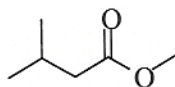


1. Predict the:

- ^1H NMR spectrum [include approximate chemical shifts (1's, 2's, 3's, 4's, 5's, etc.), integration, and splitting]
- ^{13}C NMR spectrum [include approximate chemical shifts (0-50, 50-100, 100-150, or 150-220) and splitting]
- identify any distinctive signals in the IR spectrum

Example:

	^1H NMR	^{13}C NMR	IR
$\text{CH}_3\text{CH}_2\text{OCH}_3$	1's 3H t	0-50, q	none
	3's 2H q	50-100, t	
	3's 3H s	50-100, q	

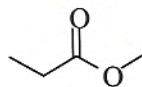


	^1H NMR	^{13}C NMR	IR
	1's 6H d	0-50 q	1700's
	1's 1H m	0-50 d	(~1745)
	2's 2H d	0-50 +	
	3's 3H s	20-150 s	
		50-100 q	

2. For the following molecule,

- Write how many "types" of H's there would be in the ^1H NMR spectrum (these are H's which might coincidentally overlap, but can't be assumed to be chemical shift equivalent)
- Write how many different ^{13}C NMR absorptions you would expect, and
- Write what the ^{13}C NMR splitting would be, i.e. singlet, doublet, triplet, or quartet for the ^{13}C NMR absorptions.

Example:

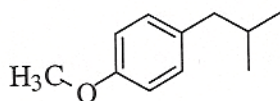


Number of Nonequivalent H's in H-NMR	Number of ^{13}C Absorptions in ^{13}C NMR	Expected Splittings in ^{13}C NMR
--------------------------------------	--	--

