TOP SCHOOLS PREDICTIONS

CHEMISTRY

KCSE PREDICTION TESTS (1-10)

2nd Series of Sampled Top Performing Schools Possible Questions in Chemistry Expected in the Forthcoming Annual Final KCSE Examinations for our Candidates.

SERIES 2

For Marking Schemes Call/WhatsApp

0746 222 000

MWALIMU AGENCY

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 1 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

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

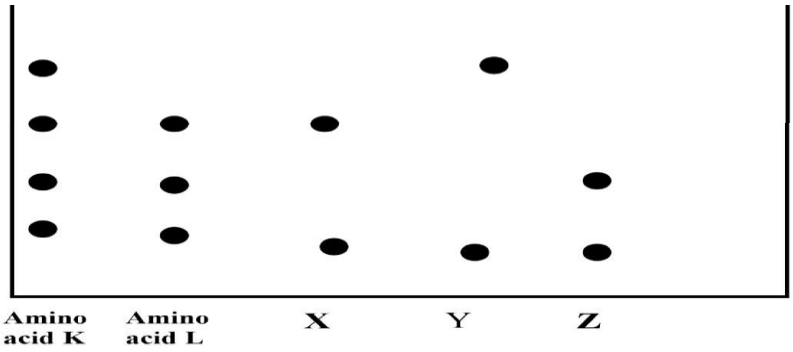
a) How do you account for the fact that :-

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)**

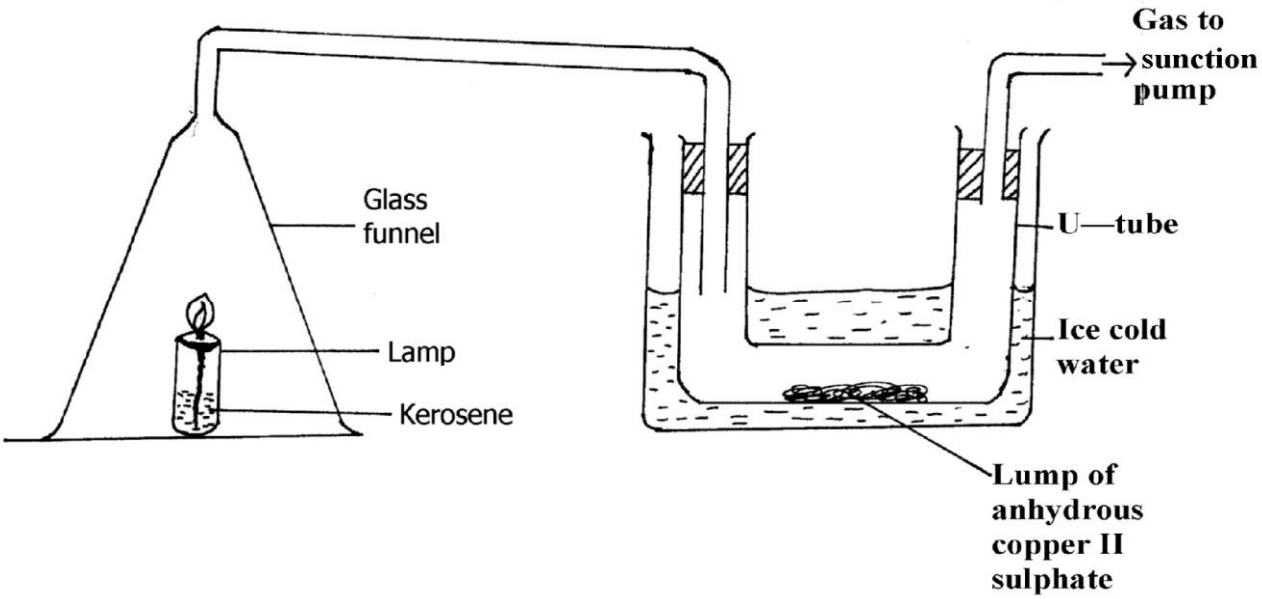
2. Amino acids k and L were found to be a pure compound. A chromatography of these amino acids of k and L and also three sugars **X,Y** and **Z** was made with the results shown below.



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.

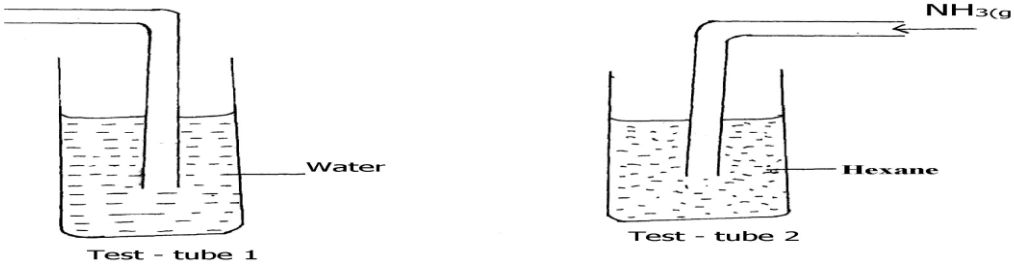
$$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)} \quad \Delta H = -10kJ\ mol^{-1}$$

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

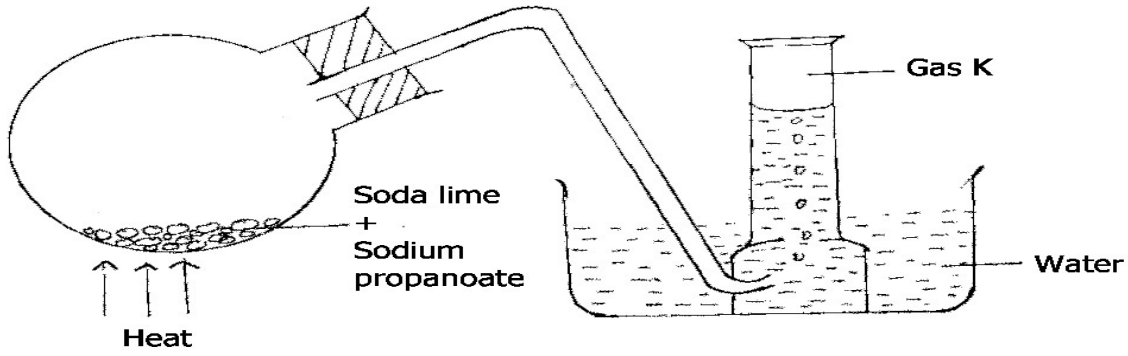
11. Using dot (•) and crosses (x) diagram to represent electrons in the outer most energy levels only show bonding in phosphine molecule.pH^{+}_{4}. (P = 15 , H = 1) **(2mks)**

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.

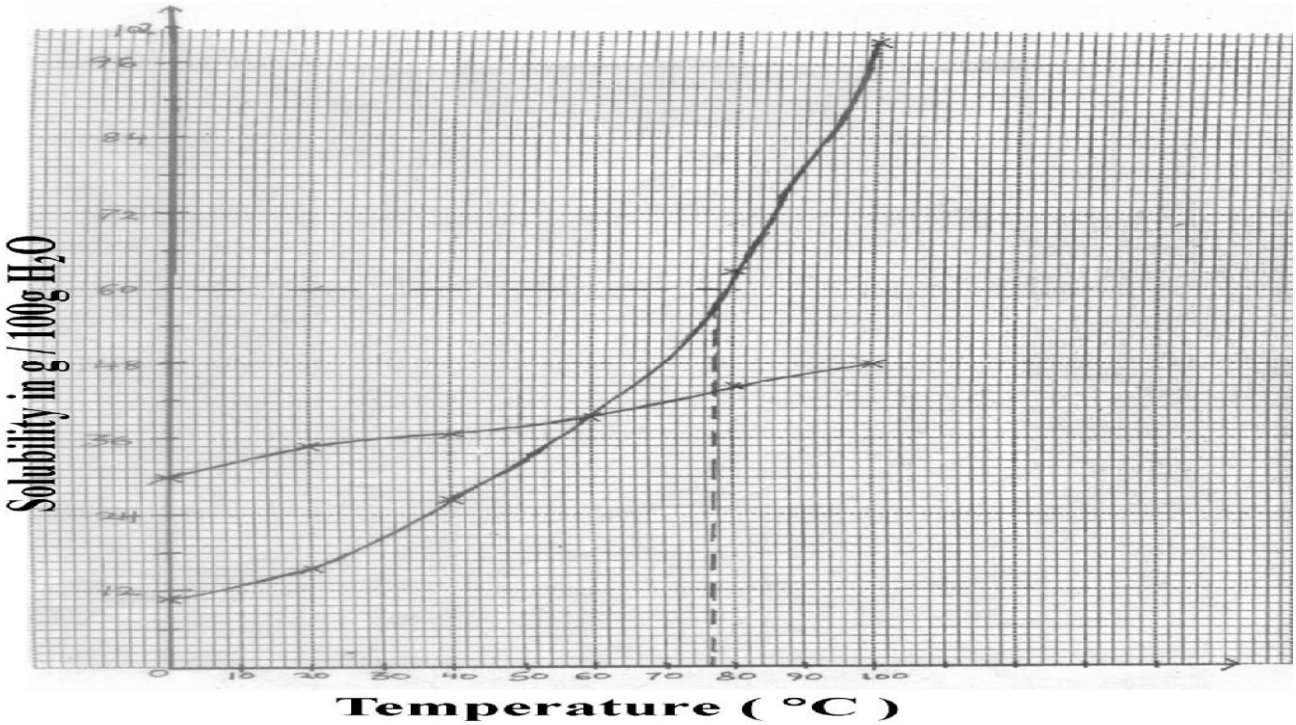
$Al^{3+}_{(g)} \longrightarrow Al^{+3}_{(aq)}$ $\Delta H = {}^{-}4690kJ / mol$

$Cl^{-}_{(g)} \longrightarrow Cl^{-}_{(aq)}$ $\Delta H = {}^{-}364kJ/ mol$

$AlCl_{3(s)} \longrightarrow AlCl_{3(aq)}$ $\Delta H = {}^{-}332kJ/ mol$

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

$$^{232}_{90}Th \rightarrow {}^{228}_{88}Ra \rightarrow {}^{238}_{89}AC$$

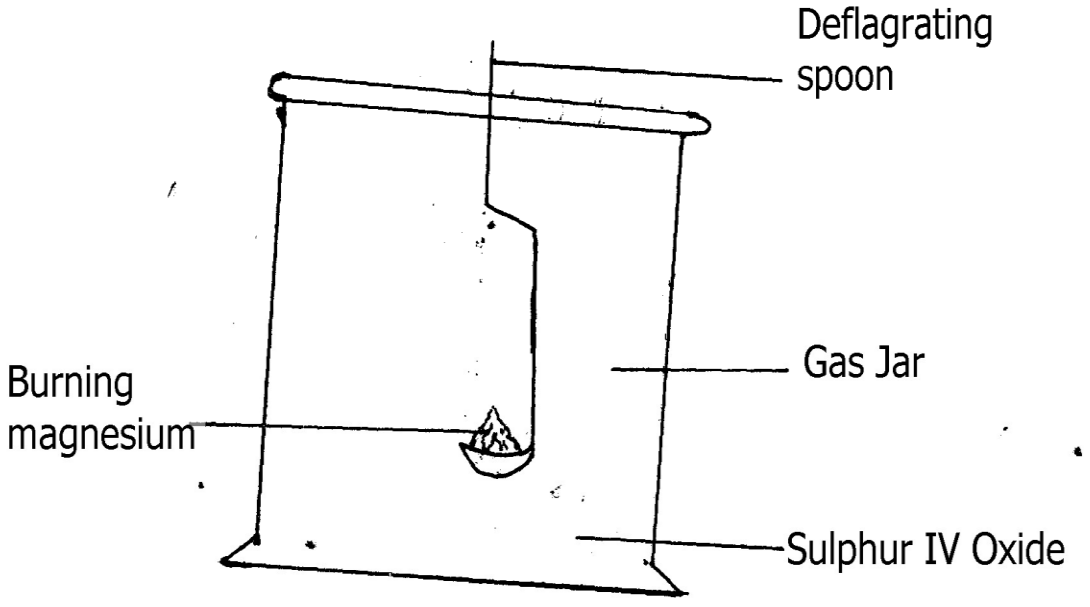
a) Name the type of radiation between

i) $^{232}_{90}Th \rightarrow {}^{228}_{89}Ra$ **(1mk)**

ii) $^{228}_{88}Ra \rightarrow {}^{228}_{89}AC$ **(1mk)**

iii) State one use of radioisotopes. **(1mk)**

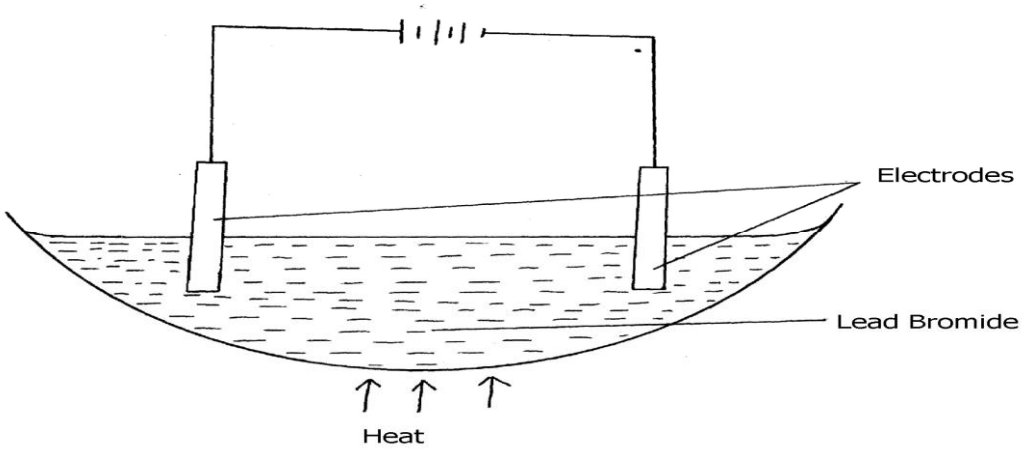
16. A piece of burning magnesium was lowered into a gas jar full of sulphur (IV) oxide gas as shown in the diagram below.



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

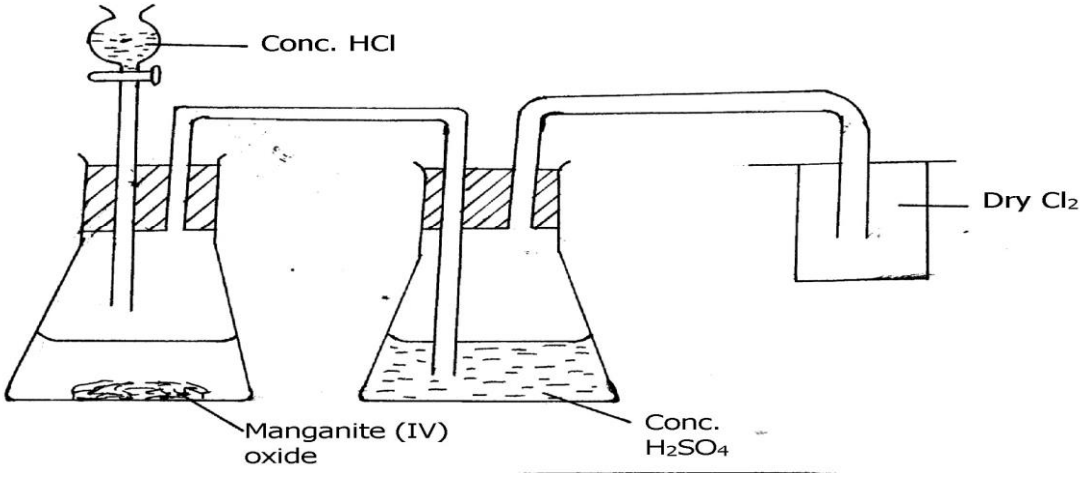


a) Label the anode . **(1mk)**

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.

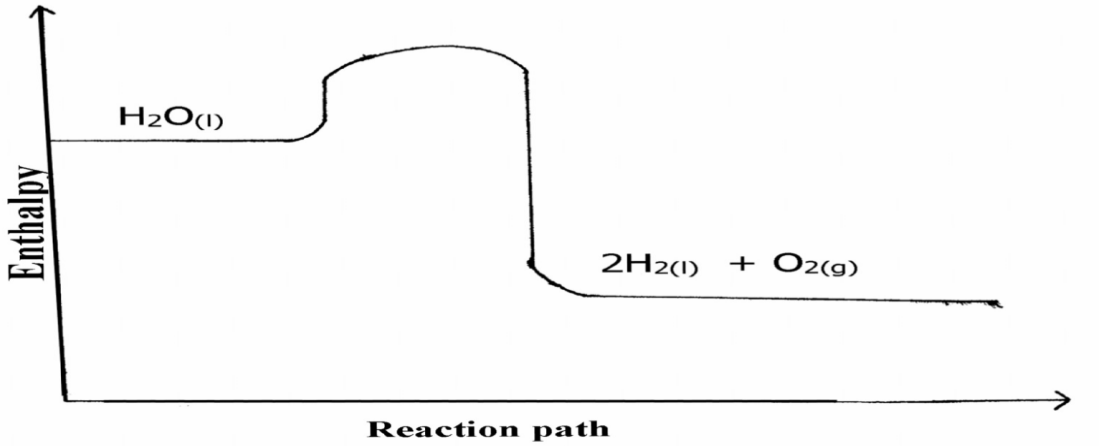


a) What is the function of manganese (IV) oxide in the preparation of chloride. **(1mk)**

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



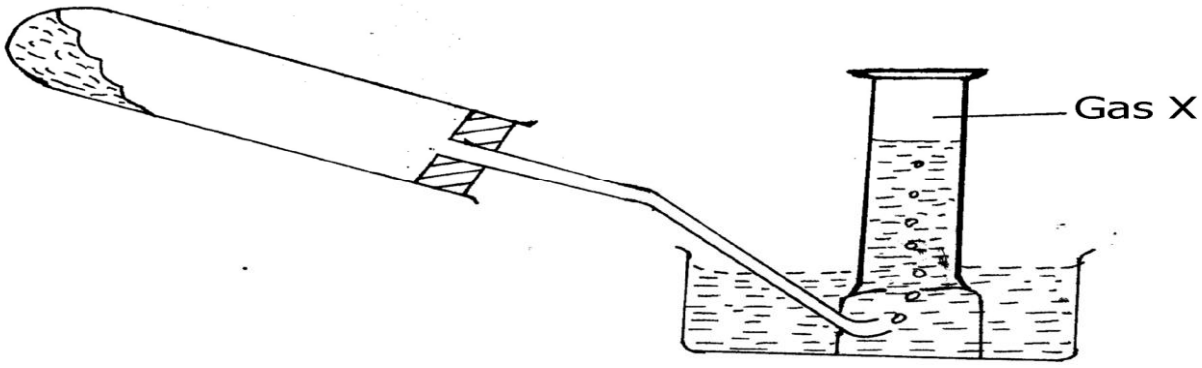
a) i) State whether the reaction is endothermic or exorthemic. **(½ mk)**

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.

$X^{+2}_{(aq)} + 2e^- \longrightarrow X(s) \quad E^\theta = +0.25V$

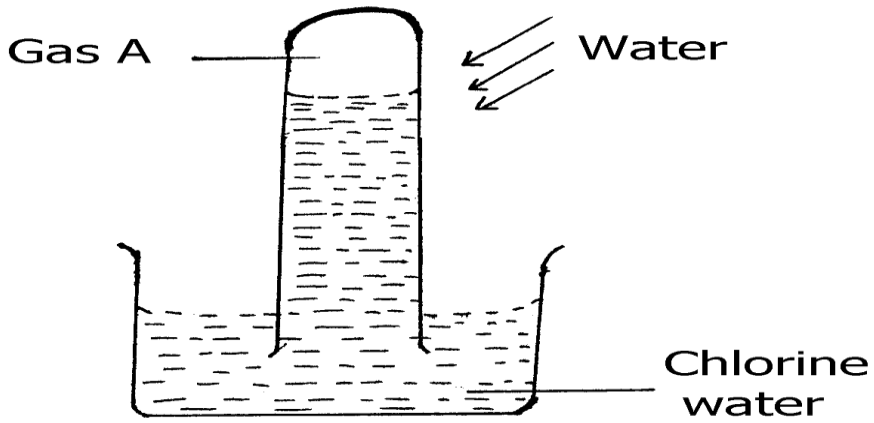
$Y^{+2}_{(aq)} + 2e^- \longrightarrow Y(s) \quad E^\theta = +0.34V$

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)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 1 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

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)**

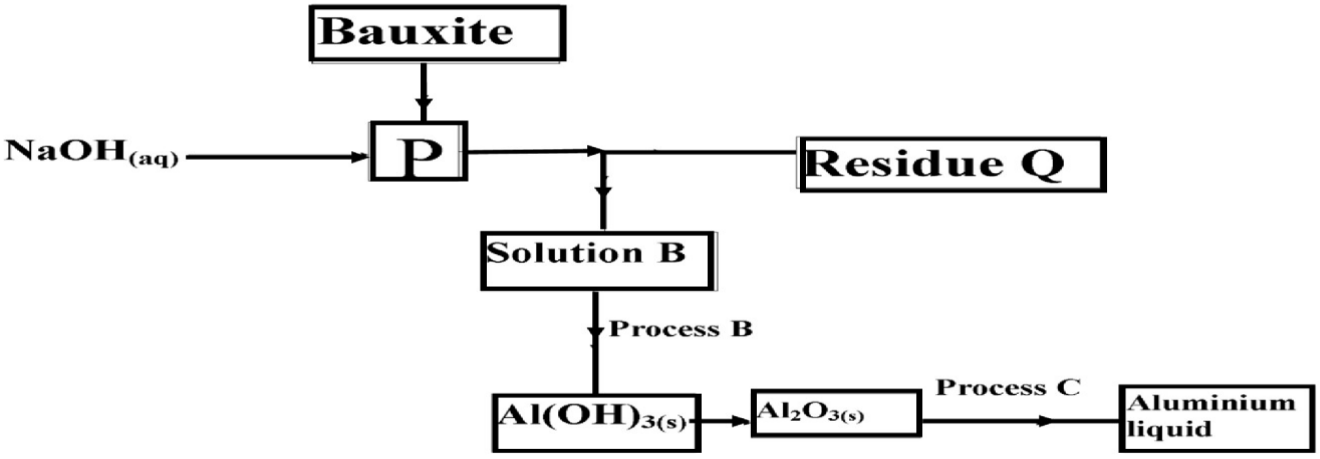
e) How many moles of carbon (IV) oxide were in the maximum produced from this reaction (M.G.V at s.t.p 22.4 litre) **(1mk)**

f) What mass of copper (II) carbonate that will have reacted with the acid after 100 seconds. (Cu = 64 ,C =12 O =16) **(2mks)**

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)**

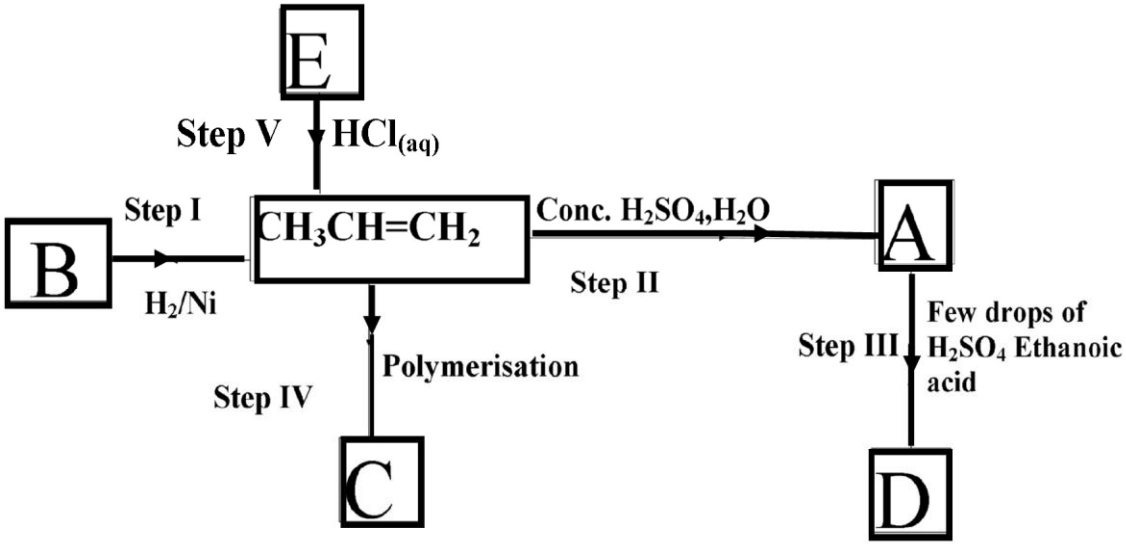
iii) Explain the following observation

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 .....

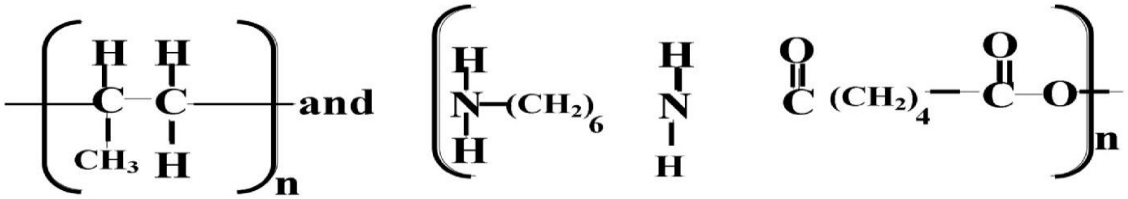
ii) State the type of reaction taking in

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.



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.

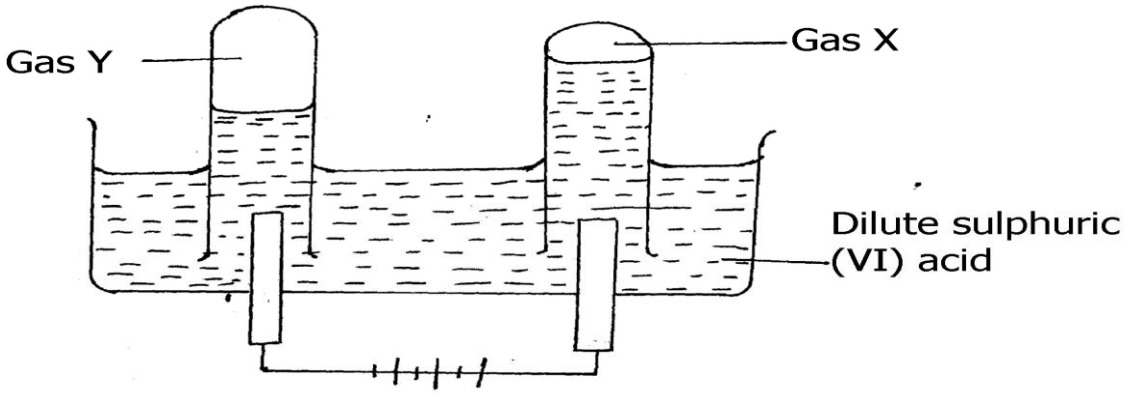


i)What name is given to the type of cleansing agent prepared by the method shown in the scheme. **(1mk)**

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

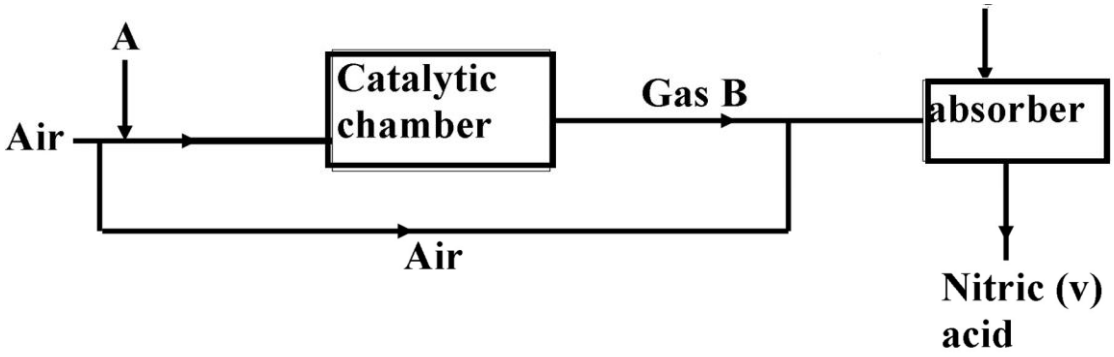
i) In the test – tube. **(1mk)**

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							**B**
					C	**D**	
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)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 2 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

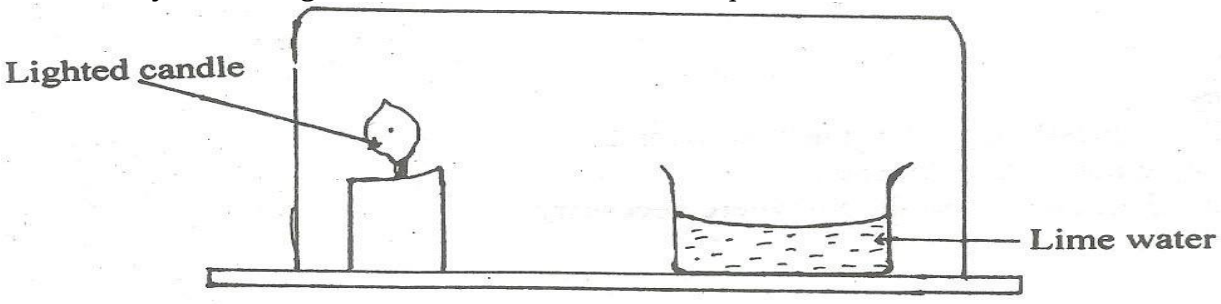
a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1. Use the information in the table below to determine the relative atomic mass of copper.**(2 mks)**

Isotope	Fractional abudance
$^{65}_{29}Cu$	0.31
$^{63}_{29}Cu$	0.69

2. Study the arrangement below and answer the question that follows.



Explain what will be observed after some time. **(3 marks)**

3. Briefly explain industrial application of the following processes.

(a) Crystallisation. **(1 ½ marks)**

(b) Fractional distillation. **(1 ½ marks)**

4. Four solutions of pH 7, 2, 8.5 and 13 respectively were each reacted with calcium turnings. In which of the solutions would hydrogen gas be produced. Explain each case. **(3 marks)**

(i) _____

(ii) _____

5. Study the information in the table below and answer the questions that follow.

	Electronic arrangement	Radius (nm)

(a) Explain why the ionic radius of K^+ is greater than that of Na^+. **(1 mark)**

(b) Account for the difference in ionic radius of Mg^{2+} and Na^+. **(2 marks)**

6. Use the following equations to determine the heat evolved when aluminium metal is reacted with iron (III) oxide. **(3 marks)**

$2Al(s) + \longrightarrow 3/2O2(g)\ Al2O3(s)$; $\Delta H, = -1673.6jKmol\text{-}1$

$2Fe(s) + \longrightarrow 3/2O2(g)\ Fe2O3(s)$; $\Delta H2 = -836.8kJmol\text{-}1$

7. Describe how you would prepare a dry sample of zinc carbonate in the laboratory starting with zinc chloride solid. **(3 marks)**

8. The solubility of salt Y at 60^0C is 40g/100g of water and 48g/100g of water at 100^0C.

(i) How much salt of Y would satulate 190g of water at 100^0C. **(1 ½ marks)**

(ii) 150g of saturated solution of Y at 100^0C is cooled to 60^0C. Calculate the mass of Y that crystallizes out. **(1 ½ marks)**

9. Below are the bond dissociation energies of some elements.

Bond	Bond dissociation energy
C – C	343 $kJmo^{-1}$
C – H	414 $kJmo^{-1}$
H – H	435 $kJmo^{-1}$
$C_{(s)} \longrightarrow C_{(g)}$	711 $kJmo^{-1}$

Use this information to calculate the heat of reaction for:-

$2C_{(s)} + 3H_{2(g)} \longrightarrow C_2H_{6(g)}$ **(3 marks)**

10. (I) An oxide of carbon contains 42.8g by mass of carbon and has R.M.M. of 28. What is its molecular formular? **(3 marks)**

(C = 12; O = 16)

(II) Sulphur dioxide gas was bubbled into acidified potassium dichromate and iron (iii) sulphate solutions respectively. Explain the observations made in each case.

(i) With potassium dichromate. **(1 ½ marks)**

(ii) With iron (III) sulphate. **(1 ½ marks)**

12. A known volume of ozonised oxygen diffuses through a small hole in 55 seconds; whereas the same amount of oxygen mixed with chlorine takes 67 seconds under the same conditions. Determine the molecular mass of ozone. (Cl = 35.5 ; O = 16) **(3 marks)**

13. (a) Give the name of the following compound $CH_3CH = CHCH_2CH_3$. **(1 mark)**

(b) Ethane and ethene react with bromine according to the equations given below.

(i) $C_2H_6(g) + Br_2(g) \xrightarrow{\text{u.v light}} C_2H_5Br(l) + HBr(g)$

(ii) $C_2H_4(g) + Br_2(g) \longrightarrow C_2H_4Br_2(l)$

Name the type of bromination reaction that takes place in:-

(i) _____

(ii) _____ **(2 marks)**

14. An organic compound with the formular $C_4H_{10}O$ reacts with potassium metal to give hydrogen gas and a white solid.

(a) Write the structural formular of the compound. **(1 mark)**

(b) To which homologous series does the compound belong. **(1 mark)**

(c) Write the equation for the reaction between the compound and potassium metal. **(1 mark)**

15. In the Haber process, the optimum yield of ammonia is obtained when a temperature of 450^0C, a pressure of 200 atmospheres and an iron catalyst are used.

$N_{2(g)} + 3H_{2(g)} \quad \Delta H = -92kJ. \quad \rightleftharpoons 2NH_{3(g)}$

(a) How would the yield of ammonia be affected if the temperature was raised to 600^0C. Explain. (2 marks)

(b) Explain the effect on the yield of lowering the pressure below 200 atmospheres. (1 ½ marks)

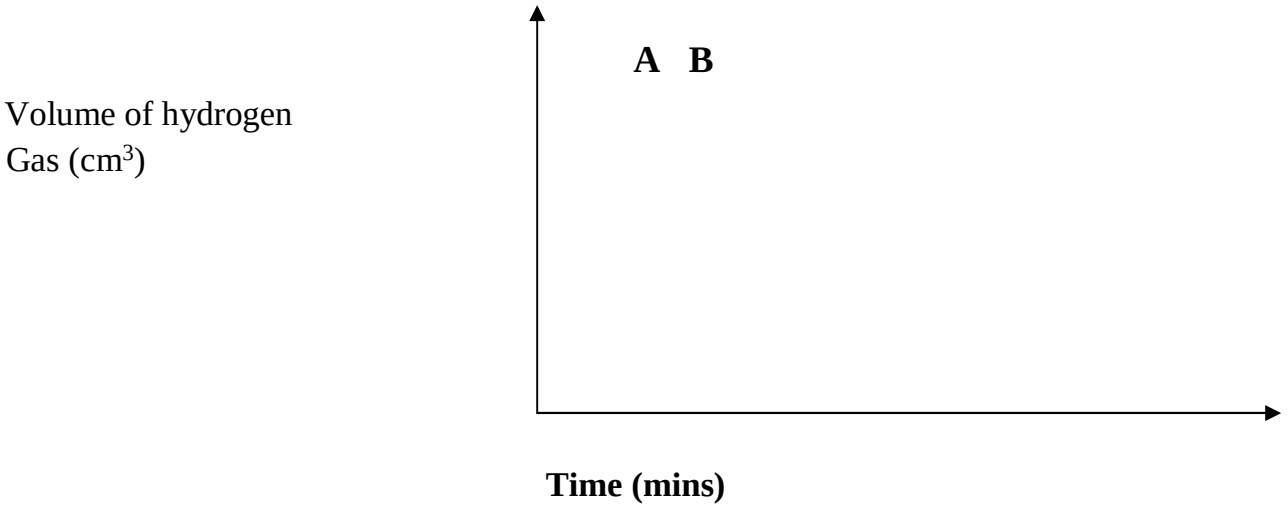
16. Two experiments were carried out as follows and the volume of hydrogen gas evolved measured at intervals of 10 seconds for 100 seconds.

(i) 8cm of magnesium ribbon was added to 1M $HCl_{(aq)}$

(ii) 8cm of magnesium ribbon was added to 0.5M $HCl_{(aq)}$.

7.

Graphs of volume of hydrogen gas evolved against time were plotted as shown below.



(a) Which of the graphs was obtained for reaction (i). Explain. **(2 marks)**

(b) Explain the general shape of the graphs. **(1 mark)**

17. The set-up below was used to prepare hydrogen chloride gas and react it with iron powder. Study it and answer the questions that follow.

Concentrated sulphuric acid Combustion tube Iron powder Glass wool Heat To pump Sodium chloride Sodium hydroxide solution

At the end of the reaction, the iron powder turned into light green solid.

(a) Identify the light green solid. **(1 mark)**

(b) At the beginning of the experiment; the pH of the solution in container 'L' was about 14; at the end; the pH was found to be 2. Explain. **(2 marks)**

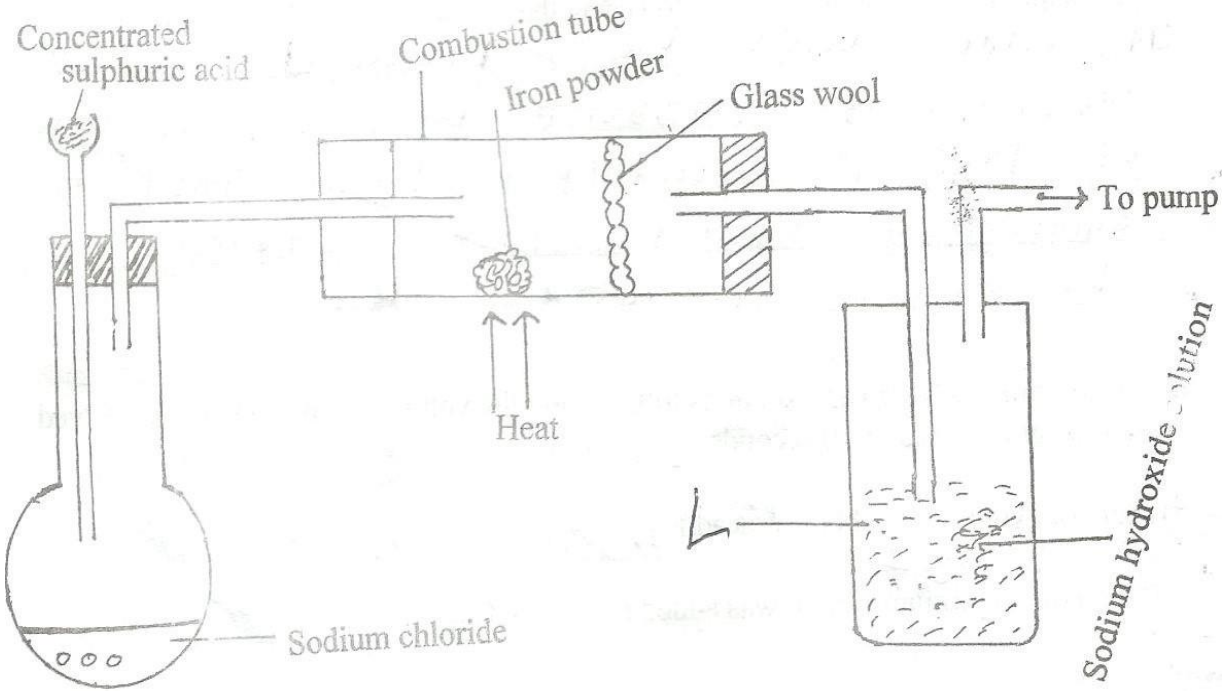
18. Ammonia gas was passed into water as shown below.



(a) When a red litmus paper was dropped into the resulting solution; it turned blue. Give a reason to this observation. **(1 mark)**

(b) What is the function of the funnel. **(1 mark)**

19. During purification of copper by electrolysis, 1.48g of copper were deposited when a current was passed through aqueous copper (II) sulphate for 2 ½ hours. Calculate the amount of current that was passed. (Cu = 63.5; IF = 96500C) **(3 marks)**



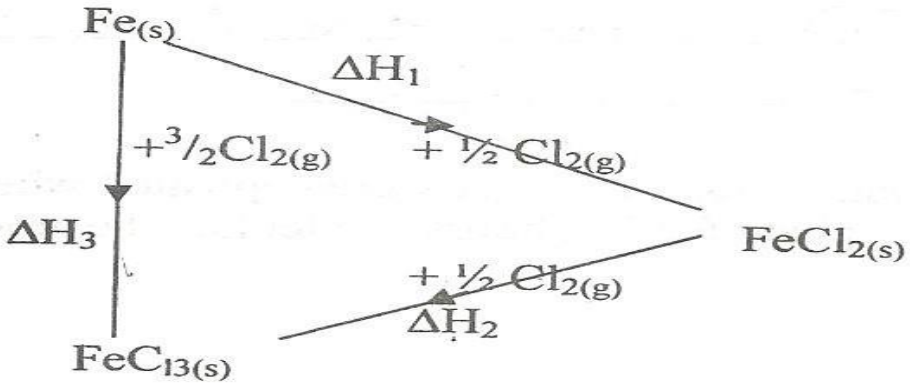
20. Draw a dot (.) and cross (x) diagram to show bonding in carbon (II) oxide. **(2 marks)**

21. Write the discharge equations (half equations) for the electrode reactions when molten sodium chloride is electrolysed using graphite electrodes.

Anode **(1 mark)**

Cathode **(1 mark)**

22. Study the energy diagram and then answer the questions that follow.



(a) What does ∧H 1 and ∧H 3 represent

(i) ΔH_1 _____ **(1 mark)**

(ii) ΔH_3 _____ **(1 mark)**

(b) Write down the relationship between $\Delta H_{1(l)}$, ΔH_2, and ΔH_3. **(1 mark)**

23. Complete the diagram below to show how particles from a radioactive source can be distinguished from each other. Label your diagram clearly.



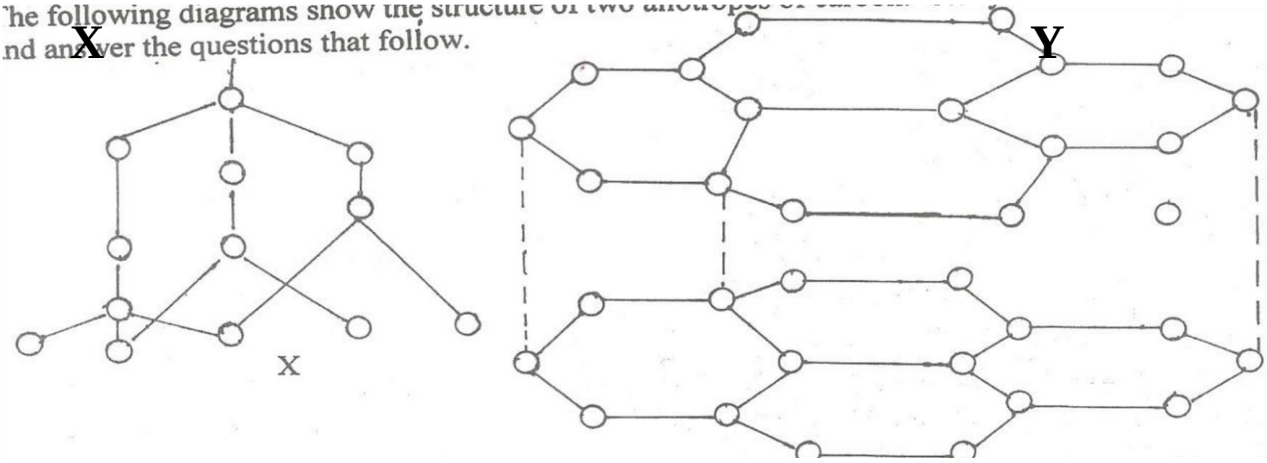
24. The diagram below represents a set-up that was used to react iron with water. Study it and answer the questions that follow.

(a) Write the equation for the reaction that takes place. **(1 mark)**

(b) Why should it not be advisable to use potassium in place of iron in the above set-up.**(1 mark)**

(c) The glass wool is heated prior to heating of iron. Explain this procedure. **(1 mark)**

25. The following diagrams show the structure of two allotropes of carbon. Study them and answer the questions that follow.



(i) Name allotropes **(1 mark)**

X _____

Y _____

(ii) Give ONE use of X. **(1 mark)**

(iii) Which allotrope conduct electricity? Explain. **(1 mark)**

26. The formula below represent the active ingredients in a soap and a detergent respectively.

(i) $CH_3(CH)_{16}\ COO^-\ Na^+$

(ii) $CH_3\ (CH_2)_6\ CH\ CH_3\ CH_2\ SO_3^-\ Na^+$

(a) Explain why 1 is not suitable for washing using water from a river. **(1 mark)**

(b) Give one advantage and one disadvantage of II. **(2 marks)**

27. Use the following standard electrode potentials to answer the questions that follow.

$Zn^{2+}_{(aq)} + 2e^-$ $Zn_{(s)}$ $E^{\theta}V = -0.76$

$Cl2(g) + 2e-$ $2Cl-(aq)$ $E\theta V = + 1.36$

(a) Calculate the e.m.f of the following cell:

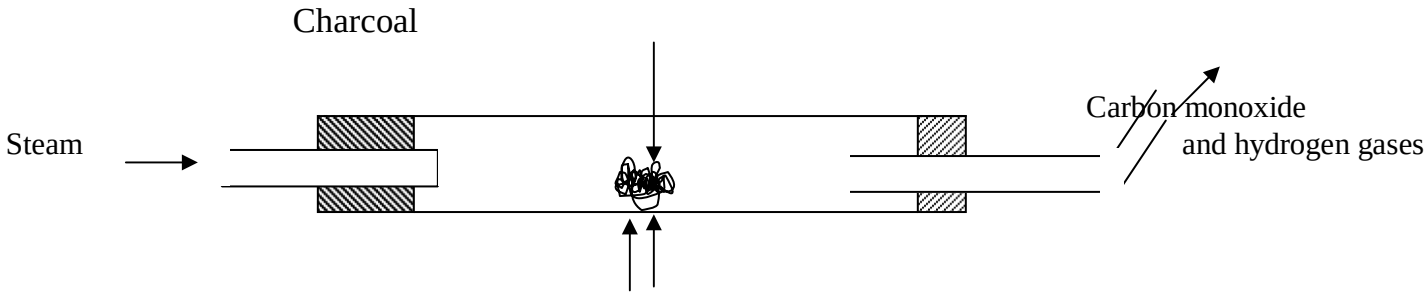
Zn(s) / Zn2+(aq) // 2Cl-(aq) / Cl2(g) **(2 marks)**

(b) Write down the equation for the overall cell reaction. **(1 mark)**

28. (a) Suppose $180cm^3$ of a 2.0M solution is diluted to $1.0dm^3$. What will be the concentration of the resulting solution. **(2 marks)**

(b) Why is water not used to put off oil fires ? **(1 mark)**

29. When steam was passed over heated charcoal as shown in the diagram below hydrogen and carbon monoxide gases were formed.



(a) Write the equation for the reaction which takes place. **(1 mark)**

(b) Name one use of carbon monoxide gas which is also a use of hydrogen gas. **(1 mark)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 2 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*

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

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

QUESTIONS.

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

								A
B				**G**		**H**	**E**	
	J		**I**	**L**				**C**
D							**M**	
Y								

(i) What name is given to the family of elements to which A and C belong? **1 mark)**

(ii) Write the chemical formula of the sulphate of element D.

(iii) Which letter represents the most reactive **(2 marks)**

(a) Metal _____

(b) Non-metal _____

(iv) Name the bond formed when B and H react. Explain your answer. **(2 marks)**

(v) Select one element that belong to period 4. **(1 mark)**

(vi) Ionic radius of element E is bigger than the atomic radius. Explain. **(2 marks)**

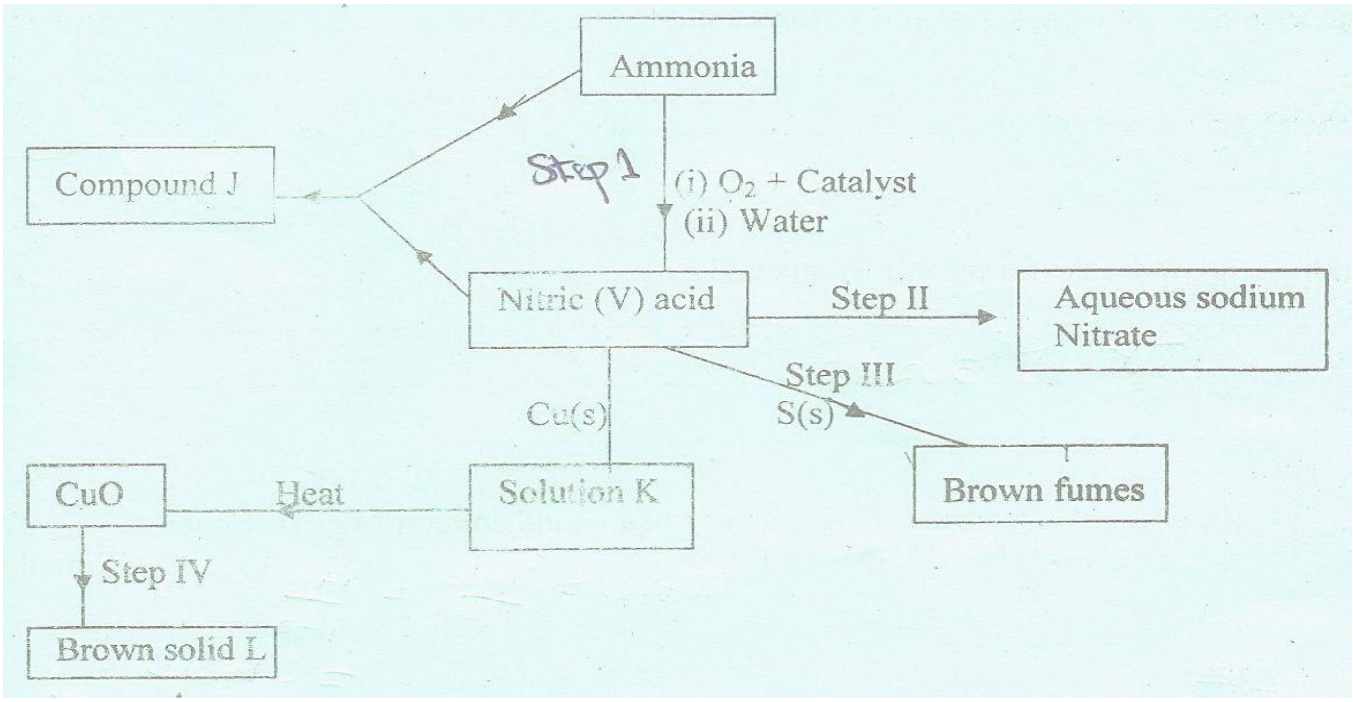
(vii) The electron configuration of a divalent anion of element N is 2.8.8. Induce the position of element N on the periodic table drawn above. **(1 mark)**

(viii) The oxide of G has a lower melting point than the oxide of L. Explain. **(1 mark)**

(ix) How do the atomic radii of I and C compare. Explain. **(2 marks)**

(x) Explain the trend in the 1st ionization energies of the elements J, I and L. **(1 mark)**

2. (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 manufacture of ammonia. **(1 mark)**

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

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

(iv) Identify the process in step II _____ **(1 mark)**

(v) Using an appropriate equation, explain how the reaction in step III occurs ? **(2 marks)**

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

(vii) (a) (i) Write the formula of compound J. **(1 mark)**

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

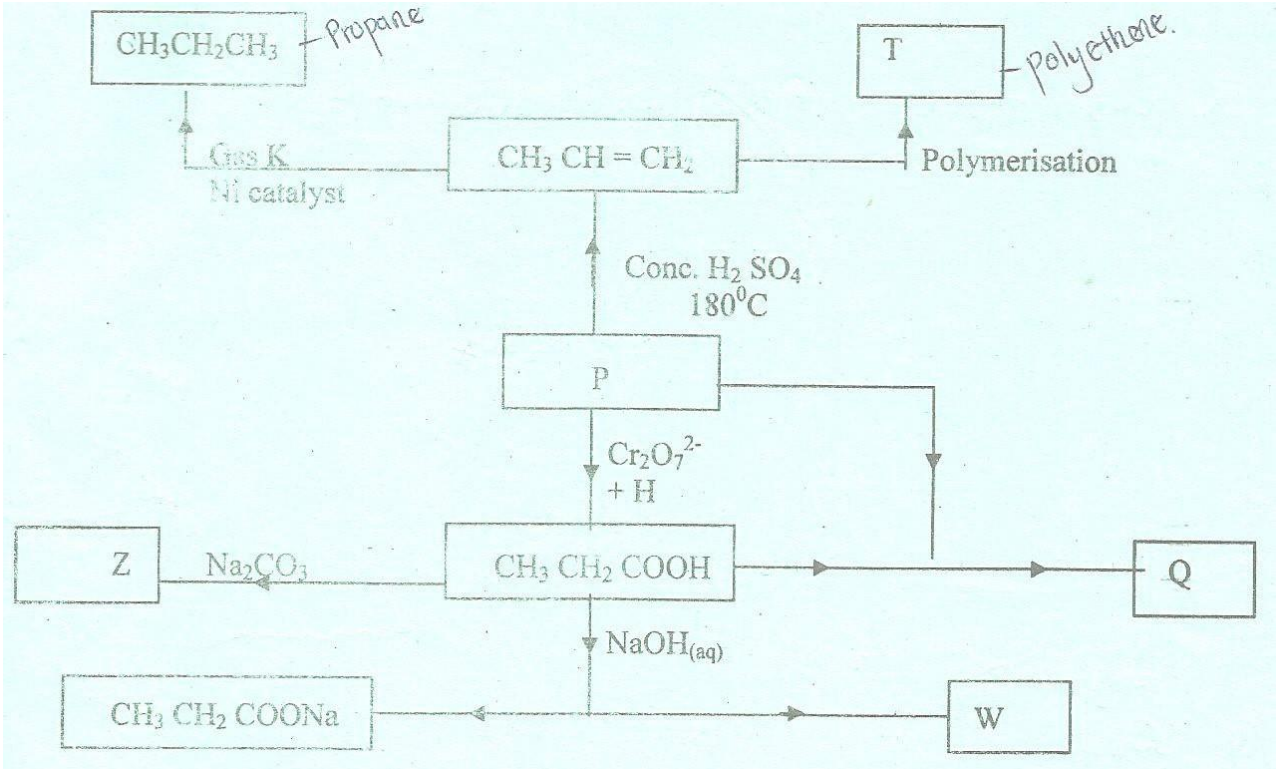
(b) State two advantages of ammonium phosphate over ammonium nitrate. **(2 marks)**

3. **(a)** Give the IUPAC names of the following compounds. **(2 marks)**

(i) $HCC\,CH_2\,CH_3$ _____

(ii) $H_2\,CCHCH_2\,CH_3$ _____

(b) Study the following diagram and answer the questions that follow.



(i) Identify substances **(2 marks)**

Q _____

P _____

W _____

Gas K _____

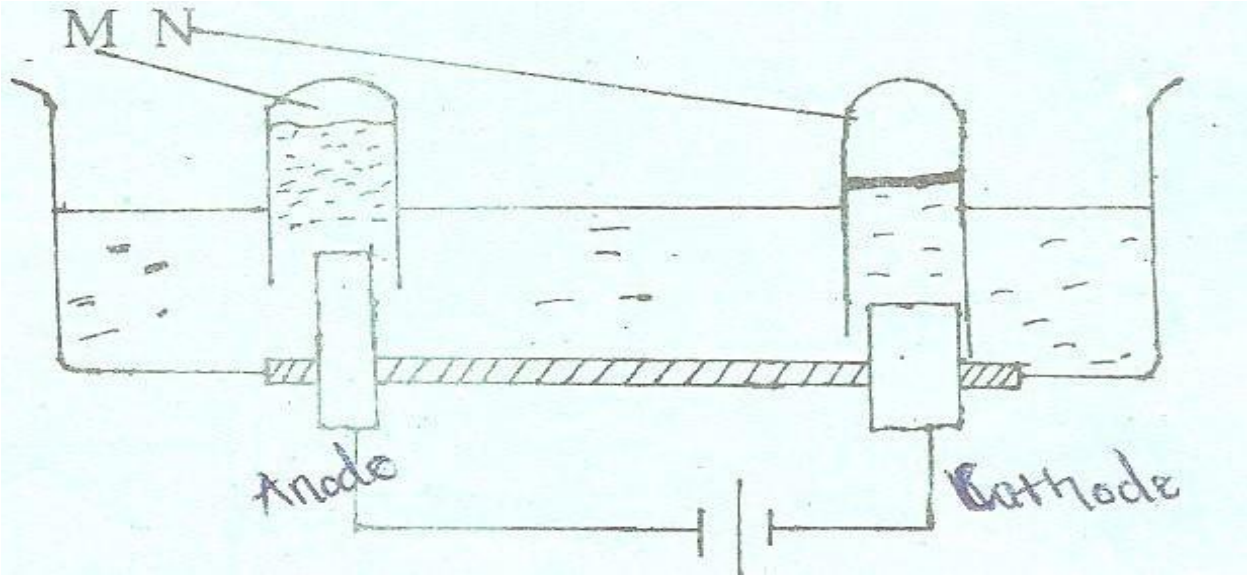
(ii) Draw the structure of compound P and state one use.

(iii) Write the equation for the reaction leading to the formation of the products in Z.

(iv) Show the general structure of polymer T and give its name.

(v) To which class of organic compounds does compound Q belong to ?

4. The set-up below represents electrolysis of dilute sulphuric (VI) acid.



(a) Identify gases M and N **(1 mark)**

M _____

N _____

(b) Write an ionic equation for the production of gas M. **(1 mark)**

(c) At what electrode does reduction take place. Explain your answer. **(2 marks)**

(d) State the most suitable electrodes that can be used in this experiment.

Explain your answer. **(2 marks)**

(e) The standard electrode potentials for some half cells are given below.

$Ag^{+}_{(aq)} + e \quad Ag_{(s)}$ + 0.80

Cl2(g) + 2e 2Cl-(aq) + 1.36

$Zn2+(aq) + 2e \longrightarrow Zn(s)$ -0.76

$Ba2+(aq) + 2e \longrightarrow Ba(s)$ -2.90

(i) Arrange the metals in order of reactivity. **(1 mark)**

(ii) Calculate the E.m.f of the cell

$Ag/Ag^{+}_{(aq)}$ and $Ba / Ba^{2+}_{(aq)}$ **(2 marks)**

(iii) What would happen if a cell with chlorine and zinc ions, the anode was made of zinc. Explain your answer. **(2 marks)**

5. A piece of marble chip (calcium carbonate) is put in a beaker containing excess of dilute hydrochloric acid which is placed on a reading balance. The mass of the beaker and its contents is recorded every two minutes, as shown in the table.

Time (min)	0	2	4	6	8	10	12
Mass(g)	126.4	126.3	126.2	126.1	126.0	126.0	126.0

(a) Why is there a continuous loss of mass of the reaction mixture. **(1 mark)**

(b) Write an equation for the reaction taking place. **(1 mark)**

(c) State two different ways by which the reaction could have been made more rapid. **(2 marks)**

(d) Why does the mass remain constant after 8 minutes. **(1 mark)**

(**e)** State the observations that would be made if a few drops of silver nitrate solution was added to $1cm^3$ of the resulting solution followed by ammonia solution. **(2 marks**

(f) State one environmental effect that excess carbon (IV) oxide in the air causes. **(1 mark)**

(g) State two uses of carbon (IV) oxide. **(2 marks)**

6. In an experiment to determine the molar heat of neutralization of hydrochloric acid with sodium hydroride, students of Furaha Secondary school reacted $100cm^3$ of 1M hydrochloric acid with $50cm^3$ of 2M sodium hydroxide solution. They obtained the following results.

Initial temperature of acid = 25.0^0C

Initial temperature of base = 25.0^0C

Highest temperature reached

With the acid – alkali mixture = 34.0^0C

(a) Define the term molar heat of neutralization. **(1 mark)**

(b) Write an ionic equation for the neutralization reaction between hydrochloric acid and sodium hydroxide. **(1 mark)**

(c) Calculate :

(i) The change in temperature. (ΔT) **(1 mark)**

(ii) The amount of heat produced during the reaction.

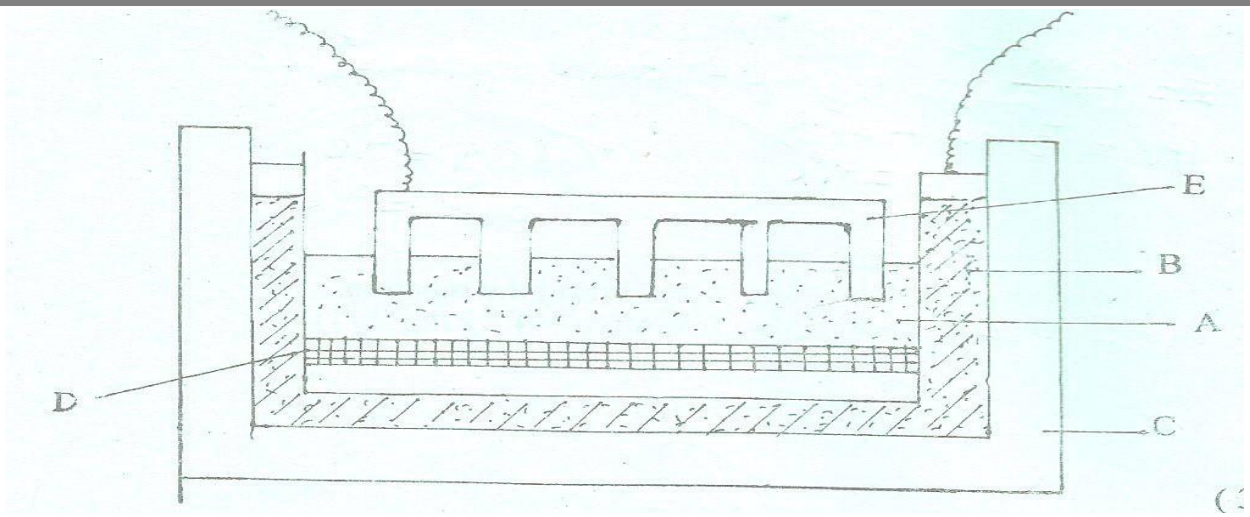
(Specific heat capacity of solution = 4.2 $kJkg^{-1}k^{-1}$) **(2 marks)**

(iii) The molar heat of neutralization of sodium hydroxide. **(2 marks)**

(d) Write the thermochemical equation for the reaction. **(1 mark)**

(e) Draw an energy level diagram for the reaction. **(2 marks)**

7. Aluminium is extracted from its ore by electrolysis method. The current required in the process is 4,000 amperes. Study the diagram and answer the questions that follow.



(a) Name: **(3 marks)**

(i) Electrolyte A _____

(ii) Substance D _____

(iii) Electrode E _____

(b) Name the material from which the electrodes are made. **(1 mark)**

(c) **(i)** Write the equation that produces aluminium metal. **(1 mark)**

(ii) Explain why E has to be replaced from time to time. **(1 mark)**

(iii) Why is cryolite added to the electrolyte before the process of electrolysis ? **(1 mark)**

(d) Name the ore from which aluminium is extracted.

(e) A current of 25 amps was passed through molten aluminium oxide for 36 hrs.

Calculate the amount of aluminium deposited in kg.

(Al = 27, IF = 96500C) **(3 marks)**

(f) Give two industrial uses of aluminium. **(2 marks)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 3 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS.

1. Study the nuclear equation below to answer the questions that follow.

$$^{14}_{6}C \longrightarrow {}^{14}_{7}x + {}^{x}_{y}y$$

i) Identify particle Q. (1mark)

ii) Determine the values of N and M.

x **(1mk)**

Y **(1mk)**

2. Hydrogen Sulphide gas reacts with moist chlorine gas according to the equation below:

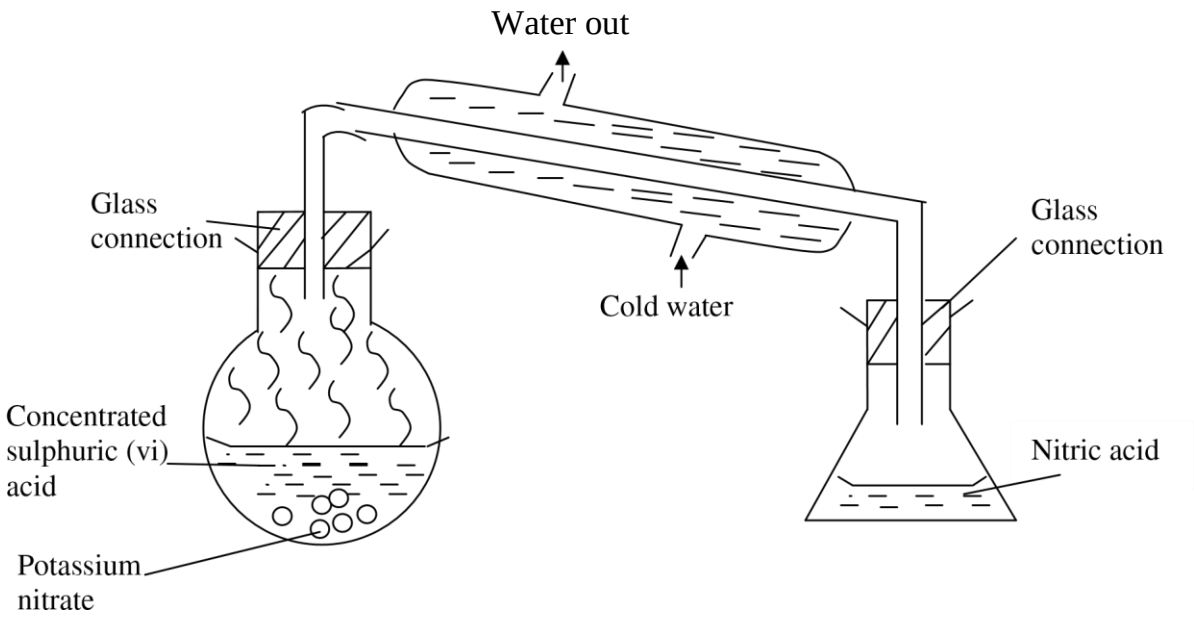
$H_2S(g) + Cl_2(g) \longrightarrow S(s) + HCl(g)$

i) Which substance is the reducing agent? Explain. **(3marks)**

ii) State the observation made when this reaction occurs. **(1mark)**

3. 15.8g of Sodium nitrate saturated 29.3cm^3 of water at 32^{0}C. Determine the solubility of Sodium nitrate at 32^{0}C. (Density of water =1g/cm^3). **(3marks)**

4. The apparatus below was used to prepare a sample of nitric acid in a laboratory.



i) Identify one mistake in the set-up. **(1mark)**

ii) Why are all the apparatus made of glass? **(1mark)**

iii) Why is cold-water put from the bottom instead of from the top? **(1mark)**

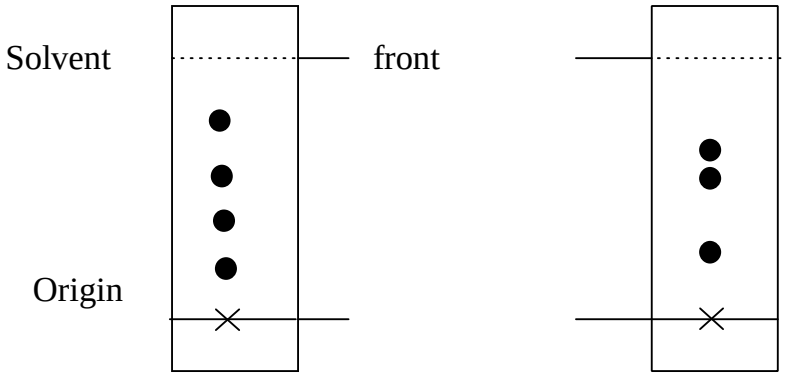
5. Calculate the number of Sulphate ions in $100cm^3$ of 0.2m Aluminium Sulphate solution. ($L=6.02x10^{23}$ particles). **(3marks)**

6. Complete the table below.

Metal	Main ore	Formula of main compound
Aluminium		
Copper		

(2mks)

7. Paper chromatography was carried out to investigate presence of amino acids in beans. Study the chromatograms below to answer the question that follow:-



Amino acids Beans Chromatogram
Chromatogram

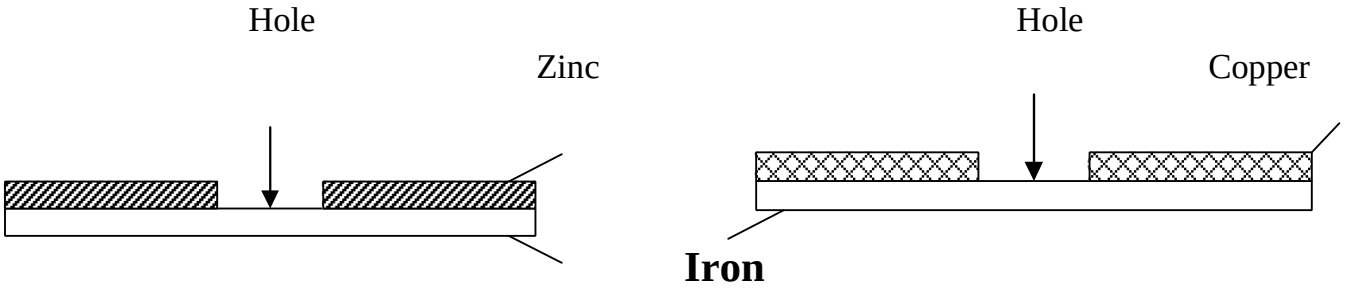
What conclusion can be drawn from these results? **(2marks)**

8. Calculate the oxidation number of manganese in:

i) $KMnO_4$ **(1mark)**

ii) $MnCl_2$ **(1mark)**

9. Below are cross-sections of two pieces coated with Zinc and Copper respectively.



Which piece would rust when the holes were filled with water and left for sometime? Explain **.** **(2marks)**

10. Name the following organic compounds.

i) $CH_3CH_2CH(CH_3)\ CH_3$ **(1mark)**

ii) CH_2CHCH_2Cl **(1mark)**

iii) $CH_2CH_2CH_2CH_{2n}$ **(1mark)**

11. Study the table below to answer the questions that follow.

Solution	X	W	Z	Y
P^H value	2.2	7.2	6.5	13.5

i) Which solution is likely to be:

I. Acid rain **(1mark)**

II. Potassium hydroxide **(1mark)**

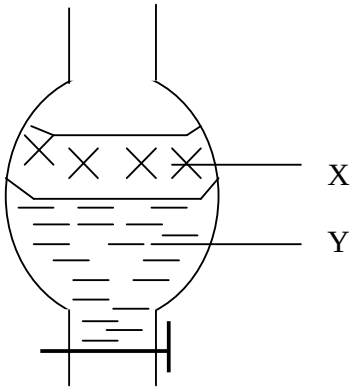
ii) A substance U reacted with both solutions X and Y

What is the nature of substance U? **(1mark)**

12. i) The percentage of $^{69}_{31}X$ is 60% and $^{71}_{31}X$ is 40% for an isotopic element X. Calculate the relative atomic mass of X. **(2marks)**

ii) Why do the two species have the same chemical properties? **(1mark)**

13. In separating a mixture of iodine and Sodium Chloride a student added water and Carbon tetrachloride to the mixture, stirred and poured the contents in a separating funnel shown below.



i) What is the purpose of adding Carbon tetrachloride? **(1mark)**

ii) Name the major components of the layer labeled Y. **(1mark)**

14. Explain why the electrical conductivity of metals decrease with increase in temperature. **(2marks)**

15. Calculate the amount of Calcium Carbonate that would remain if 17.0g of Calcium Carbonate are reacted with 0.25moles of dilute hydrochloric acid. (Ca=40, C=12, O=16). **(3mks)**

16. Chlorine gas was bubbled through a solution of Potassium iodine in a boiling tube.

i) State the observations that were made. **(1mark)**

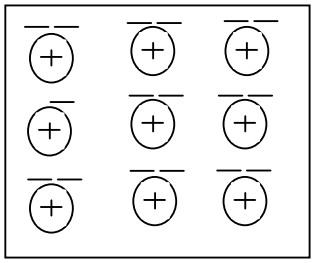
ii) Name the oxidizing agent in the reaction. Explain. **(2marks)**

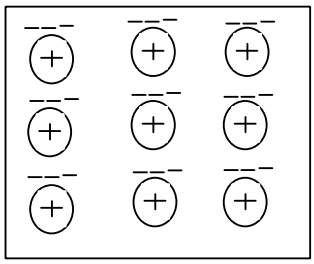
17. Name the cations and anions responsible for permanent hardness of water.

i) Cations **(1mark)**

ii) Anions **(1mark)**

18. The structures below are sections of models of the structures of elements P and Q.





Key

⊕ Charged nucleus

An electron

i) In which group of the periodic table do the elements belong?

I. P **(1mark)**

II. Q **(1mark)**

ii) Which of the two elements is a better conductor of electricity? Explain. **(1mark)**

19. Use the information below to answer the questions that follow.

$KCl(s) \longrightarrow K^+(g) + Cl^-(g)$; $\Delta H1 = -701KJMol^{-1}$

$KCl(s) \longrightarrow K^+(ag) + Cl^-(aq)$; $\Delta H2 = +5KJMol^{-1}$

i) What name is given to ΔH_1? **(1mark)**

ii) Calculate the heat change for the process: **(2marks)**

$K^+(g) + Cl^-(g) \longrightarrow K^+(aq) + Cl^-(aq)$; $\Delta H3$(2mks)

20. When bromine gas reacts with aqueous Sodium hydroxide the equilibrium is established as shown below:

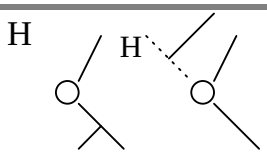
$Br_2(g) + 2OH^-(aq) \longleftrightarrow Br^-(aq) + OBr^-(aq) + H_2O(l)$

(Brown) (colourless)

State and explain the observations that would be made if a few drops of dilute Sulphuric (VI) acid were added. **(2marks)**

21. The structure of two molecules of water can be represented as shown below.

Y



X H H

i) Name the type of bonds X and Y

I. **X**……... **(1mark)**

II. **Y**……. **(1mark)**

ii) The table below gives some information about water and Methane.

Substance	Relative molecular mass	Boiling point (^{0}C)
Water	18	100
Methane	16	-161

Explain the difference between the boiling points of water and methane. **(1mark)**

22. Name the process that takes place when:

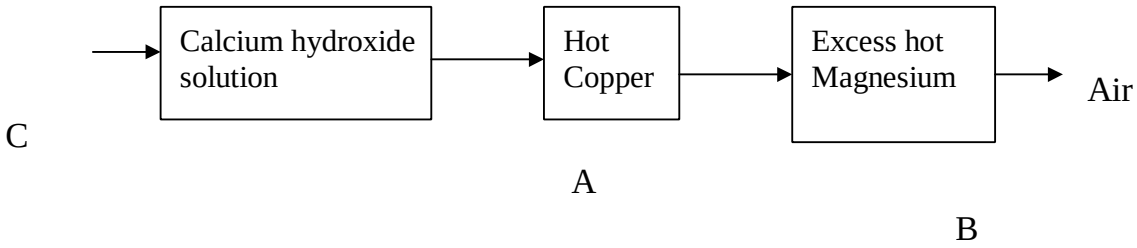
i) Fats or oils are hydrolysed using an alkali **(1mark)**

ii) A heavy nuclide is broken by fast moving neutron. **(1mark)**

iii) Sulphur is heated with natural rubber. (1mark)

23. Starting with Zinc metal describe how you would obtain a sample of solid zinc carbonate. **(3marks)**

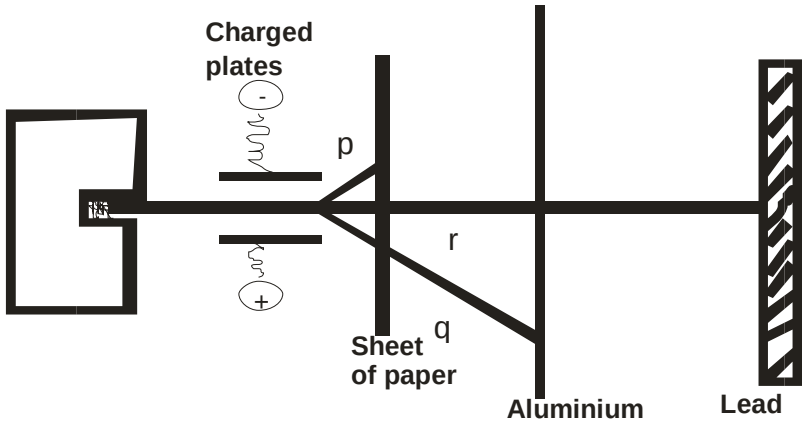
24. Air was passed through reagents as shown below.



i) State and explain the observations made when air is passed through chamber A for a long time. **(2marks)**

ii) Name one component in C. Explain **(1mark)**

25. Study the diagram below to answer the questions that follow.



Name the radiations p, q and r

i) p …… **(1mark)**

ii) q…… **(1mark)**

iii) r……...(1mark)

26. i) State the law of combining volumes of gases **(1mark)**

ii) What volume of methane would remain if a burner containing $40cm^3$ of methane gas burns in $40cm^3$ of enclosed air? (Assume oxygen is 20% by volume of air). (**2marks)**

27. Why does a luminous flame produce light and soot? **(3marks)**

28. 1.7g of ammonia gas was passed over excess heated Copper (Ii) oxide at s.t.p. Calculate the volume of ammonia gas that reacted. (N=1.4, H=1, molar gas volume at s.t.p =$22.4dm^3$) **(3marks)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 3 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1. The table below shows some information about elements X,Y,W and Z. The letters are not the actual symbols of the elements.

Element	Electron arrangement	Ion	Valency	Oxidation number
X	2.3			
Y	2.8.2			
W	2.7			
Z	2.5			

i) Complete the table by filling the missing information. **(6marks)**

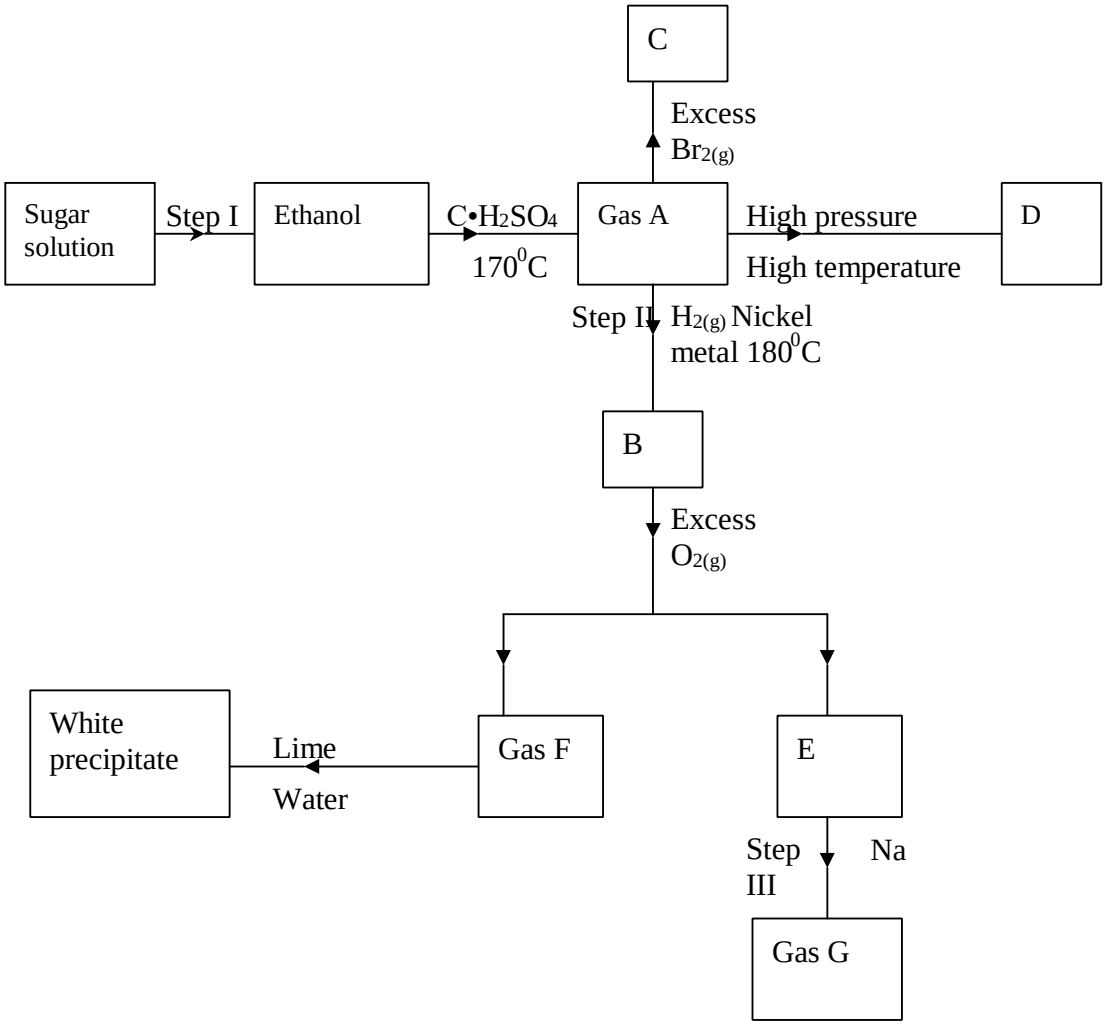
ii) Which elements belong to the same period? Explain your answer. **(2marks)**

iii) Name two elements that would conduct an electronic current. Explain your answer **(2marks)**

iv) Which of the elements in (iii) is a better conductor of electricity? Give a reason. **(2marks)**

v) Draw a dot (•) and cross (x) diagram to show the bonding in a compound formed between W and Z. **(2marks)**

2. Study the flow chart below to answer the questions that follow.



i) What name is given to the process in stepI? **(1mark)**

ii) Name the substances A, B, F and G.

I. A **(1mark)**

II. B **(1mark)**

III.F **(1mark)**

IV.G **(1mark)**

iii) Write the equation for the formation of:

I. C **(1mark)**

II.E and F **(1mark)**

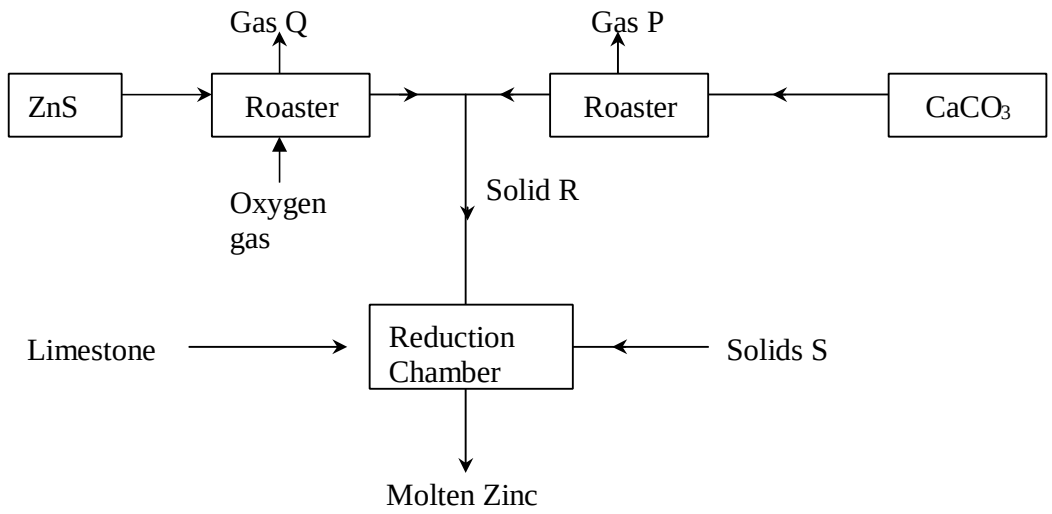
III. Gas G **(1mark)**

iv) What is the environmental effect of continued use of substance D? Explain your answer. **(2marks)**

v) Name the white precipitate? **(1mark)**

vi) What is the importance of the reaction in steps II in industry? **(1mk)**

3. The flow chart below shows the extraction of Zinc from two ores. Study it to answer the questions that follow.



i) Give the common names of the ores:

I. ZnS…… **(1mark)**

II. $CaCO_3$…… **(1mark)**

ii) Name the gases P and Q

I. P……**(1mark)**

II. Q……**(1mark)**

III. Name the solids R and S.

I. **R……1mark)**

II. **S…… (1mark)**

iv) Write a chemical equation for the reaction that produces Zinc metal. **(1mark)**

v) What is the purpose of adding limestone in the reduction chamber? **(1mark)**

vi) Give two uses of Zinc metal (2marks)

vii) Name two other industries that can be established alongside the zinc extraction plant. (2mks)

4. a) Study the standard reduction potentials given below to answer the questions that follow. The letters are not the actual symbols of the elements.

			$E^{\emptyset}$(Volts)
$F_2(aq)$ +	⟶	$2e^- 2F^-(aq)$;	+0.54
$A^{2+}(aq) + 2e^-$	⟶	A(s) ;	-0.45
$B^{2+}(aq) + 2e^-$	⟶	B(s) ;	+0.34
$2C^+(aq) + 2e^-$	⟶	$C_2(g)$;	0.00

i) Identify the strongest reducing agent. **(1mark)**

ii) Which element is likely to be hydrogen? Explain **(2marks)**

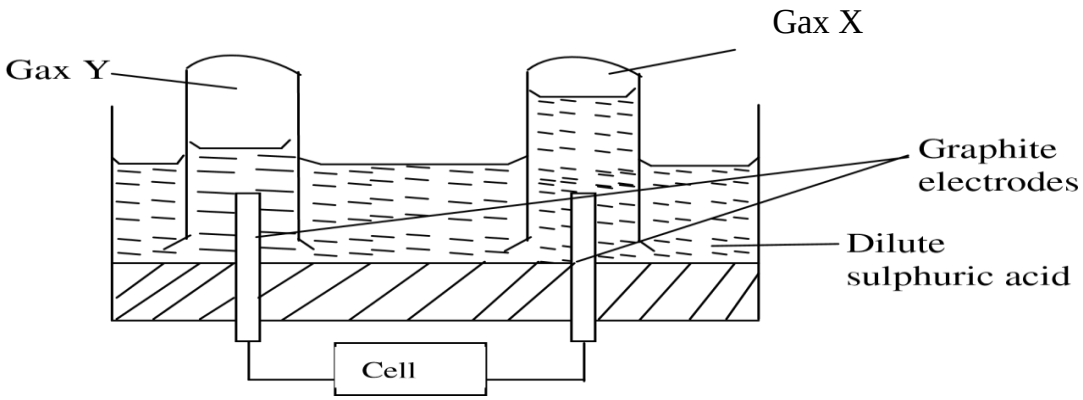
iii) Write an equation for the reaction which takes place when solid A is added to a solution containing B^{2+}ions **(1mark)**

iv) Calculate the $E^{\emptyset}$ value for the reaction in (iii) above. **(2marks)**

v) Draw a labeled diagram of the electrochemical cell that would be obtained in (iv) above **(3marks)**

b (i) What is meant by an electrolyte? **(1marks)**

ii) The diagram below shows the apparatus that can be used to electrolyse dilute Sulphuric acid. Study it to answer the questions that follow.



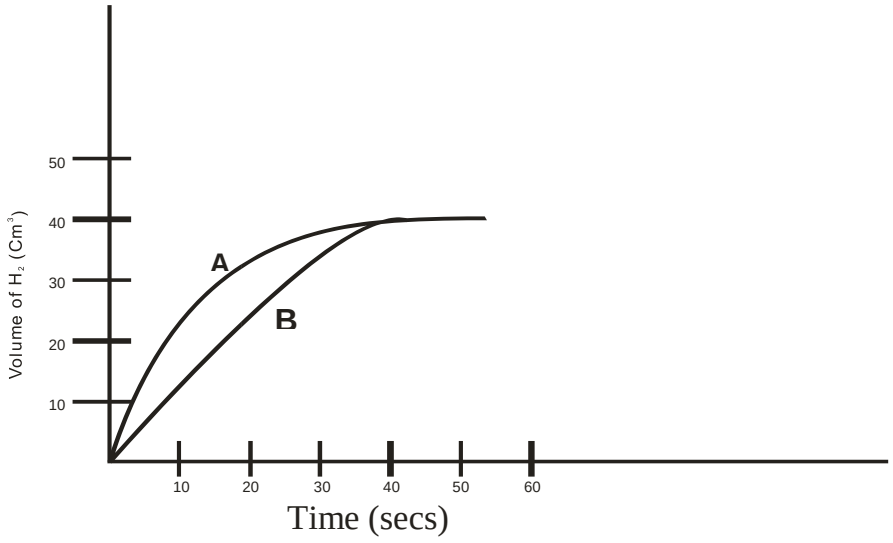
I. Identify the gases X and Y **(2mark)**

II. What happens to the concentration of the Sulphuric acid during the process with time? Explain **(2marks)**

III. During the electrolysis a current of 0.72A was passed through the electrolyte for 15 minutes. Calculate the volume of gas X produced

(1 Faraday = 96,500c, molar gas volume = 24dm3 at r.t.p). **(3marks)**

5. In an experiment to investigate the rate of reaction, 0.1g of a piece of magnesium was allowed to react with excess 1.0m hydrochloric acid. The results were used to draw a graph. The same experiment was repeated with 2.0m hydrochloric acid and a graph drawn. The results are shown in the graph below.



i) Which curve was obtained using 2m hydrochloric acid? Explain **(2marks)**

ii) Explain why the curves become horizontal where they meet. **(1mark)**

iii) Determine the number of moles of hydrogen gas that would be produced in the reaction. (Mg=24, H=1, Molar gas volume is 24dm^3). **(3mks)**

iv) Explain how the rate of reaction would be affected if the mixture is warmed. **(2marks)**

v) Explain why nitric acid is not used in preparing hydrogen gas. **(2marks)**

vi) State one industrial use of hydrogen gas. **(1mark)**

6. An experiment was done between lead (II) nitrate solution and Potassium iodine solution. 10cm^3 of 0.4M Potassium iodide solution was put in 10test-tubes and different volumes of 0.25M lead (II) nitrate added to the different test-tubes. A yellow precipitate and a colourless solution were formed each time. The table below gives the results obtained in each case.

Height of precipitate (mm)	5	10	15	20	25	30	35	39	39	39
Volume of lead(II) nitrate (cm^3)	1	2	3	4	5	6	7	8	9	9

i) Draw a graph of height of precipitate (y-axis) against volume of lead (ii) nitrate solution added. **(1mark)**

ii) Name the precipitate formed during the experiment. **(1mark)**

iii) From the graph, determine the height of precipitate when 5.4cm^3 of lead (II) nitrate solution is added.

(1mark)

iv) What volume of Lead (II) nitrate solution is required for complete reaction? Explain **(2marks)**

v) Determine the number of moles of Potassium iodide solution used. **(2marks)**

vi) Calculate the number of moles of lead (II) nitrate solution that reacted. **(2marks)**

vii) Write an ionic equation for the reaction between lead (II) nitrate solution and Potassium iodide solution

(3marks)

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 4 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

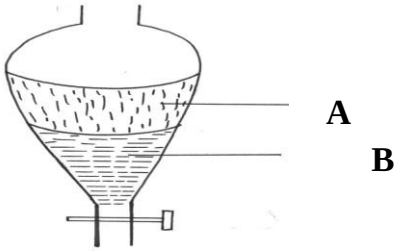
DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1. A mixture of hexane and water was shaken and left to separate out as shown in the diagram below:-



(i) Identify liquids A and B **(2mks)**

A……

B……

(ii) Apart from density, state **one** other property that makes it possible to separate them using the set-up above? **(1mk)**

2. Concentrated sulphuric (vi) acid is a common drying agent.

(i) Use an equation to explain why it cannot be used to dry ammonia gas. **(1mk)**

(ii) Name a suitable drying agent for ammonia. **(1mk)**

3. Determine the oxidation number of;

(i) Manganese in $KMnO_4$. **(1mk)**

Chromium in $Cr_2 O_7$ **(1mk)**

4. Starting with Lead (ii) oxide, describe how lead (ii) sulphate can be prepared in the laboratory.

(3mks)

5. A mass of 3.2g of XOH reacts completely with $20cm_3$ of 2M sulphuric (vi) acid. (O=16, H=1)

(i) Write the equation for the reaction. **(1mk)**

(ii) Calculate the relative atomic mass of X in the formula XOH. **(2mks)**

6. In the Haber process, the industrial manufacture of ammonia is given by the following equation:-

$N_{2\,(g)} + 3H_{2\,(g)}$ $2NH_{3\,(g)}$ ΔH=-97KJ/Mol

(i) Name **one** source of hydrogen used in this process. **(1mk)**

(ii) Name the catalyst used in the above reaction. **(1mk)**

(iii) What is the effect of increasing temperature on the yield of ammonia? Explain. **(1mk)**

7. Explain the following concepts in respect to aluminium extraction:-

(a) Why cryolite is added to Aluminium Oxide. **(1 ½mks)**

(b) Why graphite anode is replaced from time to time. **(1½mks)**

8. When concentrated hydrochloric acid was electrolysed for a long time, two gases were obtained at the anode.

(i) Name the **two** gases. **(1mk)**

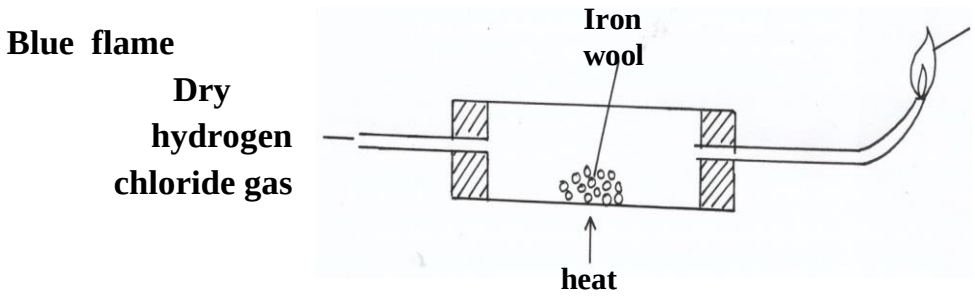
(ii) Explain why the gases were obtained. **(2mks)**

9. Given the following bond energies:-

C- H	414 KJ/Mol
CL-Cl	244KJ/Mol
C- Cl	326KJ/Mol
H- Cl	431KJ/Mol

Calculate the enthalpy change when methane reacts with excess chlorine. **(3mks)**

10. Dry hydrogen chloride gas was passed over heated iron wool as shown below:-



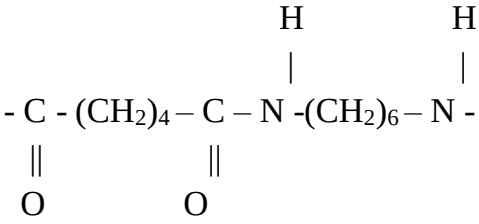
(a) State the observation made in the combustion tube at the end of the experiment. **(1mk)**

(b) Write the equation for the reaction taking place:-

(i) in the combustion tube **(1mk)**

(ii) Leading to a production of a blue flame. **(1mk)**

11. The structure below shows the repeat unit showed in a polymer.



(i) Name the polymer **(1mk)**

(ii) Draw the structures of the two monomers forming the polymer **(1mk)**

12. The table below shows the number of valence electrons in elements D, E and F.

Element	**D**	**E**	**F**
No. of valence electrons	**1**	**2**	**7**

(i) Explain why D and E would not be expected to react together to form a compound **(1mk)**

(ii) Write a chemical equation to show the effect of heat on a carbonate of E. **(1mk)**

13. The following pairs of compounds were reacted together and the maximum temperature rise recorded for each reaction.

A- 50cm^3 of 2M ammonia solution and 50 cm^3 of 2M ethanoic acid.

B- 50 cm^3 of 2M sodium hydroxide and 50 cm^3 of 2M hydrochloric acid.

C- 50 cm^3 of 2M sodium hydroxide and 50 cm^3 of 2M ethanoic acid.

(a) State the pair which showed:-

(i) the highest temperature rise. **(1mk)**

(ii) the lowest temperature rise. **(1mk)**

(b) Explain your answers above. **(1mk)**

14. (a) Radium 226, whose atomic number is 88, undergoes beta decay to form a new element X.

Write an equation for this change. **(1mk)**

(b) State **two** differences between nuclear and chemical reactions. **(2mks)**

15. The reaction below had attained a state of equilibrium between chromate and dichromate ions.

$2CrO_4^{2-}{}_{(aq)} + 2H^+_{(aq)}$ $Cr_2O_7^{2-}{}_{(aq)} + H_2O_{(l)}$

State and explain the effect of adding a few drops of sodium hydroxide to the equilibrium mixture.

(2mks)

16. Diamond and graphite are allotropes of carbon.

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

(ii) Explain why graphite conducts electricity while diamond does not. **(2mks)**

17. During electrolysis of copper (ii) sulphate solution using graphite electrodes, a current of 2 amperes was passed for 15 minutes. Determine the mass of the products at the cathode. (1F=96,500C

Cu=63.5) **(3mks)**

18. Pieces of blue and red litmus papers were placed into a beaker containing water into which Aluminium Chloride had been dissolved.

(i) Is dissolving of aluminium chloride in water a physical or chemical process? Explain **(1mk)**

(ii) State the observations made on the papers. Explain your answer. **(2mks)**

19. Two cleansing agents are $X=R\text{-}COO^-Na^+$ and $Y=R\text{-}C_6H_5\text{-}SO_3^-Na^+$ where R is a long hydrocarbon chain.

(i) Identify the two cleaning agents. **(1mk)**

X……

Y……

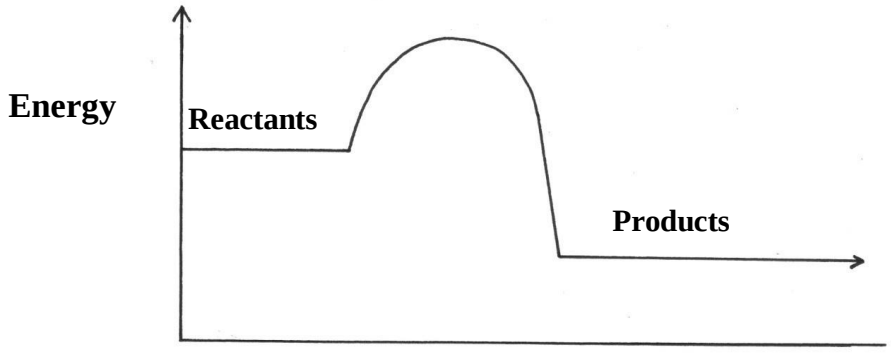
(ii) Write the formula of the salt that would be formed when cleaning agent X is added to water containing calcium ions. **(1mk)**

(iii) State **one** disadvantage of cleaning agent Y. **(1mk)**

20. The energy level diagram for the reaction:-

$2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$

Given below:-



Reaction path

(i) State **two** ways of increasing the yield of $SO_{3\,(g)}$. **(2mks)**

(ii) On the same axis, draw the curve that would be obtained if a catalyst is used. **(1mk)**

21. Carbon (II) oxide and nitrogen (iv) oxide are some of the gases released from car exhaust pipes. State how these gases affect the environment. **(3mks)**

22. When a few drops of aqueous ammonia were added to copper (ii) chloride solution, a light blue precipitate was formed. On addition of excess ammonia solution, a deep blue solution was formed. (a) Identify the substance responsible for the:-

(i) light blue precipitate.
(1mk)

(ii) deep blue solution. **(1mk)**

(b) Write an equation for the reaction leading to observation in (a) (ii) above. **(1mk)**

23. A volume of nitrogen gas diffuses through a porous pot in 70 seconds. How long would it take 400cm^3 of carbon (iv) oxide to diffuse through the same porous pot? (C=12 O=16 N=14) **(3mks)**

24. Consider the following electrochemical cell.

Zn(s)/Zn2+ (ag)// Pb (ag)/Pb(s)

(i) Name the electrodes for the above cell. **(1mk)**

(ii) Write the electrodes for the above cell. **(1mk)**

(iii) Name a possible salt bridge. **(1mk)**

25. Lead (ii)nitrate was heated strongly for some time.

(i) State **two** observations made during heating. **(2mks)**

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

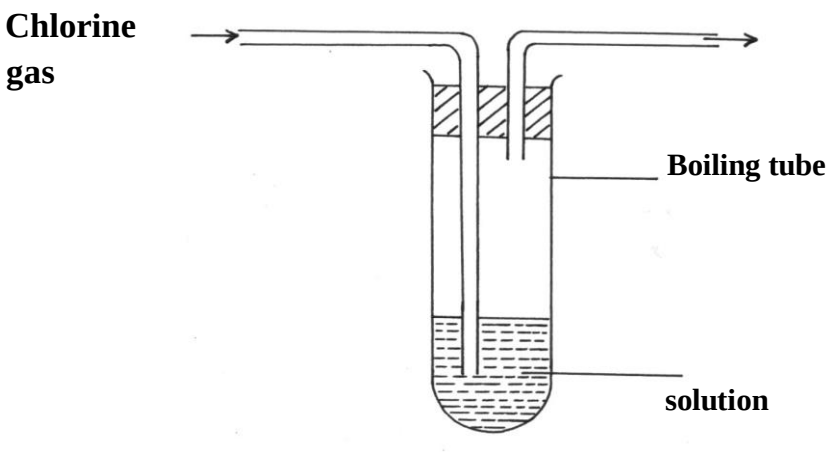
26. Draw a dot (**.**) and cross (x) diagram to show bonding in:-

(i) Ammonium ion (NH_4) **(1 ½mks)**

(ii) Silane (SiH_4) **(1 ½mks)**

(N=14 H=1 Si=14)

27. Chlorine gas was bubbled into a solution of hydrogen sulphide as shown below:-



(i) Explain the observations made in the boiling tube. **(2mks)**

(ii) What precautions should be taken in this experiment? **(1mk)**

28. What is the difference between thermosoftening and thermosetting plastics? **(2mks)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 4 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

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

Element	Atomic radius (nm)	Ionic radius (nm)	Formula of oxide	Melting point of oxide (‘C)
P	0.364 0.830	0.421 0.711	A_2O	-119
Q	0.592 0.381	0.485 0.446	BO_2	837
R	0.762	0.676	E2O3	1466
S			G2O5	242
T			JO	1054

(i) Which elements are non-metals? Give a reason. **(2mks)**

(ii) Explain why the melting point of the oxide of R is higher than that of the oxide of S. **(2mks)**

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

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

		Ionization Energy_KJ/Mole	
Element	Electronic configuration	1st 1.E	2nd 1.E
A	2.2	900	1800
B	2.8.2	736	1450
C	2.8.8.2	590	1150

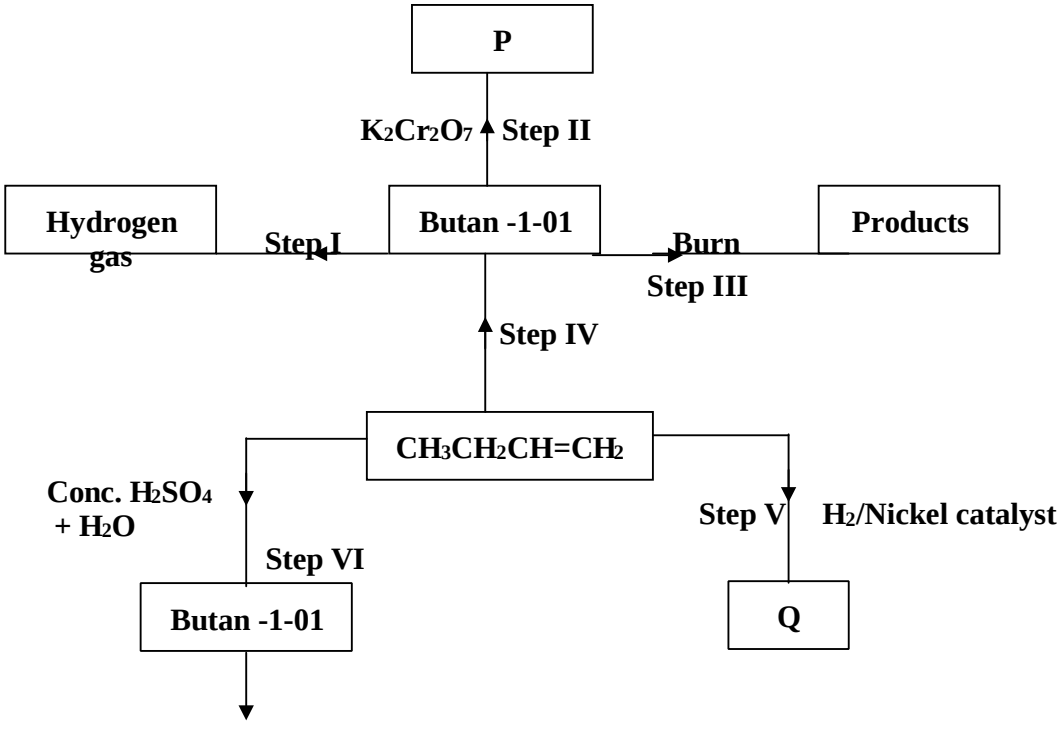
(i) What chemical family do the elements A, B and C belong? **(1mk)**

(ii) What is meant by the term ionization energy? **(1mk)**

(iii) The 2nd ionization energy is higher that the 1st ionization energy of each. Explain **(1mk)**

(iv) When a piece of element C is placed in cold water, it sinks to the bottom and an effervescence of a colourless gas that bums explosively is produced. Use a simple diagram to illustrate how this gas can be collected during this experiment. **(3mks)**

2. Use the information in the scheme below to answer the questions that follow.



$CH_3COOCH_2CH_2CH_2CH_3$

a) Name substance P **(1mk)**

b) Give the structure and name of compound Q. **(1mk)**

c) Write the equation for the chemical reaction in steps III **(1mk)**

d) Name the reagents and conditions necessary for the reaction in

(i) Step IV

Reagents **(1mk)**

Conditions **(1mk)**

(ii) Step VII

Reagents **(1mk)**

Conditions **(1mk)**

e) What name is given to the reaction in step VII? **(1mk)**

f) Below are **two** reactions showing how a long chained alkanoic acid can be converted into detergent B.

I. $CH_2 — C_{17}H_{35}COOH$
$|$
$CH — C_{17}H_{35}COOH + 3H_2O \longrightarrow 3C_{17}H_{35}COOH + C_3H_8O_3$
$|$
$CH_2 — C_{17}H_{35}COOH$

II. $3C_{17}H_{35}COOH + 3NaOH \longrightarrow C_{17}H_{35}COONa + 3H_2O$
(detergent B)

(i) Name the type of reaction in **(2mks)**

I…….

II…….

(ii) Give **one** disadvantage of using detergent B in washing clothes. **(1mk)**

3. 2.5g of a metal carbonate, MCO_3 was reacted with excess 2M nitric (v) acid, the volume of carbon (IV) oxide evolved measured and recorded at 10 second intervals. The results were recorded as shown in the table below.

volume of gas (cm^3)	0	90	150	210	280	305	390	450	480	480	480
Time in seconds	0	10	20	30	40	50	60	70	80	90	100

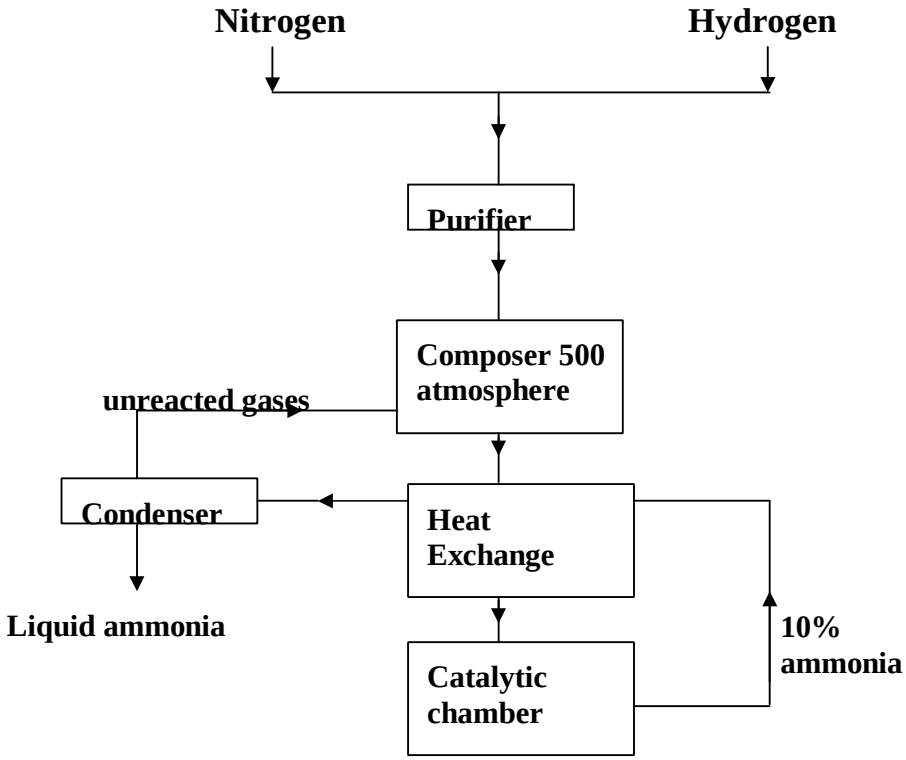
a) (i) On the grid provided, plot a graph of volume (vertical axis) against time. Label it as A **(3mks)**

(ii) From your graph, determine the rate of reaction between 25 seconds and 40 seconds. **(2 mks)**

(iii) On the same grid, sketch a curve that would be obtained if the same experiment was repeated using excess IM Nitric (V) acid. Label it as B. **(l mk)**

(iv) Given that carbon (IV) oxide was measured at room temperature and pressure, work out the relative atomic mass of metal M. (MGV = 24dm^3, C 12, 0= 16) **(3mks)**

4. The diagram below represents the Haber's process for the manufacture of ammonia. Study it and answer the questions that follow.



a) Name any **two** impurities removed by the purifier. **(2mks)**

b) The catalyst used in the process is finely divided iron. Why iron is finely divided? **(1mk)**

c) In the Haber's process the conversion of nitrogen and hydrogen into ammonia is only 10%. The remaining unreacted gases are recycled. What is the advantage of recycling. **(1mk)**

d) A part from iron catalyst and pressure of 500 atmospheres, name any other condition required for this process. **(1mk)**

e) Give any **two** uses of ammonia **(1mk)**

f) In the manufacture of nitric (V) Acid from ammonia and air of nitric (v) acid from ammonia and air, ammonia is catalytically oxidized to nitrogen (II) oxide

(i) Name the catalyst used in the reaction. **(1mk)**

(ii) Write a balanced chemical equation for the reaction between ammonia and air. **(1mk)**

(iii) State **one** environmental problem likely to be faced in an area where nitric (v) acid manufacturing plant is located. **(1mk)**

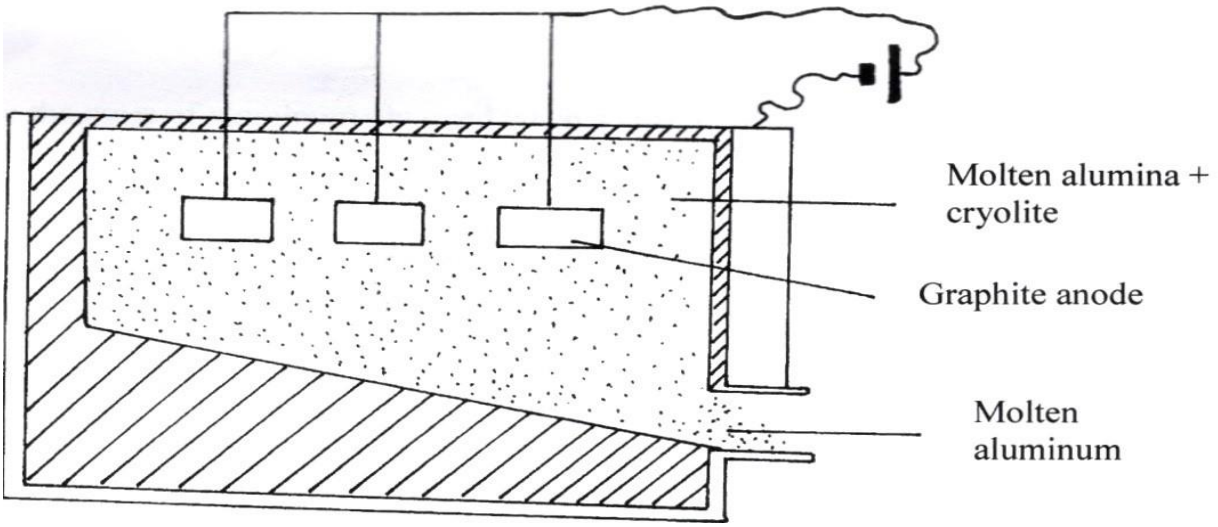
g) (i) In the preparation of chlorine gas in a school laboratory, either manganese (IV) oxide or potassium manganate(VII) may be used on concentrated hydrochloric acid. State **one** advantage of potassium manganate (VII) over manganese(IV) oxide in this reaction. **(1mk)**

(ii) State and explain what would be observed when dry litmus papers are dipped in a gas jar of chlorine. **(2mks)**

(iii) Freshly prepared chlorine water bleaches but chlorine water exposed to sunlight for sometime does not bleach. Explain. **(2mks)**

(iv) When preparing hydrogen chloride gas from sodium chloride and sulphuric (VI) acid, two conditions are necessary. State them. **(1mk)**

5. The diagram below shows industrial extraction of aluminum



a) Name and write the formulae of the major ore for this process. **(1mk)**

Name

Formulae

b) Write the equation of the reaction taking place at the:

Anode **(1mk)**

Cathode **(1mk)**

c) Write the formula of the molten alumina. **(1mk)**

d) State the role of cryolite added to molten alumina **(1mk)**

e) It is cheaper to recycle aluminum other than to extract it. Explain. **(1mk)**

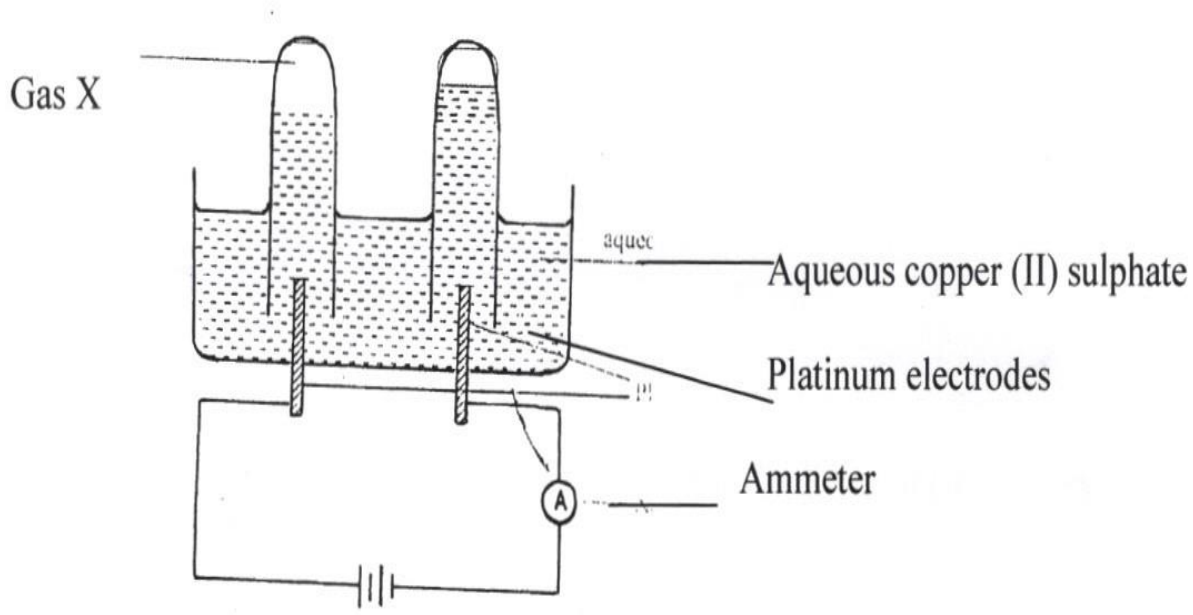
f) Explain why graphite anodes must be replaced after some time. **(1mk)**

g) State **one** property of aluminum that makes it suitable for wrapping food. **(lmk)**

h) Aluminum is high in the reactivity series yet it does not react with both acid and air. Explain. **(1mk)**

i) Calculate the mass of aluminum obtained when a current of 3A is passed through fused aluminum oxide for 4 hour 30 minutes, (Al=27, I F=96500C) **(2mks)**

6. Aqueous copper (II) sulphate was electrolyzed using the set-up represented by the diagram below.



a) (i) Name the gas X. **(1mk)**

(ii) Write an ionic equation for the reaction that produces gas X. **(1mk)**

b) What happens to the pH of the electrolyte during electrolysis? Explain your answer. **(2mks)**

c) If in the above set-up, copper electrodes were used instead of platinum electrodes.

i) Write the electrode half- equations for the reactions at the anode and the cathode. **(2mks)**

Anode:

Cathode:

ii) What happens to the color of the electrolyte during electrolysis? Explain your answer. **(2mks)**

d) An iron spoon is to be electroplated with silver. Draw a labeled diagram to represent the apparatus that could be used to carry out this process. **(3mks)**

e) The table below shows the ammeter reading obtained when two different electrolytes of the same concentration were tested.

Electrolyte	Current (amps)
Copper (II) su lphate solution	4.0
Ethanoic acid	1.2

Why does ethanoic acid give a lower reading? **(1mk)**

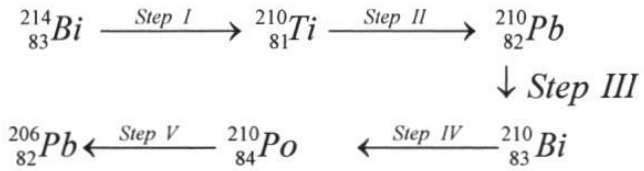
f) Use the information in the table below to answer the questions that follow.

Reaction	θ E (volts)
$Zn^{2+}_{(aq)} + 2e^- \longrightarrow Zn_{(s)}$	-0.76
$A1^{3+}_{(aq)} + 3e^- \longrightarrow Al_{(s)}$	-1.66
$Fe3+(aq) + 3e- \longrightarrow Fe(s)$	-0.44

i) Write the cell representation of the cell made of aluminum and iron half-cells. **(l mk)**

7. **(a)** State **two** differences between chemical and nuclear reactions. **(2mks)**

(b) Below is a radioactive decay series starting from $^{214}_{83}Bi$ and ending at $^{206}_{82}Pb$. Study it and answer the questions that follow;



(i) Identify the particles emitted in steps III and V **(2mks)**

III……

V……

(ii) Write the nuclear equation for the reaction which takes place in Step I. **(1mk)**

(c) **(i)** Define the term half— life. **(1mk)**

(ii) 800g of a radioactive isotope decays to 50g in 100 days. Determine the half-life of this isotope. **(2mks)**

(d) State **two** medical uses of radioactive isotopes. **(l mk)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 5 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

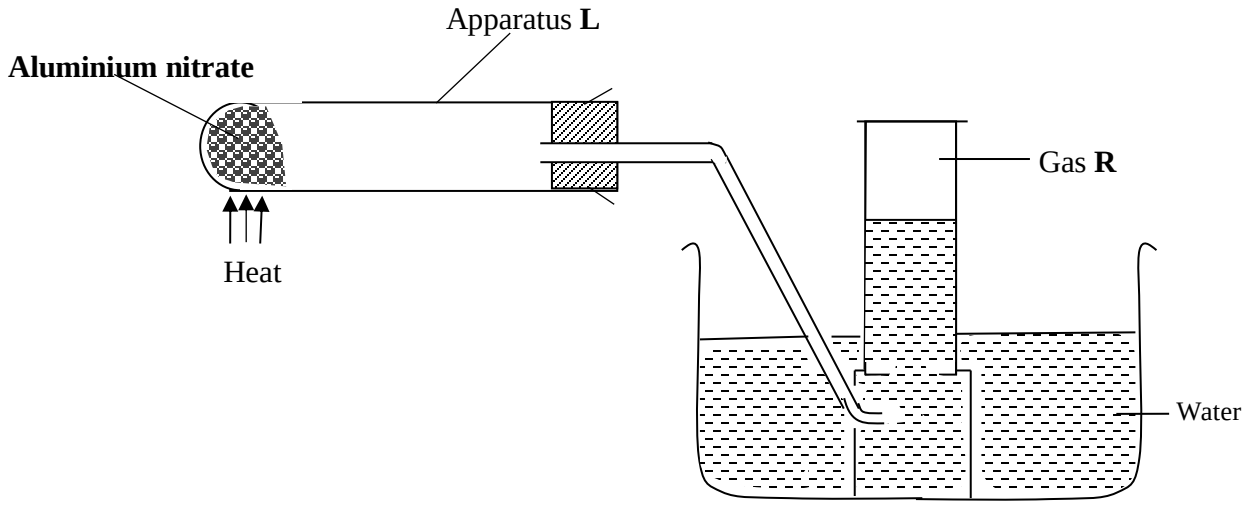
DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

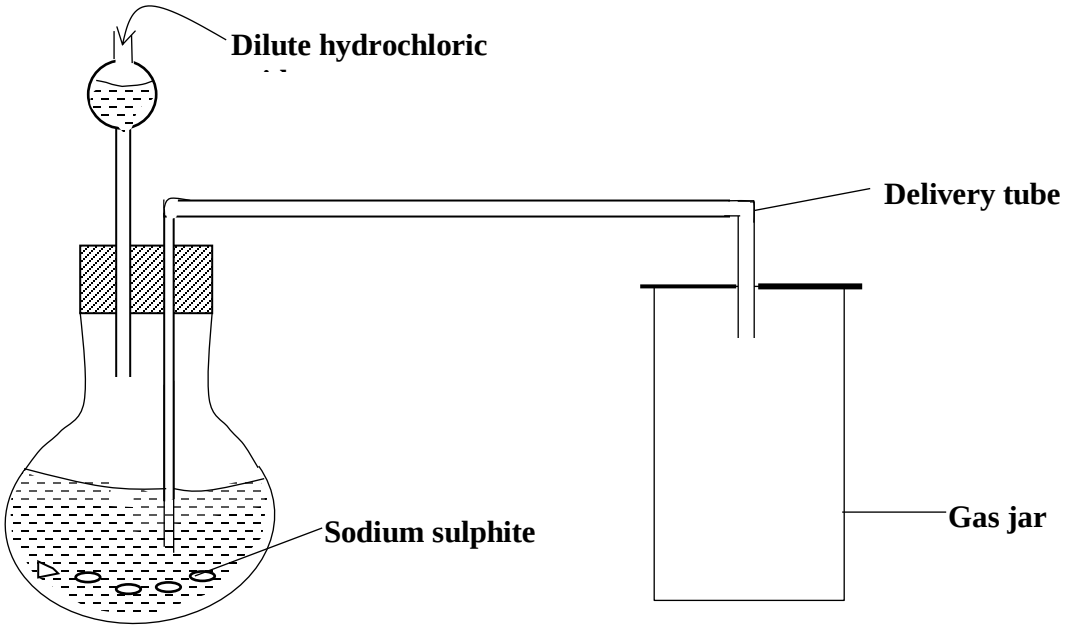
1. Ammonium nitrite was heated as shown below.



(i) Give a suitable material that can be used to make apparatus **L**, explain your answer.
(2 marks)

(ii) Write a chemical equation for formation of gas **R**. **(1 mark)**

2. Dilute hydrochloric acid and sodium sulphite were reacted as shown below.



(i) Write a chemical equation for the reaction taking place in the flask. **(1 mark)**

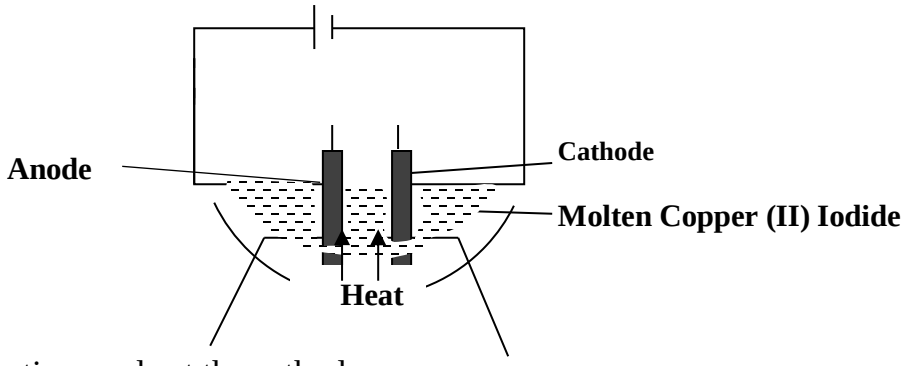
(ii) State one main laboratory rule that should be observed during the above experiment and give a reason for your choice. **(2 marks)**

(iii) Give two reasons why no gas was collected in gas jar. **(2 marks)**

3. In an experiment 3.36g of iron filling were added to excess copper (II) sulphate solution. Calculate the mass of copper that was deposited given that Iron (II) sulphate and copper were the products.
(Cu = 63.5, Fe = 56.0) **(3 marks)**

4. In a titration experiment $30cm^3$ of 2M sodium hydroxide required $30cm^3$ of sulphuric (VI) acid for complete neutralization. Determine the concentration of sulphuric (VI) acid in grams per litre. **(3 marks)**

5. Study the diagram below and answer the questions that follow.



(i) State the observation made at the cathode. **(1 mark)**

(ii) Write the equation taking place at the Anode. **(1 mark)**

(iii) What material should be used to make the cathode? **(1 mark)**

6. (a) Define the term electrolysis. **(1 mark)**

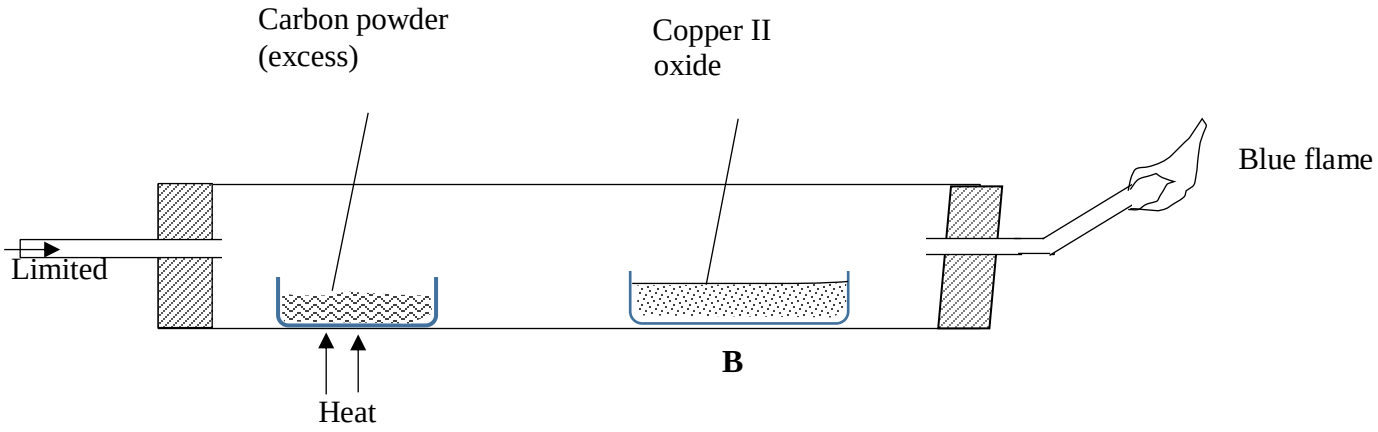
(b) State two applications of electrolysis. **(2 marks)**

7. **(a)** Write the electron arrangement of element **P** which has atomic number 16. **(1 mark)**

(b) State the group and period of element **P**. **(1 mark)**

(c) Write the equation of element **P** when burnt in air. **(1 mark)**

8. Study the diagram below and answer the question that follow.



(a) State and explain observation made and point **A**. **(2 marks)**

(b) Explain the observation made out point **B**. **(2 marks)**

(c) Why was it necessary to burn the gas at the jet? **(1 mark)**

9. Give two reasons why carbon (IV) oxide is used at a fire extinguisher. **(2 marks)**

10. To determine the purity of limestone Form 3 students heated 12.5g of limestone in a crucible until they obtained a constant mass. If the volume of CO_2 obtained was 2400. Calculate the purity of the limestone (C=12, O=16, Ca = 40, Mgv = 240dm^3). **(3 marks)**

11. Determine the relative atomic mass of Neon whose isotopic composition is as follows.

$^{20}_{10}90.92\ (90.92\%)$ $^{21}_{10}Ne\ (0.26\%)$ $^{22}_{10}Ne\ (8.82\%)$ **(3 marks)**

12. Draw a well-labelled diagram to show how dry hydrogen can be prepared and collected in the laboratory. **(3 marks)**

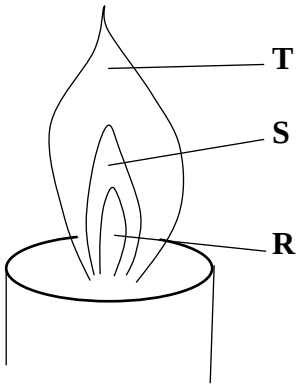
13. Give **two** characteristics of a temporary chemical change. State one example of such reaction. **(2 marks)**

14. **(a)** What is drug abuse? **(1 mark)**

(b) Name one commonly abused non-medicinal drug. **(1 mark)**

(c) A doctor prescribed drugs to a patient Amoxil 2x3. How should the patient take the drug? **(1 mark)**

15. The figure below shows a flame obtained from a Bunsen burner.

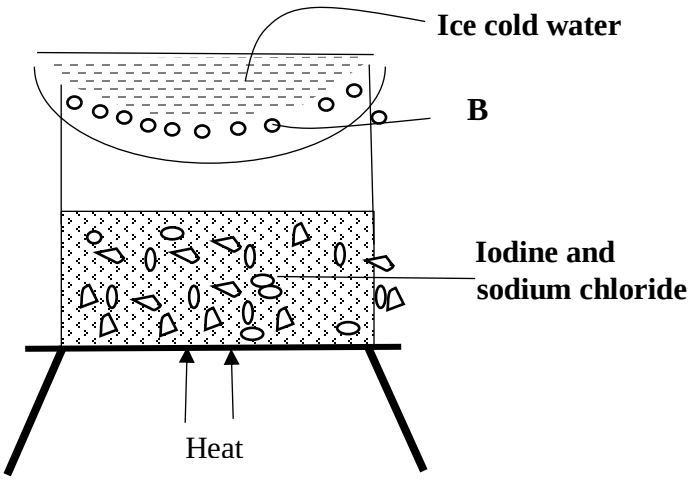


(a) Name the type of flame. **(1 mark)**

(b) A matchstick head placed at region R will not ignite. Explain. **(1 mark)**

(c) Name region **S**. **(1 mark)**

16. The set-up below was used to separate a certain mixture.



(a) Identify the method of separation shown. **(1 mark)**

(b) Identity substance **B**. **(1 mark)**

(c) Give any other substance when mixed with sodium chloride can be separated as above?

(1 mark)

17. Element **A** with atomic number 12 and **B** with atomic number 9.

(a) To which chemical family is; **(2 marks)**

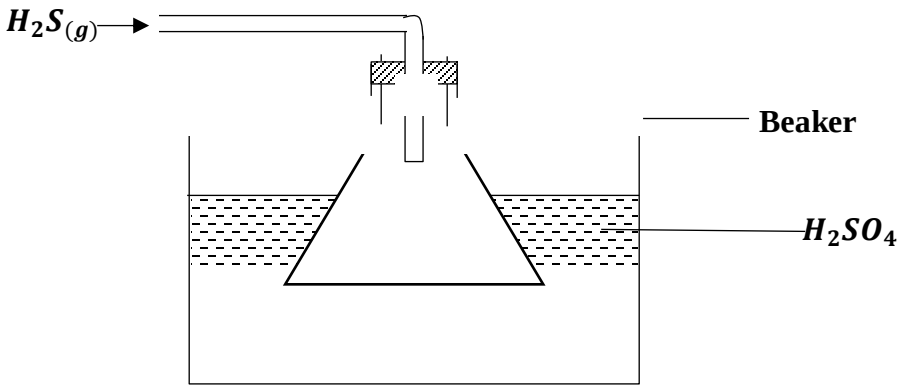
A - ……

B - ……

(b) Write the equation for the reaction between **A** and **B**. **(1 mark)**

18. When chlorine gas is passed over heated iron metal, 26.7g of the product is formed. Calculate the mass of iron which reacted. (Fe = 56, Cl = 35.5) **(3 marks)**

19. Study the diagram below and answer the questions that follow.



(a) Give the observation made in the beaker. **(1 mark)**

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

(c) Give one reason why the gas is directed into the beaker using the inverted funnel as above? **(1 mark)**

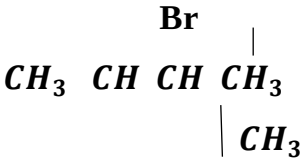
20. **(a)** State Graham's law of diffusion. **(1 mark)**

(b) It takes 50 seconds for 200cm^3 of carbon (IV) oxide to diffuse through a plug. How long will it take 300cm^3 of nitrogen (IV) oxide to diffuse through the same plug under the same conditions of temperature and pressure.
(C = 12, N = 14, O = 16) **(2 marks)**

21. **(a)** State Gay Lussac's law. **(1 mark)**

(b) Calculate the volume of air required to completely react with 100cm^3 of hydrogen gas. (Assume that oxygen is 20% by volume of air). **(3 marks)**

22. Name the following organic substances. **(3 marks)**

(a)


(b) $CH_3\ CH\ CH\ CH_2\ CH_3$

(c) $CH_3\ CH_2COOCH_2\ CH_2\ CH_3$

23. (a) Define isomers. **(1 mark)**

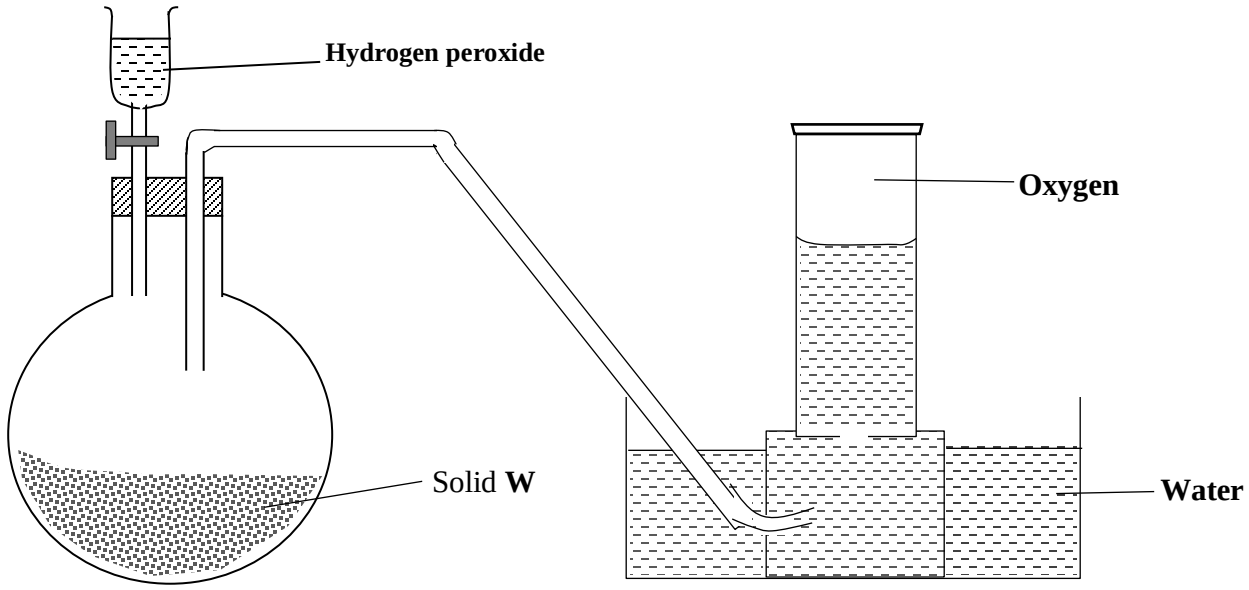
(b) Draw the possible structural isomer of C_4H_8. **(2 marks)**

24. (a) Give the chemical name for rust. **(1 mark)**

(b) Name one condition which speeds up rusting. **(1 mark)**

(c) Many iron products are coated with a layer of zinc to protect it from rusting. State two ways in which zinc prevents rusting of iron. **(1 mark)**

25. Study the diagram below for the preparation of oxygen in the laboratory.



(a) Name solid **W**. **……(1 mark)**

(b) Write the equation for the reaction. **(1 mark)**

(c) What property of oxygen makes it to be collected as above? **(1 mark)**

26. Starting with Barium Oxide describe how Barium chloride can be prepared in the Lab.

(2 marks)

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 5 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1. (a) Calculate the oxidation number of chromium Cr $(H_2O)_6^{3+}$ **(2 mks)**

(b) The table below shows the standard reduction potentials for four half-cell. Study it and answer the questions that follow:

Half reaction	**E^0 (volts)**
$Au^{3+} + 3e \longrightarrow Au_{(s)}$	+1.50
$Cu^{+} + e^{-} \longrightarrow Cu_{(s)}$	-0.52
$Pb^{2+} + 2e^{-} \longrightarrow Pb_{(s)}$	-0.13
$Fe^{2+} + 2e^{-} \longrightarrow Fe_{(s)}$	-0.44
$Cr^{3+} + Cr_{(s)} \longrightarrow Cr_{(s)}$	-0.74
$Al^{3+} + 3e^{-} \longrightarrow Al_{(s)}$	-1.66
$Mg^{2+} 2e^{-} \longrightarrow Mg_{(s)}$	-2.37
$Rb^{+} + e^{-} \longrightarrow Rb_{(s)}$	-2.98

(i) Identify the strongest reducing agent. **(1 mk)**

(ii) Write the equation for the redox reaction which takes place between (Cu / Cu^{+}) and (Al/Al^{3+}). **(1 mk)**

(iii) Draw the cell obtained in (ii) above. **(3 mks)**

(iv) Calculate the emf for the cell above. **(2 mks)**

(c) A current of 2.75 A is measured during recharging with an external potential of 2.0 V using $Cd^{2+}_{(aq)}$ solution. After 5 minutes charging, how many moles of Cadnium will be redeposited. Hence calculate the mass redeposited. (Cd = 112, F = 96500C). **(3 mks)**

(d) State two uses of electrolysis **(2 mks)**

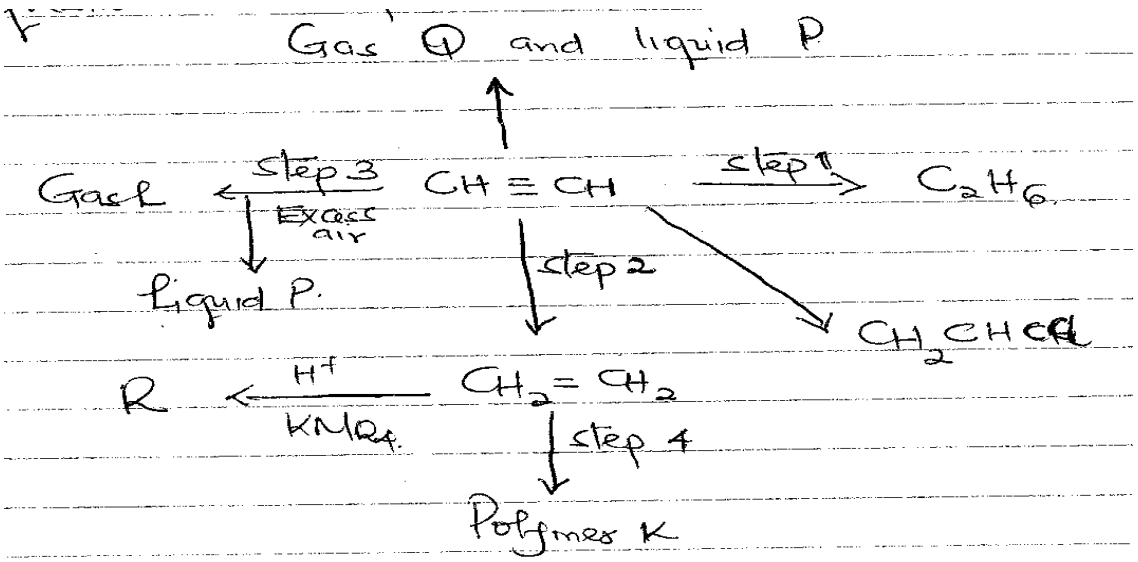
2. Petrol (octane) a long hydrocarbon alkane can be converted to ethane and hydrogen gas mixtures as follows.

$$C_8H_{18\,(l)} \longrightarrow 4\,C_2H_{4\,(g)} + H_{2\,(g)}$$

(a) What do we call the process by which the products are obtained from octane? **(1 mk)**

(b) Unleaded fuel is now widely used and has to be used in modern cars fitted with catalytic converters. State the merits of unleaded petrol. **(1 mk)**

(c) Study the scheme given below and answer the questions that follows:



(i) Name the reagents used in: **(4 mks)**

Step 1……

Step 2……

Step 3……

Step 4……

(ii) Identify substance. **(3 mks)**

L……

P……

Q……

N……

K……

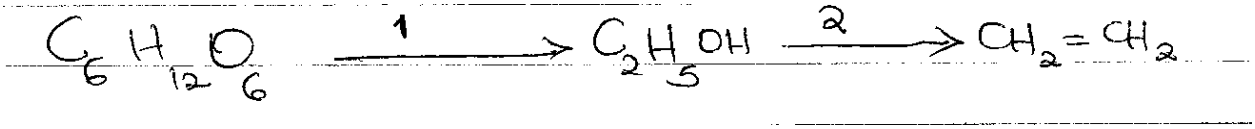
R……

(iii) Draw the structural formula of:

R **(1 mk)**

K **(1 mk)**

(d) Ethanol from glucose can be converted to ethane as shown below:



(i) Name the process that takes place in 1. **(1 mk)**

(ii) Name the reagent used in step 2. **(1 mk)**

(e) Compound A and B have the same molecular formulae $C_3H_6O_2$. Compound A liberates carbon iv oxide on addition of sodium carbonate while compound B doesn't. Compound B has a sweet smell. Draw the possible structures of: **(2 mks)**

(i) **A**

(ii) **B**

3. (i) (a) Write the chemical name for rust. **(1 mk)**

(b) State any two ways of preventing rusting. **(2 mks)**

(c) Give a reason why vehicles based in Mombasa rust faster than those based in Limuru. **(1 mk)**

(d) Oxygen to obtained by fractional distillation of liquid air. Name two other gases which are obtained during the distillation. **(1 mk)**

(ii) In an experiment to determine the solubility of sodium chloride, 5cm^3 of a saturated solution of sodium chloride of mass 5.35g were placed in a volumetric flask and diluted to a total of 250 cm^3. 25 cm^3 of the dilute solution reacted completely with 24cm^3 of 0.1 moldm^3 silver nitrate solution. Calculate:

(a) Moles of silver nitrate in 24cm^3 of solution. **(1 mk)**

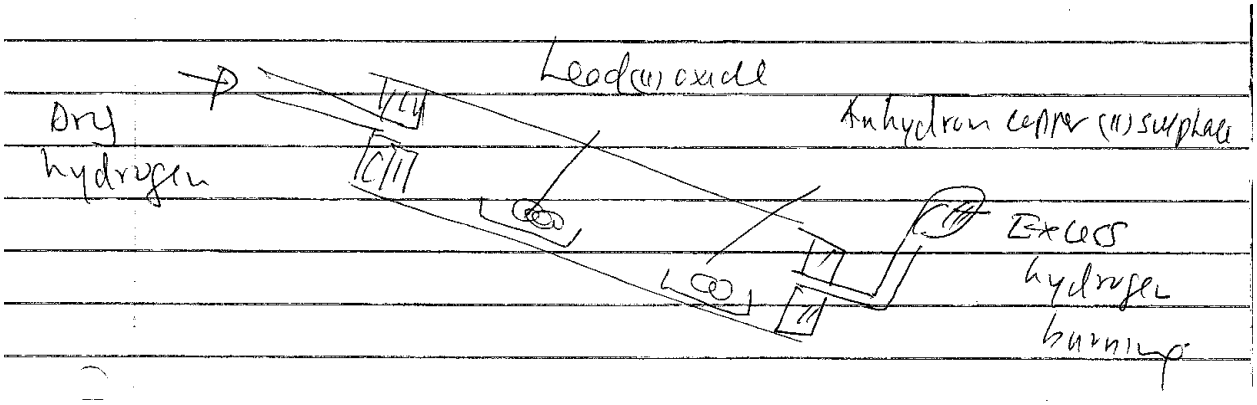
(b) Moles of sodium chloride to 25cm^3 of solution. **(1 mk)**

(c) Moles of sodium chloride in 250 cm^3 of solution. **(1 mk)**

(d) Mass of sodium chloride in 5 cm^3 of the original saturated sodium chloride solution **(1 mk)**

(e) Solubility of sodium chloride. **(1 mk)**

(iii) The apparatus below was used to investigate the effect of dry hydrogen gas on hot lead (II) oxide.



(a) What is observed in the combustion tube at the end of the experiment? **(2 mks)**

(b) Write an equation for the reaction between hydrogen gas and lead (II) oxide. **(1 mk)**

(c) Why should the tube be slanting? **(1 mk)**

(d) State any 2 precautions to be observed when doing this experiment. **(2 mks)**

4. The table below shows volumes of nitrogen (IV) oxide gas produced when different volumes of 1M nitric (V) acid were reacted with 2.07g of lead at room temperature.

Volume of 1M nutirc (V) acid	Volume of nitrogen (IV) oxide gas (cm^3)
5	60
15	180
25	300
35	420
45	480
55	480

(a) Give a reason why nitric (IV) is not used to prepare hydrogen gas. **(1 mk)**

(b) On the grid provided plot a graph of the volume of the gas produced against the volume of the gas produced against the volume of the acid. **(3 mks)**

(c) Use your graphs to determine:

(i) Volume of nitrogen (IV) oxide produced when 30 cm^3 of 1M nitric (V) acid were reacted with 2.07g of lead. **(1 mk)**

(ii) Volume of 1M nitric (V) acid that would react completely with one mole of lead. **(1 mk)**

(d) Calculate the number of moles of:

(i) 1M nitric (V) acid that reacted with one mole of lead. **(1 mk)**

(ii) Nitrogen (IV) oxide produced when one mole of lead reacted with excess nitric (V) acid. (Molar gas volume = 2400 cm) **(1 mk)**

(e) Use the answers to d above and write the equation for the reaction between lead and nitric(V) acid. **(1 mk)**

(f) Explain how the rate of the reaction between lead and nitric (V) acid would be affected if the temperature of the reaction mixture was raised. **(2 mks)**

5. (a) When ammonia gas is passed through copper (II) sulphate solution a blue precipitate is formed which dissolves to give a deep blue solution. Write an ionic equation for the formation of:

(i) The blue precipitate **(1 mk)**

(ii) the deep blue precipitate. **(1 mk)**

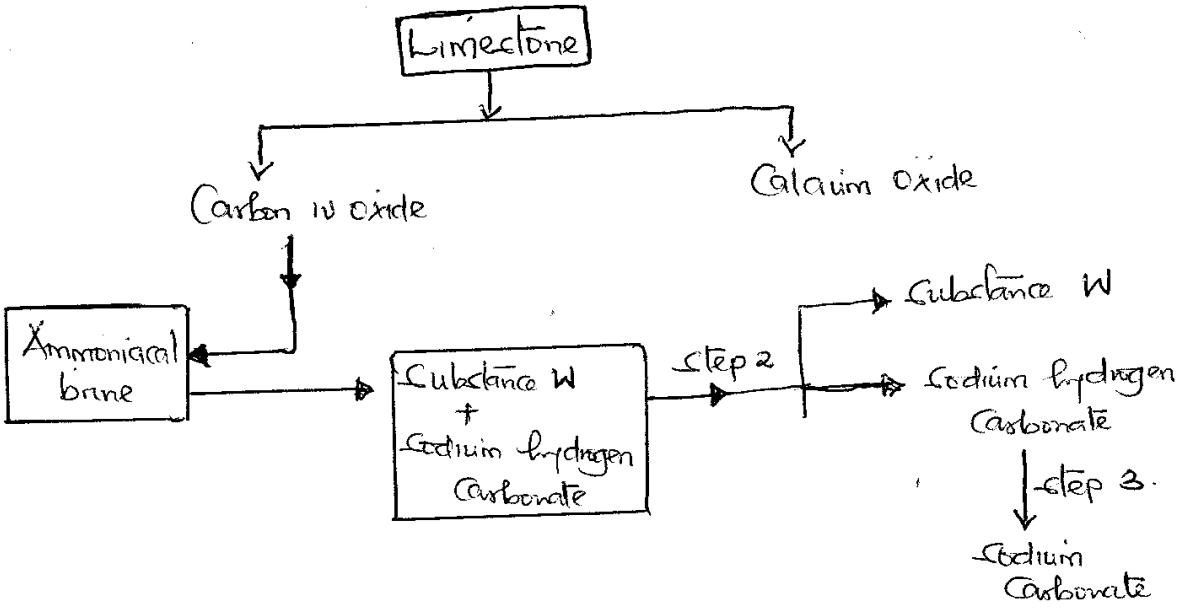
(b) Aluminum oxide is amphoteric.

(a)Explain the term amphoteric. **(1 mk)**

(b) Name and give the formula of other two amphorteric oxides. **(2 mks)**

6.

6.



(a) What is the chemical name for limestone. **(1 mk)**

(b) Identify substances: **(2 mks)**

(i) **X - ……**

(ii) **W - ……**

(c) Name the process taking place in: **(2 mks)**

(i) **Step II……**

(ii) **Step III……..**

(d) Write a chemical equation for the reaction of:

(i) Leading to formation of substances W and sodium hydrogen carbonate. **(1 mk)**

(ii) Taking place in step (III). **(1 mk)**

(e) Carbon (V) oxide and ammonia are required during the solvay process. Write equation to show how ammonia is recycled. **(1 mk)**

(f) Name the other product of solvay process and state one use of it. **(1 mk)**

(g) State two uses of sodium carbonate. **(2 mks)**

7. The grid below represents past of the periodic table. Study it and answer the questions.

				B			C	
K	F		D			E	A	Y
	G							

(a) Identify the family name to which element F and G belong. **(1 mk)**

(b) Name the type of bond formed when C and F react. **(1 mk)**

(c) Write the formulae of the oxide formed when D reacts with oxygen. **(1 mk)**

(d) What type of oxide is formed in (c) above. **(1 mk)**

(e) Compare the atomic radii of F and D. Explain. **(2 mks)**

(f) Element F burns in air to form two products. Write 2 equations for the two products formed.

(g) State two uses of element K and its compounds. **(2 mks)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 6 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1 A certain element Y has atomic number 15 and mass number of 31.

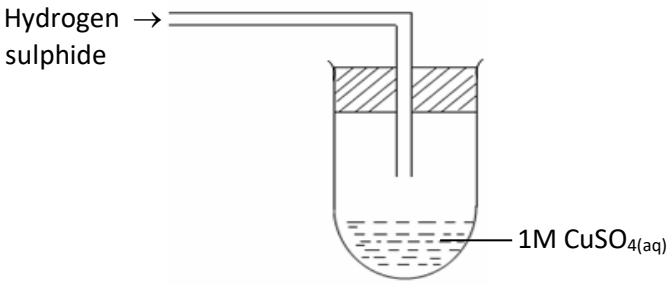
(a) Calculate the number of neutrons in the element. **(1mk)**

(b) Write the electron arrangement of the ion formed by element Y. **(1mk)**

(c) How would the atomic size of the above element compare with another atom X whose atomic number is 11 and mass number 23? Explain. **(1mk)**

2. Explain why the pH of 1.0M hydrochloric acid is 1.0M while that of 1.0M ethanoic acid is 5.0. **(2mks)**

3. In an experiment hydrogen sulphide was passed through 1m $CuSO_{4(aq)}$ in a boiling tube as shown in the diagram.



(a) State the observation made in the boiling tube. **(1mk)**

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

(c) What precaution should be taken in carrying out this experiment? Give a reason**?** **(1mk)**

4. $Na^{+}_{(g)} + Cl^{-}_{(g)} \rightarrow NaCl_{(S)} \quad \Delta H_1 = -781 KJmol^{-1}$

$$NaCl_{(S)} \xrightarrow{H_2O_{(l)}} Na^{+}_{(aq)} + Cl^{-}_{(aq)} \quad \Delta H_2 = +7 KJmol^{-1}$$

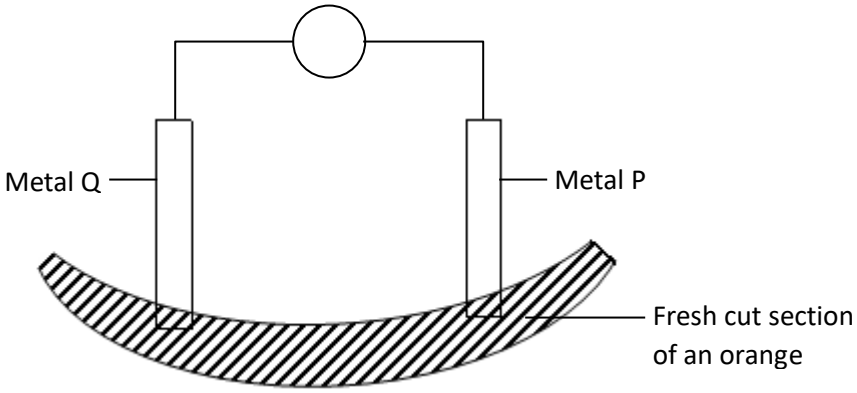
(a) What is the name of ΔH_1? **(1mk)**

(b) Calculate the heat change for the process

$$Na^{+}_{(aq)} + Cl^{-}_{(aq)} \xrightarrow{H_2O_{(l)}} Na^{+}_{(aq)} + Cl^{-}_{(aq)}$$

(2mks)

5. The set up **below** was used to show that metal **P** is more reactive than **Q**.

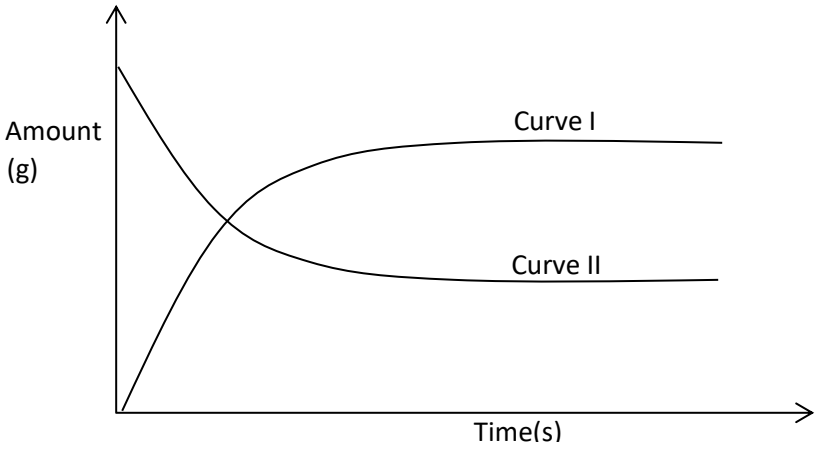


(a) Show the direction of flow of electrons on the diagram using an arrow. **(1mk)**

(b) Explain your answer in (a) above. **(1mk)**

6. The graph **below** shows the amount of calcium carbonate and calcium chloride varying with time in the reaction.

$$CaCO_{3(S)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$$



(a) Which curve shows the amount of calcium chloride varying with time? **(1mk)**

(b) Explain why the two curves become horizontal after a given period of time. **(1mk)**

(c) Sketch on the graph how curve II would appear if the experiment was repeated using a more dilute hydrochloric acid solution. **(1mk)**

7. The structure below represents two cleansing agents, L_1 and L_2.

$L_1 \rightarrow$ $R - CH_2 - CH_3$
$|$
OSO_3Na^+

$L_2 \rightarrow R - COONa^+$

(i) Identify each of the two cleansing agents, L_1 and L_2.

L_1 _____ **(½mk)**

L_2 _____ **(½mk)**

(ii) State a disadvantage of each of the above cleansing agents.

L_1 _____ **(1mk)**

L_2 _____ **(1mk)**

8. 22.2cm³ of sodium hydroxide solution, containing 4.0g per litre of sodium hydroxide were required for complete neutralization of 0.1g of a dibasic acid. Calculate the relative formula mass of the dibasic acid (Na = 23.0, O = 16.0, H = 1.0). **(3mks)**

9. Magnesium was burnt in air forming a white residue T. When put in a boiling tube with water effervescence was noticed and a colouress gas D with a characteristic pungent smell was evolved.

The gas turned a wet red litmus paper blue.

(a) Identify

(i) Residue T. **(1mk)**

(ii) Gas D. **(1mk)**

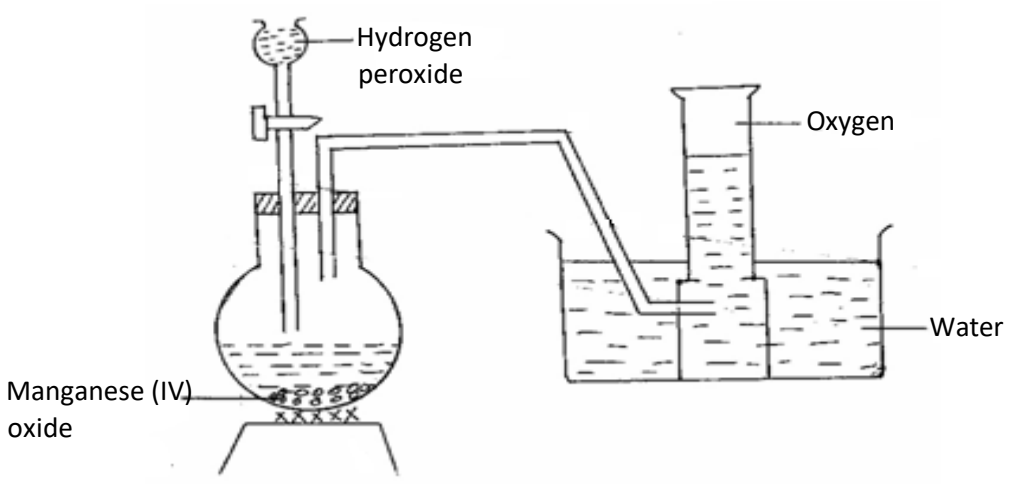
(b) Write an equation for the liberation of gas D. **(1mk)**

10. **(a)** Define half life of radioisotopes. **(1mk)**

(b) X grammes of a radioactive isotope take 100 days to decay to 20g. If half life of the element is 25 days, calculate the initial mass X of the radioisotope. (2mks)

11. Element X contains isotopes with mass number 16 and 18 respectively existing in the ratio 1: 3, calculate the relative atomic mass of X. **(2mks)**

12. The diagram **below** represent a set up that can be used to prepare and collect oxygen gas.



(a) Write an equation for the reaction that takes place. **(1mk)**

(b) What property of oxygen makes it possible for its collection as indicated in the diagram. **(1mk)**

(c) Explain why it is important not to collect any gas for the first few seconds of the experiment. **(1mk)**

13. The reaction **below** refers to the preparation of lead (II) sulphate starting with lead metal.

Lead metal $\xrightarrow{\text{Reagent A}}$ Solution X $\xrightarrow[\text{solution}]{\text{Sodium sulphate}}$ Mixture Y $\longrightarrow$ Residue Z

(a) Name the type of reaction between solution X and sodium sulphate solution. **(1mk)**

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

(c) Explain why it is not possible to prepare residue Z using lead metal and dilute sulphuric acid. **(1mk)**

14. Consider the following reaction at equilibrium.

$PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$

Complete the table **below** to show the effect of different factors on the position of equilibrium. **(2mks)**

	Factor	Effect on equilibrium position
(i)	Decrease in pressure	
(ii)	Removing chlorine	
(iii)	Adding helium to the mixture	

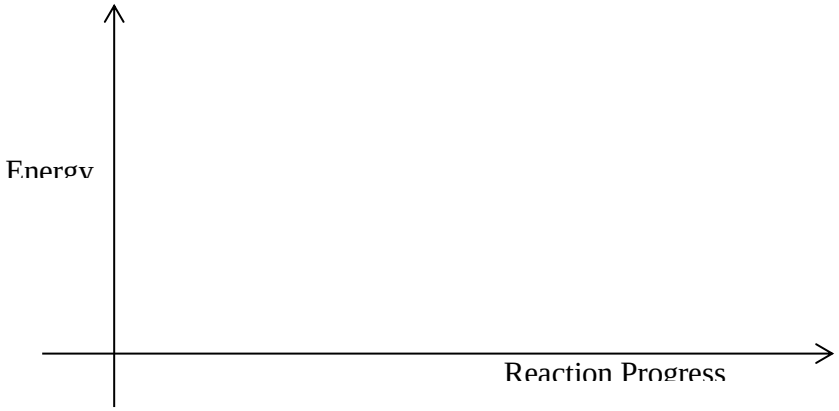
15. Study the information in the table below then answer the questions that follows.

Bond	Bond energy ($kJmol^{-1}$)
H – H	435
Cl – Cl	243
H - Cl	431

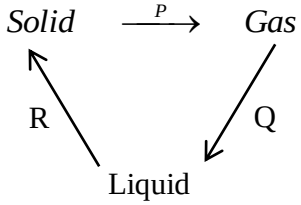
(a) Calculate the enthalpy change for the reaction.

$H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$ **(2mks)**

(b) On the axis given **below** draw an energy level diagram for the reaction above. **(1mk)**



16. Matter exists in three states which can be related as shown in the diagram **below**.



(a) Name processes:

P: _____ **(1mk)**

R: _____ **(1mk)**

(b) Explain whether process **Q** is exothermic or endothermic. **(1mk)**

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

(b) 200cm³ of nitrogen (I) oxide (N_2O) pass through a porous plug in 2 minutes 15 seconds. How long will it take the same volume of sulphur (IV) oxide (SO_2) gas to diffuse through the same plug under the same conditions. (N= 14, O = 16, S = 32). **(3mks)**

18. Write down the property of concentrated sulphuric (VI) acid shown in the following reactions. **(2mks)**

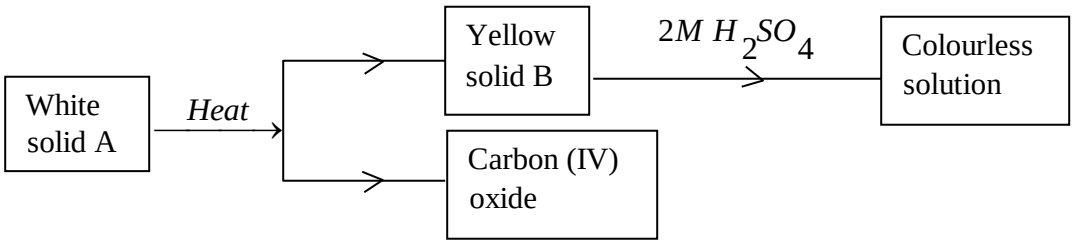
(a) $H_2C_2O_4.2H_2O_{(S)} \xrightarrow{H_2SO_{4(l)}} 2H_2O_{(l)} + CO_{2(g)} + CO_{(g)}$

Property _____ **(1mk)**

(b) $C_{(s)} + 2H_2SO_{4(l)} \rightarrow CO_{2(g)} + 2H_2O_{(l)} + 2SO_{2(g)}$

Property _____ **(1mk)**

19. The scheme **below** represents some reactions starting with a white solid A.



Identify the solids **A** and **B**.

A _____ **(1mk)**

B _____ **(1mk)**

(b) Write an equation for the reaction between B and 2M sulphuric acid. **(1mk)**

20. Study the following redox potentials.

	E^{θ}
$Fe^{3+}_{(aq)} + e^- \rightarrow Fe^{2+}_{(aq)}$	+0.77V
$Br_{2(aq)} + 2e^- \rightarrow 2Br^-_{(aq)}$	+1.09V

Using the values given above, predict whether the following reaction is possible.

$2Fe^{3+}_{(aq)} + 2Br^-_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + Br_{2(aq)}$ **(3mks)**

21. **(a)** A saturated solution contains 7.5g of solute in 20cm³ of water. When the solution is cooled crystals begin to appear at 10°C. Calculate the solubility of the solute at 10°C. **(2mks)**

(b) What causes permanent water hardness? **(1mk)**

22. When excess chlorine gas is bubbled through dilute sodium hydroxide solution, the resulting solution acts as a bleaching agent.

(a) Write an equation for the reaction between chlorine gas and sodium hydroxide solution**. (1mk)**

(b) Explain how the resulting solution acts as a bleaching agent. **(2mks)**

23. A, B, C, D are dyes present in a mixture C is more soluble than B, A is more soluble than C and D is the least soluble in a given solvent. Draw around-paper chromatogram showing how they would appear when separated using the solvent. **(2mks)**

24. **Below** are PH values of some solutions.

Solution	Z	Y	X	W
PH	6.5	13.5	2.2	7.2

(i) Which solution is likely to be

I Acidic rain _____ **(½mk)**

II Potassium hydroxide _____ **(½mk)**

(ii) A basic substance V reacted with both solutions Y and X. What is the nature of V. **(1mk)**

(iii) Name **two** substances that show these characteristics in question (ii) above. **(1mk)**

25. Hydrogen gas was passed over hot copper (II) oxide in a combustion tube.

(a) Write an equation for the reaction which took place. **(1mk)**

(b) What observations were made in the combustion tube? **(1mk)**

(c) Name any other gas which could be used to reduce copper (II) oxide. **(1mk)**

26. **(a)** Element A and B have atomic numbers 6 and 1 respectively illustrate the type of bonding formed when the two elements combine. **(2mks)**

(a) Explain why solid sodium chloride does not conduct electricity while sodium chloride solution conducts. **(1mk)**

27. 'Dry ice' is preferred to ordinary ice as a refrigerant. Explain. **(2mks)**

28. State **one** use of argon which is also a use of nitrogen gas. **(1mk)**

29. An element P has a relative atomic mass of 88 when a current of 0.5 ampheres was passed through the fused chloride for 32..16 minutues, 0.44g of P were deposited at the cathode. Determine the charge on an ion of P. (IF = 96500 coulombs). **(3mks)**

30. Consider the equation.

$NH_{3(g)} + H_2O_{(l)} \rightarrow NH^{+}_{4(aq)} + OH^{-}_{(aq)}$

(a) Identify the acid and base in the above equation using Bronsted Lowry theory. **(3mks)**

Acid _____ **(1mk)**

Base _____ **(1mk)**

Reason **(1mk)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 6 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

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

$CH_3\ CH_2\ CH_2\ COOCH_2\ CH_3$

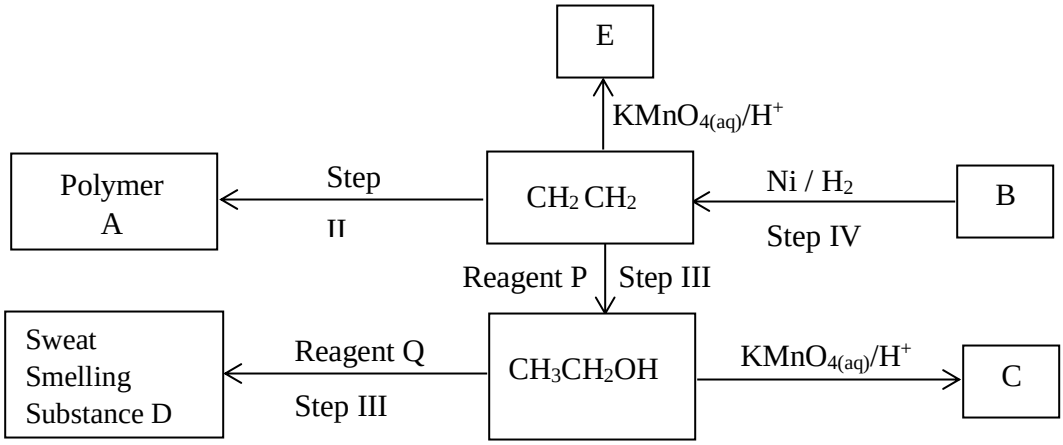
(i) Name I The type of reaction that took place. **(½mk)**

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)**

(ii) Name the process in steps.

I _____ **(½mk)**

II _____ **(½mk)**

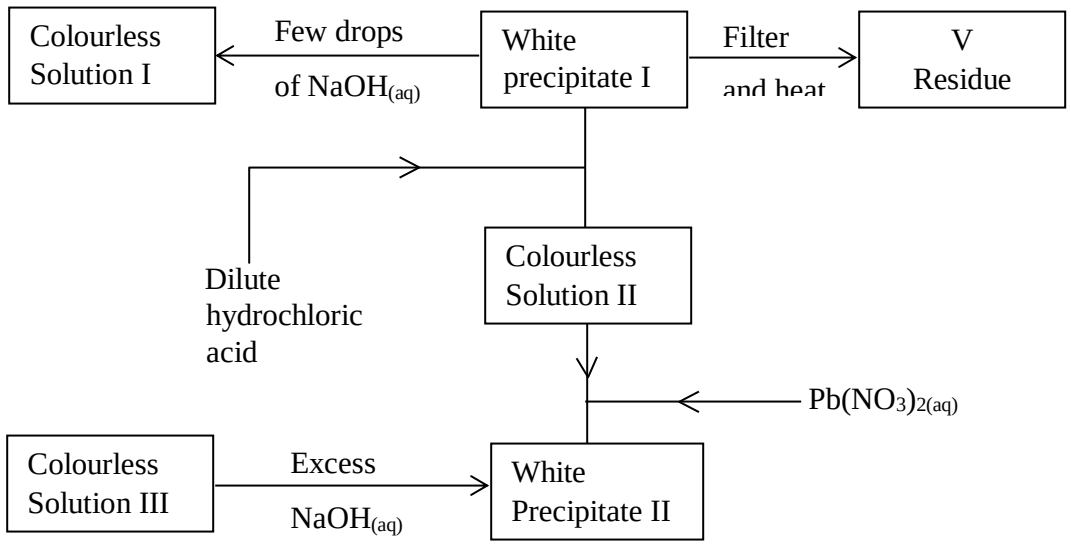
IV _____ **(½mk)**

(iii) 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)**

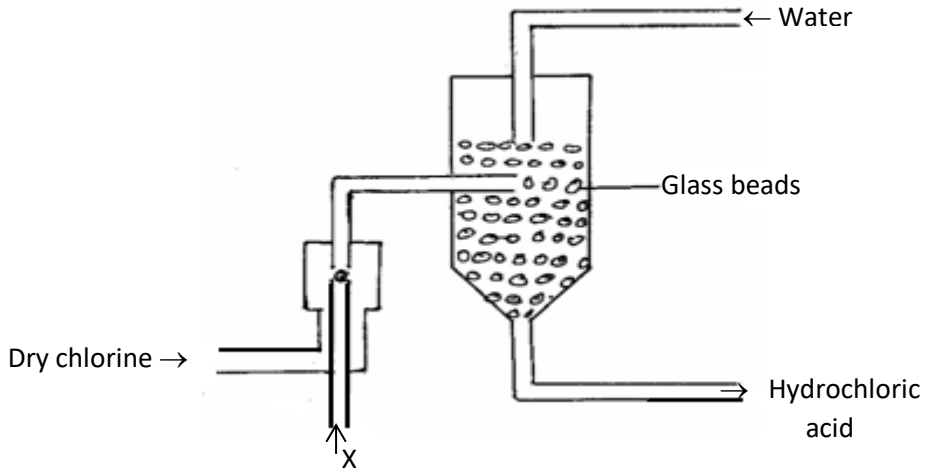
II Solution **II**. **(1mk)**

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**. (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)**

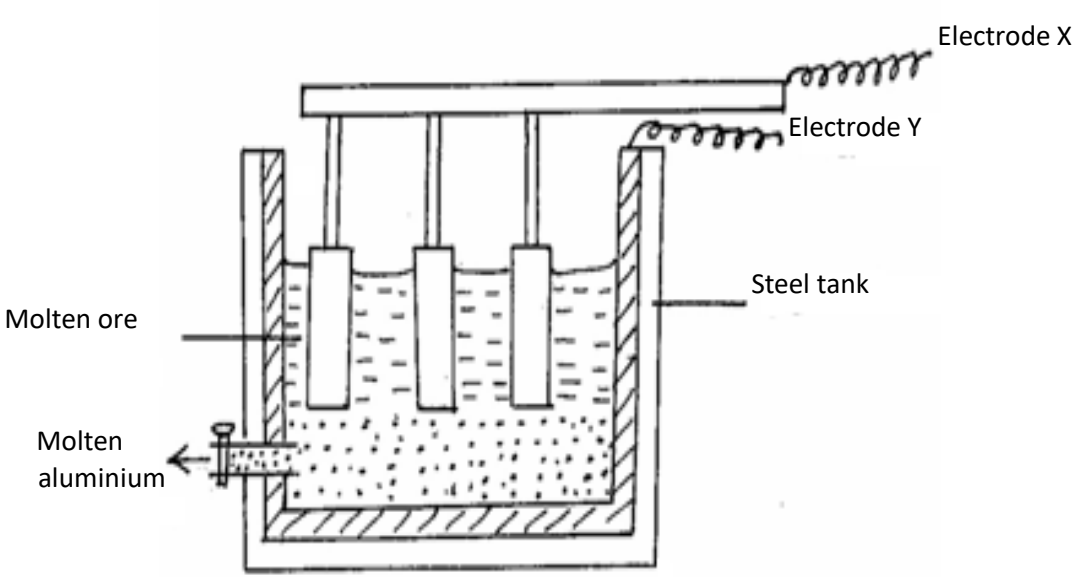
(c) In an experiment, soap solution was added to three separate samples of water. The table **below** shows volumes of soap solution required is form lather with 1000cm³ of each sample of water before and after boiling.

	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.

(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)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 7 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1. A given element E has atomic number 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) What are Isotopes? **(1mk)**

(b) Determine the relative atomic mass of E. **(2mks)**

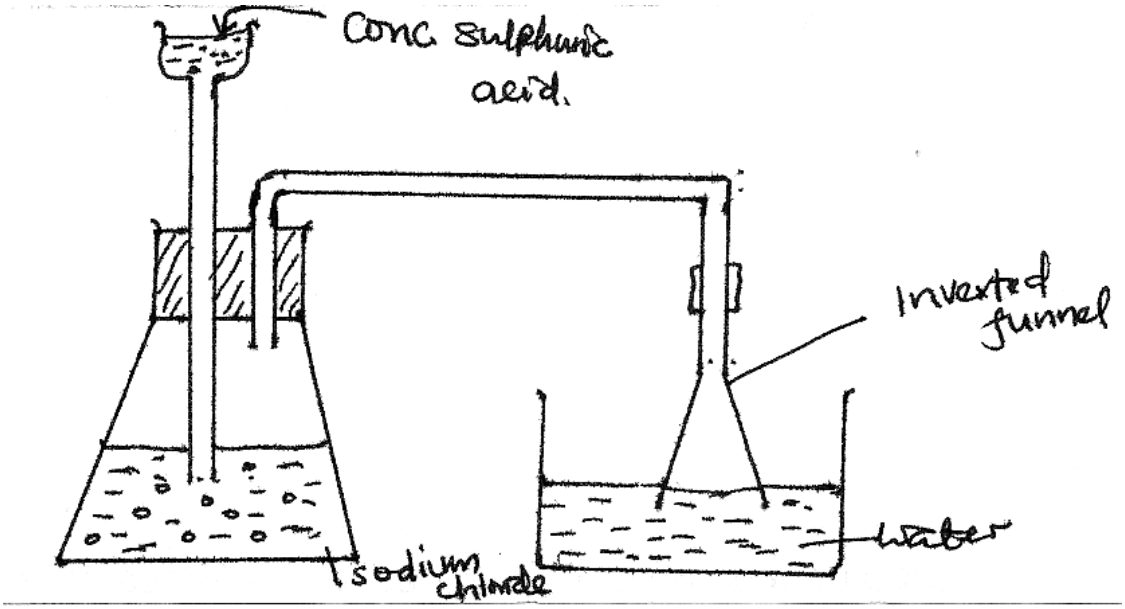
2. Passing a small quantity of carbon (iv) oxide through limewater, forms a white precipitate which dissolves when excess carbon (iv) oxide is bubbled through.

(a) Name the white precipitate. **(1mk)**

(b) Explain using a chemical equation why the white precipitate dissolve in excess carbon (iv) oxide. **(1mk)**

(c) What will happen when solution in (b) above is boiled? **(1mk)**

3. The diagram below shows the laboratory preparation of hydrochloric acid.

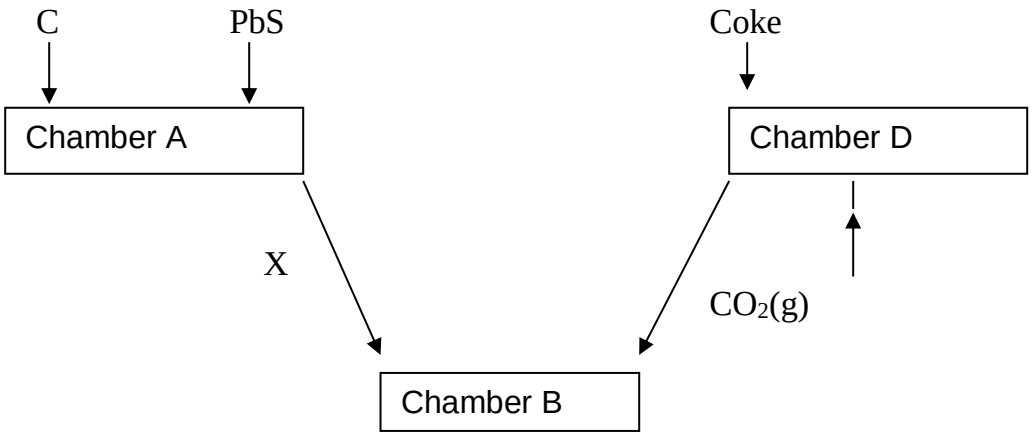


(a) State the condition necessary for the reaction to occur. **(1mk)**

(b) Write a chemical equation for the reaction between sodium chloride and concentrated sulphuric acid. **(1mk)**

(c) Give **two** reasons why an inverted funnel is used instead of delivery tube. **(2mks)**

4. The flow chart below shows some processes involved in extraction of lead metal. Study it and answer the questions that follow;



(a) Name substance C. **(1mk)**

(b) Write an equation for the reaction that take place in chamber B. **(1mk)**

(c) Give **two** uses of lead metal. **(1mk)**

5. (a) State Charles law. **(1mk)**

(b) The capacity of a balloon to hold a gas at 5^0C is $1dm^3$ before it burst due to expansion. Show whether it will hold or not at 35^0C if pressure remains constant.

(2mks)

6. The table below shows the observations made on tests carried out on a colourless solution sample.

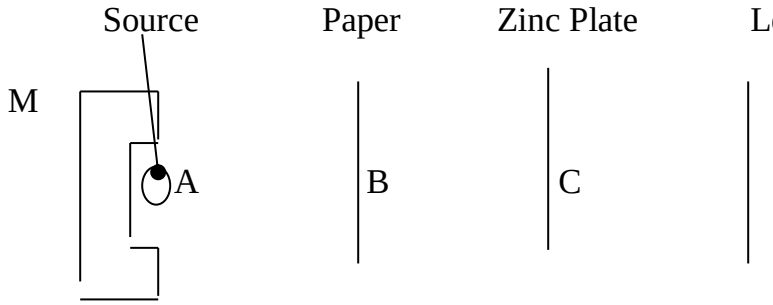
Tests	Observations
Addition of excess $NH_{3(aq)}$	White precipitate
Addition of dilute $H_2SO_{4(aq)}$	White precipitate
Addition of $AgNO_{3(aq)}$	White precipitate

Identify:

(i) Cation in the sample **(1mk)**

(ii) Anion in the sample. **(1mk)**

7. The arrangement below was used to compare the penetrating power of emissions in a radio active decay.



(a) Name the radio active that can be detected at: **(1½ mks)**

A

B

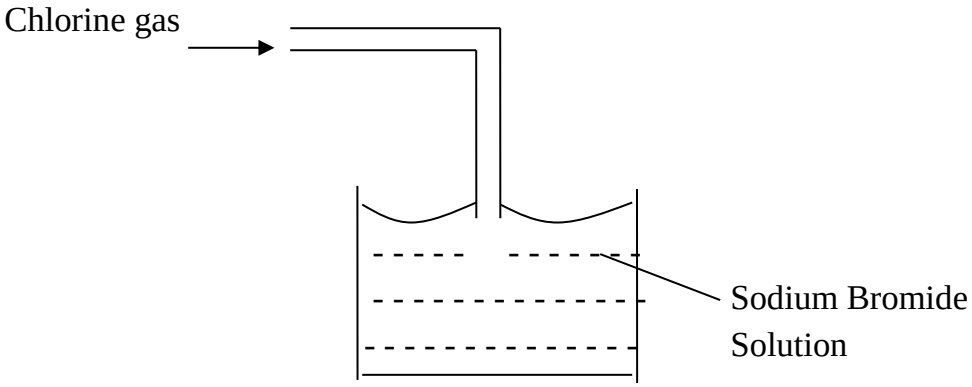
C

(b) Name the material M. **(½ mk)**

(c) The half life of $^{234}_{92}U$ is 4500 years. The isotope decays by alpha emission.

Write a nuclear equation for its decay to form Thorium (Th). **(1mk)**

8. Experiment was set as shown below. Explain what was observed. **(2mk)**



9. Study the ionization energies of alkaline earth metals shown in the table below.

Element	First ionization energy $KJmol^{-1}$	Second ionization energy $KJ\ mol^{-1}$
Beryllium	900	1800
Magnesium	740	1450
Calcium	590	1150

(a) Explain the trend in ionization energies. **(2mks)**

10. Fill the empty spaces in the table below. **(2mks)**

Apparatus	Use
Pipe-clay triangle	
Reagent bottle	

11. Some reactions of metals P, Q, R and S are given below.

Metal	Reaction with water	Reaction with dilute hydrochloric acid
P	A few bubbles form slowly in water	Vigorous reaction. Gas is given off
Q	Vigorous reaction, metal melts, gas given off.	Explosive reaction. Should not be attempted.
R	No reaction	No reaction
S	Does not react with cold water. Hot metal reacts with steam.	Steady fizzing.

(a) Arrange the metals in order of the reactivity starting with the least reactive. **(1mk)**

(b) Write a chemical equation for the reaction between metal Q and water. **(1mk)**

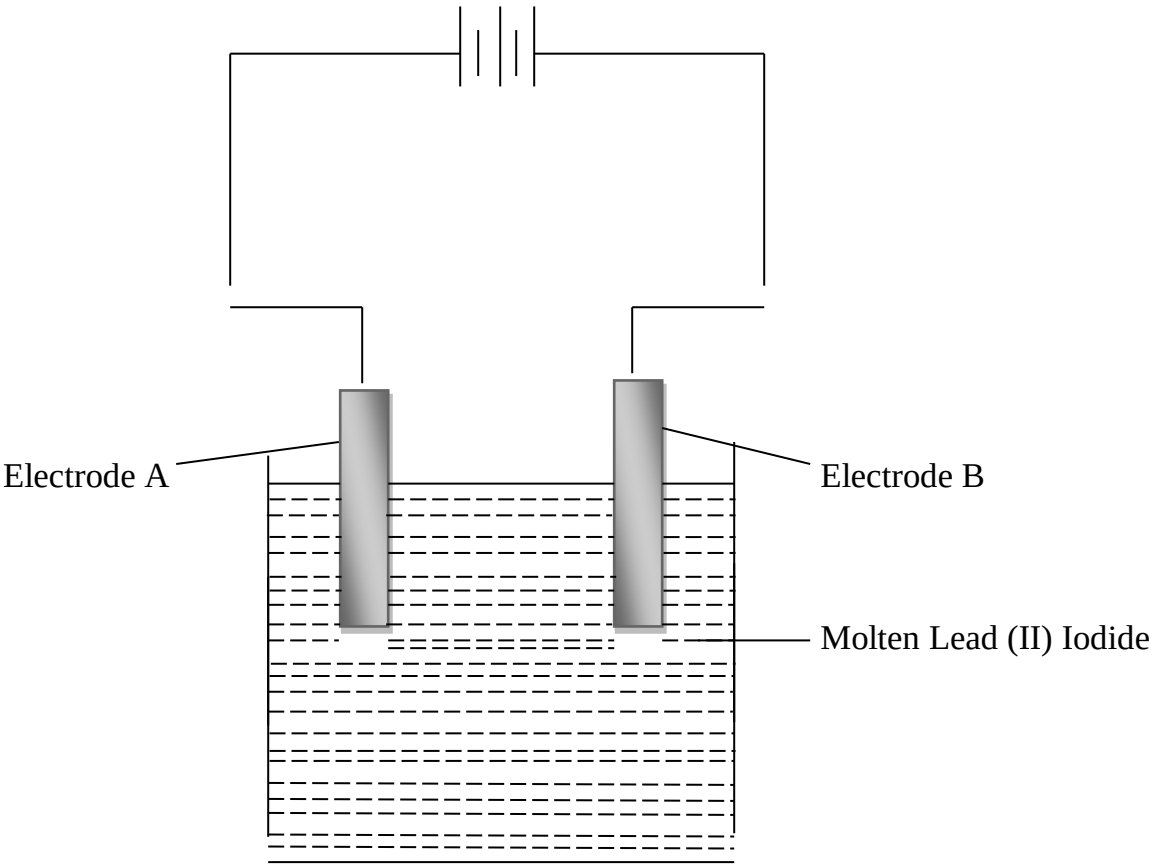
(c) Which of the metals could be:

(i) Copper **(½ mk)**

(ii) Magnesium **(½ mk)**

12. (a) What is a binary electrolyte? **(1mk)**

(b) The set-up below was used to electrolysed molten lead (ii) iodide.



(i) State the observation that was made during electrolysis at electrode A. **(1mk)**

(ii) Write the ionic equation for the reaction that took place at the anode. **(1mk)**

13. In an experiment 2.4g of sulphur was obtained by reacting hydrogen sulphide and chlorine as shown in the equation below.

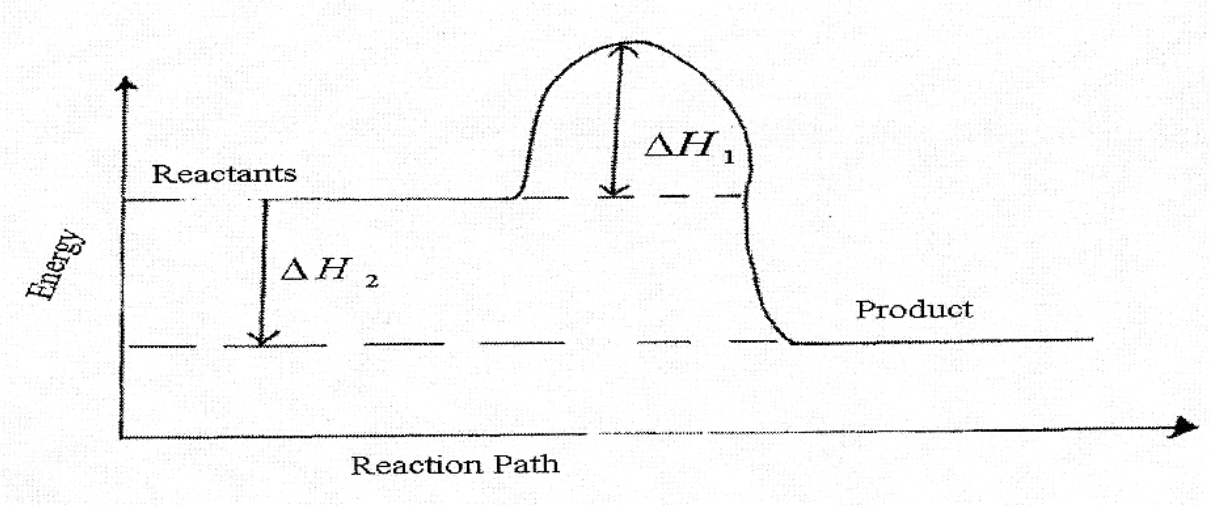
$$H_2S_{(g)} + Cl_{2(g)} \longrightarrow S(s) + 2HCl_{(g)}$$

(a) Which of the reactants acts as a reducing agent in the above reaction. Explain. **(1mk)**

(b) Given that the yield of sulphur in the above reaction is 75%, calculate the number moles of hydrogen sulphide gas used in the reaction (S=32.2 H = 1.0) **(2mks)**

14. Study the energy level diagram for the reaction shown below and use it to answer the questions that follow.

$$2SO_{2(g)} + O_{2(g)} \longrightarrow 2SO_{3(g)}$$



(i) State and explain **two** ways of increasing the yield of SO_3 per unit time from the diagram. **(2mks)**

(ii) What do the following represent?

ΔH1 **(½mk)**

ΔH2 **(½mk)**

15. An equilibrium exists between the chromate ion (CrO^{2-}_4) and the dichromate ($Cr_2O^{2-}_7$) as represented by the following equation:

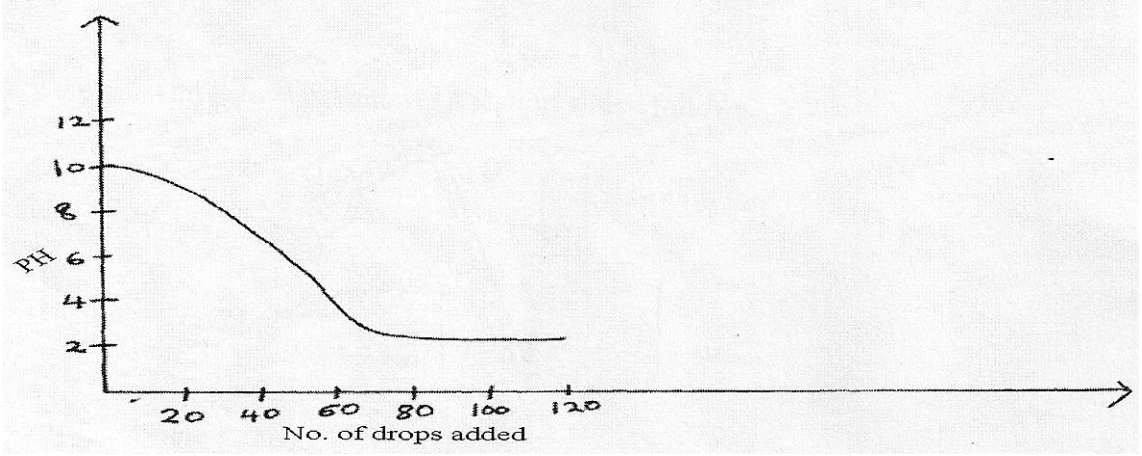
$2(CrO^{2-}_{4(aq)} + 2H^+(aq) \rightleftharpoons Cr_2O^{2-}_{7(aq)} + H_2O_{(l)}$

(Yellow) **(Orange)**

(a) State and explain the observation made on adding aqueous potassium hydroxide solution to the equilibrium mixture. **(2mks)**

(b) What would be the effect of increasing pressure on the equilibrium reaction? **(1mk)**

16. 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. **(2mks)**

(b) The table below shows solution and their pH value.

Solution	pH Value
P	2.0
R	7.0
Q	14.0

Select **two** solutions that would react with zinc hydroxide. Explain. **(1mk)**

17. The table below shows the pH values of solutions A to E.

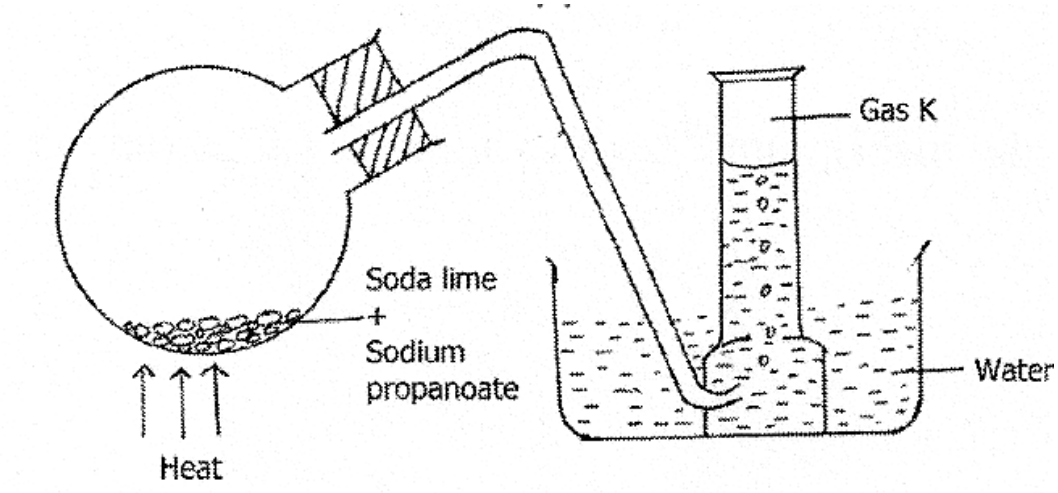
Solution	A	B	C	D	E
pH	6	13	2	10	7

(a) What is meant by the term pH? **(1mk)**

(b) Which of the solutions contains the largest number for hydroxide ions? **(1mk)**

(c) What will the pH value of the mixture of D and E? **(1mk)**

18. Study the set-up below and answer the questions that follow.

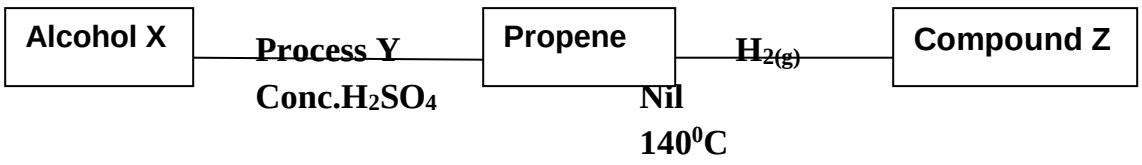


(i) Name gas K. (1mk)

(ii) To which homologous series does K belong? (1mk)

(iii) Write the chemical equation of the reaction in the round bottom flask. (1mk)

19. Use the reaction scheme below to answer the questions that follow:



(i) Draw the structure of alcohol X. **(1mk)**

(ii) Name process Y. **(1mk)**

(iii) Write the molecular formula of the 5th member in which propene belong. **(1mk)**

20. Study the two structural formula of compounds labeled Q and R.

Q $CH_3CH_2CH_2COOCH_2CH_3$

R $CH_3CH_2CHCH_2CH_3$
with HO – C = O attached to the CH

(i) Give the empirical formula that represents both compounds Q and R. **(1mk)**

(ii) Which single chemical term best describes the two substances Q and R. **(1mk)**

(iii) Which unique physical property of substance Q is used to identify it? **(1mk)**

21. Element R has atomic number 8 and a mass number 16.

(i) Draw the atomic structure of element R. **(1mk)**

(ii) Write the formula of the ion of element R. **(1mk)**

(iii) Explain why R forms a hydride with a low boiling point. **(1mk)**

22. The mass of $1dm^3$ of a gas at s.t.p. is 1.52g. What is the relative molecular mass of the gas? (Molar volume at s.t.p. is $22.4dm^3$) **(2mks)**

23. The melting and boiling points of molecular substances increase with increase in relative molecular mass. Explain why sugar with a relative mass of 183 has a higher melting point (200^0C) than iodine with a relative molecular mass of 86 and a melting point of 114^0C. **(2mks)**

24. (a) State role of the following parts during fractional distillation of a mixture of water and ethanol.

(i) Fractionating column **(1mk)**

(ii) Glass beads in the fractionating column. **(1mk)**

(b) State any **two** applications of fractional distillation process. **(2mks)**

25. $18.7cm^3$ of a dibasic acid H_2A required $25cm^3$ of 0.1m Sodium hydroxide for complete neutralization.

(a) How many moles of Sodium hydroxide are contained in $25cm^3$? **(1mk)**

(b) Calculate the molarity of the dibasic acid. **(2mks)**

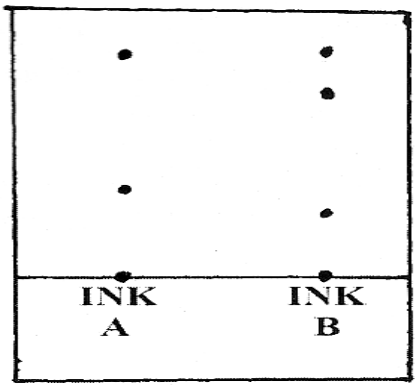
26. An oxide of Potassium has a relative formula mass of 110, if 2.75g of the oxide contains 1.95g of Potassium, determine the formula of the oxide. K = 39.0, O = 16.0. **(3mks)**

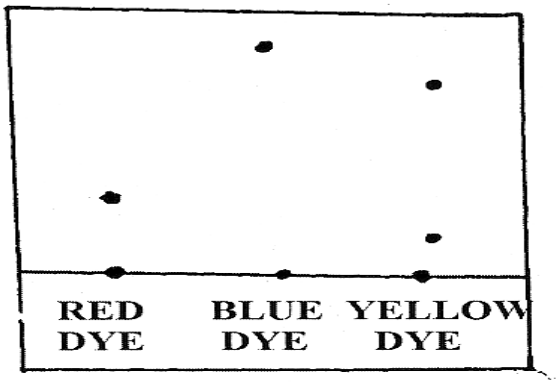
27. Using dots (.) and crosses (x), show bonding in:

(a) The compound formed when nitrogen reacts with fluorine (Atomic numbers F = 9, N = 7) **(2mks)**

(b) Sodium oxide. (Atomic numbers Na = 11, O = 8) **(1mk)**

28. The chromatogram of two inks and three dyes is drawn below.





(a) Name the colours of ink A. **(1mk)**

(b) Suggest how separated components can be recovered. **(1mk)**

(c) Suggest **two** reasons why separations occur in this method. **(1mk)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 7 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

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		

(i) How do the electrical conductivities of elements X and Y compare? Explain. **(2mks)**

(ii) Element W has two melting points. Explain this observation. **(1mk)**

(iii) 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)**

(iv) Element V has atomic number 15. Show its position in the grid. **(1mk)**

(v) State **one** use of element Z. **(1mk)**

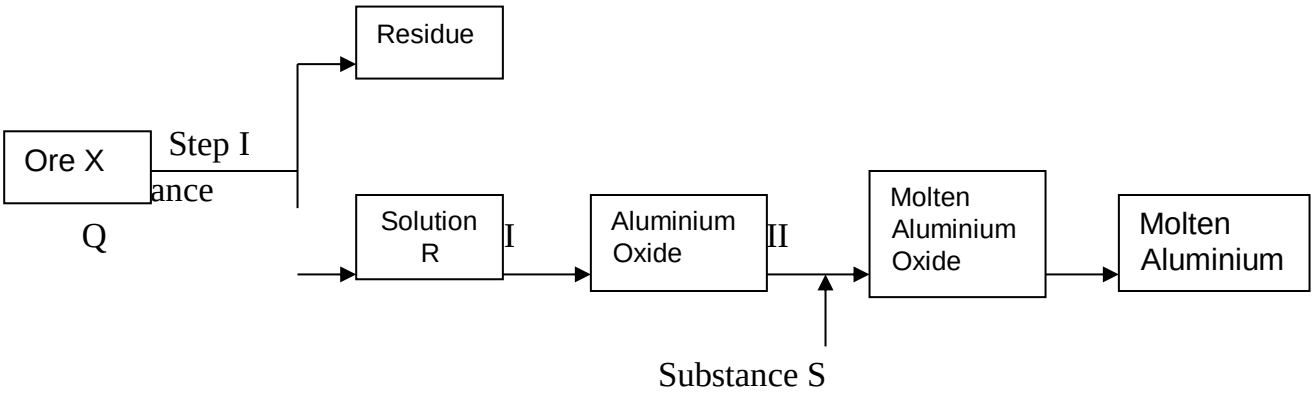
(vi) Oxide of element Y react with both acids and bases. What property is shown by element Y? **(1mk)**

(vii) Explain (vi) above using chemical equations. **(2mks)**

(viii) Write down the equation for the reaction between element Y and Oxygen. **(1mk)**

(ix) 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.

(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. **(2mks)**

(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

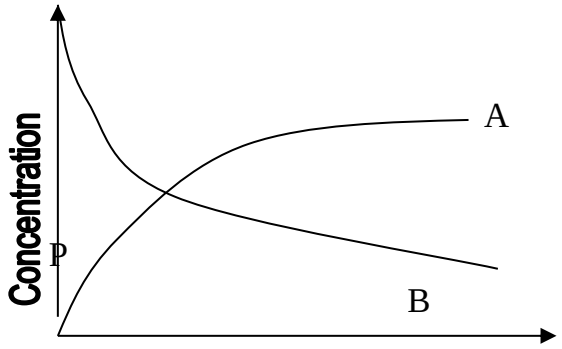
(i) Plot a graph of saturation point of Sodium Nitrate against temperature. **(3mks)**

(ii) Using the curve determine the solubility at 70^0C. **(1mk)**

(iii) 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) 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)**

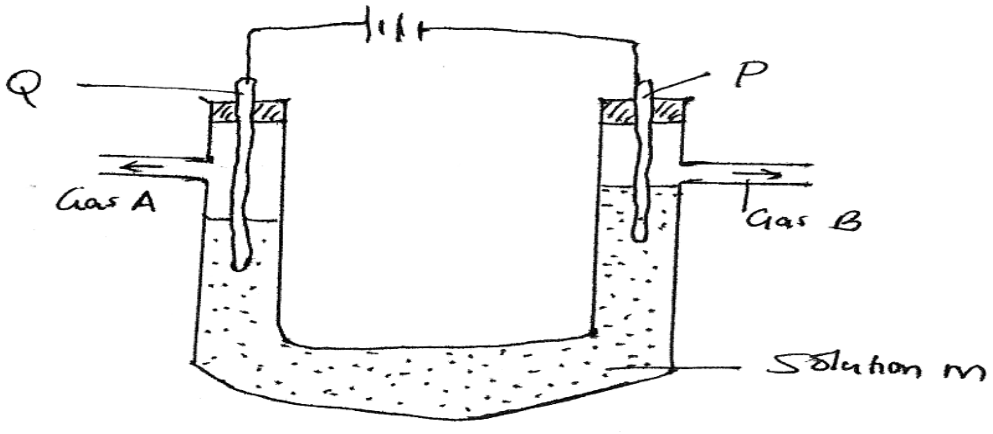
4. A tiny piece of potassium was burnt in air. A white residue was formed.

(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.

(i) Write an equation that results in the formation of the colourless solution M. **(1mk)**

(ii) 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 tormed 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^{0}C the reaction between bromine and methanoic acid proceeds according to the equation below:

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

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 x 10^{-3}	0
8.1 x 10^{-3}	1
6.6 x 10^{-3}	2
4.4 x 10^{-3}	4
3.0 x 10^{-3}	6
2.0 x 10^{-3}	8
1.3 x 10^{-3}	10

(a) Plot a graph of bromine concentration (vertical axis) against time. **(3mks)**

(b) Using your graph,

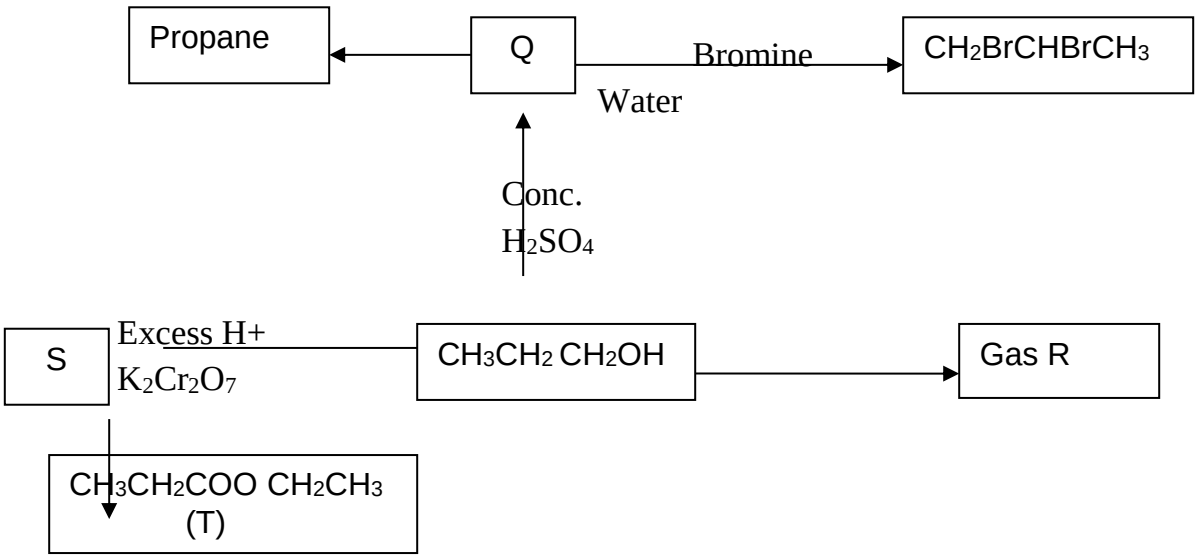
(i) State the concentration of bromine in the 3rd minute. **(1mk)**

(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^{0}C and label it I. **(1mk)**

6. The scheme below shows several reactions starting with propanol. Study the scheme and answer the questions that follow.



(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.

1	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

(i) To which homologous series do the following compounds belong? (3mks)

U

V

W

7. (a) State the Hess's law. **(1mk)**

(b) The heat of combustion of propane, carbon and hydrogen are given below.

$C_3H_{8(g)} + 5O_{2(g)} \longrightarrow 3CO_{2(g)} + 4H_2O_{(l)}, \Delta H = 2220KJmol^{-1}$

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}, \quad \Delta H_2 = -393KJmol^{-1}$

$H_{2(g)} + ½ O_{2(g)} \longrightarrow H_2O_{(l)}, \quad \Delta H_3 = -285KJmol^{-1}$

(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

(i) Predict the heat of combustion of hexane. **(1mk)**

(ii) Explain the difference in molar heat of combustion between the successive alkanes. **(1mk)**

(iii) Which of the alkanes will be the best fuel. Explain. **(1mk)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 8 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1. Two papers **A** and **B** were placed at different levels of a non-luminous flame. Paper **A** was placed

at the lowest part of the flame while **B** was placed at the tip.

(a) Indicate **below** the observations made on each paper. **(2 marks)**



Paper **A**



Paper **B**

(b) Explain the observations made on paper **A**. **(1 mark)**

2. The diagram **below** shows a set-up used by a student to separate two liquids **C** and **D**.

(a) Name the apparatus drawn. **(1 mark)**

(b) Explain why it is possible to separate **C** and **D** using the apparatus shown. **(2 marks)**

3. The pH values of some solutions labeled **E** to I are given in the table **below**. Use the information to answer the questions that follow.

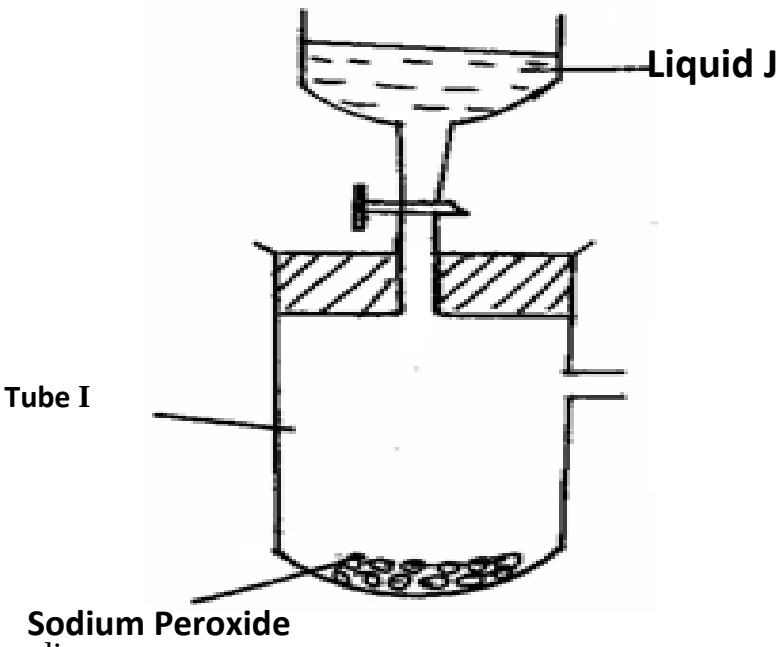
pH	14.0	1.0	8.0	6.5	7.0
Solution	E	F	G	H	I

(a) Identify the solution with the highest concentration of hydroxide ions. Give a reason for your answer. **(2 marks)**

(b) Which solution can be used as a remedy for acid indigestion in the stomach**?(1 mark)**

(c) Which solution would react most vigorously with magnesium metal? **(1 mark)**

4. The diagram **below** represents part of a set-up for preparing and collecting a dry sample of oxygen gas.

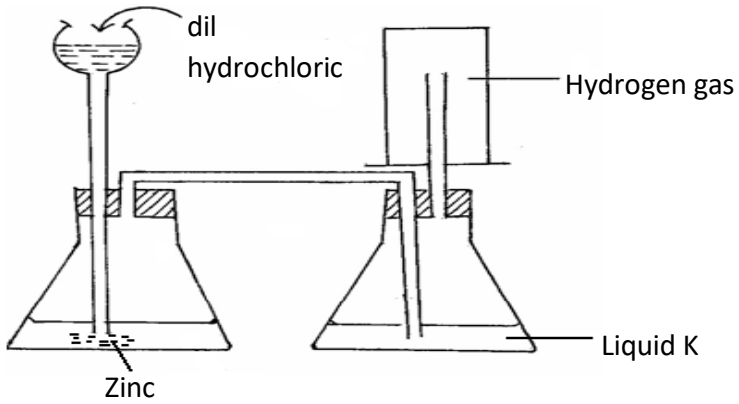


(a) Complete the diagram. **(2 marks)**

(b) Write the equation for the reaction in tube I. **(1 mark)**

(c) State **one** commercial use of oxygen gas. **(1 mark)**

5. The diagram **below** represents an arrangement for preparing and collecting dry hydrogen. Study it and answer the questions that follow.



(a) Write the equation for the reaction that produces hydrogen gas. **(1 mark)**

(b) Name a suitable substance that liquid K is likely to be. **(1 mark)**

(c) Explain why it is not advisable to use nitric (V) acid as an alternative to hydrochloric acid in this preparation experiment. **(1 mark)**

6. Study the table and answer the questions that follow. The letters are not actual symbols of the elements or ion.

	Number of		
Particle	Protons	Electrons	Neutrons
L	18	18	12
M	17	18	18
N	19	19	20
O	9	8	10
P	19	19	22

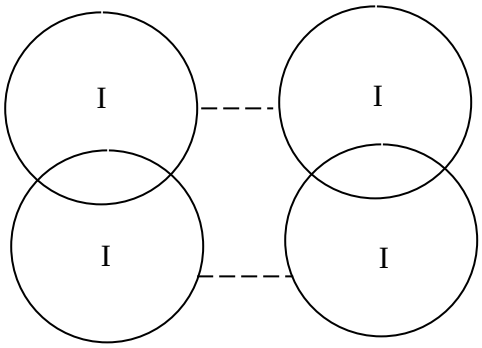
With reasons, choose the letters that represent

(a) A cation. **(1 mark)**

(b) An anion. **(1 mark)**

(c) A pair of isotopes. **(1 mark)**

7. **(a)** The diagram **below** shows the structure of solid iodine.



(i) Name the types of bond(s) in the solid. **(1 mark)**

(ii) Explain why iodine has a very low melting point. **(1 mark)**

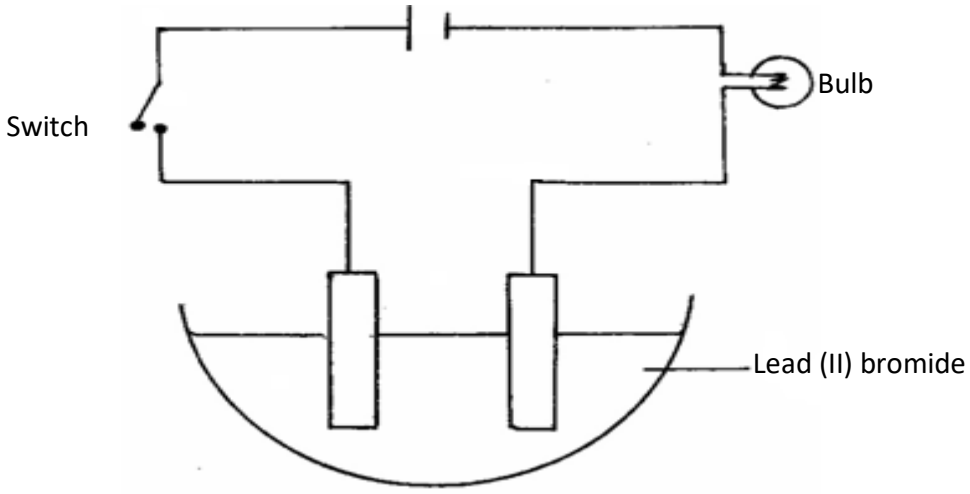
(b) Explain why graphite is a better lubricant than oil. **(1 mark)**

8. Explain the following observations.

(a) A beaker with lime water, when left exposed develops a layer of a white solid on the surface. **(1 mark)**

(b) Calcium chloride powder, when left exposed gradually turn into a colourless solution. **(1 mark)**

9. The diagram **below** shows a set-up intended for the electrolysis of molten lead (II) bromide.



(a) Label on the diagram: (i) anode **(½ mark)**
(ii) cathode **(½ mark)**

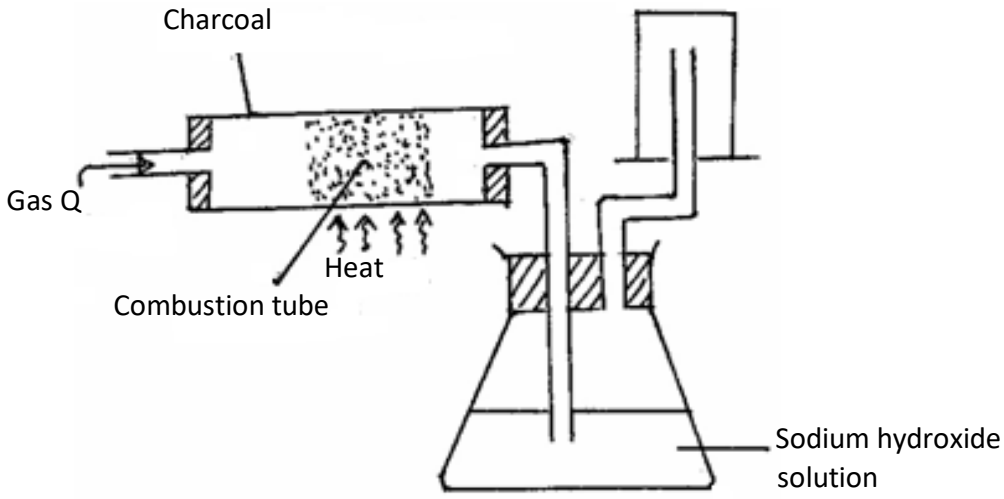
(b) Indicate on the diagram the direction of flow of electrons. **(1 mark)**

(c) State the observations made at the

(i) anode _____ **(½ mark)**

(ii) cathode _____ **(½ mark)**

10. The diagram **below** shows an experimental set-up for preparing carbon (II) oxide. Study it and answer the questions that follow.



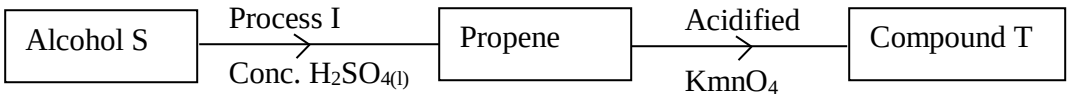
(a) State the role of sodium hydroxide solution in the set-up. **(1 mark)**

(b) State the reason why carbon (II) oxide is collected in the manner indicated. **(1 mark)**

(c) Describe a simple test that can be used to distinguish between carbon (II) oxide and carbon (IV) oxide. **(1 mark)**

11. When 3.1g of a metal carbonate RCO3 were heated, a constant mass of 2.0g of the metal oxide were formed. On reduction with coke the same oxide yielded 1.6g of pure metal. Calculate the relative atomic mass of metal R (O = 16.0). **(3 marks)**

12. Study the flow chart **below**.

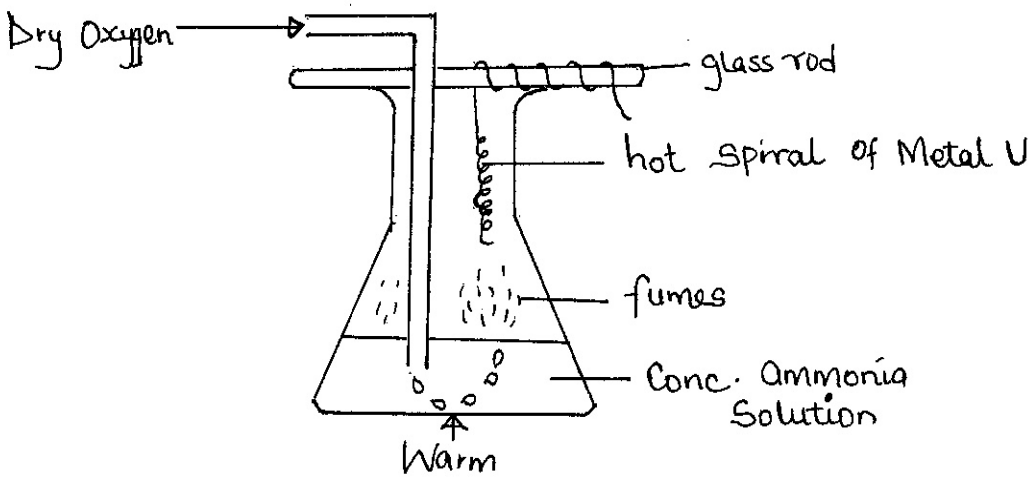


(a) Write the structural formula of alcohol **S**. **(1 mark)**

(b) Name (i)compound **T** _____ **(1 mark)**

(ii) process **I** _____ **(1 mark)**

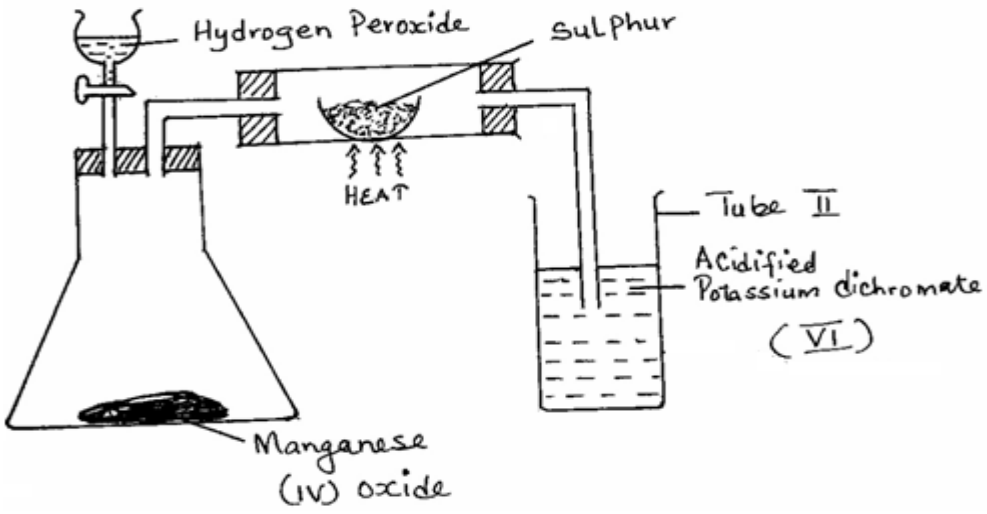
13. Study the diagram **below**:



(a) Give the most likely identity of metal **U**. **(1 mark)**

(b) State **two** observations made in the conical flask. **(2 marks)**

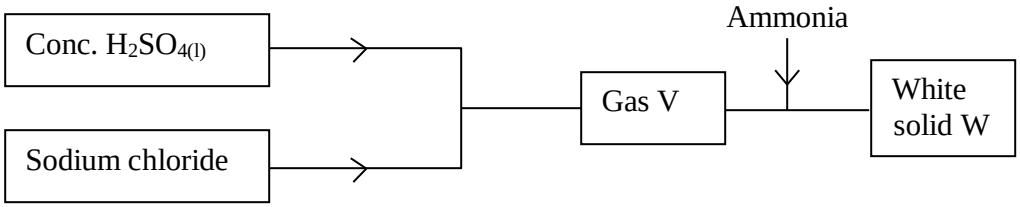
14. Study the diagram **below**.



(a) State the role of manganese (IV) oxide in the set-up shown above. **(1 mark)**

(b) State and explain the observation made in tube **II**. **(2 marks)**

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



(a) Name (i) gas **V** _____ **(1 mark)**

(ii) Solid **W** _____ **(1 mark)**

16. In an experiment, soap solution was added to three separate samples of water. The table **below** shows the volumes of soap solution added in order to form lather with 1000cm³ of each samples before and after boiling.

	Sample I	Sample II	Sample III
Volume of soap added to unboiled sample (cm³)	27.0	3.0	10.6
Volume of soap added after boiling sample (cm³)	27.0	3.0	3.0

(a) Identify the sample that was likely to be soft water. Explain. **(1 mark)**

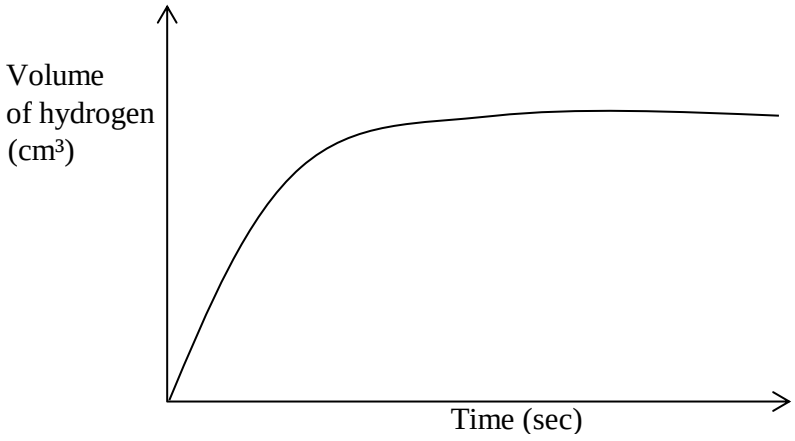
(b) Explain the change in the volume of soap solution in sample III. **(1 mark)**

(c) Give **one** disadvantage of hard water. **(1 mark)**

17. **(a)** When 8.0g of ammonium nitrate was dissolved in 100cm³ at the temperature of the solution was 14ºC. Given that the temperature of the water was initially 20ºC, calculate the molar enthalpy of solution of ammonium nitrate. (N = 14.0, H = 1.0, O = 16.0) C = $4.2Jg^{-1}K^{-1}$. **(2 marks)**

(b) Draw an energy level diagram for this process. **(1 mark)**

18. In an experiment to monitor the rate of reaction of magnesium and hydrochloric acid a student recorded the volume of hydrogen produced at regular time intervals and obtained the graph shown **below**.



(a) On the same set of axes sketch the curve expected if the experiment is repeated with a few crystals of copper (II) sulphate added to the reactants. **(1 mark)**

(b) Explain the shape of your curve. **(1 mark)**

19. A current of 4A was passed through dilute sulphuric (VI) acid for 13h 24min and 10sec. Calculate the volume of oxygen gas produced at the anode. (IF = 96500C, molar gas volume

20. **(a)** Write the formula of the chief ore (bauxite) from which aluminium is extracted**.(1 mark)**

(b) Explain the role of molten cryolite in aluminium smelting. **(1 mark)**

(c) Aluminium does not apparently react with dilute nitric acid. Explain. **(1 mark)**

21. **(a)** Determine the values of χ and y in the nuclear equation shown **below**. **(1 mark)**

$$\chi\ {}^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{141}_{56}Ba + {}^{\chi}_{y}Kr + 3{}^{1}_{0}n$$

(b) State **one** application of this type of reaction. **(1 mark)**

(c) State **one** danger associated with exposure of human beings to radioactive substances. **(1 mark)**

22. The grid **below** is a section of the periodic table. Study it answer the questions that follow. The letters do not represent actual symbols.

	A							
B			C				D	
E							F	

(a) State the name given to the family of **B** and **E**. **(1 mark)**

(b) Identify the most reactive metal. **(1 mark)**

(c) State the type of bond that exists in the compound of elements **B** and **D**. **(1 mark)**

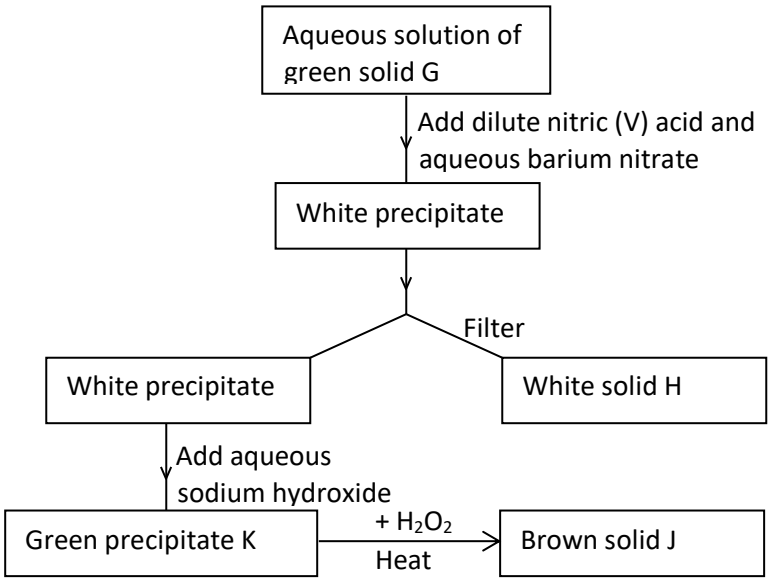
23. The reversible reaction represented below is for the equilibrium established in the reaction of hydrogen and iodine.

$H_{2(g)} + I2_{(g)} \rightleftharpoons 2HI_{(g)}$, $\Delta H = -10KJmol^{-1}$

(a) State and explain the effect on the equilibrium of decreasing the pressure. **(2 marks)**

(b) Of lowering the temperature. **(2 marks)**

24. The scheme **below** shows a series of reactions.



Identify the following:

(a) White solid **H** _____ **(1 mark)**

(b) Green precipitate **K** _____ **(1 mark)**

(c) Brown solid **J** _____ **(1 mark)**

(d) Green solid **G** _____ **(1 mark)**

25. **(a)** State Graham's law. **(1 mark)**

(b) Two gases L and M have relative densities 1.98 and 2.90 respectively. They diffuse under similar conditions. If the relative molecular mass of M is 64, determine the relative molecular mass of L. **(2 marks)**

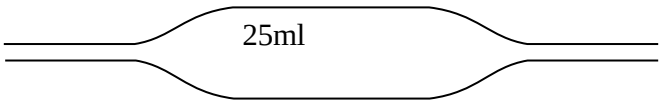
26. When concentrated sulphuric (VI) acid reacts with hydrogen bromide gas the following reaction takes place.

$2HBr(g) + H_2SO_{4(l)} \rightarrow Br_{2(g)} + SO_{2(g)} + 2H_2O_{(g)}$

(a) State the observation made during the reaction. **(1 mark)**

(b) Give the property of concentrated sulphuric (VI) acid demonstrated in the reaction. **(1 mark)**

27. **(a)** Name the apparatus shown **below**. **(1 mark)**



(b) Sate **one** safety measure to be taken while using the apparatus shown. **(1 mark)**

(c) State the use of this apparatus in the laboratory. **(1 mark)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 8 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1. The grid **below** is part of the periodic table. Study it and answer the questions that follow.

The letters do not represent the actual symbol of the element.

A											**M**
B	**C**				**F**		**G**	**J**	**L**		
	D		**E**			**H**	**K**				

(a) What name is given to the group of element n which **M** and **L** belong? **(1 mark)**

(b) Element Y has the electronic structure 2, 8, 8, 4; on the gird above, indicate the position of element Y. **(1 mark)**

(c) Write an equation to show the effect of heat on the nitrate of **B**. **(1 mark)**

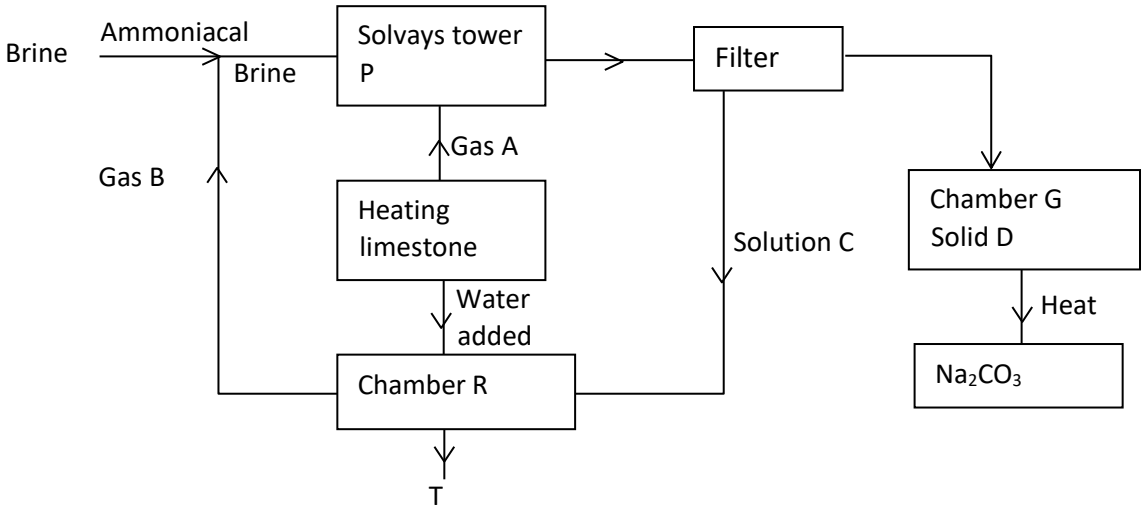
(d) When 300cm³ of chlorine gas was completely reacted with element C, 1875g of the produce was formed. Determine the relative atomic mass of element C. (Cl = 35.5, M.G.V = 24000cm³). **(3 marks)**

(e) Using dot (.) and crosses (x) to represent electron, show bonding in the compound formed between **C** and J. **(2 marks)**

(f) Compare the melting points of elements **D** and **E**. Explain. **(2 marks)**

(g) State **one** commercial use of element **G**. **(1 mark)**

2. The diagram **below** shows the process of manufacturing sodium carbonate using ammonia soda process. Study it and answer the questions that follow.



(a) Name gases **A** and **B**. **(2 marks)**

(b) Name liquid **C** and solid **D**. **(2 marks)**

(c) Write equations of the reactions in: **(2 marks)**

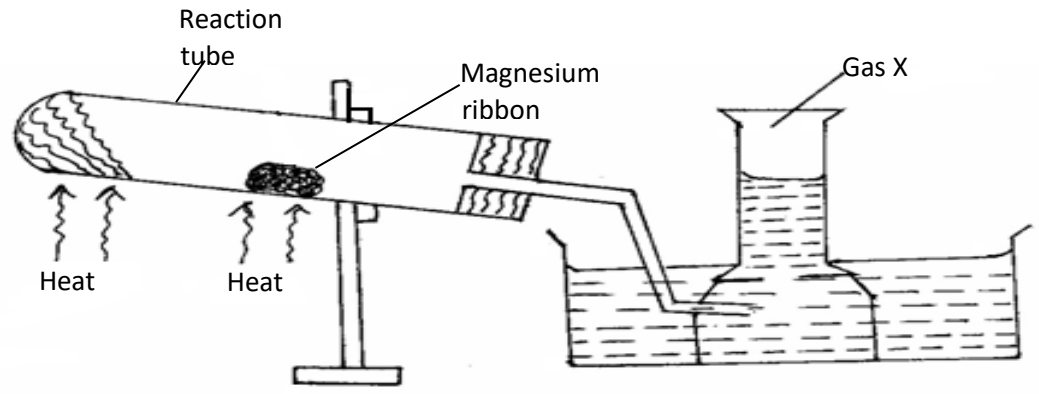
Tower **P**.

Chamber **R**.

(d) Name the product **T** formed at chamber **R** and give one of its uses. **(2 marks)**

(e) Explain using ionic equations how sodium carbonate is used to soften hard water. **(2 marks)**

3. The set-up **below** was used to prepare and collect gas **X.** During the experiment cleaned magnesium ribbon was strongly heated before heating the wet glass wool.



(a) Name gas **X** _____ **(1 mark)**

(b) Why is magnesium ribbon cleaned before it is used? **(1 mark)**

(c) State **one** observation that would be noted in the reaction tube. **(1 mark)**

(d) Write the equation for the reaction in the reaction tube. **(1 mark)**

(e) State **one** industrial use of the solid product formed in the reaction tube. **(1 mark)**

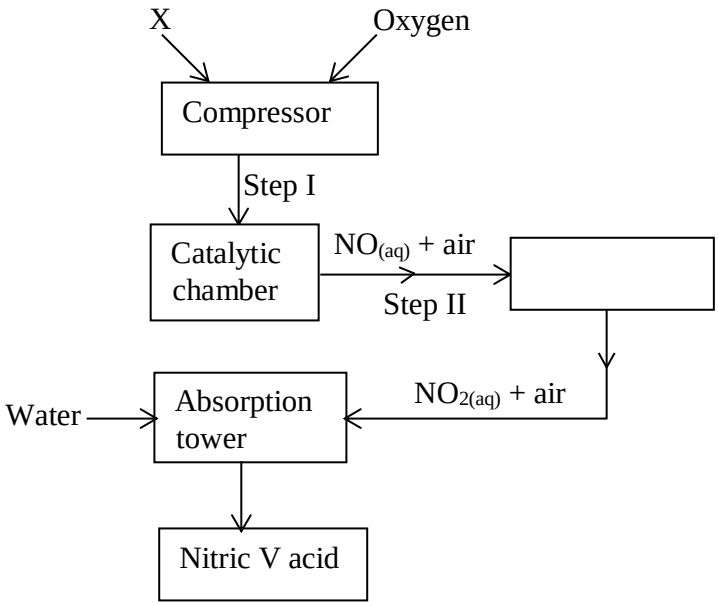
(f) What precaution should be taken at the end of experiment? Explain. **(2 marks)**

(g) At the end of the experiment 96.0cm³ of gas X were collected at 10°C and 1 atmosphere pressure. (Mg = 24, M.G.V = 22.4, T = O°C at stp, P = 1 atmosphere at stp).

(i) Determine the volume gas X would occupy at s.t.p? **(2 marks)**

(ii) Calculate the mass of magnesium ribbon used Mg = 24. **(2 marks)**

4. The flow chart **below** shows the large-scale manufacture of nitric (V) acid. Study it and answer the questions **below**.



(a) Name substance **X**. _____ **(1 mark)**

(b) Identify one source of **X** in this process. **(1 mark)**

(c) Write a balanced equation for the reaction which take place.

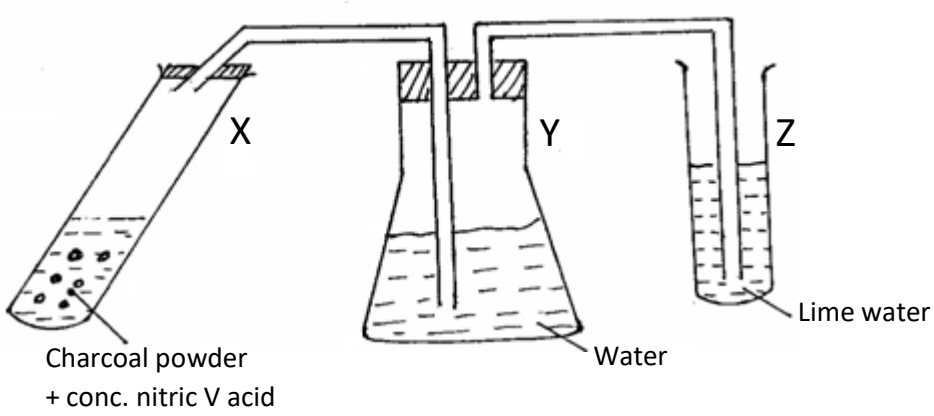
(i) At Step II. **(1 mark)**

(ii) In the absorption tower. **(1 mark)**

(d) Name the catalyst used in this process. **(1 mark)**

(e) Why is it not advisable to store nitric (V) acid in a transparent bottle? **(1 mark)**

(f) The apparatus **below** was arranged to investigate the properties of nitric (V) acid. Study the set-up and answer the questions that follow:



(i) Explain what would be observed when blue and red litmus paper is dropped into flask **Y** after the experiment. **(2 marks)**

(ii) Write an equation for the reaction in test tube **X** above. **(1 mark)**

(iii) What gaseous products would be expected if concentrated sulphuric (VI) acid was used in place of conc. nitric (V) acid? **(1 mark)**

5. The standard reduction potentials for five half cells are shown in the table **below**. Study it and answer the questions that follow. (The letters do not represent the actual symbol of elements).

Elements		E^{θ} (Volts)
(i)	$A_{2(aq)} + 2e^- \rightarrow 2A^-_{(aq)}$	$+1.09$
(ii)	$Q^{2+}_{(aq)} + 2e^- \rightarrow Q_{(s)}$	-0.13
(iii)	$R^{2+}_{(aq)} + 2e^- \rightarrow R_{(s)}$	-2.37
(iv)	$Y^{2+}_{(aq)} + 2e^- \rightarrow Y_{(s)}$	$+0.34$
(v)	$2S^{+}_{(aq)} + 2e^- \rightarrow S_{2(s)}$	0.00

I **(a)** With a reason, identify the strongest reducing agent. **(1 mark)**

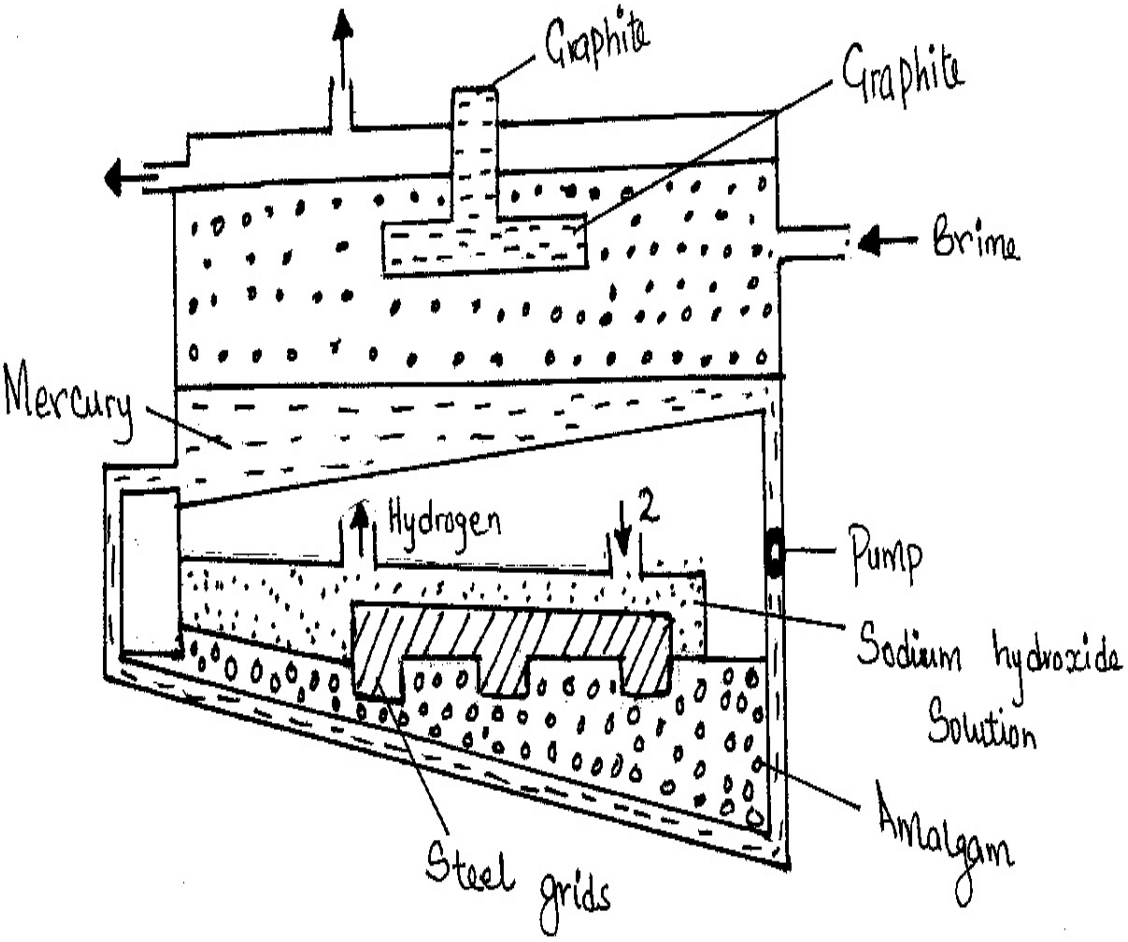
(b) Which half cell is likely to be hydrogen? **(1 mark)**

(c) Write an equation for the reaction between two half cells in (ii) and (IV)**.(1 mark)**

(d) Calculate the e.m.f of the cell in (c) above. **(1 mark)**

(e) Explain why you should not use concentrate sulphuric (VI) acid in lead acid accumulators. **(1 mark)**

II The diagram **below** represents a mercury cell that can be used in the industrial manufacture
of sodium hydroxide. Study it and answer the questions that follow:-



(a) Name:

(i) Raw material introduced at **2**. **(½ mark)**

(ii) Another substance that can be used in the cell instead of graphite.**(½ mark)**

(b) Identify the by-product that comes out at **I**. **(1 mark)**

(c) Write an equation for the reaction:-

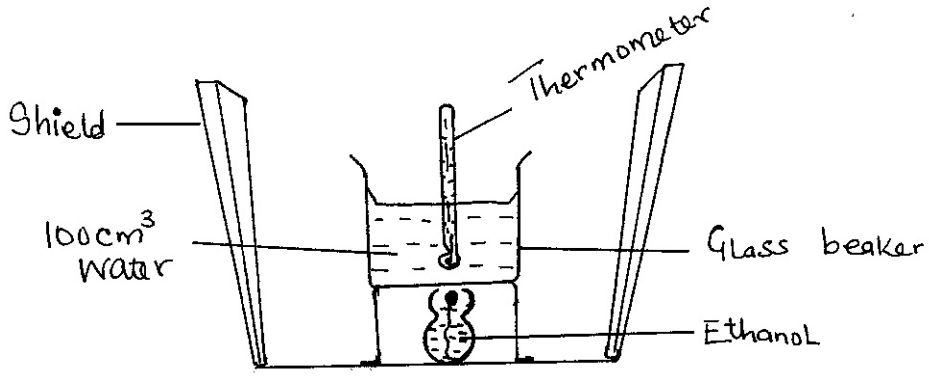
(i) That occurred at the anode. **(1 mark)**

(ii) In which sodium hydroxide was produced. **(1 mark)**

(d) Give **two** reasons why mercury is recycled. **(2 marks)**

III Draw a diagram to show how an aluminium spoon can be electroplated with copper. **(2 marks)**

6. In an experiment to determine the molar heat of combustion of ethanol (C_2H_5OH), the set-up **below** was used.



(i) Initial temperature of water 23°C.

(ii) Final temperature of water 37°C.

(iii) Initial mass of lamp and contents 26.08g.

(iv) Final mass of lamp and its content 25.83g

(Density of water = 1g/cm³, specific heat capacity 4.2KJ/Kg/K C = 12, O = 16, H = 1)

(a) What is the use of the shield? **(1 mark)**

(b) Write an equation for the combustion of ethanol? **(1 mark)**

(c) Calculate:

(i) the number of moles of ethanol used in the experiment. **(2 marks)**

(ii) the heat change in the experiment. **(1 mark)**

(iii) the molar heat of heat combustion of ethanol. **(2 marks)**

(d) The above value in c(iii) is different from the theoretical value. How can the experiment be improved to get a closer value to the theoretical value. **(2 marks)**

(e) Draw an energy level diagram to show molar heat of combustion of ethanol. **(2 marks)**

7. **(a)** Define the term solubility. **(1 mark)**

(b) The table **below** shows the solubility of substances A and B against temperature.

Temperature	15	25	35	45	55	65	75
Solubility of A in 100g of H_2O	26	38	53	72	98	124	155
Solubility of B in 100g of H_2O	35.8	36.2	36.6	37.0	37.4	38	38

(i) On the same axis, plot a graph of solubility of substance **A** and **B** against temperature. **(6 mks)**

(ii) At what temperature are the solubilities of **A** and **B** the same? **(1 mark)**

(iii) What mass of substance B is necessary to saturate 35g of water at 50°C. **(1 mark)**

(iv) 40g of A solution saturated at 50°C are cooled to 15°C. What mass of solid B will separate out? **(2 marks)**

(v) Name the method of separating mixture which would be used to obtain pure sample of A from a mixture of **A** and **B**. **(1 mark)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 9 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

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)**

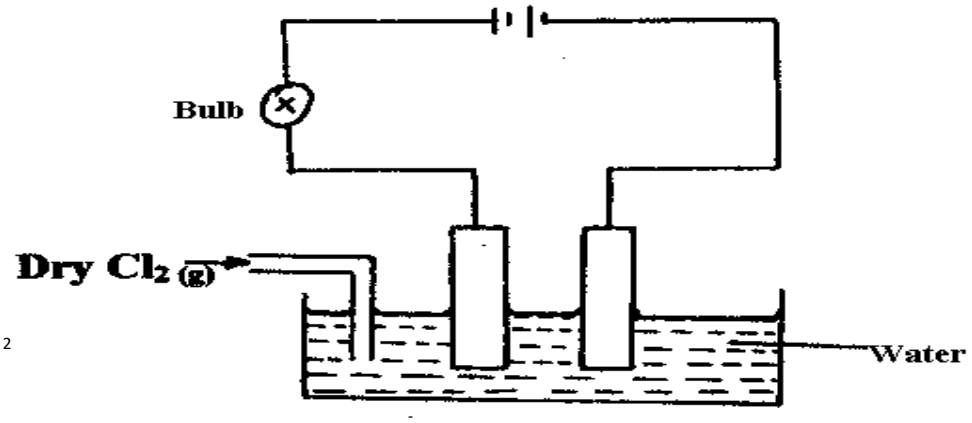
c) ***Give one*** use of the copper metal. **(1mk)**

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.

Dry Cl

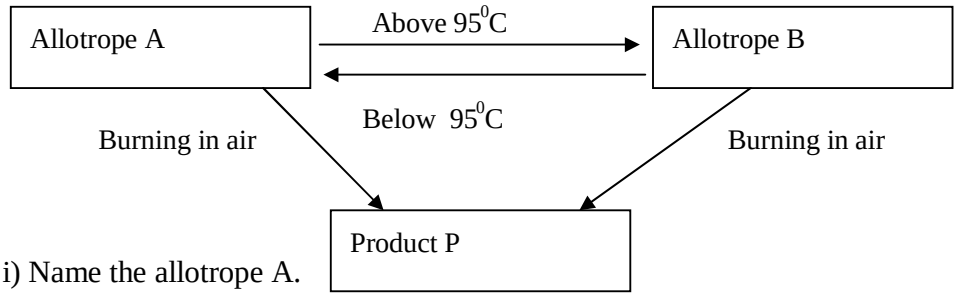


2

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 the allotrope A. (1mk)

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)**

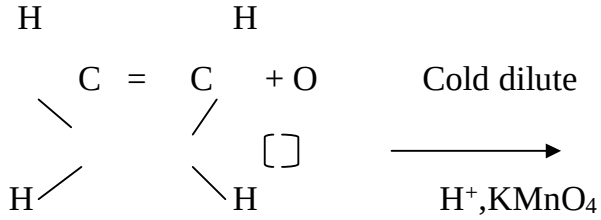
c) State ***any one*** advantage of using hard water. **(1mk)**

7. a) Name the following compounds

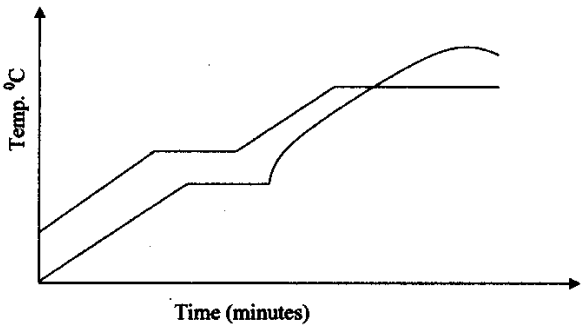
i) $CH_3CH_2CH_2\overset{O}{\overset{\|}{C}}_OH$ **……(1mk)**

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)

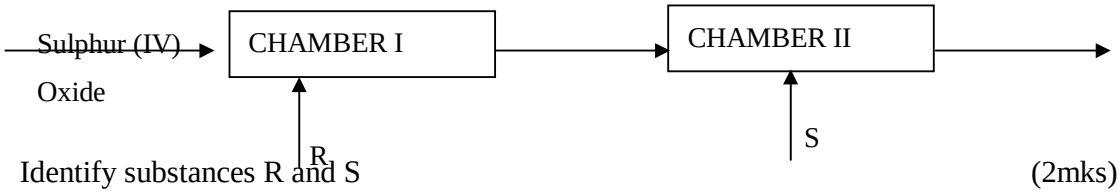
b) Common salt is sprinkled on roads during winter in temperate countries. Explain.

(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 substances R and S (2mks)

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)**

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

12. 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)**

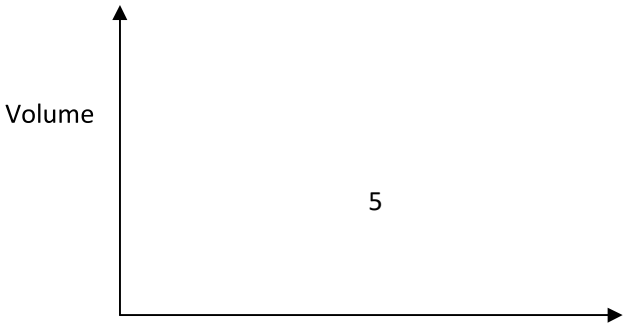
c) i) Define the term **alloy** **(1mk)**

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

13. 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)**

14. 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)

$NH4^+(aq)+H2O(l) \rightleftharpoons NH3(aq)+H3O^+(aq)$

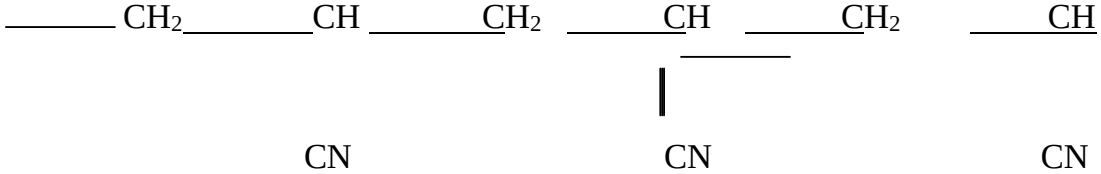
15. Hydrogen sulphide was bubbled into solutions of metallic nitrates as represented in the flow chart below. Hydrogen sulphide



a) Identify two solutions (2mks) I. Blue solution……..……

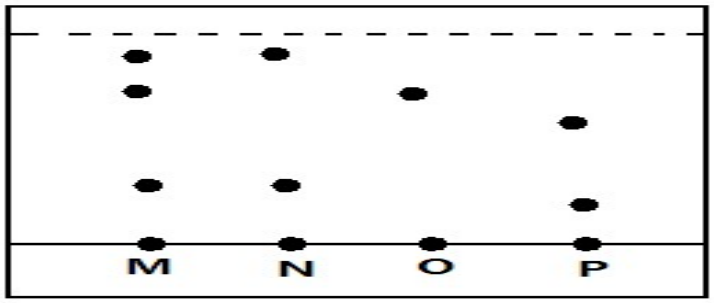
II. Green solution……

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.



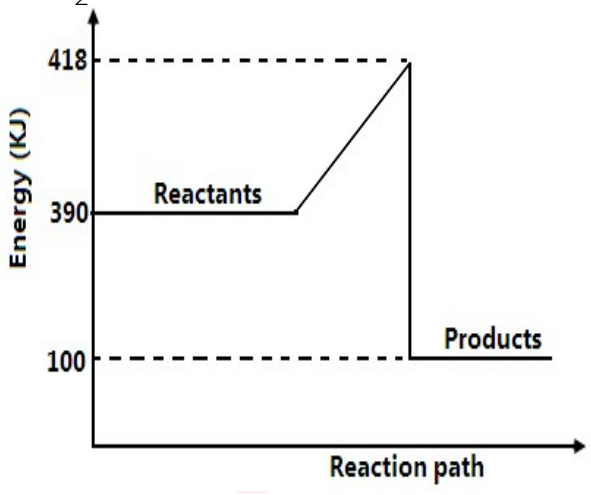
a) On the diagram mark the base line. **(1mk)**

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) $H2(g) + \frac{1}{2}O2(g) \rightarrow H2O(l)$	$\Delta H1 = -286 kJmol^{-1}$
ii) $C(s) + O2(g) \rightarrow CO2(g)$	$\Delta H2 = -394 kJmol^{-1}$
iii) $2C(s) + 3H2(g) + \frac{1}{2}O2(g) \rightarrow C2H2OH(l)$	$\Delta H3 = -277 kJmol^{2}$

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.

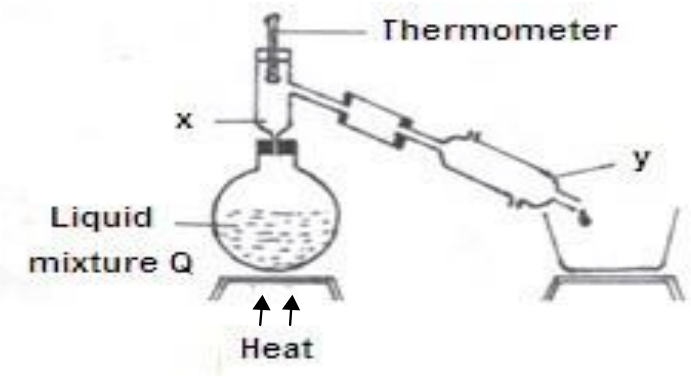
$2A2(g) + B2(g) \rightleftharpoons 2A2B(g) \quad \Delta H = -197 KJmol^{-1}$

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)**



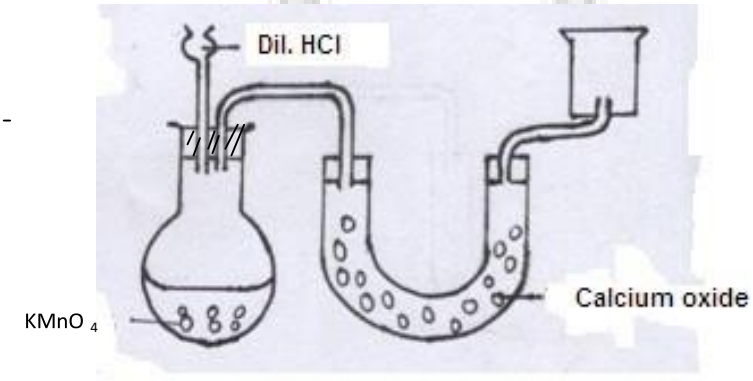
a) Name X and Y. **(1mk)**

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, two 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)**

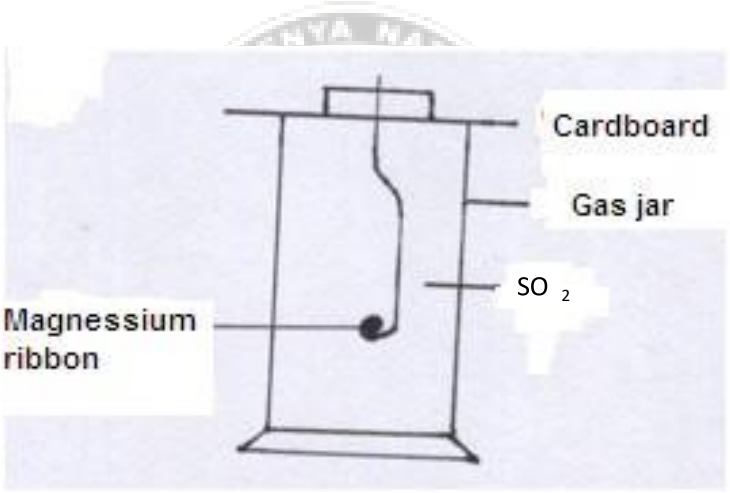
iii) Nitrogen(ii) oxide and water. **(1mk)**

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)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 9 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

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)**

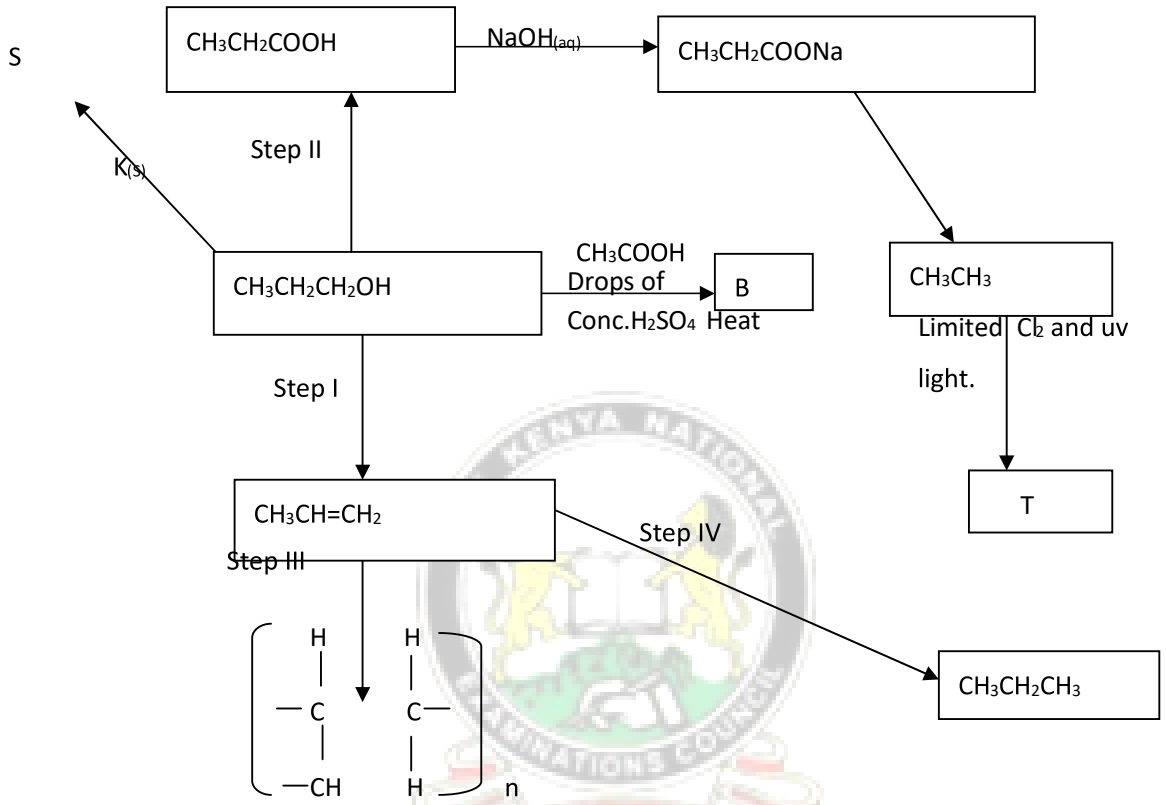
ii) Predict the relative mass of the Hydrocarbon with 5 carbon atoms**.** **(1mk)**

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.

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			

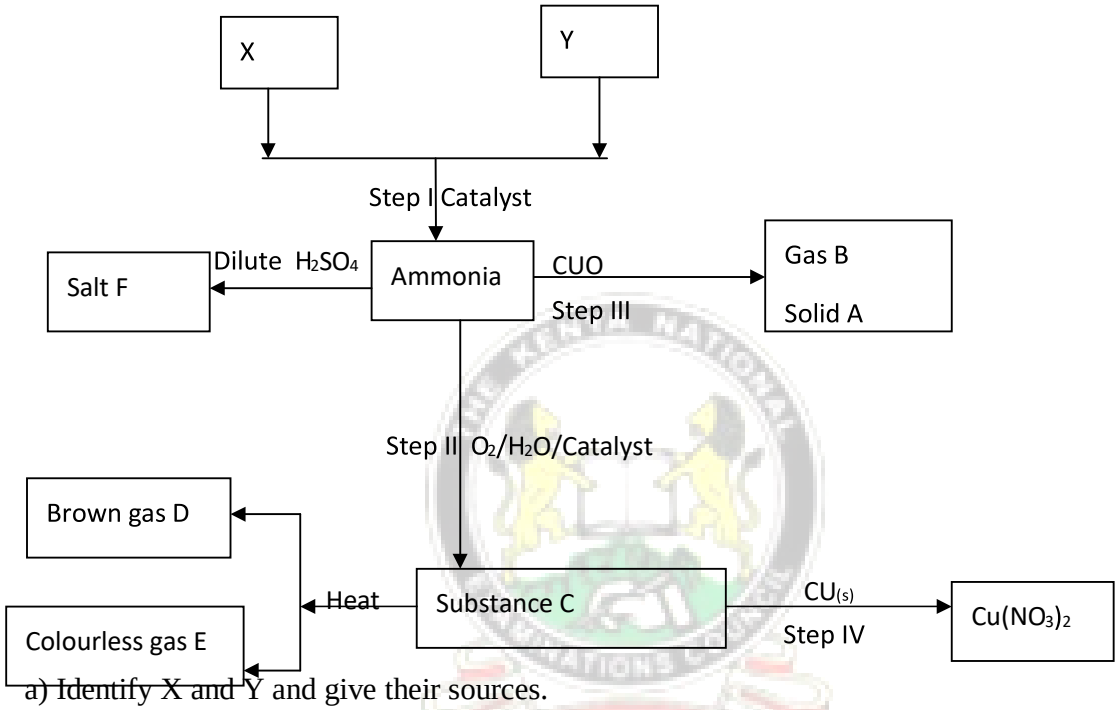
(3mks)

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.

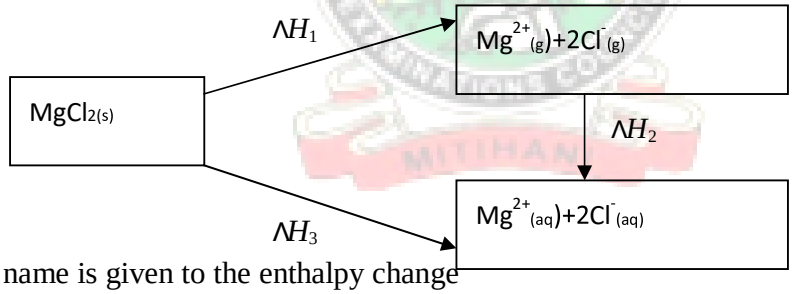
(1mk)

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

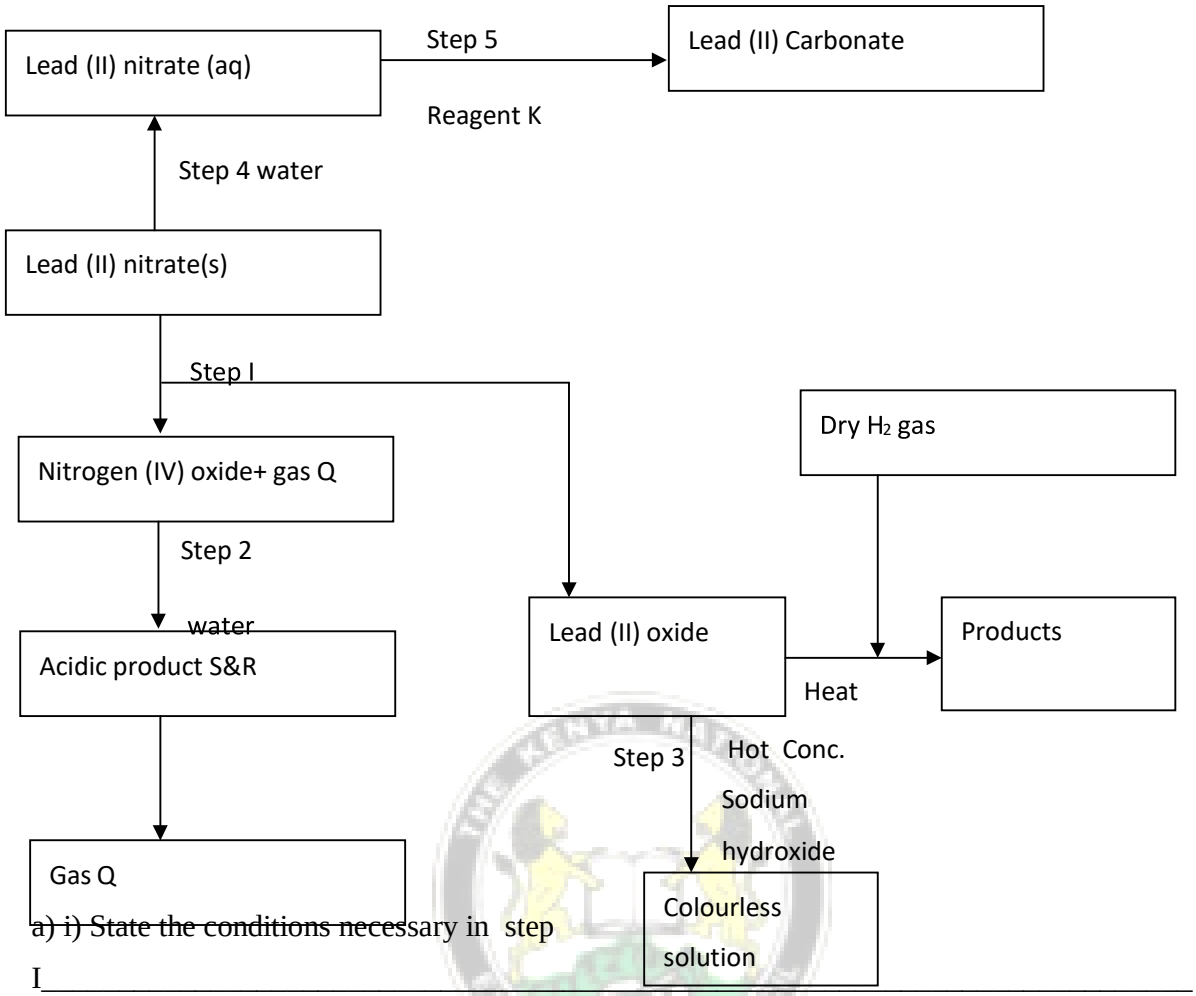
_____**(1mk)**

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_____ (1mk)

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)**

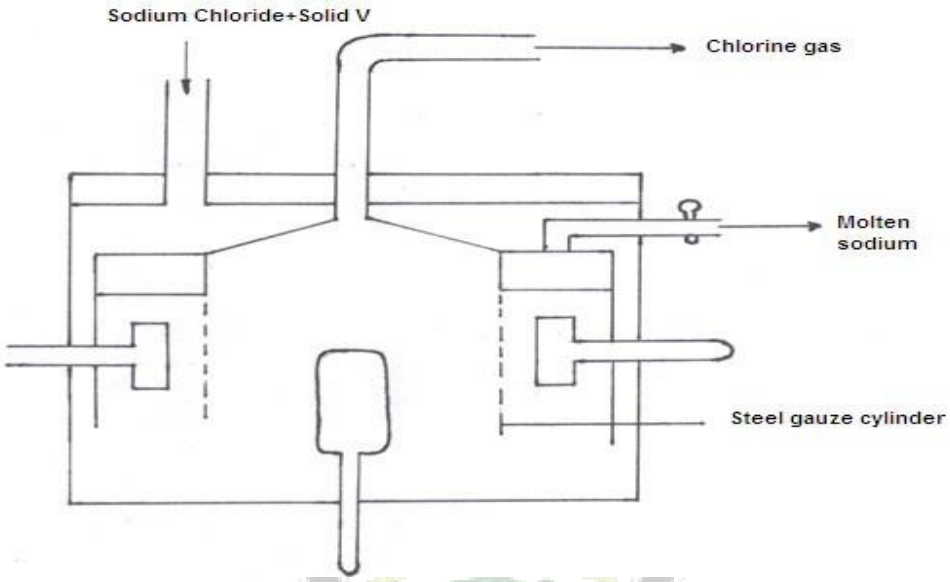
c) Write the formula of the ion formed in each of the reactions described below.

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)

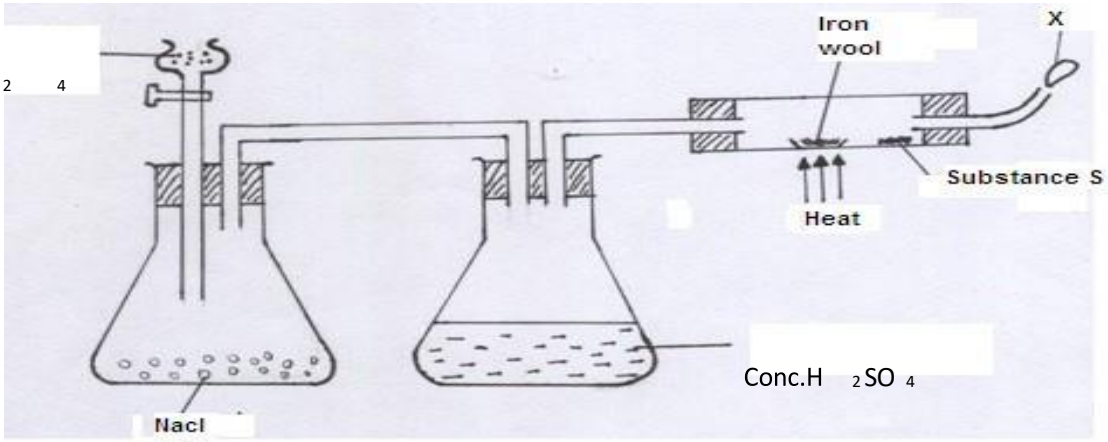
Cathode_____½ mk)

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.

Conc.H SO



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

I_____ **(½ mk)**

Reason_____ **(½ mk)**

Precaution

2_____ **(½ mk)**

Reason_____**(½ mk)**

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)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 10 PAPER 1

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

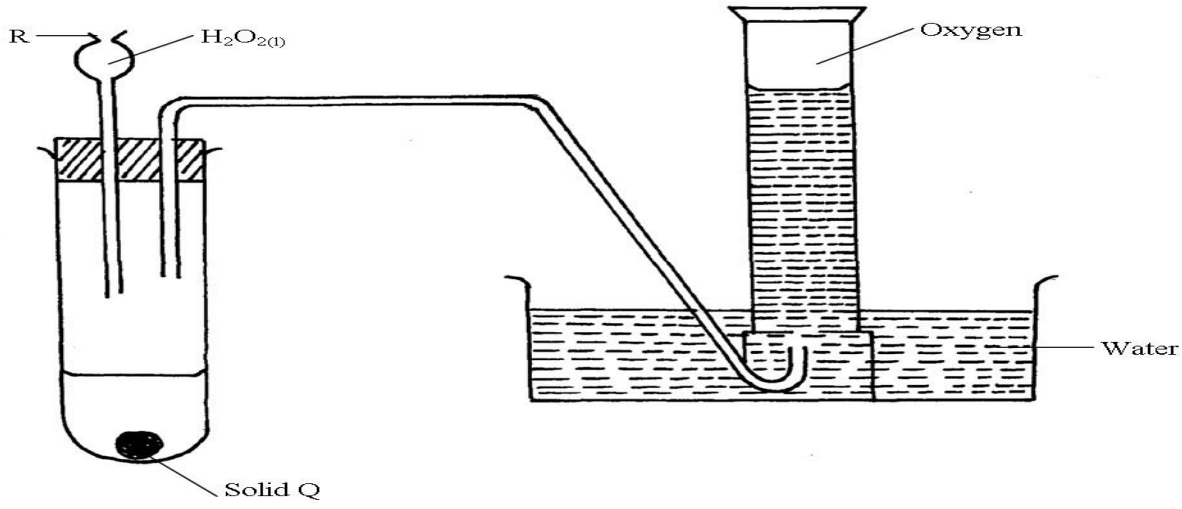
1. **(a)** What is the role of the following parts during fractional distillation of a mixture of water and ethanol.

(i) Fractionating column **(1 mark)**

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)**

(a) State one way in which the strength of an acid or a base can be determined in the laboratory **(1mark)**

(c) Give the basicity of the following acids.

(i) Sulphuric acid **(½ mark)**

(ii) Phosphoric acid **(½ mark)**

3. 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)

4. 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.**(1mk)**

(c) Give the formulae of the compound formed between X and N **(1mark)**

5. State two properties of carbon (iv) oxide that makes it suitable for extinguishing fire. **(2 marks)**

6. 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)**

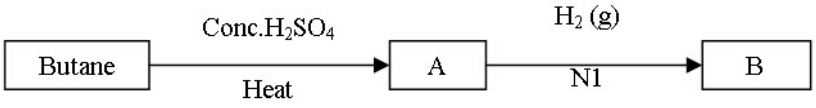
(c) Explain why atomic radii of elements in period 3 decreases generally from left to right in the periodic table **(1mark)**

7. (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)**

8. 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)

9. 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)**

10. (a) State Charles's law **(1mark)**

(b) The volume of a sample of nitrogen gas at a temperature of 298k and 600minHg pressure was 4.8×10^{-2} m^3. Calculate the temperature at which the volume of the gas would be 3.2×10^{-2} m^3

if pressure is constant. (2 marks)

11. 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)**

12. (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)**

13. 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.

H2 (g) +Cl2 (g) $\longrightarrow$ 2HCl (g) (2 marks)

14. 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)**

15. 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)**

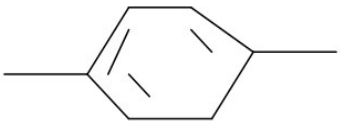
(b) Give a condition under which nitric (v) avid can produce hydrogen with the metal **(1mark)**

(c) State one use of hydrogen gas. **(1mark)**

18. The structure shown below represents two cleansing agents, A and B

$R\text{———}COO^{(-)}Na^{(+)}$ $R\ OSO_3^{(-)}Na^{+}$

(A)

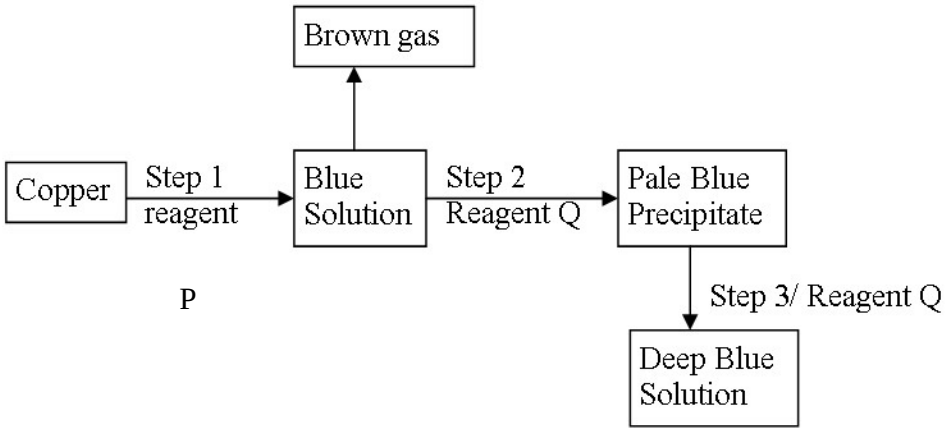


(B)

(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)**

(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
2+	
Y	2.8

(a) Select the elements in

(i) Same group **(½ mark)**

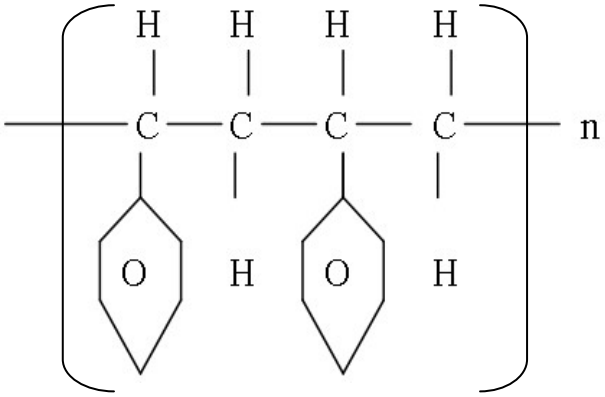
(ii) Period II **(½ mark)**

(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



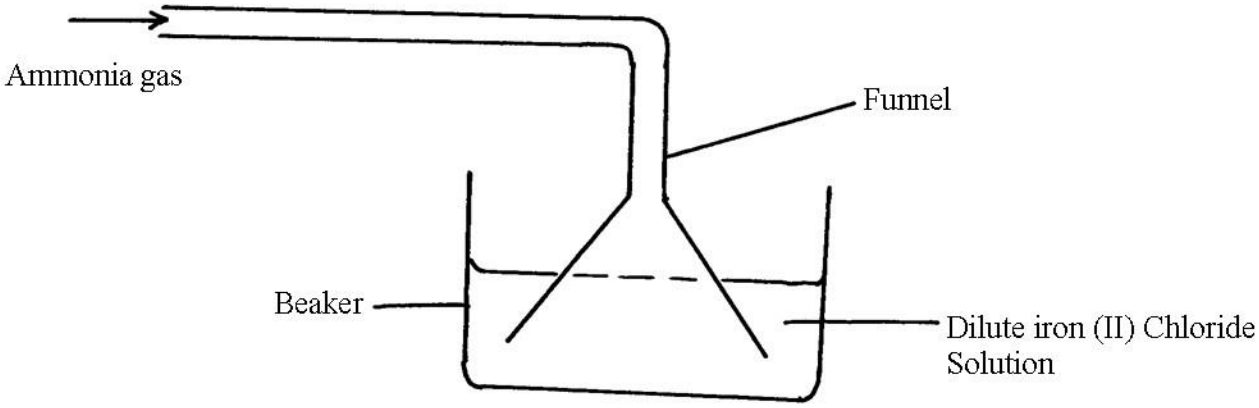
(a) Give the name of the polymer. **(1mark)**

(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)**

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)**

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)**

TOP SCHOOLS PREDICTIONS

CHEMISTRY

PREDICTION 10 PAPER 2

Time: 2 Hours

NAME…… INDEX NO……..…

SCHOOL…….. SIGN……

DATE……...

INSTRUCTIONS TO CANDIDATES.

a) *Write your **NAME, SCHOOL** and **INDEX NUMBER** in the spaces provided above.*
b) ***Sign** and write **date** of examination in the spaces provided.*
c) *Answer **ALL** the questions in the spaces provided in the question paper.*
d) *All working **must be** shown clearly where necessary.*

QUESTIONS

1. (a) Study part of the periodic table below. The letters do not represent the actual symbols. Use the letters to answer the questions that follow.

F				J	J	K	L	M
O	P			R				

(i) Which one element would form a divalent anion? **(1mark)**

(ii) Write formula of the compound formed when P reacts with L **(1mark)**

(iii) Monovalent cataion of X electronic configuration 2.8.8. Identify its position in the periodic table above. **(1mark)**

(iv) Identify most reactive metallic element **(1mark)**

(b) The table shows some properties and electron arrangements of common ions of elements represented by letters Q to X. Study the information provided then answer the questions that follow.

Element	Formula of ion	Ionic electron arrangement	Atomic Radius	Ionic Radius
Q	Q^-	2.8	0.072	0.136
R	R^+	2.8.8	0.231	0.133
S	S3+	2.8	0.143	0.050
T	T2+	2.8.8	0.133	0.074
U	U2+	2.8	0.160	0.064
V	V^+	2.8	0.186	0.095
W	W3-	2.8.8	0.110	0.190
X	X^-	2.8.8	0.099	0.181

(i) Give the atomic numbers of elements T and Q **(2marks)**

(ii) Select two non-metals that belong to the same period **(1mark)**

Which two elements would react violently with water to produce hydrogen? **(2marks)**

(c) (i) Why is the atomic radius of R larger than its ionic radius? **(2marks)**

(ii) Element S is suitable for making cooking pans. Explain **(2 marks)**

2. (a) Give the names of the following compounds

(i) $CH_3CHCHCH_2CH_3$ **(1mark)**

(ii) $CH_3\ (CH_2)_2COOH$ **(1mark)**

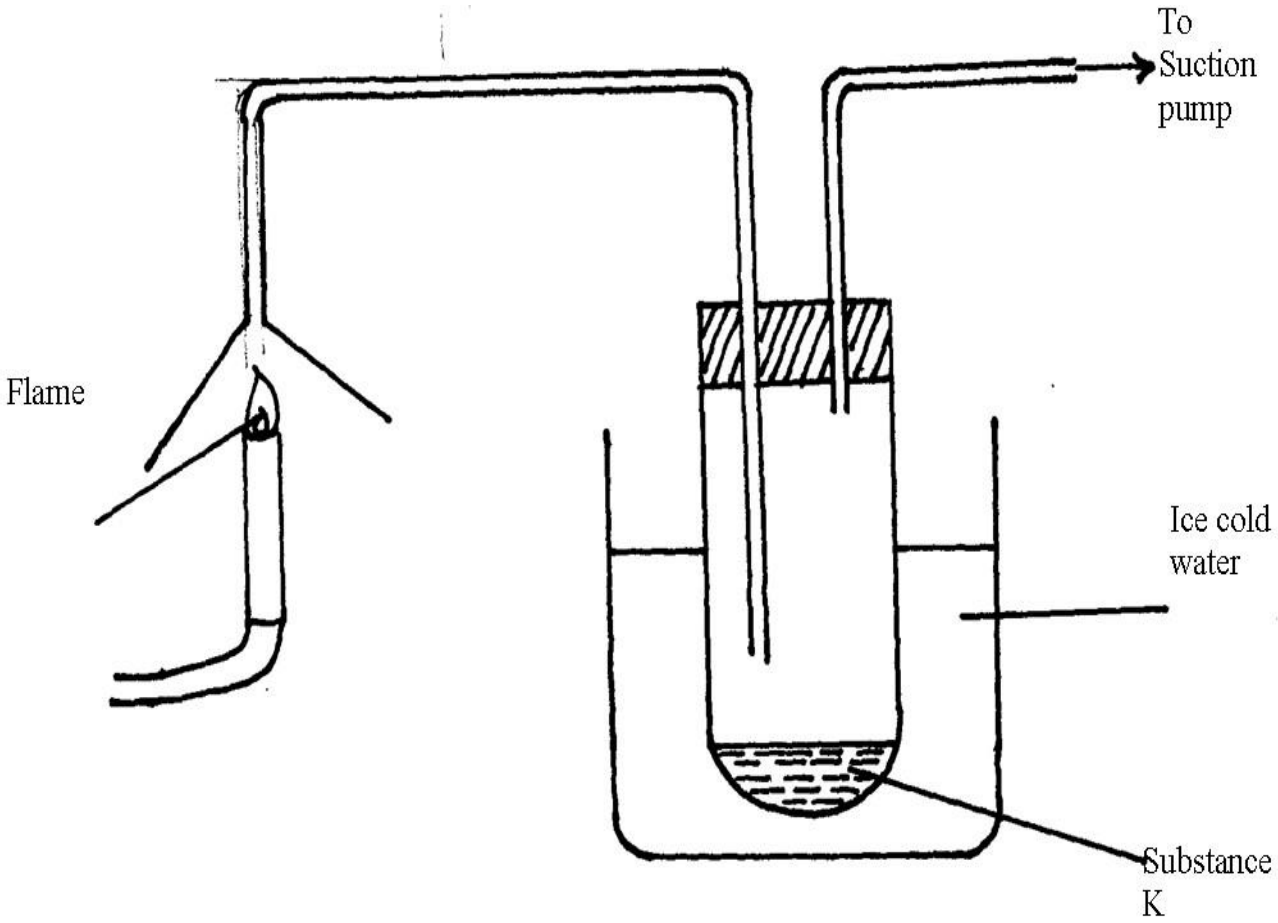
(b) Ethane and ethane react with Bromine according to the equations given below.

(i) $C_2H_6\ (g) + Br_2\ (g) \rightarrow C_2H_5Br(l) + HBr(g)$

(ii) $C_2H_4\ (g) + Br_2\ (g) \rightarrow C_2H_4Br_2(l)$

Name the type of bromination reacting taking place in (i) and (ii) above **(1mark)**

(c) Study the diagram below and answer the questions that follow.



(i) Write the equation for the complete combustion of butane

(ii) The pH of substance K was found to be less than 7.

Explain the observation **(2marks)**

(d) The polymerization of tetra fluorocarbon (C_2F_4) is similar to that of ethane (C_2H_4)

(i) What is meant by polymerization? **(1mark)**

(ii) Draw the structural formula of the polymer obtained from monomer C_2H_4 (1mark)

(iii) State any two advantages of synthetic polymers over natural polymers. **(2marks)**

(e) Propanol and ethanoic acid react according to the following equation

$$CH3CH2CH2OH\ (aq) + CH3COOH\ (aq) \rightleftharpoons R\ (aq) + H2O\ (l)$$

Name

(i) Product R **(1mark)**

(ii) The type of reaction that produce R **(1mark)**

3. Study the standard electrode potential for the half-cells given below and answer the questions that follow. The letters do not represent the actual symbols of the elements

	θ
	E - Volts
N+(aq) + e- →N(s)	-2.92
$^{J}+_{(}$aq) + ^{e}- $^{\rightarrow}$J(s)	+0.52
K+(aq) + e- → ½ K2(g)	0.00
½ G2aq) + e- →G-(aq)	+1.36
M2+(aq) + e- →M(s)	-0.44

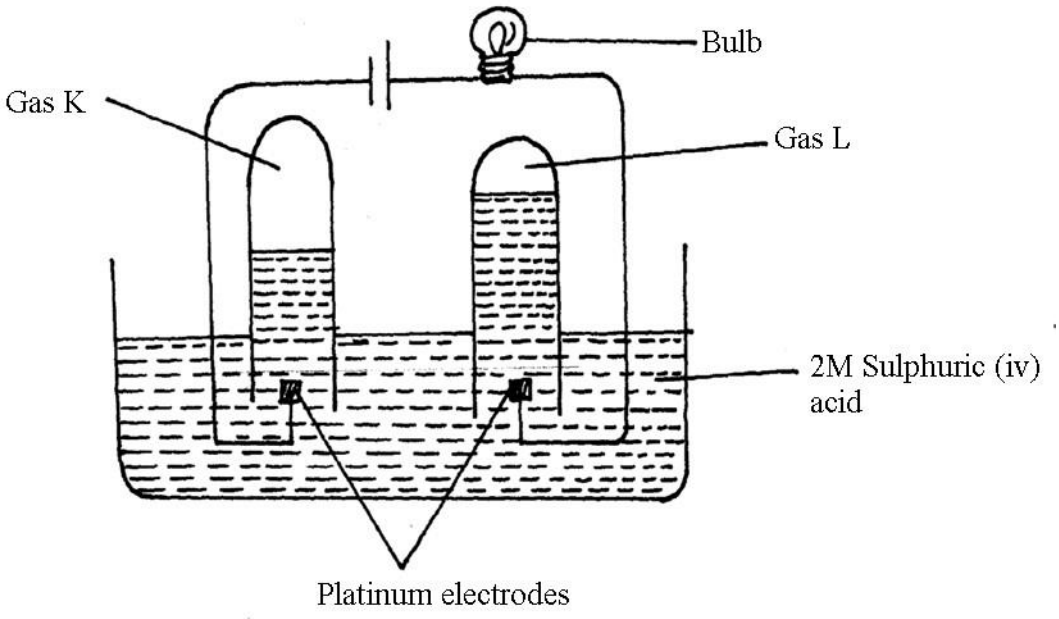
(i) Identify the strongest oxidizing agent. Give a reason for your answer **(1 ½ marks)**

(ii) Which two half-cells would produce the highest potential difference when combined? **(1mk)**

(iii) Explain whether the reaction represented below can take place **(2marks)**

M(s) + 2N+ (aq) →M2+(aq) + 2N(s)

(b) 100cm^3 of 2M sulphuric (iv) acid was electrolyzed using the set-up represented diagram below.



(i) Write an equation for the reaction that produces gas L (1mark)

(ii) Describe how gas K can be identified **(1 ½ mks)**

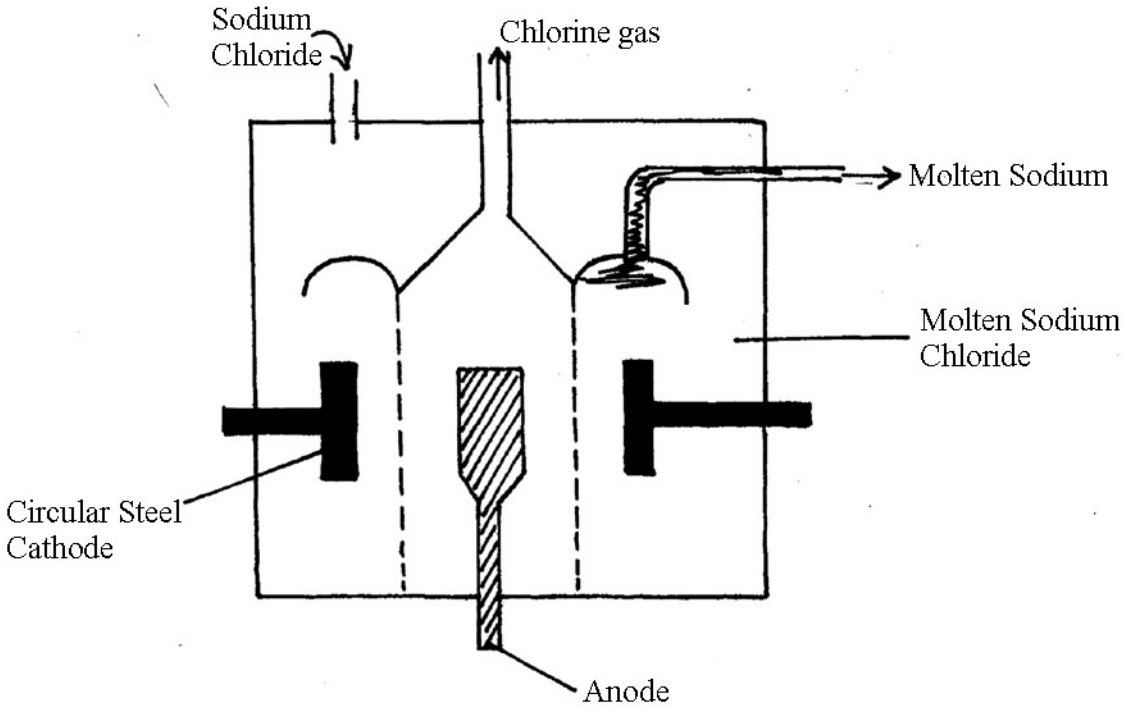
(iii) Explain the differences in;

(I) volume of gases produced at electrodes **(1mark)**

(II) Brightness of the bulb if $100cm^3$ of 2M ethanoic acid was used in place of 2M sulphuric (iv) acid **(2marks)**

(c) A current of 0.5A was passed for 2 hours. Calculate the mass of Lead deposited (Pb=207, IF=96500^0C) **(2marks)**

4. (a) Below is a simplified diagram of a down's cell used in manufacture of Sodium. Study it and answer the questions that follow,



(i) What material is the anode made of?. Give a reason **(2marks)**

(ii) What precaution is taken to prevent chlorine and sodium from recombining **(1mark)**

(iii) Write an ionic equation for the reaction in which chlorine gas is formed. **(1mark)**

(b) In the Down's cell, a certain salt is added to lower the melting point of Sodium chloride from 800°C to 600°C

(i) Name the salt that is added **(1mark)**

(ii) State why its necessary to lower melting point **(1mark)**

(c) Explain why its not suitable to use aqueous sodium chloride for the manufacture of sodium in the Down's process **(2marks)**

(d) Sodium metal reacts with air to form two oxides. Give the formulae of the two oxides **(2marks)**

(e) State two uses of sodium metal **(2mark)**

5. (a) Define the standard enthalpy of formation of a substance **(1mark)**

(b) Use the thermo chemical equations below to answer the questions that follow.

1. $C_2H_6(g) + 7/2\ O_2(g) \rightarrow 2CO_2(g) + 3H_2O(g)$ $\Delta H_1 = -1560KJmol^{-1}$

2. $C(graphite) + O_2(g) \rightarrow CO_2(g)$ $\Delta H_2 = -394KJmol^{-1}$

3. $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(g)$ $\Delta H_3 = -286KJmol^{-1}$

(i) Name two types of heat changes represented by $^{\Delta}H_3$ **(2marks)**

(ii) Draw an energy level diagram for the reaction represented by equation 1 **(2marks)**

(iii) Calculate the standard enthalpy of formation of ethane **(2marks)**

(iv) When a sample of ethane was burnt, the heat produced raised the temperature of 500g of water by 21.5k (specific heat capacity of water 4.2 $Jg^{-1}k^{-1}$)
Calculate

(I) Heat change for the reaction **(2marks)**

(II) Mass of ethane that was burnt (Relative formula mass of ethane = 30) **(1mark)**

6. (a) Define the term solubility **(2marks)**

(b)

Mass of $KCl_{(g)}$	20	20	20	20	20	20
Volume of water (cm^3)	40.0	45.0	50.0	55.0	60.0	65.0
Temperature at which crystals first appear (^oC)	77.0	56.0	40.0	26.0	15.0	8.0
Solubility in g per 100g of water						

(i) Complete the table above by calculating the solubility of KCl in grammes per 100g of water **(3marks)**

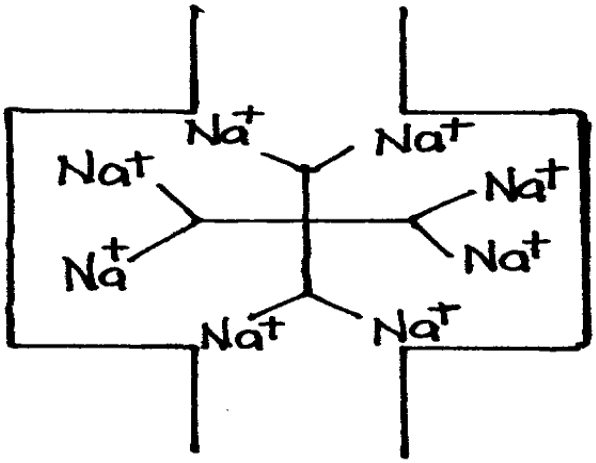
(ii) Plot the graph of solubility in g/100g of water (y-axis) against temperature (x-axis) **(3marks)**

(iii) From your graph determine solubility at 50^oC **(1mark)**

(iv) If a saturated solution of potassium chloride is cooled from 70^oC to 10^oC. What mass of the crystals would be obtained? (2marks)

(v) Calculate the concentration of the saturated solution of 50^oC. (K=39.0, Cl = 35.5) (2mks)

(c) The set-up below was used to remove hardness in water.

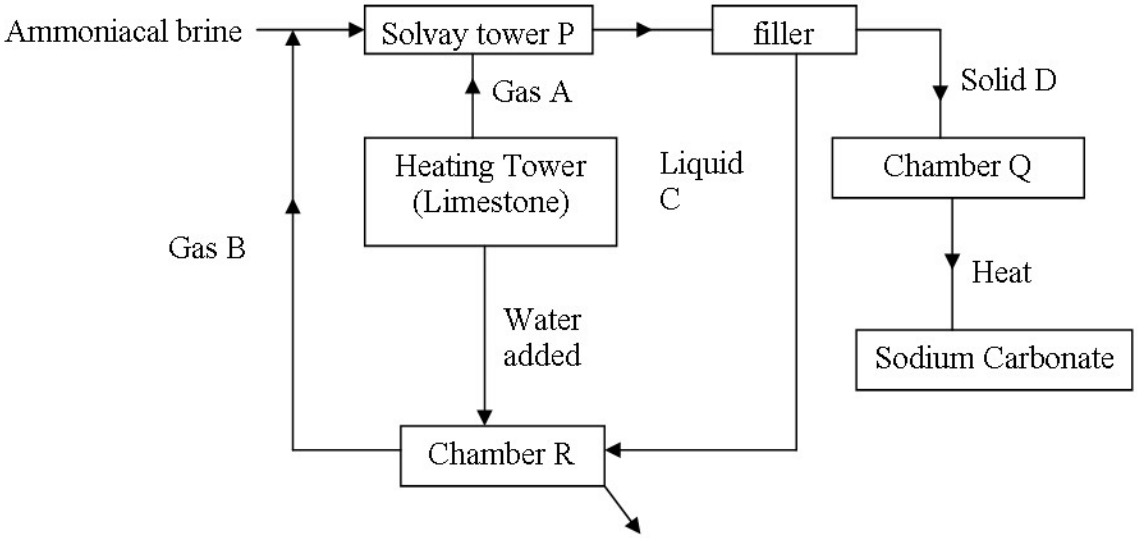


(i) Identify the above method of removing water hardness **(1mark)**

(ii) The above system eventually lack the ability to soften hard water. Explain how it can be reactivated**.** **(1mark)**

(iii) State any advantage of hard water **(1mark)**

7. The scheme below shows the manufacture of sodium carbonate by the Solvay process. Study it and use it to answer the questions that follow.



(a) Name (i) gases A and B **(1mark)**

(b) Name liquid C and Solid D **(1mark)**

(c) Write equations for the reactions taking place in tower P and chamber R **(2marks)**

(d) Name the product formed in chamber at chamber R and give one of its uses **(2marks)**

(c) State two uses of sodium carbonate **(1mark)**

FOR MORE KCSE RESOURCES &MARKING SCHEMES CONTACT 0746 222 000

THE END

THIS IS THE 2nd SERIES OF KCSE TOP KCSE PREDICTION CHEMISTRY EXAMINATIONS TRIALS

A SET OF POSSIBLE KCSE QUESTIONS

FOR MARKING SCHEMES/ANSWERS

CONTACT THE FOLLOWING OFFICIAL CONTACTS FOR MORE LEARNING RESOURCES.

FOR THE FOLLOWING;

- ✓ ONLINE TUITION
- ✓ PRIMARY SCHOOL EXAMS
- ✓ REVISION NOTES
- ✓ SERBOOKS GUIDE BOOKS
- ✓ SCHEMES OF WORK
- ✓ LESSON PLANS
- ✓ SETBOOKS VIDEOS
- ✓ TERMLY EXAMS
- ✓ QUICK REVISION KITS
- ✓ KCSE TOPICALS
- ✓ KCSE PREMOCKS
- ✓ CROSSCOUNTRY PREMOCKS
- ✓ JOINT PREMOCKS
- ✓ KCSE MOCKS
- ✓ CROSSCOUNTRY MOCKS
- ✓ JOINT MOCKS
- ✓ KCSE POSTMOCKS
- ✓ CROSSCOUNTRY PREDICTIONS
- ✓ KCSE PREDICTIONS

- ✓ KCSE REVEALED SETS
- ✓ MWALIMU MOCKS SERIES
- ✓ NATIONAL SCHOOLS MOCKS
- ✓ SUBJECTS JOINT MOCKS
- ✓ JOINT PREMOCKS
- ✓ CBC RESOURCES
- ✓ KASNEB RESOURCES
- ✓ COLLEGE MATERIALS
- ✓ UNIVERSITY EXAMS



CALL/TEXT/WHATSAPP

0746 222 000

mwalimuagency@gmail.com

THIS IS A PRODUCT OF MWALIMU PUBLISHERS

POWERED BY

MR ISABOKE

CONTACT MWALIMU PUBLISHERS FOR SERIES 1 QUESTIONS

TO ALL KCSE CANDIDATES;

SUCCESS IN YOUR KCSE EXAMS.

MAY YOU PASS EXAMS WITH FLYING COLOURS?

BY; MWALIMU AGENCY TEAM.

CAUTION TO KCSE CANDIDATES:

IN CASE / ON EVENT YOU REALIZE PART OF THESE QUESTIONS WERE DIRECTLY/INDIRECTLY LIFTED IN THE FINAL KCSE EXAMS, PLEASE, DO NOT PANIC!

KILA LA HERI