Concept Items

15.1 The Electromagnetic Spectrum 1.

Use the concepts on which Maxwell's equations are based to explain why a compass needle is deflected when the compass is brought near a wire that is carrying an electric current.

a. The charges in the compass needle and the charges in the electric current have interacting electric fields, causing the needle to deflect.
b. The electric field from the moving charges in the current interacts with the magnetic field of the compass needle, causing the needle to deflect.
c. The magnetic field from the moving charges in the current interacts with the electric field of the compass needle, causing the needle to deflect.
d. The moving charges in the current produce a magnetic field that interacts with the compass needle's magnetic field, causing the needle to deflect.

2.

Consider these colors of light: yellow, blue, and red. Part A. Put these light waves in order according to wavelength, from shortest wavelength to longest wavelength. Part B. Put these light waves in order according to frequency, from lowest frequency to highest frequency.

a. wavelength: blue, yellow, red
frequency: blue, yellow, red
b. wavelength: red, yellow, blue
frequency: red, yellow, blue
c. wavelength: red, yellow, blue
frequency: blue, yellow, red
d. wavelength: blue, yellow, red
frequency: red, yellow, blue

3.

Describe the location of gamma rays on the electromagnetic spectrum.

a. At the high-frequency and long-wavelength end of the spectrum
b. At the high-frequency and short-wavelength end of the spectrum
c. At the low-frequency and long-wavelength end of the spectrum
d. At the low-frequency and short-wavelength end of the spectrum

4.

In which region of the electromagnetic spectrum would you find radiation that is invisible to the human eye and has low energy?

a. Long-wavelength and high-frequency region
b. Long-wavelength and low-frequency region
c. Short-wavelength and high-frequency region
d. Short-wavelength and low-frequency region

15.2 The Behavior of Electromagnetic Radiation 5.

Light travels at different speeds in different media. Put these media in order, from the slowest light speed to the fastest light speed: air, diamond, vacuum, water.

a. diamond, water, air, vacuum
b. vacuum, diamond, air, water
c. diamond, air, water, vacuum
d. air, diamond, water, vacuum

6.

Visible light has wavelengths in the range of about 400 to 800 nm. What does this indicate about the approximate thickness of the wall of a soap bubble? Explain your answer.

a. The thickness of the bubble wall is ten times that of the wavelength of light.
b. The thickness of the bubble wall is similar to that of the wavelength of light.
c. The thickness of the bubble wall is half the wavelength of light.
d. The thickness of the bubble wall equals the cube of the wavelength of light.

7.

Bright sunlight is reflected from an icy pond. You look at the glare of the reflected light through polarized glasses. When you take the glasses off, rotate them 90°, and look through one of the lenses again, the light you see becomes brighter. Explain why the light you see changes.

a. The glass blocks horizontally polarized light, and the light reflected from the icy pond is, in part, polarized horizontally.
b. The glass blocks vertically polarized light, and the light reflected from the icy pond is, in part, polarized vertically.
c. The glass allows horizontally polarized light to pass, and the light reflected from the icy pond is, in part, polarized vertically.
d. The glass allows horizontally polarized light to pass, and the light reflected from the icy pond is, in part, polarized horizontally.