HYDROCARBONS

CLASSIFICATION OF HYDROCAEU3ONS:

HYDROCARBON

_Acyclic ur Aliphatic Opcn chain) **Cailxx vr:Liu**

Adkare& **Alk.e ne** **Alkyni**

Ara

cyawak..23e5. cycipi

Alkaries

Preparation of AlkaroN

{1i Metz reaction

2CH,C1413t 0.1.C1.1,0.1.c1.1,

Frankland reaction

+ 2ri + R+2riX$_2$

{2) FrQrn rignard reagent (RIM g>f)

RIvicjX+1-10H— RH+ Mg[OH)X

RM9X + R OH —s RH+ tilgrOR")X

R.MQX R NH$_2$ —a. RH4 Mg(NHR ')Y

(3) From unsaturated !hydrocarbons ;·

Sabatier-Serderens reduction

R Cl-l = SIR CH, -CFI,

R - C O^{-1} +1^{-2} R CH -CH$_I$

4. From carboxylic acids-

Clecarbonlation -

CH$_3$COO$^-$Na^t +NarOH $\xrightarrow{IQ}$ CH Na CO$_3$
Sndiurn ichanoda+ a

Kolbe's electrolytic method -

2C1-1 CCIO Na'+21-1$_2$O $\xrightarrow{8111(''b^{li}}$ rCH$_I$—CH$_)$ +20D + H$_2$ +2NaOH
5Q.diurn merAbe

Ructions

Combustion

+ 20 —k-00+ 211 0, AF; – —217.0 IK Gal /mole

Oxidation ;-

CH_4 + ¹ ˡ* ic 2 H, H

0-1,, +0, 1.4'123 , U2152 1- H_2O

SuliMitution

Ha **logenation**

CR_4 +$C1_2$ → 3 Ci-i$_3$ C1+1-1C1

r CI CI-1$_2$2 CHC1 CI$_1$

{} **The reactivity** of Haloipen5 F, CI, Br >I

fli) The rate of **replacement of** Hydrogens of allkanes is ;3 2° >1°

Cl-11$_3$0-1$_2$CH$_2$Cic —%—.5.C1-1f1HCHiCHiCII+CHCH$_2$ClCHCl-L.
n **edlone**

CH_3 3 _ Cl-1$_3$ O$_2$

Isobuteria

CH_3

CH_3 – C1-1$_3$

Cl

35% 3)

CH_3

C3-1 - **CH,** CI

CH/ 64 % (1)

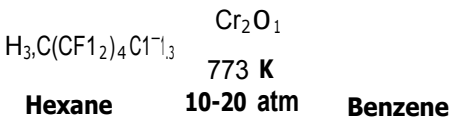
N itraltiOn

nc CH,CH,CH#O$_2$ + CH,C1-INO,C1-1$_3$ CH,NO,
Corn.wel

IS % 401 % 10% 25%

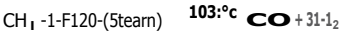
Sulphonatloin – replacement **of Ilydrogen** atom **of** aka ne b – **S011⁻I group.**

Aromatization

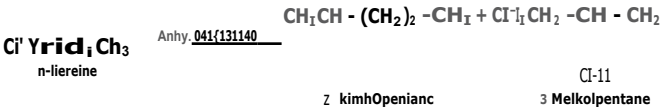


(6) Thermal decomposition or Pyrolysis or cracking or Fragmentation – when hi8her alkanes are heated at high temp (about 700 – 800 10 in the presence of alumina or silica catalysts, the aika nes break down to lower alkenes and ancanes.

(7) Action of steam ; – Catalyst ; nickel, alumina Al203



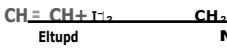
!so merization



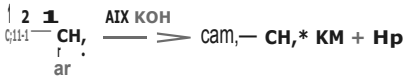
Al ke neS

Preparation

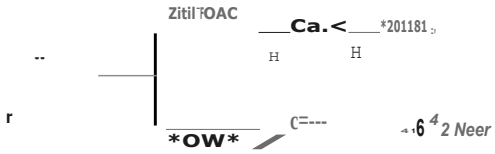
1, From Alkynes : • Allopes on partial reduction with partially deactivated palladised charcoal known as Li ndler's catalyst give allkynes_



2, From Haloalkanes dehydrohalogenation CE, or 1, 2-elimination or Beta-elimination



3. From DehaloOnatiOn



4_ From Alcohols :- Dehydration (E1 - elirninartion 1

$Cli_3CH_2CH_2CIFI \xrightarrow[1\ UP]{CDM\ H2S°1} I\text{-}CH_3CH = H_2O$

$CH_{IC}H_2CH_2CH_2OH \xrightarrow[13sPc]{} C1\text{-}1_3CHiCH = CH_2$

Reactions of Alkenas

(1) Addition Reaction :- Alkene show electnoiphilic addition reaction_

1. Addition of Hydrogen :-

$RCH = CH_2 \qquad RCH_2CH_3$

2. Addition of Halogens :-

$CH, = CH, + Elr, \qquad BrCH,$

$Cl\text{-}1_2 = CH_2 + Br_2 \xrightarrow[ilkuorn = lair)]{\&Arent} Br\text{-}C1\text{-}1_2\text{-}CH_2\text{-}01\text{-}1 + HEir$ (Colourless)

