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**Term for reaction of phenol due to aromatic ring**

Electrophilic substitution reaction

**Type of directing group exhibited by hydroxyl group at phenol**

Ortho and Para

**Cause of ortho and para directing group exhibited by hydroxyl group at phenol**

High electron density at ortho and para group

**Cause of faster rate of electrophilic substitution reaction at phenol compared to benzene**

OH is ortho and para activating group

**List of electrophilic substitution reaction exhibited by phenol**

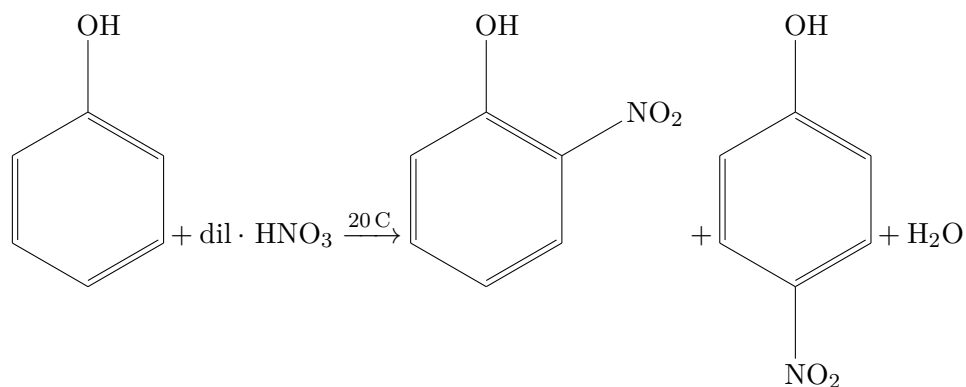
- Nitration
- Sulphonation
- Bromination
- Alkylation
- Carboxylation
- Reimer Tiemann reaction
- Fries rearrangement
- Gattermann reaction
- Condensation with phthalic anhydride
- Condensation with formaldehyde
- Diazonium salts
- Oxidation
- Reduction
- Libermann's reaction

**List of conditions for reaction of electrophilic substitution of phenol as nitration**

- Dilute nitric acid
- Conc Nitric acid

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**Expression for reaction of electrophilic substitution reaction of phenol as nitration in dilute nitric acid**



**Reactants for reaction of electrophilic substitution reaction of phenol as nitration in dilute nitric acid**

- Phenol
- Dilute nitric acid

**Products for reaction of electrophilic substitution reaction of phenol as nitration in dilute nitric acid**

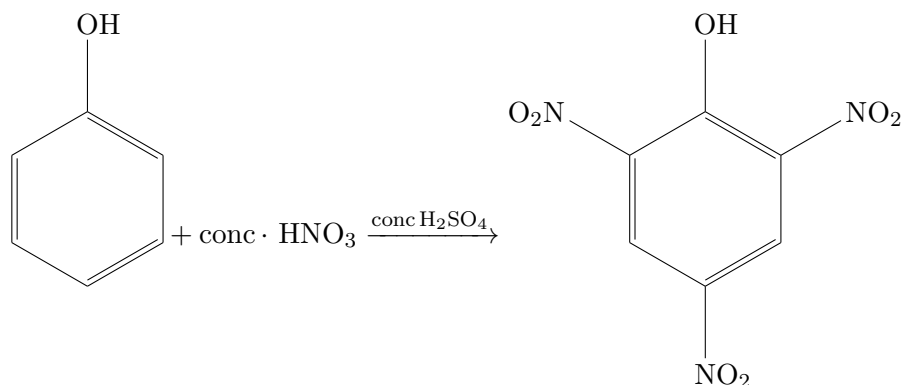
- Ortho nitro phenol
- Para nitro phenol
- Water

**Condition of temperature for reaction of electrophilic substitution reaction of phenol as nitration in dilute nitric acid**

20 degree celsius

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**Expression for reaction of electrophilic substitution reaction of phenol as nitration in concentrated nitric acid**



**Reactants for reaction of electrophilic substitution reaction of phenol as nitration in concentrated nitric acid**

- Phenol
- Concentrated Nitric acid

**Products for reaction of electrophilic substitution reaction of phenol as nitration in concentrated nitric acid**

- Picric acid
- Water

**Condition for reaction of electrophilic substitution reaction of phenol as nitration in concentrated nitric acid**

Presence of concentrated sulphuric acid

**Molecular formula of picric acid**

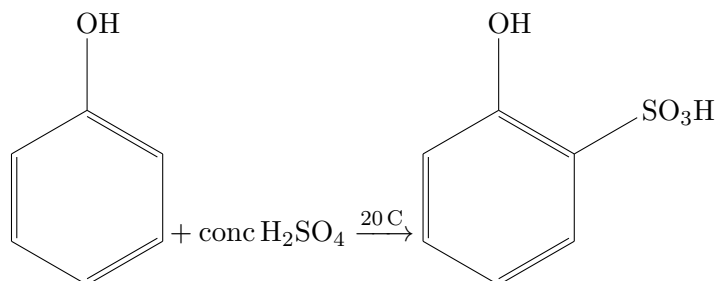
2,4,6 tri nitro phenol

**List of conditions for reaction of sulphonation of phenol**

- Low temperature
- High Temperature

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**Expression for reaction of electrophilic substitution reaction of phenol as sulphonation in low temperature**



