

Light Sources and Laser Safety

Module 1-3
of

Course 1, *Fundamentals of Light and Lasers*



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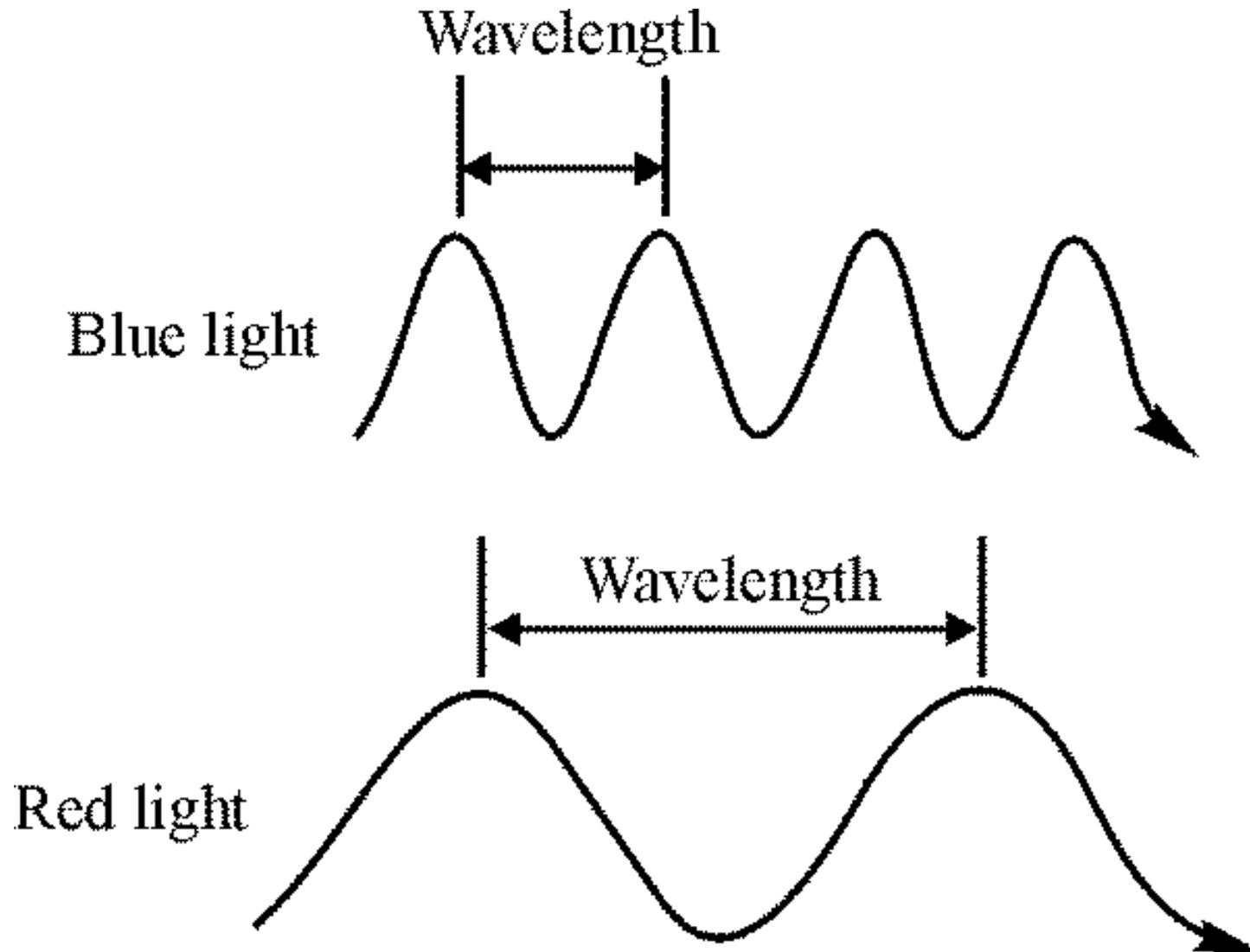


Figure 3-1 *Light Waves*

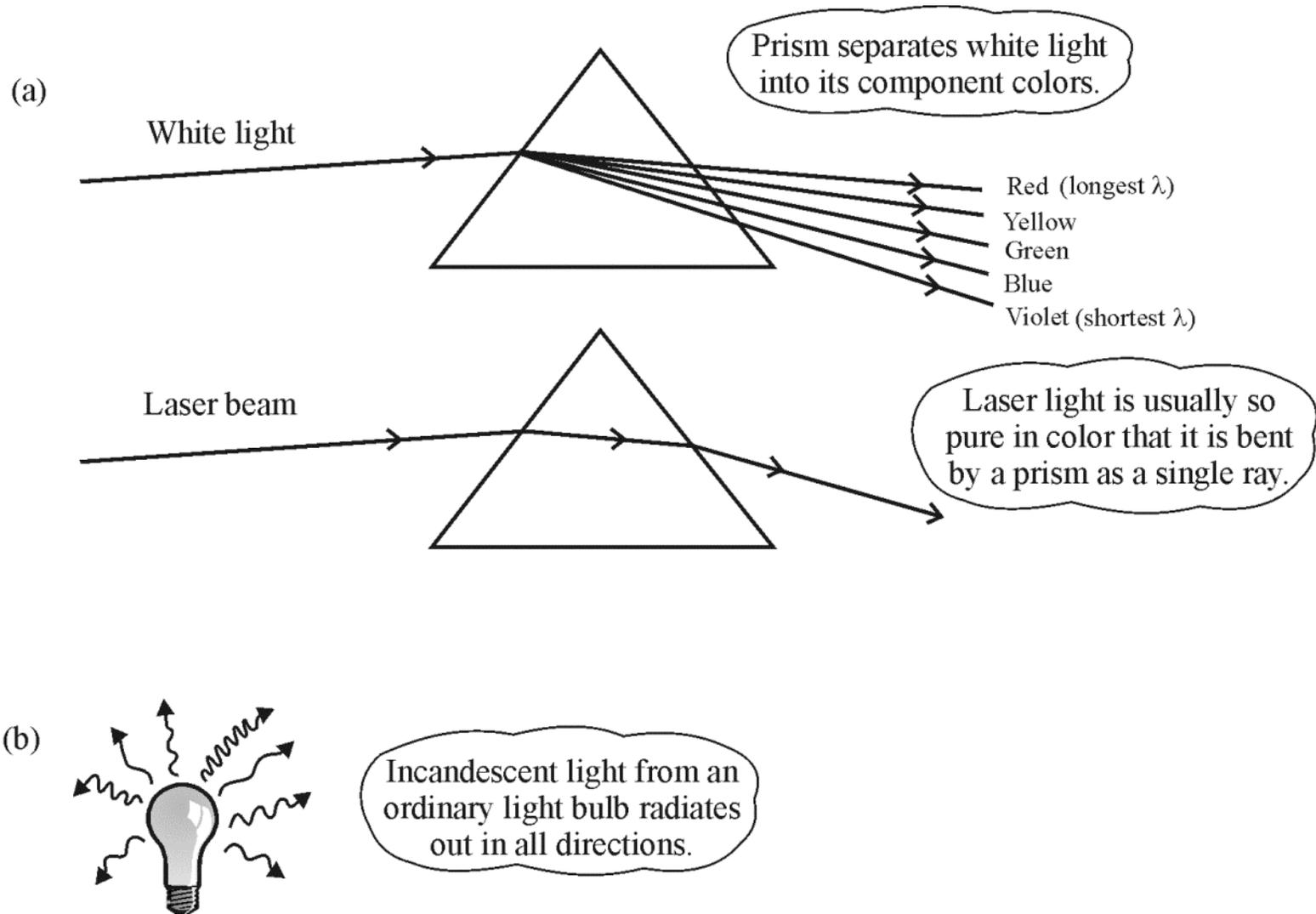


Figure 3-2 *White light, laser light, and light emitted by an incandescent bulb*

Highly directional beam
(narrow cone of divergence or beam spread)

