$$E_n = -13.6 \text{ eV} \frac{1}{n^2}$$

$$E(\text{photon}) = h\nu = \frac{hc}{\lambda} = E_f - E_i = (-13.6 \text{ eV}))(\frac{1}{n_f^2} - \frac{1}{n_i^2})$$

$$\frac{N_b}{N_a} = (\frac{g_b}{g_a})(e^{-(E_b - E_a)/kT})$$

$$\frac{\frac{N_b}{N_a}}{(\frac{g_b}{g_a})} = (e^{-(E_b - E_a)/kT})$$

$$\frac{\frac{2}{1}}{(\frac{8}{1})} = (e^{-(E_b - E_a)/kT})$$

$$\ln(\frac{2}{8}) = -(E_b - E_a)/kT$$

$$kT = -\frac{(E_b - E_a)}{\ln(\frac{2}{8})}$$

$$kT = -\frac{(-3.4 \text{ eV}) - (-13.6 \text{ eV})}{\ln(\frac{2}{8})}$$

$$KE_{\text{typ}} \simeq kT$$