

## Homework No. 12 (Spring 2025)

### PHYS 205B-002: UNIVERSITY PHYSICS

*School of Physics and Applied Physics, Southern Illinois University–Carbondale*

Due date: Friday, 2025 May 02, 11:59 PM, on D2L

### Instructions

- You are encouraged to use any of the resources to complete this homework. However, the extent to which you depend on resources while doing this homework is a measure of how much extra work you need to put in to master the associated concepts. Solutions should be the last resource.
- Links to solutions are provided.
- Variations of homework problems and additional problems with hyperlinks to old exams are available in [Lecture Notes](#). These serve as practice problems.
- Describe your thought process in detail and organize it clearly. Make sure your answer has units and right number of significant digits.
- After completion, scan the pages as a single PDF file, and submit the file on D2L (under Assessments → Assignments). You can replace your PDF file as many times as you like, only the last file is graded. The deadline has an (undisclosed) buffer period, so do not hesitate to try submissions after the deadline.

### 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  $\alpha = 50^\circ$  and  $i_1 = 45^\circ$ . Determine the angle of deviation  $\delta$ .

**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?

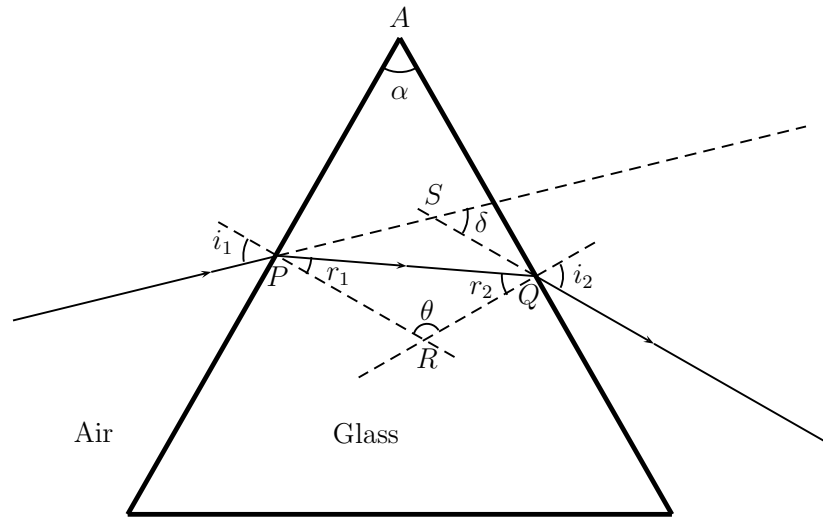


Figure 1: Problem 2

- (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.
  - (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