1. Consider an electron moving in a circular path of radius R with constant speed v. What is the current due to this motion of electron ?

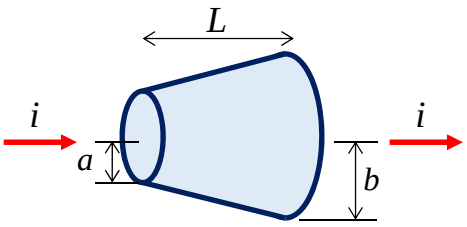
2. A uniformly charged sphere of radius R centered on the origin of a rectangular coordinate system is rotated around the z- axis with a constant angular speed ω . The total charge of the sphere is Q .

(a) Find the current density within the sphere.
(b) What is the current through a circle of radius $R/2$ centered on ($R/2$, 0 , 0) that is fixed on the xz-plane ?

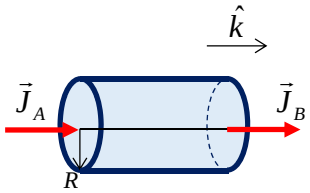
(You don't have to use the rectangular coordinate system in your answer.)

3. Consider two coaxial conducting cylindrical shells. Their radii are R_1 and R_2 ($R_1 < R_2$) respectively. Their electric potential difference is V (constant). If the region between the shells is filled with a material with the resistivity ρ , what is the current density within the medium? Assume that the cylinders are very long.
(Hint : You can use Gauss' theorem to get the electric field within the medium.)

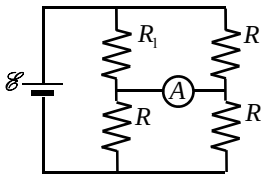
4. As shown in the figure, current is set up through a truncated right circular cone of resistivity ρ , left radius a , right radius b, and length L . Assume that the current density is uniform across any cross section taken perpendicular to the length. Find the resistance of the cone.



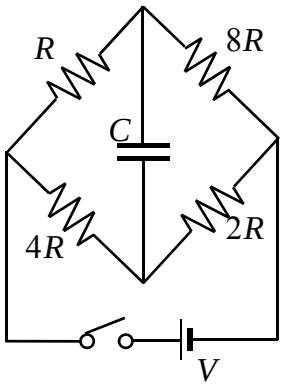
5. A cylindrical, unidentified device is set in a conducting loop as shown in the figure. The current densities are $\vec{J}_A = J_0(1-(r/R)^2)\hat{k}$ and $\vec{J}_B = J_0(1-r/R)\hat{k}$ (r is the distance from the central axis). Find the currents at the two circular surfaces and the time-rate of change of net free charge in the device.



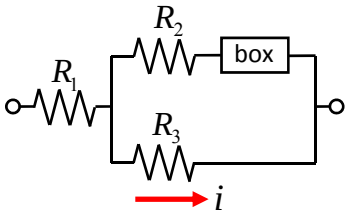
6. Consider a circuit shown in the figure. Assume that the ammeter resistance is zero, and the battery is ideal. What multiple of $\mathscr{E}/R$ gives the current in the ammeter?



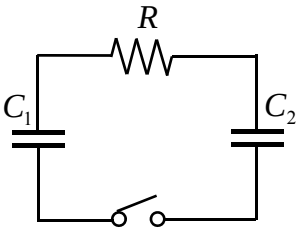
7. The switch in the following circuit is closed at $t = 0$. Find the voltage across the capacitor as a function of time.



8. A section of a circuit is shown in the figure. The potential difference between the two terminals is V. What is the energy transfer rate from the device represented by "box" to the circuit ?



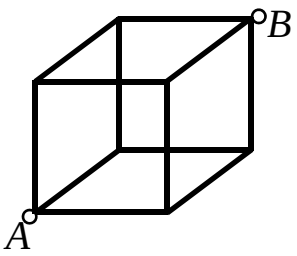
9. Consider a circuit shown in the figure. Initially, capacitor 1 (capacitance C_1) is charged to Q and capacitor 2 (capacitance C_2) is uncharged. At $t = 0$, the circuit is closed.



(a) Find the current in the circuit.
(b) What is the energy dissipated as thermal energy until the steady state is reached?

10. Find the equivalent resistance between A and B. Assume that the all edges of the cubes have the same resistance R.

(a)



(b)