Padasalai's Telegram Groups!

(தலைப்பிற்கு கீழே உள்ள லிங்கை கிளிக் செய்து குழுவில் இணையவும்!)

- Padasalai's NEWS - Group
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- Lesson Plan - Group
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UNIT-1 BASIC CONCEPTS OF CHEMISTRY AND CHEMICAL CALCULATIONS:-

1. RELATIVE ATOMIC MASS:-

Relative atomic mass = $\frac{Average\ mass\ of\ the\ atom}{unified\ atomic\ mass}$

2. MOLE:-

- The term 'MOLE' is used to represent 6.023 X 10^{23} entities
- 12g of carbon 12-isotopes.

3. EQUIVALENT MASS:-

- Equivalent mass of an element, compound or ion is defined as the mass that combines or displaces 1.008g of hydrogen ,8g of oxygen or 35.5g of chlorine.
- Equivalent mass has no unit but gram equivalent mass has the unit g eq-1

4. OXIDATION NUMBER:-

- It is defined as the imaginary charge left on atom when all other atom of the compound have been removed in their usual oxidation states that are assigned according to the set of rules.
- A term that is often used interchangeably with oxidation number is oxidation state.

5. OXIDATION AND REDUCTION:-KG

OXIDATION	REDUCTION
Addition of oxygen	Removal of oxygen
Loss of electron* (LEO)	Gain of electron* (GER)
Increasing oxidation number is oxidation	Decreasing in oxidation number is reduction

6.AVAGADRO NUMBER:-

The total number of entities present in 1 mole of any substance is equal to 6.023 X 10^{23}. 6.023 X 10^{23} is Avagadro number.

7. LIMITING REAGENT:-

When a reaction is carried out using non-stoichiometric quantities of the reactants, the product yield will be determined by the reactants that is completely consumed and is called the limiting reagent.

8. EQUIVALENT MASS:-

Gram equivalent mass = $\frac{molar\ mass\ (g\ mol^{-1})}{Equivalence\ factor\ (eq\ mol^{-1})}$

9. CALCULATE RELATIVE ATOMIC MASS OF H:-

$= \frac{Average\ mass\ of\ H-atom\ (in\ kg)}{1.6605\ X\ 10^{-27} kg}$

$= \frac{1.6736\ X\ 10^{-27} kg}{1.66o5\ X\ 10^{-27} kg}$

= 1.0078 ≈ 1.008 u

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UNIT-3 PERIODIC CLASSIFICATION OF ELEMENTS:-

1. MODERN PERIODIC TABLE:-

The physical and chemical properties of elements are periodic function based on their atomic number.

2. ISOELECTRONIC IONS:-

The ions have same electronic configuration are called isoelectronic ions.

Example: F^- 2,8 } Ne type K^+ 2,8,8 } Ar type

Na^+ 2,8 } Ne type Cl^- 2,8,8 } Ar type

3. EFFECTIVE NUCLEAR CHARGE:-

The net nuclear charge experienced by the valence electron in the outermost shell is called effective nuclear charge. $Z_{eff} = Z-S$. Where z is the atomic number and 'S' is the screening constant which can be calculated by slatter's rule

4. ELECTRONEGATIVITY:-

Electronegativity is defined as the relative tendency of an element present in a covalently bound molecules to attract the shared pair of electrons towards itself

5. ELEMENT 118:-

An element Z=118 will be present in 7^{th} period and 18^{th} group.

6. LANTHANIDES AND ACTINIDES:-

Lanthanides: (n-2) f^{1-14} (n-1) d^{0-1} ns^2 ; Actinides: (n-2) f^{0-14} (n-1) d^{0-2} ns^2

7. HALOGEN- OXIDISING AGENT:-

Halogens have ns2 np5 electronic configuration. They can ready to gain one electron in their valency shell. So they have more tendency to accept an electron in their outermost orbital. Therefore halogen act as an oxidising agents.

8. DIAGONAL RELATIONSHIP:-

The similarity in properties existing between the diagnonally placed elements is called 'diagonal relationship'.

9. TRIADS AND PERIODS:-

TRIADS: The atomic weight of the middle element nearly equal to the arithmetic mean of the atomic weights of the remaining two elements.

PERIODS: In modern periodic table horizontal rows are called periods. There are 7 periods. *(VEG—HOPE)*

10. PERIODIC LAW:-

The properties of the elements are the periodic functions of their atomic weights and this is called "PERIODIC LAW".

HFN + HYZ

Prepared by HYZ & HFN.

UNIT-2 QUANTAM MECHANICAL MODEL OF ATOM:-

1. INFORMATION ABOUT QUANTAM NUMBERS:-

i) Principal quantum (n) – energy level

ii) Azimuthal quantum (l) – shape and size

iii) Magnetic quantum (m) – orientation

2. ORBITAL POSSIBLE (N=4):-

When n=4 l= 0,1,2,3 four orbital s,p,d,f

l=0 ml= 0 one 4s orbital

l=1 ml= -1,0,+1 three 4p orbital

l=2 ml= -2,-1,0,+1,+2 five 4d orbital

l=3 ml= -3,-2,-1,0,+1,+2,+3 seven 4f orbital

overall 16 orbitals.

3. ELECTRONIC ARRANGEMENT:-

i)

↑	↑	↑	↑	↑

GROUND STATE

ii)

↑	↑	↑	↑	↑

MAXIMUM EXCHANGE ENERGY

4. PAULI'S EXCLUSION PRINCIPLE:-

"No two electron in an atom can have the same set of value of all four quantum number". Which means each electron should have a unique values for all four quantum number (n,l,m,s).

5. ORBITALS VALUE:-

ORBITAL:- Circular path with definite energy is called orbitals

ORBITAL	n	l
3Px	3	1
$4d_{x^2-y^2}$	4	2

6. AUFBAU PRINCIPLE:-

"Aufbau" is a german word meaning "building up". In the ground state of the atoms, The orbitals are filled in the order of their increasing energies.

7. ELECTRONIC CONFIGURATION:-

Mn^{2+} → Mn =25

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^0\ 3d^5$ → (half filled -stable)

Cr^{3+} → Cr =24

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^0\ 3d^3$ → (unstable electronic configuration)

9. **IONISATION ENERGY FOR H -ATOM:-**

$E_n = \frac{-13.6}{e^2}$ ev

n=3

→ $E_3 = \frac{-13.6}{9}$ ev

E_3 = -1.5 ev

10. **DE BROGLIE WAVELENGTH:-**

Potential energy = 100V = 100 x 1.6 x 10^{-19} J

$\lambda = \frac{h}{\sqrt{2}\,mev}$

$\lambda = \frac{6.626\ X\ 10^{-34} kgm^2 s^{-1}}{\sqrt{2}\ x\ 9.1\ x\ 10^{-31} kg\ x\ 100\ x\ 1.6\ x\ 10^{-19} J}$

λ = 1.22 x 10^{-10} m.

12. **HEINSBERG UNCERTAINTY PRINCIPLE:-**

It states that " it is impossible to accurately determine both the position and momentum of microscopic particle simultaneously.

13. **α – RAY EXPERIMENT:-**

i) Most of the α – particles passed through the foil

ii) some of them were deflected through a small angle

iii) very few α – particles were reflected back by 180°

11. **QUANTAM NUMBER AND SUB ENERGY LEVEL:-**

n	l	m	Sub energy level
4	2	0	4d
3	1	0	3p
5	1	-1, 0 , +1	5p
3	2	-2	3d

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UNIT-4 HYDROGEN

1. WATER SHIFT GAS:-

$$CO + H_2O \xrightarrow{400\circ C} CO + H_2$$

Carbon mono oxide of a water can be converted in to carbon di oxide by moving a gas mixture with more steam at 400◦C and passed over a shift converter contains iron/copper catalyst. This reaction is called water gas shift reaction.

2. ISOTOPES OF HYDROGEN:-

Atoms of the same elements having same atomic number but, different in mass number is called isotopes. Ex:- $_{17}Cl^{35}$,$_{17}Cl^{37}$

Isotopes of hydrogen are:- 1) protium ($_1H^1$ or H) 2) Deuterium ($_1H^2$ or D) 3) Tritium ($_1H^3$ or T)

3. USES OF HEAVY WATER:-

i) Heavy water is used as moderator in nuclear reactor

ii) It is used as tracers to study organic reaction mechanism

iii) It is also used as a coolant in nuclear reactor.

4. EXCHANGE REACTION OF DEUTERIUM:-

Deuterium can replace reversibly hydrogen in compounds either partially or completely depending upon the reaction.

