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HW 7.1 Light

1. Identify which portions of the electromagnetic spectrum are used in each of the following devices:

   microwave oven

   television set

   disposable 35 mm camera

2. If an electromagnetic wave has a frequency of 7.57 E 14 Hz, what is its wavelength? To what part of the spectrum does it belong?

3. Galileo performed an experiment to measure the speed of light by timing how long it took light to travel from a lamp he was holding to an assistant about 1.5 km away and back again. Why was Galileo unable to conclude that light had a finite speed?

4. Which portion of the electromagnetic spectrum has the lowest frequency? The shortest wavelength?

5. Which of the following waves has the highest frequency?

   radio UV blue light IR

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

7. Suppose an intelligent society capable of receiving and transmitting radio signals lives on a planet orbiting Procyon, a star 95 light-years away from the earth. If a signal were sent toward Procyon in 1999, what is the earliest year that Earth could expect to receive a return message?

8. How fast do X-rays travel in a vacuum?

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

10. The compound eyes of bees and other insects are highly sensitive to light in the UV portion of the spectrum, particularly light with frequencies between 7.5 E 14 Hz and 1 E 15 Hz. To what wavelengths do these frequencies correspond?

11. The brightest light detected from the star Antares has a frequency of about 3 E 14 Hz. What is the wavelength of this light?

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

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Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. Light reflected from a lake surface is polarized
a. vertically b. randomly c. in all directions d. horizontally

____ 2. Although visible light does strike your skin cells it doesn't cause cancer like UV light. This is because
a. visible light has a shorter wavelengths than UV
b. your cells are really used to UV light
c. visible light is lower energy light than UV
d. you can't see UV light

____ 3. Which color light carries the most energy?
a. yellow b. red c. orange d. blue

____ 4. Which of these electromagnetic waves has the shortest wavelength?
a. radio waves c. infrared waves
b. x-rays d. ultraviolet waves

____ 5. If two pairs of polarized sunglasses are held at right angles to each other, the light transmitted is
a. half as much as usual c. twice as much as usual
b. totally blocked d. the same amount as usual

____ 6. Which of the following is a result of light being diffracted?
a. rainbows seen through a grating c. our reflection in a mirror
b. fluorescent materials d. infra red and UV rays

____ 7. When red light is compared with violet light
a. both have the same frequency
b. both have the same wavelength
c. both travel the same speed
d. red light travels faster than violet light

____ 8. Refraction is the term for the bending of a wave disturbance as it passes at an angle from one ____ into another.
a. glass b. medium c. area d. boundary

____ 9. Constructive interference occurs when
a. the crest of one wave meets the trough of another
b. the crests of two waves overlap
c. two waves of the same color overlap
d. two waves have the same amplitude

____ 10. A diffraction grating consists of _____.
a. a criss-cross of narrow slits c. two closely spaced parallel slits
b. many closely spaced parallel slits d. a single narrow slit

____ 11. Electromagnetic waves transport
a. wavelength b. frequency c. energy d. charge