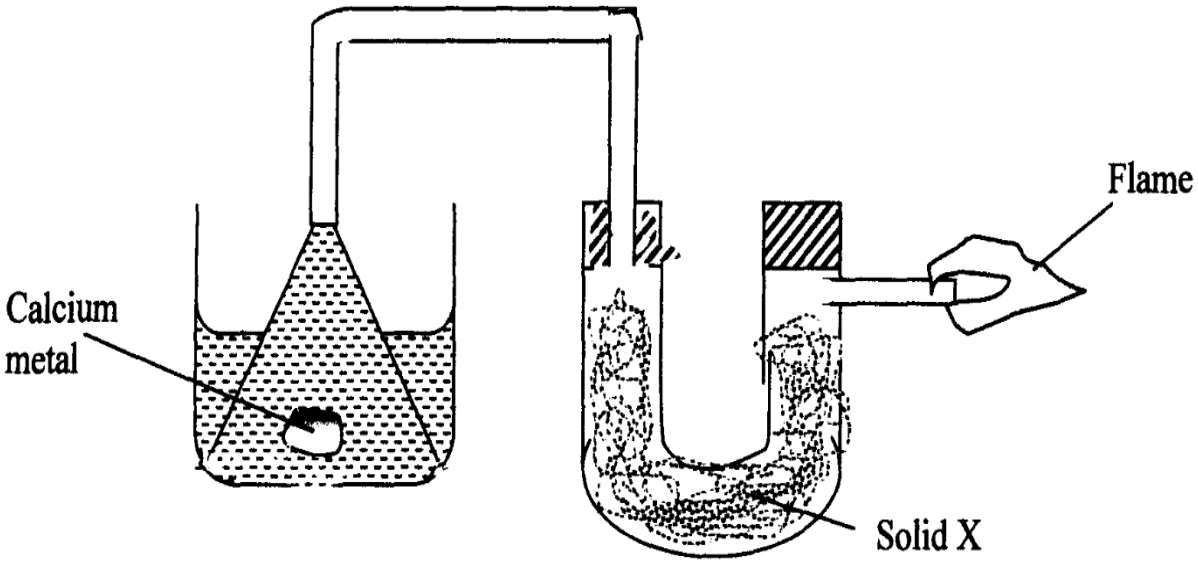
PAVEMENT FORM 4 TRIAL 1 EXAMINATION 2021/2022

Kenya Certificate of Secondary Education (K.C.S.E)

CHEMISTRY PAPER TWO MARKING SCHEME

1. i) The setup below was used to investigate the reaction between metals and water.



water

a) Identify solid **X** and state its purpose.

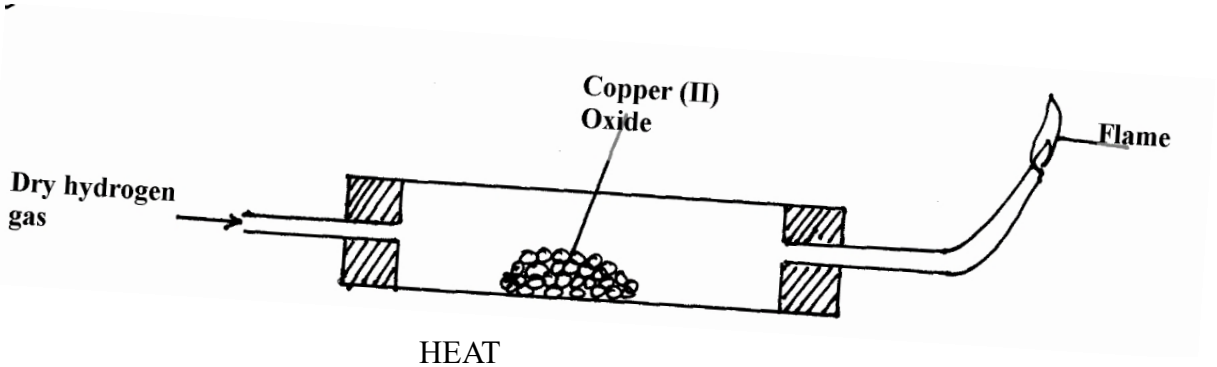
Solid X a***nhydrous calcium chloride*** ……. **(½ mark)**

Purpose …drying agent…… **(½ mark)**

b) Write a chemical equation for the reaction that produces the flame. **(1 mark)**

$H + O_2$……H_2O

ii) The set-up below was used to investigate the properties of hydrogen.