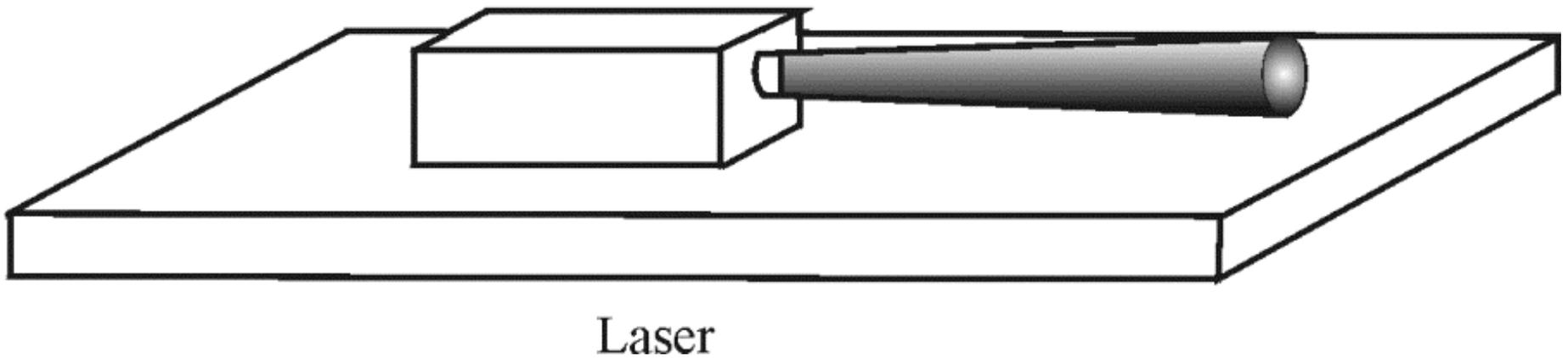
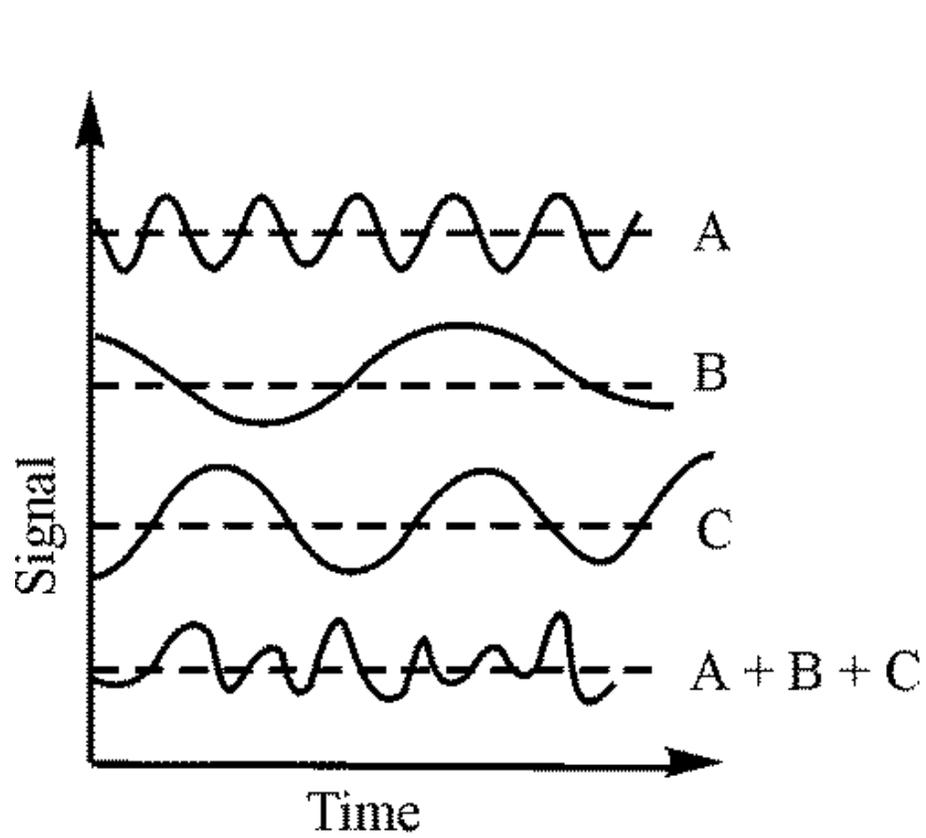
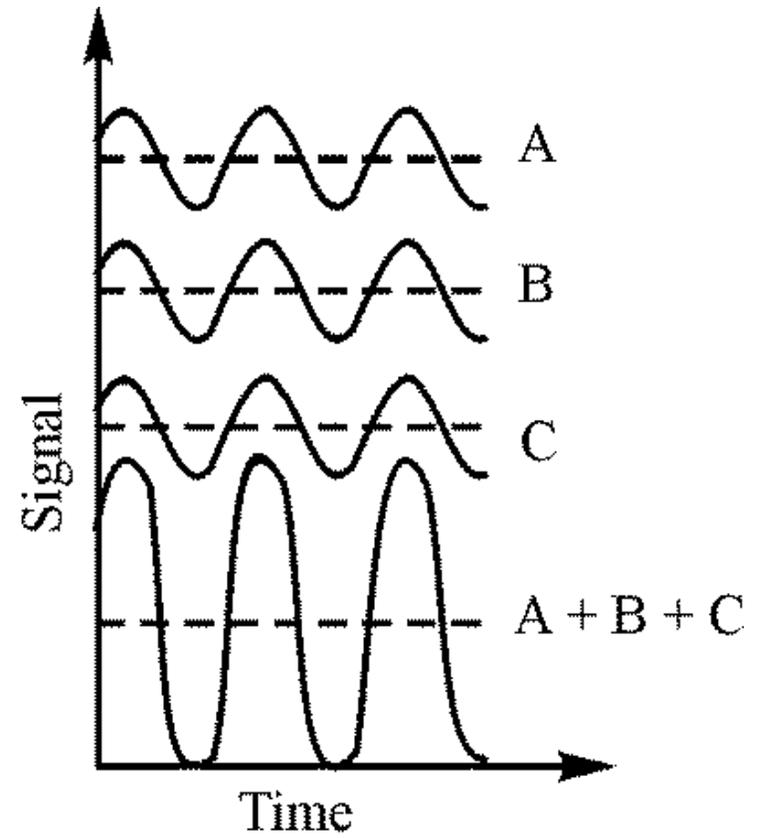


Figure 3-3 *Concentrated directionality of laser light*

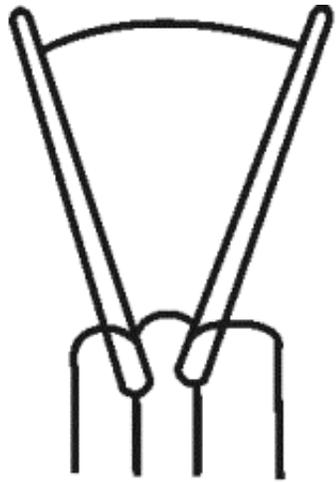


(a) Incoherent light

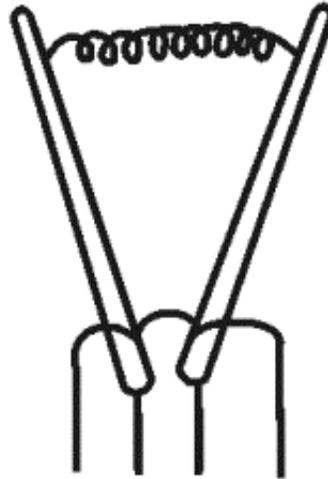


(b) Coherent light

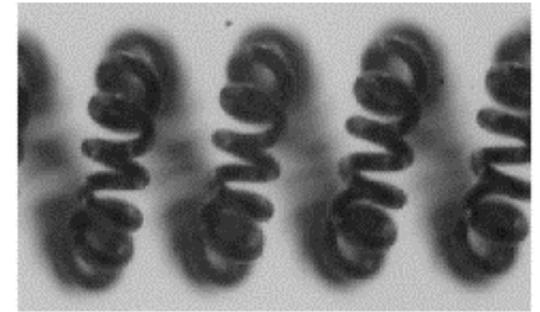
Figure 3-4 *Adding coherent and incoherent light waves*



Straight filament



Coiled filament



Coiled coil filament

Figure 3-5 *Types of incandescent filaments. Filaments are arranged upon support structures within the bulb in a variety of ways. The filament itself may be either straight, coiled, or coiled coil.*

