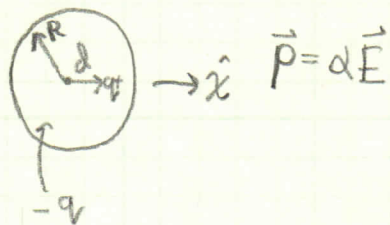


Ch4E1



Here, on  $q^+$ ,  $\vec{E}_{\text{ext}} + \vec{E}_e = 0$

Obviously,  $E_e = \frac{-q}{4\pi\epsilon_0} \frac{d}{R^3} \hat{x}$

and  $\vec{P} = q\vec{d} = qd\hat{x}$

so  $qd\hat{x} = \alpha \left( \frac{-qd}{4\pi\epsilon_0} \frac{1}{R^3} \right) \hat{x} \Rightarrow R^3 4\pi\epsilon_0 = \alpha$

Since the volume,  $V$ , is  $\frac{4}{3}\pi R^3$

$\alpha = 3V\epsilon_0$