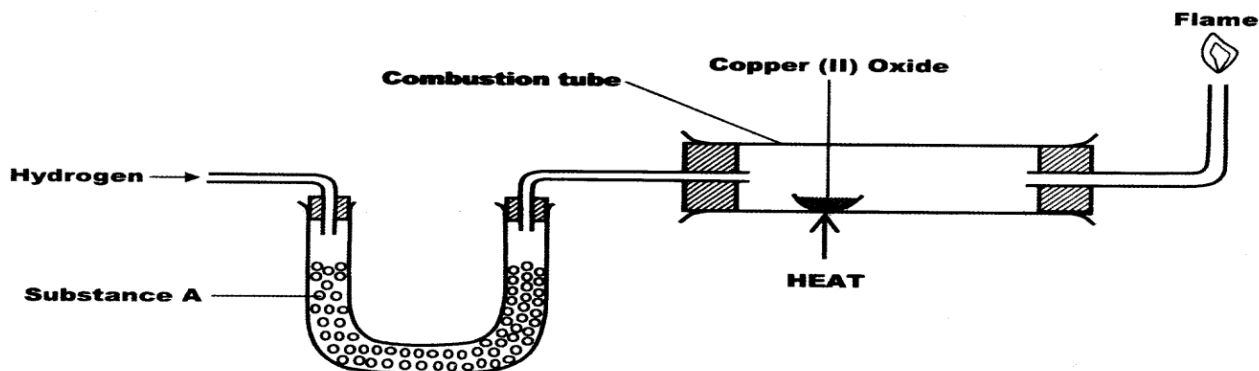


4. The set up below was used to investigate the reaction between hydrogen gas and copper



(a) Name substance A. (1 mark)

- ❖ Fused anhydrous calcium chloride
- ❖ Cao: fused CaCl_2

(b) State the observation made in the combustion tube. (1 mark)

- ❖ Black CuO changes to brown Cu metal
- ❖ Formation of colourless liquid on the cooler parts of the combustion tube.

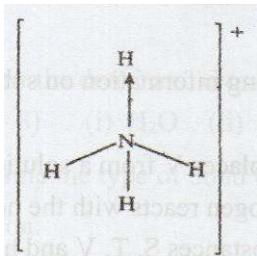
(c) Explain the observation stated in (b) above. (1 mark)

- ❖ Copper (II) oxide is reduced by hydrogen to copper metal while hydrogen is oxidized to water / CuO reduced to Cu / H_2 Oxidized to H_2O

No. 5. Starting with sodium metal, describe how a sample of crystals of sodium hydrogen carbonate may be prepared. (3 marks)

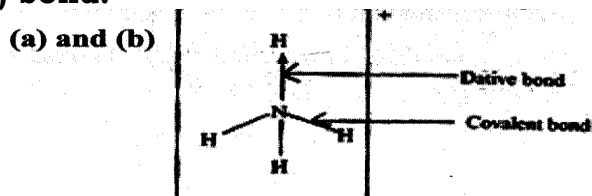
- ❖ React sodium with water to get sodium hydroxide. Bubble into this solution excess carbon (IV) oxide to get sodium hydrogen carbonate

No. 6. Ammonium ion has the following structure



Label on the structure:

- (a) covalent bond;
(b) coordinate (dative) bond.





No. 7. When 8.53g of sodium nitrate were heated in an open test tube, the mass of oxygen gas produced was 0.83 g. Given the equation of the reaction as $2\text{NaNO}_3(\text{s}) \rightarrow 2\text{NaNO}_2(\text{s}) + \text{O}_2(\text{g})$

Calculate the percentage of sodium nitrate that was converted to sodium nitrite. (Na = 23.0, N = 14.0, O = 16.0) (3 marks)

$$\text{Moles of oxygen} = 0.83 / 32 = 0.0259375$$

$$\text{Moles of NaNO}_3 = 2 \times 0.0259375 = 0.051875$$

$$0.051875 \times 85 = 4.4094$$

$$\text{R.M.M NaNO}_3 = 85$$

$$\text{Mass of NaNO}_3 = \text{converted} \frac{0.051875 \times 85}{4.4094} = 4.41$$

$$\frac{4.41 \times 100}{8.53}$$

$$= 51.693\%$$

$$= 51.7\%$$

No.8. Aluminium is both malleable and ductile.

