NAME…….....ADM NO…..……

SIGNATURE……CLASS.....DATE……

233/2 CHEMISTRY PAPER 2

(THEORY)

JULY 2024

2 HOURS

CHEMISTRY -233/2

FORM IV END TERM 2 EXAM 2024

(Theory)

(Kenya Certificate of Secondary Education)

Instructions to candidates

(a) Write your name and admission number in the spaces provided above.
(b) Answer **all** the questions in the spaces provided in the question paper.
(c) Non-programmable silent electronic calculators and KNEC mathematical tables may be used.
(d) All working **must** be clearly shown where necessary.
(e) Candidates should answer the questions in English.
(f) This paper consists of **12 printed** pages.
(g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	11	
2	13	
3	13	
4	12	
5	11	
6	08	
7	12	
Total score	80	

1. State two factors that should be considered when choosing fuel for cooking. (2 marks)

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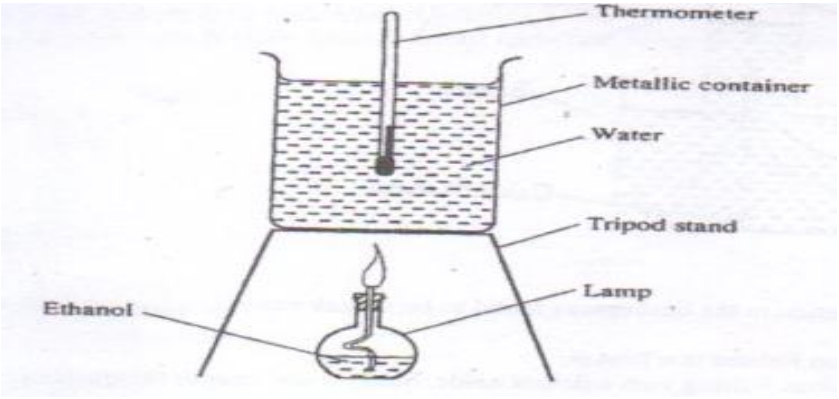
(b) The diagram below represents a set –up that was used to determine the molar heat of combustion of ethanol



During the experiment, the data given below was recorded

Volume of water	$450cm^3$
Initial temperature of water	25^0 C
Final temperature of water	46.5^0 C
Mass of ethanol + Lamp before burning	125.5g
Mass of ethanol + Lamp after burning	124.0g

Calculate the:

i.Heat evolved during the experiment (density of water=$1g/cm^3$,Specific heat capacity of water =$4.2Jg^{-}K^{-}$ (2marks)

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ii. Molar heat of combustion of ethanol (C=12.0, O=16.0, H=1.0) (3 marks)

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(c) Write the thermal chemical equation for the complete combustion of ethanol. (1mark)

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(d) The value of the molar heat of combustion of ethanol obtained (b) (ii) above is lower than the theoretical value. State two sources of error in the experiment. (2 marks)

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……..

e) Define the term molar heat of combustion (1 mark)

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2. The grid below shows a section of the periodic table. The letters do not represent the actual symbols of the elements.

K	**L**				**M**		**N**	**P**
	Q		**R**	**S**		**T**	**V**	
W								

a) Name the family to which element P belongs. (1mark)

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b) Which two elements will form carbonates that do not decompose on heating. (2 mark)

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c) With a reason, identify an element in period three with the largest atomic radius.(2marks)

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d) Write the formula of the compound formed between L and M (1 mark)

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e) State two uses of element **R** and for each use, state property of element **R** that makes it possible for the use

(i) Use (1/2mark)

……

Property (1/2 mark)

……

(ii) Use (1/2 mark)

……

Property (1/2 mark)

……

f) Using dots **(.)** and cross **(x),** show bonding in the compound formed between **R** and oxygen . (2 marks)

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g) In terms of structure and bonding, explain why the boiling point of the oxide of L is higher than that of N. (1 marks)

