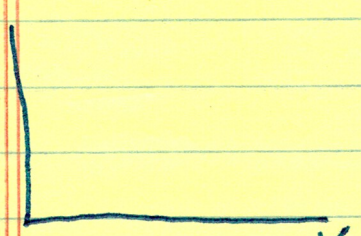
# B.2 PV Diagrams (Day 2)

Ideal Gas $PV = nRT$

n: Constant

Fixed Container (n will not change)

So: Pressure & Value determine Temp

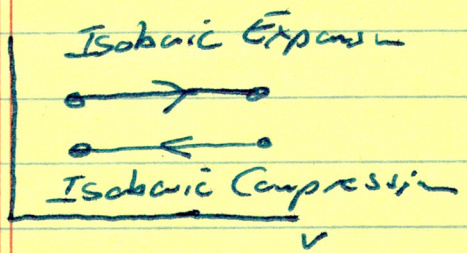



→ Expansion + Work done by the gas

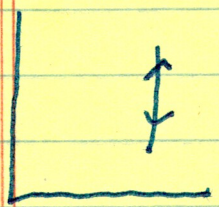
Compression ← − Work: Work being done on the gas

Ex. Isobaric Expansion (Pressure Remain Constant)

Volume increases

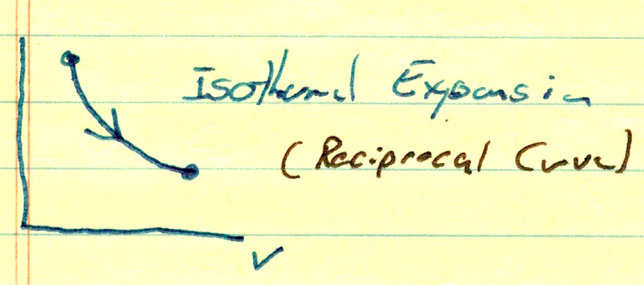



Ex. Isochoric (Volume is constant: but pressure can change




Ex. Isothermal Temp = constant $PV = nRT$ (nRT: constant)

So $P = \frac{\text{Constant}}{V}$



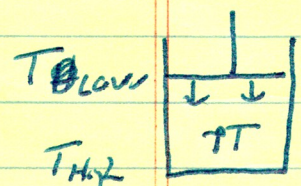

Ex. What is the difference between curve 1 & 2:


Ans: Curve 2 is @ a higher temp

Ex. Adiabatic Compression — Product of PdV will be larger on curve #2

Energy is ~~than~~ transferred without transferring heat

Energy is only transferred as Work

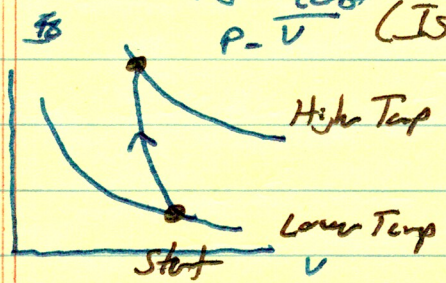



Move piston Down

Energy from Piston is transferred to the gas

↑ $T_{gas}$ ~~cool~~

P - V (Isotherms)

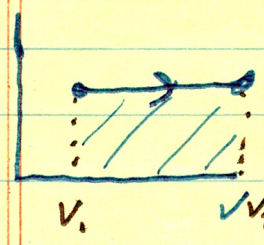



For compression ↓V

Curve is steeper than the Isotherms for an Adiabatic process

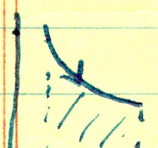
For Adiabatic $P = \frac{Const}{V^{5/3}}$ In data booklet

Work Done For Isobaric Expansion

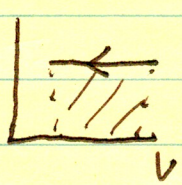



W = PΔV (Area under the curve)

Area = Work done by the gas

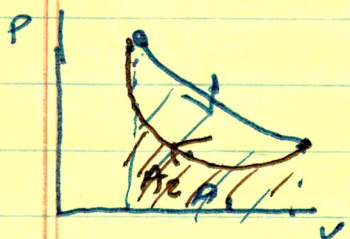



Positive W.t if Expansion




Negative W.t if compression

## Cyclic Process · Repeating Paths Ex. Car Engine

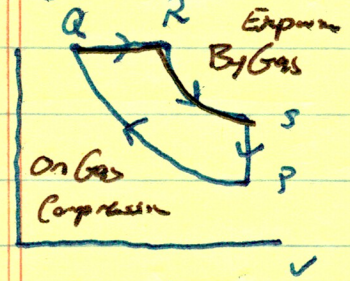



Area$_1$ = Work done during Expansion (+)
Area$_2$: Work done during Compression (−)
Work done on the gas
Area$_1$ + Area$_2$ = work done during the cycle
(+) (−) (Area between the curves)

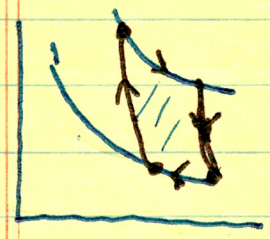
10:06 Ex Work done compressing the gas from R to P
Area under curve $1\times10^5$ Pa($6-2$ m$^3$)
Choice C $W=3.0\times10^5$ J

10:35 Ex Work done is represented by the Area

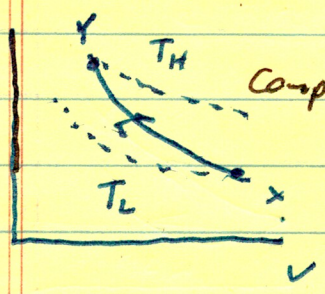

Choice A

10:49 Ex. Which section is work done on the Engine


Choice: PQ (B)
You have a compression Work done on the gas

Draw a Cyclic Process with only isothermal/adiabatic paths

work done by the cycle. known as a Carnot Cycle

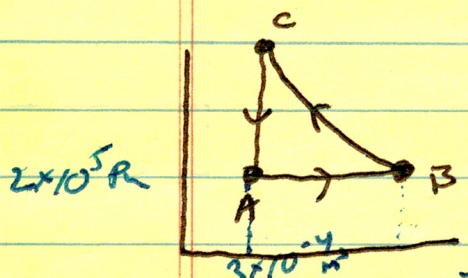
Adiabatic




13:17 Compression — Work done on gas — Internal Energy ($\Delta U$) Increase

↑Temp → ↑ Internal Energy

16:17 Log Answ Quest · Good Probl is you have the




1) States which change is isochoric
CA (No change in Volume)

2) Calc. the temp of Gas @ pt B

Temp@A = 290K

~~$PV = nRT$~~

$(2\times10^5\ Pa)(9\times10^{-4}\ m^3) = \frac{P_A V_A}{T_A} = \frac{P_B V_B}{T_B}$

$T_B = 870K$

3) During AB, 300J of thermal Energy is supplied to the gas. Determine the change in internal Energy of the gas

$Q = 300\ J$

First Law of Thermo $\Delta U = Q - W$

$\Delta U = Q - P\Delta V$

$= 300 - (2\times10^5)(6\times10^{-4}\ m^3)$

$= 300 - 120 = +180J$