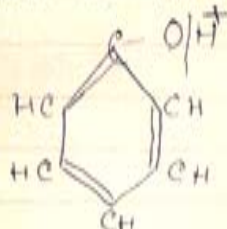


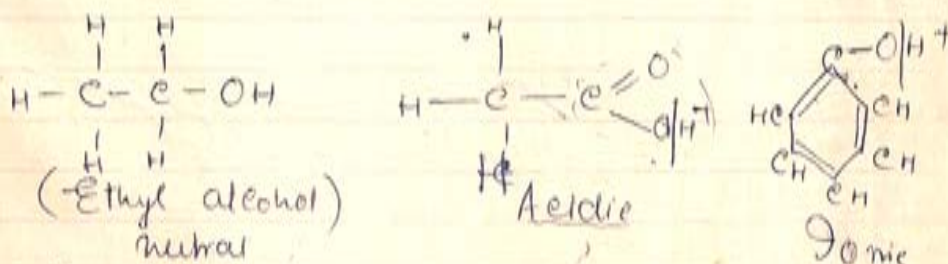


Why is phenol called Carboxylic acid although it does not contain $-COOH$ group? What do you mean by phenols? How is phenol prepared from Benzene and from Coal tar. Discuss its properties and mention the uses.

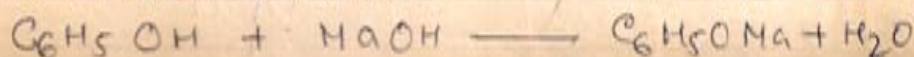


If we look at the structure of phenol very carefully we observe that the OH group is attached to a carbon atom which carbon is having a double bond therefore according to fundamental Chemistry the OH group is ionized into H^+ ion due to the presence of H^+ ion it is acidic in nature. According to modern theory (Bronsted Lowry) acid is called the donor of proton. So presence of H^+ ion indicates acidic character.

"Because of resonance character of Benzene Phenol shows acidic nature.

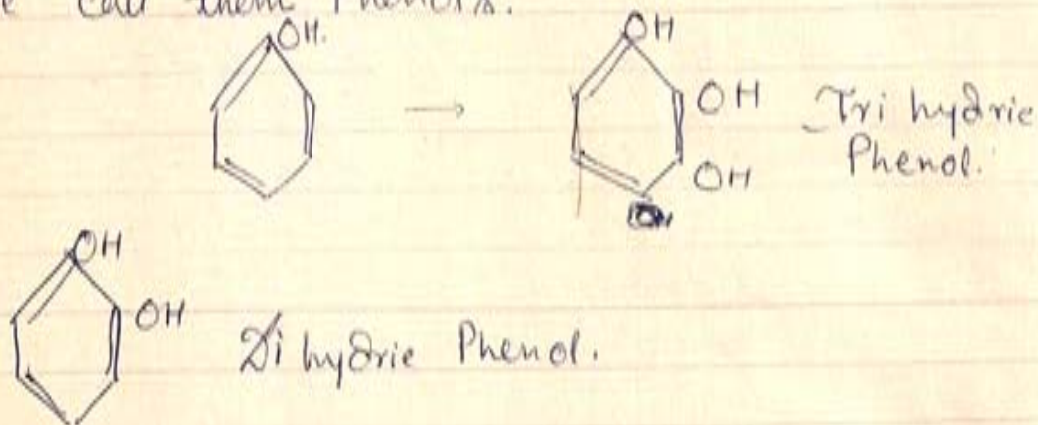


As Phenol is acid it forms Sodium Phenoxide with $NaOH$ Solution.



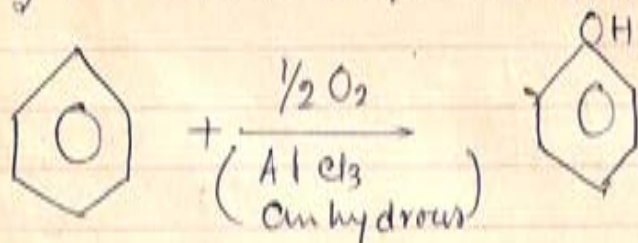


When ~~one~~ Two or more hydrogen atoms of Benzene are substituted by OH group we call them Phenols.

