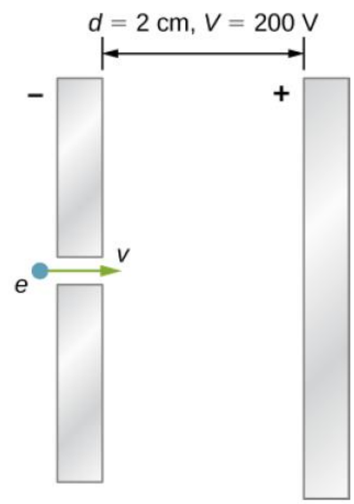
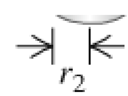
1. An electron enters a region between two large parallel plates made of aluminum separated by a distance of 2.0 cm and kept at a potential different of 200 V. The electron enters through a small hole in the negative plate and moves toward the positive plate. At the time the electron is near the negative plate, its speed is $4.0 \times 10^5\ m/s$. Assume the electric field between the plates to be uniform, and find the speed of electron at (a) 0.10 cm, and (b) 1.0 cm from the negative plate, and (c) immediately before it hits the positive plate. (d) Also determine the potential difference and potential energy difference at these locations with respect to the entrance point.



2. A conductor carries a current that is decreasing exponentially with time. The current is modeled as $I = I_0 e^{-t/\tau}$, where $I_0 = 3.00\ A$ is the current at time *t* = 0.00 s and $\tau = 0.50\ s$ is the time constant. How much charge flows through the conductor between *t* = 0.00 s and $t = 3\tau$?

3.

25.66 • CALC The region between two concentric conducting spheres with radii a and b is filled with a conducting material with resistivity ρ. (a) Show that the resistance between the spheres is given by



$$R = \frac{\rho}{4\pi}\left(\frac{1}{a} - \frac{1}{b}\right)$$

(b) Derive an expression for the current density as a function of radius, in terms of the potential difference V_{ab} between the spheres. (c) Show that the result in part (a) reduces to Eq. (25.10) when the separation $L = b - a$ between the spheres is small.