

Unnumbered 2 p19

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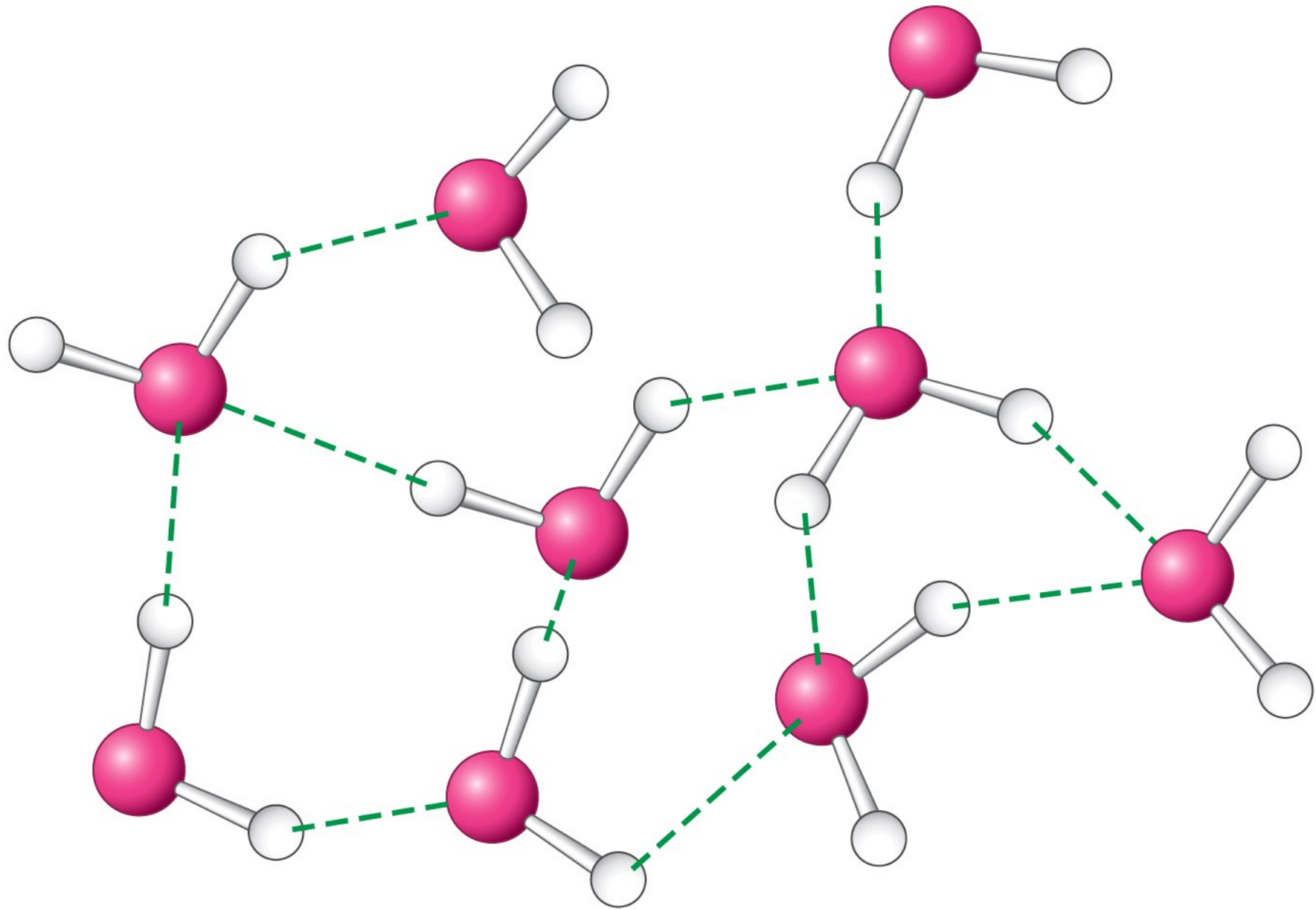


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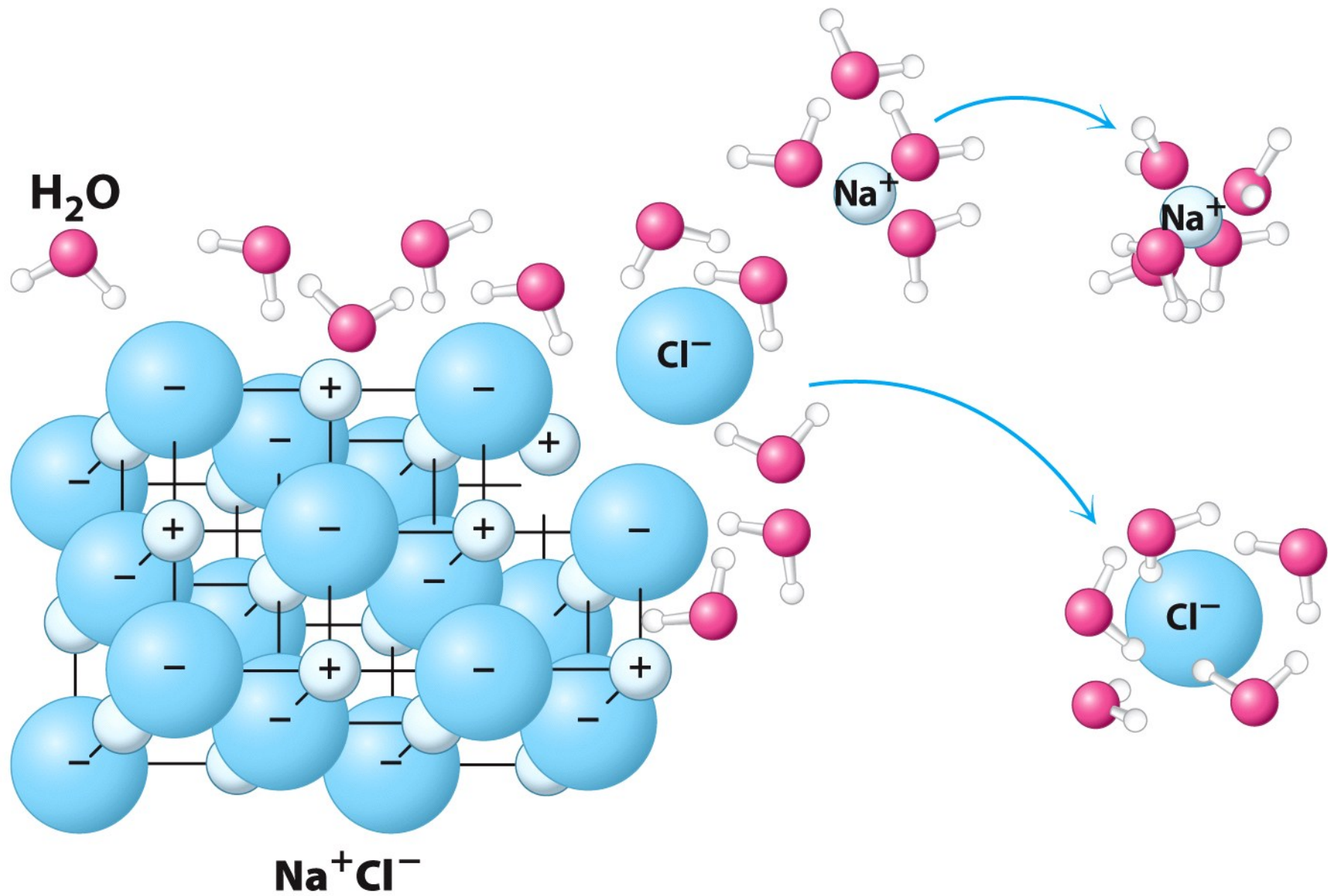
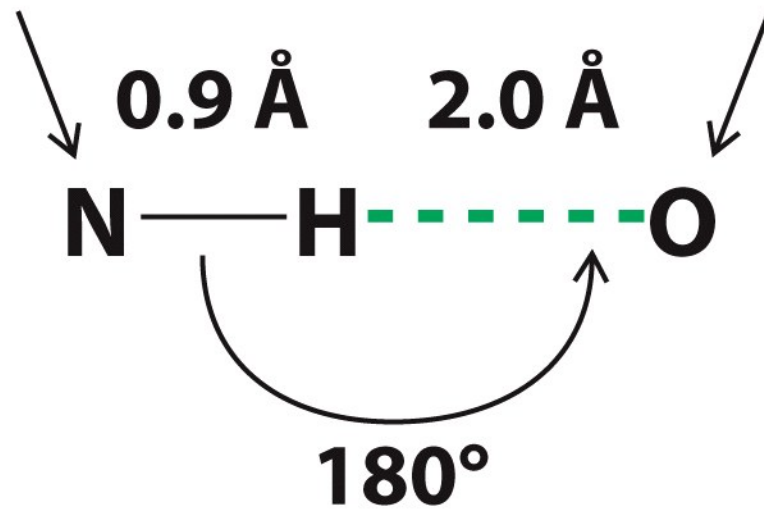


Figure 2.3
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Hydrogen-bond donor

