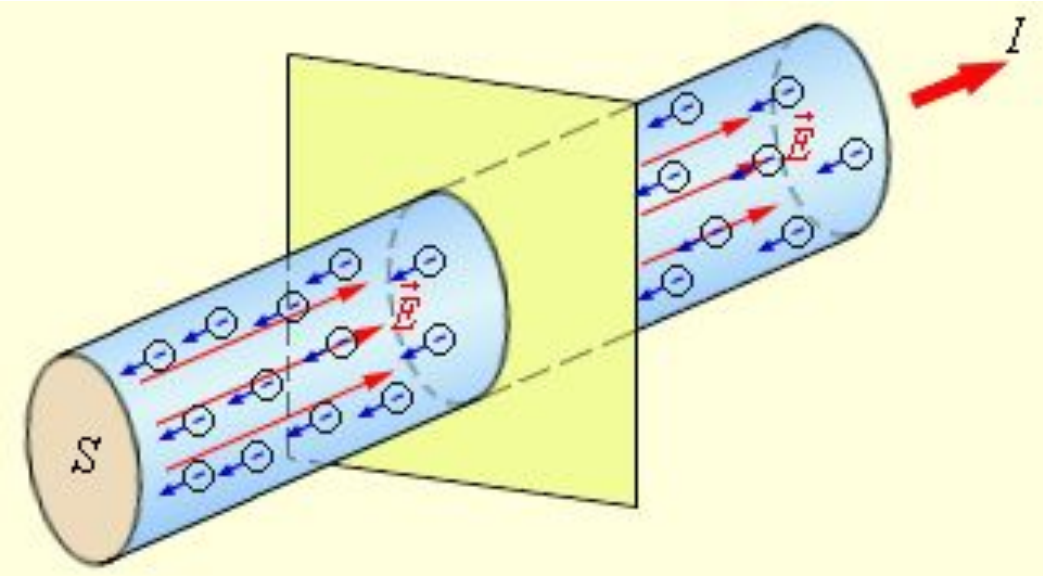
Direct current

Electrical current - movement of charged particles. **Current direction coincides with the direction of movement of positive charges.**



Ordered movement of electrons in a metallic conductor and the current *I*

S – cross-sectional area of the conductor.

E – electric field.

Amperage (сила струму) – physical quantity, which shows that the charge passing through a conductor cross section per unit time.

$$I = \frac{q}{t}$$

Direct current (DC) – electric current, which does not change direction and amperage with time.

Alternating current (AC) – electric current that changes with time.

Electromotive force (EMF)

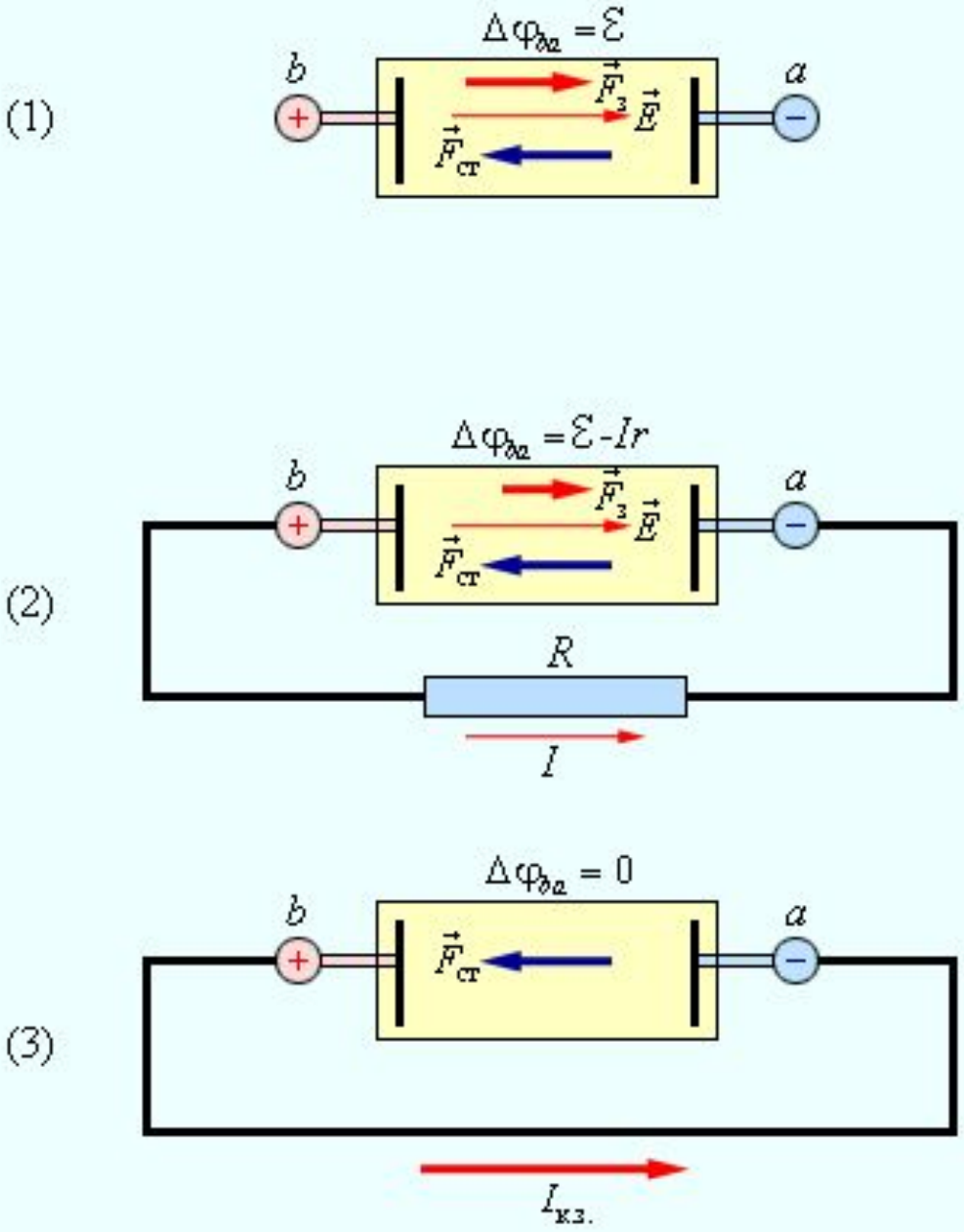
For creating direction current in the conductor can not be use charged capacitor(конденсатор), because charges will move from cover to cover, field will disappear, because the potential difference won't be. So, to obtain direct current on the charges in the electrical circuit must act in any electrostatic forces are not natural - **external forces.** The device, which occur outside forces is called a **current source.**

