

## Multiple Choice

### 15.1 The Electromagnetic Spectrum 17.

Which type of EM radiation has the shortest wavelengths?

- a. gamma rays
- b. infrared waves
- c. blue light
- d. microwaves

18.

Which form of EM radiation has the most penetrating ability?

- a. red light
- b. microwaves
- c. gamma rays
- d. infrared radiation

19.

Why are high-frequency gamma rays more dangerous to humans than visible light?

- a. Gamma rays have a lower frequency range than visible light.
- b. Gamma rays have a longer wavelength range than visible light.
- c. Gamma rays have greater energy than visible light for penetrating matter.
- d. Gamma rays have less energy than visible light for penetrating matter.

20.

A dog would have a hard time stalking and catching a red bird hiding in a field of green grass. Explain this in terms of cone cells and color perception.

- a. Dogs are red-green color-blind because they can see only blue and yellow through two kinds of cone cells present in their eyes.
- b. Dogs are only red color-blind because they can see only blue and yellow through two kinds of cones cells present in their eyes.
- c. Dogs are only green color-blind because they can see only blue and yellow through two kinds of cones cells present in their eyes.
- d. Dogs are color-blind because they have only rods and no cone cells present in their eyes.

### 15.2 The Behavior of Electromagnetic Radiation 21.

To compare the brightness of light bulbs for sale in a store, you should look on the labels to see how they are rated in terms of \_\_\_\_\_.

- a. frequency
- b. watts
- c. amps

d. lumens

22.

What is the wavelength of red light with a frequency of  $4.00 \times 10^{14}$  Hz?

- a.  $2.50 \times 10^{14}$  m
- b.  $4.00 \times 10^{15}$  m
- c.  $2.50 \times 10^6$  m
- d.  $4.00 \times 10^{-7}$  m

23.

What is the distance of one light year in kilometers?

- a.  $2.59 \times 10^{10}$  km
- b.  $1.58 \times 10^{11}$  km
- c.  $2.63 \times 10^9$  km
- d.  $9.46 \times 10^{12}$  km

24.

How does the illuminance of light change when the distance from the light source is tripled? Cite the relevant equation and explain how it supports your answer.

- a. Illuminance =  $\frac{P}{4\pi r^2}$ ; if distance is tripled, then the illuminance increases by 19 times.
- b. Illuminance =  $\frac{P}{4\pi r}$ ; if distance is tripled, then the illuminance decreases by 13 times.
- c. Illuminance =  $P \cdot 4\pi r^2$ ; if distance is tripled, then the illuminance decreases by 9 times.
- d. Illuminance =  $P \cdot 4\pi r$ ; if distance tripled, then the illuminance increases by 3 times.

25.

A light bulb has an illuminance of 19.9 lx at a distance of 2 m . What is the luminous flux of the bulb?

- a. 500 lm
- b. 320 lm
- c. 250 lm
- d. 1,000 lm