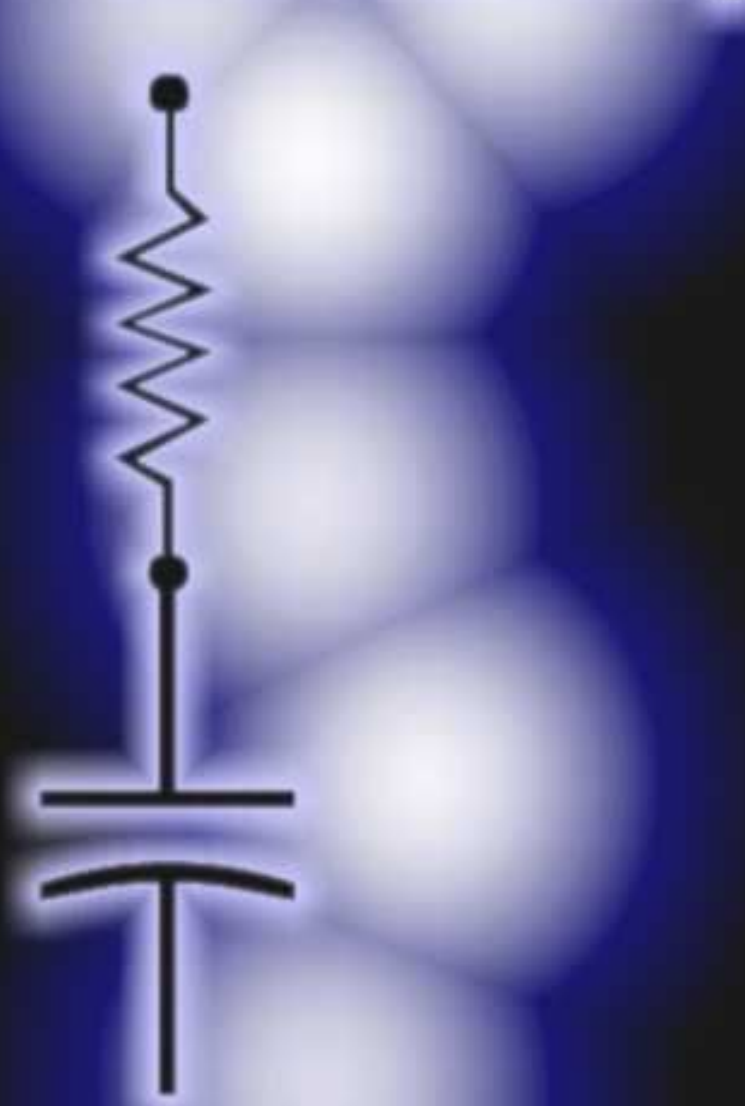
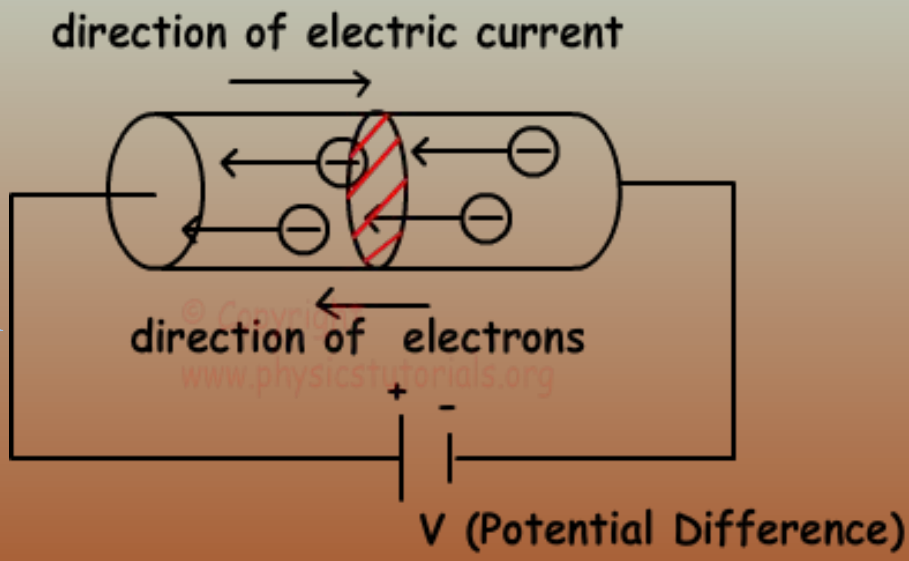


ELECTRIC PROPERTIES OF BIOLOGICAL OBJECTS

ELECTRIC CURRENT.



