Molecules
Many atoms are bound to other atoms. Together they are a molecule. Example: 2 Hydrogen atoms H and 1 Oxygen atom O bound together are a water molecule H_2O. Water consists of many water molecules. 18 g water contain $6.02 \cdot 10^{23}$ water molecules. A lot of energy is needed to separate an atom from a molecule. The bond between 2 atoms here is produced by the exchange of electrons between these 2 atoms. The number of electrons, that can be exchanged with an other atom, is normally quite small and depends of the kind of the atoms. Hydrogen atoms can bond with 1 other atom only, Carbon atoms with 2 or 4 other atoms, Oxygen atoms with 1 or 2 other atoms. These bonds are usually quite stable.

Metals
In a piece of metal, some electrons of the metal can be exchanged with all the other metal atoms of that piece. Electrons, therefore, can move through the whole piece of metal. This nearly free movement of the electrons is the reason, that many metals reflect light like a mirror.

Ions
If an atom loses 1 or more electrons, it has a positive charge. Example: A Natrium atom Na loses 1 electron and has therefore a positive electric charge. We write Na^+. A Chlorine atom Cl can take up an additional electron and gets thereby a negative electric charge. We write Cl^-. A Calcium atom Ca can lose up to 2 electrons and become thus Ca^{++} or Ca^{2+}. If a molecule has one electron too much or too few, we have a molecular ion, for example HO_3^+ and OH^-.

If we have a big number of Na^+ ions and Cl^- ions swimming in water and we let the water evaporate, the electric force between these electrical charges lets these ions come together into a very strong and solid structure, where each positive ion is surrounded by negative ions and each negative ion is surrounded by positive ions. This structure is very stable, it is a crystal of salt. When it is dissolved in water, ions swim again in the water.

Electric current
If ions swim in the water and if we put 2 metal bars into this water, and one of these bars, called A, has a positive electric charge and the other one, called B, has a negative electric charge, then all negative ions go towards the positive bar, and all positive charges go to the negative bar. We say: "An electrical current flows from A to B." The direction of the current is from the positive part A to the negative part B. Positive electric charges flow in the direction of the current, negative charges flow against the direction of the current.

If we connect A and B by a piece of metal, for example a wire, electrons can flow from B to A. That is used in electric wires.

If salt is heated so much, that it becomes liquid, the ions in it can move also and we get there an electric current.

If there is enough energy, atoms and molecules in the air or in other gases can be stripped of electrons and become ions. If the electric force is big enough, these electrons and ions can get so

much energy, that they can hit other air molecules and kick one or several electrons out of them. That increases the number of electrons and ions and increases the electric current, that flows. A gas wih free electrons and ions is called plasma. We can see plasma in fluorescent tubes and in lightnings in thunderstorms.

If a piece of matter has moving charges, it is called a conductor, if it has no moving charges, it is called an insulator.

As a quantity in physics the electrical current I is a measure of how many electrons pass a certain point in 1 s. The unit 1 A [Ampere] = 1 C/s means $6.242 \cdot 10^{18}$ electrons per second.