Problem R-11U (C\textsubscript{02}H\textsubscript{03}AsF\textsubscript{7}NXe). This problem requires you to interpret the \textsuperscript{129}Xe and \textsuperscript{14}N spectra of \([\text{CH}_3C\equiv\text{N-Xe-F}]^+\text{AsF}_6^-\) (Emara, A. A. A; Schrobilgen, G. J. Chem. Commun. 1987, 1644)

Spectrum 1. 69.56 MHz \textsuperscript{129}Xe NMR spectrum of \([\text{CH}_3C\equiv\text{N-Xe-F}]^+\text{AsF}_6^-\) in HF at -10 °C

Spectrum 2. 69.56 MHz \textsuperscript{129}Xe NMR spectrum of \([\text{CH}_3^{13}\text{C}\equiv\text{N-Xe-F}]^+\text{AsF}_6^-\) in HF at -10 °C

Spectrum 3. 18.075 MHz \textsuperscript{14}N NMR spectrum of \([\text{CH}_3C\equiv\text{N-Xe-F}]^+\text{AsF}_6^-\) in HF at -10 °C

(a) Analyze Spectrum 1 and 2. Spectrum 2 is of a compound labeled >99% with \textsuperscript{13}C at the CN carbon. Report coupling constants. Use the form \(^\circ J_{X-Y} = 00.0\) Hz.

(b) Analyze Spectrum 3. Make sure you understand and explain the origin of all peaks. Why are the signals somewhat broadened?
**Problem R-11U** (C$_2$H$_3$AsF$_7$NXe). This problem requires you to interpret the $^{129}$Xe and $^{14}$N spectra of [CH$_3$C≡N-Xe-F]$^+$ AsF$_6^-$ (Emara, A. A. A.; Schrobilgen, G. J. *Chem. Commun.* 1987, 1644).

**(a)** Analyze Spectrum 1 and 2. Spectrum 2 is of a compound labeled >99% with $^{13}$C at the CN carbon. Report coupling constants. Use the form $^{n}J_{Xe-Y} = 00.0$ Hz.

1. $^{129}$Xe, $I = 1/2$, 26.3% abundant
2. $^{129}$Xe NMR spectrum of [CH$_3$C≡N-Xe-F]$^+$ AsF$_6^-$ in HF at -10 °C
3. $^{129}$Xe, $I = 1$, 99.6% abundant
4. $^{129}$Xe NMR spectrum of [CH$_3^{13}$C≡N-Xe-F]$^+$ AsF$_6^-$ in HF at -10 °C

(a) $\delta_{Xe} = 1708$ ppm
12 $^{1}J_{Xe-F} = 6000$ Hz
12 $^{1}J_{Xe-14N} = 300$ Hz
12 $^{2}J_{Xe-13C} = 79$ Hz

Spectrum 1: a doublet (coupling to $^{19}$F) of 1:1:1 triplets (from coupling to $^{14}$N), $J = 6000, 300$ Hz

(b) Analyze Spectrum 3. Make sure you understand and explain the origin of all peaks. Why are the signals somewhat broadened?

5. Central peak: all of the isotopes of Xe except $^{129}$Xe
6. Outer peaks: $^{129}$Xe satellites due to $^{129}$Xe - $^{14}$N coupling, $J$ ca 300 Hz
7. The signals are broadened because $^{14}$N $T_1$ is quite short due to quadrupolar relaxation, so signals are broadened. There are probably also broadening effects from unresolved coupling to F and CH$_3$.