



- $n_1 = 1.55$
- $n_2 = 1.70$
- $n_3 = 1.60$
- $n_4 = 1.45$
- $n_5 = 1.59$
- $n_6 = 1.65$
- $n_7 = 1.50$

(1) Determine which light ray emerges first.

(2) What is the difference in transversal times as a multiple of  $\frac{L}{c}$  ?

(1) Ray 1       $n = \frac{c}{v}$        $d = vt$

$t = \frac{dn}{c}$        $v = \frac{c}{n}$        $t = \frac{d}{v}$

- $t_1 = \frac{L}{c} 1.55$
- $t_2 = \frac{L}{c} 1.70$
- $t_3 = \frac{L}{c} 1.60$
- $t_4 = \frac{L}{c} 1.45$

$t_{Total} = \frac{L}{c} (6.30)$

Ray 2

$$t = \frac{dn}{c}$$

$$t_5 = \frac{2L}{c} 1.59$$

$$t_6 = \frac{L}{c} 1.65$$

$$t_7 = \frac{L}{c} 1.50$$

$$t_{\text{Total}} = \frac{L}{c} [2(1.59) + 1.65 + 1.50]$$

$$= \frac{L}{c} (6.33)$$

Ray 1 takes less time

(2)

$$\Delta t_{\text{Total}} = \frac{L}{c} 6.33 - \frac{L}{c} 6.30$$

$$= \frac{L}{c} (0.03)$$