

Calculating Total Charge

Each group will be given one of the charge distributions given below: (α and k are constants with dimensions appropriate for the specific example.)

For your group's case, answer the following questions:

1. Find the total charge. (If the total charge is infinite, decide what you should calculate instead to provide a meaningful answer.)
2. Find the dimensions of the constants α and k .
 - **Spherical Symmetry** - A positively charged (dielectric) spherical shell of inner radius a and outer radius b with a spherically symmetric internal charge density:
 - a) $\rho(\vec{r}) = \alpha r^3$
 - b) $\rho(\vec{r}) = \alpha e^{(kr)^3}$
 - c) $\rho(\vec{r}) = \alpha \frac{1}{r^2} e^{(kr)}$
 - **Cylindrical Symmetry** - A positively charged (dielectric) cylindrical shell of inner radius a and outer radius b with a cylindrically symmetric internal charge density:
 - a) $\rho(\vec{r}) = \alpha e^{(ks)^2}$
 - b) $\rho(\vec{r}) = \alpha \frac{1}{s} e^{(ks)}$
 - c) $\rho(\vec{r}) = \alpha s^3$