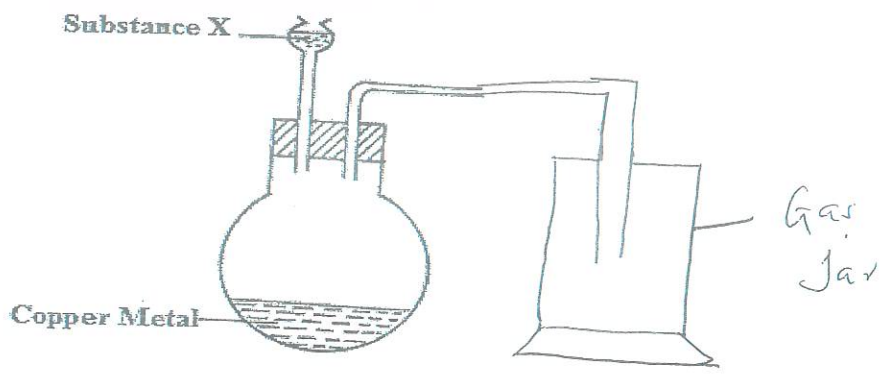


Enako Tum

1. The set shown below is used to prepare nitrogen (IV) oxide.



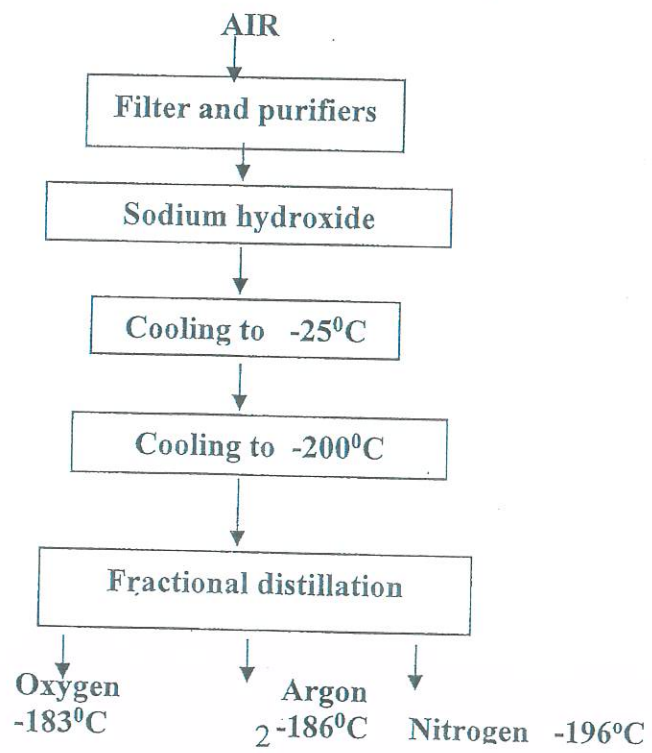
a) Complete the diagram to show the collection of the gas. (1 mark)

b) Identify substance X. (1 mark)
 Concentrated nitric acid

c) Write the equation for the reaction that occurs in the round conical flask. (1 mark)

$$Cu_{(s)} + 4HNO_{3(l)} \rightarrow Cu(NO_3)_2_{(aq)} + 2H_2O_{(l)} + 2NO_{2(g)}$$

2. The flow chart below shows stages involved in obtaining nitrogen gas from air



State the use of the,

a) Filters

Remove dust particles/impurities (1 mark)

b) Sodium hydroxide solution

Remove Carbon IV oxide (1 mark)

c) Cooling to -200°C elsius.

Condense gases into liquid (1 mark)

3. The electron arrangement of ions X^{3+} and Y^{2-} are 2. 8 and 2. 8. 8 respectively.

a) To which groups do X and Y belong to?

X... III, Y... VI (1 mark)

b) State the atomic numbers of X and Y.

X... 13, Y... 16 (1 mark)

c) Write a formula of compound formed when Y and X reacts.

X_2Y_3 (1 mark)

4. In the extraction of iron in the blast furnace, state the uses of the following in the furnace.

a) Molten slag.

(1 mark)

b) Waste gases leaving the furnace.