Hydrogen-bond acceptor



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Hydrogen-bond donor

Hydrogen-bond acceptor

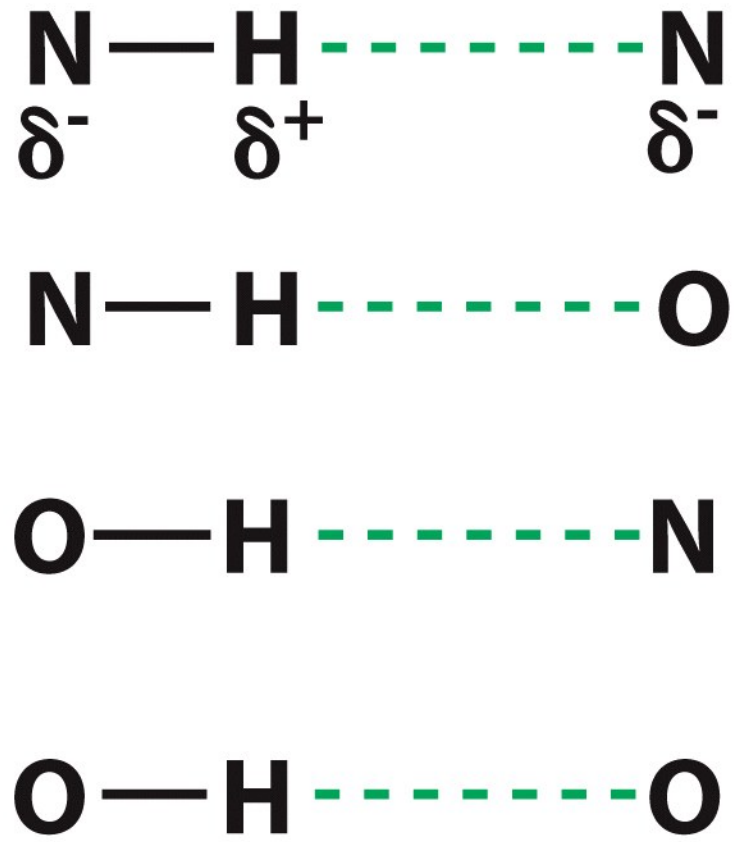


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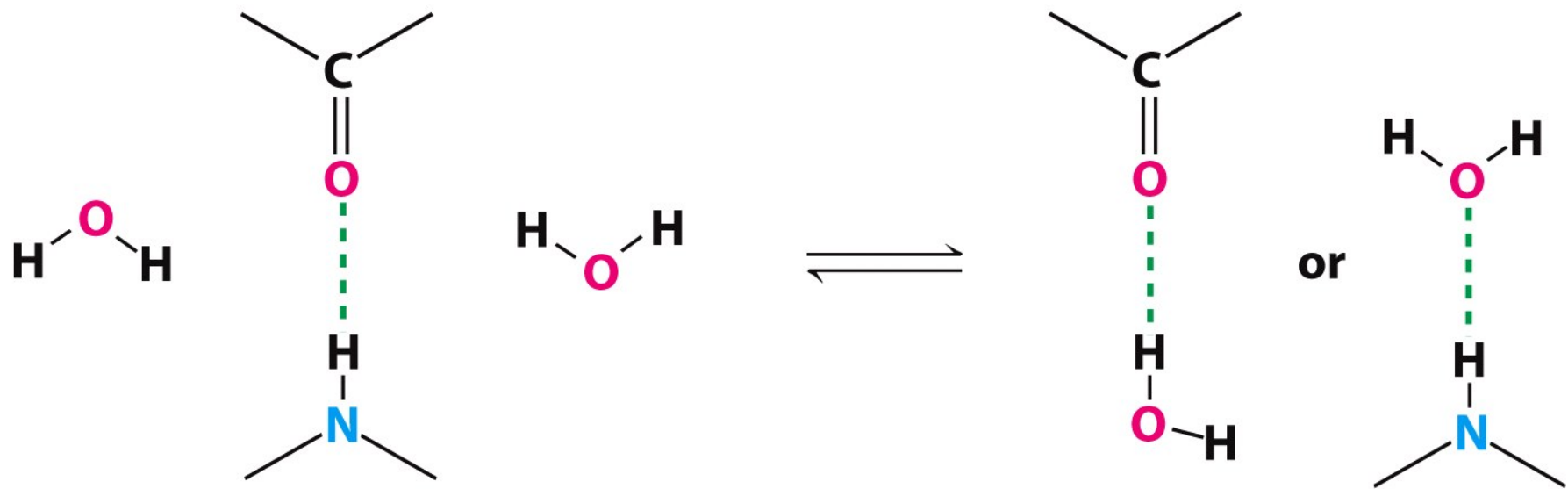


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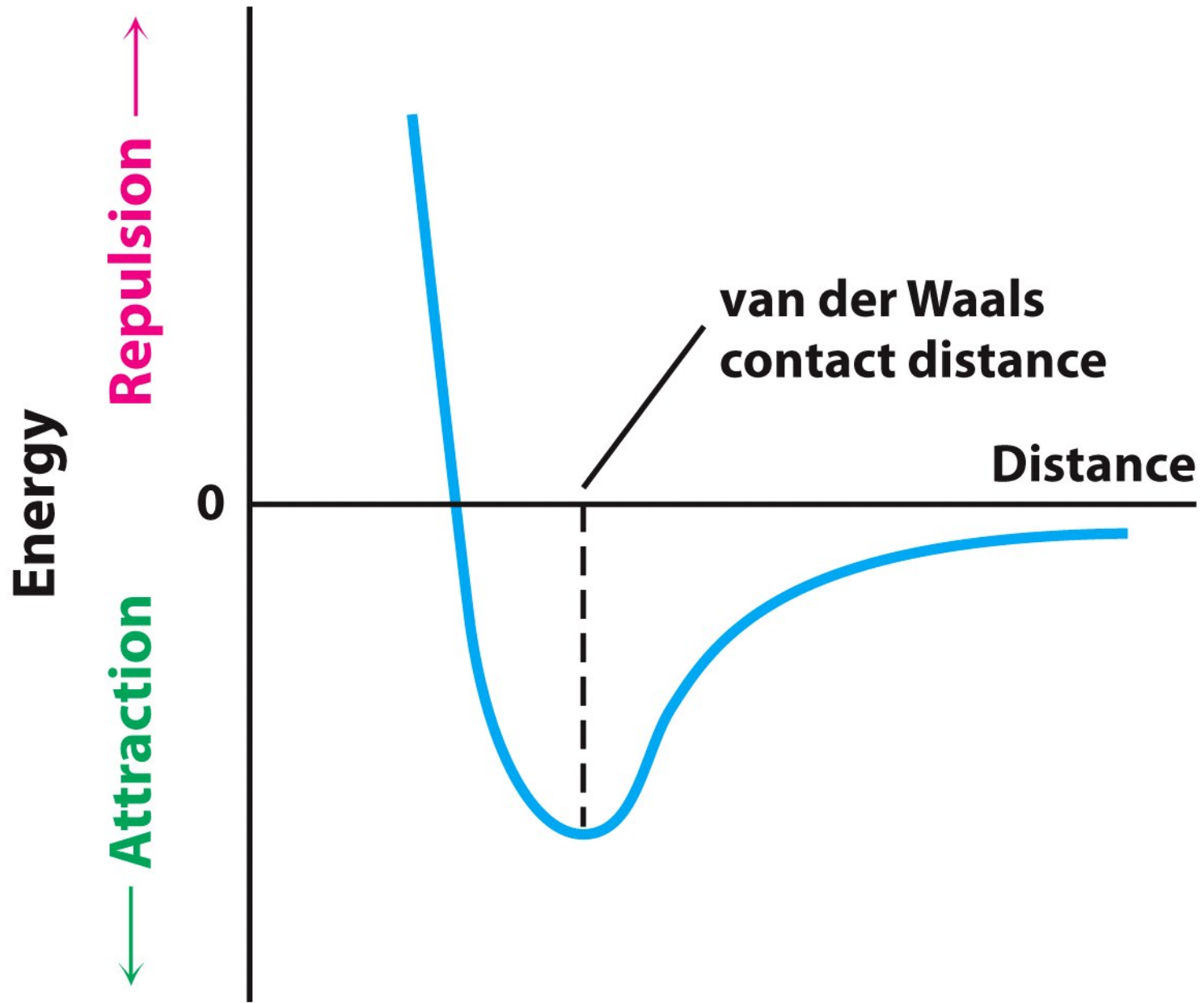
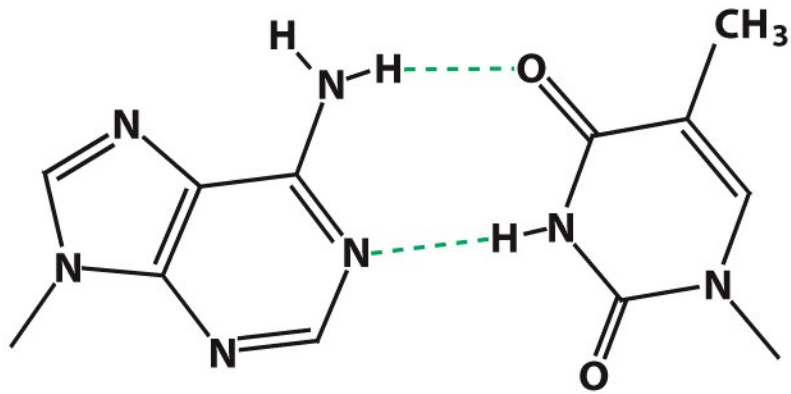
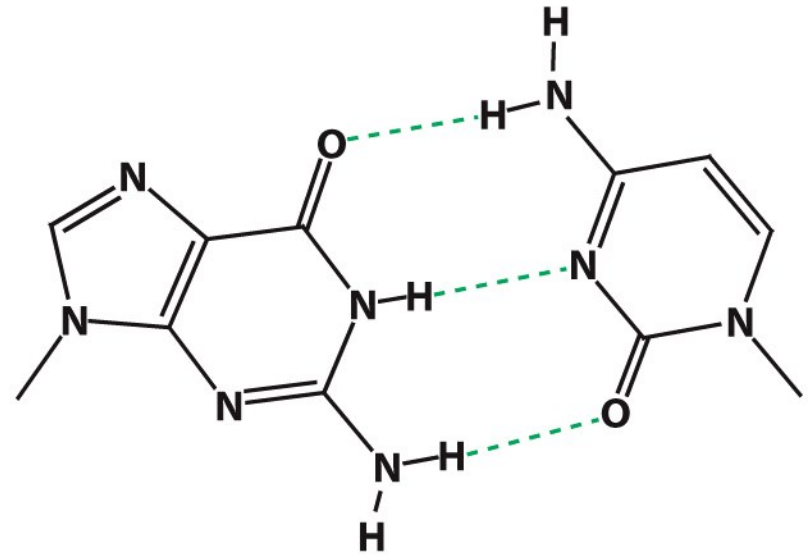


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Adenine (A)

Thymine (T)

