KEY

6. If the index of refraction for a wave going from deep to shallow water is 2.0, what is the wavelength in shallow water if the wavelength in deep water is 4.0 cm? (SHOW METHOD CLEARLY)

$\frac{\lambda_D}{\lambda_S} = n_{D\to S}$ $\quad \frac{4.0\text{cm}}{\lambda_S} = 2.0$ $\quad \lambda_S = \frac{4.0}{2.0} = 2.0\text{ cm}$

7. A particular color of light has a wavelength of 550 nm travelling in water.
(a) Will its wavelength be longer or shorter when it travels in air?
(b) Briefly justify your answer to (a):
LONGER, SINCE $\lambda$ IS INVERSELY PROPORTIONAL TO $n$

(c) Calculate the wavlength in air. (SHOW METHOD CLEARLY)

$\frac{\lambda_W}{\lambda_A} = \frac{n_A}{n_W}$ $\quad \frac{550\text{nm}}{\lambda_A} = \frac{1}{1.33}$ $\quad \lambda_A = 550\text{nm} \times 1.33$

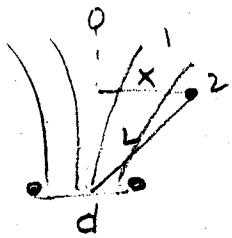
$= \boxed{732\text{nm}}$

8. In lab you have observed nodal lines and antinodal lines for water waves in a ripple tank, and for light waves through two slits on a microscope slide, and with a diffraction grating. Such patterns are called interference patterns. The nodal lines are also called dark lines, or minima; the antinodal lines are also called bright lines, or maxima. If you wanted to **decrease** the spacing between the lines in an interference pattern for either water waves or light waves, how would you have to adjust the

(a) spacing between the sources or slits INCREASE

(b) frequency INCREASE

9. Explain each of the terms $\lambda$, d, x, n, and L in the equation $\lambda = \frac{dx}{nL}$




$\lambda$ = WAVELENGTH
d = DISTANCE BETWEEN SOURCES
X = DISTANCE FROM CENTER LINE ("0" ANTINODAL) TO POINT ON $n^{TH}$ ANTINODAL LINE
L = DISTANCE FROM MIDPOINT OF SOURCES TO POINT ON $n^{TH}$ ANTINODAL LINE

10. Green light of wavelength 540 nm is passed through two slits which are $2.0 \times 10^{-4}$ cm apart. The distance from the center of the slits to the third order bright line is 1.5 m. Compute the distance from the center bright spot to the third order bright line. (SHOW METHOD CLEARLY)

$X = \frac{nL\lambda}{d} = \frac{3 \times 1.5\text{m} \times 540 \times 10^{-9}\text{m}}{2.0 \times 10^{-6}\text{m}}$

$= 1215 \times 10^{-3}\text{m} = \boxed{1.22\text{m}}$