Combining the first and second laws of thermodynamics

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- **Before watching this video** look up what we mean by the word phase when we use it in thermodynamics and write an explanation?

- **Before watching this video** explain what we can say about the values of the thermodynamic variables in two phases that are in contact.

- Write an expression that relates $\mathrm{d}E$ to T, P, $\mathrm{d}S$ and $\mathrm{d}V$.

- Write an expression for the change in internal energy if the number of atoms in the system changes by an amount ΔN. Throughout the transition the entropy of the system and the volume are kept fixed.

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- Write an expression for the change in internal energy if the magnetisation changes by an amount ΔM. Throughout the transition you can assume that the entropy, the number of atoms and the volume are kept fixed.

- Explain why, in the part of the video where I illustrate the two phases separated by a diathermal wall, $\mathrm{d}S_1 = -\mathrm{d}S_2$

- Complete the following sentence: If two phases can exchange some extensive quantity...

- Explain in your own words why the minimum energy compatible with a given value of the entropy is equivalent to the maximum entropy for a given value of the energy