3 4 q, t, s, q

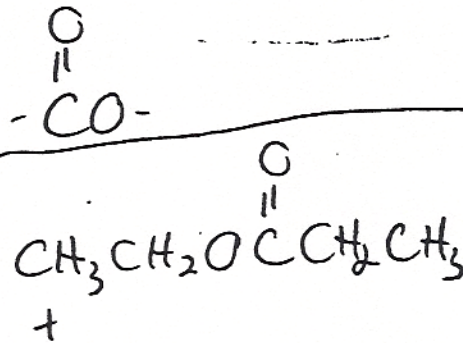
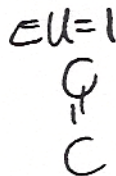
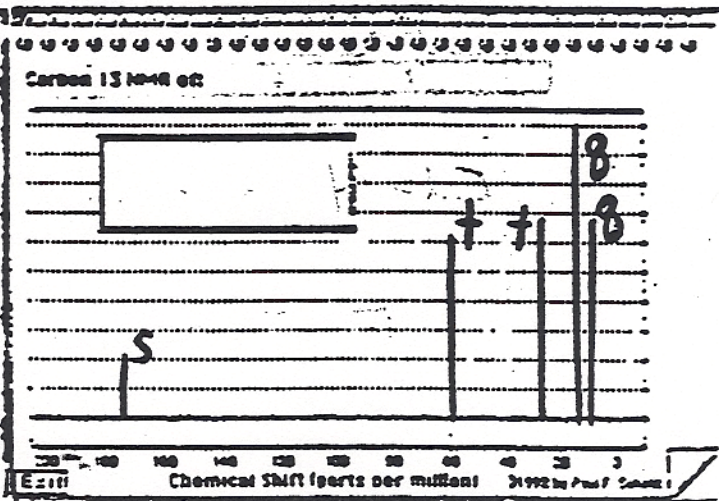
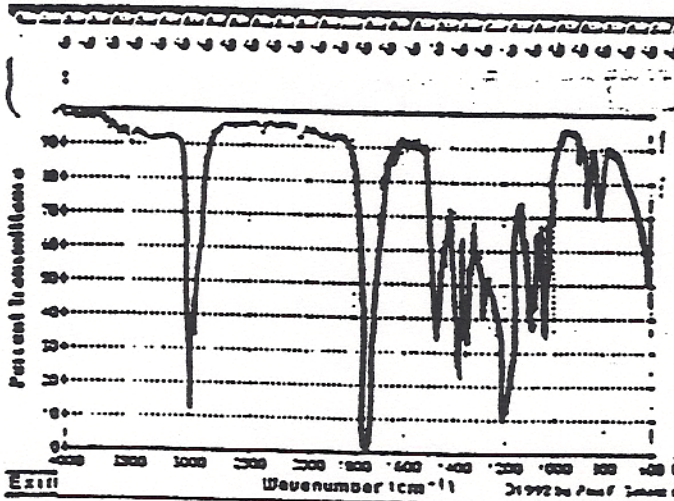
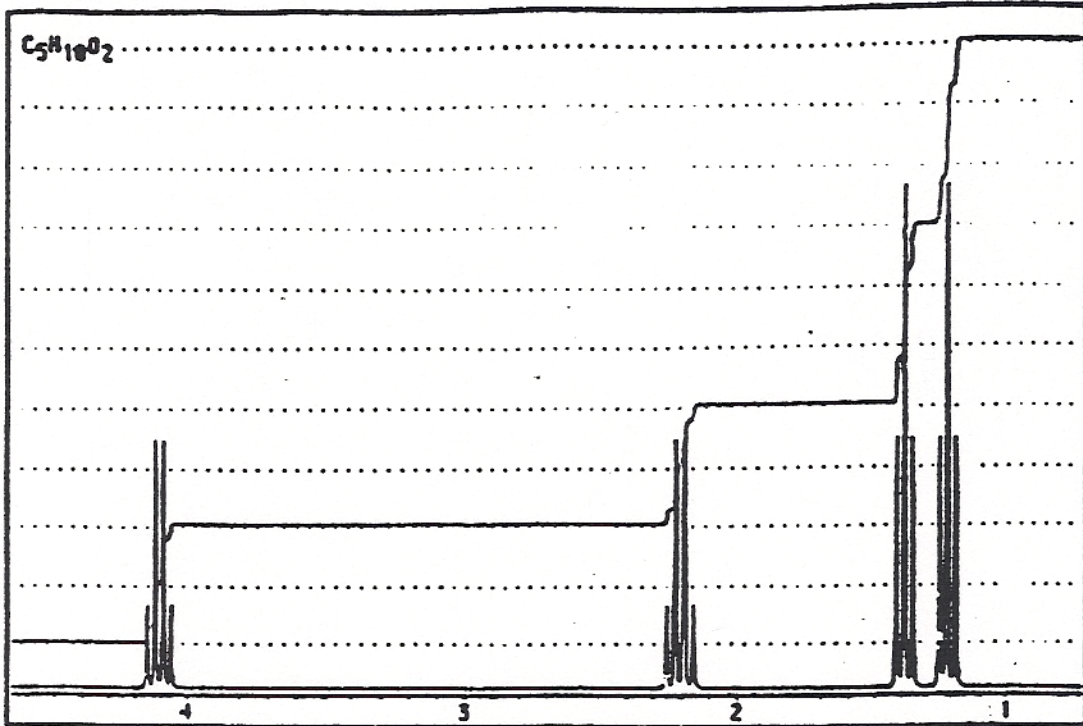
Number of Nonequivalent H's in H-NMR	Number of ^{13}C Absorptions in ^{13}C NMR	Expected Splittings in ^{13}C NMR
--------------------------------------	--	--

6 8 q, s, d d
s + d q



Provide Structures Based on the Following Spectroscopic Data (8 points each)

