

# 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  $dE$  to  $T$ ,  $P$ ,  $dS$  and  $dV$ .
  - Write an expression for the change in internal energy if the number of atoms in the system changes by an amount  $\Delta N$ . 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  $\Delta M$ . 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,  $dS_1 = -dS_2$
  - 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