

3. The energy of a photon is given by $E = hf$, where h is the Planck constant and f is the frequency. The wavelength λ is related to the frequency by $\lambda f = c$, so $E = hc/\lambda$. Since $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$ and $c = 2.998 \times 10^8 \text{ m/s}$,

$$hc = \frac{(6.626 \times 10^{-34} \text{ J}\cdot\text{s})(2.998 \times 10^8 \text{ m/s})}{(1.602 \times 10^{-19} \text{ J/eV})(10^{-9} \text{ m/nm})} = 1240 \text{ eV}\cdot\text{nm} .$$

Thus,

$$E = \frac{1240 \text{ eV}\cdot\text{nm}}{\lambda} .$$