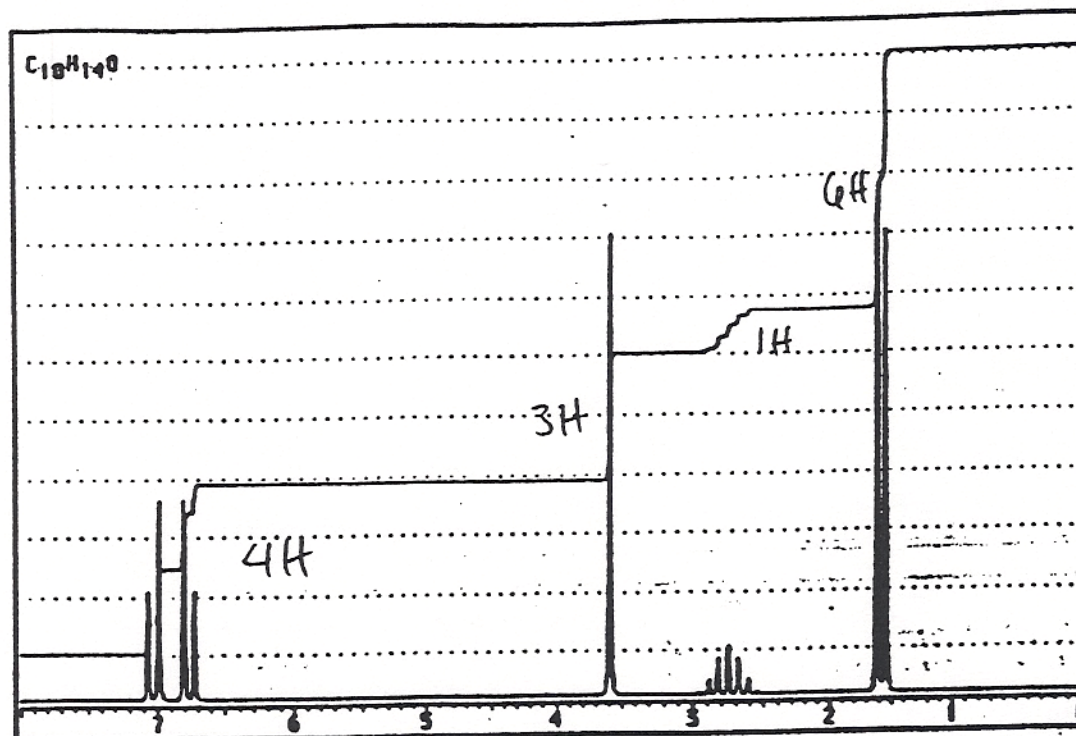
4. $C_5H_{10}O_2$



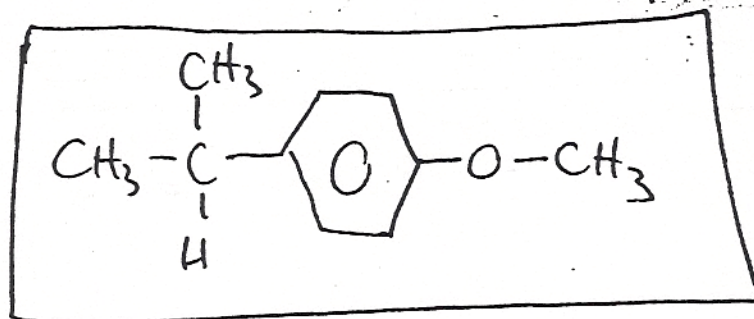
5. C₁₀H₁₄O

¹³C NMR:

148	s	135	d	75	q	50	d
122	s	128	d			22	q



EU = 4 disubbed para, from ¹³C

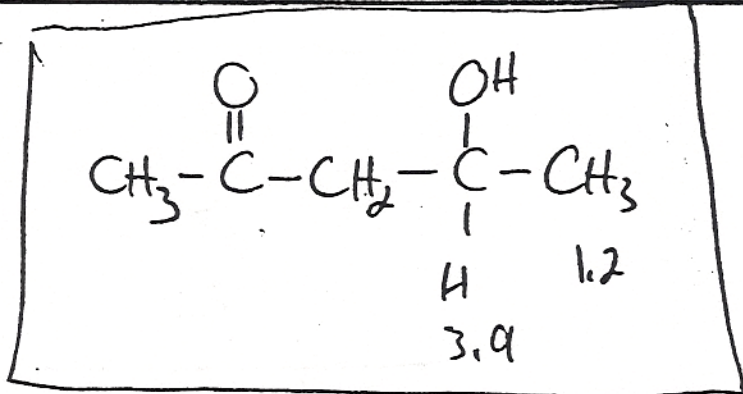
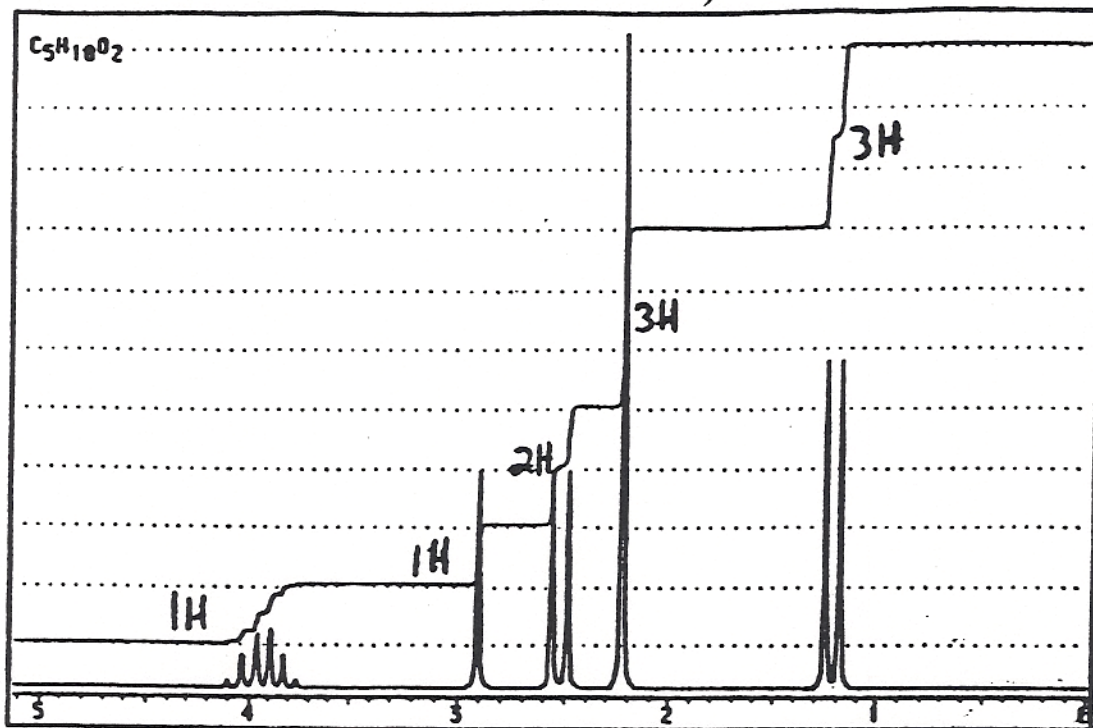


6. $C_5H_{10}O_2$

IR: 1710 (strong), 3300-3500 (broad, strong)

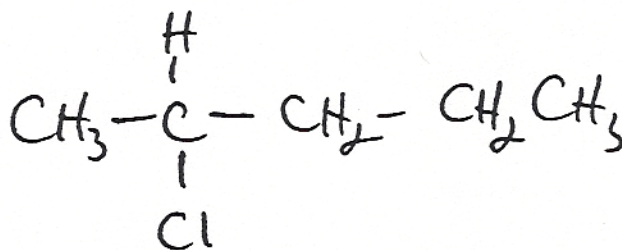
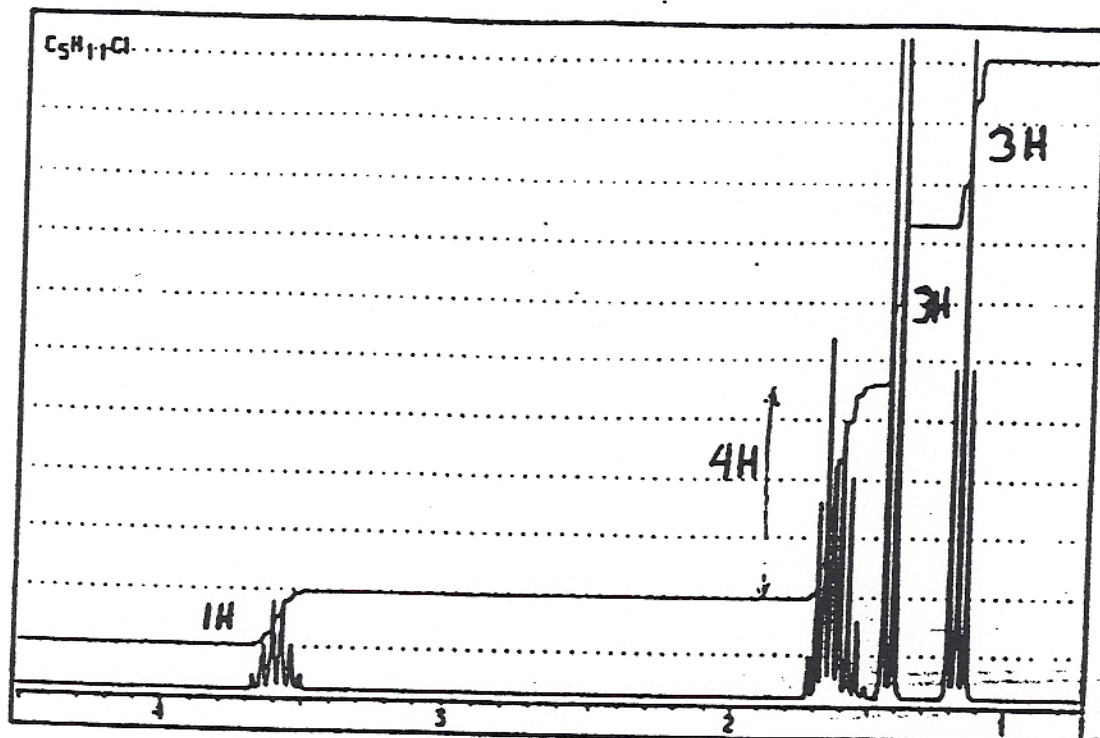
↳ C=O

↳ OH (not acid)

