F2 TOPICAL REVISION

CHEMISTRY

A SERIES OF KCSE TOPICAL REVISION QUESTIONS IN CHEMISTRY.

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1. STRUCTURE OF THE ATOM AND THE PERIODIC TABLE

1. In an experiment an unknown mass of anhydrous sodium carbonate was dissolved in water and the solution made up to 250cm^3. 25cm^3 of this solution neutralized 20cm^3 of 0.25M nitric acid.
(Na = 23.0 C = 12.0 O = 16.0)
Calculate:
(a) Moles of Nitric acid used
(b) Moles of sodium carbonate in 25cm of the solution
(c) Mass of unknown sodium carbonate used

2. Element **A** has atomic mass 23 and element **B** has atomic mass 7 and also have 12neutorns and 4 neutrons respectively.
(a) Write the electronic arrangement of **A** and **B**
(b) Which element has higher ionization energy? Explain

3. The table below shows the relative atomic masses and the percentage abundance of isotope M_1 and M_2 of element **M**.

	Relative atomic mass	**% abundance**
M_1	62.93	69.09
M_2	64.93	30.91

Calculate the relative atomic mass of element **M**

4. (a) Element **V** has two isotopes. Two thirds of V and one third of V . What is the relative atomic mass of element **V?**
(b) The following refers to element **Y**

Isotope	A	B	C
Isotope mass	54	56	57

Given that isotope **C** contains 31 neutrons in its nucleus find the number of protons in isotope **B**

5. The table below shows the relative atomic masses and the percentage abundance of the isotopes L_1 and L_2 of element L.

	Relative atomic mass	% abundance
L_1	62.93	69.09
L_2	64.93	30.91

Calculate the relative atomic mass of element K.

6. An element **M** has two isotopes **M** and **M** . The relative atomic mass of the naturally occurring is 63.55. Calculate the percentage of each isotope

7. An oxide of element **G** has the formula as G_2O_3
(a) State the valency of element **G**
(b) In which group f the periodic table is element **G**?

8. The table below gives information about the ions T^+ and Z^{2-}

Ion	**T^+**	**Z^{2-}**
Electron arrangement	2.8	2.8.8

Number of neutrons	12	16

(a) How many protons are there in the nucleus of ?
(i) Element **T**?
(ii) Element **Z**?
(b) Determine the relative formula mass of the compound formed between **T** and **Z**
(c) State **two** conditions under which the compound would conduct electricity

9. Carbon and silicon belong to the same group of the periodic table, yet Carbon (IV) oxide is a gas while silicon (IV) oxide is a solid with a high melting point. Explain this difference

10. An ion of oxygen is larger than oxygen atom. Explain

11. Copper (II) oxide and charcoal are black solids. How would you distinguish between the two solids?

12. (a) Element X is found in period III and group IV. It consists of two isotopes ^{28}X and ^{Q}X. A sample of X was found to consist of 90% of ^{28}X.If the relative atomic mass of X is 28.3, work out the number of neutrons in ^{Q}X
(b) Draw an electrochemical cell for the above cell

13. Study the table below and answer the questions that follows:- (Letters are not the actual symbols of element)

Element	Electronic arrangement	Electrical conductivity
L1	2.8.2	Higher electrical conductivity
L2	2.8.1	High electrical conductivity
L3	2.8.3	Highest electrical conductivity

L3 has the highest electrical conductivity. Explain

14. Define the term melting point of a substance

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

Element	**Q**	**P**	**R**	**S**	**T**
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
(b) Give the number of neutrons in an atom of element **R**

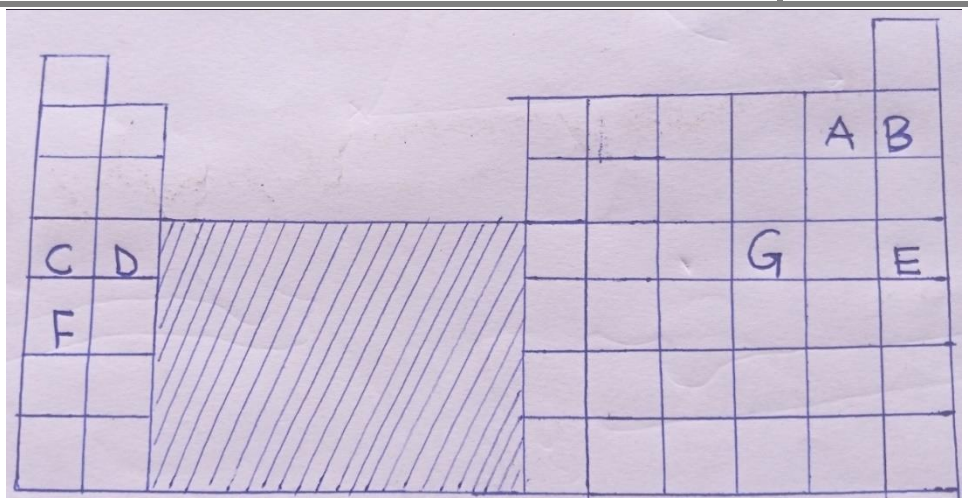
16. The table below gives some elements in the periodic table. Use it to answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	A	B	C	D	E
Atomic number	12	13	14	15	16

Which of the above letters represent:
a) A metallic element which forms ions with the smallest ionic radius? Explain
b) A non metallic element with the largest bbatomic size? Explain

17. The grid below is part of the periodic table. Use it to answer the questions that follow:

(The letters are not the actual symbols).



a) Write down the formula of the compound formed between C and A.

b) Which element has the same electron arrangement as the stable ion of:
(i) **F** ……. (ii) **A** ……..

c) Element **Q** has atomic number 15. Indicate its position on the grid.

d) Explain how the atomic radii of the following compare:
(i) C and F
(ii) C and D

e) Write the type of bond present in a compound formed between D and A.

f) Compound C and G were completely burned in oxygen.
(i) Write down equations to show the combustion of each of the elements.
(ii) State whether each of the oxides (i) above is basic or acidic.

18. The number of protons, neutrons and electrons in atoms **A** to **F** are given in the table below the letters do not represent the actual symbol of the elements:-

Atoms	**Protons**	**Neutrons**	**Electrons**
A	3	4	2
B	9	10	10
C	12	12	12
D	17	18	17
E	17	20	17
F	18	22	18

(a) Choose from the table the letters that represent:
(i) An atom of a metal .....
(ii) A neutral atom of a non-metal .....
(iii) An atom of a noble gas .....
(iv) A pair of isotopes .....
(v) A cation .....

19. (a) Study the table below and answer the questions that follow.

Particle	**Atomic number**	**Ionic configuration**	**Formula of oxide**	**Atomic radii**	**Ionic radii**

P	4	……..	……	0.110	0.031
Q	……...	2.8.8	QO	0.200	0.099
R	……	2.8.8	R_2O	0.230	0.133
S	17	2.8.8	S_2O_7	0.099	0.181
T	16	……	……	0.104	0.231

(i) Complete the table above
(ii) From the table, choose the most reactive metal. Explain
(iii) Which element is the most electronegative. Explain
(iv) Using dots (**.**) and crosses (x) to represent electrons, show the bonding in the chloride of **Q**
(v) Explain the solubility of element **T** in water
(b) (i) Why is aluminium used to make utensils yet it is a reactive metal?
(ii) Distinguish between valency and oxidation number

20. a) Work out the oxidation number of phosphorous in the following compound H_3PO_3
b) Study the equation below:

$$Mg_{(s)} + 2H_2O_{(l)} \longrightarrow Mg(OH)_{2(aq)} + H_{2\,(g)}$$

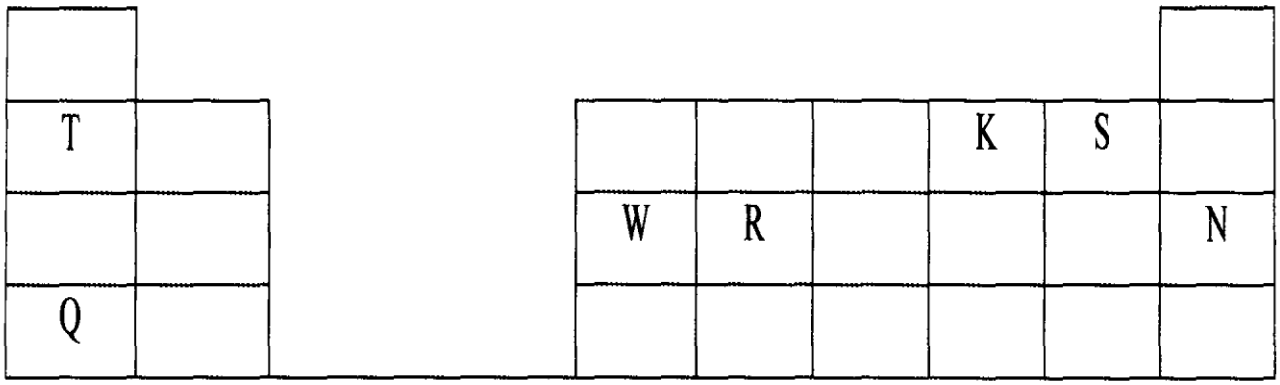
Which species has undergone oxidation .Explain

