

CHAPTER 17

1. A ray of light strikes a mirror at an angle of incidence of 28° . What is the angle of reflection?
2. A ray of light passes from an unknown substance into air. If the angle in the unknown substance is 35.0° and the angle in air is 52.0° , what is the index of refraction of the unknown substance?
3. A ray of light has an angle of incidence of 25.0° upon the surface of a piece of quartz. What is the angle of refraction?
4. A beam of light passes from water into polyethylene, index of refraction = 1.50. If the angle in water is 57.5° , what is the angle in polyethylene?
5. Dave makes some hydrogen sulfide, index of refraction = 1.000 644. If Karen measures an angle of $85.000\ 000^\circ$ in the hydrogen sulfide, what angle will Karen measure in air if the index of refraction of air is 1.000 292 6?
6. Luisa submerged some ice in water and shined a laser beam through the water and into the ice. Sue found the angle in ice was larger than the angle in water. Which material has a larger index of refraction?
7. A ray of light enters a triangular crown glass prism perpendicular to one face and it emerges from an adjacent side. If the two adjacent sides meet at a 30.0° angle, what is the angle the light ray has in the air when it comes out?
8. Make a drawing, to scale, of the side of an aquarium in which the water is 12.0 cm deep. From a single point on the bottom, draw two lines upward, one vertical and the other 5.0° from the vertical. Let these two lines represent two light rays that start from the same point on the bottom of the tank. Compute the directions the refracted rays will travel above the surface of the water. Draw in these rays and continue them backward into the tank until they intersect. At what depth does the bottom of the tank appear to be if you look into the water? Divide the apparent depth into the true depth and compare it to the index of refraction.
9. Find the speed of light in water.
10. Find the speed of light in antimony trioxide if it has an index of refraction of 2.35.
11. The speed of light in a special piece of glass is 1.75×10^8 m/s. What is its index of refraction?
12. Glenn gently pours some acetic acid, index of refraction = 1.37, onto some antimony trioxide, index of refraction = 2.35. What angle will Glenn find in the acetic acid if the angle in the antimony trioxide is 42.0° ?
13. Marcos finds that a plastic has a critical angle of 40.0° . What is the index of refraction of the plastic?
14. Aisha decides to find the critical angle of arsenic trioxide, index of refraction = 2.01, which is very toxic. What angle did Aisha find?
15. A light source is in a cylindrical container of carbon dichloride, index of refraction = 1.500. The light source sends a ray of light parallel to the bottom of the container at a 45.0° angle from the radius to the circumference. What will the path of the light ray be?
16. With a square block of glass, index of refraction = 1.50, it is impossible, when looking into one side, to see out of an adjacent side of the square block of glass. It appears to be a mirror. Use your knowledge of geometry and critical angles to show that this is true.
17. The index of refraction for red light in arsenic trioxide is 2.010, and the index of refraction for blue light is 2.023. Find the difference between the angles of refraction if white light is incident at an angle of 65.0° .
18. The index of refraction for red light in a diamond is 2.410, and the index of refraction for blue light is 2.450. Find the difference in the speed of light in diamond.