1. ELECTRICITY: LAWS AND CONCEPTS
2. 1AU3

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Laws and concepts in electricity

Dynamic electricty

1. Direct current
2. Alternate current
3. Pulsed direct current and complex waveforms

Electric current

1. Effects of electric current
2. Current intensity
3. Electric resistance

Basic equations of electricity

1. Ohm`s law
2. Energy and electric power
3. Heat generated by electric currrent

Dynamic electricity

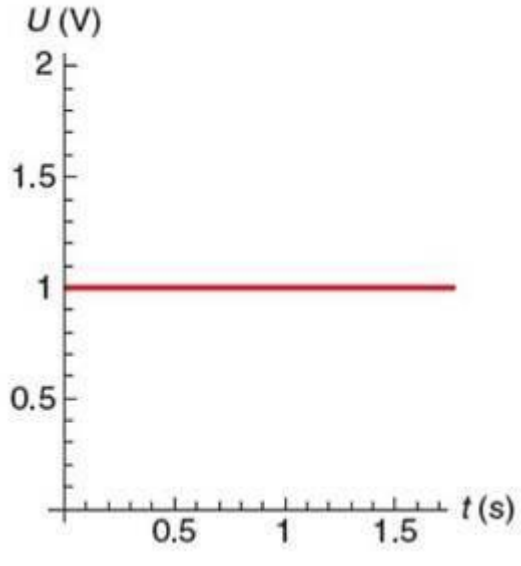
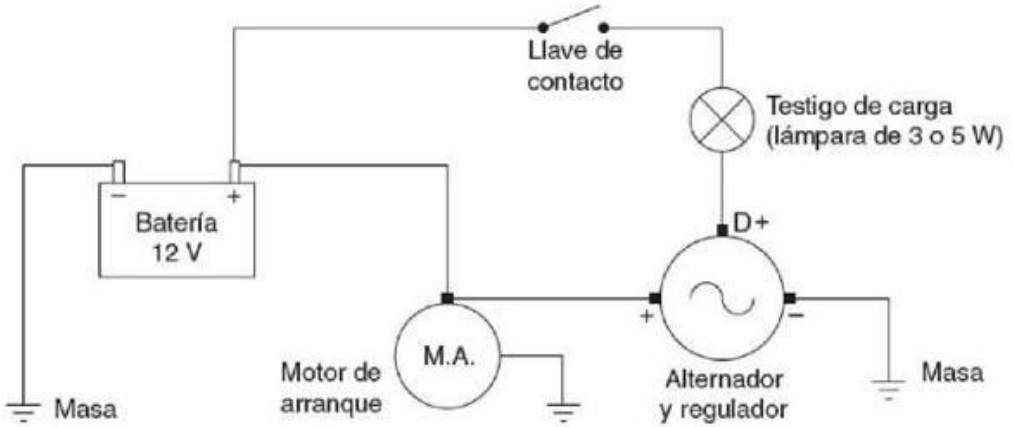


Image of 1V DC signal



Scheme of a car`s startup and charge system

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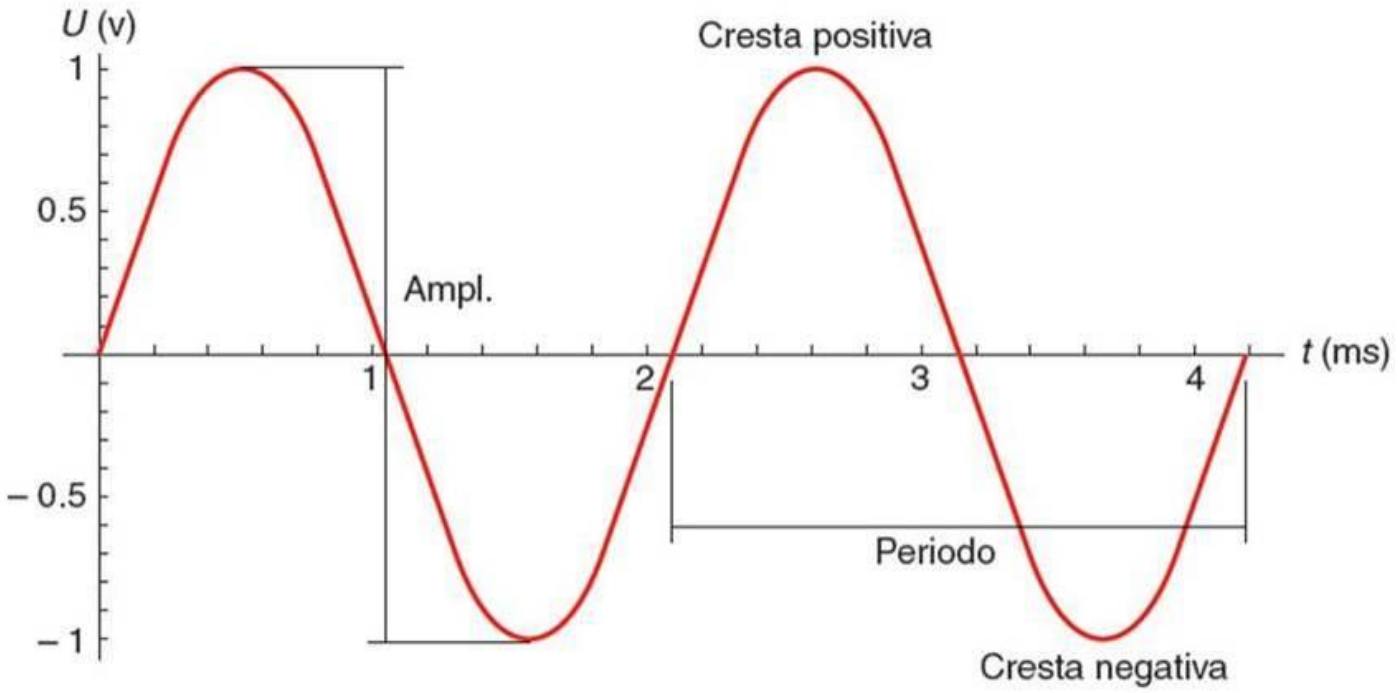
Alternating current



Sinusoidal alternate current with a Vpp = 2V (peak-to-peak voltage) and a T=2ms period.

Pulsed direct current and complex waveforms

Square or pulsed signal

Complex signal of an inyector

Electric current

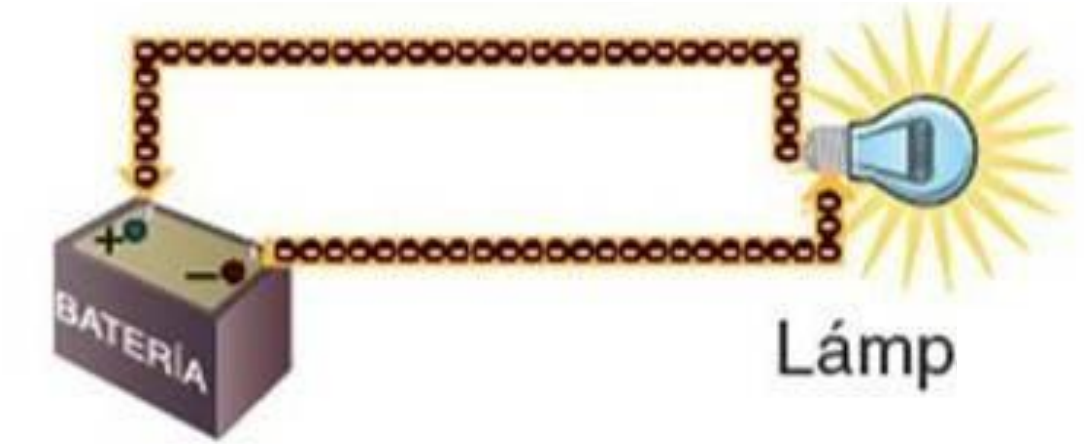
It measures the flow of charges, expressed in A (Amperes). These charges will of course be the electrons and they will travel fromo the point with the highest V to that with the smallest V value. In our car it will go from the startup battery`s positive terminal to the negative one.

What does electric current depend on?

Given two X and Y points, both with different voltage values; if we connect them through a conducting material, there will be an electrical current travelling through this conductor. The effect that tries to prevent the electrons from flowing through the conductor is called ELECTRIC RESISTANCE and it is measured in Ohms.

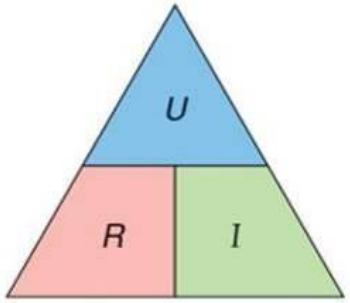
Electric current

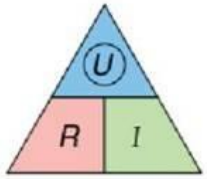
Flow of electrons through copper wirer



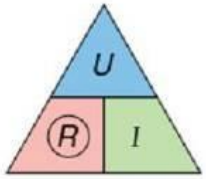
In the example above there will be an electric current flowing from one terminal of the battery to the other (they have different voltage values) because we have connected them with a conducting wire. The light bulb is on, proving there is such current. Although there is an international agreement to define positive current as the flow form the positive terminal to the negative one, we now know that the real flow of electrons goes from the negative terminal to the positive.

Ohm`s law

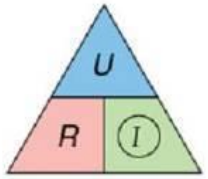




$V = I \cdot R$



$R = V / I$

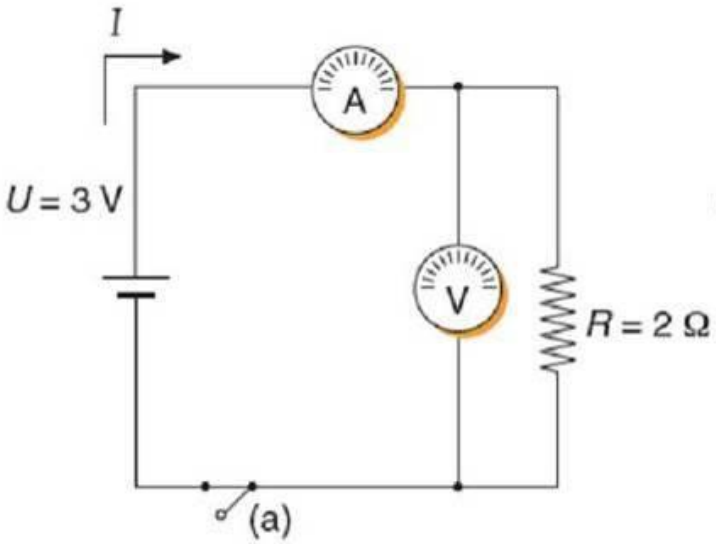


$I = V / R$

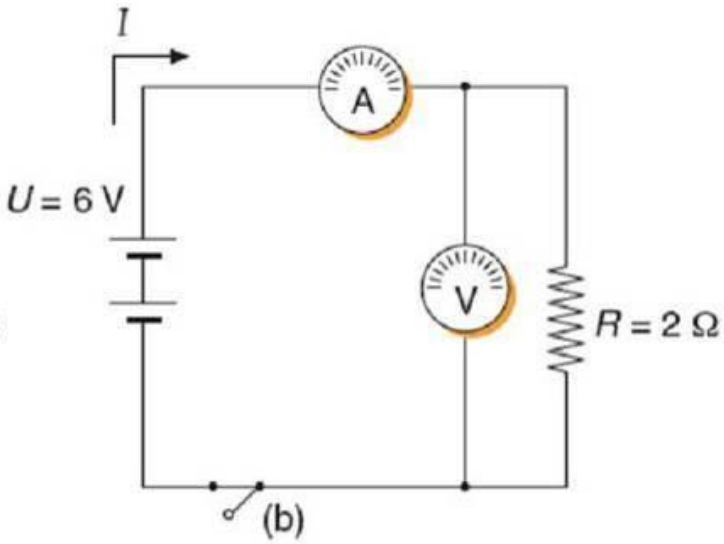
Ohm`s law: in a circuit, if we connect two points (which have different voltage values so there is a voltage differential) with a conducting wire, the intensity of the current (I) that will go through the wire is defined by dividing of the voltage applied by the resistance (R) found in the circuit.

Ohm`s law

Examples:

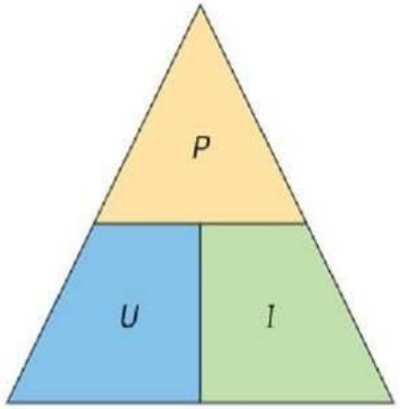


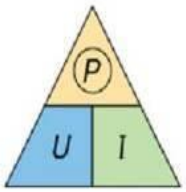
I = 3V / 2ohm =1.5A



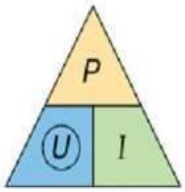
I = 6V / 2ohm = 3A

Electric power

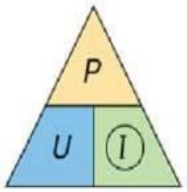




$P = U \cdot I$



$U = \frac{P}{I}$



$I = \frac{P}{U}$

Electric power: in a circuit, electric power (P) is defined as the product of the voltage applied (V) by the current generated (I).