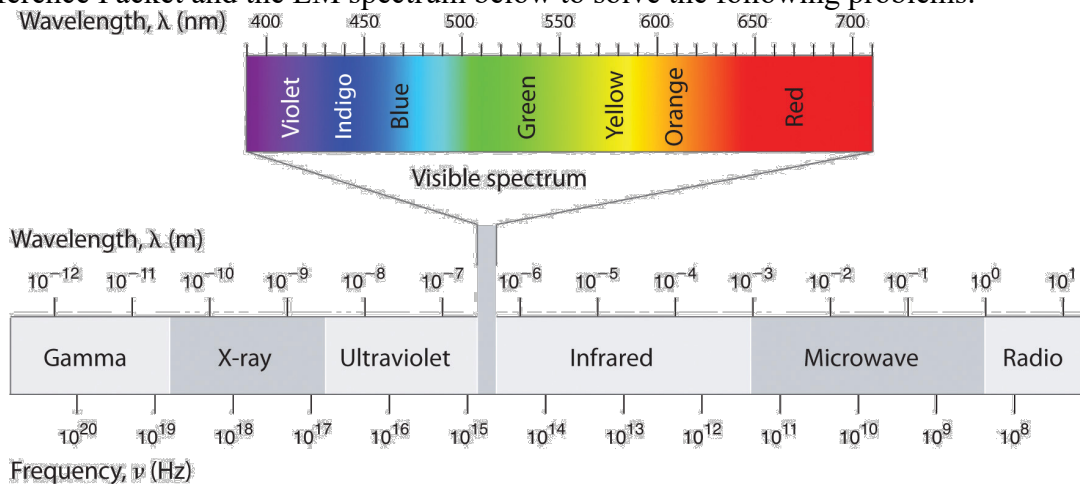


1. What is the cause of all electromagnetic radiation?
2. What is wavelength? What symbol is used to represent it? What are its units?
3. What is frequency? What symbol do we use to represent it? What are its units?
4. What is the type of relationship between wavelength and frequency? Describe it.

Use the Reference Packet and the EM spectrum below to solve the following problems:



5. What are the frequency and energy of an electromagnetic wave with a wavelength of 3.5×10^{-8} m? Use the EM spectrum above to determine the region of the electromagnetic spectrum that this light is in and make a mark on the spectrum to indicate its location.

6. What are the wavelength and energy of an electromagnetic wave with a frequency of 2.29×10^8 Hz? What region of the EM spectrum is this in? Make a mark to indicate its location.
7. Calculate the wavelength (in nm) and energy of electromagnetic radiation with a frequency of 5.70×10^{14} Hz [hint: calculate *m* first then convert]. This is visible light—what color is it? Make a mark to indicate its location.
8. Calculate the frequency and energy of electromagnetic radiation that has a wavelength of 9.35 pm (convert to *m* first). Solve for E using the combine equation $E=hc/\lambda$. What region of the EM spectrum is this in? Make a mark to indicate its location.
9. A popular radio station broadcasts with a frequency of 94.7 MHz. What are the wavelength and energy of the broadcast? (You must first convert MHz to Hz.)
10. X-rays used in medical diagnosis have energies around 1.60×10^{-15} J. What are the frequency and wavelength (in pm) of this radiation? Solve for λ using the combine equation $E=hc/\lambda$.

Answers: 5) 8.6×10^{15} Hz, 5.7×10^{-18} J, ultraviolet; 6) 1.31 m, 1.52×10^{-25} J, radio wave; 7) 526 nm, 3.78×10^{-19} J, green; 8) 3.21×10^{19} Hz, 2.13×10^{-14} J, gamma rays; 9) 3.17 m, 6.27×10^{-26} J; 10) 2.41×10^{18} Hz, 124 pm.