Oberlin College Physics 111, Spring 2024

Assignment 12

Monday, 29 April

This is the *last problem assignment!*

Reading: Chapter 3, "The First Law of Thermodynamics", and chapter 4, "The Second Law of Thermodynamics". (Section 4.7, "Entropy on a Microscopic Scale", contains errors that I will detail on the final class.)

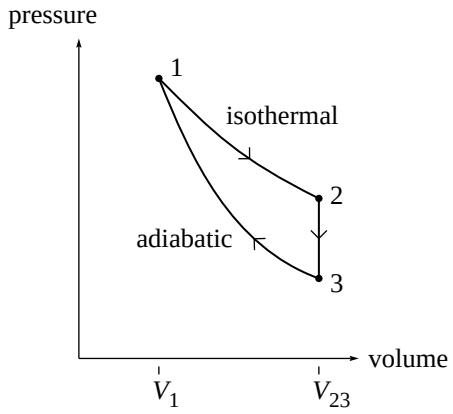
Laboratory: This week, " Polarization of Light". Final week of the semester, "Calorimetry".

Final exam will be Thursday, 16 May, from 9 AM to 11 AM.

Problems: Two problems, due Wednesday, 8 May.

- *Open the stopcock*
  Container A holds an ideal gas at pressure 5.2×10^5 Pa and temperature 300 K (room temperature). It is connected via a thin tube, closed with a valve, to container B with 3.3 times the volume of container A. Container B holds the same ideal gas at pressure 1.0×10^5 Pa (atmospheric pressure) and temperature 373 K (temperature of boiling water). The valve is opened to allow the pressure to equalize, but the temperature of each container remains the same. What is the pressure now?

- *Change in a cycle*
  Suppose n moles of an ideal gas with $\gamma = \frac{7}{5}$ are taken reversibly through the cycle outlined below, with $V_{23} = 3.00\, V_1$.



What are (a) p_2/p_1, (b) p_3/p_1, and (c) T_3/T_1?

For path $1 \to 2$, what are (d) W/nRT_1, (e) Q/nRT_1, and (f) $\Delta E_{\text{int}}/nRT_1$?

For path $3 \to 1$, what are (g) W/nRT_1, (h) Q/nRT_1, and (i) $\Delta E_{\text{int}}/nRT_1$?

For path $2 \to 3$, what are (j) W/nRT_1, (k) $\Delta E_{\text{int}}/nRT_1$, and ($\ell$) Q/nRT_1?

Practice problems: I recommend that you work these problems from LSM chapter 3: 31, 37, 41. But don't bother to write up and turn in your solutions... instead, check them against the "answer key" in the back of the book.