MASENO SCHOOL

Kenya Certificate of Secondary Education 2021

CHEMISTRY- Paper 2

DEC. 2021 - 2 hours

THE MASENO SCHOOL MOCK

Name……. Index No……/…….

INSTRUCTION TO CANDIDATES

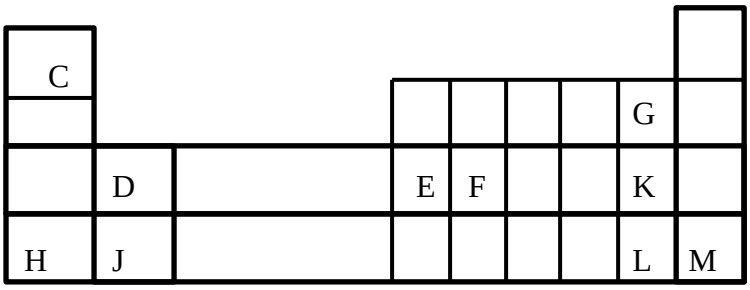
- Write your name and Admission number in the spaces provided above.
- Sign and write the date of examination in the spaces provided
- Answer all questions in the spaces provided
- All working **must** be clearly shown.
- Non-programmable silent electronic calculator and KNEC Mathematical tables may be used.

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	13	
2	12	
3	12	
4	12	
5	11	
6	10	
7	10	
TOTAL SCORE	80	

Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

1. a) The grid below shows part of the periodic table. Use it to answer the questions that follow.
The letters do not represent actual symbols.



i) Select the most reactive non-metal. Explain. (2mks)

_____

_____

_____

ii) Identify an element that does not form compounds. (1mk)

_____

iii) Write the formula of the nitride of D. (1mk)

_____

iv) Identify the element that forms giant covalent structure. (1mk)

_____

v) How does the reactivity of C with chlorine compare with of H with chlorine? Explain. (2mks)

_____

_____

_____

b) 1.08g of element E were heated in a stream of excess chlorine gas.
i) Write a balanced equation of the reaction. (1mk)

_____

ii) Calculate the maximum mass of the product formed. (E = 27, Cl = 35.5) (2mks)

c) using dots (●) and crosses (X) to represent electrons, draw a diagram to show the bonding in compound formed when K reacts with J. (1mk)

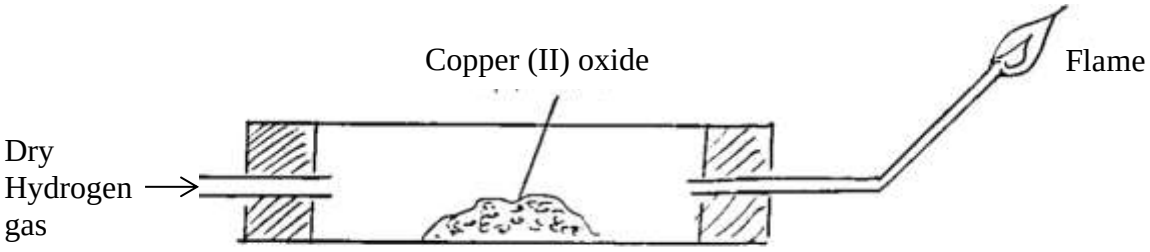
d)State and explain the observation made when sodium carbonate powder is added to aqueous solution of Iron (III) chloride in a test tube. (2mks)

_____

_____

_____

2. a) The set up below was used to investigate some properties of hydrogen,



i) What condition is missing in the set up for the reaction to occur? ($^1/_2$mk)

_____

ii) Hydrogen gas is allowed to pass through the tube for some time before it is lit. Explain. (2mks)

_____

_____

_____

iii) Write an equation for the reaction that occurs in the combustion tube. (1mk)

_____

iv) When the reaction is complete, hydrogen gas is passed through the apparatus until they cool. Explain. (1mk)

_____

_____

v) What property of hydrogen is being investigated? ($^1/_2$mk)

_____

vi) What observation confirms the property in (v) above. (1mk)

_____

b)i) State one way in which nuclear reactions differ from ordinary chemical reactions. (1mk)

_____

ii) The following is part of Uranium decay series

$$^{238}_{92}u \xrightarrow{\text{Step 1}} {}^{234}_{90}\text{Th} \xrightarrow{\textbf{Step 2}} {}^{234}_{91}\text{Pa} \xrightarrow{\text{Step 3}} {}^{Z}_{A}\text{X}$$

i) Which particles are emitted in Step 1 and 2? (2mks)

Step 1 - _____

Step 2 - _____

ii) If a beta particles is emitted in Step 3, find the value of Z and A. (1mk)

Z - _____

A - _____

iii) If the activity of Thorium – 234 is reduced to 12.5% in 48 hours, find its half-life. (2mks)

3. Study the given reduction potentials and answer the questions that follow. The letter do not represent the actual symbols of elements.

