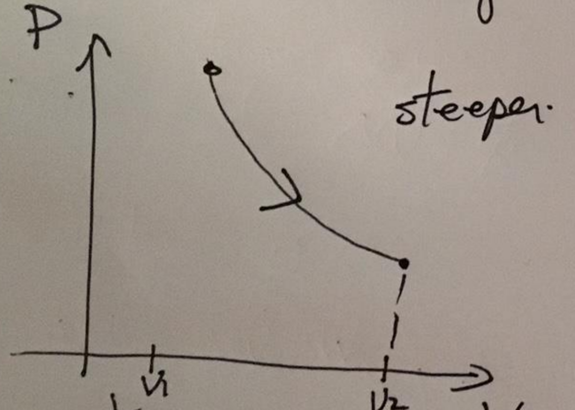
When a system is <u>compressed</u>

W is negative and ΔU is positive

On a PV Diagram (looks similar to isothermal but not quite)

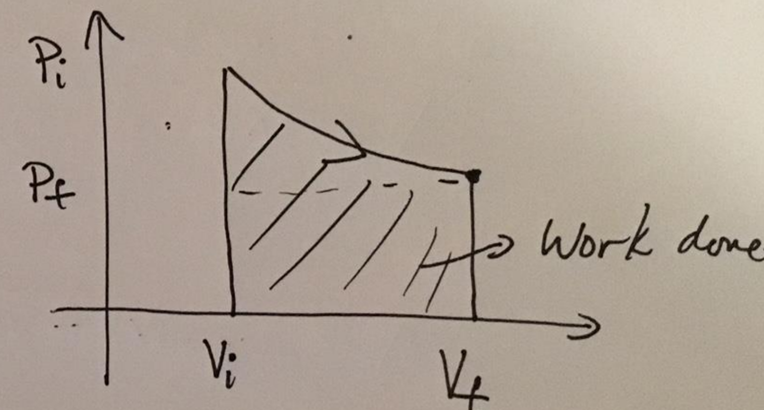


$P_1 V_1^{\gamma} = P_2 V_2^{\gamma}$ $(\gamma = 1.4)$

All of Heat energy goes to Work and we don't change kinetic energy of particles

isothermal.

$W_{by\ gas} = \int P\,dV$ = Area under curve.



Force due to pressure is in same direction as displacement

$W_{by\ gas} > \emptyset$

$\Delta U = 0$ isothermal

$\Delta Q \Rightarrow$ Heat up gas to do work.

Adiabatic

* Definition: No heat exchanged between gas and container ⇒ well insulated. $\Delta Q = \phi$

First law

$$\Delta U = \overset{0}{\cancel{\Delta Q}} - W_{by\ gas}$$

$$\Delta U = -W_{by\ gas}$$

When a system expands adiabatically $W_{by\ gas} > 0$ (positive)

so ΔU is negative and internal energy decreases.

Isothermal

* Temperature is constant. ⇒ Definition
* Since internal energy is $U = \frac{3}{2} nRT$ (ideal gas)

U is constant ⇒ $U_i = U_f$.

$$\boxed{\Delta U = \frac{3}{2} nR\,\Delta T = \phi}$$

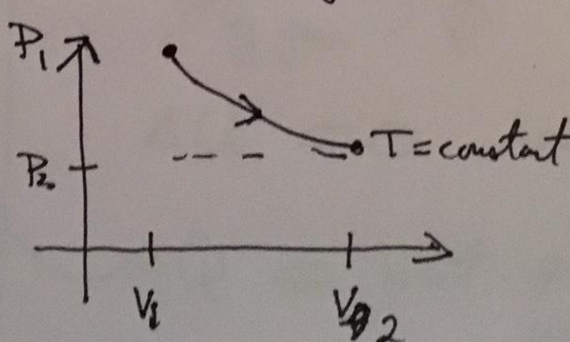
First law

$$\Delta U = \Delta Q - W_{by\ gas} = \phi$$

$$\Delta Q = W_{by\ gas}$$

For gas to do work we need to add heat!!

On a PV Diagram.



$PV = nRT$ (nRT: constant)

$$\boxed{P_1 V_1 = P_2 V_2 \quad \text{isothermal}}$$