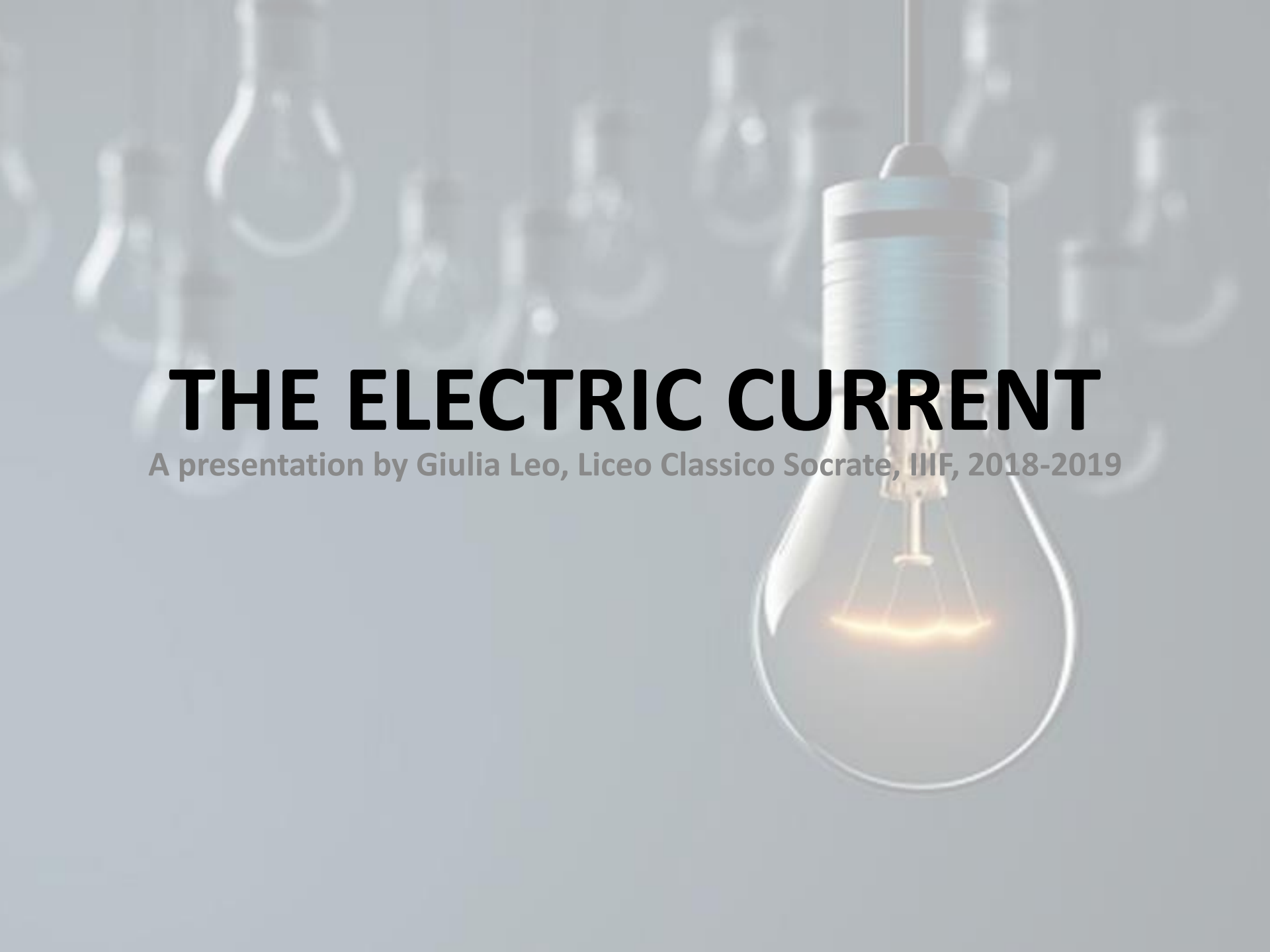
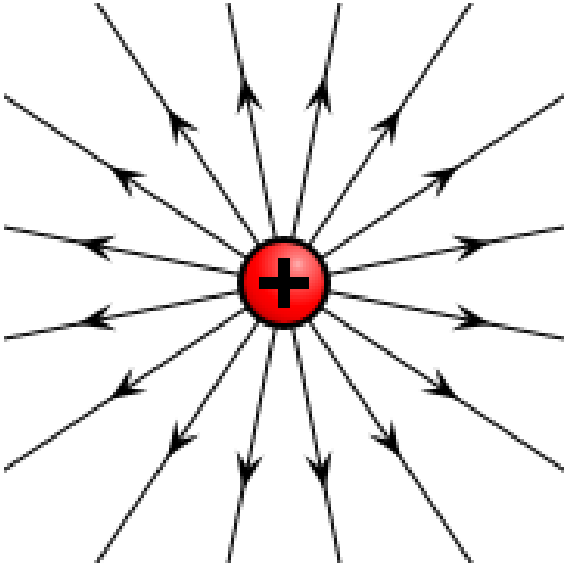


# THE ELECTRIC CURRENT

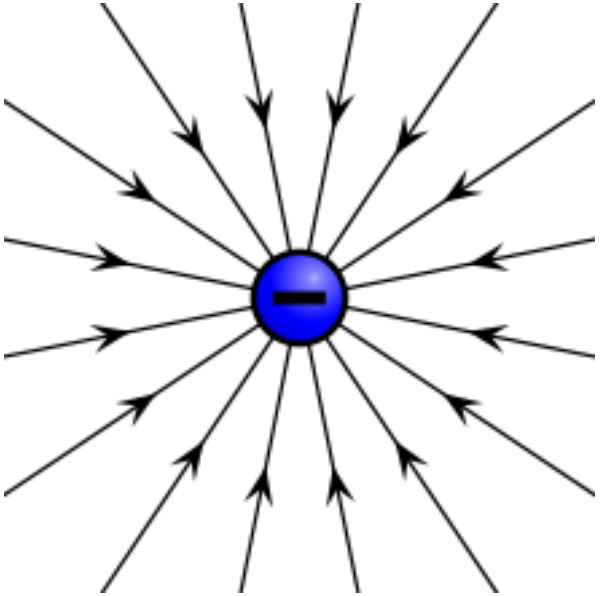
A presentation by Giulia Leo, Liceo Classico Socrate, IIIF, 2018-2019

# Before we start…

***Charge*** *= Carica*

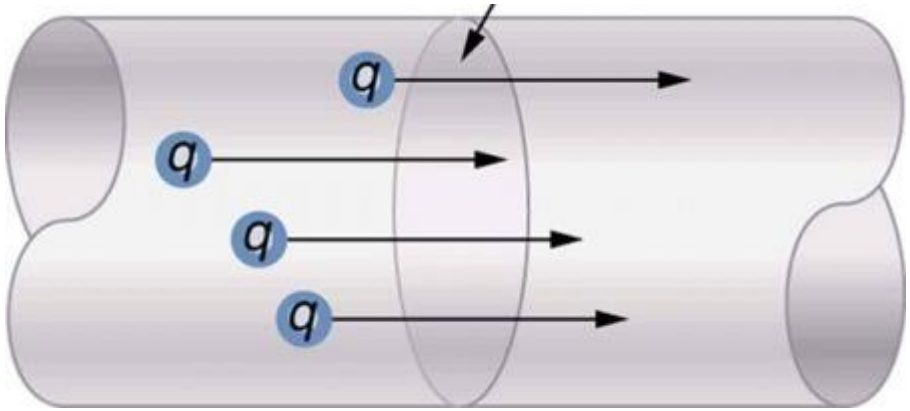


Positive charge

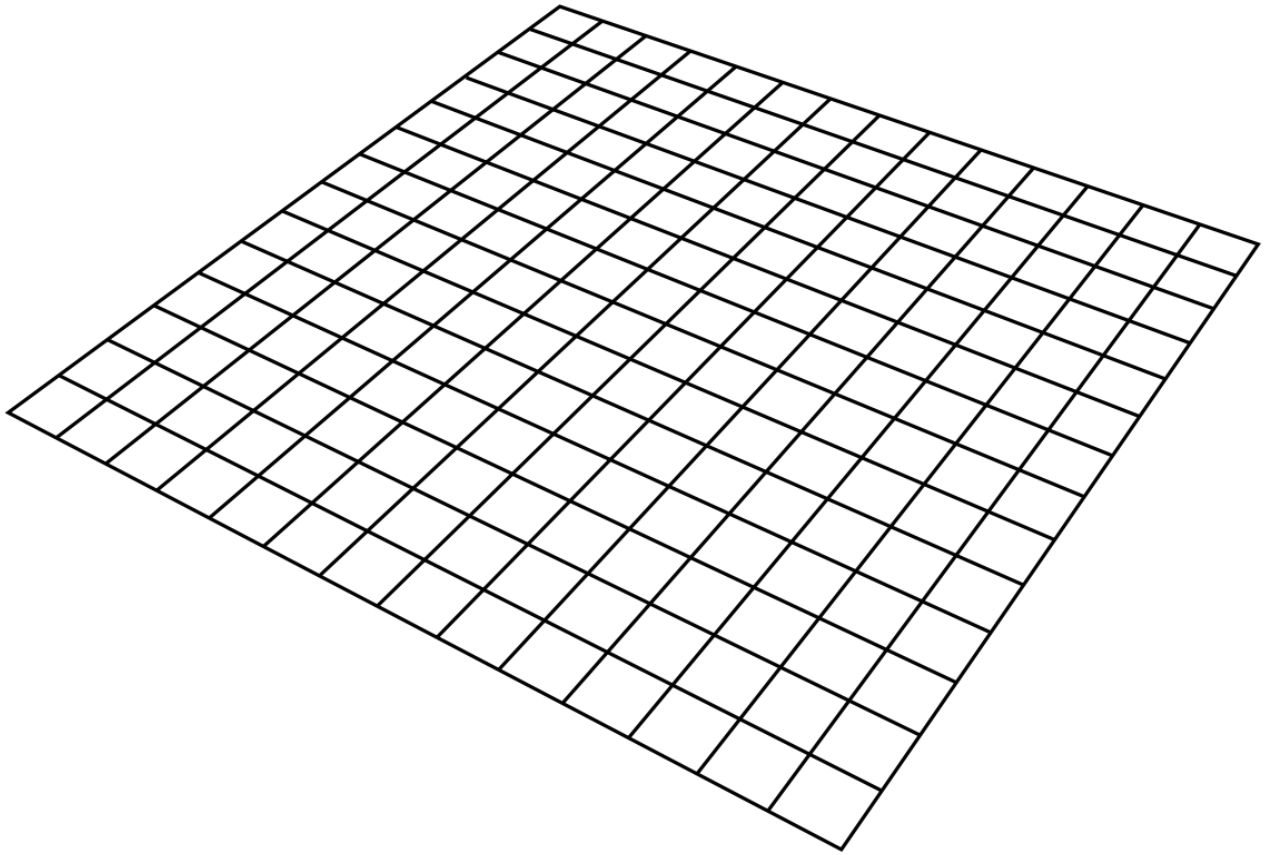


Negative charge

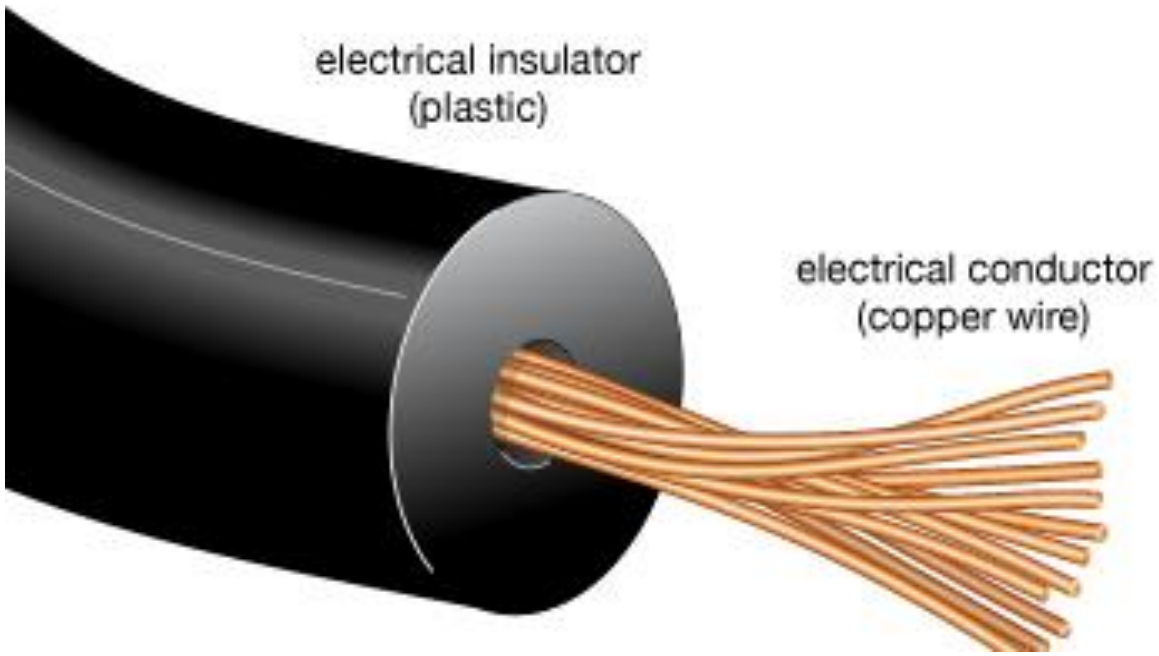
***Flow (of charges)*** = *flusso/moto di cariche*



***Surface*** = *Superficie*



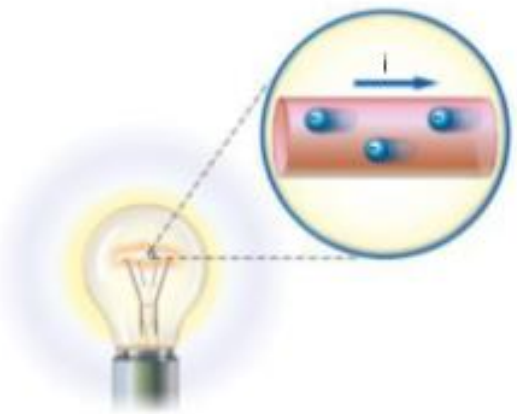
***Conductor*** = *conduttore*



# Mathematical Signs

| | |
|---|---|
| + | plus, add, positive |
| - | minus, subtract, less, take away, negative |
| x * | times, multiplied by |
| ÷ / | divided by, divide ⟌ ⟌ |
| = | is equal to, equals |