(a)What is meant by?

(i) Malleable: (1 mark)

❖ Can be hammered into sheets.

(ii)Ductile (1 mark)

❖ Can be drawn into wires.

(b)State One use of aluminium based on:

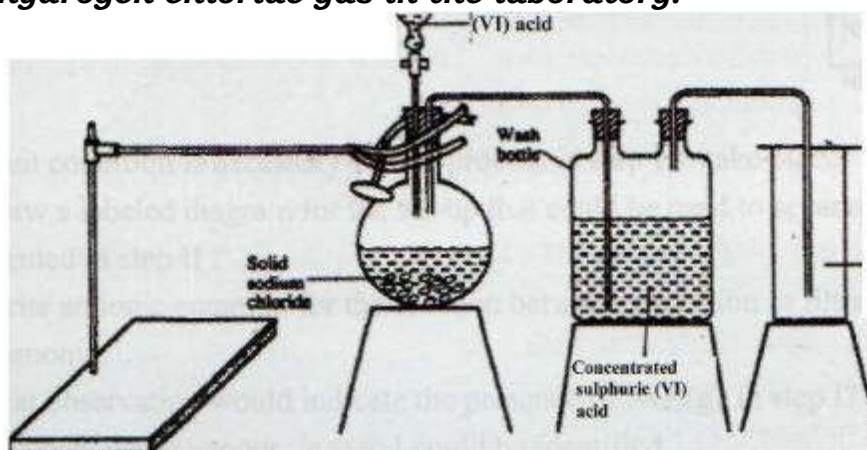
(i)malleability (½ marks)

❖ Making of furnaces/ motor vehicle parts/ aeroplane parts, window / door frames, cups, plates, packaging materials, pans, making sheets/ roof.

(ii)ductility (½ marks)

❖ electricity cables/ wires.

No. 9. The diagram below represents the set-up that was used to prepare and collect hydrogen chloride gas in the laboratory.



State the purpose of concentrated sulphuric (VI) acid in the wash bottle.

(1 mark)

❖ It is a drying agent.

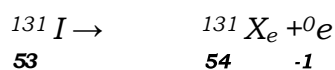
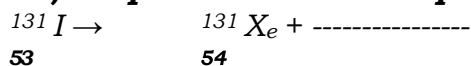
Write an equation for the reaction between dry hydrogen chloride and heated iron. (1 mark)



No. 10 . Iron (III) oxide was found to be contaminated with copper (II) sulphate. Describe how a pure sample of iron (III) oxide can be obtained. (3 marks)

- ❖ Add water to dissolve $CUSO_4$, Fe_2O_3 doesn't dissolve
- ❖ Filter out the undissolved Fe_2O_3
- ❖ Wash the residue with plenty of water to remove traces of the filtrate.
- ❖ Dry the residue between the filter papers

No. 11. a) Complete the nuclear equation below: (1 mark)



(b) The half-life of ${}^{131}I$ is 8 days.

Determine the mass of ${}^{131}I$ remaining if 50 grammes decayed for 40 days (1 mark)

53

$$\begin{matrix} \text{❖ } 50g & 25g & 12.5g & 6.25g & 3.125g & 1.5625g \\ \text{Or } & NW = 0.4(\frac{1}{2})^n & & & & \\ & NW = 50 \times (\frac{1}{2})^5 = 1.5625g & & & & \end{matrix}$$

(c) Give one harmful effect of radioisotopes. (1 mark)

- ❖ Instant / cause death
- ❖ Cause cancer
- ❖ Cause gene mutation

No. 12. During an experiment, chlorine gas was bubbled into a solution of potassium iodide.

(a) State the observations made. (1 mark)

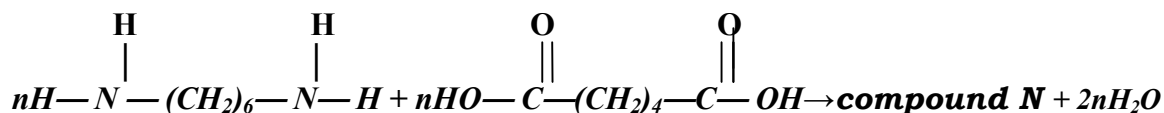
- ❖ Solution turned from colourless to dark brown
- ❖ Greenish yellow / pale green colour of Cl_2 disappears
- ❖ Brown solution / black solid is deposited

(b) Using an ionic equation, explain why the reaction is redox. (2 marks)

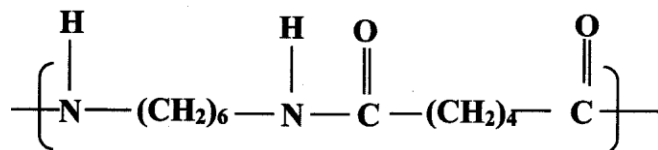
- ❖ $Cl_2(aq) + 2I^-(aq) \rightarrow I_2(aq) + 2Cl^-(aq)$
- ❖ **Explanation;** Iodine oxidation state changes from -1 to 0 hence oxidation while Cl_2 changes from 0 to -1 hence reduction / increase in ON and decrease in ON or movement of electrons Cl_2 gains e^- 's where I loses



No.13.(a) Draw the structure of compound N formed in the following reaction.



ANSWER

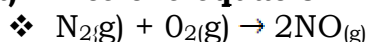


(b) Give one use of compound N. (1mk)

- ❖ Making synthetic fibres such as for: - Ropes
- ❖ Blouses
- ❖ Stockings
- ❖ Undergarments Trousers

No. 14. When fuels burn in the internal combustion engine at high temperature, one of the products formed is nitrogen (II) oxide.

(a) Write the equation for the formation of nitrogen (II) oxide. (1 mark)



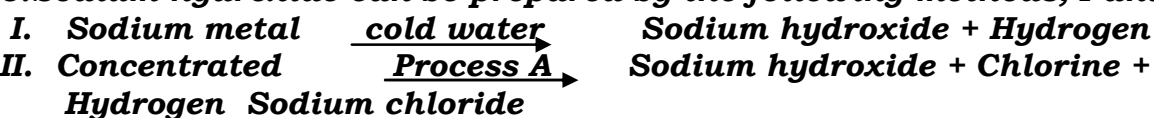
(b) Give a reason why nitrogen (II) oxide is not formed at room temperature. (1 mark)

- ❖ Nitrogen atoms in the molecule are joined by strong triple covalent bond that requires a lot of energy to break than provided at room temperature

(c) Describe how formation of nitrogen (II) oxide in the internal combustion engine leads to gaseous pollution. (2 mark)

- ❖ Nitrogen (II) oxide reacts with oxygen in air to form nitrogen (IV) oxide that dissolves in water vapour causing acid rain.

15. Sodium hydroxide can be prepared by the following methods; I and II.



(a) Name one precaution that needs to be taken in method I. (1 mark)

- ❖ Small piece of sodium metal (pea size) with a lot of water
- ❖ Perform the experiment wearing goggles.

(b) Give the name of process A. (1 mark)

- ❖ Electrolysis

(c) Give one use of sodium hydroxide. (1 mark)

- ❖ Manufacture of paper (soften), soaps and detergents
- ❖ Fractional distillation of liquid air
- ❖ Extraction of aluminium metal
- ❖ Manufacture of bleaching agents eg NaOCl paper, textiles, oil refinery
- ❖ Making herbicides on weed killers
- ❖ Textile industry to soften

No. 16. The atomic number of sulphur is 16. Write the electron configuration of sulphur in the following: (2 marks)

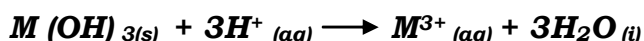
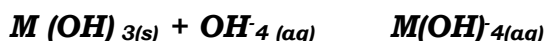
(a) H₂S

❖ 2.8.8

(b) SO₃²⁻

❖ 2.8.2

No. 17. A compound whose general formula is M(OH)₃ reacts as shown by the equation below.



