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MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

PRE-MOCK EXAMINATIONS 2023

233/2

Name: MARKING GUIDE Adm No: Stream:

Candidate's Signature: Date:/04/2023.

233/2

Paper 2

THEORY

APRIL 2023

Time: 2 Hours

233/2 Chemistry – P2
 Wednesday 2:00 Pm – 4:00Pm
 12th April, 2023

FORM FOUR PRE-MOCK CHEMISTRY EXAMS 2023

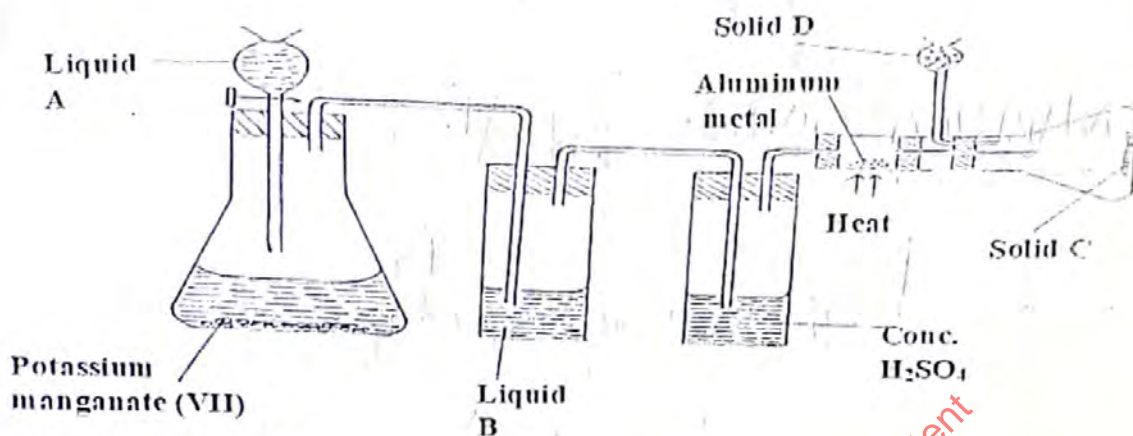
Instructions to candidates

- (a) Write your Name, Stream and Adm Number in the spaces provided above.
- (b) Answer all the questions in the spaces provided in the question paper.
- (c) KNEC mathematical tables and electronic calculators may be used for calculations.
- (d) All workings MUST be clearly shown where necessary.
- (e) This paper consists of **12** Printed pages.
- (f) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- (g) Candidates should answer the questions in English.

FOR EXAMINERS USE ONLY

Questions	Maximum Score	Candidate's Score
1	12	
2	12	
3	12	
4	11	
5	12	
6	10	
7	11	
TOTAL	80	

1. (a) Study the diagram below and use it to answer the questions that follow.



(i) Name liquids A and B

A. Concentrated Hydrochloric acid $\frac{1}{2}$ (1/2 mark)

B. Water $\frac{1}{2}$ (1/2 mark)

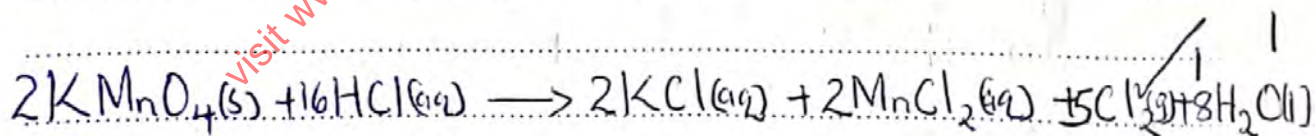
(ii) Suggest the most suitable reagent that can be used as solid D (1 mark)

Accept Quick lime / CaO.
Calcium oxide \checkmark / CaCl_2 1

(iii) State the role of Solid D (1 mark)

Absorb unreacted excess chlorine. 1

(iv) Write a balanced chemical equation for the reaction in the conical flask. (1 mark)



(v) Explain why solid C collects further away from the heated Aluminium metal. (1 mark)

