

02-09 Frequency & Wavelength

Name: _____

Remember: $\lambda = c / \nu$ speed of light = 3×10^8 m/sec = 3×10^{17} nm/sec
 $\lambda =$ wavelength $\nu =$ frequency $c =$ speed (or velocity)

1. A light wave has a frequency of 4.0×10^{14} Hz. Find its wavelength.

$$\lambda = c / \nu = 3 \times 10^{17} \text{ nm/sec} / 4.0 \times 10^{14} \text{ Hz} = 7.5 \times 10^2 \text{ nanometers} = 750 \text{ nm}$$

$$\text{or}$$

$$\lambda = c / \nu = 3 \times 10^8 \text{ m/sec} / 4.0 \times 10^{14} \text{ Hz} = 7.5 \times 10^{-7} \text{ meters} = 7.5 \times 10^2 \text{ nanometers} = 750 \text{ nm}$$

2. A light wave has a wavelength of 479 nm. Find its frequency.

$$\nu = c / \lambda = 3 \times 10^{17} \text{ nm/sec} / 479 \text{ nm} = 0.00626 \times 10^{17} \text{ Hz} = 6.26 \times 10^{14} \text{ Hz}$$

3. A light wave has a frequency of 3.7×10^{13} Hz. Find its wavelength.

$$\lambda = c / \nu = 3 \times 10^{17} \text{ nm/sec} / 3.7 \times 10^{13} \text{ Hz} = 8.1 \times 10^3 \text{ nanometers} = 8100 \text{ nm}$$

$$\text{or}$$

$$\lambda = c / \nu = 3 \times 10^8 \text{ m/sec} / 3.7 \times 10^{13} \text{ Hz} = 8.1 \times 10^{-6} \text{ meters} = 8.1 \times 10^3 \text{ nanometers} = 8100 \text{ nm}$$

4. A light wave has a wavelength of 724 nm. Find its frequency.

$$\nu = c / \lambda = 3 \times 10^{17} \text{ nm/sec} / 724 \text{ nm} = 0.00414 \times 10^{17} \text{ Hz} = 4.146 \times 10^{14} \text{ Hz}$$

5. A light wave has a frequency of 7.4×10^{15} Hz. Find its wavelength.

$$\lambda = c / \nu = 3 \times 10^{17} \text{ nm/sec} / 7.4 \times 10^{15} \text{ Hz} = 4.1 \times 10^1 \text{ nanometers} = 41 \text{ nm}$$

$$\text{or}$$

$$\lambda = c / \nu = 3 \times 10^8 \text{ m/sec} / 7.4 \times 10^{15} \text{ Hz} = 4.1 \times 10^{-8} \text{ meters} = 4.1 \times 10^1 \text{ nanometers} = 41 \text{ nm}$$

6. A light wave has a wavelength of 145 nm. Find its frequency.

$$\nu = c / \lambda = 3 \times 10^{17} \text{ nm/sec} / 145 \text{ nm} = 0.0207 \times 10^{17} \text{ Hz} = 2.07 \times 10^{15} \text{ Hz}$$

7. The frequency of yellow light is 5.0×10^{14} Hz. Find its wavelength.

$$\lambda = c / \nu = 3 \times 10^{17} \text{ nm/sec} / 5.0 \times 10^{14} \text{ Hz} = 6.0 \times 10^2 \text{ nanometers} = 600 \text{ nm}$$

$$\text{or}$$

$$\lambda = c / \nu = 3 \times 10^8 \text{ m/sec} / 5.0 \times 10^{14} \text{ Hz} = 6.0 \times 10^{-7} \text{ meters} = 6.0 \times 10^2 \text{ nanometers} = 600 \text{ nm}$$

8. What is the frequency of yellow light, $\lambda = 556$ nm?

$$\nu = c / \lambda = 3 \times 10^{17} \text{ nm/sec} / 556 \text{ nm} = 0.00540 \times 10^{17} \text{ Hz} = 5.40 \times 10^{14} \text{ Hz}$$