

## CLASS EXERCISE #24 - 1 August 2005

An atom undergoes a transition from a state of energy  $-14.7$  eV to a state of energy  $-10.6$  eV.

Determine whether a photon was absorbed or emitted, and determine that photon's energy (in both eV and joules) and frequency.

The change in energy of the atom is

$$\Delta E = E_f - E_i = - (10.6 \text{ eV}) - ( - (14.7 \text{ eV})) = 4.1 \text{ eV}.$$

Since this is positive, a photon must have been absorbed.

The energy of this photon is

$$E = 4.1 \text{ eV} = 4.1 \times 1.6 \times 10^{-19} \text{ J} = 6.56 \times 10^{-19} \text{ J}$$

so its frequency is

$$\begin{aligned} f &= E/h = (6.56 \times 10^{-19} \text{ J}) / (6.63 \times 10^{-34} \text{ J} \cdot \text{s}) \\ &= 9.9 \times 10^{14} \text{ Hz}. \end{aligned}$$