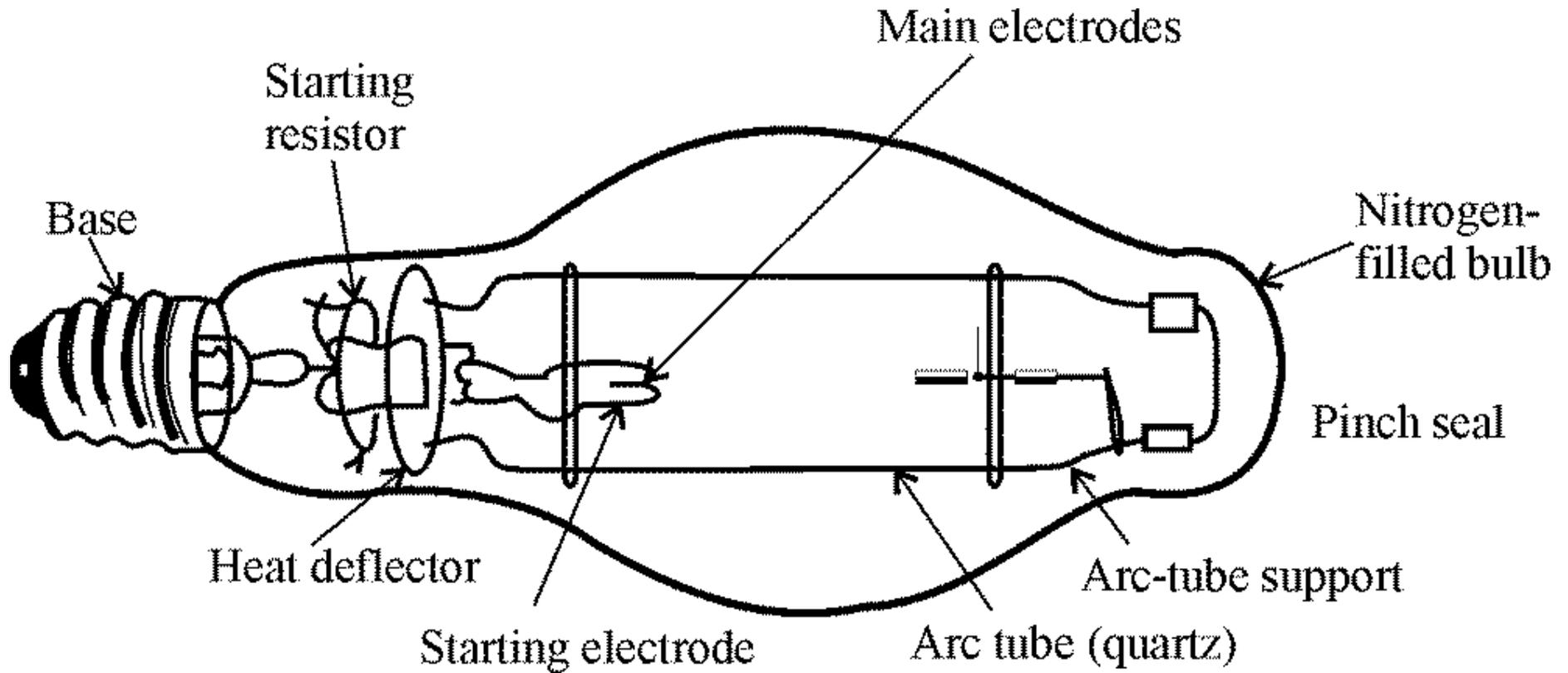


Figure 3-6 *Mercury HID lamp. This cutaway drawing shows the construction of an Hg-HID lamp. The inner envelope is of quartz; the outer envelope of borosilicate glass (adapted from Kaufman and Christensen, 1972).*

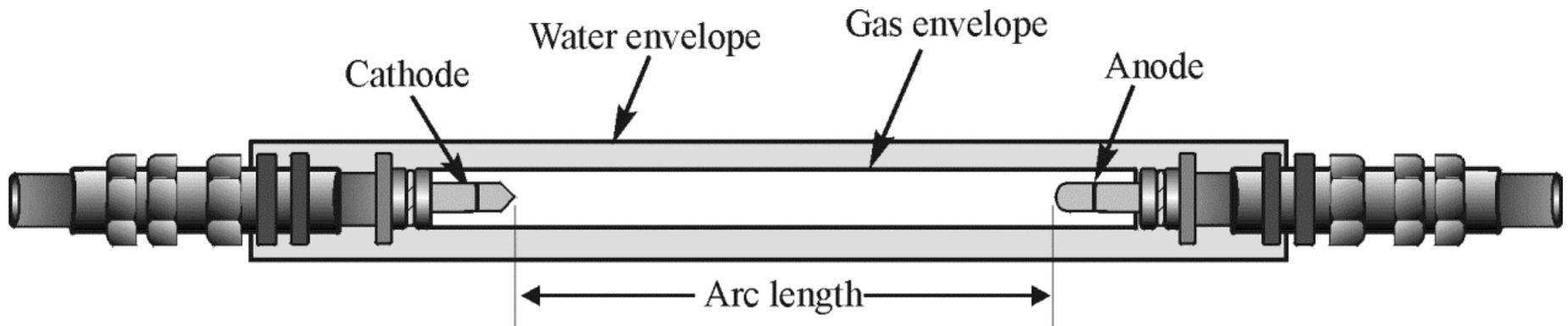
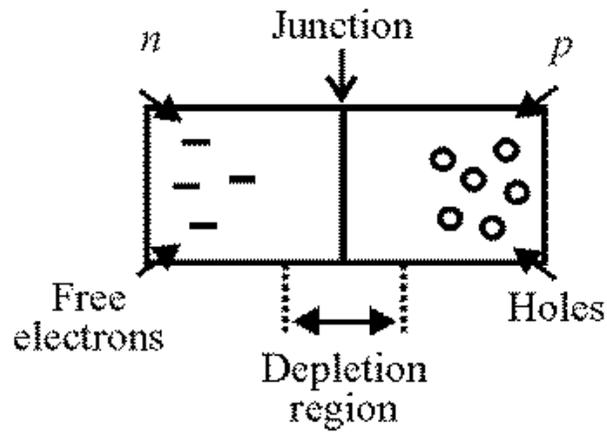
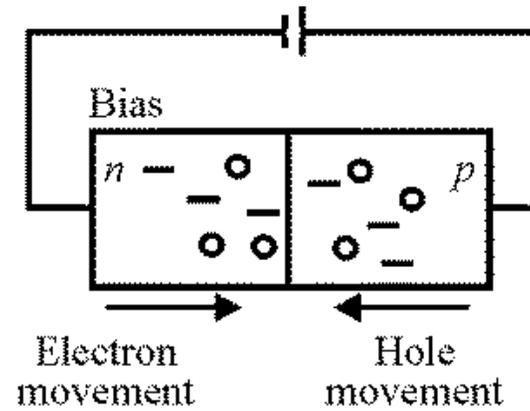


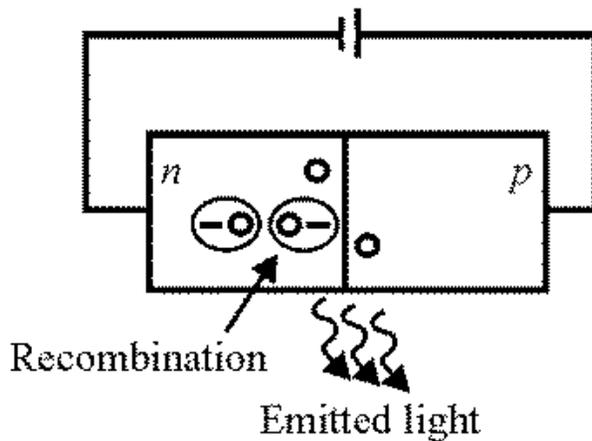
Figure 3-7 *Diagram of a gas arc lamp with water jacket for cooling*



