S11 PHY114 Problem Set 9

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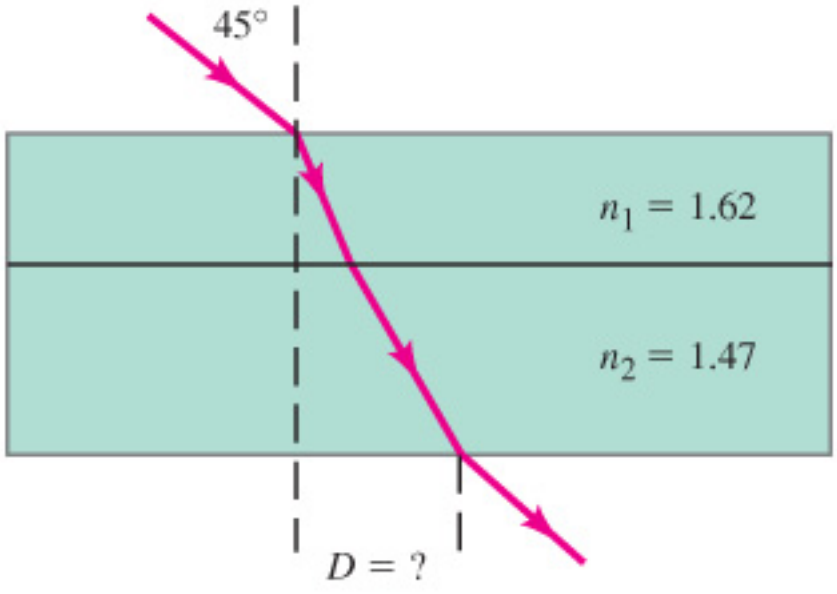
Due Monday 18 Apr 2011

1. A lighted candle is placed a distance d in front of a converging lens of focal length f_1, which in turn is a distance L in front of another converging lens of focal length f_2 . Assume that $d > f_1$. and $L > f_1 + f_2$ Calculate the position of the final image.

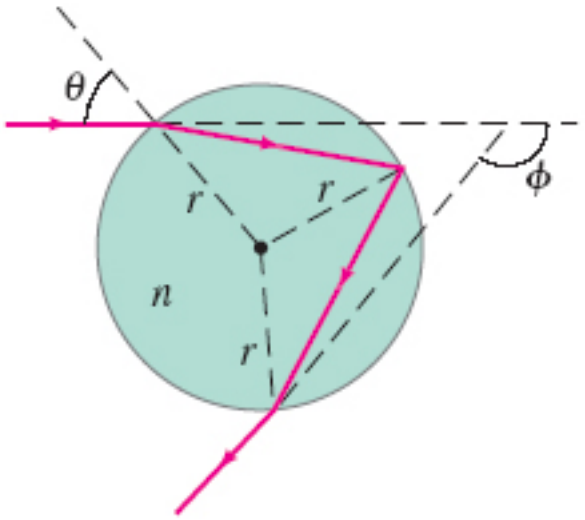
2. How far from a 80.0mm -focal-length lens must an object be placed if its image is to be magnified 4 times and be real? What if the image is to be virtual and magnified 4 times ?

3.A light beam strikes a 1.7 cm -thick piece of plastic with a refractive index of 1.62 at a 45 degree angle. The plastic is on top of a 2.7 cm-thick piece of glass for which the refractive index is 1.47. What is the distance D in the figure?



4. Consider a ray of sunlight incident from air on a spherical raindrop of radius and index of refraction . Defining θ to be its incident angle, the ray then follows the path shown in the figure , exiting the drop at a "scat-

tering angle" ϕ compared with its original incoming direction. Find a formula for the scattering angle as a function of the incident angle. Plot this is function in the range $0 \leq \theta \leq 90^\circ$. The refractive index of water is



1.33.