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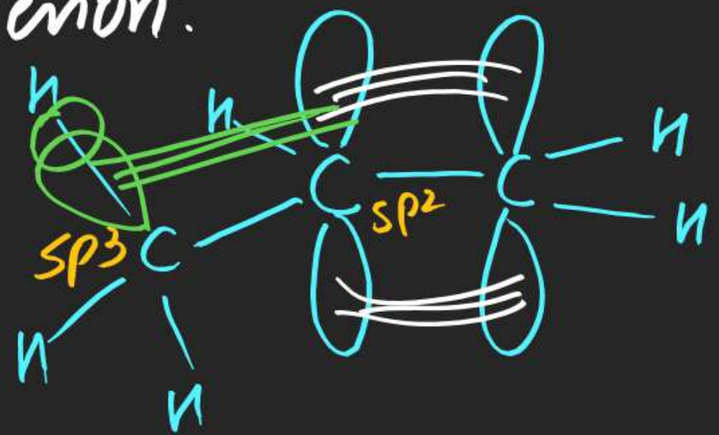
+H effect of that alkyl group.

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



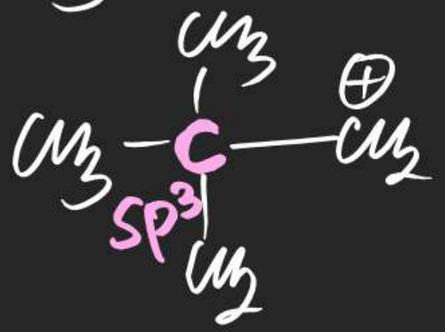
(i) ✓ $CH_3-CH=CH_2$

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

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

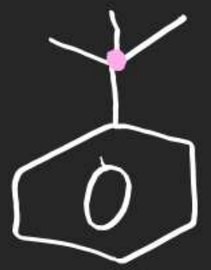
(iv) ✗ $CH_3-\overset{\ominus}{C}H_2$ (sp^3, sp^3)

(v) $\overset{\oplus}{C}H_3$ ✗

(vi) 

✗

(vii)  ✓

(viii)  ✗

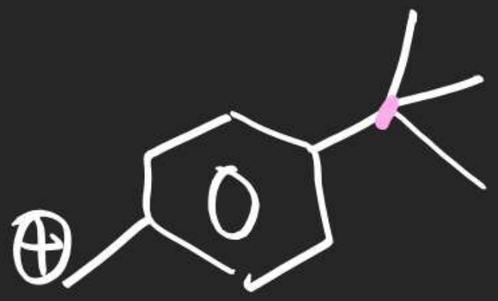
(ix)  ✓

(x)  ✗

(xi) $CH_2=CH-CH=CH_2$ ✗

(xii) $H_3C-CH=O$ ✓

(xiii)  ✓

(xiv)  ✗

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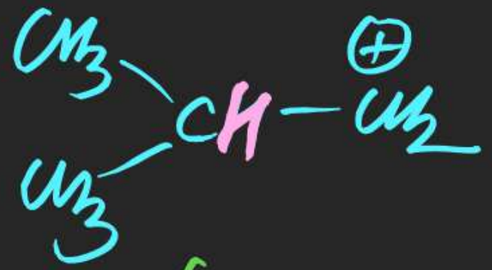
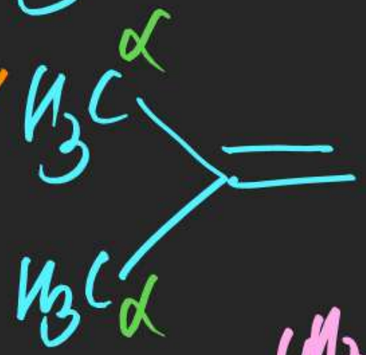
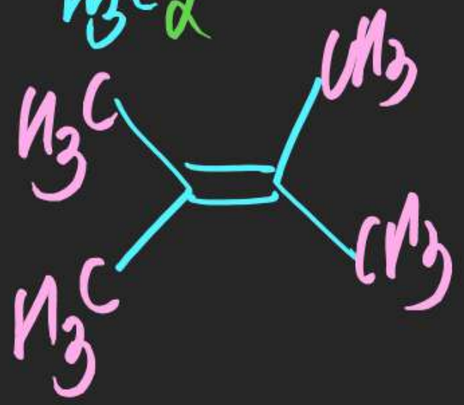
EX-4: Total no. of HS str involving C–H Bond.

