CHEMISTRY

Unit -1

PERIODIC TABLE AND ELECTRONIC CONFIGURATION

Concepts:

1. Shells and Subshells
2. The number of electrons in subshells
3. Filling of electrons in subshells
4. Peculiarity of the electronic configuration of chromium(Cr) and copper(Cu)
5. Subshell electronic configuration and blocks
6. The period and the group can be found out on the basis of subshell electronic configuration
7. The group number of s block elements
8. p block and d block elements
9. Characteristics of d block elements

Shells

According to Bohr model, in an atom electrons are arranged in various paths around the nucleus. These paths are called Shells. In shells electrons are filled in the increasing order of energy. Shells are named as K,L,M,N.

Eg: Electronic configuration of $_3$Li is 2,1

Question.

Write the electronic configuration of $_{11}$Na

Subshells

According to new assumptions electrons in each energy level are arranged in its sub energy levels. Each sub energy level in a shell is called subshell. They are named as s,p,d,f respectively.

Sub shells present in each shell is shown below.

Shell No	1	2	3	4
Subshells	s	s,p	s,p,d	s,p,d,f

The number of electrons in subshells.

Subshell	s	p	d	f
Maximum number of electrons that can be accommodated	2	6	10	14

Filling of electron in subshells

When the electrons in an atom are distributed in subshells, they are filled in the increasing order of the energies of subshells. This is called subshell electronic configuration.

Increasing order of subshell energy level is represented below

1s<2s<2p<3s<3p<4s<3d<4p.....

Example.

$_3$Li Total number of electrons=3. Two electrons are filled in 1s and remaining electrons should enter the 2s subshell. The subshell electronic configuration of this element can be written as **$1s^2 2s^1$**

Peculiarity of the electronic configuration of Chromium and Copper

The d subshell can be accommodate maximum of 10 electrons. The completely filled(d^{10}) or half filled (d^5) of this subshell is more stable. If then identify the correct subshell electronic configuration of $_{24}$Cr

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^2$ ☐

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$ ☐

Question

Write the subshell electronic configuration of $_{29}$Cu

Subshell electronic configuration and blocks

Based on subshell electronic configuration elements are classified in to four blocks s,p,d and f in the modern periodic table.

The block to which the element belongs will be the same as the subshell to which the last electron is added.

Element	Subshell electronic configuration	block
$_4$Be	$1s^2 2s^2$	s
$_{18}$Ar	$1s^2 2s^2 2p^6 3s^2 3p^6$	p
$_{21}$Sc	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^1 4s^2$	d

Method for finding the period and group of an element from subshell electronic configuration

Period number - Number of shells

Group number for s block elements - Number of electrons present in the last subshell

Group number of p block elements - Add 12 to the number of p electrons

Group number of d block elements - The sum of electrons in the outer most s and preceding d subshell

Example:

$1s^2 2s^2 2p^6 3s^2 3p^6 \mathbf{3s^1}$ Period=3 Group=1 Block= s

$1s^2 \mathbf{2s^2 2p^3}$ Period=2 Group=15 Block= p

$1s^2 2s^2 2p^6 3s^2 3p^6 \mathbf{3d^6 4s^2}$ Period=4 Group=8 Block= d

Question:

Complete the table

Atomic number	Subshell electronic configuration	Period	Group	Block
25	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$	.....	.....	.....
.....	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$	.....	.....	.....
17	.....	.....	.....	.....

Characteristics of d block elements

* Show similarities in properties in groups and in periods
* Show variable oxidation states
* Most of them form coloured compounds.

Model Questions

1. Some subshells are given. Find out the subshells which are not possible.

(3s,1p,3f,3d)

2. Of the given two subshell electronic configuration of an element A (symbol is not real)

i) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^1$

ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$

a. Find the correct electronic configuration of the element "A"

b. To which block of the periodic table does this element belong ?

3.How many electrons can be accommodated in f subshell ?

