Ch.3 Prob. 29

from Problem 29 $\Delta y = \frac{x\lambda}{d}$

a) Find distance between fringes when

$\lambda = 633\text{nm}$ + $d = 0.0800\text{ mm}$

$L = 3.00\text{ m}$

Using the formula gives

$$\Delta y = \frac{(3.00\text{m})(633\times10^{-9}\text{m})}{(0.0800\times10^{-3}\text{m})}$$

$$= 0.0237\text{ m}$$

$$= \boxed{2.37\text{ cm}}$$

b) find the distance if submerged under water,

$c = \lambda \cdot f$ and $n = \frac{c}{v}$

frequency is $f = \frac{c}{\lambda} = \frac{3\times10^{8}\text{ m/s}}{633\times10^{-9}\text{ m}}$

$= 4.74\times10^{14}\text{ Hz}$

$$v = \frac{c}{n} = \frac{3.0\times10^{8}\text{ m/s}}{1.33} = 2.26\times10^{8}\ \frac{\text{m}}{\text{s}}$$

~~Prob 3~~

Ch3 Prob 29

with the new speed of light

The wavelength is

$$\lambda = \frac{c}{f} = \frac{2.26 \times 10^{8} \frac{m}{s}}{4.74 \times 10^{14} Hz} = 4.77 \times 10^{-7} m$$

Now calculate the distance between fringes.

$$\Delta y = \frac{(3.00 m)(4.77 \times 10^{-7} m)}{(0.0800 \times 10^{-3} m)}$$

$$= 0.0179 m$$

$$= \boxed{1.79 cm}$$