

## FORM FOUR CLUSTER KCSE MODEL9

### CHEMISTRY PAPER 2 QUESTIONS

1. The grid below represents part of the periodic table. Study it and answer questions that follow. (Letters do not represent the actual symbols of the element).

|  |   |  |   |   |  |   |   |  |  |
|--|---|--|---|---|--|---|---|--|--|
|  |   |  |   |   |  |   |   |  |  |
|  |   |  |   | B |  |   | C |  |  |
|  |   |  | D |   |  | E |   |  |  |
|  | F |  |   |   |  |   |   |  |  |
|  | G |  |   |   |  |   |   |  |  |

- a) Identify the family name to which elements **F** and **C** belong.

F .....

C .....

- b) (i) Name the type of bond formed when C and G react.

.....

- (ii) Name the other types of chemical bonds other than the one formed in (i) above.

.....

- c) (i) Element D reacts with oxygen to form oxide of D. Write the formula of the oxide.

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- (ii) What type of Oxide is formed in C (i) above.

- d) Element X is in period 3 and forms an ion with the formula  $X^{3-}$ .

- (i) Indicate its position on the grid.

- (ii) Write the formula of its chloride.

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- e) How many periods should be added to the grid to complete the periodic table?

.....

f)

- (i) State two physical properties that copper and graphite share in common in relation to their structure and bonding. ....

.....

- (ii) State two physical properties of simple molecular substances.

.....

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- iii) Give one example of an element with a simple molecular structure and is a solid at room temperature. ....

2. a) Fractional distillation of liquid air usually produces nitrogen and oxygen as the major products.

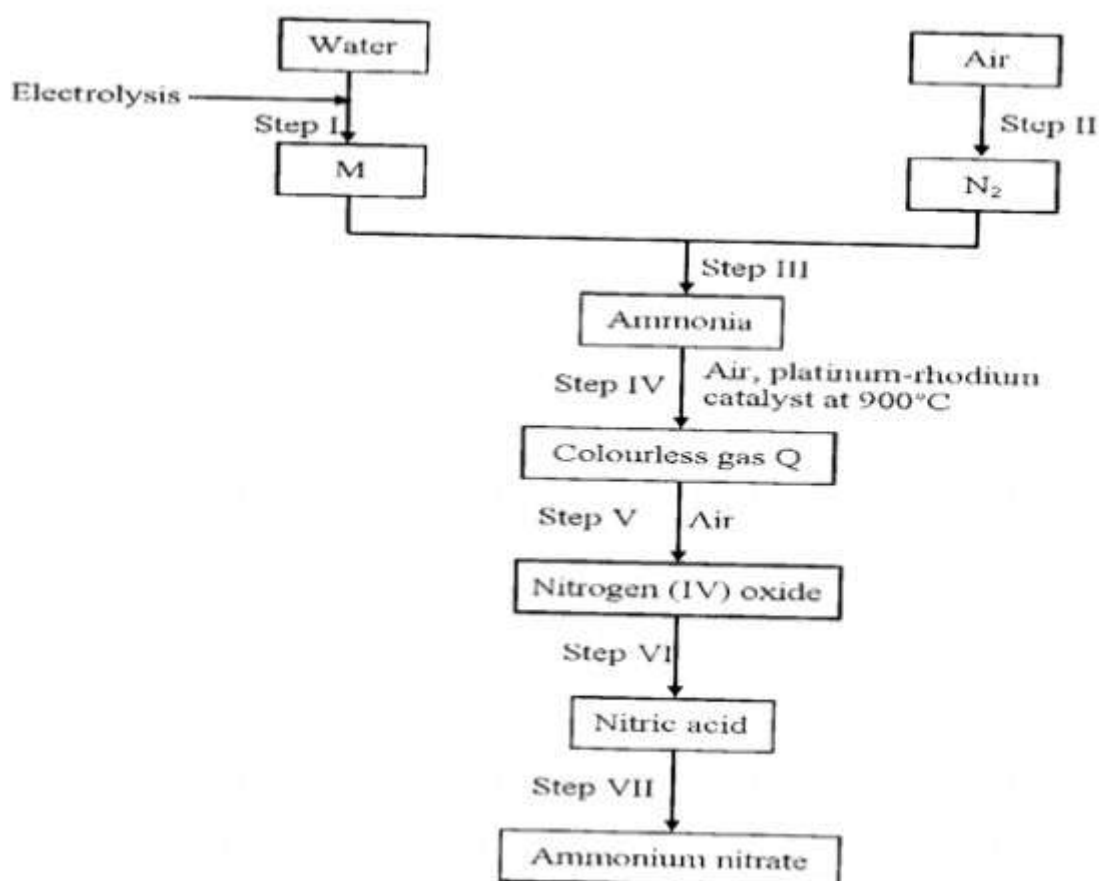
(i) Name one substance that is used to remove carbon (IV) oxide from the air before it is changed into liquid. ....

