

Refraction & Snell's Law Simulator

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/refraction/>

Name: _____ Date: _____

Learning objectives

- Apply Snell's law at an interface.
- Relate bending direction to the change in medium.
- Explain total internal reflection and the critical angle.

Variables to change

- Angle of incidence
- Index of medium 1
- Index of medium 2

Procedure

1. Send light from air into a denser medium and measure the refraction angle.
2. Increase the angle of incidence and watch how the refracted ray bends.
3. Send light from the dense medium toward air and increase the angle until the ray no longer exits.

Observations

Record incidence and refraction angles for several trials, including the angle where total internal reflection begins.

Questions

1. Which way does light bend going from a less dense to a more dense medium?
2. State Snell's law.

3. What is the critical angle?
4. What is total internal reflection and where is it used?
5. Why does light bend at all when changing media?

Answer key (instructors)

- **1.** Toward the normal (it slows down, so the refraction angle is smaller).
- **2.** $n_1 \cdot \sin\theta_1 = n_2 \cdot \sin\theta_2$.
- **3.** The incidence angle (going to a less dense medium) at which the refracted ray grazes the surface at 90° ; beyond it, total internal reflection occurs.
- **4.** All light reflects back into the denser medium when the angle exceeds the critical angle; it is used in optical fibers.
- **5.** Its speed changes between media; the change in speed redirects the wavefronts.

Refraction bends light because its speed changes between media, following Snell's law $n_1 \sin\theta_1 = n_2 \sin\theta_2$. Going into a denser medium bends light toward the normal; going the other way, angles past the critical angle cause total internal reflection, the basis of fiber optics.