maleic acid, solution P is prepared by dissolving 100 grams in 1 litre of distilled water.
- Acidified potassium manganite (VII) is prepared by dissolving 3.2g in 400cm³ of 1M H₂SO₄ then diluting to 1 litre.
- Acidified potassium dichromate (VI) is prepared by dissolving 4.6g in 400 cm³ of 1MCH2SO4 then diluting to 1 litre.

KISII CLUSTER 233/1CHEMISTRY Paper 1(THEORY) JUNE, 2018 2 hours **SECTION 1** Study the following nuclear reaction and complete it by giving the values of m and n. 1. (2mks)2. For the reaction $Cl_{2(g)} + 2I_{(aq)}$ $2Cl_{(aq)} + I_{2(s)}$ Using oxidation numbers determine the reducing agent. (2mks)3. When aqueous sodium hydroxide solution was added to freshly prepared acidified iron (II) sulphate solution, a green precipitate was formed. When hydrogen peroxide was first added to iron (II)sulphate solution followed by sodium hydroxide solution, a brown precipitate was formed. Explain these observations. (3mks) Substances X and Y consist of molecules X₂ and Y₂ respectively. When the two elements react, they 4. form a molecule XY. The X-X bonds are as strong as the Y-Y bonds but X-Y bonds are stronger than either X-X or Y-Y. The equation for the reaction for the reaction is $X_{2(g)} + Y_{2(g)}$ $2XY_{(g)}$ Is the reaction exothermic or endothermic? Give a reason for your answer. (2mks)(a) Draw an energy level diagram for the reaction in (a) above. (b) (2mks)Pentane is a saturated hydrocarbon. 5. (a) What does the term saturated hydrocarbon mean? (1mk)(b) Give the equation for complete combustion of pentane when burnt in plentiful supply of air. (2mks)A solution of potassium chloride was added to a solution containing a lot of lead (II) nitrate. A 6. precipitate that weighed 5.56g was formed. Find the amount of potassium chloride in the solution. (Pb=207, Cl=35.5, K=39) (3mks).. Aluminium chloride vapour combines readily with ammonia gas to form a solid compound of formula 7. (AlCl₃.NH₃). Explain in terms of structure and stability of atoms why this reaction occurs. (2mks) (a) Give the systematic name of the following monomer and draw the structure of the polymer it 8. forms. (2mks)CH₂CHC1. Structure of polymer (b) State one use of the polymer in (a) (1mk)9. Gas A is 16 times denser than gas B. 100cm3 of A diffuses through a hole in 20 seconds. Calculate the volume of B that will diffuse through the hole in 30 seconds. (3mks)10. Use the following information to answer the questions that follow. $\operatorname{Sn}^{2+}_{(aq)}$ + 2e- \longrightarrow $\operatorname{Sn}_{(s)}E^{Q} = -0.14V$ $\operatorname{Cu}^{2+}(_{aq})^{+}$ 2e- \longrightarrow $\operatorname{Cu}_{(s)}^{<}$ $E^{Q}=0.34$ V. (a) Write the cell representation for the cell made up of two half cells. (1mk)(b) Write an equation for the cell reaction. (1mk)(c) Calculate the E^{Q} value for the cell. (1mk)A solution of hydrogen bromide in benzene does not react with sodium carbonate while an aqueous 11. solution of hydrogen bromide reacts with carbonates. Explain this observation. (2mks)

Chemistry paper 1,2 & 3

12. A student prepared ammonia gas and led it into a solution of zinc sulphate using the arrangement shown below.



- (a) State and explain the observations that were made in the beaker. (2mks)
- (b) Write the ionic equation for the reaction involving zinctions.
- A solid mixture consists of substances Y, Y, and Z whose solubilities at room temperature are shown in 13. the table below. 4.

Substance	Solubility (g/100g water)							
	At 25°C	At 60°C						
Х	0.02	0.02						
Y	63	82						
Z	48	64						

Describe how you would separate X Y and Z.

(3mks)

(1mk)

When a hydrated sample of calcium sulphate CaSO₄.XH₂O was heated until all the water was lost, the 14. following data was recorded.

Mass of crucible= 30.296g

Mass of crucible + hydrated salt= 33.111g

Mass of crucible + anhydrous salt = 32.781g

Determine the empirical formula of the hydrated salt (RAM: $CaSO_4 = 136$, $H_2O = 18$) (3mks)..

Zinc reacts with both concentrated and dilute sulphuric(VI) acid. Write equations for the two reactions. 15. (2mks)

- Starting with copper metal, describe how a sample of copper (II) chloride may be prepared in the 16. laboratory. (3mks)
- 17. The atomic number of sulphur is 16. Write the electron arrangement of sulphur on the following. (2mks)
 - (a) H₂S.....
 - (b) SO^{2}

18. Usingdots (.) and crosses (X) show bonding in:

- (a) The compound formed between phosphorus and hydrogen. (P=15, H=1)(1mk)(1mk)
- (b) carbon(II)oxide.(C=6, O=8)

- 19. Hydrogen and oxygen can be obtained by electrolysis of acidified water. Using equation for the reaction at the electrodes, explain why the volume of hydrogen obtained is twice that of oxygen. (2mks)
- 20. The energy level diagram below shows the effect of catalyst on the reaction path.

21.



Chemistry paper 1,2 & 3

(1mk)

(1mk)

(1mk)

(1mk)

(b) Describe how solid wastes containing radioactive substances should be disposed of. (2mks)

25. 8	Study	the	inf	ormati	on be	elow	and	answ	er th	e q	uesti	ons 1	that	fol	low.

Ions	Electronic arrangement	Ionic radius
Na^+	2.8	0.095
\mathbf{K}^+	2.8.8	0.133
Mg^{2+}	2.8	0.65

Explain why ionic radius of:

- (a) K^+ is greater than that of Na⁺ (1mk)
- (b) Mg²⁺ is smaller than that of Na⁺(2mks) 26. In the industrial extraction of lead metal, the ore is first roasted in a furnace. The solid mixture obtained is then fed into another furnace together with coke, limestone and scrap iron. State the function of each of the following in this process.
- a. Coke
- b. Limestone
- c. Scrap iron
- 27. (a) State Le-Chateliar's principle.

(b) Under certain conditions, carbon (IV) oxidereacts with water to form methanol and oxygen as shown in the equation below.

 $2CO_2 + 4H_2O \longrightarrow 2CH_3OH + 3O_2 H = +1452kJ/moles$

What would be the effect on yield of methanol if the temperature of the reaction mixture is decreased? Explain. (2mks)

28. Some average bond energies are given below.

Bond	Energy(kJ/mol)
C-C	348
C-H	414
Cl-Cl	243
C-Cl	432
H-Cl	340

Calculate the energy change for the reaction below:

 $C_2H_{6(g)} + Cl_{2(g)} \longrightarrow CH_3CH_2Cl_{(g)} + HCl_{(g)}(3mks)$

29. Study the flow chart below showing the reaction involved in the preparation of sulphuric acid and answer the questions that follow.



(a) Name the reagents.

KISII CLUSTER 233/2 CHEMISTRY PAPER 2 (THEORY)

SECTION A

1. The diagram below is an arrangement for the preparation of ethane. Study the diagram and answer the questions that follow.



29

Impure copper a) Identify the ore used in the extraction. (1mk)b) Name (i) gas D (1mk)(ii) Slag E (1mk)Write an equation for the reaction which is taking place in chamber F. c) (1mk)d) Explain how impure copper in chamber G can be purified. (2mks)e) In the industrial extraction of copper a steady of 8 amps was used. Calculate the time taken in hours to deposit 24kg of copper. (Cu = 64, IF=96500C) (3mks) f) Give two uses of copper. (2mks)

a) Study the diagram below and answer the questions that follow. 3.



- It is observed that a yellow solid is formed in the boiling tube. Explain this observation. (2mks) (i) (1mk)
- (ii) Name a substance that is used to dry Hydrogen subhide.
- (iii) State the observation to be made when hydrogen sulphide is burnt in a limited supply of air in the gas jar.
- (iv) Write an equation for the burning of Hydrogen sulphide in the gas jar.
- (v) List any two properties of hydrogen sulphide gas that are demonstrated in this experiment. (2mks)
- (vi) What precaution should be taken in carrying out this experiment? Give a reason. (2mks)
- In another experiment, a gas jar containing moist sulphur (IV) oxide is inverted over another gas jar b) containing hydrogen sulphide gas. State and explain the observation that is made. (2mks)
- 4. a) A student set up the apparatus below to prepare and collect carbon (IV) oxide gas.



- (a) Identify two mistakes in the set up.
- (b) Name liquid y.
- (c) What is the purpose of liquid x.

(2mks) (1mk) (1mk)

(1mk)

(1mk)

 b) The flow chart below shows the steps in the manufacture of sodium carbonate (Solvay process). Study it and answer questions that follow.



(a) (i) On the grid provided, plot a graph of solubility of A and B (y-axis) against temperature. (4mks)

5.

31



- (ii) A solution containing 68g of salt B is 100g of water is cooled from 100° c. At what temperature will the crystals of salt B first form? (1mk)
- (iii) Find the mass of crystals formed when the solution m (ii) above is cooled to 30° C. (1mk)
- (iv) From your graph; state the temperature at which both salts have the same solubility. (1mk)
- (v) Calculate the total mass of the solution at temperature obtained in (iv) above. (2mks)b) Use the information below on solubility to answer questions that follow

the momation below on solubility to answer questions that follow.				
Salt	Solubility at			
	70 ⁰ C	35 ⁰ C		
CuSO ₄ 38		28		
Pb(NO ₃) ₂ 78		79		

A mixture of 38g of copper (II) sulphate and 78g of lead nitrate in 100g of water at 70° C is cooled to 35° C. (i) Which of the two salts will crystallize? Explain. (1mk) (1mk)

(ii) Calculate the mass of the crystals formed.

(iii) State the salt that will be unsaturated at 35° C.

(1mk)(iv) How much of the salt in (iii) above would be required to make a saturated solution at 35° C. (1mk)

6. Study the scheme below and answer the questions that follows.



	Chemistry paper 1,2 & 3
(a) What property of mixture S is shown in step 1.	(1mk)
(b) Identify the following.	
Solid U	
Gas V	
Solution T	
Write precipitate R	
(c) Identify the ions present in solution T.	(1mk)
(d) Write an ionic equation for the reaction between.	
(i) Solution T and Barium chloride solution.	(1mk)
(ii) Solution W and Hydrochloric acid.	(1mk)
(e) Identify mixture S.	(2mks)

7. Study the table below. The letters do not represent the actual symbols of the elements.

Element	Atomic Number	Boiling point (K)
А	3	1603
В	13	2743
С	16	718
D	18	<u>ج</u> 87
E	19	1047

a)	Select the elements to which belong to the same: (i) Group	(1mk)
b)	(II) PERIOD	
U)	(i) is in gaseous state at room temperature. Explain (Room temperature taken as 25 ^o C)	(2mks)
2	(11) does not for an oxide.	(1mk)
C)	(i) formula of the Nitrate of element	$(1 m l_r)$
	(1) formula of the Nitrate of element.	(1mk)
	(ii) Equation for the reaction between element B and oxygen gas.	(1mk)
d)	What type of bond would exist in the compound formed when elements A and C react? Give a	reason.
	ast i	(2mks)
e)	Using dots (.) and crosses (x) to represent outermost electrons, show bonding in the compound	formed
	between elements E and C.	(1mk)
f)	Explain why the boiling point element B is greater than that of element E.	(1mk)
g)	Write a balanced equation when A reacts with cold water.	(1mk)
	tor C.	. ,

KISII CLUSTER 233/3 CHEMISTRY PAPER 3 (PRACTICAL)

1. You are provided with:

- Solution Q sulphuric acid
- Magnesium ribbon labelled solid R
- 1.5m sodium hydroxide solution S
- Phenopthalein indicator

You are required to:

- (i) determine the rate of reaction between magnesium ribbon solid R and sulphuric acid solution Q
- (ii) Determine the concentration of sulphuric acid in moles per litre.

(a) Procedure I

- I. Using a measuring cylinder, measure 50cm³ of solution Q and transfer it into a clean 100ml beaker.
- II. Use a ruler and scapel / knife to cut out five pieces, each of exactly 1cm length of magnesium ribbon.
- III. Place one piece of magnesium into the beaker containing solution Q and start a stop clock/watch immediately. Swirl the beaker gently ensuring that the piece is always inside the solution. Record in the table the time taken for the magnesium ribbon to disappear.
- IV. Repeat procedure III for each of the remaining 4 pieces to the same solution Q and complete table 1 below. N/B: Keep solution Q for use in procedure II

b) Table 1

c)

		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
Length of solid R added cm	1	2	3	4	5
(Magnesium ribbon)	, c	(O)			
Time taken in seconds	1				
Rate of reaction = $\frac{1}{t_{\text{time}}}$	nn				
	- X				(6mks)

(i) Plot a graph of rate of reaction  $\frac{1}{1}$  (graxis) against length of solid R added. (3mks) (ii) Use the graph to determine the time that would be taken for 3.5cm of solid R to disappear. (2mks) (iii) In terms of rate of reaction, explain the shape of your graph. (1mk)

d) Given that the mass of solid R used was 0.13g and relative atomic mass of magnesium is 24. Calculate the number of moles of solution Q that were used up during the reaction. (2mks)

# e) Procedure II

- Place all the solution obtained in procedure I in 100ml measuring cylinder. Add distilled water to make 100cm³ of solution in the measuring cylinder. Transfer this solution into a 100ml beaker and stir well. Label this solution T.
- ii) Fill the burette with solution S. Using a pipette and a pipette filler, place 25.0cm³ of solution T into a conical flask. Add 2 3 drops of phenolphthalein indicator into solution T and Titrate it with solution S. Record your readings in table 2. Repeat the titration two more times and complete table
- 2.

	Ι	II	III
Final burette reading			
Initial burette reading			
Volume of solution S used (cm ³ )			

(iii)Calculate the :(1mk)I. Average volume of solution S used.(1mk)II. Number of moles of sodium hydroxide – solution S used.(1mk)III. Number of moles of sulphuric acid in 25.0cm³ of solution T.(1 ½ mks)IV. Number of moles of sulphuric acid in 100cm³ of solution T.(1mk)

(iv) Using your answer in 1 (d) above, determine the number of moles of sulphuric acid in 50cm³ of solution Q.

(4mks)

#### Chemistry paper 1,2 & 3

(1mk)

(1 ½ mks)

- (v) Calculate the concentration of the original sulphuric acid-solution Q in moles per litre.
  - You are provided with solid U. Carry out the following tests on it and record your observations and inferences. a) Using a spatula put about half of solid U provided into a boiling tube. Add 20cm³ of distilled water and
  - shake well.
  - b) Divide solution formed in (a) into five portions of  $2 \text{ cm}^3$  each in separate test tubes.
  - (i) To first portion add ammonia solution dropwise till in excess.

2.

	Observations	Inferences
	(1mk)	
		(1mk)
(ii)	To the second portion add 2cm ³ of sodium sulph	ate solution.
	Observations	Inferences
	(1mk)	(2mks)

(iii) To the third portion add 2cm³ of lead (II) nitrate solution.

	Observations	Inferences		
	(1mk)	(2mk)		
(iv)	To the fourth portion add 2cm ³ of Barium nitrate solution.			
	Observations	Inferences		
	(1mk)	(2mk)		

(v) To the fifth portion add blue and red litmus papers.

Observations	<b>S</b> Inferences
(1mk)	(1mk)

for more tree past papers, visit, www.treekce

# **COMPLIANT II CHEMISTRY**



47

	After one day a gas was (a) Identify the gas.	found to have co	llected in th	e test-tube.		(1mark)
	(b) What will happen to the Give an explanation.	PH of the solution	on in the bea	ıker after one	day?	(2marks)
9.	. Two samples of hard water, A and B were boiled for some time and allowed to cool. Soap solution was stirred				tion was stirred	
	form lather	samples B readily	formed lau	her with soap	but sample A required mu	ich more soap to
	(i) Write the formula of two	salts likely to ha	we caused h	nardness in ea	ach of the samples.	(1mark)
	I Sample A:				-	
	II Sample B:	annlas an ha s	oftened by u	aing alakaa li	ima? Evalain	(Imarka)
10.	The peaks below show the	mass spectrum of	element Q.	ising stakes n	inne: Explain.	(2IIIarks)
	-	02.0				
		02.0			aff.	
			0 1	9.1	CO.	
	Intensity		0.1		Ders	
					AL OX	
					20 ²⁵	
		24	25	26,00		
	Calculate the Relative Aton	nic Mass (R.A.M	) of Q.	KLOOK		(3marks)

 

 11. A mixture X contains three colourless substances which are; alum, camphor and sugar. The solubility of these
 (3marks)

 substances in the different solvents is as follows. isit.

		1.	
	Water	Ethanol	Ether
Alum	Soluble	Ansoluble	Insoluble
Camphor	Insoluble	Soluble	Very soluble
Sugar	Soluble	Soluble	Insoluble

(a) What is the quickest way of getting a pure sample of alum from the mixture?
(b) How would you set a pure sugar from the mixture?

form

9.

(2marks) (2marks)



Chemistry paper 1,2 & 3





Formula compound N	NaCl	MgCl ₂	$Al_2Cl_6$	SiC1 ₄	PC1 ₃	SC1 ₂
B.P(°C)	1470	1420	Sublimes	60	75	60
M.P(°C)	800	710	At 800°C	-70	90	-80

(1 mark)

(1 mark)

(2 marks)

(2 marks)

- (a) Why is the formula of aluminium chloride given as  $Al_2Cl_6$  and not  $AlCl_3$ ?
- (b) Give **two** chlorides that are liquid at room temperature. Give a reason for the answer. (2 marks)
- (c) Give a reason why  $Al_2Cl_6$  has a lower melting point than  $M_gCl_2$  although both Al and Mg are metals.

(d) Which of the chlorides would remain in liquid state for the highest temperature range explain (2 marks)

6. The reaction between bromine and methanoic acid at 30°C proceeds according to the information given **below**.

 $Br_{2(aq)} + HCOOH_{(aq)} \xrightarrow{H^+_{(aq)}} 2Br^+_{(aq)} + CO_{2(g)}$ 

Concentration of $Br_{2(aq)}$	10.0	8.1	6.6	4.4	3.0	2.0	1.3
$(Mol dm^{-3}) \times 10^{-3}$							
Time (minutes)	0	1	2	4	6	8	10
						ses.c	sn
						00	

- (a) Plot a graph of concentration of bromine (vertical axis) against time (3 marks)
  (b) From the graph determine:
  - (i) The concentration of bromine at the end of 3 minutes?
  - (ii) The rate of reaction at time t where  $t = 1\frac{1}{2}$  minutes.
- (c) Explain how the concentration of bromine affects the rate of the reaction.
- (d) On the same axis, sketch the curve that would be obtained if the reaction was carried out at 20°C and label the curve as curve II. Give a reason for your answer. (2 marks)
- 7. (i) Study the structure **below**.



- (a) What observation is made when the molecule above is heated to a temperature of 113°C? (2 marks)
- (b) Write an equation for the reaction of the atom of the above structure with hydrogen. (1 mark) (ii)Study the flow chart **below** and answer the questions that follow.





(a) Write an equation for the reaction in the burning chamber. (1mark) State one use of concentrated hydrochloric acid. (1mark) (b) 18. The following results were obtained in an experiment. Blue copper II Colourless sulphate Magnesium Red-brown rihhon denosit I beginning Identify: (i) Red-brown deposit..... (1/2mark) (ii) The colourless solution. ..... (¹/₂mark) (iii) Write an ionic equation for the reaction between copper (II) sulphate and magnesium ribbon. (1mark) 19. A green solid D was heated until there was no further change. The following observations were made. A colourless liquid condensed on the cooler part of the test-tube. (i) (ii) A colourless gas which turns acidified potassium dichromate (VI) green was formed. (iii) Red-brown residue S was left. (a) Give the identity of solid **D**. (1mark) (b) How can you identify the colourless liquid? (1mark) (c) Name the residue S.  $\mathbb{R}^{\mathbb{N}}$ (1mark) Explain why the reaction between g of sodium carbonate and 2M hydrochloric acid is faster than the reaction is 20. faster between 1g of sodium carbonate and 2M ethanoic acid. (3marks) 21. Explain why one feels colder when ethanol is put on one's skin than when water is put. (2marks) 22. Use the set-up below to answer questions that follow: Sulphur ۸  $H_2O_2$  $\uparrow\uparrow\uparrow$ Heat В Acidified potassium  $MnO_2$ manganated (VII) (i) What is the role of manganese (IV) oxide? (1mark) (ii) State and explain the observation made in the tube B. (2marks) The information in the table below relates to elements in the same group of the periodic table. 23. 54

Study it and answer the question that follows. Element Atomic size 0.19 А 0.23 В С 0.15 Which element has the lowest ionization energy? Give a reason. (2marks) 24. The rate of reaction of powdered marble with 0.1 MHCl was determined at three separate temperatures 20°C, 30°C and 40°C. X grams of calcium carbonate were used and the volume of carbon (IV) oxide evolved were measured at suitable intervals. (a) Draw a labelled diagram of the suitable apparatus used for carrying out this experiment. (b) After 20 seconds the volumes produced at the three temperatures were 20, 40 and 80cm³ respectively. After 1 minute the volumes were 180, 224, 224cm³ respectively. What do you deduce from the above information? (1mark) 25. Hydrogen and nitrogen combine to form ammonia according to the equation given below in the Haber process.  $\Delta H = -92 K J$  $\sim$  2NH_{3(g)}  $N_{2(g)} + 3 H_{2(g)}$ Explain how the following would affect the yield of ammonia. A decrease in pressure. (i) (1mark) (ii) An increase in temperature. (1mark) Study the flow chart shown below and answer the questions that follow: 26. 2 White ppt Sodium hydroxide Solution R White ppt soluble in excess solution 4 White ppt soluble in excess (aq) (i) Identify the cation and anion present in solution R. (1mark) (ii) Write ionic equation to show how barium chloride solution reacts with solution R. (1mark) (iii)Name the white ppt formed (ii) above. (1mark) 27. Classify liquids into four categories in terms of their ability to conduct electricity some are filled for you. Class How they conduct 1 Conductors Have mobile electrons, conducts but is not decomposed 2 3 Contains few ions they conduct poorly. 4 Non-electrolytes (3marks)

28. The diagram below shows the heating of ammonium chloride.

Moist red litmus paper NH₄Cl

State the observations during the experiment. Explain these observations.

(3marks)

### COMPLIANT II 233/3 CHEMISTRY

#### Paper 3

 You are provided with: Solution C (sulphuric acid) which contains 6.115g in 250cm³.
 0.5M sodium hydroxide, solution D.

You are required to determine the

- (a) Concentration of sulphuric acid in moles per litre.
- (b) Determine the R.F.M of the acid.

# Procedure:

2.

Fill the burette with solution C.

Pipette 25cm³ of solution D into a clean conical flask.

Add 2-3 drops of phenolphthalein indicator and titrate with solution C.

Repeat the procedure for two more times to get three consistent results and record your results in table I below.

TADIE I	т	п	ш	1
	1	11	IHC.	_
Final burette reading (cm ³ )			S.	
Initial burette reading (cm ³ )			000	
Volume of solution C used (cm ³ )		č	Ron	(5 marks)
<ul> <li>(a) Determine the average volume of solution C used.</li> <li>(b) Calculate the number of moles of solution D, sodium hydroxide used.</li> <li>(c) Determine the number of moles of sulphuric acid that reacted.</li> <li>(d) Determine: <ul> <li>(i) the molarity of sulphuric acid in moles per dm³</li> <li>(ii) Calculate the relative formula mass of solution C, sulphuric acid.</li> </ul> </li> </ul>			(1 mark) (1 mark) (2 marks) (2 marks) (2 marks)	
<ul> <li>Sodium hydroxide solution labeled</li> <li>Solution L, 30g of acid L per litre of</li> <li>You are required to determine the re</li> <li>Procedure:</li> </ul>	K. of solution. lative formula mas	s of acid L.		
Using a burette, transfer 25.0cm ³ of and record it in table II.	solution K into a 1	00ml beaker. Mea	asure the temperatu	are, $T_1$ of solution K

Pipette 25.0cm³ of solution L into another 100ml beaker.

Measure the temperature  $T_2$  of solution L and record it in table II. Add all the solution K at once to solution L. Stir carefully with the thermometer.

Measure the highest temperature  $T_3$ , of the mixture and record it in table II. Repeat the procedure and complete table II.

TABLE II	Ι	II
Initial temperature of solution K, T, (°C)		
Initial temperature of solution L, T ₂ (°C)		
Highest temperature of mixture T ₃ (°C)		
Average initial temperature (°C)		
Change in temperature $\Delta T$ (°C)		

Calculate:

(i) Average  $\Delta T$  value.

(ii) Heat change for the reaction.

(1 mark)

# Chemistry paper 1,2 & 3 (Assume density of the solution = $1g/cm^3$ and specific heat capacity is $4.2Jg^{-1}K^{-1}$ ) (2 marks) (iii) Number of moles of acid L used given that the heat change for one mole of acid L reacting with sodium hydroxide solution is 134.4KJ. (2 marks) (iv) Concentration of acid L in moles per litre. (2 marks) (v) Relative formula mass of acid L. (2 marks) 3. You are provided with solid Q. You are required to carry out the tests below to determine the identity of Q. (a) Put all the solid Q in a boiling tube and add 12cm³ of distilled water and shake thoroughly. Divide the resulting solution into six portions. Observation Inferences (1 mark) $(\frac{1}{2} \text{ mark})$ To the first portion add NaOH dropwise till in excess. (b) **Observation** Inferences (1 mark)(1 mark)Insert a nichrome wire to the second and burn it in a non-luminous flame. (c) Observation Inferences (1 mark)(1 mark)To the third portion add lead (II) nitrate solution. (d) Observation Inferences $(\frac{1}{2} \text{ mark})$ (1 mark)To the fourth portion, add barium nitrate followed by dilute nitric acid. (e)

Observation	Inferences
(1  mark)	(½ mark)

# (f) To the fifth portion add acidified potassium permanganate.

Observation	Inferences
(1 mark)	(½ mark)

# (g) <u>To the sixth portion add acidified potassium dichromate.</u>

0/	Observation	Inferences	
			5

Chemistry paper	1	,2	&	3
ononnou's paper	-	·-	~	~

	Chemistry pap	er 1,2&
	$(1 \text{ mark}) \tag{1}$	mark)
CO 233 CH Pra PAI <u>CO</u> Rec	OMPLIANT II 3/3 HEMISTRY actical APER 3 <u>ONFIDENTIAL</u> equirements for candidates In addition to the apparatus and fittings found in a chemistry laboratory, each candidate will requ following:	ire the
Dag	auirements	
<u>nec</u> 1	Each candidates should be provided with:-	
1.	– Burette	
	- Pinette	
	- 3 Conjeal flacks	
	$-90 \text{ cm}^3$ of colution C (subhuric acid)	
	$= 90 \text{ cm}^3 \text{ of solution D} (0.5 \text{ M N}_2 \text{ OH})$	
	- About 60cm ³ of solution K	
	<ul> <li>About 60cm³ of solution I.</li> </ul>	
	- Two beakers	
	- One thermometer	
	- About 500ml of distilled water.	
	- Phenolphthalein indicator	
	- White sheet of paper/white tile.	
	- 6 test tubes in a rack.	
	- 1 boiling tube.	
	- Source of heat.	
	- 1g of solid Q (Sodium sulphite, Na ₂ SO ₃ )	
	- 15cm of Nichrome wire.	
	~0 ⁶	
2.	Each candidate should have access to: 500	
	– 2M sodium hydroxide.	
	– 2M lead (II) nitrate solution.	
	– Aqueous barium nitrate. 🎺	
	<ul> <li>Acidified potassium permanganate.</li> </ul>	
	<ul> <li>Acidified potassium dichromate.</li> </ul>	
	– Dilute nitric acid.	
	Duran question of colution of	
	<u>r reparation of solutions</u> ; Solution C is prepared by measuring 13 6cm ³ of 08% concentrated sulphuric acid (density 1.94 c/cm ³ ) on	d
_	diluting it to one litre	u
_	Solution D is made by dissolving 20g of sodium bydrovide in 250cm ³ of distilled water and diluting it to	one
_	litre.	one

- _
- Solution K 0.8M Sodium hydroxide. Solution L 0.8M Hydrochloric acid. _
(2mks)

#### BUURI EXAMS 233/1/ CHEMISTRY PAPER 1 (THEORY)

# **SECTION 1**

1. In an experiment, soap solution was added to three samples of water. The table below shows the volumes of soap solutions required to form lather with 100cm³ of each sample of water before and after boiling.

	Sample 1	Sample II	Sample III
Volume of soap before water is boiled (cm ³ )	27.0	3.0	10.6
Volume of soap[ after water is boiled (cm ³ )	27.0	3.0	<mark>93</mark> .0

- a) Which water sample is likely to be soft? Explain.
- b) Name the cause of change in the volume of soap solution used in sample III. (1mk)
- 2. The diagram below shows a Bunsen burner when in use.



	(a) Name the regions labeled C and D.	(2mks)
	(b) Explain how the hotness of a Bunsen burner flame can be increased.	(1mk)
3.	a) Write the electron configuration of calcium (atomic number 20) and Beryllium	
	(atomic number 4)	(1mk)
	b) Why is calcium more reactive than beryllium?	(2mks)
4.	The scheme below shows the energy that are involved between ice, water and water and steam.	Study it and
	answer the questions that follow.	
	$\Delta H_{I}$ $\Delta H_{2}$	
	$H_20 \longrightarrow H_20 \longleftarrow H_20$	
	$\Delta H_4$ $\Delta H_3$	
	a) What name is given to the energy change, $\Delta H_4$ ?	(1mk)
	b) What is the sign of $\Delta H_3$ ? Give a reason.	(2mks)

#### Chemistry paper 1,2 & 3

Study the flow chart below and answer the questions that follow. Von Gas U + Fecl2 (2) HC (az) -Ompound teat a) Name i) Compound T. (1mk)ii) Gas U. (1mk)Give a chemical test that you could use to identify gas U. (1mk)b) The table below shows the relative atomic masses and the percentage abundance of the isotopes L₁ and L₂ of element L. % abundance **Relative atomic mass** 62.93 69.09  $L_1$ L₂ 64.93 30.91 Calculate the relative atomic mass of element L. (3mks)Compound L reacts with hydrogen bromide gas to give another compound whose structure is н н н н н H - C - C - C - C - C - Hн н н н н Give the structural formula and name of compound L. (2mks) a) Write an equation for the reaction which takes place between ethyne and excess chlorine gas. b) The set-up below was used to study some properties of air. Moist iron Test Beaker Water

State and explain two observations that would be made at the end of the experiment.(3mks)Use the cell representation below to answer the questions that follow.(3mks)

 $Cr_{(s)}/Cr^{3+}_{(aq)}//Fe^{2+}_{(aq)}/Fe_{(s)}$ 

5.

6.

7.

8.

9.

- a) Write the equation for the cell reaction.
- b) If the E.m.f of the cell is 0.30volts and the  $E^{\Theta}$  values for  $Fe^{2+}_{(aq)}/Fe(_{s)}$  is -044 volts, calculate the  $E^{\Theta}$  value for  $Cr^{3+}_{(aq)}/Cr_{(s)}$  (2mks)
- 10. Starting with copper metal, describe how a solid sample of copper (ii) carbonate can be prepared. (3mks)

(1mk)

#### Chemistry paper 1,2 & 3

(1mk)

(2mks)

11. A student let up the apparatus shown below to prepare ammonia gas and react it with copper (II) sulphate solution.

0	// .	910	4	or cover		
	refer	Ctimer				4
	1-4	51110	18			
	()	7	LF	-Beaker		
Mixtur- 9 solution		The second secon		- Aqueous	Copper (11)	Sulphate
Ammonia	TT					
Shiphile	Heat		-			

- a) Identify solution V.
- b) State the observations which were made in the beaker.
- 12. The set-up below was used to separate a mixture of methanol and propanol. Study it and answer the questions that follow.

	C C C C C C C C C C C C C C C C C C C
	Water ord .
0	and and and the
X -	the second secon
	74 A Fait
	Water west
ottoned	Beakon.
flask.	Of methanol
0	T T Repand
	theat of

- State the function of X a)
- b) Which liquid will collect first in the beaker? Give a reason.

(1mk) (2mks)

(2mks)

(1mk)

- 13. Charcoal is a fuel that is commonly used in cooking. When it burns it forms two oxides.
  - a) Name the two oxides.
  - b) State one use of the two oxides.
- 14. The table below gives three experiments on the reaction of excess sulphuric(VI) acid and 0.5g of Zinc done under different conditions. In each the volume of gas was recorded at different time intervals.

Experiment	Form of Zinc	Sulphuric (VI) Acid solution.
Ι	Powder	0.8M
II	Powder	1.0M
III	Granules	0.8M

On the axis below draw and label the three curves that could be obtained from such results. (3mks)



- 15. a) State the Graham's law of diffusion. (1mk)
  - b) The molar masses of gases W and X are 16.0 and 44.0 respectively. If the rate of diffusion of W through a porous material is 12cm³s⁻¹ calculate the rate of diffusion of x through the same material. (2mks)
- 16. The diagram below represents a set-up that was used to react lithium with water. Study it and answer the questions that follow.



- a) Write an equation for the reaction that takes place given that the atomic number of lithium is 3. (1mk)
- b) Why would it not be advisable to use potassium in place of lithium in the above set-up? (1mk)
- c) State the purpose of heating the wet glass wool. (1mk)
- 17. The structure of methanoic acid is



What is the total number of electrons used for bonding in a molecule of methanoic acid? Give reasons.

(2mks)

(1mk)

- 18. The basic raw material for extraction of aluminum is bauxite.a) Name the method that is used to extract aluminium from bauxite. (1mk)
  - b) Write the chemical formula of the major components of bauxite. (1mk)
    - c) Name one impurity in bauxite.
- 19. Zinc metal and hydrochloric acid reacts according to the following equation.
  - $Zn_{(S)} + 2HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2}(g)$

1.96 g of zinc metal were reacted with 100cm³ of 0.2M HCl acid.

71

# Chemistry paper 1,2 & 3

(2mks)

Determine the reagent that was in excess. a)

Calculate the total volume of hydrogen gas that was liberated at s.t.p. b)

(Zn = 65.4; Molar gas volume = 22.4 litres at s.t.p) (2mks)

20. A students investigated the effects of an electron current by passing it through some substances. The student used inert electrodes and connected a bulb to the circuit. The table below shows the substances used and their states.

Experiment	Substances	State
1	Potassium carbonate	Solid
2	Copper (II) sulphate	Solution
3	sugar	Solution
4	Lead (II) iodide	molten

- In which experiment did the bulb not light? a)
- b) Explain your answer in a) above.
- 100g of radioactive ²³³Pa was reduced to 12.5g after 81 days. Determine 21. a)

		91	
		the half life of pa.	(2mks)
	b)	²³³ Pa decays by beta emission what is the mass number of the element $_{91}$ formed.	(1mk)
2	T1.	- finet store in the industrial means fortune of nitrie (V) and in the astellation with the set of	~ ~ ~

22. The first step in the industrial manufacture of nitric (V) acid is the catalytic oxidation of ammonia gas. (1mk)

- a) What is the name of the catalyst used?
- b) Nitric (V) acid is used to make ammonium nitrate, state two uses of ammonium nitrate. (1mk)(1mk)
- c) Why is nitric (V) acid stored in dark bottles?
- 23. The grid below shows parts of a periodic table. The letters do not represent the actual symbols of the elements.

		L C	0	G			
				Η		Ι	
F		N					
and the second se							

- a) Select the:
  - i) Element which has the largest atomic radius.
  - ii) Most reactive non-metal.
- Show on the grid the position of the element J which forms  $J^{2+}$  ions with electronic configuration 2,8,8. b) (1mk)
- 24. In an experiment, chlorine gas was passed into moist hydrogen sulphide in a boiling tube as shown in the diagram.

. (	gas co-	>	<u> </u>
	tor	Aral	Bolling mbe
-	Hydrogen		J
	Sulphia	le U	

- (a) What observation was made in the boiling tube?
- (b) Write an equation for the reaction which took place in the tube. (1mk)
- (c) What precautions should be taken in carrying out this experiment? Give a reason. (1mk)

(1mk)

(1mk)

(1mk)

(2mks

(1mk)

(1mk)

25. The table below gives some information about the electrical conductivity and the likely bonding in substances N, P, and Q. Complete the table by inserting the missing information in the spaces numbered 1, II, III. (3mks)

Substance	Likely type of bonding present	Electrical conductivity	
		solid	Molten
N	Metallic	Ι	Conducts
Р	Π	Does not conduct	conducts
Q	III	Does not conduct	Does not conduct

26. The diagram below is part of a set up used in laboratory preparations of a gas.

A concorporated
(*) Sulphunic (v) acid
EEE
25th
Esert Contraction of the series of the serie
Sodium Sodium
ATIAL Chiloride
Heat
JISH.

Complete the diagram to show how a dry sample of the gas can be collected.	(3mks)
An oxide of element F has the formula $F_2O_5$	
a) Determine the oxidation state of F.	(1mk)

c) In which group of the periodic table is element F.

27

#### BUURI EAST 233/2 CHEMISTRY PAPER 2 (THEORY)

# **SECTION A**

b)

1. a) The figure below shows the changes that takes place between states of matter. Some of them have been identified and others labeled.



(1mk)
(1mk)
(1mk)
у.
(2mks)
(1mk)

(2mks)

2. The grid below represents part of the periodic table study it and answer the questions that follow. The letters so not represents actual symbols of element.

	Γ							
Μ				Ν	Р	Т		
R								

- i) Select a letter which represents an element that loses electrons most readily. Give a reason for your answer. (2mks)
- ii) Explain why the atomic radius of **P** is found to be smaller than that of **N**.

3.

a)

- iii) Element M reacts with water at room temperature to produce 0.2dm³ of gas. Determine the mass of M which was reacted with water (molar gas volume at room temperature is 24dm³, Relative atomic mass of M=7
- b) Use the information in the table below to answer the questions that follow. The letters are not actual symbols of the elements.

Element	State of oxide at room temperature	Type of oxide	Bonding oxide
U	Solid	Acidic 6.	Covalent
W	Solid	Basic	Ionic
Χ	liquid	Neutral	Covalent
Υ	Gas	Neutral	Covalent

Identify a letter which represents an element in the table that could be calcium, carbon or sulphur. Give a reason in each case.

Study the flow chart below and answer the questions that follow. c)

prince HEthanoic acid -----2) Concentrated Sulphunc (VI)acid Polymensation Step Ethene Ethanol M Warm Step 2 Hydrogen, 150°C Nickel i) Excess chlorine P N Step 3

i) Name the compounds L, N	(2mks)
ii) Draw the structural formula of compound M showing two repeat units?	(1mk)
iii)Give the reagent and the condition used in step I.	(2mks)
Reagent	
Condition	
iv)State the type of reaction that takes place in :	
I) Step 2	(1mk)
II) Step 3	(1mk)
The molecular formula of compound P is C ₂ H ₂ Cl ₄ . Fraw the structural formula of com	pound P.
Jr.	(1 mk)

The set up below was used to prepare dry hydrogen chloride gas and investigate its effects on heated 4. jisi iron fillings.

25 concentra	Herwacid	Tube B	100n. Fillings	PI
HO Supra	T/	1 /	VA	
ZZZKOZ	ZA K	A ARTA	VIA	9
4440 4	44	Heat		
				-
	==+-Liqu	idM		1
you the				-

i) Name substance L	(1mk)
ii) Name Liquid <b>M</b>	(1mk)
iii) What will be observed in tube <b>B</b> ?	(1mk)
iv) Write an equation for the reaction that occurs in tube B.	(1mk)
v) Why is the gas from tube <b>B</b> burnt?	(1mk)
i)Explain the following observations.	
I) A white precipitate is formed when hydrogen chloride gas is passed through the second seco	ough aqueous silver nitrate.
	(1mk)

	II) Hydrogen chloride gas fumes in ammonia gas.	(1mk)
)	State two uses of hydrogen chloride gas.	(1mk)

d)

b)

c) The diagram below is a representation of an industrial process for the manufacture of a bleaching powder.



i) Name substance **Q** 

(1mk)

- ii) When the bleaching powder is added to water during washing, a lot of soap is used. Explain
- d) The diagram below shows the Frasch process used for extraction of sulphur. Use it to answer the questions that follows.



- i) Identify **X**
- ii) Why is it necessary to use superheated water in this process? (1mk)
- iii) State one property of sulphur that makes it possible to be extracted by this method. (1mk)
- 5. a) Naturally occurring magnesium consists of three isotopes. 78.6% ²⁴Mg, 10%²⁵Mg and ²⁶Mg. Calculate to one decimal place, the relative atomic mass of magnesium.
  - b) When magnesium burns in air, it forms a white solid and a grey –green solid. When a few drops of water are added to the mixture, a gas that turns red litmus paper blue is evolved. Identify the:
    - i) White solid

I) Name of gas

II) Use of the Gas

Gas evolved and state its use,

ii)

(1mk)

(1mk)

(2mks)

- (1mk) (1mk)
- c) Two different samples of water, I and II, were tested with soap solution. Sample II was further subjected to two other processes before adding soap. 20cm³ of each sample of water was shaken with soap solution in a boiling tube until a permanent lather was obtained. The results are as shown in the table below.

Water Sample	Volume of soap solution needed cm ³			
	Before boiling	After boiling		
Ι	10	5		
П	6	6		
II After filtering	6	6		

		Chemist	ry paper 1,2 & 3
II after distilling	2	2	

- i) Identify the water sample that had temporary hardness. Explain your answer. (2mks)
- ii) Explain why the results for sample II are different after distilling but remain unchanged after filtering. (2mks)

iii.State two disadvantages of using both water samples for domestic purpose.

a) i) What is meant by the term Enthalpy of formation?

6.

ii) The enthalpies of combustion of carbon, methane and hydrogen are indicated below.

$$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} \Delta H = -393 \text{ kJmol}^{-1}$$

 $H_{2(g)} + \frac{1}{2} O_{2(g)} \longrightarrow H_2O_{(g)} \Delta H = -286 \text{ kJmol}^{-1}$ 

- Enthalpy of combustion of  $CH_4 = -890 \text{kJmol}^{-1}$ I Draw an energy cycle diagram that links the enthalpy of formation of methane to the enthalpies of combustion of carbon, hydrogen and methane. (2mks)
- II Determine the enthalpy of formation of methane.

b) Ethanol can be manufactured from ethane and steam as shown in the equation below.  $C_2H_{4(g)} + H_2O_{(g)} \longrightarrow CH_3CH_2OH_{(g)}$ 

Temperature and pressure will affect the position of equilibrium of the above reaction. Name the other factor that will affect the position of the equilibrium of the above reaction? (1mk)

c) In an experiment to determine the rate reaction between calcium carbonate and dilute hydrochloric acid, 2g of calcium carbonate were reacted with excess 2M hydrochloric acid. The volume of carbon (IV) oxide evolved was recorded at regular intervals of one minutes for six minutes. The results are shown in the table below.

Time (Minutes )	1	2 3	4	5	6
Volume of carbon (iv) oxide (cm ³ )	170	2965 40	465	480	480
	170	2705 10	105	100	100

i)Plot a graph of time in minutes on the horizontal axis against volume of carbon (IV) oxide on the vertical axis. (3mks)

- ii) Determine the rate of reaction at 4 minutes.
- 7. The set-up below was used by a student to investigate the products formed when aqueous copper(ii) chloride was electrolyzed using carbon electrodes.



a) i) Write an equation for the reaction that takes place at the cathode.

(1mk)

(2mks)

(1mk)

(2mks)

(2mks)

- ii) Name and describe a chemical test for the products initially formed at the anode when a highly concentrated solution of copper (ii) chloride is electrolyzed. (3mks)
- iii) How would the mass of the anode change if the carbon anode was replaced with copper metal? Explain. (2mks)
- b) 0.6g metal B was deposited when a current of 0.45A was passed through an electrolyte for 72minutes. Determine the charge on the ion of metal B. (RAM of B=59, 1 faraday = 96500coulombs) (3mks)
  c) The electrodes potential for cadmium and Zinc are given below.
  - The electrodes potential for cadmium and Zinc are given below.  $Cd^{2+}_{(aq)} + 2e^{-}$   $Cd_{(s)}$   $E^{\Theta} = -0.4V$

 $Zn^{2+}_{(aq)} + 2e^{-}$   $Zn_{(s)} = -0.76V$ Explain why it is not advisable to store a solution of cadmium nitrate in a container made of Zinc. (2mks) **BUURI EAST** 233/3/ CHEMISTY PAPER 3 (PRACTICAL)

## **CONFIDENTIAL INSTRUCTIONS TO SCHOOLS**

In addition to the fittings and apparatus found in chemistry laboratory, each student will require:

- 1.5g of solid T accurately weighed. _
- About  $250 \text{ cm}^3$  of solution **B**.
- About  $150 \text{ cm}^3$  of solution **R**.
- About 400cm³ of distilled water.
- One burette.
- One pipette filler.
- One pipette  $(25 \text{ cm}^3)$
- One 100cm³ measuring cylinder.
- One filter paper.
- One filter funnel
- 4 conical flasks(250ml)
- One thermometer
- About 0.5g of solid **F**.
- About 0.5g of solid H.
- One 10cm³ measuring cylinder.
- 1 glass rod. _
- About 0.5g NaHCO₃. _
- ree past papers, visit, www.treekcsepastpapers.com A piece of universal indicators paper
- PH chart.

# ACESS TO:

- 2M Sodium hydroxide
- 2M Ammonia solution. _
- Aqueous Barium Nitrate.
- 2M Nitric acid.
- Bromine water. _
- Acidified potassium chromate (VI) _
- Acidified potassium manganite (VII) _
- Bunsen burner. _

### Note :

- Solid  $\mathbf{T}$  = Benzoic acid
- √ Solid  $\mathbf{F}$  = sodium carbonate.
- 1 Solid  $\mathbf{H} = \mathbf{Oxalic}$  acid.

# **Preparation of solutions**

### Solution R (0.01M $H_2SO_4$ )

- Dissolve 56cm³ of conc. H₂So₄ in about 500cm³ of distilled water. Shake well and make it up to 1 litre. i)
- Take  $10 \text{ cm}^3$  of the solution of H₂SO₄ prepared in (i) above and dilute it with distilled water to make it up to 1 ii) litre of solution **R**.

# Solution B: (0.02M NaOH)

- i) Dissolve 4.0g of NaOH in distilled water and make it up to 1 litre of solution.
- Take 200cm³ of sodium hydroxide solution prepared in (i) above and dilute it with distilled water to make up ii) one litre solution **B**.

**BUURI EAST CHEMISTRY** PAPER 3 (PRACTICALS) JULY/AUGUST 2018 2 ¼ HOURS

#### You are provided with;

- A monobasic acid solid T.  $\triangleright$
- Sodium Hydroxide Solution B.  $\triangleright$
- $\triangleright$ 0.0 M solution **R** of a dibasic acid  $H_2A$ .

#### You are required to:

- i. Prepare a saturated solution of solid T.
- ii. Standardize sodium hydroxide solution B.
- iii. Determine the solubility of solid T in water at room temperature

#### PROCEDURE.

- Place all the **solid T** provided into a dry conical flask. Measure out 100cm³ of distilled water using a measuring a) cylinder and add it to solid T. Shake thoroughly and leave it to stand.
- Fill the burette with solution **B** pipette 25 cm³ of solution **R** into a conical flask. Add **2** or **3** drops of b) phenolphthalein indicator and titrate against solution **B** until a permanent pink colour appears. Record the readings in the table below. Repeat to obtain three accurate readings.

#### Table A.

	T De A		
	1:151	2	3
Final burette reading (cm ³ )			
Initial burette reading (cm ³ )			
Volume of solution <b>B</b> used (cm ³ )			
Calculate the average titre.			(1mk)

- Calculate the average titre. (a)
- i) Write the equation for the reaction of the dibasic acid and sodium hydroxide. (b) (1mk)ii) Calculate the concentration of sodium hydroxide, solution  $\mathbf{B}$  in moles per litre. (3mks)
- Measure the temperature of the solution of solid T. using a dry filler paper and dry filter funnel filter the c) solution into a dry conical flask. Pipette 25cm³ of the filtrate into a conical flask. Add 2 or 3 drops of phenolphthalein indicator and titrate against sodium hydroxide, solution **B** until a permanent pink Colour appears. Record the readings in the table below. Repeat to obtain three accurate readings.

#### Temperature of the solution of solid $T = \dots ^{0}C$ . (1mk)

	1	2	3
Final burette reading (cm ³ )			
Initial burette reading (cm) ³			
Volume of solution <b>B</b> used $(cm^3)$			

(4mks)

(1mk)

(2mks)

(4mks)

d) Calculate the average titre.

Calculate: e)

- the number of moles of acid T in 25 cm³ of the filtrate. i)
- the number of moles of acid T in  $100 \text{ cm}^3$  of solution of acid T. (1mk) ii)
- Given that the molecular formula of acid T is C₉H₆O₂, calculate the solubility of the acid in grammes per iii)

100cm³ of water.

- (C=12.0, H = 1.0, 0=16.0) ( $1^{1}/_{2}$  marks) You are provided with solid **F.** Solid **F** is suspected to be sodium sulphate. Use materials provided below to 2. show the steps you would follow to test for sodium and sulphate ions.
- 2M ammonia solution. _
- 2M Nitric acid. _
- 2M Sodium hydroxide solution. _
- Aqueous Barium Nitrate solution _
- Glass rod. _
- Non luminous Bunsen flame _
- Distilled water. _

#### Describe the procedure and the expected observations.

	Procedure	A	Expected Observation.
5.	b) Tert 1	Use the materials provided to carry	y out the tests you have described in (a) above.
1)	Test T	Observations	Inferences
			COL
		$(\frac{1}{2} \text{ mark})$	(½ mark)
ii)	Test 2	()	A A A A A A A A A A A A A A A A A A A
		Observations	Inferences
			ALCSC .
	T	(½ mark)	(la mark)
111)	Test 3	Observations	Inferences
			$(\frac{1}{2} \text{ mark})$
		(½mark)	
iv)	Test 4	Observations	Informas
			interences
v)	Test 5	( ¹ /2mark)	( ⁴ / ₂ mark)
.)		1 mo	
		Observations	Inferences
		(1mark)	(½mark)
3.	You are p	rovided with solid <b>H</b> . Carry out the	e tests described and note down your observations and inferences.
a)	Divide the	e resulting solution into 5 portions.	ing tube. Add about 6cm of distilled water and shake to dissolve.
		Observations	Inferences
		I	
		(½ mark)	(½ mark)
b)	To the 1 st	portion add <b>2-3</b> drops of acidified	potassium chromate VI.
í			
		Observations	Interences
		I	
			80

					Chemistry paper 1,2 & 3
	(1mk)			(1mk)	
c)	To the second portion add <b>2-3</b> c	lrop of acidit	fied potassium ma	nganate (VII)	
	Observations		Inf	ferences	_
	(1mk)				(1mk)
d)	To the <b>3rd</b> portion add <b>2-3</b> drops	s of Bromine	e water.		
	Observations Inf	erences	1		_
	(1mk)			(1mk	)
e)	Place a quarter spatulaful of soo in the test tube.	lium hydrog	en carbonate in a	dry test tube. Add	the $4^{th}$ portion to the NaHCO ₃
	Observations Infe	rences			, co
				-tp3P	
	(½ mai	·k)		(1/2 mark)	
f)	Determine the PH of the 5 th por	tion.	۱ . برا	284CST	
	Observa	ntions	Inferences		
	( ¹ / ₂ mks)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ers (1/2mks)		
	oret	ee Past Y			
	torn				

#### **CEKENA MOCK** 233/1 FORM FOUR **CHEMISTRY PAPER 1** THEORY

1.	a) State 2 apparatus used to measure fixed and accurate volume of liquids	(2 mks)
	b) Draw <u>one</u> of the apparatus named in 1 (a) above	(1 mk)
2.	Using the equation given below, identify the reducing agent and explain using oxidation numbers.	(3 mks)
	$2H_2S_{(g)} + SO_{2(g} \longrightarrow 2H_2O_{(1)} + 3S_{(g)}$	
3.	Illustrate using a diagram how to separate a mixture of Iodine and Sodium Chloride	(3  mks)
4.	(i) State the law of combining volumes of gases	(1  mk)
	(i) What volume of methane would remain if a burner containing 40cm ³ of methane burns in 40c	$m^3$ of enclosed
	air? (Assume oxygen is 20% by volume of air	(2  mks)
5	Dry chloring as was passed through two pieces of coloured action cloth as shown	(2 mks)
5.	Dry chlorine gas was passed through two pieces of coloured cotton cloth as shown	
	Dry ->- Cl2 Dry ->- Cl2 Dry ->- Cl2 Wet Cloth Experiment 1 Experiment 2	
	a) State what is observed in each experiment Experiment 1.	(2 mks)
	b) Write equations to show the reaction that will take place in experiment 2 if Sulphur (iv) oxide	is used
	instead of Chlorine	(2  mks)
6.	Potassium exists as a radioactive isotope 40 K as well as 39 K.	(2 1110)
	a) State how the two isotopes differ from each other with respect to their nuclear composition	(1 mk)
	b) The product of a radioactive decay of $\frac{49}{K}$ is $\frac{40}{20}$ Ca. Explain the type of radioactive decay it up	ndergoes
		(1 mk)
	c) If the half-life of the radioactive isotopes $40_{19}$ K is 1.3 x 10 ⁹ years. Determine the time it will t	take for 4g of
7	the isotope to disintegrate to Ig	(1  mk)
7.	a) lead is a conductor but not an electrolyte. Explain this statement	(1  mk)
	b) State now copper metarand monten copper (ii) Chloride conduct electric current	(2 111KS)
8.	The structure of ethanoic acid is	
	НО	
	H - C - C	
	н о – н	

What is the total number of electrons used for bonding in a molecule of ethanoic above (1 mk) A gaseous compound consists of 86% carbon, and 14% Hydrogen by mass. At S.t.P 3.2dm³ of the compound had a mass of 6g. Calculate:-

- a) Its empirical formula (c = 12, H = 1 molar gas volume at S.t.p = 22.4dm³) (2 mks)
- Its molecular formula b)

9.

