Ideal gases and Work Done

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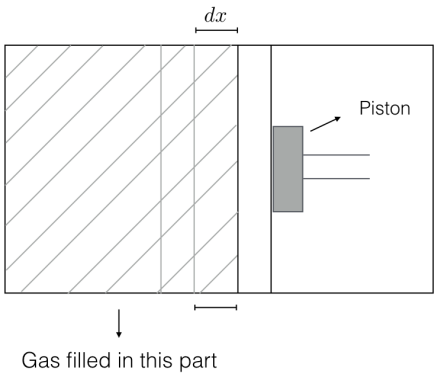
From Newtonian mechanics, we know that $W = -\int F \cdot dx$ and that *Pressure is force per unit area* that is $P = F/A$. Let's see if we can use that concepts in case of gases.

Practice Problem:
Consider the following figure. It shows that a chamber at room temperature ($T = 293K$), with a volume of $0.065m^3$ is filled with a gas. The shaded region is filled with the gas and this gas is exerting a pressure inside the chamber. The gas is confined by a piston with a weight of $100N$ and an area of $0.65m^2$. The pressure on the right side of the piston is atmospheric pressure ($P_{atm} = 1 \times 10^5 Pa$).



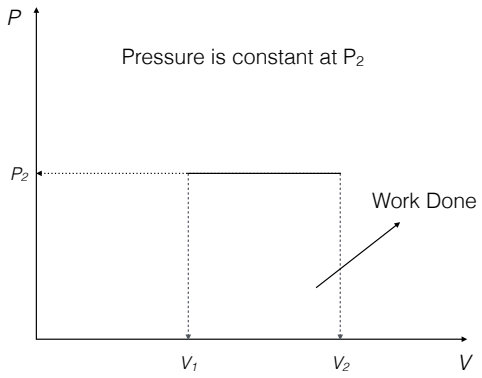
a What is the pressure of the gas?

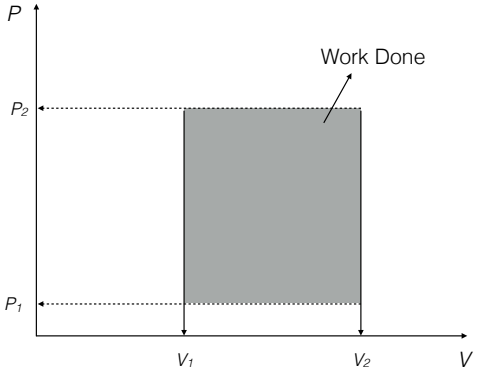
b The gas is heated, expanding it and moving the piston towards the right. This figure shows that the gas has expanded so that the piston

has been displaced by an amount dx. If the volume occupied by the gas doubles, how much work has the gas done?

So, *work done = area under the curve of a PV curve.*

Write down the work done in the following cases: First case - the pressure is held constant. Second case - both pressure and volume are allowed to change.





Extra credit:
Let's work out the work done for the following case. The temperature T is held constant.