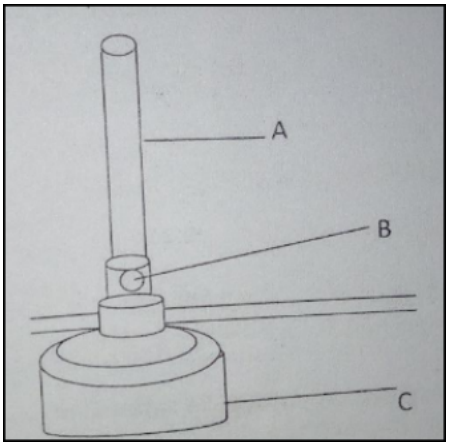
FORM 2 - CHEMISTRY - THEORY

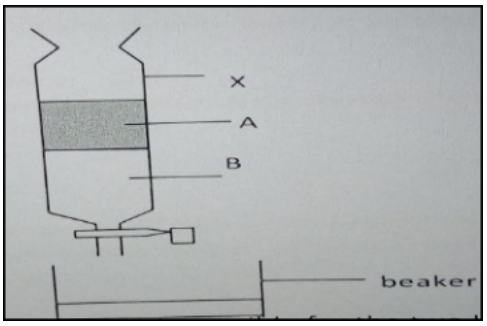
ASSIGNMENT ONE

1. The diagram below shows parts of the Bunsen burner.



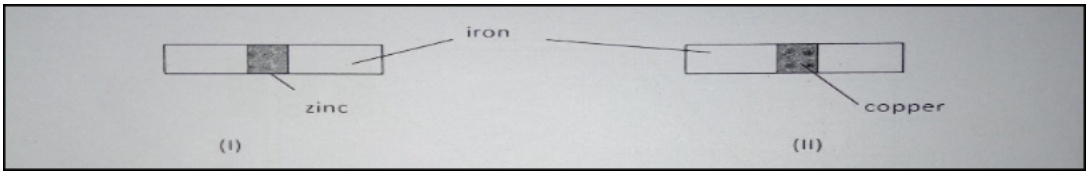
(a) Name the parts labelled (1 mark).
(b) Give one use of the part labelled B (1 mark).

2. Name two apparatus that are used to measure exact volumes (2 marks).
3. The diagram below represents a method of separation used to separate two liquids , A and B,



Use it to answer the questions that follow.
(a) Name the method of separation shown above (1 mark).
(b) Name two properties that makes it possible for the two liquids to be separated (2 marks). (c) Give one alternative method that may be used to separate the two liquids (1 mark).

4. In an experiment, two pieces of iron sheet were wrapped in each case with zinc and copper metal sheets as shown below. They were left in the open for some months.



(a) State and explain the observations made in the experiment I and II (3 marks).

5. Given zinc oxide, dilute nitric (v) acid and sodium carbonate solution. Briefly describe how you can prepare zinc carbonate (3 marks).

6. State two solids that may be heated to obtain oxygen gas as the only gas (2 marks).

7. Study the information given below and answer the questions that follow.

Formula of the compound.	NaCl	$MgCl_2$	Al_2Cl_6	$SiCl_4$	PCl_3	SCl_2
B.P (^oC)	1470	1420	sublimes	60	75	60
M.P(^0C)	800	710	At 800^0 C	-70	90	-80

(a) Give two chlorides that are liquid at room temperature. Give a reason for the answer (2 marks)

(b) Which two chlorides would remain in liquid state for the highest temperature range. Explain (2 marks).

(c) State one use of NaCl (1 mark).

8. Copper (II) oxide reacts with zinc metal as shown below.

$$CuO_{(s)} + Zn_{(s)} \longrightarrow Cu_{(s)} + ZnO_{(s)}$$

Identify the substance that has been:

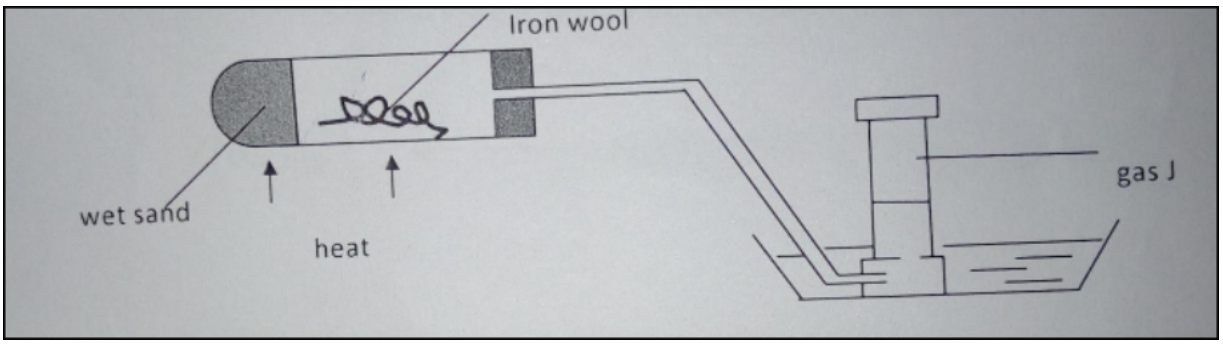
(i) Reduced (1 mark)

(ii) Oxidised (1 mark)

9. An element B burns in air to form an oxide of B which dissolve in water to form a solution that turns blue litmus paper red. (B is not the actual symbol of the element).

Is B a metal or a non-metal? Give a reason for your answer (2 marks).

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



(a) Name gas J (1 mark).

(b) Explain why it is important to heat the wet sand before heating the iron wool (1 mark).

(c) State one observation made in the combustion tube as heating is carried out (1 mark).

11. State two differences between permanent and temporary changes (2 marks).

Permanent.	Temporary.

12. The table below give some properties of substances I, J and K. Study it and answer the questions that follow.

Substance.	Melting point (^{0} c)	Solubility in Water.	Electrical Conductivity in:	
			Solid state.	Molten state.
I	1063	Insoluble	Conducts.	Conducts.
J	113	Insoluble	Doesn't	Doesn't
K	402	Sparingly soluble.	Doesn't	Conducts and it is decomposed.

(a) Suggest the type of structure in:

I (1 mark).

K (1 mark).

(b) Explain why molten K is decomposed by current but I is not decomposed (1 mark).

13. Solution R,S and T have pH values shown in the table below.

Solution	pH
R	1.0
S	6.5
T	8.0

(a) What do you deduce about the nature of solution R? (1 mark).

(b) Identify two solutions that will react to form a neutral solution (1 mark).

14. State and explain the changes in mass that occur when zinc metal is heated in an open crucible (2 marks).

15. The pH of the soil sample was found to be 6.0. An agricultural officer recommended the addition of lime(calcium oxide). State two functions of lime in the soil (2 marks).

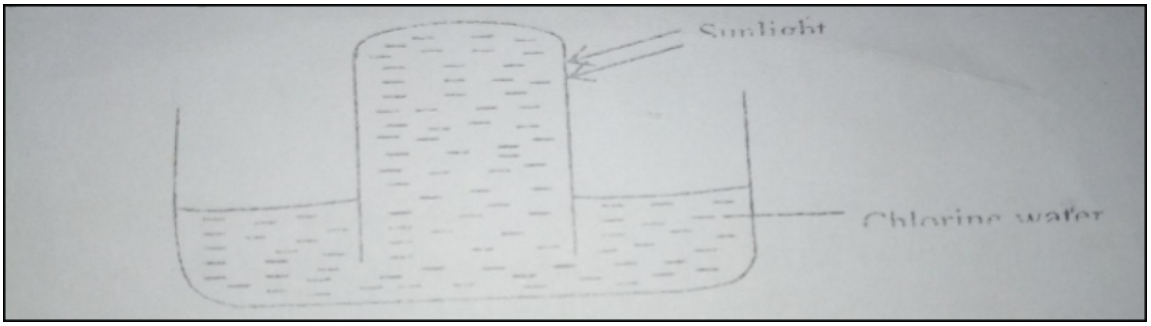
16. (a) Using a dot(.) and cross(x) to represent the outer most electrons, draw diagrams to show the

bonding in magnesium sulphide (2 marks). (Mg=12,S=16).

(b) State the structure of the above compound (1 mark).

(c) Give two properties of substances with the above structure (2 marks).

17. In an experiment a test tube full of chlorine water was inverted in chlorine water as shown in the diagram and the set up left in the sunlight for one day.



After one day a gas was found to have collected in the test tube.

(a) Identify the gas (1 mark).

(b) State the observations made when a blue litmus paper is dipped in chlorine water (1 mark).

18. The elements shown in the table below (not actual symbols) belong to a certain family of metals in the periodic table. Study the information and answer the questions that follow.

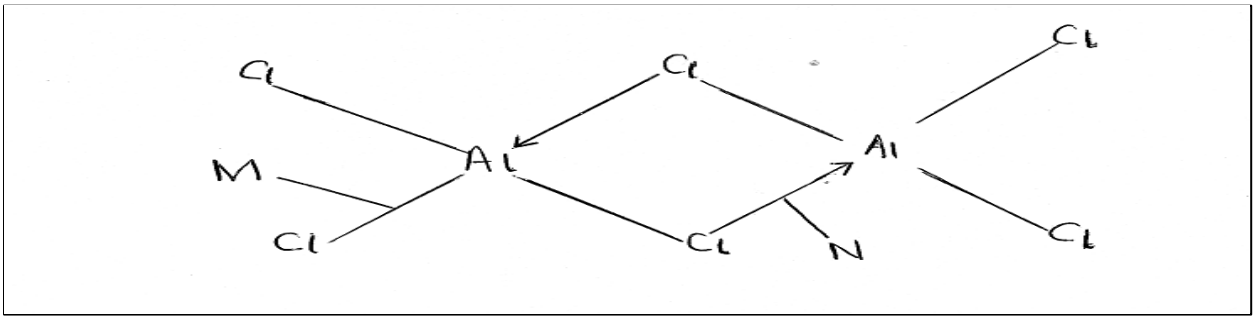
Element.	Atomic size (nm).
S	0.160
T	0.180
V	0.930

(i) Define the term ionization energy (1 mark).

(ii) Which element is likely to have the highest ionization energy. Explain (2 marks).

19. State two applications of solvent extraction (2 marks).

20. The diagram below represents the structure of aluminum chloride.



(a) Identify the bonds labeled M and N (2 marks).

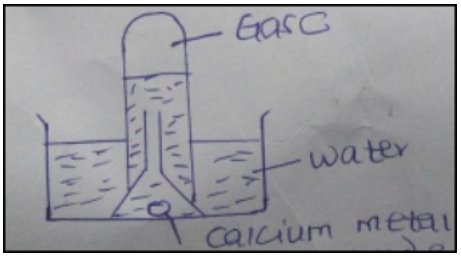
(b) What is the difference between bonds M and N (1 mark).

21. From the following list of compound; Zinc oxide, Potassium carbonate, solid carbon (Iv) oxide, nitric acid, iron(III)chloride, sodium chloride.

(i) Identify two substances that sublime (1 mark).

(ii) Identify two substances that react to form salt and water only (1 mark).

22. The figure below is a set up used to investigate the reaction of calcium with water.



(a) State the observation made in the water (1 mark).

(b) Identify gas C (1 marks).

(c) State one laboratory application of the solution formed in the reaction (1 mark).

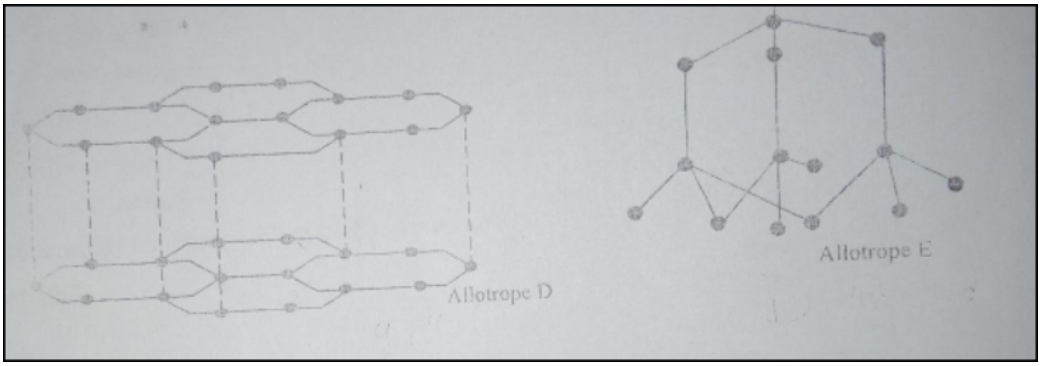
23.(i) State two types of salts (1 mark).

(ii) Name the following processes;

(a) When anhydrous calcium chloride is left in an open beaker overnight a solution was formed (1 mark).

(b) When sodium carbonate decahydrate crystals are left in an open beaker for some days it turned into a powder (1 mark).

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



(a) Name the allotrope D and E(2 marks).

(b) Which allotrope does not conduct electricity? Explain (2 marks).

25. Iron(III)chloride can be prepared in the laboratory by passing dry chlorine gas over hot steel wool.

(a) Name the above method of preparing salts (1 mark).

(b) Why should we prepare the salt in a dry environment? (1 mark)

(c) A solution of iron(III)chloride in water changes a blue litmus paper to red. Explain (1 mark).

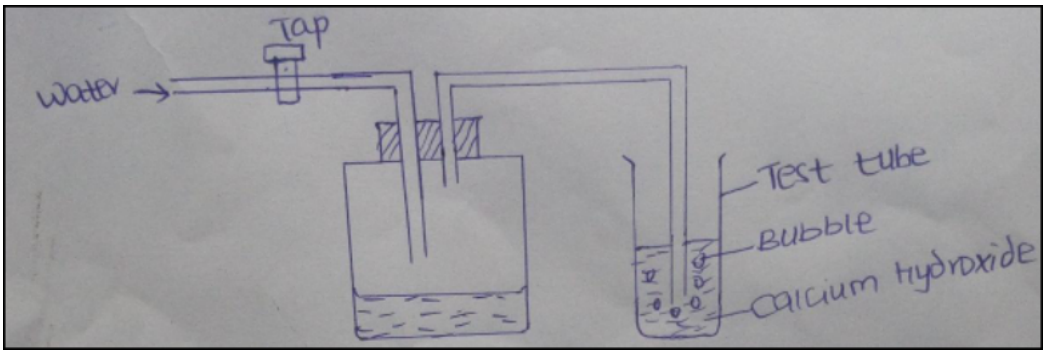
26. Metal S removes oxygen combined with P. Q reacts with an oxide of R but not with an oxide of P. P reacts with cold water but Q does not.

(a) Which is the most reactive metal? (1 mark).

(b) Which is the least reactive metal? (1 mark).

(c) Arrange the metals in order of reactivity starting with the most reactive to the least reactive (1 mark).

27. The figure represents a set up of apparatus that was used to demonstrate the existence of a component of air.



(i) What is the purpose of water from the tap? (1mark).

(ii) Other than bubbles, give one other observation made in the test tube (1 mark).

(iii) Name a gas that was not absorbed by the calcium hydroxide. (1mk)

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

A							A	
						F		
	C						E	K
	D			B			H	

(a) Element A fits in two groups. Explain (2 marks).

(b) i) Name two elements that can form ions with a charge of -1. Explain your answer (2 marks).

ii) What type of structure would the oxide of B have? (1 mark).

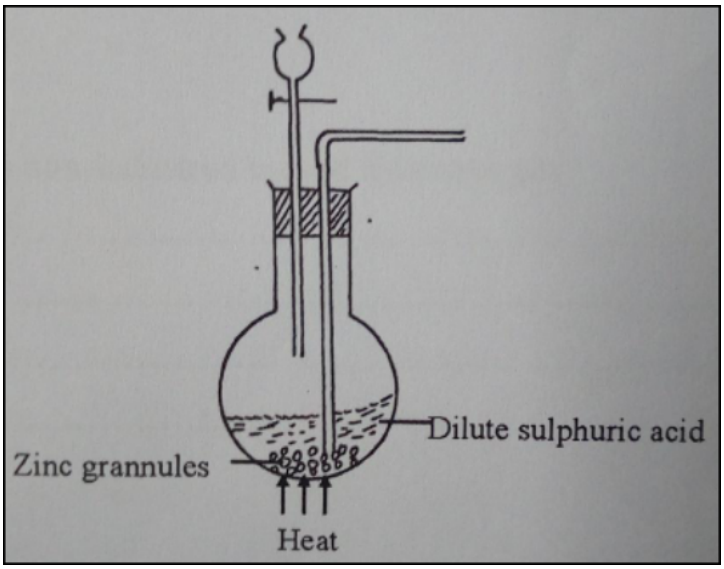
(c) How does the reactivity of H compare with that of E? Explain. (2 marks)

(d) What name is given to the group of elements to which C and D belong? (1 mark).

(e) Write the formula of the compound formed when elements C and F react (1 mark).

(f) Draw dot (.) and cross (x) diagram to represent the compound formed in (e) above (2 marks).

29. A student set up the arrangement below to prepare and collect dry hydrogen gas.



(a) State the catalyst that is used in preparation of hydrogen gas (1 mark).
(b) Identify two errors from the section of the arrangement shown above (2 marks).
(c) Complete the diagram to show how dry hydrogen gas can be collected (2 marks).
(d) Explain the effect of hydrogen gas on a wet red litmus paper (1 mark).
(e) Write a balanced chemical equation for the reaction that takes place when hydrogen gas is burnt in air. (1 mark).
(f) State one property of hydrogen gas that makes it to be used in balloons (1 mark).
(b) Name the gases obtained with respect to their boiling points (3 marks).
-196^0C
-186^0C
-183^OC

ASSIGNMENT TWO

1[a] what is an atom?
[b] Distinguish between atomic number and mass number

.2. Name two sub-atomic particles [2mks]

3. Element P has two isotopes P^{60} and P^{61} which occur in the ratio X:2. Given that its R.A.M is 60.4. ^{3030}
Calculate the value of X [3mks]

4. A patient went to the hospital and was diagnosed to have cold flu. The patient was prescribed to take drugs 1 x 3
[i] How and what hours in interval will the drugs be taken [2mks]
[ii] Supposing the patient took the drugs at 7.00a.m in the morning. What other hours of the day will the patient take the drugs [2mks]

5. Identify a suitable method that would be used to separate mixture of the following substances
[a] Iodine and potassium chloride [1mk]
[b] Water and ethanol [1mk]
[c] Table salt dissolved in water [1mk]

6. Fill the table below

compound	Chemical formulae
[i] sodium chloride	
[ii] Iron{III}oxide	
[iii]	$Al\{OH\}_3$

7. Chemistry is a science subject that involves practicals that are done in the laboratory. Safety rules are given in order for the student to take precaution while in the laboratory
{i} State three such rules to be observed [3mks]
{ii} Most of the laboratory apparatus are made of glass. Give two reasons [2mks]

8. Njoki a form 2 student, was given a colourless liquid suspected to be water.

[a] Describe one chemical test she could use to identify the liquid. [2mks]
{b} Describe an experiment she could perform to ascertain its purity [2mks]
9. Two ions X^{2+} and Y^{2-} forms ions with ionic configurations 2.8.8 each

[a] Which of the ions is of an element in

[i] period 3

[ii] Group 2

[b] Given that element Y has a mass number of 32, draw the structure of its ions [2mks]

10. The form two students were given solutions P, Q and R in three different beakers. They put in red and blue litmus papers and recorded the results as shown below

Solution	P	Q	R
Effect on blue litmus paper	Turns red	Remains blue	Remains blue
Effects on red litmus paper	Remains red	Turns red	Turns blue

Which of the solutions was most likely to be;
[i] Distilled water
[1mk]
[ii] of an oxide of sodium. Explain your answer [2mks]

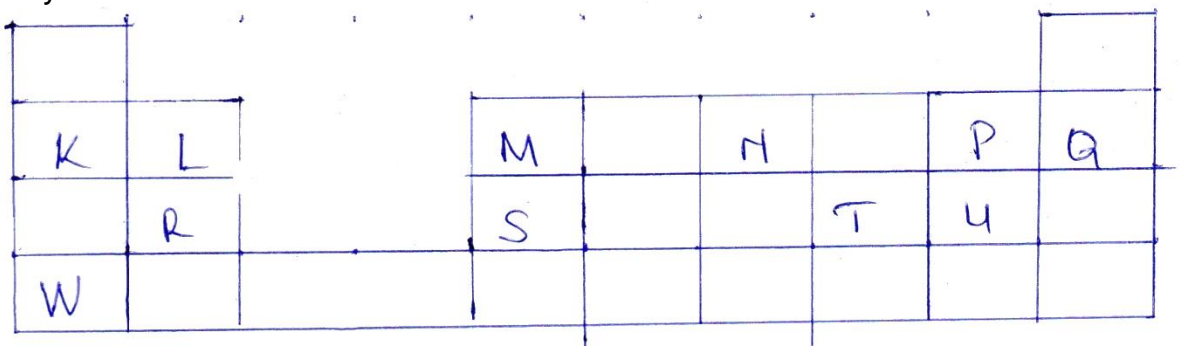
[iii] An oxide of sulphur. Explain your answer [2mks]
11. [a] Differentiate between prescription drugs and over the counter drugs [2mks]

[b] Name two commonly abused drugs in Kenya [1mk]

[c] State two physiological effects of drug abuse to the human body [2mks]

SECTION B

12. Study the grid below showing a section of the periodic table. The letters are not the actual chemical symbols of the elements



[a] State the letter that represents an element that

[i] Belongs to period 3 [2mks]

[ii] Belongs to group 2 [1mk]

[iii] Forms ions with a charge of +3 [1mk]

[iv] forms ions with a charge of +1 [1mk]

[v] Forms ions with a charge of -1 [1mk]

[b] What name is given the family to which elements K and W belong [2mks]

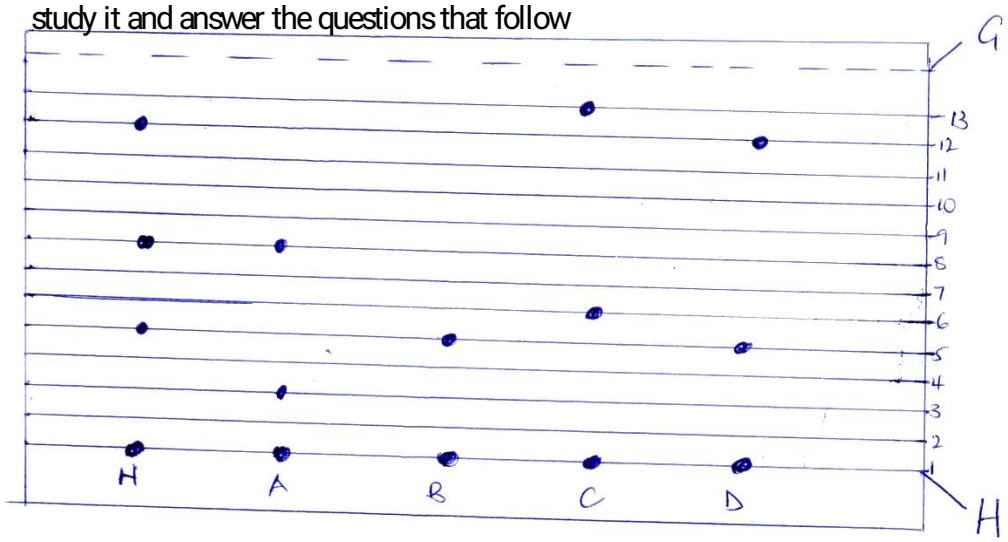
[c] How does the following compare? Explain your answer

[i] Atomic radius P and U [2mks]

[ii] Ionic and atomic radius of L [2mks]

[iii] ionic and atomic radius of U [2mks]

13. Form two students carried out paper chromatogram for mixture of K and substances A, B, C and D. study it and answer the questions that follow



[a] Label [2mks]

[i] G……

[ii] H……

[b] What is the suitable solvent to use in this paper chromatogram [1mk]

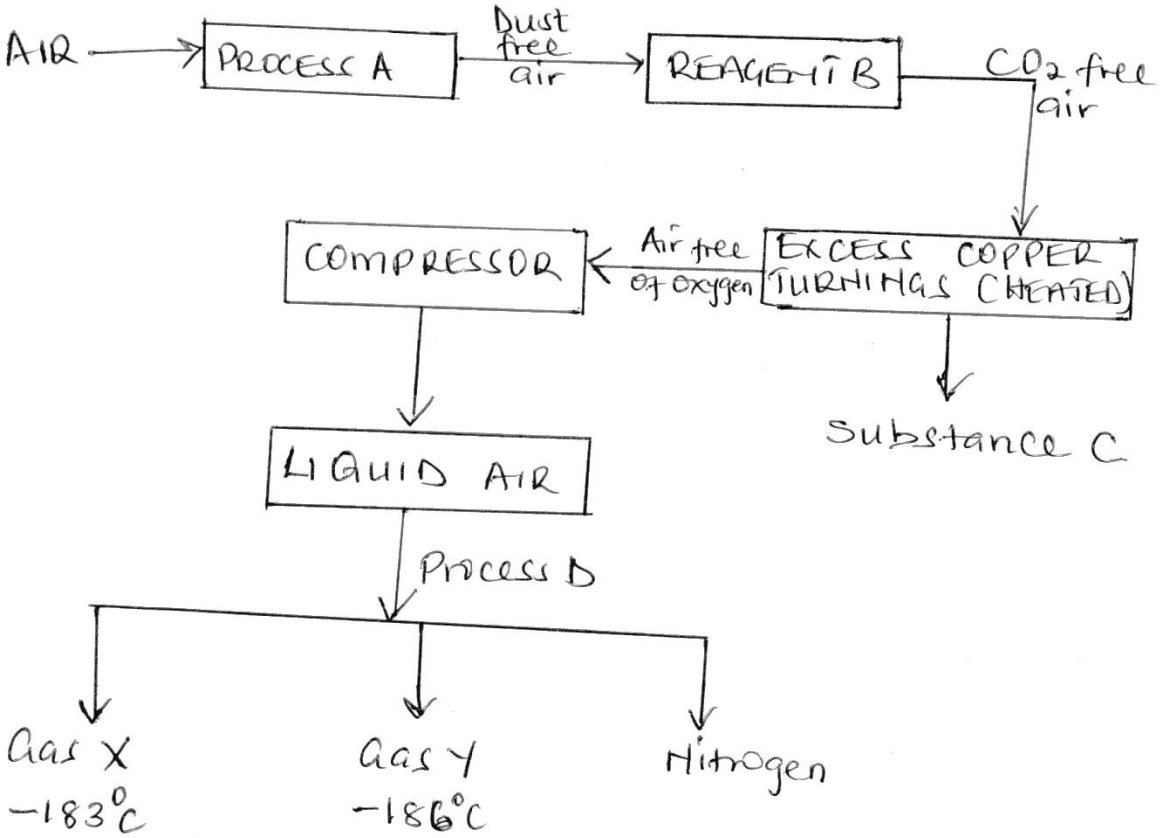
[c] Identify the substances present in mixture N [3mks]

[d] Which of the pure substance was a compound of N [1mk]

[e] State two factors that determine the speed by which a substance in a solution moves up the absorption paper [2mks]

[f] State two application of paper chromatogram [2mks]

14. The chart below shows how the main components of air are separated. Study it and answer the questions that follow



[a] Identify

[i] Gas x ……[1mk]

[ii] Gas y …… [1mk]

[iii] The temperature at which Nitrogen is distilled out

[b] Name

i. Process A …… [1mk]

ii. Reagent B …… [1mk]

iii. Substance C …… [1mk]

iv. Process D …… [1mk]

[c] What is the purpose of passing the air through compressor [1mk]

[d] Write the chemical equation of the reaction taking place when copper turnings are heated [1mk]

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

ELEMENT	A	B	C	D	E	F	G
Atomic radius [nm]	0.156	0.136	0.125	0.110	0.110	0.104	0.099
Ionic radius[nm]	0.095	0.065	0.050			0.184	0.181
1^{st} ionization energy KJ/mol	492	743	790	791	1060	1063	1254
Melting point ^0C	97.8	650	660	1410	442	119	-101
Atomic number	11	12	13	14	15	16	17

[i] Explain why;

[a] A has a larger atomic radius than ionic radius [1mk]

[b] G has a smaller atomic radius than its ionic radius [1mk]

[c] Explain on the trend of melting point from A to C [2mks]

[d] Explain why D has the highest melting point [1mk]

[e] Why is G having smallest atomic size [1mk]

ASSIGNMENT THREE

1.a)(Describe how to light and obtain a non- luminous flame from a Bunsen burner.(3 mks)

b) State one disadvantage of the flame obtained above.(1 mk)

2. State the type of changes undergone by the following substance,

a) Obtaining kerosene from crude oil.(1 mk)

b) Souring of milk.(1 mk)

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

liquid	L3	L4
L1	Miscible	Miscible
L2	miscible	immiscible

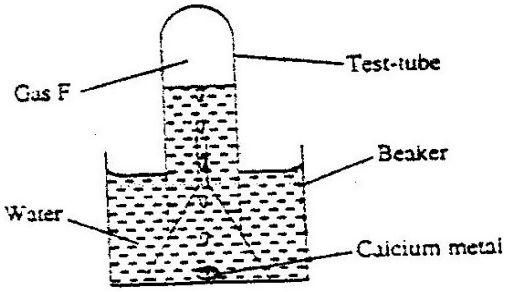
Use the information given to answer the question that follow

1. Name the method that can be used to separate L1 and L2 from a mixture of two.(1 mk)

II) Describe how a mixture of L2 and L4 can be separated.(2mks)

4. A beekeeper found that when stung by a bee application of a little solution of sodium hydroxide helped to relieve irritation from the affected area. Explain.(2 mks)

5. The set up below was used to collect gas F produced by the reaction between water and calcium metal



i) Name gas F.(1 mk)

ii) At the end of the experiment the solution in the beaker was found to be a weak base. Explain why the solution is a weak base.(2 mks)

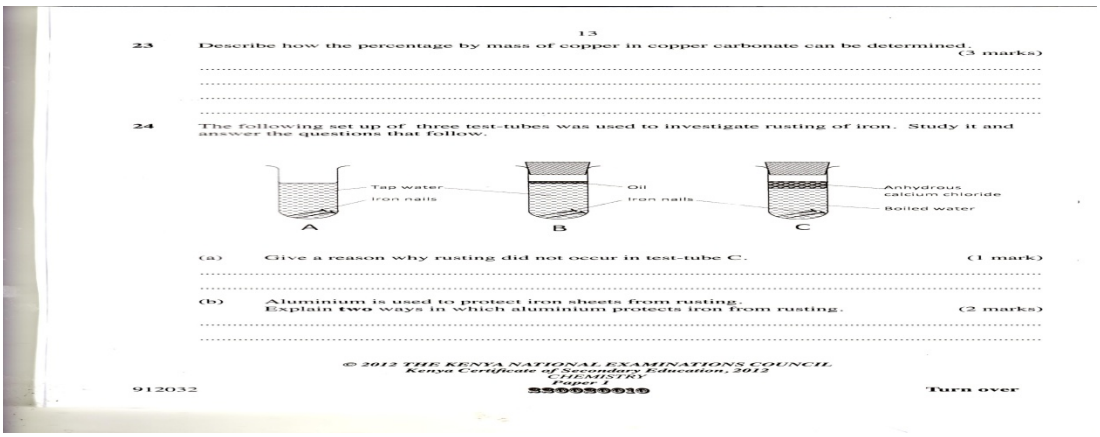
III) Give one laboratory use of the solution formed in a beaker.(1 mk)

6. Write the formula for the oxide of

A) Magnesium

b) Chlorine

7. The following set-ups were used to investigate the rusting of iron. Study it and answer the question that follow.


13

23 Describe how the percentage by mass of copper in copper carbonate can be determined. (3 marks)

24 The following set up of three test-tubes was used to investigate rusting of iron. Study it and answer the questions that follow.

Tap water
Iron nails
A
Oil
Iron nails
B
Anhydrous calcium chloride
Boiled water
C

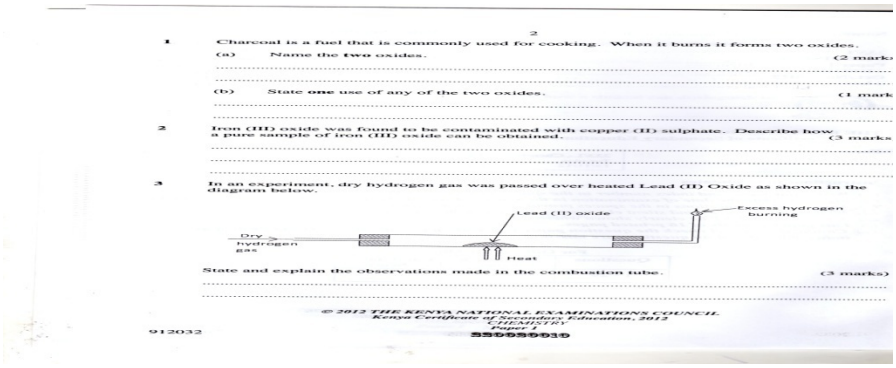
(a) Give a reason why rusting did not occur in test-tube C. (1 mark)

(b) Aluminium is used to protect iron sheets from rusting. Explain two ways in which aluminium protects iron from rusting. (2 marks)

A) Give a reason why rusting did not occur in test tube c.(1 mk)

b) Aluminum is used to protect iron sheets from rusting. Explain two ways in which aluminum protects iron from rusting.(2 mks)

8. When hydrogen gas is passed over heated lead (ii) oxide, a reaction occurs as shown in the set-up below.



Charcoal is a fuel that is commonly used for cooking. When it burns it forms two oxides.

