

The ionic bond

Sodium and chlorine react together; sodium gives its electron to chlorine. Now both elements have a full outer shell, but with a charge. Now they are ions. Sodium now has 10 electrons but 11 protons so it has a positive charge. Chlorine now has 18 electrons but 17 protons so it has a negative charge. The two ions have opposite charges, so they attract each other. The force of attraction between them is strong. It is called an ionic bond.

When sodium reacts with chlorine, billions and billions of sodium and chlorine ions form and they attract each other. But the ions don't stay in pairs. They cluster together so that each ion is surrounded by 6 ions of opposite charges. The pattern grows until a giant structure of ions is formed. The overall charge of the structure is 0 since 1 positive charge and 1 negative charge neutralize each other.

The ionic bonding is only between metals and non-metals.

Important notes:

- Hydrogen and the metals form positive ions
- Non-metals form negative ions, and their names end in -ide
- Group 4 and 5 do not usually form ions because they would have to lose or gain several electrons and that takes too much energy
- Group 0 elements do not form ions; they already have full outer shells
- Some of the transition metals form more than one ion.
- Some ions can be formed from groups of joined atoms. These are called compound ions.

Properties of ionic compound

1. Ionic compounds have high melting and boiling points.

This is because ionic bonds are very strong, so it takes a lot of heat energy to break up the lattice.

2. Ionic compounds are usually soluble in water.

The water molecules can attract the ions away from the lattice. The ions can then move freely, surrounded by water molecules.

3. Ionic compounds can conduct electricity when they are melted or dissolved.

When melted the lattice breaks up and the ions are free to move. Since they are charged, this means they can conduct electricity. The solutions of ionic compounds conduct electricity too because they are also free to move.

The covalent bond

Giving and losing an electron is not the only way to gain full outer shells since atoms can also share electrons.

Covalent bonding is for non-metals only since only non-metals need to gain electrons.

A molecule is a group of atoms held together by covalent bonds.

When a pair of electrons is shared, it is called a single covalent bond, or just single bond.

When 2 pairs of electrons are shared, it is called a double covalent bond, or just double bond.

When 3 pairs of electrons are shared, it is called a triple covalent bond, or just triple bond.

Covalent compounds

A covalent compound is when atoms of *different* elements share electrons with each other.

The molecules in a covalent compound isn't flat because each electron repel each other and try to get as far apart from each other.