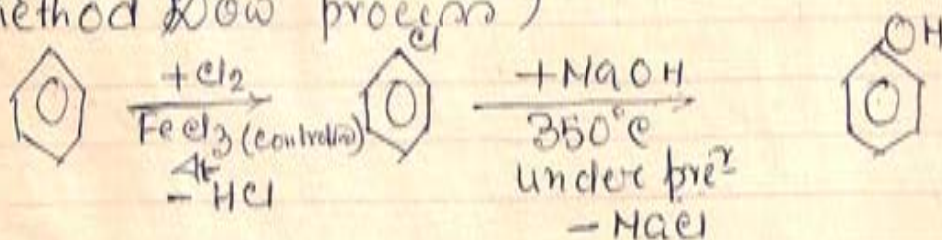


Preparation of Phenol

(1) From $C_6H_6 \rightarrow$ When C_6H_6 is heated with Oxygen in the presence of anhydrous $AlCl_3$ / Friedel Craft reaction we get Phenol.

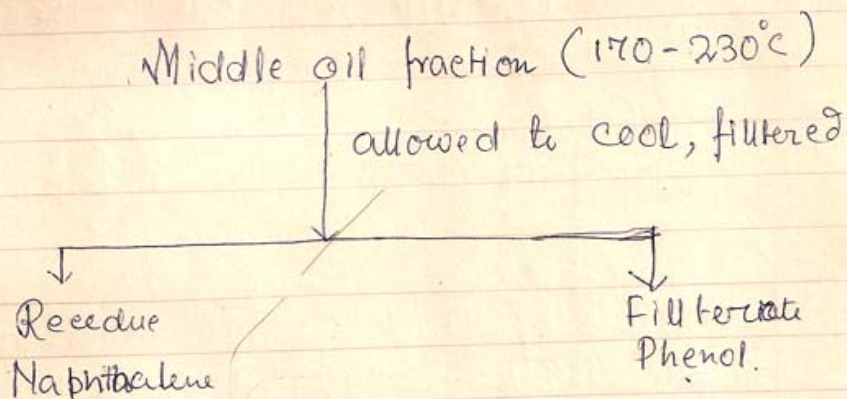


(2) When Benzene is chlorinated in a controlled way with Cl_2 in the presence of $FeCl_3$ catalyst we get Chloro Benzene. This Chloro Benzene is boiled with $NaOH$ under pressure at high temperature $350^\circ C$ we get phenol. (U.S.A method Dow process)





③ From Coal tar :-

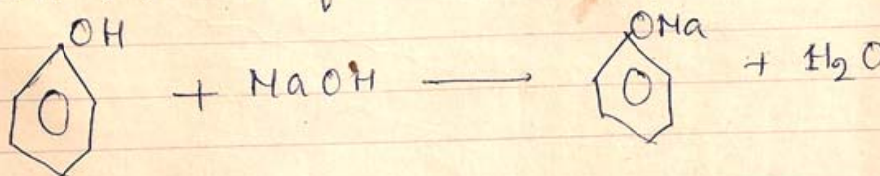


Physical properties

Phenol forms colourless needle-like crystals. Melting point only 43°C therefore at ordinary room temp^r it is a liquid. Insoluble in water but soluble in Alcohol and Ether. It turns brown on atmospheric oxidation due to long keeping. It is extremely poisonous when taken orally and it produces blisters in contact with skin.

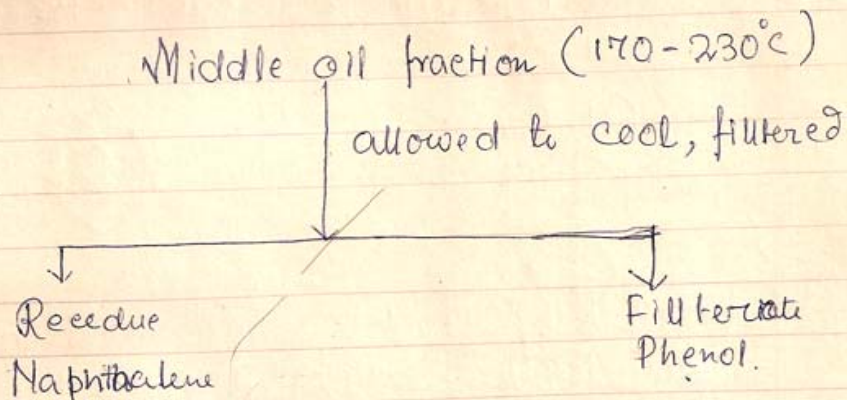
CHEMICAL PRO

① With NaOH solⁿ → When phenol is treated with NaOH solⁿ it forms Sodium phenolate.





