

QUESTION – CHEMISTRY

FORM -2

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°C
Y	2.8.7	-35°C
Z	2.8.8.7	59°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

2. 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)

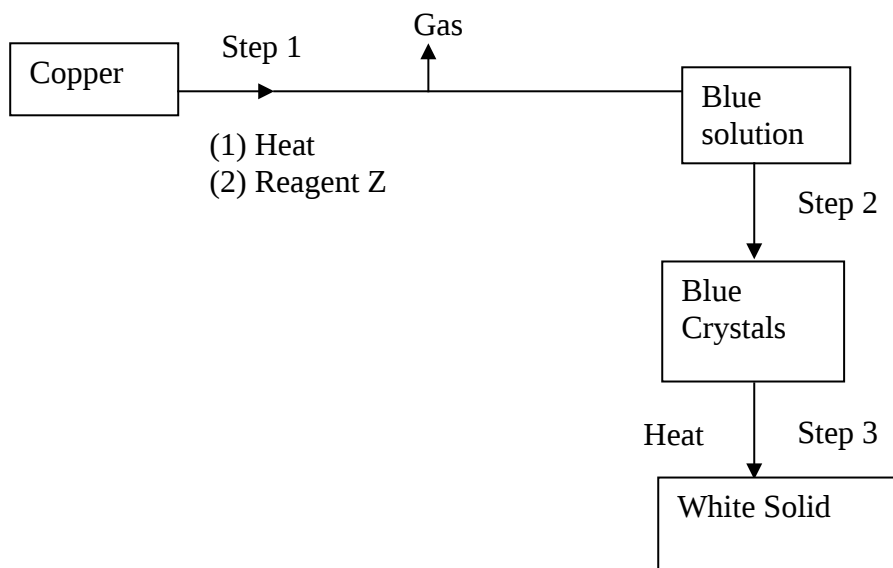
(b) Hydroxonium ion (H_3O^+)

8. Between aluminium and copper which one is a better conductor? Explain

9. Water has a boiling point of 100°C while hydrogen chloride has a boiling point of -115°C . Explain

SALTS

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



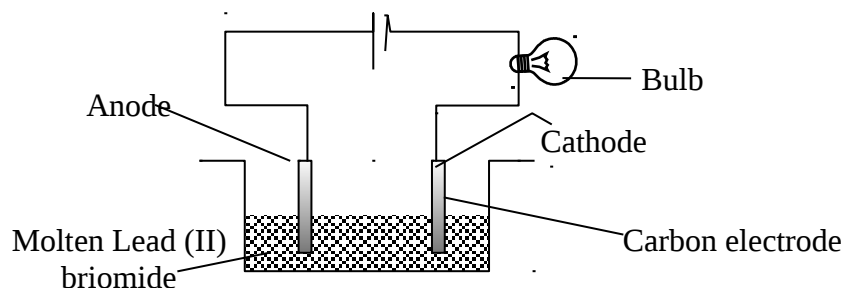
4. Name reagent Z.
5. Describe the process which takes place in step 2.
6. Identify the white solid.
2. a) Starting from solid magnesium oxide, describe how a solid sample of magnesium hydroxide can be prepared.
- b) Give **one** use of magnesium hydroxide.
3. Starting with lead (II) oxide, describe how you would prepare a solid sample of lead (II) Carbonate

- 4 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
5. Starting with sodium oxide, describe how a sample of crystals of sodium hydrogen carbonate may be prepared
- 6 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:-

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;



(c) Write an ionic equation for the reaction that occurred at the cathode

(d) State and explain what happened at the anode

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

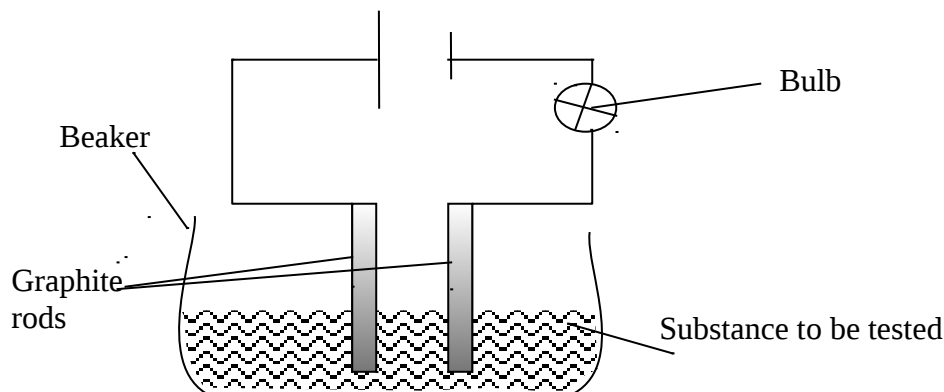
Substance	Observation	Type of structure
E	Conducts electric current and a gas is formed at one of the electrodes	
F	Conducts an electric current and is not decomposed	

