

Numbers:

$$k = 9.0 \times 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2} = \frac{1}{4\pi\epsilon_0} \quad \epsilon_0 = 8.85 \times 10^{-12} \frac{\text{C}^2}{\text{N} \cdot \text{m}^2} \quad K_{air} = 1.000$$

$$m_e = 9.1 \times 10^{-31} \text{ kg} \quad m_p = 1.67 \times 10^{-27} \text{ kg}$$

$$e = 1.6 \times 10^{-19} \text{ C} \quad G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2 \quad g = 9.80 \text{ m/s}^2$$

Equations:

$$v = v_0 + at \quad v^2 = v_0^2 + 2a(x-x_0) \quad v = \frac{v_f + v_0}{2}$$

$$x = x_0 + v_0t + \frac{1}{2}(at^2) \quad a = \frac{v^2}{r} \quad v_{ave} = \frac{d}{t}$$

$$F = k \frac{Q_1 Q_2}{r^2} \quad F = qE \quad \Phi_E = \frac{q_{encl}}{\epsilon_0}$$

$$E = k \frac{Q}{r^2} \quad PE = qV \quad \Phi_E = \Sigma E \Delta A \cos \theta$$

$$KE = \frac{1}{2}mv^2 \quad \Delta V = -E_x \Delta x \quad A_{sphere} = 4\pi r^2$$

$$\Delta V = Ed \quad W = Fd \quad A_{cylinder} = 2\pi r^2 + 2\pi r h$$

$$V = k \frac{Q}{r} \quad Q = CV \quad C = \frac{K\epsilon_0 A}{d}$$

$$I = \Delta Q / \Delta t \quad V = IR \quad PE = \frac{1}{2}CV^2$$

$$R = \frac{\rho L}{A} \quad P = IV = I^2 R = \frac{V^2}{R} \quad P = E/t$$

$$R_{eq} = R_1 + R_2 + \dots \quad \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots \quad I_{rms} = \frac{I_0}{\sqrt{2}}; \quad V_{rms} = \frac{V_0}{\sqrt{2}}$$

$$V_{term} = \epsilon - Ir \quad V_{term} = \epsilon \left(\frac{R}{R+r} \right)$$