Electric current, in solids transferred with the free electrons, in liquids with free ions and in gases with free electrons and free ions. We can also define **electric current** as the charge per unit time passing through the cross section of conductor like given in the picture which is shown with red dashed lines. Average current is found with the following formula:

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

Where; I is the current, Q is the charge and t is the time

TYPES OF CONDUCTION

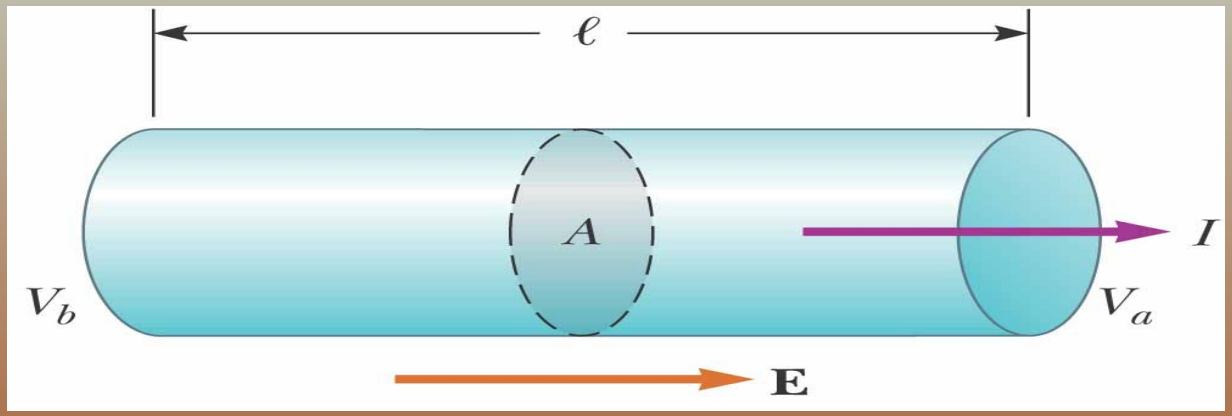
Ionic conduction -
in solutions some compounds dissociate on charged particles – ions. In electric field arranged & directed flow of these particles can be seen – the electric current.

Electronic conduction - type of conduction of most metals and some compounds. It characterizes with free charged particles – electrons – which provide electric current.

RESISTANCE

OHM's LAW

$I = U/R$

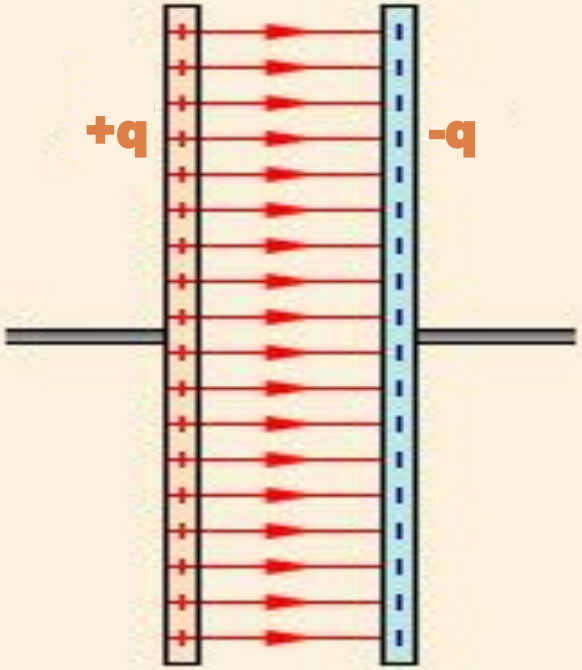


ACTIVE RESISTANCE

$R = \rho l/S$

RESISTANCE - defines counteraction to charges' flow. It depends on length , cross section and material of conductor .

