**AOSC 434: Air Pollution**

**Homework Set #1**

NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Due: February 9, 2018**

Note: This and all subsequent homework contains some twist or "trick" to ensure that you look at it prior to midnight, February 10.

1. (4 points) Fill in the following table; assume STP.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Gas/Unit | g/m3 | molecules/cm3 | ppm | ppb | % |
| SO2 | 30 |  |  |  |  |
| NO |  | 1.0E15 |  |  |  |
| NO2 |  |  |  | 1.9 |  |
| CO |  |  | 47 |  |  |

If the temperature now goes up to 25°C at constant pressure, how will the concentration of NO change?

2. (3 points) **Measure** the approximate number of molecules in a normal breath of air. Report how you made this measurement and how uncertain it might be. If your breath is completely mixed with the entire atmosphere, how many molecules from the first breath will you re-breathe on your next breath? Estimate how many molecules you will breathe in a lifetime. In your next breath how many molecules will have once been in the lungs of Achilles who died at the age of 42? Assume the atmosphere conserves all air molecules.

3. (3 points) Calculate the numeric value of o, the dry adiabatic lapse rate in units of K/km using the following expression and g and Cp in units of m/s2 and cal/mole K:

 o = -g/Cp

Show your unit analysis