PHYS 1220 Group Work Sheet
Thermodynamic paths

1. A monatomic ideal gas in a cylinder at an initial temperature of 350 K and volume of 5.00 L is heated to 490 K while being maintained at a constant pressure of 2.00 bar.
   a. What is the initial kinetic energy of the molecules of the gas?

   b. What is the final kinetic energy of the molecules of the gas?

   c. How much work does the gas do as it is heated? Is this positive or negative?

   d. How much heat is added to the gas to raise its temperature?

2. A cylinder of 5.00 L of a diatomic ideal gas at a temperature of 300 K and pressure of 2.00 bar is placed in a constant-temperature bath at 300 K. The piston of the cylinder is raised slowly ("quasisatatically") to allow the gas to remain at a constant 300 K as it expands to 7.50 L.
   a. What is the total initial kinetic energy of the molecules of the gas?

   b. What is the total final kinetic energy of the molecules of the gas?

   c. How much work does the gas do on its surroundings as it expands?

   d. How much heat flows into the gas from the constant-temperature bath as it expands?

3. A monatomic ideal gas in a cylinder at an initial temperature of 350 K and volume of 5.00 L is heated to 450 K while being maintained at a constant pressure of 2.00 bar. Does the internal energy of the gas increase or decrease?

4. A cylinder of 5.00 L of a diatomic ideal gas at a temperature of 300 K and pressure of 2.00 bar is placed in a constant-temperature bath at 300 K. The piston of the cylinder is raised slowly ("quasisatatically") to allow the gas to remain at a constant 300 K as the gas expands to 7.50 L. Does the internal energy of the gas increase or decrease?

5. A diatomic ideal gas in a cylinder initially at 1.00 bar pressure and 300 K is rapidly (adiabatically) compressed to 1/20 of its initial volume.
   a. What is the temperature of the gas after it is compressed?

   b. How much work is done on the gas to compress it if its initial volume was 20.0 mL?