TOP STUDENT KCSE

CHEMISTRY PREDICTIONS

(SERIES 1)

FOR MARKING SCHEMES

AND OTHER SIMILAR

RESOURCES,CALL/WHATSAPP

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N/B:DUE TO HIGH COSTS INCURRED

WHILE COMING UP WITH THIS AND OTHER SIMILAR RESOURSES,

MARKING SCHEMES ARE NOT FREE OF

CHARGE.

QUESTIONS ARE FREE

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 1 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

a) *Write your **NAME** and **INDEX NUMBER** in the space provided above*
b) *Sign and write the date of examination in the spaces providedabove*
c) *Answer **ALL** the questions in the spaces provided*
d) ***ALL** working must be clearly shown where necessary.*
e) *Mathematical tables and silent electronic calculators may be used.*

FOR EXAMINER'S USE ONLY

Question	Maximum score	Candidate's score
1 –31	80	
Total score	80	

1. An element K has atomic number 20 while element M has atomic number 8.

a) Write the electronic configuration for K and M

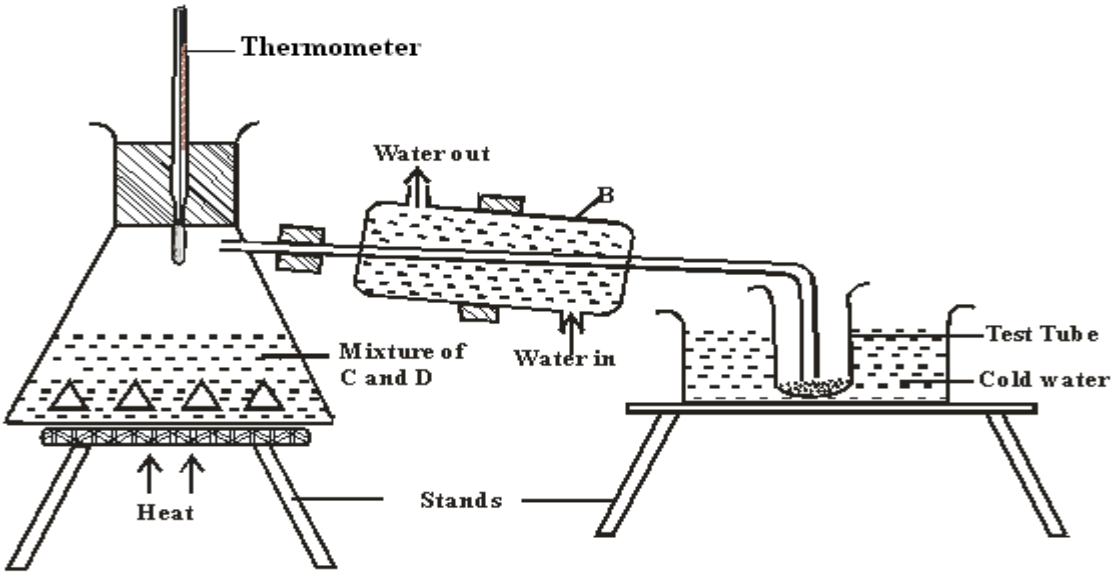
K- **1mark**

M- **1mark**

b) Write the symbol of the most stable ion of K and M

K - **1mark**

M - **1mark**



2. Molten Lead (II) bromide is electrolyzed using carbon electrodes. Write the half equations of the reactions that occur at the anode and the cathode.

a)Anode **1mark**

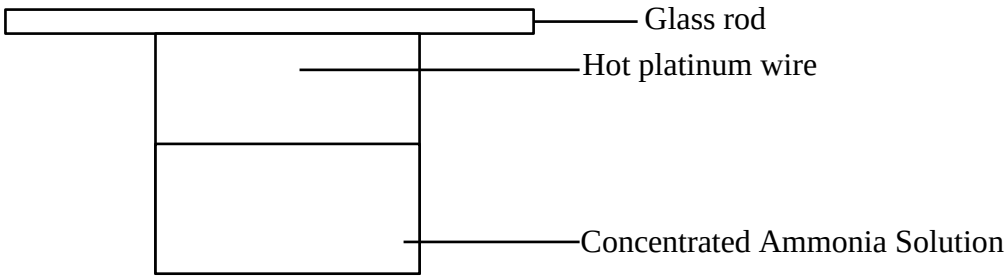
b)Cathode **1mark**

3. Explain why the conductivity of metals decreases with increase in temperature. **2marks**

4. Three metal oxides XO, YO, and ZO are heated with powdered metal Y. Hot powdered Y will remove oxygen from XO but not from ZO. Arrange the metals in order of reactivity, starting with the most reactive. **1mark**

5. Some sodium chloride was found to be contaminated with copper (II) oxide. Describe how a sample of sodium chloride can be separated from the mixture. **2marks**

6. Hot platinum wire was lowered into a flask containing concentrated ammonia solution as shown below.



State and explain the observations made. **3marks**

7. The set up below represents the apparatus that may be used to separate a mixture of ***<u>two</u>*** miscible liquids C and D whose boiling points are 80^0C and 110^0C.

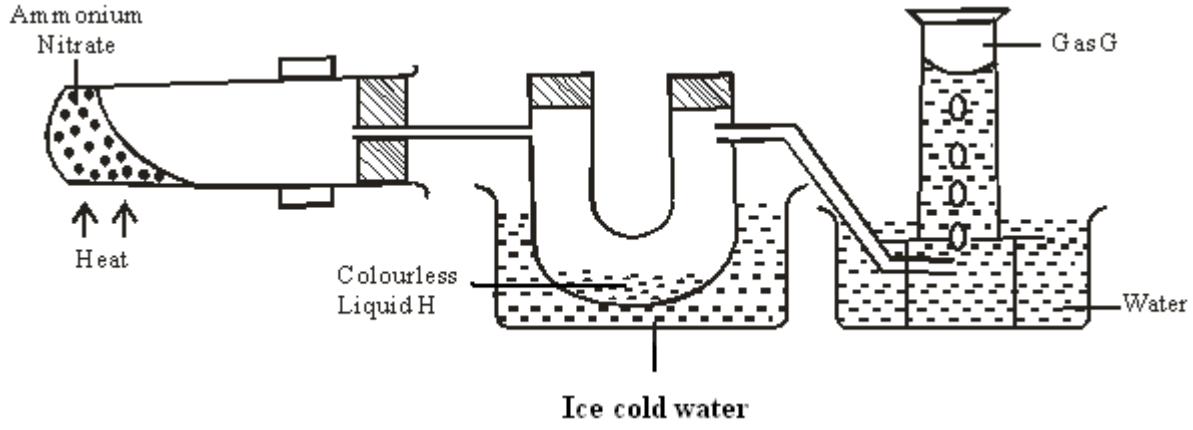
a)Name **B** **1 mark**

b)What is the purpose of the thermometer **1mark**

c)Which liquid was collected in the test tube? **1mark**

8. Draw a dot (.) and cross (x) diagram to show bonding in carbon (II) oxide. **2marks**

9. Ammonium nitrate was gently heated and the products collected as shown in the diagram.



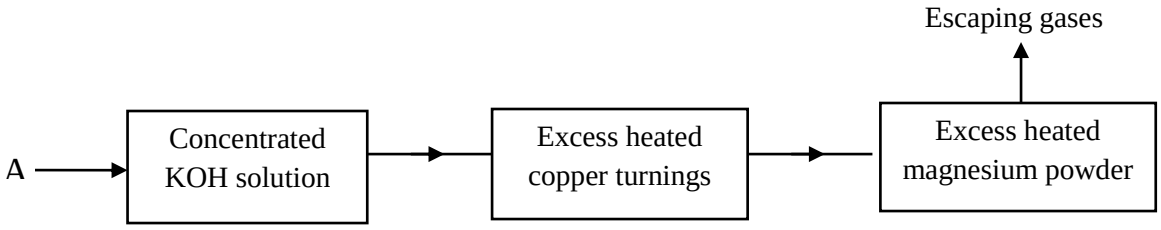
a) Identify:

i. Colourless liquid **H**

ii. Gas **G**

b) Describe one physical and one chemical test that can be used to identify gas G. **2marks**

10. Air was passed through several reagents as shown in the flow chart below.



a) What is the purpose of concentrated potassium hydroxide solution? **1mark**

b) Write an equation for the reaction which takes place in the chamber with magnesium powder. **1mark**

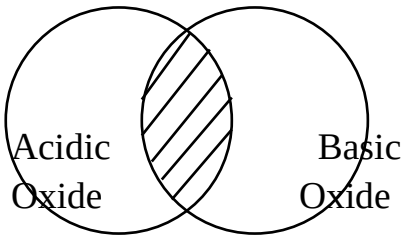
c) Name one gas which escapes from the chamber containing magnesium powder.
Give a reason for your answer **2marks**

Name the following substances.

i) $CH_2\,CH\,CH_2\,CH_3$ **1mark**

ii) $CH_3\,CH\,CH\,CH_2\,CH_3$ **1mark**

11. The diagram below shows the acidic and basic oxides fit into the general family of oxides.



a) State the name given to the type of oxide that would be placed in the shaded area.
1mark

b) Give the name of any oxide that would be placed in the shaded area. **1mark**

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

Substance	**Solubility in water**	**Electrical conductivity**	
		Solid	**Molten**
A	Insoluble	Good	Good
B	Soluble	Poor	Good
C	Insoluble	Poor	Poor

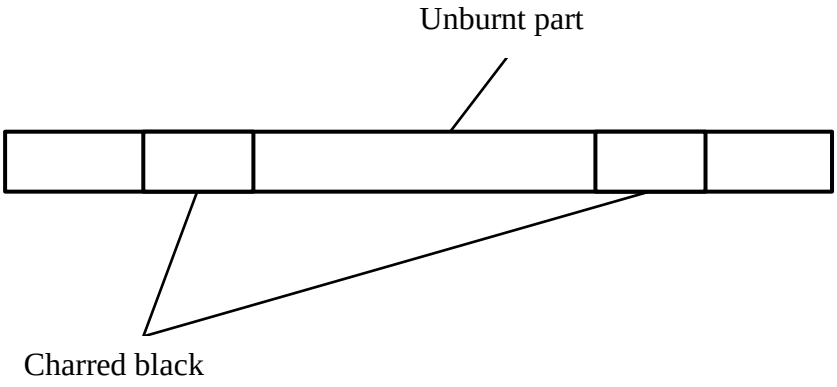
i) Which of the substances is highly likely to be sodium chloride? Explain **2marks**

ii) What type of bond exists in substance **A**? **1mark**

iii) State a possible structure in substance **C**? **1mark**

13. Laboratory results showed the composition of a compound to be 58.81% barium, 13.72%, sulphur and 27.47% Oxygen. Calculate the empirical formula of the compound. Ba=137, S = 32, O = 16. **2marks**

14. The diagram below shows a wooden splint that was placed horizontally across the middle part of a non-luminous flame.



a) Explain the observation made **2marks**

b) Explain why non-luminous flame is preferred for heating than the luminous flame. **2marks**

15. 200cm^3 of oxygen gas took 60 seconds to diffuse through a porous plug. Determine the time taken by 300cm^3 of sulphur (IV) oxide to diffuse through the same plug under the same conditions.
(O=16, S = 32) **3marks**

16. Explain why?

i) Both methane and diamond are covalently bonded. Methane is a gas but diamond is a solid with very high melting point. **2marks**

ii) Ammonia is dissolved in water using an inverted funnel. **1mark**

17. Explain giving reasons why?

a) Sulphuric acid is not used with marble in the preparation of carbon (IV) oxide **2marks**

b) Water cannot be used to distinguish oil fire. **1mark**

18. A gas occupies $4dm^3$ at -23^0C and 152 mmHg. At what pressure will its volume be halved, if the temperature then is 227^0C.? **2marks**

19.a) Sodium, Magnesium and Aluminium are elements in the periodic table. Explain why aluminium has a higher melting and boiling point than sodium and magnesium. **2marks**

b) The ionization energy of an atom is strongly influenced by three atomic parameters. State ***two*** of these parameters. **2marks**

20. $15cm^3$ of a solution containing $2.88g/dm^3$ of an alkali XOH completely reacts with $20cm^3$ of 0.045M sulphuric acid. Calculate the molarity and relative atomic mass of X present in the alkali. **3marks**

21. Describe how a solid sample of calcium sulphate can be prepared using the following reagents; dilute nitric (v)acid, dilute sulphuric (vi) acid and solid calcium carbonate **4marks**

22. Crude oil is the main source of organic compounds such as hydrocarbons. The hydrocarbons in the crude oil have to be separated.

a) Name ***two*** important hydrocarbons obtained from crude oil. **2marks**

b) Give the uses of the two hydrocarbons named in (a) above. **2marks**

23. A hydrocarbon Q was found to decolourise potassium manganate (vii) solution. When two moles of Q were burnt completely six moles of carbon (iv) oxide and six moles of water were formed.

a) Write the structural formula of Q. **1mark**

b) Name the homologous series to which Q belongs **1mark**

24. Dilute sulphuric acid was added to a compound X, of magnesium. The solid reacted with the acid to form a colourless solution, Y and a colourless gas Z which formed a white precipitate when bubbled through lime water.

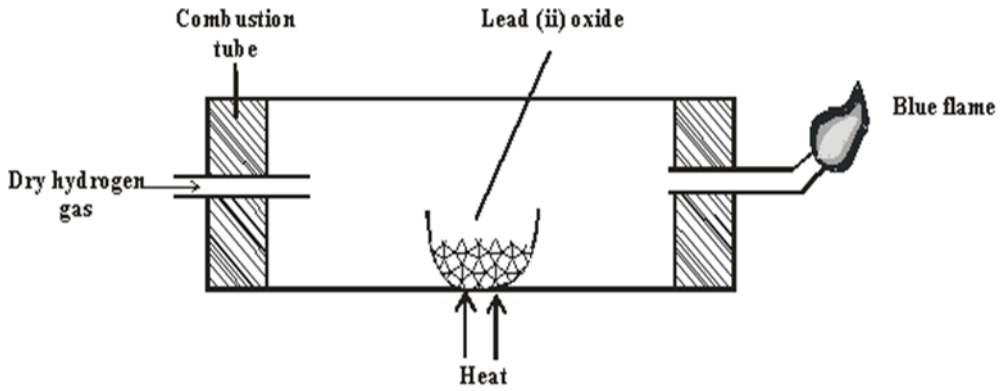
Name:-

(i) Compound **X** **1mark**

(ii) Solution **Y** **1mark**

(iii) Colourless gas **Z** **1mark**

25. When dry hydrogen gas passed over heated Lead (II) oxide in combustion tube, a grey solid was formed.



a)Identify the grey solid. **1mark**

b)Write the equation of the reaction taking place in the combustion tube. **1mark**

c)Write the equation involving the blue flame. **2marks**

26. What do (C F C' S) mean? **1mark**

27.

a)What is meant by the term allotrophy? **1mark**

b)Explain in terms of structure and bonding why graphite is soft with greasy feeling. **2marks**

NAME……ADM NO……

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TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 1 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- Sign and write the date of exam in the spaces provided above.
- Answer **ALL** the questions in the spaces provided.
- Mathematical tables and silent electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

Questions	Maximum score	Candidates score
1	13	
2	11	
3	13	
4	10	
5	10	
6	12	
7	11	
Total score	**80**	

1. The grid below shows part of the periodic table. Study it and answer the questions that follow. The letters do not represent the true symbols of the elements.

						A		
I	B		C		D		E	
F	G						H	

a) Which element forms an ion of charge - 2? Explain your answer **2marks**

b) What is the nature of the oxide formed by element C? **1mark**

c) How does the reactivity of H compare with that of E? Explain. **2marks**

d) Write the chemical equation for the reaction between B and chlorine? **1mark**

e) Explain how the atomic radii of the following compare; **2marks**

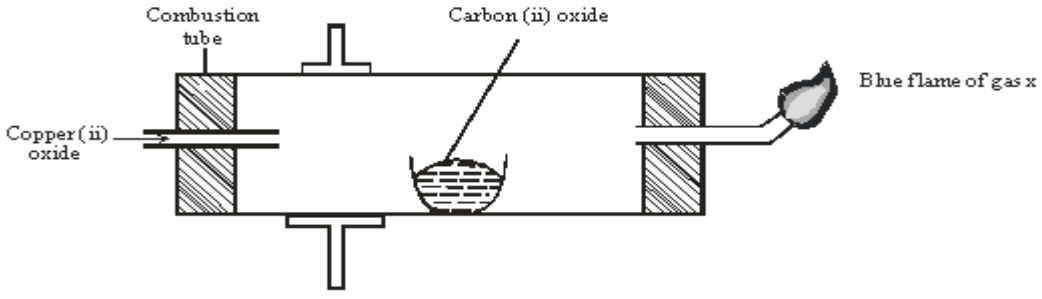
i) **F** and **G**

ii) **B** and **G**

f) The oxides of **B** and **D** are separately dissolved in water. State the effect of each product on litmus paper. **2marks**

g) $20cm^3$ of a solution of a hydroxide of I completely neutralizes $17.5cm^3$ of 0.5M sulphuric (VI) acid. Calculate the concentration in moles/litre of solution of the hydroxide of I **3marks**

2. The diagram below shows an experiment set-up to investigate a property of carbon (ii) oxide. Study it and answer the questions that follow.



a) Name one condition that is missing in the set up that must be present if the experiment to proceed. **1mark**

b) If the experiment was carried out properly. What observation would be made in the combustion tube? **1mark**

c) Give an equation for the reaction that occurs in the combustion tube. **1 ½ mark**

d) Give an equation for the reaction that takes place as gas x burns. **1 ½ marks**

e) Why is it necessary to burn gas x? **1mk**

f) Name the reducing and oxidizing agent. **2marks**

(i) Reducing agent

(ii) Oxidising agent

g) Identify any other substance that would have the same effect on copper (ii) oxide as carbon (ii) oxide. **1mark**

h) What would happen if copper (ii) oxide was replaced with sodium oxide? Explain **2mark**

3. a) Sulphur occurs naturally in two different forms called allotropes;

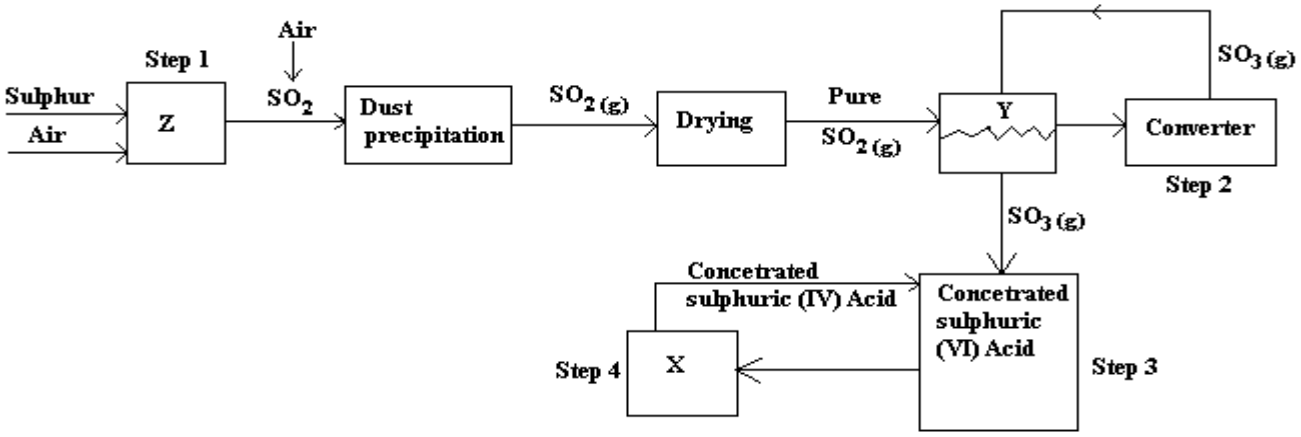
(i) What are allotropes? **1mark**

(ii) The two allotropes of sulphur are stable at different temperatures, as shown in the equation below.

$$\text{Rhombic sulphur} \underset{\text{Below } 95.5^0\text{C}}{\overset{\text{Above } 95.5^0\text{C}}{\rightleftharpoons}} \text{Monoclinic sulphur}$$

Give a name to the temperature 95.5^0C **1mark**

b) Below is a flow chart diagram for the contact process for the manufacture of sulphuric (VI) acid.



(i) Give the name of chambers labeled **1 ½ mark**

X

Y

Z

(ii) State the three conditions in the converter. **1 ½ mark**

(iii) Explain why gases are passed through ; **2marks**

I – The dust precipitator and drying power

II- The chamber labeled **Y**

(iv) Write the balanced equations for the reactions in; **3marks**

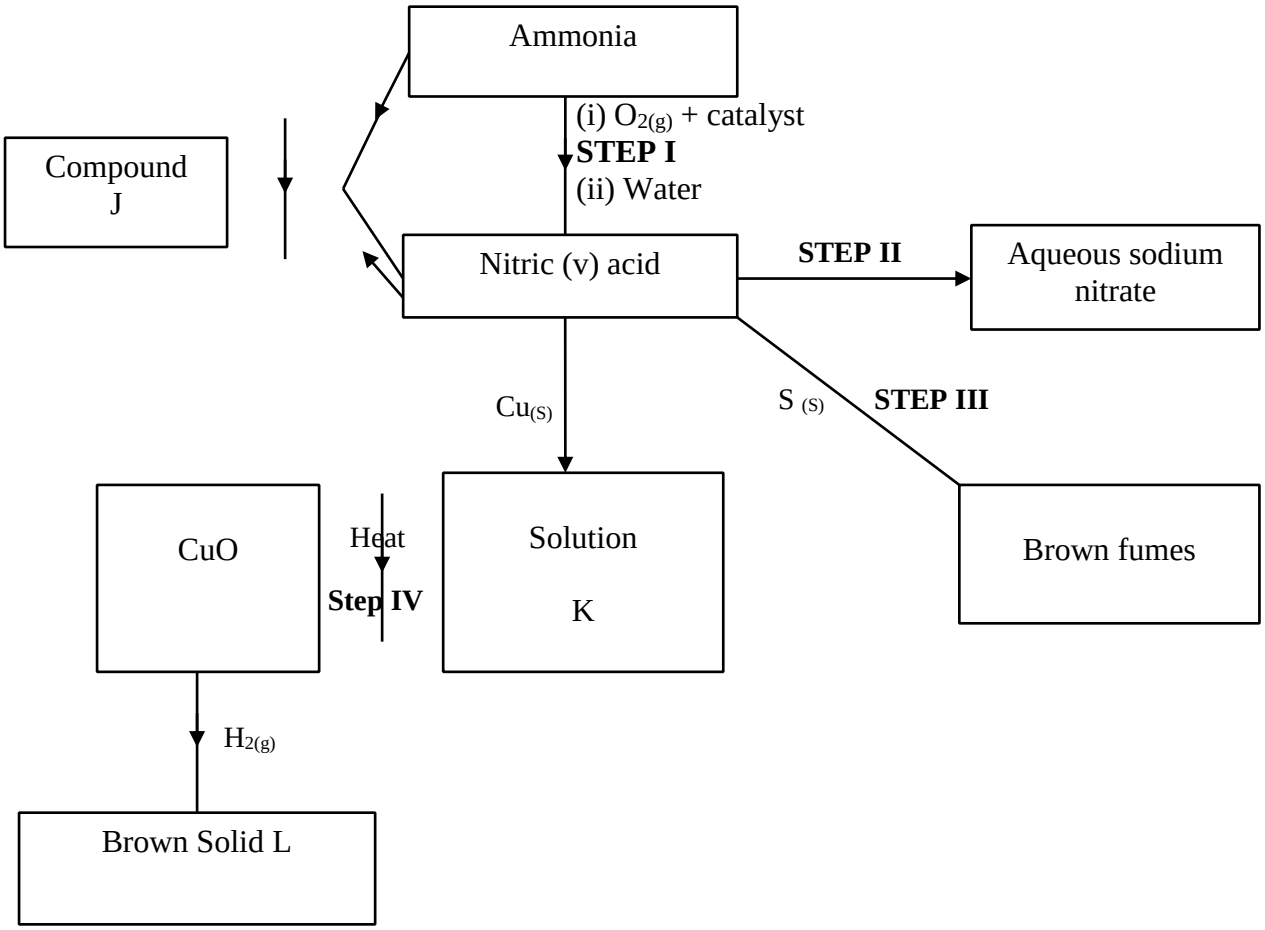
Step 2:

Step 3:

Step 4:

c) Calculate the volume of sulphur (VI) oxide gas in litres that would be required to produce 178kg of Oleum in step 3. (Molar gas volume at s.t.p.=22.4l, H=1, O=16, S=32) **3marks**

4. a) The scheme below shows various reactions starting with ammonia. Study it and answer the questions that follow.



(i) List the raw materials used in the manufacturer of ammonia gas. **1mark**

(ii) What catalyst is used in step I? **1mark**

(iii) Write an equation for the reaction that occurs between ammonia and oxygen gas in the presence of a catalyst. **1mark**

(iv) Identify the process is step II? **1mark**

(v) Using an appropriate equation, explain how the reaction in step III occurs **(1 mark)**

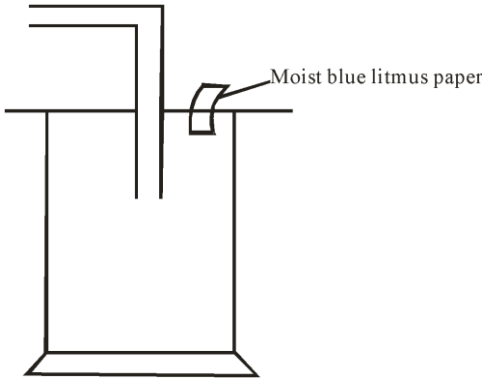
(vi) What should be added to solution K to form solid L? **(1 mark)**

(b) I. Write the formula of compound J.

II. Calculate the mass of compound J that would contain 14g of nitrogen.(N=14, O=16, H= 1) **(2marks)**

b) Explain the advantage of using ammonium phosphate fertilizer over the other nitrogenous fertilizers. (**1mark)**

5. Dry chlorine was collected using the set up below.



a) Name a suitable drying agent for chlorine gas? **1mark**

b) State one property of chlorine gas which facilitates this method of collection. **1mark**

c) State the observations on the moist blue litmus paper. **2marks**

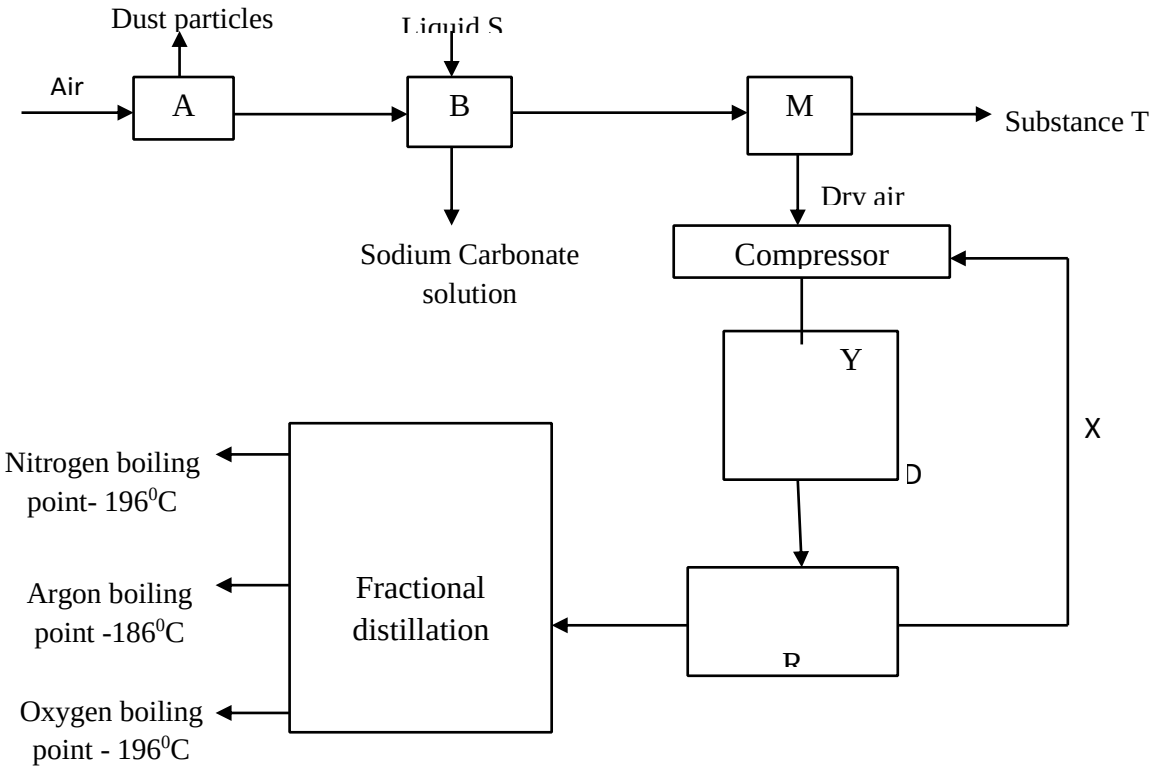
d) Chlorine gas was bubbled through distilled water. With aid of an equation show the formation of chlorine water. **1mark**

e) Write the formula of the compounds formed when chlorine gas reacts with warm dry phosphorous. **2marks**

f) Chlorine gas is mixed with moist hydrogen sulphide gas, state and explain the observations **2marks**

g) Give one use of chlorine gas. **1mark**

6. Fractional distillation of air is used in the industrial manufacture of oxygen. The diagram below shows the process.



a) What processes are taking place in chamber A,B,M and D **2marks**

A

B

M

D

b) Name;

(i) Liquid S

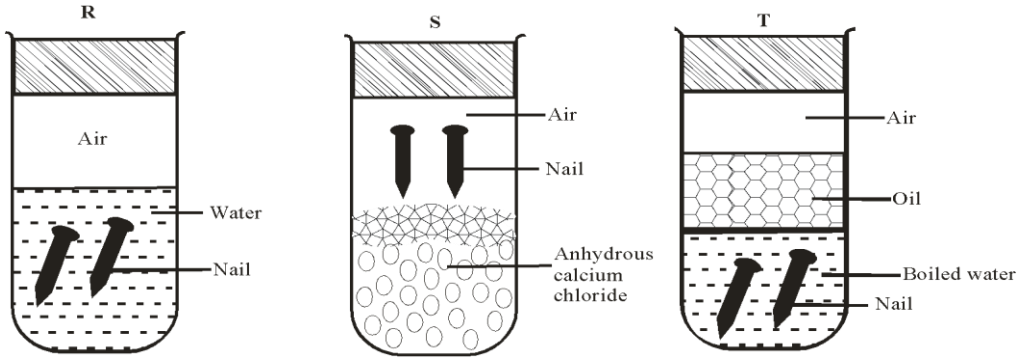
(ii) Substance T

c) Explain why part Y in chamber D is curved? **1mark**

d) Give two industrial uses of oxygen gas? **2marks**

e) In the laboratory preparation of oxygen, manganese (iv) oxide and hydrogen peroxide are used. Write an equation to show how oxygen gas is formed. **1mark**

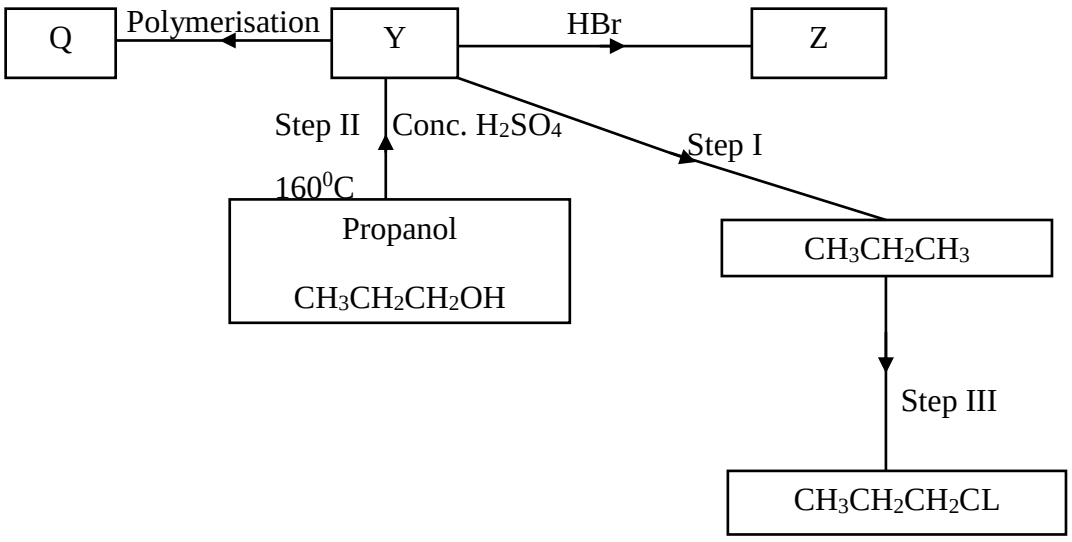
f) An investigation was carried out using the set-up below. Study it and answer the questions that follow.



(i) State and explain what will happen in the three test-tubes R, S and T after seven days. **3marks**

(ii) Give one reason why some metals are electroplated. **1mark**

7. Below is a scheme of some reactions of propanol. Study it and answer the questions that follow.



a) State the reagents and conditions required to effect step I **3marks**

b) Draw the structural formulae and name product Z. **1mark**

c) Name product **Q** **1mark**

d) Explain how product Y can be distinguished from the product formed after step I has taken place. **2marks**

e) What name is given to the process in Step II and step III **2marks**

Step

Step **III II**

f) **(i)** Define the term hydrocarbon **1mark**

(ii) Draw the structure of 1, 2 – dibromopropane **1mark**

NAME……ADM NO……

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TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 2 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- *Write your name and index number in the spaces provided.*
- *Answer **all** questions in the spaces provided*
- *KNEC mathematical tables and silent electronic calculators **may** be used for calculations.*
- *All workings **must** be clearly shown where necessary.*
- *Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.*

For Examiners Use Only

Questions	Maximum Score	Students Score
1-32	80	

1. State the observations made when a piece of sodium metal is dropped into a beaker containing water. **(2mks)**

2. During a class experiment, students passed gas X over heated copper metal, the metal changed its colour to black.

(a) Identify gas X. **(1mk)**

(b) Name the black substance formed. **(1mk)**

3. Aluminium is extracted from its ore by electrolysis.

(a) Name the main ore of Aluminium . **(1mk)**

(b) The Aluminium ore in (a) above has a very high melting point.(2015^0C),though it is electrolyzed at a lower temperature of about 900^0 C. Explain how the low temperature is achieved. **(1mk)**

(c) In the above process, graphite electrodes are used. What is the disadvantage of using this kind of electrodes **(1mk)**

4. A student added $50cm^3$ of 1.0M aqueous Sulphuric (VI) acid to $50cm^3$ of 2.0M Potassium Hydroxide and the temperature of the resulting solution rose by 4^0 C.

(a) Define the term Molar heat of neutralization. **(1mk)**

(b) Calculate the molar heat of neutralization

(C=4.2KJKg^{-1} K^{-1} ,Density of solution=1g/cm^3) **(2mks)**

5. Use the table below to answer the question that follow:

Element	Atomic number
A	11
B	13
C	14
D	17
E	19

(a) Write an equation for the reaction between element A and water. **(1mk)**

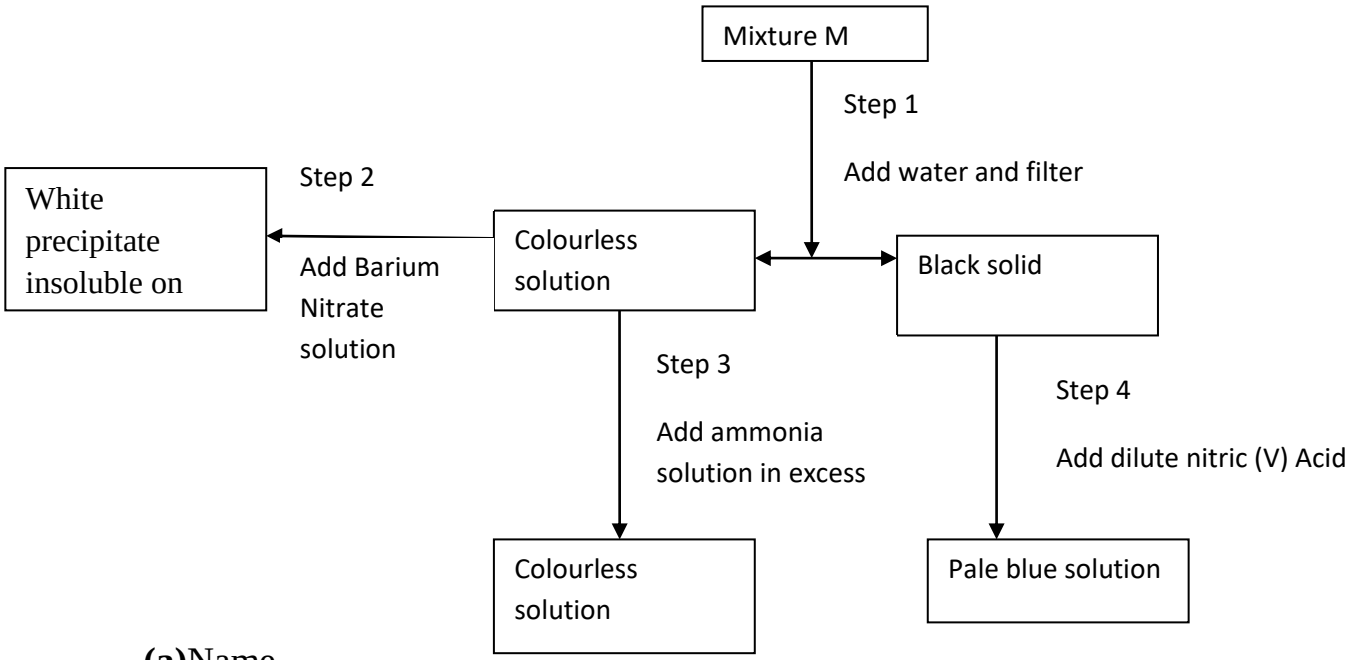
(b) Explain the trend of atomic radii between elements A and D. **(2mks)**

6. In terms of structure and bonding, explain why graphite is used as a lubricant. **(2mks)**

7. **(a)**State the Boyles Law. **(1mk)**

(b) A given mass of the gas occupies $20cm^3$ at 25^0 C and 670mmHg pressure. Find the volume it will occupy at 10^0 C and 335mmHg. **(2mks)**

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



(a) Name

(i) Cations present in mixture M. **(1mk)**

(ii) Anion present in thecolourless solution. **(1mk)**

(b) Write an equation to show how the white precipitate in step 3 dissolves. **(1mk)**

(c) Name the process outlined in step 4 above. **(1mk)**

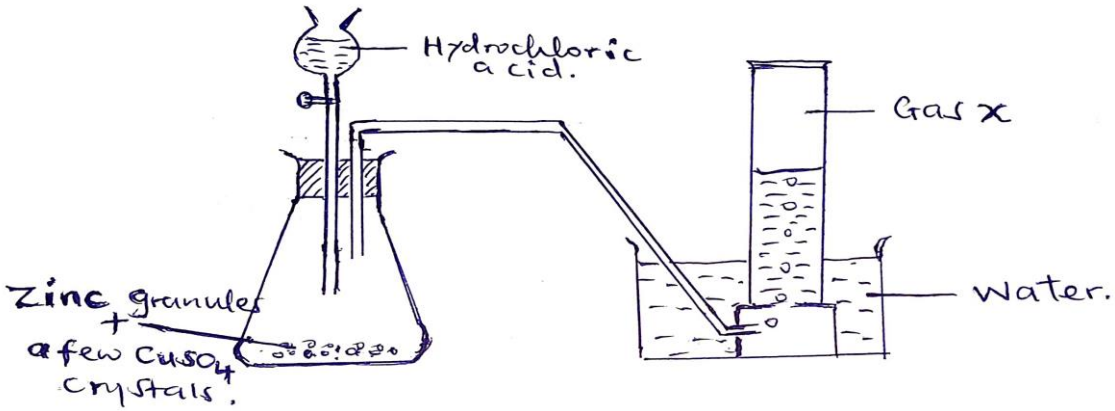
9.The solubility of potassium nitrate is 85g/100g of water at 50 ^{0} C and 32g/100g of water at 25 ^{0} C.

(a) Define the term solubility. **(1mk)**

(b) Calculate the mass of the crystals formed if a saturated solution of potassium nitrate in 50g of water at 50 ^{0} C is cooled to 25 ^{0} C. **(2mks)**

10. Magnesium Chloride dissolves in water to form a neutral solution while iron (III) chloride forms an acidic solution. Explain. **(2mks)**

11. The diagram below is a set up to prepare a certain gas X. Study it and use it to answer the questions that follow.



(a) Identify gas X. **(1mk)**

(b) Why is the gas collected over water? **(1mk).**

(c) Why are Copper (II) Sulphate crystals added to the flask where the reaction takes place?

