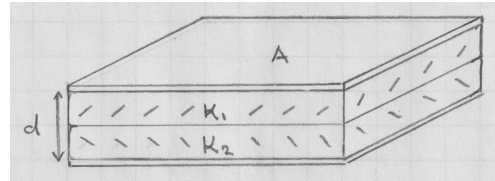## [lex44] Capacitor with stacked dielectrics I

Consider a parallel-plate capacitor. Its capacitance without dielectric is $C_0 = \epsilon_0 A/d$. However, the space between the plates is filled with two slabs of different dielectric materials, specified by dielectric constants κ_1 and κ_2. Each slab has area A and width $d/2$ as shown.

(a) Find the displacement fields D_1 and D_2 (magnitude only) inside the two dielectric materials and relate them to the charge Q (magnitude only) on the plates.

(b) Find the electric fields E_1 and E_2 inside the two dielectric materials and relate them to the voltage V between the plates.

(c) Calculate the capacitance of this capacitor with stacked dielectrics from the definition $C \doteq Q/V$ and express it in the form $C = C_0 f(\kappa_1, \kappa_2)$.

Solution: