



UNIVERSITAT DE
BARCELONA

Enantio- and Diastereoselective Cyclocondensation Reactions. Stereocontrolled Access to Azabicycles and Application to Natural Product Synthesis

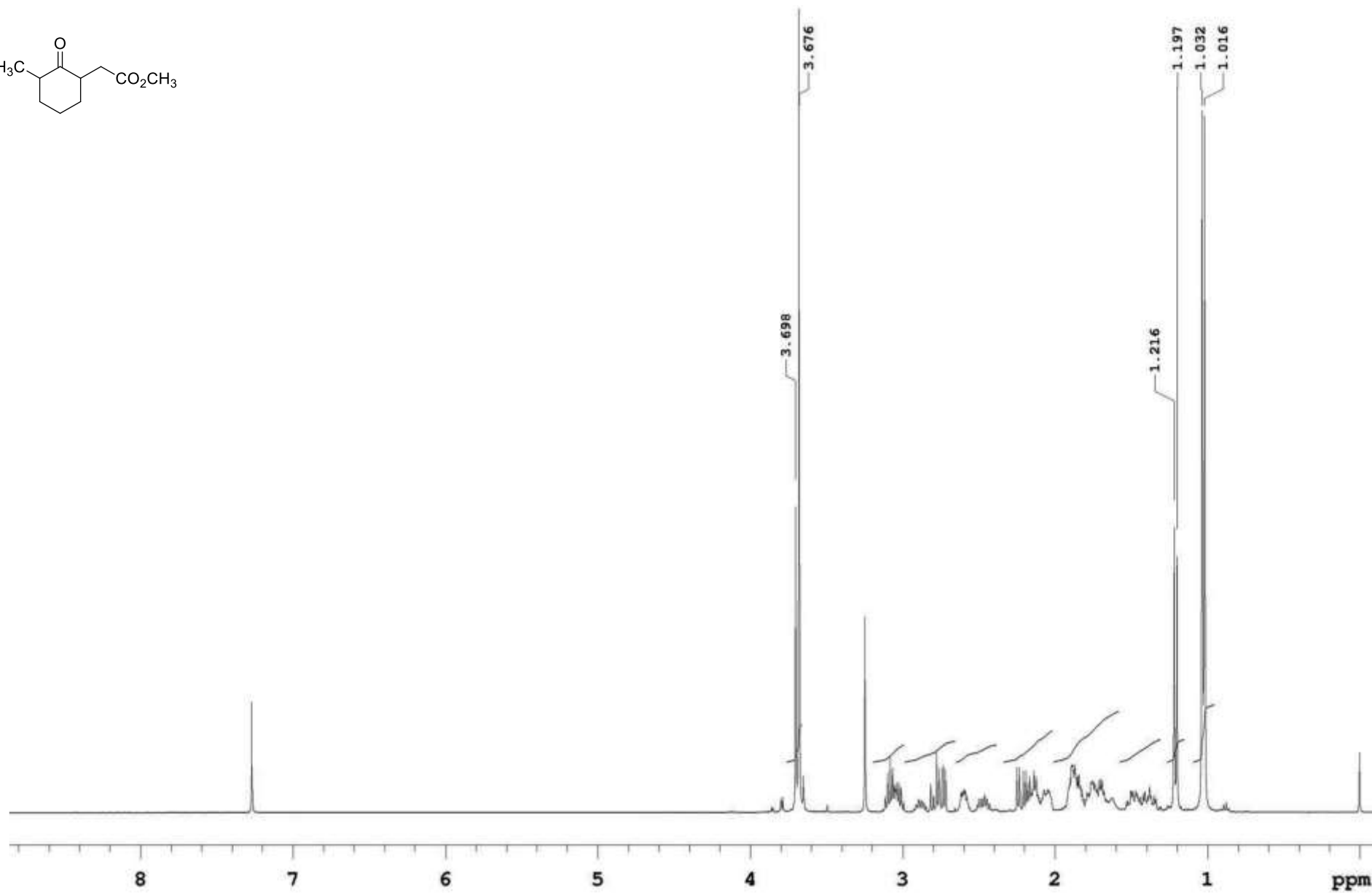
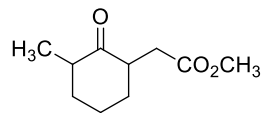
Elena Ghirardi

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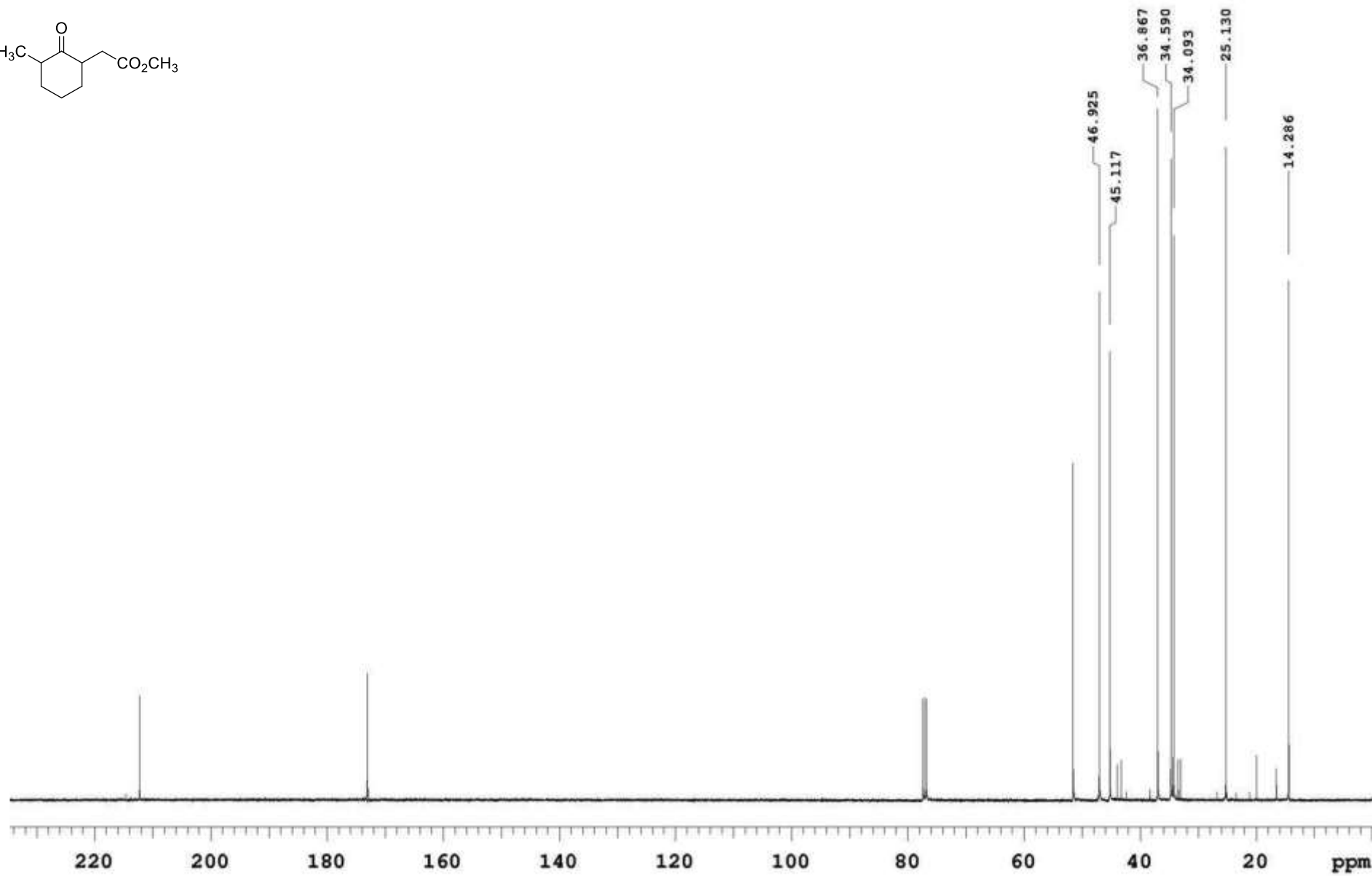
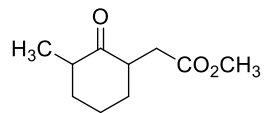
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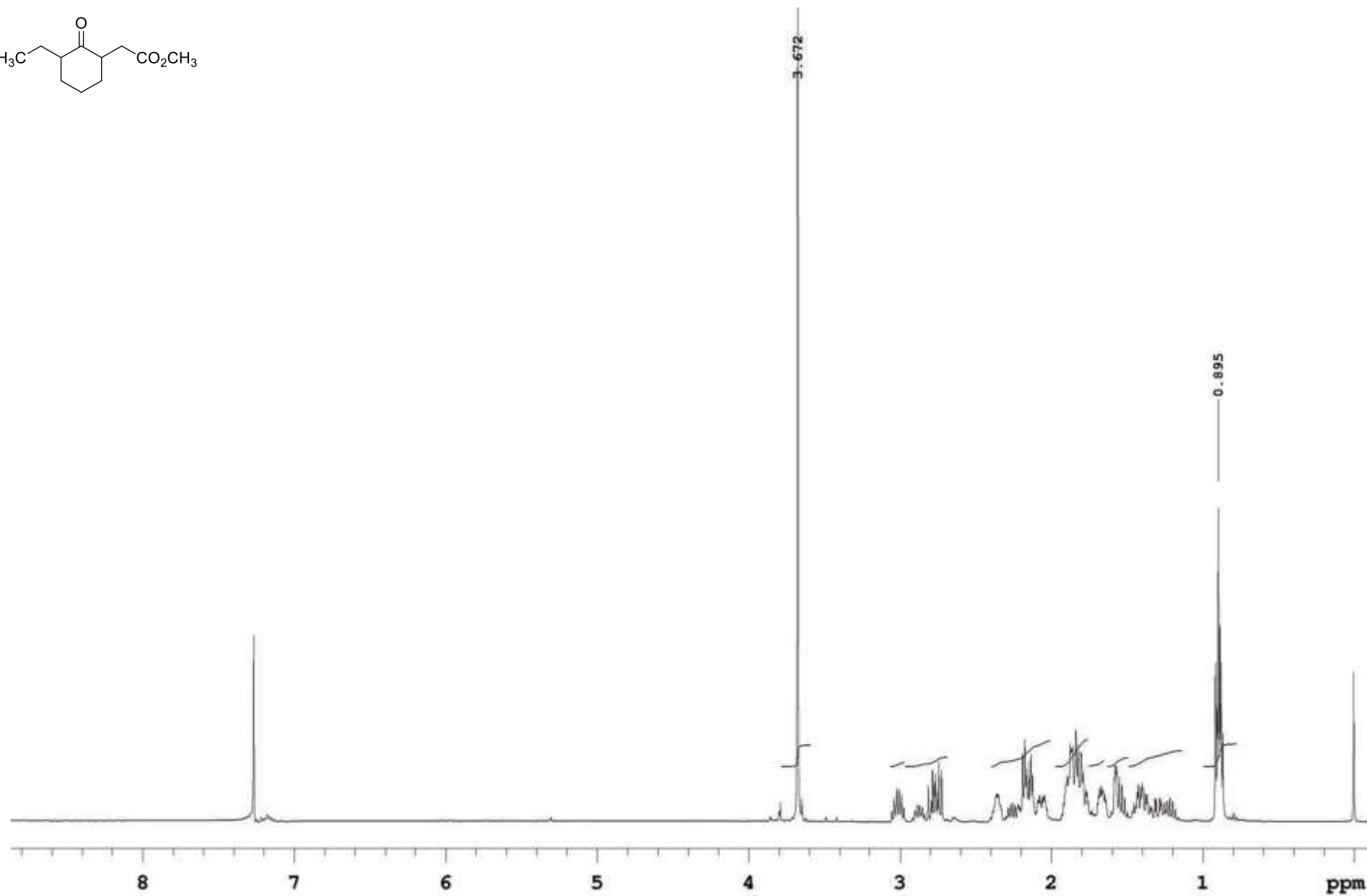
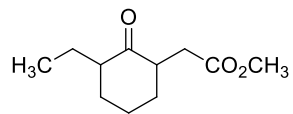
^1H and ^{13}C SPECTRA CHAPTER 4



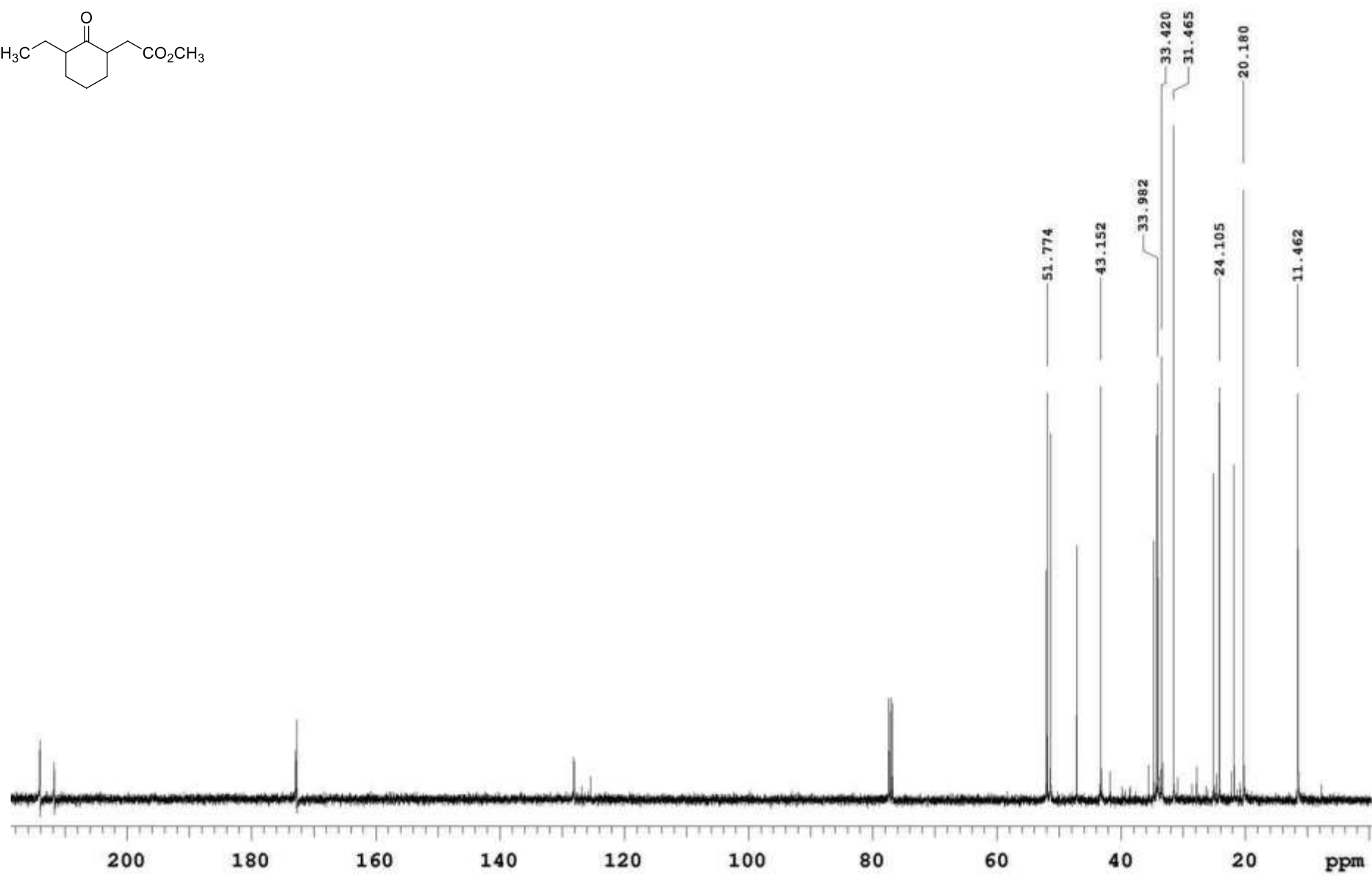
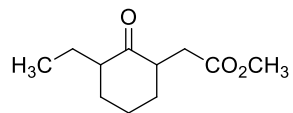
Methyl 3-methyl-2-oxocyclohexaneacetate (97)- $^1\text{H-NMR}$, CDCl_3 , 400 MHz, 25 °C



