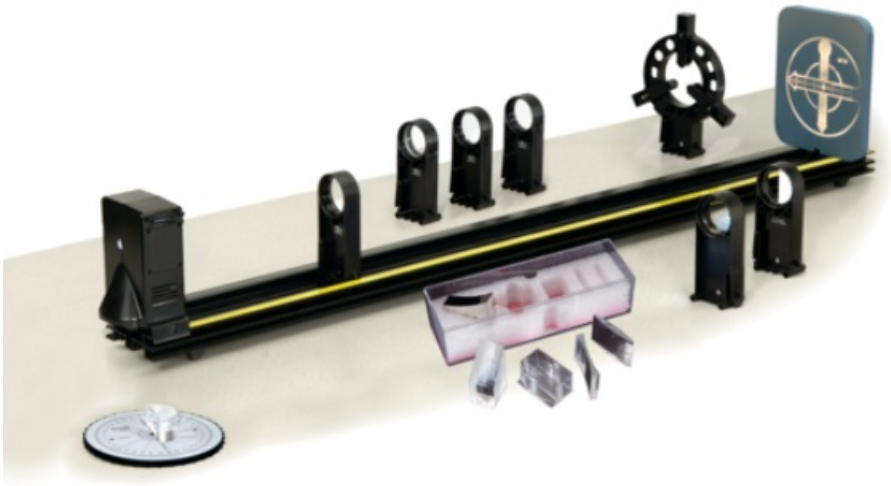
PASCO OS-8515C Basic Optics System Owner's Manual

Contents

PASCO OS-8515C Basic Optics System



Specifications

- Product Name: Acrylic Index of Refraction Experiment Kit
- Model Number: OS-8465
- Required Equipment: Basic Optics System (OS-8515C), Ray Table, D-shaped Lens, Light Source
- Main Purpose: Determine the index of refraction of acrylic at two different wavelengths

Product Usage Instructions

Theory

When light crosses the boundary between two transparent media, it is refracted according to Snell's Law. In this experiment, the index of refraction of acrylic (n1) at different wavelengths is determined by observing the refraction angles.

Setup

1. Place the light source in ray-box mode on a flat tabletop.
2. Position the ray table in front of the light source so the ray crosses the center of the table.
3. Put the acrylic D-shaped lens on the ray table in the marked outline.

Procedure

1. Hold a piece of white paper vertically near the edge of the Ray Table to observe the out-going ray.
2. Rotate the ray table slowly to increase the angle of incidence and observe the refracted light on the paper.

Analysis

1. Determine at what angle of refraction color separation in the refracted light begins.
2. Identify at what angle the maximum color separation occurs.
3. List the colors present in the refracted ray in order of minimum to maximum angle of refraction.
4. Calculate the index of refraction of acrylic for red light (nred) and blue light (nblue) using Snell's Law.

FAQ

- **Q: What should I do if I don't observe any color separation in the refracted light?**
  A: Ensure proper alignment of the equipment and try adjusting the angle of incidence gradually.
- **Q: Can I use a different light source for this experiment?**
  A: It is recommended to use the specified light source for accurate results.

Dispersion

Required Equipment from Basic Optics System (OS-8515C)

- Ray Table
- D-shaped Lens
- Light Source

Purpose

The purpose of this experiment is to determine the index of refraction of acrylic at two different wavelengths.

Theory

- When light crosses the boundary between two transparent media, it is refracted. Snell's Law expresses the relationship between index of refraction of the first medium (n1), the index of refraction of the second medium (n2), the angle of incidence (θ1), and the angle of refraction (θ2):

$$n_1 \sin\theta_1 = n_2 \sin\theta_2 \qquad (1)$$

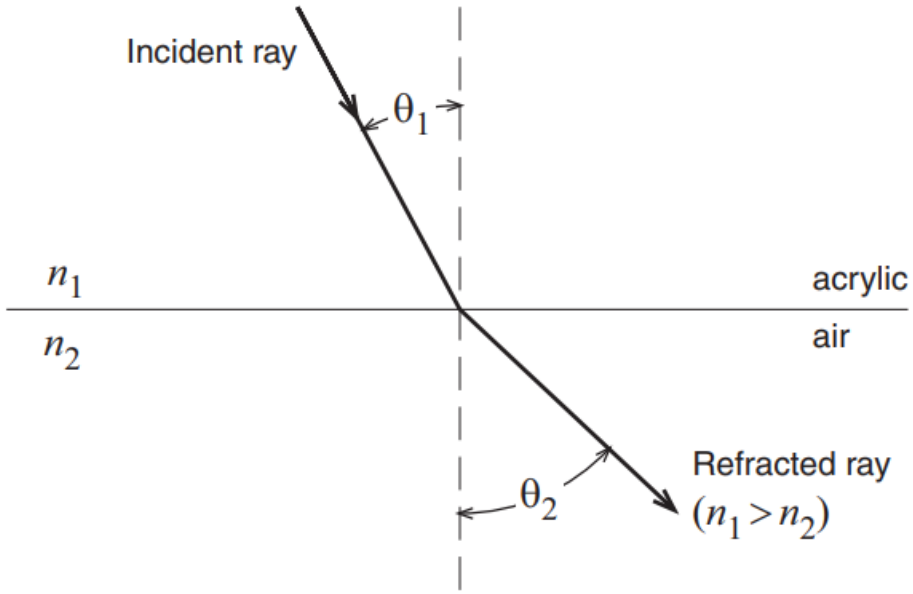


Figure 1

- We can assume the index of refraction of air (n2 in this experiment) is always equal to 1.0. However, the index of refraction of acrylic (n1) depends on the wavelength, or color, of the light. Therefore, the different wavelengths present in an incident ray of white light will be refracted at different angles. The wavelength dependence of a material's index of refraction is known as dispersion.

Setup

1. Place the light source in ray-box mode on a flat tabletop. Turn the wheel to select a single ray.
2. Put the ray table in front of the light source so the ray from the light source crosses the exact center of the ray table (see Figure 2).
3. Put the acrylic D-shaped lens on the ray table in the marked outline. Turn the ray table so the ray enters the lens through the curved surface, and the angle of incidence is 0°.

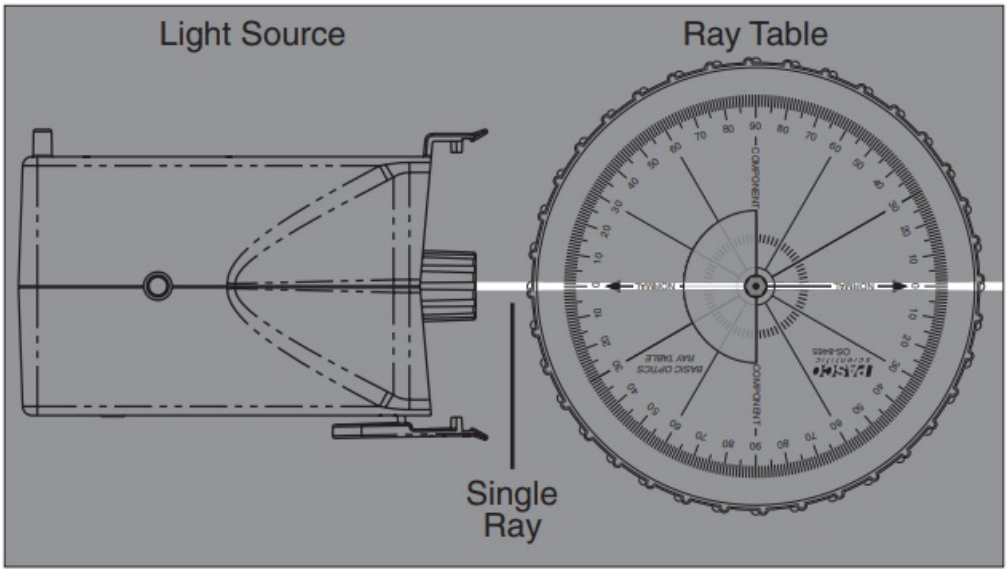


Figure 2

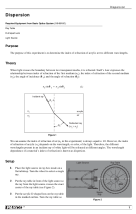
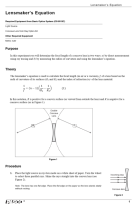
Procedure

1. Hold a piece of white paper vertically near the edge of the Ray Table so the out-going ray is visible on the paper.
2. Slowly rotate the ray table to increase the angle of incidence. Notice that the ray is refracted only at the flat surface of the lens, not at the curved surface. As you continue to increase the angle of incidence, watch the refracted light on the paper.

Analysis

1. At what angle of refraction do you begin to notice color separation in the refracted light?
2. At what angle of refraction does the maximum color separation occur?
3. What colors are present in the refracted ray? (Write them in the order of minimum to maximum angle of refraction.)
4. Use Snell's Law (Equation 1) to calculate the index of refraction of acrylic for red light (nred) and the index of refraction for blue light (nblue).

Documents / Resources

	**PASCO OS-8515C Basic Optics System** [pdf] Owner's Manual OS-8515C Basic Optics System, OS-8515C, Basic Optics System, Optics System, System
	**PASCO OS-8515C Basic Optics System** [pdf] Owner's Manual OS-8515C Basic Optics System, OS-8515C, Basic Optics System, Optics System, System

References

- **User Manual**