

$^{13}\text{C}$  NMR Spectrum  
(50.0 MHz,  $\text{CDCl}_3$  solution)

$\text{C}_{12}\text{H}_{16}\text{O}$

DEPT  $\text{CH}_2 \downarrow$   $\text{CH}_3 \uparrow$   $\text{CH} \uparrow$

proton decoupled

expansion  
130 125 ppm

$\delta$  solvent

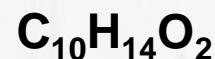
200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(200 MHz,  $\text{CDCl}_3$  solution)

TMS

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)

$^{13}\text{C}$  NMR Spectrum  
(50.0 MHz,  $\text{CDCl}_3$  solution)



DEPT  $\downarrow \text{CH}_2 \downarrow \text{CH}_3 \downarrow \text{CH} \uparrow$

proton decoupled

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(200 MHz,  $\text{CDCl}_3$  solution)

expansion

5.0 4.5 ppm

expansion

3.0 2.5 ppm

TMS

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)

$^{13}\text{C}$  NMR Spectrum  
(100.0 MHz,  $\text{CDCl}_3$  solution)



DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \uparrow \text{CH} \uparrow$

proton decoupled

solvent

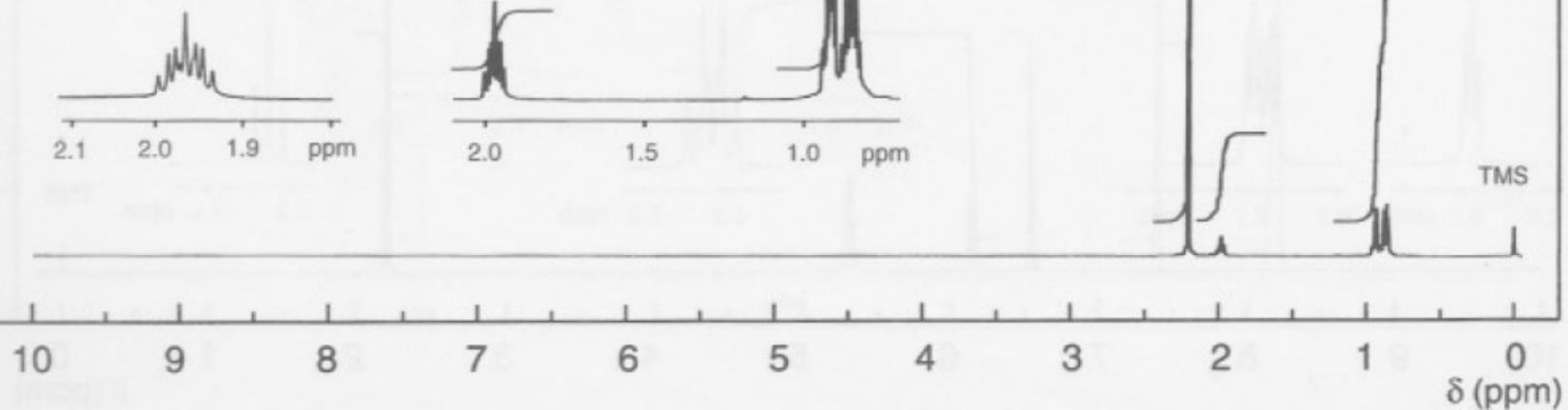
200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(400 MHz,  $\text{CDCl}_3$  solution)

expansion

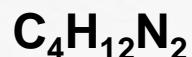
expansion

TMS



$^{13}\text{C}$  NMR Spectrum  
(100.0 MHz,  $\text{CDCl}_3$  solution)

DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \uparrow \text{CH} \uparrow$



proton decoupled

solvent

200

160

120

80

40

0

$\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(400 MHz,  $\text{CDCl}_3$  solution)

expansions

2.0 1.8 ppm

0.8 0.6 ppm

Exchanges  
with  $\text{D}_2\text{O}$

TMS

10

9

8

7

6

5

4

3

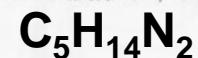
2

1

0  
 $\delta$  (ppm)

$^{13}\text{C}$  NMR Spectrum  
(100.0 MHz,  $\text{CDCl}_3$  solution)

DEPT  $\text{CH}_2\downarrow \text{CH}_3\uparrow \text{CH}\uparrow$



proton decoupled

solvent

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(400 MHz,  $\text{CDCl}_3$  solution)

expansions

Exchanges  
with  $\text{D}_2\text{O}$

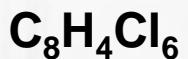
TMS

2.2 2.1 2.0 ppm

0.9 0.8 0.7 ppm

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)

$^{13}\text{C}$  NMR Spectrum  
(50.0 MHz,  $\text{CDCl}_3$  solution)



DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \uparrow \text{CH} \uparrow$

proton decoupled

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(200 MHz,  $\text{CDCl}_3$  solution)

expansion

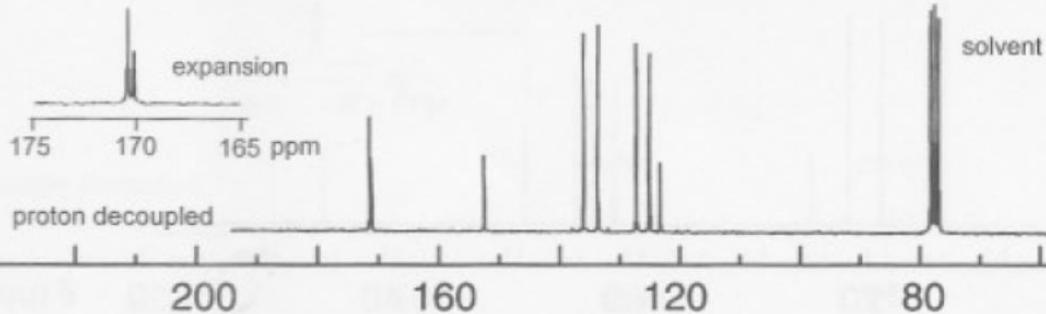
8.5 8.0 ppm

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)

$^{13}\text{C}$  NMR Spectrum  
(50.0 MHz,  $\text{CDCl}_3$  solution)



DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \uparrow \text{CH} \uparrow$



$^1\text{H}$  NMR Spectrum  
(200 MHz,  $\text{CDCl}_3$  solution)

expansion  
with resolution enhancement

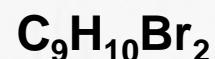
broad resonance  
exchanges  
with  $\text{D}_2\text{O}$

8.2 7.8 7.4 4.1 3.0 ppm

TMS



$^{13}\text{C}$  NMR Spectrum  
(50.0 MHz,  $\text{CDCl}_3$  solution)



DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \downarrow \text{CH} \uparrow$

proton decoupled

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(200 MHz,  $\text{CDCl}_3$  solution)

expansion

7.5 7.0 ppm

expansions

3.0 2.6 ppm

1.4 1.0 ppm

TMS

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)

$^{13}\text{C}$  NMR Spectrum  
(100.0 MHz,  $\text{CDCl}_3$  solution)



DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \uparrow \text{CH} \uparrow$

proton decoupled

solvent

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(400 MHz,  $\text{CDCl}_3$  solution)

