

**AP B Webreview ch 24 diffraction and interference****Multiple Choice**

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

- \_\_\_\_\_ 1. In order to produce a sustained interference pattern by light waves from multiple sources, which of the following conditions must be met?
- sources are coherent
  - sources are monochromatic
  - Both choices above are valid.
  - None of the choices above are valid.
- \_\_\_\_\_ 2. In a Young's double-slit interference apparatus, the distance from the slits to the screen is doubled. The distance between adjacent light and dark fringes changes by a factor of:
- $\frac{1}{4}$ .
  - $\frac{1}{2}$ .
  - 1.
  - 2.
  - 4.
- \_\_\_\_\_ 3. A Young's double-slit apparatus is set up where a screen is positioned 0.80 m from the double slits. If the distance between alternating bright fringes is 0.95 cm and the light source has a wavelength of 580 nm, what is the separation of the double slits? (1 nm =  $10^{-9}$  m)
- $2.8 \times 10^{-5}$  m
  - $4.9 \times 10^{-5}$  m
  - $5.6 \times 10^{-5}$  m
  - $6.0 \times 10^{-5}$  m
  - $7.4 \times 10^{-5}$  m
- \_\_\_\_\_ 4. A Young's double-slit apparatus is set up. The source wavelength is 430 nm and the double-slit spacing is 0.040 mm. At what distance from the double slits should the screen be placed if the spacing between alternating bright fringes is to be 2.4 cm? (1 nm =  $10^{-9}$  m)
- 1.6 m
  - 2.2 m
  - 2.4 m
  - 2.9 m
  - 3.3 m
- \_\_\_\_\_ 5. A light source simultaneously emits light of two wavelengths, 480 nm and 560 nm, respectively. The source is used in a double-slit interference experiment where the slit spacing is a 0.040 mm and the distance between double slits and the screen is 1.2 m. What is the separation between the second-order bright fringes of the two wavelengths as they appear on the screen? (1 nm =  $10^{-9}$  m)
- 0.16 cm
  - 0.32 cm
  - 0.48 cm
  - 0.64 cm
  - 0.80 cm

- \_\_\_\_\_ 6. Two beams of coherent light are shining on the same piece of white paper. With respect to the crests and troughs of such waves, darkness will occur on the paper where:
- the crest from one wave overlaps with the crest from the other.
  - the crest from one wave overlaps with the trough from the other.
  - the troughs from both waves overlap.
  - darkness cannot occur as the two waves are coherent.
  - darkness occurs anyway.
- \_\_\_\_\_ 7. If the 2nd order fringe in Young's double-slit experiment occurs at an angle of  $45.0^\circ$ , what is the relationship between the wavelength  $\lambda$  and the distance between slits,  $d$ ?
- $d = 1.41\lambda$
  - $d = 2.00\lambda$
  - $d = 2.83\lambda$
  - $d = 4.00\lambda$
  - $d = 5.66\lambda$
- \_\_\_\_\_ 8. That light can undergo interference is evidence that it:
- has electric properties.
  - is made of corpuscles.
  - behaves like a wave.
  - has a phase of  $180^\circ$ .
  - behaves like a transversal wave.
- \_\_\_\_\_ 9. In a Young's experiment, the paths from the slits to a point on the screen differ in length causing constructive interference at the point. Which of the following path difference would cause this constructive interference?
- $5\lambda/2$
  - $3\lambda/4$
  - $4\lambda$
  - $7\lambda/4$
  - none of the above
- \_\_\_\_\_ 10. Laser light sent through a double slit produces an interference pattern on a screen 3.00 m from the slits. If the second order maximum occurs at an angle of  $12.0^\circ$ , at what angle does the eighth order maximum occur?
- No eighth order maximum occurs.
  - $48.0^\circ$
  - $56.3^\circ$
  - $70.7^\circ$
  - Not enough information is given.
- \_\_\_\_\_ 11. In a Young's double-slit experiment, how many maxima occur between the 4<sup>th</sup> order maxima?
- 6
  - 7
  - 8
  - 9
  - Three more than the number of minima.

- \_\_\_\_\_ 12. The blue tint of a coated camera lens is largely caused by what effects?
- diffraction
  - refraction
  - polarization
  - interference
  - absorption
- \_\_\_\_\_ 13. The dark spot observed in the center of a Newton's rings pattern is attributed to which of the following?
- polarization of light when reflected
  - polarization of light when refracted
  - phase shift of light when reflected
  - phase shift of light when refracted
  - None of the above
- \_\_\_\_\_ 14. What wavelength monochromatic source in the visible region (390 to 710 nm) can be used to constructively reflect off a soap film ( $n = 1.46$ ) if the film is 77 nm thick?
- 409 nm
  - 430 nm
  - 450 nm
  - 558 nm
  - 627 nm
- \_\_\_\_\_ 15. A silicon monoxide ( $n = 1.45$ ) film of 100 nm thickness is used to coat a glass camera lens ( $n = 1.56$ ). What wavelength of light in the visible region (390 to 710 nm) will be most efficiently transmitted by this system? ( $1 \text{ nm} = 10^{-9} \text{ m}$ )
- 400 nm
  - 492 nm
  - 624 nm
  - 580 nm
  - 505 nm
- \_\_\_\_\_ 16. A silicon monoxide ( $n = 1.45$ ) film of 270 nm thickness is used to coat a glass camera lens ( $n = 1.56$ ). What wavelength of light in the visible region (390 to 710 nm) will be most efficiently transmitted by this system? ( $1 \text{ nm} = 10^{-9} \text{ m}$ )
- 409 nm
  - 492 nm
  - 522 nm
  - 638 nm
  - 700 nm
- \_\_\_\_\_ 17. A beam of light of wavelength 650 nm is incident along the normal to two closely spaced parallel glass plates. For what air gap separation between the plates will the transmitted beam be of maximum intensity? ( $1 \text{ nm} = 10^{-9} \text{ m}$ )
- 81 nm
  - 163 nm
  - 325 nm
  - 488 nm
  - 650 nm

- \_\_\_\_\_ 18. When light shines on a lens placed on a flat piece of glass, interference occurs which causes circular fringes called Newton's rings. The two beams that are interfering come:
- from the top and bottom surface of the lens.
  - from the top surface of the lens and the top surface of the piece of glass.
  - from the bottom surface of the lens and the top surface of the piece of glass.
  - from the top and bottom surface of the flat piece of glass.
  - from the top surface of the lens and the bottom surface of the piece of glass.
- \_\_\_\_\_ 19. A soap bubble ( $n = 1.35$ ) is floating in air. If the thickness of the bubble wall is 300 nm, which of the following wavelengths of visible light is strongly reflected?
- 620 nm (red)
  - 580 nm (yellow)
  - 540 nm (green)
  - 500 nm (blue)
  - 400 nm (violet)
- \_\_\_\_\_ 20. Two thin layers of material with different indices of refraction are coated on a glass plate. The outer first material has  $n_1 = 1.404$ , the inner second material has  $n_2 = 1.531$ , and the glass has  $n_{\text{glass}} = 1.62$ . If light is incident from air on the first layer, what is the phase change for light that reflects from the glass?
- $0^\circ$
  - $180^\circ$
  - $360^\circ$
  - $540^\circ$
  - $630^\circ$
- \_\_\_\_\_ 21. A Fraunhofer diffraction pattern is created by monochromatic light shining through which of the following?
- single slit
  - double slit
  - triple slit
  - more than 3 slits
  - any number of slits

**AP B Webreview ch 24 diffraction and interference  
Answer Section**

**MULTIPLE CHOICE**

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