1. What is the velocity of light in a glass whose index of refraction is 1.50?

\[ V = \frac{3 \times 10^8}{1.50} \]
\[ V = 2 \times 10^8 \text{ m/s} \]

2. Light travels at a velocity of \( 2.25 \times 10^8 \text{ m/s} \) in water. Calculate the index of refraction of water.

\[ N_w = \frac{3}{2.25} \]
\[ N_w = 1.33 \]

3. What is the frequency of light that has a wavelength of 4861Å in a vacuum?

\[ \nu = \frac{c}{\lambda} \]
\[ \nu = \frac{3 \times 10^{18} \text{ (Å/s)}}{4861} \]
\[ \nu = 6.17 \times 10^{14} \text{ hz} \]

4. What is the frequency of this light in water?

\[ \nu = 6.17 \times 10^{14} \text{ hz} \]
Frequency does not change

5. What is the wavelength of this light in water?

\[ \lambda = \frac{4861}{1.33} \]
\[ \lambda = 3655 \text{ Å} \]

6. In going from air to water, is light bent toward the normal (perpendicular), or away from the normal to the surface?

toward

\[ c = 3.0 \times 10^8 \text{ m/sec} \]
7. In going from water to air, what is the critical angle (measured from the perpendicular), above which a ray from the water is totally reflected back into the water?

\[ N_i \sin \omega_i = n_r \sin \omega_r \]
\[ 1.33 \sin \omega_c = 1 \times 1 \]
\[ \omega_c = \sin^{-1}(1/1.33) \]
\[ \omega_c = 48.75^\circ \]

8. A piece of glass has a Lambert's Law absorption coefficient of 0.5 cm\(^{-1}\) for all wavelengths of light. Calculate the percent of a beam of white light that is absorbed in passing through one centimeter of this glass.

\[ \frac{I}{I_0} = \exp(-kt) = \exp(-0.5) \]
\[ \frac{I}{I_0} = 0.6065 \]
60.7% transmitted; 39.3% absorbed

9. In general, as the density of a liquid increases, does the index of refraction increase or decrease?

Increases

10. Most liquids expand on heating. As the temperature of a liquid increases, would you expect its index of refraction to increase or decrease?

Decreases