Quiz #7: Pratt’s lecture, April 12, 2002

Useful stuff: \[ E_n = \frac{-13.6 \text{ eV}}{n^2}, \quad h \cdot c = 1.24 \times 10^{-6} \text{ (eV) \cdot m} \]

1. In hydrogen, when an electron jumps from the \( n = 2 \) to \( n = 1 \) state, what is the wavelength of the emitted photon?

   \[ E_{\text{photon}} = 13.6 \text{ eV} \left( \frac{1}{1^2} - \frac{1}{2^2} \right) = 10.2 \text{ eV} \]

   \[ \lambda = \frac{h \cdot c}{E_{\text{photon}}} = \frac{1.24 \times 10^{-6} \text{ eV} \cdot \text{m}}{10.2 \text{ eV}} = 122 \text{ nm} \]

   (a) 122 nm
   (b) 139 nm
   (c) 156 nm
   (d) 173 nm
   (e) 190 nm

2. In hydrogen, an electron is initially in the \( n = 3 \) state. Eventually the electron ends up in the \( n = 1 \) state. How many photons of different energies could be emitted?

   (a) 2
   (b) 3
   (c) 4
   (d) 5
   (e) 6

[Diagram showing energy levels with transitions from \( n=3 \) to \( n=2 \) to \( n=1 \): There are three photons]