Physics 301: Problems #2
August 29, 2019

1. Estimate the average temperature of the air inside a hot-air balloon. Take the total mass of the unfilled balloon and payload to be 500 kg, the balloon volume to be 2000 m^3, and note that the average molar mass of air is $\bar{m} = 29$ g/mole.

2. Suppose you have a gas containing hydrogen molecules and oxygen molecules, in thermal equilibrium. Which molecules are moving faster, on average? By what factor?

3. Prove that for a compound layer of two different materials sandwiched together (such as air and glass, or brick and wood), the effective total R value is the sum of the individual R values. Recall $R = \Delta x / k_t$.