
Chapter 3 – Water

CHEM 161

Spring, 2009

Source for all images: McKee and McKee
4/e

Noncovalent forces

Ionic

Ion-dipole

Van der waals

- Dipole-dipole
- Dipole-induced dipole
- Induced dipole-induced dipole

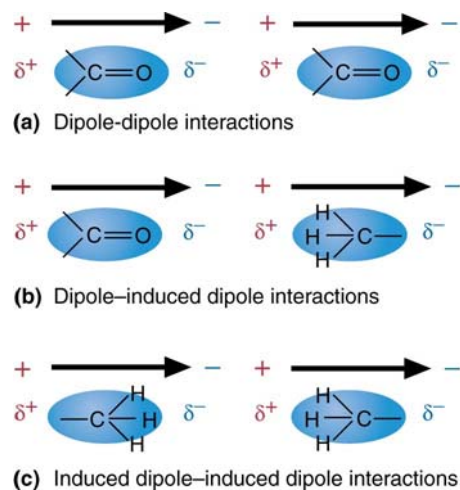


FIGURE 3.7
Dipolar Interactions

Why ice floats

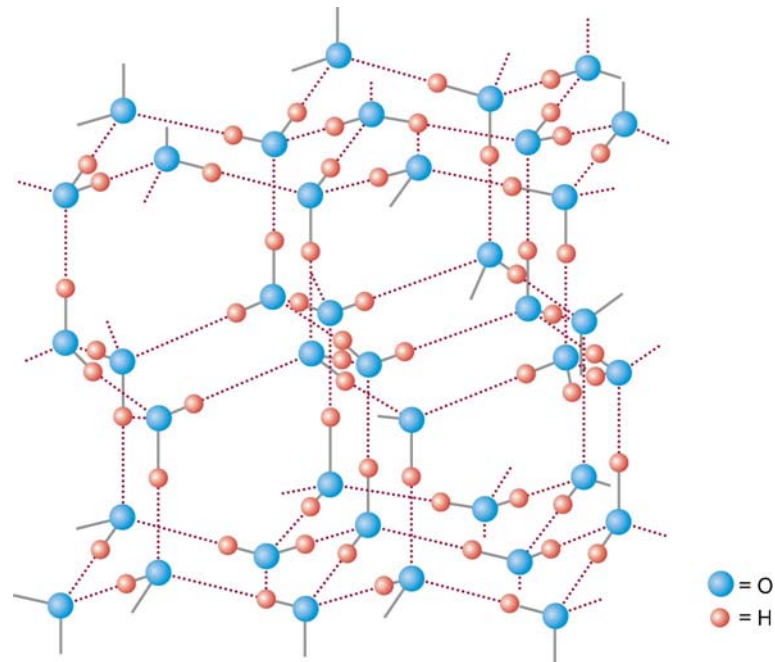


FIGURE 3.8
Hydrogen Bonding Between Water Molecules in Ice

Ice has a very open structure

Solvation - ions

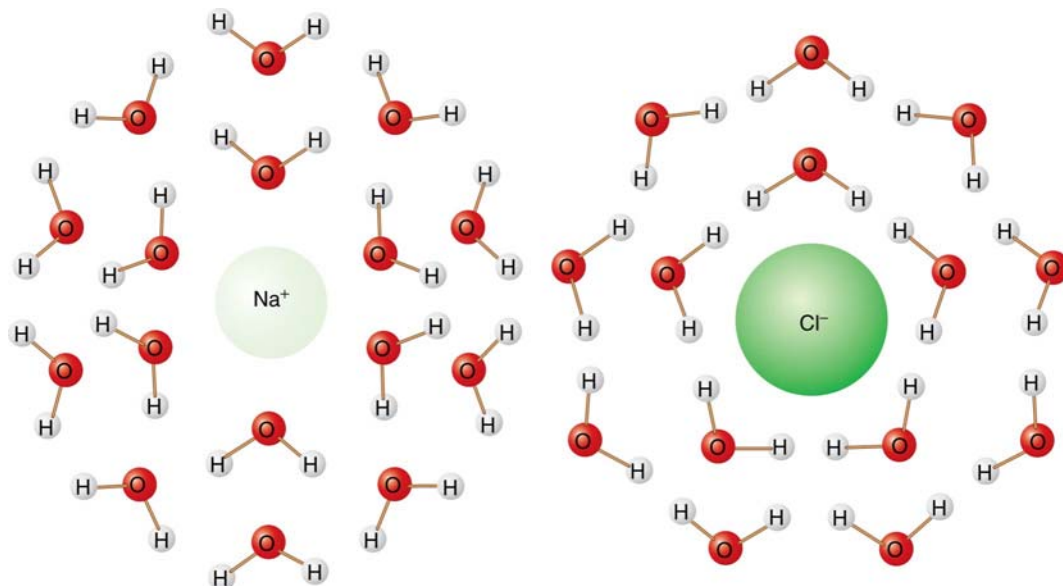


FIGURE 3.9
Solvation Spheres of Water Molecules Around Na⁺ and Cl⁻ Ions

Water reduces
the force between
two charges

(Coulomb's law)

The Hydrophobic Effect

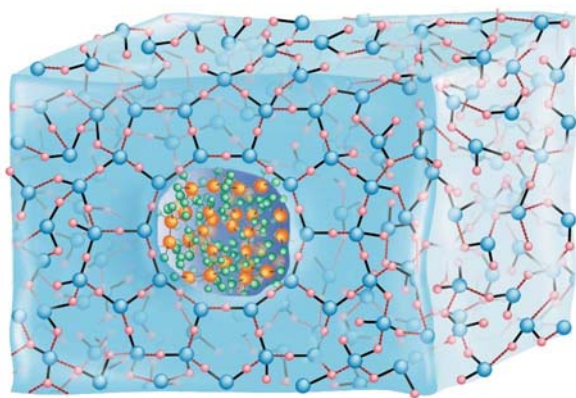


FIGURE 3.12
The Hydrophobic Effect

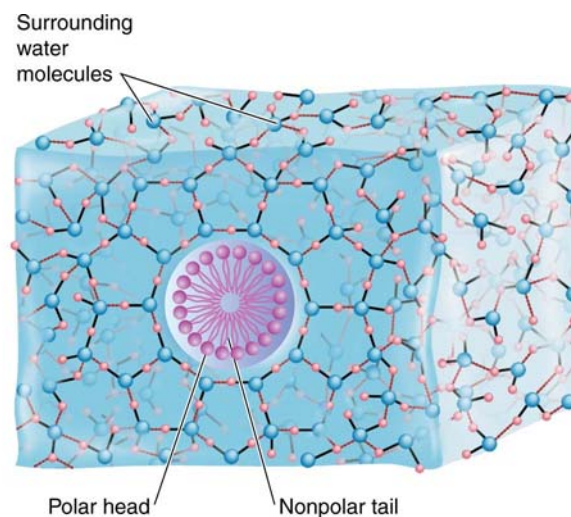
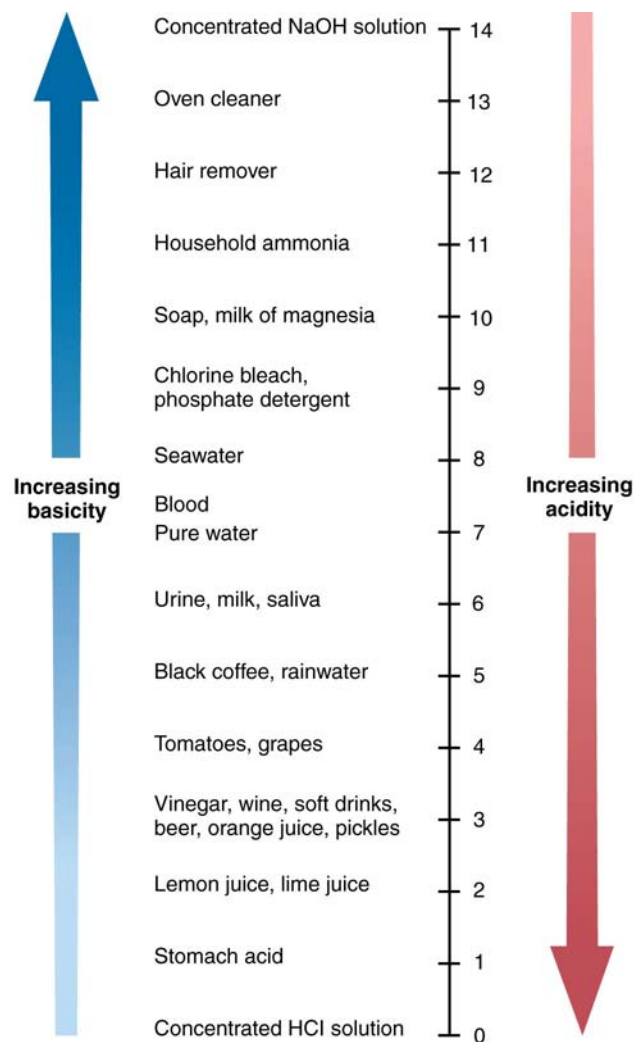