$CH_4 + 2D_2 \rightarrow CD_4 + 2H_2$

$NH_3 + 3D_2 \rightarrow 2\ ND_3 + 3H_2$

5.PARA TO ORTHO HYDROGEN:-

The para form can be catalytically transformed into ortho form using platinum/iron, by using an electric discharge, heating above 800◦C, mixing para magnetic molecules o_2, NO, NO_2 or with nascent/atomic hydrogen.

6. USES OF DEUTERIUM:-

i) Deuterium is used to prepare heavy water.

ii) Deuterium exchange reactions are useful determining the number of ionic hydrogens present in a given compound.

iii) Deuterium is also used to prepare some deuterium compounds.

7. REFER Q.NO 41 & 42:-

1) small size of nitrogen atom, polar nature of N-H bond. It forms intermolecular hydrogen bonding which are stronger than the other hydrides of the group which weak hydrogen bonding

2) This is due to expansion of lattice during the formation of their hydrides.

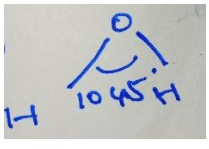
8. STRUCTURE OF H_2O AND H_2O_2:-

H_2O:-

i) H_2O has bent structure

ii) HOH bond angle is 104.5◦

iii)

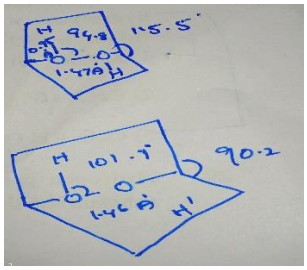


H_2O_2:-

i) H_2O_2 has a open book like structure

ii) H-O-O-H bond angle is 94.8◦ and dihedral angle is 115.5◦ in gas phase.

iii)



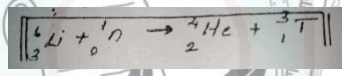
9. **INTER AND INTRA MOLECULAR HYDROGEN BOND:-**

Intra molecular bonding:- Intra molecular bonds are those which occur within a single molecule

Inter molecular bonding:- Inter molecular bonds occur between two separate molecules.

10. **PREPARATION OF TRITIUM:-**

Tritium is only present in trace amounts. So it can be artificially prepared by bombarding Lithium with slow neutrons in a nuclear fission reactor. The nuclear transmutation reaction is,



11. **USES OF H_2O_2:-**

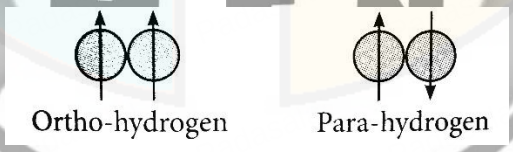
i) Hydrogen peroxide is a mild antiseptic used on the skin to prevent infection of minor cuts, scrapes and burns.

ii) It is also used as mouth rinse to help remove mucus or to relieve minor mouth irritation.

12. **ORTHO AND PARA HYDROGEN:-**

Ortho hydrogen: When molecular hydrogen is formed, the spin of nuclei in the same direction are called ortho hydrogen.

Para hydrogen: When molecular hydrogen is formed, the spin of nuclei in the opposite direction are called para hydrogen.



13. **USES OF H_2O:-**

i) liquid hydrogen is used as a rocket fuel.

ii) Hydrogen is also used in fuel cells for generating electric charge.

(For 3 marks and 5 marks – refer pg.no. 105 in volume 1)

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UNIT-5 ALKALI AND ALKALINE EARTH METALS

1. **SODIUM HYDROXIDE IS MUCH SOLUBLE THAN CHLORIDE:-**

i) Sodium hydroxide is stronger base where as sodium chloride is a salt.

ii) Sodium hydroxide dissolves easily in water with evolution of much heat on amount of intense hydration.

iii) Thus sodium hydroxide dissolves easily in water.

2. **EFFLORESCENCE:-**

i) Efflorescence is a process of losing water of hydration from hydrate.

ii) Sodium carbonate crystallises as decahydrate which is in white colour.

iii) Upon heating, it loses the water of crystallization to form monohydrate.

3. **METAL LIKELY TO BE SODIUM OR POTASSIUM:-**

X= sodium → $Na_2SO_4.10H_2O$ is readily formed; The metal is more likely to be sodium.

4. **USES OF PLASTER OF PARIS:-**

i) It is largely used in the building industry.

ii) It is used for bone fracture or sprain

iii) It is also used for cast of statue and busts.

$$2CaSO_4.2H_2O(s) \xrightarrow{393\,K} 2CaSO_4.H_2O + 3H_2O$$

5. **REFER Q.NO 32:-**

Milk of magnesia $Mg(OH)_2$	Lye $Na(OH)_2$	Lime $Ca(OH)_2$	
Caustic potash KOH	Washing soda Na_2CO_3	Soda ash Na_2CO_3	Trona Na_2CO_3

6. **BERYLLIUM HALIDES ARE COVALENT THAN MAGNESIUM:-**

Beryllium halides are covalent due to smaller size and higher ionisation energy Whereas, due to larger atomic size and lesser ionisation energy magnesium halides are ionic.

7. **ALKALINE EARTH METALS HARDER THAN ALKALI METALS:-**

i) Group 2 elements have two electrons in the valence shell

ii) They have higher nuclear charge So, the alkaline metal is harder than alkali metals.

8. **PREPARATION OF PLASTER OF PARIS:-**

$2CaSO_4.2H_2O(s) \xrightarrow{393\,K} 2CaSO_4.H_2O + 3H_2O$ → It is prepared by heating gypsum with 393K.

9. **USES OF GYPSUM:-**

i) Gypsum is used in making dry walls or plaster boards. Plaster boards are used as the finish for walls and ceilings, and partition.

ii) Gypsum is used in making surgical and orthopaedic casts, such as surgical splints and casting moulds.

iii) Gypsum plays an important role in agriculture as soil additive, fertilizer, and conditioner.

10. **LITHIUM EXHIBIT ANAMALOUS PROPERTIES:-**

Due to small size, the lithium atom has high ionisation energy. Hence it remains inactive to dry air, slowly reactivity with water, liquid bromine and forms a highly stable hydride unlike other alkali metals.

11. **USES OF WASHING SODA:-**

i) Washing soda is used heavily for laundering

ii) It is an important laboratory reagent.

iii) It is used in the manufacturing glass, paper, etc..,

12. **DEAD BURNT PLASTER:-**

When plaster of paris $CaSO_4.1/2H_2O$ is heated above 393K, its water of crystallisation is lost and anhydrous calcium sulphate is left that is known as dead burnt plaster.

13. **MILK OF LIME:-**

Lime water is the common name for a diluted solution of calcium hydroxide. Calcium hydroxide ($Ca(OH)_2$) is sparsely soluble in water. Pure limewater is colourless, with a slightly earthy smell and alkaline bitter taste of calcium hydroxide. It is unrelated to the acidic fruit.

UNIT-6 GASEOUS STATE

1. **BOYLE'S LAW:-**

When a gas is kept at constant temperature, the pressure of the gas is inversely propotional to the volume

It can be expressed as:- $P \alpha \frac{1}{v}$

2. **CHARLES LAW:-**

When the gas is kept at constant pressure, the volume is directly propotional to the temperature.

It can be expressed as:- $V \alpha T$

3. **APPLICATIONS OF GAY LUSAAC'S LAW:-**

According to Gay Lusaac's law $P \alpha T$ (n)

i) Firing a bullet

ii) Heating a closed aerosol can

iii) A burning auto mobile tire.

4. **REAL GAS DIFFER FROM IDEAL GAS:-**

Ideal gas obey the gas law PV = nRT , real gases do not obey the ideal gas law and called as non-ideal gas. The real gas tend to approach the ideal behaviour under certain condition.

5. **DIFFUSION & EFFUSION:-**

DIFFUSION	EFFUSION
The property of gas which involves the movement of the gas molecular through another gas is called diffusion	It is the property in which a gas escapes from a container through a very small hole.
It is the ability of gases to move with each other.	It is the ability of gas to travel through a small hole.
Ex:- smell of perfume diffuses in the air.	Ex:- Air escapes slowly through a pen hole in a line.

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6. **DRINKING WATER ON THE MOUNT EVERST:-**

It would be harder to drink water on the top of the mount Everest because, the external pressure pushing on the liquid to force it up the straw is less, so it is hard to drink.

7. **AEROPLANE CABINS ARE PRESSURIZED:-**

Aeroplanes cabins are pressurized because the air is very thin at the altitude they fly. To prevent all of these complications, the cabins of many aircrafts are pressurized to near sea level pressure, which makes breathing in an airplane about the same as breathing at sea level.

8. **ABSOLUTE ZERO:-**

Absolute zero is the lowest limit of the thermodynamic temperature scale, state at which the enthalpy and entropy of a cooled ideal gas reach their minimum value, taken as 0.

9. **GRAHAM'S LAW OF DIFFUSION AND EFFUSION:-**

Graham's law of diffusion and effusion is inversely propotional to the square root of molar mass. [$\alpha\ 1/\sqrt{m}$]

10. **DALTON'S LAW OF PARTIAL PRESSUE:-**

It states that in a mixture of non-reacting gases, the total pressure exerted is equal to sum of the partial pressure of the individual gases.

11. **THREE CHARACTERISTICS OF GASES:-**

i) They are easy to compress.

ii) They expand to fill their containers.

iii) They occupy far more space than the liquids or solids from which they form.

UNIT-7 THERMODYNAMICS:-

1. **FIRST LAW OF THERMODYNAMICS:-**

The total energy of an isolated system remains constant though it may change from one form to another. Alternatively it can be stated as energy can neither be created nor destroyed.

2. **HESS LAW OF CONSTANT HEAT SUMMATION:-**

The enthalpy change of reaction, either at constant volume or constant pressure is same whether it takes place in a single or multiple steps provided with the initial and final state are same.

3. **INTENSIVE PROPERTIES:-**

The property which is independent of mass or the size of the system is called intensive property.

Ex:- Refractive index, surface tension, density etc..,

4. REFER Qno. 29

5. **USUAL DEFINITION OF ENTROPY:-**

Entropy is the measure of molecular disorder or randomness of the system

Its unit is JK^{-1}.

6. **GIBB'S FREE ENERGY:-**

It is defined as, G = H -TS where G is the Gibb's free energy, H and S are the enthalpy and entropy of the system, T is the temperature. It is a extensive property and a state function. It can also be expressed as $\Delta G = \Delta H - T\Delta S$

7. **ENTHALPY OF COMBUSTION:-**

The change in enthalpy of the system when one mole of substance is completely burnt in the excess of air or oxygen.

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8. **MOLAR HEAT CAPACITY:-**

It is defined as heat absorbed by one mole of the system to raise its temperature by 1K. its unit is $JK^{-1}mol^{-1}$.

9. **CALORIFIC VALUE:-**

It is defined as heat produced in calories when one gram of substance is completely burnt, its unit is JKg^{-1}. However it can be expressed in Cal g^{-1}.

10. **ENTHALPY OF NEYTRALIZATION:-**

It is defined as "The change in enthalpy of the system when one gram equivalent acid is completely neutralized by one gram equivalent base or vice versa in dilute solution.

11. **LATTICE ENERGY:-**

It is defined as energy released when one mole of ionic compound formed from its constituent ions in the gaseous state.

$$Na^+(g) + Cl(g)^- \rightarrow NaCl(s) + L.E.$$

12. **STATE FUNCTION AND PATH FUNCTION:-**

STATE FUNCTION	PATH FUNCTION
State function is the thermodynamic property of the system, which has specific value for the given state and does not depend on the path by which the particular state is reached.	Path function depend upon the path followed by the system and does not depend on the Initial and final state.
Ex:- internal energy (U), enthalpy (H)	Ex:- work (W), heat(q)

13. **KELVIN STATEMENT FOR SECOND LAW OF THERMODYNAMICS:-**

It is impossible to construct a machine that absorbs heat from the hot source and convert it into work by a cyclic process without transferring a part of heat to the cold sink.

14. **INTENSIVE AND EXGTENSIVE PROPERTIES:-**

INTENSIVE PROPERTY	EXTENSIVE PROPERTY
Volume, mass, amount of substance, energy, enthalpy, entropy, free energy, heat capacity.	Molar volume, density, molar mass, molarity, mole fraction, specific heat capacity.

15. **C_P IS GREATER THAN C_V:-**

At constant pressure processes the system has to do work against the surroundings. Hence it require more heat to effect the given temperature raise than the constant volume, so C_p is always greater than c_v.

16. **SPONTANEOUS PROCESS:-**

The reaction occur under the given set of condition without any external driving force is called spontaneous process.

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UNIT-8 PHYSICAL AND CHEMICAL EQUILIBRIUM:-

1. LE-CHATELIER PRINCIPLE:-

It states that "If a system in equilibrium is disturbed then the system shifts itself in a direction that nullifies the effect of disturbance".

2. LAW OF MASS ACTION:-

"At any instant, the rate of chemical reaction at given temperature is directly proportional to the product of the active masses of the reactant at that instant". RATE α $[REACTANT]^x$.

3. PREDICT THE DIRECTION OF A EQUILIBRIUM REACTION:-

The direction of a equilibrium can be predicted from the values of reaction quotient (Q) and the equilibrium constant (K_c) at a given temperature. At equilibrium $Q=K_c$.

i) If $Q > K_c$, The reaction will proceed in the reverse direction ii) If $Q > K_c$, The reaction will proceed in forward direction.

4. VONT HOFF EQUATION:-

This equation gives the variation of equilibrium constant with temperature The integrated form of Vant Hoff equation is

$$\text{Log}\frac{k2}{k1} = \frac{\Delta^{Ho}}{2.303R}\left[\frac{T2-T1}{T1.T2}\right]$$

5. K_P AND K_C REALTION:-

$K_P = K_C X (RT)^{\Delta ng}$ if Δng is equal to zero 0.

$K_P = K_C X (RT)^0$ → $K_P = K_c$ EX:- $H_2 + I_2$ → 2HI

6. GENERAL EXPREESION OF EQUILIBRIUM CONSTANT AND VOLUME:-

$$3H_2(g) + N_2(g) \rightleftharpoons 2NH_3(g)$$

Let us consider the formation of ammonia in which, 'a' moles nitrogen and 'b' moles hydrogen gas are allowed to react in a container of volume V. Let 'x' moles of nitrogen react with $3x$ moles of hydrogen to give $2x$ moles of ammonia.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

	N_2	H_2	NH_3
Initial number of moles	a	b	0
Number of moles reacted	x	$3x$	0
Number of moles at equilibrium	$a-x$	$b-3x$	$2x$
Active mass or molar concentration equilibrium	$\frac{a-x}{V}$	$\frac{b-3x}{V}$	$\frac{2x}{V}$

Applying law of mass action,

$$K_c = \frac{[NH_3]^2}{[N_2][H_2]^3}$$

$$= \frac{\left(\frac{2x}{V}\right)^2}{\left(\frac{a-x}{V}\right)\left(\frac{b-3x}{V}\right)^3}$$

$$= \frac{\left(\frac{4x^2}{V^2}\right)}{\left(\frac{a-x}{V}\right)\left(\frac{b-3x}{V}\right)^3}$$

$$K_c = \frac{4x^2V^2}{(a-x)(b-3x)^3}$$

7. REACTION QUOTIENT:-

The reaction quotient (Q) is the ratio of the product of concentration of products to that of reactants. At equilibrium $Q = K_C$ at particular temperature.

8. **EFFECT OF TEMPERATURE OF EQUILIBRIUM:-**

The increase in temperature of the system, favours the endothermic reaction.

10. **THREE APPLICATION OF EQUILIBRIUM CONSTANT:-**

i) The equilibrium constant is a constant at the given temperature and pressure

ii) It also depends on the stoichiometric representation of the chemical reaction.

iii) The magnitude of the equilibrium constant depends on the mode of representation of the reaction.

UNIT- 9 SOLUTION:-

1. MOLALITY & NORMALITY:-

i) molality = number of mole of solute/mass of solvent in kg
(ii) normality = number of gram equivalents of solute/volume of solution in litre

2. VAPOUR PRESSURE OF LIQUID:-

The pressure exerted by the vapours above the liquid which is in equilibrium with the liquid at a given temperature is called vapour pressure

3. HENRY'S LAW:-

"The partial pressure of the gas in vapor phase is directly proportional to the mole fraction (x) of the gaseous solute in the solution at low concentration" this statement is known as Henry's law Psolute αx solute in solution
Psolute =KH xsolute in solution

4. OSMOSIS:-

The phenomenon of the flow of solvent through a semipermeable membrane from pure solvent to the solution is called osmosis.

5. ISOTONIC SOLUTION:-

Two solutions having same osmotic pressure at a given temperature are called isotonic solution.

6. RAOULTS LAW:-

The vapor pressure of solvent over the solution is equal to the product of its vapor pressure in pure state and its mole fraction.

7. MASS PERCENTAGE:-

Mass percentage = mass of the component in the solution x 100/total mass of the solution

Molarity = number of moles of solute /volume of the solution in litres

Formality = number of formula weight of solute in grams /volume of solution in litres

8. **CONCENTRATION:-**

The concentration of a solution gives the amount solute present in a given quantity of the solvent.

