1. Derive an expression for the average of the squared speed. Is this equal to the square of the average speed? Why is this expression important?

2. In the Maxwellian Formulation, is it possible for a molecule in the classroom to travel faster than the speed of light? If so, calculate the probability.

Using the Maxwellian Velocity or Speed Distribution Functions, calculate the following for a typical nitrogen molecule in the classroom:

3. The average thermal speed, the square root of the average squared speed, the most probable speed, and the speed of sound. Explain why these are different. (NOTE: Give the quantitative values for these – you do not have to re-derive the expressions)

4. The probability that a molecule is traveling faster than the speed of sound.

5. The probability that a molecule’s speed is between 0 and the speed of sound.

6. The average velocity of the molecules going only in the +X (positive X)-direction.

7. The average velocity of the molecules going only in the –X (minus X)-direction.

8. If the gas in the classroom has a bulk velocity in the +X-direction of 300 m/sec, what is the most probable velocity of the gas in the X-direction. Draw the distribution function for this scenario.

9. The probability that a molecule is traveling in the –X-direction in Problem #5.