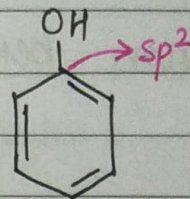


Handwritten Notes
On
Phenol



PHENOLS

• Aromatic Hydroxy compounds.

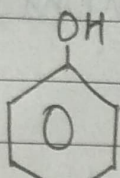


→ Classification

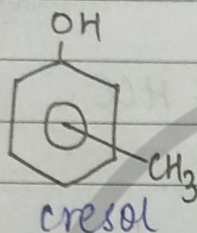
Monohydric

Dihydric

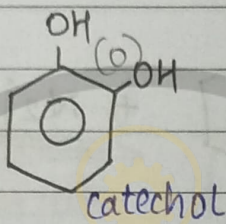
Trihydric



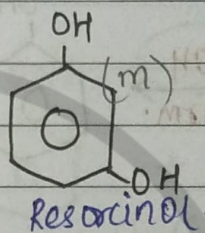
phenol / carbolic acid



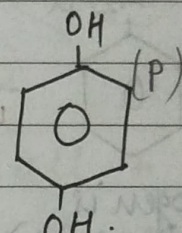
cresol



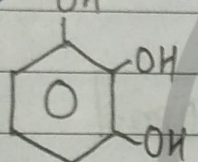
catechol



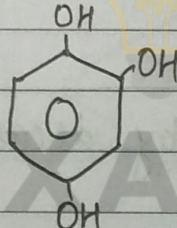
Resorcinol



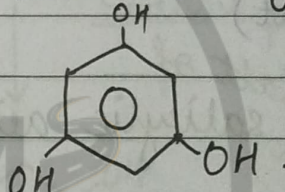
quinol.



pyrogallol



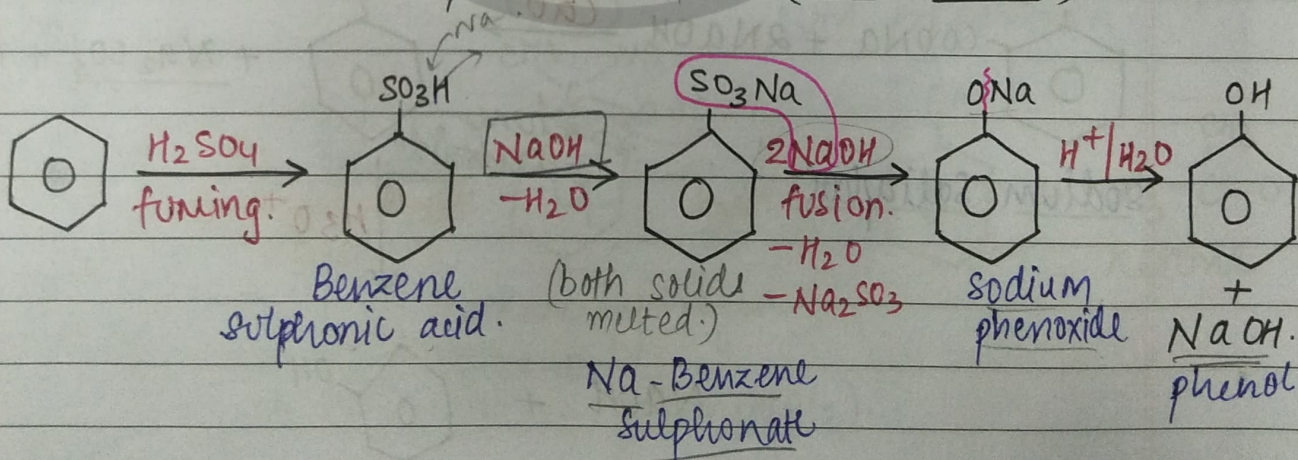
hydroxyquinol



phloroglucinol.

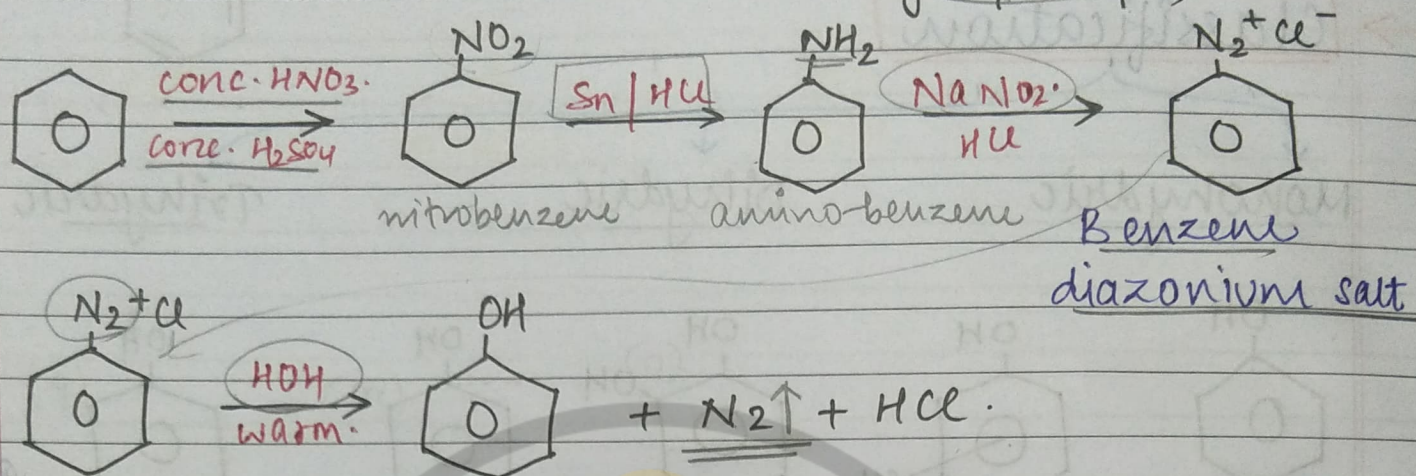
→ Methods Of Preparation

① From Benzene sulphonic acid (Lab method)



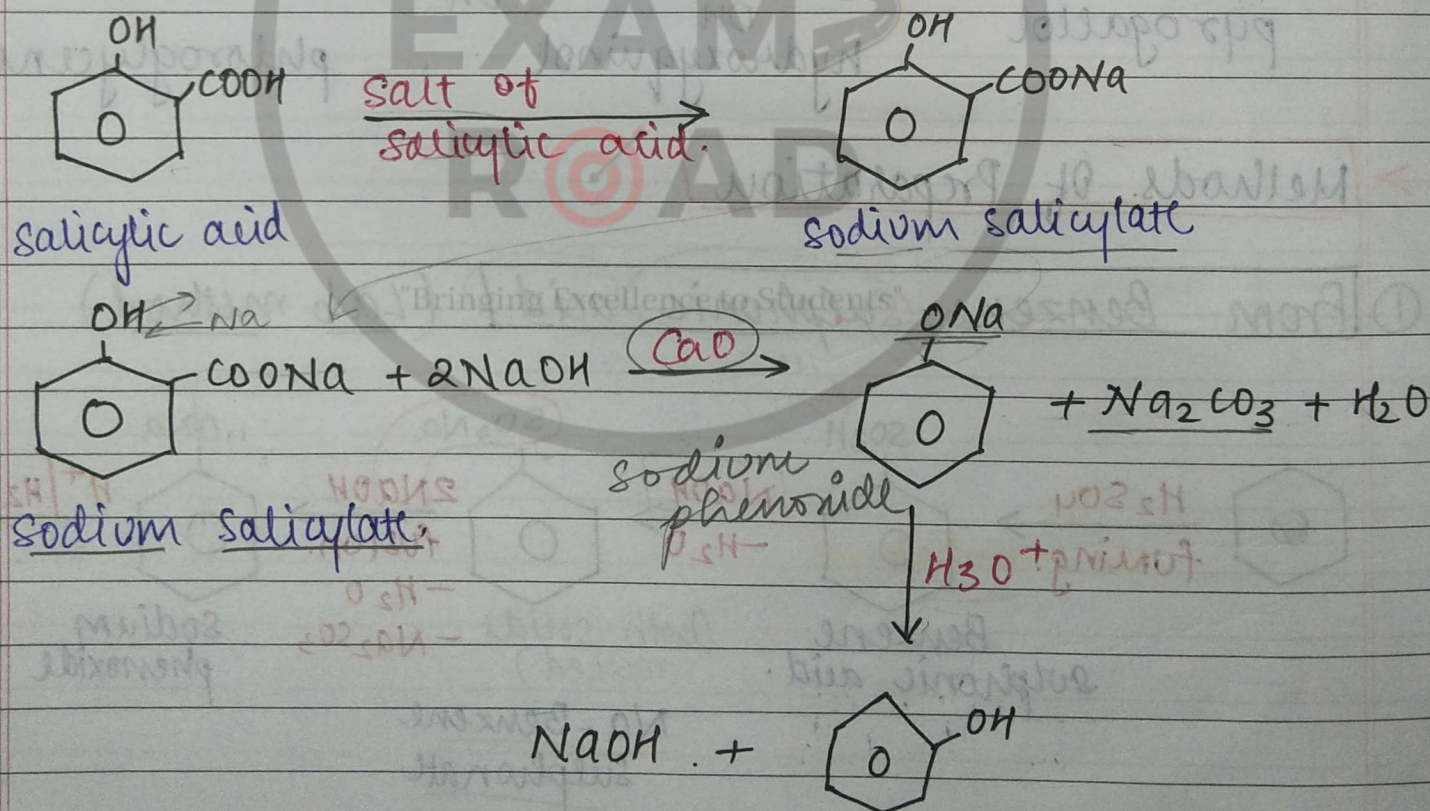
- All reactions are isolated, i.e., they happen in 4 distinct steps.

