

Ruthenium-Catalyzed *N*-Alkylation of Amines and Sulfonamides Using Borrowing Hydrogen Methodology

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Hannah C. Maytum,[†] Aoife C. Maxwell,[‡] Andrew J. A. Watson[†]
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Spectroscopic Data for Synthesized Compounds

Compounds up to and including Table 5

Table 1, Entry 1

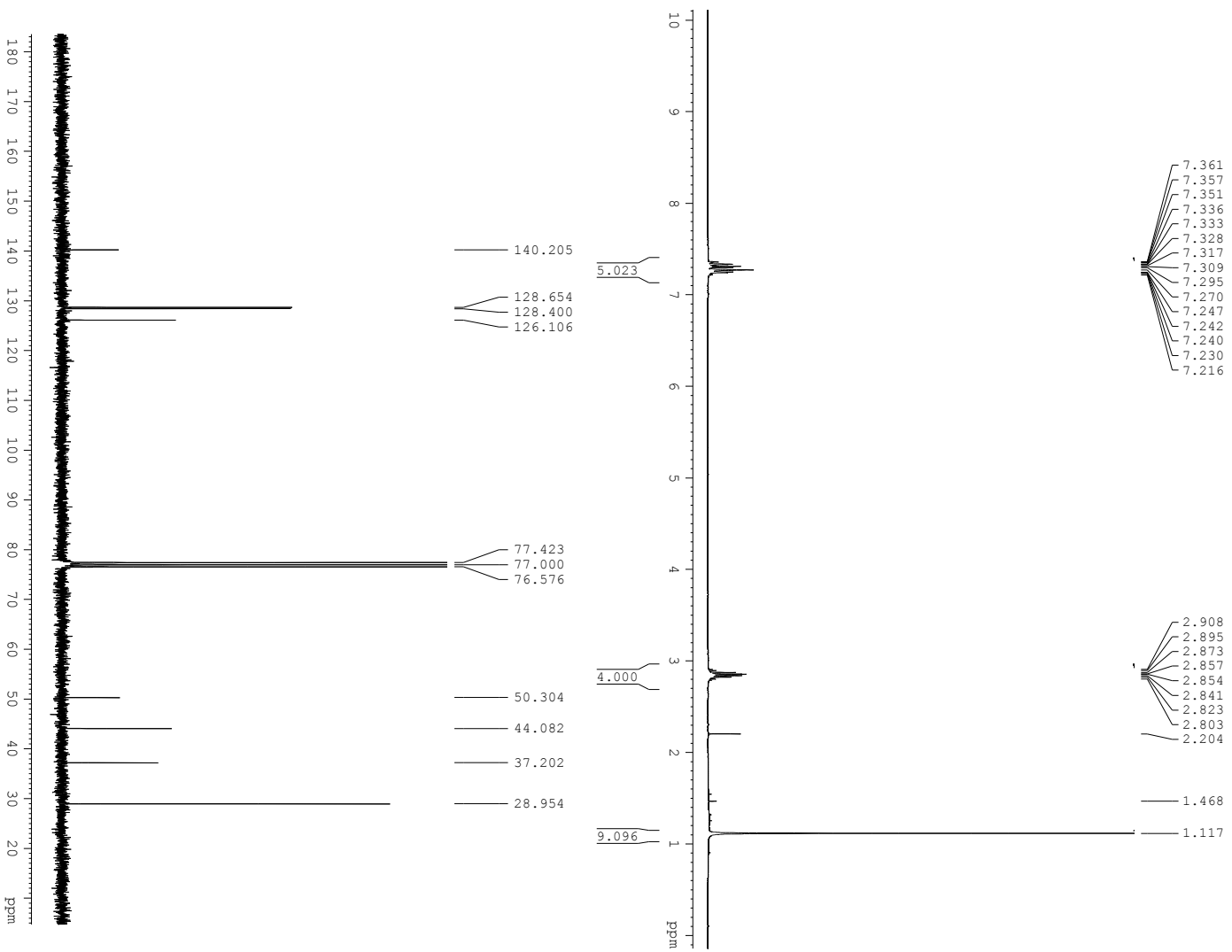


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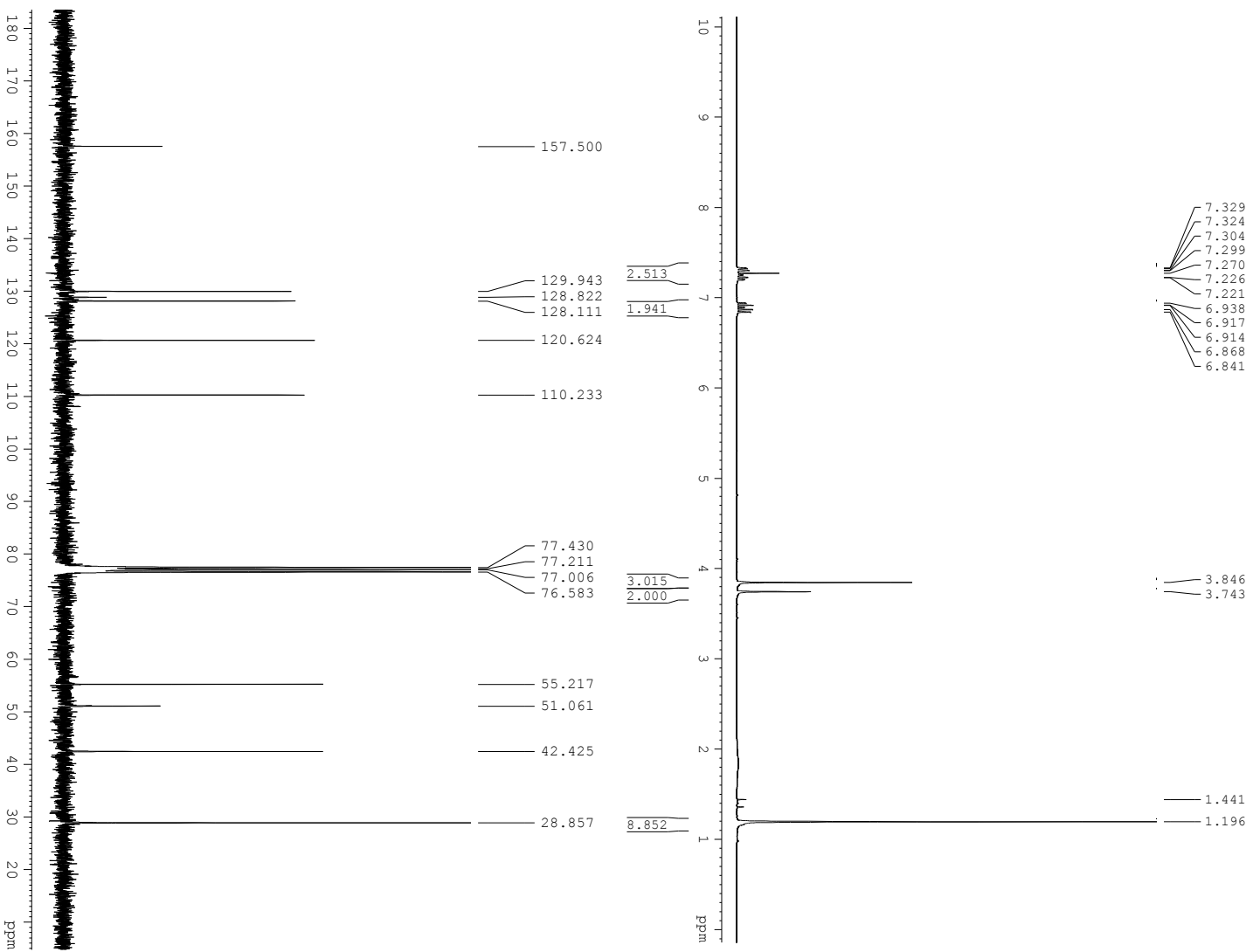
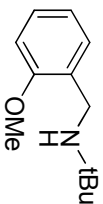


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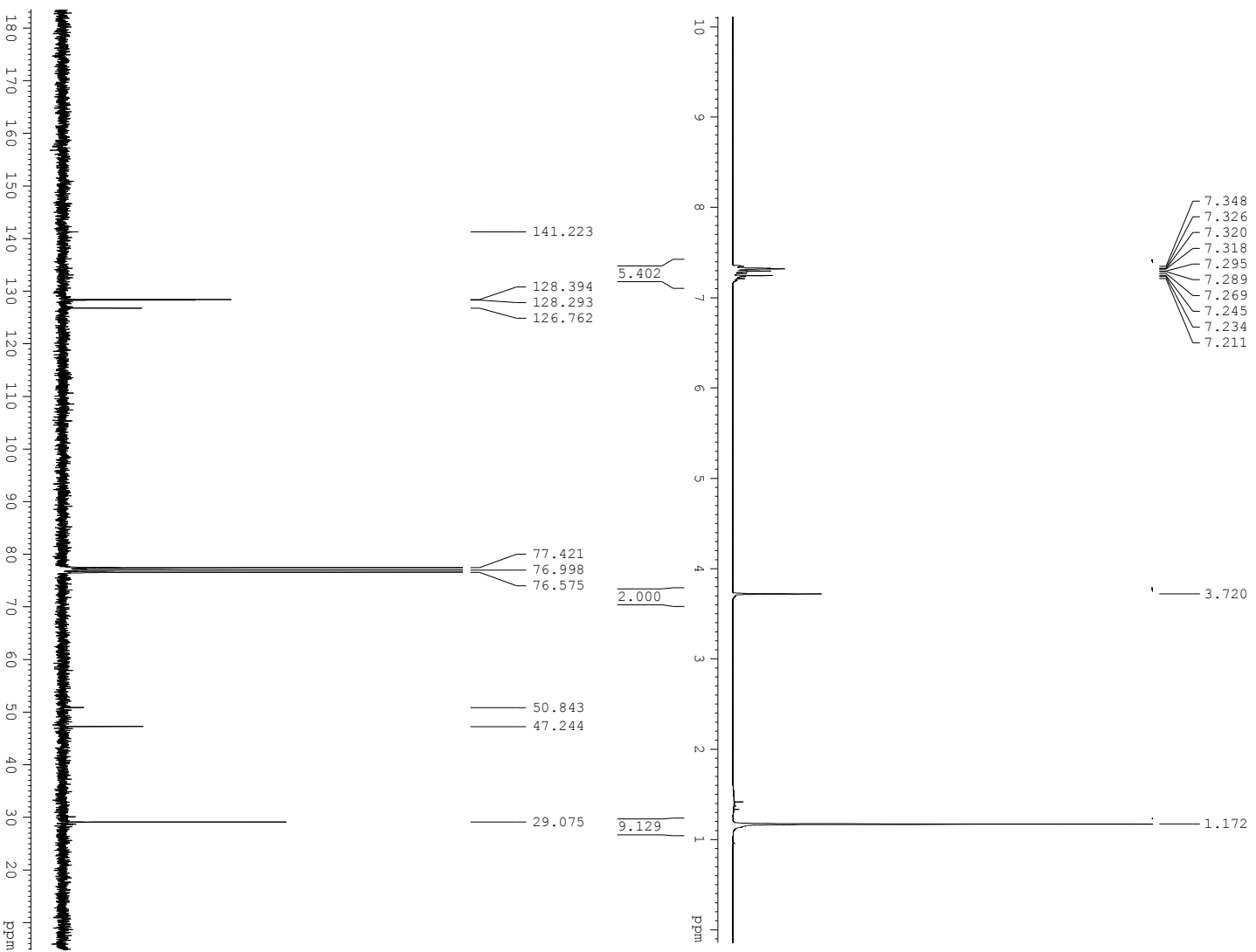
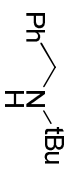


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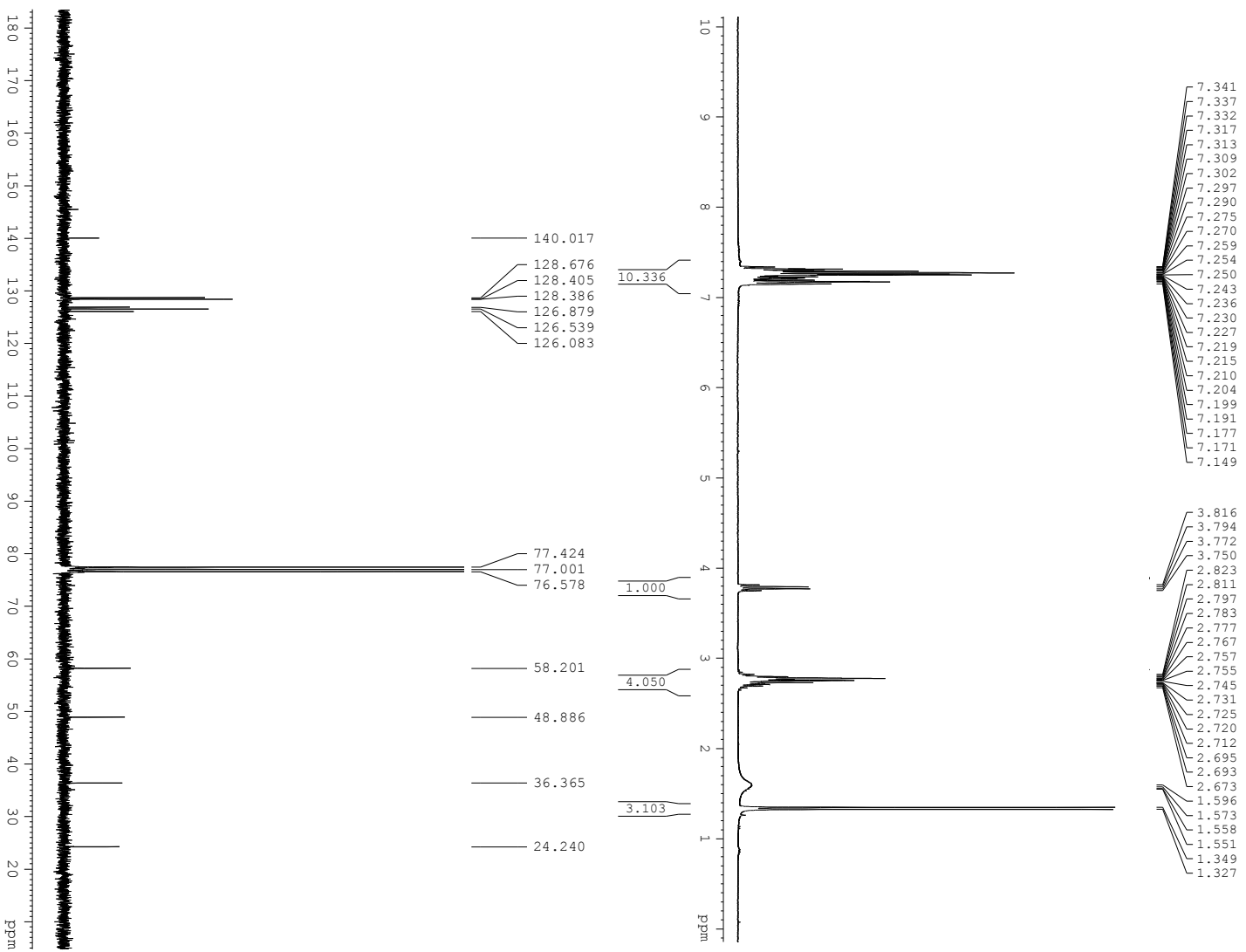
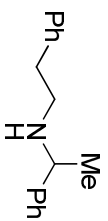


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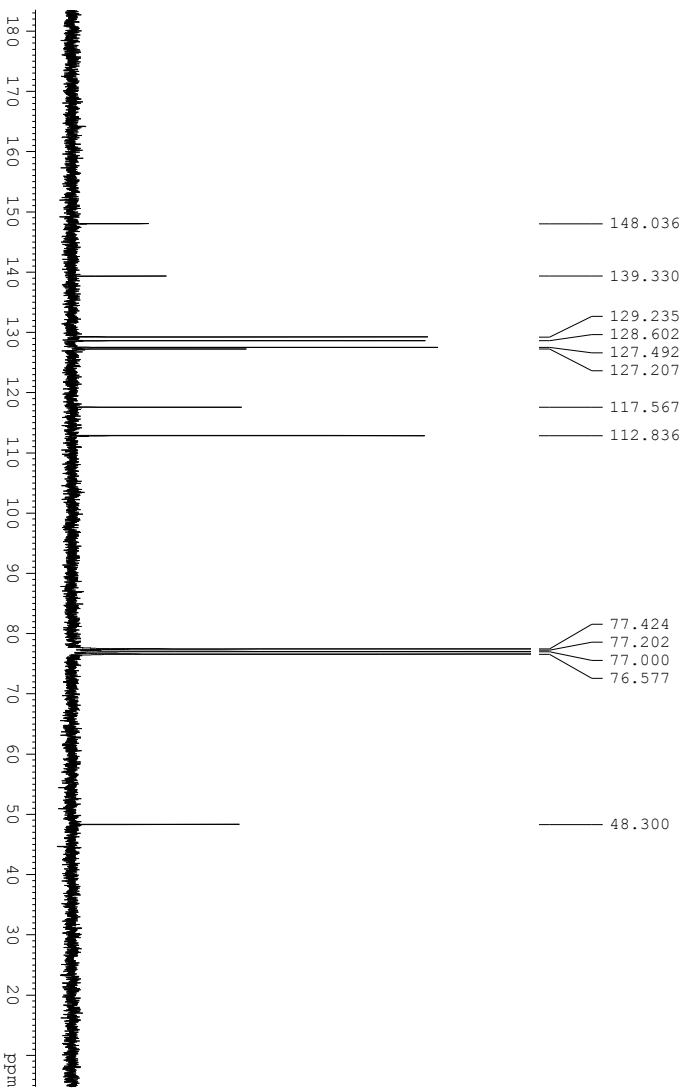
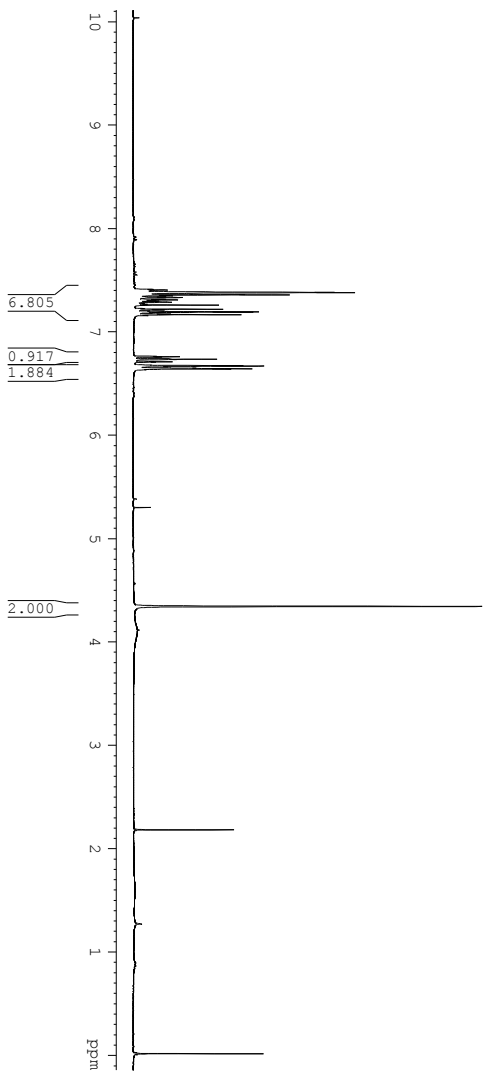
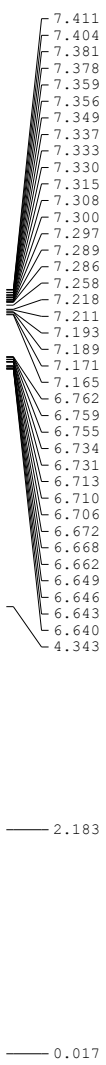
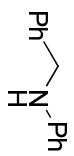


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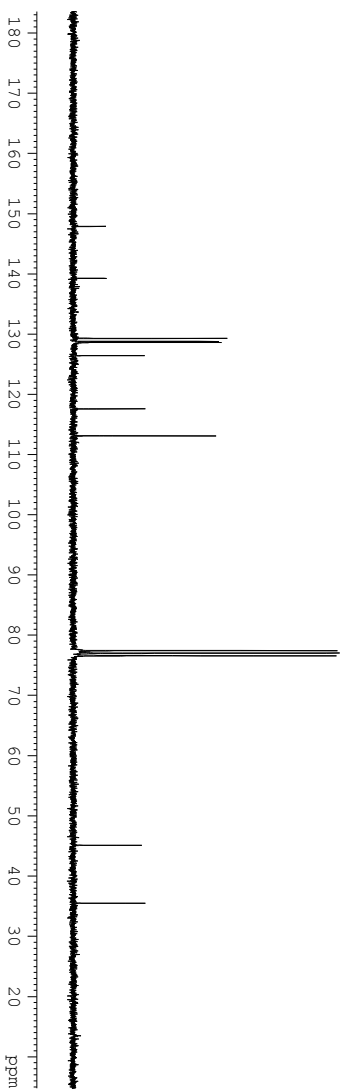
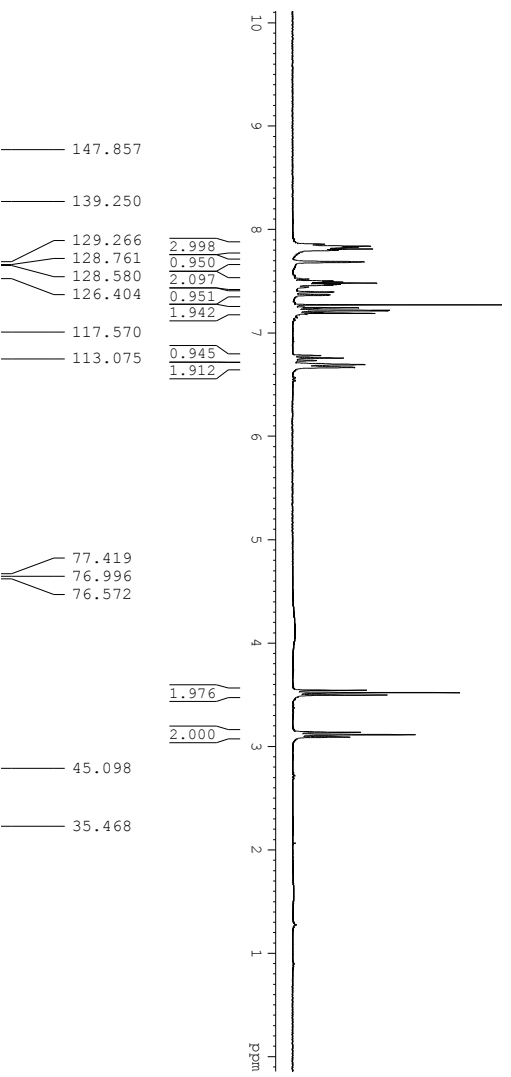
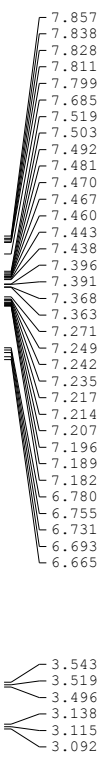
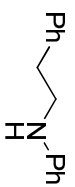


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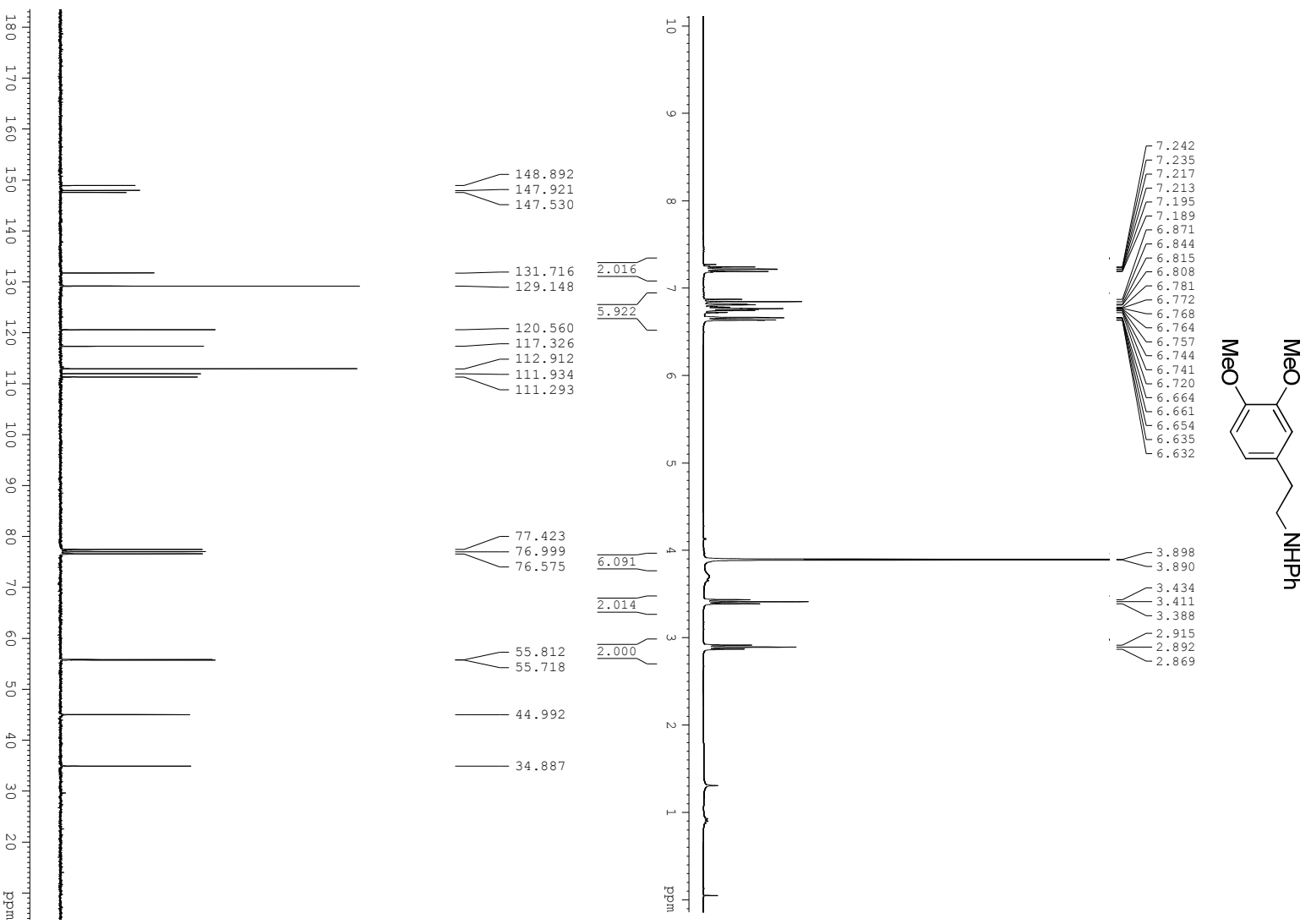


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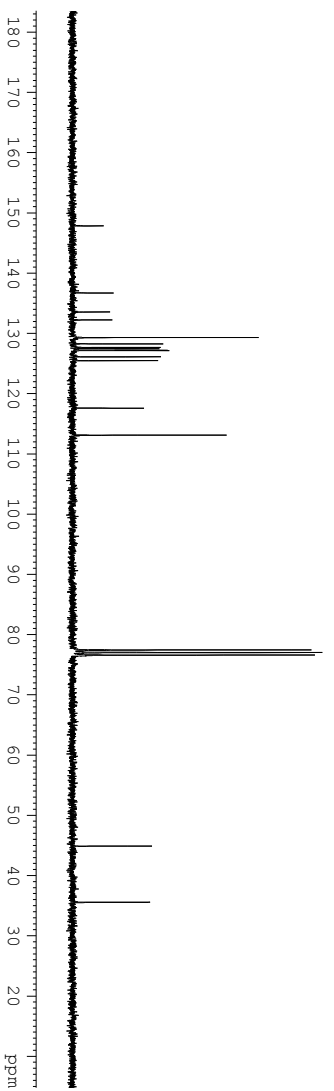
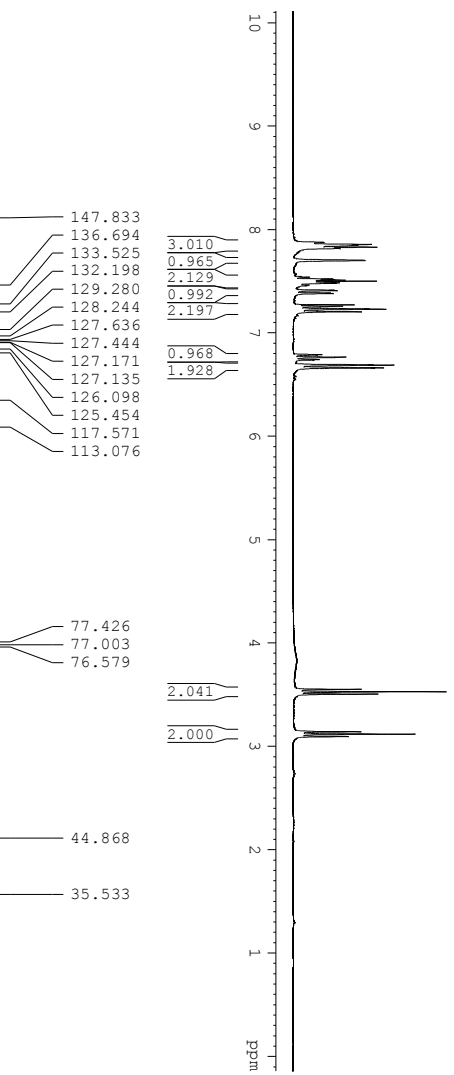
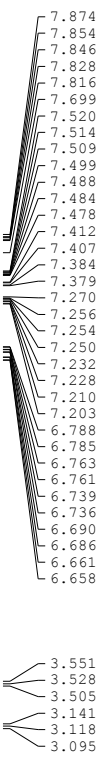
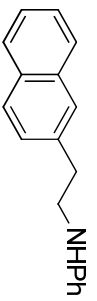


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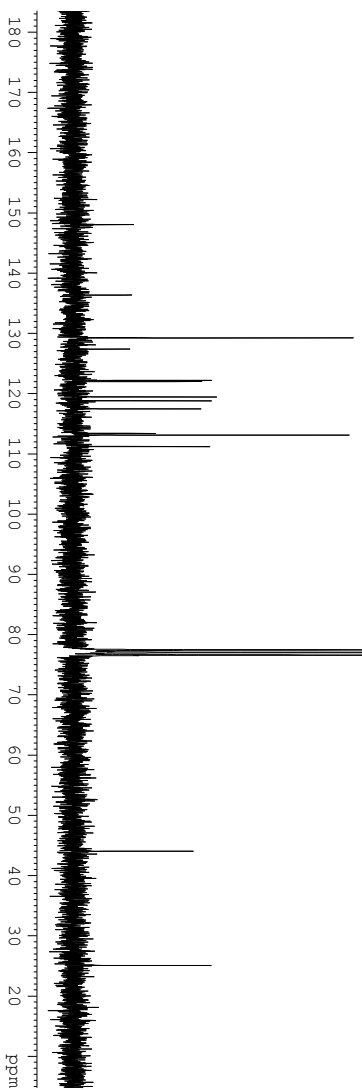
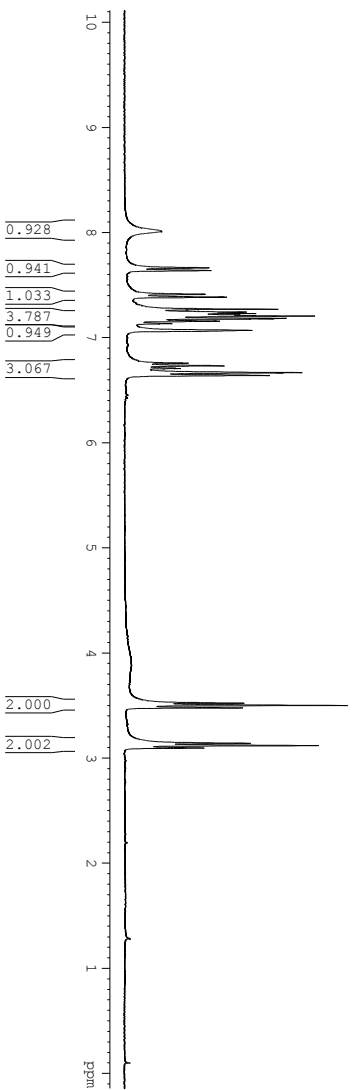
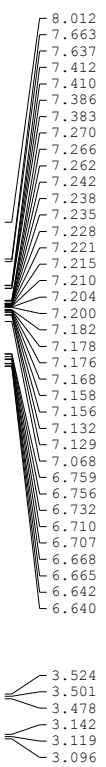
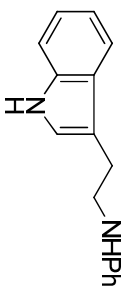