(i)  5

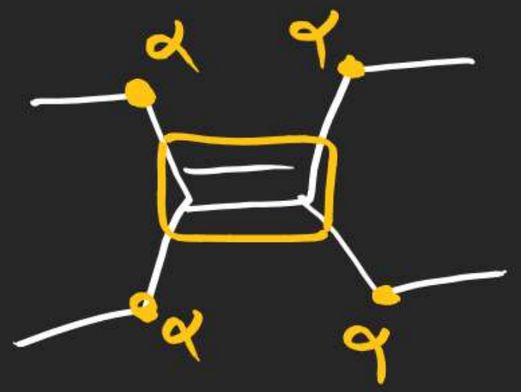
(ii)  1

(iii)  6

(iv)  12

(v)  6

(vi)  6

(vii)  8

(viii)  9

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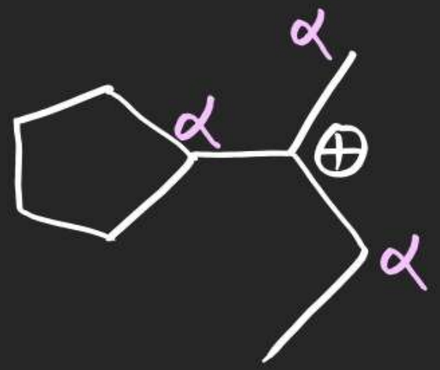
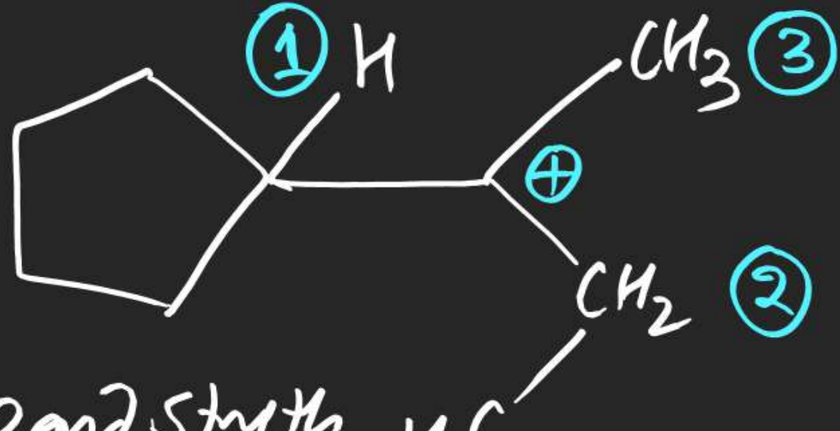
(ix) IIT Adv



⟹



6

Ans

Note: +H effect depends on Bond strength, "sp²" Carbon

Arrye following in ↓ order of +H effect when attached with a

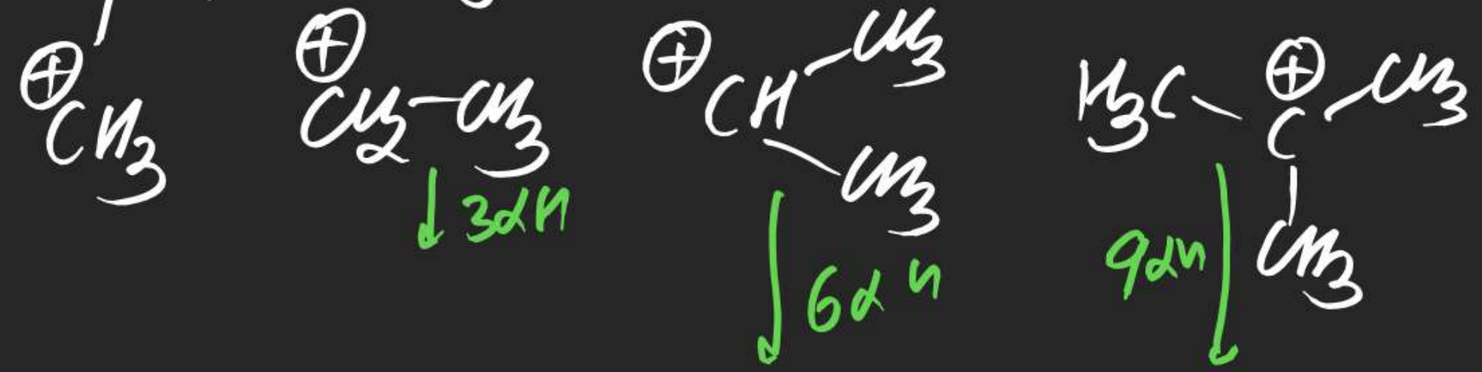
(a) $-CH_3$, $-CD_3$, $-CT_3$ (I > II > III)

Bond strength order: C–T > C–D > C–H

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

(c) $\overset{3}{-CH_3}$, $\overset{2}{-CH_2-CH_3}$, $\overset{1}{-CH(CH_3)-CH_3}$, $\overset{0}{-C(CH_3)_3}$ (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)

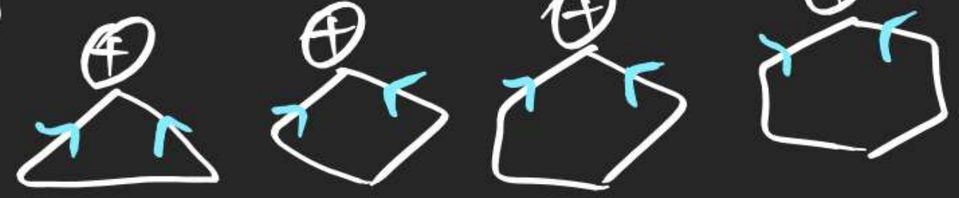
$-CH_2-CH_2-CH_3 > -CH_2-CH_3 > -CH_3$ (+I)

$2 > 3 > 1$ (+H)

(14)

(15) 

$1 > 3 > 2$ (+I)

(16) 

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

(17)

$4 > 3 > 2 > 1$

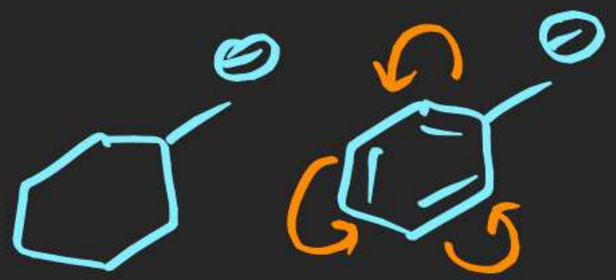
(18)

$1 > 2 > 3 > 4$

$\therefore$

(19)  2 > 1 (Resonance)

(20) 2 > 1 (")

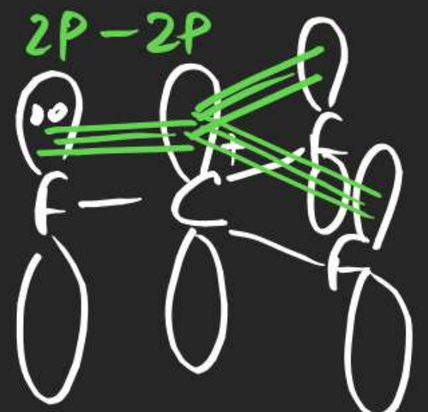
(21)  2 > 1 (")

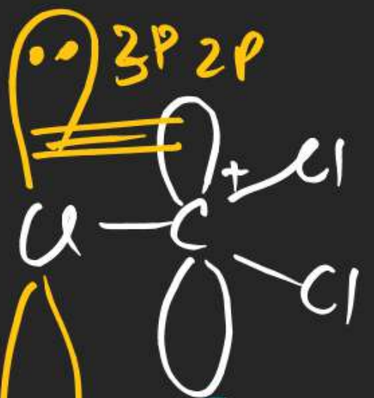
(22)  1 > 2 (")

(23) 1 > 2 (")

(24) 1 > 2 (")

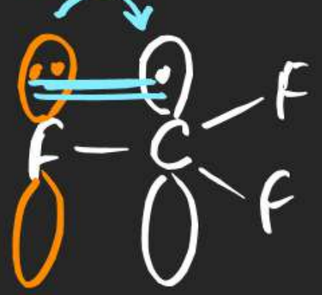
(25) $\overset{\oplus}{C}F_3$ $\overset{\oplus}{C}Cl_3$ 1 > 2 (2p-2p > 2p-3p)