Electromotive force numerically equal to work, which perform outside forces when moving in circles of test charge.

Electromotive force (EMF)

$$\varepsilon_{12} = \frac{A_{ст}}{q} \qquad [\varepsilon] = \frac{1J}{1C} = 1\text{V}$$

The nature of **external forces**:
chemical (battery, galvanic cell)
magnetic (anchor generator rotates because of mechanical action)
electromagnetic (light incident on the semiconductor(напівпровідник)).

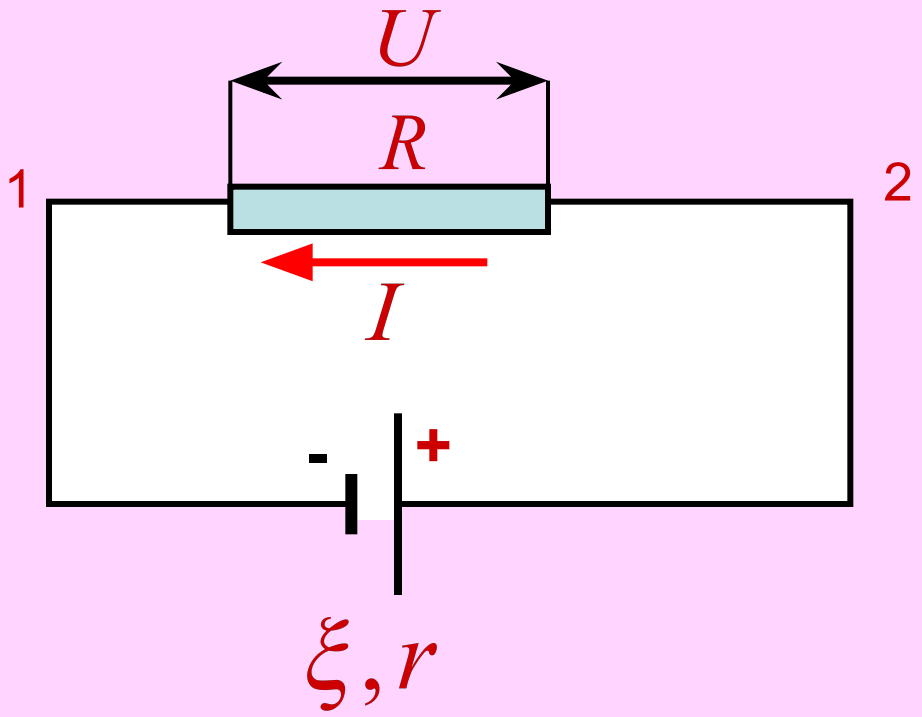


Schematic representation source of direct current(DC):

1 – battery is disconnected;

2 – battery locked to an external resistance R;

3 – mode of short circuit.



