Physics 3410 Homework #2

6 problems

Due by February 1

▷ **1.**

How many molecules are in a cubic centimeter of air at standard temperature and pressure? (You needn't worry about the different types of molecules.)

▷ **2.**

What is the internal energy U of $0.05\,\mathrm{m}^3$ of an ideal gas of point particles with pressure $P = 8 \times 10^4\,\mathrm{Pa}$?

▷ **3.**

An ideal gas is compressed from some volume V_i to half that volume ($V_f = \frac{1}{2}V_i$) at constant temperature $T = 290\,\mathrm{K}$.

(a) How much work is done on the gas?

(b) How much heat flows into or out of the gas? (Hint: think about ΔU, how the internal energy changes.)

▷ **4.**

Two hundred joules of heat flows into an ideal gas of $N = 10^{23}$ point particles which maintains a constant pressure of $P = 3 \times 10^5\,\mathrm{Pa}$ throughout the flow of heat.

(a) Is the volume of the gas increasing, staying the same, or decreasing?

(b) What is the heat capacity at constant pressure C_P?

(c) How much does the gas's temperature increase?

▷ **5.**

How many different letter sequences can I make with the letters in the word "RACECAR"?

▷ **6.**

Twenty people enter a raffle.

(a) How many different ways can I hand out identical prizes to three different people in the raffle? Give me a number, please, not just an expression.

(b) What if the prizes are different?