CAPACITY – defines potentials difference between two isolated bodies if they have charges of the same value but opposite signs. Capacity of Capacitor depends on area of plates (S), distance between them(d) & dielectric permeability of isolator material(ε).



$U = q/C$

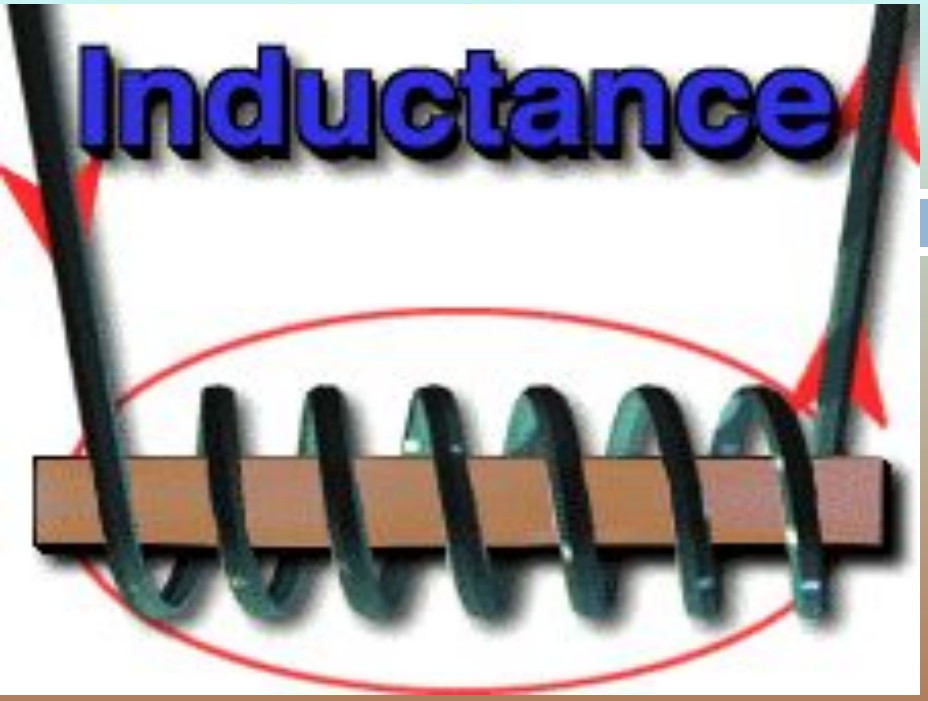
$C = \varepsilon S/d$

Alternating current resistance -

Capacity resistance $X = 1/\omega C$

L

C



Alternating current resistance -

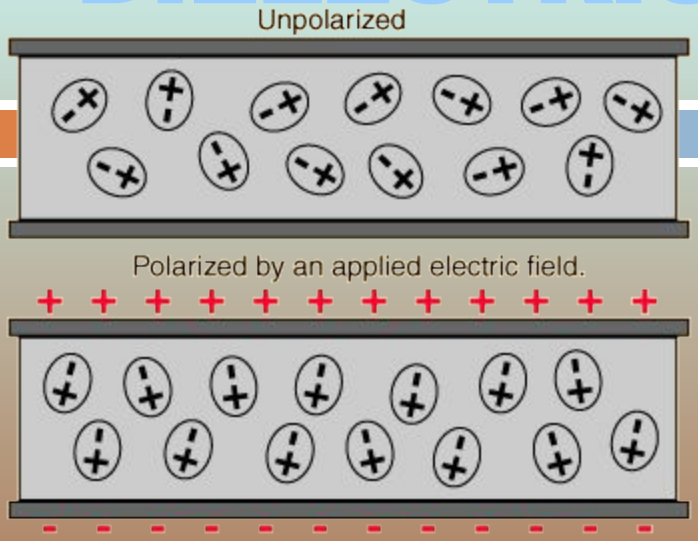
Inductive resistance X = ωL

INDUCTIVITY – characterizes electromotive force which opposes current change in the electric circuit. Inductivity of inductivity coil depends on coil length (l), quantity of coil turns (N), turns' area & magnetic permeability of the core(m).

