

MATERIALS LIST FOR PHYSICS: RADIATION

The materials needed are listed here in the sequence used, by experiment. A “shopping list” at the end gives them all together without duplicates.

B.8. Practical Application: Color and temperature.

a chart that relates temperature to color

a candle or a Bunsen burner

a chart of the visible light spectrum showing the approximate frequency of each color
(if available) a thermocouple probe to use as a temperature sensor

B.11. Practical Application: Flame test.

a Bunsen burner

the following substances to heat in a gas flame

boric acid

lithium chloride

strontium nitrate

sodium chloride (table salt)

copper (cupric) chloride

copper (cupric) sulfate

sodium bicarbonate (baking soda)

tap water

a flame test wire (a wire such as platinum that itself does not impart a color to the flame)

distilled water

(alternately) wood splints soaked in distilled water to pick up the chemical

a deep blue glass, used to filter out the yellow light from sodium impurities

C.2 and 6. Demonstrate: Put a straw or a pencil in a cup or glass of water and observe the refraction effect.

a straw (or a pencil or stick)

a glass of water

C.8. Practical Application: Refraction.

an intense narrow-beam light source such as a laser pointer

transparent materials: air, water, glass or clear rod (plastic or glass), to measure the index of refraction

(if available) an angle of incidence and refraction card, with a circle marked in degrees printed on it (may include a laser light source)

calcium oxide or chalk powder to make the water a little cloudy

a piece of graph paper so you can plot the location of the beam

a smooth round bottle (or similar container)

C.14. Practical Application: Prisms and Spectra. Use a prism to display a spectrum.

a triangular glass (or plastic) prism

a shield to block most of the light from reaching the prism

a sharp-edged slot in the shield to admit a narrow band of light
a white paper screen to display the light spectrum
a darkened room to make the spectrum easily visible
sunlight or a source of strong white light to display a broad visible spectrum
a digital camera to photograph the display so that it can be studied in detail later
a white LED flashlight
different light sources, such those used in flame tests earlier or light reflected from or filtered through different materials, to produce different color spectra
several different colored objects to look at through a prism, to see how the light from them is refracted. These objects should be a solid color and have sharp edges where a spectrum can be seen.

C. 16. Practical Application: Determine Cauchy's A and B values for a material.

sources for two known wavelengths of light (such as a red and a green laser pointer)
a sample of glass or other transparent material, to measure the index of refraction

C.19. Practical Application: Diffraction.

a (junk) CD (compact disc) to use as a diffraction grating
the same light sources used in prism experiments (sunlight, LED light, etc.)
optional: shield and screen to create spectrum display

C.21. Demonstrate: Pair of polarized sunglasses.

polarized sunglasses

C.22. Practical Application: An odd effect of polarization.

three polarized sunglass lenses (polarized plastic)
(if available) light-sensing equipment to record the different light levels that pass through the lenses as they are rotated

D.4. Practical Application: Mix colors of light.

a light mixing device (three light sources with variable intensity with red, blue and green filters).
a "color wheel" (can be found on the Internet)
one example: <http://realcolorwheel.com/tubecolors.htm>)
a white wall in a dark room
a set of colored filters (color paddle set)
a set of colored laser pointers or LED lights

E.1. Practical Application: Research properties of solar panels.

data on the properties of various types of solar panels (you may want to keep a list of good Internet sites students find)

E.2. Practical Application: Investigate the possibility of capturing useful amounts of solar energy in your area.

data on local insolation (or equipment to make his own measurements of the langleys available in the area)

estimate of total daily kilowatt hours needed to power a laptop (calculated from power or current rating data on the label)
research data on a supplier of suitable solar power generators. Here is one you might try: <http://www.siliconsolar.com/complete-solar-systems/portable-solar-power-systems.html>

E.3. Practical Application: Richard Feynman Video.

access to this Internet video: Feynman lecture series, Richard Feynman Video—The Douglas Robb Memorial Lectures Part 1: Photons—Corpuscles of Light
<http://vega.org.uk/video/subseries/8>

SHOPPING LIST

boric acid
Bunsen burner
calcium oxide or chalk powder
CD (compact disc) to use as a diffraction grating
colored filters (color paddle set)
colored laser pointers or LED lights
“color wheel” (can be found on the Internet)
 one example: <http://realcolorwheel.com/tubecolors.htm>)
copper (cupric) chloride
copper (cupric) sulfate
data on local insolation (or equipment to make own measurements of the langleys available in the area)
data on the properties of various types of solar panels (you may want to keep a list of good Internet sites students find)
deep blue glass
different light sources, such those used in flame tests
digital camera
digital camera to photograph the display so that it can be studied in detail later
distilled water
distilled water
estimate of total daily kilowatt hours needed to power a laptop (calculated from power or current rating data on the label)
flame test wire
glass/other transparent material or clear rod (plastic or glass), to measure the index of refraction
Internet video: Feynman lecture series, Richard Feynman Video—The Douglas Robb Memorial Lectures Part 1. <http://vega.org.uk/video/subseries/8>
light mixing device with variable intensity red, blue and green light sources
light-sensing equipment
lithium chloride
objects to look at through a prism (several different colors)
polarized plastic lenses (three)
polarized sunglasses
research data on a supplier of suitable solar power generators. Here is one you might try: <http://www.siliconsolar.com/complete-solar-systems/portable-solar-power-systems.html>
screen to display light spectrum
several different colored (solid color with sharp edges)
shield and screen to create spectrum display (optional)
shield or screen
shield with a sharp-edged slot
shield with sharp-edged slot to admit a narrow band of light
sodium bicarbonate (baking soda)
sodium chloride (table salt)

source of strong white light
sources for two known wavelengths of light (such as a red and a green laser pointer)
strontium nitrate
sunlight or a source of strong white light
tap water
tap water
triangular glass (or plastic) prism
white LED flashlight
white LED flashlight
white paper screen to display the light spectrum
white wall in a dark room
wood splints