

Física Estadística I
Tarea 05: Gases Ideales Cuánticos — Gas de Fermi-Dirac

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Problema 1 *Fermi gas compressibility*

Calculate the following properties of a nearly-degenerate ideal Fermi gas, up to T^2 -order terms.

1. The Fermi energy of the gas, ϵ_F .
2. The chemical potential, μ .
3. The pressure, p .
4. The isothermal compressibility κ , given by,

$$\kappa = -\frac{1}{V} \left. \frac{\partial V}{\partial P} \right|_T.$$

Hint: the energy dispersion of an ideal gas is $\epsilon_k = \hbar^2 \mathbf{k}^2 / 2m$.

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Problema 2 *Constant density of states*

Let the density of states of the electrons in some sample be assumed to be a constant D for $\epsilon > 0$ ($D = 0$ for $\epsilon < 0$) and the total number of electrons be equal to N .

1. Calculate the Fermi energy ϵ_F .
2. Show that the specific heat is proportional to T when the system is nearly-degenerate ($T \ll T_F$).

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