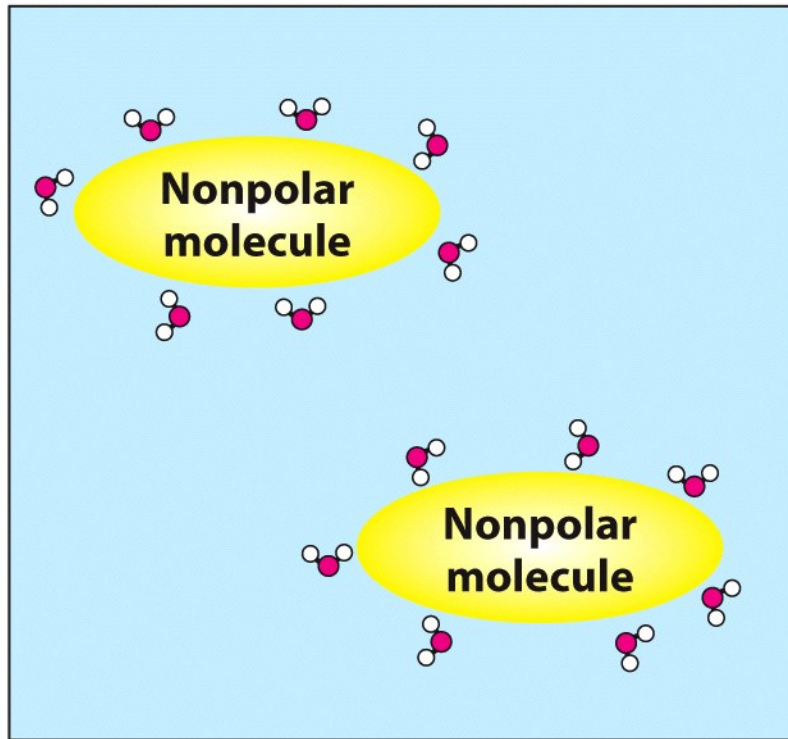


Guanine (G)

Cytosine (C)

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(A)



(B)

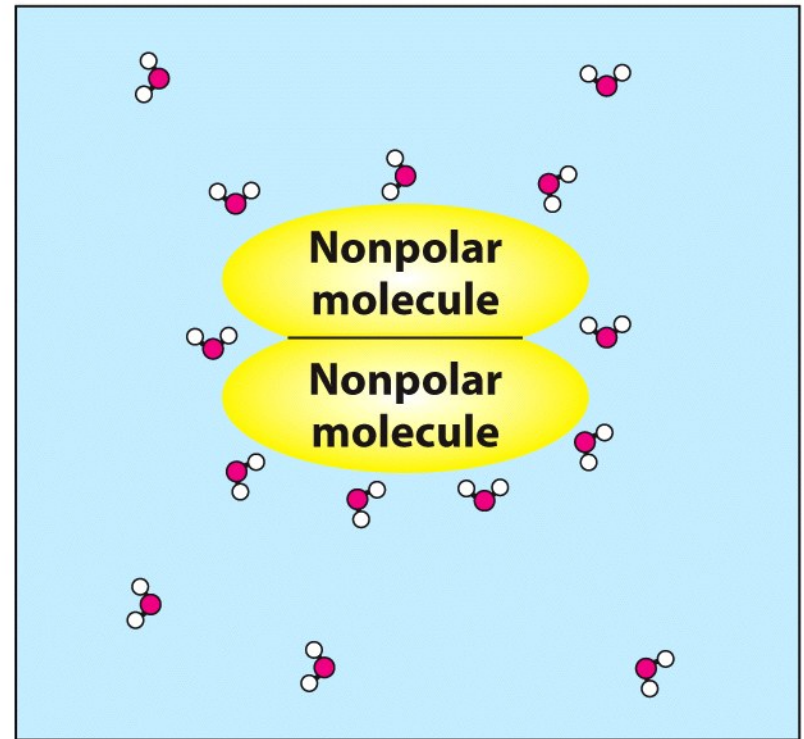
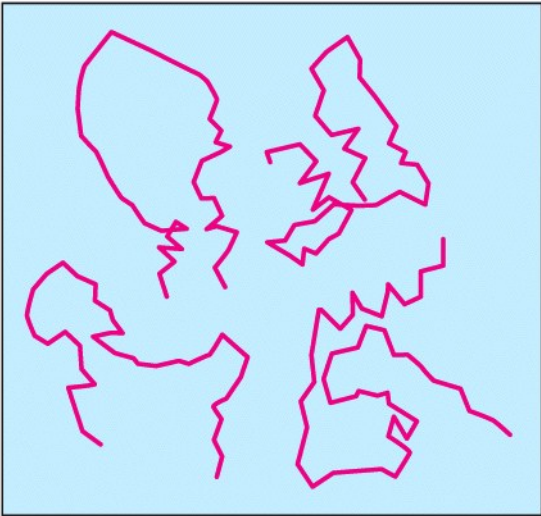


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Unfolded ensemble



Folded ensemble

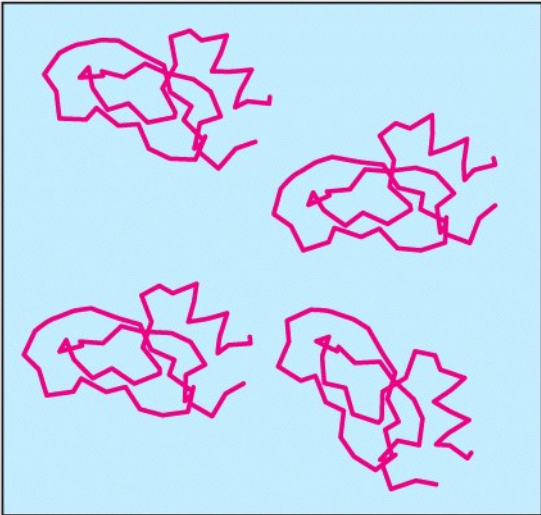


Figure 2.10
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Table 2.1 Some key functional groups in biochemistry

