PHYS 1110 Worksheet: pV work

Ideal Gas

$$pV = nRT$$

p = pressure, Pa (N/m^2)

V = volume, m^3

n = number of moles

R = universal gas constant, 8.314 J/(mol·K)

T = absolute temperature, K

Internal Energy U

Monatomic gas: $U = 3/2\ nRT$ Diatomic gas: $U = 5/2\ nRT$

Problems

1. The volume of CR 133 is something on the order of 750 cubic meters (wild guess). Normal room temperature is 21°C, and the air pressure in Laramie is around 80 kPa.

   A. How many moles of air are in the room?

   B. What would be the volume of that many moles of air outdoors on a crisp 0°C morning?

   C. How much work would that much air do as it warms from 0°C to 21°C?

3. Air is almost entirely nitrogen (N_2) and oxygen (O_2), both diatomic gases.
   A. What is the internal energy of the air in CR 133 at 21°C?

   B. What was its internal energy outdoors at 0°C?

   C. If the heating system broke and the air in CR 133 were at a temperature of 0°C, what would its internal energy be?