Electronic Supplementary Information

# Brønsted Acid Promoted Benzylic C-H Bond Functionalization of Azaarenes: Nucleophilic Addition to Aldehydes

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## 1. General information

Thin-layer chromatography (TLC) was performed using E. Merck silica gel 60 F254 precoated plates (0.25 mm) or Sorbent Silica Gel 60 F254 plates. The developed chromatography was analyzed by UV lamp (254 nm). High-resolution mass spectra (HRMS) were obtained from a JEOL JMS-700 instrument (ESI). Nuclear magnetic resonance (NMR) spectra were recorded on Varian MERCURY plus spectrometer ($^{1}$H 500 MHz, $^{13}$C 125 MHz) or a Bruker Avance 400 spectrometer at ambient temperature. Chemical shifts for $^{1}$H NMR spectra are reported in parts per million (ppm) from tetramethylsilane with the solvent resonance as the internal standard (chloroform: δ 7.26 ppm). Chemical shifts for $^{13}$C NMR spectra are reported in parts per million (ppm) from tetramethylsilane with the solvent as the internal standard ($CDCl_3$: δ 77.16 ppm). Data are reported as following: chemical shift, multiplicity (s = singlet, d = doublet, dd = doublet of doublets, t = triplet, q = quartet, m = multiplet, br = broad signal), coupling constant (Hz), and integration.

**Reagents**: Substituted 2-methylquinolines was synthesized starting from *para*-substituted anilines and crotonaldehyde according to the method reported by Minamikawa, J.-i. *et. al.* [1]. Liquid aromatic aldehydes, 2,6-lutidine, 2-picoline and 4-picoline were used after distillation. Solid aromatic aldehydes, ethyl glyoxylate (50 % in toluene) and organic solvents were used directly.

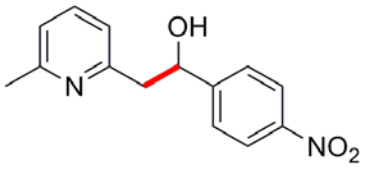
**2. General experimental procedures for benzylic C-H functionalization of azaarenes**

**Method A**: An oven-dried reaction vessel was charged with 2,6-lutidine (**1a**, 85.8 mg, 0.8 mmol, 4 equiv.), 1,2-dichloroethane (DCE, 0.2 mL), *p*-nitro-benzaldehyde (**2a**, 30.2 mg, 0.2 mmol) and acetic acid (12 μL, 0.2 mmol, 1 equiv.) under argon. The vessel was sealed and heated at 100 ℃ (oil bath temperature) for 36 h. After the resulting mixture was cooled to room temperature, aqueous $Na_2CO_3$ solution (5%, 10 ml) was added and the mixture was extracted with dichloromethane (3 × 10 ml), and washed with brine (2 × 10 ml). The organic layer was dried with anhydrous $Na_2SO_4$, and concentrated under vacuum. The residue was chromatographed on a silica gel column eluted with a mixture of petroleum ether and ethyl acetate (1:1) to give pure products **3a** (49.6 mg, 96 % yield).

**Method B**: An oven-dried reaction vessel was charged with 2-methylquinoline (**1b**, 57.3 mg, 0.4 mmol, 2 equiv.), 1,4-dioxane (0.2 mL), $H_2O$ (20 μL), *p*-nitro-benzaldehyde (**2a**, 30.2 mg, 0.2 mmol) and acetic acid (12 μL, 0.2 mmol, 1 equiv.) under argon. The vessel was sealed and heated at 80 ℃ (oil bath temperature) for 5 h. After the resulting mixture was cooled to room temperature, aqueous $Na_2CO_3$ solution (5%, 10 ml) was added and the mixture was extracted with dichloromethane (3 × 10 ml), and washed with brine (2 × 10 ml). The organic layer was dried with anhydrous $Na_2SO_4$, and concentrated under vacuum. The residue was chromatographed on a silica gel column eluted with a mixture of petroleum ether and ethyl acetate (1:1) to give pure products **3h** (52.1 mg, 95 % yield).

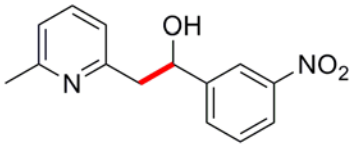
**2. Characterization data of product 3a-3t**

[1] Matsugi, M.; Fujio Tabusa, F.; Minamikawa, J.-i. *Tetrahedron Lett.* **2000**, *41*, 8523-8525.



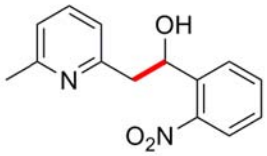

**3a**

**3a**: $^{1}$H NMR (500 MHz, $CDCl_3$, TMS) δ 8.20 (dt, *J*=2.5, 9.0 Hz, 2H), 7.60 (dt, *J*=2.5, 9.0 Hz, 2H), 7.52 (t, *J*=8.0 Hz, 1H), 7.07 (d, *J*=8.0 Hz, 1H), 6.90 (d, *J*=8.0 Hz, 1H), 5.25 (dd, *J*=2.5, 8.5 Hz, 1H), 3.12 (dd, *J*=3.0, 15.0 Hz, 1H), 3.04 (dd, *J*=9.0, 15.0 Hz, 1H), 2.57 (s, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ158.4, 157.7, 151.1, 147.3, 137.6, 126.8, 123.8, 121.9, 120.9, 72.8, 44.7, 24.6 ; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{14}H_{15}O_3N_2$ , 259.1077; found : 259.1064.



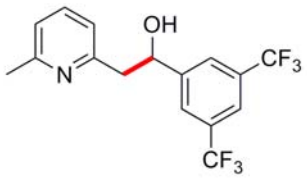

**3b**

**3b**: $^{1}$H NMR (500 MHz, $CDCl_3$, TMS) δ 8.30 (t, *J*=1.5 Hz, 1H), 8.11 (dd, *J*=1.0, 8.0 Hz, 1H), 7.78 (d, *J*=6.5 Hz, 1H), 7.54 (d, *J*=8.0 Hz, 1H), 7.50 (d, *J*=8.0 Hz, 1H), 7.07 (d, *J*=7.0 Hz, 1H), 6.91 (d, *J*=8.0 Hz, 1H), 5.24 (dd, *J*=3.0, 9.0 Hz, 1H), 3.03-3.14 (m, 2H), 2.57 (s, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ 158.5, 157.7, 148.5, 146.7, 137.6, 132.2, 129.4, 122.4, 121.9, 121.2, 120.8, 72.7, 44.8, 24.6; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{14}H_{15}O_3N_2$ , 259.1077; found : 259.1065.




**3c**

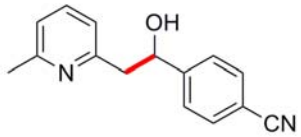
**3c**: $^{1}$H NMR (500 MHz, $CDCl_3$, TMS) δ 7.99 (dd, *J*=1.5, 8.0 Hz, 1H), 7.96 (dd, *J*=1.5, 8.0 Hz, 1H), 7.62-7.66 (m, 1H), 7.54 (t, *J*=8.0 Hz, 1H), 7.40-7.43 (m, 1H), 7.07 (d, *J*=8.0 Hz, 1H), 6.98 (d, *J*=8.0 Hz, 1H), 5.62 (dd, *J*=2.0, 9.0 Hz, 1H), 3.30 (dd, *J*=2.0, 15.0 Hz, 1H), 3.00 (dd, *J*=9.0, 15.0 Hz, 1H), 2.57 (s, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ 159.0, 157.6, 147.8, 139.9, 137.7, 133.7, 128.8, 128.1, 124.4, 121.8, 120.9, 69.4, 44.4, 24.6; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{14}H_{15}O_3N_2$ , 259.1077; found : 259.1068.




**3d**

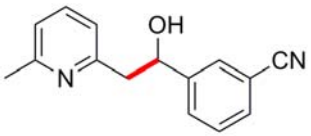
**3d**: $^{1}$H NMR (500 MHz, $CDCl_3$, TMS) δ 7.90 (s, 2H), 7.77 (s, 1H), 7.54 (t, *J*=8.0 Hz, 1H), 7.08 (d, *J*=8.0 Hz, 1H), 6.92 (d, *J*=8.0 Hz, 1H), 5.26 (dd, *J*=2.5, 9.0 Hz, 1H), 3.12 (dd, *J*=3.0, 15.0 Hz, 1H),

3.05 (dd, *J*=9.0, 15.0 Hz, 1H), 2.57 (s, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ158.3, 157.8, 147.1, 137.7, 131.7 (q, *J*=33.0 Hz), 126.4 (q, *J*=2.6 Hz), 123.7 (d, *J*=271.1 Hz), 122.0, 121.3 (q, *J*=3.9 Hz), 120.9, 72.5, 44.8, 24.5; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{16}H_{14}ONF_6$, 350.0974; found: 350.0957.



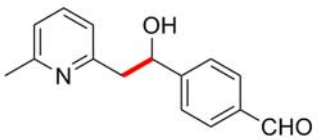

**3e**

**3e**: $^1$H NMR (500 MHz, $CDCl_3$, TMS) δ 7.63 (dt, *J*=2.0, 8.5 Hz, 2H), 7.50-7.55 (m, 3H), 7.06 (d, *J*=8.0 Hz, 1H), 6.89 (d, *J*=8.0 Hz, 1H), 5.19 (dd, *J*=3.0, 9.0 Hz, 1H), 3.01-3.10 (m, 2H), 2.56 (s, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ 158.6, 157.7, 149.8, 137.6, 132.4, 126.7, 121.8, 120.8, 119.2, 111.1, 72.90, 44.8, 24.6; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{15}H_{15}ON_2$, 239.1179; found : 239.1168.



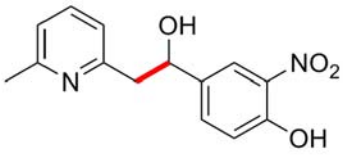

**3f**

**3f**: $^1$H NMR (400 MHz, $CDCl_3$, TMS) δ 7.74 (s, 1H), 7.67 (d, *J*=8.0 Hz, 1H), 7.53 (m, 2H), 7.45 (t, *J*=8.4 Hz, 1H), 7.07 (d, *J*=7.2 Hz, 1H), 6.90 (d, *J*=8.0 Hz, 1H), 5.17 (dd, *J*=2.8, 8.0 Hz, 1H), 3.11-3.00 (m, 2H), 2.57 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, TMS) δ 158.4, 157.6, 145.9, 137.5, 130.9, 130.4, 129.7, 129.1, 121.7, 120.8, 119.0, 112.4, 72.5, 44.9, 24.4; HRMS (ESI) m/z: $[M+H]^+$ calcd for $C_{15}H_{15}ON_2$, 239.1179; found : 239.1165.



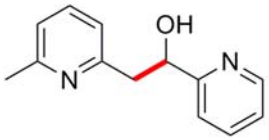

**3g**

**3g**: $^1$H NMR (500 MHz, $CDCl_3$, TMS) δ 10.00 (s, 1H), 7.86 (d, *J*=8.5 Hz, 2H), 7.60 (d, *J*=8.5 Hz, 2H), 7.51 (t, *J*=8.0 Hz, 1H), 7.06 (d, *J*=8.0 Hz, 1H), 6.90 (d, *J*=7.5 Hz, 1H), 5.22 (dd, *J*=3.5, 9.0 Hz, 1H), 3.03-3.12 (m, 2H), 2.58 (s, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ 192.3, 158.8, 157.7, 151.4, 137.6, 135.7, 130.1, 126.6, 121.7, 120.8, 73.2, 44.8, 24.6; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{15}H_{16}O_2N$, 242.1176, found : 242.1166.



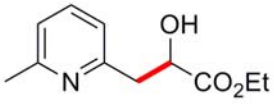

**3h**

**3h**: $^{1}$H NMR (400 MHz, $CDCl_3$, TMS) δ 10.53 (s, 1H), 8.17 (s, 1H), 7.67 (d, *J*=6.8 Hz, 1H), 7.52 (t, *J*=8.4 Hz, 1H), 7.14 (d, *J*=8.8 Hz, 1H), 7.06 (d, *J*=7.2 Hz, 1H), 6.91 (d, *J*=7.6 Hz, 1H), 5.13 (dd, *J*=2.8, 7.2 Hz, 1H), 3.09-3.00 (m, 2H), 2.57 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, TMS) δ 158.5, 157.7, 154.3, 137.5, 137.1, 135.4, 133.5, 122.3, 121.7, 120.8, 119.9, 72.1, 44.8, 24.4; HRMS (ESI) m/z: $[M+H]^+$ calcd for $C_{14}H_{15}O_4N_2$, 275.1032; found : 275.1021.



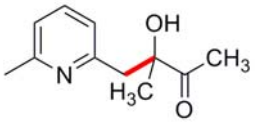

**3i**

**3i**: $^{1}$H NMR (400 MHz, $CDCl_3$, TMS) δ 8.55 (d, *J*=3.2, 1H), 7.68 (t, *J*=7.6 Hz, 1H), 7.56 (d, *J*=7.6 Hz, 1H), 7.49 (d, *J*=8.8 Hz, 1H) , 7.17 (s, 1H), 7.03 (d, *J*=8.4 Hz, 1H), 6.96 (d, *J*=8.0 Hz,1H), 5.20 (dd, *J*=2.4, 8.8 Hz, 1H), 3.34 (dd, *J*=2.4, 14.8 Hz, 1H), 3.08 (dd, *J*=8.8, 14.4 Hz, 1H), 2.55 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, TMS) δ 163.0, 159.0, 157.4, 148.5, 137.2, 136.7, 122.1, 121.3, 120.9, 120.4, 73.9, 44.1, 24.4; HRMS (ESI) m/z: $[M+H]^+$ calcd for $C_{13}H_{15}O_2N$, 215.1184; found : 215.1168.



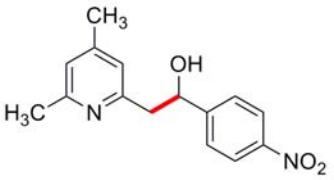

**3j**

**3j**: $^{1}$H NMR (500 MHz, $CDCl_3$, TMS) δ 7.50 (t, *J*=7.5 Hz, 1H), 7.02 (d, *J*=8.0 Hz, 1H), 6.97 (d, *J*=8.0 Hz, 1H), 4.62 (dd, *J*=3.5, 7.0 Hz, 1H), 4.19 (d, *J*=2.0 Hz, 2H), 3.26 (dd, *J*=3.5, 15.0 Hz, 1H), 3.14 (dd, *J*=7.0, 10.0 Hz, 1H), 2.50 (s, 3H), 1.22 (t, *J*=7.0 Hz, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ173.9, 157.8, 137.3, 121.7, 120.6, 120.9, 70.9, 61.4, 40.3, 24.5, 14.4; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{11}H_{16}O_3N$, 210.1125; found: 210.1119.



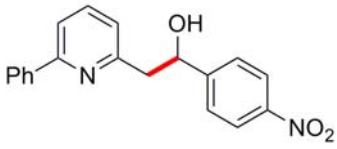

**3k**

**3k**: $^{1}$H NMR (500 MHz, $CDCl_3$, TMS) δ 7.51 (t, *J*=6.8, 1H), 6.99 (d, *J*=7.6 Hz, 1H), 6.95 (d, *J*=7.6Hz, 1H), 3.33 (d, *J*=3.6 Hz, 1H), 2.96 (d, *J*=15.2 Hz, 1H), 2.48 (s, 3H), 2.26 (s, 3H), 1.35 (s, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ 215.0, 158.0, 157.1, 137.4, 121.4, 121.36, 80.0, 44.5, 25.8, 25.5, 24.2; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{11}H_{16}O_2N$, 194.1181; found: 194.1172.



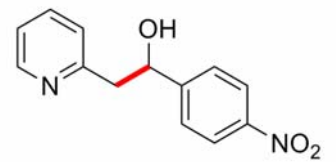

**3l**

**3l**: $^{1}$H NMR (500 MHz, $CDCl_3$, TMS) δ 8.20 (d, *J*=8.8, 2H), 7.59 (d, *J*=8.8 Hz, 2H), 6.89 (s, 1H), 6.73 (s, 1H), 5.22 (dd, *J*=2.0, 8.8 Hz, 1H), 3.08-2.95 (m, 2H), 2.52 (s, 3H), 2.28 (s, 3H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ 158.1, 157.3, 152.2, 148.8, 147.2, 126.7, 123.6, 122.6, 121.7, 72.7, 44.5, 24.2, 21.0; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{15}H_{17}O_3N_2$, 273.1239; found: 273.1231.



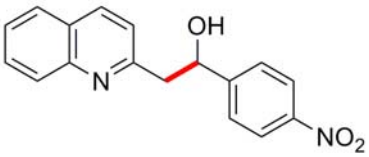

**3m**

**3m**: $^{1}$H NMR (500 MHz, $CDCl_3$, TMS) δ 8.21 (d, *J*=8.4, 2H), 7.96 (d, *J*=7.2 Hz, 2H), 7.72 (t, *J*=7.6Hz, 1H), 7.66 (d, *J*=8.8 Hz, 1H), 7.62 (d, *J*=8.0 Hz, 2H), 7.53-7.46 (m, 3H), 7.05 (d, *J*=7.2 Hz, 1H), 6.76 (s, 1H), 5.37 (d,*J*=6.0 Hz,1H), 3.26-3.14 (m, 2H); $^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ 158.9, 156.8, 151.7, 147.4, 138.7, 138.2, 129.6, 129.1, 127.0, 126.8, 123.7, 122.3, 119.2, 72.6, 44.9; HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{19}H_{17}O_3N_2$, 321.1239; found: 321.1232.




**3n**

**3n**: known compound, CAS: 20151-01-3; the following NMR data were the same as literature report[2]. $^{1}$H NMR (400 MHz, $CDCl_3$, TMS) δ 8.54 (s, 1H), 8.20 (d, *J*=8.0 Hz, 2H), 7.65 (s, 1H), 7.60 (d, *J*=7.2 Hz, 2H), 7.23(s,1H), 7.10 (d, *J*=6.4 Hz, 1H), 6.42 (s,1H), 5.29 (d, *J*=7.6 Hz, 1H), 3.19-3.07 (m, 2H)；$^{13}$C NMR (125 MHz, $CDCl_3$, TMS) δ 159.0, 151.6, 148.7, 147.3, 137.3, 126.7, 123.9, 123.7, 122.2, 72. 5, 44.9.




**3o**

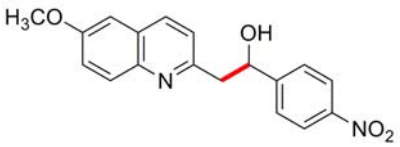
**3o**: known compound, CAS: 38101-97-2; the following NMR data were the same as literature

[2] Houminer, Y.; Williams, D. L. *J. Org. Chem.* **1983**, *48*, 2622-2625.

report[3]. $^1$H NMR (400 MHz, $CDCl_3$, TMS) δ 8.22 (d, *J*=8.8Hz, 2H), 8.13 (d, *J*=8.0Hz, 1H), 8.06 (d, *J*=8.4 Hz, 1H), 7.82 (d, *J*=7.6 Hz, 1H),7.76 (t, *J*=7.2 Hz, 1H), 7.65 (d, *J*=8.8 Hz, 2H), 7.56 (t, *J*=7.2 Hz, 1H), 7.22 (d, *J*=8.8 Hz, 1H), 6.72 (s, 1H), 5.45 (d, *J*=5.6 Hz, 1H), 3.38-3.25 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$, TMS) δ 159.6, 151.9, 148.0, 146.6, 136.2, 129.6, 129.0, 128.9, 127.6, 126.8, 126.1, 123.6, 121.9, 45.8, 45.2.

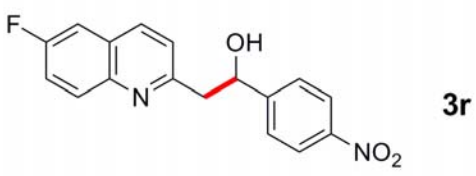

**3p**

**3p**: $^1$H NMR (400 MHz, $CDCl_3$, TMS) δ 8.21 (d, *J*=8.4 Hz, 2H), 8.02 (d, *J*=8.0 Hz, 1H), 7.95 (d, *J*=9.2 Hz, 1H), 7.64 (d, *J*=8.8 Hz, 2H), 7.57 (s, 2H), 7.16 (d, *J*=8.0 Hz, 1H), 6.79 (s, 1H), 5.42 (d, *J*=8.4 Hz, 1H), 3.35-3.22 (m, 2H), 2.55(s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, TMS) δ 158.0, 157.1, 151.7, 147.4, 143.1, 136.1, 130.2, 128.1, 126.8, 123.7, 122.9, 122.3, 105.4, 72.4, 55.7, 45.2; HRMS (EI) m/z : $[M]^+$ calcd for $C_{18}H_{16}O_3N_2$ ,308.1161; found :308.1166.




**3q**

**3q**: $^1$H NMR (400 MHz, $CDCl_3$, TMS) δ 8.21 (d, *J*=8.8 Hz, 2H), 8.01 (d, *J*=8.4 Hz, 1H), 7.95 (d, *J*=9.2 Hz, 1H), 7.64 (d, *J*=8.0 Hz, 2H), 7.40 (dd, *J*=9.2, 2.4 Hz, 1H), 7.16 (d, *J*=8.0 Hz, 1H), 7.07 (d, *J*=2.0 Hz, 1H), 6.72 (s, 1H), 5.42 (d, *J*=6.8 Hz, 1H), 3.94 (s, 3H), 3.34-3.20 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$, TMS) δ 159.7, 152.0, 148.0, 146.6, 136.2, 132.4, 129.6, 129.0, 127.6, 126.8, 126.1, 123.5, 121.9, 72.4, 45.8, 45.2; HRMS (EI) m/z : $[M]^+$ calcd for $C_{18}H_{16}O_4N_2$, 324.1110; found: 324.1115.

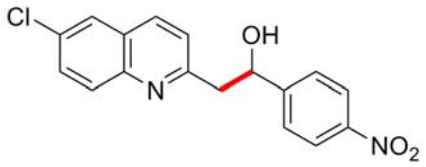



**3r**

**3r**: $^1$H NMR (400 MHz, $CDCl_3$, TMS) δ 8.22 (d, *J*=8.8 Hz, 2H), 8.09 (d, *J*=4.0 Hz, 1H), 8.07 (s, 1H), 7.65 (d, *J*=8.4 Hz, 2H), 7.53 (d, *J*=2.8 Hz, 1H), 7.45 (dd, *J*=8.8, 2.4 Hz, 1H), 7.24 (d, *J*=8.8 Hz, 1H), 6.45 (s, 1H), 5.45 (d, *J*=8.4 Hz, 1H), 3.33-3.29 (m, 2H); $^{13}$C NMR (125 MHz, $CDCl_3$,

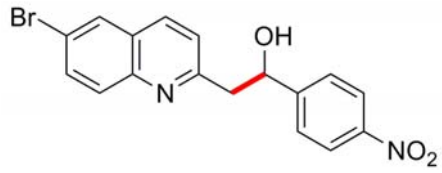
[3] Franck, X.; Fournet, A.; Prina, E.; Mahieux, R.; Hocquemiller, R.; Figadere, B. *Bioorg. Med. Chem. Lett.* **2004**, *14*, 3635-3638.

TMS) δ 161.8, 159.1, 151.4, 144.1, 136.7 (d, *J*=5.3 Hz), 131.2 (d, *J*=9.0 Hz), 130.0, 127.6, 126.8, 123.8, 122.8, 120.4 (d, *J*=157.0 Hz), 111.0 (d, *J*=114.0 Hz), 72.2, 45.3； HRMS (EI) m/z : $[M]^+$ calcd for $C_{17}H_{13}FO_3N_2$, 312.0910; found: 312.0915.




**3s**

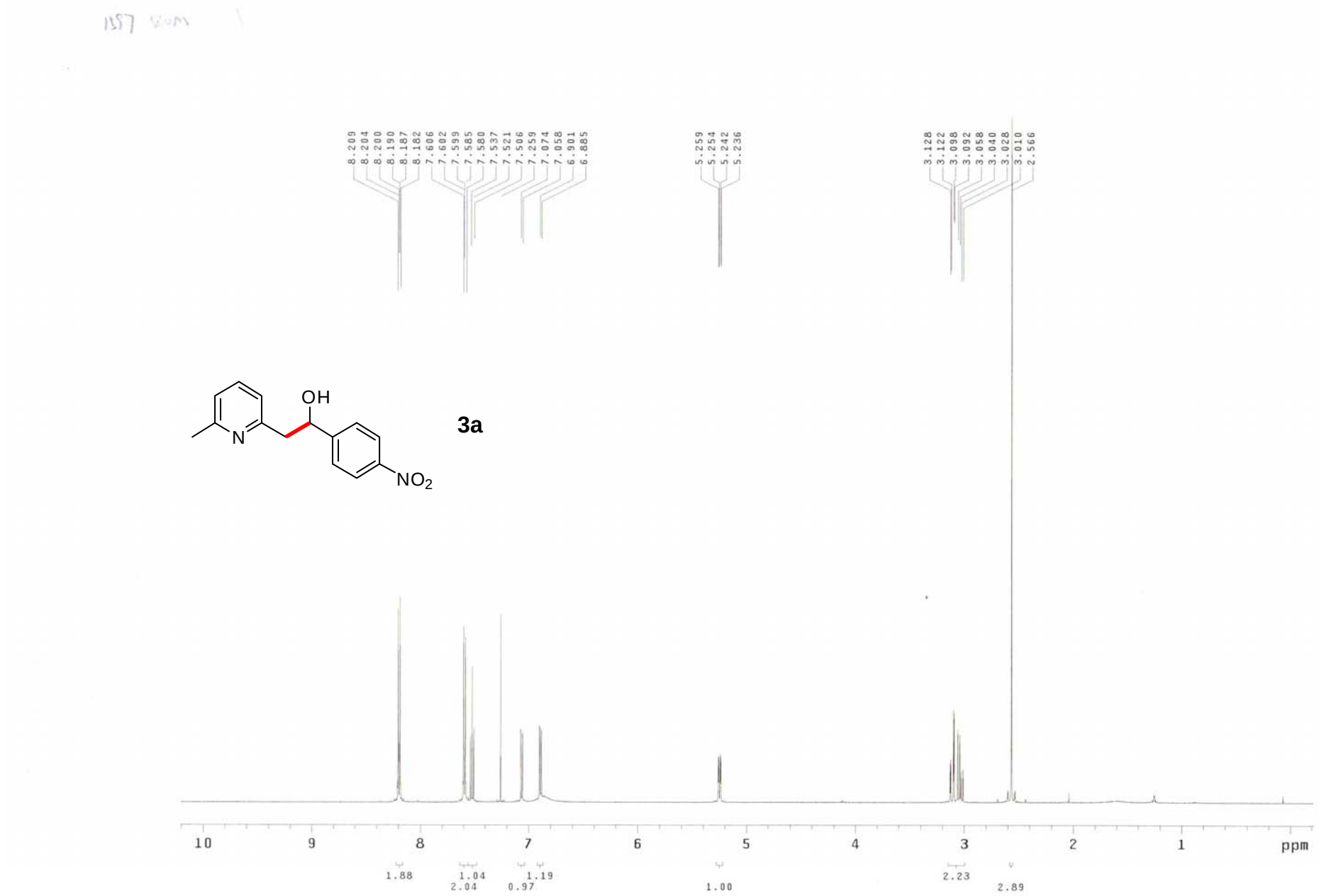
**3s**: $^1$H NMR (400 MHz, $CDCl_3$, TMS) δ 8.22 (d, *J*=8.4 Hz, 2H), 8.05 (d, *J*=8.4 Hz, 1H), 8.00 (d, *J*=8.4, 1H), 7.81 (s, 1H), 7.69 (dd, *J*=8.8, 1.2 Hz, 1H), 7.64 (d, *J*=8.8 Hz, 2H), 7.25 (d, *J*=10.8 Hz, 1H), 6.35 (s, 1H), 5.45 (d, *J*=6.8 Hz, 1H), 3.37-3.25 (m, 2H)； $^{13}$C NMR (100 MHz, $CDCl_3$, TMS) δ 160.1, 151.3, 147.4, 145.5, 136.3, 132.4, 131.1, 130.4, 127.7, 126.8, 126.5, 123.8, 123.0, 72.2, 45.6； HRMS (EI) m/z : $[M]^+$ calcd for $C_{17}H_{13}O_3N_2Cl$, 328.0615; found: 328.0619.

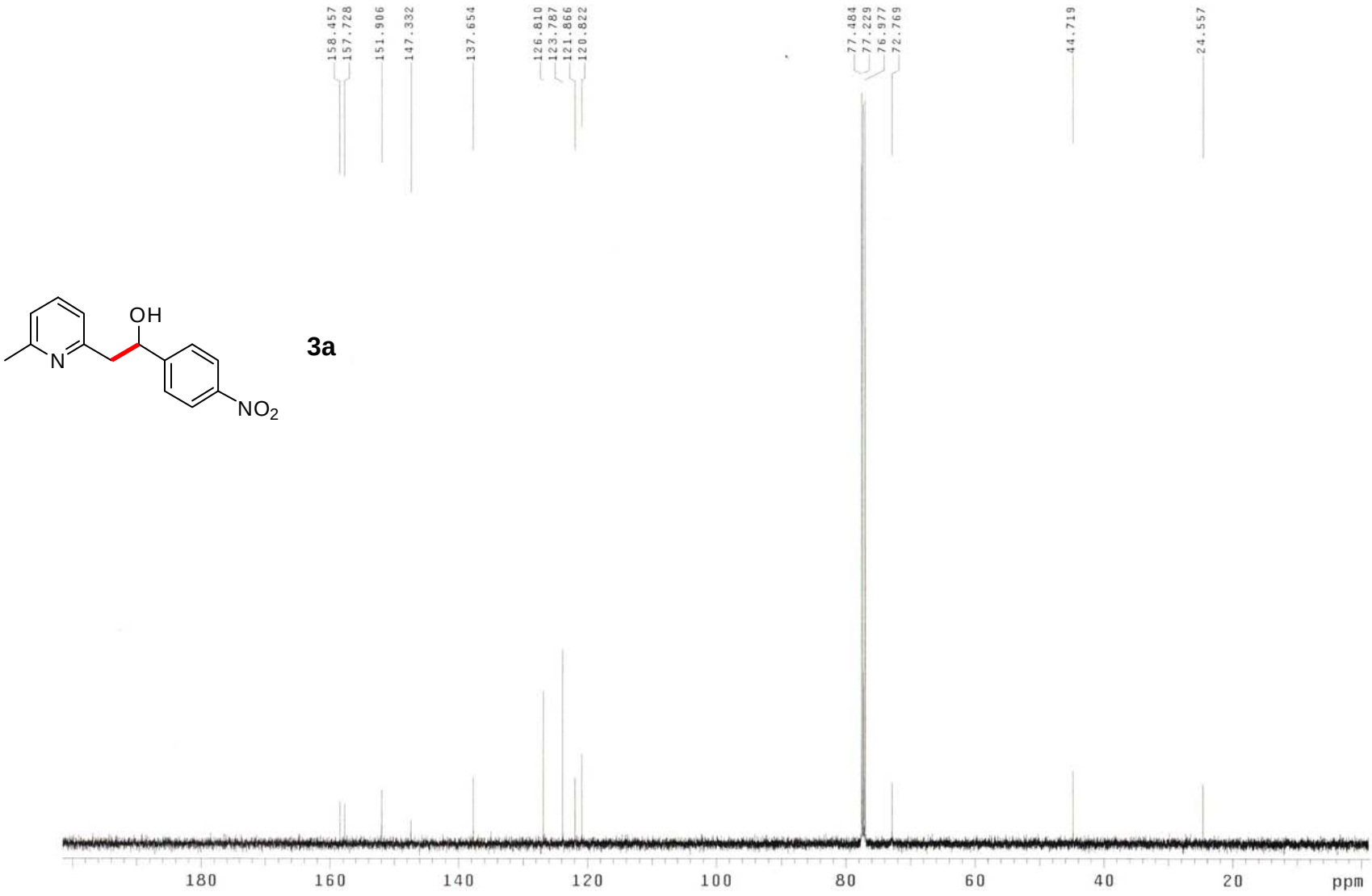



**3t**

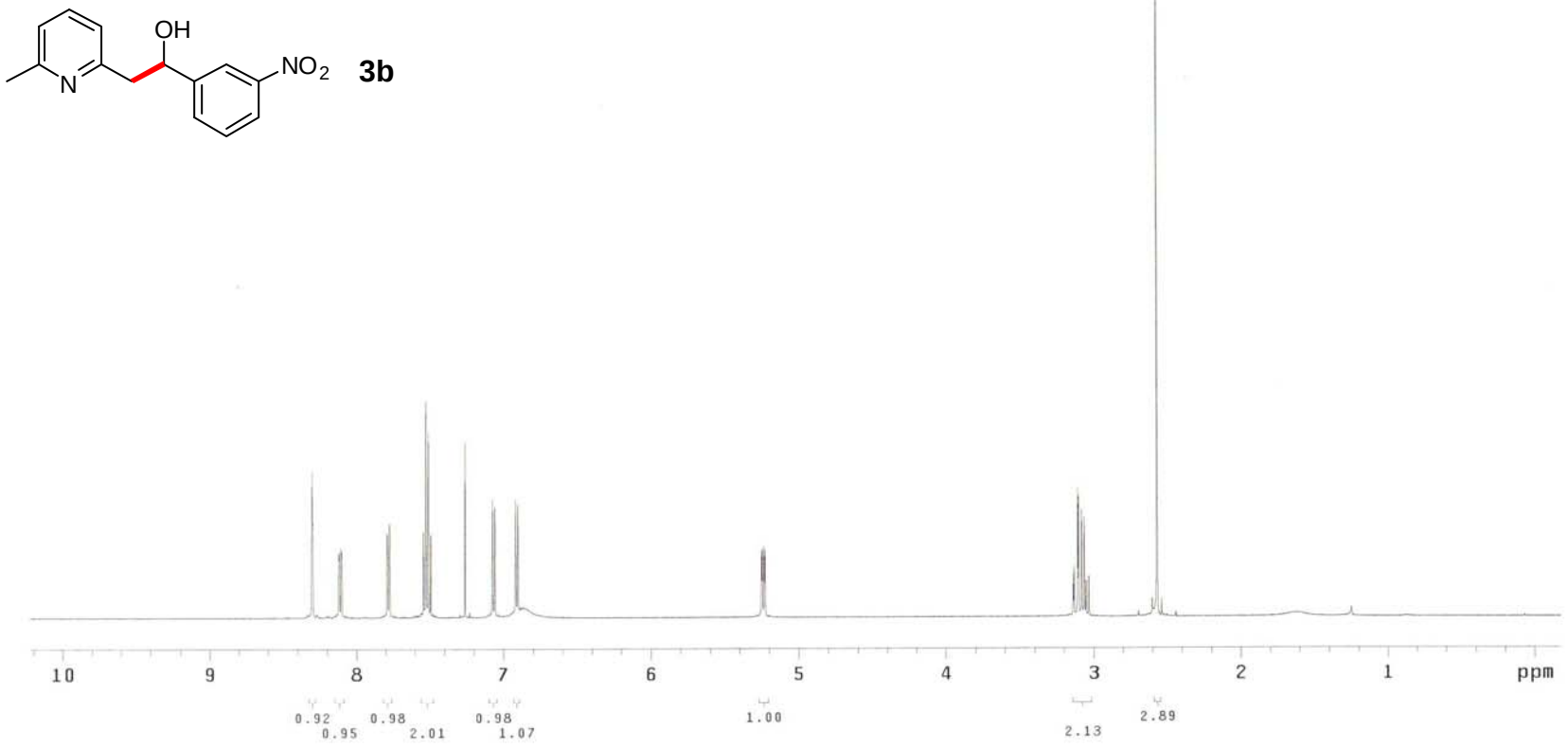
**3t**: $^1$H NMR (400 MHz, $CDCl_3$, TMS) δ 8.22 (d, *J*=8.4 Hz, 2H), 8.04 (d, *J*=8.4 Hz, 1H), 7.99 (s, 1H), 7.94 (d, *J*=9.2 Hz, 1H), 7.82 (dd, *J*=8.8, 1.6 Hz, 1H),7.64 (d, *J*=8.4 Hz, 2H), 7.25 (d, *J*=8.8 Hz, 1H), 6.37 (s, 1H), 5.45 (d, *J*=8.4 Hz, 1H), 3.37-3.24 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$, TMS) δ 160.2, 151.2, 147.3, 145.6, 136.2, 133.6, 130.4, 129.8, 128.1, 126.7, 123.8, 122.9, 120.5, 72.1, 45.5; HRMS (EI) m/z : $[M]^+$ calcd for $C_{17}H_{13}O_3N_2Br$, 374.0089; found: 374.0093.

## 4. Copies of $^1$H and $^{13}$C NMR spectra of products 3a-3t

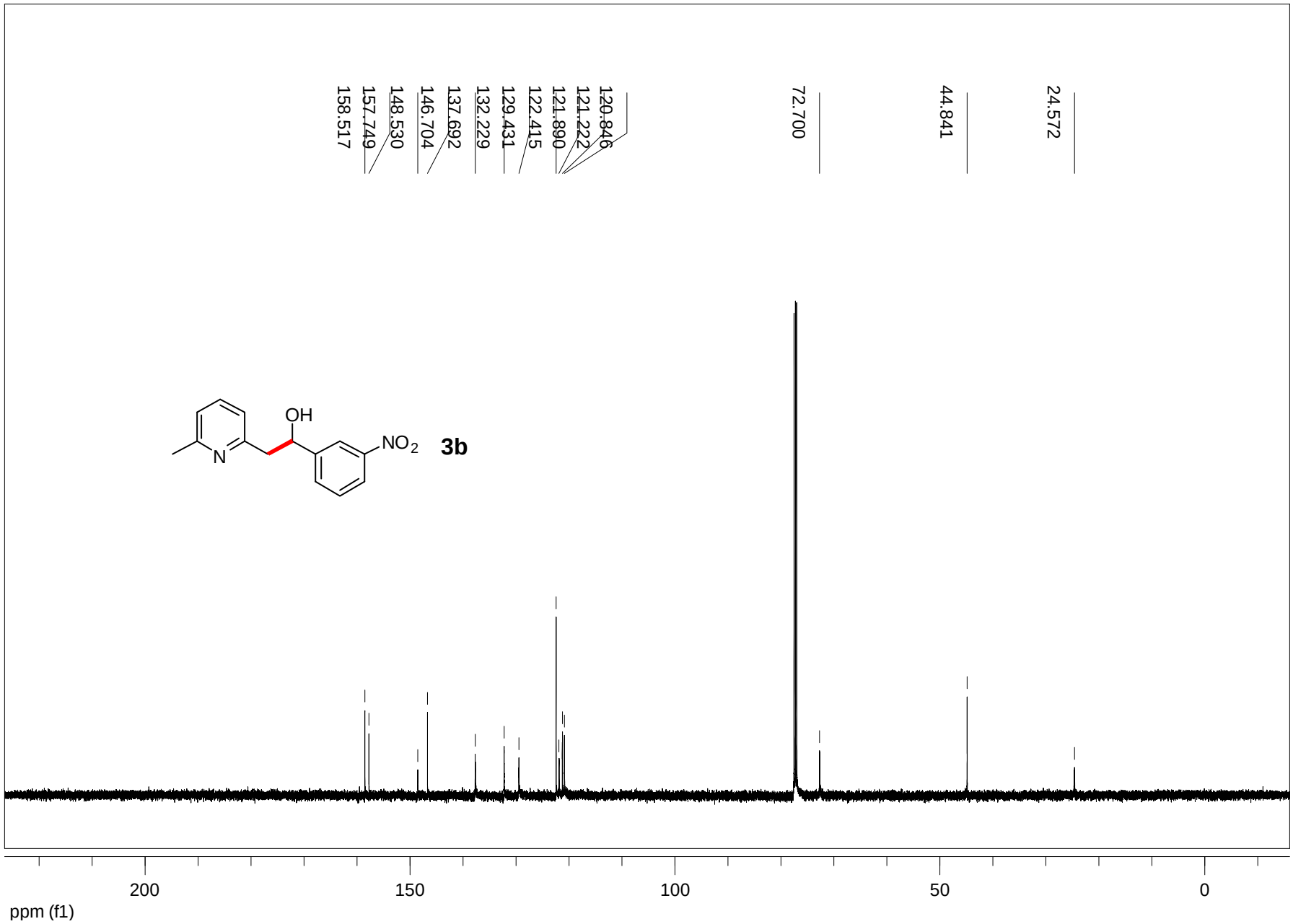


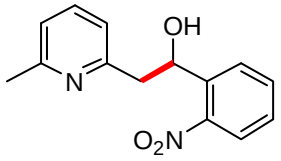



**3a**

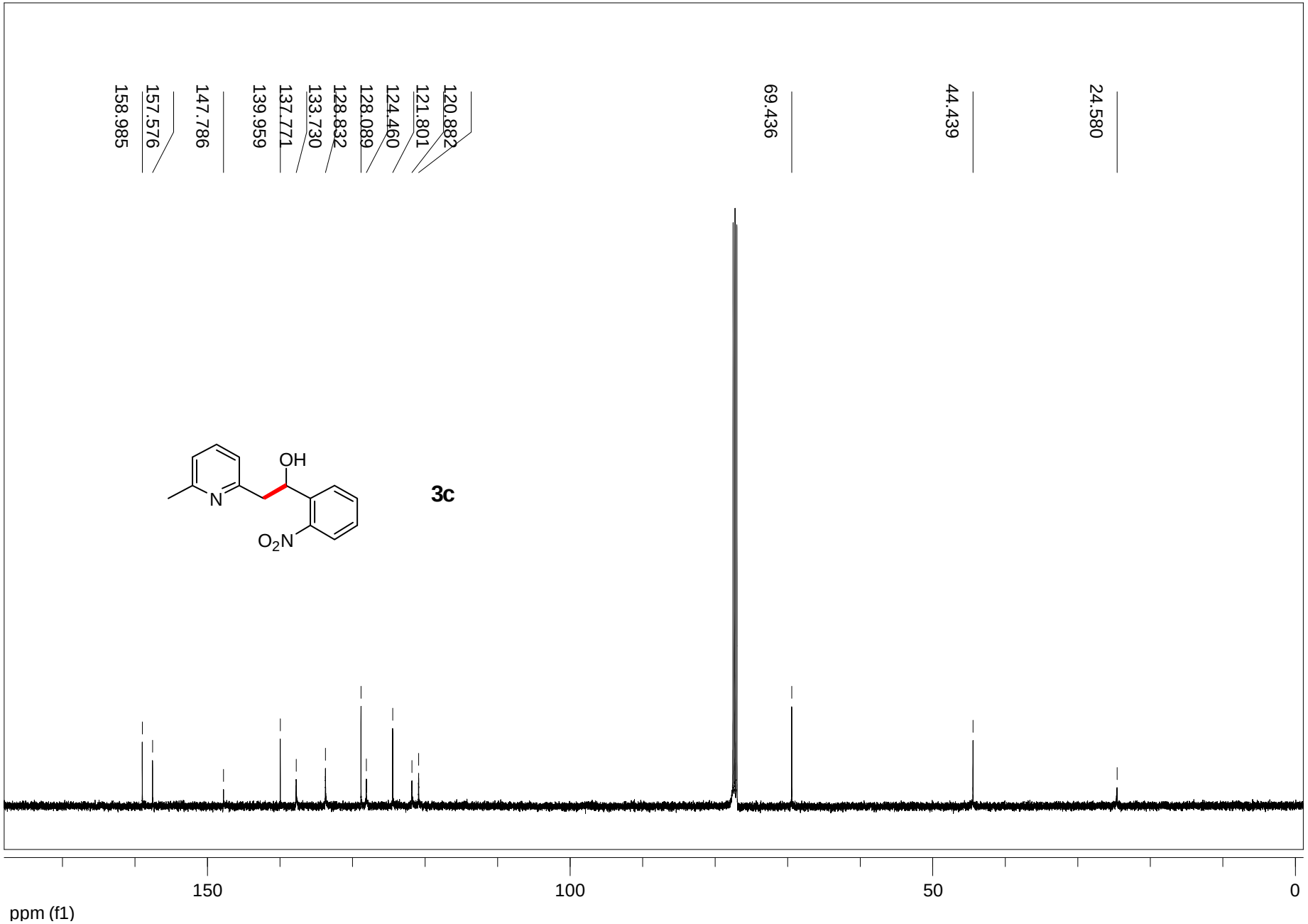


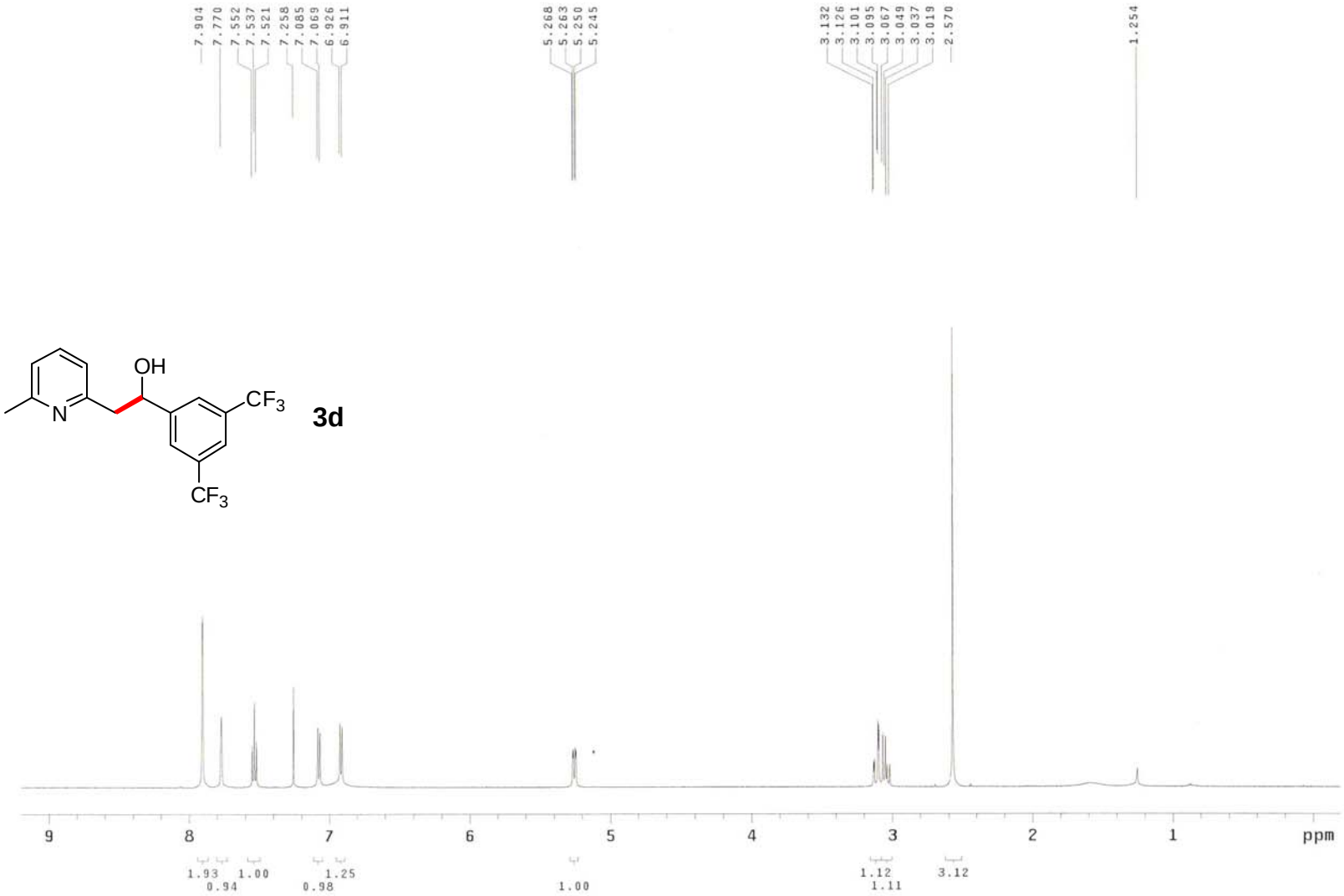

**3b**

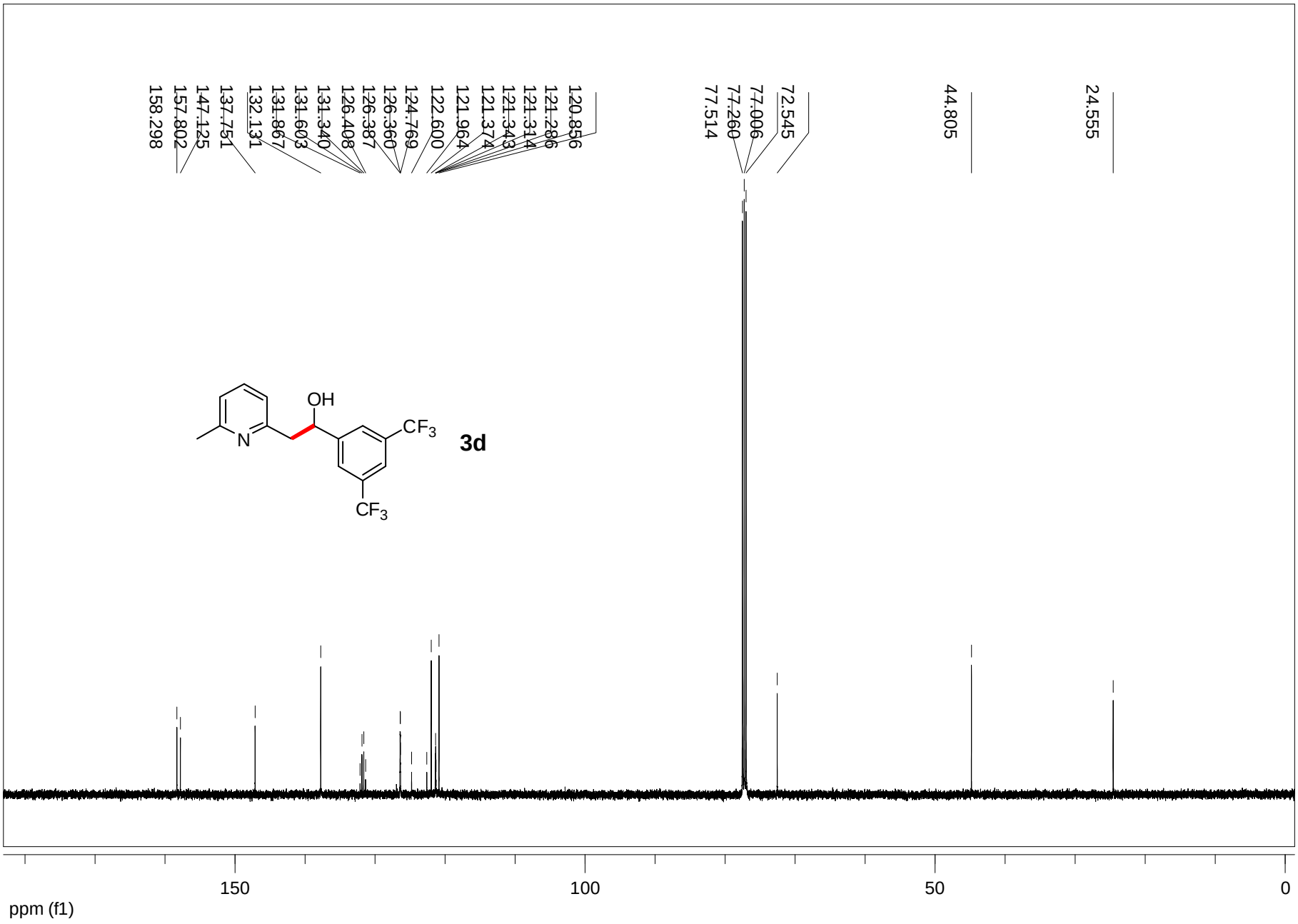


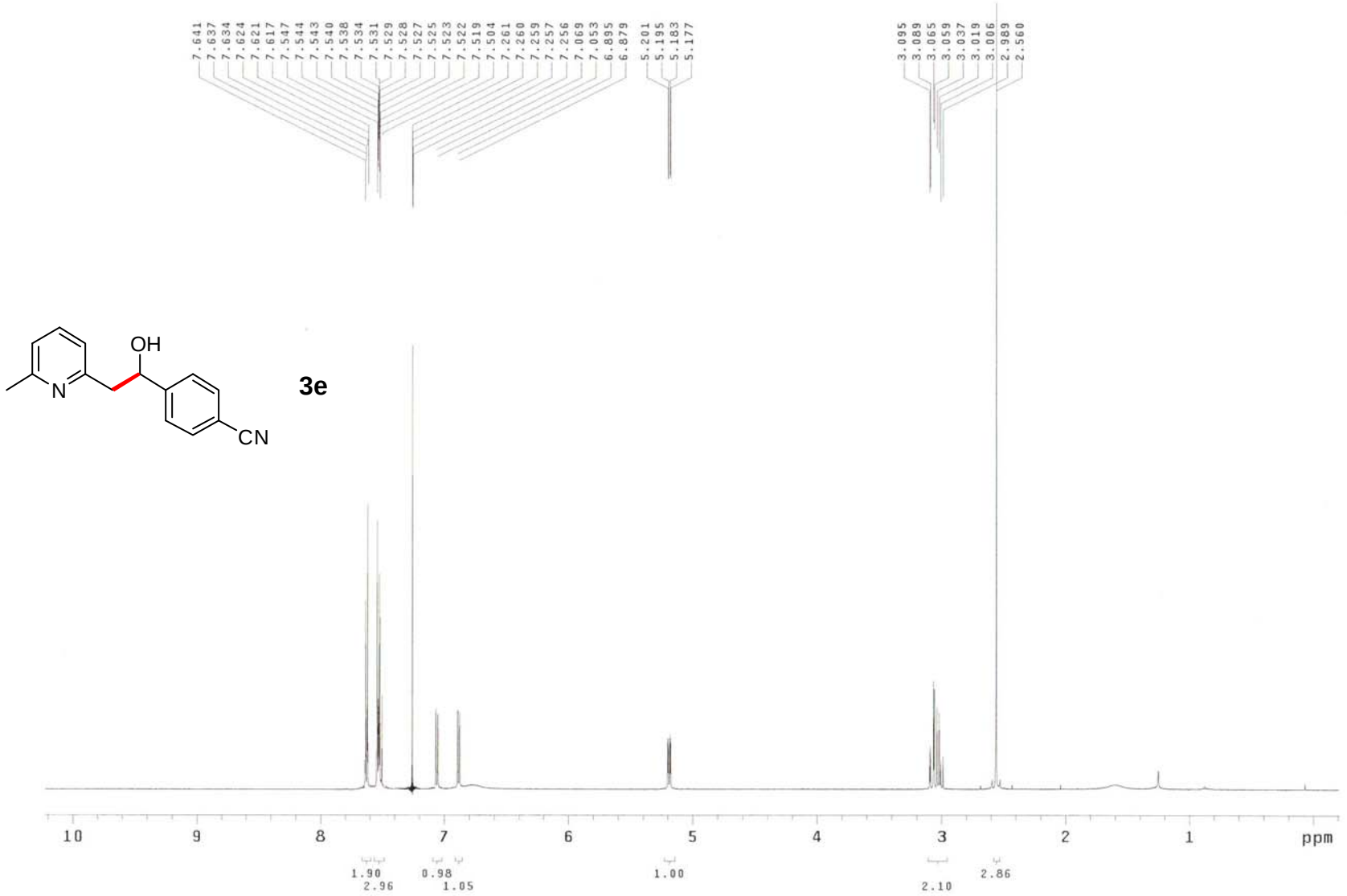


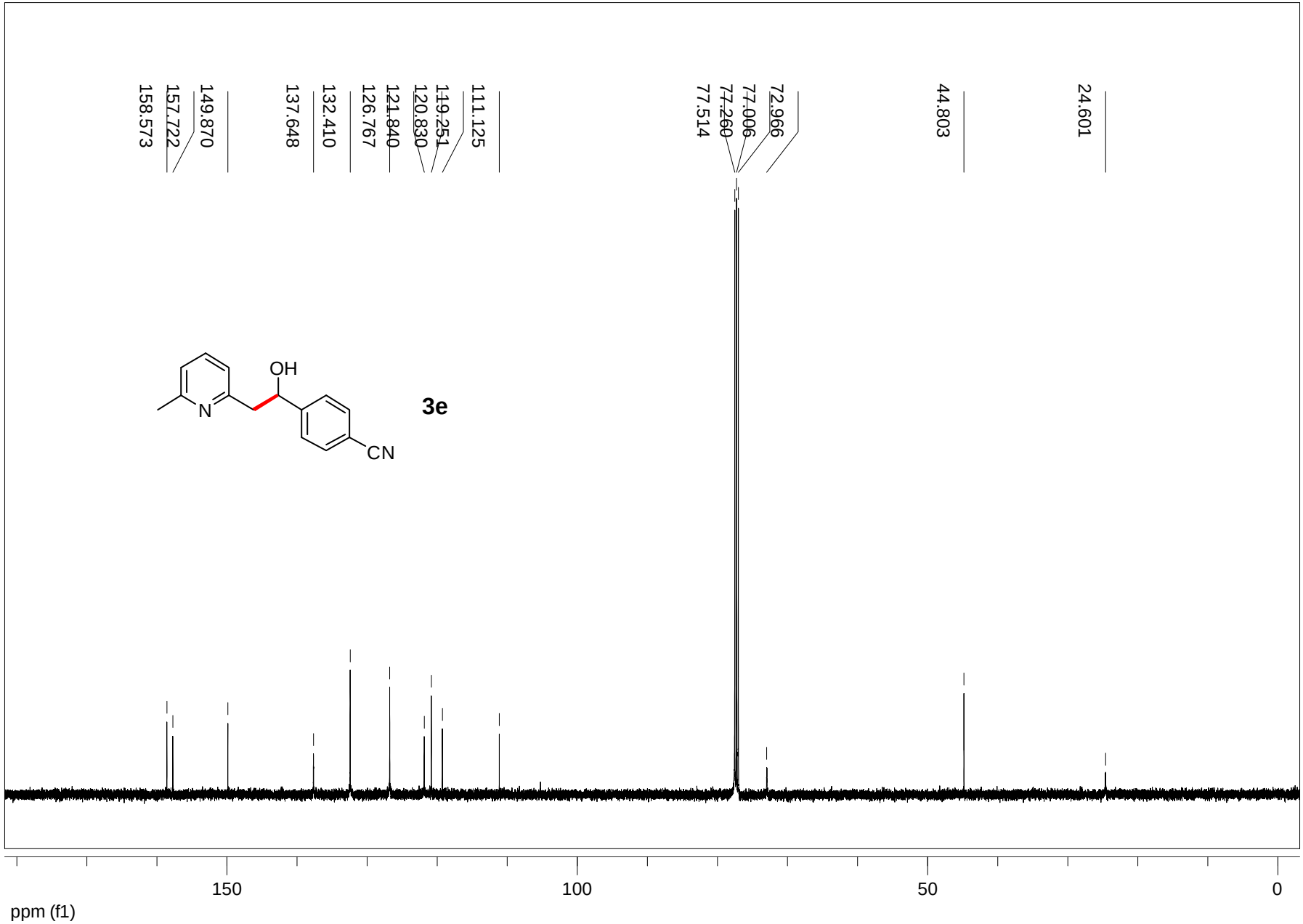

**3c**

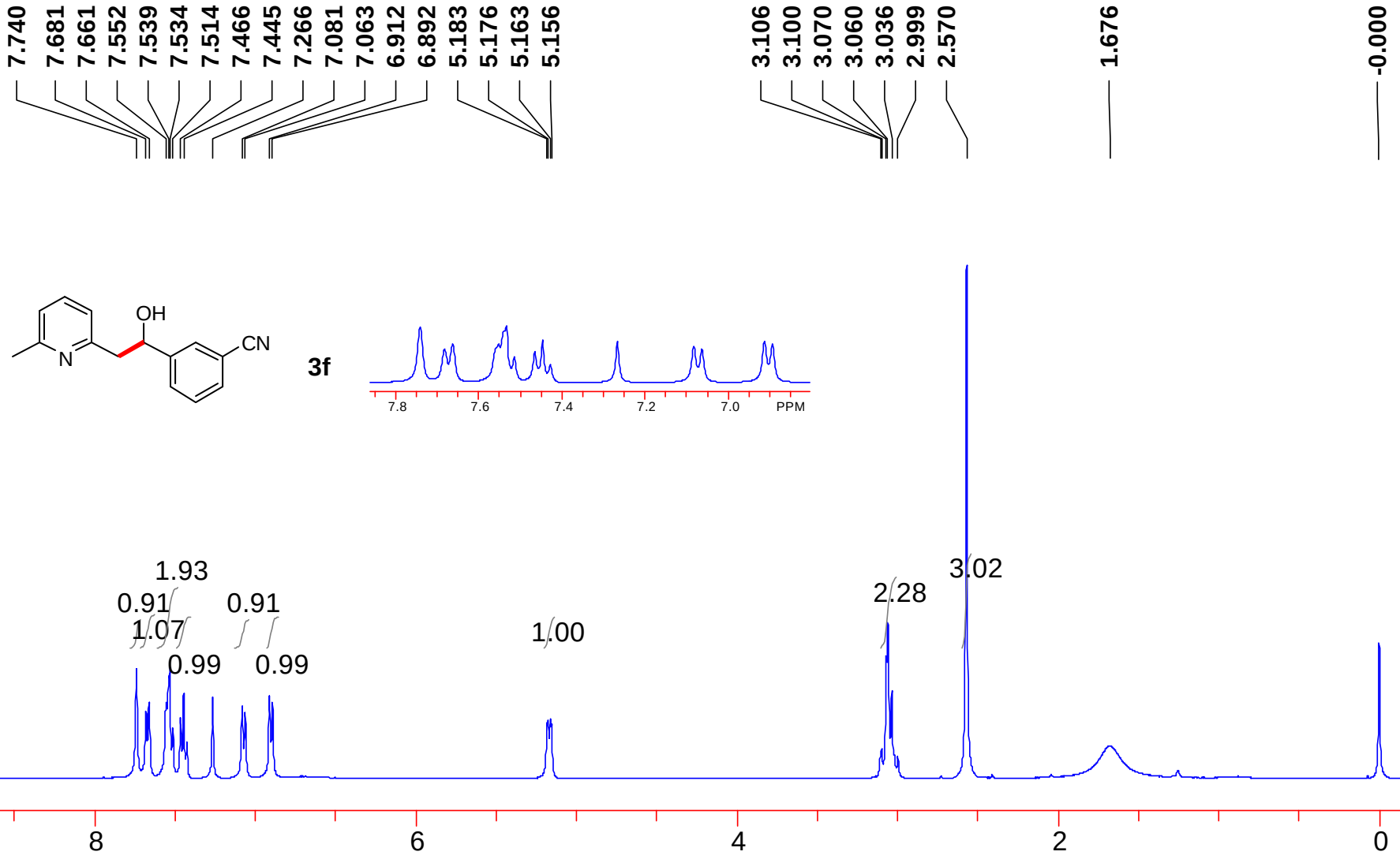


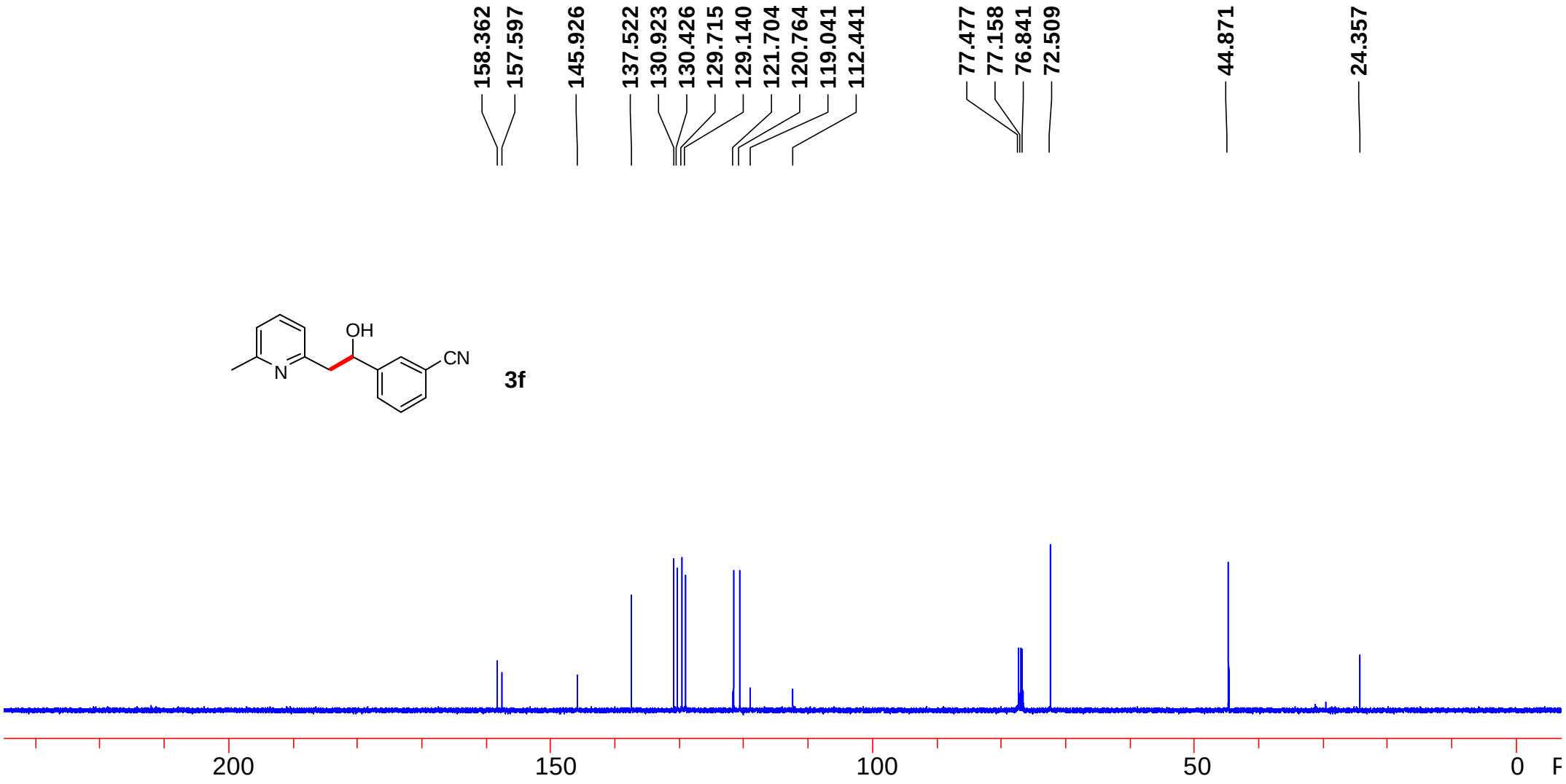


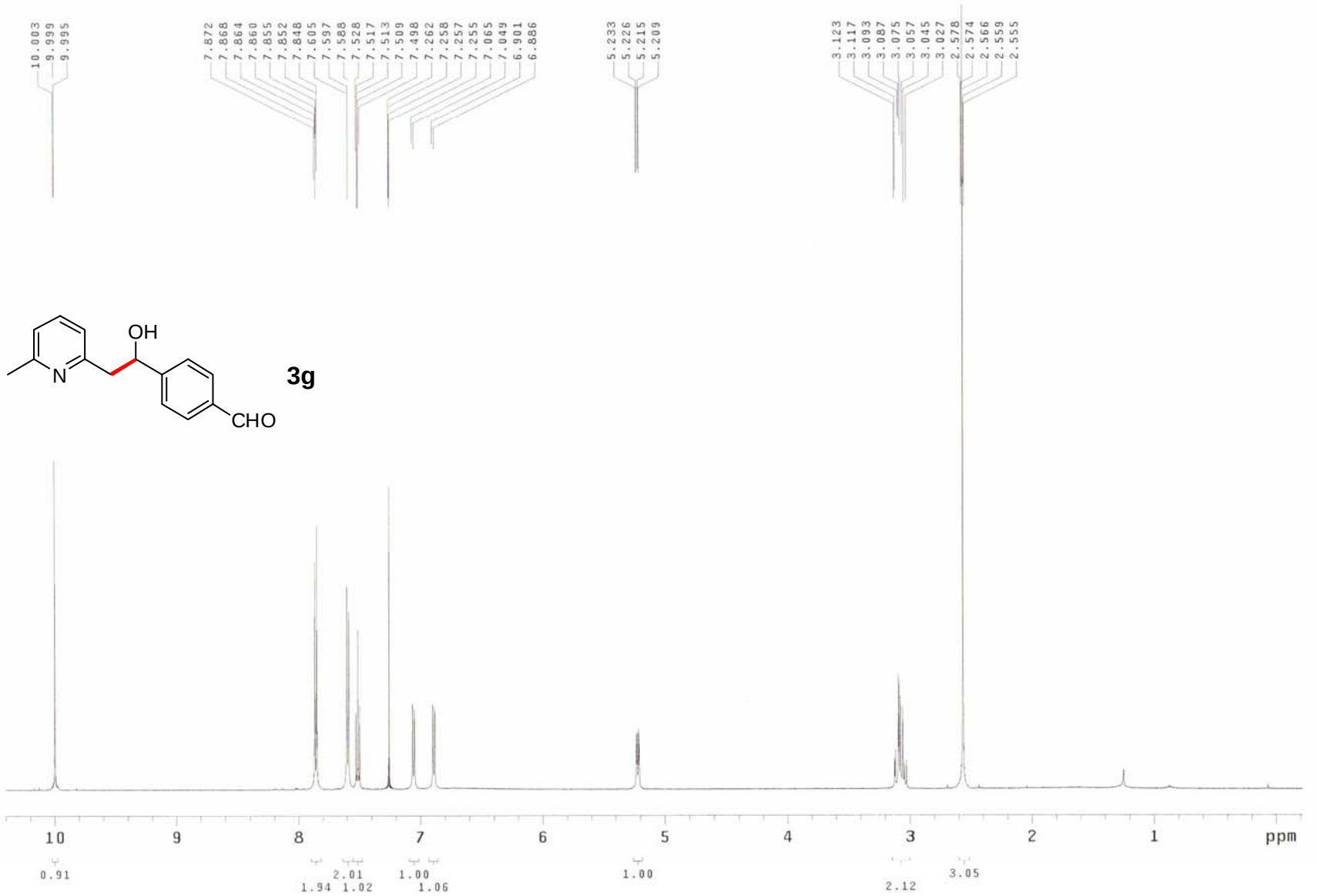


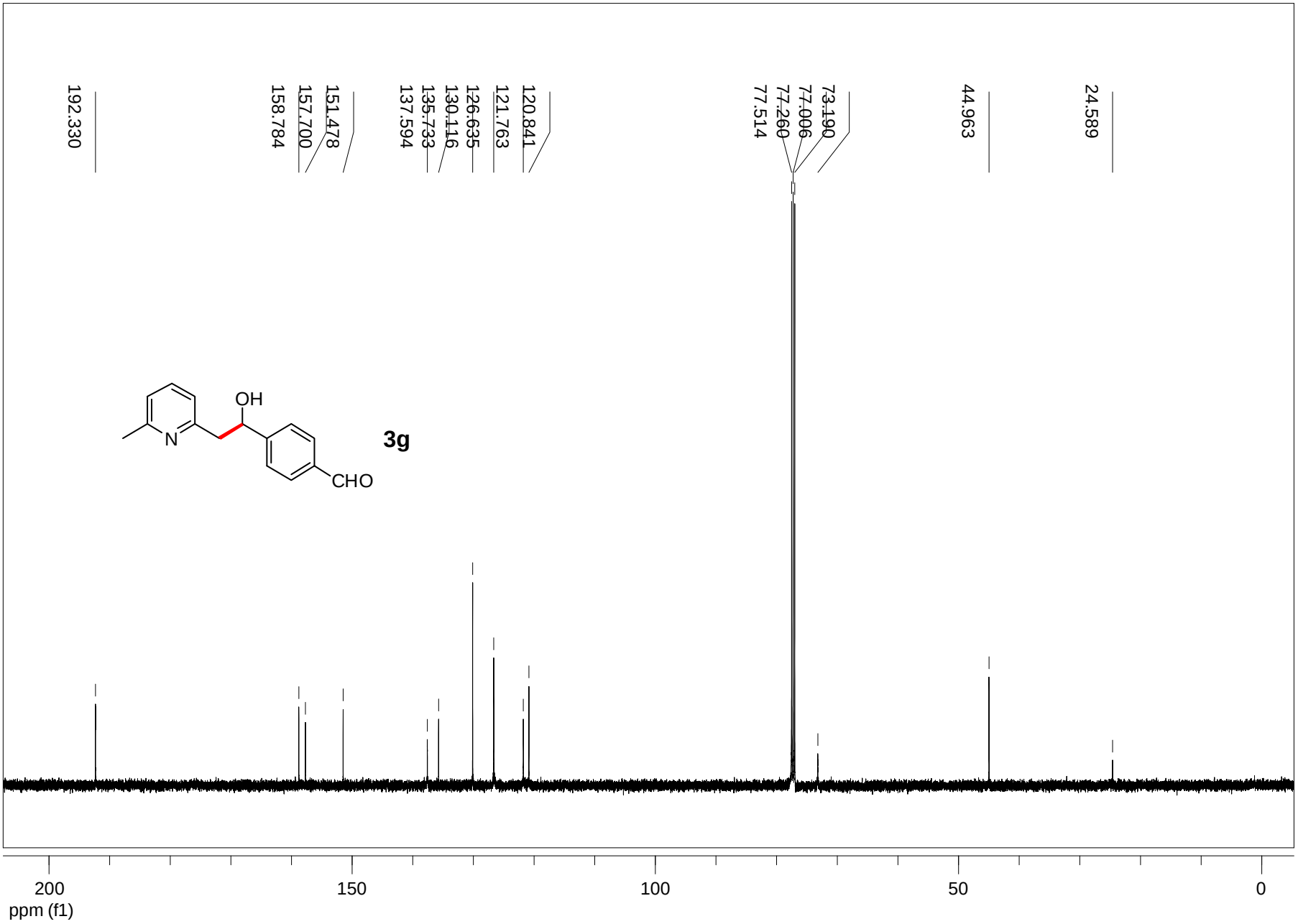


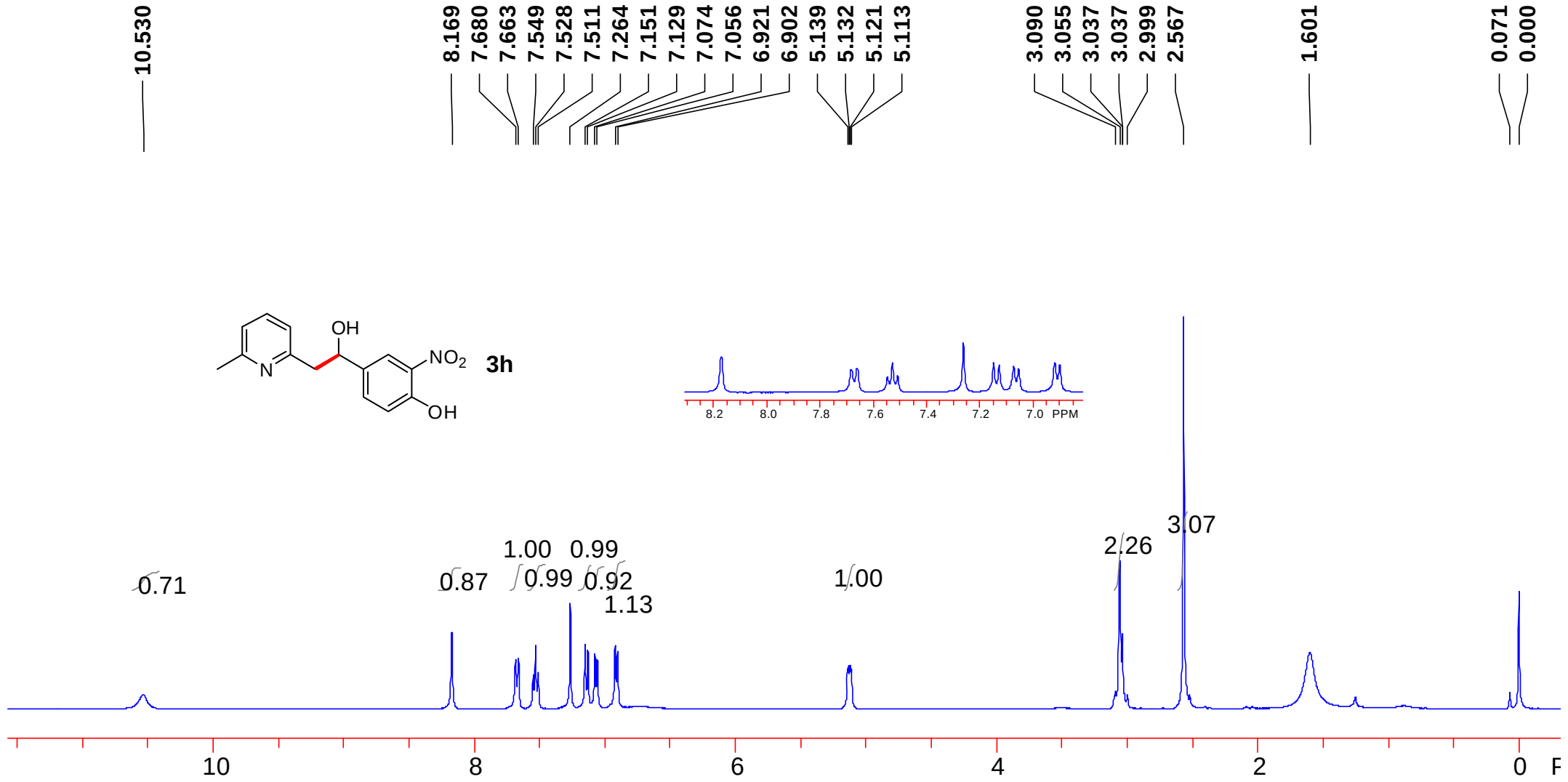


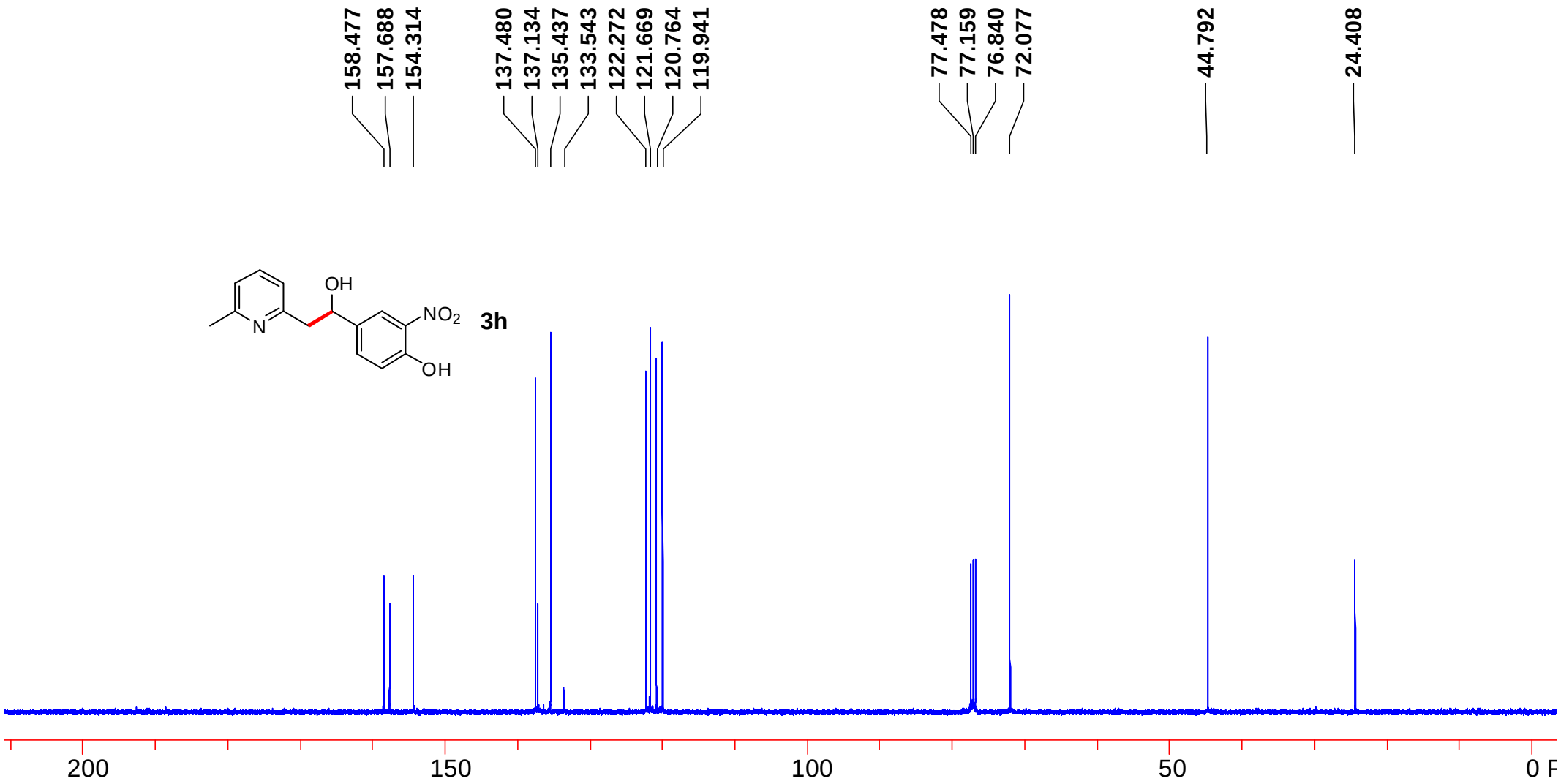


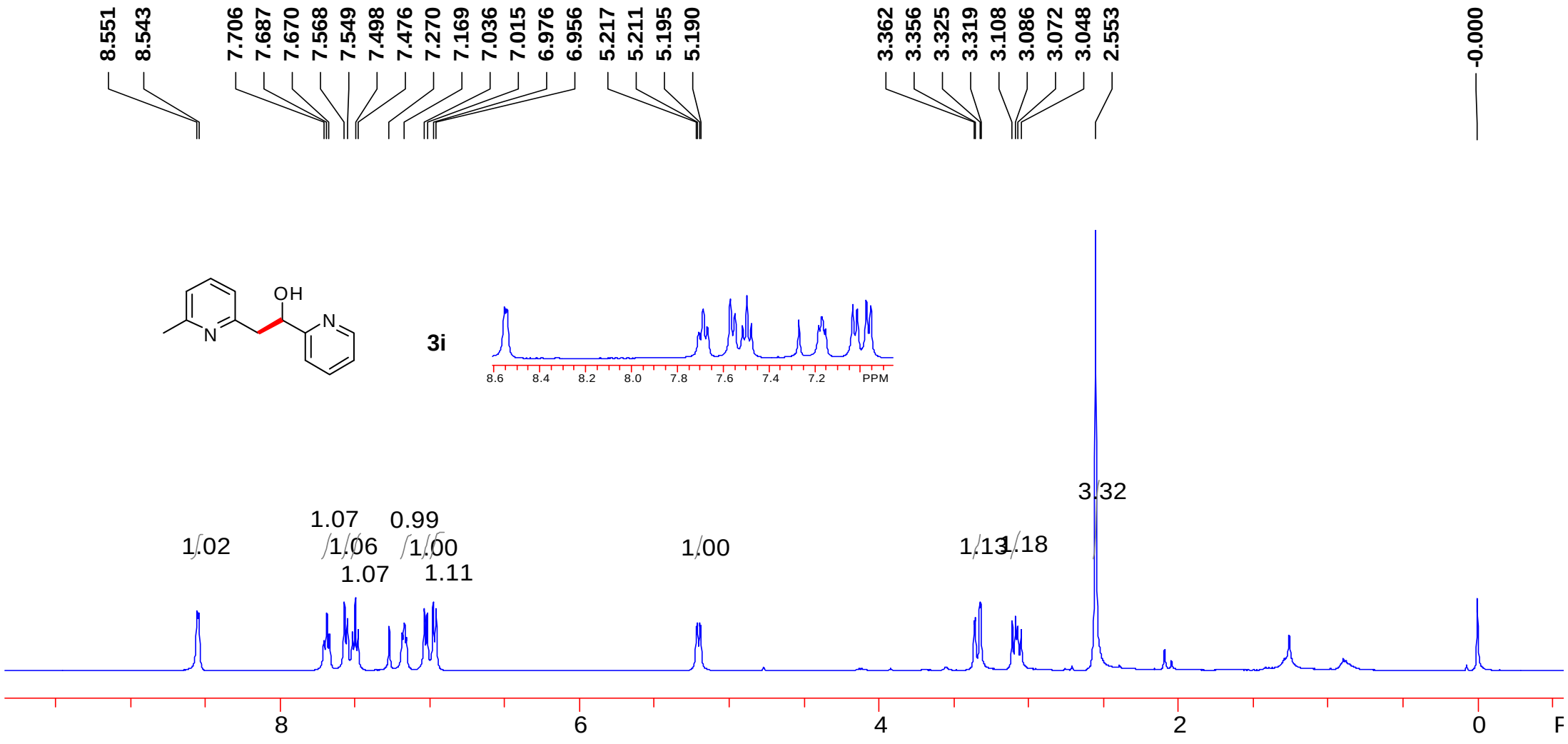


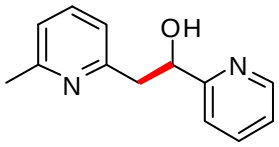




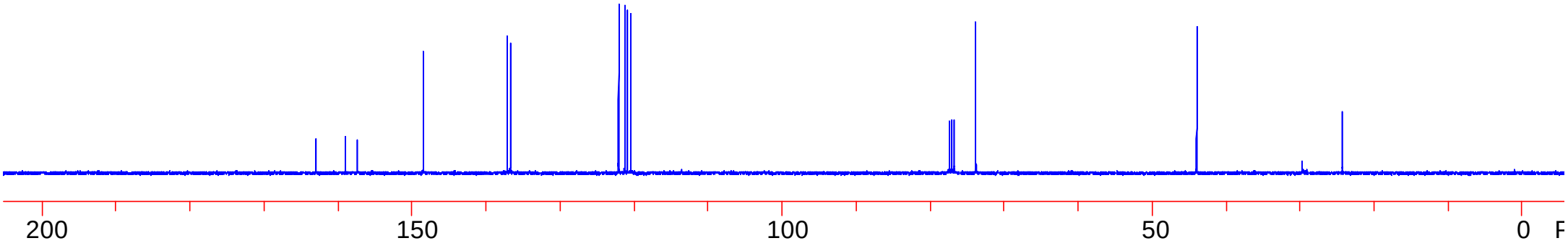


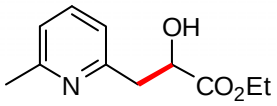




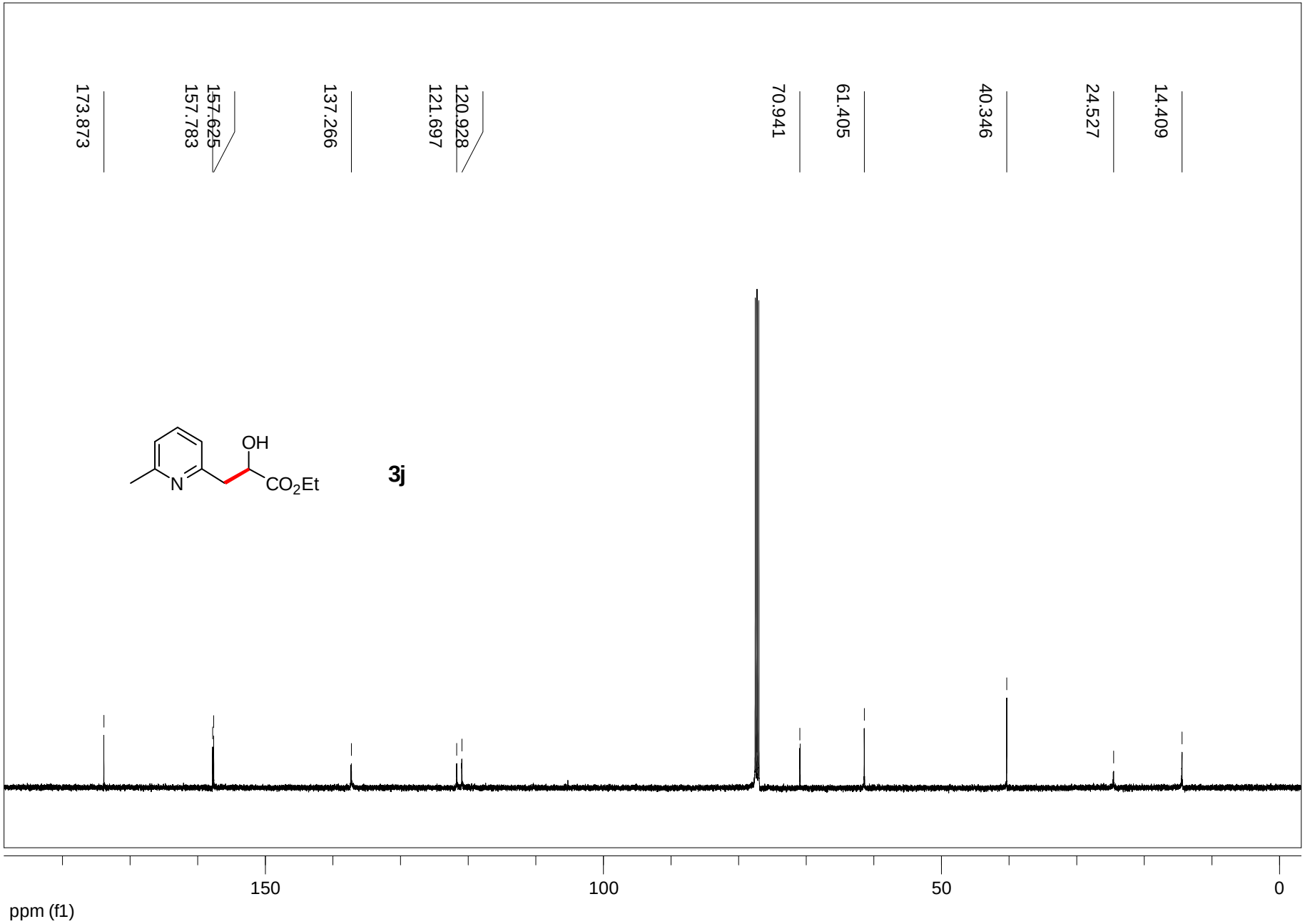



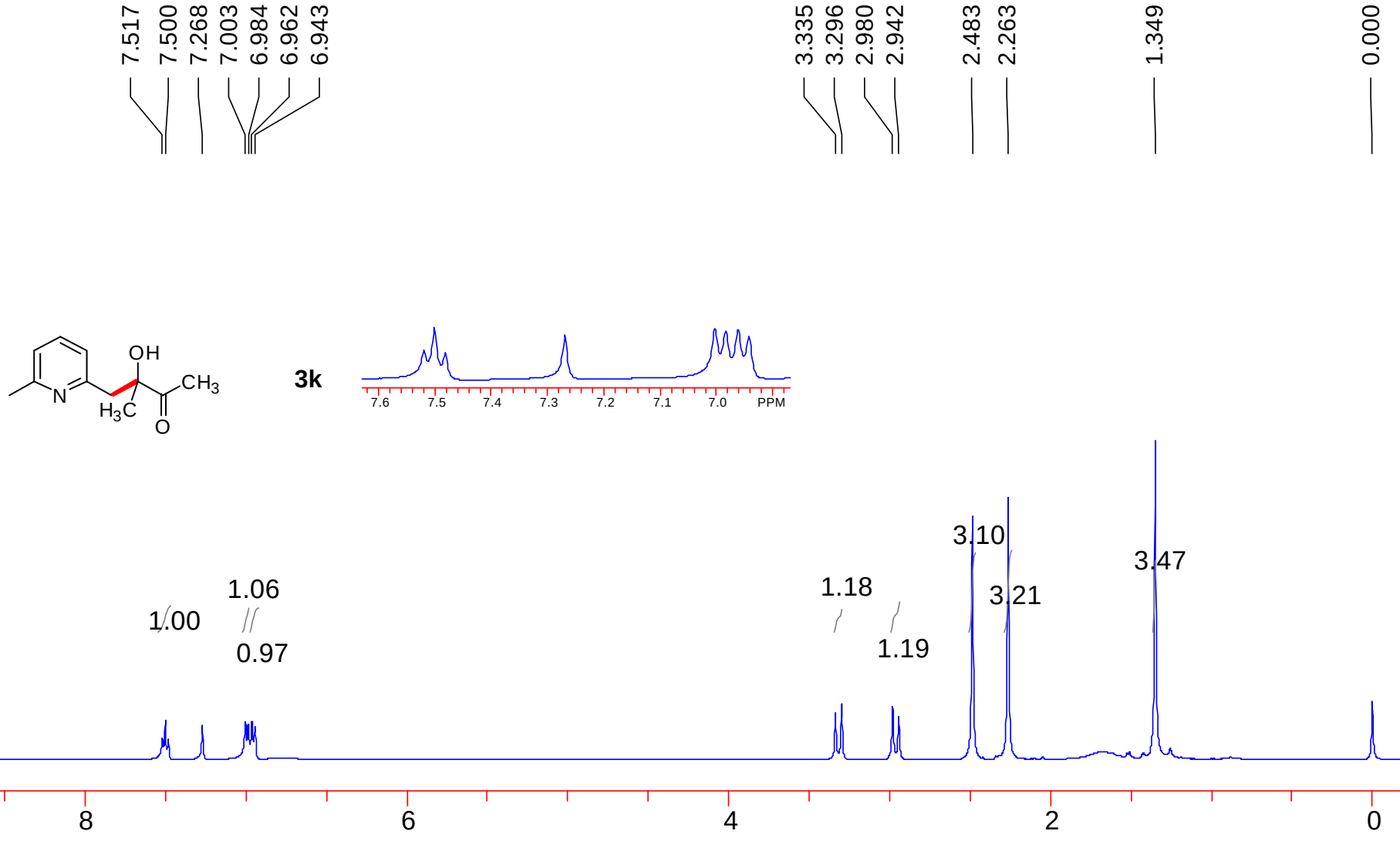

**3i**

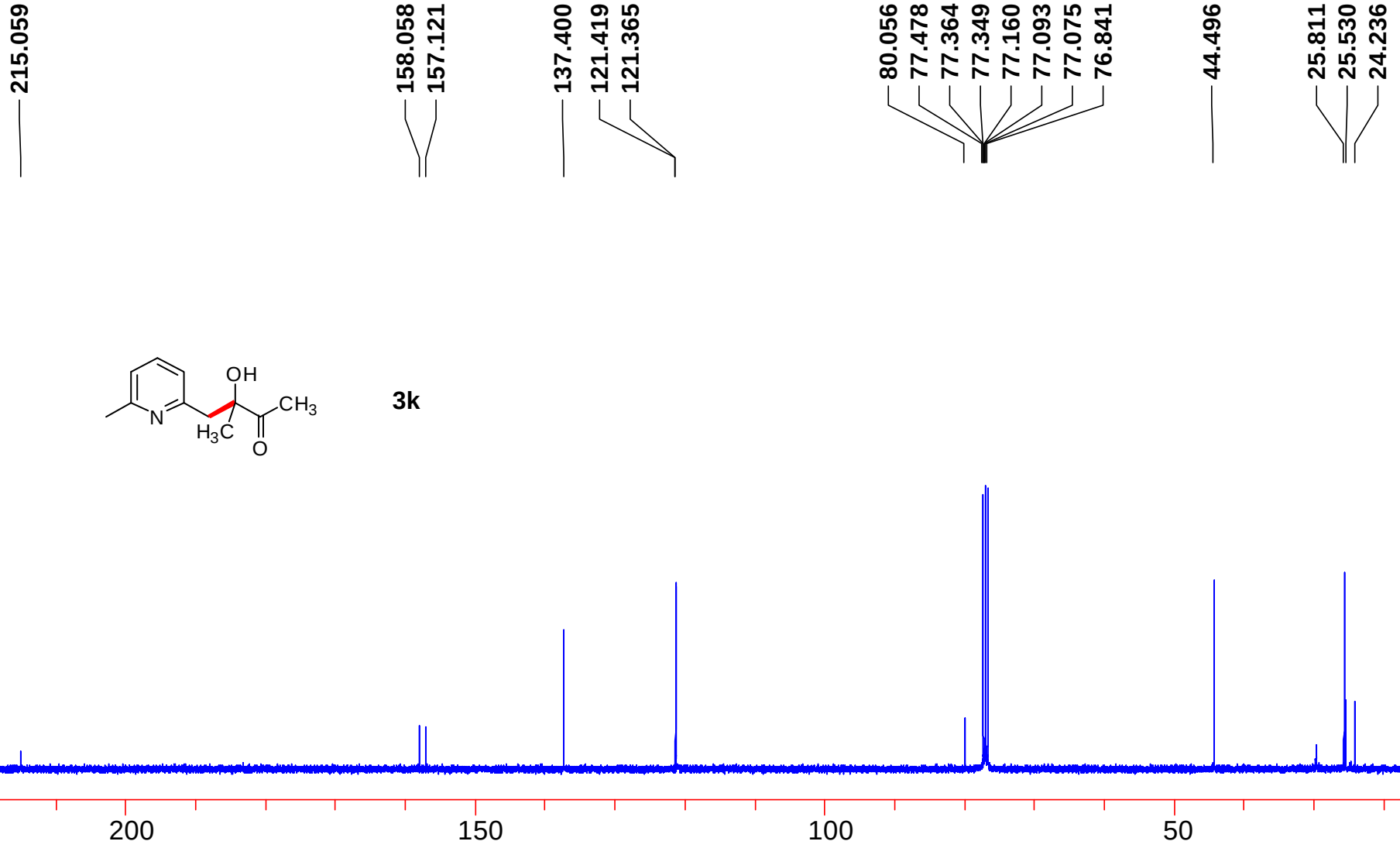


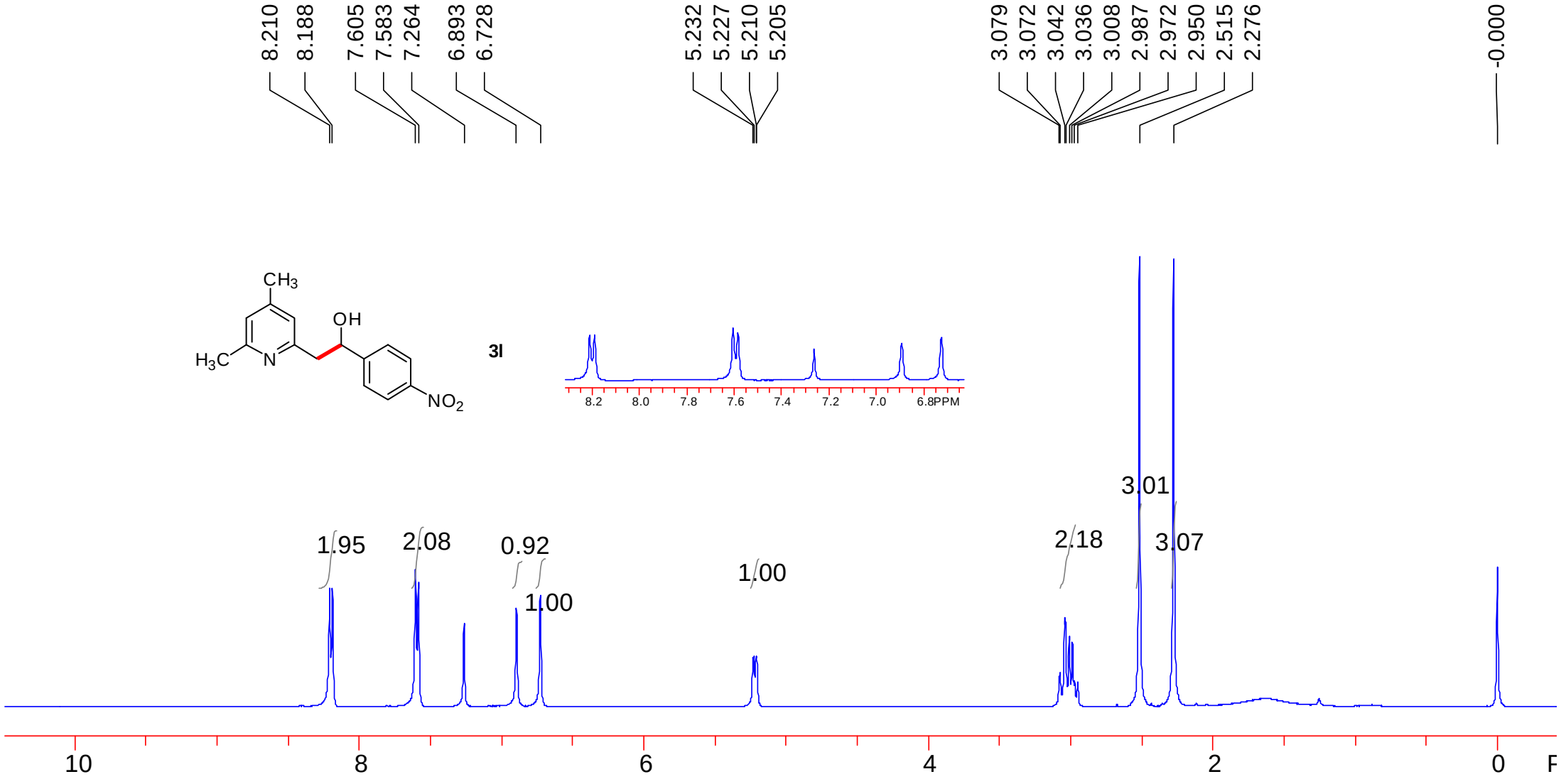


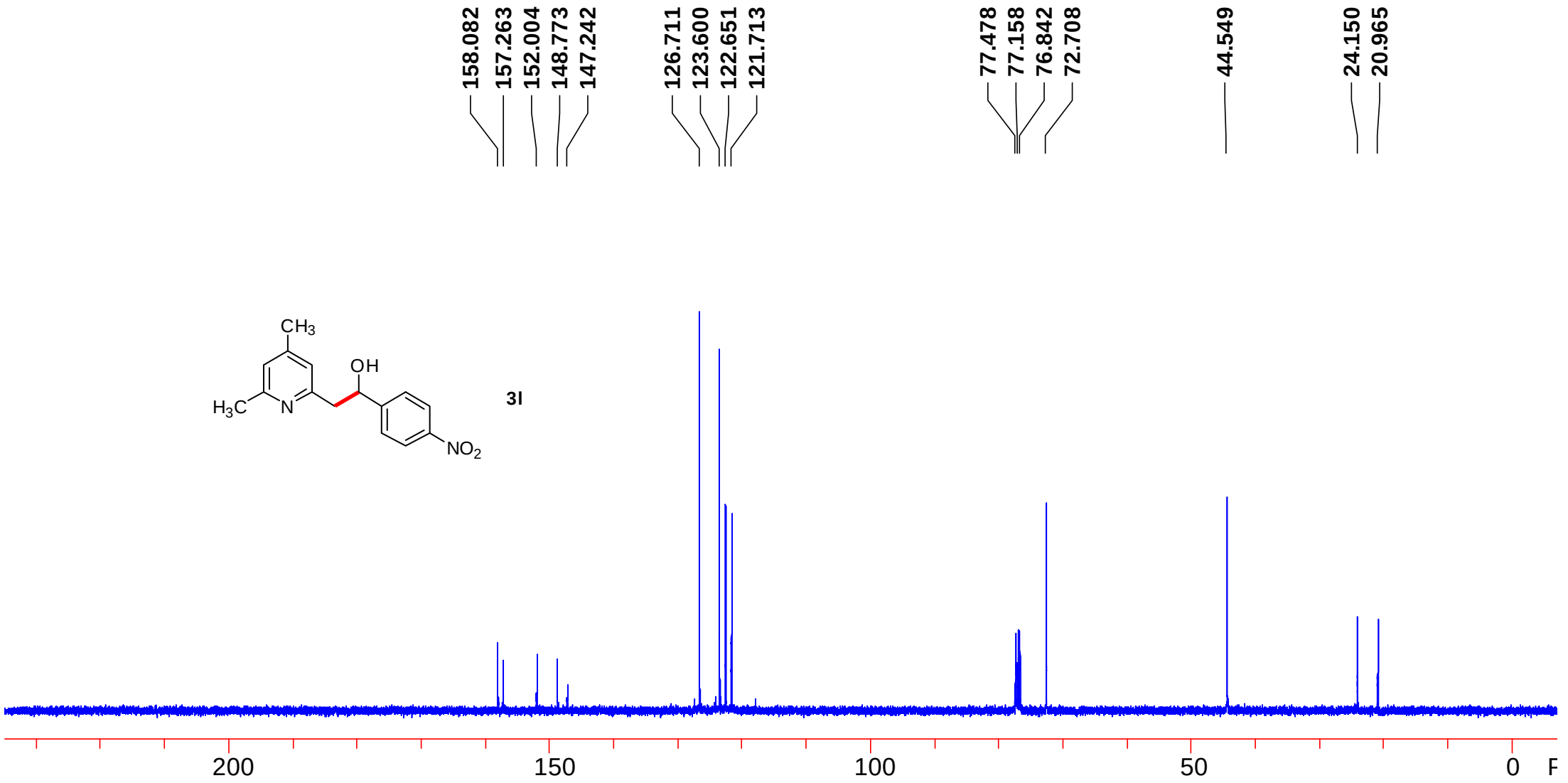

**3j**

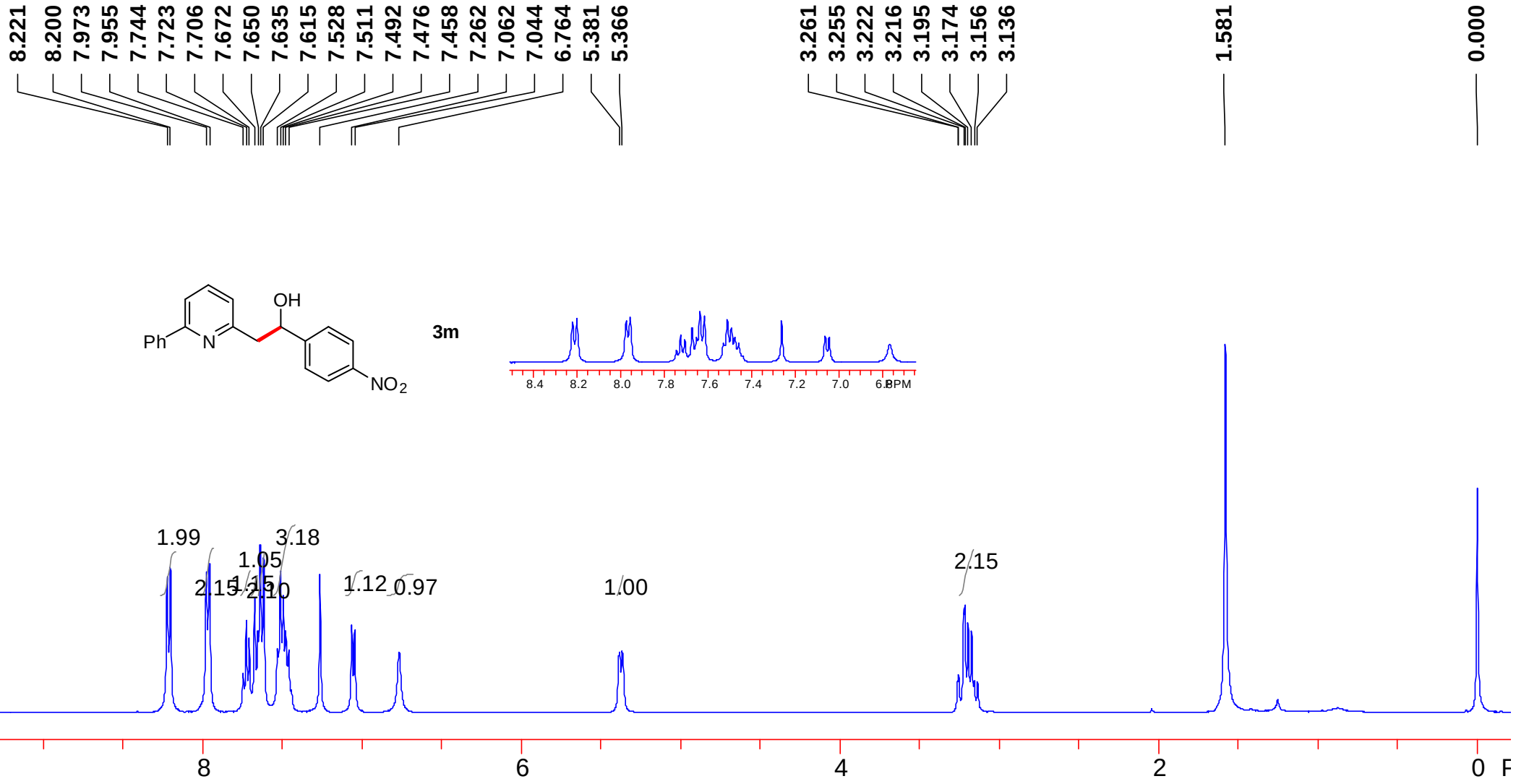


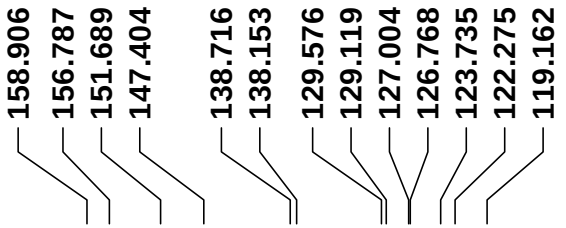


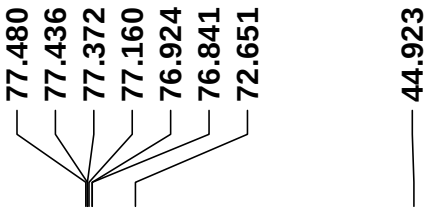






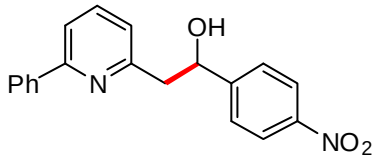




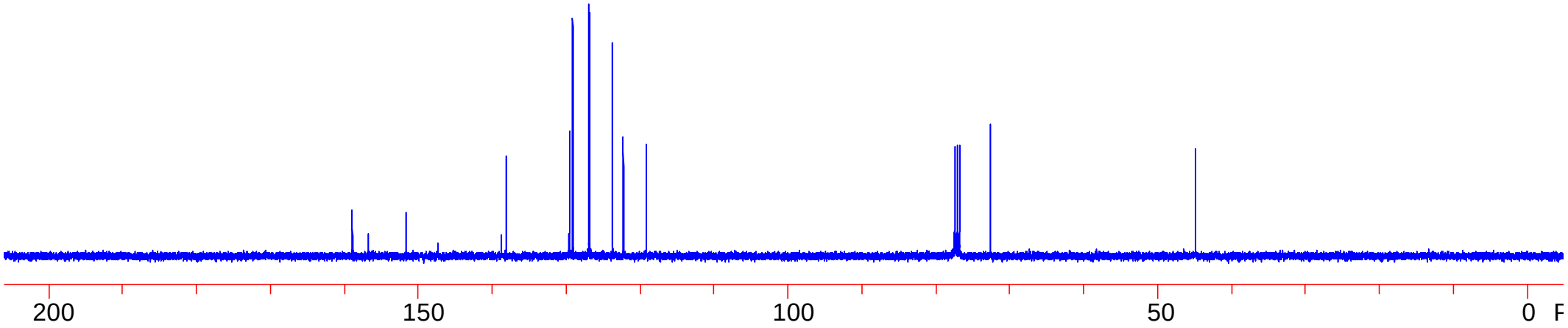



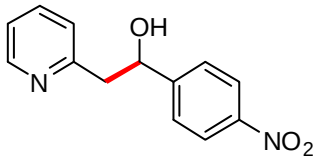




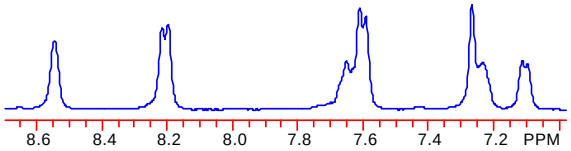


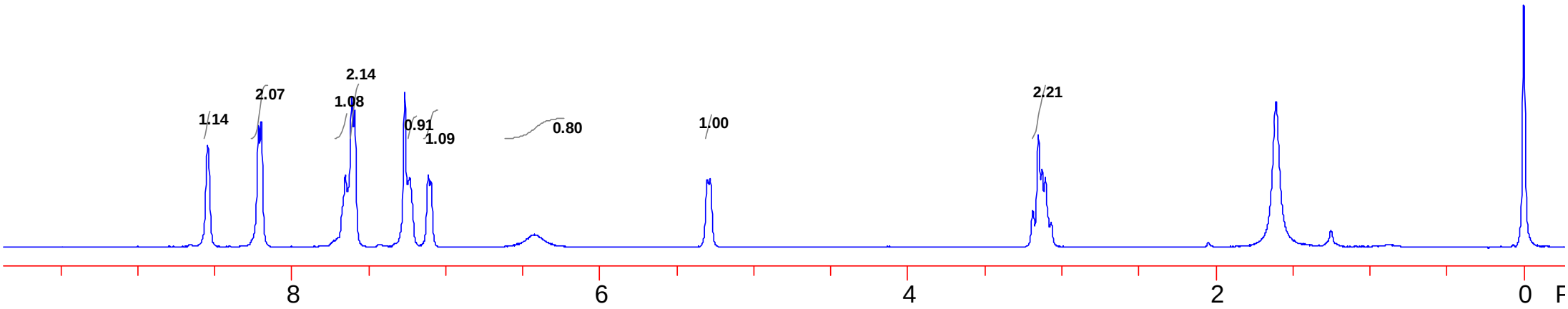

**3m**

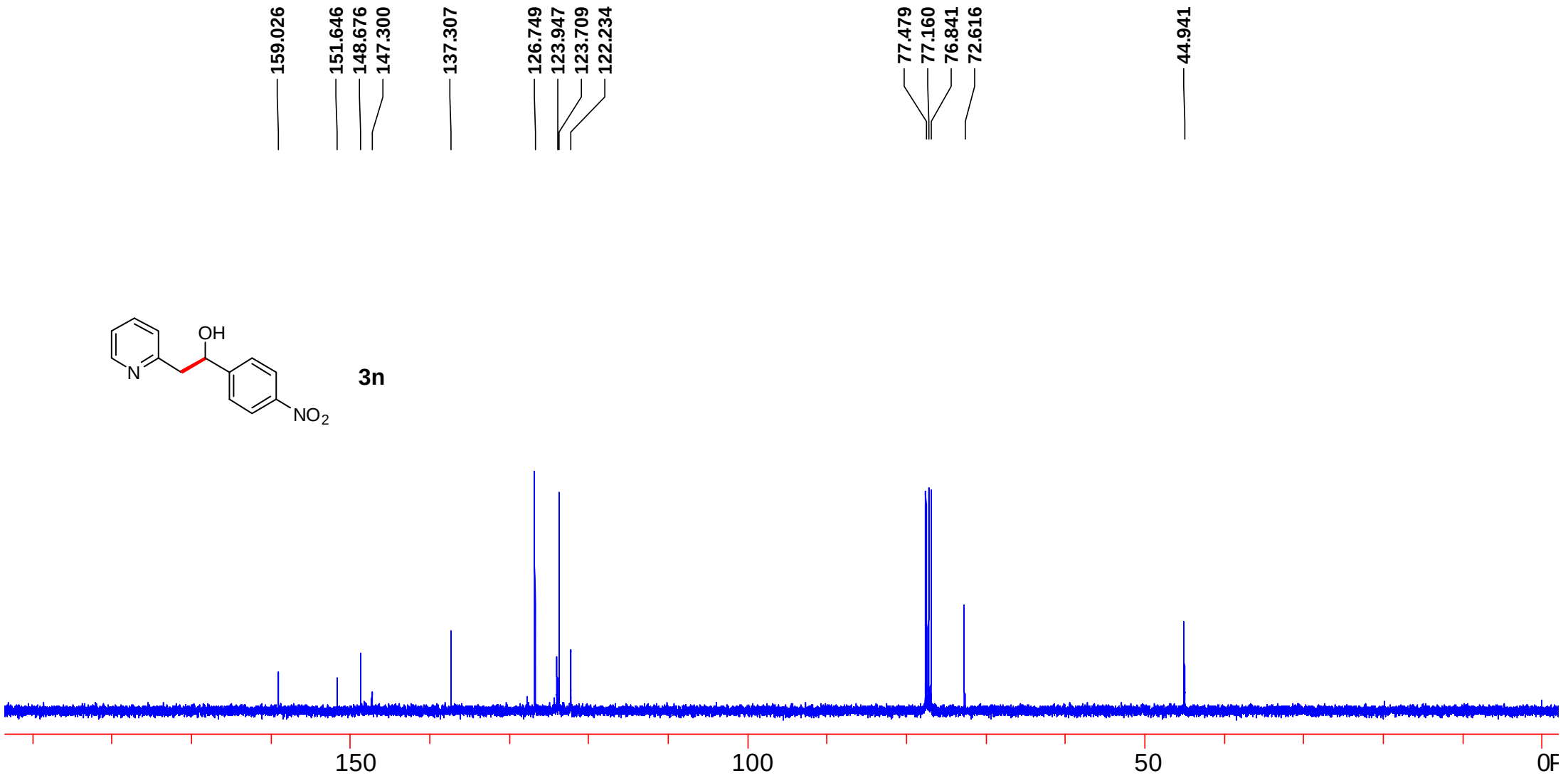


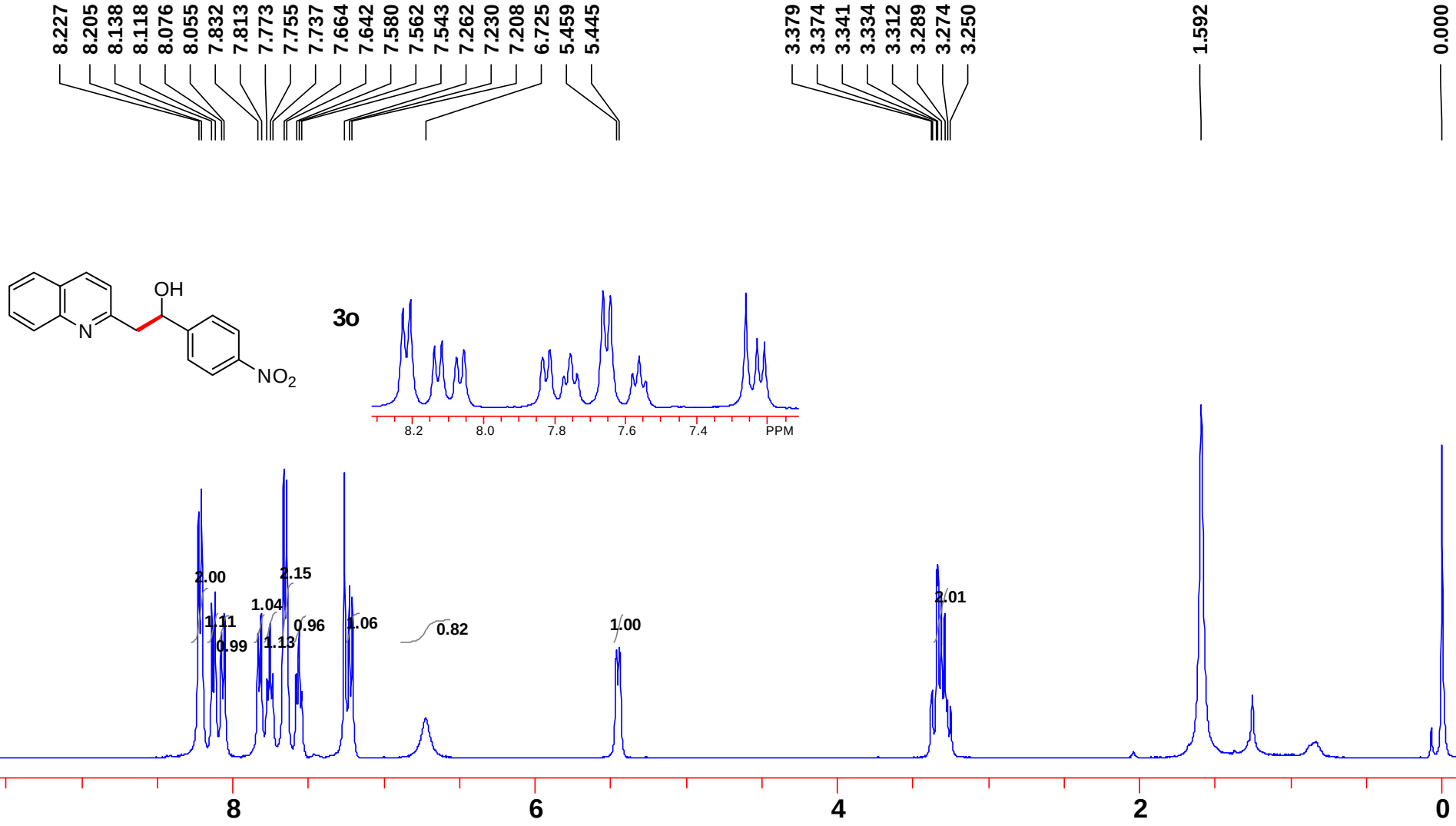



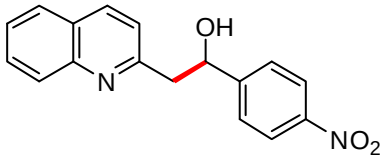

**3n**



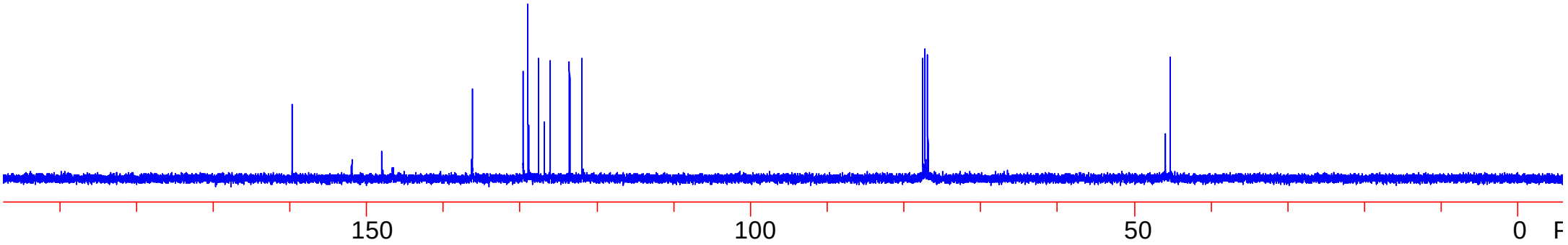



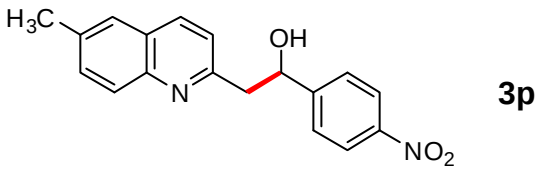




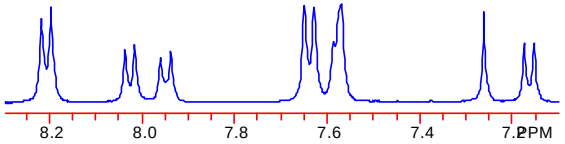



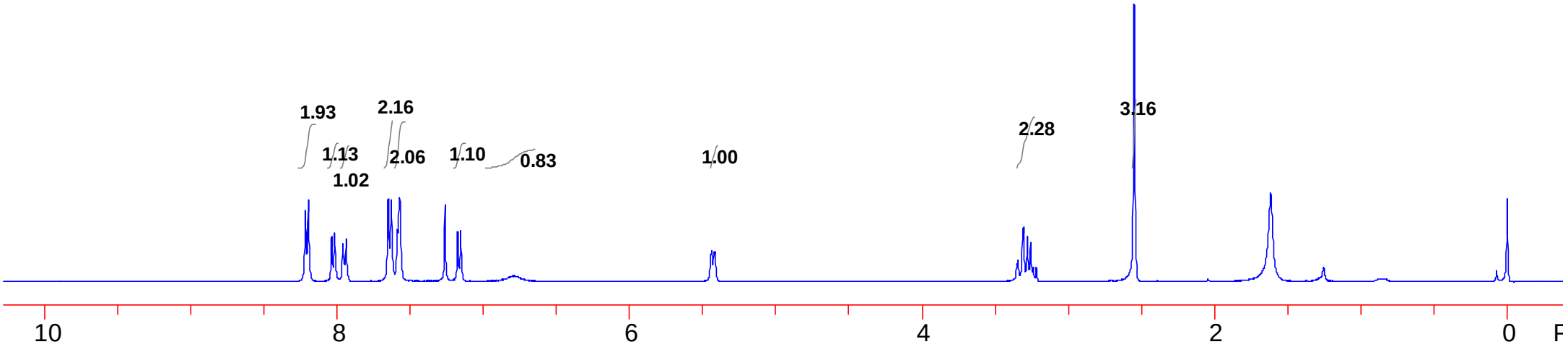

**3o**

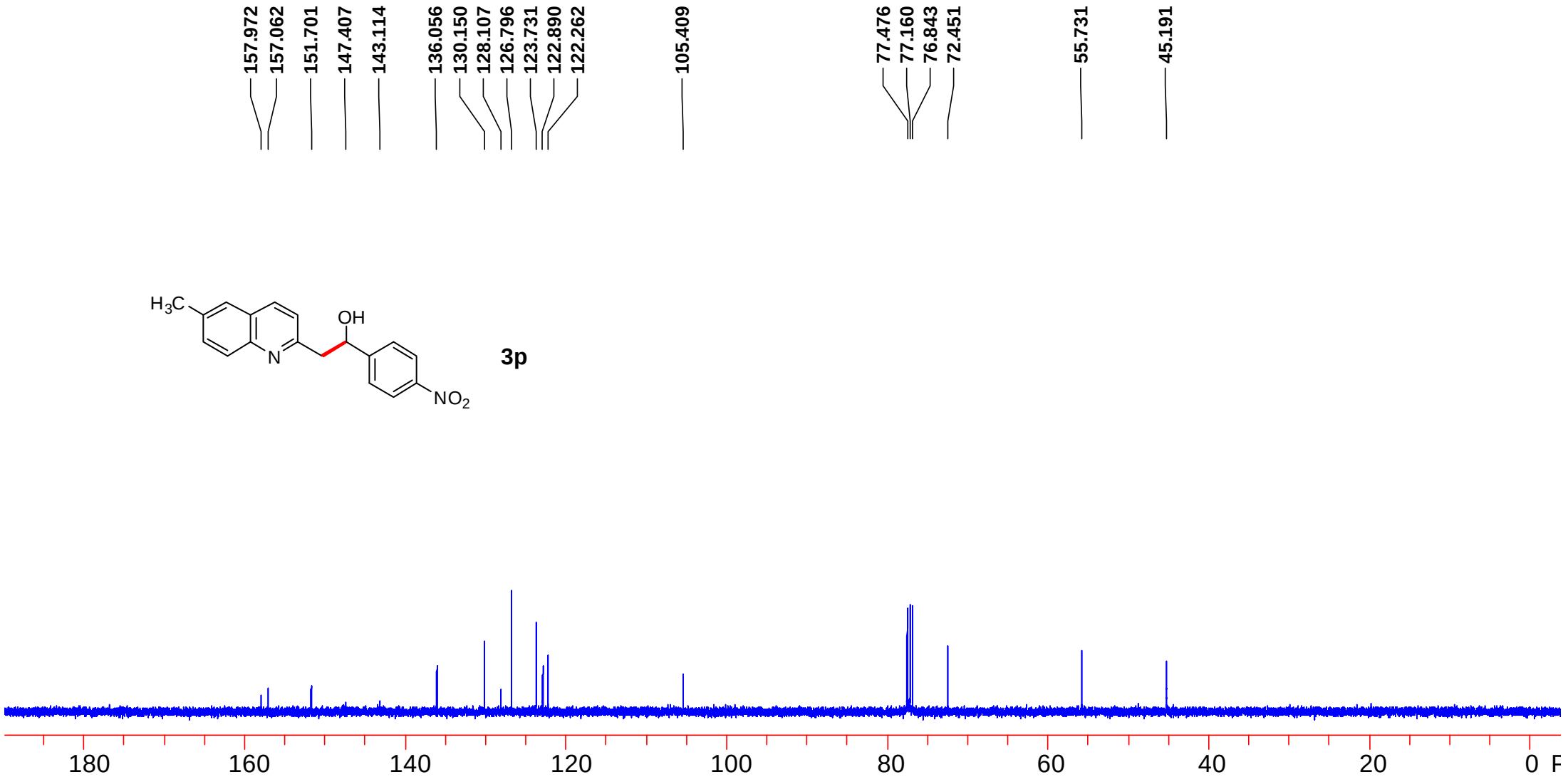


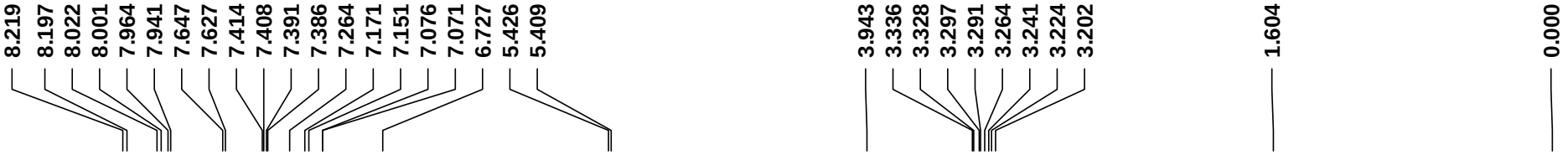



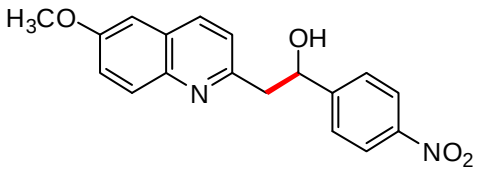

**3p**



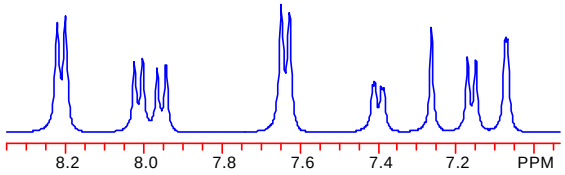



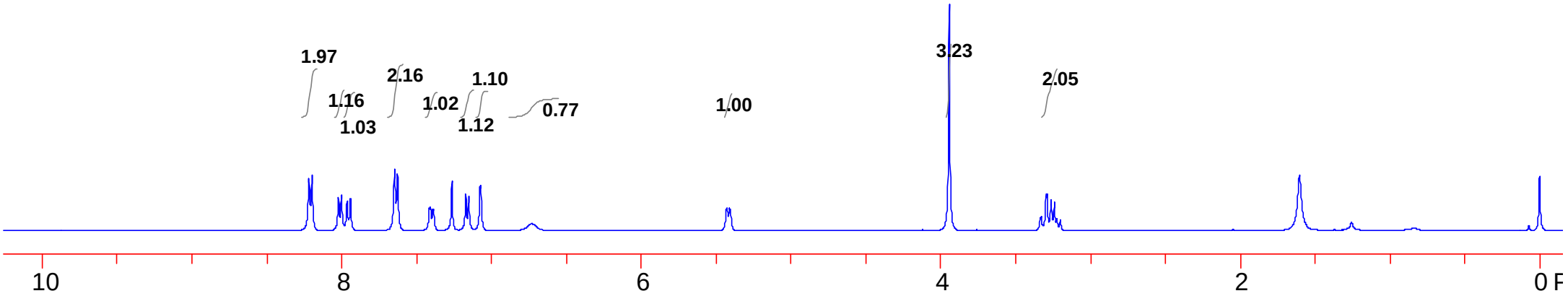


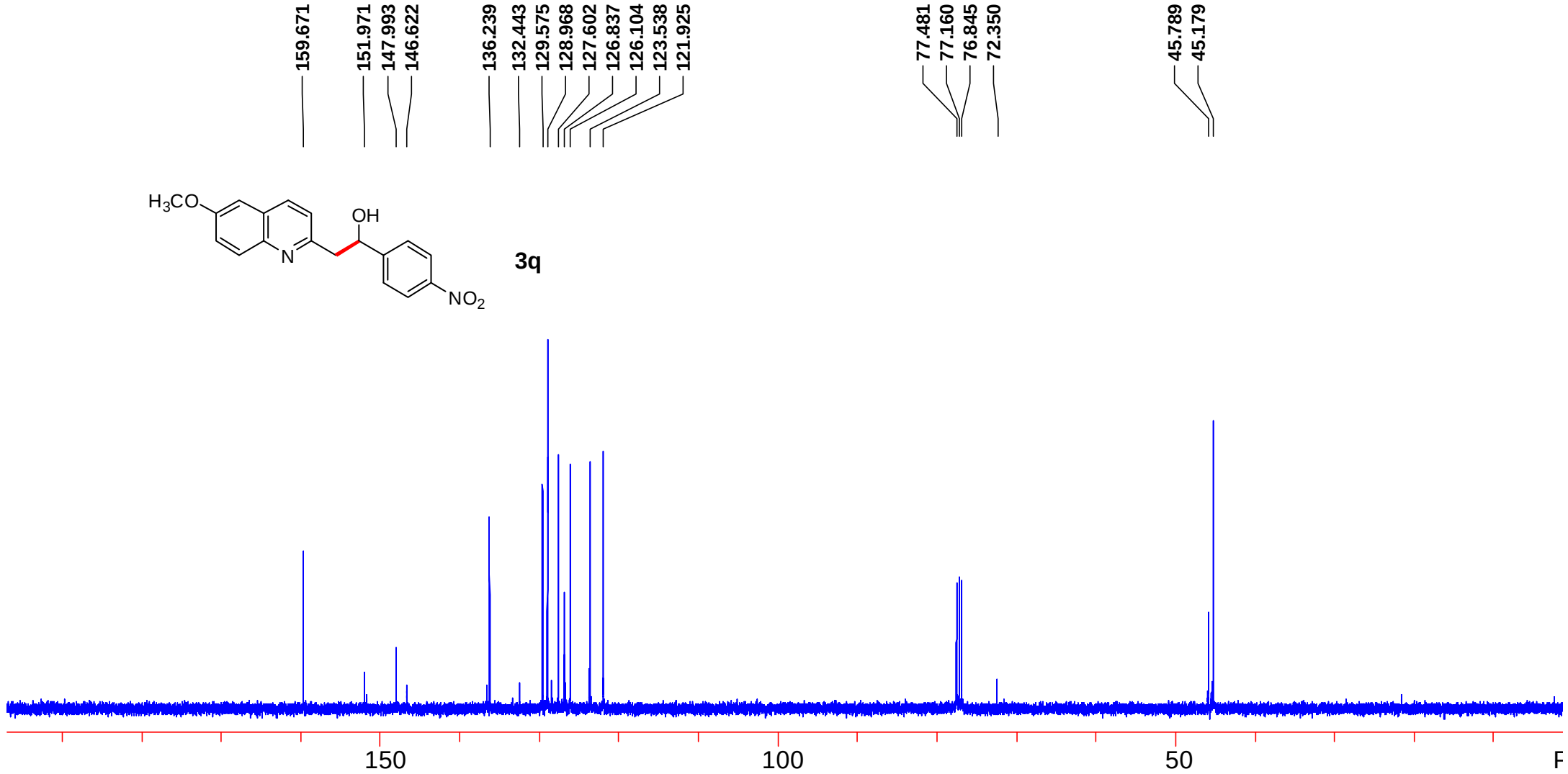


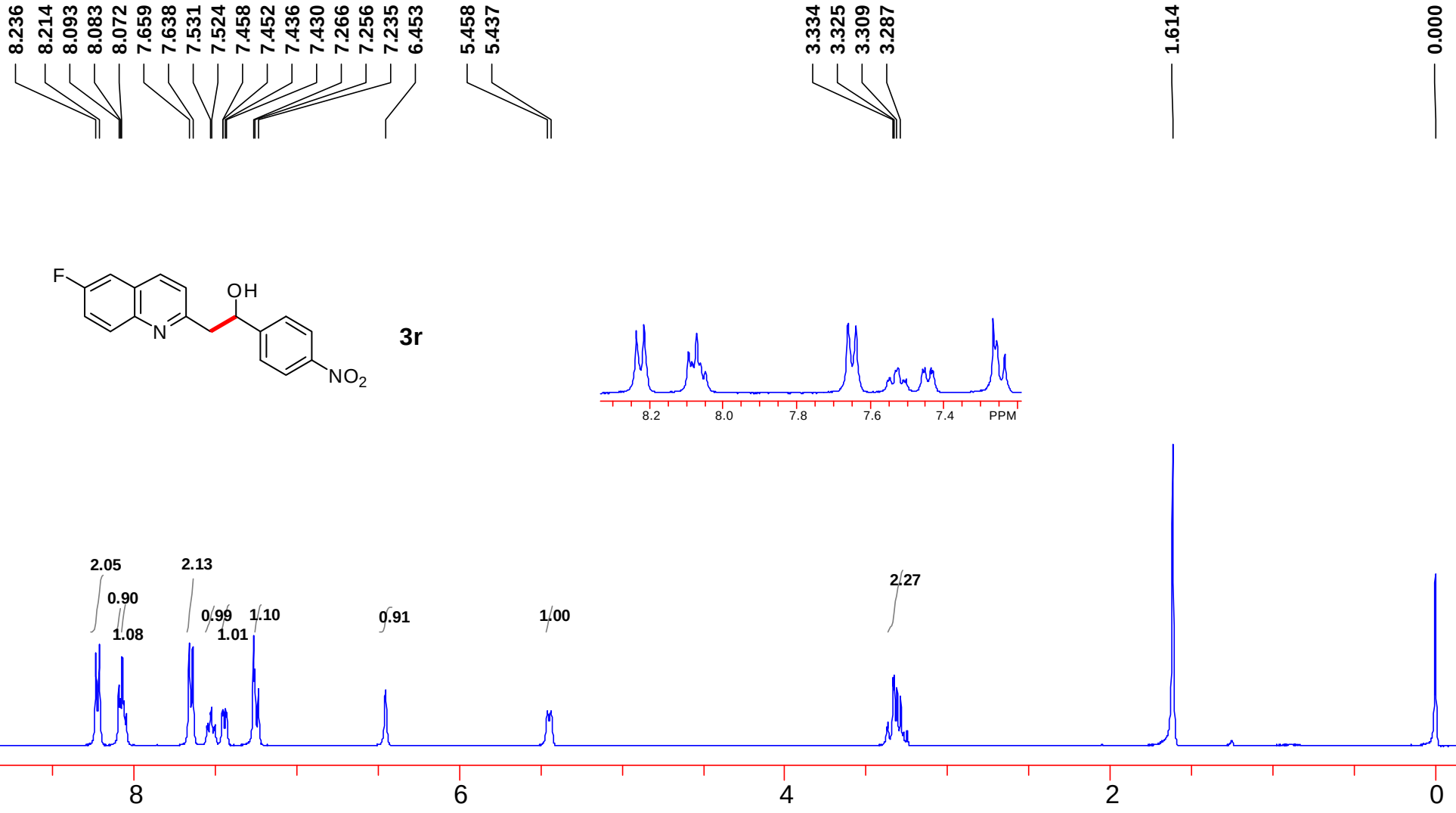



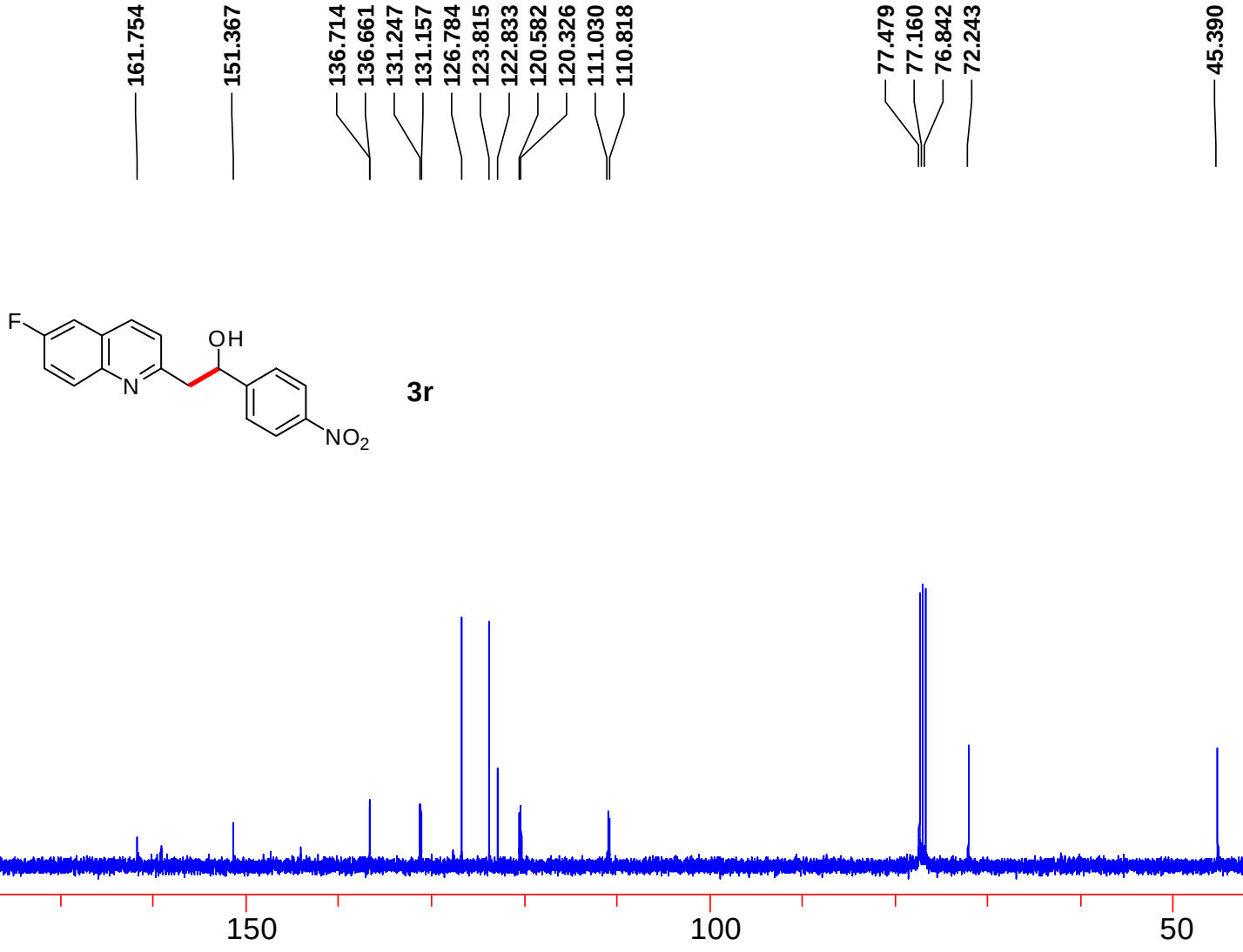

**3q**

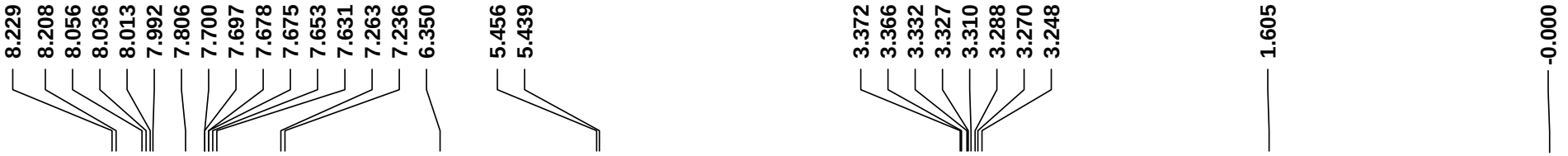


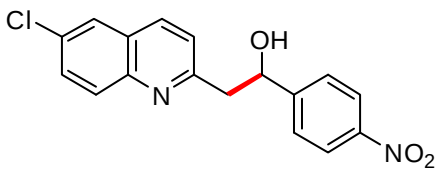





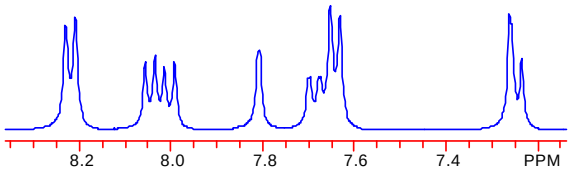


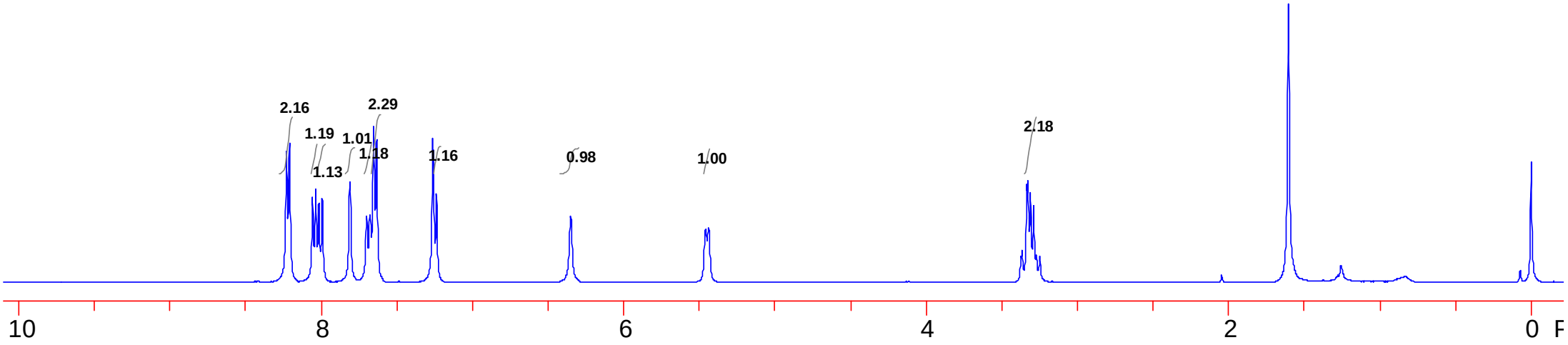


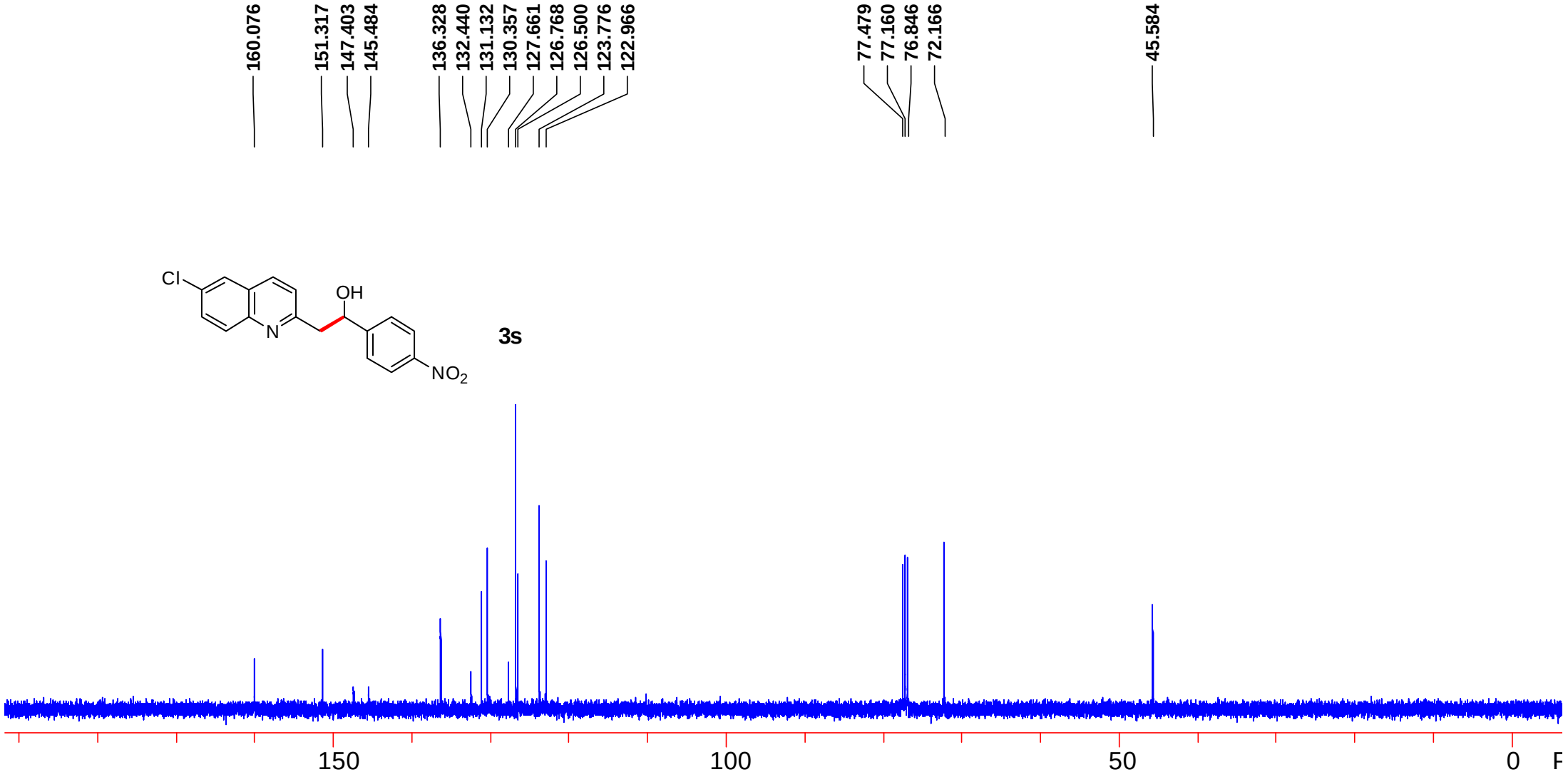


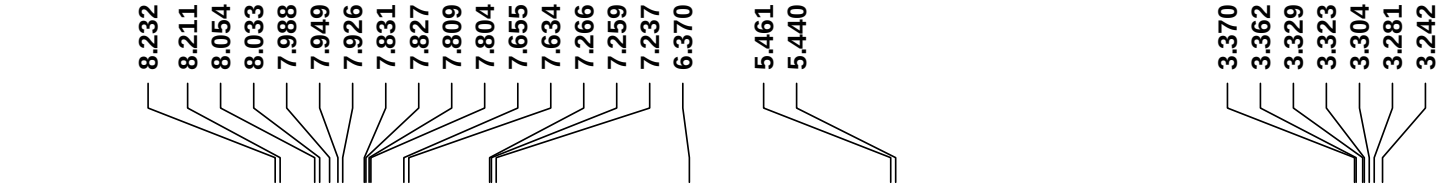



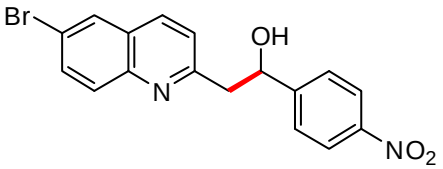

**3s**








**3t**