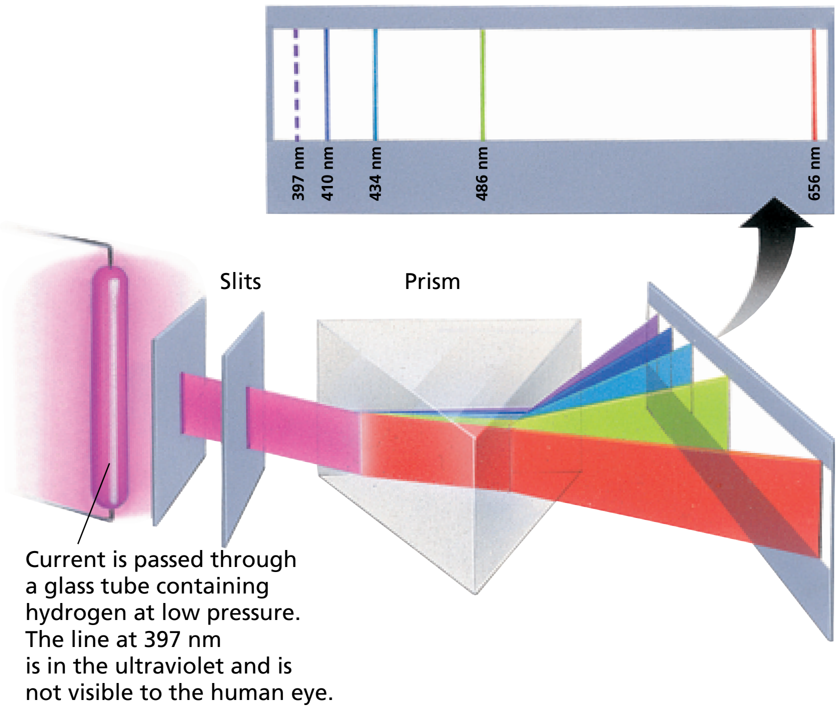

FIGURE 5 Excited hydrogen atoms emit a pinkish glow, as is shown in this diagram. When the visible portion of the emitted light is passed through a prism, it is separated into specific wavelengths that are part of hydrogen's line-emission spectrum. The line at 397 nm is in the ultraviolet and is not visible to the human eye.

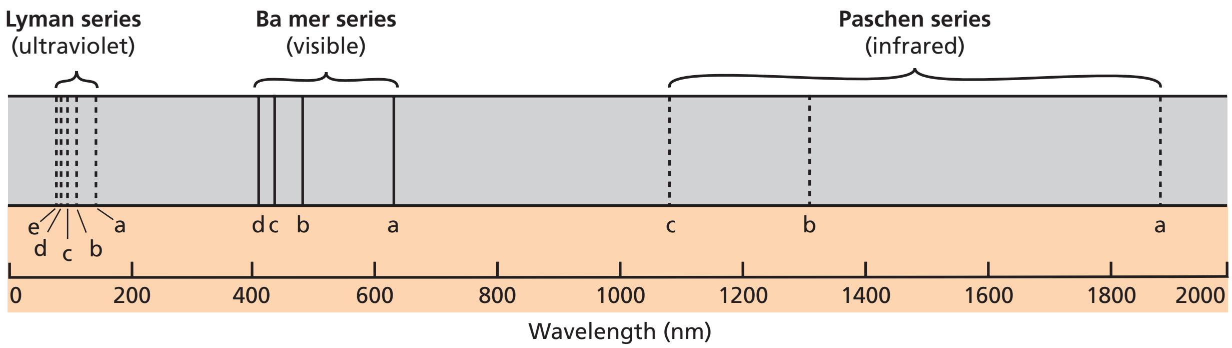

FIGURE 6 A series of specific wavelengths of emitted light makes up hydrogen's line-emission spectrum. The letters below the lines label hydrogen's various energy-level transitions. Niels Bohr's model of the hydrogen atom provided an explanation for these transitions.

Whenever an excited hydrogen atom falls to its ground state or to a lower-energy excited state, it emits a photon of radiation. The energy of this photon ($E_{photon} = h\nu$) is equal to the difference in energy between the atom's initial state and its final state, as illustrated in **Figure 7.** The fact that hydrogen atoms emit only specific frequencies of light indicated that the energy differences between the atoms' energy states were fixed. This suggested that the electron of a hydrogen atom exists only in very specific energy states.

In the late nineteenth century, a mathematical formula that related the various wavelengths of hydrogen's line-emission spectrum was discovered. The challenge facing scientists was to provide a model of the hydrogen atom that accounted for this relationship.

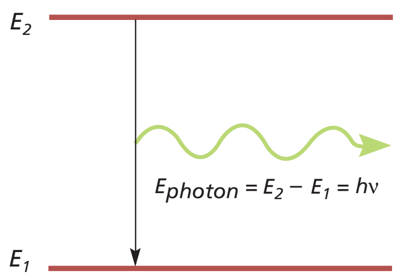

FIGURE 7 When an excited atom with energy E_2 falls back to energy E_1, it releases a photon that has energy $E_2 - E_1 = E_{photon} = h\nu$.