

Key

Chapter 22 Study Guide

1. Describe the emission of radiation.

energy is transferred as waves from a source such as a light bulb

2. Light passing through glass in a window is an example of transmission.

3. What happens when white light hits an opaque red object?

colors other than red are absorbed & red is reflected or transmitted

4. What is the relationship between the wavelength and frequency of light?

wavelength & frequency are inversely proportional. when wavelength decreases, frequency increases.

5. What is the frequency of a yellow light that has a wavelength of $7.50 \times 10^{-6} \text{ m}$? The speed of light is $3.00 \times 10^8 \text{ m/s}$.

$$f = \frac{3.00 \times 10^8 \text{ m/s}}{7.50 \times 10^{-6} \text{ m}} = \boxed{4 \times 10^{13} \text{ Hz}}$$

6. What is the wavelength of light that has a frequency of $5.40 \times 10^{18} \text{ Hz}$? The speed of light is $3.00 \times 10^8 \text{ m/s}$.

$$\lambda = \frac{3.00 \times 10^8 \text{ m/s}}{5.40 \times 10^{18} \text{ Hz}} = \boxed{5.56 \times 10^{-11} \text{ m}}$$

7. Describe the wave-particle duality of light.

both the wave model & the particle models describe light

8. List the four basic components of a spectrometer.

source of electromagnetic radiation, a device to separate wavelengths, a sample holder, a light emitter

9. What is the energy of radiation that has a frequency of $2.55 \times 10^{14} \text{ Hz}$? Planck's constant is $6.626 \times 10^{-34} \text{ J}\cdot\text{s}$.

$$E = 6.626 \times 10^{-34} \text{ J}\cdot\text{s} \times 2.55 \times 10^{14} \text{ Hz} = \boxed{1.69 \times 10^{-19} \text{ J}}$$

10. What is the energy of radiation that has a wavelength of $3.00 \times 10^{-8} \text{ m}$? The speed of light is $3.00 \times 10^8 \text{ m/s}$. Planck's constant is $6.626 \times 10^{-34} \text{ J}\cdot\text{s}$.

$$f = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{3.00 \times 10^{-8} \text{ m}}$$

$$f = 1 \times 10^{16} \text{ Hz}$$

$$E = hf = (6.626 \times 10^{-34} \text{ J}\cdot\text{s}) \times (1 \times 10^{16} \text{ Hz}) = \boxed{6.63 \times 10^{-18} \text{ J}}$$