

Thermal Physics

Gas of silver atoms

Problem 1.- Silver atoms form a gas at $T = 1000\text{K}$. Determine the fraction of atoms that will be aligned with a magnetic field of 1.5 T (tesla) knowing that their magnetic moment is one Bohr magneton ($\mu_B = 9.3 \times 10^{-24}\text{ J/T}$).

Solution: In a previous problem, we determined that the fractional magnetization is given by:

$$\text{fractional magnetization} = \frac{mB}{\tau}$$

With the values of the problem and with the fact that $\tau = k_B T$, we get:

$$\text{fractional magnetization} = \frac{(9.3 \times 10^{-24}\text{ J/T})(1.5\text{T})}{(1.38 \times 10^{-23}\text{ J/K})(1000\text{K})} = \mathbf{0.00101}$$