



The University of Zambia  
School of Natural Sciences  
Department of Physics

## PHY2712: Geometric and Wave Optics

2022-2023 Academic year-Part II

### Assignment 2

**Hand in on Monday 25th September, 2023**

1. An achromatic doublet made out of crown and flint glass lenses of 40 cm focal length have a common radius of curvature of 25 cm when their surfaces are in contact. Calculate the radii of curvature of the second face for each lens (Take  $\omega_{crown} = 0.017$  and  $n_{crown} = 1.5$ , and  $\omega_{flint} = 0.034$  and  $n_{flint} = 1.7$ , respectively).
2. A thin diverging lens is to be made of crown glass of refractive index 1.5230 and have a focal length of  $-12.0$  cm. If an object is to be placed 20.0 cm in front of the lens, and the image is to be free of coma, find
  - (a) the image distance,
  - (b) the position factor,
  - (c) the shape factor,
  - (d) the radius of the first surface, and
  - (e) the radius of the second surface.
3. A 4.60 cm thick glass lens with refractive index 1.62 and radii  $r_1 = +3.8$  cm and  $r_2 = -1.91$  is placed in the end of the tank containing a transparent liquid of refractive index 1.42. If  $r_2$  is in contact with the liquid, find
  - (a) the primary and secondary focal lengths.
  - (b) the power of the lens.
  - (c) the distances from the vertices.

- (d) the focal points, and
  - (e) the principal points.
4. A light of wavelength  $5000 \text{ \AA}$  falls on a biprism whose angle is  $1^\circ$ , in Fresnel's biprism experiment. The distance between the biprism and the source is 10 cm and that between the screen and the biprism is 1 m. If the fringe width is 0.03 cm, find the refractive index of the material of the biprism.