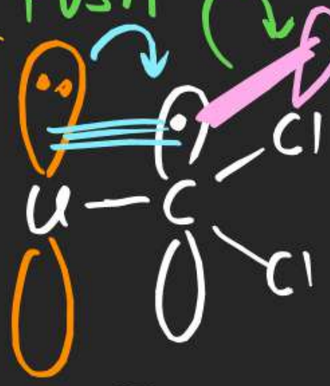


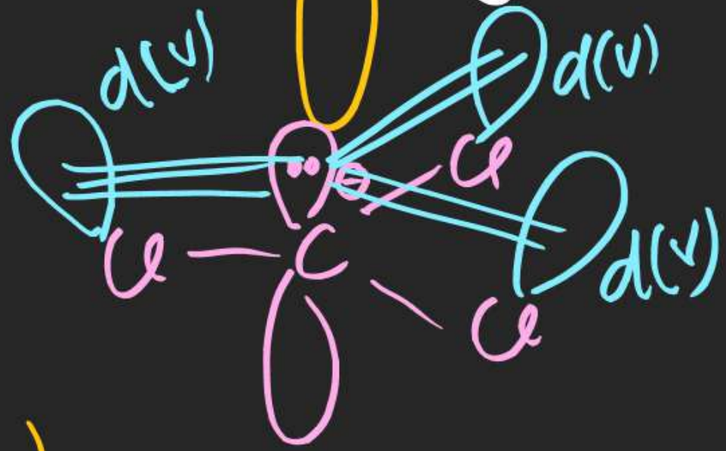
(26) $\overset{\ominus}{C}F_3$ $\overset{\ominus}{C}Cl_3$ 2 > 1 (pπ-dπ in ClO_3^-)

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



(Push, Pull effect)

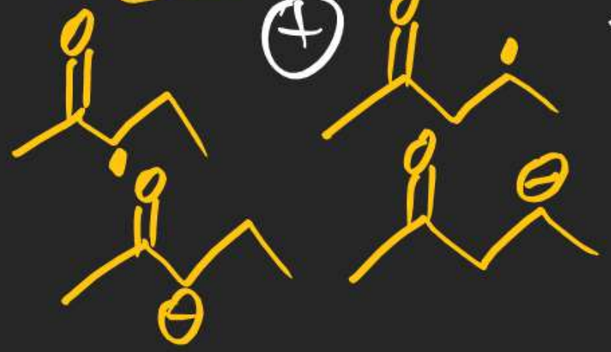




(28)

2 > 1 (+M)

(29)



1 > 2 (-R)

(30)

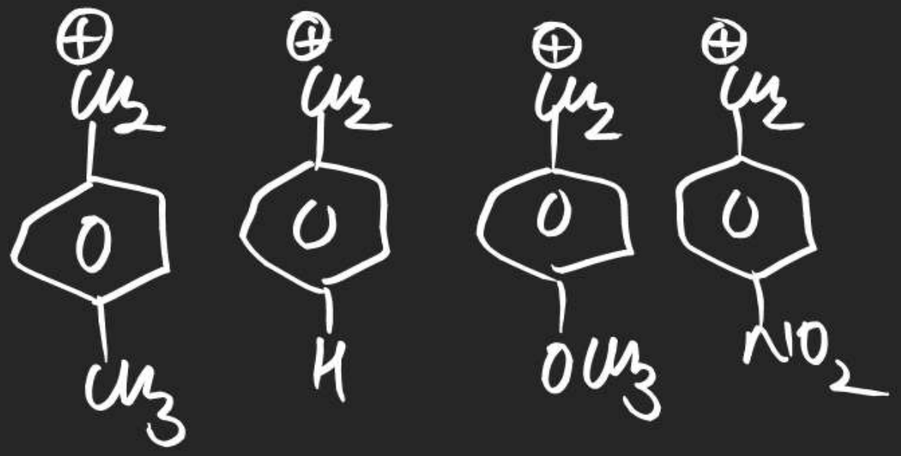
1 > 2 (-R)

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

(32)

