1. Generators: 
2. Commutators
   1. 
   2. Commuting operators have simultaneous eigenstates.
3. Operators Relations
   1. 
   2. 
   3. 
4. Eigenvalues and Eigenstates
   1. ,
   2. ,
   3. 
5. Raising and Lowering Operators
   1. 
   2. 
6. Matrix Representations (Note similarity between *J*’s and *S*’s)
   1. Rotation – 3D



* 1. Spin ½ - in terms of Pauli spin matrices.



* 1. Spin 1





1. Matrix Elements:  where is the row, is the column and one proceeds in the order 
   1. Two state example:
   2. Spin-1 
2. Uncertainty  for and Hermitian. 
3. Send particles with spin through Stern-Gerlach device oriented in different positions. Determine the number of beam channels and the probability a given particle will be found in a given channel;.
4. Time Evolution:
   1. 
   2. Schrödinger Equation
   3. 
5. Energy eigenstates: 
6. Precession of Spin: ,
7. Energy-time Uncertainty, 
8. Two Spin ½ Particle Eigenstates
   1. 
9. Fine vs hyperfine splitting
10. Addition of Angular Momenta, Eigenstates of Total Angular Momenta – two particles
    1. 
    2. 
    3. , 
11. What are entangled states?
12. Hamiltonians: 