(a) Name the two oxides. (2 marks)

(b) State one use of any of the two oxides. (1 mark)

Iron (III) oxide was found to be contaminated with copper (II) sulphate. Describe how a pure sample of iron (III) oxide can be obtained. (3 marks)

In an experiment, dry hydrogen gas was passed over heated Lead (II) Oxide as shown in the diagram below.

State and explain the observations made in the combustion tube. (3 marks)

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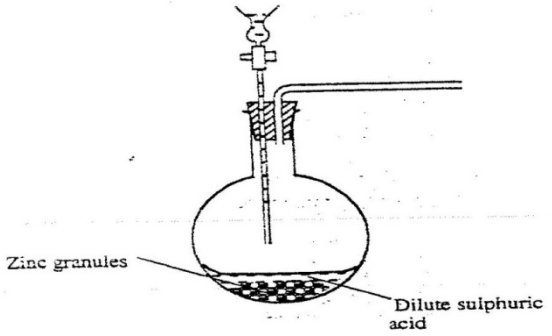
State what happens inside the combustion tube (1 mk)

9. The set-up below was used to prepare hydrogen gas



A) Complete the diagram to show how a dry sample of hydrogen gas can be collected.(3 mks)

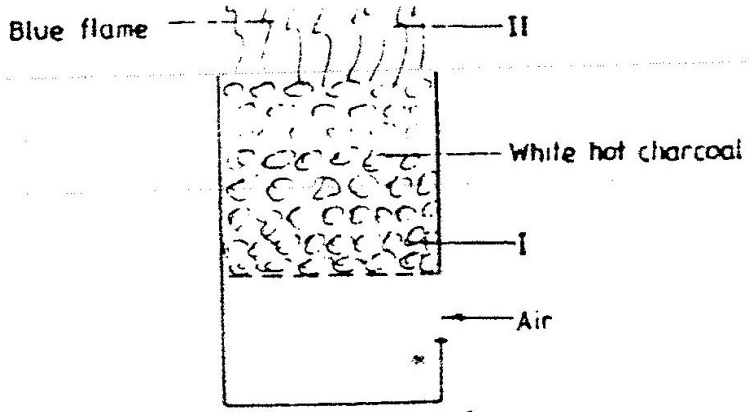
b) Write an equation for the reaction which take place when hydrogen gas burns in air.(1 mk

10. Both graphite and molten lead (ii) chloride conducts electricity. State the substance that conducts electricity in:

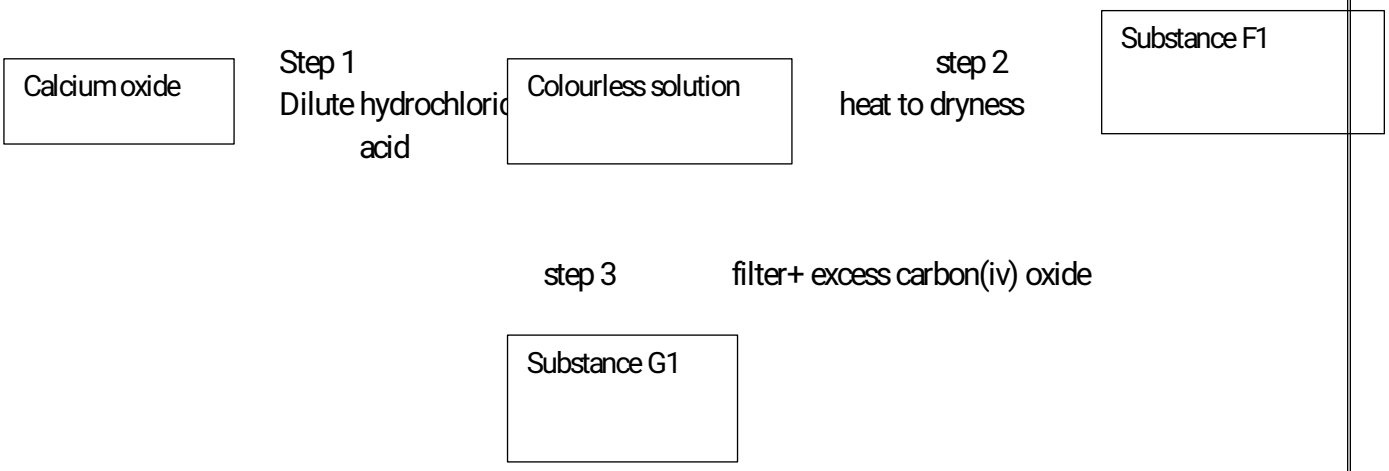
A) Graphite.(1 ½ mks)

b) Molten lead (ii) chloride.(1 mk)

11. The diagram below represents a charcoal burner. Study it and answer the question that follows



A) Write equations for the reactions taking place at (i) and (ii) above.(2 mks)
b) At region marked y an oxide of carbon forms. This oxide is often referred to as a "silent killer"
i) Identify the oxide.(1 mk)
ii) Why is this oxide described as a silent killer.(2 mks)
12. Study the flow chart below and answer the questions that follow



A) Give the name of the process that take place in step 1.(1 mk)
b) Give
i) The name of substance G.(1 mk)
ii) Suggest one use of carbon (iv) oxide.(1 mk)
13. The table below shows some of the elements of the periodic table and their atomic numbers, atomic masses and melting point. The letters are not the actual symbols of the elements

Element	B	C	D	E	F	G	H	I	J	K
Atomic no	7	8	19	15	2	9	6	16	12	11
Atomic mass	14	16	39	31	4	19	12	32	40	23
Melting point oc	-209	-218	63	44	-272	223	VARY	113	669	98

a) Select two elements with oxidation state of -3.(2 mks)
b) Which elements represent the most powerful reducing agent.(1 mk)
c) How does the atomic radii of D compare with that of K. Explain.(2 mks)
d) How do you compare the electrical conductivity of element J and K. Give your reason.(2 mks)
e) Select two elements which when reacted with element G forms a compound that conducts electricity both in molten and aqueous state.(2 mks)

f) Select two elements that have a common valency. State the elements.(2 mks)
g) In which group and period do D and G belong?
(D) Group period. (1 mk)
(G) Group period. (1 mk)
h) Select one element stored in
a) Water-
b) paraffin.- (2 mks)
14. a) Define the term "salt"(1 mk)
b) Describe how you can prepare crystals of sodium chloride under laboratory conditions starting with $100cm^3$ of a solution of dilute hydrochloric acid.(3 mks)
c) State at least two uses of salts.(2 mks)
15. State term(s) used to describe the processes below when salts are exposed to air for some time
i) Anhydrous copper ii sulphate becomes wet.(1 mk)
ii) Fresh crystals of sodium carbonate $Na_2Co_3.10H2o$ become powdery.(1 mk)
16. Using dots (.) and crosses(x) draw a diagram to show bonding in ammonia.(2 mks)
17. In terms of structure and bonding explain why graphite
A) Conducts electricity
b) Has a higher melting point.(2 mks)
18. a) What is a radical as used in chemistry.(1 mk)
b) State the formula of the compound formed when the following radicals combine
i) Ammonium, NH_4^+ and sulphate, SO_4^{2-}.(1 mk)
ii) Calcium ion Ca^{2+} and phosphate, PO_4^{3-} ion.(1 mk)
19. Study the structure below which represents an allotrope of carbon
A) Identify the allotrope. (1 mk)
b) State one of its uses, giving reasons for your answer. (2 mks)
20. Ethanol, C_2H_5OH has a boiling point of 78^0c while dimethylether, $(CH_3)_2O$ has a boiling point of only -33^oc, yet dimethyl either has a higher molecular mass than ethanol. Explain the observation in terms of structure and bonding.(2 mks)

21. The table below gives information about element in period three of the periodic table

element	Atomic no	Atomic radius	Ionization energy
Sodium	11	0.002nm	50kj
Magnesium	12	0.001nm	70kj
Aluminum	13	0.0005nm	93kj
Silicon	14	0.0001nm	107kj

a) State and explain the changes in atomic radius across the period.(2 mks)

b) Give reason(s) for increases ionization energy across the period.(2 mks)

22. The grid below represents parts of the periodic table. Study it and answer the questions that follow letter do not represent actual symbols of elements-draw the grid

A										
						m		q	w	
C					d			r		
								s	p	

i) Select two element with a charge of -2.(2 mks)

ii) Which is the most reactive non metal above.(1 mk)

iii) Give the formula of the oxide of D.(1 mk)

iv) Show on the grid an element which is mono atomic.(1 mk)

v) On the grid provided assign and indicate the position of iron metal.(1 mk)

vi) Compare the atomic radii of element d and r. Explain.(2 mks)

vii) Element m forms 2 isotopes whose isotopic composition is as given below

$^{12}_{6}M$(75%) and $^{14}_{6}m$(25%). Calculate its relative atomic mass.(3 mks)

23. Name a property of neon that makes it suitable for use in electric lamps.(1 mk)

24. Four metals F,G,H and J were each separately added to cold water and steam. Metal F and H reacted with cold water and very explosively with steam Metals G and J showed no reaction with cold water.

A) Suggest the identify of metal H.(1 mk)

b) Write an equation for the reaction between metal F and steam.(1 mk)

c) Metal J forms a hydroxide whose formula is $J(OH)_2$

Suggest the chemical family of metal.(1 mk)

d) Suggest a metal above which forms a monovalent ion.(1 mk)

ASSIGNNMENT FOUR

1. The electron arrangement of ions X^{3+} and Y^{2-} are 2.8 and 2.8.8 respectively.
   a) Write the electron arrangement of elements X and Y.
      X - (1 mk)
      Y - (1 mk)
   b) Write the formula of the compound that would be formed between element X and Y. (1 mk)
2. Study the equation below;
   $Mg_{(s)} + ZnO_{(s)} \rightarrow MgO_{(s)} + Zn_{(s)}$
   a. By use of arrows, indicate oxidation and reduction reactions in the equation. (2 mks)
   b. Name the reducing agent in the above reaction. (1 mk)
3. Distinguish between the terms deliquescent and effloresent salts. (2 mks)

4. The table below shows PH value of different solutions.

Solution	A	B	C	D
PH	14	7	2	11

a. Which solution is likely to be sugar solution? (1 mk)

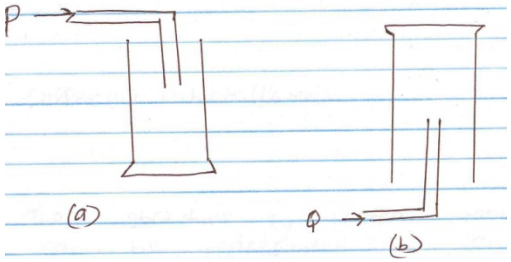
b. Two of the solutions were found to react with both aluminium oxide and zinc oxide. Identify the two giving reasons. (2 mks)

5. Identify the methods that are most appropriate to obtain. (3 mks)
   (i) Oil from coconut
   (ii) Diesel from crude oil
   (iii) Sugar crystals from sugar solution

6. An element Q has an electron arrangement of 2.8.5 (a) Identify the group and period to which it belongs.
   Group - (1 mk)
   Period - (1 mk)
   (b) is element Q a metal or a non-metal? (1 mk)

7. Carbon has two isotopes namely . Calculate the relative abundance of these two isotopes if the relative atomic mass of carbon is 12.4. (3 mks)

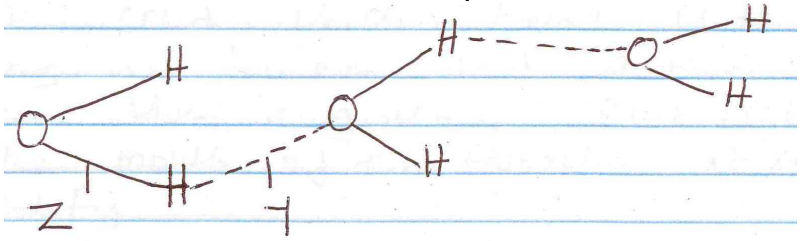
8. The diagram below shows how two gases, P and Q were collected.



(i) Name the two methods shown above.
   a - (1 mk)
   b - (1 mk)
(ii) State the property of Q that enables it to be collected as shown above. (1 mk)
(iii) Give an example of a gas that is collected using the method shown in (b) above. (1 mk

9. State and explain the changes in mass that occur when the following substances are separately heated in open crucibles.
   (i) Copper metal (1 ½ mk)
   (ii) Copper (ii) Nitrate (1 ½ mks)

10. The structure of water molecule can be represented as shown below.



(a) Name the type of bonds represented by letters Y and Z.

Y – (1 mk)

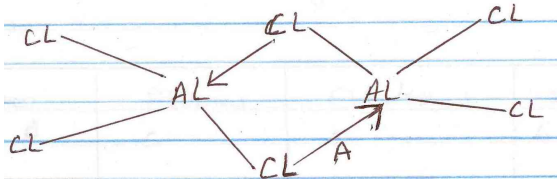
Z - (1 mk)

11. Element R has a valency of 2, element Q has a valency of 1 while element B has a valency of 3. Write the chemical formulae of their sulphates, phosphates and nitrates. (4½ mks)

Element	Sulphates	Phosphates	Nitrates
R			
B			
Q			

12. When a white solid X is heated, a yellow solid which turns white on cooling is formed and a brown gas is seen. When a glowing splint is placed at the mouth of the test-tube it relights.
    a) Identify;
        (i) Solid X - (1 mk)
        (ii) The brown gas - (1 mk)
    b) Write an equation for the decomposition of solid X. (1 mk

13. Below is a structure of aluminium chloride.



a. Identify bond A. (1 mk)
b. State the observations made when aluminium chloride solution is tested with blue and red litmus paper. Explain. (2 mks)

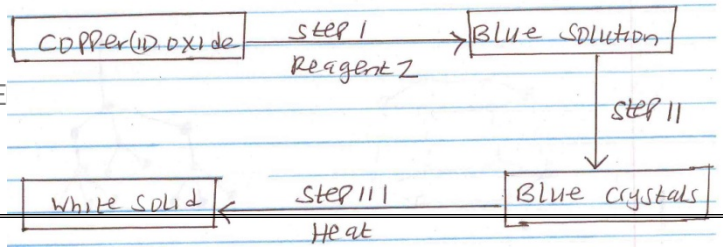
14. Which particles conduct electricity in;
    (i) Molten lead (ii) bromide (1 mk)
    (ii) Aqueous sodium chloride (1 mk)
    (iii) Graphite (1 mk)

15. The following table gives the structures of the different atoms. Study it and answer the questions that follow. (A, B, C, D and E do not represent the actual symbols of the elements).

Atom	Protons	Electrons	Neutrons
A	5	5	6
B	9	9	10
C	10	10	11
D	15	15	16
E	10	10	12

a. What is the mass number of atom B? (1 mk)
b. Which of the atoms has a mass number of 11? (1 mk)
c. Which of the atoms represent isotopes of the same element. (1 mk)

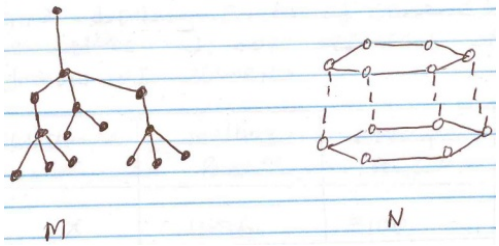
16. Study the following flow chart and answer the questions that follow.



(a) (i) Identify reagent Z. (1 mk)
(ii) Identify the white solid. (1 mk)
(b) Write a chemical equation for the formation of the blue solution. (1 mk)

17. State two properties that makes aluminium to be used in making of overhead electric cables(2 mks

18. The structures below represent two allotropes of carbon. Study them and answer the questions that follow



a) Identify the allotropes labeled
M - (1/2 mks)
N - (1/2 mks)

b) Explain in terms of structure and Bonding which of the two allotropes;
(i) Conducts electricity. (1 mk)
(ii) Is used in making drilling equipments. (1 mk)

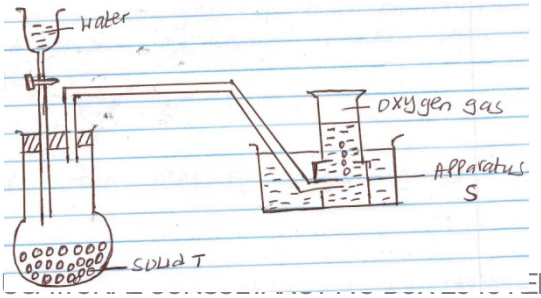
19. (a) Name two conditions which accelerate rusting. (2 mks)
(b) State ONE method used for preventing rusting. (1 mk)

20. The information below gives melting points of some substances. The letters do not represent the actual symbols of elements.

Substance	Melting point ^{0}C	Boiling point ^{0}C
X	1536	3100
Y	65	1115
Z	-40	361
P	-218	-190
Q	99	890
R	116	445

(i) Identify any two substances that are solids at room temperature (25^{0}C). (2 mks)
(ii) Identify a substance that is a liquid at room temperature. (1 mk)
(iii) Identify a substance that remains as a liquid over the widest range of temperature. (1 mk)

21. (a) The following diagram shows how oxygen can be prepared and collected in the laboratory.



(i) Name;
I apparatus S - (1 mk)
II solid T - (1 mk)
(ii) Why is it possible to collect oxygen as shown in the diagram? (1 mk)
(iii) Explain why it is important NOT to collect any gas for the first few seconds of the experiment? (1 mk)
(iv) Write an equation for the reaction that takes place. (1 mk)
(b) What name is given to the compounds formed when an element reacts with oxygen? (1 mk)
(c) State TWO uses of oxygen. (2 mks)

22. Name the salts obtained by reacting;
(i) Zinc oxide with dilute sulphuric (vi) acid. (1 mk)
(ii) Sodium carbonate with nitric acid. (1 mk)
(iii) Potassium carbonate and dilute hydrochloric acid. (1 mk)

23. (a) The table below shows properties of some substances.

Substance	Melting point (^{0}C)	Boiling point (^{0}C)	Electrical conductivity	
			Solid	Liquid
A	-112	-107	Poor	Poor
B	801	1413	Poor	Good
C	97.5	880	Good	Good
D	44	280	Poor	Poor
E	1700	2200	Poor	Poor
F	-110	46.3	Poor	Poor

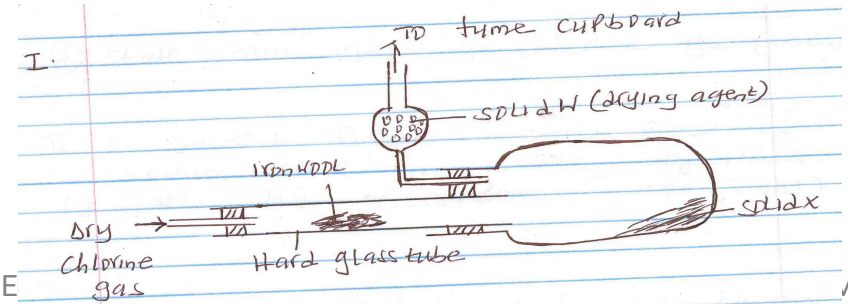
Select a substance which;
(i) Has a giant ionic structure. (1 mk)
(ii) Is a metal (1 mk)
(iii) Has a giant atomic structure. (1 mk)

(b) Using dots(.) and crosses (x) illustrate bonding in ammonia molecule (NH_3). (N=7, H=1) (2 mks)

24. When a student was stung by a nettle plant, a teacher applied an aqueous solution of ammonia to the affected area of the skin and the student was relieved of the pain. Explain.(1 mk)

25. (a) The information below is on four elements represented by letters P, Q, R and S. study it and answer the questions that follow. Q reacts with dilute acids but not with acids. S displaces P from its oxide and P reacts with cold water. Arrange the elements inorder of increasing reactivity. (1½ mks)
(b) State ONE reason why Helium is preffered to hydrogen in weather balloons. (1 mk)

26. The set up below shows the reaction between dry chlorine gas and iron wool.



a) Give one essential condition that is missing in the set up. (1 mk)
b) Why is it not advisable to release excess chlorine gas in the atmosphere?
c) Write a chemical equation for the formation of solid X. (1 mk
d) Name solid W and state why it is necessary. (2 mks)
e) Give the formula of the product formed if iodine vapour is reacted with heated iron wool. (1 mk)
f) State two uses of chlorine gas. (2 mks)

(ii) A student placed a small piece of sodium metal in a trough of water.
(i) State two observations made? (2 mks)
(ii) Write a chemical equation for the reaction that took place. 1 mk)

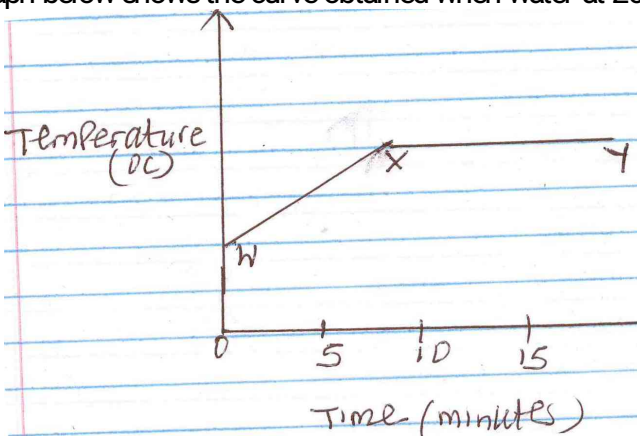
27. The products formed by action of heat on nitrates of elements A, B and C are shown below.

