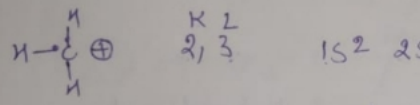
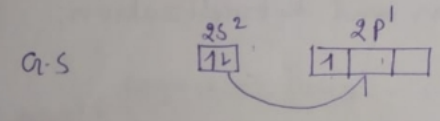
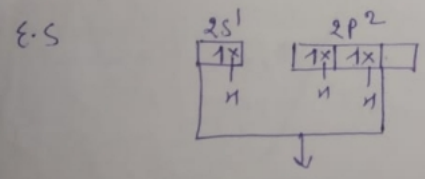
B. Tech First year By B.
Purusottam singh Niranjan

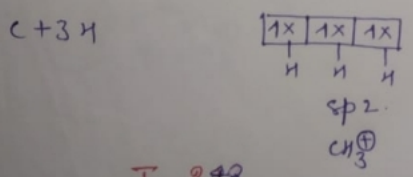
Carbocations: The carbon species containing positive charge, are called carbocations. The carbocations are intermediates and have six electrons in the octet.



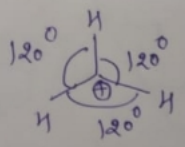
$1s^2\ 2s^2\ 2p^1$







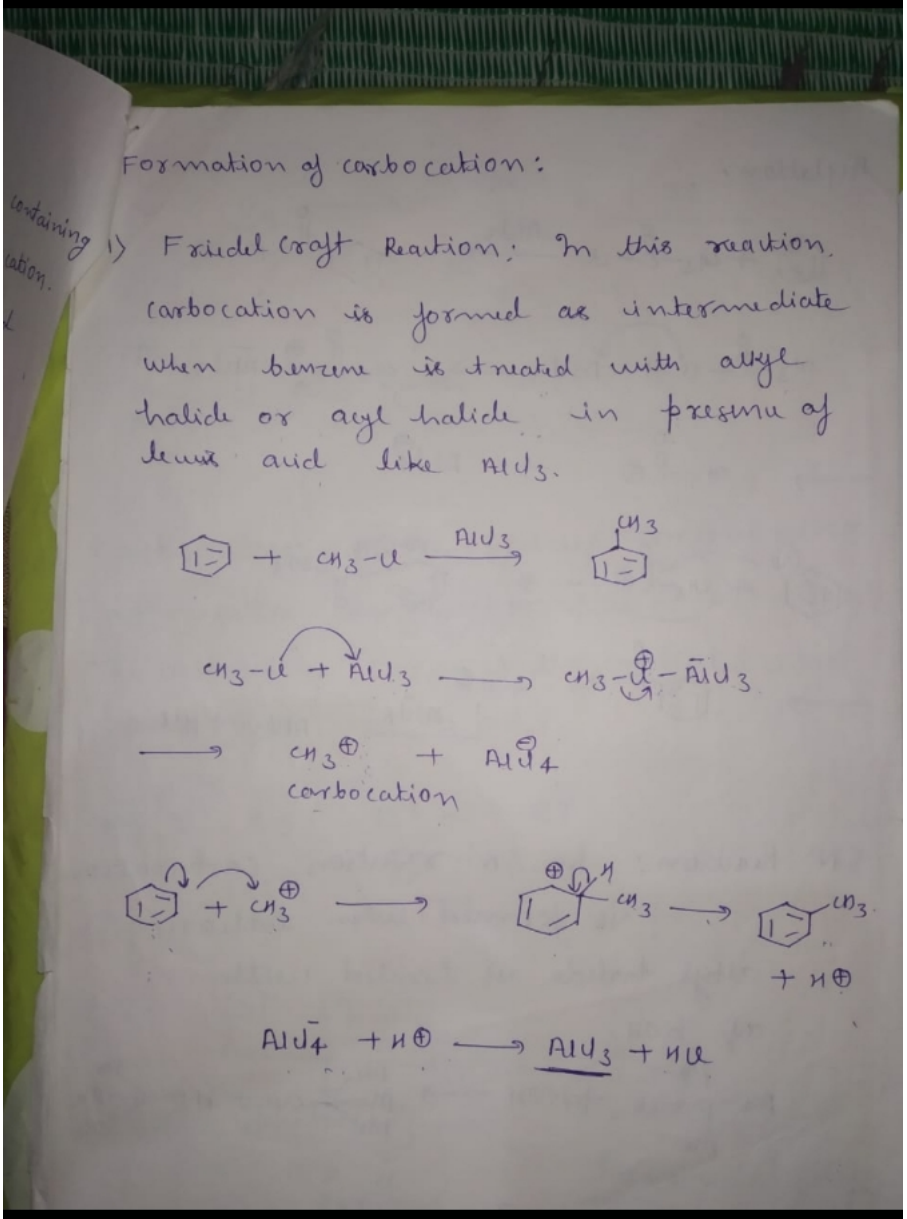
Shape



Trigonal planar

I 248

II. 209

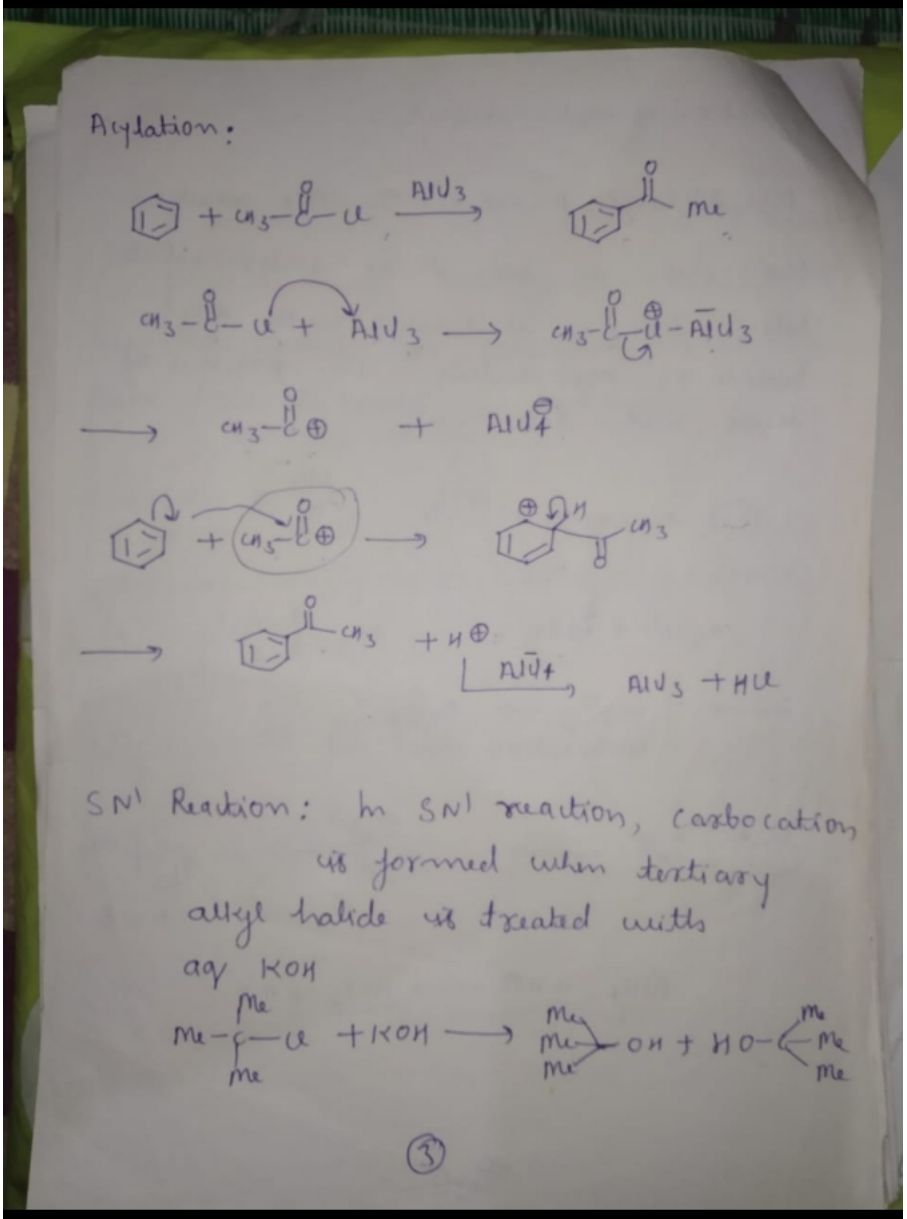


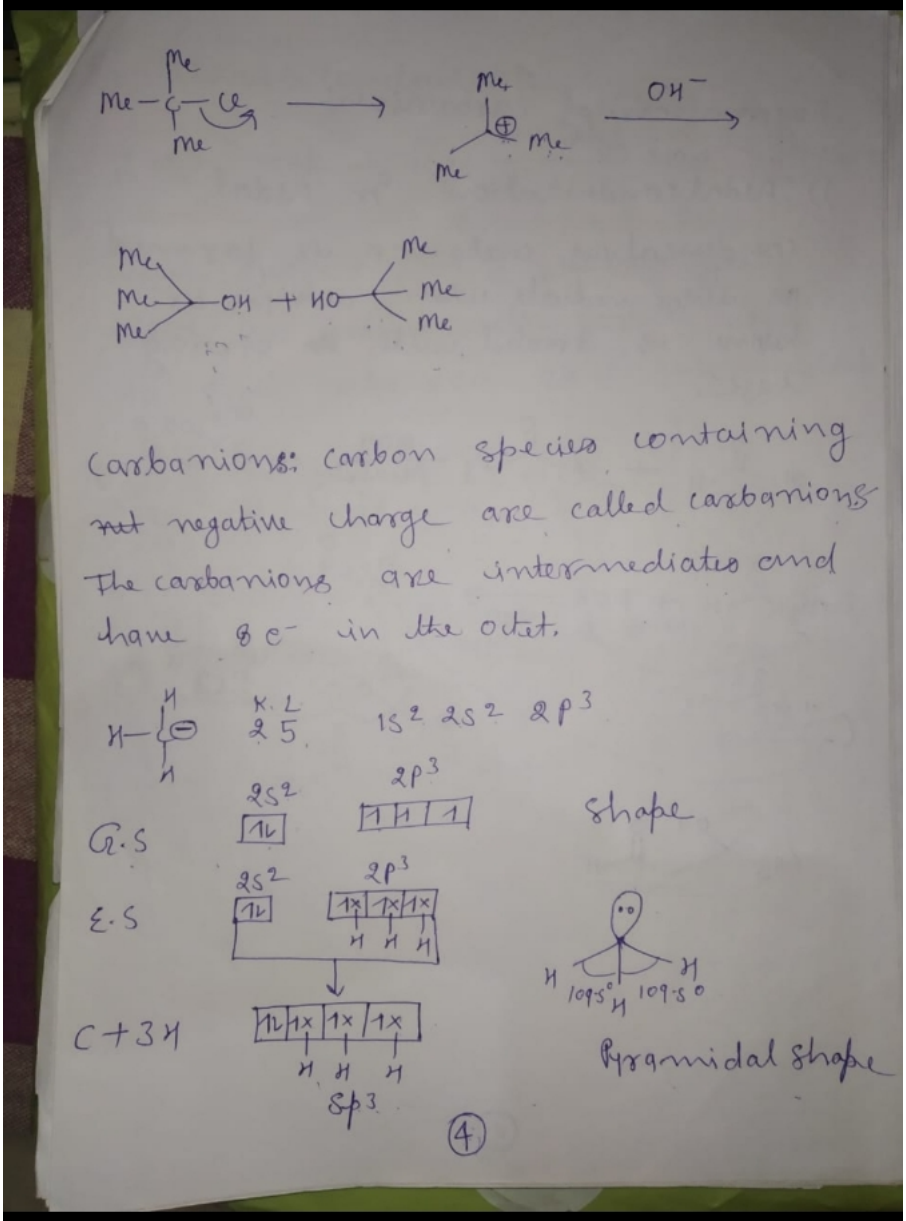
Formation of carbocation:

