

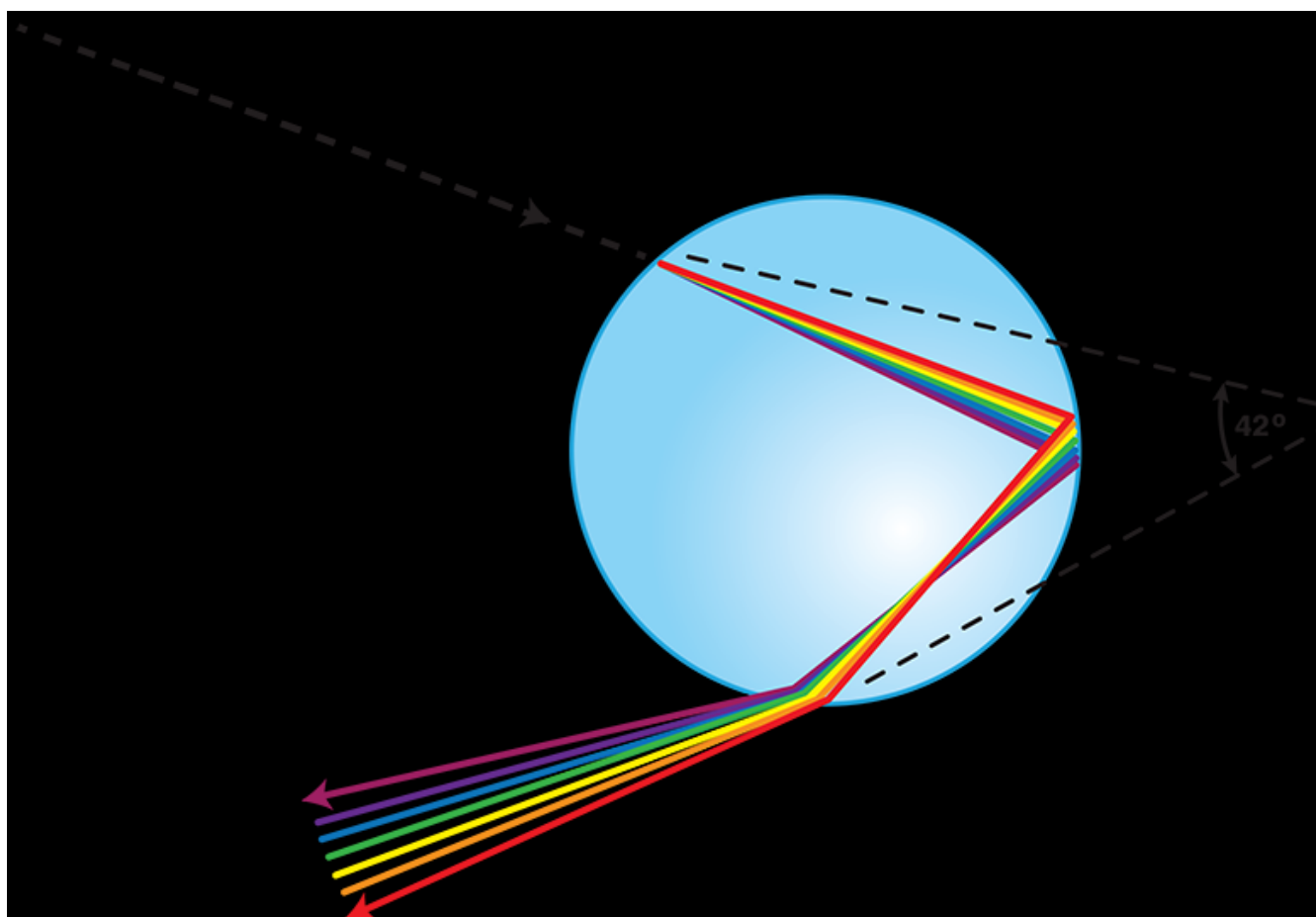
REFRACTION

Goal:

- to become familiar with light phenomena of refraction
- to be able to determine the index of refraction

What is happening here?





Dispersion is the separating of white light into the colours of the rainbow.

Each colour has a different wavelength and therefore bends a different amount.

Refraction is the change in direction of a wave as it passes from one medium to another.

Different substances have different optical densities, that is they slow light down at different rates.

The optical density of a substance is also known as its *index of refraction*, n .

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

$c = 3 \times 10^8$ m/s
speed of light in vacuum

v : speed of light in
medium

If $n = 2$ light is traveling at half the speed in vacuum

The smallest index is $n = 1$ (vacuum)

air $n \approx 1$

What is the least optically dense medium? What is the most optically dense medium?

least: air $n = 1.0001$

most: diamond $n = 2.42$

(gallium phosphide $n = 3.5$)

The refractive index of water is 1.33, what is the speed of light in water?

