

Capacitors, Resistors and Current

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1 Capacitors

Note: the solutions to these problems are 1.1 and 1.2 of capacitorssol.pdf.

1.1 Cylindrical Capacitor

Calculate the capacitance of a pair of cylinders of radii a and b and length l . What is the energy stored in the capacitor? (Calculate this using both $U = CV^2/2$ and integrating the energy density $\epsilon = \epsilon_0 \vec{E}^2/2$ over the volume between the plates.)

1.2 Different Dielectrics

A parallel-plate capacitor is filled with two different dielectrics as shown. The distance between the plates is d , the area of each plate is A and the height of each dielectric is b .

1. Assume that the charge on the plates is $\pm Q$ and find \vec{E} in each of the four regions.
2. Find the potential difference V between the plates by integrating \vec{E} .
3. Compute the capacitance.

(Source: modified from Vetri and Dan)

