

17 Reflection and Refraction

1. A ray of light in air strikes the surface of a liquid at an angle of 65° with the normal. The refracted ray is at an angle of 42° with the normal. What is the index of refraction of this liquid?
2. Lead(II) oxide is commonly added to glass to increase its index of refraction. A typical leaded glass has an index of refraction of 1.81. What is the angle of refraction of a light ray in air that is incident on this type of glass at an angle of 32.5° ?
3. A layer of the solvent toluene is floating on water in a glass container. A ray of light passing through the water is incident upon the toluene layer at an angle of 58.3° . The angle of the refracted beam in the toluene is 49.0° . Calculate the index of refraction of toluene.
4. A ray of light passing through water enters a different material at an incident angle of 27.4° and is refracted so that the angle of refraction is 31.5° . Is the speed of light in the material faster or slower than the speed of light in water? Explain your answer and show your reasoning in mathematical form.
5. The index of refraction of the polycarbonate plastic from which CDs and DVDs are made is 1.55. What is the speed of light as it passes through the plastic?
6. A certain ray of green light has a wavelength of 5.40×10^{-7} m in air. What is the wavelength of this light as it passes through a diamond, $n_{\text{diamond}} = 2.42$? Consider how the frequency (color) of the light is affected as it travels in the diamond.
7. What is the critical angle for a light ray passing into air from polystyrene plastic, $n_{\text{polystyrene}} = 1.60$?
8. The critical angle of a material is 45.0° . What is the index of refraction of this material?