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

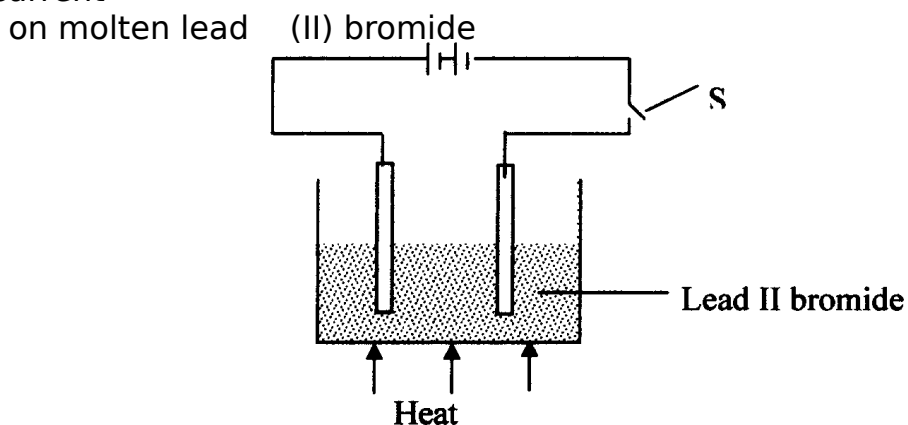
(ii) Classify the substance in (i) above as either electrolyte or non-electrolyte

(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



- Explain what happens to the lead II bromide during electrolysis
- Why is it important to carry out the experiment in a fume chamber?

5. (I) Define the following terms:

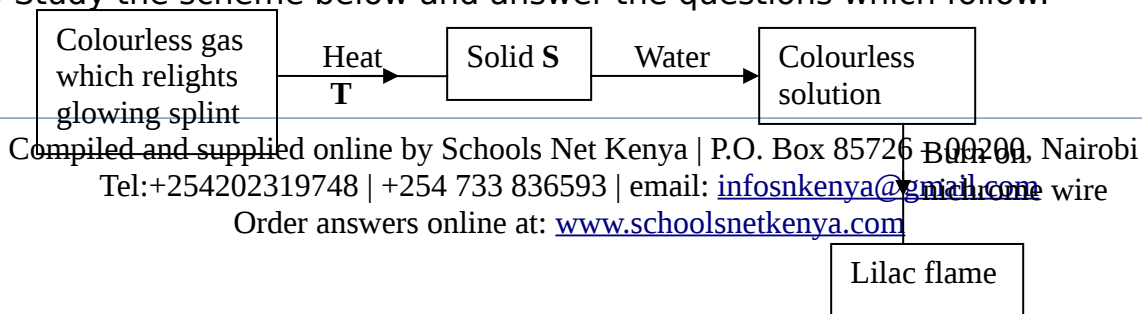
(a) Crystallization

(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

- (iii) Study the scheme below and answer the questions which follow:



(a) Identify ;

(i) The cation present in solid **S**

(ii) The anion in solid **S**

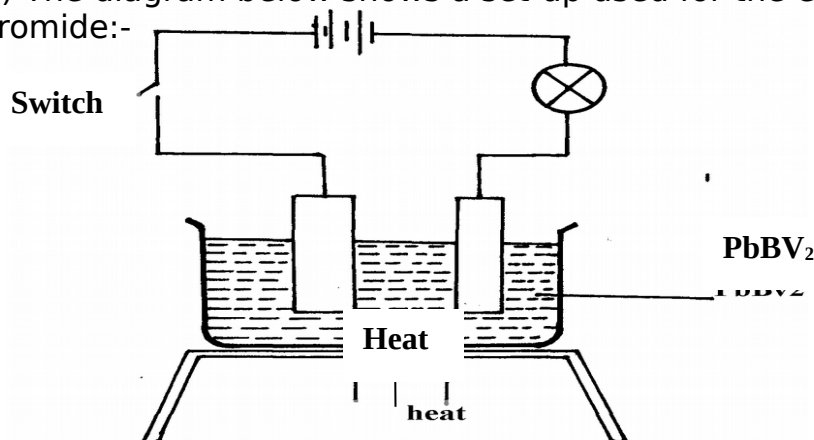
(c) Write an equation to show how solid **S** is heated in process **T**

(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 is 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

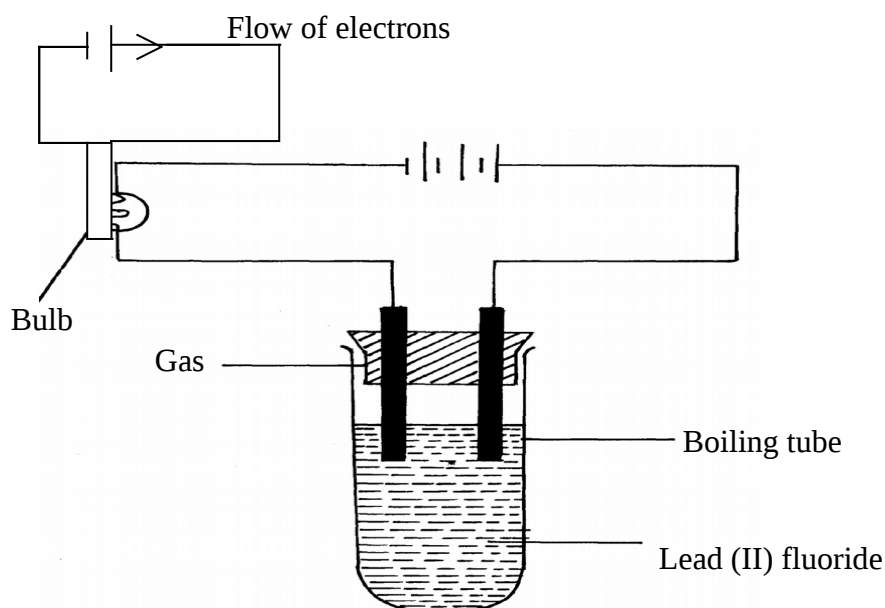
(e) (i) State what happens when lead II nitrate is strongly heated

(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

(f) Write equations for the reactions that take place at the electrodes

(g) 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
----------	-----------------	-----------------	-------------

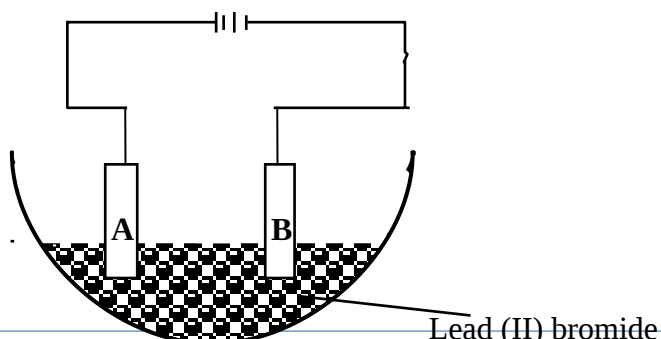
(c) Which one of the substance is likely to be plastic?

(d) Explain why the substance you have given in **(a)** above behaves in the way it does

(e) Which of the substances is likely to be sodium chloride? Explain

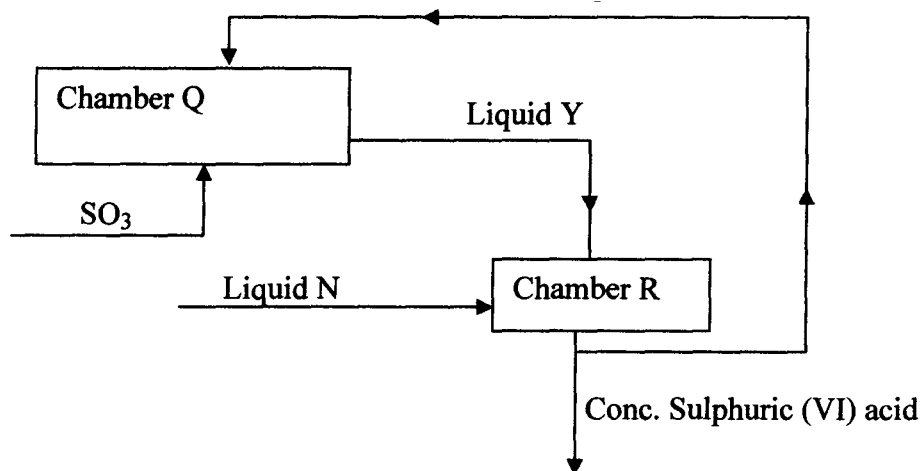
(f) Give the type of structure and bonding that is present in substance **A**

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



7. Identify electrodes **A** and **B**
8. Name the product formed at the anode
9. Write the electrode half equation of reaction at electrode **A**
10. Explain the differences in electrical conductivity between melted 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.

(c) What had been omitted in the set up?

