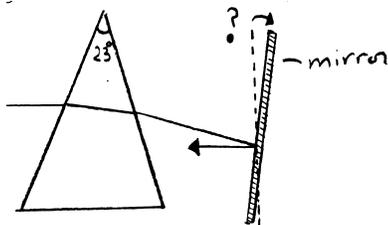


Physics 2P51 Assignment 1

Due: Tuesday, January 23, 2018 in drop box across from MC B210a by 12:00 noon.

1. A cylindrical tube is closed at both ends by glass plates 10.0 mm thick. If the inside length of the tube is 7.5 cm, the refractive index of the glass is $n = 1.5$, and the tube is filled with water ($n = \frac{4}{3}$), what is the total optical path length between the outer surfaces?
2. What is the minimum angle of total internal reflection for light passing from glass of $n = 1.5396$ to water ($n = \frac{4}{3}$).
3. An equilateral prism has an index of 1.63461. At what angle should light be incident if it is to travel through symmetrically? Assume the medium outside the prism has index one.
4. A horizontal ray of white light passes through a prism of apex angle 23° whose refractive index is 1.7 for blue light. Assume the bisector of the apex angle lies along the vertical. The light then strikes a vertical mirror as shown by the dashed line.



- (a) Through what angle must the mirror be rotated if after reflection a blue ray is to be horizontal? Assume the index of the outside medium is one.
 - (b) If the refractive index is 1.6 for red light what is the angular dispersion between red and blue rays exiting the prism?
5. Two specks of dirt are trapped in a crystal ball, one at the center and the other halfway to the surface. If you peer into the ball on a line joining the two specks, the outer one appears to be only one-third of the way to the other. What is the refractive index of the ball? [Hint: First use Gauss' formula to find the location (in terms of R) of the image of the speck positioned at the center.]