Übungsblatt I

Optik, WS2019/20

Problem 1

In the figure below, a pea sits at a focal point of the first (nearer) thin diverging lens, 4.0 cm from that lens. The lenses are identical and separated by 10.0 cm, with a common central axis.

a) Where is the image of the pea produced by the second lens?

b) Is that image inverted or does it have the same orientation as the pea?

c) Is it real or virtual?

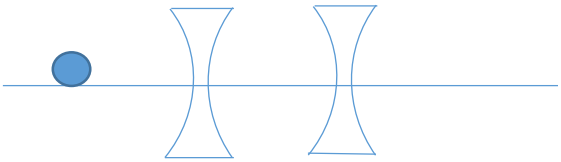

Figure 1

Problem 2

a) Determine the focal length f of a biconvex lens with radii 20.0 cm and 30.0 cm and refractive index n = 1.5. What is the focal length when the lens is immersed in water (n = 1.33)?

b) A biconvex glass (n = 1.5) thin lens is to have a + 10.0 cm focal length. If the radius of curvature of each surface is measured to be the same, what must it be? Show that a spider standing 1.0 cm from the lens will be imaged at - 1.1 cm. Describe that image and draw a ray diagram.

c) Write an expression for the focal length (fw) of a thin lens immersed in water (nw = 1.33) in terms of its focal length when it is in air (fa).

Problem 3

Determine the focal length in air of a thin spherical planar-convex lens having a radius of curvature 50 mm and a refractive index of 1.5. What if anything happens to the focal length if the lens were placed in a tank of water?

Problem 4

Roughly sketch the aperture stops and entrance and exit pupils for the lens in Figure 2

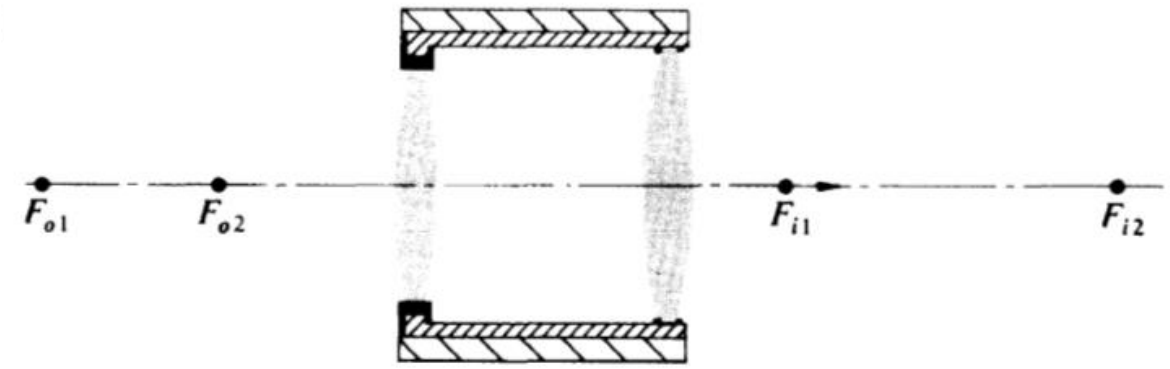

Figure 2

Problem 5

Two positive lenses with focal lengths of 0.30 m and 0.50 m are separated by a distance of 0.20 m. A small butterfly rests on the central axis 0.05 m in front of the first lens. Locate the resulting image with respect to the second lens.