To get full credit: Show your work and explain answers not based on calculation.

Problems

Problem #4 was corrected in this version.

1. About many molecules are in a cubic centimeter of air in this room now?

2. Within a factor of two, what is the partial pressure of H_2O in the air right now? (You probably will need to look up some data from the literature for this).

3. Using the ideal gas law, calculate the pressure in atm **and** Pa exerted by one mole of CO_2 at 304.2 K in a volume of (a) 0.050 liters, (b) 0.0957 liters, and (c) 50.00 liters.

4. Using the ideal gas law, calculate the volume in Liters **and** m^3 of 1.00 moles of N_2 at
(a) 0.040 bar and 298 K (b) 1.00 bar and 298 K (c) 1.00 bar and 500 K.

5.a From the *definition* of pressure, calculate the **mass** in kg of the entire gaseous atmosphere above the surface of the Earth (taking the earth as a perfect sphere with diameter, d, equal to 7918 miles, with surface at sea level, barometric pressure = 1 atm = 101.325 kPa. Take g, the gravitational acceleration constant for Earth, to be 9.807 m/s^2. Area of a sphere = πd^2 or $4\pi r^2$.

Assume the Earth's radius is enormous compared with the thickness of the atmosphere.

5.b Explain the need for this assumption.

6. According to a survey of the expenditure of energy in the United States, the American population is consuming energy equivalent to the burning of 12,000 kg of coal per person per year. If indeed this amount of coal were burned to CO_2 per year per American (taking a static population of 350 million people) for 100 years, what **mass** of CO_2 would be produced?

Treat the coal as pure carbon.