(a) 10 (b) 6 (c) 7 (d) 14

4.Subshell electronic configuration of some elements are given(Symbols are not real)

A - $1s^2\ 2s^2\ 2p^4$

B - $1s^2\ 2s^2\ 2p^6\ 3s^1$

C - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$

D - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6\ 4s^2$

a. Find the atomic number of B

b. Which subshell in D has the highest energy?

c. Find the group and period number of D

5.Which of the following electronic configuration is that of a d block element?

a. $1s^2\ 2s^2\ 2p^4$

b. $1s^2\ 2s^2\ 2p^6\ 3s^2$

c. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6 3d^6 4s^2$

6. Some Characteristic of Manganese are given.

- There are 4 shells.
- Last 5 electrons enter in d subshell.

a. Write the subshell electronic configuration of manganese.

b. Write any two characteristics of the block to which this element belongs.

7. Complete the table.

Element	No of electrons	Subshell electronic configuration
$_{7}N$	7	.....
$_{13}Al$	13	.....
$_{11}Na$	.....	$1s^2 2s^2 2p^6 3s^1$
$_{18}Ar$	18	.....

Unit – 2

GAS LAWS AND MOLE CONCEPTS

Concepts

- Gas Laws
  - Boyle's law
  - Charles law
  - Avogadro's law
- Gram Atomic Mass (GAM)
- Gram Molecular Mass (GMM)
- Avogadro Number (N_A)
- Mole atom
- Mole molecule
- Molar volume
- Molar volume at STP

Explanations:

Boyle's law: At constant temperature the volume of a definite mass of gas is inversely proportional to its pressure.

PV = a constant

Eg: The size of the air bubbles rising from the bottom of an aquarium increases.

Charles law: At constant pressure the volume of a definite mass of gas is directly proportional to the temperature in kelvin scale

$\frac{V}{T}$ = a constant

Eg: A balloon kept in direct sun light bursts

Avogadro's law: At constant temperature and pressure, the volume of a gas is directly proportional to the number of molecules

Gram Atomic Mass (GAM): The mass of an element in grams equal to its atomic mass is called 1 gram atomic mass(1 GAM)
1 GAM of an element contains 6.022×10^{23} atoms
This number is known as Avogadro number and is represented as N_A
This is equal to 1 mole atom

Gram Molecular Mass (GMM): The amount of a substance in grams equal to its molecular mass is called gram molecular mass (GMM)
1 GMM of any substance contains 6.022×10^{23} molecules.
This is equal to 1 mole molecules.

Eg: GMM of some compounds
H_2O [H – 1, O – 16] = 1x 2 + 16 = 18g
CO_2 [C – 12, O – 16] = 12 + 2 x 16 = 44g

NH_3 [N – 14, H – 1] = 14 + 1x 3 = 17g
H_2SO_4 [H – 1, S – 32, O – 16] = 1x2 + 32 + 4 x 16 = 98g
$CaCO_3$ [Ca – 40, C – 12, O – 16] = 40 + 12 + 3 x 16 = 100g

$$\text{Mole atom} = \frac{Given\ mass}{GAM}$$

Number of atoms = mole atom x 6.022×10^{23}

Eg: 60g carbon.
Mole atom = $\frac{60}{12}$ = 5, Number of atoms = 5 x 6.022×10^{23}

$$\text{Mole molecule} = \frac{Given\ mass}{GMM}$$

Number of molecules = mole molecule x 6.022×10^{23}

Eg: 360g glucose ($C_6H_{12}O_6$) [C – 12, H – 1, O – 16]

GMM of glucose = 6 x 12 + 12 x 1 + 6 x 16 = 180g
Number of moles = $\frac{360}{180}$ = 2
Number of molecules = 2 x 6.022×10^{23}

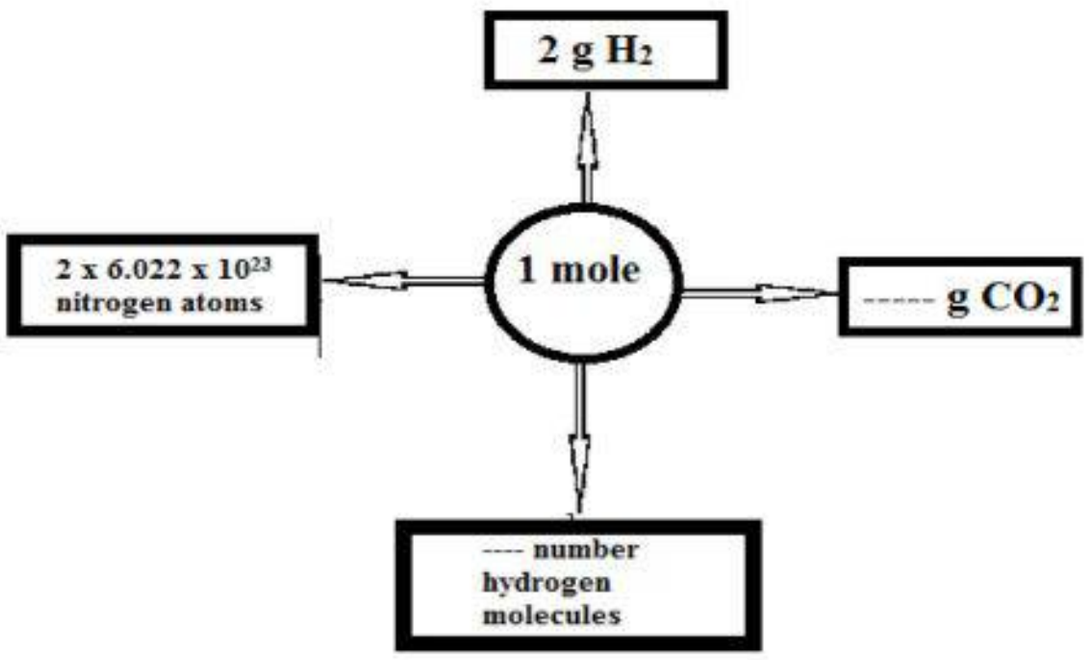
Molar volume: Volume of 1 mole of a gas is called molar volume
Molar volume of a gas at STP = 22. 4L

Model Questions:

1. Which of the following equation represents Charles law?
   [PV = a constant, V/n = a Constant, V/T = a constant]
2. Arrange the followings in the order of increasing number of molecules.
   a) 34g NH_3 b) 10g H_2 c) 1 mole carbon
3. What is the number of atoms present in 6.022×10^{23} molecules of nitrogen?
4. Calculate GMM of the following substances
   a) NaCl b) CO c) NO_2 d) H_2O
   [H – 1, C – 12, N – 14, O – 16, Na – 23, Cl – 35.5]
5. What is the mass of 6.022×10^{23} molecules of SO_2
6. Complete the following table

Substance	GMM	Given mass	No. of moles	No.of molecules	No. of atoms
NO_2	------	138g	3	------	------
CO	28g	14g	------	½ x 6.022×10^{23}	------
HNO_3	63g	------	2	------	10 x 6.022×10^{23}

7. Complete the following



Unit – 3

REACTIVITY SERIES AND ELECTROCHEMISTRY

Concepts

- Reactivity series and displacement reaction
- Galvanic cell
- Electrolytic cells
- Electrolysis of molten sodium chloride

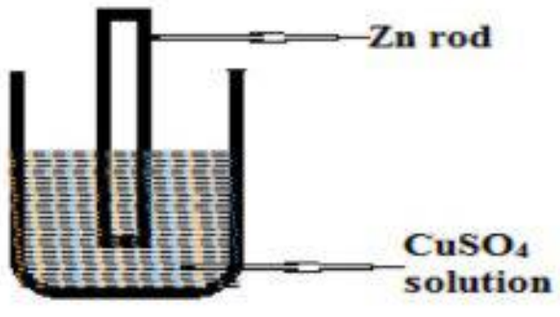
Explanations

Reactivity series and displacement reaction

* Reactivity of metals are not similar. The series in which metals have been arranged in the decreasing order of their reactivity is called reactivity series.

* When a more reactive metal comes in contact with metallic salt solution of a less reactive metal, the more reactive one replaces the less reactive one from its salt solution. This is called displacement reaction.

Eg:



(Here Zn is more reactive than Cu in $CuSO_4$ Solution)

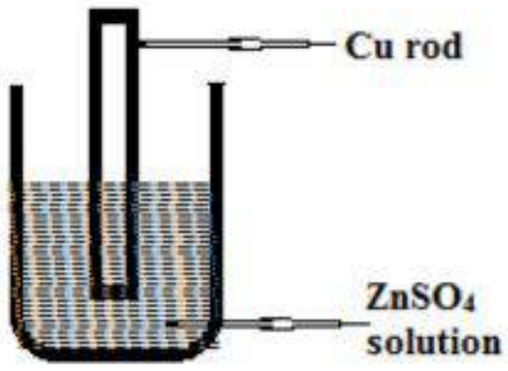
Reactions taking place,

$Zn \rightarrow Zn^{2+} + 2e^-$ (Oxidation for more reactive metal)

$Cu^{2+} + 2e^- \rightarrow Cu$ (Reduction for less reactive metal)

Over all reaction : $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

* These type of displacement reactions are Redox reactions.