Functional group	Class of compounds	Structural formula	Example
Hydrophobic	Hydrocarbon chains (aliphatic)	$R-CH_3$	$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}_2\text{N}-\text{CH}-\text{C}-\text{OH} \\ \\ \text{CH}_3 \end{array}$ <p>Alanine</p>
	Aromatic (hydrocarbons in a ring structure with multiple double bonds)	$R-\text{C}_6\text{H}_5$	$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}_2\text{N}-\text{CH}-\text{C}-\text{OH} \\ \\ \text{CH}_2 \\ \\ \text{C}_6\text{H}_5 \end{array}$ <p>Phenylalanine</p>
Hydroxyl	Alcohol	$R-OH$	$\text{H}_3\text{C}-\text{CH}_2-\text{OH}$ <p>Ethanol</p>
Aldehyde	Aldehydes	$R-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$ <p>Acetaldehyde</p>
Keto	Ketones	$R-\overset{\text{O}}{\parallel}{\text{C}}-R$	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ <p>Acetone</p>

Note: There are many aliphatic (hydrocarbon chains) and aromatic groups. The methyl group and benzyl groups are shown as examples. Notice also that many of the examples have more than one functional group. The letter R stands for the remainder of the molecule. Finally, note that a *carbon atom double-bonded to an oxygen atom*, called a carbonyl group, is present in aldehydes, ketones, and carboxylic acids, including amino acids. Carbonyl groups are common in biochemicals.

Table 2.1 part 1

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Table 2.1 Some key functional groups in biochemistry

Functional group	Class of compounds	Structural formula	Example
Carboxyl	Carboxylic acid	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$ <p>Acetic acid</p>
Amino	Amines	$\text{R}-\text{NH}_2$	$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}_2\text{N}-\text{CH}-\text{C}-\text{OH} \\ \\ \text{CH}_3 \end{array}$ <p>Alanine</p>
Phosphate	Organic phosphates	$\text{R}-\text{O}-\overset{\text{O}}{\parallel}{\text{P}}-\text{O}^-$	$\begin{array}{c} \text{OH} \\ \\ \text{C}=\text{O} \\ \\ \text{HC}-\text{OH} \\ \\ \text{H}_2\text{C}-\text{O}-\overset{\text{O}}{\parallel}{\text{P}}-\text{O}^- \\ \\ \text{O}^- \end{array}$ <p>3-Phosphoalvceric acid</p>
Sulfhydryl	Thiols	$\text{R}-\text{SH}$	$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}_2\text{N}-\text{CH}-\text{C}-\text{OH} \\ \\ \text{CH}_2 \\ \\ \text{SH} \end{array}$ <p>Cysteine</p>

Note: There are many aliphatic (hydrocarbon chains) and aromatic groups. The methyl group and benzyl groups are shown as examples. Notice also that many of the examples have more than one functional group. The letter R stands for the remainder of the molecule. Finally, note that a *carbon atom double-bonded* to an *oxygen atom*, , called a carbonyl group, is present in aldehydes, ketones, and carboxylic acids, including amino acids. Carbonyl groups are common in biochemicals.

Table 2.1 part 2

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Monoprotic acids

Acetic acid

($K_a = 1.74 \times 10^{-5} M$)

Ammonium ion

($K_a = 5.62 \times 10^{-10} M$)

Diprotic acids

Carbonic acid

($K_a = 1.70 \times 10^{-4} M$)

Bicarbonate

($K_a = 6.31 \times 10^{-11} M$)

Glycine, carboxyl

($K_a = 4.57 \times 10^{-3} M$)

Glycine, amino

($K_a = 2.51 \times 10^{-10} M$)

Triprotic acids

Phosphoric acid

($K_a = 7.25 \times 10^{-3} M$)

Dihydrogen phosphate

($K_a = 1.38 \times 10^{-7} M$)

Monohydrogen phosphate

($K_a = 3.98 \times 10^{-13} M$)

