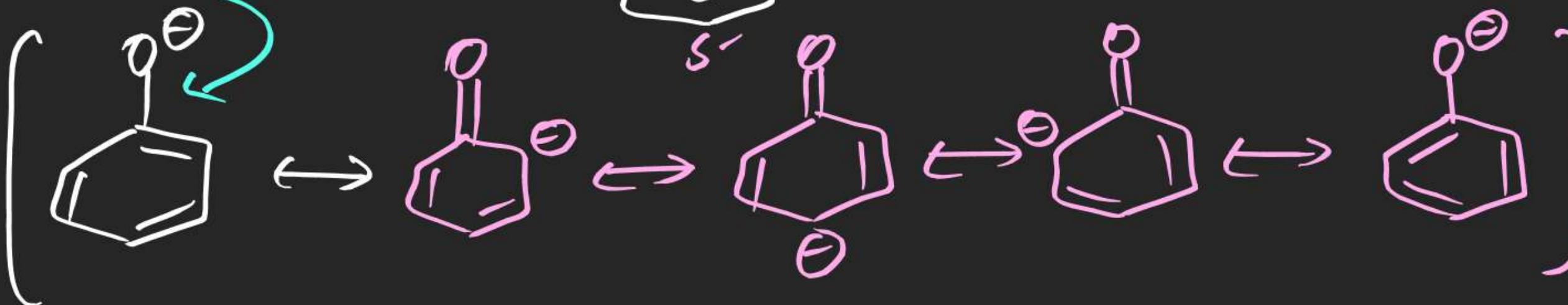
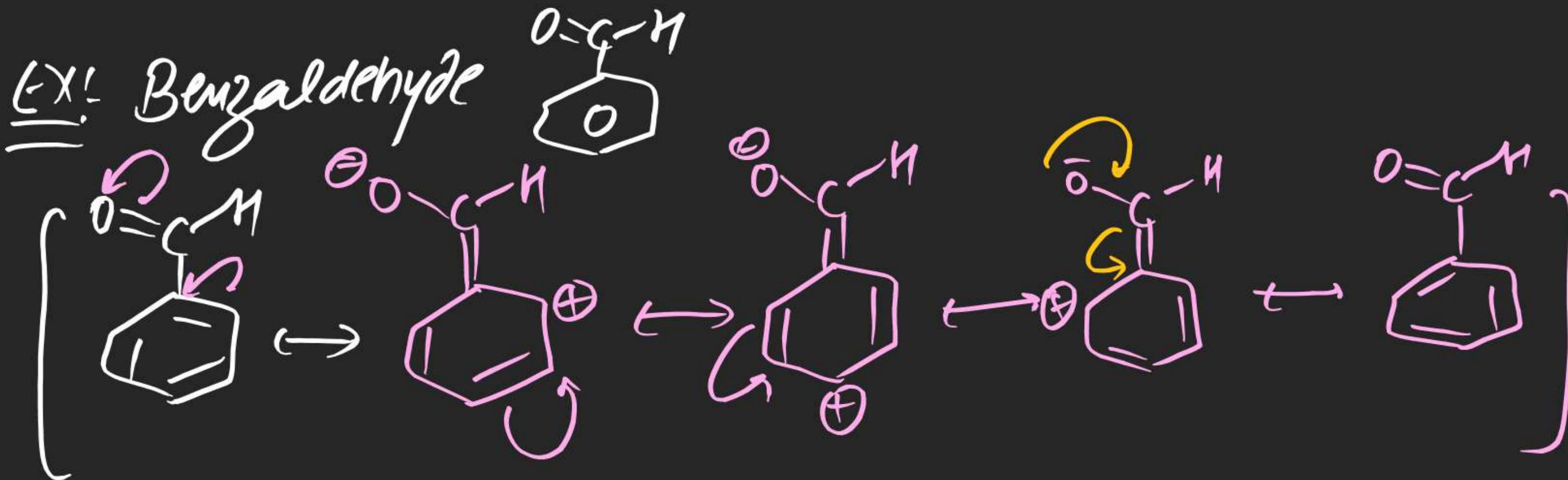


Ex: Phenoxide Ion



Note + R Series

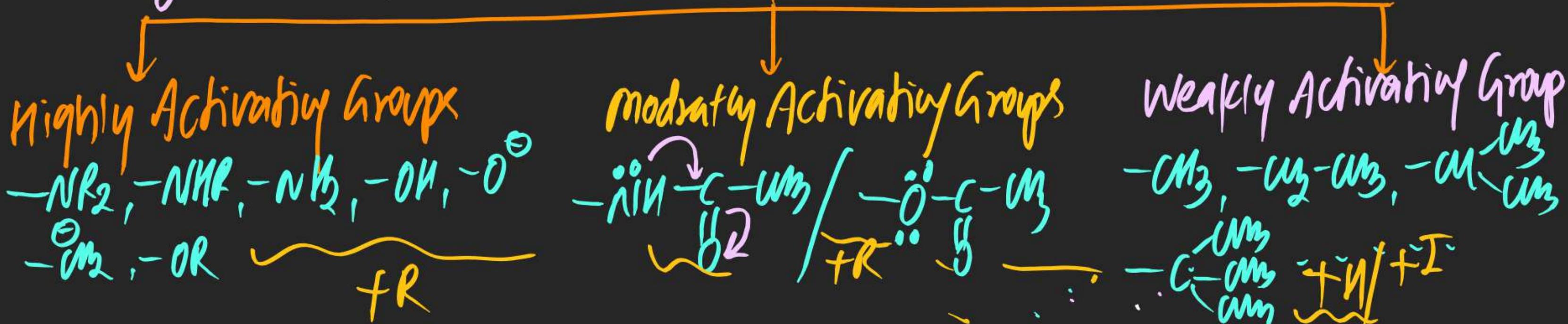


-R Benes:

⇒ Order of Rate of electrophilic attack.



Activating Compounds: All compounds which show higher rate of electrophilic substitution than Rate of electrophilic substitution of Benzene, are known as Activating Compounds.



Note:

EDG



($\sigma^- e^- \delta$ + $\pi^- e^- \delta$)

EDG: I effect R effect

+R & +I

Compound Activating

+R & -I

Compound Activating

-R & -I

Compound deactivating

-R & +I

Compound deactivating (hypothetical combination)

* * * *
* [+R] (-I) * * * *
* * * * *

+R & -I

Compound Deactivating

| In case of halogens

- (ii) OUT of Benzene & Phenol
Electrophile prefer to attack on phenol, it means +R effect of -OH is dominating over -I effect of OH
-
- +R effect of -OH is dominating over -I effect of OH
- (iii) OUT of Benzene & halo
Benzene, Electrophile prefer to attack on Benzene which means
-

For halobenzene:

-I effect of "X" > +R effect of "X" for rate of Electrophilic Substitution

+R effect of X > -I effect of X for orientation of electrophile

Ex: ① Arrange following in decreasing order of rate of electrophilic substitution Rxn.

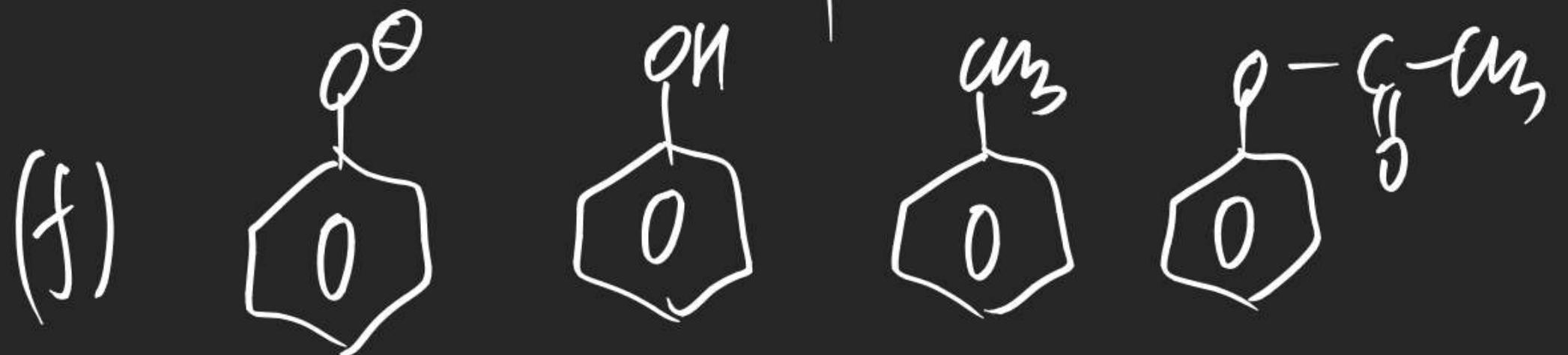
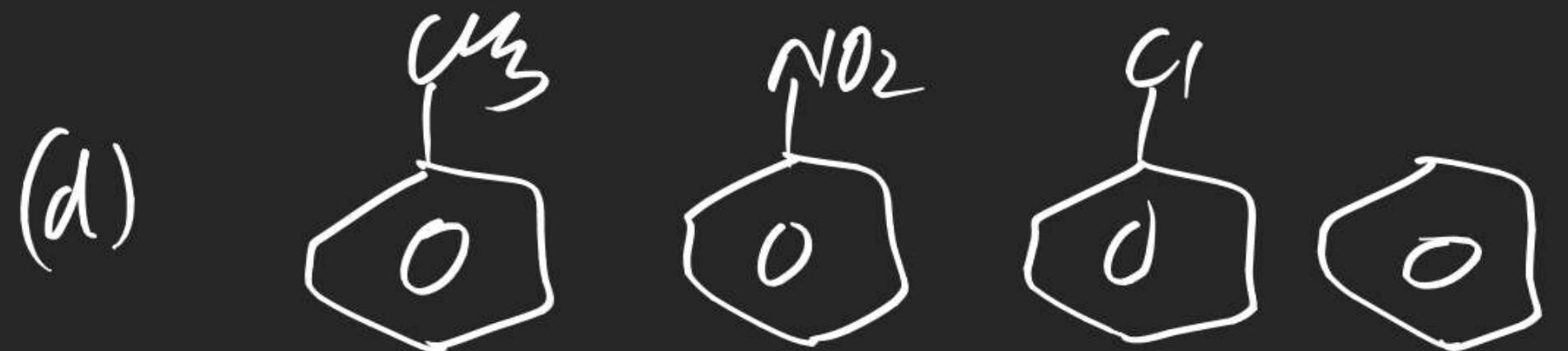
(a)