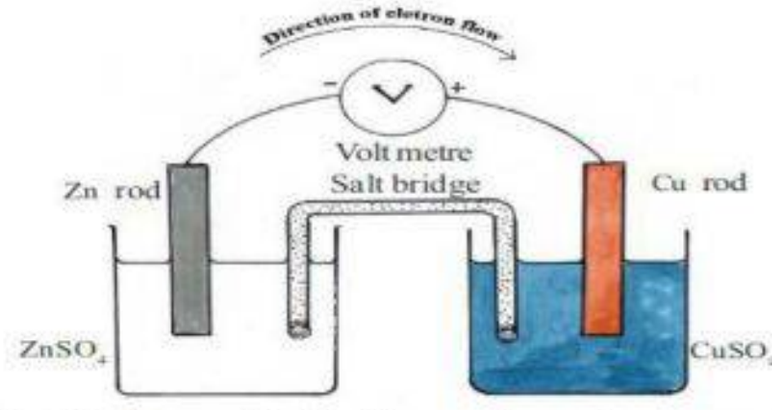


No displacement reaction takes place here.

Galvanic cell

- Galvanic cell is an arrangement in which chemical energy is converted to electrical energy by means of a redox reaction.
- Electrode that is more reactive undergoes oxidation and it is called anode, it attains negative charge Electrode that is less reactive undergoes reduction and it is called cathode, it gains positive charge.
- Salt bridge - U. tube filled with a paste of gel and salt like KCl,KNO3 etc. This maintains electrical neutrality of the cell.

In Zn - Cu galvanic cell



$Zn \rightarrow Zn^{2+} + 2e^-$ - Oxidation – Anode – negative charge

$Cu^{2+} + 2e^- \rightarrow Cu$ - Reduction – Cathode – positive charge

Redox reaction : $Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$

In a galvanic cell, transfer of electrons by the redox reaction causes flow of electric current in cell
Direction of electron flow is from anode to cathode.

Cell	Anode	Cathode
Mg – Cu	Mg	Cu
Cu – Ag	Cu	Ag
Zn - Cu	Zn	Cu

Electrolytic cells

- The process of chemical change taking place in an electrolyte by passing electricity is known as electrolysis.
- Substances which conduct electricity in molten state or in aqueous solution and undergoes chemical charge are called electrolytes. Acids, alkalies and Salts are electrolytes in their molten state or in aqueous solution.
- Electrode in which oxidation takes place is anode, this is the positive electrode here.
- Electrode in which reduction takes place is cathode, this is the negative electrode here.
- During electrolysis,
- positive ions (cations) are attracted to cathode.
- Negative ions (anions) are attracted to anode.

Electrolysis of molten sodium chloride

- In solid state sodium chloride can't conduct electricity as there is no freedom of movement for ions. But molten sodium chloride conducts electricity. When NaCl melts,

$NaCl \rightarrow Na^+ + Cl^-$

Cathode	Anode
$Na^+ + 1e^- \rightarrow Na$ Na deposits at cathode	$2Cl^- \rightarrow Cl_2 + 2e^-$ Cl_2 liberates from anode

Practice questions

1. Among the following metals which one can displace Cu from its salt solution?
   (Ag, Au, Zn)
2. In Mg- Cu galvanic cell, which is anode?
3. When molten NaCl is electrolysed , Na will be deposited at------

Unit – 4
PRODUCTION OF METALS

Concepts:

- Minerals and ores
- Concentration of ores
- Extraction of metals from concentrated ore
- Refining of metals
- Industrial preparation of iron

Explanation:

Minerals and ores

- Minerals are the metallic compounds generally seen in earth crust.
- A mineral from which a metal is extracted is called ore.
- Characteristics of ore are,
    1. Abundance
    2. Easily and cheaply separable
    3. High metal content
    4. Low making cost

Metal	Ore
Aluminium	Bauxite
Iron	Haematite, Magnetite
Copper	Copper pyrites, Cuprite
Zinc	Zinc blende, Calamine

Concentration of ore

- The process of removing the impurities (Gangue) from the ore obtained from earth's crust.

Properties of ores	Properties of impurities	Method	Example
High density	Low density	Levigation or hydraulic washing	Oxide ores, ore of gold
Low density	High density	Froth floatation	Sulphide ore,

			Copper pyrates
Magnetic	Non-Magnetic	Magnetic separation	Magnatite, the ore of iron, Tin stone
Non-Magnetic	Magnetic		
Soluble in the solution	Insoluble in the same solution	Leaching	Ore of aluminium, Bauxite

Extraction of metals from concentrated ore

- Two stages in the extraction process are,

1. Conversion of concentrated ore into its oxide.

Method	Process	Example
Calcination	Heating the ore in the absence of air at a temperature below its melting point.	Carbonates & hydroxides decompose to their oxides. $ZnCO_3 \rightarrow ZnO$
Roasting	Heating the ore in a current of air at a temperature below its melting point.	Sulphide ores are converted into oxides. $Cu_2S \rightarrow Cu_2O$

2. **Reduction of the oxide**
   - Extraction of the metal from its oxide is reduction.
   - Reducing agents like *carbon, carbon monoxide and electricity* are used for the reduction.

Refining of Metal

- The process of removal of impurities to get pure metal is refining.

Method	Characteristics	Example
Liquation	Melting point of the metal is less than the impurities.	Tin (Sn) , Lead (Pb)
Distillation	Boiling point of the metal is less than the	Zinc (Zn), Cadmium (Cd), Mercury (Hg)

	impurities.	
Electrolytic refining	Electrolysis of the salt solution of the metal.	Copper (Cu), Silver (Ag)

Industrial production of iron

Ore of the iron	Haematite (Fe_2O_3)
Raw materials fed into the blast furnace	Haematite, Limestone ($CaCO_3$), coke
Reducing agent	Carbon monoxide (CO)
Gangue	Silicon dioxide (SiO_2)
Flux	Calcium oxide (CaO)
Slag	Calcium silicate ($CaSiO_3$)

The reactions in the blast furnace are,

1. Formation of carbon monoxide
   $C + O_2 \rightarrow CO_2 + Heat$
   $CO_2 + C + Heat \rightarrow 2CO$
2. Reduction of haematite into iron
   $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
3. Decomposition of calcium carbonate
   $CaCO_3 \rightarrow CaO + CO_2$
4. Formation of slag
   $CaO + SiO_2 \rightarrow CaSiO_3$ (Flux + gangue →Slag)

Model questions

1. Identify the relation and fill up suitably.
   Iron : Haematite, Aluminium : .....
2. Select the appropriate method of concentration of the ores from the bracket.
   (froth floatation, leaching, levigation, magnetic separation)
   a) The ore is magnetic in nature and the impurities are non magnetic.
   b) Density of the impurity is higher than the ore.
3. Some minerals are given below, classify them based on the method of extraction used.
   Cu_2S, $ZnCO_3$, $Cu(OH)_2$, $CuFeS_2$

Calcination	Roasting

4. Match the following.

Metal	Refining method
Mercury	Electrolytic refining
Tin	Distillation
Copper	Liquation

5. Explain with the help of equations how the haematite is getting reduced in a blast furnace.

Unit - 5

COMPOUNDS OF NONMETALS

Concepts

1.Laboratory preparation of Ammonia
2.Properties-Physical and Chemical
3.Liquor ammonia and liquid ammonia
4.Uses of ammonia
5.Revesible reaction-Forward and backward reaction
6.Chemical equilibrium-characteristic properties
7.Lechatelier principle
9.Effect of concentration, pressure and temperature in equilibrium .

Explanation

Laboratory preparation-By heating ammonium chloride and Calcium hydroxide

$2NH_4Cl+Ca(OH)_2 \rightarrow CaCl_2+2H_2O+2NH_3$

- Formed ammonia is passed through quick lime(Calcium oxide) to remove water
- Due to less density Ammonia collected by inverted gas jar.
-

Properties

a) Easily soluble in water to form Ammonium hydroxide.
b) Pungent smell

c) Red litmus paper turn blue due to basic character
d) Density is less than air

Liquor Ammonia

Highly concentrated aqueous solution of Ammonia

Liquid Ammonia

Ammonia liquified easily by applying pressure

Uses of Ammonia

a) For the manufacture of chemical fertilizers
b) As refrigerant in ice plant
c) To clean tiles and windows pans
d) As a laboratory reagent

Reversible reaction

- Taking place in both direction
- It involves forward and backward reaction

Forward reaction-reactant change in to product

Backward reaction-product change back in to reactant.