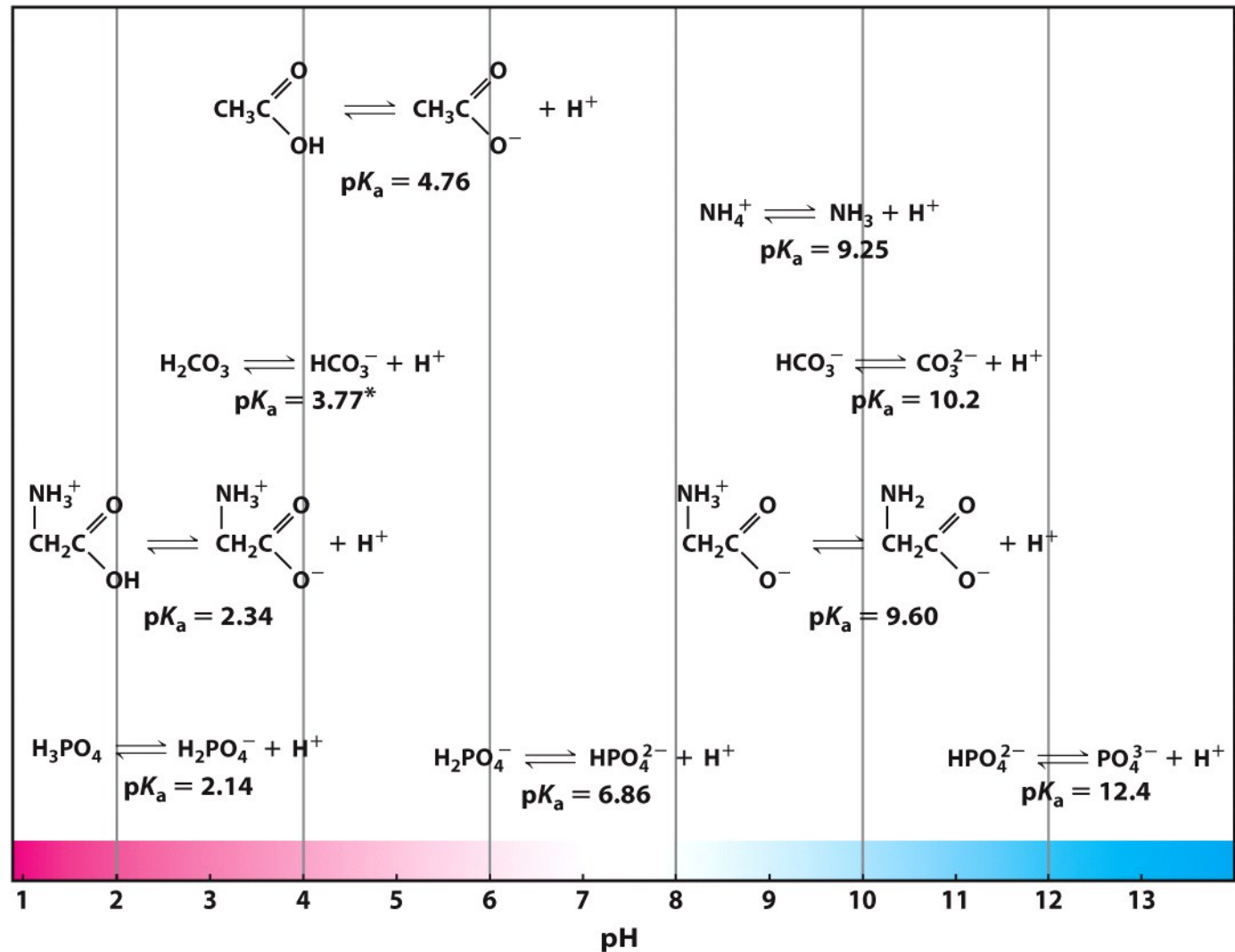


Figure 2.11

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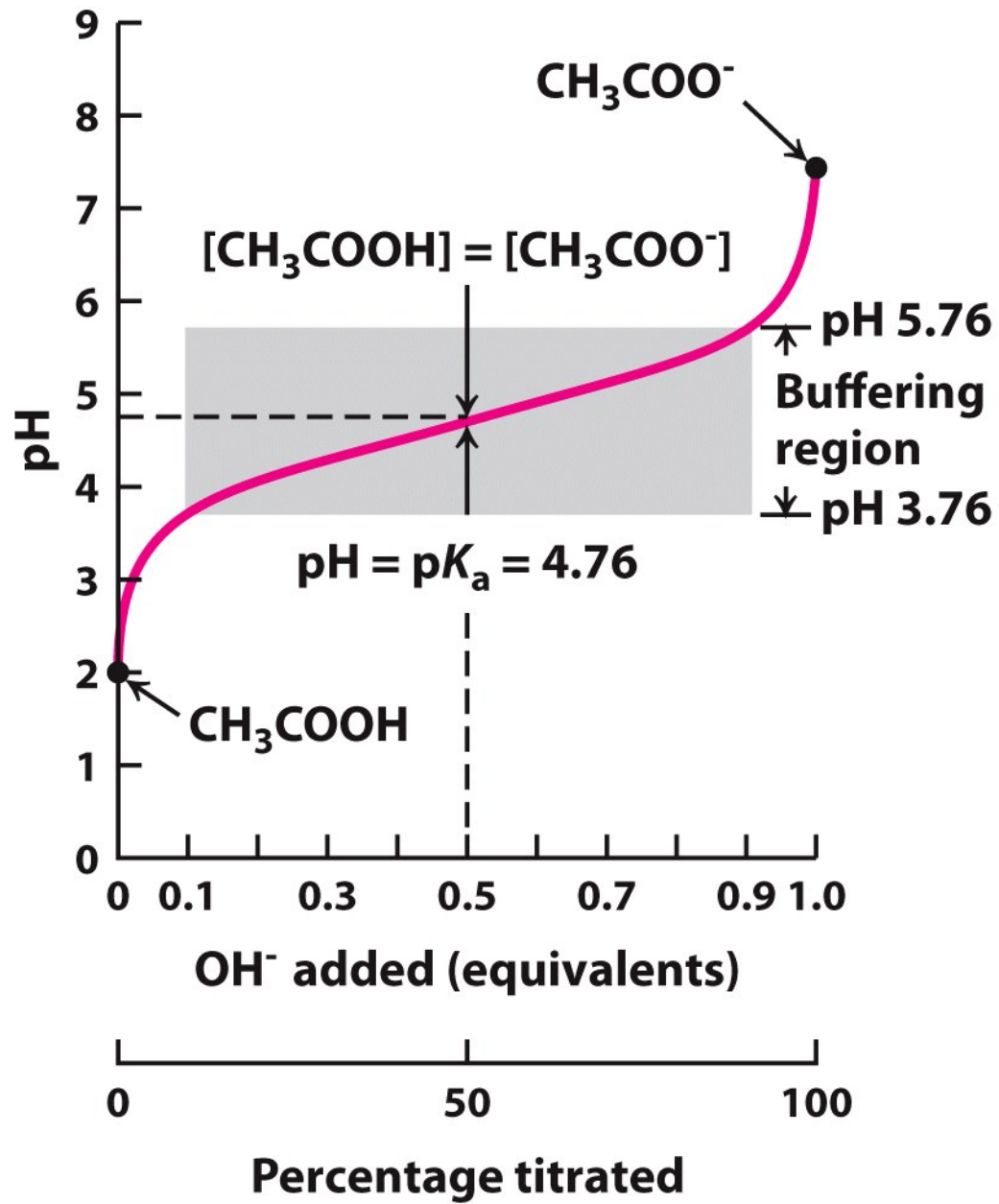