Aluminium chloride \checkmark sublimates; collects further away $\frac{1}{2}$ from heating point. 1

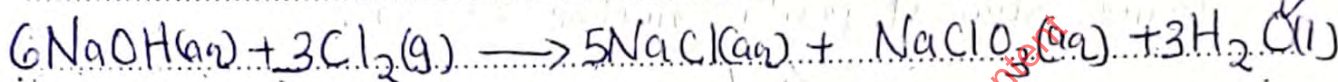
Joshua

In a combustion tube above, 0.675g of Aluminium metal reacted completely with 1800cm³ of chlorine gas at room temperature. Determine the molecular formula of Solid C, given that its relative molecular mass is 267 (Al= 27.0, Cl= 35.5 molar gas volume at r.t.p = 24.0 litres). (3marks)

Al	Cl	E.F is $AlCl_3$ ✓ $n = \frac{267}{133.5} = 2$ ✓ M.F = $(AlCl_3)_2 = Al_2Cl_6$ ✓ 3
Moles $\frac{0.675}{27}$	$\frac{1800}{24,000}$ ✓	
Molar ratio = $\frac{0.025}{0.025}$	$\frac{0.075}{0.025}$ ✓ 3 ✓	

(b) The reaction between hot concentrated sodium hydroxide and chlorine gas produces Sodium Chlorate (V) as one of the products

(i) Write the equation for the reaction. (1mark)



(ii) Give one use of sodium chlorate (V) (1mark)

✓ Used as herbicide/weed killer

✓ Bleaching agent in paper industry

1st @ 1mk

(c) Explain the difference between bleaching by chlorine and bleaching by Sulphur (IV)oxide gases. (2marks)

Chlorine bleaches by oxidation by adding [O] to the dye hence the bleaching is permanent while SO₂ bleaches by reduction by removing [O] from the dye hence temporary:
 Accept equations for each.

2. The grid below represents part of the periodic table. Study it and answer the questions that follow. Letters are not the actual symbols of the elements.

						B
Q			R		S	
T	U		V	W	X	Y
Z						

a) Select a letter that represents the most reactive non-metal. Explain (2 marks)

S! smallest atomic radius making it to gain electron easily. / Most electronegative / highest electron affinity

b) Select a letter that represents an element that forms an ion with a charge of 2-

X ✓

(1 mark)

i) Select an alkaline earth metal

V ✓ / Mg ✓

(1 mark)

ii) Which group I element has highest first ionization energy? Explain

(2 marks)

Q ✓ / Li. Has the smallest atomic radius hence strongest positive nuclear charge.

c) What is the formula of the compound formed when V reacts with X?

V₂X₃ ✓ / Al₂S₃ ✓

(1 mark)

d) What type of chemical bond exists in a compound formed when R and S react?

(1 mark)

Covalent ✓ / Molecular bond ✓

e) Explain why the atomic radius of S is smaller than that of Q.

(2 marks)

S has more protons than Q leading to higher nuclear charge hence stronger attraction.

2

f) State and explain the observation made when sodium carbonate is added to a chloride solution of element V.

(2 marks)

Bubbles/effervescence of a colourless gas - Chloride of V hydrolyses to give hydrochloric acid which reacts with the carbonate to give CO₂.

