Homework No. 11 (Spring 2022)

PHYS 203B-001: COLLEGE PHYSICS

Department of Physics, Southern Illinois University–Carbondale
Due date: Monday, 2022 Apr 25, 10:00am, on D2L

Instructions

- To the extent to which you depend on resources to complete this homework is a measure of how much extra work you need to put in to master the related concepts.

- Describe your thought process in detail and organize it clearly. Make sure your answer has the correct units and the right number of significant digits.

- After completion, scan the pages as a single PDF file, and submit the file on D2L (Assessments → Assignments).

Problems

1. (**10 points.**) The index of refraction of benzene is 1.80. Determine the critical angle for total internal reflection at a benzene-air interface.

   Solution

2. (**10 points.**) Light travels through a prism made of glass ($n = 1.5$) as shown in Figure 1. Given $\alpha = 50°$ and $i_1 = 45°$. Determine the angle of deviation δ.
   Solution

3. (**10 points.**) A 1.0 cm object is placed upright at a distance 10.0 cm away from a convex lens. The lens' focal length is 10.0 cm.

   (a) Calculate the image distance.

   (b) What is the magnification?

   (c) Is the image real or virtual?

   (d) Is the image inverted or upright?

   (e) Confirm your results by drawing a ray diagram for the above case. Choose the scale for the two relevant directions appropriately so that the relevant features are illustrated well. Points will be awarded for clarity and accuracy.

   Solution

4. (**10 points.**) A 1.0 cm object is placed upright at a distance 15.0 cm away from a concave lens. The lens' focal length is 10.0 cm.
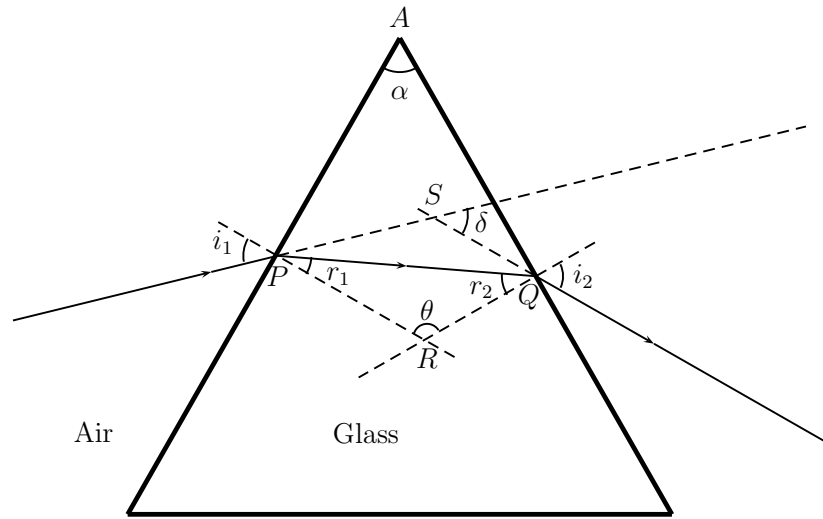
Figure 1: Problem 2

(a) Calculate the image distance.

(b) What is the magnification?

(c) Is the image real or virtual?

(d) Is the image inverted or upright?

(e) Confirm your results by drawing a ray diagram for the above case. Choose the scale for the two relevant directions appropriately so that the relevant features are illustrated well. Points will be awarded for clarity and accuracy.

Solution