

Physics 31B Third Test (100 pts)
Spring, 2003

- <I> Refer to the following figure. If the plate has a thickness τ , show that the emerging beam is laterally displaced by perpendicular distance d from the incident beam where
- <II> A coin rests on the bottom of a tank of water ($n_w = 1.33$) 1.00 m deep. On top of the water floats a layer of benzene ($n_b = 1.50$), which is 20.0 cm thick. Looking down nearly perpendicularly, how far beneath the topmost surface does the coin appear? Draw a ray diagram.
- <III> A helium-neon laser puts out a beam of red light containing a very narrow range of frequencies centered at 4.74×10^{14} Hz. Determine the energy of each photon at that frequency.
- <IV> Determine the frequency of a 200-m-long AM radiowave, assuming the condition to be that of vacuum.
- <V> Consider an ac generator in series with an inductor, capacitor, and resistor (in the following figure). The source voltage is $v(t) = V_m \cos \omega t$. Write out the differential equation governing the circuit in terms of the current.
- <VI> Given the circuit in following figure, calculate the current in each resistor. What power is delivered by the battery? What is the potential difference between A and C?