CH 19 HW

1. Plot the Maxwell-Boltzmann velocity distribution versus velocity for ***fluorine gas*** at temperatures of 400°C, 1200°C, 3600°C, and 10800°C. The range of your x-axis should be 0-7500 m/s, using increments of 25 m/s. The plots at each temperature should be shown on one plot, with a clearly labeled axes and a legend. Print this plot! Graphs should be neat and professional, with reasonable axes ranges and tick spacing (you should have no more than 10 tick marks on your x-axis). Also, print the first two pages of XY values from your graphing software. Both of these must be turned in to receive credit

2. For T = 10800°C, how would you expect the shape of the trace to change if you were analyzing hydrogen gas rather than fluorine? Why?

3. Plot $v_{rms}$, $\bar{v}$ & $v_{mp}$ vs T for fluorine gas. The range of your x-axis should be 0-10000 K. Use increments of 100 K for your excel table. On your plot, your x-axis ticks should be spaced 1000K. Turn in this plot.

4. Refer to the expression for average velocity:

$$\bar{v} = \sqrt{\frac{8RT}{\pi M}}$$

This equation is obtained by taking the following integral:

$$\bar{v} = \int_0^\infty v * p(v)\, dv$$

Where p(v) is the Maxwell-Boltzmann velocity distribution. Using the identity shown below, derive the equation for $\bar{v}$:

$$\int_0^\infty x^{2n+1}\, e^{-cx^2}\, dx = \frac{n!}{2c^{n+1}} \quad where\ c\ is\ a\ constant$$