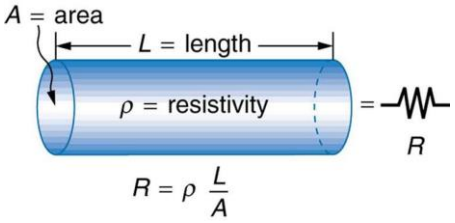
Pre-Lab Exercises

Full Names:

Lab Section:

Submit this before the beginning of the lab period. Show all work for credit.

1. You are provided with a cylindrical wire with *diameter* $d = 0.64\ \text{mm}$ and length $L = 3.60\ \text{m}$. The resistance is measured to be $R = 14.77\ \Omega$. Calculate its resistivity. Refer to the table in part **A**, from which material is this wire most likely made?



$$\rho = \frac{RA}{L} = \frac{(14.77\ \Omega)\left(\left(\frac{0.00064\ \text{m}}{2}\right)^2 \pi\right)}{3.60\ \text{m}} = 1.32 \times 10^{-6}\ \Omega\text{m}$$

this is most likely nickel-chromium.

2. In this lab you will use a voltmeter (Voltage Sensor) and ammeter (current sensor). Which of these must be "part of the circuit"? Why?

The ammeter must be part of the circuit. The ammeter only measures the current flowing through it (so the current in the circuit needs to flow through it), while the voltage just measures the difference in potential between two points in the circuit without needing to be a literal part of the circuit. The voltmeter can be in parallel with any component and read the same voltage drop because of kirchoffs rule--the sum of the voltages is 0 no matter the loop.

3. If you're creating a circuit with a maximum voltage of 4.3 V, determine the maximum/minimum resistance that should be used in order to get a current of no more than 3.1 mA. Is this a maximum or minimum resistance?

$$V = IR$$
$$4.3\ \text{V} = (0.0031\ \text{A})(R)$$
$$R = 1.4 \times 10^3\ \Omega$$

This is a minimum resistance. if the resistance was decreased while at the maximum voltage of 4.3V, then the current would exceed 3.1mA.