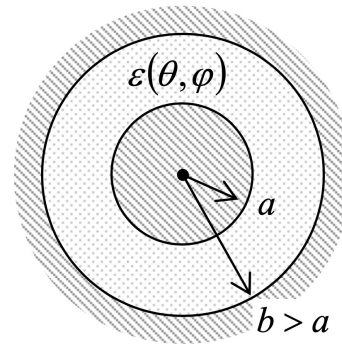


Problem 3.13. A stand-alone charge  $Q$  is distributed, in some way, in the volume of a body made of a uniform linear dielectric with a dielectric constant  $\kappa$ . Calculate the polarization charge  $Q_{\text{ef}}$  residing on the surface of the body, provided that it is surrounded by free space.

Problem 3.15. A point charge  $q$  is located at distance  $r \gg R$  from the center of a uniform sphere of radius  $R$ , made of a uniform linear dielectric. In the first nonzero approximation in small parameter  $R/r$ , calculate the interaction force, and the energy of interaction between the sphere and the charge.

Problem 3.17. A spherical capacitor (see the figure on the right) is filled with a linear dielectric whose permittivity  $\varepsilon$  depends on spherical angles  $\theta$  and  $\varphi$ , but not on the distance  $r$  from the system's center. Give an explicit expression for its capacitance  $C$ .



Problem 3.19. A uniform electric field  $\mathbf{E}_0$  has been created (by distant external sources) inside a uniform linear dielectric. Find the change of the electric field, created by carving out a cavity in the shape of a round cylinder of radius  $R$ , with its axis normal to the external field – see the figure on the right.

