



**MathsNET**

A joined up approach to  
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mathematics

# The canonical ensemble

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- Explain why function can be used to calculate the energy, number of atoms and volume of a microstate. What are the arguments of these functions?
- What is the name of the function that is used to calculate the energy of a microstate.
- Which extensive thermodynamic variables are constrained to have a particular value in the canonical ensemble.
- Give an expression for the probability of being in a microstate in the canonical ensemble



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- Give an expression for the canonical partition function
- Give an expression for  $\frac{dS}{k_B}$  for the canonical ensemble that can be obtained using arguments based on statistical mechanics.
- Explain why in the previous expression we can write terms such as  $\langle \frac{\partial H}{\partial N} \rangle$  and  $\langle \frac{\partial H}{\partial V} \rangle$
- Give an expression for  $\beta$  and explain how this result is derived.