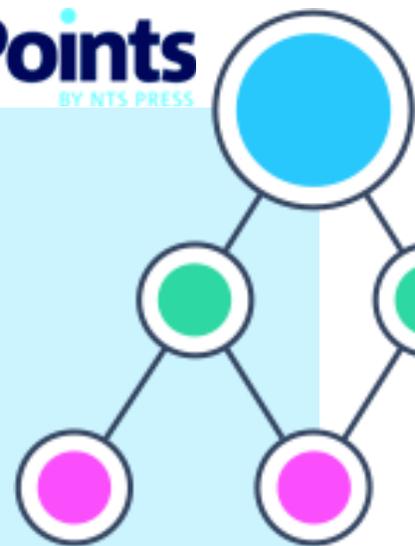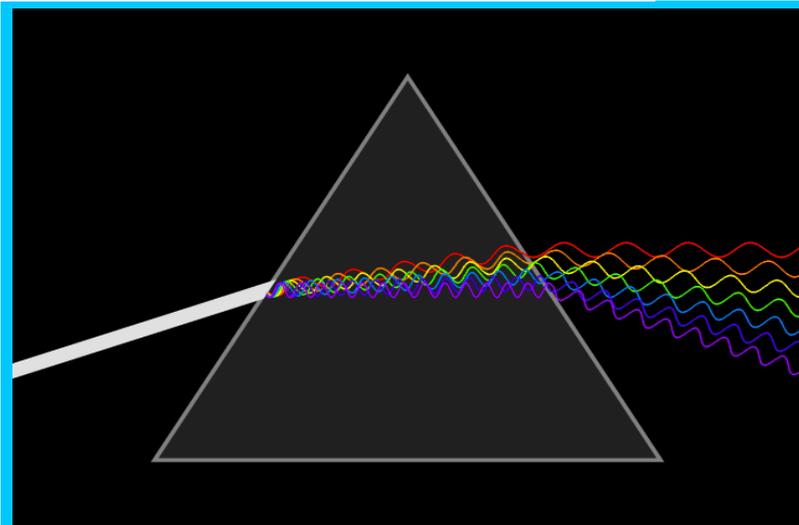# Spectrophotometer

Design Challenge

nPoints
BY NTS PRESS

Learn It!

What can light tell you about a material? Many chemistry experiments use the amount of transmitted light through a solution as a measure of the concentrations of different compounds. For example, a known substance will absorb a certain amount of a known frequency of light, but as the substance undergoes a chemical reaction a new substance will start to form whose light absorbing characteristics will be apparent. In this scenario even the rate at which the chemical reaction is occurring can be found by observing the rate of light absorption. When designing ultraviolet light blocking sunglasses, in order to test them, a sequence of light frequencies around ultraviolet must be flashed on the lenses of the sun glasses and the amount of transmission through the lenses is measured. The type of material the light is incident on can even be determined in some cases using a fine sweep of light frequencies. Spectrophotometers are used heavily in the medical field and make a great impact on the study of diseases. This simple yet effective tool has had a great impact on modern technology and health. Have you ever wondered how one of these works?

"Spectrophotometers are used heavily in the medical field and make a great impact on the study of diseases."

Build It!

Spectrophotometer Challenge

Build a transmission circuit that can either be a single tricolor LED or a series of colored LEDs. Create a program that can control this transmission circuit.

Build a light receiver circuit to detect the intensity of light coming from the transmitter. Create a control mechanism for the receiver and design it to be far enough away from the noise floor so as to have as large a swing in voltage as possible.

Use LabVIEW to sequentially step through colors to be shown by the transmitter while reading the intensity of light picked up from the receiver. Make sure to design to have a fixed time of delay to allow the receiver circuit time to produce an accurate value for intensity. Use your entire test on gel filters with known intensity curves to prove your spectrophotometer works as expected.
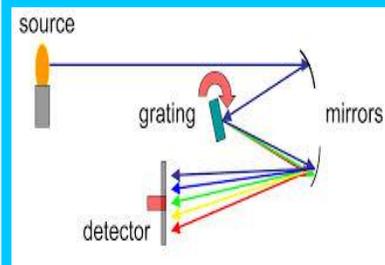

Figure 1 A simple implementation of a spectrophotometer