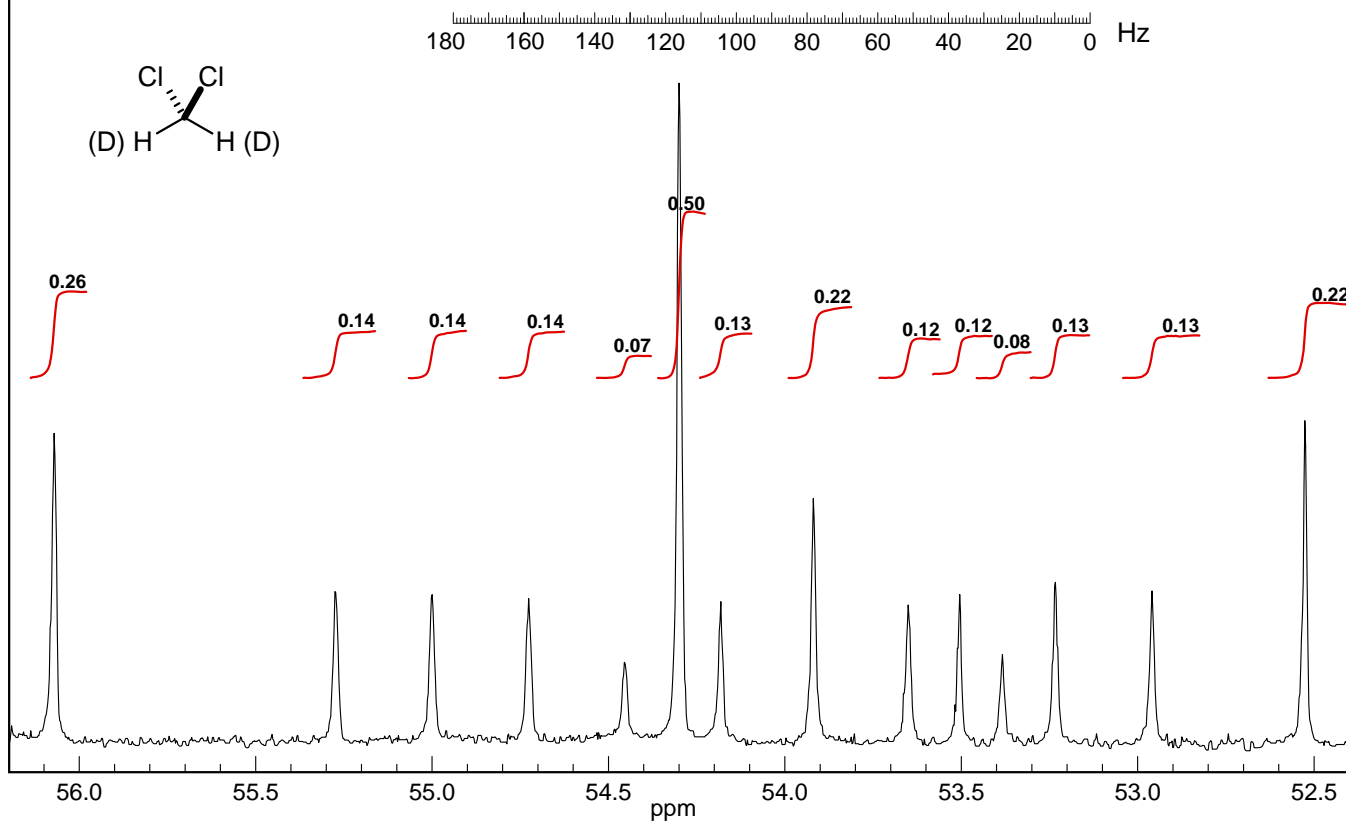


**Problem R-98G** ( $\text{CH}_2\text{Cl}_2$ ,  $\text{CHDCl}_2$ ,  $\text{CD}_2\text{Cl}_2$ )

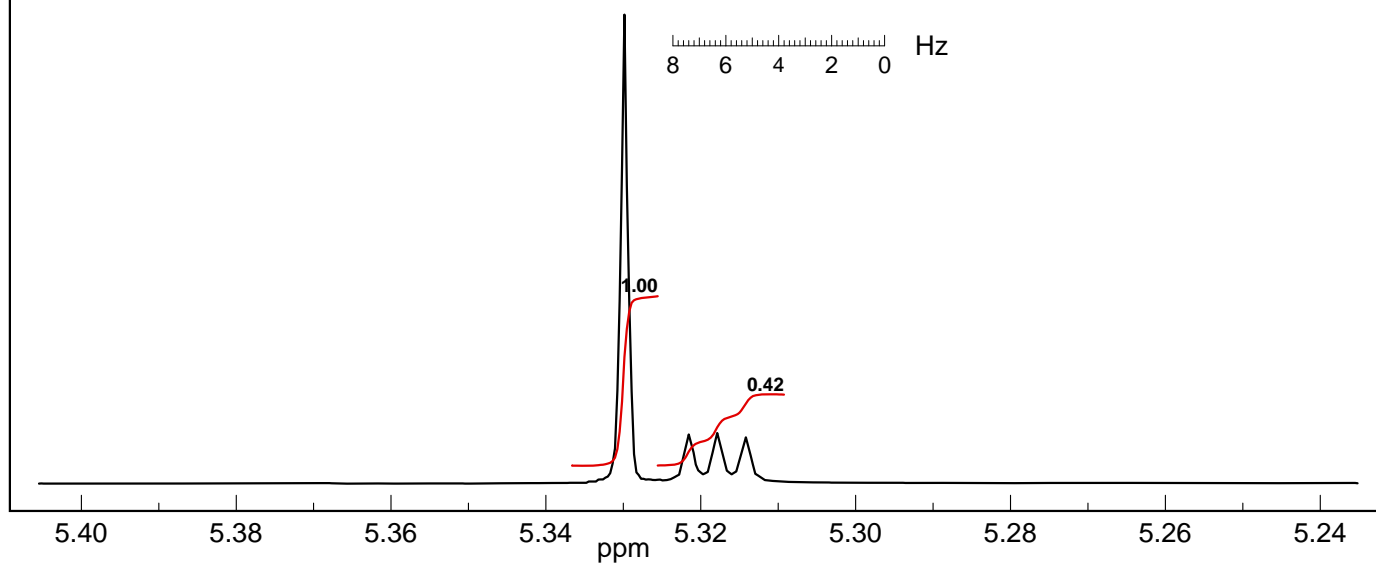
100 MHz  $^{13}\text{C}$  NMR spectrum

Source: Sergeyev *Magn. Reson. Chem.* **1994**, 32, 381 (digitized hard copy) g

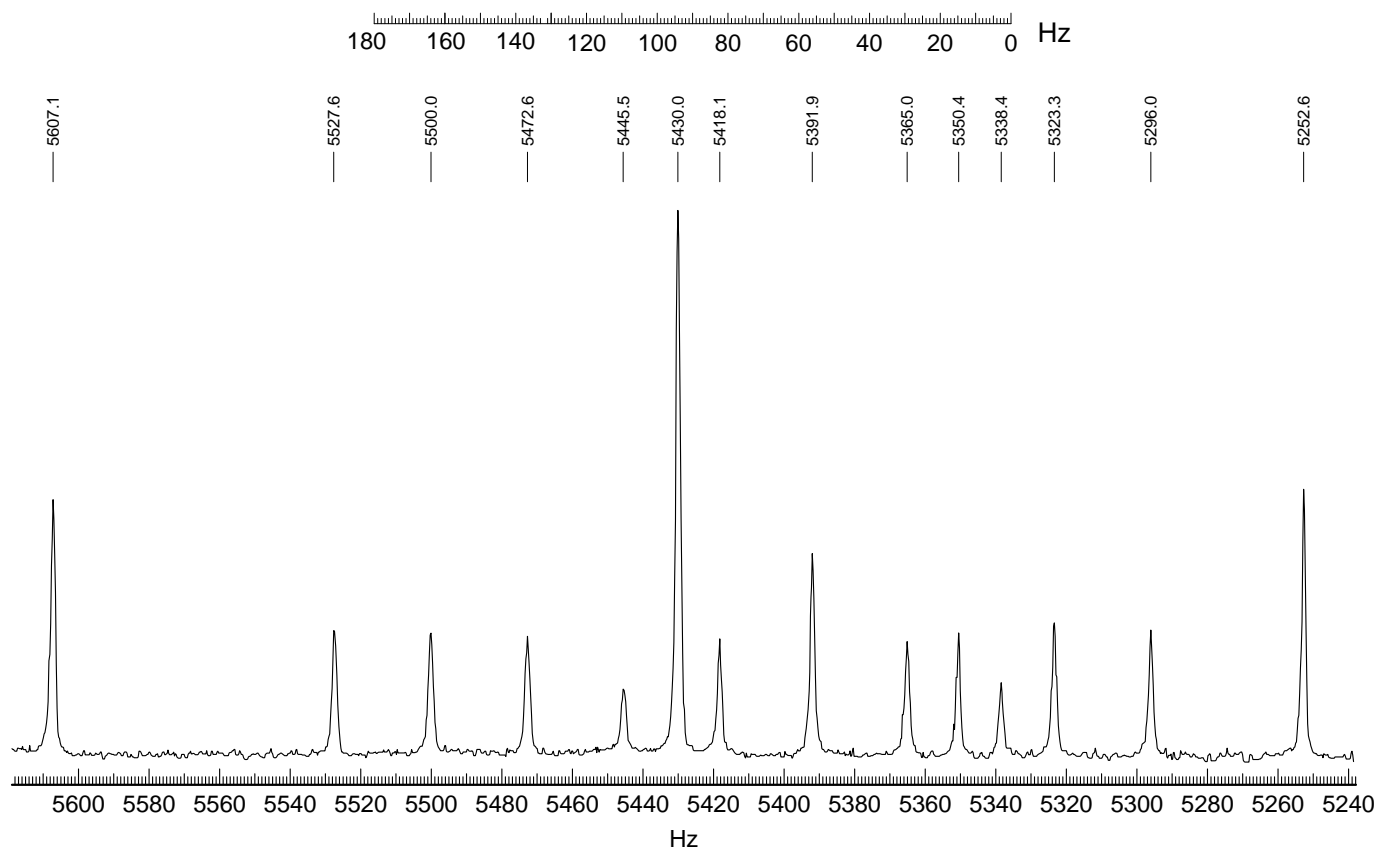


$\text{CH}_2\text{Cl}_2$ ,  $\text{CHDCl}_2$ ,

300 MHz  $^1\text{H}$  NMR spectrum in  $\text{CD}_2\text{Cl}_2$

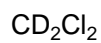
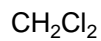


**Problem R-98G.** The spectrum below is the 100 MHz  $^{13}\text{C}$  NMR spectrum of a mixture of  $\text{CH}_2\text{Cl}_2$ ,  $\text{CDHCl}_2$  and  $\text{CD}_2\text{Cl}_2$ . The spectrum is NOT proton decoupled.



