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mm → m ÷ 1000
cm → m ÷ 100

Module 2 Equation Sheet (you may use front and back of sheet)

Develop this equation sheet as you watch pre-lecture videos, attend lecture, and work homework.

- Kirchoff's Loop Rule - Valid for any closed loop circuit $\Sigma V = 0$ KLR
- Kirchoff's Junction Rule - Valid at any junction of 3 or more wires. $\Sigma I = 0$ KJR
- KLR Requires a System of equations.
  - Choose direction of current flow.
  - outside into the loop.
  - against current = positive
  - going along current = negative.

$I_1 \quad I_2 \quad I_3 =$

$\left[\begin{array}{ccc} \text{volts go here} & & V \\ \text{then RREF 2nd matrix} & & V \\ \end{array}\right]$ > sum volts in loop.

3x4 matrix

Coulomb's Law

Magnitude of the electrostatic force between any two Charged Particles.

$\vec{F} = k\frac{q_1 q_2}{r^2}$ $\quad k = 9\times10^9 \frac{N\cdot m^2}{C^2}$

q_1 & q_2 = Charges in Coulombs

r = distance between them.

Electric Potential Energy for a pair of Charges.

$U_E = k\frac{q_1 q_2}{r^2}$

Electric Potential

$V = \frac{U_E}{q_0}$ volts = $1V = 1 J/C$

$1\ eV = 1.602\times10^{-19} J$

Capacitance in Farads

$1F = \frac{1C}{1V}$

Resistors in Series always have the Same Current.

$R_{eq} = R_1 + R_2 \dots R_n = \Sigma_{i=1}^{n} R_i$

Resistors in Parallel have the same Voltage

$R_{eq} = \frac{1}{\frac{1}{r_1} + \frac{1}{r_2} \dots \frac{1}{r_n}}$

Kirchoff's Rules

Junction = $\Sigma_I = 0$

loop = $\Sigma V = 0$

Magnetic Field $= \overline{B}$ units in Tesla $= 1 N/A\cdot m$; gauss $g = 10^{-4} T$

$\vec{F} = q(\bar{v} \times \bar{B})$

two charges that are the same charge will repel.
opposite charges will attract.

Electric charge is measured in Coulombs C

Law of Conservation of Charge - sum of all charges in a closed system is 0.

Particle	Charge C	Mass kg
proton p^+	$+1.602\times10^{-19}$	1.67×10^{-27}
neutron n^0	0	1.67×10^{-27}
electron e^-	-1.602×10^{-19}	9.11×10^{-31}

Conductors - move charge easily

Insulators - do not move charge freely.

atoms gain charge by gaining or losing electrons.

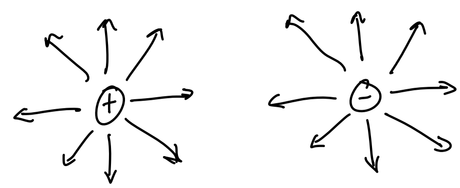
Charge Flow Rate = total charge / total time.

Electric Field - Disturbance in nearby charges ; invisible.

Strength of field E → N/C Newton Coulombs on the charge q.

$\vec{F} = q\vec{E}$

Electric Field of a point Charge $= |\vec{E}| = k\frac{q}{r^2}$



$1\ amp = 1\frac{C}{s}$

Power = Watt $= \frac{J}{C}\cdot\frac{C}{s} = \frac{J}{s} = W$.

$P = VI$

Ohms Law $= V = IR$

Resistivity of Temperature

$R = R_0(1 + \alpha\Delta T)$

R_0 = initial resistance

α = temperature coefficients.

ΔT = Change in temperature.

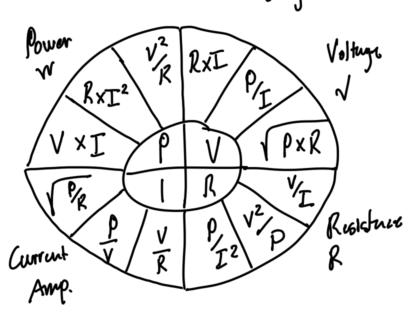
R = ohms $\frac{Volt}{amps} = \Omega$

$R = \frac{\rho L}{A}$

ρ = resistivity

A = area

L = length



Torque

$\tau = IBA\sin\theta$