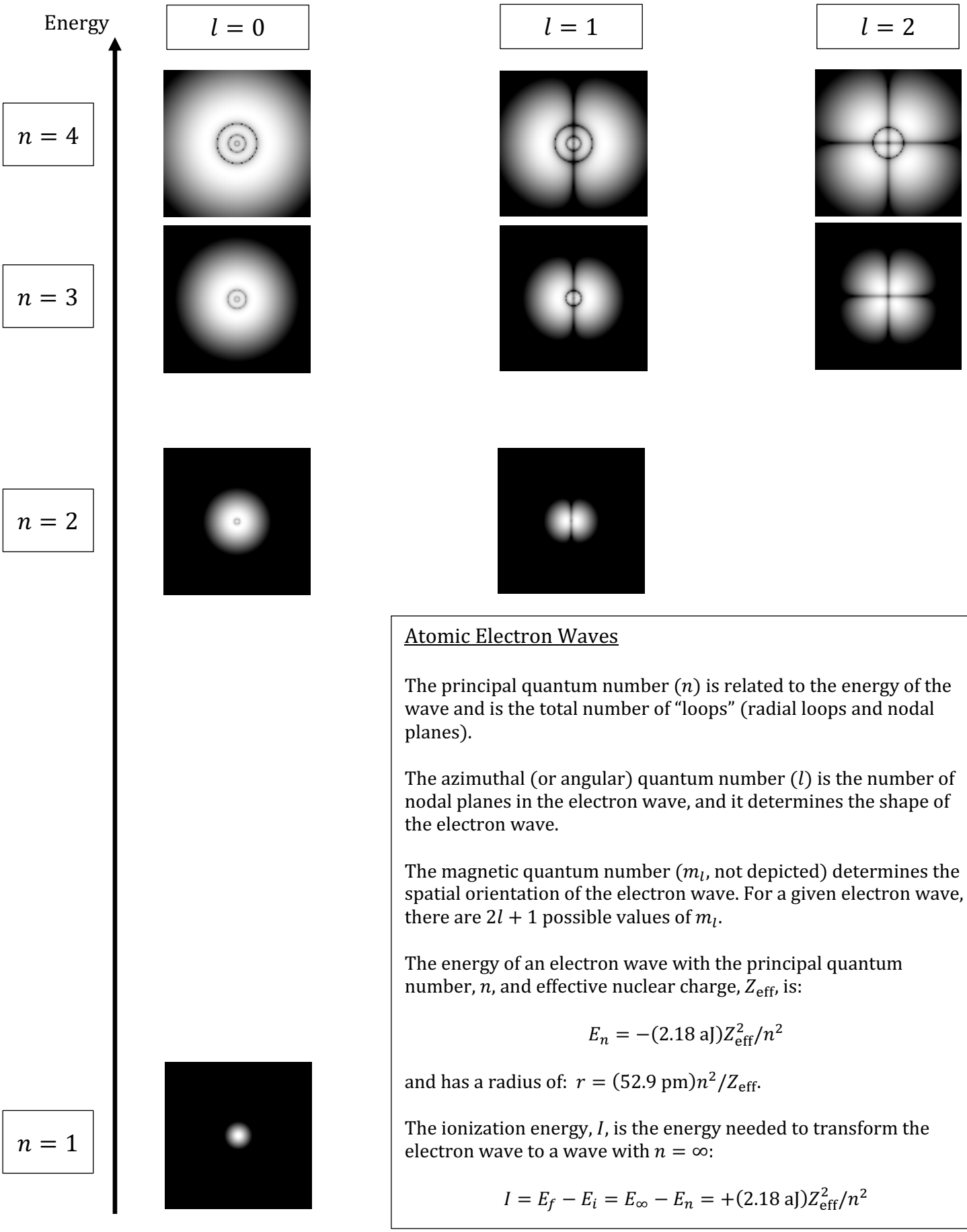

Atomic Electron Waves

The principal quantum number (n) is related to the energy of the wave and is the total number of "loops" (radial loops and nodal planes).

The azimuthal (or angular) quantum number (l) is the number of nodal planes in the electron wave, and it determines the shape of the electron wave.

The magnetic quantum number (m_l, not depicted) determines the spatial orientation of the electron wave. For a given electron wave, there are $2l + 1$ possible values of m_l.

The energy of an electron wave with the principal quantum number, n, and effective nuclear charge, Z_{eff}, is:

$$E_n = -(2.18\ \text{aJ})Z_{\text{eff}}^2/n^2$$

and has a radius of: $r = (52.9\ \text{pm})n^2/Z_{\text{eff}}$.

The ionization energy, I, is the energy needed to transform the electron wave to a wave with $n = \infty$:

$$I = E_f - E_i = E_\infty - E_n = +(2.18\ \text{aJ})Z_{\text{eff}}^2/n^2$$