The University of Zambia
School of Natural Sciences
Department of Physics

PHY2712: Geometric and wave optics

Tutorial Sheet 1

2022-2023 Academic year-Part II

1. What is the focal length of a makeup mirror that produces a magnification of 1.50 when a person's face is 12.0 cm away?
2. A narrow beam of white light enters a prism made of crown glass at a 45.0° incident angle, as shown in the Figure below. At what angles, θ_R and θ_V, do the red (660 nm) and violet (410 nm) components of the light emerge from the prism?

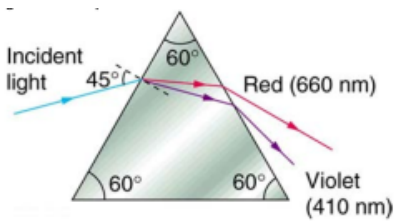

Figure 1

3. Suppose an object such as a book page is held 7.50 cm from a concave lens of focal length -10.0 cm. Such a lens could be used in eyeglasses to correct pronounced nearsightedness. What magnification is produced?
4. Calculate the index of refraction for a medium in which the speed of light is 2.012×10^8 m/s, and identify the most likely substance.
5. Suppose a man stands in front of a mirror as shown in the Figure below. His eyes are 1.65 m above the floor, and the top of his head is 0.13 m higher. Find the height above the floor of the top and bottom of the smallest mirror in which he can see both the top of his head and his feet. How is this distance related to the man's height?

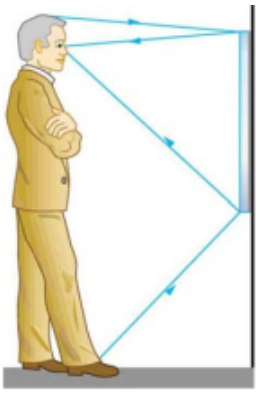

Figure 2

6. The magnification of a book held 7.50 cm from a 10.0 cm focal length lens was found to be 3.00.
   (a) Find the magnification for the book when it is held 8.50 cm from the magnifier.
   (b) Do the same for when it is held 9.50 cm from the magnifier.
   (c) Comment on the trend in m as the object distance increases as in these two calculations.
7. A doctor examines a mole with a 15.0 cm focal length magnifying glass held 13.5 cm from the mole.
   (a) Where is the image?
   (b) What is its magnification?
   (c) How big is the image of a 5.00 mm diameter mole?
8. A ray of light, emitted beneath the surface of an unknown liquid with air above it, undergoes total internal reflection as shown in Figure below. What is the index of refraction for the liquid and its likely identification?

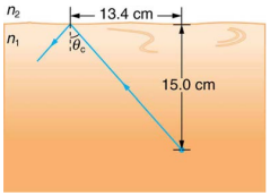

Figure 3

9. A two-lens system is made up of a converging lens followed by a diverging lens, each of focal length 15 cm. The system is used to form an image of a short nail, 1.5 cm high, standing erect, 25 cm from the first lens. The two lenses are separated by a distance of 60 cm. See accompanying diagram. Locate the final image, determine its size, and state whether it is real or virtual, erect or inverted.

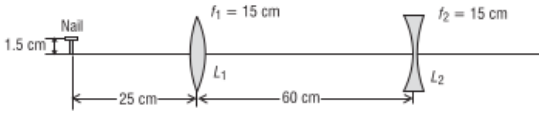

Figure 4