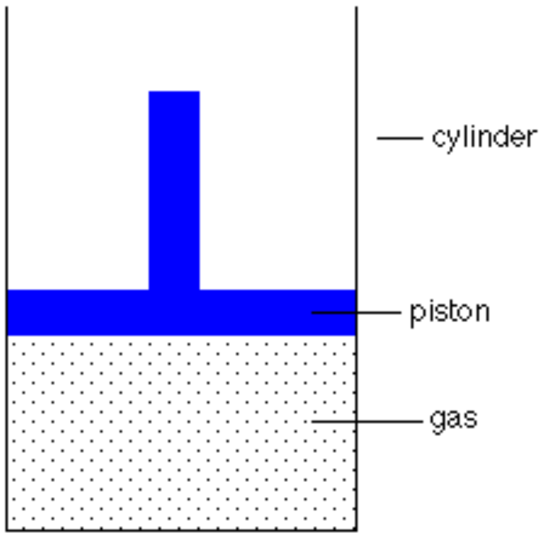
pV Diagrams

Thermodynamic state

When a system is at equilibrium under a given set of conditions, it is said to be in a definite state. For a given thermodynamic state, many of the system’s properties have a specific value corresponding to that state.

Volume Change: confined gas



Work = (Force)(displacement)

= (pressure x Area)(displacement)

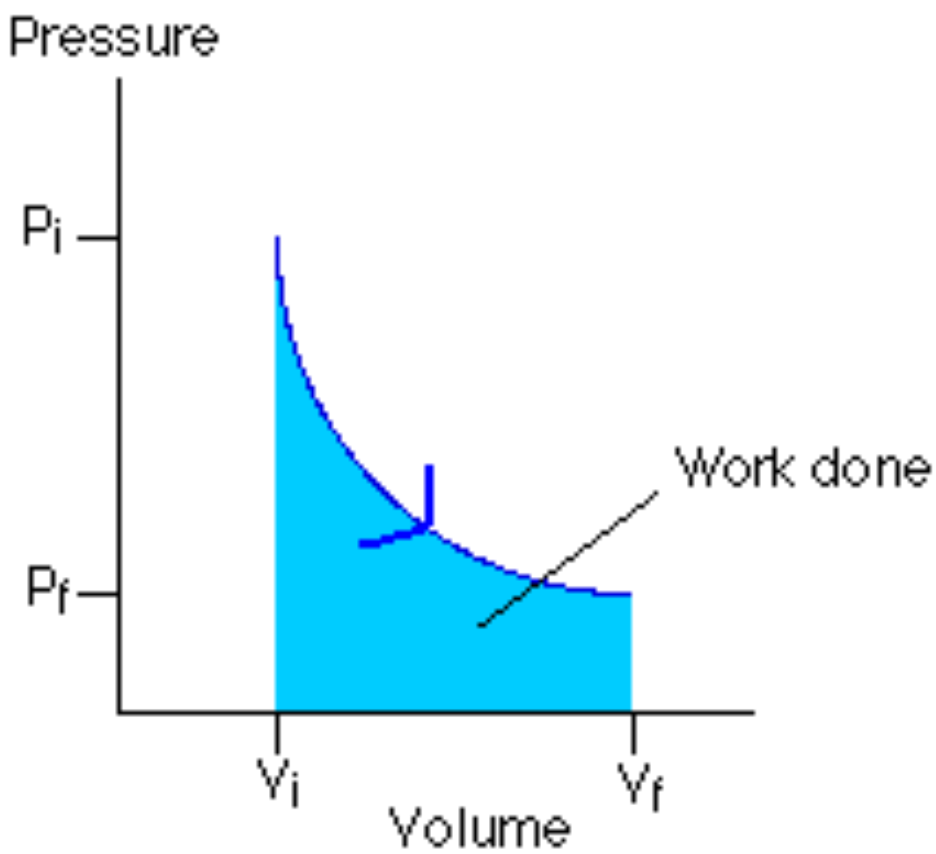
= (pressure) x **(Δvolume)**

Work = **Force** x **displacement**

	$\mathbf{F}_{GonP}$	$\mathbf{F}_{PonG}$	$\mathbf{d_y}$	**work done by gas**
expansion	↑	↓	↑	**W>0**
compression	↑	↓	↓	**W<0**