9. **PPM (PARTS PER MILLION):-**

paper per million: $\frac{mass\ of\ solute\ (in\ g)}{mass\ of\ solution\ (in\ mL)}$ x 100

10. **ADVANTAGES OF USING STANDARD SOLUTION:-**

i. The error due to weighing the solute can be minimized by using concentrated stock solution that **r**equires large quantity

ii. we can prepare working standards of different concentrations by diluting the stock solution, which is more efficient since consistency is maintained.

iii. some of the concentrated solutions are more stable and are less likely to support microbial growth than working standard used in the experiments

11. **RAOULTS LAW WITH HENRY'S LAW:-**

$P_{solute} = P^{o}_{solute}$ X solute

$P_{solute} = K_H$ X solute in solution → Raoults law becomes a special case of henry's law. For very dilute solution the solvent obey Raoults law and the solute becomes Henry's law.

12. **VANT HOFF FACTOR:-**

It is defined as the ratio of the actual molar mass to the abnormal molar mass of the solute. Here the abnormal molar mass is the molar mass calculated using the experimentally determined colligative property.

i = normal molar mass/observed molar mass.

13. **REVERSE OSMOSIS:-**

It can be defined as the solvent molecules passes through a semi permeable membrane in opposite direction of osmosis, when hydrostatic pressure greater than osmotic pressure.

14. **CARBONATED DRINKS ARE PRESSURIZED:-**

the carbonated beverages contain carbon di oxide dissolved in them. To dissolve the carbon di oxide in these drinks, the CO_2 gas is bubbled through them under high pressure. These containers are sealed to maintain the pressure. When we open these containers at atmospheric pressure, the pressure of the CO_2 drops to the atmospheric level and hence bubbles of CO_2 rapidly escape from the solution show effervescence. The burst of bubbles is even more noticeable, if the soda bottle in warm condition.

15. **GASEOUS SOLUTION:-**

i) Air (mixture of nitrogen, oxygen and other gases) ii) Humid oxygen (oxygen containing water) iii) Camphor in nitrogen gas.

UNIT- 10 CHEMICAL BONDING:-

1. **DIPOLE MOMENT:-**

Polarity of covalent bond is measured in terms of dipole moment and it is defined as → $\mu = q \times 2d$.

2. **DEFINE THE FOLOWING:-**

i) Bond order

The number of bonds formed between the two bonded atoms in a molecule is called the bond order

ii) Hybridization

Hybridisation is the process of mixing of atomic orbitals of the same atom with comparable energy to form equal number of new equivalent orbitals with same energy.

iii) σ –bond

when two atomic orbitals overlap linearly along the axis, the resultant bond is called sigma bond.

3. **PI BOND:-**

When two atomic orbitals overlaps sideways, the resultant covalent bond is called a pi bond.

4. **POLAR COVALENT BOND:-**

A polar covalent bond is formed between two atoms differing in their electro negativities.

EX:- Hydrogen Flouride

5. **FAJANS RULE:-**

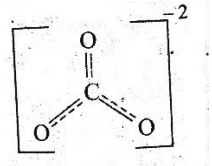
- Fajan's Rules:
  - Charge on the Cation: Higher the charge on the cation greater is the extent of polarisation.
  - Charge on the Anion: Higher the charge on the anion greater is the extent of polarisability. i.e., In a smaller cation and larger anion, the extent of polarisation being greater, greater is the covalent character.
  - Cations having $ns^2\ np^6\ nd^{10}$ configuration show greater polarising power than the cations with $ns^2\ np^6$ configuration.

6. **COVALENT CHARACTER IN IONIC BOND:-**

the term "**ionic bonding**" is given when the **ionic character** is greater than the **covalent character** – that is, a **bond** in which a large electronegativity difference exists between the two atoms, causing the **bonding** to be more polar (**ionic**) than in **covalent bonding** where electrons are shared more equally.

7. **RESONANCE WITH REFERENCE TO CARBONATE ION:-**

Resonance is the phenomenon when a single structure is unable to explain all the properties of the compound. In such cases, several lewis structure are written and the actual structure is the combination all these structure. This phenomenon is called Resonance hybrid.

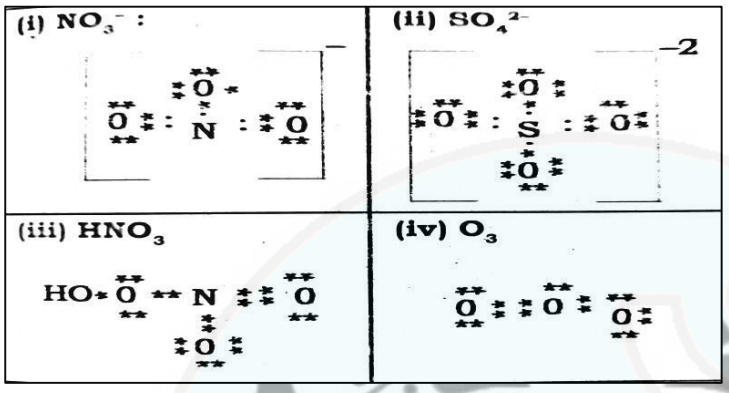


8. **HIGHEST BOND ENERGY:-**

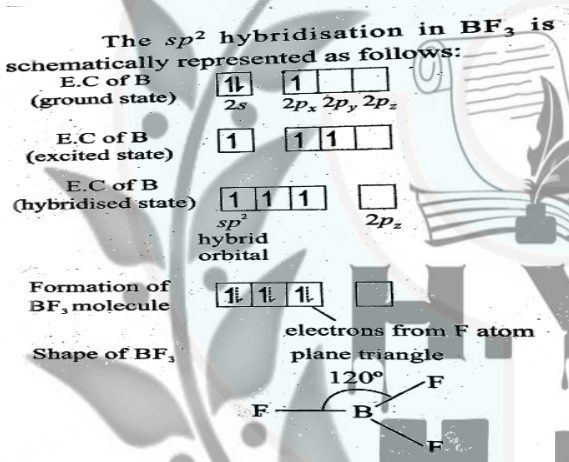
Bond order of both **N2+** and **N2**- is 2.5, but according the molecular orbital theory,**N2**- has **more** antibonding electrons than **N2+**. Also, **more** antibonding electrons lead to instability. For the purposes of this class, **N2+** and **N2**- will be considered equal as they both have a bond order of 2.5.

9. **DRAW THE LEWIS STRUCTURE OF THE FOLLOWING:-**

i) NO_3- II)SO_4^{2-} III)HNO_3 IV)O_3



10. **SP² HYBRIDISATION IN BF ³:-**



11. **STRONGER σ OR π BOND:-**

σ bond is stronger than π bond. A sigma bond is formed by head on overlapping of orbital is more effective. Hence it is strong bond. But pi bonds are formed by side wise overlapping of orbitals. The side wise overlapping orbitals is less effective the head on overlapping. Hence it is weaker

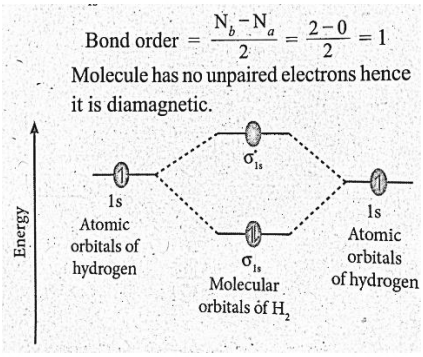
12. **BOND ENERGY:-**

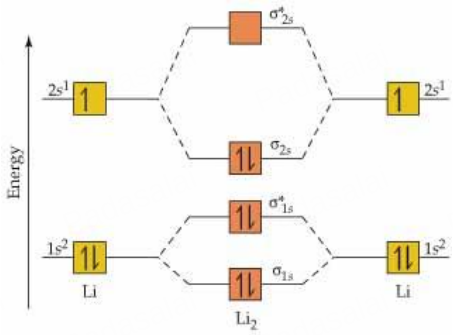
The bond enthalpy is defined as the minimum amount of energy required to break one mole of a particular bond in molecules In their gaseous state. The unit of bond enthalpy is kJ mol^{-1}

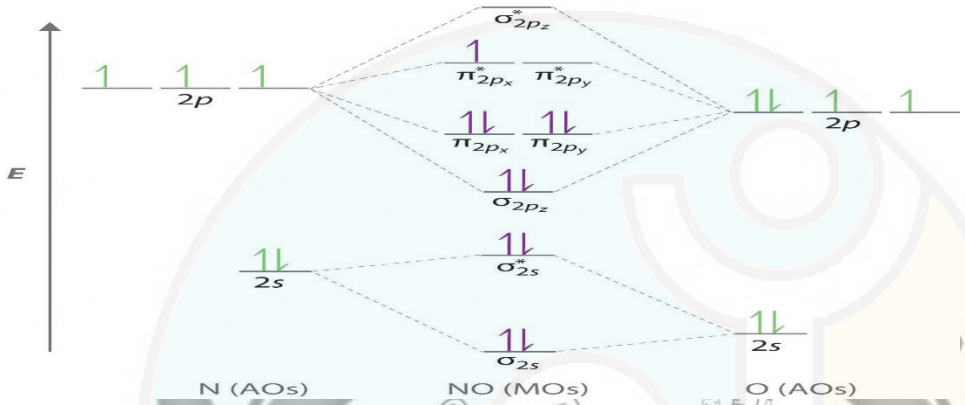
13. **OCTET RULE:-**

The atom transfer or share electron so that all atoms involved in chemical bonding obtain eight electrons in their outer shell (valence shell).

14. **DRAW THE MO THEORY OF THE FOLLOWING:- H_2 LI_2 AND NO:-**







15. **CALCULATE THE FORMAL CHANGE OF $COCl^2$:-**

16. **WRITE THE RESONANCE STRUCTURE OF THE FOLLOWING:-**

i) Ozone molecule ii)N_2O

(i) Resonance structures of Ozone:

(ii) Resonance structures of N_2O:

UNIT- 11 FUNDAMENTALS OF ORGANIC CHEMISTRY:-

1. CHARACTERISTICS OF ORGANIC COMPOUND:-

Characteristics of organic compounds:
All organic compounds have the following characteristic properties.

(i) They are covalent compounds of carbon and generally insoluble in water and readily soluble in organic solvent such as benzene, toluene, ether, chloroform etc.

(ii) Many of the organic compounds are inflammable (except CCl_4). They possess low boiling and melting points due to their covalent nature.

(iii) Organic compounds are characterised by functional groups.

(iv) They exhibit isomerism which is a unique phenomenon.

(v) Homologous series: All organic compounds exhibit the phenomenon of homology. i.e., They form a homologous series.

2. HOMOLOGOUS SERIES:-

A series of organic compounds each containing a characteristic functional group and the successive members differ from each other in molecular formula by a ch_2 group is known as homologous series

3. FUNCTIONAL GROUP:-

A functional group is an atom or a specific combination of bonded atoms that is characteristics of the organic compound.

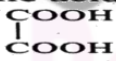
IDENTIFY THE FUNCTIONAL GROUP:-

a] acetaldehyde b] oxalic acid c]di methyl ether d]methylamine

(a) Acetaldehyde:

(Functional group in aldehyde group).

(b) oxalic acid:

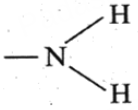


– dicarboxylic acid

(The functional group in carboxylic acid group)

(c) di methyl ether: $CH_3 - O - CH_3$
(The functional group is ether $- O -$)

(d) methyl amine: $CH_3 NH_2$
(The functional group in amino group)



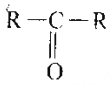
4. **GENERAL FORMULA OF ORGANIC COMPOUND:-**

A]aliphatic monohydric alcohol b]aliphatic ketones c]aliphatic amines

(a) Aliphatic monohydric alcohol

R – O – H

(b) Aliphatic ketones:



(c) Aliphatic amines: RNH_2 where 'R' is the alkyl group.

5. **FIRST SIX MEMBERS OF NITRO ALKANES:-**

The general molecular formula for nitro alkanes is $C_nH_{2n+1}NO_2$. The first six numbers are:

$n = 1$; First member i.e., CH_3NO_2

$n = 2$; Second member i.e., $C_2H_5NO_2$

$n = 3$; Third member i.e., $C_3H_7NO_2$

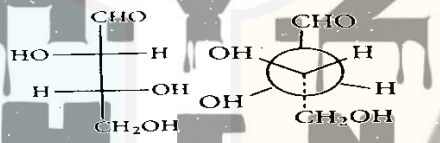
$n = 4$; Fourth member i.e., $C_4H_9NO_2$

$n = 5$; Fifth member i.e., $C_5H_{11}NO_2$

$n = 6$; Sixth member i.e., $C_6H_{13}NO_2$

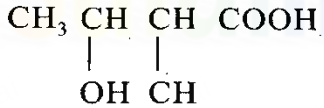
6. **NEWMAN PROJECTION FORMULA:-**

➢ Newman projection formula: In this method the molecules are viewed from the front along the carbon-carbon bond axis. The two carbon atom forming the σ bond is represented by two circles. One behind the other so that only the front carbon is seen. The front carbon atom is shown by a point where as the carbon lying further from the eye is represented by the origin of the circle. Therefore, the C – H bonds of the front carbon are depicted from the circle while C – H bonds of the back carbon are drawn from the circumference of the circle with an angle of 120° to each other.



7. **FISHER MAN PROJECTION FORMULA:-**

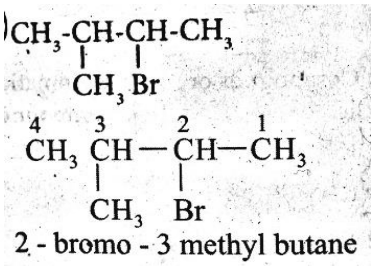
➢ Fisher projection formula: In this method, the chiral atom(s) lies in the plane of paper. The horizontal substituents are pointing towards the observer and the vertical substituents are away from the observer. Fisher projection formula for tartaric acid. A chiral carbon atom is one to which four different atoms or groups are attached.

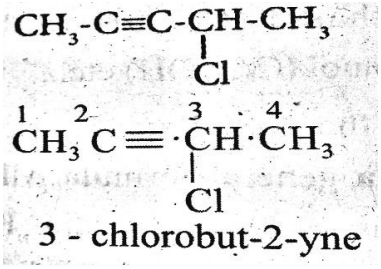


8. **ISOMERISM:-**

It is a phenomenon in which organic compounds having same molecular formula but different structural formula.

9. **IUPAC NAME OF THE FOLOWING:-**





10 . **SHORT NOTE ON:-**

a] paper chromatography

This method involves continuous differential portioning of components of a mixture between stationary and mobile phase. In paper chromatography, a special quality paper known as chromatography paper is used. The=is paper acts as a stationary phase.

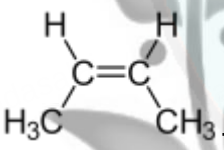
b] column chromatography.

It is based on difference in rates at which the components of a liquid mixture are adsorbed as an adsorbent. This type of chromatography is also known as adsorption chromatography.

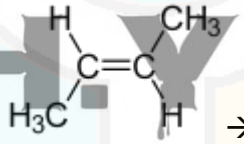
11. **PRACTICE THE BOOK BACK IUPAC NAMES OF THE MOLECULE:-**

12. **GEOMETERICAL ISOMERISM COMPOUNDS:-**

2-Butene is an acyclic alkene with four carbon atoms. It is the simplest alkene exhibiting *cis*/*trans*-isomerism (also known as (*E*/*Z*)-isomerism); that is, it exists as two geometric isomers *cis*-2-butene ((*Z*)-2-butene) and *trans*-2-butene ((*E*)-2-butene).



→ Cis isomer



→ Trans isomer

13. **LASSAIGNE'S EXTRACT:-**

The organic compound is heated in with Na in a fusion tube. It is then suddenly plunged into about 10ml of distilled water. The mixture is boiled well and filtered. The **filtrate** is known as sodium fusion extract.

14. **CHROMATOGRAPHY:-**

Chromatography is defined as a technique for the separation of a mixture brought about by differential movement of the individual compound through porous medium under the influence of moving solvent.

UNIT- 12 BASIC CONCEPTS OF ORGANIC REACTIONS:-

1. ELECTROPHILES AND NUCLEOPHILES:-

NUCLEOPHILES	ELECTROPHILE
Electron rich	Electron deficient
Nucleophiles are anion	Electrophiles are cation
They are lewis bases	They are lewis acid
They attack electron deficient site	They attack electron rich site
They donate electron pair	They gain electron pair
They are negative nucleophiles EX:- CN^-, HO^-, Cl^-, ^-OR	They are positive electrophiles EX:- Br^+, I^+, R^+

2. ELECTROMERIC EFFECT:-

Electromeric effect is a temporary effect which operates in the unsaturated compounds (containing >C=C<, >C=0) etc.., in the presence of attacking reagent.

3. INDUCTIVE EFFECT:-

Inductive effect is defined as the change in polarisation of covalent bond due to the presence of adjacent bond and atom or group in a molecule. This effect is a permanent phenomenon.

4. RESONANCE & HYPERCONJUGATION:-

RESONANCE:- Certain organic compounds can be represented in more than one structure and they differ only in position of bond and lone pair electrons. Such structure is called as RESONANCE STRUCTURE (canonical structure) and this phenomenon is called Resonance. This phenomenon is called Mesomerism or Mesomeric eefect. (**if you study this 1 question you can attend 5 question)**

HYPERCONJUGATION:- The delocalisation of electron of Ơ bond is called as hyperconjugation. This is due to the presence of interaction between electron of electron of Ơ with adjacent and empty non bonding P orbital or anti bonding Ơ*or Л* orbitals resulting the extent of molecules. This a permanent effect.