③ From Coal tar :-

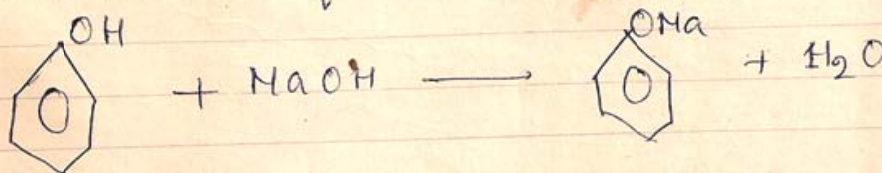


Physical properties

Phenol forms colourless needle-like crystals. Melting point only 41°C therefore at ordinary room temp^r it is a liquid. Insoluble in water but soluble in Alcohol and Ether. It turns brown on atmospheric oxidation due to long keeping. It is extremely poisonous when taken orally and it produces blisters in contact with skin.

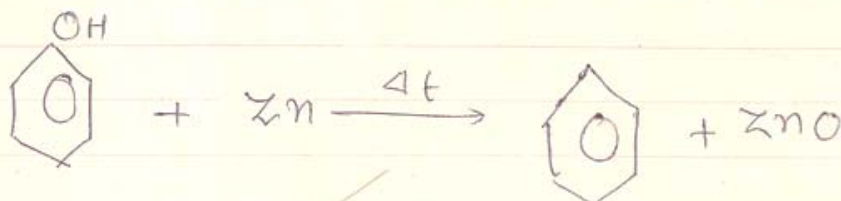
CHEMICAL PRO

① With NaOH solⁿ → When phenol is treated with NaOH solⁿ it forms Sodium phenolate.

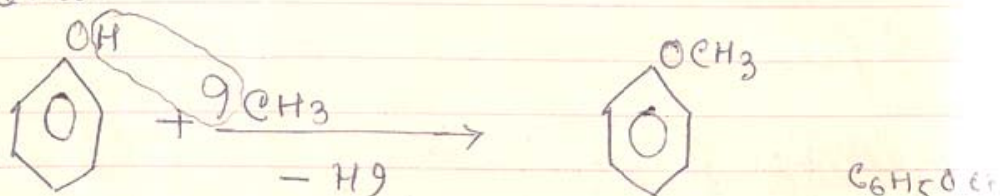




(2) With zinc dust \rightarrow (Zn + ZnO) When Phenol is heated with zinc dust Benzene is formed.



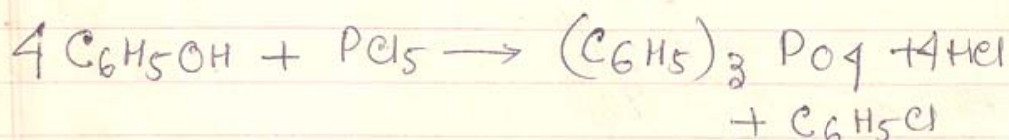
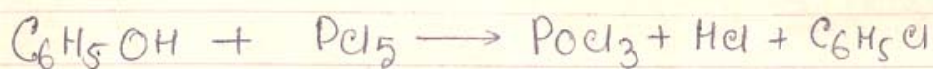
(3) With Methyl iodide \rightarrow When Phenol is treated with Methyl Iodide it forms Methyl Phenyl Ether.



