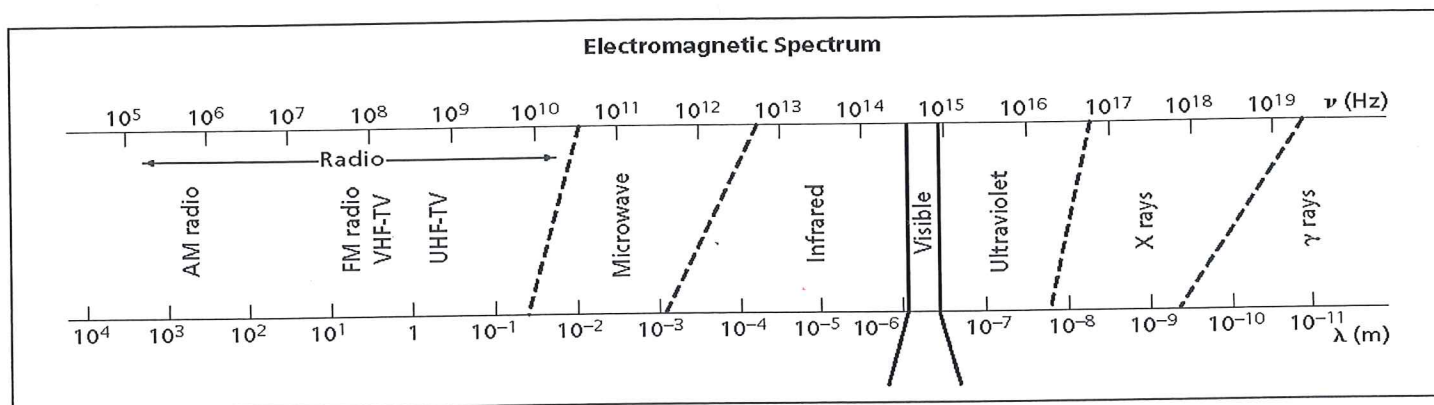


The Wave & Particle Nature of Light

(Honors Chemistry)



Use the chart above to answer the following questions: (You must show all work!)

1. A radio station is broadcasting AM radio waves at a frequency 2.0×10^5 Hz.

a. What are the wavelengths of the AM radio waves being broadcast?

$$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^8 \text{ m/s}}{2.0 \times 10^5 \text{ Hz}} = 1.50 \times 10^3 \text{ m}$$

b. What is the photon of energy for the AM radio waves being broadcast?

$$E_{\text{photon}} = h \times \nu = 1.33 \times 10^{-28} \text{ J}$$

2. A microwave oven produces waves at a frequency 5.98×10^{11} Hz.

a. What are the wavelengths of the microwaves being produced?

$$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^8 \text{ m/s}}{5.98 \times 10^{11} \text{ Hz}} = 5.02 \times 10^{-4} \text{ m}$$

b. What is the photon of energy for the microwaves being produced?

$$E_{\text{photon}} = h \times \nu = 3.96 \times 10^{-22} \text{ J}$$

3. An electromagnetic wave is producing a photon of energy 1.66×10^{-18} J.

a. What is the frequency of the electromagnetic wave?

$$\nu = \frac{E_{\text{photon}}}{h} = \frac{1.66 \times 10^{-18} \text{ J}}{6.626 \times 10^{-34} \text{ J}\cdot\text{s}} = 2.51 \times 10^{15} \text{ Hz}$$

b. What is the wavelength of the electromagnetic wave?

$$\lambda = \frac{c}{\nu} = 1.20 \times 10^{-7} \text{ m}$$

c. What type of electromagnetic wave is it?

Ultraviolet Light

4. An electromagnetic wave is producing a photon of energy at 2.52×10^{-20} J.

a. What is the frequency of the electromagnetic wave?

$$\nu = \frac{E}{h} =$$

$$3.80 \times 10^{13} \text{ Hz}$$

b. What is the wavelength of the electromagnetic wave?

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

$$7.89 \times 10^{-6} \text{ m}$$

c. What type of electromagnetic wave is it?

Infrared

5. An electromagnetic wave is producing a photon of energy at 2.78×10^{-16} J.

a. What is the frequency of the electromagnetic wave?

$$\nu = \frac{E}{h} =$$

$$4.20 \times 10^{17} \text{ Hz}$$

b. What is the wavelength of the electromagnetic wave?

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

$$7.14 \times 10^{-10} \text{ m}$$

c. What type of electromagnetic wave is it?

X-Rays

6. An electromagnetic wave is producing a photon of energy at 2.98×10^{-26} J.

a. What is the frequency of the electromagnetic wave?

$$\nu = \frac{E}{h} =$$

$$4.50 \times 10^7 \text{ Hz}$$

b. What is the wavelength of the electromagnetic wave?

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

$$6.67 \times 10^0 \text{ m}$$

or

$$6.67 \text{ m}$$

c. What type of electromagnetic wave is it?

Radio Waves