1. When this cyclohexanone is dissolved in benzene, $J_{AB} = 3$ Hz, but when it is dissolved in methanol, $J_{AB} = 11$ Hz.
   a. What are the conformations in these two solvents?
   b. Why are they different?

2. The 400 MHz $^1$H spectrum of a sample labelled "CD$_2$Cl$_2"$ is shown. Assign and explain the signals, which have a chemical shift of approximately 5.2 ppm. The scale markers are 5 Hz each.

3. Give complete assignments for the non-aromatic carbons of this compound. The multiplicities refer only to C-H splittings.

\[
\begin{align*}
^{13}C & \quad \delta \text{ (ppm)} \\
207.3 & \quad s \\
173.2 & \quad s \\
69.3 & \quad t \quad J_{CP} = 7 \text{ Hz} \\
69.0 & \quad t \quad J_{CP} = 7 \text{ Hz} \\
68.5 & \quad d \quad \text{Attached to a } ^1H \text{ signal at 4.01 ppm (dt, 2 and 7 Hz)} \\
65.8 & \quad d \quad \text{Attached to a } ^1H \text{ signal at 4.19 ppm (qn, 6.5 Hz)} \\
61.0 & \quad d \quad J_{CP} = 161 \text{ Hz} \\
51.8 & \quad d \\
41.3 & \quad t \\
21.9 & \quad q \\
\end{align*}
\]

4. Assign and interpret the major features of the two multiplets from the $^{195}$Pt-$^1$H spectrum of the complex shown. The bar represents 1000 Hz for both multiplets.
5. Assign and interpret the 300 MHz $^1$H NMR spectrum of this compound as fully as possible. Can you draw any conclusions about the conformation? (The expanded multiplets A-G are all plotted to the same height.)

6. The reaction of $[nBu_4N][BF_4]$ with excess TaF$_5$ produces $[nBu_4N][TaF_{11}]$. The $^{19}$F spectrum is shown below. What is the structure of the anion? Explain. (Hint: The two Ta centers are equivalent and octahedral.)