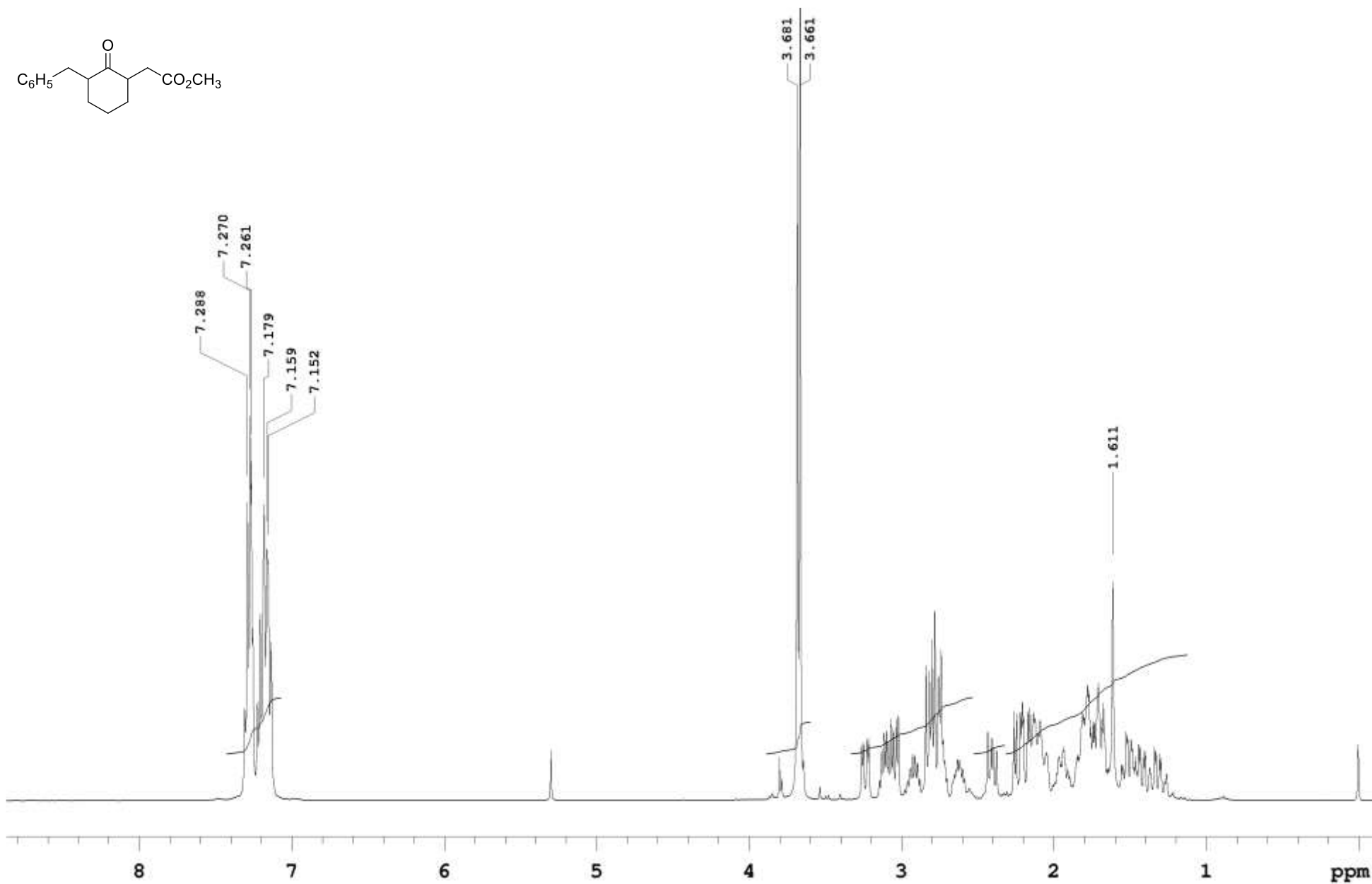
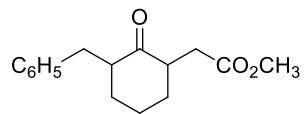
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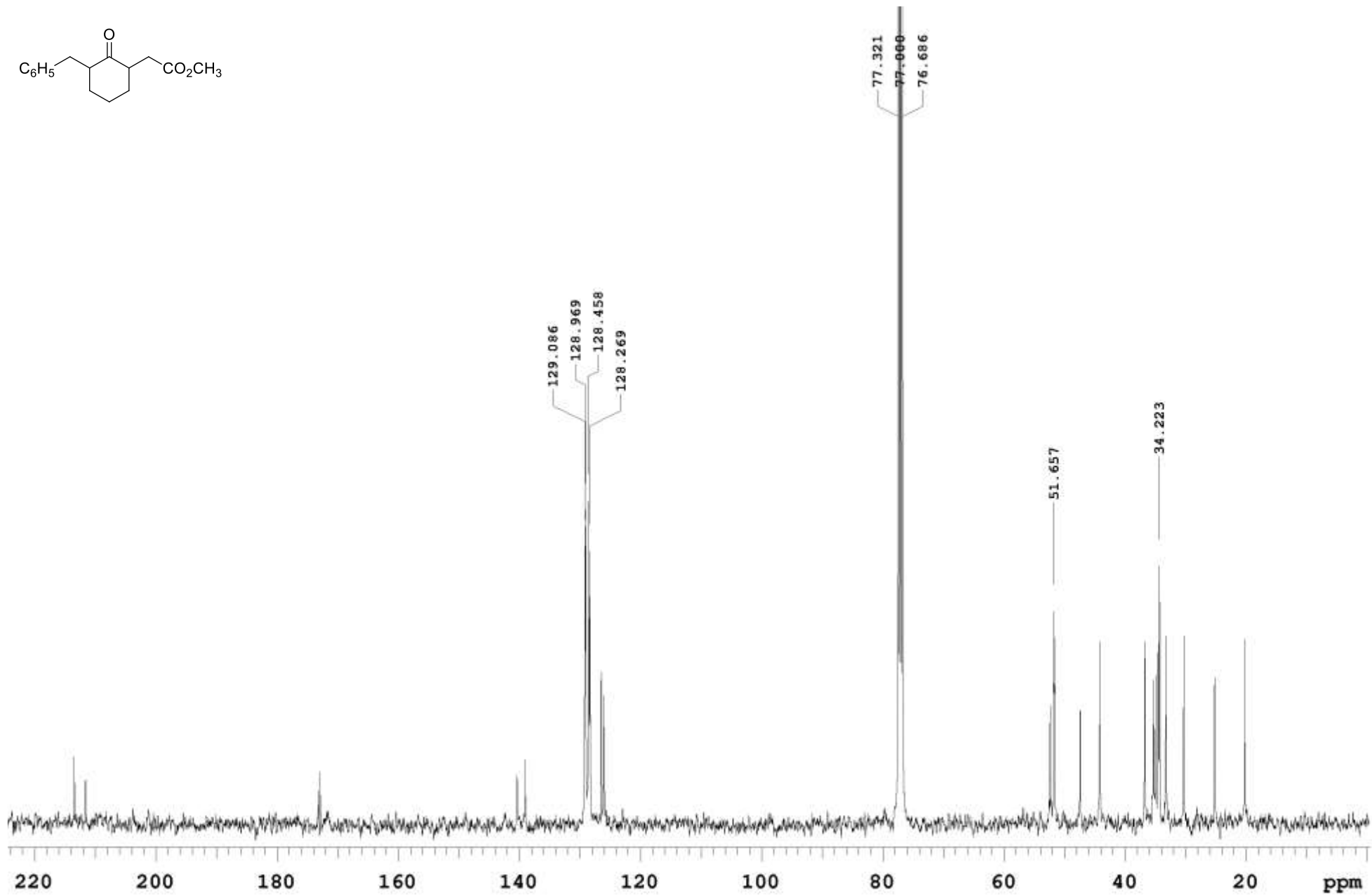
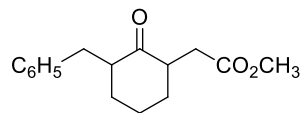
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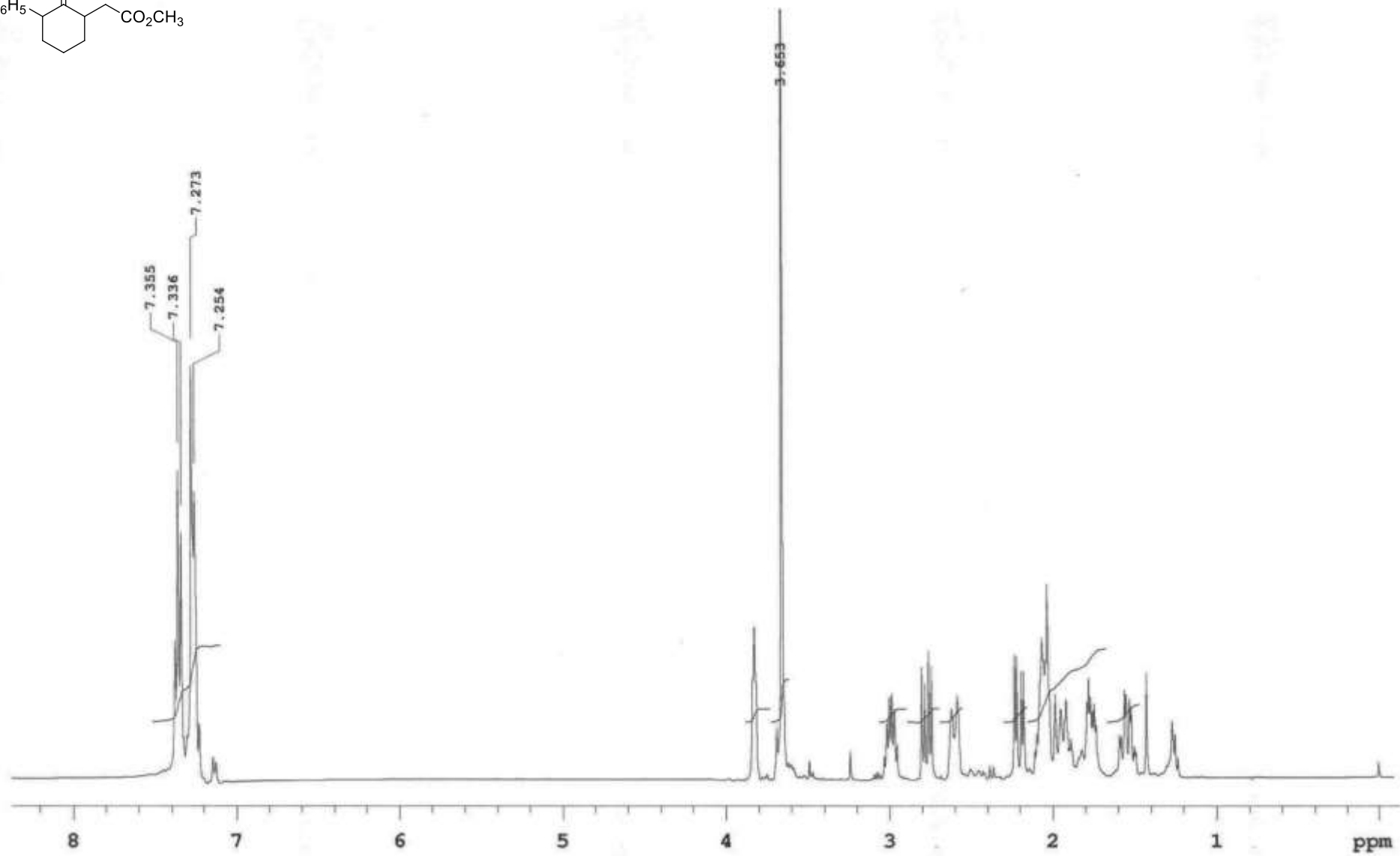
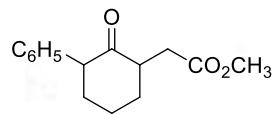
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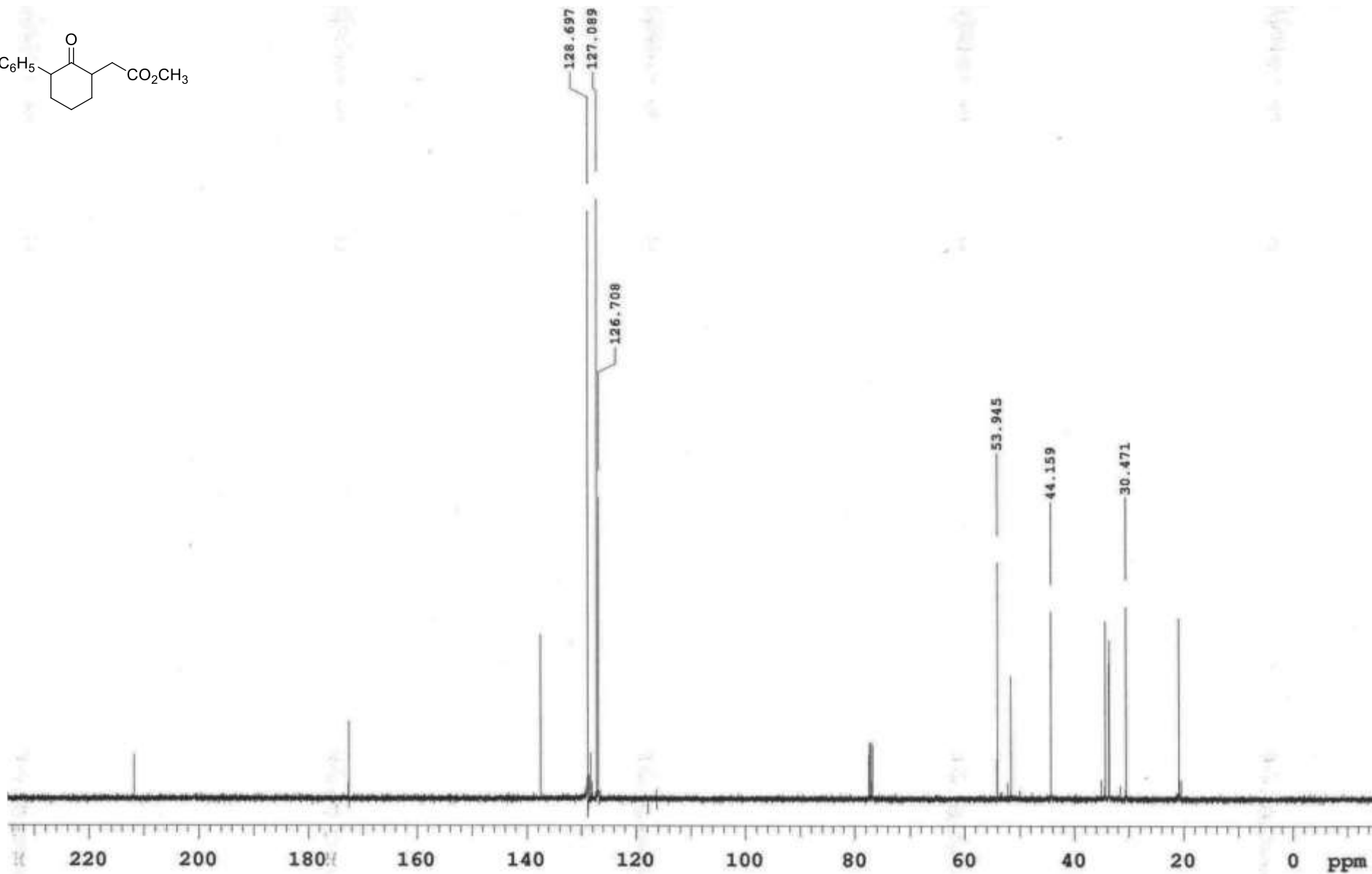
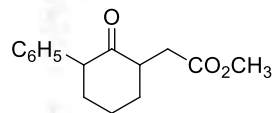
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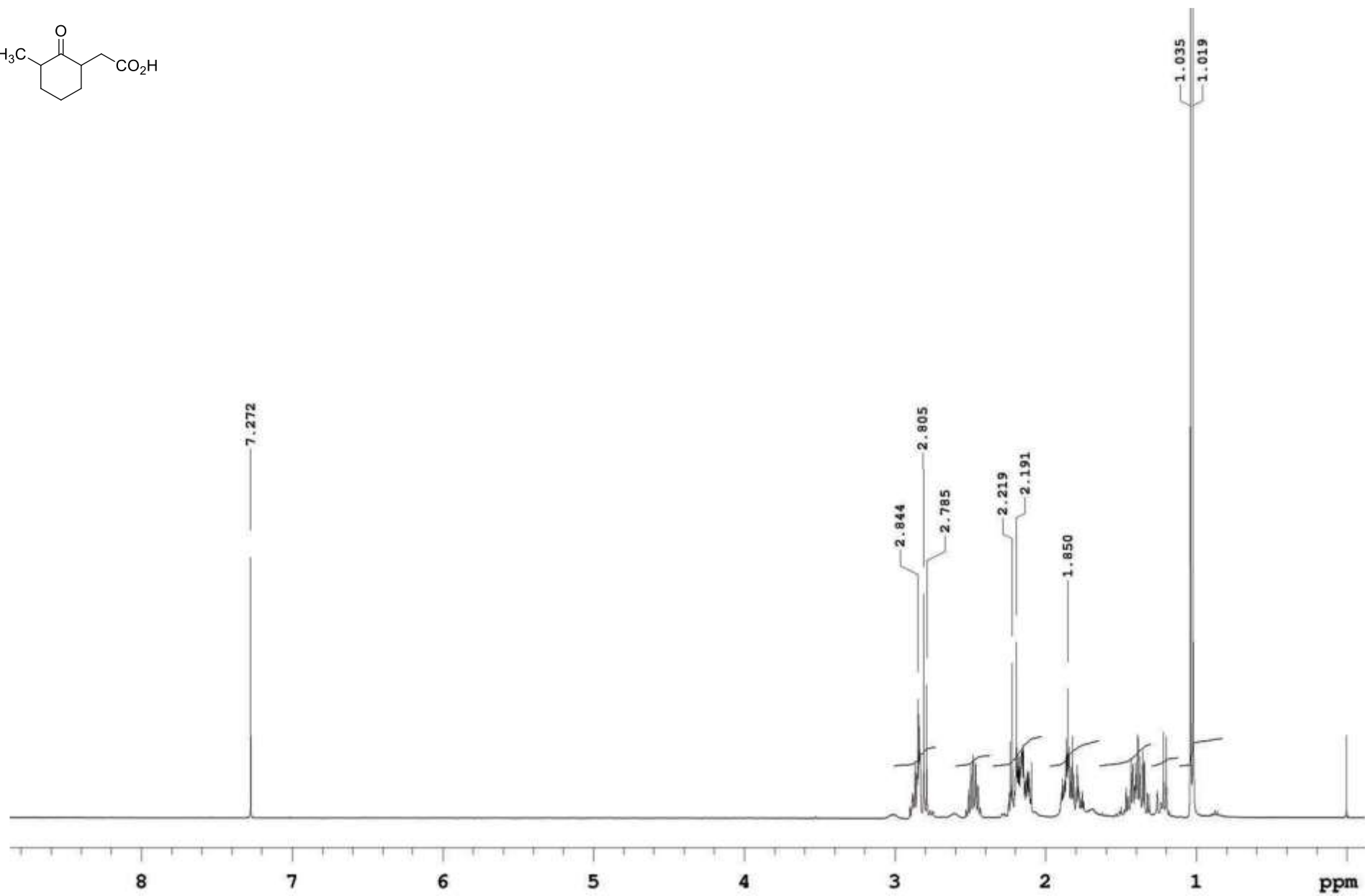
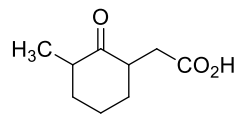
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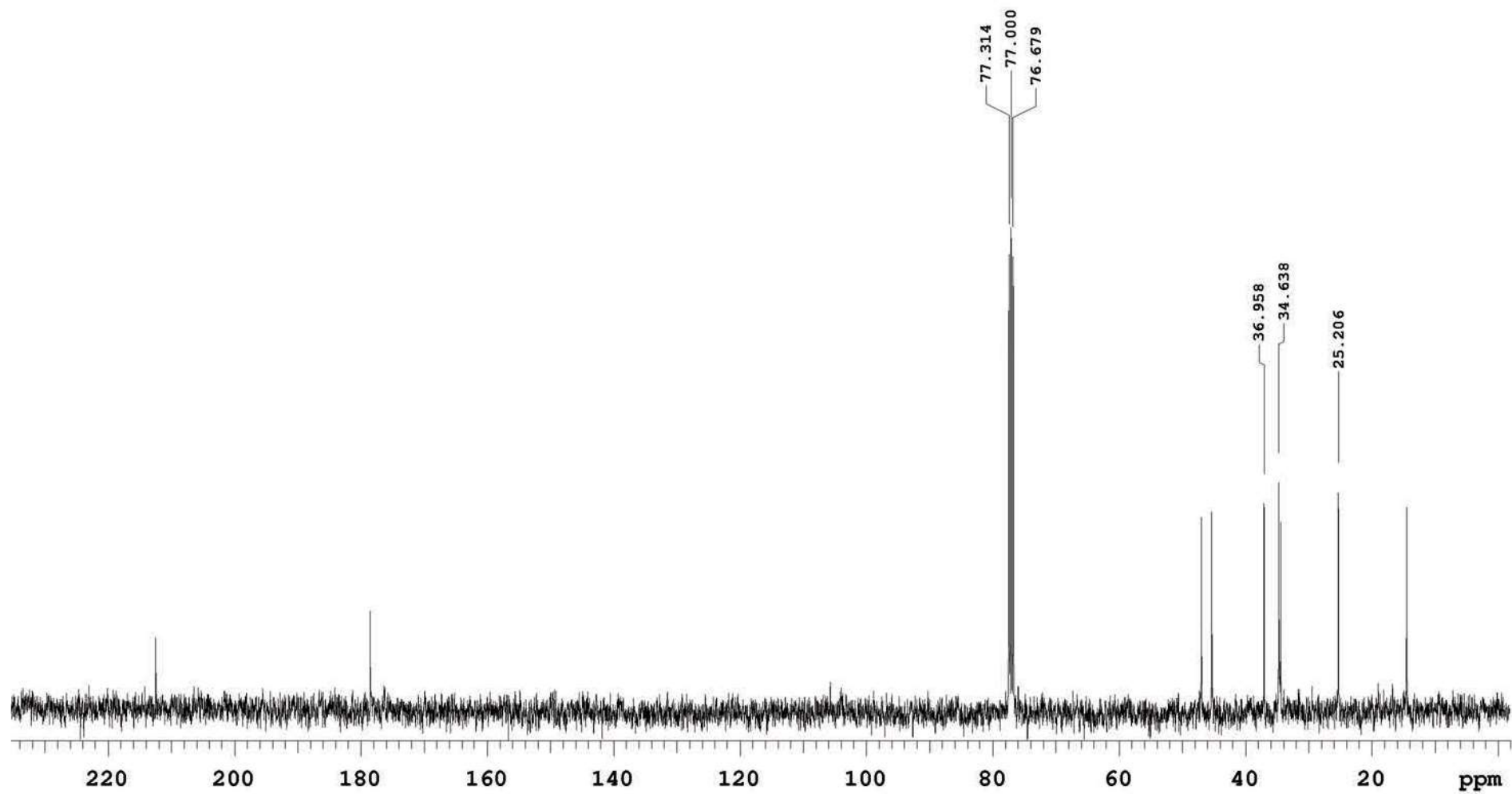
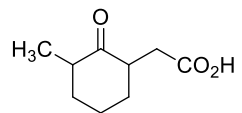
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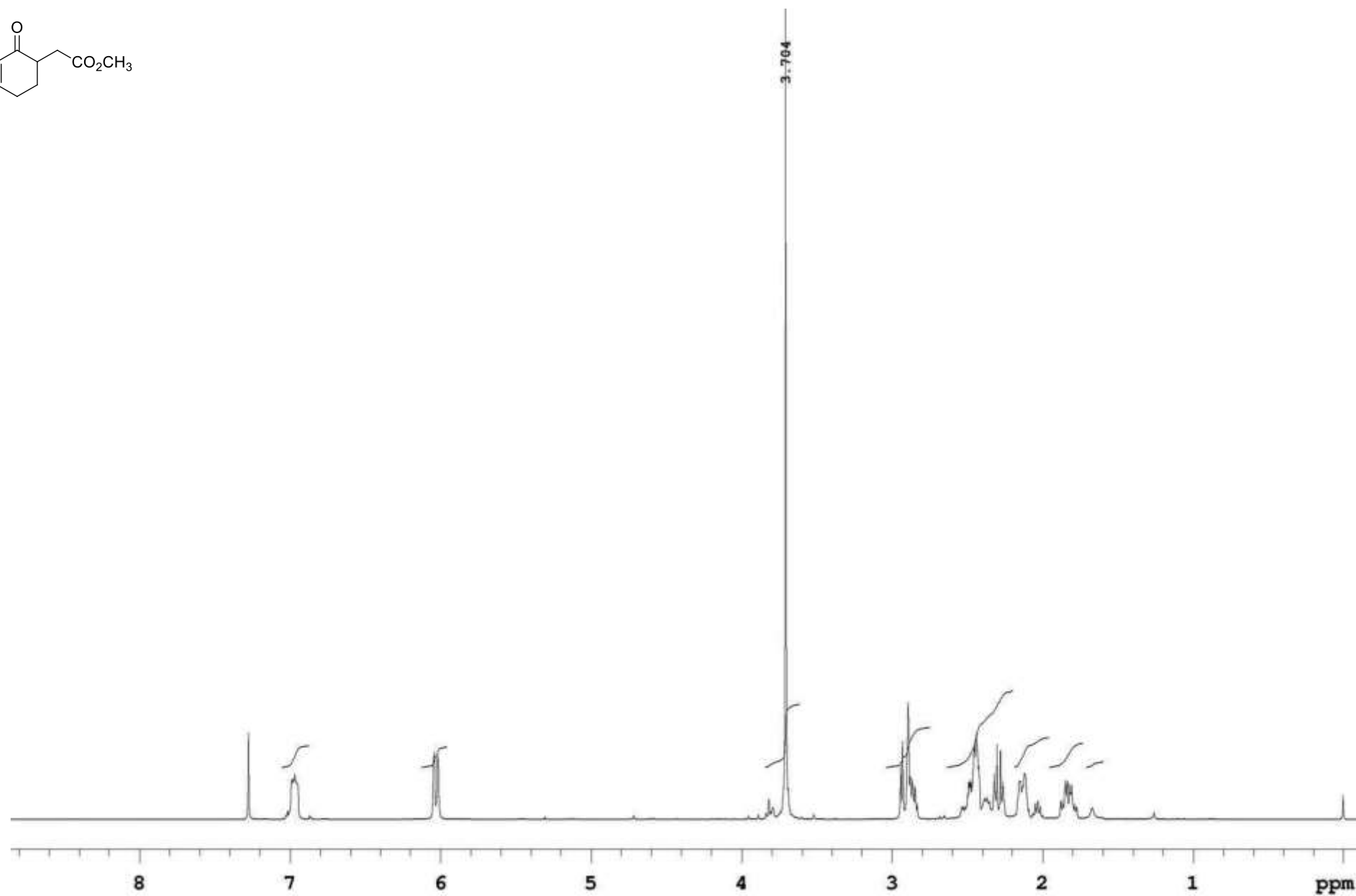
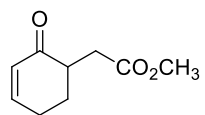
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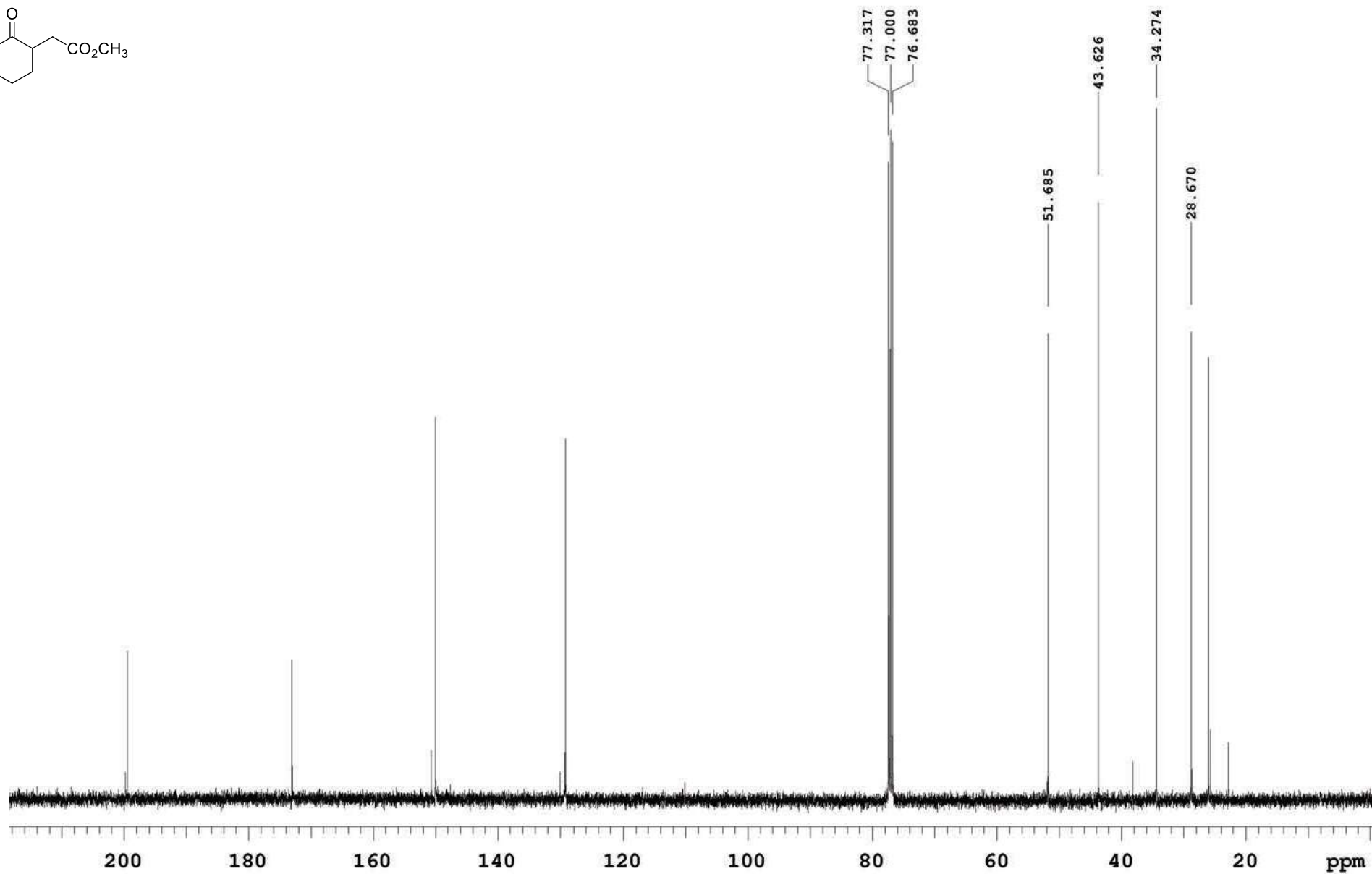
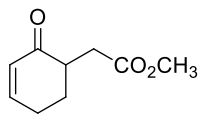
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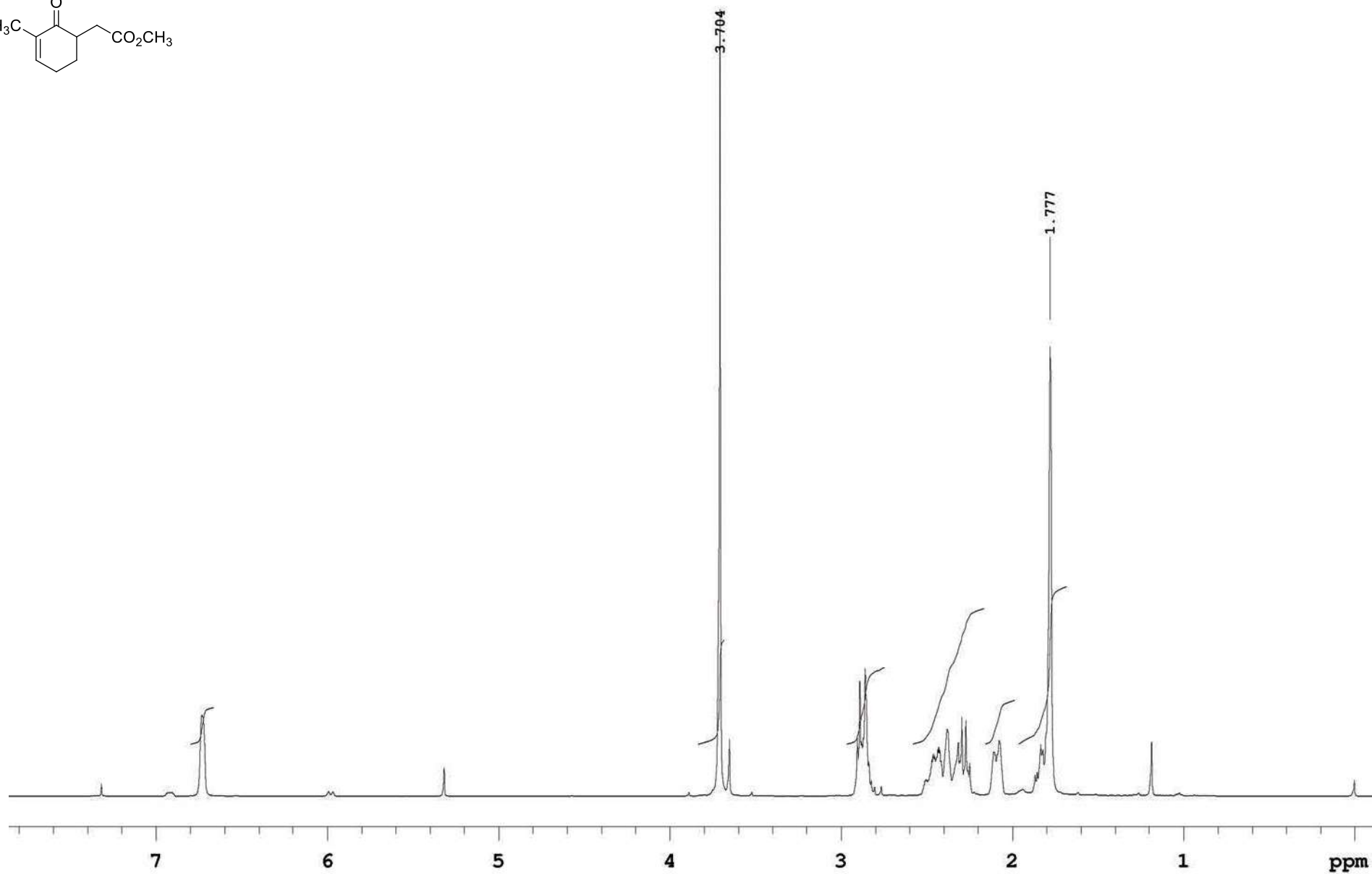
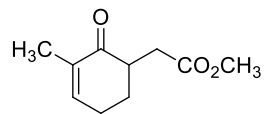
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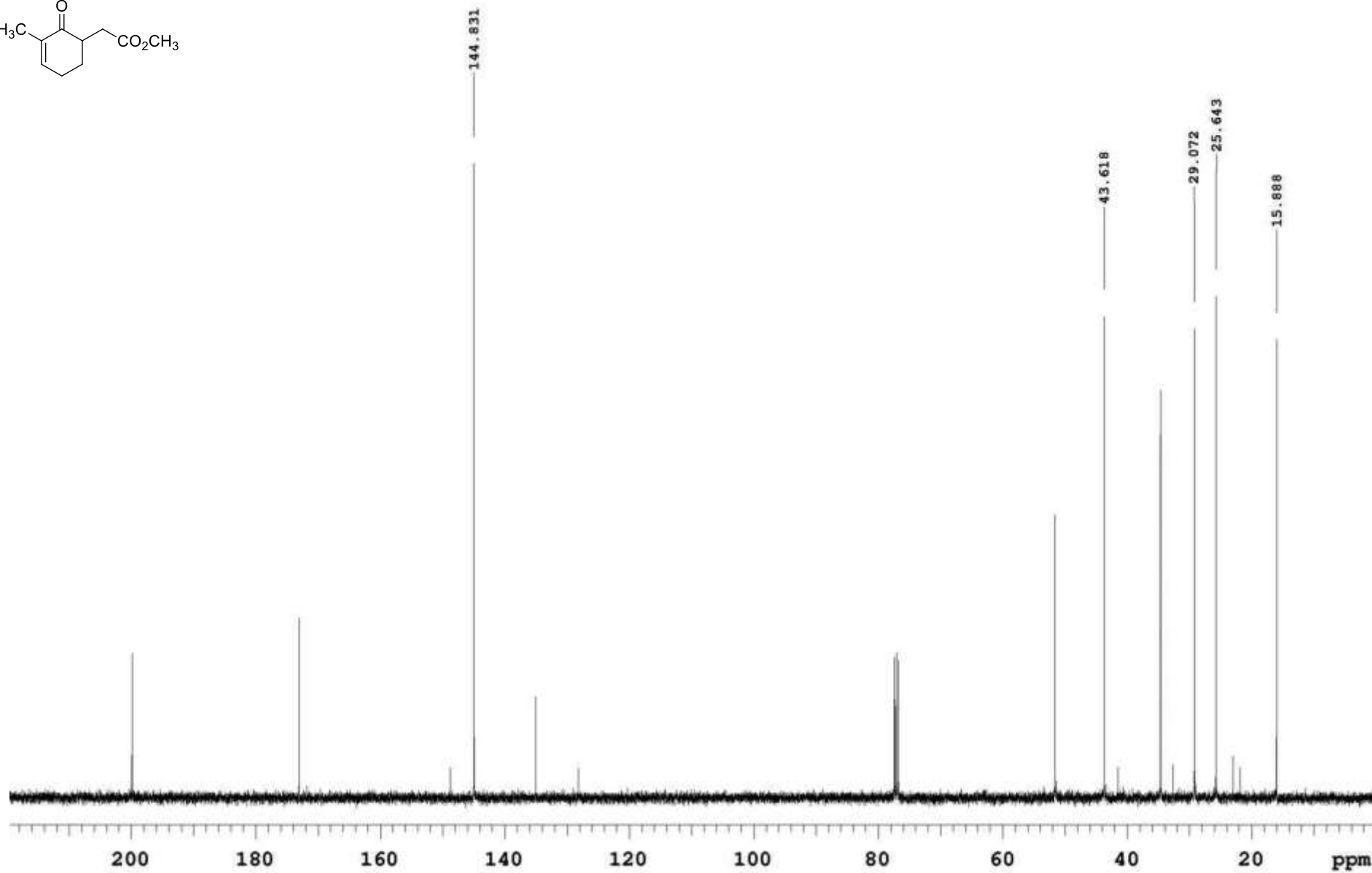
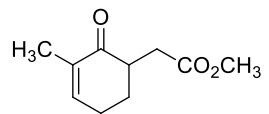
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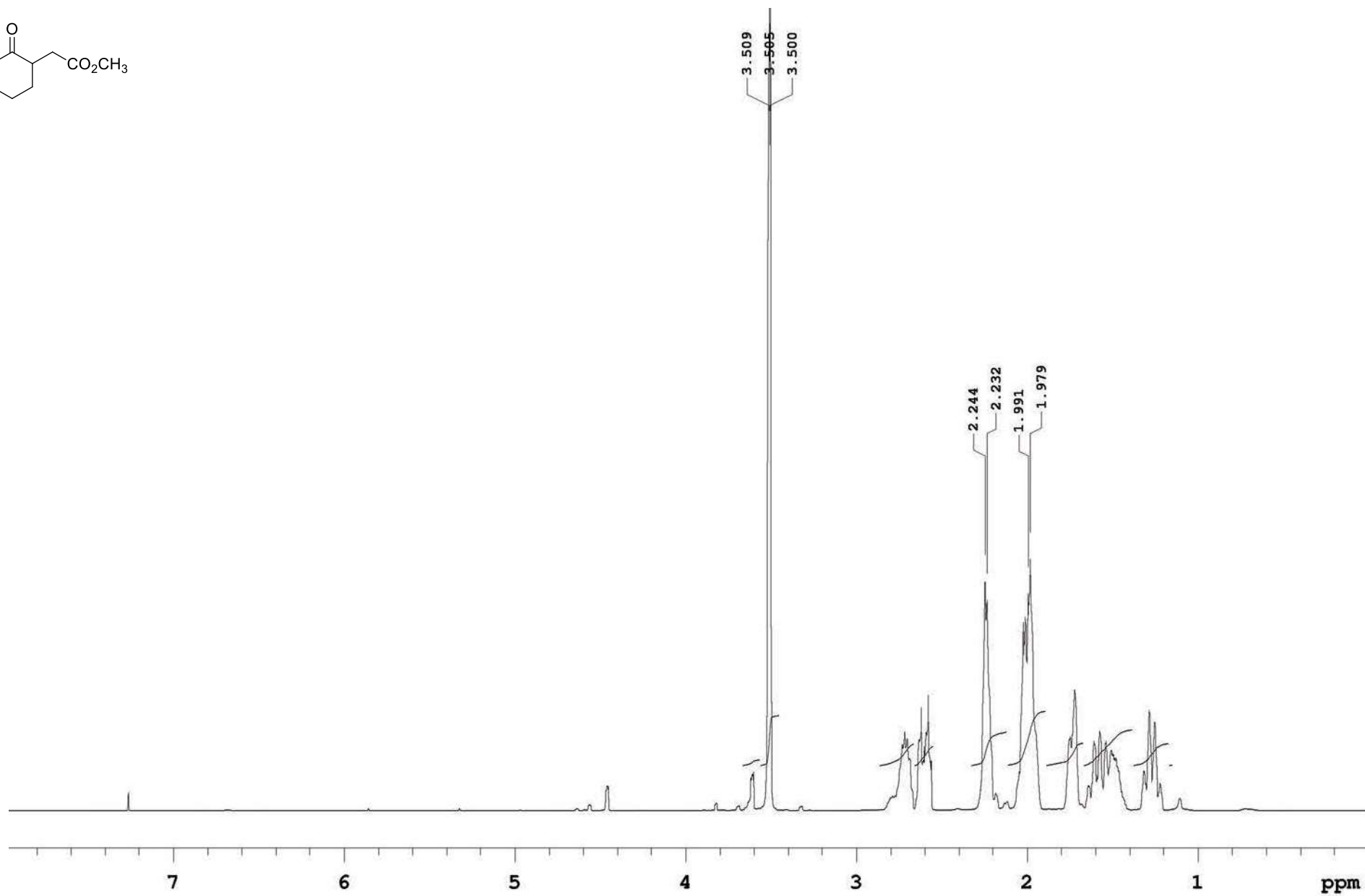
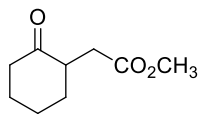
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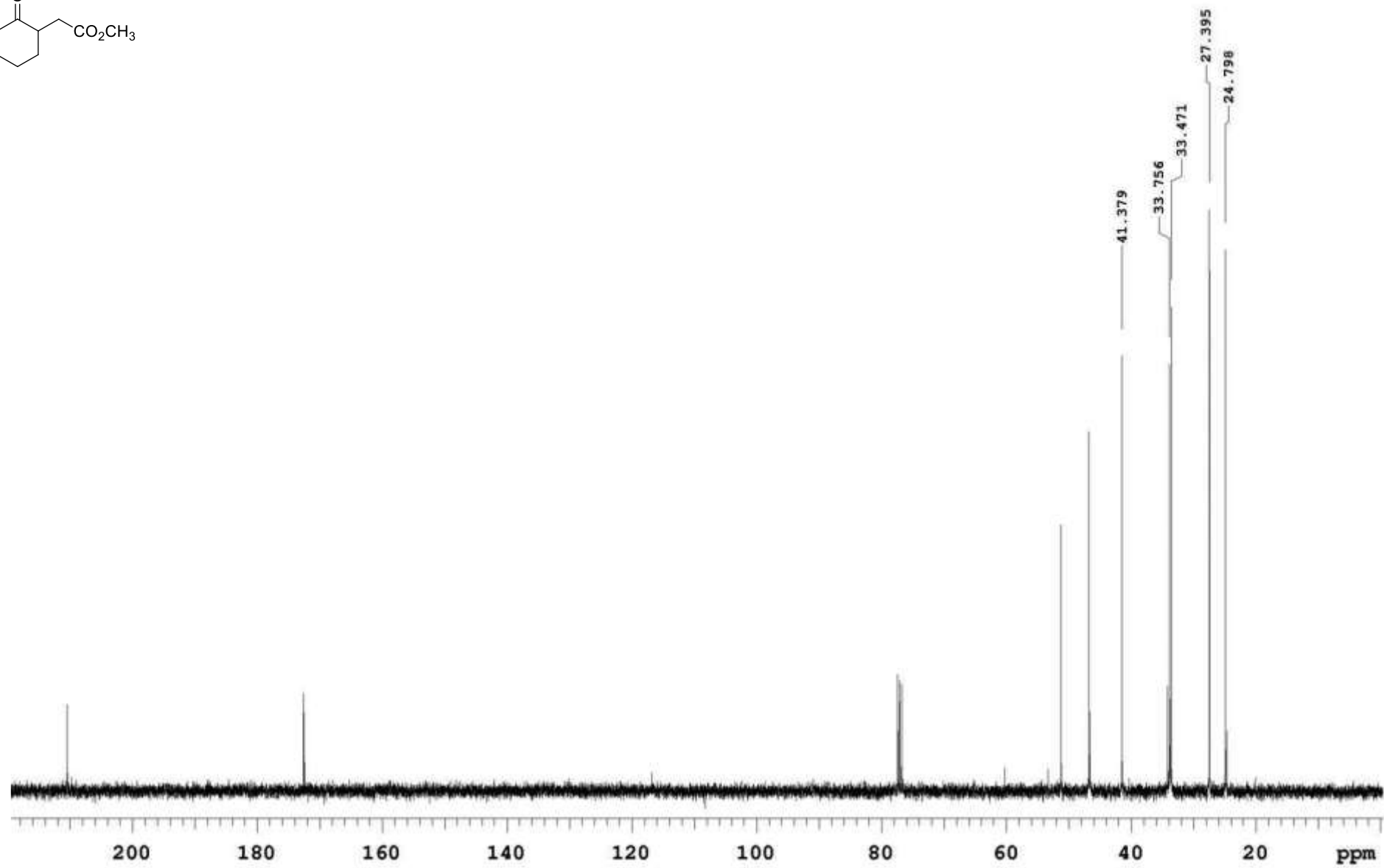
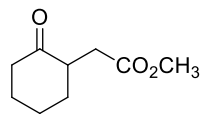
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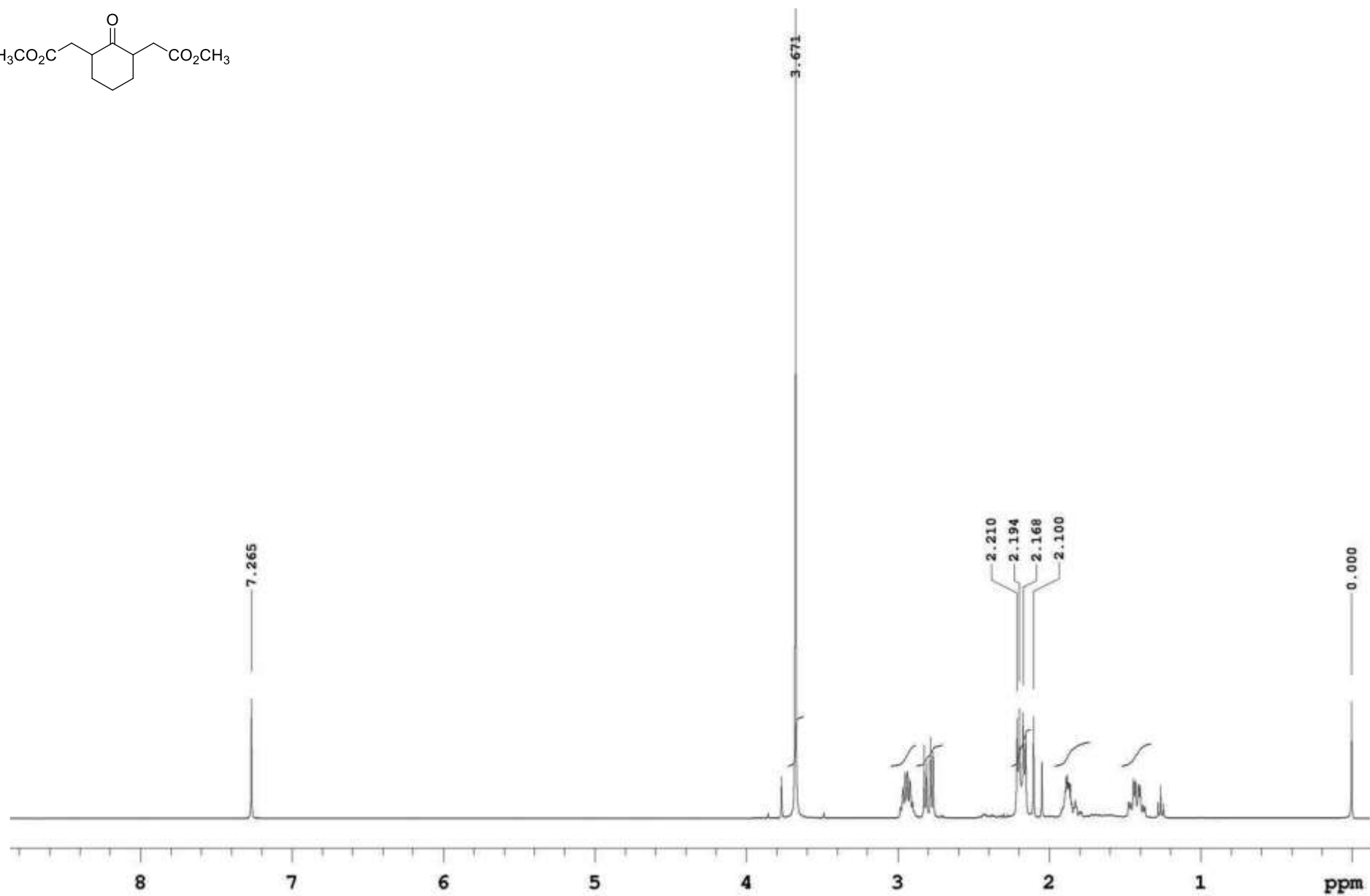
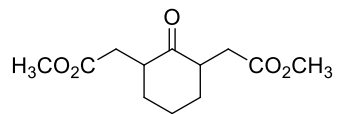
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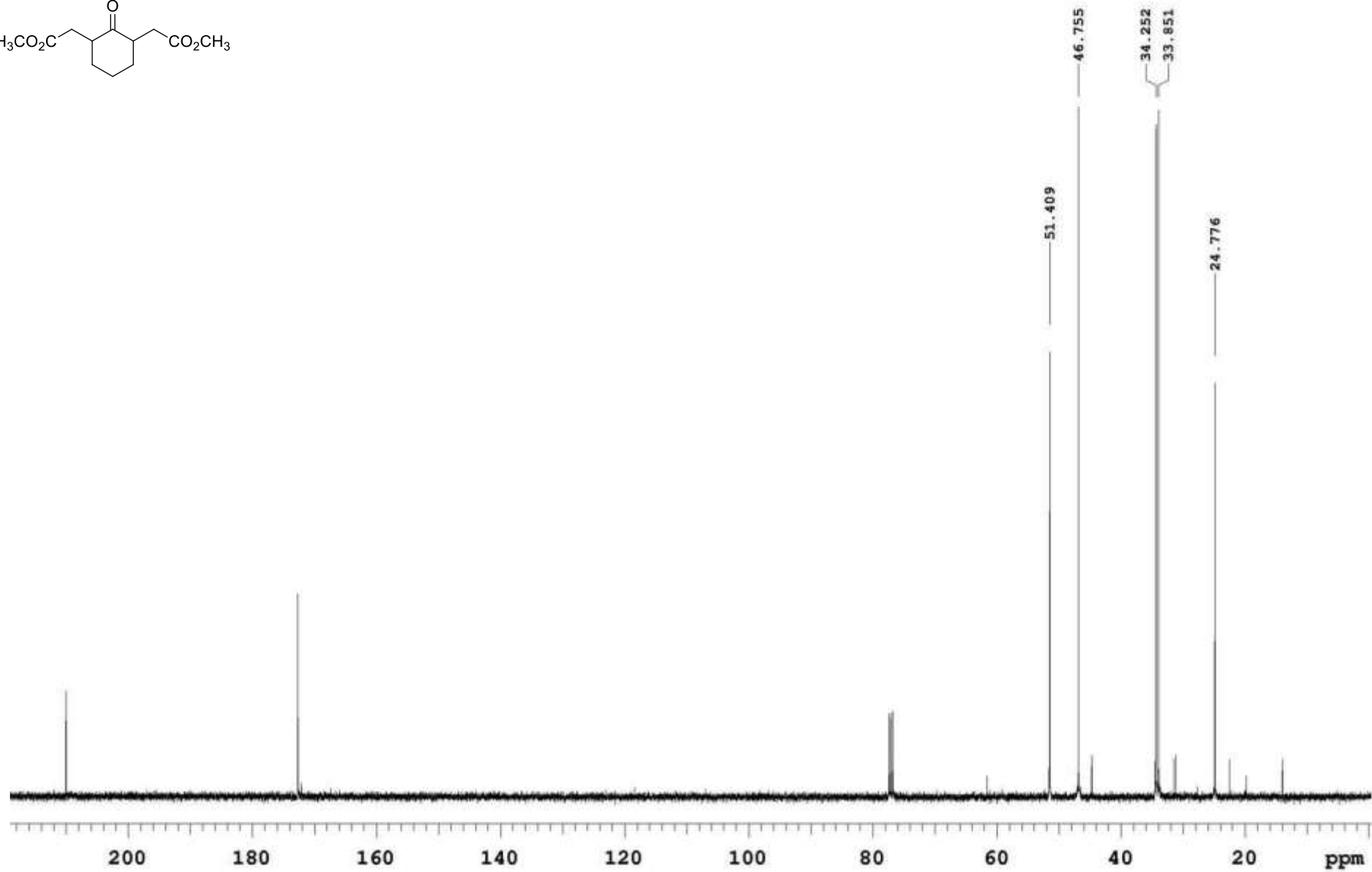
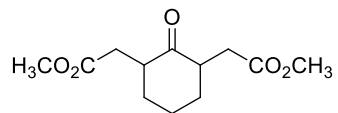
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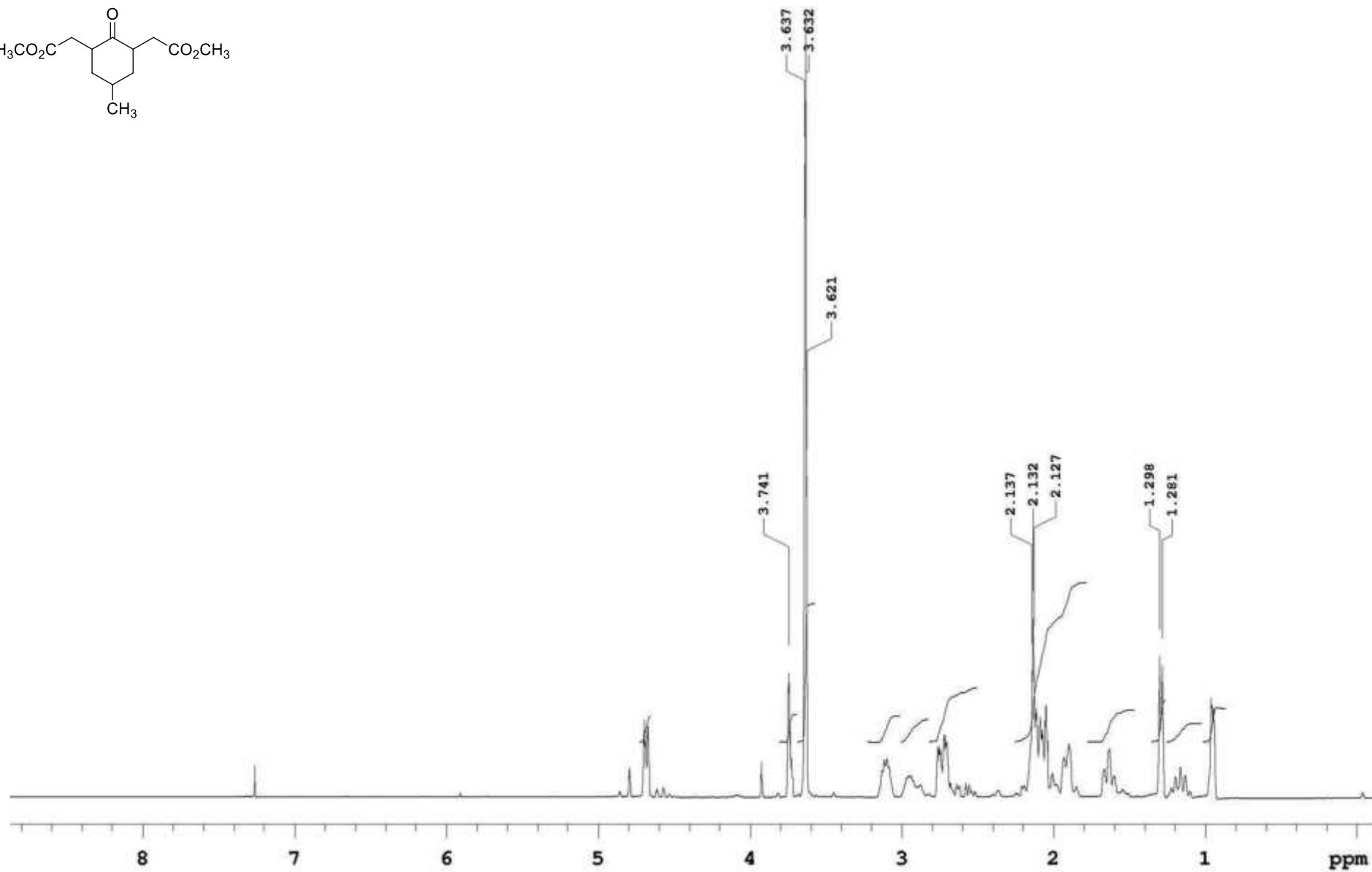
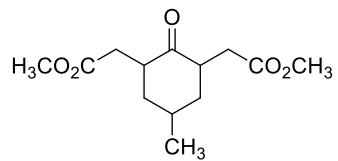
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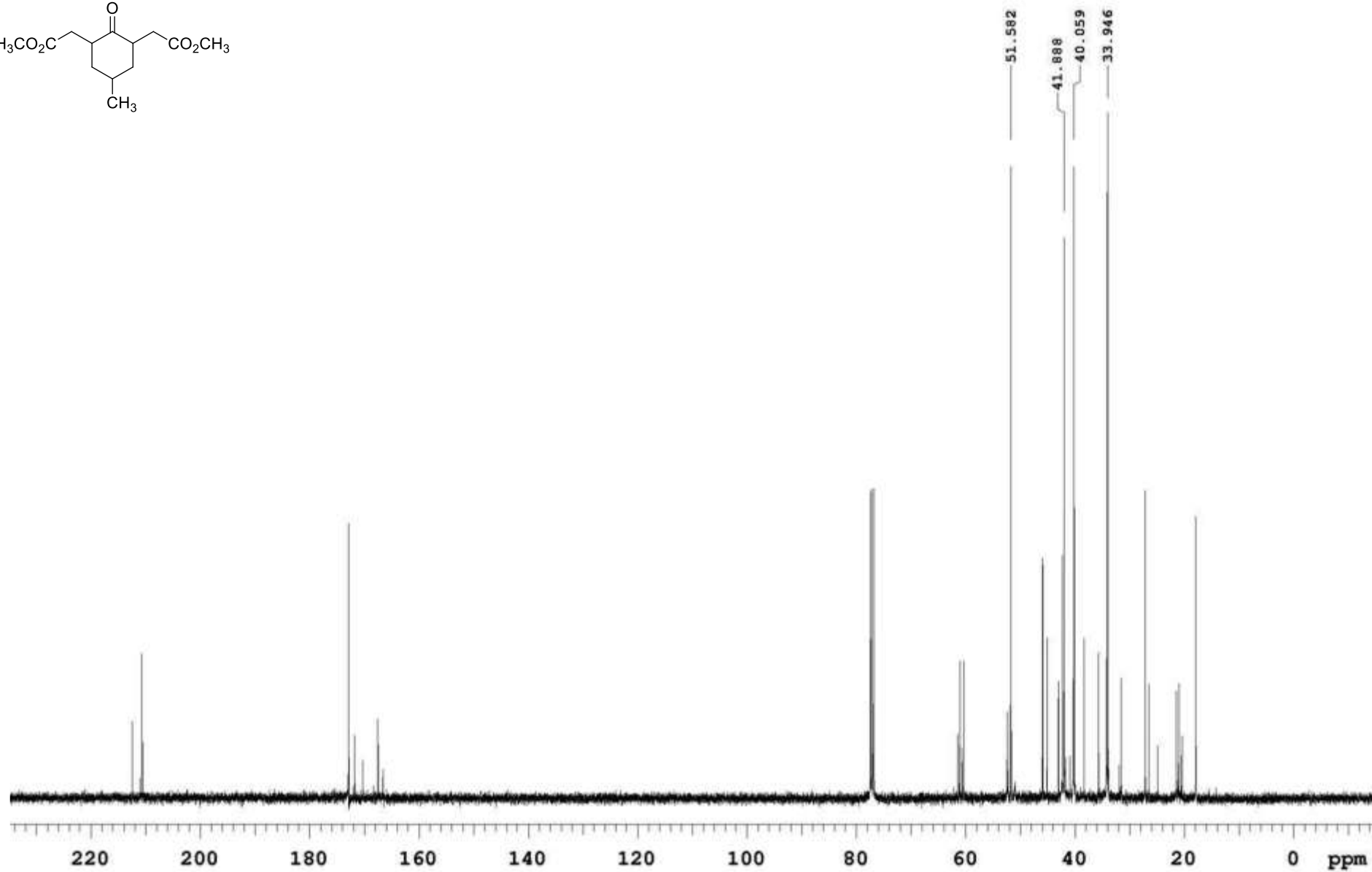
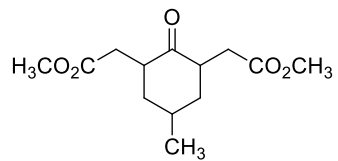
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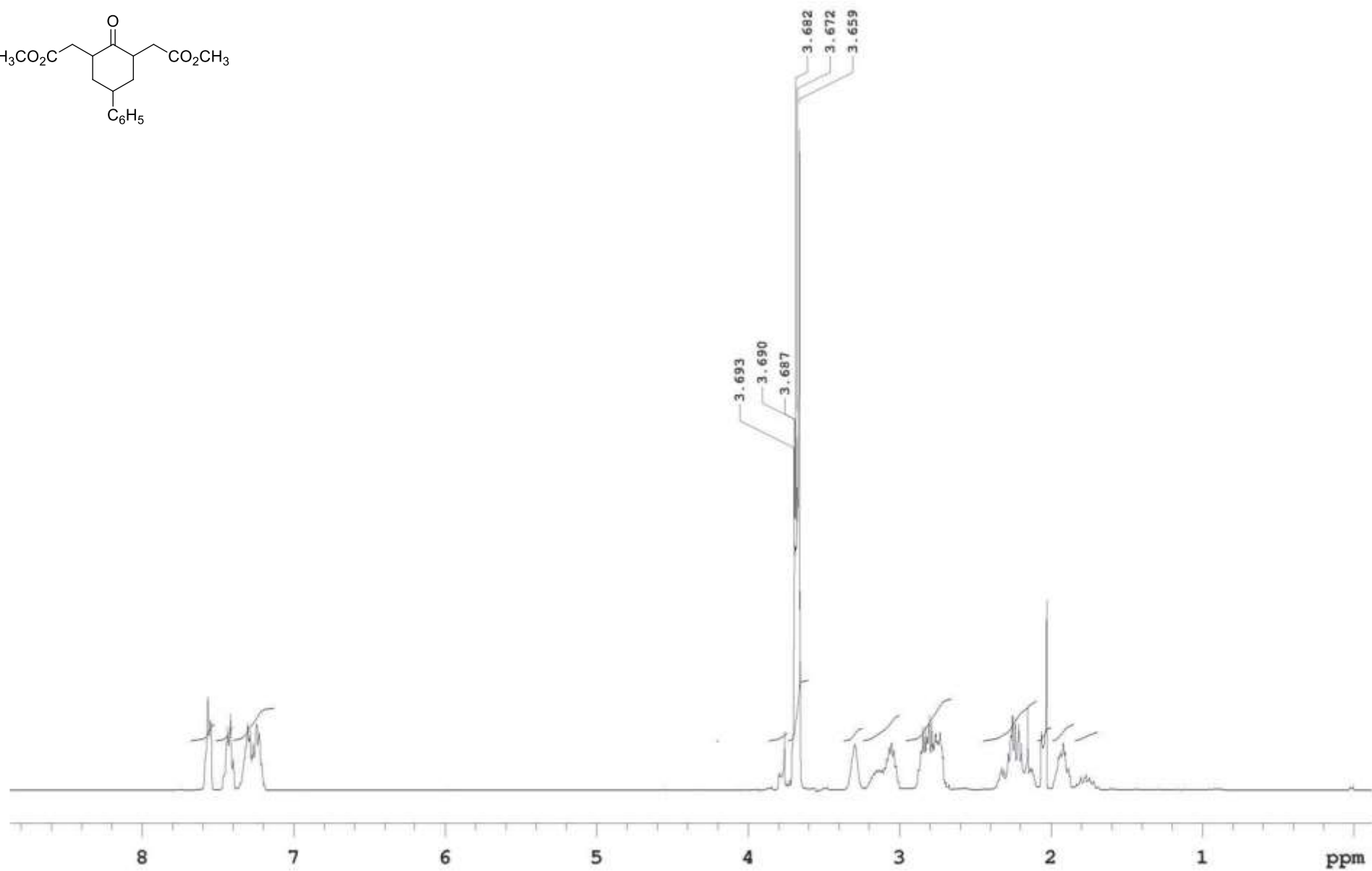
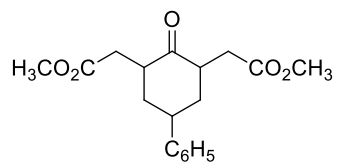
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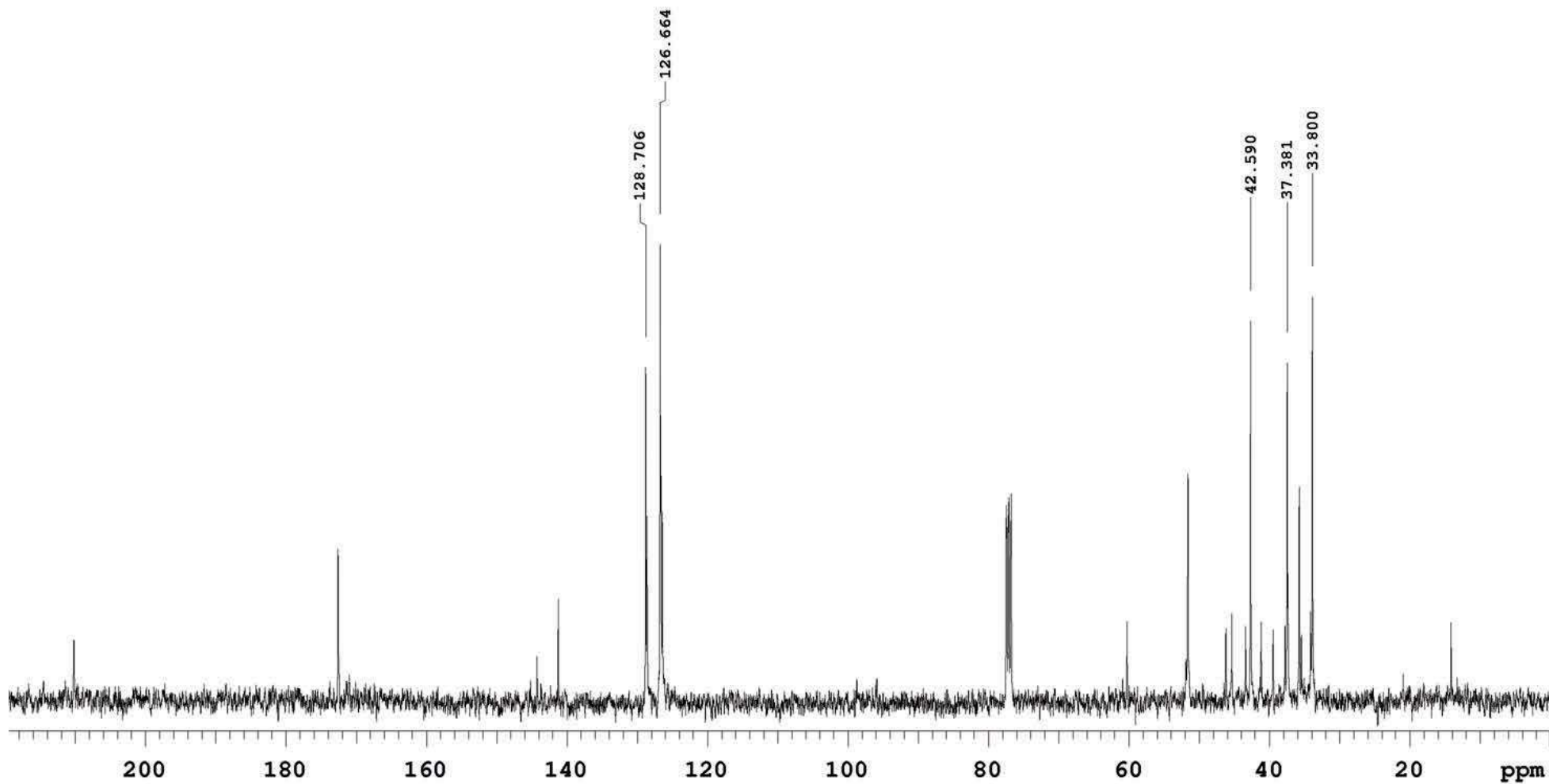
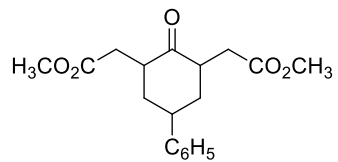
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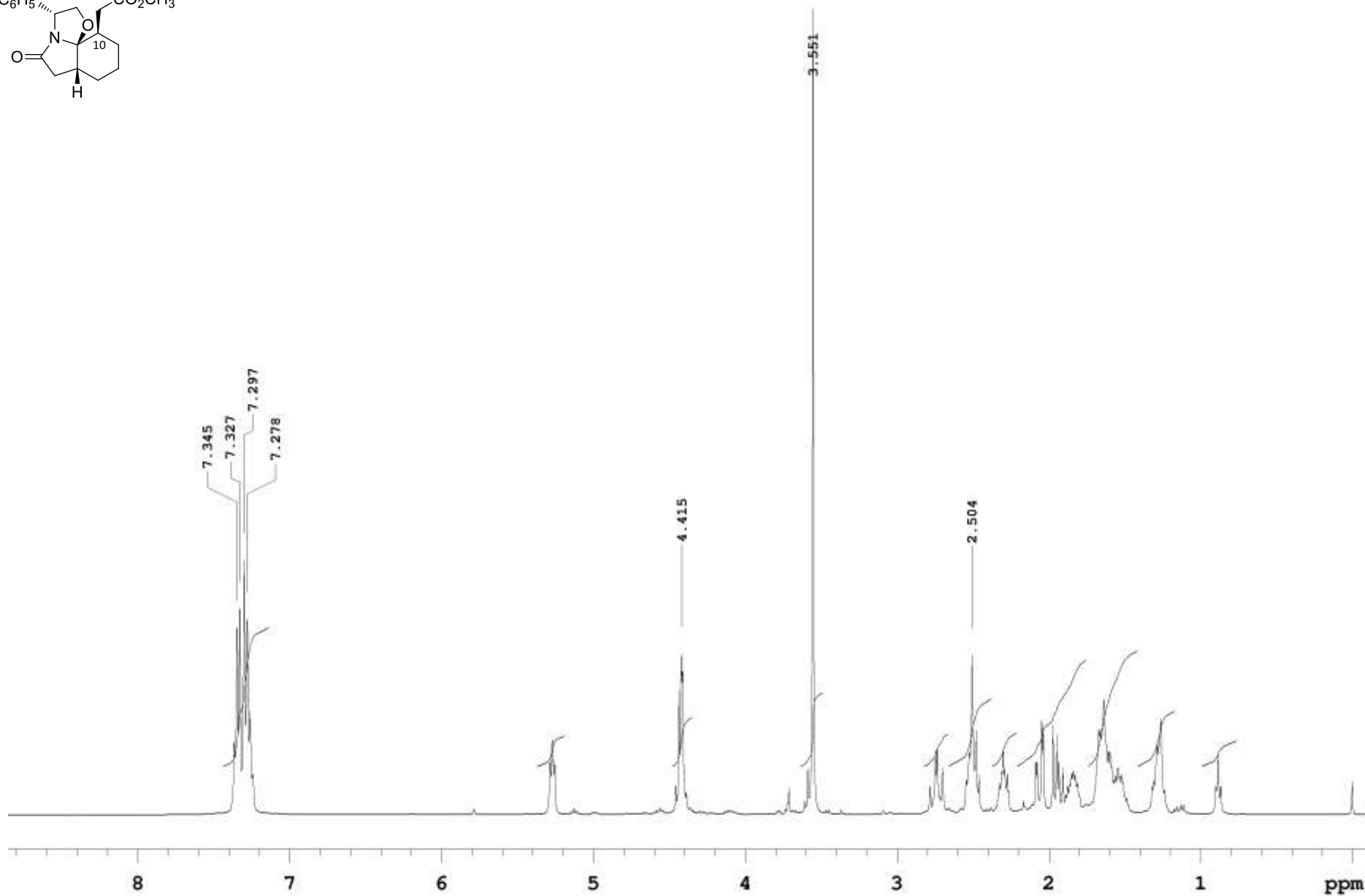
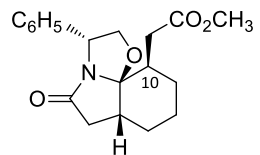
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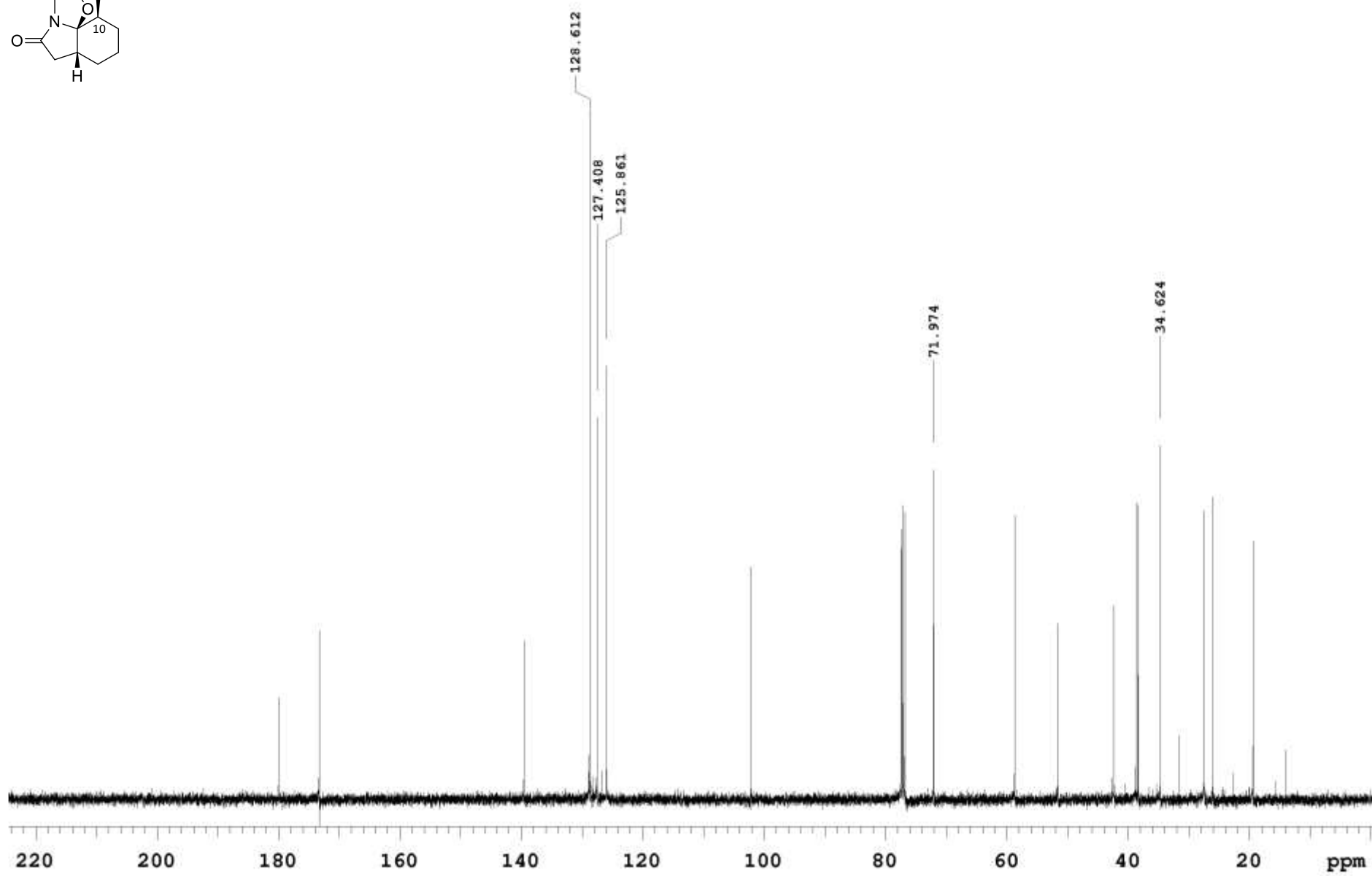
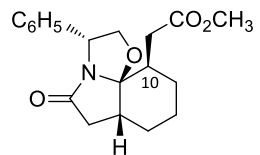
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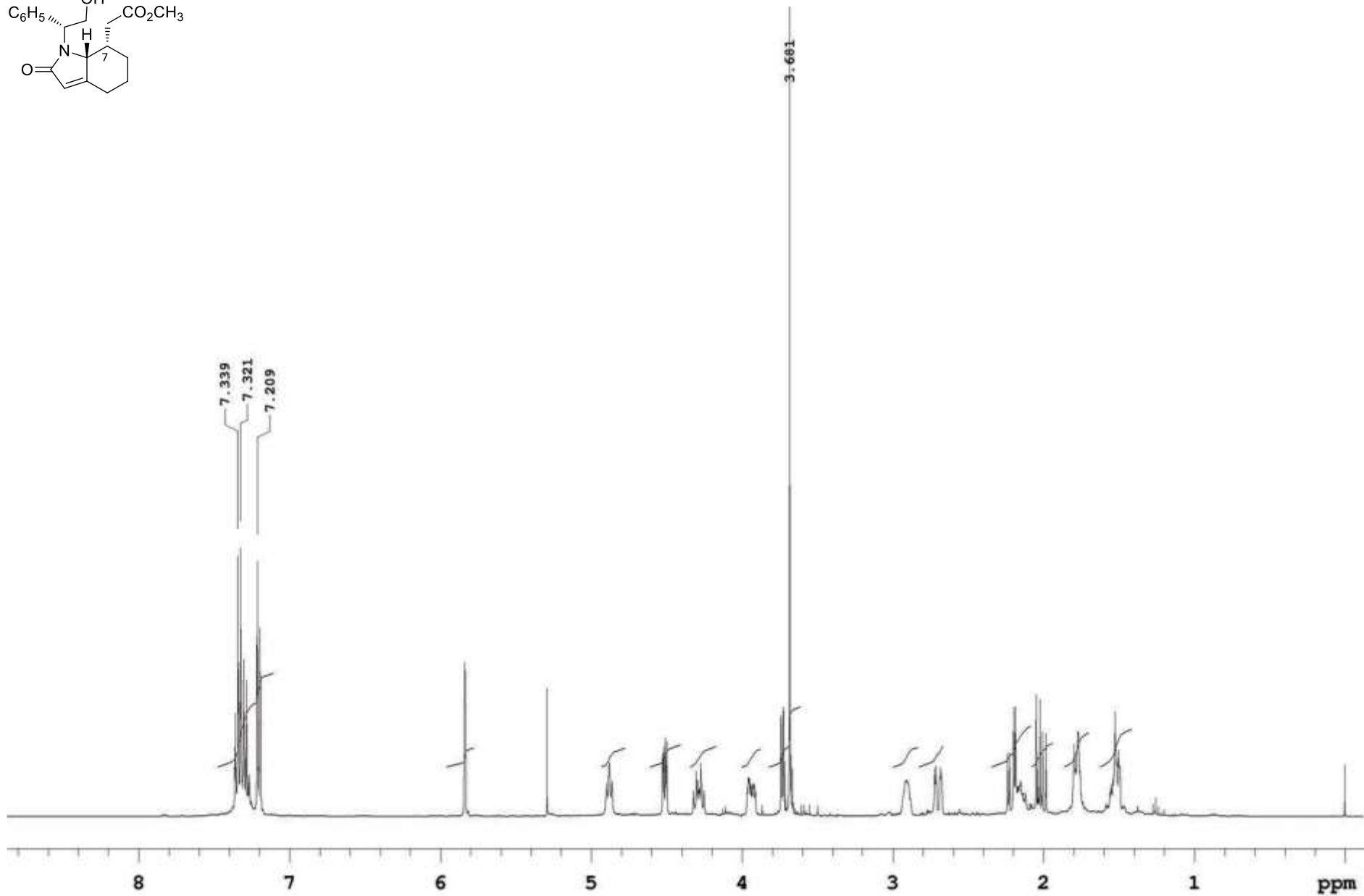
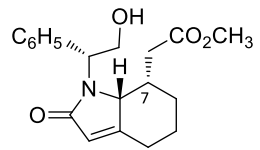
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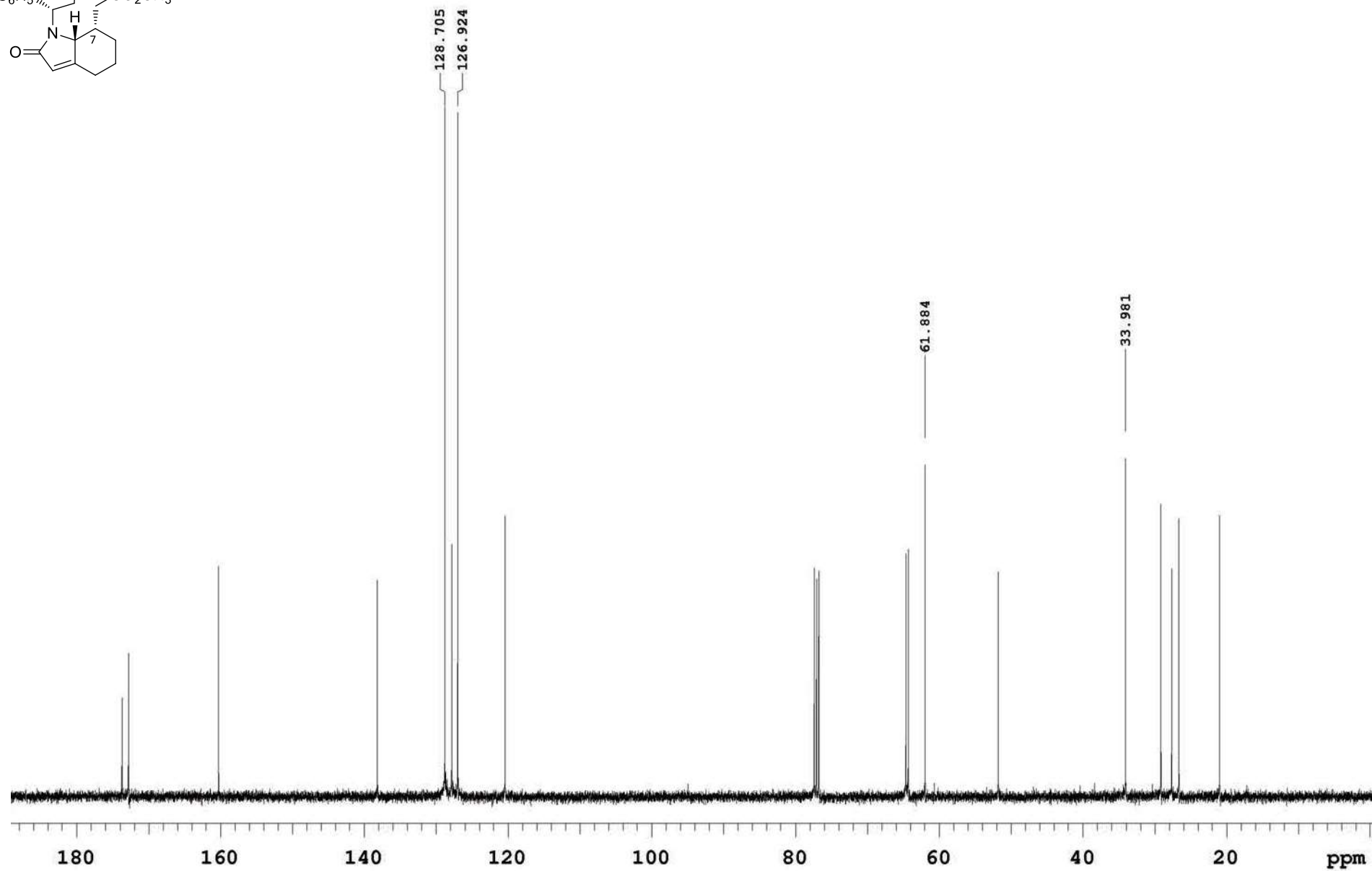
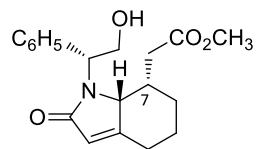
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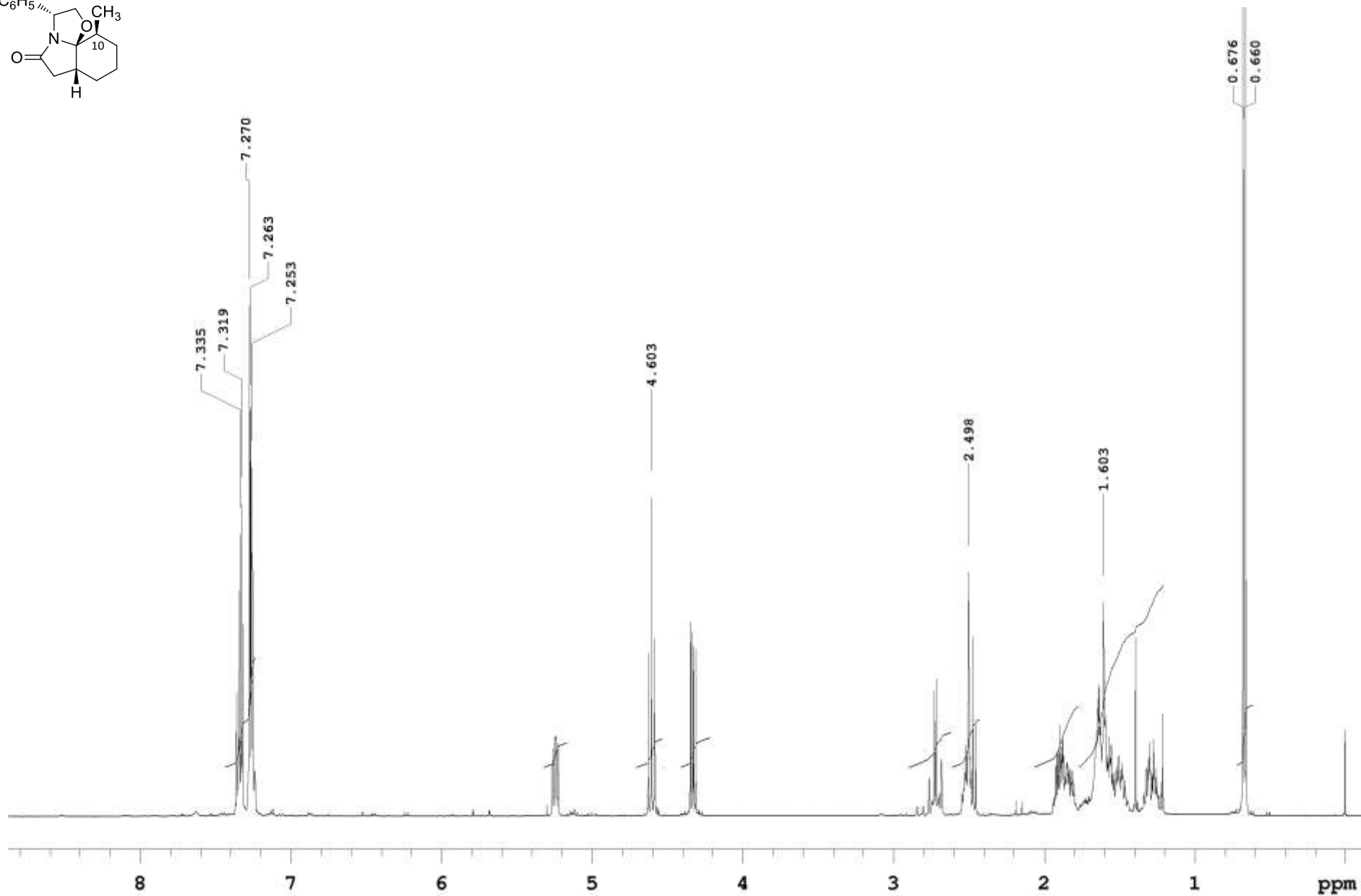
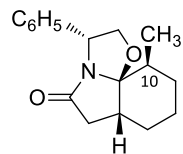
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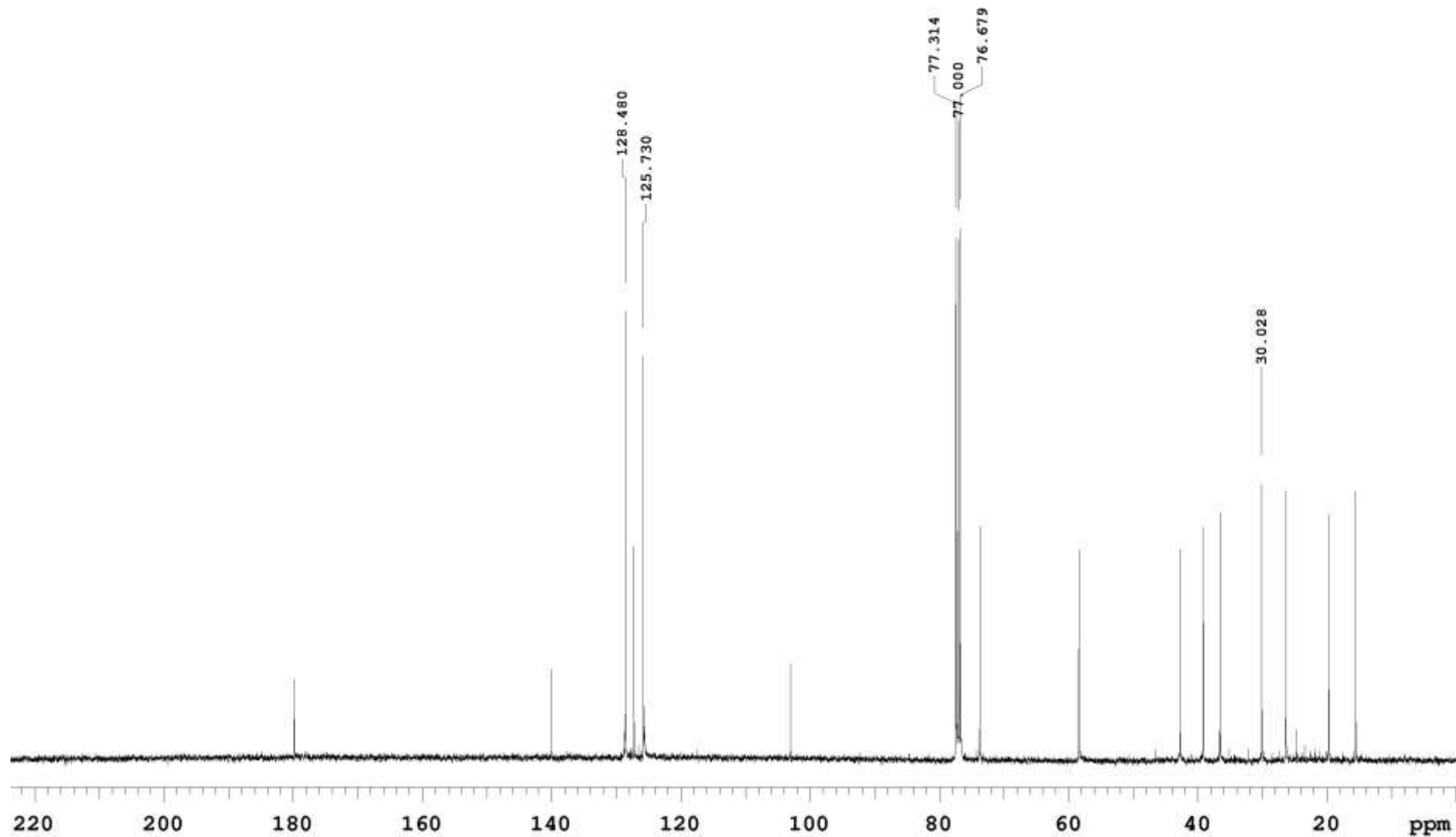
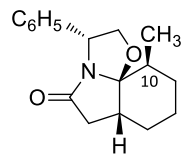
Methyl (7S,7aR)-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole-7-acetate (111a)-¹H-NMR, CDCl₃, 400 MHz, 25 °C



