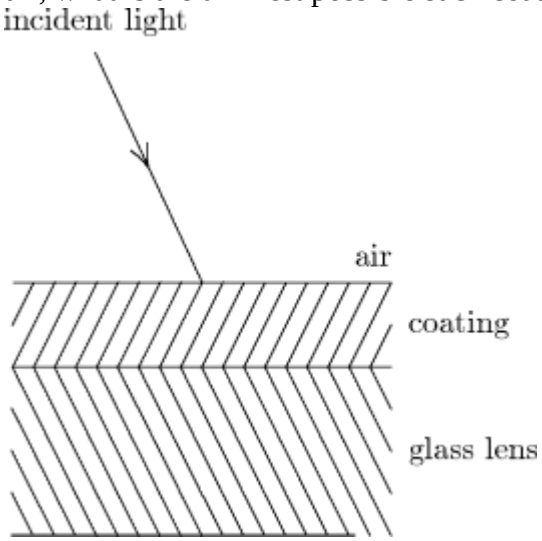
Name: _____ Date: _____

___ **1.** In an experiment to measure the wavelength of light using a double slit, it is found that the fringes are too close together to easily count them. To spread out the fringe pattern, one could:

**A)** decrease the slit separation
**B)** increase the slit separation
**C)** increase the width of each slit
**D)** decrease the width of each slit
**E)** none of these

___ **2.** A lens with a refractive index of 1.5 is coated with a material of refractive index 1.2 in order to minimize reflection. If λ denotes the wavelength of the incident light in air, what is the thinnest possible such coating?

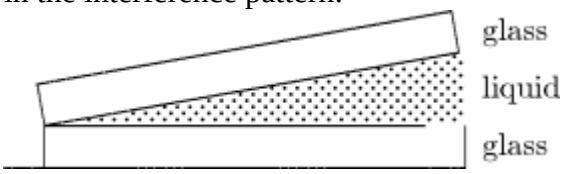



**A)** 0.5λ **B)** 0.416λ **C)** 0.3λ **D)** 0.208λ **E)** 0.25λ

___ **3.** A light wave with an electric field amplitude of $2E_0$ and a phase constant of zero is to be combined with one of the following waves: Which of these combinations produces the least intensity?

**A)** wave A has an amplitude of $E_0$ and a phase constant of zero
**B)** wave B has an amplitude of $E_0$ and a phase constant of $\pi$
**C)** wave C has an amplitude of $2E_0$ and a phase constant of zero
**D)** wave D has an amplitude of $2E_0$ and a phase constant of $\pi$
**E)** wave E has an amplitude of $3E_0$ and a phase constant of $\pi$

___ **4.** A liquid of refractive index $n = 4/3$ replaces the air between a fixed wedge formed from two glass plates as shown. As a result, the spacing between adjacent dark bands in the interference pattern:




**A)** increases by a factor of 4/3
**B)** increases by a factor of 3
**C)** remains the same
**D)** decreases to 3/4 of its original value
**E)** decreases to 1/3 of its original value

___ **5.** Monochromatic light, at normal incidence, strikes a thin film in air. If λ denotes the wavelength in the film, what is the thinnest film in which the reflected light will be a maximum?

**A)** Much less than λ **B)** λ/4 **C)** λ/2 **D)** 3λ/4 **E)** λ

___ **6.** In a Young's double-slit experiment, the slit separation is doubled. To maintain the same fringe spacing on the screen, the screen-to-slit distance $D$ must be changed to:

**A)** $D/2$ **B)** $D/\sqrt{2}$ **C)** $D\sqrt{2}$ **D)** $2D$ **E)** $4D$

___ **7.** If two light waves are coherent:

**A)** their amplitudes are the same
**B)** their frequencies are the same
**C)** their wavelengths are the same
**D)** their phase difference is constant
**E)** the difference in their frequencies is constant

___ **8.** Waves from two slits are in phase at the slits and travel to a distant screen to produce the third side maximum of the interference pattern. The difference in the distance traveled by the waves is:

**A)** half a wavelength
**B)** a wavelength
**C)** three halves of a wavelength
**D)** two wavelengths
**E)** three wavelengths

___ **9.** In a Young's double-slit experiment the center of a bright fringe occurs wherever waves from the slits differ in the distance they travel by a multiple of:

**A)** a fourth of a wavelength
**B)** a half a wavelength
**C)** a wavelength
**D)** three-fourths of a wavelength
**E)** none of the above

___ **10.** A light wave with an electric field amplitude of $E_0$ and a phase constant of zero is to be combined with one of the following waves: Which of these combinations produces the greatest intensity?

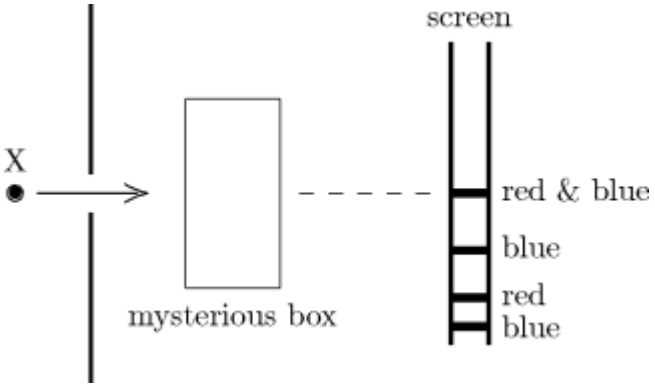
**A)** wave A has an amplitude of $E_0$ and a phase constant of zero
**B)** wave B has an amplitude of $E_0$ and a phase constant of $\pi$
**C)** wave C has an amplitude of $2E_0$ and a phase constant of zero
**D)** wave D has an amplitude of $2E_0$ and a phase constant of $\pi$
**E)** wave E has an amplitude of $3E_0$ and a phase constant of $\pi$

___ **11.** Light from a small region of an ordinary incandescent bulb is passed through a yellow filter and then serves as the source for a Young's double-slit experiment. Which of the following changes would cause the interference pattern to be more closely spaced?

**A)** Use slits that are closer together
**B)** Use a light source of lower intensity
**C)** Use a light source of higher intensity
**D)** Use a blue filter instead of a yellow filter
**E)** Move the light source further away from the slits.

___ **12.** In a Young's double-slit experiment, a thin sheet of mica is placed over one of the two slits. As a result, the center of the interference pattern (on the screen) shifts by an amount corresponding to 30 dark bands. The wavelength of the light in this experiment is 480 nm and the index of the mica is 1.60. The mica thickness is:
**A)** 0.090 mm **B)** 0.012 mm **C)** 0.014 mm **D)** 0.024 mm **E)** 0.062 mm

___ **13.** Light from a point source X contains only blue and red components. After passing through a mysterious box, the light falls on a screen. Bright red and blue hands are observed as shown. The box must contain:




**A)** a lens **B)** a mirror **C)** a prism **D)** a double slit **E)** a blue and red filter

___ **14.** In a Young's double-slit experiment the center of a bright fringe occurs wherever waves from the slits differ in phase by a multiple of:
**A)** $\pi/4$ **B)** $\pi/2$ **C)** $\pi$ **D)** $3\pi/4$ **E)** $2\pi$

___ **15.** A "wave front" is a surface of constant:
**A)** phase **B)** frequency **C)** wavelength **D)** amplitude **E)** speed

___ **16.** In a Young's double-slit experiment, light of wavelength 500 nm illuminates two slits that are separated by 1 mm. The separation between adjacent bright fringes on a screen 5 m from the slits is:
**A)** 0.10 cm **B)** 0.25 cm **C)** 0.50 cm **D)** 1.0 cm **E)** none of the above

___ **17.** The phase difference between the two waves that give rise to a dark spot in a Young's double-slit experiment is (where $m$ = integer):
**A)** zero **B)** $2\pi m + \pi/8$ **C)** $2\pi m + \pi/4$ **D)** $2\pi m + \pi/2$ **E)** $2\pi m + \pi$

___ **18.** Waves from two slits are in phase at the slits and travel to a distant screen to produce the second minimum of the interference pattern. The difference in the distance traveled by the waves is:
**A)** half a wavelength
**B)** a wavelength
**C)** three halves of a wavelength
**D)** two wavelengths
**E)** five halves of a wavelength

___ **19.** In a Young's double-slit experiment, the slit separation is doubled. This results in:
**A)** an increase in fringe intensity
**B)** a decrease in fringe intensity
**C)** a halving of the wavelength
**D)** a halving of the fringe spacing
**E)** a doubling of the fringe spacing

___ **20.** In a Young's double-slit experiment, it is essential that the two beams:
**A)** have exactly equal intensity
**B)** be exactly parallel
**C)** travel equal distances
**D)** come originally from the same source
**E)** be composed of a broad band of frequencies

## Answer Key

1. A
   Origin: Chapter 36- Interference, 18
2. D
   Origin: Chapter 36- Interference, 33
3. D
   Origin: Chapter 36- Interference, 22
4. D
   Origin: Chapter 36- Interference, 32
5. B
   Origin: Chapter 36- Interference, 27
6. D
   Origin: Chapter 36- Interference, 14
7. D
   Origin: Chapter 36- Interference, 39
8. E
   Origin: Chapter 36- Interference, 10
9. C
   Origin: Chapter 36- Interference, 8
10. C
    Origin: Chapter 36- Interference, 21
11. D
    Origin: Chapter 36- Interference, 13
12. D
    Origin: Chapter 36- Interference, 24
13. D
    Origin: Chapter 36- Interference, 25
14. E
    Origin: Chapter 36- Interference, 9
15. A
    Origin: Chapter 36- Interference, 1
16. B
    Origin: Chapter 36- Interference, 15
17. E
    Origin: Chapter 36- Interference, 19
18. C
    Origin: Chapter 36- Interference, 11
19. D
    Origin: Chapter 36- Interference, 17
20. D
    Origin: Chapter 36- Interference, 20