12. **(a)**Give the systematic names of the following organic compounds. **(2mks)**

(i) $CH_3CH_2CH_2CH_2OH$

(ii) $CH_3CH_2COOCH_2CH_3$

(b) Explain why an organic compound with the formula C_4H_8burns with a more sooty flame than C_4H_{10}. **(2mks).**

13. When solid Zinc Carbonate was added to a solution of Hydrogen Chloride in methylbenzene there was no observable change. On addition of some water to the mixture there was effervescence. Explain the observation. **(2mks)**

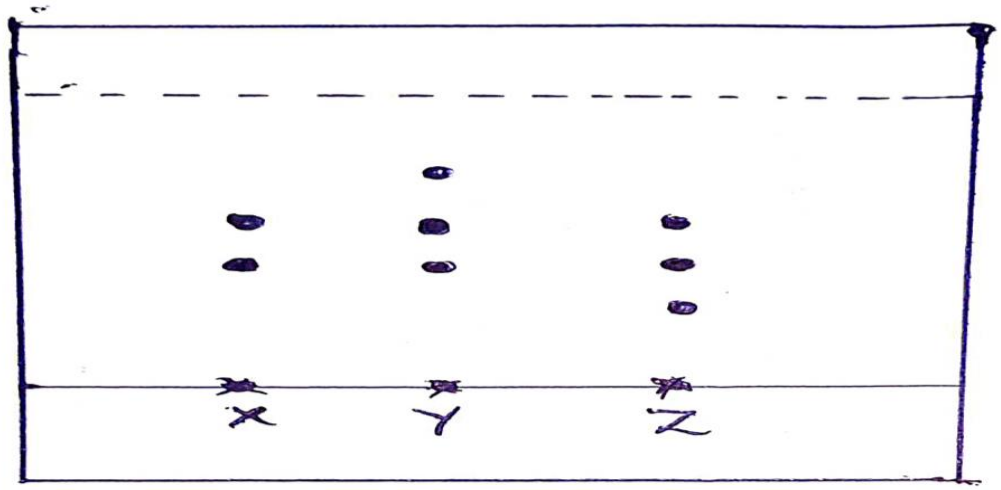
14. In titration experiment,25.0 cm^3 of sodium hydroxide containing 8.0 g per litre was required for complete neutralization of 0.245 g of a dibasic acid. Calculate the relative molecular mass of the acid. **(3mks)**

15.(a)100g of a radioactive isotope was reduced to 12.5g after 81 days. Calculate the half lifeof the radioisotope. **(2mks)**

(b) $^{212}_{80}Y$ decays by beta emission. What is the mass number and the atomic number of the product after decay? **(1 mk)**

16.(a) Distinguish between ionization energy and electron affinity. **(2mks)**

17. The diagram below represents a paper chromatography for three brands of juice suspected to contain unwanted food additives.



From the results, it was found that unwanted additives are present in Y and Z only.
On the chromatogram;

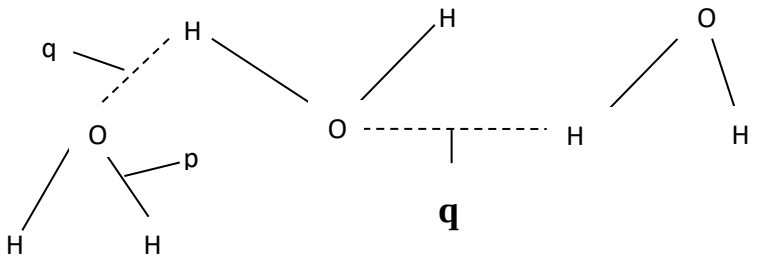
(a) Circle the spots which show unwanted food additives. **(1mk)**

(b) Name the solvent commonly used in paper chromatography. **(1mk)**

(c) State ***<u>two</u>*** applications of chromatography. **(2mks)**

18.(a) Show bonding in Aluminium Oxide. **(1mk)**

(b) Identify the type of bonds represented by p and q in the substances below.

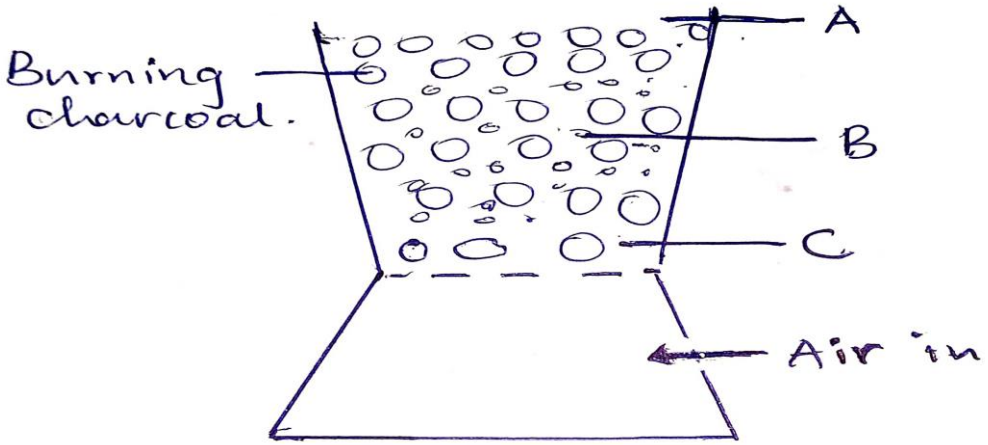


q

p- **(½ mk)**

q- **(½ mk)**

19.The following diagram represents a charcoal burner. Study it and answer the questions that follow:



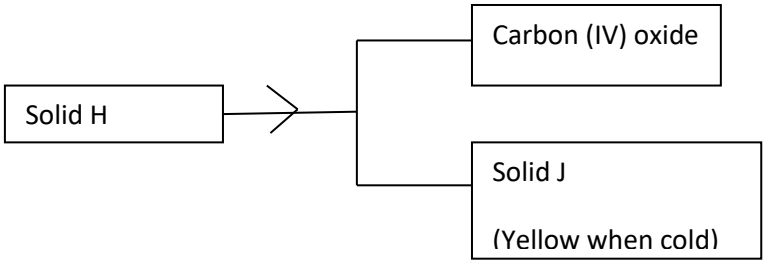
Write the equations for the reactions at A,B and C regions. **(3mks)**

A -

B –

C -

20. Use the scheme below to answer the question that follow.



(a) Identify process **N.** **(1mk)**

(b) Identify the solids

H- **(½ mk)**

J- **(½ mk)**

21. Ammonia gas is prepared by Harber process according to the equation below:

$$N_2(g)+3H_2(g) \longrightarrow 2NH_3(g) + Heat$$

State and explain the effect on equilibrium when the following conditions are applied.

(a) Pressure increased. **(1mk)**

(b) Temperature increased. **(1mk)**

(c) State Le Chatelier's principle. **(1mk)**

22. You are given the following half equations.

$I_2(s) + 2e^- \rightleftharpoons 2I^-(aq)$ $\quad E^\Theta = +0.54V$

$Br_2(l) + 2e^- \rightleftharpoons 2Br^-(aq)$ $\quad E^\Theta = +1.09V$

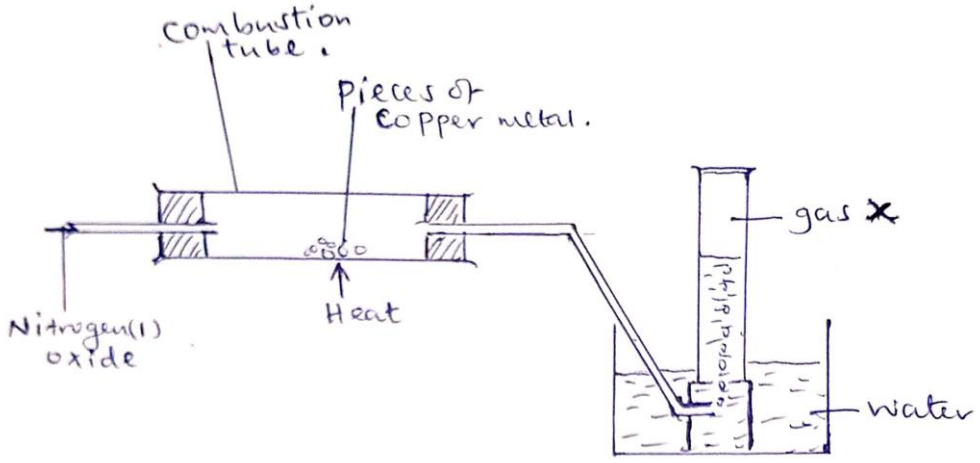
(a) Write an overall equation for the cell reaction. **(1mk)**

(b) Calculate the E^Θ value of the cell. **(1mk)**

(c) Name the oxidizing agent. **(1mk)**

23.When a current of 0.8Ampheres was passed for 44 minutes and 20 seconds through fused iodide of metal Z, 0.7167g of Z was deposited. Determine the charge of the ion of metal Z. (1 Faraday=96500C,RAM of Z=65) **(2mks)**

24.The set up below shows how small pieces of copper are heated in nitrogen (I) Oxide.



(a) Write an equation for the reaction which occurs in the glass jar. **(1mk)**

(b) Give one use of the Nitrogen (I) Oxide. **(1mk)**

25.State what would be observed if concentrated Sulphuric (VI) Acid is added to:

(a) Sugar crystals. **(1mk)**

(b) Hydrated Copper (II) Sulphate crystals. **(1mk)**

(c) What type of reaction has taken place above. **(1mk)**

26.Explain why commercial indicators are preferred to flower extracts as acid base indicators. **(2mks)**

27.(a) Magnesium reacts with hydrochloric acid according to the following equation.

$$Mg(s) + 2HCl(aq) \longrightarrow MgCl_2(aq) + H_2(g)$$

(a) Identify the reducing agent. Give a reason for your answer. **(2mks)**

(b) Iron sheets are dipped in molten Zinc to prevent rusting .Name this process. **(1mk)**

28. Explain why a balloon filled with helium gas deflates faster than a balloon of the same size filled with argon gas. **(2mks)**

29. Complete the table below. **(2mks)**

Solution	PH	Nature of Solution
H	1.0	
I		Neutral
J		Weak acid
K	13.0	

30.A farmer intended to plant cabbages in his farm. he first tested the PH of the soil and found it to be 3.0.If cabbages do well in alkaline soils, explain the advice that would be given to the farmer in order to realize a high yield. **(2mks)**

31.Name an appropriate apparatus:

(a) That is used to prepare standard solutions in the laboratory. **(1mk)**

(b) That is used in heating solid substances strongly. **(1mk)**

(c) That can be used to separate two immiscible liquids. **(1mk)**

32. Some plants have seeds that contain vegetable oil.

(a) State the reagent and apparatus used to extract the oil from the seeds. **(1mk)**

Reagent-

Apparatus-

(b) Explain how it could be confirmed that the liquid obtained from the seeds is oil?**(1mk)**

(c) State an application of the method of extracting oil above. **(1mk)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 2 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

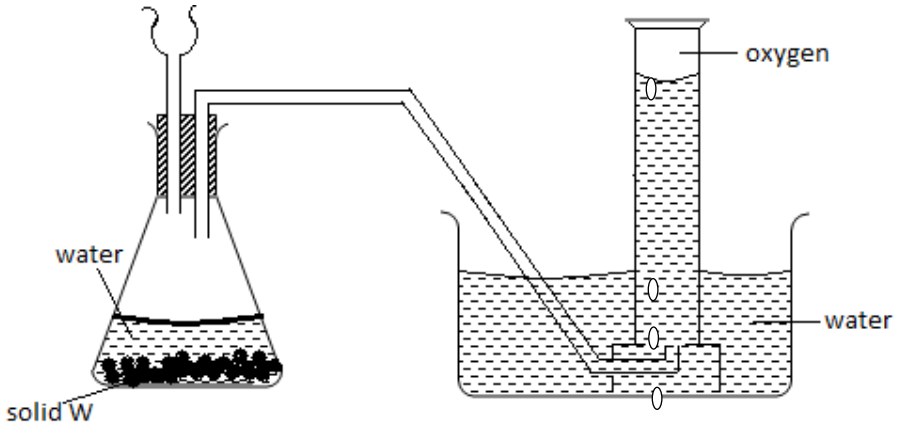
INSTRUCTIONS TO CANDIDATES

- *Write your name and index number in the spaces provided.*
- *Answer **all** questions in the spaces provided*
- *KNEC mathematical tables and silent electronic calculators **may** be used for calculations.*
- *All workings **must** be clearly shown where necessary.*
- *Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.*

For Examiners Use Only

Questions	Maximum Score	Score
1		
2		
3		
4		
5		
6		
7		
8		
TOTAL	**80**	

1. The diagram below shows a set up used by a student in an attempt to prepare collect oxygen gas



a) i) Identify and correct the mistakes in the set up to enable the preparation and collection of the gas. **(2mks)**

ii) Identify solid w. **(1mk)**

b) A piece of phosphorous was burnt in excess air. And the product dissolved in hot water to make a solution.

i) Write an equation for the burning of phosphorous in excess air. **(1mk)**

ii) The solution obtained in (b) above was found to have a pH of 2.0. Give reasons for this observation. **(1mks)**

c) Explain why cooking pots made of aluminium do not corrode easily when exposed to air. **(1mk)**

d) The reaction between sulphure (IV) Oxide and oxygen to form Sulphur (VI) Oxide is an exothermic reaction, which can be represented by the equation below;

$2SO_{2(g)} + O_{2(g)} \leftrightarrows 2SO_{3(g)} \quad \Delta H = -ve$

A factory manufacturing sulphuric (VI) acid by contact process produces 350kg of sulphur(VI)oxide per day (conditions for the reaction; catalyst, 2 atmospheres pressure and temperatures between 400 – 500 ^oC.)

i)What is meant by an exothermic reaction? **(1mk)**

ii) How would the yield per day of sulphur trioxide be affected if temperatures lower than 400^oC are used? Explain. **(1mk)**

iii) All the sulphur (VI) Oxide produced was absorbed in concentrated sulphuric acid to form oleum.

$SO_{3(g)} + H_2SO_{4(l)} \rightarrow H_2S_2O_{7(l)}$

Calculate the mass of oleum that was produced per day. (S = 32.0, O= 16: H = 1.0**)** **(3mks)**

2. Study the table below and answer the questions that follow:

Compounds	Melting point ^0C	Boiling points ^0C
$C_2H_4O_2$	16.6	118
C_3H_6	-185.0	-47.7
C_3H_8O	-127	97.2
C_5H_{12}	-130	36.3
C_6H_{14}	-95.3	68.7

(a) **(i)** Which of the compounds is a solid at 10^oC. Explain **(1mk)**

(ii) Choose two compounds which are members of the same homologous series and explain the difference in their melting points **(3mks)**

(iii) The compound $C_3H_8O$is an alcohol. How does its solubility in water differ from the solubility of C_5H_{12} in water? Explain **(2mks)**

(b) Complete combustion of one mole of a hydrocarbon produces four moles of carbon (IV) oxide and four moles of water.

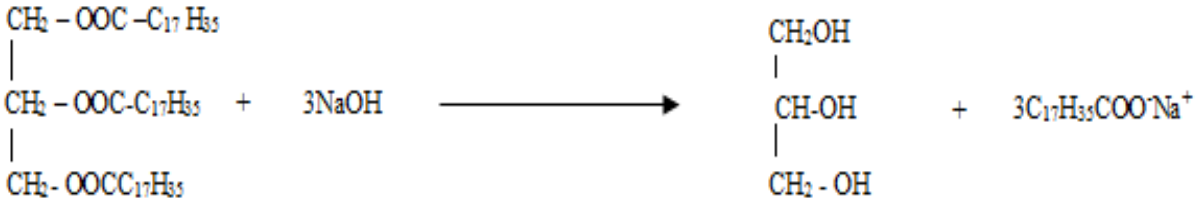
(i) Write the formula of the hydrocarbon **(1mk)**

(ii) Write the equation for the complete combustion **(1mk)**

(c) **(i)** In a reaction, an alcohol "J" was converted to hex -1-ene. Give the structural formula of alcohol "J" **(1mk)**

(ii) Name the reagent and conditions necessary for the reaction in C (ii) above **(1mk)**

(d) Compound K reacts with sodium hydroxide as shown below



(i) What type of reaction is represented by the equation above **(1mk)**

(ii) To what class of compound does "K" belong? **(1mk)**

(e) The following equations represent two different types of reactions

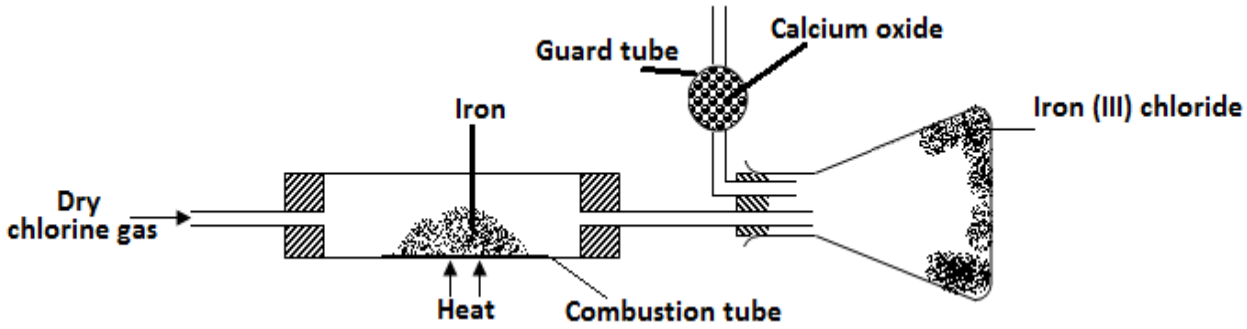
(i) $nC_4H_{8(g)} \rightarrow [C_4H_8]_{n(g)}$

(ii) $C_2H_{6(g)}$ + $Cl_{2(g)}$ → $C_2H_5Cl_{(g)}$ + $HCl_{(g)}$

State the type of reaction represented by (i) and (ii) **(1mk)**

3. (a) Give the name of one reagent which when reacted with concentrated hydrochloric acid produces chlorine gas **(1mk)**

(b) A student set out to prepare iron (lll) chloride using apparatus shown in the diagram below



(i) Explain why it is necessary to pass chlorine gas through the apparatus before heating begins? **(1mk)**

(ii) What property of iron (III) chloride makes it possible to be collected as shown in the diagram **(1mk)**

(iii) The total mass of iron (III) chloride formed was found to be 0.5g. Calculate the volume of chlorine gas that reacted with iron. (Fe = 56, Cl = 35.5 and molar gas volume at r.t.p is 24,000 cm^3) **(3mks)**

(c) When hydrogen sulphide gas passed through a solution of iron (III) chloride the following observation was made;

The colour of the solution changed from reddish brown to green and yellow solid was deposited. Explain these observations **(2mks)**

(d) State and explain the observations that would be made if a moist blue-litmus paper was placed in a gas jar full of chlorine gas **(2mks)**

(e) Study the information to answer the questions that follow. The letters do not represent the actual symbols of the elements.

Elements	Atomic number	Melting point (^0C)
L	11	97.8
M	13	660
N	14	1410
C	17	-101
R	19	63.7

a) **i)** Write the electron arrangement for the ions formed by elements " M" and "C" **(1mk)**

M-

C -

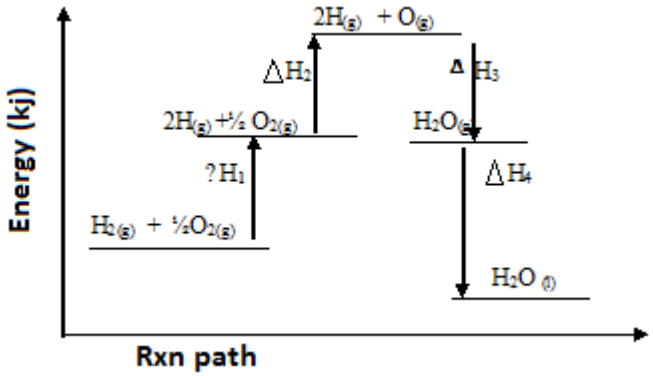
ii) State the type of the bond that will be formed when M and C react. **(1mk)**

iii) In which group and period of the periodic table does element "R" belongs? **(1mk)**

iv) Element R loses its outermost electrons more readily than "L". Explain **(1mk)**

v) Using dots and crosses to represent electrons, show bonding in the compound formed between N and C. **(2mks)**

4. Study the energy level diagram below and answer the questions that follow.



(a) **(i)**Which Δ values have a positive sign. **(1mk)**

(ii) WhichΔH values have a negative sign **(1mk)**

(iii) What chemical changes is being represented by **(2mks)**

ΔH_1

ΔH_4

(b) The hydration energy of Al^{3+} and Cl^- are -4690 and -364kJmol^{-1} respectively. The heat of solution of alluminium chloride is -332kJ mol-^{1}.

(i) Calculate the lattice energy of alluminium chloride **(2mks)**

(ii) Draw an energy level diagram for dissolving of alluminium chloride **(2mks)**

(c) When one mole of butanol is burnt. 2676kJ are liberated

(i) Write a chemical reaction for combustion of butanol.

(1mk)

(ii)Considering the following heats of combustion

- $\Delta H^\theta C$ (Graphite) = -393kJ mol^{-1}
- $\Delta H^\theta C$ $(H_2)_{(g)}$ = -286kJ mol^{-1}
- $\Delta H^\theta C$ (Butanol) = -2676kJ mol^{-1}

Draw an energy cycle for the above energy changes **(2mks)**

iii)Calculate the heat of formation of butanol **(2mks)**

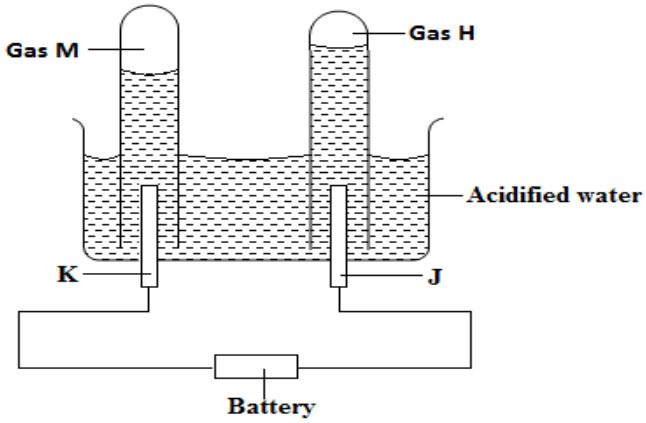
5. **(a)** The equations below shows the standard reduction potential for four half cell. Study it and answer the questions that follow. Letters are not actual symbols of the element.

				E^{θ} Volts
$F_{2(g)}$	+	2e-	→ $2F^-_{(aq)}$	+ 0.54
$G^{2+}_{(aq)}$	+	2e-	→ $G_{(s)}$	-0.44
$H^{+2}_{(aq)}$	+	2 e-	→ $H_{(s)}$	+ 0.34
$2J^{+}_{(aq)}$	+	2e-	→ $J_{2(g)}$	0.00

i. Write the equation for the reaction which takes place when solid "G" is added to a solution containing H^{2+} (ions) **(1mk)**

ii. Calculate the E^{θ} value for the reaction in (ii) above **(1mk)**

(b) The diagram below shows the apparatus used to electrolyze acidified water to obtain hydrogen and oxygen gases. Study it and answer the questions that follows?



i. Identify the electrodes marked K and J **(1mk)**

K-

J -

ii. Write the equation that led to the production of gas **(1mk)**

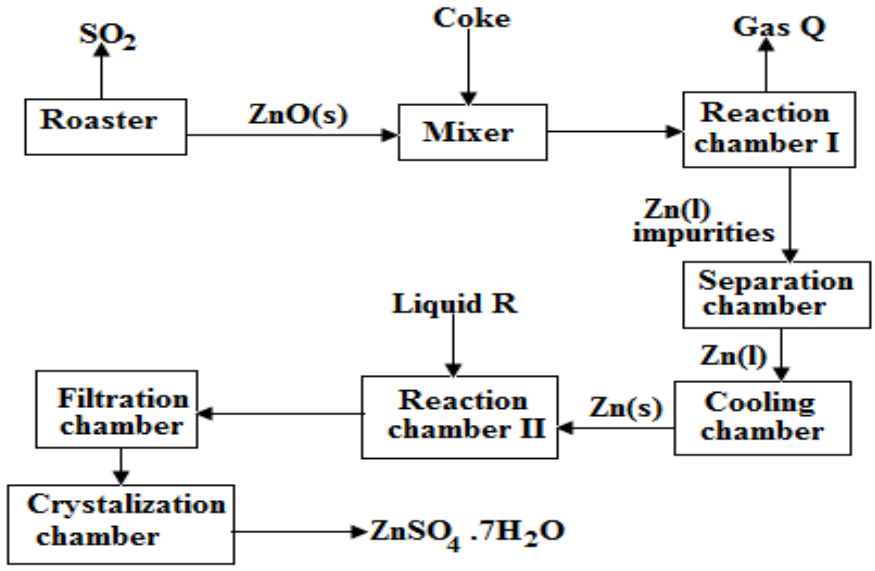
M-

H-

iii. Explain why hydrochloric acid is not used to acidify the water **(1mk)**

(c) During electrolysis of aqueous copper (II) sulphate 144750 columbus of electricity were used. Calculate the mass of copper metal that was obtained (Cu= 64, 1 Faraday = 96500 Columbus) **(2mks)**

6. The flow chart illustrates the extraction of zinc and preparation of Zinc (II) sulphate crystals. Study it and answer the questions that follow



(a)(i) Name

I. Gas **Q** **(1mk)**

II. Liquid **R** **(1mk)**

(ii) Write an equation for the reaction that takes place in

Chamber **I** **(1mk)**

The Roster **(1mk)**

Chamber **II** **(1mk)**

(iii) Given that the zinc sulphide ore contain 45% of Zinc sulphide by mass, calculate

I. The mass in grains of Zinc sulphide that would be obtained from 250 kg of the ore. **(1mk)**

II. The volume of sulphur (IV) oxide (So_2) that would be obtained from the above mass of zincsulphideat room temperature and pressure (S = 32.0, molar gas volume = 24 dm^3**).** **(2mks)**

III. The mass of zinc metalthat would be obtained in Iabove(Zn = 65.4) **(1mk)**

(b) In such an experiment sulphur (IV) Oxide may keep escaping to the atmosphere. Explain how this could affect the environment. **(1mk)**

(c) Suggest one other manufacturing plant that could be set up near Zinc extraction plant**.** **(1mk)**

7. (a) State the difference between chemical and nuclear reactions **(1mks)**

(b) Below is a radioactive decay series starting from

$^{214}_{83}Bi$ and ending at $^{206}_{82}Pb$. Study it and answer the questionsthat follows

$$^{214}_{83}Bi \xrightarrow{\text{Step I}} {}^{219}_{84}Ti \xrightarrow{\text{Step II}} {}^{210}_{82}Pb \xrightarrow{\text{Step III}} {}^{210}_{83}Bi \xrightarrow{\text{Step IV}} {}^{210}_{84}Po \xrightarrow{\text{Step V}} {}^{206}_{82}Pb$$

(i) Identify the particle emitted in step **I** and **III.** **(2mks)**

I

III

(ii) Write the nuclear equation for the reaction which takes place in step V **(1mk)**

(c) The table below gives the percentage of radioactive isotope of Bismuth that remains after decaying at different times.

Time (mm)	0	6	12	22	38	62	100
Percentage of Bismuth	100	81	65	46	29	12	3

(i) On the grid provided below, plot a graph of the percentage of bismuth remaining (vertical axis) against time(PROVIDE GRAPH PAPER) **(3mks)**

(ii) Use the graph, determine the

I. Half life of the Bismuth **(1mk)**

II. Original mass of bismuth isotope given that the mass remained after 70 minutes was 0.16g **(1mks)**

d. Give one use of radioactive isotope in medicine **(1mk)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 3 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- *Write your **name** and **index number** in the spaces provided above.*
- ***Sign and write the date of examination in the spaces provided above.***
- *Answer **ALL** the questions in the spaces provided.*
- ***Mathematical tables and electronic calculators may be used.***
- *All working **MUST** be clearly shown where necessary.*

FOR EXAMINERS USE ONLY

Questions	Maximum Score	Candidate's Score
1 – 28	**80**	

1. a) A hydrocarbon consists of 92.3% carbon. Its molecular mass is 26. Calculate it's Molecular formula. **(2 marks)**

b) Draw the structure of the hydrocarbon. **(1 mark)**

2. a) Explain why melting point of chlorine gas is greater than that of Argon. **(l mark)**

b) Using dot(•) and cross (×) to represent electrons draw a diagram to show bonding in carbon (iv) oxide. **(l mark)**

c)In terms of structure and bonding. Explain why Graphite is used as a lubricant. **(1 mark)**

3. **a)** What is observed when a few drops of phenolphthalein indicator is added to a solution whose pH value is 3.0? **(l mark)**

b) Write an equation for the reaction between Lead (ii) oxide and dilute Nitric acid. **(l mark)**

4. State and explain the observation that would be made when zinc powder is heated with copper (II) oxide. **(2 marks)**

5. Why is it dangerous to run a motor car engine in a closed garage? **(2 marks)**

6. 2 grams of sodium hydroxide is added to 30 cm3 of IM sulphuric (VI) acid. What volume of 0. 1M potassium hydroxide solution will be needed to neutralize the excess acid. (Na23,016,H1**)** **(3 marks)**

7. An aqueous solution of hydrogen chloride gas reacts with manganese (IV) oxide to form chlorine gas while a solution of hydrogen chloride gas in methylbenzene does not react with manganese (iv) oxide. Explain **(2 marks)**

8. A small piece of potassium Manganate (VII) was placed in a glass of water and was left standing for 6 hrs without shaking. State and explain the observations made. **(2 marks)**

9.Magnessium reacts with both dilute and concentrated sulphuric (VI) acid. Write a balanced equation for the two reactions**.** **(2 marks)**

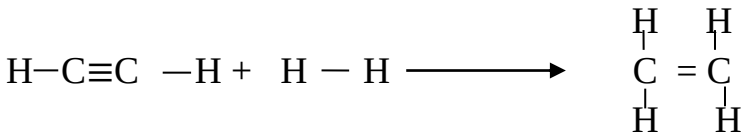
10. The table below gives the atomic numbers of elements **W, X, Y** and **Z**.

Element	W	X	y	Z
Atomic number	14	17	16	19

a) Name the type of bonding that exists in the compound formed when **X** and **Z** reacts. **(1 mark)**

b) Select the letter representing the strongest reducing agent. Give a reason for your answer. **(2 marks)**

11. Ethyne reacts with hydrogen as shown below



Use the bond energies below to calculate the enthalpy changes for the above reaction. **(3 marks)**

BOND	**ENERGY**
H-H	435
C-H	413
C ≡ C	835

C=C	611

12.a) Explain the role of common salt in defrosting ice on roads in ice cold countries. **(1 mark)**

b) Explain why the long term effects of use of common salt is costly to motorists. **(1 mark)**

13. Given the equation below

$NH_{3(aq)} + H_2O_{(l)} \rightarrow NH_4^+{}_{(aq)} + OH^-{}_{(aq)}$

Identify the species that acts as;

i) A base. Explain **(1 mark)**

ii) An acid. **(½ mark)**

14. a) State Grahams law of diffusion**.** **(1mark)**

b)The rate of diffusion of sulphur(IV)oxide gas through a porous material is 40cm3s $^{-1}$.

c)Calculate the rate of diffusion of carbon(IV)oxide gas through the same porous material *(S=32,O=16,C=12)* **(2 marks)**

15. 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 **(3 marks)**

16. The production of ammonia is given by the equation

$$3H2\,(g) + N_2(g) \rightleftharpoons 2NH_3\,(g);\ \Delta H\text{=-ve}$$

(i) State and explain the effect of addition of dilute hydrochloride acid on equilibrium. **(2 marks)**

(ii) Explain the effect of increase in temperature on the yield of ammonia. **(2 marks)**

17. $Cr_2O_7^{2-} + 14\ H^+\,(aq) + 6Fe^{2+} \rightarrow Cr_2^{3+} + 7H_2O(l) + 6Fe^{3+}$.

The above equation show a redox reaction

(a) Calculate the oxidation state of chromium in $Cr_2O_7^{2-}$ **(2 marks)**

(b) What is the role of H^+ in the above reaction. **(1 mark)**

18.a) Define the standard heat of formation. **(1 mark)**

b)Draw energy cycle diagram to show how the standard heat of formation of ethanol (C_2H_5OH) can be determined from standard heats of combustion of its elements. **(2 marks)**

c) Given that $\Delta H_C(C) = -393kJmole^{-1}$, $\Delta H_C(H_2) = -286kJmole^{-1}$ and $\Delta H_C(C_2H_5OH) = -1368kJmole^{-1}$.Calculate the enthalpy of formation of C_2H_5OH. (2 marks)

19. 3.78g of a hydrated salt of iron (II) sulphate, $FeSO_4$, in H_2O were heated until all the water of crystallization was driven off. The anhydrous salt left had a mass of 1.52g. Determine the formula of the hydrated salt. (Fe = 56, S = 32, H = 1, O = 16) **(3 marks)**

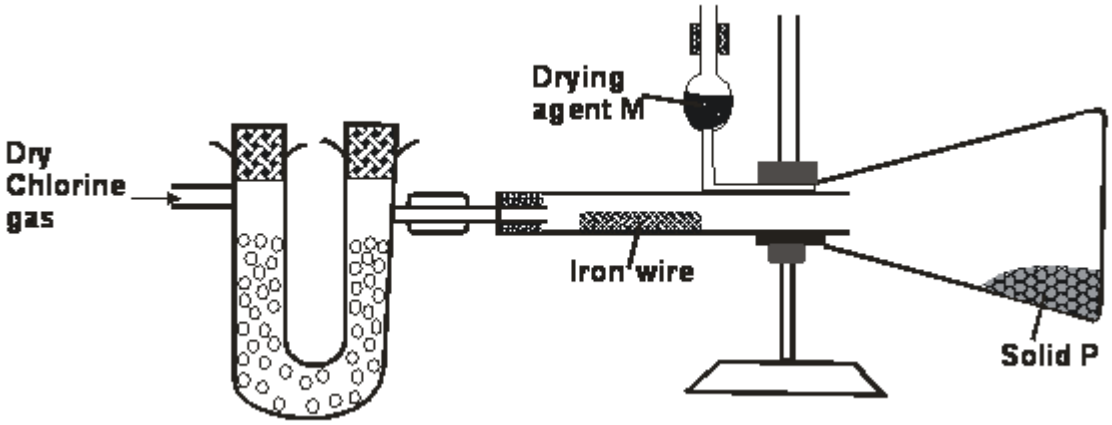
20. A steady current of 0.2 Amperes was passed through molten silver bromide for 80 minutes.

a) Calculate the quantity of electricity that passed through the set up. **(1 mark)**

b) Calculate the mass of product deposited at the cathode. (1F = 96500C; Ag = 108, Br = 80) **(2 marks)**

c) If a sample of cobalt has an activity of 1000 counts per minute, determine the time it would take for its activity to decrease to 62.50 if the half-life of the element is 30 minutes. **(2 marks)**

21. The apparatus set up below was used to prepare an anhydrous solid P



a) Write an equation for formation of solid P **(1 mark)**

b) Suppose the gas used in the set up was dry hydrogen chloride gas; what would be the product obtained after the reaction? Give a reason for your answer. **(1 mark)**

22. Aluminium is obtained from the ore with the formula $Al_2O_3.2H_2O$. The ore is first heated and refined to obtain pure aluminium oxide (Al_2O_3). The oxide is then electrolysed to get Aluminium and oxygen gas using carbon anodes and carbon as cathode.

a) Give the common name of the ore from where aluminium is extracted from **(½ mark)**

b) What would be the importance of heating the ore first before refining it? **(1 mark)**

c) The refined ore has to be dissolved in cryolite first before electrolysis. Why is this necessary? **(1 mark)**

d) Why are the carbon anodes replaced every now and then in the cell for electrolysing aluminium oxide? **(1 mark)**

23. Use the cell representation below to answer the questions that follow

$V(s) / V^{3+}(aq) // Fe^{2+}(aq) / Fe(s)$

i. Write the equation for the cell reaction **(1 mark)**

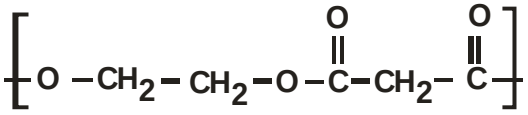
ii. If the E.M.F of the cell is 0.30 volts and the E^{θ} value for $V^{3+}aq / V(s)$ is -0.74V, calculate the E^{θ} of $Fe^{2+}(aq)/ Fe(s)$ **(2 marks)**

24. When $50cm^3$ 1M potassium hydroxide was reacted with $50cm^3$ of 1M hydrochloric acid, the temperature rose by 8^0C. When the same volume of Potassium hydroxide was reacted with $50cm^3$ of 1M Pentanoic acid, the temperature rose by 3^0C.

i)Give reasons for the above difference in temperature. **(2 marks)**

ii) Write an equation to show dissociation of pentanoic acid? **(1 mark)**

25. The following is structural formula of polyester.



a) Draw the structural formula and name the alkanoic acid and alkanol that react to form the polymer. **(2 marks)**

b) Give ***one*** use of polyester. **(1 mark)**

26. A heavy metal P was dissolved in dilute nitric acid to form a solution of compound $P(NO_3)_2$. Portions of the resulting solution were treated as follows:

a) To the first portion a solution of dilute hydrochloric acid is added, where a white precipitate (S) is formed, which dissolves on warming.

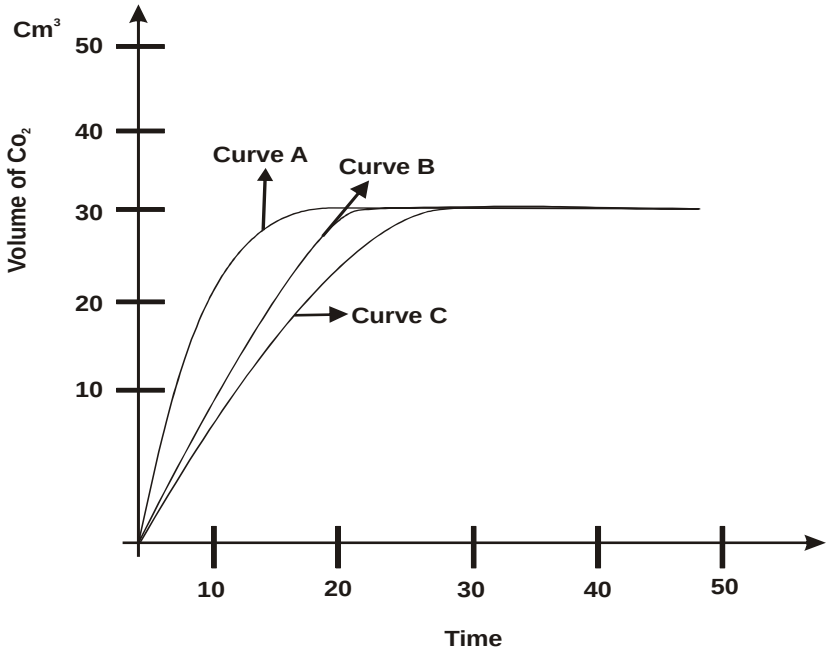
b) The second portion is treated with two drops of 2M Sodium hydroxide solution where a white precipitate T is formed. The white precipitate dissolved in excess sodium hydroxide to form a colourless solution.

c) A solution of potassium iodide is added to the third portion where a yellow precipitate (U) is formed.

d) When the resulting solution is evaporated to dryness and heated strongly a yellow solid (V) is formed and a brown gas (W) and a colourless gas (X) are formed.

Identify the substances P, S, T, U, V, W. **(3 marks)**

27. The graphs below were drawn when 15g of marble chips in different physical states were reacted with $50cm^3$ of 2M Hydrochloric acid.They are drawn by measuring the volume of carbon (iv) oxide produced with time.



a) Which curves corresponds to the reactions involving powdered calcium carbonate and large sized marble chips with the dilute acid?

