

Using Atom In a Box Software

This software is used to depict the shape of various orbitals and to calculate the energy absorbed or released by an electron transitioning from one orbital to another.

To View a Specific Orbital

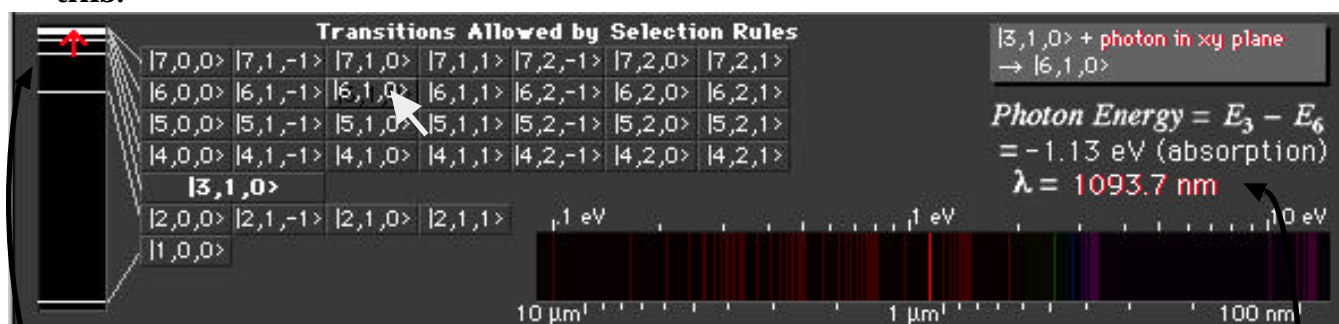
$$|\psi\rangle = |n, l, m\rangle = |1, 0, 0\rangle \text{ (1s)}$$

Find the above image in the window. This box will tell you what orbital is being viewed (in this case a 1s orbital). This can be adjusted by clicking on the + or - symbols that appear above and below the numbers. The three numbers that appear are the three quantum numbers needed to describe any particular orbital. The first number, n , indicates the energy level. The second number, l , indicates the type of orbital. The third number, m , is another measure of the type of orbital (it can be thought of as the “orientation of the orbital”).

Try clicking on the + and - symbols to view different orbitals. Pay attention to the numbers being displayed (1,0,0) and the orbital name (1s).

To See Transitions Between Orbitals and Calculate Energies

To see what part of the electromagnetic spectrum is emitted or absorbed push the **Spectrum** button. You should then see the window extend to show this:



There are several features to point out here:

- As you move the mouse over different orbital configurations the image on the left shows a graphical representation of absorption or emission and the “color” of this light. Some of the infrared is represented as red and some of the ultraviolet is represented as violet.
- There is a representation of the line that would be emitted or absorbed when viewed with a diffraction grating. The wavelength and energy is also on this scale.
- There is an exact calculation of the energy and wavelength emitted or absorbed.

Exploring the Modern Atom

Name _____

1) Sketch below the following orbitals:

1s	2s
2p	3p
3d	4f

2) What is the energy difference between level 1 and level 3? _____

3) What wavelength of light corresponds to this energy? _____

4) What color of light would be emitted by an electron jumping from level 5 to level 2? _____

5) What is the wavelength of this light? _____

6) What type of wave is given off by a transition from level 7 to level 6? _____