

PHYS 202 Formula Sheet Chapters 17—18 (Exam 1)

electron: $m_e = 9.11 \times 10^{-31}$ kg, $q_e = -e$

proton: $m_p = 1.67 \times 10^{-27}$ kg, $q_p = +e$

neutron: $m_n = 1.67 \times 10^{-27}$ kg, $q_n = 0$

$e = 1.60 \times 10^{-19}$ C

$$F = k \frac{|q_1 q_2|}{r^2} \quad k = \frac{1}{4\pi\epsilon_0} \quad k = 8.99 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2 \quad \epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2/(\text{N} \cdot \text{m}^2)$$

$$\vec{E} = \frac{\vec{F}}{q} \quad \text{point charge: } E = k \frac{|q|}{r^2} \quad \sum E_{\perp} \Delta A = 4\pi k Q_{\text{encl}}$$

circumference of a circle = $2\pi r$ area of a circle = πr^2

surface area of a cylinder = $2\pi r l + 2\pi r^2$ volume of a cylinder = $\pi r^2 l$

surface area of a sphere = $4\pi r^2$ volume of a sphere = $\frac{4}{3}\pi r^3$

$$W_{a \rightarrow b} = U_a - U_b \quad K_a + U_a = K_b + U_b \quad \text{point charges: } U = k \frac{qq'}{r}$$

$$V = \frac{U}{q'} \quad \text{point charge: } V = k \frac{q}{r} \quad E = -\frac{\Delta V}{\Delta s}$$

$$C = \frac{Q}{V_{ab}} \quad E = \frac{\sigma}{\epsilon_0} = \frac{Q}{\epsilon_0 A} \quad \text{parallel-plate capacitor: } C_0 = \epsilon_0 \frac{A}{d}$$

series: $\frac{1}{C_{\text{eq}}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$ parallel: $C_{\text{eq}} = C_1 + C_2 + C_3 + \dots$

$$U = \frac{1}{2} QV = \frac{Q^2}{2C} = \frac{1}{2} CV^2 \quad \text{energy density } u = \frac{1}{2} \epsilon_0 E^2 \quad K = \frac{C}{C_0}$$