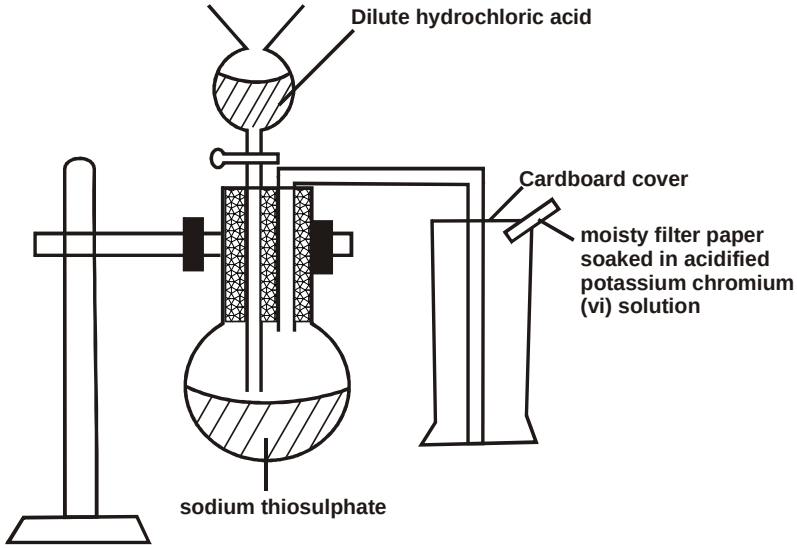
(i) Powdered calcium carbonate **(½ mark)**

(ii) Large sized calcium carbonate **(½ mark)**

b) All the graphs eventually flatten out at the same level but at different time. Why do the graphs flatten out at the same level? **(1 mark)**

c) Why is curve A very steep at any given point compared to the other curves. **(1 mark)**

28. Sodium thiosulphate was reacted with dilute hydrochloric acid in a round bottomed flask as shown below. The gas evolved was collected by downward delivery in a gas jar.



a) Write an equation to show the reaction going on in the reaction in vessel. **(1 mark)**

b) State the observation noted on the filter paper. Give a reason for your answer. **(1 mark)**

c) Give a reason why the filter paper soaked in the acidified potassium chromium (VI) is used at the top of the flask **(1 mark)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 3 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

a) *Write your **name** and **index number** in the spaces provided.*

b) *Sign and write the date of the examination in the spaces provided above.*

c) *Answer **all** the questions in the spaces provided.*

d) *Mathematical tables and silent electronic calculators may be used.*

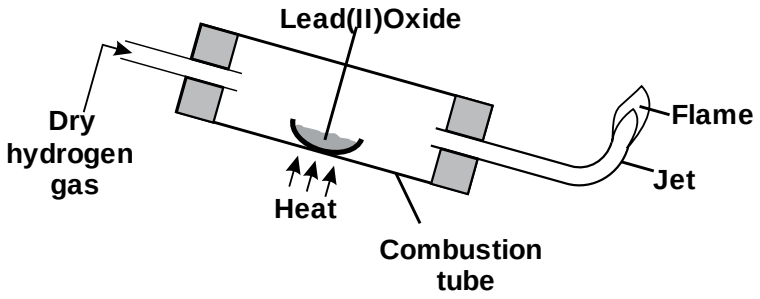
e) *All **working must be clearly shown** where necessary.*

f) *This paper **consists** of **13 printed pages**.*

FOR EXAMINERS USE ONLY

x	Maximum Score	Candidate's Score
1	11	
2	14	
3	12	
4	11	
5	12	
6	10	
7	10	
TOTAL	**80**	

1.The diagram below shows an experiment to demonstrate the properties of hydrogen as a reducing agent. Study it and answer the questions that follow.



a) Before lighting hydrogen gas at the jet, it is important to drive off all the air in the combustion tube. Explain. **(1 mark)**

b) State what would be observed in the boat containing lead (II) oxide at the end of the experiment. **(1 mark)**

c) Write chemical equations for the reaction taking place;

i) In the combustion tube. **(1 mark)**

ii) At the jet as the flame burns. **(1 mark)**

d) Why should the supply of hydrogen continue until the apparatus are cool? **(1 mark)**

e) Why is it important to clamp the glass tube or combustion tube in a slanting position? **(1 mark)**

f) i) Cars in Mombasa rust faster than in Kisumu. Explain. **(1 mark)**

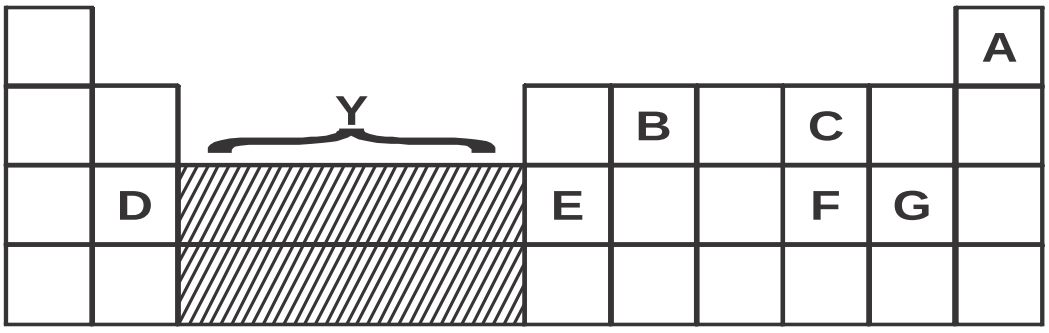
ii) Give the factors that are necessary for rusting. **(1 mark)**

iii) Name ***two*** methods used to prevent rusting. **(1 mark)**

iv) Explain why a nail paced in a sealed tube containing tap water rusts while a nail placed in a sealed tube containing boiled water fails to rust. **(1 mark)**

v) State ***two*** industrial uses of oxygen gas. **(1 mark)**

2. The grid shown below represents part of the periodic table. Study it and answer the question that follow. The letters do not represent the actual symbol of the elements.



a) What type of bonds would be formed between C and G. Explain. **(2 marks)**

b) Write the formulae of the compounds that would be formed between:

i) D and **G** **(1 mark)**

ii) E and **G** **(1 mark)**

c) State and explain how the compounds formed in **(b)** above compare in their melting points in terms of structure and bonding. **(2 marks)**

d) Give the formulae of the oxides of the elements **D** and **F** and state the nature of each oxide.

i) D oxide **(2 marks)**

Formulae-

Nature-

ii) F oxide **(2 marks)**

Formulae-

Nature-

e) Which of the elements shown does not form an oxide? Explain. **(1 mark)**

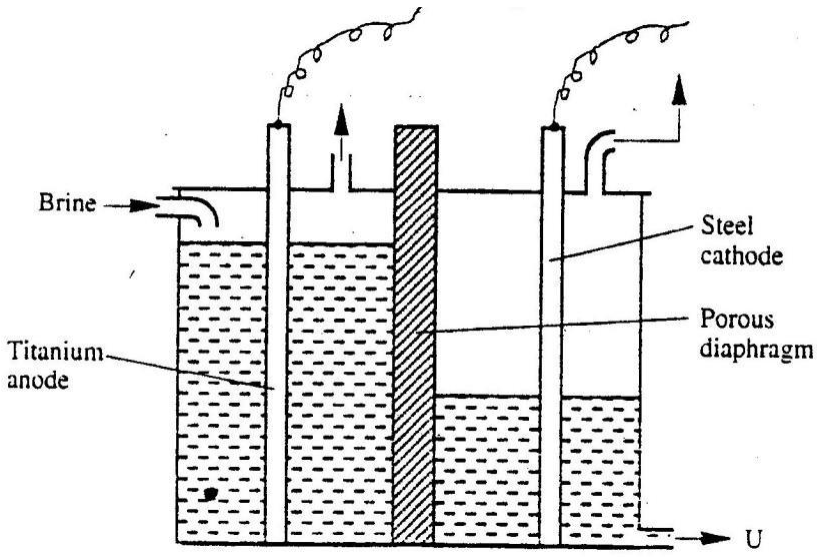
f) Which ***two*** elements shown on the grid are good conductors of electricity? Explain.

(2 marks)

g) What name if given to the group of elements represented by letter Y in the periodic table? **(1 mark)**

3. (a) Brine usually contains soluble calcium and magnesium salts. Explain how sodium carbonate is used to purify brine. **(2 marks)**

(b) The diagram below represents a diaphragm cell used to electrolysed pure brine



(a) Write the equations for the reactions that take place at :-

I Cathode **(1 mark)**

II Anode **(1 mark)**

(b) I. Name: **I** Product at **U**. **(1 mark)**

II. Another material that can be used instead of titanium **(1 mark)**

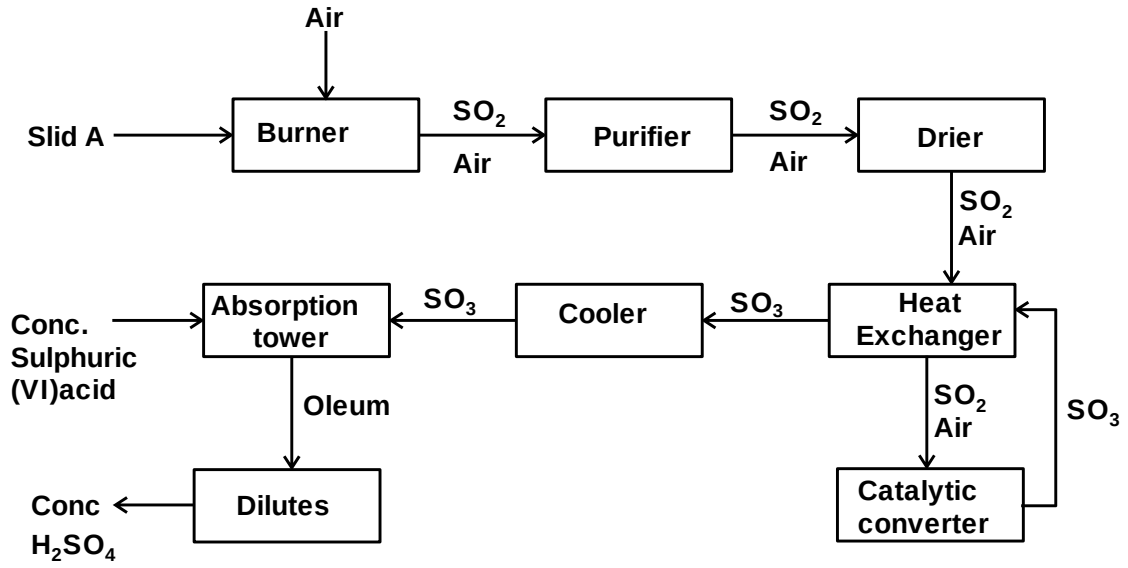
III. The impurity present in the product at **U** **(1 mark)**

IV. State ***two*** functions of the diaphragm **(2 marks)**

c) Give ***one*** industrial use of the product at **U.** **(1 mark)**

d) State ***two*** environmental hazards associated with extraction of sodium metal **(2 marks)**

4. The diagram below illustrates the contact process for the manufacture of sulphuric (VI) acid. Study it and answer the questions that follow.



a) Name ***three*** possible identities of solid A. **(1½ marks)**

b) i) Name ***two*** impurities removed by the purifier**.** **(1 mark)**

ii) Why is it necessary to remove the impurities? **(1 mark)**

c) Write down the equation for the reaction that takes place in the catalytic converter. **(1 mark)**

d) i) Name ***two*** catalysts that can be used in the converter. **(2 marks)**

ii) Which of the ***two*** catalysts is most commonly used and why? **(1 mark)**

e) Why is sulphur (VI) oxide not absorbed directly into water? **(1 mark)**

f) Give the equation for the reaction that takes place in the absorption chamber. **(1 mark)**

g) Name the main pollutant in the contact process. **(½ mark)**

h) Name ***one*** method by which the pollution is controlled in the contact process. **(1 mark)**

5. Study the table below and answer the questions that follow;

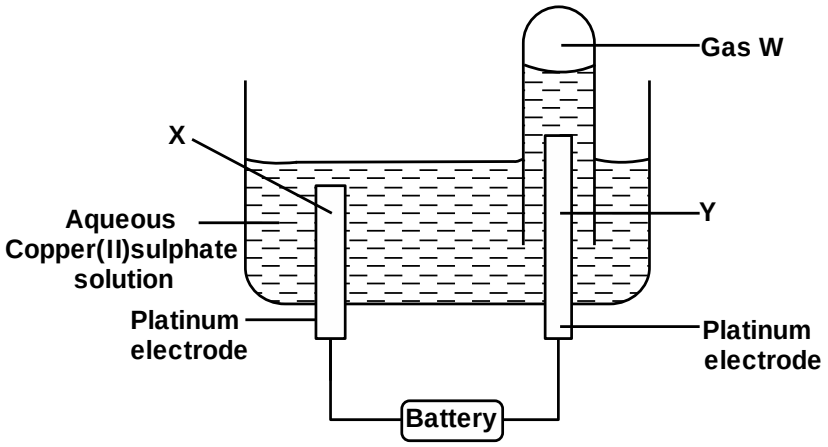
Reduction Half-reaction	E^q(Volts)
$Ag^+_{(aq)} + e^- \rightarrow Ag_{(s)}$	+ 0.80
$Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$	+ 0.34
$2H^+_{(aq)} + 2e^- \rightarrow H_{2(g)}$	0.00
$Zn^{2+}_{(aq)} + 2e^- \rightarrow Zn_{(s)}$	-0.76
$Na^+_{(aq)} + e^- \rightarrow Na_{(s)}$	-2.71

a) Which is the strongest reducing agent in the above half equations? Explain. **(2 marks)**

b) Calculate the electromotive force of a cell consisting of Zinc and silver electrodes immersed in solutions of their respective ions. **(2 marks)**

c) Give the cell representation of the cell in **(b)** above. **(1 mark)**

d) The diagram below represents an experiment set up used for the electrolysis of aqueous copper(II)sulphate solution. Study it and answer the questions that follow;



i) Name electrodes X and Y. **(2 marks)**

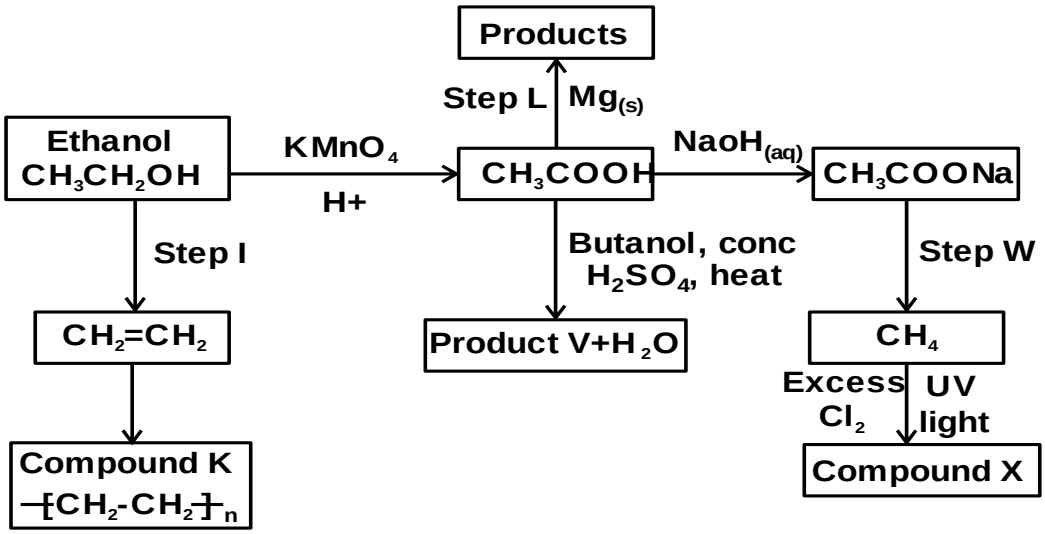
ii) Name gas W. **(1 mark)**

iii) Write the overall equation of the reactions taking place at electrodes X and Y. **(1 mark)**

iv) If a current of 0.4A was passed through the cell for 15 minutes, calculate the mass of copper that would be liberated. (*Relative atomic mass of copper = 64, 1F = 96,500C)*

(3 marks)

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



a) Give the type of reaction, the reagent(s) and the condition(s) necessary for step 1 to take place**.** **(1 mark)**

b) Write the equation for the reaction that takes place in step L. **(1 mark)**

c) Name product V and give the equation responsible for its formation. **(2 marks)**

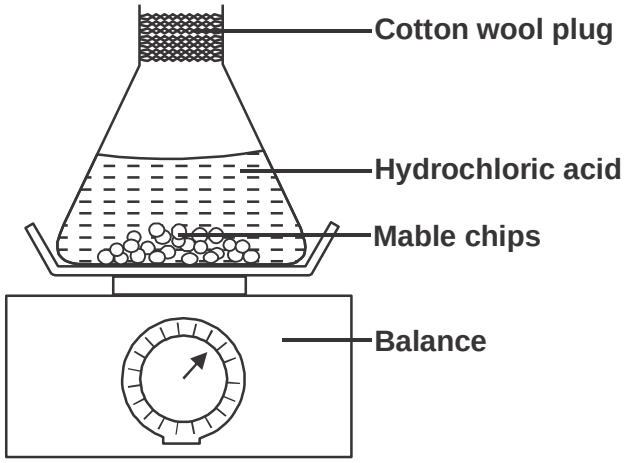
d) Give the reagent(s) and condition(s) necessary for step W to take place. **(1 mark)**

e) Give the IUPAC name and structural formula of compound X. **(1 mark)**

f) Name compound K and state the type of reaction involved in its formation. **(2 marks)**

g) If the relative molecular mass of K is 44800, determine the value of n. (*C = 12, H = 1)* **(2 marks)**

7.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°C.



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

a) Give an equation for the reaction taking place in the flask. **(1 mark)**

b) Why did the mass of the flask change with time? **(1 mark)**

c) What is the role of cotton wool at the mouth of the flask? **(1 mark)**

d) Plot a graph of loss in mass (Y-axis) against time (X-axis). Label the curve 22°C. **(3 marks) (provide a graph paper)**

Time (min)	1	2	3	4	5	6	7
Loss in mass(g)	0.26	0.46	0.60	0.69	0.73	0.73	0.73

e) On the graph same axis as in (d) above, sketch the graph you would expect to obtain if the experiment was repeated at 35°C. Label the curve 35°C. **(2 marks)**

f) State what would happen if the marble chips were replaced with the same mass of marble powder.Explain **(2 marks)**

g)Why is it not advisable to use sulphuric (VI) acid in place of hydrochloric acid in this experiment? **(1 mark)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 4 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

a) *Write your name and index number in the spaces provided above.*

b) *Sign and write the date of examination in the spaces provided above*

c) *Answer all the questions in the spaces provided*

d) *Mathematical tables and electronic calculators may be used*

e) *All working must be clearly shown where necessary.*

FOR EXAMINERS USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1 - 29	**80**	

1. State and explain the change in mass that occur when the following substances are separately heated in open crucibles.

a) Copper metal **(1 $\frac{1}{2}$ marks)**

b) Copper (II) nitrate **(1 $\frac{1}{2}$ marks)**

2. **(a)** State Graham's law of diffusion **(1 mark)**

(**b)** A volume of 120 cm^3 of nitrogen gas diffused through a membrane in 40 seconds, how long will 240cm^3 of carbon (IV) oxide defuse through the same membrane? **(2 marks)**

3. A reaction of Propane with chlorine gas gave a compound of formula C_3H_7Cl.

a) What condition is necessary for the above reaction to take place. **(1 mark)**

b) Draw the structural formula of the compound C_3H_7Cl **(2 marks)**

4. Name a gas which is used together with Oxygen in welding. **(1 mark)**

5. Study the table below and answer the questions that follow.
(The letters are not the actual symbols of the elements)

Element	B	C	D	E	F
Atomic number	18	5	3	5	20
Mass number	40	10	7	11	40

(i) Which two letters represent the same elements? Give reason. **(2 marks)**

(ii) Give the number of neutrons in an atom of element D. (Show your working) **(1 mark)**

6. A hydrated salt of copper has the formula $CuSO_4.nH2O$. About 25g of the salt was heated until all the water evaporated. If the mass of the anhydrous salt is 16.0g, find the value of n. (Cu = 64.0, S = 32.0, O = 16.0, H = 1) **(3 marks)**

7. The table below shows the pH values of the solutions I, II, III and IV

Solution	**I**	**II**	**III**	**IV**
pH	2	7	11	14

a) Which solution is likely to be that of calcium hydroxide? **(1 mark)**

b) Select the solution in which a sample of aluminum oxide is likely to dissolve. Give a reason for your answer. **(2 marks)**

c) Select a pair of solutions that would likely give a pH of 7 when equal volumes are reacted with each other. **(1 mark)**

8. Sodium chloride has a higher melting point than hydrogen chloride, explain. **(2 marks)**

9. Study the table below and answer the questions that follow

substance	M.pt ^oC	B.pt ^oC	Electrical conductivity in solid state	Electrical conductivity in molten state
J	365	463	Nil	Nil

K	1323	2773	Good	Good
L	1046	1680	Nil	Good
M	2156	2776	Nil	Nil

Place J, K, L and M in the appropriate categories from the following:

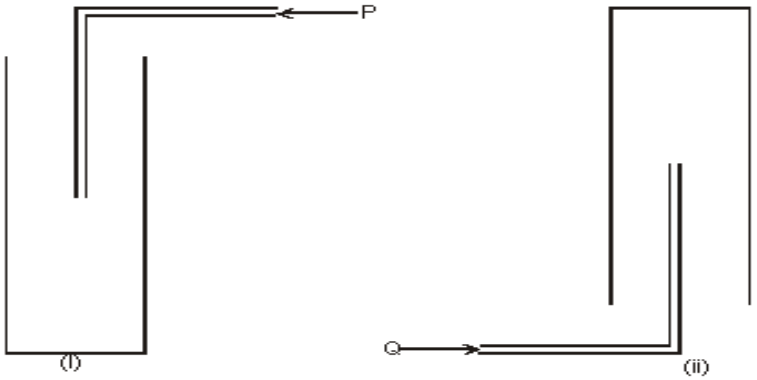
i. Metallic solid **(1 mark)**

ii. Covalent network solid **(1 mark)**

iii. Ionic solid **(1 mark)**

iv. Covalent molecular solid **(1 mark)**

10. The diagram below shows how two gases, P and Q were collected.



a) Name the ***two*** methods used. **(2 marks)**

(i)-

(ii)-

b) State properties of P and Q that enable them to be collected through the methods shown. **(2 marks)**

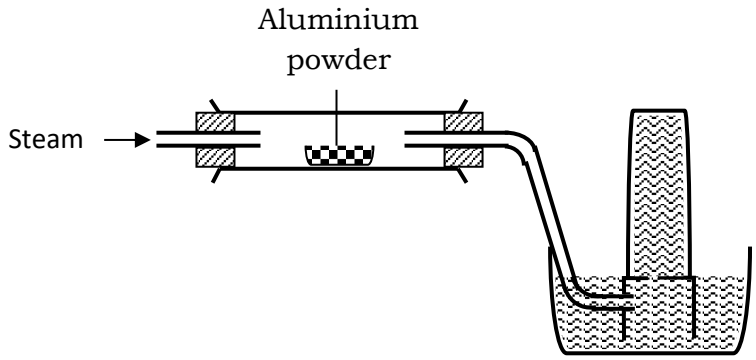
11. Study the information in the table below and answer the questions in the table below and answer the questions below the table

Bond	Bond Energy ($KJmol^{-1}$)
C-H	414
Cl-Cl	244
C-Cl	326
H-Cl	431

Calculate the enthalpy change of the following reaction

$CH_{4\,(g)} + Cl_{2\,(g)} \xrightarrow{\text{U.V. light}} CH_3Cl_{(g)} + HCl_{\,(g)}$ **(3 marks)**

12. Study the diagram below used to investigate the property of steam on aluminium

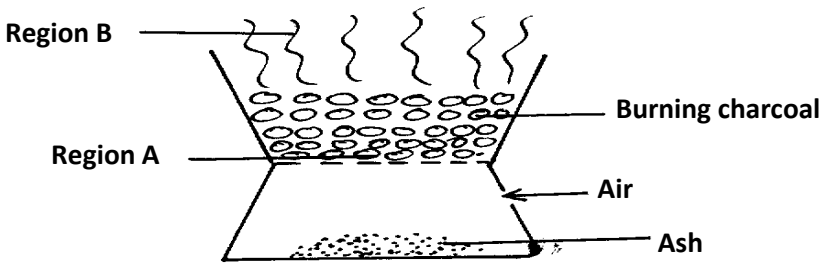


(a) Explain why no gas was collected in the set up above. **(1 mark)**

(b) Explain why the reaction between aluminium and steam stops after a short time. **(2 marks)**

13. A pupil analyzed a commercial vinegar solution by titration and found that 24.5cm^3 of 0.09 M sodium hydroxide solution was required for titration of 10 cm^3 of vinegar. Calculate the molarity of ethanoic acid CH_3COOH in vinegar. **(3 marks)**

14. The diagram below shows a 'jiko' when in use. Study it and answer the questions that follow



(a) Identify the gas formed at region **B** **(1 mark)**

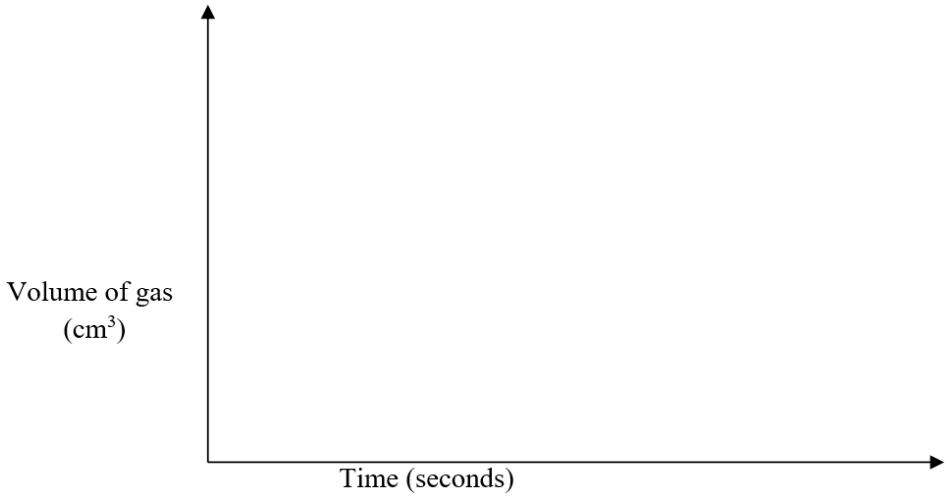
(b) Using an equation, explain what happens at region **A** **(2 marks)**

15. Sodium chloride is contaminated with copper (II) oxide. Explain how pure sodium chloride can be obtained from the mixture. **(3 marks)**

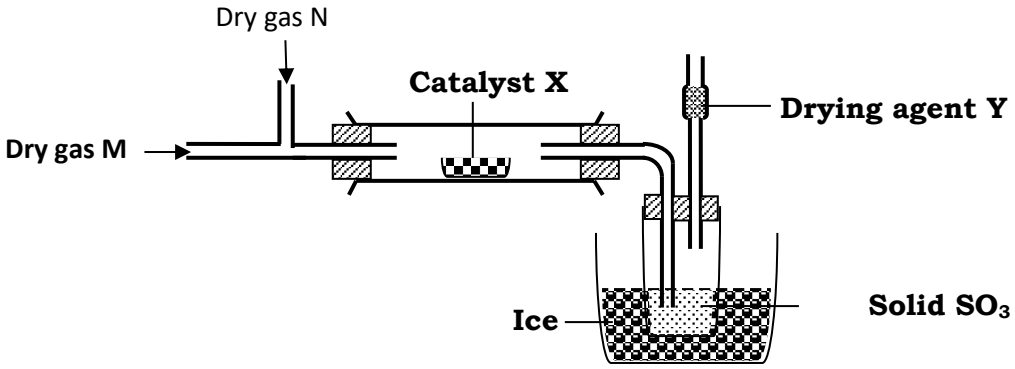
16. The table below gives three experiments on the reaction of excess sulphuric (VI) acid and 0.5g of zinc done under different conditions. In each the volume of gas was recorded at different time intervals.

Experiment	Form of zinc	Sulphuric (VI) acid solution
I	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. **(3 marks)**



17. The set-up of apparatus below used to prepare sulphur (VI) oxide:



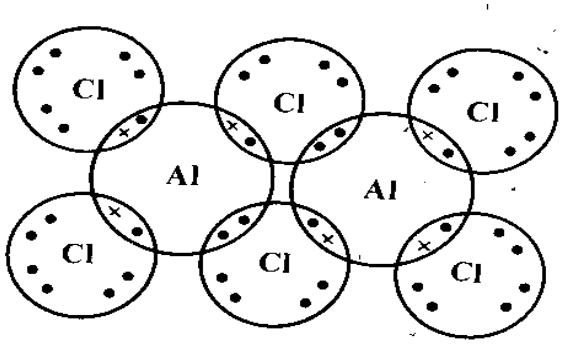
(i) Name Gas **N**……and Gas **M**…….. **(1 mark)**

(ii) Catalyst **X**…… **(1 mark)**

(iii) Why is it necessary to use drying agent **Y?** **(1 mark)**

18. State and explain the observation made when chlorine gas is bubbled into potassium iodide solution. **(2 marks)**

19. The diagram below shows an arrangement of electrons in Aluminium chloride dimer.



(i) Write down the formula of the above molecule. **(1 mark)**

(ii) On the diagram, indicate using an arrow the dative bond. **(1 mark)**

20. When Magnesium metal is burnt in air, it reacts with both oxygen and nitrogen gases giving a white solid with black specs. Write two equations for the reactions that take place.

(2 marks)

21. Below is a representation of an electrochemical cell.

$Pb_{(s)}|Pb^{2+}_{(aq)}||Ag^{+}_{(aq)}|Ag_{(s)}$

a) What does || represent? **(1 mark)**

b) Given the following:

	E^{θ} (volts)
$Pb^{2+}_{(aq)} + 2e^{-} \longrightarrow Pb_{(s)}$	-0.13
$Ag^{+}_{(aq)} + e^{-} \longrightarrow Ag_{(s)}$	+0.80

Calculate the E.M.F of the electrochemical cell **(2 marks)**

22. When hot concentrated nitric (V) acid is added to sulphur, a red – brown gas and a colourless liquid are formed.

(i) Write an equation for the reaction. **(1 mark)**

(ii) Identify the oxidizing agent in the reaction above. **(1 mark)**

(iii) State ***one*** environmental hazard of the nitrogen compounds. **(1 mark)**

23. Draw the dot (.) and cross (x) structure of:

a) Carbon (II) oxide - CO **(2 marks)**

b) Ammonium ion - NH_4^+ **(2 marks)**

24. Using sodium hydroxide solution, describe a chemical test that can be used to distinguish between copper (II) ions and iron (II) ions. **(3 marks)**

25. State and explain what would be observed if concentrated sulphuric (VI) acid is added to:

(a) Sugar crystals **(1 ½ marks)**

(b) Copper (II) sulphate crystals **(1 ½ marks)**

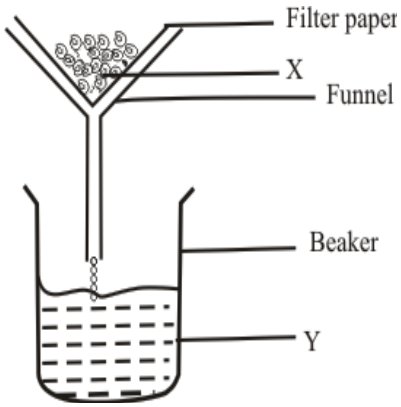
26. When 100 cm^3 of 0.5 M sulphuric acid solution, H_2SO_4, react with 100 cm^3 of 1 M sodium hydroxide solution, NaOH, the temperature rises by 6.85 Kelvins.

(Density = 1.0g/cm^3, specific heat capacity = 4.2kJ$kg^{-1}K^{-1}$)

Calculate the molar heat of neutralization described by the equation: **(3 marks)**

$H_2SO_{4(aq)} + 2NaOH_{(aq)} \rightarrow Na_2SO_{4(aq)} + 2H_2O_{(l)}$

27. Filtration is carried out in the apparatus shown



a) Name **X** …… **($\frac{1}{2}$ mark)**

b) State **one** property that makes it possible to separate mixtures using filtration. **($\frac{1}{2}$ mark)**

28. Calculate the oxidation numbers of sulphur in the following species: **(3 marks)**

a) SO_3^{2-}

b) SO_3

c) $S_2O_3^{2-}$

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 4 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

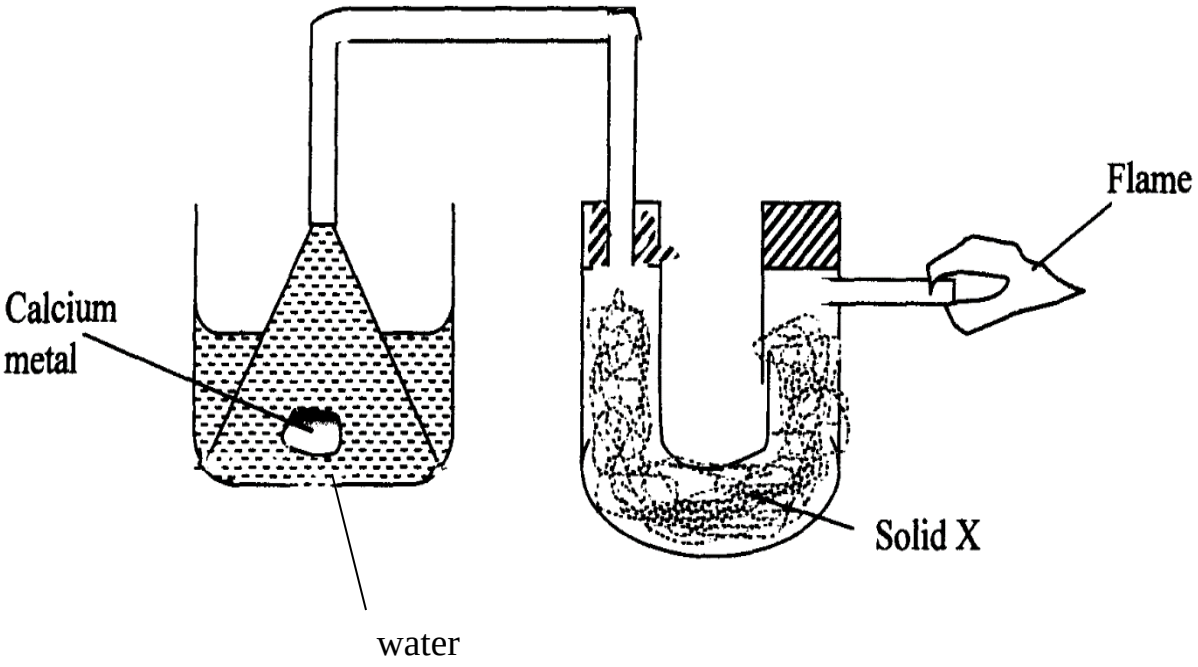
-Answer all questions in the spaces provided

-Electronic calculators may be used

FOR EXAMINER'S USE

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	11	
2	13	
3	10	
4	10	
5	11	
6	10	
7	15	
	80	

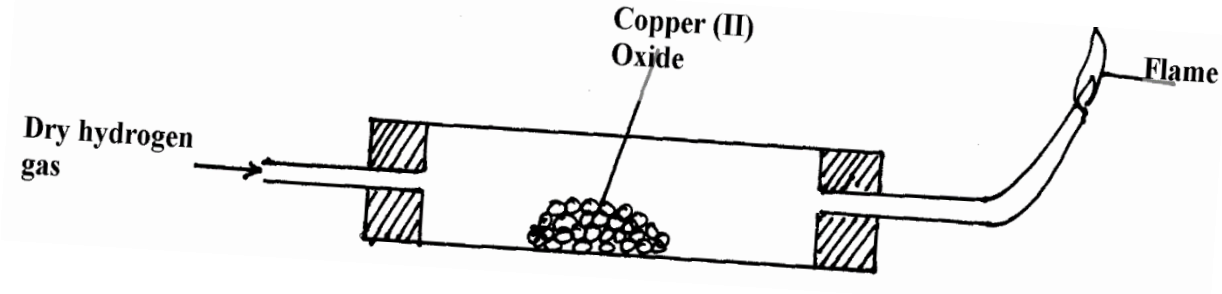
1. i) The setup below was used to investigate the reaction between metals and water.



a) Identify solid **X** and state its purpose.
Solid X **(½ mark)**
Purpose **(½ mark)**

b) Write a chemical equation for the reaction that produces the flame. **(1 mark)**

ii) The set-up below was used to investigate the properties of hydrogen.



a) On the diagram, indicate what should be done for the reaction to occur. **(1 mark)**

b) Hydrogen gas is allowed to pass through the tube for some time before it is lit. Explain. **(1 mark)**

c) Write an equation for the reaction that occurs in the combustion tube. **(1 mark)**

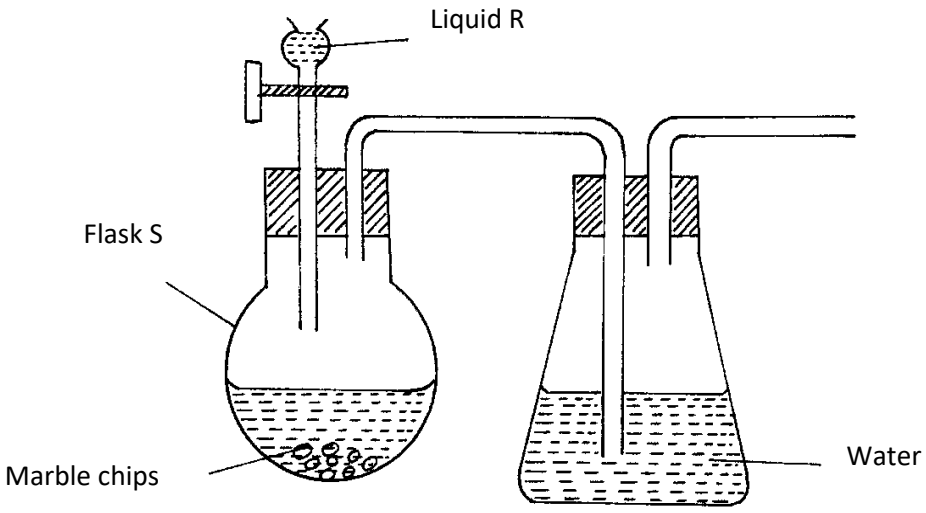
d) When the reaction is complete, hydrogen gas is passed through the apparatus until it cools down. *Explain*. **(2 marks)**

e) What property of hydrogen is being investigated? **(1 mark)**

f) What observation confirms the property stated in **(v)** above? **(1 mark)**

vii) Why is zinc oxide not used to investigate this property of hydrogen gas? **(1 mark)**

2. I. The diagram below represents an incomplete set-up of apparatus that can be used to prepare and collect dry carbon (iv) oxide gas. Complete the diagram and answer the questions that follow.



a) Complete the above diagram. **(3 marks)**

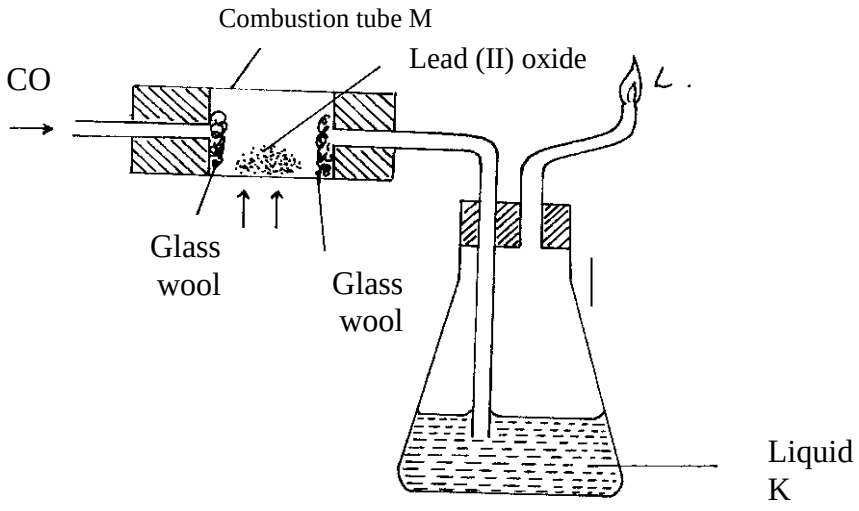
b) Identify liquid R. **(1mark)**

c) Write the equation for the reaction taking place in the flask S. **(1 mark)**

d) Explain why it is not advisable to use lead (II) carbonate in place of marble chips.

(1 mark)

II. The diagram below is used to investigate the effect of carbon (II) oxide on lead (II) oxide. Study it and answer the questions that follow.



a) Write an equation for the laboratory preparation of carbon (II) oxide. **(1 mark)**

b) State and explain the observation in the combustion tube M. **(2 marks)**

c) Identify liquid K and state its function. **(1 mark)**

d) Why is it necessary burn excess gas at L. **(1 mark)**

3. a) Name the following organic compounds.

i) $CH_3COOCH_2CH_3$ **(1mark)**

ii) $CH_3CH_2CHCCHCH_2CH_3$ **(1mark)**

4. a) The fermentation of glucose is catalysed by enzymes from yeast. Yeast is added to aqueous glucose, the solution starts to bubble and becomes cloudy as more yeast cells are formed.

$$C_6H_{12}O_{6(aq)} \xrightarrow{} 2C_2H_5OH_{(aq)} + 2CO_{2(g)}$$

The reaction is exothermic. Eventually the fermentation stops when the concentration of ethanol is about 12%.On a large scale, the reaction mixture is cooled. Suggest a reason why this is necessary. **(1mark)**

(ii) Why does the fermentation stop? Suggest one reason. **(1mark)**

(iii) What technique is used to concentrate the aqueous ethanol? **(1mark)**

b) A compound X contains carbon, hydrogen and oxygen only. X contains **54.54**% of carbon by mass, **9.09**% of hydrogen by mass and **36.37**% of oxygen by mass. (C=12, O=16, H=1) Determine the empirical formula of compound X. **(2marks)**

Compound X has a relative molecular mass of 88. Draw the structural formula of compound X. **(2marks)**

c) The table below gives formulae of three organic compounds A, B and C

Compound	Formulae
A	**$C_2H_4O_2$**
B	**C_2H_6O**

C	C_2H_6

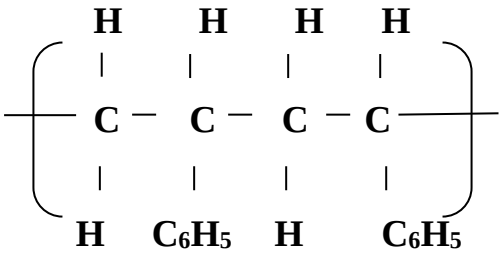
i)Giving a reason in each case, select the letter(s) which represent a compound that

ii)Decolourises acidified potassium manganate (VII). **(1mark)**

iii)Gives effervescence with sodium hydrogen carbonate. **(1mark)**

Undergoes substitution reaction with chlorine gas. **(1mark)**

d) The following is a small reaction of polystyrene polymer. Study it and answer the questions that follow.



(i) Draw the structure of the monomer unit of polystyrene. **(1mark)**

(**ii)** Calculate the number of monomers used to form the polystyrene of relative molecular mass of 18096. (H = 1, C = 12) **(1mark)**

5. An experiment was carried out using magnesium ribbon and dilute hydrochloric acid of different concentrations. The time needed to produce $50cm^3$ of the gas for every experiment was recorded in a table.

Concentration of HCl (moles per litre)	2.0	1.75	1.50	1.25	1.00	0.75	0.50	0.25
Time (seconds)	8.8	10.0	11.7	14.0	17.5	18.7	35.0	70.0
$\frac{1}{time}$ (Sec^{-1})								

i)Complete the table above for $^1/_{time}$. **(4marks)**

ii) Plot a graph of rate i.e $^1/_{time}$ against concentration.(provide a graph paper) **(3marks)**

6. When lead (II) Carbonate is reacted with dilute sulphuric (VI) acid, the reaction takes place for a short time and then stops. Explain. **(2marks)**

7. Study the following information and answer the questions below.

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

a) Determine the general formula of the hydrocarbons and the homologous series they belong to**.** **(2marks)**

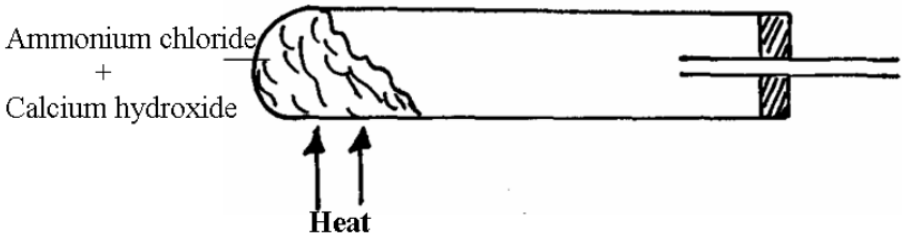
(b) Draw the structure formula of the fourth number of the series. **(1mark)**

8. a) A hydrocarbon undergoes the process represented by the equation below to produce two other hydrocarbons. C10H22 X + C6H14 (a) Name the process undergone by the hydrocarbon. **(1mark)**

(b) State one condition necessary for the process. **(1mark)**

(c) To which homologous series does substance X belong? **(1mark)**

9. Complete the diagram to show how a sample of dry ammonia gas can be prepared in the laboratory. **(3marks)**



10. In an experiment to study the properties of concentrated nitric acid, a mixture of the acid and wood charcoal was heated in a boiling tube.

(a) What observations were made? Explain your answer **(2marks)**

(b) Write an equation for the reaction that took place in the boiling tube **(1mark)**

11. Three nitrates Q,R, and S were each heated and the products formed were tabulated as shown below. Nitrate Products Q R S Metal Nitrite + Oxygen Metal + Nitrogen IV Oxide + Oxygen Nitrogen I Oxide + water

a) Identify S **(1mark)**

R **(1mark)**

b) What is the name given to elements in the same group as Q? **(1mark)**

12. a) An oxide of nitrogen contains 30.4% nitrogen. Its density at s.t.p is 4.11g/dm3. Determine the molecular formula of the compound. (N=14; O=16; moles gas volume = 22.4dm3) **(3marks)**

b) Magnesium ribbon was burnt in a gas jar of nitrogen. A few drops of water were added to the solid formed in the jar. Write an equation for the second reaction. **(1mark)**

13. In a experiment, 10.6g of a mixture of Anhydrous Sodium Carbonate and Sodium Chloride were dissolved in water to make 100cm3 of a solution required 20.0cm3 of 0.5M Hydrochloric acid solution for complete neutralization. What is the mass of Sodium Carbonate in the mixture? (Na = 23.0, C = 12.0, O = 16.0, Cl = 35.5) **(3marks)**

14. The table below gives some properties of compounds P, Q, R and S Compound M.p (0C) b.p (0C) Conductivity in water P -23 77 Does not conduct Q -19 74 Does not conduct R -85 -61 Conducts S 714 1407 Conducts

(a) Which one of the compounds in the table is ionic? Explain. **(1mark)**

(**b)** Which one of the compound (s) in the table is/are liquid(s) at room temperature? Give reasons**.** **(2marks**)

(c) Which of the compound(s) is / are gas(s) at room temperature? Explain. **(1mark)**

15. Given that element A,B and C have atomic numbers 14, 11 and 17 respectively, draw and name the bonding in the compounds formed using dots (.) and (X), when the following element react.

Name the type of bond formed between B and C

(a) B and C **(2marks)**

(b) A and C **(2marks)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 5 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

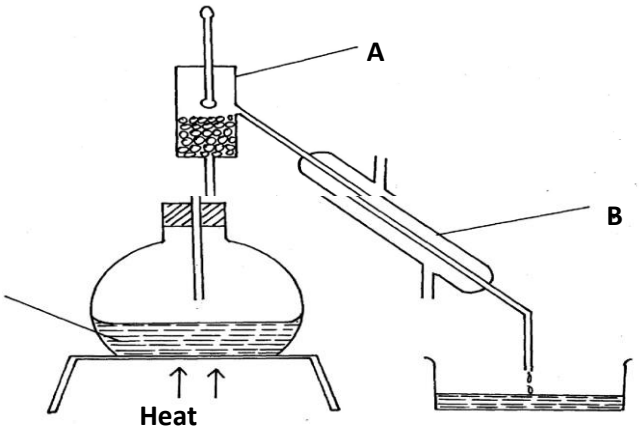
INSTRUCTIONS TO THE CANDIDATES:-

- *Write you **name** and **index number** in the spaces provided.*
- *Answer **all** the questions in the spaces provided.*
- *Mathematical tables and electronic calculators may be used*
- *All working **MUST** be clearly shown where necessary.*

FOR EXAMINERS USERS ONLY

Question	Maximum score	Candidate's score
1-30	80	

1. The diagram below shows a set-up of apparatus used to separate immisible liquids.



(a) Name the parts labelled **A** and **B** **(1mk)**

A-

B-

(b) State the function of the part labeled **A.** **(1mk)**

(c) State the property of the mixture that makes it suitable to be separated by the method above. **(1mk)**

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

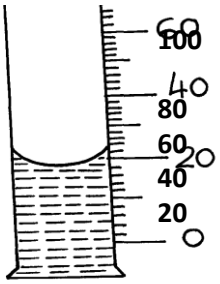
Element	Atomic Number	Melting point (^oC)
L	11	97.8
M	13	660
R	19	63.7

(i) Write the formulae of carbonate R and M **(1mk)**

(ii) Describe how the carbonate of M can be obtained from a mixture of carbonate R and M.

(iii) R is more reactive than L. Explain **(1mk)**

3. In an Experiment, concentrated sulphuric 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 acid was being investigated in the experiment. **(1mk)**

4. a) Define the term solubility. **(1mk)**

b) A form ***four*** student wanted to determine the solubility of potassium nitrate. He obtained the following results.

Mass of evaporating dish = 15.13g

Mass of evaporating dish and solution. = 36.51g

Mass of evaporating dish and salt = 19.41g

Use the information above to calculate the solubility of potassium nitrate. **(3mks)**

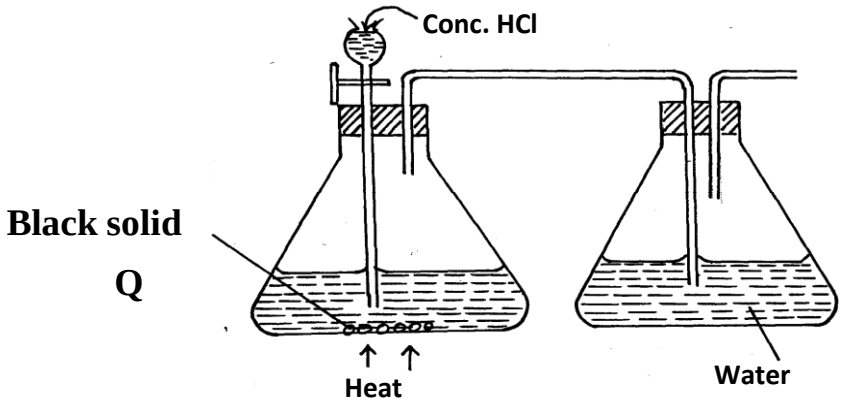
5. The table below shows the standard electrode potentials of two elements P and Q.

Half reactions	Eθ (v)
$P^{2+}(aq) + 2e^- \rightarrow P(s)$	-2.37
$Q^{2+}(aq) + 2e^- \rightarrow Q(s)$	-0.402

i)Draw a well labelled diagram of a cell that could be constructed from the pair of elements**.** **(2mks)**

(ii) Calculate the e.m.f of the cell above. **(1mk)**

6. The diagram shows an incomplete set-up for the laboratory preparation and collection of chlorine gas. Study it and answer the questions that follow.



a)Complete the set-up to show how dry chlorine gas is collected. **(2mks)**

b)Name substance **Q.** **(1mk)**

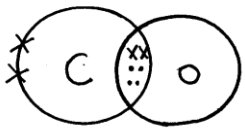
7. If aqueous lead (II) nitrate is added to aqueous solution potassium iodide, abright yellow precipitate is formed.

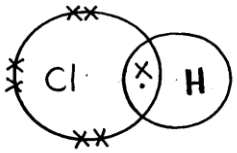
(i) Write down the formula of the precipitate formed. **(1mk)**

(ii) Write an ionic equation for the reaction above. **(1mk)**

8. Zinc carbonate decomposes on heating producing a gaseous product and a residue. What volume of the gaseous product at s.t.p is produced from 2.5 g of the carbonate? (Zn = 65, C=12,O=16 M.G.V at s.t.p = 22400cm^3) **(3mks)**

9. Identify the type of bond formed in **(i)** and **(ii) .** **(2mks)**





(I) **(II)**

(I)-

(II)-

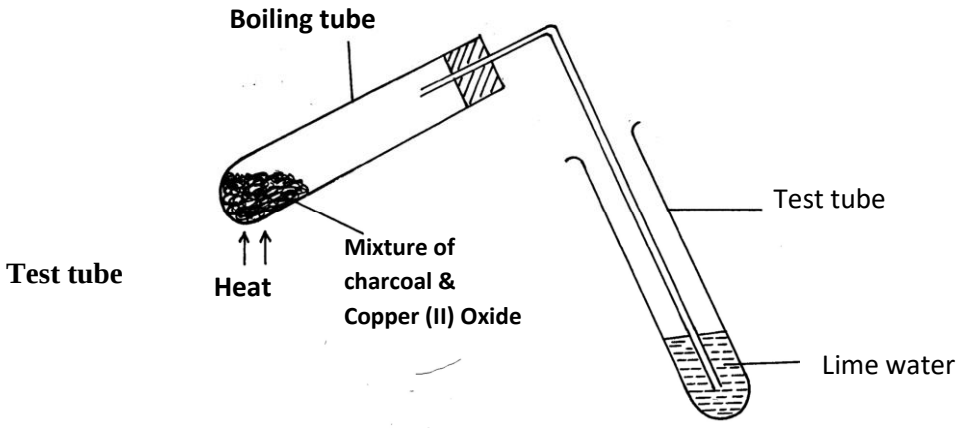
10. Give the systematic name sof the following compounds. **(3mks)**

(a) $CH_3 - C(=CH_2) - CH_3$

(b) $CH_3\,CH(C_2H_5)\,CH_2CH_2OH$

(c) $CH_3CH_2CH_2COH$ (O double-bonded)

11. The set up below was used to investigate a chemical property of carbon. Study it and answer the questions that follow.



(i) What observations were made on heating the mixture. **(2mks)**

(ii) What is the industrial application of carbon in terms of property investigated above. **(1mk)**

12 In an experiment, a few drops of concentrated nitric (IV)acid were added to aqueous Iron (II)sulphate in a test tube. excess sodium hydroxide solution was then added to the mixture.

(a) State the observations that were made when:

(i) Concentrated nitric (V) acid was added to aqueous Iron (II) sulphate **(1mk)**

(ii) Excess sodium hydroxide was added to the mixture. **(1mk)**

(b) Write an ionic equation for the reaction that occurred in a(ii) above. **(1mk)**

13.Consider the reaction represented by the equation:

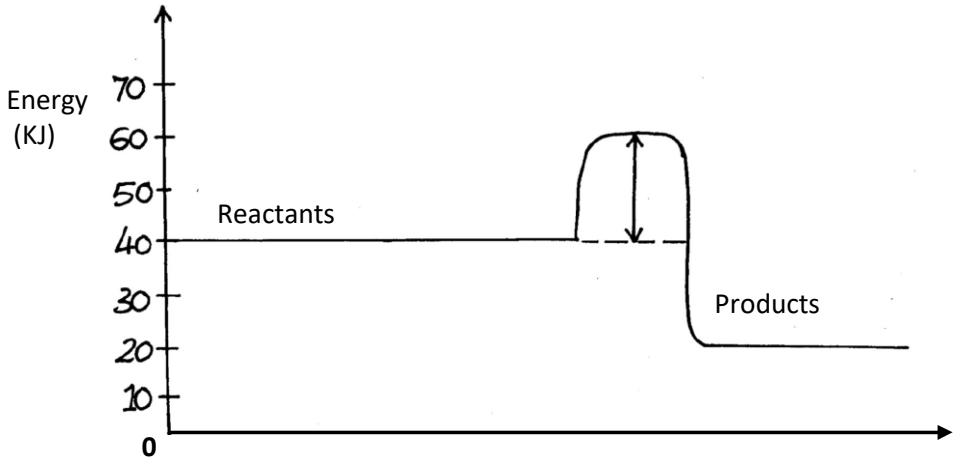
$$N_{2(g)} + O_{2(g)}\ 2\ NO_{(g)} \quad \Delta H = +\ 12\ 59\ KJ$$

Explain the effect of the following on the reaction;

(a) An increase in pressure **(1mk)**

(b) Increase in temperature **(2mk)**

14.Study the energy level below and answer the questions that follow.



Reaction path

(i) State and explain whether the reaction represented in the diagram is endothermic or exothermic. **(1mk)**

(ii) From the diagram, determine;

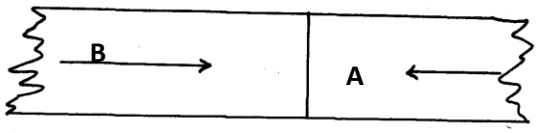
I the activation energy **(1mk)**

II enthalpy of reaction **(1mk)**

15. Explain why when heating substances with non-luminous flame, tubes should not be placed very close to the top of the chimmey. **(2mks)**

16. a) State Graham's law of diffusion. **(1mk)**

(b) Two gases A and B diffuses from two opposite ends of the glass tube as shown. After 12 seconds gas B was detected at point P and A was detected 4 seconds later



P

Calculate the relative molecular mass of A given that the relative molecular mass of B is 2. **(2mks)**

17. Starting with copper metal, describe how a sample of crystals of copper (II) chloride may be prepared in the laboratory. **(3mks)**

18. Thorium $^{232}_{90}$**Th** undergoes two consecutive alpha decays followed by two consecutive beta decays to form the nuclide $^{x}_{y}$**Ra.** Identify the values of x and y **(3mks)**

19. Explain why the reaction between 1g of calcium carbonate and 1M hydrochloric acid is faster than the reaction between 1 g of calcium carbonate and 1M butanoic acid. **(2mks)**

20. A hydrocarbon gas Y in which the percentage of hydrogen by mass is 14.3% occupies a volume of

$2.24dm^3$ at s.t.p and weighs 7g

a. Determine the empirical formula of y. (C= 12,H=10) **(1 ½ mks)**

b. Give the structural molecular formula of Y. **(1 ½ mks)**

21. When magnesium was burnt in air, a solid mixture was formed. On addition of water to the mixture a Gas which turned moist red litmus paper blue was evolved. Explain these observations. **(2mks)**

22. In an experiment to prepare nitrogen (I) oxide, ammonium nitrate was gently heated in a flask.

(a)State and explain how the gas collected. **(1mk)**

(b)A sample of the gas was tested with damp blue and red litmus papers. What observations were made? **(1mk)**

23. Complete the table below. **(2mks)**

Element	Latin Name	Symbol
_____	Plumbum	_____
Copper	_____	Cu
Potassium	_____	K

24. The grid below is part of the periodic table. Use it to answer the questions that follow. (The letters do not represent the actual symbols of elements.)

						R	**S**	
N	**Q**						**T**	**U**
P								

(a) Indicate in the grid the position of an element represented by letter V, whose atomic number is 14. **(1mk)**

(b) Select a letter which represents a monoatomic gas. **(1mk)**

(c) write an equation for the reaction between Q and T **(1mk)**

25. In an Experiment, dilute hydrochloric acid was added to sodium hydroxide solution drop – wise. The concentration of sodium hydroxide was noted at regular time intervals.

a. Sketch a graph of concentration (y-axis) against time interval to show how the concentration of sodium hydroxide changes. **(2mks)**

(ii) Explain the shape of the curve sketched above. **(1mk)**

26. A compound whose general formula is $M(OH)_3$ reacts as shown by the equations below.

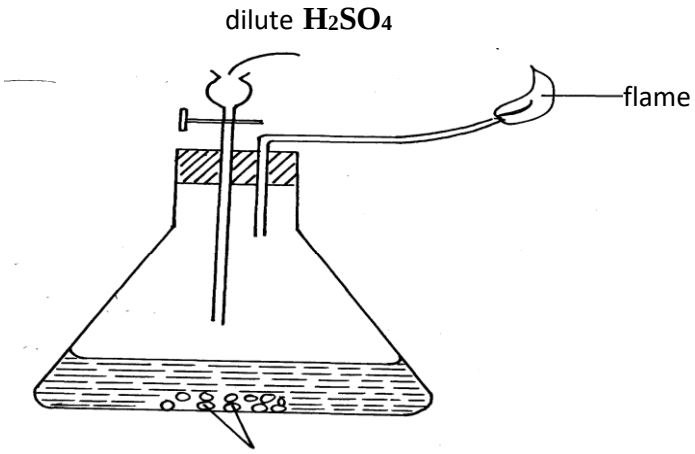
$M(OH)3(s) + OH^-(aq) \longrightarrow M(OH)4^-(aq)$

$M(OH)_{3(s)} + 3H^+_{(aq)} \longrightarrow M^{3+}_{(aq)} + 3H_2O_{(l)}$

a. what name is given to the compounds which behave like $M(OH)_3$ in the two reactions above? **(1mk)**

b. name two elements whose hydroxides behave like that of M. **(1mk)**

27. Below is a set-up of apparatus used to prepare hydrogen gas in the laboratory study it and answer the questions that follow.



Zinc granules

(a) Write the chemical equation for the two reactions taking place in the above set up. **(2 mks)**

(b) State the chemical test for hydrogen gas. **(1mk)**

28. Draw a well labelled diagram to illustrate how copper metal is purified. **(3mks)**

29.(a) What are alkali metals. **(1mk)**

(b) Explain why potassium atom is larger that n Sodium atom. **(1mk)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 5 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

Answer all questions

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

Elements	Electronic configuration	Ionization energy $kJmol^{-1}$
P	2:1	519
C	2:8:1	494
R	2:8:8:1	418

(i) What is the general name given to the group which elements P, C and R belong? **(1mk)**

(ii) What is meant by ionization energy? **(2mks)**

(iii) Explain why element P has the highest ionization energy. **(2mks)**

(iv)(a) When a piece of element "C" is placed on water, it melts and hissing sound is produced as it moves on the surface of the water. Explain these observations. **(2mks)**

(b) Distinguish between a strong and a weak base. Give an example of each. **(2mks)**

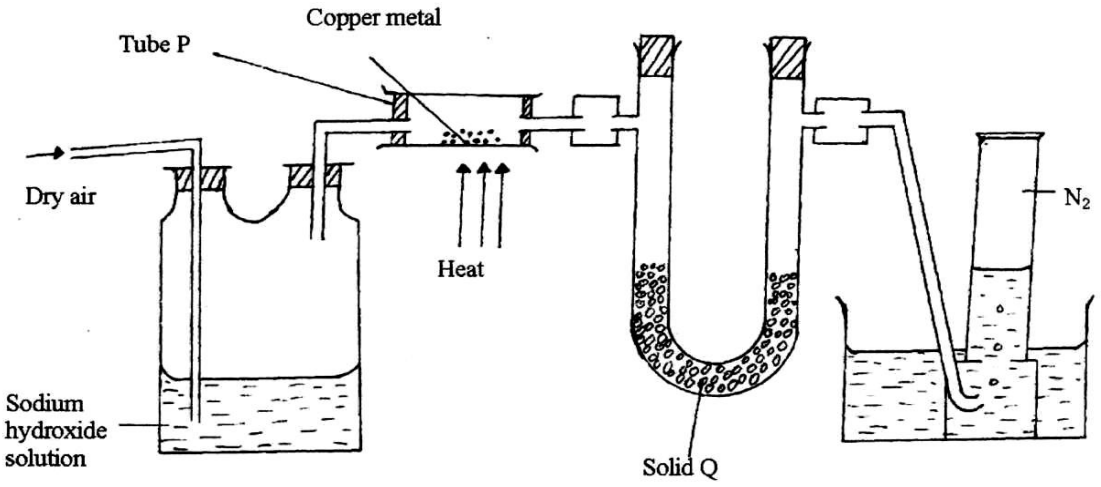
(c) Neutralization is one of the methods of preparing salts.

i. What is meant by neutralization? **(1mk)**

ii. Describe how you would prepare crystals of sodium nitrate starting with $200cm^3$ of 2M sodium hydroxide. **(3mks)**

iii. Write an equation for the reaction that takes place when a solid sample of sodium nitrate is heated. **(1mk)**

2. The diagram below represents a set-up that was used to obtain dry nitrogen from air. Study it and answer the questions that follow.



(i) Name solid Q. **(1mk)**

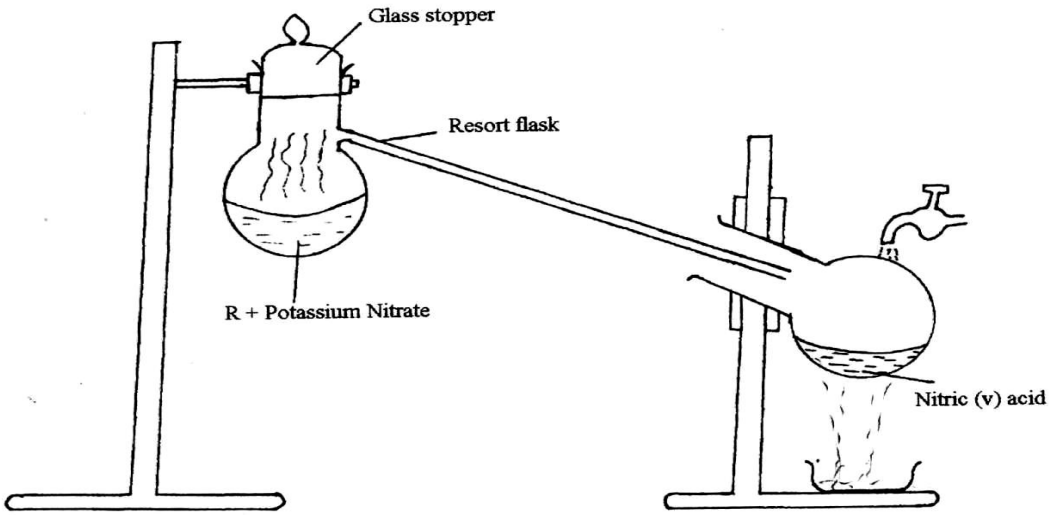
(ii) What is the purpose of $NaOH_{(aq)}$? **(1mk)**

(iii) Write an equation for the reaction which took place in tube P. **(1mk)**

(iv) Give the name of one impurity in the nitrogen gas obtained. **(1mk)**

(v) Why is liquid nitrogen used for storage of semen for artificial insemination? (1mk)

(b) The set-up below was used to prepare nitric acid.



(i) Give the name of liquid R. **(1mk)**

(ii) Write an equation for the reaction which took place in the retort flask. **(1mk)**

(iii) Explain the following:-

(a) Nitric acid is not stored in clear / transparent glass. **(2mks)**

(b) The reaction between copper metal with 50% nitric acid (one volume of acid added to an equal volume of water) in an open test tube produces brown fumes. **(2mks)**

3. Chlorine is a member of group VII.

(a) What is the family name of group VII elements? **(1mk)**

(b) Explain why the reactivity of Iodine is lower than that of Bromine. **(2mks)**

(c) Chlorine gas used for industrial purposes is obtained by electrolysis of brine.

(i) Name **<u>two</u>** other products of this electrolysis. **(2mks)**

(ii) Write the equation for the reaction at the anode. **(1mk)**

(d) Sodium chlorate ($NaClO_3$) is used as a herbicide. It is formed according to the following equation:

$6NaOH_{(aq)} + 3Cl_{2(g)} \longrightarrow NaClO_{3(aq)} + 5NaCl_{(g)} + 3H2O_{(l)}$

Sodium chloride is less soluble than sodium chlorate and crystallizes out first. Sodium chlorate is obtained from the remaining solution by crystallization of saturated solution.

(i) State ***<u>one</u>*** condition necessary for this reaction. **(1mk)**

(ii) Calculate the maximum mass of sodium chlorate in kilograms that can be formed from $206m^3$ of chlorine gas. (1 mole of gas = $24dm^3$, Na = 23.0, Cl = 16.0). **(3mks)**

(e) Name ***<u>two</u>*** other uses of chlorine. **(2mks)**

4. (a) The table below contains information from the measurements made of the radioactivity in counts per minutes from a radioisotope iodine – 128.

Counts per min	240	204	180	156	138	122	108
Time (min)	0	5	10	15	20	25	30

(i) Plot a graph of counts per minute against time. **(3mks)**

(GRAPH PAPER PROVIDED)

(ii) Use the graph to determine the half-life of iodine – 128. **(1mk)**

(iii) What is the counts rate after 22 minutes? **(1mk)**

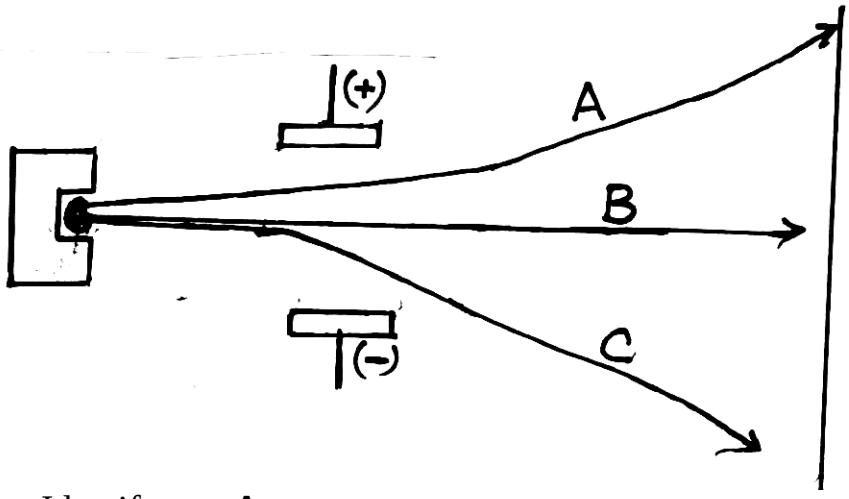
(iv) After how many minutes were the counts rate 160 counts per minute? **(1mk)**

(b)If isotope $^{232}_{90}Th$ decays to $^{216}_{83}Bi$ as a result of X alpha-particles and Y-beta particles emission

(i) Find the numerical value of X and Y. (2mks)

(ii) Write the nuclear equation. (1mk)

(c) A radioactive material emitted radiations as shown below.



(i) Identify: **A** **(1½mks)**
B
C

(ii) Which radiation: **(1½mks)**

i. Has no mass?

ii. Has the lowest ionizing power?

iii. Contains Helium particles?

5. The 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 for the major components of bauxite. **(1mk)**

(c) **(i)**Name the major impurities in bauxite. **(2mks)**

(ii) Explain how the impurities in bauxite are removed. **(1mk)**

(d) Crayolite is used in the extraction of aluminium from bauxite. State its function. **(1mk)**

(e) Describe how carbon (IV) oxide is formed during the extraction of aluminium. **(2mks)**

(f) Aluminum is a reactive metal yet utensils made from aluminium do not corrode easily. Explain this observation. **(2mks)**

6. Standard electrode potentials for half cell reactions are shown below.

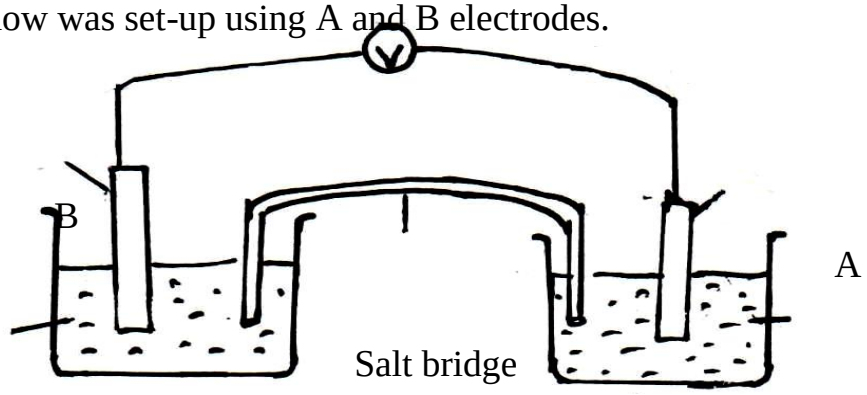
$A^{2+}_{(aq)} + 2e \longrightarrow A_{(s)}$ - 0.76V

$B^{2+}_{(aq)} + 2e \longrightarrow B_{(s)}$ - 0.13V

$C^{+}_{(aq)} + e \longrightarrow C_{(s)}$ +0.80V

$D^{2+}_{(aq)} + 2e \longrightarrow D_{(s)}$ +0.34V

The cell below was set-up using A and B electrodes.



$B(NO_3)_{2(aq)}$ $A(NO_3)_{2(aq)}$

(a) **(i)** Give the half-cell equations for each half cell. **(1mk)**

(ii) Write the overall cell equation. **(1mk)**

(iii) Calculate the e.m.f. of the cell above. (1mk)

(iv) Describe how the salt bridge helps in maintaining the change balance in each half cell when the cell is in operation. **(2mks)**

(v) It is not advisable to use potassium chloride salt bridge when Lead (II) nitrate solution is used as an electrolyte in the above set-up. Explain. **(2mks)**

(b) Sodium hydroxide is a chemical that can be prepared industrially in a mercury cell.

(i) Give the name of the main raw material used. **(½mk)**

(ii) In the cell, graphite is used as anode electrode. Name another substance that can be used in place of graphite (carbon). **(½mk)**

(iii) Give **<u>two</u>** uses of sodium hydroxide. **(2mks)**

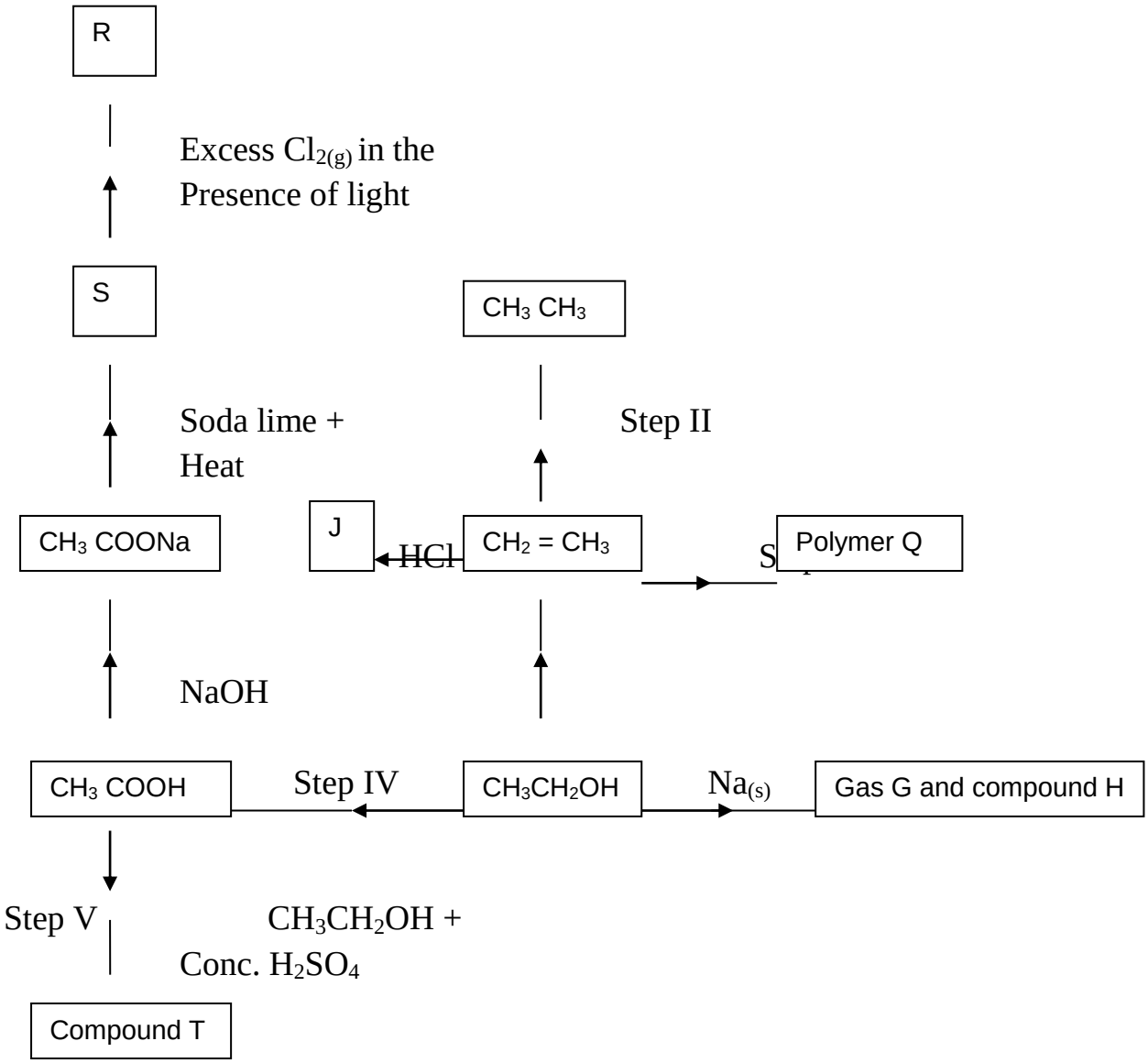
(iv) Give **<u>two</u>** reasons why mercury is recycled. **(2mks)**

(v) Write the equation in which sodium hydroxide is produced. **(1mk)**

(vi) If the volume of hydrogen produced in the mercury cell is 100 litres. Calculate the mass of sodium hydroxide formed at room temperature.
(H = 1.0, Na = 23.0, O = 16.0 MGV = 24 litres) **(2mks)**

7. **(a)** Name **<u>two</u>** advantages of synthetic fibre over natural fibre. **(2mks)**

(b)The scheme below shows reactions starting with ethanol. Study it and answer the questions that follow.



(i) Name gas **G**. **(1mk)**

(ii) Write the structural formulae and names of:

(a) T **(1mk)**

(b) S **(1mk)**

(iii) Name the homologous series to which T belongs. **(1mk)**

(iv) Write down the structural formula of compound R. **(1mk)**

(v) Name the compound R. **(1mk)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 6 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

*Write your name and index number in the **spaces** provided.*
Sign and write the date the examination is done.
*Answer **all** the questions in the spaces provided.*
*Mathematical tables and **electronic calculators** may be used.*
*ALL workings **MUST** be clearly shown where necessary.*

For Examiner's Use Only

Question	Maximum score	Candidates score
1-27	80	

1. During the extraction of copper from copper pyrite ($CuFeS_2$), some of the processes include.

(i) Crushing the ore.

(ii) Mixing the crushed ore with water, oil and bubbling air through it.

(iii) Roasting the ore.

a) What name is given to process (ii) and give its use. **(1 ½ mk)**

Name-

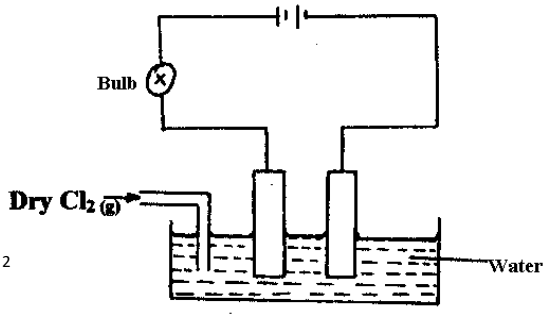
Use-

b) Write equation for roasting of the copper pyrite. **(1mk)**

c) ***Give one*** use of the copper metal. **(1mk)**

2. Aluminium chloride solution changes the blue litmus paper red. Explain this observation. **(1½mks)**

3. The set up below was made by a form four student. At the start of the experiment, the bulb did not light.

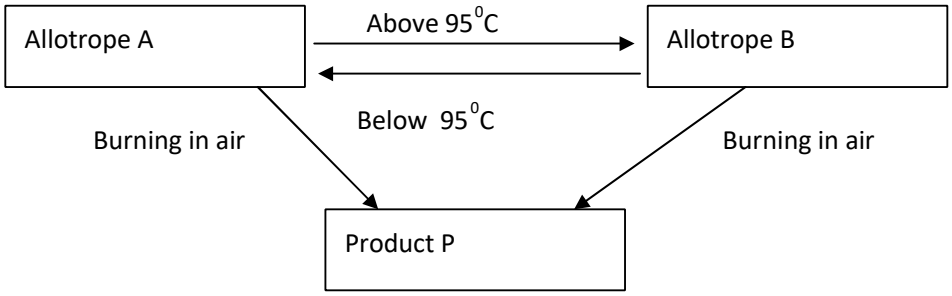


2

a) ***State*** and ***explain*** the observation made when $Cl_{2(g)}$ was bubbled in the water for about 10 minutes. **(2mks)**

b) Write the chemical equation for the reaction which took place at the cathode. **(1mk)**

4. The flow chart below shows some properties of two allotropes of element P.



i)Name allotrope **A** **(1 mark)**

ii)W rite an equation to show formation of product P. **(1mk)**

iii) What does 95^0C represent? **(1mk)**

5. a) 100g of a radio isotope was reduced to 12.5g after 81days. Calculate the half-life of the radio isotope. **(2mks)**

b) $_{80}^{212}x$ decays by beta emission. What is the mass number and the atomic number the element produced after the decay? **(1mk)**

6. Boilers used for boiling hard water are normally covered with boiler scale after sometime.

a)What is the chemical name for the boiler scale? **(1mk)**

b)How is the boiler scale removed? **(1mk)**

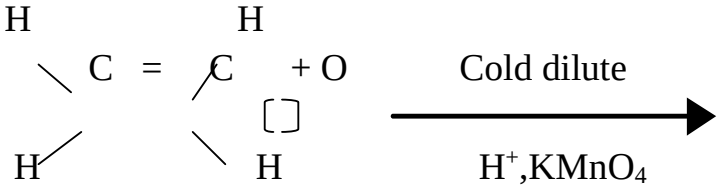
c)State ***any one*** advantage of using hard water**.** **(1mk)**

7. a) Name the following compounds

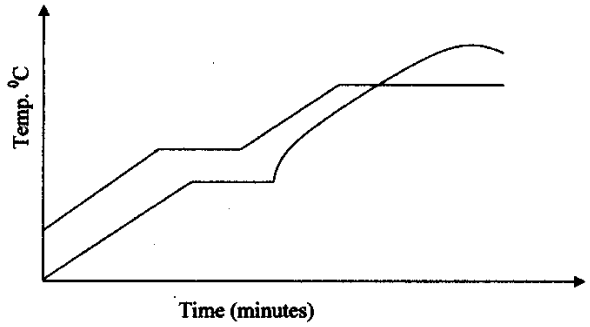
i) $CH_3CH_2CH_2C(=O)OH$- **(1mk)**

ii) $CH_3COOCH_2CH_2CH_3$ **(1mk)**

b) Complete the following equation.



8. Two samples of a similar substance from different containers were investigated. The graph below represents the variation of temperature with time when heated.



a) Explain the variation in the curves of:

Sample **I** **(1mk)**

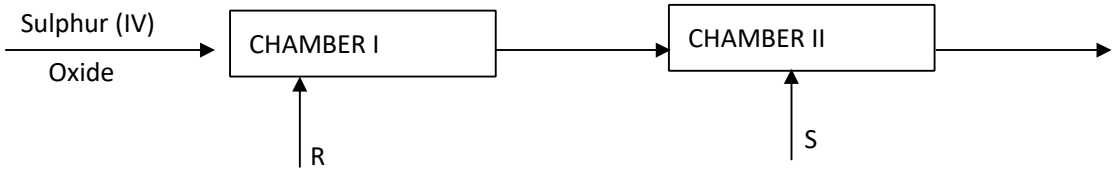
Sample **II** **(1mk)**

b) Common salt is sprinkled on roads during winter in temperate countries. Explain. **(1mk)**

9. a) Write an ionic equation for the reaction between copper II ions in solution and excess ammonia solution. **(1mk)**

b) Name the complex ion formed in the reaction in (a) above. **(1mk)**

10.The chart below shows the last stages in the manufacture of sulphuric acid using the contact process.

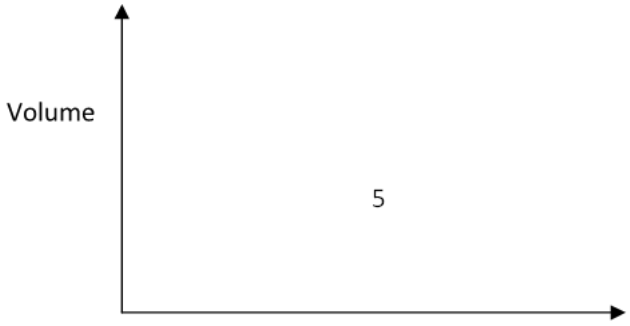


a)Identify substance R and S

b)Write an equation for the reaction taking place in chamber II**.** **(1mk)**

11.a) State Boyle's Law. **(1mk)**

b) On the axes below sketch a graph of pressure against volume. **(1mk)**



For marking scheme,contact Mdm Mariam@0746711892

b) Explain the shape of the graph terms of kinetic theory. **(1mk)**

11. a) Aluminium is reactive metal yet most household utensils are made up using it. Explain. **(1mk)**

b) It is not advisable to use wood ash to wash aluminium utensils. ***Explain*** **(1mk)**

c)i) Define the term **alloy** **(1mk)**

ii) Duralumin is an alloy used for making aircraft components. What is its constituent? **(1mk)**

12. The following information is for two chlorides of element A and B.

Chloride Mpt (^{0}C)	Bpt(^{0}C)	Solubility in 100g of water	Solubility in 100g of benzene
800	1140	38	0.07
23	77	0.08	Very soluble

a) Which chloride has a molecular structure? Explain. **(1mk)**

b) Which of the elements A and B could be a metal? Explain. **(1mk)**

c) Explain the differences in solubility of the chloride in water. **(1mk)**

13. The table below shows the P^H values of solutions J to N

Solution	J	K	L	M	N
P^H	5	13	2	10	7

b) Which solution.