Circuit if direct current

R - external resistance.

r – impedance current source - internal resistance.

Ohm's Law

Ohm's Law for the chain in the integral form :

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

Ohm's Law for full circuit:

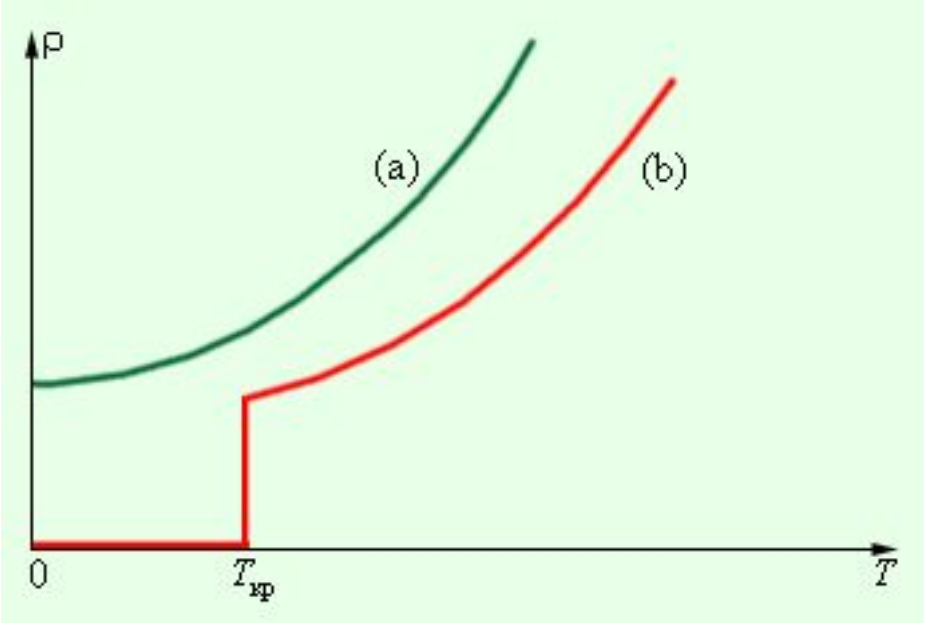
$$I = \frac{\xi}{R + r}$$

Electrical resistance

The electrical resistance depends on the electrical properties of the conductor and its geometrical parameters. For a homogeneous conductor of constant cross section:

$$R = \rho \frac{\square}{S} \qquad [R] = \frac{1\,V}{1\,A} = 1\,\Omega$$

where ρ - resistivity of the conductor.



In a large range(діапазон) of indoor temperature field

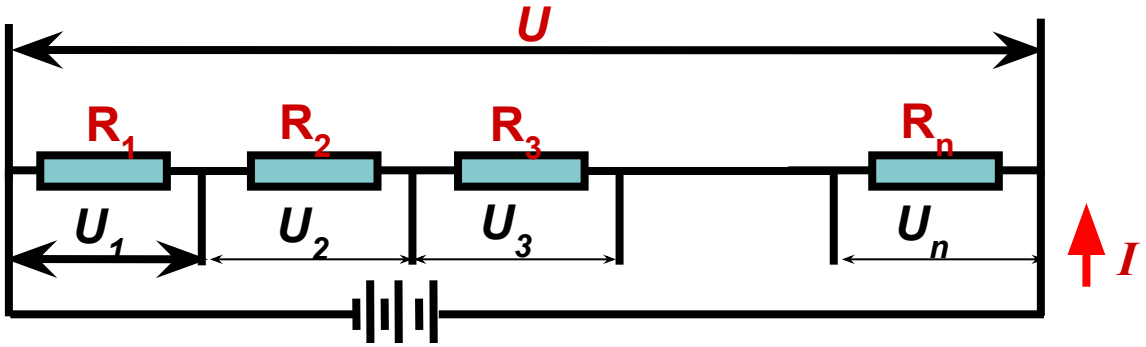
$$\rho = \rho_0(1 + \alpha t)$$

The dependence of the resistivity ρ of the absolute temperature T at low temperatures::

a – normal metal;

b – superconductor.

