

Name: _____

Date: _____

Astron 211 OOM #6 Wind

OOM Policy: You can work in pairs or groups of 3 if desired. You can consult class notes and books — no phones or computers. Make sure you are clear about the process you use to solve the problems: partial credit will be awarded. Always include units.

I've heard it on the radio that the weather is bad when the wind speed (measured in miles/hour) is larger than the temperature (measured in degrees F). However, that is only true in one system of units.

1. The actual diameter of an atom is about 1 \AA (10^{-10} m). If we have 1 liter of air at room temperature and a pressure of 105 Pa:
 - (a) Calculate the number of molecules in the sample of gas
 - (b) Estimate the average spacing between the molecules.
 - (c) Estimate the average speed of a molecule

2. Given a typical winter day in Milwaukee, estimate values for the wind speed v , and how much *bulk* kinetic energy a molecule has just from the wind.

3. What the ratio of bulk kinetic energy (#2) to random kinetic energy (#1). How fast would the wind have to be in order to have (#2) greater than (#1)?

Useful info:

- 1 mile/hour is 0.44 m/s
- $k_B = 1.4 \times 10^{-23} \text{ J K}^{-1}$
- $m_p = 1.7 \times 10^{-27} \text{ kg}$