1) Friedel Craft Reaction: In this reaction carbocation is formed as intermediate when benzene is treated with alkyl halide or acyl halide in presence of lewis acid like $AlCl_3$.

carbocation

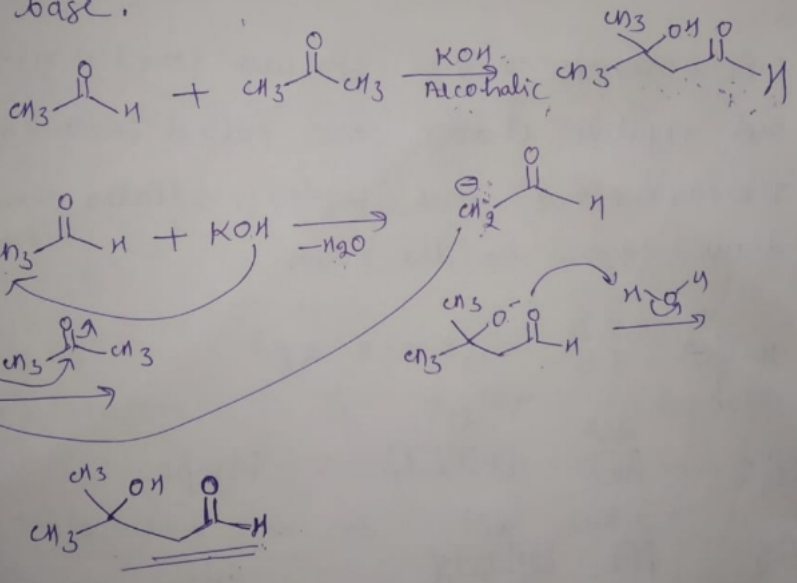
$AlCl_4^- + H^+ \longrightarrow AlCl_3 + HCl$

