LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Department of Physics
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Thermodynamics
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www2.physik.uni-muenchen.de/lehre/vorlesungen/sose_23/thermodynamik/index.html

Sheet 02: Entropy of Simple Gases

Discussion: Thursday, 25.05.23

Exercise 1 Entropy of the ideal gas

(a) Use the Gibbs fundamental form for entropie to derive a Gibbs-Duhem equation for $\mathrm{d}\frac{\{1,P,\mu\}}{T}$.

(b) Use (a) to obtain an expression for $\frac{\mu}{T}$ for the ideal gas. Check that your result is intensive

(c) Derive from (b) an expression for entropy $S(E,V,N)$ of the ideal gas. Check extensivity.

Exercise 2 Entropy of the van der Waals gas

Calculate the entropy of the van der Waals gas starting from its molar equations of state,

$$P = \frac{RT}{v-b} - \frac{a}{v^2}, \qquad \epsilon = \xi RT - \frac{a}{v} \tag{1}$$

Finally, reconstitute the dependency of entropy on particle number.