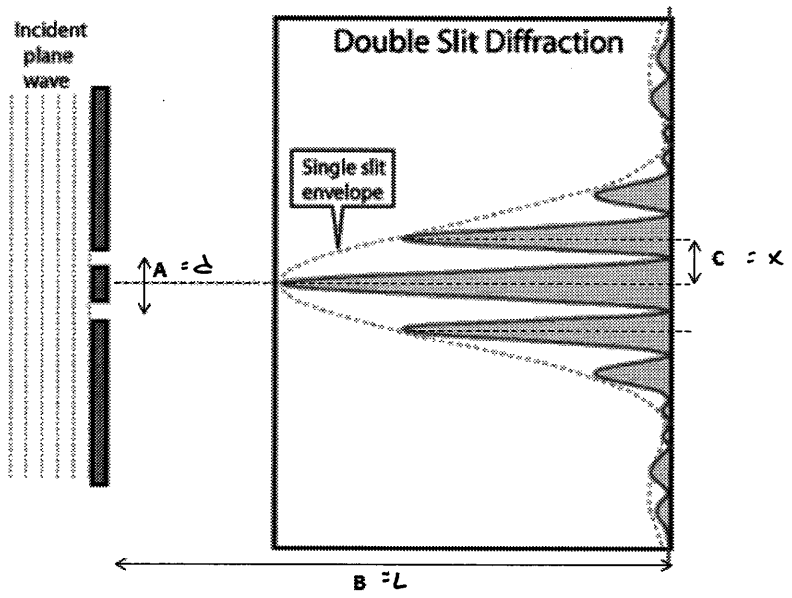
KEY

First Name:_____ Last Name:_____

L10 - FQ – Diffraction, Interference, and Polarization

Use the following diagram to answer Q1:



$$\lambda = \frac{dsin\theta}{n}$$

$$\lambda = \frac{xd}{nl}$$

Interference Variables

1 – *d* 2 – *L* 3 – *n* 4 – *x* 5 – **θ**

Q1: For the given diagram above, the best labels for ***A, B,*** and ***C*** are ____, ____, and ____.

*(Record you **three-digit** answer in the numerical response boxes below.)*

1	2	4	

KEY

n=1

Q2: A light of wavelength 480nm is incident on two slits separated by 0.2mm. The first bright fringe is located at an angle of ***a.bc*** x 10^{-d} degrees from the central antinode. The values of ***a,b,c,*** and ***d*** are ____, ____, ____, and ____.

*(Record you **four-digit** answer in the numerical response boxes below.)*

1	3	8	1

$\lambda = \frac{d\sin\theta}{n}$

$(480\times10^{-9}) = \frac{(0.2\times10^{-3})\sin\theta}{(1)}$

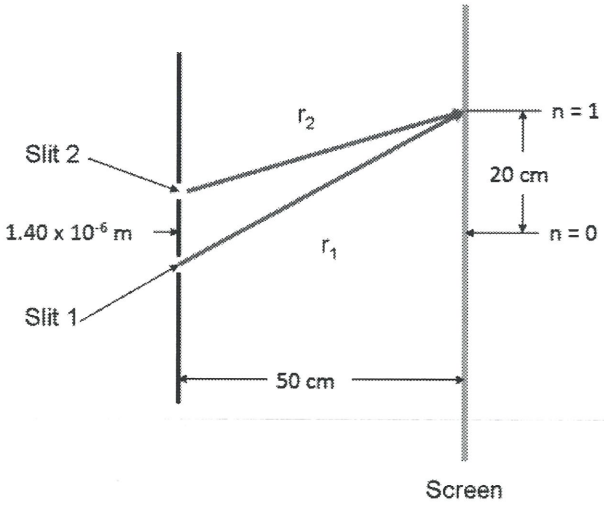
$\sin\theta = 0.0024$

$\theta = 0.1375^\circ$

$\approx 1.38\times10^{-1}$ deg.

