Task. When a potential difference of $\Delta\phi = 115\ V$ is applied between the ends of a $l = 9.66\ m$ long wire, the current density is $J = 1.42\ A/cm * m$. Calculate the resistivity of the wire material.

Solution. The resistivity ρ of the wire material is defined as follows:

$$\rho = \frac{E}{J},$$

where E is the electric field and J is the density of the current it creates.

The electric field E can be expressed via the potential difference of $\Delta\phi$ and the length l of the wire by the following formula:

$$E = \Delta\phi \cdot l.$$

Hence

$$\rho = \frac{E}{J} = \frac{\Delta\phi \cdot l}{J}.$$

Substituting values we get

$$\rho = \frac{\Delta\phi \cdot l}{J} = \frac{115 * 9.66}{1.42} = \frac{1110.9}{1.42} \approx 782.32\ Ohm \cdot m.$$

Answer. $\rho = 782.32$ Ohm $\cdot$ m.