

40. (a) $\Delta E = -(13.6 \text{ eV})(4^{-2} - 1^{-2}) = 12.8 \text{ eV}$.

(b) The values of the photon energies are:

$$E_{4 \rightarrow 1} = \Delta E_{\text{part (a)}} = 12.8 \text{ eV}$$

$$E_{3 \rightarrow 1} = -(13.6 \text{ eV})(3^{-2} - 1^{-2}) = 12.1 \text{ eV}$$

$$E_{2 \rightarrow 1} = -(13.6 \text{ eV})(2^{-2} - 1^{-2}) = 10.2 \text{ eV}$$

$$E_{4 \rightarrow 2} = -(13.6 \text{ eV})(4^{-2} - 2^{-2}) = 2.55 \text{ eV}$$

$$E_{3 \rightarrow 2} = -(13.6 \text{ eV})(3^{-2} - 2^{-2}) = 1.89 \text{ eV}$$

$$E_{4 \rightarrow 3} = -(13.6 \text{ eV})(4^{-2} - 3^{-2}) = 0.66 \text{ eV}$$

The various photon energies correspond to the transitions between energy levels indicated below. The levels are not drawn to scale.