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h) Calculate the volume of the gas produced when 1.95g of element W reacts with water (W= 39, Molar gas volume at S.T.P= 24,000cm^3) (2 marks)

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3. Use the information below on standard electrode potentials to answer the questions that follow

Electronic reaction	E^{Θ} volts
$C^{2+}_{(aq)} + 2e^- \rightarrow C_{(s)}$	+0.34
$D^{2+}_{(aq)} + 2e^- \rightarrow D_{(s)}$	+0.44
$E^{+}_{(aq)} + e^- \rightarrow E_{(s)}$	-2.92
$F^{2+}_{(aq)} + 2e^- \rightarrow F_{(s)}$	-2.71
$G^{2+}_{(aq)} + 2e^- \rightarrow G_{(s)}$	-0.14
$\frac{1}{2}H_{2(g)} + e^- \rightarrow H^-_{(aq)}$	+2.87
$\frac{1}{2}K_{2(g)} + e^- \rightarrow K^-_{(aq)}$	+1.09
$L^{+}_{(aq)} + e^- \rightarrow \frac{1}{2}L_{2(aq)}$	0.00

a) i) Identify the strongest reducing agent. (1 mark)

……

ii) Calculate the e.m.f of the cell obtained by connecting half cells **C** and **D** (1 mark)

……

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b) Draw a well labeled diagram of a cell formed by connecting half cells **C** and **D**. (3 marks)

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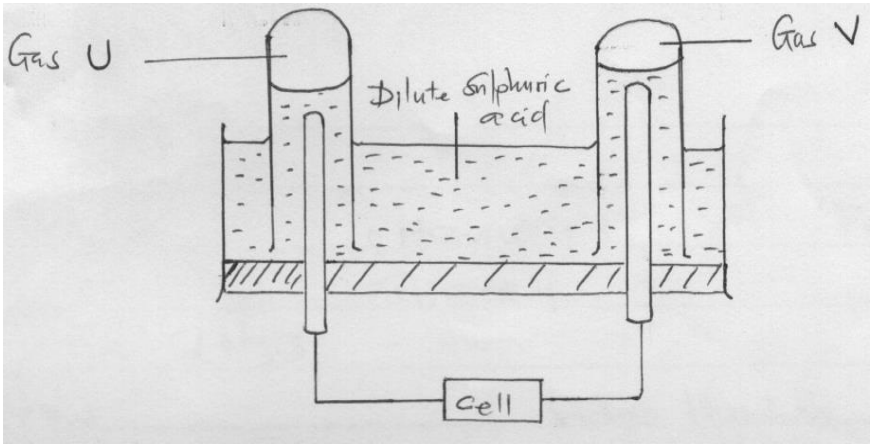
c) he figure below shows the electrolysis of dilute sulphuric (VI) acid



i) On the diagram label the cathode and anode (2 mark)

ii) Name the gases **U** and **V** (2 mark)

Gas **U**

……...……..

Gas **V** ……

iii) Write the equation taking place at the anode (1 mark)

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d) Define the term electrolysis (1 marks)

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e)State **two** applications of electrolysis (2 marks)