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

L							**L**	
M	**P**			**T**		**J**	**U**	**X**
N	**Q**			**S**			**V**	**Y**
							W	

(a) Explain why element **L** appears in two different groups in the grid above
(b) State the name of the chemical family to which **P** and **Q** belong
(c) Write the formula of the compound formed between **P** and **V**
(d) Compare the melting points of **Q** and **S**. Explain
(e) Identify an element whose oxide dissolves in both acids and alkalis
(f) Write the equation for the burning of **T** in excess air
(g) Using dots (•) and cross (**x**) to represent electrons, draw a diagram to illustrate bonding in the sulphide of **Q** (h) State **one** use of element **X**

22. The grid below is part of the periodic table. The elements are not represented by their actual symbols. Use the information to answer the questions that follow.



a) (i) Which is the most reactive
(I) Non — metal? *
Explain
(II) Metal?
Explain
(ii) Name the family to which elements **T** and **Q** belongs.
(iii) Write the formula of the compound formed when **W** reacts with **S**.
(iv) Name the type of bond and structure formed when elements **R** and **K** react.
(v) Explain why element **N** doesn't form compounds with other elements.
(vi) Compare the atomic radii of **T** and **Q.** Explain.

23. Study the data given in the following table and answer the questions that follow. The letters are not the actual symbols of elements.

Element	Number of protons	Melting point	Bpt ^oC
A	11	98	890
B	12	650	1110
C	13	60	2470
D	14	1410	2360
E	15	442 590	280
F	16	113 119	445
G	17	-101	-35
H	18	-189	-186

(i) State and explain the trend in melting point in **A B C**
(ii) Explain why the melting point and boiling points of element **D** is the highest
(iii) Explain why the element represented by letter **E** has two melting point values
(iv) Write down the chemical formula between element **C** and sulphate ions
(v) Name the chemical family in which **H** belong and state one use of the element
(vi) What is the nature of the oxide of the elements represented by letters **C** and **F**?

24. An element **W** has an atomic number 13.
a) Write the electronic configuration of the most stable ion of **W**
b) Write the formula of the oxide of the element **W**

25. Identify the particles that facilitate the electric conductivity of the following substances
(i) Sodium metal
(ii) Sodium Chloride solution
(iii) Molten Lead Bromide

26. Compare with a reason the atomic radius of Sodium to that of Aluminum.

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

Ion	No. of protons	No. of electrons
P^{3-}	7	10
Q^{+}	19	18
R^{2+}	12	10

a) Write the electron arrangement of element P.
b) Give the group and period to which elements Q and R respectively.
Q ……
R ……

28. Ethanol is a liquid at room temperature but does not conduct electricity. Explain.

29. Electronic configuration for elements represented by **P, Q, R** and **S** are:-
P= 2.8.6, Q= 2.8.2, R= 2.8.1 D= 2.8.8.
(a) Select the element which forms
(i) A double charged ion
(ii) A soluble carbonate

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

Element	Electron arrangement	Atomic radius (nm)	Ionic radius (nm)
K	2.8.2	0.136	0.065
L	2.8.7	0.099	0.181
M	2.8.8.1	0.203	0.133
N	2.8.8.2	0.174	0.099

(a) Which **two** elements have similar properties? Explain
(b) What is the most likely formula of the oxide of **L**?
(c) Which element is non-metal? Explain

31. 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)
A	0.364	0.421	A_2O	-119
D	0.830	0.711	DO_2	837
E	0.592	0.485	E_2O_3	1466
G	0.381	0.446	G_2O_5	242
J	0.762	0.676	JO	1054

(i) Write the formula of the compound formed when **J** combined with **G**
(b) Explain why the melting point of the oxide of **E** is higher than that of the oxide of **G**

CHEMICAL FAMILIES

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

Element	Atomic radius (nm)	Ionic radius (nm)
W	0.114	0.195
X	0.072	0.136
Y	0.133	0.216
Z	0.099	0.181

(a) Would these form part of a metallic or a non-metallic group? Explain
(b) Suggest an element in the table above likely to be the most reactive. Explain

2 State the reason for using Argon in electric light bulbs

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

Element	Electronic configuration	Boiling point
X	2.7	-188^{o}C
Y	2.8.7	-35^{o}C
Z	2.8.8.7	59^{o}C

(a) What is the general name given to the group in which the elements **X, Y** and **Z** belong?
(b) Select **two** elements which are coloured gases
(c) Explain why **Z** has the highest boiling point
(d) Write an equation for the reaction of element **Z** with iron metal
(e) Element **Y** was dissolved in water and a piece of blue litmus paper was put into the resulting solution. State and explain the observation that was made on the litmus paper

4. The table below shows elements **A, B, C, E, F**, and **G**. Elements in group **X** have a valency of 2 while elements in group **Y** have a valency of 1. Use the table to answer the questions that follow:-

	GROUP X				**GROUP Y**	
Element	**A**	**B**	**C**	**E**	**F**	**G**
Atomic radius (nm)	14.0	19.5	19.7	5.2	7.9	11.3
Ionic radius (nm)	7.6	10.5	12.4	12.6	16.1	19.6

(i) Atomic radius increases from **A** to **C** and from **E** to **G.** Explain
(ii) Explain the difference in the atomic and ionic radii of group **X** elements
(iii) Elements **C** and **G** belong to the same period. Explain why the atomic radius of **C** is greater than that of **G**
(iv) Give the formula of the compound formed when **B** and **F** react
(v) What type of bonding is formed in the compound above? Explain
(vi) Starting with the least reactive, arrange the elements in group **Y** in the order of reactivity.Explain:

5. The information in the table below relates to elements in the same group of the periodic table.Study it and answer the question that follows.

Element	Atomic size (nm)
P	0.19
Q	0.23
R	0.15

Which element has the highest ionization energy? Explain

6. Starting with Lead (II) carbonate explain how you would prepare a pure sample of Lead (II) sulphate

7. a) What is an isotope?
b) An element **Q** consists of 3 isotopes of mass 28, 29, 30 and percentage abundance of 92.2, 4.7, 3.1 respectively. Determine the relative atomic mass of the element?

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

Element	Electronic configuration	Ionization energy Kj/mol)
P	2.2	1800
Q	2.8.2	1450
R	2.8.8.2	1150

(a) What is the general name given to the group in which elements **P, Q** and **R** belong?
(b) Explain why **P** has the highest ionization energy
(c) Write a balanced chemical equation for the reaction between element **Q** and water

STRUCTURE AND BONDING

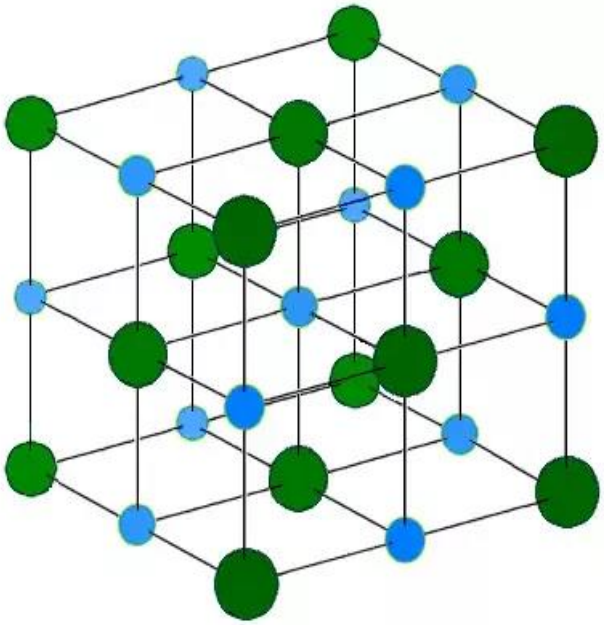
1. Ethanol is a liquid at room temperature but does not conduct electricity. Explain.
2. a) Distinguish between a covalent bond and a co-ordinate bond.
   b) Draw a diagram to show bonding in an ammonium ion. (N = 7, H = 1)
3. a) Explain why the metals magnesium and aluminium are good conductors of electricity.
   b) Other than cost, give **two** reasons why aluminium is used for making electric cables while magnesium is not.
4. Explain why the boiling point of ethanol is higher than that of hexane.
   (Relative molecular mass of ethanol is 46 while that of hexane is 86).
5. a) What is meant by **dative covalent bond**?

