Chapter 4 UNIT-4 ORGANIC CHEMISTRY

It is defind as the chemistry Covalent bonded Carbon compound.

→ Carbon contain 4 bond.

ane → - (single bond)
ene → = (Double bond)
yne → ≡ (triple bond)

3 functional Group
1) alcohol -OH
2) alkyl or Halide } R (F, Cl, Br, I)
3) Methyl -CH3

Ane (C_nH_{2n+2})	ene (C_nH_{2n})	yne (C_nH_{2n-2})
1. Methane - CH_4	1) methene - CH_2	1) Methyne -
2. Ethane - C_2H_6	2) Ethene - C_2H_4	2) Ethyne - C_2H_2
3. Propane - C_3H_8	3) Propene - C_3H_6	3) Propyne - C_3H_4
4. Butane - C_4H_{10}	4) Butene - C_4H_8	4) Butyne - C_4H_6
5. Pentane - C_5H_{12}	5) Pentene - C_5H_{10}	5) Pentyne - C_5H_8
6. Heptane - C_6H_{14}	6) Heptene - C_6H_{12}	6) Heptyne - C_6H_{10}
7. Septane - C_7H_{16}	7) Septene - C_7H_{14}	7) Septyne - C_7H_{12}
8. Octane - C_8H_{18}	8) Octene - C_8H_{16}	8) Octyne - C_8H_{14}
9. Noneane - C_9H_{20}	9) Nonene - C_9H_{18}	9) Nonyne - C_9H_{16}
10. Decane - $C_{10}H_{22}$	10) Decene - $C_{10}H_{20}$	10) Decyne - $C_{10}H_{18}$

Hydro Carbon

Hydro carbon's are the compound which are made up of carbon and hydrogen.

Types of Hydrocarbon

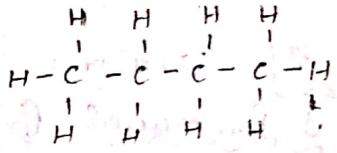
It is two types 1. Open chain or acyclic or elifatic
2. Close chain or cyclic hydrocarbon

1. Open chain

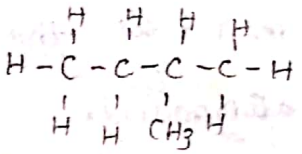
These are the compounds in which the first and last carbon are not directly joined to each other. The open chains of carbon may be straight

or branch.

Eg



(n-Butane)
(Straight chain)



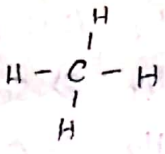
2-methyl Butane
(Branch chain)

$CH_4 - H$ = methyl
$C_2H_5 - 5$ = Ethyl

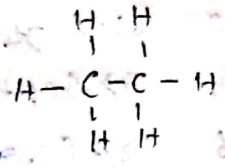
It is two types a. Sachurated
b. Unsachurated

a) Sachurated hydrocarbon

These are the compounds which contains only carbon compound and hydrogen compound in their molicules. These are also called alkens.



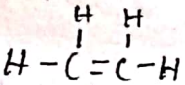
Methane



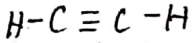
Ethane

b) Unsachurated hydrocarbon :-

These are the compounds which have a carbon=carbon (C=C) or carbon ≡ carbon (C≡C) in their molicules. The unsachurated hydrocarbon are devided in to alkens and alkynes.



alkene
Ethelene



alkyne
Acetylene

2) Closed chain

Compound having closed chain or rings of carbon atom in their molicules are called closed chain. These are devided in to two types.

i) Alicyclic hydrocarbon

ii) Arromatic

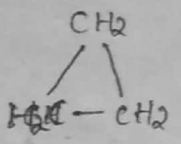
i) Alicyclic :-

These are the hydrocarbons which contains closed chain of carbon atom in molicules both have many property similar to open chain.

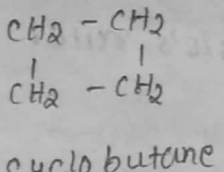
Alicyclic hydrocarbs are two types

1. Sachurated alicyclic hydrocarbon (C-C)
2. Un sachurated alicyclic (C=C) (C≡C)

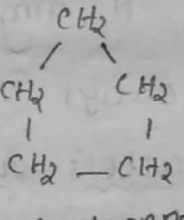
1. Sachurated ~~hydro~~ alicyclic



Cyclopropane



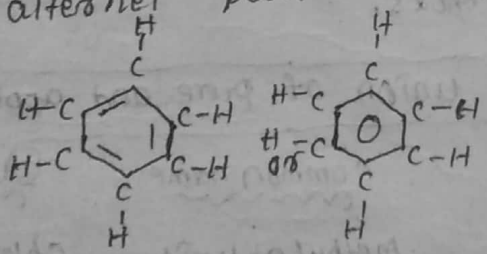
cyclobutane



cyclopentane

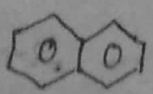
ii) Arromatic hydrocarbon :-

The arromatic hydrocarbon which differentiate property from alephitic compound. The parent arromatic hydrocarbon is Benzene. The molicules of benzene was represented as a ring of 6 carbon atom with single bond & double bonds with alternet position.

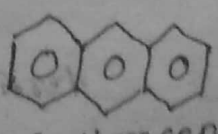


(C_6H_6).

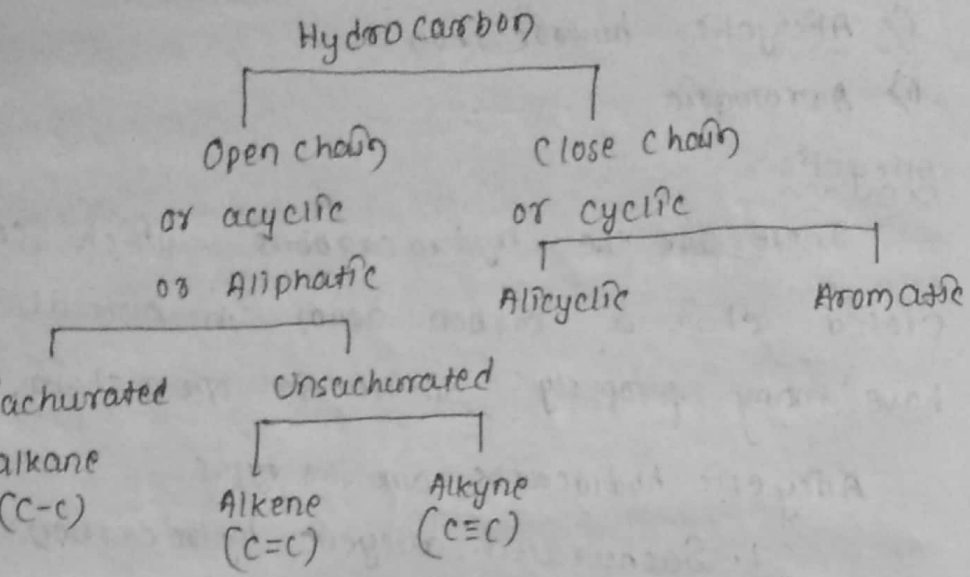
The arromatic hydro carbon may also contains more then one benzene.



Naphthalene



Anthracene



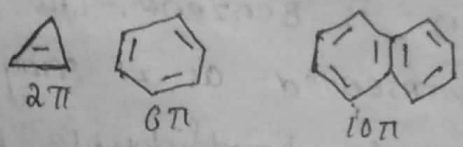
Nomene - clature of aromatic Compound :-

A ring compound is said to be aromatic if it oways Huckle's rule.

Huckel's rule

All ring compound which contains (4n+2) π electron are called aromatic compounds. n=0,1,2,3...etc

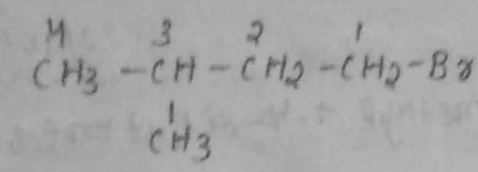
Thus all ring compounds which contain 2π, 6π, 10π 14π electrons are called aromatic.



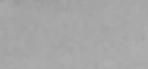
IUPAC Nomene - clature of alkane, alkene, alkyne, alkel halides and alcohols.

IUPAC - International union of pure and applied chemistry

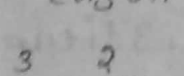
Structural formula	common name	IUPAC Name
CH_3Cl	Methyl chloride	chloro methane
$CH_3-CH_2-CH_2-I$	propane Iodide	Iodo propane
$CH_3-\overset{2}{C}H-\overset{1}{C}H_2-Cl$ (CH3 on 2)	Isobutyle chloride	2-methyl 1-chloro propane
$CH_3-\overset{2}{C}(CH_3)_2-Cl$ (CH3 on 1)	tertiary Butyle Chloride	2-chloro 2,2-methyl Butane


Iso pentyle Bromide

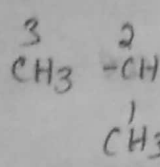
1-Bromo 3-methyl Butane


methane alcohol

methanol / Propanal


n-propyle alcohol

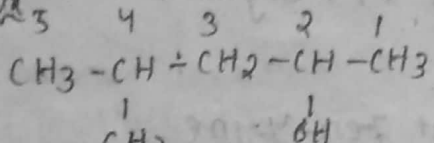
propane 1-ol

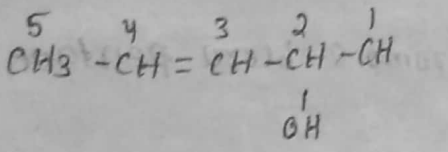

Iso Butyle alcohol

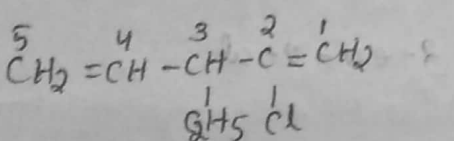
3methyl propanal

IUPAC Name

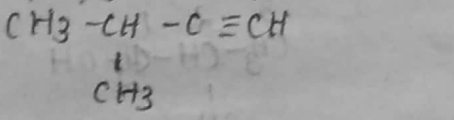
Ex


4-methyl pentan-2-ol

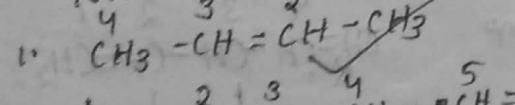

3-pentan-2-al

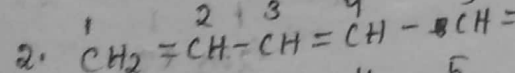

~~3-methel pentan~~

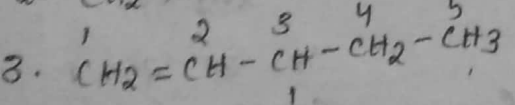
2-chloro 3-ethyle penen 1,4-diene

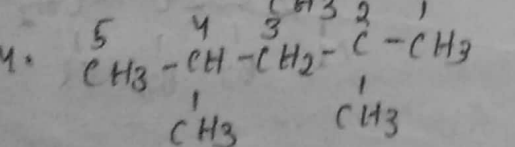

3-methyl But-1-yne

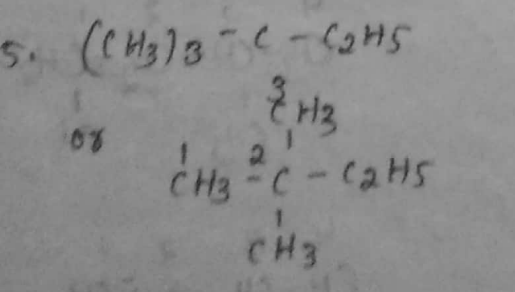
HOME WORK


1. But-2-ene

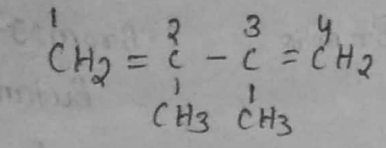

2. Hex-1,3,5 triene


3. 3-methyl 1-penene

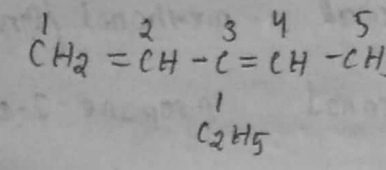

4. 2,4-dimethyl Pentane


5. 2-ethyl 2-methy propane

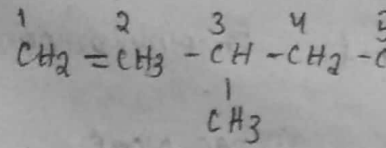
22/10/2019



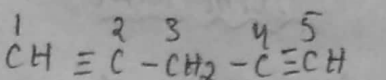
2,3-methyl ~~1,4-di~~ But ~~ene~~-1,3-diene



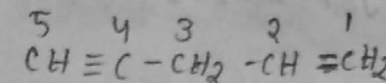
3-ethyle pent 1,3 diene



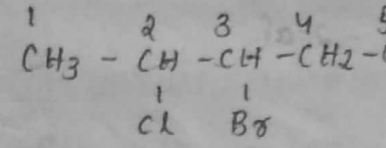
3-methyl pent 1-ene



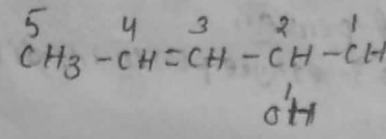
pent 1,4 diyne



pent 1en-4yne



3-Bromo 2-chloro pentane



pent 3-en-2-al

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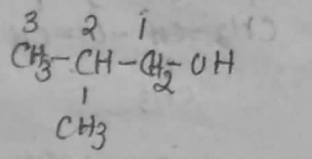
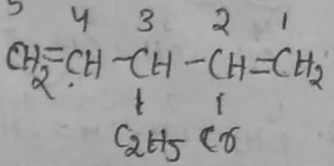
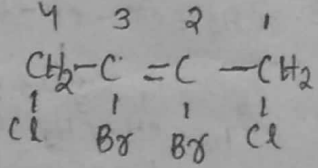
2 Methyl prop-1-ol



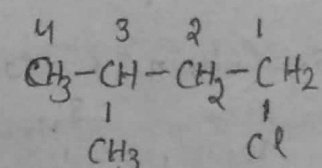
2 chromo 3-ethyl pant 1,4-diene



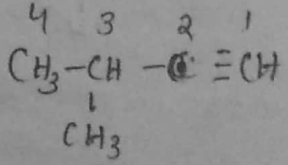
2,3-di bromo 1,4-dichloro but 2-ene



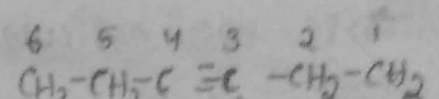
1-chloro 3-methyl Butane



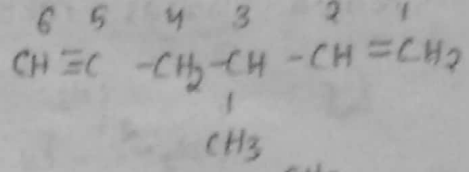
3-methyl But-1-yne



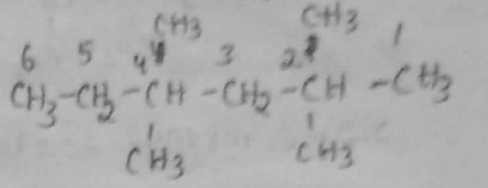
Hept 3-yne



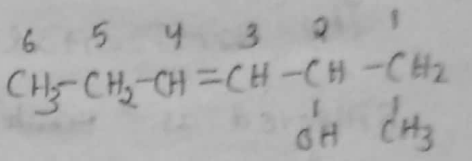
3-methyl Hex-1-ene-5-yne



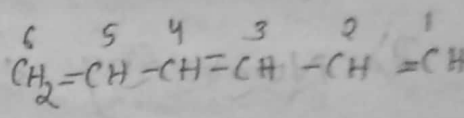
2,2,4,4-tetra methyl Hexane



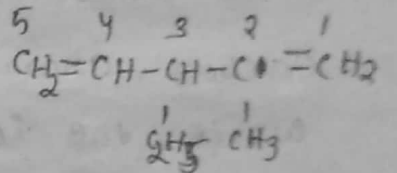
1-methyl Hex 3-ene-2ol



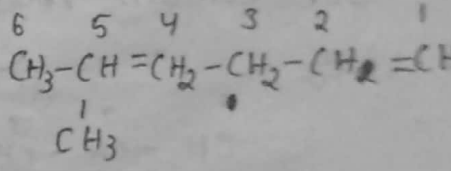
Hex 1,3,5 triene



3-ethyl-2-methyl pent 1,4,diene



5-methyl Hex 1,4-diene

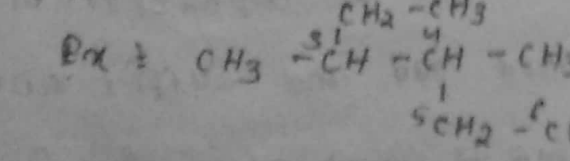


ALKANE

Longes chain Rule :-

Silect the longest chain of carbon atoms called principal chain. Other carbon atoms which are not included the chain are substituents.

Ex :-

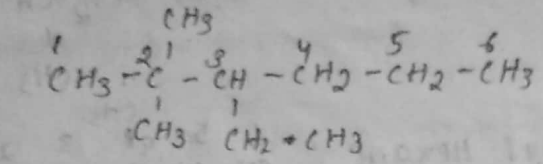


3,4-dimethyl Hexane

It is a continues chain of 6 carbon atom.

i) If the molicule contain 2 or more chains conta. ining the same no of carbon atom, select the one which caries more no. of substituent.

Ex



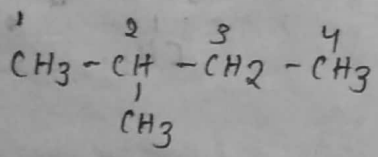
2,2-dimethyl 3-ethyle Hexane

The Horrizental chain of '6' carbon atom is sillected as ~~each~~ it contains more no. of substituent i.e "3".

2) Numbering the princical chain

i) The numbering of carbon atom in the continue carbon chain is done from the both the ends. write the locant no in the form of set. The set contain lowest locate no is correct.

Ex



2-methyl Butane

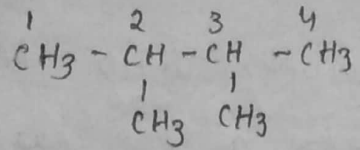
Substituest locant is "2".

ii) when writing the IUPAC name, separte the locant from substituent name by a hyphane (-). and arrange the substituent in alphabitical order followed by word rad and suffix ane. Locant - substituent name + word root + suffix

iii) If a particular substituent appears two or more time, attach the prefix ie di, tri, tetra

respectly to the name of the substituent. write the locants in the increasing order Separated by "comonas" among them series and by a hypane from the name of a substituent.

Ex

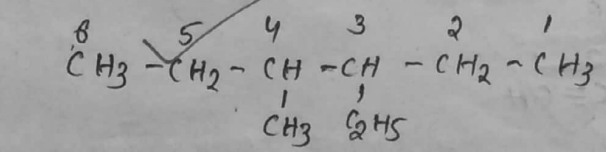


2,3-dimethyl Butane

3) Naming the different substituent of equal positions:-

If two different substituent present at equal position from the two ends of the parent chain then numbering of the chain is done in such a way that the substituent which comes first in the alphabitical order gets the lower no.

Ex



3-ethyl 4-methyl Hexane.

4) Rule for branched substituent in chain:-

Each substituent is further branched then name it as the substituted alkyl group the branched chain is chain from the carbon atom linked to the parent chain.

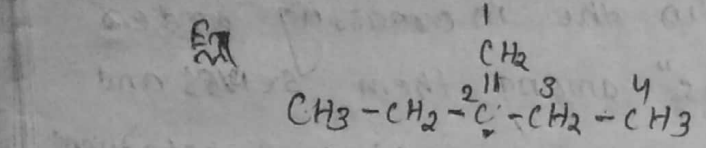
Locant - substituent name + word rut + suffix

Alken and Alkyne:-

i) Slect the longest continues carbon chain which contains the max^{m} no of multibal bond

as the principal chain.

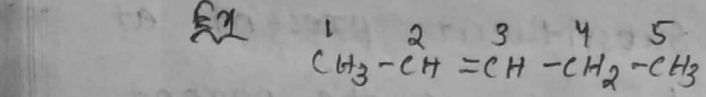
Ex



2-ethyl But 1-ene

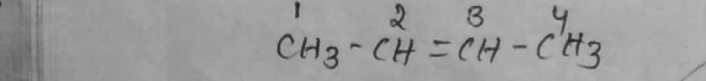
ii) Numbering the principal chain if there is one multipul. bond (=/≡) no the carbon chain from such an end so as to give lowest numeral two carbon atom containing multipul bond.

Ex

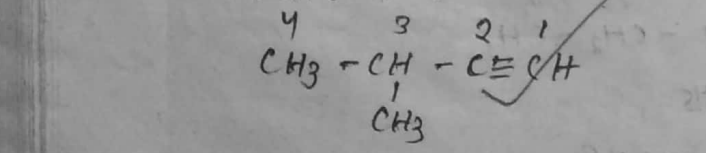


Pent-2-ene

iii) The primary suffix for double bone is ene and for triple bond is yne.



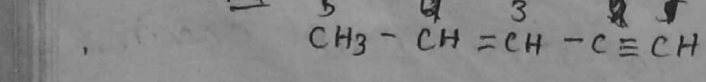
Bute 2-ene



3-methyl-But-1-yne

iv) If the principal chain contains ~~more~~ two or multipul bonds then no. the principal chain from both ends in the form of set.

Ex



Pent 2-ene, 1-yne

v) If the numbering of principal chain from both ~~chain~~ ends give the same set of locant two multipul bonds the the set which

gives lowest locant two double bond is select.

Ex $\overset{1}{CH_2}=\overset{2}{CH}-\overset{3}{CH_2}-\overset{4}{C}\equiv\overset{5}{CH}$

pent 1-en-4-yne

vi) When both double and triple bonds are present in the principal chain, the compound is named as the derivatives of alkyne. In other words the suffix ene always comes yne. and "e" of the ene is omitted if it followed by suffix stating vowel (a, e, i, o, u)

Ex $\overset{5}{CH}\equiv\overset{4}{C}-\overset{3}{CH_2}-\overset{2}{CH}=\overset{1}{CH_2}$

pent 1-en-4-yne

vii) If the principal chain contains two double or three triple bond then suffix is diene, di-yne.

$\overset{1}{CH_2}=\overset{2}{CH}-\overset{3}{CH_2}-\overset{4}{CH}=\overset{5}{CH_2}$

pent-1,4-diene

$\overset{1}{CH}\equiv\overset{2}{C}-\overset{3}{CH_2}-\overset{4}{C}\equiv\overset{5}{CH}$

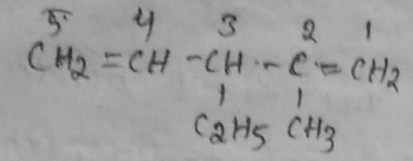
pent 1, 4-diyne

viii) In case substituent present in the principal chain containg principal multipul bonds, the no. of carbon chain so as to get lowest set of locant to the multipul bonds.

$\overset{1}{CH_2}=\overset{2}{CH}-\overset{3}{CH_2}-\overset{4}{CH}=\overset{5}{C}(\overset{CH_3}{|})-\overset{6}{CH_3}$

5-methyl-1, 4-di ene Hexene.

iv) If the same set of locant for multiple bond in both the numbering which gives lowest set of locant two substituent



2-methyl 3-ethen pent-1,4-diene

Alcohols:-

According to IUPAC name alcohols are called alkanols. It is represented as ~~word root~~ word root + an + ol.

Ex CH_3-CH_2-OH

~~Propan-ol~~ Ethan-ol

Uses of Sum common aromatic Compound :-

1) Use of Benzene

Benzene is a industrial chemical. It is found in crud oil and is a measure part of gasolene It is used to make plastics, synthetic fibure detargents, drugs, pesti-cides.

2) Use of tolune:-

Tolune is used as a solvent i.e prevant in paint thinners, nail pulish ~~thinne~~ remover. Tolune has many uses in different industry

3) Use of BHC (Benzene Hexa Chloride

It is an organo chlorine chemical and an isomore of ~~hexa~~ ethan cyclo hexane.

hexa chloro hexane. It is use both as an agricultural insecticide and as a formaceutical treatment.

4) Use of phenal

phenals are use house hold products. It is used as a ~~this~~ dis-infectant in house hold cleaner and mouth wash.

5) Use of naptha alene

It is made from Carid oil. It is also produce when things burn, so nepthalene is found in cigarate smoke, car exhaust (gas), and smoke from forest fire. It is used as a insectisite.

6) Use of anthracene :-

It is solid polycyclic arromate hydrocarbon concesting of steap hused benzen rings. It is used in wood presarbative, insecticide, coating materials.

7) Use of benzoic acid.

It has to prevant infections caused by bacteria salicylic acid hencethe body rough or ded skin cells. Benzoic acid and salicylic acid is a combination of medicin used to skin irritation, insect bite, fungal infection, eczima.

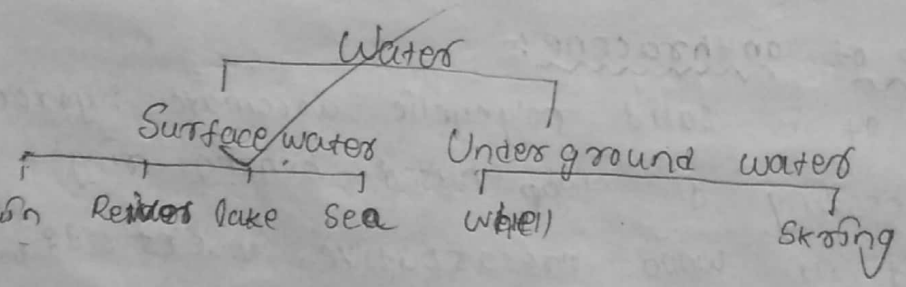
CHAPTER-10 INDUSTRIAL CHEMISTRY 26/10/2019

WATER TREATMENT

The natures most abundant supply i.e water, which is accential for the survival of all leaving beings (humans, animals, plants) water is not only assential of the survivers of life, but it is also used for the operation in a large no of industrys. Water is used for domastic purpose, like barthing, washing, drinking etc.

Shorcess of water

Water is avalable from different shorcess. Shorcess of water can be classified surface water and underground water.



