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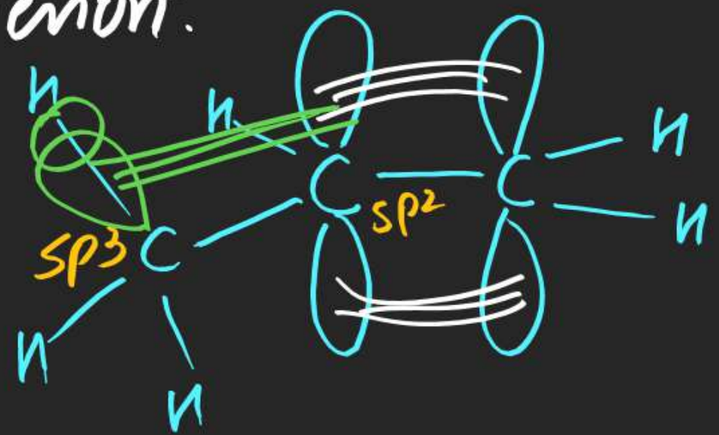
+H effect of that alkyl group.

Ex: (1) which of the following contains H effect phenomenon.



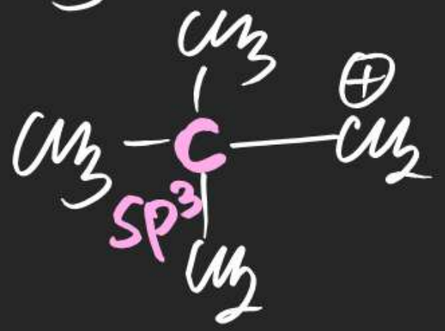
(i) ✓ $CH_3-CH=CH_2$

(ii) ✓ $CH_3-\overset{\oplus}{C}H_2$ (sp^3, sp^2)

(iii) ✓ $CH_3-\dot{C}H_2$ (sp^3, sp^2)

(iv) ✗ $CH_3-\overset{\ominus}{C}H_2$ (sp^3, sp^3)

(v) $\overset{\oplus}{C}H_3$ ✗

(vi) 

✗

(vii)  ✓

(viii) 

✗

(ix) 

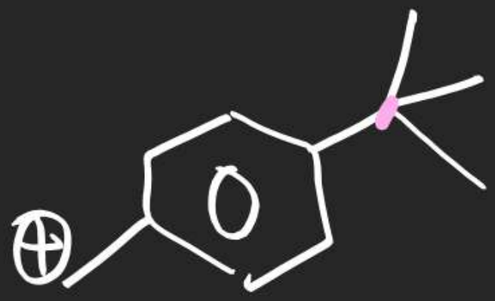
✓

(x)  ✗

(xi) $CH_2=CH-CH=CH_2$ ✗

(xii) $H_3C-CH=O$ ✓

(xiii)  ✓

(xiv)  ✗

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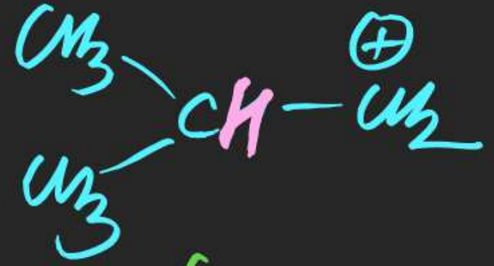
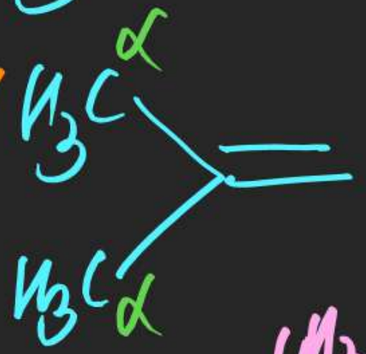
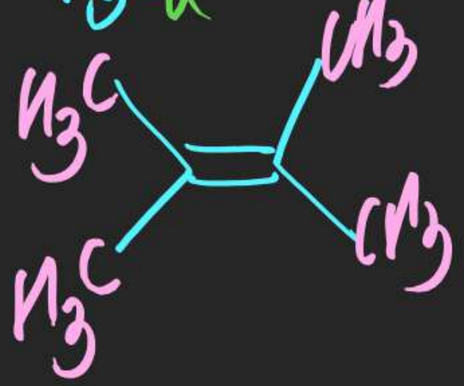
EX-4: Total no. of HS str involving C–H Bond.

(i) $\overset{\alpha}{C}H_3-\overset{\oplus}{C}H-\overset{\alpha}{C}H_2-CH_3$ — 5

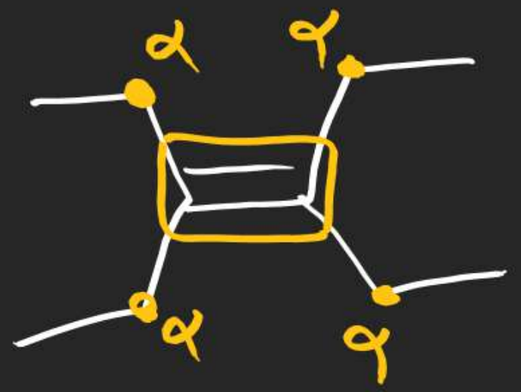
(ii)  — 1

(iii)  — 6

(iv)  — 12

(v)  — 6

(vi)  — 6

(vii)  — 8

(viii)  — 9

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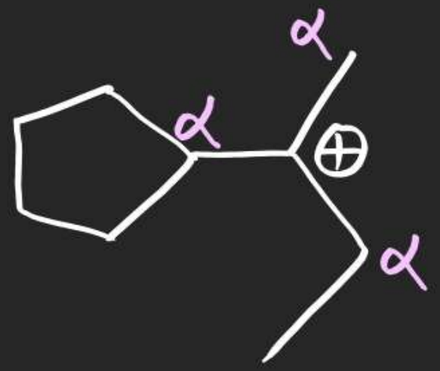
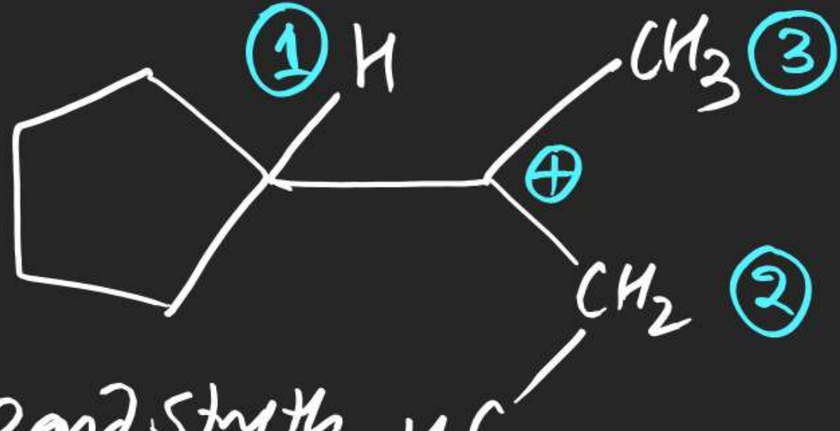
(ix) IIT Adv



⟹



6

Ans

Note: +H effect depends on Bond strength

Arrange following in ↓ order of +H effect when attached with a "sp^2" Carbon

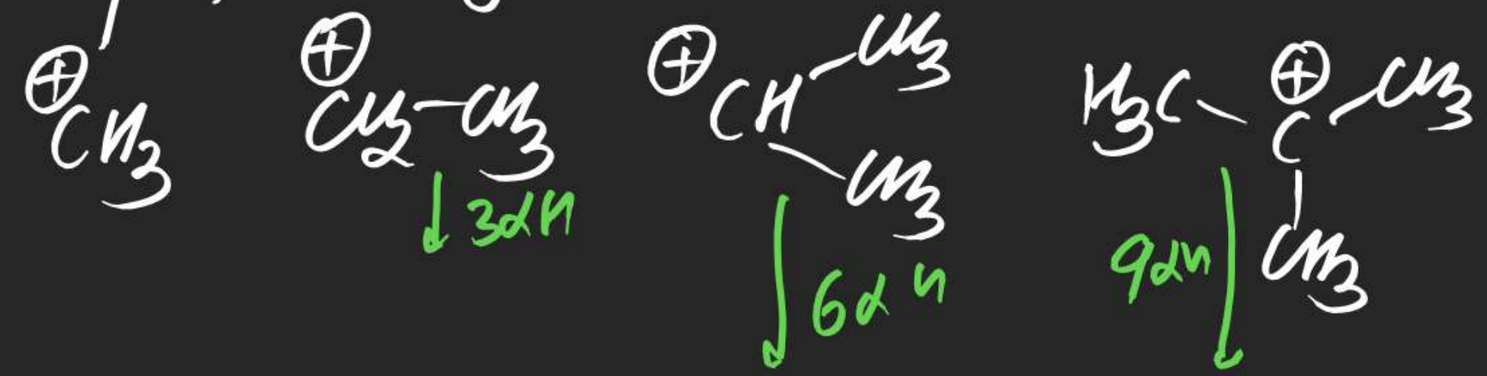
(a) $-CH_3$, $-CD_3$, $-CT_3$ $(I > II > III)$

Bond strength order: C–T > C–D > C–H

(b) $-CH_3$, $-CH_2D$, $-CHD_2$, $-CD_3$ $(I > II > III > IV)$

(c) $-\overset{3}{C}H_3$, $-\overset{2}{C}H_2-CH_3$, $-\overset{1}{C}H(CH_3)-CH_3$, $-\overset{0}{C}(CH_3)_3$ $(I > II > III > IV)$

(#) Arrange following in ↓ order of stability

(1) 

IV > III > II > I
(due to +H effect)

(2) 

IV > III > II > I
(due to +H effect)

(3) 

I > II > III > IV

(4) 

1 > 2 > 3

(5) 

1 > 2 > 3

(6) $\overset{\ominus}{C}H_2-CH_3$ $\overset{\ominus}{C}H_2-CD_3$ $\overset{\ominus}{C}H_2-CT_3$ 1 > 2 > 3 (due to +I effect)

(7) $\overset{\oplus}{C}H_2-CD_3$ $\overset{\oplus}{C}H_2-CHD_2$ $\overset{\oplus}{C}H_2-CH_2D$ $\overset{\oplus}{C}H_2-CH_3$ 4 > 3 > 2 > 1 (+H)

(8) $\dot{C}H_2-CD_3$ $\dot{C}H_2-CHD_2$ $\dot{C}H_2-CH_2D$ $\dot{C}H_2-CH_3$ 4 > 3 > 2 > 1 (+H)

4 > 3 > 2 > 1 (+I)

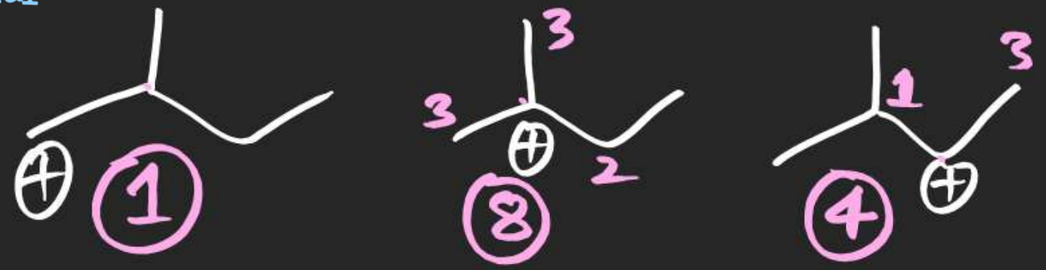
(9)

(10) $\overset{\oplus}{C}H_3$ $\overset{\oplus}{C}D_3$ $\overset{\oplus}{C}T_3$ 3 > 2 > 1 (+I)

3 > 2 > 1 (+I)

(11)

(12) 1 > 2 > 3 (+I)

(13) 

$2 > 3 > 1$ (+H)

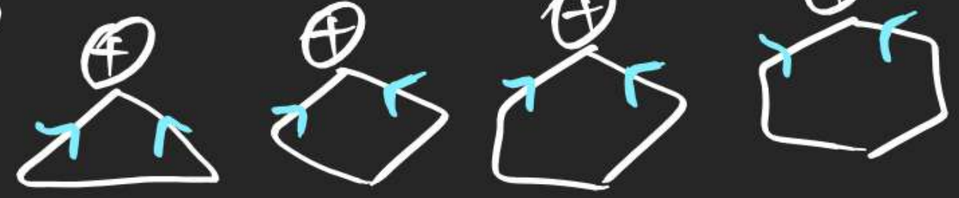
$-CH_2-CH_2-CH_3 > -CH_2-CH_3 > -CH_3$ (+I)

$2 > 3 > 1$ (+H)

(14)

(15) 

$1 > 3 > 2$ (+I)

(16) 

$4 > 3 > 2 > 1$ [Angle Strain]

$4 > 3 > 2 > 1$

(17)

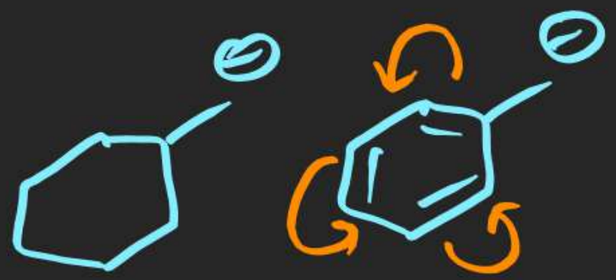
$1 > 2 > 3 > 4$

(18)

∴

(19)  2 > 1 (Resonance)

(20) 2 > 1 (")