(a) pn junction



(b) Movement across junction



(c) Photon generation

Figure 3-8 *Simplified theory of LED operation*

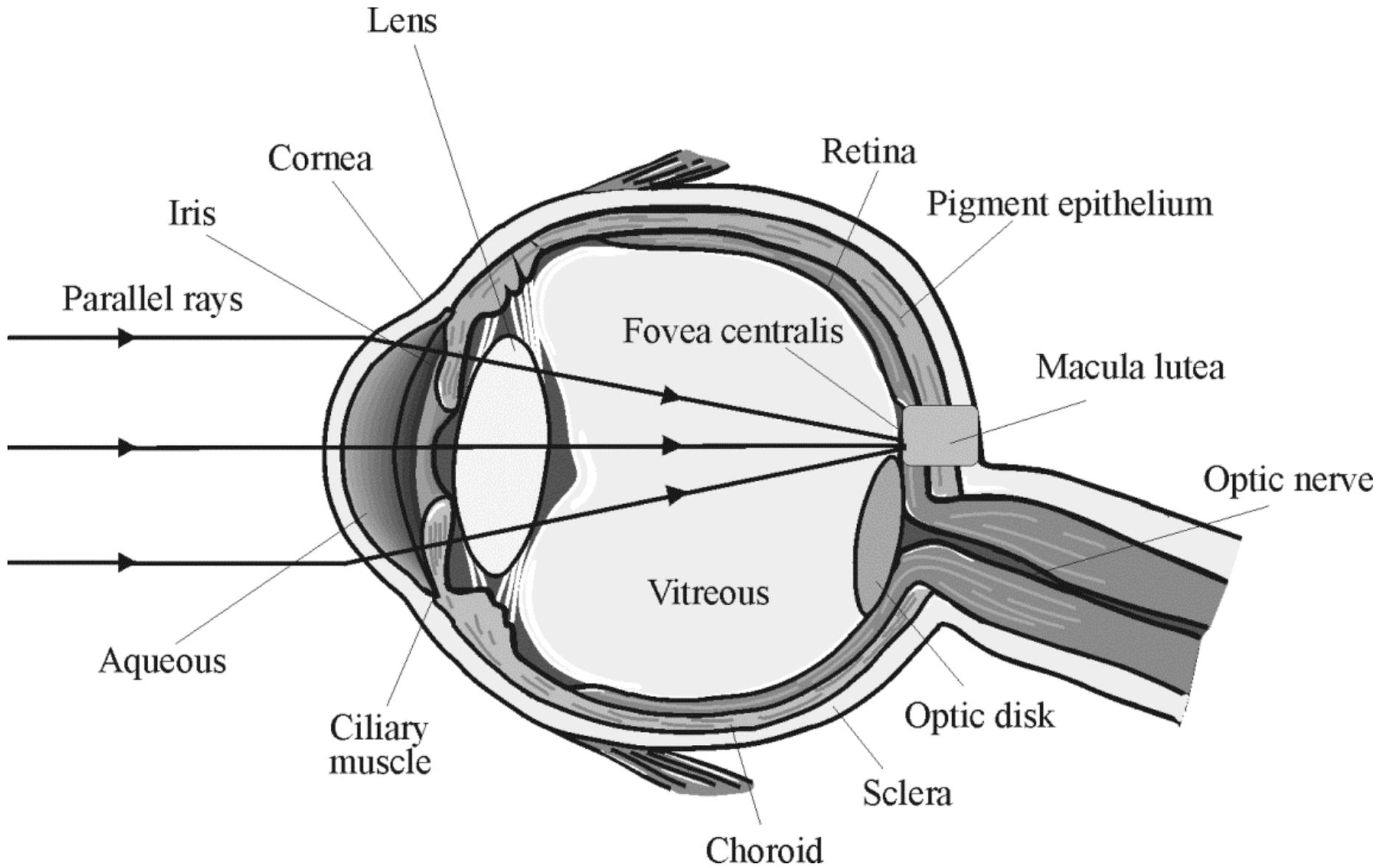


Figure 3-9 *Schematic diagram of the eye*

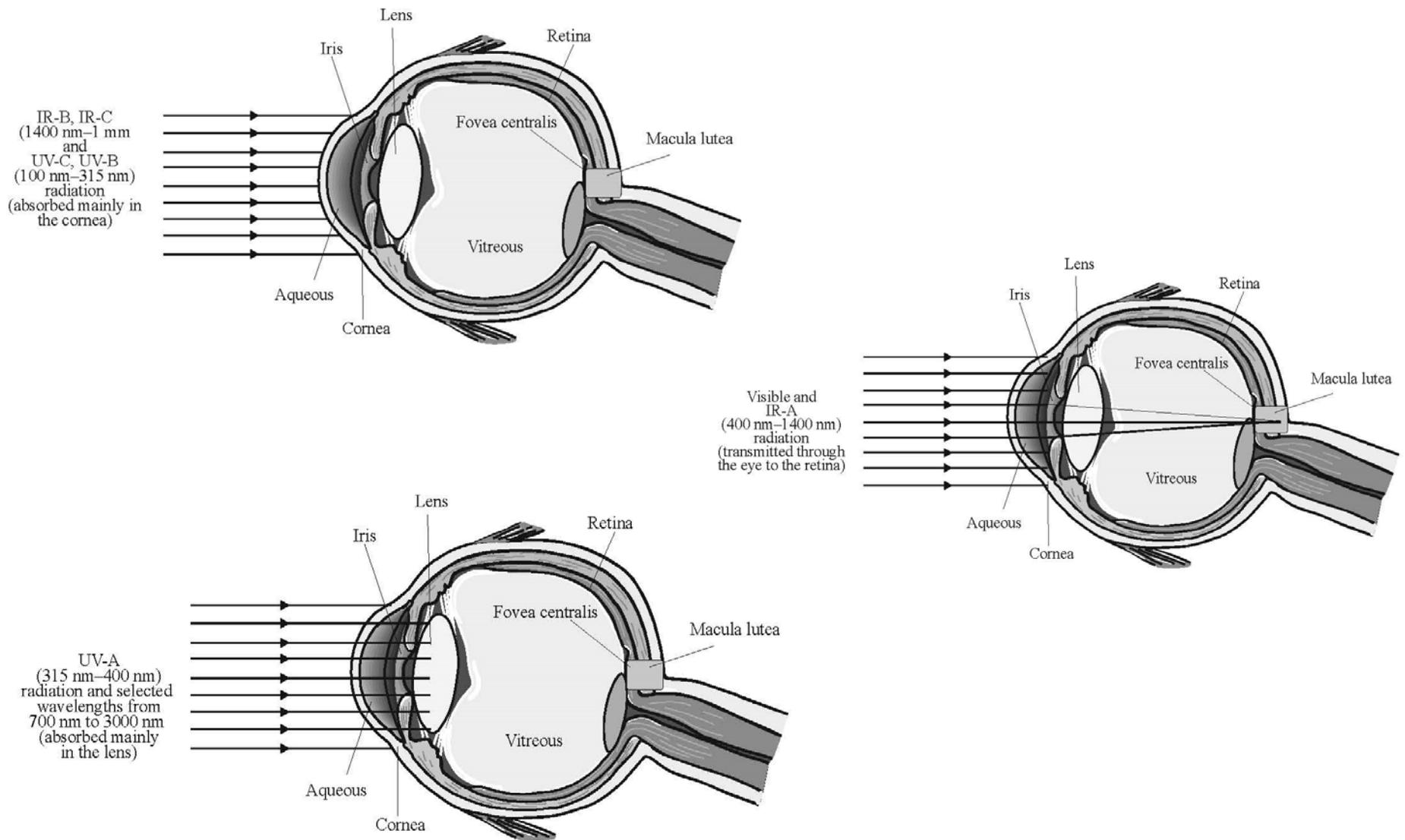


Figure 3-10 *Absorption characteristics of the eye for different wavelengths*

