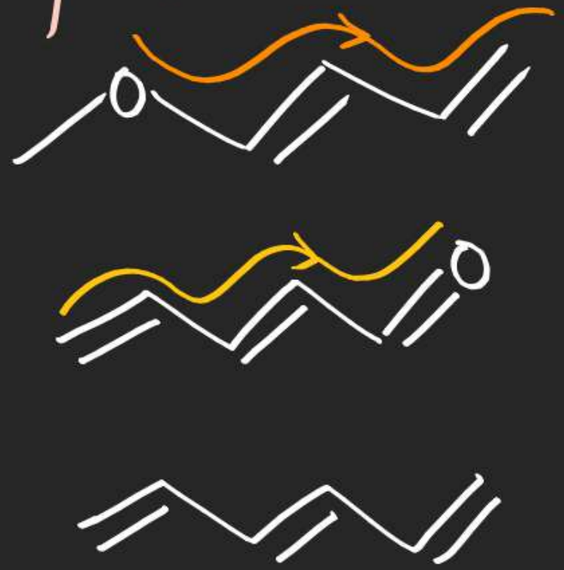
Extended Conjugation

⇒ Compound must have at least "3" segments

⇒ Flow of $\bar{e}$s in same direction

Ex:

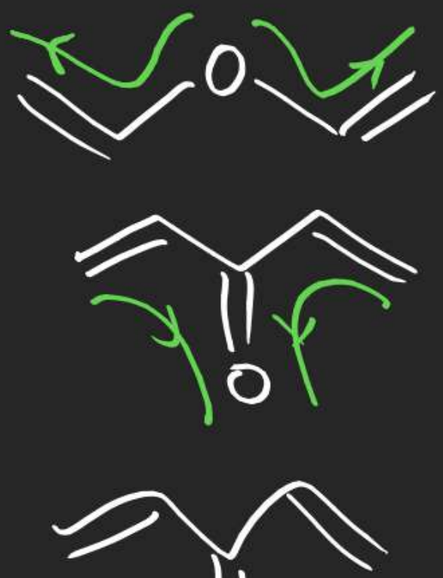


Cross Conjugation

⇒ Compound must have at least "3" segments

⇒ Flow of $\bar{e}$s in opp. direction

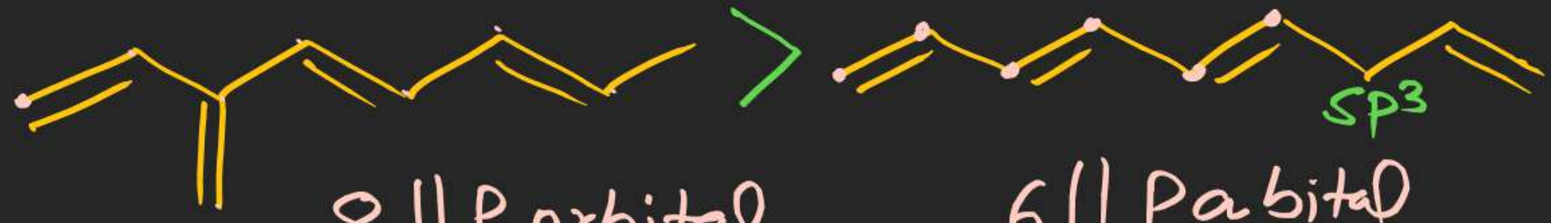
Ex:



Note: Extended conjugation is more stable than cross conjugated system

(1) Stability order:-

(a)



8 || P orbital in Conjugation

6 || P orbital in Conjugation

(b)

6 || P orbital in Conjugation

6 || P orbital in Conjugation

(Cross Conjugated)

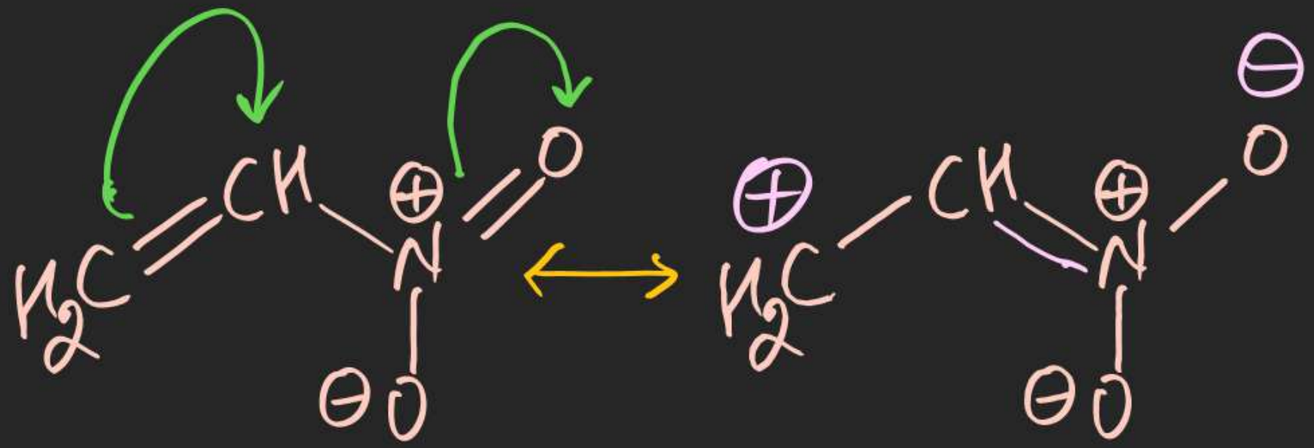
(Extended Conjugation)

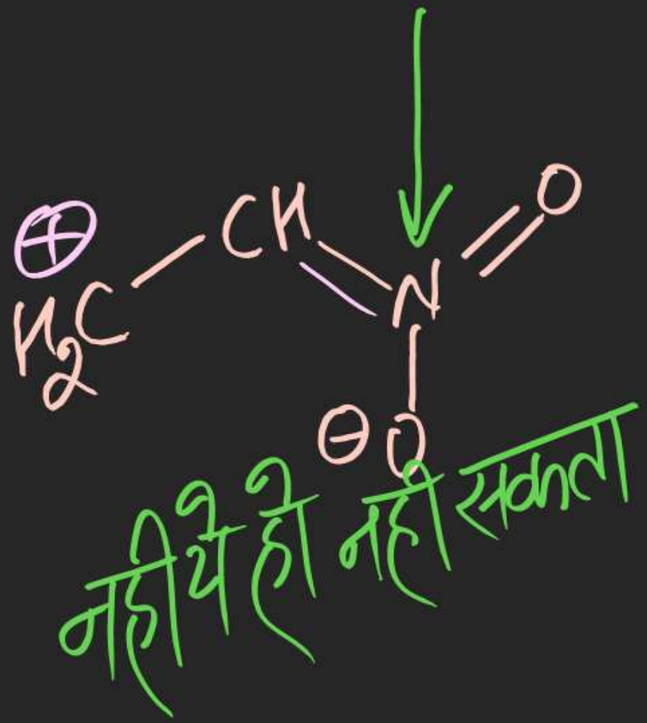
(#) Rules for Drawing R.S :-

Rule-1: Each RS must have valid str. (doesn't violate octet Rule)

Ex-1:

Nitro Ethene





नहीं ऐसा हो नहीं सकता

Rule-2 : Each RS must have same no. of unpaired e⁻s.

EX-2 :

Buta-1,3-Diene

(up e⁻s = 0)

(I)

(up e⁻s = 0)

(II)

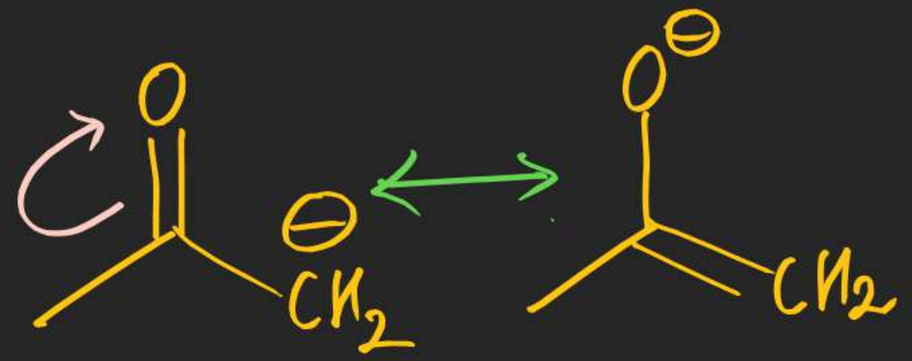
(up e⁻s = 2)

नहीं है RS

I & II का

Rule-3:- Nuclei of Each atom in R-S must be same.