	$E^{\ominus}$(V)
$X^{2+}_{(aq)} + 2e^- \longrightarrow X(s)$	-2.90
$Y^{2+}_{(aq)} + 2e^- \longrightarrow Y(s)$	-2.38
$Z^{2+}_{(aq)} + 2e^- \longrightarrow Z(s)$	0.00
$\frac{1}{2} A_{2(g)} + e^- \longrightarrow A(aq)$	+2.87

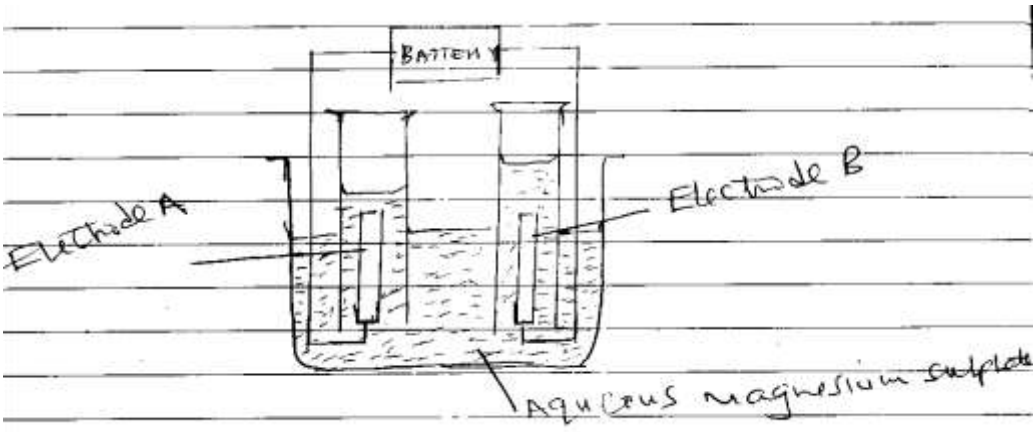
i) Which element is likely to be hydrogen. (1mk)

_____

ii) Draw an electrochemical cell formed when Y and A are combined. Show the direction of flow of electrons. (2mks)

iii) Calculate the e.m.f. of the electrochemical cell in (ii) above. (2mks)

b) The set up below was used during the electrolysis of a solution of Magnesium sulphate using inert electrodes.



i) Identify the ions present in the electrolyte. (1mk)

_____

ii) Write half equation for the reactions taking place at
i) Cathode (1mk)

_____

ii) Anode (1mk)

_____

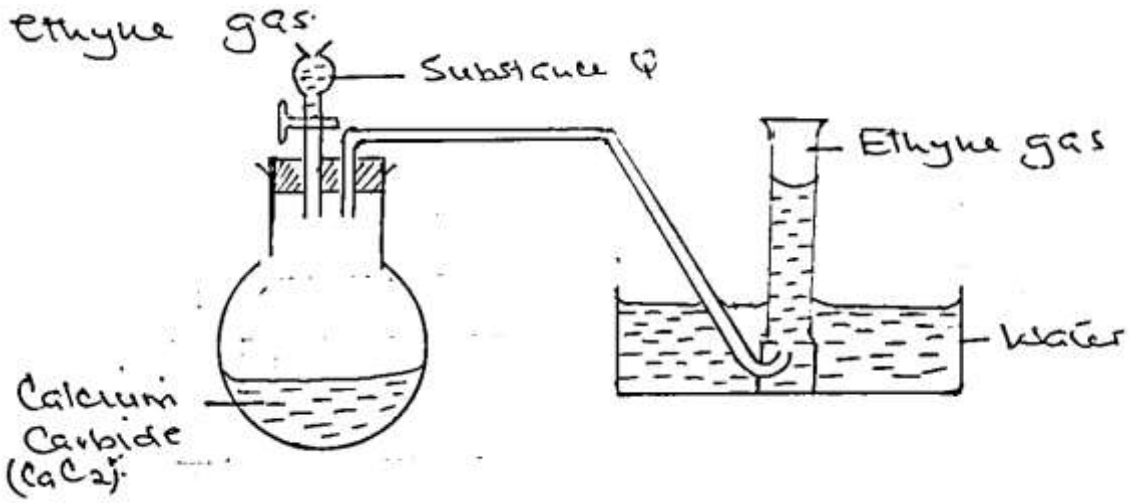
iii) Which electrode is the cathode? Explain. (2mks)

