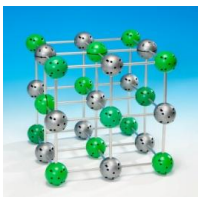

Teaching resource 1

The structure of sodium chloride and why salt dissolves in water

You will need:

for the sodium chloride crystal	*for the sodium ion in water*
13 silver metal, M[l] (for sodium ions)	12 white hydrogen, H[b]
14 green halogen, Hal[l] (for chloride ions)	6 red oxygen, O[k]
54 grey straws	1 silver metal, M[l]
	12 grey straws, 6 longer white straws

Structure of Solid Sodium Chloride

1. First have a look at some crystals of common salt through a magnifying glass. Note the cubic structure.

2. Take four sodium ions and four chloride ions and build them into a cube. Make sure that you never join two similar ions together. You will need twelve straws, and the result will be as in figure 1 below.

You have made a model of a tiny piece of a sodium chloride crystal. Does the model explain the shape of the common salt crystal?

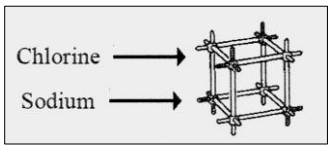

Figure 1

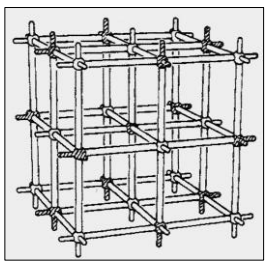

Figure 2

3. Extend the model as shown in figure 2, using up the remainder of your sodium ions and chloride ions.

Suggested topics for study:
What is the angle between adjacent straws in the model? [90°]
Why do like ions never come into contact? [Because they repel each other electrostatically]
How many near neighbours does each chloride and each metal ion have? [Each ion has six near neighbours and the structure is said to show 6:6 coordination.]

No 1. The structure of sodium chloride and how salt dissolves in water

What happens when salt dissolves in water?

Salt is an ionic compound, the lattice is formed with negative and positive ions. When added to water ions detach themselves from the crystal and join loosely to water molecules

1. To demonstrate this, first make a model of a water molecule, H_2O. Take two hydrogen atoms and one oxygen atom, and join them together as shown in figure 3, using green straws. Make six such molecules.

2. Remove a sodium ion from your crystal model, and attach six white straws to it – these are used to represent the loose forces that connect the atoms to the water molecules. Now connect six water molecules to these white straws as shown in figure 4.

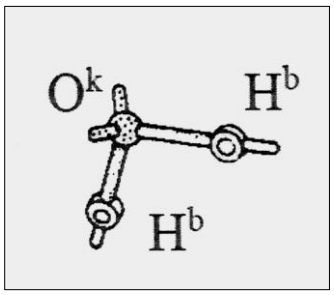

Figure 3

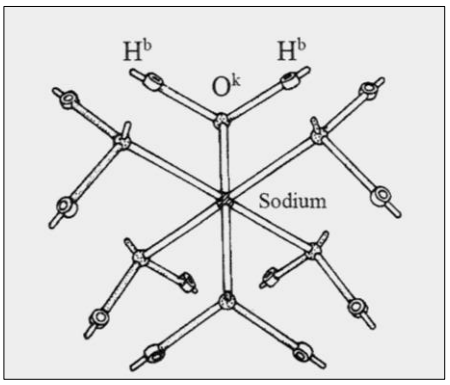

Figure 4

Water molecules can join on to chloride ions in the same sort of way, but the molecules are connected via their hydrogen atoms.

3. Try to make a model of a dissolved chloride ion.

When the ions are dissolved, they cannot so easily join together to form a crystal since they are all surrounded by water molecules.

Products which can be used for this demonstration:

0046 Orbit Basic Structures Class Set (contains enough pieces for two models per set)
0026 Orbit Basic Structures Individual Set
0041 Large Class set
Or you can order sufficient individual atoms from the Orbit, Minit or Unit systems for your individual needs.