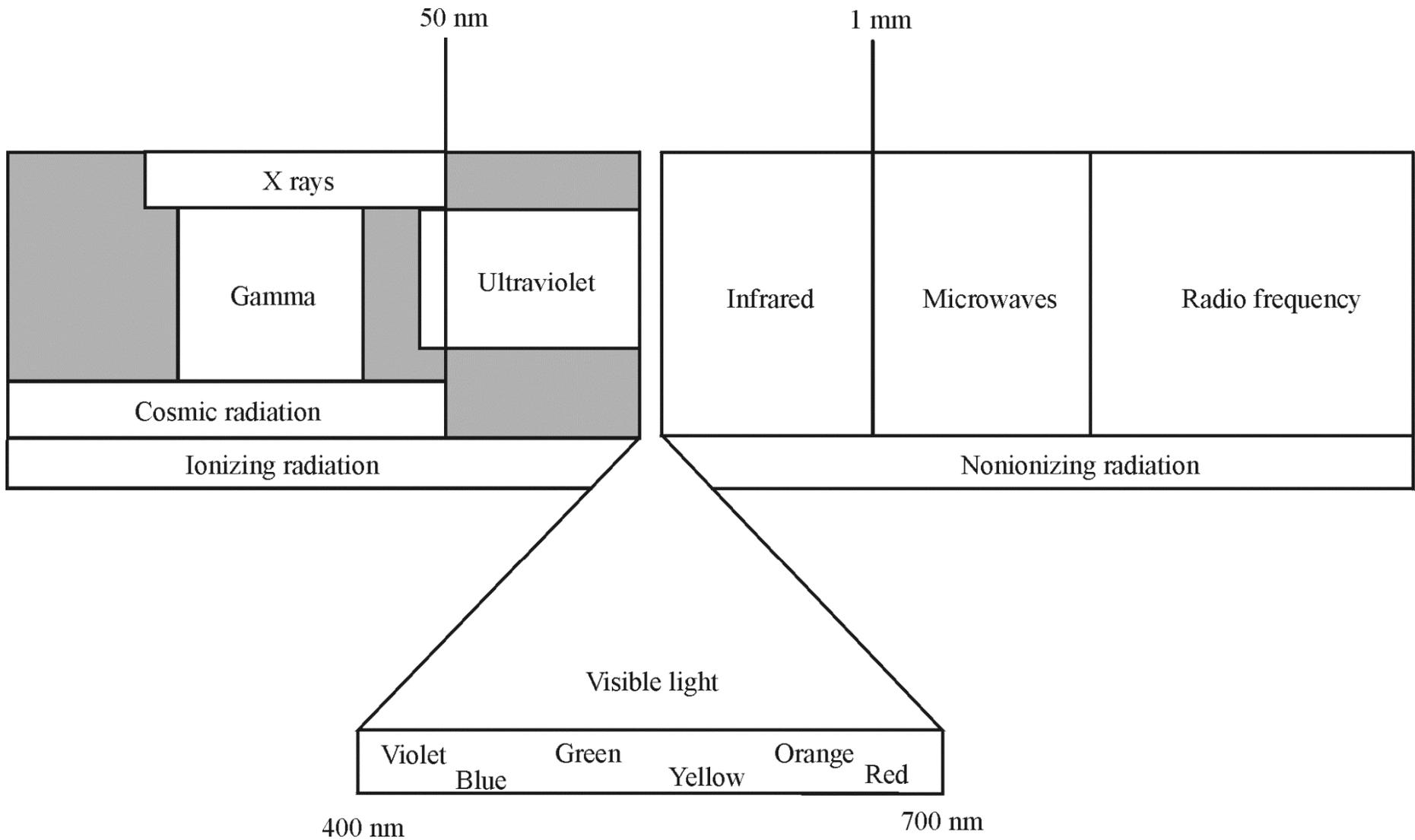


Figure 3-11 *Important regions of the electromagnetic spectrum*

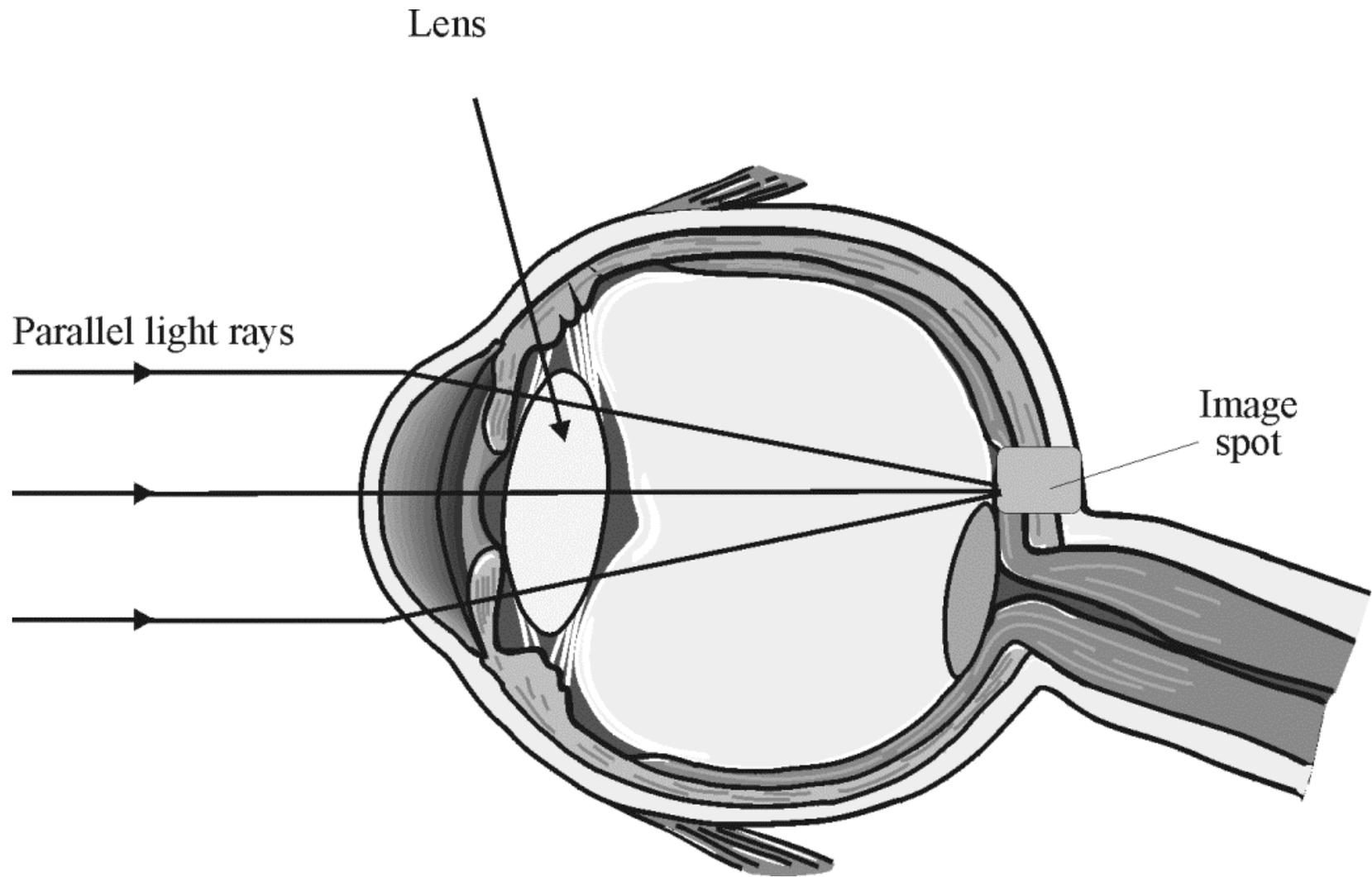


Figure 3-12 *Focusing of parallel light rays from a distant source or laser beam to a small spot on the retina*