2

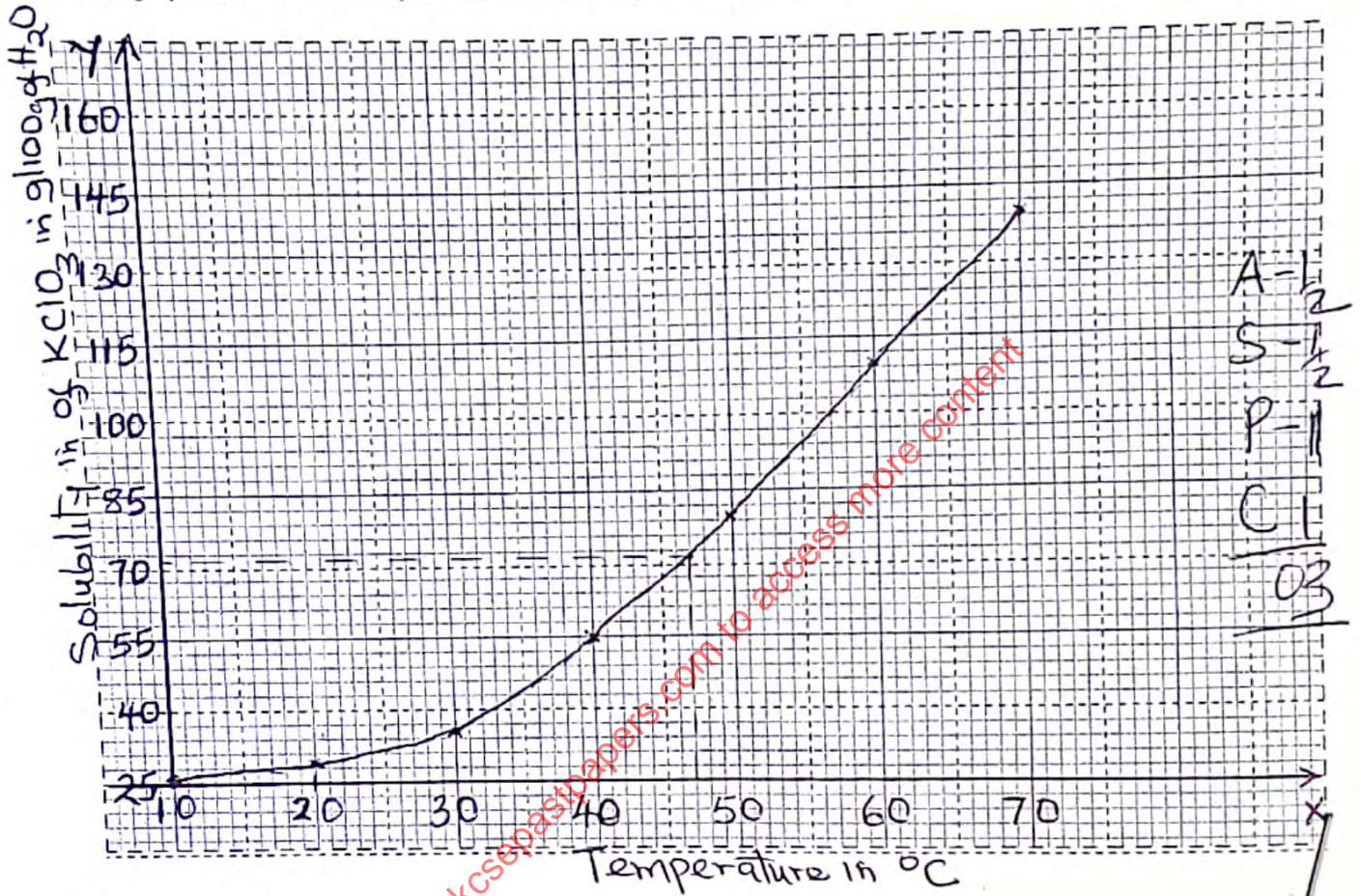
Jerry

(a) The table below shows the solubility of potassium chlorate at different temperatures

Temperature (°C)	10°	20°	30°	40°	50°	60°	70°
Solubility g/100g water	27	30	36	55	80	110	140

(i) Plot a graph of solubilities of potassium chlorate against temperature

(3 marks)



(ii) Using your graph:

(I) Determine the solubility of potassium chlorate at 47°C

(1 mark)

Showing \checkmark
 Correct reading \checkmark 72g/100g of H₂O ± 3

(II) Determine the concentration in moles per litre of potassium chlorate at 47°C

(K= 39, Cl = 35.5, O= 16) density of solution = 1g/cm³

(1 mark)

Ans. $\frac{72 \times 1000}{100} \times \frac{1}{122.5} \checkmark$ Correct Ans \checkmark

GOA

(III) Determine the mass of potassium chlorate that would crystallize if the solution is cooled from 62°C to 45°C.

(2 marks)

Solubility at 62°C = 115.5g/100g H₂O
 42°C = 60

showing $\sqrt{2}$ reading $\sqrt{2}$

Mass of Crystals
 $115.5 - 60 \sqrt{2}$
 $= 55.5g \sqrt{2}$

2

(b) In an experiment to determine the solubility of sodium hydroxide, 25cm³ of a saturated solution of sodium hydroxide weighing 28g was diluted in a volumetric flask and the volume made to 250cm³ mark. 20cm³ of this reacted completely with 25cm³ of 0.2M hydrochloric acid according to the equation.



Calculate:

(1 mark)

(i) The number of moles of hydrochloric acid used

$$\frac{25 \times 0.2}{1000} \sqrt{2} = 0.005 \sqrt{2} \text{ moles}$$

(ii) The number of moles of sodium hydroxide in 20cm³

(1 mark)

Mole ratio = 1/1 $\sqrt{2}$ Accept for 1 without ratio

Mole of NaOH = 0.005 moles $\sqrt{2}$

(iii) The moles of sodium hydroxide in 250cm³ of solution

(1 mark)

if 20cm³ → 0.005

250cm³ → ?

$$\frac{250 \times 0.005 \sqrt{2}}{20} = 0.0625 \text{ moles} \sqrt{2}$$

(iv) The mass in grams of sodium hydroxide in 250cm³ of solution

(1 mark)

$$\text{Mass} = 0.0625 \times 40 = 2.5g \sqrt{2}$$

(v) The solubility of sodium hydroxide in g/100g water

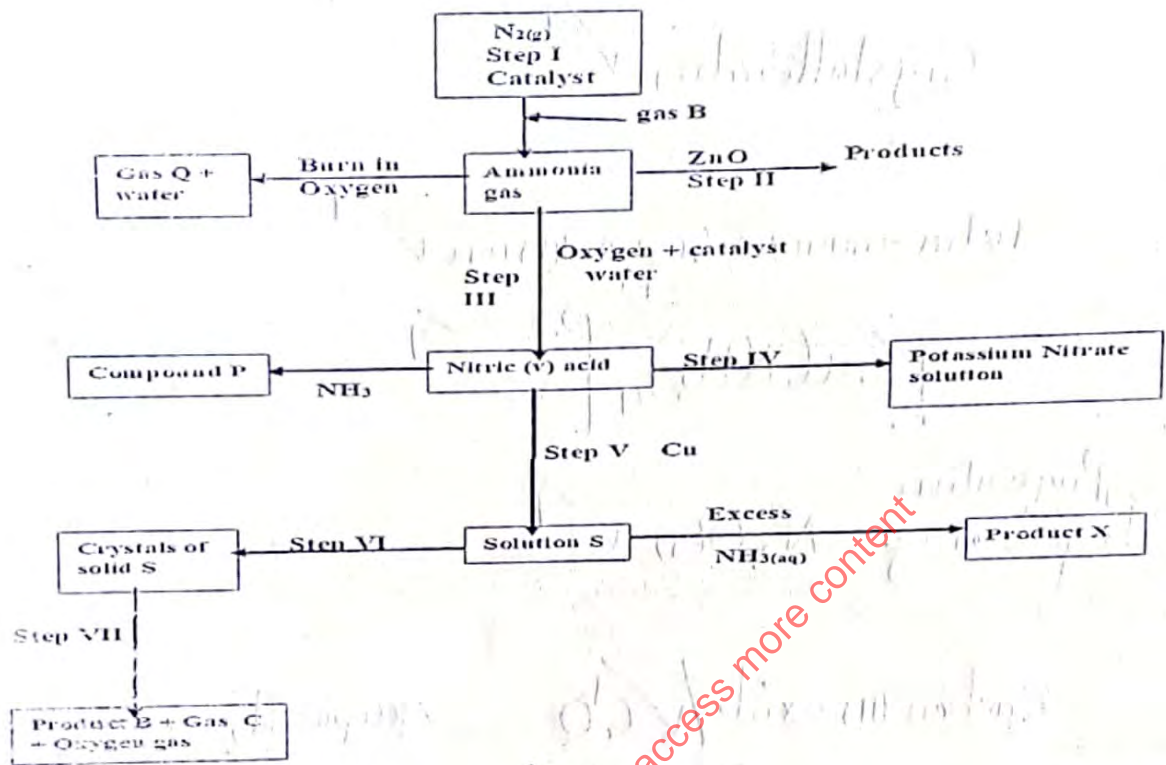
(1 mark)

