

## (WO.L1.1) Familiarize Stage

Thursday, March 29, 2018 8:34 PM

### Wave Optics (WO)

#### Familiarize Stage:

##### Pre-lecture 1: Young's Double Slit Experiment

**Reading**

1. none

**Lecture Videos**

1. none

**Example Problems**

1. none

**Simulations**

1. none

**Other Suggested Content**

1. none

**Practice**

1. none

**Homework****WO.L1.1-01**

**Description:** infographic quiz Young's double slit #1 - label matching

**Learning Objectives:** [x]

**Problem Statement:** Consider a double slit experiment. Match each term in the equation with the correct description from the following list. (1) Diffraction angle of the  $m^{\text{th}}$  order bright fringe, (2)  $m^{\text{th}}$  order bright fringe, (3) wavelength, (4) distance between two adjacent slits, (5) subscript for the  $m^{\text{th}}$  order bright fringe.

The diagram shows the equation  $dsin\theta_m = m\lambda$  with five labels and arrows pointing to specific parts: (a) points to 'd', (b) points to 'sin', (c) points to 'λ', (d) points to 'm', and (e) points to the subscript 'm' in  $\theta_m$ .

**Answer:** (1) - (b)  
 (2) - (c)  
 (3) - (d)  
 (4) - (a)  
 (5) - (e)

## WO.L1.1-02

**Description:** infographic quiz Young's double slit #2 - label matching

**Learning Objectives:** [x]

**Problem Statement:** Consider a double slit experiment. Match each term in the equation with the correct description from the following list. (1) Diffraction angle of the  $m^{\text{th}}$  order bright fringe, (2) distance between slits and viewing screen, (3) distance from central bright fringe to the  $m^{\text{th}}$  order bright fringe, (4) subscript for the  $m^{\text{th}}$  order bright fringe.

$$y_m = L \tan(\theta_m)$$

(a) points to  $y_m$ , (b) points to  $L$ , (c) points to  $\theta_m$ , (d) points to  $m$ .

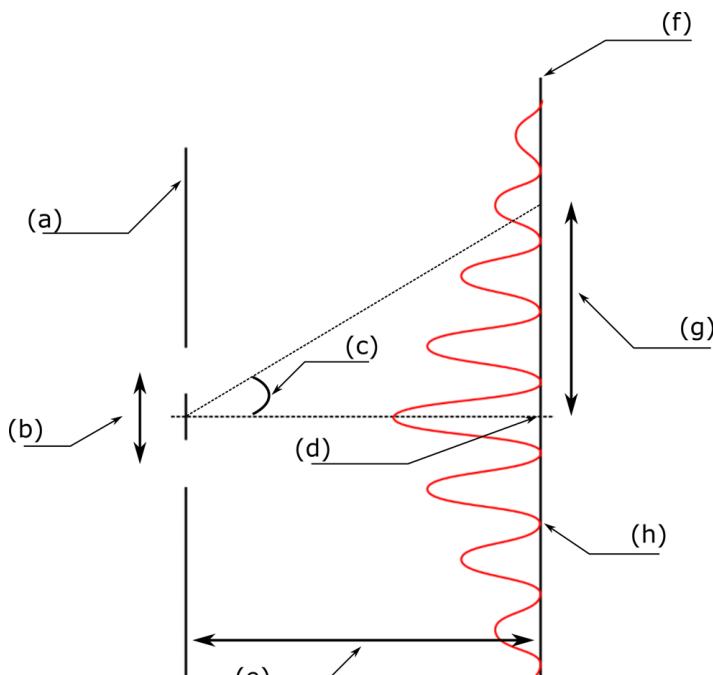
**Answer:** (1) - (c)  
 (2) - (b)  
 (3) - (a)  
 (4) - (d)

## WO.L1.1-03

**Description:** infographic quiz Young's double slit #2 - label matching

**Learning Objectives:** [x]

**Problem Statement:** Consider a double slit experiment. Match each term in the physical representation with the correct description from the following list. (1) Diffraction angle of the  $m^{\text{th}}$  order bright fringe, (2) central bright fringe, (3) 2nd dark fringe, (4) distance from central bright fringe to the  $m^{\text{th}}$  order bright fringe, (5) viewing screen, (6) double slit apparatus, (7) distance between two adjacent slits, (8) distance between slits and viewing screen.



- Answer: (1) - (c)  
(2) - (d)  
(3) - (h)  
(4) - (g)  
(5) - (f)  
(6) - (a)  
(7) - (b)  
(8) - (e)

**WO.L1.1-04: (TAKEN FROM LECTURE)**

**Description:** Identify path length difference in mathematical model.

**Problem Statement:** For the double slit experiment, we use a mathematical model  $m\lambda = d \sin(\theta_m)$ .

Where in this model is the path length difference?

- (1)  $m$   
(2)  $\lambda$   
(3)  $d$   
(4)  $d \sin(\theta)$   
(5)  $\sin(\theta)$   
(6)  $\lambda d$

**Answer:** (4)

**WO.L1.1-05: (TAKEN FROM LECTURE)**

**Problem Statement:** Young's double slit experiment is just one example of two source interference. Which of the following is/are necessary to see a spatial interference pattern on a screen opposite two slits?

- (1) A single frequency source.  
(2) A coherent source of light.  
(3) Experimental apparatus needs to be in air.  
(4) The source needs to be a light source.  
(5) The distance between the slits must be on the order of the wavelength of the light illuminating the slits.

**Answer:** (1), (2), and (5)

**WO.L1.1-06:**

**Problem Statement:** Which of the following constraints must we follow when setting up a double slit experiment if we wish to use the mathematical model:  $m\lambda = d \sin(\theta_m)$  ?

- (1) The viewing screen can be placed any distance away from the slits.
- (2) The viewing screen must be placed close to the slits.
- (3) The viewing screen must be placed far away from the slits.
- (4) The entire experiment must take place in an atmosphere like the Earth's.

**Answer:** (3)