Series connection of conductors



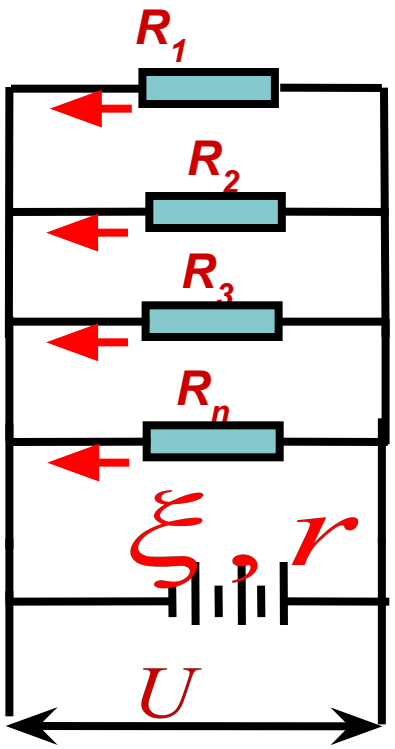
ξ, r

$$U = \sum_{i=1}^{n} U_i$$

$$I = I_1 = I_2 = I_3 = \ldots = I_n$$

$$R = \sum_{i=1}^{n} R_i$$

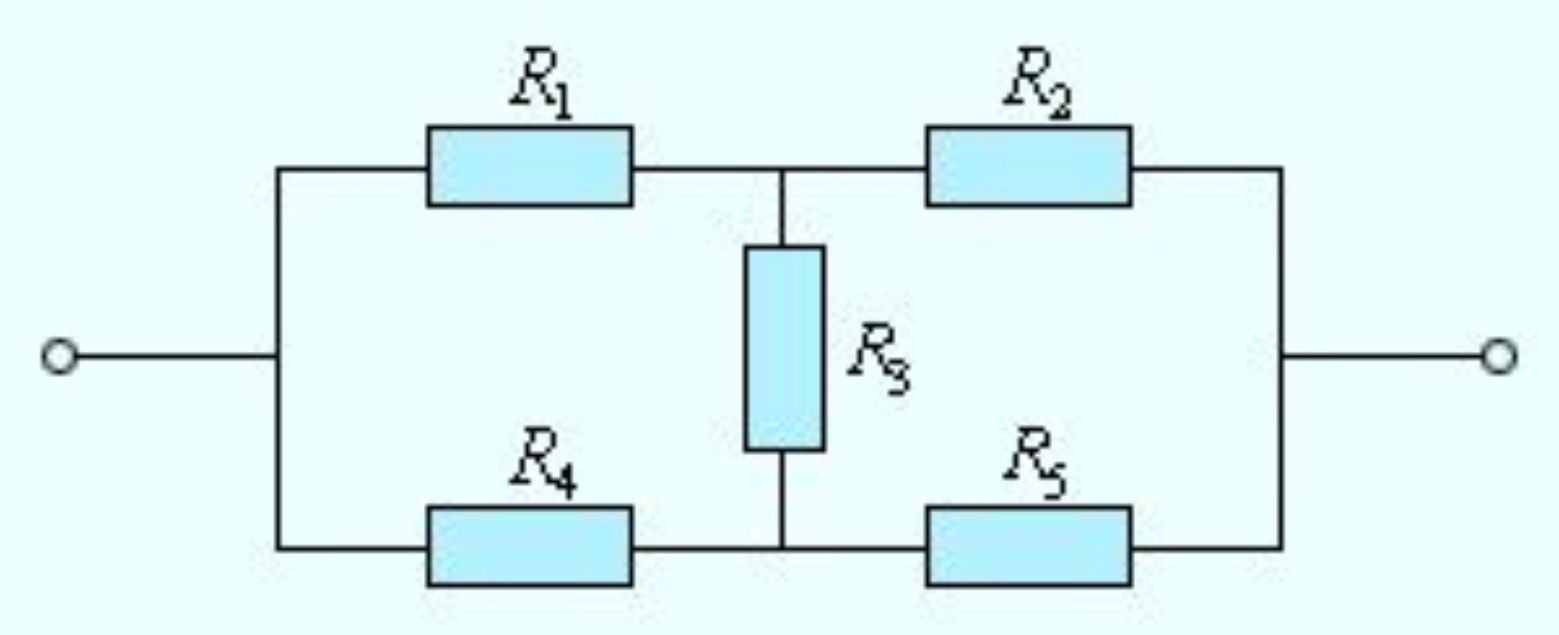
Parallel connection of conductors



$$I = \sum_{i=1}^{n} I_i;$$

$$U = U_1 = U_2 = \ldots = U_n;$$

$$\frac{1}{R} = \sum \frac{1}{R_i}$$



An example of an electrical circuit that can not be reduced to a combination of series and parallel connected conductors.

Law of Joule - Lenz

In the circle, which consists of a fixed metallic conductors, work dc entirely spent on heating conductors.

The law of the transformation of power in the heat was experimentally established independently by J. Joule and E. Lenz.

Law of Joule - Lenz for the chain:

amount of heat released in the conductor during the passage through it of direct electric current is the product of square of current at the time of its passage and the electrical resistance of the conductor.

$$Q = I^2Rt$$

In view of Ohm's law :

$$Q = IUt$$

Thank you for attention=)