(1 mark)

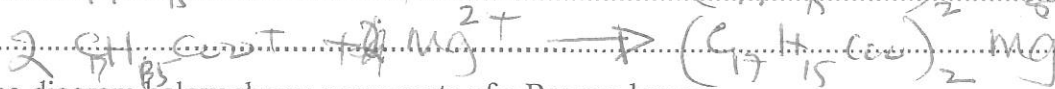
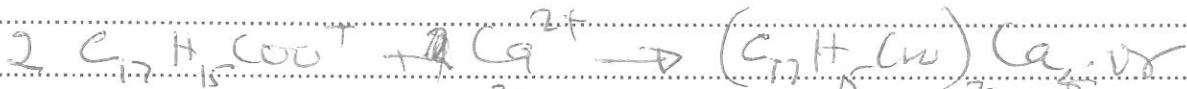
Misingi

5. a) Water from Nairobi dam is suspected to be hard water with a little presence of chloride ions from the industrial effluents. Give the formulae of **two** ions that cause hardness of water and describe a chemical test to detect the presence of chloride ions. (3 mark)

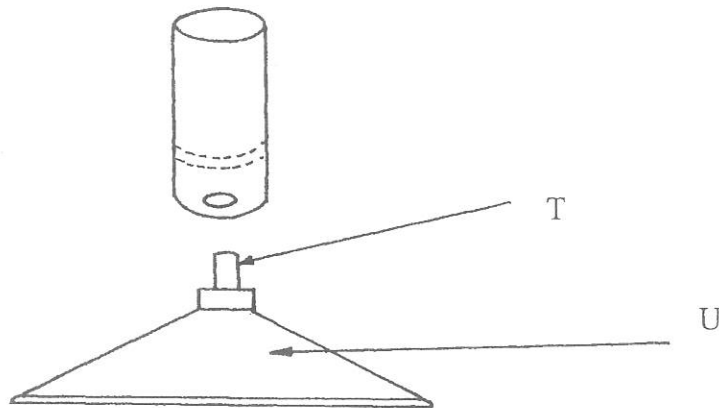
Mg^{2+} or Ca^{2+}

Add $AgNO_3$ to the sample, a white ppt
in furnace. (3)

b) Given that the structure of soap is $C_{17}H_{35}COONa$, use ionic equations to show the reaction that occurs when the above ions react with soap. *hard water* (2 marks)



6. The diagram below shows some parts of a Bunsen burner

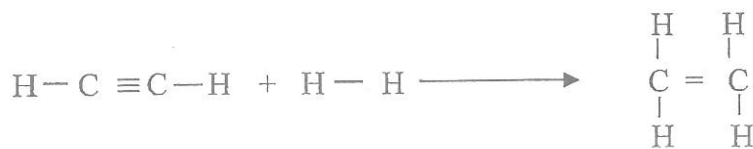


Explain how the parts labelled T and U are suited to their functions (2marks)

T Jet - direct the gas into chimney, forcing air to follow duct.

U Stand - wide base and heavy to support the burner.

7. Ethyne reacts with hydrogen as shown below



Use the bond energies below to calculate the enthalpy changes for the above reaction (3marks)

BOND	ENERGY(kJ/Mole)
H-H	435
C-H	413
C≡C	835
C=C	611

Broken - formed

$$[2(\text{H}-\text{C}) + (\text{C}\equiv\text{C}) + (\text{H}-\text{H})] - [2(\text{C}-\text{H}) + (\text{C}=\text{C})]$$

$$(2(473) + 835 + 435) - 2(413) + 611$$

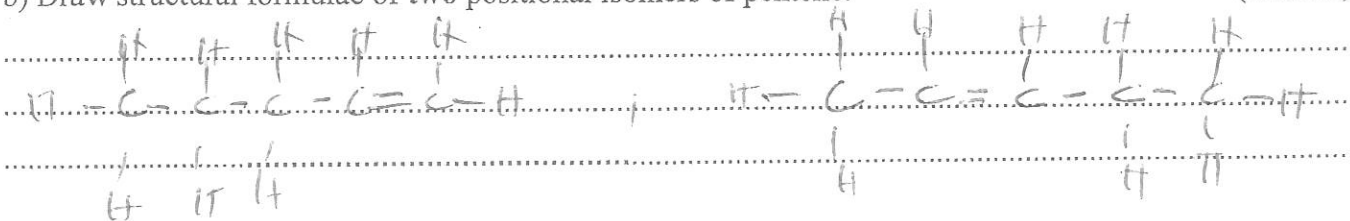
$$826 + 835 + 435 \quad \quad \quad 2096 \quad \quad \quad 1222$$

$$= -874 \text{ kJ/mol}$$

8. a) What is meant by the term isomerism? (1mark)