(2 mks)

(1 mk)

(1 mk)

10. a) A certain solution K was analysed using various testing reagents. The table below shows the tests and observations made

Test		Observation
(i)	Addition of 3 drops of Pb(NO ₃ ) ₂	White precipitate formed
(ii)	Addition of 3 drops of Ba(NO ₃ ) ₂	White precipitate formed
(iii)	Addition of 5cm ³ of 2M HCL acid	Effervescence of gas observed
(iv)	Addition of 2cm ³ acidified potassium chromate(vi)	Change of colour from orange to green

- (i) Identify the anion present in the solution
- (ii) Write an ionic equation for the reaction that takes place in test (ii)
- b) Solid Aluminium hydroxide can be prepared by reacting excess ammonia solution with aluminium chloride solution. Explain why excess sodium hydroxide can not be used (1 mk)
- 11. Below is a diagram of a flame. Study it and answer questions that follow



17. An equilibrium exists between the reaction of Chromate(vi) ion and dichromate(vi)  

$$2\text{CrO}_4^{2^-}(\text{aq}) + 2\text{H}^+(\text{aq}) \xrightarrow{} \text{Cr}_2\text{O}_7^{2^-}(\text{aq}) + \text{H}_2\text{O}_{(l)}$$
  
Yellow Orange  
State and explain observation made when acueous HCl is added to the above systemic equation of the s

#### State and explain observation made when aqueous HCl is added to the above system at equilibrium (2 mks) 18. a) Name the type of artificial radioactivity represented by each of the following nuclear equations

- (i)  $H + H \longrightarrow He + n + Energy$  (1 mk)
  - (ii)  $U + n \longrightarrow Ba + Kr + 3 n + Energy$  (1 mk)
- b) Give one difference between nuclear reactions and chemical reactions (1 mk)

	Chemistry	y paper 1,2 & 3
19.	Dacron is a synthetic fibre formed by polymerization reaction between a alkanoic acid and diol (al	kanol with
	two functional groups)	
	$HOOC - C_6H_4 - COOH$ $OH - CH_2 - CH_2 - OH$	$(2 m l r_{a})$
	<ul> <li>a) Show now polymerization between the two occurs</li> <li>b) Name the type of polymerization involved in forming deeron</li> </ul>	(2  mks)
20	Given elements W has atomic number 14 and consist of isotopes as shown below.	(1 mk)
20.	Isotope A B C	
	Isotope mass 28 29 30	
	Percentage abundance 92.2 4.7 3.1	
	a) What are isotopes	(1 mk)
	b) Determine the relative atomic mass of W.	(2  mks)
21.	The set up below shows how dry chlorine gas is prepared in the lab.	< <i>,</i>
1		
	+ conc	
	$= \frac{1}{1+c_1} + \frac{1}{1+c_1}$	
T		
-		
-1-	The set of conc sulphur gor and	
-+-	1000 goods -	
	heat Solid W	
1	a) Identify colid W	(1 ml)
	a) Identify solid w b) Identify another drying agent that can be used to dry the gas	(1  mk)
	c) Identify mistakes made in the set up above	(1  mk)
22	State and explain the observations made when burning magnesium is lowered in a gas iar full of ca	arbon (iv)
	oxide.	(3  mks)
23.	Jepkemoi performed an experiment to determine the solubility of potassium chlorate in water at 30	0 C. She
	obtained the following results.	
	Mass of dish $=$ 15.86g	
	Mass of dish + saturated solution $= 26.86g$	
	Mass of dish + solid potassium chlorate after evaporation to dryness $= 16.86$ g	
	Calculate the solubility of potassium chlorate	(3 mks)
24.	The structure below represents a cleansing agent	
	$R \longrightarrow S \longrightarrow O^{*} Na^{*}$	
	0	
	(i) Which type of cleansing agent is represented above	(1  mk)
	(11) State one advantage & disadvantage of using the cleansing agent above	(2 mks)
	Advantage	
25	Disauvaniage	(2 m l m)
23. 26	The diagram below shows the effect of heat on conner (II) nitrate	(2 mks)
∠0.	The magram below shows the effect of heat on copper (11) intrate	

#### Chemistry paper 1,2 & 3



- b) Identify the liquid to be collected first. Explain
- c) On the diagram indicate the direction of the flow of water

(1 mk)

# **CENA MOCK** 233/2 **FORM FOUR CHEMISTRY PAPER 2** THEORY

# SECTION A

			SECTIONA	
1.	Use the table	below to answer the q	uestions that follows. (The letters are not the actu	al symbols of the elements)
	Element	Atomic number n	nelting point ⁰ C	
	Q	11	97.8	
	R	13	660	
	S	14	1410	
	Т	17	-101	
	U	19	63.7	
	a) Write the e	lectronic arrangement	for the ions formed by the elements R and T	(1 mk)
	(i) A set	ni-conductor of electri	city	(1 mk)
	(ii) The 1	nost reactive metal	-	(1 mk)
	c) To which g	roup of the periodic ta	ble does Q belong	(1 mk)
	d) Compare th	e atomic radius of Q a	nd R	(1 mk)

- e) Use dots (.) and crosses (x) to represent the outermost electrons and show the bonding formed between S and (1 mk) Т
- f) Explain why the melting point of element R is higher than that of element Q (2 mks) (1 mk)
- g) Write an equation for the reaction that takes place between T and water
- The diagram below shows a set up by a student in an attempt to prepare and collect dry oxygen gas 2.



a)	(i) complete the diagram to show how dry oxygen can be collected	(2 mks)
	(ii) Identify solid W	(1 mk)
	(iii) Write a chemical equation for the reaction talking place in the boiling tube	(1 mk)
b)	State one use of oxygen gas	(1 mk)
c)	A piece of phosphorous was burnt in excess air and the product obtained was shaken with small	amount of
	hot water to make a solution.	
	(i) Write an equation for the burning phosphorous in excess air	(1 mk)
d)	Explain why cooking pots made of aluminium do not corrode easily when exposed to air	(1  mk)

e)

3.

The following schem represents various reactions starting with ethanol



96

					Chem	istry paper 1,2 & 3
	d)	Explain why gas L is	passed into wa	ter through an inverted funnel		(2 mks)
	e)	(i) identify M and N				(1 mk)
		(ii) Write an equation	on for the reacti	on between M and Sulphuric a	ncid	(1 mk)
	f)	In industry, the gas L	is obtained by	direct combination of two gas	es D and E, by passing th	em over a
		catalyst F at 450°C an	nd high pressur	e		
		(i) Name the gases l	D and E			(2 mks)
		(ii) Name the catalys	st F			(1 mk)
		(iii) Write an equation	on for the reacti	on between the gases D and E		(1 mk)
		(iv) Copper (II) oxide	e was heated in	a pure sample of gas L. State	and explain the observati	on you would
		make				(2 mks)
5.	U	se standard potential	for elements	G, M, P and Q given below	to answer the questions	s that follow.
	E	^θ volts			-	
	G	$e^+$ (aq) + e $\longrightarrow$	$G_{(s)}$	-2.71		
	N	$[^{2+}_{(aq)} + 2e^{-}_{(aq)}$	M _(a)	-2.37		
	21	$N^+(aq) + 2e$	$N_{2(-)}$	0.00		
	$\mathbf{p}^{2}$	$2^+$ $+2^ $	$\mathbf{P}_{(\mathbf{a})}$	+0.34	~	
	1/	(aq) + 2c	$\Gamma_{(s)}$	+0.5+	COL	
	1	$_{2}O_{2(g)} + c$	<b>Q</b> (g)	12.07	els.	
					R	
`	$(\cdot)$	x 71 · 1 1 4 · 1·1 1			stl	(2, 1)
a)	(1)	Which elements is likel What is the $E^{\theta}$ of the	ly to be hydrog	en? Give a reason to your answ	ver	(2  mks)
	(iii)	Draw a well labeled d	liagram of the	electrochemical cell that would	d be obtained when half c	ells of M and P
	()	are combined				(3 mks)
	(iv)	Calculate the $E^{\theta}$ value	e of the electri	c chemical cell constructed in	(iii) above	(2 mks)
b)	Du	ring electrolysis of aque	eous copper (II	) sulphate using copper electro	odes a current of 0.8 ampl	nere was passed
	thro	bugh the cell for 10 hou	lrs.			(1 1-)
	(1) (ii)	Determine the change	for the reaction	anode which occurred as a res	sult of the electrolysis pro	(1  mK)
	(11)	1Faraday = 96500 cor	ulombs)	anode which occurred as a re.	suit of the electronysis pre	(3  mks)
		,	,	all a		(- )
			Ś	X		
6.	(a)	The diagram below rep	present the ext	raction of sulphur by the frash	process	
	(1)	Identify and state the	use of the subs	stances that pass through tube A	A and C	(2  mks)
	(11)	Knomble and mono	chine are allo	subpes of sulphur. They are	interconvertible as show	will below
		Rhombic	<u>, <u>()</u></u>	Monoclinic		
		401	9600			

What does temperature 96[°]C represent (1 mk) (iii) State the differences in crystalline appearances between rhombic and monoclinic crystals(1 mk) (b) The following scheme represents the steps followed in the contact process. Study it and then answer the questions that follow:-



Chemistry paper 1,2 & 3

Calculate the volume that would be produced at r.t.p from 13g of Zinc (f) (Zn = 65.0, molar gas volume at r.t.p= 24dm³)

(3 mks)

#### **CENEKA MOCKS** 233/3 **CHEMISTRY PAPER 3**

# (CONFIDENTIAL)

- 1. Solution A
- 2. Solution B
- 3. Solution C
- 4. 100ml measuring cylinder
- 5. 100ml measuring beaker
- 6. Burette (0 - 50ml)
- 7. Thermometer  $(-10 - 100^{\circ}C)$
- 1g Solid Q in a stoppered container 8.
- 9. Metallic spatula
- 10. Boiling tube
- 11. 3 test tubes
- 12. Dist. Water in a wash bottle
- 10ml measuring cylinder 13.
- 14. 0.5g Solid R (about) in a stoppered container
- 15. About 5cm³ of absolute ethanol in a dry test tube
- 16. About 0.2g of Sodium Hydrogen Carbonate

### Access to :

- Source of heat 1.
- 2. Acidified Potassium dichromate(VI)
- 3. 20v hydrogen peroxide
- 4. 2M sodium hydroxide
- 5. Barium nitrate solution
- 6. 2M Nitric (V) acid

# ast papers, visit. www.treekcsepastpapers.com NB: the access solutions, each to be provided with a dropper.

- **Preparation of solutions**
- 1M Hơi[©] 1. Solution A
- Solution B - 1M Ethanoic acid 2.
- 3. Solution C - M NaOH
- 4. Solid Q - Hydrated Iron (II) Sulphate
- 5. Solid R - Maleic acid

#### CEKENA MOCKS 232/3 FORM FOUR CHEMISTRY PAPER 3 PRACTICAL

#### For examiner's use only.

Q1. You are provided with

- 1M Hydrochloric acid labeled solution A
- 1M Ethanoic acid labeled solution B
- Sodium hydroxide solution labeled solution C

You are required to compare the molar enthalpy of neutralization of the two acids when reacted with sodium hydroxide

### **Procedure I**

- Using a measuring cylinder transfer 50.0cm³ of aqueous sodium hydroxide into a 100cm³ plastic beaker
- Measure its temperature and record it in the table 1 below.
- Fill the burette with Acid A to the 0.0 cm³ mark.
- Add 5.0cm³ of Acid A to the sodium hydroxide and stir with the thermometer. Measure and record the highest temperature reached in the table 1 below. Add a further 5.0cm³ of Acid A to the contents in the beaker and stir. Measure and record in the table the highest temperature reached.
- Continue to add 5.0cm³ portions of Acid A until total volume of 40.0cm³ of acidA has been added. Stir after each addition and measure and record the highest temperature reached in the table 1 below.

X

Table 1

1	
Volume of Acid A (cm ³ )	Maximum temperature (°C)
0.0	
0.0	
5.0	S
5.0	
	Can
10.0	
10.0	
15.0	
15.0	
20.0	
20.0	
در 🖉	
25.0	
23.0	
~ <b>O</b> `	
20.0	
50.0	
ξO.	
35.0	
55.0	
40.0	
40.0	

#### **Procedure II**

- Empty the burette and rinse it thoroughly with distilled water
- Fill the burette with Acid B
- Pour the contents in the beaker. Rinse it and transfer 50.0cm³ of sodium hydroxide solution into it.
- Repeat activity in procedure I, using Acid B in place of Acid A.
  - Record your results in table 2 below

#### Table 2

Volume of Acid B (cm ³ )	Maximum temperature ( ⁰ C)
0.0	

(3 mks)

		Chemistry paper 1,2 & 3
	5.0	
	10.0	
	15.0	
	20.0	
	25.0	
	30.0	
	35.0	
	40.0	
		(3 mks)
On th	ne grid below draw graphs of temperature against volume for the two experiments on the s	ame axes
(4 m	ıks)	
(a)	Use your graphs	
(1) I A .	To determine the highest change in temperature $(\Delta T)$ for the two acids	(11-)
	10 A	(1  mk)
	Determine the realized of A is a A is a Darie bit the transmission of A is a darie of A is a d	(1  mk)
(11)	Determine the volume of Acid A and Acid B used in the two experiments	(1 mk)
(b) (de	Use yor values in (a) (1) above to calculate the Molar enthalpy of neutralization for the ty ensity of solution = $1g/cm^3$ , $c = 4.2J/g/k$ )	vo acids
Acid	A	(2  mks)
Acid	B	(2  mks)
(c)	Explain the difference in the values obtained in (b) above	(2  mks)
(d)	Draw an energy level diagram for the Molar enthality of neutralization of Acid A	(2  mks)
(e)	Identify source of error in procedure II above given than the value you have obtained in	(b) above is less than
(-)	the theoretical value	(1 mk)
	R	()
02. (	a) Suppose you are provided with	
$\geq$	Solid P	
$\succ$	2M Sodium hydroxide	
$\triangleright$	Aqueous Sodium sulphate 🖉	
$\triangleright$	Aqueous Lead (II) Nitrate	
$\triangleright$	Distilled water	

Solip P is suspected to be Barium chloride

From the reagents provided, select and describe three tests that could be carried out <u>Consecutively</u> to confirm if solid P is Barium chloride. Write the tests and expected observations in the spaces provided.

(i)	Test 1	Expected observation	
	1mk	1 mk	
- (ii)	Test 2	Expected observation	
	1mk	1 mk	
(iii)	Test 3	Expected observation	
(iv)			
			101

	1mk	1 mk						
<b>(1)</b>	N							
(b)	You are provided with inorganic solid Q, carry out the tests and record your observations and inferences in the spaces provided							
(i)	Place solid Q into a boiling tube and add about 8cm ³ of distilled water. Shake the mixture. To about 2cm ³ of							
	solution Q in a test tube add 3 drops of Acidified potassium dichromate (vi) solution							
(ii) _								
-	Observation	inferences						
	1mk	1 mk						
(iii)	To about $2 \text{ cm}^3$ of solution O in a test tube add	2 cm ³ of hydrogen peroxide followed by sodium hydroxide						
()	dropwise until in excess							
-	Observation	inferences						
		o ere						
	lmk	1 mk						
		2005						
(iv)	To about 2cm ³ of solution Q in a test tube, add	2 drops of Barium nitrate solution followed by 3 drops of dilute						
_	nitric (V) acid							
	Observation	inferences						
		. NM						
	1mk	i mk						
	all and a second s							
03.	You are provided with organic solid R carry	but the tests and record your observations and inferences in						
	the spaces provided.							
(a) _	Using a metallic spatula ignite about half of so	lid R in a Bunsen burner flame						
	Observation	inferences						
	1mk of	1 mk						
	CI C							
	$\sim$							
(b)	(i) Place the other half of solid R in a test tube	containing 5cm ³ of absolute ethanol provided. Shake the mixture.						
	Retain the mixture for use in part (II) below.							
	Observation							
	lmk	1 mk						
	THIN							
(ii)	Add solid sodium hydrogen carbonate provided to the mixture in part b(i) above							
	Observation	inferences						
	lmk	1 mk						

(1mk)

(1mk)

(2mks)

(1mk)

(1mk)

#### COMPLIANT I 233/1 CHEMISTRY PAPER 1 THEORY

1. Study the figure below and answer questions that follow.



Name the parts labelled F and G.

2. The table below gives information on four elements represented by K, L, M and N. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electron arrangement	Atomic radius	Ionic radius	
K	2, 8, 2	0.136	0.065	S
L	2, 8, 7	0.099	0,181	
М	2, 8, 8, 1	0.203	0.133	
Ν	2, 8, 8, 2	0.174	0.099	

(a) Which twoelements have similar chemical properties? Explain.(2mks)Describe how a solid sample of Lead (II) Chloride can be prepared using the following reagents:Dilute Nitric Acid, Dilute Hydrochloric Acid and Lead Carbonate.(3mks)

+7KJmol⁻¹

Dilute Nitric Acid, Dilute Hydrochloric Acid and Lead Carbonate. 4.  $Na+_{(g)} + Cl_{(g)} \longrightarrow NaCl_{(s)} \Delta H_1 = -781 \text{KJmol}^{-1}$ 

 $H_2O_{(l)}$ 

3.

 $\operatorname{NaCl}_{(s)} \longrightarrow \operatorname{Na}_{(aq)}^{+} + \operatorname{Cl}_{(aq)}^{-} \Delta H_2$ 

(a) What is the name of  $\Delta H_1$ ?

(b) Calculate the heat change for the process:  $H_2O_{(1)}$ 

$$Na^+_{(aq)} + Cl^-_{(aq)}$$
  $Na^+_{(aq)} + Cl^-_{(aq)}$ 

5. The table below gives the solubility of potassium bromide and potassium sulphate at  $0^{\circ}$ C and  $40^{\circ}$ C.

Substance	Solubility $g/100g H_2O$ at				
Substance	$0^{0}C$	$40^{0}$ C			
Potassium bromide	55	75			
Potassium sulphate	10	12			

When an aqueous mixture containing 60g of potassium bromide and 7g potassium sulphate in 100g of water at  $80^{\circ}$ C was cooled to  $0^{\circ}$ C, some crystals were formed.

(a) Identify the crystals.

- (b) Determine the mass of the crystals.
- 6. The graph below shows the amount of calcium carbonate and calcium chloride varying with time in the reaction.  $CaCO_{3(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + H_2O + CO_{2(g)}$

#### Chemistry paper 1,2 & 3



- (a) Which curve shows the amount of calcium chloride varying with time? (1mk)
- (b) Explain why the two curves become horizontal after a given period of time. (1mk)
- (c) Sketch on the graph, how curve II would appear if the experiment was repeated using a more dilute hydrochloric acid solution. (1mk)
- 200cm³ of Nitrogen (I) Oxide (N₂O) pass through a porous plug in 2 minute 15 seconds. How long will it take the same volume of Sulphur (IV) Oxide (SO₂) gas to diffuse through the same plug under the same conditions? (N = 14, O = 16, S = 32)
- 8. An organic compound contains carbon and hydrogen only. When this compound was completely burnt in excess air, it gave 9.6g of Carbon (IV) Oxide and 4.9g of water vapour. The molecular mass of the hydrocarbon is 58. Determine the molecular formula. (C = 12, O = 16, H = 1) (3mks)
- 9. Study the flow chart below and answer the questions that follow.







(2mks)

- Calculate the relative atomic mass of X. 17. In an experiment, concentrated sulphuric (VI) acid was put in a beaker and exposed to air for one week as shown
  - below.



(i) What observation was made after one week? Explain.

(2mks)

- (ii) What property of sulphuric (VI) acid was being investigated in the experiment? (1mk)
- 18. Below is a set-up of apparatus used to prepare hydrogen gas in the laboratory. Study it and answer the questions that follow.



(a) Write a chemical equation for the two reactions taking place in he above set-up.	(2mks)
(b) State the chemical test for hydrogen gas.	(1mk)
State three reasons why air is considered to be a mixture but not a compound.	(3mks)
19. Study the set up below and answer the questions that follow.	

Copper turnings



<ul> <li>(a) Identify gas X.</li> <li>(b) State the observation</li> <li>(c) Write equation for the set-up below shows the set-up below s</li></ul>	n made in the comb he reaction in comb he catalytic oxidation	bustion tube. bustion tube. on of ammonia in t	the laboratory.	(1mk) (1mk) (1mk)			
	E.	Red hot platinum					
<ul> <li>(a) State and explain the</li> <li>(b) Write a chemical equ</li> <li>21. When sulphur is heated liquid at 113°C. The 400°C, produces a brow</li> </ul>	observation made. ation for the first re in a boiling tube in liquid changes at 1 vnless viscous liqui	eaction taking place n absence of air, th 80 ⁰ C into a dark b d.	e in the beaker. he yellow crystals melts prown very viscous liqu	(2mks) (1mk) (1mk) (1mk) (1mk) (1mk) (1mk)			
<ul><li>(a) Draw the molecular s</li><li>(b) Explain why the mol</li><li>(c) If the brown liquid produced?</li></ul>	ten liquid becomes at 400 [°] C is coole	in the yellow cryst viscous. d rapidly by pour	ing it into cold water,	(1mk) (1mk) which form of sulphur is (1mk)			
Sunlight Gas X Burette Visit, MMM							
<ul> <li>(i) Identify gas X.</li> <li>(ii) Write an equation fo</li> <li>23 The 1st 2nd and 3rd ionization</li> </ul>	r the production of t	gas X. Mol of elements G	and R are given below	(1mk) (2mks)			
Element	st I.E	$\frac{1}{2^{nd} I.E}$	3 rd I.E				
G	520	7,300	9,500				
R	420	3,100	4,800				
<ul> <li>(i) Define the term I</li> <li>(ii) Apart from the de energies.</li> <li>(iii) Calculate the ama R_(g)</li> <li>24. A gaseous compound corr</li> </ul>	st ionization energy ecrease in energy le pount of energy for th ► R ³⁺ _(g) + 3e ⁻ usists of 86% carbor	vels, explain the bi he process: 1 and 14% hydroge	g difference between th en by mass. At s.t.p. 3.2	(1mk) the 1 st and 2 nd ionization (1mk) (1mk) 2dm ³ of the compound had a			
mass of 6g. Calculate its	s molecular formula	. (1 mole of a gas a	at s.t.p. = $22.4$ dm ³ )	(3mks)			

25. The table below shows the pH values of some solutions.

Solution	J	K	L	М	Ν	
рН	6	13	2	10	7	

- (a) Which solution is likely to be:
  - (i) Potassium hydroxide
  - (ii) Lemon juice
- (b) Explain why a solution of hydrogen chloride gas in methyl benzene was identified as N. (1mk)
- 26. Using dots (•) and crosses (x) to represent electrons, show bonding in the compound formed when the following elements reacts. (N = 14, H = 1).

Nitrogen and Hydrogen.

(1mk)

(1mk)

(1mk)

(1mk)

- 27. Some salts may be classified as double salts or basic salts. Trona with the formula Na₂CO₃.NaHCO₃ is an example of a double salt. An example of a basic salt is basic magnesium carbonate with formula MgCO₃.Mg(OH)₂.
- (a) What is meant by a double salt?
- (b) Write equations of reactions that occur when dilute hydrochloric acid is reacted with: (2mks) (2mks)
  - (ii) Basic magnesium carbonate.
- 28. During Olympics, urine sample of five short distance runners were taken and tested for the presence of two illegal steroids by paper chromatography. Methanol was used as the solvent. A chromatogram from the test appeared as shown below. Study the chromatogram and answer the questions that follow.



(a) Which of the two steroids is most likely to be more soluble in methanol? Give a reason. (1mk)(b) Identify the athletes that tested positive for the illegal steroids. (2mks)

### COMPLIANT I 33/2 CHEMISTRY PAPER 2 THEORY

1. (a) Study the flow chart below and answer the questions that follow.



(1mk)

(1mk)

(1mk)

(2mks)

2. The flow chart below shows the Haber process in the large scale manufacture of Ammonia gas. Use it to answer the questions that follow.



- (iv) In the Haber process optimum temperature of  $500^{\circ}$ C and 200 atmospheres of pressure are used to get optimum yield of Ammonia. Why can⁴ lower temperatures and higher pressure be used? (2mks)
- (c) Give <u>two</u> reasons why finely divided iron is the commonly used catalyst.
- (d) State and explain the observation made when dry ammonia gas is passed over heated copper (II) Oxide in a combustion tube. (2mks) (1mk)
- (e) Give **two** uses of ammonia gas.
- 3. (a) In a reaction to determine the rate of a reaction between magnesium ribbon and dilute hydrochloric acid 2g of magnesium ribbon were reacted with excess 2M hydrochloric acid. The volume of hydrogen gas evolved was recorded at regular intervals of one minute for eight minutes. The results are as shown in the table below.

Time (minutes)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
Volume of Hydrogen gas (cm ³ )	95	160	210	237.5	260	272.5	275	275

- (i) Plot the graph of time in minutes on the horizontal axis against volume of hydrogen gas on the vertical axis. (3mks)
- (ii) Name the factor that was investigated in this experiment.
- (iii) Use the graph to determine the volume of hydrogen gas that was produced between  $2\frac{3}{4}$  minute and 5.0 minutes. (2mks)
- (iv) Explain the shape of the graph between minutes 7.0 and 8.0.
- (b) Hydrogen gas reacts with chlorine gas to form hydrogen chloride gas as shown in the equation below.

$$H_{2(g)} + Cl_{(g)} \ge 2HCl_{(g)}$$

- (i) Explain the effect on the yield of  $HCl_{(g)}$  by lowering the pressure for this reaction. (2mks)
- (ii) Using a well labeled diagram, describe how a solution of hydrogen chloride can be prepared in the laboratory. (2mks)

4. The diagram below shows a set up which was used by student to investigate effect of electricity on solid Molten Lead (II) Bromide. Study it and answer the questions that follow.


#### Chemistry paper 1,2 & 3

(1mk)

(2mks)

(2mks)

(1mk)

The following data was collected from the experiment:

Initial temperature of water	12°C
Final temperature of water	22 [°] C
Initial mass of spirit lamp	11.42g
Final mass of spirit lamp	10.50g
Specific heat capacity of water	4.20Jg ⁻¹ k ⁻¹

- (i) What is the function of the part labeled X.
- (ii) Using the data above, calculate the change in heat of combustion of ethanol, assuming density of water is 1g/cm³.
   (2mks)
- (iii) Calculate the molar heat of combustion of Ethanol (C = 12, O = 16, H = 1)
- (iv) Find the heating value of ethanol.
- (d) Give <u>two</u> precautions necessary when using fuels.
- 5. (a) Starting with a solid sample of calcium carbonate, describe how a pure dry sample of calcium sulphate can be prepared in the laboratory. (3mks)
  - (b) The flow chart below shows a sequence of reactions involving a mixture of two salts, mixture Z. Study it and answer the questions that follow.



(e) Write an equation showing the effect of heating a sample of anhydrous copper (II) suphate in a test tube.

(1mk)

123

(2mks)

29. The grid below forms part of the Periodic Table. Use it to answer the questions that follow. The letters do not represent the actual symbols of element.

А			С	М	D	Е	F
	В	Н	Ι		J	К	
	G						

- (a) (i) What name is given to the group of elements where B and G belong? (1mk)
  - (ii) Select a letter which represents an element that gain electrons most readily. Give a reason for your answer.
     (2mks)
  - (iii) Explain why the atomic radius of K is smaller than its ionic radius.
  - (iv) Using dots (•) and crosses(x) show the bonding between element G and M. (2mks)
  - (v) A carbonate of element G react with dilute sulphuric (VI) acid at s.t.p to produce  $0.4 \text{dm}^3$  of gas. Determine the mass of G which was reacted with the acid. (Molar gas volume at s.t.p is 22.4 dm³. (Relative atomic mass of G = 24 and C = 12, O = 16) (2mks)
- (b) Explain why sodium chloride has melting point of 1074[°]C whereas silicon tetrachloride has a melting point of 203[°]C under the same conditions. (2mks)

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#### **COMPLIANT I** 233/3 **CHEMISTRY PRACTICALS CONFIDENTIAL INSTRUCTIONS TO SCHOOLS**

Each candidate will require the following in addition to the apparatus and fittings in a Chemistry Laboratory:-

- $100 \text{cm}^2$  of solution Q. 1.
- Accurately weighed 0.4g of hydrated euthanedioic acid Solution T. 2.
- One burette 50ml. 3.
- 4. One pipette – 25ml.
- One pipette filler. 5.
- 6. One 250ml volumetric flask.
- One thermometer  $-10^{\circ}\text{C} 110^{\circ}\text{C}$ . 7.
- 8. One boiling tube.
- Six test-tubes in a rack. 9.
- 10. One metallic spatula.
- 400cm² of distilled water. 11.
- 12. Means of labeling.
- About 1g of NaHCO₃ Solid A. 13.
- 14. 5 cm³ of solution D.
- 15. About 1g of solid R.
- 16. Bunsen burner.

# Access to:-

- Visit. www.freekcsepastpapers.com 2M aqueous ammonia solution supplied with a dropper.
- Phenolphthalein indicator supplied with a dropper.
- 0.5M KI solution.
- 2M HCL
- 2M NaOH .
- Zinc granules.
- Acidified KMnO₄ supplied with a dropper.
- Acidified K₂Cr₂O₇ supplied with a dropper
- Solution D is a mixture of  $Pb(NO_3)_2$  and  $Cu(NO_3)_2$
- Solid R is a maleic acid. for more tree

# **COMPLIANT I**

233/3

# CHEMISTRY

PAPER 3

# PRACTICAL

- 1. You are provided with:-
- 4.5g of solid P in a boiling tube.
- Solution Q, 0.2M sodium hydroxide.
- Phenolphthalein indicator.
- You are required to determine:
- Solubility of solid P at different temperatures. (i)
- (ii) The value of **n** in the formula  $(HX)_n \cdot 2H_2O$  of solid P.

# Procedure I

- (a) Fill the burette with distilled water. Using the burette, add  $4.0 \text{ cm}^3$  of distilled water to solid P in (i) a boiling tube. Heat the mixture in a water bath while stirring with a thermometer to about 70°C until all the solid dissolves.
  - (b) Allow the solution to cool while stirring with the thermometer and note the temperature at which crystals of solid P start to appear. Record this temperature in table I.

- Using the burette, add  $2.0 \text{ cm}^3$  of distilled water to the contents of the boiling tube. Heat the mixture while (c) stirring with the thermometer until all the solid dissolves while in the water bath.
- (d) Allow the mixture to cool while stirring and note the temperature at which crystals of solid P start to appear.
- (e) Repeat the procedure (c) and (d) three more times, heating the solution in a water bath and record the temperature in the table I. Retain the contents of the boiling tube for use in procedure II.
- (ii) Complete the table by calculating the solubility of solid P at the different temperatures. (The solubility of substance is the mass of that substance that dissolves in 100cm³ (100gm) of water at a particular temperature.

