

### Calculating Total Charge

Each group will be given one of the charge distributions given below: ( $\alpha$  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  $\alpha$  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)  $\rho(\vec{r}) = \alpha s^3$