The behavior of light indicates that it is comprised of waves. The distance between successive waves is called the **wavelength** \( (\lambda) \) and the wavelength determines the type of light. The size of the waves determines the type of light. All of the various light waves move with the same speed, a value abbreviated \( (c) \) equal to \( 3.00 \times 10^8 \) m/s. The **frequency** \( (\nu) \) that light waves pass a given point is measured in waves/second or simply ‘per second’ \( (1/s) \). The unit \( 1/s \) is also given the name hertz \( (Hz) \).

### Useful Equations

\[
c = \lambda \times \nu
c = 3.00 \times 10^8 \text{ m/s}
1 \text{ m} = 1 \times 10^3 \text{ mm}
1 \text{ m} = 1 \times 10^6 \text{ \( \mu \)m}
1 \text{ MHz} = 1 \times 10^6 \text{ Hz}
1 \text{ GHz} = 1 \times 10^9 \text{ Hz}
\]

### Answer the following questions about light waves. Show all work

1. What type of light has a wavelength of:  
   a) \( 5.0 \times 10^{-4} \) m?  
   b) \( 2.4 \times 10^{-8} \) m?  
   c) 12 mm?

2. An ultraviolet light wave is used to kill bacterial. It has a frequency of \( 1.2 \times 10^{15} \) 1/s. Find the wavelength.

3. An x-ray has a wavelength of \( 1.54 \times 10^{-10} \) m. Find the frequency of this light.

4. A visible light wave has a frequency of \( 7.5 \times 10^{14} \) 1/s. Find the wavelength in nanometers \( (\text{nm}) \) and determine the color of the light.

5. One of the light waves produced when hydrogen is energized has a wavelength of 410.5 nm. What is the frequency of this light?

6. The frequency of light used to heat food in a microwave oven is 2.45 GHz \( (2.45 \times 10^9 \) 1/s). What is the wavelength of this light?

7. A radio wave broadcast on the AM dial has a wavelength of 280.4 m. Find the frequency of this radio wave in hertz. Convert the frequency to kilohertz.

8. What is the wavelength of a radio wave broadcast with a frequency of 99.5 MHz \( \text{(FM 99.5)} \)?

9. Pilots often use waves of about 2,340 m to communicate. What is the frequency of this wave?

10. The light used in night vision devices has a wavelength of about 25 micrometers \( (\mu\text{m}) \). What is the frequency of this light? In what part of the electromagnetic spectrum are these waves?