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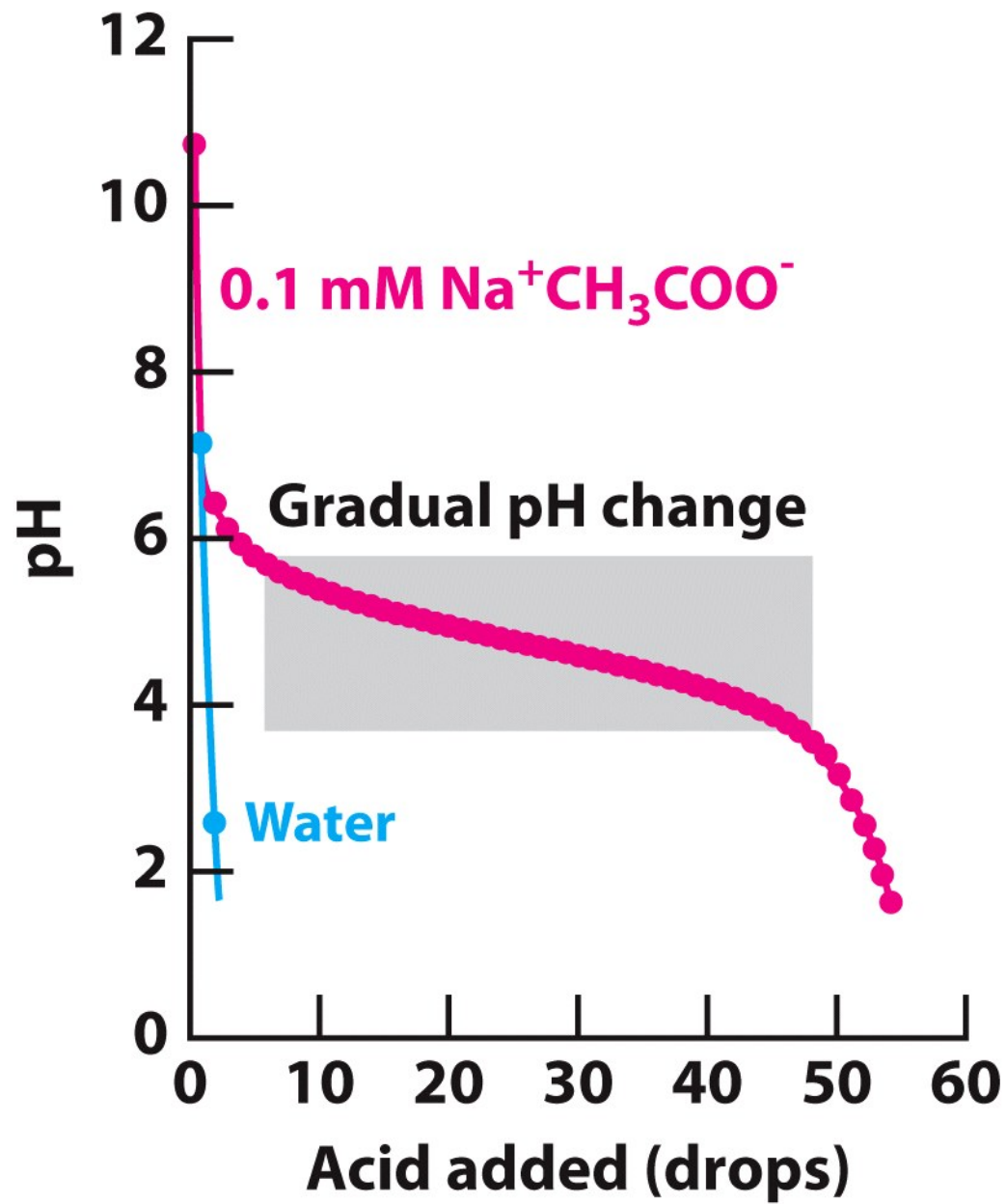


Figure 2.13
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