1. What is the optical pumping?
2. Distribution of the spins in thermal equilibrium under magnetic field.
3. Natural abundance, total magnetic moments and electronic configuration of Rb^{85}?
4. Natural abundance, total magnetic moments and electronic configuration of Rb^{87}?
5. Aufbau principle (Madelung's rule)
6. The rule of the addition of non-interacting angular momenta, projections of such sum
7. Term and state of the multielectron atom
8. How to calculate the Fine structute?
9. By which quantum number does the splitting occur (fine, hyperfine)?
10. What is the hyperfine coupling? Equation.
11. Zeeman effect. Which magnetic field and the number of components.
12. Write down the Hamiltonian that accounts for the interaction of the system with magnetic field.
13. How many sublevels occurs due to the presence of the weak magnetic field.
14. Write down the Breit-Rabi equation.
15. Energy of interaction of an atom with external magnetic field.
16. Where does the g-factor Lande comes from?
17. Nuclear g-factor
18. Paschen-Back effect
19. Which transitions will we drive?
20. Why from L=0 to L=0 transition is not allowed?
21. Where do the selection rules come from? When do they work?
22. What is the electric dipole approximation?
23. Laporte rule
24. Cross section and absorption coefficient
25. Why are only $\Delta M=1$ or -1 transitions allowed?
26. Natural linewidth and Doppler broadening
27. Why do we need the buffer gas?
28. Why do we have equal amount of Rb^{87} and Rb^{85} ?
29. Why does spontaneous emission occur?
30. Which level of which isotope will we pump up and how?
31. Zero field transition
32. Larmor frequency
33. The Einstein coefficients for absorption and stimulated emission of light
34. How does quarter wave plate work?
35. How to create circularly polarized light?
36. How to check if the light is circularly polarized?
37. Which transitions correspond to two main resonance lines?
38. Transitions involved in the optical pumping of Rb^{87}
39. Derive the Dirac's fine-structure formula.
40. Derive the equation for the Lande g-factor.
41. Derive equations for resonance frequencies (2F-4 and 2F-5)
42. Derive the equation for gyromagnetic ratio
43. Derive the solution for the rate equations (2G-15)
44. Derive the equation for the effective magnetic field
45. Show that magnetization rotates with Larmor frequency around magnetic field