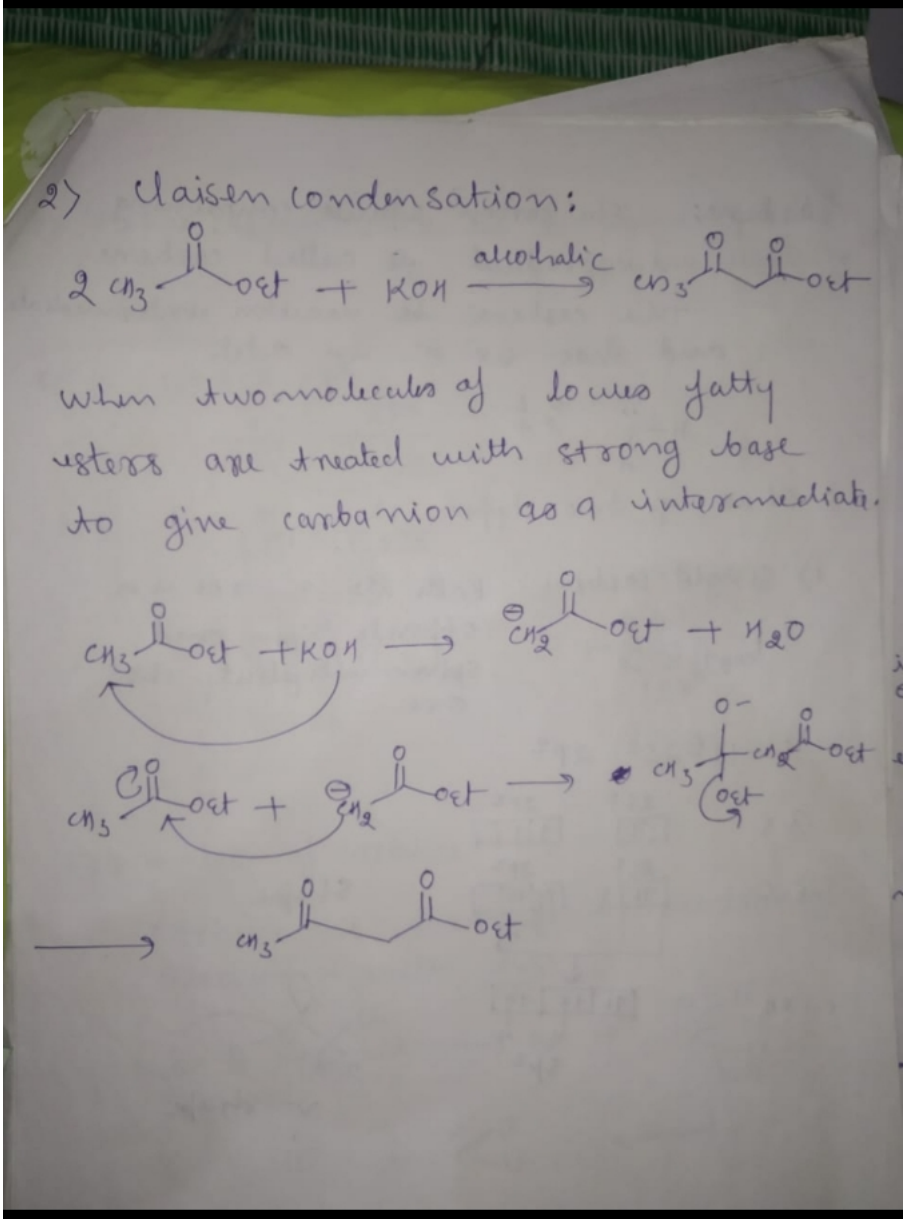




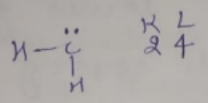
Formation of carbanion:

1) Aldol condensation: In Aldol condensation, carbanion is formed as intermediate when aldehyde or ketone is treated with strong base.





Carbene: The carbon species containing two radical is called carbene. The carbene is reaction intermediate and has six e^- in octet.

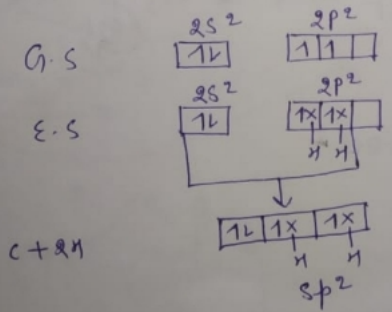


It is of two types.

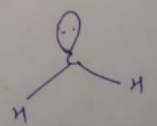
1) Singlet carbene: Both the e^- are in opposite spin and spin multiplicity is one.

$^1CH_2$

$1s^2 2s^2 2p^2$



Shape

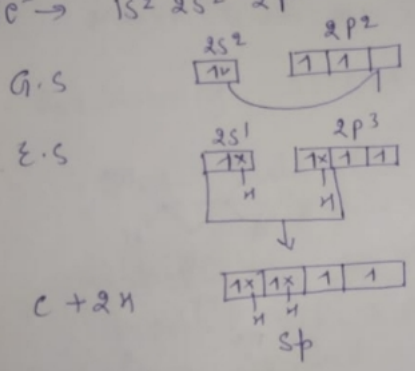


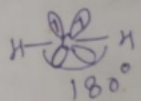
V- shape

2) Triplet carbene: Both the e^- are in parallel spin and spin multiplicity is 3.

$^3a_{g}1$

$6C^- \rightarrow 1s^2\ 2s^2\ 2p^2$

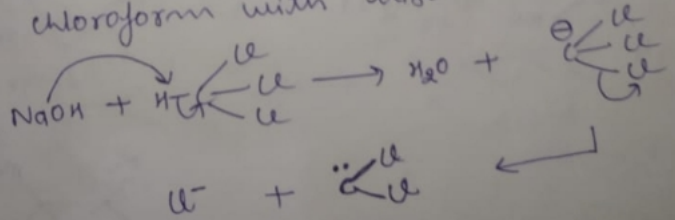




Linear

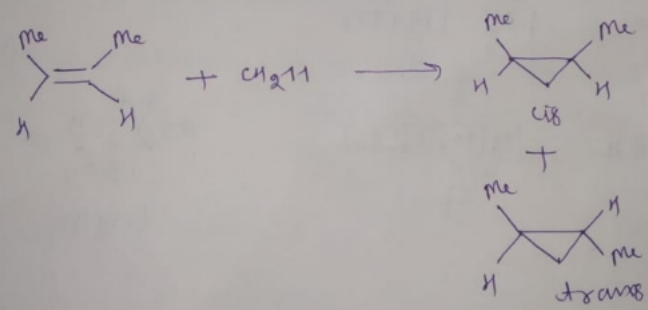
Formation of carbene:

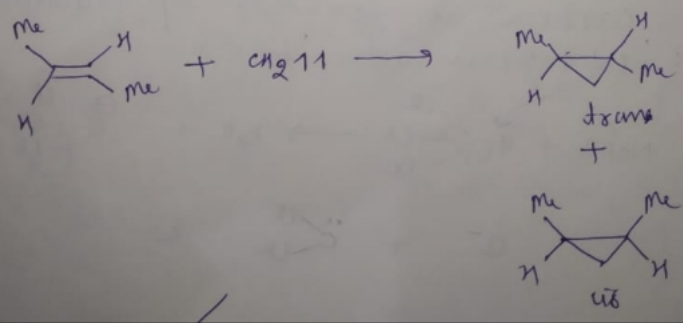
1) carbene is formed by reaction of chloroform with base.



2) Triplet carbene: It is non stereo specific in nature.

cis or trans, both alkene give a mixture of cis and trans Product



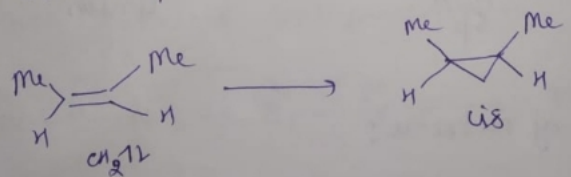


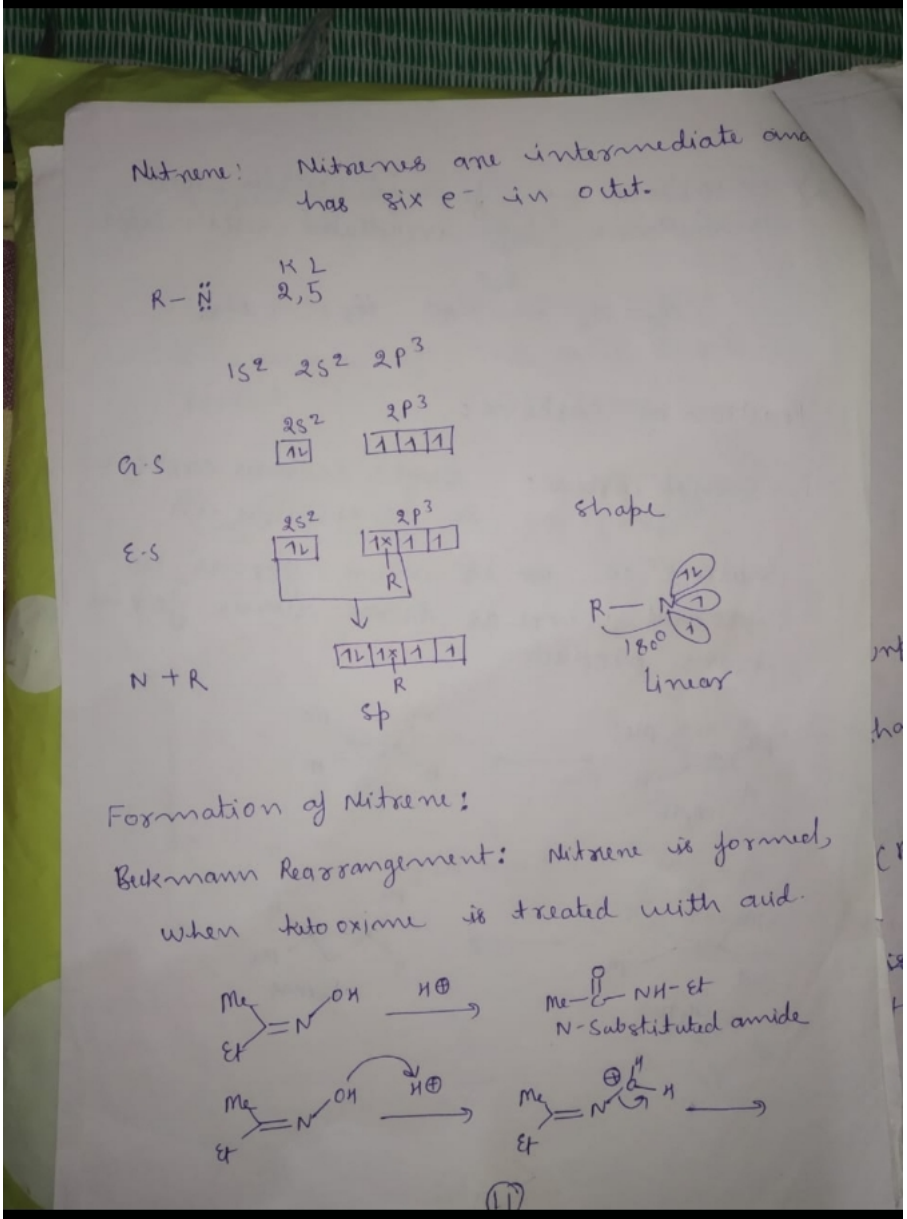
2) Carbene is formed when diazo methane is irradiated with light

$$CH_2=N_2 \xrightarrow{h\nu} \dot{C}H_2 + N_2$$

Reaction of carbene:

1) Singlet carbene: Singlet ~~carbene~~ carbene is stereospecific in nature ie. ~~cis~~ cis alkene forms cis product where as trans alkene form trans product.





Nitrene: Nitrenes are intermediate and has six e^- in octet.