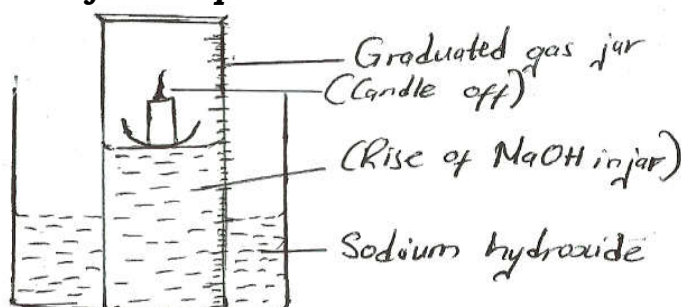
(a) What name is given to compounds which behave like M(OH)₃ in the two reactions. (1 mark)

❖ Amphoteric

(b) Name two elements whose hydroxides behave like that of M. (2 marks)

❖ Lead, Zinc and Aluminium

No. 18. A water trough, aqueous sodium hydroxide, burning candle, watch glass and a graduated gas jar were used in an experimental set up to determine the percentage of active part of air. Draw a labeled diagram of the set up at the end of the experiment.



No. 19. In an experiment on rates of reaction, potassium carbonate was reacted with dilute sulphuric (VI) acid.

(a) What would be the effect of an increase in the concentration of the acid on the rate of the reaction? (1 mark)

❖ The rate of reaction increases. This is because when the concentration is high: the number of collisions between particles is also high hence reacts faster,

(b) Explain why the rate of reaction is found to increase with temperature. (2 mark)

❖ Increase in temperature results in increase in the kinetic energy of the particles. This makes particles move faster and collide frequently leading to faster rate of reaction.



No. 20. 60 cm³ of oxygen gas diffused through a porous partition in 50 seconds. How long would it take 60 cm³ of sulphur (IV) oxide gas to diffuse through the same partition under the same conditions? (S = 32.0, O = 16.0) (3 marks)

$$\frac{\text{Time for SO}_2}{\text{Time for O}_2}$$

$$= \sqrt{\frac{R.M.M_{SO_2}}{R.M.M_{O_2}}}$$

$$R.M.M \text{ of SO}_2 = 64$$

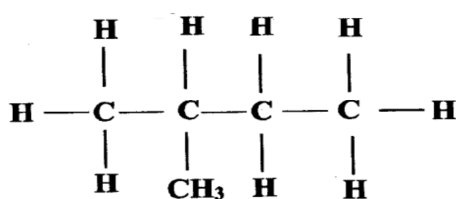
$$R.M.M \text{ of O}_2 = 32$$

$$\frac{\text{Time for SO}_2}{50}$$

$$= \sqrt{\frac{64}{32}}$$

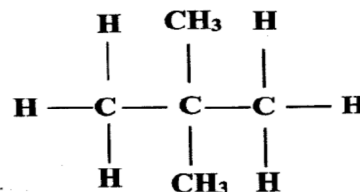
$$\text{Time for SO}_2 = 70.7 \text{ seconds}$$

No. 21. Draw and name the isomers of pentane. (3 marks)



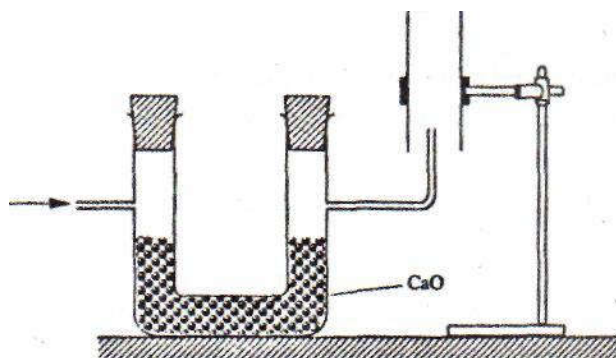
Name: 2-methylbutane

and



Name: 2,2 dimethylpropane

No. 22. The set-up below was used to collect a dry sample of a gas



Give two reasons why the set-up cannot be used to collect carbon (IV) oxide gas. (2 marks)

- ❖ It is denser than air
- ❖ It will react with calcium oxide since CO₂ is acidic and CaO is basic



No. 23. Given the following substances: wood ash, lemon juice chloride.

