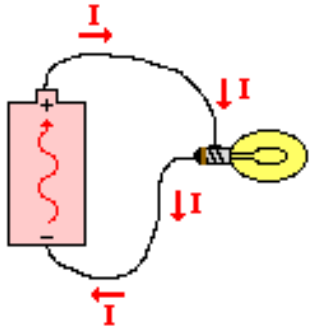
Electric current

$$I = \frac{\Delta Q}{\Delta t}$$

current — charge — time



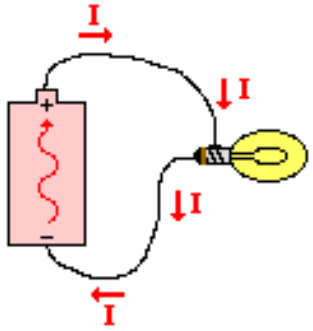
Electric current in the external circuit is directed from the positive to the negative terminal.

Electric Current (represented by letter **I**) is the **total charge** flowing through a wire in **1 sec**. Measured in **Amperes [A]** (Coulomb per second) **: 1A=1C/s.**

In most cases the current is the flow of electrons (negative charges), but the convention is to assume that current is the motion of positive chages. When electrons are moving to the right, it is the same as positive charge (and current) is moving to the left. Therefore, the current is flowing from '+' to '-' terminal of a battery.

Voltage

$$V = \frac{E_{potential}}{\Delta Q}$$



Electric current in the external circuit is directed from the positive to the negative terminal.

Voltage **V** is a potential energy of a unit charge. It tell you how much work the charge can do in an electric circuit. One typically measures a **Voltage difference** between two points in a circuit. It is similar to measuring height on a ski slope.

Homework

Problem 1

The brightest phase of a lightning bolt lasts approximately 1 millisecond (1ms, “milli” stands for 1/1000). During that time, a charge of approximately 10 C moves between the cloud and the ground. Estimate the typical electric current during this event.

Problem 2

A good “AA” battery can “pump” a total charge of about 7000 C through an electric circuit, until it dies. Consider an electric circuit made of a single battery and a single LED (light-emitting diode) shown in the picture. The current in LED is 20 mA (mA=milliampere). How long will the battery last?