

Refraction

Snell's Law: $n_i \sin \theta_i = n_r \sin \theta_r$

MP/399

air \rightarrow unknown liquid.

$\theta_i = 65.0^\circ$

$\theta_r = 42.0^\circ$

$n_r = ?$

$n_i = 1.00$

air \rightarrow unk. liq.

$n_i \sin \theta_i = n_r \sin \theta_r$

$(1.00) \sin 65.0^\circ = n_r \sin 42.0^\circ$

$n_r = \frac{(1.00) \sin 65.0^\circ}{\sin 42.0^\circ}$

$n_r = 1.35$

MP/404

air \rightarrow ruby

$\theta_i = 45^\circ$

$n_i = 1.00$

$\theta_r = ??$

$n_r = 1.54$

(p 397)

air \rightarrow ruby

$n_i \sin \theta_i = n_r \sin \theta_r$

$(1.00) \sin 45^\circ = (1.54) \sin \theta_r$

$\sin \theta_r = \frac{1.00 \sin 45^\circ}{1.54}$

$\sin \theta_r = 0.459 \dots$

$\theta_r = \sin^{-1}(0.459 \dots)$

$\theta_r = 27^\circ$

MP/409

diamond \rightarrow air

$n_i = 2.42$

$\theta_i = ??$

$\theta_r = 90^\circ$

$n_r = 1.00$

diamond \rightarrow air

$n_i \sin \theta_i = n_r \sin \theta_r$ ← exactly

$(2.42) \sin \theta_i = (1.00) \sin 90^\circ$

$\sin \theta_i = \frac{(1.00) \sin 90^\circ}{2.42}$

$\theta_i = 24.4^\circ$

If the angle of incidence exceeds 24.4° , there will be total internal reflection.