Solutions 6.1

Solution Terminology
Types of Solutions

Solvent and Solute

Solvent
• The substance that is more plentiful in a solution.

Solute
• The substance that is less plentiful in a solution.

Suspensions or Mechanical Mixtures
• A heterogeneous mixture of two or more substances.
• The substances do not dissolve in one another.
• The substances remain suspended for a period of time but eventually sink to the bottom or float to the top.
• The concentrations of particles are not consistent throughout a suspension.
• Particles do not break up into individual ions or molecules.
• (e.g. sand and water)

Solutions
• A homogeneous mixture of two or more substances.
• The substances dissolve in one another.
• The concentration of solute particles remains the same at all locations in the solution so long as the temperature remains the same.
• Solute particles break up into individual ions or molecules.
• (e.g. sugar and water)

Saturated Solution
• When the solvent has dissolved the maximum amount of solute possible at a certain temperature, and some solid particles remain undissolved.
• This is an equilibrium system where solid particles continually dissolve in the solvent and dissolved particles fall out of solution.

Unsaturated Solution
• When the solvent has dissolved less than the maximum amount of solute possible at a certain temperature.
• No undissolved solute remains in the system.

© 2009 High School Chem Solutions. All rights reserved.
Types of Solutions

**Liquid – Liquid Solutions**
- CH₃OH (a type of alcohol) and water

Strong H-Bonds allow these species to form a solution.

Methanol and water are **miscible** (soluble in all proportions). Miscible solutions never become saturated.

**Liquid – Liquid Solutions**
- CH₃(CH₂)₅OH (another alcohol) and water

Hexanol and water are not miscible. Some hexanol will dissolve in water. The solubility of hexanol is limited by the long non-polar carbon chain.

**Liquid – Liquid Solutions**
- CH₃(CH₂)₅OH and C₆H₁₄

Hexane and hexanol are miscible.
  - Hexane is completely non-polar.
  - Hexanol is mostly non-polar.

They form strong London dispersion forces of attraction for one another.

**Solid – Liquid Solutions**
- Many ionic compounds dissolve in polar solvents. (ion-dipole).
  - Polar solids, such as glucose, dissolve in polar solvents. (dipole-dipole or H-bonds)
  - Non-polar solids, such as mothballs, dissolve in non-polar solvents. (dispersion)

**Gas – Liquid Solutions**
- Carbonated drinks
  \[ H₂O_{(l)} + CO₂_{(g)} \rightarrow H₂CO₃_{(aq)} \]
- Oxygen gas dissolves in water
  \[ O₂_{(g)} \rightarrow O₂_{(aq)} \]

**Gas – Gas Solutions**
- Gases are always infinitely soluble in one another.
  - Air
    - N₂(g), O₂(g), CO₂(g), H₂O(g), etc.
Types of Solutions

Gas – Solid Solutions
• H₂ gas can occupy the spaces between some metal atoms such as iron, and palladium.

Solid – Solid Solutions
• Formed by melting, mixing, and solidifying.

Steel – An interstitial alloy
• Carbon fills some spaces between iron atoms.

Brass – A substitutional alloy
• Zinc atoms substitute some copper atoms.