Exercise 9.4
Kinetic Molecular Theory

1. The Maxwell-Boltzmann equation states that $P = \frac{Nmv_{rms}^2}{3V}$.

   The ideal gas law states that $P = \frac{nRT}{V}$. This is often rearranged to $PV = nRT$.

(a) On a molecular level, what causes the pressure in a container of gas?

(b) In the Maxwell-Boltzmann equation, pressure is directly related to the number of gas particles (N). Why?

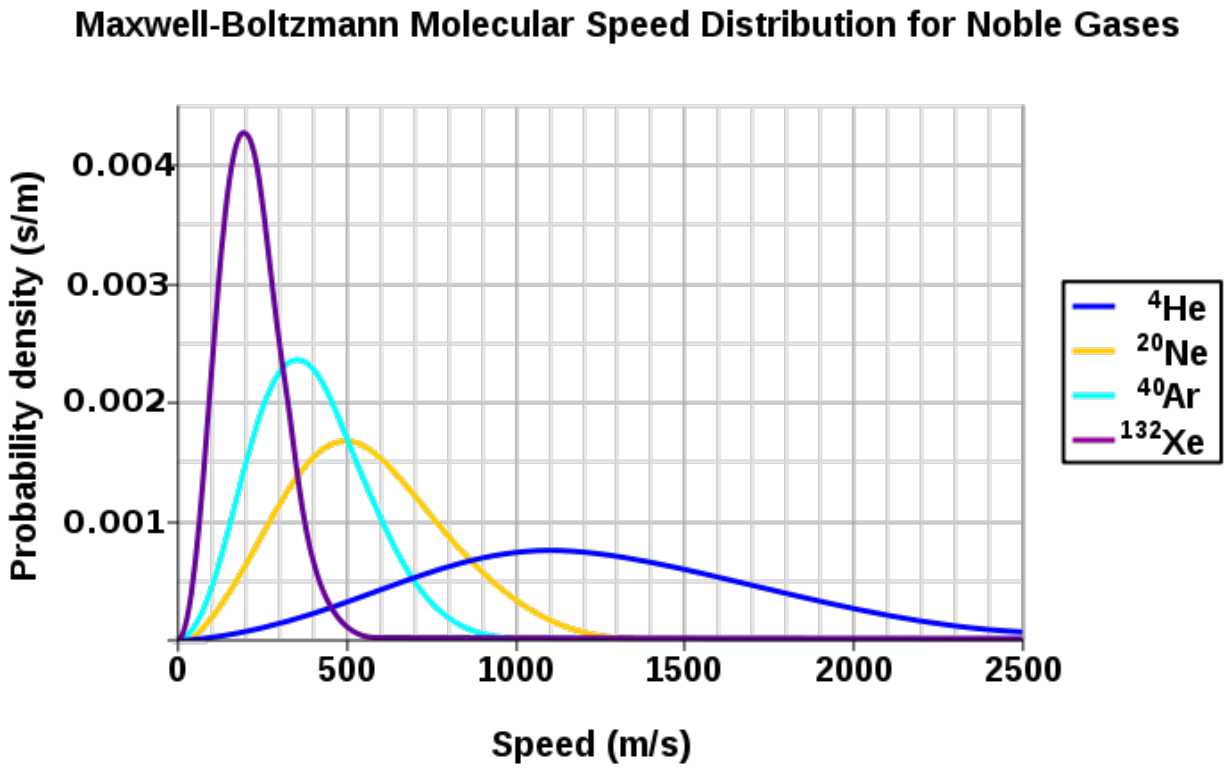
(c) In the Maxwell-Boltzmann equation, pressure is directly related to the mass of each gas particle (m). Why?

(d) In the Maxwell-Boltzmann equation, pressure is directly related to the root-mean-square speed squared (v_{rms}^2) of the gas. Why?

(e) In both equations, pressure is inversely related to the volume of the container. Why?

(f) In the ideal gas law, pressure is directly related to temperature (T) in Kelvin. Why?

2. The graph below[1] shows the speed distribution for atoms of four noble gases.



(a) The top of each curve represents the most probable speed for each noble gas. Is the root-mean-square speed (v_{rms}) larger or smaller than the most probable speed? Explain.

(b) Explain why the four noble gases have different speed distributions.

[1] The original uploader was Pdbailey at English Wikipedia.

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