Chapter 35 Lecture Problems (& 37 too)

Index of Refraction: \( n = \frac{c}{v} = \frac{\lambda}{\lambda_n} \); Law of Reflection: \( \theta_i = \theta_r \); Snell's Law: \( n_1 \sin \theta_1 = n_2 \sin \theta_2 \)

Thin films: \( 2nt = (m + \frac{1}{2})\lambda \); \( 2nt = m\lambda \) (\( m = 0, 1, 2, ... \)) Index of refraction: \( n = \frac{\text{speed of light in a vacuum}}{\text{speed of light in a medium}} = \frac{c}{v} = \frac{\lambda}{\lambda_n} \)

How many times will the incident beam shown be reflected by each of the parallel mirrors?

A scuba diver training in a pool looks at his instructor as shown. What is the apparent height above the water that he sees her? What is the apparent depth that the teacher sees the diver?
A ray of light, emitted by a laser located beneath the surface of an unknown liquid with air above it, undergoes total internal reflection as shown. What is the index of refraction for the liquid? What is its likely identification?

The index of refraction for violet light in silica flint glass is 1.66, and that for red light is 1.62. What is the angular dispersion of visible light passing through a prism of apex angle 60.0° if the angle of incidence is 50.0°? red (660 nm) violet (410 nm)?
A thin film of gasoline floats on a puddle of water. Sunlight falls almost perpendicularly on the film and reflects into your eyes a yellow hue. Interference in the thin gasoline film has eliminated blue (469nm in vacuum) from the reflected light. The refractive indices of the blue light in gasoline and water are 1.40 and 1.33 respectively. Determine the minimum nonzero thickness of the film.

The light reflected from a soap bubble (n = 1.40) appears red (\(\lambda = 640\) nm). What is the minimum thickness (in nm)?

a. 124  
b. 104  
c. 114  
d. 134  
e. 234