CHAPTER 13 Review

CHARACTERISTICS OF LIGHT

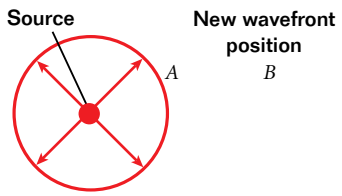
Review Questions

1. Which band of the electromagnetic spectrum has
   - **a.** the lowest frequency?
   - **b.** the shortest wavelength?

2. Which of the following electromagnetic waves has the highest frequency?
   - **a.** radio
   - **b.** ultraviolet radiation
   - **c.** blue light
   - **d.** infrared radiation

3. Why can light be used to measure distances accurately? What must be known in order to make distance measurements?

4. For the diagram below, use Huygens' principle to show what the wave front at point *A* will look like at point *B*. How would you represent this wave front in the ray approximation?



5. What is the relationship between the actual brightness of a light source and its apparent brightness from where you see it?

Conceptual Questions

6. Suppose an intelligent society capable of receiving and transmitting radio signals lives on a planet orbiting Procyon, a star 95 light-years away from Earth. If a signal were sent toward Procyon in 1999, what is the earliest year that Earth could expect to receive a return message? (Hint: A light-year is the distance a ray of light travels in one year.)

7. How fast do X rays travel in a vacuum?

8. Why do astronomers observing distant galaxies talk about looking backward in time?

9. Do the brightest stars that you see in the night sky necessarily give off more light than dimmer stars? Explain your answer.

Practice Problems

For problems 10–13, see Sample Problem A.

10. The compound eyes of bees and other insects are highly sensitive to light in the ultraviolet portion of the spectrum, particularly light with frequencies between 7.5×10^{14} Hz and 1.0×10^{15} Hz. To what wavelengths do these frequencies correspond?

11. The brightest light detected from the star Antares has a frequency of about 3×10^{14} Hz. What is the wavelength of this light?

12. What is the wavelength for an FM radio signal if the number on the dial reads 99.5 MHz?

13. What is the wavelength of a radar signal that has a frequency of 33 GHz?

FLAT MIRRORS

Review Questions

14. For each of the objects listed below, identify whether light is reflected diffusely or specularly.
   - **a.** a concrete driveway
   - **b.** an undisturbed pond
   - **c.** a polished silver tray
   - **d.** a sheet of paper
   - **e.** a mercury column in a thermometer