

Intro to Solutions

A solution is a homogeneous mixture. By strict definition air is a solution because it is a mixture of basically air and oxygen and the mixture has only one phase. Alloys such as the gold and copper that make up a gold ring or the mixture of copper and zinc that make up bronze are also solutions for the same reason.

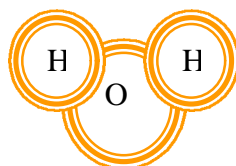
In a solution the major part is known as the **solvent**. So in air (78% nitrogen) nitrogen is the solvent. In most solutions, water is the solvent because water is so common and such a good solvent.

The minor part of the solution is the **solute**. If you dissolve 1 g of sugar in 100 g of water, sugar is the minor component and hence the solute.

If we add more solvent to a solution we are *diluting* it. We lower its concentration of solute. In other words, a given amount of solution we will find less solute and more solvent.

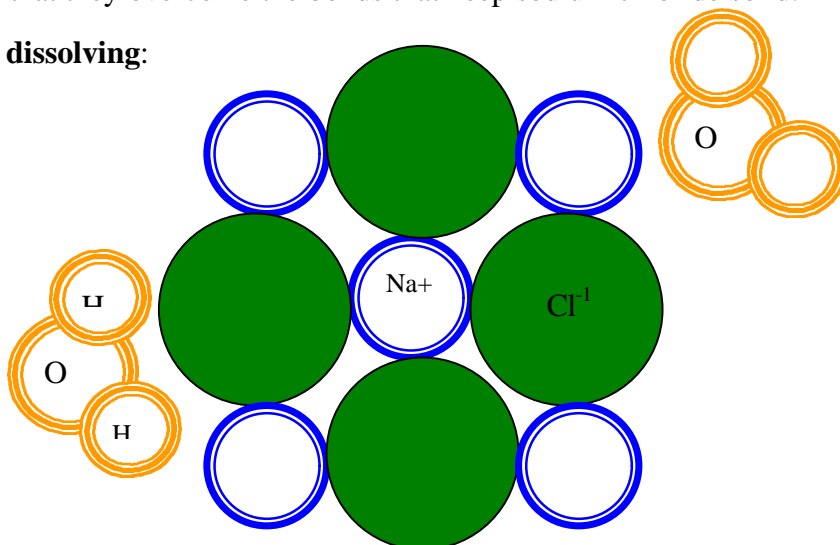
Before venturing more deeply into concentration, let's explain what happens when a substance dissolves in water. Why is for instance that when salt is added to water, it eventually disappears ?

Water is a polar molecule. This does not imply that it has relatives in Northern Canada, but it means that the electronegative (greedy) oxygen atom in water has a partial negative charge, which allows it to attract the positive sodium ion in salt.

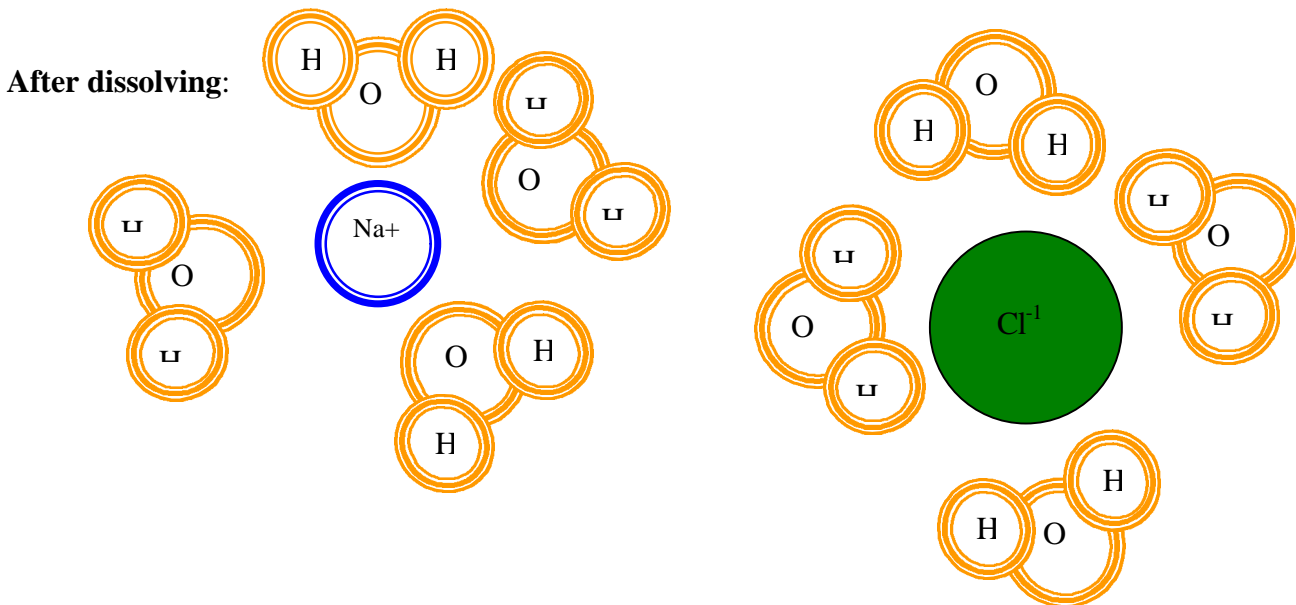


The wimpy hydrogen atoms in water allow the electrons they share to actually move towards the oxygen, and so the H's carry a partial positive charge. This allows the H's to attract salt's negative chloride ion. The attractions between water and salt are strong enough that they overcome the bonds that keep sodium chloride solid.

Before dissolving:



As salt's ions come apart and find themselves trapped among water molecules, we no longer see them.



Ionic Equations:

When an ionic solid dissolves in water, positive and negative ions appear in solution. The subscripts (little numbers) in the compound's formula reveal the number of each ion that will form on the right hand side of the equation.

Example: $\text{Na}_2\text{S}_{(s)} \rightarrow ???$

Answer: $2 \text{Na}^{+1}_{(aq)} + \text{S}^{-2}_{(aq)}$ The charges are those typical of families of the periodic table.

If a polyatomic group appears in the compound, the *subscripts do not become coefficients unless brackets appear*.

Examples: $\text{CaSO}_{4(s)} \rightarrow \text{Ca}^{+2}_{(aq)} + \text{SO}_4^{-2}_{(aq)}$
Note the 4 is part of the sulfate group, SO_4^{-2}

$\text{Mg}(\text{NO}_3)_2(s) \rightarrow \text{Mg}^{+2}_{(aq)} + 2 \text{NO}_3^{-1}_{(aq)}$
Now that we have brackets, we show that two nitrate groups, NO_3^{-1} , are present.