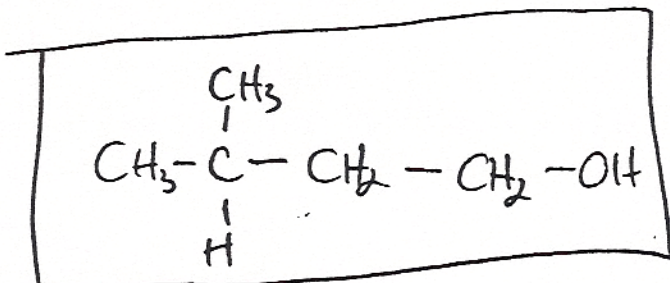
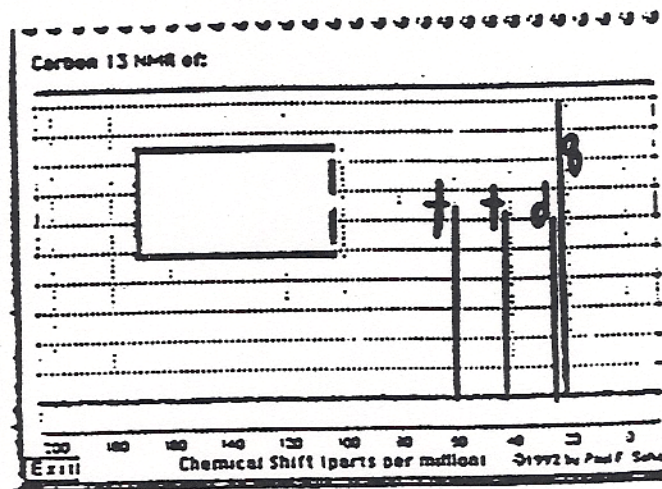
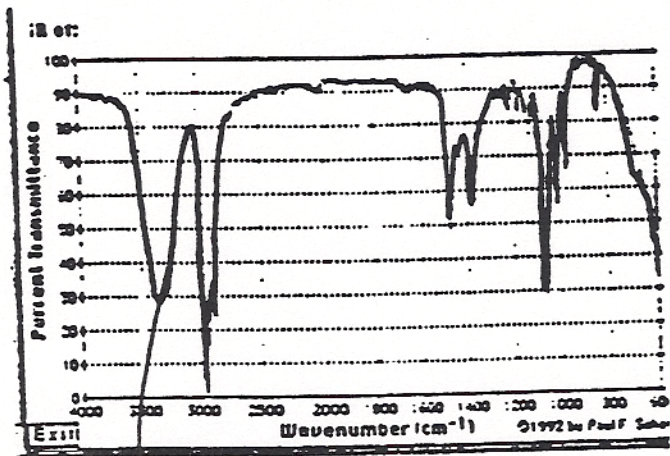
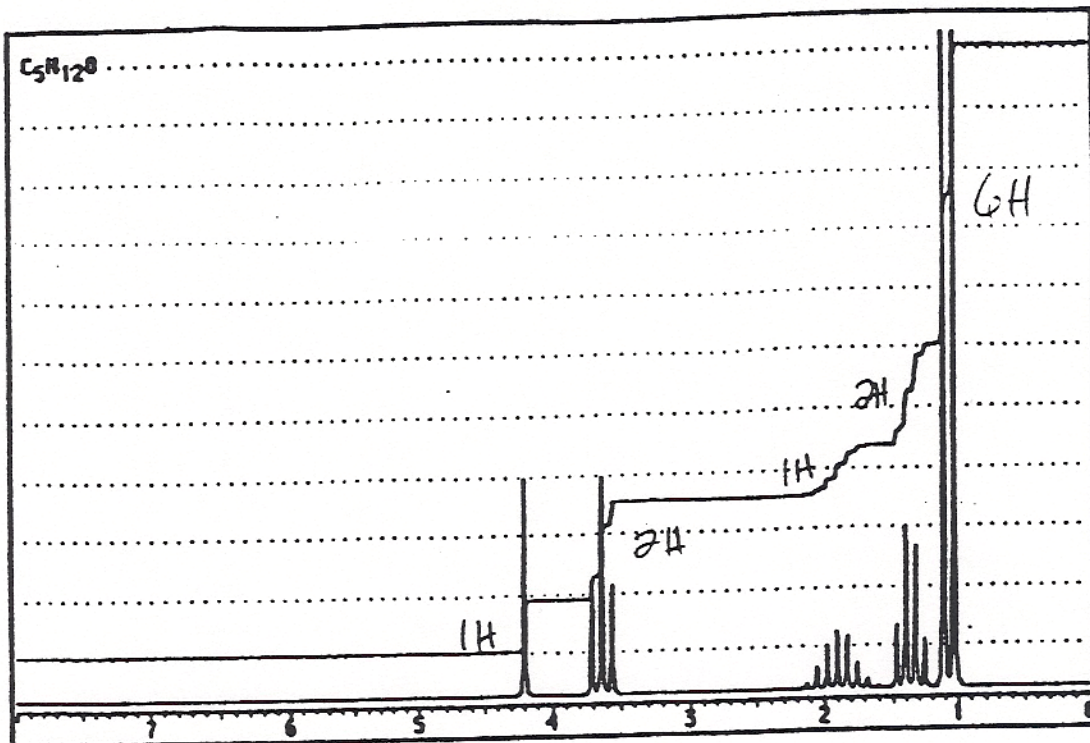


7. $C_5H_{11}Cl$

^{13}C NMR: 60 (d), 40 (t), 37 (t), 33 (q), 20 (q) no symmetry



8. C₅H₁₂O



no other
CH₃'s, 7
so other
end must be OH

9. C₄H₈O₂ EU=1
triplet, 1.02, 3H
sextet, 1.43, 2H
triplet, 2.35, 2H
singlet, 10.95, 1H

IR 1715 cm⁻¹ and broad 2500-3000
-COH