Nitrates	Products formed
A	Metal oxide + Nitrogen(iv)oxide + Oxygen
B	Metal + Oxygen + Nitrogen(iv)oxide
C	Metal nitrite + Oxygen

I. (a) Arrange the metals inorder of increasing reactivity. (1 mk)
(b) Which element forms a soluble carbonate? (1 mk)
(c) Give an example of element B. (1 mk)

II. (i) Write an equation to show the effect of heat on each of the following;
a. Sodium hydrogen carbonate. (1 mk)
b. Copper(ii)carbonate (1 mk

28. The graph below shows the curve obtained when water at 20^0C was heated for 15 minutes.



a. What happens to water molecules between point W and X? (1 mk)
b. In which part of the curve does change of state occur? (1 mk
c. Explain why the temperature does not rise between point X and Y. (1 mk)
d. Which test would be used to check if water is pure? (1 mk)

ASSIGNMENT FIVE

1. Define the term Chemistry? (1mks)
2. An atom of element x is represented as shown below.

$$^{23}_{11}X$$

   a) Using dots or crosses diagrams draw the atom of element x. (2mks)
   b) Show the electronic configuration of a stable ion formed by element x. (1mk)
3. Define the following terms. (3mks)
   a) Crystallization
   b) Radical
   c) Mixture

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

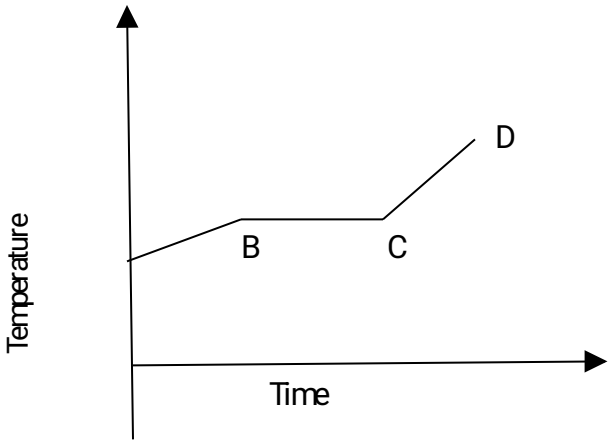
								E
A	B		C				D	
	G		I				H	
F								

   a) (i) Write down the electronic configuration of element E. (1mk)
      (ii) Ion formed by element H. (1mk)
      (iii) Formula or compound formed when G combines with D. (1mk)
   b) By giving reason, identify the type of bond formed in a (iii) above? (2mks)
   c) Explain the differences in the melting points of A and B. (2mks)
   d) Compare the reactivity of element D and H. (2mks)

5. Name that particles that are responsible for electricity conductivity in ?
   a) Melts
   b) Solids
   c) Aqueous solutions?
6. (a) Give the chemical name of rust? (1mk
   (b) Name 3 conditions necessary for rusting. (3mks)
7. Distinguish the following terms: (6mks)
   a) Allotropes and isotopes
   b) Isotopes
   c) Hydroscopic and deliquescent salts.
   d) Thistle funnel and separating funnel
8. Give two substances which can be separated by sublimation (2mks
9. Is air a mixture or a compound? Explain. (2mks)

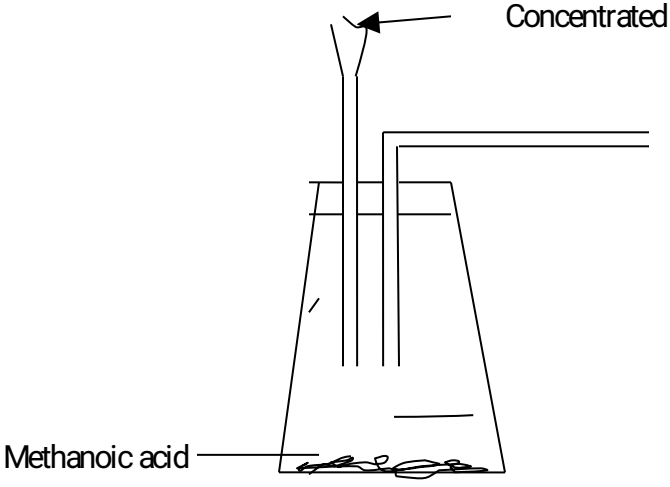
10. When magnesium is reacted with air, there is around 90% change in volume of air. With the help of chemical equations. Explain this. (4mks

11. The graph below shows the changes that occur when solid A is heated. Study it and answer the questions that follow.



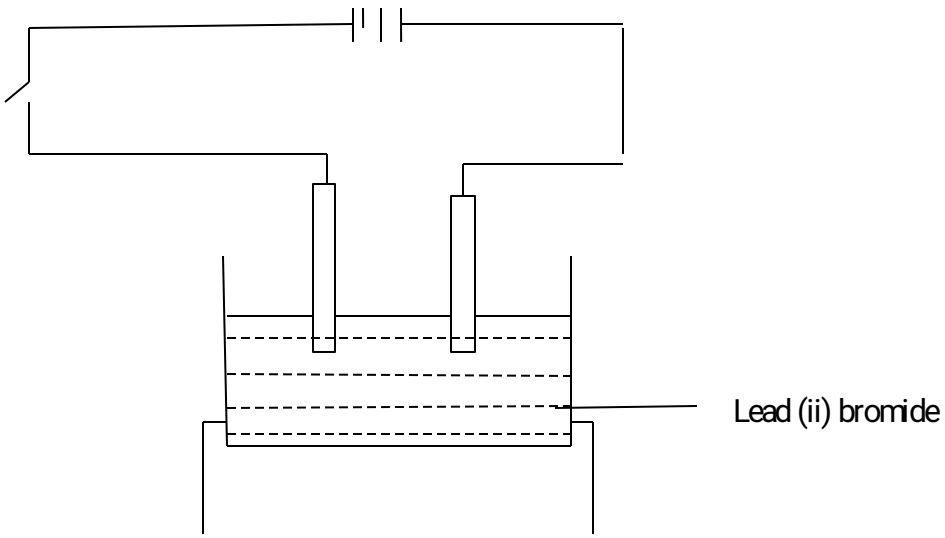
a) What happens between points A and B. (2mks)
b) What happens between Point B and C. (2mks)
c) What are the effects of impurities on the melting point and boiling point of substances? (2mks)

12. The set up below shows laboratory preparation of carbon (ii) oxide gas.



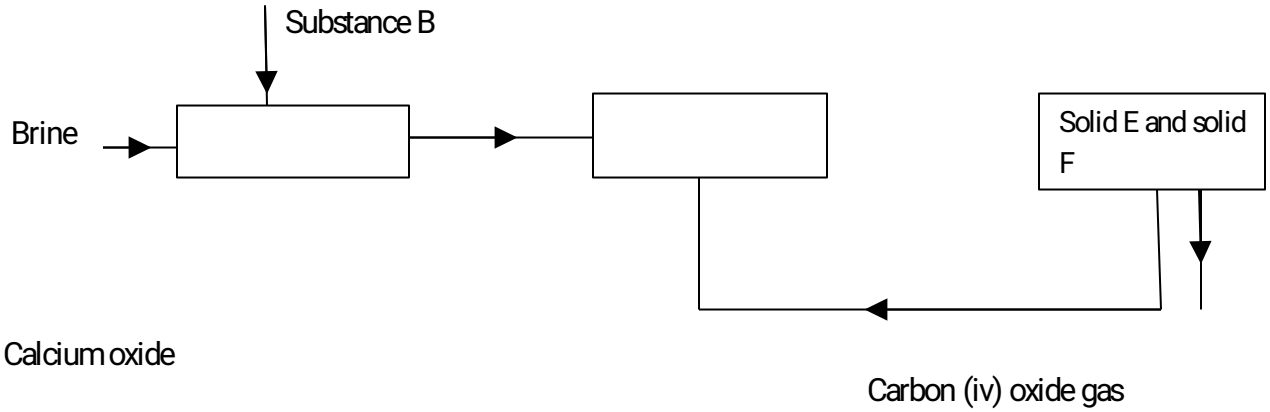
a) Complete the diagram to show how carbon (ii) oxide gas is collected. (4mks)
b) Explain why carbon (ii) oxide gas is collected as shown above. (1mk)
c) Write a chemical equation for the reaction above. (1mk)
d) Name 2 other methods that can be used to prepare carbon (ii) oxide gas. (2mks)
e) A charcoal Jiko should be left burning in poorly ventilated room. Explain. (2mk)

13. Study the set up below and answer the questions that follow.



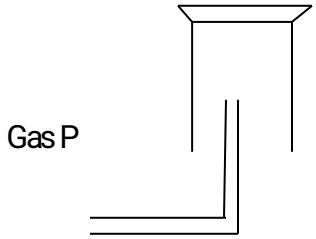
a) State one condition missing in the set up (1mk)
b) What happens to lead (ii) Bromide and the bulb when the condition above is available. (2mks)
c) Write equations for the reactions occurring at (2mks)
(i) The cathode
(ii) The anode

14. The figure below shows a section of the solvary process.



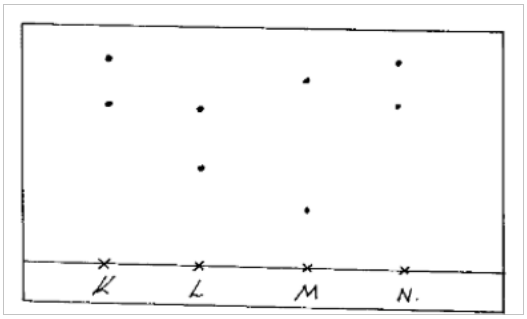
a) Name substance B. (1mk)
b) Where should the solvary process be carried out? Explain (2mks)
c) Name solids E and F. (2mks)
d) Name 3 substances recycled in the Solvary process. (3mks)

15. Give the method used to separate components of crude oil. (1mk)
16. Give 2 applications of crystallization (2mks)
17. Give the name of the following method of gas collection. (1mk)



ASSIGNMENT 6

1. Chebet, Mutua and Waweru are international athletes. Paper chromatography was used to test for the presence of illegal drugs in their blood which enhance the performance. The diagram below shows the chromatogram with the illegal drug labeled N.