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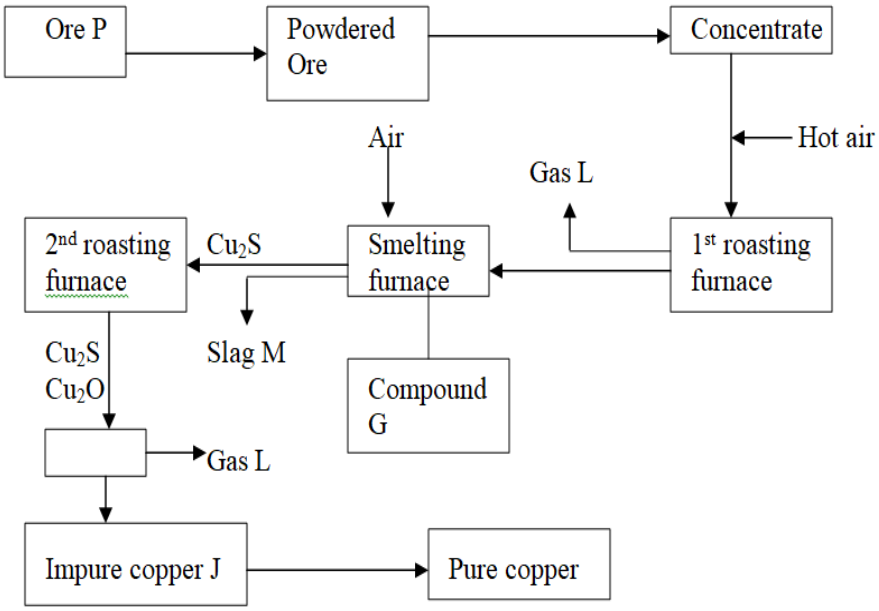
4. The flow chart below outlines some processes involved in the extraction of copper from copper pyrites. Study it and answer the questions that follow.



(a) Name the following: (3 marks)

(i) Ore P ……..…..

(ii) Gas L…….

(iii) Slag M ……..….

(b) (i) Explain how the ore is concentrated. (1 mark)

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……

(ii) Why is it necessary to grind the ore into powder? (1 mark)

……

(c) Give the purpose of adding silicon (IV) oxide compound G into the smelting furnace.

(1 mark)

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……

(d) Pure copper is obtained from impure copper by electrolysis. Name the material used as anode and cathode. (1 mark)

Anode ……

Cathode …….

(e) What effects does this process of copper extraction have to the environment? (1 mark)

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(f) State two uses of copper metal. (2 marks)

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(g) A current of 100 Amperes was passed for 20 days. What mass of copper in kg was deposited at the cathode? (Cu = 64, If = 96500 C) (2 marks)

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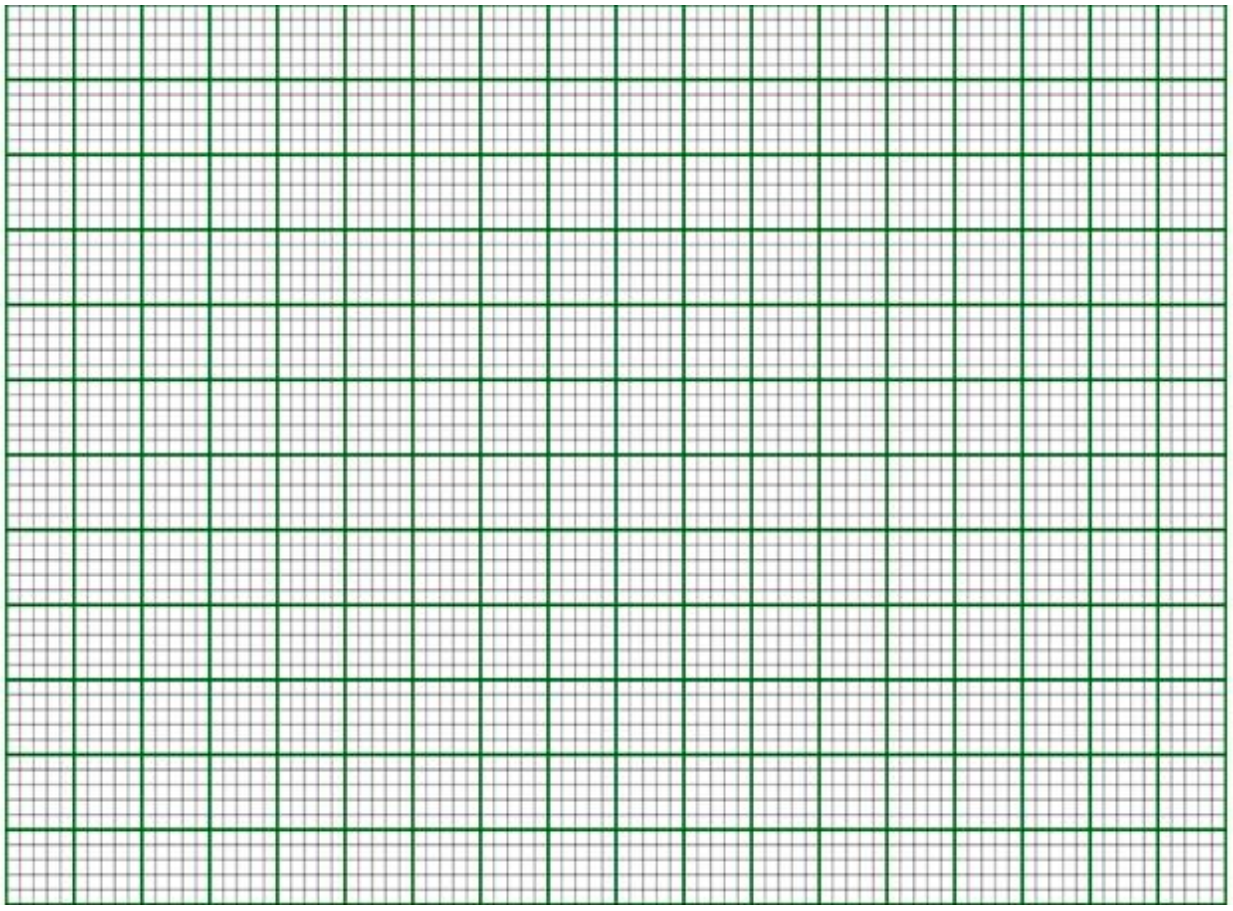
5. The table below shows the solubility of potassium nitrate at different temperatures.

Temperature ^{0} c	10	20	30	40	50	60	70	80	90	100
Solubility g/100g of water	80	88	96	104	114	124	136	148	162	180

a) Plot a graph of solubilities of potassium nitrate against temperature. (3mk)



b) From your graph determine;

i) the solubility of the potassium nitrate at 65^0c. (1mk)

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ii) the mass of potassium nitrate that would **dissolve in 50g of water at 82^0c**. (2mk)

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c) Determine the molar concentration of potassium nitrate at 37^0 c. (N=14, O= 16, K= 39. Assume the density of solution to be $1g/cm^3$) (3mk)

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d) 130g of potassium nitrate salt was added to 100g of water and heated to 90^0c. It was then cooled to 15^0 c.

i) At what temperature were the crystals first formed? (1mk)

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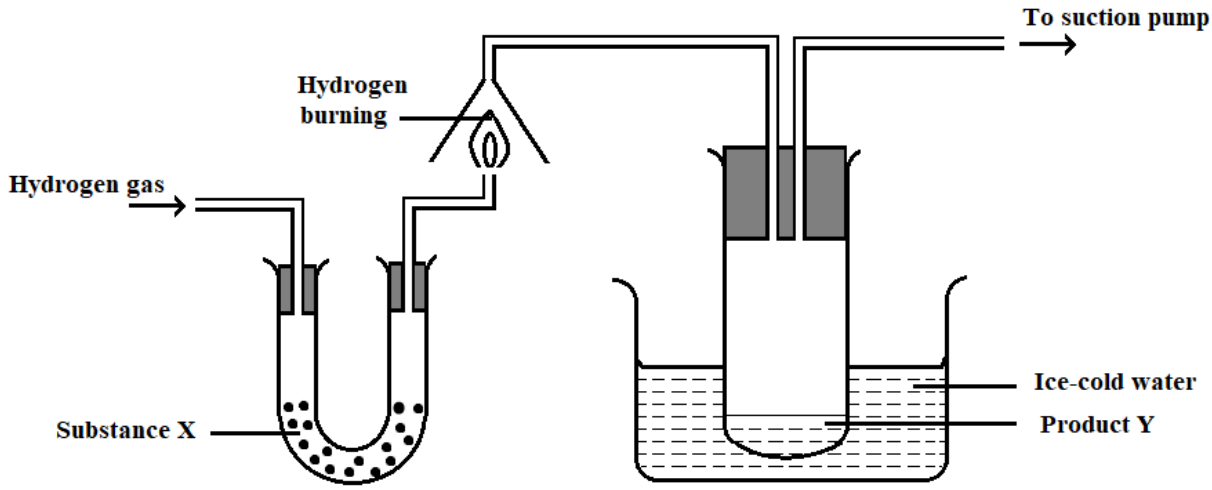
ii) Calculate the mass of crystals formed. (1mk)

