1. D2 Transition frequencies. (based on Figs. 7,8 in manual and related discussion).
    a. Write down the selection rules for optical transitions between states F and F'
    b. Write down the expected transition frequencies of all allowed transition of Rb85 and Rb87 (relative to the lowest transition frequency)
    c. The spectrum in Fig. 7 has only four peaks--why is that and which groups of transitions do they represent.
2. Linewidths.
    a. Estimate the Doppler-broadened absorption linewidth for Rb-87 at room temperature based on Maxwell-Boltzmann velocity distribution for ideal gas.
    b. What is the expected linewidth of the saturated absorption peaks in the limit of very low laser power (no power broadening)?
3. Doppler-free Spectrum.
    a. Draw and explain the expected Saturated Absorption Spectrum for Rb 87 (ignore cross-over peaks for now).
4. Crossover peaks
    a. Explain why do we get cross-over peaks? Write down the expected frequencies for Rb87.
    b. Add the cross-over peaks to the S.A.S. drawing and write down the expected frequencies.

If it helps, a textbook on Atomic Physics by Christopher Foot is available to download for free at UNM library: https://ebookcentral.proquest.com/lib/unm/detail.action?docID=422882

Important note: the final goal of the experiment is to determine the hyperfine coupling constant and its uncertainty based on the measured central frequencies of the SAS resonances. See the equation at the top of page 8.