#### TABLE I

Volume of water in boiling tube (cm ³ )	Temperatures at which crystals of solid P first appear ( ⁰ C)	Solubility of solid P (g/100g) of water
4		
6		
8		
10		
12		aff
		(6mks)

(i)	On the grid provided, plot a graph of solubility P against ter	mperature.	(3mks)
(ii)	Using your graph, determine the temperature at which 100g	g of solid P would dissolve in	100cm ³ of water.
		- Store	(1mk)
(iii)	Determine the solubility of solid P at 55 ^o C.	0000	(1mk)
		NCS N	
Pro	cedure II		

## **Procedure II**

- Transfer the contents of the boiling tube from Procedure I into 250ml volumetric flask. Rinse the boiling tube and the thermometer with distilled water and add to the volumetric flask.
- Add more distilled water to make up the mark. Label this solution P. .

tor more tree past f

- Fill the burette with solution P. Using a pipette and pipette filler place 25.0cm³ of solution Q into a conical flask. .
- Titrate solution Q with solution P using phenolphthalein indicator. •

	I	II	Ш	
Final burette reading cm ³				
Initial burette reading om ³				
$\frac{1}{2}$				
volume of P used cm				(4 1)
<ul> <li>alculate the:</li> <li>Average volume of solution</li> <li>Number of moles of solution</li> <li>Number of moles of solution</li> <li>The number of moles of solution</li> <li>The formula (HX) n•2H₂O.</li> <li>You are provided with solicits</li> <li>Solution K. Write your obs</li> <li>(a) Place all solid W in a bout 10 cm³ of comparison of the solution of the solution</li></ul>	on P used in the example on P used in the example of the second s	<ul> <li>Apperiment.</li> <li>1 in solution Q.</li> <li>are relative formula mass or required to react with one</li> <li>K. You are required to can ences accordingly.</li> <li>olid W, and shake.</li> </ul>	f P, (HX) $_{n} \cdot 2H_{2}O$ is e mole of P. Hence ry out the tests pres	(4mks) (1mk) (2mks) 126. (2mks) find the value of n (2mks) scribed in solid W a
Observations		Inference	- that	
(1mk)		(1mk) CSER	<del>,</del>	
(ii) Divide the product in	(i) into four equ	NN	£ 2) ( 1' 1	
first portion.		al portions. Add 5 drops	of 21vi sodium nyd	roxide solution to
first portion. Observation		al portions. Add 5 drops		roxide solution to
<ul> <li>i) Divide the product in first portion.</li> <li>Observation</li> <li>(1mk)</li> <li>i) Add 2 – 3 drops of lease</li> </ul>	ad (II) nitrate solu	Inference (1mk) tion to the second portion		roxide solution to
(ii) Divide the product in first portion. Observation (1mk) Add 2 – 3 drops of lea	ad (II) nito rour equa	Inference Inference		roxide solution to
(1) Divide the product in first portion. Observation (1mk) i) Add 2 – 3 drops of leave Observation (1mk)	nd (II) hitrate solu	Inference (1mk) (1mk) ion to the second portion Inference (1mk)		roxide solution to
(1mk) i) $Observation$ (1mk) i) $Add 2 - 3 drops of lease Observation (1mk) (1mk) (1mk) (1mk) (1mk)$	add 2 – 3 drop	Inference (1mk) tion to the second portion Inference (1mk) s of barium (II) chloride	e provided followe	roxide solution to
(ii) Divide the product in first portion. Observation (1mk) (i) Add 2 – 3 drops of lea Observation (1mk) (1mk) v) To the third portion, hydrochloric acid. Shake th	add 2 – 3 drop ne mixture well.	Inference (1mk) tion to the second portion Inference (1mk) s of barium (II) chloride	e provided followe	roxide solution to d by 5 drops of 3
<ul> <li>(ii) Divide the product in first portion.</li> <li>Observation         <ul> <li>(1mk)</li> <li>ii) Add 2 – 3 drops of lease</li> <li>Observation</li></ul></li></ul>	add 2 – 3 drop ne mixture well.	Inference (1mk) tion to the second portion Inference (1mk) s of barium (II) chloride Infe	e provided followe	roxide solution to

Observation Inferences 127

		Chemistry paper 1,2 & 3
(1mk)	(1mk)	
To about 2cm ³ of solution K,	add few drops of sodium hydroxide till in excess.	
Observation	Inference	
(1mk)	(1mk)	
To about $2 \text{cm}^3$ of solution	n K. add $2 - 3$ drops of Barium chloride solution.	
Observation	Inference	
(1mlr)	(1ml)	
(1mk)		
To about 2cm ² of solution K, a	add 2cm [°] of bromine water provided.	
Observation	Inference	
(1mk)	(1mk) strong	
To about $2$ cm ³ of solution K, a	dd 2 – 3 drops of lead (II) nitrate solution.	
Observation	Inferences	
(1mk)	visit. www.fre	
	e Past papers'	
for more t	Kor	

KI	GUMO EX	AMS					
CH 231	EMISTRY /1	-					
251 SE(	CTION A						
1.	Study th	e nuclides belov	V				
	Nuclide	Mass number	Atomic Numb	erNo. of Neut	rons%Abudai	nce	
	A1	36	18		-	0.34	
	A2	38	18		-	0.06	
	A3	40	18		-	99.6	
	(i)	Calculate the r	number neutrons	on each isotop	pes		(1mk)
	(ii)	Calculate the r	elative atomic m	ass of nuclide	A		(2mk)
	(iii)	Give two com	mercial uses of C	Dxygen			(1mk)
2.	In terms	of electron defin	ne the following	terms			
	(i)	Oxidation				on	(1mk)
	(ii)	Reduction				.S.C	(1mk)
3.	(a) Diffe	erentiate between	n a strong acid ar	nd a concentra	ted acid.	Det -	(2mk)
	(b) State	the types of har	dness in water.			* Qat	(1mk)
4.	The tabl	e below gives th	e solubilities of	salts Q and P	at O°C and 40	°CS	
		Sal4 6	- l h : 1:4 ~/100	<b>f</b> 4	جع	×	
		San	Solubility g/100g	g of water	et		
		0 5	5	75			
		P 1	0	12	wai		
	When an	n aqueous mixtu	re of 60g of Q ar	nd 7g of P in 1	00g of water	at 80°C was cooled to O°C s	ome crystals
	were for	med.		VISIT			
	1. Identif	y the crystals fo	rmed.	S'			(1MK)
-	11. How n	nuch crystals in	grams were form	ied.			(IMK)
5.	When 5.	.04g of mixture of	of anhydrous So	drum carbonat	e and sodium	hydrogen carbonate were he	eated to a
	constant	mass of 4.11g r	esidue.	. 1 1 1		. 1 . 1	(1) (12)
	a. Write	an equation for t	he reaction that	takes place wi	ien the mixtui	re is heated.	(1MK)
	D.	Calculate the p	ercentage of and	iyarous soaiu	n carbonate ii	n the mixture.	(2NIKS)
6.	One mo	le hydrogen chlo	ride gas reacts v	vith an organic	compound Z	to give a simple product wi	th structural
	formula	shown below		C			
		11 11	ci H				
		T H	1 1	11			
		4-0-0	- C - C	-H			
		it it	1				
		H TI	HH				
				0			

	a.	Name the product	(1MK)
	b.	Draw the structural formula of the compound Z	(1MK)
	c.	To which homologous series does compound Z belong?	(1MK)
7.	Wł	nat is meant by the term enthalpy of neutralization	(1MK)
8	a) Sta	te Graham's law of diffusion	(2MKS)





		Chemistry paper 1,2 & 3
$E^{2+}$	2.8	
Select the elements in		
i. Same group		(1/2 MKS)
ii. Period II		(1/2 MKS)
Write the electronic config	uration of elements	
i. C		(1/2 MKS)
ii. D		(1/2 MKS)
24. Use the bond energies give	n below to calculate the enthalpy change for the	reaction
Bond	Energy kj/mole	
C – H	413	
C - Br	280	
		off
Br – Br	193	5. 19.
		×°.
H - Br	365	
$C_2 H_{6 (g)} + Br_{2(g)}$ —	$\longrightarrow$ C ₂ H ₅ Br _(g) + HBr _(g)	(2MKS)
25 Study the encode come	und holow Witte	
25. Study the organic compo	und below when	
H H	H di	
H-C-C-C.	- O - C th	
1 4 11	10°	
H " 0	ST. H	

Q. In which homologous series does the compound belong to? (1MKS) a.

b. Name and draw the structure of two compounds that can be used to prepare the above compound (2MKS)

26. The grid below shows a section of the periodic table. The letters do not represent the actual symbols for elements. Study it and answer the question that follows. (1MK)

a) Give the name of the family in which element H and I belong.

A				,			t
-			E	F	H		T
4	B	5			I		I
C				4		J	
 -							

b) Compare the atomic radii of elements.

- i) F and G explain (1MK)
- ii) D and I Explain (1MK)
- 27. The set-up below was used to prepare hydrogen gas. Study it and answer the questions that follow

i. What would be liquid G

(1MK)



- ii. Is the method of collecting the gas correct? Give a reason
- iii. Give two physical properties of hydrogen gas

tormore

- 28 . Given sodium carbonate, Lead (ii) nitrate solid and water, explain how you can obtain a solid sample of lead (ii) carbonate. (3MK)
- 29. Solution can be classified as acid ,base and neutral. The table below shows solutions and their pH value.

Solution	PH value
R	2.5
S	6.9
T	13.5

Identify two solutions that would react with Aluminum Oxide. Explain

(2MKS)

(1MK)

(1MK)

(1mark)

## KIGUMO CLUSTER CHEMISTRY PP2

- 1. (a) Define an electrolyte.
  - (b) The set-up below was used to carry out electrolysis of an aqueous solution of magnesium sulphate using carbon electrodes.



- i) State and explain the observation made at the cathode.
- (ii) Write down an equation for the reaction that occurs at the anode.

(1 mark) (1mark)

(3 marks)

- (iii) What change occurred to the concentration of magnesium sulphate solution during the experiment? Explain. (3 marks)
  - (c) During the electrolysis of dilute copper (II) chloride, the mass of the platinum cathode increased by 3.2g. If a current of 2.5 amperes was passed through the solution for some time, calculate the time taken. (Cu= 64.0; 1 faraday = 96,500 Coulombs)
     (3 marks)
  - (d) Use the information below to answer the question that follows.
  - $Al^{3+}(aq) + 3e \xrightarrow{} Al(s) \qquad E^{\theta} = -1.66v$
- $Fe^{2+}(aq) + 2e^{-} \sum Fe(s) \qquad E^{\theta} = -0.44v^{-}$
- Why is it not advisable to keep a solution of fron (II) nitrate in a container made of aluminium? (2 marks) (e) Other than electroplating, give one application of electrolysis. (1 mark)
- 2. a) Draw the structural formula of
  - (i) Propan-1-ol
  - (ii) Pent-2-yne
  - (iii) 2,3-dimethylbutane

(b)Study the reaction scheme below and answer the questions that follow.



(1 mark) (2 marks) (1 mark) (1 mark) (1 mark)

(iv) Name compound J.(v) Draw the structural formula of compound K.

(ii) Give the two conditions necessary in step II

(iii) State the observation made in step III.

143

(c) (d) 3. The g	) Water is a (i)Identif (ii)Write a Part of a po H I C	added dropw by the gas pro- chemical equivalent of the structural C - C - C $CH_3 H C$ he structural ne use of this epresents parts of the structural	vise to cald oduced. puation for puired belo H C—– CH ₃ formula o s polymer rt of the p he elemen	cium carbide in the reaction that ow. of the monomer c eriodic table. St	a conica at occurs of this j cudy it a	il flask. s. polymer nd answ	ver the q	uestion	s that fo	ollow. The	(1 mark) (1 mark) (1 mark) (1 mark) letters are
		Y R						Q	X	TT	
		V			W					U	
<ul> <li>(a) Sel</li> <li>(b) On</li> <li>(c) Dr.</li> <li>(d) Wr</li> <li>(e) Wl</li> <li>(f) Wr</li> <li>(g) Ho</li> <li>(h) Na</li> <li>4. a) U</li> </ul>	lect an elem the grid ind aw a dot-cro rite an equat hich is the le rite an equat ow does the me the cher Use the chan	ent whose o dicate with hose o dicate with hose of the second second second construction for the re- atomic radiu nical family t below to a	xide is am etter J the to show by the forma element? eaction the s of W co to which nswer the Steam	photeric. position of elements onding in the contion of an ion of an ion of at occurs when ompare with that elements R and questions that for the second structure of the seco	nent J w ompound f R. for your element of V? H V belor	hich is i l consis answer Y ispla Xplain. g.	in period ting of e aced in v	1 3 and lement vater.	forms a s V and Solid	x only.	(1 mark) J ²⁻ . (1 mark) (2 marks) (1 mark) (2 marks) (1 mark) (2 marks) (1 mark)
<ul> <li>b) Nam</li> <li>c) i)</li> <li>ii)</li> <li>d) Ho</li> <li>e) i)</li> <li>ii)</li> <li>iii)</li> </ul>	Identify: Gas N Solid P Solid M Liquid L. the the methor In the me Describe ow is phosph In the frace Why mus State the p	od that can b thod named an experime torus stored ctional distil t water be re processes in	e used to o above, sta ntal proce in the labo lation of li emoved? volved in t	extract oil from te the property edure that can be oratory? Explain iquid air water i fractional distill	castor of of oil th e used to n your as s remov	il seeds at enabl o extract nswer. ved, nan	es the ex oil fron ne two c	xtractio n the se	n to tak eds. bstance	e place. s that are	( ¹ / ₂ mark) ( ¹ / ₂ mark) ( ¹ / ₂ mark) ( ¹ / ₂ mark) (1 mark) (1 mark) (1 mark) removed. (1 mark) (1 mark) (1 mark) (2 marks)

5. Study the flow chart below showing the Solvay process and use it to answer the questions that follow.





that follow.

b)

- a) i) Name the main ore from which aluminium is extracted from.
- .ii) Explain how the impurities present in the ore are removed.

(1 mark) (3 marks) (1 mark)

(1 mark)

(1 mark)

- The melting point of aluminium oxide is 2015°C but the electrolysis is carried out at temperature of around c) 800°C.
  - i) Why is the electrolysis not carried out at 2015°C?
  - ii) How is the temperature lowered to about 800°C?
- Duralumin (an alloy of aluminium) is preferred to pure aluminium in the construction of aeroplane bodies. d) Give **two** properties that make it suitable for making the aeroplane bodies. (2 marks)
- 7. State two reasons why wood charcoal is not a suitable fuel for cooking. a)
  - (1 mark) The diagram below represents a set up that was used to determine the molar heat of combustion of ethanol. b) -Thermometer



- III. The value of the molar heat of combustion of ethanol obtained in b(ii) above is lower than the theoretical value. State two reasons which lead to this. (2 marks)
- IV. On the axis below, draw an energy level diagram for combustion of ethanol. ( $1\frac{1}{2}$  marks)



c) In order to determine the molar enthalpy of neutralization of sodium hydroxide,  $50 \text{ cm}^3$  of 2M sodium hydroxide and 50cm³ of 2M hydrochloric acid both at the same initial temperature were mixed and stirred continuously with a thermometer. The temperature of the resulting solution was recorded after every 15 seconds until the highest temperature of the solution was attained. Thereafter the temperature of the solution was recorded for a further two minutes.

The sketch below was obtained when the temperature of the mixture were plotted against time. Study and answer the questions that follow.



146

i)What is the significance of point  $y_2$ 

ii) Explain why there is a temperature change between points  $y_1$  and  $y_2$ 

(1 mark) iii) Explain how the value of temperature rise obtained in this experiment would compare with the one that would be obtained if the experiment was repeated using 50cm³ of 2M methanoic acid instead of hydrochloric acid.

(2 marks)

(1mark) (1 mark)

# **KIGUMO CLUSTER EXAMINATION TERM II** FORM 4 EXAM CHEMISTRY PRACTICAL CONFIDENTIAL

Besides the usual laboratory fittings and equipment's each student requires lee past papers, which we have a set of the -sulphuric (VI) acid solution P 60cm³ 0.7 M sodium hydroxide 100cm³ Magnesium powder 0.24 g weighed exactly Solid c(approx. 1g) Metallic spatula Thermometer Burette Pipette 2 Conical flasks Measuring cylinder 100ml Measuring cylinder 10ml Plastic beaker 100ml Stop watch/wall clock 250ml volumetric flask 1 label Litmus papers (blue and red) Solid c about (1g) 1boiling tube 6 test tubes in a rack Distilled water in a wash bottle 2 cm Universal indicator paper and chart Sodium hydrogen carbonate (about 0.5g)

# ACCESS TO

Source of heat Phenolphthalein indicator NH₃ (aq Lead (ii) nitrate HNO3 ((aq)  $Ba (NO)_3 (aq)$ Acidified kKMnO₄ Acidified K₂CrO₇ NB each access solution should be supplied with dropper SolutionP is 2M sulphuric (VI) acid Solid C is hydrated alumunium ammonium sulphate Solid z is table sugar. Should be in a stoppered container

#### KIGUMO CLUSTER EXAMINATION CHEMISTRY PP3

You are provided with the following; -.07 M Sodium hydroxide -0.24 g Mg powder -Sulphuric (VI) acid solution P You are required to determine the concentration of the acid

# **PROCEDURE 1**

a) b)

c)

d)

Using a measuring cylinder Place 50cm³ of the acid in a plastic beaker

Using a thermometer measure the temperature of the acid and record it in table below

Continue measuring the temperature of the acid after ever thirty seconds and record it until one and a half minute. At exactly two minutes add all the magnesium into the acid. Stir and .continue measuring the temperature and

recording it after every thirty seconds until the sixth minute 31/2 Time(minutes) 0  $\frac{1}{2}$ 1 11/2 2 21/2 3 4  $4^{1/2}$ 5 51/2 6 Х Temperature( °C) ,s.con 4mks on the grid below draw a graph of temperature (Y axis) against time. (3mks) on your graph show the highest change in temperature(  $\Delta T$ ) (1mk)use your value in (b) above to calculate the heat change for the reaction.  $(c=4.2J/g/kdensity of solution = 1g/cm^3)$ (2mks) Jist. www.treekcs use the energy level diagram below to calculate the moles of acid that reacted (1mk) $H_2SO_4$  (aq) + Mg (s)  $\Delta H = -252 kJ/mole$ Energy kJ  $MgSO_4(aq) + H_2(g)$ Reaction path

## **PROCEDURE 2**

(1mk)

(1mk)

(1mk)

(2mk)

Transfer all the contents in the beaker into a 250ml volumetric flaskAdd distilled water as you shake to 250ml mark. Label this solution Q

Fill the burette with sodium hydroxide.

Pipette 25cm³ of Q into a clean conical flask

Carry out titration using phenolphthalein indicator

	1	2	3
(1, 1, 2, 3)			
Final burette reading( cm ² )			
Initial burette reading(cm ³ )			
Volume of sodium hydroxide used(cm ³ )			
5			

(4mks)

- e) calculate:
- (i) the average titre volume
- ii) the moles of sodium hydroxide used
- iii) Moles of sulphuric (vi) acid used
- iv) molarity of sulphuric (vi) acid in solution P
- 2. You are provided with solid C. Carry out the following tests and write your observations and inferences in the spaces provided

a) Place a spatulaful of solid C in a boiling tube. Heat it gently then strongly. Test the gas produced if any using moist litmus papers

Observation s	inferences	
1mk	ist Imk	

b.) Put the rest of solid C in a boiling tube .Add 10cm³ of distilled water and shake. Divide the resulting solution into four portions

i) To the first portion add sodium hydroxide drop wise till in excess then warm and test any gas given off using moist pH indicator paper

Observations 0	inferences
1mk 📢	1mk

ii) To the second portion add ammonia solution drop wise till in excess

	observations	inferences
	1mk	1mk
iii) To	the third portion add a few drops of lead (ii) n	itrate and warm
	observations	inferences

Chemistry paper	1	,2 &	3
-----------------	---	------	---

			,_
	1mk	1mk	
			Ì
a.	To the fourth portion add dilute nitric $(V)$ a	cid followed by barium nitrate	
	observations	inferences	
	1mk	1mk	
		1	

3. You are provided with solid z. carry out the tests described below and record your observations and inferences in the spaces provided'

1mk
an an

- iii) Place the remaining solid in boiling tube and add 6cm³ of water and shake. Divide the resulting mixture into 3 portions
- iv) To the first portion add acidified potassium manganate( vil) and warm

ii)

Observation		inferences
0.00000		
		<b>V</b>
1mk	N.	1mk
	in the second	
	JIS	
	Gab	

v) To the second portion add acidified potassium dichromate (VI) and warm.

	Jon Land	
observations	at t	inferences
	025	
1mk		1mk
fle		
ale ale		
n ^e		

vi) i) Using the remaining portion and the unused reagent, describe a procedure that can be used to test whether the solid is an organic acid and give expected observations if test is positive

description	observations
1mk	1mk

ii) Carry out the test you have described in e (i) above and record your observation and inferences in the spaces provided

observations	inferences
1mk	1mk

## MURANGA SOUTH EXAMINATION 233/1 CHEMISTRY PAPER 1

<u>SE(</u> 1.	CTION Aa) What is a hydrocarbon?b) Give the IUPAC names of the following compounds (2mks) $CH_3$ HHFIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII <tr< th=""><th>(1mk)</th></tr<>	(1mk)
	CL H H H $       $ $H C - C = C C - C - H$ $     $ $H Br H$	
2.	<ul><li>a) Define half-life P</li><li>b) 100g of a radioactive isotope was reduced to 12.5g after 81 days. Calculate the half-life of the radioactive isotope was reduced to 12.5g after 81 days.</li></ul>	(1mk) lioisotope
3.	<ul> <li>a) State Graham's law of diffusion</li> <li>b) Hydrogen gas diffuses through a porous plug in 80 seconds. The same volume of gas W diffuses same aperture in 300 seconds. Calculate the molecular mass of gas W (3mks)</li> </ul>	(2mks) (1mk) through the
4. 5.	<ul> <li>Explain why the pH of 0.1M Hydrochloric acid is lower than that of 0.1M Carbonic acid</li> <li>a) State Gay Lussac's law</li> <li>b) 30cm of a hydrocarbon which is in gaseous form reacted completely with 90cm³ of oxygen to for carbon (IV) oxide. Given that all the volumes were measured at the same conditions of temperature</li> </ul>	(2mks) (1mk) orm 60cm ³ of and pressure
6.	<ul> <li>determine the formula of the hydrocarbon</li> <li>a) Define allotropy</li> <li>b) Carbon has two allotropes. Give their names and in each case state two uses</li> </ul>	(3mks) (1mk) (3mks)
	Allotrope Uses	

7. Below is the structure of aluminium chloride



(1/2 mks)

(1/2 mks)

(1mk)

(2mks)

(1mk)

(1mk)

(2mks)

(1mk)

(1mk)

(2mks)

- a) Identify the types of bonds labeled x
  - у -

- b) When aluminium chloride is dissolved in water, the resulting solution has apH of 3. Explain (1mk)
- c) Using a dot(.) and cross(x) diagram, show the bonding in a phosphine ion  $PH_4^+$

(P=15,H=1) (2mks)

8. The table below gives the first ionization energy of four elements. Study it and answer the questions that follow.

Element	Ι	II	III	IV
Ionization energy KJmol ⁻¹	44	418	51	376

- a) What is ionization energy?
- b) If the elements were metals, arrange them in the order of their reactivity starting with the most reactive
- 9. a) Define a binary electrolyte
  - b) Study the electrode potentials below and answer the questions that follow

- i) Identify the strongest oxidizing agent . (1/2 mk)
- ii) Identify the half cells that will produce the highest e.m.f if they are used to form a cell (1/2mk)
- iii) Write down the cell notation for the cell identified in (ii) above
- 10. Copper (II) oxide was found to be contaminated with sodium chloride crystals and iron filling. Describe how a sample of copper(II)oxide can be obtained from the mixture (3mks)
- 11. a) Element U has isotopes with relative abundances as shown below

isotope	% abundance
Nº NO	18.69
10 U	
<u>s</u> -	
¹¹ ₅ U	81.31
5	

Calculate the relative atomic mass of U.

b) What are isotopes (1mk)

- 12. a) A piece of burning magnesium was introduced into a gas jar of nitrogen gas. State the observation made.
  - b) Using a balanced equation, state and explain the observation made when water is added to the product in (a) above and the resulting solution tested with blue and red litmus papers (2mks)
- 13. Hydrogen Sulphide gas and Sulphur(IV) Oxide gas react as shown in the equation below.

$$2H_2S_{(g)} + SO_{2(g)} \longrightarrow 3 S_{(s)} + 2 H_2O_{(l)}$$

- a) State one condition necessary for the reaction above to take place (1mk)
- b) What property of Sulphur (IV) Oxide is illustrated above
- c) Give two uses of Sulphur (IV) Oxide

166

14. Study the flow chart below and answer the questions that follow





- (a) Name solid z (1mk)
- (b) Complete the diagram to show how oxygen gas can be collected (2mks)
- 20. The flow chart below outlines some of the process involved during the extractions of zinc . study it and answer the questions that follow



(1mk)

(1mk)

- When a form four students was stung by a bee, he applied solution M on the affected area. Explain (1mk) c)
- 23. a) Draw the structure of the following compound
  - Sodium Ethoxide (i)
    - (ii) Butanedioic acid

b) Alkanols react with alkanoic acids to form a sweet smelling substance. What is the condition necessary for this reaction to take place? (1mk)(1mk)

- 24. Define lattice energy
- 25. (a) A student heated a platinum wire and held it in a conical flask containing concentrated ammonia as shown

Glass rod TAT sxygen platinum Concentrated Ammonia Solution

- eron (i) What will be observed when the hot platinum wire was lowered into the conical flask (1mk)
- (c) What is the purpose of the platinum wire in this experiment?
- (c) Write a balanced chemical equation for the reaction on the wire?

(2mks)

(1mk)

**MURANGA SOUTH EXAMS** 233/2 **CHEMISTRY** PAPER 2 FORM 4 JULY/AUGUST 2018 **2 HOURS** 

# ANSWER ALL QUESTIONS IN THE SPACES PROVIDED.

The grid below represents part of the periodic table. Each letter represents an 1. element but not the actual symbol of the element. Use the information provided in the grid to answer the questions that follow

										$\rightarrow$		_			
G		←		elemen	nts X								Ι	J	
	Η									+	C	R	М	N	Q
K	L						R			~6	in of the second s				
	0								5.	astP					
									LCSOK						

a)	What is the general name given to elements 'X'	(1mk)
b)	Explain how the reaction between chlorine and each of the following elements would compare	e
	(i) K and L	(2mks)
	(ii) H and L	(2mks)
c)	How does reactivity of I and M compare? Give a reason for your answer	(2mks)
d)	Indicate the position of element W whose atomic number is 15 on the grid. Explain	(2mks)
e)	What type of bonding would you predict for an oxide of P? Give a reason for your answer	(2mks)
f)	Predict the pH of an aqueous solution of the oxide of M. Give a reason for your answer	(2mks)
g)	A pupil discovered that the empirical formula for the chloride of R was the same as that of the	2
	bromide of P. What would the formula of the oxide of R be? Explain	(2mks)
h)	Write the electron arrangement of H and Q	(1mk)
i)	Explain why Q does not react with oxygen gas	(1mk)

In an experiment to the reaction between German silver (an alloy of nickel, zinc and copper) and excess 2. Sulphuric (IV) acid, the data below was recorded. It showed the volume of gas collected after every 1 minute. Use it to answer the questions that follow

Time (minutes)	0	1	2	3	4	5	6	7	8
Total volume of gas (cm ³ )	0	110	205	270	310	330	340	340	340

Plot the graph of volume of gas produced against time (3mks) a)

Use the graph to determine the volume of gas produced at the end of  $3^{1/2}$  minutes (1mk) b) (2mks)

- Explain why some solid remained at the end of the experiment c)
- Determine the rate of reaction between the third and fourth minutes d)

Write a well-balanced chemical equation for reaction taking place between the alloy and Sulphuric (IV) acid. e)

(2mks)



(a) What name is given to the above structure?

