

COMPARING INDICES OF REFRACTION

Experiment 9

INTRODUCTION:

Not all material refract, or bend, light by the same amount. A diamond, for example, will refract light much more than air will. Every substance has a measurement that indicates its refracting power. This measurement is called *index of refraction (n)*, and is defined as the ratio of the speed of light in vacuum compared to the speed of light in a medium.

$$n = \frac{c}{v}$$

where,

n=index of refraction

c= speed of light in vacuum= 3.00×10^8 m/s

v=speed of light in medium

Since the speed of light is greatest in vacuum, the index of refraction is always greater than one. The index of refraction of some common substances are listed below:

Substance	Index of refraction
Air	1.00
Water	1.33
Oil	1.50
Glass	1.52

In this activity, you will observe how different substances refract light and how it affects visibility of objects.

APPARATUS & MATERIAL:

- ? large and small glass beakers
- ? water
- ? cooking oil

PROCEDURE:

1. Place the small glass beaker inside the large glass beaker.
2. Fill the beakers with water. Look at the beakers from the side. Record observations.
3. Empty out the water and replace it with cooking oil. Observe the beakers once more from the side, and record your observations.

REPORT FORM
Experiment 9

OBSERVATIONS :

1. Were you able to see the small beaker when you placed it inside the large one?

2. Did you see the small beaker when you used water in step 2?

3. Were you able to see the small beaker when you used oil in step 3?

ANALYSIS OF DATA:

Calculate the speed of light in each medium. Show all your calculations.

Speed of light in	Answer (include units)	Show calculations here
Air		
Oil		
Glass		
Water		

Complete each statement below with a suitable word or phrase:

1. As light rays travel from air to glass their speed _____ and as a result the light waves _____.
2. As light rays travel from glass to water their speed _____ and as a result the light waves _____.
3. As light rays travel from glass to oil their speed _____ and as a result the light waves _____.

Based on observations in questions 1-3,

4. Can you see the small beaker best when light is refracted **more** or **less** from the glass to the substance filling it? _____
5. Use your observations above to describe how **visibility** and **index of refraction** are related. (Compare the visibility of the beaker to the difference between the index of refraction of the two mediums).

QUESTIONS:

1. Why is the index of refraction for a substance always greater than one?

2. Diamond has an index of refraction of 2.42. What is the speed of light in diamond?