A. Surface water

i) Rain water:-

It is the puerosest form of natural water but it acts impurities in it due to the poluted atmosphere it desolves large amount of industrial gas like CO_2, SO_2 NO_2 etc. and also it carries some organic and inorganic particel.

ii) River water:-

It starts from spring water. Rain waters and some other shorcess of water also add to it. It also desolve some minerals of soil and finaly falls into the sea.

iii) Lake water:-

This water is confined in a particular space, it contains lessed amount of minerals. There are some lake which provide pure water. Such water can be used for drinking and disinfaction. Examples are nainetalslake(UP), Sasthamkotal lake (kerala).

iv) Sea water:-

It is the most impure form of all water. It contains 2.6% Sodium chloride, and more then 3.5% of desolved impurities. It contains large amount of organic impurities. Sea water contains chlorides, bromides, iodide, magnesium, calcium.

B: Underground water.

A part of the rain water on the surface perpoleds in to the earth. During it's down words journy it desolve some minerals. This process continues till water riches some hard water. Under ground water rushes upword and come out in the form of spring. The spring water contains sulphor. Due to the germicidal action of sulphor, contamination of water is privanted. Such water is used as medichine aginest skindisease.

Soft water and hard water

water is two types 1. soft water.
2. Hard water.

1. Soft water:-

It is that water which forms lather with soap soln.

Soap soln.

Ex:- Rain water, demineralise waters, distil. water

2. Hard water:-

It is that water which does not form lather with soap soln, it forms curdy white precipitate. It contains bicarbonates, chlorides and sulphates of calcium & magnesium.

Ex Sea water, river waters, pond water.

Types of hard water:-

There are two types of hard water.

1. Temporary hard water
2. Permanent hard water

1) Tempory hard water:-

It is that water which contains bicarbonate of calcium and magnesium.

Whey this hard ness?

→ During first shower of ~~water~~ rain, carbon dioxide of rain desolved of water. To form Carbonic acid (H_2CO_3).

$$CO_2 + H_2O \longrightarrow H_2CO_3$$

→ The above water containing Carbonic acid reacts with calcium Carbonate present in earth. ~~with~~ ~~calc~~ to form Saliblle calcium bi-Carbonate the presence of bicarbonate ~~presen~~ make it temporary hard.

$$CaCO_3 + H_2CO_3 \longrightarrow Ca(HCO_3)_2$$

Why called temporary hardness?

→ The temporary hard ness because Suitable bicarbonate decompose in to in suitable carbonate simple on hitting. Thus water becomes soft.

$$Ca(HCO_3)_2 \xrightarrow{Heat} CaCO_3 + H_2O + CO_2$$

2) Permanent hard waters

It is that water which contains chlorids and Sulphate of calcium and magnesium.

why this hard ness?

when rain water flows down the earth and passes over beds of rocks, hard water formed.

why called permanent hard ness?

It is permanent hard ness because such a hard ness can't be remove by boiling of water.

Softening of hard water (Removal of hard ness):-

It is the process of removal of desolved Salt's. i.e bicarbonate, Chloride, Sulphates of calcium and magnesium.

a) Removal of tempory hardness of water:

i) by boiling:-

when tempory hard water is boiled the bicarbonets presents in water decompose to give in sulible carbonates. Soft water is formed.

$$Ca(HCO_3)_2 \xrightarrow{Heat} CaCO_3\downarrow + H_2O + CO_2$$

$$Mg(HCO_3)_2 \xrightarrow{Heat} MgCO_3\downarrow + H_2O + CO_2$$

b) by adding sodalime ($Ca(OH)_2$)

when tempory hard water is dripted with some quantity of lime, bicarbonate present in water change to insulibule carbonates. Soft water is formed.

$$Ca(HCO_3)_2 + Ca(OH)_2 \longrightarrow 2H_2O + 2CaCO_3$$

$$Mg(H_2O)_2 + Ca(OH)_2 \longrightarrow MgCO_3 + 2H_2O + CO_3$$

Effect of axcess of lime

Axcess of lime in water converts soft water in to hard water again by carbon dioxide. from air.

$$Ca(OH)_2 + 2CO_2 \longrightarrow Ca(HCO_3)_2$$

(axcess) from air

Complite removal of hardness by this process is not possible because bothe $CaCO_3$ and $MgCO_3$ are widely sulible in water.

Permanent hardness hardness by adding washing Soda (Na_2CO_3) :-

when permanent hardwater is dripted calculated quantity with Sodium carbonate sol, Calcium and magnesium salt present in water get precipited as insulible carbonate. Soft water is then decanted off (Origin अनुसार)

$$CaCl_2 + Na_2CO_3 \longrightarrow CaCO_3 + 2NaCl_2$$

$$MgCl_2 + Na_2CO_3 \longrightarrow MgCO_3 + NaCl$$

$$MgSO_4 + Na_2CO_3 \longrightarrow MgCO_3 + Na_2SO_4$$

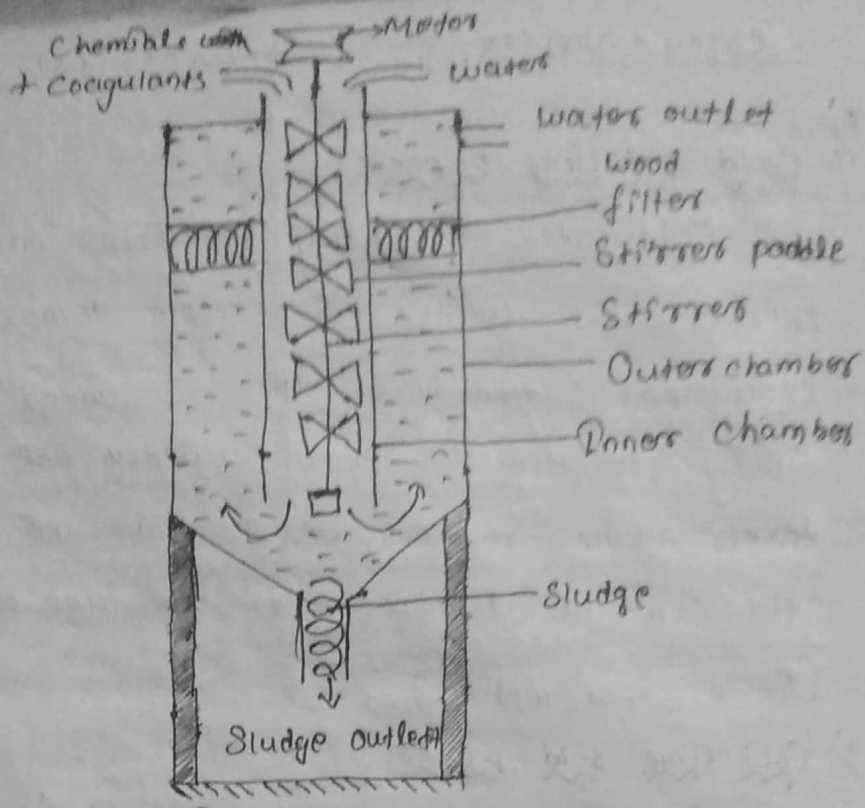
$CaSO_4 + Na_2CO_3 \longrightarrow CaCO_3 \downarrow +$

