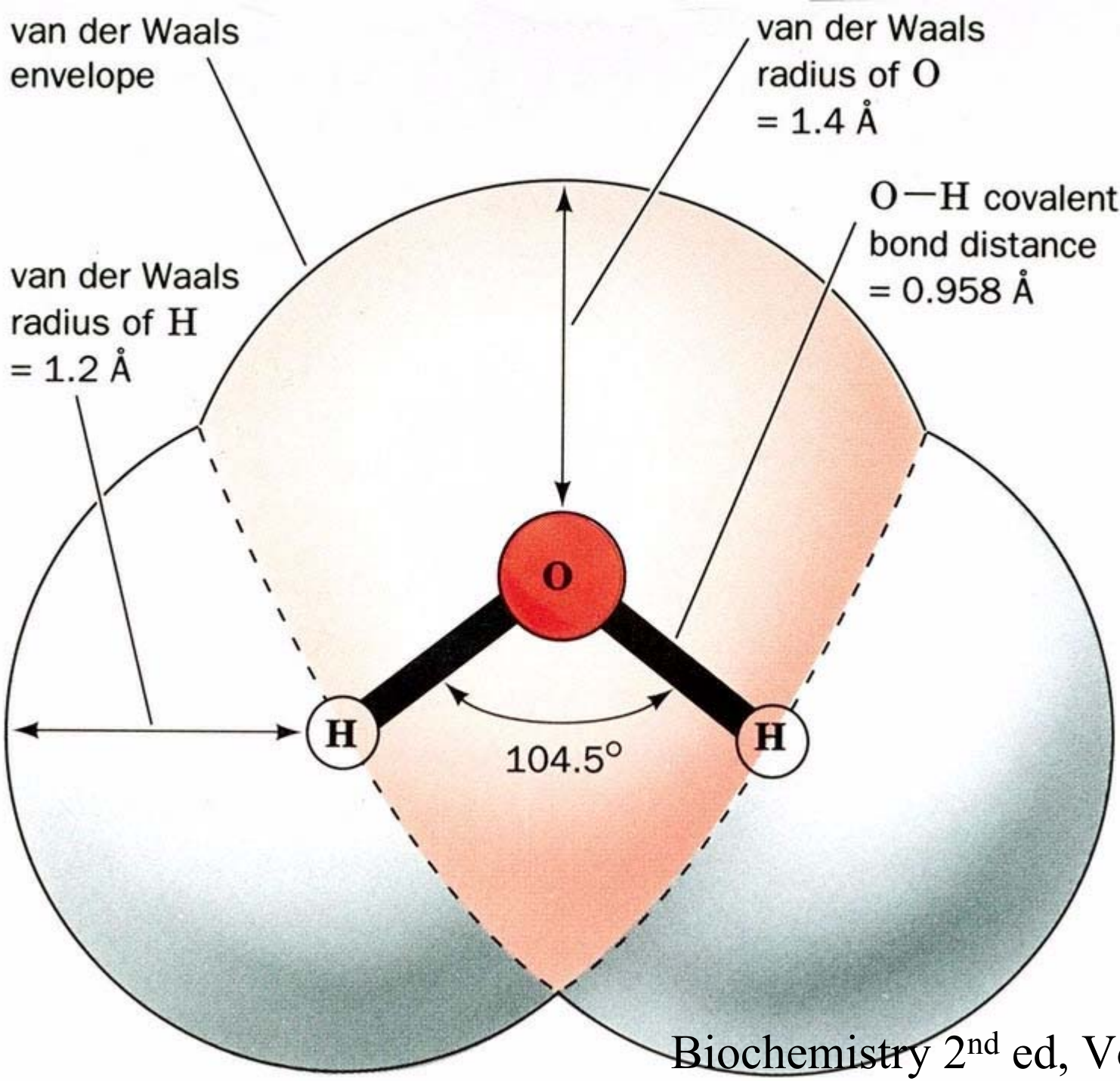
Acid/Base Chemistry

Basics (water structure, acids)
Ka and pKa
