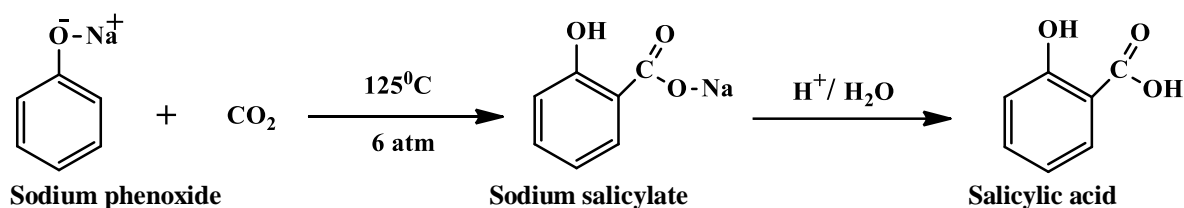


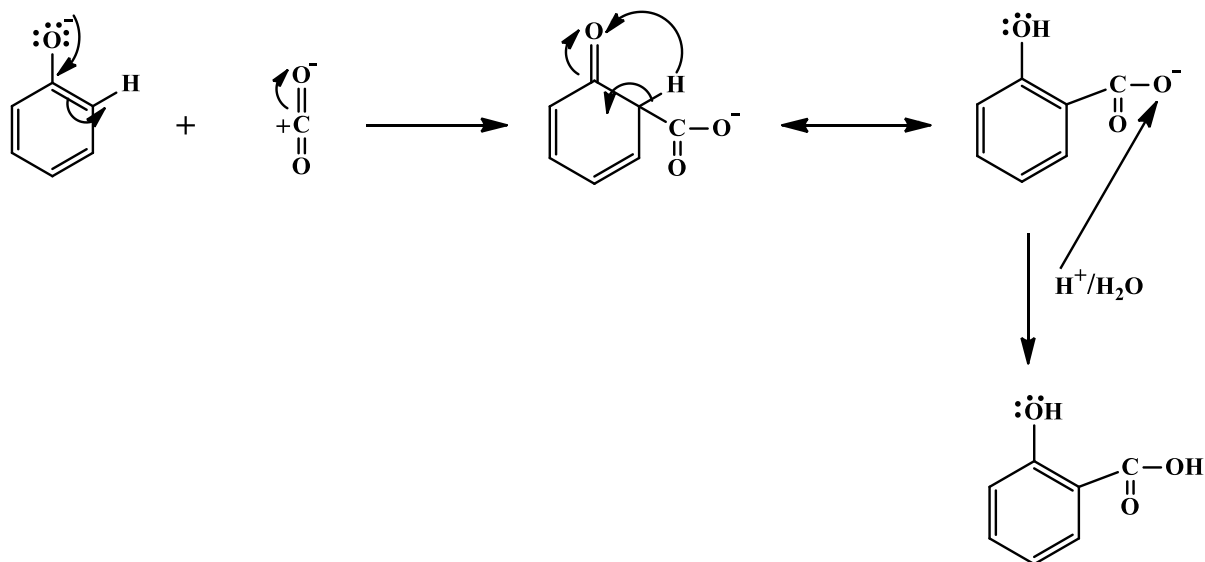
6. Kolbe reaction:

This involves the treatment of sodium phenoxide with CO_2 at 125°C under 6 atm pressure followed by acid hydrolysis. Salicylic acid is formed.



Mechanism:

The phenoxide carbanion adds to the electrophilic carbon of CO_2 :

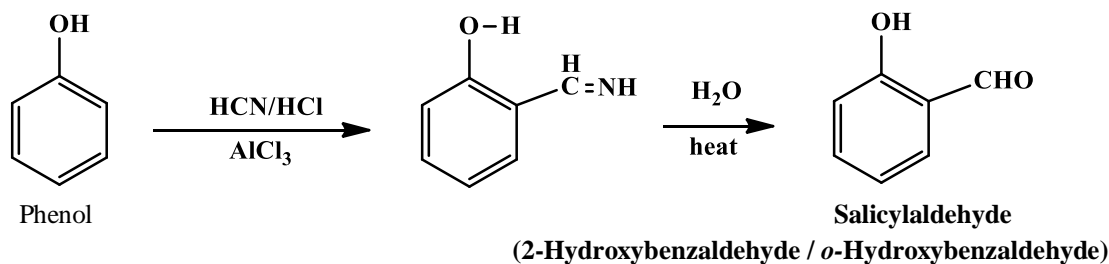


Note: 1. This reaction is also known as **Kolbe-Schmidt reaction**.

2. The Kolbe reaction is also given by other phenols and introduce $-\text{COOH}$ group in ortho-position.

7. Gattermann reaction:

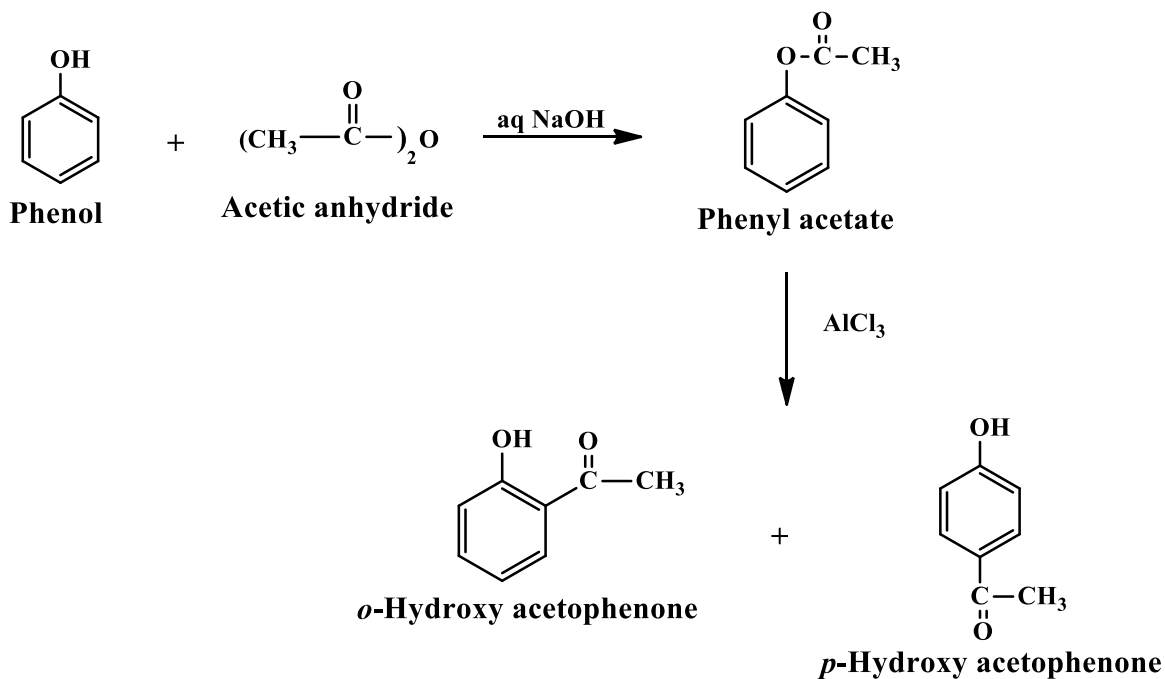
This involves the treatment of phenol with a mixture of HCN/HCl in presence of AlCl_3 (aluminium chloride) catalyst. Salicylaldehyde is formed.



8. Fries Rearrangement:

The Phenol is first treated with acetic anhydride in the presence of aqueous sodium hydroxide to give phenyl acetate. The ester is then heated with AlCl_3 catalyst when acyl group migrates from the

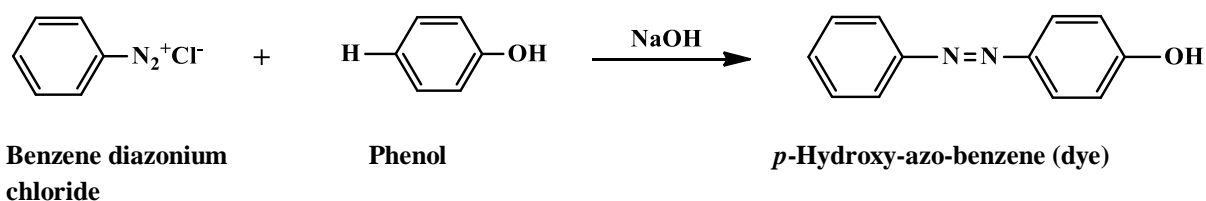
carbolic/ phenolic oxygen to an ortho or para position of the ring. The product is a mixture of *o*- and *p*-hydroxyl acetophenone.



Note: This reaction is also given by other phenol and introduces $\begin{array}{c} \text{---C---R} \\ || \\ \text{O} \end{array}$ (acyl group) in ortho- and para- position.

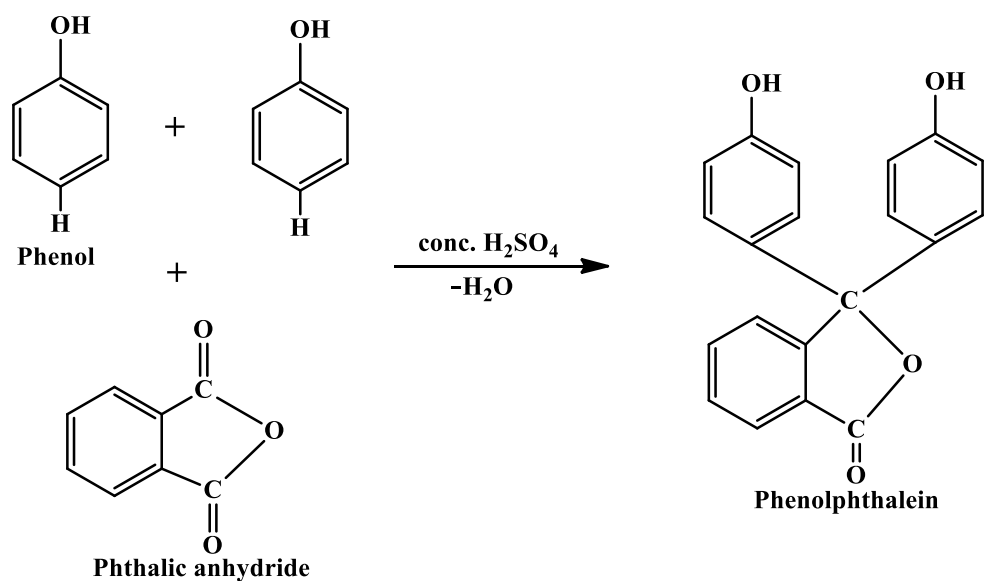
9. Reaction with benzene diazonium chloride:

Phenol reacts with benzene diazonium chloride in an alkaline solution to form para-hydroxy-azo-benzene.



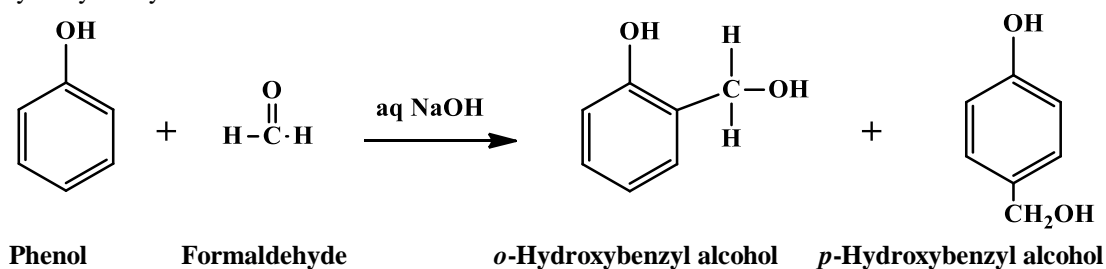
10. Reaction with phthalic anhydride:

When Phenol heated with phthalic anhydride (2:1 molar ratio) in the presence of catalyst (Lewis acid or conc. H₂SO₄) to form phenolphthalein.



11. Reaction with formaldehyde:

When phenol is heated with an alkaline solution of formaldehyde, a mixture of ortho- and para-hydroxy benzyl alcohol is formed.



Note: If reaction is carried at high temperature and in excess of formaldehyde, a hard thermosetting plastic **Bakelite** is formed.