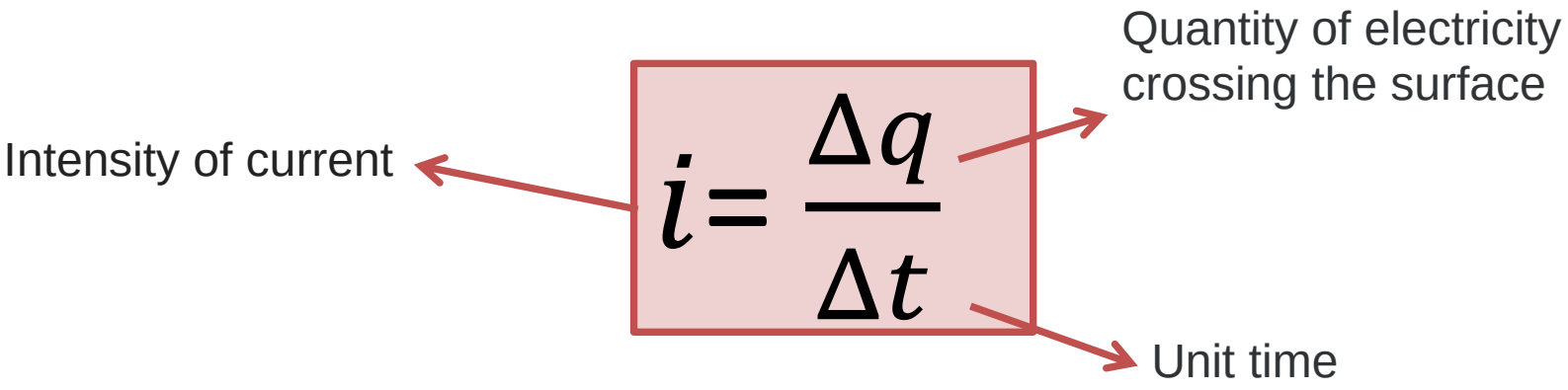
# Definition of Electric Current



Electric current can be defined as an ordered flow of positive or negative electric charges.

In order to quantify electric current, we use the **Intensity of current**.

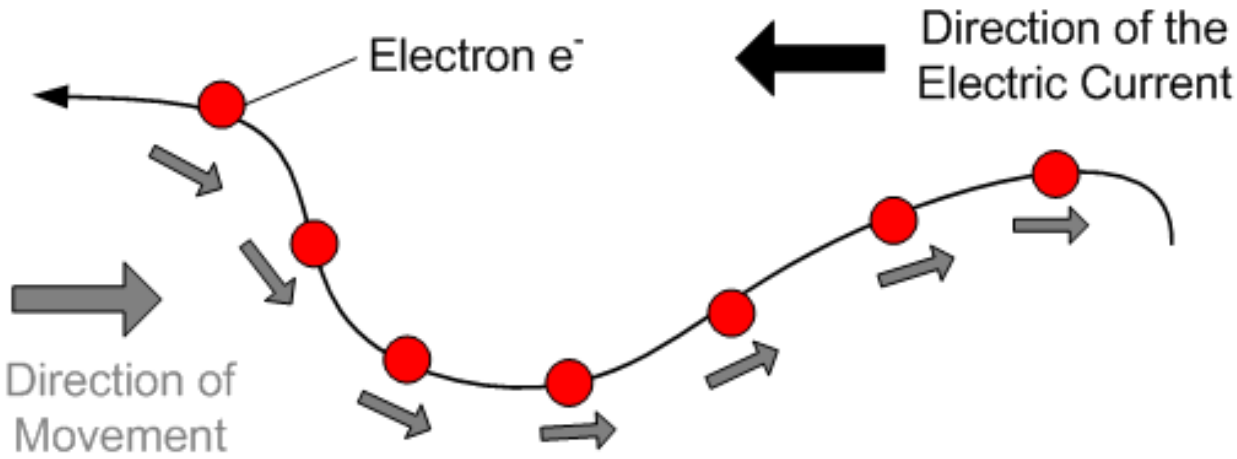
Intensity of current is measured by the quantity of electricity crossing a specified area of equipotential surface per unit time.



The SI unit of electric current is the Ampere, which is the flow of electric charge across a surface at the rate of one coulomb per second.