6. Sodium and Magnesium belong to the same period on the periodic table and both are metals.
   Explain why magnesium is a better conductor of electricity than sodium.
7. Using dots and crosses to represent electrons, draw the structures of the following:
   (a) Phosphorous chloride (PCl_3)
   (b) Hydroxonium ion (H_3O^+)
8. Between aluminium and copper which one is a better conductor? Explain
9. Water has a boiling point of 100^oC while hydrogen chloride has a boiling point of –115^oC. Explain
10. Explain why luminous flame is capable of giving out light and soot
11. When blue litmus paper is dipped in a solution of aluminium chloride it turns red. Explain
12. Carbon and Silicon are in the same group of the periodic table. Silicon (IV) Oxide melts at 2440^oC while solid Carbon (IV) Oxide sublimes at -70^oC. In terms of structure and bonding, explain this difference

13. Element **A** has an atomic number of 6 and b has an atomic number of 9:
   (i) Write the electron arrangements for elements **A** and **B**
   (ii) Using dot (•) and cross (X)diagram, show how **A** and **B** combine to form a compound

14. (a) Explain why aluminium is a better conductor of electricity than magnesium
   (b) Other than cost and ability to conduct, give a reason why aluminium is used for making cables while magnesium is not
15. Explain how electrical conductivity can be used to distinguish between magnesium oxide And silicon (IV) oxide

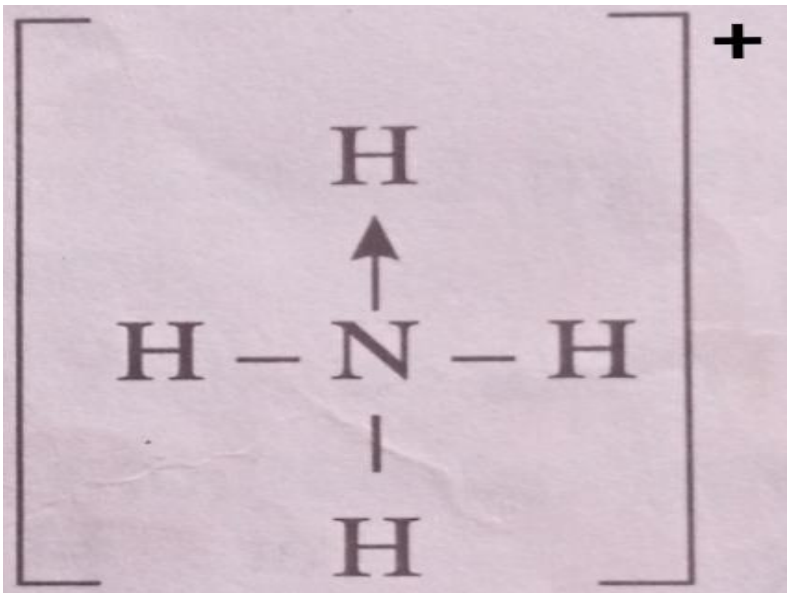
16. a) The diagram below represents part of the structure of sodium chloride crystal



The melting and boiling points of sodium chloride are 801C and 1413C respectively. Explain why sodium chloride does not conduct electricity at 25C, but does not at temperature between 801C and 1413C

b) Give a reason why ammonia gas is highly soluble in water

c) The structure of ammonium ion is shown below;



Name the type of bond represented in the diagram

d) Carbon exists in different crystalline forms. Some of these forms were recently discovered in soot and are called fullerenes

i) What name is given to different crystalline forms of the same element

ii) Fullerenes dissolve in methylbenzene while the other forms of carbon do not. Given that soot is a mixture of fullerenes and other solid forms of carbon, describe how crystals of fullerenes can be obtained from soot

iii) The relative molecular mass of one of the fullerenes is 720. What is the molecular mass of this fullerene

17. (a) Explain the following observations:-
(i) NaCl allows electric current to pass through them in molten state
(ii) Graphite is a non-metal yet it is a conductor of electricity

18. Study the table below and answer the questions that follow:-

Substance		**A**	**B**	**C**	**D**	**E**	**F**
Melting Point (^oC)		801	113 119	-39	5	-101	1356
Boiling point (^oC)		1410	445	457	54	-36	2860
Electrical Conductivity	Solid	Poor	Poor	Good	Poor	Poor	Poor
	liquid	Good	Poor	Good	Poor	Poor	Poor

I Identify with reasons the substances that:
(i) Have a metallic structure (1½mk)
(ii) Have a molecular structure and exist in the liquid state at room temperature and pressure
(iii) Suggest a reason why substance **B** has two melting points
(iv) Substances **A** and **C** conduct electric current in the liquid state. State how the two Substances differ as conductors of electric current

19. (I) Sodium metal tarnishes when exposed to the air where a white powder is formed on its surface. A small piece of this sodium metal was dropped into 25g of ethanol and $1200cm^3$ of hydrogen gas was evolved at r.t.p. The unreacted ethanol was evaporated and a white solid remained. (Na=23, molar gas volume at r.t.p = $24dm^3$, C=12, O =16, H=1)
(a) Write a chemical equation for the reaction between ethanol and sodium metal
(b) Determine the mass of sodium that reacted with ethanol
(c) What mass of ethanol evaporated?
(d) The ethanol was evaporated at 80^oC, while the white solid remained unaffected at this temperature. What is the difference in structure of ethanol and the white solid?
(II) (a) Name an inorganic liquid which liberates hydrogen gas with sodium metal
(b) What **two** differences would you observe if similar pieces of sodium were Dropped separately into small beakers containing equal amount of ethanol and the liquid named in **(II)(a)** above respectively

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

Element	**Electronic configuration**	**Ionization energy $KJmol^{-1}$**
P	2:1	519
Q	2:8:1	494
R	2:8:8:1	418

(i) What is meant by ionization energy?
(ii) Element **R** has the lowest ionization energy. Explain
(iii) When a piece of element **Q** is placed on water it melts and a hissing sound is produced as it moves on the water surface. Explain these observations
(iv) Write the equation for the reaction between element **Q** and water

21. The table below shows the elements in the third period, the oxides of the third period and their properties. The letters are not the actual symbols of the elements. Study the information and answer
the questions that follow:

Element	Atomic number	Atomic radius(nm)	Oxide	State at RT	oxide melting point ºC
M	11	0.191	M_2O	Solid	1132
N	…… ……	0.160	NO	Solid	2852
P	13	0.130	……	Solid	2072
Q	14	0.118	QO_2	…….	1610
R	……	0.110	……	Solid	580
S	16	0.102	SO_2	……	-75
T	17	0.099	TO_2	Gas	-60
V	18	0.095	X	X	X

a) i) Complete the table above
ii) Explain the trend in the atomic radius across the period
iii) Explain why the oxide of element **V** does not exist
b) Name the type of structure and bond in the following oxide

Oxide	Structure	Bond type
NO		
TO_2		

ii) Using dots and crosses to represent electrons. Show the bonding in the oxide, **QO_2**
c) i)Explain why elements **P** conducts electricity but **T** does not
ii) The oxide of **P** reacts both acids and alkalis. Give the name of this kind of oxide

22. The table below gives information about elements A_1, A_2, A_3 and A_4

Element	Atomic number	Atomic radius (nm)	Ionic radius (nm)
A_1	3	0.134	0.74
A_2	5	0.090	0.012
A_3	13	0.143	0.050
A_4	17	0.099	0.181

(i) In which period of the periodic table is element A_2? Give a reason
(ii) Explain why the atomic radius of:
I. A_1 is greater than that of A_2
II. A_4 is smaller than its ionic radius
III. Select the element which is in the same group as A_3
IV. Using dots (●) and cross (**x**) to represent outermost electrons, draw a diagram to show the bonding in the compound formed when A_1 reacts with A_4

23. The atomic number of element **P** is **11** and that of **Q** is **8**
a) Write down the possible formula of the compound formed between **P** and **Q**
b) Using dots (**·**) and crosses(**x**) to represent electrons draw a diagram to represent the bonding in the compound in **(a)** above

24. Name the type of bonding and structure found in: -

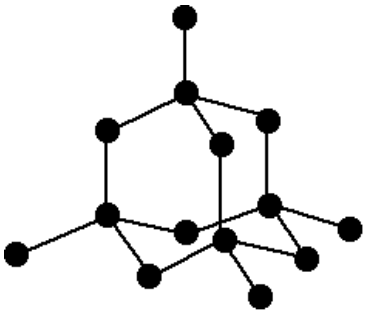
(a) Ice
(b) Magnesium chloride

25. (a) Using dots (•) and crosses (**x**) to represent electrons show bonding in:
NH^-_2 (N=7, H=1) S_8 (S = 16)

(b) Show bonding in Carbon (II) Oxide by use of (—) or ( ) to represent bonds.

26. In terms of structure and bonding, explain why diamond is the hardest naturally occurring Substance

27. Identify the bond types in the diagram below



28. Elements **A, B, C**, and **D** are not actual symbols, have atomic numbers **19, 9, 12** and **10** respectively.
(a) Which **two** elements represent non-metals
(b) Write the formula of the compound formed between elements **B** and **C** and identity the bond present in the compound

29. (a) Distinguish between a covalent and dative bond
(b) Explain why nitrogen gas reacts with oxygen at very high temperature

30. Draw a dot ( ) and cross (**x**) diagram to show bonding in:-
(i) Ammonium ion (NH_4^+
(N = 7.0, H= 1)
(ii) Silane (SiH_4)

(Si= 14, H = 1)

31. Below is a table oxides of some period three elements

Oxides	Na_2O	P_4O_6	SO_2	Cl_2O
State at room temp	Solid	Solid	Gas	Gas

(a) Give the systematic name of Cl_2O
(b) Explain why Na_2O exists as a solid whereas SO_2 is a gas at room temperature

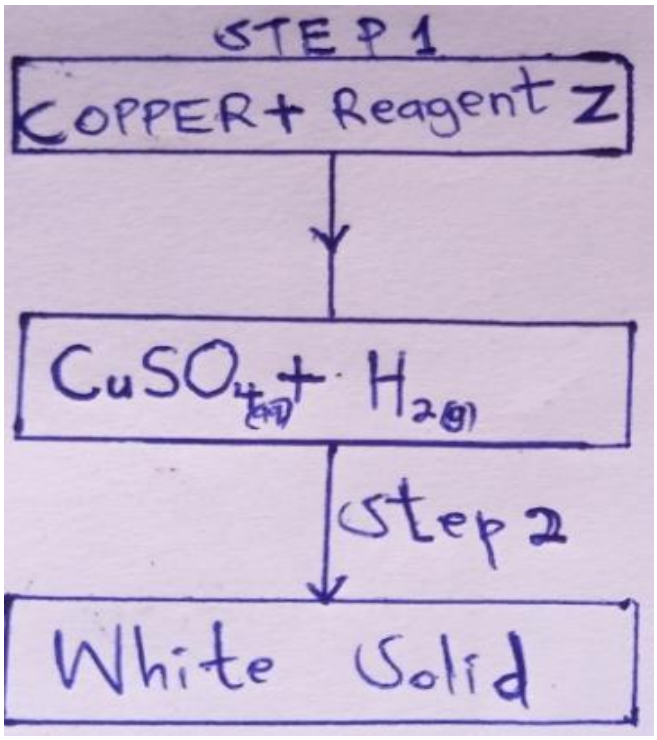
32. The table below shows properties of period three chlorides

Formular of compound	NaCl	$MgCl_2$	$AlCl_3$	$SiCl_4$
Bp ^oC	1470^oC	1420^oC	180^oC	60^oC

Explain why $AlCl_3$ solid has a much lower boiling point than $MgCl_2$ solid

SALTS

1. Study the flow chart below and answer the questions that follow:

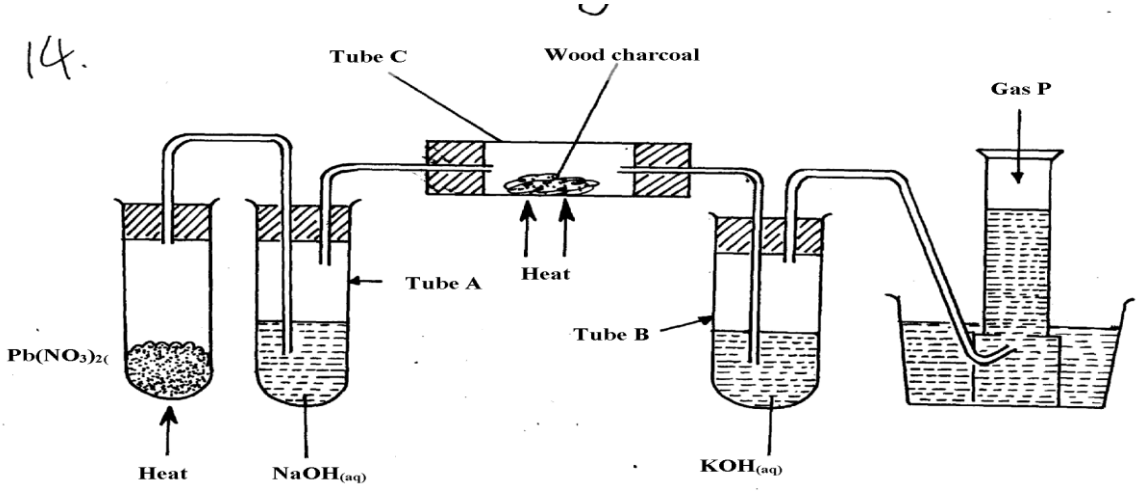


a) Name reagent Z.
b) Describe the process which takes place in step 2.
c) Identify the white solid.

2. a) Starting from solid magnesium oxide, describe how a solid sample of magnesium hydroxide can be prepared.
b) Give **one** use of magnesium hydroxide.

3. Starting with lead (II) oxide, describe how you would prepare a solid sample of lead (II) Carbonate

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



(a) Name the **two** salts formed in tube **A**

(b) State the observations made in tube **C**
(c) Name gas **P**

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

PARTICLE	MASS NUMBER	NUMBER OF PROTONS	NUMBER OF NEUTRONS	NUMBER OF ELECTRONS
E	37	17	**(i)**	18
F	32	**(ii)**	16	16
G	**(iii)**	19	20	18
H	40	20	**(iv)**	18

(a) Complete the table by filling in the blank spaces (**i) , (ii) (iii),** and **(iv)**
(b) Identify the particles which are electrically charged

6. Sodium Carbonate Decahydrate crystals were left exposed on a watch glass for two days.
a) State the observations made on the crystals after two days.
b) Name the property of salts investigated in the above experiment

7. Starting with sodium oxide, describe how a sample of crystals of sodium hydrogen carbonate may be prepared

8. In an experiment, ammonium chloride was heated in test-tube. A moist red litmus paper placed at the mouth of test first changed blue then red. Explain these observations:-

9. Using dots (•) and cross (x), show the structure of ammonium ion

10. a) Give the name of each of the processes described below which takes place when salts are exposed to air for sometime
i) Anhydrous copper sulphate becomes wet
ii) Magnesium chloride forms an aqueous solution
iii) Fresh crystals of sodium carbonate, $Na_2CO_3.10H_2O$ become covered with white powder of formula $Na_2CO_3.H_2O$
b) Write the formula of the complex ion formed in each of the following reactions described below;
i) Zinc metal dissolves in hot alkaline solution
ii) Copper hydroxide dissolves excess ammonia solution

11 (a) Write an equation to show the effect of heat on the nitrate of:-
(i) Potassium
(ii) Silver

12. Describe how a solid sample of anhydrous magnesium carbonate is obtained

13. In the preparation of magnesium carbonate, magnesium was burnt in air and the product collected. Dilute sulphuric acid was then added and the mixture filtered and cooled. Sodium carbonate was added to the filtrate and the contents filtered. The residue was then washed and dried to give a white powder.
(a) Give the name of the product
(b) Write the chemical equation for the formation of the product
(c) (i) Name the filtrate collected after sodium carbonate was added.
(ii) Write down the chemical formula of the white powder
(d) Write a chemical equation for the reaction between product in **(a)** and the acid
(e) Write an ionic equation to show the formation of the white powder.

(f) Write an equation to show what happens when the white powder is strongly heated.
(g) Identify the ions present in the filtrate after addition of sodium carbonate.
(h) What is the name given to the reaction that takes place when sodium carbonate was added to the filtrate?
(i)Explain the observations made when crystals of sodium carbonate decahydrate are left exposed to the atmosphere for two days

14. a) Give the name of each of the processes described below which takes place when salts are exposed to air for sometime
i) Anhydrous copper sulphate becomes wet
ii) Magnesium chloride forms an aqueous solution
iii) Fresh crystals of sodium carbonate, $Na_2CO_3.10H_2O$ become covered with white powder of formula $Na_2CO_3.H_2O$

15. You are provided with the following:- solid lead (II) nitrate, magnesium oxide Powder, dilute sulphuric (VI)acid and distilled water. Describe how you can prepare a dry sample of lead (II) sulphate

16. When potassium nitrate is heated,it produces potassium nitrite and gas **C**
[a]Identify gas c
[b]Name the type of reaction undergone by the potassium nitrate

17. When exposed to air, crystals of hydrated sodium carbonate loses water of crystallizations;-
(i) Name this process
(ii) Write the formula of hydrated sodium carbonate

18. A student poured sodium iodide solution into a small portion of solution **Q**, a yellow precipitate was formed.
(i) Which ion was most likely in solution **Q**?
(ii) Write an ionic equation leading to the formation of the yellow precipitate

19. Calcium oxide can be used as a solid drying agent for some laboratory gases. Explain

20. A piece of marble chips was strongly heated in air for about 30 minutes. Some drops of water were added drop by drop to the product when it was still warm.
Using equation, explain:
(i) What happens when the piece of marble chips is heated?
(ii) The reaction that takes place when water is added to the final warm product.

21. Starting withbarium nitrate solution,describe how a pure sample of barium carbonate can be prepared in the laboratory

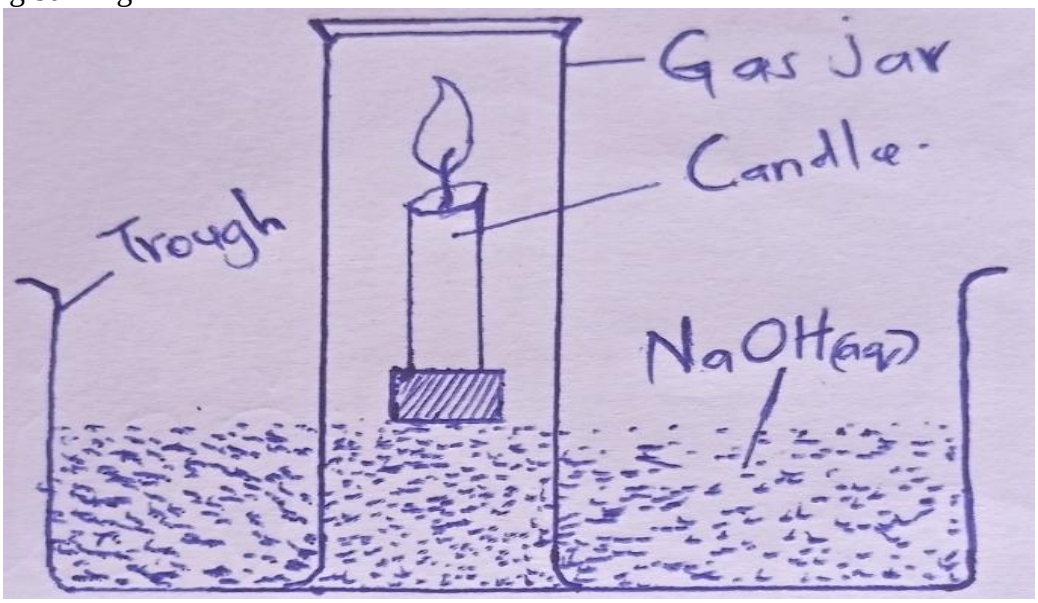
22. Potassium nitrate crystals in a test-tube were heated strongly for some time. State the observation made:
(a) When a glowing splint is introduced into the test-tube during the heating
(b) At the end of the heating

23. Name the process which takes place when:
(a) Anhydrous iron (III) chloride absorb water vapour from the air to form solution
(b) Zinc chloride vapour changes directly to zinc chloride solid

24. (a) Starting form solid magnesium oxide, describe how a solid sample of magnesium hydroxide can be prepared
(b) Give **one** use of magnesium hydroxide

25. The diagram below represents a set-up that was used to show that part of air s used

during burning



(a) State **two** sources of errors in this experiment

26. In an experiment the following solids were provided to form three students; $Ca(NO_3)_{2(s)}$, $NaH_2PO_{4(s)}$; $Mg(OH)Cl_{(s)}$ and $Fe(NH_4)_2(SO_4)_2$**.** $6H_2O$. They were then told to dissolve the given solids in differently in 20ml of water.

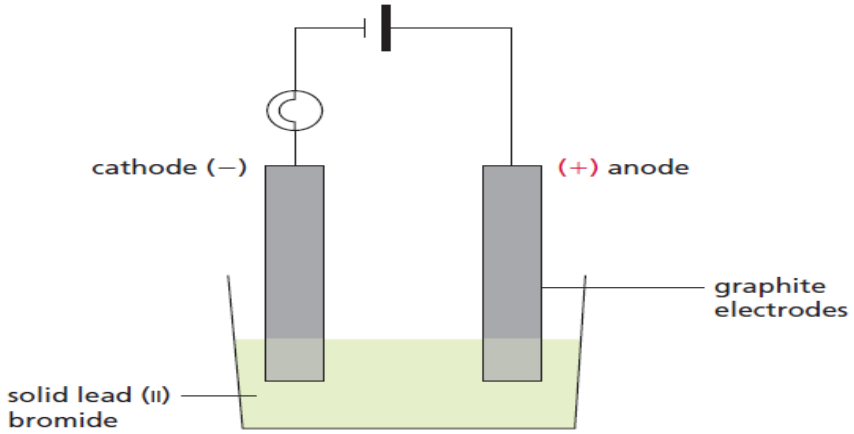
(a) Classify the given salts accordingly

(b) (i) Explain the process which takes place when $FeCl_3$ is dissolved in water

(ii) A student placed a moist litmus paper on the product in **(i)** above. State and explain the observation made

EFFECT OF AN ELECTRIC CURRENT ON SUBSTANCES

1. The set-up was used to electrolyse Lead (II) bromide. Study it and answer the questions that follow;



↑↑↑↑

HEAT

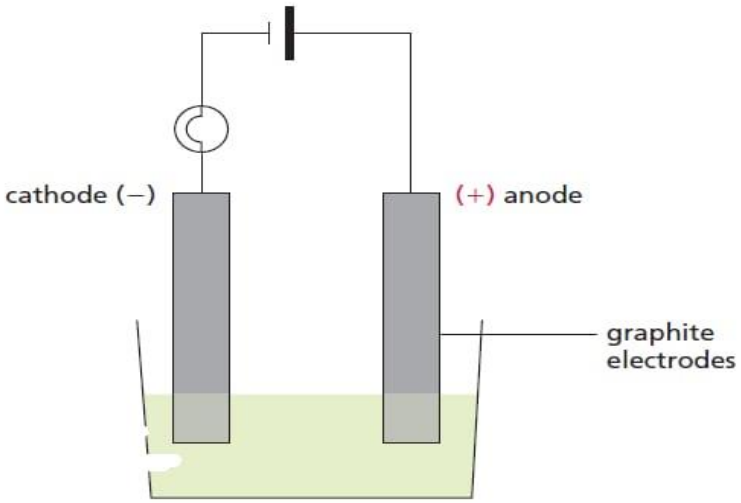
(a) Write an ionic equation for the reaction that occurred at the cathode
(b) State and explain what happened at the anode

2. When an electric current was passed through two molten substances **E** and **F** in separate voltammeters. The observations recorded below were made:-

Substance	Observation	Type of structure
E	Conducts electric current and a gas is formed at one of the electrodes	
F	Conducts an electric current and is not decomposed	

Complete the table above

3. (a) Differentiate the following terms :-
Electrolyte and non-electrolyte
(b) The diagram below is a set-up used to investigate the conductivity of electric current by some aqueous solution. Study it and answer the questions that follow;



(i) State the observation made on the bulb when each of the following solution were put onto the beaker

(a) Sugar solution

(b) (i) Salt solution

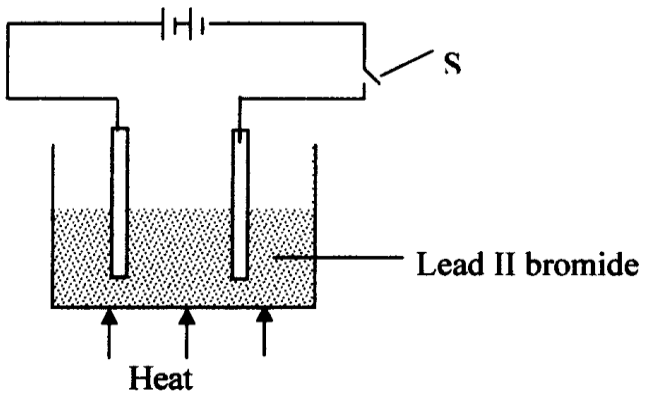
(ii) Classify the substance in (i) above as either electrolyte or non-electrolyte

(b) If in the above set-up of apparatus, the substance to be tested is Lead II Bromide, what modification should be included in the set-up?

