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Continuing Education Course #021
Displacement Measuring Interferometry
Precision Measurement

1. The velocity of light is related to its wavelength using the:
 - a. constant speed of light
 - b. index of refraction
 - c. wave number
 - d. polarization state.

2. The velocity of light in air is _____ the velocity of light in vacuum.
 - a. the same as
 - b. more than
 - c. less than
 - d. exactly twice.

3. The wavelength range of the visible spectrum of light is approximately between _____ nm.
 - a. 0.5 and 17.5
 - b. 70 and 240
 - c. 380 and 770
 - d. 7500 and 9400.

4. The behavior of light is best described using:
 - a. wave theory
 - b. particle theory
 - c. both a. and b.
 - d. neither a. or b.

5. A single frequency light source is referred to as:
 - a. polarized
 - b. tuned
 - c. monochromatic
 - d. a reflector.

6. The incident and reflected angles for light that is reflected from a planar surface are:
 - a. equal
 - b. unequal
 - c. dependent on the light wavelength
 - d. none of the above.

7. The polarization of a light wave is defined as the direction of the _____ field vector.
 - a. magnetic
 - b. electric

- c. wavelength
 - d. circular.
8. Sunlight is:
- a. linearly polarized
 - b. unpolarized
 - c. right circularly polarized
 - d. left circularly polarized.
9. Polarized light can be produced using:
- a. a polarizing filter
 - b. reflection
 - c. scattering
 - d. all of these.
10. Quality sunglass lenses are made from a _____ material in order to reduce glare.
- a. high strength
 - b. dichroic
 - c. birefringent
 - d. reflective.
11. A quarter wave plate is an example of a _____ optical element.
- a. dichroic
 - b. refractive
 - c. reflective
 - d. birefringent.
12. Interference of light was demonstrated in 1802 by Thomas Young using:
- a. a partially reflective mirror
 - b. a slit screen and monochromatic source
 - c. a rotating sphere
 - d. the first camera.
13. Diffraction is the:
- a. bending of light waves
 - b. polarization state of light
 - c. wavelength of light
 - d. all of the above.
14. In Michelson's 1881 interferometer, a relative displacement of _____ produced a light-dark-light transition for the interfered waves.
- a. one-quarter of the source wavelength
 - b. one-half of the source wavelength
 - c. the source wavelength
 - d. two times the source wavelength.
15. A common variation of the Michelson interferometer is the:
- a. Twyman-Green interferometer
 - b. optical telescope
 - c. Young optical slit
 - d. none of the above.

16. Homodyne interferometry relies on:

- a. one source wavelength
- b. two source wavelengths
- c. polarizing optics
- d. the Mach-Zehner configuration.

17. Heterodyne interferometry relies on:

- a. one source wavelength
- b. two source wavelengths
- c. non-polarizing optics
- d. the Twyman-Green configuration.

18. The light source in most heterodyne interferometers is a frequency-stabilized _____ laser tube:

- a. Ga-As
- b. H-O
- c. He-Ne
- d. Au-C.

19. In heterodyne interferometry, the displacement information is carried in the _____ of the interfered signals rather than the _____:

- a. phase, amplitude
- b. amplitude, phase
- c. polarization, amplitude
- d. none of the above.

20. The second frequency in heterodyne interferometers is typically produced using:

- a. an acousto-optic modulator
- b. Zeeman split (magnetic field)
- c. both a. and b.
- d. neither a. or b.

21. The two frequencies in a heterodyne interferometer typically have _____ polarizations:

- a. perpendicular linear
- b. parallel linear
- c. perpendicular circular
- d. parallel circular.

22. A polarizing beam splitter is used to _____ the two frequencies in a heterodyne interferometer:

- a. circularly polarize
- b. normalize
- c. Doppler shift
- d. separate and combine.

23. The acronym SMPM refers to a _____ fiber:

- a. single mode polarization-maintaining
- b. single mirror polarization mode
- c. sum of many polarizations and modes
- d. sum of multiple prisms and mirrors.

24. The index of the cladding in a fiber optic is _____ the index of the core:

- a. lower than
 - b. high than
 - c. equal to
 - d. unrelated to.
25. The value of the refractive index of materials depends on the _____ of the propagating light.
- a. electric field strength
 - b. magnetic field strength
 - c. wavelength
 - d. all of the above.
26. A fiber's numerical aperture (NA) is a measure of the _____ capability of the fiber.
- a. polarizing
 - b. frequency shifting
 - c. refracting
 - d. light gathering.
27. Transmission losses for the propagation of light by fiber optics are caused by:
- a. underfilling
 - b. overfilling
 - c. both a. and b.
 - d. neither a. or b.
28. Fibers with smaller diameters tend to support _____ propagating modes.
- a. more
 - b. fewer
 - c. no
 - d. infinite.
29. Single mode fibers require a normalized wavenumber that is _____ 2.405:
- a. less than
 - b. more than
 - c. at least 10 times
 - d. at least 100 times.
30. The interference signal produced by a displacement measuring interferometer is often carried to the phase measuring electronics using a _____ fiber:
- a. single mode polarization-maintaining
 - b. single mode
 - c. multi-mode
 - d. low NA.

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