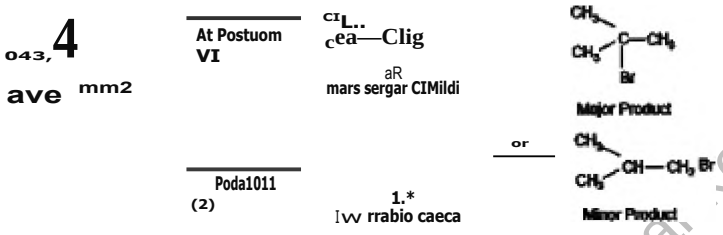
1 Addition of hydrogen hal icl es –

Addition reaction of Her to symmetrical al kenes

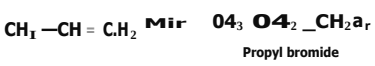
$CHI_2 = C1^{-}_2 H\_ \text{--}3.\text{-}0\text{-}1_3\text{-}C1\text{-}1_2$

Addition reaction of HER to unsymmetrical alkenes takes place according to Markovnikov Rule

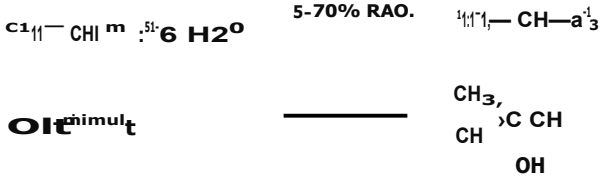
Markown ikon/ rule :- negative part of the addendum gadding molecule} gets attached to that carbon atom which possesses lesser number of hydrogen atoms. E.g.



Peroxide effect or Kharasch (Anti Markownikoff's addition) In 1933 Kharasth and Mayo observed that when HBr is added to an unsymmetrical double bond in the presence of organic peroxide, the reaction take places opposite to the markovn ikov rule.



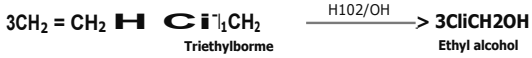
4. Addition of water (Hydration};- Acid catalyzed addition of water



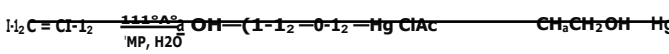
2- Oxidation :-

1. Combustion CO2+ H2O

I Hydroca rhoration ·oxidatiom - Alkenes react with dihorane to form trialkyl boranes which on oxidation with alkaline H 42 give alcohols.



3- Os' mercuration-clernercuraltion



4, Oxidation with potassium permanganate :-

$2KIVIND + H_2O—)2KOH + 2fieln0_2 + 3[O]$

3 $^{1}t=C'''.\ 1120\ +O$ cold

$^{\circ}F$ Flo7L OH

(pink Colour) (Colourless)

Bayer's lest

$CH_3—CH\text{-}CH_2 \xrightarrow[4R1\ ^{14,}6]{KIVICI} CH_3COOFI + CO_2 + 11_20$

Oxidation *with* Drone **Olonolysis-give** carbonyls compounds

CINCEISH CCIA. $\xrightarrow{Cos.}$ CH,C2.01 $\xrightarrow{I\ CH)}$ CHO-1_2M + 01141.11+ZnIQL.12

CP/e 01_1

Ozwilcie

Aikynes

Preparation :-

From vicinal di halides clehalagenation

$Cl\text{-}I,— NCH – CH_2 —Br\ ''\ ^{m} \longrightarrow Cl\text{-}1_3 —C\ CH + 2KEIr + 2H_2O$

By the ardon of water on calcium oz tide

$CRC\ 1^{-}{}_2O \longrightarrow$ C3(Oh(1.

Reactions

{111 **Addition** Reaction **A.lkyne** show electrophilic addition **reaction.**

1_ **Addition** of **Hydrogen** — Hydrogenation.

$CH,C=.CH^{4}\ 31, \longrightarrow CH,C1\text{-}1,C1\text{-}1,$

Propene

Birch Reduction

$$CH_3C \equiv CCH_3 \xrightarrow[\text{Catalyst}]{H_2,\ \text{Lindlar}} C=C \begin{matrix} H \\ CH_3 \end{matrix}$$

$$CH_3C \equiv C\text{-}CH_3 \xrightarrow[\text{Naurhil}]{Na/NH_3\ (liq.)} \begin{matrix} H_3C \\ \\ H \end{matrix} C=C \begin{matrix} H \\ \\ CH_3 \end{matrix}$$

2_ Addition of Halogens

$$HC \equiv C\text{-}H \xrightarrow{2E} ArHC = CHAr$$

Addition of hydrogen halides

$$HC \equiv CH + HBr \rightarrow$$

4- Addition of water {Hydration}:- Acid catalyzed addition of water

$$HC \equiv CH + H_2O \xrightarrow[HgSO_4]{1\%\ H_2SO_4} [CH_2=CHOH] \rightarrow CH_3CHO$$

5_ Polymerisation

{a) Linear polymerization ; of ethyne gives oolyacetylene or polyethre which Is a high molecular weight polyene containing repeating unit of (CH = CH CH = CH and can be represented as – : CH CH= Chl)n-

{13) Cyclic polymerization-results in the formation of aromatic compound.

$$3\,HC \equiv CH \xrightarrow[873\ K]{\text{Red hot iron tube}} C_6H_6$$

Aromatic 1-1v€1 roca rbon

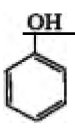
Preparation of Benzene

(i) DeCartm)PelatiOn of aromatic acids.

