2. An object is placed 6.00 cm in front of a concave mirror that has a 10.0-cm focal length.

   a) Determine the location of the image. $d_o = 6.00 cm$ $f = 10.0 cm$

   $$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

   $$d_i = \left[\frac{1}{f} - \frac{1}{d_o}\right]^{-1}$$ $\boxed{d_i = -15.0 cm}$

   b) The object is 1.2 cm high. Find the height of the image. $h_o = 1.2 cm$

   $$M = \frac{-d_i}{d_o} = \frac{h_i}{h_o}$$ $h_i = \frac{-d_i (h_o)}{d_o}$ $\boxed{h_i = 3.0 cm}$

3. A convex mirror is used to reflect light from an object placed 66 centimeters in front of the mirror. The focal point is 46 centimeters from the mirror. Find the location of the image.

   $d_o = 66 cm$
   $f = \ominus 46 cm$

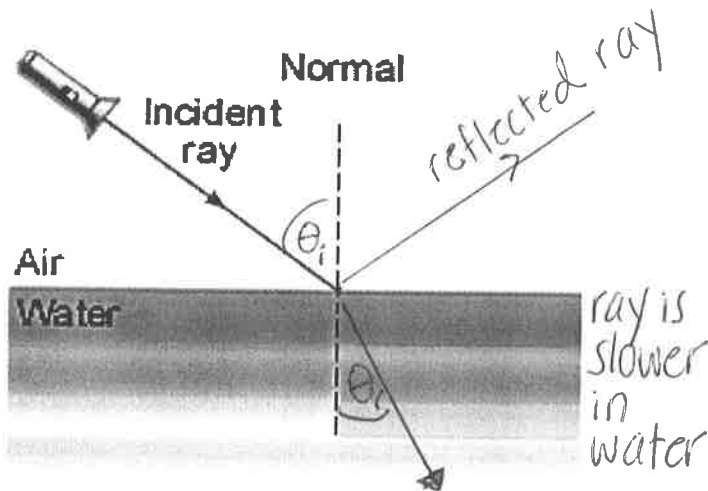 $$d_i = \left[\frac{1}{f} - \frac{1}{d_o}\right]^{-1}$$ $\boxed{d_i = -27 cm}$
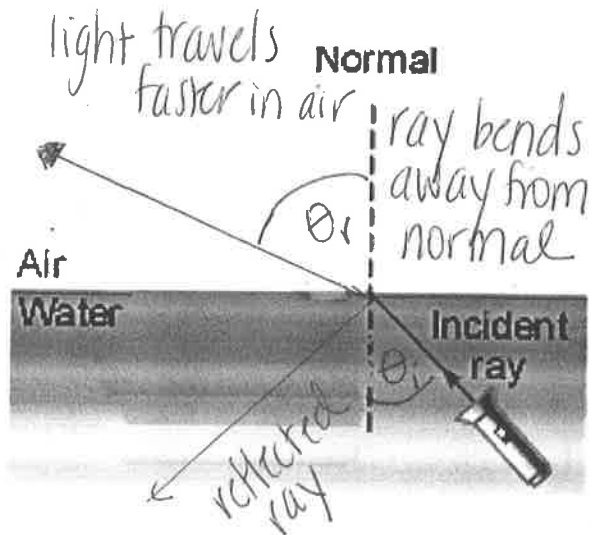

Refraction of Light

Refraction: The change in direction of a wave due to a change in speed when it crosses a boundary at an angle.

Complete the path of each light ray shown below.

ray bends toward normal

light travels faster in air
ray bends away from normal

Angle of refraction: angle between refracted ray and normal line

In which substance does light travel faster — air or water?

Rule for Refraction: F   A   S   T
                         faster   away   slower   toward
                                from normal   the normal

6

Index of refraction: Ratio of speed of light in a vacuum to speed of light in a substance.

Formula:

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

Variable:	n	$3.00 \times 10^8 \frac{m}{s}$ c	v
Quantity:	index of refraction (optical density)	speed of light in a vacuum	speed of light in medium
Units:	$\times$	$\frac{m}{s}$	$\frac{m}{s}$
Type:	scalar	vector	vector

Examine the tables of **Absolute Indices of Refraction** in your Reference Tables. p. 486

by Tues. 4/9

1. In which substance will light travel the fastest? What is its index of refraction?

2. In which substance will light travel the slowest? What is its index of refraction?

3. What is the relationship between the index of refraction of a substance and the speed of light in that substance?

4. Calculate the speed of light in water.

5. Will light slow down if it travels from corn oil to glycerol? Explain.

6. If light crosses a boundary between two substances with very different indices of refraction . . .

7. If light crosses a boundary between two substances with very similar indices of refraction . .

8. Why does the table indicate ($f = 5.09 \times 10^{14}$ Hz)?

Complete the path of the light ray through the Glass block in each diagram below.

Rule for Refraction:

7