Electrostatics & Magnetism

Constants

Coulomb's constant, $k = 9x10^9\ Nm^2/C^2$

Charge on electron, $e = -1.602 \times 10^{-19}$ Coulomb

Mass of electron, $m_e = 9.11 \times 10^{-31}$ kg

Electrostatics

Force between two charges

$$F = \frac{kqQ}{r^2}$$

F *- Force, N;* ***q, Q*** *- charges, Coulombs;* ***r*** *- distance between charges, m*

Dark-face Vectors

Quantities in this document that are set in **dark type** are vectors.

Field around a charge

$$E = \frac{kQ}{r^2}$$

F *- Force, N;* ***Q*** *- charge, Coulombs;* ***r*** *- distance from charge, m*

Force on a charge in an electric field

$$F = Eq$$

F *- Force, N;* ***E*** *- Field strength, n/c;* ***q*** *- charge, Coulombs*

Potential Energy of a charge in an electric field

$$PE = qEd$$

PE *- Potential energy, J;* ***q*** *- charge, C;* ***E*** *- Field strength, N/C;* ***d*** *- distance, m*

Magnetism

Magnetic force on a moving charge

$F = qvB$ (Direction: right-hand rule: *v* - thumb, *B* - fingers, *F* - palm)

F *- Force, N;* ***q*** *- charge, C;* ***v*** *- Velocity, m/s;* ***B*** *- Magnetic field, T*

Magnetic force on a current-carrying wire

$F = ILB$ (Direction: right-hand rule: *I* - thumb, *B* - fingers, *F* - palm)

F *- Force, N;* ***I*** *- current, A;* ***L*** *- lenth of wire, m;* ***B*** *- Magnetic field, T*