_____

_____

c) Calculate the quantity of electricity that would liberate $1.2dm^3$ of oxygen gas at r.t.p.
(1 mole of gas at r.t.p = $24dm^3$, 1F = 96500) (2mks)

4. a) The set up below can be used to prepare ethyne gas.



i) Identify substance Q (1mk)

_____

ii) Write the equation for the reaction for the production of enthyne gas. (1mk)

_____

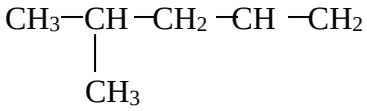
iii) In an experiment, $100cm^3$ of ethyne gas was mixed with $60cm^3$ of oxygen gas and the mixture ignited. Determine the total volume of the gaseous mixture at the end of experiment under standard conditions. (2mks)

_____

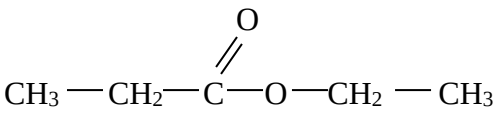
_____

_____

b) Give the systematic names of the following compounds.

i) 

_____ (1mk)

ii) 

_____ (1mk)

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

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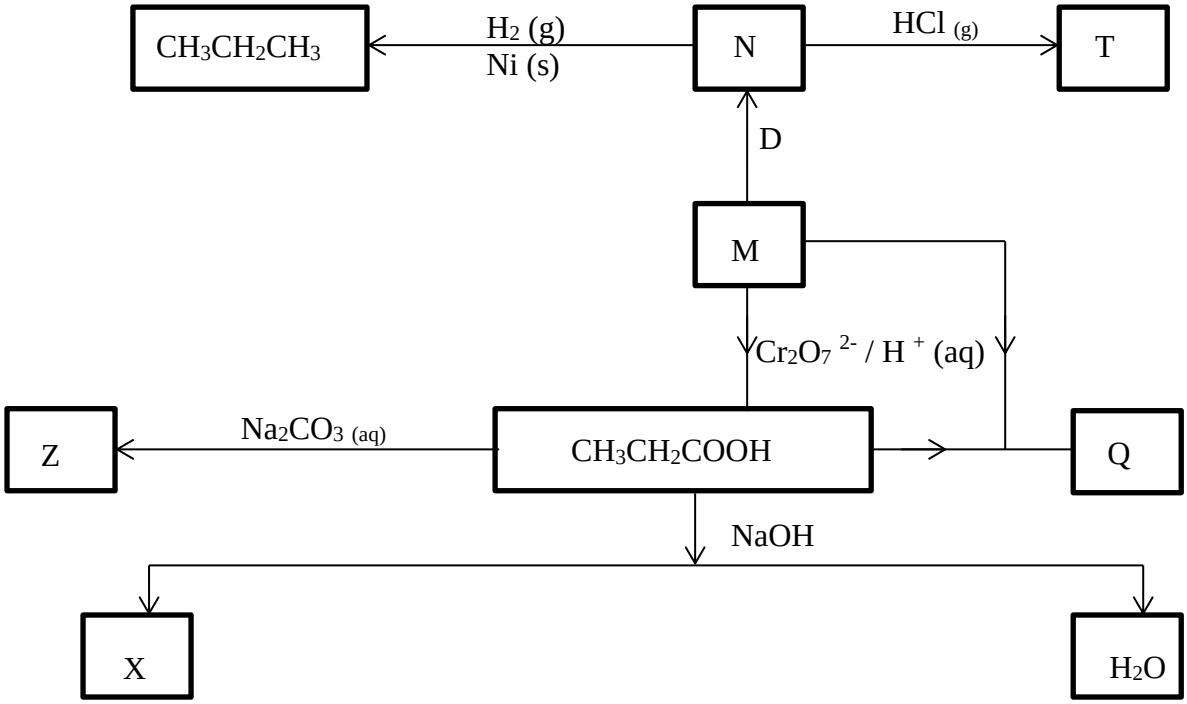


i) Name the substances

X - _____

M - _____

N - _____

Q- _____ (2mk)

ii) Write the equation for the reaction leading to the formation of product Z. (1mk)

_____

iii) Substance M reacts with propanoic acid to form substance Q. Name this type of reaction. (1mk)

_____

iv) Draw the structure of the compound T and give its name. (2mks)

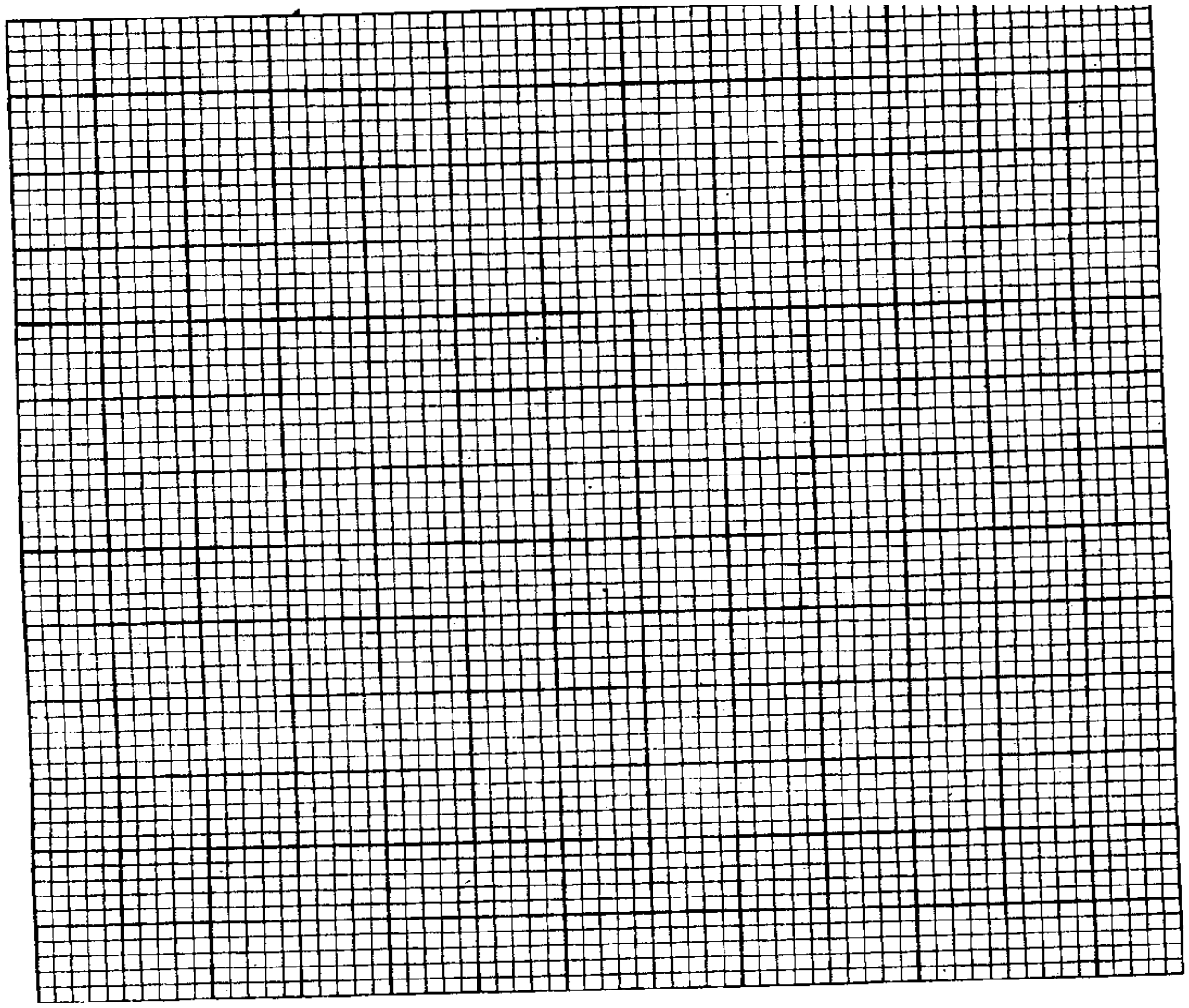
5. The table below gives the volume of the gas produced when different volumes of 2M hydrochloric acid were reacted with 1.0g of a lump of an alloy of magnesium and copper at room temperature.

