

# CHEMISTRY STUDY MATERIALS FOR CLASS 12

(NCERT Based Notes of Chapter - 11)

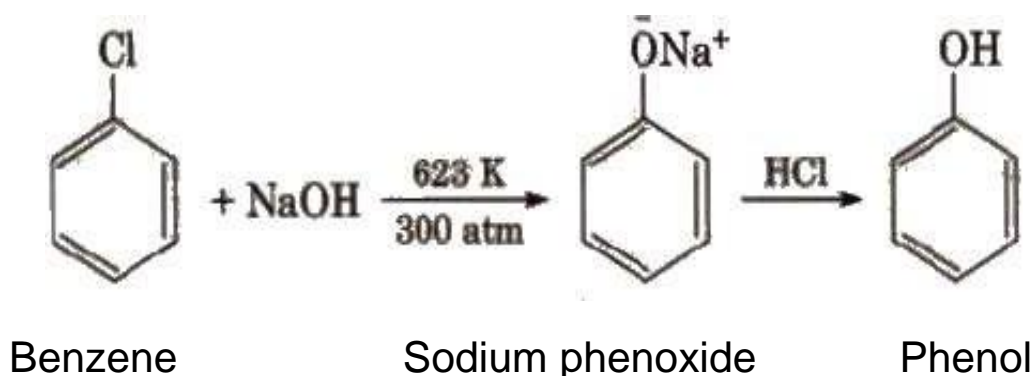
GANESH KUMAR

DATE:- 03/10/2020

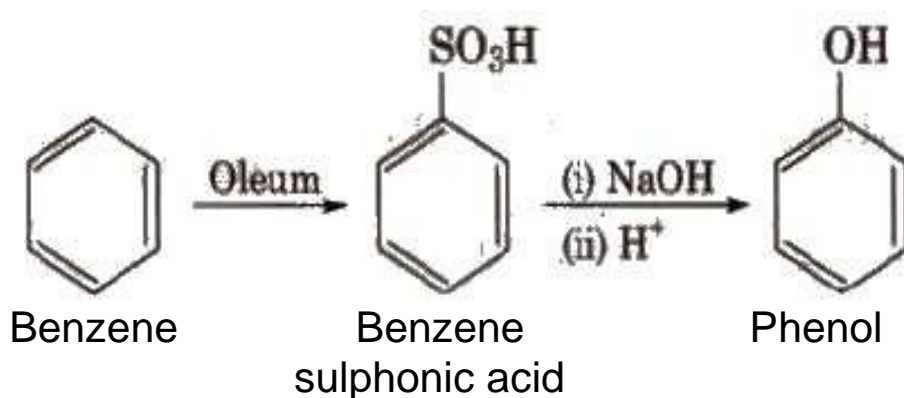
## Alcohols, Phenols and Ethers

### Preparation of Phenols

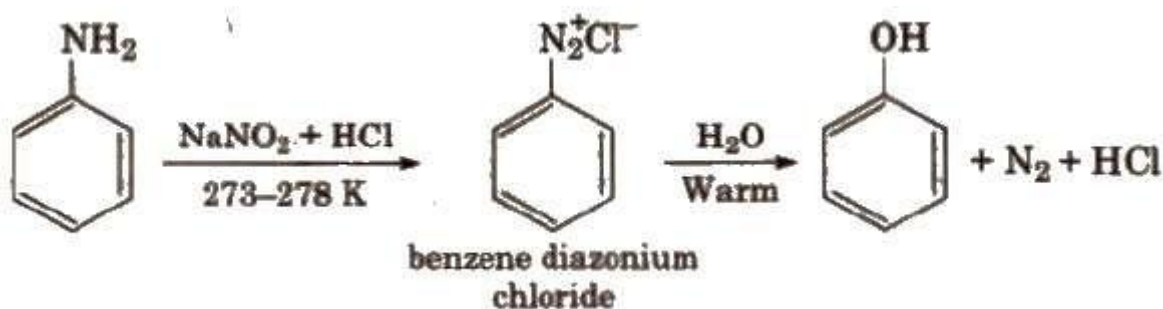
#### (i) From haloarenes



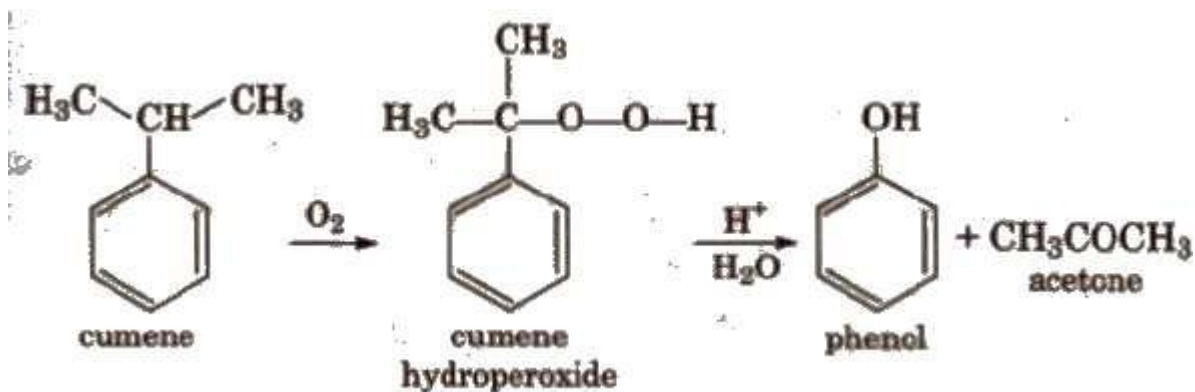
#### (ii) From benzene sulphonic acid



#### (iii) From diazonium salts

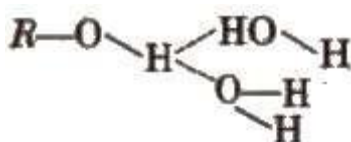


#### (iv) From cumene



## Physical Properties of Alcohols

1. Lower alcohols are colourless liquids, members from  $C_5 - C_{11}$  are oily liquids and higher members are waxy solids.
2. The hydroxyl groups in alcohols can form H-bonds with water, so alcohols are miscible with water. The solubility decreases with increase in molecular mass.



3. Boiling points of alkanes are higher than expected because of the presence of intermolecular hydrogen bonding in the polar molecules.

[The boiling point decreases in the order  $1^\circ > 2^\circ > 3^\circ$  as the Vander Waals' forces of attraction decreases]

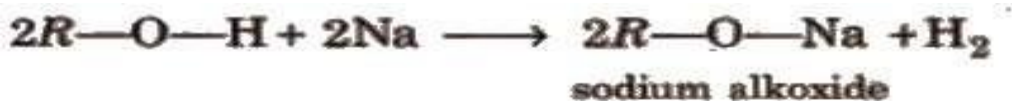
## Physical Properties of Phenols

1. These are colourless liquids or crystalline solids but become coloured due to slow oxidation with air.
2. Phenol is also called carbolic acid.
3. Because of the presence of polar -OH bond, phenols form intermolecular H-bonding with other phenol molecules and with water.

## Chemical Reactions of Alcohols and Phenols

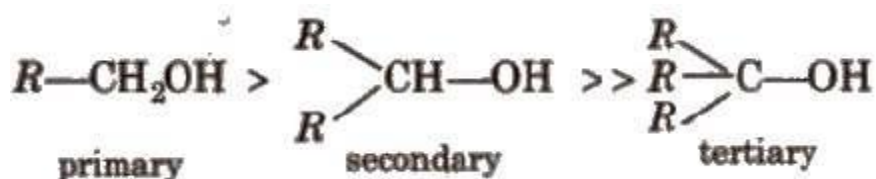
### (i) Reactions involving cleavage of O - H Bond

#### (a) Acidity of alcohols and phenols



Alcohols are weaker acids than water due to +I group present in alcohols, which decreases the polarity of -O-H bond.

Acid strength of alcohols



Electron releasing group increases electron density on oxygen to decrease the polarity of -OH bond.

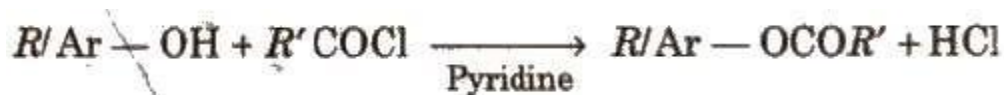
**Order of acidity is**  $RCOOH > H_2CO_3 > C_6H_5OH > H_2O > R-OH$ .

Phenol is more acidic than alcohols due to stabilization of phenoxide ion through resonance. Presence of electron withdrawing group increases the acidity of phenol by stabilizing phenoxide ion while presence of electron releasing group decreases the acidity of phenol by destabilizing phenoxide ion.

Thus, increasing acidic strength is **o-cresol < p-cresol < m-cresol < phenol < o-nitrophenol < 2, 4, 6-trinitrophenol (picric acid)**

Higher  $K_a$  and lower  $pK_a$  value corresponds to the stronger acid.

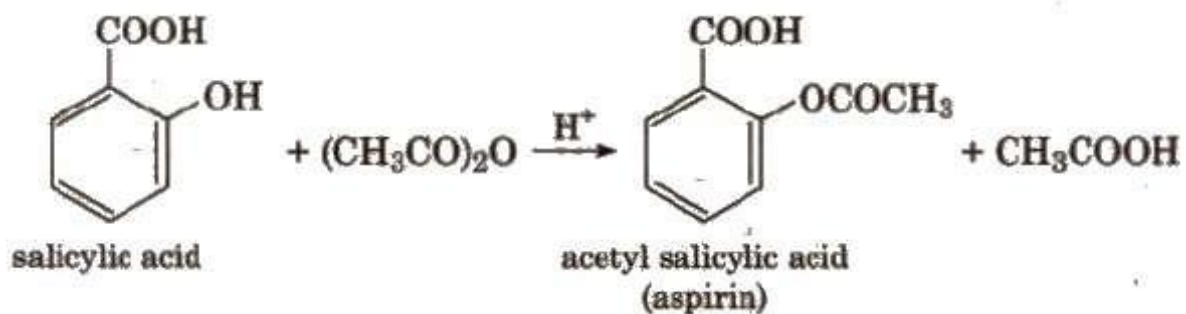
**(b) Esterification:** The reaction of an alcohol with carboxylic acid in presence of mineral acid produces an ester is called Esterification.



The reaction with  $R'COOH$  and  $(R'CO)_2O$  is reversible, so conc.  $H_2SO_4$  is used to remove water.

The reaction with  $R'COCl$  is carried out in the presence of pyridine so as to neutralise  $HCl$  which is formed during the reaction.

The introduction of acetyl ( $CH_3CO-$ ) group in phenols is known as acetylation. Acetylation of salicylic acid produces aspirin.



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