Mass of solvent = 28 - 2.5 = 25.5

$$\text{solubility} = \frac{2.5 \times 100}{25.5 \sqrt{2}} = 9.804g/100g \text{ of } H_2O$$

Dr. Malala

Study the flow chart below and answer questions that follow:



a) State one source of gas B - Electrolysis of brine (1 mark)

- Cracking of alkanes. 1 @ 1mk

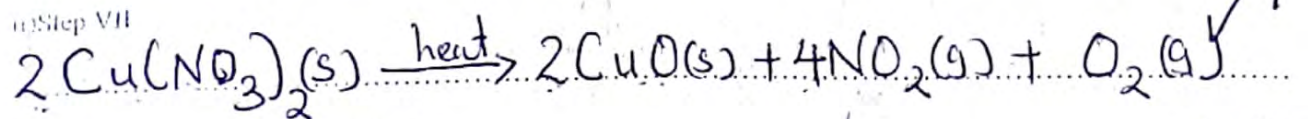
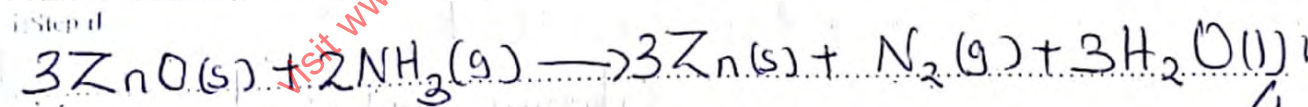
- Reaction of natural gas with steam

b) Name the catalysts used in; (1 mark)

i) Step I Finely divided iron. 1/2 Accept iron 1/2

ii) Step III Platinum-rhodium / Platinum 1/2

c) Write chemical equations for reactions in; (2 marks)



d) Name the process that takes place in; (2 marks)

i) Step IV Neutralization ✓

* Rose.

Shared Page
Joshua / Jerry

ii) Step VI

Crystallization ✓

1

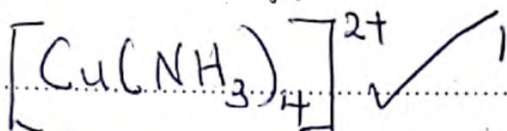
c) Name and write the chemical formula of product X

i) Name

Tetra-amine Copper(II) ion ✓

(1 mark)

ii) Formula



(1 mark)

f) i) State one laboratory use of compound P

Preparation of $\text{N}_2\text{O}(\text{g})$ ✓

(1 mark)

ii) Identify any other gas that can be used instead of Ammonia in step II

Carbon (II) oxide / CO Accept H_2

(1 mark)

iii) State one use of gas Q - liquid Q used as refrigerant

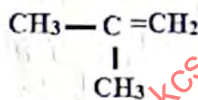
- Haber process
- In light bulbs
- Dilute effect of O_2 in deep sea diving

(1 mark)

Any correct @ 1mk

5. a) Give the IUPAC names of the following

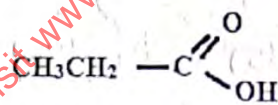
i)



2-methylprop-1-ene ✓

(2 marks)

ii)



Propanoic acid ✓

(b) Describe one chemical test that you would use to distinguish between the two compounds represented by the formulae $\text{C}_2\text{H}_6\text{O}$ and $\text{C}_2\text{H}_4\text{O}_2$

