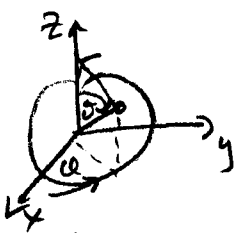


Name

Quiz 1
PH361

1. Charge is NOT uniformly distributed on the surface of a spherical shell with charge density σ . Write the expression for $d\vec{E}$ on the z axis due to a dq on the surface of a sphere.


$$d\vec{E} = k \frac{dq}{r_2^2} \hat{r}$$
$$\vec{r} = R \sin\theta \cos\phi \hat{x} + R \sin\theta \sin\phi \hat{y} + R \cos\theta \hat{z}$$
$$dq = \sigma R^2 \sin\theta d\theta d\phi$$
$$\vec{r}' = z \hat{z}$$

2. The electric field in some region of space is found to be $\vec{E} = kr^3 \hat{r}$ where k is a constant. Find the charge contained in a sphere of radius R , centered at the origin.

$$\oint \vec{E} \cdot d\vec{a} = \frac{Q_{\text{enc}}}{\epsilon_0} = \int_0^{2\pi} \int_0^\pi k R^3 \hat{r} \cdot R^2 \sin\theta d\theta d\phi \hat{r}$$

$$Q_{\text{enc}} = R^5 4\pi k \epsilon_0$$