

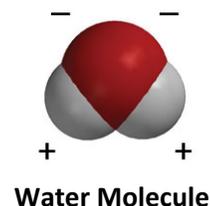
5th Grade - Lesson 1.3

Dissolving and Back Again

Teacher Background

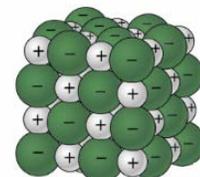
Water is a polar molecule

Water molecules are made up of two hydrogen atoms bonded to one oxygen atom. The bond between oxygen and hydrogen causes the area near the oxygen to be slightly negative and the area near the hydrogen to be slightly positive. This charge separation makes water a *polar* molecule.



Salt is composed of positive and negative ions

Salt, or sodium chloride (NaCl), is composed of positively charged sodium ions (Na⁺) and negatively charged chloride ions (Cl⁻). An ion is an atom that has gained or lost one or more electrons. Since electrons are negatively charged, an atom that gains an electron becomes a negative ion, and an atom that loses an electron becomes a positive ion (since it then has more protons, which are positively charged, than electrons).

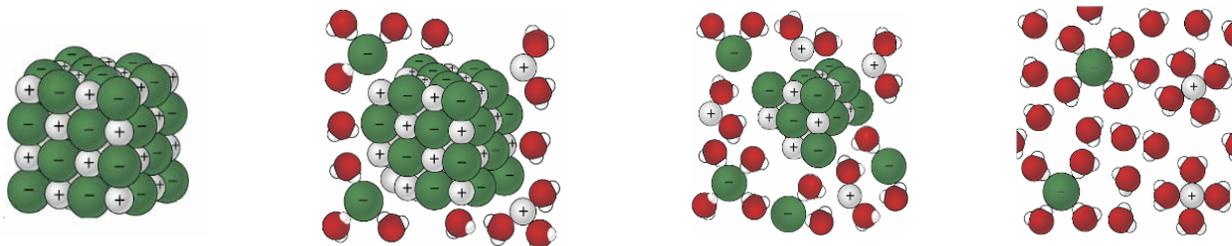


Model of Sodium Chloride

How does water dissolve salt?

In a single granule of salt there are millions of trillions of ions, so this model is extremely simplified to show the basics. In a granule of salt, the positively charged sodium ions and the negatively charged chloride ions attract each other and form a salt crystal.

Water dissolves salt because of the attraction between the water molecules and the ions in salt.



Notice how the positive end of the water molecule, near the hydrogen atoms (white), attracts the negative chloride ion (green). Also note how the negative end of the water molecule, near the oxygen (red), attracts the positive sodium ion (white). When the attraction that the water molecules have for the ions overcomes the attraction the ions have for one another, the salt ions separate (technically called “dissociation”) and dissolve.

Some ionic substances do not dissolve in water

But not all ionic substances readily dissolve in water. Calcium carbonate (CaCO₃) is an ionic substance that makes up egg shells, sea shells, and a mineral called limestone. Calcium carbonate is composed of the calcium ion (Ca²⁺) and the carbonate ion (CO₃²⁻) and does not dissolve in water. The calcium and carbonate ionic attractions for each other are stronger than the attraction that water molecules have for either ion. That is a good thing considering this substance forms the protective structures for so many creatures.



Calcium carbonate does not dissolve in water.