Work done in gases

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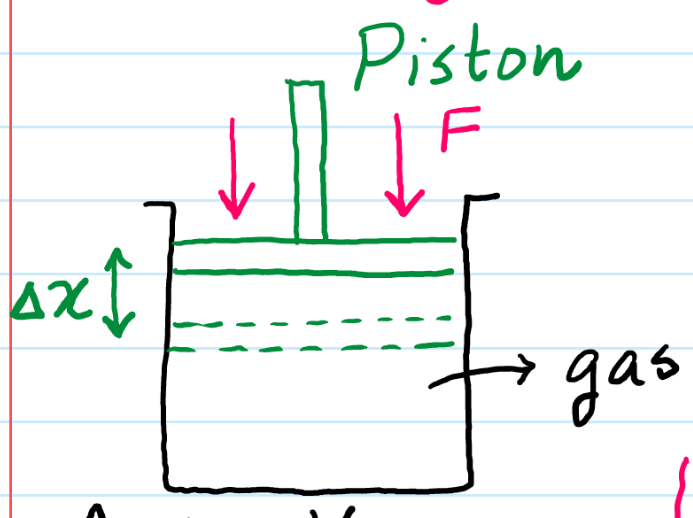
Formula for calculating work done in case of gases.

The diagram below shows a container filled with a gas. The gas pressure is denoted as P. A piston is positioned as shown. The area of the piston is denoted by A. We apply a force F downwards on the piston so that the piston moves through a small distance Δx. In this case, since the gas molecules will get "compressed" ∴ we use the term **Work is done ON the gas.** This value can be calculated as shown



W.d on the gas

$F \cdot \Delta x$

↓

$P \cdot A \cdot \Delta x$

$$W = P \cdot \Delta V$$

$A \cdot x = V$

$A \cdot \Delta x = \Delta V$

where ΔV represents "Change in Volume"

Q:: A press. of 100 KPa causes volume of a gas to change from $50\ cm^3$ to $35\ cm^3$

W.d on the gas $= P \cdot \Delta V$

$= 100 \times 10^3 \times (15 \times 10^{-6})$

$= 1.5\ J$

Reverse application

W. done BY the gas ::

If the gas undergoes expansion which causes the piston to move upwards, then we use the term W.done BY the gas.

W.d by the gas = $P \cdot \Delta V$

Q $P = 100\ KPa$

volume of the gas changes from $100\ cm^3$ to $140\ cm^3$.

W.d BY the gas $= P \times \Delta V$

$= 100 \times 10^3 \times 40 \times 10^{-6}$

$= 4\ J.$

Graph.

If a graph of Press. against Volume. Then Area under graph gives a value for W.done