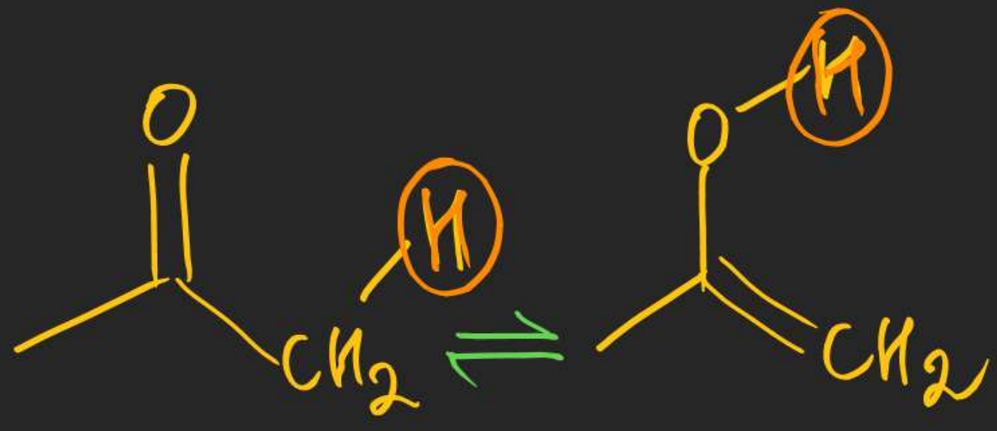
Ex-3:



P Q

Resonating structures

Ex-4:-

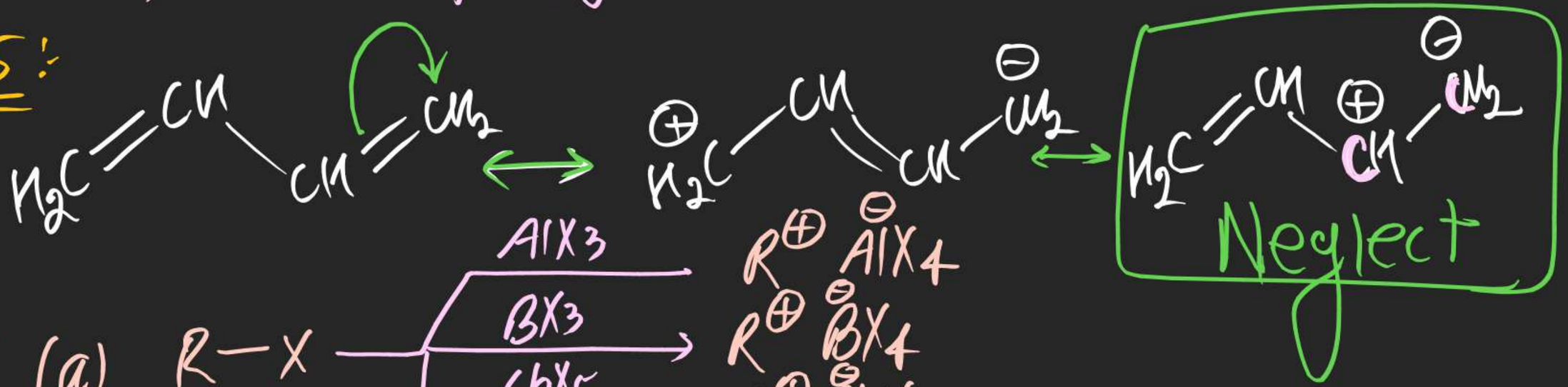


P' Q'

Not Resonating Structures (Tautomers)

Rule-4: RS having opp charges on adjacent atoms (which can form Bond) is usually neglected.

