Excited State Electron Configurations:

So far we have only been talking about ground state electron configurations, when all of the electrons are in their most stable, lowest energy configurations. However, electrons can also jump to an excited state if energy is added to them. What this means in terms of electron configuration is that the orbitals are no longer filled in starting with the lowest energy and going up. If an electron has absorbed energy, it can skip an orbital and jump up to a higher energy level. You should be able to recognize an excited state electron configuration.

Let's look at the energy level way of writing configurations first. For example, sodium in the ground state is 2-8-1. One excited state configuration could be 2-7-2; on electron has jumped from the second energy level to the third. The only rules to excited state configurations are that they must contain the same total number of electrons as the ground state, and no energy level, or sublevel can have more than its maximum number of electrons. I could not have written 1-9-1 because the middle energy level was already full with 8 electrons.

What is a possible excited state configuration for potassium if its ground state is 2-8-8-1?
Which of these is an excited state configuration? 2-8, 2-8-6, or (1-8-4)

Bright-Line Spectrum:

The electrons in atoms can **absorb (take in) energy** and **emit (send away)** energy. When an electron releases the energy, the energy is released in different colors of light. Each color of light has a different wavelength and a different amount of energy. When an electron absorbs energy, it becomes excited and jumps to a **higher electron shell (energy level)**. An excited electron will then **emit** the energy it absorbed by sending out colored light. When the electron loses this energy in the form of colored light, it returns to the ground state or a different lower electron shell/energy level.

The collection of colors produced when an element's electrons absorb and release energy is called its **atomic emissions spectrum**, or its **bright line spectrum**. Every element produces a different atomic emissions spectrum, so it is like a "fingerprint" that scientists can use to identify atoms.

Stars are made of elements, and they all give off an atomic emissions spectrum. Some stars glow green and red while others like our star (the sun) glow orange. Based on the light emitted by the elements in stars, we can analyze their atomic emissions spectrum and determine which elements the star is composed of.