Plane-Polarized Light

Electromagnetic radiation (light) is comprised of oscillating electric and magnetic fields propagating through space (Figure 5.8). Notice that each oscillating field is located in a plane, and these planes are perpendicular to each other. The orientation of the electric field (shown in red) is called the **polarization** of the light wave. When many waves of light are traveling in the same direction, they each have a different polarization, randomly oriented with respect to one another (Figure 5.9a). When light passes through a polarizing filter, only photons of a particular polarization are allowed to pass through the filter, giving rise to **plane-polarized light** (Figure 5.9b). When plane-polarized light is passed through a second polarizing filter, the orientation of the filter will determine whether light passes through or is blocked (Figure 5.10).

FIGURE 5.9
(a) Unpolarized light (b) Polarized light

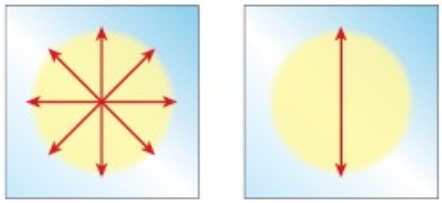
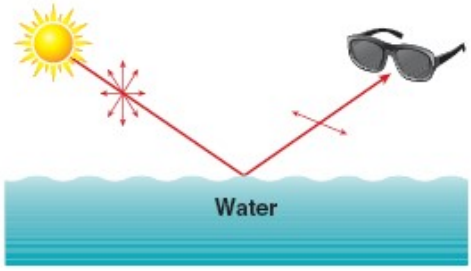


FIGURE 5.10
Plane-polarized light passing through (a) two parallel polarizing filters or (b) two perpendicular polarizing filters.

One way to create plane-polarized light is by reflecting light off a surface. For example, when sunlight reflects off a body of water, the reflected light is highly polarized.



If you study photography, you might learn how to use a polarizing filter for a camera lens (also known as a polarizer). A polarizer can be highly effective at eliminating reflected light (Figure 5.11). If you wear polarized sunglasses, you will experience reduced glare for the same reason.

FIGURE 5.11
(a) A photo of a pond taken under typical conditions (no filter) (b) The same pond photographed with a polarizing filter.