FIGURE 3.13
Formation of Micelles

The driving force is the minimization of increased organization of the water. This leads to reduced surface area of non-polar substance.

pH scale



Log scale:

A pH difference of 1 unit corresponds to a concentration difference of 10 units

FIGURE 3.18
The pH Scale and the pH Values of Common Fluids

Titration of a buffer

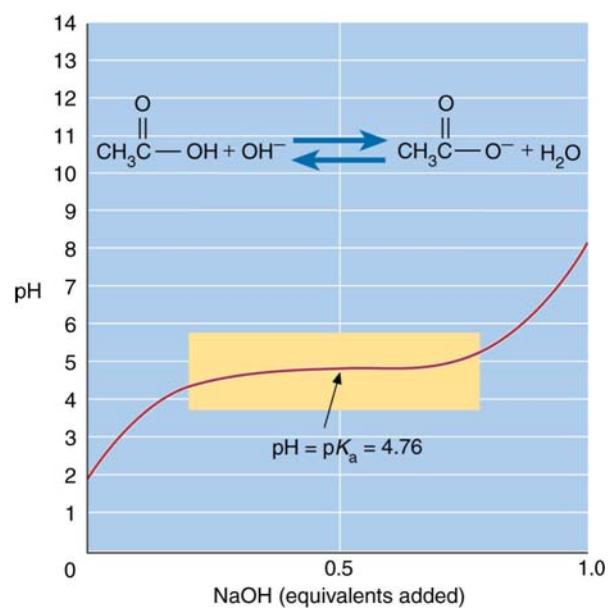


FIGURE 3.19
Titration of Acetic Acid with NaOH

Polyprotic acids

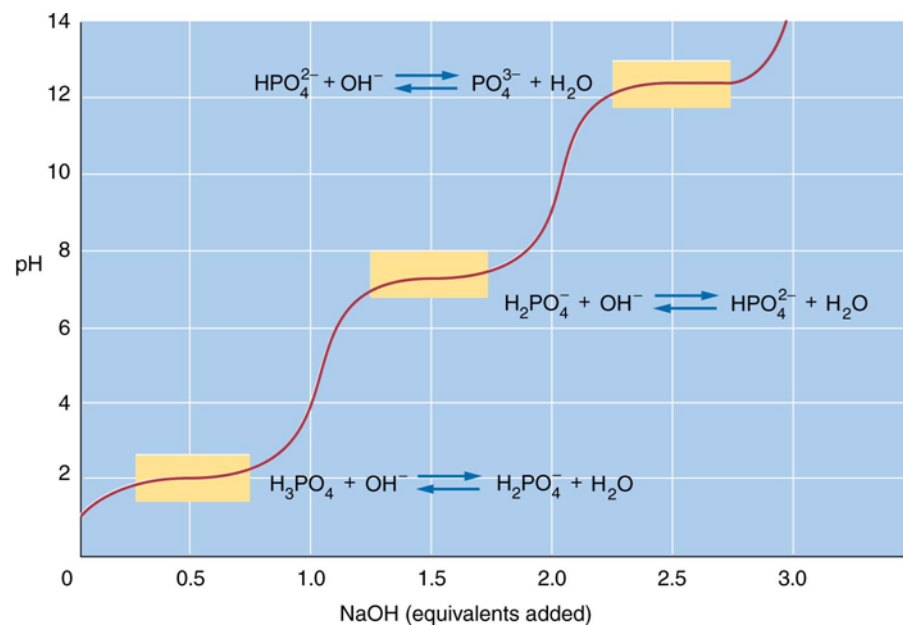


FIGURE 3.20
Titration of Phosphoric Acid with NaOH

Biologically important buffers

- Laboratory buffers
 - Phosphate, tris, HEPES
- Physiological buffers
 - Phosphate, carbonic acid
- Physiological acids
 - amino acids
 - nucleic acids
 - metabolic acids

