

Optics I: Theory CPHY 6/72250

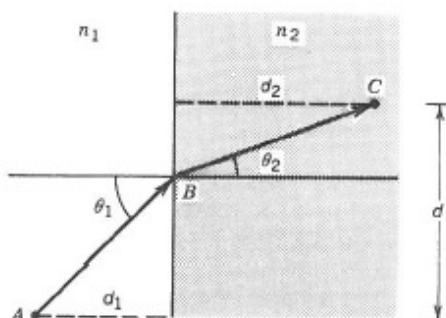
Assignment 1.

P. Palffy-Muhoray

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Due: Sept. 13, 2016

1. What length plane mirror must you purchase to see your full height when it is mounted in a vertical position? (Do not assume that you have eyes on the top of your head.) Make a sketch, and label distances.
2. Consider the planar interface shown.



Show that the optical path length from A to C is minimized if

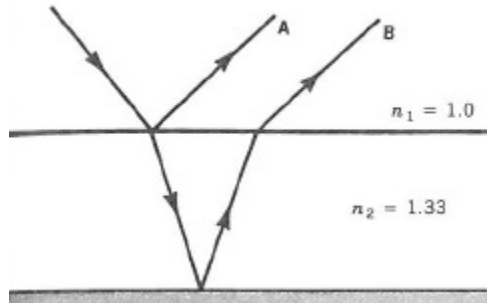
$$n_1 \sin \theta_1 = n_2 \sin \theta_2 \quad (1)$$

This is Snell's Law.

3. Consider a series of plane interfaces, all parallel. At the first, the index changes from n_0 to n_1 ; at the second, it changes from n_1 to n_2 ; at the m th from n_{m-1} to n_m . If θ_m is the angle of refraction and θ_{m-1} is the angle of incidence at the m th interface, show that

$$n_0 \sin \theta_0 = n_m \sin \theta_m \quad (2)$$

4. A collimated laser beam shines on a tank of water. Part reflects from the surface (beam *A*) and part reflects from the bottom, and exits the water as beam *B*.



Show that the beams are parallel.