38. Od bakrenog štapa mase 1.5 kg želi se napraviti žica otpora 250 Ω. Kolika je duljina žice ako je električna otpornost bakra $1.7\cdot10^{-8}\,\Omega$ m , a gustoća bakra $8.9\cdot10^{3}\ \mathrm{kg/m^3}$?

A. 232 m B. 318 m C. 1.57 m D. 2.38 m E. 5.62 m

$m = 1{,}5\ \mathrm{kg}$

$R = 250\ \Omega$

$\rho_{\mathrm{Cu}}\left(\text{otpornost bakra}\right) = 1{,}7\cdot10^{-8}\,\Omega$ m

$\rho\left(\text{gustoća}\right) = 8.9\cdot10^{3}\ \mathrm{kg/m^3}$

$l\left(\text{duljina žice}\right) = ?$

|a

površina presjeka S l = duljina žice

|b

V = volumen štapa $= L\cdot S$

$$\rho = \frac{m}{V} \qquad \Rightarrow V = \frac{m}{S}$$

$$V = \frac{1{,}5\ \mathrm{kg}}{8{,}9\cdot10^{3}\ \mathrm{kg/m^3}} = 1{,}685\cdot10^{-4}\ \mathrm{m^3}$$

$$S = \frac{V}{l} = \frac{1{,}685\cdot10^{-4}}{l}$$

|c

$$R = \rho_{\mathrm{Cu}}\cdot\frac{l}{S}$$

$$250 = 1{,}7\cdot10^{-8}\cdot\frac{l}{S}$$

$$250 = 1{,}7\cdot10^{-8}\cdot\frac{l}{\frac{1{,}685\cdot10^{-4}}{l}}$$

$$250 = 1{,}7\cdot10^{-8}\cdot\frac{l^2}{1{,}685\cdot10^{-4}}$$

$$250 = l^2\cdot1{,}008910^{-4} \qquad \Rightarrow \qquad l^2 = 2477946{,}278$$

$$l = \sqrt{2477946{,}278} = 1574\ \mathrm{m} = 1{,}574\ \mathrm{km}$$