As you have seen in lecture and lab, it is useful to think of electric current as a flow; more specifically, the flow of charged particles through the wires, light bulbs, and other materials that make up a circuit.

Visualizing resistivity and Ohm’s law

As charged particles move through matter, they encounter “obstacles” along the way. Materials with more obstacles have a larger resistivity.

Use your phone or computer to search for “phet resistivity,” and open the simulation. The simulation is called “Resistance in a Wire” and is at the URL https://phet.colorado.edu/en/simulation/resistance-in-a-wire

First, play with the simulation until you have a feel for what is going on. Adjust the various sliders and see how they affect the picture and the resistance.

A. Now think about how quantities are related:

1. Write down your initial values for resistivity $\rho$, length $L$, cross sectional area $A$, and resistance $R$. Include units.

<table>
<thead>
<tr>
<th>$\rho =$</th>
<th>$L =$</th>
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</thead>
<tbody>
<tr>
<td>$A =$</td>
<td>$R =$</td>
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2. What happens to the resistance of the piece of wire if the length of the wire is doubled, while the resistivity and the cross-sectional area are held constant? Does the resistance double as well?

3. What happens to the resistance if the cross sectional area is doubled?

4. What happens to the resistance if the resistivity is doubled?

5. Is it possible for the length to double, but the resistance to stay constant? If so, how could that happen? Explain your reasoning in words.