5. +E AND -E:-

i) +E is called as Electromeric effect

ii) -E is called as Inductive effect

6. DIFFERENT TYPES OF ORGANIC REACTION:-

i) Substitution reaction (electrophile and nucleophile, Free radical substitution reaction)

ii) Addition reaction (electrophile, nucleophile and free radical addition reaction)

iii) Elimination reaction

iV) Oxidation and Reduction reaction.

7. ADDITION REACTION:-

i) Addition reaction takes place between the compound containing double or triple bond and a electrophile, nucleophile and free radical.

ii) In addition reaction, the hybridisation of carbon atom changes from the substrate to the product

iii) The double or triple bond are broken and new bonds are formed in the product.

8. ELIMINATION REACTION:-

In this reaction two substituent is eliminated from the molecule and new C-C is formed in the carbon atom to which the eliminated atom/ group which previously attached.

9. **OXIDATIION AND REDUCTION REACTION:-**

Many oxidation and reduction reaction of organic compound fall into one of the four types of organic reaction that we have already discussed but they do not. Most of the oxidation reaction involves in gain of oxygen and loss of hydrogen and reduction reaction involves gain of hydrogen and loss of oxygen.

10. **DIFFERENCE BETWEEN INDUCTIVE AND RESSONANCE EFFECT:-**

INDUCTIVE EFFECT	RESONANCE EFFECT
Inductive effect is defined as the change in polarisation of covalent bond	Certain organic compounds can be represented in more than one structure and they differ only in position of bond and lone pair electrons.
Inductive effect is defined as the change in polarisation of covalent bond due to the presence of adjacent bond and atom or group in a molecule.	Certain organic compounds can be represented in more than one structure and they differ only in position of bond and lone pair electrons. Such structure is called as RESONANCE STRUCTURE (canonical structure) and this phenomenon is called Resonance. This phenomenon is called Mesomerism or Mesomeric eefect.
This effect is a permanent phenomenon	This effect is a permanent phenomenon

11. **HOMOLYTIC CLEAVAGE:-**

Breaking up of covalent bond by supplying energy is called fission or cleavage of the bond. The fission occur in such way that each of the bonded atom retains one electron.

12. **FREE RADICAL:-**

The neutral species which contains one odd or unpaired electron produced by the homolytic fission of the covalent bond is called free radicals.

13.ß **ELININATION:-**

In these reaction two atom or group of atoms from adjacent carbon atom (α,ß) in the substrate molecule is removed and multiple bond is formed.

ELECTROPHILE SUBSTITUTION:-

It generally occur in the aromatic compounds.

EX:- Benzene. In these compounds Π electrons are highly de localised and an electrophile attack the region of electron rich site EG:- Chlorination of benzene

14. **SO_3 ACTS AS A ELECTROPHILE:-**

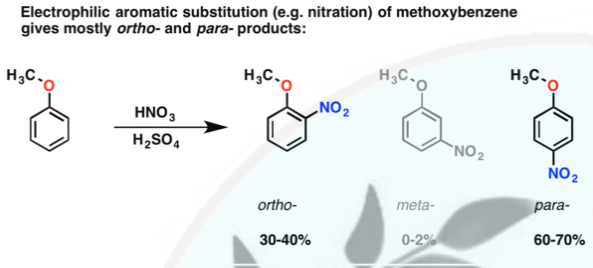
Sulphur trioxide is an **electrophile** because it is a highly polar molecule with a fair amount of positive charge on the sulphur atom. It is this which is attracted to the ring electrons. The second stage of the reaction involves a transfer of the hydrogen from the ring to the negative oxygen.

UNIT- 13 HYDROCARBONS:-

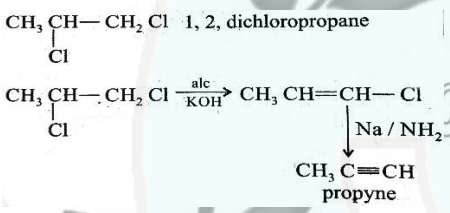
1. ORTHO AND PARA DIRECTORS IN AROMATIC ELECTROPHILIC SUBSTITUTION:-

Substituents which lead to this result are called, "ortho-, para- directors". Examples of ortho-, para– directors are hydroxyl groups, ethers, amines, alkyl groups, thiols, and halogens.

Here's a concrete example: the nitration of methoxybenzene (also known as anisole).



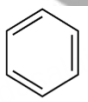
2. PROPYNE PREPARED FROM AN ALKYNE DIHALIDE:-



3. HUCKEL RULE HELP TO DECIDE AROMATIC COMPOUND:-

According to the Huckel's rule the number of pi electrons should satisfy (4n+2)Л electron in the ring where n= 0,1,2,3 etc..,. Presence of Л electron indicate the compound is aromatic.

EX:- Benzene



it has 6 delocalised pi electrons

i.e,, 4n+2 = 6 → 4n = 6-2 → 4n = 4 → n = 1

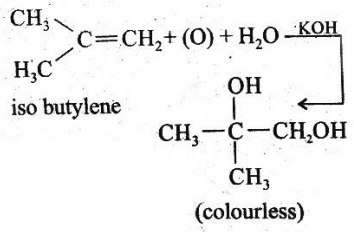
it obeys the Huckel's rule with n= 1. Hence it is aromatic.

4. SIMPLE CHEMICAL TEST FOR PROPANE AND PROPENE:-

TEST	PROPANE	PROPENE
Add bromine water	No reaction	The reddish brown colour of bromine is decolorised
Add acidified $KMnO_4$	No reaction	The pink of $KMnO_4$ is decolorised

5. ISO BUTYL TRAETED WITH ACIDIFIED POTASSIUM PERMANGANATE:-

The colour of potassium permanganate is decolorised to the formation of colourless glycol.



6. **CONVERT ETHYL CHLORIDE IN TO THE FOLLOWING:-**

(i) ethane?

$CH_3CH_2\boxed{Cl + H}H \xrightarrow{Ni} CH_3CH_3 + HCl$

(Reduction)

(ii) n -butane?

$CH_3CH_2\boxed{Cl + 2Na + Cl}CH_2CH_3$

$\xrightarrow{ether} CH_3CH_2CH_2\ CH_3 + 2NaCl$

butane

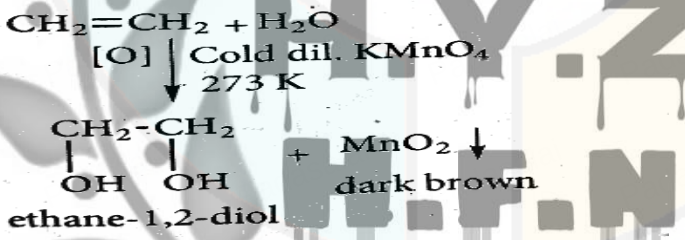
(wintz reaction)

7. **MARKOWNIKOFF'S RULE:-**

It states that "When an unsymmetrical alkene reacts with hydrogen halide, the hydrogen adds to the carbon that has more number of hydrogen and halide is added to the carbon having fewer hydrogen".

8. **ETYLENE PASSED THROUGH COLD DILUTE ALKALINE POTASSIUM PERMANGANATE:-**

Alkenes react with Baeyer's reagent to form vicinal diols. The purple solution (Mn^{2+}) becomes dark green (Mn^{6+}), and then produces a dark brown precipitate (Mn^{4+}).



9. **PREPARE PROPANE FROM SODIUM SALT OR FATTY ACID:-**

Decarboxylation of Sodium butyrate with soda lime.

$CH_3CH_2CH_2\boxed{COONa + NaO}H \xrightarrow{CaO}$

$Na_2CO_3 + CH_3CH_2CH_3$

propane

10. **DISTINGUISH 1 – BUTYNE AND 2- BUTYNE:-**

Test	$CH_3\ CH_2C \equiv CH$	$CH_3C \equiv CH \cdot CH_3$
	1-butyne	2-butyne
Add ammoniacal $AgNO_3$	White precipitate is formed.	No white precipitate is formed.
Add ammoniacal cuprous chloride.	A red precipitate is formed.	No red precipitate is formed.

11. **SABASTIER SENDERESNS REACTION:-**

It involves the reaction of hydrogen with carbon dioxide at elevated temperatures (optimally 300–400 °C) and pressures in the presence of a nickel catalyst to produce methane and water. Optionally, ruthenium on alumina (aluminium oxide) makes a more efficient catalyst. It is described by the following exothermic reaction.

