

of phenols.

PHENOL (C_6H_5OH)

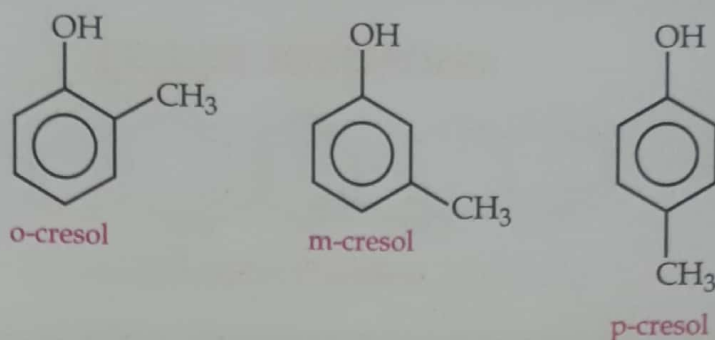


Phenol is also known as carbolic acid. It is an aromatic compound having molecular formula C_6H_5OH . The molecule consists of a phenyl group (C_6H_5) bonded to a hydroxy group ($-OH$). It is slightly acidic in nature; phenol has stronger hydrogen bonding compared to alcohol, so it is more soluble in water and has high boiling points. It occurs as either a colorless liquid or white solids at room temperature and may be highly toxic and caustic. Since the $-OH$ group in phenol is directly attached to the benzene ring, the $C-O$ bond is formed by the overlap of sp^2 -hybrid orbital of carbon with sp^3 -hybrid orbital of oxygen.

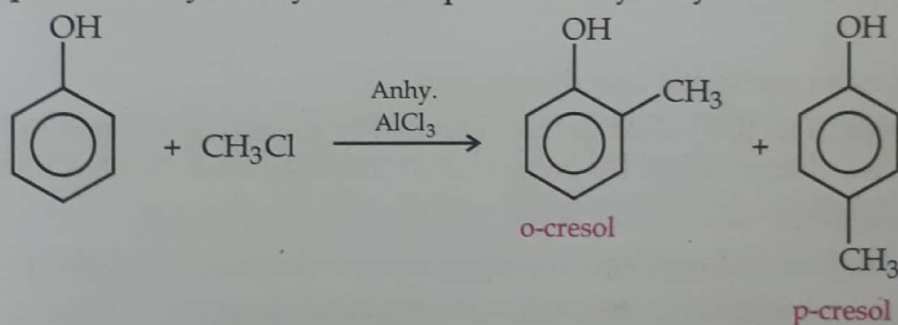
Uses :

1. It is used as a powerful antiseptic in soaps, lotion etc.
2. It is used to synthesize the bakelite plastic, resin etc.
3. Partial hydrogenation of phenol gives cyclohexanone which is a precursor of nylon.
4. Phenol is used for extraction of nucleic acid.
5. Condensation of phenol with acetone gives bisphenol which is used to synthesize various epoxide resins and polycarbonates.
6. Phenol is used in cosmetic industries in the manufacturing of sunscreens, skin lightening creams and hair coloring solutions.
7. It is also used in cosmetic surgery as an exfoliant, to remove layers of dead skin.
8. Medically it is used temporarily to treat the pharyngitis.
9. Phenol is used in the manufacturing of drugs like salol, aspirin, salicylic acid etc.
10. It is a component of industrial paint strippers used in the aviation industry for the removal of epoxy, polyurethane and other chemically resistant coating.
11. Phenol is used in manufacturing of picric acid (an explosive and a dye).
12. It is used as a preservative for ink.

CRESOLS (C_7H_8O)



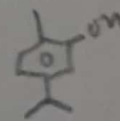
Cresols are organic compounds which are also known as hydroxy toluene or methyl phenols. Cresols are solid or liquid, depends upon temperature on long exposure to air they are oxidised and the impurities oftenly gives cresols a yellowish to brown red tint. Cresols have characteristic odour like phenols. In cresols structure methyl group substituted on to the ring of phenol. There are three isomers of cresol i.e. o-cresol, m-cresol and p-cresol. The mixture of these isomers of cresol is called tricresol. Cresol is extracted from coal tar or synthetically produced by methylation of phenol or hydrolysis of chlorotoluenes.



Exposure to cresol in high concentration can cause irritation and burning of skin, eyes, mouth and throat abdominal pain, vomiting, anemia, liver and kidney damage.

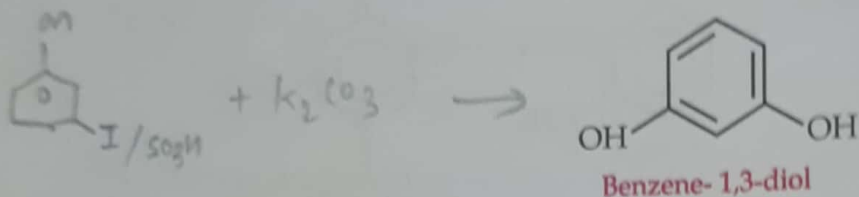
Uses :

1. Chlorination and etherification of o-cresol gives 2-methyl 4-chlorophenoxy acetic acid (MCPA) which is used as herbicides.
2. Alkylation of o-cresol gives carvacrol which is a strong antibacterial agent.
3. O-cresol is used in synthesis of muscle relaxant drug Mephenesin.
4. p-cresol is used in the production of butylated hydroxytoluene (BHT) which is an antioxidant.
5. m-cresol is a precursor for various compounds such as
 - a) Fenitrothion and fenthion used as pesticides.
 - b) Synthetic vitamin E.
 - c) Amylmetacresol used as antiseptic.
 - d) A solvent for polymers.
 - e) Preservative in some insulins.
 - f) Toliprolol and Tolamolol are beta adrenergic antagonist.