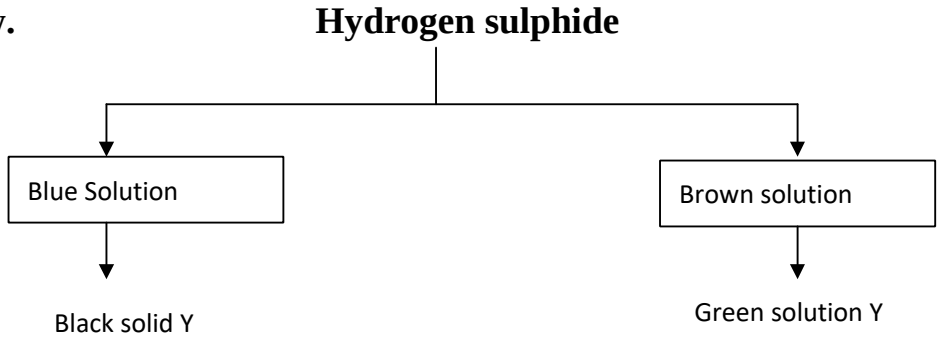
i) Contains the largest concentration of hydroxide ions? **(1mk)**

ii) Is likely to be a solution of acetic acid? **(1mk)**

b) In the equation below, identify the reagent that acts as an acid in the forward reaction. Give a reason**.** **(2mks)**

$$NH4+(aq)+H2O(l) \rightleftharpoons NH3(aq)+H3O+(aq)$$

15. Hydrogen sulphide was bubbled into solutions of metallic nitrates as represented in the flow chart below.

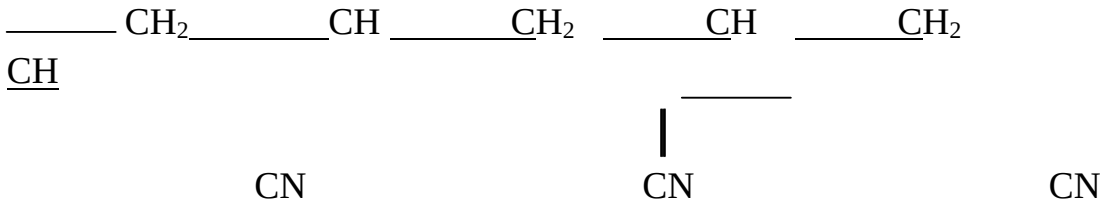


a) Identify two solutions **(2mks)**

I. Blue solution

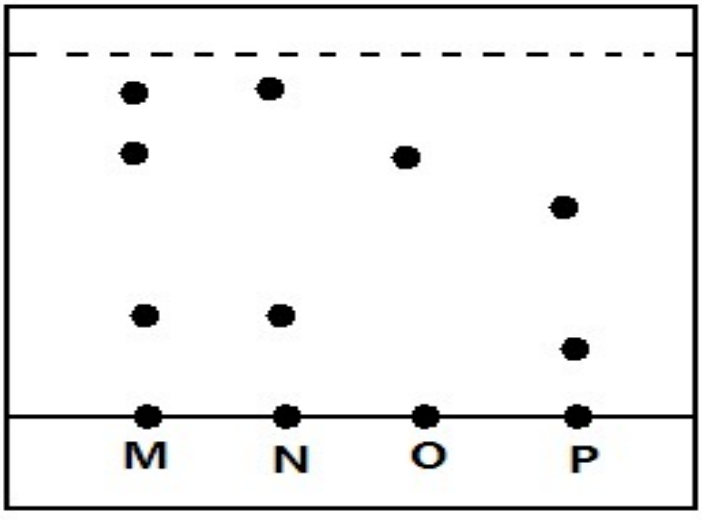
II. Green solution

16. A polymer has the following structure.



A sample of this polymer is found to have a molecular mass of 5194. ***Determine*** the number of monomers in the polymer (H=1.0, C=12.0,N=14.0) **(2mks)**

17. Study the diagram below and answer the questions.



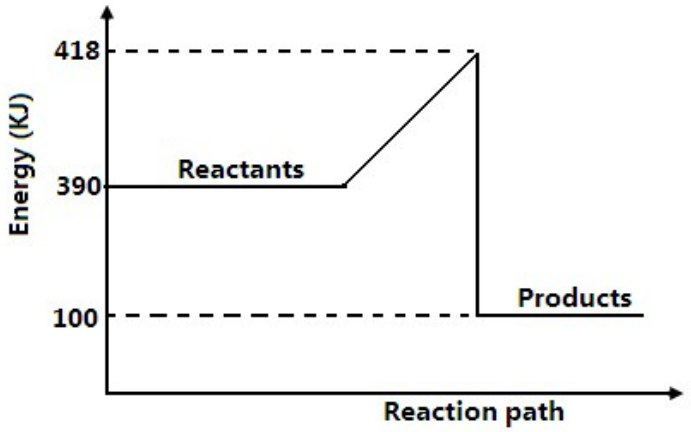
a) On the diagram mark the base line. **(1mk)**

b) Name the dyes which are in M. **(1mk)**

c) Which mixture of dyes has the dye with lowest solubility? Explain. **(1mk)**

18. The following is energy level diagram for the reaction.

$$\frac{1}{2}A_{2(g)} + \frac{1}{2}B_{2(g)} \rightarrow AB_{(g)}$$



a) Calculate the activation energy for this reaction. **(1mk)**

b) Calculate the enthalpy change ($^{\Delta}H$)for the reaction. **(1mk)**

19. Use the information below to answer the questions that follow:

Equation: Enthalpy of formation

i) $H2(g) + \frac{1}{2}O2(g) \rightarrow H2O(l) \quad \Delta H1 = -286kJmol^{-1}$

ii) $C(s) + O2(g) \rightarrow CO2(g) \quad \Delta H2 = -394kJmol^{-1}$

iii) $2C(s) + 3H2(g) + \frac{1}{2}O2(g) \rightarrow C2H2OH(l) \quad \Delta H3 = -277kJmol^{-1}$

Calculate the molar enthalpy of combustion of ethanol. Given that:

$C2H5OH(l) + 3O2(g) \rightarrow 2CO2(g) + 3H2O(l)$ **(3mks)**

20. A given element Q has atomic number of 14 and consists of isotopes as shown below.

Isotope	X	Y	Z
Isotopic mass	28	29	30
Percentage abundance	92.2	4.7	3.1

a) Determine the relative atomic mass of Q. **(2mks)**

b) State the group and period to which Q belongs.

Group **(½ mk)**

Period **(½ mk)**

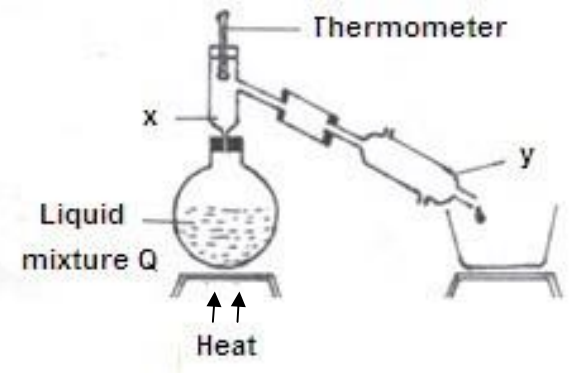
21. Study the following equilibrium equation.

$$2A2(g) + B2(g) \rightleftharpoons 2A2B(g) \Delta H = -197KJmol-1$$

a) Suggest two ways of increasing the yield of A_2B. **(2mks)**

b) Draw the energy level diagram for the forward reaction**.** **(1mk)**

22. Study the diagram below and answer the questions that follow. The diagram shows the method used to separate components of mixture Q. **(1mk)**



a) Name **X** and **Y.** **(1mk)**

X-

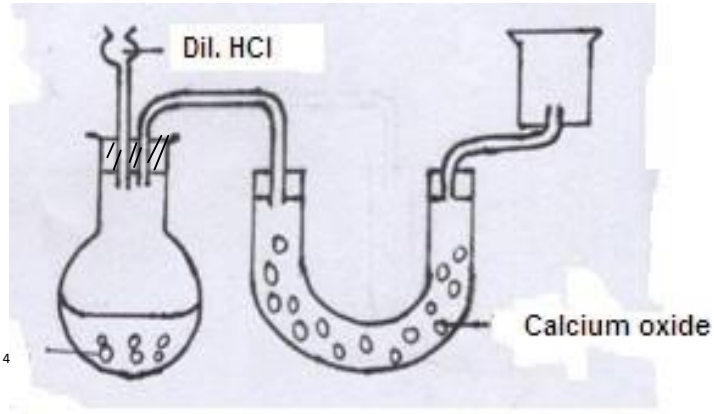
Y -

b) What is the purpose of apparatus **X?** **(1mk)**

c) Show the direction of flow of cold water used for cooling the vapour formed. **(½mk)**

d) What name is given to the above method of separating mixtures? **(1mk)**

23. The set up below was used by students to collect dry chlorine gas.



a) Identify with reasons, ***<u>two</u>*** faults in the set up **(2mks)**

b) Give another reagent that can be used in the place of potassium manganate. **(½ mk)**

24. The following are standard electrode potentials for the given half-cells.

	E^{θ} *Volts*
$Zn2+(aq) + 2e- \rightarrow Zn(s)$	$=-0.76$

$Pb2+(aq) + 2e- \rightarrow Pb(s)$ $= -0.13$

$Fe^{2+} + 2e \rightarrow Fe_{(s)}$ $= -0.44$

$Ag^{+} + e \rightarrow Ag_{(s)}$ $= +0.80$

$Cu2+ + 2e \rightarrow Cu_{(s)}$ $= +0.34$

a) Which one of the above is the

i) Strongest reducing agent? **(½ mk)**

ii) Strongest oxidizing agent? **(½ mk)**

b) What would be observed when a zinc rod is dipped into a solution containing copper II ions? Explain using E^{θ}values. **(2mks)**

25. State the conditions under which ammonia gives the following products when heated.

i)Nitrogen and hydrogen. **(1mk)**

ii) Nitrogen and water. **(1mk)**

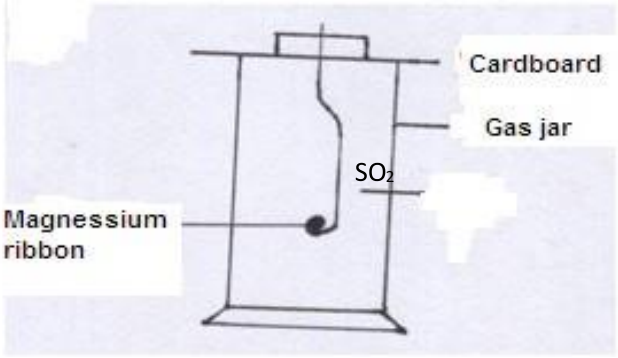
iii) Nitrogen**(ii)** oxide and water. **(1mk)**

26. The elements **P,R,Q,S** has atomic numbers **11, 14, 17** and **18** respectively

a) Which of the elements is the most electronegative? **Explain** **(1mk)**

b) Which of the elements would react most vigorously with cold water? **(1mk)**

27. A student lowered burning magnesium in gas jar of sulphur (IV) oxide as shown the diagram below.



a) Explain the observation made in the gas jar. **(1mk)**

b) Write the equation of the reaction that takes place in the gas jar. **(1mk)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 6 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO THE CANDIDATES:

*-Write your **name** and **index number** in the spaces provided above **Sign** and write the **date** of examination in the spaces provided.*

*-Answer **all** the questions in the spaces provided.*

*-All working **must** be clearly shown where necessary.*

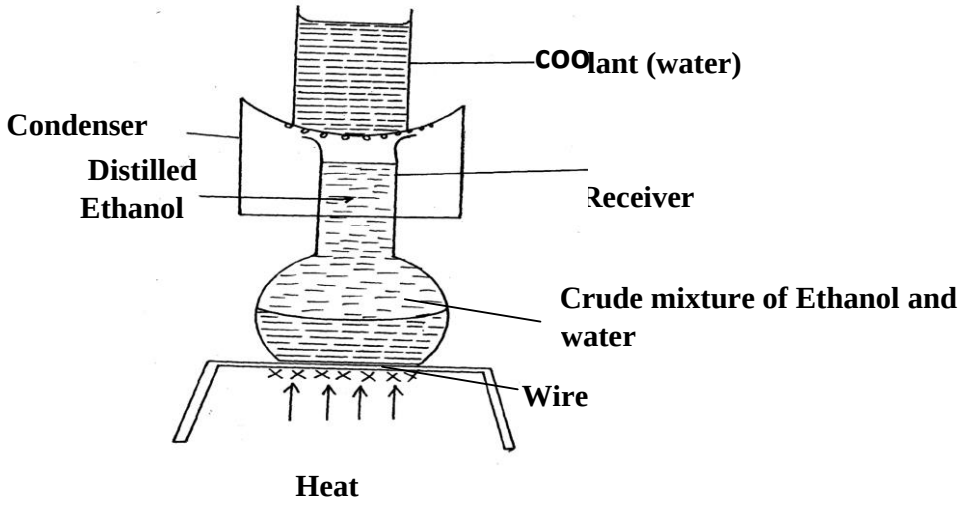
-Mathematical tables and electronic calculators can be used.

For Examiners Use Only

Question	Maximum score	Candidate's score
1	12	
2	11	
3	13	
4	13	
5	11	
6	9	
7	9	
Total	**80**	

1. (a) What is a saturated solution? **(1mk)**

(b) The diagram below represents an arrangement for a large scale manufacture of ethanol for domestic consumption.



(i) Name the process by which ethanol is obtained from the crude oil. **(1mk)**

(ii) Suggest ***two*** reasons why water is a coolant in this process. **(2mks)**

b) Why is it possible to separate ethanol from the mixture by this process. **(1mk)**

(c)(i) Describe how the mixture of Ammonium chloride, sodium chloride and lead II chloride can be separated if all the components of the mixture are to be recovered. **(3mks)**

(ii) The following process shows how Nitrogen and Oxygen can be obtained from air.

Filter → Air → $KOH_{(aq)}$ and Anhydrous Calcium chloride → Nitrogen and Oxygen mixture → A → Liquid Air → B → Nitrogen, Oxygen

I. Name the processes

A- **(1mk)**

B- **(1mk)**

II. What is the purpose of

Potassium hydroxide solution $KOH_{(aq)}$ in the process. **(1mk)**

Anhydrous Calcium Chloride solid. **(1mk)**

2. (a) Give the names of the following compounds.

(i) $CH_3CH_2CH_2OH$ **(1mk)**

(ii) CH_3CH_2COOH **(1mk)**

(b) Study the information in the table below and answer the questions that follow.

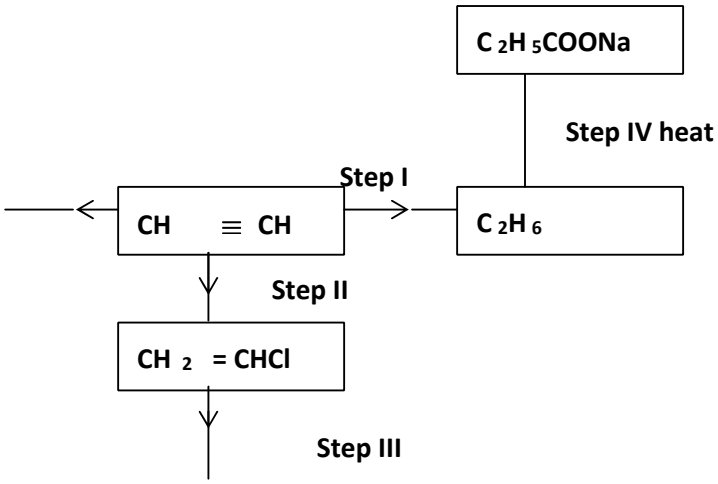
No. of carbon atoms per molecule	**Relative molecular mass of hydrogen**
2	28
3	42
4	56

(i) Write the general formula of the hydrocarbons in the table. **(1mk)**

(ii) Predict the relative molecular mass of the hydrocarbon with 5 carbon atoms. **(1mk)**

(iii) Determine the molecular formula of the hydrocarbon in (ii) and draw its structural formula. **(2mks)**

(c) Study the scheme given below and answer questions that follow.



$$-\left(CH_2 = CHCl\right)-$$

(i) Name the reagent used in

Step **I** **(1mk)**

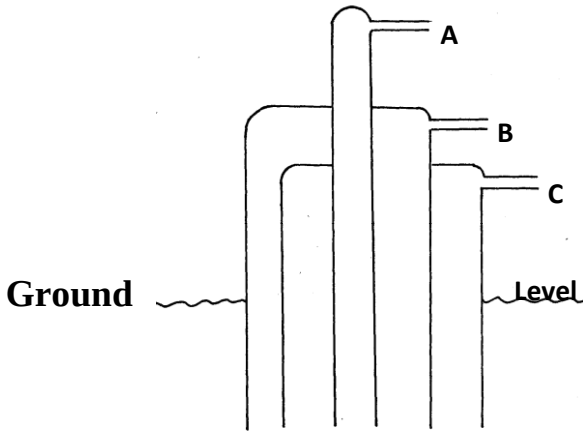
Step **II** **(1mk)**

Step **III** **(1mk)**

(ii) Write an equation for complete combustion of CH≡CH. **(1mk)**

(iii) Explain ***one*** disadvantage of the continued use of items in step III. **(1mk)**

3. (a) The diagram below represents the extraction of sulphur by the frasch process.



(i) Identify and state the use of the substances that pass through tubes A and C. **(2mks)**

A-

C-

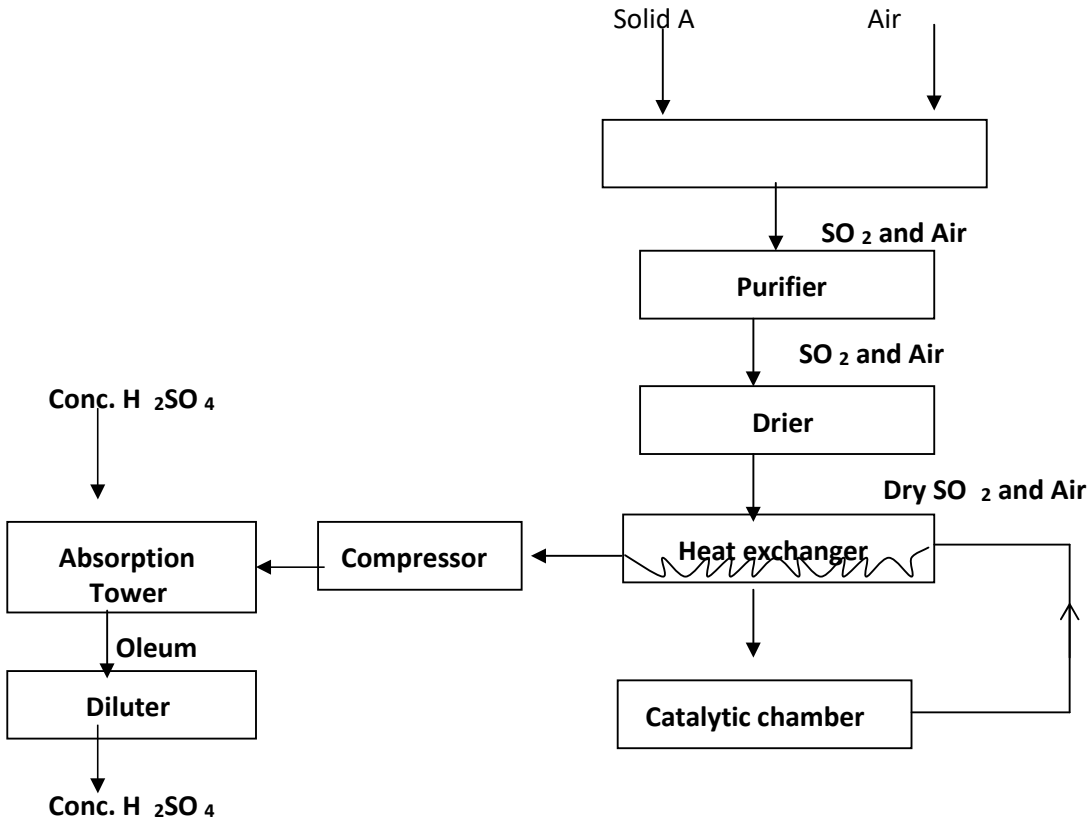
(ii) Rhombic and monoclinic are Allotropes of sulphur. They are inter convertible as shown below. 96 C ^{o}

Rhombic Monoclinic

I. What does the temperature 96^{o}C represent. **(1mk)**

II. State the differences in crystalline appearances between rhombic and monoclinic crystals. **(1mk)**

(b) The following scheme represents the steps followed in the contact process, study it and answer the questions which follow.



(i) Name ***three*** possible identities of solid A. **(1mk)**

(ii) Name **two** impurities removed by the purifier. **(1mk)**

(iii) Why is it necessary to remove impurities. **(1mk)**

(c) The following chemical equation shows a reaction taking place in the catalytic chamber/converter.

$2SO_{2S} + O_{2(g)} \quad 2SO_{3\,(g)} \quad D\,H^{o} = -197 kjmol^{-1}$

(i) How would the following factors affect the production of sulphur (IV) oxide.

I Increase in temperature. **(1mk)**

II Decrease in pressure **(1mk)**

(ii) Name the catalyst which is commonly used in this process and why? **(1mk)**

(iii) State and explain one environmental effect of sulphur (IV) oxide in the atmosphere. **(2mks)**

4. The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

A								**K**
B	**D**				**G**		**I**	
			F		**H**			**L**
C	**E**						**J**	

(a) (i) Which letter represents an element that is least reactive. **(1mk)**

(ii) Why are elements D and E referred to as alkali earth metals. **(1mk)**

(b) How does the atomic radius of F and H compare? **(2mks)**

(c) Select ***<u>two</u>*** letters representing a pair of elements that would react most explosively. **(2mks)**

(d) Write an equation showing how D forms its ions. **(1mk)**

(e) Write the formulae of

(i) Bromide of D **(½ mk)**

(ii) Sulphate of C **(½ mk)**

(f) What type of bonding exists between

(i) E and I **(½ mk)**

(ii) G and J **(½ mk)**

(g) Explain why the melting point of J is higher than that of I. (1mk)

(h) The 1st, 2nd and 3rd ionization energies in KJ/mol of element B and C are given below.

Element	1st I.E	2nd I.E	3rd I.E
B	520	7,300	9,500

C	420	3,100	4,800

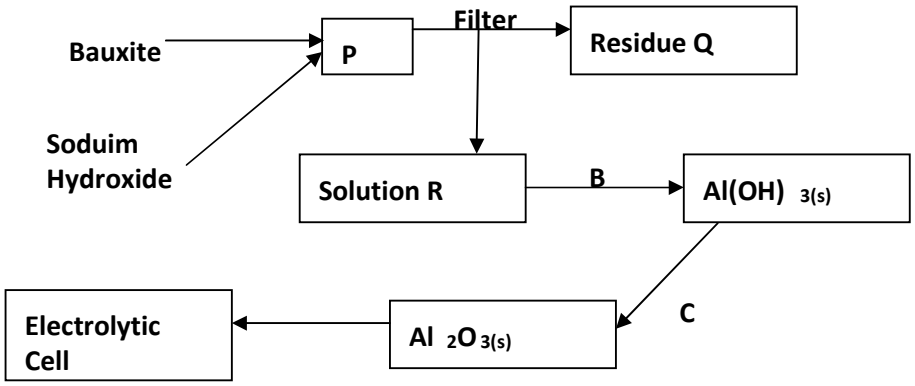
(i) What is the 1st ionization energy. **(1mk)**

(ii) Apart from the decrease in energy levels, explain the difference between 1st and 2nd Ionization energies. **(1mk)**

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

C_g $C_g^{3+} + 3e^-$ **(1mk)**

5. The flow chart below illustrates the major steps in extraction of aluminium from bauxite.



(a) (i) Give the chemical formula of bauxite. **(1mk)**

(ii) Write the equation for the reaction in chamber P. **(1mk)**

(iii) Write the formula of the main impurity in chamber Q. **(1mk)**

(iv) Name and explain the process that takes place at B. **(2mks)**

(b) state the role of cryolite(Na_2AlF_6)in the extraction of alluminium **(2mrks)**

(c) Write an equation for the reaction taking place at :

i) Anode **(1mrk)**

ii) Cathode **(1mrk)**

(d) Give two properties which make alluminium and its alloys suitable for making aircraft bodies. **(2mrks)**

6.Use the standard electrode potentials given below to answer the questions that follow:

		$E^\theta V$
$Ag^+_{(aq)} + e^- \longrightarrow$	$Ag_{(s)}$	+ 0.80
$Cu^{2+}_{(aq)} + 2e^- \longrightarrow$	$Cu_{(s)}$	+ 0.34
$Pb^{2+}_{(aq)} + 2e^- \longrightarrow$	$Pb_{(s)}$	- 0.13
$Zn^{2+}_{(aq)} + 2e^- \longrightarrow$	$Zn_{(s)}$	- 0.76

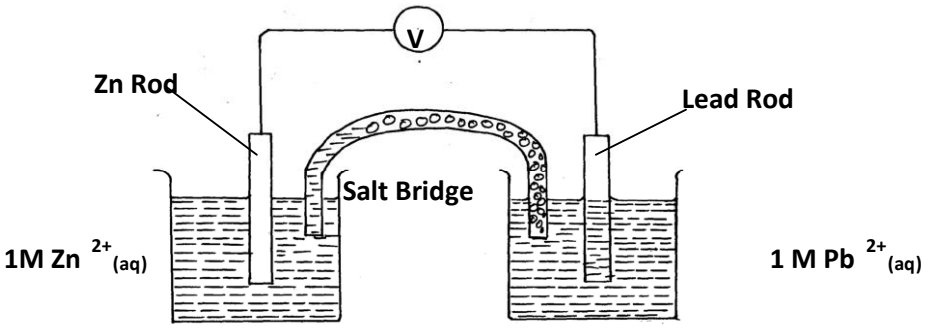
(a) Select **two** half-cells which when combined give the lowest workable cell.(lowest e.m.f) **(1mk)**

(b) Calculate the e.m.f of the cell formed by combining the two half-cells in (a) above. **(1mk)**

(c) **(i)** Select the strongest oxidizing agent. **(½ mk)**

(ii) Strongest reducing agent. **(½ mk)**

(d) A cell was set up using lead and zinc electrodes as shown below.



(i) Write the half equation for the half-cell in which oxidation occurs. **(1mk)**

(ii) Write the overall cell equation. **(1mk)**

(iii) What is the role of the salt bridge. **(2mks)**

(e) An iron cup was electroplated using chromium. The chromium electrode and the iron cup was thoroughly cleaned and weighed before being dipped into the elcolyte.

(i) Why was it necessary to clean the metals before dipping them into the electrolyte. **(1mk)**

(ii) A current of 0.75 A was passed through the solution for one hour and four minutes. The mass of chromium deposited on the cup was 0.52g (1Faraday=96500C) Cr=52

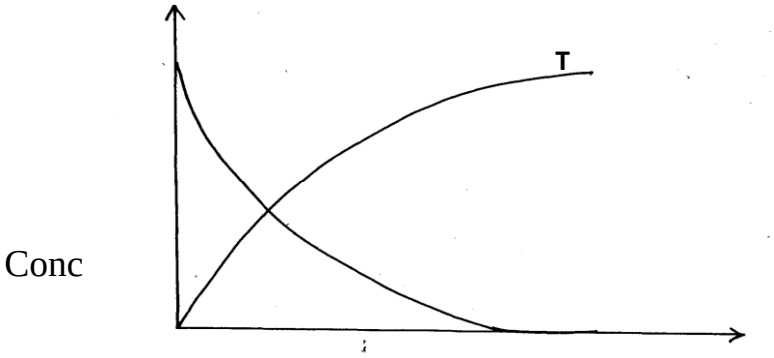
I. Calculate the quantity of electricity. **(1mk)**

II. How many mole of chromium were deposited. **(1mk)**

III. Calculate the quantity of electricity to deposit one mole of chromium. **(1mk)**

IV. Calculate the number of Faradays required to deposit one mole of chromium and hence deduce the charge of ion. **(2mks)**

7.(a) The curve below represents the change of concentration with time in a chemical reaction.



(i) Which curve represents change in concentration for:

Reactants **(½ mk)**

Products **(½ mk)**

(ii) On the same axes sketch the curves of T and M for the catalysed reaction. **(1mk)**

(b) (i) Y grammes of a radioactive isotope take 120 days to decay to 3.5 grammes. The half-life period of the isotope is 20 days. Find the initial mass of the isotope. **(2mks)**

(ii) Below is a radioactive decay series starting from $^{214}_{83}Bi$ and ending at $^{206}_{82}Pb$

$$^{214}_{83}Bi \xrightarrow{\text{Step I}} {}^{210}_{81}T \xrightarrow{\text{Step II}} {}^{210}_{82}Pb \xrightarrow{\text{Step I II}} {}^{210}_{83}Bi \longrightarrow {}^{219}_{82}Po \longrightarrow {}^{206}_{84}Pb$$

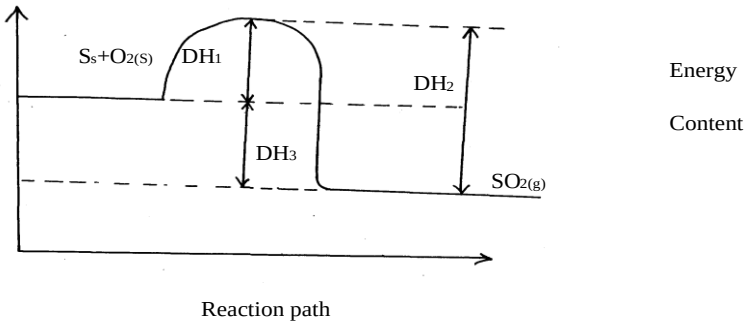
I. Identify the particles emitted in Steps I and II.

Step I

Step II

II. Write the nuclear equation which takes place in step V. **(1mk)**

(c) (i) Sulphur burns in air to form sulphur IV oxide. A simple energy level diagram for the reaction is given below. Study it and answer the questions that follow.



(i) What do the following represent

DH_1 **(1mk)**

DH_3 **(1mk)**

(ii) Write an expression for DH_3 in terms of DH_1 and DH_2.(1mk)

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 7 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- *Write your name and index No. in the spaces provided above.*
- *Sign and write the date of the examination in space provided.*
- *Answer ALL the questions in the spaces provided.*
- *Mathematical tables and electronic calculators may be used for calculations*
- *All working must be clearly shown where necessary*

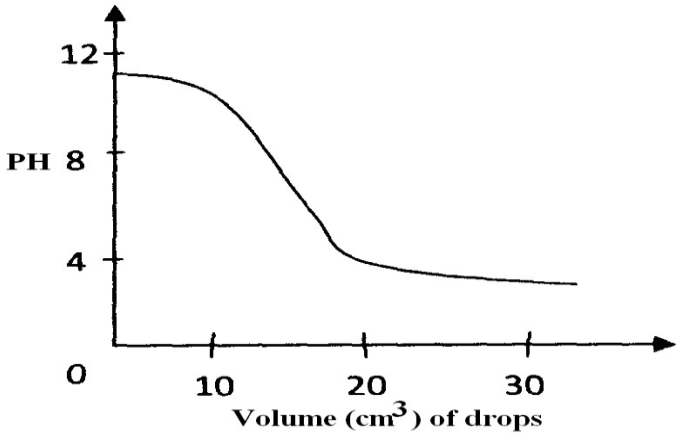
FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1-30	80	

1. **a)** Name the process used to separate two solids both soluble in the same solvent when the Solids are both present in the mixture **(l mk)**

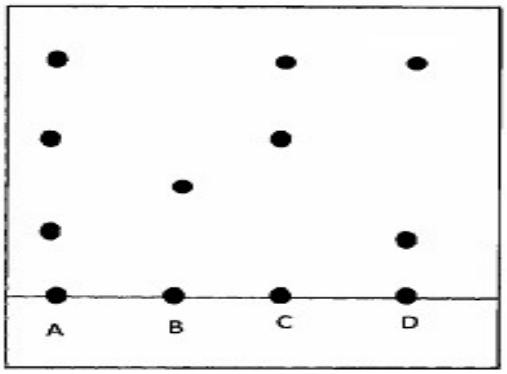
b)Sodium chloride is neither deliquescent nor hygroscopic. Explain why common salt left on a table overnight becomes wet **(2 mks)**

2. A liquid is added dropwise to 10 cm^3 of house-hold ammonia solution. The pH value is noted after the addition of every 10 drops and plotted on the graph below.



From the evidence of this graph only, what is the nature of the liquid added? Explain you answer **(2mks)**

3. The following chromatogram was obtained in an experiment to investigate the components present in certain dyes.



a). Which two dyes when mixed would produce A? **(lmk)**

b) Which dye is pure? **(lmk)**

c). Indicate on the diagram the probable position of the solvent front. **(lmk)**

4. a) The pH of 0.001M solution of hydrochloric acid is about the same as the pH of 0.IM solution of ethanoic (acetic) acid. Explain **(2mks)**

b) In a reaction dilute hydrochloric acid was added to a colourless solution, a white precipitate which dissolved on warming was formed. Write an ionic equation for the formation of the white precipitate **(lmk)**

5. Element R has atomic number 8 and mass number 16.

a) Draw the atomic structure of element R **(lmk)**

b) Write is the formula of the ion of element R **(lmk)**

c) Explain why R forms a hydroxide with low boiling point **(lmk)**

6. The following were the results obtained in an experiment to determine solubility of potassium nitrate at room temperature.

Mass of evaporating dish 14.32g

Mass of evaporating dish + solution = 35.70g

Mass of evaporating dish + salt =18.60g

a). What is solubility? **(1 mk)**

b). Calculate the solubility of potassium nitrate from the specimen results **(2mks)**

7. **a)** Write an equation to show how carbon (IV) oxide can be obtained from limestone ($CaCO_3$) by heating **(1 mk)**

b) Give two properties of Carbon (IV) Oxide that makes it suitable for use in

i) Extinguishing fire **(lmk)**

ii) Making of Fizzy drinks **(lmk)**

8. An element X has a Relative atomic mass of 88. When a current of 0.5 amps was passed through the fused chloride of X for 32 minutes 10 seconds, 0.44g of X was deposited at the cathode.

(1F = 96500C).

a. Calculate the number of faradays needed to liberate 1 mole of X **(2mks)**

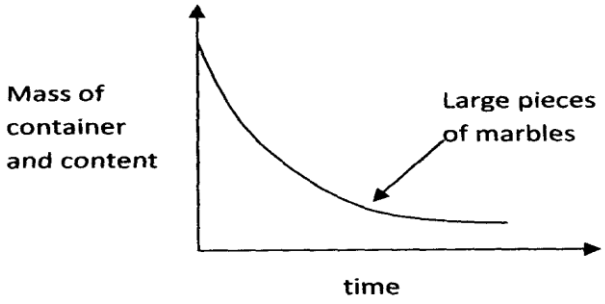
b). Write the formula of the chloride of X **(1 mk)**

9. When a grey powder P, which has no action on cold water, is placed into a salt solution of Q, a brown solid R is deposited. The blue solution of Q, fades giving way to a green solution.

a. Name the type of reaction that takes place **(1 mk)**

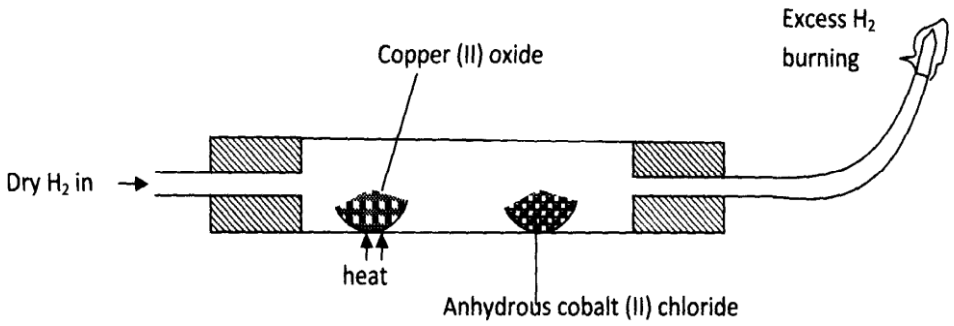
b. Identify solids P and R **(2mks)**

10. The diagram below shows effect of surface area on the rate of reaction



On the same diagram sketch the graph that would be obtained if smaller pieces of marble were used. Explain your answer using the kinetic theory of matter **(2mks)**

11. The set-up below was used to investigate the effect of dry hydrogen gas on hot copper (ii) oxide powder.



Explain what is observed in the combustion tube during the experiment **(3mks)**

12. Consider the reversible reaction below

$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g) \quad \Delta H = -53KJ$$

Explain how each of the following factors would affect the concentration of hydrogen iodide

a. Increase in temperature **(1 ½ mks)**

b. Adding helium gas **(1 ½ mks)**

13. You are provided with three black powders known to be copper (ii) oxide, manganese (iv) oxide and iron (ii) sulphide. How would you distinguish between the three using hydrochloric acid only **(3mks)**

14. a) Tap water produces a precipitate with sodium carbonate solution. Explain **(1 mk)**

b) State one *advantage* and one disadvantage of using the water in (a) above in industry.

i) Advantages **(l mk)**

ii) Disadvantages **(lmk)**

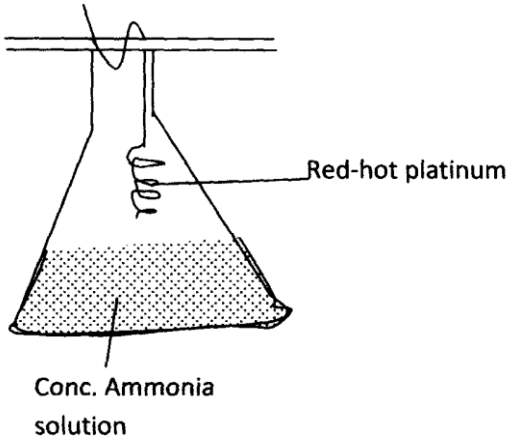
15. a) Potassium manganate (VII) reacts with chloride salts to produce chlorine. Both chlorine and potassium manganate (VII) are strong oxidizing agents. Which one of the two is the stronger oxidizing agent? Explain your answer **(2mks)**

b) Chlorine and sulphur (IV) oxide are bleaching agents; explain the difference in their bleaching action **(lmk)**

16. Calculate the number of molecules of water of crystallization in oxalic acid crystals, $H_2C_2O_4.XH_2O$, from the following data. 5g of the crystals were made up to 250cm^3 of this solution required 15.9cm^3 of 0.5M sodium hydroxide to

neutralize it. (H=1, C=12, 0 16, H_20 18)
(3mks)

17. The set-up below shows the catalytic oxidation of ammonia in laboratory



One of the observations made in the tube is that the platinum wire stays red-hot even though it is no longer heated.

a. Explain this observation **(lmk)**

b. State another observation made in the conical flask **(1 mk)**

c)Write an equation for the catalytic oxidation of ammonia **(lmk)**

18. Two carbon electrodes were placed in a flask containing $50cm^3$ of 0.1 M barium hydroxide solution and connected in series with the 12 volt supply of direct current electricity and a lamp.

1.0M sulphuric acid was slowly run into the solution from a burette until neutralization occurred.

a. What would you see in the flask when the first few drops of acid are added? **(1 mk)**

b. At the neutrality point, the lamp ceases to glow, explain why? **(1 mk)**

c. What would you see if more 1.0 M sulphuric acid were now added? **(lmk)**

19. Use the standard electrode potentials given below to answer the questions that follow.

	E(Volts)
$Ni^{2+}_{(aq)} / Ni_{(s)}$	-0.025
$Zn^{2+}_{(aq)} / Zn_{(s)}$	-0.76
$Cu^{2+}_{(aq)} / Cu_{(s)}$	+0.34
$F_{2(g)} / 2F^{-}_{(aq)}$	+2.85
$Br_{2(aq)} / 2Br^{-}_{(aq)}$	+1.09

a. Which is the weakest reducing agent? **(l mk)**

b. Below is the cell representation between the Zinc and Lead half cells.

$$Zn_{(s)} / Zn^{2+}_{(aq)} \,//\, Pb^{2+}_{(aq)} / Pb_{(s)}$$
KCl

i) What is the role of KCl?

