P # 11 Ch 22 - pg 707

a) $v_1 = 3.0 \times 10^8$ m/s (vacuum) $\lambda_2 = 438$ nm
$\lambda_1 = ?$

Find v_2: $n_2 = 1.333$ (water)

$$n_2 = \frac{c}{v_2} \qquad 1.333 = \frac{(3 \times 10^8 \text{ m/s})}{v_2}$$

$$v_2 = 2.25 \times 10^8 \text{ m/s}$$

Find λ_1: f is constant, so

$$\frac{v_1}{\lambda_1} = \frac{v_2}{\lambda_2}$$

$$\frac{(3 \times 10^8 \text{ m/s})}{\lambda_1} = \frac{(2.25 \times 10^8 \text{ m/s})}{(438 \times 10^{-9} \text{ m})}$$

$$\boxed{\lambda_1 = 584 \text{ nm}}$$

b) $\lambda_2 = 438$ nm (water)
$\lambda_3 = 390$ nm (benzene)

$\frac{n_3}{n_2} = ?$ f is constant, so $\frac{v_2}{\lambda_2} = \frac{v_3}{\lambda_3}$

$v_2 \cdot \lambda_3 = v_3 \cdot \lambda_2$ (cross multiply)

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

$\left(\frac{c}{n_2}\right) \cdot \lambda_3 = \left(\frac{c}{n_3}\right) \cdot \lambda_2$ (substitute)

$\lambda_3 \cdot n_3 = \lambda_2 \cdot n_2$ (cross multiply)

$$\frac{n_3}{n_2} = \frac{\lambda_2}{\lambda_3} = \frac{438 \text{ nm}}{390 \text{ nm}}$$

$$\boxed{\frac{n_3}{n_2} = 1.12}$$