A.) i. **Cold sodalime process:-**

Calculated quantity of lime and soda are mixed with water at room temp. Also coagulands like alum is added for removing finely precipted to septail quickly. This process is taken 24 hr to complite. In this method water still contains hardness to the tune of 60 ppm. (60 parts per melion).

ii) **Cold lime sold process**

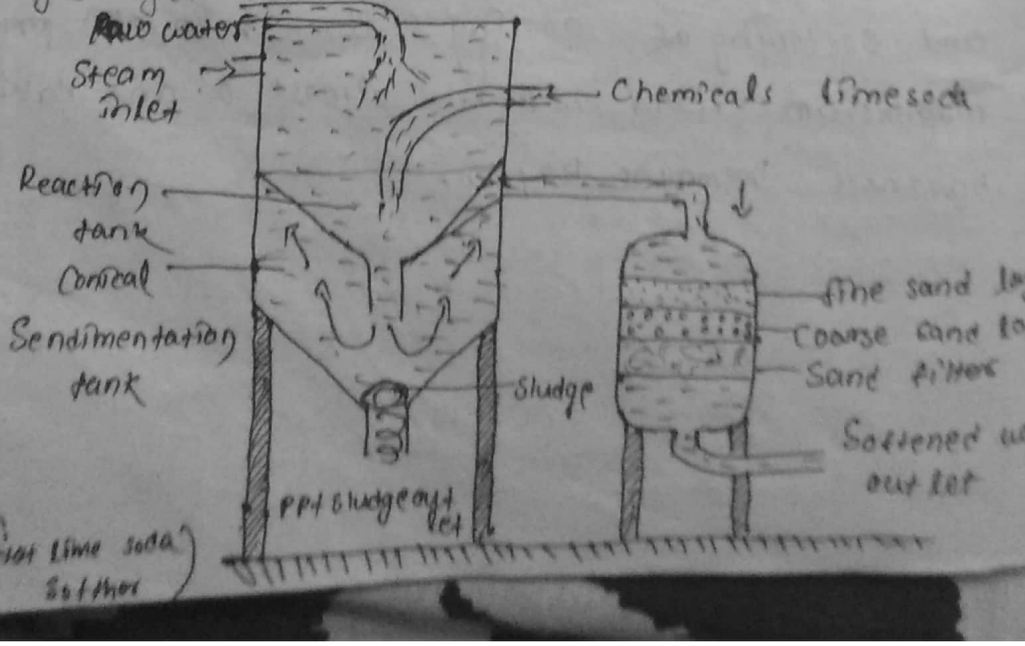
Calcwated quantity of chemicals and be water along with accelarates and coagulands are added to a tank hitted with stirrer. On Continues stirring mixing takes place. After softening the soft water rises up words and that havies sludges septail down. The soft water passes through a filtering media ensuring Complite removal of siddge. Cold lime soda process is used for softening of mancipalwater and softening of cooling water. In this process magnesium hard ness is almost 0 and calcium hardness remains 40 ppm.



(Cold sodalime softner)

Hot soda process

In this process hard water is ~~t~~ripted with lime and soda at 80-150 c. Advantage of hot process is that the softening capacity is increase The precipited and sludge is formed repted. Thus no coagulands are nidded. The desolved gas get removed in this process.



Hot lime soda softner

Cold sodalime process	Hot soda
→ This process is conducted a room temp. (25°)	→ This process is con... at room tem (80–150°C)
→ Coabulant like alog is added.	→ No coabulant is added.
→ It takes 24 hrs to complite	→ It takes complited with in
→ Hardness left in the water is 60 ppm	is min. → Hardness left max^m 80 ppm.

Advantage of hot sodalime process :-

→ The precipitation rea^n becomes almost complite.
→ The rea^n takes place faster.
→ The sludge septain rapidly.
→ No coabulant is nidded.
→ Disolved gasses (which may cause corrosion) are removed.
→ Viscocity of soft water is lower, hence filter easily.
→ Recidure hardness is low comper to cold sodalime process.
→ Hot lime soda process consists of 3 parts :-
1) Reaction tank in which complite mixing of the ingridant takes place.
2) Conical sedimentation (conical) tank wher the sludge settle down.
3) Sand filter where sludge is compliyely remove.

CHAPTER-II LUBRICANTS 29/10/19

Lubricants:-

Lubricants are the substants which are introduced bet^n two sliding surfece to raduce the frictional resistance.

Typeof Lubricants:-

There are three types of lubricants.

i. Solid lubricant

ii. Lequid lubricants

iii. Semi solid lubricants

1. Solid lubricants

1) Graphite

2.) Molybenum disulphide

3) Boron nitride

1) Graphite

→ It consist of multipul flat plates, one atom thick which are held to gather by wick bond.

→ The carbons atoms are arranged in hexagon in several flat layers which are held togather by wick bond.

→ The carbon-carbon bon(C-C) distance in rings is 142 nm, when the distance bet^n two succeive sheets is 34 pm (per miter)

⇒ Due to large distance bet^n the two successive layer, they can slide past one anather by rubbing.

⇒ It is a good conductor of electricity.

⇒ Each carbon atom in graphide is sp^2 hybrid

Properties :-

→ It is very ~~soapy~~ soapy to touch.

→ It is ~~non-flmt~~ non-flamable and non oxidised in layar up to 375°C.

Uses as a lubricants :-

→ It is used as a emulsifying agent like tanin.

→ Oil~~da~~-dag is used in internal combustin engines because it forms a film bet^n the piston ring and a silender.

→ Aquadag is used e-spacially food industry where a lubricat free from oil is requid.

→ It is also used in mechine work shop, railway track joint, open gears, chain etc.

Other uses as graphite

→ It is used in lead pencils.

→ As a lubricant in heavy mechinary in making electrods.

→ In the manufacture of crucibules for melting metal.

→ As a pigment in paints.

Lequid lubricants

→ In the lequid lubricant the operating temp. is high.

→ The ~~sfting~~ sealing arrang ment is perfect to prevant the lose of oil.

→ Speed of the rollers is very high.

A good lubricating oil having some characterstick.

→ It should have high boiling point and low freezing point.
→ Should have adequey viscocity at a particular condition.
→ Should causes non corrosive property.

Types of lubricanting oils

1) Petrolium oil :-
It is obtained by fractional distilation of petrolium. These are used because they are chief, easily avolable and stable under surface condition.

2) Blended oil :-
It is found that a single oil can't act as a good lubricants under all situation. Property of the mineral oil can be improved by adding specific additives. Some additives are.
i) Antifoming foaming agent like glycerals.
ii) Corroson preventeds like phosporous and antimony.
iii) Oil in a improved like vegitable oil.
iv) Anti oxident like amino compound.