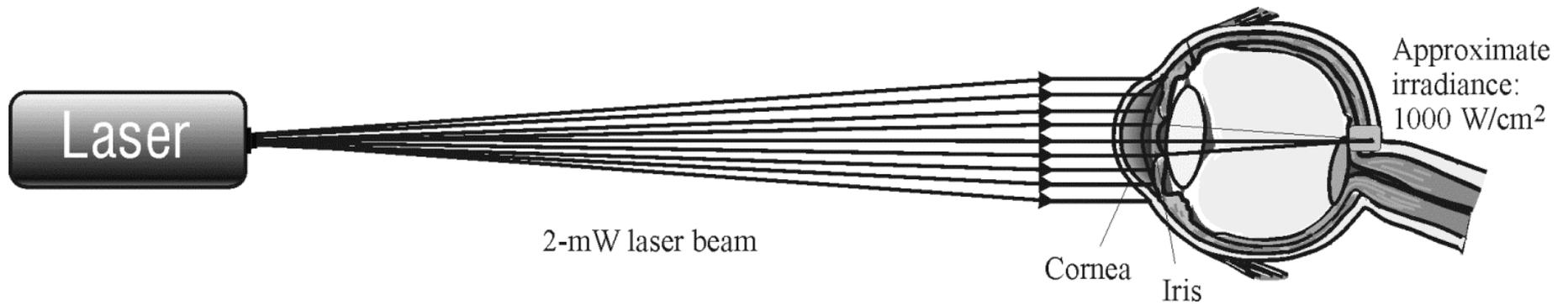


Figure 3-13 *Intrabeam viewing conditions with eye intercepting a laser beam*

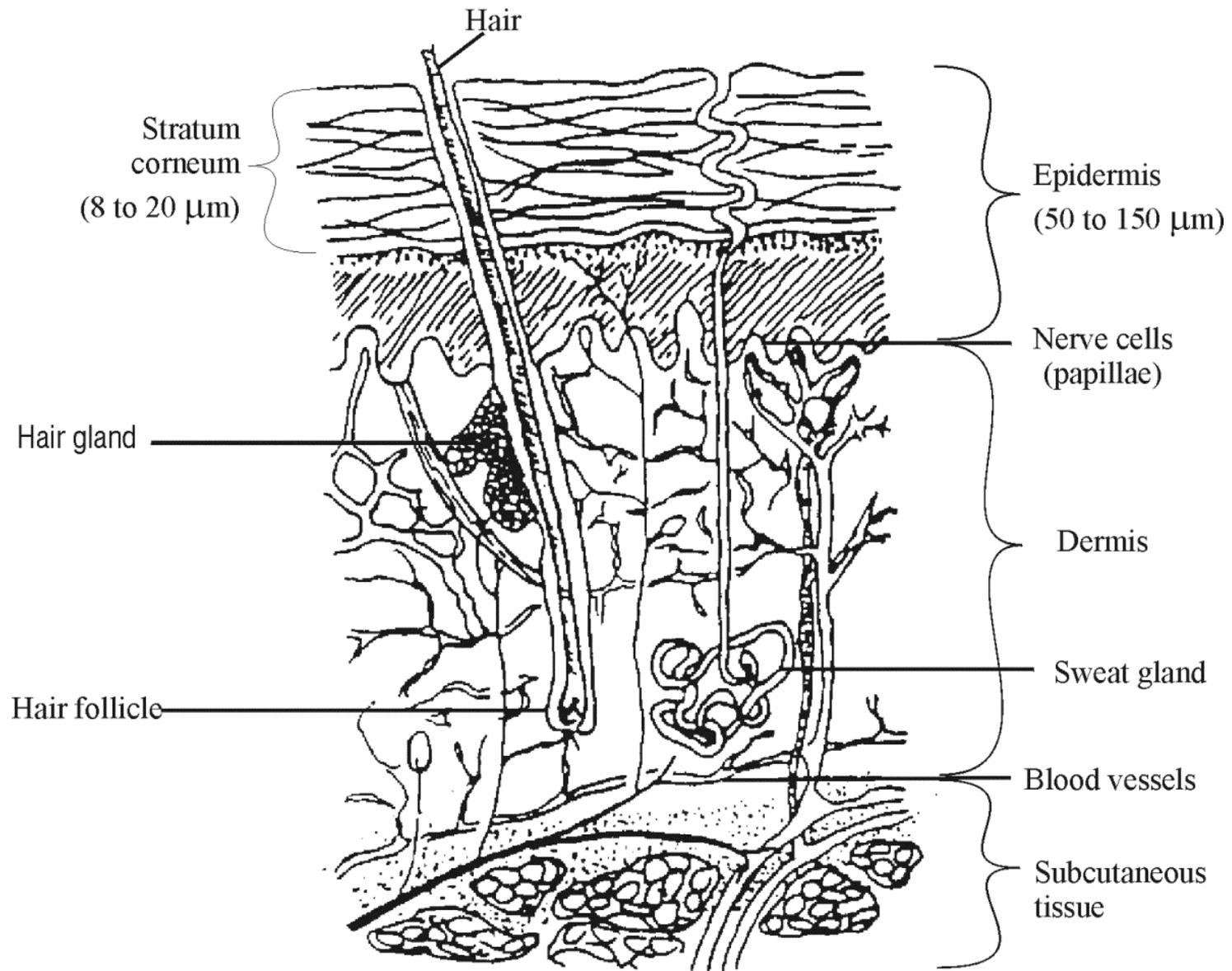


Figure 3-14 *Anatomy of the skin*

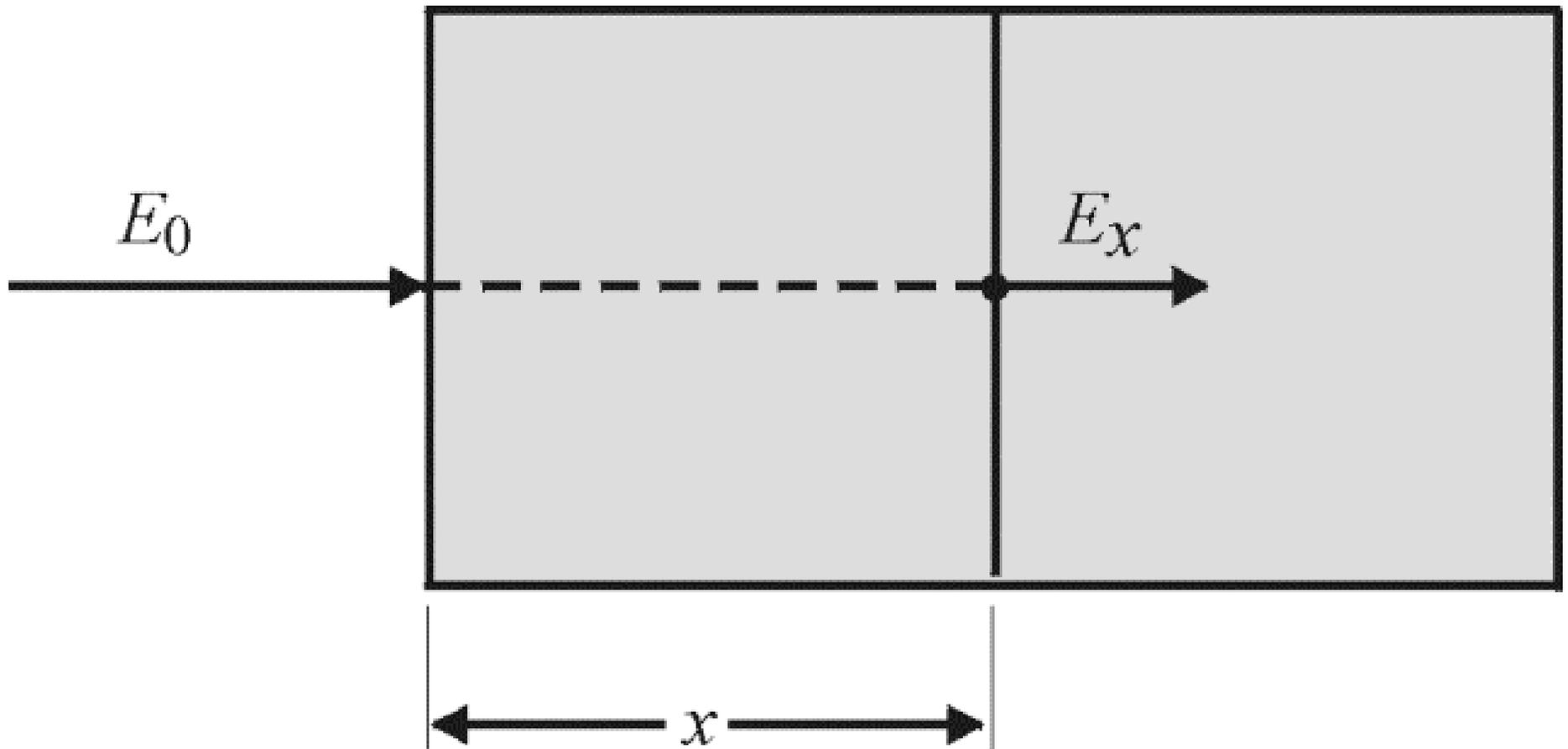


Figure 3-15 *Absorption of light in transparent materials*

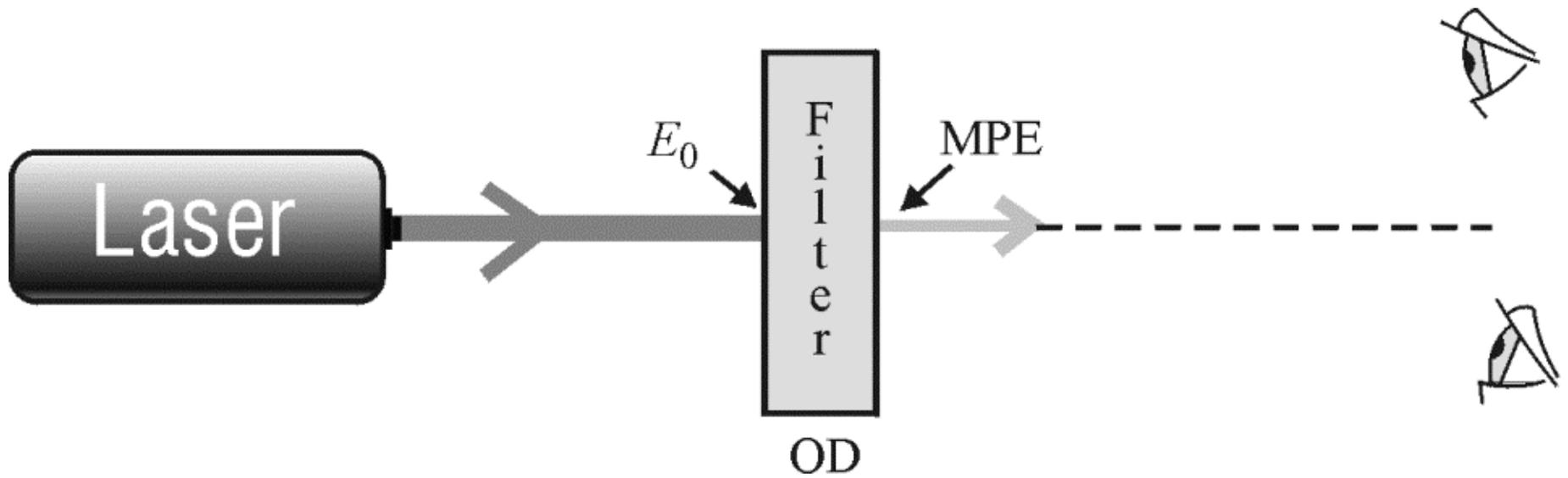


Figure 3-16 *Using an optical filter to reduce beam irradiance*

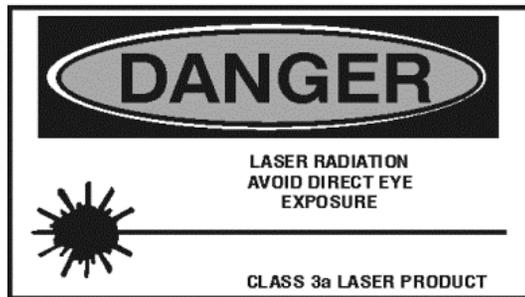
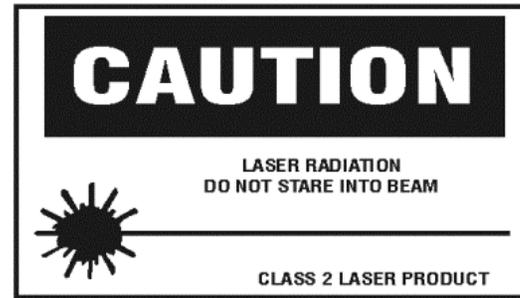
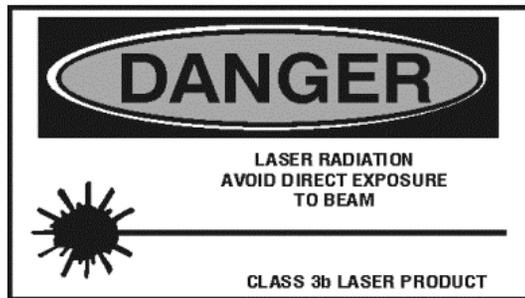
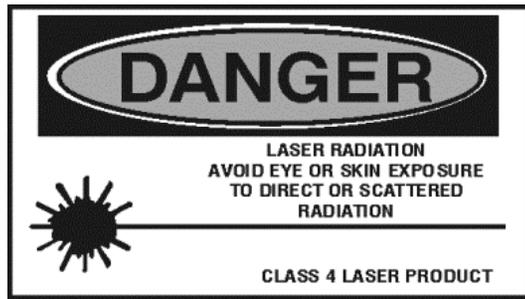