expansions

6.9 6.8 ppm

5.90 5.85 ppm

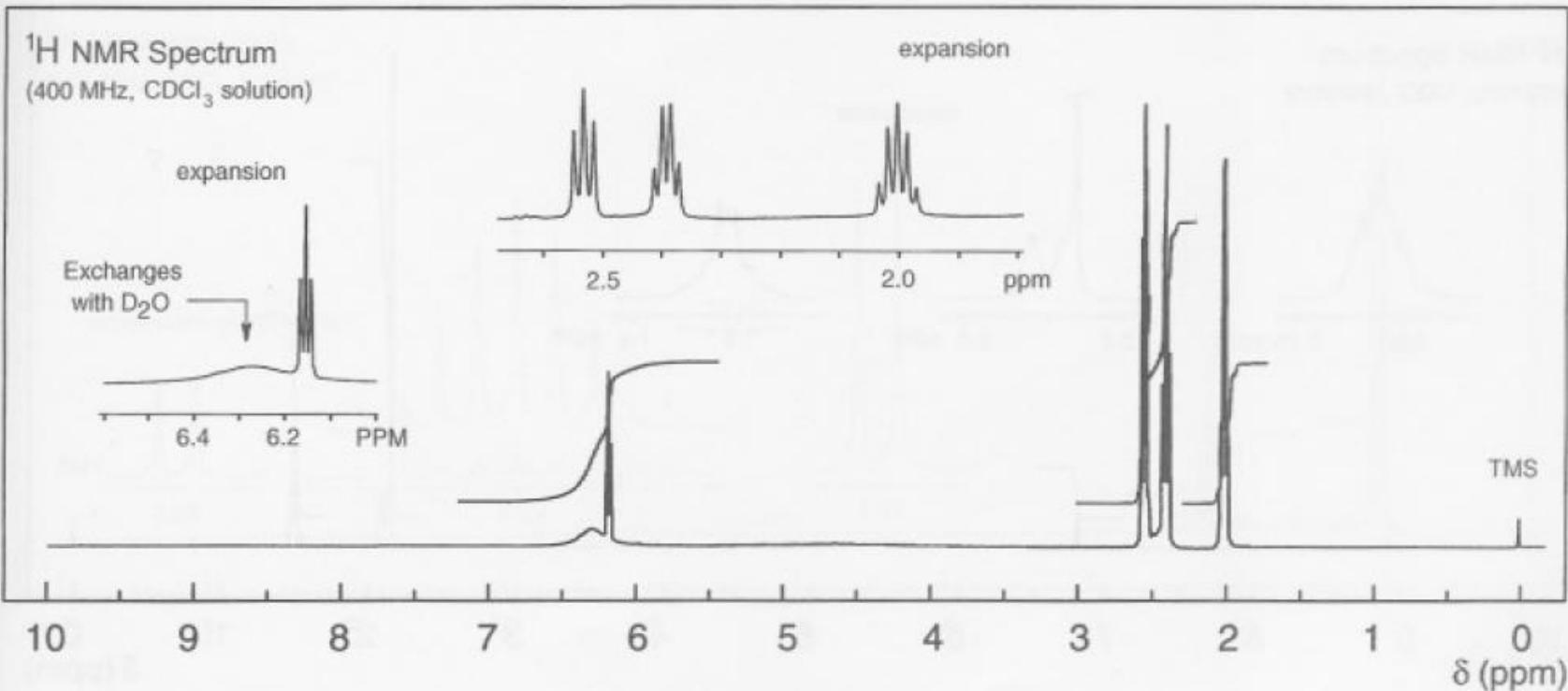
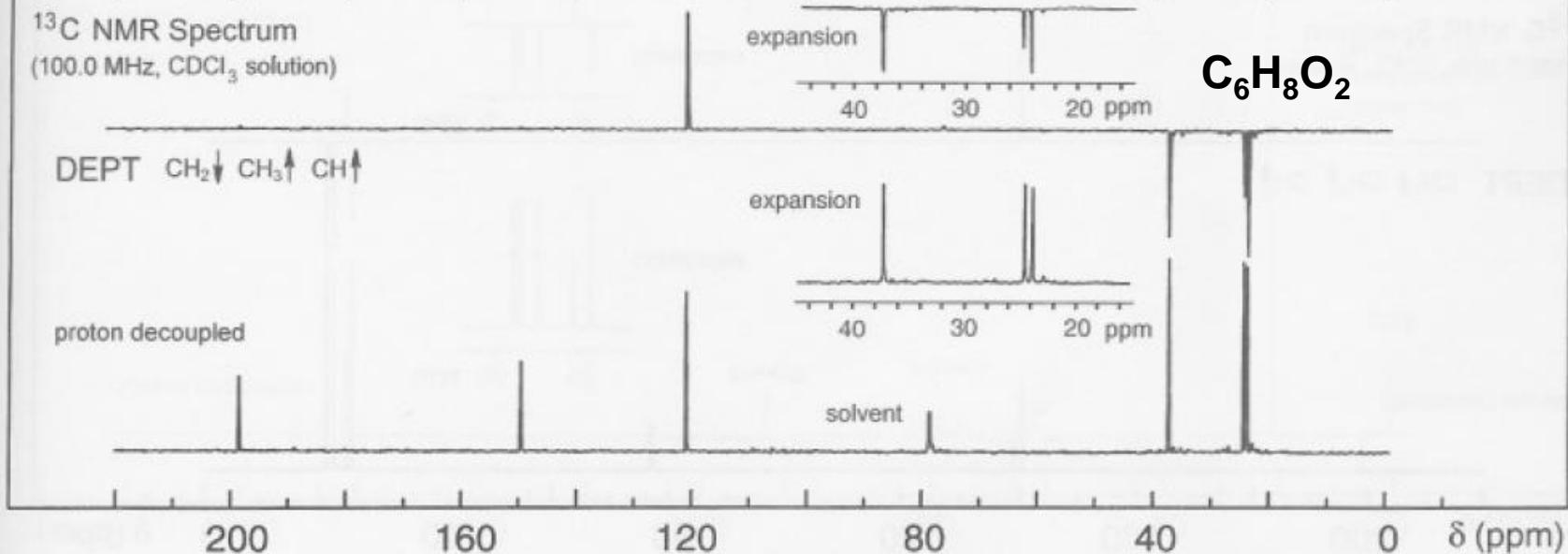
expansions

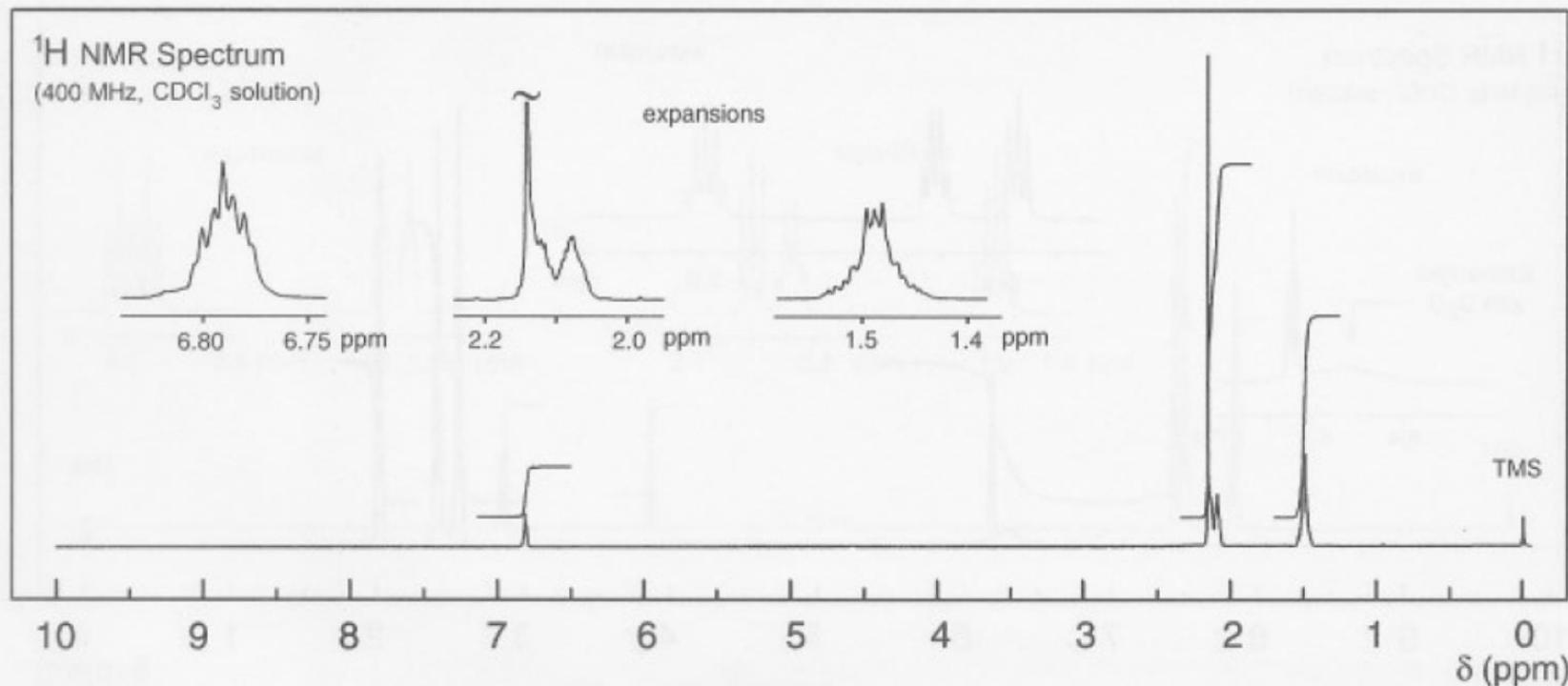
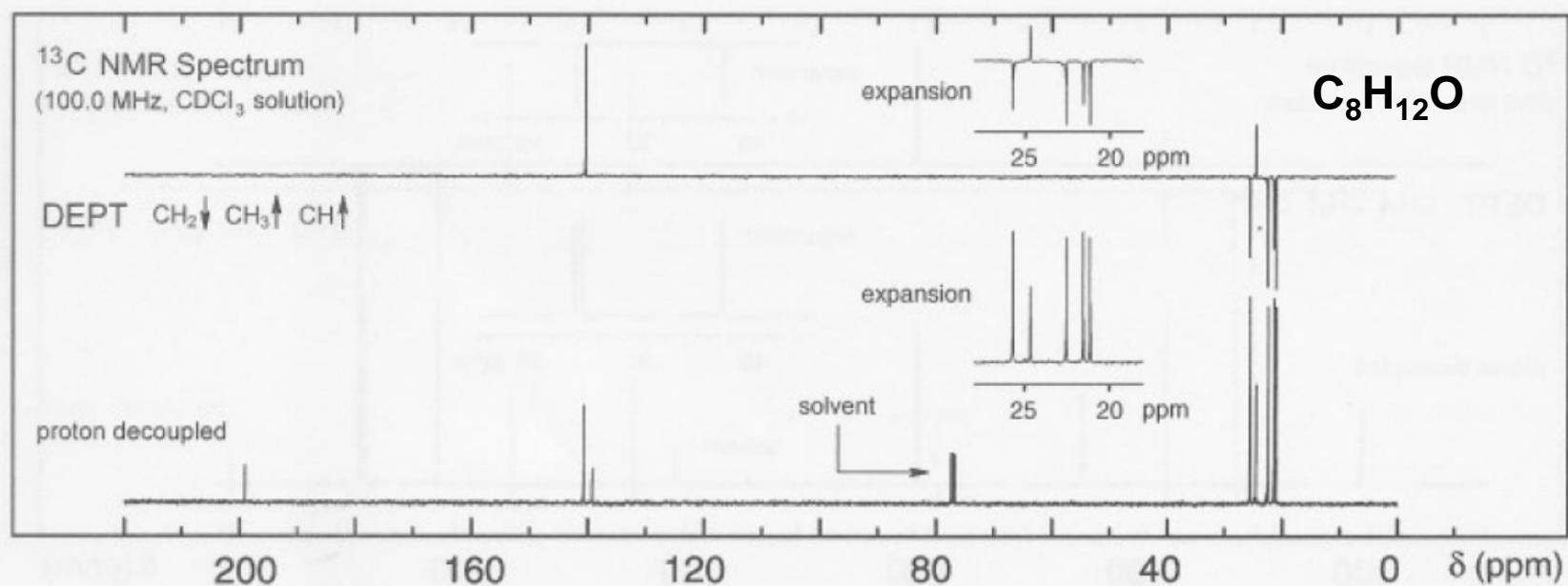
2.4 2.2 ppm

