

Name \_\_\_\_\_ # \_\_\_\_\_

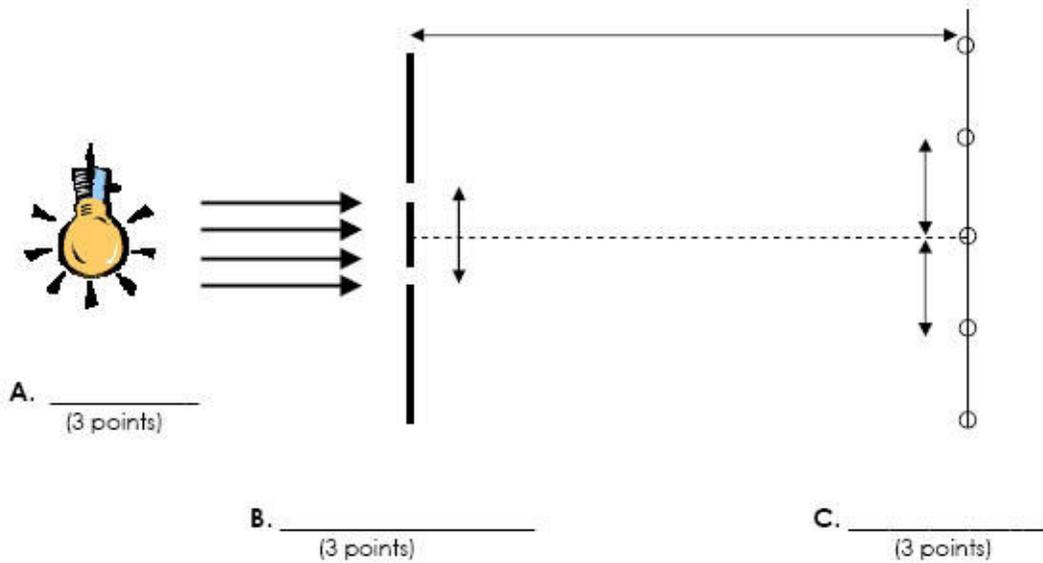
Date \_\_\_\_/\_\_\_\_/\_\_\_\_

Section \_\_\_\_\_

Physics Regents

Double Slit Experiment  
Observing Interference Patterns

Part I - Background Questions - Answer the following questions to prepare you for your experiment.



1. What did Young's Double slit experiment prove about the nature of light?  
**(Correct Answer - 7 points) (Full sentence - one point)**

2. Letters in the picture above designate the three main components of Young's Double Slit Apparatus. Identify each one below AND in the picture above.

A. \_\_\_\_\_ (2 points) B. \_\_\_\_\_ (2 points)

C. \_\_\_\_\_ (2 points)

3. Find Young's double slit equation in your notes and write it in the space below. Use your notes to determine what each variable in the equation means.

Young's Double Slit Equation \_\_\_\_\_ (1 points)

What does each variable mean? - (1 point each)

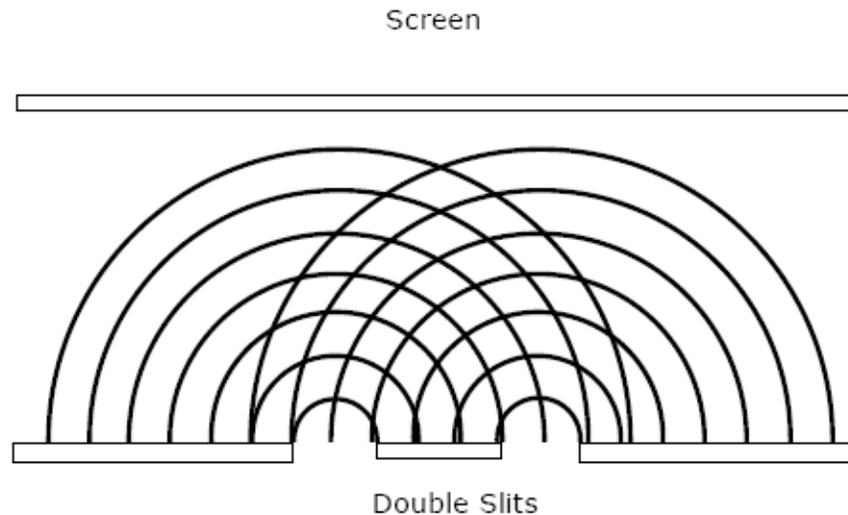
\_\_\_\_\_ - \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_

4. Place each variable mentioned above in its proper place in the illustration on the previous page. (1 point each)
5. Label the part of the screen below where the "**Central Maximum**" will fall with the letter C. Show where the **two first order bright lines** will fall by using the letter F.  
(6 points)



- 5a) What is the wavelength of the light shown in the picture above. \_\_\_\_ cm (4 pts)
- b) What is the distance between the slits  $d$  \_\_\_\_ cm (4 pts)
- c) What is the distance between the central maximum and the first order bright line? (x) \_\_\_\_\_ (4 pts)

### Part II - Experiment

1. Hold the negative so that the slits are vertical and parallel to the filament in the lamp
  2. Put the double slit negative close to one of your eyes and look at the light source.
  3. Adjust and readjust the orientation of the double slit negative until you get the clearest picture.
  4. Neatly draw and label what you see. DON'T INCLUDE BULB IN YOUR PICTURE (4 points)
- Be sure to label the central maxima and the first order bright lines. (1 point each)

5. a) What kind of interference created the bright lines? \_\_\_\_\_

b) What kind of interference created the absence of light in between each bright line?  
(Correct Answer - 6 points) (Full sentence - one point) \_\_\_\_\_

6. Thomas Young found three ways that he could change the distance between the central maxima and the first order bright line. (x) List them. (2 points each)

1.

2.

3.

7. Do an experiment to determine how your distance to the light source (L) affects the distance between the central maxima and the first order bright line. (x)

a) What is the mathematical relationship between these variables? (3 points)

(Full Sentence 2 points)

b) Does the double slit equation agree with the conclusion you drew? Yes or NO (circle) (5 points)

c) How can you tell from the equation? (2 points) (Full Sentence 1 point)

8. Calculating the wavelength of laser light.

a) What is the distance between the slits in your Diffraction Grating? \_\_\_\_\_ meters (1)

b) **Move your slit toward and then away from the screen.** How is the distance between the slit (diffraction gratings) and the screen affect the distance between the central maximum and the first order bright lines? (1)

Instructions: Adjust the distance between the slit (diffraction grating) and the screen (index card) until the two first order bright lines appear at the outer edge of the index card.

Distance between the slits and the screen \_\_\_\_\_ meters (1)

Distance between the central maximum and the first order bright line \_\_\_\_\_ meters (1)

Slit separation (see part a) above) \_\_\_\_\_ meters (1)

c) Use Young's Double Slit Equation from your notes and the information above to calculate the **wavelength** of the laser pointer. **Answer in METERS**

Equation (1) Substitution with Units (1) Answer with units (5)

d) What is the frequency of your laser? (4 points) \_\_\_\_\_

Equation (1) Substitution with Units (1) Answer with units (2)

e) Everything being equal, if your laser were green, would the distance between the central maximum and the first order bright line be larger or smaller? (1) **Explain** (4)