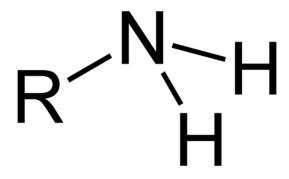
# Amines and Amides

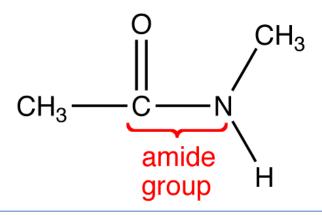
Chapter 1.7

### **Amines and Amides**

- Amines and amides both contain nitrogen (N)
- An amine is an organic compound, related to ammonia, that contains a nitrogen atom bonded to one or more alkyl groups on each molecule

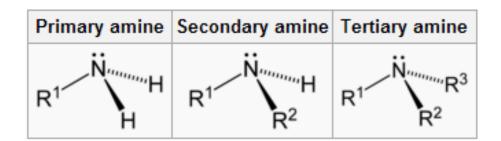


 An amide is an organic compound that contains a carbonyl group bonded to a nitrogen atom



## Classifying Amines

 Amines can be classified as primary secondary or tertiary



## Naming Amines

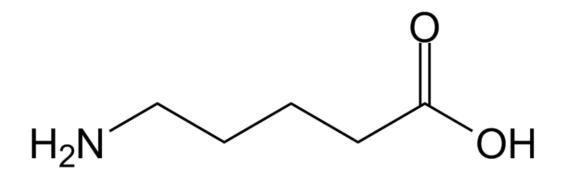
- Use the suffix –amine
- It may be necessary to include a number in the suffix to indicate which carbon group the amine is attached to

### Naming Amines

 Secondary and tertiary amines are named using the locator, N, to indicate the attachment of additional chains to the nitrogen atom

### Naming Amines

- Sometimes it is necessary to name the amine group as a branch
- In this case the prefix amino- is used

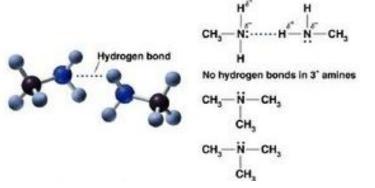


## **Properties of Amines**

Amines are polar and some can hydrogen bond

Amines have higher melting and boiling points than their

corresponding alkanes



Can you explain the trend below?

(a) 
$$CH_3 - CH_2 - CH_2 - NH_2$$
 (b)  $CH_3 - CH_2 - NH - CH_3$  (c)  $CH_3 - N - CH_3$ 

o) 
$$CH_3 - CH_2 - NH - CH_3$$

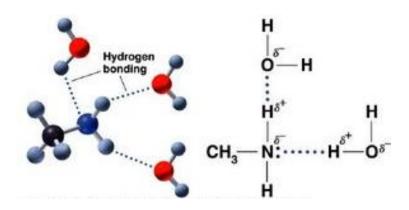
primary amine b.p. 49 °C

secondary amine b.p. 37 °C

tertiary amine b.p. 3 °C

## **Properties of Amines**

Small amines are soluble in water



## Reactions Involving Amines

Amines behave as weak bases in water

$$\begin{array}{c} \mathsf{CH_3} \\ \\ \mathsf{CH_3} \\ \\ \mathsf{N} \\ \mathsf{I} \\ \\ \mathsf{CH_3} \end{array} + \ \mathsf{H}_2\mathsf{O} \longrightarrow \begin{array}{c} \mathsf{CH_3} \\ \\ \\ \mathsf{CH_3} \\ \\ \\ \mathsf{CH_3} \end{array} + \ \mathsf{O} \ \mathsf{H}^+ + \ \mathsf{O} \ \mathsf{H}^-$$

Amines can undergo neutralization reactions with acid

$$H_3C$$
  $\rightarrow$   $H_3C$   $\rightarrow$   $H_3C$   $\rightarrow$   $H_3C$ 

