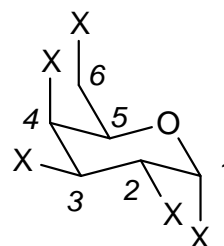


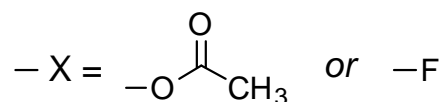
In-Class Exercise:
¹H-¹H (Homonuclear) COSY

The ¹H, ¹⁹F, ¹³C and ¹H-¹H COSY spectra (all in DMSO-*d*₆) shown on the following pages are of the fluorogalactoside shown at right. Of the five substituents X, one is a fluorine, and the other four are acetyl groups.



a. ¹⁹F has a nuclear spin of $I = \frac{1}{2}$, so it will exhibit coupling to nearby nuclei. What coupling is observed in these spectra?

b. Which substituent X is the fluorine?

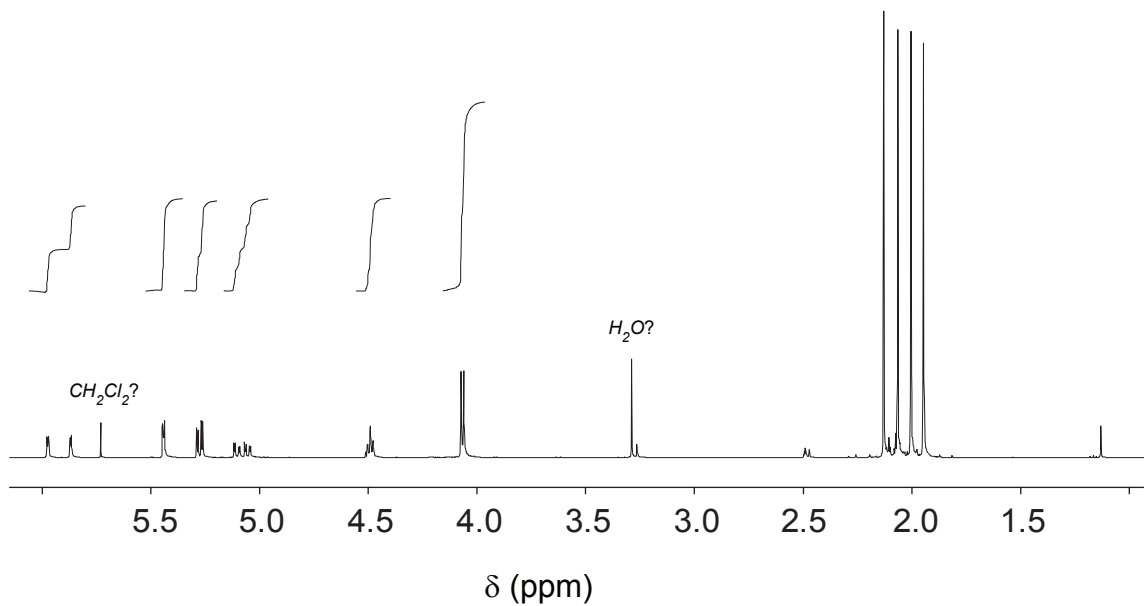


c. Assign chemical shift values to each proton in the molecule.