Compounds with the same chemical formula but different in their structural formulae.

b) Draw structural formulae of two positional isomers of pentene. (2marks)



Rembe

9. 18.7cm^3 of a dibasic acid (H_2A) required 25cm^3 of 0.1M Sodium hydroxide for complete neutralization.

a) How many moles of sodium hydroxide are contained in 25cm^3 ? (1 mark)

$$\text{If } 0.1 \text{ moles NaOH} \text{ --- } 1000$$

$$\frac{25 \times 0.1}{1000}$$

$$0.0025 \text{ moles}$$

b) Calculate the molarity of the acid. (2 marks)

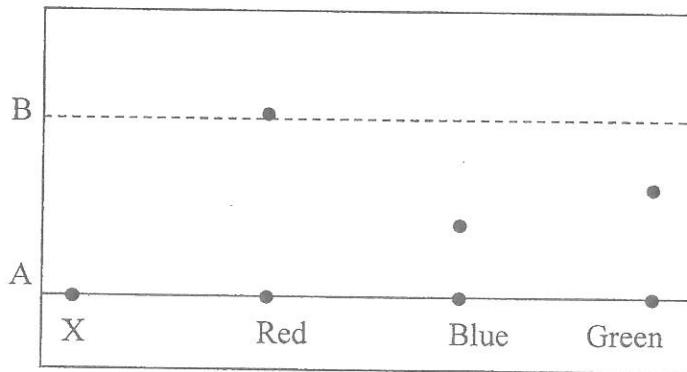


$$\begin{aligned} 0.0025 \\ \text{moles of H}_2\text{A} &= \frac{1}{2} \times 0.0025 \\ &= 0.00125 \end{aligned}$$

$$\begin{aligned} \text{If } 0.00125 \text{ moles --- } 18.7 \text{ cm}^3 \\ ? \text{ --- } 1000 \text{ cm}^3 \end{aligned}$$

$$\frac{1000 \times 0.00125}{18.7} = 0.066845$$

10. The figure below shows a paper chromatography for a pure substance X



a) What do the letters A and B represent? (1 mark)

A..... Base line

B..... Solvent front

b) Given that X contains blue and green dyes, show the chromatography of X on the diagram. (1 mark)

c) Give the reason why the spot for red moves further than that of blue and green. (1 mark)