**Reactants for reaction of electrophilic substitution reaction of phenol as sulphonation in low temperature**

- Phenol
- Concentrated Sulphuric acid

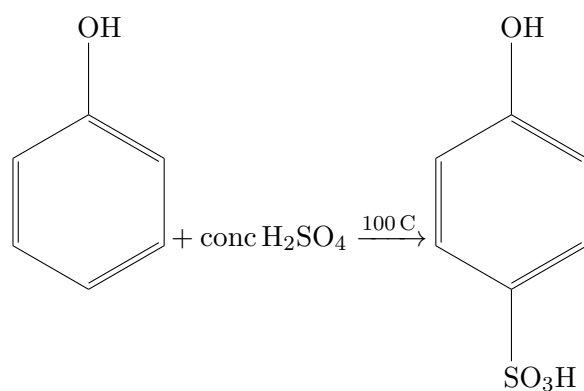
**Products for reaction of electrophilic substitution reaction of phenol as sulphonation in low temperature**

- Ortho nitro phenol

**Condition for temperature at reaction of electrophilic substitution reaction of phenol as sulphonation in low temperature**

20 Celsius

**Expression for reaction of electrophilic substitution reaction of phenol as sulphonation in high temperature**



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**Reactants for reaction of electrophilic substitution reaction of phenol as sulphonation in high temperature**

- Phenol
- Concentrated Sulphuric acid

**Products for reaction of electrophilic substitution reaction of phenol as sulphonation in high temperature**

- Para nitro phenol

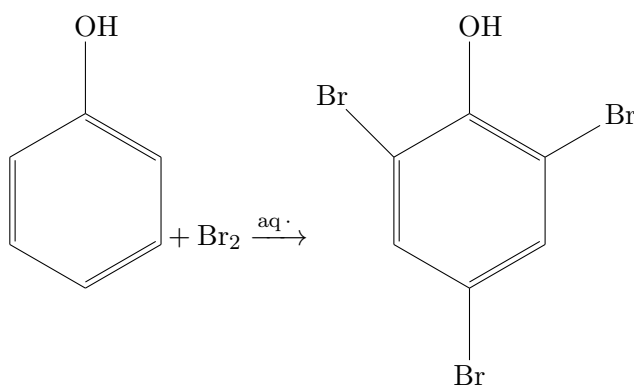
**Condition for temperature at reaction of electrophilic substitution reaction of phenol as sulphonation in high temperature**

100 C

**List of types of reactions present at bromination of phenol**

- Excess aqueous bromine solution
- Solvent of low dielectric constant

**Expression for reaction of electrophilic substitution reaction of phenol as bromination in aqueous bromine solution**



**Reactants for reaction of electrophilic substitution reaction of phenol as aqueous bromine solution**

- Phenol

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- Aqueous bromine

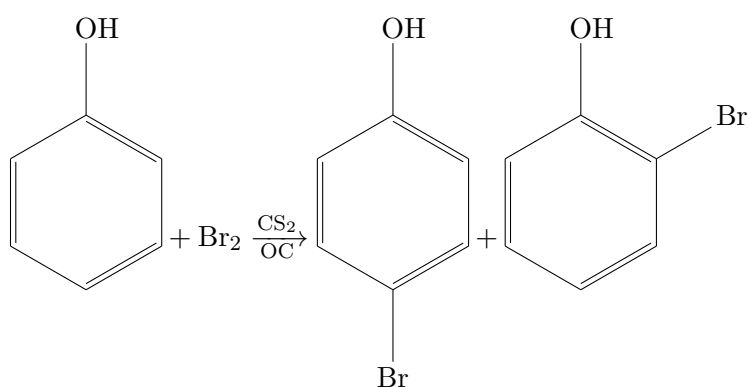
**Products for reaction of electrophilic substitution reaction of phenol as aqueous bromine solution**

- 2,4,6 tribromo phenol

**List of solvents of low dielectric constant at bromination of phenol**

- Chloroform
- Carbon tetra chloride
- Carbon disulphide

**Expression for reaction of electrophilic substitution reaction of phenol as bromination in solvent of low dielectric constant**



**Reactants for reaction of electrophilic substitution reaction of phenol as bromination in solvent of low dielectric constant**

- Phenol
- Bromine

**Products for reaction of electrophilic substitution reaction of phenol as bromination in solvent of low dielectric constant**

- Ortho bromo phenol
- Para bromo phenol

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**Major product for reaction of electrophilic substitution reaction of phenol as bromination in solvent of low dielectric constant**

Para bromo phenol

**Condition for temperature reaction of electrophilic substitution reaction of phenol as bromination in solvent of low dielectric constant**

0 Celsius

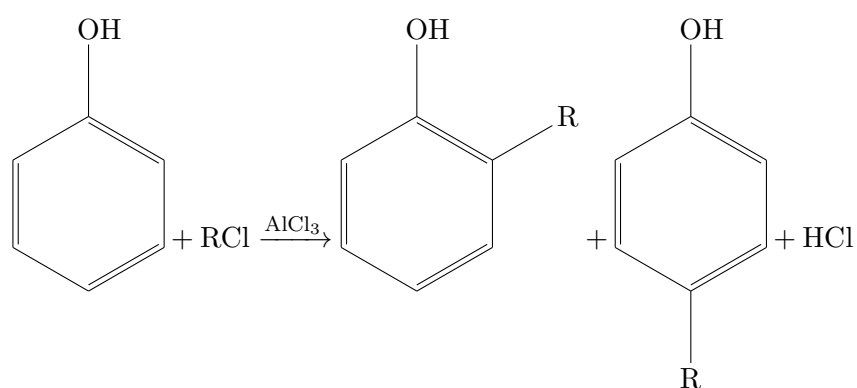
**Cause of occurrence of bromination of phenol even in absence of lewis acid**