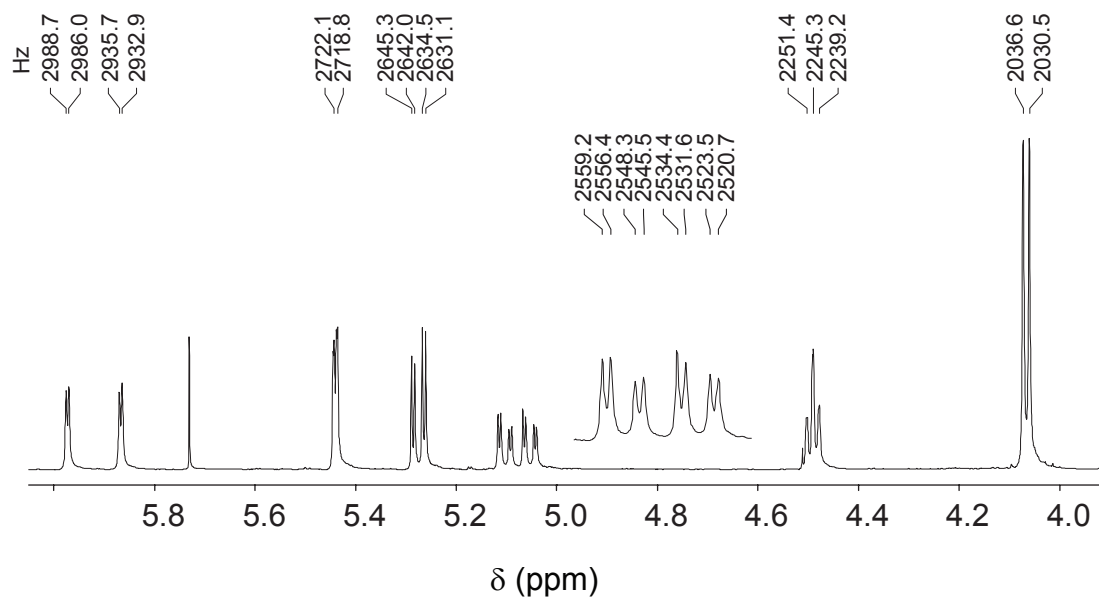
| proton | δ (ppm) |
|-----------------|----------------|
| H ₁ | |
| H ₂ | |
| H ₃ | |
| H ₄ | |
| H ₅ | |
| H _{6a} | |
| H _{6b} | |

d. Can you assign any of the ¹³C resonances?