(1mk)

	Ch	emistry paper 1,2 & 3
	(b) Name the raw materials used in the process	(3mks)
	(c) Identify substances X,Y and Z	(3mks)
	(d) Give equation for the reaction leading to formation of substances Y and Z	(2mks)
	(e) Identify the part where temperatures are lowest	(1mk)
	(f) Name the waste gases in the process	(2mks)
	5. Use the standard electrode potentials for elements A,B,C,D and F given below to an	nswer the
	questions that follow. (letters do not represent the actual symbols of the elements)	
	Half cell $E\theta$ (volts)	
	$A^{2+}(x_{c}) + 2e^{-} \longrightarrow A(x) - 2.90$	
	$B^{2+}(x_{c}) + 2e^{-} \longrightarrow B(x) - 2 38$	
	$C^+ + e^- \longrightarrow \frac{1}{2} C_{2,3,3,5}$	
	$D_{(aq)}^{2+} + 2a^{-}$ $D_{(aq)}^{2+} + 2a^{-}$	
	$D_{(aq)}^{-} + 2c$ $\rightarrow$ $D_{(s)}^{-} + 0.34$	
	$\frac{72}{12} \frac{\Gamma_{2(g)}}{\Gamma_{(aq)}} + \frac{12.8}{12}$	(2 1)
	(a) Which element is likely to be hydrogen? Give a reason for your answer	(2mks)
	(b) What is the E ^D value for the strongest reducing agent?	(1mk)
	(c) Draw a well labeled diagram of the electrochemical cell that would be obtained when the	he half-cell of B
	and D are combined	(3mks)
	(d) Calculate the $E\theta$ value of the cell in (c) above	(2mks)
	(e) During electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of through the cell for 8hrs	0.2A was passed
	(i) Write the ionic equation for the reaction that took place at the anode	(1mk)
	(ii) Determine the change in mass of the anode. ( $Cu = 63.5$ , IF = 96,500C)	(3mks)
6.	The flow chart below illustrates two industrial processes; Haber process and Contact p	rocess
_	NM.	
	AIR > NITROGEN > HABER PADCESS > Y	Z
	Drye al Hart	
-	UX IGEN	
+	SUL DUNGONDERT LA TONIDET PORCETA VIL SUL	PHURICT
-	Suchando DAISE POLONIACI TROLES FILL A	IN A
-		
	WATER.	
(a)	(i) What process can be used to separate air into oxygen and nitrogen?	(1mk)
	(iii) Apart from oxygen and nitrogen produced in the process named in (a) (i) above, name the	e other gas
	produced	(1mk)
(b)	Name the substances labeled	(4mks)
	W-	
	X-	
	Y- 7	
(c)	L- Name the catalyst used in (2mks)	
	(i) Haber process –	
	(ii) Contact process –	
(J)	State the role of a catalyst in both Haber and Contact process (1mk)	
(e)	Write a chemical equation for the formation of compound Z (1mk)	
(f)	Calculate the percentage mass of nitrogen in compound Z. (N=14,O=16.H=1, S=32) 3mks)	
(g)	Give the major use of compound Z (1mk)	
(h)	State the nature of ammonia gas on dissolving in water (1mk).	
		172

## **MURANGA SOUTH** 233/3**CHEMISTRY** PAPER 3

- You are provided with: 1.
  - Solution P-0.02M acidified potassium manganate (VII)
    - SolutionM a reducing agent containing 23.5g/litre

You are required to determine the number of moles of reducing agent that react with one mole of acidified potassium manganate (VII)

Procedure

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- (i) Fill the burette with solution P.
- (ii) Prepare 25cm³ of solution M into a conical flask. Titrate solution M with solution P until a pink colour just appears.

(iii) Record your results in the table 1 below. Repeat the titration to complete the table 1 Table I

Burette readings	Ι	II	III	
Final readings(cm ³ )				3-
Initial readings (cm ³ )				c ^O `
Volume of solution $p(cm^3)$				ers.

(i) Determine the average volume of solution P used

- (ii) Determine the number of moles of potassium manganite (VII) reacting (2mks)
- (iii) Determine the concentration of solution M used in mole per  $dm^3$  (R.F.M of M=391) (2mks) (2mks)
- (iv) Determine the number of moles of M in 25cm³ solution

(v) Determine the number of moles of M which reacts with me mole of potassium manganate (VII)

(1mk)

(4mks)

(1mk)

2. You are provided with the following:

i) Solution K with 0.05M Sodium thiosulphate

ii) Solution L with 2M Hydrochloric acid

iii) Distilled water

You are required to find out the effect of change of concentration on the rate of reaction between Sodium thiosulphate ( $Na_2S_2O_3$ ) and Hydrochloric acid

Procedure

Measure 10cm³ of sodium thiosulphate into each of the five 100ml beakers provided. Measure 15cm³ of the 2M hydrochloric acid into a clean beaker. Make a mark (x) on a piece of paper and place the beaker containing the hydrochloric acid on the mark. Observe the cross(x) directly from above the solution in the beaker. Record the time it takes for the cross(x) to become invisible: repeat the procedure using several other volumes of hydrochloric acid and distilled water as shown in table 2 Table 2

10010 2							
Experiment number	1	2	3	4	5	6	7
Volume of sodium thiosulphate (cm ³ )	10	10	10	10	10	10	10
Volume of 2m hydrochloric acid (cm ³ )	15	13	10	8	6	4	2
Volume of water (cm ³ )	0	2	5	7	9	11	13
Time taken for the cross to disappear (sec)							
Reciprocal of time $(1/t)$ sec-1							

a) Plot a graph of volume (in cm³) of hydrochloric against time (in seconds) taken for the cross to be invisible

b) Use the graph in (a) above to estimate the;

(i) Average rate of reaction for the first four experiments

(ii) Rate of reaction in the fourth experiment

(iii) Determine the time it takes for the cross to disappear when the volume of the acid is 12cm³ (1mk)

3. You have been provided with solid R. you are required to carry out the test below. (a) (i) Place a spatula of solid R in a dry test-tube. Heat gently then strongly

173

(4mks)

(2mks)

(2mks)

Observations	Inference
(1mk)	(1mk)

(ii) Place the remaining portion in a test-tube and add water to fill it to two third. Divide the resulting solution into three equal portions.

## (iii) Add sodium hydroxide to the first portion drop- wise until in excess

Observations	Inference
(1mk)	(1mk)

## iv) Add aqueous ammonia to the second portion drop- wise until in excess

Observations	Inference
(1mk)	(tmk)

## (v) Add sodium sulphate drop- wise to the third portion

Observations		Inference	
	(1mk)	NCS BY	(1mk)
		05	

(b) You are provided with liquid C. Carry out the following tests and record your observations and inference in the table below. Divide the liquid into 4 portions.

(i)	i) To the first portion add 2 or 3 drops of acidified potassium manganate						
	Observations	SIL	Inference				
		No					
		(1mk)	(1mk)				

(ii) To the second portion add few drops of potassium dichromate (VI) solution

Observations		Inference
tormore	(1mk)	(1mk)

(iii) To the third portion add half spatula endful of sodium hydrogen carbonate

Observations	Inference
(1/2mk)	(1/2mk)

(iv) Place the fourth portion on a clean metallic spatula and ignite it on a Bunsen Burner flame.

Observations	Inference

iv) Liquid C burns with pale blue flame R – OH present **GRAPHICS EXAMS** 233/1**CHEMISTRY PAPER 1 (THEORY) JULY/AUGUST 2018 Time: 2 Hours** 1. a) Name two major components of air? (2marks) b) Write an equation for the reaction that would take place when one of the components of air named in (a) above is passed over heated magnesium. (1mark) 2. Study the information given below and use it to answer the questions that follow; Red dye is more soluble than green dye, green is more soluble than yellow whereas blue dye is the least soluble. Represent the three dyes on a round paper chromatography. (2marks) i) ii) Name one industrial application of chromatography. (1mark) a) What is a fuel? (1mark) 3. b) Calculate the heat value of ethanol if its molar enthalpy of combustion is-1360kjmol⁻¹ (C=12.0, O=16.0, H=1.0) (2marks) Study the set up below and use it to answer the questions that follow. 4. W. Heekcsepastpat Gas X Calcium metal Water What physical property of calcium metal is demonstrated in the diagram above? (1mark) a) b) What would be observed if water was replaced with Sulphuric (VI) acid? (2marks) What is electroplating? 5. (1mark) i) ii) Draw a well labeled diagram to show how an iron spoon can be electroplated with silver. (2marks) A hydrocarbon decolorizes chlorine gas in presence of ultra violet light but does not decolorize acidified 6. potassium manganate (VII) solution. Name the homologous series to which the hydrocarbon belongs. (1mark) i) ii) Draw the structural formula and name the fourth member of the homologous series to which the hydrocarbon (2marks) belongs? Explain why a solution of hydrogen chloride in water turns blue litmus paper red but a solution of hydrogen 7. chloride in methylbenzene has no effect on litmus papers. (3marks) The diagram below represents a cross section of the apparatus used to extract sulphur from its deposits. Study it 8. and answer the questions that follow.



a) State the role of the substance that is passed through;

С

ii)

(1mark) (1mark)

b) Give one reason why the method shown in the diagram is suitable for extraction of sulphur.

(2marks)

Chemistry paper 1,2 & 3

(1mark)

# 9. Study the equation below and answer the questions which follow.

$$H_2 \bigcirc_{(s)} \underbrace{\Delta H_1}_{\Delta H_4} H_2 \bigcirc_{(1)} \underbrace{\Delta H_2}_{\Delta H_3} H_2 \bigcirc_{(g)}$$

i) What name is given to the energy change  $\Delta H_2$ ?

- ii) Indicate the sign for  $\Delta H_1$ . Give a reason. (2marks) 10. Explain how you would obtain magnesium carbonate from a mixture of magnesium carbonate and sodium carbonate. (2marks) 11. 20g of potassium carbonate were dissolved in 50cm³ of water in a conical flask. Lemon juice was then added drop wise while shaking until there was no further observable change. a) Explain the observation that was made in the conical flask when the reaction was in progress. (1mark) b) What observation would be made if lemon juice had been added to copper turnings in a conical flask? Give a reason. (2marks) 12. Explain why a burning magnesium continues to burn in a gas jar full of carbon (IV) oxide while a burning candle would be extinguished. (3marks) 13. a) Give the names of any two reagents that when reacted with concentrated hydrochloric acid produces chlorine (1mark) gas. b) With the aid of an equation, explain the observation made when chlorine gas is reacted with ammonia. (2marks) 14. 8.4g of carbon (IV) oxide and 3.42g of water are formed when a hydrocarbon is burnt completely in oxygen. Determine the empirical formula of the hydrocarbon. (H=1.0; C=12.0; O=16.0) (3marks) 15. The melting point of nitrogen is  $-196^{0}$ C while that of sodium is 98%, in terms of structure and bonding explain the differences in the melting points of nitrogen and sodium. (3marks) 16. a) What is an amphoteric substance? (1mark) b) Identify the reagent that acts as a base in the equation below. Give a reason for your answer.  $H_2O_{2(aq)} + H_2O_{(I)} \longrightarrow H_3^+O_{(aq)} + HO_{2(aq)}$ (2marks) 17. The following tests were carried out on three separate portion of a colourless solution H. Test Observation Addition of dilute hydrochloric and to the first Colourless gas evolved with effervescence i) portion of solution H. ii) Addition of aqueous sodium sulphate solution No observable change to the second portion of H. iii) Addition of aqueous sodium hydroxide White precipitate was formed which dissolved in
  - a) From the information in test (i), name two anions that are likely to be present in solution H. (1mark)
  - b) Identify cations that are likely to be present in solution H. (1mark)
  - c) Write an ionic equation for the reaction which takes place in test (i) . (1mark)

excess sodium hydroxide solution

- 18. Sulphur forms many compounds in which its oxidation state varies.
  - a) What is meant by oxidation state? (1mark)
  - b) Determine the oxidation state of sulphur in NaHSO₃.

solution to the third portion of solution H

19. In the industrial manufacture of ammonia gas by Harber process, Nitrogen and hydrogen gases are reacted together.



a) Which curve represents the reaction with;

i)Least concentrated acid?(1mark)ii)Most concentrated acid?(1mark)Which curve did the reaction complete last?(1mark)

24. a) State Charle's Law.

b)

- b) Explain how the density of gas N compare with that of oxygen given that the time taken for equal volumes of oxygen and gas N to diffuse through the same hole is 35 seconds and 42seconds respectively. (2marks)
- 25. Study the diagram below and answer the questions that follow:

(1mark)

Chemistry paper 1,2 & 3



Name one chemical and one physical property of hydrogen being demonstrated in the set-up above. a)

	i)	Physical property.	(½mark)
	ii)	Chemical property.	(½mark)
b)	Name a	any other substance that can be used in place of concentrated sulphuric (VI) acid.	(1mark)

c) Give a reason why it is necessary to burn the hydrogen gas as shown in the set-up. (1mark)

26. Elements Q, R and S have the following electronic arrangements.

Q=2,3; R = 2,8,3 and S = 2,8,8,3

i) Are the elements metals or non-metals?

- ii) Give the formula of the compound formed when elements R reacts with a suphate radical. (1mark)
- iii) Selects the element that is most reactive.
- 27. Below is the structural formula of a given polymer. Use it to answer the questions that follow:



ers, visit. www.treet Name the monomer. a)

(1mark) (1mark)

(1mark)

(1mark)

b) State one use of the above polymer.

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28. Sodium and magnesium fall on the same period in the periodic table and both of them are metals. Explain why magnesium is a better conductor than sodium. (2marks) 4100

#### GRAPHICS EXAMS 233/2 CHEMISTRY Paper 2 (THEORY) TIME 2 HOURS

1. a) The diagram below shows spot of pure substances X, Y and Z on a chromatography paper. Spot Q is that of a mixture.



After development X, Y and Z were found to have moved 8cm, 3cm and 6cm respectively Q had separated into three spots which had moved 5cm, 6cm and 8cm.

- i) On the diagram,
- I. Label the baseline.
- II. Show the positions of all the spots after development.
- ii) Identify the substances present in the mixture Q.

b) Describe how solid ammonium chloride can be separated from a solid mixture of ammonium chloride and anhydrous calcium chloride. (2marks)

c) The table below shows liquids that are miscible and those that are immiscible.

Liquid	A	В
С	Miscible	Miscible
D	Miscible 🔗	Immiscible

Use the information given to answer the questions that follow:

- i) Name the method that can be used to separate A and C from a mixture of the two. (1mark)
- ii) Describe how a mixture of B and D can be separated.
- 2. a) Sodium hydroxide pellets were accidentally mixed with sodium chloride-18.2g of the mixture were dissolve in
  - water to make one liter of solution.  $100 \text{cm}^3$  of the solution was neutralized by  $50 \text{cm}^3$  of 0.45M Sulphuric acid. i) Write an equation for the reaction that took place. (1mark)
  - ii) Calculate the;
  - I. Number of moles of the substance that reacted with sulphuric acid.
  - II. Number of moles of the substance that would react with sulphuric acid in the one litre of solution.
    - (1mark) (2marks)

(2mark)

(2marks)

(1mark)

(3marks)

(2marks)

- III. Mass of the unreacted substance in the one litre of solution. (H = 1.0, Na = 23.0, Cl = 35.5, O = 16.0)
- b) The diagram below shows an incomplete set-up used to prepare and collect ammonia gas.



i) Name solid P.

(1mark)

- Complete the diagram to show how a dry sample of ammonia gas can be collected. (3marks) ii)
- In an experiment, excess ammonia gas was passed over heated copper (II) oxide in a combustion tube. c)
- State the observation that was made in the combustion tube at the end of the experiment. (1mark) )
- What property of ammonia is shown in the above reaction? ii) (1mark)
- iii) Give one use of ammonia.
- 3. a) An atom Z can be represented as

³⁹Z

What does the number 39 represent?

b) Study the information in the table below and answer the questions that follow. (Letters are not the actual symbols of the elements).

Element	Electron arrangement of stable ion	Atomic radius (nm)	Ionic radius (nm)
L	2.8	0.072	0.136
М	2	0.152	0.068 🔬
N	2.8	0.186	0.095 🔗
0	2.8	0.160	0.065
P	2.8.8	0.099	0.181
Q	2.8.8	0.197	<b>Q</b> 0099

i) Write the formula of the compound formed when P reacts with Q Atomic numbers are; (P = 17, Q = 20)(1mark)

Identify the elements which belong to the third period of the periodic table. Explain. ii

- Which of the elements identified in b(ii) above comes first in the third period? (2marks) iii) (1mark)
- Select two elements which are non-metals. iv)

c) The table below gives some properties of substances A, B, C and D. study it and answer the questions that follow;

Substance	Electrical conductivity		$MP(^{U}C)$	BP(C)
	Solid Molten			
В	Does not conduct	Conducts	701	1320
В	Conducts 🔗 🔗	Conducts	550	1100
С	Does not conduct	Does not conduct	1600	2100
D	Does not conduct	Does not conduct	113	440

What type of bonding exists in substances A and B? i)

ii) Which substance is likely to be sulphur? Explain

The flow chart below shows a sequence of reactions starting with iron. Study it and answer the questions that 4. a) follow;



Name the reagents and state the condition for the reaction in Step 1. i)

(1mark)

(1mark)

(2marks)

(2marks)

(2marks)

	Reagent							
ii)	Condition Give the names of the following. I. Solid S II. Solid V III) Solid T							(3marks)
	iii) Give reasons for the colour change	in step 2			(21	marks)		
	iv) Write an ionic equation for the react	tion which	ch takes pl	ace in step	3.			(1mark)
	v) Name one other substance that could	d be use	d instead o	of sodium l	nydroxide in	n Step 3.		.(1mark)
b)	In an experiment, 3.36g of iron fillings copper that was deposited. ( $Cu = 63.5$ , H	were add Fe = 56.0	led to exce ))	ess aqueou	s copper (II	) sulphate,	Calculate	the mass of (3marks)
5.	The table below shows the variation of s	solubilit	y of substa	nces P and	l Q in g/100	gH ₂ O wit	h temperat	ture ( 0 C).
	Temperature	0	20	40	60	80	100	
	Solubility of P (g/100g of water)	10	15	20	40	63	100	
	Solubility of Q (g/100g of water)	30	34	37	40 2	44	48	
a)	<ul><li>i) Using the information above plot a provided.</li><li>ii) What is observed when a solution control of the solution o</li></ul>	graph of ontainin	`solubility g 30g of P	of P and C in 100g of	) against ter f water is co	nperature oled from	on the grap 80 ⁰ C to 1	oh paper (5marks) 0 ⁰ (1mark)
	iii) Calculate the mass of substance P th	nat satura	ate 25g of	water at 92	$2^{0}$ C.			(2marks)
b)	i) At what temperature do substances	P and Q	have the s	ame solub	ility?			(1mark)
	ii) How would you make a saturated so	olution c	ontaining	35g of sub	stance Q?			(2marks)
	c) Given a mixture containing 45g of I pure sample of substance Q?	P and 43	g of Q diss	solved in 1	00g of wate	er, how wo	ould you ob	otain a (2marks)
6.	Study the flow chart below and answer $CaC_2 + S$ Step 1 Compound T Polymerisation	Gas H Step 4	tions that f	iole of 2 Step Co	Gas P 5 KMnO, H ⁺ (14)/H mpound R	1 <u>,</u> tep 3►	J	
	<ul> <li>a) Identify reagent S.</li> <li>b) Write the equation for the reaction t</li> <li>c) Identify substance K.</li> <li>d) What name are given to processes b</li> <li>i) Process in Step 3.</li> <li>ii) Step 2.</li> <li>e) State two conditions necessary for s</li> </ul>	aking pla velow; tep 2.	ace in Step	01.				(1mark) (1mark) (1mark) (1mark) (1mark) (2marks)
								189
			Chemistry paper 1,2 & 3					
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	f)	Write the equation for the reaction in Step 3.	(1mark)					
	g)	Draw the structural formula of gas H.	(1mark)					
	h)	Describe one chemical test that can differentiate gas H from ethane gas.	(3marks)					
7.	a)	Define enthalpy change.	(2mark)					
	b)	Use the following bond energies to answer the questions that follow:						
	0)	Bond Bond energy kI/mol						
		C H $13$						
		$\begin{array}{ccc} C = 11 \\ C 1 \\ C 1 \\ \end{array} $						
		$C_1 - C_1$ 239						
		C - Cl 346						
		H-Cl 428						
	i)	Write a balanced equation for the reaction between chlorine and methane to give chloron	nethane.					
			(1mark)					
	ii)	Calculate the enthalpy change for the reaction leading to formation of chloromethane fro	m chlorine and					
	me	thane.	(3marks)					
	iii)	Write the thermochemical equation for the reaction.	(2mark)					
	iv)	List three factors to consider when choosing a fuel.	(3marks)					
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## GRAPHICS 233/3 CHEMISTRY PRACTICAL CONFIDENTIAL

In addition to the apparatus and fittings found in the Chemistry Laboratory, each candidate will require the following;

- 1.  $150 \text{ cm}^3$  of solution C
- 2.  $150 \text{ cm}^3$  of solution D
- 3. 60cm³ of Copper (II) sulphate (2 molar)
- 4. 50cm³Burette
- 5. 25cm³ pipette
- 6. Atleast 2 conical flasks
- 7. 100ml plastic beaker
- 8.  $(-10^{\circ}C = 110^{\circ}C)$  thermometer
- 9. Spatula
- 10. One boiling tube
- 11. 5 test tubes
- 12. 1g of Zinc powder (accurately measured)
- 13. About 0.5g of solid Q
- 14. Tissue paper
- 15. Distilled water in a wash bottle

# Access to;

- Phenolphthalein indicator
- Source of heat
- 2M sodium hydroxide with a dropper
- 2M ammonia solution with a dropper
- 2M hydrochloric acid with a dropper
- 2M Barium nitrate with a dropper
- 2M nitric (v) acid with a dropper
- 2M Lead (II) nitrate with a dropper

# NOTES

- 1. Solution C is made by dissolving 10.08 g/l of ethanedioic acid (oxalic acid) in 400 cm³.
- 2. Solution D is made by dissolving 8.0g of Sodium hydroxide in 400cm³ of water and made to one litre.

ars, visit, www.freekcsepastpapers.com

3. Solid Q – aluminum sulphate  $(Al_2(SO_4)_3)$ 

### 233/3 CHEMISTRY

# Paper 3

2.

Time: 2 ¹⁄₄ Hours

# 1. You are provided with;

- Solution C which is solution of dibasic acid (COOH)₂ XH₂O containing 10.08g per litre of solution.
- Solution D which is 0.2M solution of sodium hydroxide.

You are required to determine the value of X in the formula (COOH)₂. XH₂O

(H=1, C=12, O=16)

# **Procedure**

- Fill the burette to the mark with solution C.
- Pipette 25.0cm³ of solution D into a clean conical flask
- Add two drops of phenolphthalein indicator and titrate with solution C.
- Repeat the titration to obtain consistent results and record your results in table 1 below.

TABLE I

	I	П	Ш		
Final burette reading (cm ³ )			n.		
Initial burette reading (cm ³ )			çõ	1	
Volume of acid used (cm ³ )			oel	1	
<ul> <li>a) Calculate the average volume of so</li> <li>b) Calculate the number of moles of D</li> <li>c) Calculate the number of moles of C</li> <li>d) Calculate the concentration of acid</li> <li>e) Calculate the relative formula mass</li> <li>f) Hence, determine the value of X in</li> <li>You are required to determine the enthal</li> </ul>	lution C used. O used. C used given that the solution C in moles of the acid (COOH (COOH) ₂ X H ₂ Q	reacting ratio of a per litre. $2 \times H_2$ -O. of Cu ²⁺ (aq) by Z	cid to base is 1:2	(5 marks) (1mark) (2marks) (2mks) (2marks) (2marks) (2marks)	
Procedure	S1	(uq)			
i) Wrap the plastic beaker that has been	en provided with a ti	issue paper.			
<ul> <li>i) Place 50cm³ of 0.2M Copper (II) Sulphate solution in the beaker. Dip the thermometer in the solution and note the steady temperature of the solution.</li> <li>ii) Carefully transfer all the 1.0g of Zinc powder provided into the plastic beaker and stir carefully with the hermometer.</li> <li>v) Record the highest temperature that the solution attain. Record the results in the Table II below. Table II.</li> </ul>					
Volume of Copper (II) Sulphate so	olution used (cm³)				
Highest temperature of the mixture	e ('C)				
Initial temperature of Copper $(\Pi)$ :	Sulphate Solution	(°C)			
Change in temperature ( ⁰ C)					

(2marks)

(2marks)

(2marks)

(2marks)

(1mark)

Specific heat capacity = 4.2kJKg⁻¹k⁻¹ Density of the solution = 1g/cm³

- a) Calculate the number of moles of  $Cu^{2+}$  ions that are in 50cm³ of the solution.
- b) Calculate the amount of heat liberated in the reaction.
- c) Determine the enthalpy of displacement of Copper.
- Explain why excess Zinc powder was added into the beaker d)
- Write the ionic equation for the reaction that takes place. Indicate the enthalpy change for the reaction.2marks) e) You have been provided with solid Q. Perform the tests below and identify ions present in the sample. 3.
  - Put all the solid Q in a boiling tube and then add 8cm³ of distilled water a little at a time while shaking. i)

192

	Chemistry paper 1,2 & 3
Divide the solution formed into five portions in test tub	es. (2 marks)
OBSERVATION	INFERENCE
ii) To the first portion add dilute sodium hydroxide dr	opwise until in excess. (2 marks)
OBSERVATION	INFERENCE
iii) To the second portion add ammonia solution dropw	vise until in excess. (2 marks)
OBSERVATION	INFERENCE
	ers.com
iv) To the third portion add dilute Hydrochloric acid at	nd then warm. (1 ¹ / ₂ marks)
OBSERVATION	INFERENCE
	MNN HEET
v) To the fourth portion add 3 drops of Barium nitrate	solution (NB keep the mixture for part (vi) (2 marks)
OBSERVATION	INFEDENCE
THEE PAST	
vi) Add 1cm ³ of nitric (V) acid (HNO ₃ ) to the mixture	e obtained in (v) above. (2 marks)
OBSERVATION	INFERENCE
vii) To the fifth portion add 3 drop Lead (II) nitrate	(1 ½ marks)
OBSERVATION	INFERENCE

(2marks)

## KURIA EAST EXAMINATION 233/1**CHEMISTRY PAPER 1 (THEORY)**

Name two major components of air? 1. a)

- b) Write an equation for the reaction that would take place when one of the components of air named in (a) above is passed over heated magnesium. (1mark)
- Study the information given below and use it to answer the questions that follow; 2.

Red dye is more soluble than green dye, green is more soluble than yellow whereas blue dye is the least soluble.

- Represent the three dyes on a round paper chromatography. (2marks) i)
- ii) Name one industrial application of chromatography.
- a) What is a fuel? 3.
  - b) Calculate the heat value of ethanol if its molar enthalpy of combustion is-1360kjmol⁻¹ (C=12.0, O=16.0, H=1.0)

(2marks)

(1mark)

(1mark)

(1mark)

(1mark)

treekcsepastpapers.co Study the set up below and use it to answer the questions that follow. 4.



- What physical property of calcium metal is demonstrated in the diagram above? (1mark) a)
- What would be observed if water was replaced with Sulphuric (VI) acid? (2marks) b)
- 5. i) What is electroplating?
  - ii) Draw a well labeled diagram to show how an iron spoon can be electroplated with silver. (2marks)
- 6. A hydrocarbon decolorizes chlorine gas in presence of ultra violet light but does not decolorize acidified potassium manganate (VII) solution.
  - i) Name the homologous series to which the hydrocarbon belongs.

ii) Draw the structural formula and name the fourth member of the homologous series to which the hydrocarbon belongs? (2marks)

- 7. Explain why a solution of hydrogen chloride in water turns blue litmus paper red but a solution of hydrogen chloride in methylbenzene has no effect on litmus papers. (3marks)
- The diagram below represents a cross section of the apparatus used to extract sulphur from its deposits. Study it 8. and answer the questions that follow.



