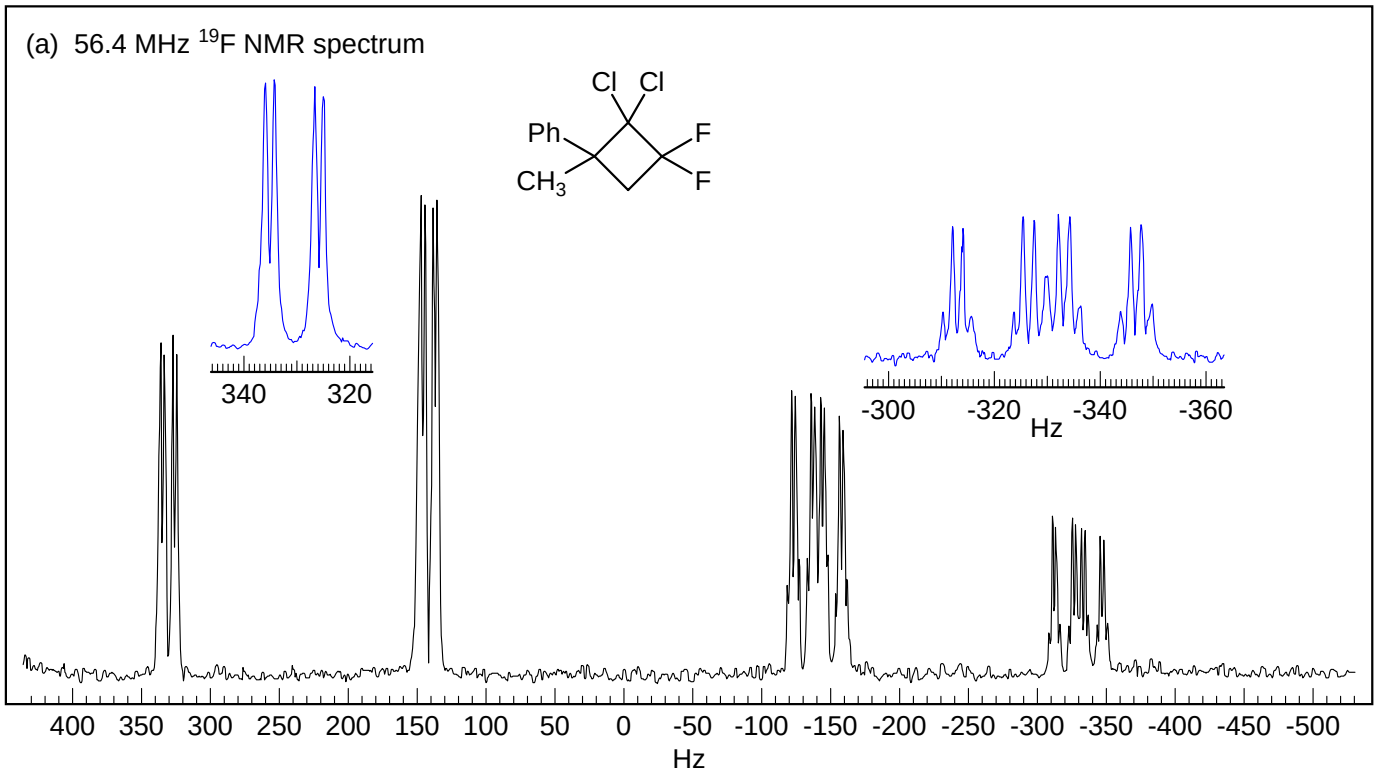
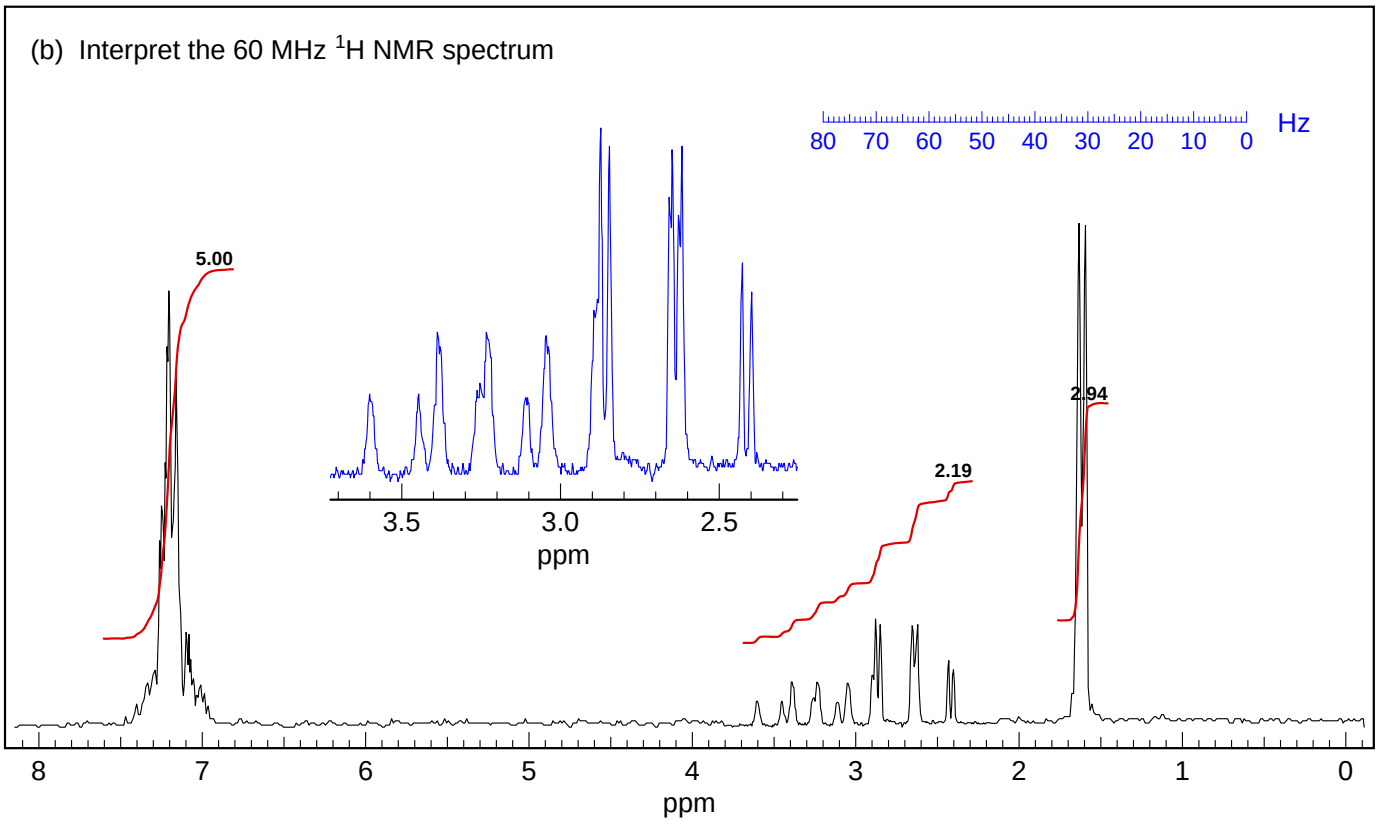
Problem R-310 ($C_{11}H_{10}Cl_2F_2$). Interpret the 56.4 MHz ^{19}F NMR spectrum below (CCl_4 solvent). Determine the chemical shifts of the fluorines, and estimate the various coupling constants. Consider conformations of the cyclobutane ring (Source: *J. Am. Chem. Soc.* **1962**, *84*, 2935; digitized hard copy).