Highly activating effect of OH group

**Term for alkylation of phenol**

Friedel Crafts Reaction

**Expression for reaction of electrophilic substitution reaction of phenol as alkylation**



**Reactants for reaction of electrophilic substitution reaction of phenol as alkylation**

- Phenol
- Halo alkane

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### Products for reaction of electrophilic substitution reaction of phenol as alkylation

- Ortho alkyl derivative
- Para alkyl derivative
- Hydro chloric acid

### Condition for reaction of electrophilic substitution reaction of phenol as alkylation

- Heat
- Anhydrous aluminium chloride

### Major product in alkylation of phenol

Para derivative

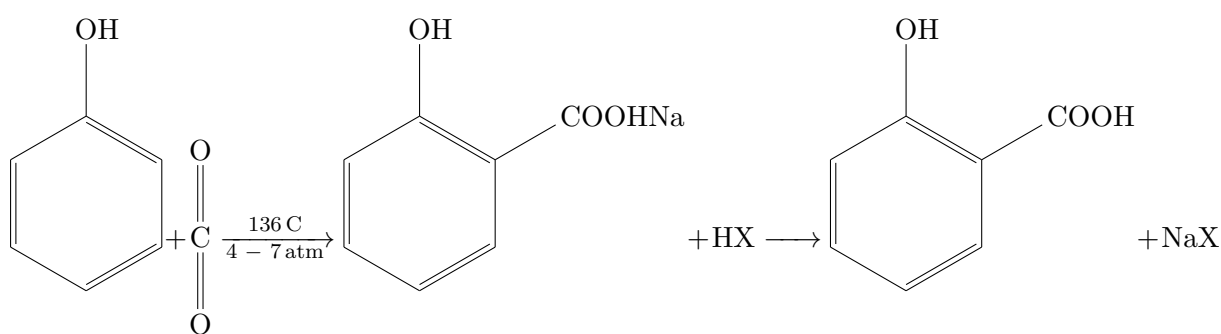
### Term for carboxylation of phenol

Kolbe's reaction

### Carboxylation in organic chemistry in phenol

Introduction of COOH group in the molecule

### Expression for reaction of electrophilic substitution reaction of phenol as carboxylation



### Reactants for reaction of electrophilic substitution reaction of phenol as carboxylation

- Sodium phenoxide
- Carbon dioxide



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**Products for reaction of electrophilic substitution reaction of phenol as carboxylation**

- Salicylic acid
- Sodium Halide

**Molecular formula of salicylic acid**

o-hydroxy benzoic acid

**Intermediate product in carboxylation of phenol**

Sodium salicylate

**Reagent introduced to reduce intermediate product in carboxylation of phenol**

Halo acid

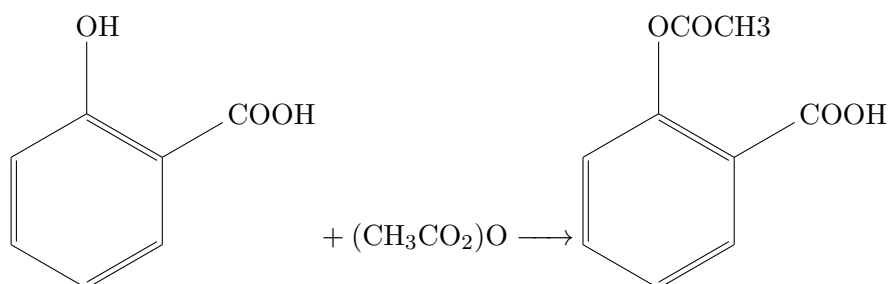
**Condition for temperature at reaction of electrophilic substitution reaction of phenol as carboxylation**

136 C

**Condition for atmospheric pressure at reaction of electrophilic substitution reaction of phenol as carboxylation**

4 - 7 atm

**Expression for reaction of electrophilic substitution reaction of preparation of aspirin**



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### Reactants for reaction of electrophilic substitution reaction of preparation of aspirin

