1. Answer the following questions based on the above figure:

   (a) Which type of radiation involves less energy, x-rays or microwaves?

   - microwaves

   (b) Which radiation has the higher frequency, infrared (IR) or blue light?

   - blue light

   \[ E = h \frac{c}{\lambda} \]

   \[ E \propto \lambda^{-1} \]

   (c) Which radiation has the longer wavelength, ultraviolet (UV) or gamma (\(\gamma\)) rays?

   - ultraviolet

   \[ E = h \frac{c}{\lambda} \]

2. Consider the colors of the visible spectrum.

   (a) Which colors of light involve less energy than green light?

   \( ROY \ G \ B \ IV \) - red, orange, yellow.

   (b) Which color of light has photons of greater energy, yellow or blue?

   - blue

   (c) Which color of light has the greater frequency, blue or green?

   - blue
3. Green light has a wavelength of 5.0 x 10⁷ nm. What is the energy, in joules, of one photon of green light? What is the energy, in joules, of 1.0 mol of photons of green light?

\[ E = h\nu = \frac{hc}{\lambda} = 6.626 \times 10^{-34} \frac{\text{J} \cdot \text{s}}{\text{photon}} \times \left( \frac{2.998 \times 10^8 \text{m/s}}{5.0 \times 10^{-7} \text{m}} \right) \]

\[ = 4.0 \times 10^{-19} \frac{\text{J}}{\text{photon}} \]

\[ 4.0 \times 10^{-19} \frac{\text{J}}{\text{photon}} \times 6.022 \times 10^{23} \frac{\text{photons}}{\text{mol}} = 2.4 \times 10^5 \frac{\text{J}}{\text{mol}} \]

4. The most prominent line in the spectrum of magnesium is 285.2 nm. Other lines are found at 383.8 and 518.4 nm. In what region of the electromagnetic spectrum are these lines found? Which is the most energetic line? What is the energy of 1 mol of photons with the wavelength of the most energetic line?

- 285.2nm in UV
- 383.8 and 518.4 nm are in the visible
- 285.2 nm is the most energetic.

\[ E = \frac{hc}{\lambda} = 6.626 \times 10^{-34} \frac{\text{J} \cdot \text{s}}{\text{photon}} \times \left( \frac{2.998 \times 10^8 \text{m/s}}{285.2 \times 10^{-7} \text{m}} \right) \]

\[ = 6.965 \times 10^{-19} \frac{\text{J}}{\text{photon}} \]

\[ 6.965 \times 10^{-19} \frac{\text{J}}{\text{photon}} \times 6.022 \times 10^{23} \frac{\text{photons}}{\text{mol}} = 4.194 \times 10^5 \frac{\text{J}}{\text{mol}} \]