Red is the most soluble dye

Red is the least adsorbent dye

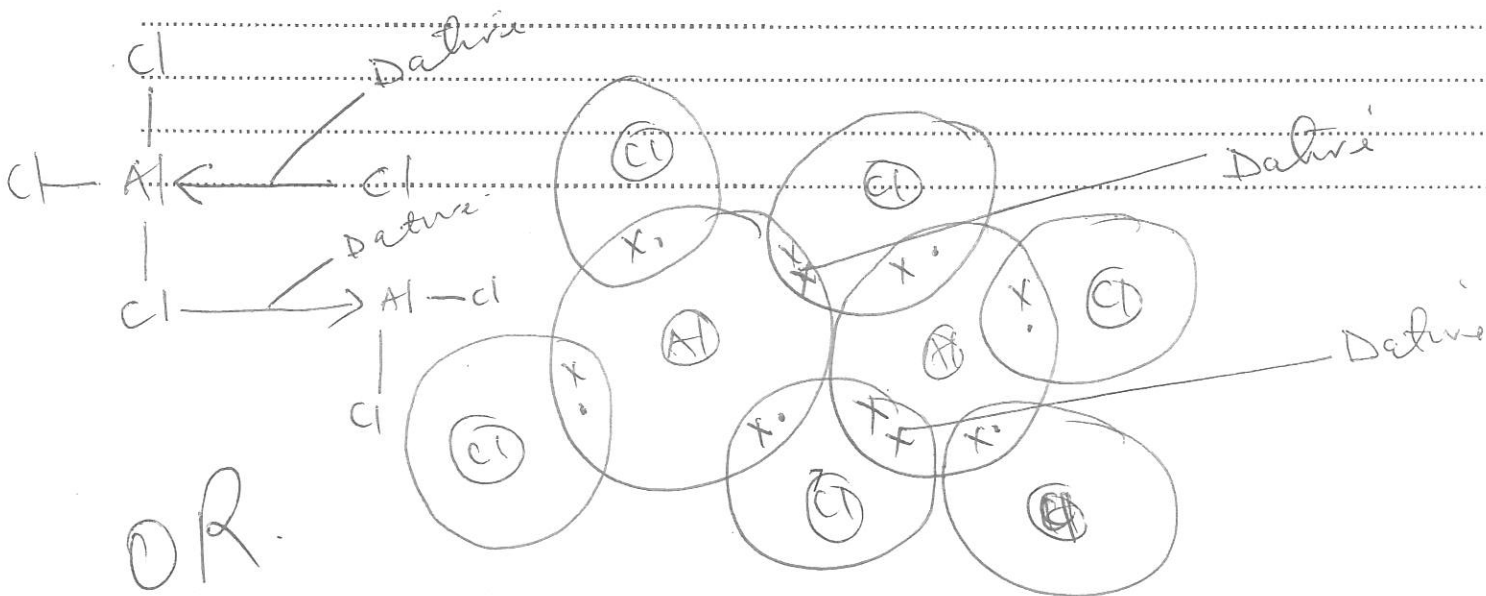
11. Draw the dimer structure of aluminium chloride and name the bonds. (2 marks)

(Atomic number Al = 13, Cl = 17)

12. One of the applications of electrolysis is electroplating of iron.

a) Give two reasons why iron is electroplated. (1 mark)

b) An iron spoon was to be electroplated with silver. Draw the labelled set-up that can be used. (2 marks)



Wamala

13.a) Distinguish between isotopes and allotropes.

(2marks)

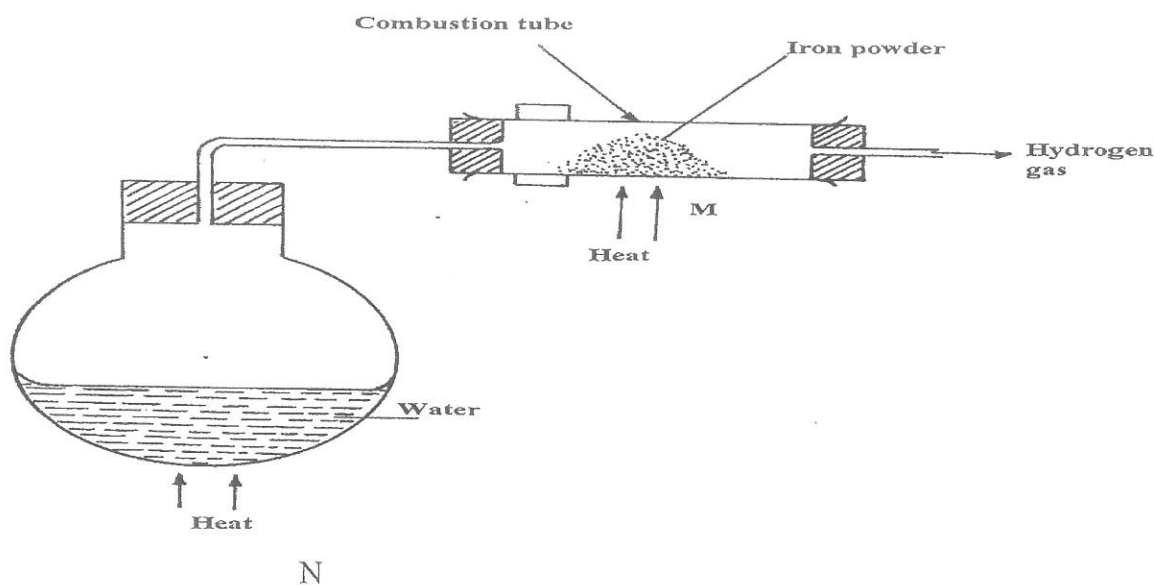
Isotopes - are atoms of the same element with the same atomic number but different mass numbers (no. of protons).
allotropes - diff forms of an element, but in the same physical state.

b) Other than sulphur, name two elements that are allotropic.

