Phys.12-Q3W3-interference and diffraction-Test

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

____ 1. If light waves are coherent,
a. they remain in phase.
b. their intensity is less than that of incoherent light.
c. they have less than three different wavelengths.
d. they shift over time.

____ 2. In a double-slit interference experiment, a wave from one slit arrives at a point on a screen one-half wavelength behind the wave from the other slit. What is observed at that point?
a. dark fringe
b. gray fringe, neither dark nor bright
c. bright fringe
d. multicolored fringe

____ 3. In a double-slit interference experiment, a wave from one slit arrives at a point on a screen one wavelength behind the wave from the other slit. What is observed at that point?
a. dark fringe
b. gray fringe, neither dark nor bright
c. multicolored fringe
d. bright fringe

____ 4. Monochromatic light shines on the surface of a diffraction grating with 5.3×10^3 lines/cm. The first-order maximum is observed at an angle of 17°. Find the wavelength.
a. 520 nm
b. 420 nm
c. 530 nm
d. 550 nm

____ 5. Which of the following is a device that produces an intense, nearly parallel beam of coherent light?
a. spectroscope
b. diffraction grating
c. telescope
d. laser

____ 6. The distance between the two slits in a double-slit interference experiment is 0.040 mm. The second-order bright fringe ($m = 2$) is measured on a screen at an angle of 2.2° from the central maximum. What is the wavelength of the light?
a. 560 nm
b. 630 nm
c. 750 nm
d. 770 nm

____ 7. Monochromatic light ($\lambda = 632.8$ nm) from a helium-neon laser shines at a right angle onto the surface of a diffraction grating that contains 531 001 lines/m. Find the angles at which one would observe the first-order and second-order maxima.
a. $\theta_1 = 19.63°$; $\theta_2 = 39.26°$
b. $\theta_1 = 19.63°$; $\theta_2 = 42.20°$
c. $\theta_1 = 21.10°$; $\theta_2 = 42.20°$
d. $\theta_1 = 33.60°$; $\theta_2 = 67.20°$

____ 8. Coherence is the property by which two waves with identical wavelengths maintain a constant
a. frequency.
b. phase relationship.
c. amplitude.
d. speed.

____ 9. The acronym *laser* stands for light amplification by ____ emission of radiation.
a. simultaneous
b. stimulated
c. spontaneous
d. similar

____ 10. Which of the following is the process of using a light wave to produce more waves with properties identical to those of the first wave?
a. active medium
b. hologram
c. bandwidth
d. stimulated emission

____ 11. Monochromatic light shines on the surface of a diffraction grating with 5.0×10^3 lines/cm. The first-order maximum is observed at an angle of 20.0°. Find the wavelength.
a. 520 nm
b. 480 nm
c. 680 nm
d. 360 nm

____ 12. At the first dark band in a single-slit diffraction pattern, the path lengths of selected pairs of wavelets differ by
a. one wavelength.
b. one-half wavelength.
c. more than one wavelength.
d. less than half of one wavelength.

____ 13. The angle between the first-order maximum and the central maximum for monochromatic light of 2300 nm is 27°. Calculate the number of lines per centimeter on this grating.
a. 2500 lines/cm
b. 1600 lines/cm
c. 2000 lines/cm
d. 4500 lines/cm

____ 14. A laser can be used
a. to measure distance.
b. to treat glaucoma.
c. to read bar codes.
d. All of the above

____ 15. If two lightbulbs are placed side by side, no interference is observed because
a. incandescent light is coherent.
b. each bulb produces only one wavelength of light.
c. incandescent light is incoherent.
d. each bulb produces many wavelengths of light.

____ 16. The distance between two slits in a double-slit interference experiment is 2.9×10^{-6} m. The first-order bright fringe is measured on a screen at an angle of 12° from the central maximum. What is the wavelength of the light?
a. 6.0×10^2 nm
b. 4.6×10^2 nm
c. 3.0×10^2 nm
d. 1.2×10^2 nm

____ 17. In a double-slit interference pattern, the path length from one slit to the first bright fringe of a double-slit interference pattern is longer than the path length from the other slit to the fringe by
a. one-quarter of a wavelength.
b. one full wavelength.
c. one-half of a wavelength.
d. three-quarters of a wavelength.

____ 18. In a laser, all of the following forms of energy can be converted into coherent light *except*
a. nuclear energy.
b. electrical energy.
c. chemical energy.
d. light.

____ 19. To produce a sustained interference pattern by light waves from multiple sources, which condition or conditions must be met?
a. Sources must be neither coherent nor monochromatic.
b. Sources must be monochromatic.
c. Sources must be coherent and monochromatic.
d. Sources must be coherent.

____ 20. In a laser, energy is added to a(n)
a. active medium.
b. light wave.
c. mirror.
d. partially transparent mirror.

____ 21. For high resolution in optical instruments, the angle between resolved objects should be
a. 1.22°.
b. as small as possible.
c. 45°.
d. as large as possible.

____ 22. In a double-slit interference pattern, the path length from one slit to the first dark fringe of a double-slit interference pattern is longer than the path length from the other slit to the fringe by
a. one full wavelength.
b. one-half of a wavelength.
c. one-quarter of a wavelength.
d. three-quarters of a wavelength.

____ 23. Two beams of coherent light are shining on the same sheet of white paper. When referring to the crests and troughs of such waves, where will darkness appear on the paper?
a. Darkness cannot occur because the two waves are coherent.
b. where the troughs from both waves overlap
c. where the crest from one wave overlaps the crest from the other
d. where the crest from one wave overlaps the trough from the other

____ 24. Light with a wavelength of 400.0 nm passes through a 1.00×10^{4} lines/cm diffraction grating. What is the second-order angle of diffraction?
a. 53.1°
b. 72.1°
c. 56.5°
d. 21.3°

____ 25. Interference effects observed in the early 19th century were instrumental in supporting a concept of the existence of which property of light?
a. wave nature
b. particle nature
c. electromagnetic character
d. polarization

==========