



The University of Zambia
School of Natural Sciences
Department of Physics

PHY2712: Geometric and wave optics

Tutorial Sheet 2

2022-2023 Academic year-Part II

1. An equiconcave lens has radii of 6.0 cm, thickness of 2.0 cm, and a refractive index of 1.6 cm. It is placed in a water tank, while an object in air is placed on the lens axis at 8.0 cm from the lens' vertex. Find the position of the final image. Take $n_{air} = 1.00$ and $n_{water} = 1.33$.
2. A convergent thick lens has radii of curvature 10.0 cm and -6.0 cm, $n = 1.6$ and thickness $t = 5.0$ cm. Find the focal length of the lens. At what thickness will the lens become divergent?
3. A thin lens made up of glass of index 1.74 has two faces with radii $R_1 = +10.0$ cm and $R_2 = -25.0$ cm. The lens is then submerged in water whose index is 1.33 while a 3.5 cm object is located 10.0 cm in front of the thin lens. Calculate
 - (a) the focal length of the submerged thin lens.
 - (b) the power of the submerged thin lens.
 - (c) the image distance in the water.
 - (d) the magnification of image formed in water.
 - (e) the size and nature of image formed in water.
4. Two thin lenses separated by a distance of 5.0 cm form a combination free from spherical aberrations. If the system has an equivalent focal length of 14 cm, calculate the focal lengths of its component lenses.
5. A parallel beam of light of wavelength 600 nm is incident normally on a slit of width a . If the distance between the slits and the screen is 0.8 m and the distance of 2nd order maximum from the centre of the screen is 15 mm, calculate the width of the slit.

6. An achromatic converging combination of of focal length 30 cm is made by two lenses have dispersive power in the ratio 3:5. What is the focal lengths of the lenses?
7. If two sources of coherent light with intensity ratio of 81:9 produce interference fringes, what is the maximum and minimum intensity?
8. Two coherent waves $y_1 = 5 \sin(\omega t + \pi/3)$ and $y_2 = 3 \sin(\omega t + \pi/2)$, find
 - (a) the resultant amplitude,
 - (b) the initial phase angle of the resultant, and
 - (c) the resultant wave equation.