- Salicylic acid
- Acetic anhydride

### Products for reaction of electrophilic substitution reaction of preparation of aspirin

Aspirin

### Molecular formula of aspirin

2 - acetoxybenzoic acid

### List of types of reaction on the basis of reagent at reimer tiemann reaction of phenol

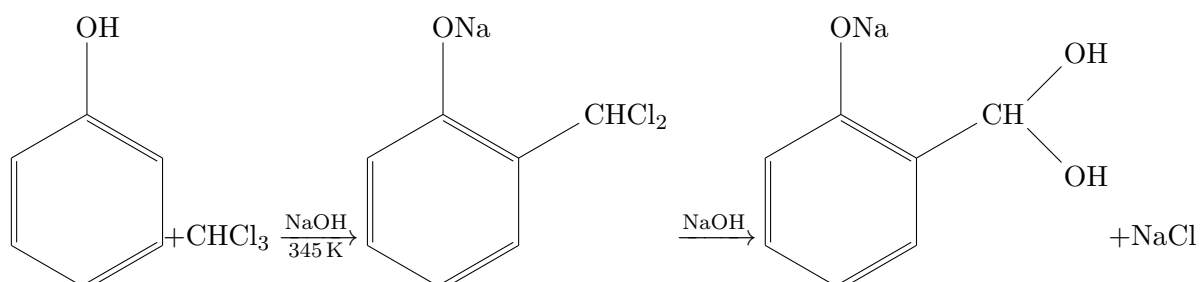
- Chloroform
- Carbon tetra chloride

### List of activities at reimer tiemann reaction of phenol with chloroform

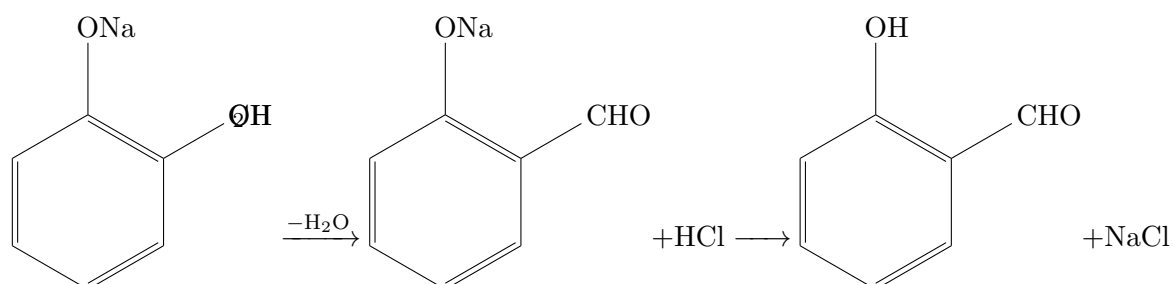
- Formation of Sodium phenoxide with dichloro methane at ortho position
- Formation of unstable Sodium phenoxide with methane diol
- Formation of sodium oxy benzaldehyde
- Formation of salicylaldehyde

### Expression for reaction of electrophilic substitution reaction of phenol as reimer tiemann reaction in chloroform

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**Reactants for reaction of electrophilic substitution reaction of phenol as reimer tiemann reaction in chloroform**

- Phenol
- Chloroform

**Products for reaction of electrophilic substitution reaction of phenol as reimer tiemann reaction in chloroform**

- Salicylaldehyde
- Sodium chloride
- Water

**Molecular formula of salicylaldehyde**

ortho-hydroxy benzaldehyde

**List of intermediate Products for reaction of electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

- Sodium phenoxide with carbon dichloro methane at ortho position
- Sodium phenoxide with methane diol at ortho position
- Sodium phenoxide with methaldehyde at ortho position

**List of reagents for reaction of intermediate products electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

- Sodium hydroxide

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- Hydro chloric acid

**Condition for reaction of electrophilic substitution reaction of phenol as reimer tiemann reaction in chloroform**

- Sodium Hydroxide / Potassium hydroxide

**Condition for temperature in reaction of electrophilic substitution reaction of phenol as reimer tiemann reaction in chloroform**

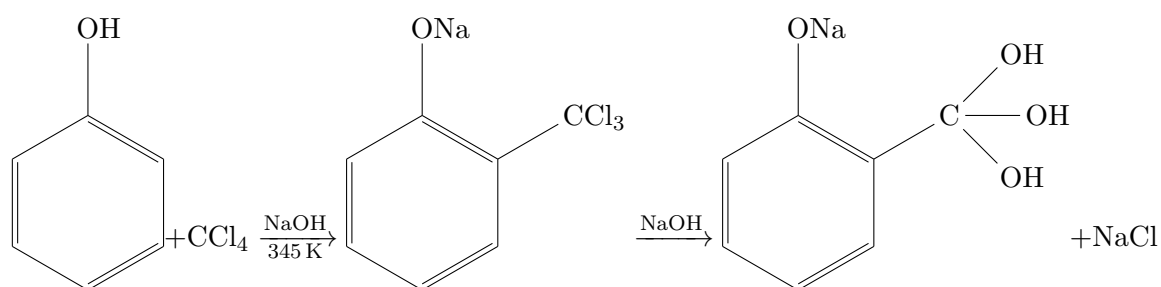
345 K

**List of activities at reaction of electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

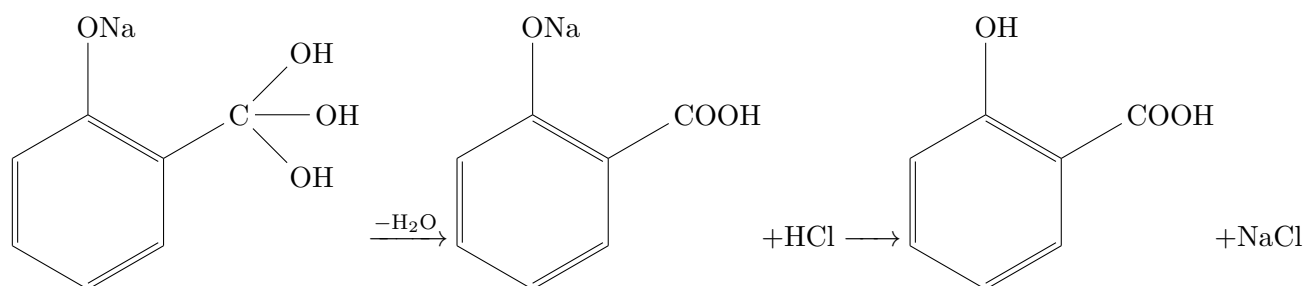
- Formation of sodium phenoxide with carbon trichloride at ortho position
- Formation of sodium phenoxide with methane triol at ortho position
- Disassociation of methane triol at ortho position
- Formation of Sodium phenoxide with methanoic acid at ortho position
- Formation of hydroxy benzoic acid

**Expression for reaction of electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

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**Reactants for reaction of electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

- Phenol
- Carbon tetra chloride

**Products for reaction of electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

- Salicylic acid
- Water
- Sodium chloride

**List of intermediate Products for reaction of electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

- Sodium phenoxide with carbon trichloride at ortho position
- Sodium phenoxide with methane triol at ortho position
- Sodium phenoxide with methanoic acid at ortho position

**List of reagents for reaction of intermediate products electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

- Sodium hydroxide
- Hydro chloric acid

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**Condition for reaction of electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

- Potassium hydroxide
- Sodium hydroxide

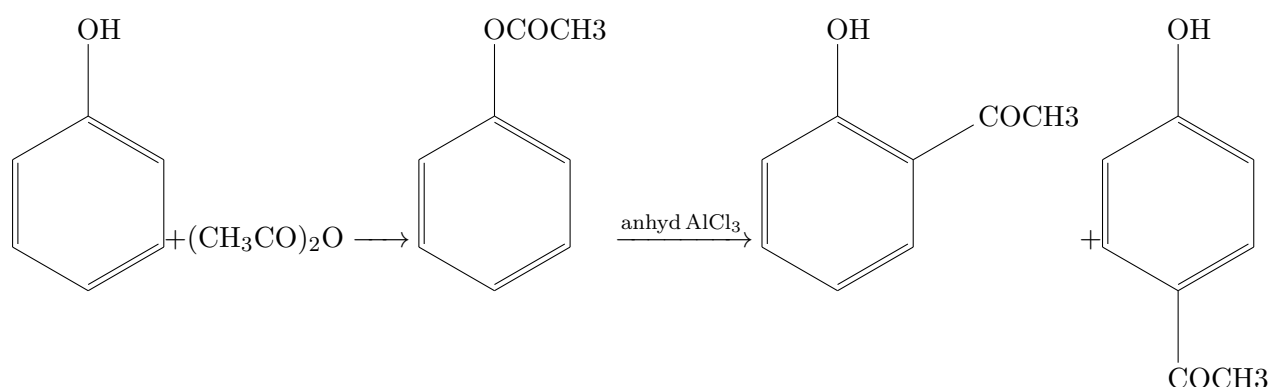
**Condition for temperature in reaction of electrophilic substitution reaction of phenol as Reimer Tiemann reaction in carbon tetra chloride**

345 K

**Fries rearrangement in phenol**

Isomerisation of aryl esters to aryl ketones in the presence of anhydrous aluminium chloride

**Expression for reaction of electrophilic substitution reaction of phenol as fries rearrangement**



**Reactants for reaction of electrophilic substitution reaction of phenol as Fries rearrangement**

- Phenol
- Acetic anhydride

**Intermediate product in reaction of electrophilic substitution of phenol as Fries rearrangement**

- Phenyl ethanoate

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**Reagent to react Intermediate product in reaction of electrophilic substitution of phenol as Fries rearrangement**

Anhydrous aluminium chloride

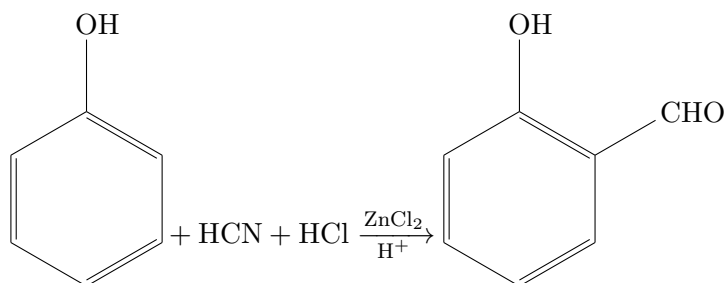
**Products for reaction of electrophilic substitution reaction of phenol as Fries rearrangement**

- o- hydroxyacetophenone
- p- hydroxyacetophenone
- Ethanoic acid

**Term for fries gattermann reaction in phenol**

Formylation reaction

**Expression for reaction of electrophilic substitution reaction of phenol as Gatterman reaction**



**Reactants for reaction of electrophilic substitution reaction of phenol as**

- Phenol
- Hydrogen Cyanide
- Hydrogen Chloride

**Products for reaction of electrophilic substitution reaction of phenol as**

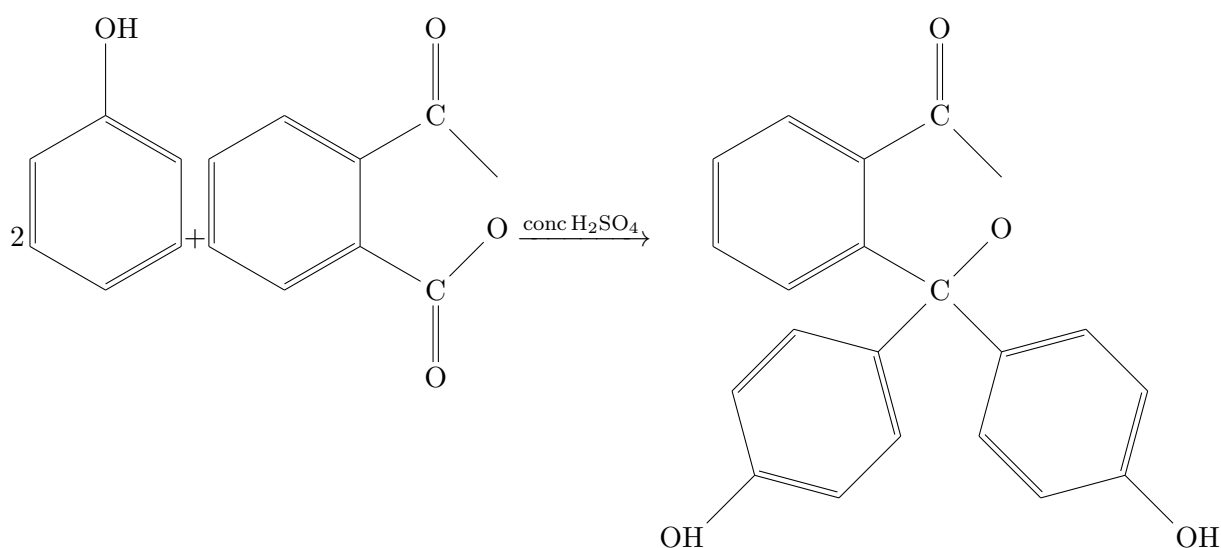
- o-hydroxy benzaldehyde

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### Condition for reaction of electrophilic substitution reaction of phenol as

- Zinc chloride
- Acidic condition ( Hydrogen ions )

### Expression for reaction of electrophilic substitution reaction of phenol as with phthalic anhydride



### Reactants for reaction of electrophilic substitution reaction of phenol as with phthalic anhydride

- Phthalic anhydride
- 2 Phenol

### IUPAC name of phthalic anhydride

2-Benzofuran-1,3-dione

### Products for reaction of electrophilic substitution reaction of phenol as with phthalic anhydride

- Phenolphthalein
- Water



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### IUPAC Name of phenolphthalein

3,3-bis(4-hydroxyphenyl)-2-benzofuran-1-one

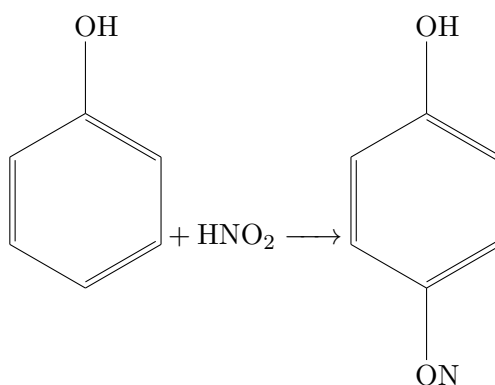
### List of activities at libermann's reaction in phenol

- Formation of para nitrosophenol
- Resonance of para nitrosophenol to give double bond at oxygen and double bond at nitrogen with hydroxyl group at para position
- Formation of indophenol
- Formation of sodium salt of indophenol

### Condition for reaction of electrophilic substitution reaction of phenol as with phthalic anhydride

- Presence of conc sulphuric acid

### Expression for reaction of formation of para nitrosophenol in libermann's test

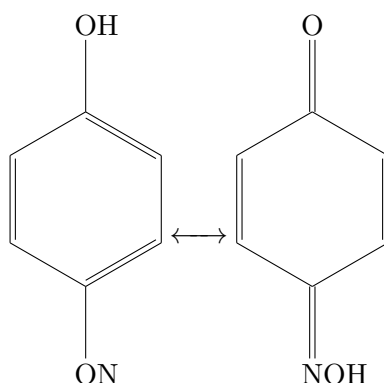


### Reactants in reaction for formation of para nitrosophenol in libermann's test

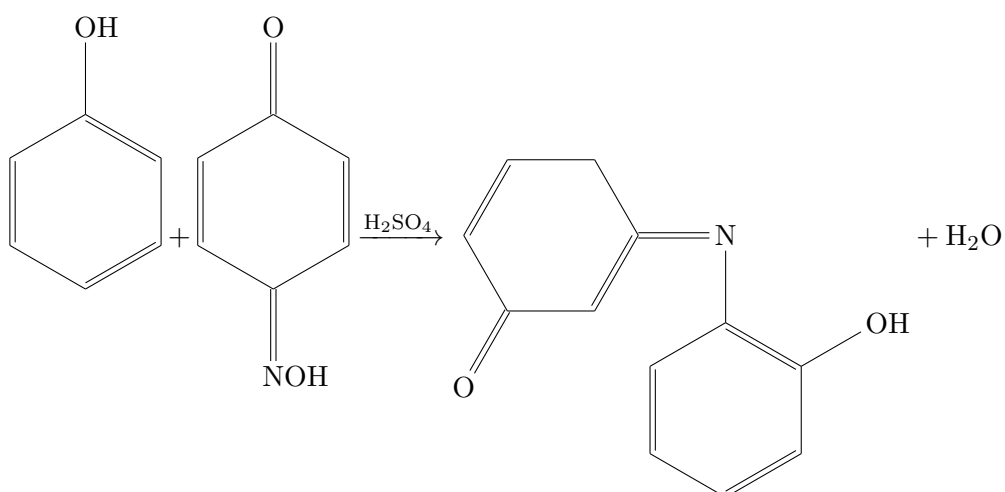
- Phenol
- Nitrous acid

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**Expression for reaction of rearrangement of para nitrosophenol in libermann's test**



**Expression for reaction of electrophilic substitution reaction of phenol as libermann's reaction for formation of indo phenol**



**Reactants for reaction of electrophilic substitution reaction of phenol as libermann's reaction for formation of indo phenol**

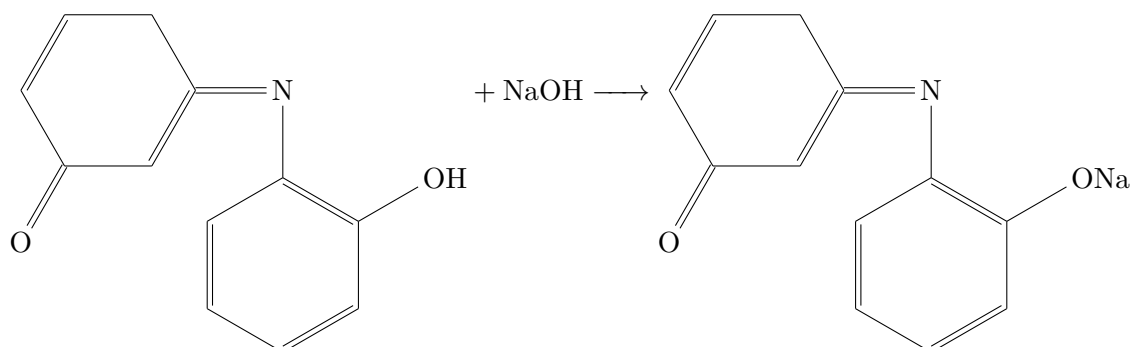
- Phenol
- Rearranged para nitroso phenol
- Sulphuric acid

**Colour of indo phenol in libermann's test**

Red

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### Expression for reaction of indophenol in libermann's reaction



### Reactants for reaction of indo phenol in libermann's reaction

- Indophenol
- Sodium hydroxide

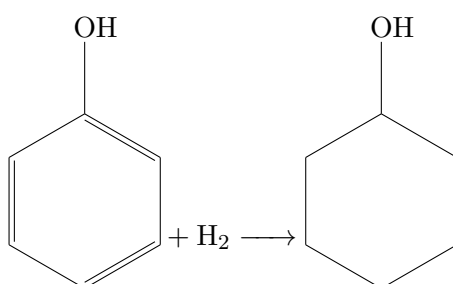
### Products for reaction of indo phenol in libermann's reaction

- Sodium salt of indo phenol

### Colour of sodium salt of indo phenol

- Intense blue or green

### Expression for reaction of electrophilic substitution reaction of phenol as hydrogenation of phenol



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**Reactants for reaction of electrophilic substitution reaction of phenol as hydrogenation of phenol**

- Phenol
- Hydrogen

**Products for reaction of electrophilic substitution reaction of phenol as hydrogenation of phenol**

- Cyclohexanol

**Condition for reaction of electrophilic substitution reaction of phenol as**

Nickel

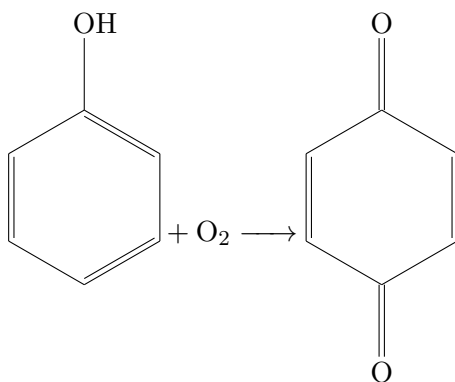
**List of types of reaction on the basis of reagents in oxidation of phenol**

- Oxidation due to air
- Oxidation by alkaline potassium persulphate

**List of types of oxidation of phenol by air on the basis of quantity of phenol**

- Oxidation in normal quantity of phenol
- Oxidation in excess quantity of phenol

**Expression for reaction of electrophilic substitution reaction of phenol as oxidation due to air in normal quantity**



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**Reactants for reaction of electrophilic substitution reaction of phenol as in normal quantity**

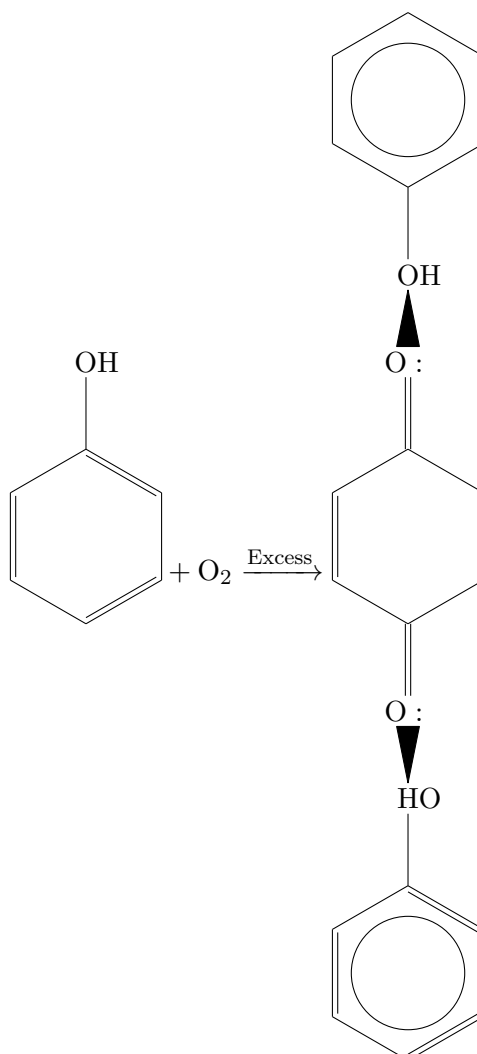
- Phenol
- Air

**Products for reaction of electrophilic substitution reaction of phenol as in normal quantity**

- para Benzo Quinone

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**Expression for reaction of electrophilic substitution reaction of phenol as in excess quantity**