### Reactions Involving Amines

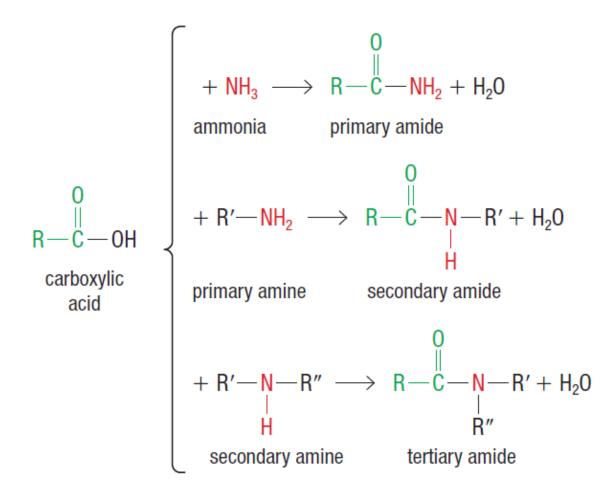
Primary amines can be synthesized by reacting an alkyl halide with ammonia

Secondary amines require an alkyl halide and a primary amine

Tertiary amines require an alkyl halide and a secondary amine

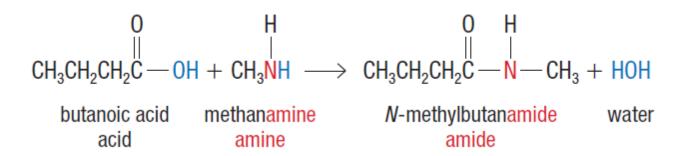
### From Amines to Amides

 Amides can be synthesized by the condensation reaction of a carboxylic acid with ammonia or a primary or secondary amine



## Naming Amides

- Use the suffix –amide
- Recall that amides are synthesized from the reaction of an amine with a carboxylic acid
  - The first part of the name comes from the amine
  - The second part of the name comes from the carboxylic acid



### **Practice**

Name the following:

Draw a structural diagram for:

3-chloro-4-methylpentanamide

## Properties of Amides

- Amides are weak bases
- Low molecular weight amides are soluble in water
- Amides that have the ability to hydrogen bond will have higher melting and boiling points

## Reactions Involving Amides

- Amides can undergo a hydrolysis reaction (the reverse of condensation) to form an amine (or ammonia) and a carboxylic acid
- This reaction can take place under acidic or basic conditions

$$R - C - N - R' + H_2O + HCI \longrightarrow R - C - OH + H - N^{+} - R' CI^{-}$$

$$R - C - N - R' + H_2O + HCI \longrightarrow R - C - OH + H - N^{+} - R' CI^{-}$$

$$R - C - N - R' + NaOH \longrightarrow R - C - O - Na^{+} + H - N - R'$$

### **HOMEWORK**

#### Required Reading:

p. 56-62

#### **Questions:**

p. 58 #1-2

p. 60 #1-2

p. 62 #1-6

	The Periodic Table According to Organic Chemists																
1 <b>H</b> 10079																	C 12.011
C 12.011	C 12.011						5 C 12.011	6 C 12.011	7 N 14,007	8 O 15,999	9 <b>F</b> 18,999	10 C 12.011					
11 C 12.011	12 C 12.011						13 C 12.011	14 C 12.011	15 C 12.011	16 C	17 Cl 35,450	18 <b>C</b>					
19 <b>C</b>	20 <b>C</b>	21 <b>C</b>	22 <b>C</b>	23 <b>C</b>	24 <b>C</b>	25 <b>C</b>	26 <b>C</b>	27 <b>C</b>	28 <b>C</b>	29 <b>C</b>	°C	31 <b>C</b>	32 <b>C</b>	33 C	34 <b>C</b>	35 Br	38 C
12.011	12.011	12.011	12.011	12.011	12.011	12.011	12.011	12.011	12.011 48	12.011	12.011	12.011	12.011	12.011	12.011 52	79.904 53	12.011
C 12.011	C 12.011	C 12.011	C 12.011	C 12.011	C 12.011	C 12.011	C 12.011	C 12.011	C 12.011	Č 12.011	C 12.011	C 12.011	C 12.011	C 12.011	C 12.011	I 126.90	C 12,011
55 C 12.011	58 C 12,011	71 <b>C</b> 12.011	72 <b>C</b>	73 <b>C</b>	74 C 12.011	75 <b>C</b>	76 C 12.011	77 C 12.011	78 <b>C</b> 12.011	79 <b>C</b>	80 C 12,011	81 C	82 C 12.011	83 C 12,011	84 C 12.011	85 C 12.011	88 C 12.011
87 C 12.011	88 C 12.011	103 <b>C</b> 12.011	104 <b>C</b> 12.011	105 C 12.011	108 C 12.011	107 <b>C</b> 12.011	108 C 12.011	109 C 12.011	110 <b>C</b>		.2.011	12.211		-2.011	12.511	12.011	