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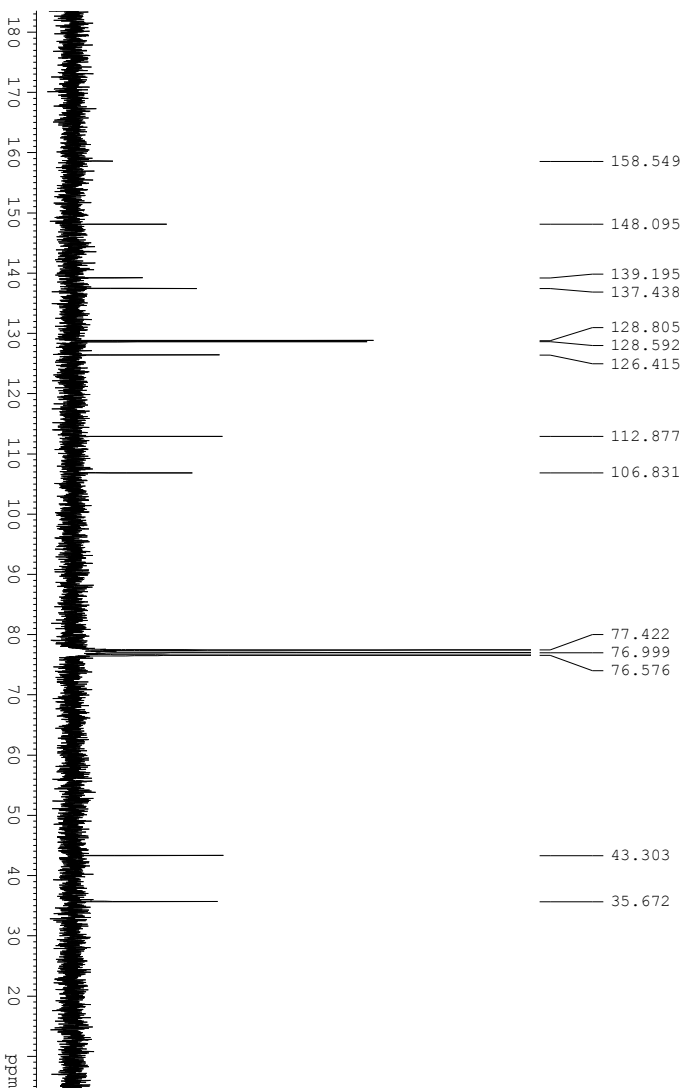
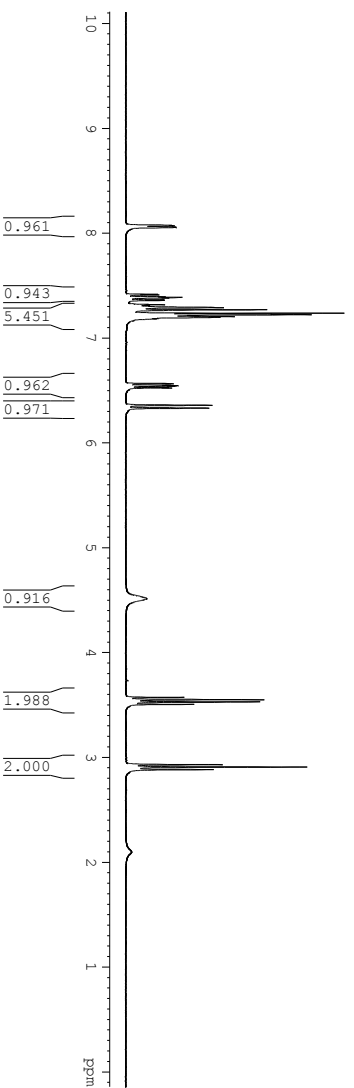
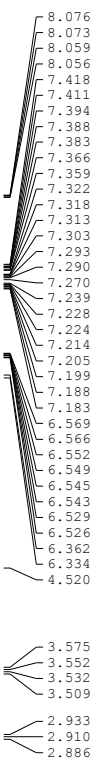
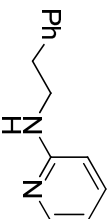


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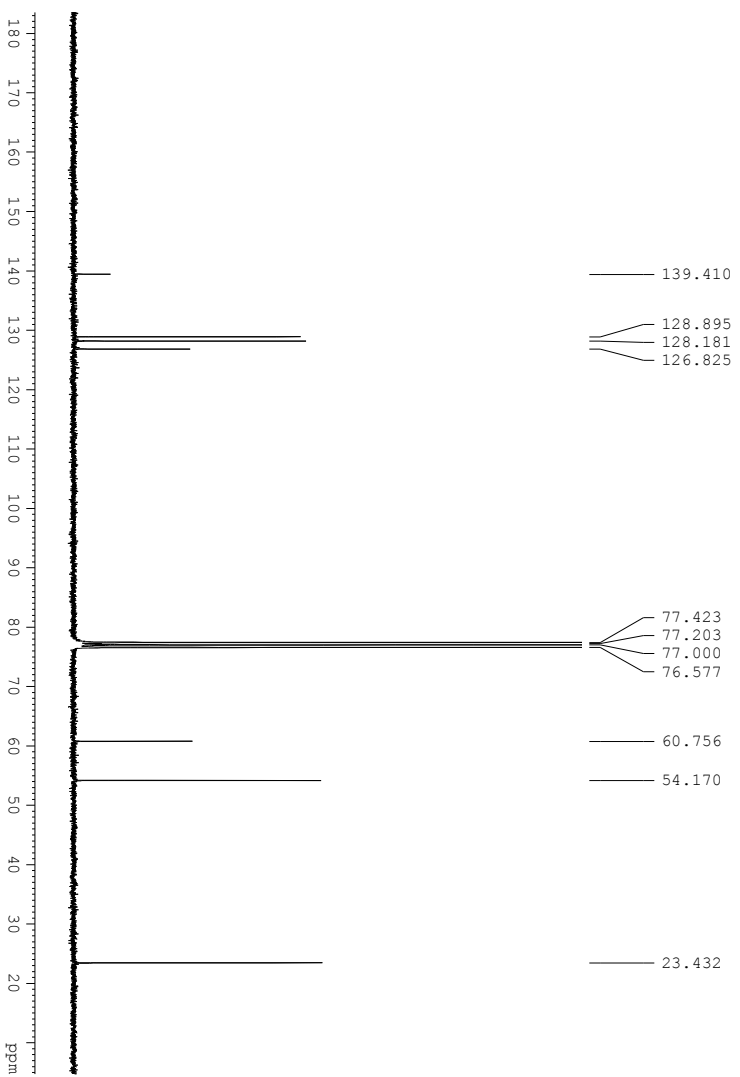
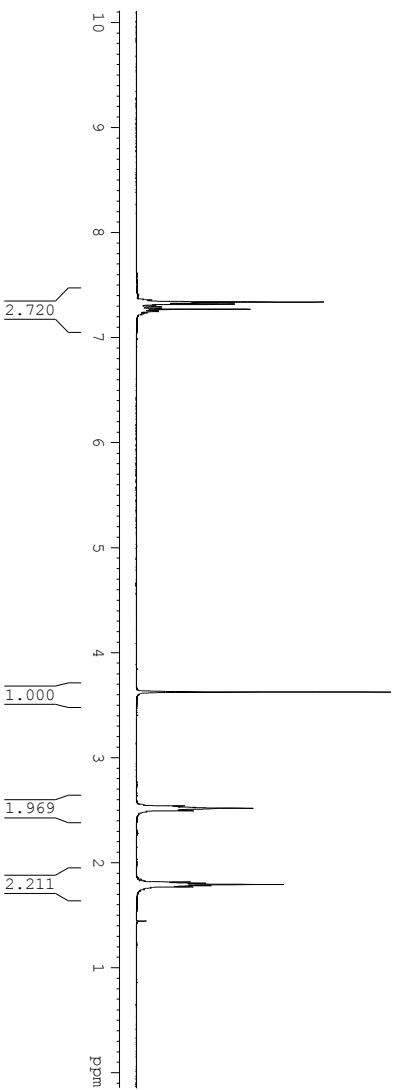
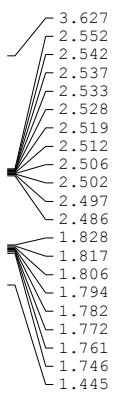
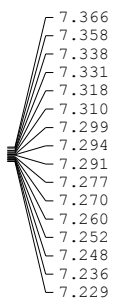
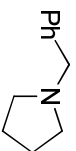


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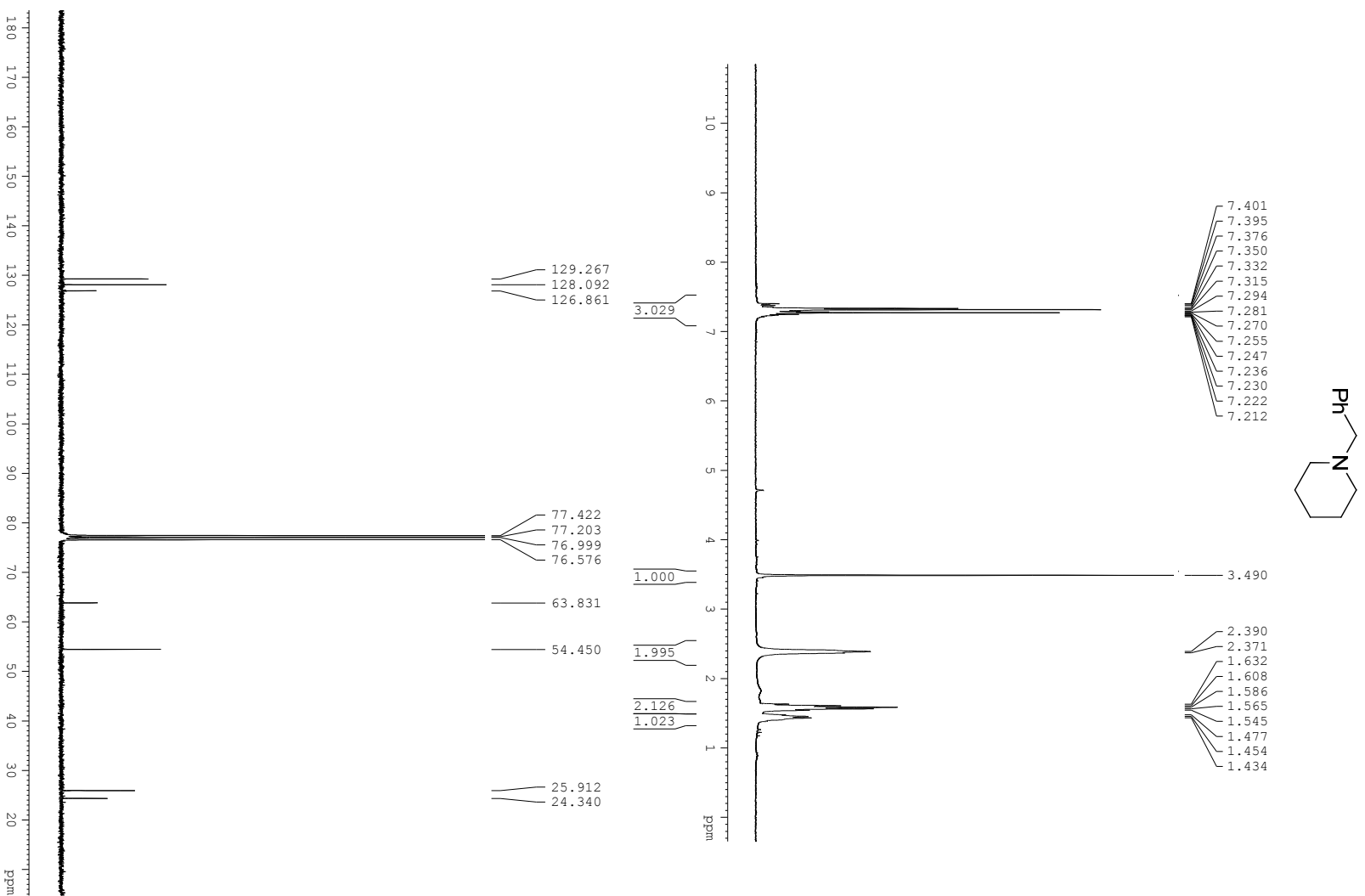


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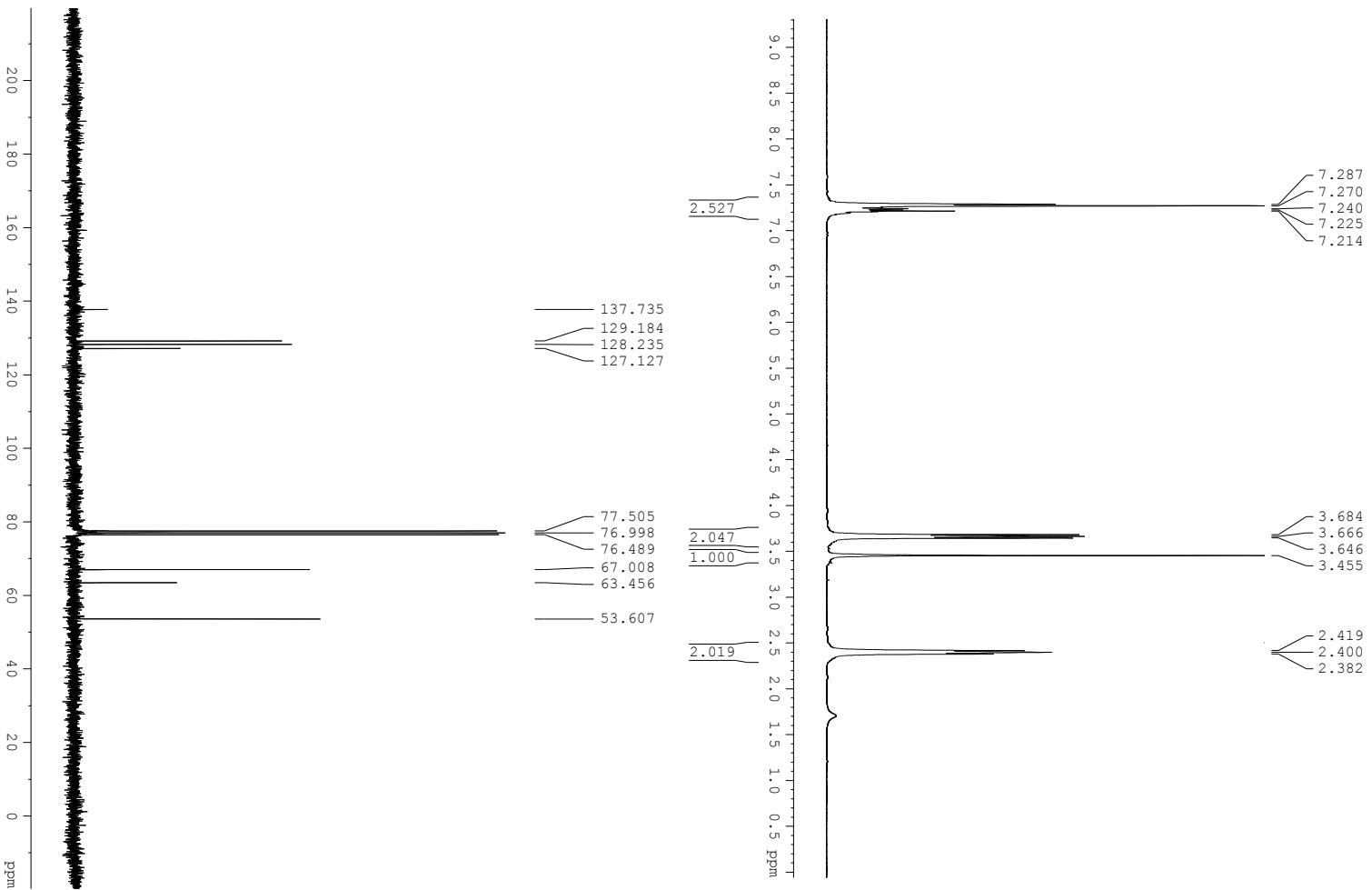
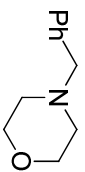


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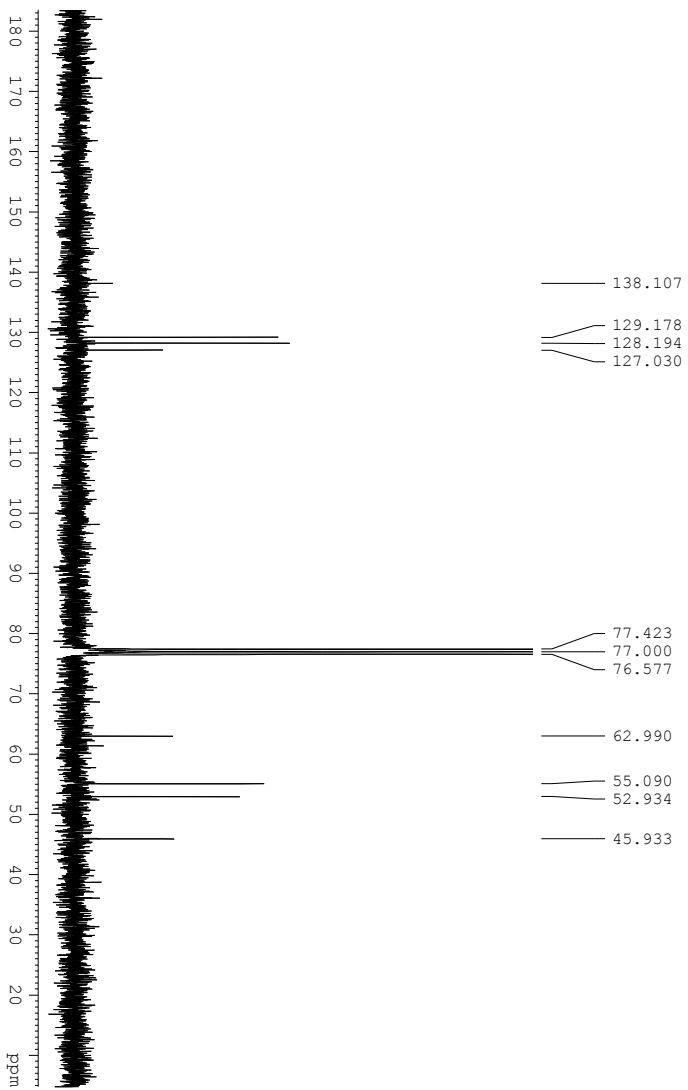
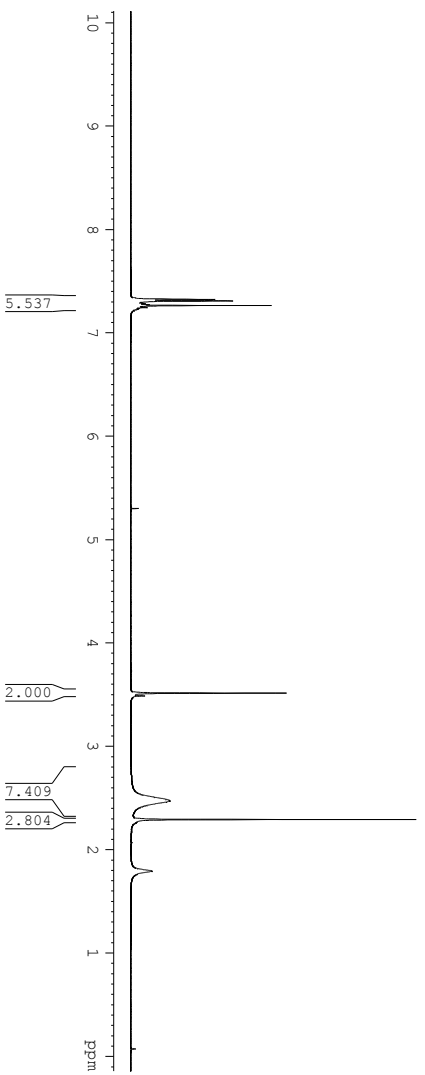
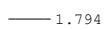
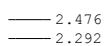
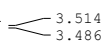
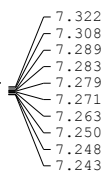
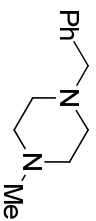


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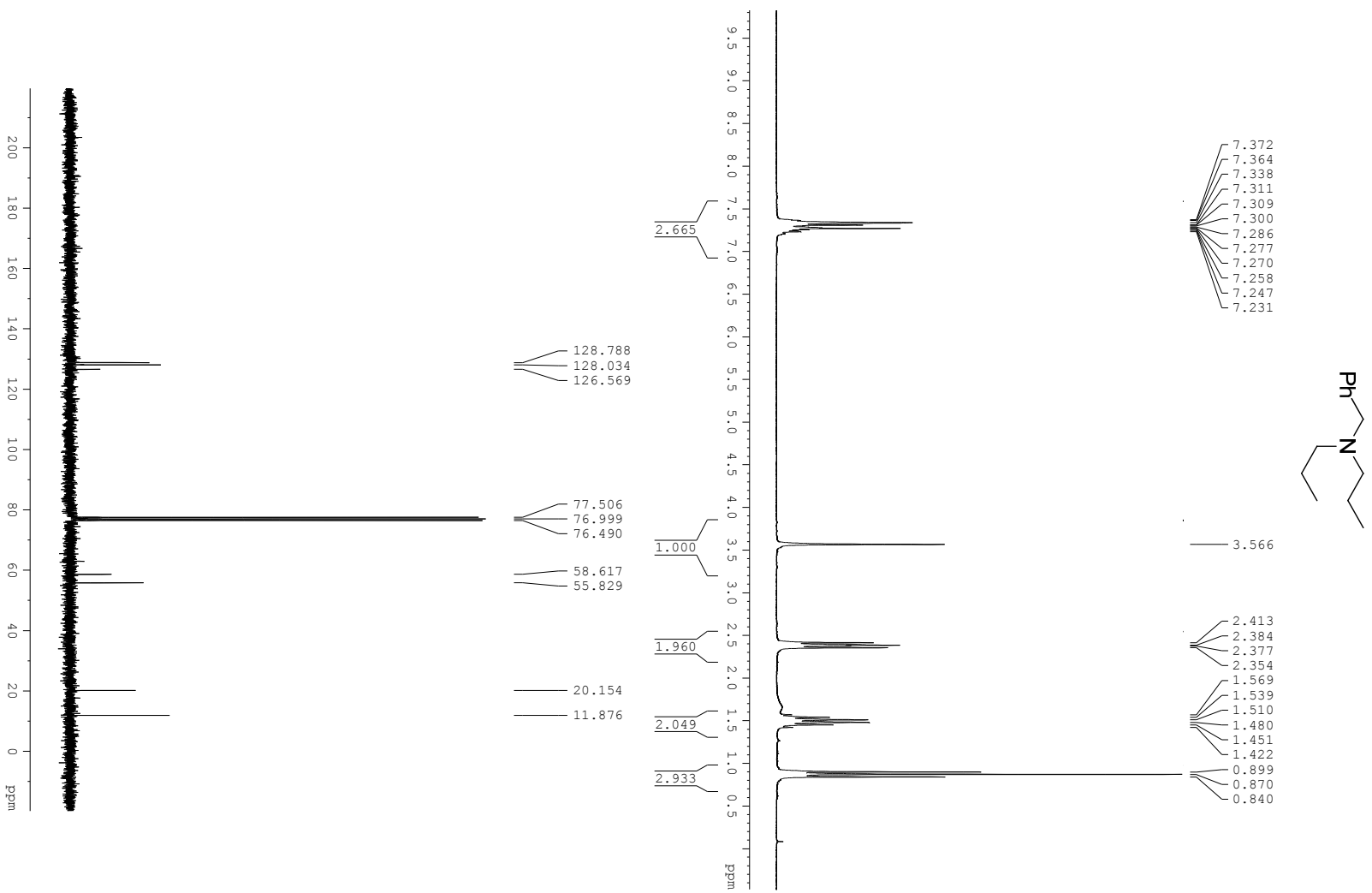


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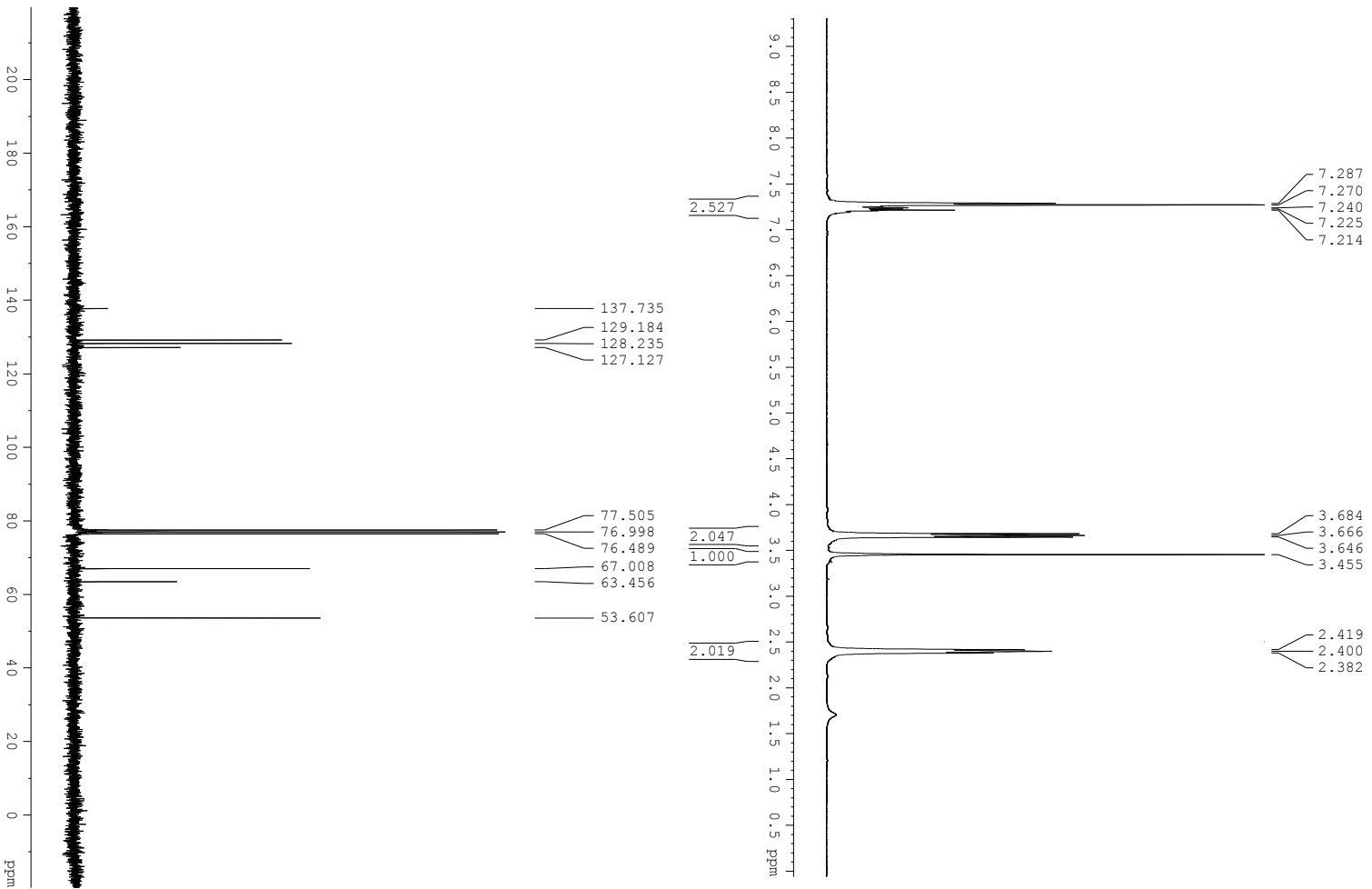
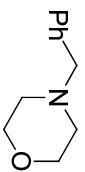


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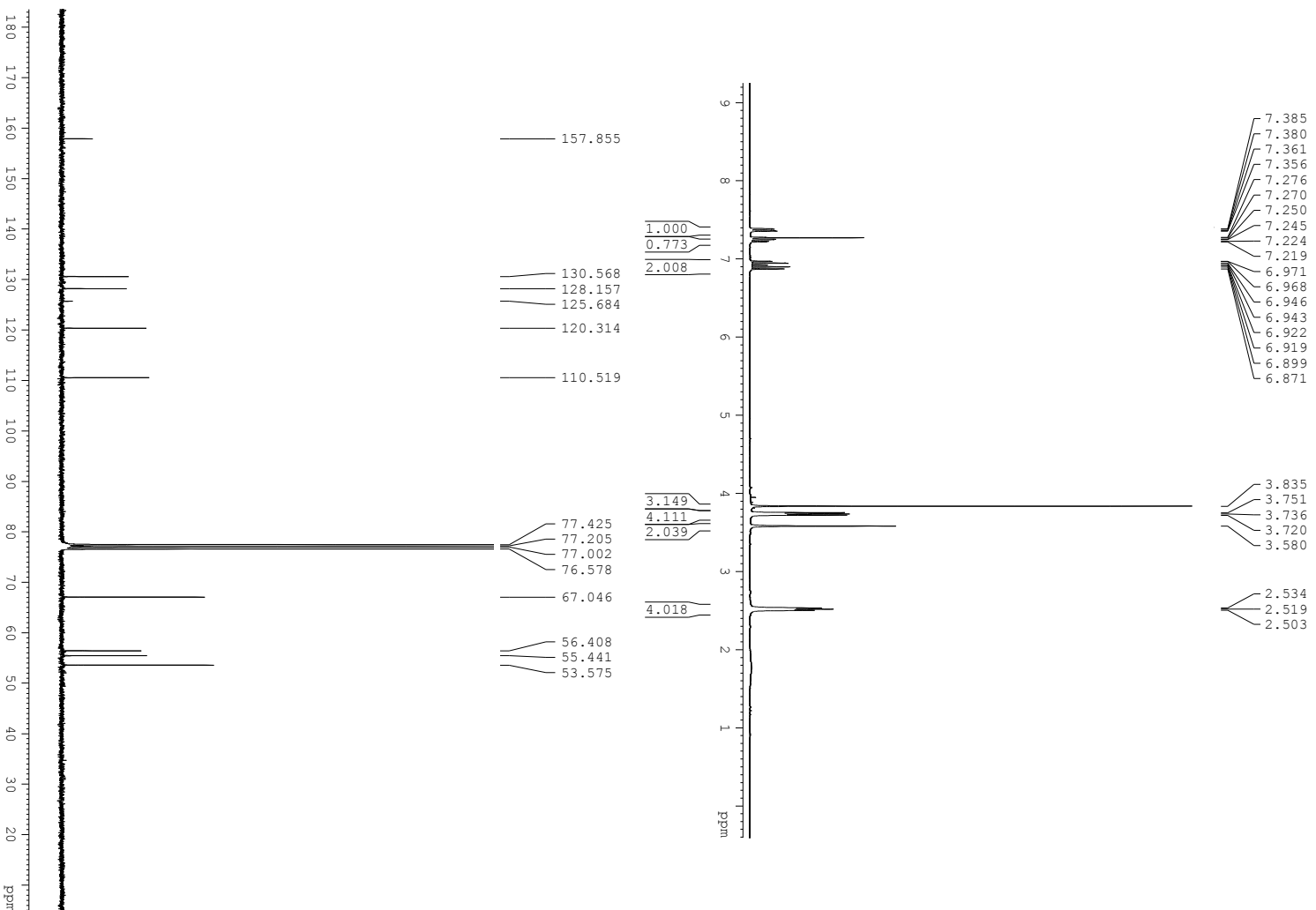
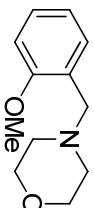


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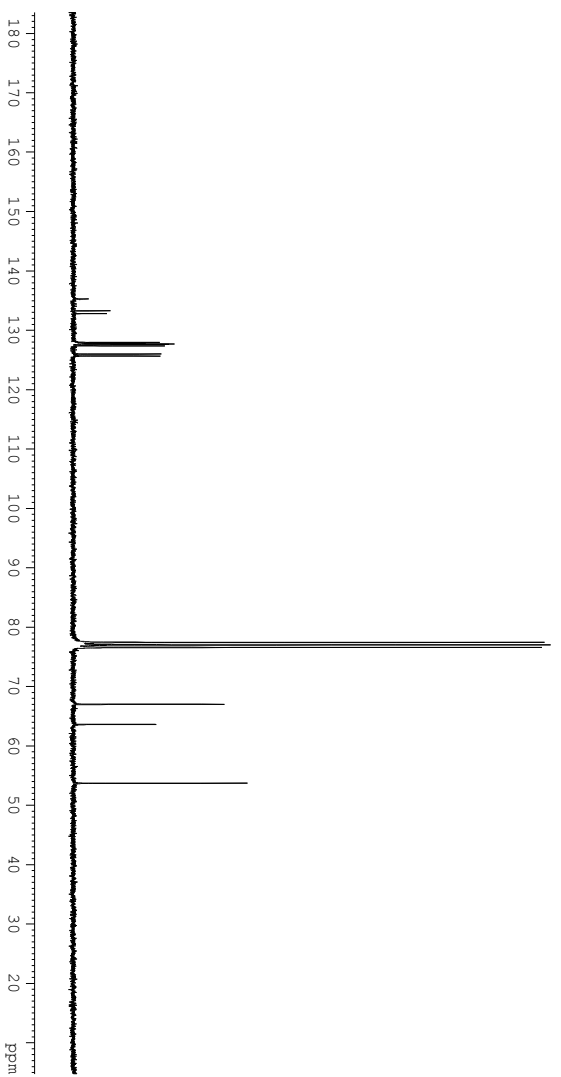
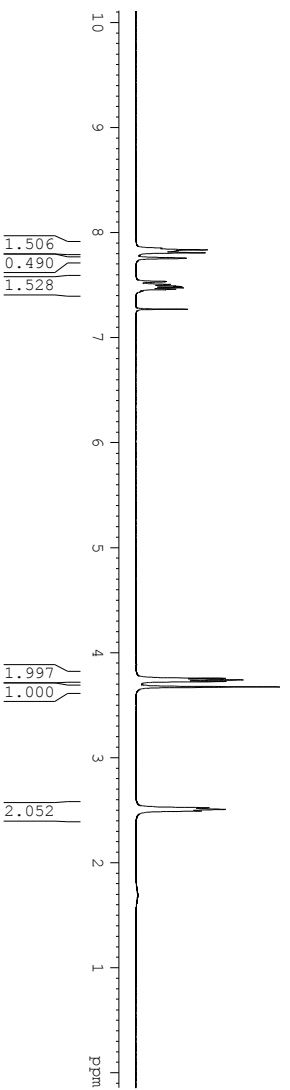
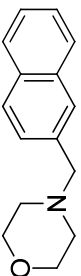


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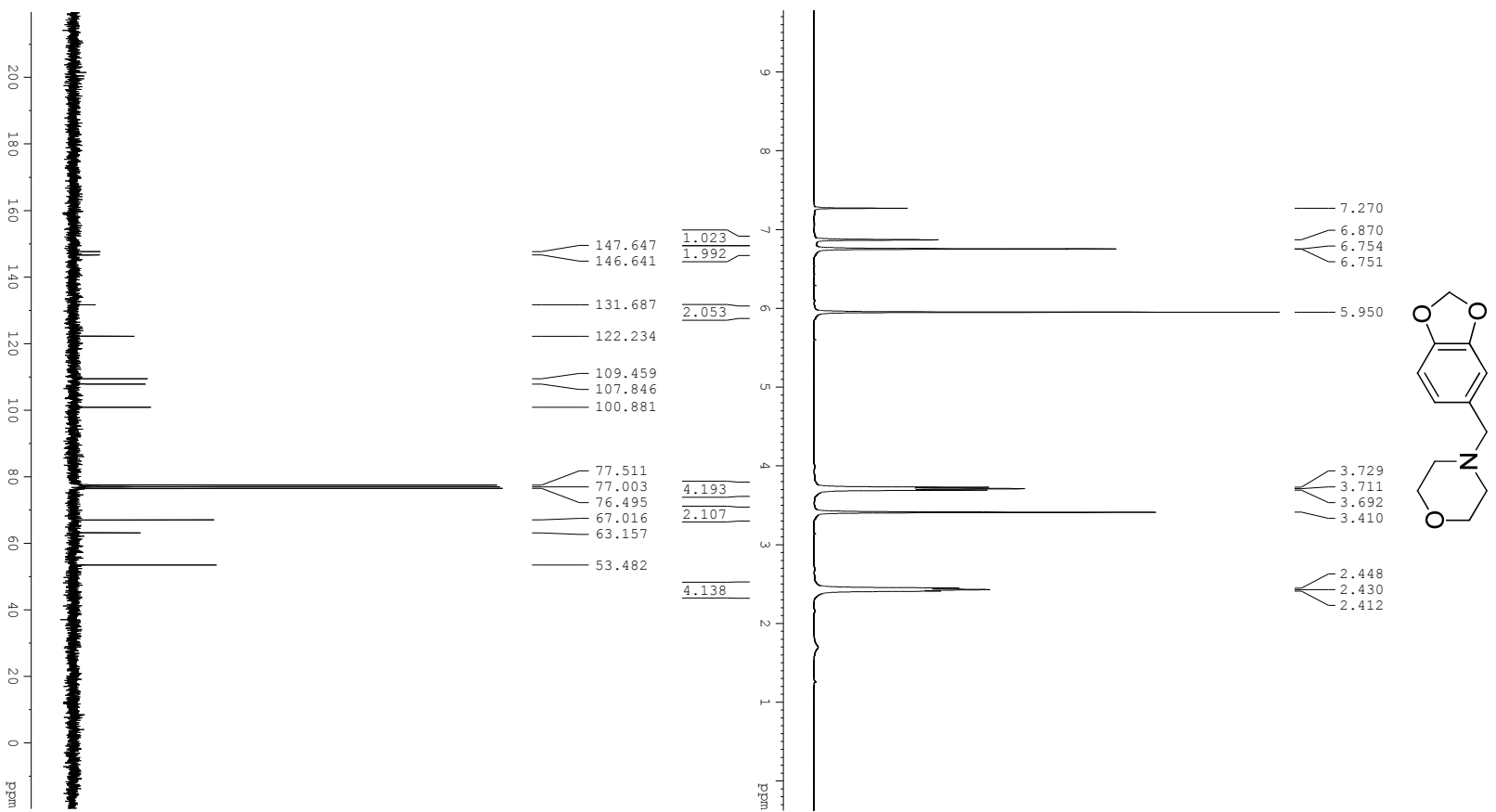


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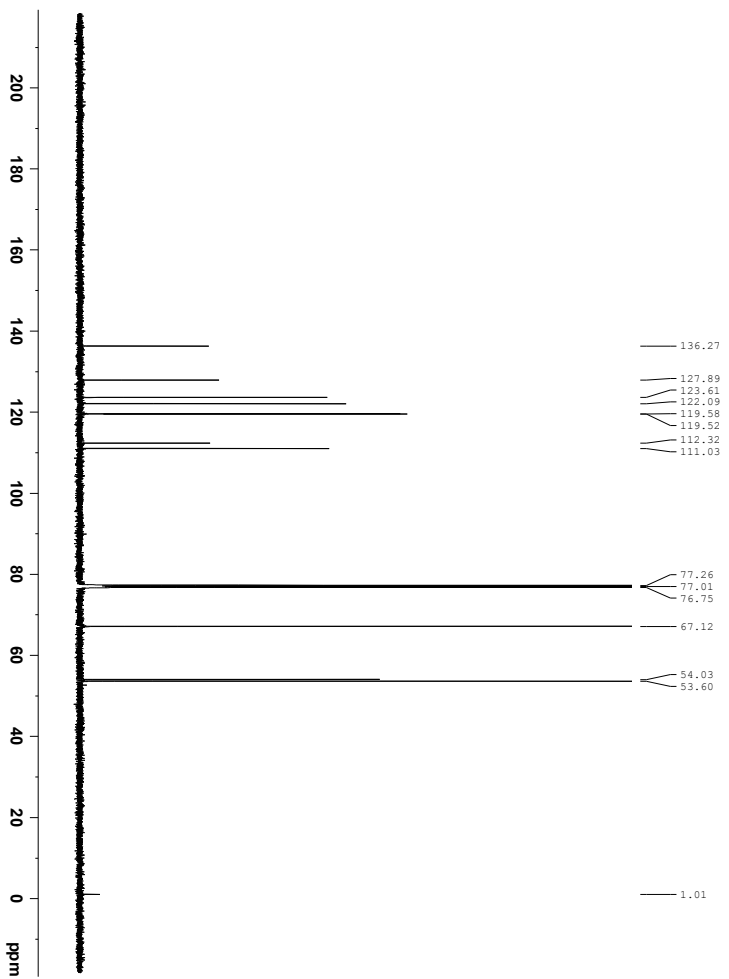
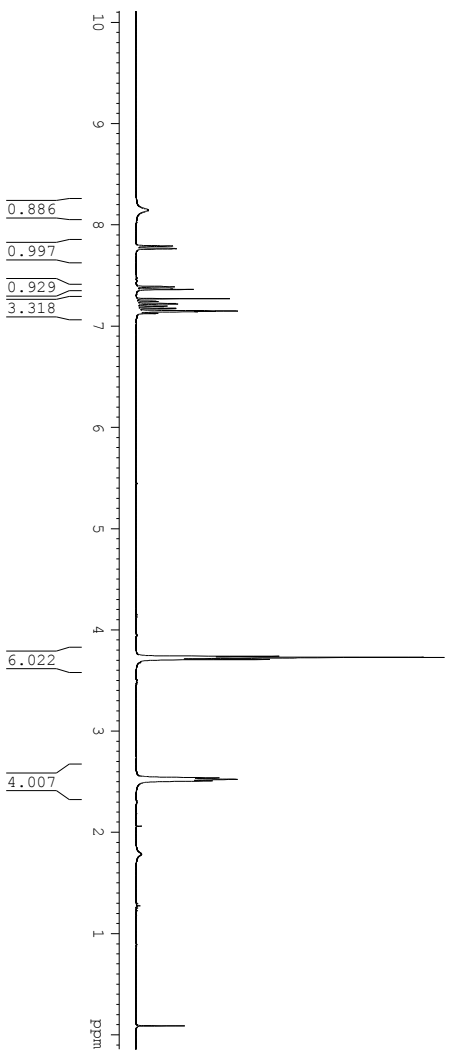
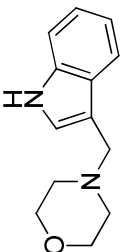


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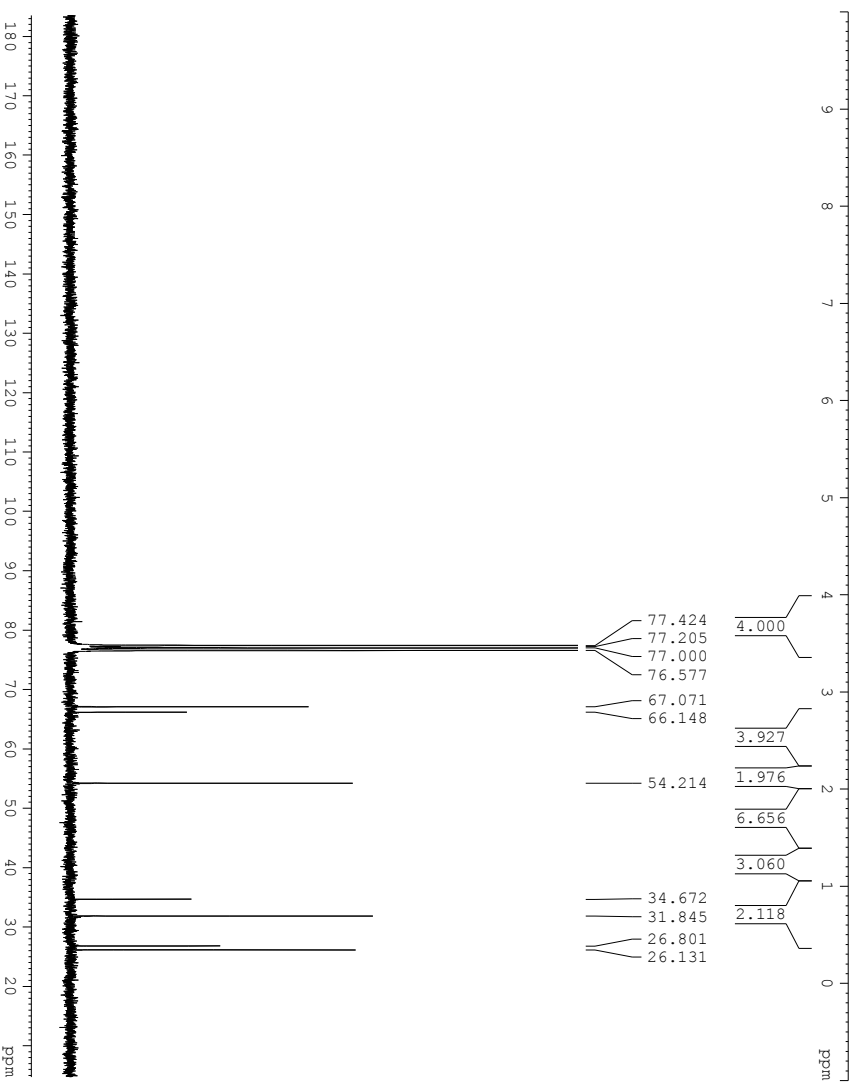
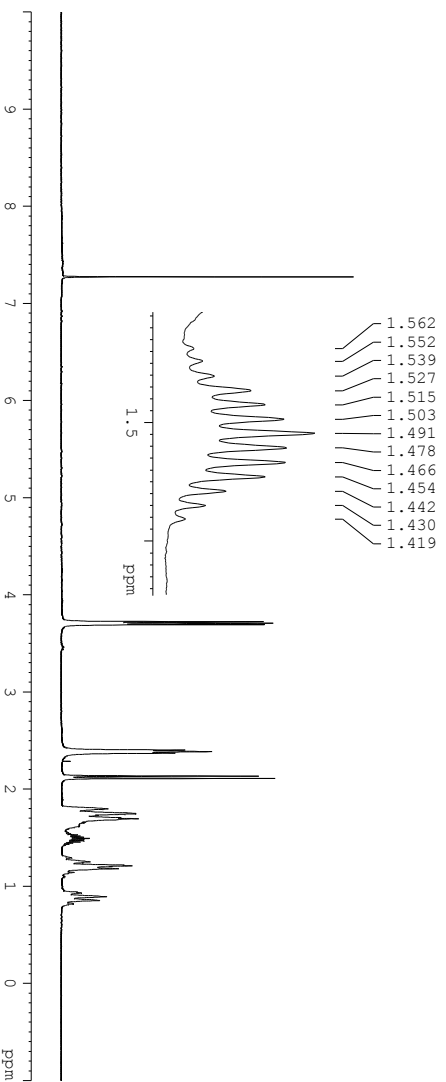
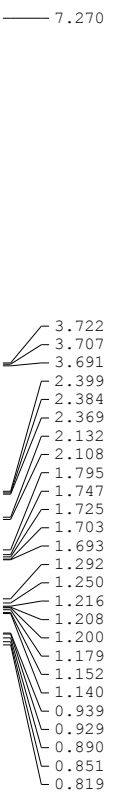
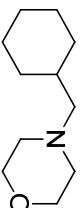


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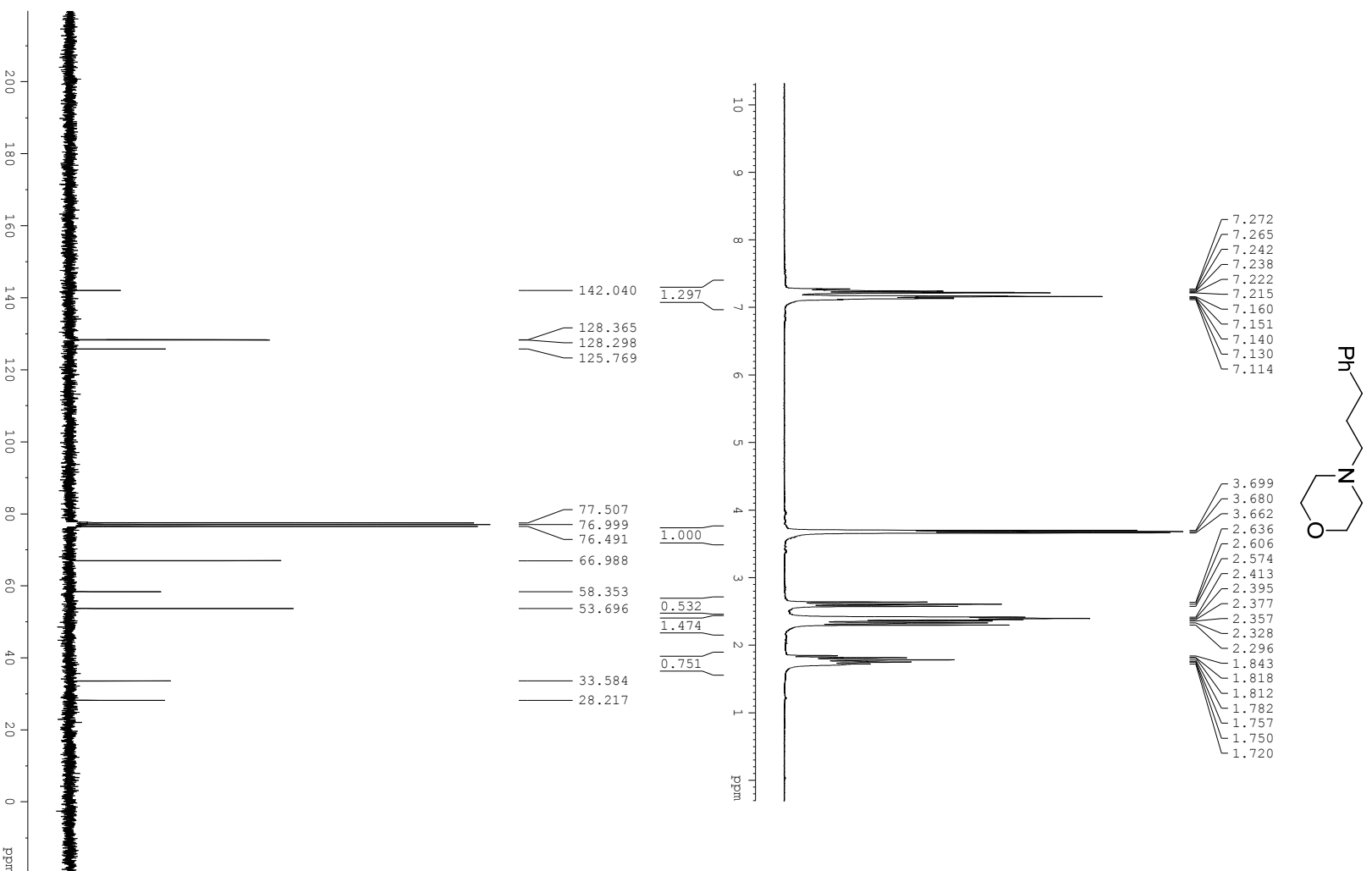


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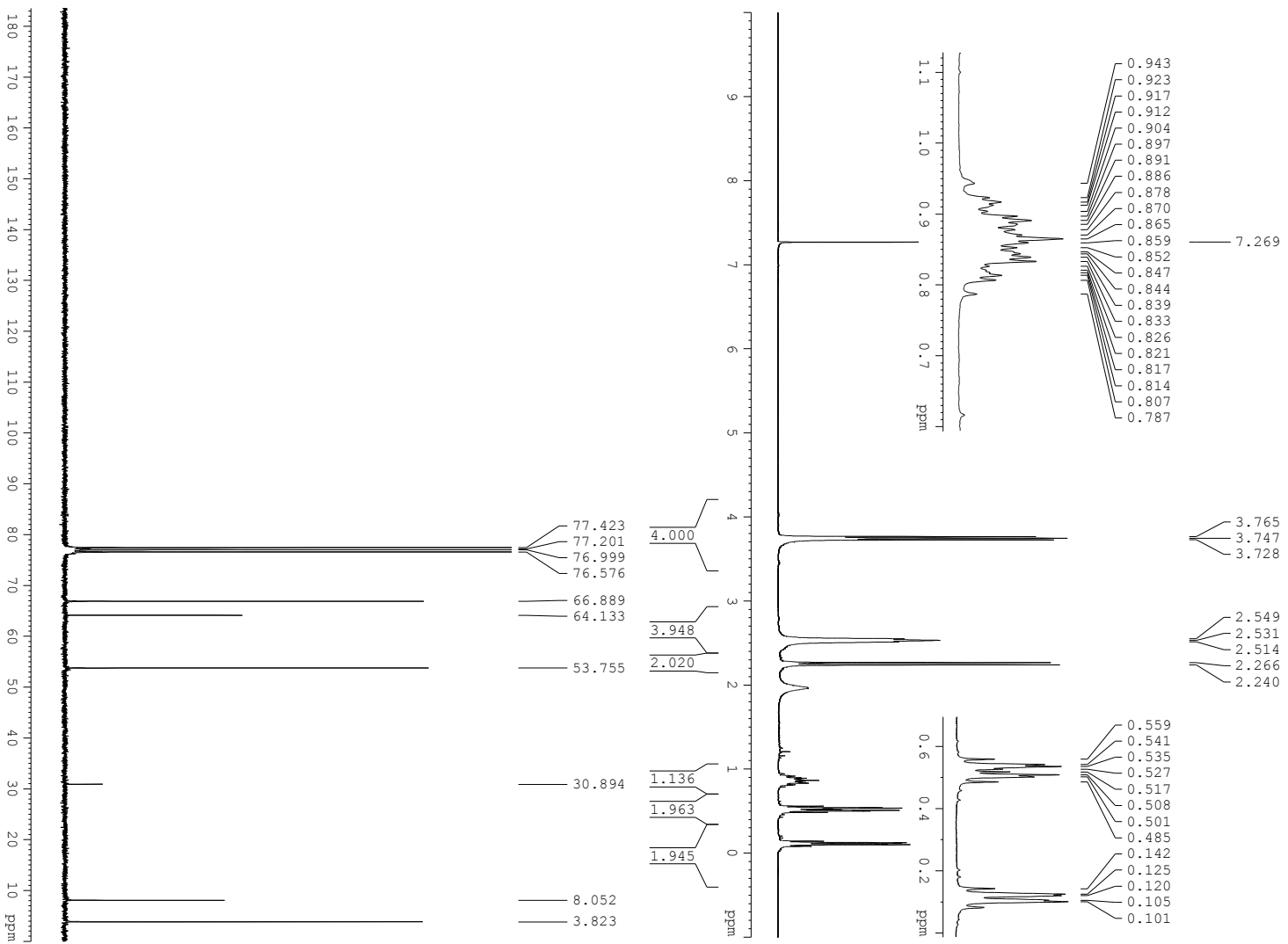
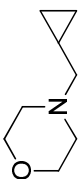


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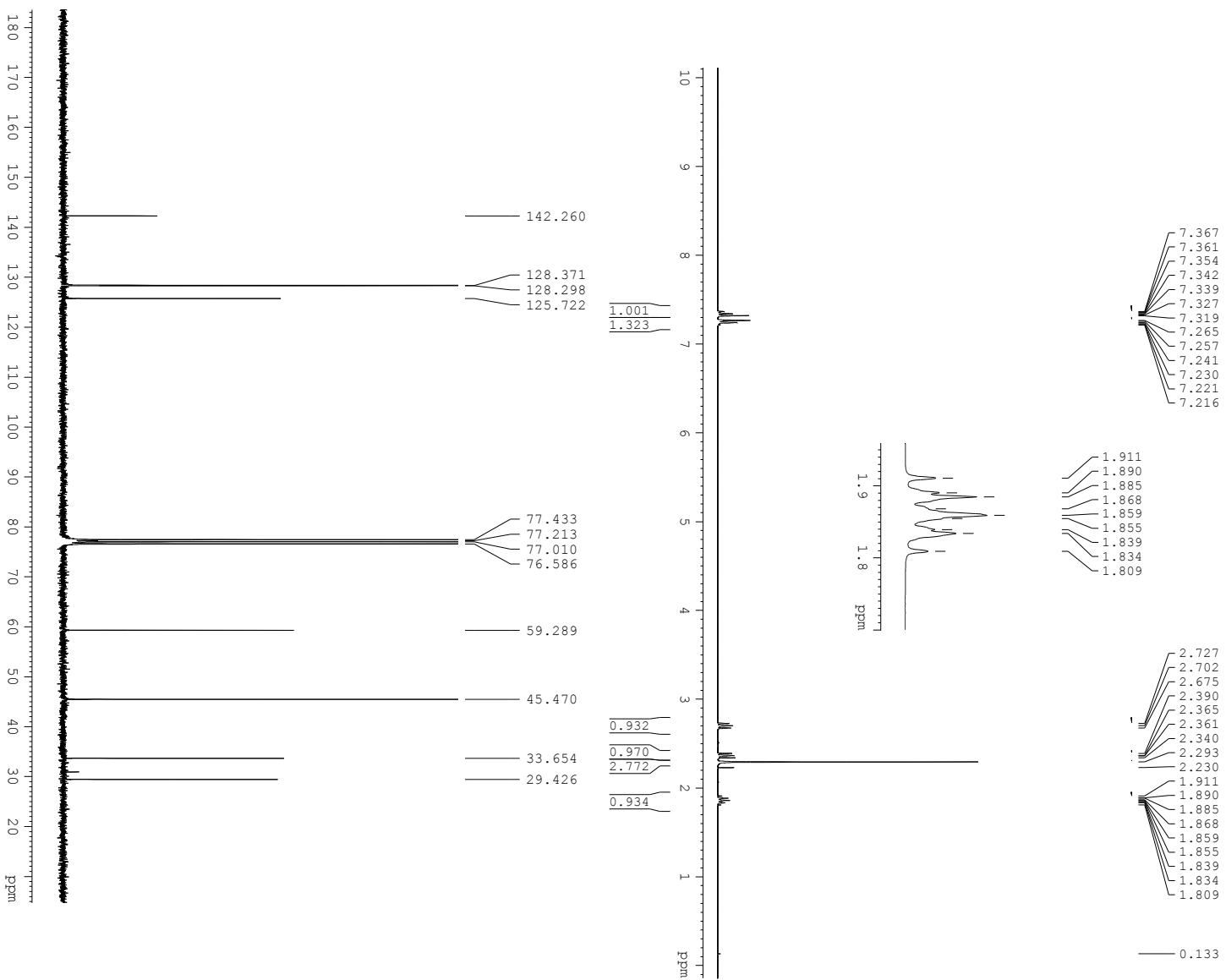


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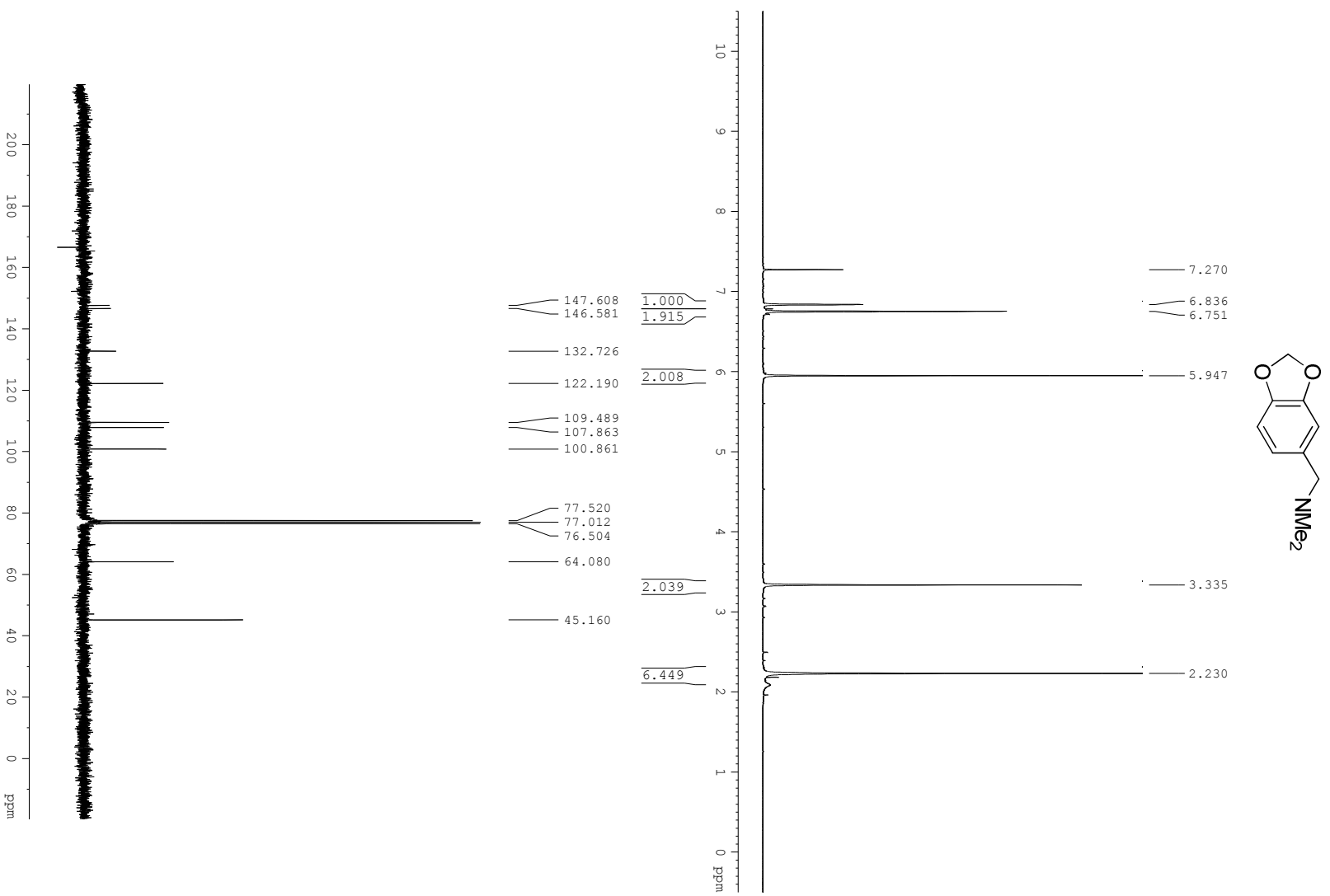


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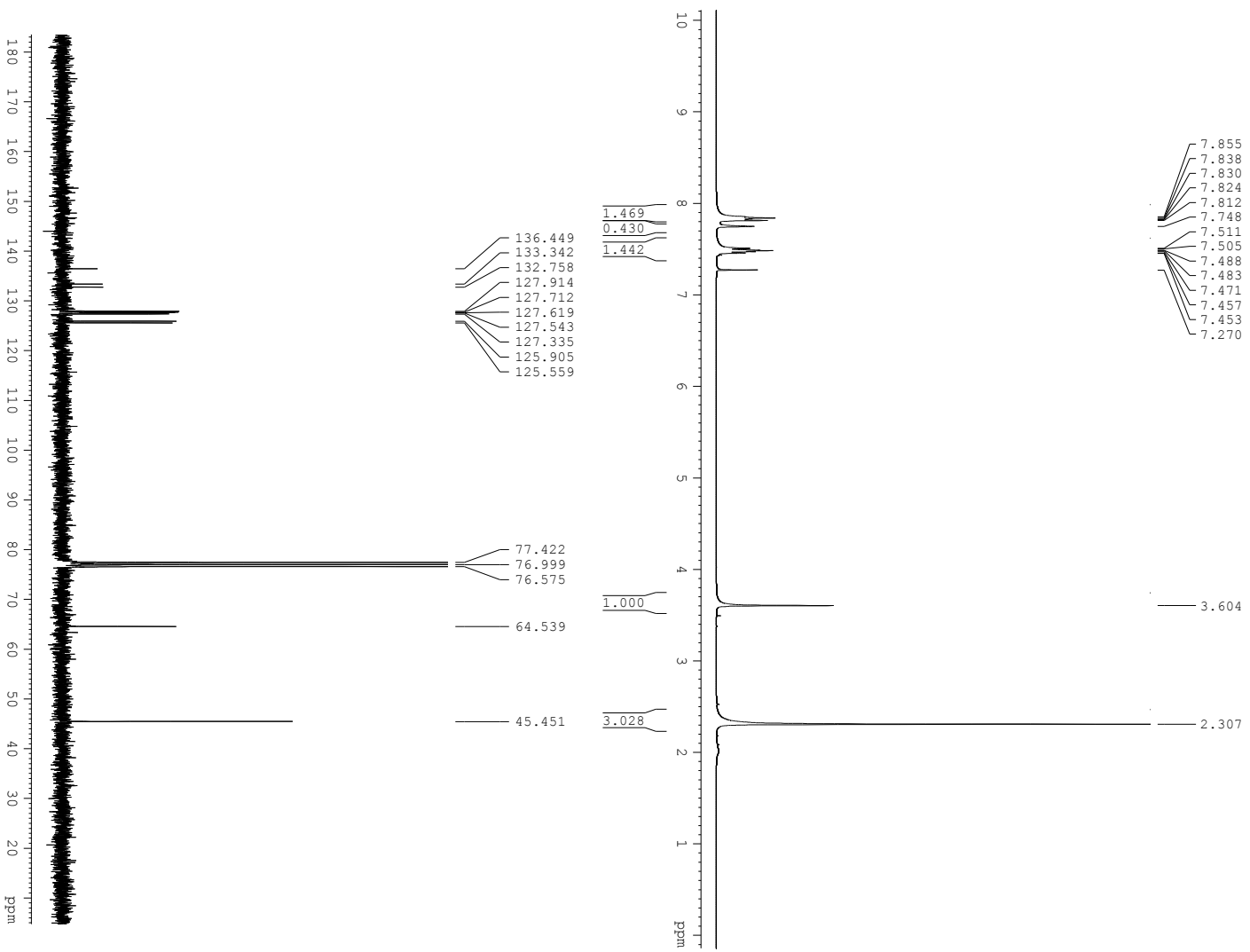
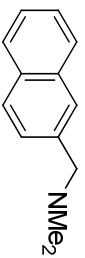


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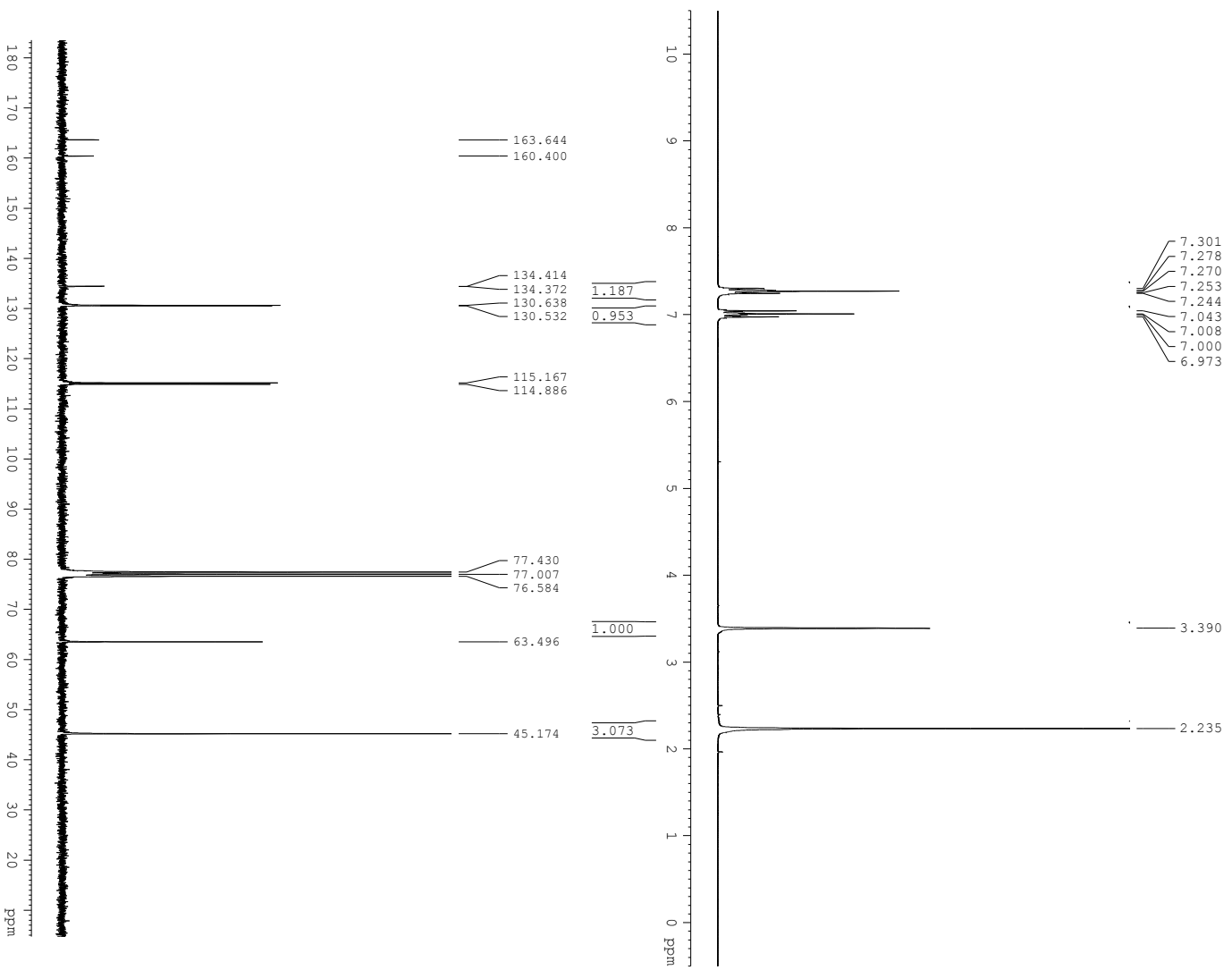
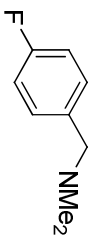


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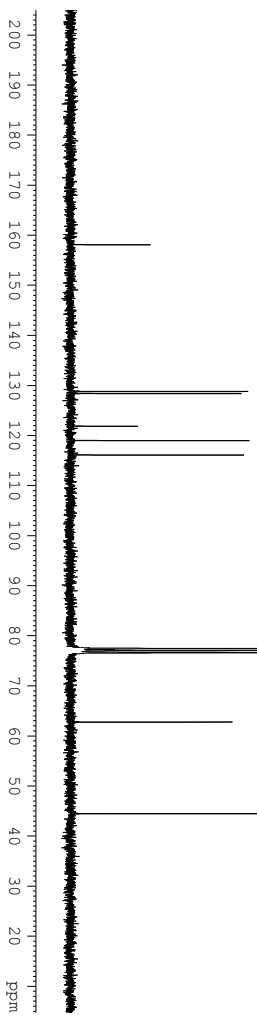
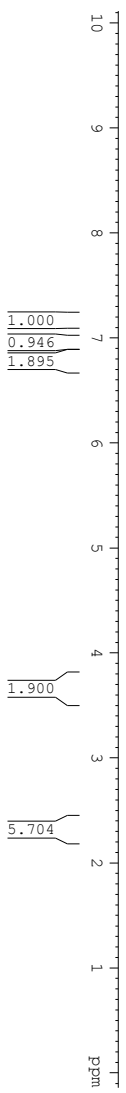
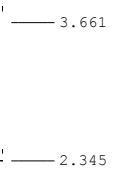
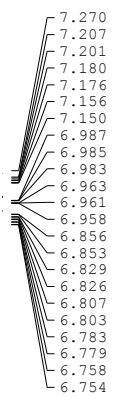
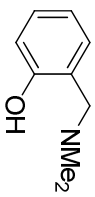


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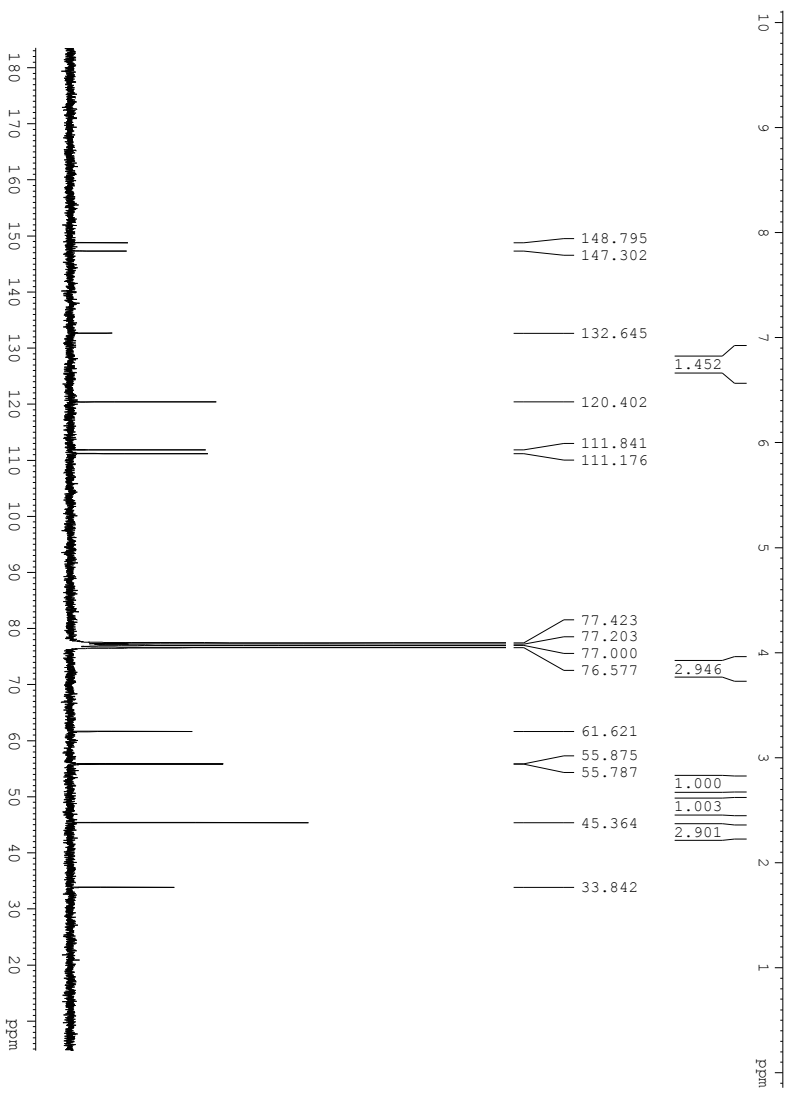
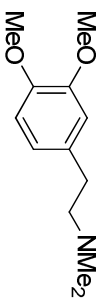


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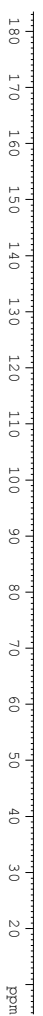
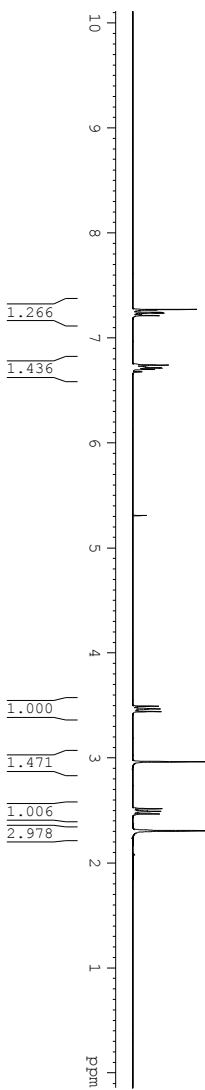
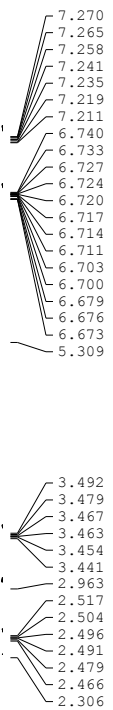
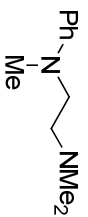


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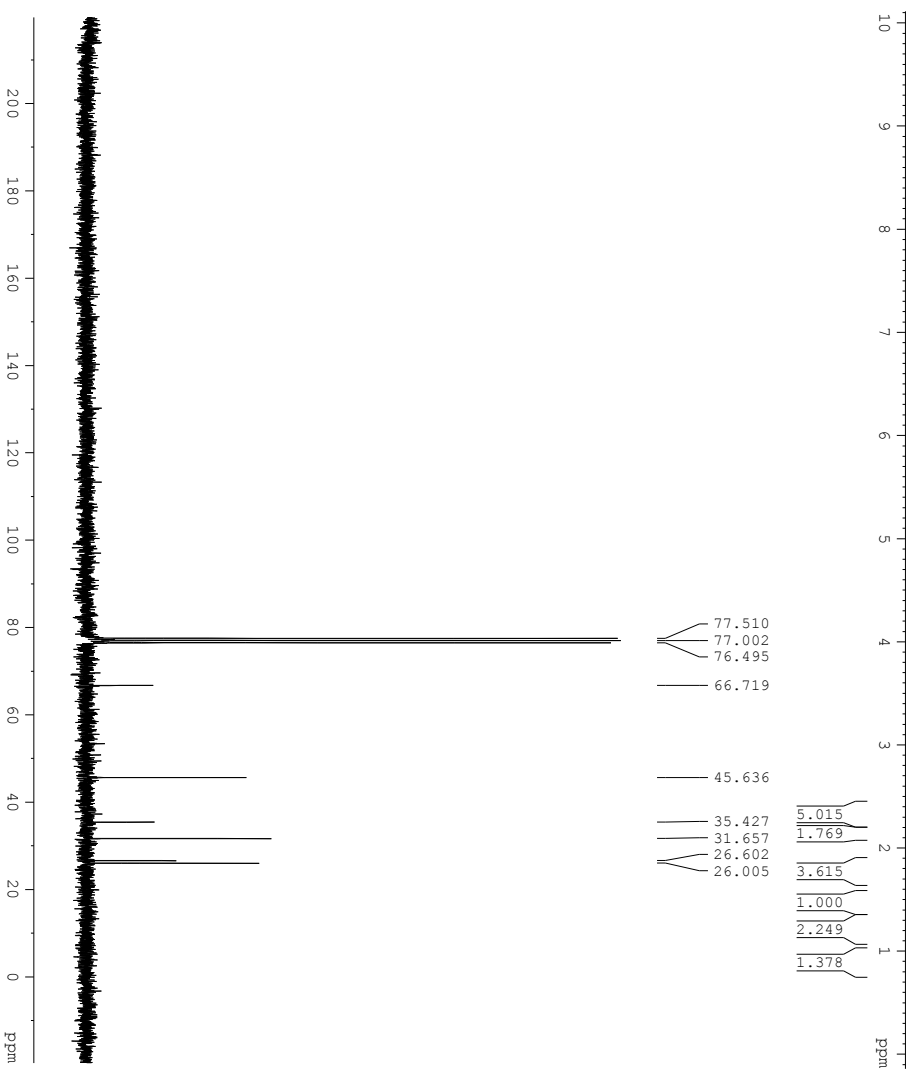
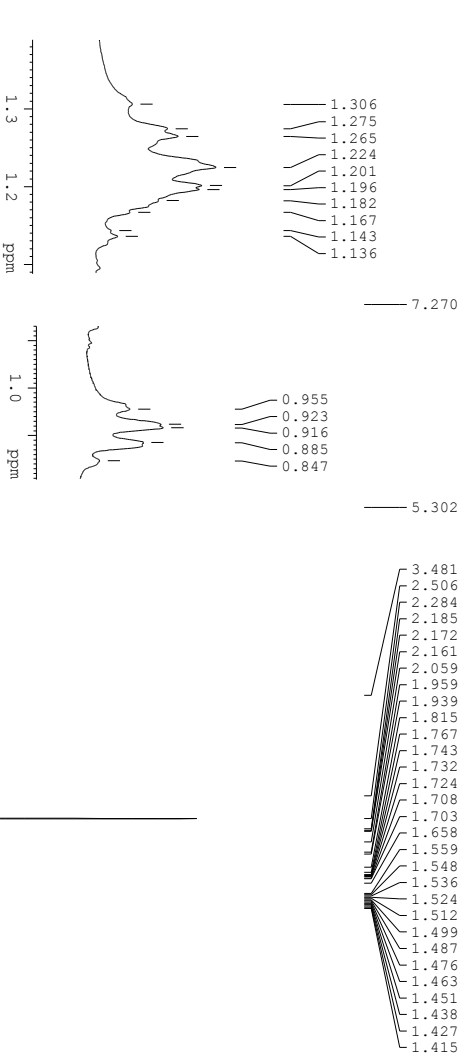
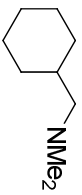


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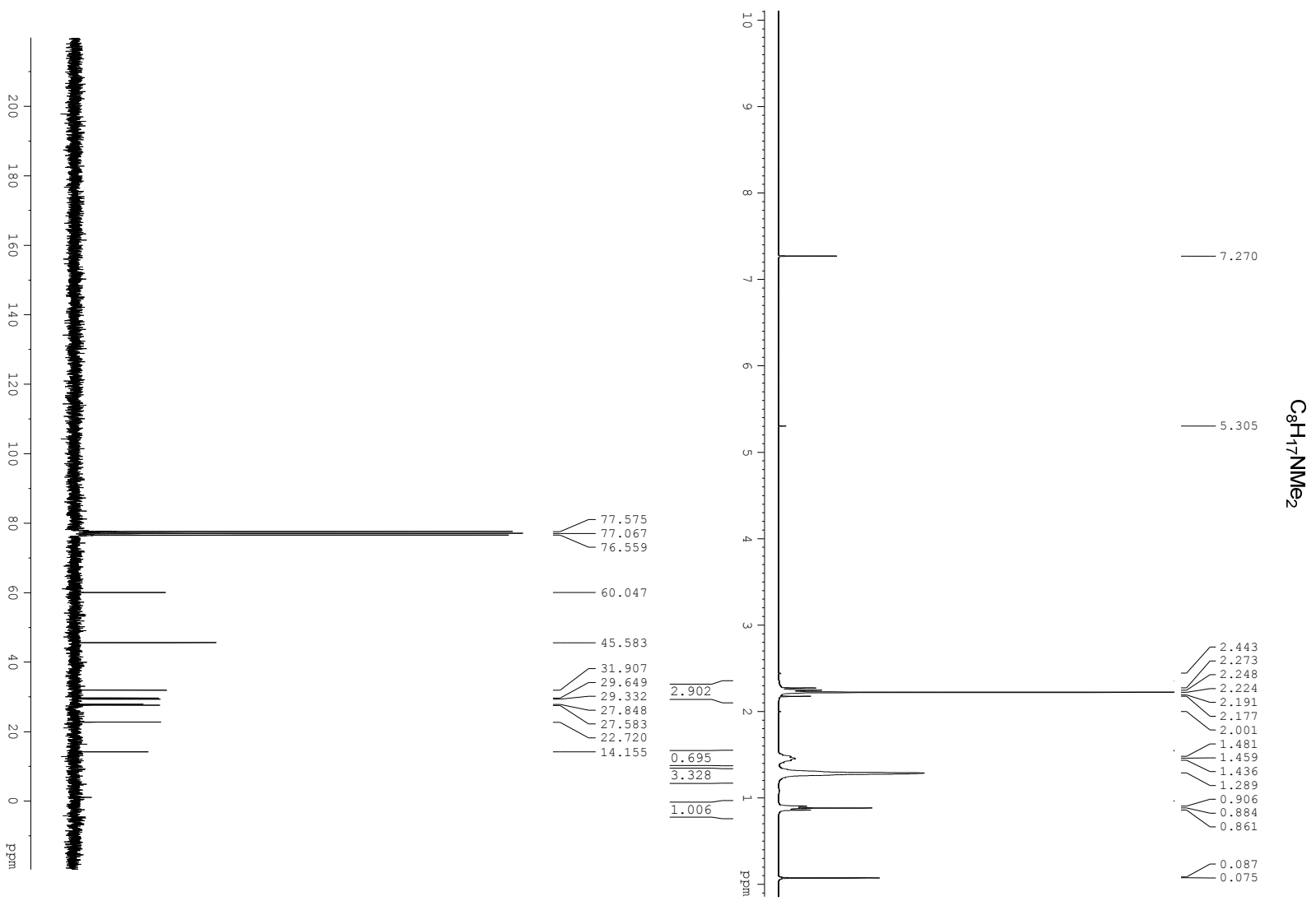
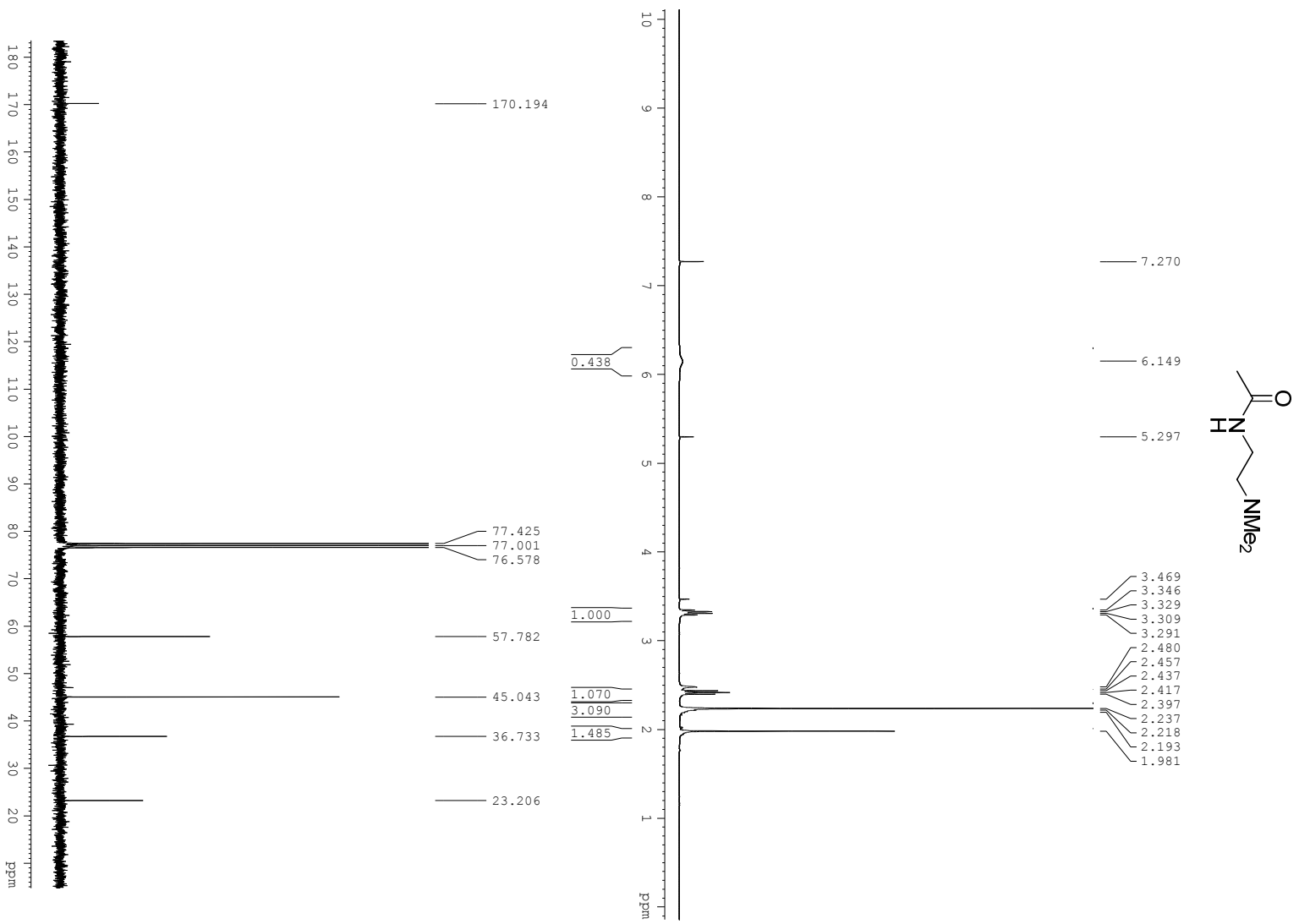
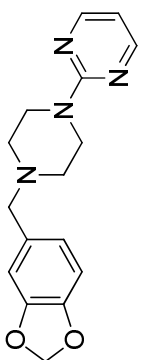


Table 4, Entry 10



Compound 11

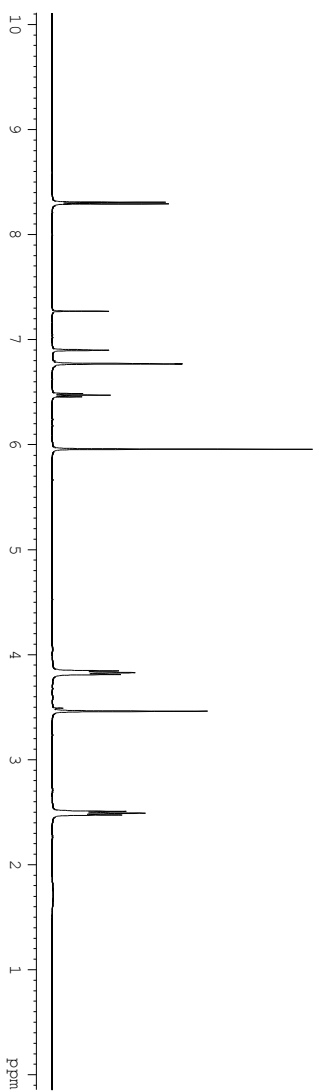


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6.899
6.770
6.768
6.486
6.470
6.455
5.957

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3.830
3.813
3.462

2.509
2.492
2.475



161.663
157.672

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131.862

122.220

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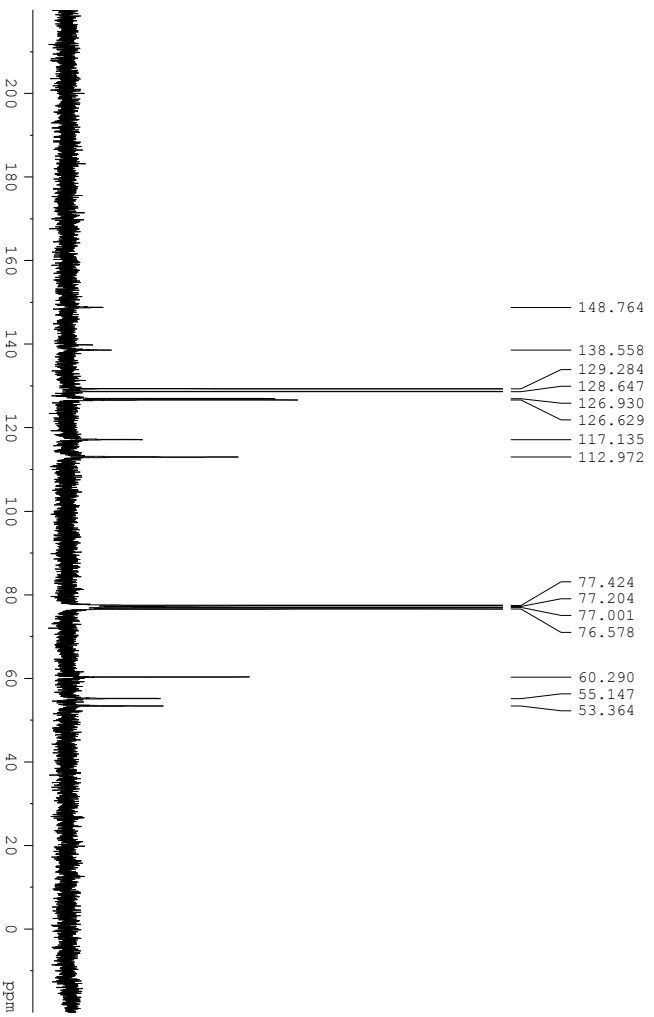
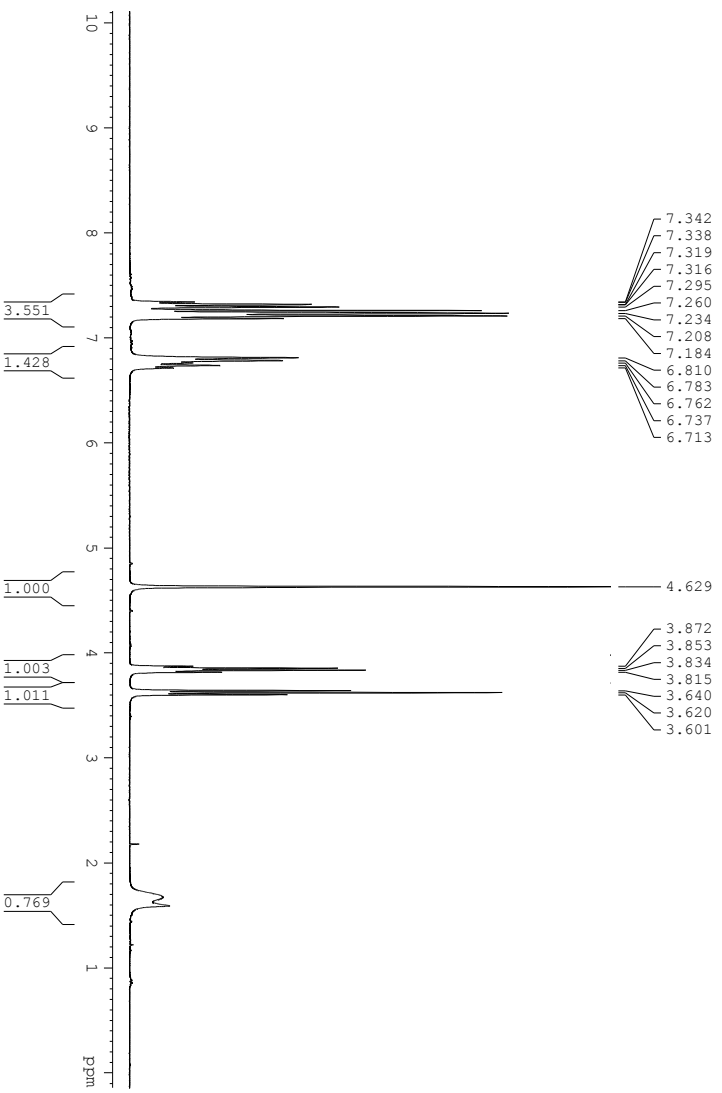
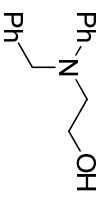
62.861

52.827

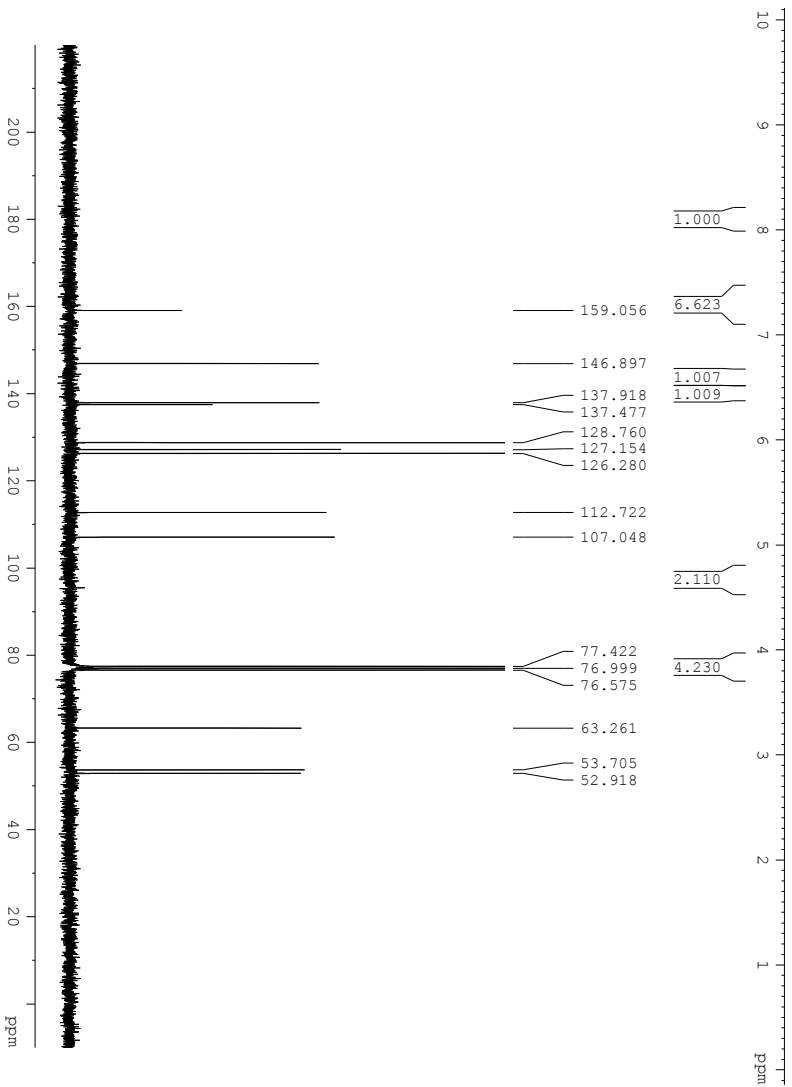
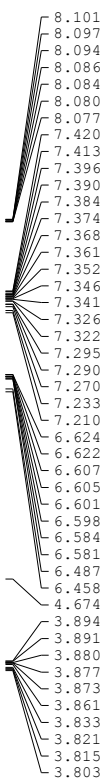
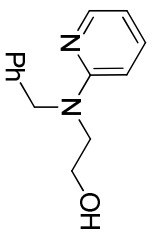
43.673



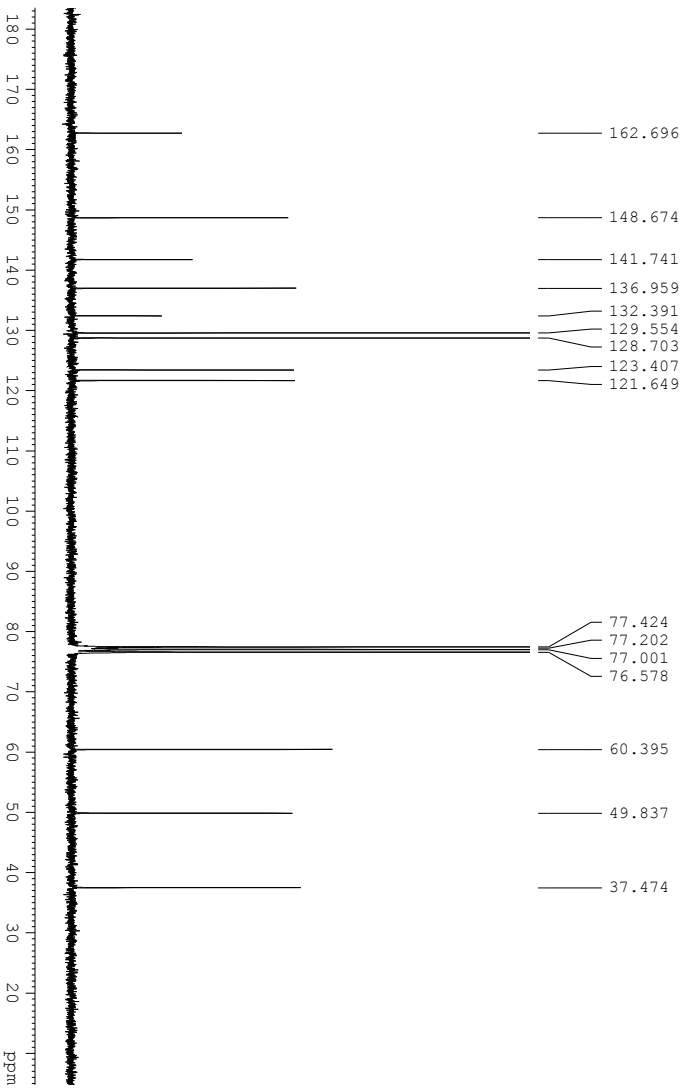
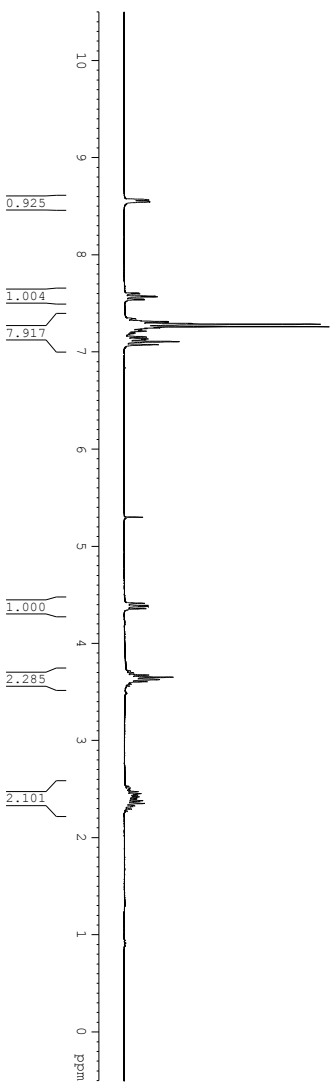
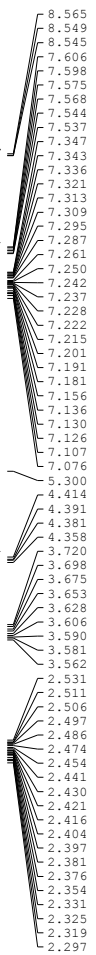
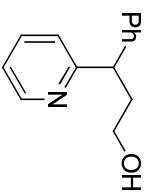
Compound 12



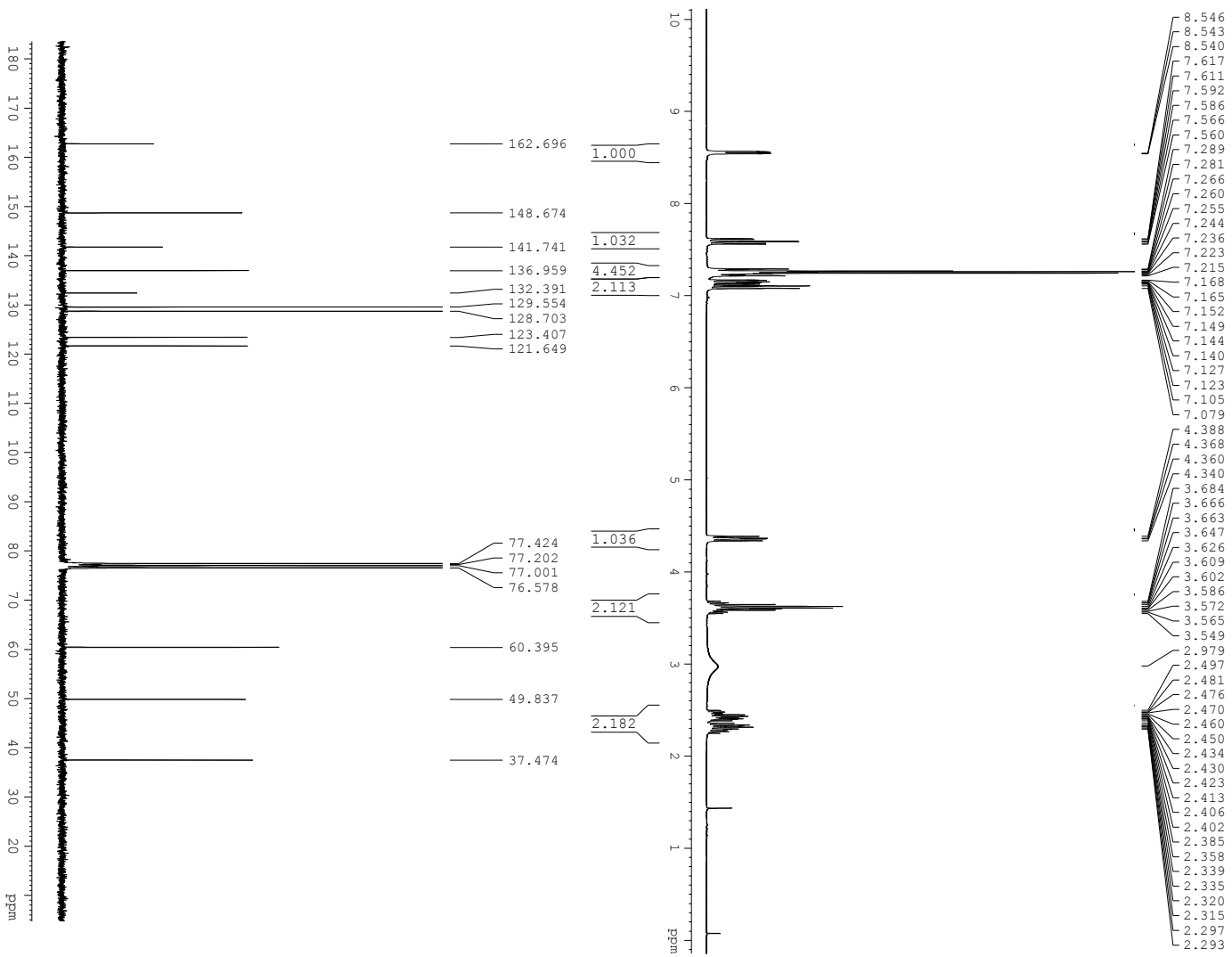
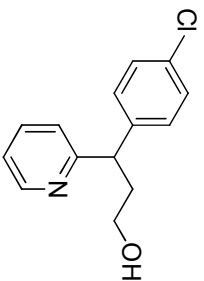
Compound 13



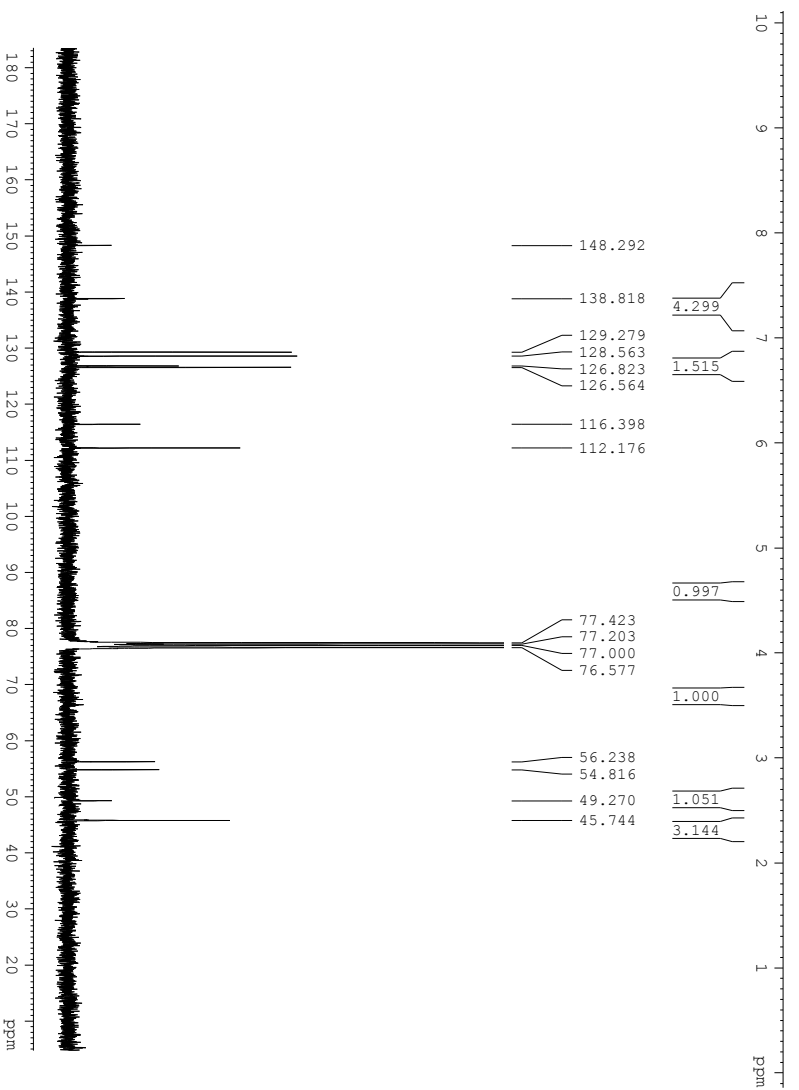
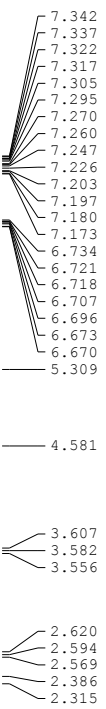
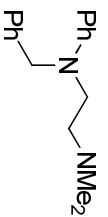
Compound 14



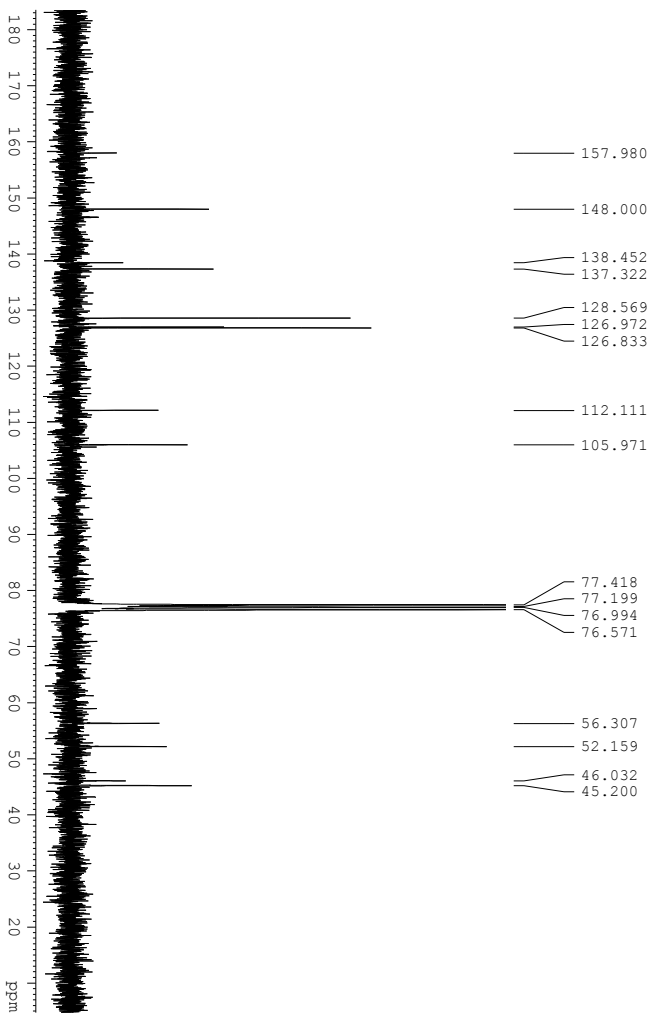
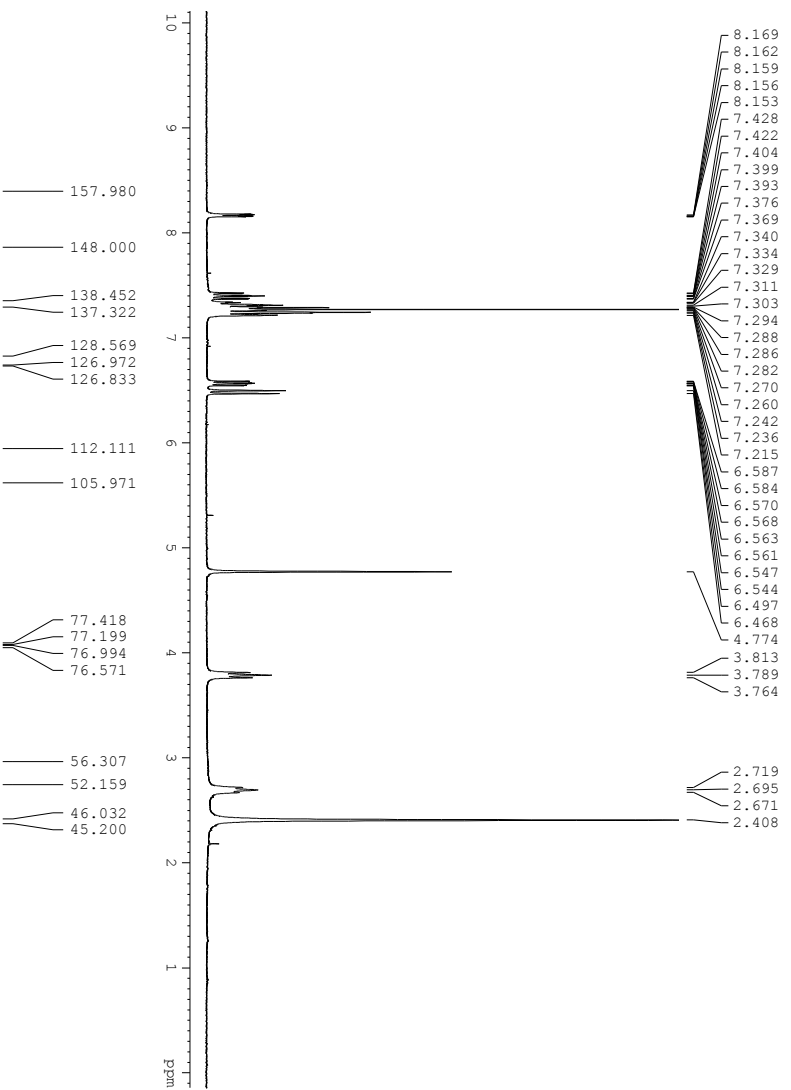
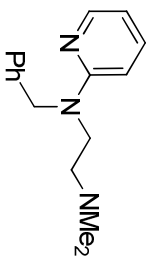
Compound 15



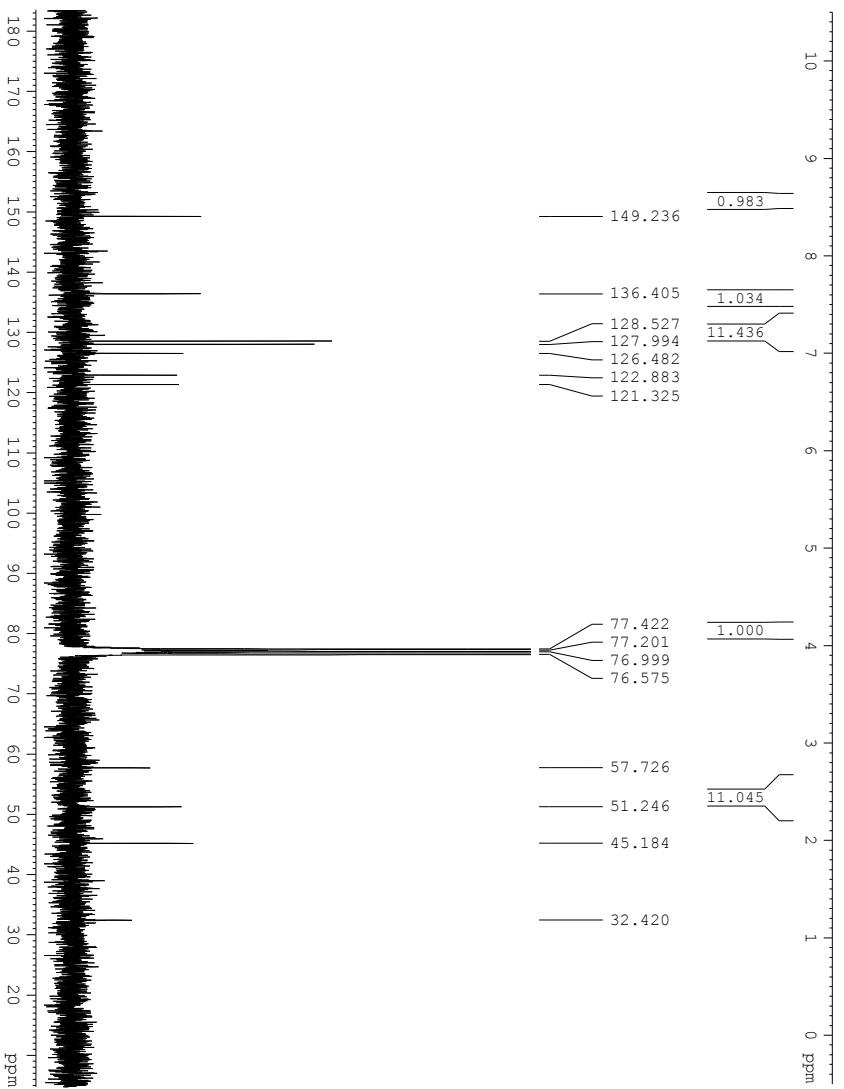
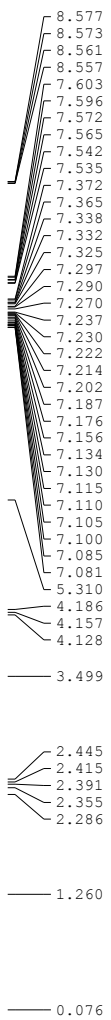
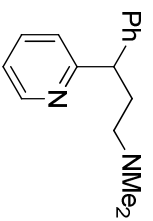
Compound 16



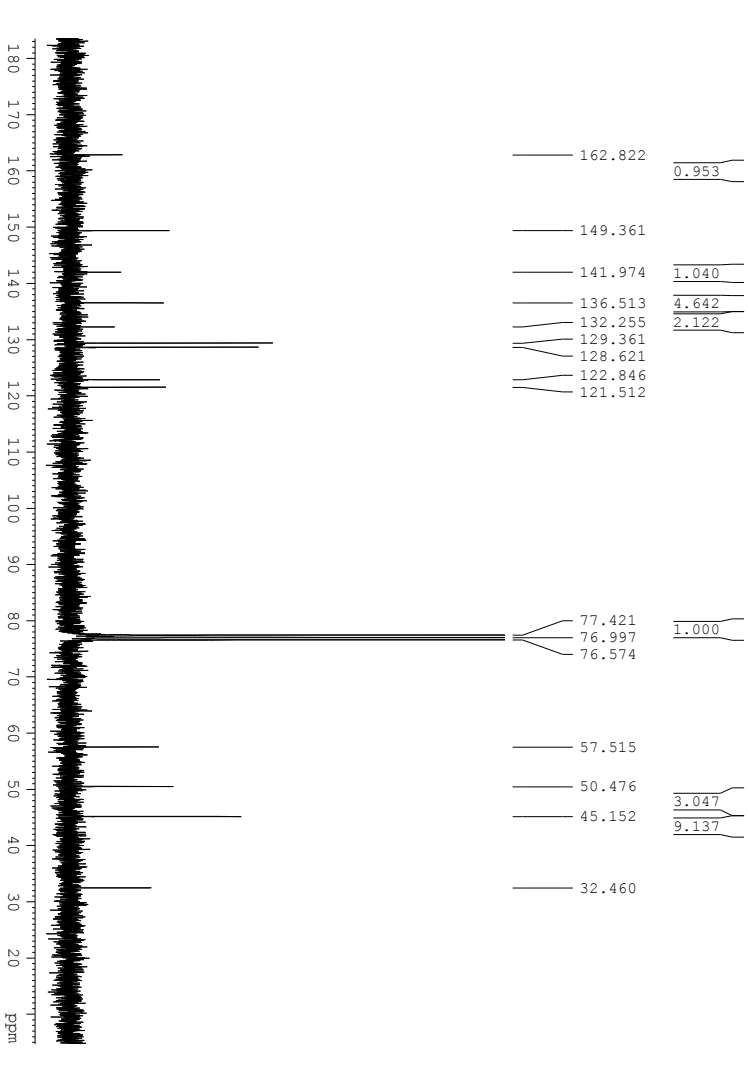
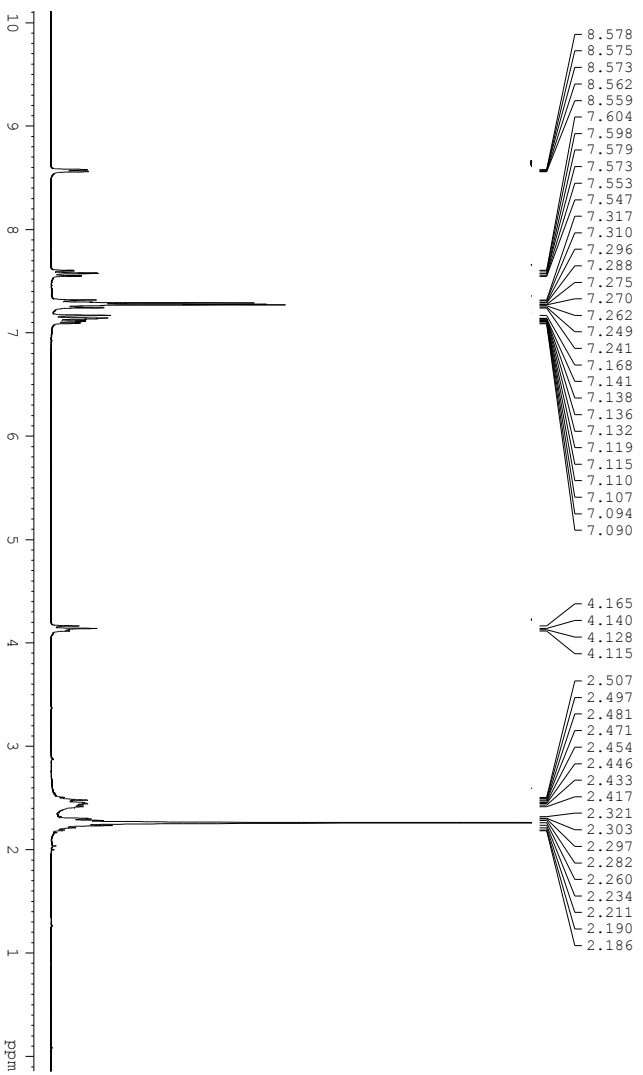
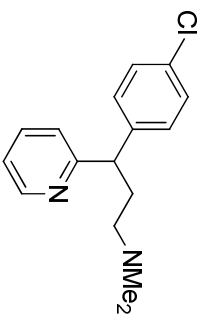
Compound 17



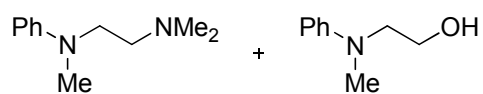
Compound 18



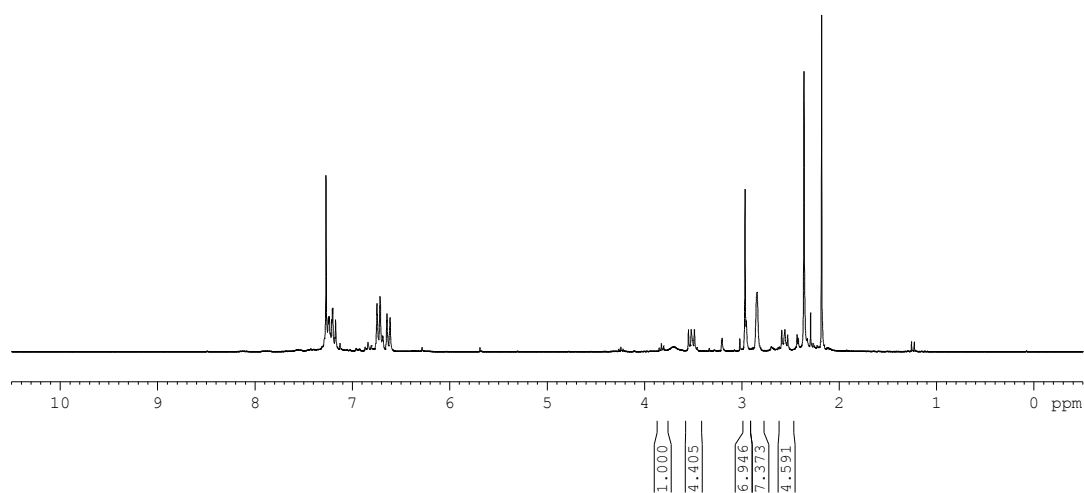
Compound 19



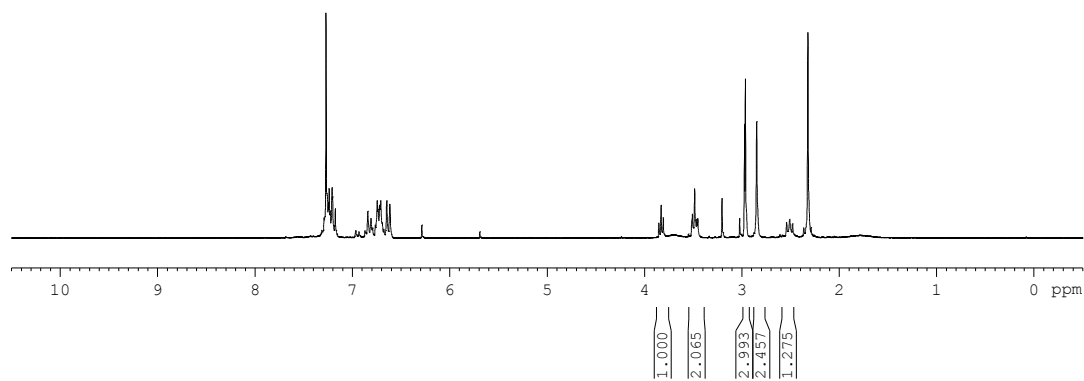
Compound 22 & Compound 23 (See Table 4, Entry 7)

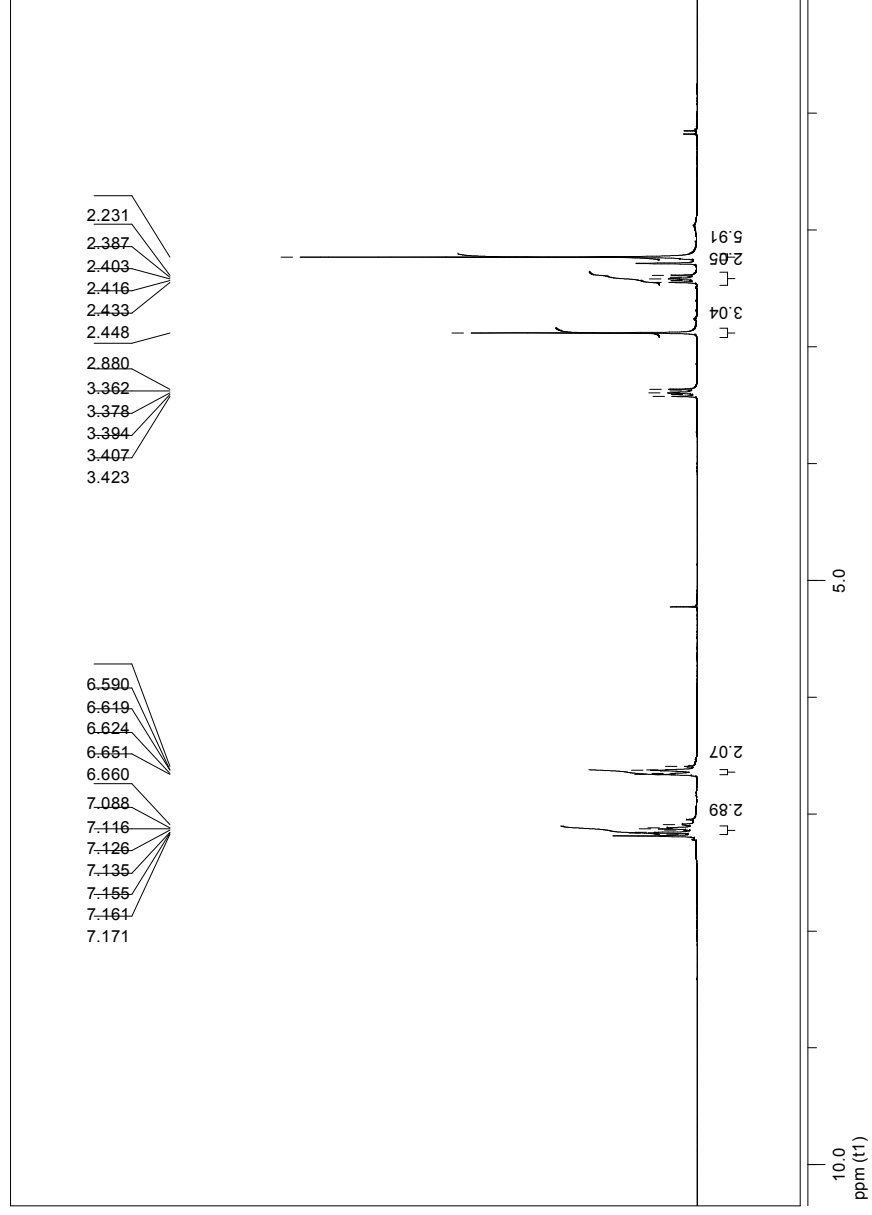
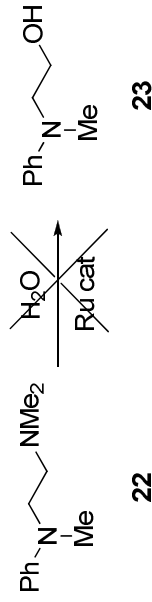


5 mol% Ru – Crude Spectra

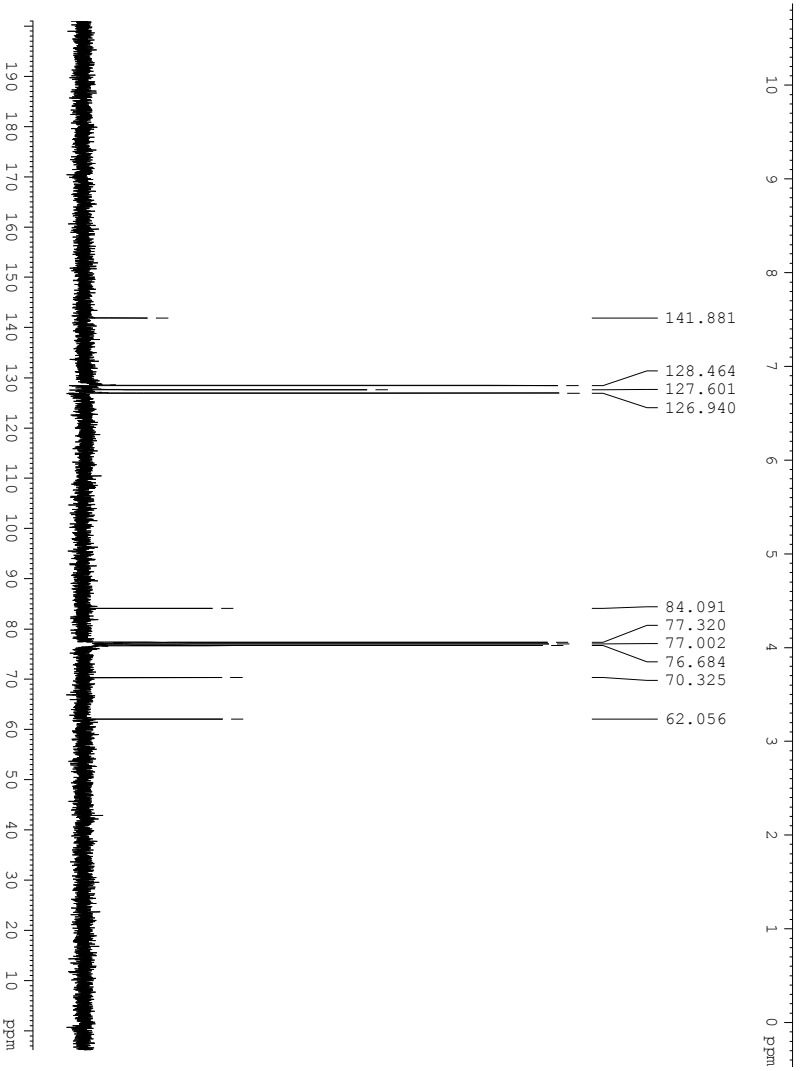
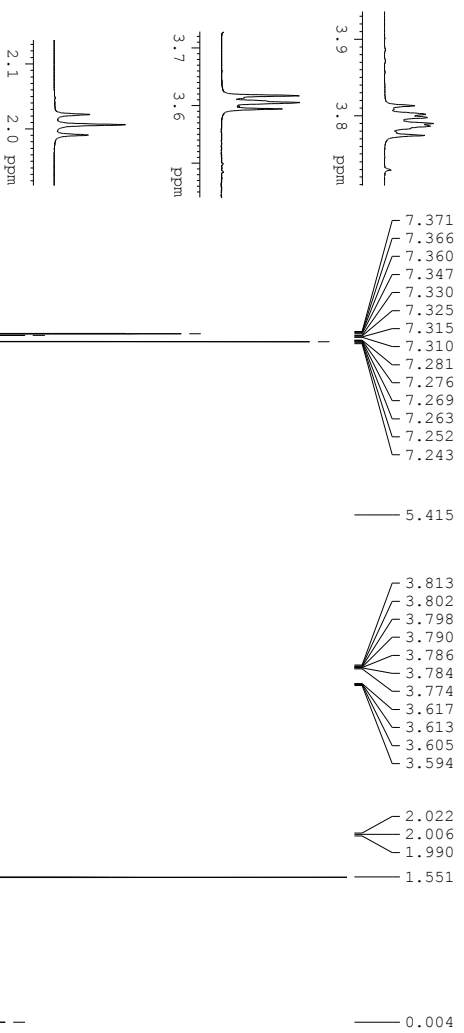
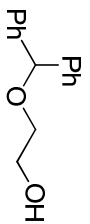


1 mol% Ru – Crude Spectra

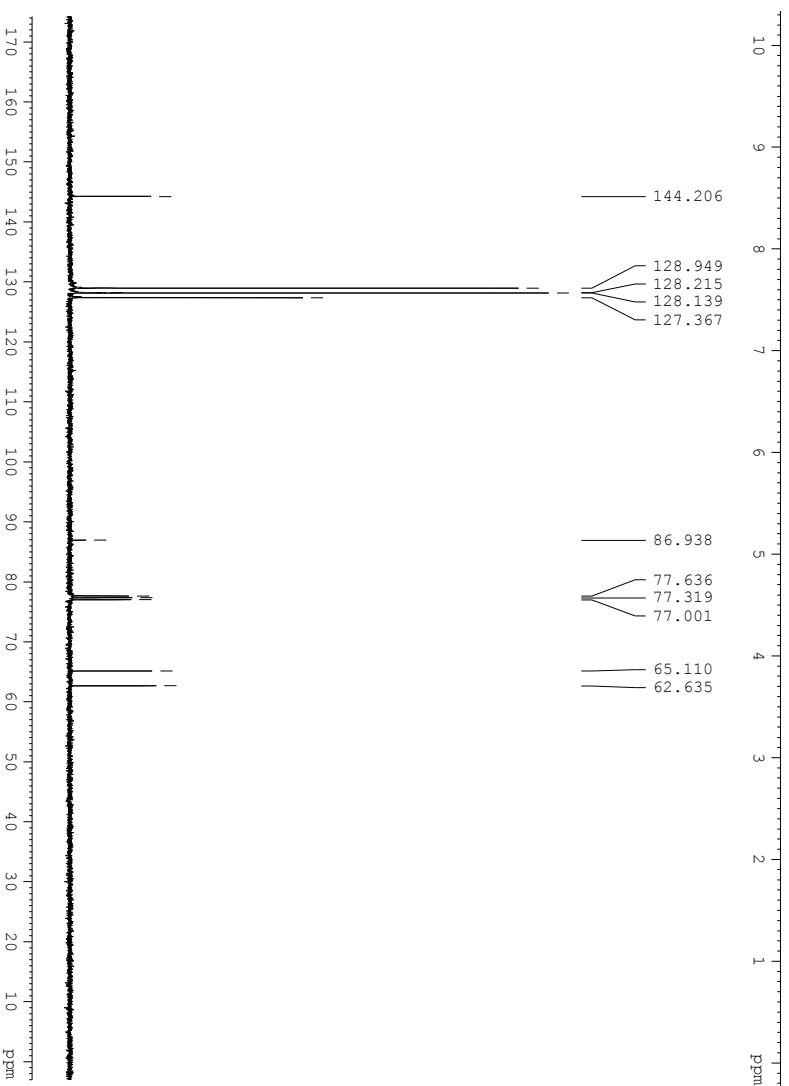
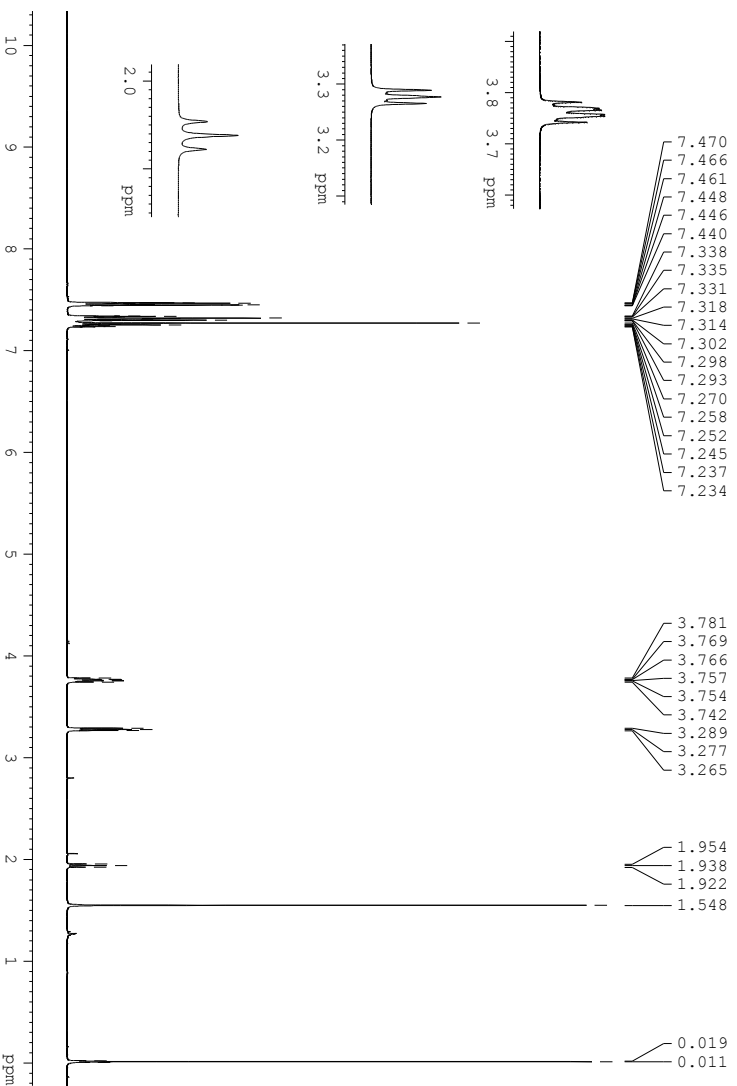
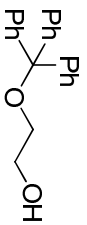




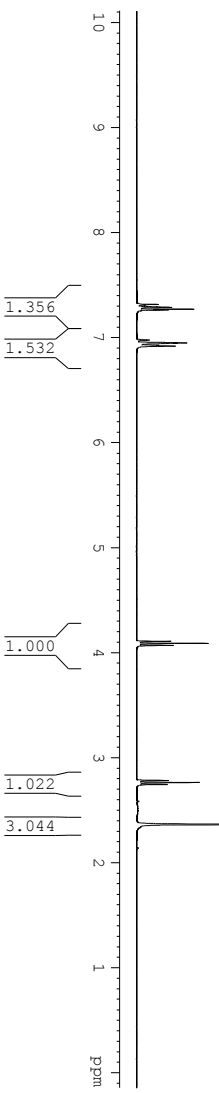
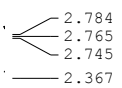
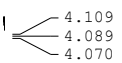
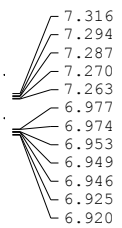
Compound 27



Compound 28



Compound 29



158.739

129.406

120.754

114.532

77.443
77.224
77.019
76.596

65.713

58.260

45.843

1.356

1.532

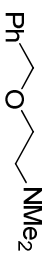
1.000

1.022

3.044

180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 ppm

Compound 30

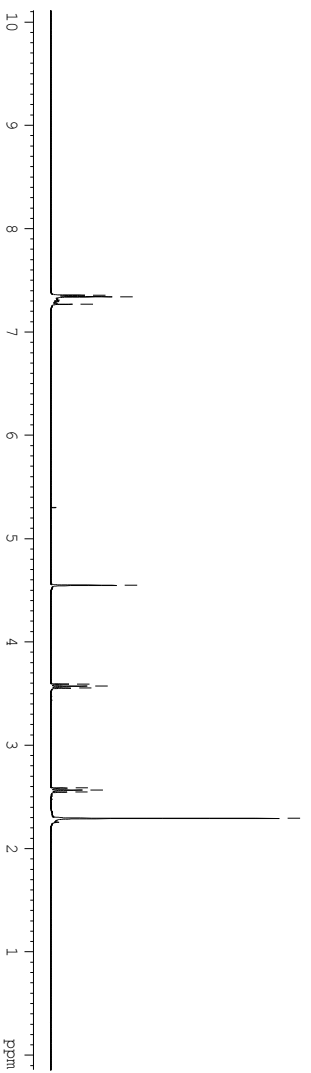
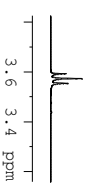
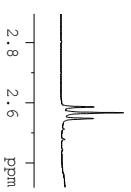


7.355
7.340
7.268

4.549

3.593
3.574
3.554

2.586
2.566
2.547
2.293



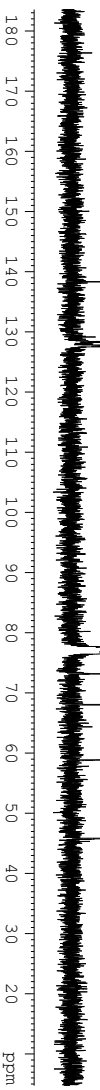
138.298

128.331
127.730
127.554

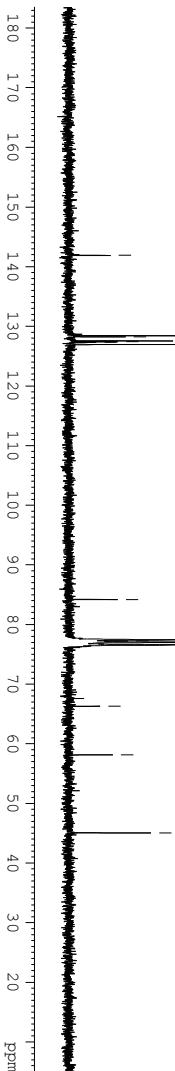
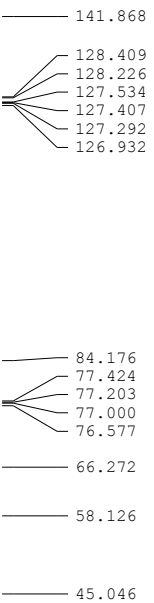
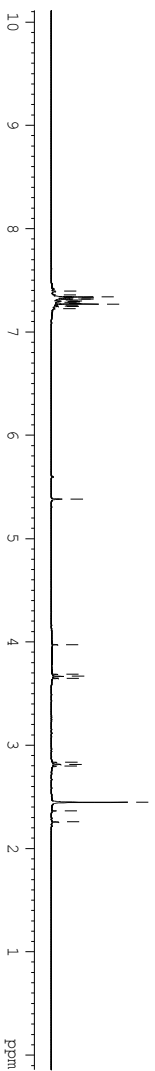
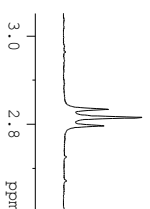
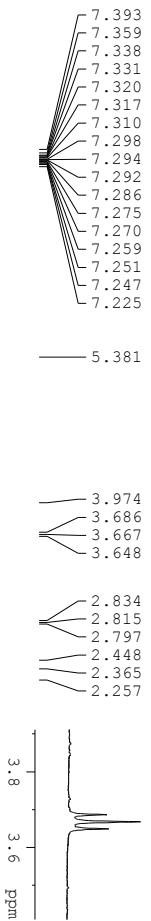
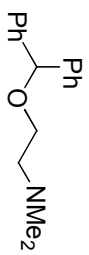
77.422
76.999
76.576
73.169
68.032

58.836

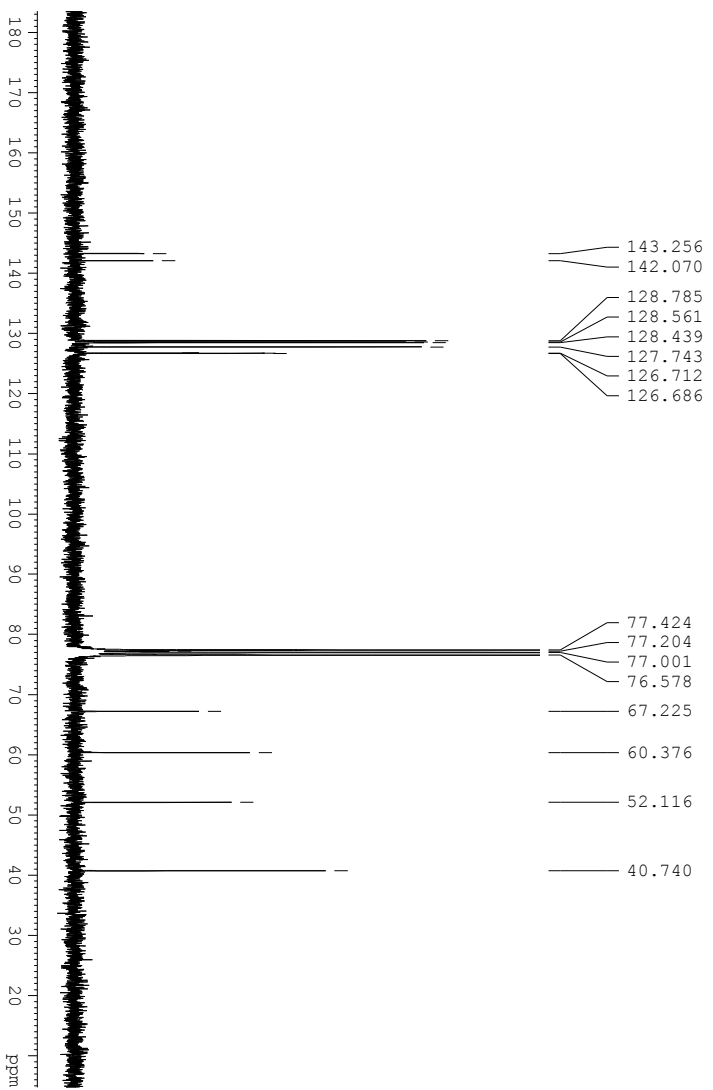
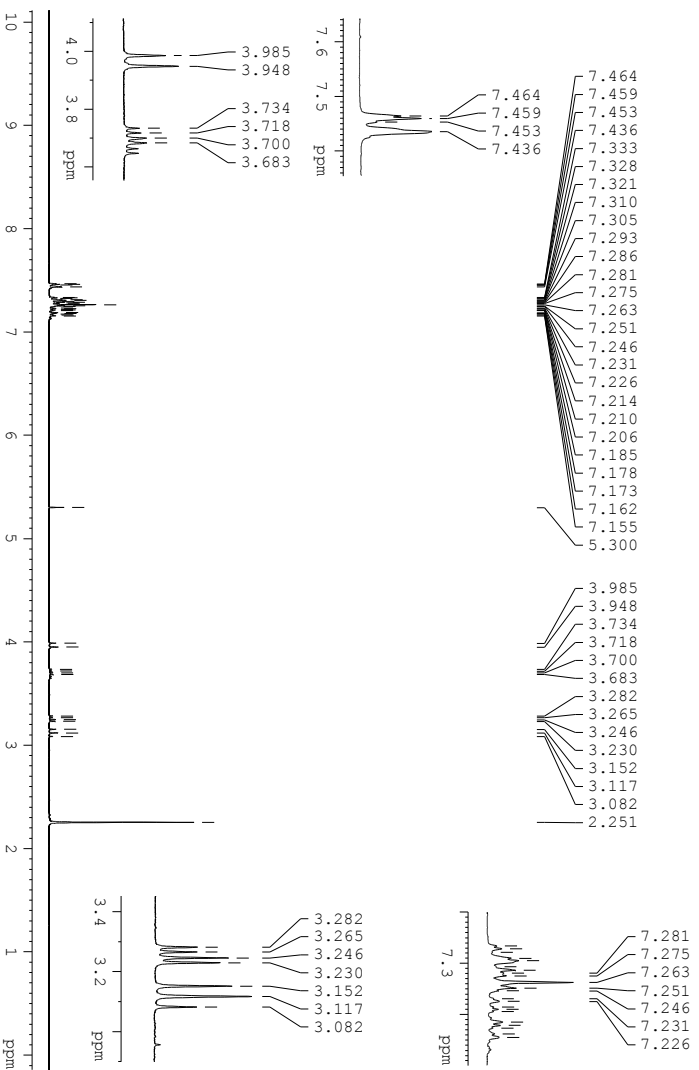
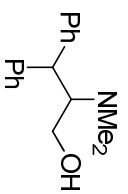
45.781

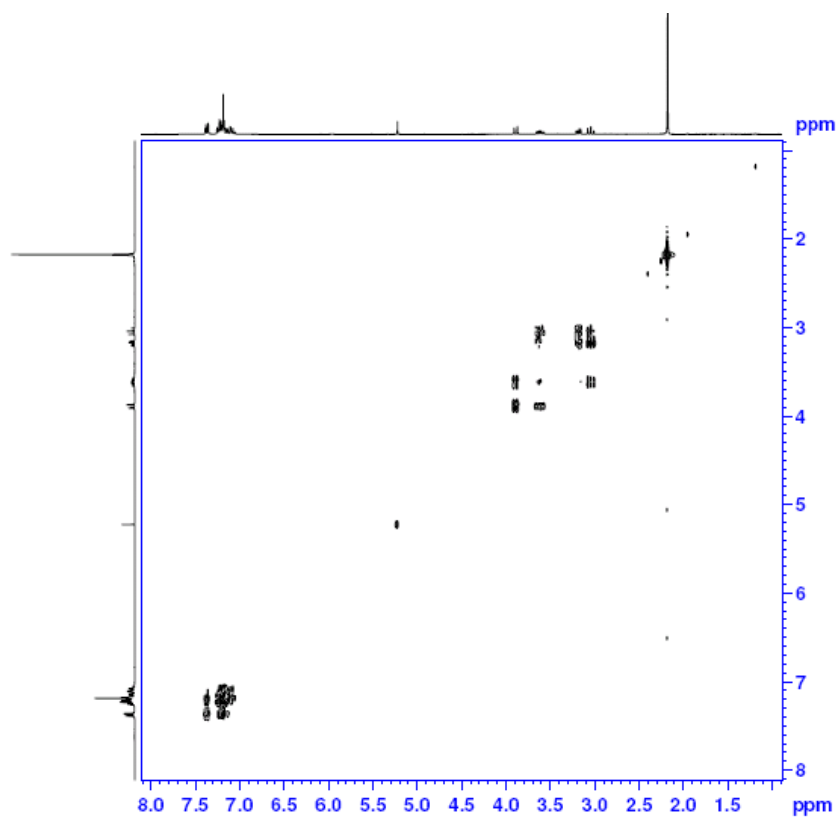
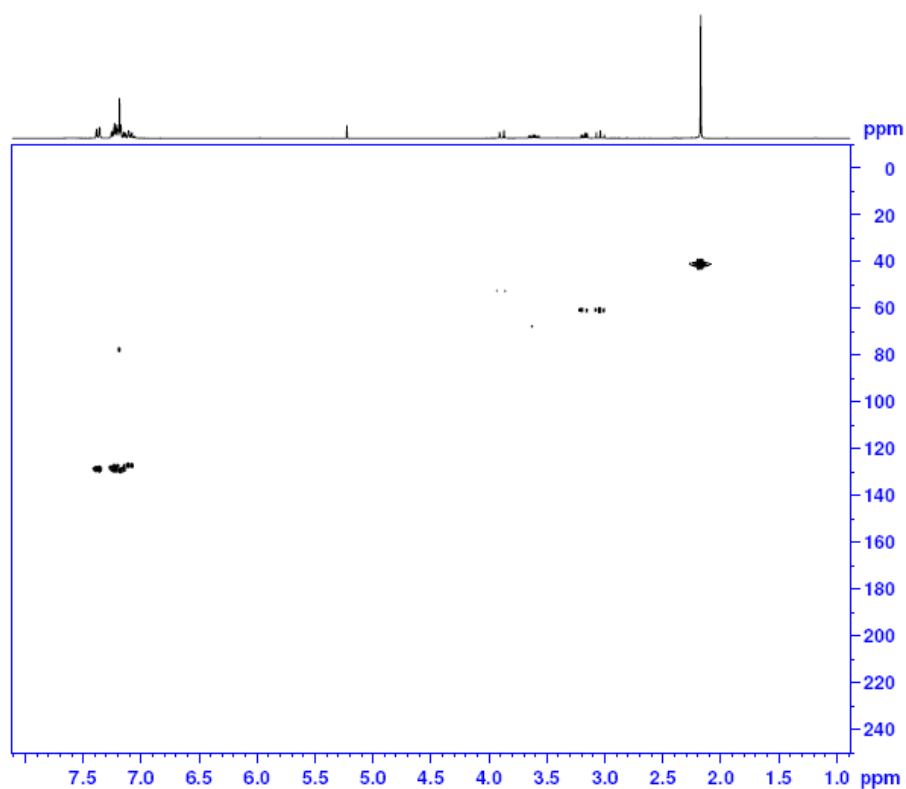


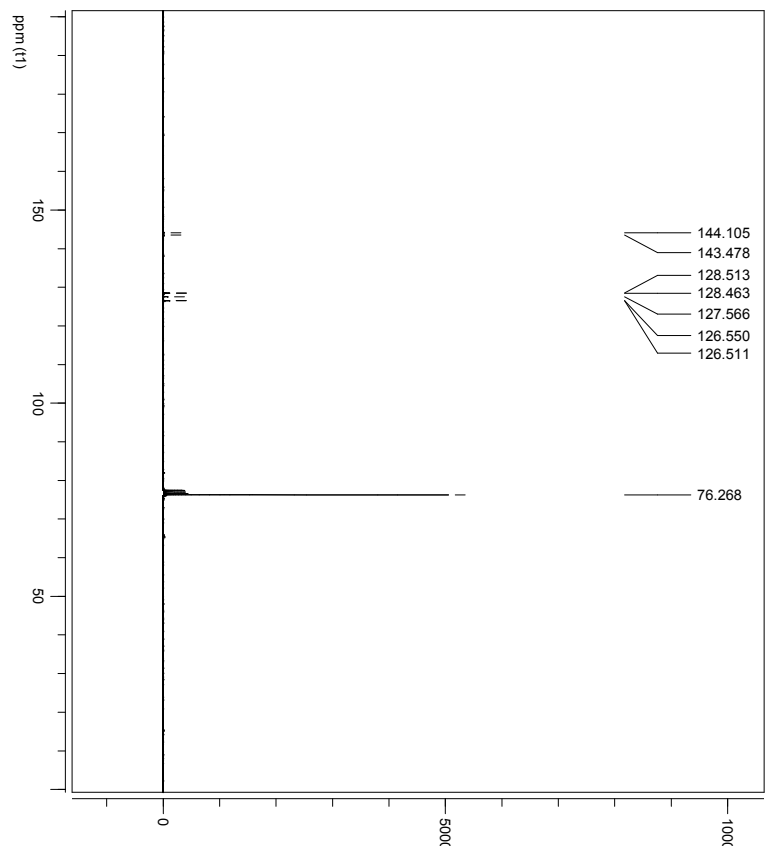
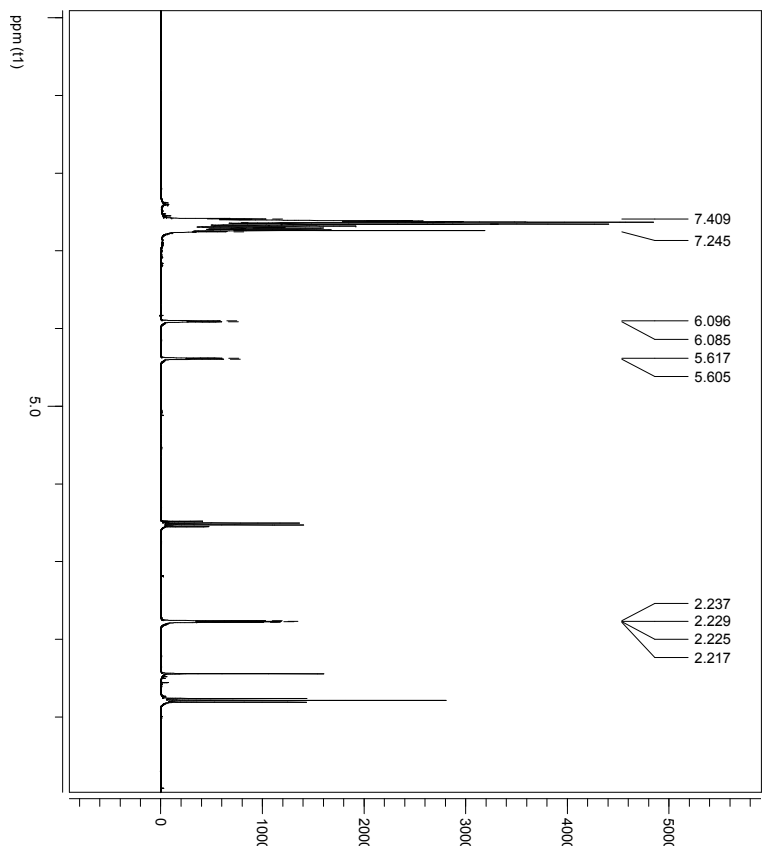
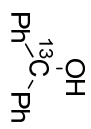
Compound 31

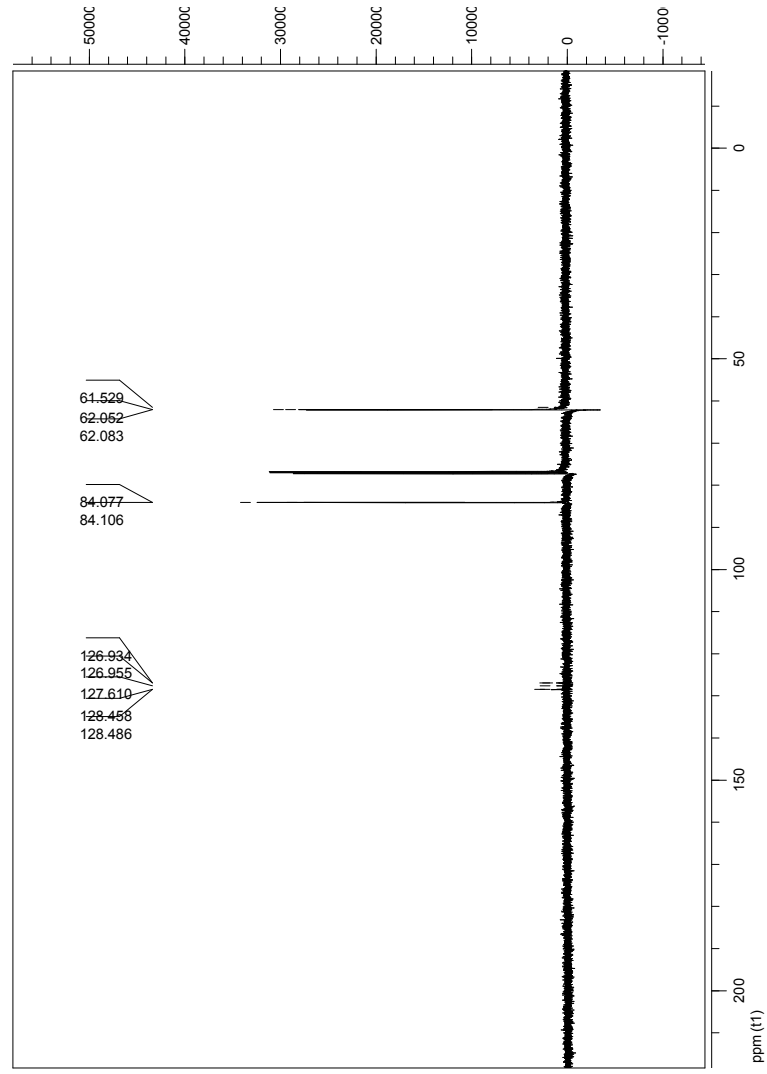
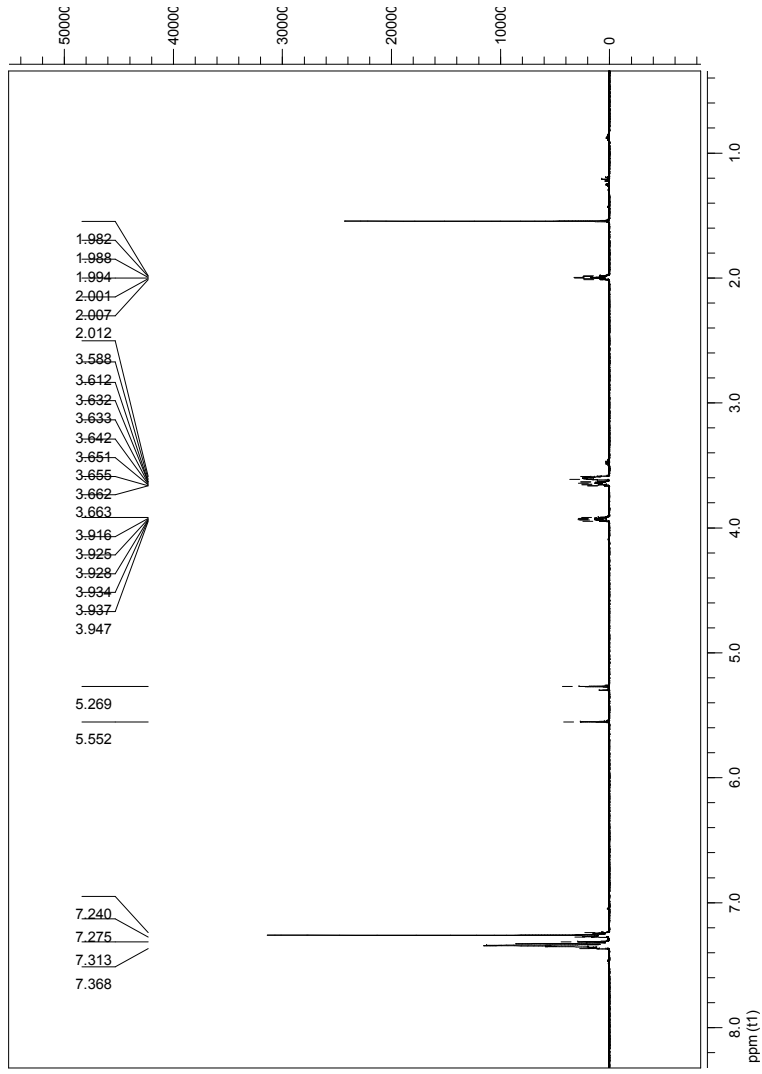
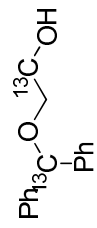


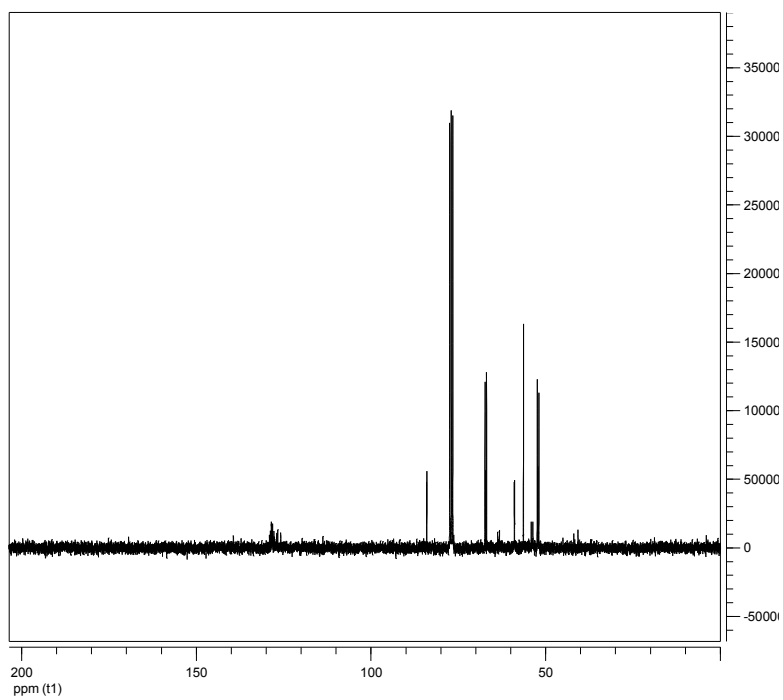
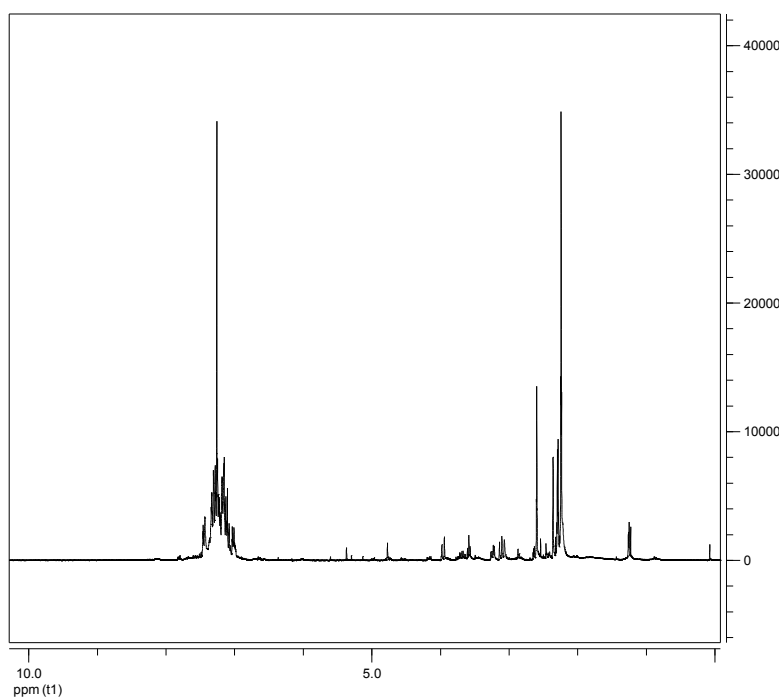
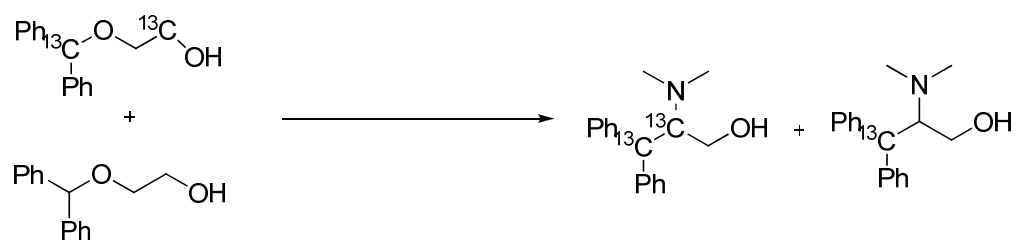
Compound 32

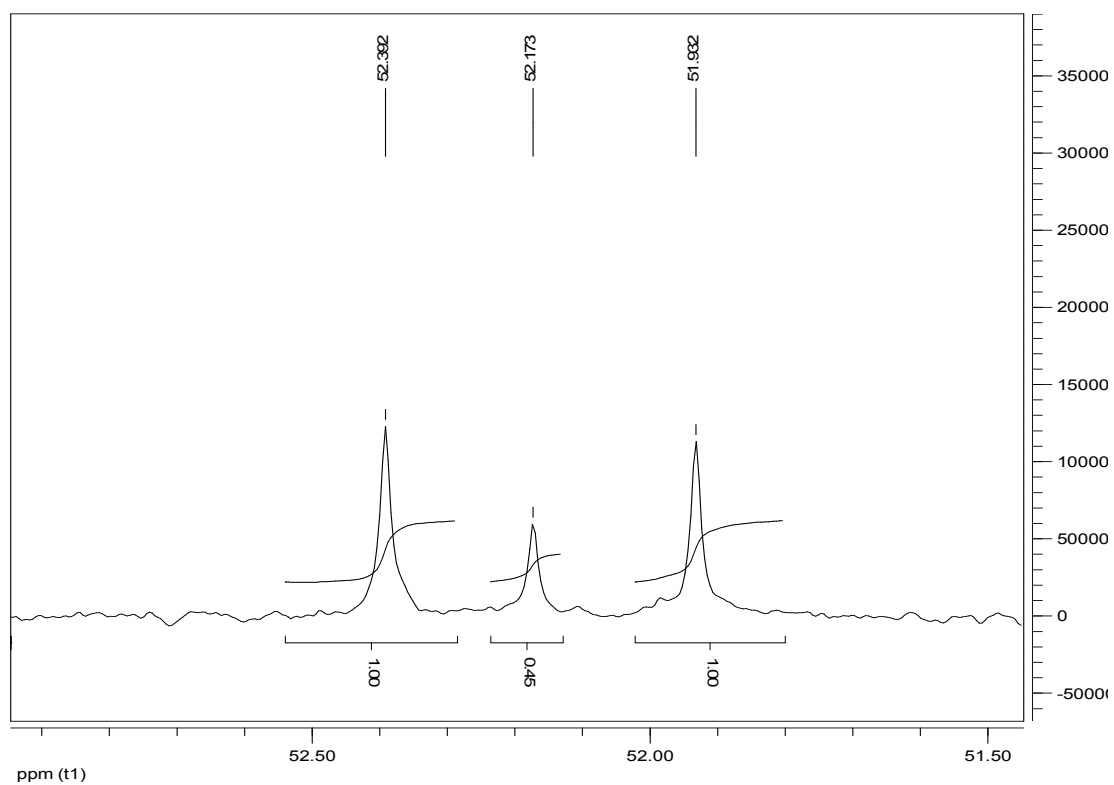
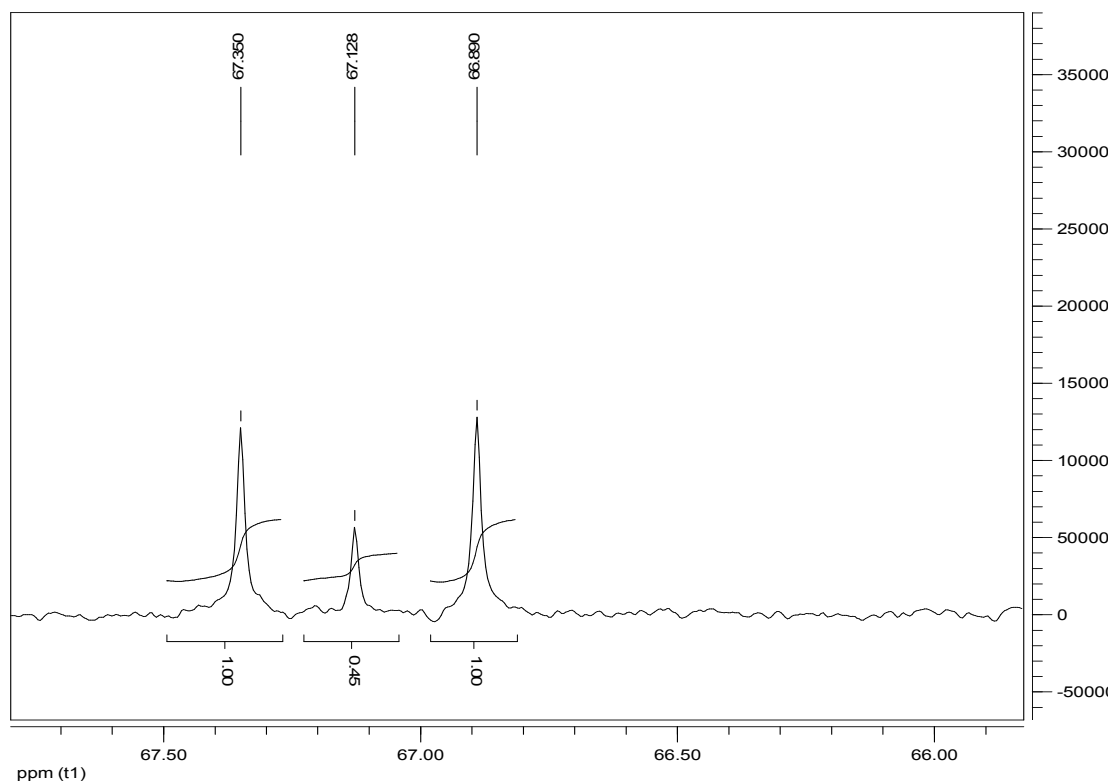


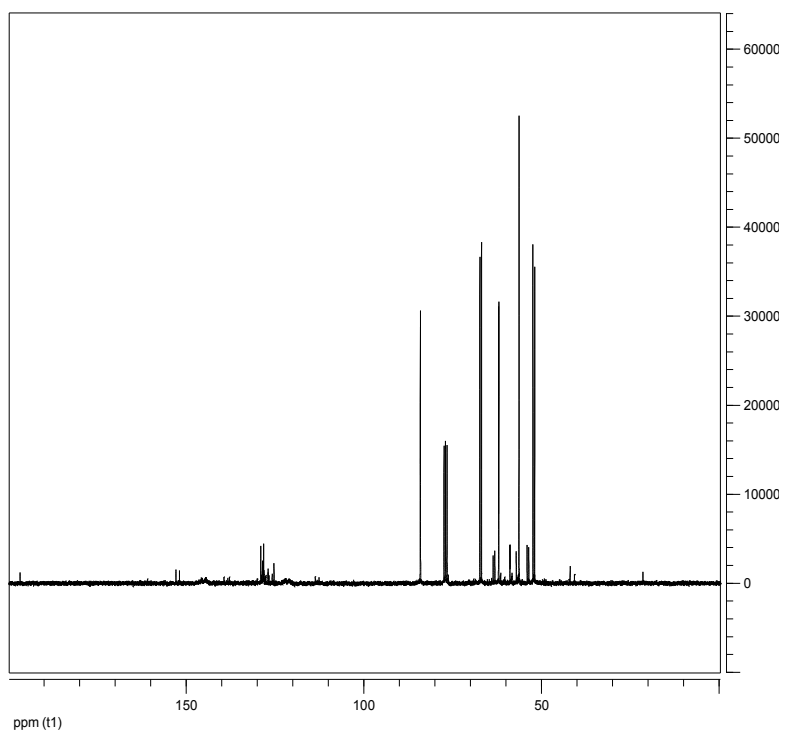
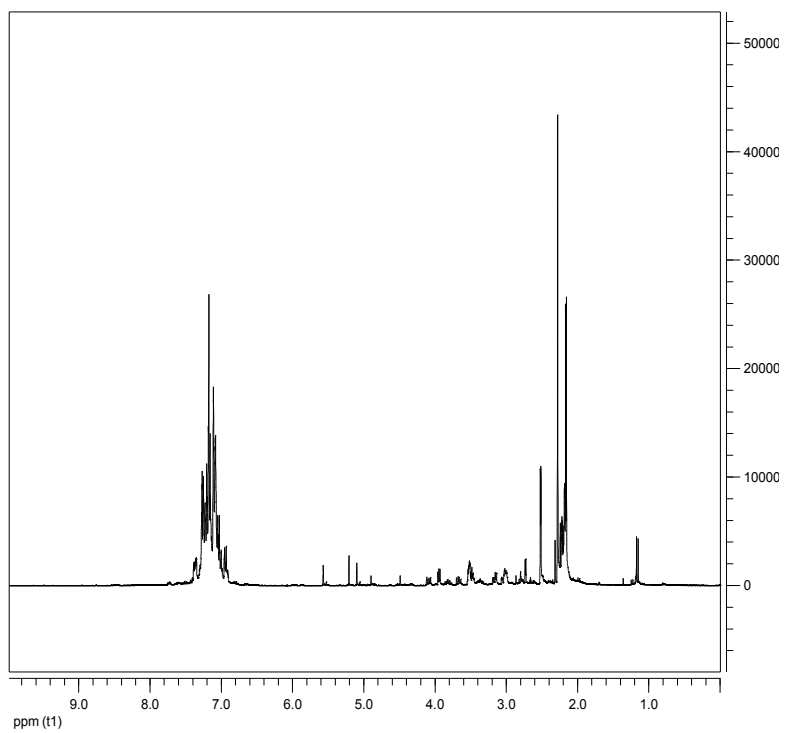
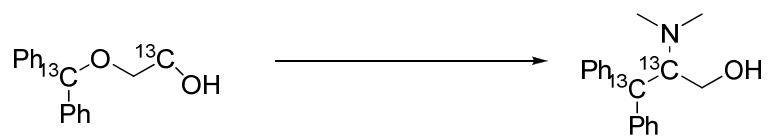












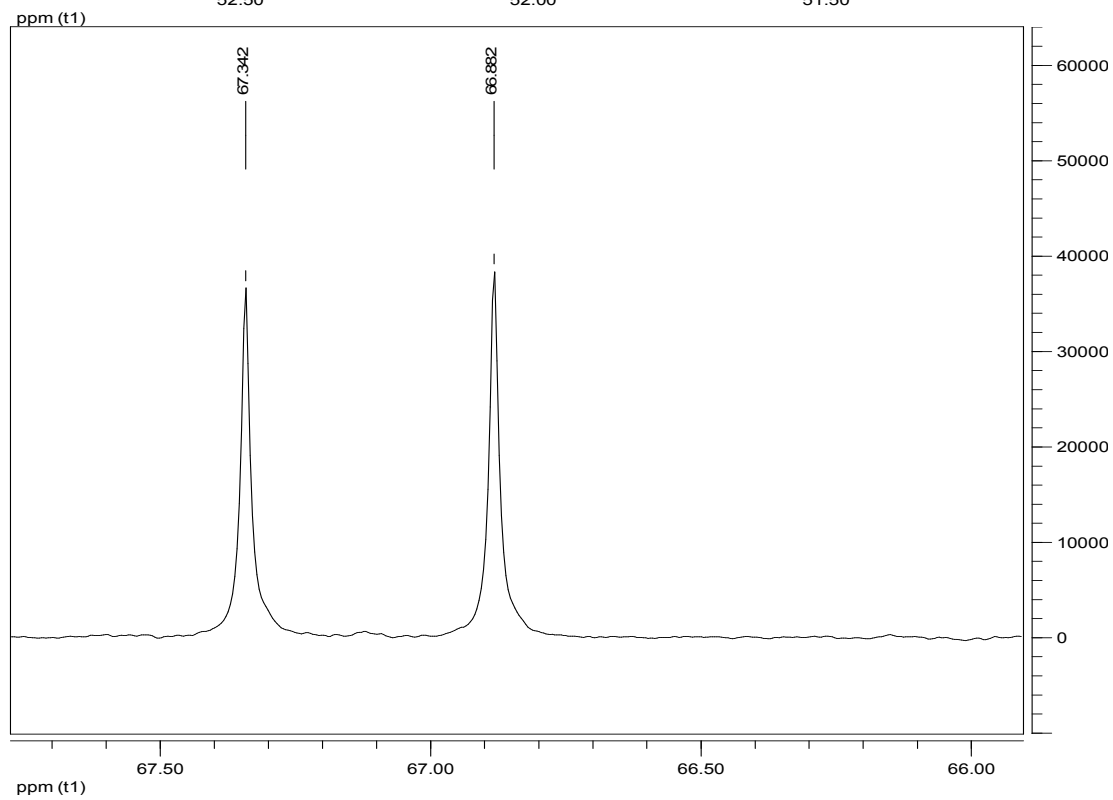
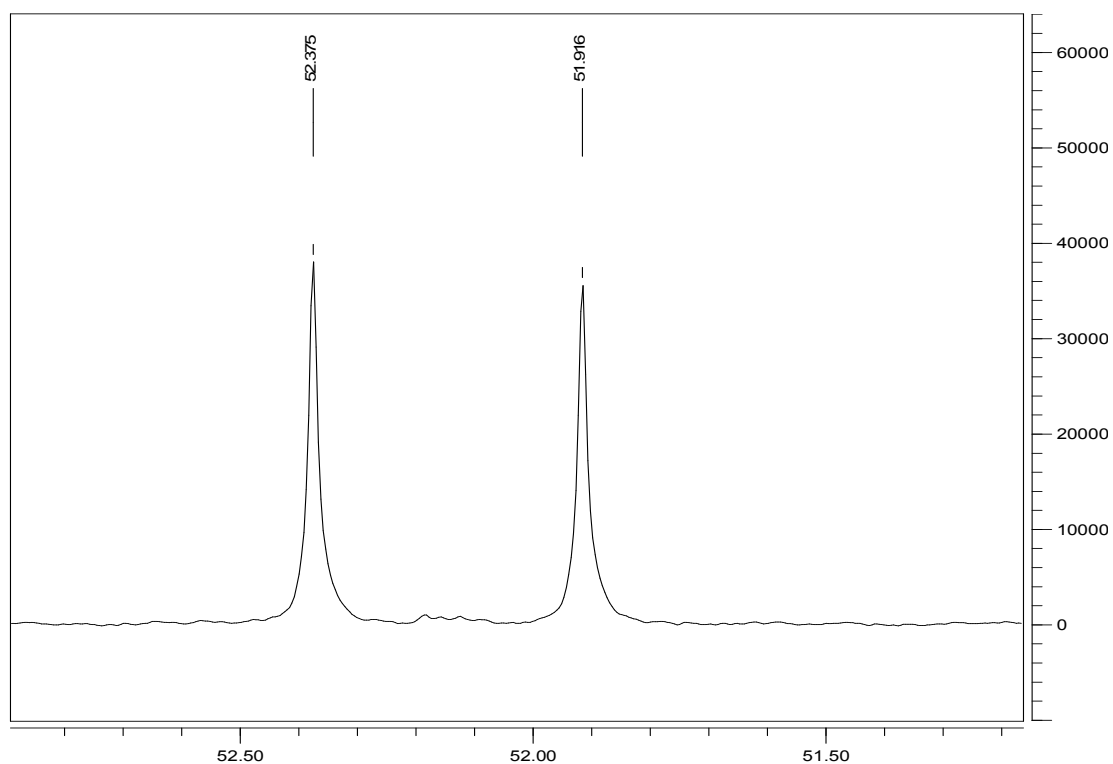


Table 5, Entry 1

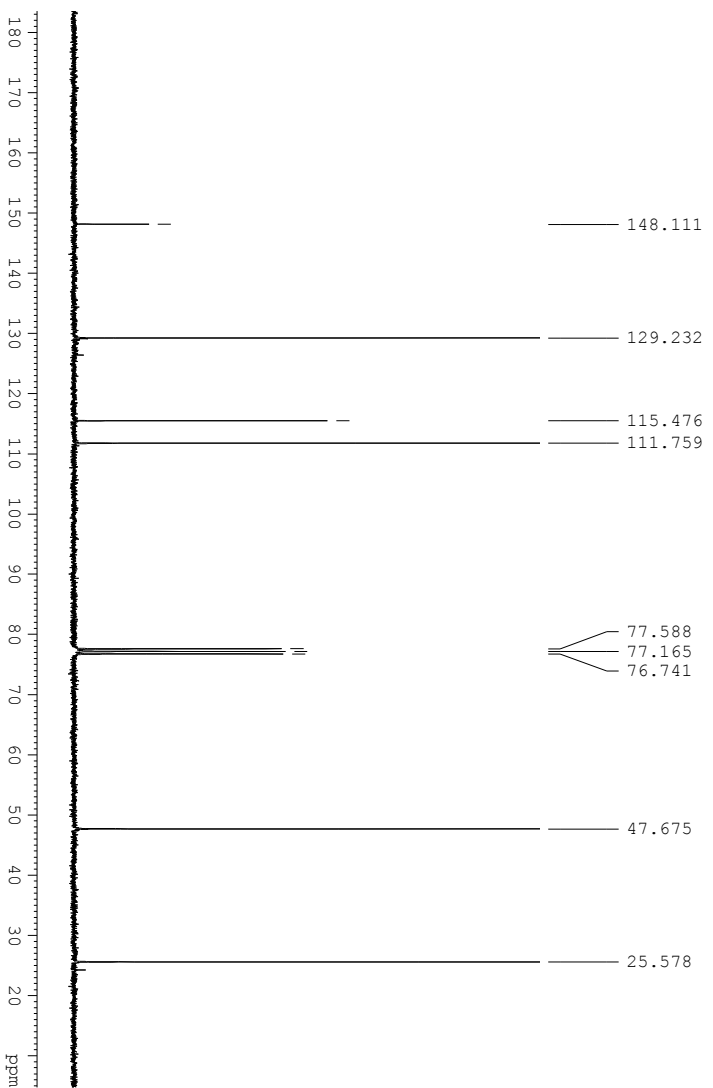
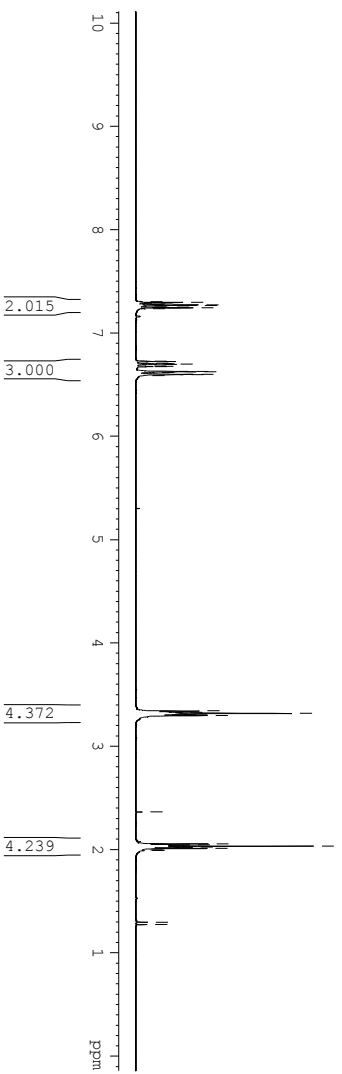
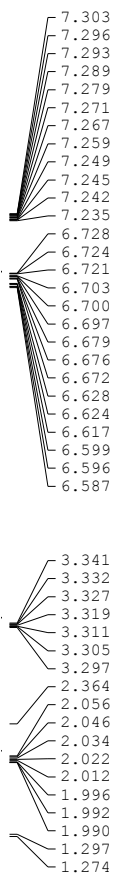
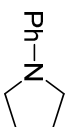


Table 5, Entry 2

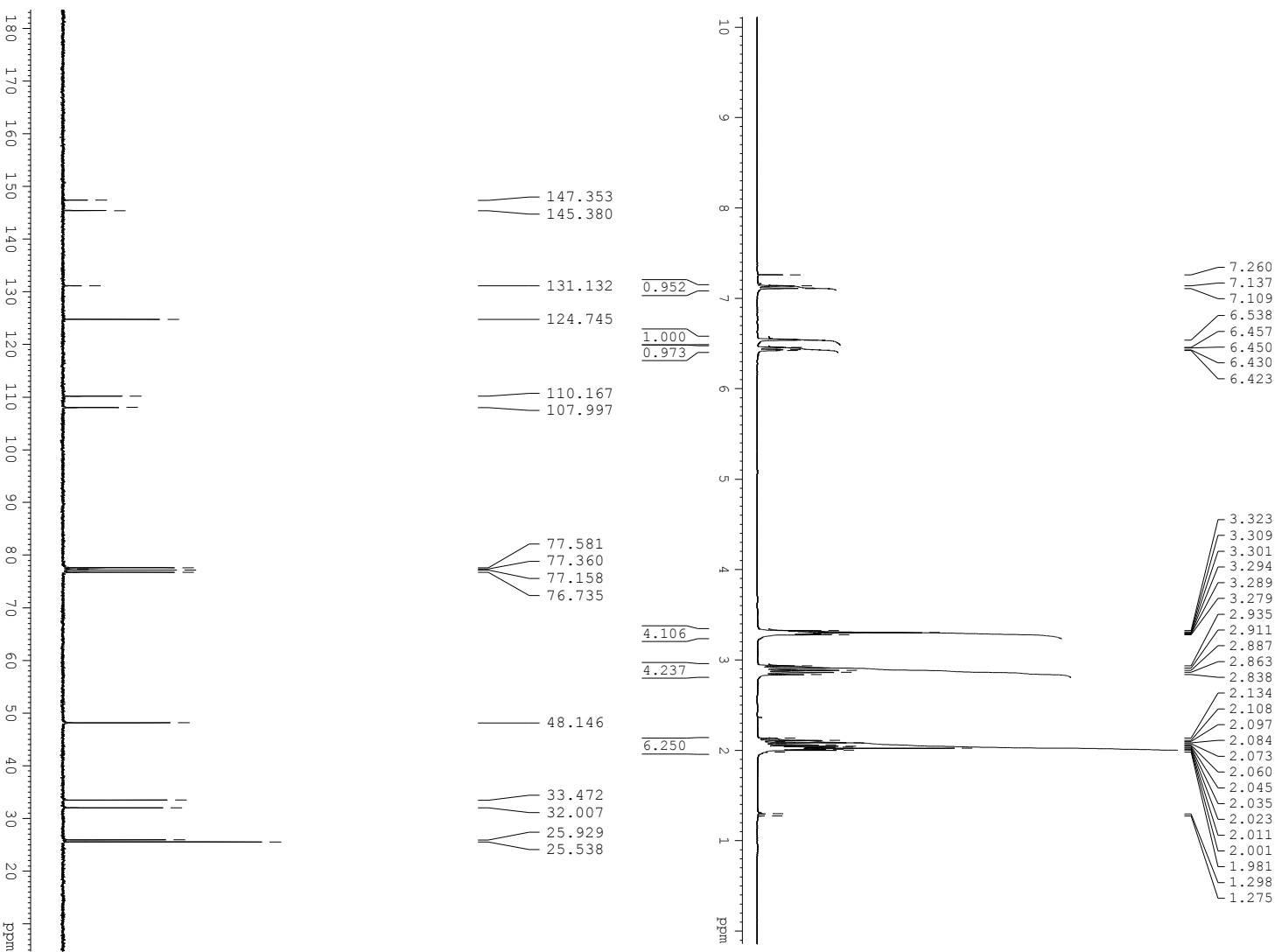
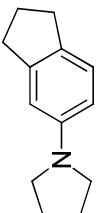


Table 5, Entry 3

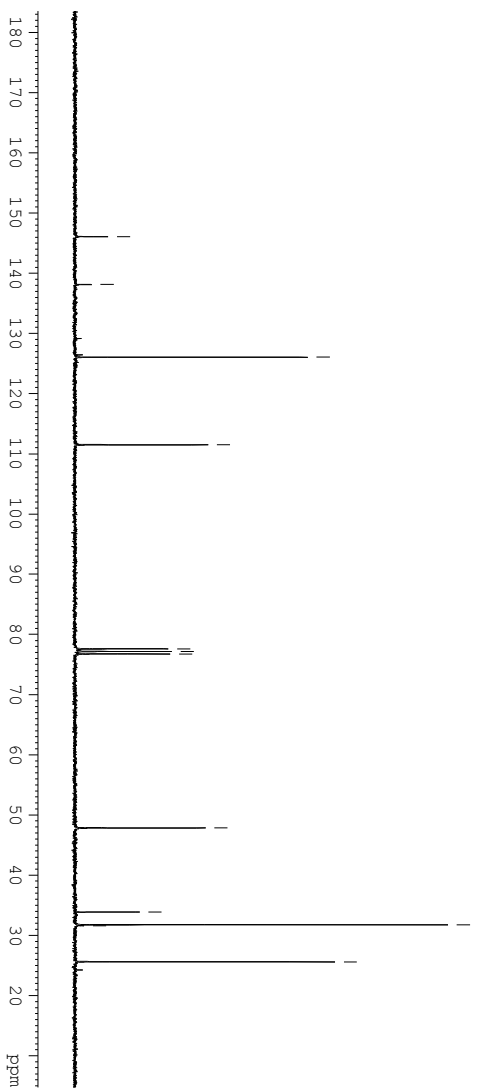
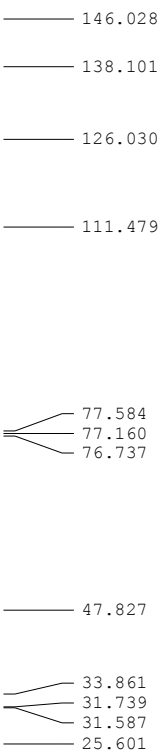
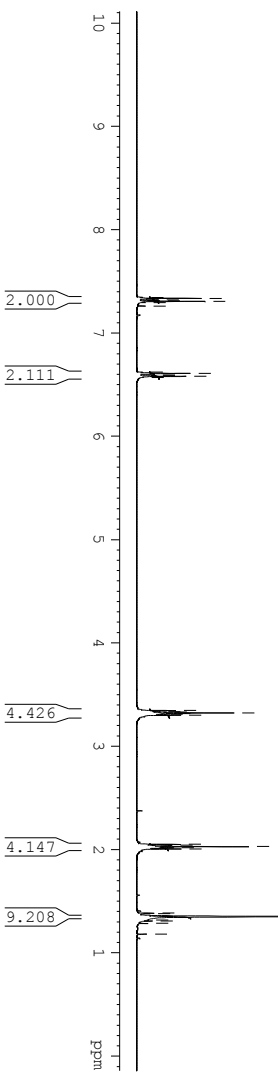
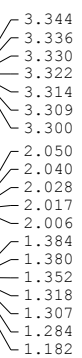
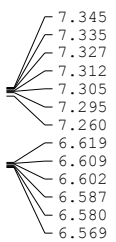
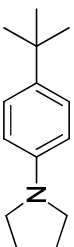


Table 5, Entry 4

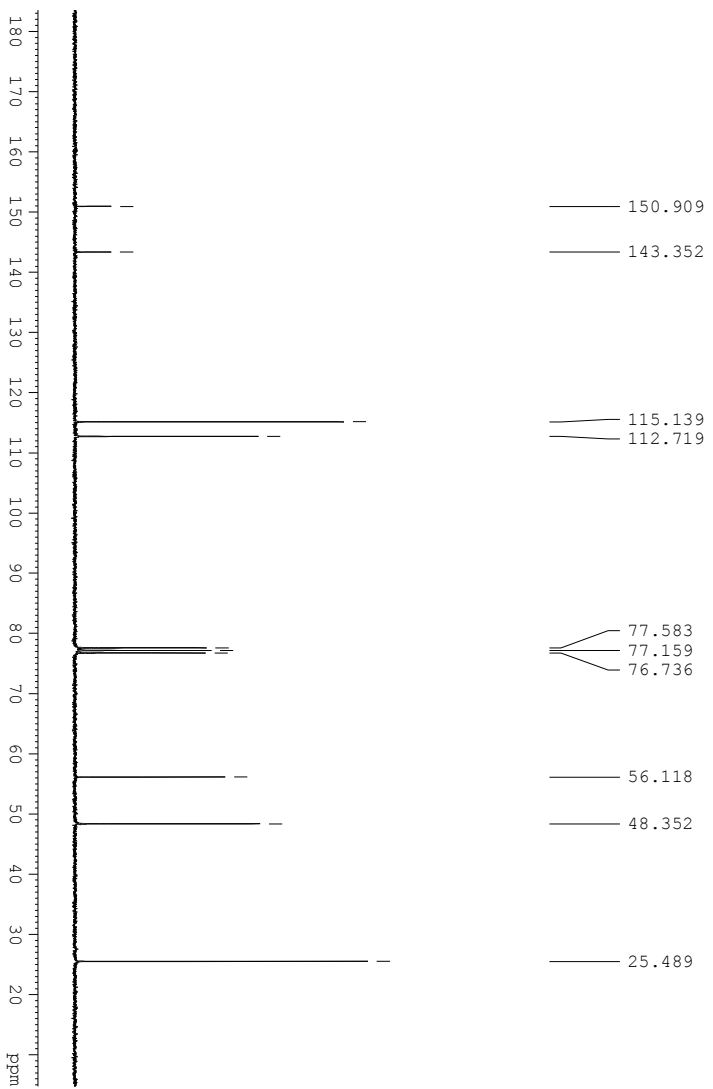
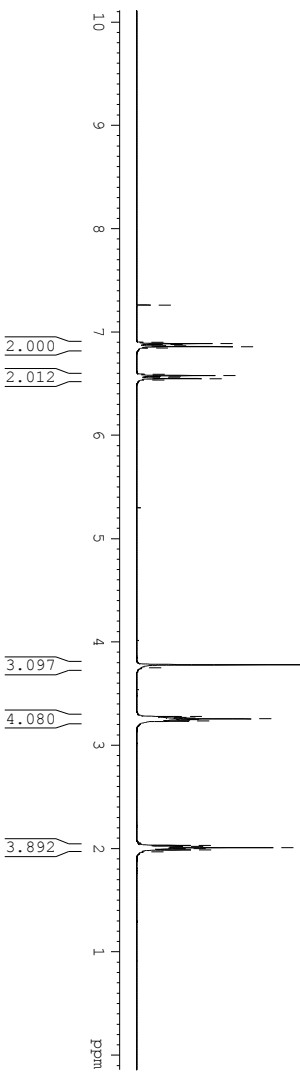
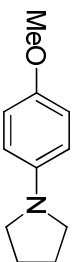


Table 5, Entry 5

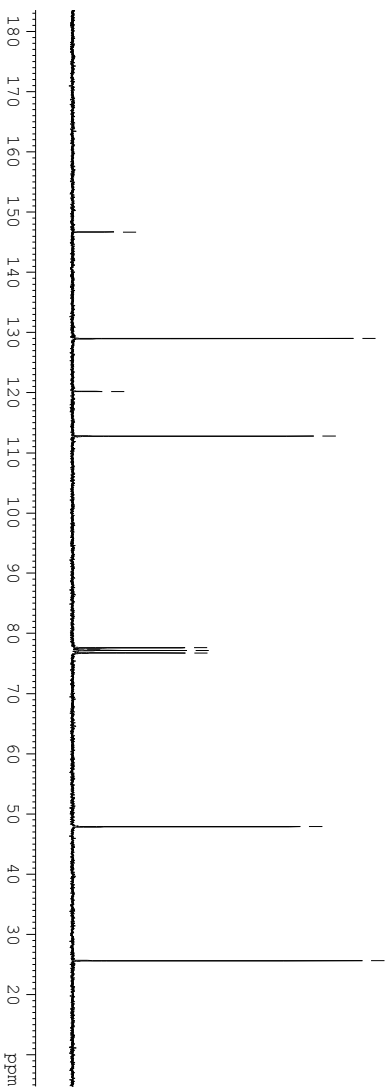
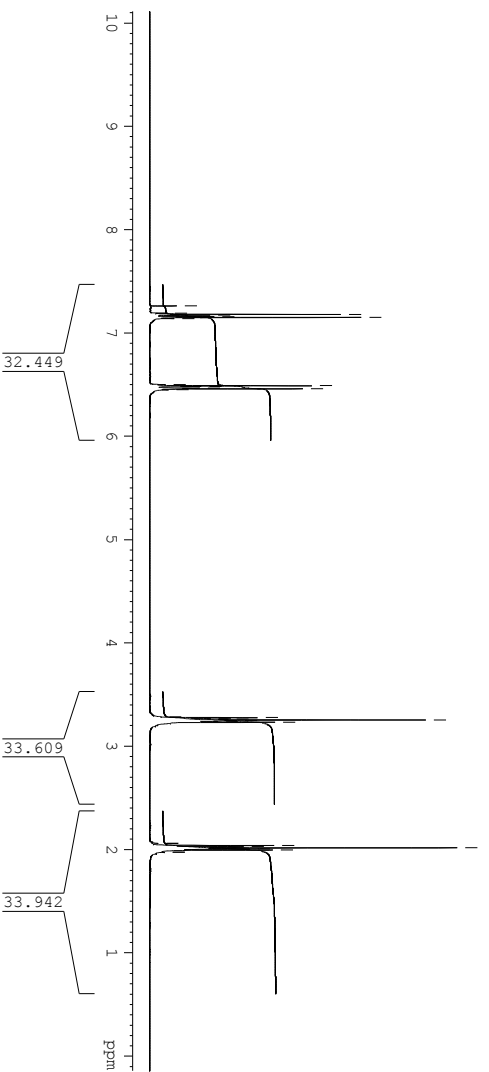
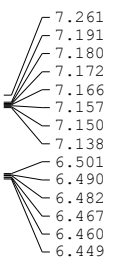
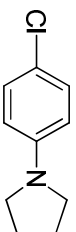


Table 5, Entry 6

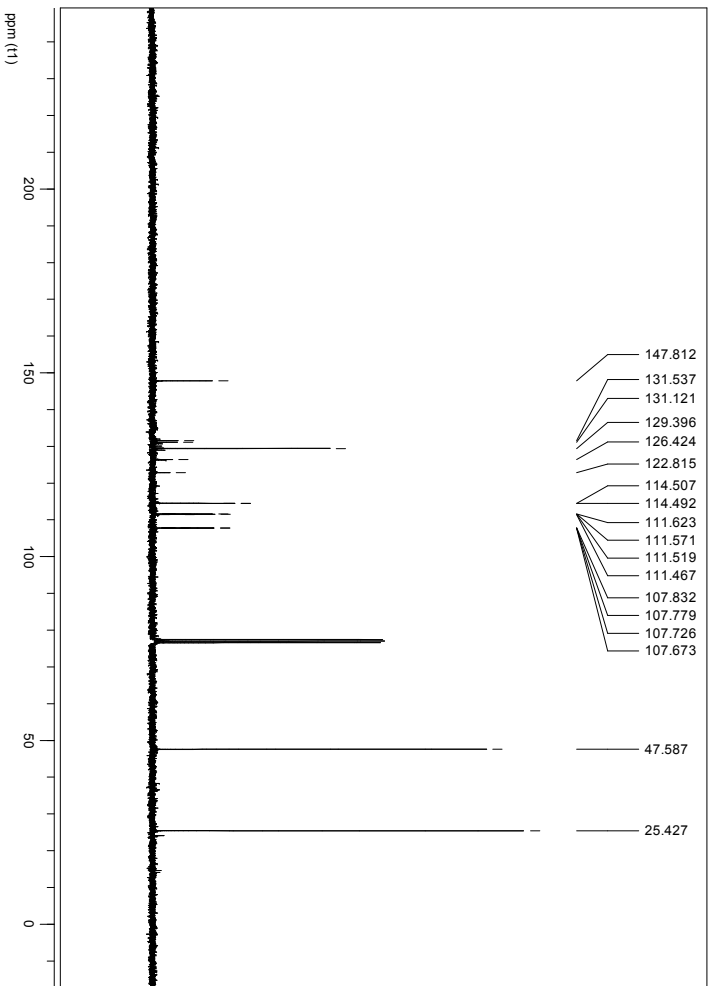
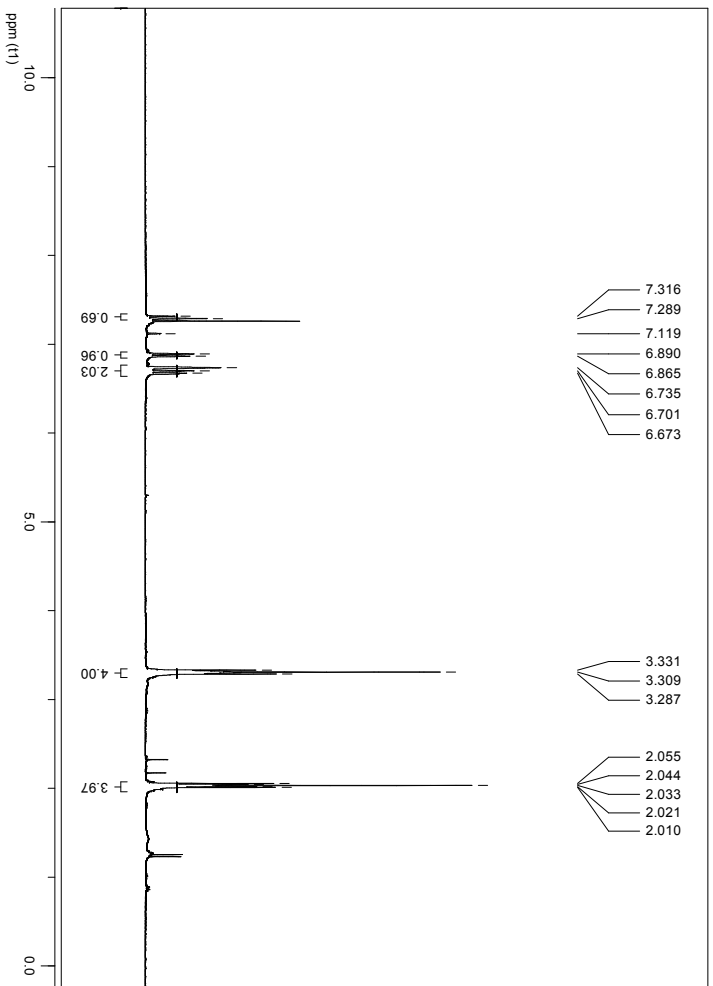
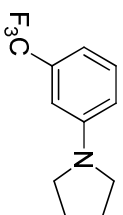


Table 5, Entry 7

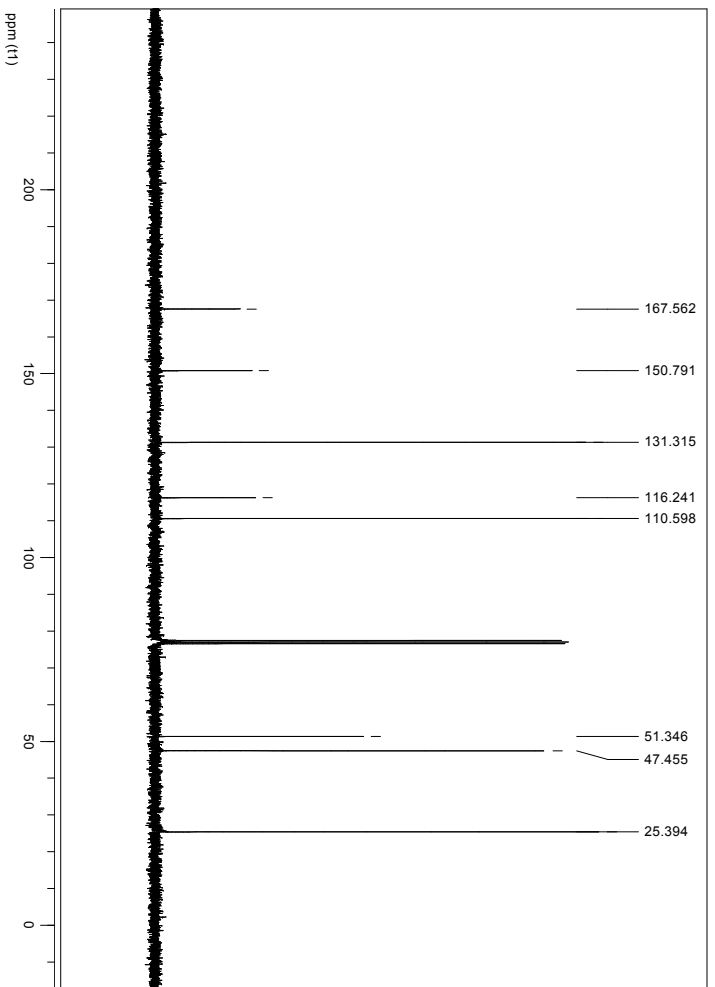
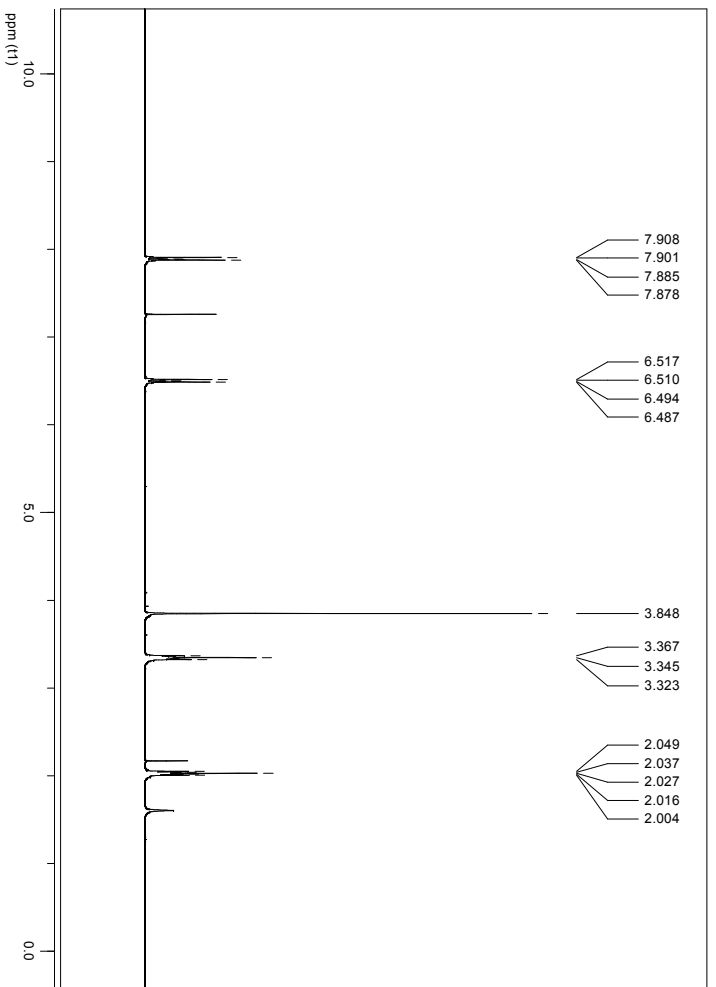
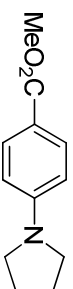


Table 5, Entry 8

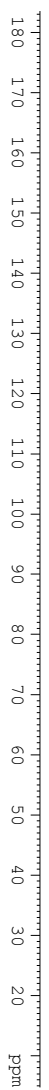
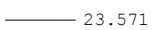
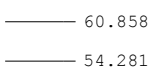
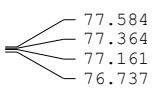
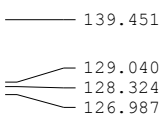
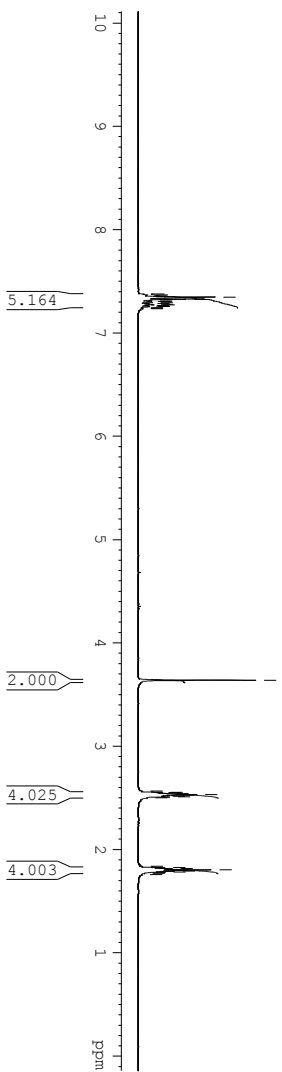
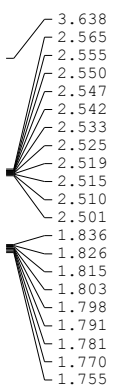
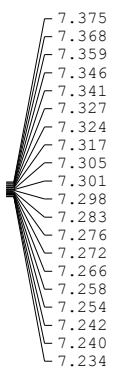
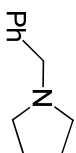


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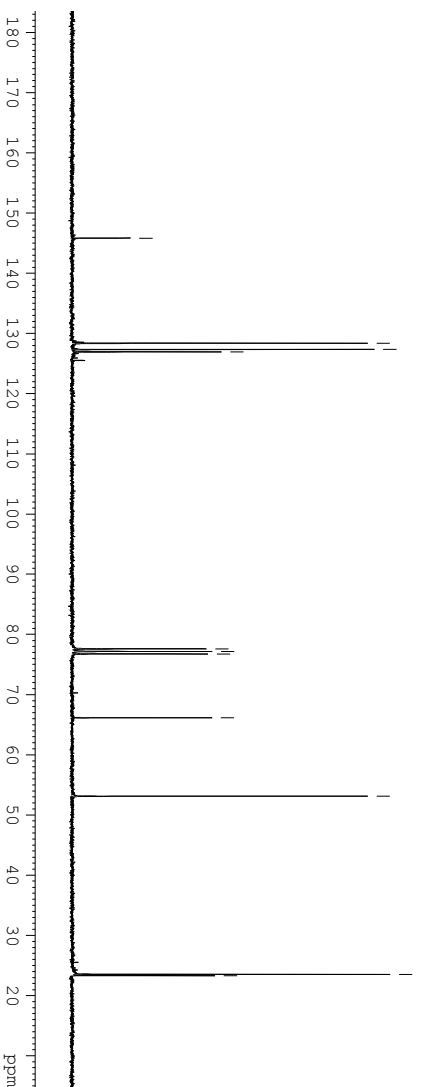
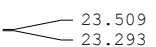
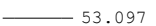
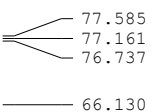
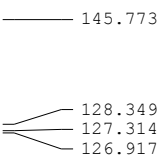
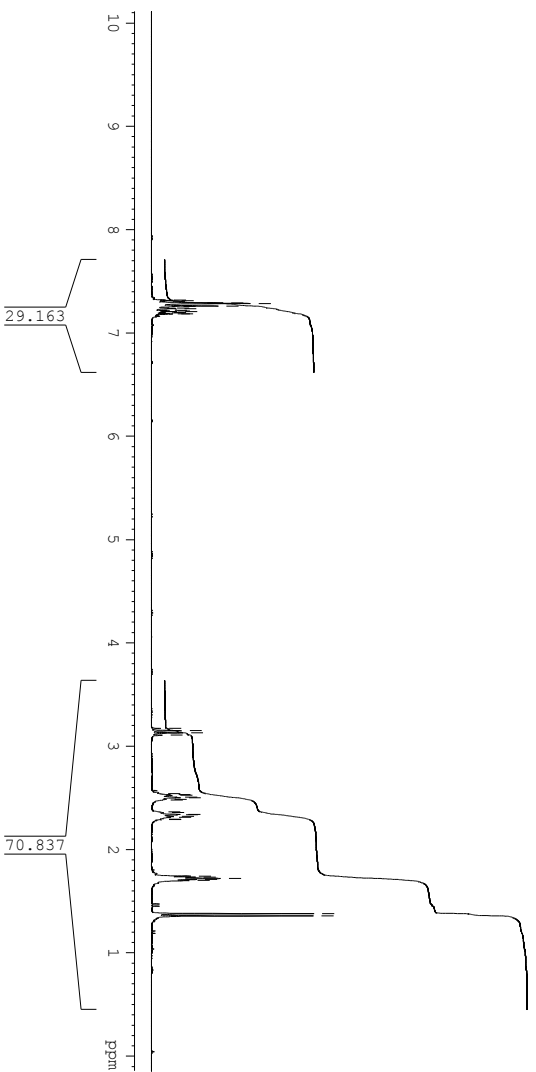
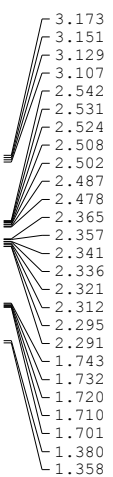
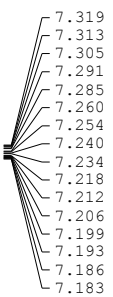
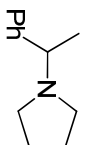


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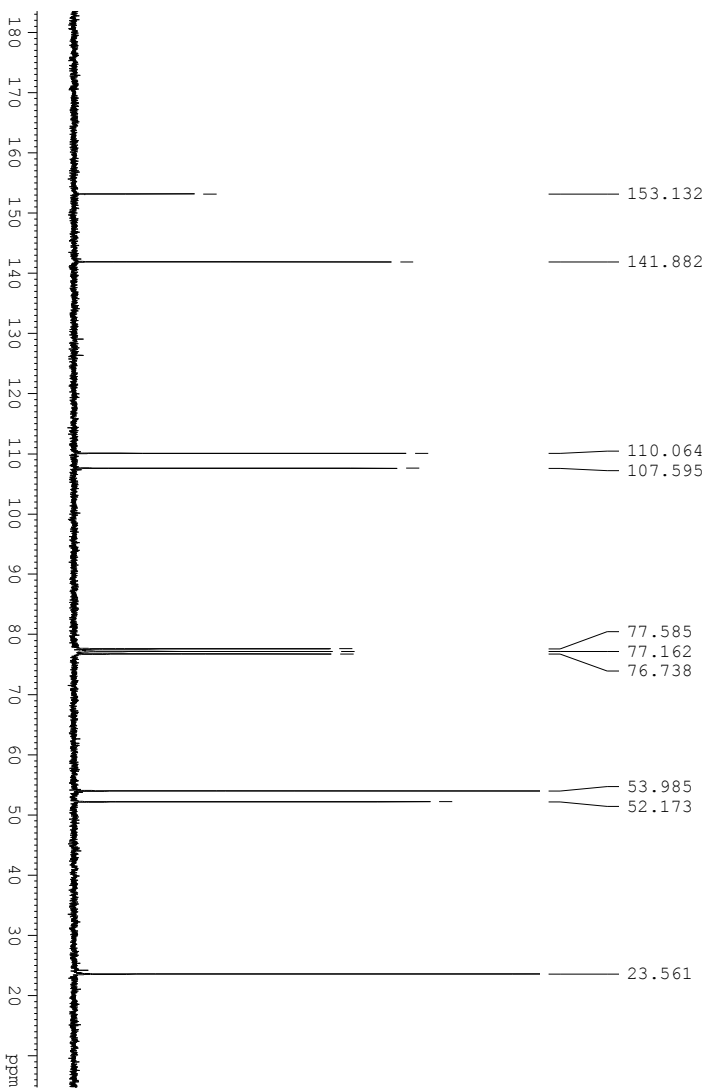
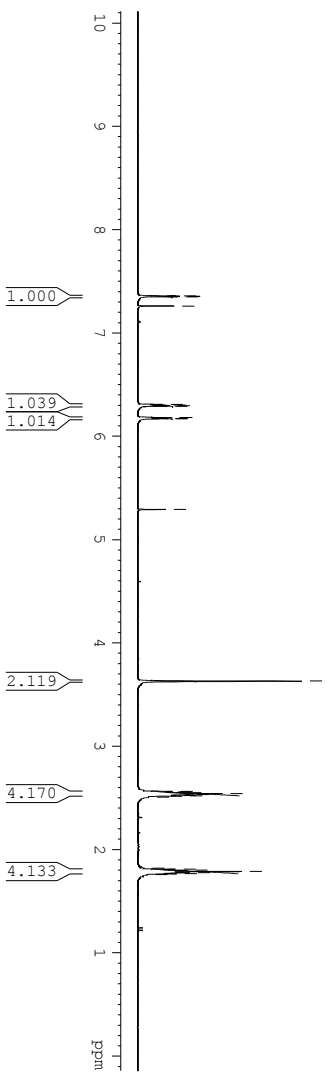
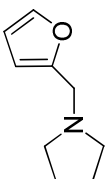


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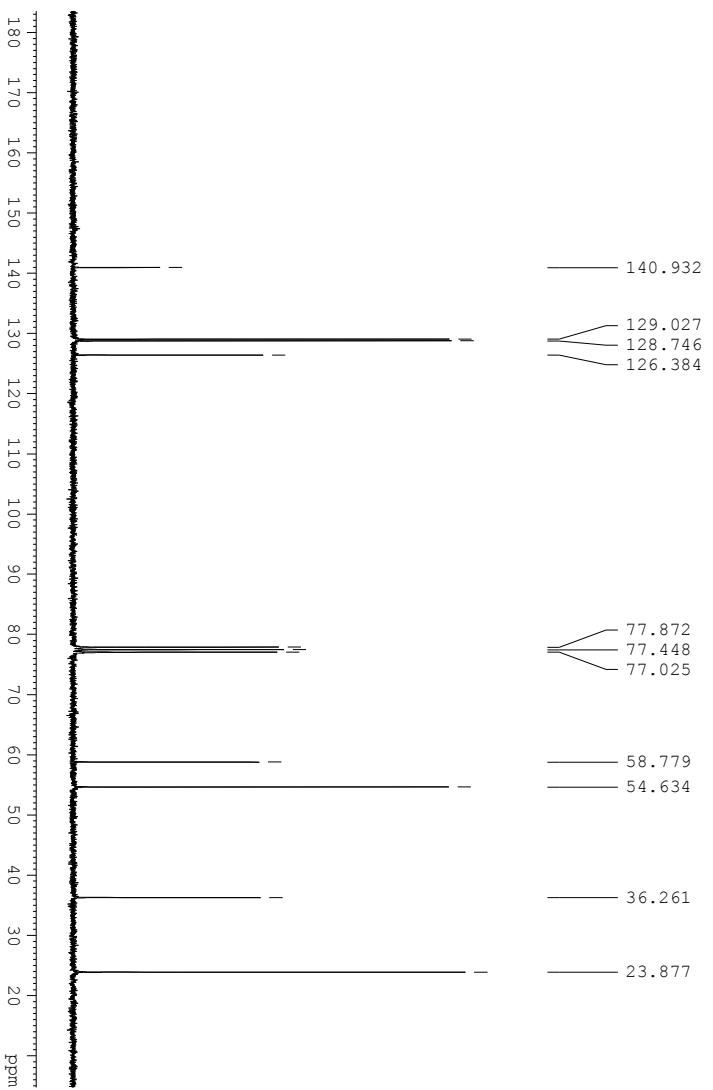
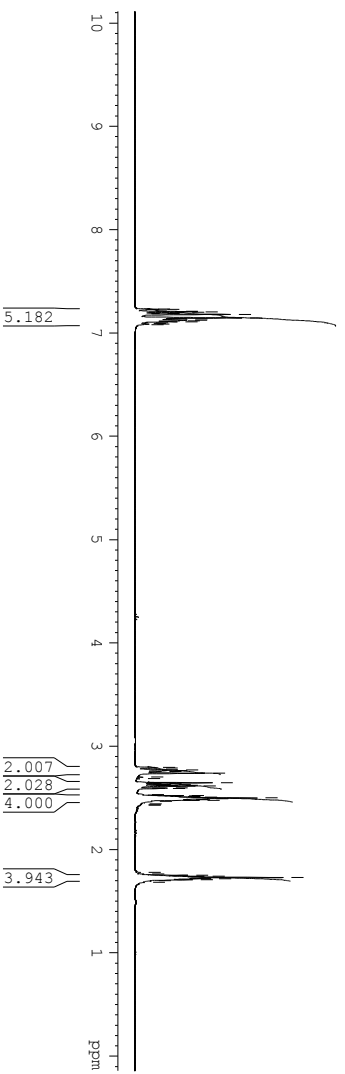
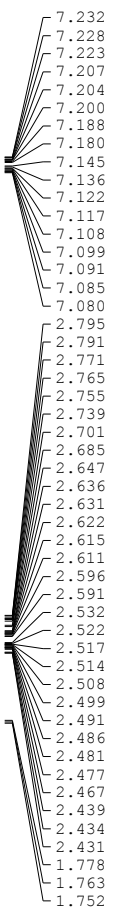
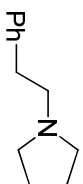


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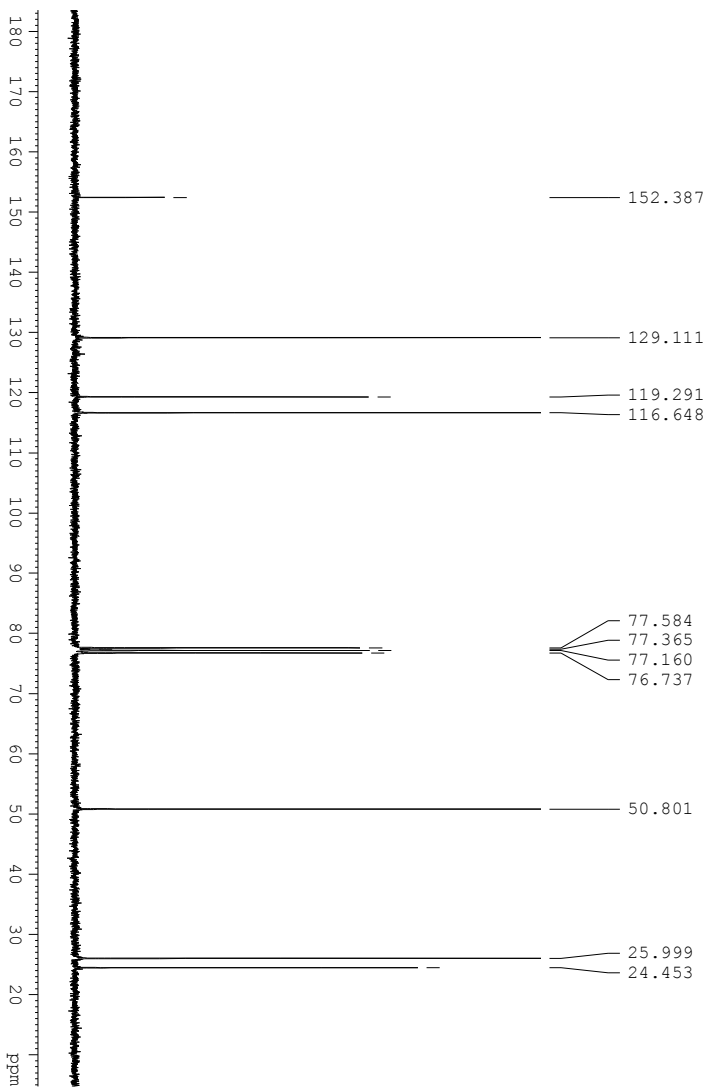
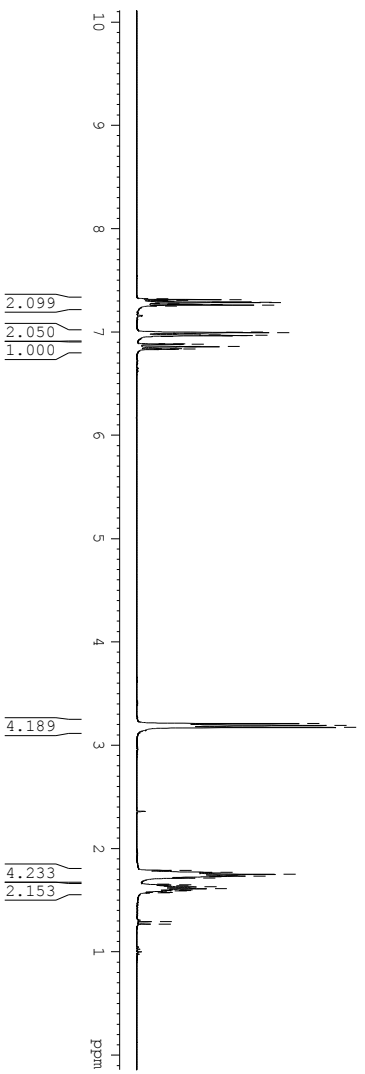
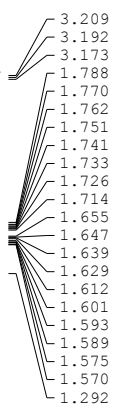
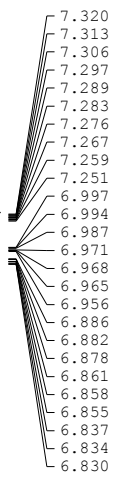
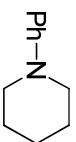
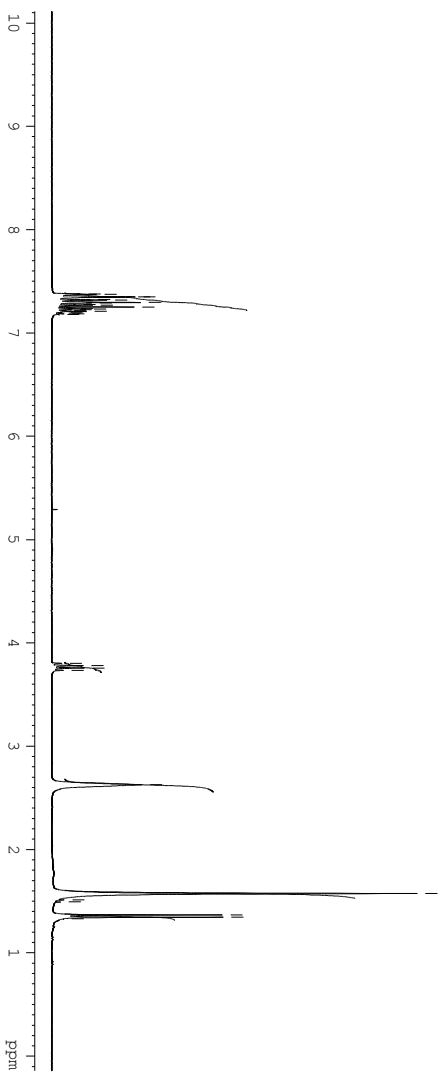
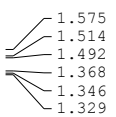
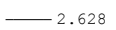
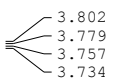
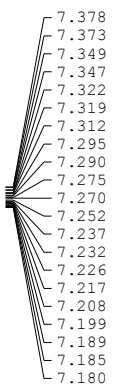
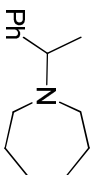


Table 5, Entry 13



5.032

1.000

4.088

8.015

3.035

