CHEM 450/450G HW #1

Note: Be sure that you have done HW 0 (a trivial, but required assignment). HW 0 is an introduction to Mastering, and will give you a dry run at submitting your work for handwritten problems (HW 0 is due 8/27). These written assignments are due through Gradescope; Mastering assignments are due at 11:59 pm on the due date.

Reading: Chapter 1(All), 2.1-2.4 and 7.1-7.4.

For each "Q" question, write a brief (1 to 5 sentence) paragraph that completely answers the question. Use equations or sketches as appropriate. A ***complete answer*** shows all the steps in your thinking, and uses facts (like equations, definitions, conceptual ideas) as evidence in support of that argument.

For each "P" question, show all work. You may use red equations from the text without reference, but you should show any manipulations and always state all assumptions made. Partial credit will be issued, but only if I can figure out what you have done!

Hand in:

Q 1.11 (3 points)

P 7.7 (3 points), 7.22 (4 points)

Extra Credit: 1.33

Notes:

P7.7: "Show that" means "prove mathematically." This is a process (mathematical proof, but perhaps not as rigorous as in a math course) that we will use every day in class, and on many problems, so it is worth mastering now. To do this, start with the vdW equation, and evaluate what is meant by "in the limit of low density." Density does not appear explicitly in these equations, but both moles and volume do. Decide how to describe density with those two variables, then ask what it means to be in the limit of low density. Substitute that into the vdW equation, and you should find that, regardless of the values of a or b for a particular gas, in the limit of low density, the vdW equation reduces to the ideal gas law.

P7.22: Tables 7.2 and 7.4 are in the appendix, rather than in the text. I don't know why. First, calculate R using the relationship between z_c, P_c, V_c, and T_c. How good is it? Then, use this value of R to calculate a and b. Would your results be more accurate if you used the standard value for R? Note that to get the units to work, you must recall that the critical constants are for a single mole of gas.

Practice:

Q 1.4, 1.10, 2.8, 7.1, 7.14

P 1.3, 1.22, 2.19, 2.22, 7.27, 7.28