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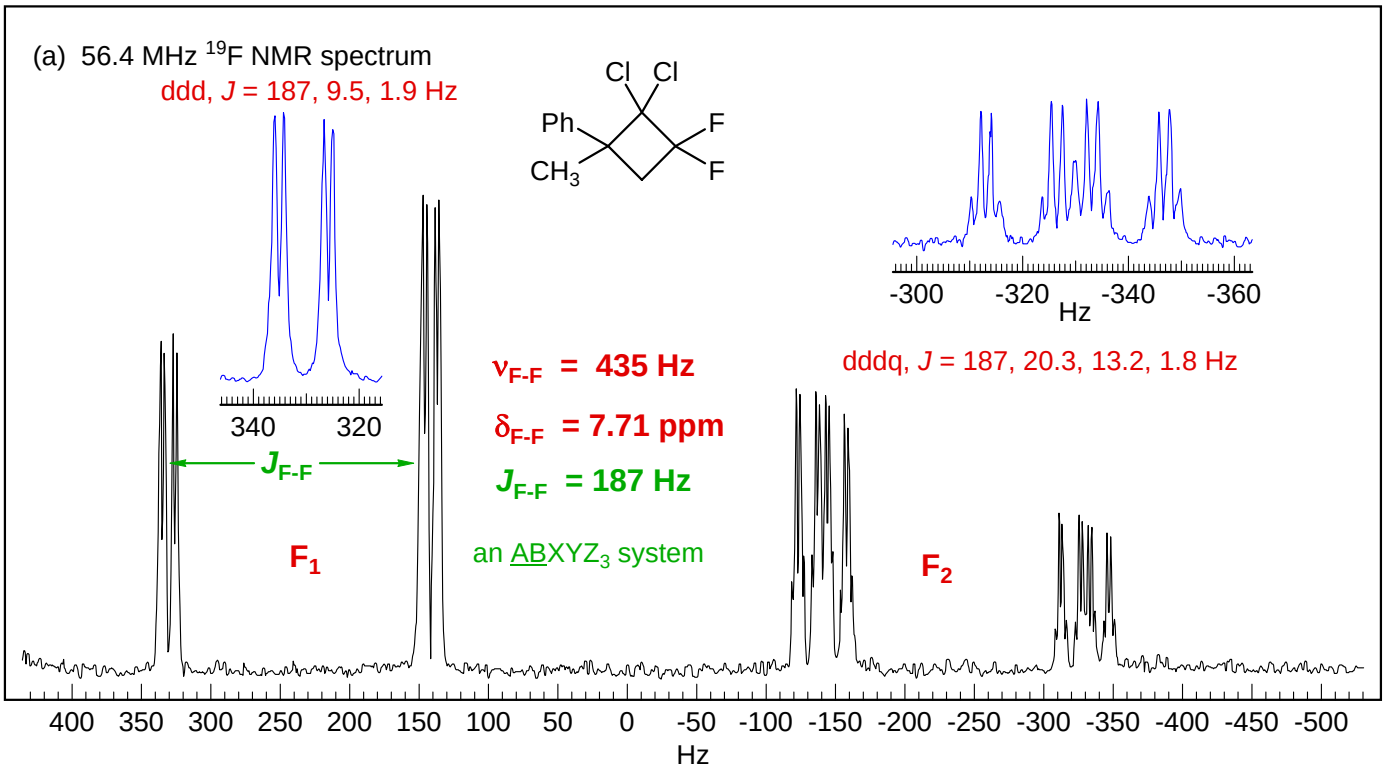
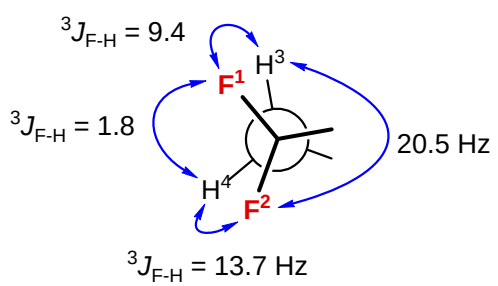
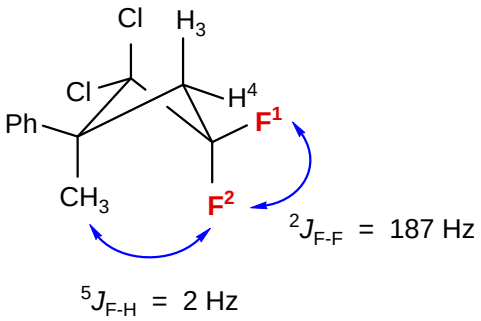
