

CHEM FORM 3 MS

INSTRUCTIONS: (ANSWER ALL QUESTIONS)

TIME: (1 HOUR 30 MINUTES)

1. Study the information below and answer the questions that follow:

| | | | | | | | |
|-------------------------|-------------------|-------------------|--------------------------------|-------------------|--------------------------------|------------------|--------------------------------|
| Formula of the chloride | NaCl | MgCl ₂ | AlCl ₃ | SiCl ₄ | PCl ₃ | SCl ₂ | |
| M.P(⁰ C) | 801 | 714 | - | -70 | -91 | -80 | |
| Formula of the oxide | Na ₂ O | MgO | Al ₂ O ₃ | SiO ₂ | P ₄ O ₁₀ | SO ₂ | Cl ₂ O ₇ |
| M.P(⁰ C) | 1190 | 3080 | 2050 | 1730 | 560 | -73 | -90 |

- i. Aluminium chloride AlCl₃, has an unexpected bond type and structure. State the type of bond and the structure in AlCl₃

(2 marks)

a. Bond type *Covalent*

b. Structure *Simple Molecular structure*

- ii. What type of bonding would AlCl₃ be expected to have why?

(2 marks)

..... *ionic bond. Aluminium is expected to transfer 3 electrons to 3 atoms of chlorine.*

- iii. Why is the melting point of AlCl₃ not indicated in the table above?

(1 mark)

..... *Because it sublimes when heated*

- iv. A piece of blue litmus paper is placed in a solution of sodium chloride and a solution of aluminium chloride. Explain what would be observed in each case.

(2 marks)

- a. Sodium chloride solution

..... *The blue litmus paper remains blue*

..... *The solution is neutral*

- b. Aluminium chloride solution

..... *The blue litmus paper turns red*

CHEM FORM 3 MS

The solution is acidic.

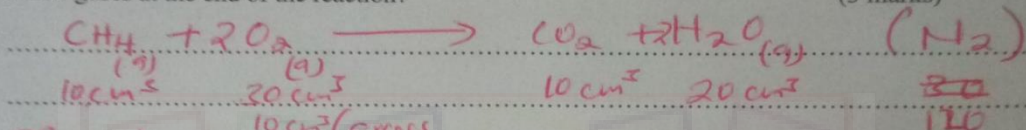
Explain the large difference in the melting point of the compound of formula MgO and P_4O_{10} (2 marks)

MgO is made of strong ionic bond and has a giant ionic structure while P_4O_{10} has weak covalent bond and simple molecular structure.

2. State Gay Lussac's law (1 mark)

When gases react they do so in simple volumes that bear a simple ratio to one another and to the volumes of the products if gaseous at constant temperature and pressure.

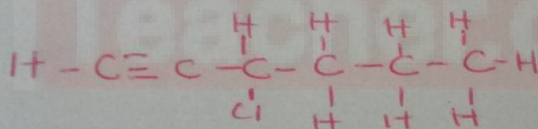
a. 10cm^3 of methane (CH_4) gas is exploded with 150cm^3 of air containing 20% oxygen and 80% nitrogen. The products were allowed to cool to room temperature. What will be the total volume of the gases at the end of the reaction? (3 marks)



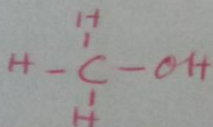
$\frac{20}{100} \times 150 = 30$ (excess oxygen)
 $150 - 30 = 120$
 Total volume = $10 + 20 + 120 = 160\text{cm}^3$

b. Give the open structures of:-

i. 3-chlorohex-1-yne (2 marks)



ii. CH_3OH (2 marks)



vi. What is meant by Isomerism? (1 mark)

The existence of different forms of the same element in the same physical state the existence of compounds with same molecular formula but different structural formula.

vii. Draw and name two Isomers of butane. (2 marks)

CHEM FORM 3 MS

Download this and other FREE materials from <https://teacher.co.ke/notes>



CHEM FORM 3 MS

The solution is acidic.

