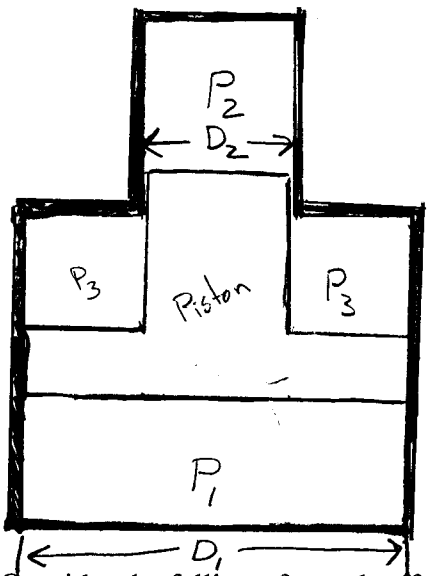
ME/CH EN 2300
Homework # 2
Due January 24, 2007

To ensure that you receive full credit for your solutions, please write out all equations in symbolic form, give numerical values for all variables and constants in the equations, and write answers to conceptual problems in complete sentences.

1. (1-56) In the figure below, the piston diameters are D_1= 10 cm and D_2 = 4 cm. If P_1 = 1000 kPa and P_3 = 500 kPa, what is the pressure in chamber 2 in kPa?



2. (2-1) Consider the falling of a rock off a cliff into seawater and eventually settling at the bottom of the sea. Starting with the potential energy of the rock, identify the energy transfers and transformations involved during this process.

3. (2-5) How are heat, internal energy, and thermal energy related to each other?

4. (2-6) What is mechanical energy? How does it differ from thermal energy? What are the forms of mechanical energy in a fluid stream?

5. (2-14) At a certain location, wind is blowing steadily at 10 m/s. Determine the mechanical energy of the air per unit mass and the power generation potential of a wind turbine with a 60 m diameter blade at that location. Take the air density to be 1.25 kg/m^3.

6. (2-31) Determine the energy required to accelerate an 800 kg car from rest to 100 km/h on a level road.

7. (2-47) An adiabatic closed system is raised 100 m at a location where the gravitational acceleration is 9.8 m/s^2. Determine the energy change of the system in kJ/kg.