PHY102 HW #1 – Due Thursday. 1/23/03
Ideal Gases, Energy, and Temperature

This HW will be fairly short due to all of the reading you are doing right now.

1. Explain the difference between temperature and energy. Tell how you would measure each one. Note: This topic will be addressed in detail in Activity #3 on Wednesday, 1/22. As a result, you may want to save this one to do Wednesday evening. The other problems you should be able to work earlier.

2. **Essay Question:** *Note: There will be Essay Questions on the exams. Start Practicing now.* When you use a microwave to cook food, energy is transferred from the power lines outside your house to the food you cook. Write a paragraph explaining as many stages in this process as you can. What forms of energy are involved at each stage – in the power lines, in any intermediate stages, and in your food?

3. Consider two boxes of gas at room temperature (around 300K). One box contains Hydrogen gas while one box contains Argon gas.

   a) Suppose that the gases are at 1 Atm. ($= 10^5 N/m^2$) of pressure. If each box is has a volume of one liter (one liter $= 10^{-3} m^3$), how many molecules are there of each?

   b) Suppose that these boxes are maintained at a constant volume and that no molecules are allowed in or out. However, they are heated until the pressure doubles. What is the new temperature of the boxes?

   c) Suppose the the boxes are compressed to half of their original size but that the temperature remains the same. i) What is the new pressure? ii) Has any heat entered or left the boxes? (If yes, did heat enter or leave, and was it the same amount for both boxes?)

4. **Short Answer:** In Brownian motion, why doesn't friction slow the particles down and turn their kinetic energy into heat?.