II > I > III

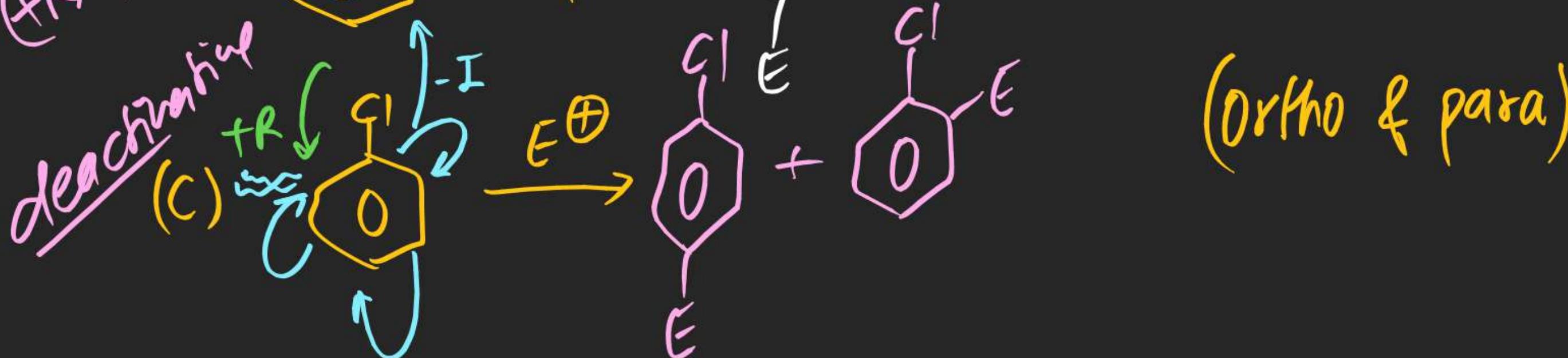
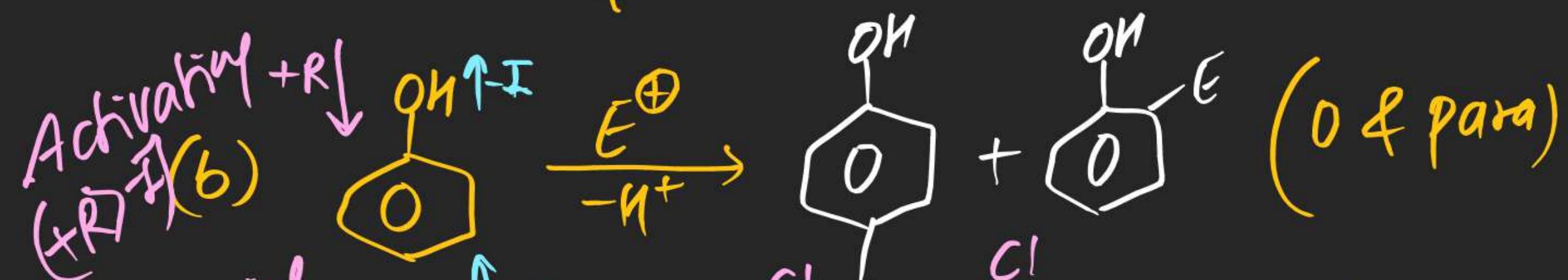
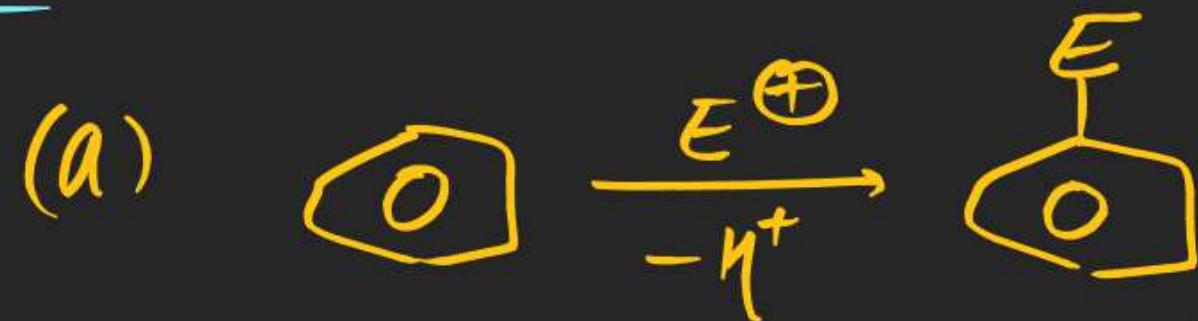
(b)





