Do Now

- Given the following formula, solve for the desired variable: M=mol/V
  - Solve for V. V=?
  - Solve for mol. mol = ?

Ch 16: Solutions

This Week 5/12-5/16

- Monday: Intro to solutions
- Tuesday: Further exploration of solutions and molarity
- Wednesday: Lab Day. Yeah!
- Thursday: Review and finish lab
- Friday: Quiz

Basic Concepts

- Rate of solubility
- Units for solubility
- Factors that determine mass of solute that will dissolve
- Molar concentration, % mass, & % volume.

Basic Concepts

- 3 colligative properties of solutions
- Differences in vapor pressure, freezing point, & boiling point of solutions vs. pure solvents.
- Computation of molality in solutions.
- Freezing point depression and boiling point elevation as related to molality.

Vocabulary

- Solution-Homogeneous mixture of a solid, liquid or gas. The majority of this class, we will refer to solutions in their liquid & gas forms.
- Solvent-The substance that something is mixed into.
- Solute-The substance mixed into a solvent.

Identification

- Mr. B puts a sugar cube into his morning tea and mixes it in.
- Identify the solute and the solvent.

Dissolving Solutes

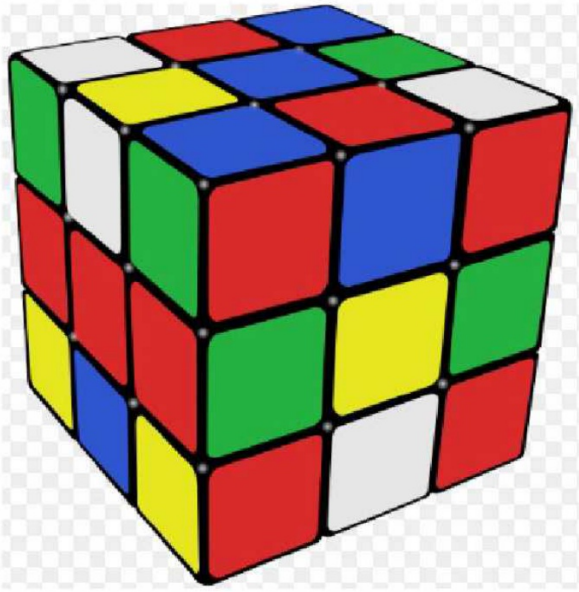
- This occurs at the surface area between the solute and solvent.
- As salt mixes into water, the ions break up. Think of salt breaking apart in water. Though we cannot see the salt when it is mixed in, if you taste it, you can tell that the salt is still there.

Dissolving Factors

- Agitation-stirring. Moves higher concentrations of solute around mixture.
- Temperature. The warmer the fluid, the faster the molecules are moving. This allows the solvent to move around more quickly, having more contact with the solute.
- Surface area. A teaspoon of granulated sugar has more surface area than a sugar cube.

Surface Area

- Take a cube made of smaller cubes. Each small cube is 1”x 1”
- Find the surface area of the cube as it appears and the total surface area of all 27 individual blocks



Solubility

- Only so much of a substance can be dissolved into solution. You have probably experienced putting too much sugar into a drink. When you get to the bottom, there is a sludge of sugar that did not dissolve.
- Only a certain amount of solute will dissolve. This is called **solubility**.

Molarity

- Molarity (M) is a concentration of a solution. Molarity is measured in moles of solute per volume (liters) of solvent.
- If a solution is labeled 2.1M NaCl, then there are 2.1 moles of NaCl for every liter of solution.
- How many moles of NaCl would be present if there was only 500 ml of 2.1M solution?

Measuring Molarity

- The formula is generally written M=mol/V, where V is the volume of liters.
- Most of the time we will have less than 1 liter of solute. How can we convert from ml to L?

How many moles of H_2SO_4 are necessary to create a 0.8M solution in 300 ml of water?

- Knowns: V= M=
- Unknown: mol=?
- Formula: M=mol/V
- Rearrange formula to isolate the unknown.

- Plug and chug.

Conversion Factors

- We know that one mole of a substance is the molar mass. This number is calculated from the atomic mass.
- Many problems will ask for or provide a mass that must be converted to moles before it can be solved.

Worksheet

- We will do #1 together.
- You do 2-4.
- We can go over 4 together in about ten minutes. Hint: molar ratio is used in #4.
- Check the answers to 2 & 3 with a neighbor.

1) What is the molarity of a solution which is formed when 2.58 g of $CaCl_2$ is dissolved in enough water to produce 250 ml of solution.

4) What is the molar concentration of the aluminum ions and chloride ions present in a solution which is prepared when 6.97 g of $AlCl_3$ is dissolved in 1.25 L of solution?

How many grams of magnesium are required to react with 25.1 g of hydrochloric acid?

$Mg + 2HCl \longrightarrow MgCl_2 + H_2$