(c) Write an Ionic equation at the electrodes and state the observation:-

Anode

4. (a) The diagram below shows the set up used to investigate the effect of an electric current on molten lead (II) bromide

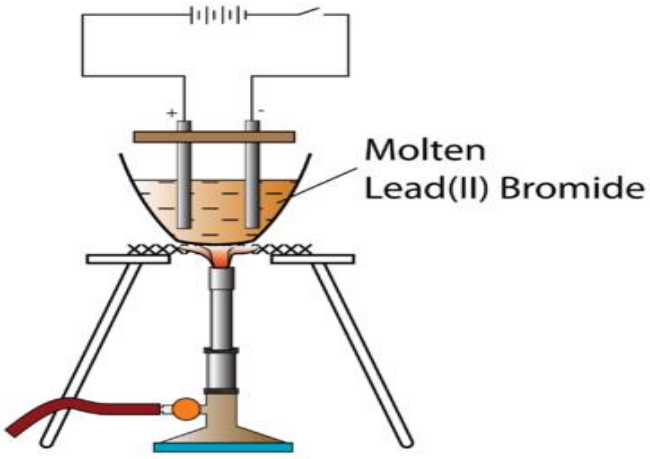


i. Explain what happens to the lead II bromide during electrolysis

ii. Why is it important to carry out the experiment in a fume chamber?

5. (I) Define the following terms:
   (a) Crystallization
   (b) (i) Salting out as used in soap making
   (ii) Starting with barium carbonate solid, dilute sulphuric acid and dilute nitric acid, describe how you would prepare dry barium sulphate solid

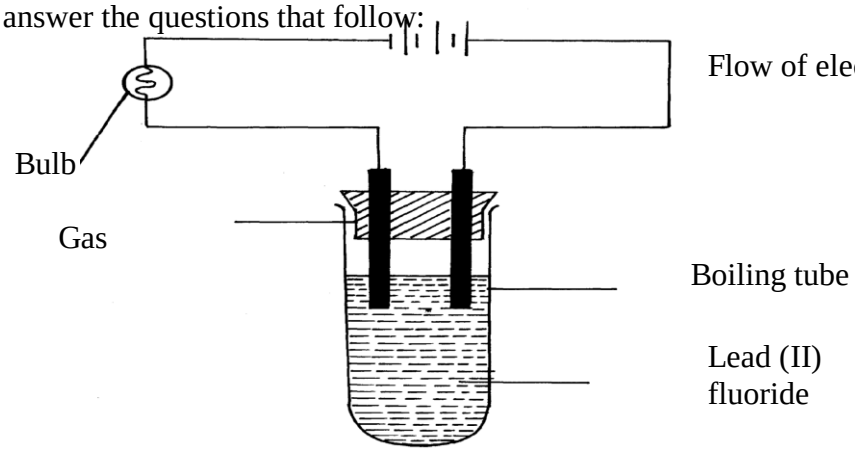
   (iv) Copper II chloride solution dissolves in excess ammonia solution to form a deep blue solution. Give the ion responsible for the deep blue solution
   (v) A solution of hydrogen chloride is an electrolyte but a solution of hydrogen chloride in methylbenzene in a non-electrolyte. Explain
6. (i) State Faraday's first law of electrolysis
   (ii) The diagram below shows a set-up used for the electrolysis of molten Lead bromide:-



   State the observations that would be made at the anode and cathode as the electrolysis progressed
7. (a) (i) Describe how you would prepare pure crystals of lead II nitrate in the laboratory from lead II oxide

   (ii) Write an equation for the reaction that takes place in **(a)(i)** above
   (b) (i) State what happens when lead II nitrate is strongly heated
   (ii) Write an equation for the reaction in **b(i)** above
   (c) (i) State what is observed when ammonia solution is gradually added to a solution of lead II nitrate until the alkali is in excess
   (ii) Write an ionic equation for the reaction that takes place in (i) above

8. The diagram show an experiment for investigating electrical conduction in lead (II) fluoride. Study it and answer the questions that follow:



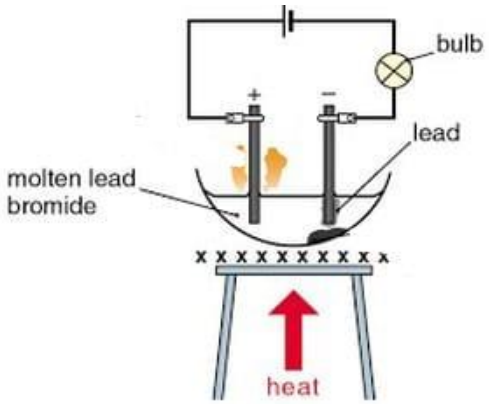
(a) On the diagram
(i) Label the anode and the cathode
(ii) Show the direction of movement of electrons
(iii) Complete the diagram by indicating the condition that is missing but must be present for electrical conduction to take place.
(b) Why is it necessary to leave a gap between the cork and the boiling tube?
(c) State the observations that are expected at the electrodes during electrical conduction and at the experiment
(d) Write equations for the reactions that take place at the electrodes
(e) Why should this experiment be carried out in a fume chamber?

II. The table below shows the electrical conductivity of substance **A, B** and **C**

Substance	**Solid state**	**Molten state**	**Aqueous solution**
A	Conducts	Conducts	Not soluble
B	Doesn't conduct	Conducts	Conducts
C	Doesn't conduct	Doesn't conduct	Not soluble

(a) Which one of the substance is likely to be plastic?
(b) Explain why the substance you have given in **(a)** above behaves in the way it does
(c) Which of the substances is likely to be sodium chloride? Explain
(d) Give the type of structure and bonding that is present in substance **A**

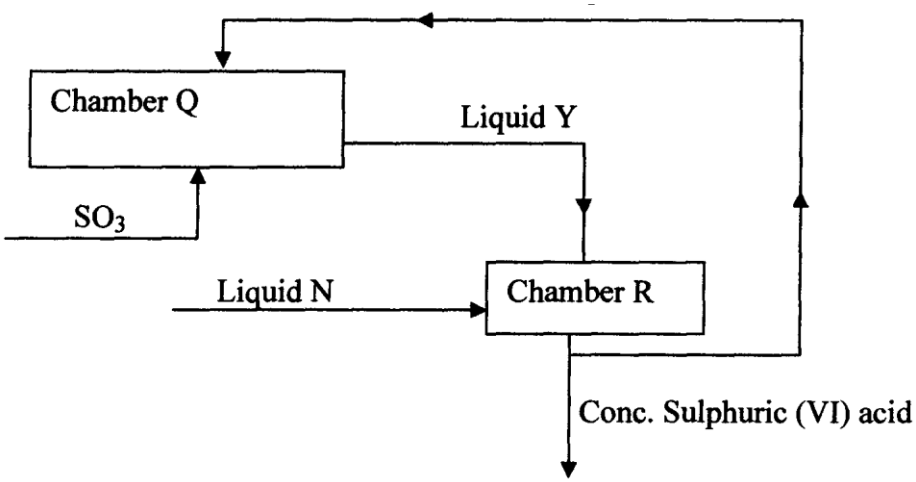
9. Study the diagram below and use it to answer the questions that follow:-



(a) Identify electrodes **A** and **B**
(b) Name the product formed at the anode
(c) Write the electrode half equation of reaction at electrode **A**

10. Explain the differences in electrical conductivity between molten sodium chloride and liquid mercury

11. Below is part of a flow diagram for the contact process:



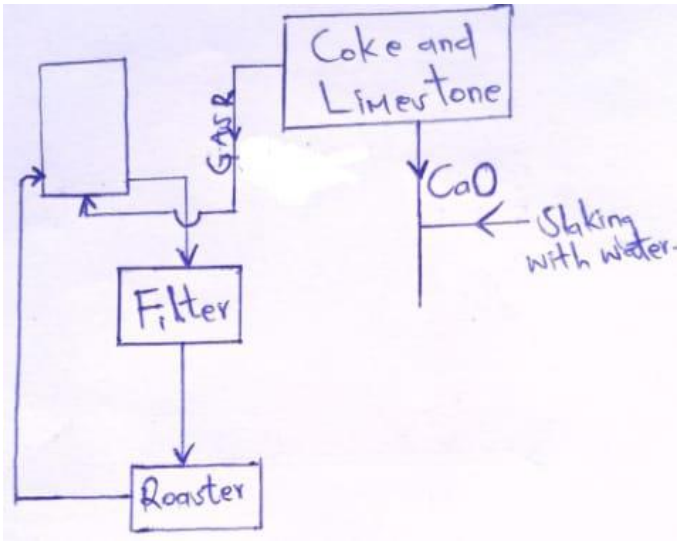
(a) Name :
I. Liquid **Y** …….
II. Liquid **N**…….
(b) Write the equation for the reaction taking place in;
I. Chamber **Q**
II. Chamber **R**

12. In an experiment to investigate the conductivity of substances, a student used the set-up Shown below.
The student noted that the bulb did not light.
a) What had been omitted in the set up.
b) Explain why the bulb lights when the omission is corrected.