Ex-5:



Note: (a) $R-X$ → AlX_3 → $R^{\oplus}\,AlX_4^{\ominus}$

BX_3 → $R^{\oplus}\,BX_4^{\ominus}$

SbX_5 → $R^{\oplus}\,SbX_6^{\ominus}$

$AgNO_3$ → $R^{\oplus}\,NO_3^{\ominus} + AgX$

(b)  $\xrightarrow{NaOH}$  $+ H_2O$

(#) Calculate Total no. of RS of Product of following Reaction.

H | D | T isotopes

C^{12} | C^{14} isotopes

Ex-6: $H_3C-CH=CH-CH_2-Cl \xrightarrow{AlCl_3}$

Soln: $H_3C-CH=CH-CH_2-Cl \xrightarrow{AlCl_3} \left[H_3C-CH=CH-\overset{\oplus}{C}H_2 \longleftrightarrow H_3C-\overset{\oplus}{C}H-CH=CH_2 \right] AlCl_4^{\ominus}$

$\left[H_3C-\overset{\delta+}{C}H\cdots CH\cdots\overset{\delta+}{C}H_2 \right] AlCl_4^{\ominus}$ "2" Resonating structure

(Product) (Resonance Hybrid)

Ex-7: $CH_2^{14}=CH-CH_2-Cl \xrightarrow{BCl_3}$

Soln: $CH_2^{14}=CH-CH_2-Cl \xrightarrow{BCl_3} \left[CH_2^{14}=CH-\overset{\oplus}{C}H_2 \longleftrightarrow \overset{\oplus}{C}H_2-CH=CH_2^{14} \right]$ (2 RS)

Ex-8: $CH_2=CH-CH_2-Cl \xrightarrow{SbCl_5}$

Soln: $CH_2=CH-CH_2-Cl \xrightarrow{SbCl_5} \left[CH_2(1)=CH(2)-CH_2(3) \leftrightarrow {}^{\oplus}CH_2(1)-CH(2)=CH_2(3)\right]$

$\left(CH_2 \cdots CH \cdots CH_2\right)$ ($+\frac{1}{2}$ on each terminal CH_2)

Ex-9:

$\xrightarrow{AlCl_3}$

Ex-10:

$\xrightarrow{AlCl_3}$

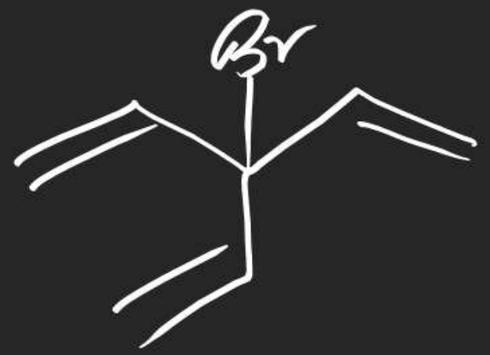
Ex-11:

$\xrightarrow{\Delta}$

Ex-12

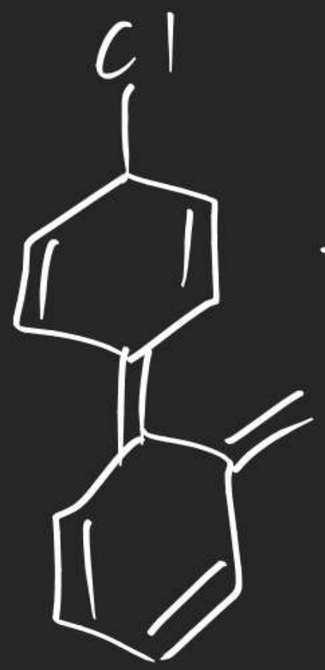
$\xrightarrow{\Delta}$

Ex-13:



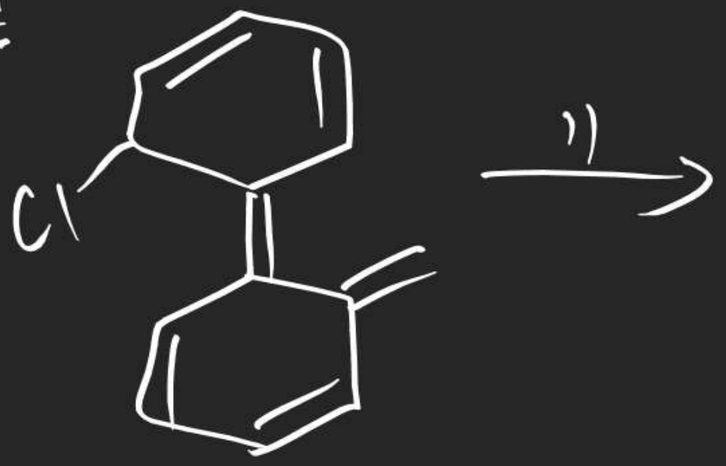
$AlBr_3$ →

Ex-14:

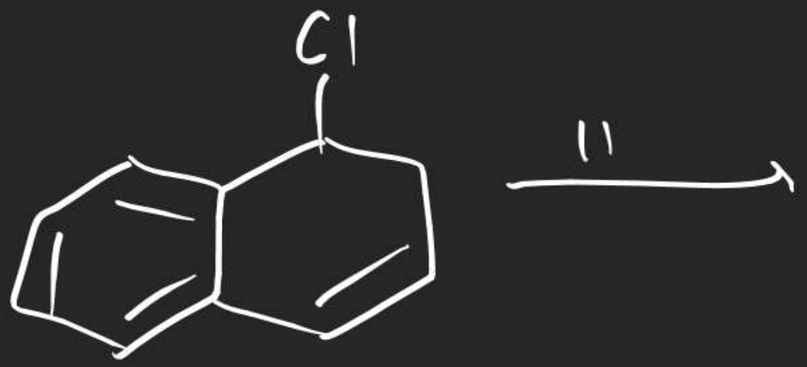


$AlCl_3$ →

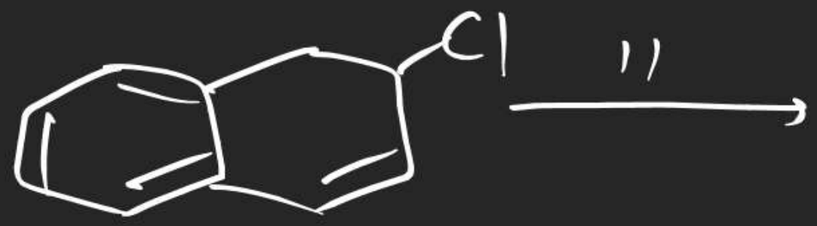
Ex-5:



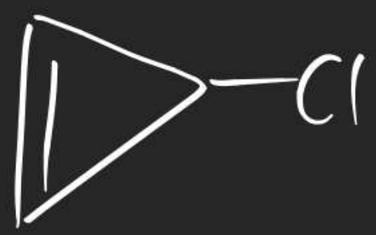
Ex-6



Ex-17

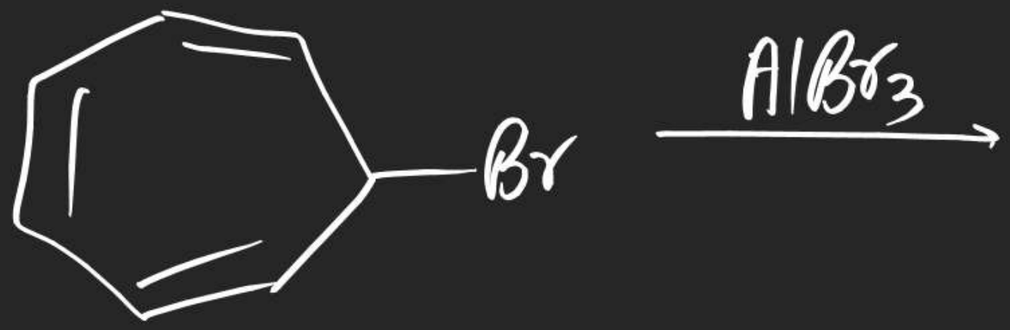


Ex-18:



$AlCl_3$ →

Ex-19



Ex-20: