

Refraction

Problem C**CRITICAL ANGLE****PROBLEM**

The critical angle for light traveling from a red spinel gemstone into air is 35.8° . What is the index of refraction for red spinel?

SOLUTION

Given: $\theta_c = 35.8^\circ$ $n_r = 1.00$

Unknown: $n_i = ?$

Choose the equation(s) or situation: Use the equation for critical angle.

$$\sin \theta_c = \frac{n_r}{n_i}$$

Rearrange the equation(s) to isolate the unknown(s):

$$n_i = \frac{n_r}{\sin \theta_c} = \frac{1.00}{\sin 35.8^\circ} = \boxed{1.71}$$

ADDITIONAL PRACTICE

- The critical angle for light traveling from a green tourmaline gemstone into air is 37.8° . What is tourmaline's index of refraction?
- The critical angle for light traveling from an aquamarine gemstone into air is 39.18° . What is the index of refraction for aquamarine?
- The critical angle for light traveling from almandine garnet into air ranges from $35.3^\circ - 33.1^\circ$. Calculate the range of almandine garnet's index of refraction.
- Light moves from olivine ($n = 1.670$) into onyx. If the critical angle for olivine is 62.85° , what is the index of refraction for onyx?
- Light moves from spessartite garnet ($n = 1.80$)—also called spessartine—into obsidian. If the critical angle for spessartine is 57.0° , what is the index of refraction for obsidian?
- Light moves from a clear andalusite ($n = 1.64$) crystal into ivory. If the critical angle for andalusite is 69.9° , what is the index of refraction for ivory?
- Find the critical angle for light traveling from ruby ($n = 1.766$) into air.
- Find the critical angle for light traveling from sapphire ($n = 1.774$) into air.
- Find the critical angle for light traveling from blue topaz ($n = 1.61$) into air.
- Find the critical angle for light traveling from emerald ($n = 1.576$) into air.