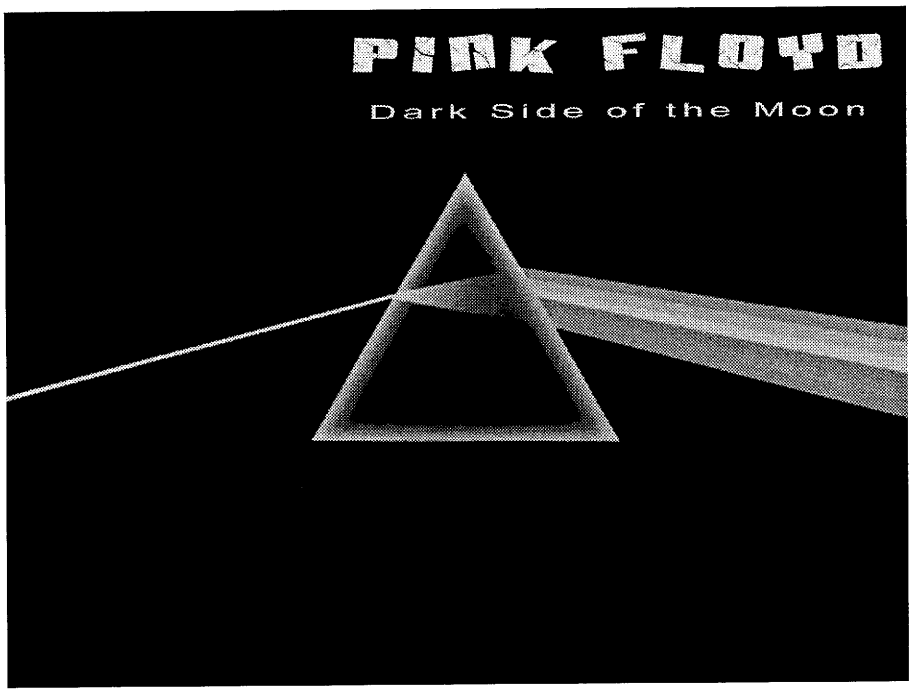
Physics 2102 Section 004 Dowling

April 12, 2007 Quiz 19 Name (print): SOLUTION

The prism has index of refraction n_1 and the surrounding vacuum index n_2. What can we conclude from Snell's Law?

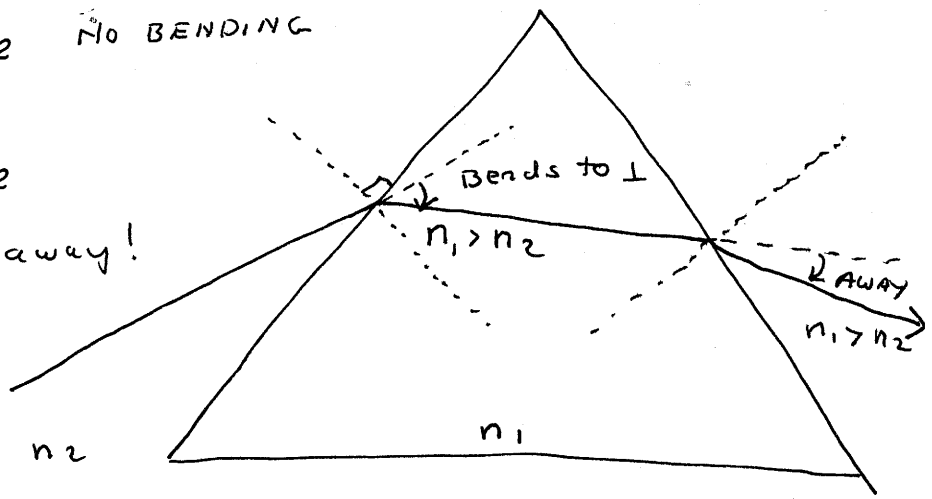


Circle one.

(a) $n_1 > n_2$ Bends to ⊥ ✓

(b) ~~$n_1 = n_2$~~ NO BENDING

(c) ~~$n_1 < n_2$~~ Bends away!



"There is no dark side of the Moon, it's all dark, really."

Physics 2102 Section 004 Dowling

April 19, 2007 Quiz 20 Name (print): SOLUTION

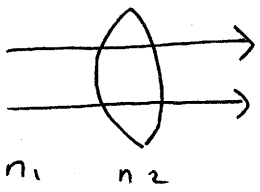
Three thin lenses are shown with light rays going through them. In each n1 is outside the lens and n_2 is inside the lens. What can we conclude about the indices of refraction in each case?

Circle one each.

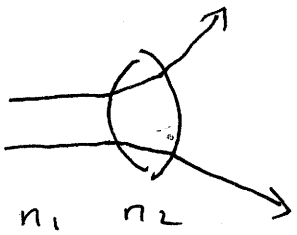
(a) $n_1 < n_2$ **$n_1 = n_2$** $n_1 > n_2$

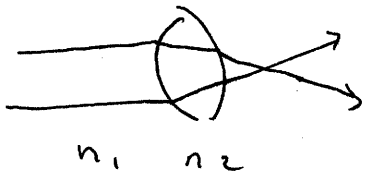
(b) $n_1 < n_2$ $n_1 = n_2$ **$n_1 > n_2$**

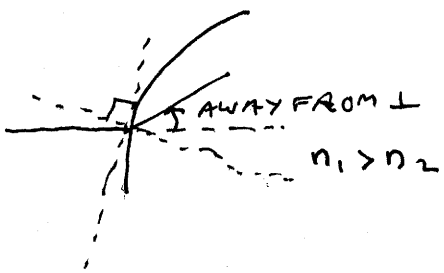
(c) **$n_1 < n_2$** $n_1 = n_2$ $n_1 > n_2$

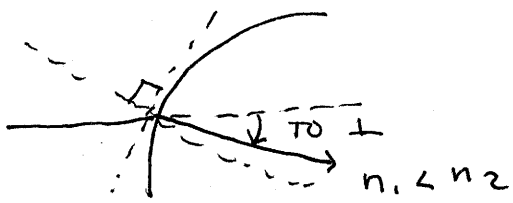


No bend
$n_1 = n_2$







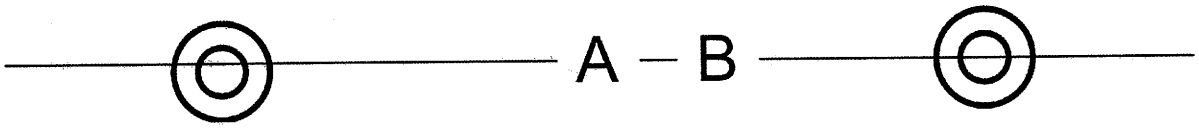


"There is no dark side of the Moon, it's all dark, really."

Physics 2102 Section 004 Dowling

April 24, 2007 Quiz 21 Name (print): SOLUTION

Alice and Bob are on a line connecting two radio towers both broadcasting in phase the same station at λ = 100 m wavelength. They have handheld radios tuned to that station and walk back and forth on the line until Alice's signal is at a maximum and Bob hears nothing. What is the minimum possible distance between them?



Circle one.

(a) 100 m

(b) 50 m

(c) 0 m

IF ALICE MAX AND BOB MIN

THEN 180° OUT OF PHASE

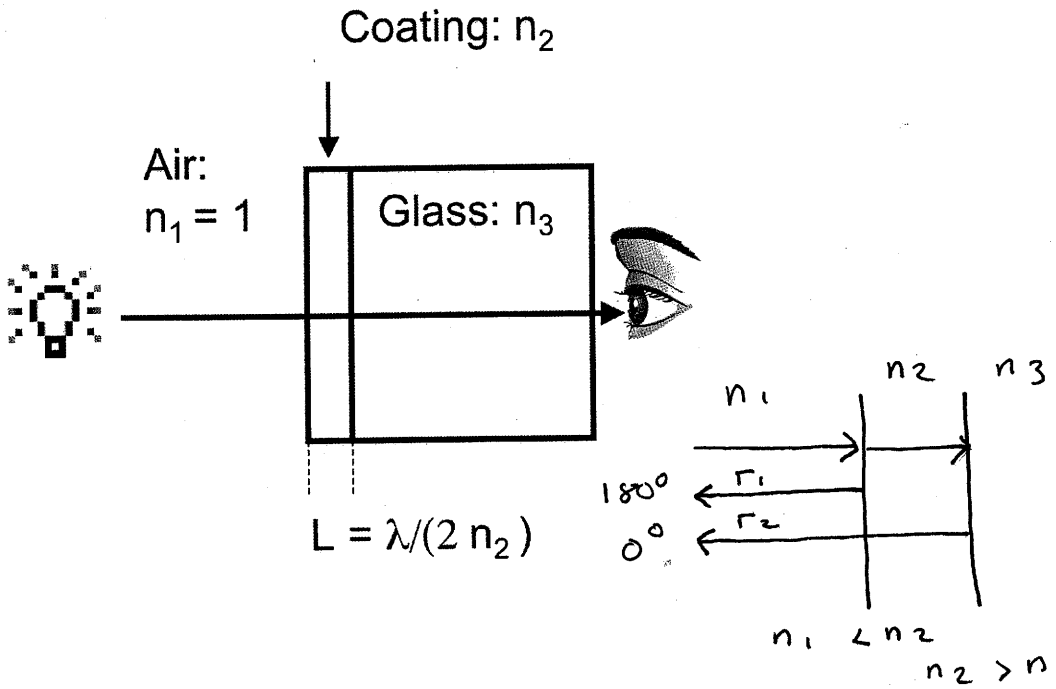
$\Rightarrow$ $\lambda/2$ APART MIN

$\Rightarrow$ 50 m

Physics 2102 Section 004 Dowling

April 26, 2007 Quiz 22 Name (print): SOLUTION

My reading glasses have an anti-reflective coating optimized for the mid-visible wavelength λ = 500 nm. This ensures if you take a picture of me with a flash camera, there will be minimum glare off my glasses in the photo – most of the light of the flash goes through the glasses and very little reflects. The set up is shown in the figure and the thickness of the coating is equal to half of the wavelength in the material.



What can we say about the relative values of the index of the coating material, n_2, and index of the glass, n_3?

Circle one.

(a) $n_2 > n_3$

(b) $n_2 = n_3$

(c) $n_2 < n_3$

SINCE $2L = \lambda/n_2$ r_2 TRAVELS A WHOLE WAVELENGHT IN (L) AND OUT (L) = 2L. SO m = 1. IF THAT WAS IT THEN r_1 & r_2 WOULD BE IN PHASE — A REFLECTIVE COATING. FOR AN ANTI REF. COAT r_1 & r_2 MUST BE OUT OF PHASE. WE KNOW $n_2 > n_1$ SINCE AIR IS LEAST POSSIBLE LOW 2 HIGH = π! HENCE WE NEED NO SHIFT r_2: HIGH 2 LOW = NO $\Rightarrow$ $n_2 > n_3$