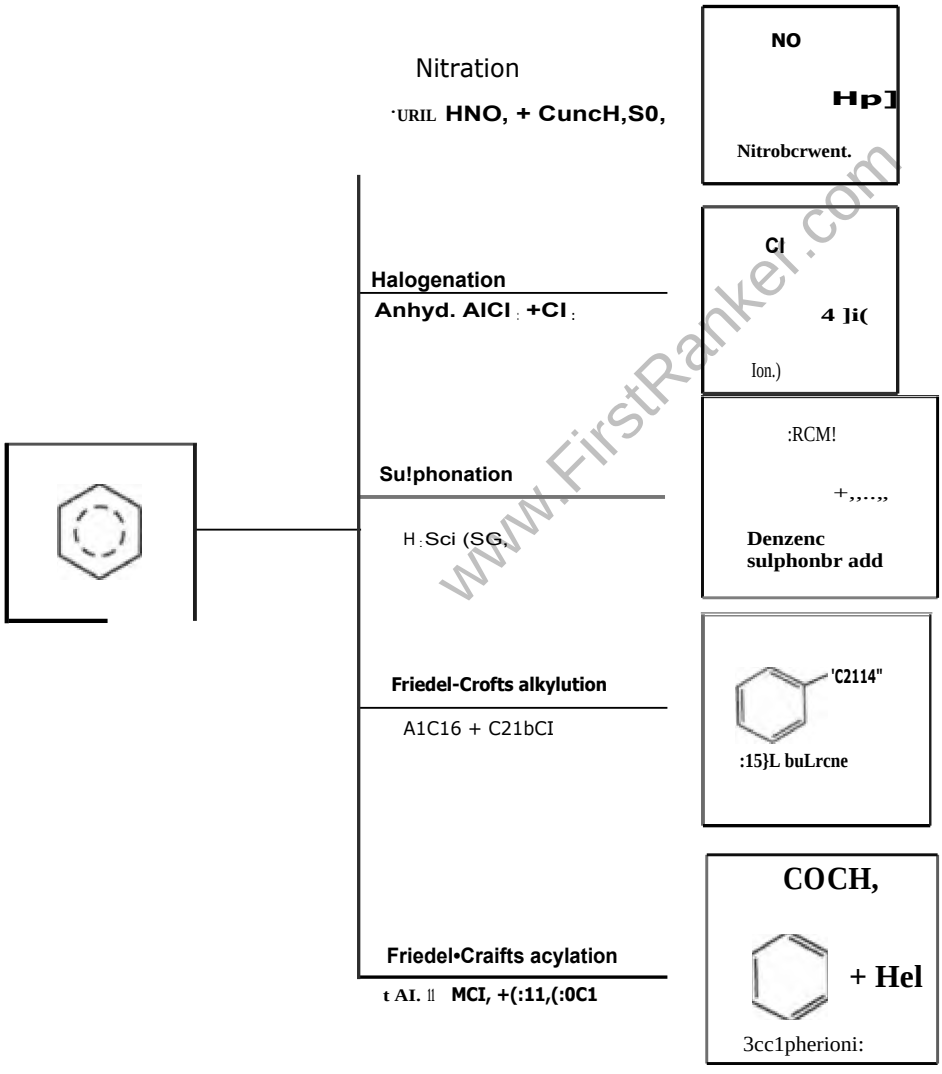
C DONa

+ Naar.] Ca.()

(ii) Reduction of phenol: Phenol is reduced to benzene by passing its vapours over heated zinc dud



—— **+ ZnO**



Benzene on tveatenent with excess of chlorine In the presence of anhydrous AllCl $_0$ In dark yields hexachlombenzene (CE,C161

CI

C1

Maw& Ai%

D s dark, cold

6F101

Cl

Cl

Rexachlorobenzene

W g s] __

Lire 'e influence of a functional group in m1n051.11xtituted benzene :-

1. Ortho and Para directing groups and actikrating

—01-l, —N1-1 .-1111R,-141-10X1-1, —OCH, —CH, —C_2H_5 etc.

2. Meta directing group and deactivating :- —CN, —COP,. —GOOK OOR,

3. Ortho and para directing groups and deactiwating— Halogens because of their strori — I effect, overall electron, density orli Ilm.rize m ring decreases. However due to resdnance the. .1tit tv oft dlansti ork el- and p- position is greater than that at the rn-pos idol% Hence, they