

Aqueous Solutions

Most of the chemistry that we do take place in water. We need to understand how things dissolve into water to form aqueous solutions.

Water is called the universal solvent because it will dissolve many different compounds. In particular many ionic compounds dissolve well in to water, as well most polar covalent compounds will dissolve in to water well.

Ionic compounds dissolve in water in a process called hydration. The ions of the crystal are surrounded by water molecules and break off of the crystal.

Electrolytes are substances that dissolve into water and produce ions that can conduct electricity. We classify electrolytes as strong or weak. Strong electrolytes completely dissociate in water.

Polar compounds dissolve in a similar process, the polar parts of the molecule are attracted to the appropriate parts of the water molecule and pulled into solution.

To talk about solutions we need to define some terms:

Solute- the solute is the substance that is dissolved into the solvent.

Solvent- the solvent, usually water, is what the other substances are dissolved into.

Solution Composition

The most common way to describe the concentration of a solution is with a quantity that we call molarity.

The molarity (M) of a solution is defined as the moles of solute per liter of solution. We would say that a solution that has 1.0 moles of solute for every 1.0 liters of solution is a 1.0 molar solution.

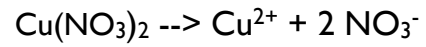
$$M = \text{molarity} = \frac{\text{moles of solute}}{\text{liters of solution}} = \frac{n}{V}$$

5% Ethanol by Volume 100mL of Solution = 5mL of Ethanol

$$5\text{mL Ethanol} \cdot \frac{0.789\text{g}}{1\text{mL}} \cdot \frac{1\text{mol Ethanol}}{46.07\text{g Ethanol}} = 0.0856 \text{ Ethanol}$$

$$M = \frac{0.0856\text{mol Ethanol}}{0.100\text{L}} = 0.856\text{M Ethanol}$$

When the substance that dissolves is an ionic compound the molarity of each ion should be calculated separately. The key is to determine the ratio between the compound and each element.



$$1.0\text{M Cu}(\text{NO}_3)_2 = 1.0 \text{ M Cu}^{2+} = 2.0 \text{ M NO}_3^-$$

Ex: