

Inclass 25.1. Electron and proton have the same spin angular momentum, $|\mathbf{S}| = \sqrt{\frac{1}{2}(\frac{1}{2} + 1)}\hbar$. What is the ratio of their magnetic moment? Electron mass $= 9.1 \times 10^{-31} \text{ kg}$; proton mass $= 1.6 \times 10^{-27} \text{ kg}$.

Inclass 25.2. When placing a spin $\frac{1}{2}$ particle in a magnetic field pointing to the z-direction, what are the possible directions of the spin angular momentum with respect to the z-direction?

Inclass 25.3. A box of low density electron gas is immersed in a magnetic field of 1 *tesla* pointing in the z direction. What type of radiation (in terms of wavelength) is emitted due to spin flips? Electron mass $9.1 \times 10^{-31} kg$.

Inclass 25.4. Show that $[\hat{S}_x, \hat{S}_y] = i\hbar\hat{S}_z$.

Note: $(\hat{S}_x) = \frac{\hbar}{2} \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$, $(\hat{S}_y) = \frac{\hbar}{2} \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$