Volume of 2M HCl ($cm^{3)}$	Volume of gas (cm^3)
0	0
10	240
20	480
30	600
40	600
50	600

a) Write an equation for the reaction that occurred. (1mk)

_____

b) On the grid provided below, plot a graph of the volume of the gas produced (vertical axis) against the volume of acid added. (3mks)



c) From the graph, determine

i) the volume of the gas produced if 13.0cm^3 of the 2M HCl had been used. ($^1/_2$mk)

_____

ii) The volume of the 2M HCl required for the reaction to go to completion. ($^1/_2$mk)

_____

_____

d) State and explain the effect on the rate of production of gas if

i) 1.0g of the lump of the alloy was replaced by 1.0g powder of the alloy. ($1^1/_2$mks)

_____

_____

_____

_____

ii) the reaction was carried out at 35^0C. ($1^1/_2$mks)

_____

_____

_____

_____

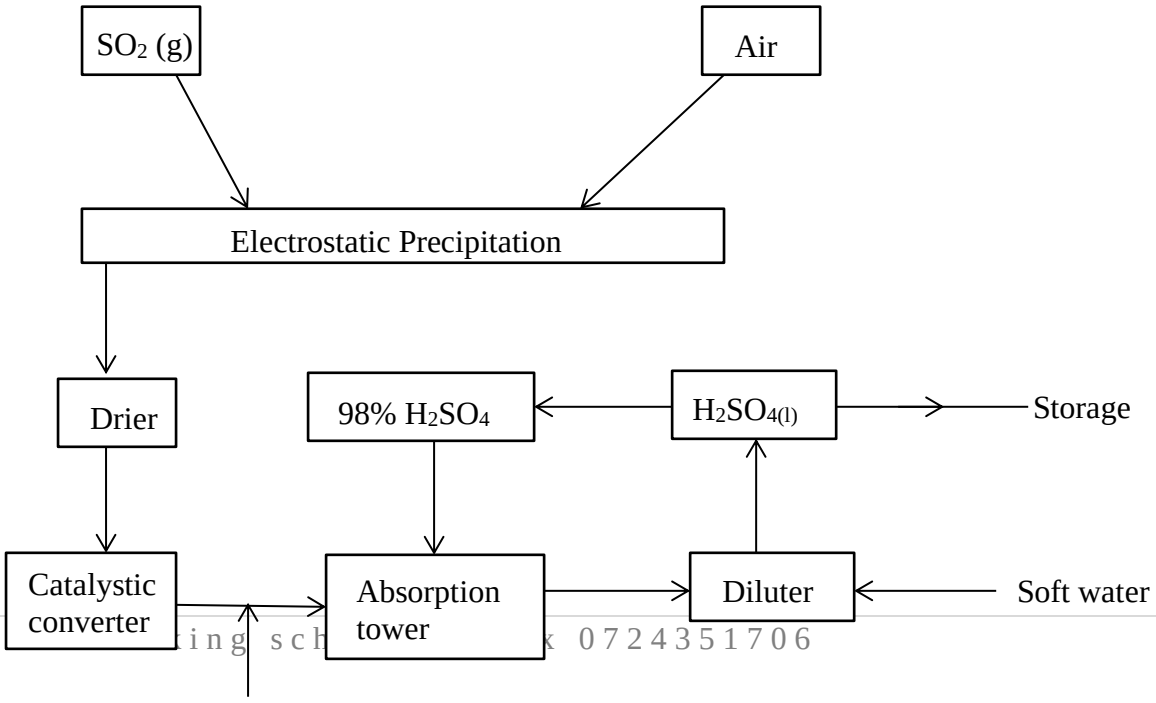
e) Calculate the percentage of copper in the alloy.
(Mg = 24, Molar gas volume at r.t.p = 24000cm^3) (3mks)

