

Physics 102-Rec
Quiz # 6
Chapter 24

Date: 28 April 2002

Name: Key Id: _____ Sect: _____

Consider a non-conducting solid sphere of radius 10 cm and carrying a charge density of $8.0 \mu\text{C}/\text{m}^3$. Determine

- (a) The net charge q on the sphere.

$$\rho = \frac{q}{V} \Rightarrow q = \rho V = 8 \times 10^{-6} \times \frac{4}{3} \pi (0.1)^3$$
$$\Rightarrow \boxed{q = 3.35 \times 10^{-8} \text{ C}}$$

- (b) The electric field 5.0 cm from the center of the sphere.

Inside the sphere

$$E = \frac{kq}{R^3} r = \frac{9 \times 10^9 \times 3.35 \times 10^{-8} \times 0.05}{(0.1)^3}$$
$$\boxed{E = 1.5 \times 10^4 \frac{\text{N}}{\text{C}}}$$

- (c) 12 cm from the center of the sphere.

Outside the sphere

$$E = \frac{kq}{r^2} = \frac{9 \times 10^9 \times 3.35 \times 10^{-8}}{(0.12)^2} = \boxed{2.1 \times 10^4 \frac{\text{N}}{\text{C}}}$$

- (d) The electric flux through a Gaussian surface of radius 20 cm whose center coincide with the center of the sphere.

$$\Phi = \frac{q_{\text{enc}}}{\epsilon_0} = \frac{3.35 \times 10^{-8}}{8.85 \times 10^{-12}} = \boxed{3785.3 \frac{\text{N} \cdot \text{m}^2}{\text{C}}}$$