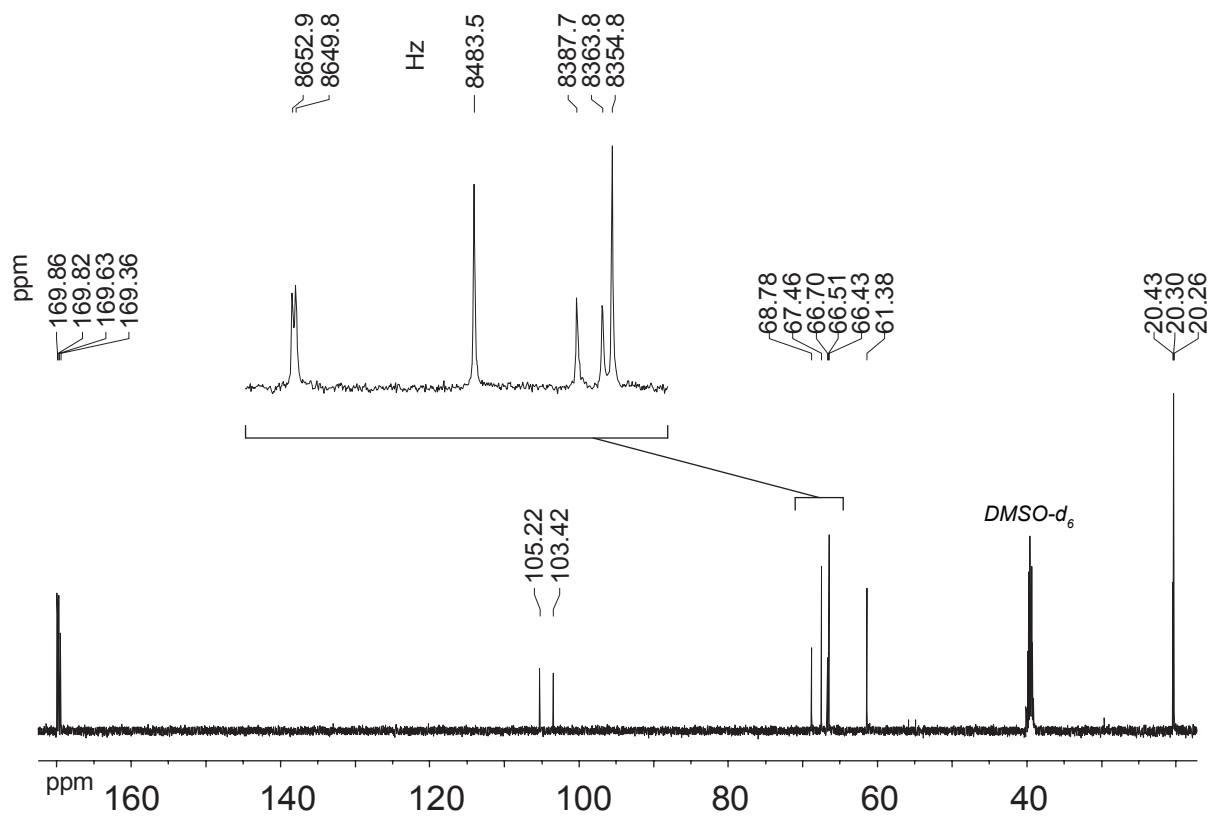
^1H NMR, 500 MHz, in $\text{DMSO-}d_6$



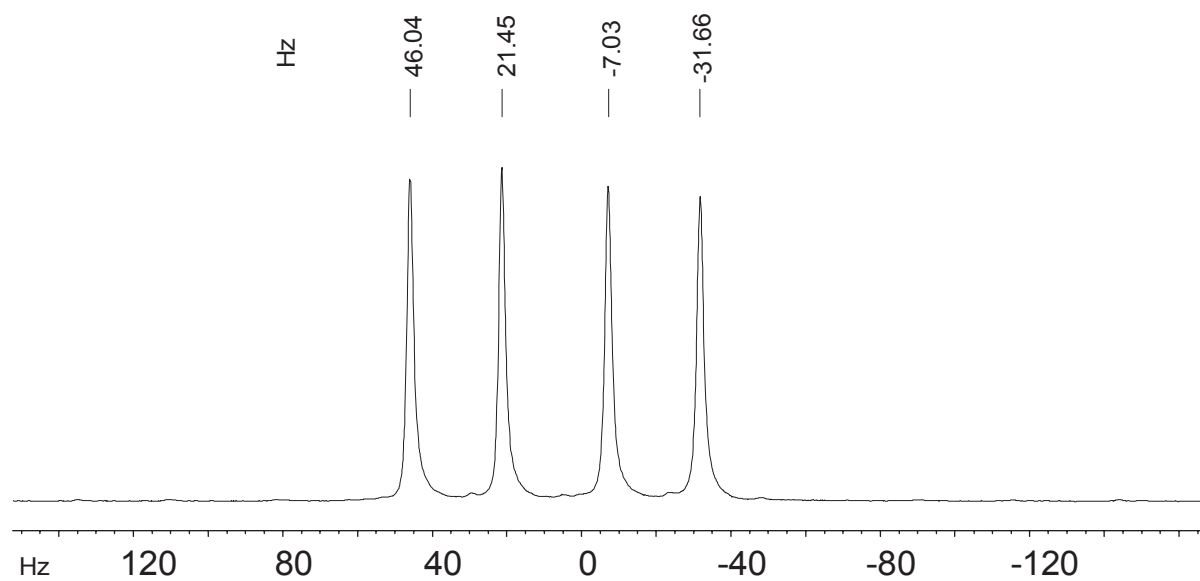
(closeup of above)



^{13}C NMR, 125 MHz, in $\text{DMSO-}d_6$



^{19}F NMR, 235 MHz, in $\text{DMSO-}d_6$



^1H - ^1H COSY, 500 MHz, in $\text{DMSO-}d_6$

