

Non-obvious controls:

- In the **One Atom** tab, you can grab and move the atom.
- If **Atom Type** is set to **Configurable**, you can grab the lines of the excited states in the energy level diagram and move them up and down.
- Be sure to try all the different tabs at the top of the simulation.
- You can **Pause** the sim and then use **Step** to incrementally analyze.
- If you are doing a lecture demonstration, set your screen resolution to 1024x768 so the simulation will fill the screen and be seen easily.

Important modeling notes / simplifications:

- We use the convention of labeling the ground state as “1,” the first excited state as “2,” etc. Another common convention is labeling the ground state as “G,” the first excited state as “1,” etc. If your textbook and/or course materials use the latter convention, point out the discrepancy to your students. (Note that old versions of this simulation used the latter convention. It was changed in May 2008.)
- In order to create a large amount of light in such a small system, the likelihood of absorption and stimulated emission are higher than in real life. Thus, you will occasionally see stimulated emission, although in real life this process is very rare.

Insights into student use / thinking:

- We recommend starting with the first tab to help students learn the basic ideas with a single atom. The second tab can be overwhelming if it is the first thing students see.
- Students sometimes have trouble relating what they see in the simulation to what they would see if they looked at a real discharge lamp. **View Picture of Actual Discharge Lamps** should help with this. We also recommend using the simulation in conjunction with a lab or lecture demo with real discharge lamps.
- Students often think that it is the voltage, rather than the heater, that makes the electrons come off the plate. To address this, ask them to predict what will happen if they turn the voltage way up and the heater off.
- In interviews, we found that even students with no science background were able to figure out the basics of how a discharge lamp works by playing with this simulation.

Suggestions for sim use:

- For tips on using PhET sims with your students see: [Guidelines for Inquiry Contributions](#) and [Using PhET Sims](#)
- The simulations have been used successfully with homework, lectures, in-class activities, or lab activities. Use them for introduction to concepts, learning new concepts, reinforcement of concepts, as visual aids for interactive demonstrations, or with in-class clicker questions. To read more, see [Teaching Physics using PhET Simulations](#)
- For activities and lesson plans written by the PhET team and other teachers, see: [Teacher Ideas & Activities](#)
- Use discharge lamps as a context for helping students understand atomic transitions, absorption, emission, and spectral lines.
- Challenge students to design a discharge lamp that produces primarily green light.

- Ask students to track and explain the transfers and conversions between different forms of energy that occur in a discharge lamp that make it work to produce light.