**8.** What steps should you employ to design a telescope with a high degree of resolution?

    F. Widen the aperture, or design the telescope to detect light of short wavelength.

    G. Narrow the aperture, or design the telescope to detect light of short wavelength.

    H. Widen the aperture, or design the telescope to detect light of long wavelength.

    J. Narrow the aperture, or design the telescope to detect light of long wavelength.

9. What is the property of a laser called that causes coherent light to be emitted?

    A. different intensities

    B. light amplification

    C. monochromaticity

    D. stimulated emission

10. Which of the following is *not* an essential component of a laser?

    F. a partially transparent mirror

    G. a fully reflecting mirror

    H. a converging lens

    J. an active medium

SHORT RESPONSE

11. Why is laser light useful for the purposes of making astronomical measurements and surveying?

12. A diffraction grating used in a spectrometer causes the third-order maximum of blue light with a wavelength of 490 nm to form at an angle of 6.33° from the central maximum ($m = 0$). What is the ruling of the grating in lines/cm?

13. Telescopes that orbit Earth provide better images of distant objects because orbiting telescopes are more able to operate near their theoretical resolution than telescopes on Earth. The orbiting telescopes needed to provide high resolution in the visible part of the spectrum are much larger than the orbiting telescopes that provide similar images in the ultraviolet and X-ray portion of the spectrum. Explain why the sizes must vary.

EXTENDED RESPONSE

14. Radio signals often reflect from objects and recombine at a distance. Suppose you are moving in a direction perpendicular to a radio signal source and its reflected signal. How would interference between these two signals sound on a radio receiver?
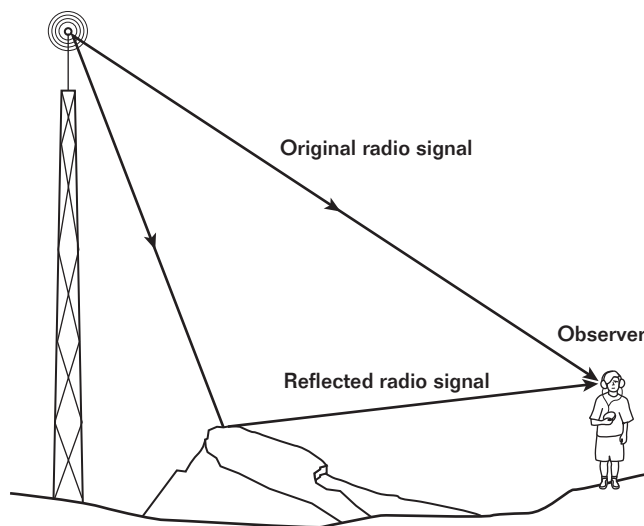
Base your answers to questions 15–17 on the information below. In each problem, show all of your work.

A double-slit apparatus for demonstrating interference is constructed so that the slits are separated by 15.0 μm. A first-order fringe for constructive interference appears at an angle of 2.25° from the zeroth-order (central) fringe.

15. What is the wavelength of the light?

16. At what angle would the third-order ($m = 3$) bright fringe appear?

17. At what angle would the third-order ($m = 3$) dark fringe appear?

Test *TIP* Be sure that angles in all calculations involving trigonometric functions are computed in the proper units (degrees or radians).