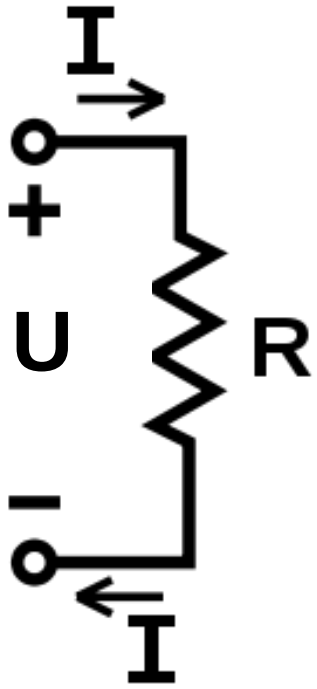
Ohm's Law

$$V = I \cdot R$$



• **V** is **Voltage**, the **Potential Difference** between two ends of a wire (or resistor, light bulb etc). Measured in **Volts [V]**

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

• **R** is **Resistance** of the wire. Measured in **Ohms [Ω].** $1\Omega = 1\,V/A$

POWER

$$Power = \frac{Work}{time}, \qquad \mathrm{P} = \frac{\Delta \mathrm{W}}{\Delta t}$$

- **W** may be mechanical work, or work done by a battery driving an electric current.

- In this definition, ***Work*** can also be replaced with ***Heat***. That will be thermal power rather than mechanical or electric one.

- Units of power are Watts [W]: 1W=1J/s (Joule per second)

POWER IN ELECTRIC CIRCUIT

$$Power = Current \times Voltage, \qquad \mathrm{P} = I \cdot V$$

Homework

Problem 1. Derive expression for Power ***P*** consumed by a resistor or a light bulb with resistance ***R***, for two cases :
(a) you know the current ***I*** flowing through it, (b) you know the voltage ***V*** applied to it.

Problem 2. When two light bulbs are attached to a certain battery in parallel, one of them consumes power **P**, and the other **3P**. What will be the ratio of the two powers if they are plugged in series? Assume them to behave as ideal resistors.

Problem 3. An electric motor is used to lift a mass **m=50 kg** to height **h=10m**, over time **t=10s.** Find the power of the motor and the current that runs through it, if the voltage on the motor is **V=110V.** Assume 100% efficiency.