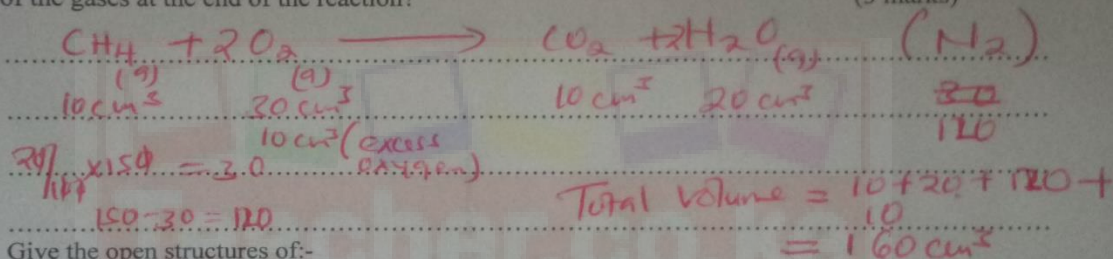
- v. Explain the large difference in the melting point of the compound of formula MgO and P_4O_{10} (2 marks)

MgO is made of strong ionic bond and has a giant ionic structure while P_4O_{10} has weak covalent bond and simple molecular structure.

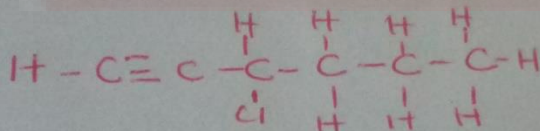
2. State Gay Lussac's law (1 mark)

When gases react they do so in simple volumes that bear a simple ratio to one another and to the volumes of the products if gaseous at constant temperature and pressure.

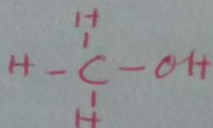
- a. 10cm^3 of methane (CH_4) gas is exploded with 150cm^3 of air containing 20% oxygen and 80% nitrogen. The products were allowed to cool to room temperature. What will be the total volume of the gases at the end of the reaction? (3 marks)



- b. Give the open structures of:-
i. 3-chlorohex-1-yne (2 marks)



- ii. CH_3OH (2marks)



- vi. What is meant by Isomerism? (1 mark)

The existence of different forms of the same element in the same physical state. The existence of compounds with same molecular formula but different structural formula.

- vii. Draw and name two Isomers of butane. (2 marks)

3. (a) (i) Name two allotropes of sulphur. (2 marks)

Rhombic

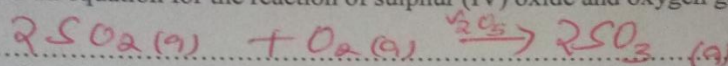
Monoclinic

(ii) During extraction of sulphur ^{from compressed air} super-heated water is used. State its two functions. (2 marks)

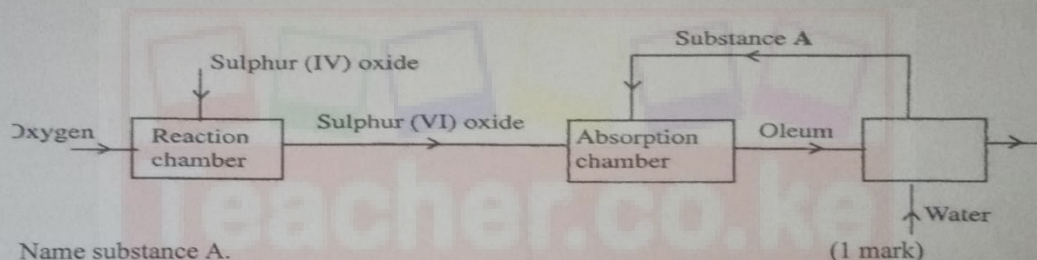
- To melt the sulphur in molten state

- To push molten sulphur upwards to the surface

(iv). Write an equation for the reaction of sulphur (IV) oxide and oxygen gas (1 mark)



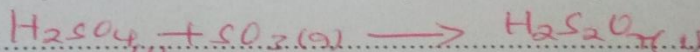
(b). The flow diagram below shows some of the process involved in production of sulphuric (vi) acid. Use it to answer the questions that follow.



I. Name substance A. (1 mark)

Concentrated Sulphuric (vi) acid

II. Write an equation for the reaction that takes place in the absorption chamber. (1 mark)



III. Vanadium V oxide is commonly used catalyst in contact process. Name another catalyst which can be used for this process. (1 mark)

Platinum catalyst

IV. Give two reasons why vanadium (v) Oxide is the commonly used catalyst. (2 marks)

- It is cheap

- It is less easily poisoned

V. Explain the reason why sulphur (vi) oxide is not dissolved directly in water during manufacture of sulphuric (vi) acid. (1 mark)

The reaction is extremely exothermic. It would boil to produce a mist of sulphuric (vi) acid which is dangerous.

