T3-15

a) $c_{jää} = 2{,}29 \cdot 10^8\ m/s$ $\qquad n = \frac{c}{c_{jää}} = \frac{2{,}998 \cdot 10^8\ m/s}{2{,}29 \cdot 10^8\ m/s} \approx 1{,}31$

b) $n = 1{,}51$ $\qquad c_{lasi} = \frac{c}{n} = \frac{2{,}998 \cdot 10^8\ m/s}{1{,}51} \approx 1{,}99 \cdot 10^8\ m/s$

T3-16

a) $\alpha_1 = 40^\circ$

$n_{vesi} = 1{,}33$

$n_{lasi} = 1{,}51$

$$\frac{\sin\alpha_1}{\sin\alpha_2} = \frac{n_2}{n_1}$$

$$\sin\alpha_2 = \frac{n_1 \sin\alpha_1}{n_2} = \frac{1{,}00 \cdot \sin 40{,}0^\circ}{1{,}33}$$

$$\alpha_2 \approx 28{,}9^\circ$$

b) $$\sin\alpha_2 = \frac{n_1 \sin\alpha_1}{n_2} = \frac{1{,}51 \cdot \sin 40{,}0^\circ}{1{,}33}$$

$$\alpha_2 \approx 46{,}5^\circ$$

T3-17

$\lambda_{min} = 400\ nm$ $\qquad n_{vesi} = 1{,}33$

$\lambda_{max} = 700\ nm$

$$\frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1}$$

$$\lambda_2 = \frac{n_1}{n_2} \cdot \lambda_{min} = \frac{1{,}00}{1{,}33} \cdot 400\ nm \approx 301\ nm$$

$$\lambda_3 = \frac{n_1}{n_2} \cdot \lambda_{max} = \frac{1{,}00}{1{,}33} \cdot 700\ nm \approx 526\ nm$$

Vastaus: Aallonpituus on väliltä 300 – 530 nm.