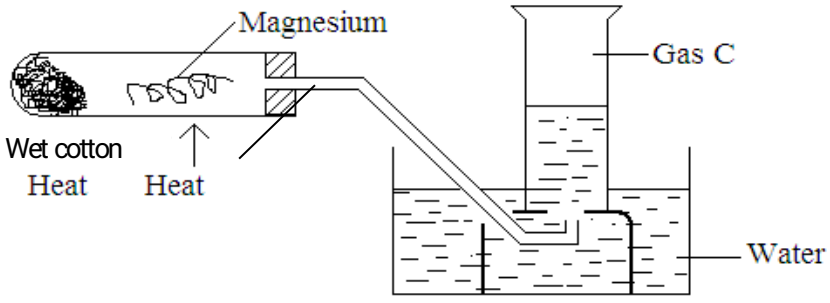
(a) Who among them tested positive for the illegal drug? Explain. **(2marks)**

(b) Explain what is meant by 'solvent front' **(1mark)**

2. a) describe how oxygen gas can be tested in the laboratory **(2marks)**

b) State two uses of oxygen gas. **(2marks**

3. The diagram below represents the apparatus used to react steam with magnesium.



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

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

c) State and explain one precaution required before the heating is stopped **(2marks)**

d) Identify gas C **(1mark)**

4. Both chloride and iodine are halogens

(a) What are halogens **(1mark)**

5. Oxygen exists naturally as isotopes of mass number 16, 17 and 18 in the ratio 96:2:2 respectively. Calculate its R.A.M. **(3 marks)**

6. Elements **X** and **Y** have the atomic masses of 39 and 23 respectively.

(a) Complete the table below by filling the blank spaces **(2marks**

Elements	**X**	**Y**
Atomic mass	39	23
Number of neutrons	20	12
Electronic configuration		

(b) Which element has a higher ionization energy? **(1mark)**

(c) Explain your answer in (b) above. **(2marks)**

7. The following two tests were carried out on chlorine water contained in two test tubes:

a) A piece of blue flower was dropped into the first test tube. Explain why the flower was bleached. **(2marks)**

c) The second test-tube was corked and exposed to sunlight. After a few days, it was found to contain a gas that rekindles a glowing splint. Write an equation for the reaction which produced the gas. **(1 mark)**

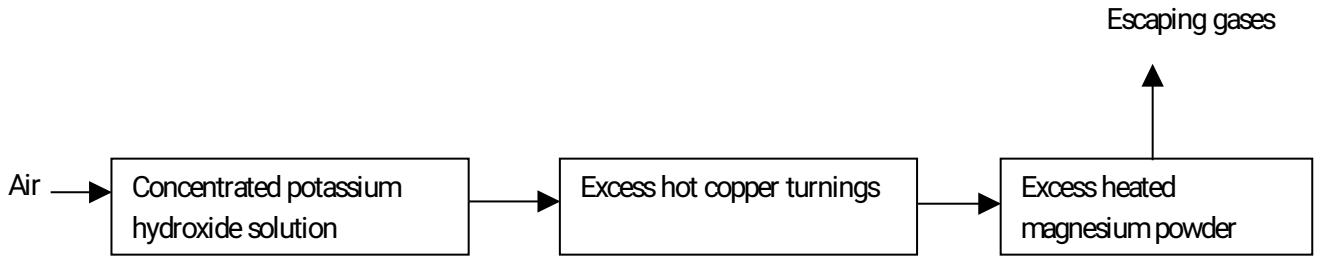
8. State and explain the changes in mass that occurs when the following substances are separately

heated in open crucibles. **(4marks)**

a) Copper metal.

b) Copper (II) nitrate

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



(a) Write an equation for the reaction that took place in the chamber with the magnesium powder. **(1mark)**

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

10. Give **two** reasons why helium is used in weather balloons. **(2marks)**

11. Name another gas which is used together with oxygen in welding. **(1 mark**

12. When extinguishing a fire caused by burning kerosene, carbon dioxide is used in preference to water. Explain **(2marks)**

14. 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. **(1 mark)**

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

(a) Metal ……

(b) Non-metal ……

(iv) Select one element that belongs to period 4. **(1mark)**

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

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

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

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

15. For each of the following experiments, give the observations and the type of change that Occurs (Physical or chemical) **(3 marks)**

Experiment	Observation	Type of change
A few drops of water are added to small amount of anhydrous Copper (II) Sulphate		
A few crystals of Iodine are heated gently in a test tube		
A few crystals of copper (II) Nitrate are heated strongly in a test tube.		

16. 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 **(1 mark)**.

Equation **(1 mark)**

II. Product in (I)above is added to water.

Observation

Equation **(1 mark)**

III. Heated sodium is lowered into a gas jar of chlorine.

Observation **(1 mark)**

Equation **(1 mark)**

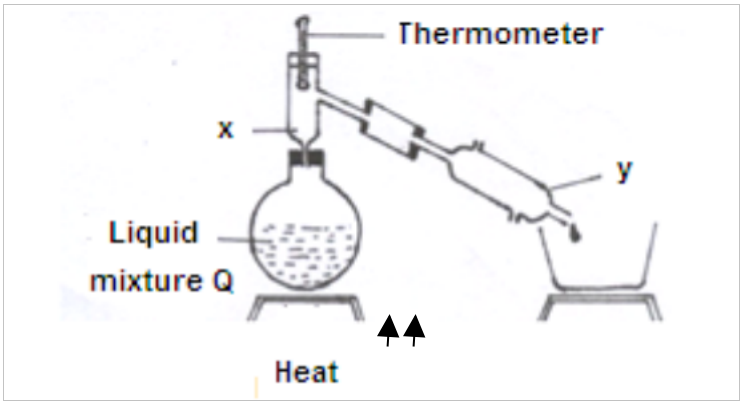
IV. A small piece of sodium is put in cold water in a beaker and resulting solution is tested with litmus paper.

Observation **(1 mark)**

Equation **(1 mark)**

b) Define the term ionization energy. **(1 mark)**

17.Study the diagram below and answer the questions that follow. The diagram shows the method used to separate components of mixture Q.



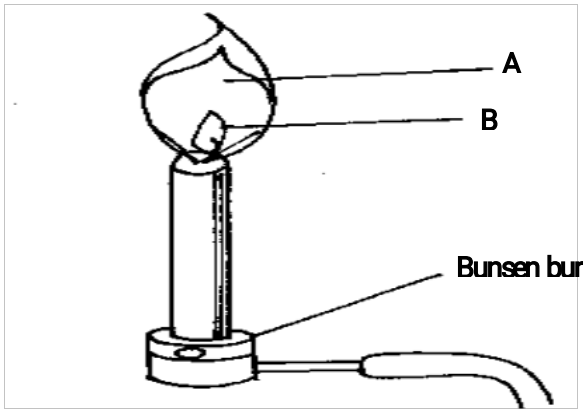
a) Name X and Y. **(2 marks)**

b) What is the purpose of apparatus X? **(1mark)**

c) What name is given to the above method of separating mixtures? **(1mark)**

ASSIGNMENT 7

1. The diagram below shows a bunsen burner when in use.



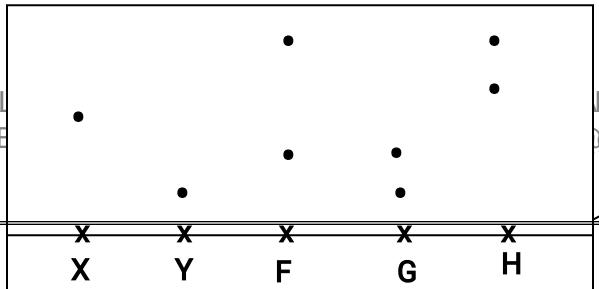
Name the regions labeled **A** and **B** **(2 marks)**

2. Both chloride and iodine are halogens

(a) What are halogens **(1 mark**

(b) In terms of structure and bonding, explain why the boiling point of chlorine is lower than that of iodine **(2 marks)**

3. A sample of urine from three students **F,G** and **H** suspected to have taken illegal drugs were sported onto a chromatography paper alongside two from illegal drugs **X** and **Y**. A chromatogram was run using methanol. The figure below shows the chromatogram.



(a) Identify the student who had used an illegal drug **(1 mark)**

(b) Which drug is less soluble in methanol **(1 mark)**

4. Using dots (.) and crosses (x) to represent electrons, show bonding in the compounds formed when the following elements react (Si = 14, Na = 11 and Cl = 17)

(a) Sodium and chlorine **(1 mark)**

(b) Silicon and chlorine **(1 mark)**

5. Zinc oxide reacts with acids and alkalis.

(a) Write the equation for the reaction between zinc oxide and;

(i) Dilute sulphuric acid **(1 mark)**

(ii) Sodium hydroxide solution **(1 mark)**

(b) What property of zinc oxide is shown by the reaction in (a) above **(1 mark)**

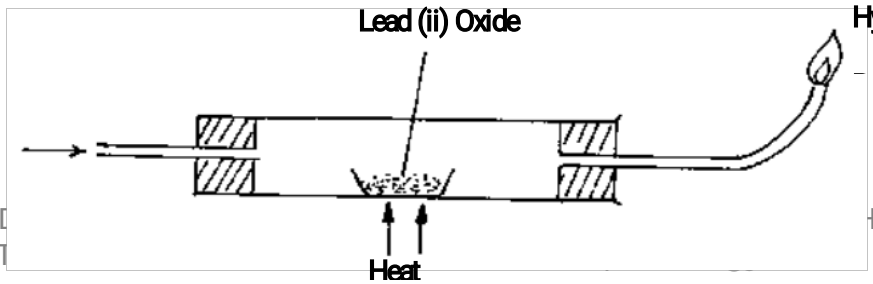
6. Use the information in the table below to answer the questions that follow. (The letters do not represent the actual symbol of the elements)

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

(a) Which **two** letters represent the same element? Give a reason. **(2 marks)**

(b) Give the number of neutrons in an atom of element **C** **(1 mark)**

7. When hydrogen gas is passed over heated lead (II) oxide, a reaction occurs. The diagram below shows a set up that could be used for this reaction



What observations would be made in the combustion tube? **(2 marks)**

8. Both molten lead (II) chloride and graphite conduct electricity. State how each of the substances conduct

electricity.

(i) Graphite **(1 mark)**

(ii) Molten lead (II) chloride **(2 marks)**

9. Substances J, K, L and M have the following properties.

Substance	M.P.	Solubility in water	Electrical conductivity	
			Solid state	Liquid state
J	Low	Soluble	Does not	Does not
K	High	Soluble	Does not	Conducts
L	High	Soluble	Conducts	Conducts
M	High	Insoluble	Does not	Does not

(i) Select the letter which represents a substance which is suitable for making kettle handles. **(1 mark)**

(ii) Which letter represents a substance which is likely to be sodium chloride? **(1 mark)**

(iii) Name the **structure** and **bond type** likely to be in J.

a) Structure. **(1 mark)**

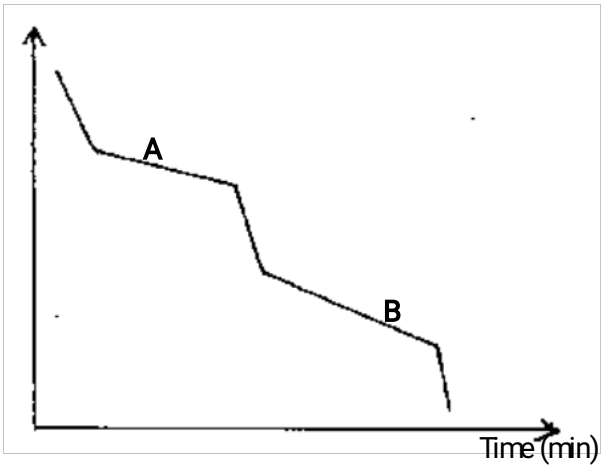
b) Bond type. **(1 mark)**

10. Starting with red roses, describe how:

(a) A solution containing the red pigment may be prepared; **(2 marks)**

(b) The solution can be shown to be an indicator **(2 marks)**

11. The following is a cooling curve of a certain substance.



(a) Is this a pure or impure substance? Explain **(2 marks)**

(b) Explain using kinetic theory what happens in region **A** **(2 marks)**

12. **(a)** Distinguishing between weak and strong alkali **(2 marks)**

(b) The following is a list of pH values of some substance:

Substance	**M**	**N**	**V**	**X**	**Z**
pH	10.6	7.2	13.2	5.9	1.5

Identify:

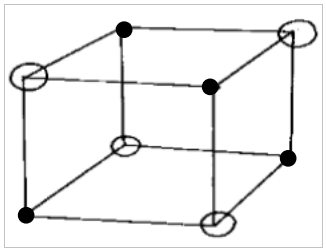
(i) Strong acid **(1 mark)**

(ii) Weak base **(1 mark)**

13. Ethanol and pentane are miscible liquids. Explain how water can be used to separate a mixture of

ethanol and pentane **3 marks)**

14. The figure below shows part of sodium chloride crystal lattice.



a) Which ion are represented in

(i) Larger circles (O) **(1 mark)**

(ii) Smaller circle (•) **(1 mark)**

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

15. Elements **X** and **Y** have the atomic masses of 39 and 23 respectively.

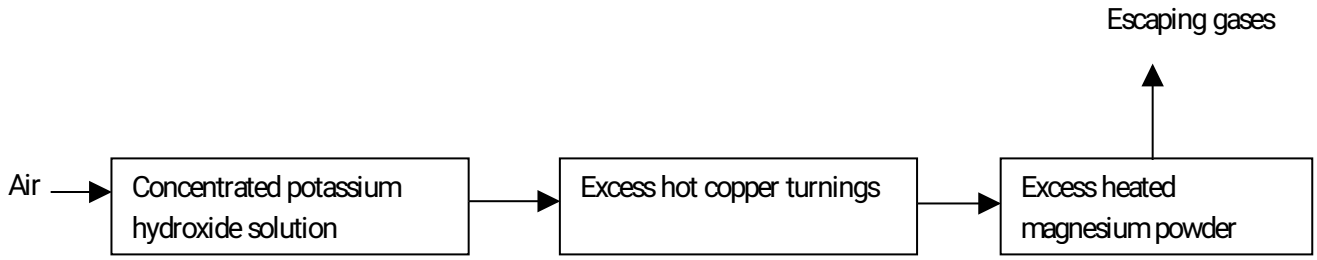
(a) Complete the table below by filling the blank spaces **(2 marks)**

Elements	**X**	**Y**
Atomic mass	39	23
Number of neutrons	20	12
Electronic configuration		

(b) Which element has a higher ionization energy? **(1 mark)**

(c) Explain your answer in (b) above. **(2 marks)**

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



(c) Write an equation for the reaction that took place in the chamber with the magnesium powder. **(1 mark)**

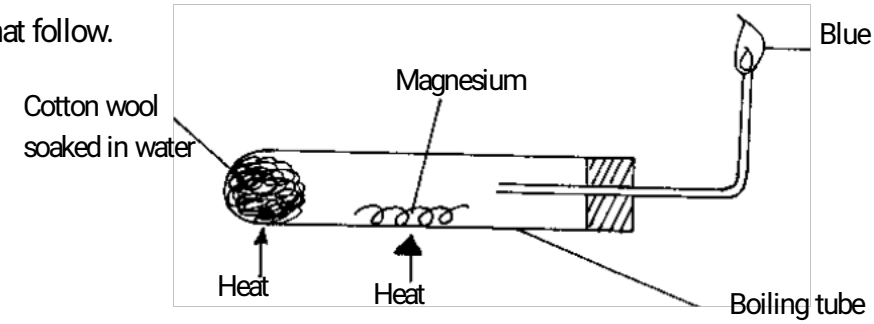
(d) Name **one** gas that escapes from the chamber containing magnesium powder. Give a reason for your answer. **(2 marks)**

17. When the air-hole is fully opened, the Bunsen burner produces a non-luminous flame. Explain. **(1 mark)**

18. Element **T** consists of two isotopes ^{62}T and ^{64}T in the ratio 7 : 3 respectively. Calculate the relative

atomic mass of element **T**. **(3 marks)**

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



(a) State the observations that would be made when heat is applied. **(1 mark)**

(b) Write chemical equations for the reactions taking place in :

(i) The boiling tube **(1 mark**

(ii) The blue flame **(1 mark)**

20. Briefly explain the following:

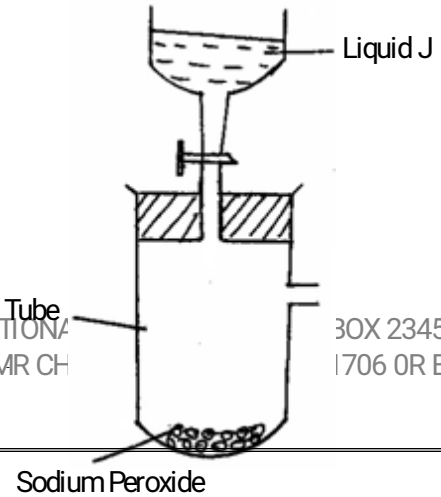
(a) Alkaline earth metals are generally less reactive than-alkali metals. **(2 marks)**

(b) Though sodium and aluminum are in the same period and are both metals, aluminum is a better

conductor of electricity. **(2 marks)**

21. The diagram **below** represents part of a set-up for preparing and collecting a dry sample of oxygen

gas.



(a) Complete the diagram. (3 marks)

(b) Write the equation for the reaction in tube I. (1 mark)

(c) State **one** commercial use of oxygen gas. 1 mark)

22. The table below shows physical properties of some substances. Use the information in the table to answer the questions that follow.

Substance	Melting point ^0C	Boiling point ^0C	Electrical conductivity	
			solid	Liquid
M	1083	2595	Good	Good
N	801	1413	Poor	Good
O	5.5	80.1	Poor	Poor
P	-114.8	-84.9	Poor	Poor
Q	3350	4827	Poor	Poor

Which substance is likely to be:

i. An ionic compound? Give reason (2 marks)

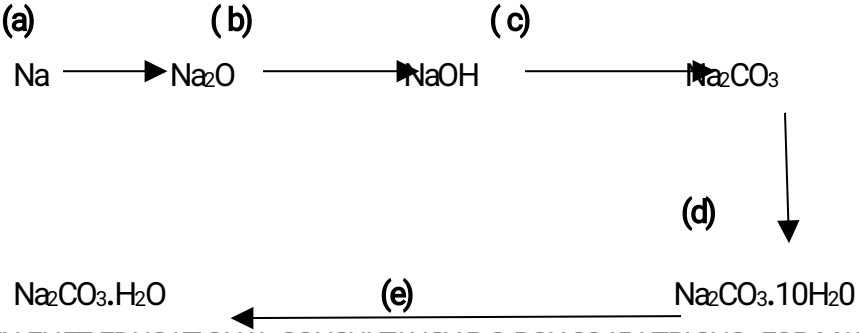
ii. A liquid at room temperature? (1 mark)

iii. Simple molecular? (1 mark

iv. Giant atomic? (1 mark)

ASSIGNMENT 8

1. When sodium metal is left exposed to the atmosphere it may undergo the following processes.



i. What substances are absorbed in

a) ----------(1 mark)

b) ---------- (1 mark)

c) ---------- (1 mark)

ii. Name process (5 marks)

a) ----------

b) ----------

c) ----------

d) ----------

e) ----------

iii. Give examples of **two** substances that undergo process

a). ---------- (2 marks)

b). ---------- - (2 marks)

c). ---------- (2 marks)

2. The following is an outline of one of the methods for the preparation of crystals of copper (II) sulphate

II. Dry the crystals between filter papers or sunshine

III. Filter off the excess carbonate and collect the filtrate

IV. Pour $50cm^3$ of dilute sulphuric acid into a beaker.

V. Continue to add the carbonate a little at a time stirring until no more carbonate reacts with the acid.

VI. Heat the filtrate to evaporate excess water and test to see whether the solution is saturated with a glass rod, leave it for several days.

VII. Place the beaker on the tripod stand and warm the acid gently but do not boil.

VIII. When good crystals form, pour off the "mother" liquor.

IX. Add copper (II) carbonate to the to the hot acid a little at time until no more reacts.

i. Arrange the steps above in the correct sequence. Use the numerals **(4 marks)**

ii. Why was the dilute acid warmed **(1 mark)**

iii. State **three** ways one can tell that the reaction has come to completion. **(3 marks)**

iv. Why is the filtrate not evaporated to dryness **(1 mark)**

v. Explain why copper (II) sulphate crystals cannot be prepared by the method of metal and dilute acid **(2 marks)**

3. Magnesium —steam→ gas P + Solid R —copper (II) oxide→ Solid T + Liquid
(Heat)

Use the chart above to answer the following questions. **(4 marks)**

i) Identify

Gas P ----------

Solid T ----------

Solid R ----------

Liquid S ----------

ii) Write a chemical equation to show the reaction between copper (II) oxide and gas P in presence

of heat **(1 mark)**

4. Balance the following equations. **(7 marks)**

I **i.** Cl_2 (g)+ NaOH (aq) $\longrightarrow$ NaCl (aq)+ NaOCl(aq) + $H_2O_{(l)}$

ii. Cl_2(g) + KOH(aq) $\longrightarrow$ KCl(aq) + $KClO_3$(aq) + $H_2O_{(l)}$

iii. Fe Cl_2(aq) + Cl_2(g) $\longrightarrow$ $FeCl_3$(aq)

iv. $NaHCO_3$(aq) + H_2SO_4(aq) $\longrightarrow$ Na_2SO_4(aq)+ CO_2(aq) + $H_2O_{(l)}$

v. Pb $(NO_3)_2$ (aq)+NaCl (aq) $\longrightarrow$ $NaNO_3$(aq) + $PbCl_2$(s)

vi. Mg(s) + Cu SO_4(aq) $\longrightarrow$ $MgSO_4$(aq) + Cu(s)

vii. KOH(aq) + H_2SO_4(aq) $\longrightarrow$ K_2SO_4aq + $H_2O_{(l)}$

II. Write ionic equations for each reaction in (I) above **(7 marks)**

III. Give the general names referred to reactions (e), (f) and (g) **(3 marks)**

5. **i.** What is basicity of an acid **(1 mark)**

ii. Give the basicity of the following acids **(3 marks)**

a) Hydrochloric acid _____

b) Sulphuric acid _____

c) Phosphoric acid _____

6. If sodium was to react with dilute phosphoric acid in controlled conditions. Give the formulae of **three** salts that could be formed **(6 marks)**

7. Select two substances or salts that could be used to prepare the following salts

i. a) Lead (II) iodide **(2 marks)**

b) Silver chloride **(2 marks**

c) Barium sulphate **(2 marks**

ii. Write an ionic equation to show the reaction taking place in

a) _____**(2 marks)**

b) _____**(2 marks)**

c) _____**(2 marks)**

8. Describe how you would prepare copper (II) carbonate crystals if provided with the following, copper (II) oxide , sodium carbonate solid, distilled water and dilute sulphuric acid. **(4 marks)**

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

substance	M.pt ^{o}C	B.pt ^{o}C	Electrical conductivity	
			In solid	in molten
J	365	463	Nil	Nil
K	1323	2773	Good	Good
L	1046	1680	Nil	Good
M	2156	2776	Nil	Nil

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

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

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

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

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

10. The table below gives the energy required to remove the outermost electron for some group (I) elements.

Element	1	II	III	IV
Energy Kj mol^{-1}	494	418	518	376

Arrange the elements in decreasing reactivity **(2 marks)**

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