





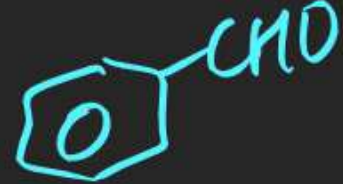






Aromatic Compound

Few Aromatic Compounds:

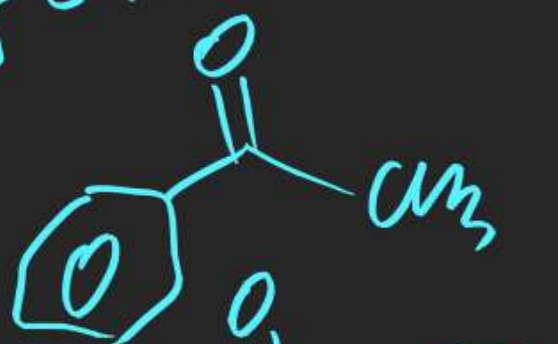
- (1) Benzene 
- (2) Chloro Benzene 
- (3) Toluene 
- (4) Cumene 
- (5) Nitro Benzene
(oil of mirbane) 
- (6) Aniline 

- (7) Benzaldehyde 
- (8) Benzoic Acid (white crystalline) 
- (9) Benzene Sulphonic Acid 
- (10) Phenol (Carbolic Acid) 
- (11) Benzene diazonium chloride 

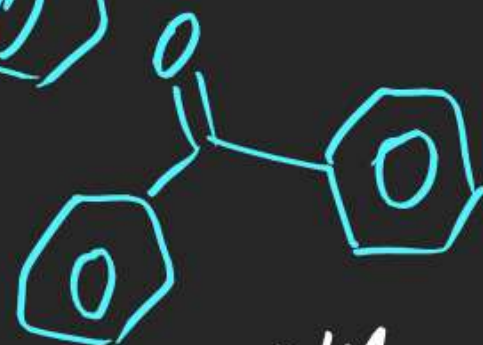
(12) Benzonitrile



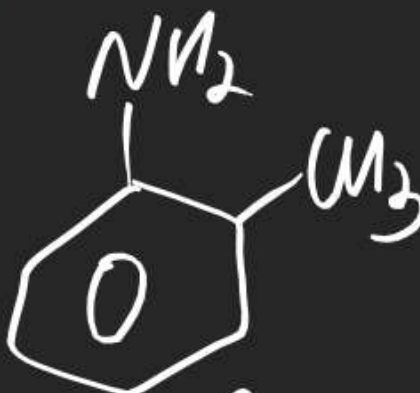
(13) Acetophenone



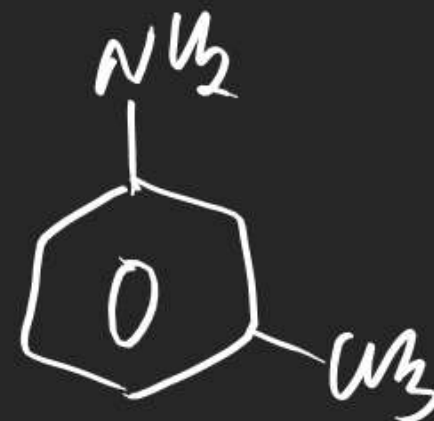
(14) Benzophenone



(15) Toluidine (o, m, p)



o-Toluidine

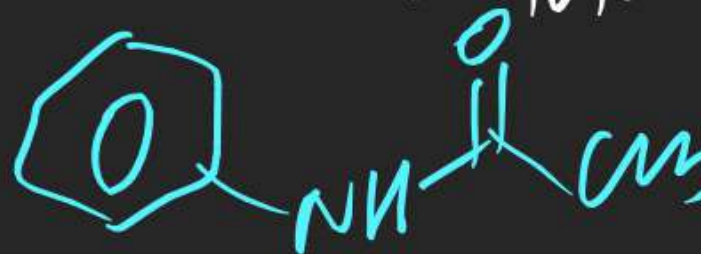


m-Toluidine

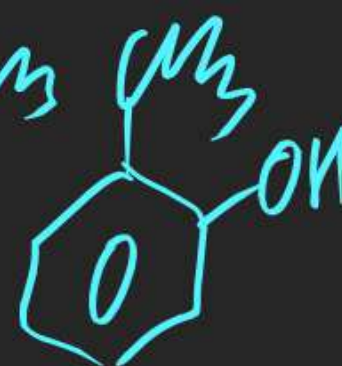


p-Toluidine

(16) Acetamide



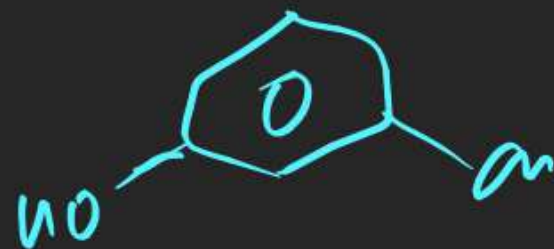
(17) Cresol (o, m, p)



(18) Catechol



(19) Resorcinol



(20) Quinol



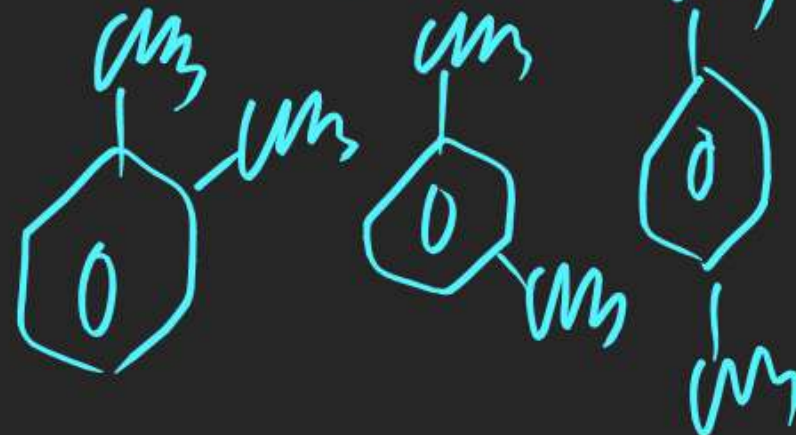
(21) pthalic Acid



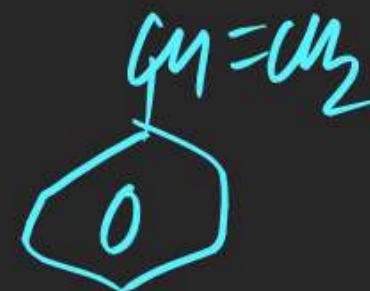
(22) Tet pthalic Acid



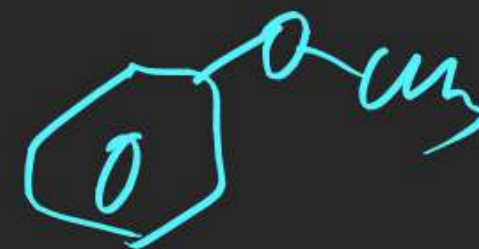
(23) Xylene (o, m, p)



(24) Styrene



(25) Anisole



(26) Furan



(27) Pyrole



(28) Thiophene

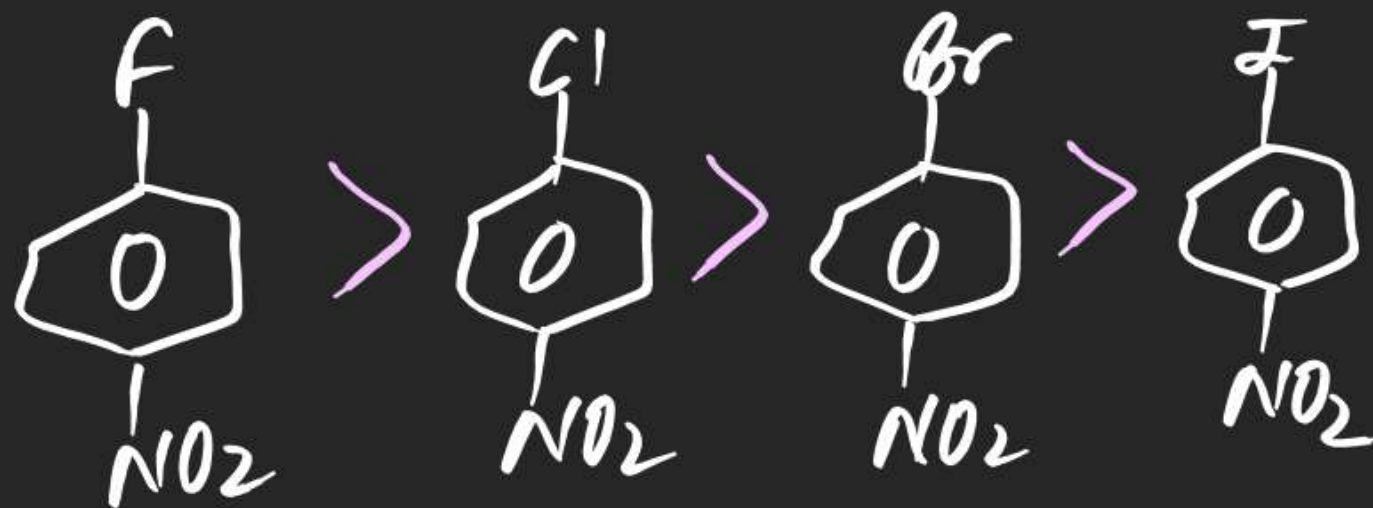


(46) Inorganic Benzene / Borazine / Borazole

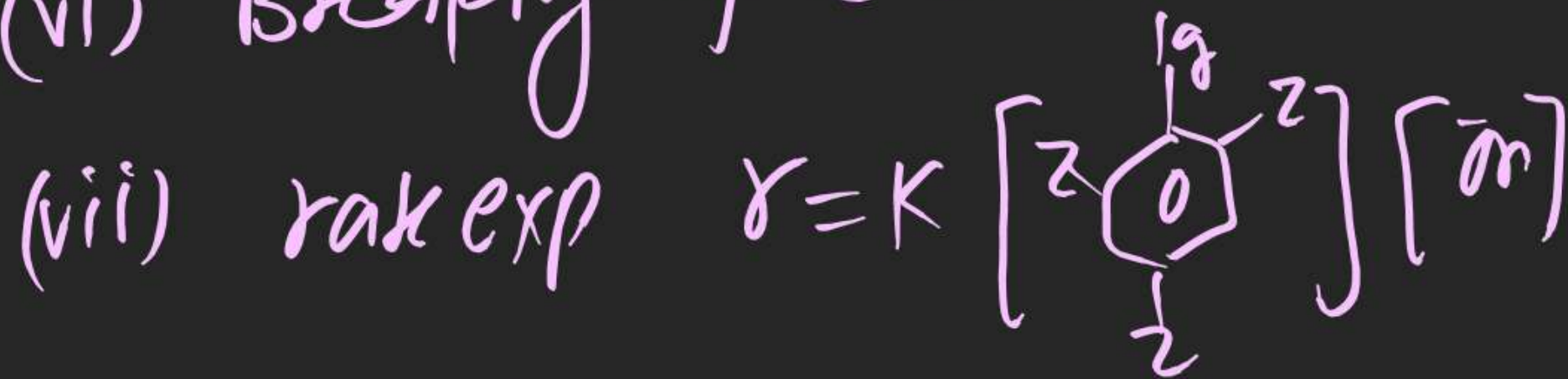
(47) Indole

(48) Benzene Hexa chloride.

