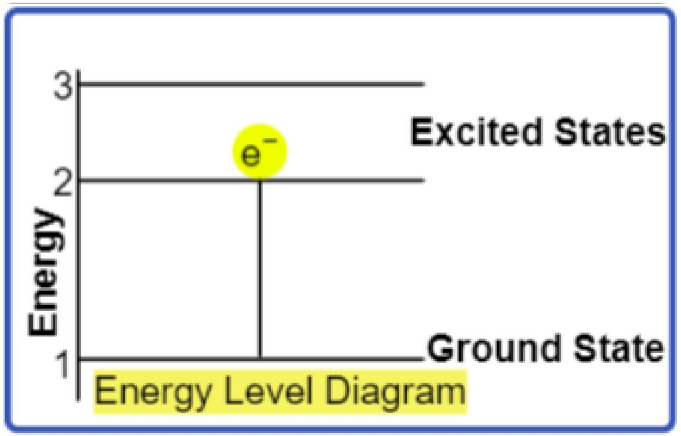
Norton

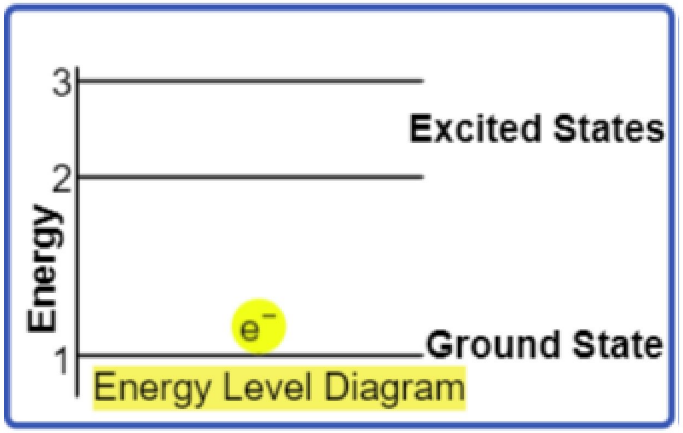
Chapter 4 Pre-read

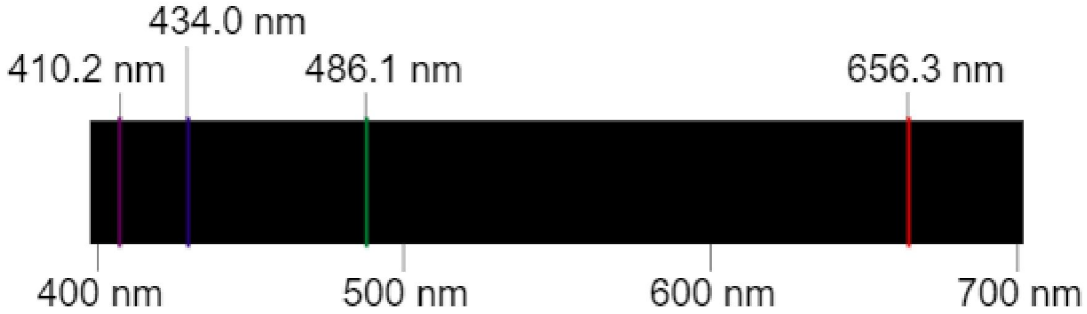
The **ground state** of an atom is the lowest energy electron configuration for that atom. The ground state of hydrogen has an electron configuration of $1s^1$, indicating that the lone electron occupies the *s* orbital in the $n = 1$ energy level.

An electron can transition from a lower energy level to a higher level, an **excited state**, by *absorbing* a quantity of energy (ΔE) that exactly matches the energy difference between the two states. This process is called **absorption**.

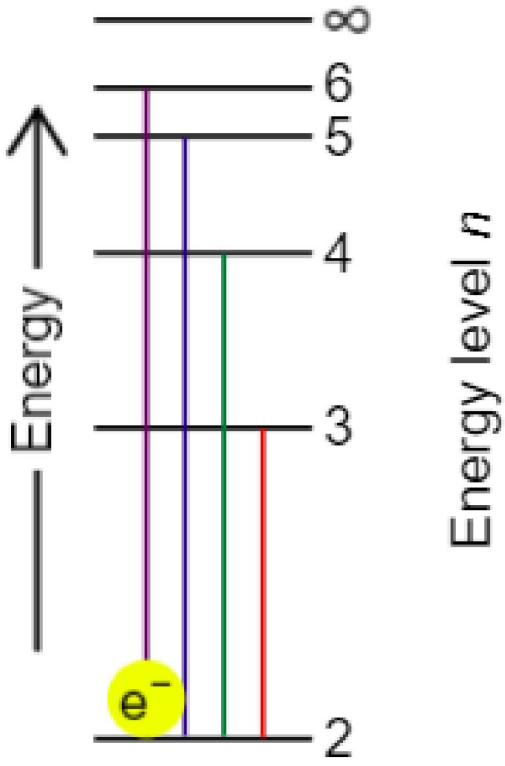


An excited state is a less stable state for an electron. An electron in a higher energy level will transition to a lower energy level, a more stable state. In the process, a quantum of energy is released as a photon that exactly matches the energy difference between the two states. This process is called **emission**.



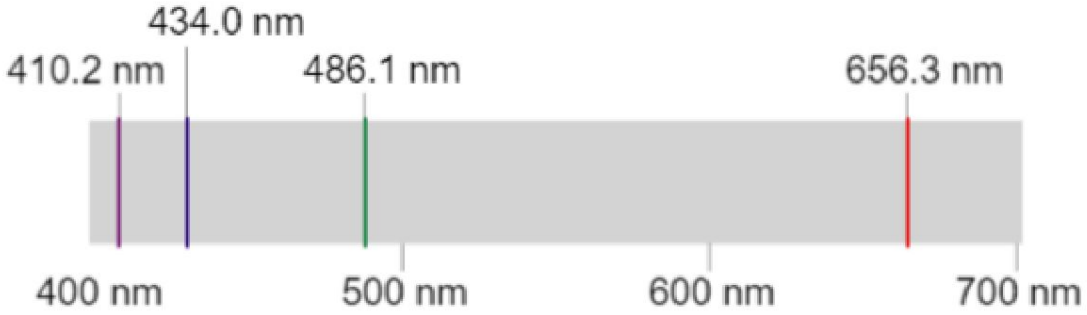


Recall that energy and wavelength of electromagnetic radiation are inversely proportional.

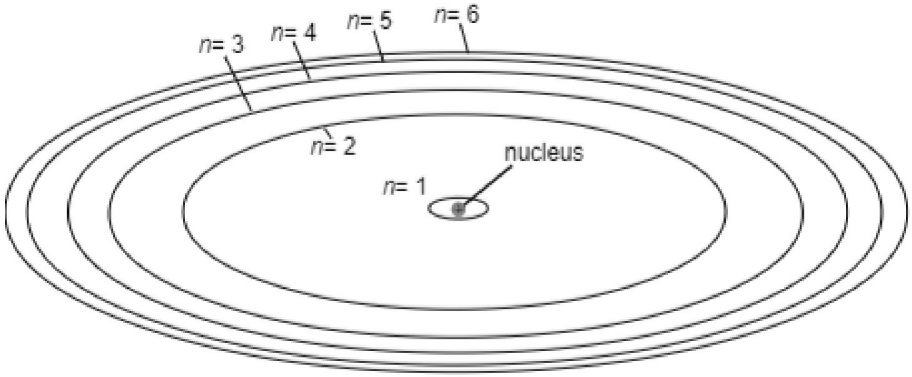


When an electron in a hydrogen atom transitions from the $n = 6$ excited state to the $n = 2$ excited state, a violet photon of light is ***emitted*** with an energy exactly equal to the energy difference between the two n levels. For a sample of hydrogen gas containing a large number of atoms, the emitted photons of light with wavelengths of 410.2 nm will show up as a violet line in the emission spectrum.

In the visible region of the hydrogen emission spectrum, there are four, distinct lines. There is a violet line at a wavelength of 410.2 nm, a dark blue line at a wavelength of 434.0 nm, a blue-green line at a wavelength of 486.1 nm, and a red-orange line at a wavelength of 656.3 nm.



Classical physics tells us that the electron can have any energy, but Bohr concluded that the electron can only occupy specific orbits. We say that the energies of the orbits are *quantized*. There are only certain allowed energy levels for an electron in an atom and *not* a continuum of energies. These energy levels can be represented visually by concentric circles around the nucleus or by horizontal lines.



According to the Bohr Model where can electrons exist?

- Certain quantized energy states

Lyman
Balmer
Ultraviolet
Visible
High energy
Return to 2nd Energy Level