Name: _____ **Class:** _____ **Date:** _____ **ID: A**

AP Physics 2 - Ch 24 Practice

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. A laser beam (λ = 694 nm) is incident on two slits 0.100 mm apart. Approximately how far apart (in m) will the bright interference fringes be on the screen 5.00 m from the double slits?
a. 3.47×10^{-3} b. 3.47×10^{-2} c. 3.47×10^{-4} d. 3.47×10^{-6} e. 3.47×10^{-5}

____ 2. Estimate the distance (in cm) between the central bright region and the third dark fringe on a screen 5.00 m from two double slits 0.500 mm apart illuminated by 500-nm light.
a. 3.47 b. 2.15 c. 1.75 d. 1.50 e. 1.25

____ 3. Light is incident on a double-slit. The fourth bright band has an angular distance of 7.0 ° from the central maximum. What is the distance between the slits (in «m)? (The frequency of the light is 5.4×10^{14} Hz.)
a. 27 b. 21 c. 24 d. 18 e. 14

____ 4. Monochromatic light (λ = 500 nm) is incident on a soap bubble (n = 1.40). What is the wavelength of the light (in nm) in the bubble film?
a. 255 b. 500 c. 700 d. 357 e. 422

____ 5. Monochromatic light (λ = 500 nm) is incident on a soap bubble (n = 1.40). How thick is the bubble (in nm) if destructive interference occurs in the reflected light?
a. 102 b. 179 c. 54 d. 1 e. 89

____ 6. The light reflected from a soap bubble (n = 1.40) appears red (λ = 640 nm) at its center. What is the minimum thickness (in nm)?
a. 124 b. 104 c. 114 d. 134 e. 234

____ 7. A thin sheet of plastic (n = 1.60) is inserted between two panes of glass to reduce infrared (λ = 700 nm) losses. What thickness (in nm) is necessary to produce constructive interference in the reflected infrared radiation?
a. 218 b. 109 c. 55 d. 318 e. 443

____ 8. The bright and dark bands you see in a photograph of a double slit interference pattern represent
a. the respective positions of the crests and the troughs of the light wave.
b. an interference pattern that is not present unless it is produced by the camera lens.
c. the respective positions of constructive and destructive interference of light from the two sources.
d. the respective positions of destructive and constructive interference of light from the two sources.
e. the respective positions of bright and dark particles of light.

____ 9. In an interference pattern, the wavelength and frequency are
a. the same in both the regions of constructive interference and the regions of destructive interference.
b. greater in regions of constructive interference than in regions of destructive interference.
c. smaller in regions of constructive interference than in regions of destructive interference.
d. unchanged in regions of destructive interference but greater in regions of constructive interference.
e. unchanged in regions of destructive interference but smaller in regions of constructive interference.

____ 10. A film of index of refraction n_1 coats a surface with index of refraction n_2. When $n_1 > n_2$, the condition for constructive interference for reflected monochromatic light of wavelength λ in air is

a. $t = m\frac{\lambda}{n_1}$. c. $2t = m\frac{\lambda}{n_1}$. e. $4t = m\frac{\lambda}{n_1}$.

b. $t = \left(m + \frac{1}{2}\right)\frac{\lambda}{n_1}$. d. $2t = \left(m + \frac{1}{2}\right)\frac{\lambda}{n_1}$.

____ 11. A film of index of refraction n_1 coats a surface with index of refraction n_2. When $n_1 > n_2$, the condition for destructive interference for reflected monochromatic light of wavelength λ in air is

a. $t = m\frac{\lambda}{n_1}$. c. $2t = m\frac{\lambda}{n_1}$. e. $4t = m\frac{\lambda}{n_1}$.

b. $t = \left(m + \frac{1}{2}\right)\frac{\lambda}{n_1}$. d. $2t = \left(m + \frac{1}{2}\right)\frac{\lambda}{n_1}$.

____ 12. Bright and dark fringes are seen on a screen when light from a single source reaches two narrow slits a short distance apart. The number of fringes per unit length on the screen can be doubled

a. if the distance between the slits is doubled.

b. if the wavelength is changed to $\lambda' = \frac{\lambda}{2}$.

c. if the distance between the slits is quadruple the original distance and the wavelength is changed to $\lambda' = 2\lambda$.

d. if any of the above occurs.

e. only if the width of the slits is changed to $w' = \frac{w}{2}$.

____ 13. Bright and dark fringes are seen on a screen when light from a single source reaches two narrow slits a short distance apart. The number of fringes per unit length on the screen can be halved

a. if the distance between the slits is changed to $d' = \frac{d}{2}$.

b. if the wavelength is changed to $\lambda' = 2\lambda$.

c. if the distance between the slits is $d' = 2d$ the wavelength is changed to $\lambda' = 4\lambda$.

d. if any of the above occurs.

e. only if the width of the slits is changed to $w' = 2w$.

____ 14. Helium-neon laser light ($\lambda = 6.33 \times 10^{-7}$ m) is sent through a 0.30 mm-wide single slit. What is the width of the central maximum on a screen 1.0 m from the slit?

a. 2.0 cm b. 4.2 mm c. 1.1 cm d. 2.0 mm e. 0.70 mm

____ 15. How wide must a narrow slit be if the first diffraction minimum occurs at ±12° with laser light of 633 nm?

a. 3.0×10^{-6} m b. 3.0×10^{-5} m c. 6.1×10^{-6} m d. 6.1×10^{-5} m e. 1.5×10^{-6} m

____ 16. Monochromatic light from a He-Ne laser (λ = 632.8 nm) is incident on a diffraction grating containing 5 000 lines/cm. Determine the angle of the first-order maximum.

a. 18.4° b. 39.2° c. 14.6° d. 27.7° e. 13.9°

____ 17. White light is spread out into spectral hues by a diffraction grating. If the grating has 1 000 lines per cm, at what angle will red light (λ = 640 nm) appear in first order?

a. 14.7° b. 7.35° c. 17.7° d. 3.67° e. 1.84°

AP Physics 2 - Ch 24 Practice
Answer Section

MULTIPLE CHOICE

1. B
2. E
3. D
4. D
5. B
6. C
7. B
8. C
9. A
10. D
11. C
12. D
13. D
14. B
15. A
16. A
17. D