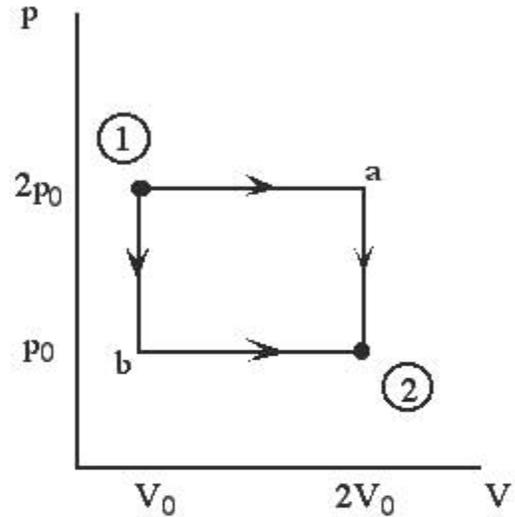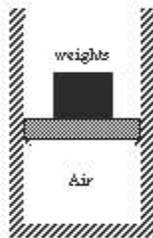# Chapter 3 Question #3

Along Path a: $W = 2p_0(2V_0 - V_0) = 2p_0V_0$

Along Path b: $W = p_0(2V_0 - V_0) = p_0V_0$

Question: Given a piston filled with air, ice, a bunsen burner, and a
stack of small weights, describe how you would use these to move
along either path a or path b above. When you move along either
path how do you physically know the work is different?

Chapter 3 Question 3 Answer:

For the upper path (path a), the pressure will be maintained constant if the weights are left on the piston. Then heat needs to be added to cause the system to expand. After it has expanded, it needs to be cooled and simultaneously have weights removed so that the volume stays constant while it cools.

For path (b), the lower path, the two processes just need to be reversed. The weights should be gradually removed while the system is being cooled, then the weights should be left on to maintain constant pressure while the system is being heated.

You physically know that less work is done because on path a more weights are moved during the expansion from small volume to large volume.

Hence, work is path dependent. One can go between the same two thermodynamic states along an infinite number of paths, but the work differs along these paths.