$R-\ddot{N}$ K L 2,5

$1s^2\ 2s^2\ 2p^3$

G.S $2s^2$ $2p^3$ 1↿⇂ 1 1 1

E.S $2s^2$ $2p^3$ 1↿⇂ 1 1 1 — R

N + R 1↿⇂ 1↿⇂ 1 1 — R

Sp

Shape

R— N (1↿⇂, 1, 1) 180°

Linear

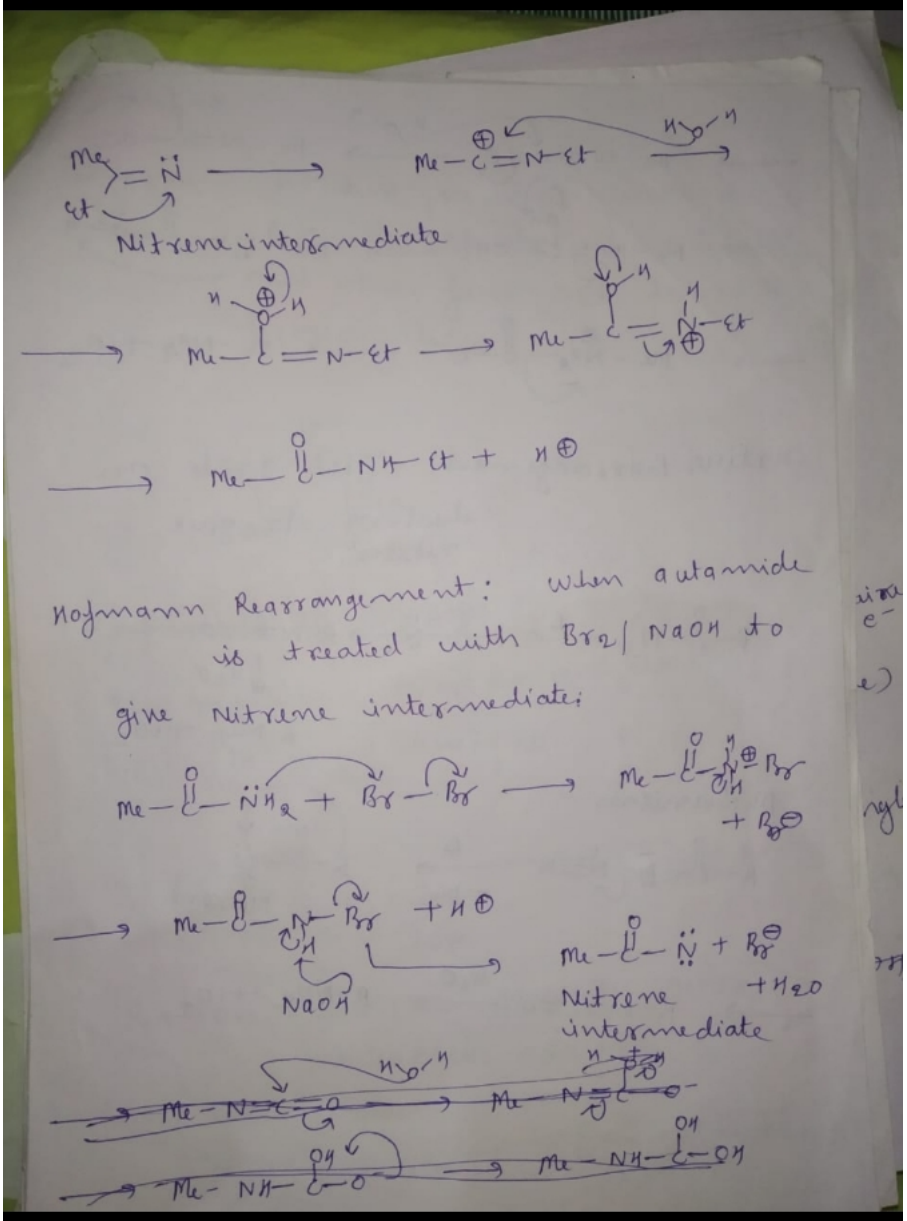
Formation of Nitrene:

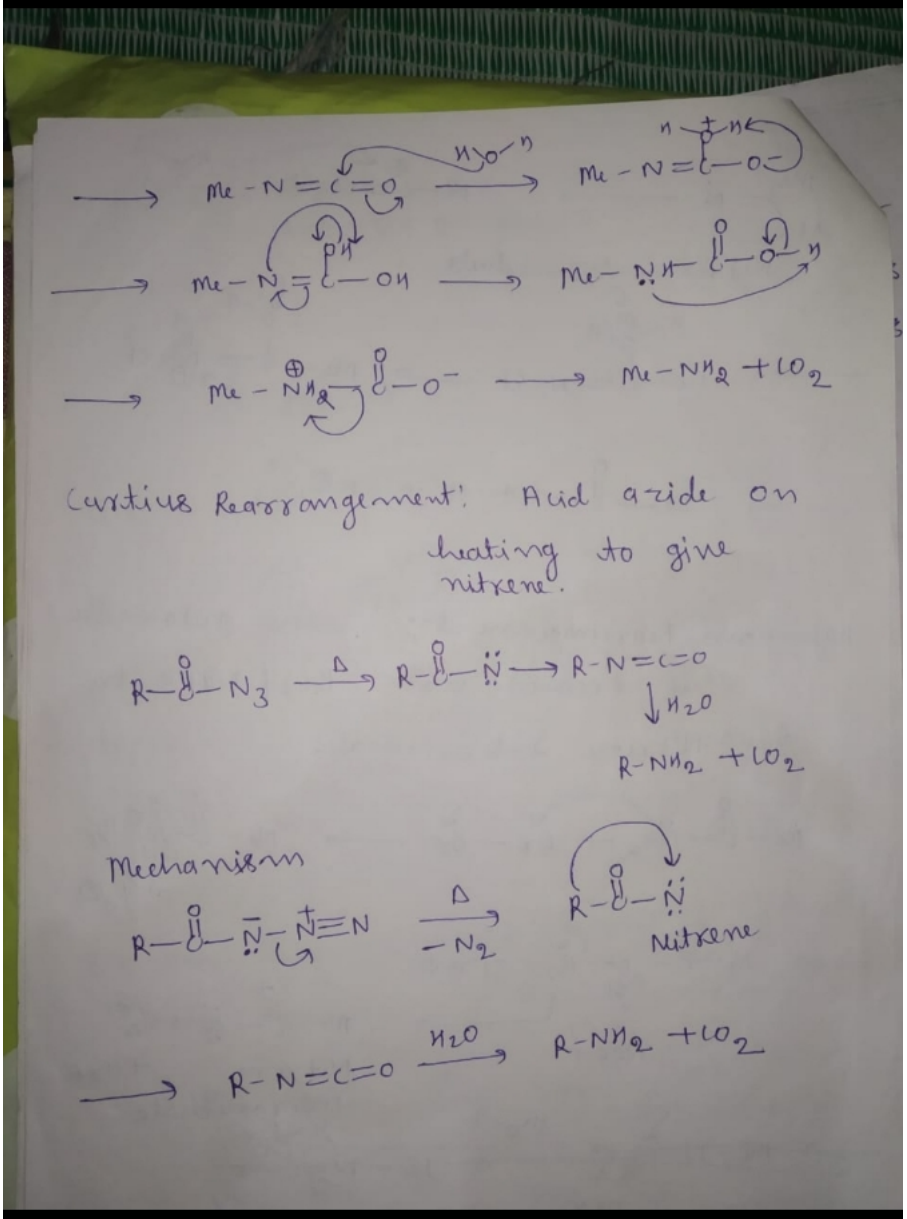
Beckmann Rearrangement: Nitrene is formed, when keto oxime is treated with acid.

Me, Et, =N, OH $\xrightarrow{H\oplus}$ Me—C(=O)—NH-Et

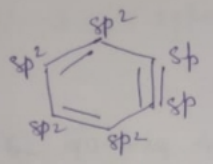
N-Substituted amide

Me, Et, =N, OH $\xrightarrow{H\oplus}$ $\xrightarrow{\oplus}$ Me, Et, =N, H



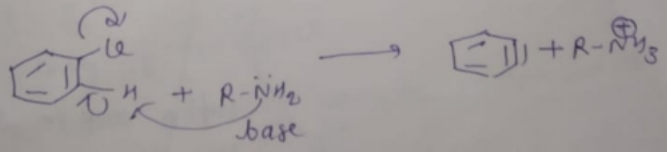

Me - N = C = O
Me - N = C - O
Me - N - C - OH
Me - NH - C - O
Me - NH2
Me - NH2 + CO2
Curtius Rearrangement: Acid azide on heating to give nitrene.
R - C - N3
R - C - N
R - N = C = O
H2O
R - NH2 + CO2
Mechanism
- N2
Nitrene
H2O

Benzyne: In benzyne, two carbons are in sp ~~hy~~ hybridization and other four are in sp^2 hybridization

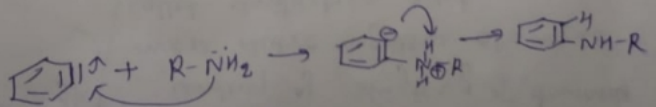


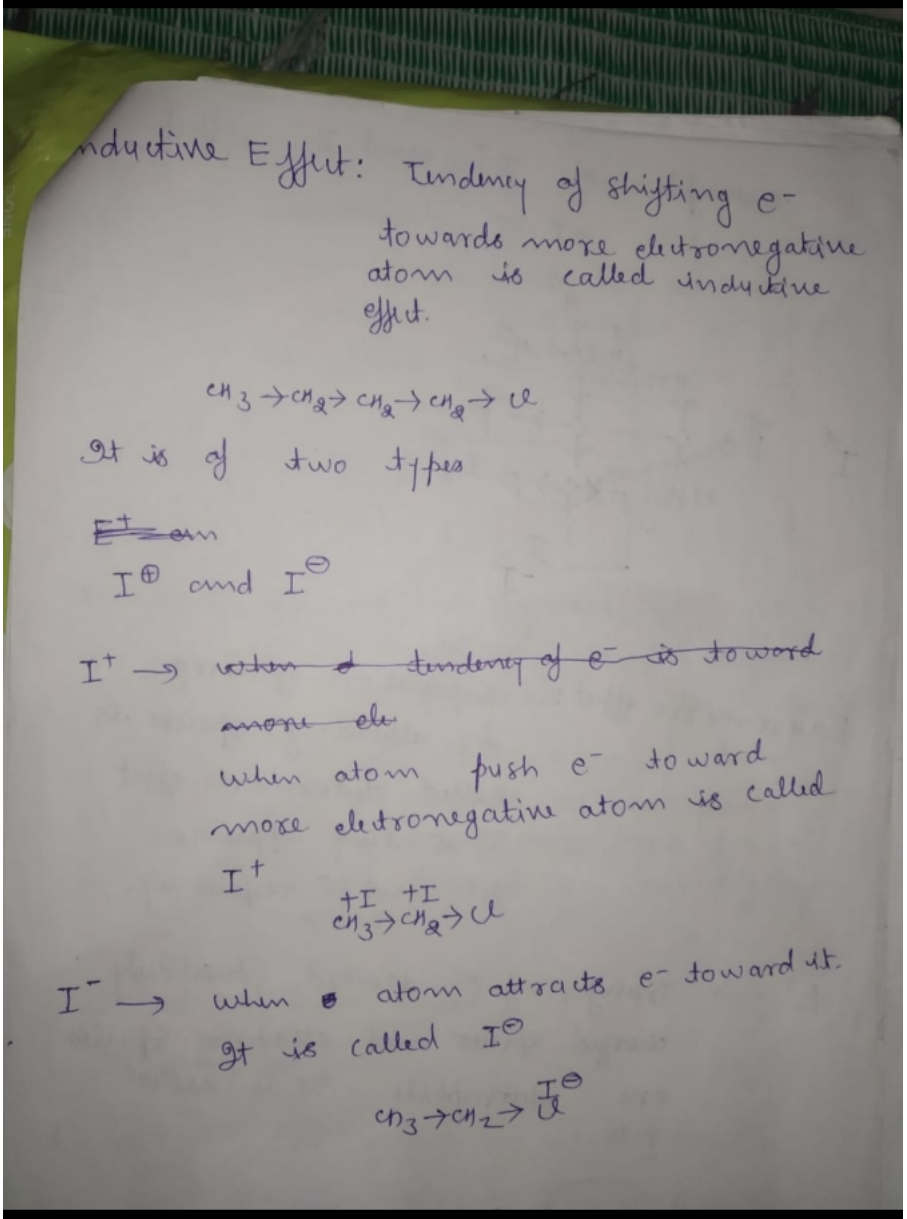
Formation of Benzyne:

The reaction chlorobenzene with base to give benzyne.



