



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

<b>Name(s)</b> Anh T. Nguyen	<b>Project Number</b> <b>S1912</b>
<b>Project Title</b> <b>A Semiclassical Method to Predict Helium-like Energy Levels</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective of my project is to develop a modified Bohr's model using a semi-classical approach (using the Bohr theory and Coulomb repulsion energy) that can be easily understood by any high school students with simple geometry and pre-calculus math level to predict the energy levels and emission spectra of Helium-like atoms (ex: Helium and Lithium+1). <b>Methods/Materials</b> For materials, I used a spectrometer, a diffraction grating, and gas discharge tubes to measure the emission spectra lines. I also used the NIST database to get the energy levels for Helium-like atoms. Use my method to predict the emission lines and the energy levels, and then compare it to experimental lines and real energy levels from NIST database. <b>Results</b> The calculated energy levels of Helium and Lithium+1 was found surprisingly close to the NIST database. As for the spectral lines, the calculated and the experimental result was a little off. This is due to the fact that my method is based on Bohr's model, which did not include elements of Quantum Mechanics: the 2nd quantum number, spins of electrons, possibilities of transitions...etc. <b>Conclusions/Discussion</b> Because my model is simple (based on Bohr model, without Quantum Mechanics elements), it can be used to predict a approximate value of energy levels and spectral lines of Helium-like atoms, but not the exact value. This can be used as a tool for any high-school student with pre-calculus math level to predict energy levels, spectral lines, and somewhat have an understanding of Helium-like atoms without dealing with Quantum Mechanics which require Calculus-level math skills.	
<b>Summary Statement</b> I propose a semi-classical model to predict energy levels and spectral lines of Helium-like atoms.	
<b>Help Received</b> I work in my school's lab and used the school's equipments. My friends helped me finish the board, and Dr.Kuiper provided me important information and advice for my project.	