VI. Give 2 uses four use of sulphuric (vi) acid. (2 marks)

CHEM FORM 3 MS

Download this and other FREE materials from <https://teacher.co.ke/notes>



CHEM FORM 3 MS

Download this and other FREE materials from <https://teacher.co.ke/notes>

$\frac{5}{5} = 5$
 - used in manufacture of fertilizers
 - used in car batteries

4. A mixture contains iron (III) chloride, zinc (II) oxide and potassium chloride. Describe how each of the substance can be obtained from the mixture. (2 marks)

Heat the mixture for iron (III) chloride to sublime. Cool the vapour to collect deposits of iron (III) chloride. Add water and stir the remaining mixture for KCl to dissolve. Filter to collect ZnO as the residue. Wash the filtrate to dryness to collect KCl powder.

5. Starting with copper (II) oxide, describe how you can prepare copper (II) sulphate crystals. (2 marks)

Add excess copper (II) oxide to dilute sulphuric (VI) acid to form a solution of copper (II) sulphate. Filter to remove excess CuO as the residue. Wash the filtrate to saturation to form crystals of copper (II) sulphate.

6. (a) State Graham's law of diffusion (1 mark)

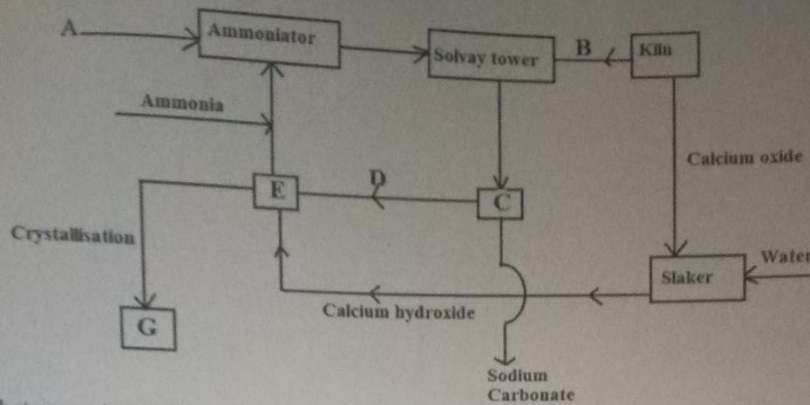
Under the same conditions of temperature and pressure, the rate of diffusion of a gas is inversely proportional to the square root of its density.

(b) 60cm^3 of oxygen gas diffused through a porous hole in 50 seconds. How long will it take 80cm^3 of sulphur (IV) oxide to diffuse through the same hole under the same conditions? (3 marks)

(S = 32.0, O = 16.0)

| | | | | |
|--|--|---|--|---|
| O_2 $V = 60\text{cm}^3$ $M = 32$ $T = 50\text{sec}$ | SO_2 $V = 80\text{cm}^3$ $M = 64$ $T = ?$ | $\frac{60 - 750}{80 \times 50}$ $\frac{80 \times 50}{60}$ $= 66.67\text{sec}$ | $\frac{T_{O_2}}{T_{SO_2}} = \sqrt{\frac{32 M_{O_2}}{64 M_{SO_2}}}$ $\frac{66.67}{x} = \sqrt{\frac{32}{64}}$ | $x = \frac{66.67}{0.7071}$ $T = 94.28\text{sec}$ |
|--|--|---|--|---|

7. The following diagram below shows a series of steps followed in the manufacture of sodium carbonate.



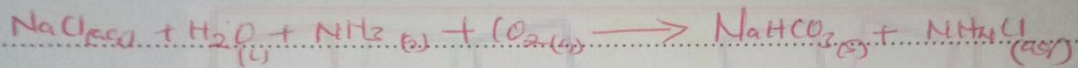
a) Name substances A and B. (2mks)

A *Brine*

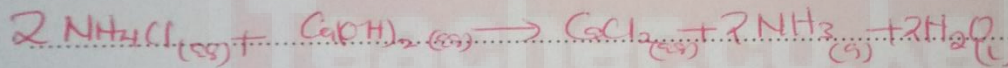
B *Carbon(IV) oxide*

b) Write equations for the reactions taking place in:

i) The Solvay tower. (2mks)



ii) Chamber E. (1mk)



c) i) Identify substance G. (1mk)

Calcium chloride

ii) State one laboratory use of substance G. (1mark)

I. Laboratory use

used as a drying agent

d) Name two important industrial use of sodium carbonate. (2mks)

- used in manufacture of glasses

- used to soften hard water

- used in paper industries