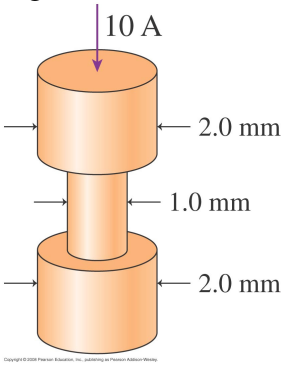
Problem 1

A car battery is rated at 90Ahr, meaning that it can supply a 90 A current for 1 hr before being completely discharged. If you leave your headlights on until the battery is completely dead, how much charge leaves the battery?

Problem 2

An aluminum wire consists of three segments shown in Figure. The current in the top segment is 10 A. For each of the other two segments, what is the current?



Problem 3

A 20-cm-long hollow nichrome (resistivity 1.5×10^{-6} Ωm) tube of inner diameter 2.8 mm, outer diameter 3.0 mm is connected to a 3.0 V battery. What is the current in the tube?

Problem 4

You have decided to protect your house by placing a 5.0-m-tall iron lightning rod next to the house. The top is sharpened to a point and the bottom is in good contact with the ground. From your research, you have learned that lightning bolts can carry up to 50 kA of current and last up to 50μs.

(a) How much charge is delivered by a lightning bolt with these parameters?

(b) You don't want the potential difference between the top and bottom of the lightning rod to exceed 100 V. What is the minimum diameter, in cm, the rod can be?

Note: resistivity of iron is 9.7×10^{-8} Ωm.