

Homework Assignment #1

Due at 5pm to the Grader on Thursday 21 Jan 2021

(1) A beam of silver atoms is created by heating a vapor in an oven to 1227°C , and selecting atoms with a velocity close to the mean of the thermal distribution. The beam moves through a 1 m long magnetic field with a vertical gradient 10 T/m, and impinges a screen 1 m downstream of the end of the magnet. Assuming the silver atom has spin-1/2 with a magnetic moment of one Bohr magneton, find the separation distance in mm of the two states on the screen.

(2) A solid uniform sphere of mass m has a charge q uniformly distributed over its surface. The sphere spins on its axis with angular momentum \mathbf{L} . Calculate its magnetic moment $\boldsymbol{\mu} = g(q/2mc)\mathbf{L}$ and determine the (dimensionless) constant g . (If you work the problem in SI units, you will not get the factor of c in the denominator.)