6. p-Cresol is used in synthesis of Bupranolol which is a non-selective beta blocker.
7. Chloro-m-cresol is used as household disinfectant.

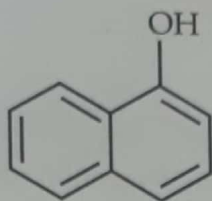
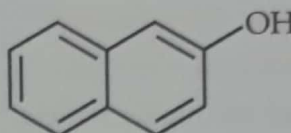
RESORCINOL ($C_6H_6O_2$)



It is 1,3-isomer of benzenediol. It is colorless, readily soluble in water, alcohol and ether but insoluble in chloroform and CS_2 . It reduces the Fehling's solution. It condenses with acid and acid chlorides to give resacetophenone. It condense readily with aldehyde to give form-aldehyde. It undergoes electrophilic as well as nucleophilic substitution reactions. Synthetically it is produced by melting 3 iodophenol or phenol-3-sulfonic acid with potassium carbonate or by the action of nitrous acid on 3-aminophenol. Resorcinol will become pink upon exposure to light and air or contact with iron. It has a sweet taste. On exposure to Resorcinol, irritation on skin and mucous membrane can occur.

Uses :

1. It is used as an antiseptic and disinfectant.
2. It's ointment (5 to 10%) used in the treatment of psoriasis, eczema and hidradenitis (skin disease characterized by occurrence of inflamed and swollen lumps).
3. It's 2% solution is used in hay fever and in whooping cough.
4. It is also used in anti-dandruff shampoo or in sunscreen cosmetics.
5. It has been also employed in treatment of gastric ulcer.
6. It has also having analgesic effect so used as an ingredient in some drugs like Resinol, Vagisil and clearasil.
7. It is used in the production of diazodyes and plasticizers and as a UV absorber in resin.
8. Resorcinol is used as an analytical reagent for determination of Ketoses sugar.
9. Resorcinol is mainly used for the field of rubber adhesives and synthetic resins.
10. It can be used for making glue silk and the adhesive agent of tire cord for nylon-purpose, making wood glue and adhesive for vinyl material.
11. It can be used for characterisation and determination of zinc, lead, tartaric acid through colorimetric method.
12. Resorcinol has bactericidal effects and can be used as preservatives in cosmetics and dermatological drugs.
13. It is also used as a parent molecule in supramolecular chemistry, holding the target molecules in proper alignments for reactions.

NAPHTHOLS ($C_{10}H_7OH$)**1- naphthol****2- naphthol**

Naphthol is composed of a hydroxyl group bonded to a naphthalene ring. It can exist as one of two isomers i.e. 1-naphthol and 2-naphthol. These two isomers differ by which carbon in the naphthalene ring, the hydroxyl group is bonded to. Being its aromatic nature it has alternating double and single bonds throughout its rings. Due to more electronegativity of oxygen, than both carbon and hydrogen, naphthol is highly polar in nature. 1-naphthol (α -naphthol) is a white solid, fluorescent compound and soluble in alcohols, ethers and chloroform. 2-naphthol (β -naphthol) is a colorless or yellow crystalline solid, fluorescent having same solubility as 1-naphthol.

Uses :

1. 1-Naphthol is an ingredient of Molisch's reagent which is used for detecting the presence of carbohydrates.
2. 1-Naphthol is a precursor of variety of insecticides like carbaryl.
3. 1-Naphthol is used to detect the presence of arginine in proteins by Sakaguchi test.
4. 1-Naphthol is used to detect the breakdown of glucose into acetoin, which is used by bacteria for external energy storage, by voges-proskauer test.
5. 2-Naphthol is precursor for preparation of Sudan dyes (used as dyes for various plastics and to stain sudanophilic biological samples usually lipids).
6. 2-Naphthol is used for synthesis of BINOL which is used as ligand for transition metal catalysed synthesis.
7. 2-Naphthol is also used as an antiseptic, in perfumes, synthesis of fungicides and antioxidants for rubber.
8. Detection of α and β naphthol in urine, results pesticides content in the body, mainly the chlorpyrifos pesticide.

SHORT ANSWER TYPE QUESTIONS

- Q.1. Write a short note on structure of phenol.
- Q.2. What are phenols? How do they differ structurally from aromatic alcohols?
- Q.3. How can phenol be prepared from benzene sulphonic acid?
- Q.4. What happens when-
- Sodium benzene sulphonate is heated with NaOH
 - Sodium phenate is treated with methyl iodide
 - Phenol is heated with benzoyl chloride
 - Phenol is heated with zinc
 - Phenol is treated with bromine water
 - Phenol is heated with phthalic anhydride
- Q.5. Give the mechanism of Reimer-Tiemann reaction.
- Q.6. Write a note on Fries rearrangement.
- Q.7. How phenol is used to prepared the following :
- Salicylic acid
 - Benzene
 - p-hydroxy benzene
 - Picric acid
- Q.8. How do you explain acidic nature of phenols?
- Q.9. What is Kolbe's reaction? Explain its mechanism.
- Q.10. Explain claisen rearrangement.
- Q.11. Give two examples of electrophillic substitution in phenol.
- Q.12. Write a detailed note on Gattermann's synthesis.
- Q.13. How will you prepare phenol phthalein from phenol.
- Q.14. How is phenol prepared from cumene?