Forward Reaction

Eg. $NH_3+HCl \rightarrow NH_4Cl$

Backward Reaction

$NH_4Cl \rightarrow NH_3+HCl$

Irreversible reaction--Reactant give product only

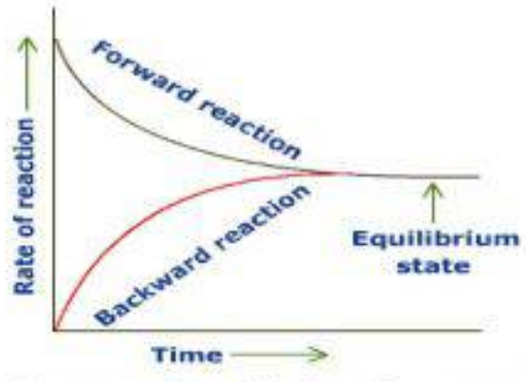
Eg. $NaOH+HCl \rightarrow NaCl+H_2O$

Chemical equilibrium: Stage at which the rate of forward reaction become equal to backward reaction.

Characteristics of Chemical equilibrium

- Both reactant and product coexist
- Rate of forward and backward reaction become equal
- Dynamics at molecular level-because forward and backward reaction occur simultaneously at equal rate.
- Occur in closed system

Graph of a Reversible Reaction



Attainment of equilibrium in a reversible reaction

Le – Chatelier principle

When the concentration, pressure or temperature of a system at equilibrium is changed, the system will readjust itself so as to nullify the effect of that change and attained a new state of equilibrium.

Influence of concentration in equilibrium

- When increase the concentration of reactant or decrease the concentration of product will increase the rate of forward reaction
- Increase the concentration of product increase backward reaction.

Eg 

  - To increase rate of forward reaction-increase the concentration of N_2 or H_2
  - To remove ammonia from the system

Effect of pressure----Influence in the case of gases only

(Boyls law--. Pressure is inversely proportion to Volume)

Eg. 

4 → 2

Here total volume of reactant is 4 and that of product is 2

When pressure of system increases volume (number of molecule) decreases on forward direction. Hence forward reaction increases.

Pressure decreases volume increases (number of molecule increases) on backward direction. Hence backward reaction increases.

Eg. 

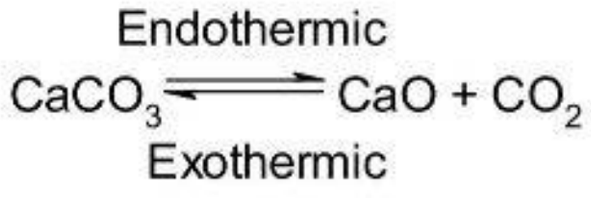
2 → 2

There is no change in total number of molecule of reactant and product. Hence pressure will not have any effect on equilibrium.

Effect of temperature

When temperature increases direction at which endothermic reaction increases.

Ie.,If forward reaction is endothermic when temperature increases forward reaction increases.



Here forward reaction is endothermic. When temperature increases forward reaction increases.
Temperature decreases backward reaction increases because it is exothermic.

Model Questions
1. Ammonia gas is collected in an inverted jar. Why?
2. Write factors that influence chemical equilibria
See the equation given below.

$$N_2 + 3\,H_2 \rightleftharpoons 2NH_3$$

Write 2 methods to increase the amount of ammonia.

Unit 6

NOMENCLATURE OF ORGANIC COMPOUNDS AND ISOMERISM

Concepts:

1. Hydrocarbons and their classification as Alkane, Alkene and Alkynes
2. General formula of Alkane, Alkene and Alkynes
3. writing the structures of Alkane, Alkene and Alkynes
4. Homologous series
5. Naming of Alkanes
   - With no branch
   - With one branch
   - with more than one same branch
6. Naming of alkenes
7. Naming of alkynes
8. Functional groups – Alcohols and ethers
9. Naming of alcohols and ethers
10. Isomerism
    - Chain
    - Functional
    - Position

Explanations:

Hydrocarbons:- Organic compounds containing carbon and hydrogen only
Classification: Alkanes – Saturated hydrocarbons **(C_nH_{2n+2})**
Alkenes – Unsaturated hydrocarbons with C – C double bond **(C_nH_{2n})**
Alkynes – Unsaturated hydrocarbons with C – C triple bond **(C_nH_{2n-2})**
Homologous series: The followings are the characteristics of homologous series

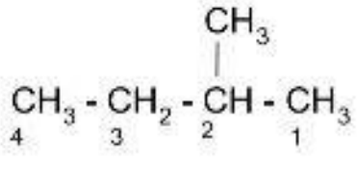
- They can be represented by a general formula
- The neighbouring members differ by – CH_2 group
- The chemical properties are similar
- Physical properties show a gradation

[Alkane is an example of homologous series. Alkenes and alkynes are other two examples of homologous series.]

Naming of alkanes with no branch :
Word root + ane

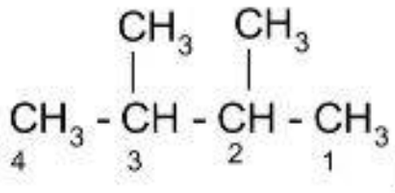
$CH_3 – CH_2 – CH_2 – CH_3$: But + ane (Butane)

Naming of alkanes with one branch :
Position number of branch + Name of branch + Word root + ane



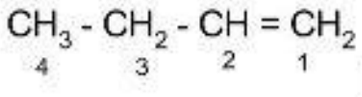
[2-Methylbutane]

Naming of alkanes with more than one same branch :
Position numbers of branches + di/tri/tetra + Name of branch + Word root + ane



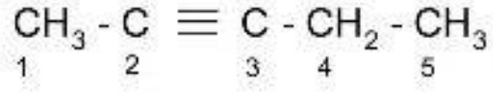
[2,3-Dimethylbutane]

Naming of alkenes :
Word root + Position numbers of double bond + ene



[But-1-ene]

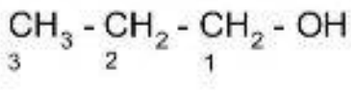
Naming of alkynes :
Word root + Position numbers of triple bond + yne



[Pent-2-yne]

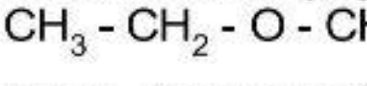
Function group : The atoms or groups of atoms which decides the physical and chemical properties of an organic compound is called functional group.
Functional group of alcohols : **– OH (Hydroxy)**
Functional group of ethers : **– OR (Alkoxy) [– OCH_3 (methoxy), – $OCH_2 CH_3$ (ethoxy)]**

Naming of alcohols :
Word root + Position numbers of – OH group + ol



[Propan-1-ol]

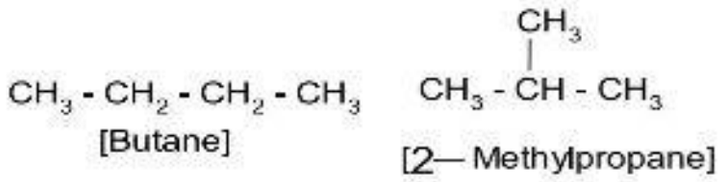
Naming of ethers :
Word root smaller alkyl group + oxy + word root of bigger alkyl group + ane



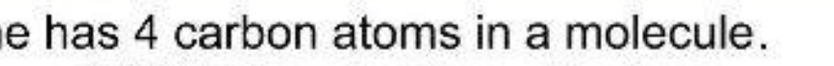
[Methoxyethane]

Isomerism: Compounds having same molecular formula but differ in their properties are called isomers and the phenomenon is called isomerism.

Chain Isomerism: Compounds having same molecular formula but differ in the structure of carbon chain are called chain isomers and the phenomenon is called chain isomerism.

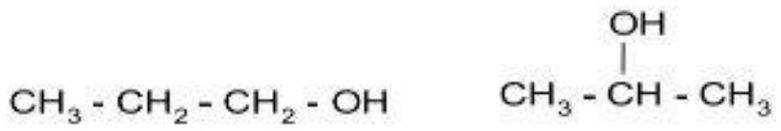


Functional Isomerism: Compounds having same molecular formula but differ in the functional group are called functional isomers and the phenomenon is called functional isomerism.