12. **PYROLYSIS:-**

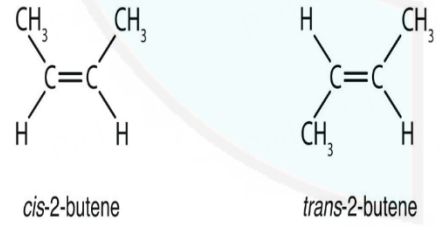
Pyrolysis is defined as the thermal decomposition of organic compound into smaller fragments in the absence of air through the application of heat.

13. **ISOMERISATION:-**

Isomerisation is a chemical process by which compound is transformed into any its isomeric forms. Normal alkanes can be converted into branched alkanes in the presence of $AlCl_3$ at HCl at 298K.

14. **CIS AND TRANS OF 2- BUTENE:-**

Cis-2-butene has both methyl groups on the same side of the molecule. *Trans*-2-butene has the methyl groups on opposite sides of the molecule. Their structural formulas are as follows:



cis-2-butene *trans*-2-butene

15. **TEST FOR ALKENE:-**

Step 1:-Test-tube containing bromine water
Step 2:-Add the alkene to the bromine water to the solution.
Step 3:- Shake.
Step 4:- The bromine water turns colourless
Step 5:- confirming the presence of an alkene.

16. **COMPLETE THE FOLLOWING:-**

$$CH_3CH = CH_2 \xrightarrow[\text{Peroxide}]{HBr} A \xrightarrow[aq]{KOH} B.$$

A = $CH_3CH_2C \equiv C.Na$;

B = $CH_3CH_2C \equiv C.CH_2CH_3$

UNIT- 14 HALOALKANES & HALOARANES:-

1. **PREPARE *n* PROPYL IODIDE FROM *n* PROPYL BROMIDE:-**

$$CH_3CH_2CH_2Br + NaI \xrightarrow[\Delta]{\text{acetone}} CH_3CH_2CH_2I + NaBr$$

n-propyl bromide → *n*-propyl iodide

2. **AVOID THE TRACES OF GRIGNARD REAGENT:-**

Any traces of water, destroys the Grignard reagent formed by converting it to an alkane.

$$RMgX + H{\cdot}OH \longrightarrow RH + Mg\begin{matrix}X\\OH\end{matrix}$$

3. **CHLOROFORM REACTS WITH OXYGEN IN THE PRESENCE OF SUNLIGHT:-**

Chloroform forms a poisonous gas phosgene $COCl_2$ when chloroform reacts with oxygen in the presence of sunlight.

$$CHCl_3 + \frac{1}{2}O_2 \xrightarrow[\text{light}]{\text{air}} \underset{\text{(phosgene)}}{COCl_2} + 2HCl$$

4. **3 POSSIBLE ISOMERS AND IUPAC NAME:-**

(i) Structural formula:

$CH_3CH_2CH_2CH_2CH_2Br$

Common name: n-pentyl bromide

IUPAC name: 1-Bromopentane

(ii) Structural formula:

$CH_3\underset{\displaystyle Br}{\underset{|}{C}}H - CH_2CH_2CH_3$

Common name: secondary pentyl bromide

IUPAC name: 2-Bromopentane

(iii) Structural formula:

$CH_3CH_2\underset{\displaystyle Br}{\underset{|}{C}}H{\cdot}CH_2CH_3$

Common name: secondary pentyl bromide

IUPAC name: 3-Bromopentane

5. **FREONS:-**

The chloro fluoro derivatives of methane and ethane are called freons.

6. **PREDICT THE PRODUCT WHEN BROMO ETHANE IS TREATED WITH i]KNO3 ii] AgNO3:-**

ERROR 401 ! NOT FOUND

7. **NAMING REACTION:-**

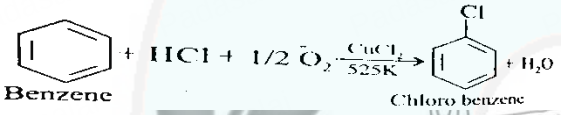
i] Dow's process

$$\underset{\text{Chlorobenzene}}{C_6H_5Cl} + NaOH \xrightarrow[300\ atm]{350^{\circ}C} \underset{\text{Phenol}}{C_6H_5OH} + NaCl$$

This reaction is known as Dow's process.

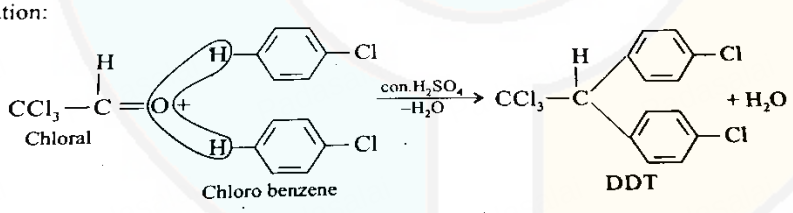
Ii]Raschig process

Chloro bezene is commercially prepared by passing a mixture of benzene vapour, air and HCl over heated cupric chloride. This rection is known as Raschig reaction.

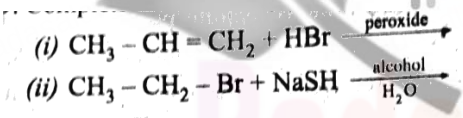


8. **PREPARATION OF DDT:-**

- DDT (p,p' dichloro diphenyl trichloro ethane): DDT can be prepared by heating a mixture of chlorobenzene with chloral (Trichloro acetaldehyde) in the presence of con.H_2SO_4.
- Preparation:



9. **COMPLETE THE REACTION:-**



(i) $CH_3 - CH = CH_2 + HBr \xrightarrow{peroxide} CH_3CH_2CH_2Br$ (bromo ethane)

(ii) $CH_3 - CH_2 - Br + NaSH \xrightarrow[H_2O]{alcohol} CH_3CH_2SH + NaBr$ (ethane thiol)

10. **HUNDSDICKER REACTION:-**

Silver salts of fatty acids when refluxed with bromine in CCl_4 gives bromo alkane.

$$\underset{\text{Silver propionate}}{CH_3CH_2COOAg} + Br_2 \xrightarrow[\text{reflux}]{CCl_4} \underset{\text{Bromo ethane}}{CH_3CH_2Br} + CO_2 + AgBr$$

11. **TEL PREPARED FROM ETYL BROMIDE:-**

Using ethyl alcohol:- Ethyl bromide can be prepared from ethyl alcohol by treating it with phosphorus tribromide. It is a substitution reaction.

The reaction is :- $3C_2H_5OH + PBr_3 \rightarrow C_2H_5Br + H_3PO_3$

12. **FINKELSTEIN REACTION:-**

Chloro or bromo alkane on heating with a concentrated solution of sodium iodide in dry acetone gives iodo alkanes. This reaction is called Finkelstein reaction.

$$\underset{\text{Bromoethane}}{CH_3CH_2Br} + NaI \xrightarrow[\Delta]{\text{Acetone}} \underset{\text{Iodoethane}}{CH_3CH_2I} + NaI$$

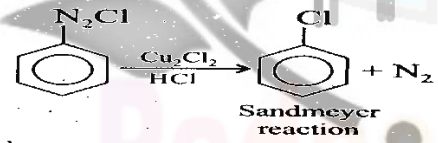
13. **SWARTZ REACTION:-**

Chloro or bromo alkanes on heating with metallic fluorides like AgF, SbF_3, or Hg_2F_2 gives fluoro alkanes. This reaction is called Swarts reaction.

$$\underset{\text{Bromo ethane}}{CH_3CH_2Br} + AgF \xrightarrow{\Delta} \underset{\text{Fluoro ethane}}{CH_3CH_2F} + AgBr$$

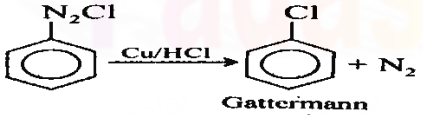
14. **GATTERMANN AND SANDMEYER REACTION:-**

(i) Sandmeyer reaction:



Sandmeyer reaction

(ii) Gattermann reaction:



Gattermann reaction -

15. **HALOALKANES WITH EXAMPLE:-**

The halogen derivatives of alkanes are known as haloalkanes. i.e., the hydrogen atoms in alkanes are replaced by halogen atom i.e., fluorine, chlorine, bromine and iodine.

16. **HALOARANES WITH EXAMPLE:-**

They are the halogen derivatives of benzene, where one or more hydrogen atoms of benzene are replaced by a halogen atom.

17. **CHLORINATION OF METHANE:-**.

If a mixture of methane and chlorine is exposed to a flame, it explodes - producing carbon and hydrogen chloride. This is not a very useful reaction! The reaction we are going to explore is a more gentle one between methane and chlorine in the presence of ultraviolet light - typically sunlight. This is a good example of a photochemical reaction - a reaction brought about by light.