(ii) Describe how nitrogen gas is obtained from liquid air.

(Boiling points Nitrogen =  $-196^{\circ}\text{C}$ , Oxygen =  $-183^{\circ}\text{C}$ )

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b) Study the flow chart below and answer the questions that follow.



(i) Name element M.

.....

(ii) Why is it necessary to use excess air in Step IV?

.....

(iii) Identify gas Q.

.....

(iv) Write an equation for the reaction in Step VII.

.....

(v) State one use of ammonium nitrate.

.....

c) State and explain the observations that would be made if a sample of sulphur is heated with concentrated nitric acid. ....

.....

3. A hydrocarbon has a molecular mass 54 and has four Carbon atoms.(C=12,H=1)

a)

(i) Name the homologous series to which hydrocarbon belongs

.....

(ii) Draw and name two isomers of the hydrocarbon.

b) The following table is showing physical properties of five alkanes.

| Name     | Formula                        | M.P (K) | B.P |
|----------|--------------------------------|---------|-----|
| Methane  | CH <sub>4</sub>                | 90      | 112 |
| Ethane.  | C <sub>2</sub> H <sub>6</sub>  | 91      | 184 |
| Propane  | C <sub>3</sub> H <sub>8</sub>  | 85      | 231 |
| Butane   | C <sub>4</sub> H <sub>10</sub> | 138     | 273 |
| Pentane. | C <sub>5</sub> H <sub>12</sub> | 143     | 309 |

i) Draw and name the structure of all the isomers of Pentane

ii) From the table state two reasons why the melting and boiling points increase down the series.

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c) Biogas is fuel that is improved by removing an impurity by passing it through an alkaline solution.

i) Name two main components of Biogas.

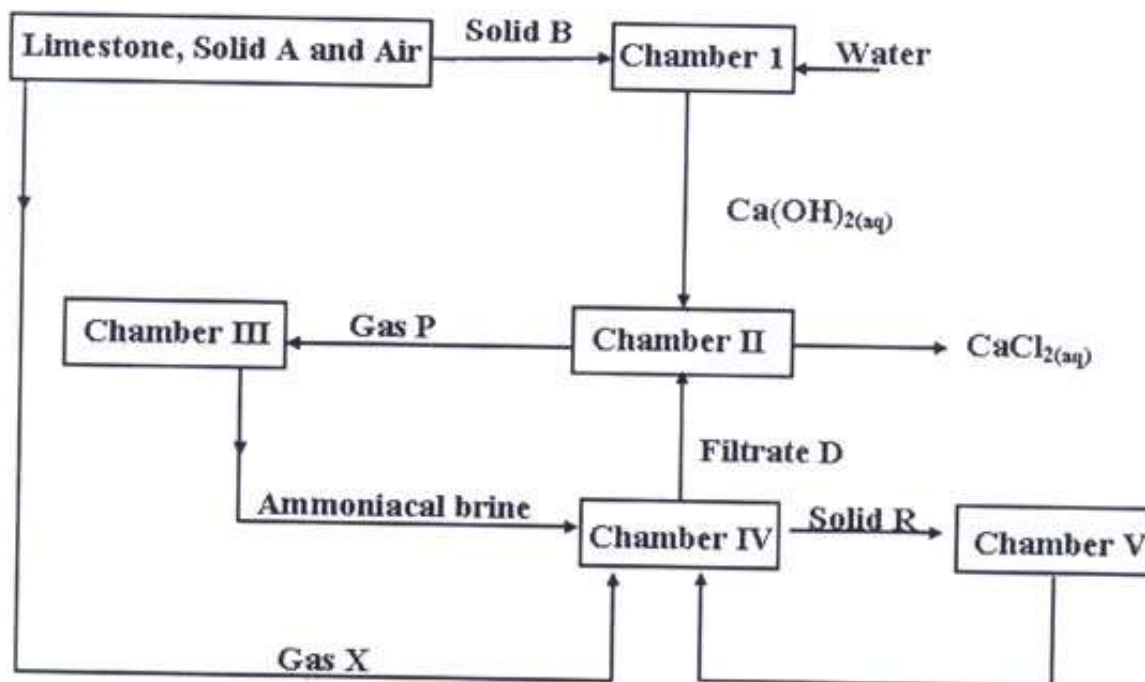
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ii) State a reason why Biogas is fuel.