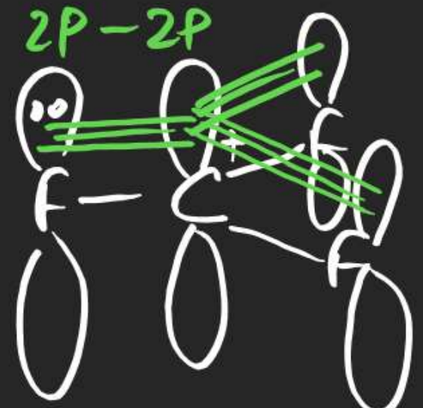
(21)  2 > 1 (")

(22)  1 > 2 (")

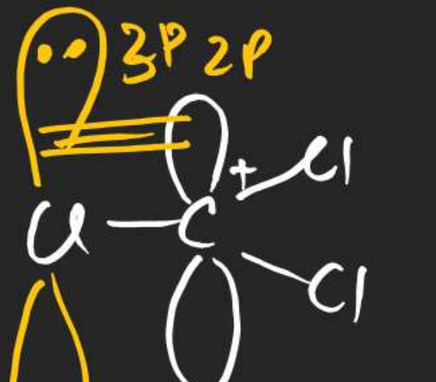
(23) 1 > 2 (")

(24) 1 > 2 (")

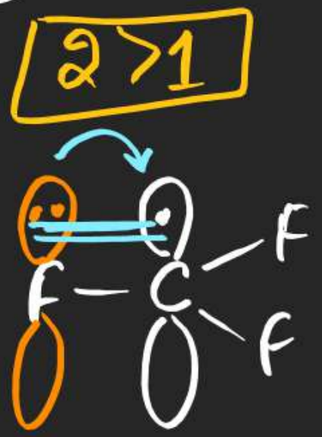
(25) $\overset{\oplus}{C}F_3$ $\overset{\oplus}{C}Cl_3$ — 1 > 2 (2p–2p > 2p–3p)



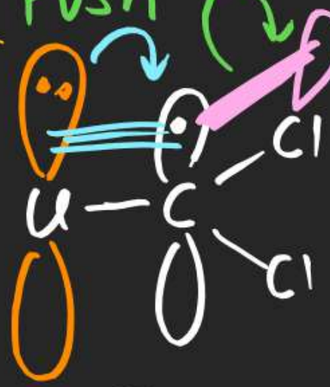
(26) $\overset{\ominus}{C}F_3$ $\overset{\ominus}{C}Cl_3$ — 2 > 1 ($p\pi$–$d\pi$ in CCl_3)

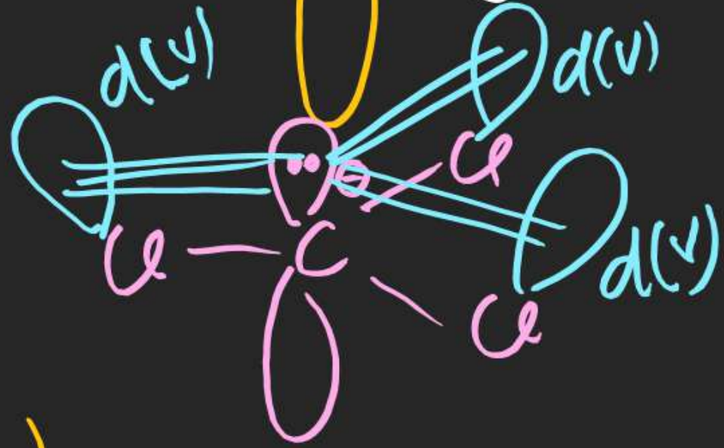


(27) $\dot{C}F_3$ $\dot{C}Cl_3$ — 2 > 1



(Push, Pull effect)

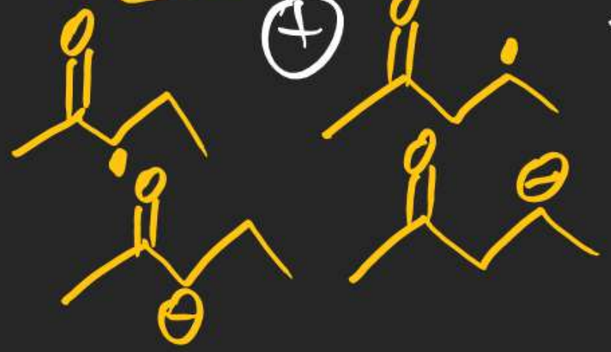




(28)

2 > 1 (+M)

(29)



1 > 2 (–R)

(30)

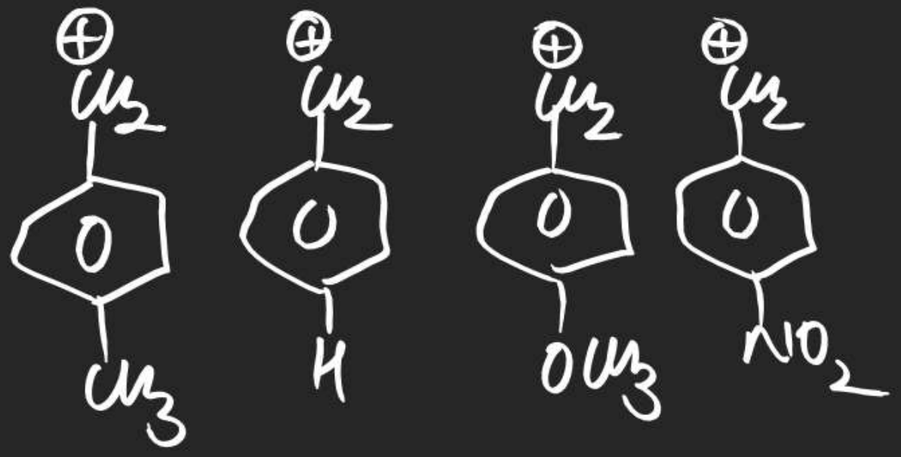
1 > 2 (–R)

(31) $CH_3-\overset{\oplus}{C}H_2$ $\quad CH_2=\overset{\oplus}{C}H$ $\quad HC\equiv\overset{\oplus}{C}$

(32)

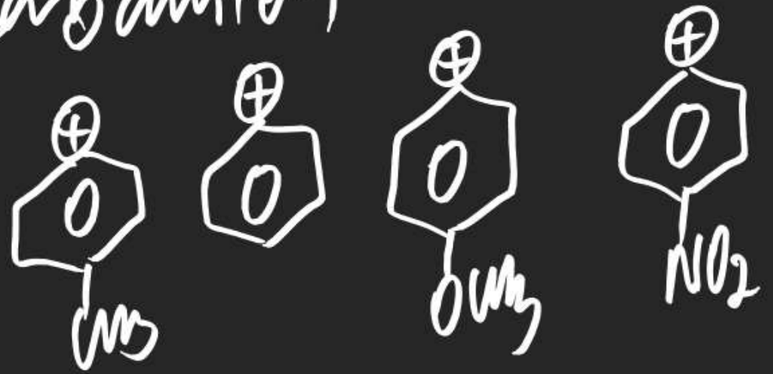
(33)

(34)