② From benzene diazonium chloride (by hydrolysis)



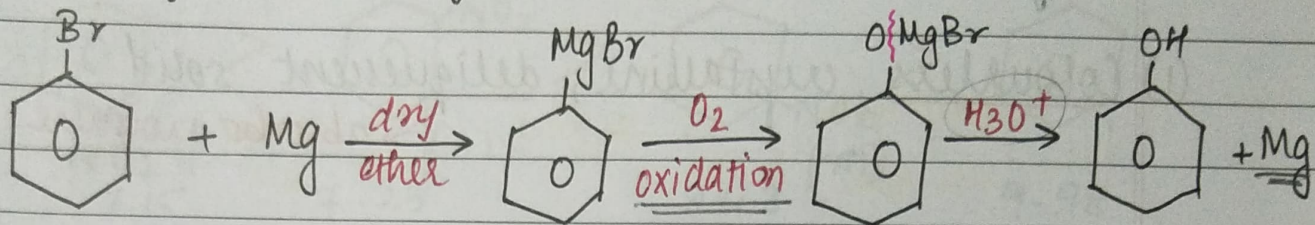
(nitrogen is easily lost)

③ From ^{salt of} salicylic acid by decarboxylation.

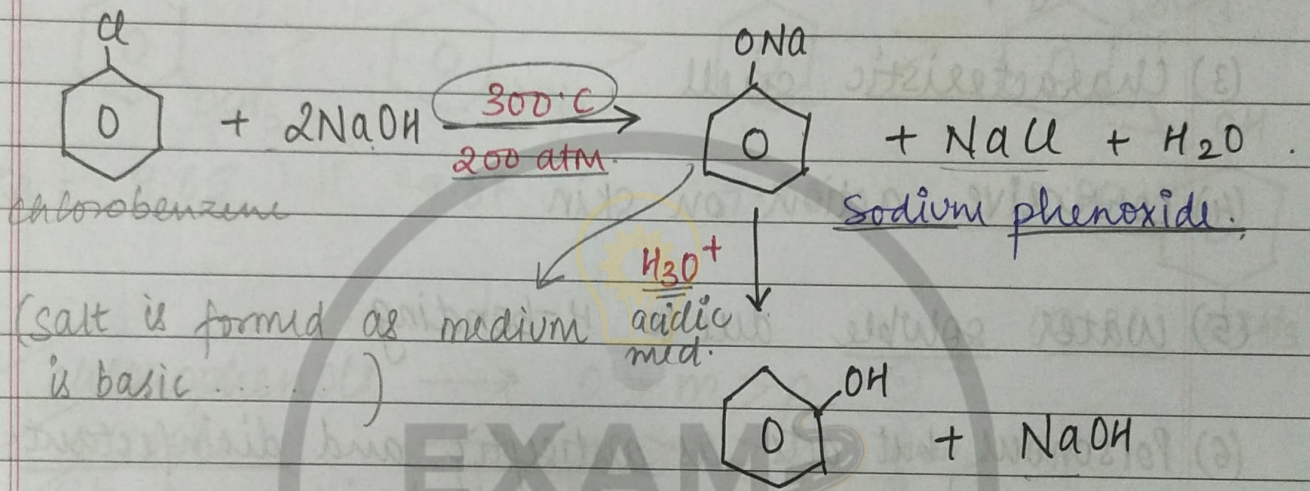


Here, phenol is not formed directly. as medium is basic and phenol is acidic, thus a salt is formed.

④ By Grignard's Reagent

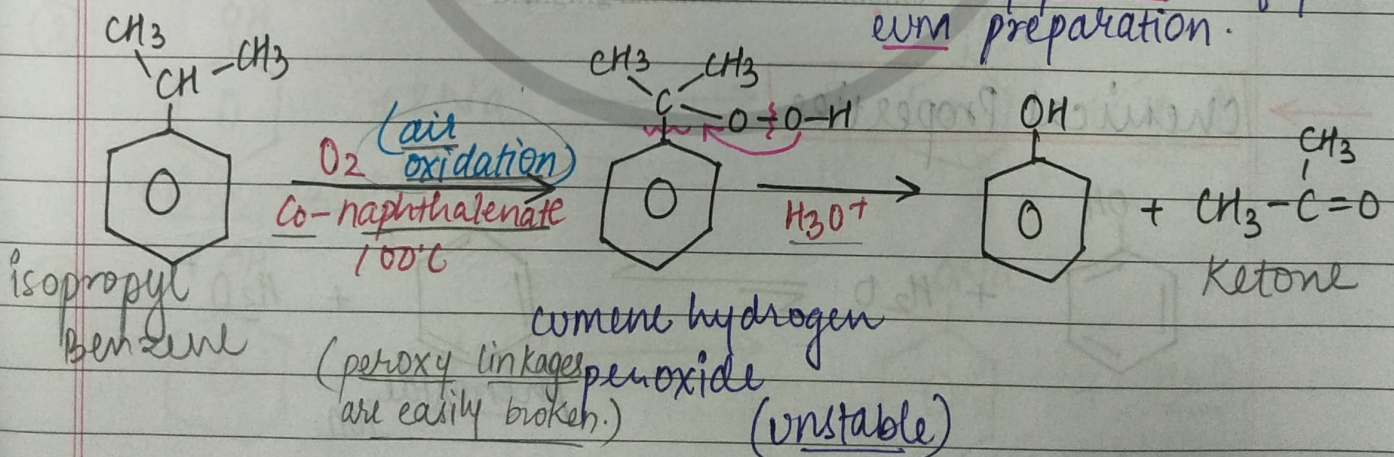


* ⑤ Dow's Process

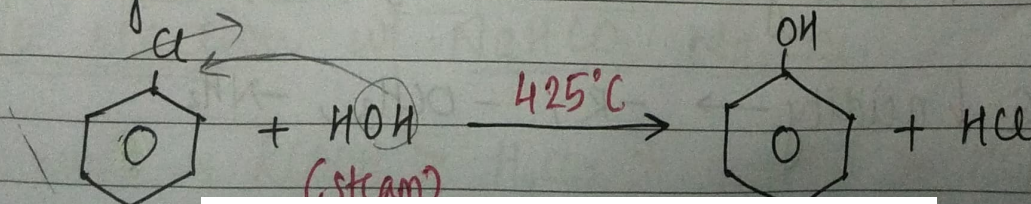


⑥ From Cumene

— Commercial Method — cumene is ^{an} easily available by-product of petroleum preparation.

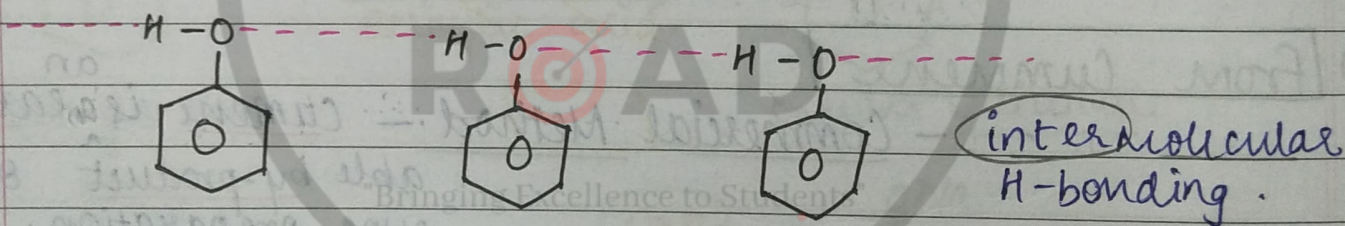


⑦ Raschig's Process

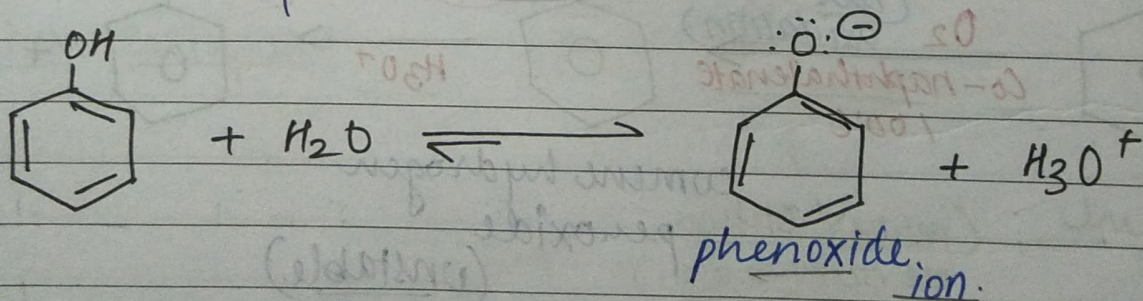


→ Physical Properties

- (1) Colourless, crystalline, deliquescent solid
↳ absorbs moisture
- (2) Melting pt - 42°C
Boiling pt - 182°C
- (3) Characteristic smell
- (4) corrosive action on skin
- (5) Water soluble due to H-bonding.
- (6) Poisonous but acts as antiseptic and disinfectant.



→ Chemical Properties

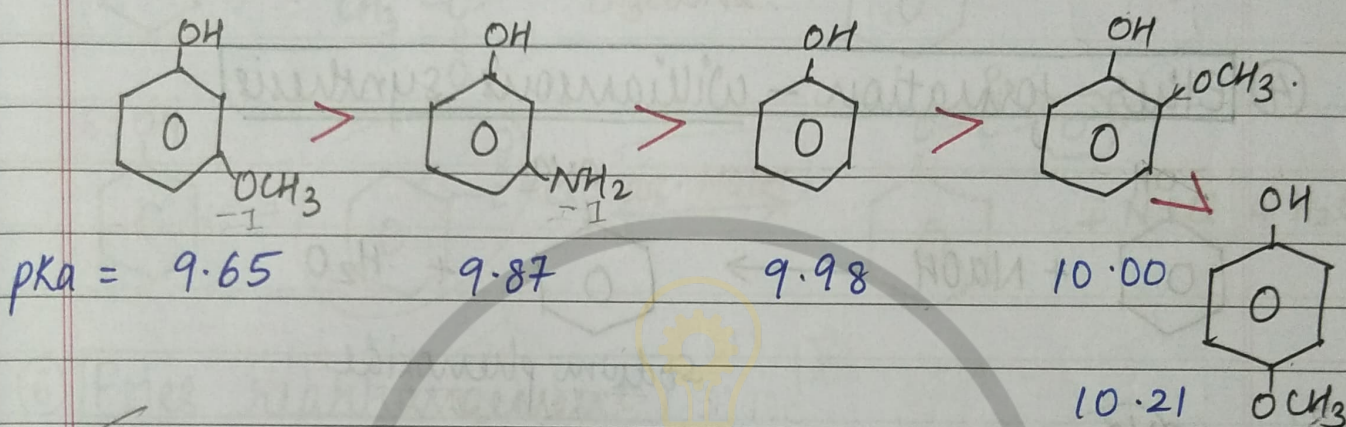
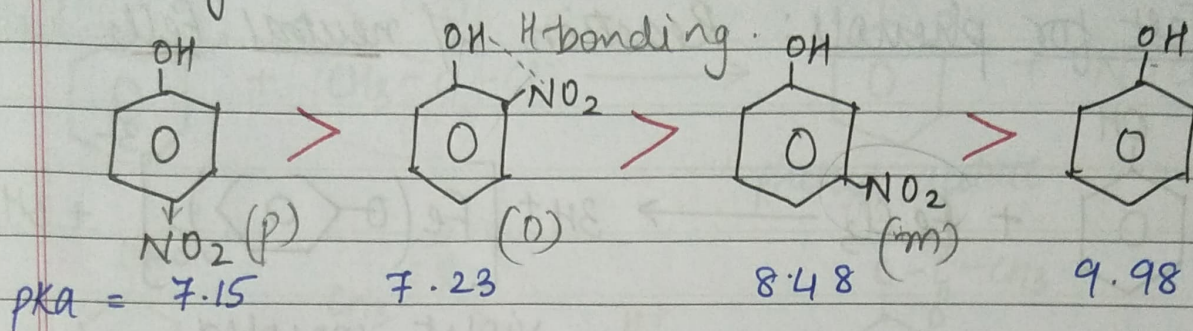


EWG ↑ acidity → $-\text{NO}_2$, $-\text{NR}_3^+$, $-\text{X}$, $-\text{CHO}$, $-\text{COOH}$.

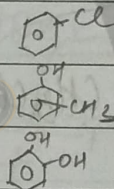
EDG ↓ acidity → $-\text{R}$, $-\text{H}$, $-\text{NH}_2$.



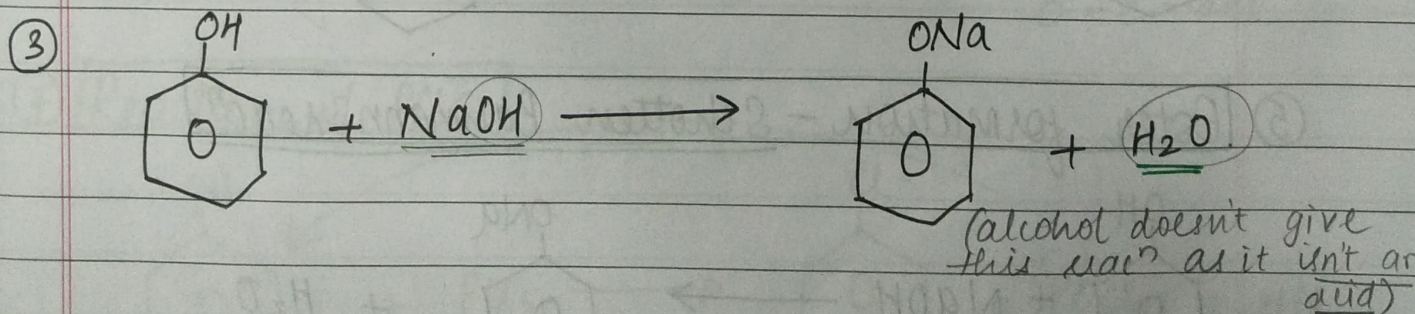
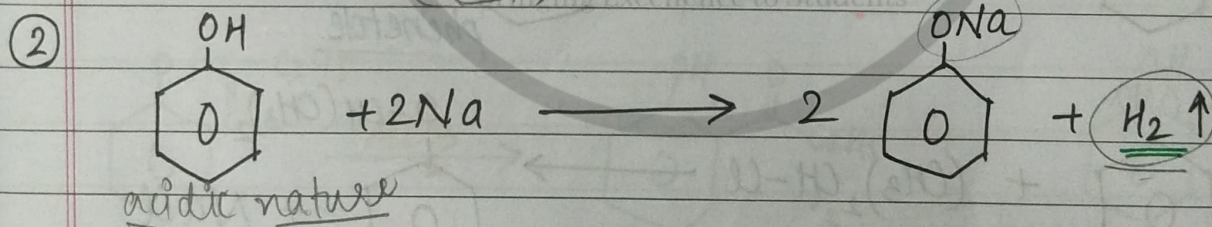
acidity:



- ✓ chlorophenols $\rightarrow o > m > p$
- ✓ cresols $\rightarrow m > p > o$
- ✓ dihydric phenols $\rightarrow m > p > o$



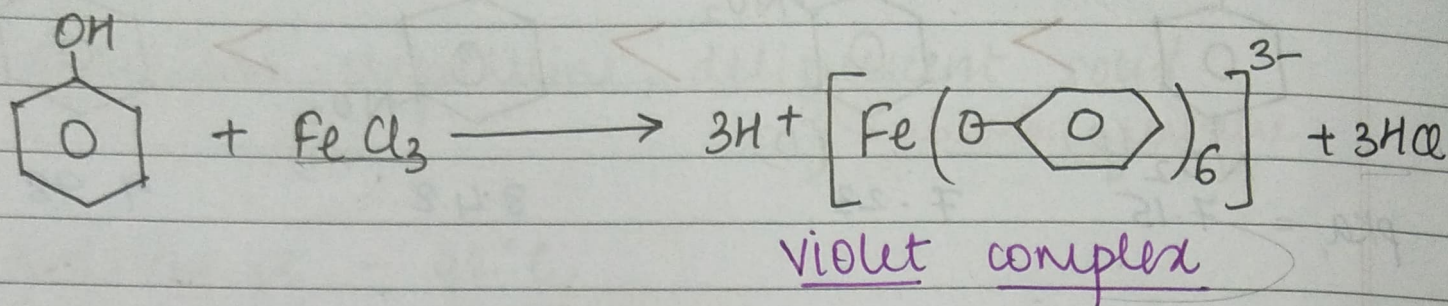
① Blue litmus turns red (alcohols don't give this test)
 (BAR)



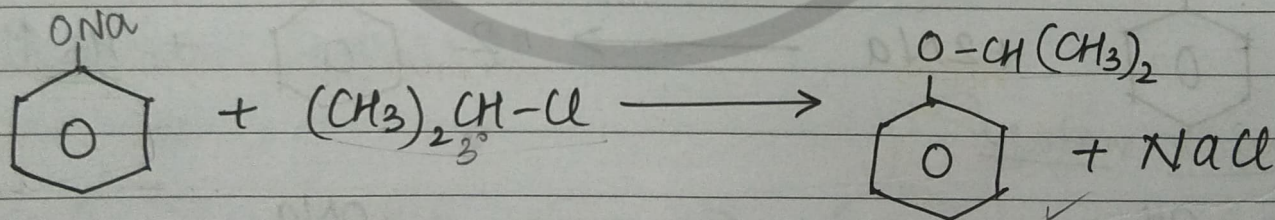
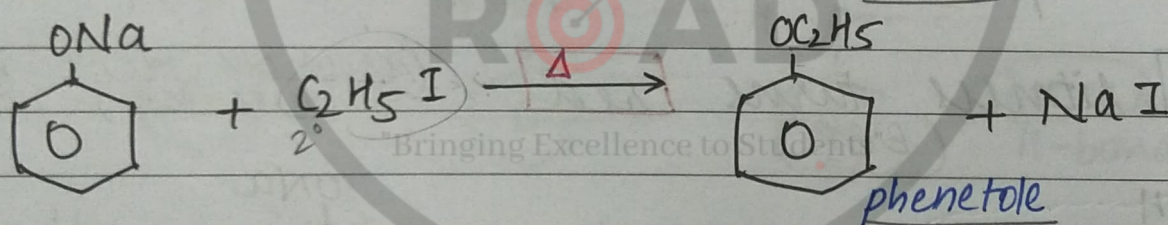
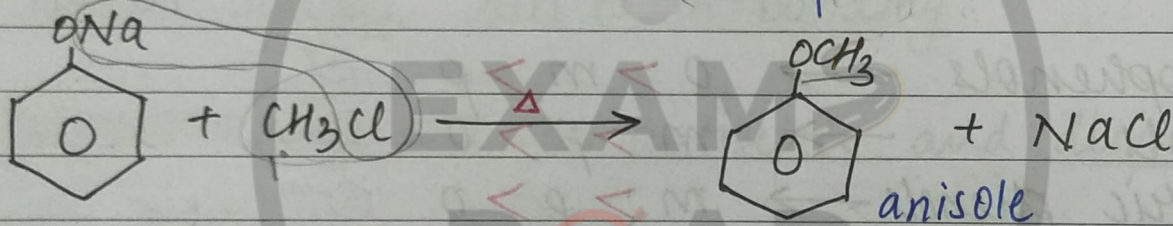
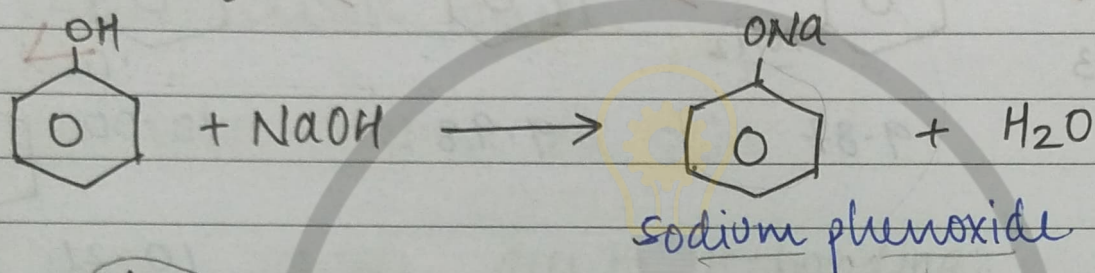
* No reaction w/ NaHCO₃, Na₂CO₃.

acidic nature $\rightarrow \text{RCOOH} > \text{H}_2\text{CO}_3 > \text{C}_6\text{H}_5\text{OH} > \text{HOH} > \text{ROH}$

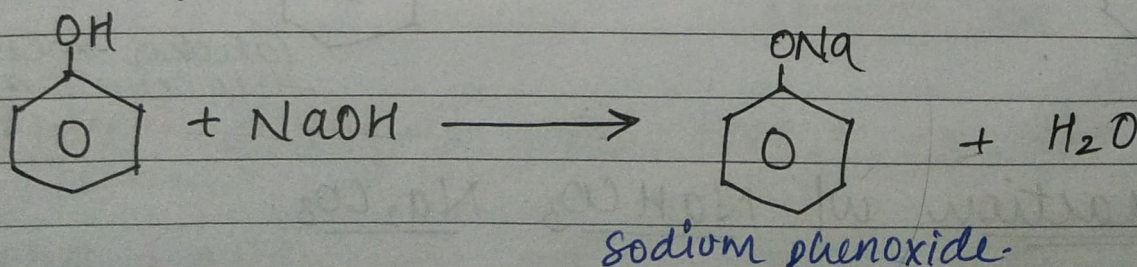
Test for phenols: Reaction w/ neutral FeCl_3 (not acidic)

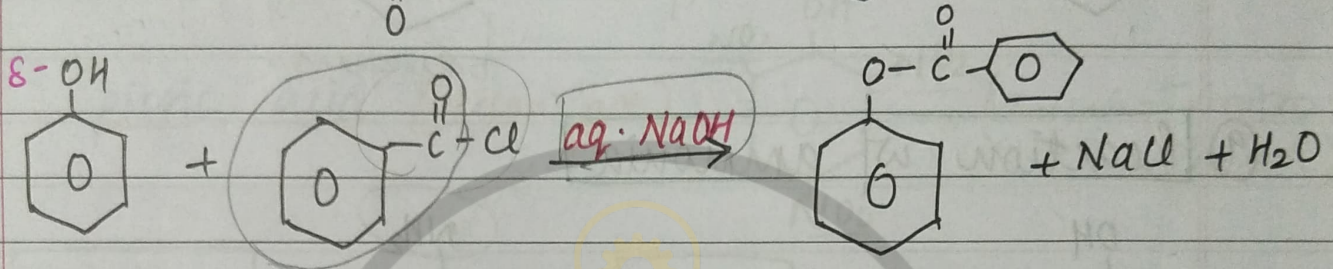
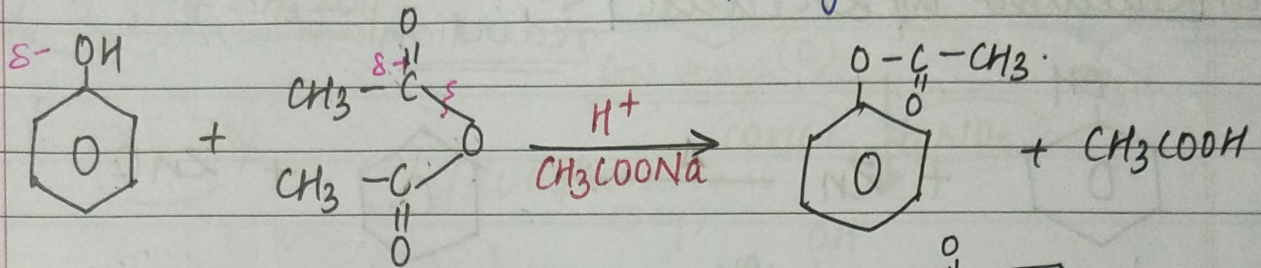
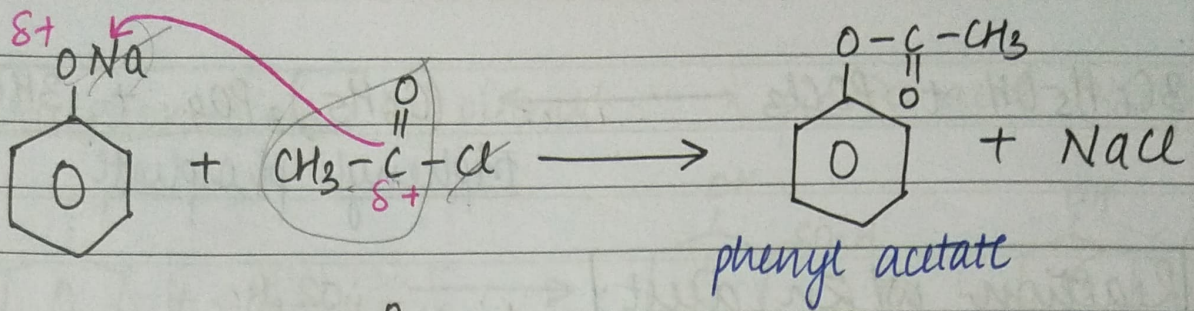


④ Ether formation - Williamson's synthesis



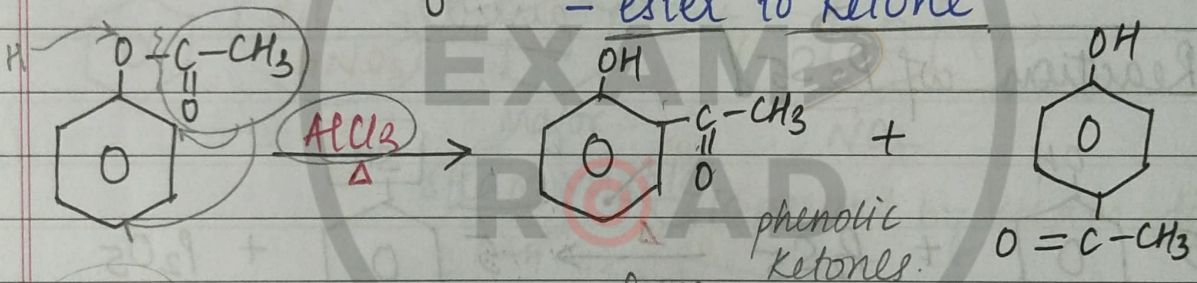
⑤ Ester formation - Schotten Baumann reacⁿ



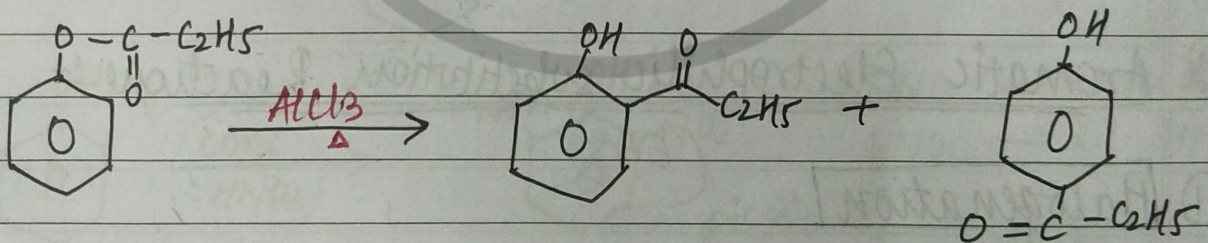


⑥ Fries rearrangement

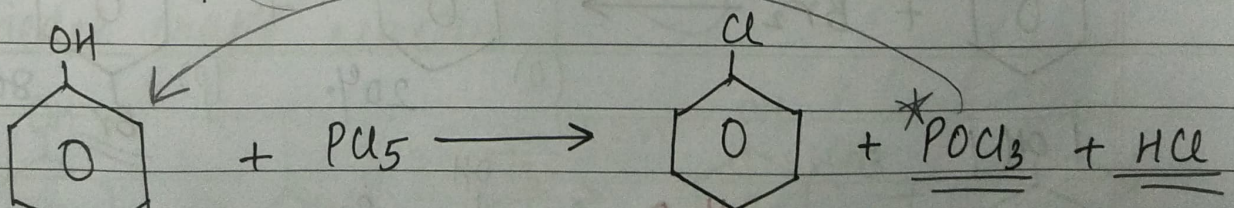
- ester to ketone



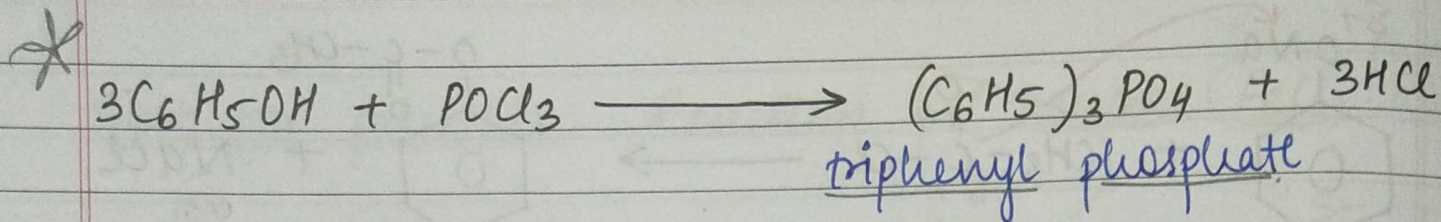
Ketone at o/p position from esters.



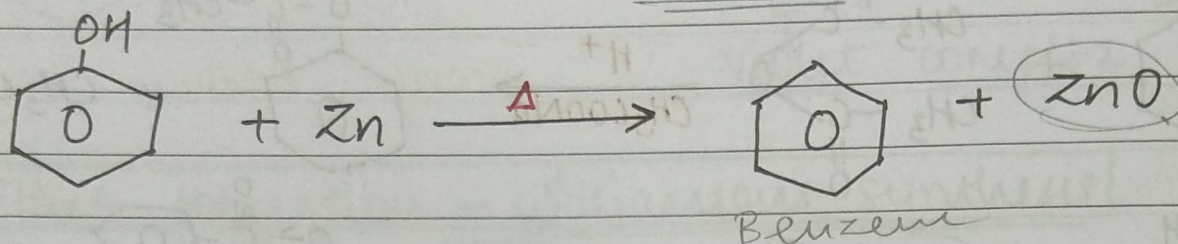
⑦ Reaction w/ PCl_5



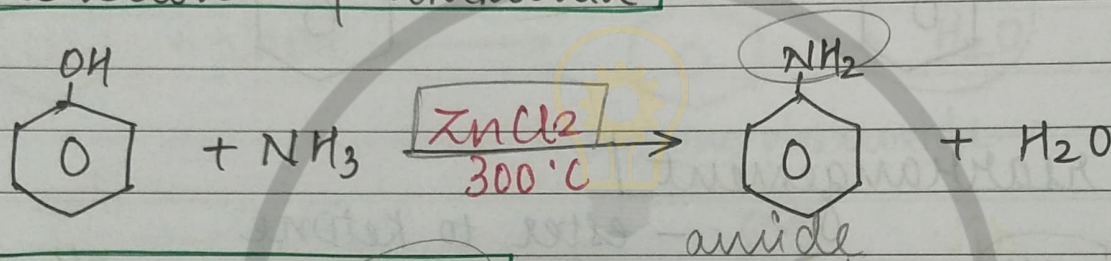
poor yield
as aromatic nucleophilic
substitution is difficult



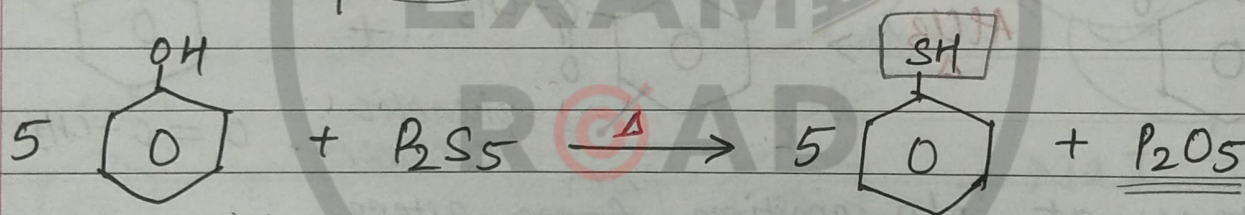
⑧ Reaction w/ Zn dust: reduction.



⑨ Reaction w/ ammonia

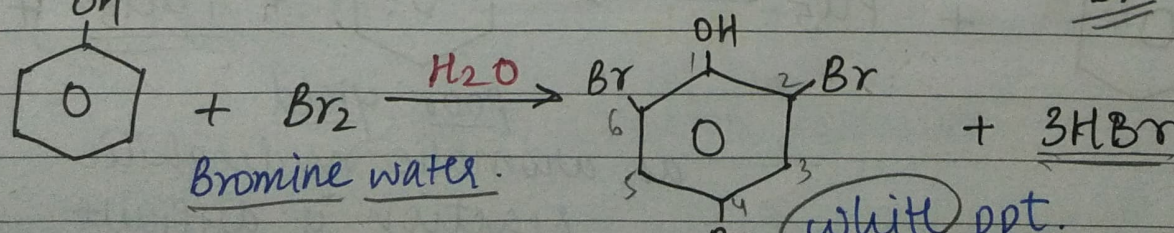
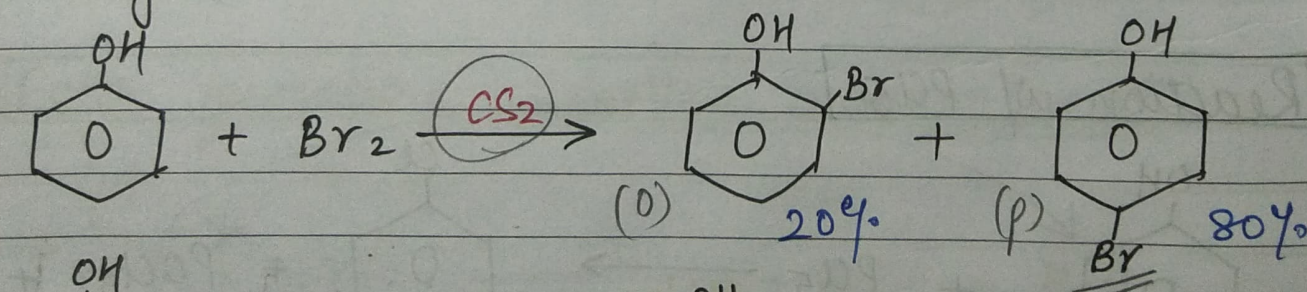


⑩ Reaction w/ P_2S_5

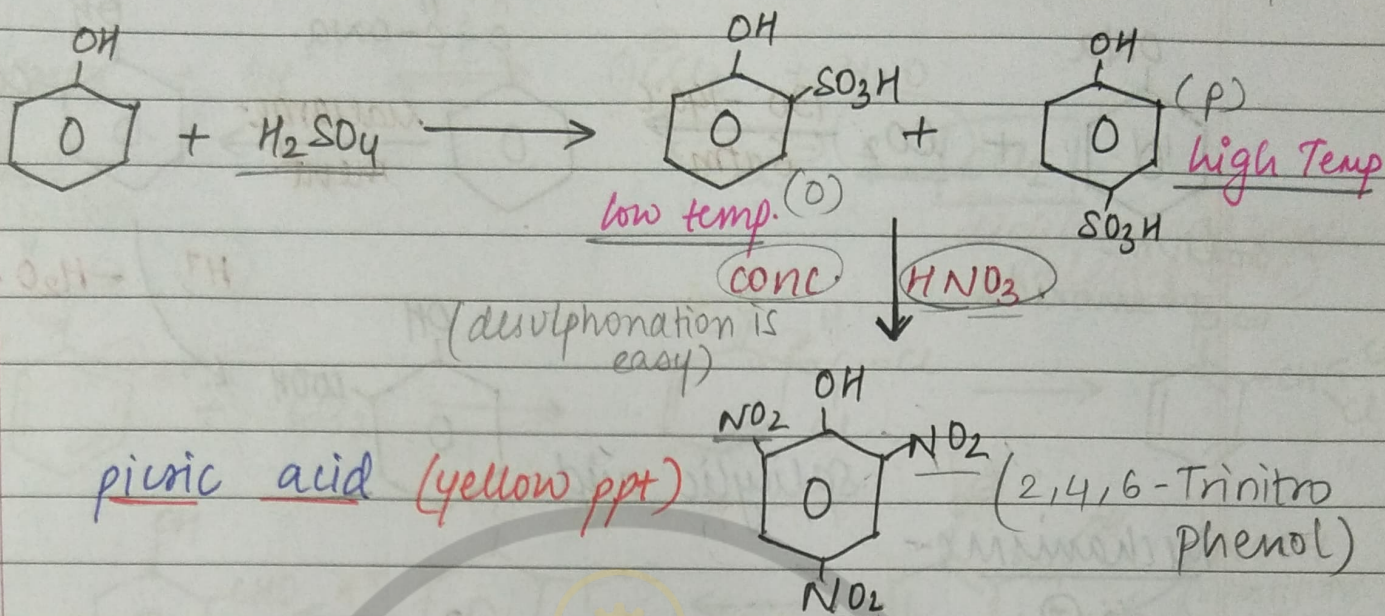


* Aromatic Electrophilic substitution Reactions:-
 (EAS)

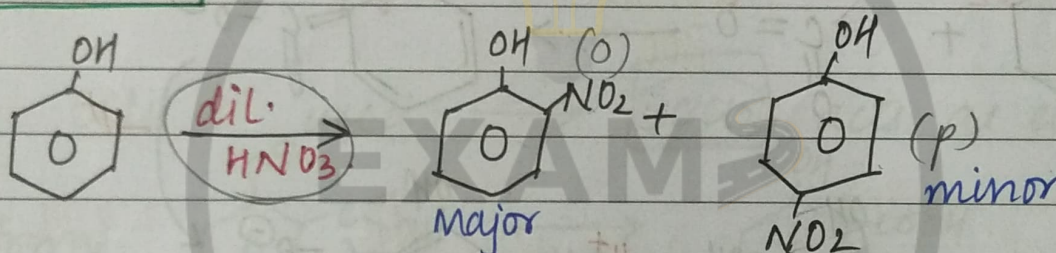
⑪ Halogenation



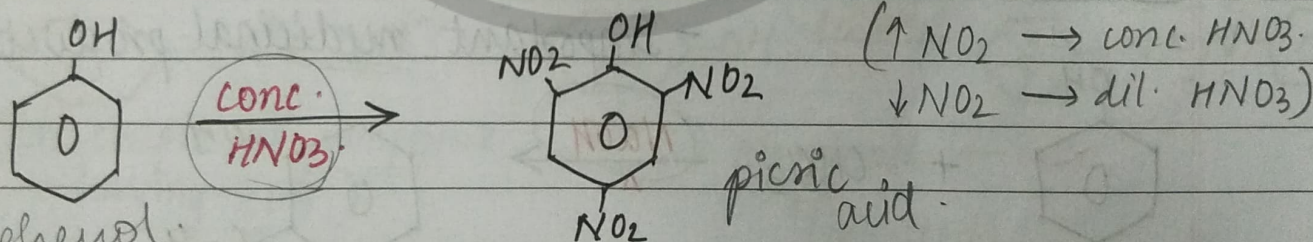
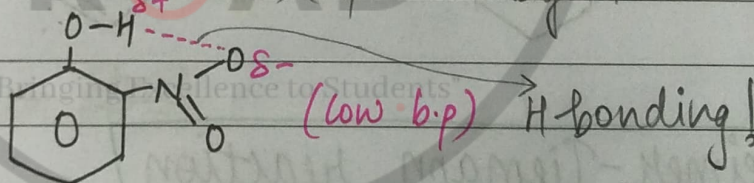
⑫ Sulphonation of phenol $\rightarrow$ picric acid. (yellow ppt)



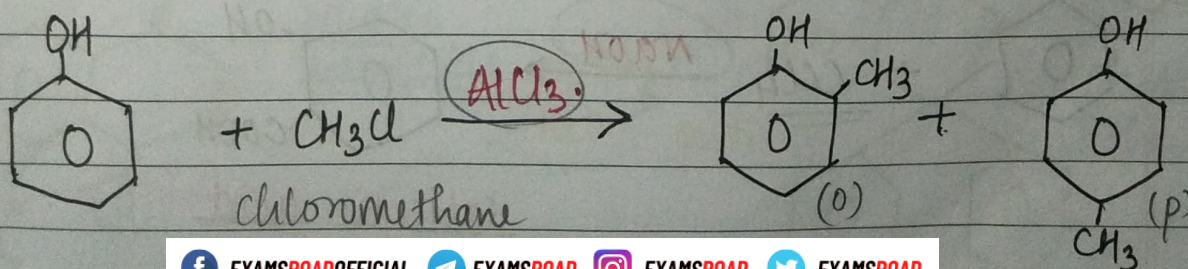
⑬ Nitration



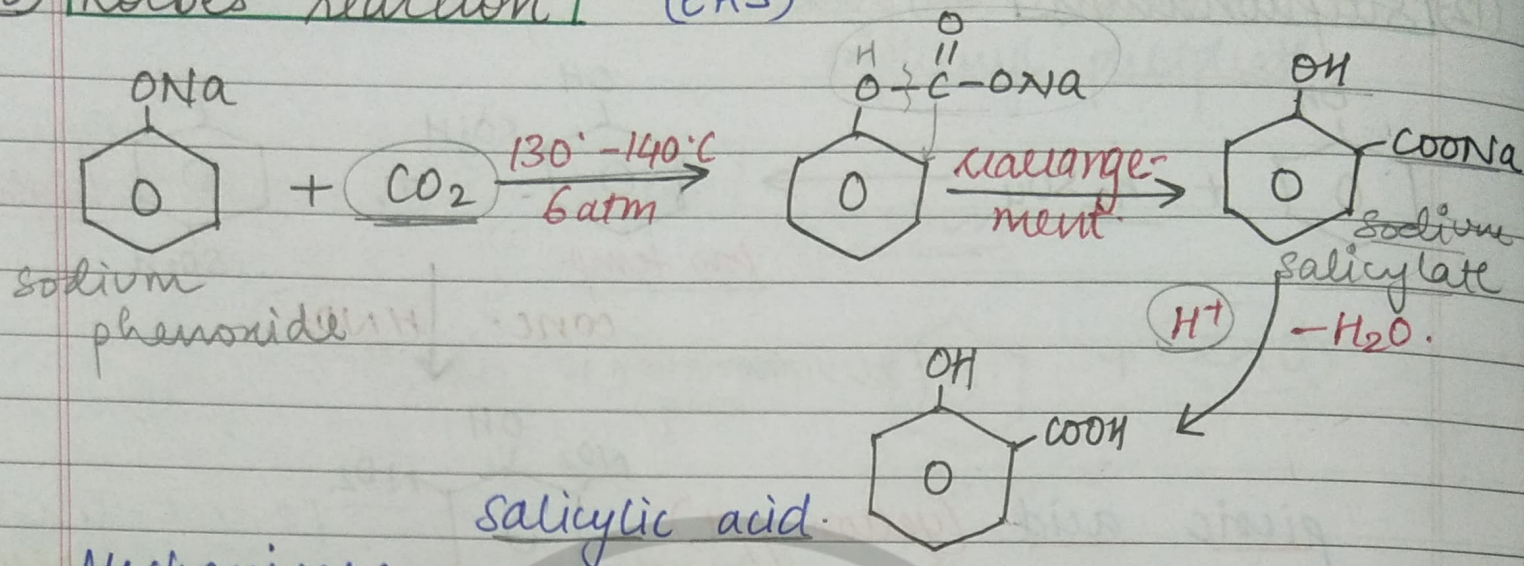
steam volatile (separated by steam distillation)



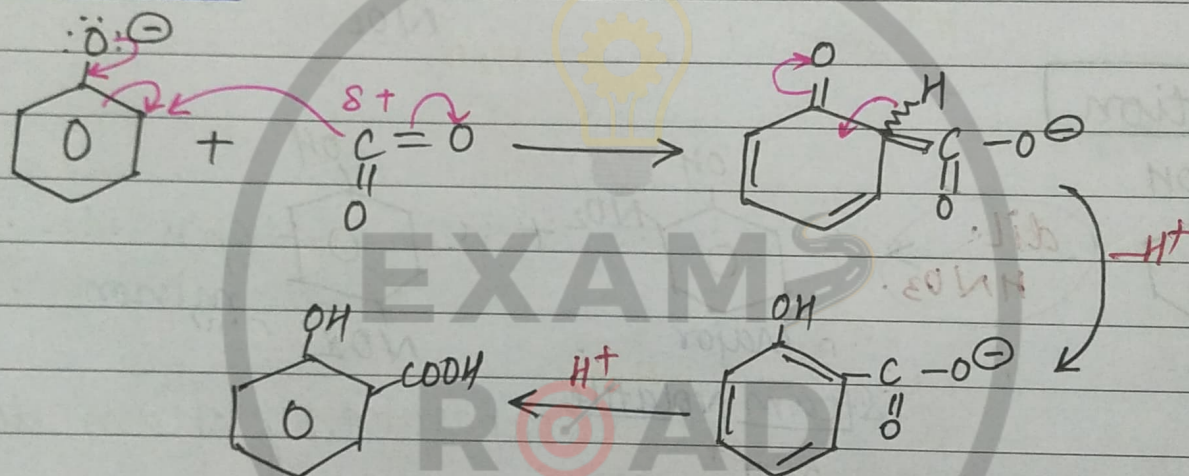
* ⑭ Friedel craft's reaction



⑮ Kolbe's reaction (EAS)

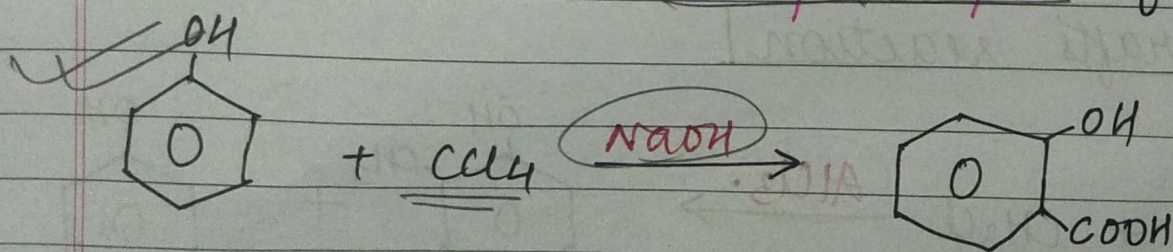
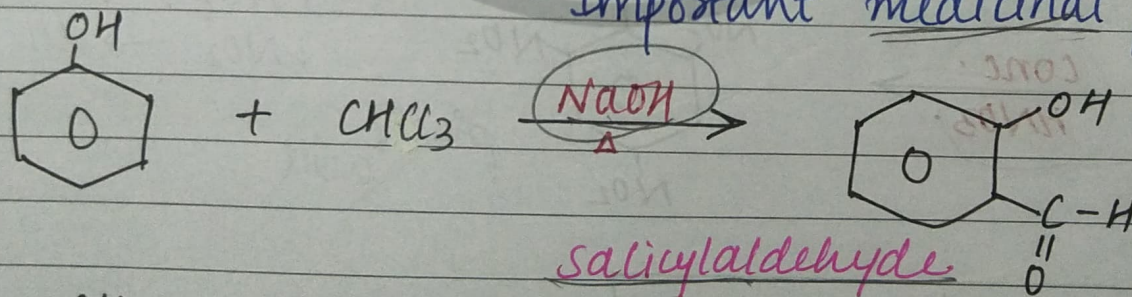


Mechanism:-

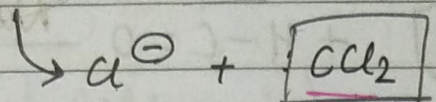
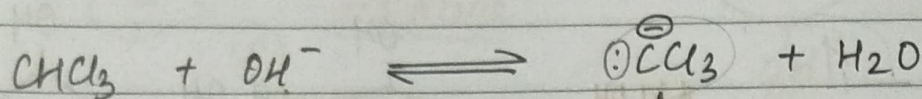


* ⑯ Reimer-Tiemann reaction

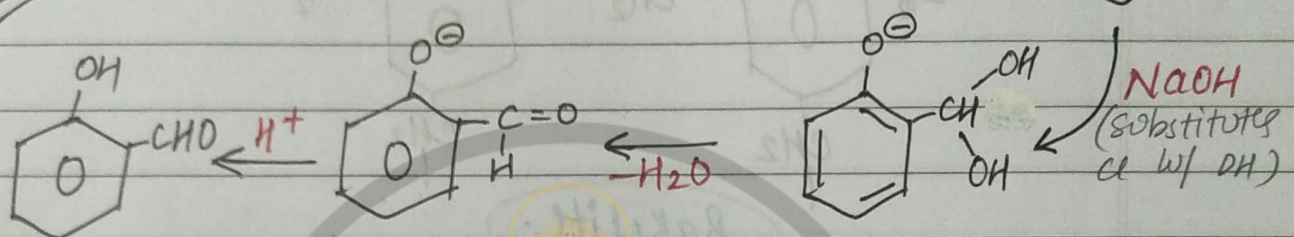
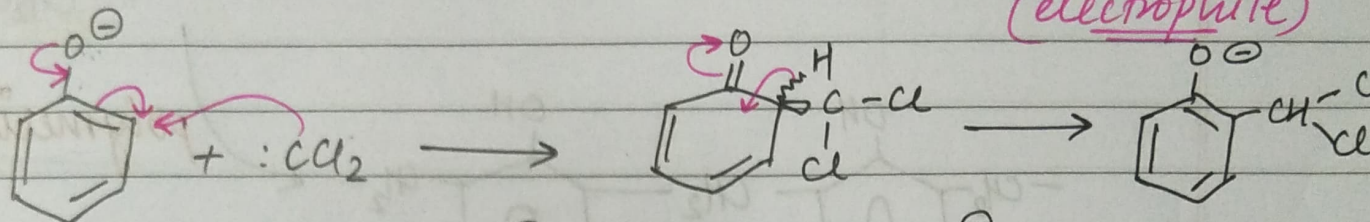
- Important medicinal products.



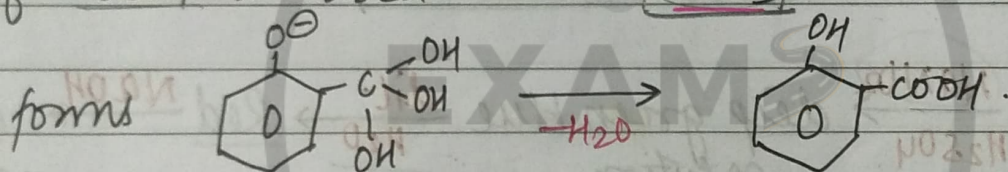
Mechanism:-



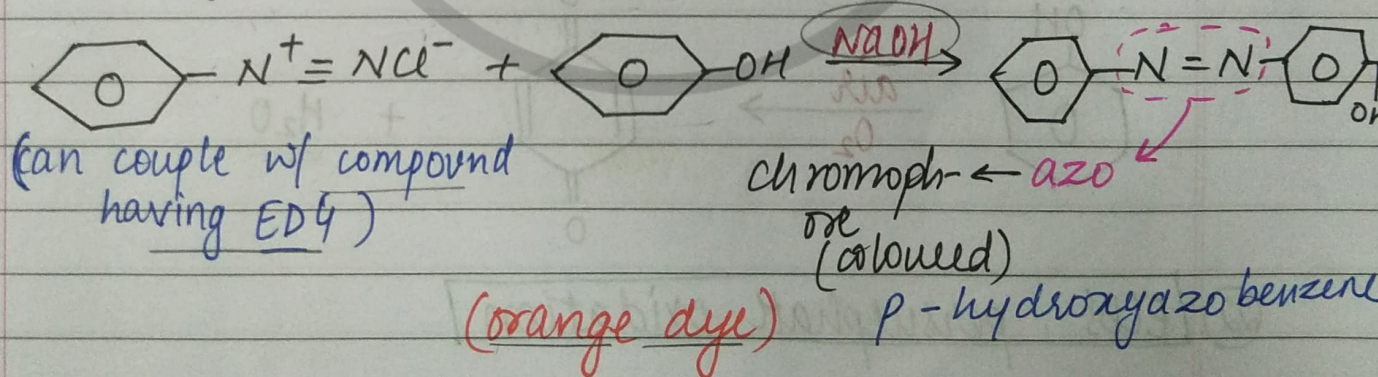
dichloro carbene
(electrophile)



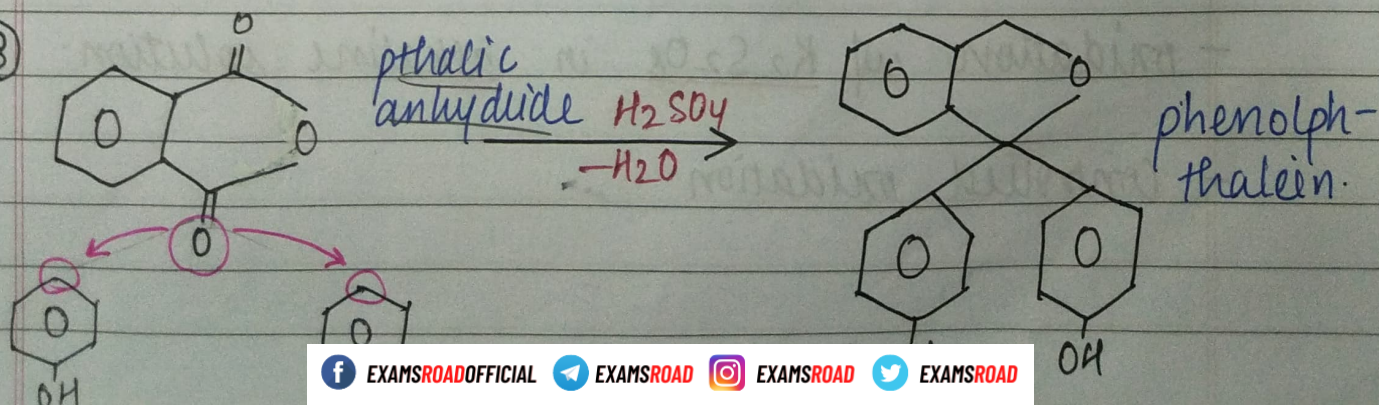
If CCl_4 is used $\rightarrow$ $\boxed{\text{:CCl}_3^-}$ acts as electrophile



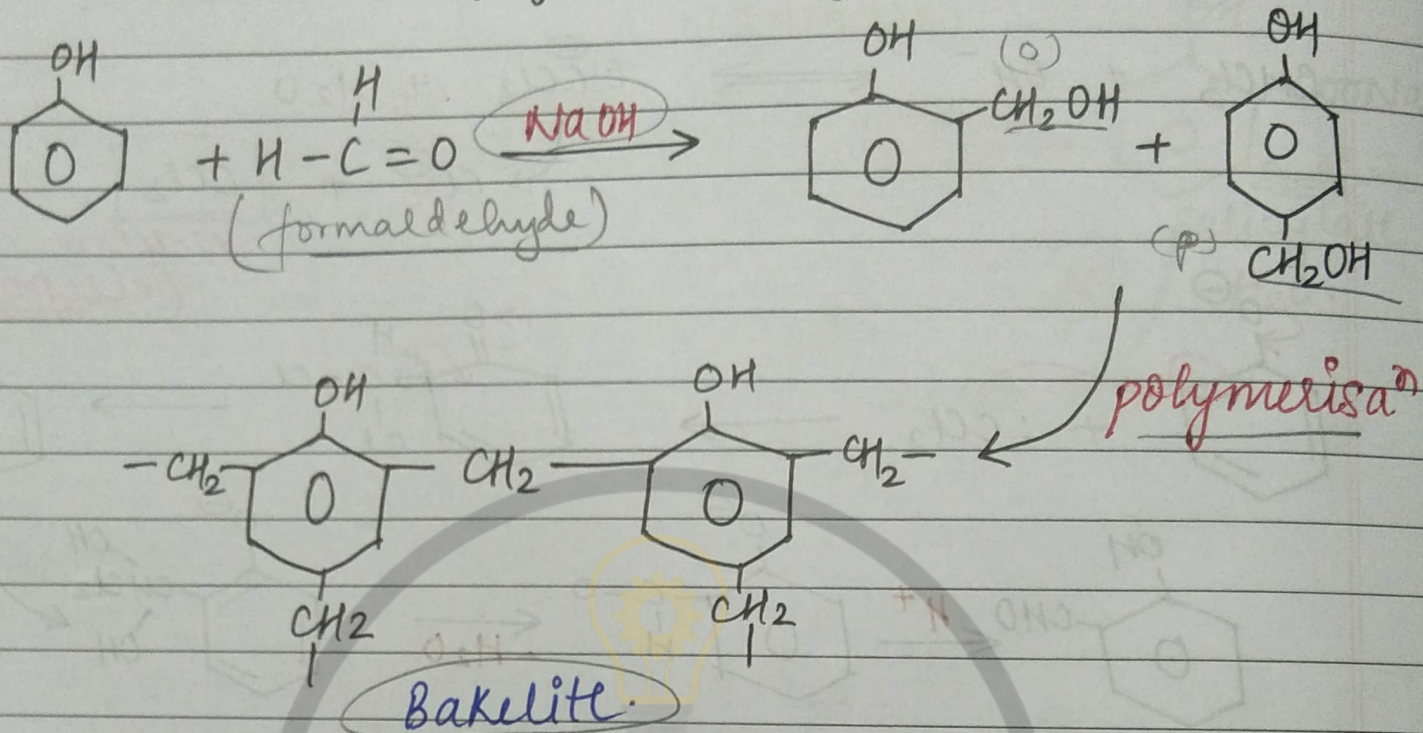
(17) Coupling Reaction



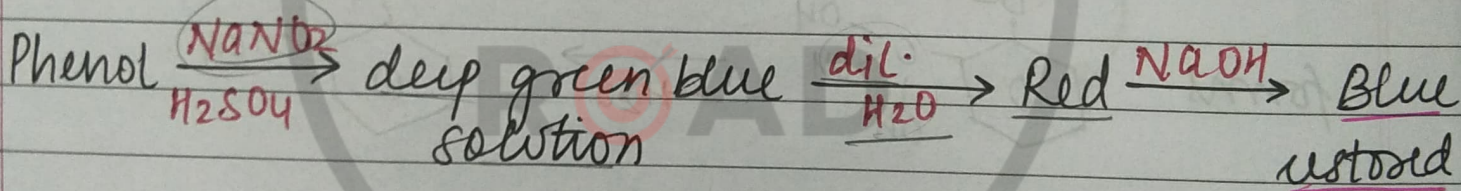
(18)



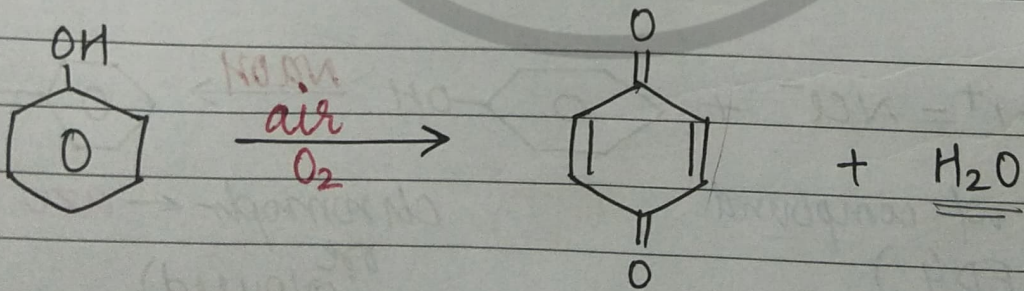
(19) Condensation w/ formaldehyde



②② Liberman's Nitroso reactions

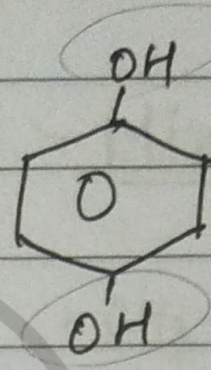
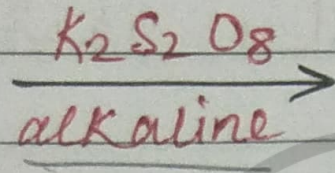
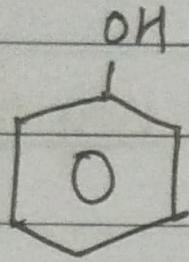


(21) Oxidation



②② Elb's persulphate oxidation

- oxidation w/ $K_2S_2O_8$ in alkaline solution.
- controlled oxidation



+ quinol

→ Uses

take from NCERT



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