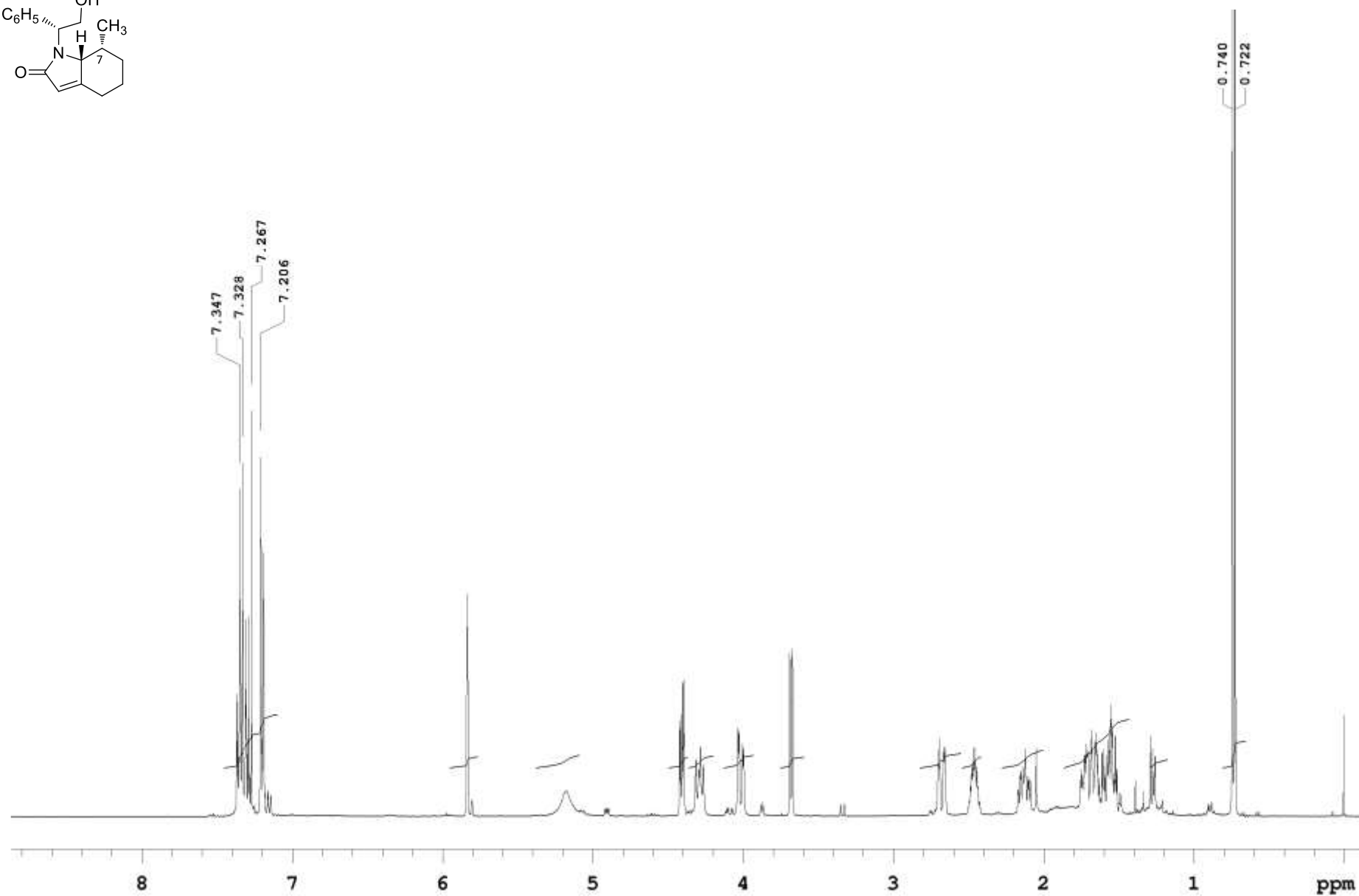
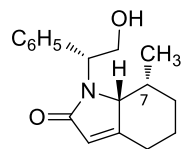
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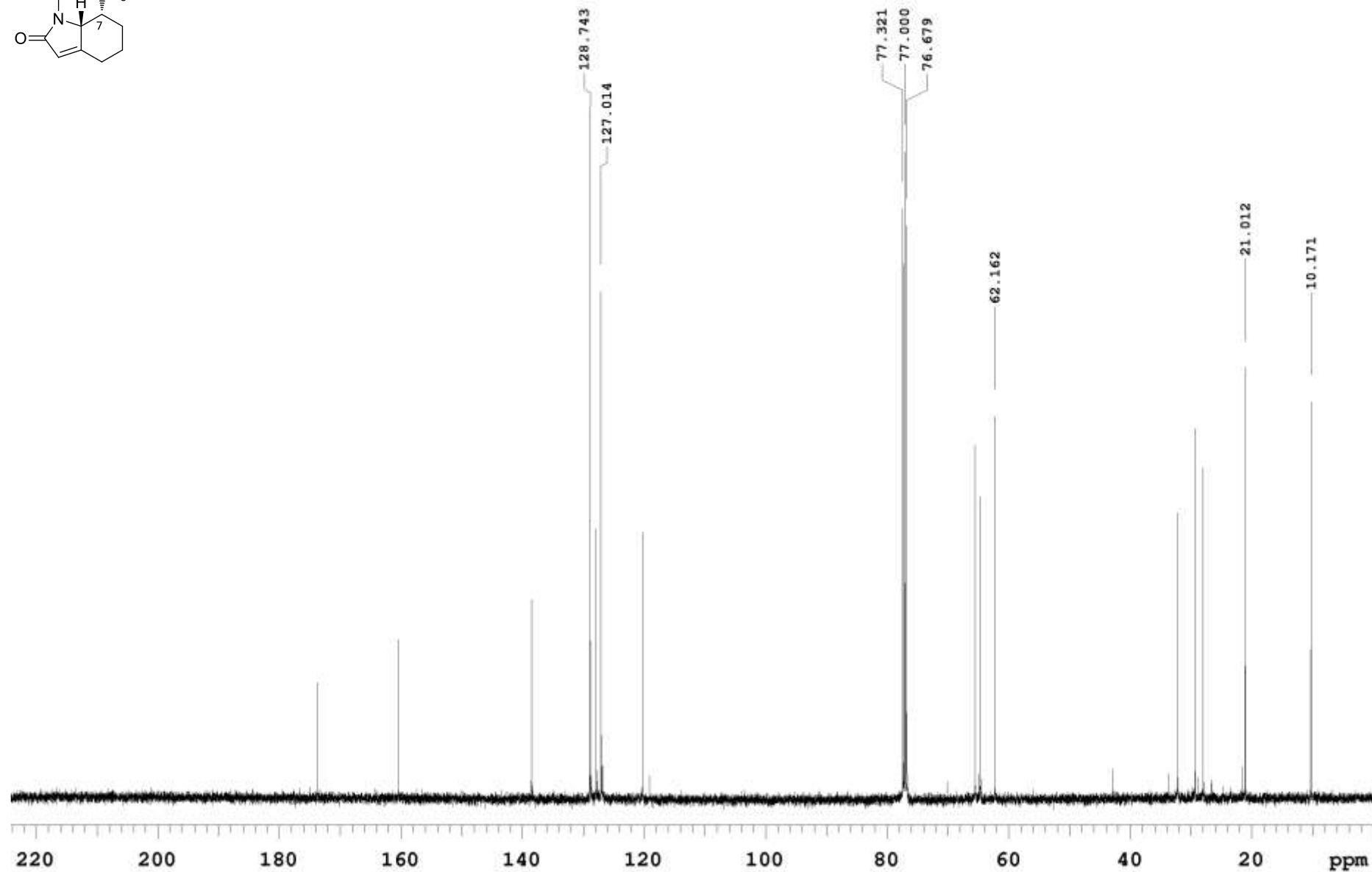
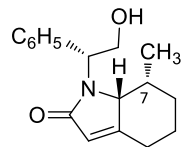
(3R,6aR,10S,10aS)-10-Methyl-5-oxo-3-phenylperhydrooxazolo[2,3-j]indole (112a)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



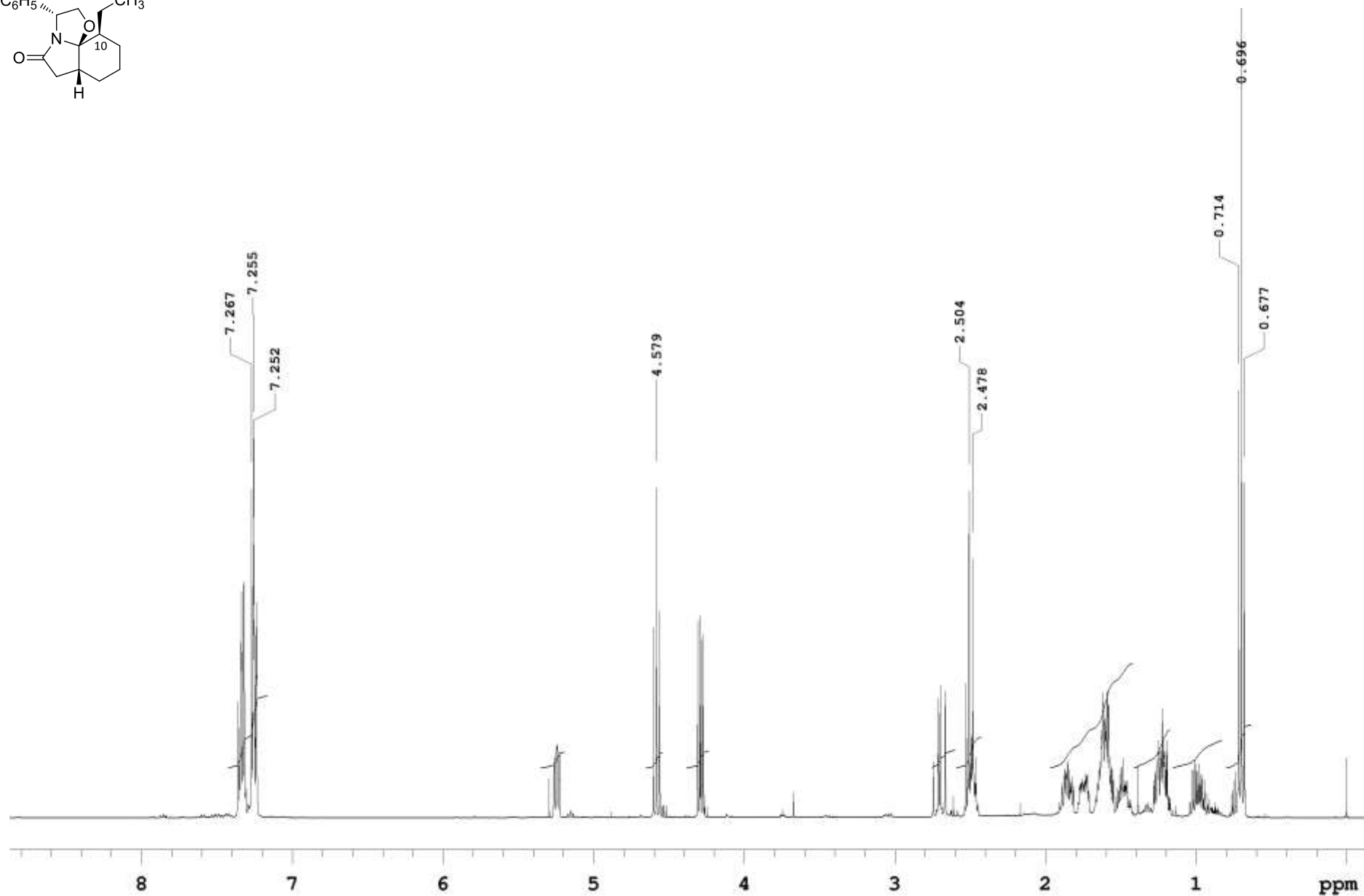
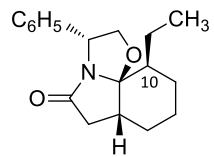
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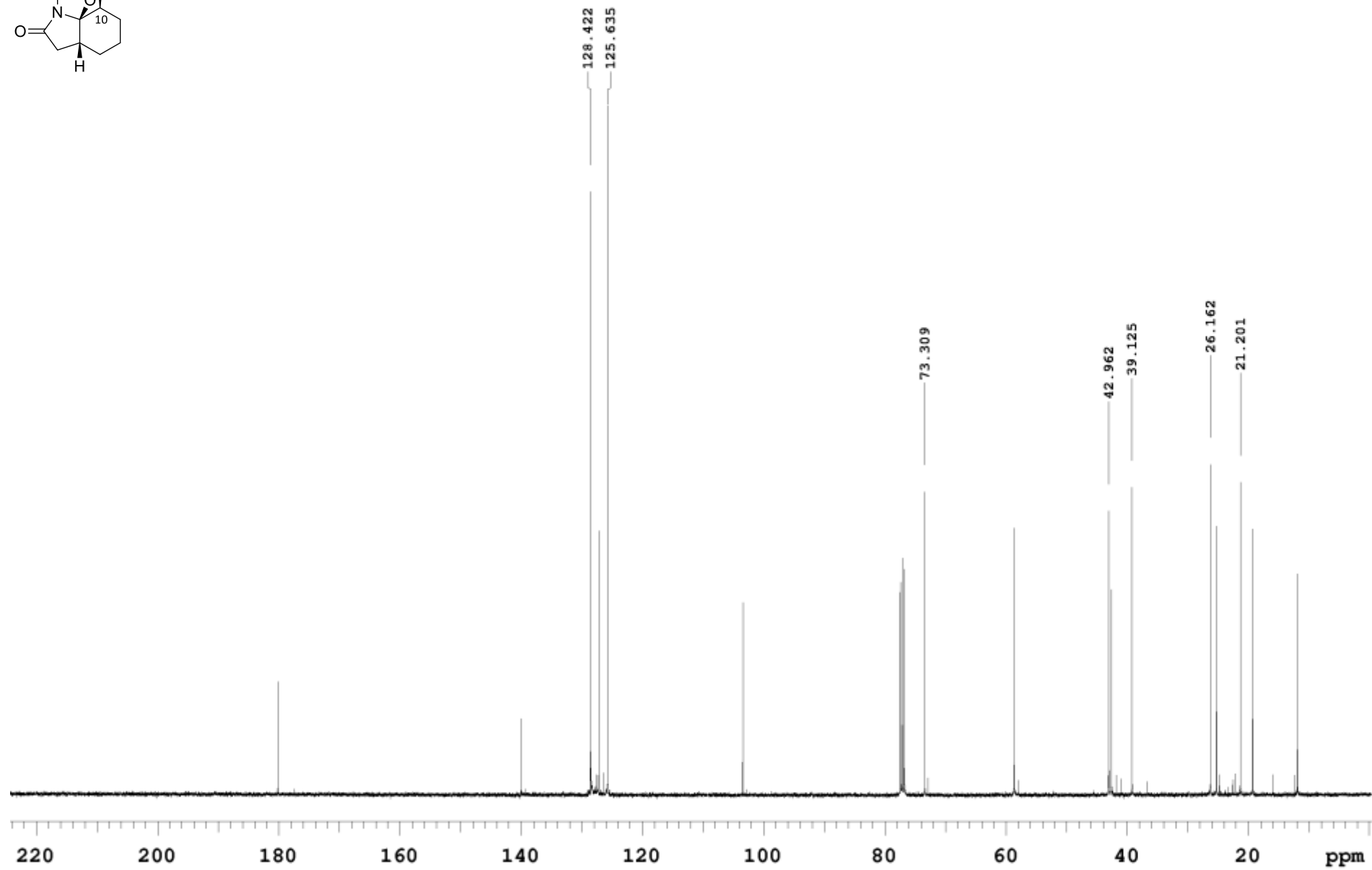
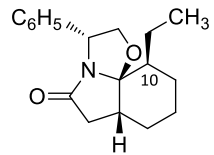
(7R,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-methyl-2-oxo-2,4,5,6,7,7a-hexahydroindole (113a)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



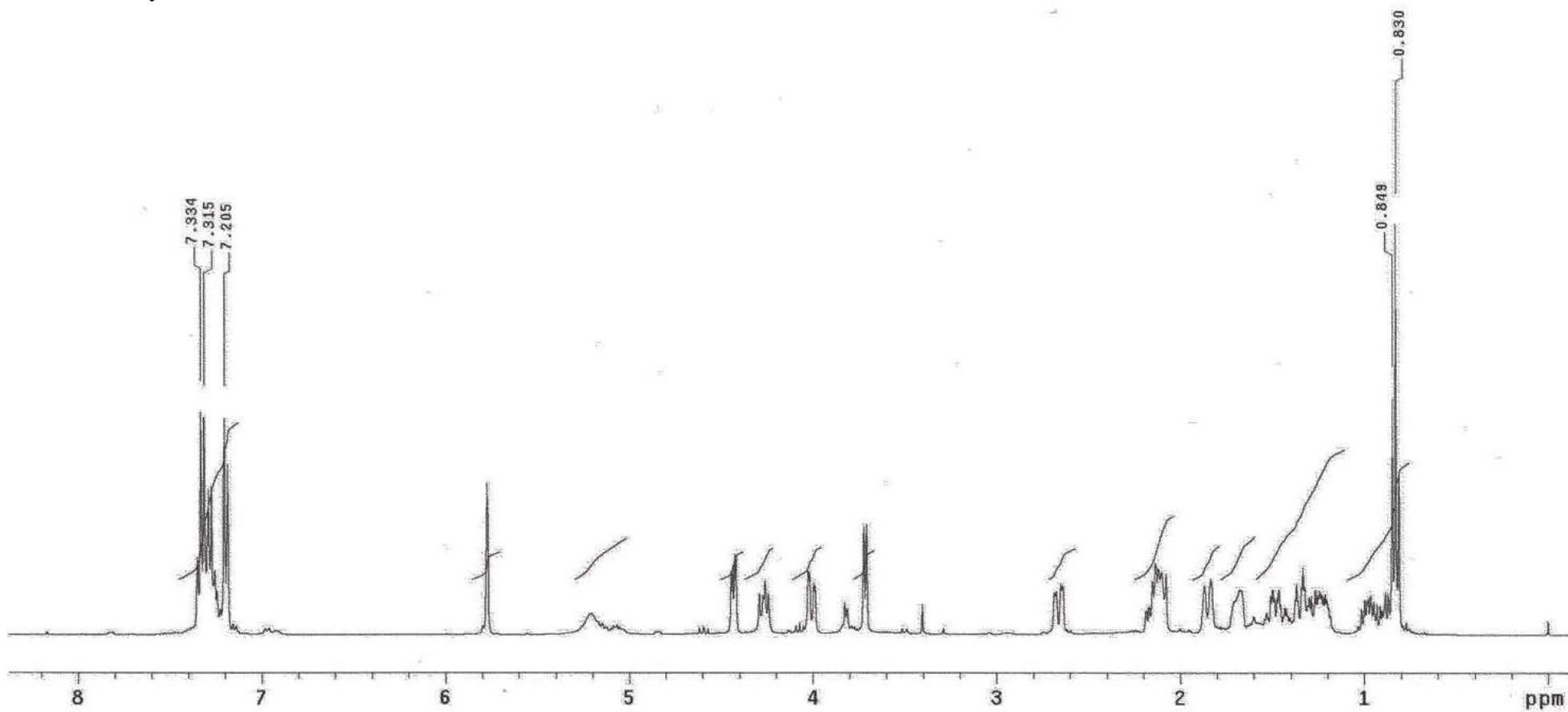
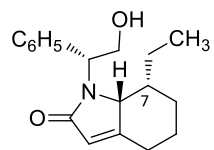
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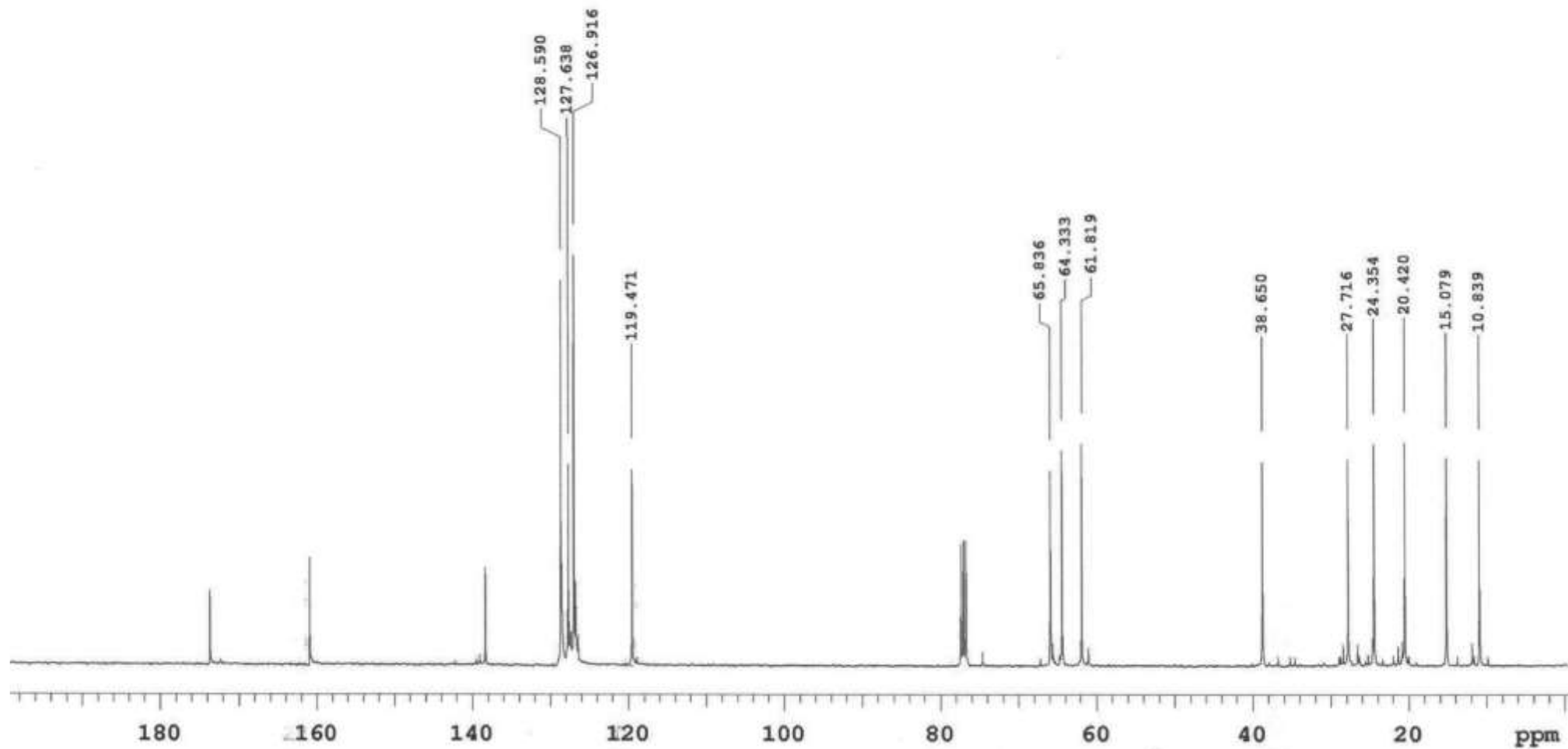
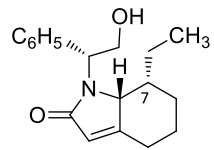
(3*R*,6*aR*,10*S*,10*aS*)-10-Ethyl-5-oxo-3-phenylperhydrooxazolo[2,3-*i*]insole (114)-¹H-NMR, CDCl₃, 400 MHz, 25 °C



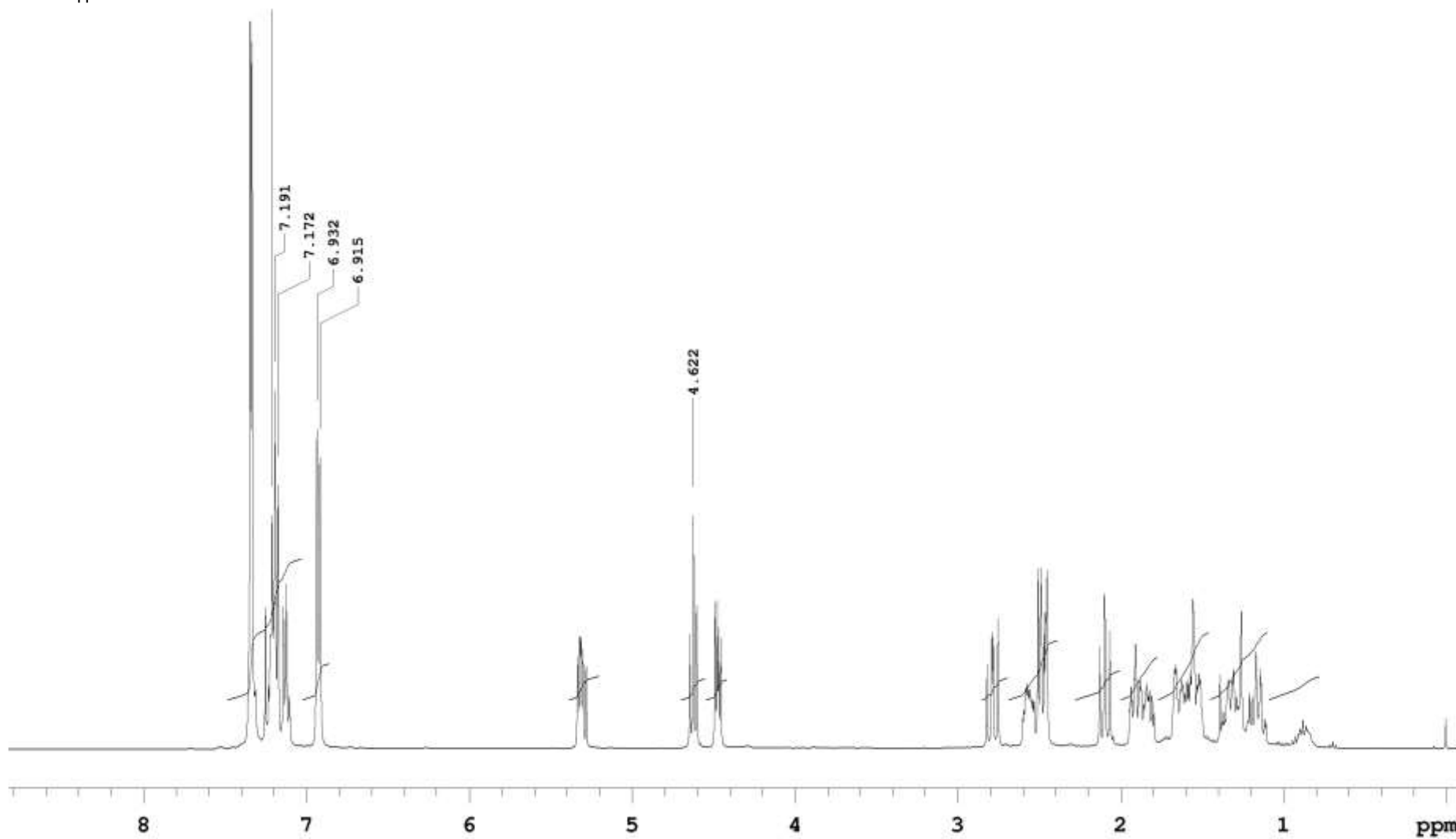
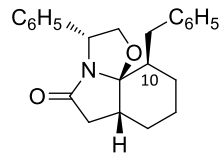
(3R,6aR,10S,10aS)-10-Ethyl-5-oxo-3-phenylperhydrooxazolo[2,3-f]insole (114)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



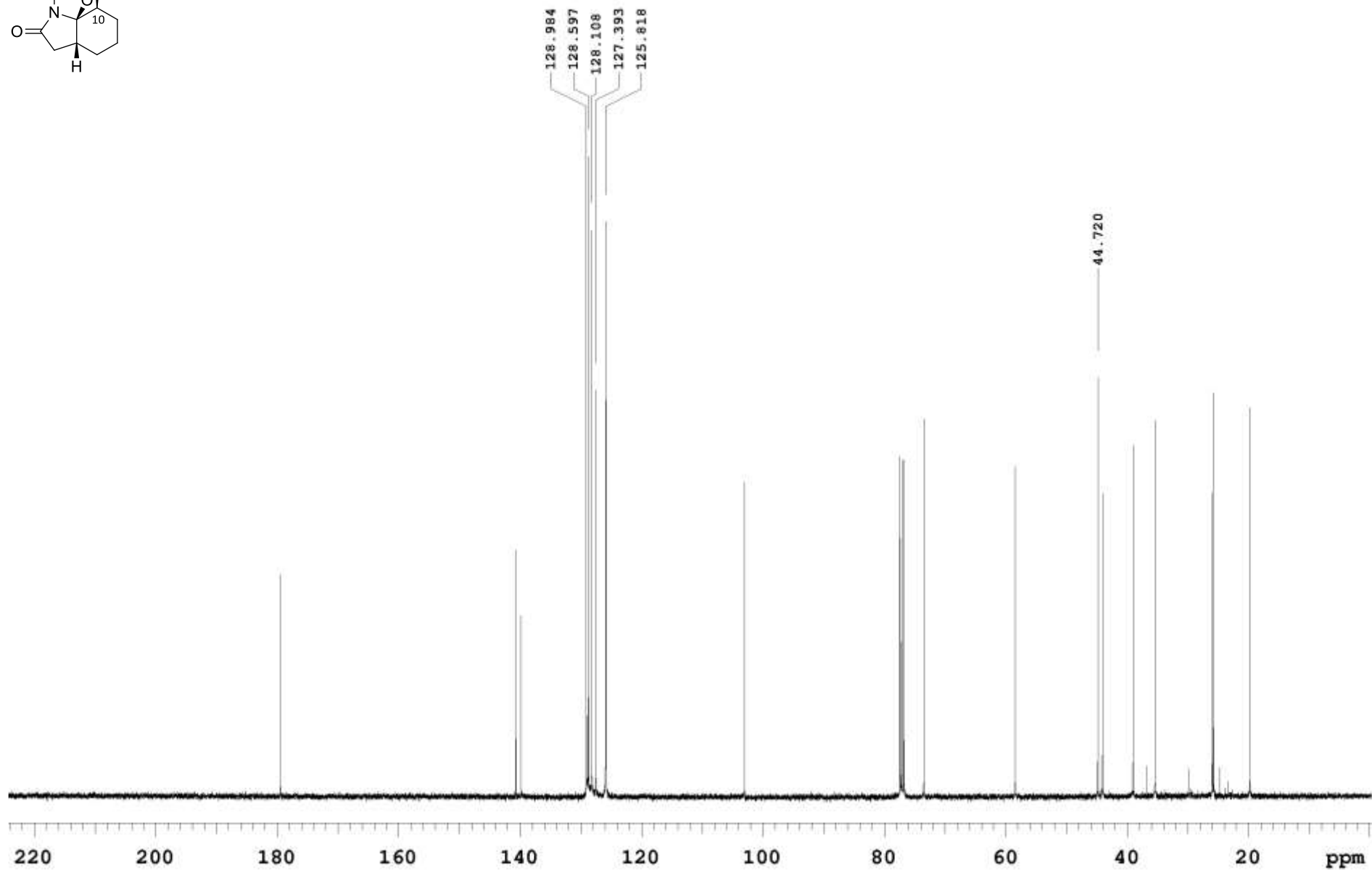
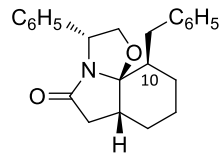
(7R,7aR)-7-Ethyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole (115a)-¹H-NMR, CDCl₃, 400 MHz, 25 °C



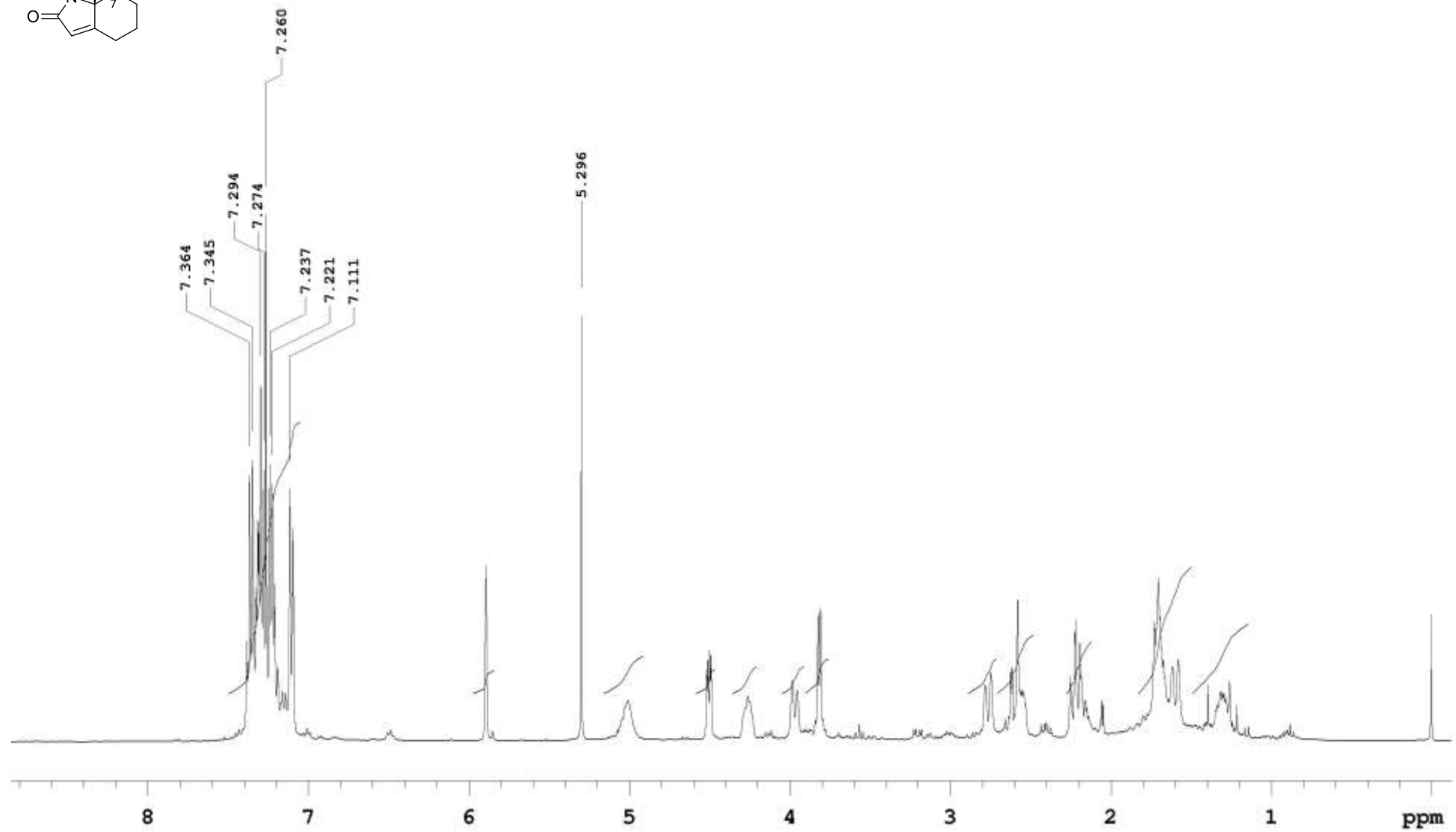
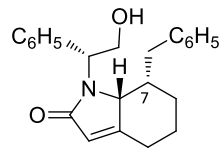
(7R,7aR)-7-Ethyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole (115a)- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



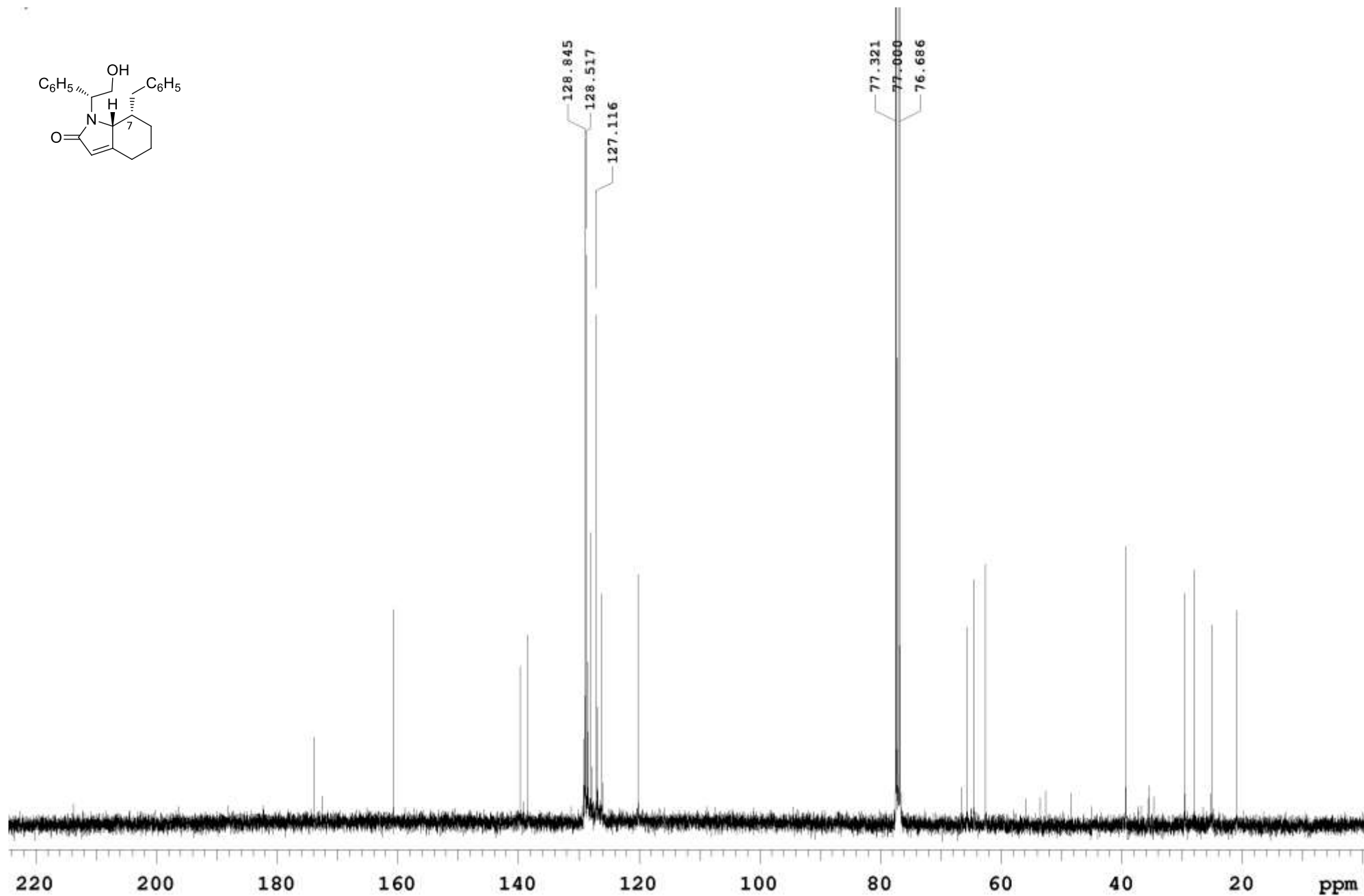
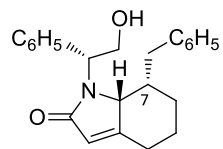
(3*R*,6*aR*,10*R*,10*aS*)-10-Benzyl-5-oxo-3-phenylperhydrooxazolo[2,3-*i*]indole (116)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



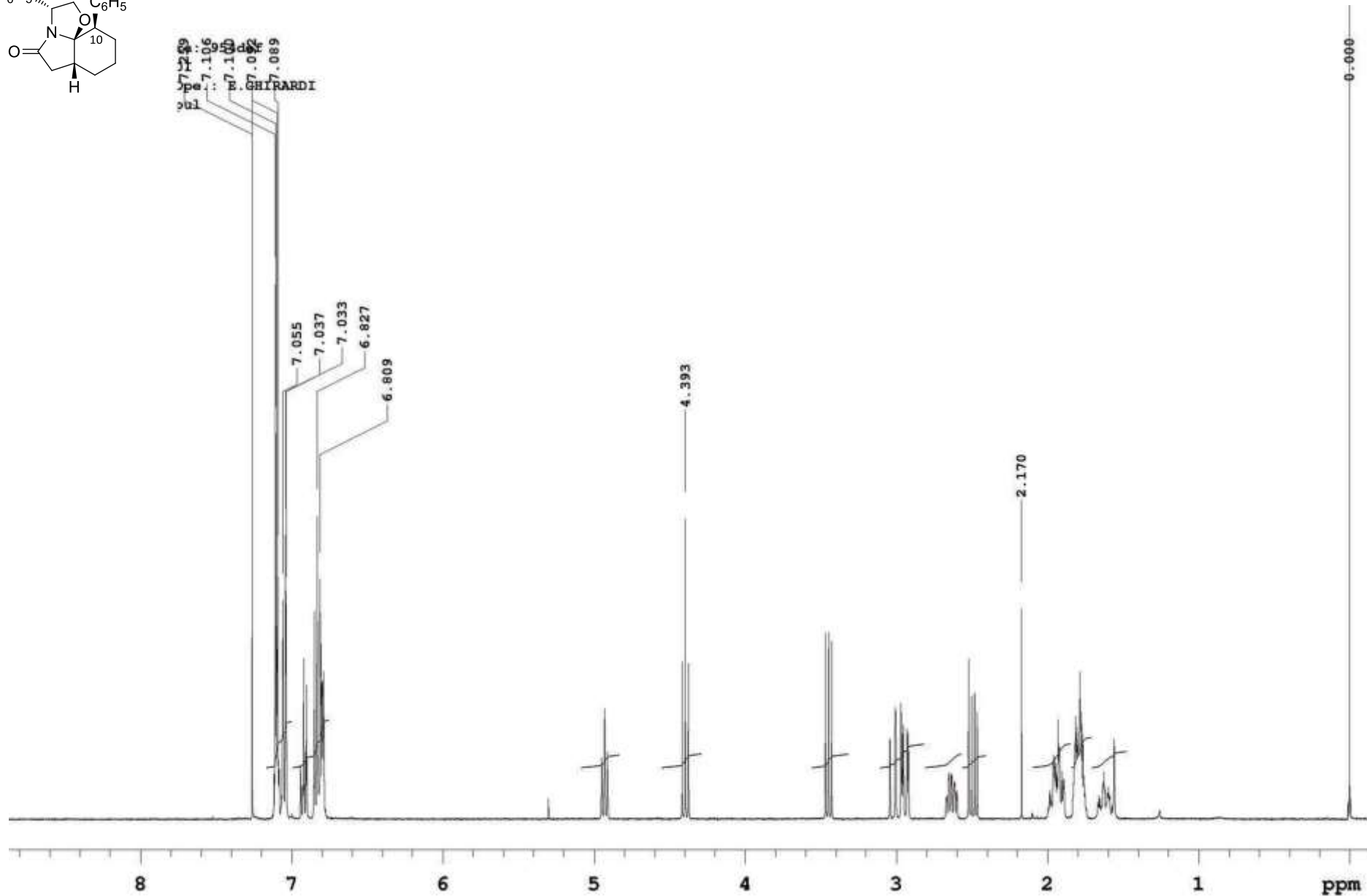
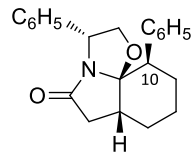
(3*R*,6*aR*,10*R*,10*aS*)-10-Benzyl-5-oxo-3-phenylperhydrooxazolo[2,3-*i*]indole (116)- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



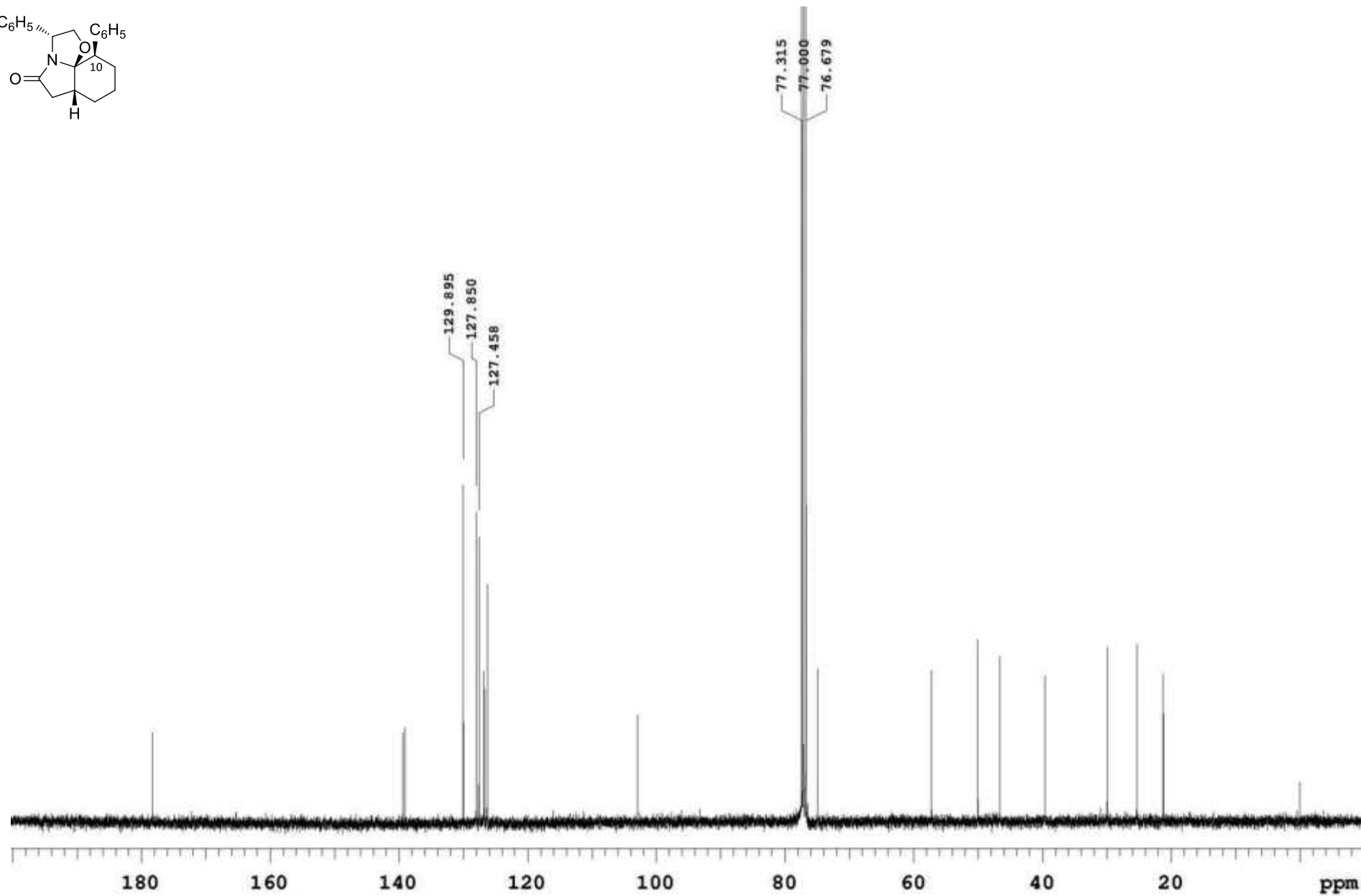
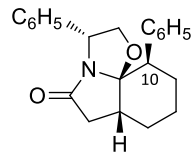
(7S,7aR)-7-Benzyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole (117a)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



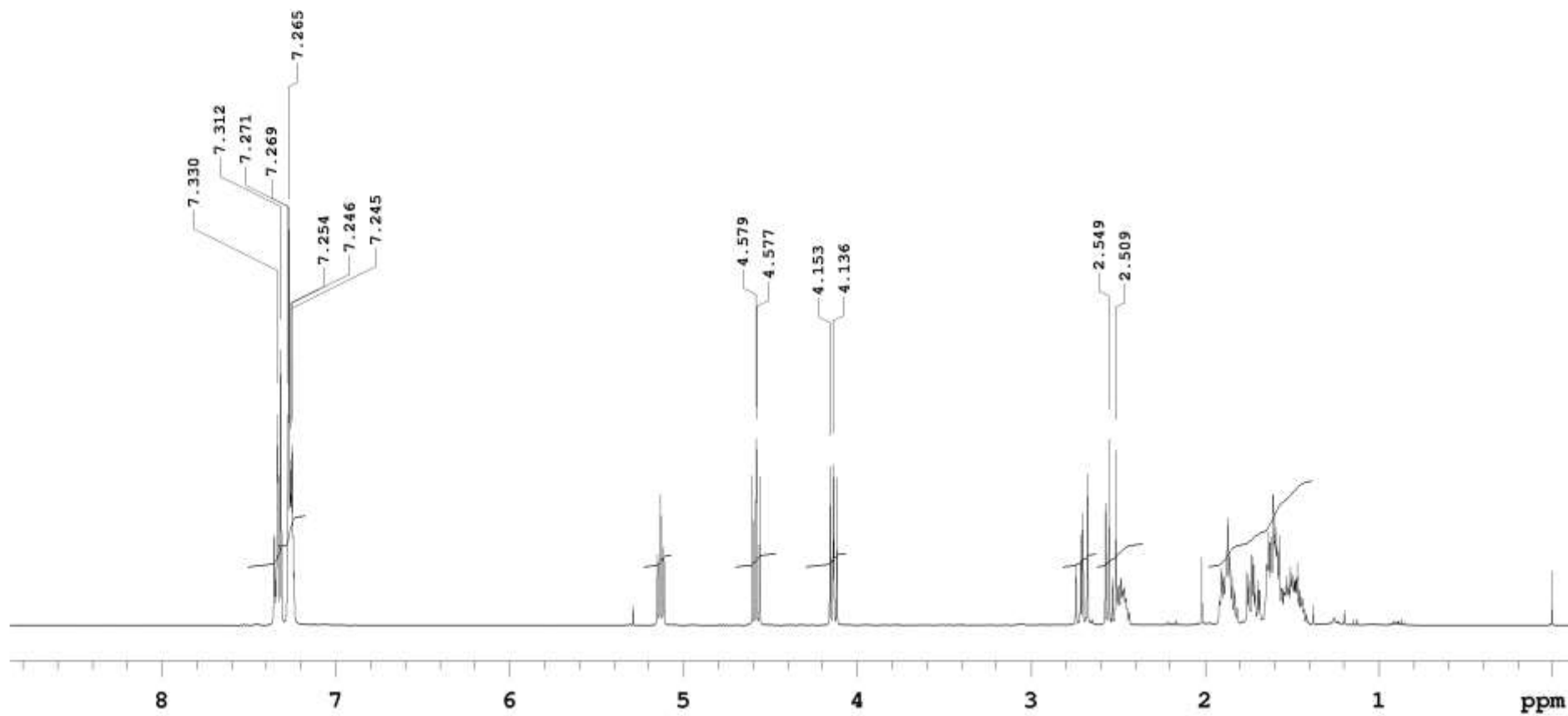
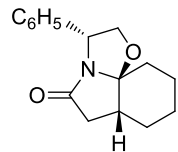
(7S,7aR)-7-Benzyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole (117a)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



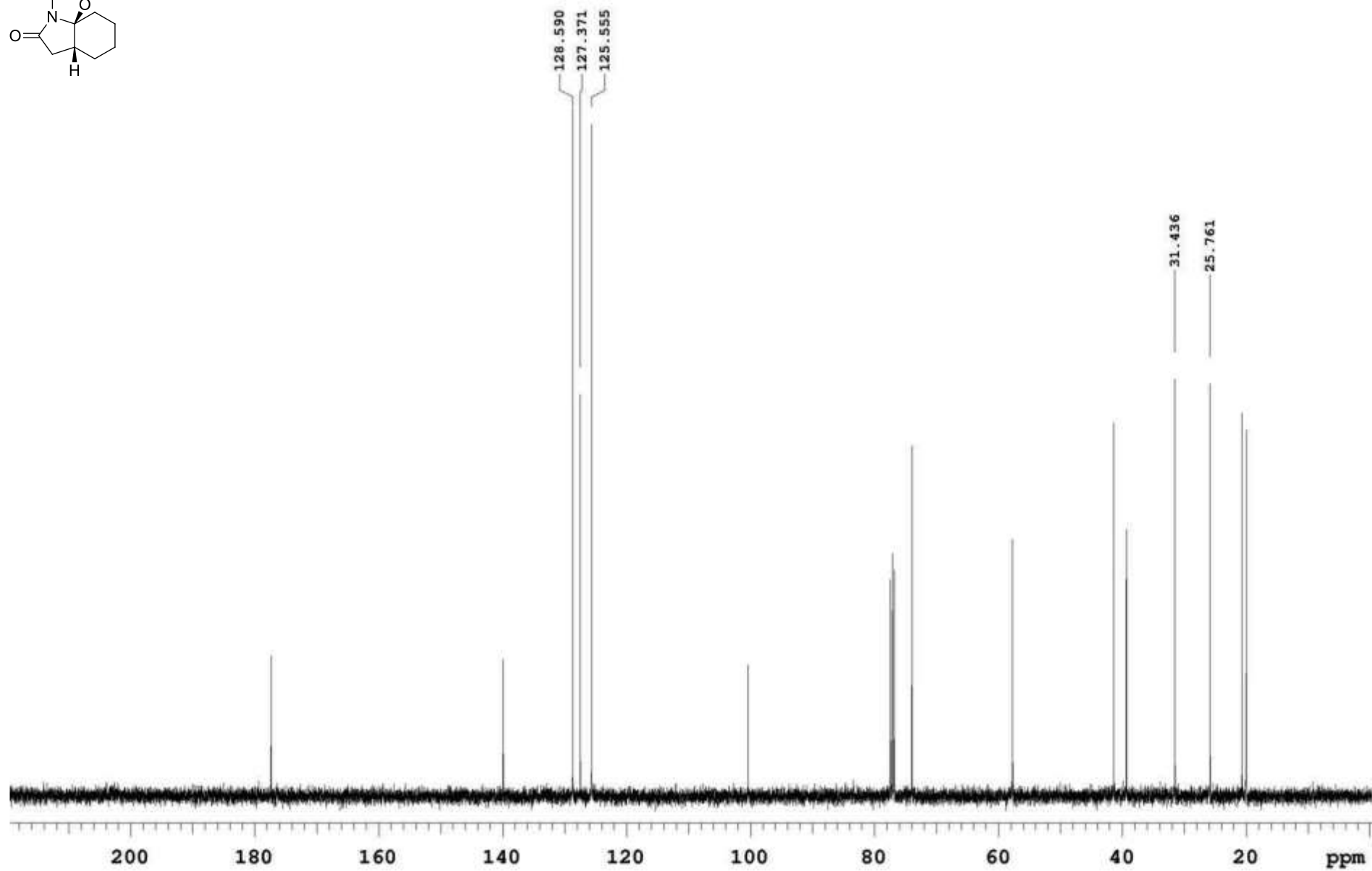
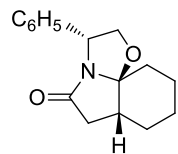
(3R,6aR,10R,10aR)-5-Oxo-3,10-diphenylperhydrooxazolo[2,3-*i*]indole (118)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



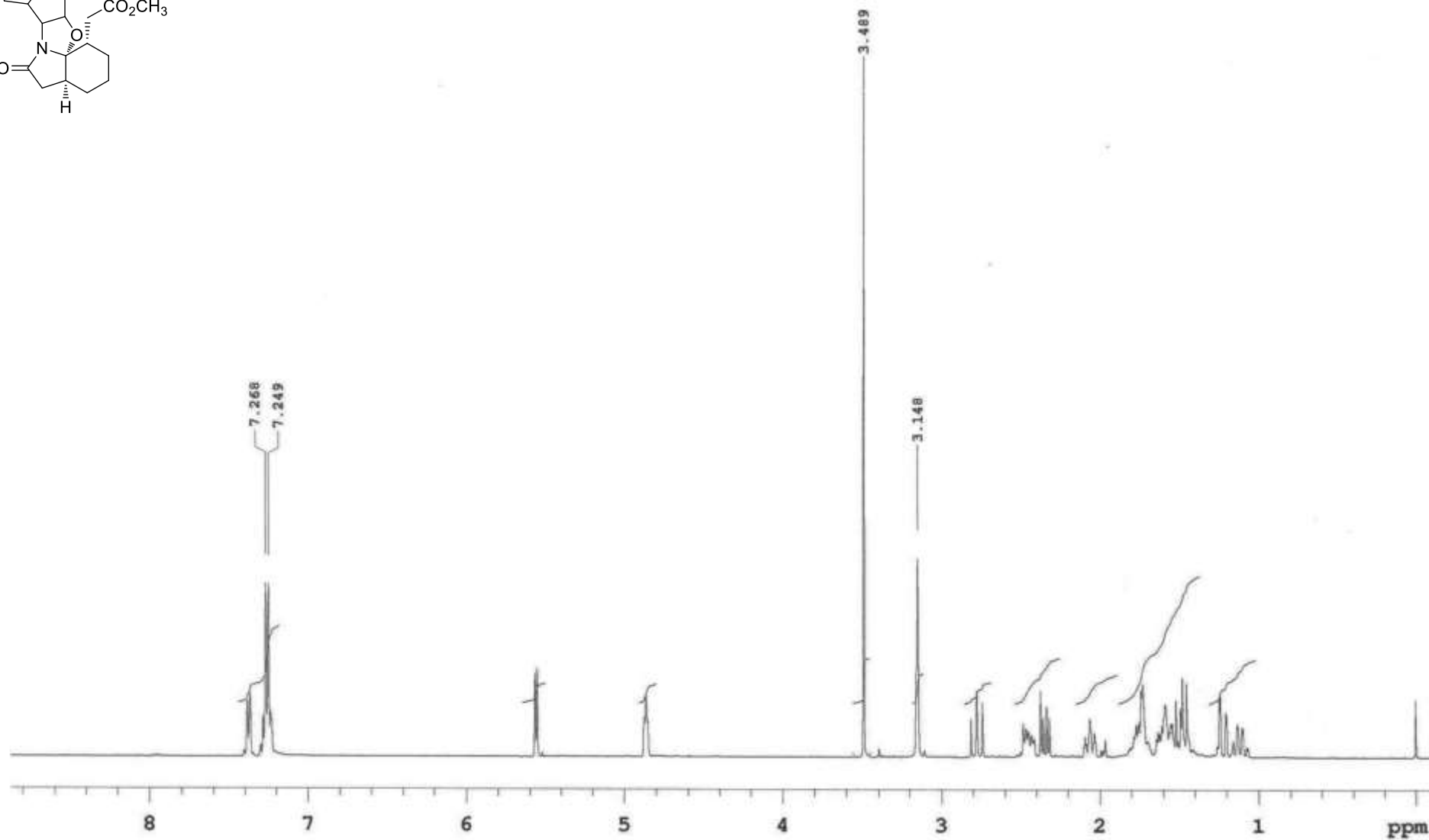
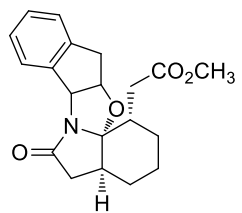
(3*R*,6*aR*,10*R*,10*aR*)-5-oxo-3,10-diphenylperhydrooxazolo[2,3-*f*]indole (118)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



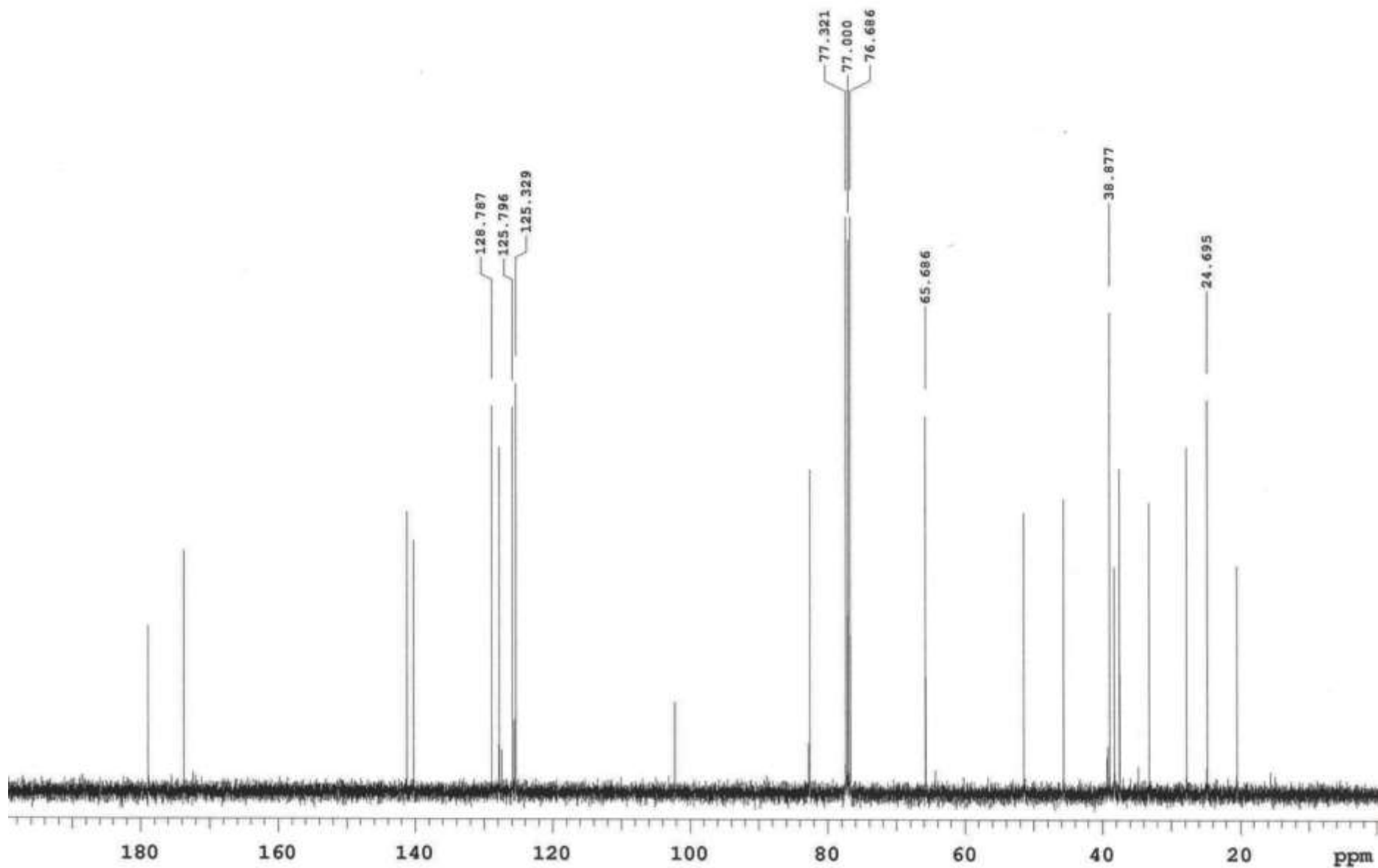
(3R,6aR,10aS)-5-Oxo-3-phenylperhydrooxazolo[2,3-j]indole (119)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



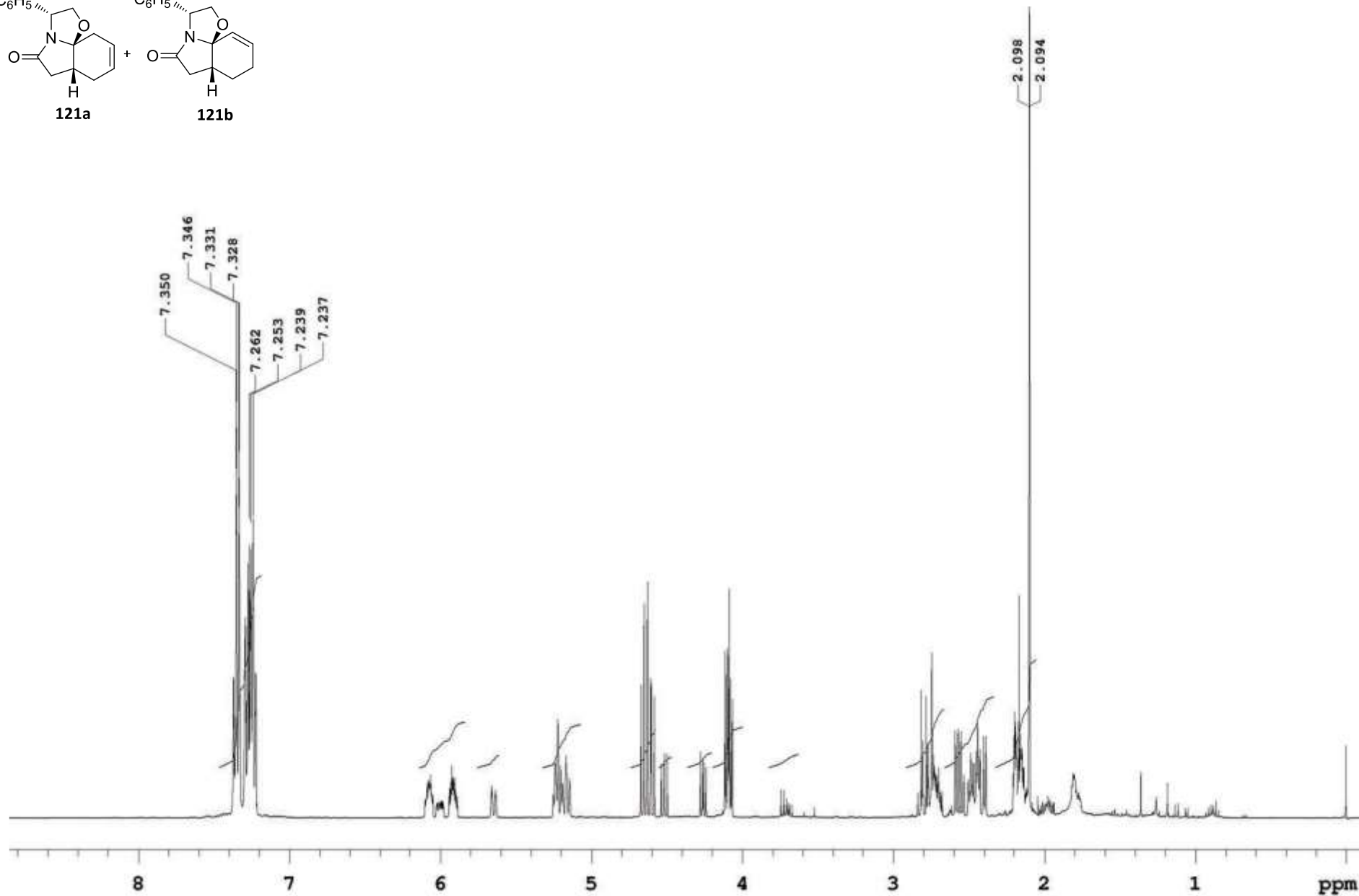
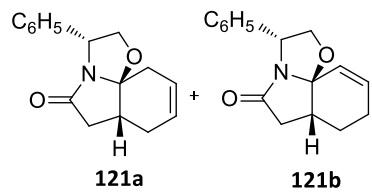
(3*R*,6*aR*,10*aS*)-5-Oxo-3-phenylperhydrooxazolo[2,3-*i*]indole (119)- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



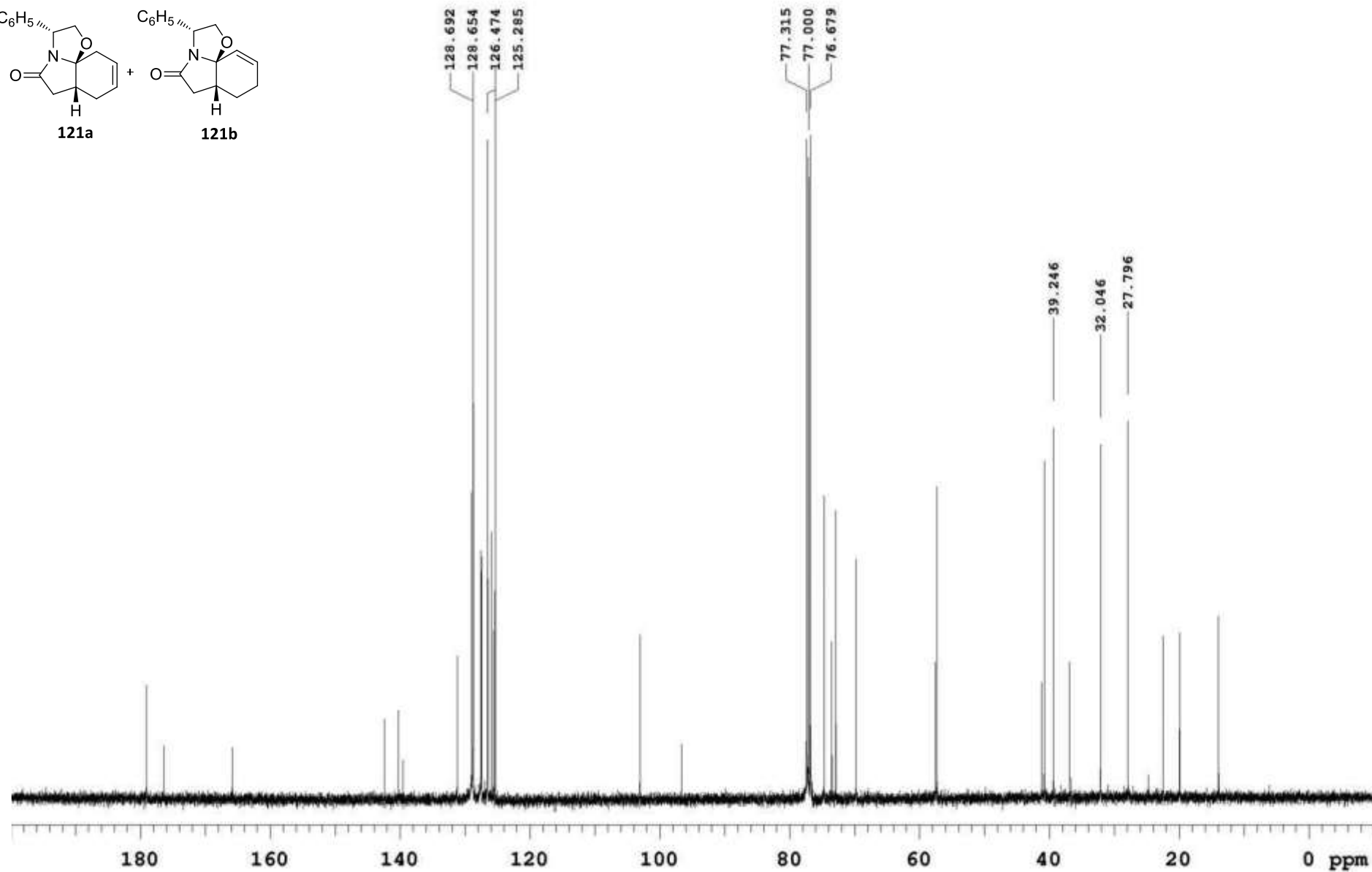
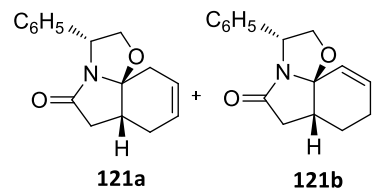
Methyl (1*S*,4*aS*,7*aS*,12*aR*,13*aS*)-6-oxo-2,3,4,4*a*,5,6,7*a*,12,12*a*,13*a*-dodecahydro-[1*H*]-indeno[1'2':4,5]oxazolo[2,3-*i*]indole-1-propionate (120a)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



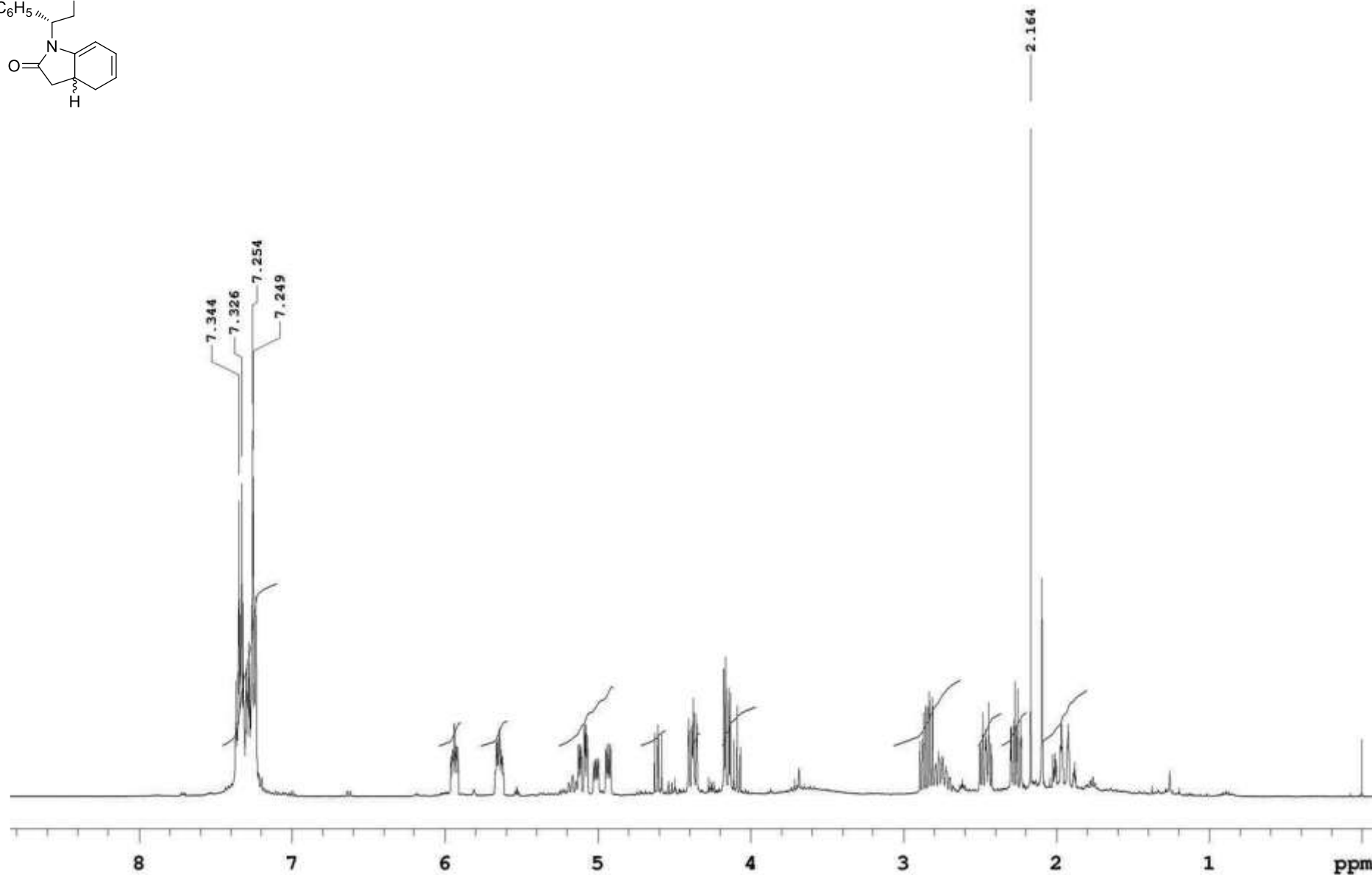
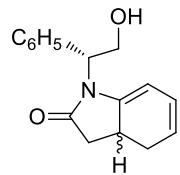
Methyl (1*S*,4*aS*,7*aS*,12*aR*,13*aS*)-6-oxo-2,3,4,4*a*,5,6,7*a*,12,12*a*,13*a*-dodecahydro-[1*H*]-indeno[1'2':4,5]oxazolo[2,3-*i*]indole-1-propionate (120a)- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



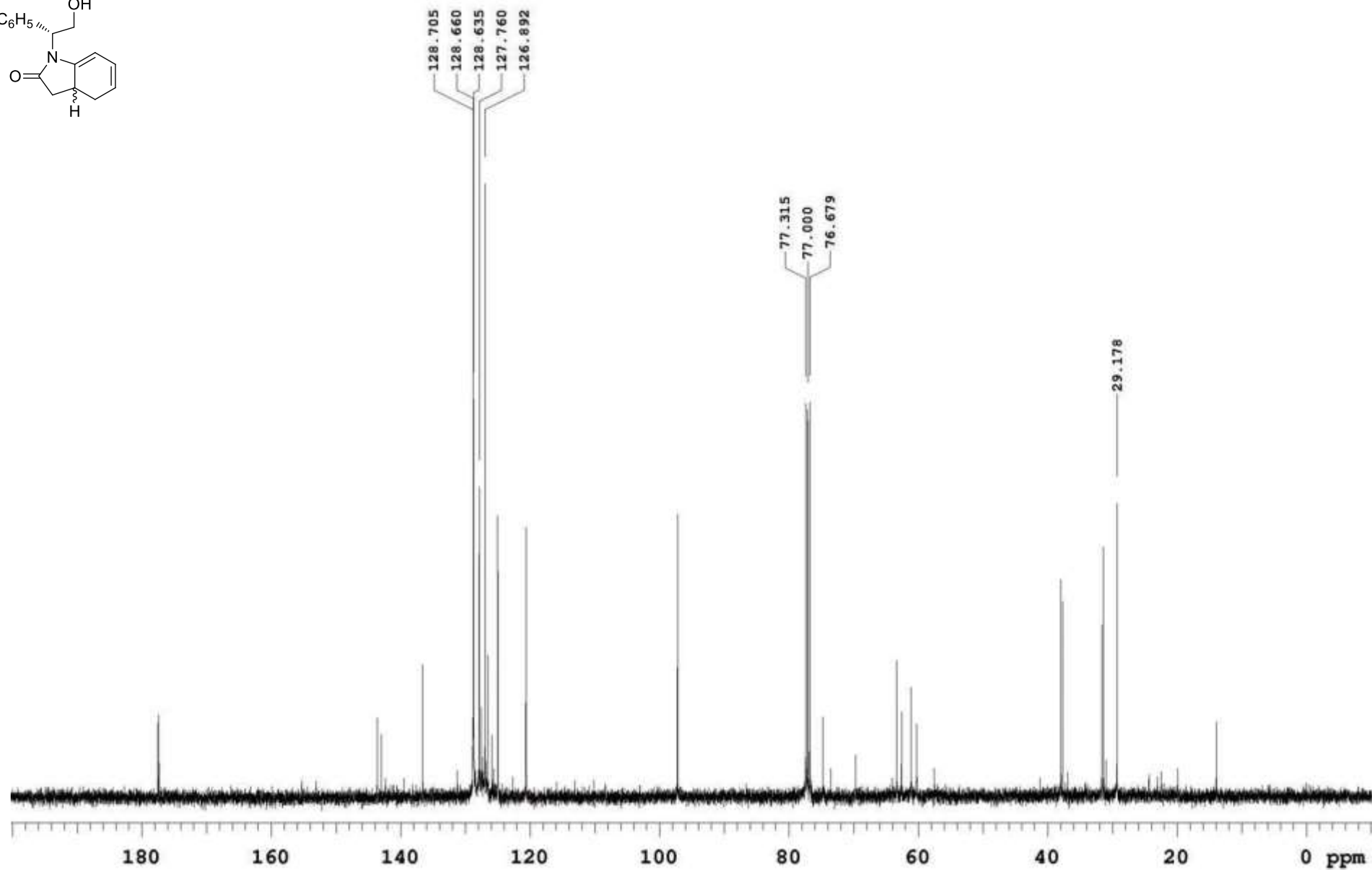
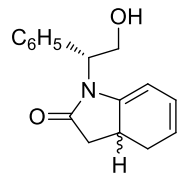
(121a and 121b)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



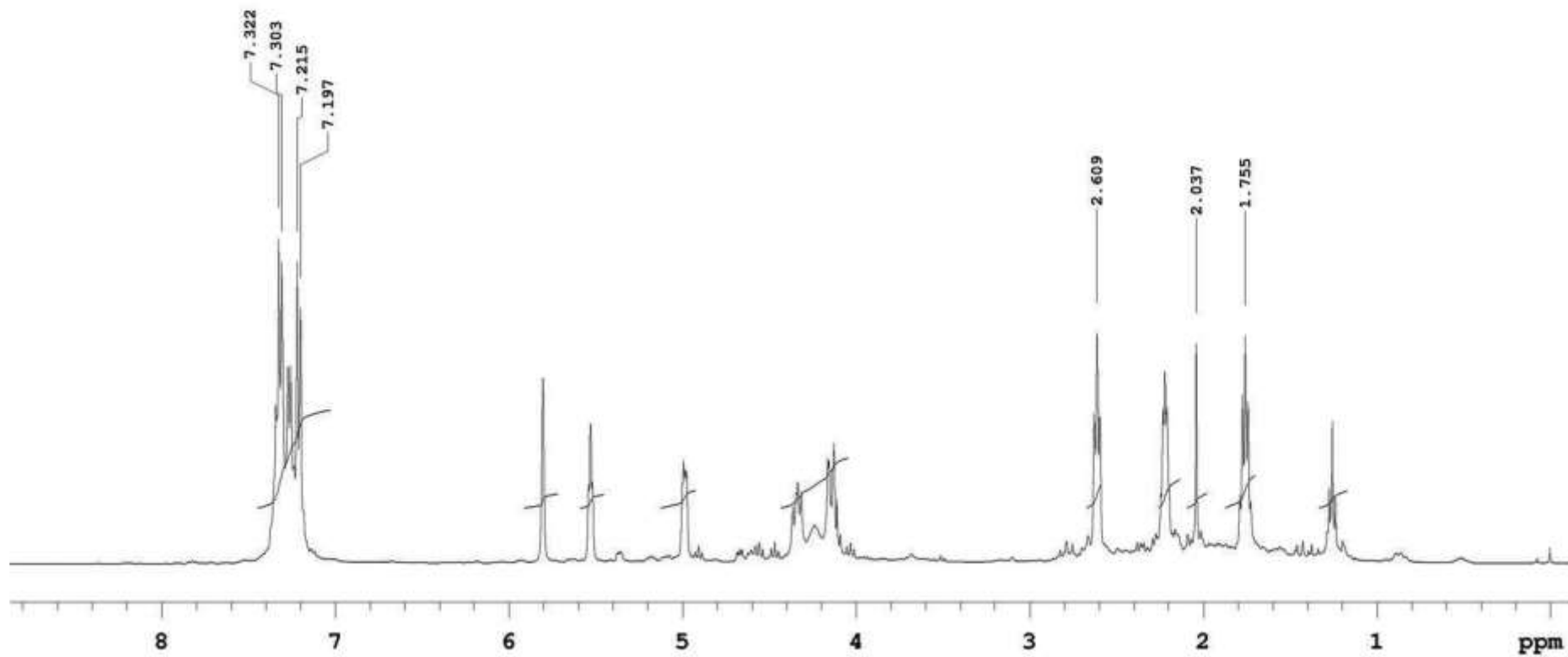
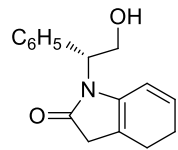
(121a and 121b)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



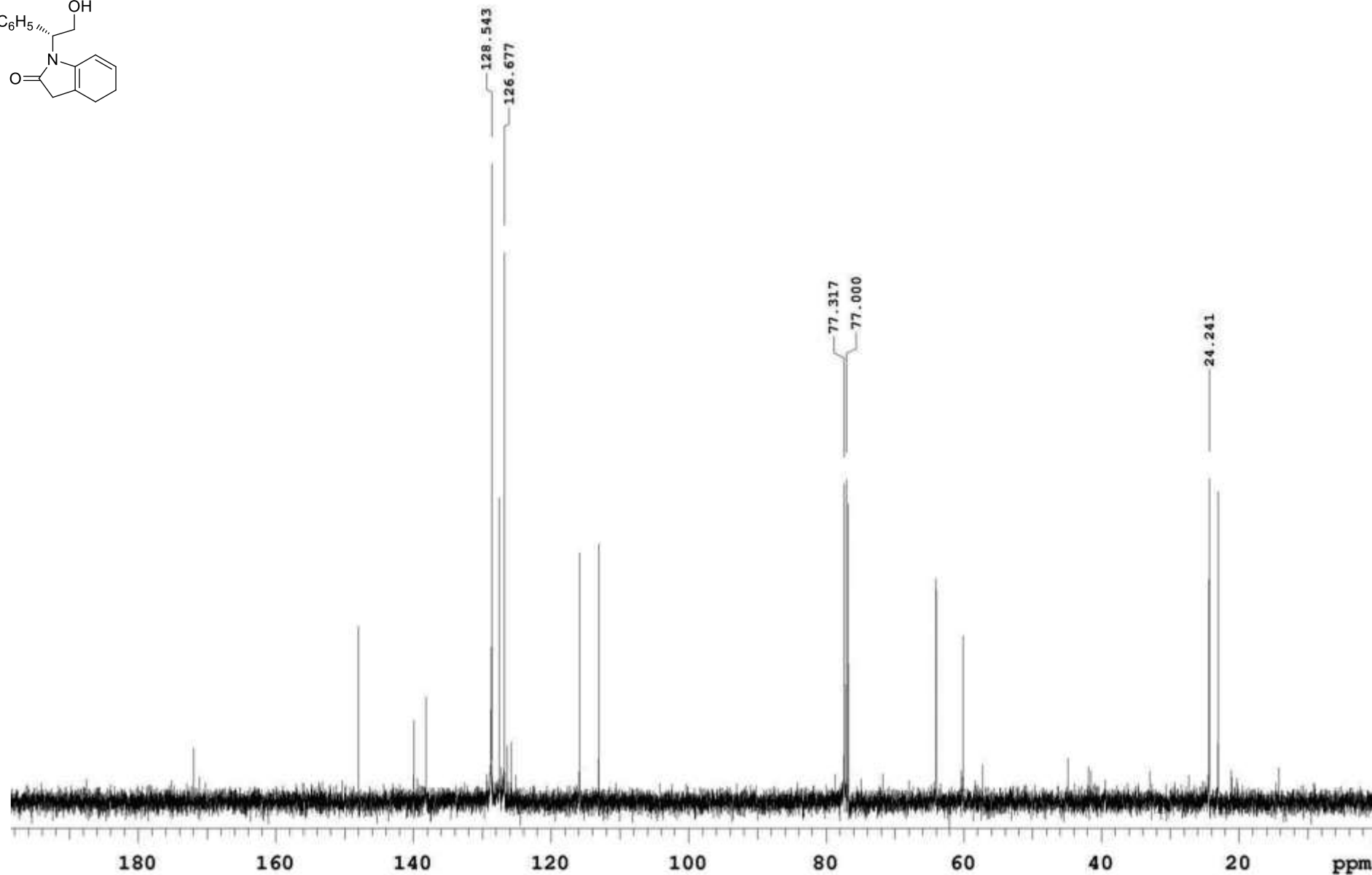
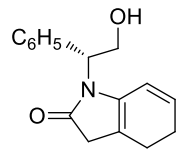
(121c)- $^1\text{H-NMR}$, CDCl_3 , 400 MHz, 25 °C



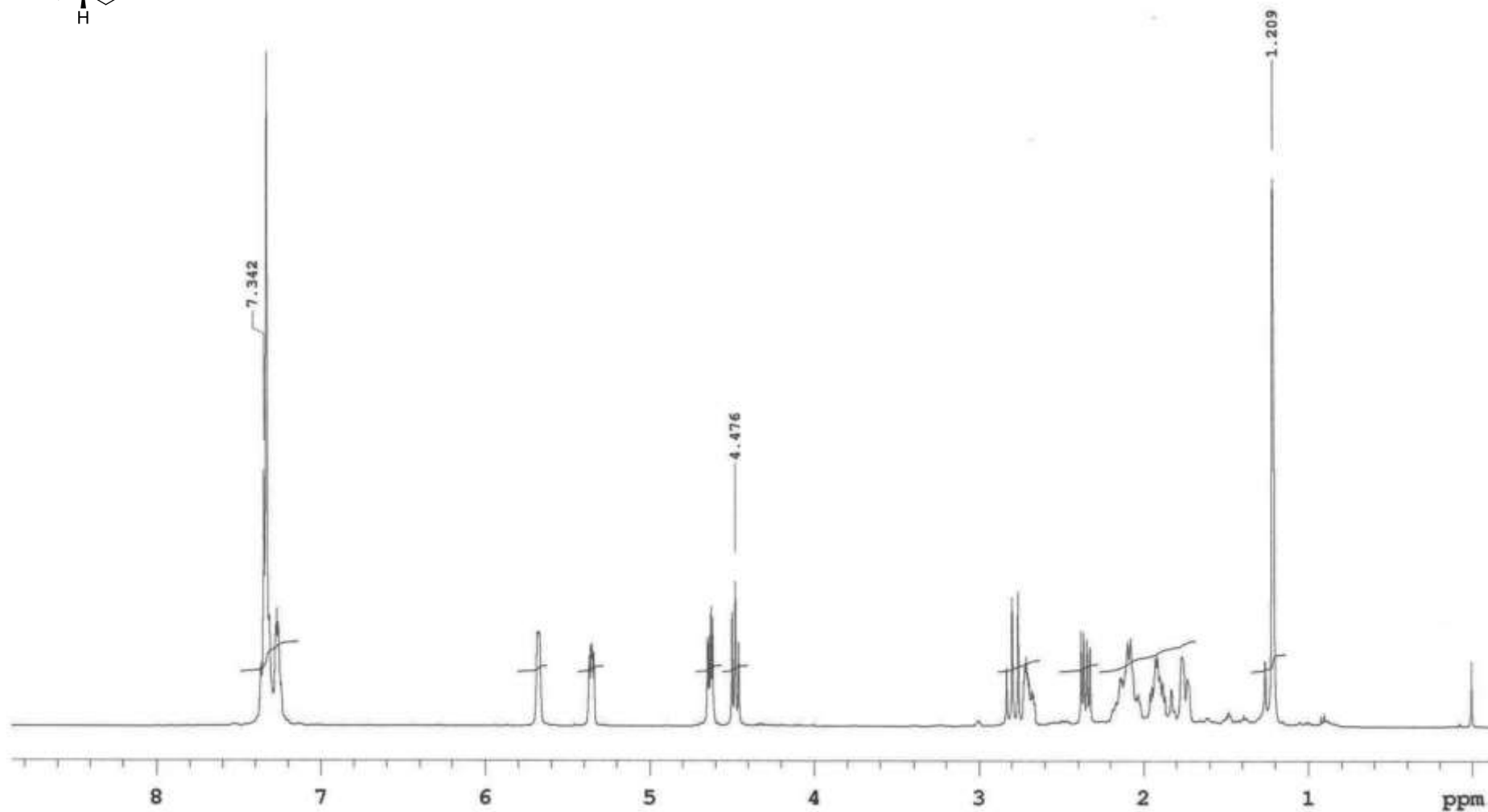
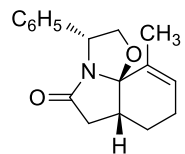
(121c- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C)



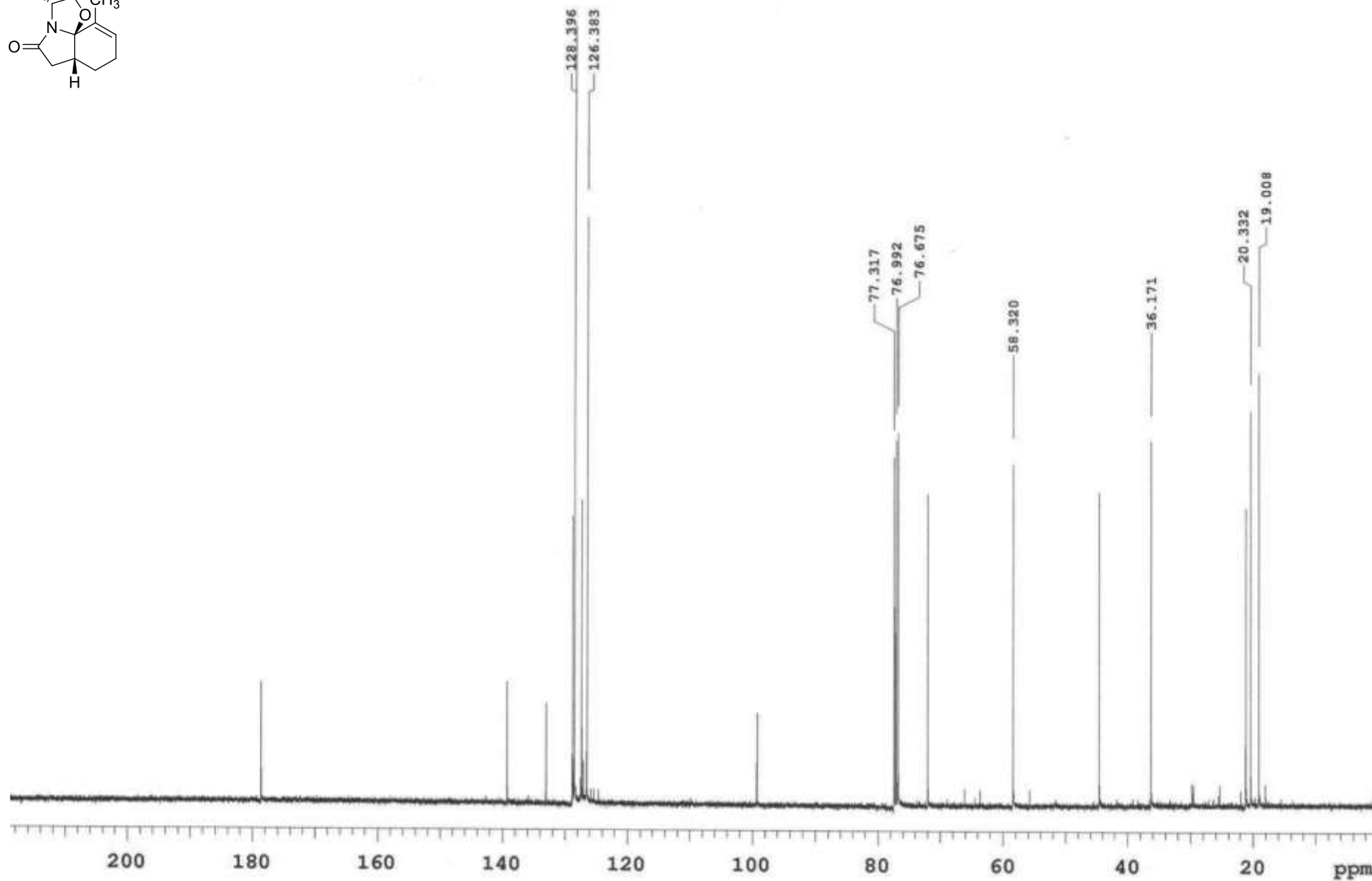
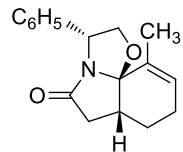
(121d)- $^1\text{H-NMR}$, CDCl_3 , 400 MHz, 25 °C



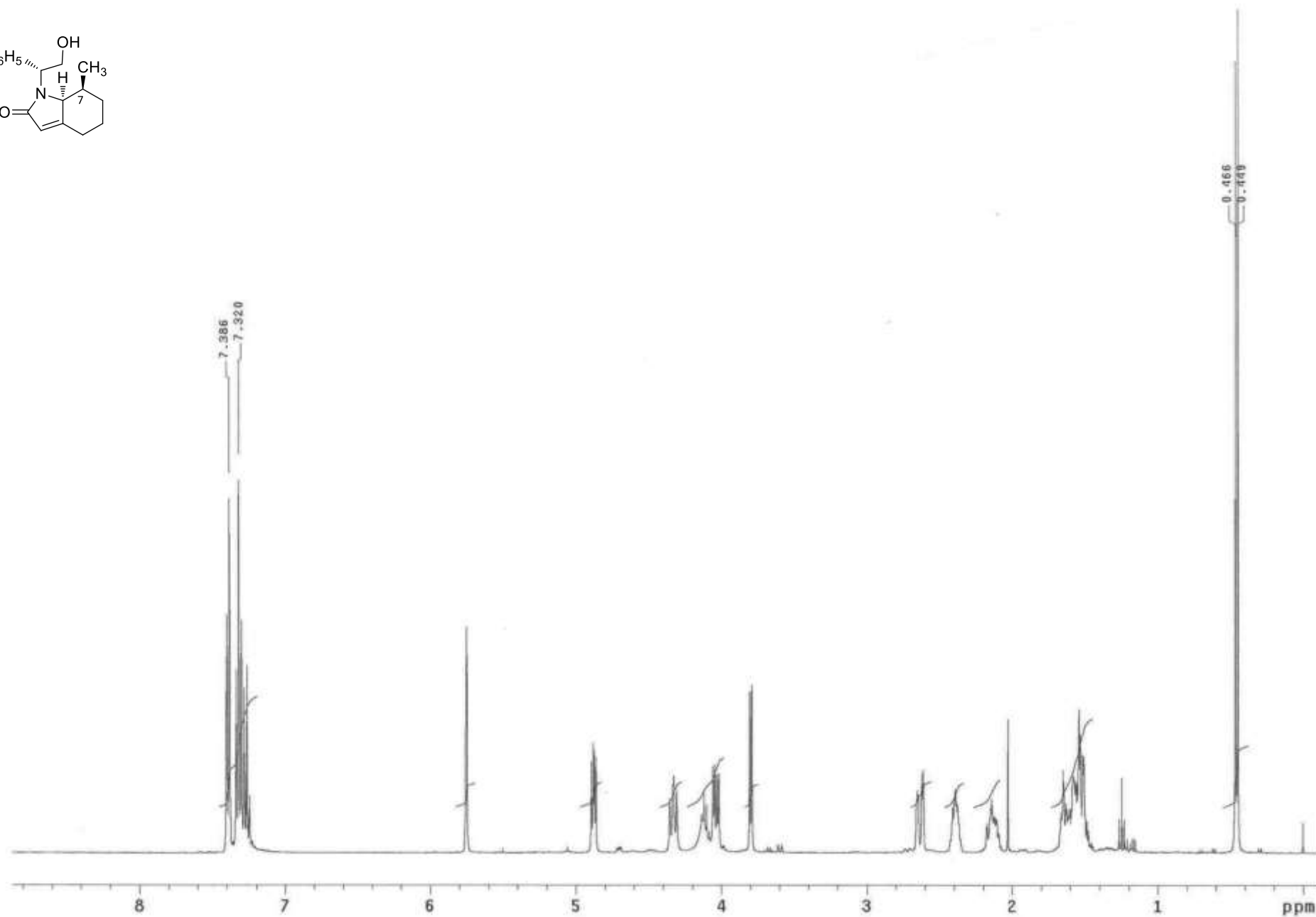
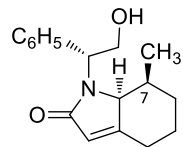
(121d)- ^{13}C -NMR, CDCl_3 , 100.6 MHz, 25 °C



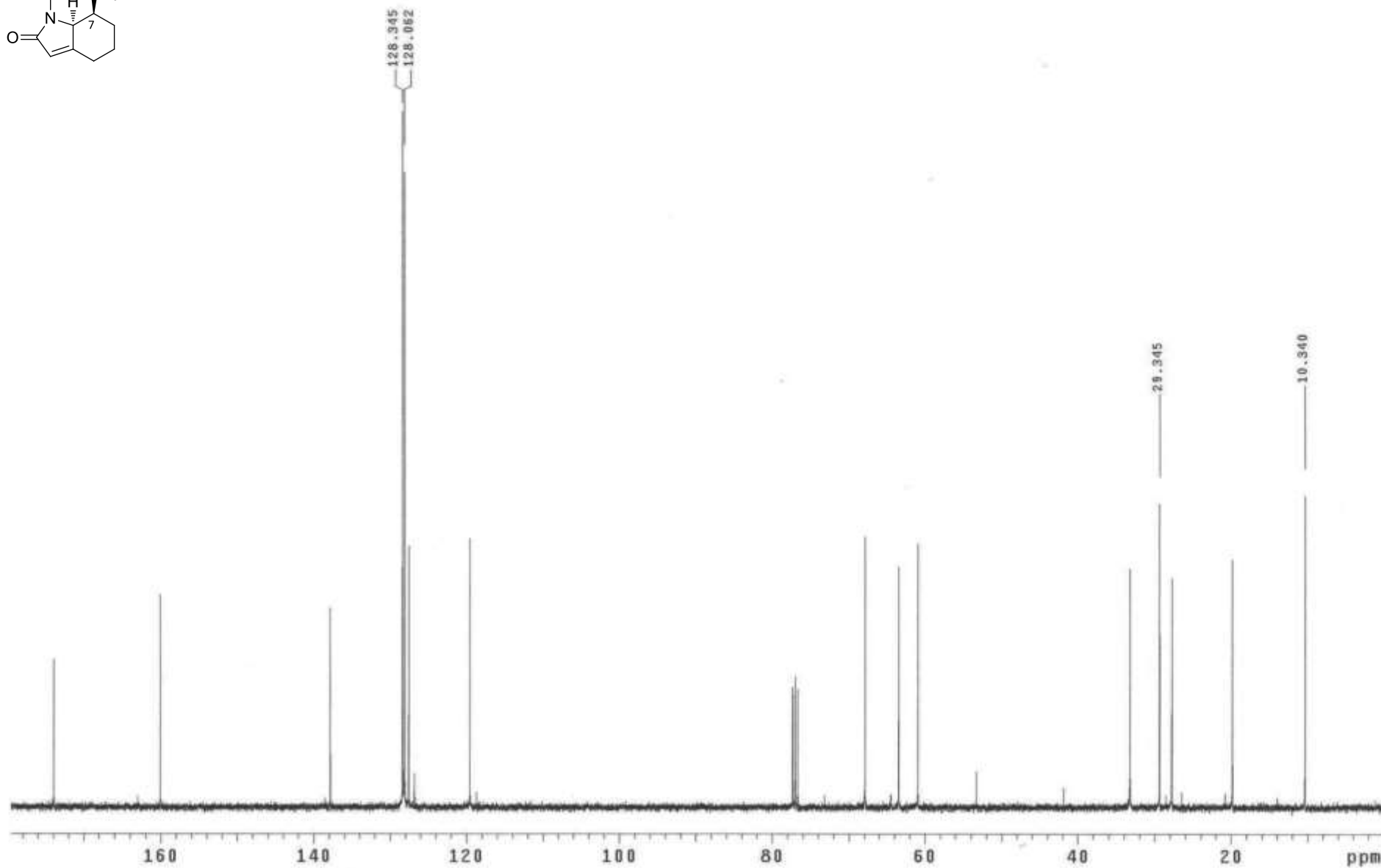
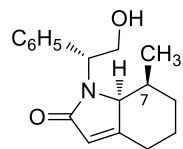
(3R,6aS,10aS)-10-Methyl-5-oxo-3-phenyl-2,3,5,6,6a,7,8,10a-octahydrooxazolo[2,3-f]indole (122)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



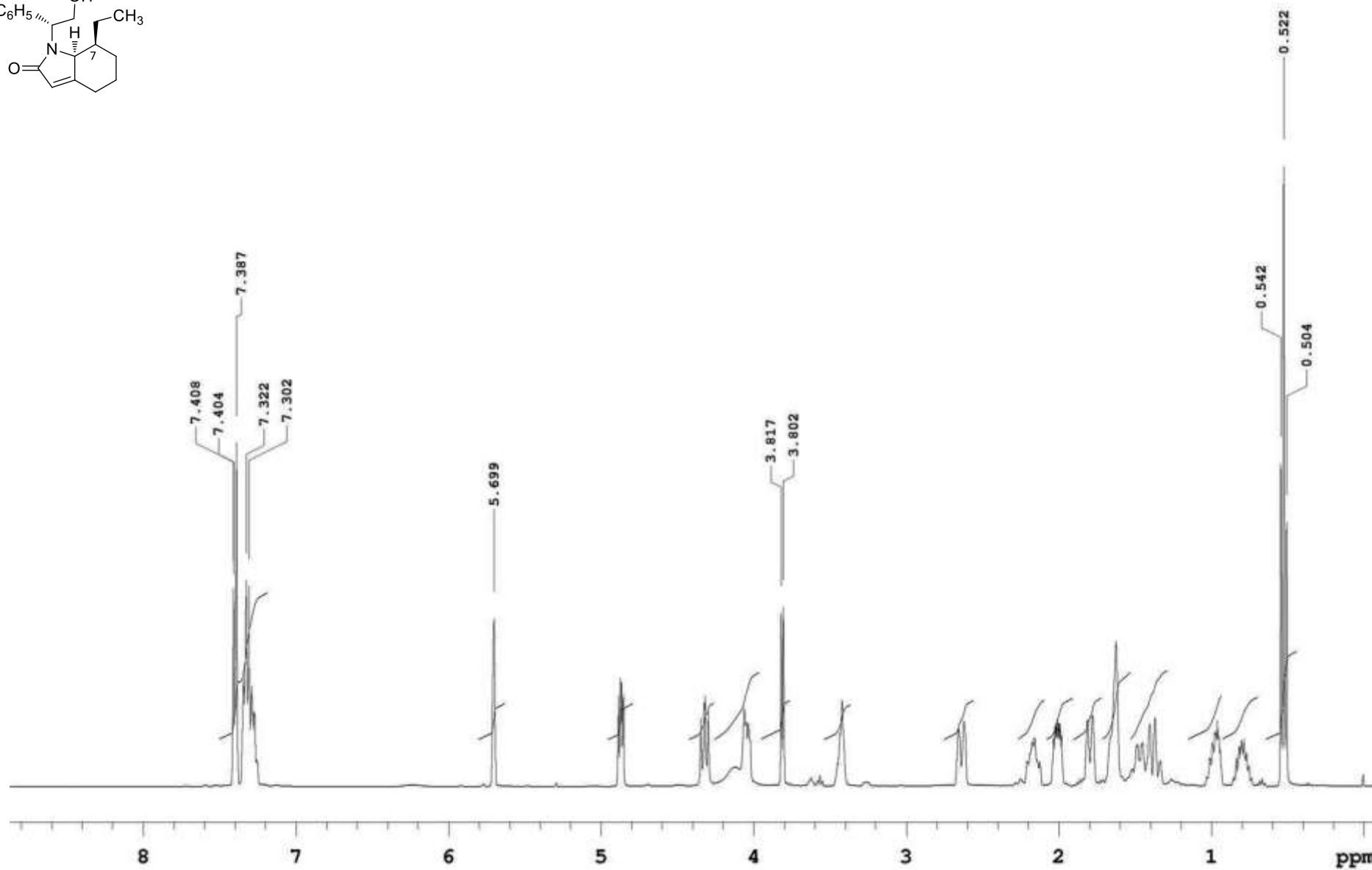
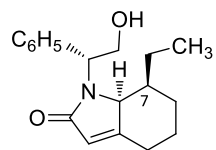
(3R,6aS,10aS)-10-Methyl-5-oxo-3-phenyl-2,3,5,6,6a,7,8,10a-octahydrooxazolo[2,3-f]indole (122)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



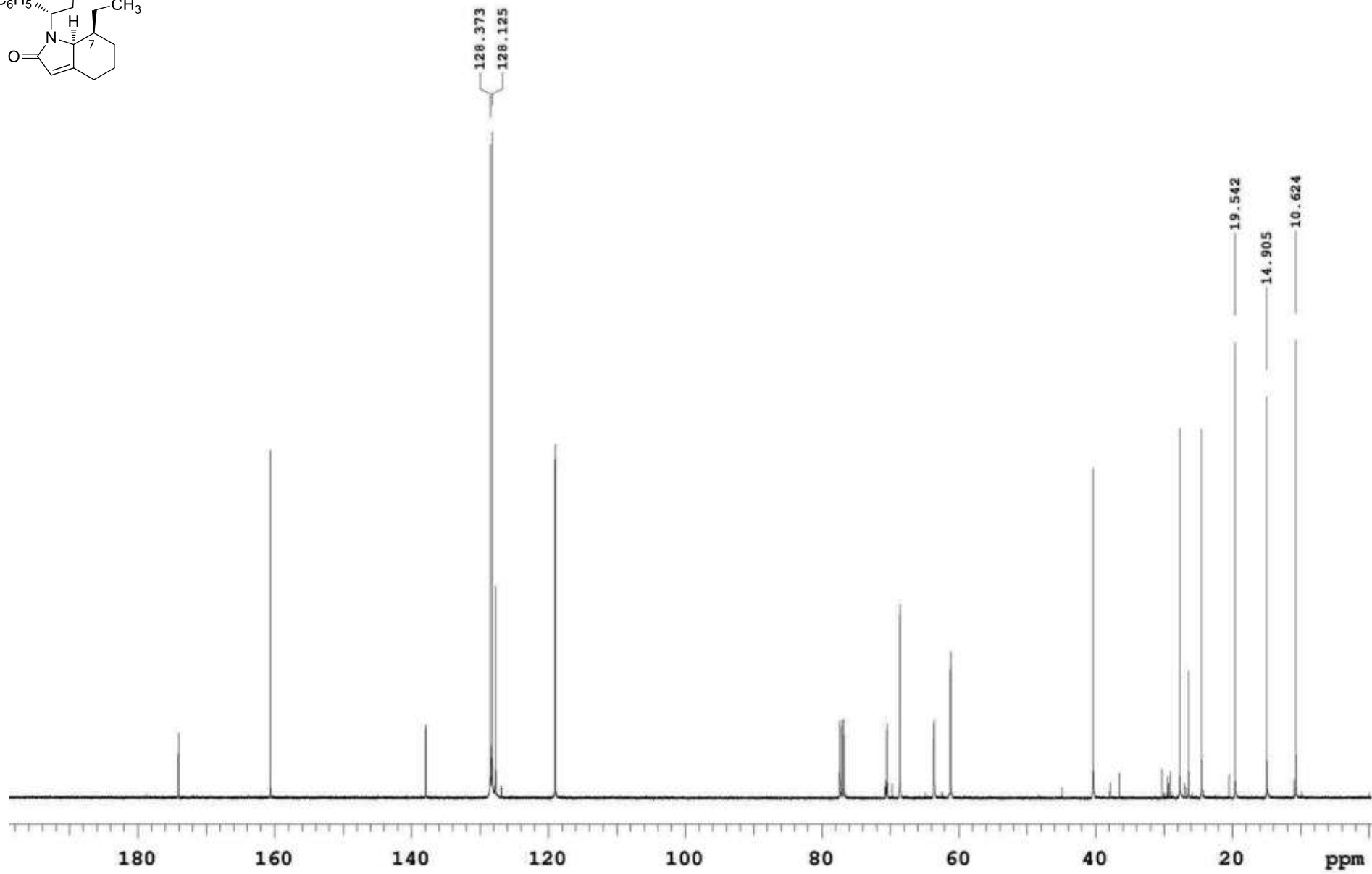
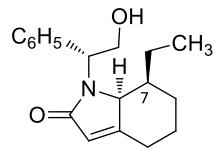
(7S,7aS)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-methyl-2-oxo-2,4,5,6,7,7a-hexahydroindole (113b)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



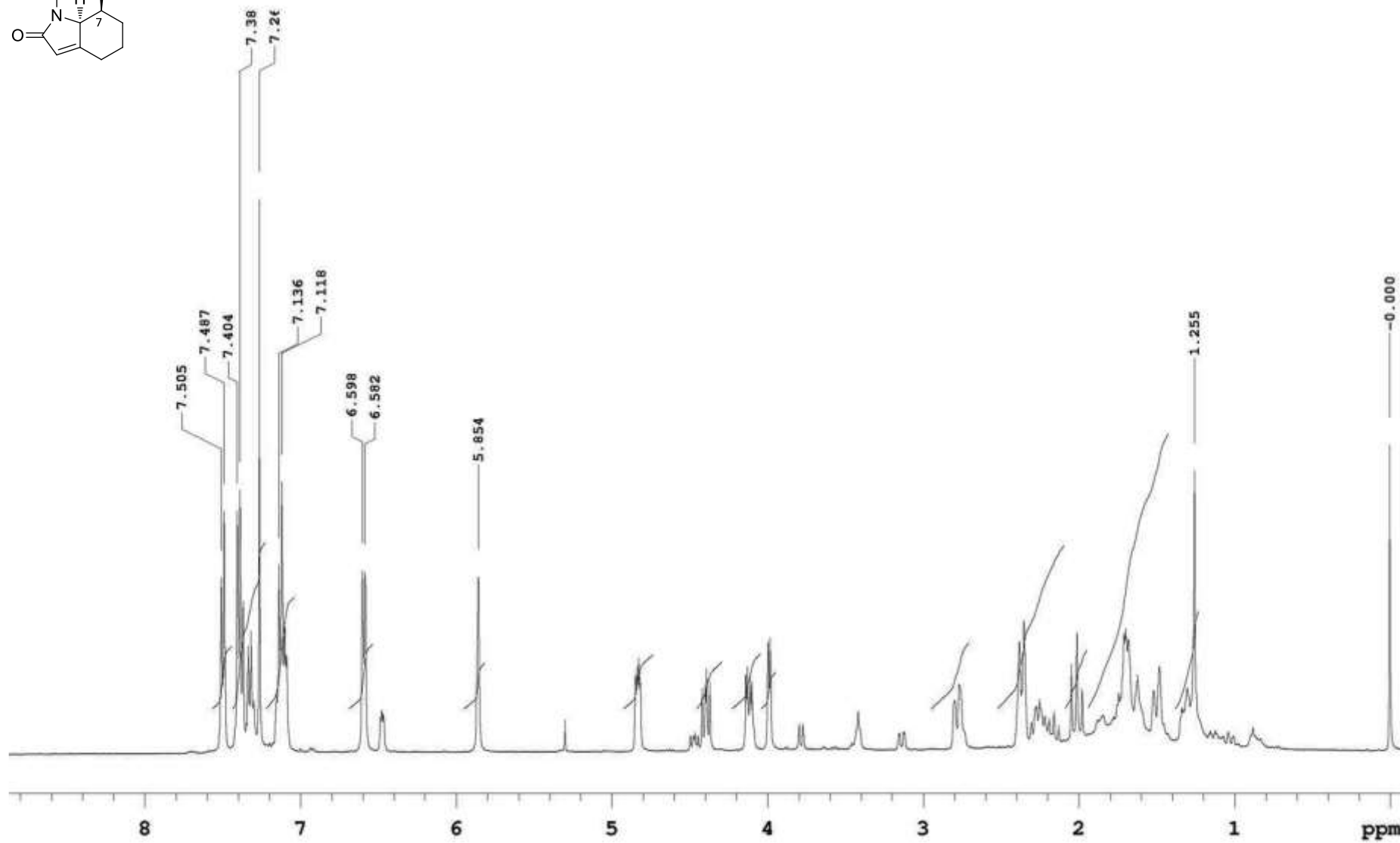
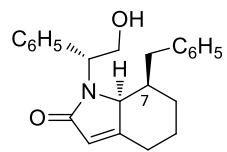
(7S,7aS)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-methyl-2-oxo-2,4,5,6,7,7a-hexahydroindole (113b)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



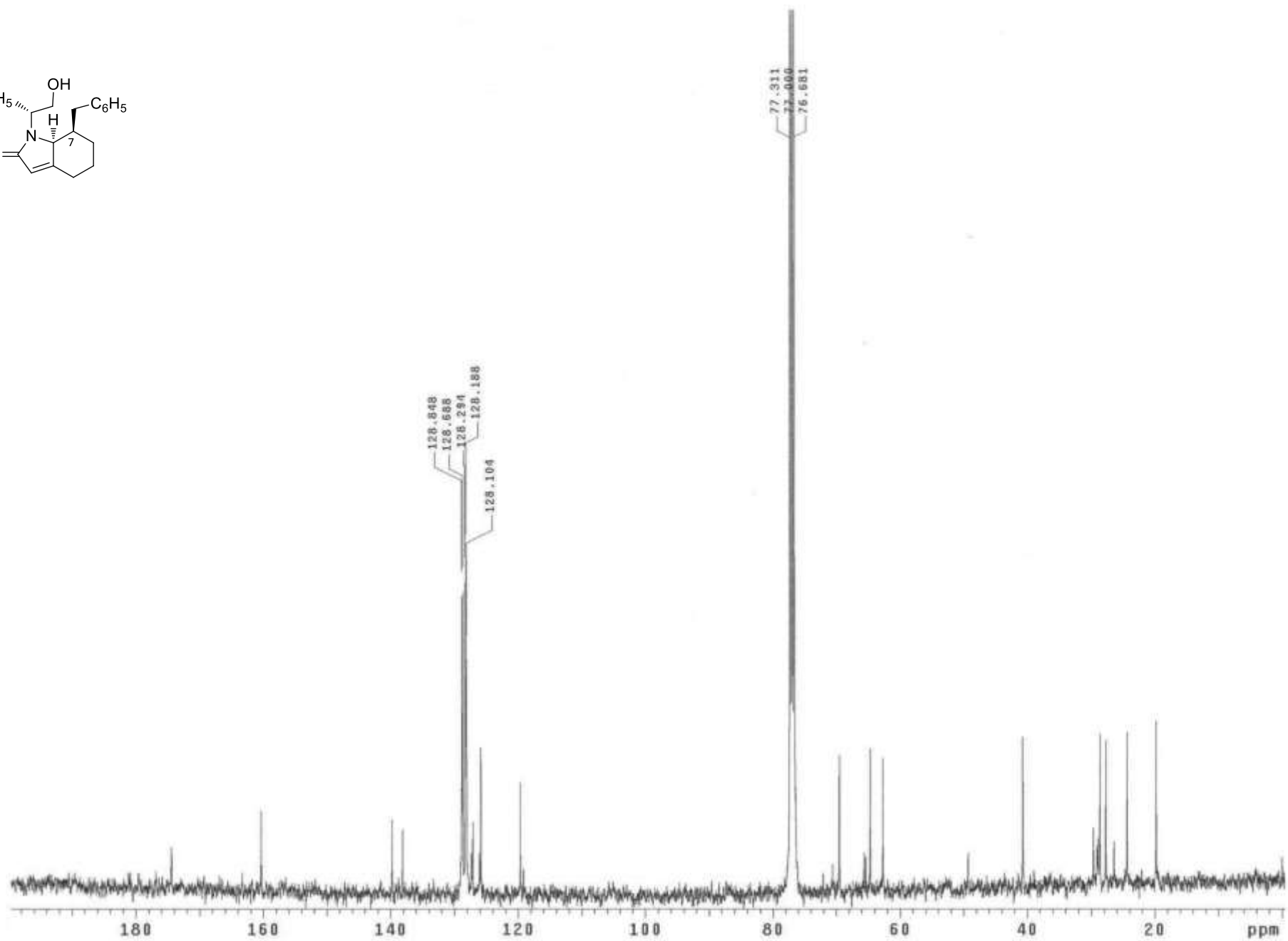
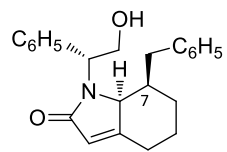
(7S,7aS)-7-Ethyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole (115b)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



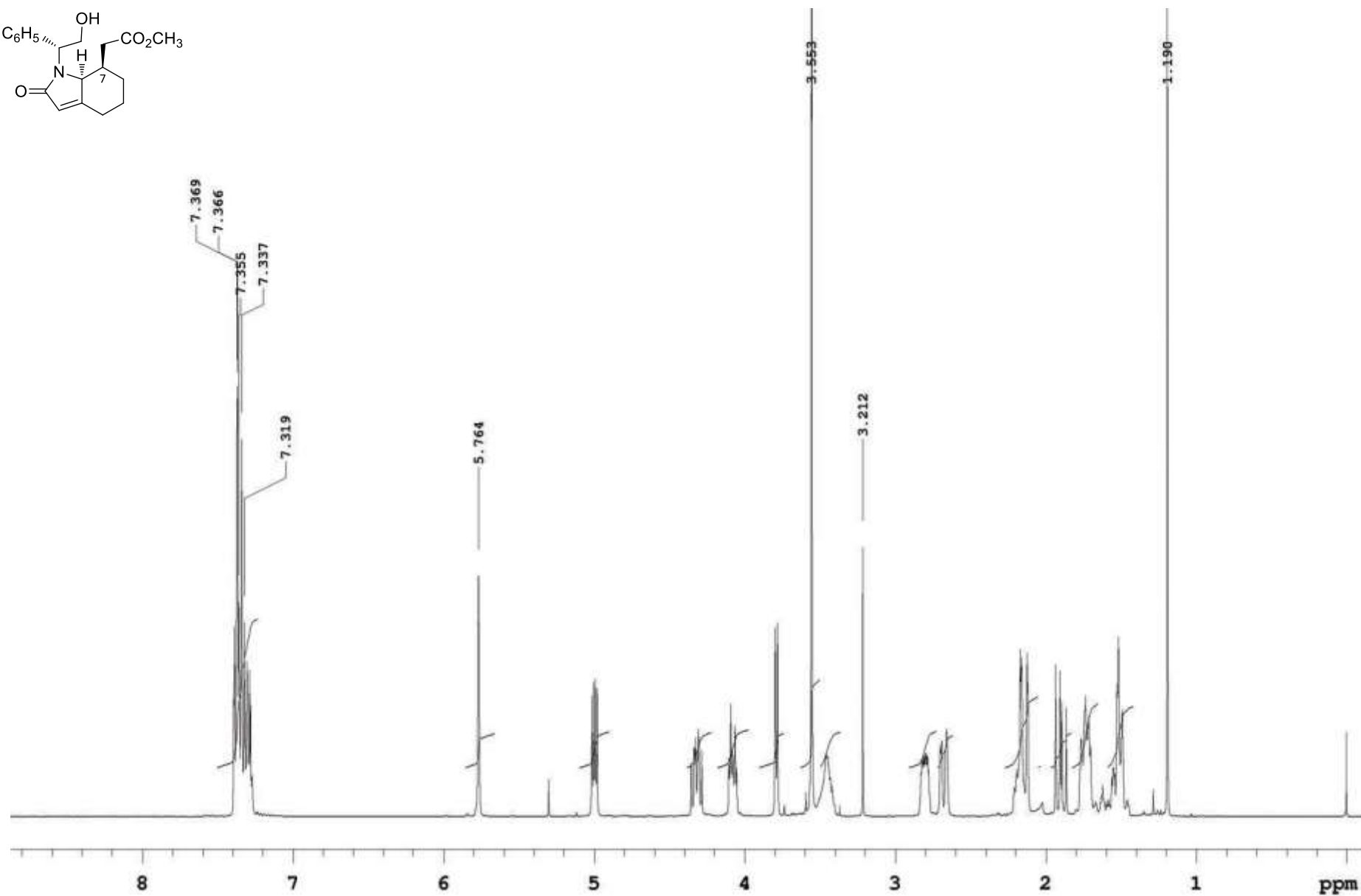
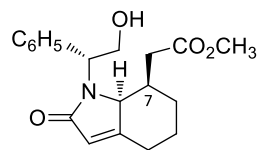
(7S,7aS)-7-Ethyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole (115b)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



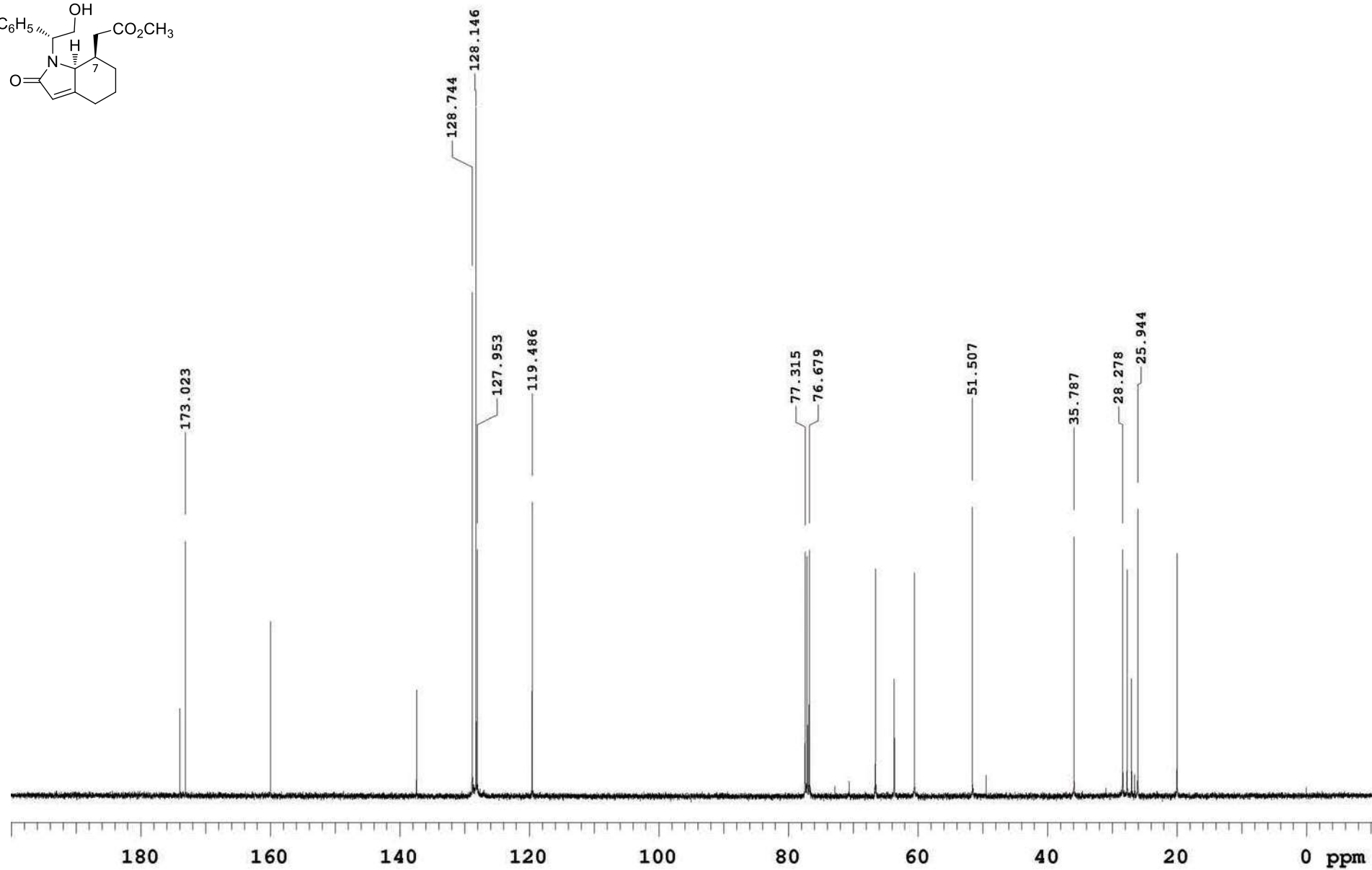
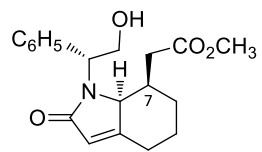
(7*R*,7*aS*)-7-Benzyl-1-[(1*R*)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7*a*-hexahydroindole (117b)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



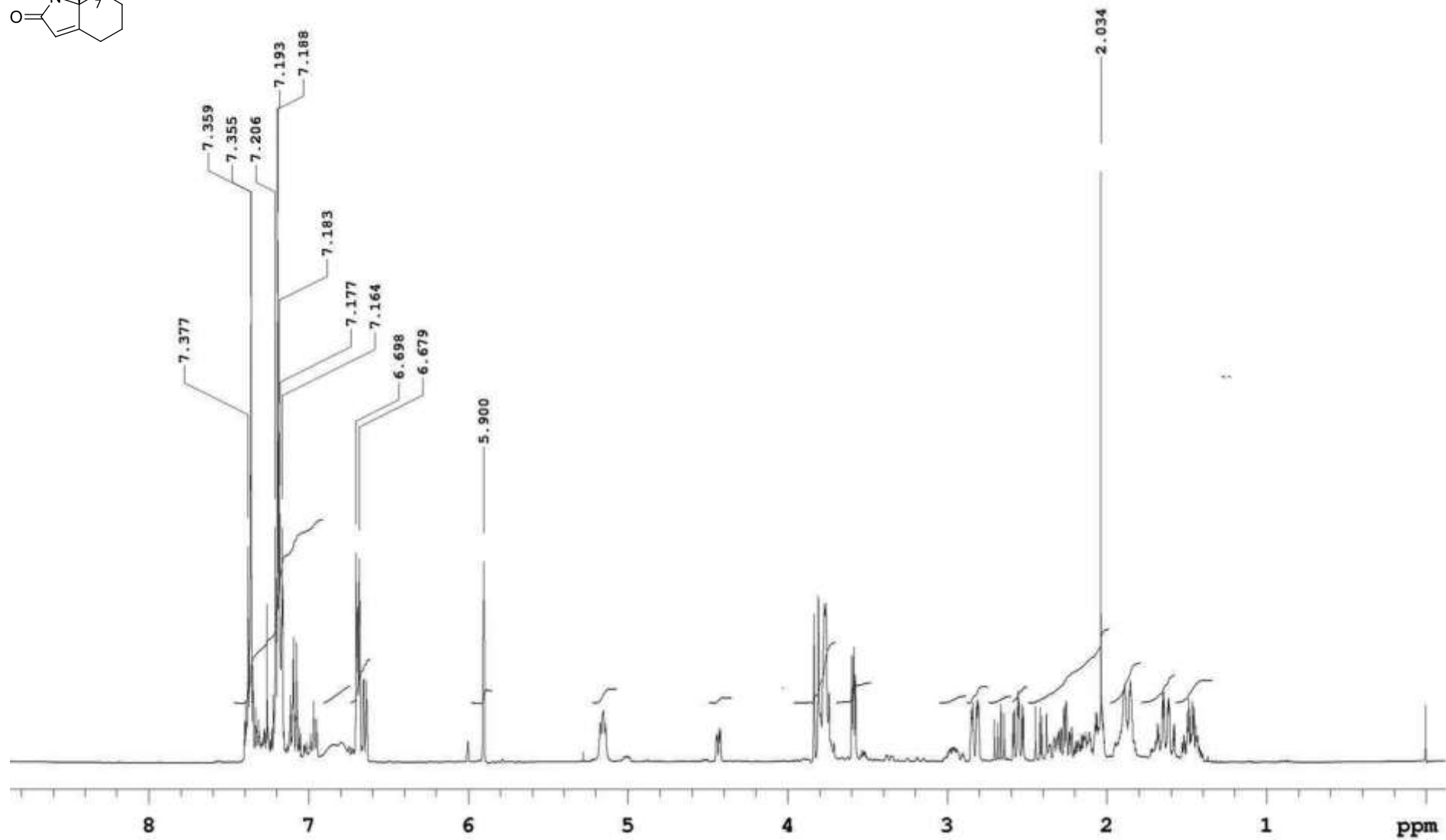
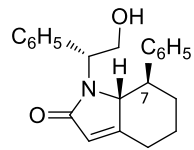
(7R,7aS)-7-Benzyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole (117b)- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



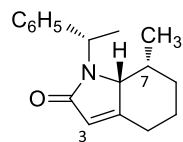
Methyl (7R,7aS)-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole-7-acetate (111b)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



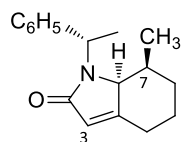
Methyl (7R,7aS)-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-2,4,5,6,7,7a-hexahydroindole-7-acetate (111b)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



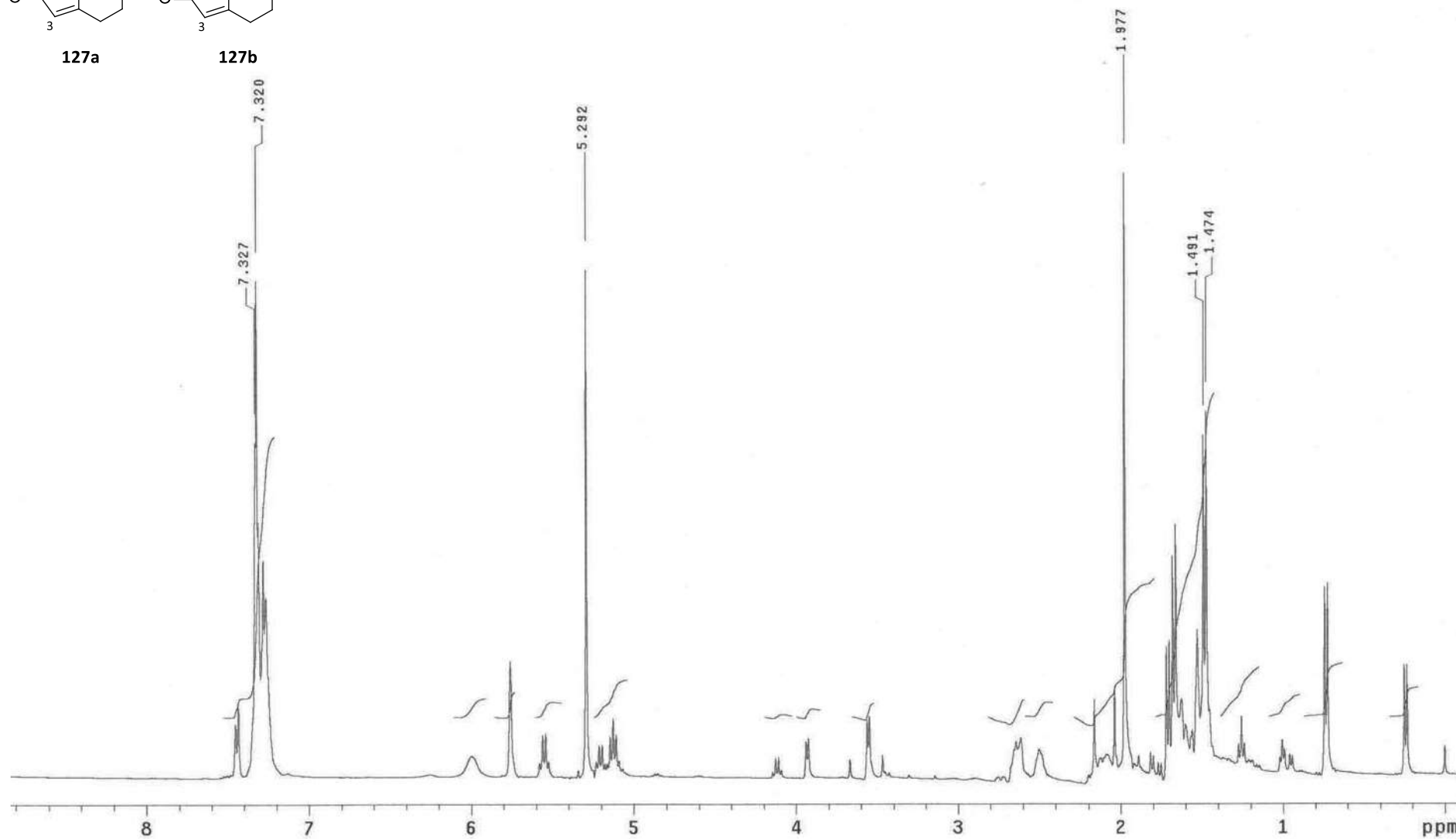
(7S,7aS)-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxo-7-phenyl-2,4,5,6,7,7a-hexahydroindole (125)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



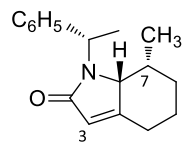
127a



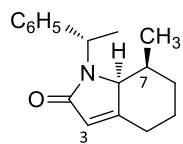
127b



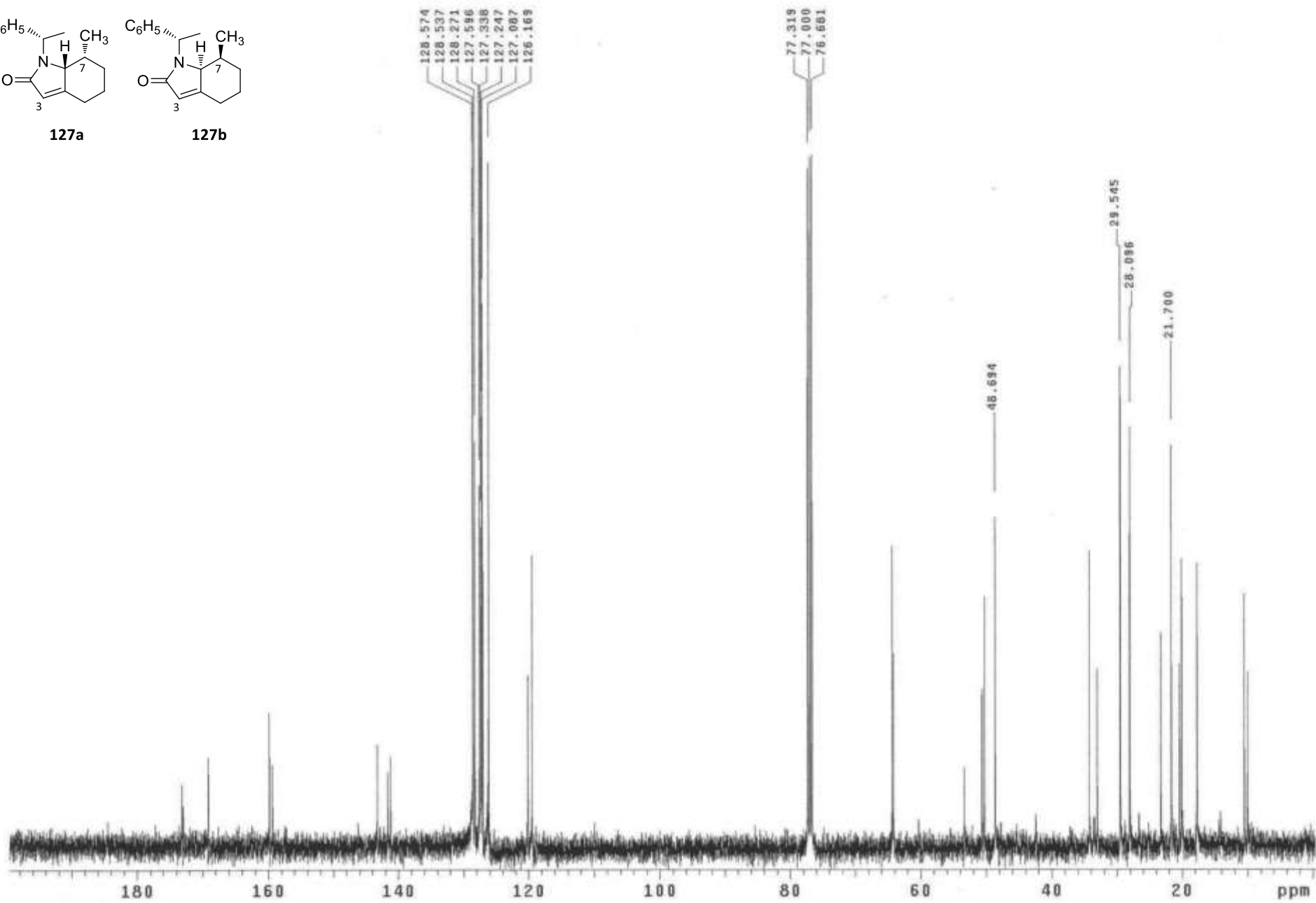
(127a/127b)



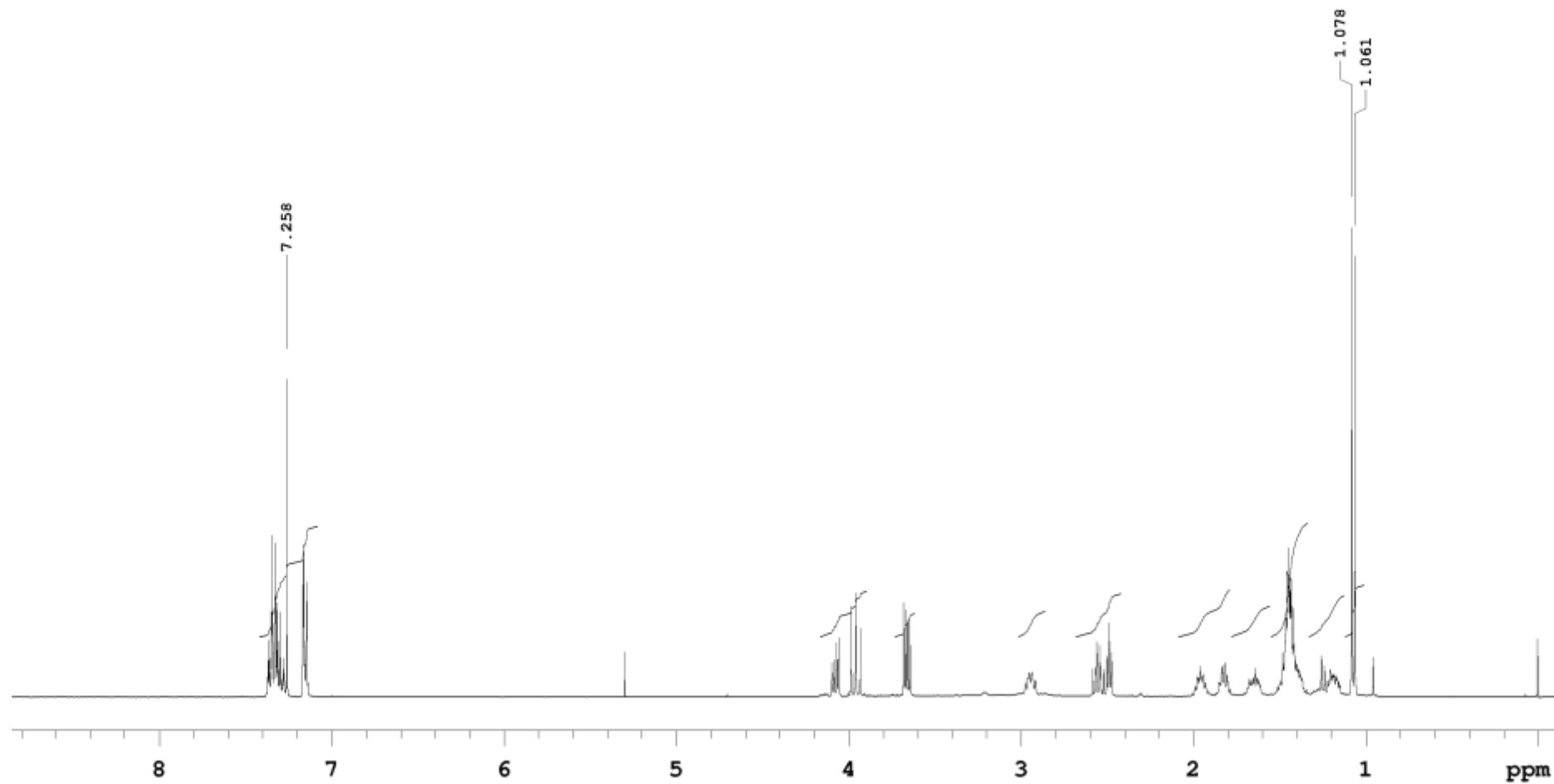
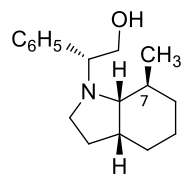
127a



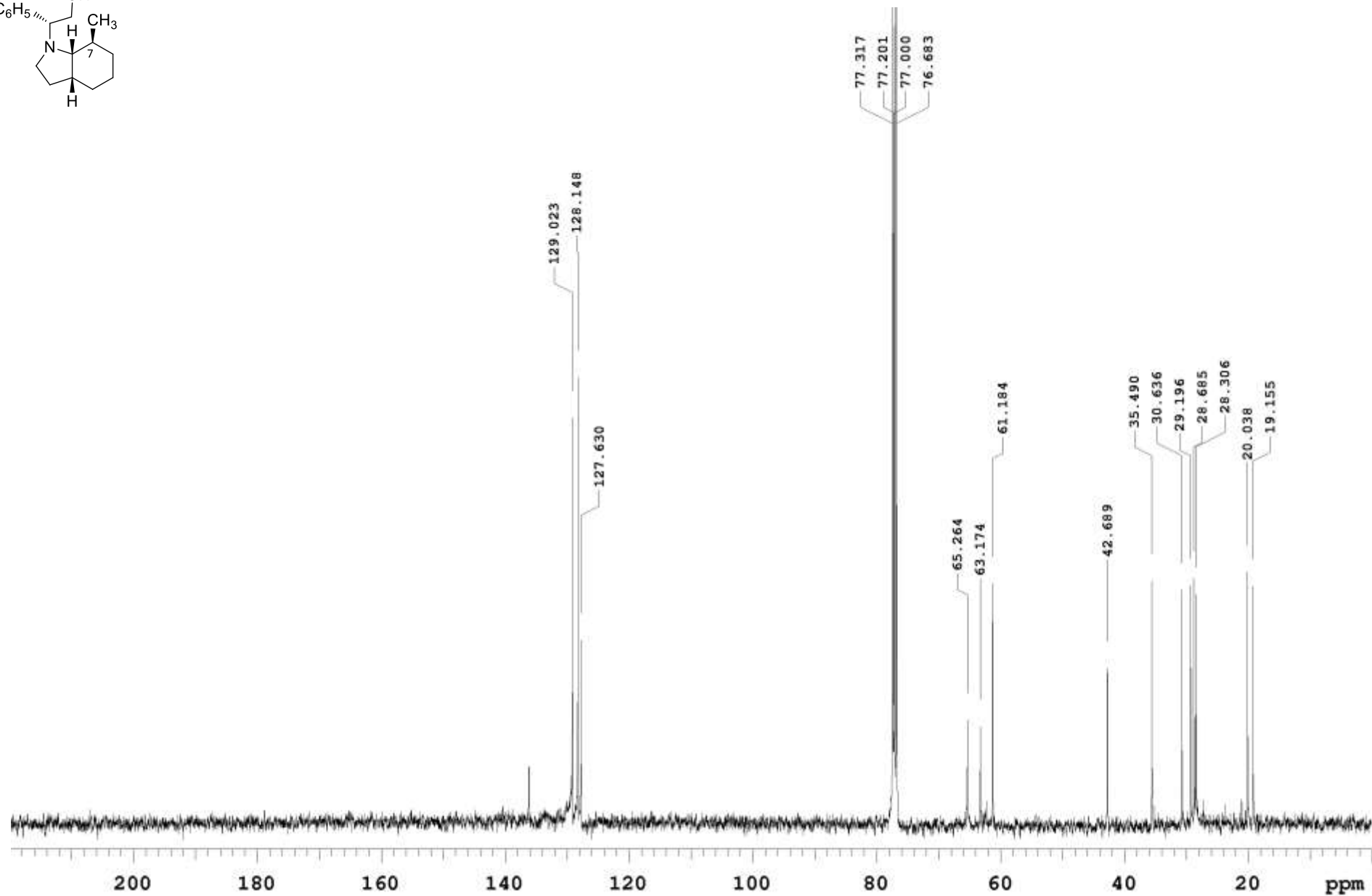
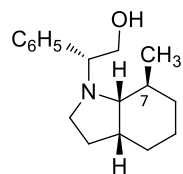
127b



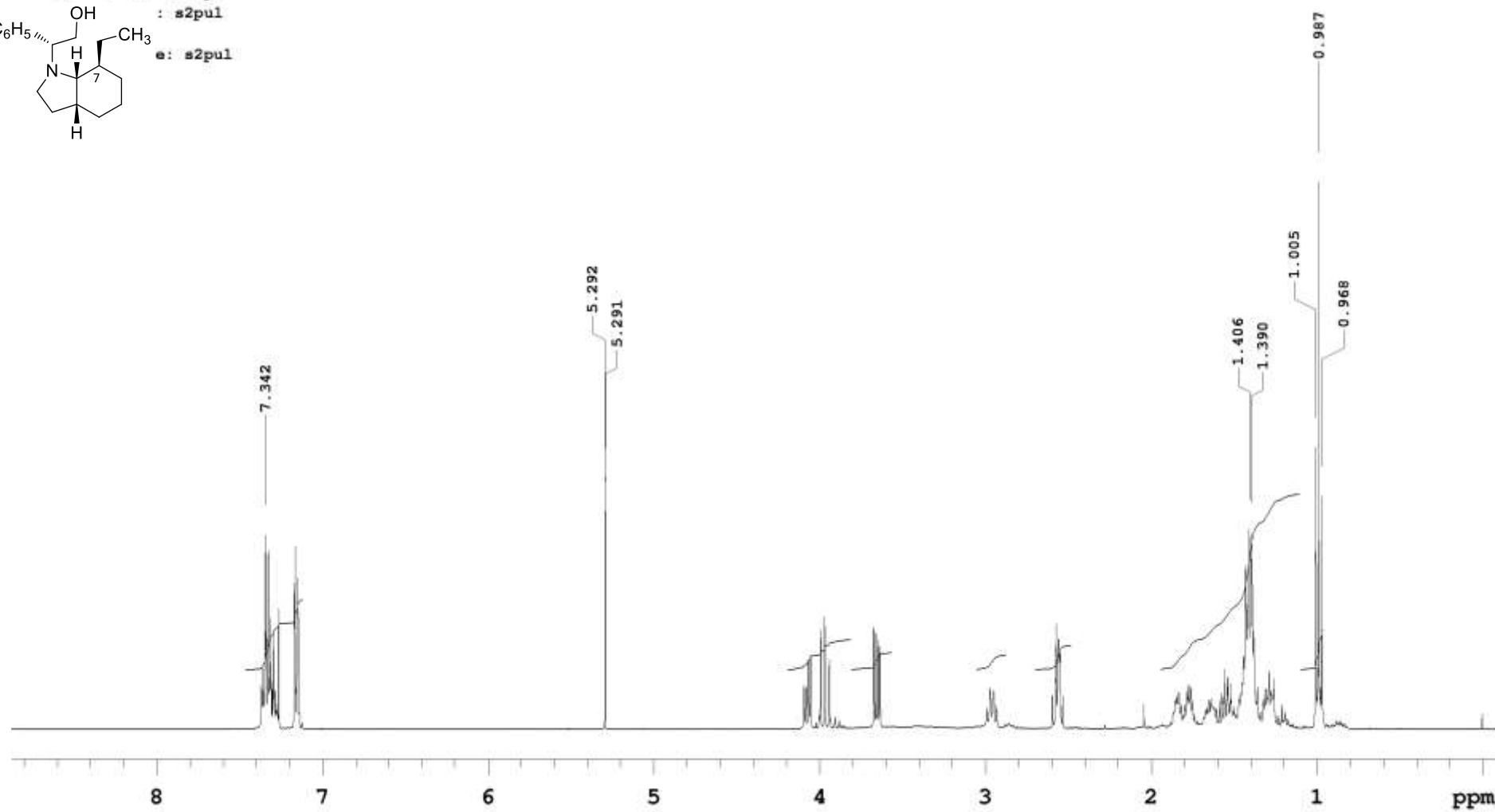
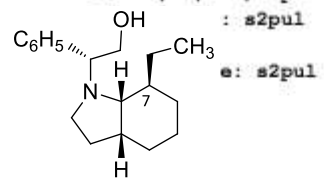
(127a/127b)



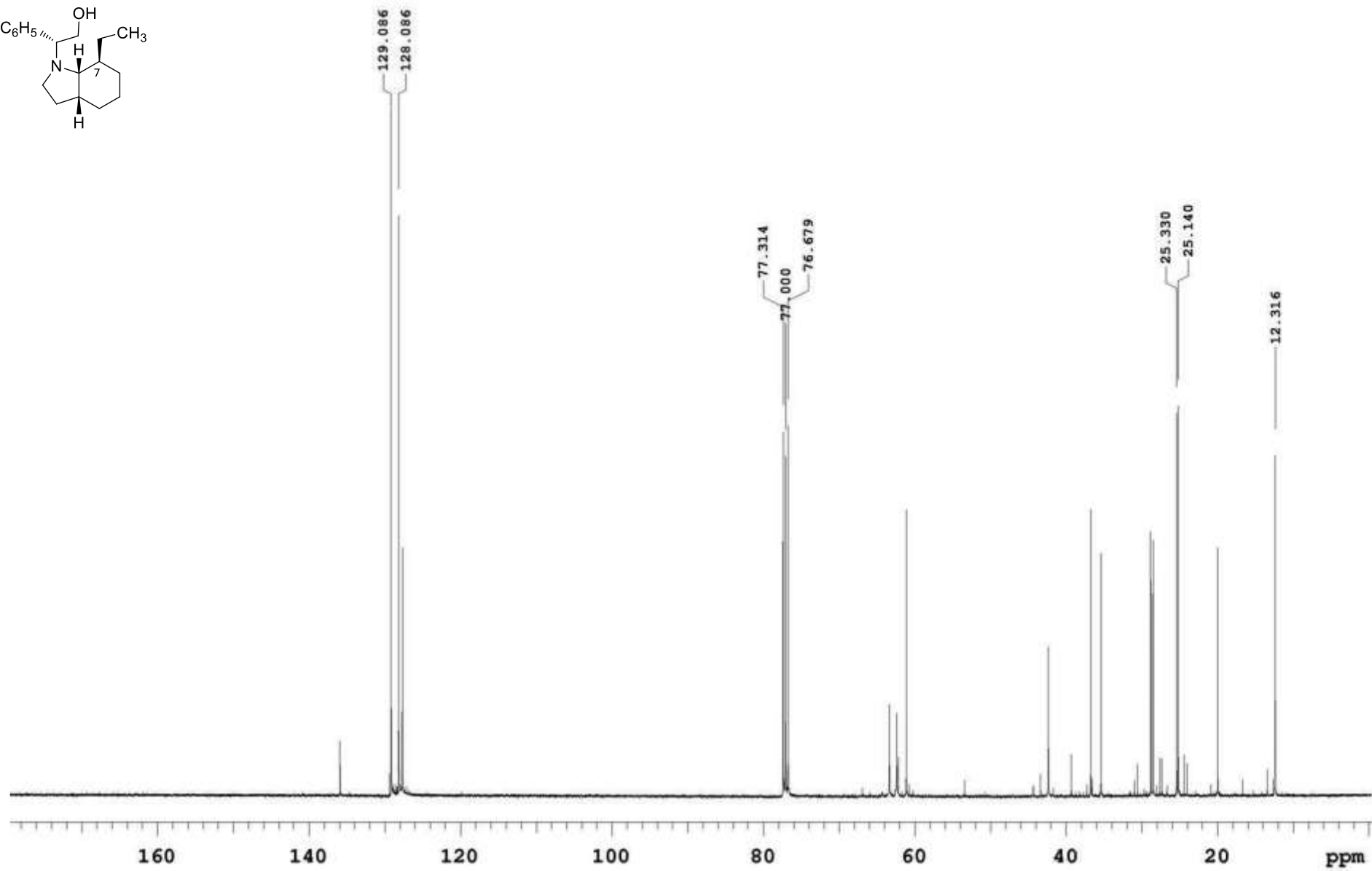
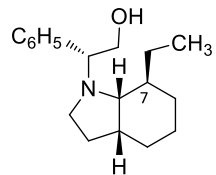
(3aR,7S,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-methyloctahydroindole (128)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



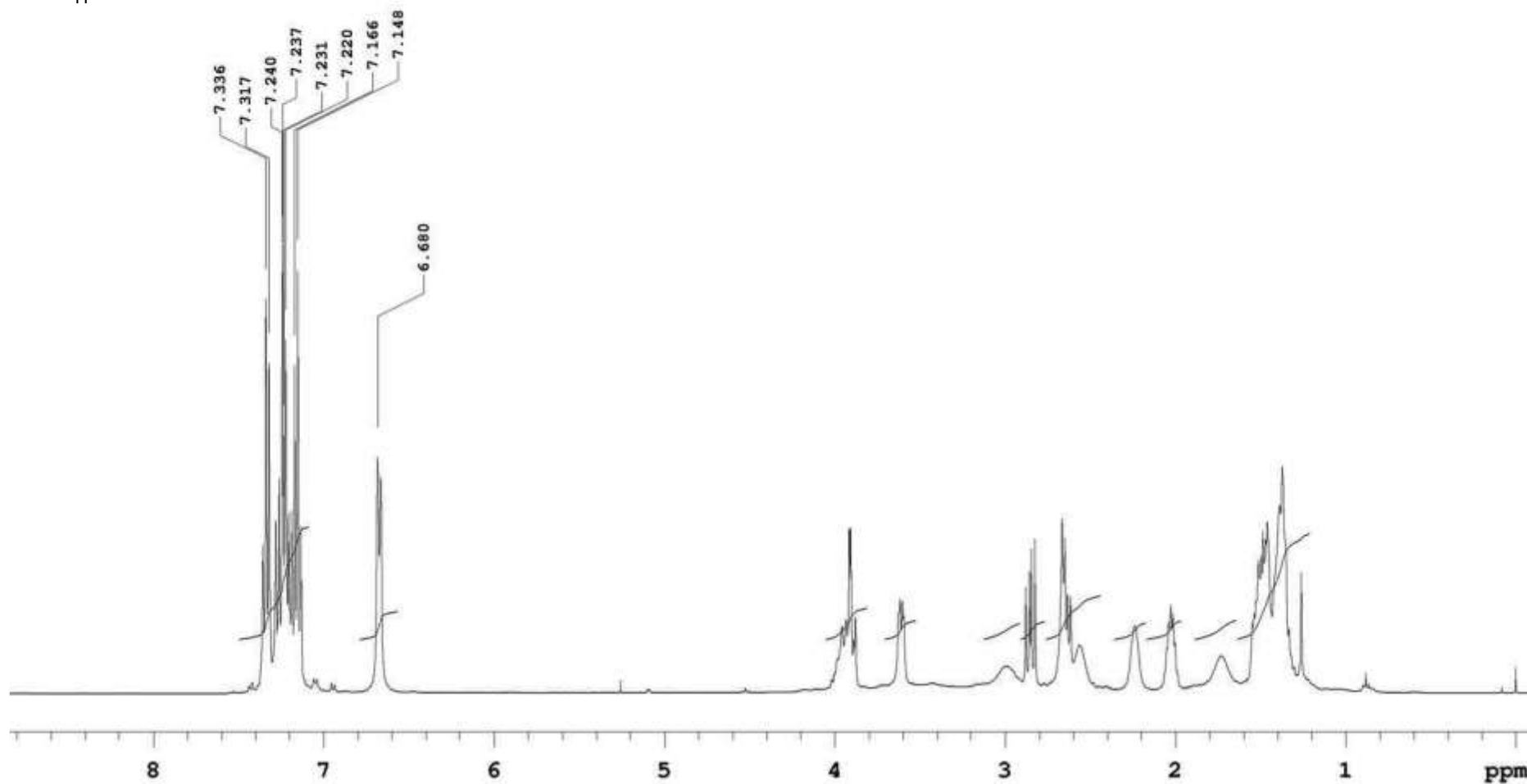
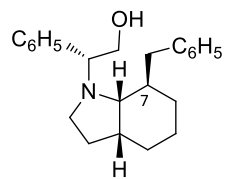
(3aR,7S,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-methyloctahydroindole (128)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



(3aR,7S,7aR)-7-Ethyl-1-[(1R)-2-hydroxy-1-phenylethyl]octahydroindole (129)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C

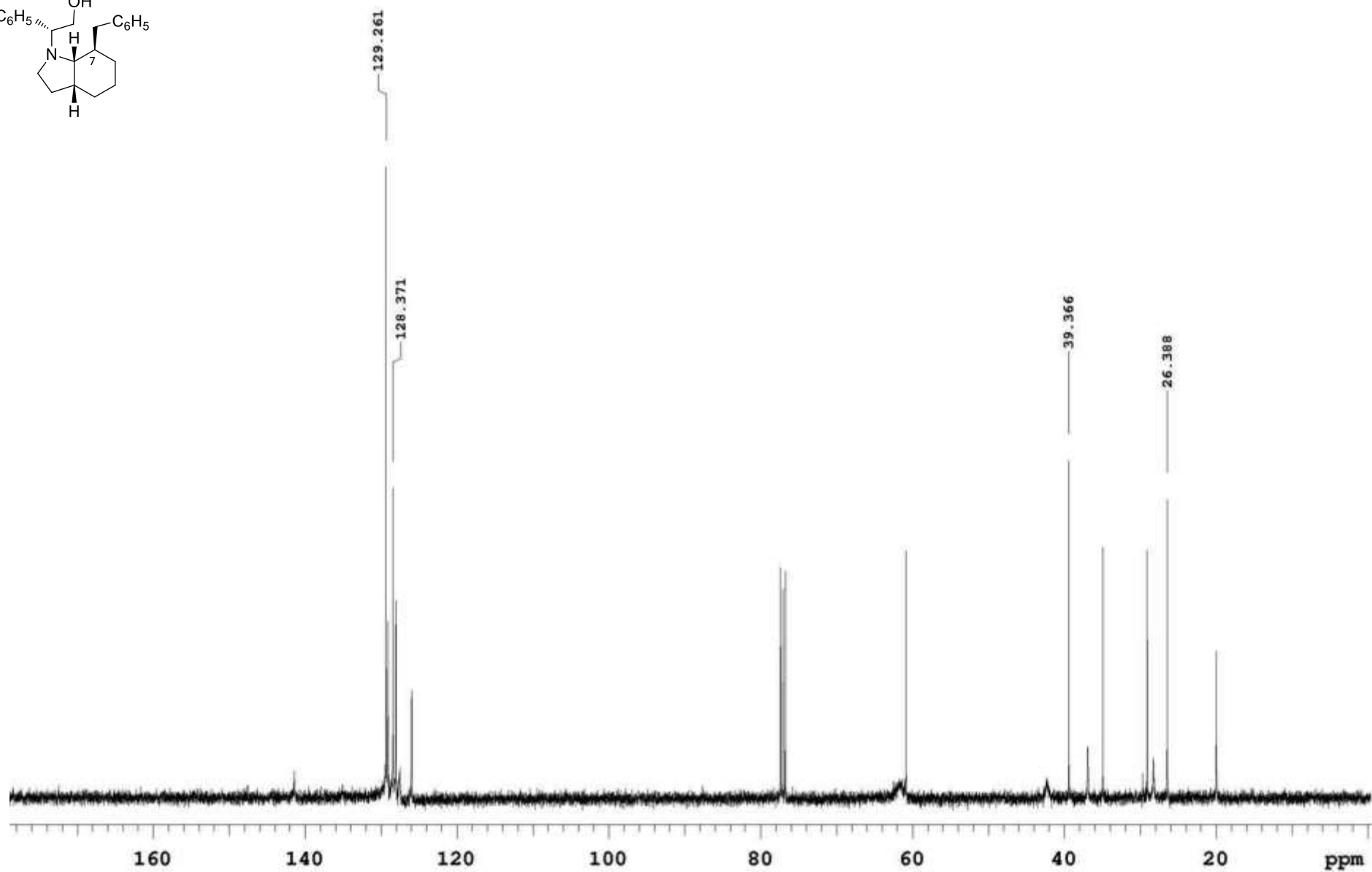
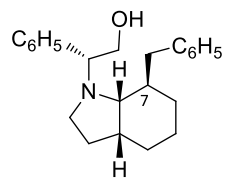