Figure 3-17 *Laser area warning signs for lasers approved prior to 2000. Some may still be in use in laser environments.*



Figure 3-18 *General structure (top) and samples (bottom) of the new DANGER, CAUTION, and NOTICE warning signs adopted in the year 2000 (Note: The actual signs are in color, as described in the text. The colors do not show up on the black-and-white versions shown here.)*

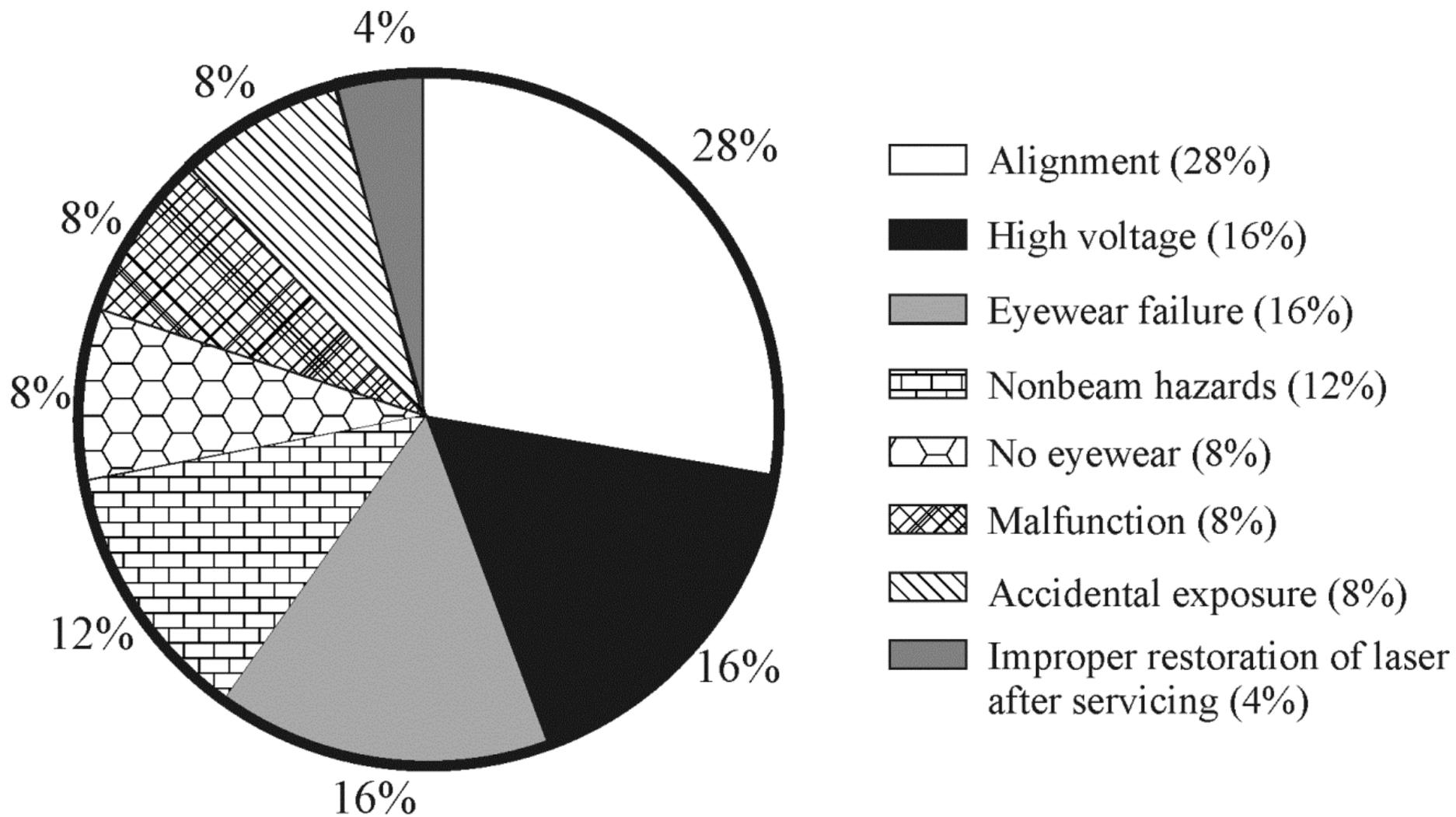


Figure 3-19 *Causes of most laser accidents*

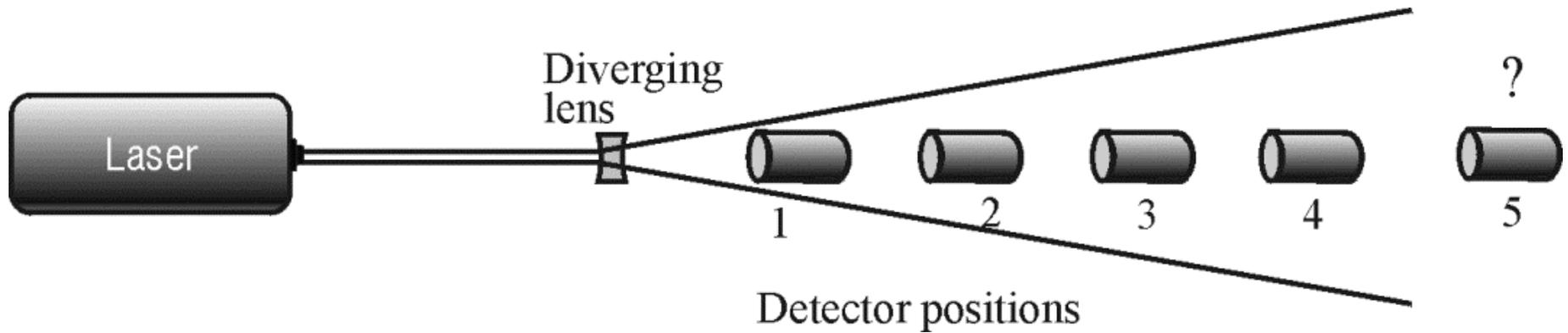


Figure 3-20
(Laboratory 1-3A: Irradiance)

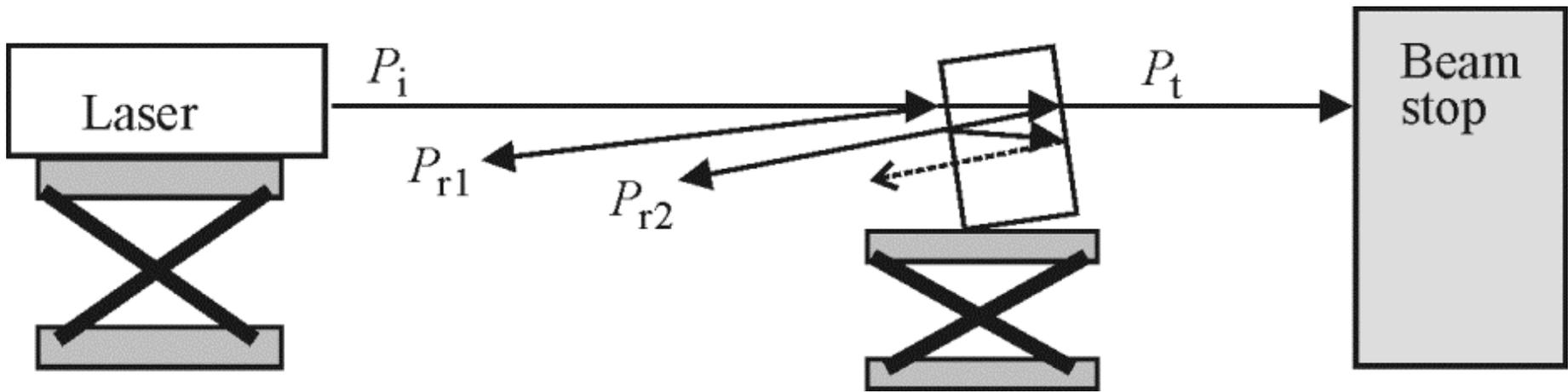


Figure 3-21
(Laboratory 1-3C: Windows and Mirrors)

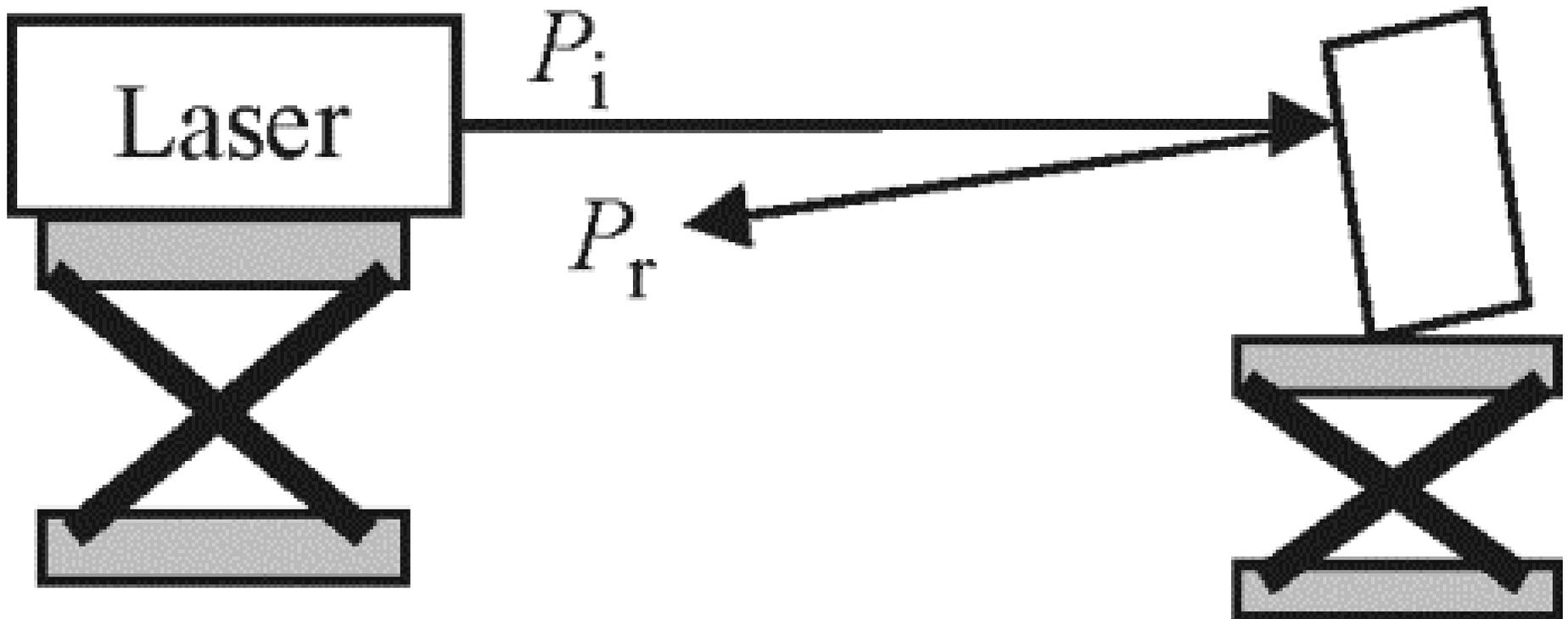


Figure 3-22
(Laboratory 1-3C: Windows and Mirrors)

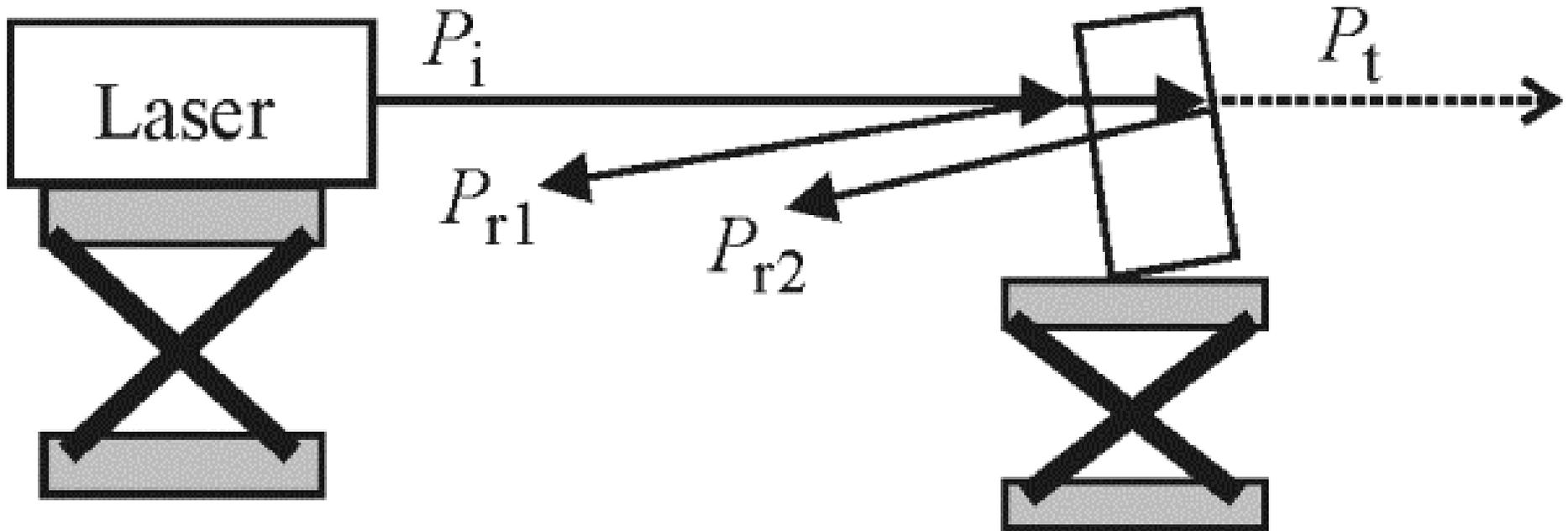


Figure 3-23
(Laboratory 1-3C: Windows and Mirrors)