

7.E: Orbital Angular Momentum (Exercises)

1. A system is in the state $\psi = Y_{l,m}(\theta, \phi)$. Calculate $\langle L_x \rangle$ and $\langle L_x^2 \rangle$.
2. Find the eigenvalues and eigenfunctions (in terms of the angles θ and ϕ) of L_x .
3. Consider a beam of particles with $l = 1$. A measurement of L_x yields the result \hbar . What values will be obtained by a subsequent measurement of L_z , and with what probabilities? Repeat the calculation for the cases in which the measurement of L_x yields the results 0 and $-\hbar$.
4. The Hamiltonian for an axially symmetric rotator is given by

$$H = \frac{L_x^2 + L_y^2}{2 I_1} + \frac{L_z^2}{2 I_2}. \quad (7.E.1)$$

What are the eigenvalues of H ?

Contributors and Attributions

- [Richard Fitzpatrick](#) (Professor of Physics, The University of Texas at Austin)

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