

## Exercises

ONLY the (✓) mark questions.

13.1 Write IUPAC names of the following compounds and classify them into primary, secondary and tertiary amines.

- |   |  |   |
|---|--|---|
| (i) $(\text{CH}_3)_2\text{CHNH}_2$          | (ii) $\text{CH}_3(\text{CH}_2)_2\text{NH}_2$ | (iii) $\text{CH}_3\text{NHCH}(\text{CH}_3)_2$ |
| (iv) $(\text{CH}_3)_3\text{CNH}_2$          | (v) $\text{C}_6\text{H}_5\text{NHCH}_3$      | (vi) $(\text{CH}_3\text{CH}_2)_2\text{NCH}_3$ |
| (vii) $m\text{-BrC}_6\text{H}_4\text{NH}_2$ |  |   |

13.2 Give one chemical test to distinguish between the following pairs of compounds.

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| (i) Methylamine and dimethylamine | (ii) Secondary and tertiary amines |
| (iii) Ethylamine and aniline      | (iv) Aniline and benzylamine       |
| (v) Aniline and N-methylaniline.  |                                    |

13.3 Account for the following:

- $\text{p}K_b$  of aniline is more than that of methylamine.
- Ethylamine is soluble in water whereas aniline is not.
- Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.
- Although amino group is *o*- and *p*- directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of *m*-nitroaniline.
- Aniline does not undergo Friedel-Crafts reaction.
- Diazonium salts of aromatic amines are more stable than those of aliphatic amines.
- Gabriel phthalimide synthesis is preferred for synthesising primary amines.

13.4 Arrange the following:

- In decreasing order of the  $\text{p}K_b$  values:  
 $\text{C}_2\text{H}_5\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{NHCH}_3$ ,  $(\text{C}_2\text{H}_5)_2\text{NH}$  and  $\text{C}_6\text{H}_5\text{NH}_2$
- In increasing order of basic strength:  
 $\text{C}_6\text{H}_5\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$ ,  $(\text{C}_2\text{H}_5)_2\text{NH}$  and  $\text{CH}_3\text{NH}_2$
- In increasing order of basic strength:  
(a) Aniline, *p*-nitroaniline and *p*-toluidine

- (b)  $C_6H_5NH_2$ ,  $C_6H_5NHCH_3$ ,  $C_6H_5CH_2NH_2$ .
- (iv) In decreasing order of basic strength in gas phase:  
 $C_2H_5NH_2$ ,  $(C_2H_5)_2NH$ ,  $(C_2H_5)_3N$  and  $NH_3$
- (v) In increasing order of boiling point:  
 $C_2H_5OH$ ,  $(CH_3)_2NH$ ,  $C_2H_5NH_2$
- (vi) In increasing order of solubility in water:  
 $C_6H_5NH_2$ ,  $(C_2H_5)_2NH$ ,  $C_2H_5NH_2$ .

13.5 How will you convert:

- Ethanoic acid into methanamine
- Hexanenitrile into 1-aminopentane
- Methanol to ethanoic acid
- Ethanamine into methanamine
- Ethanoic acid into propanoic acid
- Methanamine into ethanamine
- Nitromethane into dimethylamine
- Propanoic acid into ethanoic acid?

13.6 Describe a method for the identification of primary, secondary and tertiary amines. Also write chemical equations of the reactions involved.

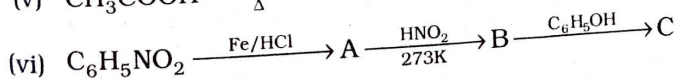
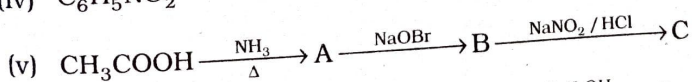
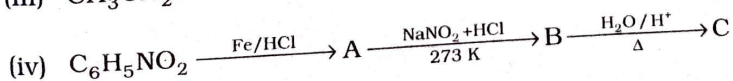
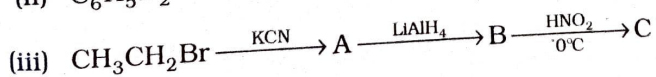
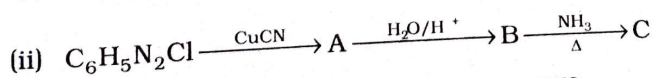
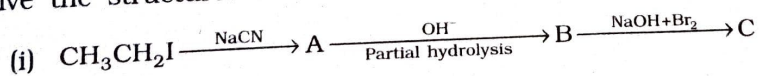
13.7 Write short notes on the following:

- Carbylamine reaction
- Diazotisation
- Hofmann's bromamide reaction
- Coupling reaction
- Ammonolysis
- Acetylation
- Gabriel phthalimide synthesis.

13.8 Accomplish the following conversions:

- Nitrobenzene to benzoic acid
- Benzene to *m*-bromophenol
- Benzoic acid to aniline
- Aniline to 2,4,6-tribromofluorobenzene
- Benzyl chloride to 2-phenylethanamine
- Chlorobenzene to *p*-chloroaniline
- Aniline to *p*-bromoaniline
- Benzamide to toluene
- Aniline to benzyl alcohol.

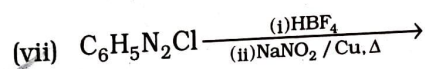
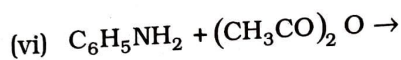
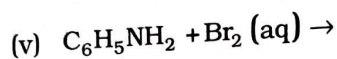
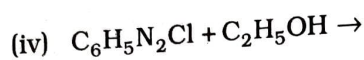
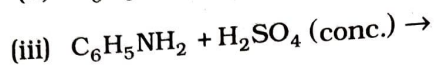
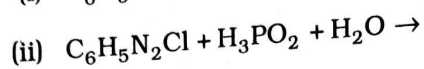
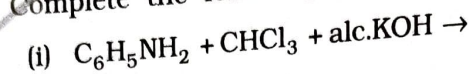
13.9 Give the structures of A, B and C in the following reactions:





**13.10** An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound 'B' which on heating with  $\text{Br}_2$  and  $\text{KOH}$  forms a compound 'C' of molecular formula  $\text{C}_6\text{H}_7\text{N}$ . Write the structures and IUPAC names of compounds A, B and C.

**13.11** Complete the following reactions:



**13.12** Why cannot aromatic primary amines be prepared by Gabriel phthalimide synthesis?

**13.13** Write the reactions of (i) aromatic and (ii) aliphatic primary amines with nitrous acid.

**13.14** Give plausible explanation for each of the following:

- Why are amines less acidic than alcohols of comparable molecular masses?
- Why do primary amines have higher boiling point than tertiary amines?
- Why are aliphatic amines stronger bases than aromatic amines?

### Answers to Some Intext Questions

