

Reflection and Transmission

When light traveling through air strikes the surface of a transparent material (e.g., glass) a fraction of the light will be reflected and a fraction will be transmitted into the material.

See **Figure 1**. The exact values of these fractions depend on a variety of factors. The most notable factors include the angle of incidence (θ_i in **Figure 1**) and the index of refraction of air and of the material that the light is approaching. The index of refraction of air is approximately 1.00. The index of refraction of other materials is shown in **Table 1**. **Figure 2** shows the dependence of the percent reflection upon the angle of incidence for light traveling through air and approaching four different materials.

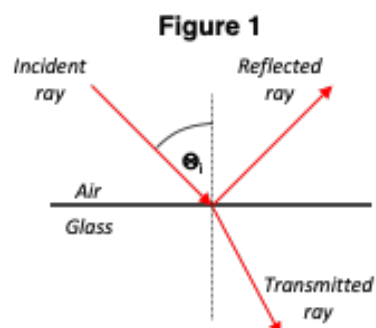
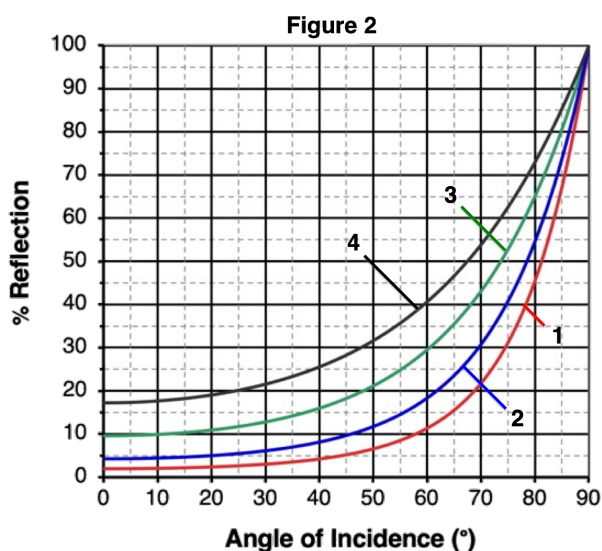


Table 1

Material	Index of Refraction
1 = Water	1.33
2 = Glass (crown)	1.52
Glass (flint)	1.62
Sapphire	1.77
3 = Zircon	1.94
4 = Diamond	2.42

NOTE: numbers 1, 2, 3 and 4 above correspond to numbers on graphs.



The above examples are for light moving from air into another material. If the light moves from some material into air, a dramatic difference is observed. This is shown in **Figure 3**. For each material, there is an angle that is noticeably less than 90° at which 100% reflection occurs. This angle is known as the **critical angle**. For any angle of incidence greater than the critical angle, 100% of the light undergoes reflection and 0% of the light transmits across the boundary. The value of the critical angle is dependent upon the index of refraction of the material. Thus, different materials have different critical angle values.

