Problem R-06M \((C_2H_2F_6P_2)\)

36.4 MHz \(^{31}\)P NMR spectrum. The spectrum is NOT proton decoupled.

Source: R. Demuth, J. Grobe \textit{J. Fluorine Chem.} 1972/73, 2, 269. (Reich digitized hard copy) g
Problem R-06M  One of the phosphorus signals of $(\text{CF}_3)_2\text{P}-\text{PH}_2$ is shown below. The spectrum is NOT proton decoupled. Source: R. Demuth, J. Grobe *J. Fluorine Chem.* **1972/73**, 2, 269.

(a) Which P signal is it? Explain briefly.

(b) Identify couplings and report then in the standard format ($^\text{n}J_{\text{HH}} = 00$ Hz)
**Problem R-06M** One of the phosphorus signals of \((\text{CF}_3)_2\text{P-\text{PH}_2}\) is shown below. The spectrum is NOT proton decoupled. Source: R. Demuth, J. Grobe *J. Fluorine Chem.* 1972/73, 2, 269.

This is the \(\text{P(\text{CF}_3)_2}\) signal. If it was the \(\text{PH}_2\) signal would expect a triplet of doublets (or even a quartet) with large couplings to \(\text{H}\) and \(\text{P}\) (150-200 Hz). As it is, the triplet splitting is only about 12 Hz.

(b) Identify couplings and report then in the standard format \((^nJ_{HH} = 00 \text{ Hz})\)

This is a doublet of septets of triplets due to coupling of \(\text{P}\) to \(\text{P}\), \(\text{F}_6\) and \(\text{H}_2\)

\[ ^1J_{\text{P-P}} = 195 \text{ Hz} \]
\[ ^2J_{\text{P-F}} = 70 \text{ Hz} \]
\[ ^2J_{\text{P-H}} = 12 \text{ Hz} \]

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*J. Fluorine Chem.* 1972/73, 2, 276

\[ ^1J_{\text{PH}} = 202 \text{ Hz} \]
\[ ^2J_{\text{PPH}} = 12.3 \text{ Hz} \]
\[ ^2J_{\text{FCP}} = 70.0 \text{ Hz} \]
\[ ^1J_{\text{PP}} = 195 \text{ Hz} \]
\[ \delta_{\text{H}} = 3.03 \]
\[ \delta_{\text{F}} = 52.2 \text{ (sign?)} \]
\[ \delta_{\text{PCF}_3} = 12.5 \]
\[ \delta_{\text{PH}_2} = 199 \]