

Name: Key Date: _____ Period: _____

ELECTROMAGNETIC RADIATION WAVELENGTH AND FREQUENCY CALCULATIONS

Complete the following calculations using the relationship among wavelength, frequency, and the speed of light.

1. Determine the frequency of light with a wavelength of 675nm.

$$\nu = \frac{c}{\lambda} = \frac{3 \times 10^8}{675 \times 10^{-9}} = 4.44 \times 10^{14} \text{ Hz}$$

2. Determine the frequency of light with a wavelength of $4.50 \times 10^{-7} \text{ m}$.

$$\nu = \frac{c}{\lambda} = \frac{3 \times 10^8}{4.50 \times 10^{-7}} = 6.67 \times 10^{14} \text{ Hz}$$

3. What is the wavelength of an X ray that has a frequency of $7.8 \times 10^{17} \text{ Hz}$?

$$\lambda = \frac{c}{\nu} = \frac{3 \times 10^8}{7.8} = 3.84 \times 10^{-10} \text{ m}$$

4. What is the wavelength of a light wave with a frequency of $8.96 \times 10^{14} \text{ Hz}$?

$$\lambda = \frac{c}{\nu} = \frac{3 \times 10^8}{8.96 \times 10^{14}} = 3.34 \times 10^{-7} \text{ m}$$

5. A form of electromagnetic radiation is traveling with a frequency of $3.61 \times 10^6 \text{ Hz}$. What is the wavelength?

$$\lambda = \frac{c}{\nu} = \frac{3 \times 10^8}{3.61 \times 10^6} = 83 \text{ m}$$

6. What is the frequency of a microwave that has a wavelength of 116.3 m?

$$\nu = \frac{c}{\lambda} = \frac{3 \times 10^8}{116.3} = 2.579536 \times 10^6 \text{ Hz}$$

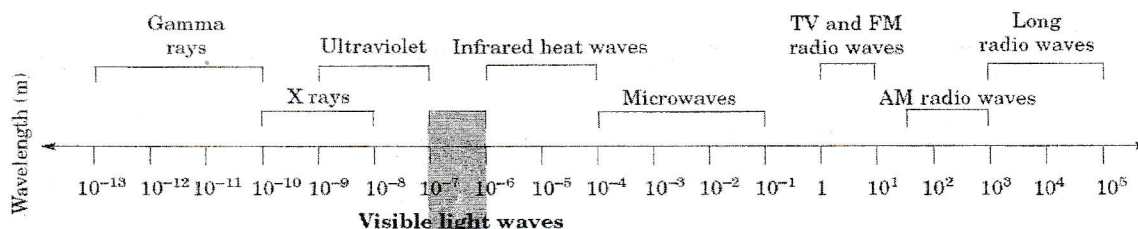
7. What is the wavelength of a radio wave that has a frequency of $9.40 \times 10^8 \text{ Hz}$?

$$\lambda = \frac{c}{\nu} = \frac{3 \times 10^8}{9.40 \times 10^8} = 0.319 \text{ m}$$

8. What is the frequency of a light wave that has a wavelength of 470 nm?

$$\nu = \frac{c}{\lambda} = \frac{3 \times 10^8}{470 \times 10^{-9}} = 6.38 \times 10^{14} \text{ Hz}$$

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- Violet: 400-430 nm
- Indigo: 430-450 nm
- Blue: 450-500 nm
- Green: 500-570 nm
- Yellow: 570-590 nm
- Orange: 590-610 nm
- Red: 610-700 nm

9. Using the figures above, what color is the light wave from question 8?

Blue

10. What is the frequency of an electromagnetic wave that has a wavelength of 72.6 nm?

$$\nu = c / \lambda$$

$$= \frac{3 \times 10^8}{72.6 \times 10^{-9}} = 4.13 \times 10^{15} \text{ Hz}$$

11. Using the figures above what kind of electromagnetic radiation is used in question 10?

X-Rays

12. What is the wavelength of an electromagnetic wave that has a frequency of $6.79 \times 10^9 \text{ Hz}$?

$$\lambda = c / \nu = \frac{3 \times 10^8}{6.79 \times 10^9} = 0.0442 \text{ m}$$

13. What is the wavelength of a light wave that has a frequency of $4.42 \times 10^{14} \text{ Hz}$?

$$\lambda = c / \nu = \frac{3 \times 10^8}{4.42 \times 10^{14}} = 6.79 \times 10^{-7} \text{ m}$$

14. Using the figures above, what color is the light wave from question 13?

Red

15. A gamma ray has a wavelength of 0.039 nm. What is the frequency of the wave?

$$\nu = c / \lambda = \frac{3 \times 10^8}{0.039 \times 10^{-9}} = 7.69 \times 10^{18} \text{ Hz}$$