(a) Name one commercial indicator that can be used to show whether wood ash, lemon juice and sodium chloride are acidic, basic or neutral. (1 mark)

(b) Classify the substances in 15(a) above as acids, bases or neutral. (2 marks)

No. 24. Describe how a solid sample of potassium sulphate can be prepared starting with 200cm³ of 2M potassium hydroxide. (3 marks)

❖ Vol of 2KOH = 100cm³ (or mols = $\frac{0.4}{2} = 0.2$)

- ❖ Mix the KOH_(aq) and H₂SO₄ acid
- ❖ Concentrate the mixture/ heat the mixture
- ❖ Crystallise the solution (or heating the solution to dryness)
- ❖ Dry crystals

No. 25. Charcoal is a fuel that is commonly used for cooking. When it burns it forms two oxides.

(a) Name the two oxides. (2 marks)

- ❖ Carbon (IV) oxide / CO₂/ carbon dioxide
- ❖ Carbon (II) oxide/ CO/ carbon monoxide

(b) State one use of the two oxides. (1 mark)

- ❖ Fire extinguisher/ photosynthesis
- ❖ Refrigeration
- ❖ Solway process
- ❖ Fizzy drinks
- ❖ Food preservation
- ❖ Extraction of metals
- ❖ Manufacture of methanol
- ❖ Manufacture of fuel (water, gas)

NO. 26. Hydrogen sulphide is a highly toxic and flammable gas. It is normally prepared in a fume chamber.

(a) Name two reagents that can be used to prepare hydrogen sulphide in the laboratory. (1 mark)

- ❖ Iron (II) sulphide or conc sulphide / copper sulphide (Accp formula: FeS/ HCl)
- ❖ Hydrochloric acid or lead (II) sulphide/ HNO₃

(b) One of the uses of hydrogen sulphide is to produce sulphur as shown in the following equation: 2H₂S(g) + SO₂ (g) -> 3S(s) + 2H₂O(l)

Identify the reducing agent in this reaction and give a reason for your answer. (1 mark)

- ❖ Hydrogen sulphide
- ❖ The sulphur changes from -2 to zero/ (it reduces SO₂ to S) i.e. +4 to 0 / sulphur lost e's in the H₂S to form sulphur

(c) Other than production of sulphuric (VI) acid, state one commercial use of sulphur. (1 mark)

- ❖ Vulcanization of rubber
- ❖ Manufacture of sulphur drugs
- ❖ Manufacture of gun powder/ match sticks / explosives/ fungicides



No. 27. Describe an experimental procedure that can be used to extract oil from nut seeds. (2 marks)

- ❖ Crush and grind using a pestle and mortar, add a suitable solvent of propanone, ethanol, alcohol and stir to dissolve oil. Filter the mixture to obtain a solution of the oil. Leave the solution in the sun for propanone to evaporate, leaving the oil.

No. 28 . A mixture contains ammonium chloride, copper (II) oxide and sodium chloride. Describe how each of the substances can be obtained from the mixture. (3 marks)

- ❖ Heat the mixture to sublime the NH_4Cl . Add water to dissolve the NaCl . Copper (II) oxide does not dissolve. Filter and evaporate the filtrate to obtain sodium chloride.

No. 29 . When a student was stung by a nettle plant, a teacher applied an aqueous solution of ammonia to the affected area of the skin and the student was relieved of pain. Explain. (2 marks)

- ❖ The product from the nettle plant is acidic; an aqueous ammonia solution being basic neutralizes the acidic product.