Inquiry Investigation 11.7

The Refraction of Light

INQUIRY SKILLS	
● Questioning	● Hypothesizing
○ Predicting	● Planning
● Conducting	● Recording
● Analyzing	● Evaluating
● Communicating	

You have seen that light travels in straight lines through air. What happens when light travels from one material into another? Have you ever noticed that your legs look different when you are standing in a swimming pool? **Figure 1** shows this distorted view. The distortion happens because light bends as it passes from water into air. The bending of light as it travels from one material into another is called **refraction. Figure 2** shows some terms that are used to describe refraction.

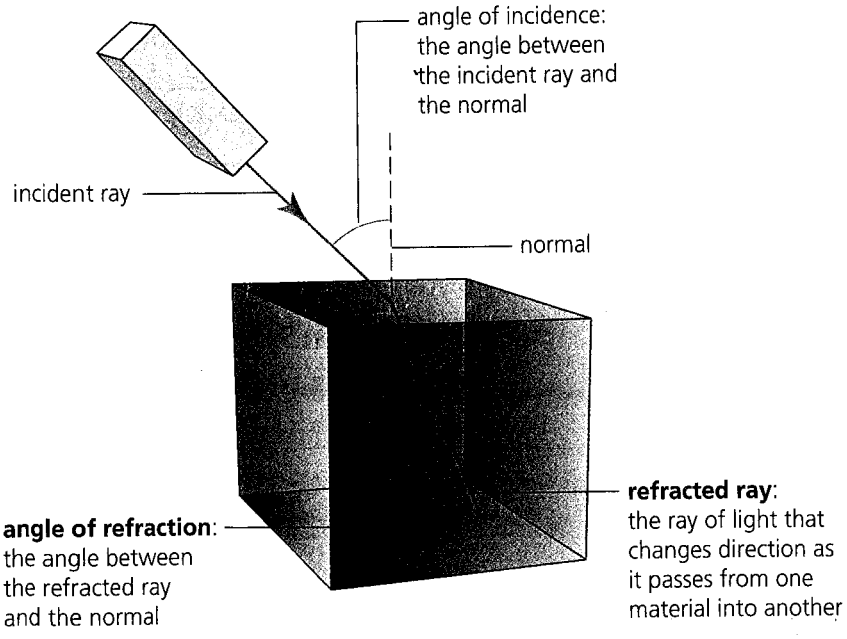

Figure 2
Some terms that are used to describe refraction

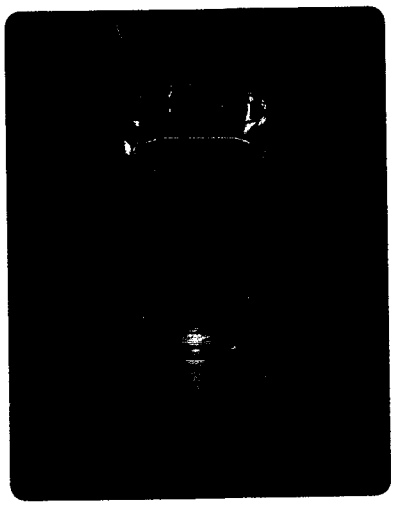

Figure 1
Light refracts as it travels from water into air, causing a distorted view. Will light refract the same amount in glycerin or a block of acrylic?

In this Investigation, you will be using transparent materials to investigate refraction.

LEARNING TIP

For help with this Investigation, see the Skills Handbook section **Designing an Investigation**.

Question

(a) Formulate a question you can use to investigate the refraction of light in transparent materials.

Hypothesis

(b) Create a hypothesis for this Investigation.

Experimental Design

(c) Design an investigation to test your hypothesis. You want to explore refraction as light travels from air into another material, and when light travels from this material back into air. You should test several transparent liquids and at least one solid.

(d) List the materials you will require and the steps you will take, including any safety precautions. Describe how you will record your data.

Materials

- apron
- safety goggles
- thin transparent dishes (containers for liquids)
- ray box with single-slit window

Possible transparent materials:

- water
- glycerin
- mineral oil
- saltwater solution
- sugar-water solution
- solid rectangular prism (acrylic block)

Clean up any spills immediately.
Do not touch the light bulb in the ray box or look directly into the light.

Procedure

1. Show your investigation plan to your teacher. With your teacher's approval, carry out your investigation. Be sure to wear your apron and safety goggles. Record any changes you make to your plan as you proceed. Record your observations.

Analysis

(e) Light travels in straight lines in air. How does it travel in other transparent materials?

(f) Compare the angle of refraction as light travels from air into a liquid or solid with the angle of refraction as light travels from a liquid or solid into air.

(g) List the differences between the materials you tested. Speculate about what property of the materials you tested explains your results.

(h) List the materials you tested in order of least refraction to greatest refraction for light entering from air.

Evaluation

(i) In this Investigation, you used a container to hold the liquids. Did the container affect the results? Support your answer using a diagram.

(j) How could you improve the design of your Investigation?

PERFORMANCE TASK

Is light refracted in your optical device? Why is it necessary to refract the light in this device?