Formula Sheet

Physical Quantity	Value	Physical Quantity	Value
Charge of electron	-1.6×10^{-19} C	Charge of proton	1.6×10^{-19} C
Mass of electron	$m_e = 9.11 \times 10^{-31}$ kg	Mass of proton	$m_p = 1.67 \times 10^{-27}$ kg
Coulomb's constant	$k = 9 \times 10^9\ N.m^2/C^2$	Permittivity constant	$\varepsilon_o = 8.85 \times 10^{-12}\ C^2/(N.m^2)$
Acc. of gravity	$g = 9.8\ m/s^2$	Permeability constant	$\mu_o = 4\pi \times 10^{-7}$ T.m/A

$F_e = \frac{k\lvert q_1\rvert\lvert q_2\rvert}{r^2}$, Coulomb's Law	$E = \frac{k\lvert q\rvert}{r^2}$, Electric field due to a point charge
$E = \frac{\lambda}{2\pi\varepsilon_0 r}$, Electric field of a line of charge	$E = \frac{kqz}{(z^2 + R^2)^{3/2}}$, Electric field of a charged ring
$E = \frac{\sigma}{2\varepsilon_0}\left(1 - \frac{z}{\sqrt{z^2 + R^2}}\right)$, E.F. of a charged disk	$E = \frac{\sigma}{2\varepsilon_0}$, Electric field of an infinite sheet
$E = \frac{\rho R^2}{2\varepsilon_0 r}$, E.F. outside a long charged cylinder	$E = \frac{q}{4\pi\varepsilon_0 R^3} r$, E. F. inside a charged solid sphere
$E = \frac{q}{4\pi\varepsilon_0 r^2}$, E. F. outside a charged sphere	
$\Phi = \iint \vec{E} \cdot d\vec{A}$, E. flux through a surface	$\oiint \vec{E} \cdot d\vec{A} = \frac{q_{enc}}{\varepsilon_0}$, Gauss's Law
$V = \frac{kq}{r}$, E. Potential of a point charge	$V_f - V_i = -\int_i^f \vec{E} \cdot d\vec{s}$, P. difference from the E. field
$V = \frac{kq}{R}$, Electric Potential of a conducting sphere	$U = W = \frac{kq_1q_2}{r}$, P. energy of two point charges
$C = \frac{\varepsilon_0 A}{d}$, Parallel plate capacitor	
$C_{eq} = \sum_{j=1}^{n} C_j$, in parallel, $\frac{1}{C_{eq}} = \sum_{j=1}^{n} \frac{1}{C_j}$, in series	$U = \frac{q^2}{2C} = \frac{1}{2}CV^2$, Potential energy of a capacitor
$u = \frac{1}{2}\varepsilon_0 E^2$, Energy density	$I = \iint \vec{J} \cdot d\vec{A}$, Current Intensity
$J = \frac{i}{A}$, Current density	$R = \frac{\rho L}{A}$, Resistance of a conductor
$R_{eq} = \sum_{j=1}^{n} R_j$, in series, $\frac{1}{R_{eq}} = \sum_{j=1}^{n} \frac{1}{R_j}$, in parallel	$\gamma = \frac{1}{\rho}$, Definition of conductivity
$i = \frac{q}{t}$, Definition of current	$q = CV$, charge on the plate of a capacitor

$\rho = \frac{E}{J}$, *Definition of resistivity*	$V = R.I$, *Ohm's law*
$P = iV = \frac{V^2}{R}$, *Rate of electrical energy transfer*	***Loop Rule.*** *The algebraic sum of the changes in potential encountered in a complete traversal of any loop of a circuit must be zero.*
Junction Rule. *The sum of the currents entering any junction must be equal to the sum of the currents leaving that junction.*	$\vec{F}_B = q\vec{V} \times \vec{B}$, *Magnetic force*
$\vec{F}_B = I\vec{L} \times \vec{B}$, *Force on current* $F_B = \frac{\mu_0 I_1 I_2}{2\pi r}$, *Magnetic F. between two parallel currents*	
$\vec{\tau} = \vec{\mu} \times \vec{B}$, *Torque on a magnetic dipole*	
$B = \frac{\mu_0 I}{2\pi r}$, *Magnetic field of a long straight wire*	$\oint \vec{B} \cdot d\vec{s} = \mu_0 I_{enc}$, *Ampere's law*
$B = \mu_0 n I$, *Magnetic field of an ideal solenoid*	