HEAT

a) On the diagram, indicate what should be done for the reaction to occur. **(1 mark)**

b) Hydrogen gas is allowed to pass through the tube for some time before it is lit. Explain.
(1 mark)

To drive out air that occupied the tube

……

c) Write an equation for the reaction that occurs in the combustion tube. **(1 mark)**

$CuO_{(g)} + H_{2(g)}$ $H_2O + CU_{(g)}$

……

……

d) When the reaction is complete, hydrogen gas is passed through the apparatus until it cools down. Explain. **(2 marks)**

to avoid de-oxidizing the copper

……

e) What property of hydrogen is being investigated? **(1 mark)**

Reducing agent

……

f) What observation confirms the property stated in **(v)** above? **(1 mark)**

Copper is reduced from copper oxide

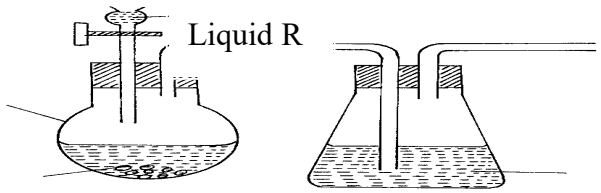
……

vii) Why is zinc oxide not used to investigate this property of hydrogen gas?(1 mark)

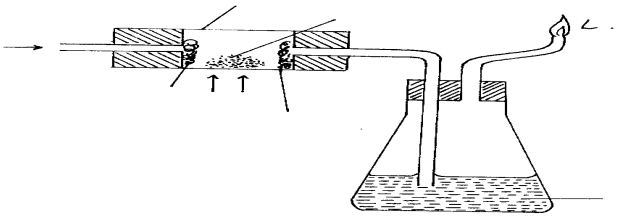
Zinc is more reactive than hydrogen

……

2. I. The diagram below represents an incomplete set-up of apparatus that can be used to prepare collect dry carbon (iv) oxide gas. Complete the diagram and answer the questions that follow.



Flask S



Water

Marble chips

a) Complete the above diagram. **(3 marks)**

b) Identify liquid R. ***Dilute sulphuric/ hydrochloric acid*** … **(1mark)**

c) Write the equation for the reaction taking place in the flask S. **(1 mark)**

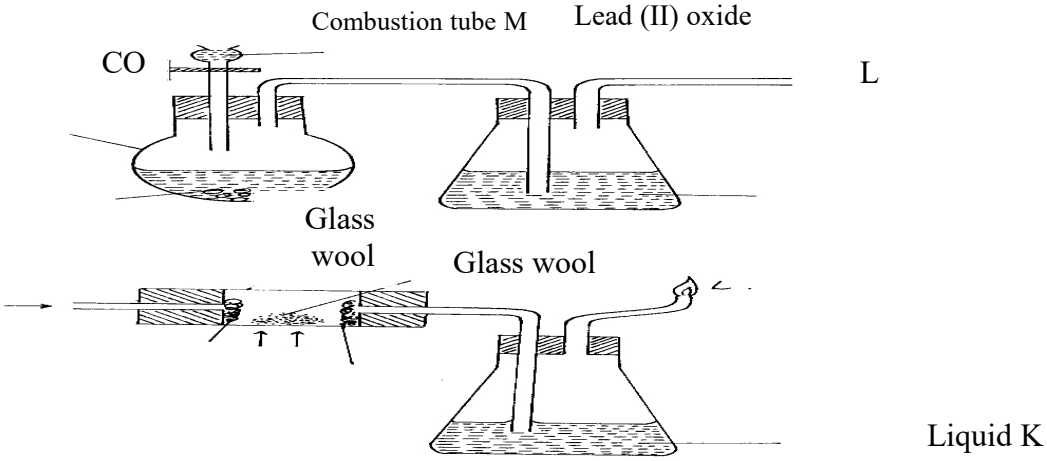
…… $Hcl + Caco_3$ $Cacl_2 + H_2O + CO_2$

……

d) Explain why it is not advisable to use lead (II) carbonate in place of marble chips. **(1 mark)**

…… $H_2SO + PbCO_{(4)}$ ***will for*** $Pbso_{(4)}$ ***which is insoluble***

II. The diagram below is used to investigate the effect of carbon (II) oxide on lead (II) oxide. Study it and answer the questions that follow.



Liquid K

a) Write an equation for the laboratory preparation of carbon (II) oxide. **(1 mark)**

…… ***PbO + CO*** ***Pb + CO_2***

……

b) State and explain the observation in the combustion tube M. **(2 marks)**

Red/Yellowish poweder changed to grey solid

……..

c) Identify liquid K and state its function. **(1 mark)**

lime water, test for CO2

……..

d) Why is it necessary burn excess gas at L. **(1 mark)**

CO is poisonus, causes suffocation

……..

3. Name the following organic compounds.

i) $CH_3COOCH_2CH_3$ **(1mark)**

……ETHYL ETHANOATE……

ii) $CH_3CH_2CHCCHCH_2CH_3$ **(1mark)**

2 pentene

4. a) The fermentation of glucose is catalysed by enzymes from yeast. Yeast is added to aqueous glucose, the solution starts to bubble and becomes cloudy as more yeast cells are formed.

$C_6H_{12}O_{6(aq)}$ ***$2C_2H_5OH_{(aq)}+2CO_{2(g)}$***

The reaction is exothermic. Eventually the fermentation stops when the concentration of ethanol is about 12%.

On a large scale, the reaction mixture is cooled. Suggest a reason why this is necessary. **(1mark)**

$C_6H_{12}O_{6(aq)}$ ***$2C_2H_5OH_{(aq)}+2CO_{2(g}$ …… It causes heating high temperature***

……

(ii) Why does the fermentation stop? Suggest one reasons. **(1mark)**

Kill the yeast, high temperatures destroy the yeast

……

……

(iii) What technique is used to concentrate the aqueous ethanol? **(1mark)**

……*distilation*……

b) A compound X contains carbon, hydrogen and oxygen only. X contains **54.54**% of carbon by mass, **9.09**% of hydrogen by mass and **36.37**% of oxygen by mass. (C=12, O=16, H=1)

Determine the empirical formula of compound X. **(2marks)**

	C	H	O
MASS	54.54	9.09	36.37
RAM	12	1	16
NO OF MOLES	4.545	9.09	2.27
	2	4	1

$(C_2H_4O)n$

Compound X has a relative molecular mass of 88. Draw the structural formula of compound X.

(2marks)

c) The table below gives formulae of three organic compounds A, B and C

Compound	Formulae
A	**$C_2H_4O_2$**
B	**C_2H_6O**
C	**C_2H_6**

Giving a reason in each case, select the letter(s) which represent a compound that

Decolourises acidified potassium manganate (VII). **(1mark)**

B…….

.Gives effervescence with sodium hydrogen carbonate. **(1mark)**

A

Undergoes substitution reaction with chlorine gas. **(1mark)**

C

d) The following is a small reaction of polystyrene polymer. Study it and answer the questions that follow.

H H H H

C C C C

H C_6H_5 H C_6H_5

(i) Draw the structure of the monomer unit of polystyrene. **(1mark)**

H H

C C

H C_6H_5

(ii) Calculate the number of monomers used to form the polystyrene of relative molecular mass of 18096. (H = 1, C = 12) **(1mark)**

