

PHY114 – Summer 2009 – Midterm 1

LIST OF POSSIBLY USEFUL FORMULAS

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 / \text{N.m}^2$$

$$e = -1.6 \times 10^{-19} \text{ C}$$

$$\vec{\mathbf{F}} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2} \hat{\mathbf{r}}$$

$$\vec{\mathbf{E}} = \frac{\vec{\mathbf{F}}}{q_0}$$

$$a_y = q \frac{E}{m}$$

$$\Phi = \int \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}}$$

$$\oint \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}} = \frac{q_{in}}{\epsilon_0}$$

$$E = k_e \frac{q}{r^2}$$

$$\vec{\mathbf{E}} = k_e \int \frac{dq}{r^2} \hat{\mathbf{r}}$$

$$\text{arclength} = r\theta$$

$$\Delta V = - \int_i^f \vec{\mathbf{E}} \cdot d\vec{\mathbf{s}}$$

$$\Delta V = \frac{\Delta U}{q_0}$$

$$V = k_e \frac{q}{r}$$

$$V = k_e \int \frac{dq}{r}$$

$$k_e = 8.99 \times 10^9 \text{ N.m}^2 / \text{C}^2$$

$$m_e = 9.11 \times 10^{-31} \text{ kg}$$

$$C = \frac{Q}{\Delta V}$$

$$C = \epsilon_0 \frac{A}{d}$$

$$C = \frac{2\pi\epsilon_0 L}{\ln(b/a)}$$

$$C = \kappa C_0$$

$$U = \frac{Q^2}{2C}$$

$$I = \frac{dq}{dt}$$

$$R = \frac{V}{I}$$

$$P = IV$$

$$J = nqv_d$$

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

$$R = R_0 [1 + \alpha(T - T_0)]$$

$$\tau = RC$$

$$q(t) = Q_0 e^{-t/\tau} \quad \text{or} \quad q(t) = C\Delta V (1 - e^{-t/\tau})$$