

Lesson Plan: Resistance and Resistivity of Conductors

This lesson plan includes the objectives, prerequisites, and exclusions of the lesson teaching students how to relate the dimensions of and the motion of free electrons through an object to its resistance.

■ Objectives

Students will be able to

- ▶ use the formula $R = \frac{\rho l}{A}$ to relate the resistivity, resistance, and dimensions of a resistor,
- ▶ diagrammatically represent, in terms of the motion of free electrons, the effects of varying the length, cross-sectional area, and resistivity of a resistor on its resistance,
- ▶ diagrammatically represent, in terms of the motion of free electrons, the effects of varying the temperature of resistors,
- ▶ use the formula $I = nAv_d e$ to relate the current in a resistor to the drift speed of free electrons in the resistor.

■ Prerequisites

Students should already be familiar with

- ▶ $Q = It$,
- ▶ $W = QV$,
- ▶ $R = \frac{V}{I}$,
- ▶ $P = VI$,
- ▶ effects of temperature on resistors,
- ▶ thermistors.

■ Exclusions

Students will not cover

- ▶ current density,
- ▶ impedance.