

### EXERCISE: 11-A

- How do you obtain phenol from (i) Benzene (ii) Toluene (iii) Chlorobenzene (iv) Nitrobenzene?
- Show your familiarity with
  - Reimer-Tiemann reaction
  - Schotten-Baumann reaction
  - Dow process
  - Diazotisation
  - Diazocoupling reaction
  - Kolbe's reaction
  - Diazo-coupling test
- What happens when phenol is
  - Treated with aqueous bromine?
  - Treated with aqueous ferric chloride?
  - Treated with a small piece of sodium?
  - Treated with benzene diazonium salt in slightly alkaline pH?
- Which organic compound is formed when diazotized solution of aniline is hydrolysed?
- Which organic compound is formed when diazotized solution of aniline is treated with phenol?

### EXERCISE: 11-B

- Account for the followings;
  - p*-nitrophenol is more acidic than phenol
  - p*-cresol is less acidic than phenol
- Suggest a suitable laboratory chemical test to distinguish phenol from
  - Benzic acid
  - Salicylic acid
  - Formic acid
  - Acetic acid
  - Picric acid
  - Formaldehyde
  - Acetone
  - Ethanol
  - Chlorobenzene
  - Benzene
- Give reason;
  - Phenol turns moist blue litmus into faint red.
  - Phenol changes its colour on standing in air.
- Why is  $-OH$  group in phenol ortho- and para-directing towards electrophilic substitution reaction?

### EXERCISE: 11-C

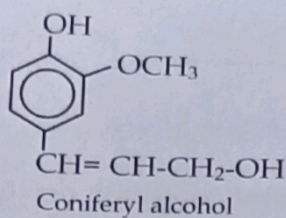
- An aromatic compound A on reduction gives parent hydrocarbon B. B on nitration gives C. C on reduction in acidic solution gives D. On coupling with diazonium salt, D gives *p*-aminoazobenzene. Identify A, B, C and D writing related reactions.

An organic compound A with a molecular formula  $C_6H_6O$  gives a parent hydrocarbon B. The compound A responds to  $FeCl_3$  test. The compound B can also be obtained by the polymerisation of acetylene. Identify A and B writing related reactions. Why is compound A slightly acidic?

An organic compound A reacts with caustic soda at about  $350^\circ C$  under high pressure which on acidification gives B. B reacts with aqueous bromine to give C. C on heating with Zn dust produces 1,3,5-tribromobenzene. Identify A, B and C with necessary chemical reactions.



- 3 About 20-30 % by weight of a dry wood is lignin. Lignin is phenolic polymer formed by cross linking of different monomers. Coniferyl alcohol is one of the precursors. Based on the given molecular structure,

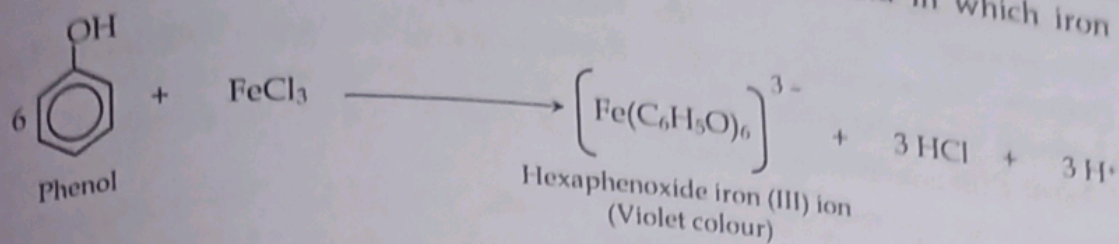


- (a) Encircle all functional groups present in coniferyl alcohol.
- (b) What organic product would you expect when it is treated with aqueous NaOH?
- (c) What product is obtained when product obtained in (b) reacts with methyl iodide?
- (d) Researches have shown that lignin protects wood from microbial attack. Based on structure of coniferyl alcohol, comment on this research finding.
4. Components of a mixture of two aromatic compounds (A) and (B) were dissolved in  $\text{CHCl}_3$  followed by the extraction with aq. KOH solution. The organic layer containing (A) when heated with alcoholic solution of KOH produces (C) ( $\text{C}_7\text{H}_5\text{N}$ ) associated with an unpleasant odour. The alkaline aqueous layer containing (B), on the other hand, when heated with  $\text{CHCl}_3$  followed by acidification gave a mixture of two isomeric compounds (D) and (E) with the molecular formula  $\text{C}_7\text{H}_6\text{O}_2$ . Identify the compounds (A) to (E), writing related reactions.

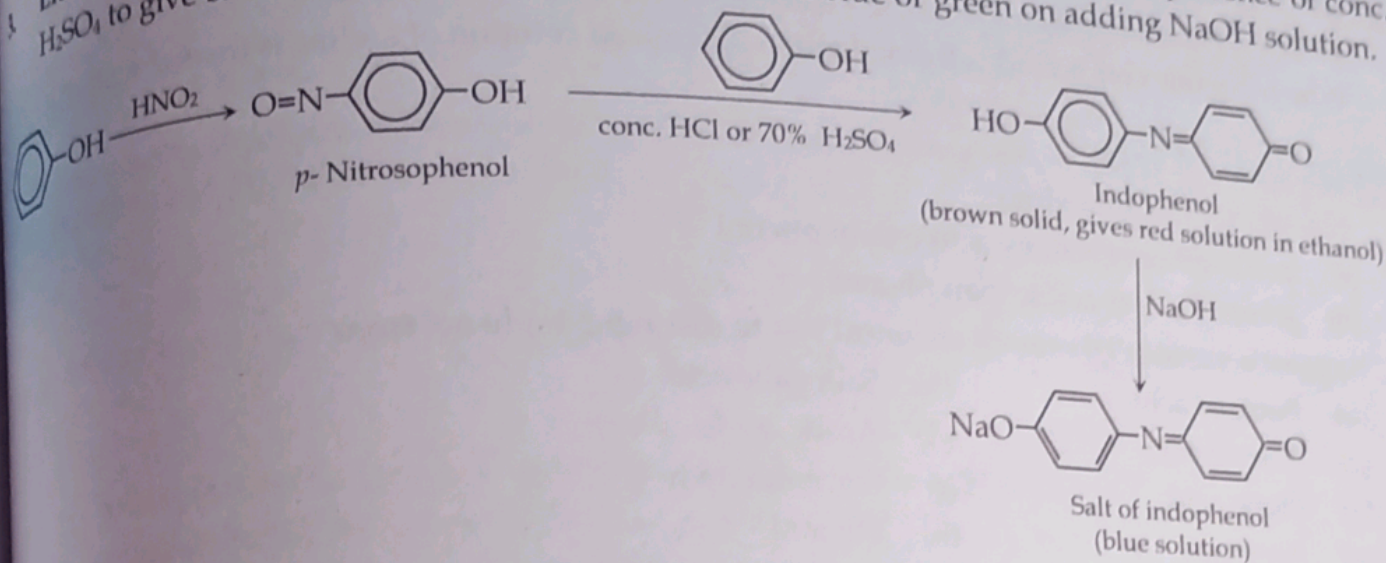
**EXERCISE: 11-E (Multiple Choice Questions)**

## 11.6 Tests for Phenols

1. **Solubility test:** A water insoluble compound soluble in aqueous NaOH but insoluble in  $\text{NaHCO}_3$  is most likely a phenol.
2. **Ferric chloride test:** Phenol reacts with  $\text{FeCl}_3$  solution to give green, blue, violet or red coloured water soluble complex. It is a coordination compound in which iron is hexa covalent.



3. **Libermann's test:** Many phenols react with nitrous acid ( $\text{NaNO}_2 + \text{H}_2\text{SO}_4$ ) in presence of conc.  $\text{H}_2\text{SO}_4$  to give brown and red colour which becomes a blue or green on adding NaOH solution.



**Self Test: 11.13** Suggest a suitable chemical test to distinguish phenol from: (a) Ethanol (b) Formaldehyde

## 11.7 Uses of Phenol

1. Large quantities of phenol are used for the preparation plastic materials such as bakelite.
2. For the manufacture of dyes, drugs, explosives, etc.
3. For the preparation of phenolphthalein.
4. As disinfectant and germicides.