

UNIVERSITY OF ALABAMA
Department of Physics and Astronomy

PH 102 / LeClair

Summer II 2012

Problem Set 5: Optics

Instructions:

1. Answer all questions below. Show your work for full credit.
2. All problems are due Tuesday 31 July 2012 by the end of the day (11:59pm if electronically submitted, by 5pm as a hard copy)
3. You may collaborate, but everyone must turn in their own work.

1. What is the apparent depth of a swimming pool in which there is water of depth 3 m: **(a)** when viewed from normal incidence, and **(b)** when viewed at an angle of 60° with respect to the surface normal? The refractive index of water is 1.33.
2. A point source of light is placed at a fixed distance l from a screen. A thin convex lens of focal length f is placed somewhere between the source and screen, a distance q from the screen and p from the source. The lens is moved back and forth between the source and screen, but both screen and source remain fixed, thus $p + q = l$ at all times. What is the minimum value of l such that a focused image will be formed at two different positions of the lens?
3. Referring to the previous question, it is found that at one position the image height is a , while at the second, the image height is b . Show that the height of the object is \sqrt{ab} .
4. A spherical mirror which forms only virtual images has a radius of curvature of $R=0.5$ m. **(a)** Is the mirror concave or convex? What is the focal length of the mirror? **(b)** Where should an object be placed to obtain a magnification of +0.5?