

Lab 2: Refraction, Total internal reflection, and Reflection

Experiment 1

Goal: To measure the index of refraction of acrylic plastic with two methods. The expected value is between 1.490-1.492. Make sure to compare all three values, using error bars to draw conclusions.

First method: By using Snell's law and measuring the angle of incidence, θ_i in Figure 1, and the angle of refraction, shown in red, determine the index of refraction. Make sure to record several angles, including small and large ones, and find the weighted average. The light box provided can be used to produce a single ray of light.

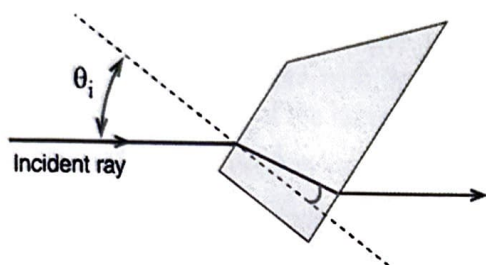


Figure 2. Acrylic Rhombus

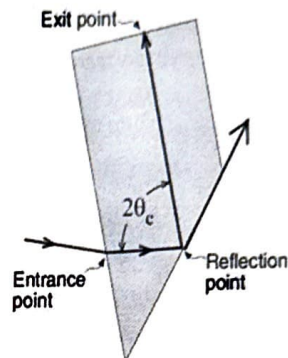


Figure 1. The refracted ray is shown in blue.

Second method: By finding the critical angle, that is the smallest angle for total internal reflection as shown in Figure 2, determine the index of refraction.

Experiment 2

Goal: To measure the radius of curvature of various spherical mirrors (concave, convex, plane) using two different methods. Make sure to compare the methods, using error bars to draw conclusions.

First method: By measuring the focal point, and using the relationship between the focal point and the radius, Figure 3. For the concave mirror the focal point is the distance between the surface of the mirror and where the rays converge. For the convex the rays diverge and the focal point can be found by extending the reflected rays backwards. What is the focal point of the plane mirror? You will need multiple parallel rays from the light box to make these measurements.

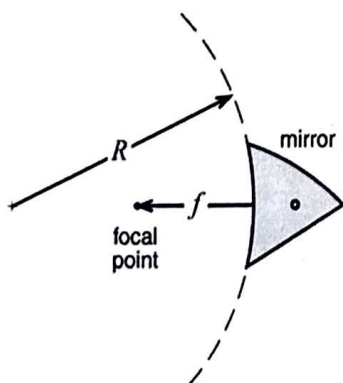


Figure 3. The triangular piece shown has 3 mirrored sides: concave, convex, and plane.

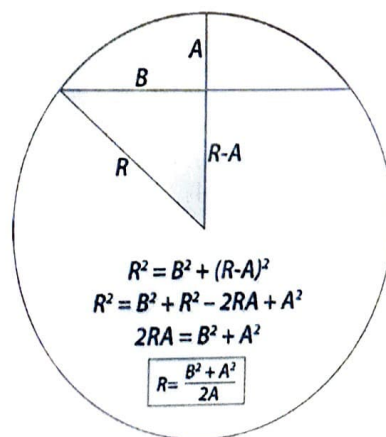


Figure 4.

Second Method: Measure the radius of curvature using geometry, Figure 4.