Ex-2

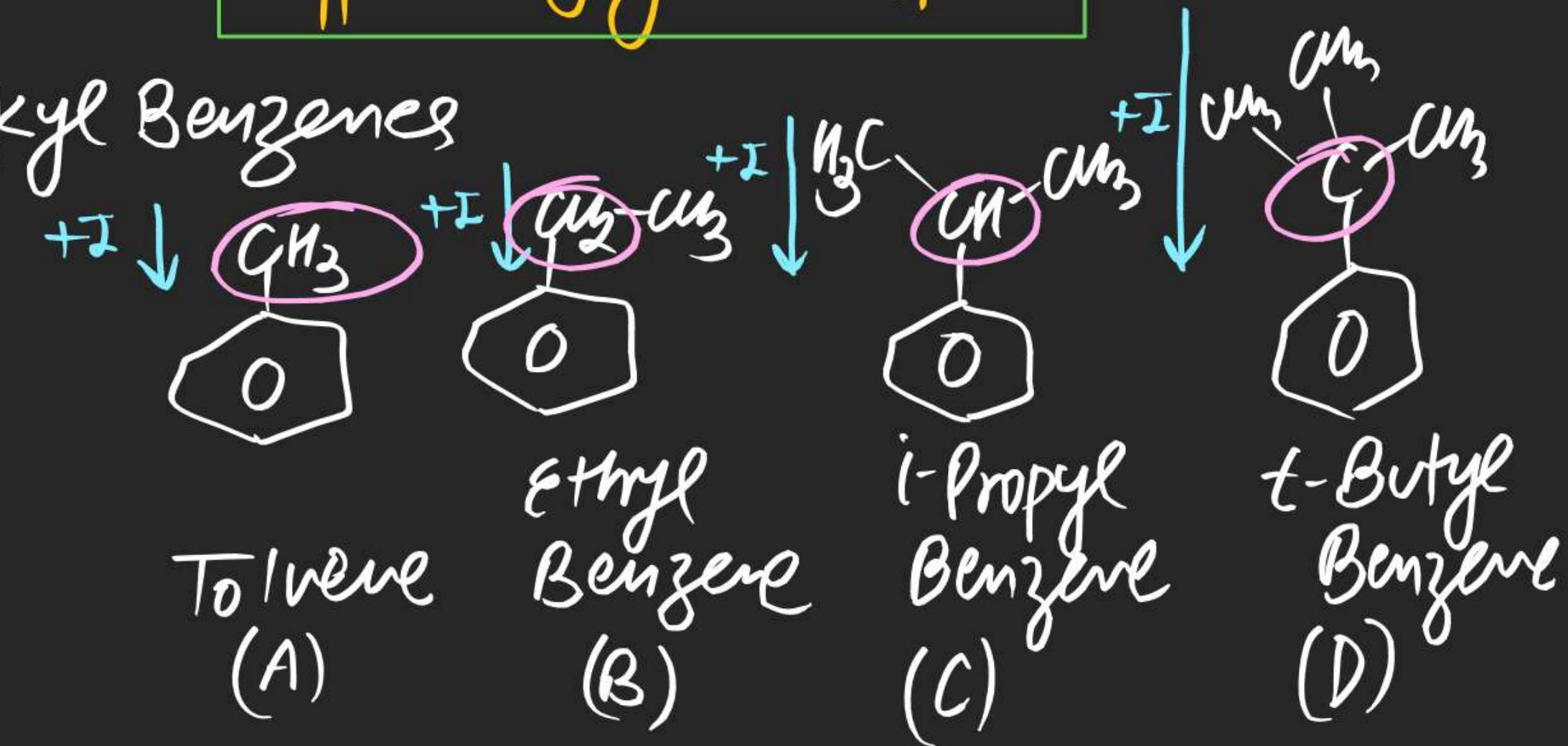
write product of following Reaction



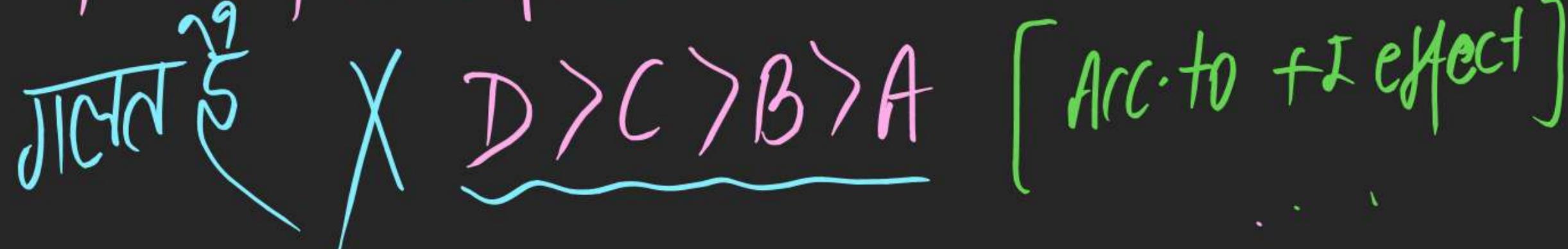
HyperConjugation effect

for alkyl Benzenes

Nathan
Baker



order of rate of electrophilic substitution should be