(lmk)

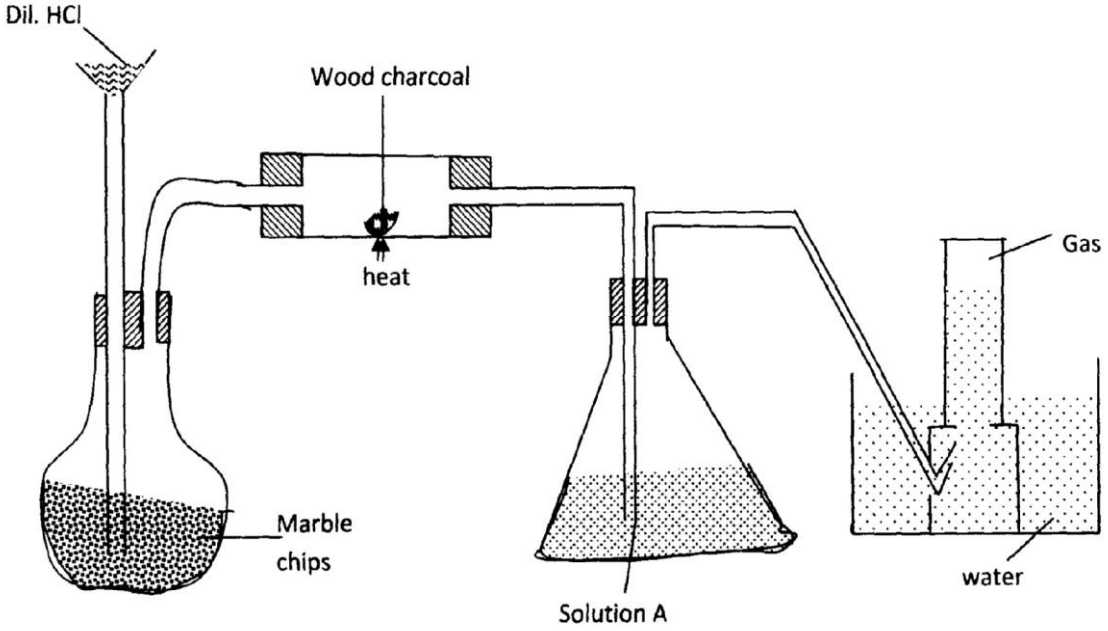
ii) Explain why the above cell cannot function **(1 mk)**

20. Use the information in the table below to answer the questions that follow

Salt	Lattice energy KJ/Mol	Hydration energy Kj/Mol
KCl	+718	-695
LiCl	+862	-883

If the two salts, Lithium chloride and potassium chloride were dissolved in water separately, which solution will its temperature be above and which solution will its temperature be below room temperature? Explain your answer **(3mks)**

21. Study the setup below and answer the questions that follow.

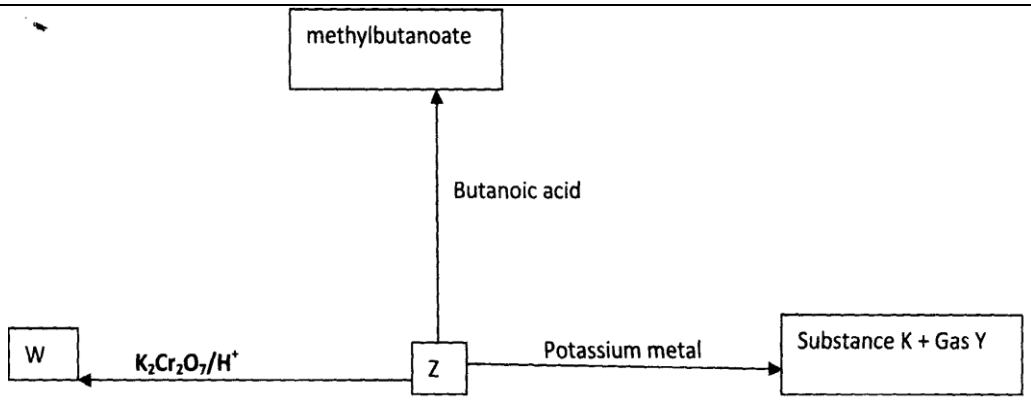


a. What is the role of solution A? **(lmk)**

b. Name gas X **(lmk)**

c. Which property of carbon makes it suitable to be used in the combustion tube above? **(1 mk)**

22. Study the flow chart below and use it to answer the questions that follow



Identify substances below **(2mks)**

K -

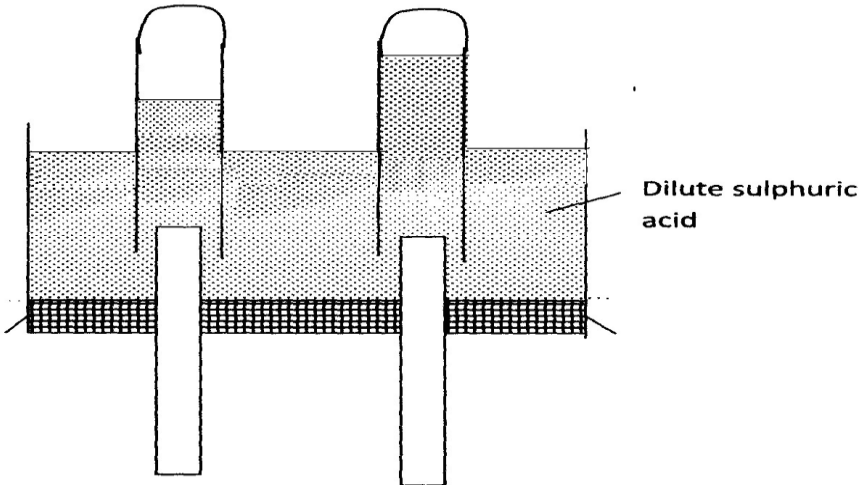
W-

Y -

Z -

23. 10g of an organic compound contains carbon, hydrogen and oxygen only produced 14.7g of carbon (iv) oxide and 6.3g of steam when completely burned in excess oxygen. If the relative molecular mass of the compound is 60. Determine the molecular formula of Z (C=12, 0=16, H=1**)** **(3mks)**

24. 100cm3 of 2M sulphuric acid was electrolyzed using the set-up represented by the diagram below.



a. Identify the anode and the cathode(label on the diagram) **(1 mk)**

b. What is the effect on the electrolyte by the end of the experiment **(1 mk)**

25. study the information in the diagram below and answer the questions that follow.

(the letters do not represent the actual symbols of the elements)

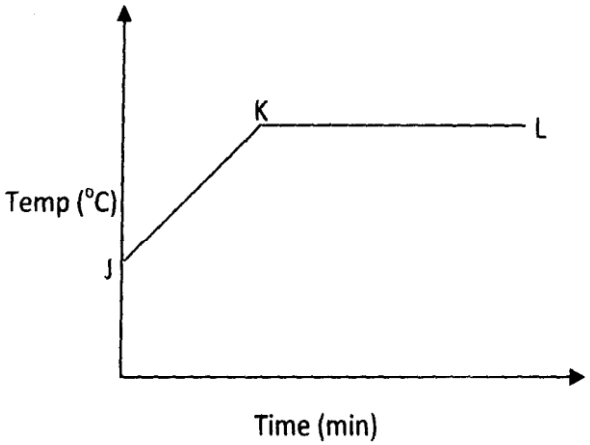
Element	Electronic configuration	Ionization energy KJ/Mol
P	2.1	519
Q	2.8.1	494
R	2.8.8.1	418

a). What is the general name given to the group in which elements P,Q and R belong? **(1 mk)**

b). What is meant by ionization energy? **(1 mk)**

c). Explain why element P has the highest ionization energy **(1 mk)**

26. The graph below shows part of a temperature time curve obtained when solid naphthalene was heated.



Explain what happens to the naphthalene molecules along the curves

a. JK **(lmk)**

b. KL **(lmk)**

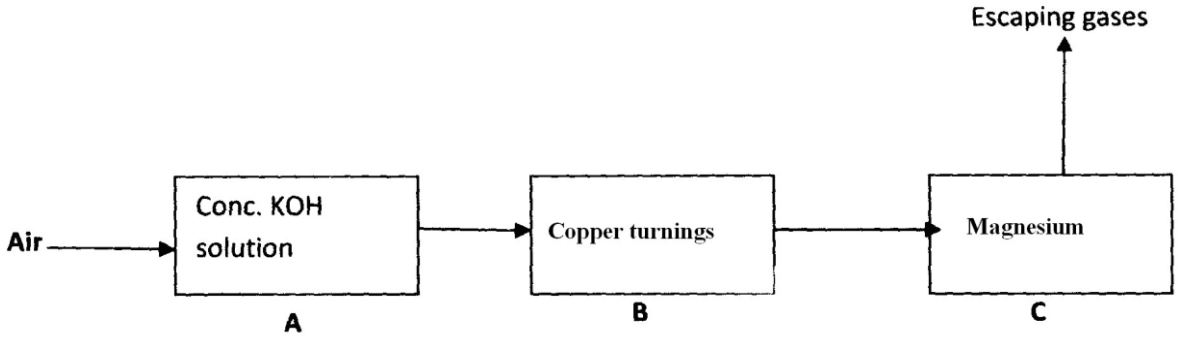
27. Oleum ($H_2S_20_7$) is an intermediate product in the industrial manufacture of sulphuric acid.

a). How is Oleum converted to sulphuric acid? **(1 mk)**

b). Why is the reaction below discouraged **(1 mk)**

SO3(g)+H2O(l) $\longrightarrow$ H2SO4(al)

28. Air is passed through several reagents as shown in the flow diagram below



Name one gas which escapes from chamber C. Give a reason for your answer **(3mks)**

29. The table below shows the ions of elements W, X, Y, Z and their electronic configuration

Ion	Electronic configuration
W^{-}	2.8.8
X^{2+}	2.8.8
Y^{3+}	2.8
Z^{2-}	2.8

a. Which two elements belong to the same period? **(1 mk)**

b. In which group does ion Y^{3+} belong? **(1 mk)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 7 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

-Answer all the questions in the spaces provided.

-Mathematical tables and electronic calculators may be used.

- All workings must be clearly shown where necessary.

For Examiner's Use only

Questions	Max. score	Candidates scores
1	13	
2	13	
3	12	
4	11	
5	12	
6	10	
7	09	
TOTAL	**80**	

1. A form one teacher cut small pieces of sodium and performed different experiments. In each of the experiments below, state the observations and write an equation of the reaction.
   i. A piece of sodium metal is burnt in excess air.

Observation **(1mk)**

Equation **(1mk)**

II. Product in (I)above is added to water.

Observation **(1mk)**

Equation **(1mk)**

III. Heated sodium is lowered into a gas jar of chlorine.

Observation **(1mk)**

Equation **(1mk)**

IV. A small piece of sodium is put in cold water in a beaker and resulting solution is tested with litmus paper.

Observation **(1mk)**

Equation **(1mk)**

b) Define the term ionization energy. **(1mk)**

c) Study the following ionization energy values and answer the questions that follow.

Ionization	Ionization Energy(kj/mole
$Na\ (g) \rightarrow Na^+(g) + e$	500
$Na^+(g \rightarrow Na\ 2^+(g) + e$	4600
$Na\ 2^+(g) \rightarrow Na\ 3^+(g) + e$	6900
$Mg\ (g) \rightarrow Mg^+(g) + e$	740
$Mg^+(g) \rightarrow Mg2^+(g) + e$	4500
$Mg2^+(g) \rightarrow Mg3^+(g) + e$	7700
$Mg3^+(g) \rightarrow Mg4^+(g) + e$	10500

i) What do the values of energies of ionization suggest about the

I. First electron removed from a sodium atom. **(1 ½ mk)**

II. First two electrons removed from a magnesium atom. **(1½mk)**

ii) Calculate the energy change in the process $Mg_{(g)} \rightarrow Mg_{(g)}^{3+} + 3e$ **(1mk)**

2. a) 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	28
3	42
4	56

i) Write the general formula of the Hydrocarbons in the table. **(1mk)**

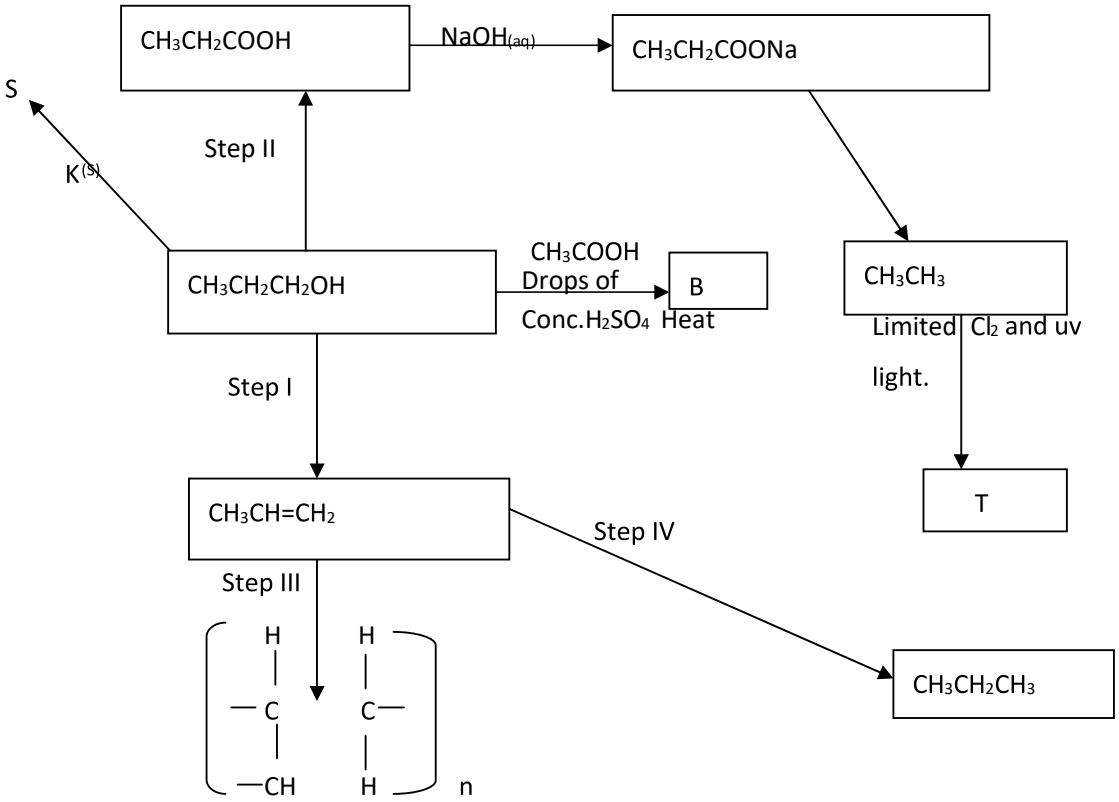
ii) Predict the relative mass of the Hydrocarbon with 5 carbon atoms**.** **(1mk)**

iii) Determine the molecular formula of the Hydrocarbon in (ii) above and draw the structural formula.

Molecular formula **(1mk)**

Structural formula **(1mk)**

2 (b) The scheme below shows some reactions starting with Propanol. Study it and answer the questions that follow.



i) Write down the formula of compounds S and T.

S **(1m k)**

T **(1m k)**

ii) Draw the structural formula of compound B. **(2mks)**

iii) Name the type of reaction, reagent and conditions in the reactions in step I and step IV.

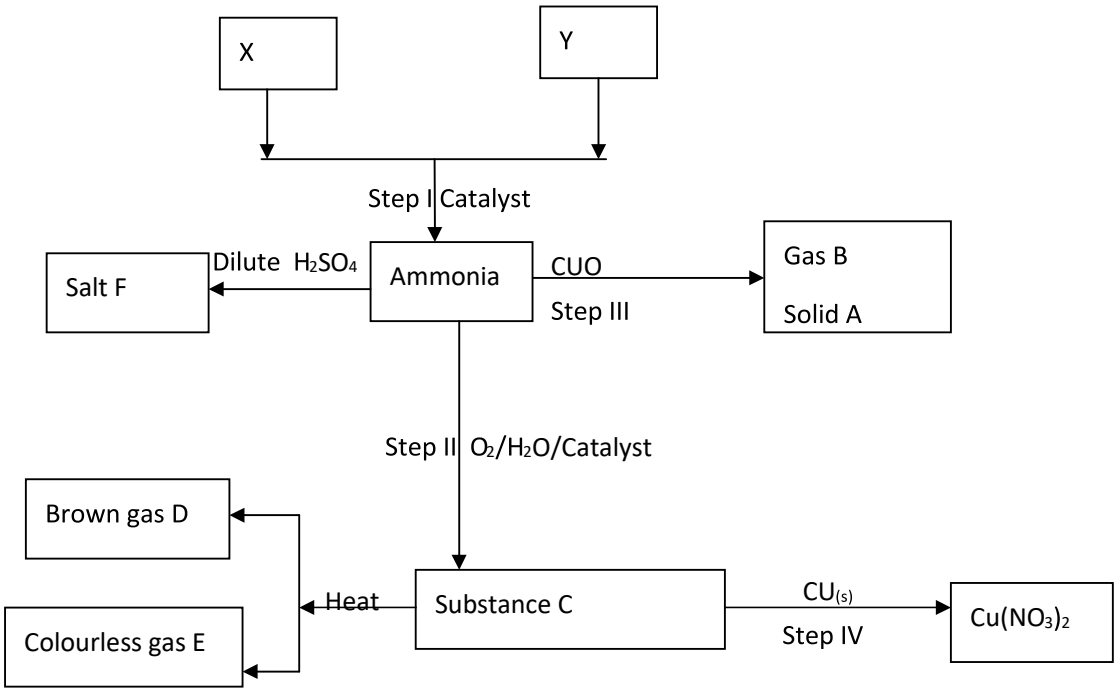
Step	Type of reaction	Reagent	Condition
I			
IV			

(3mks)

iv)*Name two* chemical tests that can be used to differentiate propanol from propanoic acid.

Propanol	Propanoic acid
i)	
ii)	

3. Study the scheme below and answer the questions that follow.



a)Identify X and Y and give their sources

X **(1mk)**

Source

Y **(1mk)**

Source

b) Identify the catalyst used in step **I** **(1mk)**

c) Name the substances **(2mks)**

A-

B-

C-

D-

d) Write chemical equations that shows

i) The formation of substance C **(2mks)**

ii) The reaction between substance C and copper metal. **(2mks)**

e) Describe a chemical test for gas E. **(1mk)**

f) i) ***State one*** economic use of substance F. **(1mk)**

ii) ***Name*** the optimum conditions for the production of ammonia gas. **(1mk)**

4. a) In a class experiment 5.0g of ethanol CH_3CH_2OH, were completely burnt and all the heat evolved was used to heat $500cm^3$ of water from 20^0c to 80^0c. Given that the specific heat capacity of water =4.2kj/kg/k, density of water $=1cm^{-3}$, c=12, O=16.0 and H=1.0

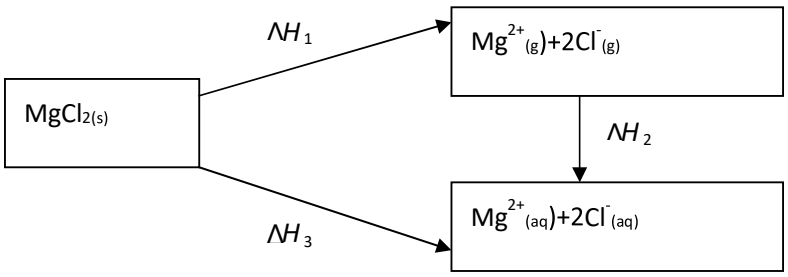
i) Write a balanced equation to show the reaction that takes place when ethanol burns. **(1mk)**

ii) Calculate the heat energy.

I. absorbed by the water**.** **(1mk)**

II. Given out when one mole of ethanol was burned completely. **(2mks)**

b) Use the information in the energy cycle diagram below to answer the questions that follow.



i)What name is given to the enthalpy change

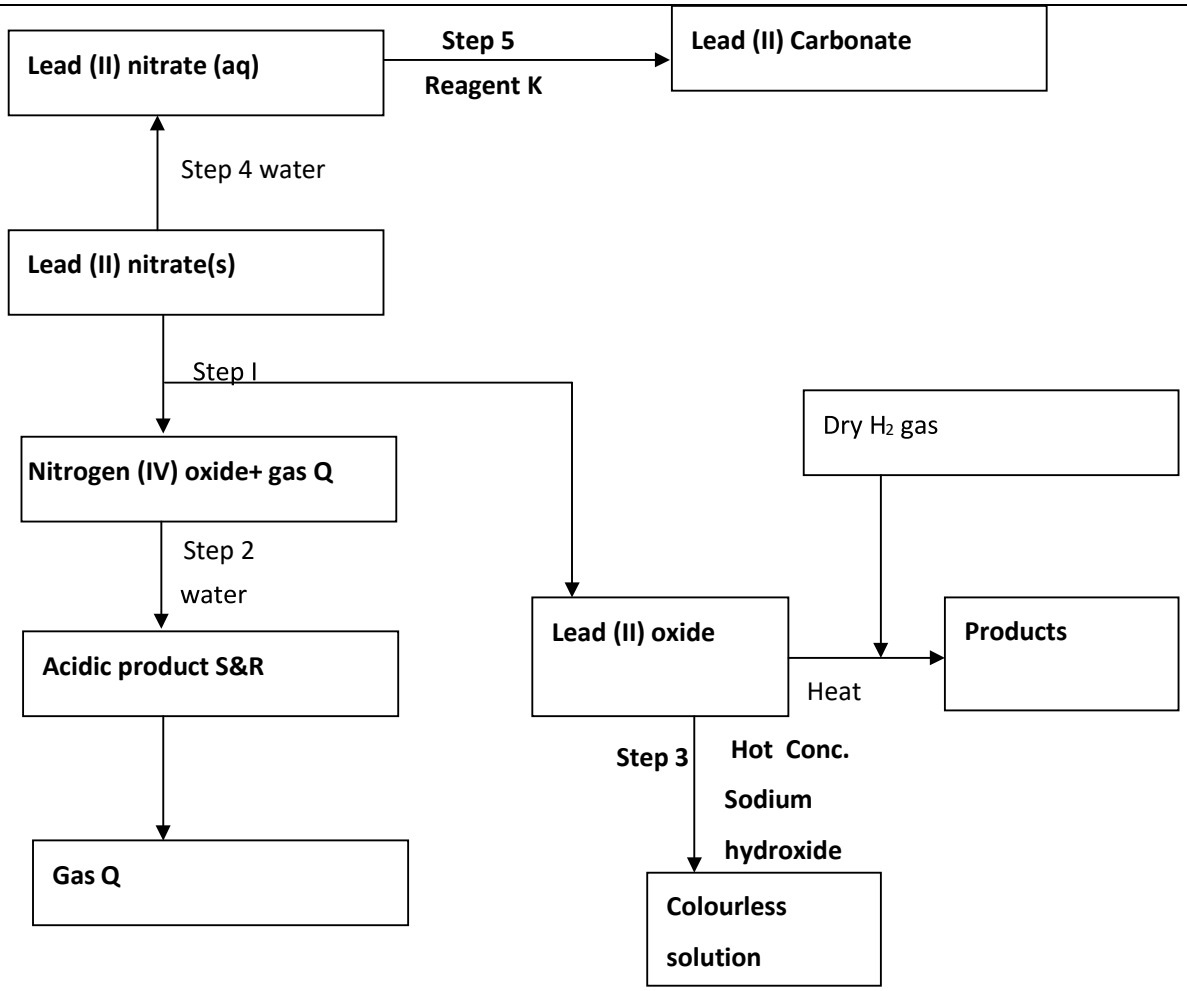
I. ΔH_2 **(1mk)**

II. $^{\Delta}H_3$ **(1mk)**

ii) Given the $^{\Delta}H_1$ =2489kj and $^{\Delta}H_2$ =-2659kj, ***calculate*** the value of $^{\Delta}H_3$. **(2mks)**

c) Using the information and answer in b (ii) above draw the energy level diagram for dissolving magnesium chloride.

5. The diagram below shows some reactions starting with Lead(II) nitrate solid. Study it and answer the questions that follow.



a)i) State the conditions necessary in step I

ii) Identify

I. Reagent K**.** **(1mk)**

II. Gas **Q** **(1mk)**

III. Acidic products S and R**.** **(2mks)**

iii) Write

I. The formula of the complex ion formed in step 3. **(1mk)**

II. The equation for the reaction in step 5**.** **(1mk)**

b) i) The reaction between lead (II) nitrate and concentrated sulphuric acid starts but stops immediately. Explain with the help of an equation**.** **(2mks)**

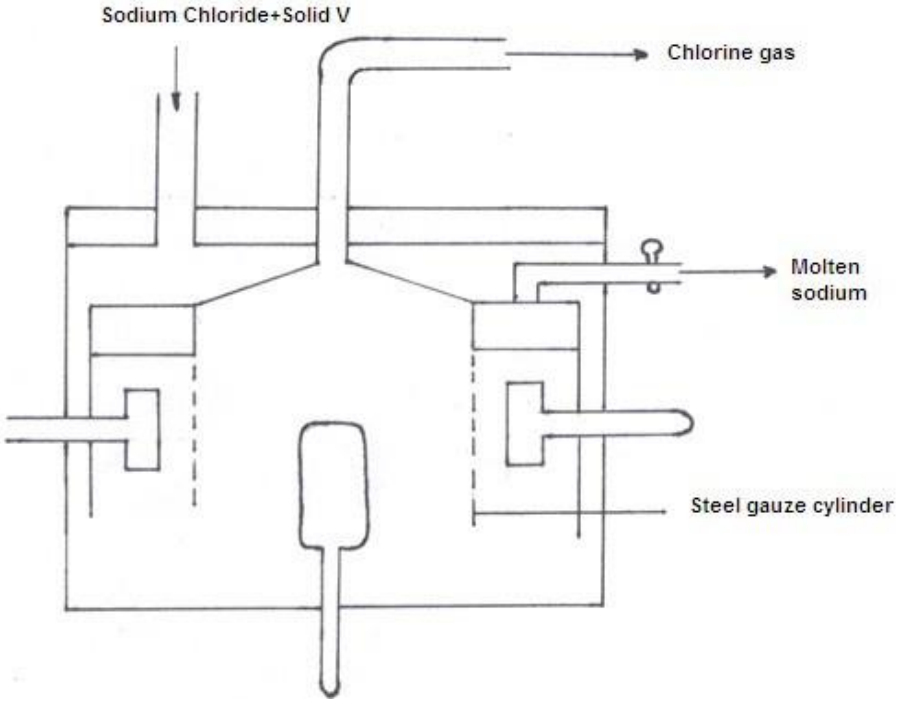
ii) Name one reagent that can be reacted with concentrated sulphuric acid to produce nitric (v) acid. **(1mk)**

c) Write the formula of the ion formed in each of the reactions described below.

i) Excess ammonia is added to solution containing copper (II) ions**.** **(1mk)**

ii) Excess sodium hydroxide solution is added to a solution containing aluminium ions. **(1mk)**

6. The diagram below is the down cell for the extraction of sodium metal. Use it to answer the questions that follow.



a) In which state is sodium chloride and how is it maintained in the state. **(2mks)**

b) Name solid V and state its use.

Name **(½ mk)**

Use **(½ mk)**

c) Give a reason why the anode is made of graphite and not steel**.** **(1mk)**

d) Write equations for reactions that take place at

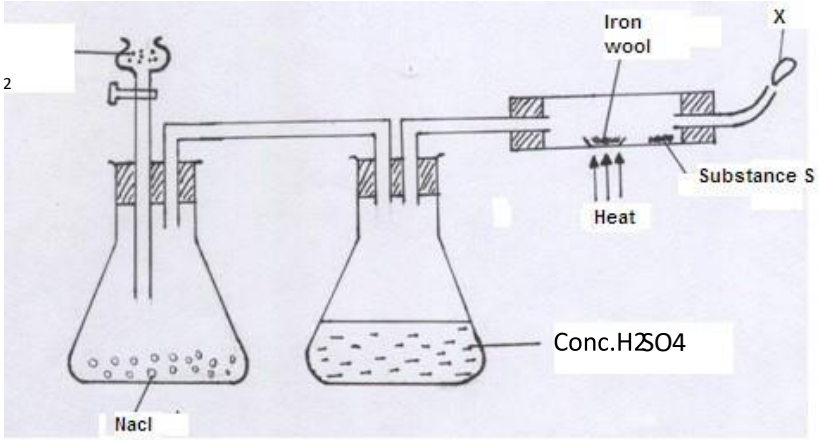
Anode **(½ mk)**

Cathode **(½ mk)**

e) State the main impurity in the sodium collected and state how it is removed. **(1mk)**

g) State ***any two*** uses of sodium metal**.** **(2mks)**

7. a) The set up below represents the arrangement used to prepare substance S by passing a stream of dry hydrogen chloride gas over heated iron wool.



i) Correct the mistake in the set up above **(1mk)**

ii) Give the chemical equations for the reaction.

I. that involves formation of substance

S. **(1mk)**

II. at point

X **(1mk)**

iii) What precautions would you take when carrying out this experiment. Give reasons precaution **(2 mks)**

b) 300cm^3 of hydrogen chloride gas were passed over 7.0g of heated iron wool until there was no further change. The reaction vessel then was allowed to cool to room temperature.

i) Determine the mass of iron that remained at the end of the experiment.(Molar gas volume at r.t.p=24000cm^3, Fe=56) **(2mks)**

ii) Determine the volume of 2M sulphuric acid that would be required to react with excess iron that remained in the above experiment, b(i) above. **(2mks)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 8 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

FOR EXAMINER'S USE ONLY

QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
1 - 30	80	

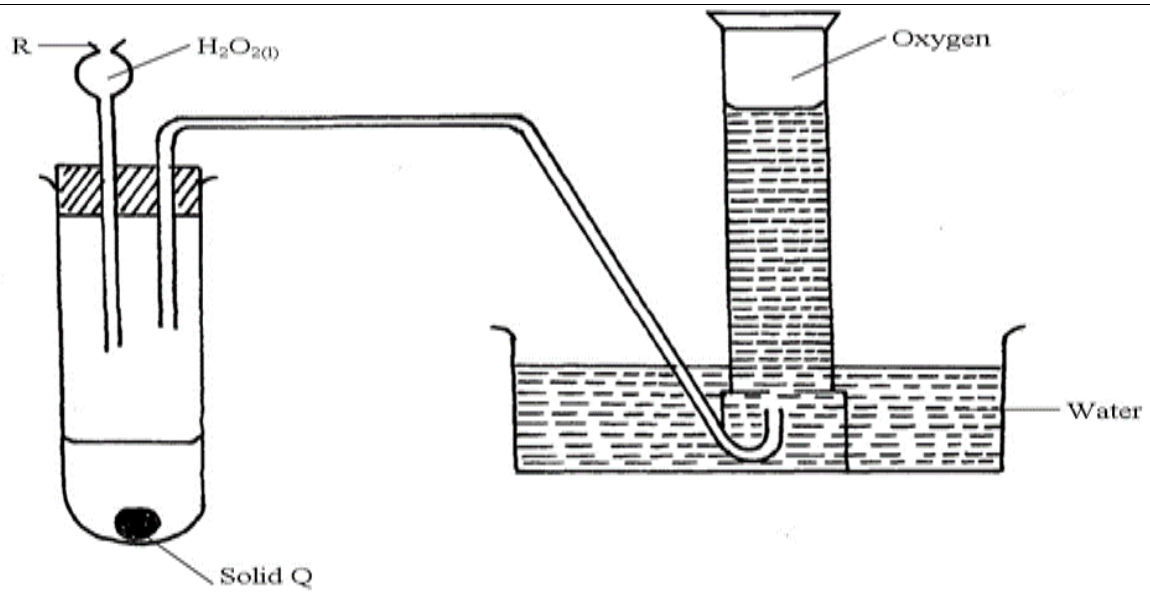
1. **(a)** What is the role of the following parts during fractional distillation of a mixture of water and ethanol.

(i) Fractionating column **(1 mark)**

(ii) Class beads in the fractionating column **(1 mark)**

(b) State any one application of fractional distillation process **(1 mark)**

2. Below is a set up used to prepare oxygen in a laboratory?



(a) Identify

(i) Solid Q **(½ mark)**

(ii) Apparatus R **(½ mark)**

(b) Write a balanced equation for reaction in which oxygen is produced in the above set up. **(1 mark)**

(c) State and explain observation which is made when white phosphorus is introduced into a gas jar full of oxygen. **(1mark)**

3. **(a)**State one way in which the strength of an acid or a base can be determined in the laboratory **(1mark)**

(b) Give the basicity of the following acids.

(i) Sulphuric acid **(½ marks)**

(ii) Phosphoric acid **(½ mark)**

4. Name the process which takes place when:

(i) Iodine changes directly from solid to gas **(1 mark)**

(ii) Fe 2+ (aq) changes to form Fe 3+ (aq) **(1 mark)**

(iii) White sugar changes to black solid when mixed with excess concentrated Sulphuric (vi) acid **(1 mark)**

5. The grid below represents part of the periodic table. Study it and answer questions that follow. The letters do not represent the actual symbols of the elements.

P			Q	R			N	
								V
S	X					M		
							T	

(a) Identify the most reactive non-metal **(1 mark)**

(b) Give a reason why the ionic radii of S are smaller than that of M. **(1mark)**

(c) Give the formulae of the compound formed between X and N **(1mark)**

6. State two properties of carbon (iv) oxide that makes it suitable for extinguishing fire. **(2 marks)**

7. Use the information in the table below to answer the questions that follow

Element	Sodium	Magnesium	Phosphorus	Chlorine
Electric conductivity	Good	Good	Poor	Poor
M.P (^oC)	98	660	44/115	-173

(a) Explain why both Sodium and Magnesium conducts electricity while phosphorus and chlorine do not. **(1mark)**

(b) Suggest a reason why phosphorus has been assigned two melting point values. **(1mark)**

(c) Explain why atomic radii of elements in period 3 decreases generally from left to right in the periodic table **(1mark)**

8. **(a)** Define half-life of radioisotopes **(1mark)**

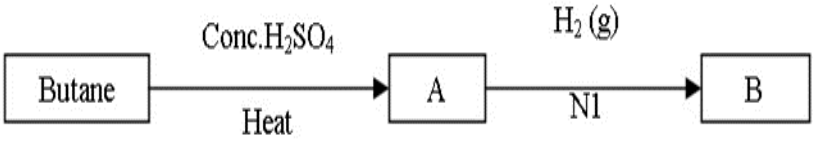
(b) X grams of a radioactive isotope takes 100 days to decay to 20gms. If half-life of the element is 25 days. Calculate the initial mass of X of the radio-isotope. **(2marks)**

9. When a hydrocarbon was completely burnt in Oxygen 4.2g of CO_2 gas and 1.71g H_2O of water were formed. (Determine the empirical formulae of the hydrocarbon) **(2 marks)**

(C=120, H=1.0, O=16.0)

10. Use the information in the scheme diagram below to answer the questions that

follow.



(a) Draw two structures of isomers of compound A. Name each isomer. **(2marks)**

(b) Name two products produced when B is burnt in excess oxygen. **(1 mark)**

11. **(a)** State Charles's law **(1mark)**

(b) The volume of a sample of nitrogen gas at a temperature of 298k and 600minHg pressure was 4.8 x 10^{-2} m^3. Calculate the temperature at which the volume of the gas would be 3.2 x 10^{-2} m^3 if pressure is constant. **(2 marks)**

12. Aluminium is extracted from its ore by the process of electrolysis

(a) Name the ore from which aluminium is normally extracted. **(1mark)**

(b) Aluminium Ore in (a) above has a very high melting point (2015^0C) through it is electrolyzed at a lower temperature of about 900^0C. Explain how the low temperature is achieved. **(1mark)**

(c) Graphite electrodes are used in the above process. Give the advantage of using graphite electrodes in the above process **(1mark)**

13. (a) Name a suitable drying agent to be used to dry chlorine gas. **(1mark)**

(b) Chlorine reacts with red hot Iron powder to give iron (iii) chloride but not Iron (ii) chloride. Explain **(1mark)**

(c) Sodium hydroxide reacts with chlorine to form bleaching powder. Write a balanced equation for the reaction. **(1mark)**

14. The table below gives some bond energies of some bonds.

Bond	Bond energy (lgmol-[1])
H-H	435
Cl-Cl	243
H-Cl	431

Calculate the enthalpy change of the reaction below.

$H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$ **(2 marks)**

15. When a mixture of iron filings and Sulphur was heated, a red glow spreads through the mixture and a dark grey solid was formed.

(a) Identify the dark grey solid formed. **(1mark)**

(b) Write a chemical equation in which the dark grey solid is formed during healing. **(1mark)**

(c) What observations can be made when the dark grey solid reacts with dilute Hydrochloric acid. **(1mark)**

16. Study the reversible reaction below

$$2CrO_4^{-}(aq) + 2H^{+}(aq) \rightleftharpoons Cr_2O_7^{2}(aq) + H_2O(l)$$

(Yellow) (Orange)

(a) State the colour change if few drops of sodium hydroxide was added to the mixture. **(1mark)**

(b) Explain the observation in (a) above **(1mark)**

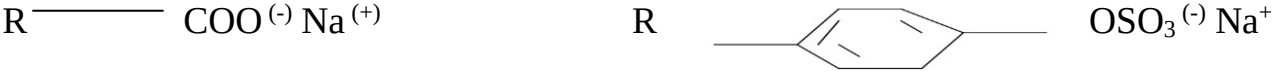
17. Nitric (V) acid rarely give hydrogen with metals e.g. Zn.

(a) Give reasons for this. **(1mark)**

(b) Give a condition under which nitric (v) avid can produce hydrogen with the metal **(1mark)**

(c) State one use of hydrogen gas. **(1mark)**

18. The structure shown below represents two cleansing agents, A and B

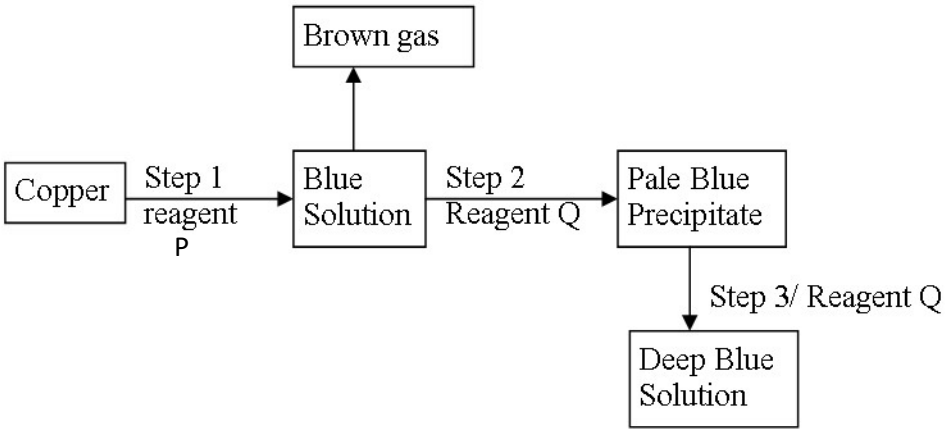


(A) (B)

(a) Which cleansing agent would be more suitable for the washing in water containing calcium sulphate? (1mark)

(b) Give one advantage of B over A (1mark)

19. Study the flow chart below and answer the following questions.



(a) Name reagents P and Q **(2marks)**

(b) Write the formulae of the complex ions present in the deep blue solution **(1mark)**

20. In an experiment to determine the solubility of potassium nitrate at 30^0c, a saturated solution was heated in an evaporation dish until there was no further change in mass. The following date was obtained.

Mass of dish + Solution = 128.9g

Mass of dish + Dry salt = 103.9g

Mass of empty dish = 94.3g

Determine the solubility of Potassium nitrate at 30^0c (2marks)

21. You are given the following half equations

$I_2(s) + 2e^- \rightleftharpoons 2I^-_{(aq)}$ $\quad E^\theta = +0.54V$

$Br_2(I) + 2e^- \rightleftharpoons 2Br^-_{(aq)}$ $\quad E^\theta = +1.09V$

(a) Write an overall equation of the cell reaction (1mark)

θ

(b) Calculate the *E* value of the cell **(1mark)**

(c) Name the Oxidizing agent **(1mark)**

22. Describe how a solid sample of calcium sulphate can be prepared using the following reagents, dilute nitric acid, dilute sulphuric acid and calcium carbonate. **(1mark)**

23. Study the table below and answer the questions that follow.

The letters do not represent the actual symbols of elements.

Formulae of Ion	Electronic configuration of Ion
U^{2+}	2

V^-	2.8
W^{2-}	2.8.8
X^{3+}	2.8
Y^{2+}	2.8

(a) Select the elements in

(i) Same group **(½ mark)**

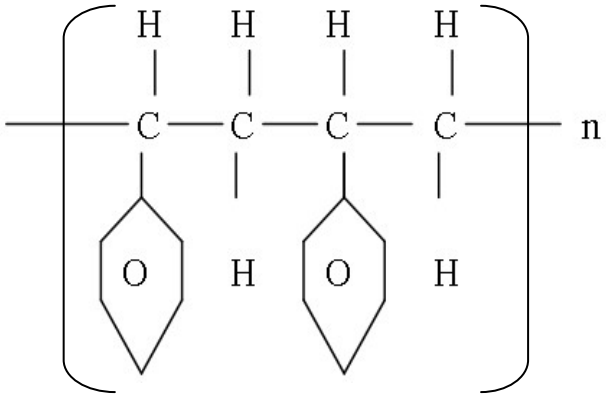
(ii) Period II **(½ mark)**

(b) Write the electronic configuration of elements

(i) W **(½ mark)**

(ii) X **(½ mark)**

24. The formula given below represents a potion of polymer

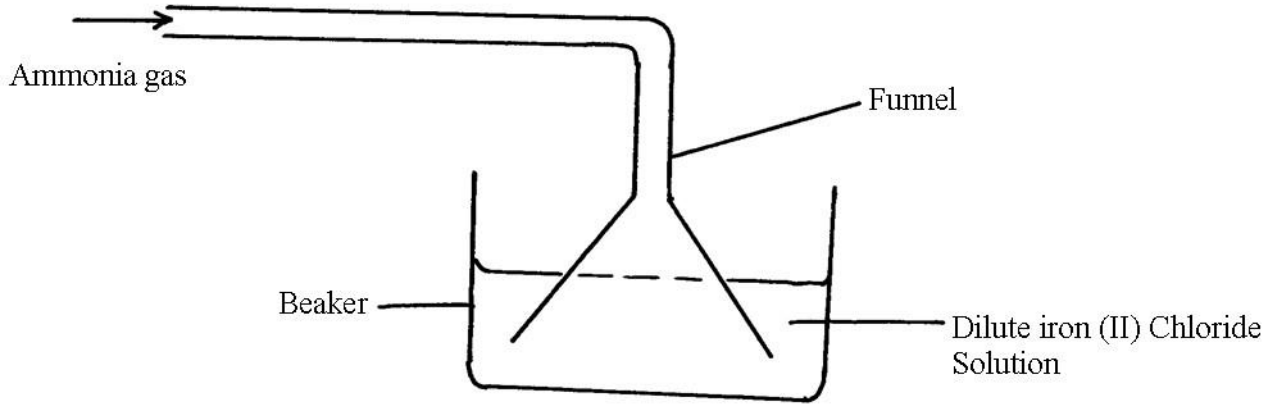


(a) Give the name of the polymer. **(1mark)**

(b) Draw the structure of the monomer used to manufacture the polymer **(1mark)**

25. In an experiment 3.36g of iron fillings were added to excess of copper (ii) Sulphate. Calculate the mass of copper that was deposited. (Cu=63.5, Fe=56.0) **(3marks)**

26. Below is a set up of apparatus used to react ammonia gas with Iron (ii) Chloride.



(a) State observation made in the beaker **(1mark)**

(b) Give reason of using a funnel to deliver the ammonia to the beaker. **(1mark)**

27. Using dots (.) and crosses(x) to represent -electrons show the bonding between oxygen and carbon to form carbon (ii) oxide. **(2marks)**

28. An atom of hydrogen can form two ions. Write two equations to show how a neutral atom of hydrogen can form the two ions. In each case show the sign of the energy change involved**.** **(2marks)**

29. Elements X and Y reacted forming a compound Z. The compound has the following properties.

(i) It does not conduct electricity in solid.

