SOLVING THE HYDROGEN ATOM

Purpose

The purpose of this experiment is to investigate solutions (Eigenvalues and Eigenfunctions) of the Schroedinger equation for the Hydrogen atom.

Equipment and Chemicals

A PC running Mathematica 3.0, and a printer.

Directions

See the instructor for directions on how to load and run Mathematica.

Calculations

In Mathematica a **cell** is a small segment of the commands and/or text. You can identify a cell by the bracket (**]**) on the right of the notebook. To execute a command in a bracket place the cursor behind the command and type: **Shift+Enter**.
That is, hold down the Shift key and press the Enter key.

In this laboratory you will solve the Hydrogen atom exactly by using Mathematica. The text guides you through the solution of the problem and gives explanations of the results.

Start at the top of the Notebook which begins with **Vector Calculus**. Place the cursor after each successive command (which are given in **bold** face) and press **Shift+Enter**. As you proceed down the notebook, you will see Mathematica solve each equation and present algebraic answers and graphics.

Warning: Sometimes Mathematica takes a few seconds to solve some of the complicated equations. In the upper left hand corner of the notebook window you will see the work "Running…" whenever Mathematica is "thinking". Simply wait a few seconds and let it complete its work.

At the end of the experiment use the commands you learn there to plot a wave function for the Hydrogen atom ***other than one of those given*** in the notebook. Print out your graph and answer the following questions.

Questions

There are no questions for this experiment, yet!