Use the following information to answer Q3-Q4:

A monochromatic wave is incident on two slits separated by 1.40 x 10^{-6} m. The first antinode is measured to be 20.0 cm from the central antinode.



Q3: The waves from *Slit 1* and *Slit 2*, when meeting at the first antinode, are how many degrees out of phase?

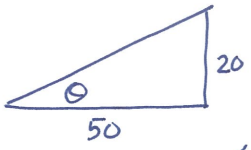
a. 90^0
b. 180^0 Crest to trough, or ½ λ
c. 270^0
d. 360^0

KEY

Q4: The wavelength of the incident light is _____ nm.

*(Record you **three-digit** answer in the numerical response boxes below.)*

5	2	0	



$\theta = \tan^{-1}\left(\frac{20}{50}\right)$

$\theta = 21.8014°$

So $\theta > 10°$

Use $\lambda = \frac{d\sin\theta}{n}$

WRONG METHOD

$\lambda = \frac{xd}{nL}$

$\lambda = \frac{(0.20)(1.40\times10^{-6})}{(1)(0.50)}$

$\lambda = 5.60\times10^{-7}\ m$

$\lambda = 560\ nm$

CORRECT METHOD

$\lambda = \frac{d\sin\theta}{n}$

$\lambda = \frac{(1.40\times10^{-6})\sin(21.8014)}{(1)}$

$\lambda = 5.19947\times10^{-7}\ m$

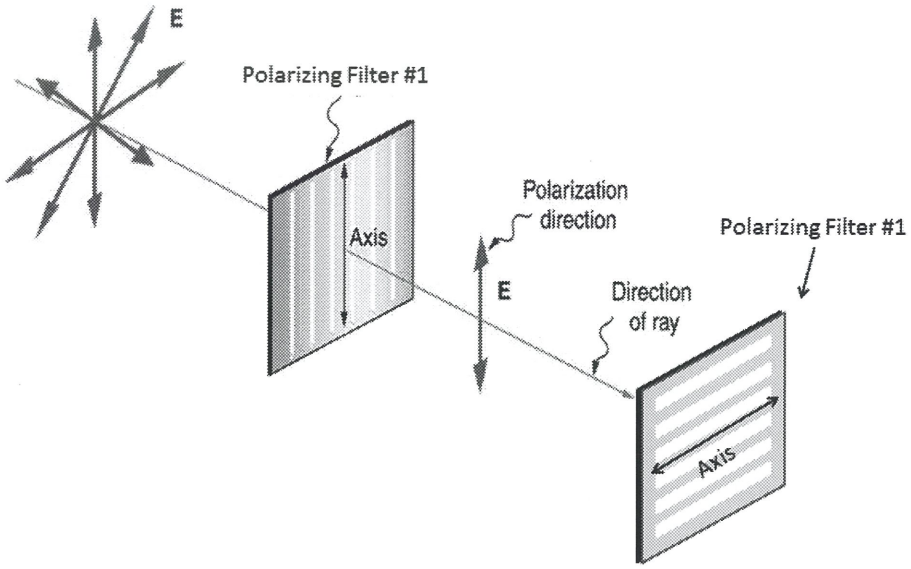
$\lambda = 5.20\times10^{-7}\ m$

$\lambda = 520\ nm$

KEY

Use the following to answer Q5:

Unpolarized light is shown through both *Polarizing Filter #1* and *Polarizing Filter #2*, per the diagram below.



Polarizing Filter #2 is slowly rotated until its axis is vertically oriented.

Q5: As *Polarizing Filter #2* is rotated, the intensity of the light seen by an observer would

a. increase → Right now the filters are rotated 90° to another, so intensity is at a minimum.
b. decrease
c. stay the same
d. none of the above

MARKING:

Beginning	0.0 – 2.0
Progressing	2.5 – 3.5
Competent	4.0 – 4.5
Exemplary	5.0