

## Supporting Materials to

# Palladium-Catalyzed Cross-coupling Reaction of Carboxylic Anhydrides with Organozinc Reagents

Donghui Wang and Zhaoguo Zhang \*

State Key Laboratory of Organometallic Chemistry, Shanghai Institute of Organic Chemistry, Shanghai 200032, China

<b>Experimental section</b> .....	S2-S3
<b>Analytical data for 3</b> .....	S4-S11
<b>References</b> .....	S11-S13

## Experimental Section

All reactions were carried out under argon atmosphere using standard Schlenk techniques. Solvents were purified by the standard methods.<sup>1</sup> Ph<sub>2</sub>Zn was commercially available from Acros. The carboxylic anhydrides were prepared according to literature procedure.<sup>2</sup> Pd(PPh<sub>3</sub>)<sub>4</sub> was prepared according to literature procedure.<sup>3</sup> <sup>1</sup>H NMR (300 MHz), <sup>13</sup>C NMR (75.4 MHz) and <sup>19</sup>F NMR (282 MHz) were registered with CDCl<sub>3</sub> as solvent and tetramethylsilane (TMS) as internal standard. Chemical shifts are reported in units (ppm) by assigning TMS resonance in the <sup>1</sup>H spectrum as 0.00 ppm and CDCl<sub>3</sub> resonance in the <sup>13</sup>C spectrum as 77.0 ppm. All coupling constants (*J* values) were reported in Hertz (Hz). Column chromatography was performed on silica gel 300-400 mesh. Gas chromatographic analysis (GC) was carried out on an Agilent-6890N equipped with capillary column (0.25 mm i.d.X30 m), using N<sub>2</sub> as carrier gas. Analytical thin-layer chromatography (TLC) was visualized with UV light (254 and 365 nm) or by iodine vapor staining. Electron impact (EI, 70 eV) was used as the ionization method for the mass spectrometry (percent values were given in parentheses). Mass data were reported in mass units (*m/z*).

**General Procedure For the Palladium-Catalyzed Reaction of Carboxylic Anhydrides and Organozinc Reagents (Table 1).** A typical procedure is as follows: To a THF solution (3 mL) containing benzoic anhydride (227 mg, 1.00 mmol) in a dry 25 mL Schlenk tube under argon, Ph<sub>2</sub>Zn (286 mg, 1.2 mmol, 92% purity) and Pd(PPh<sub>3</sub>)<sub>4</sub> (58 mg, 0.05 mmol) were added at room temperature. The reaction mixture was then heated in an oil bath (80°C) for 18 hours. The yield of benzophenone was determined by GC using dibenzyl ether as an internal standard and characterized by comparison with an authentic sample.

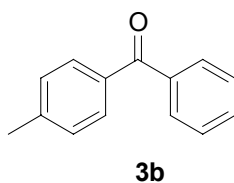
**Cross-Coupling Reaction of Carboxylic Anhydrides With Organozinc Reagents in the Presence of Pd(PPh<sub>3</sub>)<sub>4</sub> (Table 2).** A typical procedure is as follows: To the THF solution (3 mL) containing *p*-toluic anhydride (240 mg, 1.00 mmol) in a dry 25 mL Schlenk tube under argon, Ph<sub>2</sub>Zn (286 mg, 1.2 mmol, 92% purity) and Pd(PPh<sub>3</sub>)<sub>4</sub> (58 mg, 0.05 mmol) were added at room temperature. The system was then heated under argon in an oil bath (80°C) for 18 hours. After cooling the reaction mixture, diethyl ether (50 mL) and H<sub>2</sub>O (50 mL) were added and the aqueous layer was extracted with diethyl ether (50 mL).

mLX3). The combined ether solution was dried  $\text{Na}_2\text{SO}_4$ , filtered and then evaporated in vacuum. Purification of the residue by column chromatography gave the corresponding product **3b** (138 mg; yield 70%).

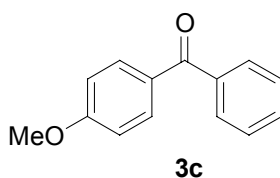
**Coupling of  $\text{Ph}_2\text{Zn}$  with Mixed Anhydride *in situ* (Table 3).** A typical procedure is as follows (entry 1): To a mixture of benzoic acid (122 mg, 1 mmol) and  $\text{Et}_3\text{N}$  (0.14 mL, 1 mmol) under argon in ice- salt bath, ethyl chloroformate (0.095 mL, 1 mmol) was added. Then the system was stirred at room temperature for 15 minutes. Finally,  $\text{Ph}_2\text{Zn}$  (286 mg, 1.2 mmol, 92% purity) and  $\text{Pd}(\text{PPh}_3)_4$  (58 mg, 0.05 mmol) were added and the reaction mixture was heated in an oil bath ( $80^\circ\text{C}$ ) for 16 hours. The yield of benzophenone was determined by GC using dibenzyl ether as an internal standard and characterized by comparison with an authentic sample.

**Synthesis of Ketones from Sodium Carboxylates and Organozinc Reagents.** A typical procedure is as follows: To a mixture of sodium benzoate (288 mg, 2 mmol) and ethyl chloroformate (0.57 mL, 6 mmol) in dry THF (5 mL) that had been stirred for 15 min at room temperature under argon,  $\text{Ph}_2\text{Zn}$  (572 mg, 2.4 mmol, 92% purity) and  $\text{Pd}(\text{PPh}_3)_4$  (116 mg, 0.10 mmol) were added. Then the system temperature was raised to  $70^\circ\text{C}$  and kept at this temperature for 14 hours. After cooling the reaction mixture, diethyl ether (50 mL) and  $\text{H}_2\text{O}$  (50 mL) were added and the aqueous layer was extracted with diethyl ether(50 mL X 3). The combined ether solution was dried ( $\text{Na}_2\text{SO}_4$ ), filtered and evaporated in vacuum. Purification of the residue by column chromatography gave the corresponding product **3a** (346 mg; yield 95%).

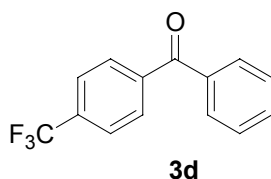
**Analytical data for 3b-3q**



4-Methylbenzophenone (**3b**)<sup>4</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.78 (d, *J* = 7.0 Hz, 2 H), 7.72 (d, *J* = 7.0 Hz, 2 H), 7.57 (t, *J* = 7.0 Hz, 1H), 7.47 (t, *J* = 7.0 Hz, 2H), 7.28 (d, 2H, *J* = 7.0 Hz), 2.44 (s, 3H); <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>): δ 196.5, 143.2, 137.9, 134.8, 132.2, 130.3, 129.9, 128.9, 128.2, 21.7; MS (EI) (%): 196 (M<sup>+</sup>, 43), 181(9), 165 (4), 152(4), 19(100), 105(32), 91(46), 77(43); IR: 1656, 1606, 1317, 1278, 836, 730, 700 cm<sup>-1</sup>.

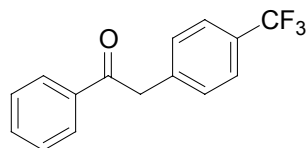


4-Methoxybenzophenone (**3c**)<sup>5</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.82 (m, 2H), 7.76-7.73(m, 2H), 7.55 (t, *J* = 7.0 Hz, 1H), 7.46 (t, *J* = 7.0 Hz, 2H), 6.95 (m, 2H), 3.87 (s, 3H); <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>): δ 197.2, 163.2, 138.3, 132.6, 131.9, 130.1, 129.7, 128.2, 113.5, 55.5; MS (EI): 212(M<sup>+</sup>, 436), 181 (3), 135 (100), 105 (10), 92 (12), 77 (28), 51 (6); IR (KBr) 1653, 1602, 1510, 1171, 1030, 846, 742, 702 cm<sup>-1</sup>.



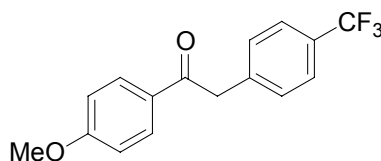
4-Trifluoromethylbenzophenone (**3d**)<sup>6</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.51 (d, *J* = 7.2 Hz, 2H), 7.63 (t, *J* = 7.2 Hz, 1H), 7.76 (d, *J* = 8.1 Hz, 2H), 7.81 (d, *J* = 8.1 Hz, 2H), 7.90 (d, *J* = 7.2 Hz, 2H); <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>): δ 195.5, 140.7 (q, *J* = 4.2 Hz), 136.7,

133.9, 133.5, 133.0, 130.0 (d,  $J = 10.4$  Hz), 128.5, 125.3 (q,  $J = 14.1$  Hz), 121.8;  $^{19}\text{F}$  NMR (282 MHz,  $\text{CDCl}_3$ ):  $\delta$  -63.4.



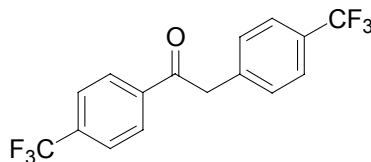
**3e**

4'-Trifluoromethyl-deoxybenzoin (**3e**):  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )<sup>7</sup>:  $\delta$  4.35 (s, 2H), 7.38 (d,  $J = 8.4$  Hz, 2H), 7.43-7.53 (m, 2H), 7.55-7.62 (m, 2H), 7.70-7.81 (m, 1H), 7.99-8.02 (m, 2H);  $^{13}\text{C}$  NMR (75 MHz,  $\text{CDCl}_3$ ):  $\delta$  196.7, 142.8, 138.5, 136.3, 135.3, 133.5, 139.1, 128.8, 128.5, 125.5 (q,  $J = 15.2$  Hz), 44.99;  $^{19}\text{F}$  NMR (282 MHz  $\text{CDCl}_3$ ):  $\delta$  -62.9;



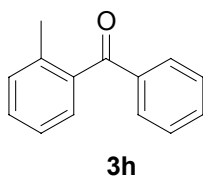
**3f**

1-(4-methoxy-phenyl)-2-(4-trifluoromethyl-phenyl)-ethanone (**3f**)<sup>8</sup>:  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ ):  $\delta$  3.87 (s, 3H), 4.30 (s, 2H), 6.95 (d,  $J = 9$  Hz, 2H), 7.38 (d,  $J = 8$  Hz, 2H), 7.58 (d,  $J = 8$  Hz, 2H), 7.99 (d,  $J = 9$  Hz, 2H);  $^{13}\text{C}$  NMR (75 MHz,  $\text{CDCl}_3$ ):  $\delta$  195.2, 163.8, 138.9 (q,  $J = 3.4$  Hz), 130.8, 129.9, 129.9, 129.3, 128.9, 125.5 (q,  $J = 13.8$  Hz), 113.9, 55.5, 44.8;  $^{19}\text{F}$  NMR (282 MHz,  $\text{CDCl}_3$ ):  $\delta$  -62.9;

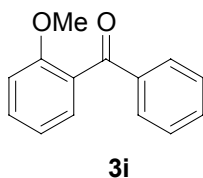


**3g**

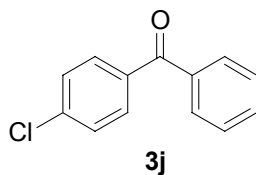
1,2-bis-(4-trifluoromethyl-phenyl)-ethanone (**3g**)<sup>9</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 4.38 (s, 2H), 7.38 (d, *J* = 8.0 Hz, 2H), 7.60 (d, *J* = 8.0 Hz, 2H), 7.75 (d, *J* = 8.0 Hz, 2H), 8.11 (d, *J* = 8.0 Hz, 2H); <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>): δ 196.6, 166.1, 158.5, 142.4, 138.9 (q, *J* = 4.0 Hz), 137.0 (q, *J* = 5.4 Hz), 129.9, 128.8, 125.9 (q, *J* = 14.1 Hz), 125.7 (q, *J* = 13.5 Hz), 122.3, 45.5; <sup>19</sup>F NMR (282 MHz, CDCl<sub>3</sub>): δ -63.02, -63.6.



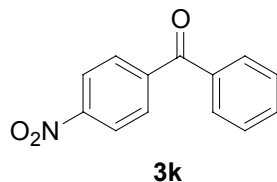
2-Methylbenzophenone (**3h**)<sup>10</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 2.33 (s, 3H), 7.20-7.32 (m, 3H), 7.35-7.46 (m, 3H), 7.53-7.58 (m, 1H), 7.78-7.81 (m, 2H); <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>): δ 198.5, 138.5, 137.6, 136.6, 133.0, 130.9, 130.1, 130.0, 128.4, 128.4, 125.1, 19.9; IR (KBr): 1666, 1598, 1449, 1315, 1268, 925, 732, 709 cm<sup>-1</sup>; MS (EI): 196(M<sup>+</sup>, 67), 195 (100), 178 (11), 119 (29), 105 (21), 91 (33), 77(33), 51 (13).



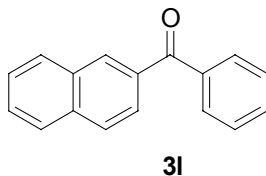
2-Methoxybenzophenone (**3i**)<sup>11</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 3.72 (s, 3H), 6.98-7.07 (m, 2H), 7.35-7.50 (m, 4H), 7.52-7.58 (m, 1H), 7.79-7.84 (m, 2H); <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>): δ 55.5, 111.4, 120.4, 128.2, 128.7, 129.5, 129.8, 131.8, 132.9, 137.7, 157.3, 196.5; MS (EI): 213 (M+1<sup>+</sup>, 15.61), 212 (M<sup>+</sup>, 35), 195 (20), 135 (80), 121 (22), 105 (39), 77 (100), 51 (46); IR (KBr): 1666, 1599, 1488, 1245, 1024, 926, 755, 703 cm<sup>-1</sup>.



4-Chlorobenzophenone (**3j**)<sup>12</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.78-7.73 (m, 4H), 7.67-7.57 (m, 1H), 7.51-7.44 (m, 4H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>): δ 195.5, 138.8, 137.2, 135.8, 132.6, 131.4, 129.9, 128.6, 128.4; MS (EI): 218 (M<sup>+</sup>, <sup>37</sup>Cl, 8), 216 (M<sup>+</sup>, <sup>35</sup>Cl, 24), 181 (10), 139 (52), 111 (52), 105 (83), 77 (100), 51 (72); IR (KBr) 1651, 1584, 1281, 1089, 844, 728, 695 cm<sup>-1</sup>.

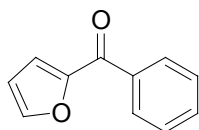


4-Nitrobenzophenone (**3k**)<sup>13</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.53 (t, *J* = 7.8 Hz, 2H), 7.66 (t, *J* = 7.8 Hz, 1H), 7.80 (d, *J* = 7.8 Hz, 2H), 7.94 (d, *J* = 8.6 Hz, 2H), 8.32-37 (d, *J* = 8.6 Hz, 2H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>): δ 194.8, 142.8, 136.2, 133.4, 130.6, 130.1, 128.7, 128.6, 123.5; MS (EI): 227 (M<sup>+</sup>, 53), 181, (4), 150 (13), 105 (100), 77 (578), 76 (19), 51 (20); IR (KBr): 3101, 1651, 1595, 1514, 1359, 1318, 1106, 930, 873, 734, 705 cm<sup>-1</sup>.



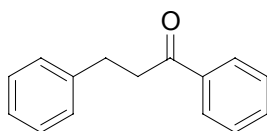
2-Benzoylnaphthalene (**3l**)<sup>14</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.49-7.65 (m, 5H), 7.84-7.95 (m, 6H), 8.26 (s, 1H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>): δ 196.7, 137.8, 135.2, 134.7, 132.4, 132.2, 131.8, 130.1, 129.4, 128.30, 128.29, 128.26, 127.8, 126.7, 125.7; MS (EI):

233 ( $M+1^+$ , 18), 232 ( $M^+$ , 92), 231 (20), 155 (100), 127 (65), 105 (34), 77 (46); IR (KBr): 3055, 1658, 1270, 1116, 819, 754, 697  $\text{cm}^{-1}$ .



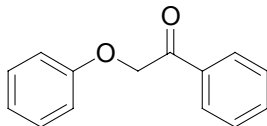
**3m**

2-Benzoylfuran (**3m**)<sup>15</sup>:  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.99-7.96 (m, 2H), 7.72 (s, 1H), 7.60-7.57 (m, 1H), 7.53-7.48 (m, 2H), 7.26-7.23 (m, 1H), 6.61-6.59 (m, 1H).  $^{13}\text{C}$  NMR: (75 MHz,  $\text{CDCl}_3$ ):  $\delta$  182.5, 152.1, 147.1, 137.1, 132.5, 129.2, 128.3, 120.6, 112.1.



**3n**

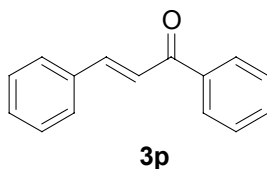
1,3-Diphenyl-1-propanone (**3n**)<sup>16</sup>:  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ ):  $\delta$  3.07 (t,  $J = 8.0$  Hz, 2H), 3.30 (t,  $J = 8.0$  Hz, 2H), 7.18-7.32 (m, 5H), 7.42-7.47 (m, 2H), 7.55 (t,  $J = 7.8$  Hz, 1H), 7.95 (d,  $J = 7.8$  Hz, 2H);  $^{13}\text{C}$  NMR: (75 MHz,  $\text{CDCl}_3$ ):  $\delta$  30.1, 40.4, 126.1, 128.0, 128.4, 128.5, 128.6, 133.1, 136.8, 141.2, 199.2; MS (EI): 211( $M+1^+$ , 8), 210( $M^+$ , 46), 131 (1), 106 (9), 105 (100), 103 (5), 91 (11), 79 (3), 78 (6), 77 (396), 65 (41), 51 (9); IR (KBr): 3062, 3026, 1682, 1596, 1448, 1209, 973, 744, 689  $\text{cm}^{-1}$ .



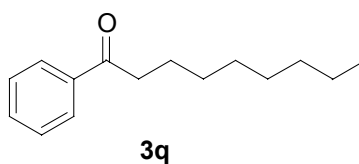
**3o**

2-Phenoxyacetophenone (**3o**)<sup>17</sup>:  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ ):  $\delta$  5.26 (s, 2H), 6.92-7.00 (m, 3H), 7.28 (m, 2H), 7.46-7.51 (m, 2H), 7.60(m, 1H), 7.97-8.00 (m, 2H);  $^{13}\text{C}$  NMR (75MHz,  $\text{CDCl}_3$ ):  $\delta$  194.5, 157.9, 134.5, 133.8, 129.5, 128.8, 128.1, 121.6, 114.7, 70.7;

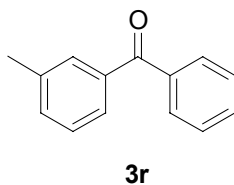
MS (EI): 213 (M+<sup>+</sup>, 6), 212(M, 36), 106 (8), 105 (100), 91 (10), 77 (90), 65 (15), 51 (41); IR (KBr): 3066, 1708, 1600, 1581, 1500, 1449, 1228, 1094 cm<sup>-1</sup>.



*trans*-Chalcone (**3p**)<sup>18</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 8.02 (d, *J* = 7.0 Hz, 2H) , 7.81 (d, *J* = 15.9 Hz, 1H), 7.63 (m, 2H), 7.52 (m, 4H), 7.40 (m, 3H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>): δ 190.6, 144.8, 138.2, 134.8, 132.8, 130.6, 128.9, 128.6, 128.5, 128.4, 122.0; MS (EI): 209 (M+<sup>+</sup>, 12.27), 208 (M<sup>+</sup>, 80), 207 (100), 131 (23), 105 (17), 103 (23), 77 (51), 51 (23); IR (KBr): 3060, 1762, 1662, 1605, 1575, 1496, 1448, 978, 746, 689 cm<sup>-1</sup>.

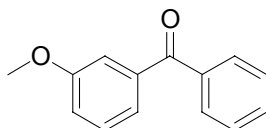


1-Phenyl-1-nonanone (**3q**)<sup>19</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.94-7.98 (d, *J* = 7.1 Hz, 2H), 7.52-7.58 (m, 1H), 7.42-7.48 (t, *J* = 7.1 Hz, 2H), 2.96 (t, *J* = 7.8 Hz, 2H), 1.74 (m, 2H), 1.13-1.40 (m, 10H), 0.88 (t, *J* = 7.2 Hz, 3H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>): δ 200.6, 137.0, 132.8, 128.5, 128.0, 38.6, 31.8, 29.4, 29.3, 29.1, 24.3, 22.6, 14.1; MS (EI): 219 (M+<sup>+</sup>, 4.14), 218 (M<sup>+</sup>, 11), 133 (11), 120 (100), 105 (81), 77 (27), 51 (4); IR (KBr): 3063, 2928, 2856, 1690, 1689, 1582, 1450, 1258, 1217 cm<sup>-1</sup>.



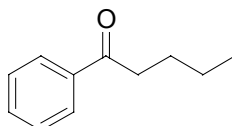
3-Methylbenzophenone (**3r**)<sup>20</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.82-7.78 (m, 2 H), 7.63-7.56 (m, 3H), 7.50-7.45 (m, 2H), 7.40-7.33 (m, 2H), 2.42 (s, 3H); <sup>13</sup>C NMR (75 MHz,

CDCl<sub>3</sub>):  $\delta$  196.9, 138.1, 137.7, 137.6, 133.2, 132.3, 130.4, 130.0, 128.2, 128.0, 127.3, 21.3; MS (EI) (%): 197 (M+<sup>+</sup>, 27), 196 (M<sup>+</sup>, 82), 119 (100), 105 (64), 91 (43), 77 (44), 65 (24), 51 (22), 41 (2); IR: 1661, 1598, 1318, 1212, 958, 778, 720, 705 cm<sup>-1</sup>.



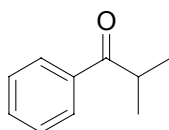
**3s**

3-Methoxybenzophenone (**3s**)<sup>21</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>):  $\delta$  7.82-7.79 (m, 2H), 7.59-7.56(m, 1H), 7.50-7.45 (m, 2H), 7.38-7.34 (t, 3H), 7.15-7.11 (m, 1H), 3.85 (s, 3H); <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>):  $\delta$  196.5, 159.5, 138.8, 137.5, 132.4, 130.0, 129.2, 128.2, 122.8, 118.8, 114.3, 55.4; MS (EI): 213 (M+<sup>+</sup>, 18), 212 (M<sup>+</sup>, 100), 135 (88), 107 (23), 105 (83), 92 (18), 77 (72), 64 (11), 51 (17); IR (KBr) 1660, 1597, 1580, 1450, 1430, 1283, 1047, 826, 724, 704 cm<sup>-1</sup>.



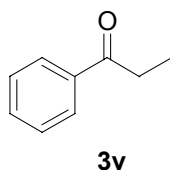
**3t**

Pentanophenone (**3t**)<sup>22</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>):  $\delta$  7.96 (d, *J* = 7.1 Hz, 2H), 7.57-7.52 (m, 1H), 7.45 (t, *J* = 7.1 Hz, 2H), 2.96 (t, *J* = 7.8 Hz, 2H), 1.72 (m, 2H), 1.41 (m, 2H), 0.95 (t, *J* = 7.2 Hz, 3H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>):  $\delta$  200.5, 137.0, 132.8, 128.4, 127.9, 38.2, 26.4, 22.4, 13.9; MS (EI): 163 (M+<sup>+</sup>, 2), 162 (M<sup>+</sup>, 14), 147 (1), 133 (5), 120 (61), 105 (100), 85 (1), 77 (41), 57 (2), 51 (10), 43 (2), 41 (3); IR (KBr): 3064, 2960, 2874, 1687, 1598, 1450, 1267, 1209, 691 cm<sup>-1</sup>.

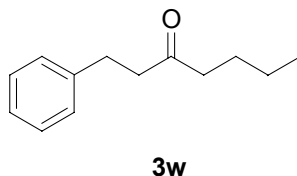


**3u**

Isobutyrophenone (**3u**)<sup>23</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.63 (d, *J* = 7.1 Hz, 2H), 7.58-7.53 (m, 1H), 7.47 (t, *J* = 7.1 Hz, 2H), 3.57 (m, *J* = 6.6 Hz, 1H), 1.22 (d, *J* = 6.6 Hz, 6H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>): δ 204.5, 136.2, 132.8, 128.6, 128.3, 35.3, 19.1; MS (EI): 148 (M+1<sup>+</sup>, 11.16), 147 (M<sup>+</sup>, 39), 105 (82), 77 (97), 71 (8), 51 (57), 43 (85), 41 (100); IR (KBr): 3063, 2972, 2874, 1685, 1467, 1448, 1384, 1225, 980, 703 cm<sup>-1</sup>.



Propiophenone (**3v**)<sup>24</sup>: <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.97 (d, *J* = 7.1 Hz, 2H), 7.58-7.52 (m, 1H), 7.45 (t, *J* = 7.1 Hz, 2H), 3.01 (q, *J* = 6.9 Hz, 2H), 1.24 (t, *J* = 6.9 Hz, 3H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>): δ 200.8, 136.9, 132.8, 128.5, 127.9, 31.8, 8.2; MS (EI): 135 (M+1<sup>+</sup>, 3), 134 (M<sup>+</sup>, 21), 105 (100), 77 (54), 71 (10), 57 (16), 51 (19), 43 (11), 41 (7); IR (KBr): 2980, 2940, 1689, 1598, 1450, 1221, 952, 746, 691 cm<sup>-1</sup>.

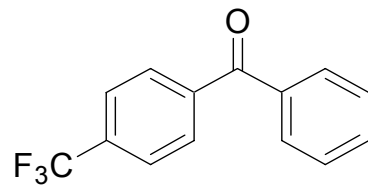


1-phenyl-heptan-3-one (**3w**)<sup>25</sup> <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 7.30-7.14(m, 5H), 2.86 (t, *J* = 7.8 Hz, 2H), 2.70 (t, *J* = 7.8 Hz, 2H), 2.36 (t, *J* = 7.5 Hz, 2H), 1.53 (m, *J* = 7.5 Hz, 2H), 1.27 (m, *J* = 7.5 Hz, 2H), 0.88 (t, *J* = 7.5 Hz, 3H); <sup>13</sup>C NMR: (75 MHz, CDCl<sub>3</sub>): δ 210.2, 141.1, 128.4, 128.2, 126.2, 44.1, 42.6, 29.7, 25.8, 22.2, 13.7; MS (GC-EI): 190 (M<sup>+</sup>, 40), 172 (14), 161 (3), 148 (39), 130 (51), 115 (8), 105 (100), 91 (90), 77 (28), 57 (43).

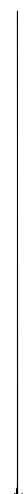
## References:

1. Armarego, W. L. F.; Perrin, D. D. *Purification of Laboratory Chemicals* 4<sup>th</sup> Ed. Butterworth-Heinemann: Oxford, 1997.
2. Kim, J. and Jang, D. O. *Synth. Commun.* **2001**, *31*, 395.
3. Coulson, D. R. *Inorg. Synth.* **1972**, *13*, 121.
4. (a) Hwang, Je Pil; Prakash, G. K. Surya; Olah, George A. *Tetrahedron* **2000**, *56*, 7199. (b) Wu, Tse-Chong; Xiong, Heping; Rieke, R. D. *J. Org. Chem.* **1990**, *55*, 5045.
5. (a) Goossen, L. J.; Ghosh, K. *Eur. J. Org. Chem.* **2002**, *19*, 3254. (b) Taber, D. F.; Sethuraman, M. R. *J. Org. Chem.* **2000**, *65*, 254.
6. Kakino, R.; Narahashi, H.; Shimizu, I.; Yamamoto, A. *Bull. Chem. Soc. Jpn.* **2002**, *75*, 1333.
7. (a) Nilsson, P.; Larhed, M.; Hallberg, A. *J. Am. Chem. Soc.* **2001**; *123*, 8217. (b) Blanco, F. E.; Harris, F. L. *J. Org. Chem.* **1977**, *42*, 868-871.
8. Moorthy, J. N.; Monahan, S. L.; Sunoj, R. B.; Chandrasekhar, J.; Bohne, C. *J. Am. Chem. Soc.* **1999**, *121*, 3093 .
9. Sakurai, H.; Imamoto, Y.; Hirao, T. *Chem. Lett.* **2002**, 44.
10. (a) Singh, R. P.; Kamble, R. M.; Chandra, K. L.; Saravanan, P.; Singh, V. K. *Tetrahedron*, **2001**, *57*, 241. (b) Parham, W. E.; Bradsher, C. K.; Edgar, K. J. *J. Org. Chem.* **1981**, *46*, 1057. (c) Bomben, A.; Marques, C. A.; Selva, M.; Tundo, P. *Synthesis*, **1996**, 1109-1114.
11. (a) Kalena, G. P.; Jadhav, S. M.; Banerji, A. *Molecules*, **2000**, *5*, 240. (b) Wagner, P. J.; Meador, M. A.; Park, B.-S. *J. Am. Chem. Soc.* **1990**, *112*, 5199. (c) Tomioka, H.; Nakanishi, K.; Izawa, Y. *J. Chem. Soc. Perkin Trans.1*, **1991**, 465.
12. (a) Rieke, R. D.; Klein, W. R.; Wu, T.-C. *J. Org. Chem.* **1993**, *58*, 2492. (b) Katritzky, A. R.; Rahimi-Rastgoo, S.; Sabongi, G. J.; Fischer, G. W. *J. Chem. Soc. Perkin Trans.1*, **1980**, 362. (c) Kakino, R.; Yasumi, S.; Shimizu, I.; Yamamoto, A. *Bull. Chem. Soc. Jpn.* **2002**, *75*, 137.
13. (a) Suzuki, H.; Murashima, T. *J. Chem. Soc. Perkin Trans.1*, **1994**; 903. (b) Andrus, M. B.; Ma, Y.; Zang, Y.; Song, C. *Tetrahedron Lett.* **2002**, *43*, 9137. (c) Frahm, A. W.; Hambloch, H. F. *Org. Magn. Reson.* **1980**, *14*, 444.
14. (a) Kim, S. -H.; Rieke, R. D. *Synth. Commun.* **1998**, *28*, 1065. (b) Kang, S.-K.;

- Ryu, H. -C.; Lee, S.-W. *Synth. Commun.* **2001**, *31*, 1027.
15. Kang, S.-K.; Ryu, H.-C.; Lee, S.-W. *J. Organomet. Chem.* **2000**, *610*, 38.
16. Gossen, L. J.; Ghosh, K. *Angew. Chem. Int. Ed.* **2001**, *40*, 3458.
17. Kandamarachchi, P. H.; Autrey, T.; Franz, J. A. *J. Org. Chem.* **2002**, *67*, 7937.
18. Cave, G. W. V.; Raston, C. L. *J. Chem. Soc. Perkin Trans. 1*, **2001**, 3258.
19. Jensen, A. E.; Knochel, P. *J. Org. Chem.* **2002**, *67*, 79.
20. Goossen, L. J.; Ghosh, K. *Eur. J. Org. Chem.* **2002**, *19*, 3254.
21. Morley, J. A.; Woolsey, N. F. *J. Org. Chem.* **1992**, *57*, 6487.
22. (a) Yamamoto, H. M.; Sakurai, H.; Narasaka, K. *Bull. Chem. Soc. Jpn.* **1996**, *69*, 157. (b) Kim, S.; Lee, J. I. *J. Org. Chem.* **1983**, *48*, 26080.
23. Blay, G.; Fernandez, I.; Formentin, P.; Monje, B.; Pedro, J. R.; Ruiz, R. *Tetrahedron* **2001**, *57*, 1075.
24. Huang, Z.-Z.; Tang, Y. *J. Org. Chem.* **2002**, *67*, 5320.
25. Trost, B. M.; Kulawiec, R. J. *J. Am. Chem. Soc.* **1993**, *115*, 2027.



63.437



50

0

-50

-100

-150

-200

PPM

SIOC-OMCMercuryVX-300F19 Sensitivity TestSample: 0.05% Trifluorotoluene2002

USER: -- DATE: Jul 8 2003

F1: 282.286

F2: 300.029

SW1: 84746

OF1: -22384.9

PTS1d: 65536

EX: s2pul

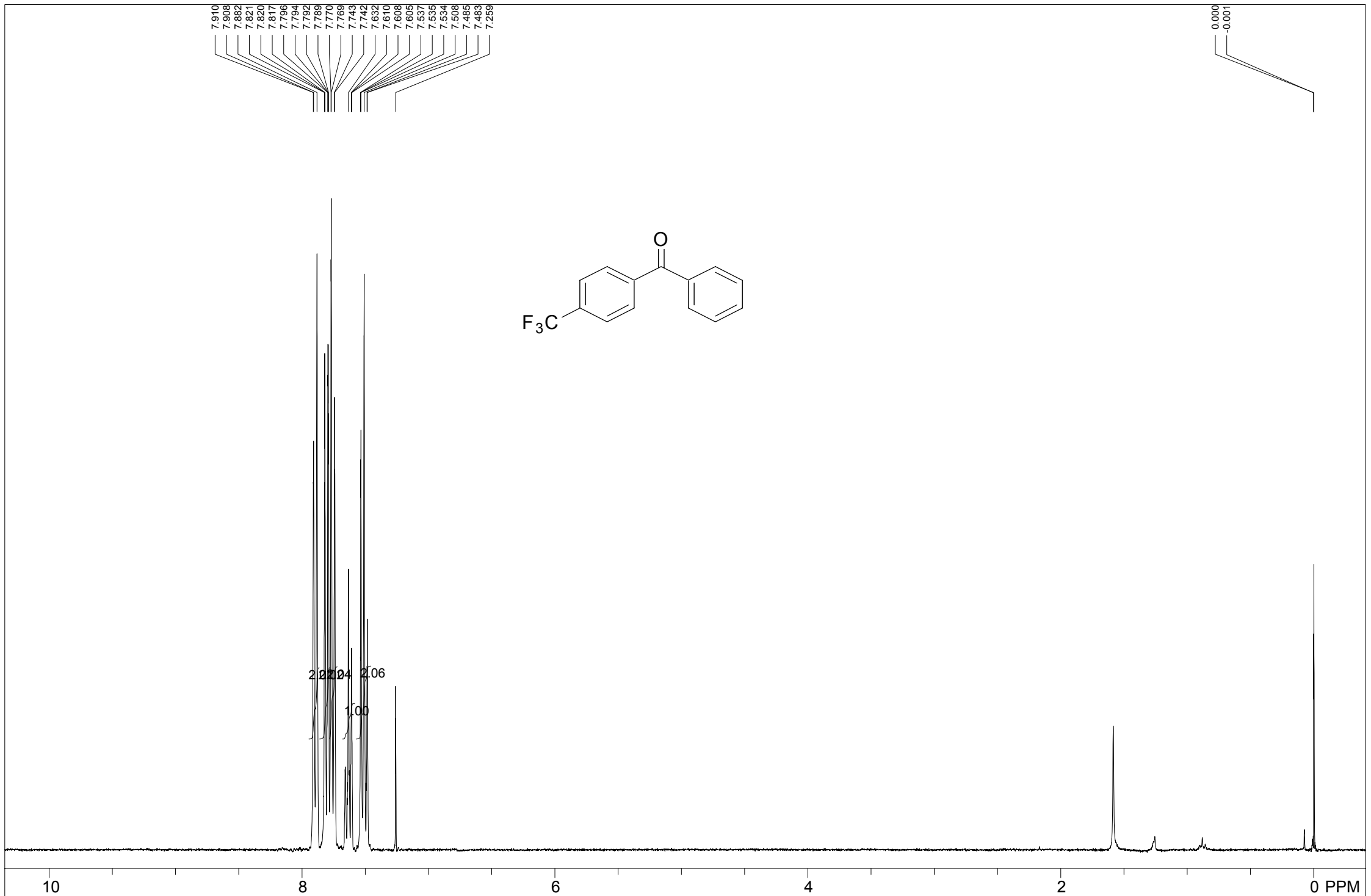
PW: 5.1 usec

PD: 1.5 sec

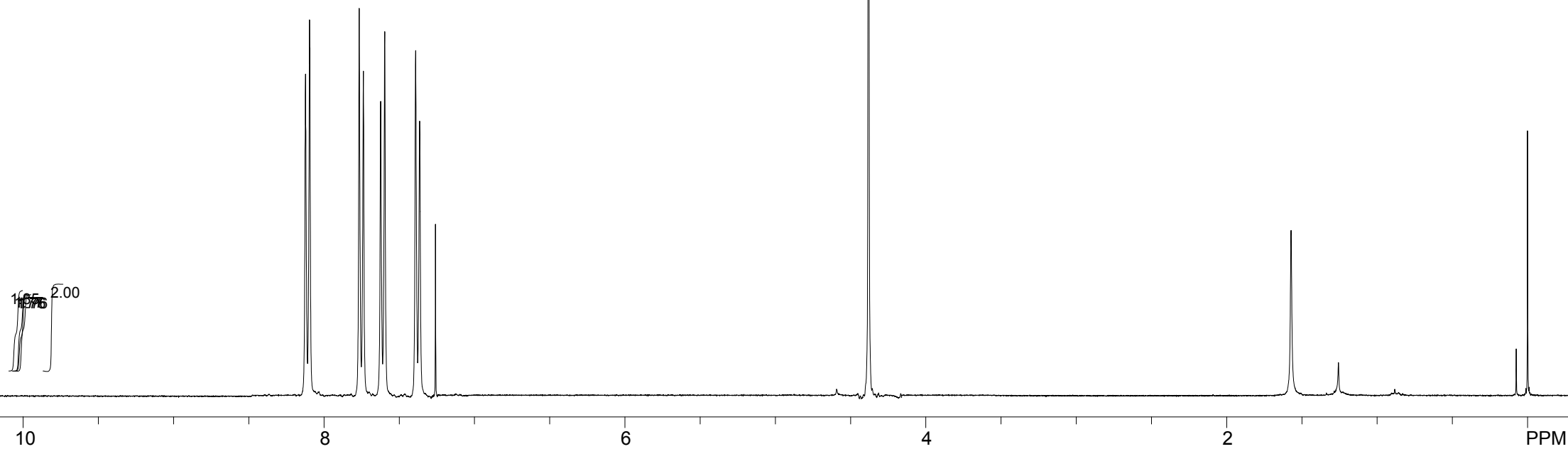
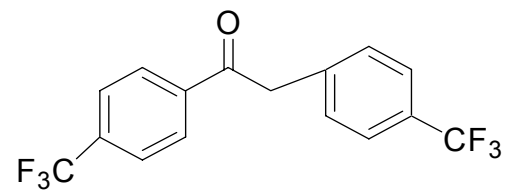
NA: 4

LB: 0.0

WinNuts - \$wdh-5-65-1-1-f.fid



txf-7-14			USER: -- DATE: Jul 8 2003			
F1: 300.030	F2: 75.450	SW1: 5495	OF1: 1810.9	PTS1d: 16384		
EX: s2pul	PW: 3.8 usec	PD: 1.0 sec	NA: 4	LB: 0.0	WinNuts - \$wdh-5-65-1-1-h.fid	



