

47. (a) Since $E_2 = -0.85 \text{ eV}$ and $E_1 = -13.6 \text{ eV} + 10.2 \text{ eV} = -3.4 \text{ eV}$, the photon energy is $E_{\text{photon}} = E_2 - E_1 = -0.85 \text{ eV} - (-3.4 \text{ eV}) = 2.6 \text{ eV}$.

(b) From

$$E_2 - E_1 = (-13.6 \text{ eV}) \left(\frac{1}{n_2^2} - \frac{1}{n_1^2} \right) = 2.6 \text{ eV}$$

we obtain

$$\frac{1}{n_2^2} - \frac{1}{n_1^2} = -\frac{2.6 \text{ eV}}{13.6 \text{ eV}} \approx -\frac{3}{16} = \frac{1}{4^2} - \frac{1}{2^2} .$$

Thus, $n_2 = 4$ and $n_1 = 2$. So the transition is from the $n = 4$ state to the $n = 2$ state. One can easily verify this by inspecting the energy level diagram of Fig. 40-16.