CARBON AND ITS COMPOUNDS

1. (a) State **one** use of graphite
   (b) Both graphite and diamond are allotropes of element Carbon. Graphite conducts electricity whereas diamond does not. Explain

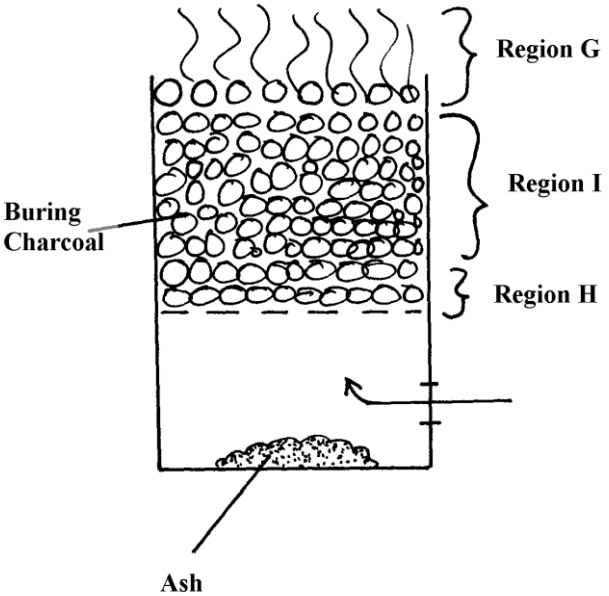
2. Below is a simplified scheme of solvay process. Study it and answer the questions that follow:



   a) Identify gas R.
   b) Write an equation for the process that takes place in the filter

   c) Give **one** use of sodium carbonate.

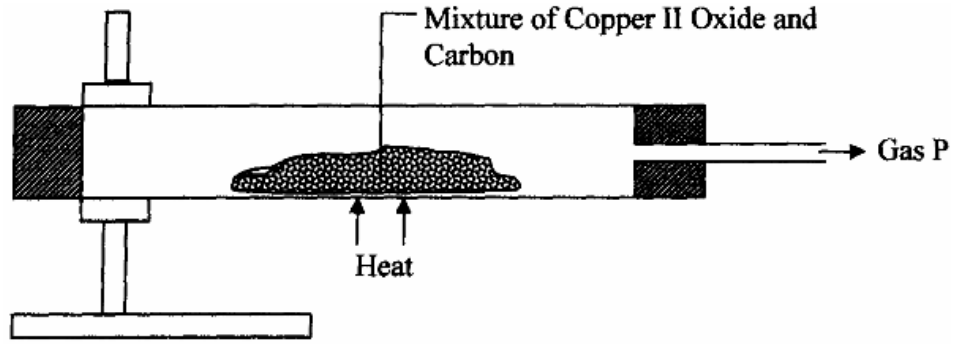
3. A burning magnesium continues to burn inside a gas jar full of carbon (IV) oxide. Explain.
4. The diagram below shows a jiko when in use



(a) Identify the gas formed at region **H**

(b) State and explain the observation made at region **G**

5. Study the diagram below and use it to answer the questions that follow.



(a) State the observation made in the combustion tube.

(b) Write an equation for the reaction that took place in the combustion tube

(c) Give **one** use of **P**

6. (a) Identify **two** substance that are reacted to regenerate ammonia gas in the solvary process

(b) Write down a balanced chemical equation for the reaction above

7. When the oxide of element **H** was heated with powdered Carbon, the mixture glowed and Carbon (IV) oxide was formed. When the experiment was repeated using the oxide of element **J**,there was no apparent reaction

(a) Suggest **one** method that can be used to extract element **J** from its oxide

(b) Arrange the elements **H, J** and Carbon in order of their decreasing reactivity

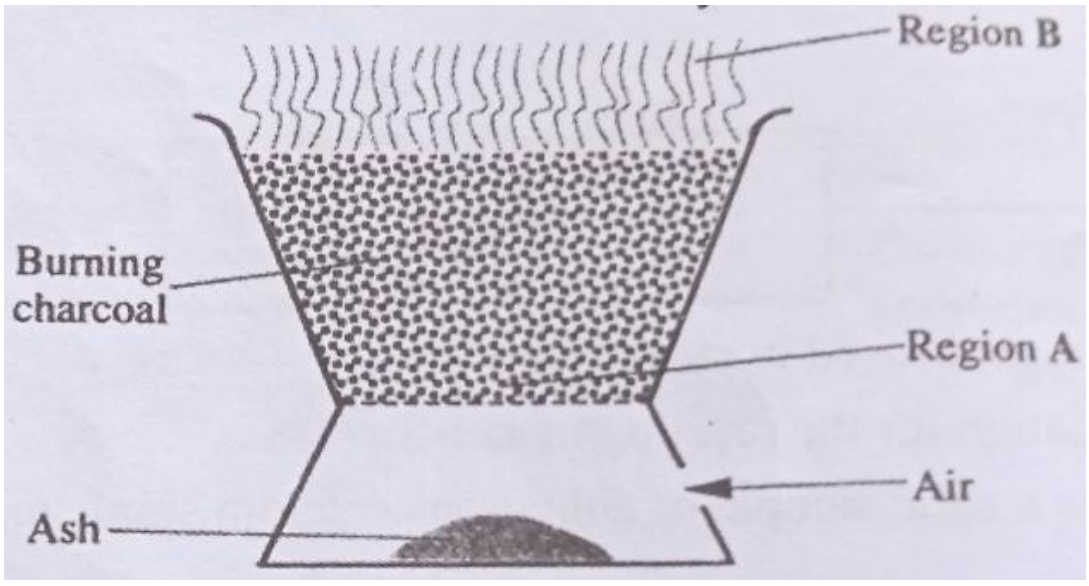
8. (i) Diamond and silicon (IV) Oxide have a certain similarity in terms of structure and bonding.State it

(ii) State **one** use of diamond

9. (a) What is allotropy?

(b) Diamond and graphite are allotropes of Carbon. In terms of structure and bonding explain why graphite conducts electricity but not diamond

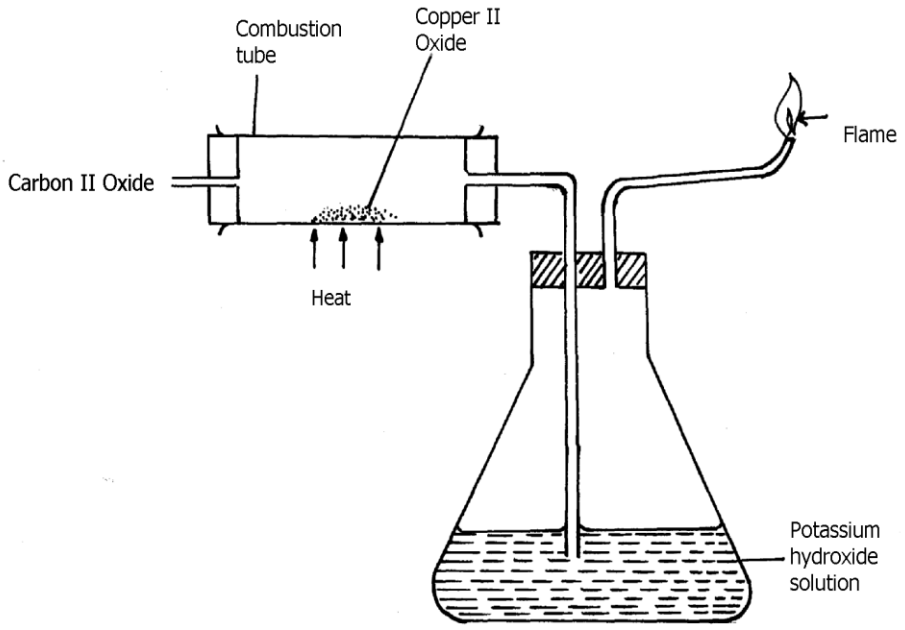
10. The diagram below shows a charcoal stove with different regions



(a) Write an equation for the formation of the product in region **B**

(b) How would one avoid the production of the product at **B**? Give a reason for your answer