State the role of the substance that is passed through; a)

	Chemistr	ry paper 1,2 & 3
i) A		(1mark)
ii) C		(1mark)
b) Give one reason why the method shown in the dia	agram is suitable for extraction of sulphur.	(1mark)
9. Study the equation below and answer the questions w	hich follow.	
$\mathrm{H_2O}_{(\mathrm{s})} \underbrace{ \begin{array}{c} \Delta \mathrm{H_1} \\ \hline \Delta \mathrm{H_4} \end{array}}_{\Delta \mathrm{H_2}} \mathrm{H_2O}_{(\mathrm{l})} \underbrace{ \begin{array}{c} \Delta \mathrm{H_2} \\ \hline \Delta \mathrm{H_3} \end{array}}_{\Delta \mathrm{H_3}} \mathrm{H_2O}_{(\mathrm{g})}$		
i) What name is given to the energy change $\Delta H_2$ ?		(1mark)
ii) Indicate the sign for $\Delta H_1$ . Give a reason.		(2marks)
10. Explain how you would obtain magnesium carbonate carbonate.	from a mixture of magnesium carbonate and s	odium (2mark
11. 20g of potassium carbonate were dissolved in 50cm ³ wise while shaking until there was no further observal	of water in a conical flask. Lemon juice was the ble change.	en added drop
<ul><li>a) Explain the observation that was made in the coni</li><li>b) What observation would be made if lemon juice h</li></ul>	cal flask when the reaction was in progress. ad been added to copper turnings in a conical	(1mark) flask?
Give a reason.	on	(2marks)
12. Explain why a burning magnesium continues to burn would be extinguished.	in a gas jar full of carbon (IV) oxide while a bu	urning candle (3marks)
13. a) Give the names of any two reagents that when reagas.	cted with concentrate hydrochloric acid prod	uces chlorine (1mark)
b) With the aid of an equation, explain the observation	on made when chlorine gas is reacted with am	nonia.
	Kee.	(2marks)
14. 8.4g of carbon (IV) oxide and 3.42g of water are form Determine the empirical formula of the hydrocarbon.	ned when a hydrocarbon is burnt completely in	oxygen.
(H=1.0; C=12.0; O=16.0)		(3marks)
15. The melting point of nitrogen is -196 ⁰ C while that of the differences in the melting points of nitrogen and set	sodium is 98 ⁰ C, in terms of structure and bond odium.	ling explain (3marks)
16. a) What is an amphoteric substance?		(1mark)
b) Identify the reagent that acts as a base in the equation	below. Give a reason for your answer.	
$H_2O_{2(aq)} + H_2O_{(I)} \longrightarrow H_3^+O_{(aq)} + H_3^+O_{(ad)} + H_3^+O_{(ad)} + H_3^+O_{(ad)} + $	HO _{2(aq)}	(2marks)
17. The following tests were carried out on three separate	portion of a colourless solution H.	
Test	Observation	
<ul> <li>i) Addition of dilute hydrochloric acid to the firs portion of solution H.</li> </ul>	t Colourless gas evolved with effervesce	nce
ii) Addition of aqueous sodium sulphate solution to the second portion of H.	No observable change	
iii) Addition of aqueous sodium hydroxide solution to the third portion of solution H	White precipitate was formed which di excess sodium hydroxide solution	ssolved in

a) From the information in test (i), name two anions that are likely to be present in solution H. (1mark)

b) Identify cations that are likely to be present in solution H.

c) Write an ionic equation for the reaction which takes place in test (i) (1mark)

18. Sulphur forms many compounds in which its oxidation state varies.

202

(1mark)

	Chemistry paper 1,2 & 3
a) What is meant by oxidation state?	(1mark)
b) Determine the oxidation state of sulphur in NaHSO ₃ .	(2marks)
19. In the industrial manufacture of ammonia gas by Harber process, Nitrogen and hydrogen group together.	ases are reacted
a) State any two conditions necessary for ammonia to be formed in the Harber process.	(1mark)
b) Nitrogen and hydrogen must be purified before they are reacted. Give a reason.	(1mark)
c) Other than manufacture of fertilizers state one use of ammonia.	(1mark)
20. Describe how you would prepare crystals of potassium sulphate starting with 100cm ³ of 0. hydroxide.	.5M potassium (3marks)
21. Distinguish between atomic mass and relative atomic mass.	(2marks)
22. Study the diagram below and use it to answer the questions that follow.	
Inert elec- trode Crucible Copper (II) chloride	
a) State the observation that would be made in the crucible when the crucit is switched of	n. (1mark)
b) Write an ionic equation for the reaction at anode.	(1mark)
c) Give a reason why this experiment should be performed in the fume chamber.	(1mark)
23. The following curves are obtained from reacting the same amount of marble chips lumps we concentrations.	/ith acids of different
a) Which curve represents the reaction with;	
i) Least concentrated acid?	(1mark)
ii) Most concentrated acid?	(1mark)
b) Which curve did the reaction complete last?	(1mark)
24. a) State Charle's Law.	(1mark)

- b) Explain how the density of gas N compare with that of oxygen given that the time taken for equal volumes of oxygen and gas N to diffuse through the same hole is 35 seconds and 42seconds respectively. (2marks)
- 25. Study the diagram below and answer the questions that follow:



## KURIA EAST 233/2 CHEMISTRY Paper 2 (THEORY) TIME 2 HOURS

1. a) The diagram below shows spot of pure substances X, Y and Z on a chromatography paper. Spot Q is that of a mixture.



After development X, Y and Z were found to have moved 8cm, 3cm and 6cm respectively Q had separated into three spots which had moved 5cm, 6cm and 8cm.

- i) On the diagram, I. Label the baseline. (1mark)
- . Show the positions of all the spots after development.
   (3marks)

   ii) Identify the substances present in the mixture Q. x.
   (2marks)
- b) Describe how solid ammonium chloride can be separated from a solid mixture of ammonium chloride and anhydrous calcium chloride. (2marks)
- c) The table below shows liquids that are miscible and those that are immiscible.

Liquid	A	В
С	Miscible	Miscible
D	Miscible	Immiscible

Use the information given to answer the questions that follow:

i) Name the method that can be used to separate A and C from a mixture of the two.

ii) Describe how a mixture of B and D can be separated.

2. a) Sodium hydroxide pellets were accidentally mixed with sodium chloride-18.2g of the mixture were dissolve in water to make one liter of solution.  $100 \text{ cm}^3$  of the solution was neutralized by  $50 \text{ cm}^3$  of 0.45M Sulphuric acid.

- i) Write an equation for the reaction that took place.
  - ii) Calculate the;
  - I. Number of moles of the substance that reacted with sulphuric acid. (2mark)
  - II. Number of moles of the substance that would react with sulphuric acid in the one litre of solution. (1mark)
- III. Mass of the unreacted substance in the one litre of solution. (2marks) (H = 1.0, Na = 23.0, Cl = 35.5, O = 16.0)
- b) The diagram below shows an incomplete set-up used to prepare and collect ammonia gas.

Solid P + Potassium hydroxide

205

(1mark)

(2marks)

(1mark)

206

- i) Name solid P. (1mark)ii) Complete the diagram to show how a dry sample of ammonia gas can be collected. (3marks)
- c) In an experiment, excess ammonia gas was passed over heated copper (II) oxide in a combustion tube.
- i) State the observation that was made in the combustion tube at the end of the experiment. (1mark)
- ii) What property of ammonia is shown in the above reaction?
- iii) Give one use of ammonia.
- 3. a) An atom Z can be represented as

What does the number 39 represent?

b) Study the information in the table below and answer the questions that follow. (Letters are not the actual symbols of the elements).

Element	Electron arrangement of stable ion	Atomic radius (nm)	Ionic radius (nm)
L	2.8	0.072	0.136
М	2	0.152	0.068
N	2.8	0.186	0.095
0	2.8	0.160	20.065
P	2.8.8	0.099	0.181
Q	2.8.8	0.197	0.099

i) Write the formula of the compound formed when P reacts with Q Atomic numbers are; (P = 17, Q = 20) (1mark)

- ii) Identify the elements which belong to the third period of the periodic table. Explain. (2marks)
- iii) Which of the elements identified in b(ii) above comes first in the third period?
- iv) Select two elements which are non-metals.
- c) The table below gives some properties of substances A, B, C and D. study it and answer the questions that follow;

Substance	Electrical conductivity		MP ("C)	BP (C)
	Solid 🔨	Molten		
В	Does not conduct	Conducts	701	1320
В	Conducts	Conducts	550	1100
С	Does not conduct	Does not conduct	1600	2100
D	Does not conduct	Does not conduct	113	440
		1. 1. 2. 2		

i) What type of bonding exists in substances A and B?

ii) Which substance is likely to be sulphur? Explain

4. a) The flow chart below shows a sequence of reactions starting with iron. Study it and answer the questions that follow;

(1mark)

(1mark)

(1mark)

(2marks)

(1mark)

(2marks)

(2marks)



(2marks)



## KURIA EAST EXAMS 233/3 CHEMISTRY PRACTICAL CONFIDENTIAL

In addition to the apparatus and fittings found in the Chemistry Laboratory, each candidate will require the following;

- 16.  $150 \text{ cm}^3$  of solution C
- 17. 150cm³ of solution D
- 18. 60cm³ of Copper (II) sulphate (2 molar)
- 19. 50cm³Burette
- 20. 25cm³ pipette
- 21. Atleast 2 conical flasks
- 22. 100ml plastic beaker
- 23.  $(-10^{\circ}C = 110^{\circ}C)$  thermometer
- 24. Spatula
- 25. One boiling tube
- 26. 5 test tubes
- 27. 1g of Zinc powder (accurately measured)
- 28. About 0.5g of solid Q
- 29. Tissue paper
- 30. Distilled water in a wash bottle

### Access to;

- Phenolphthalein indicator
- Source of heat
- 2M sodium hydroxide with a dropper
- 2M ammonia solution with a dropper
- 2M hydrochloric acid with a dropper
- 2M Barium nitrate with a dropper
- 2M nitric (v) acid with a dropper
- 2M Lead (II) nitrate with a dropper

### NOTES

- 4. Solution C is made by dissolving 10.08g/l of ethanedioic acid (oxalic acid) in 400cm³.
- 5. Solution D is made by dissolving 8.0g of Sodium hydroxide in 400cm³ of water and made to one litre.

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6. Solid Q – aluminum sulphate  $(Al_2(SO_4)_3)$ 

# NAKURU CLUSTER 233/1CHEMISTRY (THEORY) PAPER 1 **JULY 2018** TIME: 2 HOURS.

1. The diagram below shows a simple distillation to separate water and ethanol.



b) Ethanol collected is 95% pure. Secondary distillation is carried out in which calcium metal is placed in ethanol to react with water. Give a reason why the following cannot be used. (2marks)

- Sodium metal i.
- Copper metal ii.
- Study the diagram below and answer the questions that follow. 2.

Substance	Melting Point ( ⁰ C)	Boiling Point	Electrical co	nductivity	Solubility
		× 9.0×	Solid	Liquid	
Х	37	344	Poor	Poor	Insoluble
Y	-114 🤫	<mark>2-85</mark>	Poor	Poor	Good
K	1610	2230	Poor	Poor	Insoluble
L	29	685	Good	Good	Good
М	614	1382	Poor	Good	Good

- (i) Select a substance from the given date which;-
  - Has giant ionic structure a.
  - b. Has giant covalent structure (1mark) (1mark)
  - Is a gas at room temperature c.

3. A form three student weighed a piece of plain paper, wrote her name on it and re-weighed it. The following were the results.

Mass of plain paper	=	2.804
Mass of paper with name	=	2.9053

If she wrote her name using pure graphite, determine the number of carbon atoms used to write her name. (C=12.0, Mole constant  $L = 6.0 \times 10^{23}$ ) (3marks)

The table below shows tests carried out on a sample of water and the results obtained. 4.

(1mark)

(1mark)

(1mark)

(1mark)

(1mark)

(2marks)

	Test	Results
Ι	Addition of sodium hydroxide solution	White precipitate which dissolves in excess
II	Addition of excess aqueous ammonia	Colourless solution obtained
III	Addition of dilute hydrochloric acid and barium chloride	White precipitate

a) Identify the anion present in the water.

- b) Write an ionic equation for the reaction in III
- c) Write the formula of the complex ion formed in II
- Solutions can be classified as acids bases or neutral. The table below shows solutions and their pH values. 5.

Solution	PH - VALUES
К	1.5
L	7.0
М	14.0

(i) Select any pair that would react to form a solution of pH 7.

(ii) Identify two solutions that would react with aluminum hydroxide.

Explain

6. The diagram below is a set up to investigate the effect of heat on hydrated copper (ii) sulphate. Study the diagram and answer the questions that follow.



7. 1.9g of Magnesium chloride was dissolved in water. Silver nitrate solution was added till excess. Calculate the mass of silver nitrate that was added for complete reaction. (MgCl₂= 95, N=14, O=16, Ag = 108) (3marks)

²¹⁸ 



	Chemistry paper 1,2 & 3
Use	 (½ mark)

14. a) Element P and Q have atomic numbers 13 and 17 respectively. Write down the electron arrangement of the ions.

i) <b>P</b> ⁺	1mk
ii) Q ⁻	1mk
b) Write down the formula of the compound formed between element P and Q.	(1mark)
15. a) In an experiment, chlorine gas was passed into moist hydrogen sulphide in a gas jar.	
b) What observation was made in the gas jar.	(1mark)
c) Which of the reagents is a reducing agent? Explain	(2marks)
16. Boilers used for boiling hard water are normally covered with boilers scale after some time.	
a) What is a chemical name for boilers scale	(1mark)
b) How is the boilers scale removed?	(1mark)
c) State one advantage of using hard water.	(1mark)

17. A form one student set up the following apparatus to investigate the percentage of oxygen in air.



ii) Why is NaOH preferred to water in the above experiment?

(1mark) (1mark)

18. The diagram below shows a section of a model of the structure of element T.



a) State the bonding that exists in element T.(1mark)b) In which group of the periodic table does T belong? Give a reason.(2marks)

- 19. When a hydrocarbon was completely burnt in oxygen, 4.2g of carbon (IV) oxide and 1.71g of water were formed. Determine the empirical formula of the hydrocarbon (H=1.0, C = 12.0, O = 16.0) (3marks)
- 20. Consider the following equilibrium reaction

 $2SO_{2(g)} + O_{2(g)} = -ve$ 

- a) What will be the effect of increasing the temperature on the yield of sulphur (VI) oxide. Explain
- 21. Using dot (.) and cross (x) diagram, show the bonding in the two compound. Phosphonium ion  $PH_{4}^{+}$  (2marks) (P = 15.0, H= 1.0) (2marks)

22. The diagram below shows an incomplete set up of the laboratory preparation of dry carbon (IV) oxide. Complete it. (3marks)



(2marks)

(2marks)

(1mark)

 $(\frac{1}{2} \text{ mark})$ 

(1mark)

## NAKURU CLUSTER 233/2 CHEMISTRY PAPER 2

1. a) Study the information below and answer the questions that follow;

Element	Atomic Radius (am)	Ionic radius (nm)	Formular of oxide	Melting point of oxide ⁰ C
А	0.364	0.421	A ₂ O	-119
В	0.830	0.711	BO ₂	837
С	0.592	0.485	C ₂ O ₃	1466
D	0.381	0.446	D ₂ O ₅	242
Е	0.762	0.676	EO	1054

i) Which elements are non –metals. Give a reason.

ii) Explain why the melting point of the oxide of C is higher than that of the oxide of D.

iii) Give two elements that would react vigorously with each other. Explain your answer. (2marks)

b) Study the information in the table below and answer the questions that follow. The letters do not represent the actual symbols of elements.

		Ionizatio	n Energy
Element	Electron arrangement	1 st I.E.	2 nd I.E
Р	2.2	900	1800
Q	2.8.2	736	1450
R	2.8.8.2	590	1150

i) What chemical family does elements P, Q and R belong? (¹/₂ mark)

- ii) What is meant by the term ionization energy?
- iii) The 2nd ionization energy is higher than the first ionization energy of each. Explain. (1mark)
- iv) When a piece of element R is placed in cold water, it sinks to the bottom and an effervescence of a
- colourless gas is observed. c) Name the colourless gas.
- d) Write a chemical equation for the reaction taking place. (1mark)
  2. Butane is a gas at room temperature and pressure, it is used to melt bitumen to apply on roads.
  a) Write an equation for complete combustion of butane. (1mark)
  - b) Define the term standard enthalpy of combustion.
  - c) The set up below was used to determine the enthalpy change of combustion of butane.







4. The scheme below shows a series of reactions starting with propanol. Study it and answer the questions that follow.

224

(1mark)

(1mark)

(1mark)

(1mark)

In an experiment to study how rate of reaction varies with concentration, 10cm³ of 0.4M sodium thiosulphate was mixed with 10cm³ of 2M Hydrochloric Acid in a flask. The flask was placed in a white paper marked with a cross Х.

The time taken for the cross (x) to be invisible when viewed from the above was noted and recorded in the table below.

Experiment	Volume of 0.4M thiosulphate	Volume of water	Volume of 2MHCl	Time in seconds
1	10	0	10	16
2	7.5	2.5	10	23
3	5.0	5.0	10	32
4	2.5	7.5	10	72

(a) (i) On the grid provided, plot a graph of volume of thiosulphate (vertical axis) against time taken for cross to become invisible. (4marks)

From the graph determine how long it would take for the cross to become invisible if the experiment was (i) done.

MM. Heekcsepastpr

Using 6cm³ of 0.4M thiosulphate I.

II. Using  $60 \text{ cm}^3$  of 0.2M thiosulphate

(b)

- Using values from the experiment i. Calculate
- Moles of thiosulphate used I.
  - II. Moles of hydrochloric acid used.
- Explain which of the two reactants in the experiment I in b(i) above controlled the rate of reaction. ii.
- (c) Give two precautions which should be taken in the experiment I controlled rate of reaction. (2marks)
- 6. A form four student dissolved 9.57g of potassium chloride and potassium carbonate in distilled water to make up half a litre of solution. He pipetted 20cm³ of this solution into a conical flask and titrated it against a monobasic acid of concentration 0.25M using phenopthalein indicator. His results were as follows; , (O

oret	Trial	Ι	II	III
Final burette reading (cm ³ )	15.9	31.0	46.0	15.0
Initial burette reading (cm ³ )	0.0	15.9	31.0	0.0
Volume of acid used (cm ³ )				

а	<ul> <li>What observation was made at the end poin</li> </ul>	t?	(1mark)
b	b) Complete the table.		(1mark)
С	c) Determine the average volume of the acid u	sed.	(1mark)
d	l) Calculate the percentage of potassium chlor	ide in the mixture.	(4marks)
e	b) The equation of combustion of hydrogen ch	loride is as follows:-	
	$H_2S_{(g)} + O_{2(g)} \rightarrow SO_{2(g)} + H_2O_{(l)}$		
(i)	Balance the equation		(1mark)
(ii)	What volume of sulphur (IV) oxide is prod	uced when a mixture of 30cm ³ of hydrogen sulphide	e and 30cm ³ of
	hydrogen sulphide and 30cm ³ of oxygen is burn	t in a closed vessel.	(1mark)
f)	2	35	
(i)	The symbol of a radioactive isotope is	U What is the nucleus composition of the isotope?	(1mark)

225

(1mark)

(1mark)

(ii) The isotope decays by alpha emission write a nuclear equation for the decay using the symbol of the new nucleide as X (1mark)

- The half life of the isotope is 4500yrs determine the fraction of the radioactive material that would be (iii) remaining after 1800vrs. (2marks)
- 7.a)Aqueous potassium sulphate was electrolyzed using platinum electrodes in a cell.

i) Write the products formed at the anode and cathode

Anode. (1mark)

92

Cathode. ..... (1mark) ii) Why would it not be advisable to electrolyze aqueous potassium sulphate using potassium metal electrodes? b)Use the standard electrode potentials for elements A, B, C, D and F given below to answer the questions that follow.

		$E^{\theta}$ (volts)
$A^{2+}_{(aq)} + 2e^{-}$	$\longrightarrow$ A _(s)	-2.90
$B^{2+(aq)} + 2e^{-}$		- 2.38
$C^{+}_{(aq)} + e^{-}$		- 0.00
$D^{2^+}_{(aq)} + 2e^-$	$$ $D_{(s)}$	+0.34
$\frac{1}{2}F_{2(g)} + e$	<b>F</b> (aq)	+2.87

Which element is likely to be hydrogen? Give a reason for your answer. (i)

- (ii) What is the  $E^{\theta}$  value of the strongest reducing agent?
- In the space provided draw a labelled diagram of the electrochemical cell that would be formed when half (iii) cells of elements B and D are combined (3marks) (1mark)
- Calculate the  $E^{\theta}$  value of the electrochemical cell constructed in (iii) above. (iv)
- During electrolysis of aqueous copper (II) sulphate using copper electrodes a current of 0.2 Amperes was b) passed through the cell for 5hours.
- Write an ionic equation for the reaction that took place at the anode. (i) (1mark)
- Determine the change in mass of the anode which occurred as a result of electrolysis. (2marks) (ii) (Cu = 63.5, 1 Faraday = 96 500 c)

NAKURU CLUSTER 233/3 **CHEMISTRY** PAPER 3

# CONFIDENTIAL INSTRUCTIONS TO SCHOOLS.

In addition the apparatus and fittings found in a chemistry laboratory, each candidate will require the following;

- A burette
- A 25cm³ pipette
- A pipette filler
- 2 conical flasks
- Water in a washing Bottle (250ml distilled)
- A stand and a clamp
- 150cm³ of solution A
- 100cm³ of solution B
- 80cm³ of solution C
- Exactly 2g of solid D (Oxalic Acid)
- 50ml or 100ml measuring cylinder
- 100ml plastic beaker
- A thermometer ( $-10^{\circ}$ C to  $110^{\circ}$ C)
- About 1g of solid E
- Boiling tube
- 10cm³ measuring cylinder
- 6 test tubes in a rack
- Test tube holder
- Spatula holder
- Spatula (metallic)

# ACCES TO;

- 0.5M Pb(NO₃)₂, Lead (ii) nitrate
- 0.5M barium nitrate
- 1M nitric (v) acid
- Acidified potassium manganate VII
- Acidified potassium dichromate
- Methyl orange indicator
- 1M sodium hydroxide solution

# NOTES

- 1. Solid D is Oxalic acid
- 2. Solid E is sodium sulphite (Na₂SO₃)
- 3. Solution A is prepared by adding 12.9cm³ of concentrated hydrochloric acid (specific gravity 1.18) to 500cm³ of distilled water then top up to one litre.
- 4. Solution is prepared by dissolving 4g of sodium hydroxide (NaOH) in 600cm³ of distilled water then top up to one litre.
- 5. Solution C is prepared by dissolving a mixture of 8.4g of sodium hydrogen carbonate (NaHCO₃) and 1.6g of Sodium chloride in about 500cm³ of distilled water and then making it to one litre.
- 6. Acidified potassium manganate VII is prepared by dissolving 3.16g of potassium manganate VII in 500cm³ of 2M sulphuric acid and diluting to one litre of solution with distilled water.
- 7. Acidified potassium dichromate VI is prepared by dissolving 3.0g potassium dichromate VI in 500cm³ of 2M sulphuric acid and diluting to one litre of solution.

Each supplied with a dropper

(21marks)

NAKURU CLUSTER 233/3**CHEMISTRY** PRACTICAL PAPER 3 **JULY 2018** TIME: 2¹/₄ HOURS.

### **FORM FOUR TRIAL EXAMINATION 2018**

### Question 1

You are provided with;

- Dilute hydrochloric acid solution A .
- 0.1M sodium hydroxide solution B •
- 10g of a mixture of sodium hydrogen carbonate and sodium chloride per litre, solution C You are required to determine;
- i. Molarity of solution A
- Percentage purity by mass of Sodium hydrogen carbonate ii.

### **PROCEDURE 1**

Fill the burette with solution A. Pipette 25cm³ of 0.1M sodium hydroxide solution B into a clean conical flask and add 2 drops of methyl orange indicator and titrate with solution A until a permanent pink colour occurs. Fill in the table below. Repeat the titration two more times and complete the table below.

TABLE I	1	2	3
Final burette reading (cm ³ )	410	S.	
Initial burette reading (cm ³ )	www.		
Volume of solution A used (cm ³ )	, citi		

(4marks) (1mark)

- Calculate the average volume of solution Aused. a)
- Calculate the number of moles of hydrochloric acid solution A that reacted with 25cm³ of sodium hydroxide b) solution B. (2marks) (2marks)
- Calculate the concentration of solution A in moles per litre. c)

# **PROCEDURE II**

d) e) f)

Pipette 25cm³ of solution C into a conical flask. Titrate with solution A using 2 drops of methyl orange indicator. Record your results in table II below.

,	TABLE I	1	2	3
]	Final burette reading (cm ³ )			
]	Initial burette reading (cm ³ )			
7	Volume of solution A used $(cm^3)$			
				(4marks)
	Calculate the average volume of solution	ion A used.		(1mark)
	Write an ionic equation for the reactio	n taking place between	n solution A and mixt	ure C. (1mark)
	Calculate			
i.	Molarity of sodium hydrogen carbona	te in moles per litre.		(2marks)
ii.	Mass of sodium hydrogen carbonate in	n the mixture in gramn	nes per litre.	(1mark)

- Mass of the sodium chloride in the mixture. iii.
- The percentage purity of the sodium hydrogen carbonate. iv.

(1mark)

(2marks)

		Chemistry paper 1,2 & 3
	QUESTION 2	(07Marks)
•	You are provided with exactly 2g of solid D(oxalic act You are required to determine the molar heat of solution	$d H_2C_2O_4$ . $2H_2O$ ) on of solid D.
$(\cdot)$	PROCEDURE Place 20 cm ³ of distilled system into a 100 ml selectio hash	h
(1) (ii)	Measure the initial temperature of the water and record	ker. d it in table III below Add all the solid D at once Sti
(11)	the mixture carefully with the thermometer until all the sol record it in table III below.	id dissolves. Measure the final temperature reached and
	TABLE III	
	Final temperature (°C)	
	Initial temperature (°C)	
		(1mark)
(i) (ii)	Determine the change in temperature, $\Delta T$ . Calculate the	(1mark)
I.	Heat change when solid D dissolves in water. (Assume density solution is 1gcm ⁻³ )	ne the heat capacity of the solution is 4.2kJKg ⁻¹ K ⁻¹ and (2marks)
	Moles of solid D, oxalic acid $(H_2C_2O_4, 2H_2O)$ used.	(2mortes)
П.	Molar heat of solution. $\Delta H$ of solid D. (Oxalic acid)	(2marks)
	QUESTION 3	(12marks)
	You are provided with solid E. Carry out the tests below of	on it to determine its identity. Record your observation
	and inferences in the spaces provided	in it to determine its identity. Record your observation
a)	Put all the solid E provided in a boiling tube and add	10cm ³ of distilled water and shake thoroughly. Divid
	the resulting solution into six portions. To portion one add	sodium hydroxide solution dropwise until in excess.
[	Observations	Inferences
	, N	
b)	Insert a clean metallic spatula (or wet) to the second po	prtion and burn it in a non-luminous flame.
[	Observations	Inferences
c)	To the third portion, add 4 drops of Lead (II) nitrate so	olution.
	Observations	Inferences
d)	To the fourth portion, add 4 drops of barium nitrate sol	ution followed by 2cm ³ of dilute nitric (V) acid.
	Observations	Inferences
	1mk	lmk
e)	To the fifth portion, add 3 drops of acidified potassium	manganate VII
	Observations	Inferences
	1mk	1mk
f)	To the sixth portion, add 3 drops of acidified potassiun	n dichromate VI
[	Observations	Inferences
ŀ	1mk	1mk

g) Give the identity of solid E.

(1mark)

(2 marks)

(1 mark)

(1 mark)

(1 mark)

(1 mark)

(2 marks)

1 mark)

1 mark)

**MERU CLUSTER** 233/1CHEMISTRY Paper 1 July/August Time : 2 hours

Elements R - 238 decays in series forming different nuclides as shown below. 1.

²³⁸₉₂
$$\mathbf{R} \xrightarrow{\mathbf{X}} {}^{234}_{90}\mathbf{P} \xrightarrow{\mathbf{Y}} {}^{234}_{91}\mathbf{T}$$
  
a) Identify the type of decay X and Y.

b) Give one use of radioactive isotopes in medicine.

- 2. Chlorine can be manufactured by electrolysis of brine in a mercury cathode cell. 15.0m
  - a) Write equations for the electrode reactions at :
  - i) Anode :
  - ii) Cathode:
- a) State Charles law. 3.
  - b) Sketch a graph to illustrate Charle's law.
- In an experiment, 2 drops of universal indicators were added into a series of alkali. 4. The table below summarises part of the results.

Alkali	Colour in universal indicator soln	pH value
Sodium hydroxide	Violet wh	13
Ammonia solution	Blue	9

- What is an alkali. a)
- Account for the results. b)
- 5. Name the process that takes place when: i) Ethanol reacts with concentrated sulphuric acid at 180°C to form ethene. (1 mark)ii) Ammonium chloride is heated and forms white powder on the cooler parts of the boiling tube. 1 mark)
  - iii) Propanol reacts with propanoic acid in presence of a catalyst to form propylpropanoate. (1 mark)
- The following reaction is in equilibrium in a closed container 6.

 $C_{(S)} + H_2 O \longrightarrow CO_{(g)} + H_2$ 

State giving reasons how an increase in pressure would affect to amount of hydrogen produced. (2 marks)

The diagram below represents a flame of the Bunsen burner. 7.



2	Δ	2
_	-	_





b) The table below shows the results when rods of the three metals X, Y and Z are used in separate experiments. All the metals are less reactive than magnesium

Rod 1	Rod 2	Voltmeter reading (V)
Magnesium	Х	2.72
Magnesium	Y	0.78
Magnesium	Z	1.10

Arrange the metals in order of starting with the most reactive.

