

Special Problem 6-4.5

Consider 2 perfectly conducting spheres.

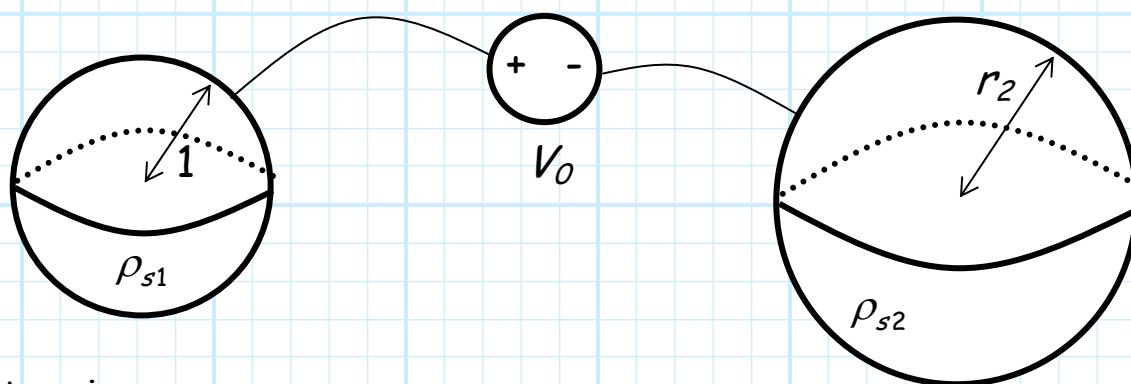
The **first** sphere has radius 1 m. Distributed across the surface of this sphere is free charge with density:

$$\rho_{s1}(\vec{r}) = \frac{3}{4\pi} \quad [C/m^2]$$

Distributed across the surface of the **second** sphere is free charge with density:

$$\rho_{s2}(\vec{r}) = \frac{-3}{16\pi} \quad [C/m^2]$$

The charge densities store a total energy of **45.0 Joules**.



Determine:

- 1) the electric potential difference V_0 between these two spheres.
- 2) the capacitance of this structure.
- 3) the radius r_2 of the second sphere.

Hint: The surface area S of a sphere is $S = 4\pi r^2$.