

Remember the second problem in your first exam:

A two electron system is known to be in the spin state $|\psi, 0\rangle = |\uparrow_x\rangle |\uparrow_x\rangle$ at time $t = 0$. The total energy of the system is given as $H = \beta \vec{S}_1 \cdot \vec{S}_2 + \alpha \vec{B} \cdot \vec{S}$, where α and β are constants and \vec{B} represents a uniform magnetic field in the z -direction: $\vec{B} = B_0 \hat{z}$. Find the time development of this state, $|\psi, t\rangle$.

As homework, find the following expectation values of the following quantities with respect to the state $|\psi, t\rangle$:

- (a) Total angular momentum S^2 .
- (b) z -component of the total angular momentum S_z .
- (c) x -component of the total angular momentum S_x .

Discuss these time dependencies.