

Problem Set 6

Physics 212: Spring 2008

Handed out: Tuesday, February 26, 2008
Due in class: Tuesday, March 4, 2008
Total Marks: 20

Problems

Problems 18.2.2, 18.2.4, 18.2.6 Shankar

5 marks each

Problem 2:

Consider a system of two spin-1/2 particles whose positions are fixed. Assume the two spins interact through the Hamiltonian

$$H = A\mathbf{S}_1 \cdot \mathbf{S}_2 \exp(-t^2/\tau^2).$$

Here A and τ are constants. At $t = -\infty$ the state of the system is $|+ -\rangle$. Here $|m_1 m_2\rangle$ represents the simultaneous eigenstate of S_{1z} and S_{2z} with eigenvalues $m_1\hbar/2$ and $m_2\hbar/2$ respectively. Compute the probability of finding the state in $| - +\rangle$ at $t = \infty$. Solve the problem exactly and by using first order perturbation theory and compare your answers.

5 marks