Chapter 26

Properties of Light

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a. electromagnetic waves.
b. ultrasonic waves.
c. infrasonic waves.
d. electron vibrations.

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Which of these does NOT belong in the family of electromagnetic waves?

a. Light
b. Sound
c. Radio waves
d. X-rays

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The source of electromagnetic waves is vibrating

a. electrons.
b. atoms.
c. molecules.
d. energy fields.

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Comment: It may be said that light is transmitted by vibrating energy fields, but the source of these is vibrating electric charges—most commonly, electrons.

The electromagnetic spectrum is a span of electromagnetic waves ranging from very low to very high frequencies. Which of the following occupies the smallest percentage of the electromagnetic spectrum?

a. Radio waves
b. Microwaves
c. Visible light
d. Gamma rays

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Which of these waves has a higher frequency than visible light?

a. Radio wave
b. Microwave
c. Infrared wave
d. Ultraviolet wave

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c. Visible light
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a. Radio waves
b. Microwaves
c. Visible light
d. Gamma rays

Comment: Figure 26.3 confirms this.

The frequency of a vibrating electron that emits violet light is about

a. the same as the frequency that emits other colors of light.
b. half the frequency of one that emits red light.
c. twice the frequency of one that emits red light.
d. 4 times the frequency of one that emits red light.

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a. the same as the frequency that emits other colors of light.
b. half the frequency of one that emits red light.
c. twice the frequency of one that emits red light.
d. 4 times the frequency of one that emits red light.

Comment: Figure 26.4 confirms this.

Electrons in the atoms that make up glass have a natural frequency in the

a. microwave part of the spectrum.
b. infrared part of the spectrum.
c. visible part of the spectrum.
d. ultraviolet part of the spectrum.

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Visible light that shines on a pane of transparent glass

a. produces a chain of absorptions and re-emissions through the glass.
b. turns to thermal energy for only a short time.
c. turns entirely to thermal energy.
d. is mostly reflected.

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Strictly speaking, the light that shines on glass is

a. the very same light that travels through and exits the other side.
b. not the same light that travels through and exits the other side.
c. absorbed and transformed to internal energy.
d. reflected.

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Explanation: Figure 26.7 illustrates this nicely. The light that leaves is not the same light that begins the process of absorption and re-emission.

The slowing of light in transparent materials has to do with

a. the time for absorption and re-emission of light.
b. the density of materials.
c. different frequency ranges in materials.
d. the fundamental difference between light and sound.

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Light that does not pass freely through opaque materials is

a. converted to internal energy in the material.
b. mainly reflected.
c. mainly refracted.
d. transmitted at a lower frequency.

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The type of waves that are absorbed by glass are

a. infrared but not ultraviolet.
b. ultraviolet but not infrared.
c. both infrared and ultraviolet.
d. neither infrared nor ultraviolet.

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The color of light that best passes through violet glass is

a. red.
b. green.
c. blue.
d. violet.

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b. green.
c. blue.
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Comment: If you got this wrong, you may be overly cautious!

The sharper shadow is cast by a small light source that is

a. near the object.
b. far from the object.
c. Either of these.
d. None of these.

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When the shadow of the Moon falls on Earth we have a

a. lunar eclipse.
b. solar eclipse.
c. solar eclipse if it's daytime and lunar eclipse if it's nighttime.
d. very dangerous event.

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Comment: Although viewing an eclipse is no more dangerous than viewing the Sun high in the sky at any other time, great nonsense is attributed to eclipses. In some societies, people hide from the Sun for days in fear of drastic consequences. Boo for ignorance and hooray for knowledge!

The type of eclipse in view of most people on Earth is a

a. solar eclipse.
b. lunar eclipse.
c. Both about as often.
d. Varies with the year.

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Explanation: All viewers on the nighttime side of Earth can view the same lunar eclipse, while only those in the relatively small shadow of the Moon can view a solar eclipse.

Total solar eclipses would not be possible if the Sun were appreciably

a. larger.
b. closer.
c. Both of these.
d. None of the above.

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d. None of the above.

Explanation: If the Sun were closer or larger, it would be bigger in the sky than the Moon. Then the Moon wouldn't be able to cover it and there'd be no total eclipse. If on the other hand, the Sun were smaller in the sky than the Moon, solar eclipses would be longer in duration.

The retina of the human eye

a. is composed of rod and cone-shaped receptors.
b. is sensitive to far peripheral objects only if they move.
c. does some “thinking” before passing information to the brain.
d. All of these.

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The main reason we aren't ordinarily aware of our "blind spot" is that

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b. we depend more on our other senses anyway.
c. the rods and cones fill them in.
d. we've adjusted nicely to maladjustment.

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