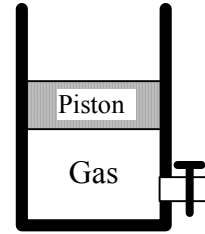Due on Friday 09/04

1. A cylinder with a valve at the bottom is filled with an
   ideal gas. The valve is now opened and some of the
   gas escapes slowly. The valve is then closed, after
   which the piston is observed to be at a lower position.
   Assume that the system is in thermal equilibrium with
   the surroundings at all times.
   (a) Is the final pressure of the gas in the cylinder greater
   than, less than or equal to the initial pressure? Explain.
   (b) In this process, which of the quantities P, V, n and T
   are held constant and which are allowed to change? Draw a P-V graph for this
   process.
   (c) Also draw a V-T graph for this process.

2. For each of the following parts, state whether there exists an ideal gas process that
   satisfies the conditions given. If so, describe the process and give an example
   from class if possible. If not, explain why such a process does not exist.
   (a) There is heat transfer, but the temperature of the gas does not change ($Q \neq 0$,
   $\Delta T = 0$).
   (b) There is no heat transfer, but the temperature of the gas changes ($Q = 0$, $\Delta T \neq 0$).
   (c) There is no heat transfer, but the work is done on the gas ($Q = 0$, $W \neq 0$).
   (d) There is no work done on the gas, but there is heat transfer ($Q \neq 0$, $W = 0$).