3. Animals and vegitable oil
These are commonly used for lubrication. These are blanded with mineral oil do increase oilness. The undergo oxidation easily - some examples are olivoil, castoroil, etc.

Semisolid :-
Grease is a semisolid lubricant. It generaly consist of soap emulsified. The characterstics of

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greash is they posesses high viscocity. Greash is some times use to describe lubricating material which have high viscocity.

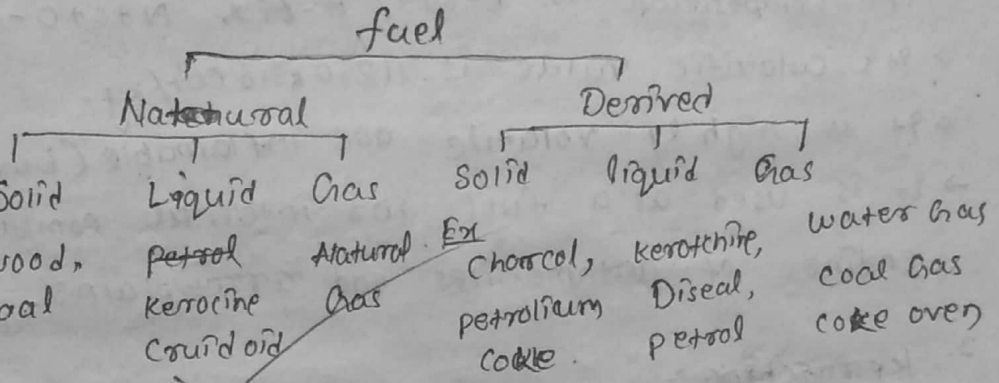
Ex. petrolium gelies such as vesline.

CHAPTER-12 *FUEL* 31/10/19

fuel :-

fuel may be defind as any substance which on combustion release a large amount of heat energy. with out producing axcess recidue.

Classification of fuel :-



Choice of Good fuel :-

1) A good fuel which have some character tricks
   - → It should have high calorefic value.
   - → It should leave only small amount of recidue.
   - → It should contain min^m quantity of moisture.
2) Products of combustion should not be harmful
3) It should be cheap easy to transport.

Good

Calorific value of fuel

The amount of heat energy released by the complite combustion of 1 gm of the fuel or food.

Calorific value of some fuel:

Solid fuel	carbon	hydrogen	oxygen	calorific value
Celulose	44.5	6.1	49.2	7500
Wood	50.0	6.0	44.0	8600
Lignite (browncoal)	67.0	5.2	27.8	11700
Anthracite	94.1	3.5	2.5	15720

Liquid fuels:-

1. Petrol or gesoline

It is obtained bet^{n} 40°-120°c and is a mixture of hydrocarbons such as pentan (C_5H_{12}) octane (C_8H_{18})

→ The composition is C-84%. H-15%. N+S+O-11%.

→ It's calorific value is 11250 kilo cal/kg.

→ It is highly volatile and inflamable (burn).

→ It is used as a fuel for internal combustion of engines of automobiles and arrowplains.

2. Kerosene:-

→ It is a fraction obtained bet^{n} 180°-250°c and is a mixture of hydrocarban suchas decane ($C_{10}H_{20}$) - Hexadecane ($C_{16}H_{34}$).

→ The composition is C-84%, H 16%, S ≤ 1.

→ The calorific value is 11100 K.C/kg.

→ It is used as a domastic fuel as stoave.

3. Diesel:-

→ It is a fraction obtained bet^{n} 250°-320°c and is a mixture of penta decane ($C_{15}H_{32}$) - Octadecane ($C_{18}H_{38}$).

→ The composition is carbon 85%. H 12%. rest 3%.

→ It's density is 0.862 - 0.95 and it's calorific value is 11000 K.C/kg.

→ It is used as a engine fuel.

Composition and industrial application of water gas and producer gas

Producer gas :-

Producer gas is essentialy a mixture of combustible gas like carbon manoxide and hydrogen, associated with large % of non combustible gas like NO_2, CO_2 etc.

Composition

The average composition of producer gas Carbon manoxide - 20-30%, H_2 8-12, N_2-52-54% and CO_2-3%, It's calorific value is 1300 k.c/m^3.

Uses :-

→ It is chief, clean and easily preparable gas and is used for hitting oper hearth forness (steel and grass manufacture).

⇒ Used as a reducing agent metallurgical operation

Water gas :-

water gas is essentialy a mixture of combusiable gases CO and H_2 with a little non combustable gases like CO_2, N_2.

Composition :-

→ The average composition of water gas H_2-51%, CO-41%, N_2-4%, CO_2-4%.

→ It's calorific value is 2800 k.c/m^3.

Uses :-

→ It is used as a shorce of hydrogen gas and a fuel gas.

→ It's flame is short but vary hot and it's used for welding purpose.

LPG (Liquidified petroleum gas)

→ LPG Gas can be attained during cracking of heavy oil or from natural gas.

Composition:-

N-butane 27%, Isobutane - 25%, butene - 43%, Propene 2.5%, Propane 2.5%, with little or no ethane.

Uses:-

It is mainly used as a domastic fuel and Industrial fuel. It is also used as a motor fuel.

CNG (Compressed Natural gas)

→ It is natural colourless, odourless mixture of gases which is attain from the upper portion of petrolium deposition.

Composition:-

Methane ~~(CH_4)~~ (CH_4) 70-90%, ethane (C_2H_6) 4-7% traces (little amount) of propane and butane.

Uses:-

→ It is used as a fuel of vehical's.

→ It is used as a domastic and industrial fuel.

→ It is used as a shorce of carbon used in ~~thyre~~ industry. Carbon attained by complete combustion of natural gas is called carbon black.

CHAPTER-13 *POLYMAR* 16/11/2019

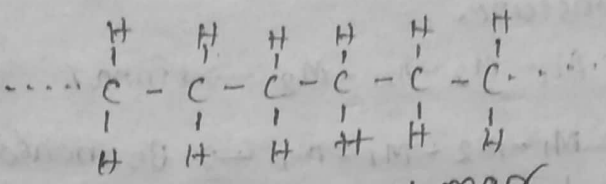
Manomer

It is defind as the small molicules of a substance which combines with each other to form polymer molicules.

→ Ex:- Polythin is a poly mor form by linking togather of a ethene molicules. (C_2H_4)

$$C_2H_4 \longrightarrow C_6H_{14}$$

ethene monomer



ethylene polymar

→ Vinyl cloride ($CH_2=CH\cdot Cl$) is the manomer of poly veniyl cloride (PVC).

Polymer

poly — many

mer - unit

Polymer may be defind as the macro molicules (very large) of tained by large no of simple molicules through co-valent bond.

Ex $CH_2=CH\cdot Cl \xrightarrow{B_2O_2} \cdots CH_2-CH(Cl)-CH_2-CH(Cl)-CH_2\cdots$

vinyl cloride PVC

Homo polymer

A homo polymer which is form by the combination of identical manomer through co-valent bond. It is a hole no.

Ex:- polyvenyl cloride.

The manomeric unit of polymer may be present in a linear, branchly structure.

$M_1-M_1-M_1-M_1$ → Linear structure

$M_2-M_2-M_2-M_2$ → Linear structure

$M_1 - M_1 - M_1 - M_1$ ⟷ branched
        |
        M_1

Copolymer

A copolymer is form from two or more different monomer through covalent bond.

Ex Nylon 6-6

The manomeric unit may be linear or branched structure.

$M_1 - M_2 - M_1 - M_2$ → linear structure

$M_1 - M_2 - M_1 - M_1$ → Branched structure.
  | |
  M_2 M_1

Digree of polymerisation

The no of repeting unit present in a polymer is called digree of polymerisation. It is denoted by "n".

Most of the polymers have molicular masses in the rains of 5000 – 200000. which indicates high digree of polymerisation. Exceding of 10000 belongs to high polymer but less then 100–1000 it is called low polymer.

Diffrance bet^n thermo plastick & thermo septing

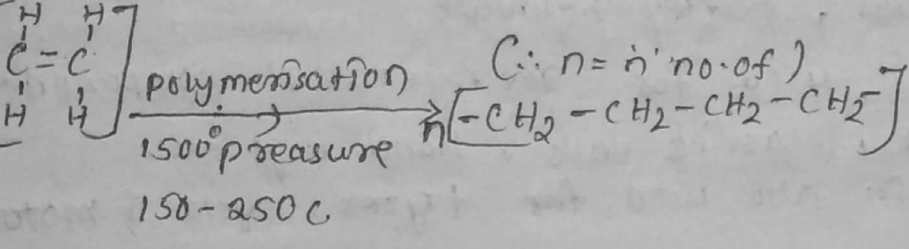
Thermo plastick :	Thermo septing
→ These are form by addition (straight) polymerisation.	→ These are form by condensation (branch) polymer.
→ These have usualy linear structur.	→ These have branched structure.
→ These soften melting hitting and hardden again cooling.	→ These don't soften on hitting but rather becomes hard.
→ These can be re shape.	→ These can't be re shape.
→ These are solibul in some organic solvent.	→ These are insulibul in organic solvent.
Ex - PVC, Polythin, Teflon, nylon, etc.	Ex urea, bakulite etc.

Composition and uses

1. Polythene

The IUPAC name is polythin (P.E).

It is obtained by liquifying ethylene at 1500°C atmosphearic preasure and about 150-250 °C, in presence of oxigen when it is polymerise in to a waxisolid, which comes out from the bottom of the vasels.



Low density polythin is obtain by using free redical indicator.

High density polythin is obtain by using ionic catalysis.

Uses:-

-> It is used for making high frequancy insulator part.

-> Packing materials in the form of bags.

-> flaxibul bottles, kitchen, and domastic application.

-> Toys, tubes, pipes, cotted wire.

-> HDPE is use for manufacturing bockets and tubes.

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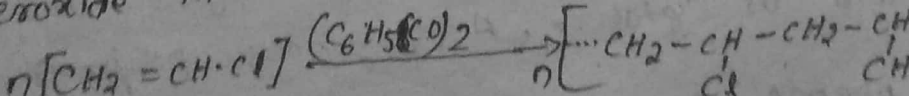
2. Poly venyl clorid (PVC)

It is obtained by hitting water emulsion of vinylcloride in presence of small amount of benzoyl peroxide in an autoclave (prestin high preasure)



Uses:-

There are two types of pvc 1. plasticized
2. Unplasticized

(1). Uses:-

→ Unplasticized plastic are used for electrical insulator.
→ It is also used for light fittings gramophone records, battery helimate.
→ It is used for refrigerator component, rain coate, plastick dalls, hand bags etc.
→ It is also used for tyres, cycle & motor cycel mudguards.

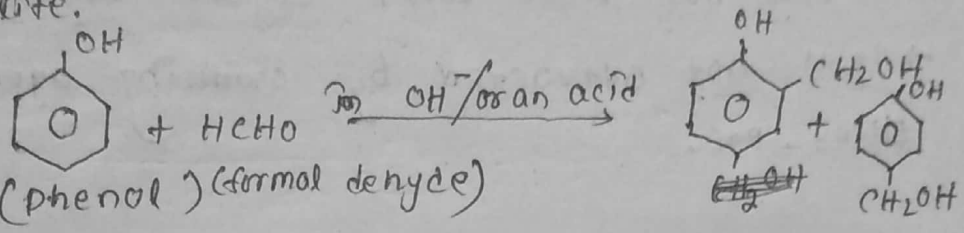
(2) Plasticized

→ plasticize plastics are use in packing, tabble cloths, etc.
→ It is also used for making electrical insulator like covering of electric cabbles, injection syringe, moulding articels like toys., etc.
→ Making floor tiles, thermal insulating foam used in cinema hall and building and in crafts.

Baklite

→ The production of baklite two monomers are use phenol and formal dehyde. It is also called phenol formal dehyde regin.
→ phenol reacts with formal dehyde in presence of acid as catalist. A regious polymer known as phenal formal dehyde resion or baklite.

→ The reaction involves the formation of methylene in ortho and para position. As a result either linear or crush linked material is obtained. The rea^n is deficult because condensation of ortho and para hydroxy methyl phenol leads to the formation of polymeric products The final product is dark, crash linked, called bakelite.



Uses

→ It is used for making electrical insuleting parts like switch, plucks.
→ for moulded artical like teliphone parts like television and radio parts.
→ It is also use in paints and vernishes.

Natural rubber

Natural rubber is a polymer of isoprin (2methyl, but, 1, 3-diene). It is poly isoprin (C_5H_8). It may be notted that natural rubber is cis isomer.

Vulcanisation of rubber

It is a process of hitting raw rubber with varying amount of sulphor 140°C for some time.

Draw backs of natural rubber (Raw Rubber) :-

→ It is plastic in nature.
→ water abborption tendency is very high.
→ It has no resistance towards non polar solvents.

→ It swells in organic solvent.
→ It is attacked by oxidising agent like H_2SO_4, HNO_3, etc.

Advantage of Vulanised rubber

→ It is less plastic.
→ water absorbation tandancy is low.
→ It is resistant towards polar solvent.
→ It does not react with organic solvent.
→ It is not attracted by oxidising agent H_2SO_4, HNO_3. etc.