(v) order of rate of S_N2 -Ar mechⁿ for Ar-X



(vi) Breaking of C-X Bond is not involved in r.d.s



(viii) II-order

(ix) Bimolecular

(X) P.E Diagram

PE

m-Complex

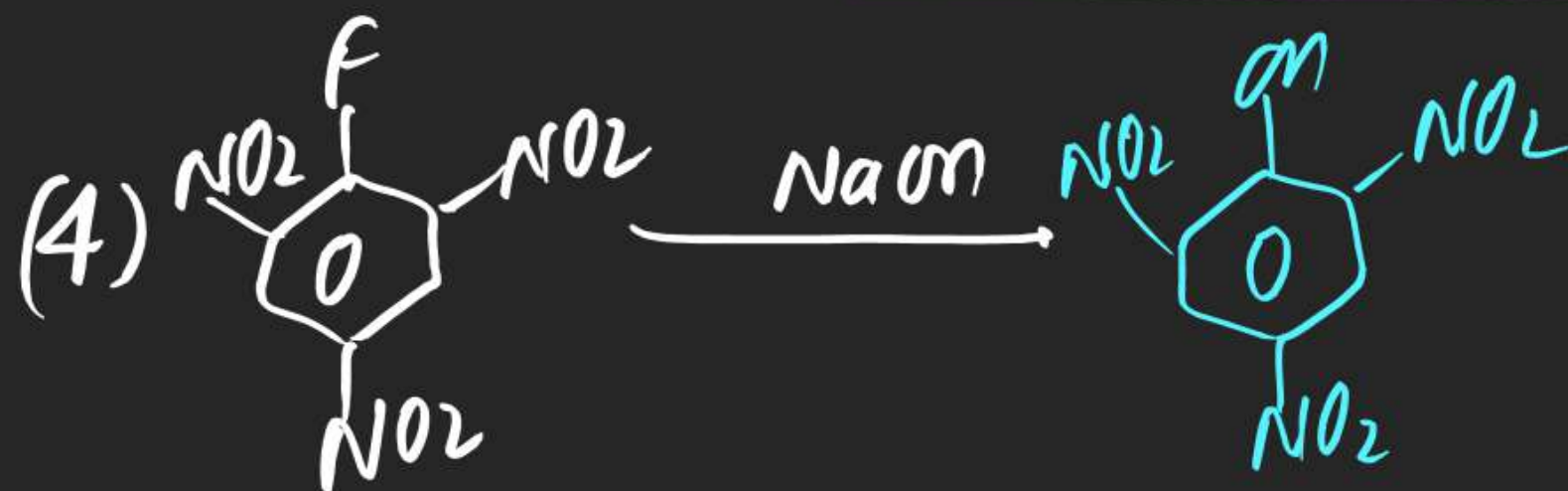
(xi) Two step mechⁿ

Product

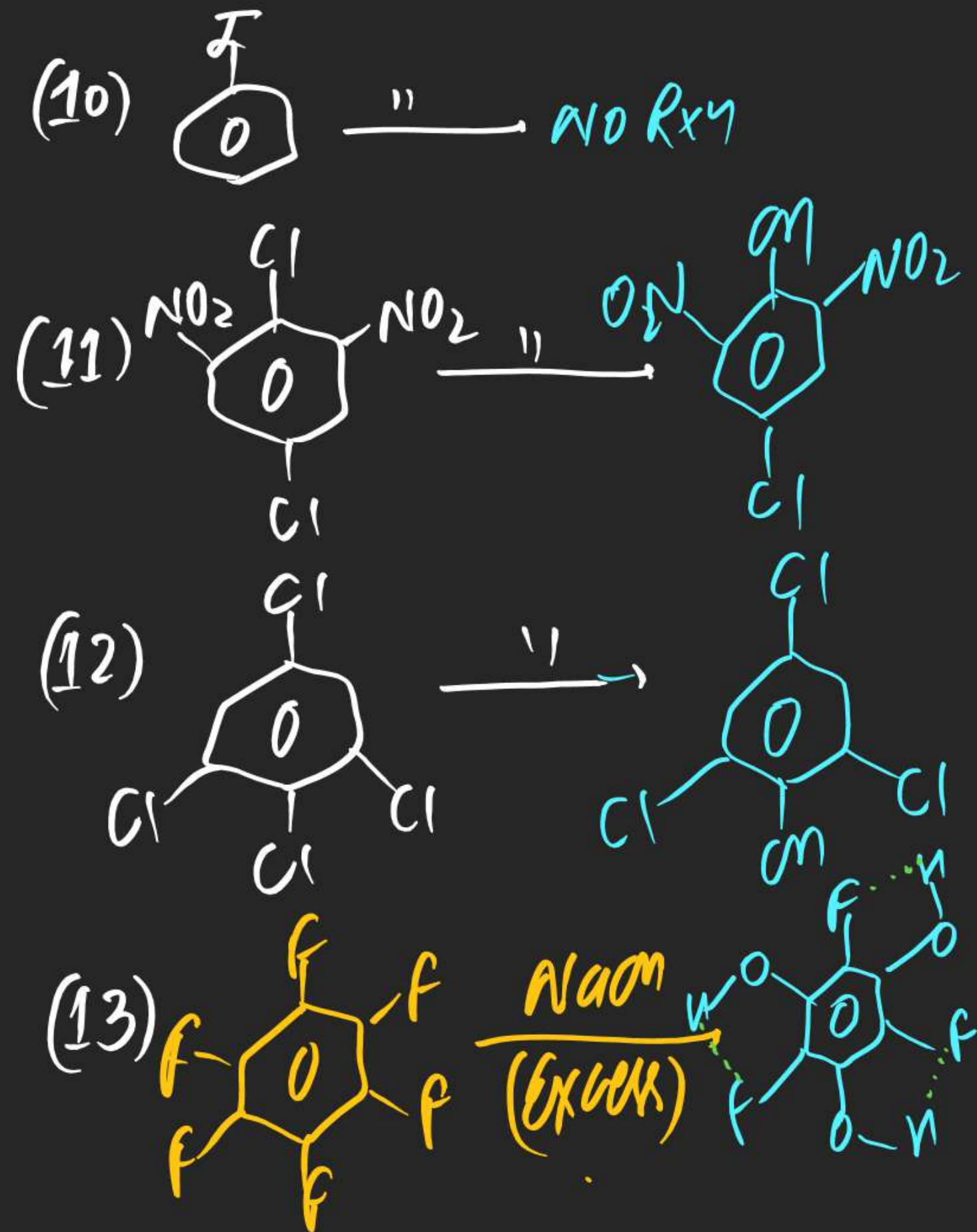
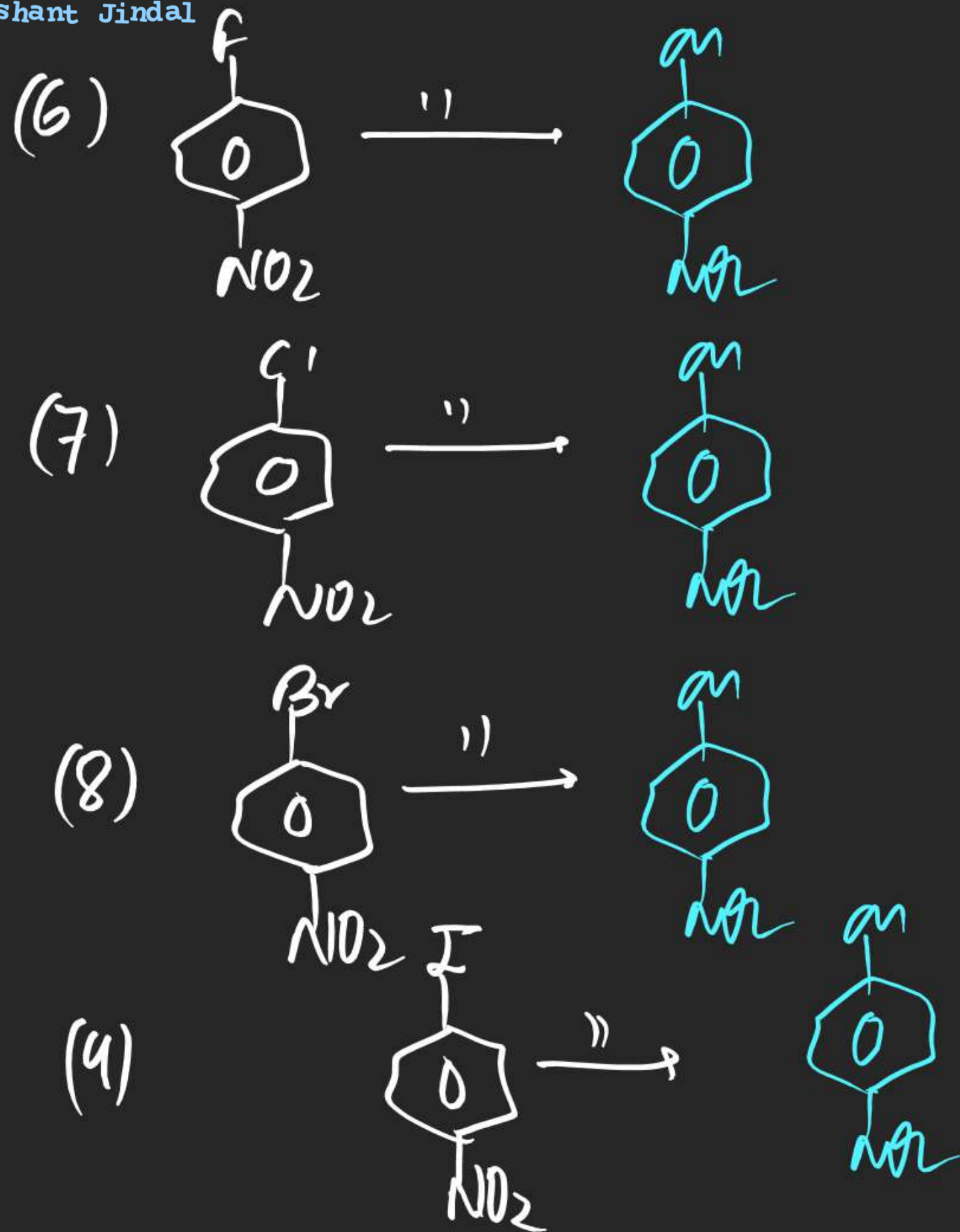
(xii) Rxⁿ is used in POC
To distinguish -NO₂
group.

m-Complex

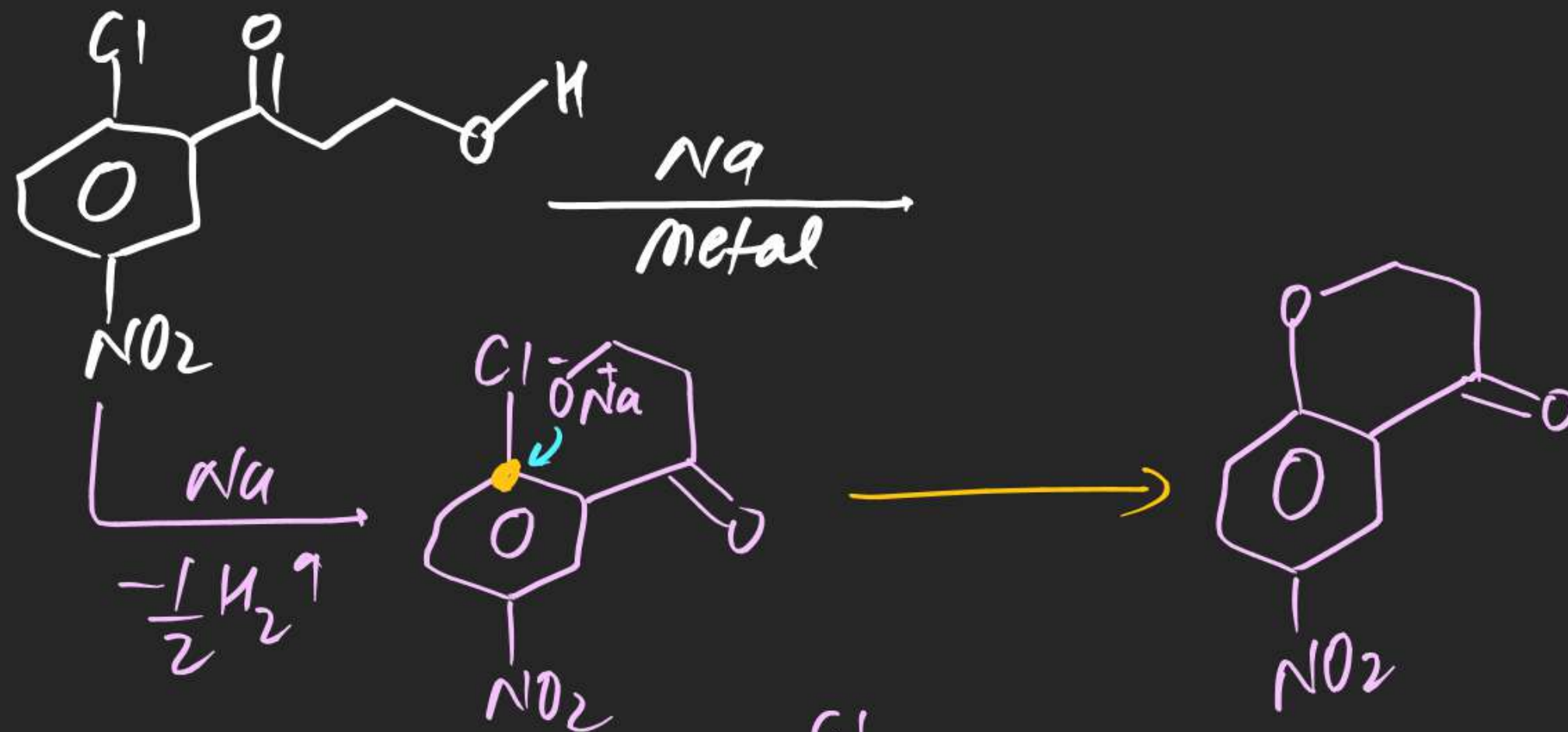
Red when 3 NO₂
purple — 2 NO₂
yellow — 1 NO₂



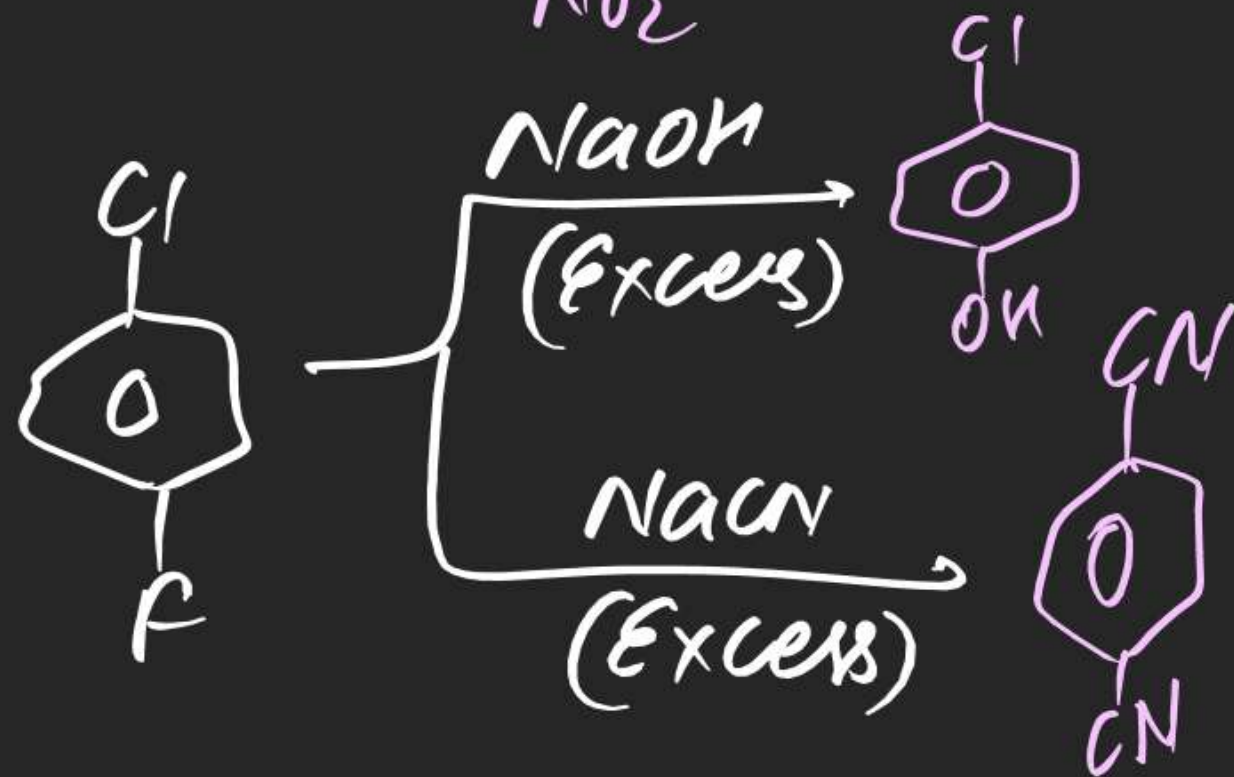
γ₄ > γ₅ > γ₆ > γ₇ > γ₈ > γ₉ > γ₁₀



(14)



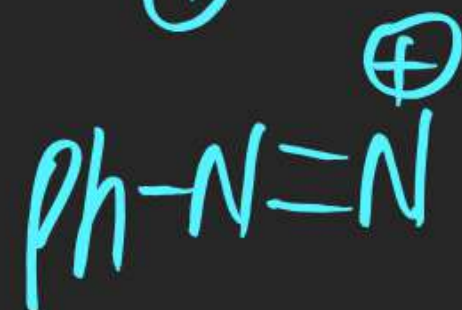
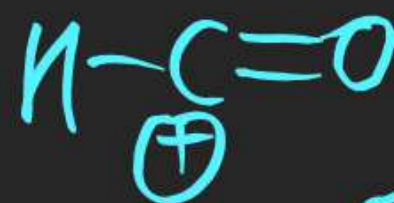
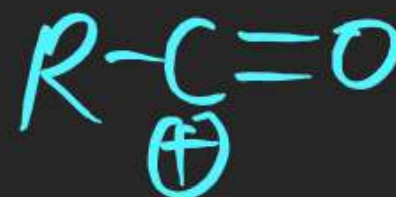
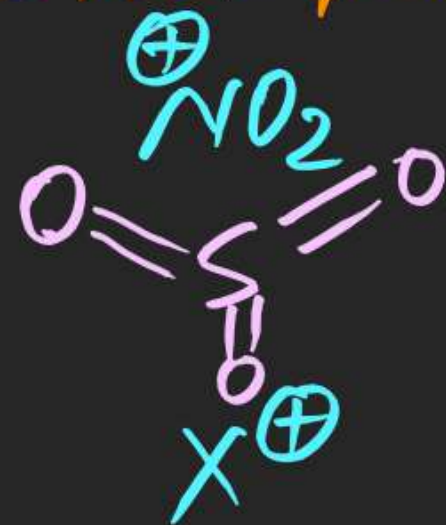
(15)



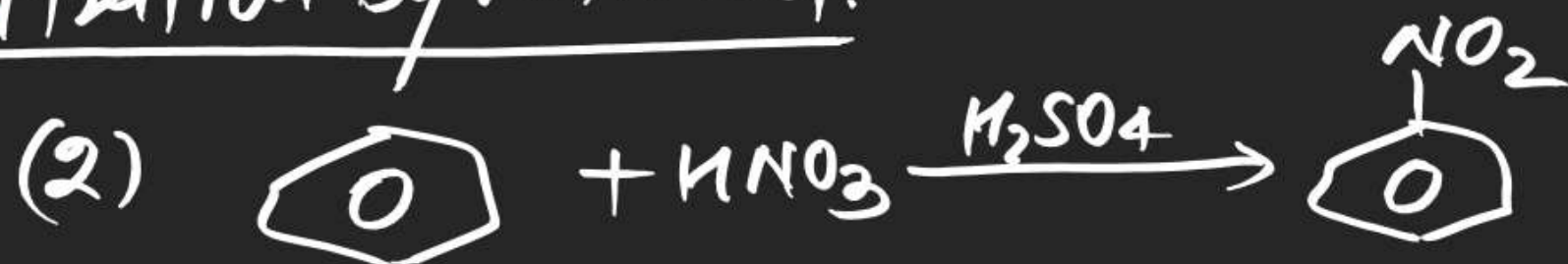
(#) Application of EAS:

- (i) Nitration of Benzene
- (ii) Sulphonation of Benzene
- (iii) Halogenation of Benzene
- (iv) Alkylation of Benzene
- (v) Acylation of Benzene
- (vi) Formylation of Benzene
- (vii) Coupling RX^n

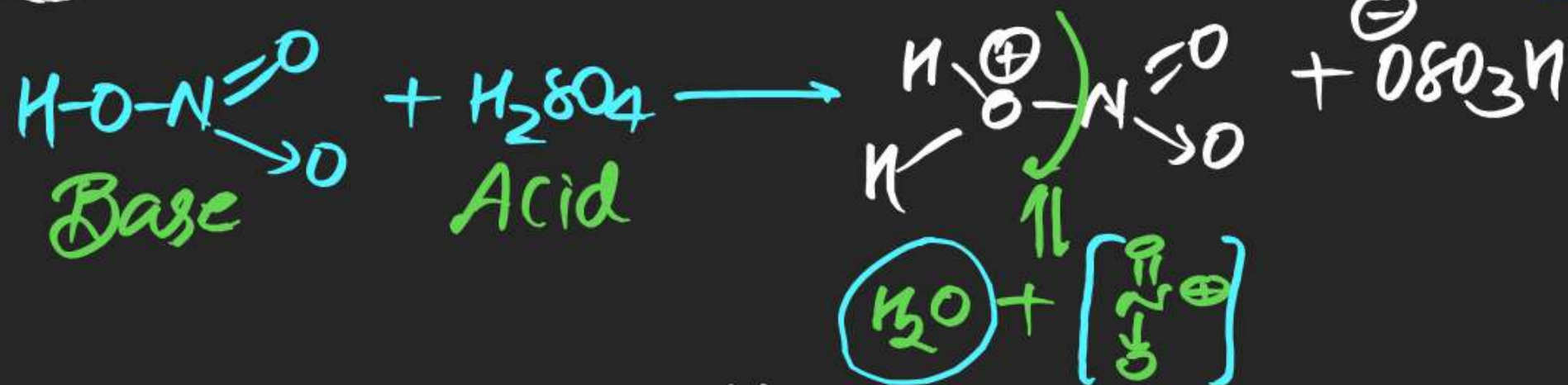
Electrophile (E^+)



