What is Refraction of Light (Snell's Law)?

Worksheet

Snell's law states n1 sin1 = n2 sin2: light bends toward the normal entering a denser medium, and away from the normal leaving one.

$$n_1 \sin(\theta_1) = n_2 \sin(\theta_2)$$

Questions

1. Light travels from air (n = 1.00) into glass (n = 1.50) at 30 incidence. What happens to the refracted ray?

A) Bends toward the normal
B) Bends away from the normal
C) Travels straight
D) Reflects entirely

2. In n1 sin1 = n2 sin2, the angles are measured from

A) The surface
B) The normal (perpendicular to the surface)
C) The horizon
D) The refracted ray itself

3. Air to water (n1 = 1.00, n2 = 1.33), 1 = 40. What is 2 approximately?

A) 29
B) 40
C) 53
D) 19

4. Going from a denser to a less dense medium, if the angle exceeds the critical angle, light

A) Refracts normally
B) Totally internally reflects
C) Disappears
D) Speeds up but continues straight

5. Light passes from air (n1 = 1.00) into water (n2 = 1.33) at a 40 angle of incidence. Find the refraction angle.

6. Light travels from glass (n = 1.50) into air (n = 1.00) at a 25 angle of incidence.

7. Light in air (n1 = 1.00) hits an unknown medium at 60 and refracts to 35. Find n2.

8. Define: What is Snell's law?

9. Define: What causes refraction?

10. Define: What is the critical angle?

Answer Key

1. A) Bends toward the normal - Entering a denser medium, light always bends toward the normal.

2. B) The normal (perpendicular to the surface) - Angles in Snell's law are always measured from the normal, not the surface.

3. A) 29 - sin2 = (1.00sin40)/1.33 0.483 2 29.

4. B) Totally internally reflects - Beyond the critical angle no refraction occurs - light is totally internally reflected.

5. n1sin1 = n2sin2 sin2 = (1.00sin40)/1.33 = 0.483 2 = sin(0.483) 28.9

6. sin2 = 1.50sin25/1.00 = 0.634 2 = sin(0.634) 39.3

7. n2 = n1sin1/sin2 n2 = 1.00sin60/sin35 = 0.866/0.574 n2 1.51

8. n1 sin1 = n2 sin2 - it relates the angles of incidence and refraction to the refractive indices of the two media.

9. A change in the speed of light as it crosses into a medium with a different refractive index.

10. The incidence angle beyond which light in a denser medium is totally internally reflected instead of refracting.