Module: **Diffusion** Look under 2-D or 3-D.

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:** **Be sure to list all of your values, i.e., report your raw data.**

1. Count the He atoms on the Ar side from the screen shots saved in Step (4). Find the mean number of He atoms for groups of 10 shots at a time. You should have at least 3 different values. (For example, I found 26.3, 21.7, and 23.7). If this were an ideal system of point mass atoms, what would you expect the overall mean value to be? What was yours? Estimate the probability of finding 23, 24, 25, 26, 27 He atoms on the Ar side in a screen shot. **Assume the Ar atoms occupy no area.**

2. Repeat Step (1) using the screen shots from Procedure Step (5). Now, what would you expect the overall mean value to be? (I found means of 24, 23.9, and 25.7 for my groups of 10.) Do you think the differences between the overall means from step (1) and (2) show that the argon atom size is a significant factor?

3. Your results probably don’t agree too well with the statistically expected values. What do you think this is due to? Why do you think I asked you to take data at the highest speed setting?

4. Use the Gaussian distribution to find the *ratio* of probabilities for finding 24 and 25 atoms on one side. Compare this to the *ratio* of probabilities for finding 2400 and 2500 atoms on one side in a system with 5000 total atoms. How does the system size affect the chance of observing the same relative fluctuation? In your write-up, show only a few screen shots with the extreme fluctuations (high and low) that you observed.