……

6. The figure below shows the apparatus used to burn hydrogen in air. Use it to answer the questions that follow.



i) State the role of substance **X** (1 mark)

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ii) Give the name of the substance that could be used as **X** (1 mark)

……

iii) State the role of the suction pump (1 mark)

……

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iv) Name the product **Y** formed (1 mark)

……

v) Give a simple physical test to prove the identity of **Y** (2 mark)

……

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vi) State the difference between **"dry"** and **"anhydrous".** (2 marks)

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7 a)Name the following compounds (3 marks)

i) $CH_3CH_2CH_2OH$

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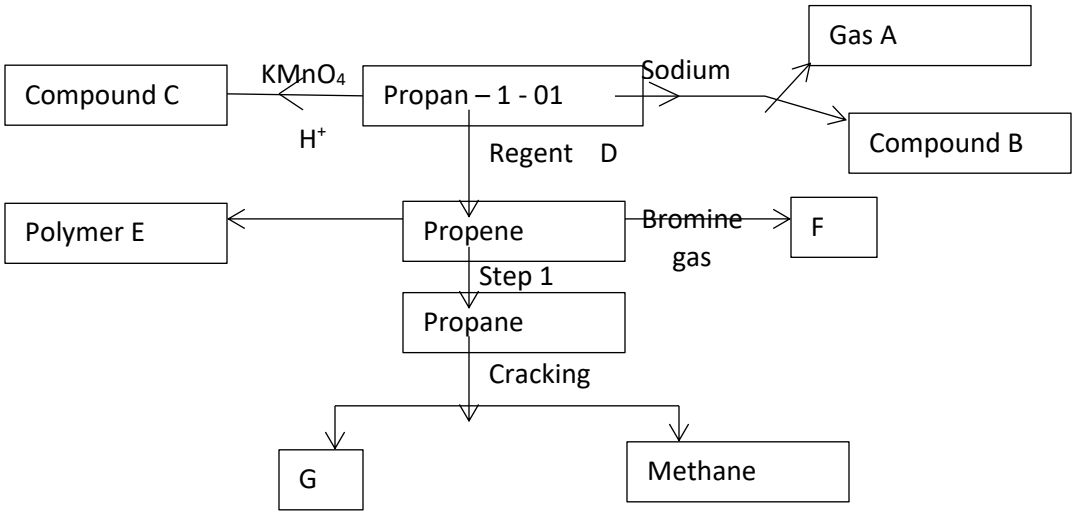
ii). $CH_3\ CH_2\ CH_2\ COOH$

.....

iii). $CH_3CH_2CH_2COOCH_2CH_3$

.....

b). Study the scheme below and answer the questions that follow



i. Identify product

A. .....(1 mark)

F. .....(1 mark)

ii. Name the compound C (1 mark)

.....

iii. State the conditions for step 1 (2 mark)

.....

iv. Name the process leading to formation of compound C (1 mark)

.....

v. Write an equation for the reaction leading to the formation of methane.(1 mark)

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vi. Identify reagent D. (1 mark)

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vii. Draw the structure of F. (1 mark)

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