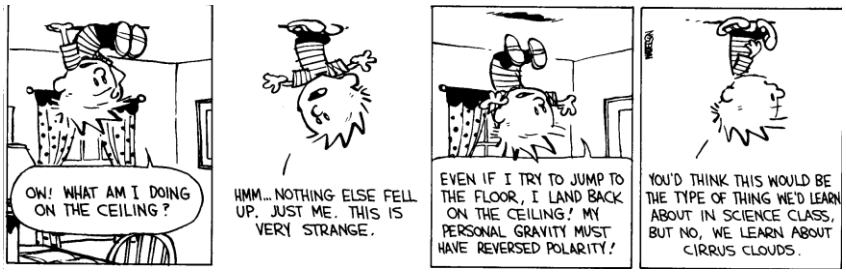
AP 2 Thermodynamics WS 4

Name: _____ Period: _____

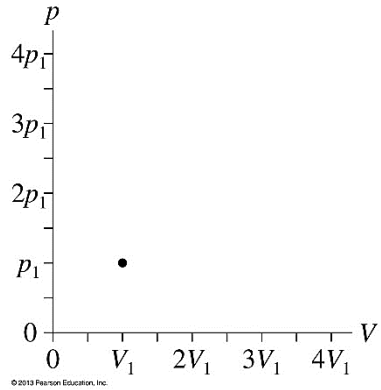


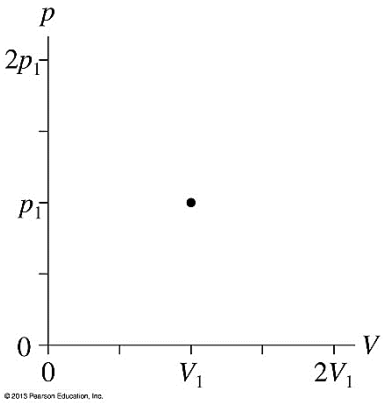
With thermodynamics, one can calculate almost everything crudely; with kinetic theory, one can calculate fewer things, but more accurately; and with statistical mechanics, one can calculate almost nothing exactly – Eugene Wigner

1. The molecular mass of water is 18. How many protons are there in 1 L of liquid water?

2. A gas at temperature T_0 and atmospheric pressure fills a cylinder. The gas is transferred to a new cylinder with three times the volume, after which the pressure is half the original pressure. What is the new temperature of the gas?

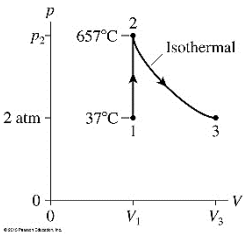
3. A gas starts with pressure p_1 and volume V_1. Show on the figure the process in which the gas undergoes an isochoric process that doubles the pressure, then an isobaric process that doubles the volume, followed by an isothermal process that doubles the volume again. Label each of the three processes.

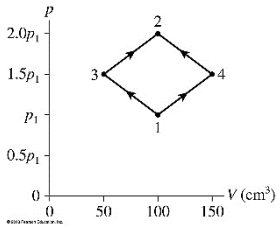




4. A gas starts with pressure p_1 and volume V_1. Show on the figure the process in which the gas undergoes an isothermal process during which the volume is halved, then an isochoric process during which the pressure is halved, followed by an isobaric process during which the volume is doubled. Label each of the three processes.

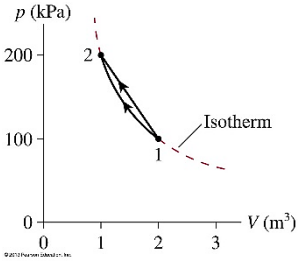
5. 8.0 g of helium gas follows the process 1 → 2 → 3 shown in the figure. Find the values of V_1, V_3, p_2, and T_3.

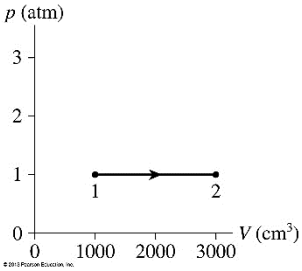




6. The figure shows two different processes by which 1.0 g of nitrogen gas moves from state 1 to state 2. The temperature of state 1 is 25°C. What are (a) pressure p_1 and (b) temperatures (in °C) T_2, T_3, T_4?

7. The figure shows two different processes by which 80 mol of gas moves from state 1 to state 2. The dashed line is an isotherm.
   a. What is the temperature of the isothermal process?
   b. What maximum temperature is reached along the straight-line process?





8. 0.10 mol of gas undergoes the process 1 → 2 shown in the figure.
   a. What are the temperatures T_1 and T_2 (in °C)?
   b. What type of process is this?
   c. The gas undergoes an isothermal compression from point 2 until the volume is restored to the value it had at point 1. What is the final pressure of the gas?