Ball, Stick and Straw Model of the Bohr Atom

Deborah Scherrer, Stanford Solar Center

Materials:

- 2-3" styrofoam ball: atomic nucleus
- 10" wood skewer: increasing energy levels from first level near nucleus (low energy) to outer valence shells (high energy)
- 2 - 1" striped straw pieces: 1st and 2nd energy levels
- Bead: electron (make sure it fits over the skewer but not over the straws)
- 1½ " red (pink) straw: energy absorbed/released during electron transition between 2nd and 3rd energy levels
- 2¾ " blue straw: energy absorbed/released during electron transition between 2nd and 4th energy levels
- 4" violet straw: energy absorbed/released during electron transition between 2nd and 6th energy levels

- Spectra Worksheet

Activity:

Place the wooden skewer into the styrofoam ball sharp point down. Place one striped straw onto the skewer and add the bead (electron). The electron is now in its ground state. Remove the electron bead, add the second striped straw piece onto the skewer and add the bead, indicating that the electron is now in an excited state in the 2nd energy level. This is where the electron starts before absorbing additional energy to generate an absorption line in the Balmer series. Remove the electron bead, and add the red (pink) straw. Add the electron bead, indicating that the electron is now exited to the 3rd energy level by absorbing the exact amount of energy corresponding to a photon at the $H_{\square}$ wavelength (656 nm, red), thus yielding an absorption line at the same wavelength with this jump. Remove the bead, remove the pink straw and add the bead, indicating that the electron has relaxed back down to the 2nd energy level, emitting a photon of the same energy and wavelength (red). These transitions between levels 2 and 3 are indicated on the absorption and emission spectra on the Spectra Worksheet handout.

Let the students explore other electron transitions (jumps) using the different color straws and electron bead to produce both absorption and emission lines in the Balmer series.