

PHYSICS 2220

Equation Sheet #2

1. Coulomb's law: $F = k \frac{|q_1||q_2|}{r^2}$ $k = \frac{1}{4\pi\epsilon_0}$
2. $\mathbf{F}_E = q\mathbf{E}$ For point charge, $E = k \frac{|q|}{r^2}$
3. $C = \frac{Q}{\Delta V}$ $C = \frac{\epsilon_0 A}{d}$ $\Delta V = Ed$ Parallel: $C_{\text{eq}} = C_1 + C_2 + \dots$
 Series: $\frac{1}{C_{\text{eq}}} = \frac{1}{C_1} + \frac{1}{C_2} \dots$ or $C_{\text{eq}} = \frac{C_1 C_2}{C_1 + C_2}$ (2 only)
4. $V = iR$ $P = iV = i^2 R = \frac{V^2}{R}$ $R = \frac{\rho L}{A}$
5. Parallel: $\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$ $R_{\text{eq}} = \frac{R_1 R_2}{R_1 + R_2}$ (2 only)
 Series: $R_{\text{eq}} = R_1 + R_2 + \dots$
6. Kirchhoff's rules: 1) current in = current out; 2) sum of voltage rises and drops = 0 around a closed loop
7. $q = q_0 e^{-t/RC}$ $q = q_0 (1 - e^{-t/RC})$ $i = i_0 e^{-t/RC}$ $\tau = RC$
8. $U = \frac{1}{2} CV^2 = \frac{1}{2} \frac{Q^2}{C} = \frac{1}{2} QV$ $u_e = \frac{1}{2} \epsilon_0 E^2$
9. $\mathbf{F}_B = q\mathbf{v} \times \mathbf{B}$ $|\mathbf{F}_B| = |q||\mathbf{v}||\mathbf{B}| \sin \phi$ $\mathbf{F} = q\mathbf{E} + q\mathbf{v} \times \mathbf{B}$
10. $r = \frac{mv}{qB}$ $T = \frac{1}{f} = \frac{2\pi r}{v}$
11. $\mathbf{F}_B = i\mathbf{L} \times \mathbf{B}$ $|\mathbf{F}_B| = i|\mathbf{L}||\mathbf{B}| \sin \phi$ $\tau = NiAB \sin \theta$
12. $k = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$ $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2$ $g = 9.8 \text{ m/s}^2$
 $e = 1.60 \times 10^{-19} \text{ C}$ $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$ $c = 3 \times 10^8 \text{ m/s}$
13. electron mass $m_e = 9.11 \times 10^{-31} \text{ kg}$
 proton mass $m_p = 1.67 \times 10^{-27} \text{ kg}$
14. Circle: $C = 2\pi r$ $A = \pi r^2$