

Pre-lecture reading /viewing assignment for Solutions

Solutions are important in living things and in medicine. In CHM 109 we will define a **solution** as a homogeneous mixture. While these mixtures can be in the gas, liquid, or solid state, our main interest will be in liquid solutions (minor interest in gas phase solutions).

Additional definitions: The **solvent** is the component of the solution that is present in greatest quantity. **Solutes** are components of the solution that are present in lesser quantity than the solvent. A solution may have one or many solutes. One might say it is the solvent that dissolves the solute.

It is possible to think of solutions from a Boltzmann point of view. With this approach the red spheres of Boltzmann represent the solute molecules/ions. The black background of the Boltzmann box represents the solvent molecules. While this approach will help us significantly when we get to kinetics, it clearly is not a help understanding phenomena like the interactions between the solute and the solvent. We will need to look at and draw additional pictures to help us with topics like that. Animations can be quite useful in helping us understand solutions. Please look at the animation below to get a feel for the behavior of our most important solvent (H₂O).

“Molecular Motion in Water:”

<http://www.youtube.com/watch?v=t5ZFoU0S5iE&feature=related> Note how in the last half of the video, there are greenish-yellow lines that represent hydrogen bonds between water molecules that are breaking and forming as the molecules move around each other.

Solute-solvent interactions are an important factor in determining whether and how much of a given solute will dissolve in a given solvent. View the following animation to start learning about a salt dissolving in water.

Animation of salt dissolving in water:

<http://www.mhhe.com/physsci/chemistry/essentialchemistry/flash/molvie1.swf> Make sure you hit the "Zoom" button after the spoon stops stirring.

Because of the importance of biological membranes we also need to learn about how certain molecules that are not polar and not very soluble in H₂O behave when they are in contact with H₂O. The animation below will help you get started understanding the "Hydrophobic Effect." (Actually, you don't need to watch the whole thing to understand.)

“Hydration shell dynamics of a hydrophobic particle:”

<http://www.youtube.com/watch?v=ETMmH2trTpM&feature=related>