**Electric charge** is the physical property of matter that causes it to experience an electric force. There are two types of electric charges: positive and negative (commonly carried by protons and electrons respectively). Electric charge is measured in Coulombs.

* The smallest unit of charge is the charge on an electron or proton. It is 1.602×10-19 C.
* Like (same) charges repel
* Opposite charges attract
* Objects become charged when they gain or lose electrons

**Conductors** allow electrons to flow freely

**Insulators** do not allow electrons to flow freely

**Polarization** occurs when an electric force causes the atoms in an object to line up with (+) charge on one side and (-) charge on the other. This can occur in conductors or insulators, but it slightly different at the atomic level.

**Current** is the rate of [charge](http://hyperphysics.phy-astr.gsu.edu/hbase/electric/elecur.html#c2) flow past a given point in an electric circuit, measured in Coulombs/second or Amperes (Amps).

**Voltage** is electric potential energy per unit charge, measured in joules per coulomb ( = volts). It is often referred to as "electric potential", which is different from “electric potential energy”, because "potential" is an "energy per-unit-charge" quantity.

**Resistance** in an electrical circuit reduces the current (it slows down the flow of charge). Resistance is measured in Ohm’s.

**Power** the rate at which energy is converted from the electrical energy of the moving charges to some other form, e.g., heat, mechanical energy, or energy stored in electric fields or magnetic fields. Power is measured in Watts.

|  |  |  |
| --- | --- | --- |
| **Quantity** | **Symbol** | **Units** |
| Charge | q | C (Coulombs) |
| Current | I | A (Amperes) |
| Voltage | V | V (Volts) |
| Resistance | R | Ω (Ohms) |
| (Electric) Potential Energy | U | J (Joules) |
| Power | **ℙ** | W (Watts) |

**I = q/Δt**

**V = U/q**

**V = IR**

**Req = {R1 + R2 + … + Rn**, series**} or {(1/ R1+ 1/R2 + … + 1/Rn)-1**, parallel**}**

**ℙ = IV = I2R = V2/R**