1. Monochromatic light shines on a pair of microscope slides forming a narrow wedge. Considering reflections only from the inner surfaces A and B, a top view of the slides looks like:

   A. pattern I
   B. pattern II

2. Monochromatic light shines on two slides forming a narrow wedge. The top slide has index of 1.5, the bottom 1.7, and the oil between them 1.6. Considering reflections only from surfaces A and B, a top view of the slides looks like:

   A. pattern I
3. Monochromatic light shines on a pair of microscope slides forming a narrow wedge. The bottom slide is rotated so that the wedge angle gets smaller. What happens to the fringes?

* A. They get farther apart from one another.

B. They get closer together.

C. They don't change.

4. Monochromatic light shines on a pair of parallel microscope slides forming a narrow gap. As the top slide is moved slowly away from the lower slide, what do you see in reflection?

A. all dark

B. all bright

C. a set of fringes

* D. sequentially all dark and all bright

E. none of the above

5. Diffraction occurs when light passes:
6. Why don't the wavelets spreading out from the leading edge of a laser beam cause light to diffract outward to point P even in the absence of a slit?

* A. Because those wavelets interfere destructively.

B. They do, and so there is lots of light at P.

C. Huygens principle only applies to slits.

7. The center of the shadow of a disk held in a laser beam is:
8. The observed diffraction pattern is due to a slit that is:

* A. a bright spot

B. the darkest part of the shadow

C. just as dark as the rest of the shadow
9. Suppose each slit in Young's experiment is covered with a polarizer, one vertical and one horizontal. What do we now see on the screen?

A. The same fringe pattern.
B. The fringe pattern with the maxima and minima interchanged.
C. Complete darkness.
* D. A fairly uniformly gray, elongated spot.

10. Yellow light shining on a diffraction grating produces three spots at -45, 0, and +45 degrees. If you now add red light of equal intensity to the incident beam, you will see:
A. the same pattern as before

B. orange spots at -45, 0, and +45 degrees

* C. an orange spot at 0, yellow spots at +/- 45, and red spots at slightly larger angles

D. an orange spot at 0, yellow spots at +/- 45, and red spots at slightly smaller angles

What will you see on the screen?

A. Two bright spots.

B. Only one spot, at the center.

C. Many random spots.

* D. Many evenly spaced spots.
12. What happens if a glass slide is put in front of one of the slits?

A. The interference pattern vanishes.
B. The bright spots lie closer together.
C. The bright spots lie farther apart.
D. There is no change in the pattern.
* E. The pattern shifts vertically without change in spacing.

13. Blue light passes through a single slit to make a diffraction pattern. If we replace the blue light with red light of double the wavelength, we can restore the pattern by changing the slit width to:

A. a/4
B. a/2
C. leaving it unchanged
* D. 2a
E. 4a
14. The 1st-order max is formed when light from the top third of the slit cancels that from the middle third. Thus its intensity is only due to light from the bottom third of the slit and is 1/9th that of the central max. What is the fractional intensity of the 2nd order max?

A. 1/4
B. 1/9
C. 1/16
*D. 1/25

15. Two crossed polarizers transmit no light. If a third polarizer is inserted with its axis midway between that of the other two, what fraction of the incident unpolarized light now gets transmitted?
16. When a third polarizer at $45^\circ$ is inserted, some light is transmitted. If instead of a single polarizer at $45^\circ$, we insert a large number $N$ of polarizers each rotated by $90^\circ/N$ compared to the previous one, how much light gets through?

A. 0

* B. $1/8$

C. $1/4$

D. $1/2$

E. $1/\sqrt{2}$
17. Which color light gives the best resolution in a microscope?

A. yellow
B. red
* C. blue
D. green
E. All give the same resolution.
18. Suppose rays 1 and 2 are in phase for light of wavelength \( \lambda \) incident on a slab of index \( n \). The two rays will be out of phase if the film thickness is increased by

A. \( \lambda \)
B. \( \lambda/n \)
C. \( \lambda/4 \)
* D. \( \lambda/4n \)
E. \( \lambda/2n \)

19. Unpolarized light is incident on a single polarizer. How much of the light passes through it?

A. all of it
* B. half of it
C. a quarter of it
D. none of it
20. Which of the following has nothing to do with polarization?

A. Polaroid sunglasses
B. an incandescent light bulb
C. atmospheric scattering
D. reflection from the surface of a lake
E. reception of a radio signal

21. What is the orientation of the pass axis of Polaroid sunglasses to reduce glare off horizontal surfaces such as snow or water?

A. vertical
B. horizontal

22. What is the direction of polarization of sky light seen by an observer looking at the zenith of the sky at sunset?

A. east-west
B. up-down
C. north-south
D. The sky light is not polarized.
23. What kinds of waves exhibit interference?

A. light waves
B. sound waves
C. water waves
D. exactly two of the above
* E. all three of the above

24. A steady interference pattern is only observed for two sources having:

A. different frequencies and a phase difference that could be variable
B. the same frequency but a phase difference that could be variable
C. different frequencies and a constant phase difference
* D. the same frequency and a constant phase difference

25. The bending of light around an obstacle is called:

A. interference
B. resolution
* C. diffraction
D. coherence

26. Light incident on a slit is not significantly diffracted. We conclude that the wavelength of
the light is:

* A. much smaller than the slit width
B. much bigger than the slit width
C. comparable to the slit width
D. We cannot conclude anything about the slit width.

27. A telescope will be able to resolve two stars if which of the following conditions is met?

A. the Fraunhofer approximation
B. the Huygen-Fresnel principle
C. the paraxial approximation
* D. the Rayleigh criterion