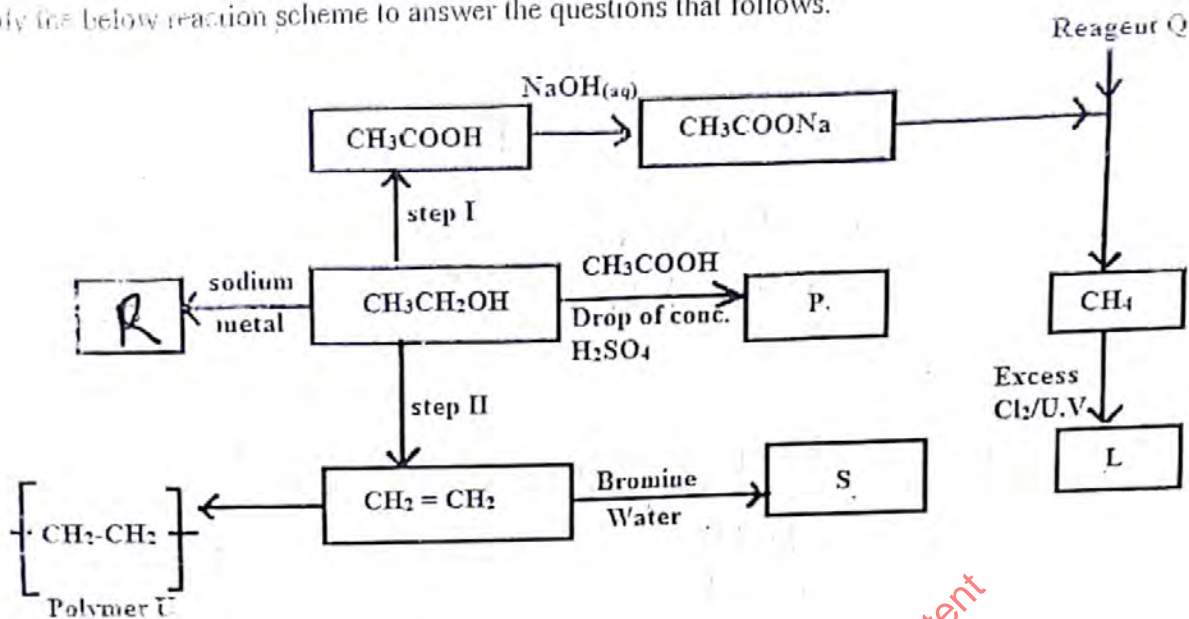
(2 marks)

Add Na_2CO_3 / NaHCO_3 into different solutions of $\text{C}_2\text{H}_6\text{O}$ and $\text{C}_2\text{H}_4\text{O}_2$ in test tubes. $\text{C}_2\text{H}_4\text{O}_2$ produces bubbles of a colourless gas while $\text{C}_2\text{H}_6\text{O}$ does not.

*Dr Adongo / Imbuga

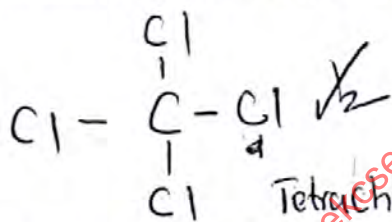
Navine

Study the below reaction scheme to answer the questions that follows.



Identify

- i) Reagent Q Sodalime ✓ / NaOH (1 mark)
- ii) Substance S 2-bromoethane / $\text{H}-\overset{\text{Br}}{\text{C}}-\overset{\text{H}}{\text{C}}-\text{H}$ ✓ / $\text{CH}_3\text{CH}_2\text{Br}$ ✓ (1 mark)
- iii) Write the formula of compound P $\text{CH}_3\text{COOCH}_2\text{CH}_3$ ✓ / Accept open structure. (1 mark)
- iv) Draw the structural formula of L and give its name



Tetrachloromethane ✓ Accept 1,1,1,1-tetrachloromethane

iv) Name the type of reaction, the reagent(s) and condition for the reactions in the following steps

