35.2 $\Delta x = ct$; $c = \dfrac{\Delta x}{t} = \dfrac{2(1.50 \times 10^8 \text{ km})(1000 \text{ m/km})}{(22.0 \text{ min})(60.0 \text{ s/min})} = 2.27 \times 10^8 \text{ m/s} = \boxed{227 \text{ Mm/s}}$

35.6 (a) $f = \dfrac{c}{\lambda} = \dfrac{3.00 \times 10^8 \text{ m/s}}{6.328 \times 10^{-7} \text{ m}} = \boxed{4.74 \times 10^{14} \text{ Hz}}$

(b) $\lambda_{glass} = \dfrac{\lambda_{air}}{n} = \dfrac{632.8 \text{ nm}}{1.50} = \boxed{422 \text{ nm}}$

(c) $v_{glass} = \dfrac{c_{air}}{n} = \dfrac{3.00 \times 10^8 \text{ m/s}}{1.50} = 2.00 \times 10^8 \text{ m/s} = \boxed{200 \text{ Mm/s}}$

*35.20 Consider glass with an index of refraction of 1.5, which is 3 mm thick The speed of light in the glass is

$$\dfrac{3 \times 10^8 \text{ m/s}}{1.5} = 2 \times 10^8 \text{ m/s}$$

The extra travel time is $\dfrac{3 \times 10^{-3} \text{ m}}{2 \times 10^8 \text{ m/s}} - \dfrac{3 \times 10^{-3} \text{ m}}{3 \times 10^8 \text{ m/s}}$ $\boxed{\sim 10^{-11} \text{ s}}$

For light of wavelength 600 nm in vacuum and wavelength $\dfrac{600 \text{ nm}}{1.5} = 400 \text{ nm}$ in glass,

the extra optical path, in wavelengths, is $\dfrac{3 \times 10^{-3} \text{ m}}{4 \times 10^{-7} \text{ m}} - \dfrac{3 \times 10^{-3} \text{ m}}{6 \times 10^{-7} \text{ m}}$ $\boxed{\sim 10^3 \text{ wavelengths}}$

35.25 From Fig. 35.20 $n_v = 1.470$ at 400 nm   and $n_r = 1.458$ at 700 nm
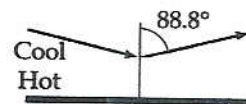
Then $(1.00)\sin\theta = 1.470 \sin\theta_v$ and $(1.00)\sin\theta = 1.458 \sin\theta_r$

$\delta_r - \delta_v = \theta_r - \theta_v = \sin^{-1}\left(\dfrac{\sin\theta}{1.458}\right) - \sin^{-1}\left(\dfrac{\sin\theta}{1.470}\right)$

$\Delta\delta = \sin^{-1}\left(\dfrac{\sin 30.0°}{1.458}\right) - \sin^{-1}\left(\dfrac{\sin 30.0°}{1.470}\right) = \boxed{0.171°}$

35.37 $\sin\theta_c = \dfrac{n_2}{n_1}$ (Equation 35.10)

$n_2 = n_1 \sin 88.8° = (1.0003)(0.9998) = \boxed{1.000\ 08}$

35.39   For total internal reflection, $n_1 \sin\theta_1 = n_2 \sin 90.0°$

$(1.50)\sin\theta_1 = (1.33)(1.00)$ or $\theta_1 = \boxed{62.4°}$