(3aR,7S,7aR)-7-Ethyl-1-[(1R)-2-hydroxy-1-phenylethyl]octahydroindole (129)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C

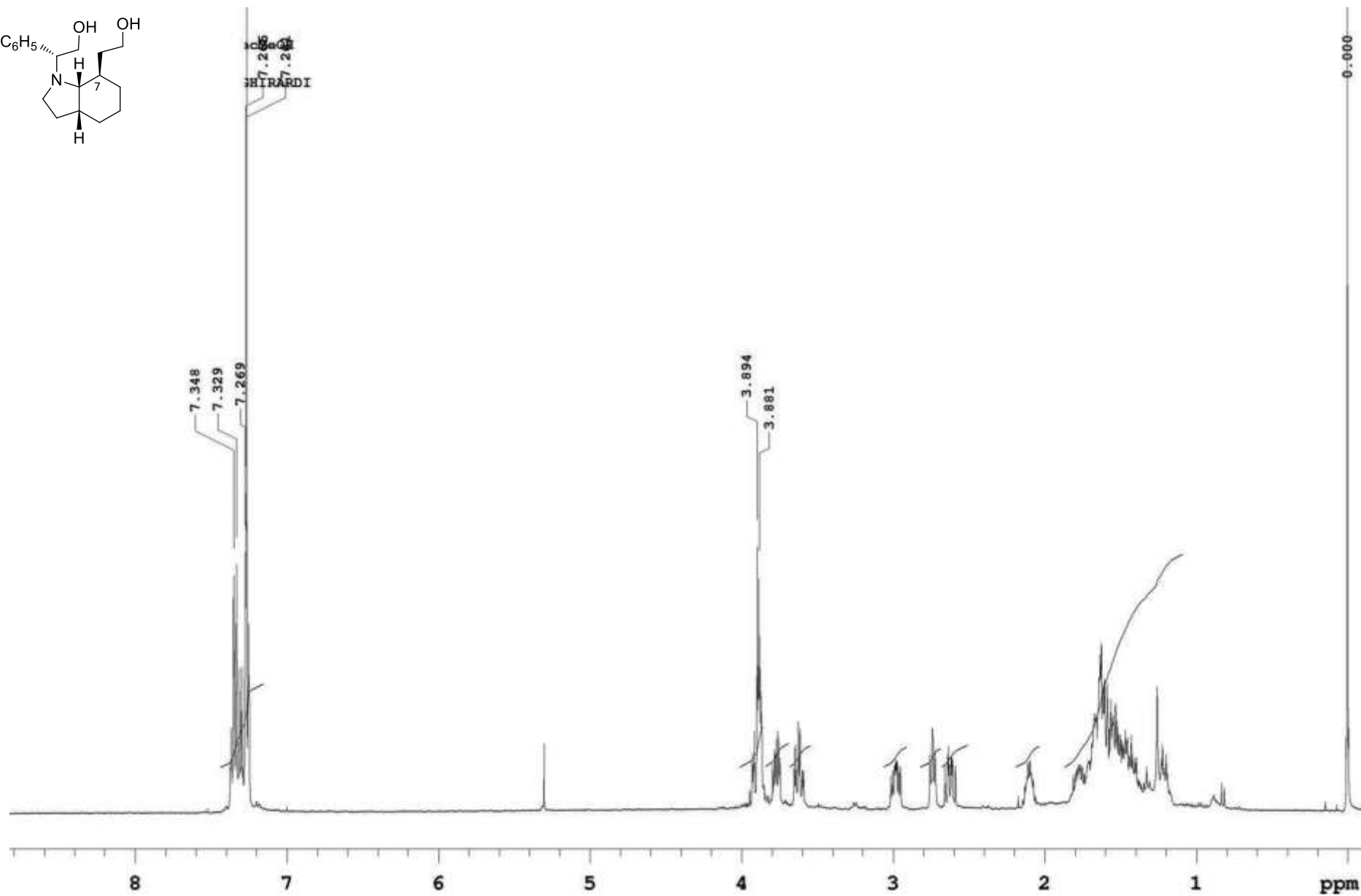
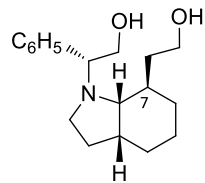


(3aR,7R,7aR)-7-Benzyl-1-[(1R)-2-hydroxy-1-phenylethyl]octahydroindole (130)-¹H-NMR, CDCl₃, 400 MHz, 25 °C

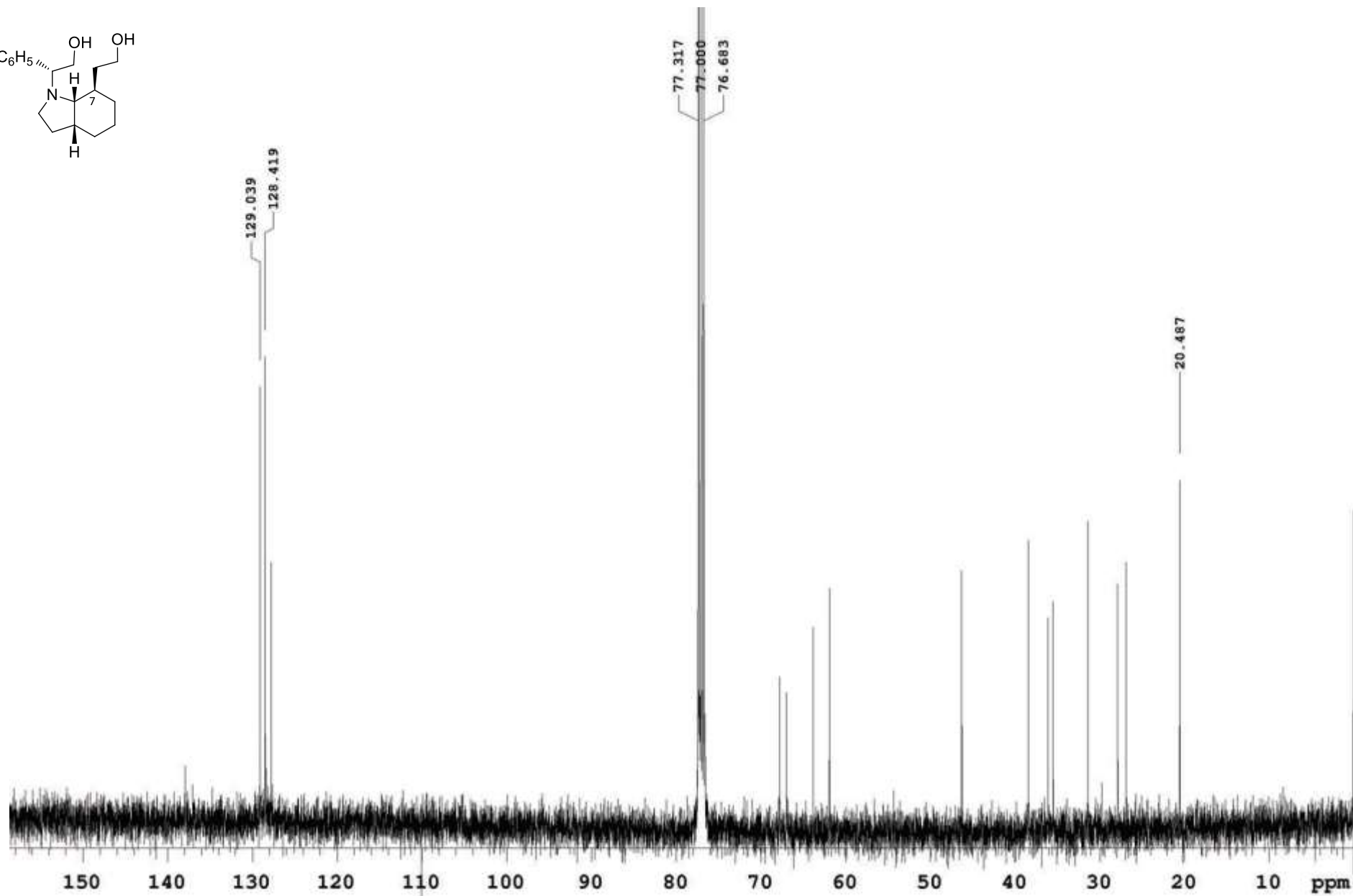
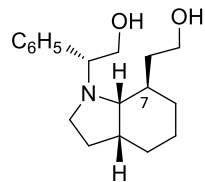
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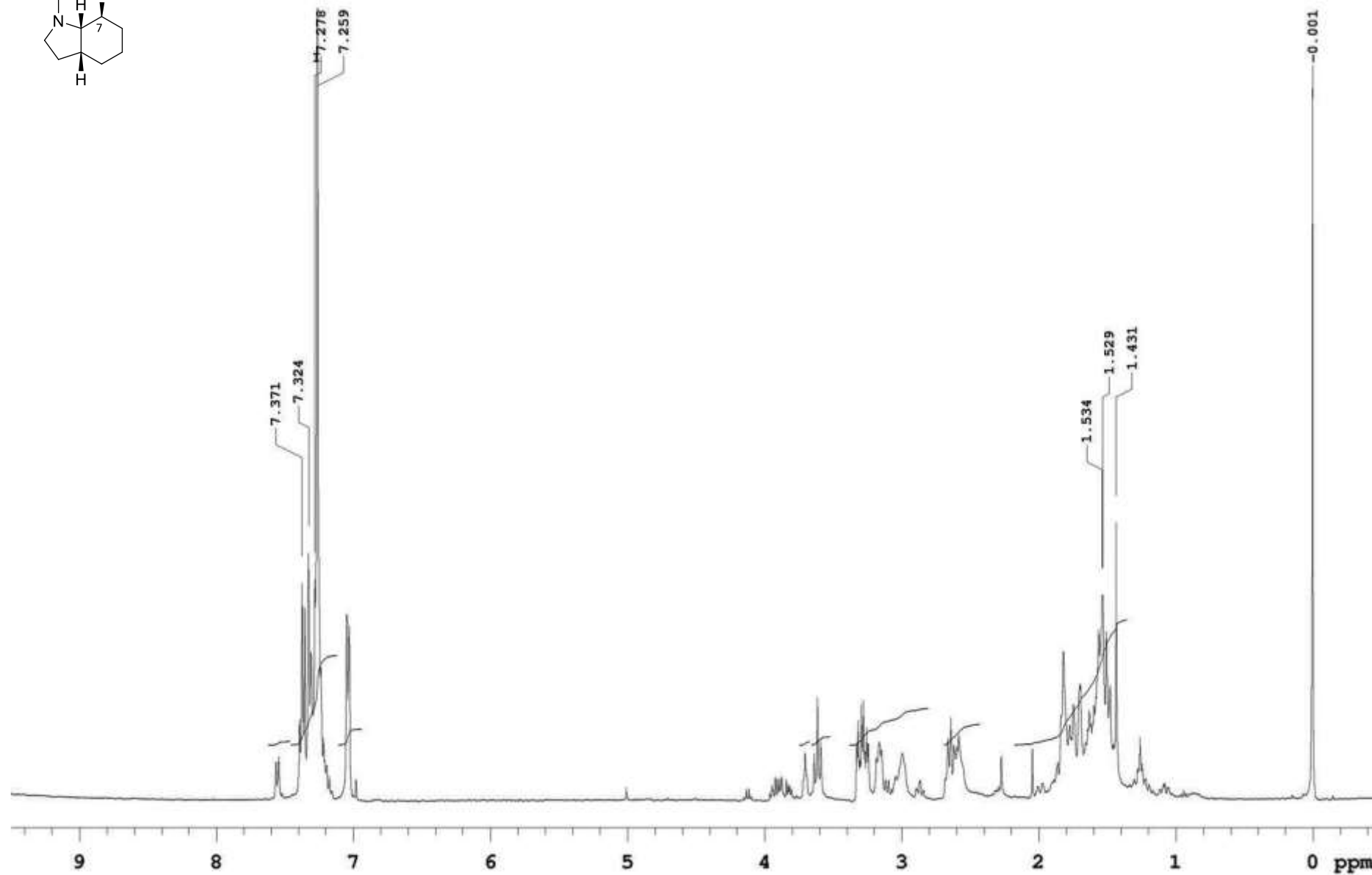
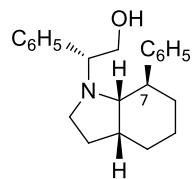
(3a*R*,7*R*,7a*R*)-7-Benzyl-1-[(1*R*)-2-hydroxy-1-phenylethyl]octahydroindole (130)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °



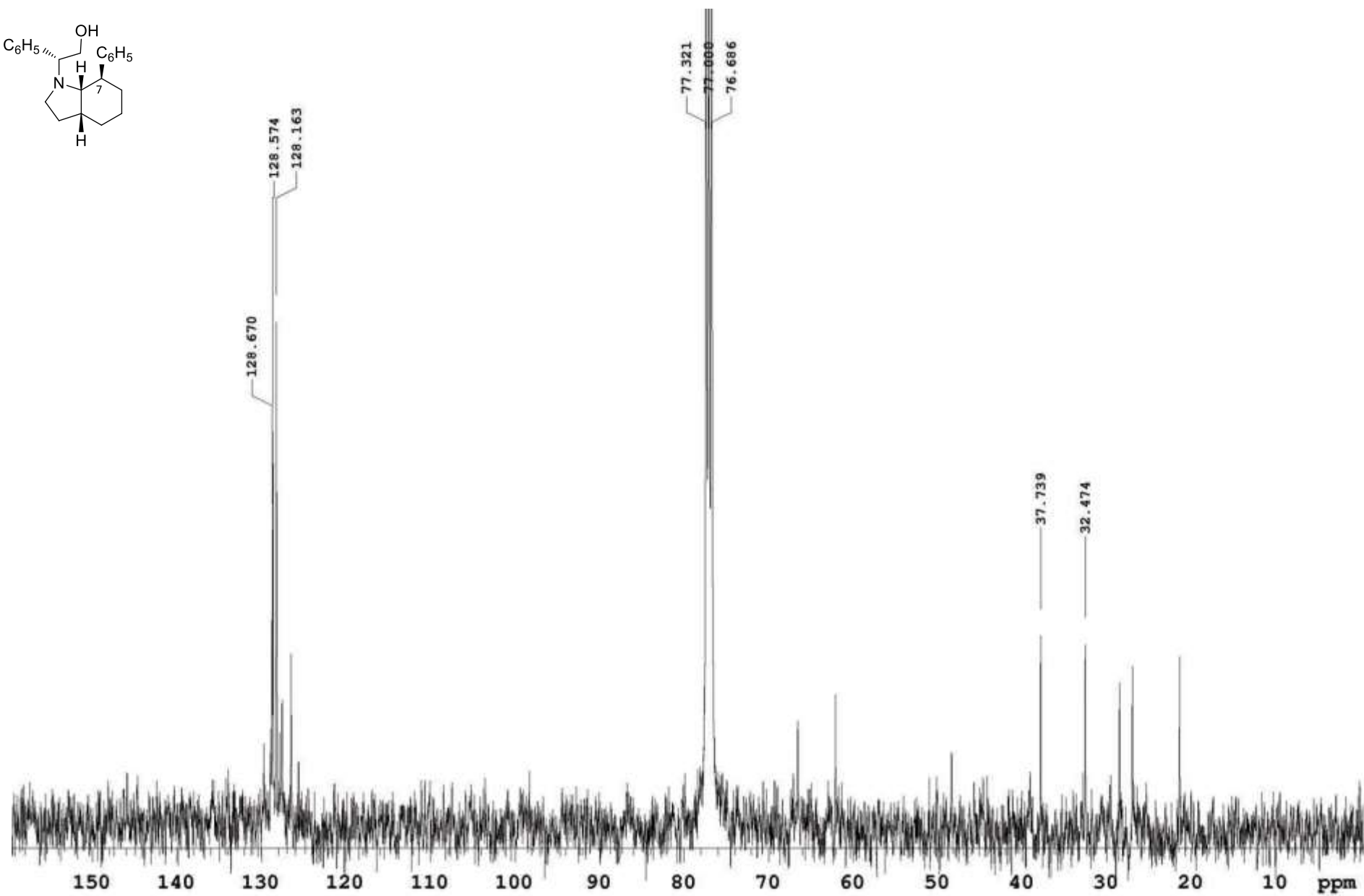
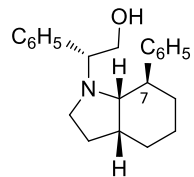
(3aR,7R,7aS)-7-(2-Hydroxyethyl)-1-[(1R)-2-hydroxy-1-phenylethyl]octahydroindole (131)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



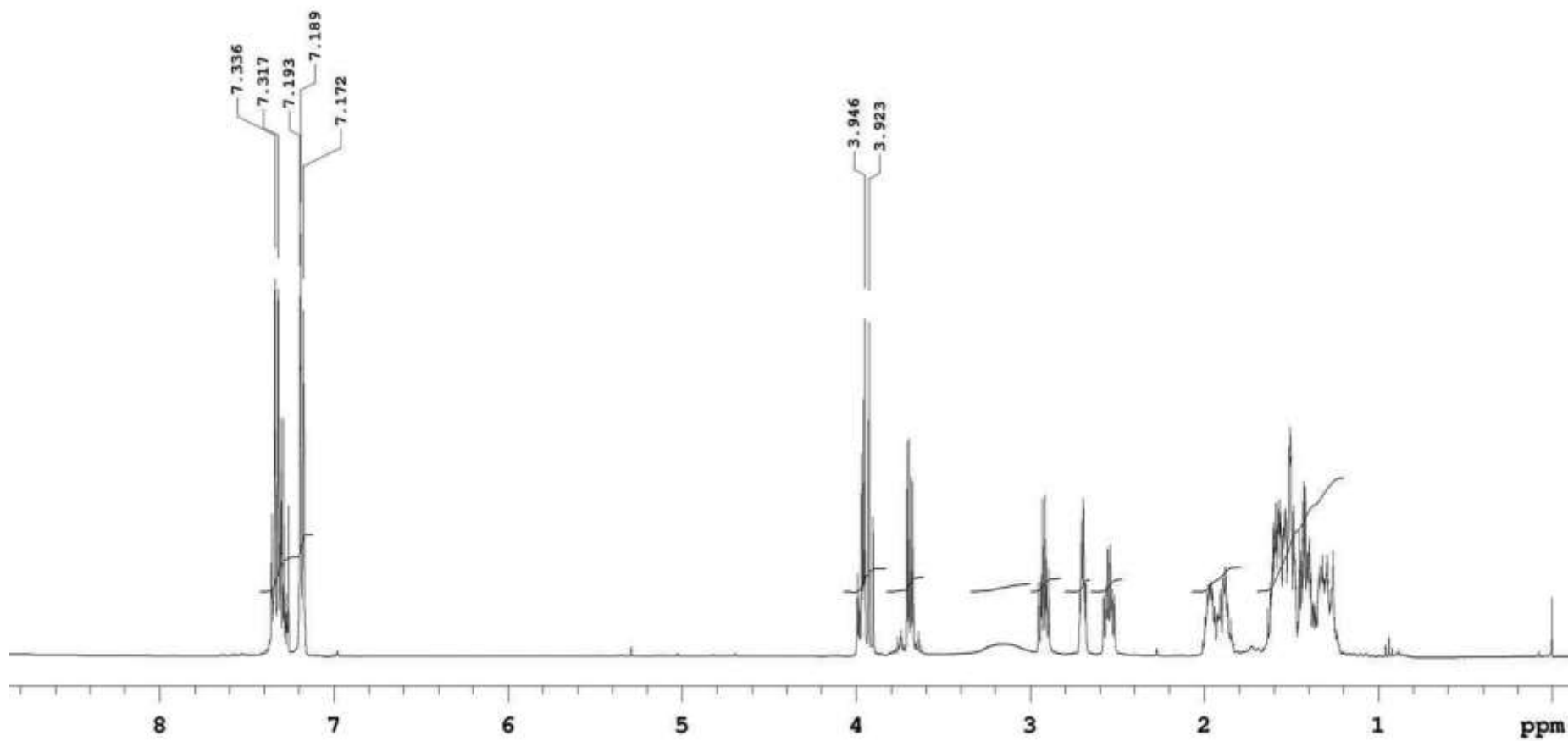
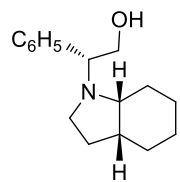
(3aR,7R,7aS)-7-(2-Hydroxyethyl)-1-[(1R)-2-hydroxy-1-phenylethyl]octahydroindole (131)- ^{13}C -NMR, CDCl_3 , 100.6 MHz, 25 °C



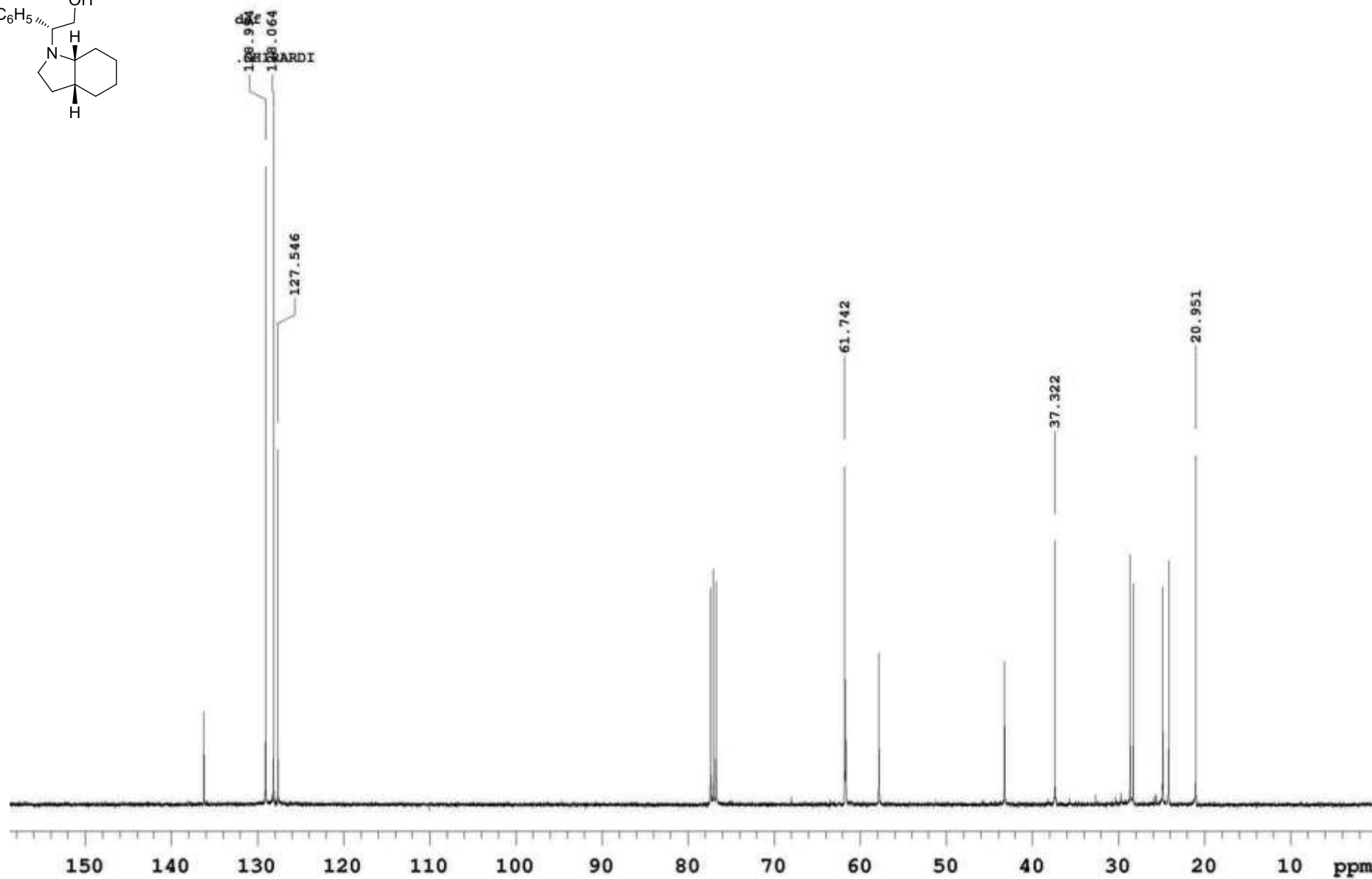
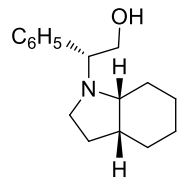
(3aR,7R,7aS)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-phenyloctahydroindole (132)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



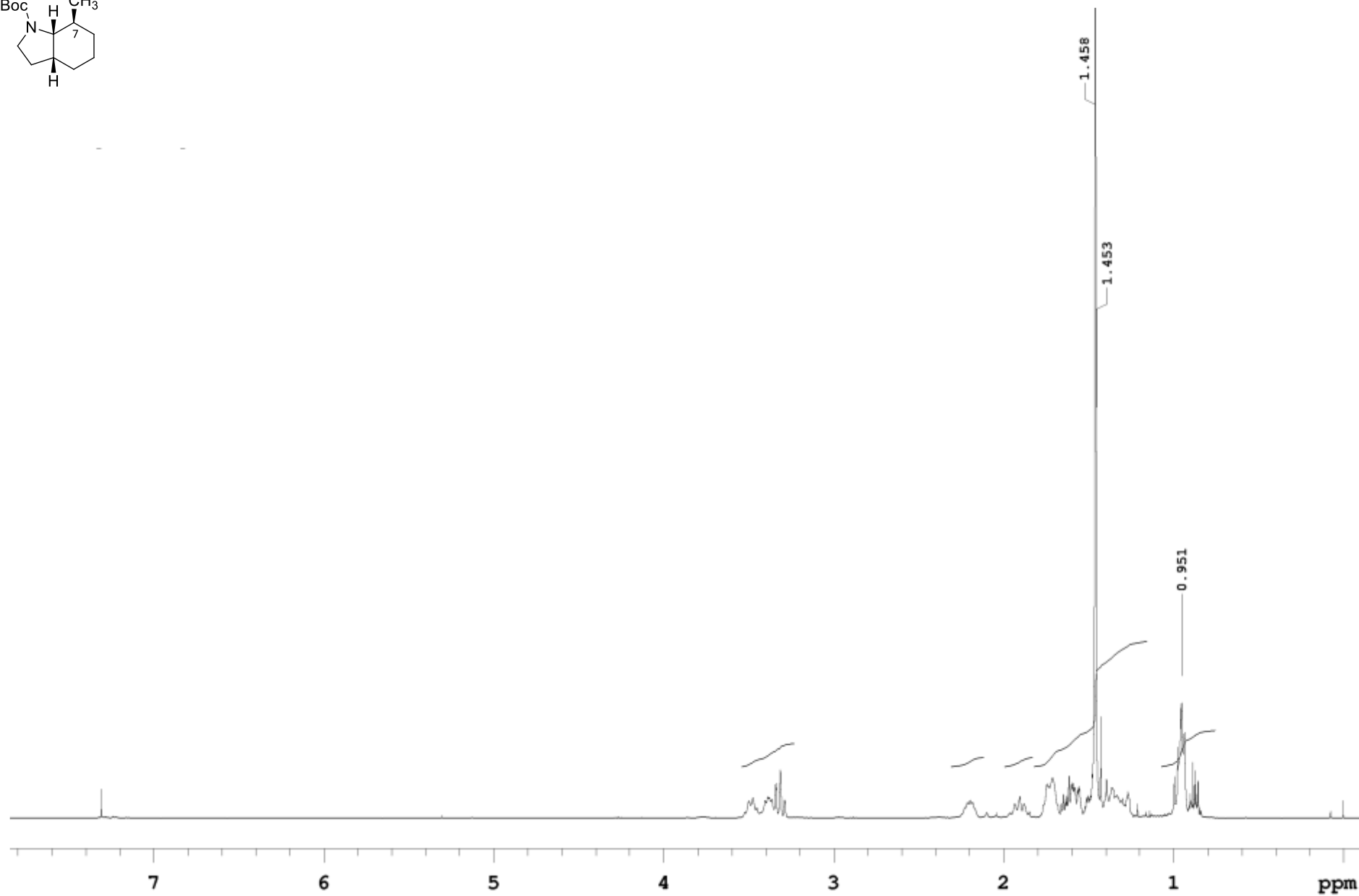
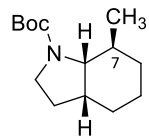
(3*aR*,7*R*,7*aS*)-1-[(1*R*)-2-Hydroxy-1-phenylethyl]-7-phenyloctahydroindole (132)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



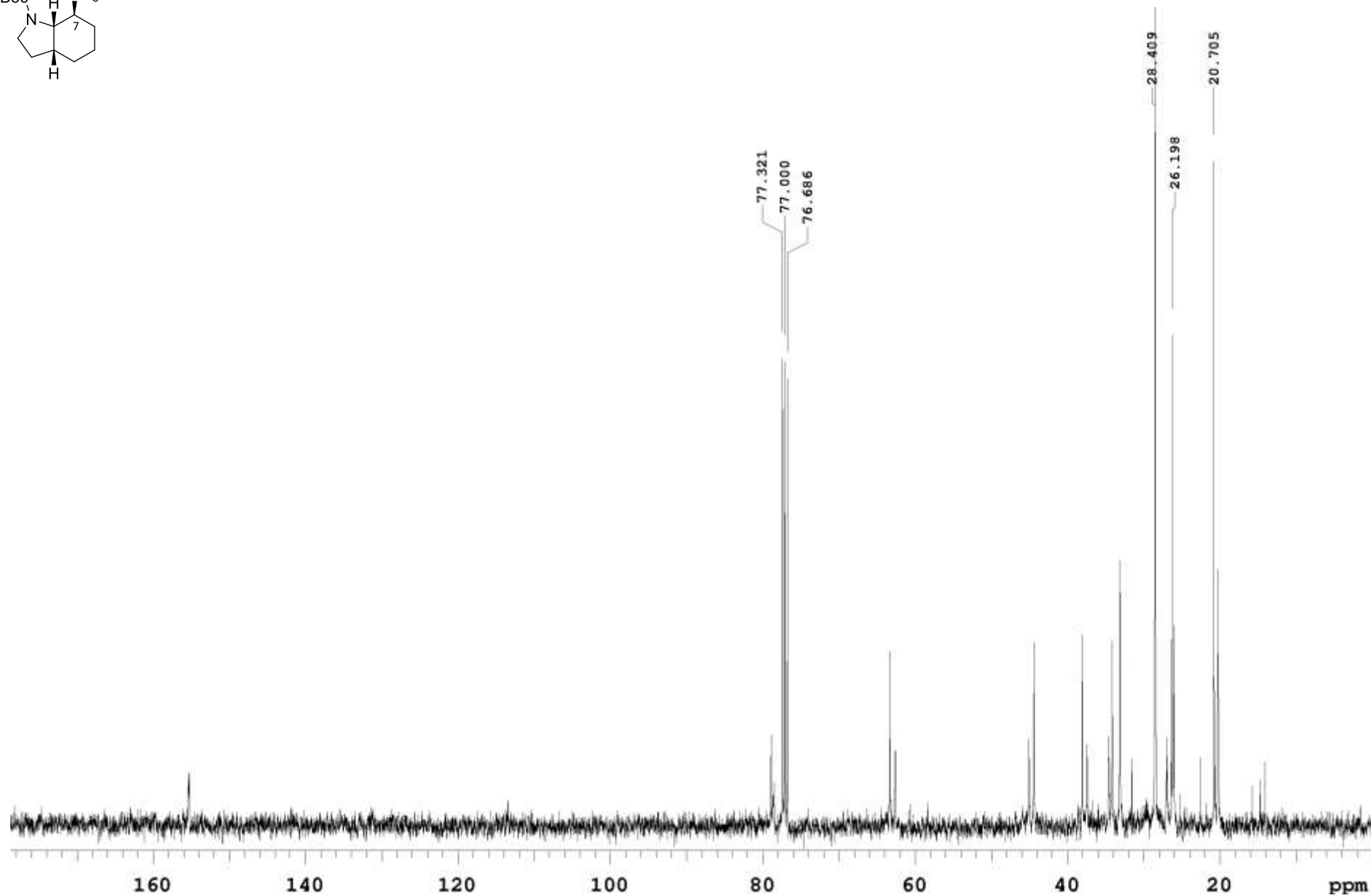
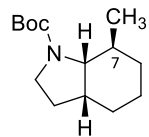
(3aR,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]octahydroindole (133)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



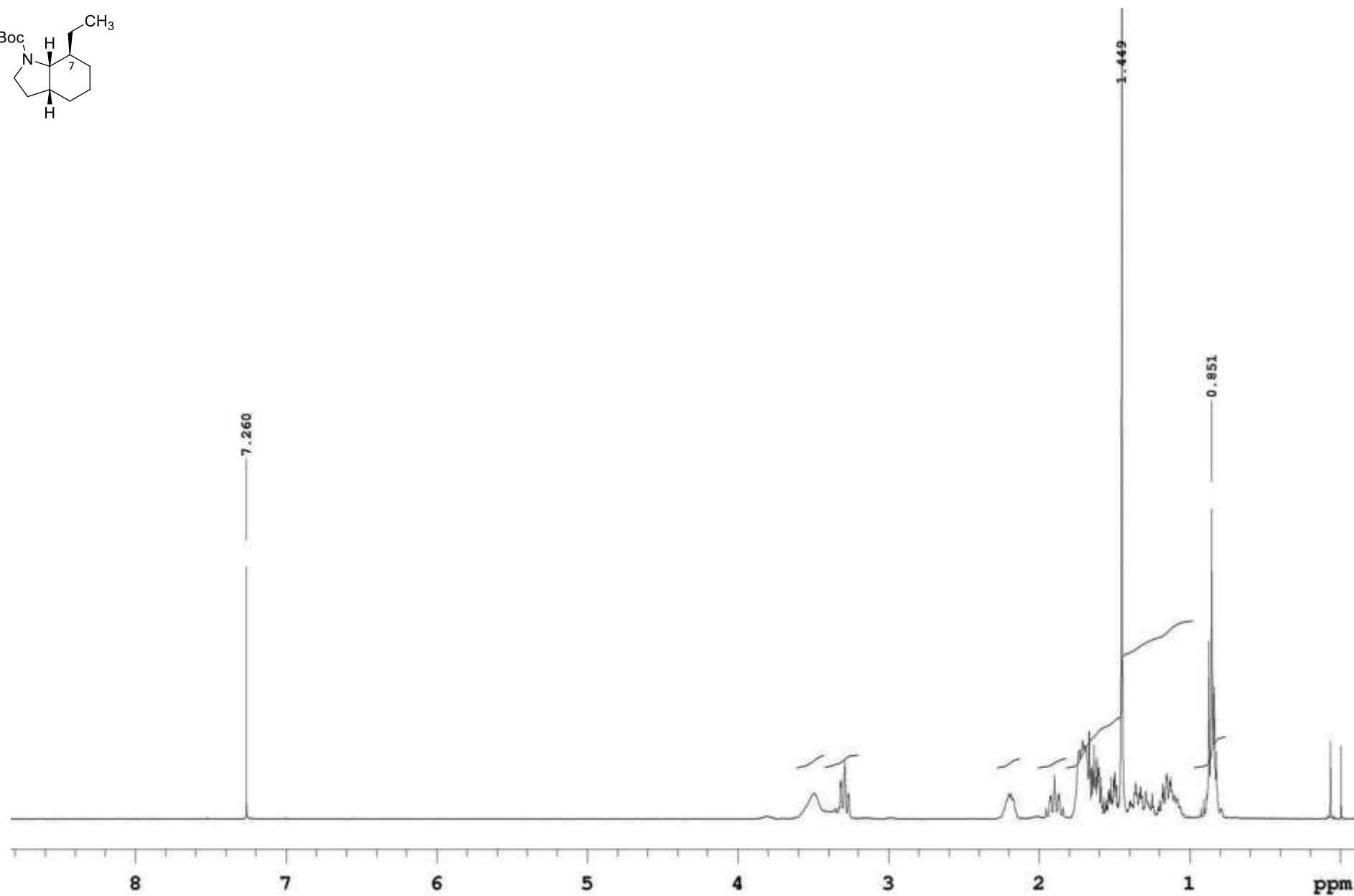
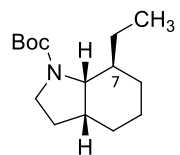
(3aR,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]octahydroindole (133)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



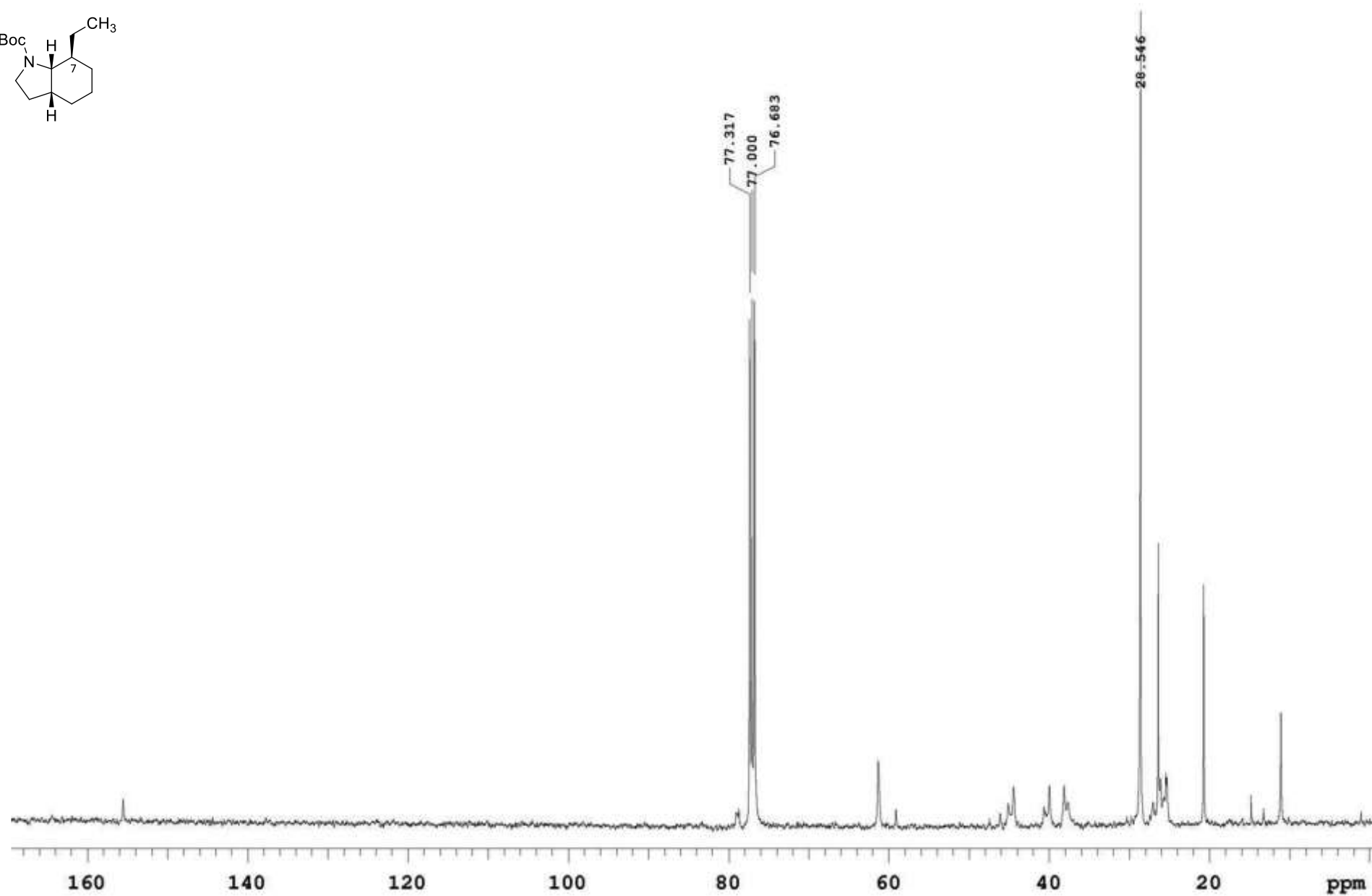
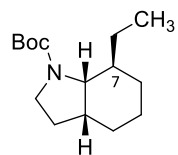
(3aR,7S,7aR)-1-(tert-Butoxycarbonyl)-7-methyloctahydroindole (134)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



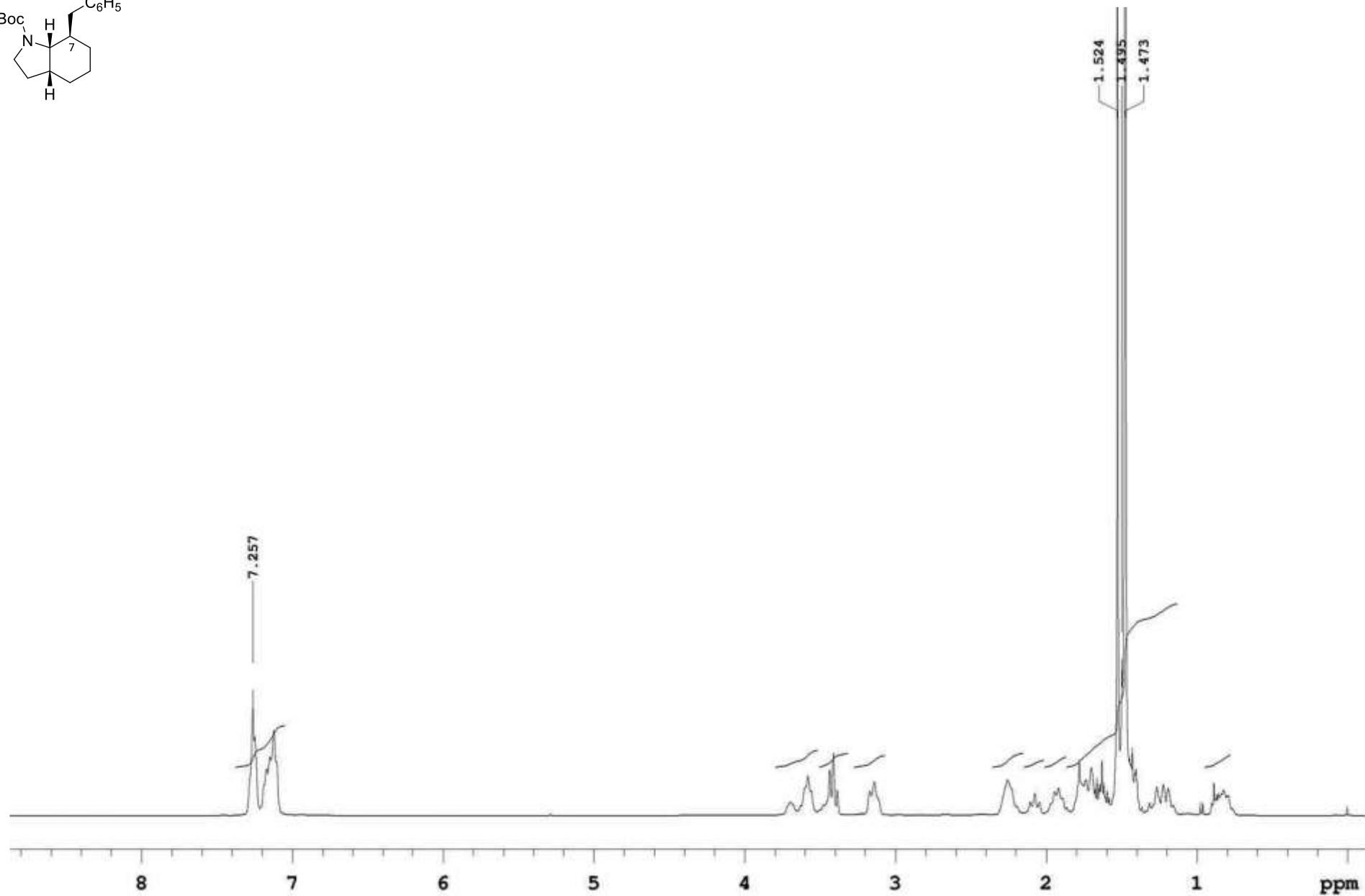
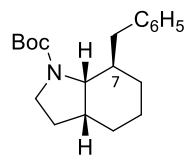
(3aR,7S,7aR)-1-(tert-butoxycarbonyl)-7-methyloctahydroindole (134)- ^{13}C -NMR, CDCl_3 , 100.6 MHz, 25 °C



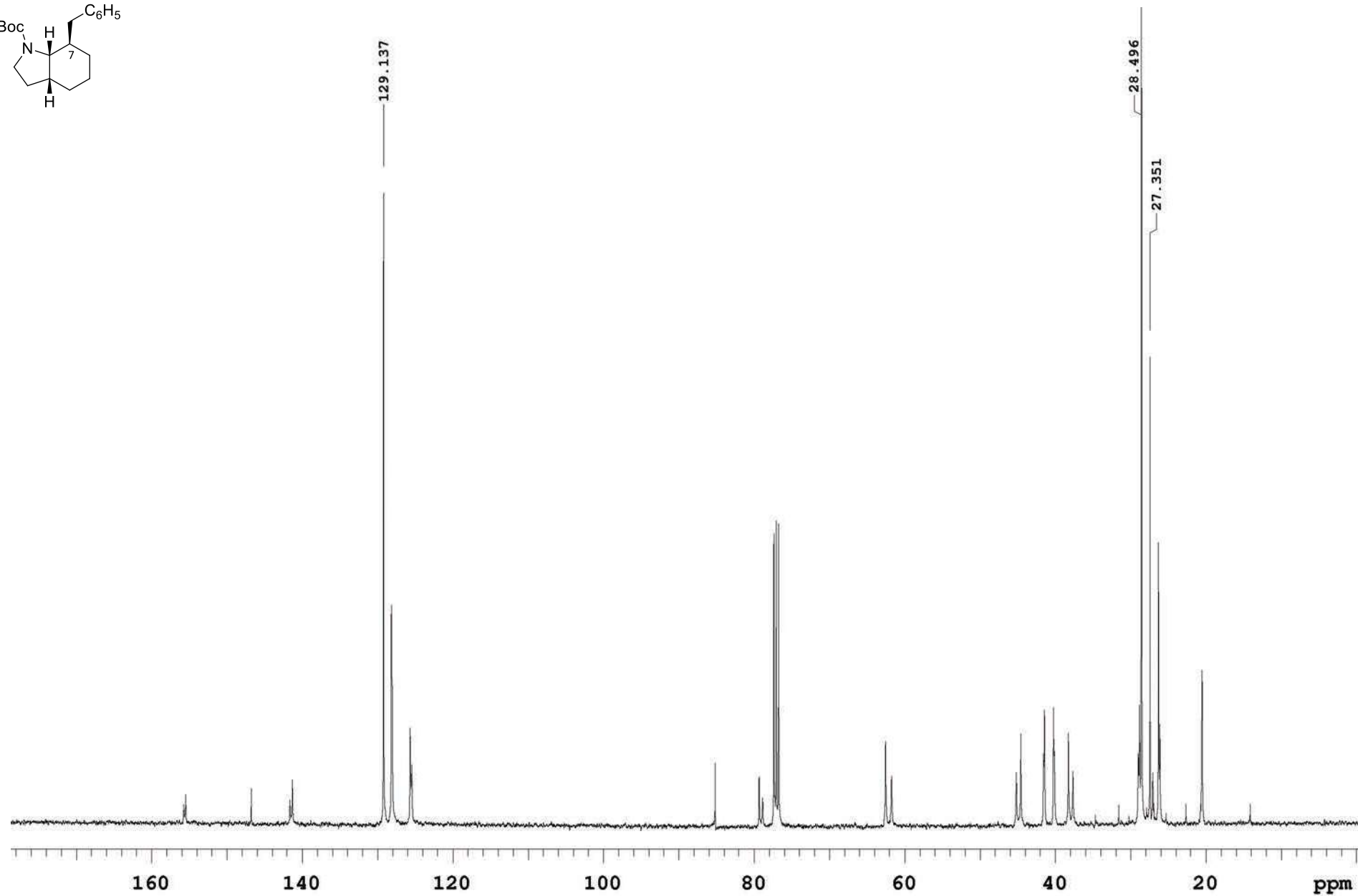
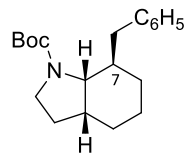
(3aR,7S,7aR)-1-(tert-Butoxycarbonyl)-7-ethyloctahydroindole (135)- $^1\text{H-NMR}$, CDCl_3 , 400 MHz, 25 °C



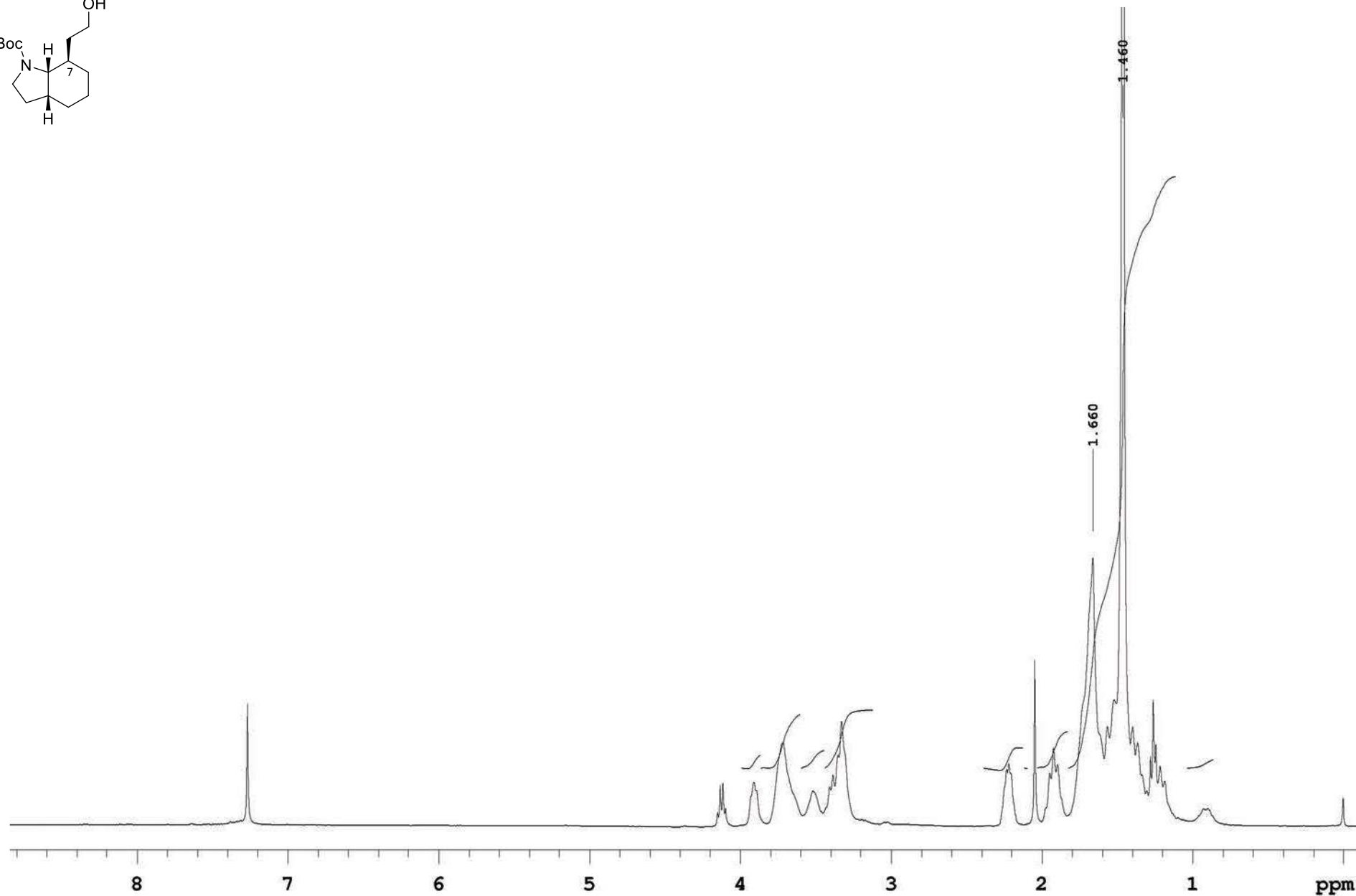
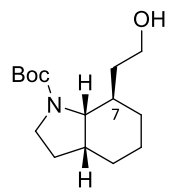
(3aR,7S,7aR)-1-(tert-Butoxycarbonyl)-7-ethyloctahydroindole (135)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