(1mark)

- carbon
- phosphorus

14. Study the diagram below and answer the questions that follow.



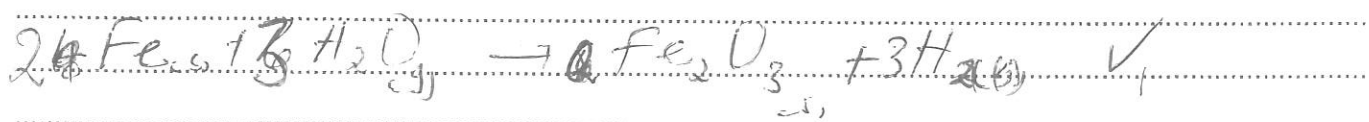
a) Between N and M which part should be heated first? Explain

(2marks)

N - water is heated to produce steam to expel the air in combustion before heating iron to avoid the formation of iron oxide with oxygen.

b) Write the equation for the reaction occurring in the combustion tube.

(1mark)



15. Describe how you would prepare crystals of sodium nitrate starting with 200 cm³ of 2M sodium hydroxide. (3 marks)

prepare 200cm³ of 2M nitric (v) acid in a beaker. Add all the 200cm³ of 2M sodium hydroxide. to the resulting solution evaporate heat boil and evaporate till obtain the crystals.

16. Two reagents that can be used to prepare chlorine gas are potassium manganate (VII) and hydrochloric acid.

a) What is the role of potassium manganate (VII) in this reaction? (1 mark)

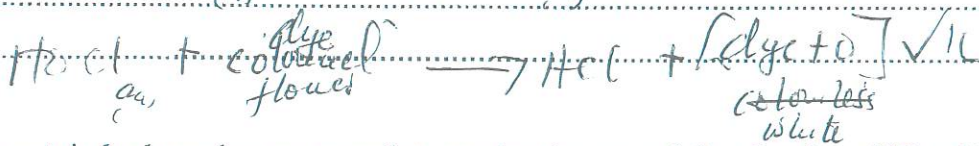
oxidising agent ✓

b) Give the formula of another reagent that can be used instead of potassium manganate (VII). (1 mark)

- Lead (IV) oxide ✓

- Manganese (IV) oxide ✓

c) Using an equation, illustrate how chlorine bleach coloured substances. (1 mark)



17. A certain hydrocarbon on complete combustion gave 9.9g of carbon (IV) oxide and 4.86g of water.

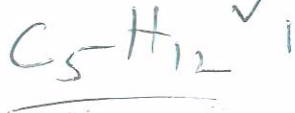
Calculate the empirical formula of the hydrocarbon (3marks)

$$\frac{12}{44} \times 9.9 = 2.699997 \quad \checkmark$$

$$\frac{2}{18} \times 4.86 = 0.539999 \quad \checkmark$$

$$\frac{2.7}{120}$$

C	H		
2.7g	0.54	1	2.4 x 3
12	1	5	12
2.7	0.54		
12	0.54 ✓		
0.225	0.225 ✓		
0.225	0.225 ✓		



A-A

Duko

18. Magnesium hydroxide is used as a medication to relieve stomach acidity.

a) Write the equation for the reaction that occurs in the stomach when one takes in the medicine. (1 mark)



b) What type of reaction takes place in the stomach after taking the medicine? (1 mark)

Neutralisation

c) Sodium hydroxide cannot be used for the same purpose. Explain. (1 mark)

- Sodium hydroxide is a strong base. It affects the stomach lining/mucosa.

19. The table below shows atomic numbers of elements represented by the letter R to Y. The letters are not the actual chemical symbols of the elements.

