

24.11. Model: Use the photon model of light.

Solve: The energy of the single photon is

$$E_{\text{photon}} = hf = h\left(\frac{c}{\lambda}\right) = \frac{(6.63 \times 10^{-34} \text{ Js})(3.0 \times 10^8 \text{ m/s})}{1.0 \times 10^{-6} \text{ m}} = 1.99 \times 10^{-19} \text{ J}$$

$$\Rightarrow E_{\text{mol}} = N_A E_{\text{photon}} = (6.023 \times 10^{23})(1.99 \times 10^{-19} \text{ J}) = 1.2 \times 10^5 \text{ J}$$

Assess: Although the energy of a single photon is very small, a mole of photons has a significant amount of energy.