1.9 1.8 ppm

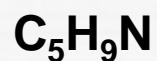
TMS

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)





$^{13}\text{C}$  NMR Spectrum  
(20.0 MHz,  $\text{CDCl}_3$  solution)



proton decoupled

solvent

TMS

200

160

120

80

40

0

$\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(100 MHz,  $\text{CDCl}_3$  solution)

expansions at 400 MHz

20 Hz

2.26

2.03

1.07

TMS

10

9

8

7

6

5

4

3

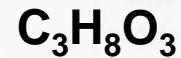
2

1

0  
 $\delta$  (ppm)

145

$^{13}\text{C}$  NMR Spectrum  
(100.0 MHz,  $\text{D}_2\text{O}$  solution)



DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \uparrow \text{CH} \uparrow$

proton decoupled

200 160 120 80 40 0  $\delta$  (ppm)

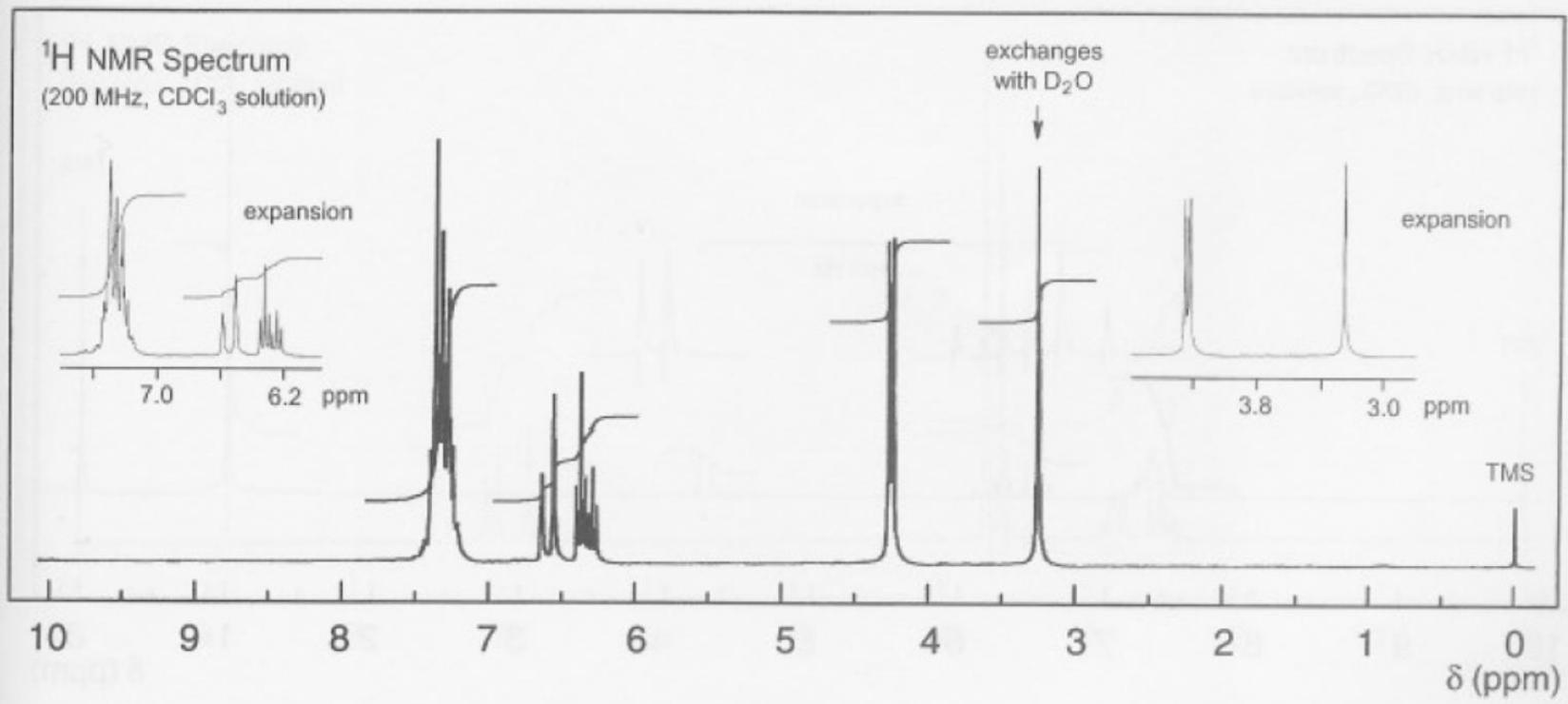
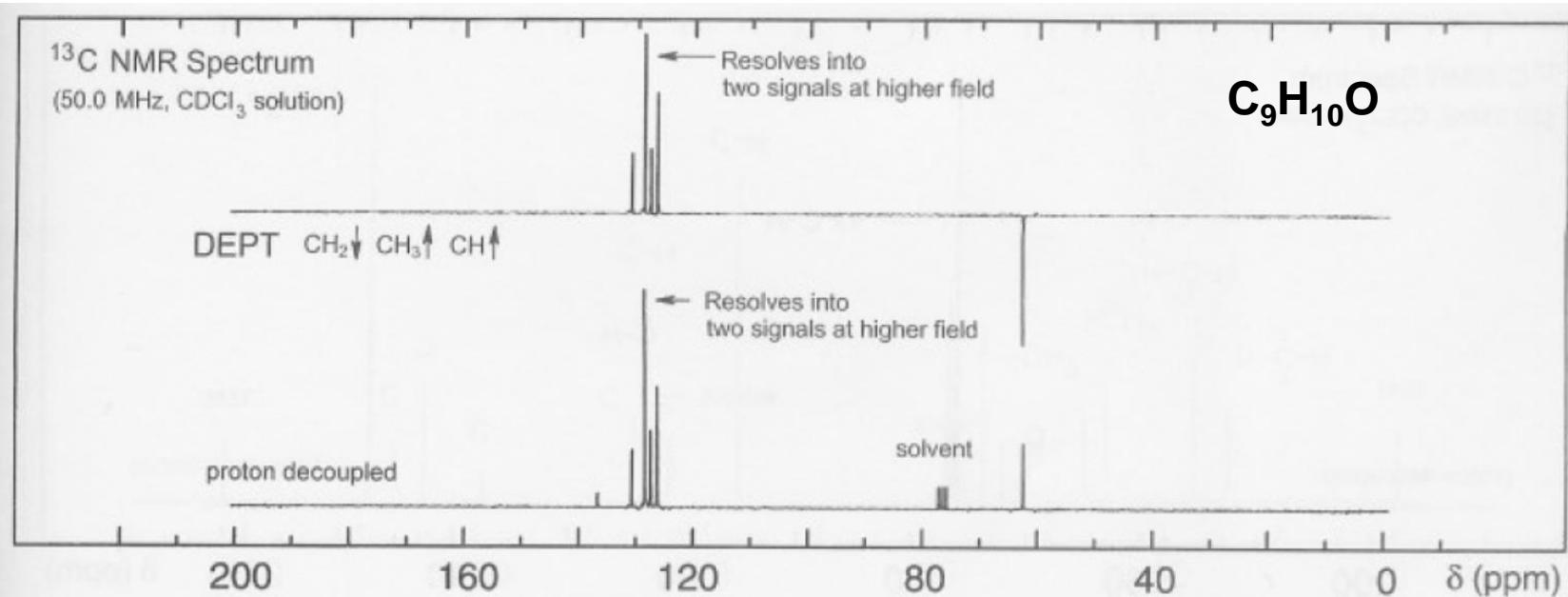
$^1\text{H}$  NMR Spectrum  
(400 MHz,  $\text{D}_2\text{O}$  solution)

expansion

3.8 3.6 ppm

$\text{H}_2\text{O}$  and  $\text{HOD}$   
in solvent

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)



$^{13}\text{C}$  NMR Spectrum  
(50.0 MHz,  $\text{CDCl}_3$  solution)

$\text{C}_5\text{H}_5\text{N}$

proton coupled

proton decoupled

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(200 MHz,  $\text{CDCl}_3$  solution)

expansion

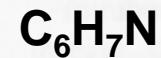
10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)

8.8 8.0 7.2 ppm

TMS

199

$^{13}\text{C}$  NMR Spectrum  
(20.0 MHz,  $\text{CDCl}_3$  solution)



off-resonance decoupled

proton decoupled

solvent

TMS

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(100 MHz,  $\text{CDCl}_3$  solution)

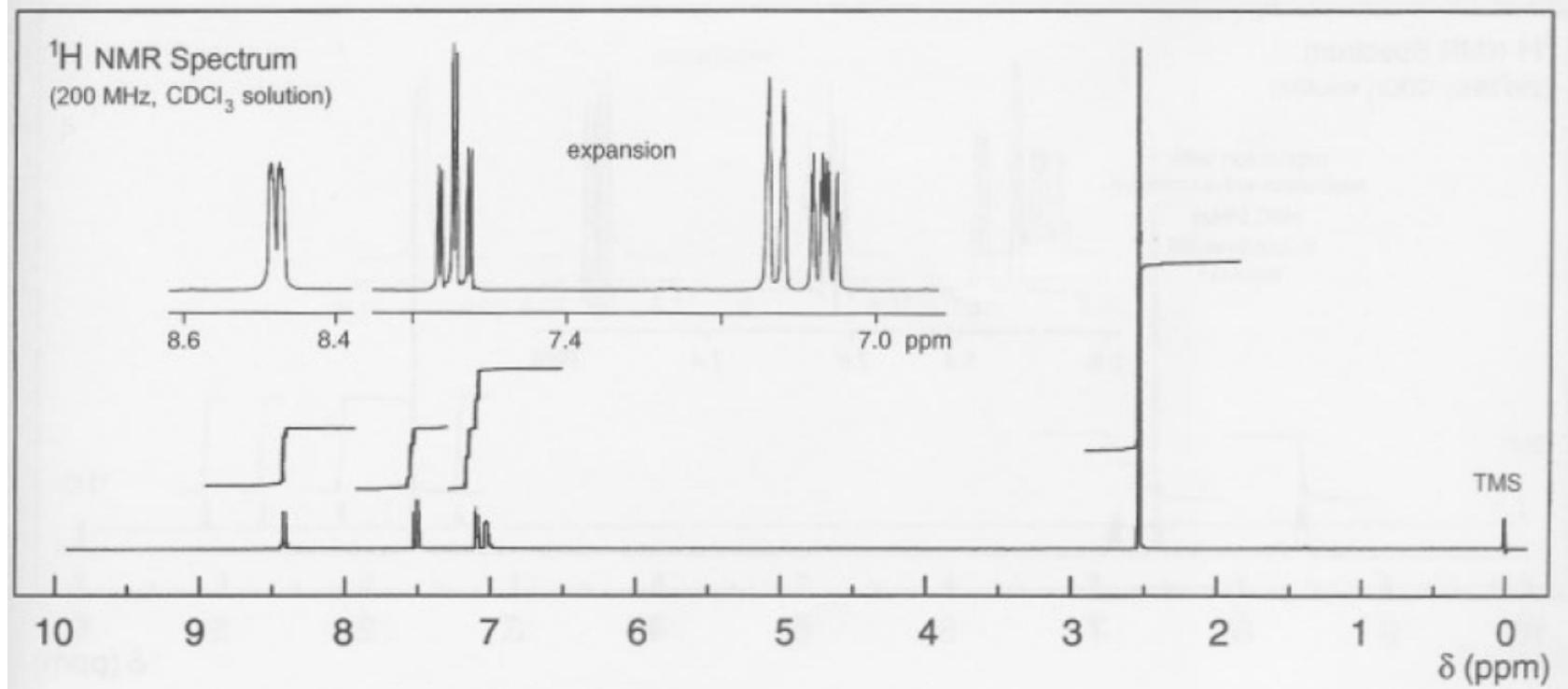
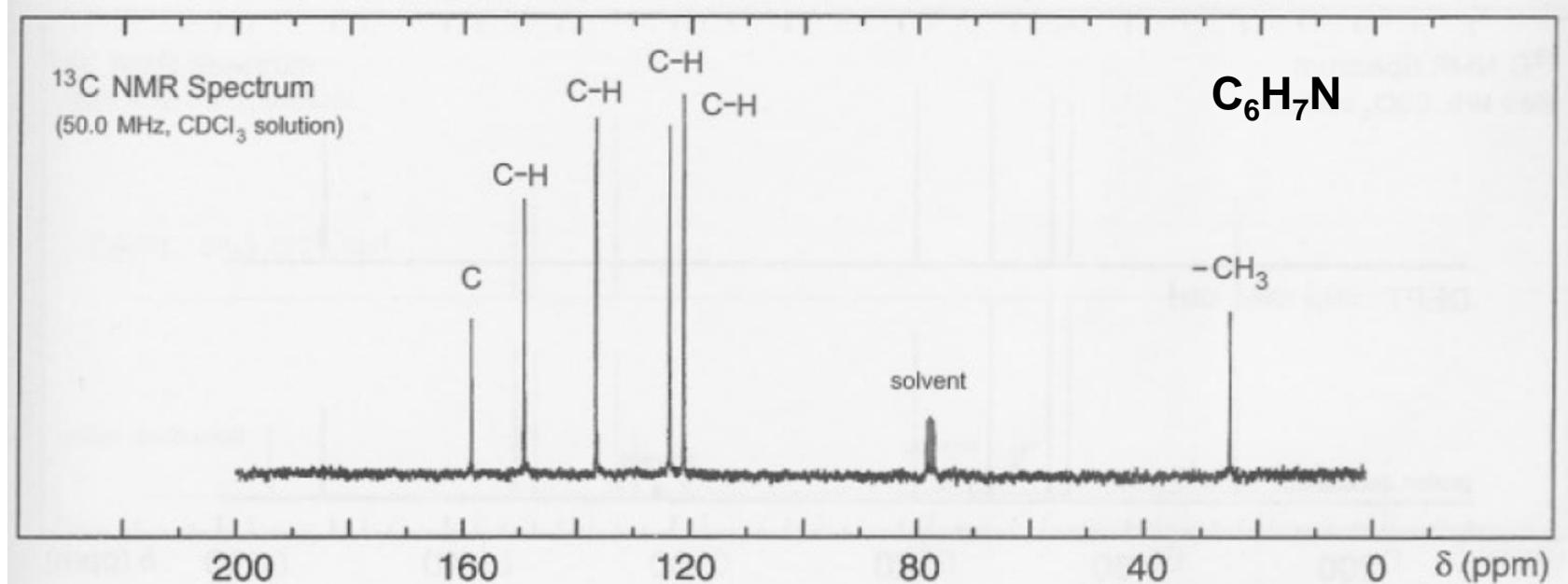
3H

2H

2H

TMS

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)



$^{13}\text{C}$  NMR Spectrum  
(50.0 MHz,  $\text{CDCl}_3$  solution)

$\text{C}_6\text{H}_7\text{N}$

DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \uparrow \text{CH} \uparrow$

proton decoupled

solvent

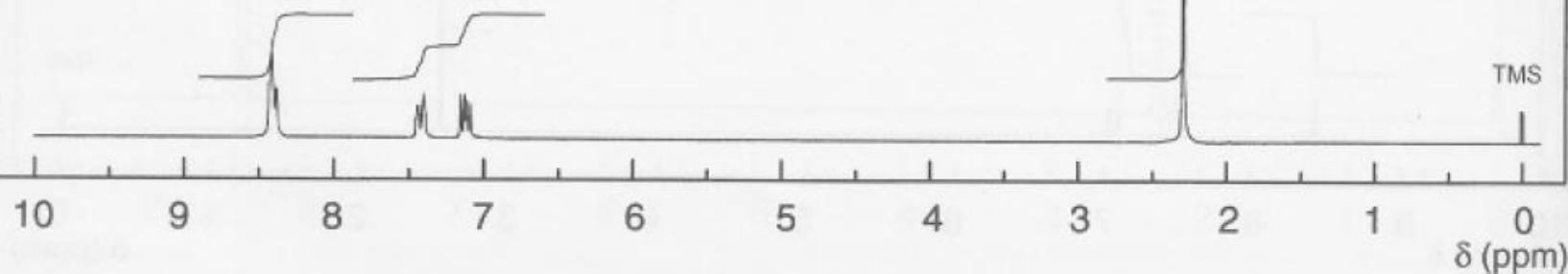
200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum

(200 MHz,  $\text{CDCl}_3$  solution)

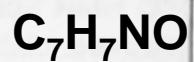
expansion with  
resolution enhancement  
(400 MHz)  
in acetone- $d_6$   
solution

8.6 8.4 7.6 7.4 ppm



202

$^{13}\text{C}$  NMR Spectrum  
(100.0 MHz,  $\text{CDCl}_3$  solution)



DEPT  $\text{CH}_2 \downarrow \text{CH}_3 \uparrow \text{CH} \uparrow$

proton decoupled

solvent

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(400 MHz,  $\text{CDCl}_3$  solution)

expansions

9.11 9.01 8.62 8.72

8.17 8.07

7.37 7.27

TMS

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)

245

$^{13}\text{C}$  NMR Spectrum  
(50.0 MHz,  $\text{CDCl}_3$  solution)

$\text{C}_4\text{H}_6\text{O}$

proton coupled

proton decoupled

solvent

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(200 MHz,  $\text{CDCl}_3$  solution)

TMS

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)

$^{13}\text{C}$  NMR Spectrum  
(20.0 MHz,  $\text{CDCl}_3$  solution)

$\text{C}_4\text{H}_6\text{O}$

off-resonance decoupled

proton decoupled

200 160 120 80 40 0  $\delta$  (ppm)

$^1\text{H}$  NMR Spectrum  
(100 MHz,  $\text{CDCl}_3$  solution)

25 Hz

6.27

4.90

4.25

2.55 ppm

TMS

10 9 8 7 6 5 4 3 2 1 0  $\delta$  (ppm)