[Propan-1-ol and Methoxyethane]

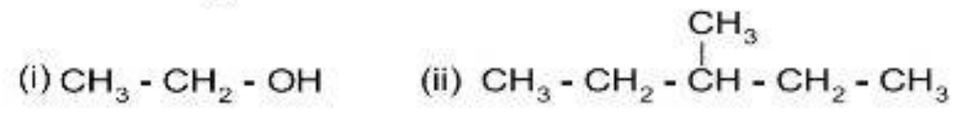
Position Isomerism: Compounds having same molecular formula but differ in the position of functional group are called position isomers and the phenomenon is called position isomerism.



[Propan-1-ol and Propan-2-ol]

Model Questions:

1. Structures of some compounds are given below. Select the correct IUPAC name of each from those given in the box.



Methoxymethane, 3-Methylpentane, Ethanol, Ethene

2. Butane has 4 carbon atoms in a molecule.
   a) Write the structure of butane.
   b) Write the structure of chain isomer of this compound.
3. What is the functional isomer of alcohol? (Carboxylic acid, Ethers, Esters)

Unit – 7
CHEMICAL REACTIONS OF ORGANIC COMPOUNDS

Concepts

- Substitution Reactions.
- Addition Reactions.
- Polymerisation
- Combustion of Hydrocarbons
- Thermal cracking.

Explanation

Substitution Reactions :- One atom in a compound is replaced by another atom or group of atom.

Eg: $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} CH_3Cl + HCl$
Methane — Chloromethane

Addition Reactions:- Unsaturated hydrocarbons. (double bond/triple bond) react with other molecules (H_2, Cl_2, HCl, HBr etc) to form saturated hydrocarbons.

Eg: $CH_2 = CH_2 + H_2 \xrightarrow{Ni} CH_3 - CH_3$
Ethene — Ethane

Polymerisation:- Monomers combines to form polymers.

$nCH_2 = CH_2 \rightarrow \text{—}[CH_2 - CH_2]\text{—}_n$

Monomer	Polymer	Use
Ethene	Polythene	Making covers and bags.
Vinyl chloride	Poly vinyl chloride (PVC)	Making pipes and tapes.
Tetrafluro ethene	Teflon	Coating on the inner surface of non-stick cookware.
Isoprene	Natural rubber (Poly isoprene)	Making tubes and tyres.

Combustion of hydrocarbons: - Hydrocarbon combines with oxygen to form CO_2 and H_2O

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Heat$

methane.

Thermal cracking:- Some hydro carbons with high molecular masses, when heated in the absence of air undergo decomposition to form hydrocarbons with lower molecular masses.

Eg: $CH_3 - CH_2 - CH_3(C_3H_8) \rightarrow CH_2 = CH_2 + CH_4$
Propane — Ethene — Methane

MODEL QUESTIONS

1. Match the Suitably

Reactants	Products	Name of the reaction
$CH_3Cl + Cl_2$	$CO_2 + H_2O$	Addition reaction
$CH_3 - CH = CH_2 + H_2$	$CH_2Cl_2 + HCl$	Polymerisation

$nCH_2 = CHCl$	$CH_3 - CH_2 - CH_3$	Combustion
$C_2H_6 + O_2$	$-[CH_2 - \underset{\displaystyle Cl}{\underset{\vert}{CH}}]_n-$	Substitution reaction

2. Three reactions are given below

a) $CH_3 - CH_3 + Cl_2 \rightarrow CH_3 - CH_2Cl + HCl$

b) $nCF_2 = CF_2 \rightarrow \quad [CF_2 - CF_2]_n$

c) $CH_2 + CH_2H_2 \xrightarrow{Ni} CH_3 - CH_3$

i) Identify the polymerization reaction.
ii) Name the monomer of Teflon.
iii) What is the name of reaction (i).
iv) Identify the unsaturated compound in reaction (iii).

3. Complete the following reactions

a) $CH_3 - CH = CH - CH_3 + HBr \rightarrow$ __(i)__

b) $CH_3 - Cl +$ __(ii)__ $\rightarrow CH_2Cl_2 + HCl$

c) $C_7H_{16} \xrightarrow{heat} C_4H_{10} +$ __(iii)__

d) $C_4H_{10} +$ __(iv)__ $\rightarrow CO_2 + H_2O$