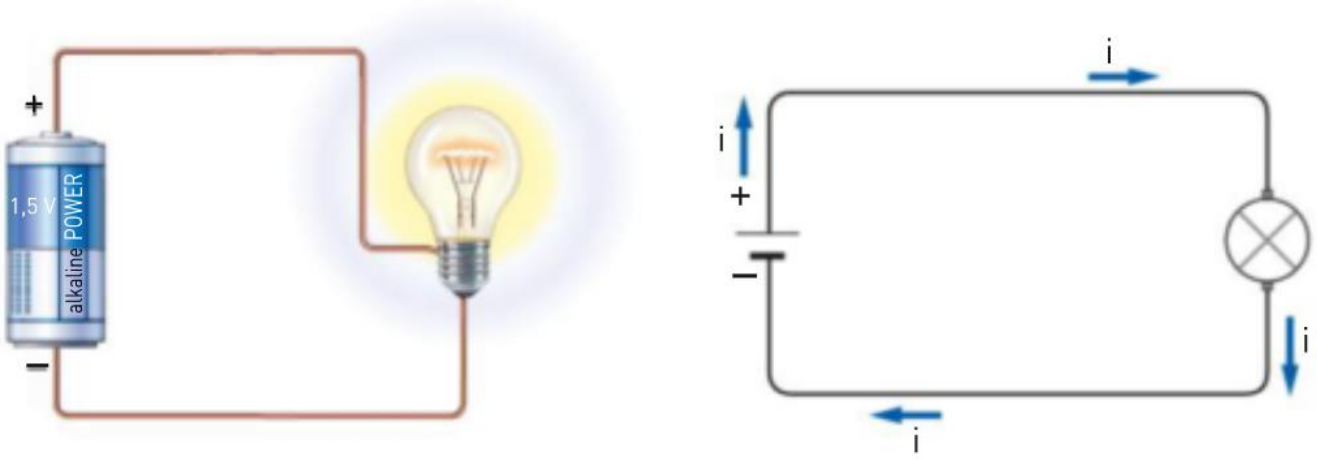
$$1\ A = 1\ C/1s$$

# The Direction of Electric Current




Benjamin Franklin defined the direction of electric current as opposite to the direction of motion of electrons.

# The Electrical Circuit

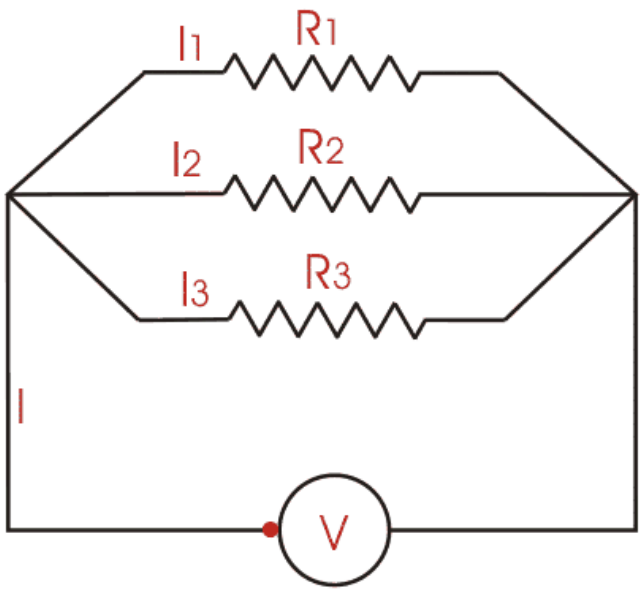



An electrical circuit is a path through which an electrical current flows.

It is composed by a chain of conductors connected to an energy source.

