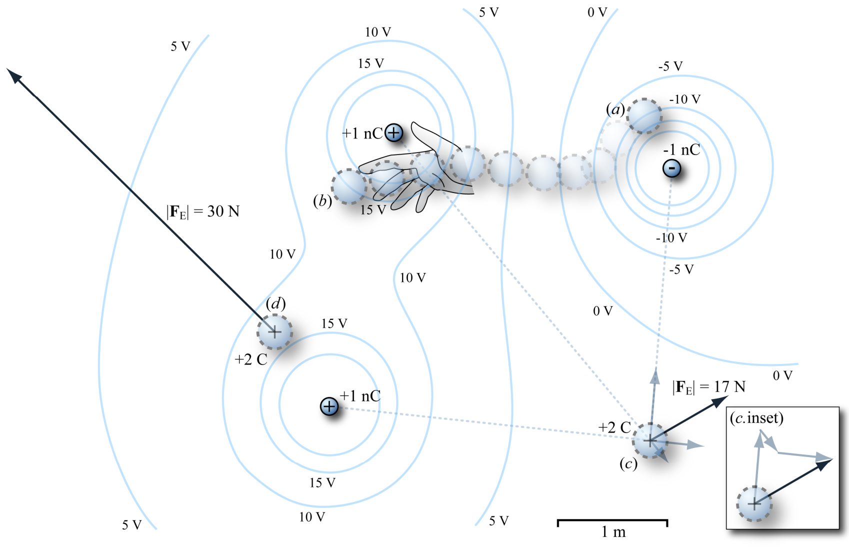
Electric (electrostatic) potential

Potential difference between points (*a*) and (*b*) – amount of work that would be required of your hand per each unit of charge pushed from (*a*) to (*b*). The amount of work that you deliver to transport a particular charge is the gain in the electric potential energy.



$$\Delta W_{\mathrm{HAND},a\to b} = q_{\mathrm{TEST}}\Delta V_{a\to b}$$

$$\Delta U_{\mathrm{E},a\to b} = q_{\mathrm{TEST}}\Delta V_{a\to b}$$

$$[V] = \frac{\mathrm{J}}{\mathrm{C}} = \mathrm{V}$$

compare with

$$\Delta U_{\mathrm{G},a\to b} = mg\Delta h_{a\to b}$$

Analogy

m	q_{TEST}
$g\Delta h$	ΔV

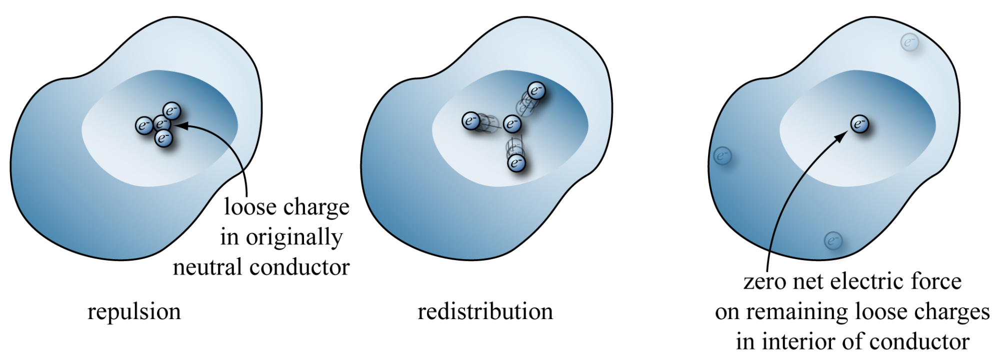
Potential is analogous to (the product of gravitational acceleration and) height.

Equipotential set – a set of positions in space with the same potential (it takes no net work to move a charge from one point in the set to another point in the set)

Electrostatic equilibrium – situation in which spatial distribution of charge is not changing

Conductor – material in which charge carriers (typically electrons in everyday solids) move very freely. The typical drag force on a charge carrier is so weak that even when only a slight electric force is exerted on a particular charge carrier, that charge carrier will move quickly enough that the spatial distribution of charge will be in the process of changing.

Conductors rapidly approach electrostatic equilibrium – Charges will continue to be redistributing themselves in a conductor so long as the net electric force on every charge in the interior bulk of the conductor has yet to equal zero. Because the net electric force on any particle is, in this way, kept almost always very close to zero in the bulk of the conductor, any contiguous portion of the material is almost always very nearly an equipotential set.



Excess charge resides on the surface of a conductor at electrostatic equilibrium – if excess charge were found in the bulk of a conductor, then the electric force it would exert on other loosely bound charge carriers in the bulk of the conductor would cause those charge carriers to move. The charge distribution would be in the process of changing. Thus, the conductor would not be at electrostatic equilibrium.