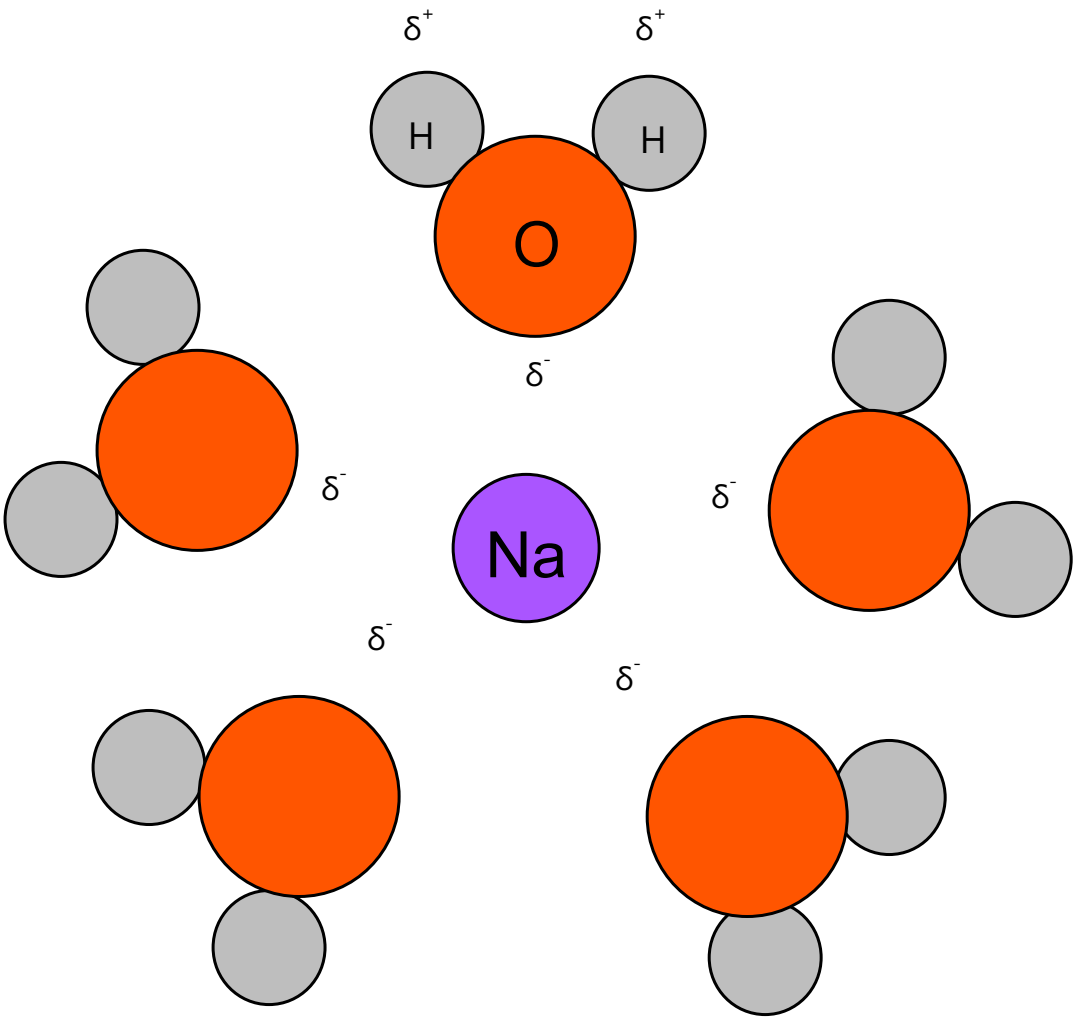
Molecular and ionic equations

We will now consider the reaction that occurs when we mix aqueous solutions of $NaCl$ and $AgNO_3$. Let's write the reactants on the left hand side of the reaction arrow: $NaCl(aq)$ and $AgNO_3(aq)$. The reaction produces $NaNO_3(aq)$ and $AgCl(s)$.

$$NaCl(aq) + AgNO3(aq) \rightarrow NaNO_3(aq) + AgCl(s)$$

Since $NaCl$, $AgNO_3$ and $NaNO_3$ are all soluble ionic compounds, they dissociate into their constituent ions when in water. A molecule of $NaCl$ would dissociate into one ion of Na^+ and one ion of Cl^-; and they will later be stabilized by ion-dipole interactions with water molecules that surround them.



Hydrated sodium ion

Let's write the soluble ionic compounds as dissociated ions to get the complete ionic equation.

$$Na^+(aq) + Cl^-(aq) + Ag^+(aq) + NO_3^-(aq) \rightarrow Na^+(aq) + NO_3^-(aq) + AgCl(s)$$

We have $Na^+(aq)$ and $NO_3^-(aq)$ on both sides of the reaction arrow. We can cancel out these components from our equation since they appear on the both sides of the equation. That give's us our final equation, which includes only the species involved in the chemical reaction:

$$Cl\text{-}(aq) + Ag+(aq) \rightarrow AgCl(s)$$

This equation tells us that solid silver chloride may be produced from dissolved Cl^- and Ag^+ ions, regardless of what the source of these ions is.

Copper and oxygen reaction

Balanced equations shows us what happens to different atoms in reactions.
In our example, copper and oxygen react together to make copper oxide. Copper and oxygen are the reactants and coper oxide is the product of this reaction.

Let's write the unbalanced equation for this reaction:

$$Cu + O_2 \rightarrow CuO$$

copper + oxygen → copper oxide

There is an unequal number of each type of atom on the left hand side of equation compared with the right hand side of equation. To make things equal, we need to adjust the number of units of some of the substances until we get equal numbers of each type of atom on both sides.

So the **balanced symbol equation** will be:

$$2Cu + O_2 \rightarrow 2CuO$$

Now we can see that there are two copper atoms and two oxygen atoms on either side. This equation nicely represent what happens in the reaction.