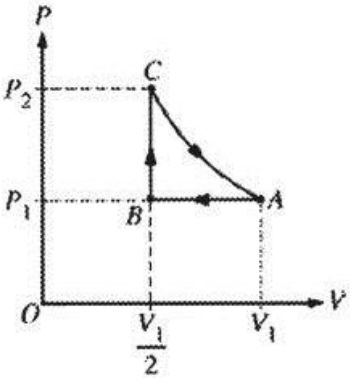
Name:_____ Date:_____

PV Diagram Practice (whiteboarding)



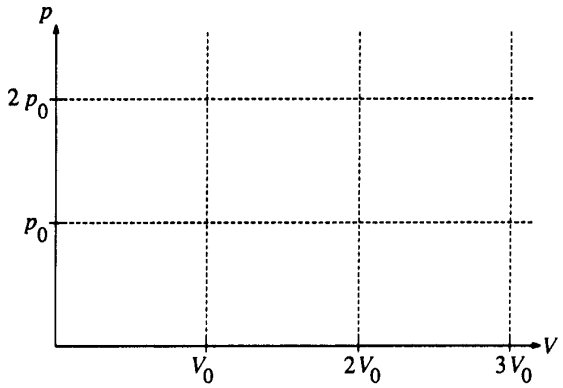
1. One mole of an ideal gas is initially at pressure P_1, volume V_1, and temperature T_1, represented by point *A* on the *PV* diagram above. The gas is taken around cycle *ABCA* shown. Process *AB* is isobaric, process *BC* is isochoric, and process *CA* is isothermal.

a. Calculate the temperature T_2 at the end of process *AB* in terms of temperature T_1.

b. Calculate the pressure P_2 at the end of process *BC* in terms of pressure P_1.

2. An ideal gas initially has pressure p_o, volume V_o, and absolute temperature T_o. It then undergoes the following series of processes:
   - I. It is heated, at constant volume, until it reaches a pressure $2p_o$.
   - II. It is heated, at constant pressure, until it reaches a volume $3\ V_o$.
   - III. It is cooled, at constant volume, until it reaches a pressure p_o.
   - IV. It is cooled, at constant pressure, until it reaches a volume V_o.

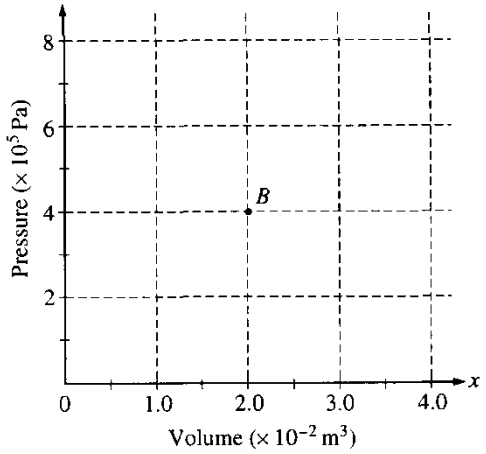
a. On the axes below
   - i. draw the p-V diagram representing the series of processes;
   - ii. label each end point with the appropriate value of absolute temperature in terms of T_o.



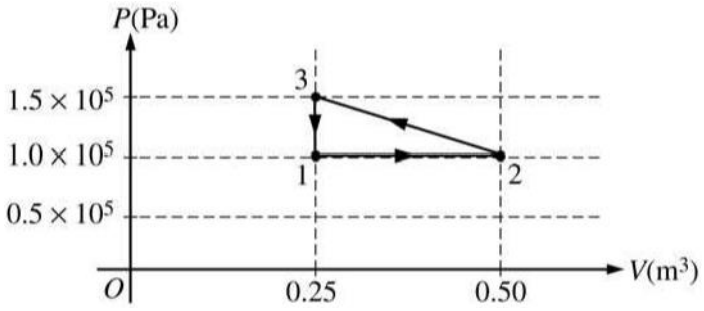
3. A cylinder contains 2 moles of an ideal monatomic gas that is initially at state A with a volume of 1.0×10^{-2} m^3 and a pressure of 4.0×10^5 Pa. The gas is brought isobarically to state B. where the volume is 2.0×10^{-2} m^3. The gas is then brought at constant volume to state C, where its temperature is the same as at state A. The gas is then brought isothermally back to state A.

   a. Determine the pressure of the gas at state C.

   b. On the axes below, state B is represented by the point B. Sketch a graph of the complete cycle. Label points A and C to represent states A and C, respectively.



4. A cylinder with a movable frictionless piston contains an ideal gas that is initially in state 1 at 1×10^5 Pa, 373 K, and 0.25 m^3. The gas is taken through a reversible thermodynamic cycle as shown in the *PV* diagram.

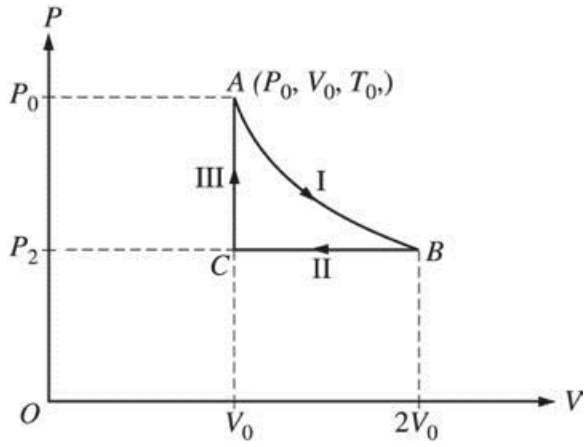


   a. Calculate the temperature of the gas when it is in the following states.

      i. State 2

      ii. State 3

5. A sample of ideal gas is taken through steps I, II, and III in a closed cycle, as shown on the pressure *P* versus volume *V* diagram, so that the gas returns to its original state. The steps in the cycle are as follows:



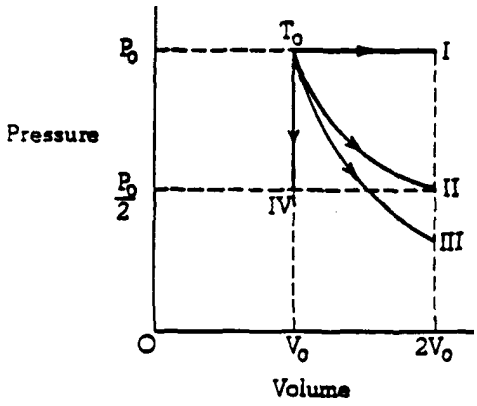
I. An isothermal expansion occurs from point *A* to point *B,* and the volume of the gas doubles.

II. An isobaric compression occurs from point *B* to point *C,* and the gas returns to its original volume.

III. A constant volume addition of heat occurs from point *C* to point *A* and the gas returns to its original pressure.

a. Determine numerical values for the following ratios, justifying your answers in the spaces next to each ratio.

i. $\frac{P_B}{P_A}$ = ii. $\frac{P_C}{P_A}$ = iii. $\frac{T_B}{T_A}$ = iv. $\frac{T_C}{T_A}$ =



6. Four samples of ideal gas are each initially at a pressure P_o and volume V_o, and a temperature T_o as shown on the diagram above. The samples are taken in separate experiment from this initial state to the final states I, II, III, and IV along the processes shown on the diagram.
   a. One of the processes is isothermal. Identify which one and explain.

   b. One of the processes is adiabatic. Identify this one and explain.