

ASG vol 3 EX 25.1 (Electro-motive force and Ohm's law)

The electrical resistivity of tungsten is $53 \text{ n}\Omega\text{-m}$ (at 20°C)

The resistance $R = \rho L/A$

a) 28 gauge wire has a diameter of 0.321 mm

$$A = \pi \left(\frac{D}{2}\right)^2 = 8.1 \times 10^{-8} \text{ m}^2$$

$$L = 1 \text{ m}$$

$$R = 0.65 \Omega$$

$$I = V/R = 9/0.65$$

$$I = 13.8 \text{ Amps}$$

b) If there are 2 wires, the area will be doubled, the resistance will be halved, and the current will be doubled. In other words, 13.8 amps will flow through each wire.

c) If the wires are end-to-end (series) the length (L) will be doubled; the resistance (R) will be doubled, and the current (I) will be halved. So 6.9 Amps will flow thru each wire.

d) If the battery could not provide this much current, the voltage would drop to a level from which it could source its highest current level.