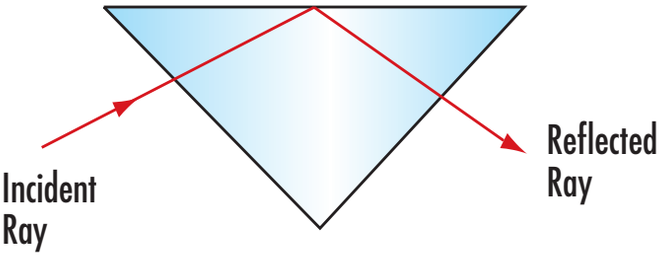
Total Internal Reflection

Introduction

When light travels from one medium to another, some of the light is always reflected. When you get to a certain angle, called the critical angle, all of the light is reflected. Total internal reflection (TIR) occurs when all (the total amount) of the light is reflected.



Purpose

To determine the critical angle of a semicircle.

Question/State the Problem

- What principle can be made to describe the phenomenon that occurs when a ray of light traveling from one medium to another meets and exceeds the critical angle?

Hypothesis

Materials

- Semicircular Optic
- Ray Box or Flashlight
- Full Circle Protractor Template

Procedure

1. Position the semicircular optic on the template. The flat edge of the optic should rest on the 90° 270° line. The center of the semicircle should rest on the 0° line.
2. Using the ray box or flashlight, shine a light ray toward the middle point of the template. Your light source should start at the curved edge of the semicircle and make it's way through to the flat edge. Record the angle of incidence, the angle of refraction, and the angle of reflection.
3. Repeat Step 2 several times, starting with a small angle of incidence and working up to larger angles of incidence.
4. When the reflected ray is parallel to the flat edge of the semicircle, slowly move the light source until all the light is reflected. Record the critical angle.

Data

Angle of Incidence	Angle of Refraction	Angle of Reflection

Critical Angle: _____

Analysis

1. Describe what happens to the incident ray and the reflected ray as the angle of incidence gets increasingly closer to the critical angle.
2. What two conditions must be met in order for TIR to occur?
3. What could have caused errors in this lab? What could you have done differently to reduce the likelihood of errors?

Conclusion

For Teachers Only

Prior to the Lab

1. Obtain a semicircular optic here. Or, obtain a plastic semicircular container and fill it with water.
2. If you are using a flashlight instead of a ray box, place duck tape or electrical tape on either side of the flashlight, creating a small sliver for light to come through. The face of the flashlight should look like this: