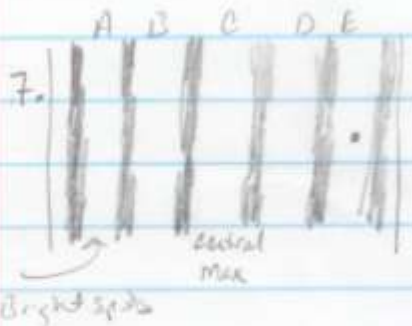
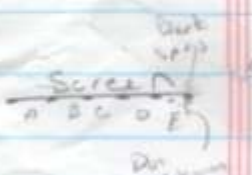
Ch 17 Conceptual 7, P 4, 38, 75-77

7. 

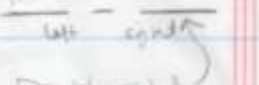
a. If the wavelength of light is decreased, the fringe spacing (bright spots) will also decrease. $y_m = \frac{m\lambda L}{d}$ shows that wavelength and space between bright spots, y_m are directly proportional.

b. If the spacing between the slits (double slit) is decreased, the fringes will spread further apart. $y_m = \frac{m\lambda L}{d}$ This shows that y_m, the space between bright spots (fringes) is inversely proportional to the space between the two slits, d.

c. If the distance to the screen is decreased, the fringe spacing (bright spots) will also decrease. Less distance for the light to spread. This is also clear from the formula again $y_m = \frac{m\lambda L}{d}$ which shows distance to the screen L is directly proportional to fringe spacing, y_m.



d. Question is asking for the path difference for the second bright spot (E). First path difference is one wavelength & second is two wavelengths. $2.50 \mu m = 11,000 nm$



4. A light wave has a 670nm wavelength in air. Its wavelength in a transparent solid is 420 nm.

a. What is the speed of light in this solid?

red / cannot change only d.

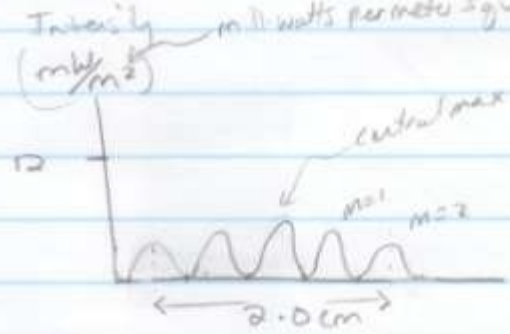
$c = 670\text{nm} \cdot f$ so $f = \frac{3.0\times10^{8}\text{m/s}}{670\times10^{-9}\text{m}} = 4.48\times10^{14}\text{ Hz}$

new material $v = 420\text{nm} \cdot 4.48\times10^{14}\text{ Hz} = \boxed{1.88\times10^{8}\text{ m/s}}$

b. What is the light's frequency in this solid?

Found above $\boxed{4.48\times10^{14}\text{ Hz}}$ Does not change

38. Shows the light intensity on a screen behind a double slit. The slit spacing is 0.20mm and the wavelength of the light is 600nm. What is the distance from the slits to the screen?



1.0cm from m=0 to m=2
or 0.50cm from m=0 to m=1

$y_m = \frac{m\lambda L}{d}$ or $L = \frac{y_m d}{m\lambda}$

Given: $d = 0.20\text{mm} = 2.0\times10^{-4}\text{ m}$

$\lambda = 600\text{nm} = 6.00\times10^{-7}\text{ m}$

$y_1 = 0.50\text{cm} = 5.0\times10^{-3}\text{ m}$

$L = \frac{5.0\times10^{-3}\text{m}\ \ 2.0\times10^{-4}\text{m}}{1 \cdot 6.00\times10^{-7}\text{ m}}$

$\boxed{= 1.67\text{m}}$

75. The color change of the blue morpho butterfly changes as it flaps its wings because
(D.) As the angle changes, the differences in paths among light reflected from different surfaces change, resulting in constructive interference for a different color.

76. Light of some particular color will change in acetone
(C.) The wavelength of light will be less than in air.

77. The butterfly's scales are actually transparent (not blue) and have an index of refraction of 1.56. Light reflects from the surface because
(A.) The index of refraction of the scales is different than that of air