Methyl Phenyl Ether

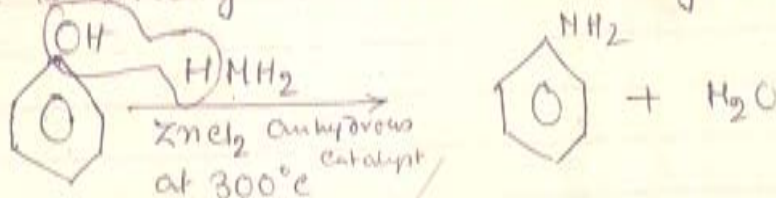
or Anisole (Goodman's)

Comp (A) With $\text{PCl}_5 \rightarrow$ It forms not only $\text{C}_6\text{H}_5\text{Cl}$ but also triphenyl phosphate.

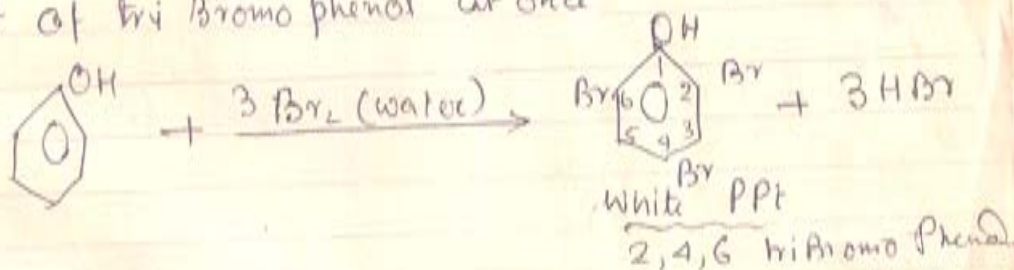




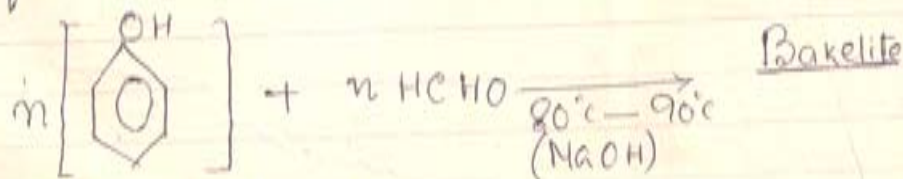
- ⑤ With $\text{NH}_3 \rightarrow$ On heating with NH_3 at 300°C in the presence of anhydrous ZnCl_2 catalysts it is directly converted into aniline.



- ⑥ With Br_2 water - When Phenol is treated with Bromine water at room temp^r we get white ppt of tri Bromo phenol at once



- ⑦ With Formaldehyde:- When phenol is mixed with formaldehyde under suitable condition of temp^r and pres^r we get Bakelite, a kind of plastic which is a polycondensation product of complex structure. This is used in plastic industry for switch board.



Uses of Phenol

- ① To make antiseptic soap like lifebuoy soap, Carbolic soap, ointment
- ② For preserving ink.
- ③ To make Bakelite plastic, medicine like aspirine, Salicylic acid, lucanol (Picric acid) etc.



Qr. Test of Phenol / OH group present in Benzene ring.

(1) When Bromine water is added we get white ppt of 2,4,6 tri Bromo phenol.

(2) With $FeCl_3$ solⁿ → When $FeCl_3$ Solⁿ is added to phenol it gives a violet-colour due to complex formation.

4/2/2017

Qr. Distinction between Aromatic and Aliphatic Compounds.

Properties/Reagent	Aromatic	Aliphatic
1. Status	Benzene and its derivative.	Straight chain compounds generally or methane & its derivative.
2. Percentage of Carbon	The percentage of Carbon is approximately 90% however Benzene has 92.3% Carbon.	The percentage of Carbon is less however hexane has 83.7% Carbon.
3. Reactivity	Comparatively less reactive.	More reactive than aromatic compounds.



(4)	Burning on a Copper Spoon.	Sooty flame is observe. (✓)	No sooty flame but burns with flame ^{none} luminous flame.
(5)	With Cone. HNO_3	Nitration is done easily.	Nitration is not done easily.
(6)	Sulphonation with Cone. H_2SO_4	Easily done.	Not possible.
(7)	Friedel Craft re^{20} and Diazotization.	occurs in aromatic compounds.	NO such reaction.
(8)	Hydroxide compounds	Are acidic in nature. (Phenol)	Form only alcohol which are neutral ($\text{C}_2\text{H}_5\text{OH}$)
(9)	Amines	Basic	More basic than aromatic.