

Recommended Problems for Week 1

I suggest trying to do these problems without looking anything up in your textbook or on the internet or in the solutions I'll provide. Even when you think you're stuck, do the best you can (as if this were a test).

On the other hand, if you find any of these problems too easy, just skip 'em.

1. Problem 1.3, page 5.
2. Problem 1.4, page 5.
3. Problem 1.6, page 6.
4. Problem 1.9, page 7.
5. Problem 1.12, page 8. Try to remember the approximate answer to the last question. It's something every educated person should know!
6. Problem 1.13, page 8. Go ahead and use a periodic table for this one. But try to memorize the atomic masses of H, He, C, N, and O. Every educated person should know those.
7. Problem 1.16, pages 8–9. This is a multi-part problem that will take you some time. I hope that you, living amid the mountains here in Utah, find the answers interesting!
8. Run the Interactive Molecular Dynamics simulation (physics.weber.edu/schroeder/md/). After playing with it for a while, and reading all the instructions (especially the part about units), set it up as follows: Set the number of atoms (N) to approximately 100 and the volume (V , actually an area in two dimensions) to approximately 5000. Add or remove energy until the temperature (T) remains stable at approximately 1.0. After the temperature and pressure have both stabilized, record the pressure (P) and compute the ratio PV/NkT (be careful with units!). What is this ratio for an ideal gas, and how does your result compare? Repeat (using the same N and V) for $T \approx 0.5$ and $T \approx 0.3$, being sure to remove enough energy for the system to equilibrate at these temperatures. Describe the way in which this system's behavior differs from that of an ideal gas, and explain the reason for this difference, noting the visual appearance of the system at each temperature.
9. Problem 1.18, page 13. Again, the approximate answer is something every educated person should know.
10. Problem 1.23, page 17.