# Types of Circuits

## *A) PARALLEL CIRCUIT*



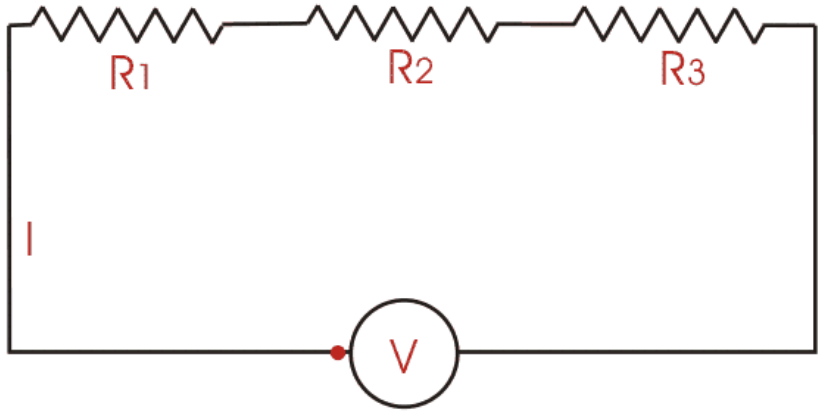

- A parallel circuit has two or more paths for current to flow through.
- Voltage is the same across each component of the parallel circuit.
- You can find total resistance in a Parallel circuit with the following formula:

  **1/Rt = 1/R1 + 1/R2 + 1/R3 +...**
- If one of the parallel paths is broken, current will continue to flow in all the other paths.

# Types of Circuits

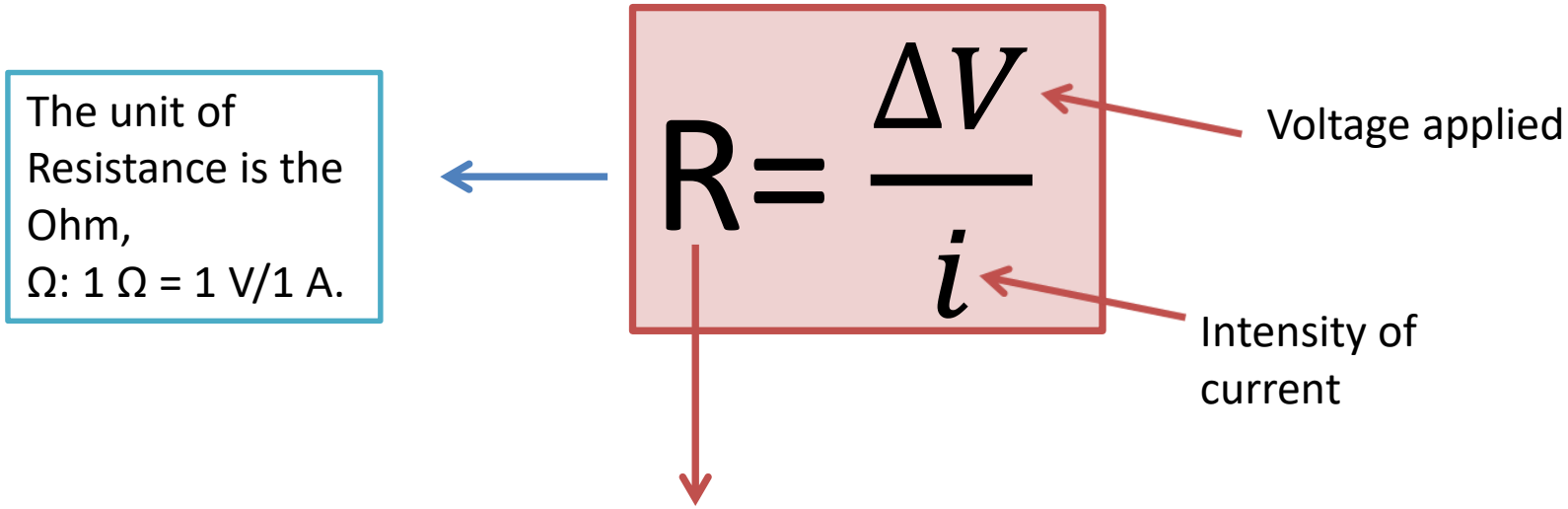
## *B) SERIES CIRCUIT*

- In a series circuit the current remains unchanged all along the circuit: all electric components receive the same current.
- The total resistance of a series circuit is equal to the sum of individual resistances.
- If the circuit is broken at any point, no current will flow.



# First Ohm's Law

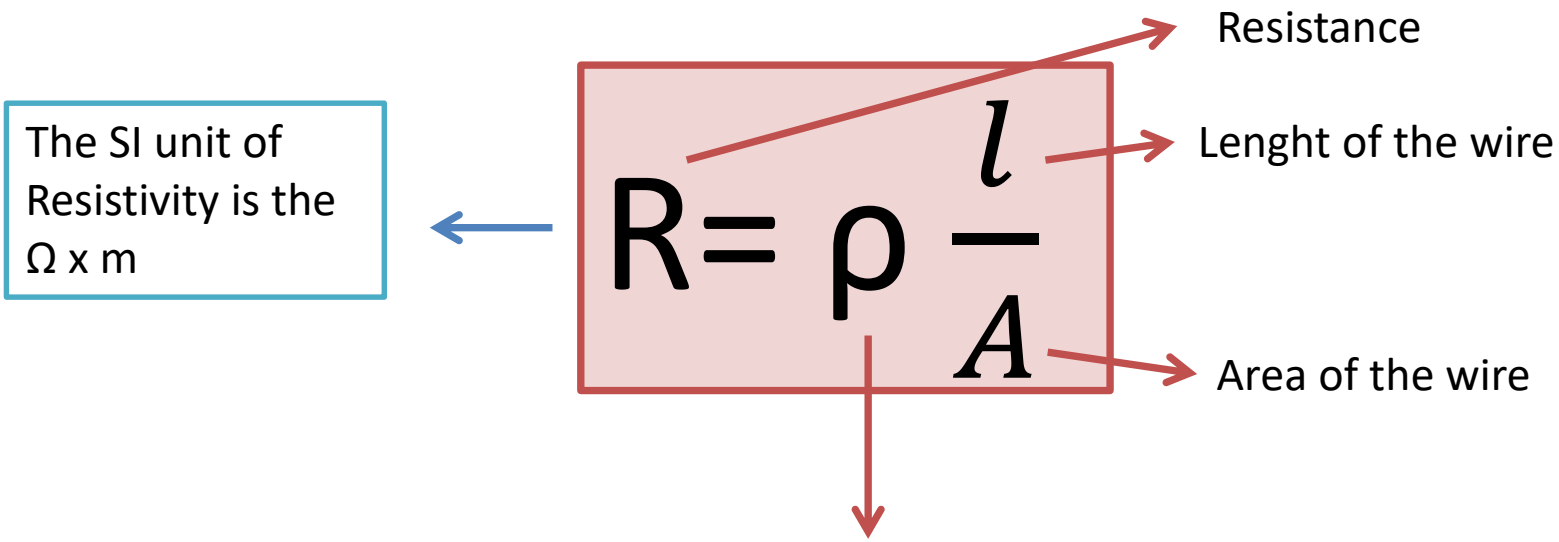
In Ohmic conductors the intensity of current that flows through a device is directly proportional to the applied voltage.




R stands for **Resistance**, and it is the constant of proportionality between $\Delta V$ and $i$.

# Second Ohm's Law

The Resistance in a conducting wire is directly proportional to its length and inversely proportional to its crosssectional area.




ρ stands for **Resistivity**, and it's the constant of direct proportionality between R and $l$ and of inverse proportionality between R and $A$.

# Resistance VS Resistivity

- **Resistance** depends on the geometry, section and lenght of the conductor.
- **Resistivity** can depend on the material of the conductor or on variations of temperature.
- **Resistance** is a characteristic of the conductor.
- **Resistivity** is a characteristic of the material.

# Superconductivity

Superconductivity is the property of some materials to conduct electricity without resistance below a certain temperature, whose value changes depending on the material.