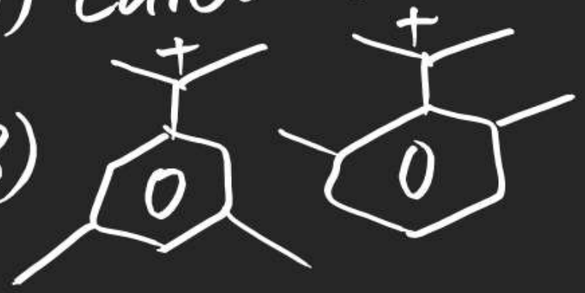
(35) Carbanion

(36)



(37) Carbanion

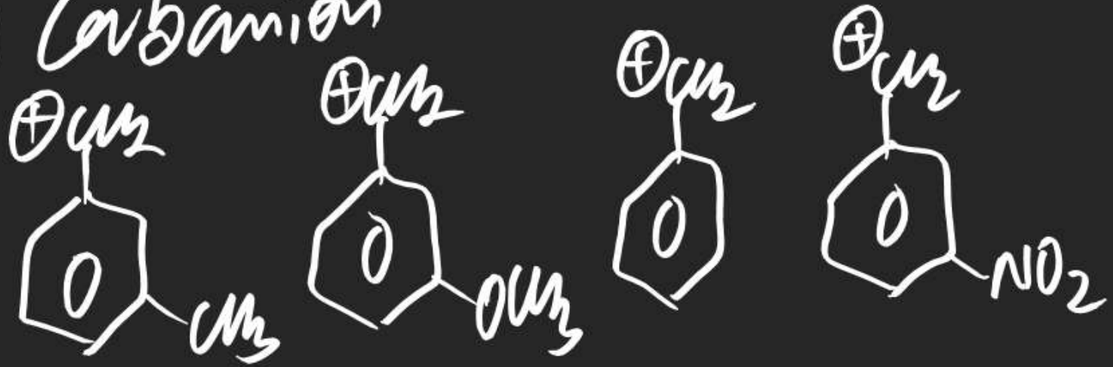
(38)



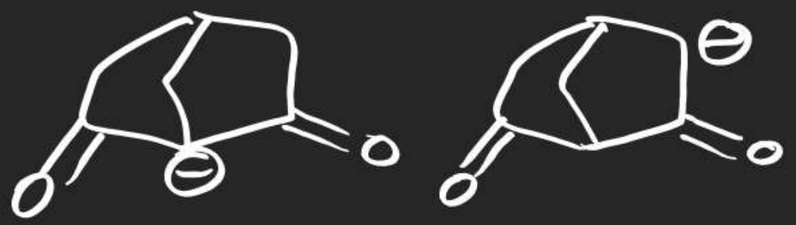
(39) Free Radical

(40) Carbanion

(41)



(42) Carbanion.

(43) 

(44) 

(45) 

(46) Carbanion

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(47) 

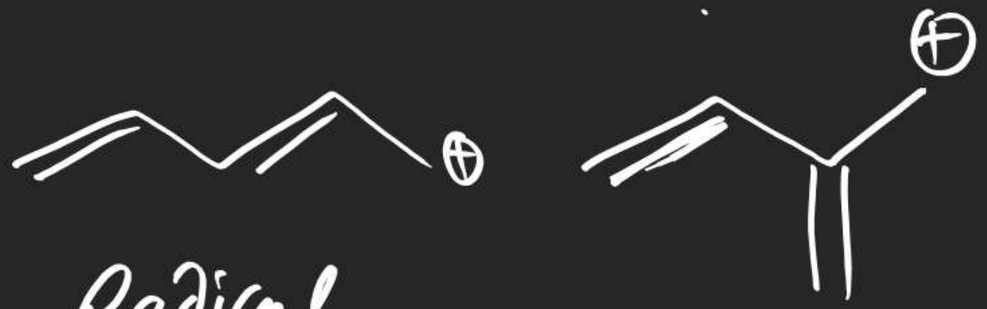
(48) 

(49) Carbanion

(50) 

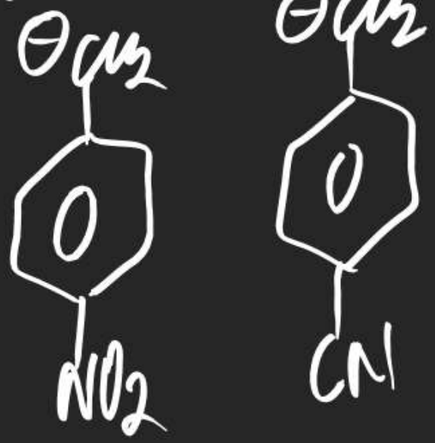
(51) Free Radical

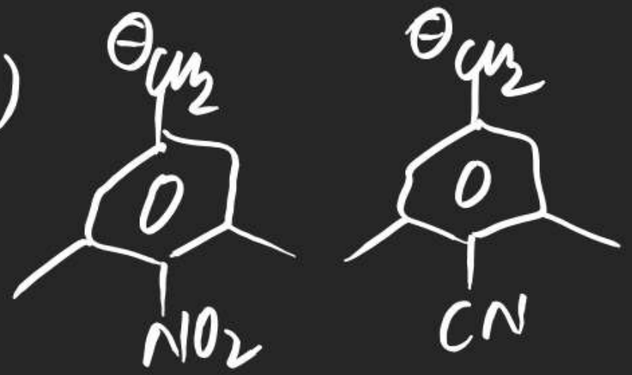
(52) Carbanion

(53) 

(54) Radical

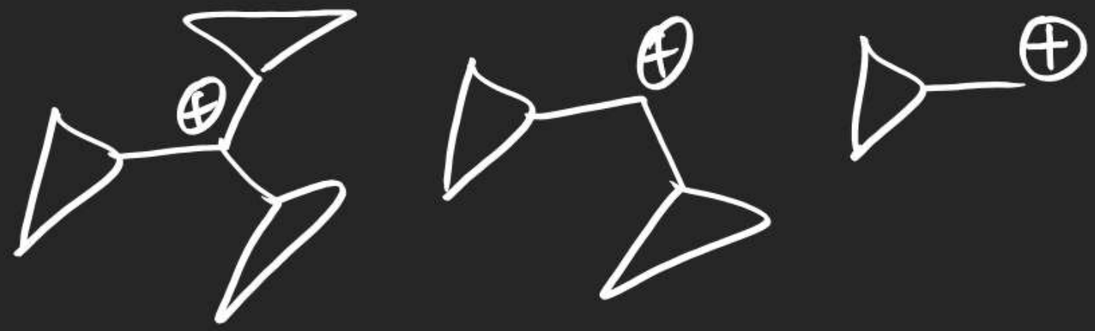
(55) Carbanion

(56) 

(57) 

(58) 

(59) 

(60) 

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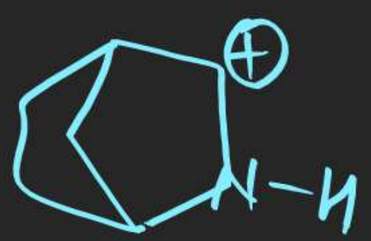
(61) 

(62)  

(63)  

(64) Free Radical

MSP

(65)

Stability order of carbocation.

