Module: Pressure Number of Atoms (3-D) (Lrg. Pop.)

On a separate sheet of paper, put your name and the title of this experiment, and write a short introduction (a short paragraph of just a few sentences). Attach screen shots of all the results that were asked for. Finally, answer the following Analysis questions, either on this sheet or a new one.

Analysis Questions:
(1) At high $N$, your data points should have a step-like character. What do you think this is due to?

(2) At an intermediate value of $N$, the data points begin to follow a more regular, linear variation illustrating Goals 1 and 2. Estimate this value of $N$ from your plot.

(3) Using the diameter of a real Kr atom (0.314 nm) to calibrate the box volume, estimate the number density ($N/V$) of a gas with $N=250$. Compare it to the value for air at 273 K and 1 atm using the ideal gas law, $pV = NkT$.

(4) Calculate the volume (or packing) fractions, $\eta$, occupied by 220 Kr atoms and 250 He atoms. (Get the He size by comparison with Kr.) Use this to explain the difference in behavior between He and Kr at high $N$. See Eq.(1) on the lab instructions for more help. Do the series expansion!

(5) Assume $T=273$ K, and use Eq.(1) to calculate the pressure for 220 Kr atoms and 250 He atoms.