$CH_4+Cl_2 \rightarrow CH_3Cl+HCl$

UNIT- 15 ENVIRONMENTAL CHEMISTYRY:-

1. **SMOG:-**

i) Smog is a combination of smoke and fog forms droplets that remain suspended in the air

ii) Smog mainly consist of ground level ozone, oxides of nitrogen, volatile organic compounds, SO_2, acidified aerosols and gases and particular matter.

2. **EARTH PROTECTIVE UMBRELLA:-**

In the stratosphere (11-50 km), the oxygen is partially converted to ozone. At an altitude of 25-30 km, a layer of ozone where concentration is about 10 ppm is formed. This region is called ozone layer and is called ozonosphere. It does not allow the harmful ultraviolet radiations coming from the Sun to reach the surface of the Earth and thus protects life on the Earth. That is why the ozone layer is called Earth's protective umbrella.

3. **DEGRADABLE AND NON DEGRADABLE POLLUTANTS:-**

Degradable pollutants can be decomposed, removed or reduced to adequate level either by natural or artificial means.

Examples of degradable pollutants are sewage, paper products, vegetables, juice, seeds, leaves, human sewage, animal and crop waste etc.

Non-degradable pollutants cannot be degraded by natural or artificial means. They are not recycled in the aqueous system naturally.

e.g. radioactive materials, heavy metals and plastics.

4. **OZONE COME INTO PHOTO-CHEMICAL SMOG:-**

Ozone is formed by a series of reactions that occur when the Sun shines.

$N_2 + O_2 \longrightarrow 2NO$

$2NO + O_2 \longrightarrow 2NO_2$

$NO_2 \xrightarrow{\text{sunlight}} NO + (O)$

$(O) + O_2 \longrightarrow O_3$

5. **GREEN CHEMISRY:-**

Green chemistry is a chemical philosophy encouraging the the designs of products and processes that minimize the use and generation of hazardous substances.

6. **GLOBAL WARMING:-**

A gradual increase in the overall temperature of the earth's atmosphere generally attributed to the greenhouse effect caused by increased levels of carbon dioxide, CFCs, and other pollutants.

7. **PARTICULATE POLLUTANTS:-**

Particulate matter is the sum of all solid and liquid particles suspended in air many of which are hazardous. This complex mixture includes both organic and inorganic particles, such as dust, pollen, soot, smoke, and liquid droplets.

8. **ACID RAIN FORMED:-**

Acid rains are formed when sulphur dioxide and nitrogen dioxide in the atmosphere are absorbed by droplets of water that make up clouds and get converted to sulphuric acid and nitric acid respectively.

$2SO_2 + O_2 + 2H_2O \longrightarrow 2H_2SO_4$

$4NO_2 + O_2 + 2H_2O \longrightarrow 4HNO_3$

9. **DIFFERENCE BETWEEN BOD AND COD:-**

BOD	COD
BOD refers to the biochemical oxygen demand, which measures the amount of dissolved oxygen (DO) required by aerobic organisms to break down organic material present in a given water sample at a given temperature and specified time.	COD refers to the chemical oxygen demand, which measures the amount of DO, required by the decomposition of organic matter and the oxidation of inorganic chemicals like ammonia and nitrite. COD is determined by incubating a closed water sample with a strong oxidant like potassium dichromate (K2Cr2O7) in combination with boiling sulfuric acid (H2SO4) under specific temperature for a specified period of time.
BOD is expressed in milligrams of oxygen consumed per litter The permissible limit of BOD is 30 mg/L.	The permissible limit of COD is 250 to 500 ppm.
BOD is determined by incubating a sealed water sample for five days and measuring the loss of oxygen from the beginning of the test.	COD measurement can be taken from few days.

10. **PROTECT OUR ENVIRONMENTFROM POLLUTION:-**

The following strategies are recommended to control environmental pollution.

(i) Waste management: Environmental pollution can be controlled by proper disposal of wastes.

(ii) Recycling: A large amount of disposed waste material can be reused by recycling the waste, thus it reduces the land fill and converts waste into useful forms.

(iii) Substitution of less toxic solvents for highly toxic ones used in certain industrial processes.

(iv) Use of fuels with lower sulphur content (eg: washed coal).

(v) Growing more trees.

(vi) Control measures in vehicle emissions are adequate.

Efforts to control environmental pollution have resulted in development of science for synthesis of chemical favorable to environment and it is called green chemistry.

12. **TECHNIQUES ADOPT TO REDUCE PARTICULATE POLLUTANTS:-**

Reduce the amount of particulate matter produced through smoke:

i) Stop smoking; if you do smoke, do not smoke indoors.

ii) Mulch garden refuse instead of burning it.

iii) Limit the use of fireplaces and wood stoves. ...

Iv) Switch to cleaner burning appliances. ...

V) Take action to reduce wildfires.

13. **PAH:-**

PAHs (Polycyclic aromatic hydrocarbon) are uncharged, non-polar molecules found in coal and in tar deposits. They are also produced by the thermal decomposition of organic matter (for example, in engines and incinerators or when biomass burns in forest fires).

14. **OZONE DEPLETION SUBSTANCE:-**

Ozone-depleting substances (ODS. ODS include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, methyl bromide, carbon tetrachloride, hydro bromo fluorocarbons, chloro bromo methane, and methyl chloroform.

15. **EFFECT OF PHOTO-CHEMICAL SMOG:-**

Photochemical smog is formed when sunlight interacts with certain chemicals in the atmosphere. Ozone is the main component in this type of air pollution. Ozone in the stratosphere protects us against harmful ultraviolet radiation, but on the ground, it is hazardous to human health. Photochemical smog is capable of inflicting irreversible damage on the lungs and heart. Even short-term exposure to photochemical smog tends to have ill effects on both the young and the elderly. It causes painful irritation of the respiratory system, reduced lung function and difficulty breathing; this is more evident while exercising or working outdoors. High levels of smog also trigger asthma attacks because the smog causes increased sensitivity to allergens, which are triggers for asthma.

16. **IMPACT OF OZONE DEPLETION:-**

A loss of ozone in the stratosphere because of mankind's pollution with ozone depleting chemicals such as CFCs will increase the amount of UV radiation that reaches the Earth's surface. As a consequence, health disorders, damage to plant and aquatic life, and degradation of materials will probably increase. Ozone depletion may even affect the global climate.

17. **CFC ENTERS THE STARTOSPHERE:-**

The abundance of CFC-11 decreases as the gas reaches higher altitudes, where it is broken down by high energy solar ultraviolet radiation. Chlorine released from this breakdown of CFC-11 and other **CFCs** remains in the **stratosphere** for several years, where it destroys many thousands of molecules of ozone.

18. **ROLE OF NITROGEN OXIDE IN OZONE DEPLETION:-**

In nature, bacteria in soil and the oceans break down nitrogen-containing compounds, releasing nitrous oxide. ... Nitrous oxide, like CFCs, is stable when emitted at ground level, but breaks down when it reaches the stratosphere to form other gases, called nitrogen oxides, that trigger ozone-destroying reactions.

19. **CONTROLLING AIR POLLUTION:-**

i) Conserve energy - at home, at work, everywhere.

ii) Look for the ENERGY STAR label when buying home or office equipment.

iii) Carpool, use public transportation, bike, or walk whenever possible.

Iv) Follow gasoline refueling instructions for efficient vapor recovery, being careful not to spill fuel and always tightening your gas cap securely.

V) Consider purchasing portable gasoline containers labeled “spill-proof,” where available.

VI) Keep car, boat, and other engines properly tuned.

VII) Be sure your tires are properly inflated.

VIII) Use environmentally safe paints and cleaning products whenever possible.

IX) Mulch or compost leaves and yard waste.

X) Consider using gas logs instead of wood.

20. **NCESSARY STEPS TO CONTROL ENVIRONMENTAL PLLUTION IN LOCAL AREA:-**

i) Stop smoking or at least follow the “No Smoking” sign.

ii) Use unleaded gasoline in your cars.

iii) Keep your car properly maintained to keep it in good running condition to avoid smoke emissions.

iv) Share a ride or engage in carpooling.

21. **PHOTOCHEMICAL SMOG DIFFER FROM CLASSICAL SMOG:-**

Classical Smog (London Smog)	Photochemical Smog (Los Angels Smog)
This type of smog was first observed in London in 1952.	This type of smog was first observed in Los Angels in 1950.
It is formed due to the presence of SO_2 and humidity in the air which combine to form H_2SO_4 fog which deposits on the particulates.	It is formed due to photochemical reaction taking place between NO_2 and hydrocarbons.
It involves smog and fog.	It does not involve smog or fog. The word smog is a misnomer here.
It is formed in the months of winter particularly in the morning hours when the temperature is low.	It is formed in the months of summer during afternoon when there is bright Sun light so that photochemical reactions can take place.
It is reducing in character.	It is oxidising in character.