Buffers



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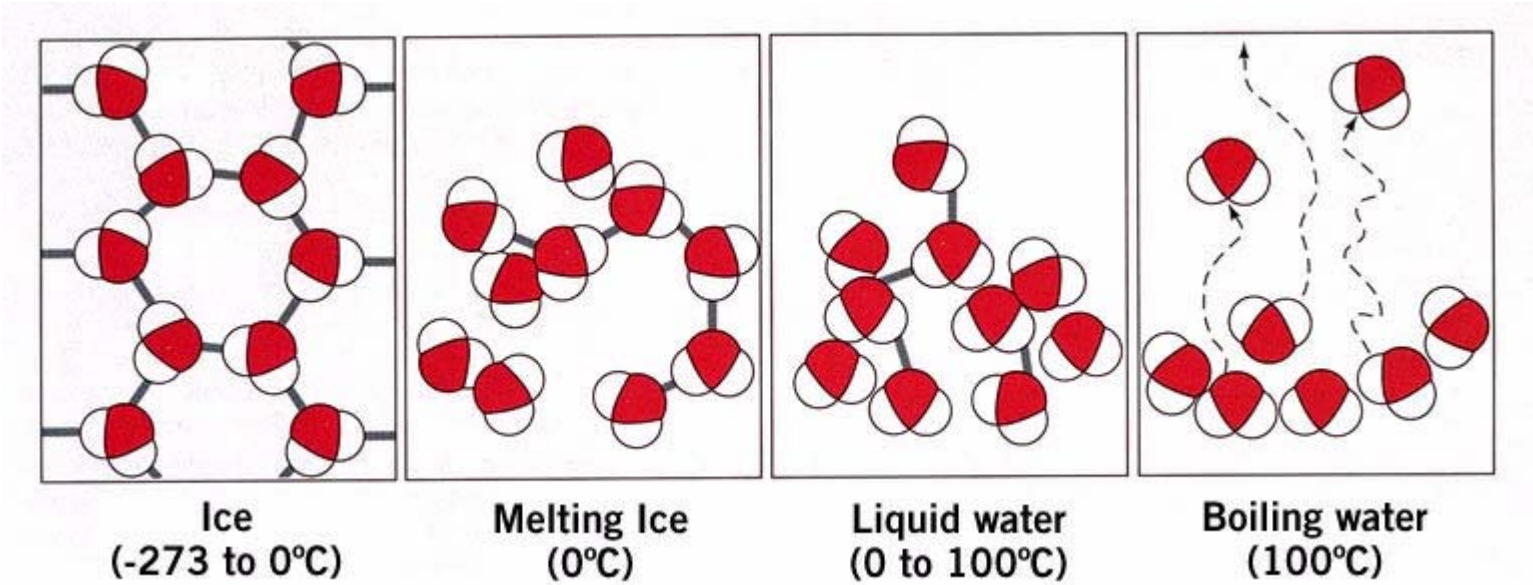

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Figure 2.3

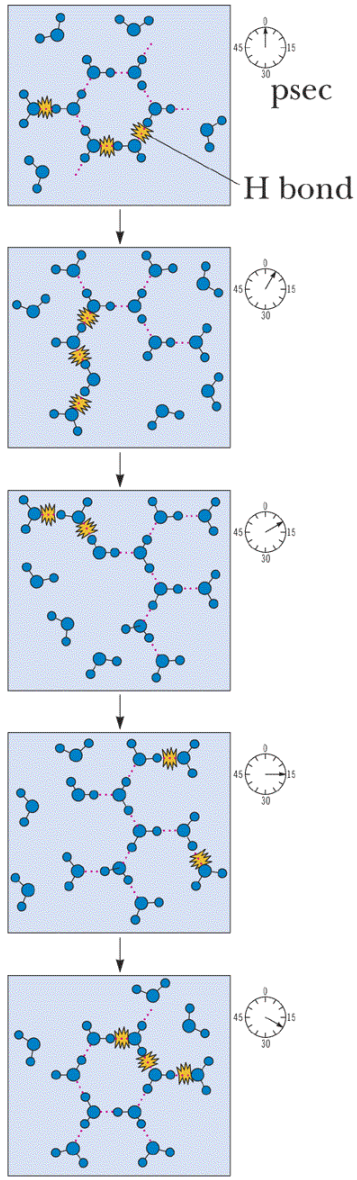

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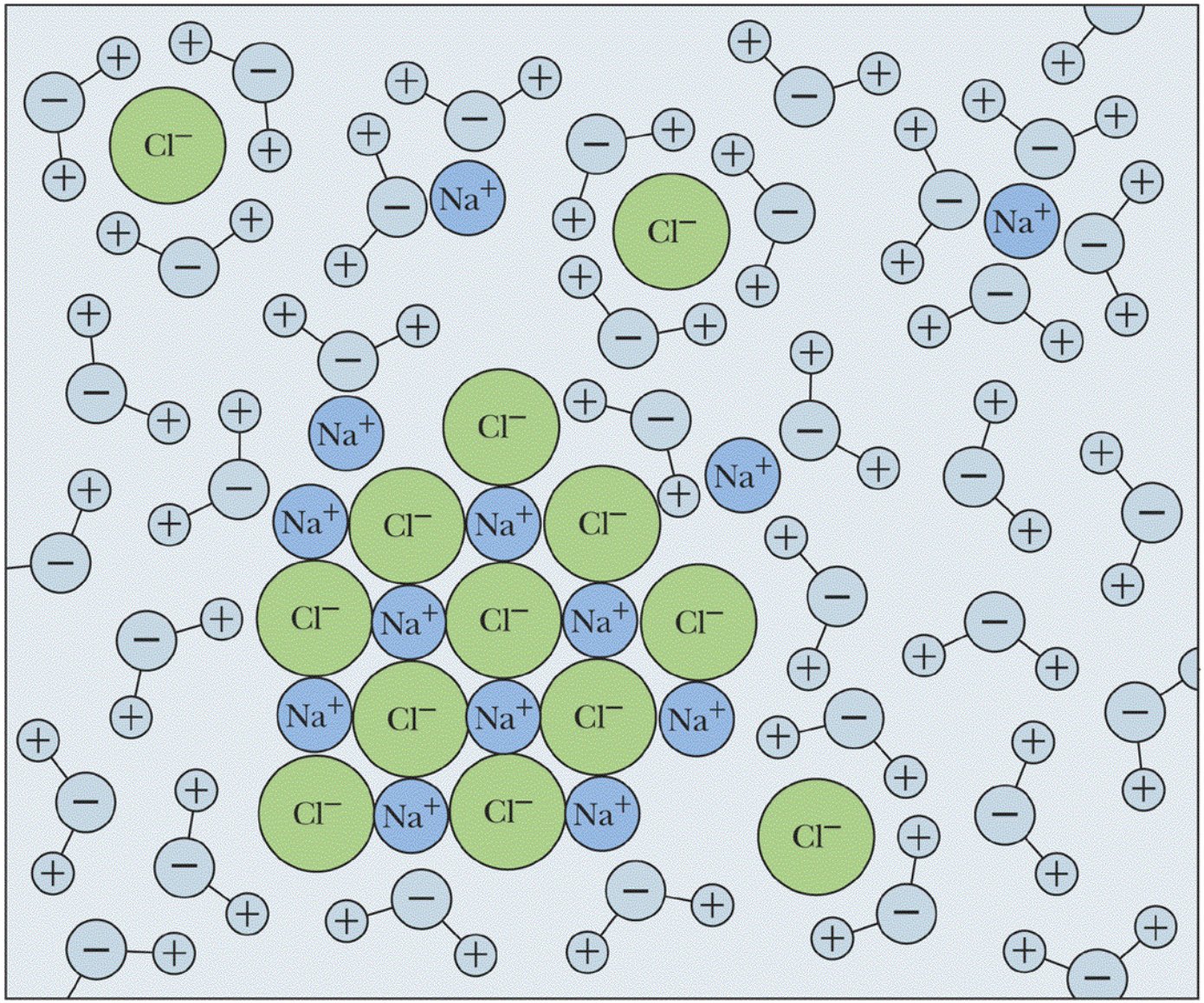
Figure 2.4



