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T.D.C. Part-I (Hons)

**\* Structure and reactivity:**

Methyl amine both nitrogen and carbon are SP3 hybridised.

One of the SP3 orbital of nitrogen is completely filled and cannot take part in bond formation. The C-N $σ$ bond in methyl amine is formed by overlap of an SP3 orbital of carbon and an SP3 orbital of nitrogen.

Each N-H $σ$ bond is formed by the overlap of an SP3orbital of nitrogen and S-orbital of hydrogen. Each C-H $σ$ bond is formed by overlap of an SP3 orbital of carbon and S-orbital of hydrogen.

 H ..

 C N

 H H

 H H

**Separation of Amines:**

Primary,secondary and tertiary amines can be separated by the following methods:

1. Fractional Distillation
2. Hinsberg Method
3. **Fractional Distillation:** The boiling point of primary,secondary and tertiary amines are quite different i.e.,the boiling point of C2H5 NH2 is 290 K,( C2H5 )2NH is 329K and (C2H5 )3N is 310K and thus ,these can be separated by fractional distillation.

C2H5 NH2  ( C2H5 )2NH (C2H5 )3N

1$°$ amine 2$°$ amine 3$°$ amine

1. 329K 310K
2. Hinsberg Method: The separation of amines is performed by Hinsberg method.For this,benzene sulphonyl chloride is used .Primary amine reacts with benzene sulphonyl chloride to give a base soluble compound.Secondary amine reacts with benzene sulphonyl chloride to give a base insoluble product .Tertiary amine does not react with benzene sulphonyl chloride due to the lack of replaceable hydrogen.The reaction have been illustrated below: H

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 O - SO2Cl + H N R → O -SO2-N-R

Benzene | base soluble product

Sulphonyl H

chloride 1$°$ amine

 H K

 | |

 O -SO2-N-R + KOH → O -SO2-N-R + H2O

 O O

 || ||

O -S-Cl + R2NH → O -S-N-R

 || || |

 O O R

The reaction mixture obtained after treatment with benzene sulphonyl chloride in presence of KOH is now distilled.The tertiary amine distils off first .The rest mixture is filtered and the filtrate on acidification yield the sulphonamide are the primary amine ,while the solid residue is the sulphonamide are then hydrolysed with HCl to give primary and secondary amines which are then fractionally distilled.

 O O

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 O -S-NH-R + H.OH $→$ O -S-OH + R-NH2

 || || 1$°$amine

 O O

N-alkyl benzene sulphonamide benzene sulphonic acid

 O O

 || ||

 O -S-N-R $→$ O -S-OH + R2-NH

 || | || sec.amine

 O R O

N,N Dialkyl benzene sulphonic acid

sulphonamide

**Preparation and properties of aliphathic amines**

 **Methyl amine**

 **H**

 **| H**

 **SF:** H-C-N

 | H

 H

 **MF:** CH5N or CH3NH2

 **FG:** -NH2

 **IUPAC NAME:**Amino methane or Methanamine

 **Preparation:**

**1.Hofmann Bromide reaction:** Acetamide reacts with Br2 and NaOH and then gives Methyl amine.

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CH3-C-NH2 + Br2 + + 4NaOH → CH3-NH2 + 2NaBr + Na2CO3 + 2H2O

 Acetamide Methyl amine

**2.** On reduction with HCN in presence C2H5OH/Na then gives Methyl amine.

 H

 | H

H-C$≡$N + 4(H) $→$ H-C-N

 | H

 H

 Methyl amine

**Properties:**

1. It is gases.
2. It is colourless.

3.Amine are soluble in water.

1. **Reaction with HNO2 :** Methyl amine reacts with HNO2 and then gives methyl alcohol.

CH3NH2 + HO.NO → CH3-OH + N2 + H2O

1. **Reaction with methyl chloride:** Methyl amine reacts with methyl chloride and then give dimethyl amine.

CH3NH2 + Cl-CH3 → CH3-NH-CH3 + HCl

1. **Reaction with Grignard reagent:** Methyl amine reacts with Grignard reagent and then give methane.

CH3NH2 + CH3-Mg-Br → CH3-H + CH3NH-MgBr

1. **Reaction with HCl:** Methyl amine reacts with HCl and then give methyl ammonium chloride.

CH3NH2 + HCl → CH3-NH3+-Cl-

1. **Carbylamine reaction:** Methyl amine reacts with chloroform and KOH and then give methyl isocyanide.

CH3-NH2 + HCCl3 + 3KOH $→$ CH3-N=C + 3KCl + 3H2O

1. **Reaction with Acetyl Chloride :** Methyl amine reacts with acetyl chloride and then give N-methyl acetamide.

CH3-NH2 + Cl-CO-CH3 → CH3-NH-CO-CH3 + HCl

**Uses:**

1. It is uses in rubber industries.
2. It is uses in preparation of medicine.