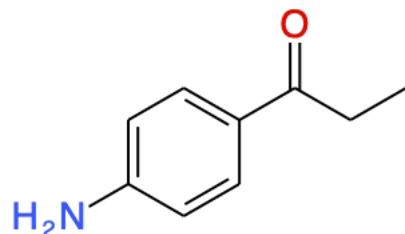


## Jigsaw 4D

1. [From Past Exam] Consider the following molecule.



a. Draw schematically the solution state  $^1\text{H}$  spectrum of the molecule in  $\text{CDCl}_3$  and label the peaks. Use qualitative estimates for the expected chemical shifts. Consider only  $^3\text{J}_{\text{HH}}$  couplings.

b. [Keeler Sections 8.7 and 10.6] Draw schematically the  $^1\text{H}$ - $^{13}\text{C}$  HMBC and HSQC spectra on the same plot. Assume the HMBC spectrum shows connectivity through up to three bonds. Circle the peaks unique to the HMBC spectrum.

2. [From Past Exam] [Keeler Section 12.2 and Hore Section 3.3] For each compound, determine whether the protons shown in bold are magnetically and/or chemically equivalent.