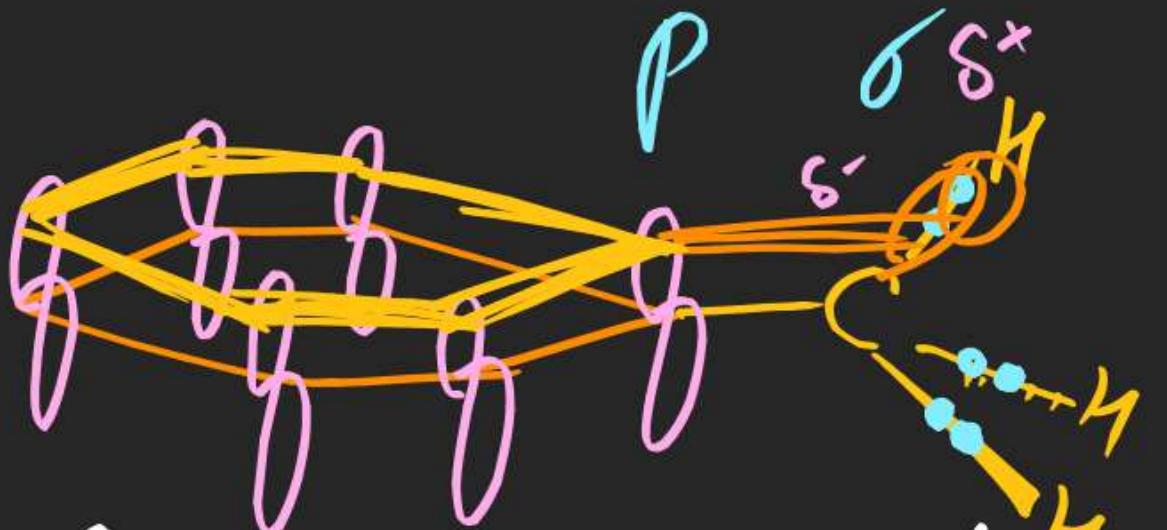


⇒ But experiment shows actual order
of Rate of electrophilic attack is

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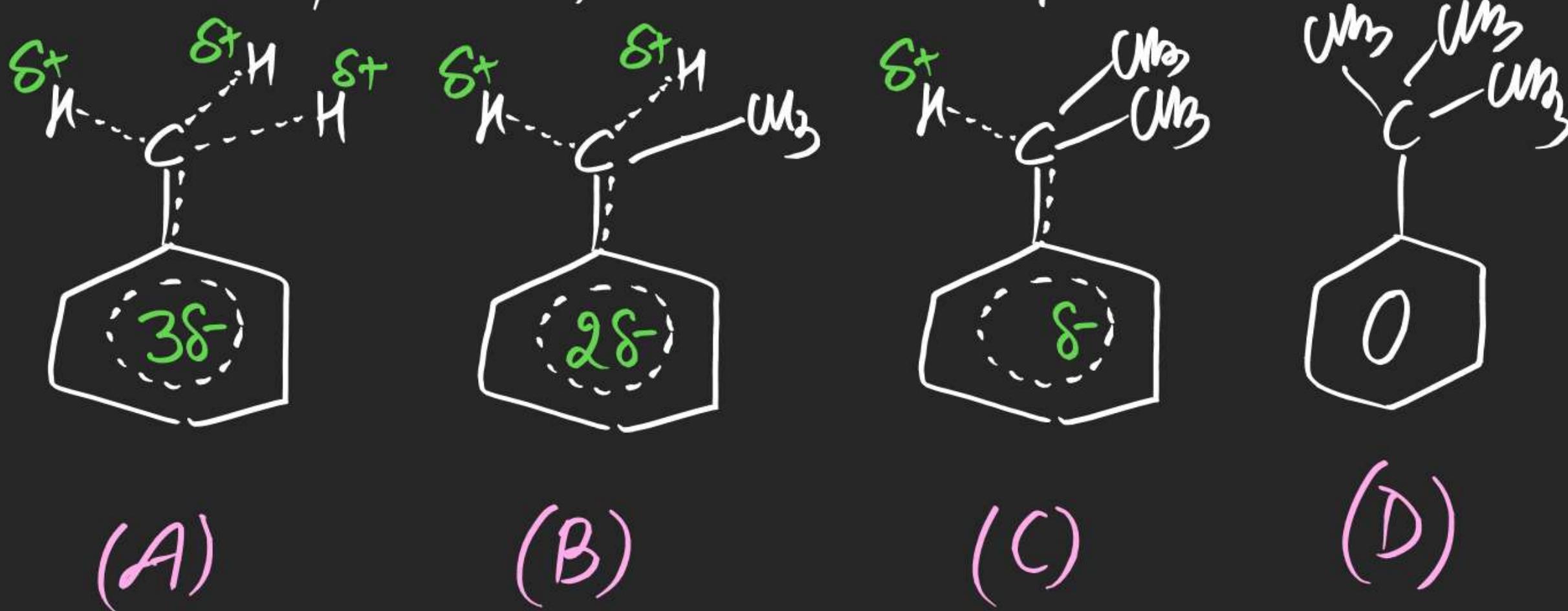
$$A > B > C > D$$

(due to effect)



this order can be explained by overlapping b/w 'P' orbital of Benzene with σ orbital of C-H Bond of directly attached alkyl group.

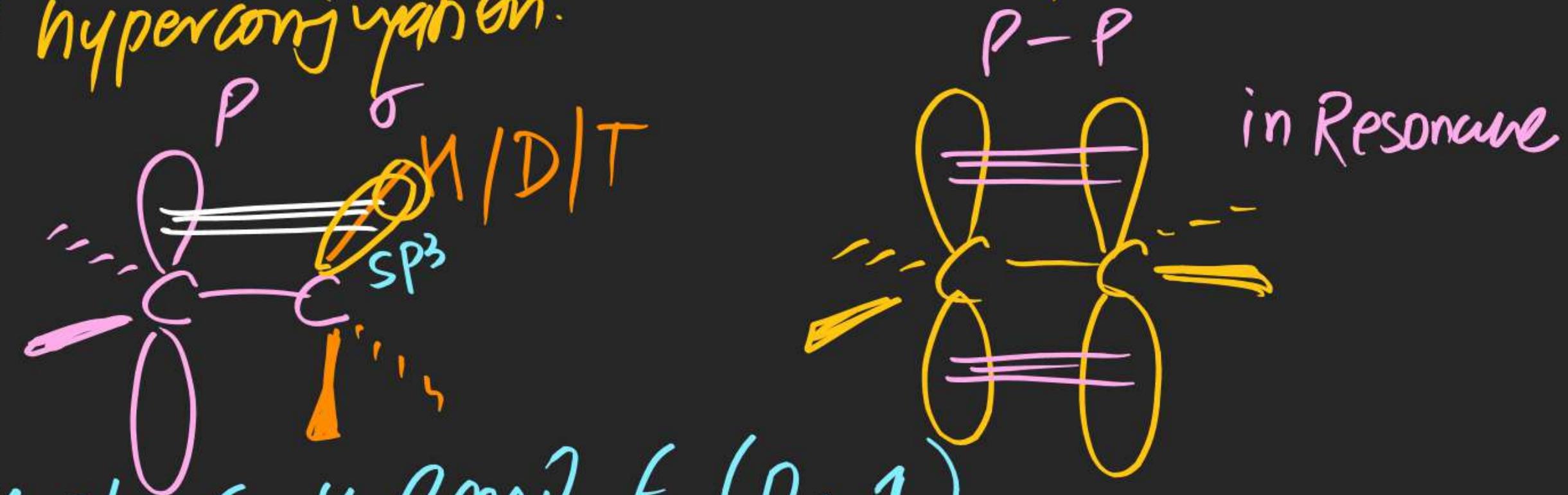
higher the NO of such $\delta_c - \delta_H$ Bonds higher would be such



overlapping & higher wd be electron density in Riu.

Note This phenomenon is known as hyperconjugation & effect is
(1) Known as hyperconjugation effect.

- (ii) hyperconjugation involves (σ -P) overlapping
(iii) Condition of hyperconjugation.



- (iv) Bond angle of C-H Bond $\epsilon (0, 1)$
(v) Also known as Nathan Baker effect.
(vi) H effect is stronger than Inductive effect (I effect)
 $(H > I)$

(vii) H effect is weaker effect than R effect

$$R > H > I$$

(viii) Permanent effect.

(ix) Distance independent effect.