

①

Refraction Problems Answer Key

1) $n = \frac{3.00 \times 10^8 \text{ m/s}}{2.00 \times 10^8 \text{ m/s}} = 1.50$

$n = \frac{3.00 \times 10^8 \text{ m/s}}{2.00 \times 10^8 \text{ m/s}} = \boxed{1.50}$

2) a) $n = 1.46$ $v = \frac{3.00 \times 10^8 \text{ m/s}}{1.46} = \boxed{2.05 \times 10^8 \text{ m/s}}$

second #2
on next page!

b) $n = 1.65$ $v = \frac{3.00 \times 10^8 \text{ m/s}}{1.65} = \boxed{1.82 \times 10^8 \text{ m/s}}$

3) $\theta_i = 48^\circ$ $n_i = 1.0003$ $n_r = 1.58$ $\theta_r = ?$
 $n_i \sin \theta_i = n_r \sin \theta_r$ $(1.0003) \sin(48) = 1.58 \sin \theta_r$
 $\boxed{\theta_r = 28^\circ}$

4) $n_i = 1.0003$ $n_r = 1.33$ $\theta_r = 30.0^\circ$ $\theta_i = ?$
 $n_i \sin \theta_i = n_r \sin \theta_r$ $(1.0003) \sin \theta_i = 1.33 \sin(30)$
 $\boxed{\theta_i = 42^\circ}$

5) $n = \frac{3.00 \times 10^8 \text{ m/s}}{2.50 \times 10^8 \text{ m/s}} = \boxed{1.20}$

6) $n = \frac{3.00 \times 10^8 \text{ m/s}}{2.42} = 2.42$ $v = \frac{3.00 \times 10^8 \text{ m/s}}{2.42} = \boxed{1.24 \times 10^8 \text{ m/s}}$
 diamond

7) $n = 1.92$ $n = \frac{3.00 \times 10^8 \text{ m/s}}{1.92} = 1.56 \times 10^8 \text{ m/s}$
Slows down by $3.00 \times 10^8 \text{ m/s} - 1.56 \times 10^8 \text{ m/s} = \boxed{1.44 \times 10^8 \text{ m/s}}$

8) $n_i = 1.0003$ $n_r = 2.42$ $\theta_i = 60.0^\circ$ $\theta_r = ?$
 $n_i \sin \theta_i = n_r \sin \theta_r$ $(1.0003) \sin(60.0) = 2.42 \sin \theta_r$
 $\boxed{\theta_r = 21.0^\circ}$

Q1

Refraction Problems Answer Key

9) $n_i = 1.0003$ $n_R = 1.30$ $\theta_R = 45^\circ$ $\theta_i = ?$
 $n_i \sin \theta_i = n_R \sin \theta_R$ $(1.0003) \sin \theta_i = (1.30) \sin(45)$
 $\theta_i = 67^\circ$

10) $\theta_R = 40.0$ $\theta_i = 50.0$ $n_R = ?$ → Assume the incident medium is $n_i = 1.0003$ air (bends towards normal, so incident medium is the fastest).

$$n_i \sin \theta_i = n_R \sin \theta_R$$

$$(1.0003) \sin(50.0) = n_R \sin(40.0)$$

$$n_R = 1.19$$

Second #2) $n_R = ?$ $\theta_i = 63^\circ$ $n_i = 1.0003$ $\theta_R = 38^\circ$
 $n_i \sin \theta_i = n_R \sin \theta_R$ $(1.0003) \sin(63) = n_R \sin(38)$
 $n_R = 1.45$