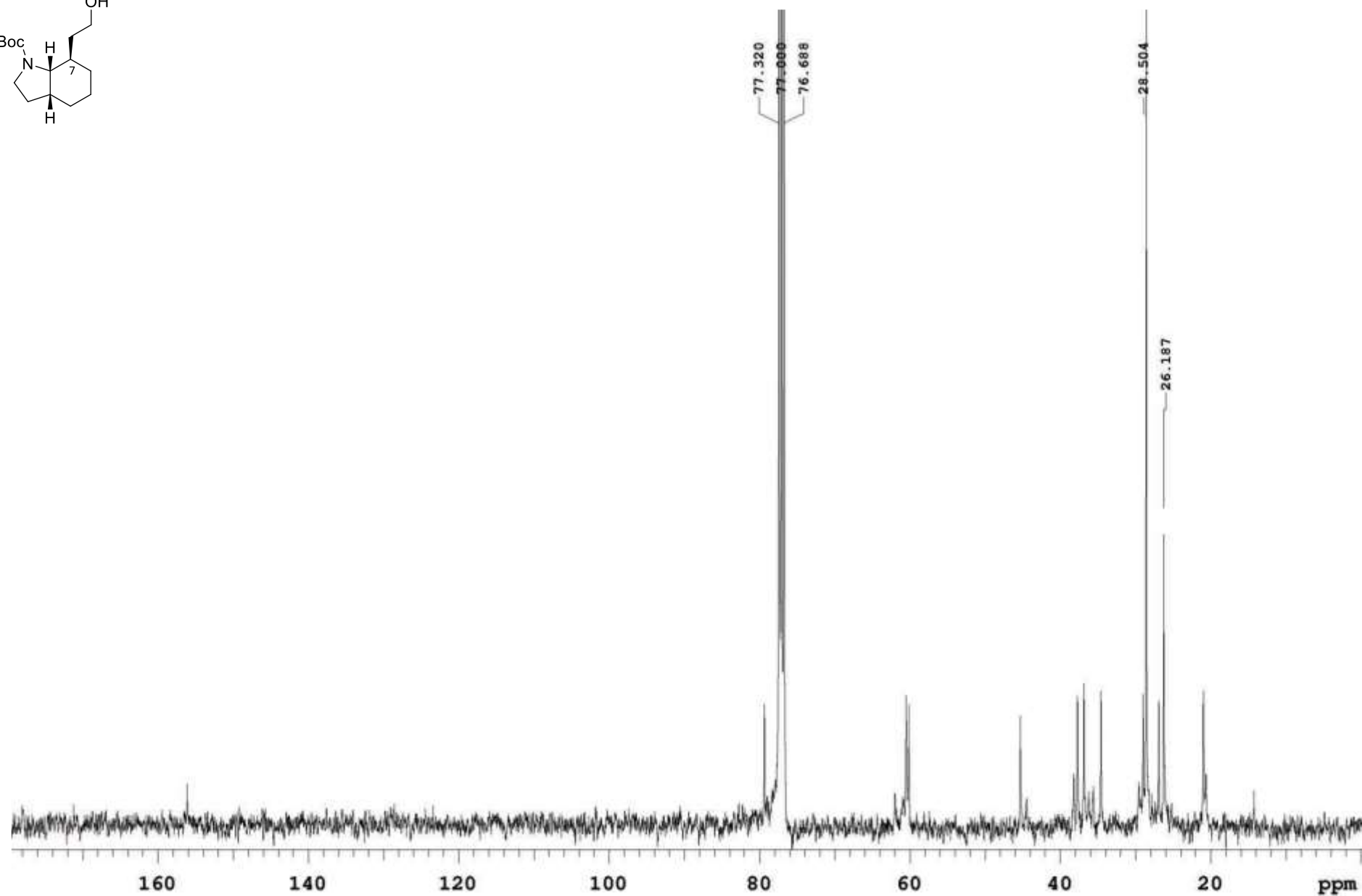
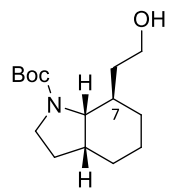
(3*aR*,7*R*,7*aR*)-7-Benzyl-1-(*tert*-butoxycarbonyl)octahydroindole (136)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



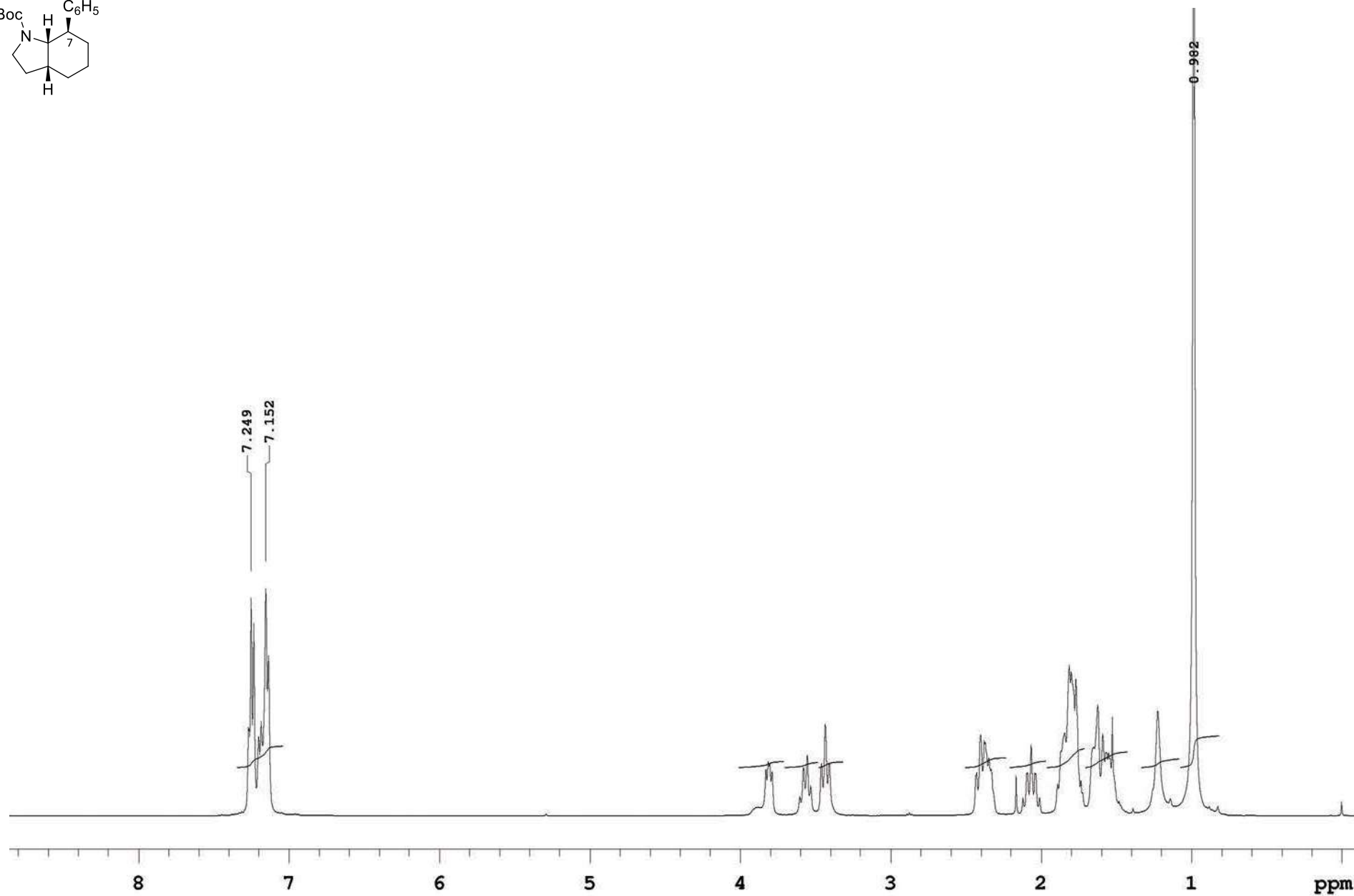
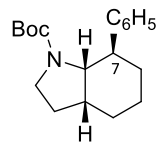
(3*R*,7*R*,7*aR*)-7-Benzyl-1-(*tert*-butoxycarbonyl)octahydroindole (136)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



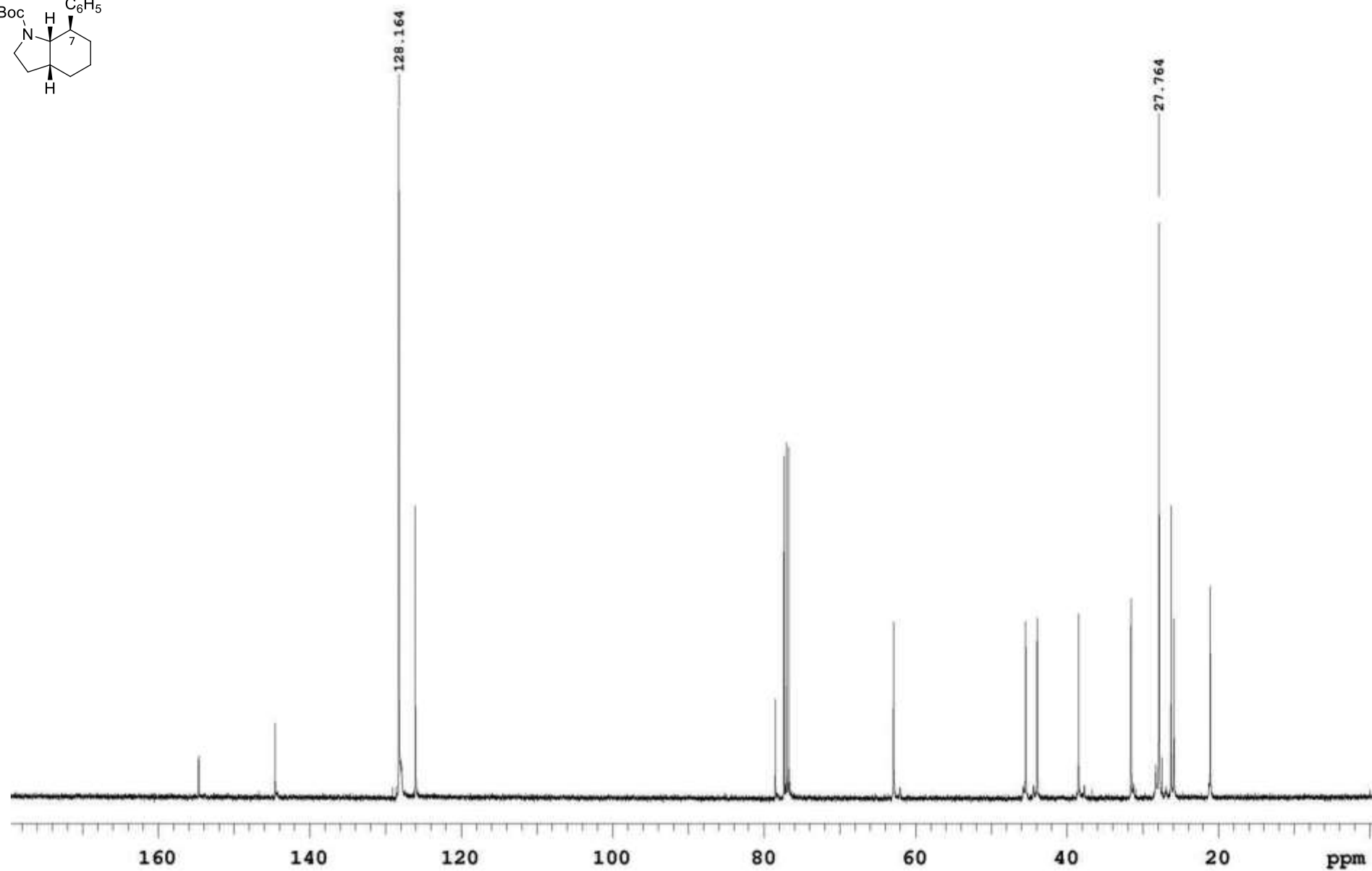
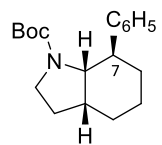
(3aR,7R,7aS)-1-(tert-butoxycarbonyl)-7-(2-hydroxyethyl)octahydroindole (137)- $^1\text{H-NMR}$, CDCl_3 , 400 MHz, 25 °C



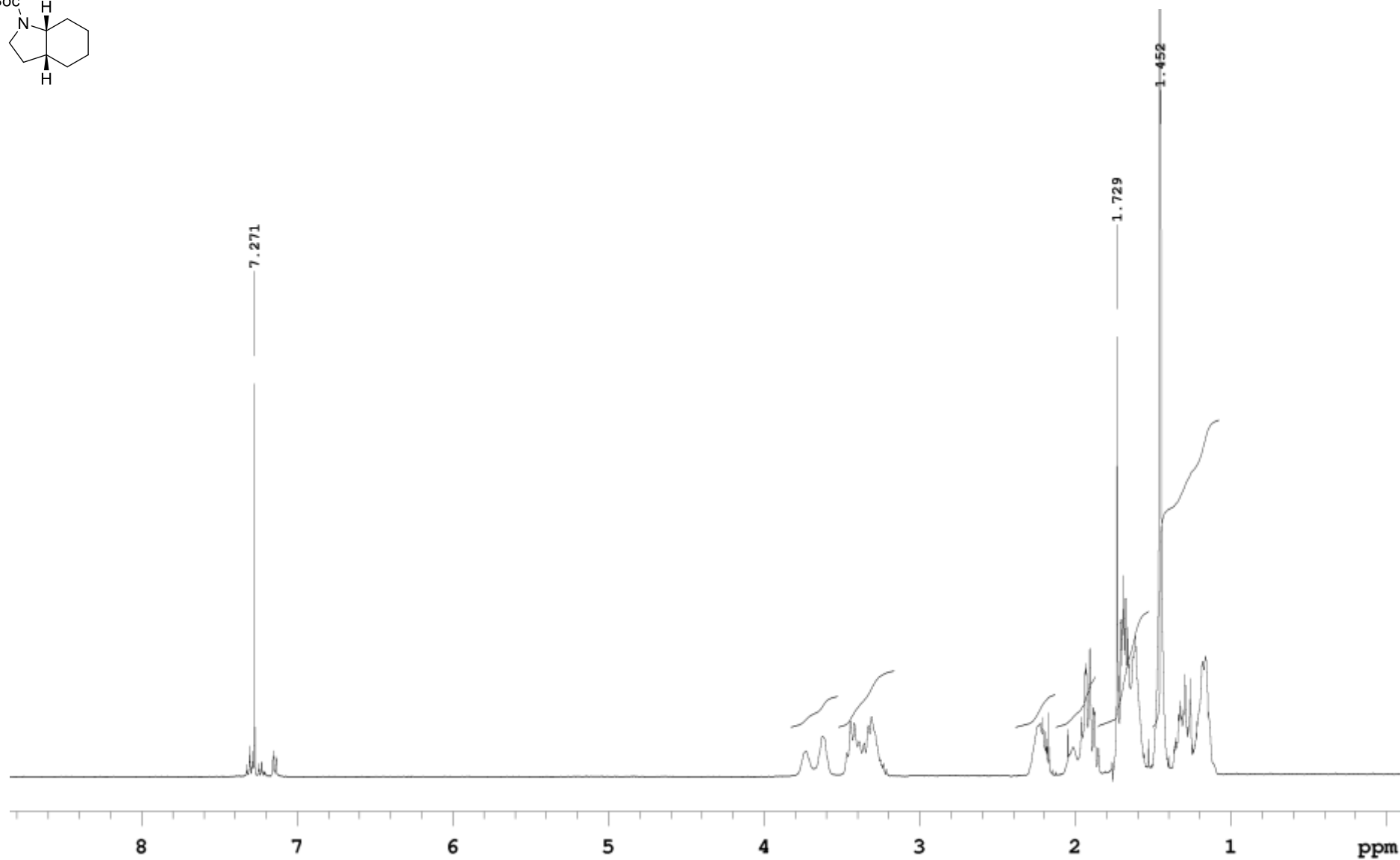
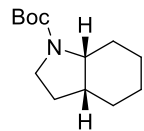
(3aR,7R,7aS)-1-(tert-Butoxycarbonyl)-7-(2-hydroxyethyl)octahydroindole (137)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



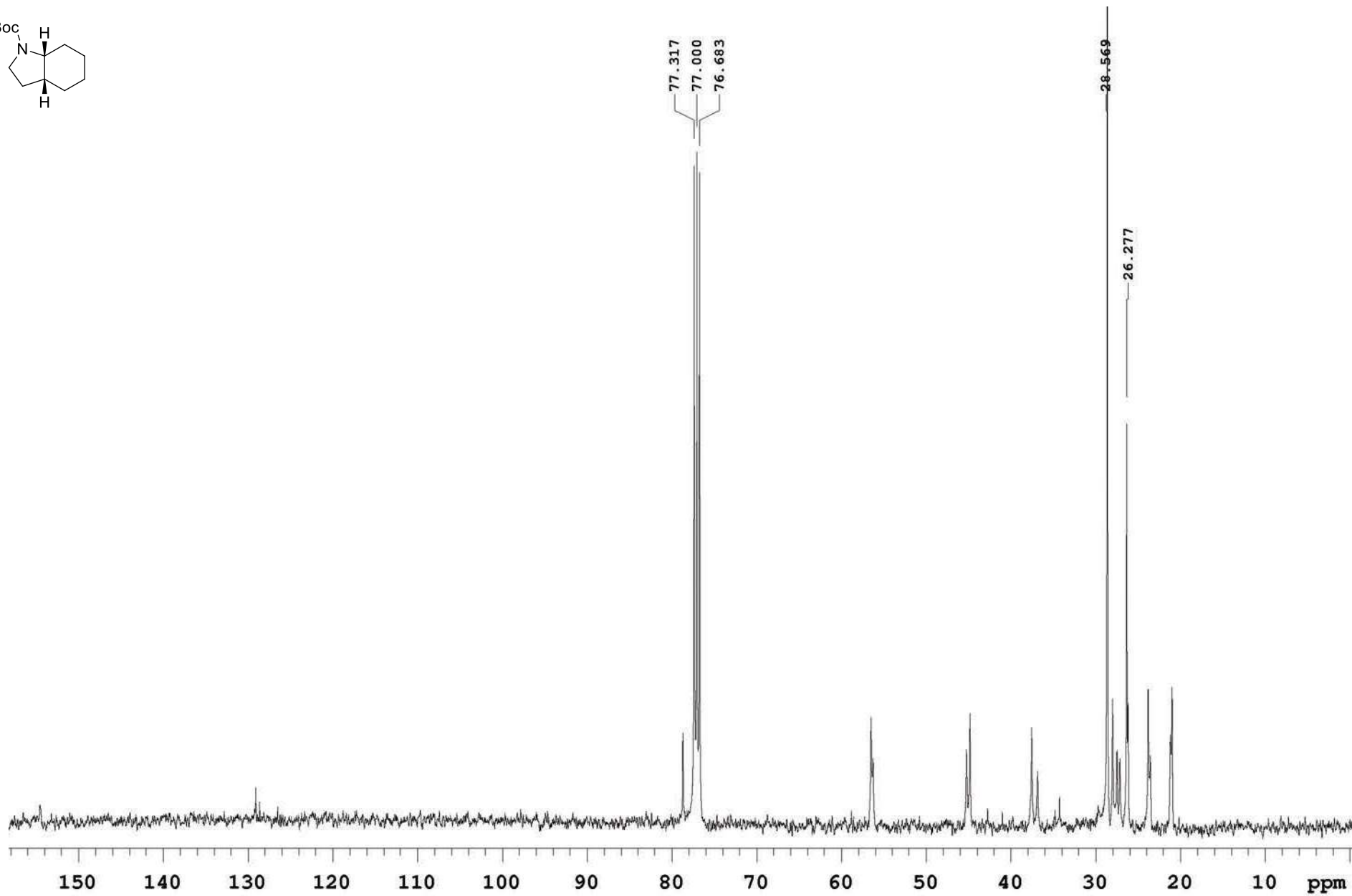
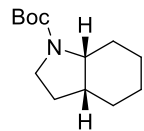
(3aR,7R,7aS)-1-(tert-Butoxycarbonyl)-7-phenyloctahydroindole (138)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



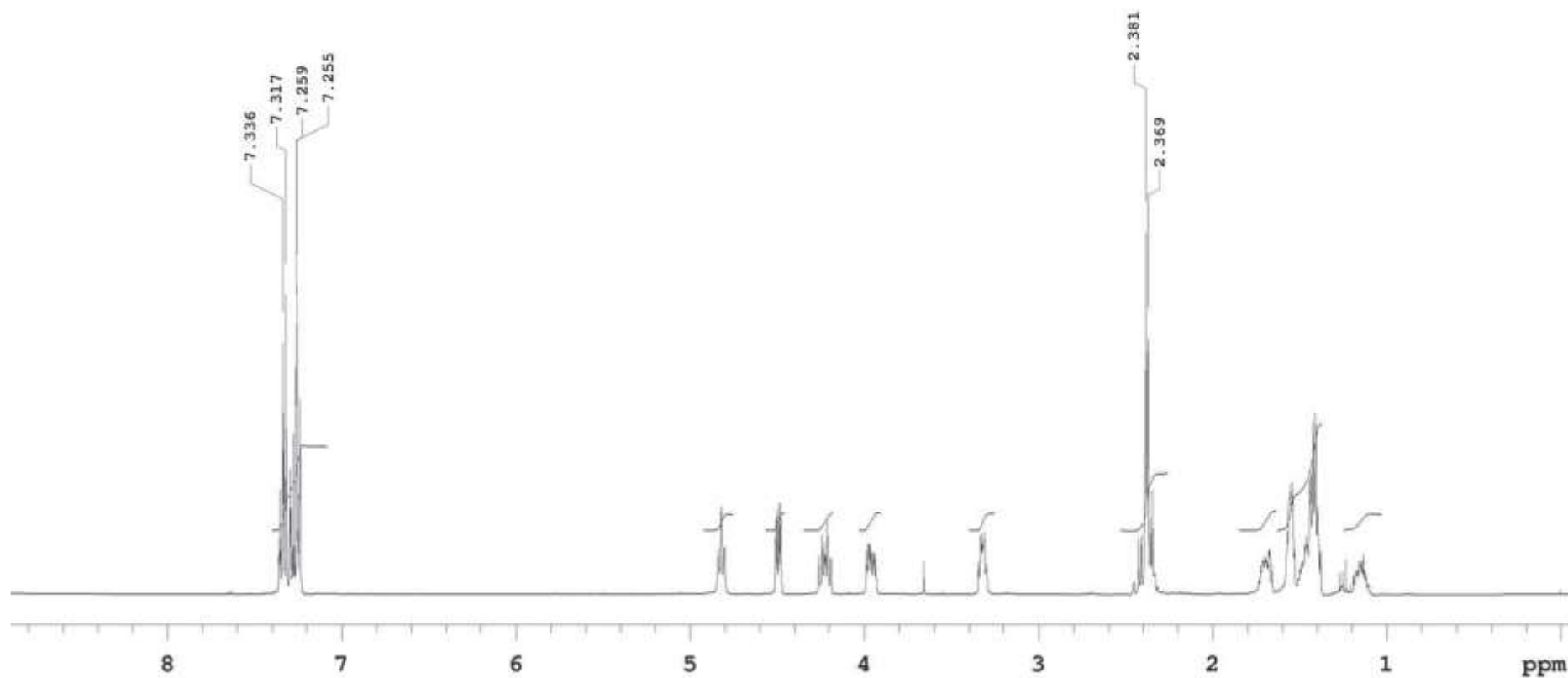
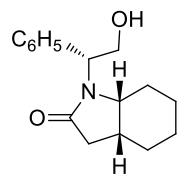
(3aR,7R,7aS)-1-(tert-butoxycarbonyl)-7-phenyloctahydroindole (138)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



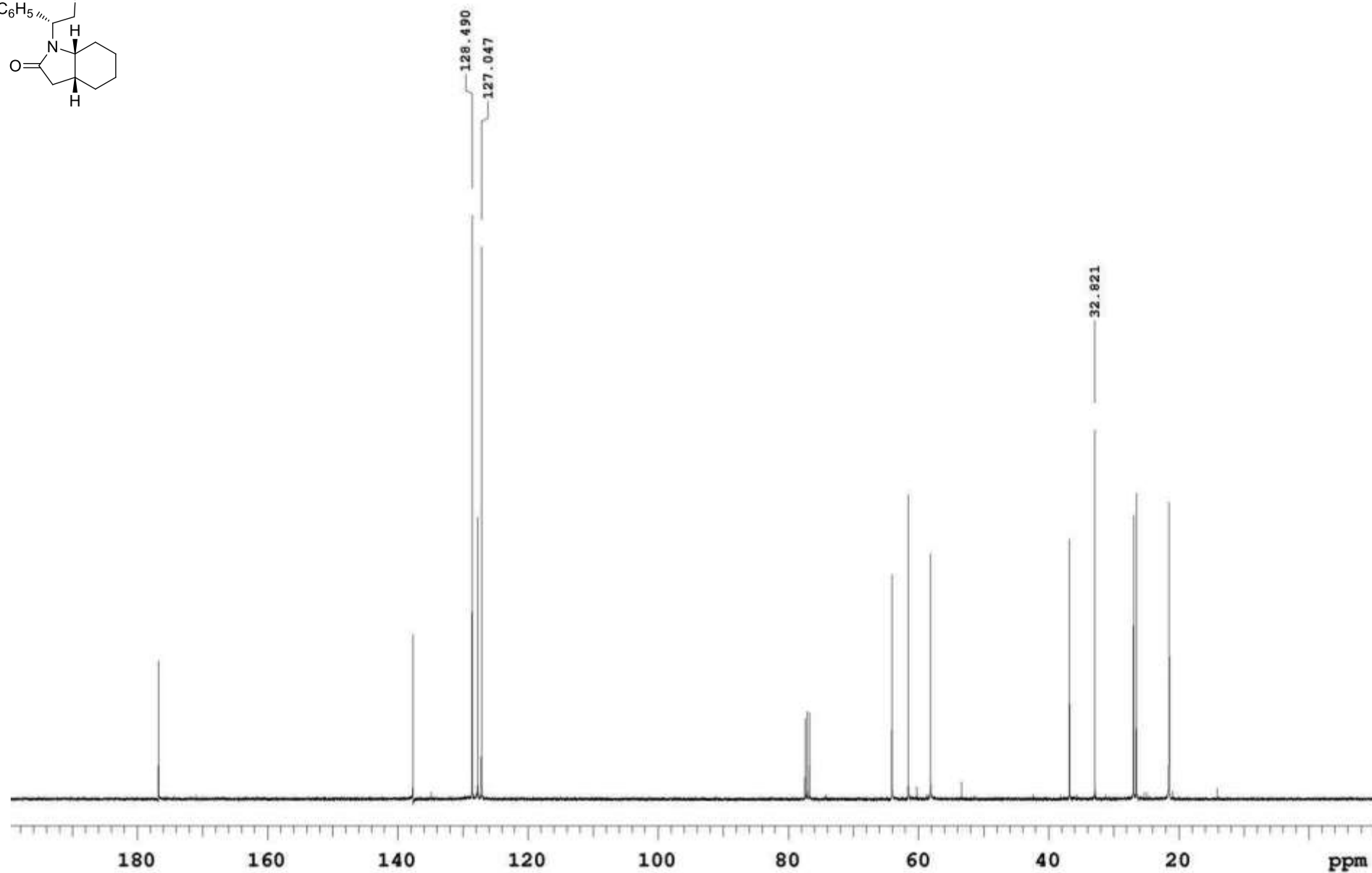
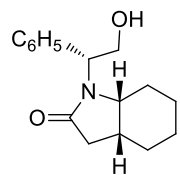
(3aR,7aR)-1-(tert-Butoxycarbonyl)octahydroindole (139)-¹H-NMR, CDCl₃, 400 MHz, 25 °C



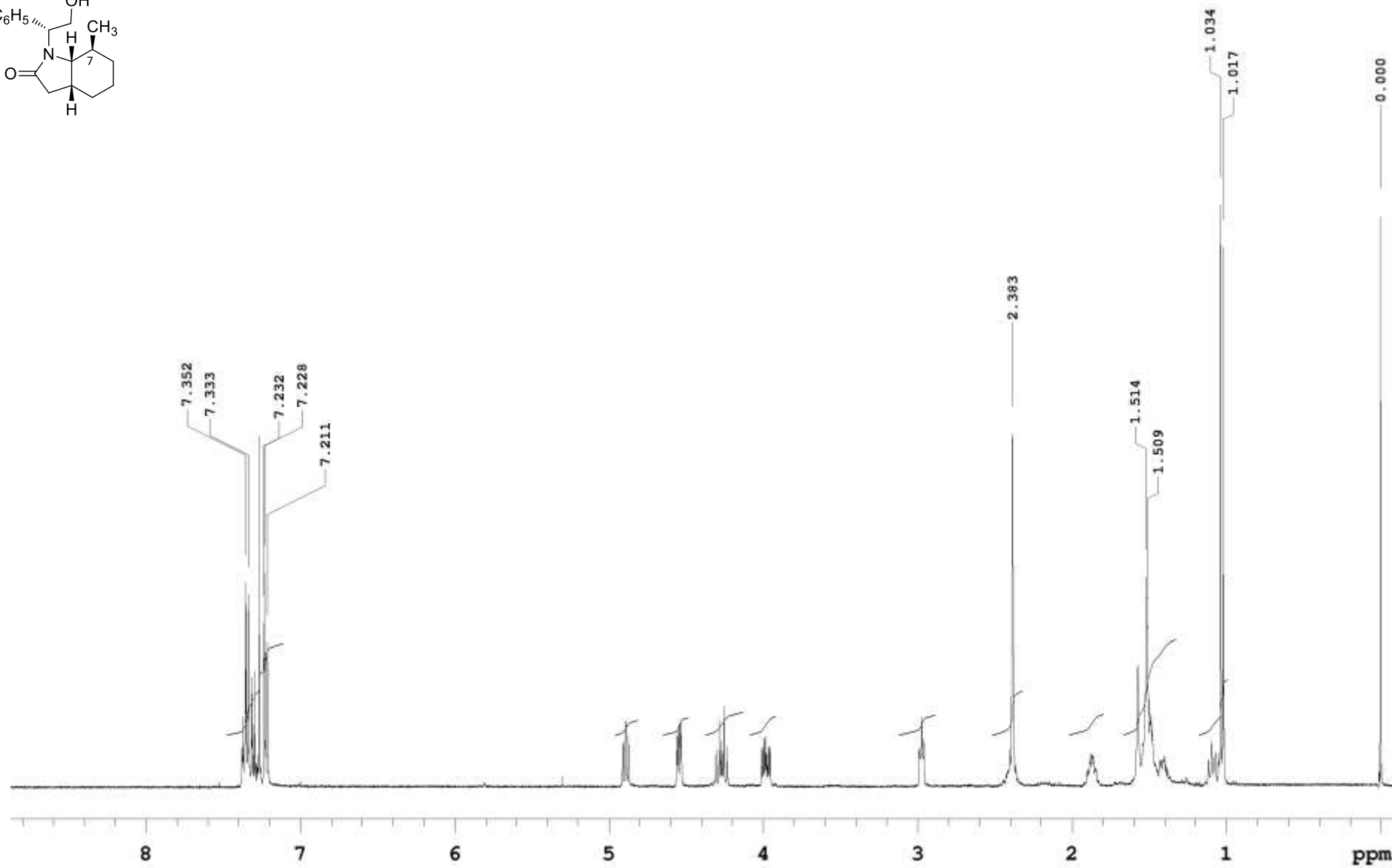
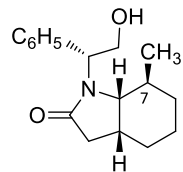
(3aR,7aR)-1-(tert-butoxycarbonyl)octahydroindole (139)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



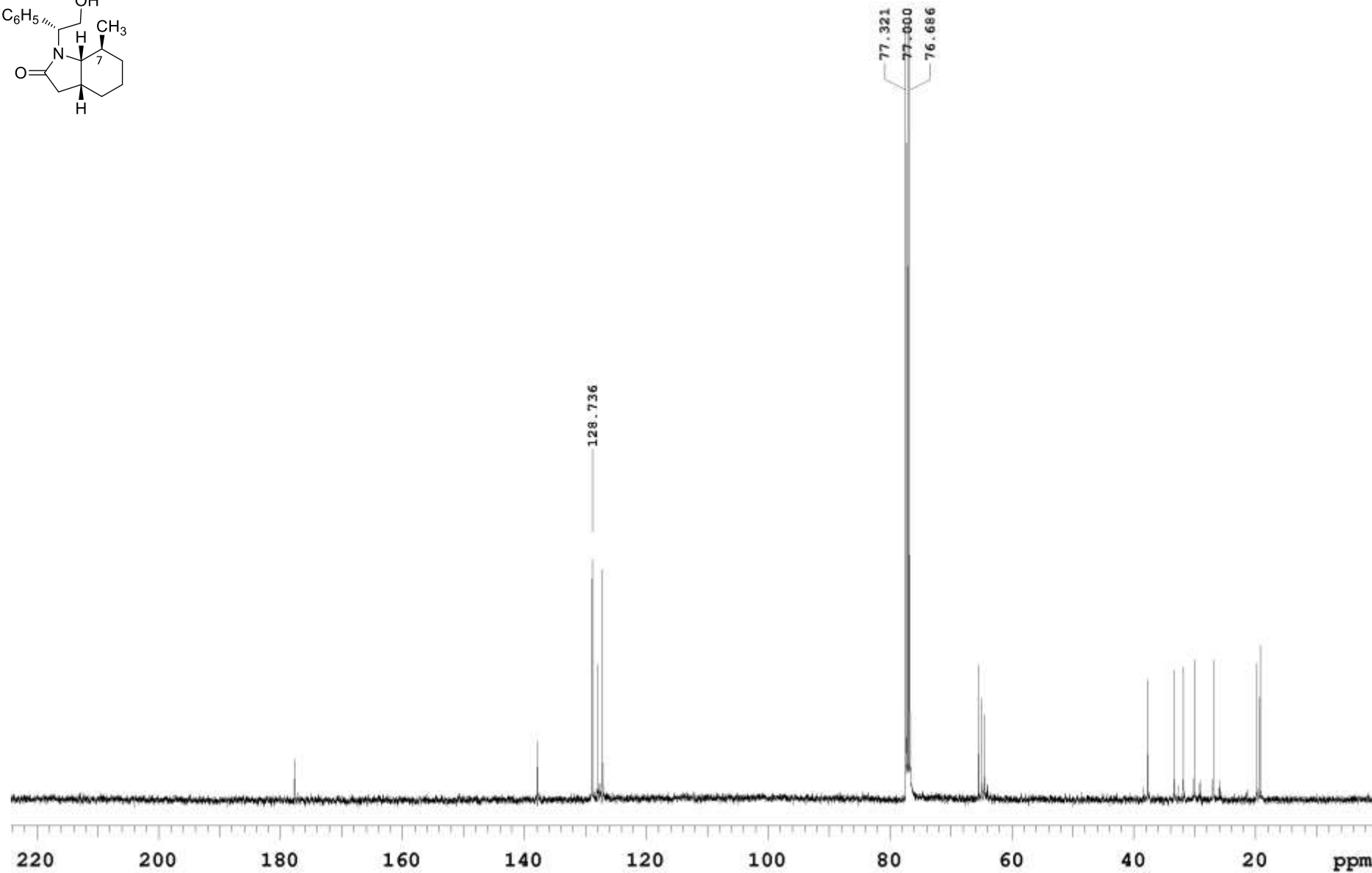
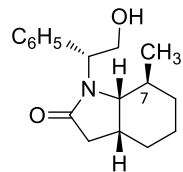
(3aR,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]-2-oxooctahydroindole (140)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



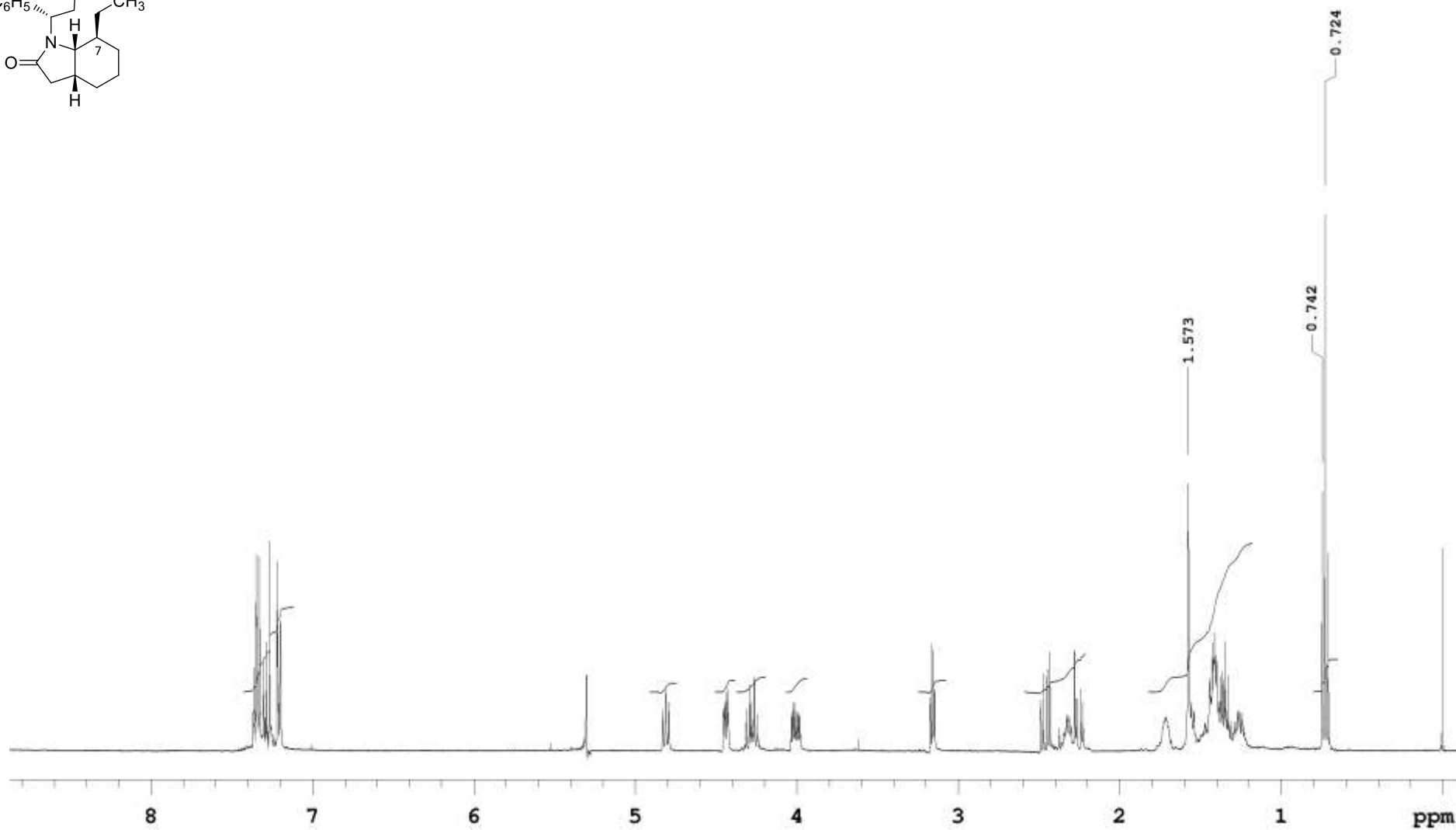
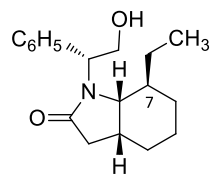
(3aR,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]-2-oxooctahydroindole (140)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



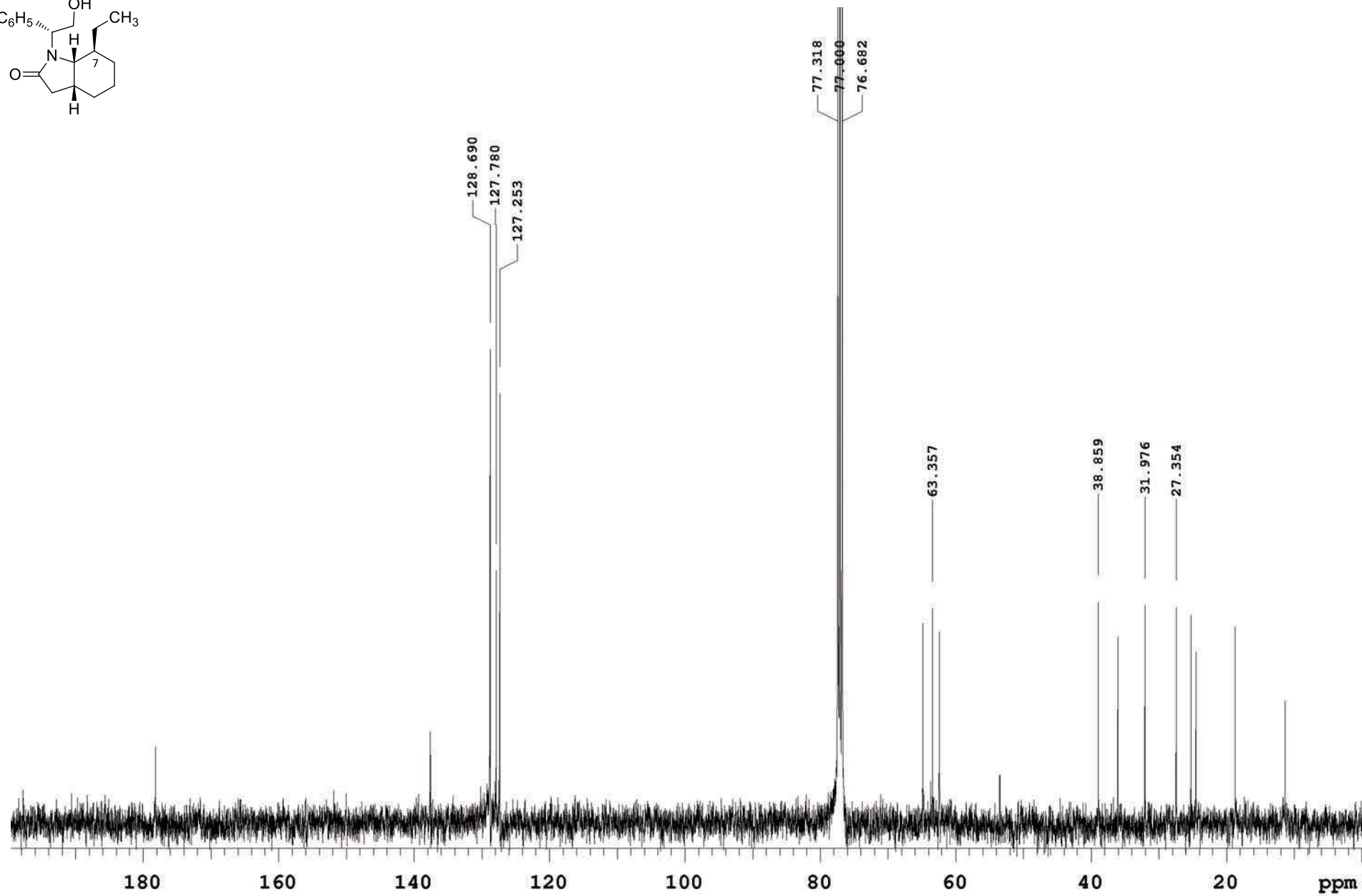
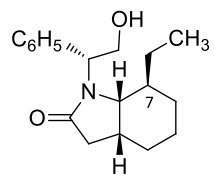
(3aR,7S,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-methyl-2-oxooctahydroindole (141)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



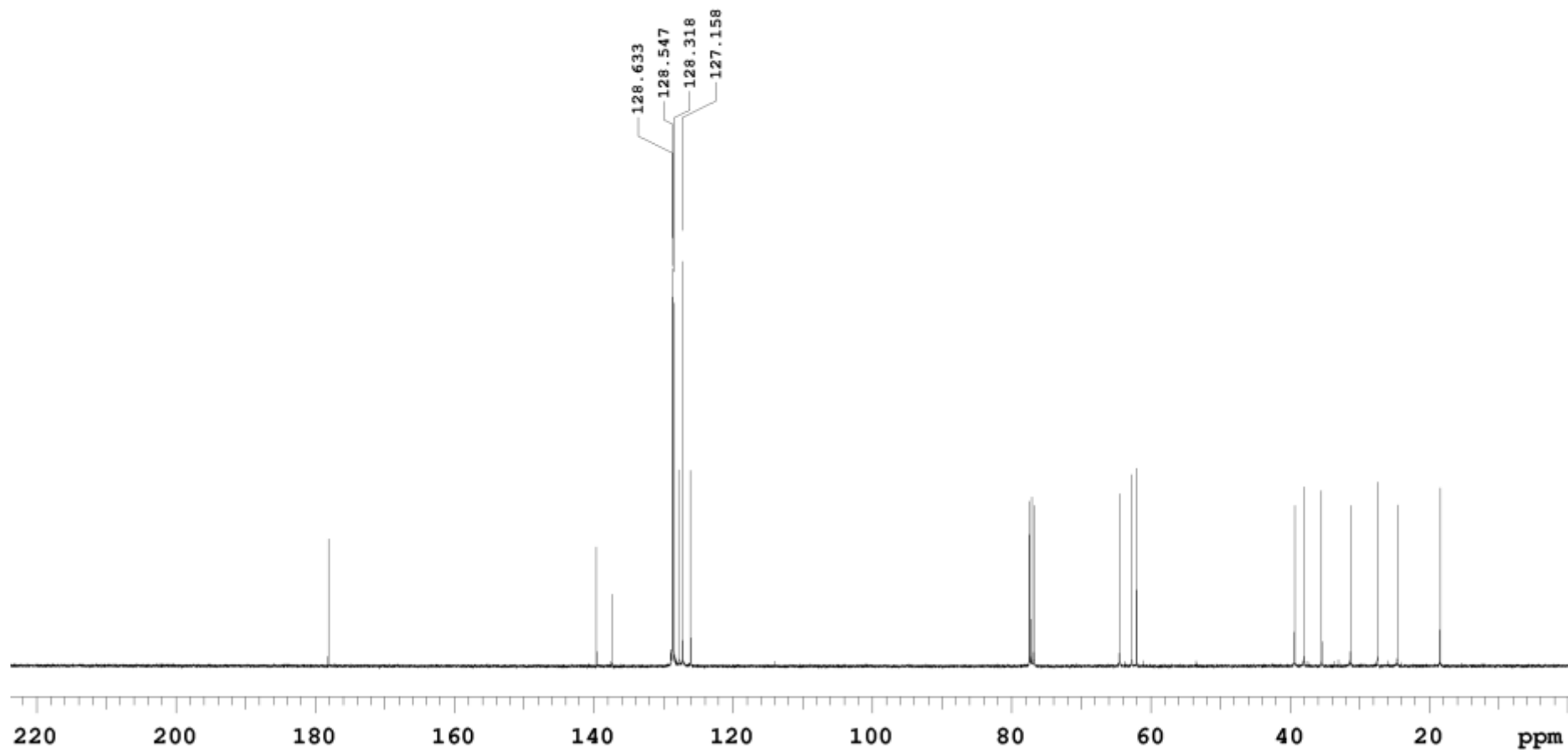
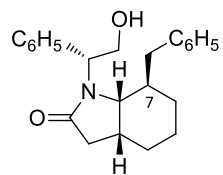
(3aR,7S,7aR)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-methyl-2-oxooctahydroindole (141)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



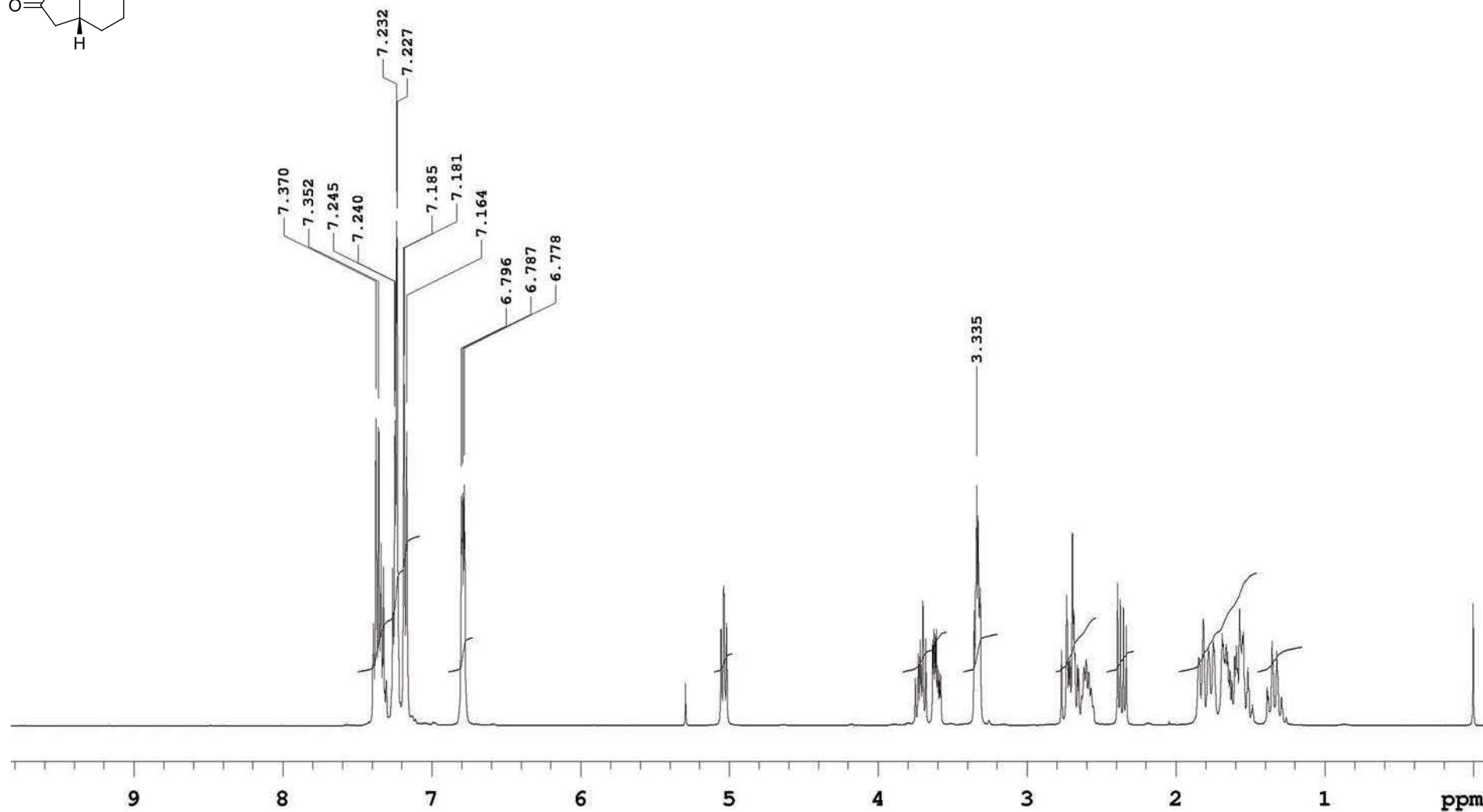
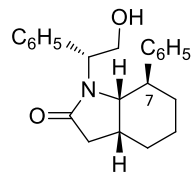
(3aR,7S,7aR)-7-Ethyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxooctahydroindole (142)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



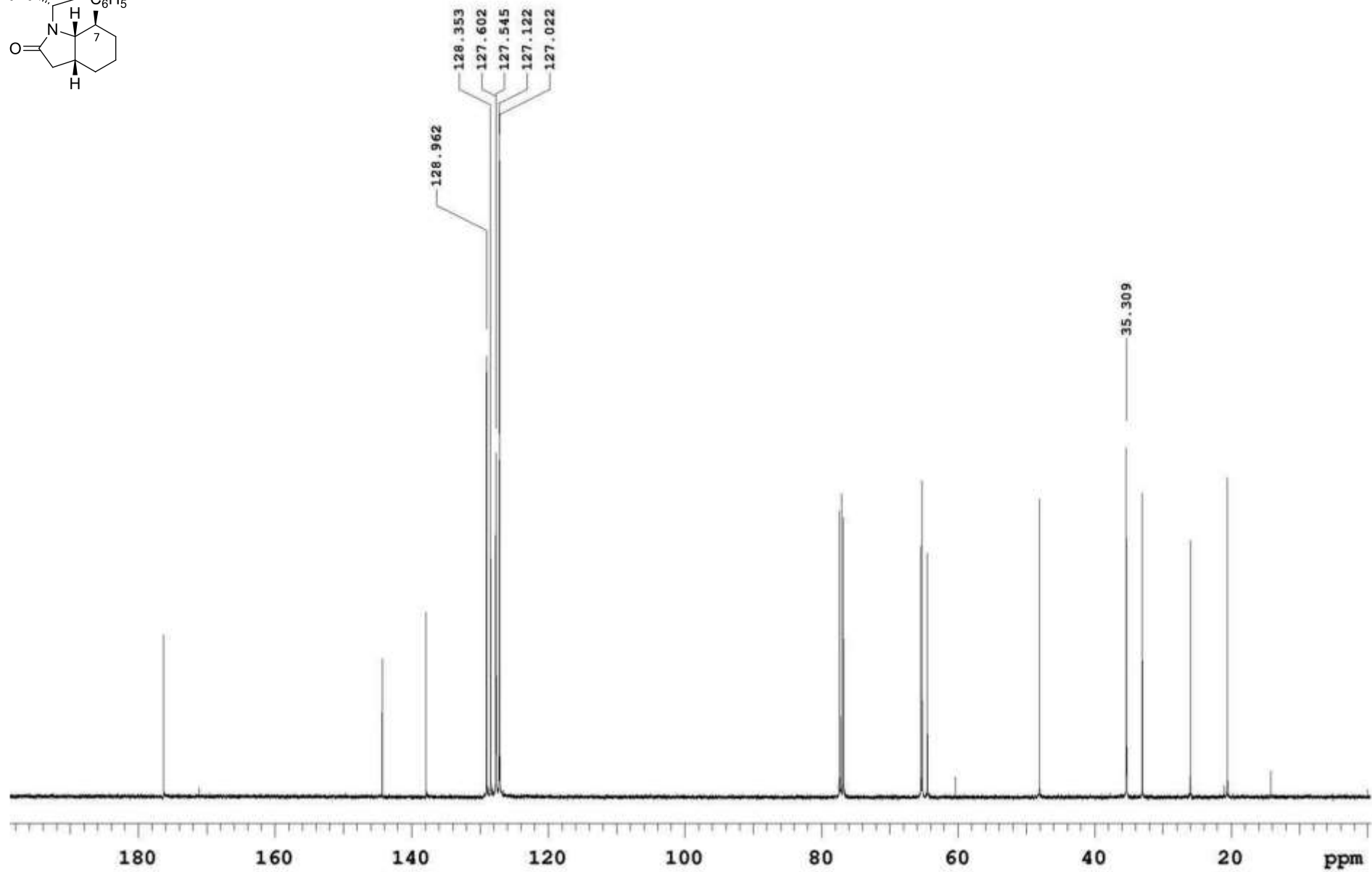
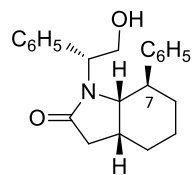
(3aR,7S,7aR)-7-Ethyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxooctahydroindole (142)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



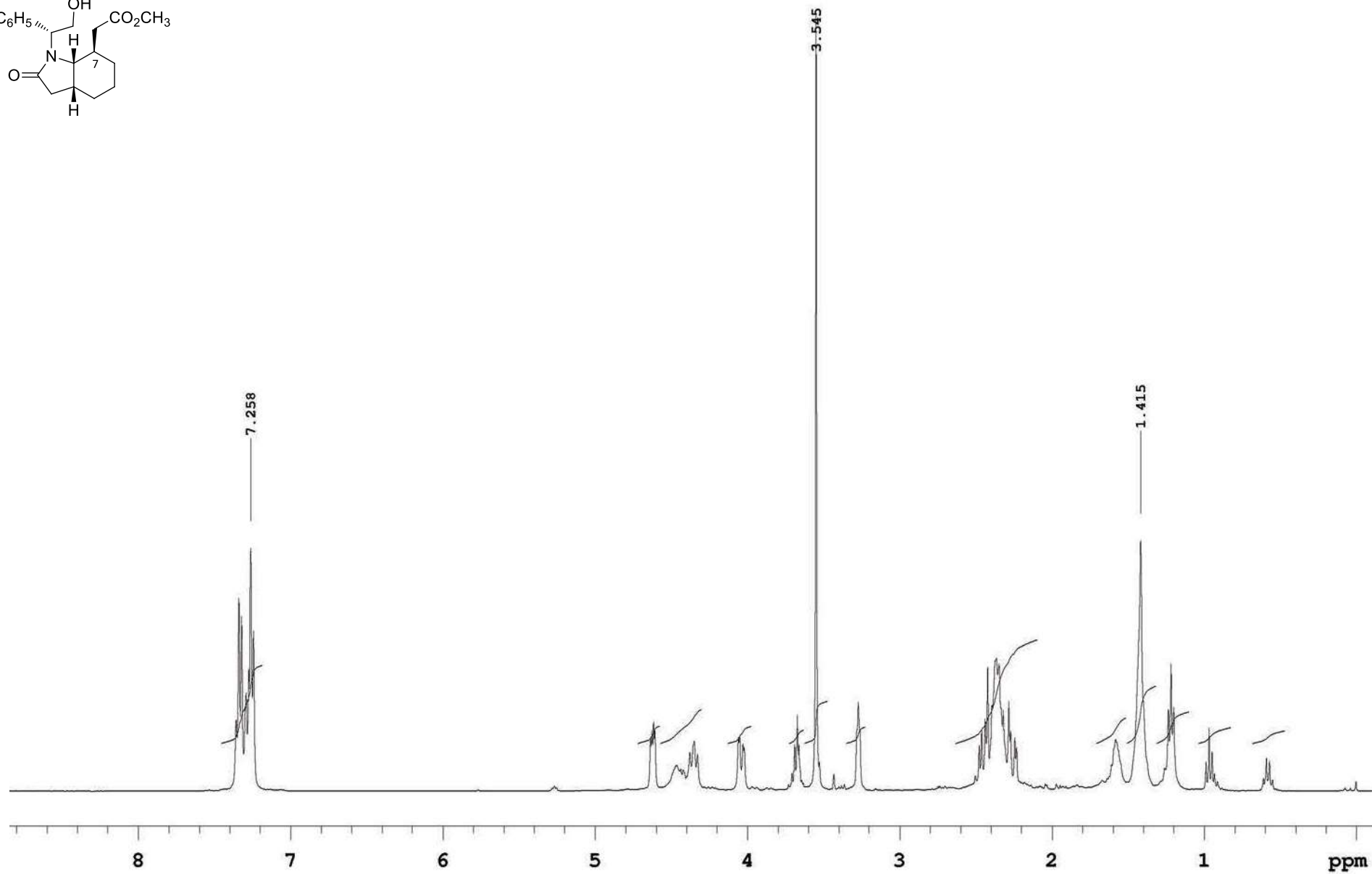
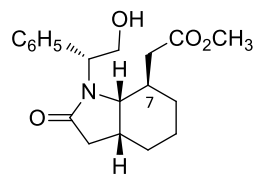
(3aR,7R,7aR)-7-Benzyl-1-[(1R)-2-hydroxy-1-phenylethyl]-2-oxooctahydroindole (143)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



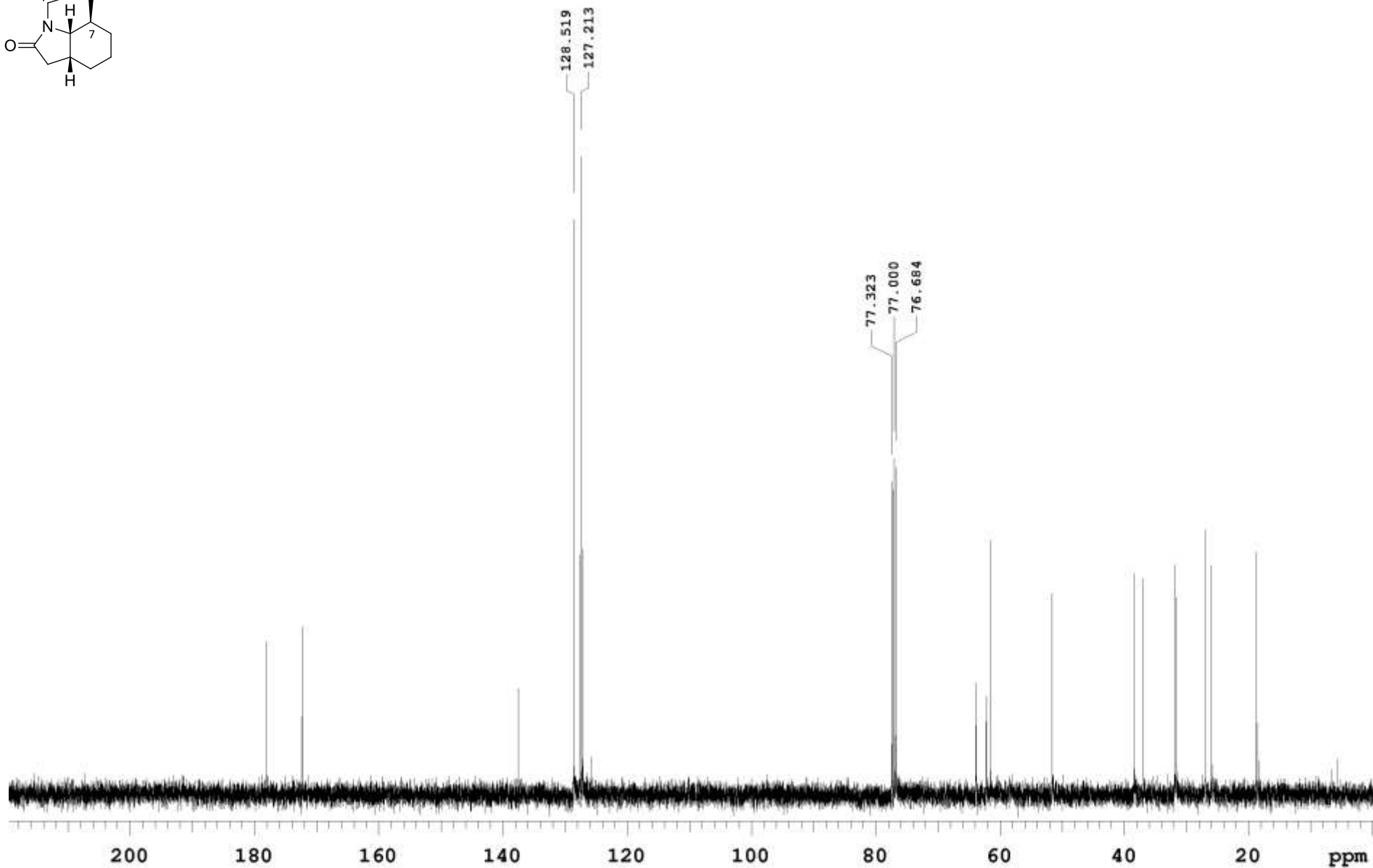
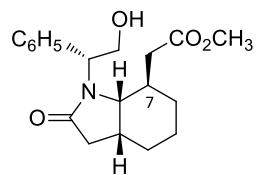
(3aR,7R,7aS)-1-[(1R)-2-Hydroxy-1-phenylethyl]-7-phenyl-2-oxooctahydroindole (144)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



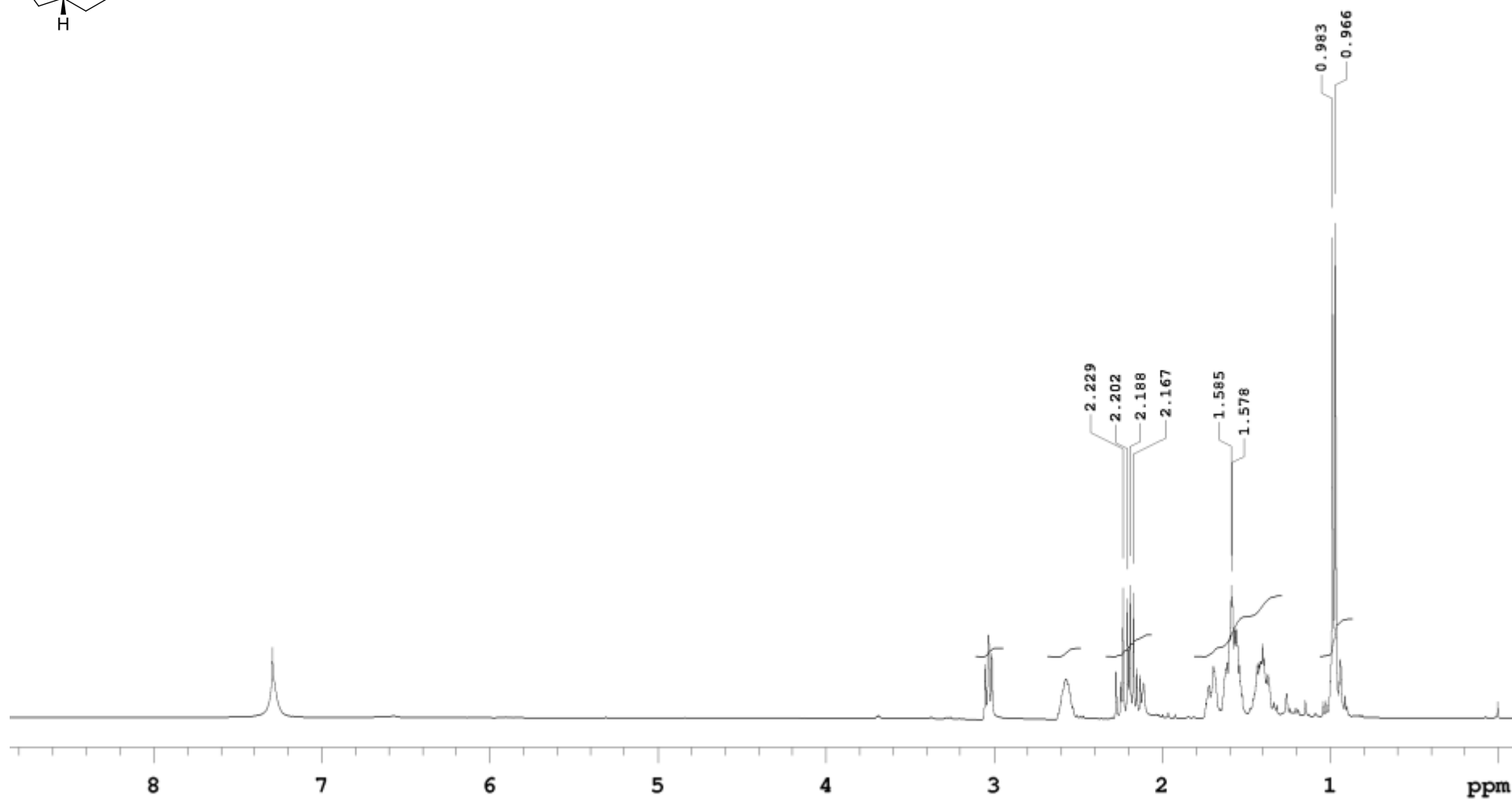
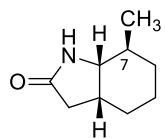
(3*aR*,7*R*,7*aS*)-1-[(1*R*)-2-Hydroxy-1-phenylethyl]-7-phenyl-2-oxooctahydroindole (144)- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



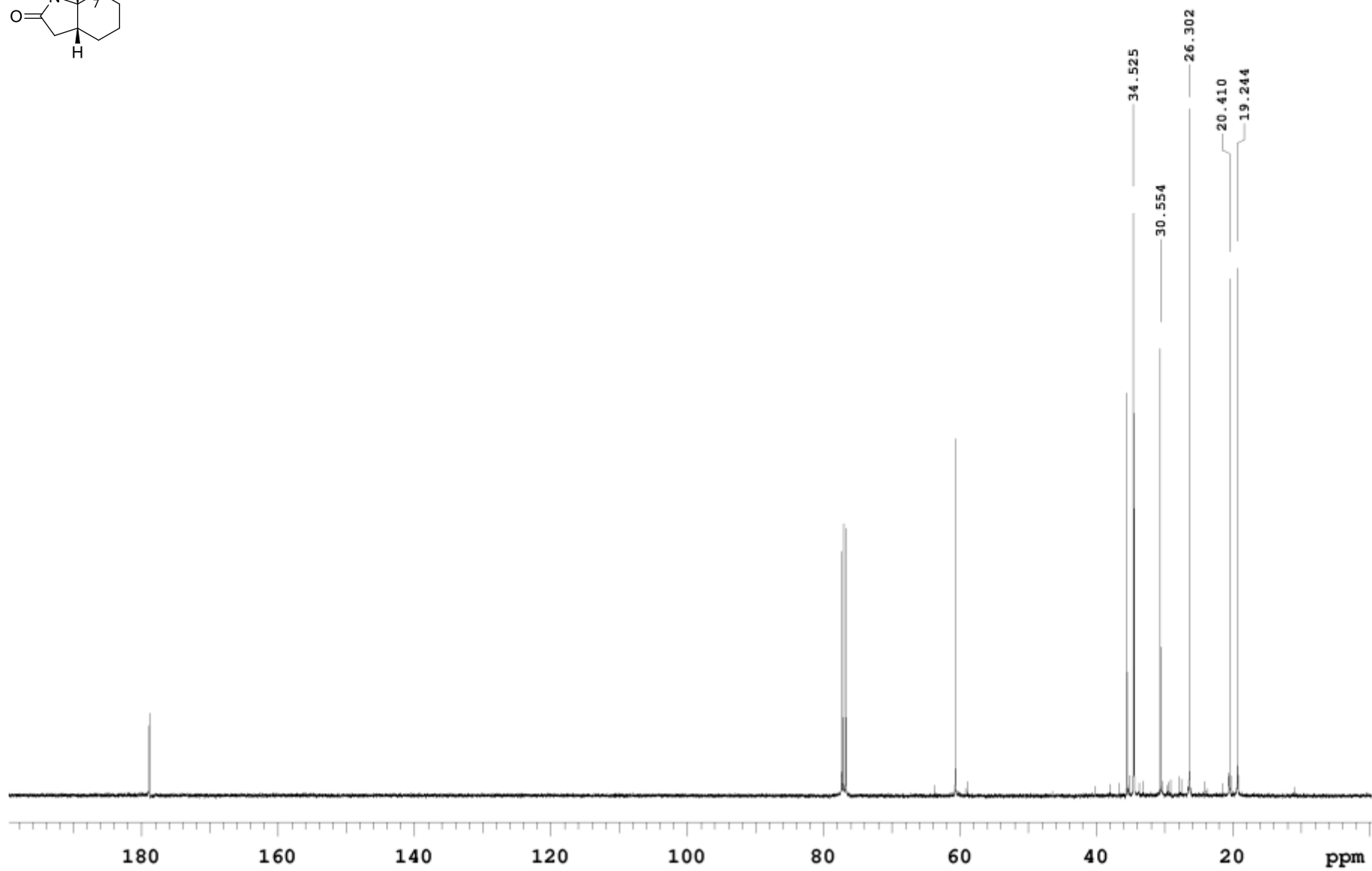
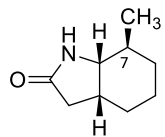
Methyl (3aR,7R,7aS)-1-[(1R)-2-Hydroxy-1-phenylethyl]-2-oxooctahydroindoline-7-acetate (145)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



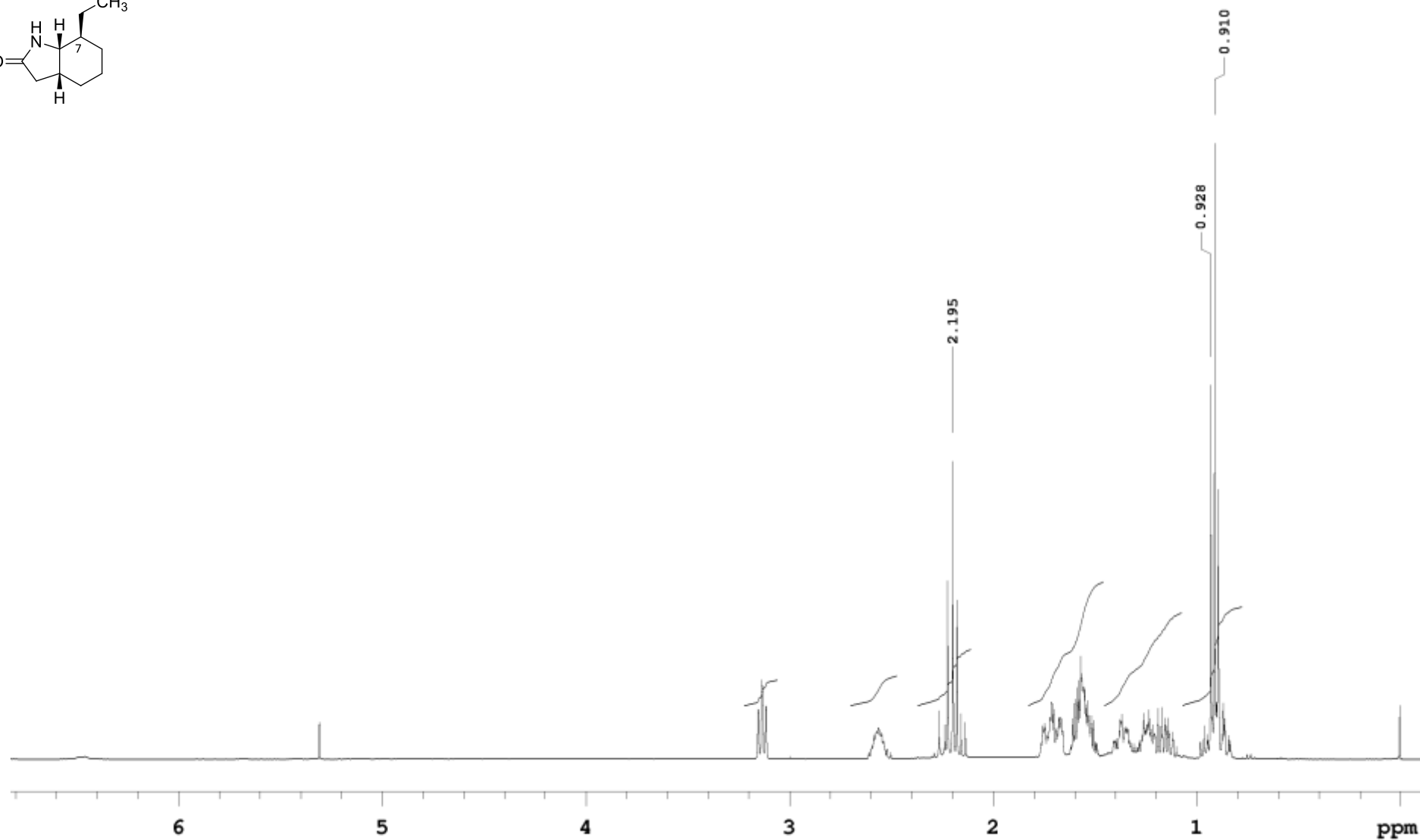
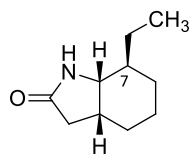
Methyl (3*R*,7*R*,7*a*S)-1-[(1*R*)-2-Hydroxy-1-phenylethyl]-2-oxooctahydroindoline-7-acetate (145)- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



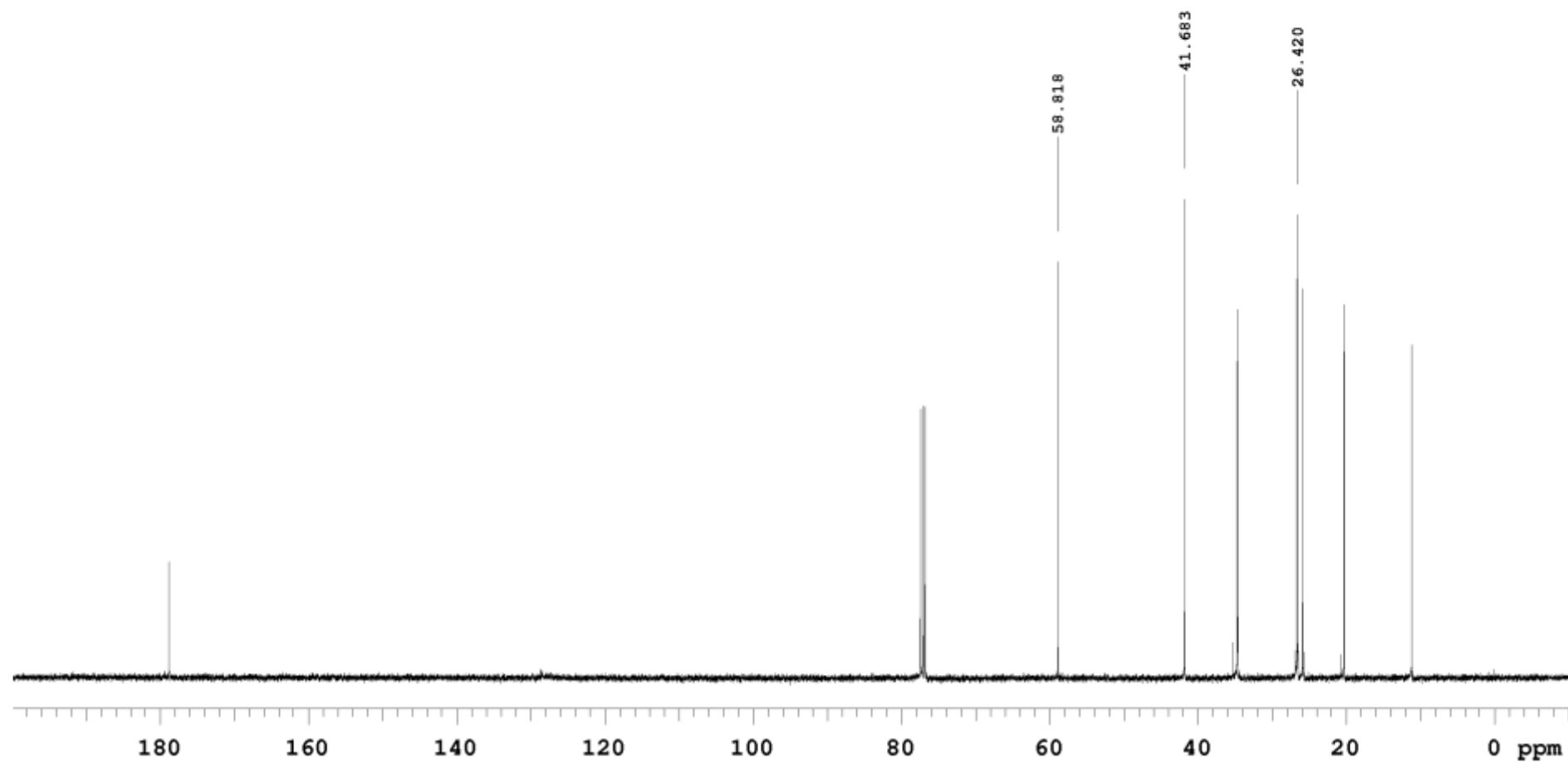
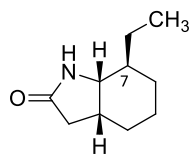
(3aR,7S,7aR)-7-Methyl-2-oxooctahydroindole (146a)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



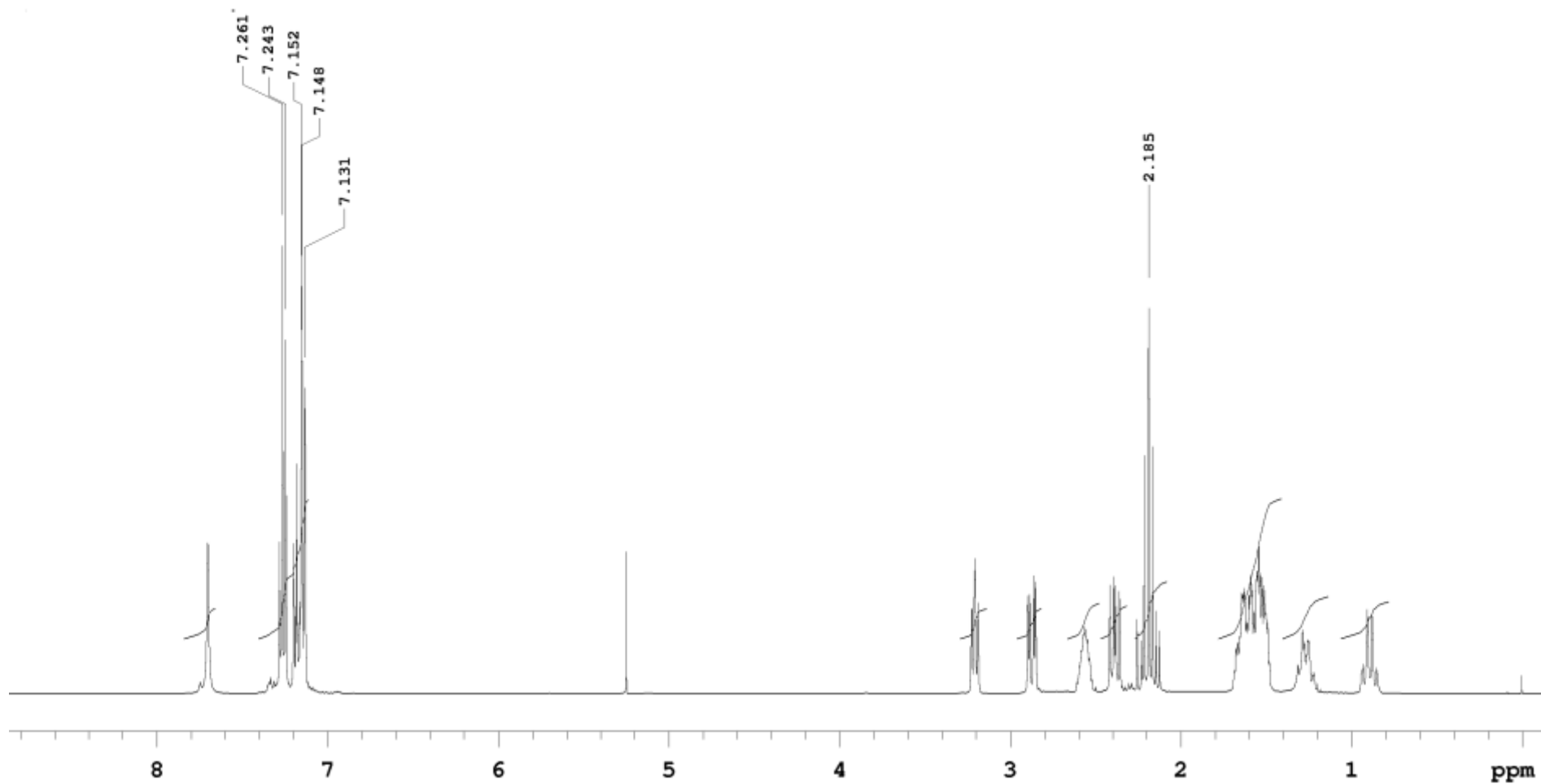
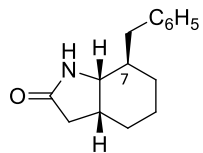
(3aR,7S,7aR)-7-Methyl-2-oxooctahydroindole (146a)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



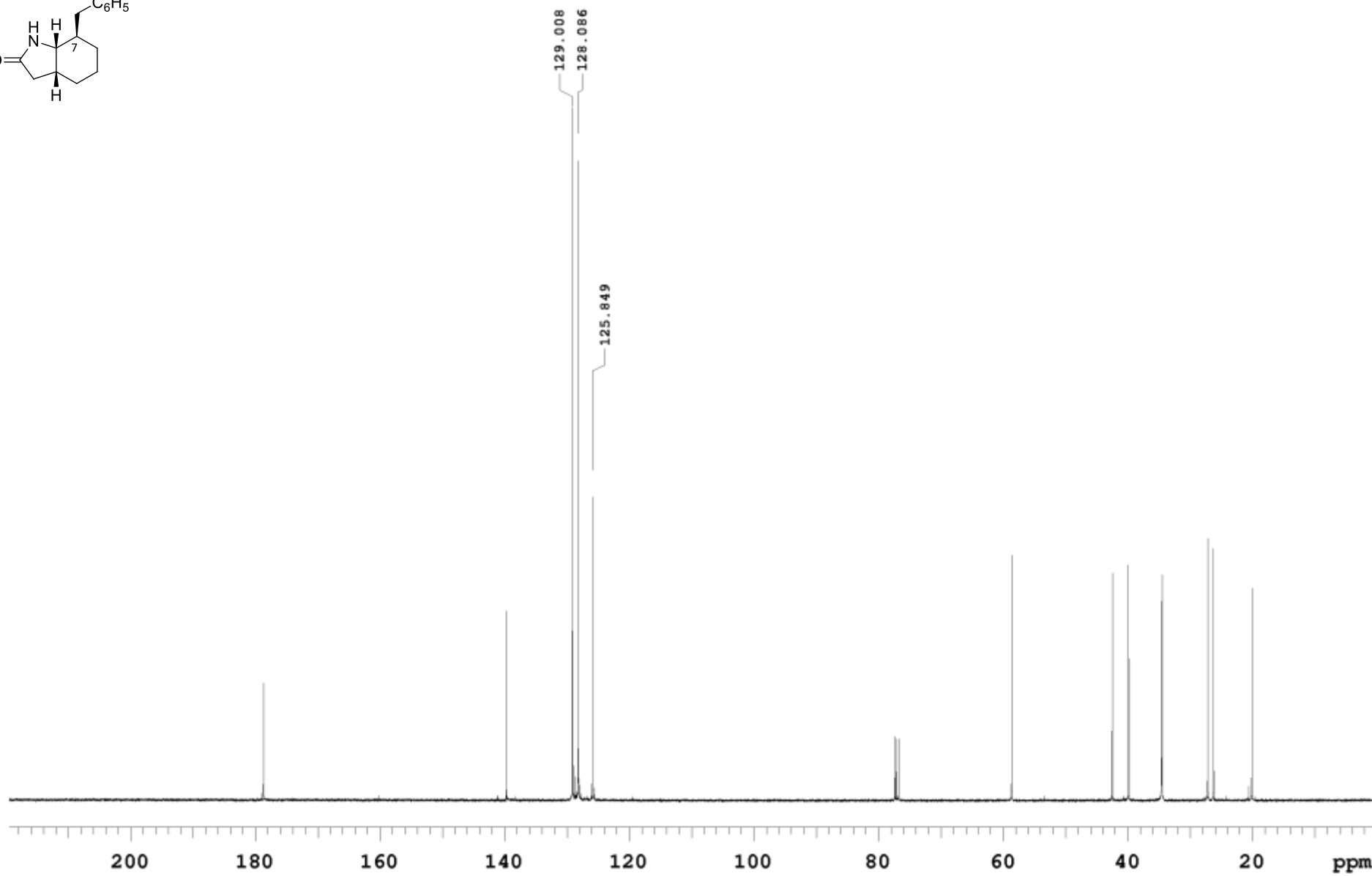
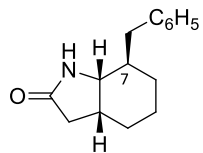
(3*aR*,7*S*,7*aR*)-7-Ethyl-2-oxooctahydroindole (147a)- $^1\text{H-NMR}$, CDCl_3 , 400 MHz, 25 °C



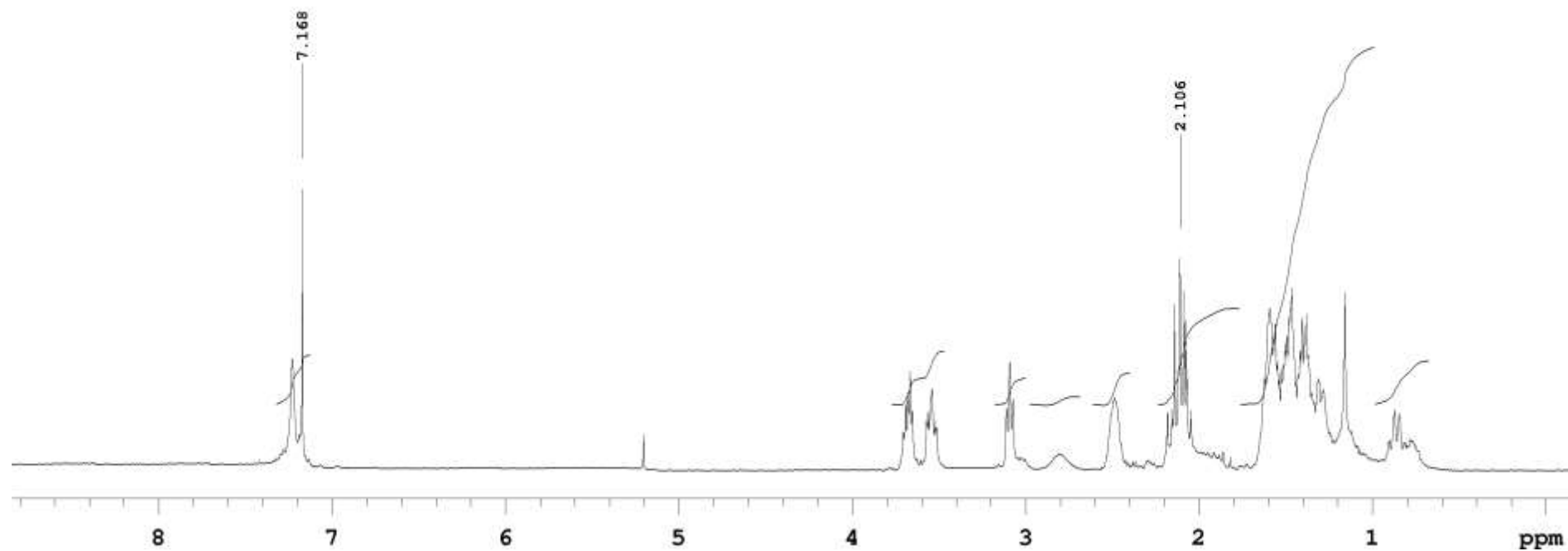
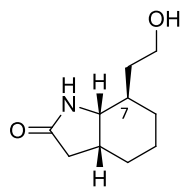
(3aR,7S,7aR)-7-Ethyl-2-oxooctahydroindole (147a)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



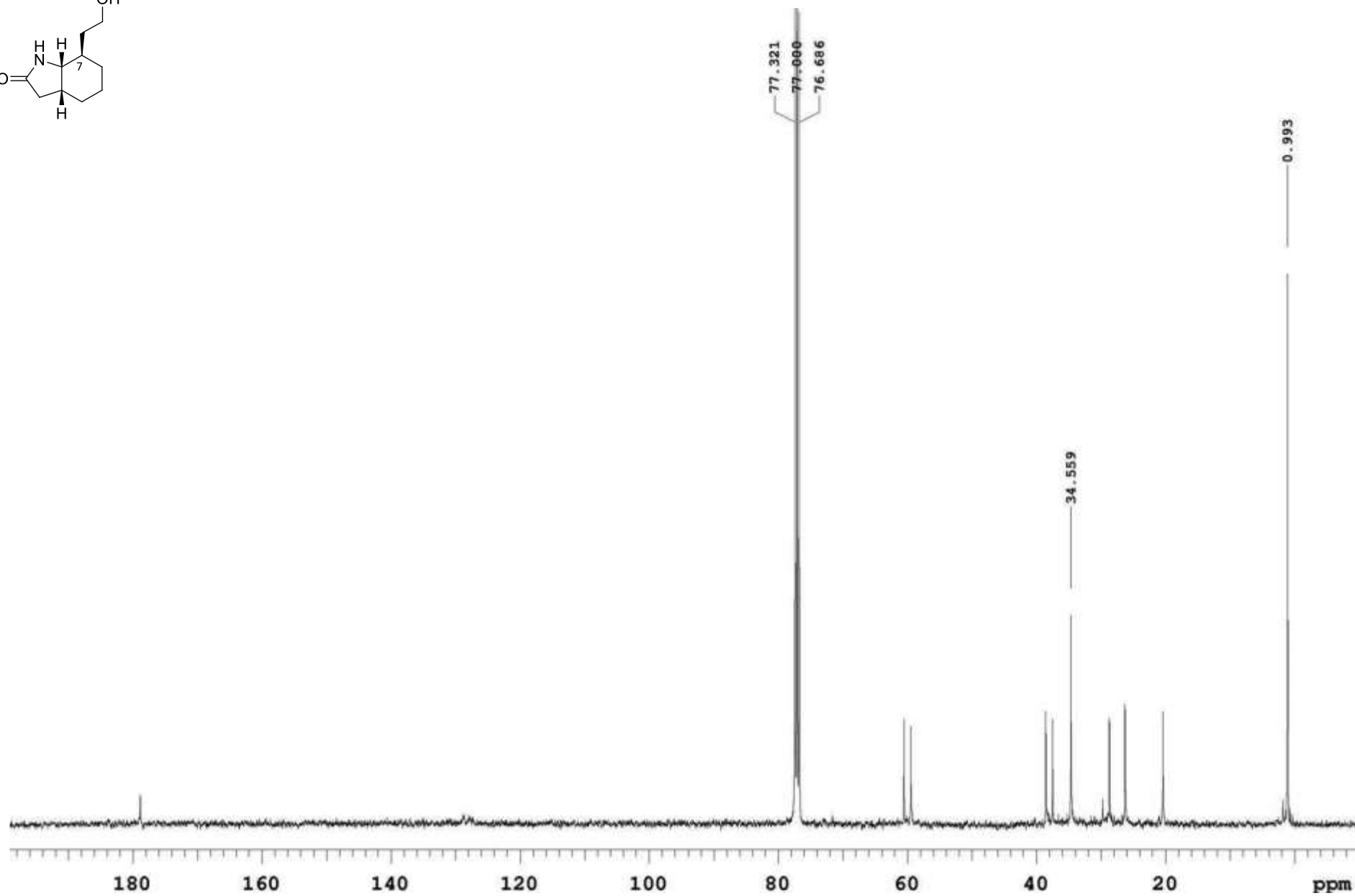
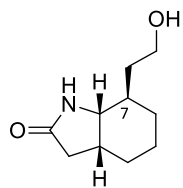
(3*aR*,7*R*,7*aR*)-7-Benzyl-2-oxooctahydroindole (148a)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



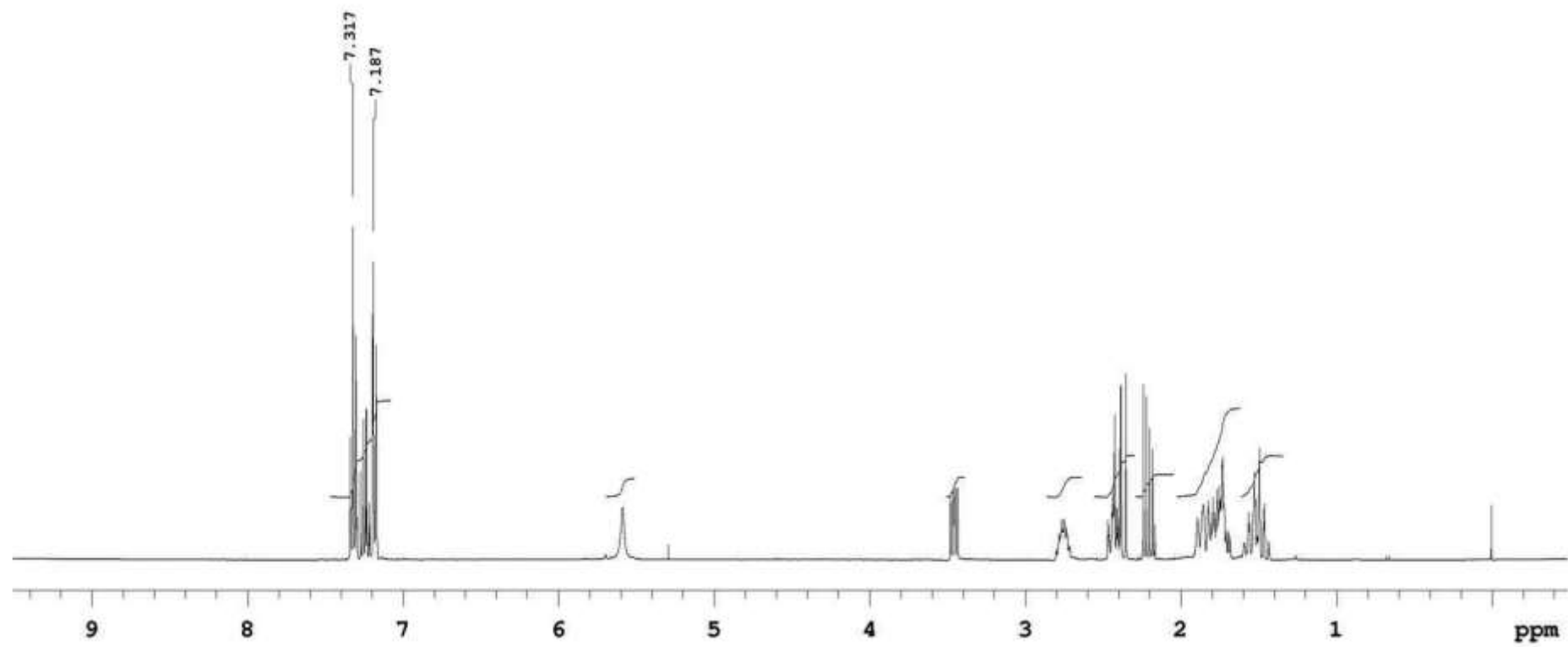
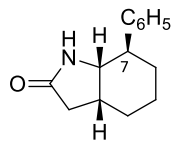
(3*aR*,7*R*,7*aR*)-7-Benzyl-2-oxooctahydroindole (148a)- ¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



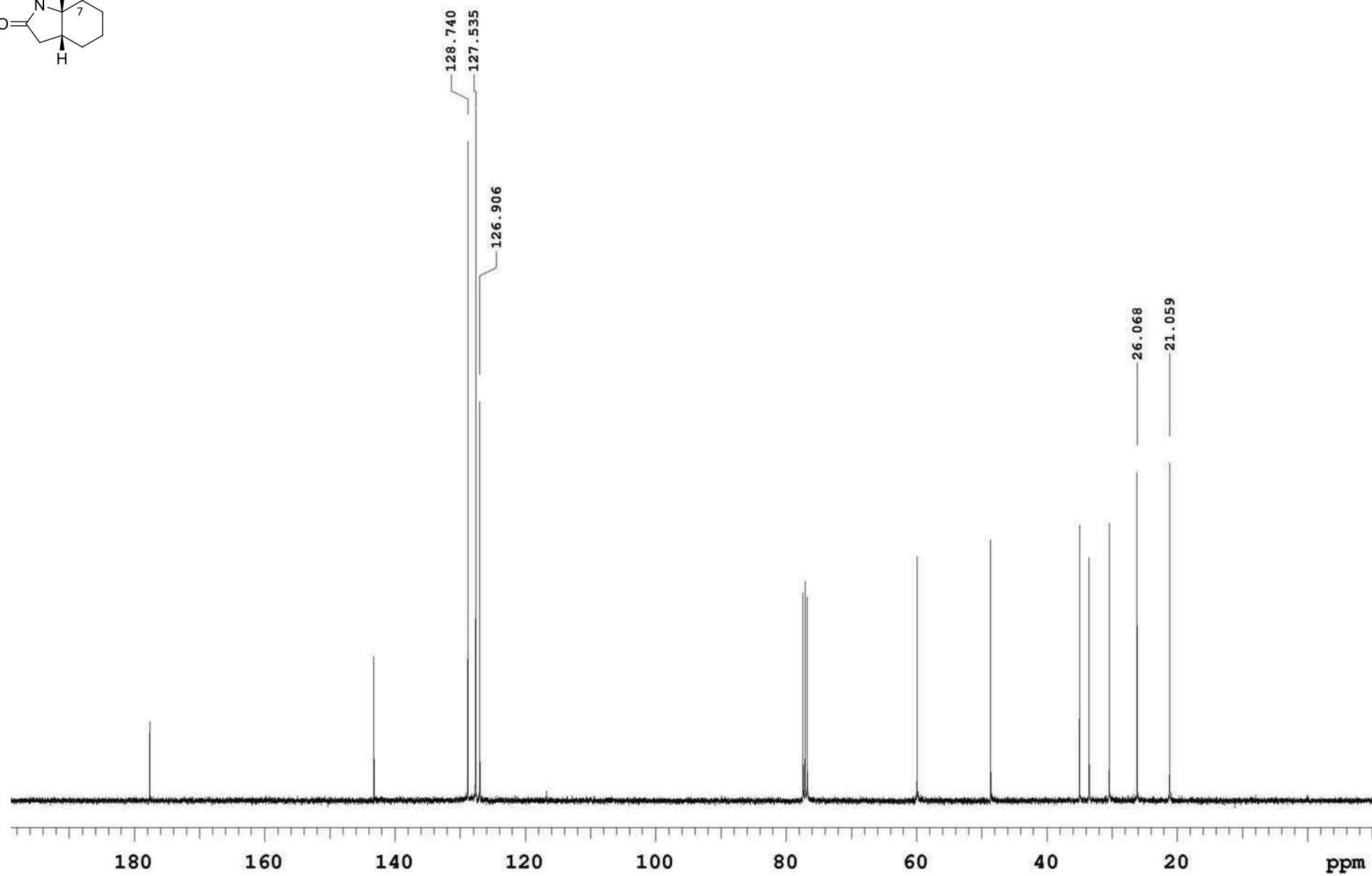
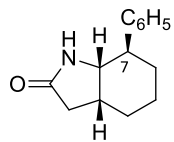
(3aR,7R,7aR)-7-(2-Hydroxyethyl)-2-oxooctahydroindole (149a)- $^1\text{H-NMR}$, CDCl_3 , 400 MHz, 25 °C



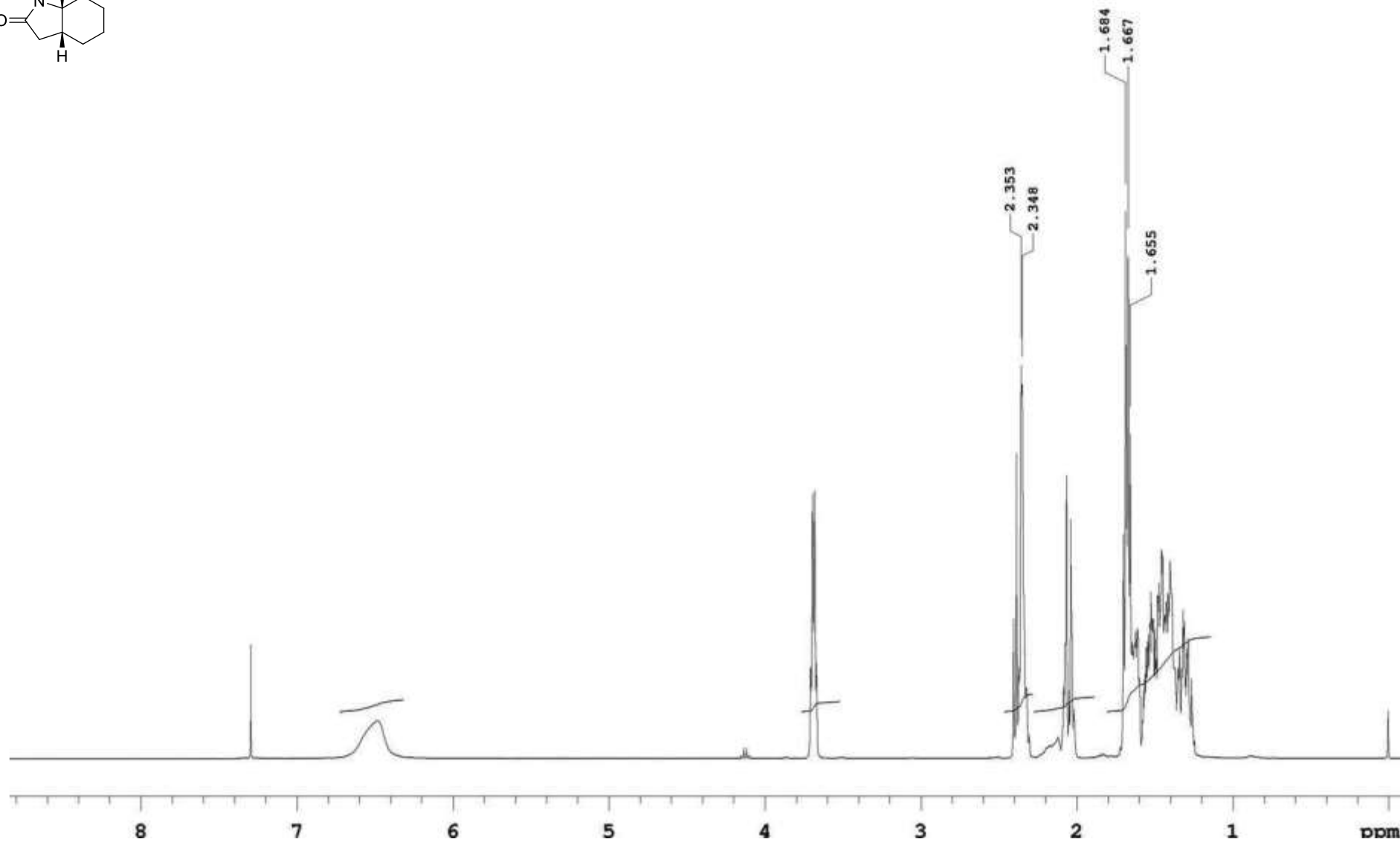
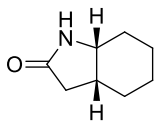
(3aR,7R,7aR)-7-(2-Hydroxyethyl)-2-oxooctahydroindole (149a)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



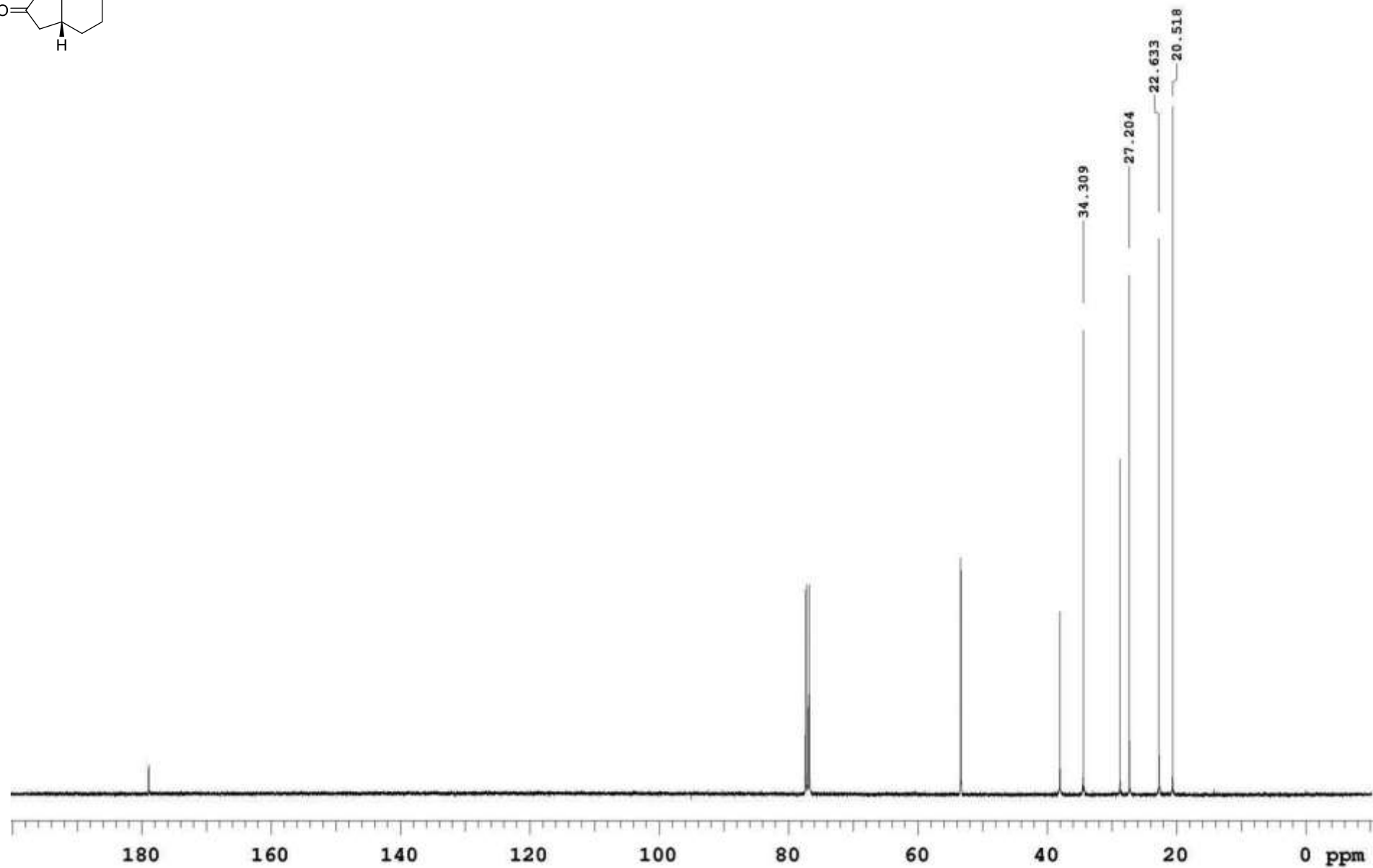
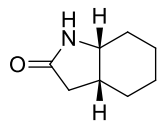
(3aR,7R,7aS)-7-Phenyl-2-oxooctahydroindole (126a)- ¹H-NMR, CDCl₃, 400 MHz, 25 °C



(3aR,7R,7aS)-7-Phenyl-2-oxooctahydroindole (126a)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C



(3aR,7aR)-2-oxooctahydroindole (150)- $^1\text{H-NMR}$, CDCl_3 , 400 MHz, 25 °C



(3aR,7aR)-2-oxooctahydroindole (150)-¹³C-NMR, CDCl₃, 100.6 MHz, 25 °C