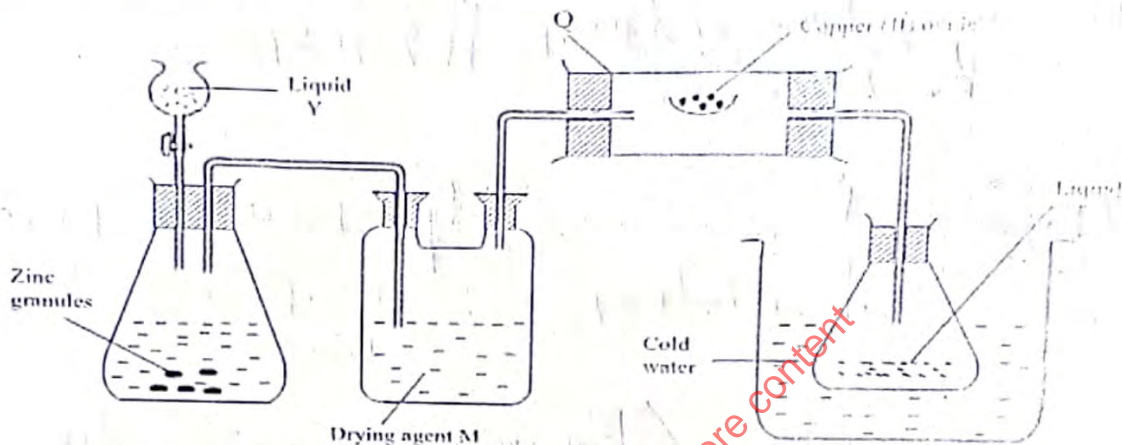
- Step I. Type - Oxidation; Reagent - H^+/KMnO_4 / $\text{H}^+/\text{K}_2\text{Cr}_2\text{O}_7$ ✓ (2 marks)
- Step II. Rxn: Dehydration ✓ Reagent: Concentrated sulphuric acid ✓ / Al_2O_3 ✓
Condition: Heat / Temp of $160^\circ\text{C} - 180^\circ\text{C}$ ✓

v) If the relative molecular mass of U is 56000, determine the number of monomer samples n in the polymer (2marks)

$$n = \frac{56,000}{28} = 2,000$$

* Jesse. Peter

6. Below is diagram showing how hydrogen can be prepared in the laboratory and the study of its reducing action of hydrogen



(a) Define the term reduction

- Removal of Chemically combined Oxygen from a substance
 - loss of electrons
 - Decrease Reduction in Oxidation number.

(1 mark)

(b) Identify apparatus Q

Combustion tube ✓

(1 mark)

(c) Identify one mistake in the set up

Copper (II) oxide is not heated ✓

(1 mark)

(d) Suggest a suitable drying agent M

Concentrated sulphuric (VI) acid ✓ / reject: CaO
 CaCl₂(s)

(1 mark)

(e) What is liquid Y

Dilute hydrochloric acid ✓ / Hydrochloric acid

(1 mark)

(f) Explain chemical reaction taking place in apparatus Q

H₂ reduces CuO to Cu metal and H₂ is oxidised to water

(1 mark)

(g) i) Name liquid T

Water ✓ / Mdm Rose.

(1 mark)

(c) Describe one physical test of liquid T - Heat to boil; b.p of 100°C . (1 mark)

- Determine its density; Has a density of 1gcm^{-3} Any 1 @ 1mk

- Freeze the liquid; freezes at 0°C

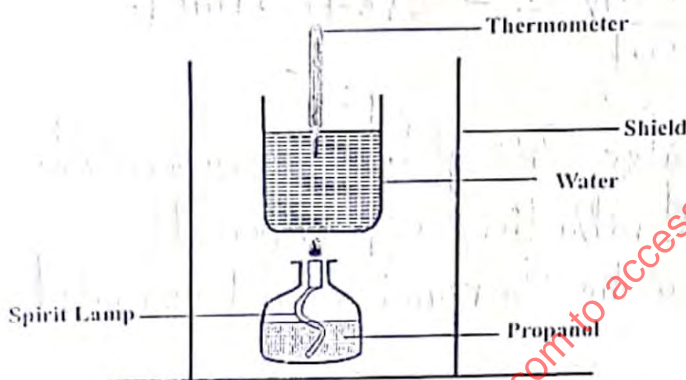
- Determine its refractive index; Its refractive index is 1.33158 (2 marks)

(d) Explain the role of hydrogen in the manufacture of margarine

Hydrogen breaks double bond in oil to form saturated fats

Accept: Hardening of oils to fats for 1 mk.