Reaction: Benzyne generally gives nucleophilic addition.





Inductive Effect: Tendency of shifting e⁻ towards more electronegative atom is called inductive effect.

$CH_3 \rightarrow CH_2 \rightarrow CH_2 \rightarrow CH_2 \rightarrow Cl$

It is of two types

~~E⁺ effect~~

$I^{\oplus}$ and $I^{\ominus}$

$I^+ \rightarrow$ ~~when atom d tendency of e⁻ is toward more ele~~

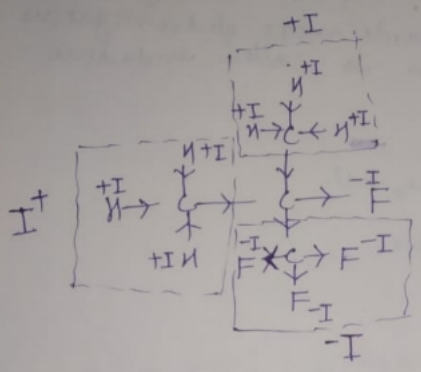
when atom push e⁻ toward more electronegative atom is called I^+

$CH_3 \xrightarrow{+I} CH_2 \xrightarrow{+I} Cl$

$I^- \rightarrow$ when atom attracts e⁻ toward it. It is called $I^{\ominus}$

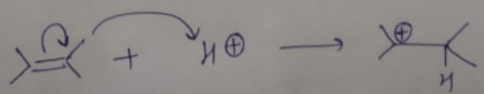
$CH_3 \rightarrow CH_2 \rightarrow \overset{I^{\ominus}}{Cl}$

example of I^+ and I^- effect

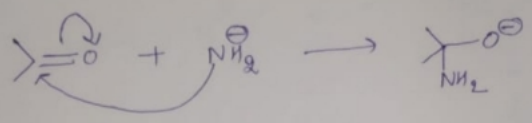


Electromeric effect: Separation of charge by attacking species is called electromeric effect. It is two types ie. E^+ and E^- respectively.

E^+ → Transfer of e^- toward positively charged species and attacking species are electrophile. It is called $E^{\oplus}$



E^- ⟶ when attacking species are nucleophile. The e^- are transferred from nucleophile to substrate molecule. This types of effect is called E^- effect.



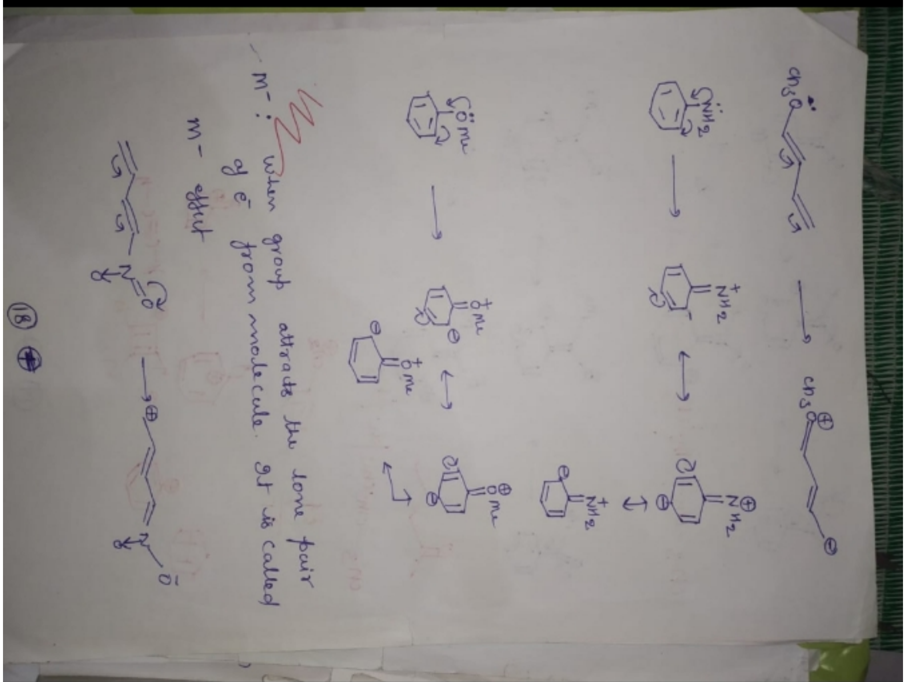
Mesomeric effect ⟶ Mesomeric effect is defined as the polarity produced in the molecule by interaction of two pi bonds or between a pi bond and lone pair of e^- present on an adjacent atom.

It is of two types
M+ and M−

1) M+ : when group or atom donate the e^- pair to the conjugated system. It is called M+

8:51

+91 94536 45689
January 15, 10:24 AM



M⁻ : When group attracts the lone pair of e⁻ from molecule. It is called M- effect

(18)

8:51

+91 94536 45689

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