(12X8) +8

104

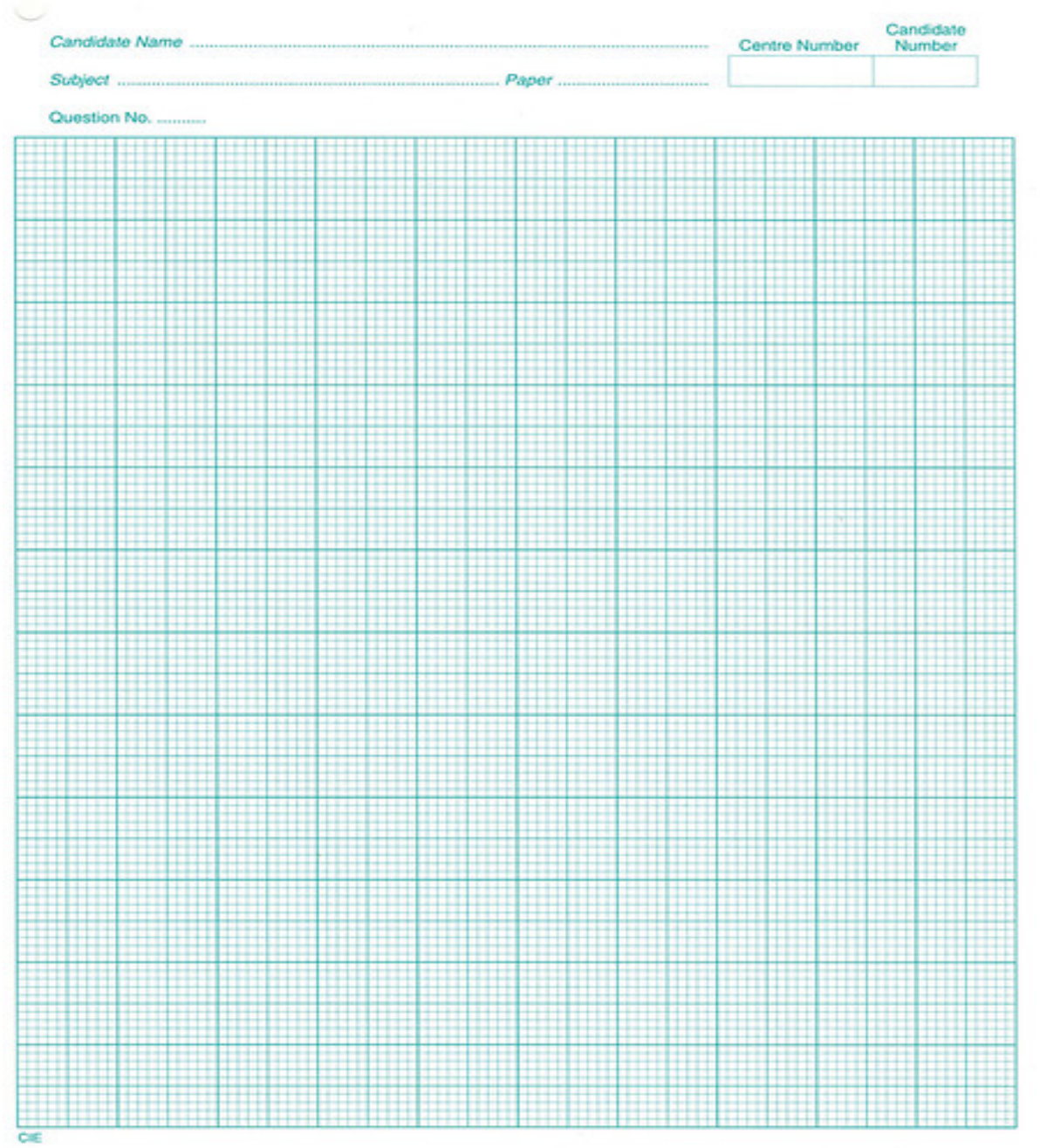
18096/104 =174 MONOMERS

5. An experiment was carried out using magnesium ribbon and dilute hydrochloric acid of different concentrations. The time needed to produce $50cm^3$ of the gas for every experiment was recorded in a table.

Concentration of HCl (moles per litre)	2.0	1.75	1.50	1.25	1.00	0.75	0.50	0.25
Time (seconds)	8.8	10.0	11.7	14.0	17.5	18.7	35.0	70.0
$\frac{1}{time}$ (Sec^{-1})								

Complete the table above for $^1/_{time}$. **(4marks)**

Plot a graph of rate i.e $^1/_{time}$ against concentration. **(3marks)**



6. When lead (II) Carbonate is reacted with dilute sulphuric (VI) acid, the reaction takes place for a short time and then stops. Explain. **(2marks)**

There is the formation of a insoluble coat of lead ii sulphate that lead to the reaction to stop

7. Study the following information and answer the questions below.

Number of carbon atoms per molecule	Relative molecular mass of hydrocarbon
2	26
3	40
4	54

a) Determine the general formula of the hydrocarbons and the homologous series they belong to.

(2marks)

C_nH_{2n-2}

(b) Draw the structure formula of the fourth number of the series. **(1mark)**

H H. H. H
HC=C-C-C-C-H
H H. H. H

(b) Draw the structure formula of the fourth number of the series. **(1mark)**

8. A hydrocarbon undergoes the process represented by the equation below to produce two other hydrocarbons. C10H22 X + C6H14 (a) Name the process undergone by the hydrocarbon. (1mk) CRACKING

(b) State one condition necessary for the process. **(1mark)**

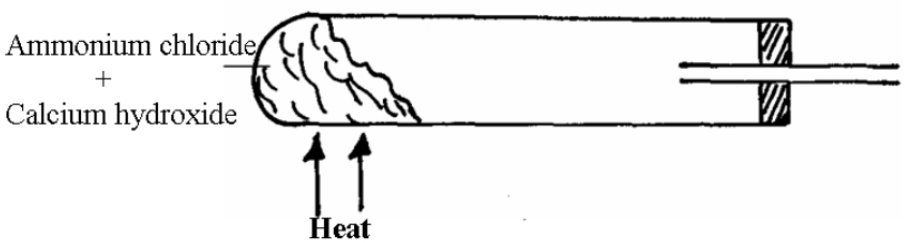
HIGH TEMPERATURES

(c) To which homologous series does substance X belong? **(1mark)**

ALKYNES

9. Complete the diagram to show how a sample of dry ammonia gas can be prepared in the laboratory.

(3marks)



Na2CO3 + **NH4OH** → H2O + NaOH + CO2 + NH3

10. In an experiment to study the properties of concentrated nitric acid, a mixture of the acid and wood

charcoal was heated in a boiling tube.

(a) What observations were made? Explain your answer (2mks)

TURNED TO BLACK, Concentrated Sulfuric acid a is **strong dehydrating agent**. When it falls on wood, which is basically cellulose which is a sugar, it removes water from wood. Not only that, it takes away hydrogen and oxygen in the cellulose and converts then into water. This leaves back the third element in the wood, which is carbo

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

$C + 2\ H_2SO_4 \rightarrow CO_2 + 2\ SO_2 + 2\ H_2O$

11. Three nitrates Q,R, and S were each heated and the products formed were tabulated as shown below.

    Nitrate Products Q R S Metal Nitrite + Oxygen Metal , Nitrogen IV Oxide + Oxygen, Nitrogen I Oxide + water

    a) Identify S …Sodium…… **(1mark)**

    R…Magnesium …… **(1mark)**

    b) What is the name given to elements in the same group as Q? **(1mark)**

Alkali earth metals

12. a) An oxide of nitrogen contains 30.4% nitrogen. Its density at s.t.p is 4.11g/dm3. Determine the molecular formula of the compound. (N=14; O=16; moles gas volume = 22.4dm3) **(3marks)**
    Density ==mass/volume

    b) Magnesium ribbon was burnt in a gas jar of nitrogen. A few drops of water were added to the solid formed in the jar. Write an equation for the second reaction. **(1mark)**

MgN+ H2O
MgO + H2O. Mg(OH)2

13. In an experiment, 10.6g of a mixture of Anhydrous Sodium Carbonate and Sodium Chloride were dissolved in water to make 100cm3 of a solution required 20.0cm3 of 0.5M Hydrochloric acid solution for complete neutralization. What is the mass of Sodium Carbonate in the mixture? (Na = 23.0, C = 12.0, O = 16.0, Cl = 35.5) **(3marks)**

    ##**

14. The table below gives some properties of compounds P, Q, R and S

Compound	M.p (0C)	b.p (0C)	Conductivity in water
P	-23	77	Does not conduct
Q	-19	74	Does not conduct
R	-85	-61	Conducts
S	714	1407	Conducts

(a) Which one of the compounds in the table is ionic? Explain. (1mk) S High temperature of MP and BP……..

……

(b) Which one of the compound (s) in the table is/are liquid(s) at room temperature? Give reasons. (2mks) P & Q..(COMPOUND) 2 elements

……

(c) Which of the compound(s) is / are gas(s) at room temperature? Explain. **(1mark)**

R

15. Given that element A,B and C have atomic numbers 14, 11 and 17 respectively, draw and name the bonding in the compounds formed using dots (.) and (X), when the following element react.

Name the type of bond formed between B and C
ionic

(a) B and C **(2marks)**

(b) A and C **(2marks)**
covalent