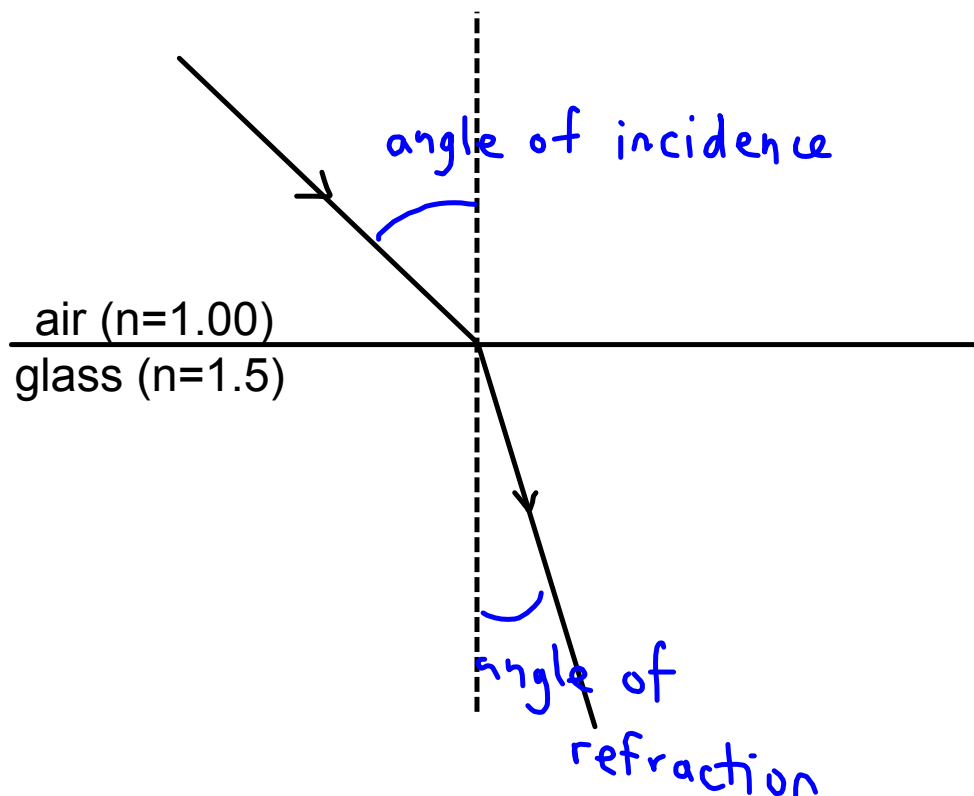
$$n_w = \frac{c}{v_w}$$

$$1.33 = \frac{3 \times 10^8 \text{ m/s}}{v_w}$$

$$v_w = 2.25 \times 10^8 \text{ m/s}$$

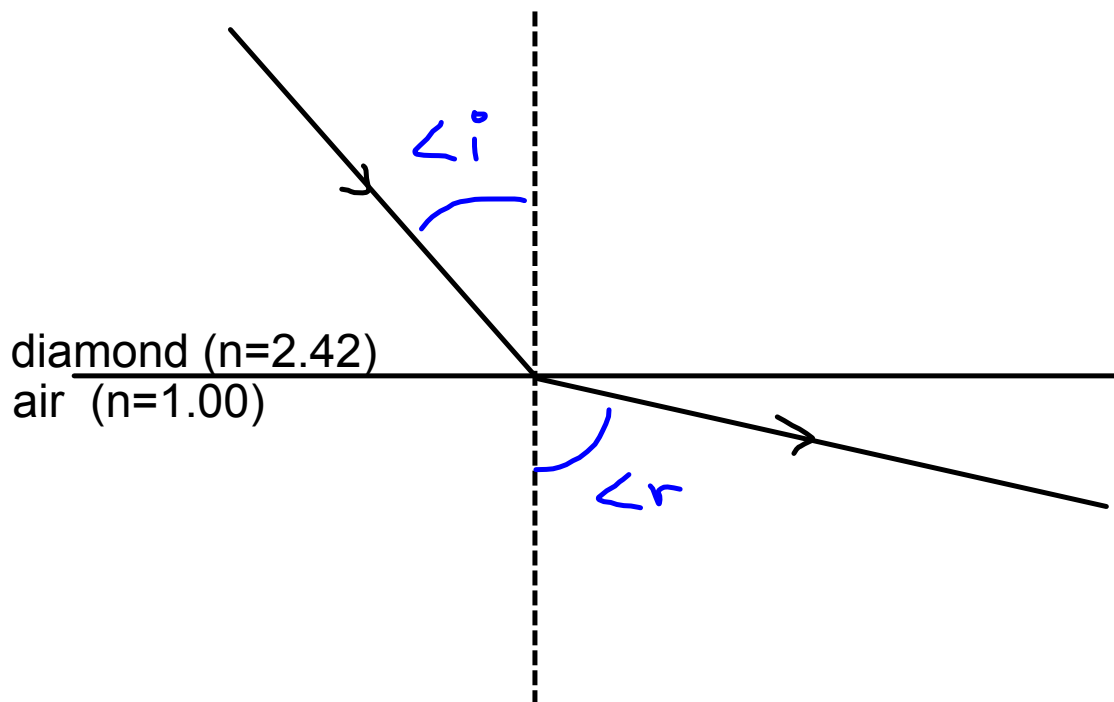
When light travels from a less dense medium to a more dense medium:

Light ray bends towards normal



When light travels from a more dense medium to a less dense medium:

Light bends away from normal



The angle is smaller when light is
traveling slower