(ii) It has low melting and boiling points.

(a) What type of elements are X and Y? (**1mark)**

(b) What type of structure is compound Z has **(1mark)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 8 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- *Write your name and index No. in the spaces provided above.*
- *Sign and write the date of the examination in space provided.*
- *Answer ALL the questions in the spaces provided.*
- *Mathematical tables and electronic calculators may be used for calculations.*
- *All working must be clearly shown where necessary.*

FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1-29	80	

1. An impure solid of copper (II) carbonate weighing 10.8g was placed in a beaker containing $50cm^3$ of dilute Nitric (V) acid. The volume of carbon (IV) oxide evolved was recorded at 20 second interval in the table below.

Time from start of reaction (sec)	0	20	40	60	80	100	120
Volume of CO_2 at s.t.p(litres)	0.0	0.65	0.90	1.07	1.10	1.12	1.12

a) Write the equation for the reaction between copper (II) carbonate and nitric (V) acid. **(1mk)**

b) Calculate the reaction rate between

i) 20 second and 40 sec interval **(2mks)**

ii) 40 sec and 60 second interval. **(2mks)**

c) Explain the difference in the reaction rates in (b)m above. **(2mks)**

d) Why was there no increase in volume of the gas after 100 sec. **(1mk)**

e) How many moles of carbon (IV) oxide were in the maximum produced from this reaction (M.G.V at s.t.p 22.4 litre) **(1mk)**

f) What mass of copper (II) carbonate that will have reacted with the acid after 100 seconds. **(2mks)**

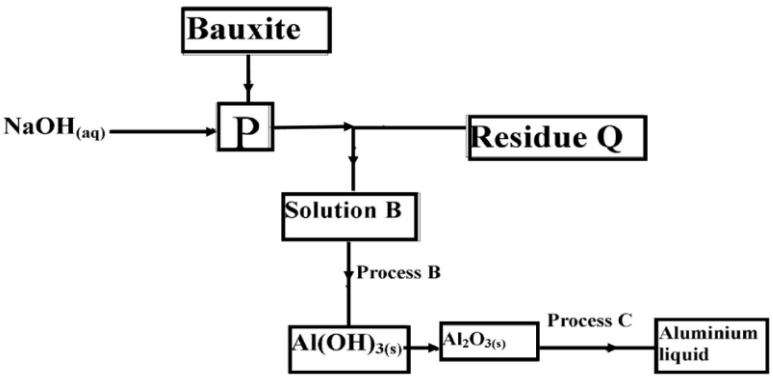
(Cu = 64 ,C =12 O =16)

g) Calculate the original concentration of the nitric (V) acid in moles per litres.

(2mks)

2. **a)** Give a reason why copper metal can be extract by a reaction copper (II) oxide where aluminium cannot be extracted by reduction of aluminium oxide. **(1mk)**

b) Study the flow chart below of extraction of aluminium questions that follows:



i) Write the equation for the reaction in chamber P. **(1mk)**

ii) Name the compound present in residue Q. **(2mks)**

iii) Explain the following observation

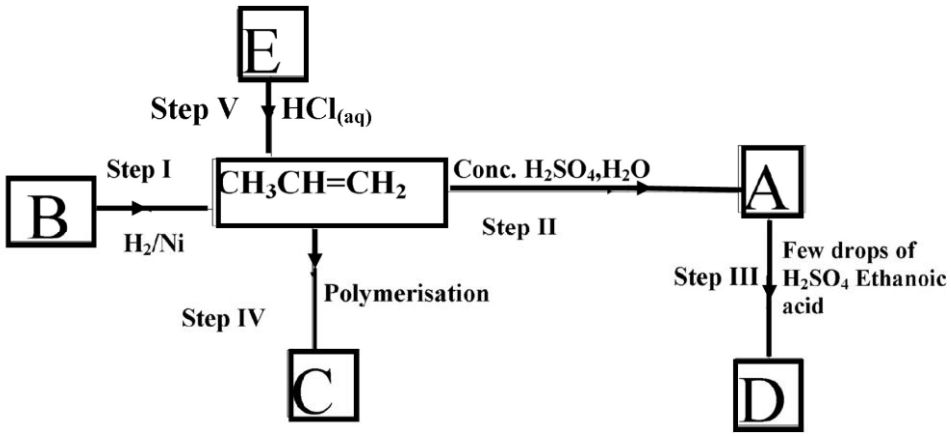
i) Aluminium utensils should not be cleared with strongly alkaline washing liquids**.** **(1mk)**

ii) Aluminium Alloys commonly used in aeroplane constructions .

(1mk)

d) In process C above, a current of 88.0A was passed through molten aluminium oxide for 8 hours. Determine the mass of aluminium producted. (IF = 96 500 C and Al = 27) **(3mks)**

3. a) Study the scheme below and use it to answer question that follow.



i) Give the structure formula of . **(3mks)**

A

B

D

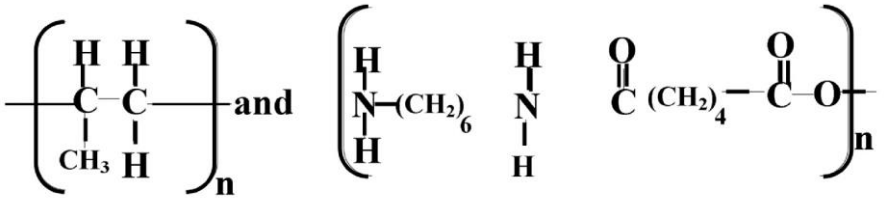
ii) State the type of reaction taking in

Step II

Step III

iii) Write the equation for step IV **(1mk)**

c) The repeating unit for polymer C and nylon have the structures below.

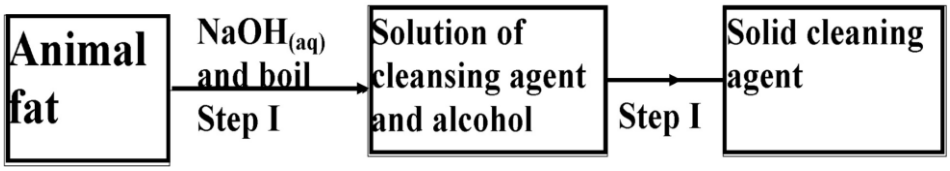


Polymer C **Nylon**

i) State two difference between the types of polymersation from which polymer C and nylon are formed. **(2mks)**

ii) State one disadvantage of synthesis . **(1mk)**

d) The scheme below was used to prepare a cleansing agent. Study and answer questions which follows.

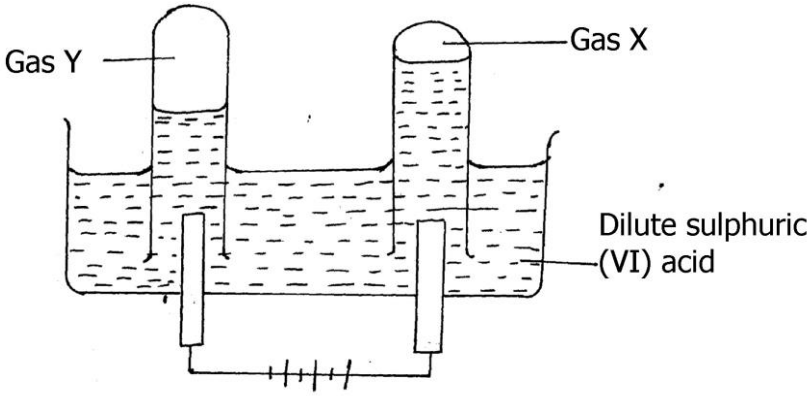


i) What name is given to the type of cleansing agent prepared by the method shown in the scheme. **(1mk)**

ii) Name a chemical substance added in step II. **(1mk)**

iii) Explain how an aqueous solution of the cleansing agent removes oil from utensil during washing**.** **(2mks)**

4. **a)** The diagram below represents electrolytes of dilute sulphuric (VI) acid.



i) Name gas Y **(1mk)**

ii) Give a reason why

I the volume of gas y formed is twice the volume of gas X

II Concentrated Hydrochloric acid cannot be used in place of sulphuric (VI) Acid

b) The standard electrode potential for some half – cell are listed below. Use them to answer questions that follows.

Half reaction	**E^{θ}(v)**
$Ag_{(aq)} + e^- \longrightarrow Ag_{(s)}$	$^+0.80$
$Ba^{+2}_{(aq)} + 2e^- \longrightarrow Ba_{(s)}$	$^-2.90$
$Cl_{2(g)} + 2e^- \longrightarrow 2Cl^-_{(aq)}$	$^+1.36$
$Ge^{+2} + 2e^- \longrightarrow Ge_{(s)}$	$^+0.32$
$Zn^{+2} + 2e^- \longrightarrow Zn_{(s)}$	$^-0.76$

i) Which two half cells will give the largest e.m.f when combined?

(1mk)

ii) Select the strongest oxidizing agent. **(1mk)**

iii) Explain whether the reaction represented below can take place.

$$Ba^{+2}(aq) + Ge(s) \longrightarrow Ba(s) + Ge^{+2}(aq)$$ **(3mks)**

5. Aluminium chloride was placed in a dry test – tube and heated test tube A glass rod having a drop of lead (II) nitrate solution was placed at the mouth of the test tube.

a) State what was observed

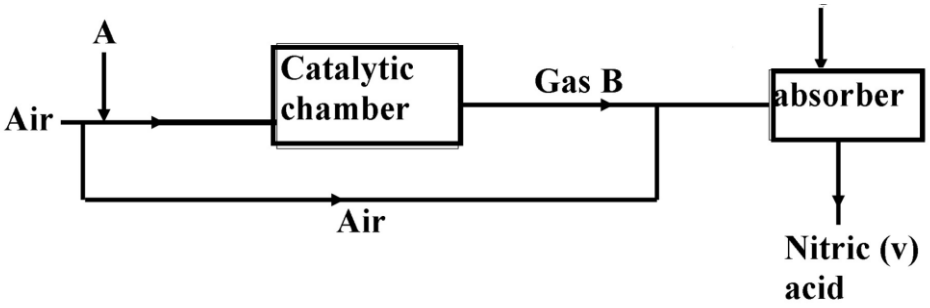
i) In the test – tube. **(1mk)**

ii) on the glass rod **(1mk)**

iii) Write an ionic equation for the reaction that took place on the glass rod.

iv) Name a reagent that can be used to test for the second product which was not tested for when lead (II) nitrate was used.

b) Use the diagram to answer the questions that follow.



i) Name substance . **(2mks)**

A

C

ii) Describe a chemical test for gas B. **(2mks)**

iii) The product obtained 65% nitric (V) acid, how can it be made more concentrated? **(1mk)**

c) Explain the observations made when hydrogen sulphide is bubbles through Conc. Nitric (V) acid. (3mks)

6. The grid below represents part of a periodic table.The letters are not actual symbol of the elements Study the grid below answer the questions that follows.

A					C	D	B
E	F		K	G			
						M	

a) How do atomic radii of elements E and F compare. Explain . **(2mks)**

b) Explain why element G has the highest melting point and boiling point than all the other elements in the same period. **(2mks)**

c) State with a reason type of structure expected in

i) Chloride of E. **(2mks)**

ii) Oxide of G. **(2mks)**

d) Draw a dot(•) and cross (x) diagram to show bonding in the compound formed by element F and D. **(2mks)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 9 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- *Write your name and index number in the spaces provided above and sign*
- *Answer ALL the questions in the spaces provided.*
- *Mathematical tables and electronic calculators may be used*
- *All working MUST be clearly shown where necessary*

FOR EXAMINER USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1 - 26		
Total	80	

1. This question concerns about alkaline earth metals. The following table gives information about their atomic and ionic Radii

Elements	Atomic	Ionic radius m+2	1st ionization Energy	2nd ionization energy
Berflium	0.112	0.030		1800
Magnesium	0.160	0.065	736	1450

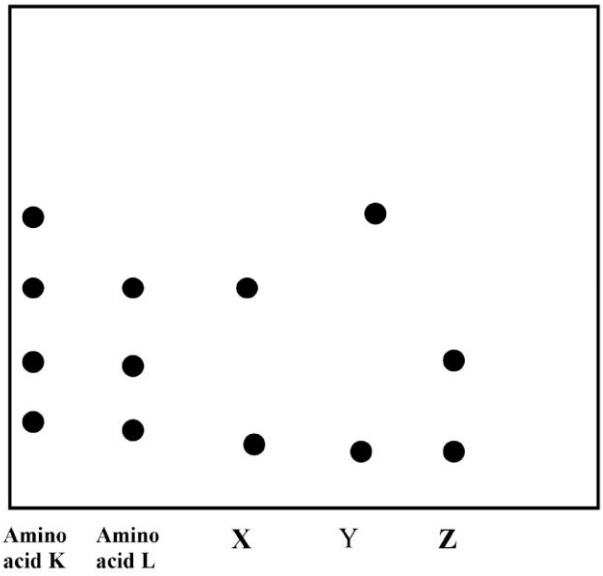
calcium	0.197	0.094	590	1150

a) How do you account for the fact that :-

For all elements the ionic radius is smaller than the atomic radius . **(1mk)**

b) The second ionization energy is higher than 1st ionization energy is higher than 1st ionization energy for each element. Explain. **(2mks)**

2. Amino acids k and L were found to be a pure compound. A chromatography of these amino acids of k and L and also three sugars X,Y and Z was made with the results shown below.

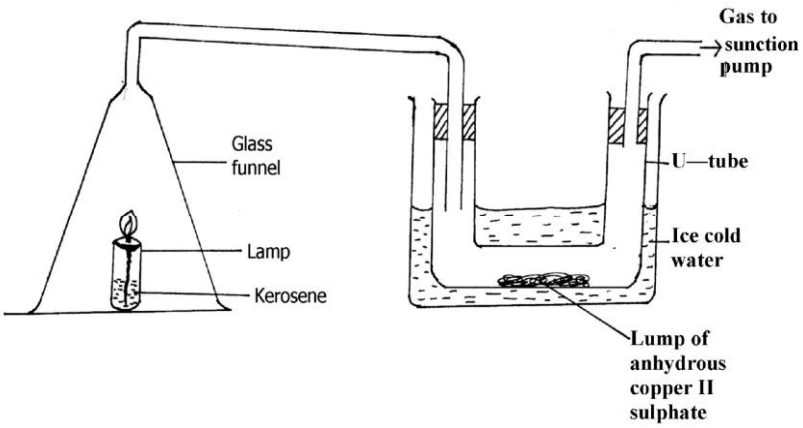


a) Which two sugars must be present in amino acid K and L. (1mk)

b) State and briefly explain two factors that made amino acid K and Y to more furthest.

(2mks)

3. Study the set- up below and answer questions that follows.



a) State and explain the observation made in the U- tube. **(1mk)**

b) Explain what will happen to lamp when the sunction pump is turned off.

(2mks)

4. The reaction between hydrogen and iodine can be represented by the equation below.

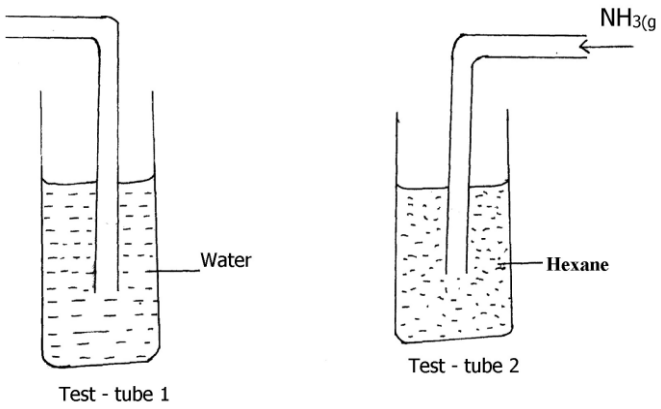
$H_{2(g)} + I_{2(g)} \rightleftharpoons 2H_{I(g)}$ $\Delta H = -10kJ\ mol^{-1}$

State and explain the effect on the equilibrium

If : **a)** Pressure is increased. **(1 ½ mk)**

b) Temperature is lowered. **(1 ½ mk)**

5. **a)** Ammonia gas was bubbled through equal amount of water and Hexane in separate test – tubes as shown below.



Explain the observations made when a wet red litmus paper was dipped into the two test – tube. **(2mks)**

b) The table below shows the PH values of some solution

Solution	A	B	C	D
pH	12.0	7.0	2.0	5.5

i) Which solution form a complex with aluminium oxide . **(1mk)**

ii) Which solution is likely to be a passion juice. **(1mk)**

6. 62g of hydrated sodium carbonated $Na2CO_3.nH_2O$, were dissolved in distilled water and made up to one litre of solution $20cm^3$ of 1.5 m hydrochloric acid completely reacted with $30.0Cm^3$ sample of the sodium carbonate solution. Determine the value of n. (Na = 23.0 , C = 12.0, 0= 16.0). **(3mks)**

7. The table below gives atomic number of elements I,II,III, and IV

Element	I	II	III	IV
Atomic number	15	16	17	20

a) Name the types of bonding that exists in the compound formed when element I and IV reacts. **(1mk)**

b) Select the elements which is the best oxidizing agent. Give a reason for your answer **(2mks)**

8. A hydrocarbon was completely burnt in oxygen 1.08g of water and 5.28g of carbon IV) oxide were produced. Find the molecular formula of the hydrocarbon if it has a molar mass of 78**.** **(3mks)**

9. **a)** Diamond and graphite are both allotropes of carbon. Explain why graphite is used as a lubricate whereas diamond is used as an abrasive . **(2mks)**

b) State one use of carbon II oxide. **(1mk)**

10. **a)** To what temperature must 2 litres of air at 17°C be heated at a constant pressure in order to double the volume. **(2mks)**

b) State Charles law

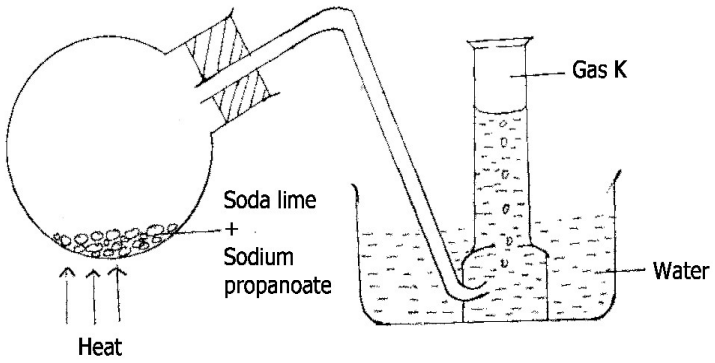
11. Using dot (•) and crosses (x) diagram to represent electrons in the outer most energy levels only show bonding in phosphine molecule.pH^{+}_{4}. (P = 15 , H = 1) **(2mks)**

12. **a)** Give the systematic IUPAC name of the following substances

i) $CH_3CH\ CH\ CH_3$ **(1mk)**

ii) $CH_3\ CH\ BY\ CH\ \ Br\ \ CH_3$ **(1mk)**

b) Study the set – up below and answer question which follows.



c) Name gas K. **(1mk)**

13. The equations below shows the hydration energies of aluminium ions chlorine ions and the heart of solution of aluminium chloride.

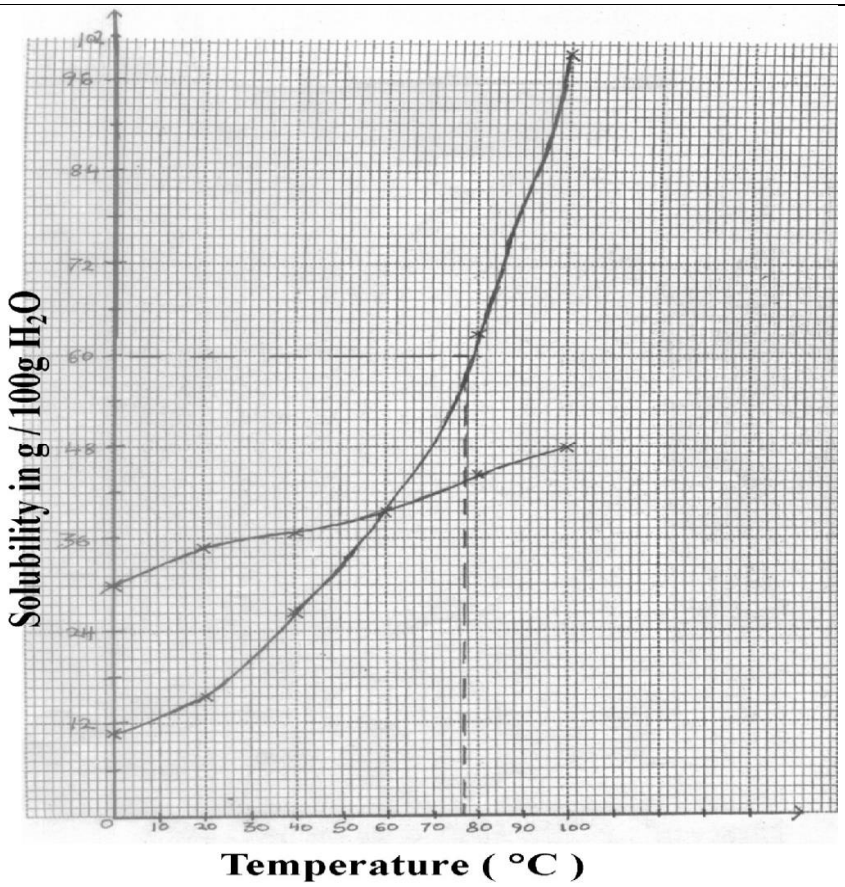
$Al^{3+}_{(g)}\ \ Al^{+3}_{(aq)} \longrightarrow \Delta H = {}^{-}4690kJ / mol$

$Cl^{-}_{(g)}\ \ \ Cl^{-}_{(aq)} \longrightarrow \Delta H = {}^{-}364kJ/ mol$

$AlCl_{3(s)}\ AlCl_{3(aq)} \longrightarrow \Delta H = {}^{-}332kJ/ mol$

Use the above equations to calculate the lattice energy of alluminium chloride. (3mks)

14. The graph below shows solubility of potassium nitrate and potassium chloride at different temperature .Study and answer the question below.



i) What happens when a solution containing 20g of potassium nitrate and 45g of potassium chloride in 100g of water at 80°C is cooled to 40°C? **(2mks)**

b) What technique can be used to separate solid with different solubilities. **(1mk)**

15. Radio active Thorium decays as shown

$$\overset{232}{90}Th \rightarrow \overset{228}{88}Ra \rightarrow \overset{228}{89}AC$$

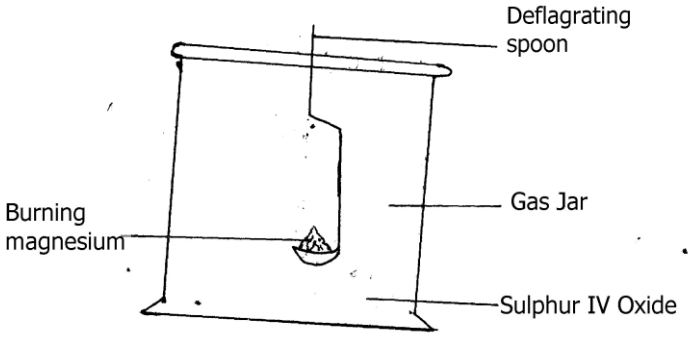
a) Name the type of radiation between

i) $\overset{232}{90}Th \rightarrow \overset{228}{89}Ra$ **(1mk)**

ii) $\overset{228}{88}Ra \rightarrow \overset{228}{89}AC$ **(1mk)**

iii) State one use of radioisotopes. **(1mk)**

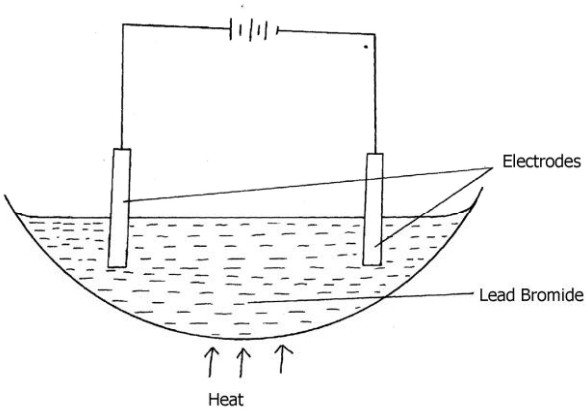
16. A piece of burning magnesium was lowered into a gas jar full of sulphur (IV) oxide gas as shown in the diagram below.



i) State one use of sulphur (IV) Oxide. **(1mk)**

ii) State and explain one observation made in the gas jar. **(2mks)**

17. The d diagram below shows electrolysis of lead bromide

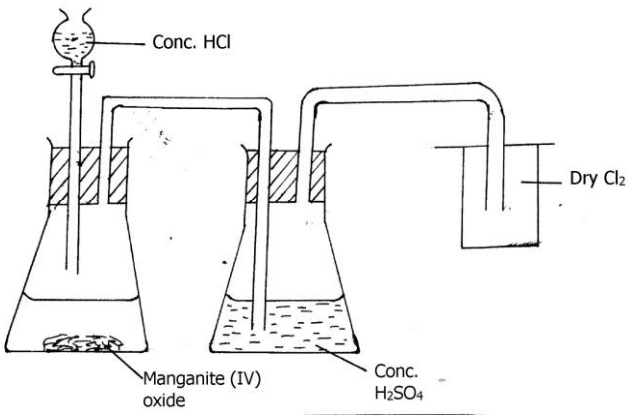


a) Label the anode . **(1mk)**

b) Write half equations to shows reactions at cathode. (**1mk)**

c) State one application of electrolysis . **(1mk)**

18 .The set up below was used to prepare dry sample of chloride gas.

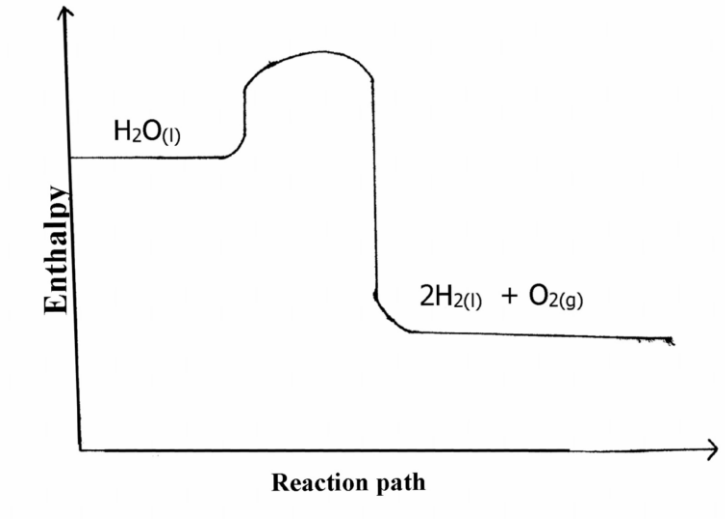


a) What is the function of manganese (IV) oxide in the preparation of chloride. **(1mk)**

b) Explain the observations made when chlorine gas is bubbled through a solution of iron II sulphate**.** **(2mks)**

19. Starting with lead metal describe how a sample of lead II hydroxide is prepared . (3mks)

20. The graph below represents the energy charges when hydrogen peroxide decomposes



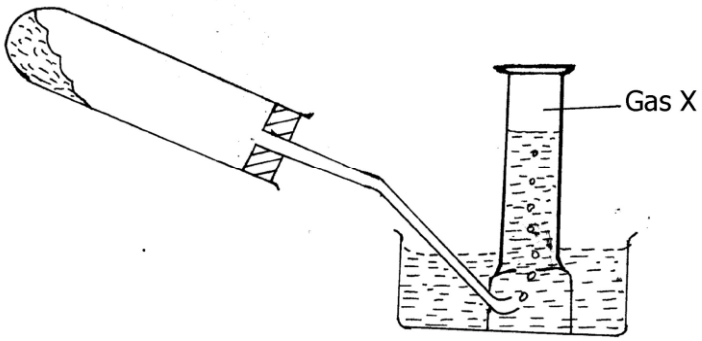
a) **i)** State whether the reaction is endothermic or exorthemic. **(½ mk)**

ii) Give reason for your answer. **(½ mk)**

b) On the diagram, sketch the reaction path for a catalysed reaction. **(1mk)**

c) State one factor other than a catalyst, which can improve decomposition of hydrogen peroxide. **(1mk)**

21. The diagram below shows preparation of a certain gas x



i) Name gas X. **(1mk)**

ii) State the confirmatory test for gas X. **(1mk)**

iii) Write an equation that occurs above,. **(1mk)**

22. In the extraction of sodium metal using down's cell

a) Graphite is used as anode instead of steel give a reason . **(1mk)**
Give a reason

b) State the function of a steel gauze. **(1mk)**

c) List one use of sodium metals. **(1mk)**

23. The following are half cell reduction potential for cell metal X and Y.

$X^{+2}_{(aq)} + 2e- \longrightarrow X(s) \quad E^{\theta} = +0.25V$

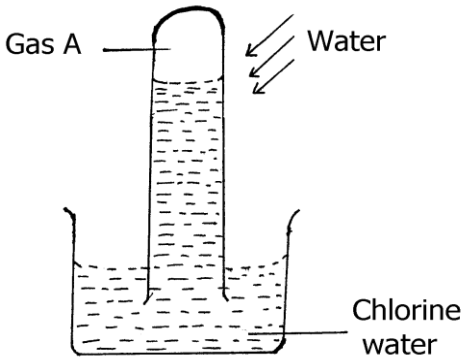
$Y^{+2}_{(aq)} + 2e- \longrightarrow Y(s) \quad E^{\theta} = +0.34V$

a) Calculate the e.m.f of the electrochemical formed when the two half cells are connect**.** **(1mk)**

b) Write the cell representation for the reaction in (a) above. **(1mk)**

c) Half cell of metal x was connect to another half cell of metal Z and the electrochemical cell formed overall e.m.f of +0.69V .Determine the reduction potential of metal Z **(1mk)**

24. The diagram below shows an experiment involving chlorine water.



a) Describe the confirmatory test for Gas A. (2mks)

b) Write an equation to show the formation of gas A. (1mk)

c) State one use of chlorine gas. (1mk)

25. When solid B was heated, a gas which formed a white precipitate when passed through lime water was produced.

The residue was dissolved in dilute Nitric (V) acid to form a colourless solution B2 when dilute hydrochloric acid was added to solution B2 a white precipitate which dissolved on warming was formed

a) Write the formular of the :-

i) Cation is solid B_1 **(1mk)**

ii) Anion in solid B_1 **(1mk)**

b) Write an ionic equation for the reaction between the residue and dilute nitric (V) acid. **(1mk)**

26. **a)** A certain volume of gas X diffuses through a porous boundary in 30 seconds. How much time is required for an equal volume of gas Y to diffuse through the same boundary under the same conditions? Rmm of x = 28 Y = 7 **(3mks)**

b) State Graham's law. **(1mk)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 9 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your **name** and **index number** in the spaces provided **above**.
- **Sign** and write the **date** of examination in the spaces provided **above**.
- Answer **all** the questions in the spaces provided.
- Mathematics tables and electronic calculators may be used.
- All working **mus**t be clearly shown where necessary.

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1	12	
2	12	
3	12	
4	10	
5	11	
6	13	

7	**10**	
Total Score	**80**	

1.(a)The table **below** shows the ions of elements **W**, **X**, **Y**, **Z** and their electron arrangement. The letters do not represent the actual symbols of the element.

Ion	Electron configuration
W^-	2, 8, 8
X^{2+}	2, 8, 8
Y^{3+}	2, 8
Z^{2-}	2, 8

(i) Which **two** elements belong to the same period? Give a reason. **(2mks)**

(ii) In which group of the periodic table does Y belong? **(1mk)**

(iii) Write the formula of the compound formed between **W** and **X**. **(1mk)**

(iv) What type of bond is formed between **W** and **X**. Explain. **(2mks)**

(**b)(i)**What is a coordinate bond. **(1mk)**

(ii) Draw a dot (**.**) cross (X) diagram to show bonding in the hydroxonium. H_3O^+ ion (H = 1, O = 8). **(2mks)**

(c) Aluminium chloride and sodium chloride are both chlorides of period 3 elements.Use this information to explain the following observations.

I.A solution of $AlCl_3$ in water turns blue litmus paper red while that of sodium chloride does hot. **(1½mks)**

II. The melting point of sodium chloride (801°C) is higher than that of $AlCl_3$ (180°C). **(1½mks)**

2.(a) Use the standard electrode potentials for elements A, B, C, D and E given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.

	E^{Θ} (volts)
$A^{2+}_{(aq)} + 2e^- \rightleftharpoons A_{(S)}$	-2.90
$B^{2+}_{(aq)} + 2e^- \rightleftharpoons B_{(S)}$	-2.38
$C^{+}_{(aq)} + e^- \rightleftharpoons \frac{1}{2}C_{2(g)}$	0.00
$D^{2+}_{(aq)} + 2e^- \rightleftharpoons D_{(S)}$	+0.34

$\frac{1}{2}E_{(aq)} + e^- \rightleftharpoons E^-$ +2.87

(i) Which element is likely to be hydrogen? Give a reason for your answer. **(2mks)**

(ii) Identify the strongest reducing agent. **(1mk)**

(iii) In the space provided draw a labeled diagram of the electrochemical cell that would be obtained when half cells of element B and D are combined. **(3mks)**

iv) Calculate the E^{Θ} value of the electrochemical cell constructed in (iii) above. **(2mks)**

(b) During the electrolysis of copper (II) sulphate solution using copper electrodes, a current of 0.2A was passed through the cell for 5 hours.

(i) Write the equation of the reaction occurring at the anode. **(1mk)**

(ii) Determine the change in mass of the cathode which occurred as a result of the electrolysis process. (Cu = 64, IF = 96500C). **(3mks)**

3. (a) A hydrocarbon contains 85% carbon. Its molecular mass is 68g.

(i) Determine its empirical and molecular formula. (C = 12, H = 1). **(2mks)**

(ii) Draw two positional isomers of the hydrocarbon. **(1mk)**

(iii) Write an equation for the reaction between one of the isomers with chlorine and name the products formed. **(2mks)**

Equation.-

Name-

(b) In an experiment an organic compound was reacted with absolute ethanol in the presence of concentrated sulphuric (VI) acid to form a compound whose formula is

$CH_3\ CH_2\ CH_2\ COOCH_2\ CH_3$

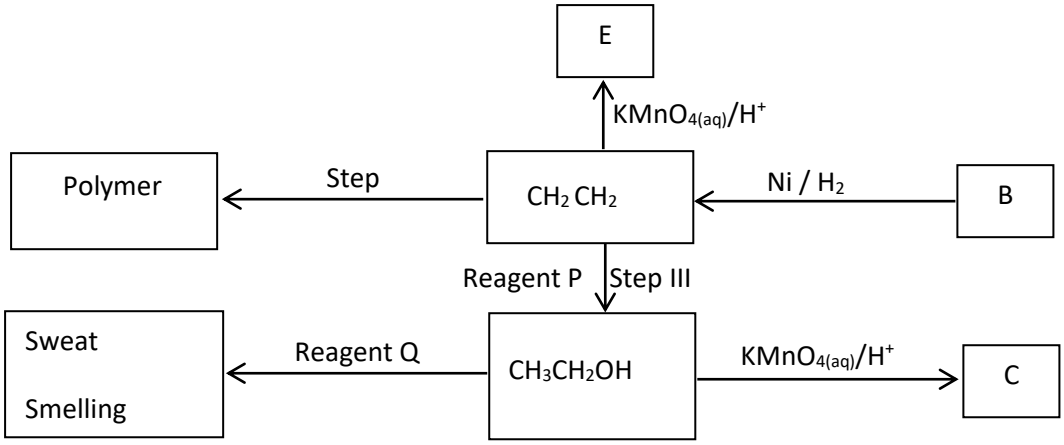
(i) Name

I. The type of reaction that took place. **(½mk)**

II. The name of the organic compounds to which the compound belonged. **(½mk)**

(ii) Write the structural formula and give the systematic name of the acid used in the above experiment. **(1mk)**

(c) Study the flow diagram **below** and answer the questions that follow.



(i) Identify the following compounds.

B _ **(½mk)**

C _ **(½mk)**

A _ **(½mk)**

E _ **(½mk)**

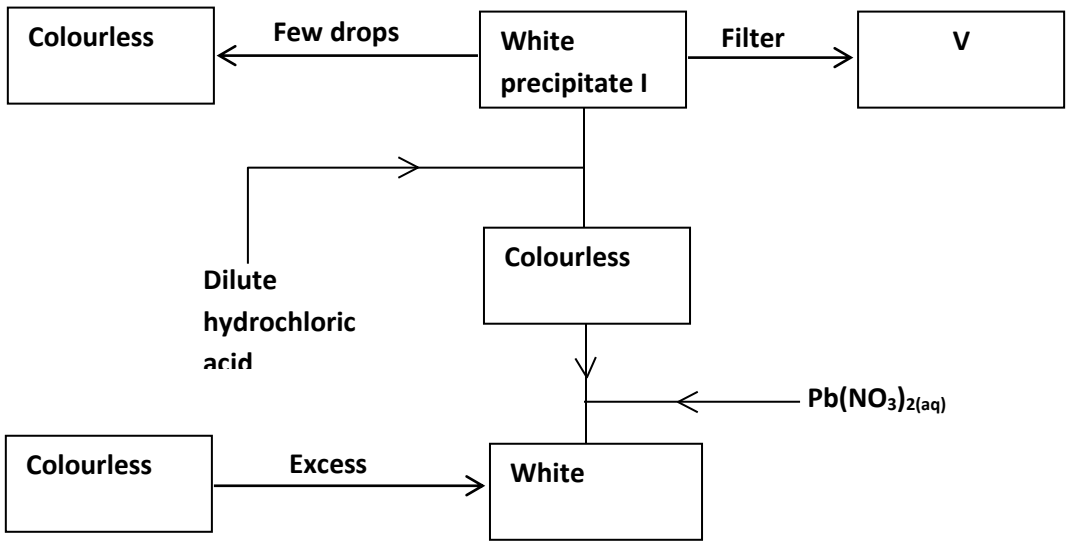
(i) Name the process in steps.

I _ **(½mk)**
II _ **(½mk)**
IV _ **(½mk)**

(ii) Reagent

P _ **(½mk)**
Q _ **(½mk)**

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



Residue **V** was yellow when hot and white when cold.

(i) Identify

I. White precipitate **I**. **(1mk)**

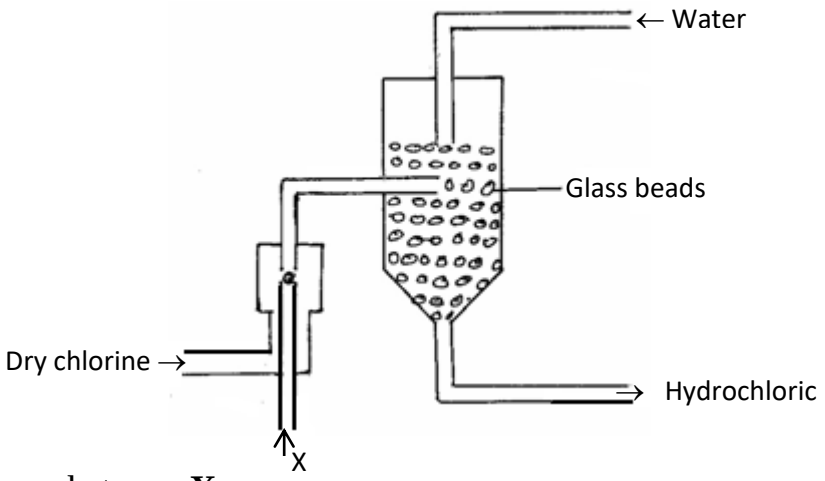
II.Solution **II**. **(1mk)**

III.Residue **V**. **(1mk)**

(ii) Write an ionic equation for the reaction of solution **II** with $Pb(NO_3)_{2(aq)}$. **(1mk)**

(iii) Write observations that would be made when ammonia solution is added drop wise till in excess to the colourless solution II. **(1mk)**

(b) The diagram ***below*** represents a set-up for large scale manufacture of hydrochloric acid.Study it and answer the questions that follow:



(i) Name substance **X**. **(1mk)**

(ii) What is the purpose of glass beads? **(1mk)**

(iii) Give **one** source of substance X used in the above process. **(1mk)**

(iv) Give **two** use of hydrochloric acid. **(2mks)**

5. (a) Use the information below to answer the questions that follow.

$Ca_{(s)} + \frac{1}{2}O_{2(g)} \rightarrow CaO_{(s)}$ $\Delta H = -635$ KJ mol^{-1}

$Ca_{(s)} + O_{2(g)} \rightarrow CaO_{2(g)}$ $\Delta H = -394$ KJ mol^{-1}

$Ca_{(s)} + e_{(s)} + \frac{3}{2}O_{2(g)} \rightarrow CaCO_{3(s)}$ $\Delta H = -1207$ KJ mol^{-1}

Calculate the enthalpy change for the reaction.

$CaO_{(s)} + CO_{2(g)} \rightarrow CaCO_{3(s)}$ **(3mks)**

(b) State ***one*** factor that should be considered when choosing a fuel for cooking. **(1mk)**

(c) The following data was obtained during an experiment to determine the molar heat of combustion of ethanol.

Volume of water used	= 500cm^3
Initial temperature of water	= 25°C
Final temperature of water	= 44.5°C
Mass of ethanol + lamp before burning	= 121.5g
Mass of ethanol + lamp after burning	= 120.0g

Calculate the

(i) heat evolved during the experiment (density of water = 1g/cm^3, specific heat capacity of water = 4.2Jg^{-1}K^{-1}). **(1mk)**

(ii) molar heat of combustion of ethanol (C = 12, O = 16, H = 1). **(2mks)**

(d) Write the thermo equation for the complete combustion of ethanol. **(1mk)**

(e) At 298K and one atmosphere pressure, graphite changes into diamond according to the equation.

$C_{(graphite)} \rightarrow C_{(diamond)}$ $\Delta H = +2.9$ KJ/mol

In the space provided, sketch a simple energy level diagram for the above change. **(2mks)**

6. **(a)**At 25°C 50g of substance X were added to 100g of water to make a saturated solution.What is meant a saturated solution? (1mk)

(b) The table **below** gives the solubilities of substance X at different temperatures.

Temperature °C	14	24	33	40	46	52
Solubility g/100g H_2O	24	36	50	62	72	90

(i) Plot a graph of the solubility of substance X (vertical axis) against temperature. (provide a graph paper) **(3mks)**

(ii) Using the graph.

I determine the solubility of substance X at 20°C. **(2mks)**

II determine the mass of substance X that remained undissolved given that 90g of substance X were added to 100cm³ of water and warmed to 35°C. **(2mks)**

III Calculate the molarity of the solution at 30°C. (Relative formula mass of X = 122.5**).** **(3mks)**

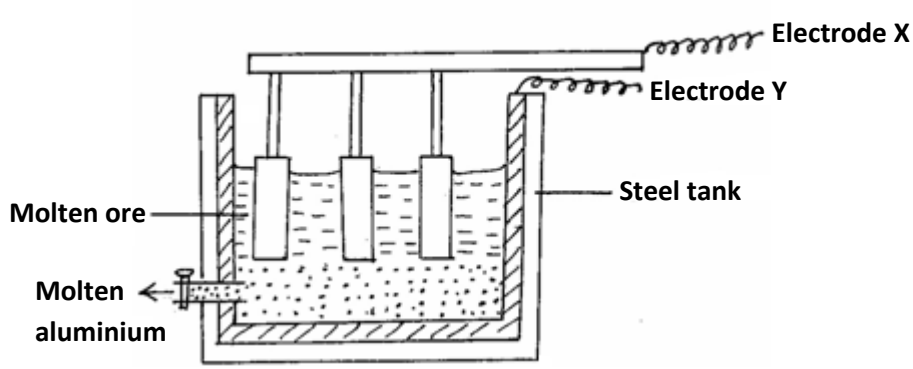
(c) In an experiment, soap solution was added to three separate samples of water. The table **below** shows volumes of soap solution required is form lather with 1000cm³ of each sample of water before and after boiling.

	Sample		
Volume of soap before water is boiled (cm³)	25.0	5.0	10.0
Volume of soap after water is boiled (cm³	25.0	5.0	5.0

(i) Which water was likely to be soft? Explain. **(2mks)**

(ii) Explain the change in volume of soap solution used in sample III. **(1mk)**

7. Aluminium is extracted using the electrolytic cell represented by the diagram **below**.



(a) Why is aluminium extracted by electrolytic method? **(1mk)**

(b) Name the electrodes labeled.

X _ **(½mk)**

Y _ **(½mk)**

(**c**) The chief ore from which aluminium is extracted is bauxite.

(i) Name **two** main impurities present in bauxite. **(2mks)**

(ii) Aluminium oxide is the main component in bauxite with a melting point of 2015°C but electrolysis of molten aluminium oxide is carried out at 800°C. Explain how this is achieved. **(2mks)**

(d) Write the equations for the reaction taking place at the anode. **(1mk)**

(e) One of the electrodes is replaced periodically. Which one and why? **(2mks)**

(f) Duralumin (an alloy of copper, aluminium and magnesium) is preferred to pure aluminium in the construction of aeroplane bodies. Give **one** property of duralumin that is considered. **(1mk)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 10 CHEMISTRY PAPER 1

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. *Write your name and index numbers in the space provided above.*
2. *Sign and write the date of examination in the space provided above.*
3. *Answers all the questions in the spaces provided in the question paper.*
4. *Mathematics tables and silent electronic calculators maybe used.*
5. *All working **MUST** be clearly shown where necessary.*

***6**. This paper consists of 14 printed pages. Candidates should confirm the 14 printed pages are there.*

FOR EXAMINER USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1- 30	80	

1. Name the process that takes place when
   (i) Fat or oils are hydrolyzed using an alkali. **(1 mk)**
   (ii) Sulphur is heated with natural rubber. **(1 mk)**
2. When anhydrous Calcium Chloride is exposed to the atmosphere. It forms a solution.

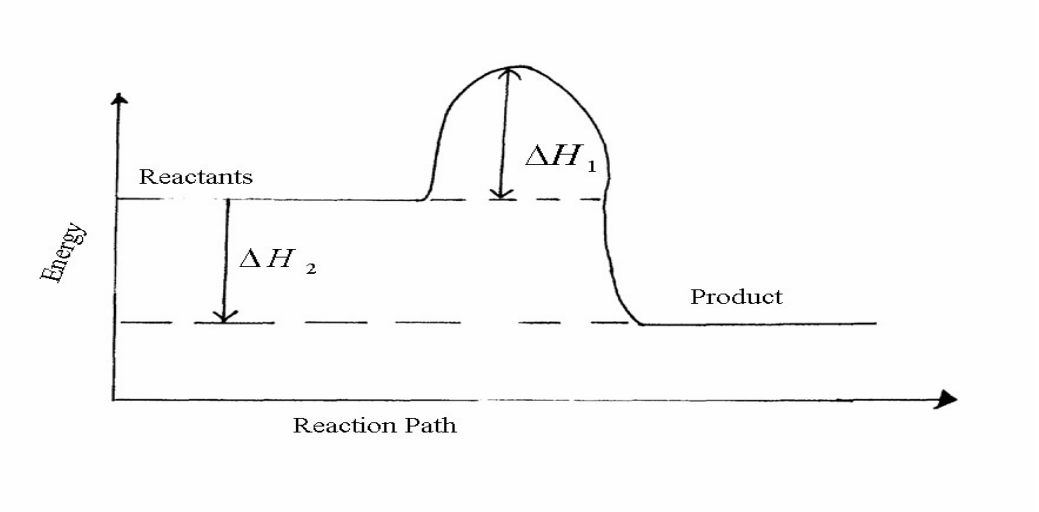
(a) Name the process that takes place. **(1 mk)**

(b) State one use of the process named in 2 (a) above. **(1 mk)**

3. Study the energy level diagram for the reaction shown below and **use it to** answer the questions that follow.

$2SO_2 + O_2 \longrightarrow 2SO_3$

(g) (g) (g)



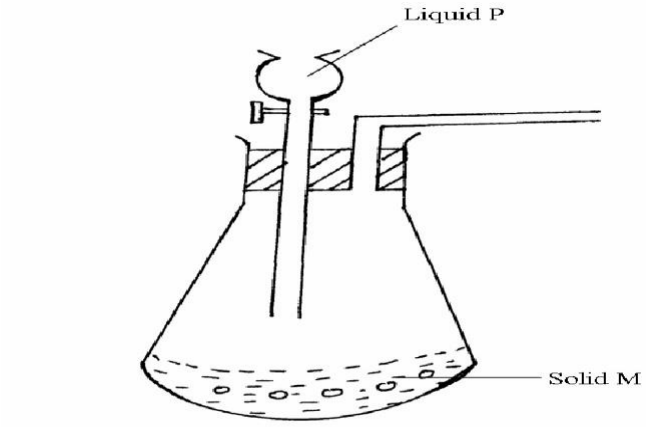
(i) State and explain two ways of increasing the yield of SO_3 per unit time from the diagram. **(2 mks)**

(ii) What do the following represent?

$^{\Delta}H_1$. **(½ mk)**

$^{\Delta}H_2$ **(½ mk)**

4. The diagram below shows an incomplete set-up of preparation and collect of dry hydrogen chloride gas. Use it to answer the questions that follow.



(a) Identify solid M and liquid P.

M -

(b) Complete the diagram above to show how the preparation and collection was achieved. **(1 mk)**

5. Give the reaction type of the following:

(i) Reaction between Butan – 1-oic acid and Pentan – 1- ol in the presence of drops of conc. Sulphuric acid to form an organic compound. **(1 mk)**

(ii) Reaction between Chlorine and Potassium Iodide to form a dark brown solution. **(1 mk)**

(iii) Reaction between bromine and methane in the presence of U.V light **(1 mk)**

6. A fossil was discovered in the year 2007. Its half-life was found to be 440 yrs. Calculate the time it will take for the mass of the fossil to have reduced from 240g to 15g. **(3 mks)**

7. A form four student accidentally mixed Sodium Carbonate and Calcium Carbonate. Describe how he would obtain a dry sample of Sodium Carbonate from the mixture. **(3 mks)**

8. State the conditions under which ammonia gives the following products when heated

(i) Nitrogen and hydrogen. **(1 mk)**

(ii) Nitrogen and water. **(1 mk)**

(iii) Nitrogen (II) oxide and water. **(1 mk)**

9. **(a)** The atomic number of Sulphur hydrogen and oxygen are 16, 1 and 8 respectively. Write the electron arrangement of Sulphur in the following substances.

(i) H_2S **(1 mk)**

(ii) SO_3^{2-} **(1 mk)**

(b) State the number of neutrons and electrons in the species of Aluminum shown below:

1327 *Al*3+

Neutrons **(½ mk)**

Electrons **(½ mk)**

10. The graph below shows the behaviour of a fixed mass of a gas at constant temperature.



(i) What is the relationship between the volume and the pressure of the gas.

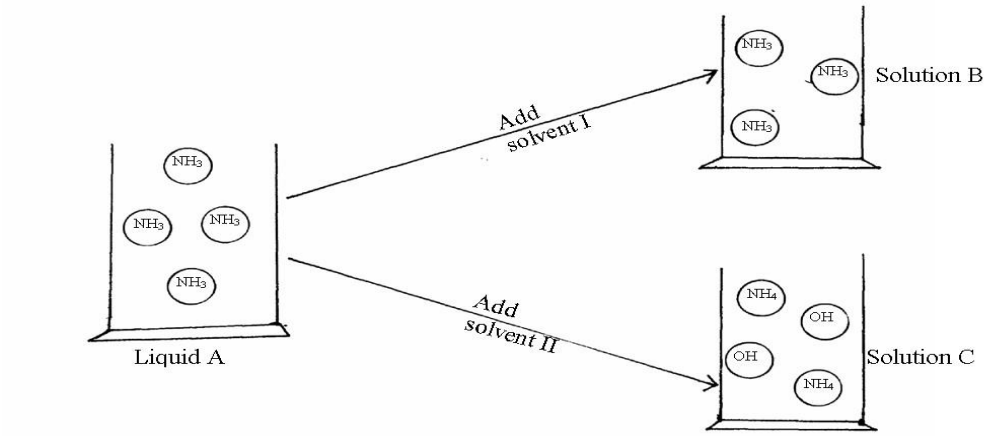
(1 mk)

(ii) 12 litres of oxygen gas at one atmosphere pressure were compressed to 2.5 atmospheres pressure at constant temperature. Calculate the volume occupied by the oxygen gas.

(2 mks)

11. 20 cm^3 of 2 M Sulphuric (IV) acid reacted completely with 3.2 g of WOH (O=16, H=1) Calculate the R.A.M of W in the formula WOH. **(3 mks)**

12. Study the diagram below and answer the questions that follow.



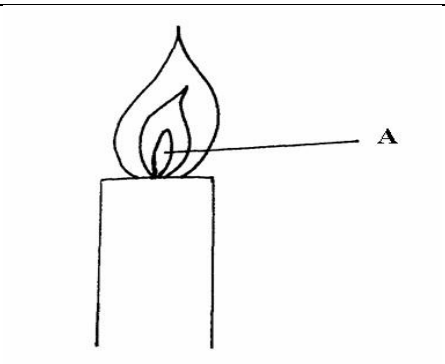
(a) Identify the solvent used in step I and step II.

I **(½ mk)**

II **(½ mk)**

(b) State and explain what is observed if a red litmus paper was dipped in solution B and C. (2 mks)

13. The figure below shows part of non-luminous flame.



(a) **(i)** Describe an experiment that would confirm that region labeled A is not suitable for heating. **(1 ½ mks)**

(ii) Explain why luminous flame produce light and soot. **(1 ½ mks)**

14. An organic compound with the formula $C_4H_{10}O$ reacts with sodium metal to give hydrogen gas
and a white solid.

(a) Give the formula of the white solid. **(1 mk)**

(b) To which homologous series does the white solid belong? **(1 mk)**

(c) Write the equation for the reaction between the organic compound $C_4H_{10}O$ and sodium metal. **(1 mk)**

15. (a) Carbon (IV) oxide is bubbled through Calcium hydroxide until there is no further change. Explain using equations the changes observed. **(2 mks)**

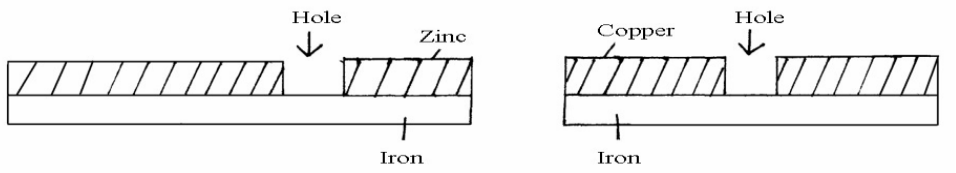
(b) Explain why diamond is used in cutting of glass and drilling. **(1 mk)**

16. The table below shows ammeter reading recorded when 2M Sulphuric (IV) acid and 2M ethanoic acid were tested separately.

Electrolyte	Current (A)
2M Sulphuric acid	8.1
2M Ethanoic acid	2.5

Explain the difference in the ammeter readings. **(2 mks)**

17. The figure below shows cross – sections of two pieces of iron coated with Zinc and Copper respectively.



Which piece of iron would rust when the holes were filled with water and left for

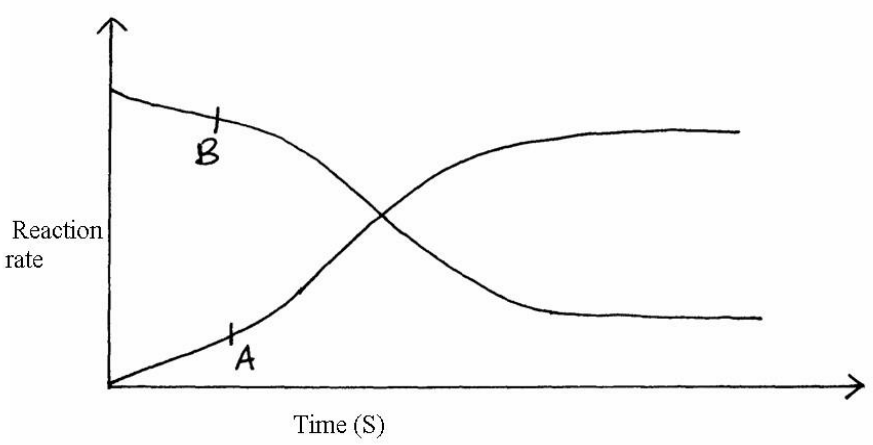
sometime?Explain. **(2 mks)**

18. (i) Define a dynamic equilibrium. **(1 mk)**

(ii) The equation below shows a reaction at equilibrium

$2CrO_4^{2-}{}_{(aq)} + 2H^+{}_{(aq)} \rightleftharpoons Cr_2O_7^{2-}{}_{(aq)} + H_2O_{(l)}$

If a graph of reaction rate against time plotted, the curve obtained is as below.



Giving a reason, identify species A and B.

A **(1 mk)**

B **(1 mk)**

19. (a) Using electrons in the outermost energy level, draw a dot (.) and cross (X) diagram for the

ion of PH_4^+ and compound B_2O_3. (P=15, H=1, B=5, O= 16)

(i) PH_4^+ **(1 mk)**

(ii) B_2O_3 **(1 m**

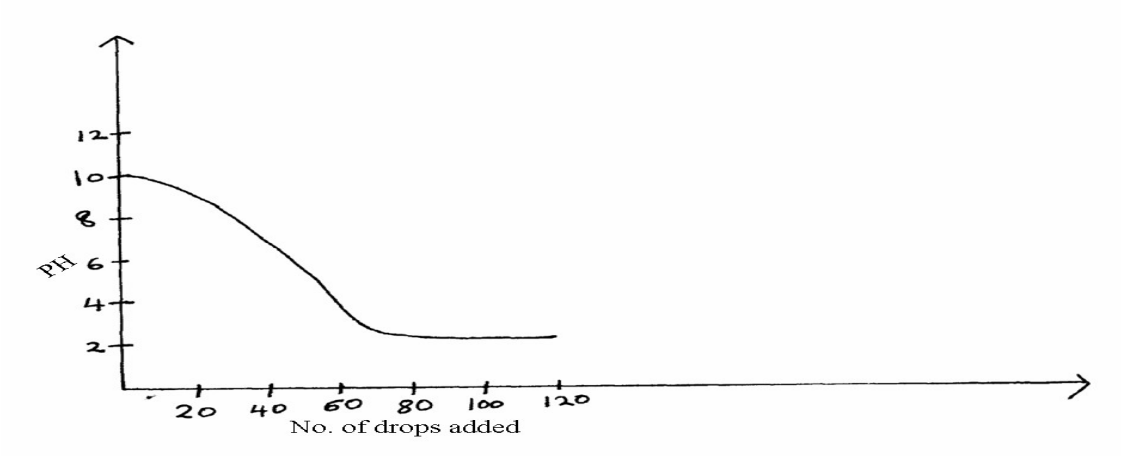
(b) The formula of the compound formed when Aluminum and chlorine react is Al_2Cl_6. Name the types of bonds that exist in the compound. **(1 mk)**

20. Sulphur (IV) oxide gas was bubbled through acidified potassium chromate (VI) solution and Iron (III) Sulphate solution chromate. Explain the observations made in each case.

(i) With Potassium Chromate (VI) solution. **(1 ½ mk2)**

(ii) Iron (III) Sulphate solution **(1 ½ mks)**

21. A liquid X is added dropwise to $20cm^3$ of Urea fertilizer $(NH_2)_2$ CO solution. The PH value is noted after the addition of every 10 drops and a graph of PH against number of drops is drawn as shown below.



(a) From the evidence on the graph, state the nature of liquid X added and explain your deduction **(2 mks)**

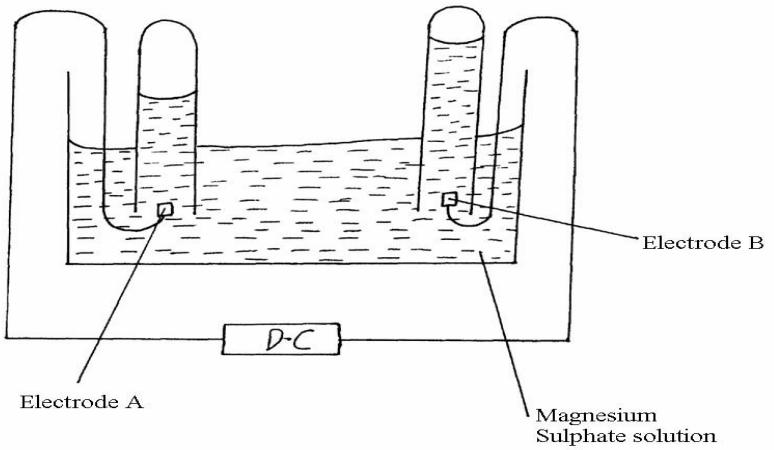
(b) The table below shows solution and their P^H value.

Solution	P^H value
P	2.0
R	7.0
R	14.0

Select two solutions that would react with zinc hydroxide. Explain. **(1 mk)**

22. State and explain what is observed when a burning piece of magnesium is lowered into a gas jar containing dry chlorine gas. **(2 mks)**

23. The set-up below was used during the electrolysis of Magnesium Sulphate solution using graphite electrons.



(i) Identify the anode and the cathode. **(1 mk)**

Anode-

Cathode-

(ii) Write half ionic equation at the anode and cathode: **(1 mk)**

Anode-

(iii) Explain the P^H change of the electrolyte during the experiment. **(1 mk)**

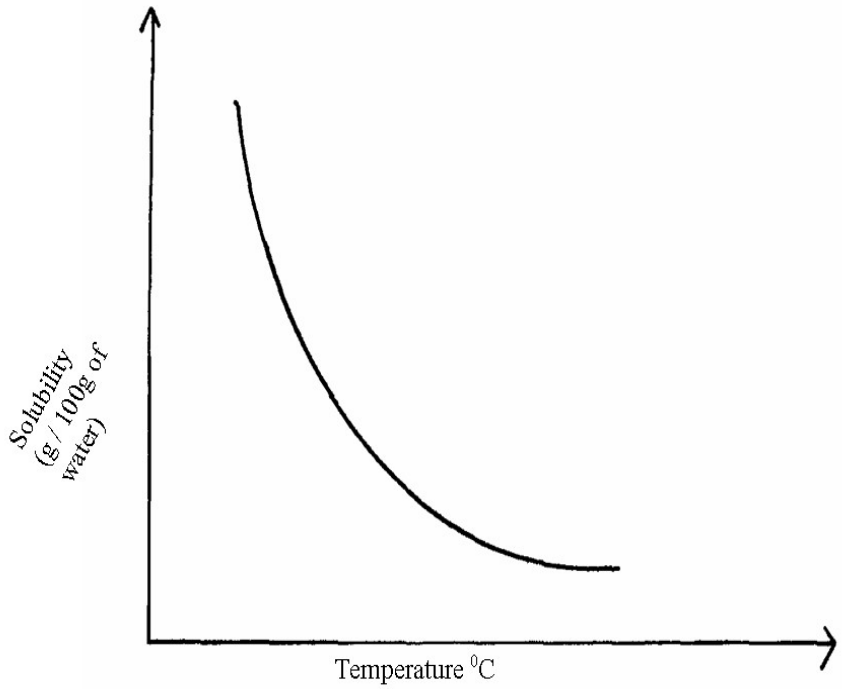
24. Calculate the standard enthalpy of formation of carbon disulphide given that:-

$S_{(s)} + O_{2\,(g)} \longrightarrow SO_2 \quad \Delta H = -294 KJmol^{-}$

$CS_{2\,(l)} + 3OCO_2 \longrightarrow + 2SO_2 \quad \Delta H = -1072 KJmol^{-}$

$C(s) + O2(g) \longrightarrow CO2\,(g) \quad \Delta H = -393 KJmol -$

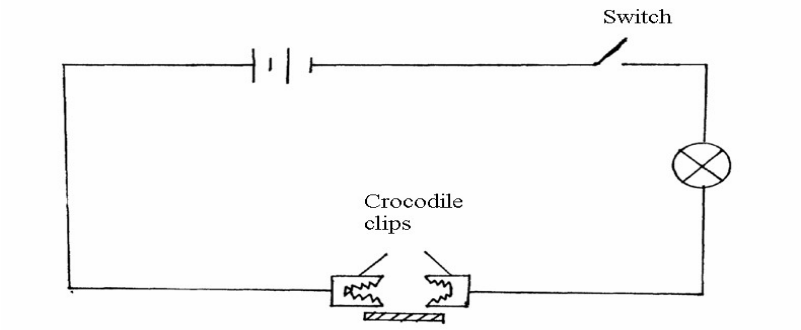
24. The graph below represent the solubility curve of a gas in water.



a) State and explain the conclusion that can be drawn from this curve about the solubility of the gas. **(1 mk)**

(b) The solubility of salt T at 80°C is 40g / 100g of water. What mass of T will saturate 65g of water at 80^0C? **(2 mks)**

25. The following circuit was set – up to investigate effect of electric current on substances.



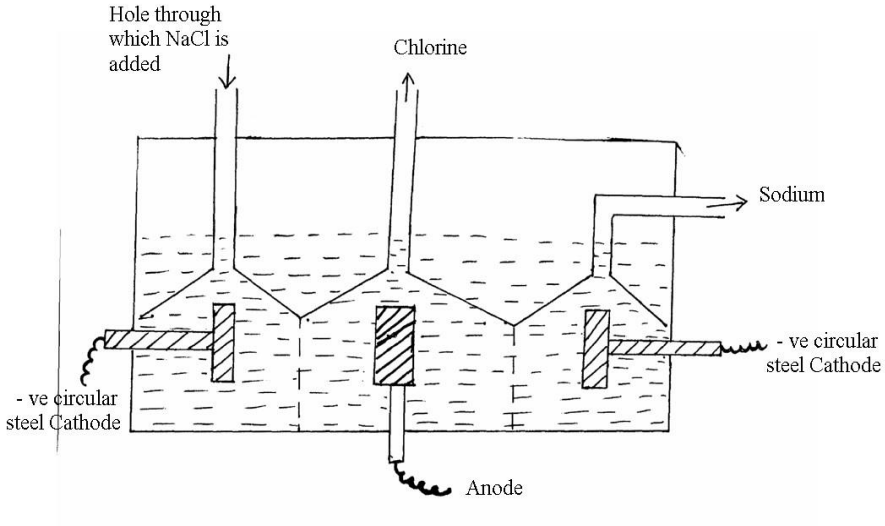
State and explain the effect on the bulb when the following substances were connected between crocodile clips.

(i) Mercury **(1 mk)**

(ii) Sugar crystals. **(1 mk)**

26. A sample of pesticide is suspected to contain lead (II) ions. Describe how the presence of lead (II) ions can be established. **(2 mks)**

27. Below is a simplified diagram of the Down's cell used for the manufacture of Sodium. Study it and answer the questions that follow.

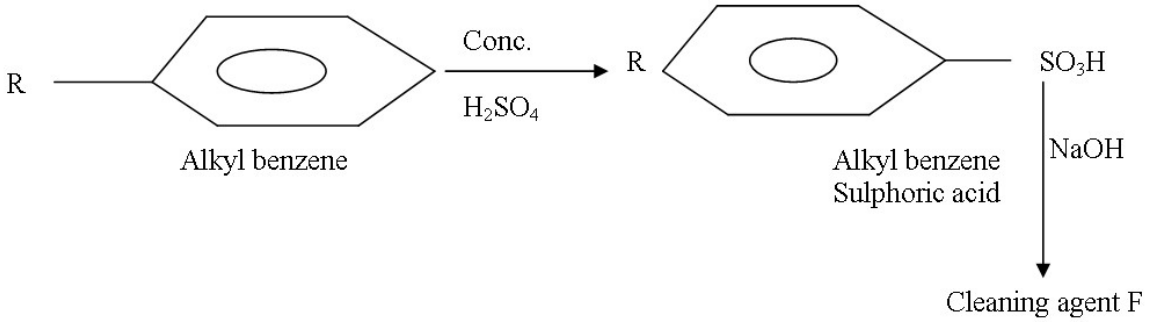


(i) Name two physical properties of Sodium utilized in the extraction and collection of sodium metal. **(2 mks)**

(ii) What precaution is taken to prevent Chlorine and Sodium from recombining **(½ mk)**

(iii) State one use of Sodium metal. **(½ mk)**

28. The scheme below represents the manufacture of a cleaning agent F.



(a) Give the formula of F and the type of cleaning agent in which F belongs. **(2 mk)**

Formula:

Type:

(b) State one disadvantage of using F as a cleaning agent. **(1 mk)**

29. 3.22g of hydrated Sodium Sulphate, $Na_2SO_4{}^{o}X\ H_2O$ were heated to a constant mass of 1.42g, determine the value of X in the formula. (Na = 23, S = 32, O = 16, H=1). **(2 mks)**

NAME……ADM NO……

SCHOOL……..CLASS……

DATE……

TOP STUDENT KCSE PREDICTIONS

SERIES 1 TRIAL 10 CHEMISTRY PAPER 2

Kenya Certificate of Secondary Exams

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- Write your Name and Index Number in the spaces provided above.
- Answer all the questions in the spaces provided after each question.
- Mathematical tables and non-programmable electronic calculators may be used.
- ALL working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

QUESTIONS	MAX SCORE	CANDIDATE'S SCORE
1	14	
2	13	
3	13	
4	13	
5	09	
6	09	
7	09	
TOTAL	**80**	

1. The table below shows part of the Periodic table. The letter of the elements do not represent the actual symbols of the elements:-

X			Y					Z
U						W		

(iii) How do the electrical conductivities of elements X and Y compare? Explain. **(2mks)**

(iv) Element W has two melting points. Explain this observation. **(1mk)**

(v) When 1.15g of element U was reacted with cold water $0.6dm^3$ of hydrogen was produced at r.t.p. Calculate the relative atomic mas of U. (Molar gas volume = $24dm^s$ at r.t.p) **(3mks)**

(vi) Element V has atomic number 15. Show its position in the grid. **(1mk)**

(vii) State **one** use of element Z. **(1mk)**

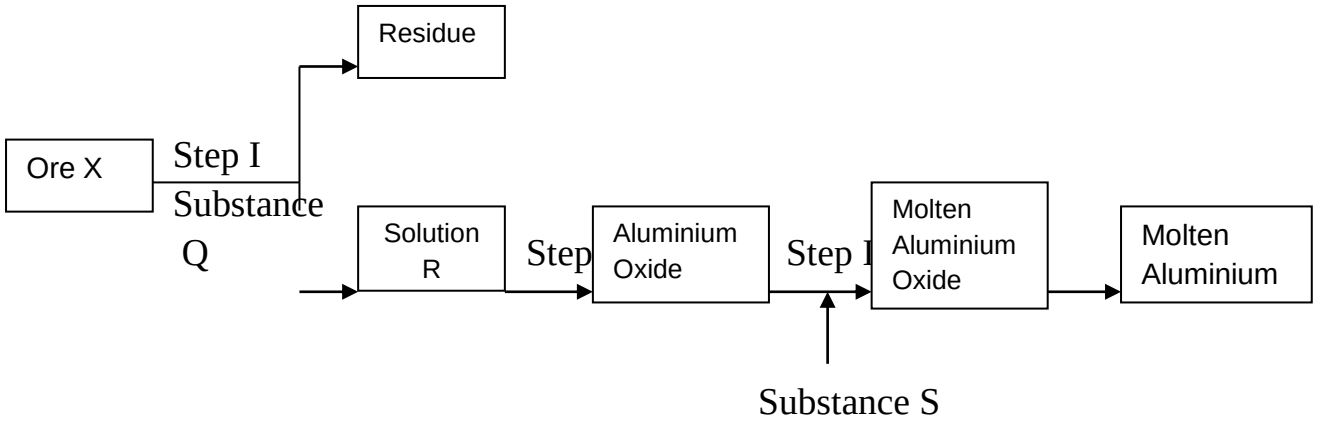
(viii) Oxide of element Y react with both acids and bases. What property is shown by element Y? **(1mk)**

(ix) Explain (vi) above using chemical equations. **(2mks)**

(x) Write down the equation for the reaction between element Y and Oxygen. **(1mk)**

(xi) Explain how the reactivity of elements X and U with chlorine compare. **(2mks)**

2. The process of extraction of Aluminium is summarized as below:



(a) (i) Write the formula of the main Ore X which is used in extraction of aluminium. **(1mk)**

(ii) Name:

(a) The main residue formed after filtration in step I. **(1mk)**

(b) Substance Q. **(1mk)**

(iii) How is the sodium Aluminate in Solution R separated from the impurity silicon (iv) oxide. **(2mks)**

(iv) What is the purpose of addition of substance S in step III. **(2mks)**

(b) (i) Explain why the Anode in extraction of Aluminium is replaced periodically. **(2mks)**

(ii) Write an equation for the formation of Aluminium at the cathode. **(1mk)**

(c) (i) Explain why Duralum an alloy of Aluminium is used in construction of aircraft parts and car window frames. **(1mk)**

(ii) Apart from the application of Aluminium above, state two other uses. **(2mks)**

3. (a)(i) With the aid of a chemical equation, explain how boiling affects water hardness.

(b) The saturated point of Sodium Nitrate in 100g of water is given for various temperatures in ^0C.

Temperature (^0C)	0	20	40	60	80	100
Saturation point (g/100g of H_2O)	73	88	104	124	148	180

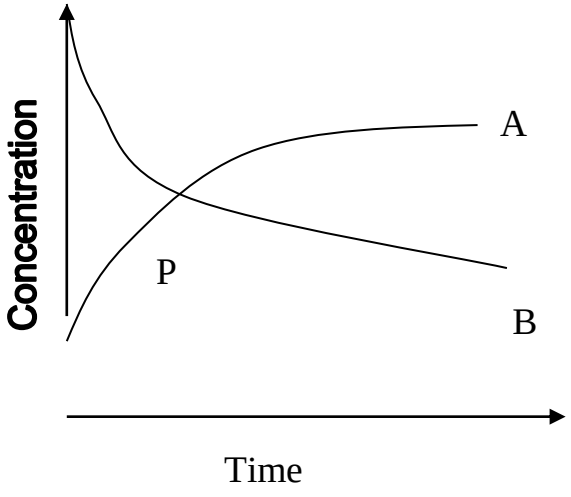
(ii) Plot a graph of saturation point of Sodium Nitrate against temperature.
(provide a graph paper) **(3mks)**

(iii) Using the curve determine the solubility at 70^0C. **(1mk)**

(iv) 100 grams of solution of sodium nitrate is in saturated conditions at 10^0C. How many grams of the salt will have to be added to make the solution just saturation at 80^0C. **(2mks)**

iv) (I) State **one** application of solubility. **(1mk)**

(II) The graph below is a plot of concentration against time for a given reaction.



a) What is represented by curve A? Explain. **(2mks)**

b) Explain why curve A rises fast then constant. **(1mk)**

c) What does point P represent on the graph? **(1mk)**

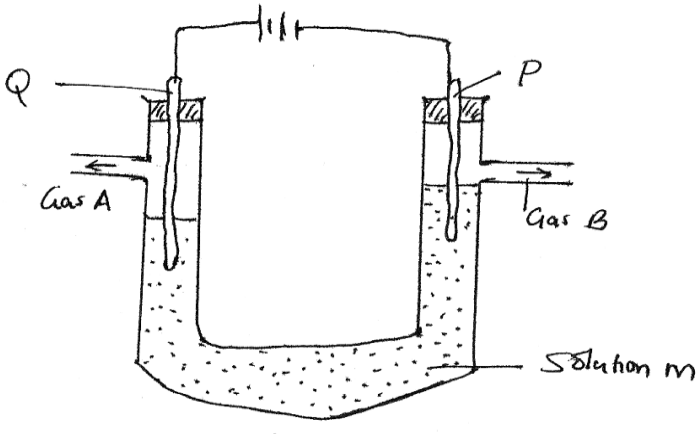
4. A tiny piece of potassium was burnt in air. A white residue was formed.

(a) Apart from the white residue state any other observation that was made. **(1mk)**

(b) Dilute Sulphuric (vi) acid was added to the white residue. A colourless solution M was formed.

(ii) Write an equation that results in the formation of the colourless solution M. **(1mk)**

(iii) The solution M was electrolysed using graphite electrodes as shown in the set up below.



a) Identify **four** ions present in solution M. **(2mks)**

b) State the observation made at electrode P. Give a reason for your answer. **(2mks)**

c) Describe a simple test for gas A produced at electrode Q. **(2mks)**

d) Write the equation for the reaction taking place at electrode P. **(1mk)**

e) A current of 6A was passed through solution M for 27 minutes. Calculate the volume of gas A that was produced at room temperature and pressure. (Molar gas volume at r.t.p. = 24dm^3, 1 Faraday = 96500 C). **(3mks)**

f) Compare the concentration of the electrolyte at the beginning of the experiment and at the end of the experiment. Explain. **(2mks)**

5. (I) The following account describes how crystals of a salt were made.

30cm^3 of sodium hydroxide solution was measured out and transferred into a conical flask. Dilute nitric (v) acid was then added, a little at a time until the solution was neutral. The volume of nitric (v) acid added was noted to be 28cm^3. The solution was then evaporated until it was saturated. It was then left to cool to form crystals which later dried.

(a) What apparatus was used:

(i) to measure the 30cm^3 of the sodium hydroxide solution? **(1mk)**

(ii) to add nitric (v) acid to the sodium hydroxide solution. **(1mk)**

(b) How would you determine if the solution is neutral? **(1mk)**

(c) Explain why crystals of the salt are formed when the saturated solution is cooled. **(1mk)**

(d) Write a chemical equation for the reaction. **(1mk)**

(e) Explain **one** of the salt prepared in this experiment. **(1mk)**

(II) At 35^0C the reaction between bromine and methanoic acid proceeds according to the equation below: H^+

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

The rate of reaction was determined by monitoring the time taken for bromine to be decolorized.

Concentration of bromine (mol dm^{-3})	Time taken
10.0×10^{-3}	0
8.1×10^{-3}	1
6.6×10^{-3}	2
4.4×10^{-3}	4
3.0×10^{-3}	6
2.0×10^{-3}	8
1.3×10^{-3}	10

(a) Plot a graph of bromine concentration (vertical axis) against time. **(3mks)**
(provide a graph paper)

(b) Using your graph,

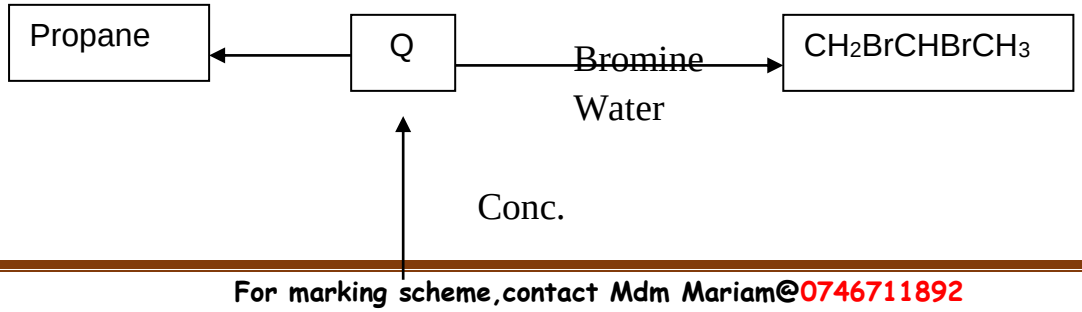
(i) State the concentration of bromine in the 3rd minute. **(1mk)**

(ii) Calculate the rate of reaction at 1½ minute. **(2mks)**

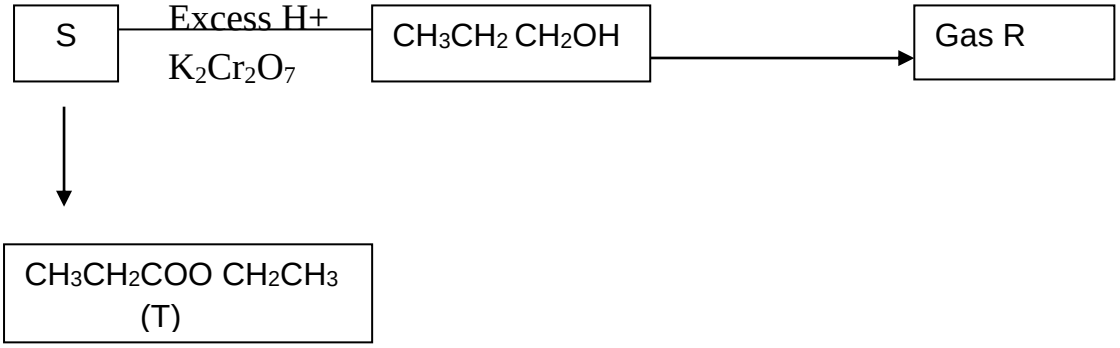
(c) Explain how the concentration of bromine affects reaction rate. **(1mk)**

(d) On the same axis, sketch the curve that would be obtained if the reaction was carried out at 20^0C and label it I. **(1mk)**

6. The scheme below shows several reactions starting with propanol. Study the scheme and answer the questions that follow.



H_2SO_4



(a) **(i)** Name gas R. **(1mk)**

(ii) Name and draw the structural formula of compound Q. **(2mks)**

(iii) What conditions and reagents are necessary to convert S to T? **(2mks)**

Reagent

Condition

(iv) Write an equation for the reaction that takes place when one mole of chlorine gas react with propane. **(1mk)**

(b) The diagram below shows some properties of the organic compounds U, V and W. Use the information to answer the questions that follow.

	U	V	W
Reaction with liquid bromine	Decolourize bromine very fast	No reaction	Decolourizes bromine liquid slowly
Combustion	Burns with yellow smoky flame	Burns with a blue flame leaving no residue	Burns with a clear yellow flame
Reaction with conc. H_2SO_4	No reaction	It is dehydrated to form compound U	No reaction

(vii) To which homologous series do the following compounds belong? **(3mks)**

U

VW

7. **(a)** State the Hess's law. **(1mk)**

(b) The heat of combustion of propane, carbon and hydrogen are given below.

$C_3H_{8(g)} + 5O_{2(g)} \longrightarrow 3CO_{2(g)} + 4H_2O_{(l)}, \Delta H = 2220KJmol^{-1}$

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}, \quad \Delta H_2 = -393KJmol^{-1}$

$H_{2(g)} + ½ O_{2(g)} \longrightarrow H_2O_{(l),}$ $\Delta H_3 = -285KJmol^{-1}$

(i) Using the information above, show the formation of propane using an energy cycle diagram. **(2mks)**

(ii) Calculate the heat of formation of propane. **(2mks)**

(iii) Write a thermochemical equation to show the formation of propane from its constituent elements. **(1mk)**

(c) Use the information below to answer the questions below:

Alkane	Heat of combustion (KJmol-1
Methane	$8.9x\ 10^2$
Ethane	1.56×10^3
Propane	2.22×10^3
Butane	2.877×10^3
Pentane	3.534×10^3

(vi) Predict the heat of combustion of hexane. **(1mk)**

(vii) Explain the difference in molar heat of combustion between the successive alkanes. **(1mk)**

(viii) Which of the alkanes will be the best fuel. Explain. **(1mk)**



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