Test 4: Example #1

1. All holograms must be viewed by light coming from a monochromatic source.
   * (a) False
   (b) True

2. In making a hologram, one must be sure that the difference in length of the reference and object beams does not exceed the coherence length of the laser.
   * (a) True
   (b) False

3. Under no circumstances can you see a rainbow consisting of more than one-half of a circle.
   * (a) False
   (b) True

4. Mirages may be either “inferior” or “superior”, depending on whether the layer of air close to the earth's surface is warmer or cooler than the air above it.
   * (a) True
   (b) False

5. Refer to previous problem: The refractive index of air varies slightly with temperature. For warmer air, the refractive index is somewhat
   * (a) smaller
   (b) larger

6. The halos seen around the moon are due to the reflection and refraction of light from the moon by ice crystals.
   * (a) True
   (b) False

7. In the secondary rainbow, red is at the top, and blue is at the bottom.
   * (a) False
   (b) True
8. The best time to observe a rainbow in this latitude is at noon on a rainy summer day.
   * (a) False
   (b) True

9. Light reflected off a smooth water surface is circularly polarized.
   * (a) False
   (b) True

10. Holograms are possible only because the light beam from a laser is
    * (a) coherent
    (b) polarized
    (c) unpolarized
    (d) parallel
    (e) very intense

11. All but one of the following concepts are necessary for the production of holograms. Which one is NOT necessary?
    * (a) Total internal reflection
    (b) Monochromatic light
    (c) Coherence
    (d) Reflection
    (e) Metastable state of an atom

12. Consider a hologram of a map, which was made with the map one foot from the photographic plate. Suppose that the center part of the hologram is scratched and torn. When the hologram is viewed in laser light it will be found that
    * (a) the entire map can still be seen, but only from the perspective at the edge of the hologram, not the center.
    (b) the entire holographic pattern has been destroyed, and nothing can be seen.
    (c) the center portion of the map will not be visible, but the remainder can still be seen.

13. It is possible to produce holograms using sound waves. This implies that
    * (a) coherent sound waves can be produced.
    (b) sound waves invert upon reflection.
    (c) sound waves can be polarized.
    (d) sound waves can be refracted.
    (e) none of these
14. A very thin film of oil floating on water can take on many different colors. The colors you see depend mostly on
   (a) the color of the water.
   (b) the thickness of the oil film.
   (c) the intrinsic color of the oil.
   (d) dirt particles in the oil.
   (e) the color of the material beneath the water.

15. There is no atmosphere on the moon. Therefore, to an astronaut on the moon the sky appears (when he is not looking directly at the sun):
   (a) black.
   (b) white.
   (c) blue.
   (d) violet.
   (e) red.

16. The clear sky is blue because
   (a) the scattering of light is more efficient for shorter wavelengths.
   (b) the scattering of light is more efficient for longer wavelengths.
   (c) the lens of the eye is blue.
   (d) air molecules are blue.
   (e) of an optical illusion: it isn't really blue.

17. A rainbow is produced in raindrops by
   (a) refraction and internal reflection.
   (b) a focusing effect in which the raindrop acts like a converging lens.
   (c) additive color mixing.
   (d) selective absorption.
   (e) none of these

18. The colors seen in soap bubbles result from
   (a) interference.
   (b) reflection.
   (c) refraction.
   (d) polarization.
   (e) soap pigmentation.
19. The sun appears red at sunset because
*  (a) the long wavelengths are transmitted better than the short ones.
   (b) the long wavelengths are scattered more than the short ones.
   (c) the short wavelengths are transmitted better than the long ones.
   (d) short wavelengths are refracted more than the long ones.
   (e) none of the above

20. The semitransparent coating seen in reflection on many camera lenses is there to
*  (a) reduce reflection from the lens surfaces.
   (b) correct for spherical aberration.
   (c) correct for chromatic aberration.
   (d) polarize the light incident on the lens.
   (e) none of these

21. When a source of light is observed through two pieces of polaroid, it is possible to change
   from maximum absorption to minimum absorption by rotating one polaroid
*  (a) a quarter turn.
   (b) an eighth turn.
   (c) a half turn.
   (d) a whole turn (360 degrees).
   (e) none of these

22. The colors seen in a soap bubble are most closely related, by a physical principle, to
*  (a) the effects of a diffraction grating.
   (b) the colors in a rainbow.
   (c) the blue sky.
   (d) a red laser.
   (e) polarization.