Elements	R	S	T	U	V	W	Z	Y
Atomic Number	3 2, 1	7 2, 5	8 2, 6	9 2, 7	10 2, 8	11 2, 8, 1	12 2, 8, 2	13 2, 8, 3

a) Two elements that belong to the same period of the periodic table. (1 mark)

R, S, T, U, V OR W, X, Y.

b) Two elements in the same group (1 mark)

R and W

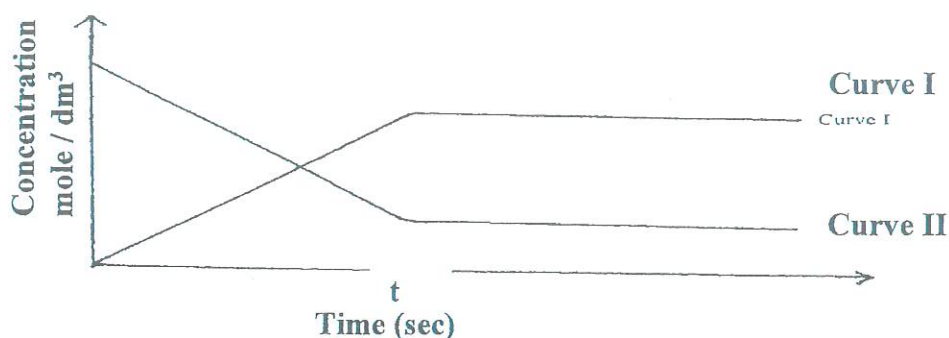
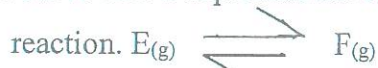
c) State **one** use of the element V.

(1 mark)

- Street / advertisement lights

- Provide inert environment in bulbs.

20. The curve below represent the changes in the concentrations of substance E and F with time in the



a) Which curve represents the changes in the concentration of substance F? Give a reason. (2 marks)

Curve I - Concentration increases with time until equilibrium.

b) Give a reason for the shapes of the curves after time (t) seconds. (1 mark)

- The rate of forward / back ward reaction is attained (Dynamic equilibrium is attained)

21.(a) Define the term solubility.

(1 mark)

- The maximum amount of a solid that can saturate 100g of water at a given temperature

b) The following were the results obtained in an experiment to determine solubility of potassium nitrate at room temperature.

Case

Mass of evaporating dish = 14.32 g

Mass of evaporating dish + saturated solution = 35.70 g

Mass of evaporating dish + salt (residue) = 18.60 g

Calculate the solubility of potassium nitrate from the above results.

(2 marks)

Mass of saturated solution = $35.70 - 14.32 \Rightarrow 21.38 \text{ g}$

Mass of dry salt = $18.60 - 14.32 \Rightarrow 4.28$

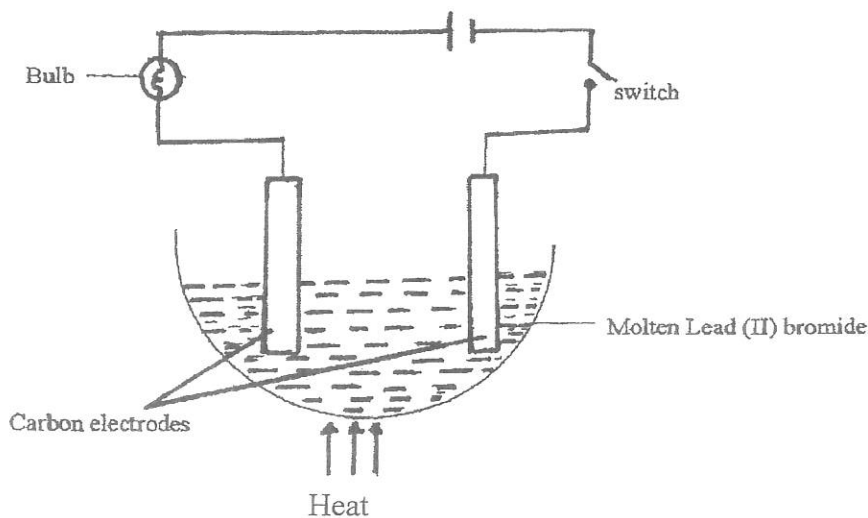
Mass of water $\Rightarrow 21.38 - 4.28$

$= 17.1 \text{ g}$

If $17.1 \text{ g H}_2\text{O} - 4.28 \text{ g salt}$
 $100 \text{ g H}_2\text{O} - ?$

$\frac{100 \times 4.28}{17.1} = 25.029 \text{ g/100g H}_2\text{O}$

22. Study the set-up below and answer the questions that follow;



a) State and explain two observations made when the circuit is completed.

(2marks)

i) Bulb lights

ii) Grey beads of lead metal are deposited at the cathode

iii) Red-brown vapour of bromine are produced at the anode

b) What precaution should be taken when performing this experiment? Give a reason

(1 mark)

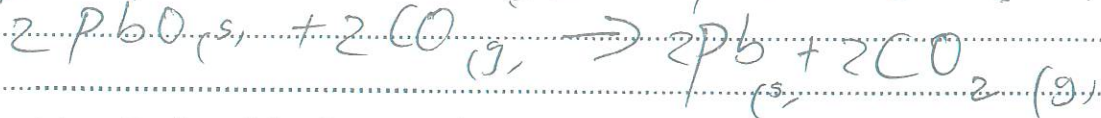
~~avoid inhaling~~

use a gas mask / do the experiment in the fume chamber to avoid inhaling the bromine gas. It is corrosive to human tissue, irritates eyes.

23. Dry carbon (II) oxide gas was passed over heated lead (II) oxide.

a) Write the equation for the reaction.

(1 mark)



b) Give the industrial application of the above reaction.

(1 mark)

In extraction of lead metal/metals

c) Name another gas that can be used in the above reaction.

(1 mark)

- Hydrogen
- ~~Nitrogen (II) oxide~~ Ammonia

24. a) Consider the reaction shown below.



Using oxidation numbers of sulphur in H_2S and SO_2 , identify the reducing agent. Explain

(2 marks)

Hydrogen sulphide

b) What name is given to the process used to control pollution caused by sulphur (IV) oxide in a sulphuric (VI) acid plant?

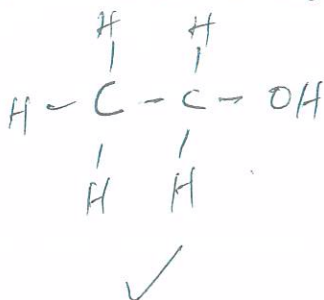
(1 mark)

Scrubbing

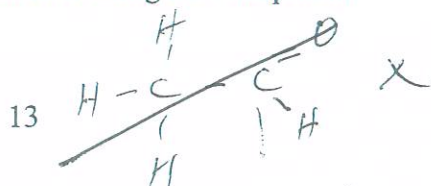
* 25. The following is a formula of an organic compound: $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$

a) Draw and name the organic acid and alkanol used in making the compound.

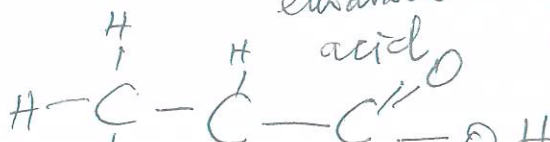
(2 marks)



Ethanol



ethanoic acid



Propanoic Acid

Q12

b) Name the compound and the gas formed when the alkanol in (a) above is reacted with potassium.

(1 mark)

(i) potassium ethoxide

(ii) Hydrogen gas.

26. (a) State **Graham's law** of diffusion.

(1 mark)

Rate of diffusion of a gas is inversely proportional to the square root of its density provided temp. and pressure remains constant

(b) A certain volume of gas T takes 180 seconds to diffuse through a porous plug. An equal volume of gas Q takes 240 seconds to diffuse through the same plug. Calculate the molar mass of Q. (2marks)

(Relative molecular mass of gas T = 18)

$$\frac{R_A}{R_B} = \sqrt{\frac{M_B}{M_A}} = \sqrt{\frac{t_B}{t_A}} = \frac{t_{m A}}{t_{m B}}$$

$$\frac{T}{Q} = \sqrt{\frac{M_T}{M_Q}} = \frac{180}{240} = \sqrt{\frac{18}{M_Q}}$$

27. Sulphur IV oxide gas dissolves in water to form sulphuric IV acid (H_2SO_3),

a) Write the electronic arrangement of Sulphur in the compound H_2SO_3

(2mks)



$$(+2) + 5 + (-6) = 0$$

$$S = (+6 - 2)$$

$$S = +4$$