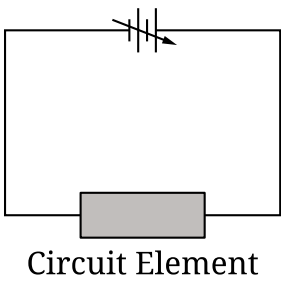


3. In Experiment 1, students are asked to use a graph to determine the resistivity ρ_1 of a circuit element that is connected to a variable power supply, as shown in Figure 1. The circuit element is cylindrical and has uniform resistivity. The students have access to a voltmeter, an ammeter, and a ruler.

Figure 1



- A. **Describe** a procedure for collecting data that would allow the students to use a graph to determine ρ_1 , including any steps necessary to reduce experimental uncertainty.
- B. **Describe** how the collected data could be graphed and how that graph would be analyzed to determine ρ_1 .

In Experiment 2, the students are asked to use a graph to determine the resistivity ρ_2 of solid, cylindrical resistors made of the same material but of different lengths L . The cross-sectional area of each resistor is $5.0 \times 10^{-6} \text{ m}^2$. The students directly measure the resistance R between the ends of each resistor. Table 1 provides L and R for each resistor.

Table 1

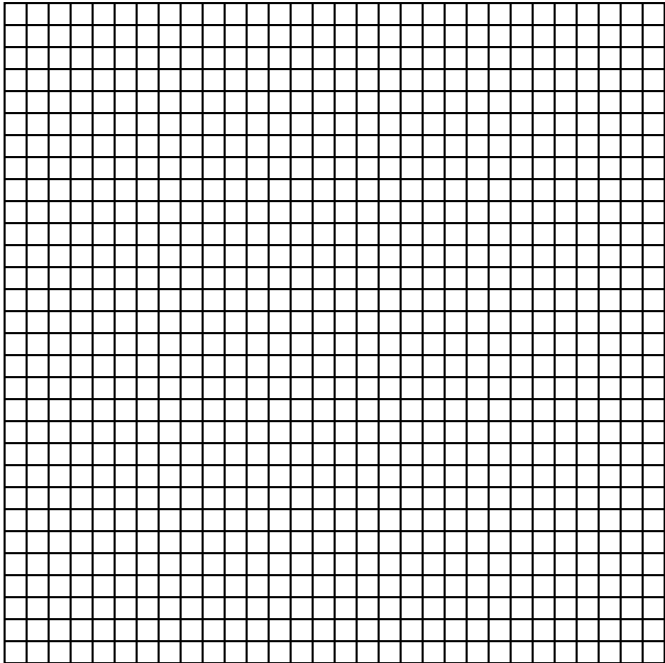
L (m)	R (Ω)
0.010	0.90
0.020	1.6
0.030	2.5
0.040	3.2
0.050	4.0

- C.
- i. **Indicate** two quantities, either measured quantities from Table 1 or additional calculated quantities, that could be graphed to produce a straight line that could be used to determine ρ_2 .

Vertical axis: _____ Horizontal axis: _____

AP Physics C: ELECTRICITY AND MAGNETISM 2020 FREE-RESPONSE QUESTIONS

- ii. On the grid provided, create a graph of the quantities indicated in part C (i).
- Use Table 2 to record the measured or calculated quantities that you will plot.
 - Clearly **label** the axes, including units as appropriate.
 - **Plot** the points you recorded in Table 2.



- iii. **Draw** a best-fit line for the data graphed in part C (ii).
- D. Using the best-fit line that you drew in part C (iii), **calculate** an experimental value for ρ_2 .