

# System Size Dependencies for the Canonical and Grand Canonical Ensembles

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An analysis of system size dependencies for the thermodynamics obtained from the Grand Canonical and Canonical ensembles is described for the homogeneous, non-interacting electron gas. The thermodynamic parameters for a system described by the Canonical ensemble are temperature, density and volume. Those for a system described by the Grand Canonical ensemble are temperature, chemical potential (or average density) and volume. We explore the exact expressions for the *free energy* for each case in order to characterise and compare their system size dependencies. We also discuss the relevance of these results for applications of Density Functional Theory (DFT).

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