**Combined and Ideal Gas Laws**

1) I have an empty water bottle in my office that has a volume of 500 mL. If the temperature in my office were to go from 295 K to a very chilly 275 K, what would the new volume of the bottle be?

2) I also have a full water bottle in my office with the same volume. However, if the temperature decreased in my office from 295 K to the same 275 K as in the last problem, the volume of the bottle would not change at all. Explain why this bottle would not get smaller while the one in problem 1 would.

3) I have an empty bottle of ammonium hydroxide in my office – it contains nothing but normal room air. If the temperature in my office is 295 K and the pressure inside the bottle is 1 atm, what would be the new pressure inside the bottle if I decreased the temperature of my office to 275 K?

4) I have a 2 L empty soda bottle in my office – it contains only normal room air. If this bottle contains 2.5 moles of air and is at a temperature of 295 K, what is the pressure inside the bottle? R = 0.08206 Latm/mol K.

5) The frontal sinus in a human typically has a volume of 0.006 liters. If the temperature inside of the person’s nose is 305 K and the pressure is 1.00 atm, how many moles of air can fit into the frontal sinus? R = 0.08206 Latm/molK.