

$$\begin{aligned}
 \textcircled{1} \quad n &= \frac{\sin \angle i}{\sin \angle R} & \angle i &= 40^\circ \\
 & & \angle R &= 50^\circ \\
 & & n &= ? \\
 &= \frac{\sin 40^\circ}{\sin 50^\circ} \\
 &= \frac{0.642}{0.766} \\
 &= 0.838
 \end{aligned}$$

\therefore the index of refraction is 0.84

$$\begin{aligned}
 \textcircled{2} \quad n &= \frac{c}{v} & v &= 2.4 \times 10^8 \text{ m/s} \\
 & & c &= 3 \times 10^8 \text{ m/s} \\
 & & n &= ? \\
 &= \frac{3 \times 10^8}{2.4 \times 10^8} \\
 &= 1.25
 \end{aligned}$$

\therefore the index of refraction is 1.25

(3)

$$n = \frac{c}{v}$$

$$1.417 = \frac{3 \times 10^8}{v}$$

$$1.417v = 3 \times 10^8$$

$$v = \frac{3 \times 10^8}{1.417}$$

$$= 2.04 \times 10^8$$

∴ the speed of light is 2.0×10^8 m/s

$$n = 1.417$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$v = ?$$

(4)

$$n_1 \sin \theta_i = n_2 \sin \theta_r$$

$$(1.00) (\sin 40^\circ) = (1.33) \sin \theta_r$$

$$0.643 = 1.33 (\sin \theta_r)$$

$$\sin \theta_r = \frac{0.643}{1.33}$$

$$\theta_r = 28.9^\circ$$

∴ the angle of refraction is 29°

$$n_1 = 1.00$$

$$\theta_i = 40^\circ$$

$$n_2 = 1.33$$

$$\theta_r = ?$$

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$$n_1 \sin \theta_i = n_2 \sin \theta_R$$

$$(2.42) \sin \theta_i = (1) (\sin 90^\circ)$$

$$(2.42) \sin \theta_i = (1)(1)$$

$$\sin \theta_i = \frac{1}{2.42}$$

$$\theta_i = 24.4^\circ$$

$$n_1 = 2.42$$

$$n_2 = 1.00$$

$$\theta_R = 90^\circ$$

$$\theta_i = ?$$

∴ the critical angle for diamond
to air is 24°