p-V Diagram

work done = area under *p*-V curve

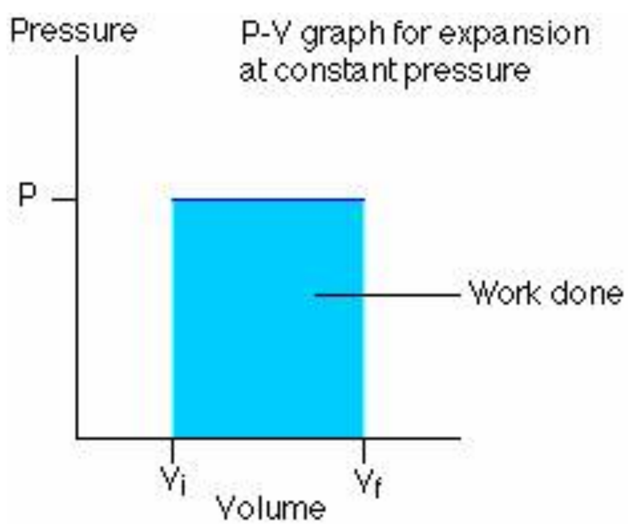


Thermodynamic Process

-a process in which there are changes in the state of a thermodynamic system

1. **ISOBARIC**

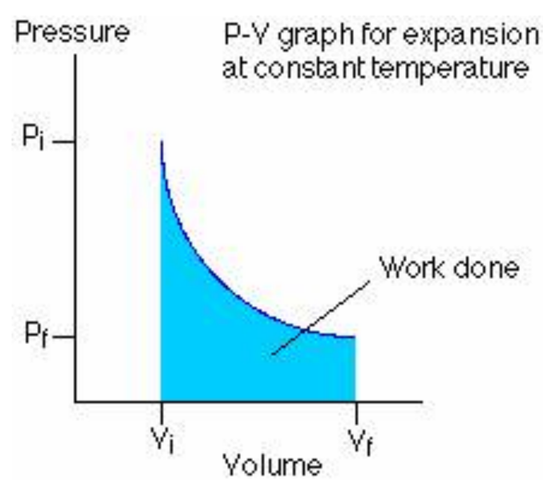
– constant pressure



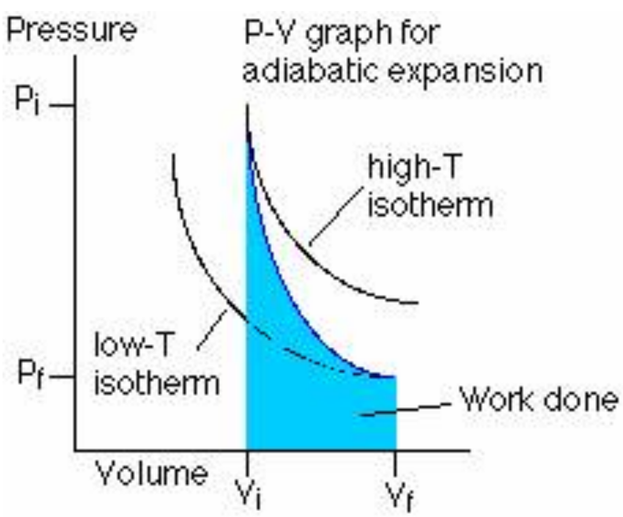
2. **ISOTHERMAL**

– constant temperature

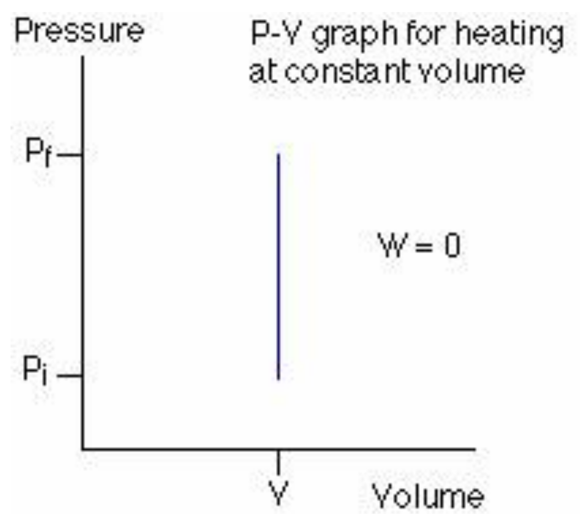
- heat flow slow enough that thermal equilibrium is maintained



3. **ADIABATIC** – no heat transfer
- insulation
- very quick process



4. **ISOCHORIC** – no work done
- fixed volume
- rigid walls
- “free expansion”



Internal energy is a ***state function***

- function of state coordinates (*p*, V, T)
- a thermodynamic system in a specific state has a unique internal energy that depends only on that state