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4. The flow chart below shows how sodium carbonate is manufactured by the Solvay process. Study it and answer the questions that follow.



a) Name the following substances.

- Gas P.....
- Gas X.....
- Solid A .....
- Solid B .....
- Filtrate D .....
- Solid R .....

b) Write chemical equations for the reactions that occur in;

i) Chamber I

ii) Chamber II

c) State one use of calcium chloride product.

.....

d) Name the gases that are recycled in the above process.

.....  
 .....

e) Give two uses of sodium carbonate.

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 .....

f) When carbon is burnt in air, two gases are formed; carbon (IV) oxide and carbon (II) oxide. Give conditions which favour the formation of each gas.

i) Carbon (IV) oxide.

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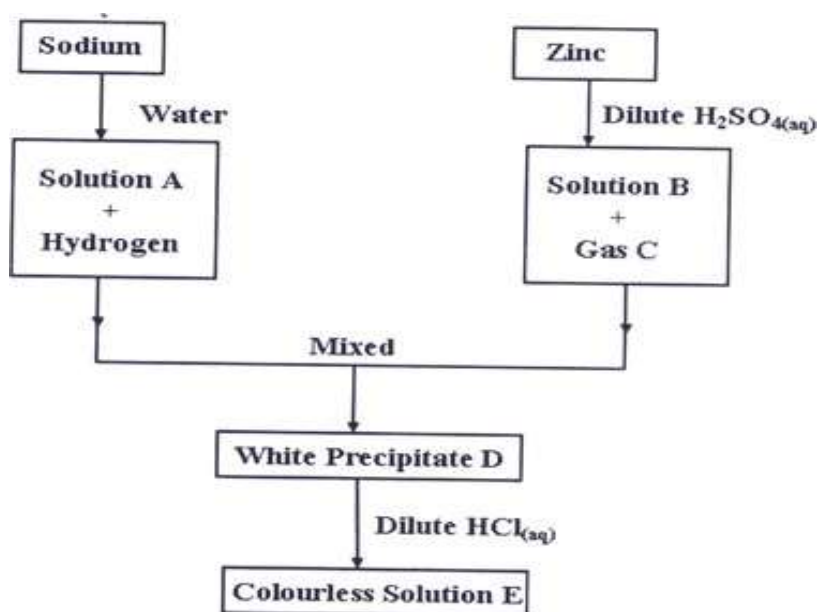
ii) Carbon (II) oxide.

.....

iii) State a chemical test that distinguishes carbon (IV) oxide from carbon (II) oxide in the laboratory. ....

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5. The scheme below shows the preparation of a certain salt. Study and answer the questions that follow.



a) Give the name and the formula of the following;

i) Solution A

.....

.....

ii) Precipitate D.

.....

b) Give the equation for the ;

i) Formation of B and C

ii) Formation of colourless solution E.

c) How can gas C be tested?

.....

d) Give the observation made when sodium reacts with water.

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e) Explain how you can obtain from solution E. i) A hydrated salt

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.....

ii) Anhydrous salt

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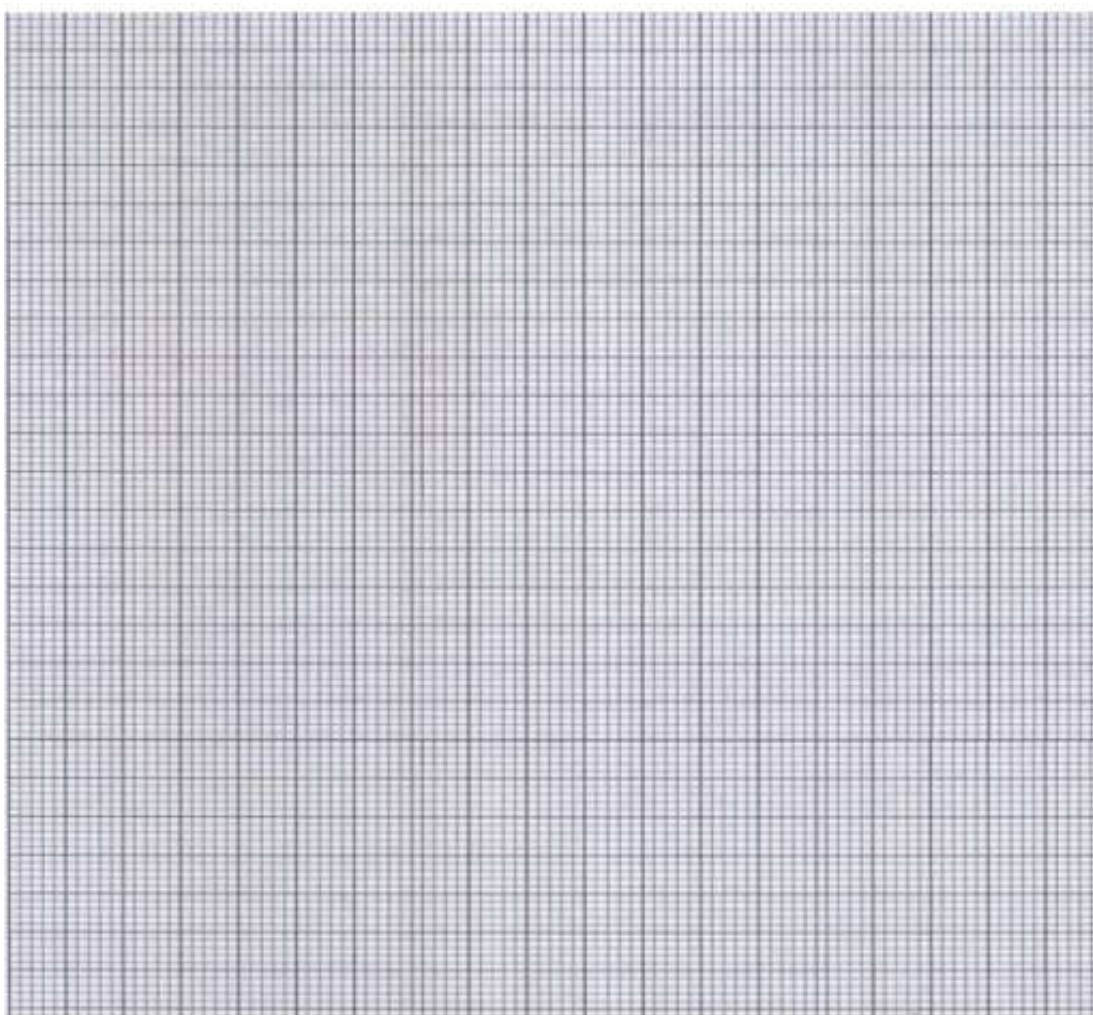
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f) With an equation, give another method of preparing the same salt.

6. The results below were obtained when 2.5 g of MCO<sub>3</sub> were reacted with excess 2M nitric (V) acid at standard temperature and pressure.

| Time(sec)                        | 0 | 2   | 4   | 6   | 8   | 10  | 12  | 14  | 16  | 18  |
|----------------------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Volume of gas (cm <sup>3</sup> ) | 0 | 165 | 270 | 350 | 410 | 445 | 465 | 480 | 480 | 480 |

a) i) on the grid provided draw the graph of volume of gas against time (x-axis)



ii) From the graph, find the time the reaction stops.

iii) Why does the reaction stop?

.....  
.....

iv) What is the maximum volume of the gas evolved?

b) i) Write down the equation for the reaction.

ii) Write the molar mass of  $\text{MCO}_3$ .

iii) Hence, find the relative atomic mass of M.

7. a) 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

.....

.....  
Equation.

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

.....  
Equation

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

Observation

.....  
Equation

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

Observation.

.....  
Equation.

b) Define the term ionization energy.

.....  
c) Study the following ionization energy values and answer the questions that follow.

| Ionization                                    | Ionization Energy<br>(KJ/mole) |
|-----------------------------------------------|--------------------------------|
| $Na_{(g)} \rightarrow Na^+_{(g)} + e$         | 500                            |
| $Na^+_{(g)} \rightarrow Na^{2+}_{(g)} + e$    | 4600                           |
| $Na^{2+}_{(g)} \rightarrow Na^{3+}_{(g)} + e$ | 6900                           |
| $Mg_{(g)} \rightarrow Mg^+_{(g)} + e$         | 740                            |
| $Mg^+_{(g)} \rightarrow Mg^{2+}_{(g)} + e$    | 4500                           |
| $Mg^{2+}_{(g)} \rightarrow Mg^{3+}_{(g)} + e$ | 7700                           |
| $Mg^{3+}_{(g)} \rightarrow Mg^{4+}_{(g)} + e$ | 10500                          |

i) What do the values of energies of ionization suggest about the

I. First electron removed from a sodium atom.

II. First two electrons removed from a magnesium atom.

ii) Calculate the energy change in the process  $Mg_{(g)} \rightarrow Mg^{3+}_{(g)} + 3e$