

## 1.8 Amines and Amides

### Amines

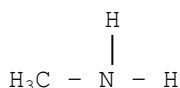
- Amines are compounds with made with ammonia where 1, 2, or all of the hydrogen have been replaced by alkyl groups.



- General formula:  $\text{RN(R')R''}$
- Formed from the decomposition of proteins and usually have a distinct odour.
- Can be 1°, 2°, or 3°

### Naming Amines

- $\text{CH}_3\text{NH}_2$



- Method 1: as a nitrogen derivative of an alkane. E.g. aminomethane
  - Method 2: as an alkyl derivative of ammonia. E.g. methylamine
- Examples:
    - 1-aminobutane or butylamine (1°)

b) 3-aminohexane (1°)

c) *N*-methyl-1-aminobutane or butyl-methylamine (2°)

d) *N,N*-dimethyl-aminomethane or trimethylamine (3°)

e) 1,4-diaminobutane (1°)

### Properties of Amines

- The N – C bond and the N – H bonds create a polar molecule and the N – H also forms hydrogen bonds.
- Amines have a higher boiling point than the parent alkane but a slightly lower boiling point than a similar alcohol (O– H is more polar than N– H).

### Preparing Amines

- Amines are formed by the reaction of ammonia (a weak base) with an alkyl halide.
- E.g. ethyl iodide + ammonia  $\rightarrow$  ethylamine (aminoethane) + hydrogen iodide

- If the above reaction were allowed to continue, a 2° and a 3° amine would eventually be produced.

### Amides

- Similar to esters, except the alcohol is replaced by an amine.
- Amide bonds are called peptide bonds and are important in the formation of proteins.

- General formula: 
$$\begin{array}{c} \text{O} \quad \text{R}'' \\ \parallel \quad | \\ \text{R} - \text{C} - \text{N} - \text{R}' \end{array} \quad \text{RCON(R'')R}'$$

### Naming Amides

- Similar to esters, instead of -oate, use -amide.
- E.g. ethanamide

### Preparing Amides

- E.g. ethanoic acid + ammonia  $\rightarrow$  ethanamide + water
  
- E.g. butanoic acid + methylamine  $\rightarrow$  *N*-methyl-butanamide + water
  
- E.g. butanoic acid + *N*-methyl-aminomethane  $\rightarrow$  *N,N*-dimethyl-butanamide

### Properties of Amides

- Amides are weak bases and generally insoluble in water.

### Reactions of Amides

- A hydrolysis reaction will convert an amide back into a carboxylic acid and amine. However, the amide linkage is very resistant to hydrolysis, which is a good thing since this bond is essential in producing stable proteins.

### Homework

- Practice 1,2,3,4,5,6,7,8
- Questions 1,3,4,5