7. The diagram below shows a set-up to determine the heat of combustion of propanol. The heat produced by burning fuel heats a known mass of water. By measuring the temperature rise of water it's possible to approximate the value for the heat of combustion of propanol



Volume of water = 400cm^3

Initial temp. of water = 20°C

Final temp. of water = 33°C

Mass of propanol burnt = 0.6g

Specific heat capacity of water = $4.2\text{Jg}^{-1}\text{K}^{-1}$

(a) Define molar heat of combustion.

(1 mark)

Enthalpy change that occurs when one mole of a substance is completely burnt in oxygen.

(b) Calculate the number of moles of propanol that burnt (C=12, H=1, O=16)

(1 mark)

$$\frac{0.6\sqrt{2}}{60} = 0.01\text{ moles}$$

(c) Calculate the enthalpy change in this experiment

$$\Delta H = 400 \times 4.2 \times 13 \checkmark$$

$$= 21840 \text{ J} \checkmark \quad 21.84 \text{ kJ. (Accept if converted).}$$

reject $\frac{1}{2}$ for \checkmark

(d) Find the molar heat of combustion of propanol

(2 marks)

If 0.01 \rightarrow 21.84 kJ

$$1 \text{ mole} \rightarrow \frac{21.84 \checkmark}{0.01} = -2184 \text{ kJ/mol.} \checkmark$$

reject $\frac{1}{2}$ for wrong units or sign.

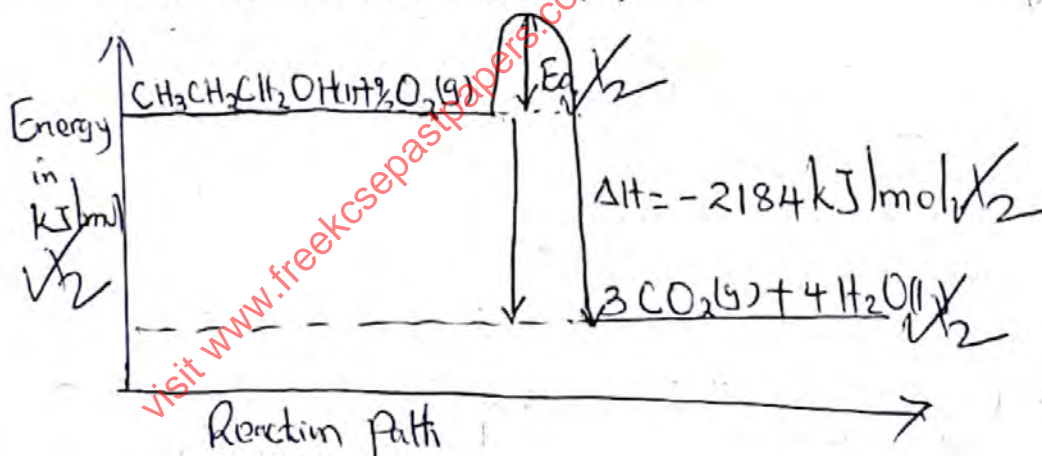
(e) The accurate value of molar heat of combustion of propanol is -2221 kJ/mol. State one error that could account for this difference

(1 mark)

- Propanol and water may have evaporated.
 - Incomplete combustion of Propanol.
 - Heat lost to the surroundings not accounted for
- (Any 1 at 1mk)

(f) Draw an energy level diagram showing combustion of propanol

(2 marks)



2

(g) State two precautions taken when using a fuel

(2 marks)

- Fuel stores be located away from populated areas.
 - Ensure gas taps are closed tightly after use.
 - Gas cylinders should be kept away from heat
 - Charcoal stoves to be used in well ventilated rooms to CO poisoning
 - Keep away from oil spills.
- Any 2 @ 1mk

Obonyo