**Reactants for reaction of electrophilic substitution reaction of phenol as in excess quantity**

- Phenol
- Air

**Products for reaction of electrophilic substitution reaction of phenol as in excess quantity**

- Phenoquinone

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### Molecular structure of phenoquinone

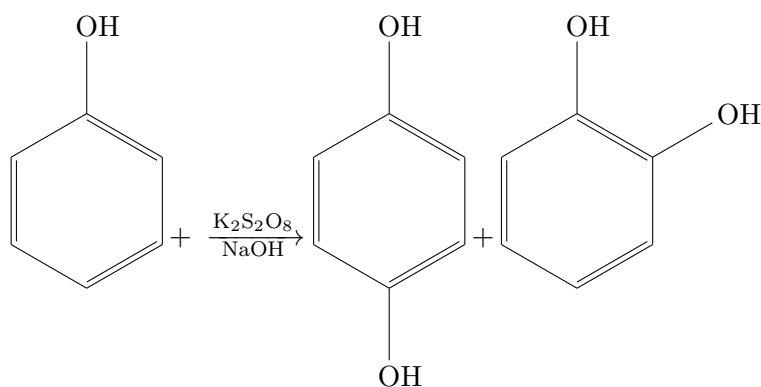
[IM]

Two phenol joined at both sides of oxygen in para benzo quinone

### Cause of red colouration of phenol in oxidation by air

- Formation of phenoquinone

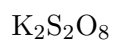
### Expression for reaction of electrophilic substitution reaction of phenol as oxidation by potassium persulphate



### Reactants for reaction of electrophilic substitution reaction of phenol as

- Phenol
- Potassium persulphate

### Molecular formula of potassium per sulphate



### Products for reaction of electrophilic substitution reaction of phenol as

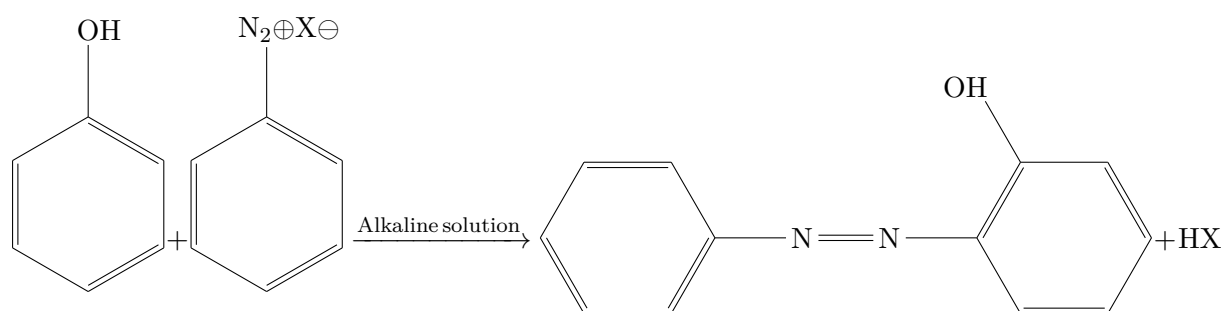
- Benzene-1,4 diol
- Benzene-1,2 diol

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### Condition for reaction of electrophilic substitution reaction of phenol as

Alkaline condition

### Expression for reaction of electrophilic substitution reaction of phenol as with diazonium salts



### Reactants for reaction of electrophilic substitution reaction of phenol as with diazonium salts

- Benzene diazonium salt
- Phenol

### Products for reaction of electrophilic substitution reaction of phenol as with diazonium salts

- Para hydroxyazobenzene

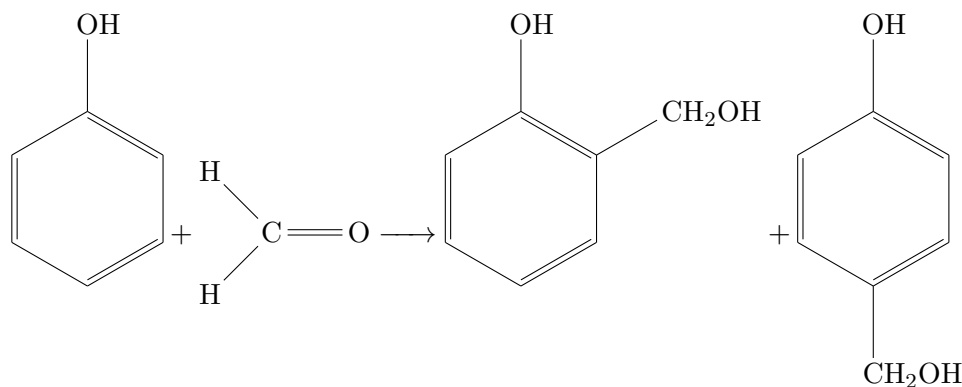
### Condition for reaction of electrophilic substitution reaction of phenol as with diazonium salts

Ice cooled alkaline medium



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**Expression for reaction of electrophilic substitution reaction of phenol as condensation of formaldehyde**



**Reactants for reaction of electrophilic substitution reaction of phenol as condensation with formaldehyde**

- Phenol
- Formaldehyde

**Products for reaction of electrophilic substitution reaction of phenol as condensation with formaldehyde**

- ortho hydro oxy benzyl alcohol
- para hydro oxy benzyl alcohol

**List of activites for formation of linear polymer**

- Polymerization of ortho hydro oxy benzyl alcohol

**List of activity for formation of bakelite**

- Polymerization of ortho hydro oxy benzyl alcohol with para hydro oxy benzyl alcohol