

1. Two identical capacitors are connected in parallel charged by a battery of voltage V , and then isolated from the battery. One of the capacitors is then filled with a material of relative permittivity ε . What is the final potential difference across its plates?
2. A piece of dielectric of relative permittivity ε fills the space between $z = \pm a$ in the x - y plane, and contains a uniform density of free charge ρ_f per unit volume. Find \vec{E} , \vec{D} and \vec{P} as functions of z . What is the surface density of polarization charge on the surface of the dielectric.