11. Study the diagram below and answer the questions that follow:



(a) Explain the observation made in the combustion tube during the experiment

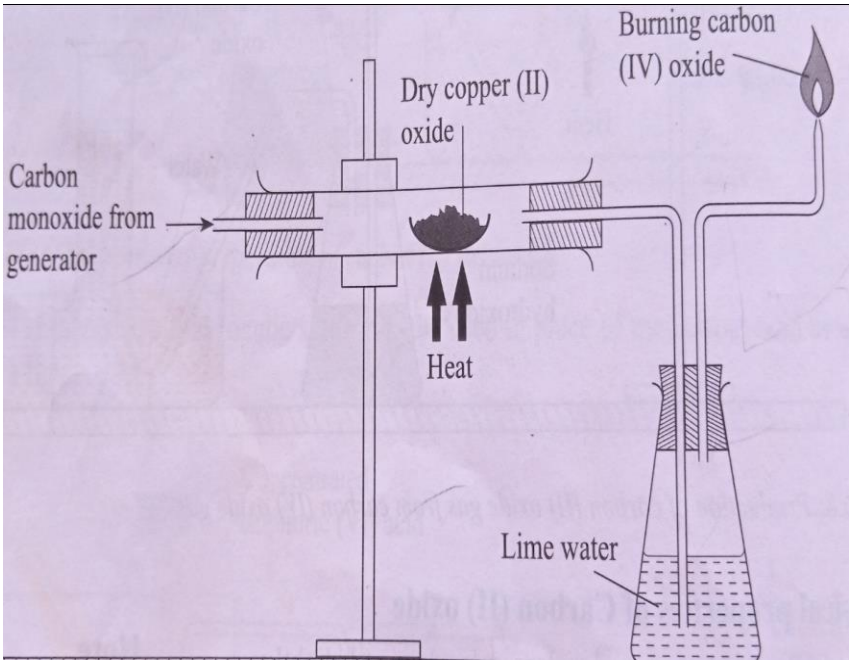
(b) Write an equation for the reaction that takes place in the combustion tube

12. Diamond and graphite are allotropes of carbon:-

(a) What is meant by allotropes?

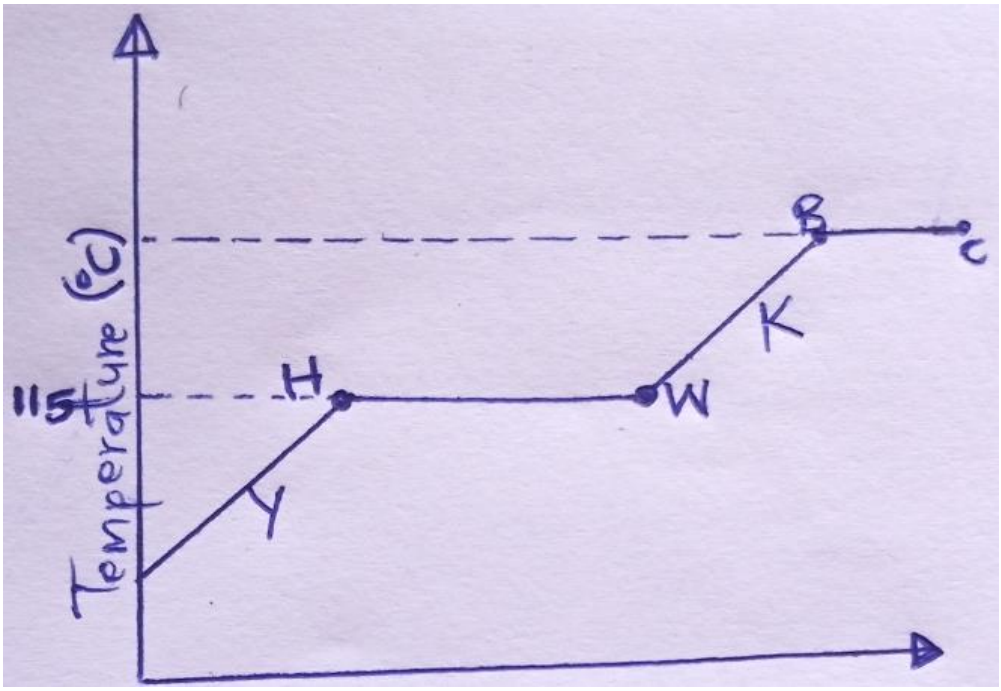
(b) How do they differ in their structure and bonding

13. Study the experimental set-up below:



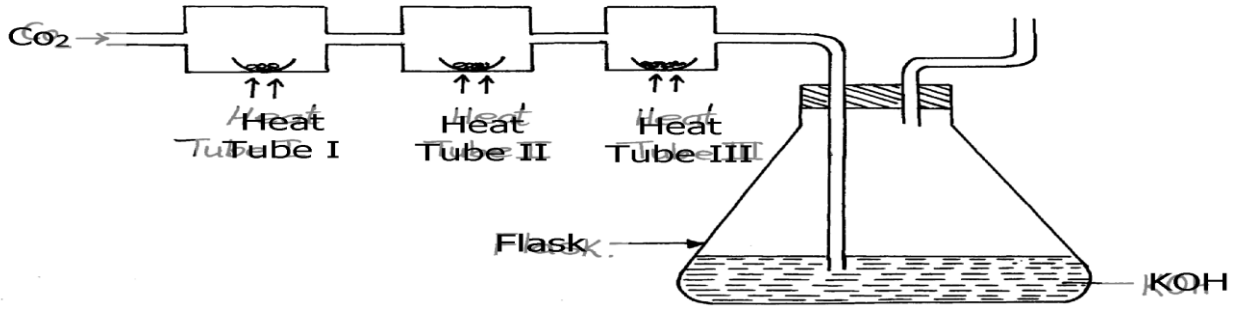
a) State **two** observations made in the set up as the experiment progressed
b) By use of a chemical equation, explain the changes that occurred in the boiling tube
c) Why was it necessary to burn the excess gas?

14. The diagram below shows the heating curve of a pure substance. Study it and answer the questions that follow:



(a) What physical changes are taking place at **H** and **W**?
(b) What are the physical states of the substance at **Y** and **K**?
(c) Using the simple kinetic theory of matter, explain what happens to the substance between points **A** and **C**
(d) The substance under test is definitely not water; Give a reason for this
(e) What would happen to the melting point of this substance if it were contaminated with sodium chloride?
(f) What happens to the temperature between points **B** and **C**?

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



(a) (i) Name Gas **X** ……
(ii) State the effect of releasing gas **X** to the environment
(b) Write down equations for the reactions taking place in;
(i) Tube **I**
(ii) Tube **II**
(iii) Flask
(c) State the observation made in tube **III**

(d) Write down an equation for the reaction which could be used to generate Carbon (IV) Oxide for the above set up
(e) Name the reagents used to generate gas **x** in the laboratory
(f) Complete the diagram above to show how excess gas **x** can be collected

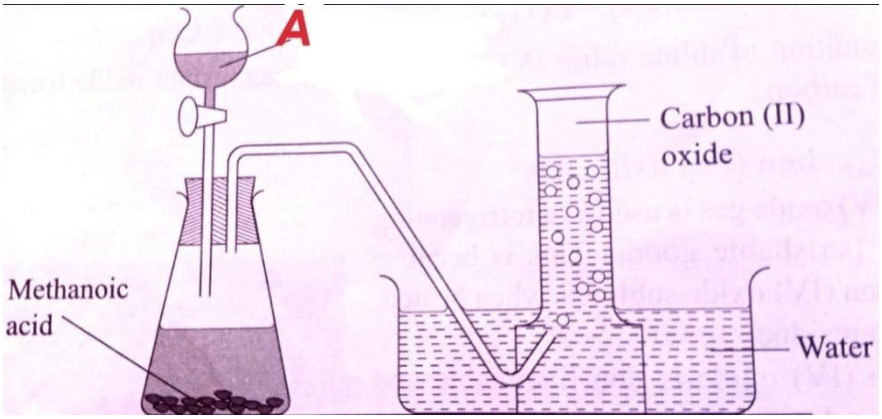
16.a) (i) Name **three** starting materials in the manufacturer of sodium carbonate.
(ii) Which substances are recycled in this process?
b) State **one** commercial use for
(i) Sodium carbonate.

17. [a] (i) State **one** use of carbon (IV) Oxide gas apart from fire extinguisher
(ii) Give **two** properties that make carbon (IV) Oxide to be used as fire extinguisher
(b) $PbO_{(s)} + CO_{(g)} \quad Pb_{(s)} + CO_{2(g)}$
Which property of carbon (II) Oxide is demonstrated by the above equation?
(c) Aluminium carbonate does not exist. Give a reason
(d) Ammonium carbonate decomposes when heated. Write a chemical equation to represent this decomposition

18. State and explain the observation made when a piece of charcoal is dropped in a jar containing concentrated nitric (V) acid

19. When Carbon (IV) oxide is passed through lime water, a white precipitate is formed but when excess Carbon (IV) Oxide is passed, the white precipitate disappears;
(a) Explain why the white precipitate disappears
(b) Give an equation for the reaction that takes place in (a) above

20. The set-up below was used to prepare a carbon (II) oxide gas.



(a) Give the name of substance **A** …….
(b) Complete the diagram to show how the gas can be collected
(c)Write the equation for the reaction

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