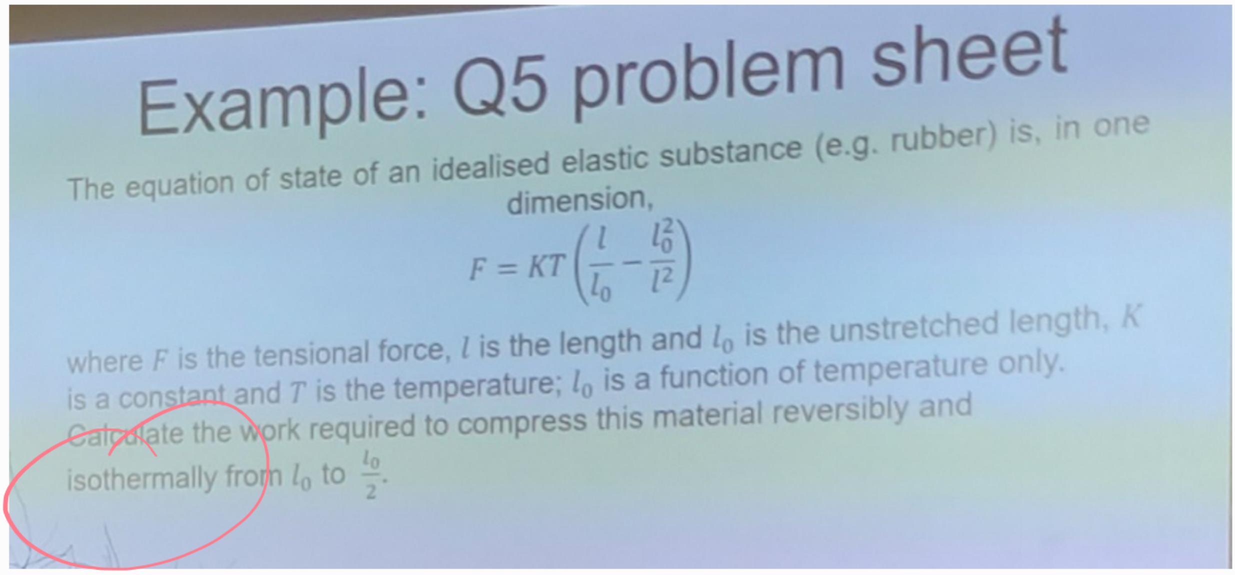


$$W = -p\,dV$$

$l_0 \to \frac{l_0}{2}$: compressio : unstretched length

S??

$\to$ $\cancel{T = \text{const}}$ Vs compressio

$$dW = F\,dl \Rightarrow \Delta W = \int_{l_0}^{l_0/2} F\,dl \leftarrow \text{compressio}$$

$$= \int_{l_0}^{l_0/2} KT\left(\frac{l}{l_0} - \frac{l_0^2}{l^2}\right) dl$$

$$\Delta W = KT\left(\frac{l^2}{2l_0} + \frac{l_0^2}{l}\right)\Bigg|_{l_0}^{l_0/2}$$

$$\left(\left(\frac{l_0}{2}\right)^2 + l_0^2\right) - KT\left(\left(l_0\right)^2\right.$$

$$= uT\left(\frac{\quad}{2l_0} - \frac{\quad}{l_0/2}\right) \; uT\left(\frac{2l_0 + l_0^2}{l_0}\right)$$

$$= \frac{5}{8}\, uT l_0$$

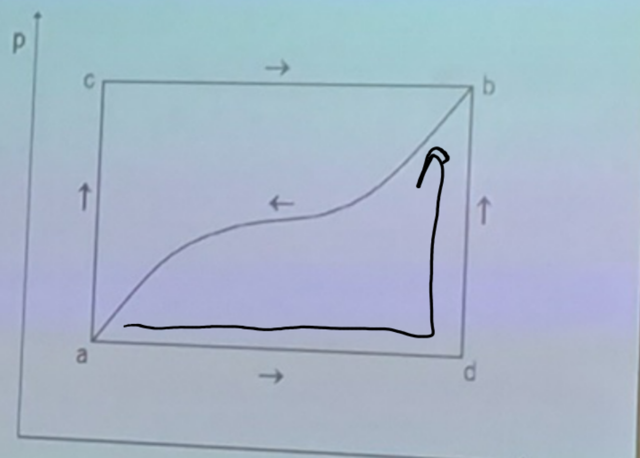
+ : doing work to the system which makes shrink in a compression

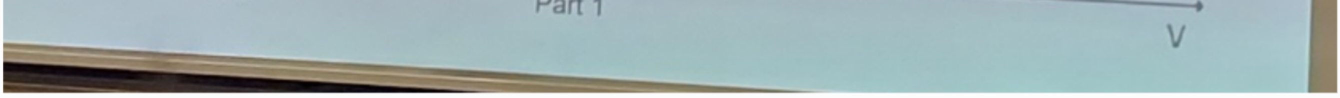
Example: Q6 Problem sheet

A system is taken from state *a* to state *b* along path *acb* during which 800 J of heat flows into the system and the system does 300 J of work.

a) How much heat flows into the system along path *adb* if the work done by the system is then 100 J?

b) When the system returns from *b* to *a* along the curved path, the work done on the system is 200 J. Does the system absorb or liberate heat, and how much?





a) $W_{on} = 100J$

$W_{out} = 300J$?!

cell from 800 − 300 = 500

$$\underbrace{\Delta U}_{\cancel{3}00 \;\; 5} - \underbrace{\Delta W}_{-100} = \Delta Q$$

6 ~~4~~00?

≥ I kinda think this is wrong

500 − (−100)

b) liberates ✓ : 300 ?

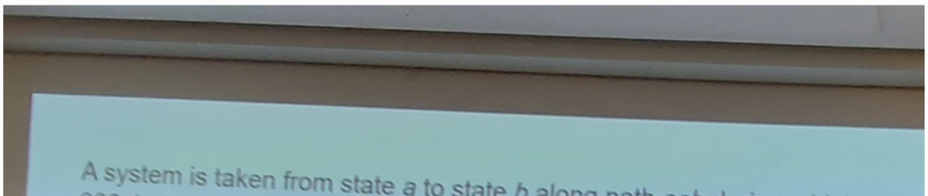
work on syst

ΔQ = −700

800 + 200 = 1000

1000 − 700

liberates 700 J heat



…along path acb during which 800 J of heat flows into the system and the system does 300 J of work.

1st law $\Delta U = \Delta Q + \Delta W$.

$\Delta Q > 0$ if heat is given to the system

$\Delta W > 0$ if work is done on the system

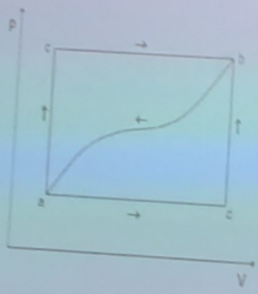
$\Delta U = \Delta Q + \Delta W = 800\,\mathrm{J} - 300\,\mathrm{J} = 500\,\mathrm{J}$

Here work done by system & heat flows into system

a) (adb) $\Delta W = -100\,\mathrm{J}$ (work done **by** system)

$\Delta Q = \Delta U - \Delta W =$

$500\,\mathrm{J} + 100\,\mathrm{J} = 600\,\mathrm{J}$



b) (b->a) $\Delta W = 200\,J$ (work done **on** system)

$\Delta Q = -\Delta U - \Delta W = -500\,\mathrm{J} - 200\,\mathrm{J} = -700\,\mathrm{J}$

so the system liberates 700 J of heat.