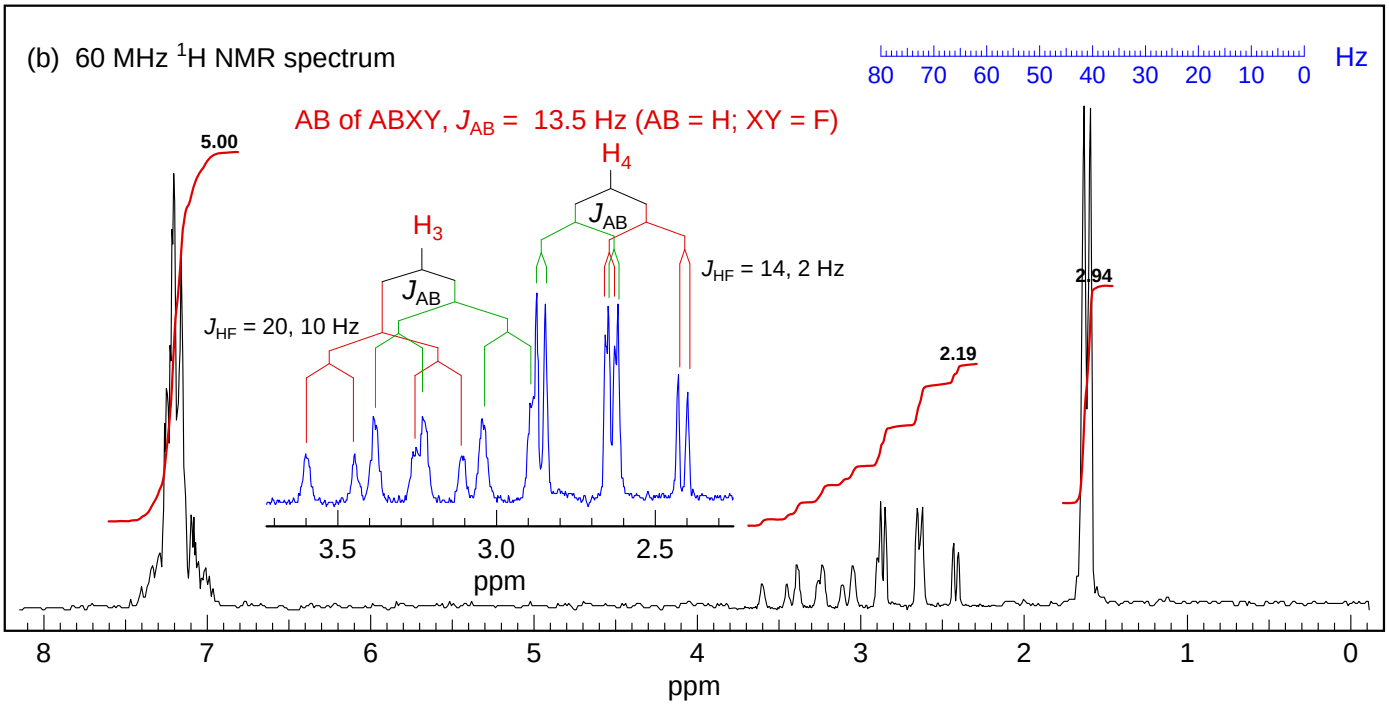


H-F couplings also follow a Karplus-like relationship, with large coupling when Θ is 0 or 180 °







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