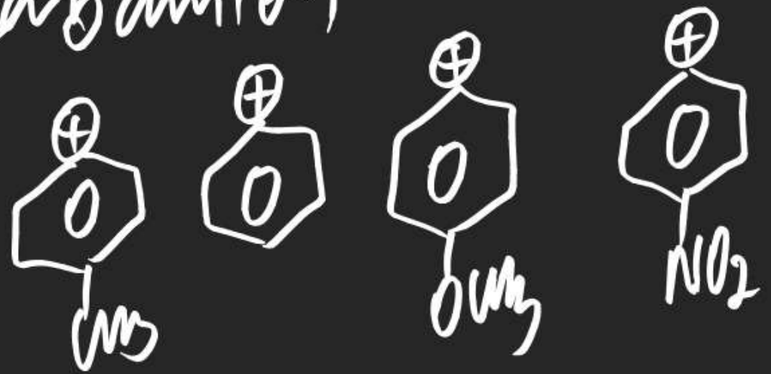
(33)

(34)



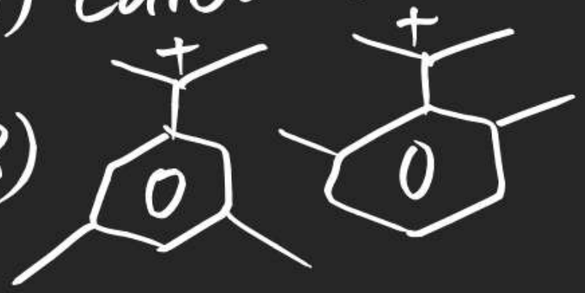
(35) Carbanion

(36)



(37) Carbanion

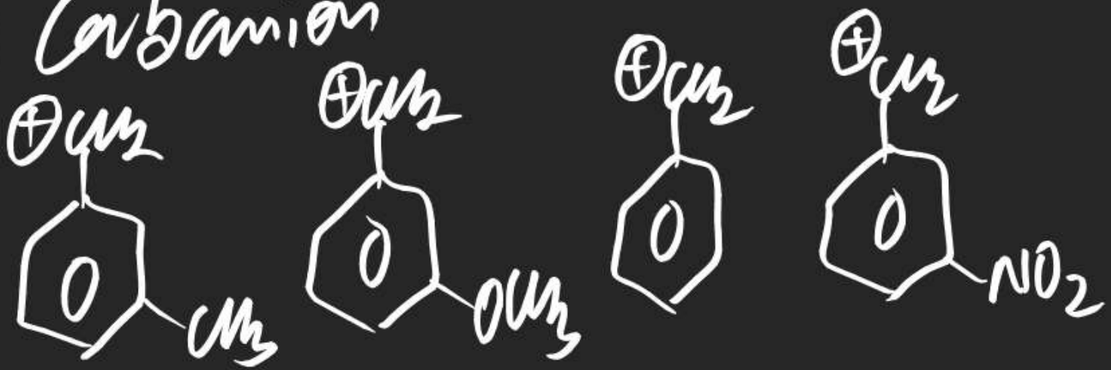
(38)



(39) Free Radical

(40) Carbanion

(41)



(42) Carbanion.

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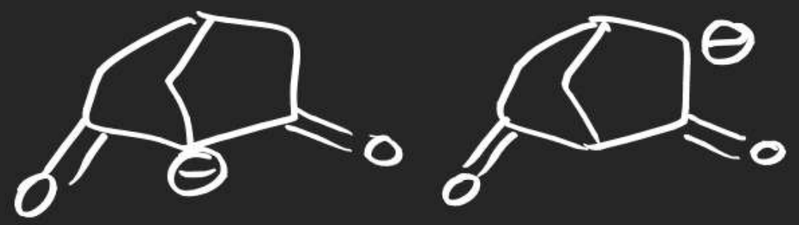
(43) 

(44) 

(45) 

(46) Carbanion

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(47) 

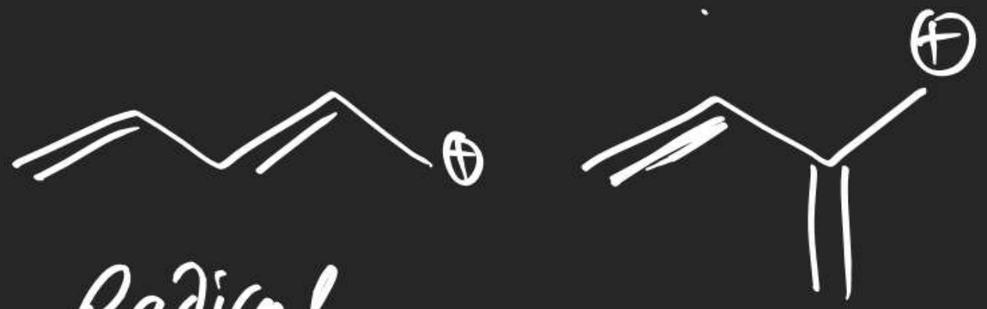
(48) 

