Special Problem 6-4.2

Consider two conducting cubes with a difference in electric potential of \(V_s\) volts.

Each edge of the first cube is two meters in length, and the cube is completely covered (all 6 sides) with surface charge of density:

\[
\rho_{s+}(\vec{r}) = \frac{1}{8} \left[ \frac{C}{m^2} \right]
\]

Each edge of the second cube is one meter in length, and it is completely covered (all 6 sides) with surface charge of density:

\[
\rho_{s-}(\vec{r}) = -\frac{1}{2} \left[ \frac{C}{m^2} \right]
\]

It took 4.5 Joules of work to create these charge densities.

Determine the capacitance of these conductors, and the value (in volts) of \(V_s\).