Nitration By mix Acid:



mechⁿ



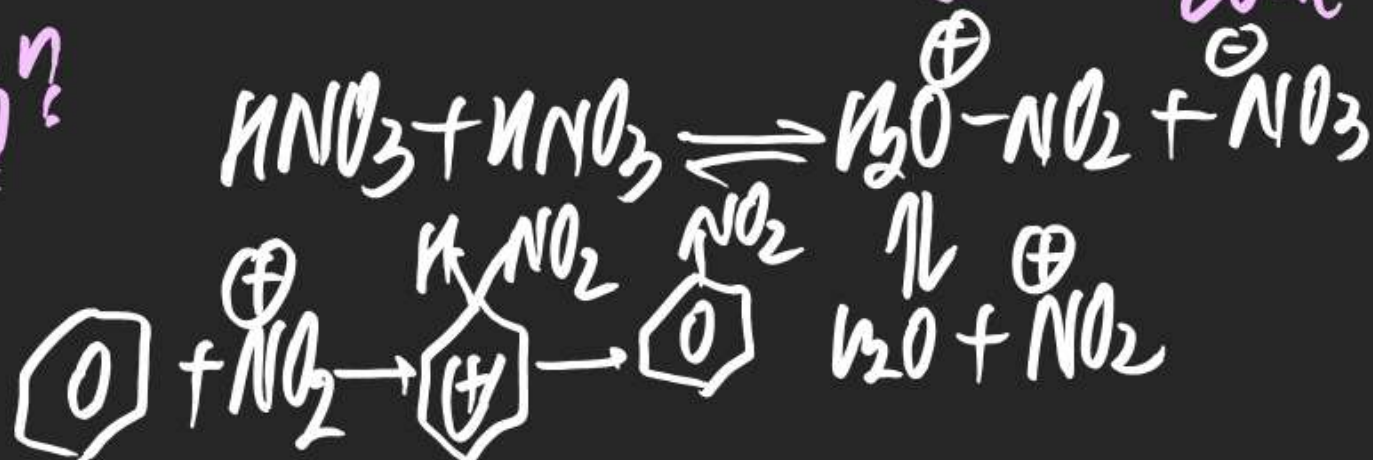
Note:- (i) HNO_3 behaves like a Base during nitration of Benzene by Nitrating mixture.

(ii) H_2SO_4 is used in generation of NO_2^+ & it consumes H_2O present in Rxⁿ.

Nitration By Conc. HNO_3 :



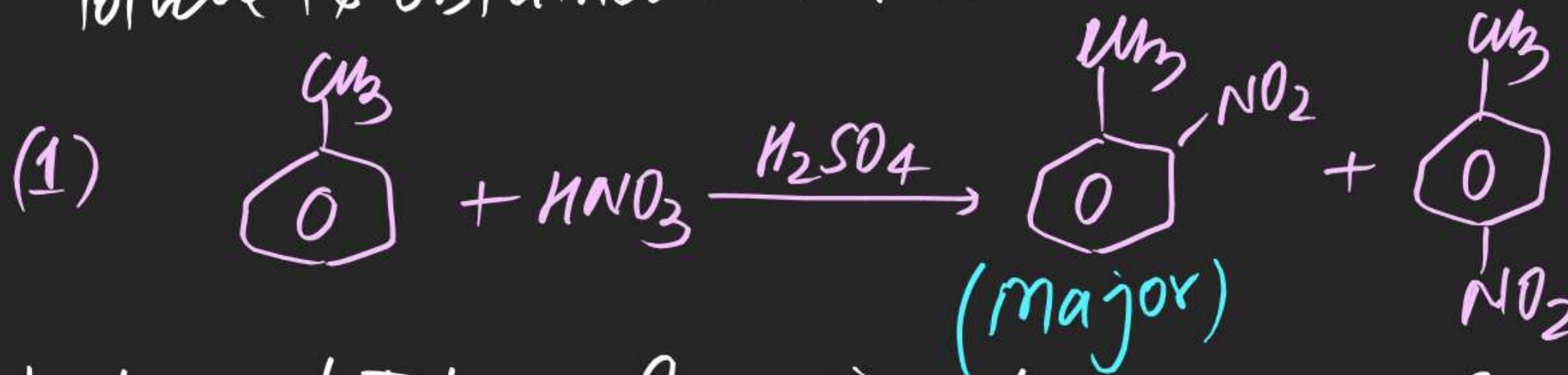
mechⁿ



Note

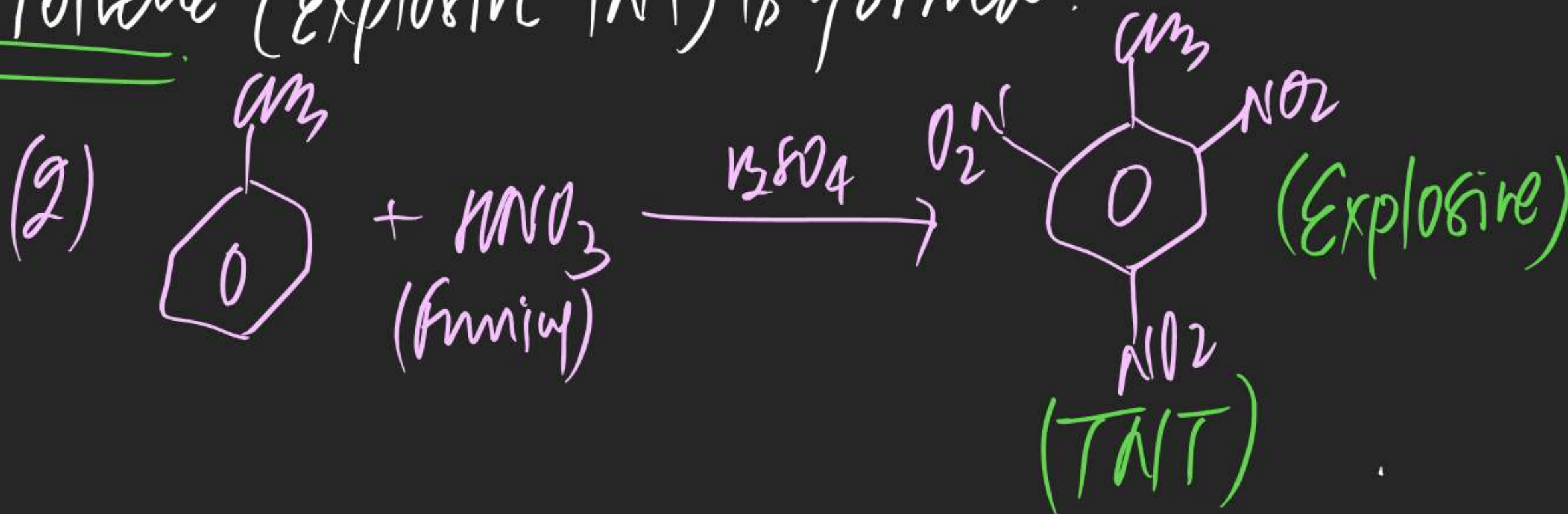
(i) On nitration of Toluene, O-nitro Toluene
Toluene is obtained as a product.

& p-nitro

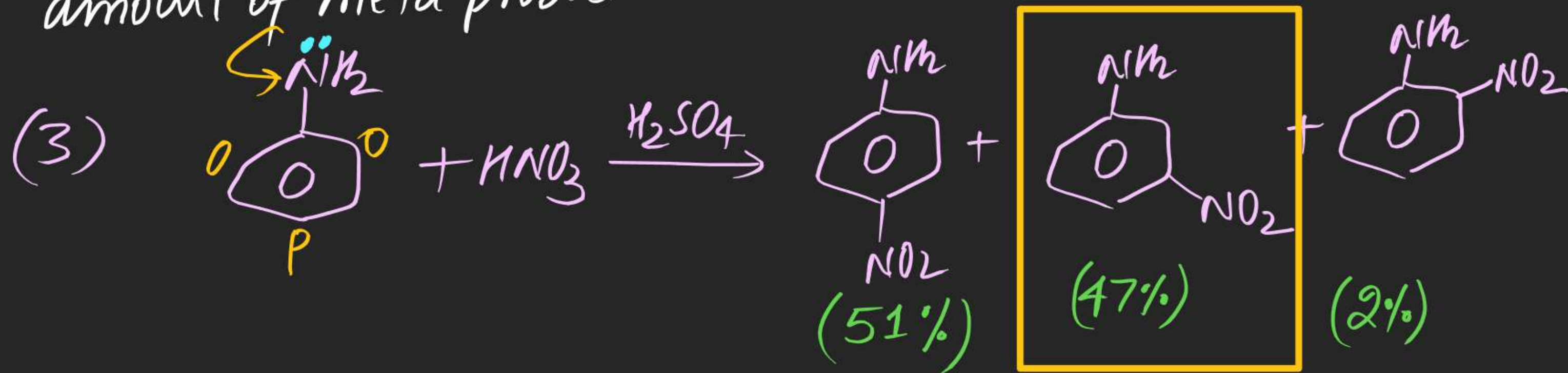


(ii)

On nitration of Toluene By using fuming HNO_3 & H_2SO_4 , 2,4,6-Trinitro Toluene (Explosive TNT) is formed.



(#) Nitration of Activated Aromatic Compound gives appreciable amount of meta product.



⇒ Formation of 47% meta product can be explained as shown.

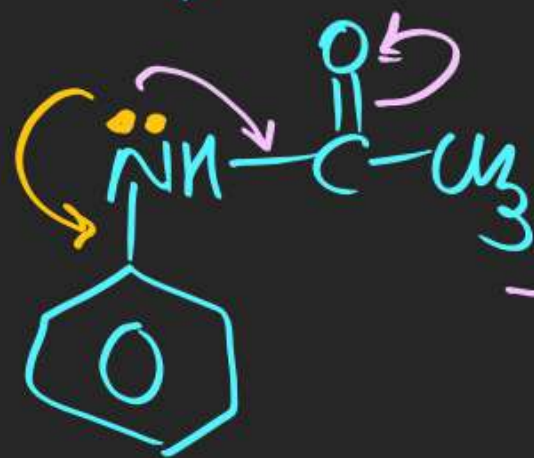


~~(#)~~ Direct nitration of highly Activated Compound is not carried out following procedure is used.

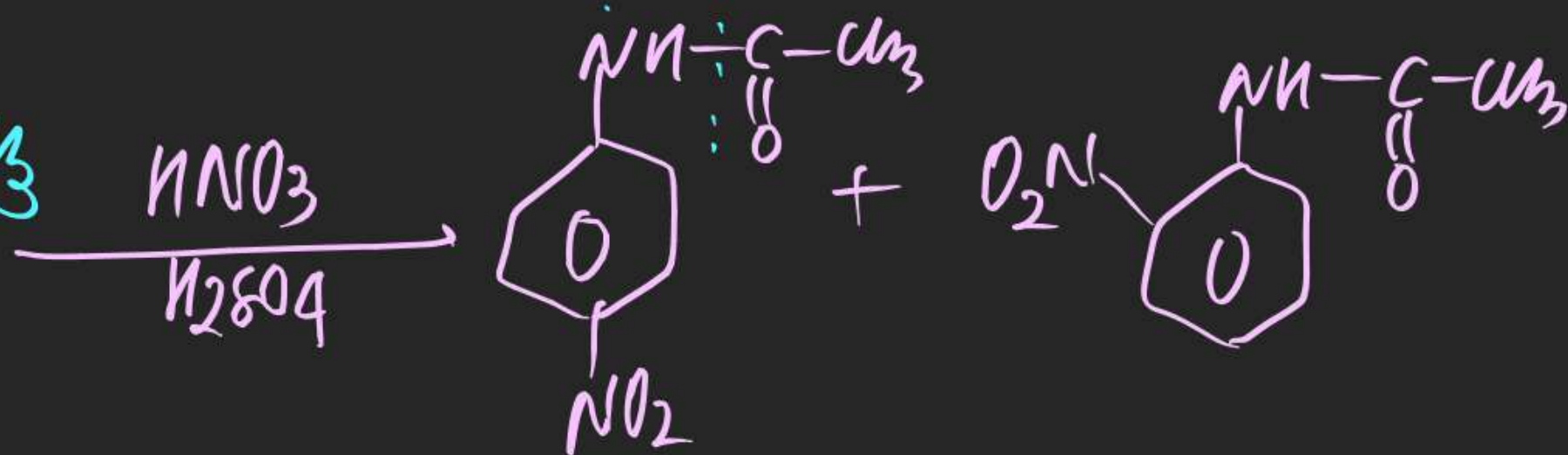
(To avoid m-product) (4)



H_3O^+ or $Ag \cdot HCl$



Acetanilide
mod. Activating (O & P)



(#) Sulphonation of Benzene:

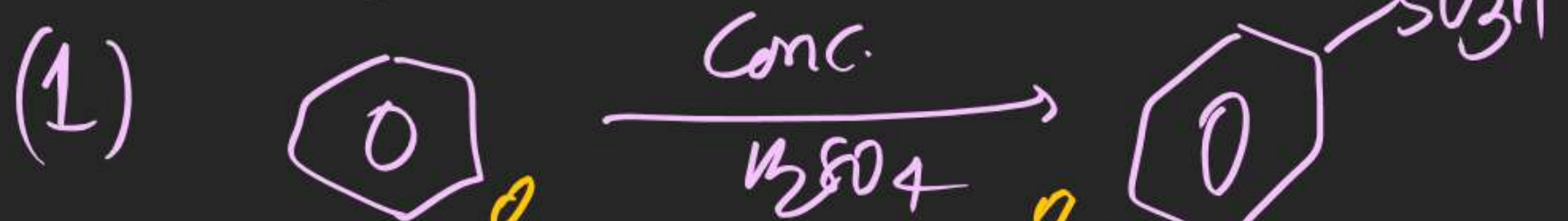
⇒ on sulphonation of Benzene, Benzene Sulphonic Acid is obtained as a product.



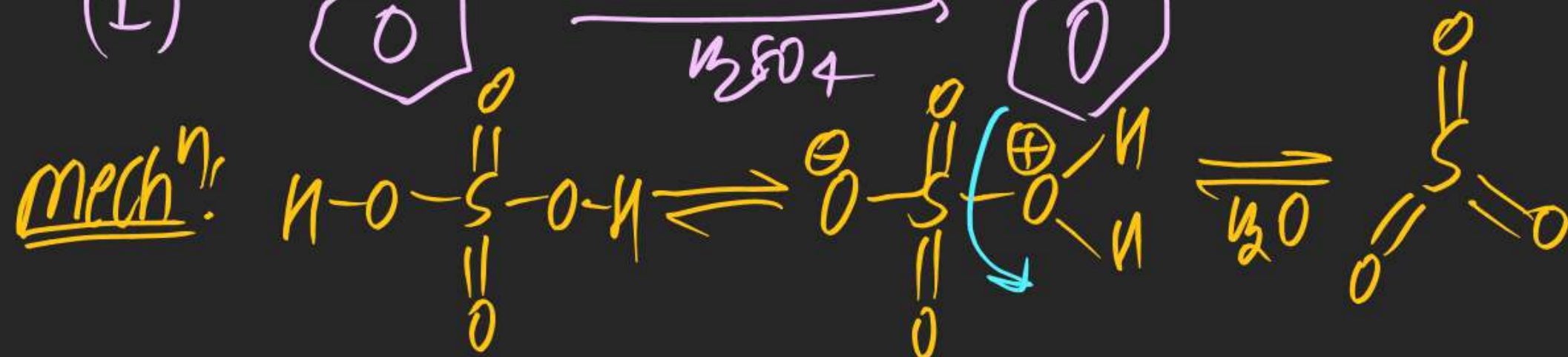
p may be

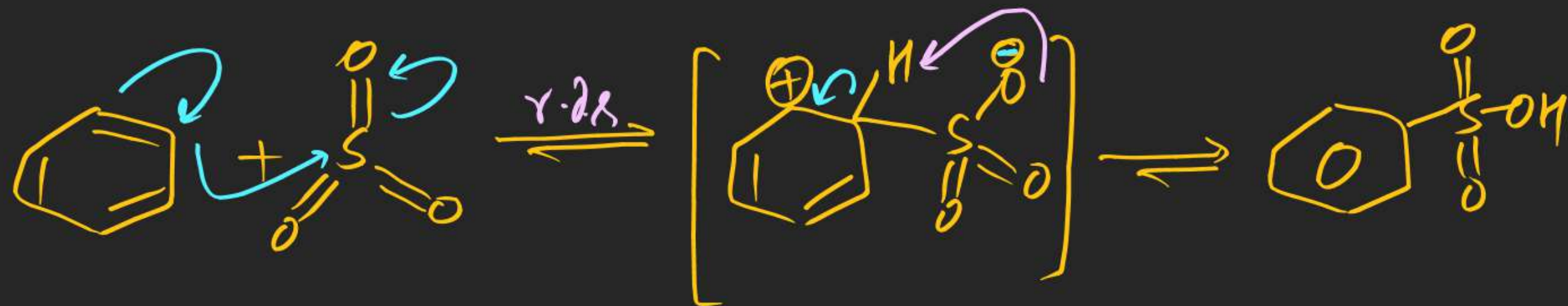
(a) Conc. H_2SO_4

(b) Oleum ($\text{H}_2\text{S}_2\text{O}_7$) ($\text{H}_2\text{SO}_4 + \text{SO}_3$)



mechⁿ:





Note

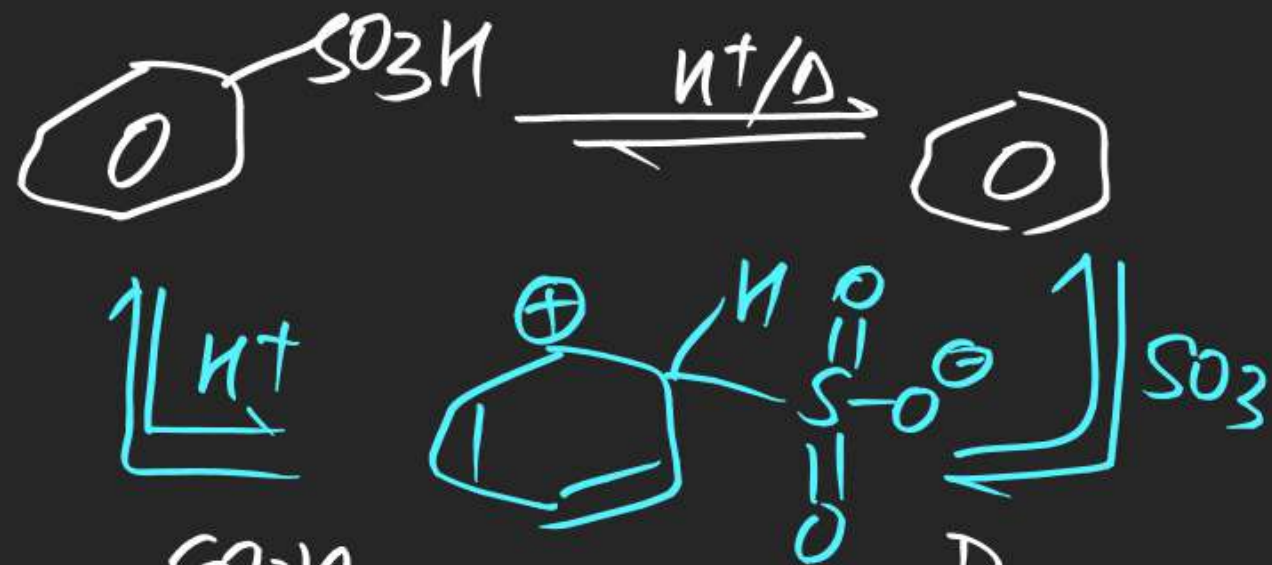
- (i) SO_3 attacking electrophile
- (ii) Reversible R_N^+
- (iii) Kinetic isotopic effect observed



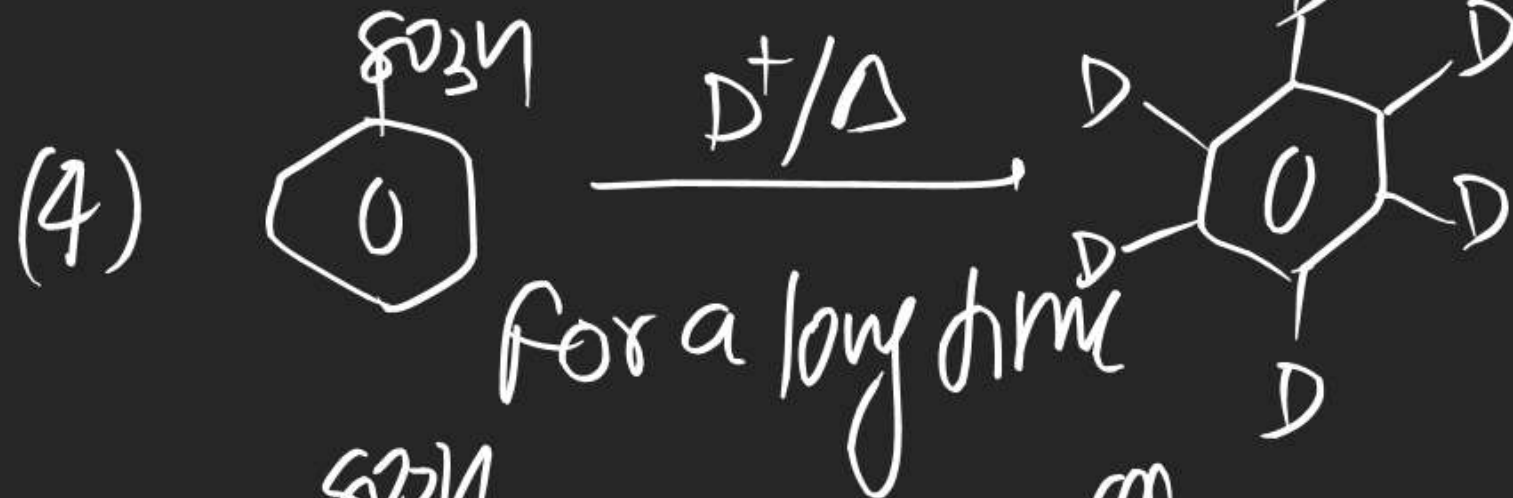
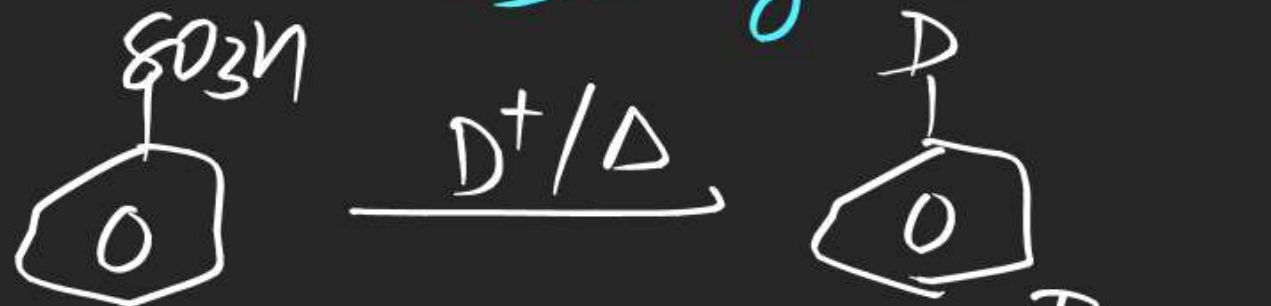
(iv) No chance of polysulphonation because product is less electron dense than reactant.

(v) Desulphonation can also be carried out.

(2)
Imp



(3)
Imp



(5)

SN
Rxn



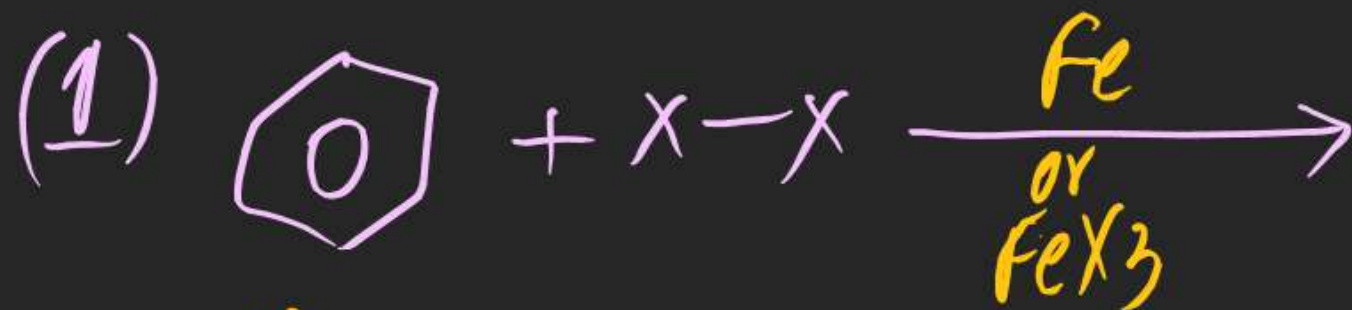
(#) Halogenation of Benzene!

⇒ Benzene on halogenation gives halo Benzene as a Product.



P may be

- (a) X_2 / Lewis Acid
- (b) $\text{X}-\text{X}'$ / Lewis Acid
- (c) $\text{O}=\text{C}_6\text{H}_4\text{X}_2$



Mechⁿ:



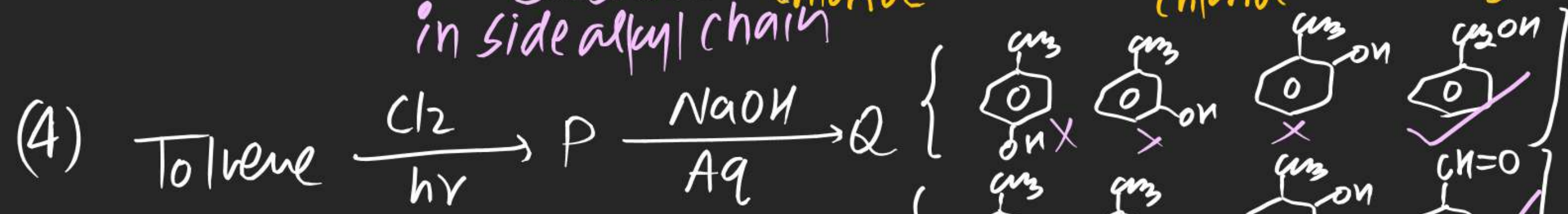
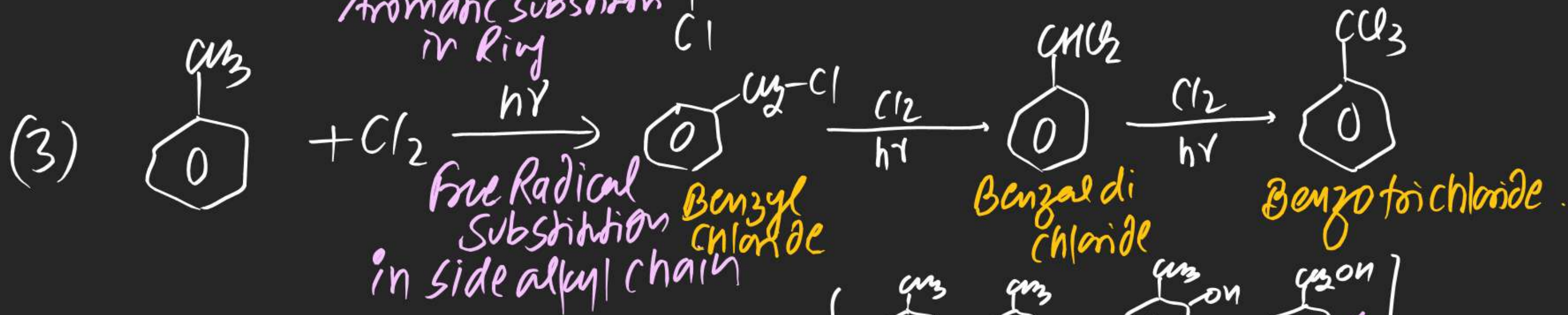
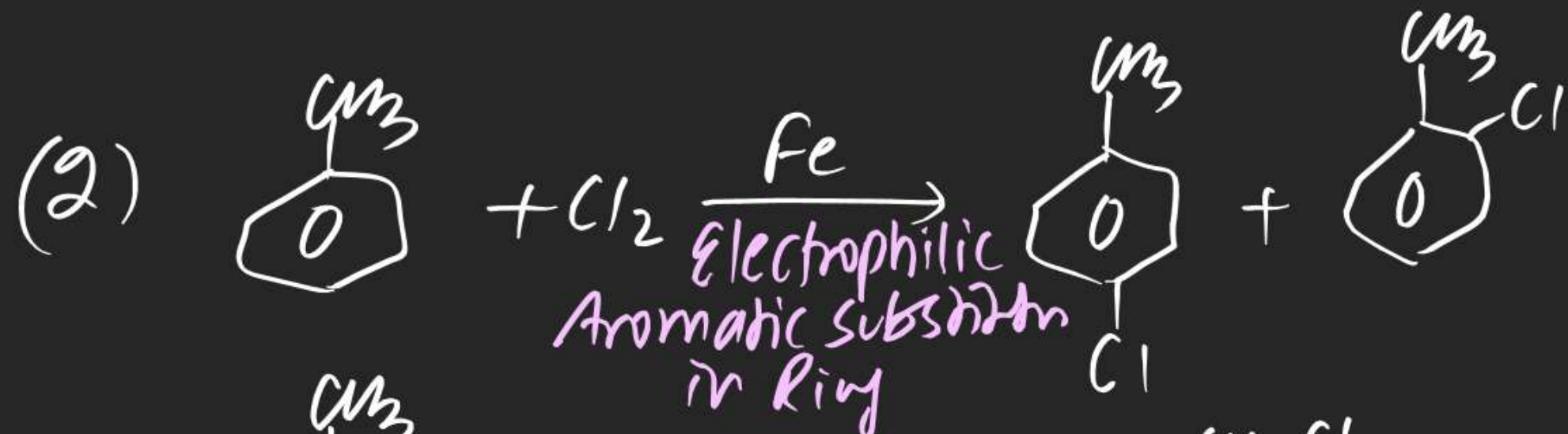


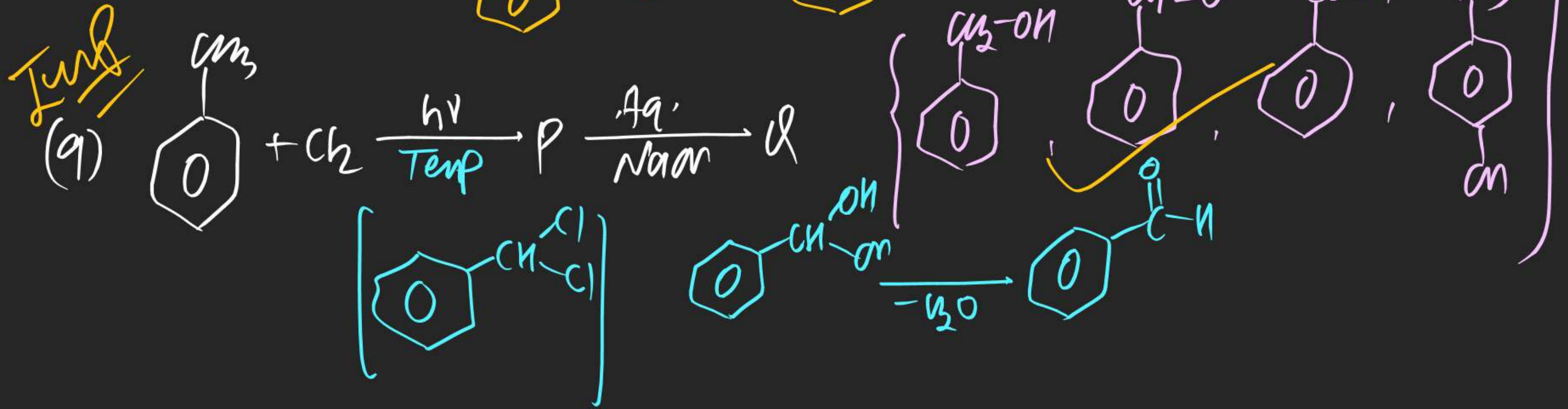
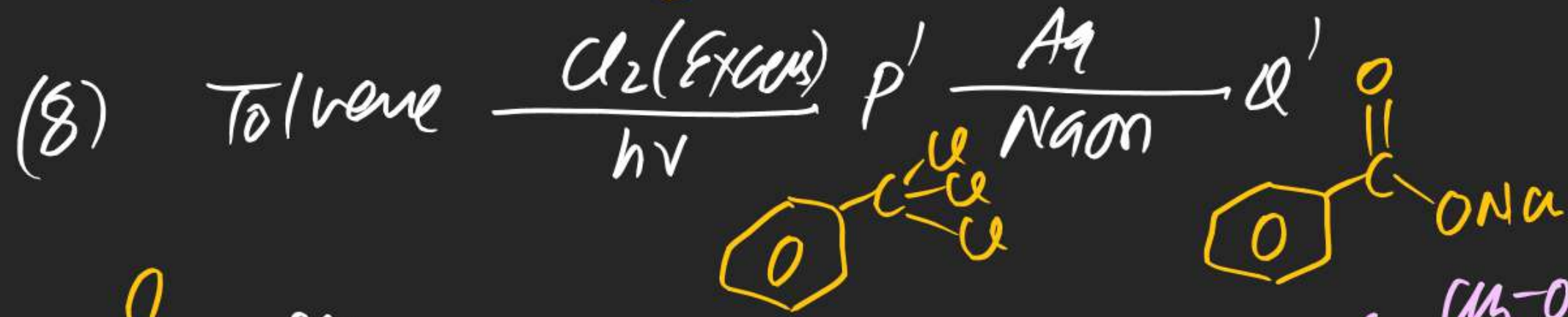
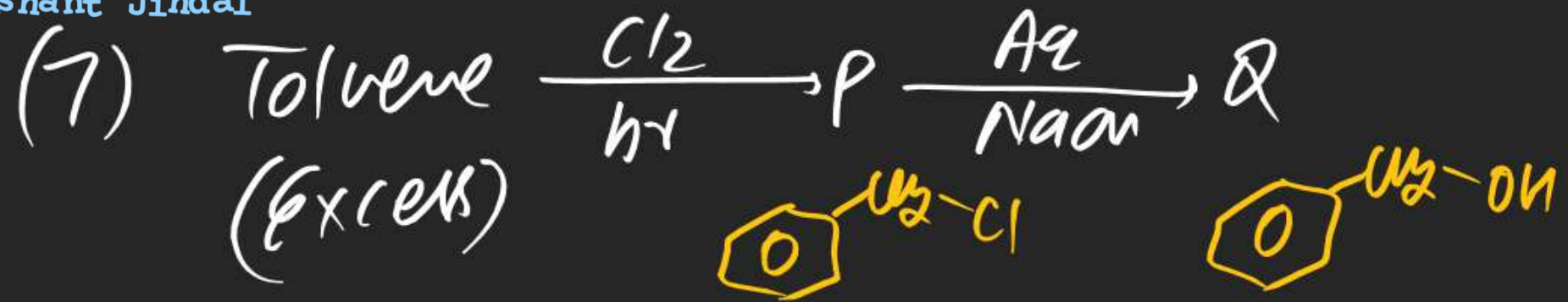
Note (i) attacking electrophile is X^+

(ii) No chance of polyhalogenation, because product is less electron dense than reactant.

(iii) Lewis Acid used is known as halogen carrier.

(iv) No halogen carrier is required in case of Activated Aromatic Compound.

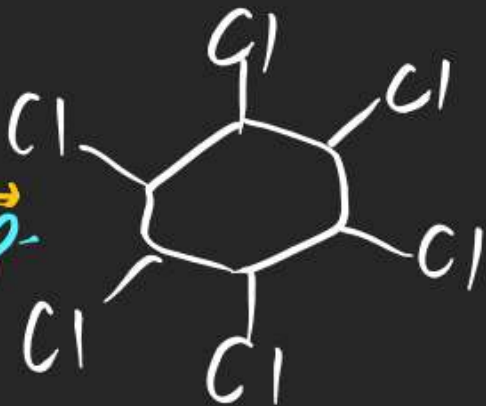






+ Cl₂
(Excess)

$h\nu$
high Temp.



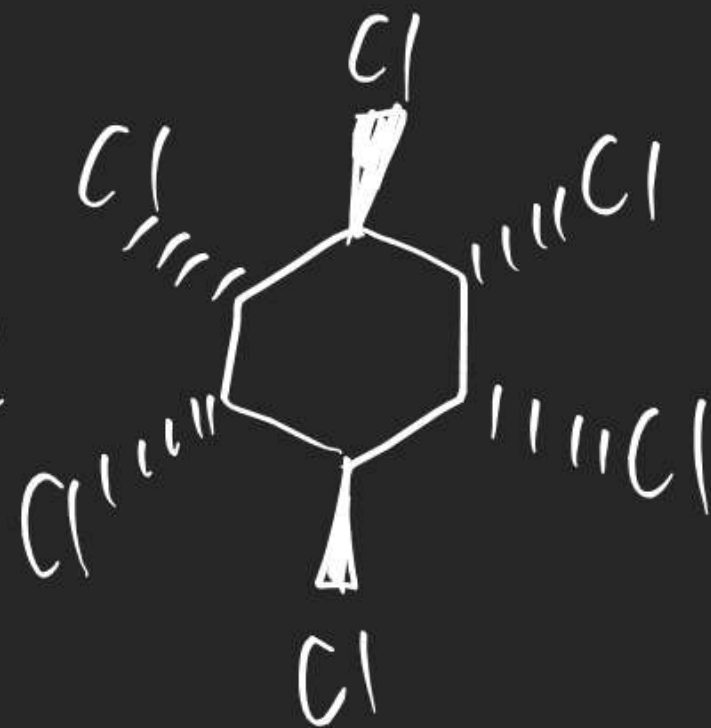
(Free Radical addⁿ)

(*) Benzene Hexa chloride

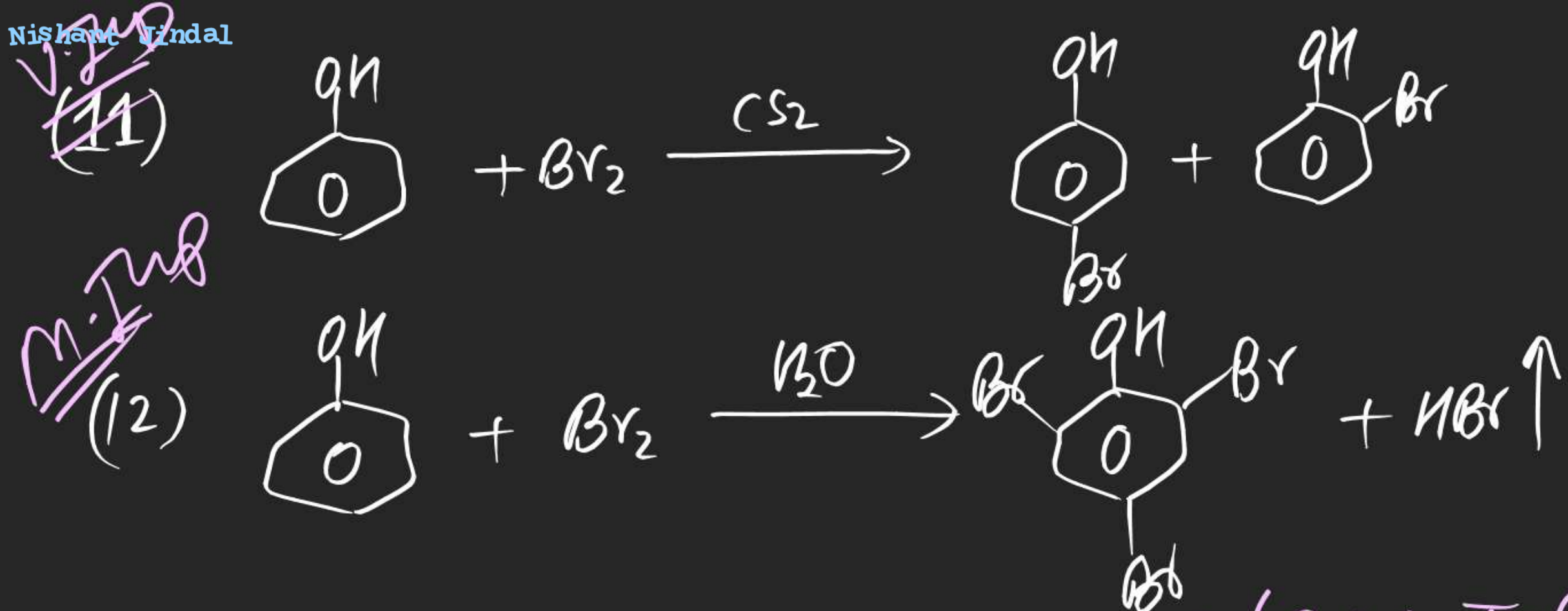
(*) BHC/666/lindane

(*) mol. Formula (C₆H₆Cl₆)

its γ-isomer is Gammaexene

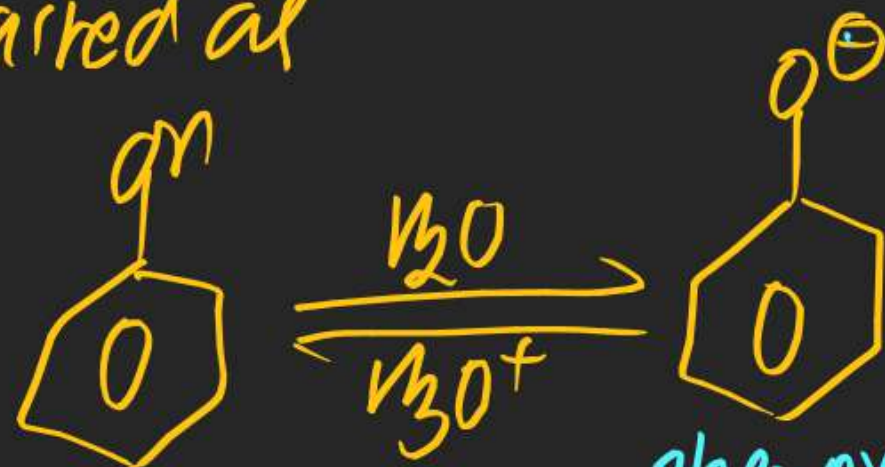


(Insecticide)



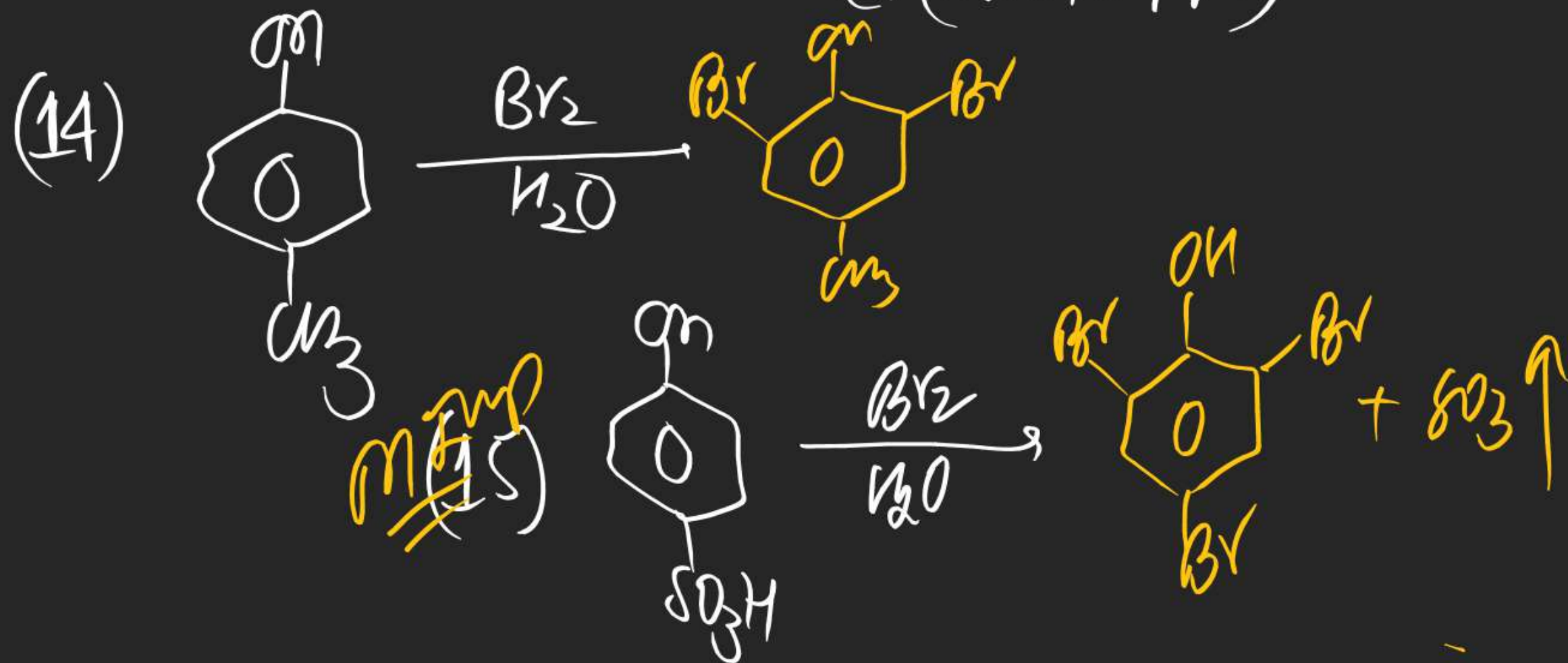
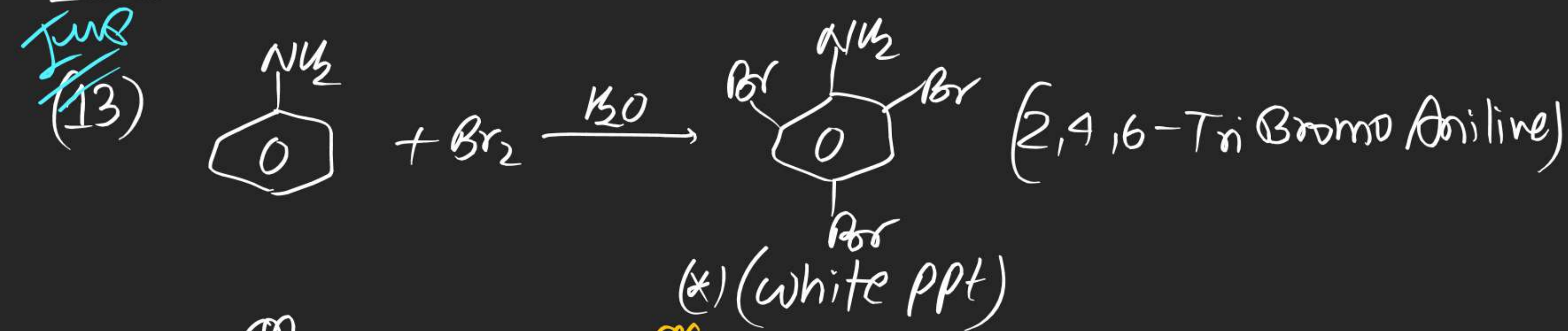
white ppt (2,4,6-Tri Bromo Phenol)

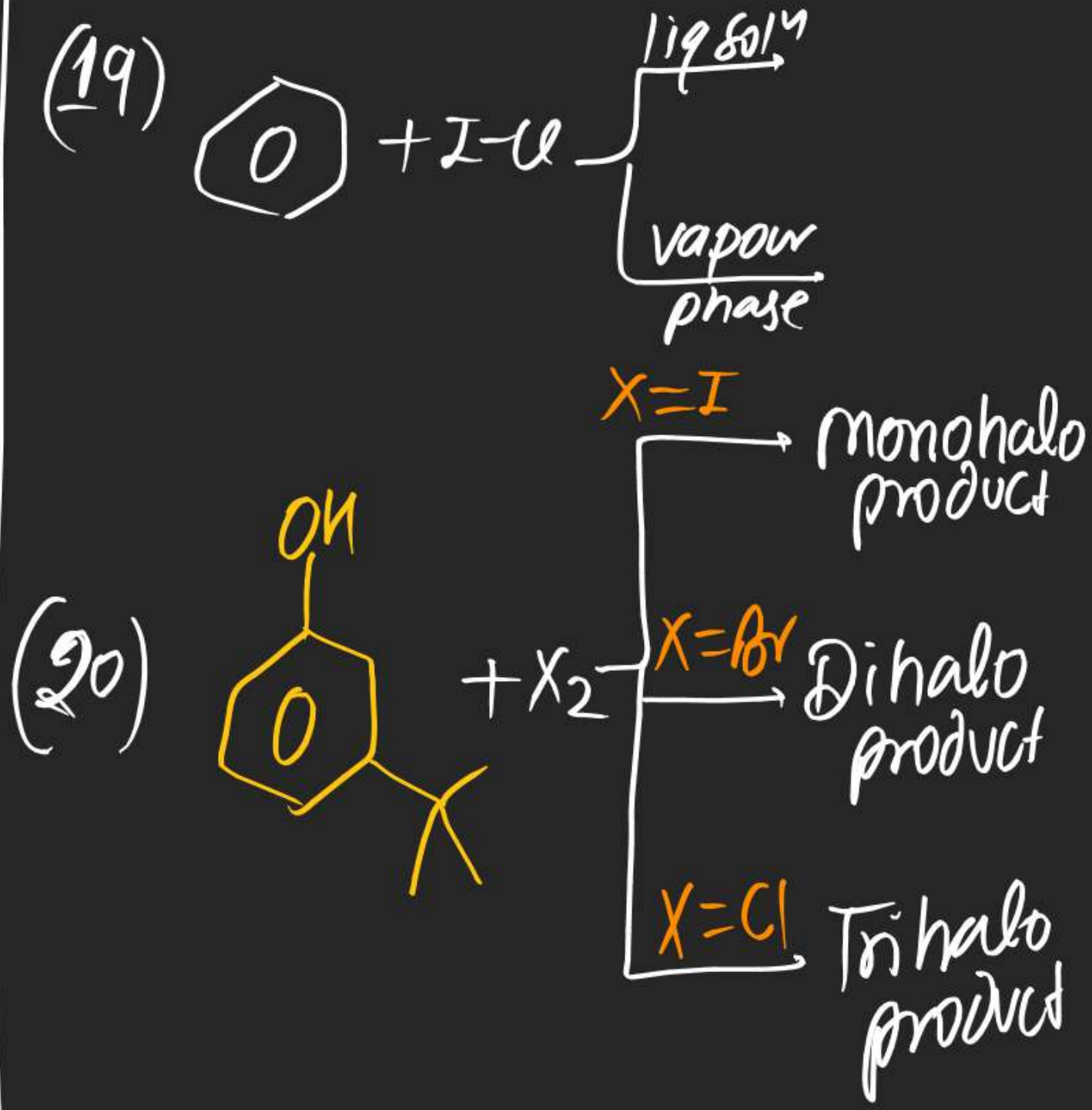
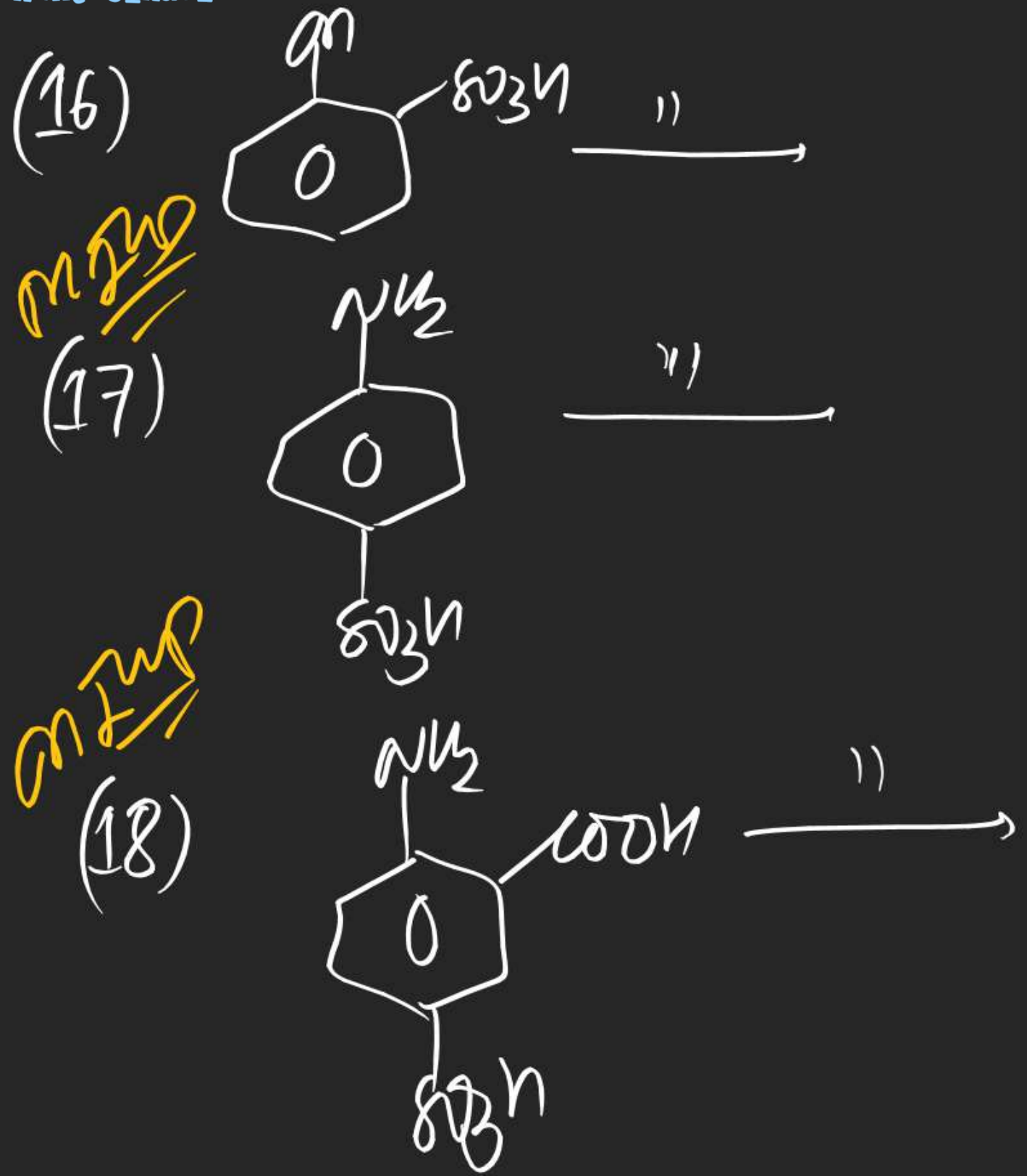
It can be explained as



phenoxide ion
(highly Activated) hence poly halogenation takes place

Note Rxⁿ of Ph-OH & Br₂/H₂O is used in POC as a Test of Phenol.





(#) Alkylation of Benzene (F. Craft Rxn):