(49) Carbanion

(50) 

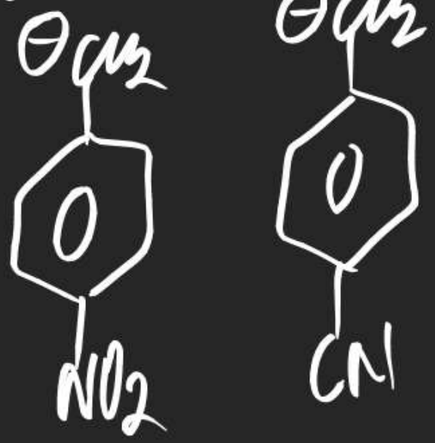
(51) Free Radical

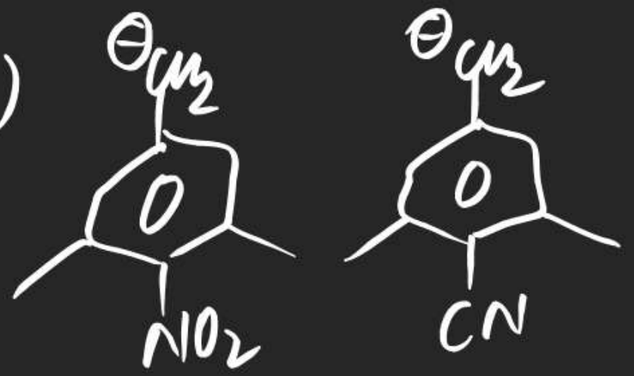
(52) Carbanion

(53) 

(54) Radical

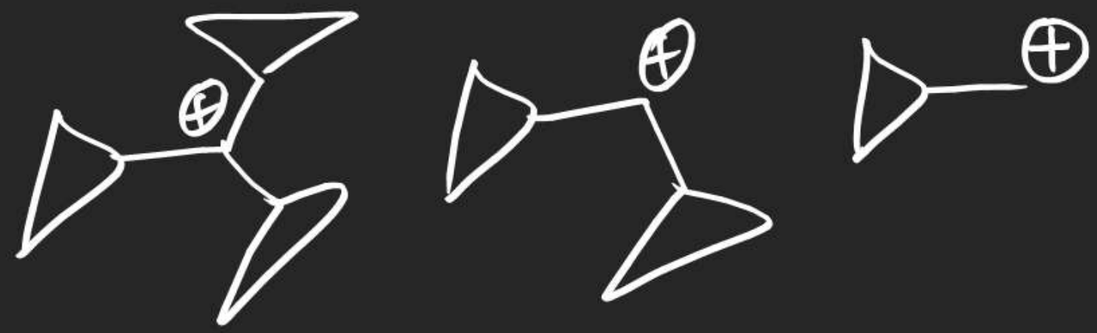
(55) Carbanion

(56) 

(57) 

(58) 

(59) 

(60) 

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(61) 

(62) 

(63) 

(64) Free Radical

MJP

(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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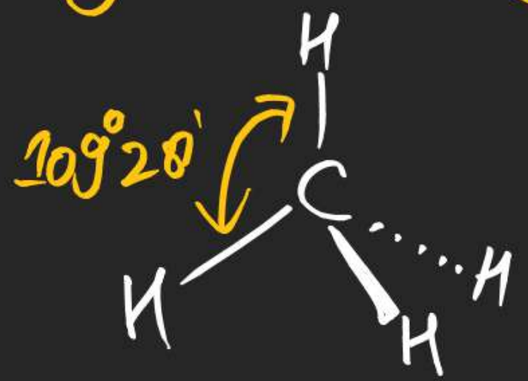
(#) Bayer's Strain Angle Theory:



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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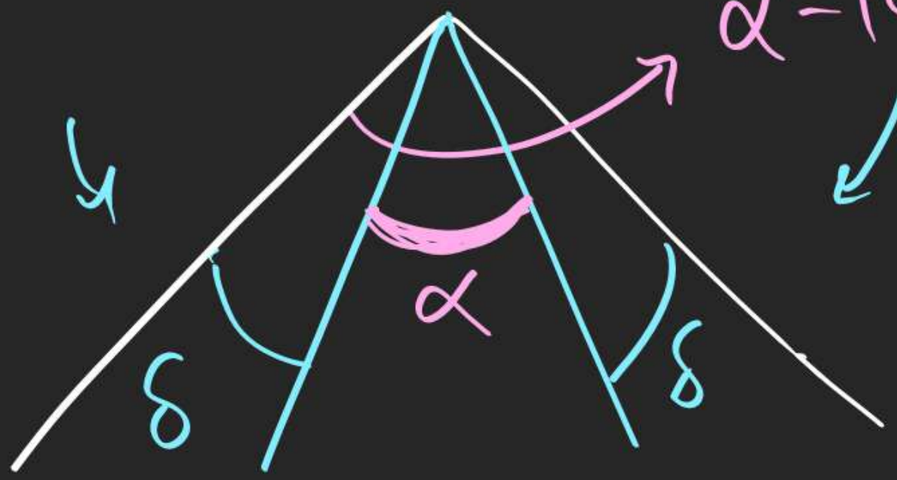

$\alpha = 109^\circ 28'$

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

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

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

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

$\alpha = 100^\circ$ $\quad \delta = +0.5^\circ$

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

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) 

(3) 
6C 6C

1>2>3

(4) 

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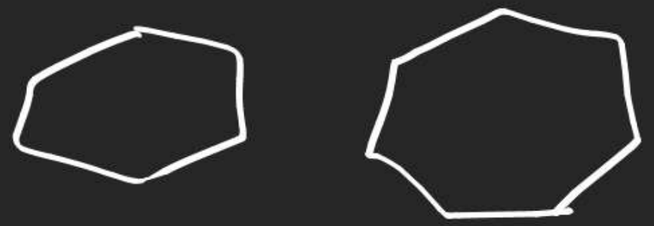
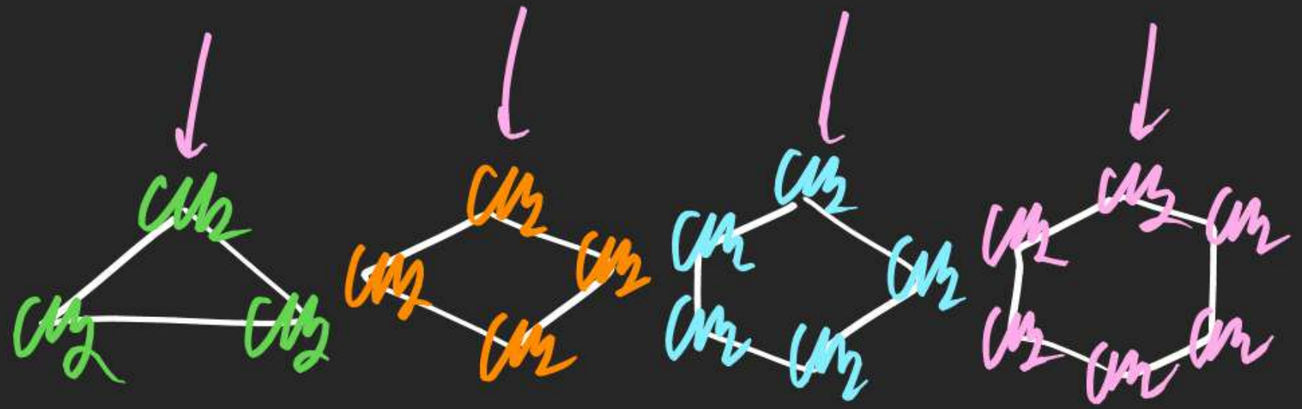
(5) 

$\frac{x}{3}$ $\frac{y}{4}$ $\frac{z}{5}$ $\frac{w}{6}$

(6) 

(7) 

HOC $4 > 3 > 2 > 1$

(8) 

HOC per CH_2 $\propto$ Strain

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(9) 

(10) 

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