_____

_____

_____

6. The flow chart below shows the industrial manufacture of sulphuric (VI) acid. Study it and answer the questions that follow.



a) i) Using an equation state one source of sulphur (IV) oxide. (1mk)

Air

_____

ii) Name one substance removed by electrostatic precipitation. (1mk)

_____

iii) Name a suitable substance that can be used in the drier. (1mk)

_____

iv) In the catalytic converter, the temperature is adjusted to about 450^0C without external heating. Explain. (1mk)

_____

_____

v) Write an equation of the process taking place in the absorption tower. (1mk)

_____

vi) Explain why it is not advisable to use hard water in the diluter. (1mk)

_____

b) Sulphuric acid reacts both as an acid and an oxidizing agent. Using zinc metal illustrate with equations these properties. (2mks)

c) Concentrated sulphuric acid is used to prepare the other two mineral acids i.e. nitric acid and hydrochloric acid. What property of the acid makes it possible? (1mk)

_____

_____

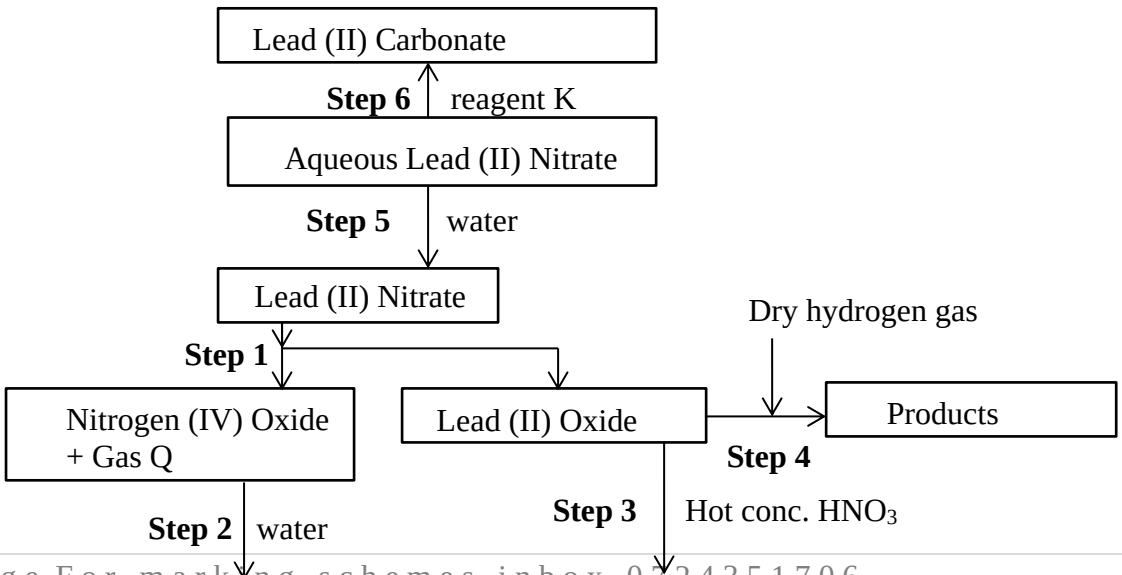
d) The reaction shown below occurs in the catalytic converter.

$2SO_{2\,(g)} + O_{2\,(g)} \rightleftharpoons 2SO_{3\,(g)}$; ΔH = -ve. State two ways that could be used to increase the yield of $SO_{3\,(g)}$ (1mk)

_____

_____

7. The flow chart below shows some reactions starting with lead (II) nitrate. Study it and answer the questions that follow.



Gas Q ← Acidic products S and R | Colourless solution

a) i) State the conditions necessary in Step 4 (1mk)

_____

_____

ii) Identify

a) Reagent K ($^1/_2$mk)

_____

b) Gas Q ($^1/_2$mk)

_____

c) Acidic products S and R. (1mk)

_____

iii) Write

a) The ionic equation for the reaction in step 6. (1mk)

_____

b) The equation for the reaction in Step 4. (1mk)

_____

b) The use of materials made by Lead in roofing and water pipes is being discharged. State

i) Two reasons why these materials have been used in the past. (2mks)

_____

_____

ii) One reason why their use is discouraged. (1mk)

_____

c) The reaction between Lead (II) Nitrate and sulphuric acid starts and stops immediately. Explain. (2mks)

_____

_____

_____