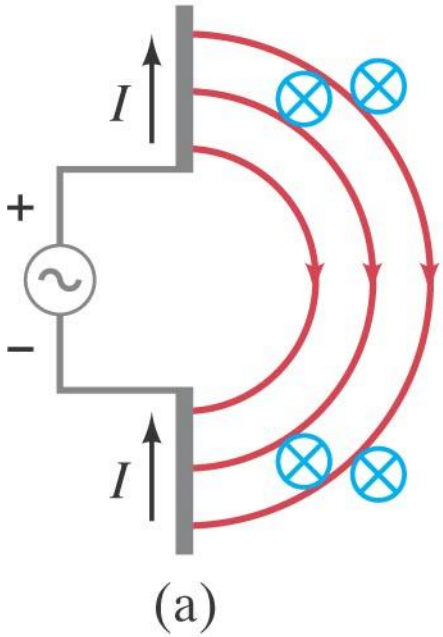
Final Exam

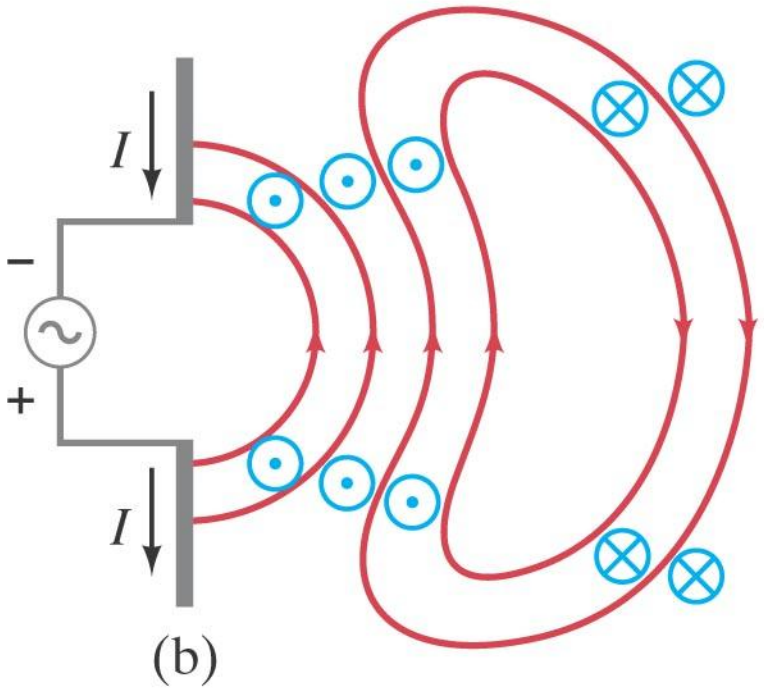
- Tuesday, Dec. 20 at 2 pm in Merrill 3.
- Three-hour exam; 150 points.
- Exam will be cumulative, but there will be a greater emphasis on material in chapters 30 – 35.

Properties of EM Waves

- Move at the speed of light (in vacuum): $c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$
- Magnitudes of fields related by $E = Bc$.
- $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ are perpendicular to each other.
- Wave moves in direction of $\vec{\mathbf{E}} \times \vec{\mathbf{B}}$, i.e. perpendicular to both fields.



t = 0



Later time

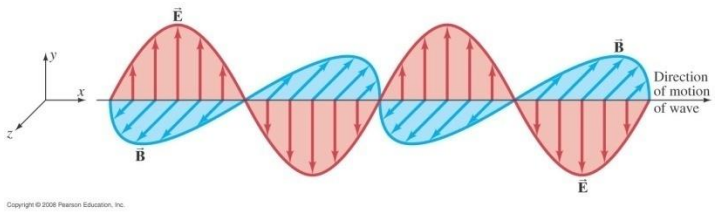
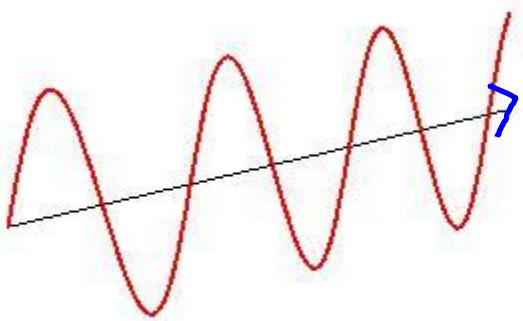


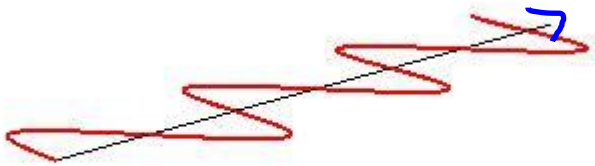
Figure 31.

Polarization

Vertical



Horizontal



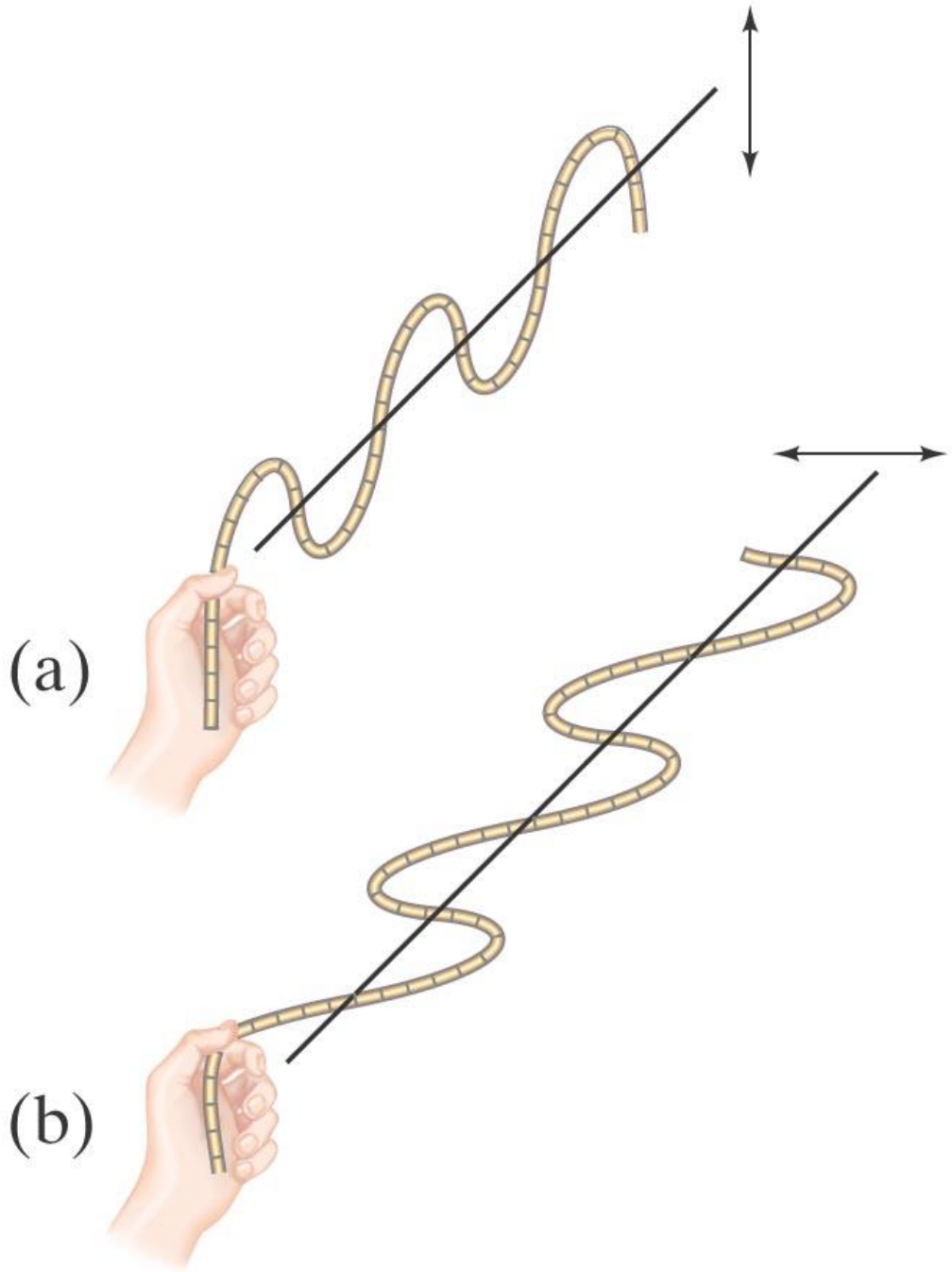
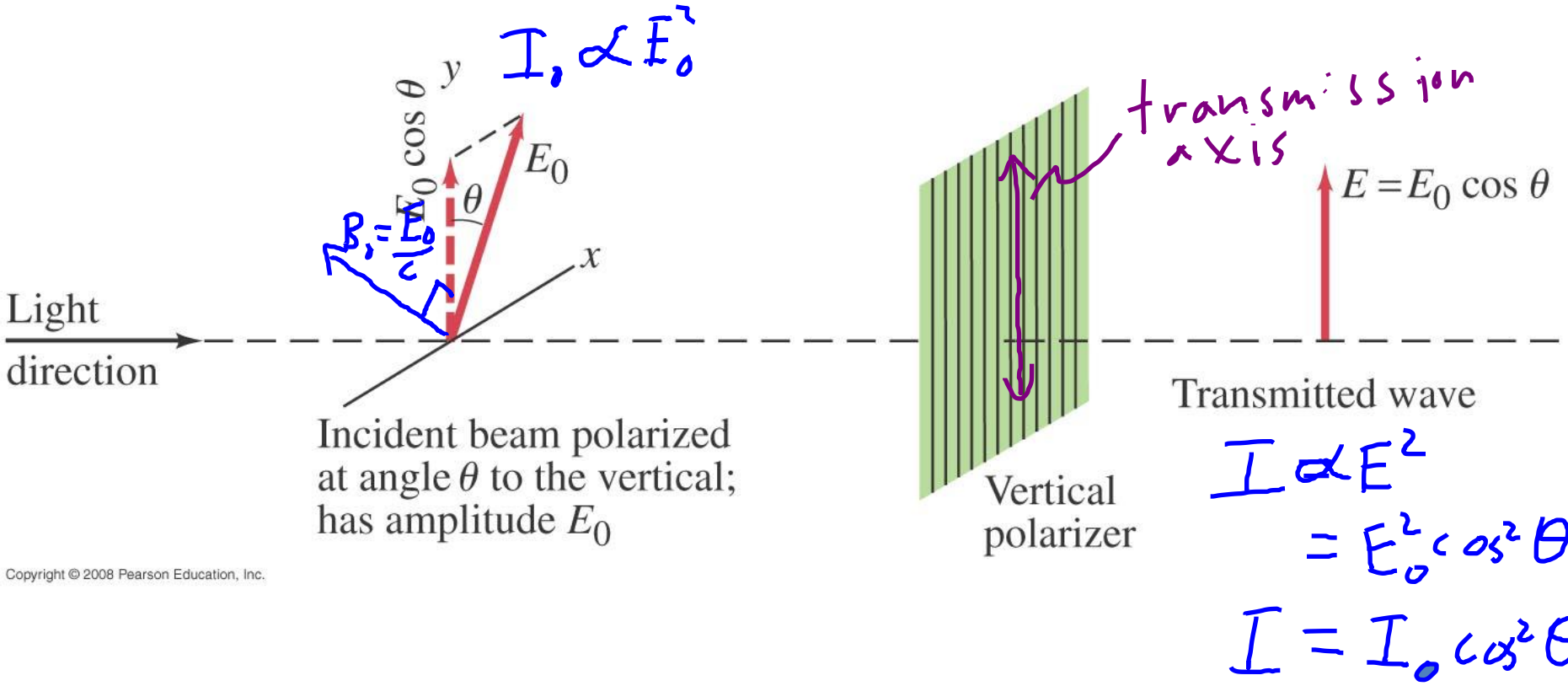


Figure 35.31

$I = \frac{P}{A} = \frac{E}{tA}$ $I \propto u_E = \frac{1}{2}\epsilon_0 E^2$

$I \propto E^2$



$I \propto E^2$

$= E_0^2 \cos^2\theta$

$I = I_0 \cos^2\theta$

Figure 35.34

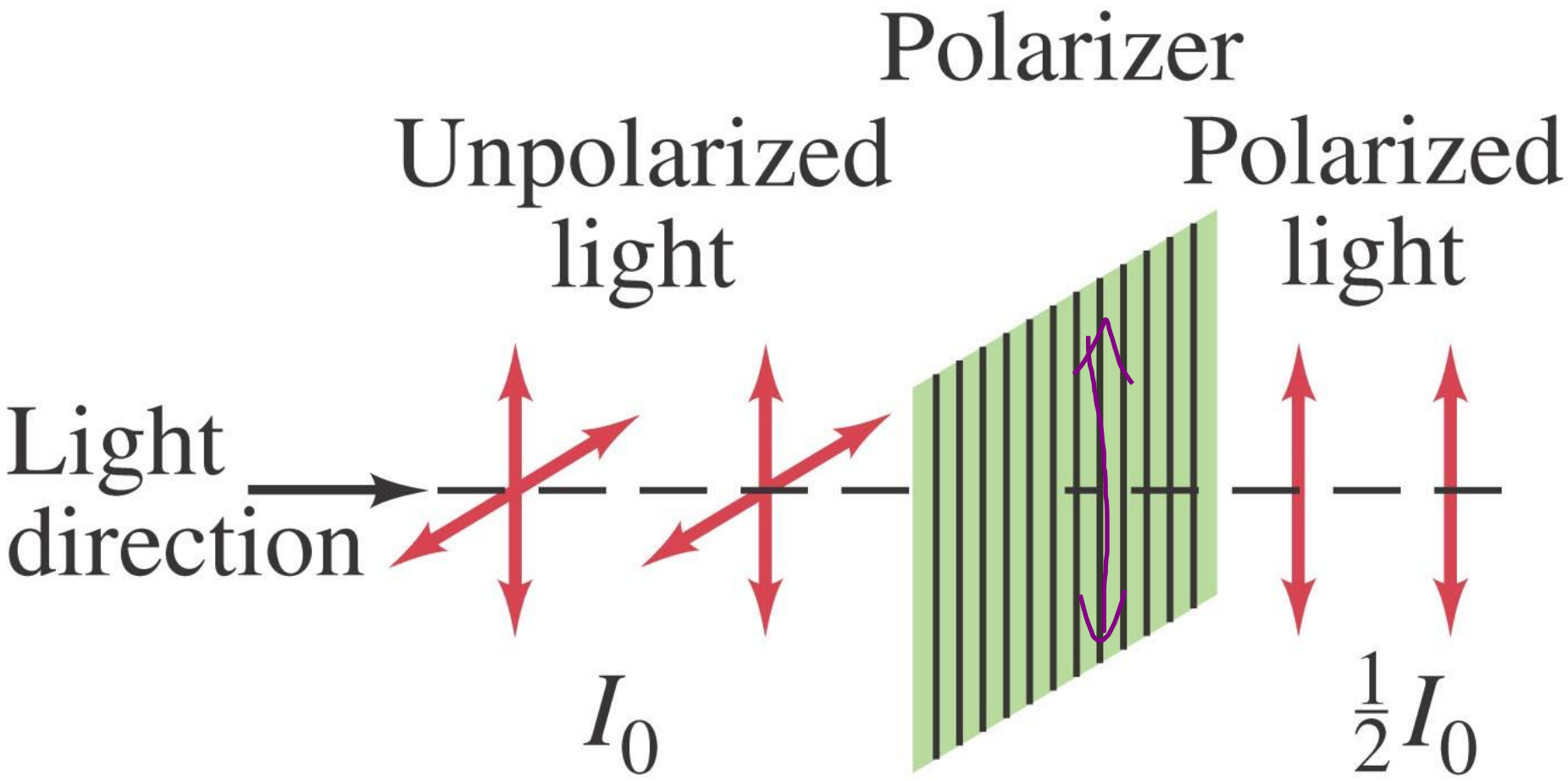
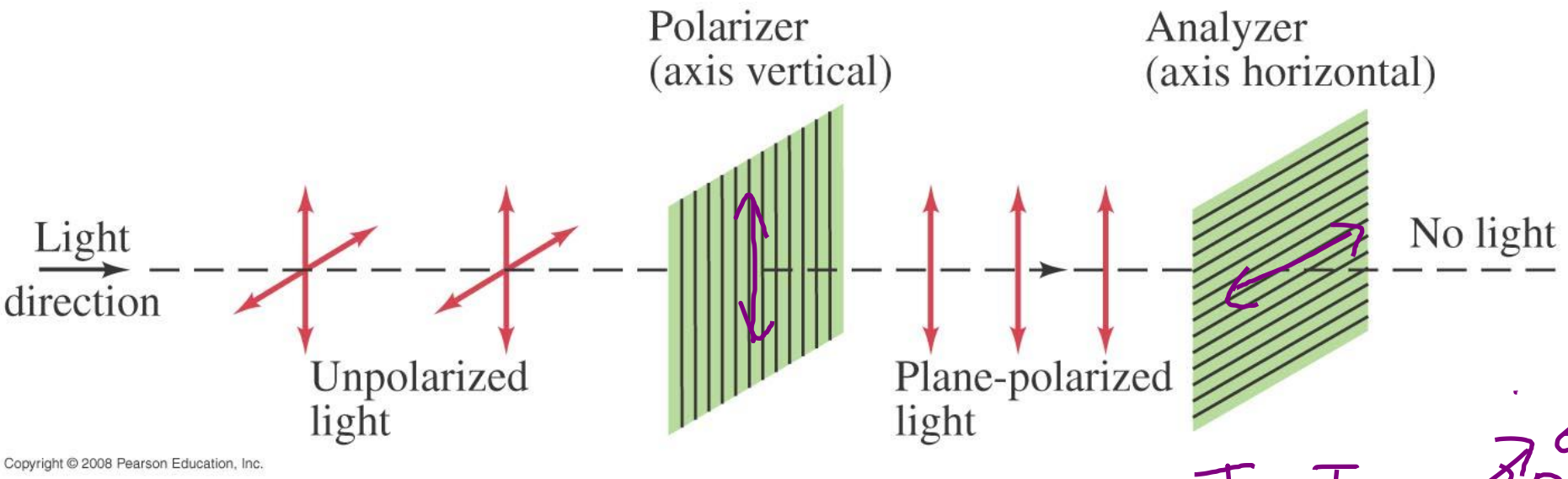


Figure 35.35



$I = I_0 \cos^2\theta^0$

$= 0$

Figure 35.36

Figure 35.37

Between two crossed polarizers, a third polarizer is inserted with polarization axis 45 degrees from the other two. If unpolarized light is shone on this configuration, what percentage of the incident intensity is transmitted through all three polarizers?

1) 0
2) 12.5%
3) 25%
4) 50%
5) 100%

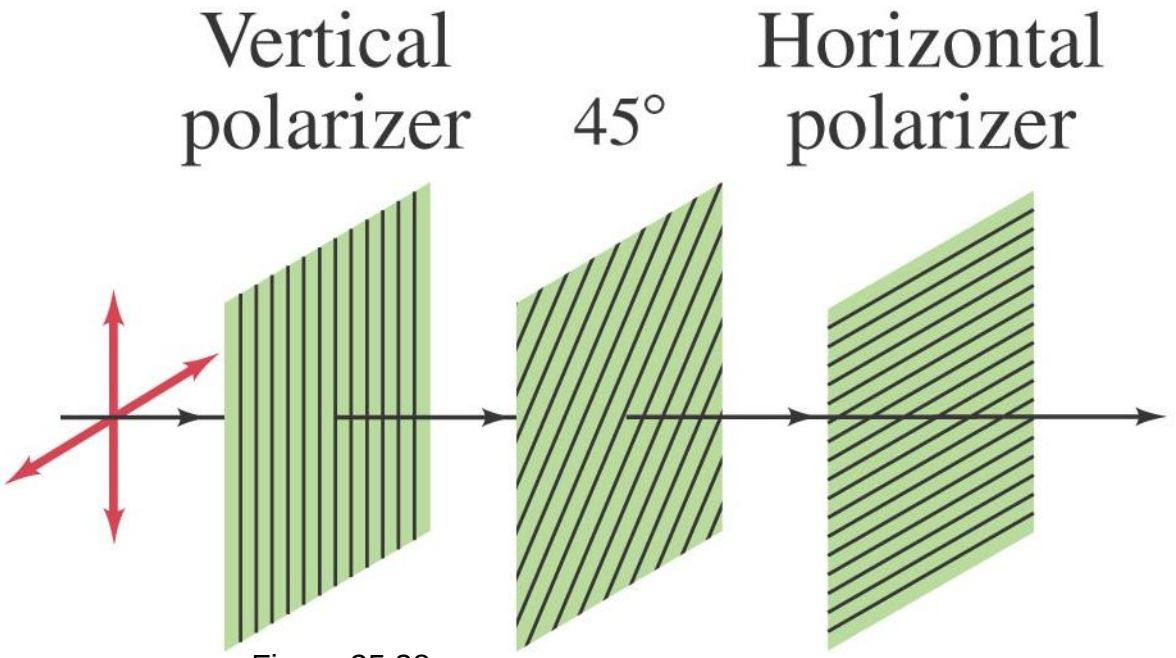


Figure 35.38

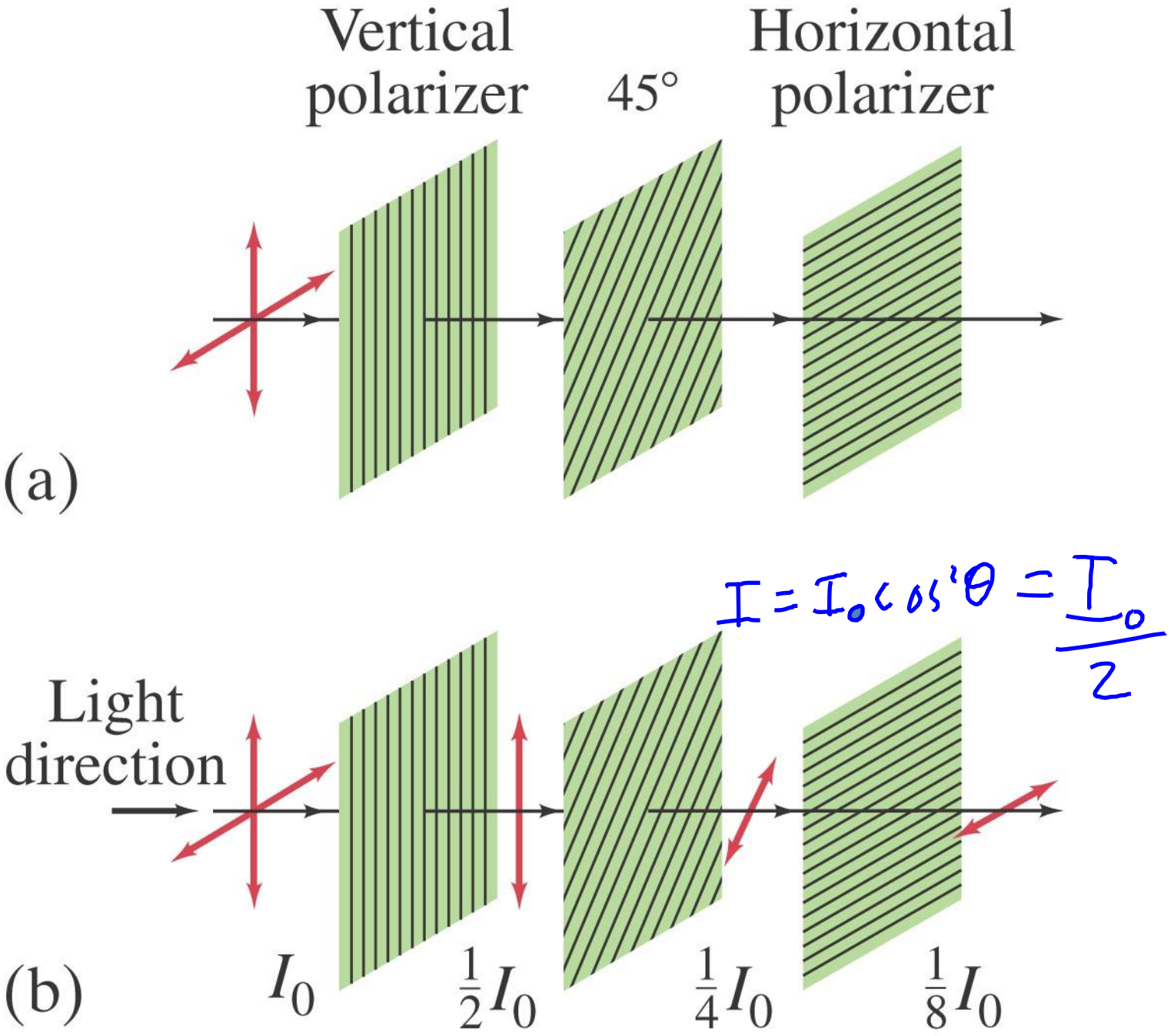


Figure 35.38

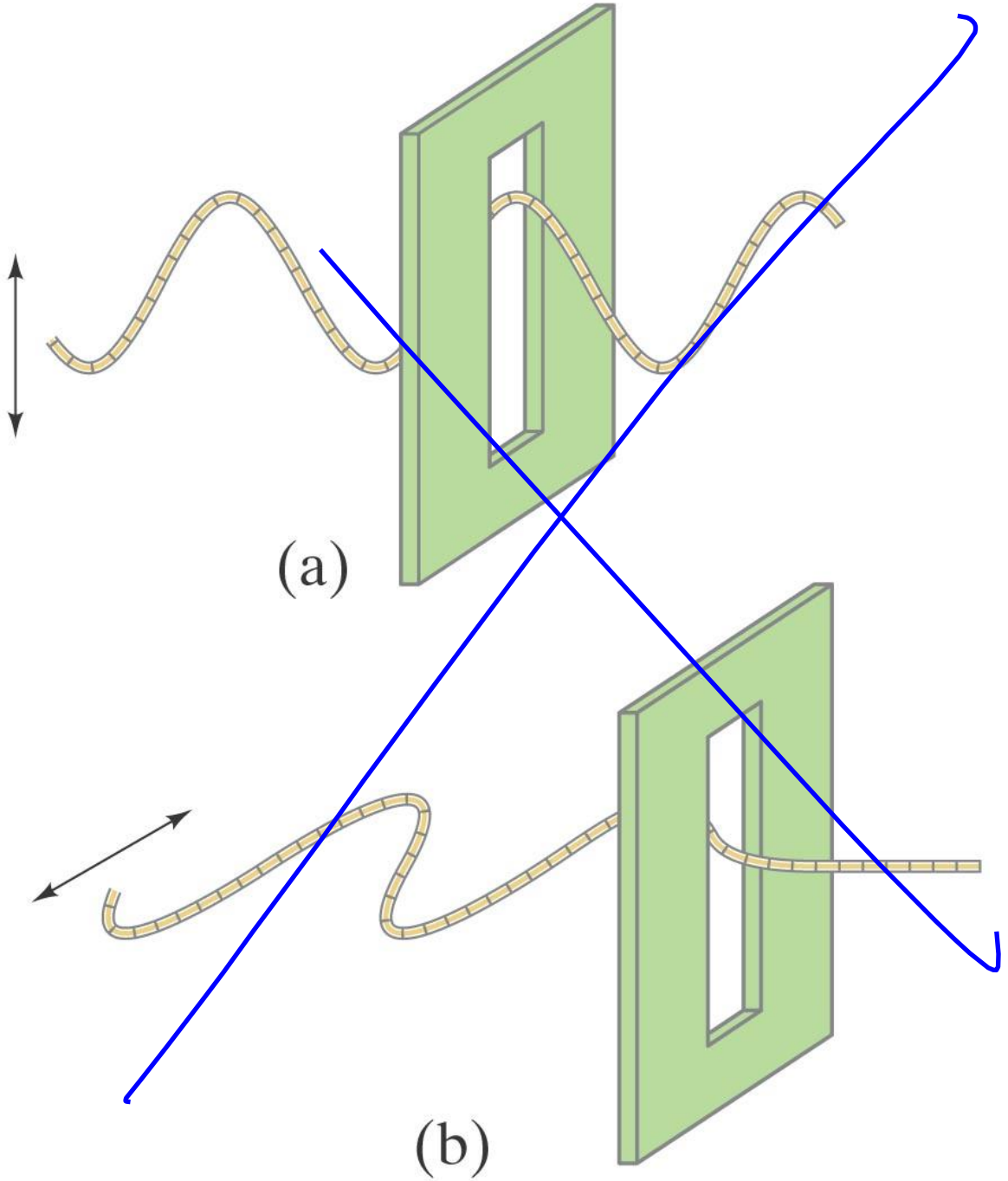
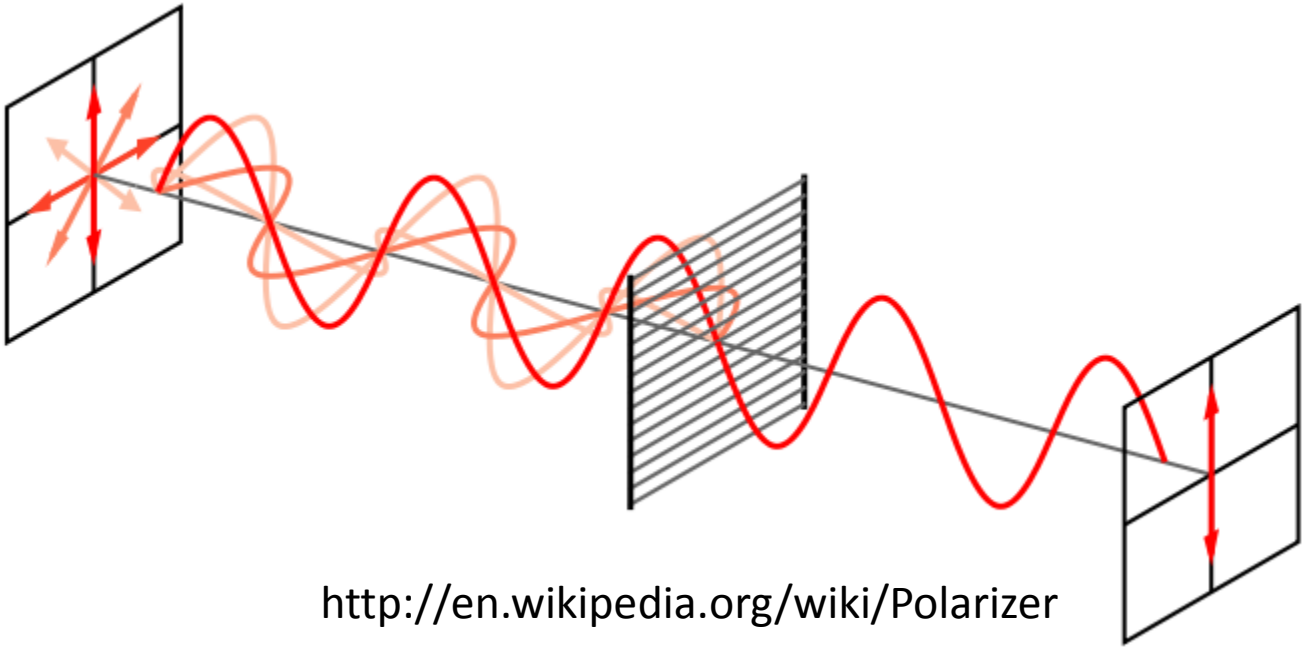


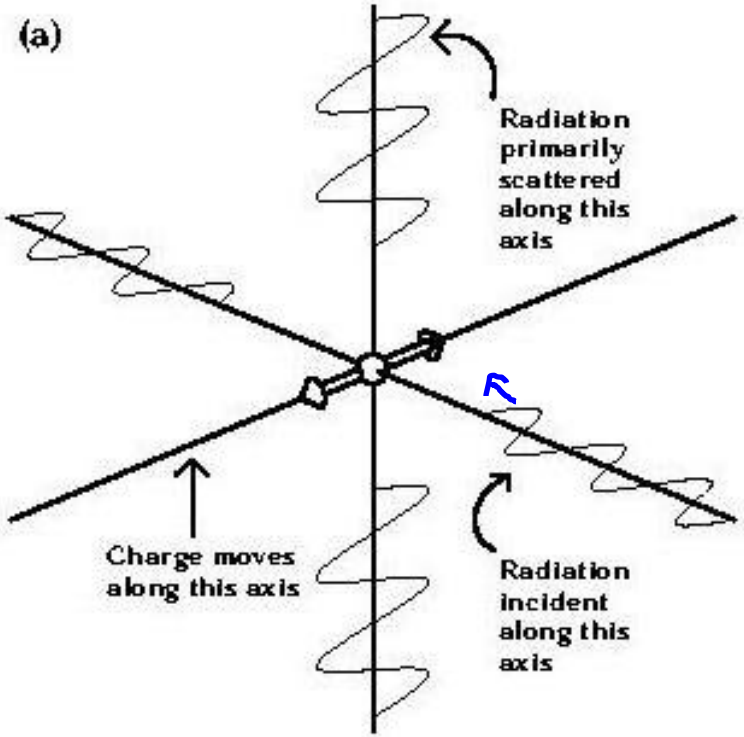
Figure 35.32

How polarizers really work



http://en.wikipedia.org/wiki/Polarizer

Polarization and scattering



http://quiet.uchicago.edu/capmap/thomson.jpg

Polarization and reflection

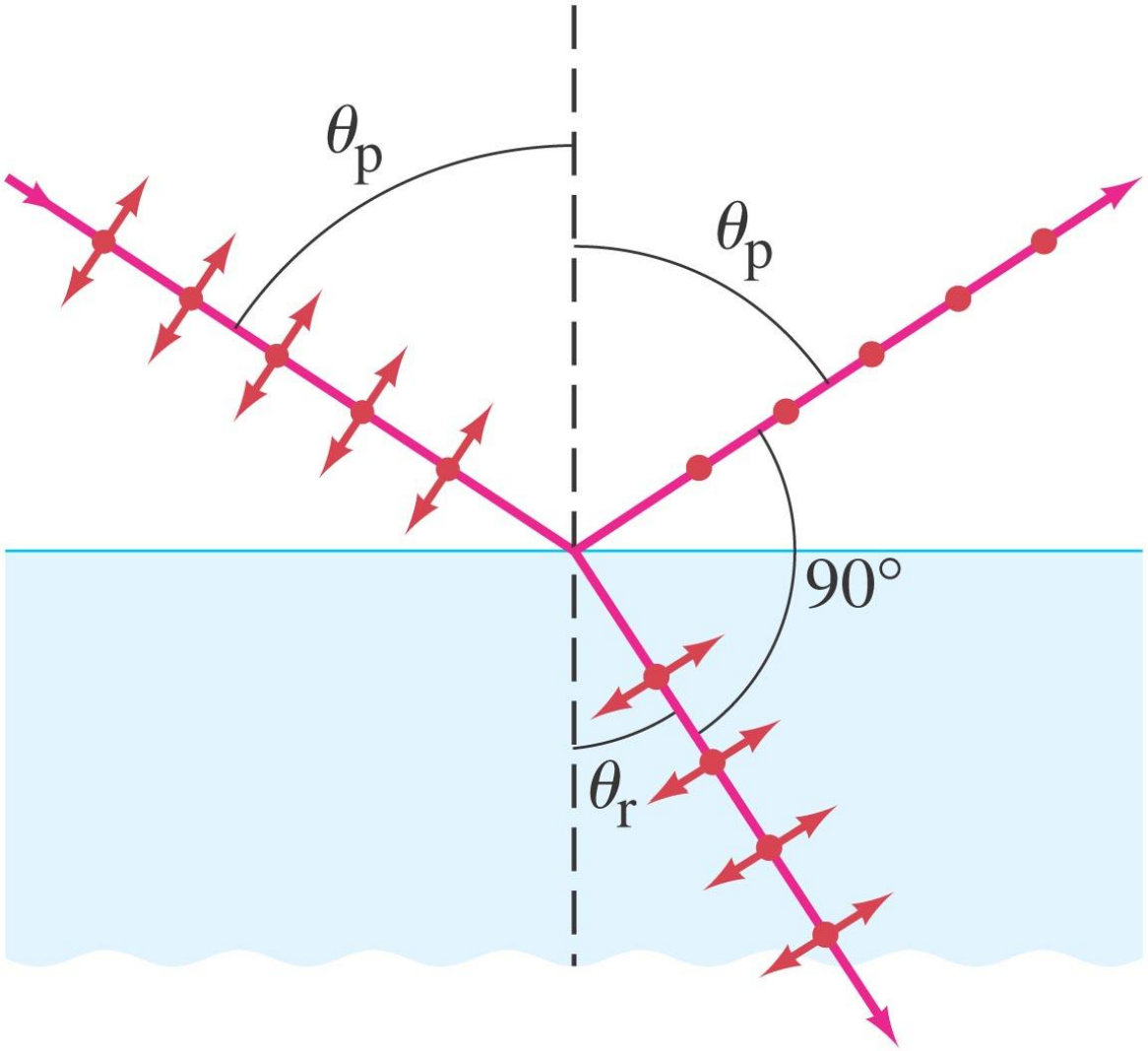


Figure 35.41

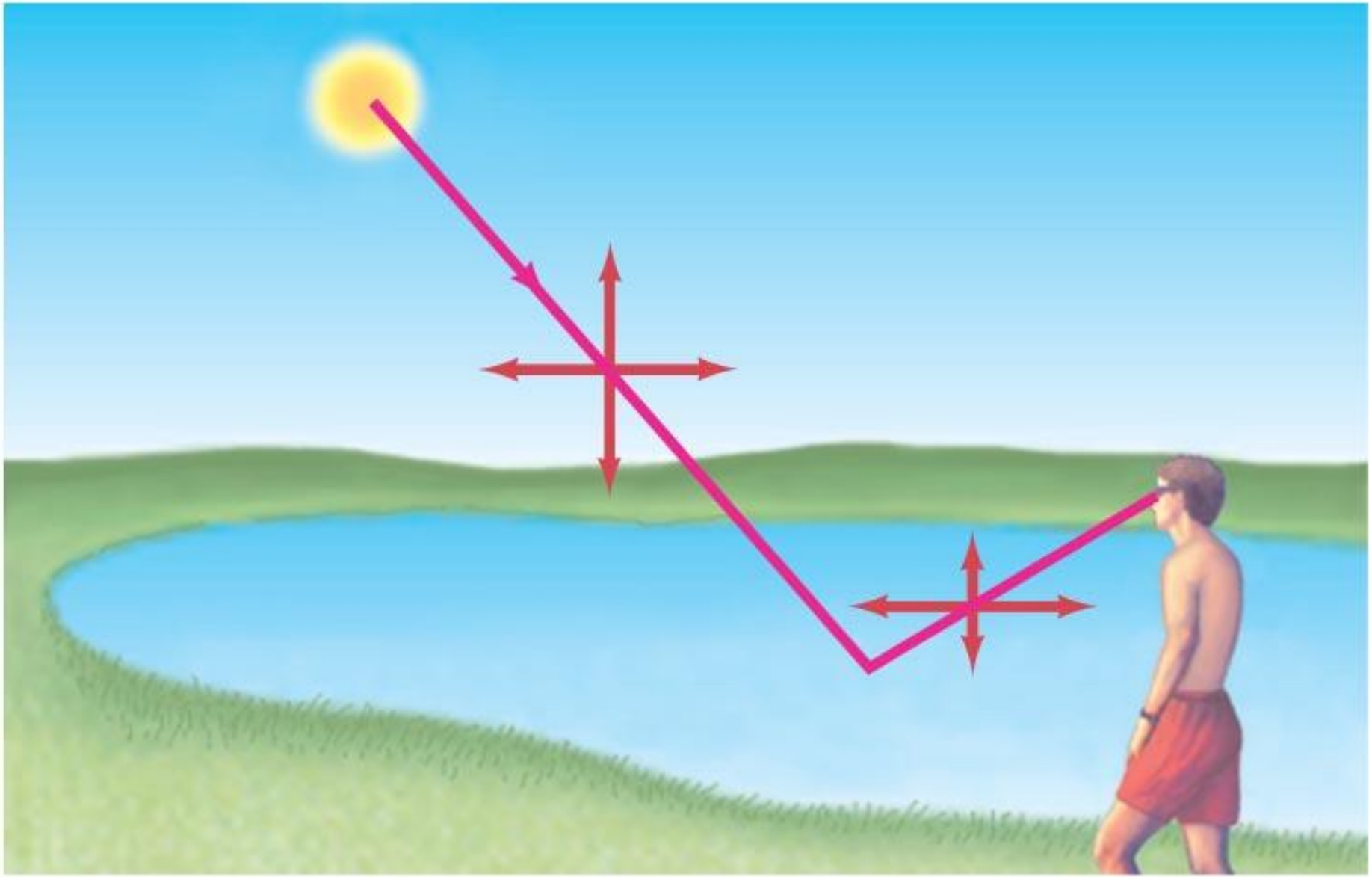
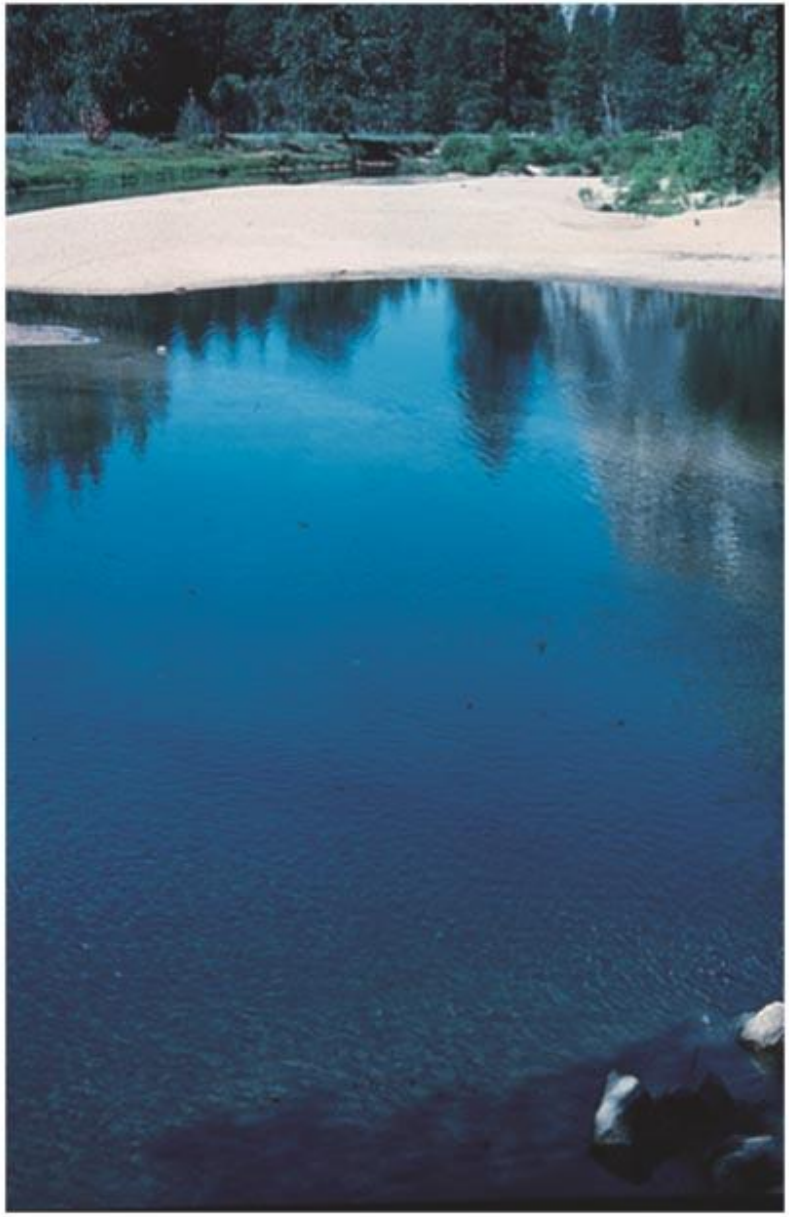


Figure 35.39



(a)

(b)

Figure 35.40