Ions are solubilized by directional H-bonds

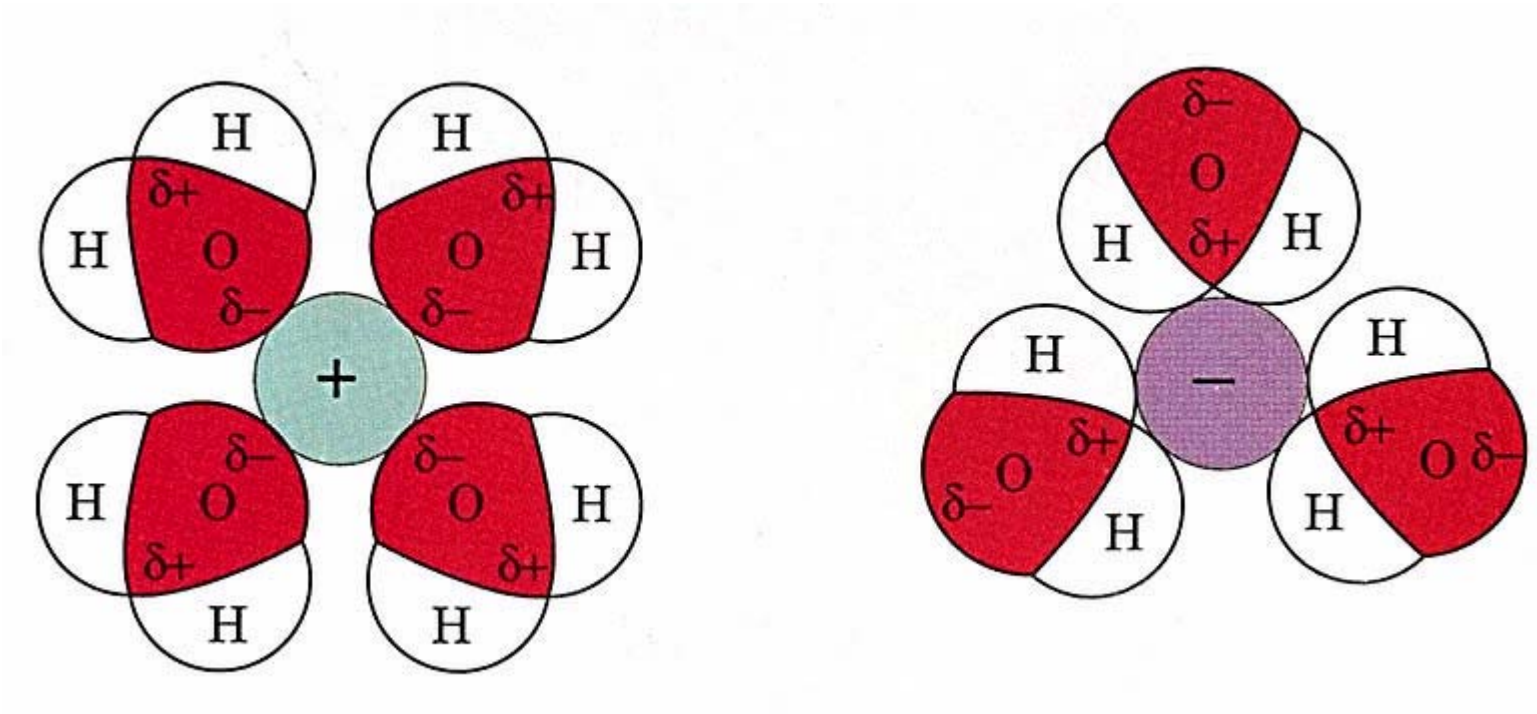


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Table 2.4 Acid Dissociation Constants and pK_a Values for Some Weak Electrolytes (at 25°C)

Acid	K_a (M)	pK_a
HCOOH (formic acid)	1.78×10^{-4}	3.75
CH_3COOH (acetic acid)	1.74×10^{-5}	4.76
CH_3CH_2COOH (propionic acid)	1.35×10^{-5}	4.87
$CH_3CHOHCOOH$ (lactic acid)	1.38×10^{-4}	3.86
$HOOCCH_2CH_2COOH$ (succinic acid) pK_1*	6.16×10^{-5}	4.21
$HOOCCH_2CH_2COO^-$ (succinic acid) pK_2	2.34×10^{-6}	5.63
H_3PO_4 (phosphoric acid) pK_1	7.08×10^{-3}	2.15
$H_2PO_4^-$ (phosphoric acid) pK_2	6.31×10^{-8}	7.20
HPO_4^{2-} (phosphoric acid) pK_3	3.98×10^{-13}	12.40
$C_3N_2H_3^+$ (imidazole)	1.02×10^{-7}	6.99
$C_6O_2N_3H_{11}^+$ (histidine–imidazole group) pK_R†	9.12×10^{-7}	6.04
H_2CO_3 (carbonic acid) pK_1	1.70×10^{-4}	3.77
HCO_3^- (bicarbonate) pK_2	5.75×10^{-11}	10.24
$(HOCH_2)_3CNH_3^+$ (*tris*-hydroxymethyl aminomethane)	8.32×10^{-9}	8.07
NH_4^+ (ammonium)	5.62×10^{-10}	9.25
$CH_3NH_4^+$ (methylammonium)	2.46×10^{-11}	10.62

*These pK values listed as pK_1, pK_2, or pK_3 are in actuality pK_a values for the respective dissociations. This simplification in notation is used throughout this book.

†pK_R refers to the imidazole ionization of histidine.

Data from *CRC Handbook of Biochemistry*. Chemical Rubber Co., 1968.

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Figure 2.14