

Student Revision Notes (age 11 – 14): Electric Current

Solids and liquids conduct electricity because they contain charged particles that can move around in them.

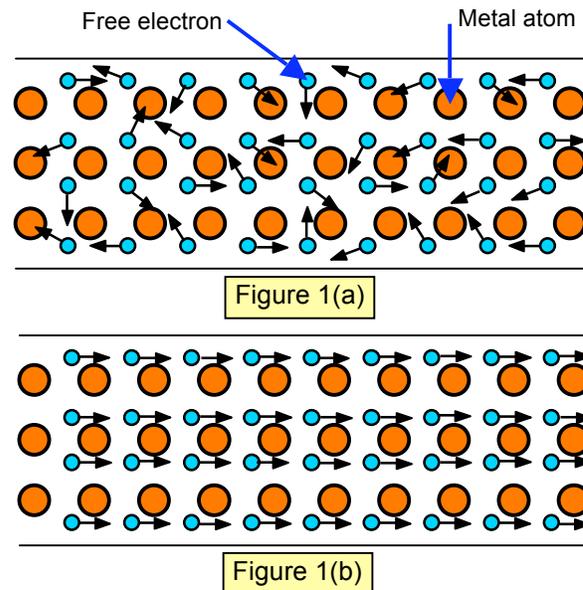
The rate of flow of the charge in the solid or liquid is called the **electric current**.

Electric current in solids

In solids the negatively charged particles are called **electrons**.

In some solids the electrons can wander about between the atoms, these electrons are called **free electrons**.

The more free electrons there are in a solid the better it will conduct electricity. If we now think of the metal as a wire as shown in the diagram then the tiny electrons show no particular direction of movement (Figure 1(a)). But if we now connect a battery to the two ends of the wire the electrons drift down the wire in one direction (Figure 1(b)).



- The rate of flow of free electrons in a solid is called an **electric current**.

Examples of solids that will conduct electricity (by using batteries alone) include:

- All metals e.g. copper wire.
- Carbon e.g. brushes on an electric motor.

Examples of solids that will not conduct electricity (by using batteries alone):

- Dry wood
- Rubber
- Plastics

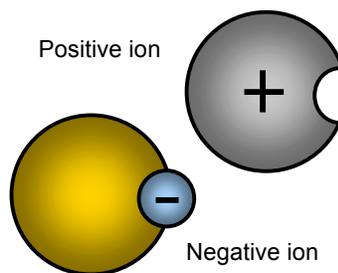
Electric current in liquids

In liquids the electric current is a flow of **charged atoms**. These charged atoms are called **ions**.

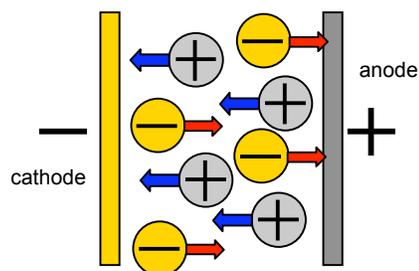
Ions come in two types which are illustrated in the diagram below:

Positive ions - atoms that have lost one or more negative electrons.

Negative ions - atoms that have gained one or more negative electrons.



Negative ions will flow towards the positive electrode in a liquid and positive ions will flow towards the negative electrode.



- The rate of flow of ions in a liquid is called an **electric current**.

Examples of liquids that will conduct electricity include:

- Water (not distilled).
- Copper sulphate solution.
- All acids e.g. sulphuric acid.

Examples of liquids that will not conduct electricity include:

- Distilled water.
- Paraffin.
- Methylated spirits.

Units of Electric Current

Materials that will conduct electricity are called electrical **conductors** and those that won't are called electrical **insulators**.

Electric current is measured in **Amperes** (AMPS, symbol A). A current of 1 A is flowing in a circuit if a charge of 1 coulomb passes any point in the circuit every second. We can write this formula as:

$$\text{Current (I)} = \text{Charge (Q)} / \text{Time (t)}$$

You may meet smaller currents than one amp. For these currents we use milliamps and micro amps.

$$1 \text{ A} = 1000 \text{ milliamp (mA)}$$

$$1 \text{ A} = 1,000,000 \text{ micro amps (}\mu\text{A)}$$

Examples of the different levels of electric current include:

- Electric currents of millions of amps are used in fusion reactors.
- Lightning is thousands of amps.
- Electrical currents of around an amp flow in light bulbs.
- Electric currents in an electric clock will be milliamps.
- Electric current in electronic circuits are a few micro amps.

Linked Resources

www.twothirtyvolts.org:

Electric Current (11-14) Student Quiz