**19.**a) Water from a town in Kenya is suspected to contain chloride ion but not sulphate ions. Describe how the presence of the chloride ion in the water can be shown. (2 marks) (1 mark)

b) State one advantage of drinking hard water rather than soft water.

(1 mark)

(1 mark)

(2 marks)

(1 mark)

1 mark)

mark)

2 marks)

(1 mark)

1 mark)

(1 mark)

(1 mark)

**20.** Sulphur (IV) oxide reacts with potassium chromate (VI) according to the equation below.

$$3SO_{2(g)} + Cr_2O_{7(aq)}^{2-} + 2H_{(aq)}^+ \rightarrow 3SO_4^{2-} + 2Cr_{(aq)}^{3+} + H_2O_{(l)}$$

- $Cr_{2}O_{7}^{2-}$ i) What is the oxidation number of chromium ion in
- ii) State and explain the observation made is the above reaction
- 21. The table below shows the observation made on tests carried out on a colourless liquid sample.

Test	Observation	]
Addition of excess NH _{3(aq)}	White precipitate	-
Addition in dilute $H_2SO_{4(aq)}$	White precipitate	-
Addition in AgNO _{3(aq)}	White precipitate	
		etpapers.con
Cation in the sample Anion in the sample Define the term isomerism Draw and name two isomers lain each of the following p Malleability. Ductility Sonorocity.	s of butanol. roperties of metals.	LCSB Past

Identify

- i) Cation in the sample
- ii) Anion in the sample
- **22.**a) Define the term isomerism
- b) Draw and name two isomers of butanol.
- 23. Explain each of the following properties of metals.
  - i) Malleability.
  - ii) Ductility iii) Sonorocity.
- (1 mark) 24. An alkanol has the following composition by mass; hydrogen 13.5%, Oxygen 21.6% and carbon 64.9% a) Determine the empirical formula of the alkanol. (2 marks)

(C=12.0, H=1.0, O=16.0)

b) Give that empirical formular and the molecular formular of the alkanol are the same, draw the structure of the alkanol. (1 mark)

- **21.** Explain the following observations:
  - i) Graphite is a non-metal that conducts electricity.
  - ii) Graphite rods are the most preferred electrodes.

iii) Molten lead (II) iodide conducts electric current while solid lead (II) iodide does not. (1 mark)

**26.** Study the table below and answer the questions that follow.

Formula of compound	Х	XCl ₂	Y	YCl ₃	Ζ	ZCl ₄
Boiling point	650	710	660	Sublimes at 180°C	1410	-70
Melting point	1120	1420	2450		2680	60
Electrical conductivity in liquid state	Good	Good	Good		poor	poor

Element X, Y and Z are period 3.

- Which element has giant covalent structure. Explain. i)
- Explain the difference in mode of electrical conductivity in substances XCl₂ and Y. ii)

(2 marks) (2 marks)

245

27. When a solid R was heated in a test tube, it gave off two gases. The two gases were separated by passing them through a plug of glass wool in a test tube as shown below.



The first gas which evolved turned moist red litmus paper blue. The other gas evolved turned the litmus paper back red. Identify solid R. (1 mark)

28. When potassium chlorate (V) is heated, it decomposes according to the following equation.

 $2KClO_{3(S)} \rightarrow 2KCl_{(S)} + 3O_{2(g)}$ 

Calculate the volume of oxygen measured at r.t.p that is evolved when 2.5g of potassium chlorate (V) is heated to a constant mass. (Molar gas volume at r.t.p = 24000cm³, K=39, Cl=35.5, O=16. (3 marks)

29. Explain why hydrogen sulphide is a gas at room temperature while water is liquid at room temperature. for more thee past papers, visit, www.treekcsepastpe

(2 marks)

# **MERU CLUSTER** 233/2 CHEMISTRY

# Paper 2

### Section A

1. Study the information below and answer the question that follow, letters do not represent actual symbol of the element.

Element	Atomic No.	Melting point °C	Boiling point °C	Atomic radii	Ionic radius
L	3	-179	1340	0.08	0.100
М	9	-220	-188	0.101	0.105
Ν	11	98	890	0.135	0.132
Р	12	650	1110	0.126	0.124
Q	13	660	2470	0.125	0.120
R	15	442/590	280	0.111	0.119
S	16	113/119	445	0.103	0.109
Т	17	-101	ann tha	0.109	0.120
U	19	63.5	-775	0.167	0.160

a)	Write the electronic configuration of an ion of element T and U	(2 marks)
b)	Why do the elements represented by R and S have two values of melting point.	(1 mark)
c)	Select an element.	
,	i) Which is the most electronegative.	(1 mark)
	ii) That belong to period 4, explain.	(2 marks)
d)	Explain why	
	i) Ionic radius of R is bigger than its atomic radius	(1 mark)
	ii) The atomic radius of L is bigger than that of R yet they are in the same period.	(1 mark)
	KON THE REPORT OF THE REPORT O	. ,
e)	Using dots (•) and cross (×) to represent outermost electrons, show bonding in the compound form	ned between
,	L and M.	(2 marks)
f)	Write an equation for the reaction that occur between U and water.	(2 marks)
<b>g</b> )	Describe how a solid mixture of the sulphate of element N and lead (II) sulphate can be separated	into solid
	sample of a dry lead (II) sulphate.	(2 marks)
a)	Give the systematic name for compound whose structural formula is given below.	(1 mark)

**b**) Draw the structural formular of the third member of alkyne homologous series.

(1 mark)



248



(orange)

(yellow)

Use Le Chatelier's principle to explain the observation that would be made when dilute hydrochloric acid is added to the equilibrium mixture. (2 marks)

When sodium thiosulphate reacts with hydrochloric acid, a yellow solid sulphur forms according to the following equation.

 $Na_2S_2O_{3(aq)} + 2HCl_{(aq)} \rightarrow S_{(S)} + 2NaCl_{(aq)} + SO_{2(g)} + H_2O_{(l)}$ 

The effect of temperature on the rate of reaction was studied. A 25cm³ portion of 0.02 molar solution sodium thiosulphate was run into a conical flask. A cross sign ( $\times$ ) was drawn on a piece of paper underneath a flask. An excess hydrochloric acid was added and temperature was noted. The time taken for cross sign to disappear was also noted. The experiment was also repeated at different temperatures. The result was as shown below.

Temperature	10	20	30	40	50	60	70
Time (S)	20	37	50	67	72	74	74

- i) Plot a graph of time against temperature on the grid provided.
  - ii) From the graph, determine the reaction rate between 25°C and 45°C
- 7.a) Iron pyrites, a naturally existing mineral was heated in air to give iron (III) oxide and gas X. This gas is also formed when a yellow powder is burned in limited amount of air.
  - i) Identify the yellow powder. (1 mark)ii) Identify gas X. (1 mark) iii) Write a chemical equation to show the reaction between gas X and aqueous sodium hydroxide. (1 mark)When a piece of metal X is placed in a solution of metal Y ions, metal Y plates out on the piece of X. Which
- b) metal: (1 mark)
  - i) is oxidised.

ii) is reduced. (1 mark)c) Iron windows frames corrode quickly unless carefully protected but aluminium window frames are resistant to

- corrosion.
- i) Give the chemical name of the substance formed when iron rusts.
- ii) Why does aluminium not corrode as quickly as iron?

tor more

iii) Explain why galvanised iron is resistant to corrosion even when the protective surface of Zinc is broken.

(2 marks)

(1 mark)

(2 marks)

(3 marks)

(2 marks)

MERU CLUSTER 233/3 CHEMISTRY Paper 3 July/August 2018 Time :2 hours CONFIDENTIAL

# Each candidate will require:

- In addition to the fitting and apparatus in the school laboratory, each student should be provided with the following: 1. Solution C
  - 2. Specimen L
  - 3. Drinking straw
  - 4. Three boiling tubes with boiling tube corks / stoppers.
  - 5. Two empty 250ml plastic beaker.
  - 6. Two pieces of aluminum foil enough to wrap the boiling tubes completely.
  - 7. Specimen P Ripe orange (Medium sized with seeds)
  - 8. Specimen Q Mature bean pod.
  - 9. Solution X Benedicts Solution.
  - 10. Solution Y-DCPIP.
  - 11. Scalpel.
  - 12. Hand lens.
  - 13. Piece of cotton thread 20 cm long.
  - 14. Stop watch.

# NB

a) Solution C is prepared by measuring 50 Cm³ of Bromothymol blue and dissolve it in 1000 Cm³ of distilled water to make 5% of solution.

b) Specimen L is a twig of Cassia SP freshly obtained with 2.3 leaves.
(1 mk)

(1 mk)

(2 mks)

(1 mk)

#### IGEMBE CENTRAL 233/1 CHEMISTRY PAPER 1

## TIME: 2 HRS

2.

1. A column chromatography of a solution of spinach was done using petrol solvent. The results were as shown in the diagram below.

a) Why is it possible to separate chlorophyll and carotene? b) On the diagram label the solvent front and the base line. The chemical formula of elements P and Q is P₂Q₃, P is an element in period 3 while Q is a non-metal in period 2 Write the electronic configuration of:a) An atom of P (1 mk) b) An ion of Q (1 mk)

- c) Write the chemical formula of a compound formed when Q reacts with element V a metal in group one.
- 3. A sample of hard water was divided into portions and analysed. The results of the analysis were tabulated as shown below.

		<u>2</u> '	
Portion of water	Observations on	treating of	water with:
	$Na_2CO_3(aq)$	$Pb (NO_3)_2$	$Ba(NO_3)_2$
Unboiled water	White ppt	White ppt	No ppt
Boiled water	White ppt?	White ppt	No ppt

a) Predict the type of hardness in the water.

b) Suggest the compounds likely to be present in the water.

4. a) State Gay Lussac's law.

b)  $10 \text{cm}^3$  of a gaseous hydrocarbon,  $C_2H_x$  require  $30 \text{cm}^3$  of oxygen for complete combustion. If steam and  $20 \text{cm}^3$  of Carbon (iv) Oxide were produced what is the value of x? (2 mks)

5. The set up in the diagram below was used to prepare oxygen gas in the laboratory.



	С	hemistry paper 1,2 & 3
	a) Identify solid x.	(1 mk)
	b) State any two uses of oxygen gas.	
6.	a) What do you understand by the term dative covalent bond?	(1 mk)
	b) Using dots (.) and crosses draw a diagram to show the bonding in Carbon II Oxide molecu	ıle. (1 mk)
	c) State one property of ionic compounds. (1 mk)	
7.	The following are organic compounds belonging to different homologous series.	
	CH ₄ , C ₄ H ₁₀ , C ₂ H ₂ , C ₂ H ₅ OH, CH ₃ COOH	
	Which of the above compounds:-	
	a) Would decolourise chlorine gas in presence of U.V light but does not decolourise	acidified potassium
	Manganate (VII).	(1  mk)
	b) Decolourise potassium Manganate (VII) but does not decolourise bromine water.	(1 mk)
	c) Does not decolourise both Potassium Manganate (VII) and bromine water.	(1 mk)

8. Using the data below, draw a energy cycle diagram and use it to determine the heat of formation of propane. (2 mks)

15.com

$C_{(s)} + O_{2(g)} \otimes CO_{2(g)}$	DH -406kJ/mol
$H_{2(g)}^{-} + \frac{1}{2}O_2 \otimes H_2O_{(1)}$	DH= -286kJ/mol
$C_{3}H_{8(g)}^{\circ} + 5O_{2(g)} \otimes 3CO_{2(g)} + 4H_{2}O_{(l)}$	DH = -2209 kJ/mol

9. The products formed by the action of heat on nitrates of elements A, B and C are shown below.

Nitrate	Products formed
А	Metal oxide + Nitrogen (IV) Oxide+ Oxygen
В	Metal + Oxygen + Nitrogen (IV) Oxide
С	Metal Nitrite + Oxygen

a) Arrange the metals in increasing order of reactivity.	(1 mk)
b) Which element forms a soluble carbonate?	(1 mk)

- c) Give one example of metal B.
- **10.** A radio active substance emits three different particles.
  - a) Give the name of the particle with the highest ionising power. (1 mk)
    - b) Find the values of Y and Z in the equation below.

$$y_{92}^{y}u + {}^{1}n \rightarrow S_{38}^{y}Sr + {}^{140}zXe + 2{}^{1}n$$

11. When Sodium Carbonate crystal Na₂CO₃.xH₂O with formula mass 286 were left exposed to the air, a white powder Na₂CO₃.H₂O is formed.

a) What name is given to the phenomenon?	(1 mk)
b) Determine the value of x.	(2 mks)
(Na=23, C=12, O=16, H=1)	

**12.** Study the flow chart below and answer the questions that follow.

(1 mk)



c) Write a chemical equation for the reaction taking place in the combustion tube.

(1 mk)18. In an experiment 40cm³ of 0.5M nitric acid was reacted with excess Sodium Carbonate and the volume of Carbon (IV) Oxide produced recorded with time. In another experiment, the same volume and concentration of ethanoic acid was reacted with excess Sodium Carbonate and the volume of Carbon (IV) Oxide produced recorded with time.

a) Why was Sodium Carbonate used in excess?

volume of CO₂(cm

b) On the graph below sketch and label the curves of the volumes of Carbon (IV) Oxide produced against time.

time (min)

**19.** The set up below was used to carry out electrolysis of a bromide of metal T, TBr₂.



i) Anode

ii) Cathode

b) Give a reason why this experiment should be carried out in a fume chamber. (1 mk)

**20.** Nitrogen gas reacts reversibly with hydrogen gas as shown in the equation below.

$$N_{2(g)} + 3 H_{2(g)} \longrightarrow 2NH_{3(g)} DH = -92 \text{ KJ/Mol}$$

a) What would be the effect on the reaction of:-

- i) Increasing the pressure
- ii) Lowering the temperature.
- b) Which catalyst is used to encourage the formation of ammonia in this reaction? (1 mk)
- 21. Study the reaction scheme below and answer the questions that follow.

265



(2 mks)

(1 mk)

(1 mk)

(1 mk)

(1 mk)

(1 mk)

(3 mks)

(1 mk)

(1 mk)

brown salid

solid X | water

heat

step III

a) Write the formula of the cation present in solution F.

vellow solution F

b) What property of Chlorine is shown in step I?

Cl_s(g)

- c) Write an equation for the reaction which occurs in step III.
- 22. Calculate the mass of Calcium Carbonate which would produce 480cm³ of Carbon (IV) Oxide when heated at room temperature and pressure. (3 mks)(N

step 🛙

add NaOII(aq) then filter

- 23. In an experiment, ammonium Chloride was heated in a test tube. A moist red litmus paper placed at the mouth of the test tube first changes to blue litmus then to red. Explain these observation.
- **24.** Zinc is normally extracted from its natural ores like Zinc blende (ZnS) and Calamine  $ZnCO_3$ . a) Explain why it is wrong to refer to these ores as Zinc Sulphide and Zinc Carbonate respectively. (1 mk)
  - b) Write an equation for roasting Zinc blendes in the air.
  - c) Give one use of Zinc metal.

FeSO₄(aq)

25. In an experiment the electrical conductivity of some substances and the effect of electricity on them was studied. The observations made were recorded in the table below. Study it and answer the questions that follow.

	Conductivity in:	
Substance	Solid state	Aqueous/ Molten State
Q	Does not conduct	Conducts
R	Conducts jist	Conducts
s	Does not conduct	Does not conduct

- a) Which of the substances is likely to be
  - i) a metal?
  - ii) a substance with giant covalent structure?
- b) Explain why substances Q conducts only when in aqueous or molten state.
- 26. Study the information in the table below and answer the questions that follow. The letters are not the actual symbols of the element.

Element	Atomic Number	Melting point (ºC)
U	11	97.8
v	13	660
W	14	1410
Х	17	-101
Y	19	63.7

Select an element which is:-

a) The most reactive non-metal

b) A poor conductor of electricity.

27. 25cm³ of 0.15M Sodium Carbonate solution required 18cm³ of dilute hydrochloric acid for complete neutralisation. Determine the concentration of the hydrochloric acid solution. (1 mk)

266

(1 mk)

(1 mk)

 $(\frac{1}{2} \text{ mk})$ 

- (2 mks)
- $(\frac{1}{2} \text{ mk})$

(1 mk)

(2 mks)

(1 mk)

(1 mk)

(1 mk)

(1 mk)

(1 mk)

(1 mk)

(3 mks)

(1 mk)

### **IGEMBE CENTRAL** 233/2**CHEMISTRY** PAPER 2

The grid below is part of the periodic table of the elements. The letters are not the actual symbols of the 1. elements. Study it and answer the questions that follow.

Е		Η			J	
	Ν	R				
F	G		Ζ	L		К
					Μ	

- i) Name the group to which elements J and M belong.
- ii) Give the name of the most reactive metal. Explain.
- iii) Write down the equation for the reaction between G and J.
- iv) Explain why the atomic radius of G is larger than that of Z.
- v) An element P forms a compound with the formula NP₂ with  $\mathcal{N}$  P is not in group seven but in period 3. Identify the group in which element P belong and show it on the periodic table. (2 mks)
- vi) Explain why the melting point of M is higher than that of J.
- (1 mk) vii) Give the name of the bond formed between R and J and give the formula of the compound formed.
- b) The 1st, 2nd and 3rd ionization energy in kJ/mol of element W and Q are given below.

Element	lst I.E	2nd I.E	3rd I.E
W	550	7300	9500
Q	420 v	3000	4800

i) What is 2nd ionization energy?

ii) Apart from decrease in energy levels. Explain why there is a big difference between 1st and 2nd ionization (2 mks)energy.

iii) Calculate the amount of energy in KJ/mol for the process below.

 $Q^{3+}(g) + 3e^{-}$  $Q_{(g)}$ 

a) The equations below shows the standard reduction potentials for four half cells. Study them and answer the 2. questions that follow. Letters are not the actual symbols of elements.

Half reaction	E ^θ Volts
$A^{2+}_{(aq)} + 2e^{-} \longrightarrow A_{(s)}$	- 2. 38
$B^+_{(aq)} + e^- \longrightarrow B_{(s)}$	+ 0.80
$D^{2+a}_{(aq)} + 2e^{-} \longrightarrow D_{(s)}$	0.00
$E^{2+(aq)} + 2e^{-} \longrightarrow E_{(s)}$	- 0.25

i) Identify the reference electrode. Explain

- ii) Draw an electrochemical cell formed when B half cell is combined with A half cell.
- iii) Write the cell representation for the cell in a (ii) above.



		Chemistry paper 1,2 & 3
	i) Step (I)	(1 mk
	ii) Step (IV)	(½ mk)
	d) Write the equation for the reaction in:	<i></i>
	i) Step (l)	(1 mk)
	$(1) \operatorname{Step}(1V)$	(1  mk)
	e) What are the observations made when $C_2H_2$ and gas A are completely burnt.	(1  mk)
4.	In an experiment to determine molar heat of displacement, excess Zinc was added to a	a 250cm ³ plastic beaker
	containing 100cm 0.5M Copper (II) Sulphate solution. The solution was stirred v	with thermometer. The
	temperature of the solution charged from 21°C to 45°C.	
	(Given that $Zn=65$ , specific heat capacity =4.2jg ^{-k} , density of the solution = 1g/cm ^o )	(2, 1)
	a) State and explain the observations made.	(2  mks)
	b) Calculate :-	(1 1-)
	1) Moles of $CuSO_4$ in solution.	(1  mK)
	ii) Heat of the reaction.	(1  mK)
	a) i) Determine the mass of Zine used	(1  IIIK) (1  mk)
	i) Determine the mass of Zine used.	(1  IIIK) (1  mk)
	d) Write the therma chemical equation for the reaction	(1  mk)
	e) The theoretical value is greater than the experiment value. Explain	(1  mk)
	f) Draw an energy level diagram for the reaction	(1  mk)
		(2 111KS)
	*Ogz	
5.	Study the flow diagram below and answer the questions that follow	
	$O_2$ excess air	
	sulphur from	
	frasch process chamber K chamber J	
	5	
	ammonia	
		1
	98% H_SO(0) K absorption lower	← conc H ₂ SO4
		• •
	fertilizer Z water	
	a) Write equations occurring in the following chamber.	<i></i>
	i) Chamber k	(1 mk)
	ii) Absorption tower	(1 mk)
	iii) Diluter	(1 mk)
	b) The reaction taking place in chamber J is given below.	
	$2SO_2 + O_2 \implies 2SO_3 DH = -196kJmol$	
	1) Explain why it is necessary to use excess air in chamber J.	(2  mks)
	11) Name another substance used in chamber J.	(1  mk)
	11) What name is given to chamber J.	(1 mk)
	iv) State and explain the effect on the yield of Sulphur (VI) Oxide when temperature is in	creased
	a) Colored to the measurement of $n^{2}$ to compare the triling $7$ (b) 14 C (20 C) 14 U (1)	(1  mk)
	c) Calculate the percentage of nitrogen on fertilizer Z. (N=14, S=32, U=16, H=1)	(2 mks)

6. The table below shows the solubility of two salts X and Y in g/100cm³. Use it and answer the questions that follow.

(5 mks)

(1 mk)

(1 mk)

(1 mk)

(2 mks)

(2 mks)

(2 mks)

(2 mks)

Temperature in (°C)	0	20	50	60	80	90
Solubility of X in g/100cm ³	6	10	22	35	55	65
Solubility of Y in g/100cm ³	90	40	16	10	6	5

On the grid provided plot the graphs of temperature against the solubility of salts X and Y in g/100cm³

b) From your graph determine the solubility of:

i) Salt X at  $71^{\circ}$ C.

ii) Salt Y at 35°C.

- c) At what temperature is the solubility of X and Y the same.
- d)  $50 \text{cm}^3$  of saturated solution of salt X was cooled from  $70^{\circ}\text{C}$  to  $30^{\circ}\text{C}$ . Calculate the mass of salt X formed.

e) State two uses of solubility.

7. The diagram below shows the extraction of Sodium metal using downs cells. Study it and answer the questions that follow.



c) State two properties of Sodium metal that makes it possible for it to be collected as shown in the diagram. (2 mks)
d) What is the function of steel gauze cylinder? (1mk)
e) Write ionic equations for the reactions which take place at:i) Cathode. (1 mk)
ii) Anode (1 mk)
f) Give two industrial use of Sodium metal. (2 mks)
g) Explain why the Sodium metal is kept stored under Kerosene. (1 mk)

## IGEMBE CENTRAL 233/3 CHEMISTRY PAPER 3 PRACTICAL

**Q1.** You are provided with 0.06g Magnesium ribbon, solid C. - 2M H₂SO₄, solution D

You are required to determine the molar heat of reaction between Sulphuric (IV) acid and Magnesium ribbon.

## **PROCEDURE**

Using a burette, place  $50.0 \text{cm}^3$  of  $\text{H}_2\text{SO}_4$  solution D in 100ml plastic beaker. Stir the solution gently with a thermometer measure the temperature after every one minute. Record the values in table 1 below. Fold Solid C once, at exactly 3 minutes, place Solid C into solution D in the beaker. Stir the mixture gently with the thermometer. Measure the temperature of the mixture after every one minute and record the values in table 1 below.



i) Plot a graph of temperature (x-axis) against Time on the grid provided. Show the change in temperature (DT) on the graph. (4 mks)

ii) Use your graph to determine the highest change in temperature (DT)

ii) Calculate the heat change for the reaction given that the specific heat capacity of the mixture is 4.2j/g/k. Assume the density of the resulting solution to be  $1 g/cm^3$ . (2 mks)

iii) Calculate the molar heat of the reaction of Magnesium with excess Sulphuric (VI) acid. (2mks)

#### Q2. You are provided with

- Solution E containing 14.84g per litre of anhydrous Sodium Carbonate.

- Hydrochloric acid, Solution F

- Phenolphthalein Indicator
- Methyl orange indicator

You are required to determine the morality of Solution F.

Procedure.

a) Fill the burette with solution F.

b) Pipette 25cm³ of solution E into a conical flask

c) Add the drops of phenolphthalein indicator and titrate against solution F. DO NOT POUR OUT THE CONTENT OF THE CONICAL FLASK. Record the reading in table II below.

d) Add three drops of the methyl orange indicator to the content of the conical flack and continue titration with solution F.

e) Record the readings in table III below. Repeat the procedure to complete table II and III.

Table II

	Ι	Ш
Final burette reading (cm ³ )		
Initial burette reading (cm ³ )		
Volume of solution F used (cm ³ )		

a) Calculate the average volume of solution F used (V₁)

(3½ mks) (½mk)

(1 mk)

Chemistry paper	1	,2	&	3
-----------------	---	----	---	---

	I	П
Final burette reading (cm ³ )		
Initial burette reading (cm³)		
Volume of solution F used (cm ³ )		

b) i) Calculate the average volume of solution F used  $(V_2)$  (V2) (1/2 mk) ii) Calculate the total volume of solution F used  $(V_1 + V_2)$  (1 mk)

c) Calculate the molarity of sodium Carbonate.

(*Na* = 23, *C*=12, *O*=16) (1mk)

d) Calculate the moles of Sodium Carbonate in 25cm³ of solution. (1 mk)

- e) Calculate the moles of solution F in the total volume. (1 mk)
- f) Calculate the molarity of hydrochloric acid Solution F (2 mks)

Q3. You are provided with Solid W. Carry out the following tests on it and record your observations and inferences in the spaces provided.

a) Place all solid W in a boiling tube. To it add about 10cm³ of distilled water and shake well. Divide resultant mixture into the 4 portions.

Observation	Inference
	at cset
	10 ⁰
(1 mk)	(1 mk)

b) To the 1st portion, add 2M NaOH drop wise till in excess.

Observation	15	Inference	
	and the second s		
	2 AST Y		
(½ mk)	Q~~~	(1 mk)	

c) To the 2nd portion dip a glass rod in it and place it on a non-luminous flame.

Observation	Inference
Cosci valion	Interence
(1/2  mk)	$(\frac{1}{2} \text{ mk})$

d) To the 3rd portion, add 3 drops of Ba(NO₃)₂

Observation	Inference
(½ mk)	(1 mk)

e) To the 4th portion, add 2 drops of Pb(NO₃)₂ solution.

Observation	Inference	
	2	272

(½ mk)

(½ mk)

II. You are provided with Solid X. Carry out the test below and record your observations and inferences in spaces provided.

a) Put all the solid given in a boiling tube. To it add about 10cm³ of distilled water and shake well.

Observation	Inference
(½ mk)	(½ mk)

b) To about 2cm³ of the solution obtained in (a) above add 2 drops of potassium Manganate (VII)

Observation	Inference
	oers.ce
(½ mk)	(½ mk)

c) To about 2cm³ of the solution obtained in (a) above add 2 drops of Bromine water.

Observation	Inference
	ik. www.
(½ mk)	(½ mk)
for more free past papers.	

(2marks)

(1mark)

(1mark)

### M.C. CLUSTER OF SCHOOLS FORM 4 EVALUATION TEST - 2018 233/1**CHEMISTRY** PAPER 1

- 1. Explain why luminous flame of a Bunsen burner appears yellow?
  - The empirical formula of a compound is  $CH_2$  and it has a molecular mass of 42.
  - (a) What is the molecular formula of this compound?
  - (b) Write the general formula of the homologous series to which the compound belongs. (1mark)
  - (c) Draw the structural formula of the third member of this series and give its IUPAC name. (1mark)
- 3. The table below shows some elements and their atomic numbers. The letters do not represent the actual symbols of the elements.

Element	Х	Y	Ζ	R	S	Q	Т
Atomic Number	11	10	20	13	14	4	8

- (a) From the given letters of elements select two elements with the same chemical properties. (1mark) (1mark)
- (b) Write the formula of a compound formed when element S reacts with element T.
- (c) Identify the most stable element.

2.

(a)

4. The diagram below represents an electrochemical cell.



(b) Write the overall ionic equation.

5. Polyvinylchloride has the following structure.



A sample of the polymer was found to have a molecular mass of 6750. Determine the number of monomers in the polymer. (C=12, H=1, Cl=35.5)

(3marks) (3marks)

(1mark)

- 6. Describe how a mixture of sodium carbonate and Lead (II) carbonate can be separated.
- 7. In an experiment to study diffusion of gases, the following set up was used.



Cotton wool soaked in Conc. Ammonia

Cotton wool soaked in Conc. Hydrochloric Acid

284



(1mark)

- 12. Carbon 14 represented as  ${}^{14}{}_{6}$ C which is used for radiocarbon dating decays by beta emission and has a half life of 5730 years.
  - a) Given an equation for the decay process.
  - b) A fossil skull has an activity of carbon 14, which was only 12.5 % of the activity found in living animals. How old is the fossil skull. (2marks)
- 13. The table below shows the observations made when an electronic current was passed though two substances A and B.

SUBSTANCE OBSERVATION	
Molten A Conducts an electric current and a grey substance is deposited at the cathode.	
Molten B Conducts an electric current and is not decomposed.	
(a) Name the type of structure in A & B	(2mark)
(b) Name the particles that are responsible for electrical conductivity in	
i) A	( ½ mark
ii) <b>B</b>	$(\frac{1}{2} \text{ mark})$
14. Dry chlorine gas was passed through two pieces of coloured cotton cloth as shown.	(
Dry Chlorine Dry Chlorine	
Dry Cloth	Cloth
a) State what is observed in each experiment. Experiment 1 Experiment 2	(2mark)
b) Explain your observation using an equation.	(1mark)
A compound G reacts with 2 moles of bromine to form another compound whose graphical formula i	
H - C - C - C - H   $ $ $ $ $ $ $ H Br Br Hi) What is the formula and name of compound G.$	(2marks
<ul> <li>11) State the observations made when acidified potassium chromate (VI) is added to compound G.</li> <li>During the extraction of Copper and Zinc from their Ores, some of the processes include.</li> <li>(i) Crushing</li> <li>(ii) Mixing of the crushed Ore with Oil and water and bubbling air through it</li> </ul>	(1mark
(a) (i) Name the process (ii) above	(1mark)
(ii) What is the purpose of (ii) above?	(1mark)
(b) Bronze is an allow of copper and another metal Identify the other metal	(1mark)
A white solid K was heated It produced a brown gas A and another gas B which relights a glowing	(Thank)
splint. The residue left was vellow even after cooling	
a) Identify gases A and B	(Imarka
a) Write a balanced chemical equation for the decomposition of solid K	(1mark)
	(IIIIaIK)
Study the following changes that took place when the following substances are exposed in air	
Study the following changes that took place when the following substances are exposed in air.	
Study the following changes that took place when the following substances are exposed in air. (a) $NaOH_{(s)}I \longrightarrow NaOH_{(aq)}$	
Study the following changes that took place when the following substances are exposed in air. (a) $NaOH_{(s)}I \longrightarrow NaOH_{(aq)}$ (b) $Na_2CO_3$ . $10H_2O_{(s)}$ II $Na_2CO_{3(s)} + 10H_2O_{(l)}$	
Study the following changes that took place when the following substances are exposed in air. (a) $NaOH_{(s)}I \longrightarrow NaOH_{(aq)}$ (b) $Na_2CO_3.\ 10H_2O_{(s)} \coprod Na_2CO_{3(s)} + \ 10H_2O_{(l)}$ (c) $CuSO_{4(s)} + 5H_2O_{(l)} \coprod CuSO_4.\ 5H_2O_{(s)}$	
Study the following changes that took place when the following substances are exposed in air. (a) $NaOH_{(s)}I \longrightarrow NaOH_{(aq)}$ (b) $Na_2CO_3.\ 10H_2O_{(s)} \coprod Na_2CO_{3(s)} + \ 10H_2O_{(l)}$ (c) $CuSO_{4(s)} + 5H_2O_{(l)} \coprod CuSO_4.\ 5H_2O_{(s)}$ Name the process I, II and III	(3 mks)





# M.C. CLUSTER OF SCHOOLS FORM 4 EVALUATION TEST - 2018 233/2**CHEMISTRY**

PAPER 2

The letter P, Q, R, S and T represent some elements. These are not the usual symbols of the elements. The table below gives the formulae and electronic arrangement of the ions of the above elements. Study it and answer the questions that follow.

1	
Ion	Electronic arrangement
P ⁻	2.8
$Q^{2-}$	2.8.8
$R^{2+}$	2.8.8
$S^{2-}$	2.8
$T^{3+}$	2.8

- (i) Select two elements that;
  - (a) Belong to the same group of the periodic table.
  - (b) Are members of the same period of the periodic table?
- Write the formula of the sulphate of element **T**. (ii)
- (iii) Compare the reactivities of elements **Q** and **S**.

	(b) Are members of the same period of the periodic table?	(1mark)
(ii)	Write the formula of the sulphate of element $T$ .	(1mark)
(iii)	Compare the reactivities of elements Q and S.	(2marks)
(iv)	A sample of the chloride of element <b>T</b> was dissolved in distilled water. Both red and blue litmus	
	papers were dropped into this solution. State and explain what was observed.	(2marks)

- A mixture contains both potassium carbonate and the carbonate of  $\mathbf{R}$ . Explain how this mixture can (v) be separated. (2marks)
- (vi) What is the name given to the elements which belong to the same group of the periodic table as element **P**?
- (vii) Write down the electronic arrangement of the ion formed by the element found just below element S in the periodic table. (1mark)
- (viii) Write down the equation for the reaction that takes place when element  $\mathbf{R}$  reacts with cold water.

(1mark)

(1mark)

(1mark)

(1mark)

(1mark)

(a) What is the molar heat of combustion of a substance? 2. b) The experiment below was set up to determine the molar heat of combustion of methanol.



The following data was obtained from the above experiment.

Mass of burner + methanol before burning		=	62.74g
Mass of burner + methanol after burning		=	62.36g
Final temperature of water		=	38.5°C
Initial temperature of water		=	23.5°C
Volume of water used	=	$100 \text{cm}^3$	







(1mark)

a) Identify

(i)	Gas U.		$(\frac{1}{2} \text{ mark})$
	Reagent F.		(½ mark)

- b) Name the process represented by the reaction in A, B and D (3 mks)(2 mks)
- c) Name the type of polymerization shown by the steps C and G (2 mks)
- d) Name suitable reagent (substance) for the process A and B.
- e) Give one advantage of the soaps formed in step **D** over soapless ones.
- f) An organic compound S contains 60% carbon, 13.3% hydrogen and 26.7% Oxygen. The Relative Molecular Mass of S is 60. Determine the molecular formula of S. (C = 12.0, H = 1.0, O = 16.0)(3marks)
- 6. The set up below is used to measure the change in mass during the course of the reaction between dilute hydrochloric acid (Excess) and marble chips at  $22^{\circ}$ C.



Changes in mass were noted at one minute intervals and were as follows;

Time (Min)	1	2	3	í de la como de la com	5	6	7
Loss in mass (g)	0.26	0.46	0.60	0.69	0.73	0.73	0.73

a) Write an equation for the reaction taking place in the flask.	(1mark)
b) Give a reason why the mass of the flask charged with time?	(1mark)

c) What is the role of cotton wool at the mouth of the flask?

- (1mark) d) Explain why it is not advisable to use dilute sulphuric (VI) acid with marble chips in this experiment. (1mark)
- e) Plot a graph of loss  $\hat{\mathbf{m}}$  mass (vertical axis) against time. Label the curve 22^oC.
- (3marks) f) On the same axis in (e) above sketch the graph you would expect to obtain if the experiment was repeated at  $35^{\circ}$ C. Label the curve  $35^{\circ}$ C. (1mark)
- g) State what would happen if the marble chips were replaced with the same mass of marble powder. Explain your answer. (1mark)
- h) Determine the volume of carbon (IV) oxide produced if 0.12g of marble chips was reacted with excess dilute hydrochloric acid. (Experiment done at room temperature and pressure. Molar gas volume at r.t.p =  $24 dm^3$ , Ca = 40.0, O = 16, C = 12.0). (2marks)



- e) Write two equations for the two reactions that take place in step V.
- f) Draw a simple diagram showing the set up that is used in the electrolytic purification of copper. (2marks)
- g) During the electrolysis of blister copper, contaminating metals like iron and zinc also go into solution as ions. Explain why they are not discharged at the cathode? (1mark) tor more tree p

# M.C. CLUSTER OF SCHOOLS FORM 4 EVALUATION TEST – 2018 233/3 CHEMISTRY PAPER 3

# CHEMISTRY 233/3 PRACTICAL CONFIDENTIAL TO SCHOOLS

Each candidate will require

- 1. Solution A  $100 \text{ cm}^3$
- 2. Solution B 150  $\text{cm}^3$
- 3. Solution C  $100 \text{cm}^3$
- 4. Burette
- 5. 25ml pipette
- 6. 2 conical flasks
- 7. Retort stand
- 8. Filter funnel
- 9. Pipette filler
- 10. 100ml of distilled water
- 11. Thermometer
- 12. 1 Spatula full of solid D
- 13. About 10ml liquid E
- 14. 4g solid F (weighed exactly)
- 15. 2 boiling tubes
- 16. Six test tubes in a rack
- 17. Test tube holder
- 18. Metallic spatula

## ACCESS TO

- 1M NaOH
- 1M NH₄OH
- 0.1M NaCl
- Acidified K₂Cr₂O₇
- KMnO₄- use some amount of solution B
- Source of heating
- NOTES 1. Solid A

_

**Solid A** Dissolve 7.0g Ferrous Sulphate (FeSO₄.7H₂O) in 50ml of 1MH₂SO₄, dilute to 1dm³ with water. (Should be prepared in the morning of the exam day)

is, visit. www.freekcsepastpapers.com

2. Solution B

Dissolve 0.8g of KMnQ₄ in 50cm³ of  $1MH_2SO_4$ . Dilute to 1 dm³ with water.

3. Solution C

Measure  $3 \text{ cm}^3$  of  $20 \text{ vol. } \text{H}_2\text{O}_2$ Dissolve in  $1 \text{ dm}^3$  of solution.

4. 1M H₂SO₄

Measure 55cm³ of conc.  $H_2SO_4$  add to about 200cm³ of water, stir, dilute to 1 dm³

- 5. Solid D
  - Aluminium Nitrate
- 6. Solid F

Potassium Chlorate (KClO₃)

## 7. Acidified K₂Cr₂O₇

Dissolve 0.3g of  $K_2Cr_2O_7$  in 50cm³ of 1MH₂SO₄. Dilute to 1 dm³ with water.

8. Liquid E

Ethanol.

(1 marks)

(1mark)

(1mark)

(1mark)

#### M.C. CLUSTER OF SCHOOLS FORM 4 EVALUATION TEST - 2018 233/3CHEMISTRY PAPER 3

- You are provided with: 1.
  - Solution A containing 6.95g of Iron II Sulphate heptahydrate R.F.M = 278 in 250cm³ of solution.
  - Solution B of potassium manganate (VII).
  - Solution C of hydrogen peroxide.
  - You are required to:
  - (a) Standardize the potassium manganate (VII) solution C.
  - (b) Determine the concentration of hydrogen peroxide solution C.

### **PROCEDURE I**

Pipette 25cm³ of solution A into a conical flask.

Fill the burette with solution B. Titrate this solution against solution A until the first permanent pink colour appears. Record your results in table I and repeat the procedure to fill the table 1 below.

#### **TABLE 1**

II	Ι	II	III
Final burette reading (cm ³ )		CO.	
Initial burette reading (cm ³ )		el s	
Volume of solution B used (cm ³ )		200	
		et P	(4 marks)

- (i) Calculate the average volume of solution B used
- (ii) Given that the equation for the reaction is

•  $Mn^{2+}_{(aq)}$  $Mno_{4(aq)}^{-} + 5Fe^{2+}_{(aq)} + 8H^{+}_{(aq)}$ 

#### Calculate

- a) The number of moles of Iron II sulphate solution A used.
- b) The number of moles of solution B that reacted.
- The concentration of the potassium manganate (VII) solution B in moles per litre. c) (1mark)

## **PROCEDURE II**

Pipette 25cm³ of hydrogen peroxide, solution *into a conical flask*. Fill the burette with solution B. Titrate this solution against solution C until the first permanent pink colour appears. Record results in table II.

#### **TABLE II**

2.

Titre number	NO T	Ι	II	III	
Final burette reading cm ³					
Initial burette reading cm ²	3 010				
Volume solution B used c	2m ³				
<i>4</i> 0.				(4m	arks

(i) Work out average volume of potassium manganate (VII) solution B used.

(ii) Given that the equation for the reaction is

 $\rightarrow$  2Mn²⁺_(aq) + 8H₂O_{(l) (aq)} + 5O_{2(aq)}  $2MnO_{4(ag)}^{-} + 5H_2O_{(aq)} + 6H_{(aq)}^{+}$ Calculate

- The number of moles of Potassium Manganate (VII) solution B that reacted. (1mark) a)
- The number of moles of hydrogen peroxide solution C that reacted. b) (1mark)
- The concentration of hydrogen peroxide solution C in moles per dm³(mol dm⁻³). (1mark) c)

#### You are provided with 4g of Solid F.

You are required to determine the solubility of solid F at different temperatures. PROCEDURE

Carefully transfer all solid F in a clean boiling test tube and using a burette, add 15cm³ of distilled water. Heat the mixture while stirring with a thermometer to about 85°C. When all the solid has dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which the crystals of solid F first appear. Record this temperature in Table III.

(3marks)

(1mark)

- b) Transfer 5cm³ of distilled water to the contents in the boiling tube. Warm the mixture while stirring with the thermometer until the solid dissolve. Allow the mixture to cool while stirring. Note and record the temperature at which crystals first appear.
- c) Repeat procedure (b) two or more times and record the temperatures in table III.
- d) Complete table III by calculating the solubility of solid F at the different temperatures.

## TABLE III

Volume of water in the	Temperature at which crystals of	Solubility of solid F in g / 100g of
boiling tube (cm ³ )	solid F first appear.	water.
15		
20		
25		
35		
40		
	·	(6marks)

- (i) On the grid provided plot a graph of solubility of solid F (vertical axis) against temperature (horizontal axis).
- (ii)Using your graph, determine the temperature at which 15g of solid F, would dissolve in 100cm³ of water.
- 3. You are provided with solid D. carry out the following tests and write down all the observations and inferences.
  - a) Place half spatula end full of solid D in a dry test tube. Heat gently then strongly until there is no further change.

Observations	inferences 🔗	
(1mark)	CS CS	(1mark)

b) Place the remaining solid D in a test tube, add about 10cm³ of distilled water and shake vigorously. Divide the mixture into four portions.

i. To the 1st portion, add 2M sodium hydroxide solution drop wise until in excess.

Observations	inferences
(1mark)	(1mark)

ii. To the 2nd portion, add ammonia solution drop wise till in excess.

Observations	× Qor	inferences
	(1mark)	(1mark)
	a P	
iii. To the fourth portion add 4	drops of sodium chlori	de.
Observations	2,	informage

Observations		Interences	
	(1mark)		1mark)

# II. You are provided with liquid E, Carry out the following tests on it.

a) Place about one spatula end full of liquid E on a metallic spatula and ignite it in a Bunsen burner flame.

Observations	inferences
(1mark)	(1mark)

## b) To $2 \text{cm}^3$ of liquid E add 3 drops of acidified KMnO₄. Solution B.

Observations	inferences
(1mark)	(1mark)

## c) To 2cm³ of liquid E add 3 drops of acidified K₂Cr₂O₇.

Observations	References
	(1mark)
(1mark)	

(1 mk)

## CEKENA PRE MOCK 233/1 FORM FOUR CHEMISTRY PAPER 1

- 1. It is advisable to leave your flame in the luminous state when not in use. Give a reason
- 2. The table below shows information about three solid substances P, R and T. study it and answer the question that follows.

Solid	Cold water	Hot water
Р	Soluble	Soluble
R	Insoluble	Insoluble
Т	Insoluble	soluble

Describe how you would separate the three solid from the mixture of the three (3 mks)

3. The diagram below shows the heating curve of a pure substance. Study it and answer the question that follow



9. The set-up below was used to prepare a dry sample of hydrogen sulphide gas.



(i) Write the general formula of the hydrocarbons in the table

14.

(ii) Predict the relative molecular mass of the hydrocarbon with 5 carbons

The diagram below shows a fountain experiment using hydrogen chloride gas.

(iii) Determine the molecular formula of the hydrocarbon ii, above. Draw its structural formula (H=1 C = 12)

(2 mks)

(1 mk)

(1 mk)



				Chemistry	, paper 1,2 & 3
				(nm)	
L	19		1047	0.231	
Μ	13		2743	0.126	
Ν	17		238	0.099	
Р	11		1163	0.158	
Q	16		718	0.104	
(a) (b)	Identify the elements with sim Using dots (.) and crosses (x)	ilar chemical prop draw a molecule o	perties. Explain f oxide of P		(2 mks) (2 mks)
(c)	Draw a structure of a molecule	e of element Q			(1 mk)
19.	(a) State Grahams law of diff	usion			(1
mk)					× ×
(b)	Gas B take 110 seconds to dif	fuse through a por	ous pot, how long will it take	for the same amo	unt of
	Ammonia gas to diffuse under	the same condition	ons of temperature and pressu	re?	
(	(RMM of B = 34  N = 1)	4 H =1)	<b>1 1</b>		(2 mks)
20.	Below are PH values of four t	ypes of medicine r	epresented by letters P,Q,R a	ndS	· · · ·
Ν	ledicine	PH values		ço.	
			ers		
P		7.0	*Ogk		
Q	2	5.0	E BORE L		
R	2	8.0	reekcis		
S		6.0	www.		
		. ċ	<u>.</u>		
(a) It	t is not advisable to use S when	a patient has indi	gestion Explain		(1  mk)
(b) G	Give two harmful effects of smo	oking tobacco on t	he Kenvan vouths.		(2  mks)
21. Duri	ng extraction of copper metal,	the ore from which	h copper is got undergoes pro	cesses that includ	e:
(i) C	Crushing of ore	at P			
(ii) M	Aixing of crushed ore with oil a	and water and bub	bling of ore		
(a) N	lame the process in (ii) above	٥ <b>`</b>			(1 mk)
(b) W	What is the purpose of the proc	ess (a) above			(1 mk)
(с) Б	use of bronze	a another metal. Id	lenting the other metal and giv	e one	(2  mks)
22 Use f	the diagram below to answer t	he questions that f	ollow		(2 111KS)
-L	$\mathcal{P}$			D.	
	<u> </u>	الالعيد المراجب ويسترك المراجب ال	/	<u> </u>	an and the second
L'	ron har.		won ver		
	100	and the second second second second second second second		$\sim$	a na antara sa na an
(	1-FF		$Q = \overline{z}$		
	/ I-z	ii strip	-1	- Copi	222
	and the second sec	Γ		chrin	
				2004	
In wh 23. Mag	hich set up will the iron nail ru nesium reacts as shown below	st. Explain			(2 mks)



#### CEKENA PRE MOCK 233/2 CHEMISTRY PAPER 2 THEORY

1. The grid below shows a section of the periodic table. The letters do not represent the actual symbols for elements. Study it and answer the questions that follow.

Χ									
				T	1		<b>XX</b> 7		
				Y		C	W		
	Z		R				Α		
	2		i c				11		
Е						D		В	
							2		
(i) Co	mpare the at	omic radii of elemen	ts						
(1) 00	(i) A and	R. Explain				્ર્સ	S.		$(1^{1}/_{2} \text{ mks})$
	(ii) C and	D. Explain				and and a			$(1^{1}/_{2} \text{ mks})$
(ii)	Give the na	ame of family in which	h elements W	and A be	elong	Sit			$(^{1}/_{2} \text{ mk})$
(iii)	Compare e	lectrical conductivity	of elements Z	Z and R	୍ଚିତ୍ତ	5			(1  mk)
(iv)	Identify the	e element which is			XCS				
	(i) Most e	lectronegative		4	e e			$(^{1}/_{2} m)$	k)
	(ii) Strong	est reducing agent		· have				、 -	$(1/_2 \text{ mk})$
(v)	Write the formula of the oxide of X							$(^{1}/_{2} \text{ mk})$	
(vi)	(i) What ty	pe of bond exists in	the chloride o	fŔ					(1 mk)
	(ii) Draw t	he structure of the me	olecule of R in	1 gaseous	state				(1 mk)
	(iii) Write a	an equation for the re	action betwee	n element	A and y	vater.		(1 mk	c)
(vii)	The table b	elow shows the melt	ing points of s	some oxid	es of ele	ments in j	period 3.		
	Oxide	SiO ₂	$P_2O_5$	SC	<b>)</b> ₂				
	0	fre-							
	M.P ^o C	1610	23.6	-72	2.7				
	г 1 [•] 4	1.00 . 1	,	( <b>G</b> ' <b>O</b>					(1  1)
<i>.</i>	Explain th	le difference in mel	ting points of	t S1O ₂ an	$d P_2 O_5$	10.20	6 O .	C" 11 1	(1  mk)
(V111)	Excess hyc	rogen gas is reacted	with $4.3g$ of h	eated oxid	ie of me	tal Q. 3.6	g 01 Q 1s :	finally le	IT in the
(i	reaction ve	ssel. Given that $O =$	10, $Q$ has a va	alence of	2				(1
(1X	) write the e	equation for the reaction	on taking						(1  mK)
<pre>/ ```</pre>	(11) Calcul	ate the relative atomic	c mass of Q						(2 mks)

2. (a) In an experiment, hydrogen chloride gas was prepared and reacted with aluminium turnings to form a solid A and gas R as shown in the diagram below



314





Using the structure above show how soap removes an oily smear from the fabric shown

(2 mks)



(d) Describe a chemical test that can be used to distinguish an alkanol and an alkanoic acid (2 mks)

5. i. in an experiment to investigate the solubility of solid X and Y the following results were obtained

Temperature (0C)		0	10	20	30	40	50
Solubility of Solid	Х	8	13	24	38	6	98
					5		
(g/100g of water	Y	28	32	35	38	42	46
					stR		

- (a) On the grid provided plot a graph of solubility of X and Y against temperature on the same axis (4 mks) From the graph determine (b) (i) Solubility of X at room temperature (1 mk)(ii) The temperature at which the solubility of X is 452/100g of water (1 mk)(c) If a solution of X contains 35g of solid in 100g of water, is cooled from 40°C determine The temperature at which crystal will first form (1 mk)(i) The mass of crystals deposited if the solution is cooled to  $5^{\circ}$ C (ii) (1 mk)(d) Comment on the solubilities of X and Y in water (1 mk)ii. Study the information in the table below and answer the questions that follow Solubility (g/100g water Salt At  $30^{\circ}$ C at  $70^{\circ}$ C CuSO₄ 28 38 98 79 AgNO₃ A mixture containing 36g of CuSO₄ and 78g of AgNO₃ in 100g of water at 70^oC was cooled to 30^oC Which salt crystallized out? Give a reason (1 (a) mk) (b) Calculate the mass of the salt crystallized out (1 mk)(a) Name the compound responsible for temporary water hardness Iii (1mk) (b) State two advantages of hard water (1 mk)
- 6. Study the flow chart below and answer the questions that follow



White

(a)	Identify R,S, T	(3 mks)
(b)	(i) What observation is made during formation of Precipitate Q	(1 mk)
	(ii) Write an ionic equation for the formation of Q	(1 mk)
(c)	Describe how the colourless odourless gas would be tested	(2 mks)
(d)	Explain why O.IM HCL has a PH of 1 while O.IM ethanoic acid has a pH of 5	(2 mks)

M/bita proginitata

7. The diagram below represents the blast furnace used for the extraction of iron. Study it and answer the questions that follow.



(a)	At what point N, M, K would you expect the highest temperature? Explain	(1
	mk)	
(b)	Write an equation for the reaction in which carbon (iv) oxide is converted into carbon (ii) oxide	(1 mk)
(c)	One of the components of the waste gases is nitrogen (iv) oxide. State the effects of this gas on the	he
	environment.	
	(2 mks)	
(d)	Write two equations for the reaction in which liquid iron is produced	(2 mks)
(e)	Name the compound formed when	
	(i) Dilute hydrochloric acid reacts with solid iron (ii) sulphide	(1 mk)
	(ii) Excess dry chlorine gas reacts with hot iron fillings	(1 mk)
(f)	Two test tubes are each half filled with solid iron (ii) oxide and the other with solid iron (iii) oxide	le,. State a
	physical test that you can use to differentiate the two	(2 mks)

#### CEKENA PRE MOCK 233/3 CHEMISTRY PAPER 3 PRACTICAL

You are provided with;

- A dibasic acid, labeled solutionP
- Solution R containing 5.56g per litre of potassium carbonate
- Aqueous sodium hydroxide, labeled solution T
  - You are required to determine the :
  - Concentration of solution P in moles per litre
  - Molar heat of neutralization of solution p with sodium hydroxide labeled solution T

## A Procedure 1

Using a pipette and a pipette filler, place 25cm³ of solution P into a 250ml volumetric flask. Add water to make 250cm³ of solution.Label this solution Q. Place solution Q in a burette. Clean the pipette and use it to place 25.0cm³ of solution R into a conical flask. Add 2 drops of methyl orange indicator provided and titrate with solution Q. Record your results in table 1. Repeat the titration two more time and complete the table.

			$\sim$	
	Ι	II	III	
Final burette reading		ers		
Initial burette reading		- at		
Volume of solution Q used $(cm^3)$		25th		
		Color-	(4	mks)

Calculate the:

- (i) Average volume of solution Q used
- (ii) Concentration of potassium carbonate in solution R (K = 39.0, O = 16.0, C = 12.0) ( (1 mk)
- (iii) Concentration of dibasic acid in solution Q
- (iv) Concentration of dibasic acid in solution P

## Procedure 2

Clean the burette and fill it with solution T. Clean the pipette and use it to place 25.0cm³ of solution P into a 100cm³ plastic beaker. Measure the initial temperature of this solution and record it in table 2.

From the burette, place 5cm³ of solution T into the beaker containin 25.0cm³ of solution P, stir the mixture carefully with a thermometer and record the highest temperature of the mixture in table 2. Place another 5cm³ of solution T into the mixture in the beaker, stir carefully and record the highest temperature of this mixture in table2. Continue this procedure of placing 5cm³ portions of solution T and complete table 2.

Tat	ble 2							
	Total volume of solution T	0	5	10	15	20	25	30
	added (cm ³ ) $\checkmark$							
	Volume of solution P	25	25	25	25	25	25	25
	$(\mathrm{cm}^3)$							
	Temperature ( ⁰ C)							

(4 mks)

(1 mk)

(2 mks)

(1 mk)

(i) On the grid provided, draw a graph of temperature (vertical axes) against volume of solution T used.

(3 mks) (1 mk)

#### (ii) From the graph, determine

I The highest temperature change,  $T\Delta$ 

II	The volume of solution	T required to react with	25cm ³ of solution P	(1 mk)

(iii) Calculate the,
		Chemi	stry paper 1 ,2 & 3
	I The number of moles of solution P used		(1 mk)
	II Molar heat of neutralization of P with sodium	m hydroxide solution labeled T (assume the speci	fic heat capacity
	of the solution is 4.2Jg ⁻¹ K ⁻¹ and density of	solution is 1.0gcm ⁻³	(3 mks)
2.	You are provided with solid labeled M. Use it for	or the test below.	
(a)	Put all of solid M in a clean boiling tube. Add a	bout 10cm ³ of distilled water and shake thorough	y. Use about
	2cm ^o of the resulting mixture for the test (b) to b	t below	
	Observation	informaç	
		Interences	
	(1 mk)	$(1 \text{ m} \mathbf{k})$	
	(1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)	(1 IIIK)	
	(b) Add a few drops of aqueous sodium	nydroxide and then excess	
	Observation	inferences	
	(1 mk)	(1 mk)	
	(c) Add about 2cm ³ of dilute sulphuric (	vi) acid	
	Observation	inferences	
		let's	
	(1 mk)	(1 mk)	
	(d) Add a few drops of aqueous ammoni	a solution and then excess	
	Observation	inferences	
		OKU.	
	(1 mk)	$(^{1}/_{2} \text{ mk})$	
		unn.	
	(e) Add about $2 \text{ cm}^3$ of acidified lead (ii)	nitrate	
	Observation	inferences	
		6°	
	$\binom{1}{2}$ mk)	(1 mk)	
		(1 1111)	
	(f) Add about 2 cm ³ of barium nitrate sol	lution	
	(i) And about 2cm of building inflate sol	inferences	
		$\left(\frac{1}{2}\right)$	
		( / ₂ IIIK)	
2	X '1 1 '4 1' '1 X D' '1 '6'		
3.	Y ou are provided with liquid N. Divide it i	into 4 portions and use it for the tests below.	
	(a)Place about 3 drops of N on a clean watc	ch glass and ignite	
	Observation	inferences	
	(1 mk)	(1 mk)	
	I		
	(b) Add about 3 drops of acidified potassium	n manganate (vii) to the second portion	
	Observation	inferences	
			319



(1 mk)

 5 of 6

 (c) Add the sodium carbonate provided to the third portion.

 Observation
 inferences

$(^{1}/_{2}mk)$	( ¹ / ₂ mk)	

(d) Use sample 4 to test whether the substance is polar or not. Give the procedure for the test Procedure Observation | inferences