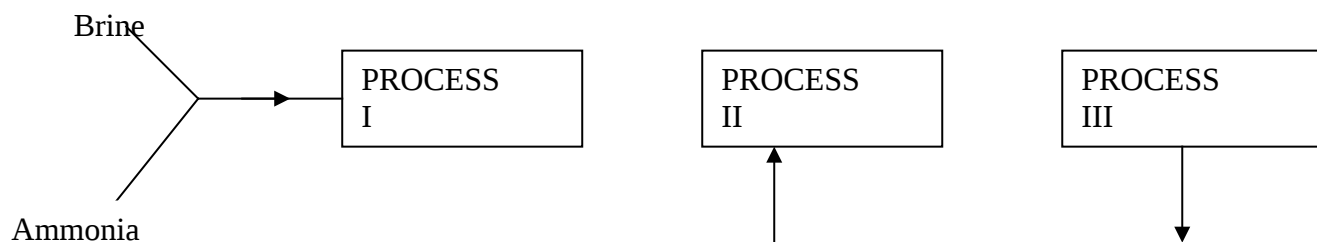
b) Explain why the bulb lights when the omission is corrected.

CARBON AND ITS COMPOUNDS

1.(a) State **one** use of graphite [1m]

(b) Both graphite and diamond are allotropes of element Carbon. Graphite conducts electricity whereas diamond does not. Explain [2m]

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



(g) Identify gas R. [1m]

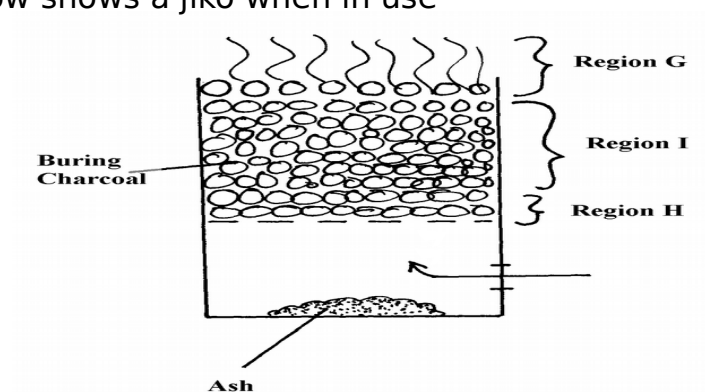
(h) Write an equation for the process III. [1m]

c) Give **one** use of sodium carbonate. [1m]

[Total 3m]

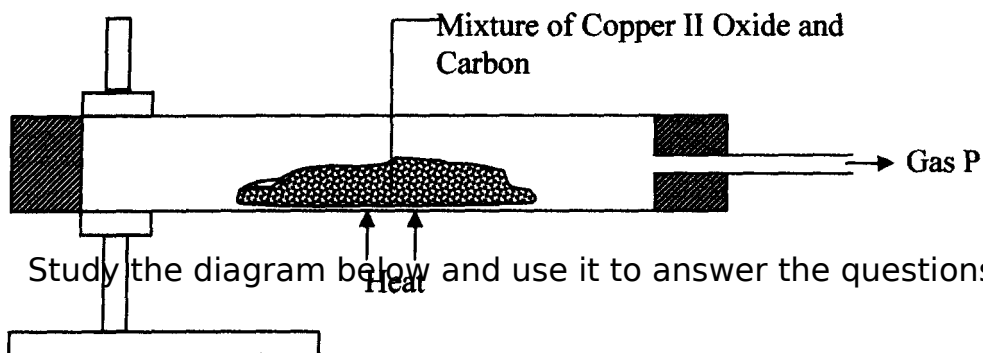
(d) A burning magnesium continues to burn inside a gas jar full of carbon (IV) oxide. Explain.

4. The diagram below shows a jiko when in use



10. 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 Solvay process

11. 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

iii. Suggest **one** method that can be used to extract element **J** from its oxide

iv. Arrange the elements **H, J** and Carbon in order of their decreasing reactivity

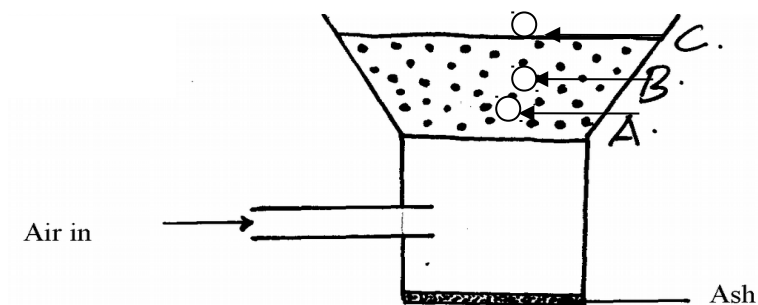
8. (i) Diamond and silicon (IV) Oxide have a certain similarity in terms of structure and bonding.
Describe this similarity.

(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



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

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