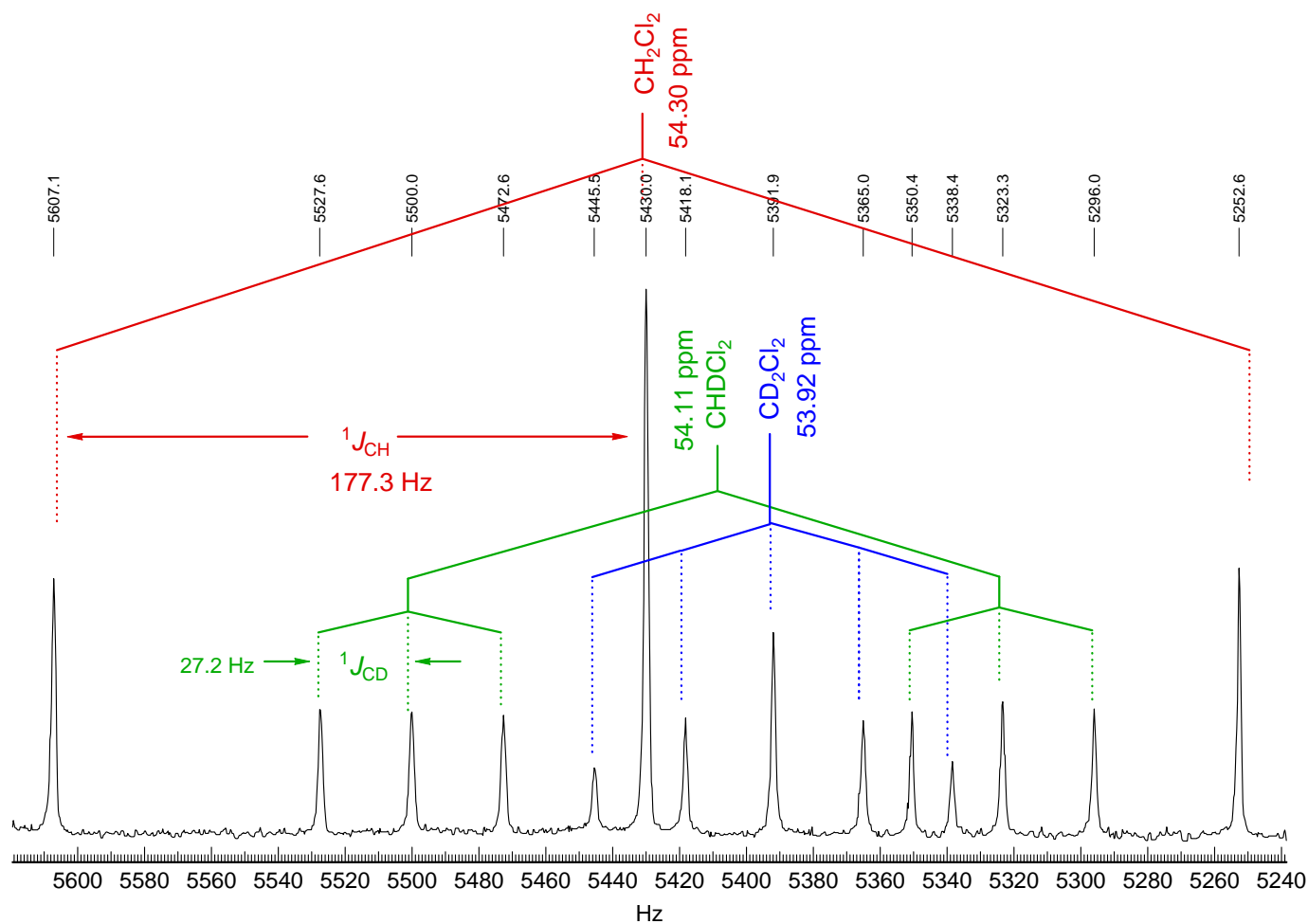
(a) On the spectrum, clearly mark the signals corresponding to each of the isotopomers.

(b) Report the coupling constants and chemical shifts of each of the isotopomers. The Hz scale is referenced to TMS.



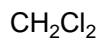
**Problem R-98G.** The spectrum below is the 100 MHz  $^{13}\text{C}$  NMR spectrum of a mixture of  $\text{CH}_2\text{Cl}_2$ ,  $\text{CDHCl}_2$  and  $\text{CD}_2\text{Cl}_2$ . The spectrum is NOT proton decoupled.

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(a) On the spectrum, clearly mark the signals corresponding to each of the isotopomers.

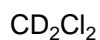
(b) Report the coupling constants and chemical shifts of each of the isotopomers. The Hz scale is referenced to TMS.



$\delta$  54.30, triplet,  $^1J_{\text{CH}} = 177.3$  Hz



$\delta$  54.11, doublet of 1:1:1 triplets,  $^1J_{\text{CH}} = 177.3$  Hz,  $^1J_{\text{CD}} = 27.2$  Hz



$\delta$  53.92, 1:2:3:2:1 pentet,  $^1J_{\text{CD}} = 27.0$  Hz

The isotope shift is 0.19 ppm per deuterium