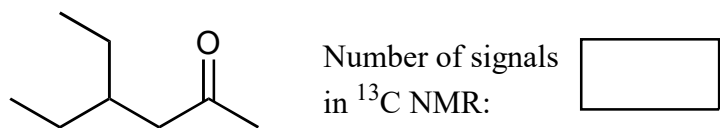
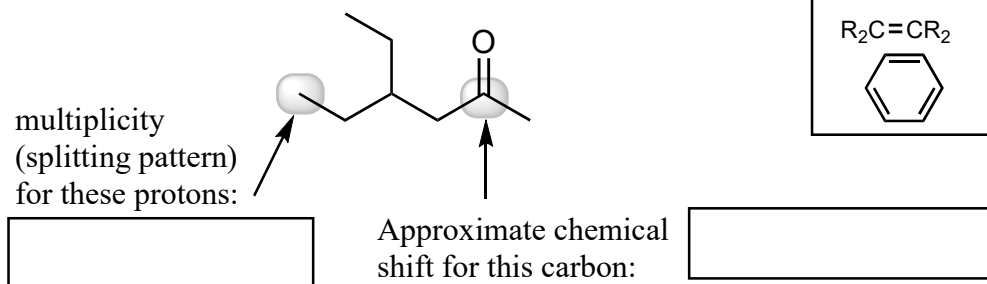


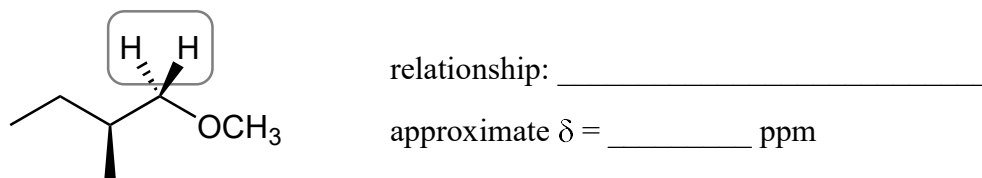
6A. (6 pts) Refer to the given compound to answer the following questions.



$^{13}\text{C}$ NMR			
Type of carbon	$\delta$ (ppm)	Type of carbon	$\delta$ (ppm)
R-CH <sub>3</sub>	10-30	$\left. \begin{array}{l} \text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OR} \\ \text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 \end{array} \right\}$	165-185
C=O	40-80		
RC $\equiv$ CR	65-90		
R <sub>2</sub> C=CR <sub>2</sub>	100-150	R- $\overset{\text{O}}{\parallel}{\text{C}}-\text{R/H}$	185-220
	110-170		

$^1\text{H}$ NMR	
Protons on Carbon	
Type of C-H	$\delta$ (ppm)
R-CH <sub>3</sub>	0.9
R-CH <sub>2</sub> -R	1.3
R <sub>3</sub> C-H	1.5-2
	1.8
R- $\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$	2-2.3
Ar-CH <sub>3</sub>	2.3
RC $\equiv$ C-H	2.5
R <sub>2</sub> N-CH <sub>3</sub>	2-3
R-CH <sub>2</sub> -X	3-3.5
RO-CH <sub>3</sub>	3.8
R-CH <sub>2</sub> -F	4.5
R <sub>2</sub> C=CR	5-5.3
Ar-H	7.3
R- $\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$	9.7
Protons on Oxygen	
Type of H	$\delta$ (ppm)
ROH	0.5-5
ArOH	4-7
R- $\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$	10-13

6B. (4 pts) Describe the relationship of the highlighted protons (homotopic, enantiotopic, diastereotopic), and provide the approximate chemical shift (also known as the  $\delta$  value) for these protons in a  $^1\text{H}$  NMR spectrum. No explanation is needed.



6C. (6 pts) Match the labeled peaks in the  $^1\text{H}$  NMR with the protons on the given structure. In other words, label every proton on the structure as a, b, c, d, e or f.