$>$

$> Ph_3\overset{\oplus}{C} > Ph_2\overset{\oplus}{C}H > Ph-\overset{\oplus}{C}H-R >$

$> Ph-\overset{\oplus}{C}H_2 >$

$> \overset{\oplus}{C}H(CH_3)_2 > \overset{\oplus}{C}H_2-CH_3 > \overset{\oplus}{C}H_3 > \overset{\oplus}{C}H=CH_2 > \overset{\oplus}{C}\equiv CH$

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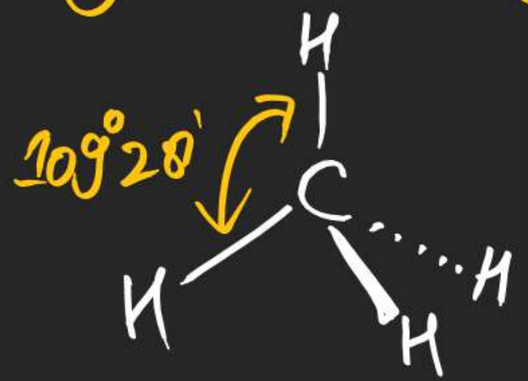
(#) Bayer's Strain Angle Theory:



For max. stability of sp^3 atom Bondangle must Be Close to $109°28'$.

$\Rightarrow$ For Cycloalkanes (Considered as planer Compounds)

$\Rightarrow$ Stability $\propto \frac{1}{\text{Strain}}$

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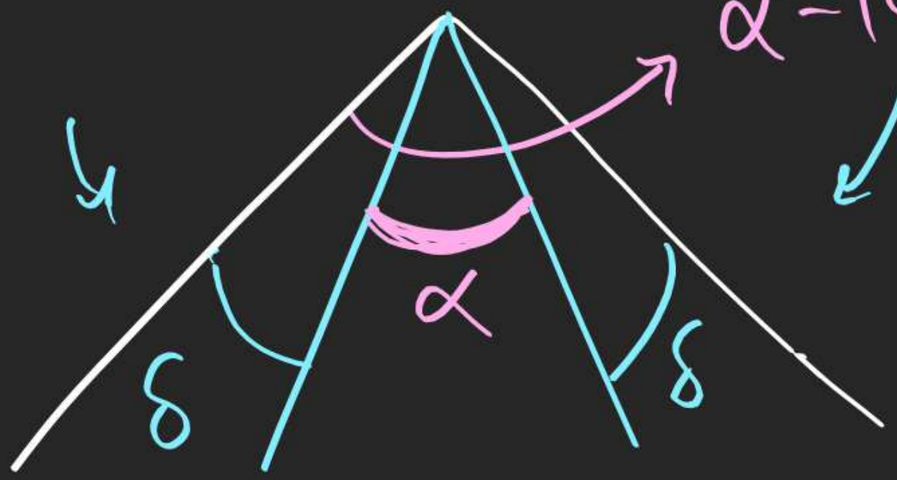

$\alpha = 109^\circ 28'$

$\Rightarrow \delta + \alpha + \delta = 109^\circ 28'$

$\Rightarrow \delta = \frac{1}{2}[109^\circ 28' - \alpha]$

For $\alpha = 60^\circ$ $\quad \delta = +24.5^\circ$

$\alpha = 90^\circ$ $\quad \delta = +9.5^\circ$

$\alpha = 108^\circ$ $\quad \delta = +0.5^\circ$

$\alpha = 120^\circ$ $\quad \delta = -5.5^\circ$

Acc. to Bayer's

Strain order

Stability order

(गलत है)

But HOC per CH_2 data shows

Strain order is

Stability order

It can be Explained By that cycloalkanes are not planer (Except cyclopropane). They Exist in various non planer forms in cyclohexane $\alpha \longrightarrow 109°28'$

$\delta \longrightarrow 0$

(#) Heat of Combustion (HOC)

$\Rightarrow$ Enthalpy change when 1 mole of any compound gets completely Burnt or oxidised.

$$A + O_2 \longrightarrow \text{Combustion product}$$

x ↑ , y ↓

$$HOC = (y - x)$$

Heat of Combustion $\propto$ No. of Carbon atom.

$\propto \frac{1}{\text{Stability}}$ $\propto$ Strain

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Arrange following in ↓ order of HOC

(1) 

4 > 3 > 2 > 1

(2) 

(1 > 2)

(3) 

6C 6C

1 > 2 > 3

(4) 

5C 4C 6C

3 > 1 > 2

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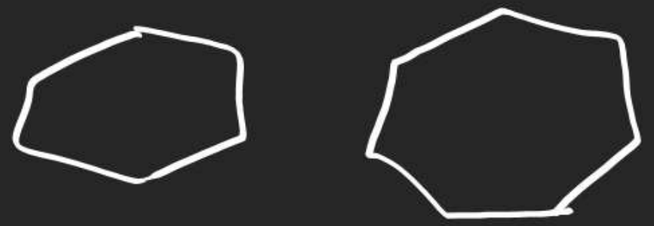
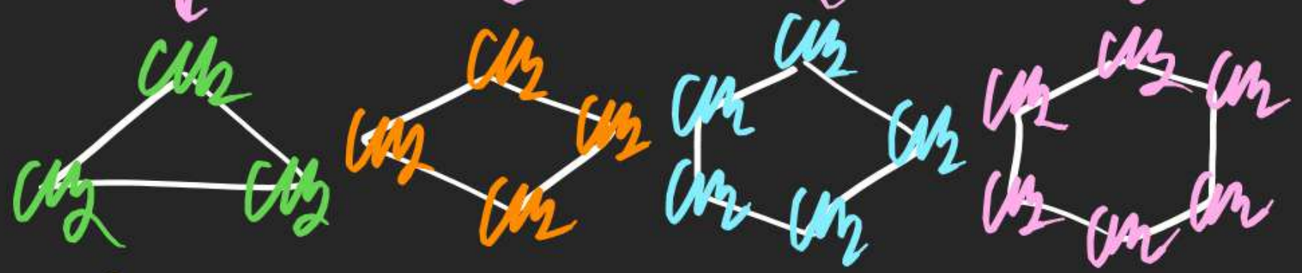
(5)  $(2>1)$ $\frac{x}{3}$ $\frac{y}{4}$ $\frac{z}{5}$ $\frac{w}{6}$

(6) ——— $(n$ OC per $CH_2)$

(7)  $(z>1)$ nOC $4>3>2>1$

(8) Imp 

nOC per CH_2 $\propto$ Strain $\triangle > \square > \pentagon > \hexagon$

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(9) 

1 > 2 > 3 > 4

HOC $\propto$ $\frac{\text{No. of Carbon atoms}}{\text{Stability}}$ $\propto$ Strain

$\propto \frac{1}{\text{Stability}}$

(10) 

Resonance stabilised

(1 > 2)

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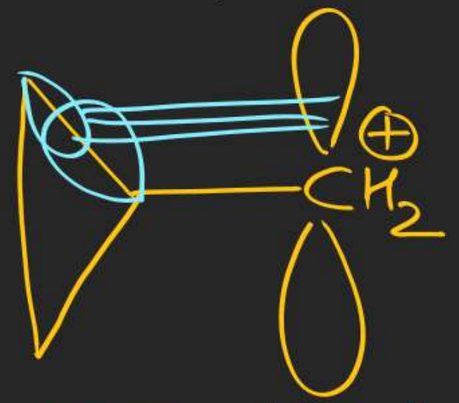
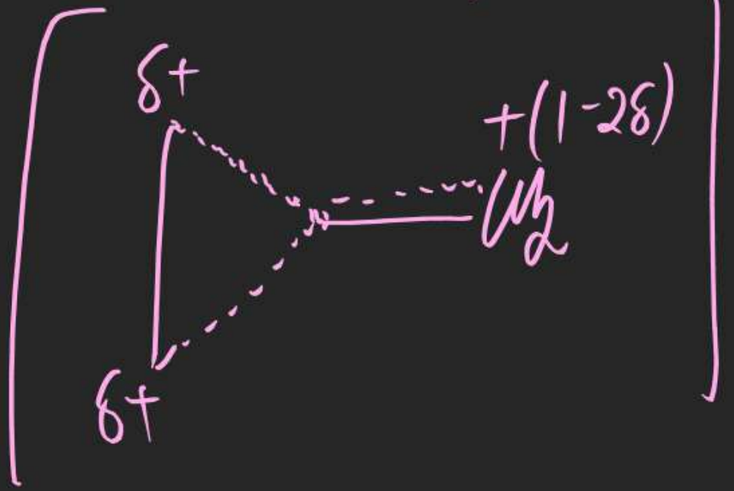
(#) Sigma Resonance:

⇒ In Cyclopropyl methyl (CPM) Carbocation, it is unusually high Stability due to Sigma Resonance



Ex ①



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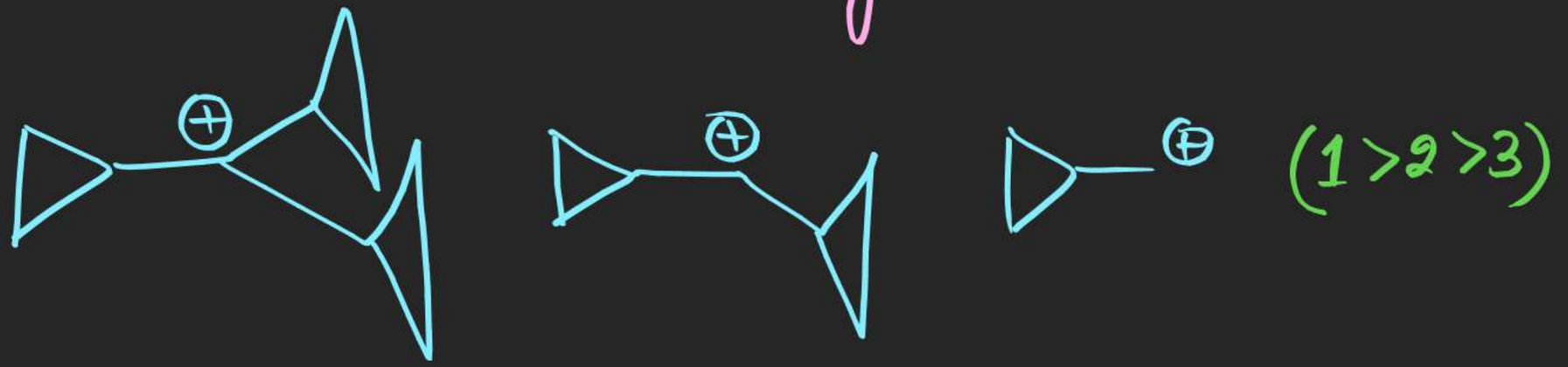
Stability order

(2)  (1 > 2)
(Sigma Resonance)

(3)  (1 > 2 > 3)

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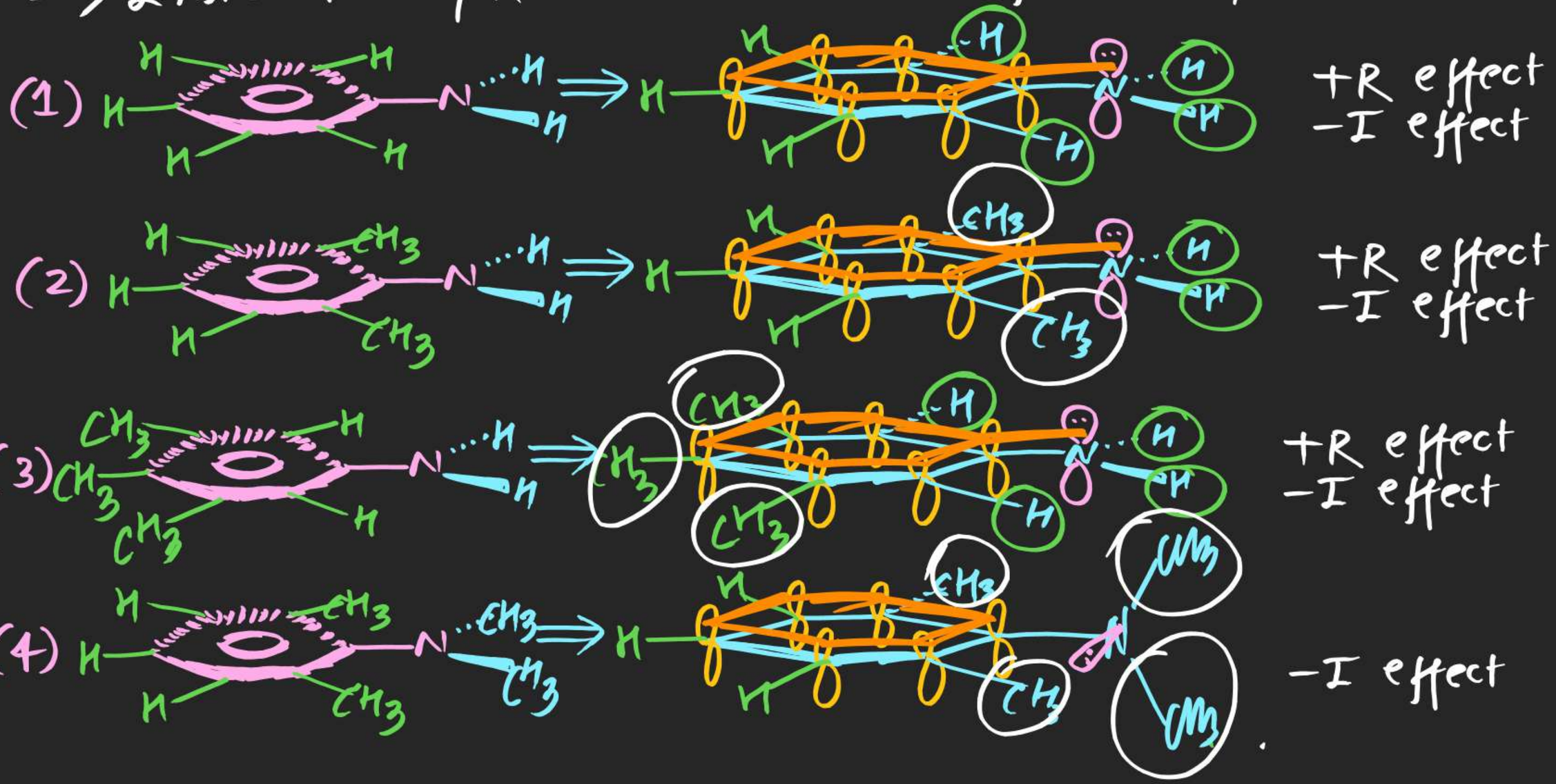
(#) Steric Inhibitation of Resonance (SIR effect)

⇒ Inhibitation of Resonance due to steric factor is known as SIR effect



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Note (i) only ortho substituted large group can show SIR effect.

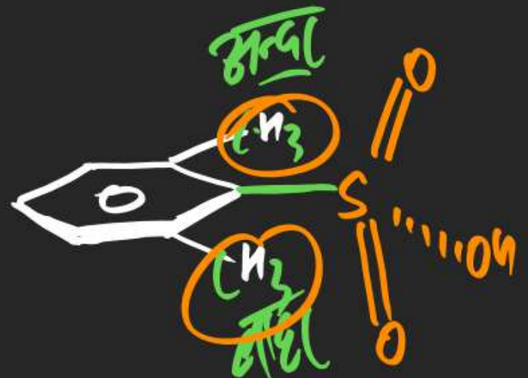
(ii) SIR effect is not applicable on

atoms { −F, −Cl, −Br, −I, $-O^{\ominus}$

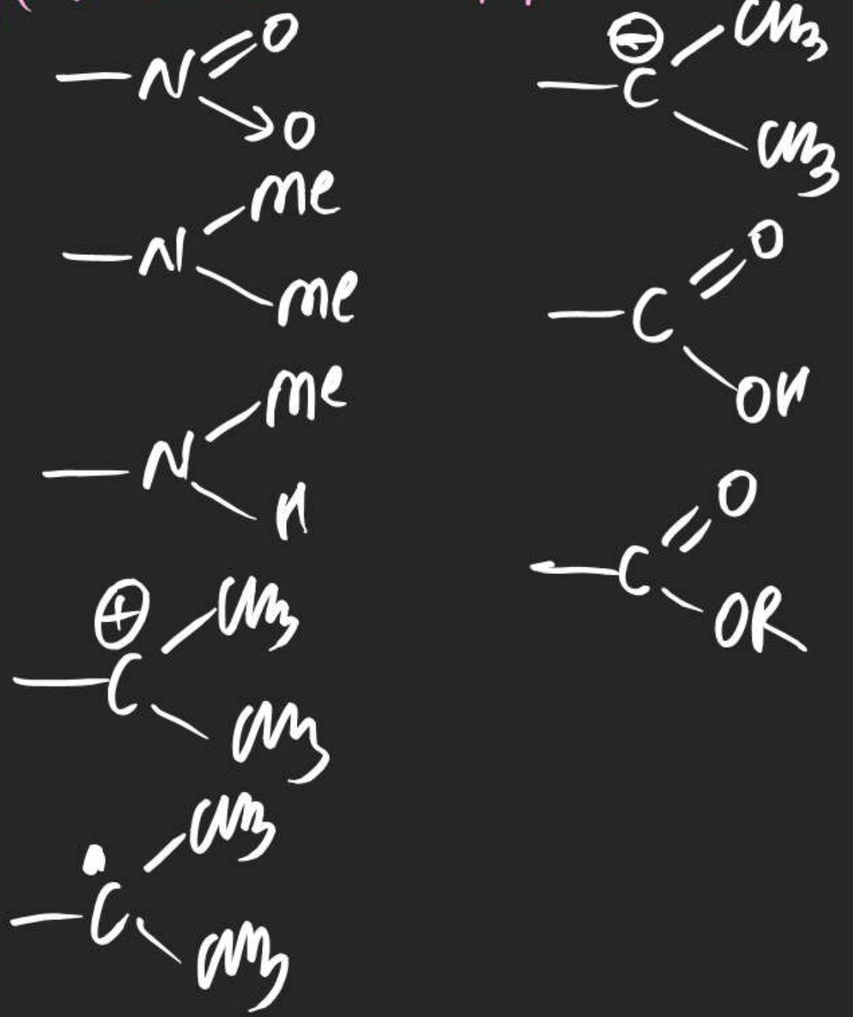
Small Groups { $-NH_2$, −OH, −OR

linear Group { $-C\equiv N$, $-C\equiv CH$

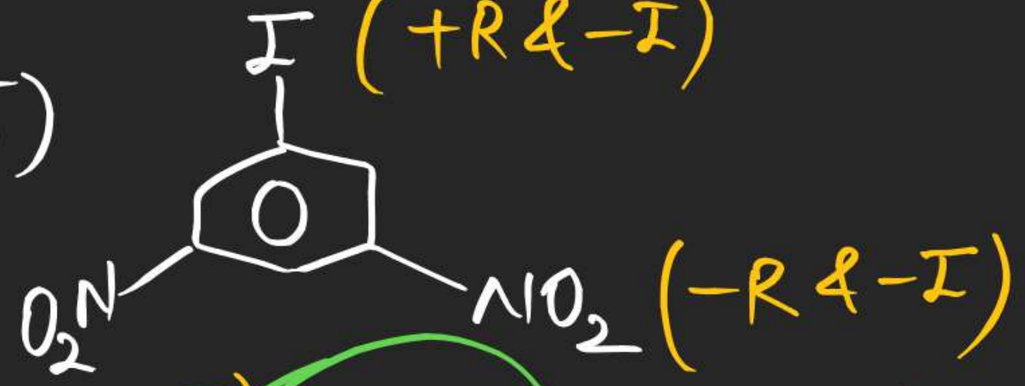
Non planer group { $-SO_3H$



(iii) SIR is applicable on



(5)



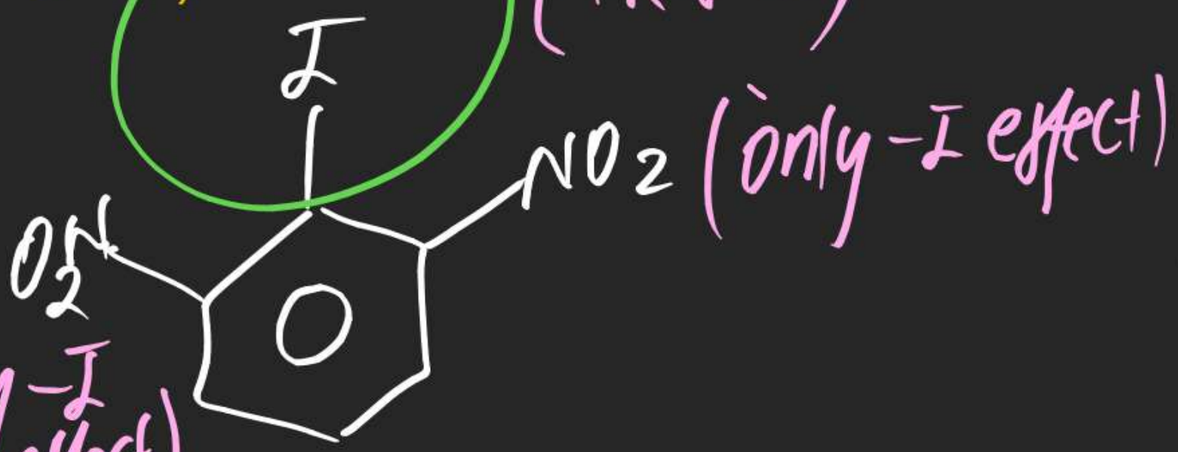
(+R & −I)

(−R & −I)

(−R & −I)

(+R & −I)

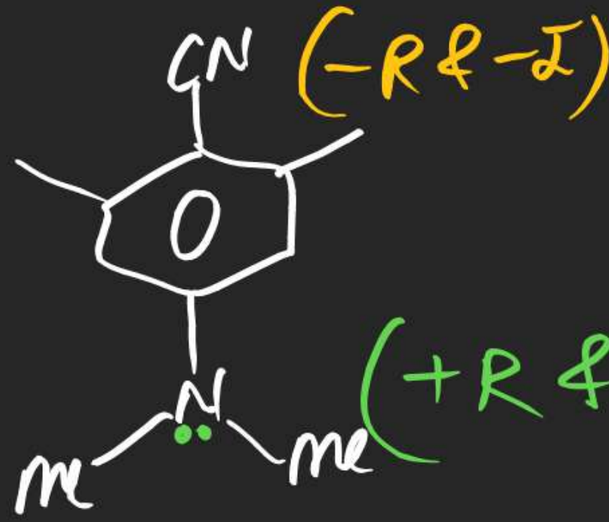
(6)



(only −I effect)

(only −I effect)

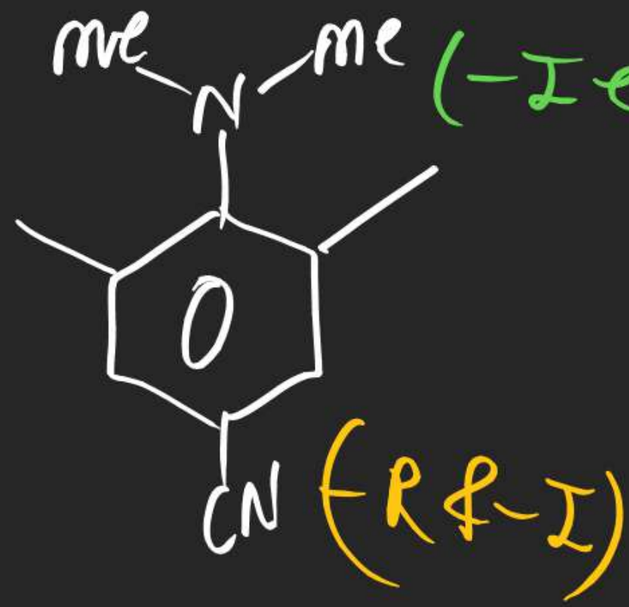
(7)



(−R & −I)

(+R & −I) effect

(8)

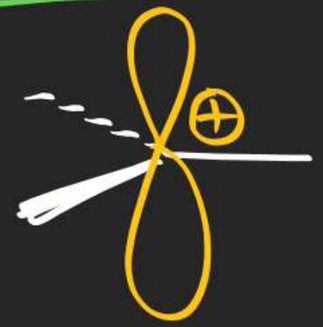


(−I effect)

(−R & −I)

(#) Bredt's Rule: Planarity (SP^2) never can be achieved on Bridge head centre of Bicyclo System containg 8 or less than 8 Carbon atom

(1)

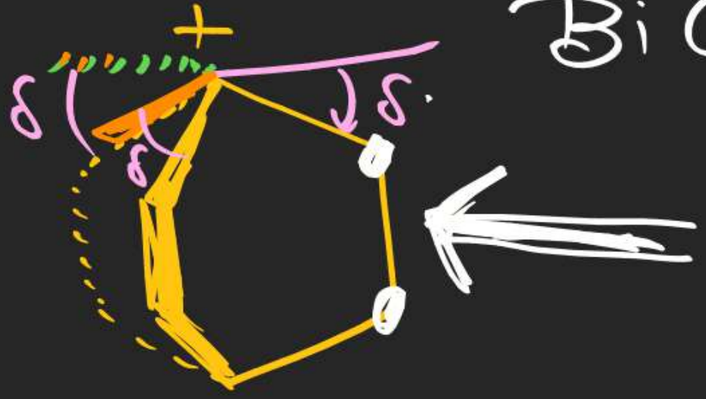


(Trigonal planer)

सही है

(2)

गलत है।



Bi Cyclic compound

⇒ Bridge head (pyramidal)

Planer ⇒ Carbocation
Free Radical
Alkene

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(3) sp^2

ना Real Real

(4) sp^2

Na रियल रियल

(5) sp^2

ना रियल रियल

(6) sp^3

Real Real

(7) ~~(7)~~

Na रियल

Real

(8)

रियल

रियल

(9)

रियल

>

रियल

(stability)

Nishant Jindal

Aromaticity

(#) Aromatic Compound :-

Compounds obtained on fractional distillation of coal tar having characteristic Aroma are known as Aromatic Compounds

or

Compounds having induced diamagnetic Ring current are known as Aromatic Compound.

or

All cyclic Compounds which are unusually very stable than its open chain analogues compound are known as Aromatic compound.

(Stability order)  >>>

Condition for Aromatic Compound :-

Compounds must be

(a) Cyclic
(b) Planer (sp or sp^2)
(c) Cyclic Conjugated
(d) $(4n+2)\pi e^{\ominus}$ $\{n = 0, 1, 2, 3 - - - -\}$

Huckle's Rule Huckle No. (2, 6, 10, 14 - - - - -)

(#) Anti Aromatic compound:-

All cyclic Compounds which are highly unstable than its open chain analogous system are known as Anti aromatic Compound.

I pape

Condn for Anti Aromatic Compound

(a) cyclic
(b) planer
(c) Conjugated
(d) $4n\pi$ e⁻ $(n = 1, 2, 3 \ldots)$

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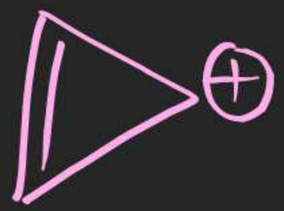
(1) 

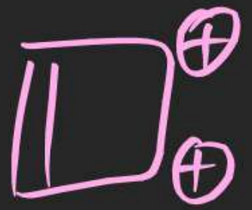
(2) 

(3) 

(4) 

(5) 

(6) 

(7) 

(8) 

(9) 

(10) 

Nishant Jindal

(11) 

(12) 

(13) 

(14) 

(15)