

J04Q.3—Spin in a Magnetic Field

Problem

A spin $1/2$ particle of magnetic moment μ has spin up along the z direction. At time $t = 0$ the magnetic field $\vec{B} = B\hat{y}$ is turned on.

- a) Calculate the expectation value of spin \vec{S} as a function of time. Compare the result with the classical answer.
- b) At $t = T$ what is the probability that the spin is down?
- c) At $t = T/2$ another experimentalist measures the z -component of the spin but does not tell you the result. What is the probability that your subsequent measurement at $t = T$ will find the spin to be down?