

Chapter 27 Light

Relating Properties of Light

Assume the visible yellow light emitted by the sun has a wavelength of 5.8×10^{-7} m. What is the frequency of this light?

1. Read and Understand

What information are you given?

$$\text{wavelength} = \lambda = 5.8 \times 10^{-7} \text{ m}$$

2. Plan and Solve

What unknown are you trying to calculate?

$$\text{frequency} = f$$

What other information do you need to use?

$$\text{speed of light} = c = 3.0 \times 10^8 \text{ m/s}$$

What relationship can you use?

$$\text{speed of light} = c = \lambda f$$

Rearrange the equation to solve for the unknown.

$$f = \frac{c}{\lambda}$$

Replace each variable and constant with its known value.

$$f = \frac{3.0 \times 10^8 \text{ m/s}}{5.8 \times 10^{-7} \text{ m}} = 5.2 \times 10^{14} \text{ Hz}$$

3. Look Back and Check

Is your answer reasonable?

A frequency around 10^{14} Hz is reasonable for visible light. The units of meters cancel, leaving 1/s or Hz, as it should.

Math Practice

On a separate sheet of paper, solve the following problems.

1. Ultraviolet rays from the sun can cause sunburn and skin damage. What is the wavelength of ultraviolet rays that have a frequency of 8.6×10^{14} Hz?
2. Green light from a laser has a wavelength of 5.3×10^{-7} m. What is the frequency of this light?
3. A microwave oven cooks food by emitting electromagnetic waves with a frequency of about 2.45×10^9 Hz. What is the wavelength, in centimeters, of these waves?