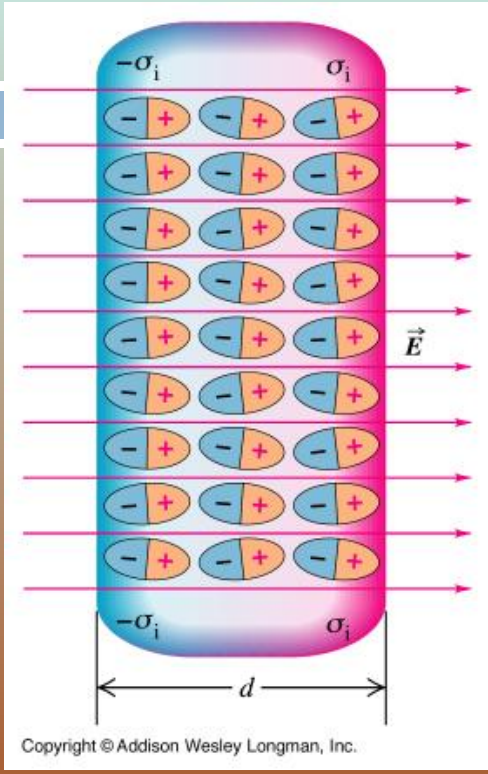
$$U = - L \, di/dt$$

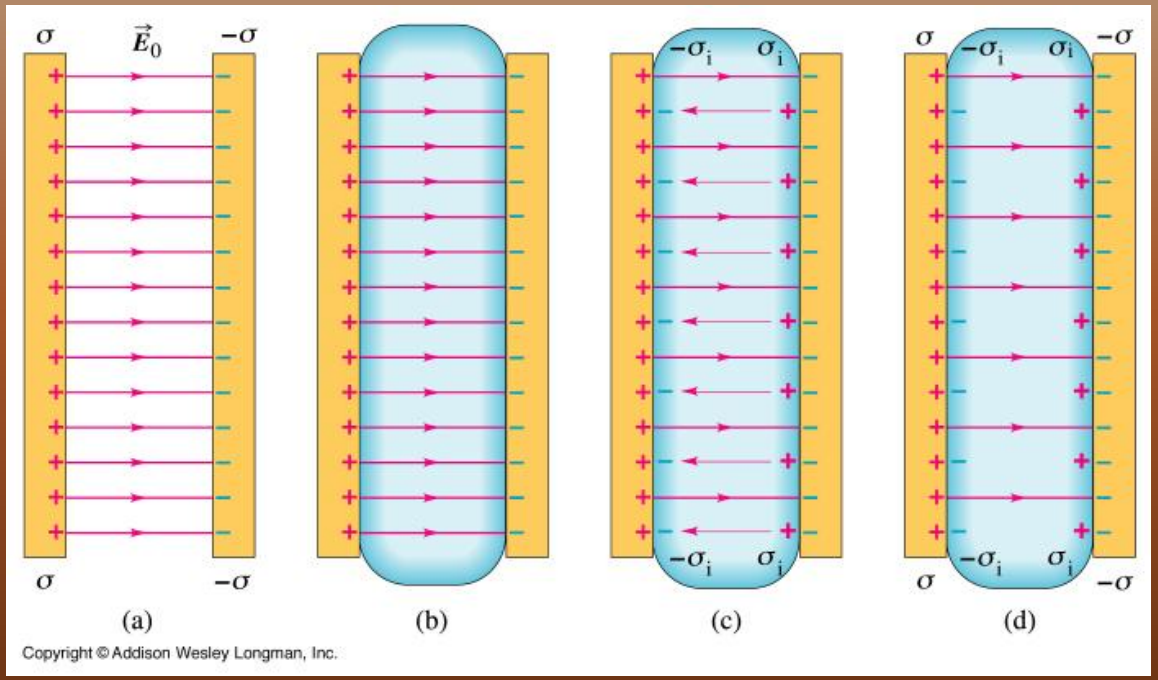
$$L = \mu N \, S/l$$

DIELECTRICS POLARIZATION



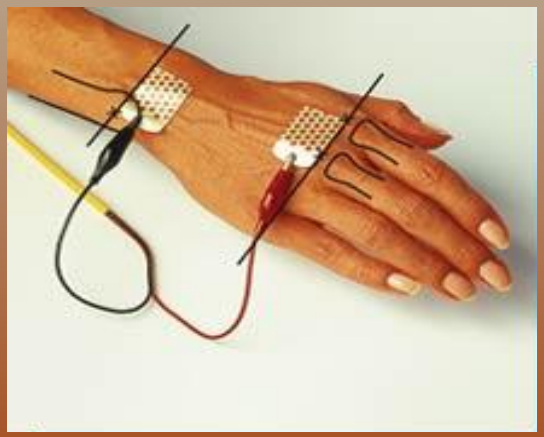
Cells & tissues polarization.



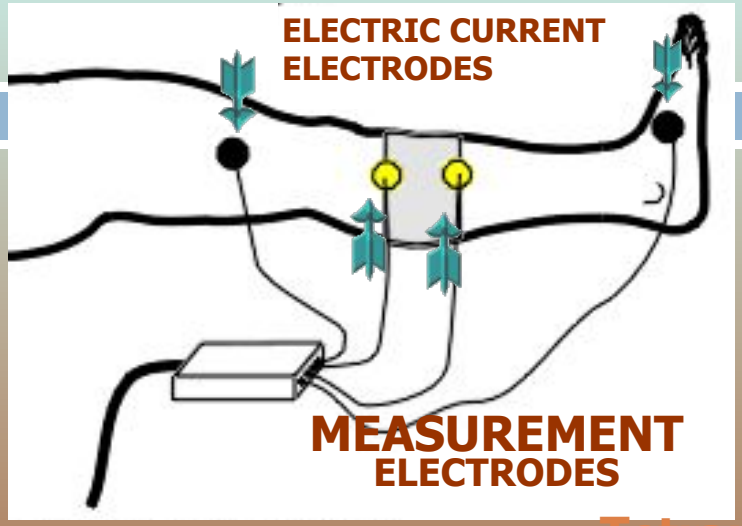


IMPEDANCE PLETISMOGRAPHY

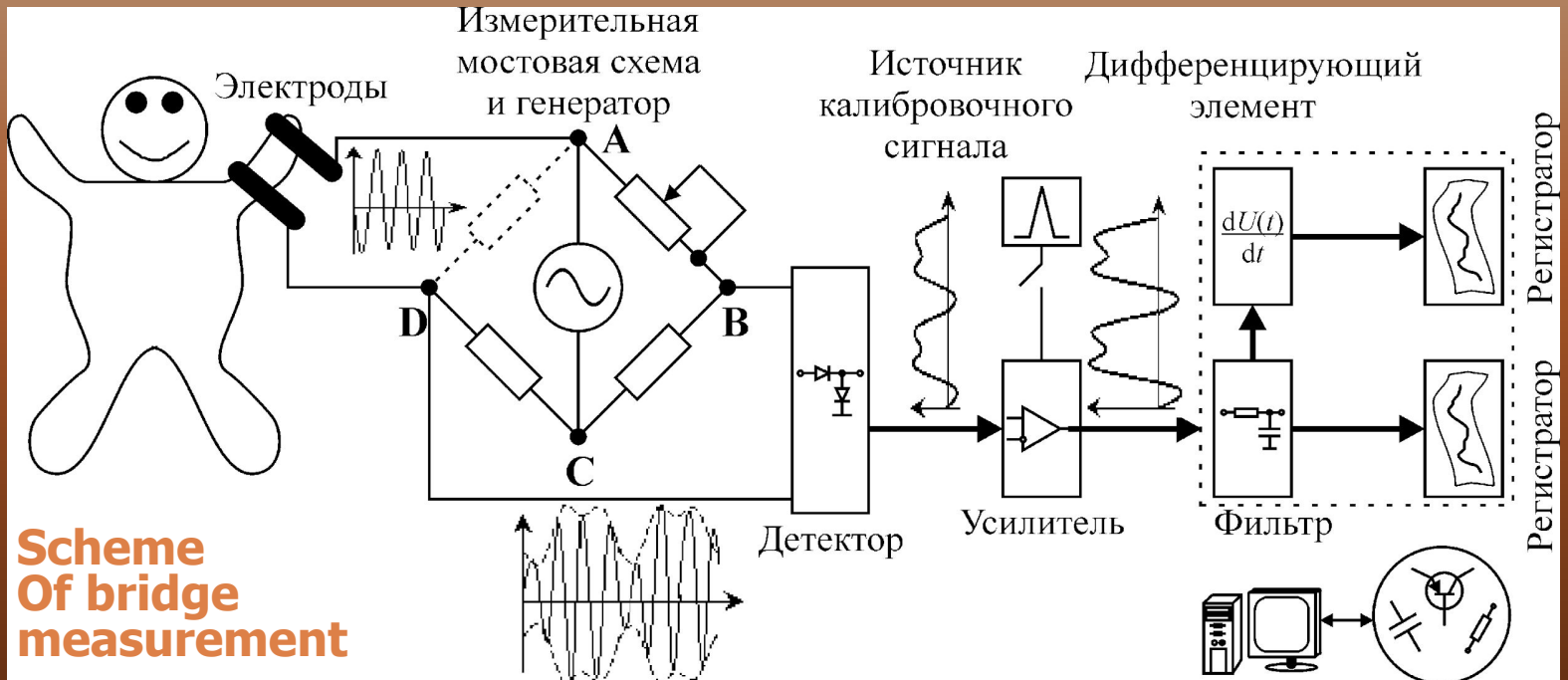
IMPEDANCE PLETISMOGRAPHY (Rheography) - noninvasive method of organs' blood supply examination. The greater the tissue blood income the smaller the resistance in this tissue. For pletismography registration the alternating electric current with frequency 50-100кHz & with intensity less than 10 мкA is used. It is generated by special generator.



RHEOGRAM REGISTRATION METHODS

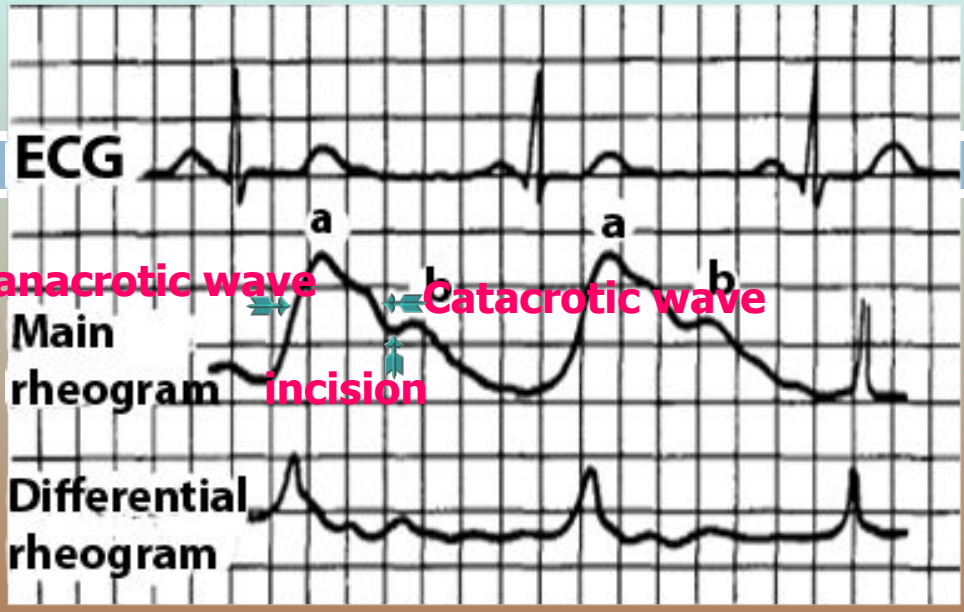


Tetrapolar method



Scheme Of bridge measurement

RHEOGRAM ANALYSIS



There are two parts on rheogram: sistolic (anacrotic wave) & diastolic (catacrotic wave). First part (anacrotic wave) is caused by inflow of blood to the organ. Second part of rheogram (anacrotic wave) is caused by outflow of the blood from the organ. The curve on the declining part of the graph is called incision. To analyze the rheogram its amplitudes and time periods should be measured. These characteristics shows the tonus state of vessels, their elasticity, systolic volume. Besides the special rheographic parameters are measured.