txf-7-14

USER: -- DATE: Jul 8 2003

F1: 300.030

F2: 75.450

SW1: 5495

OF1: 1810.9

PTS1d: 16384

EX: s2pul

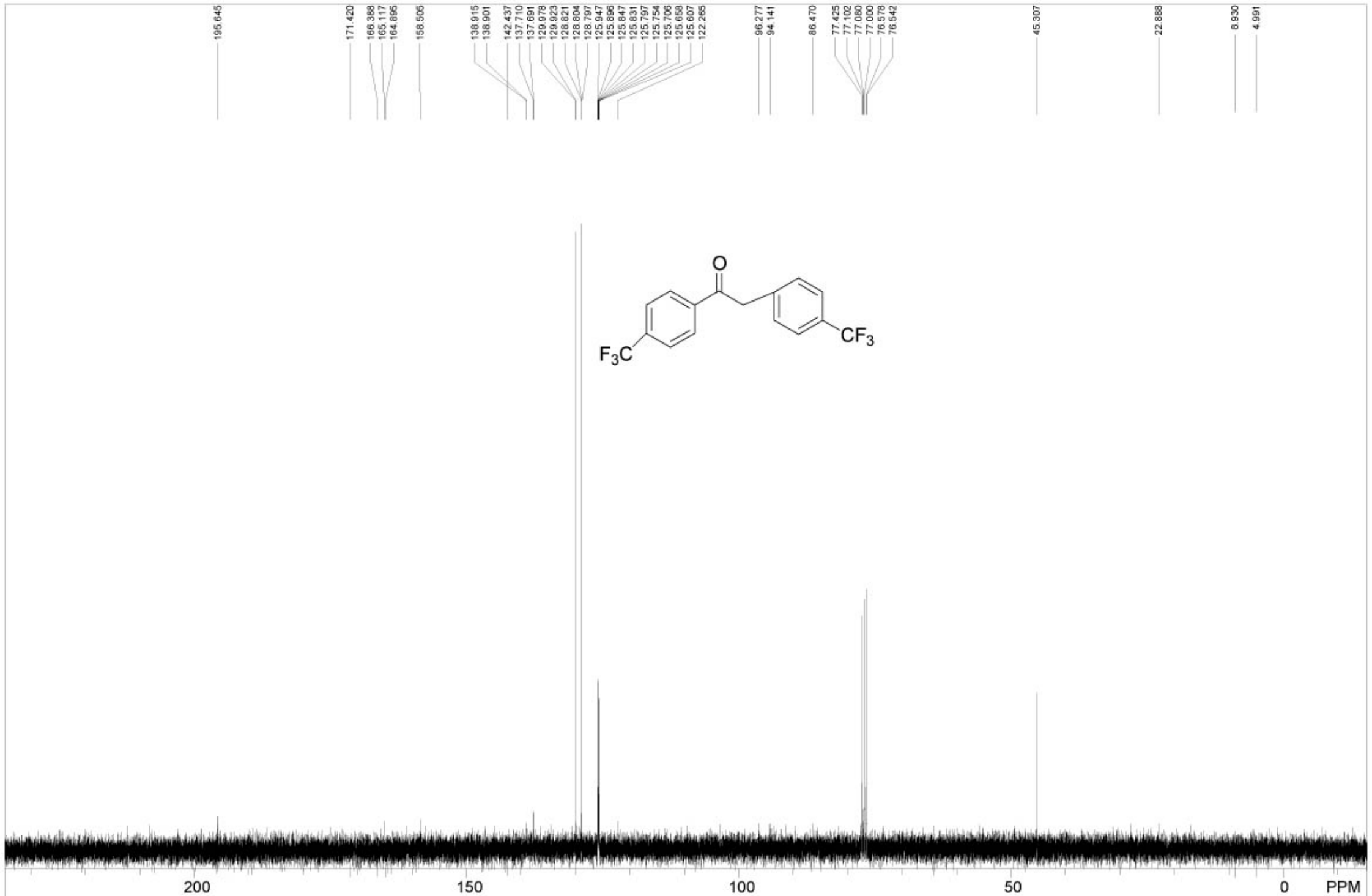
PW: 3.8 usec

PD: 1.0 sec

NA: 8

LB: 0.0

WinNuts - \$wdh-5-72-1-1-h.fid



zgg-7-73c

USER: -- DATE: Jul 8 2003

F1: 75.450

F2: 300.029

SW1: 18868

OF1: 8282.0

PTS1d: 65536

EX: s2pul

PW: 4.2 usec

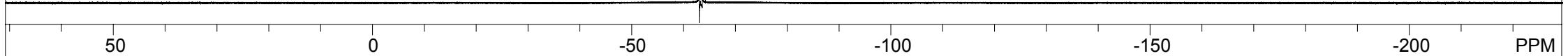
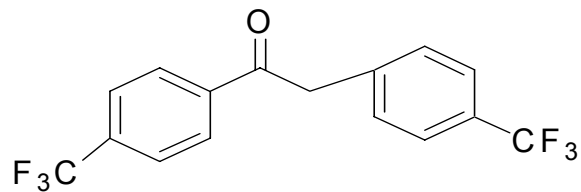
PD: 1.0 sec

NA: 220

LB: 0.0

WinNuts - \$wdh-5-72-1-1-c.fid

63.023  
63.632

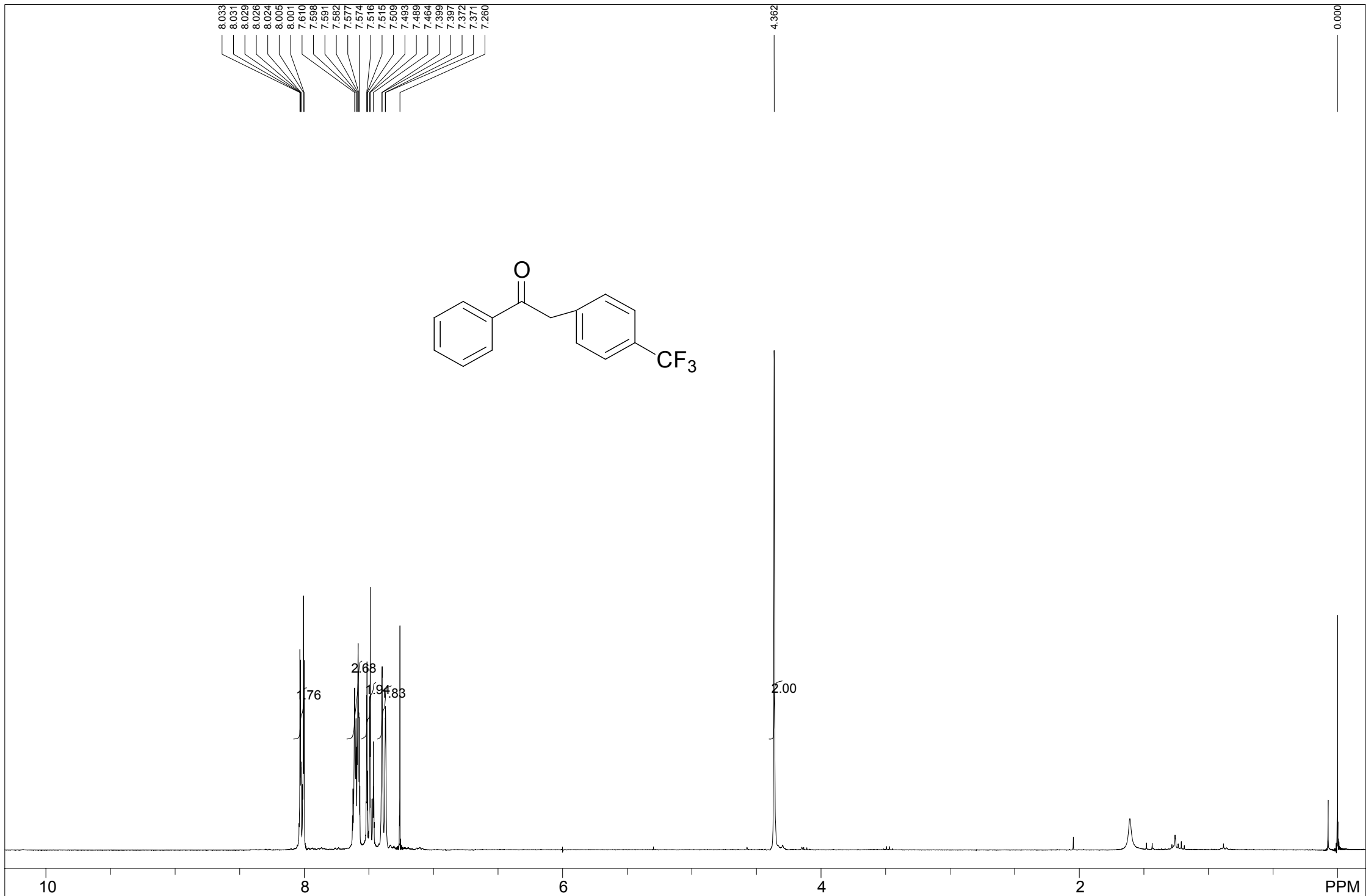
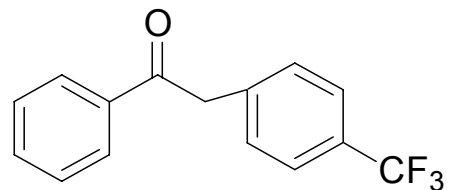


SIOC-OMCMercuryVX-300F19 Sensitivity TestSample: 0.05% Trifluorotoluene2002				USER: -- DATE: Jul 8 2003			
F1: 282.286	F2: 300.029	SW1: 84746		OF1: -22384.9		PTS1d: 65536	
EX: s2pul		PW: 5.1 usec	PD: 1.5 sec	NA: 16	LB: 0.0	WinNuts - \$wdh-5-72-1-1-f.fid	

8.033  
8.031  
8.029  
8.026  
8.024  
8.005  
8.001  
7.610  
7.598  
7.591  
7.582  
7.577  
7.574  
7.516  
7.515  
7.509  
7.493  
7.489  
7.464  
7.399  
7.397  
7.372  
7.371  
7.260

4.362

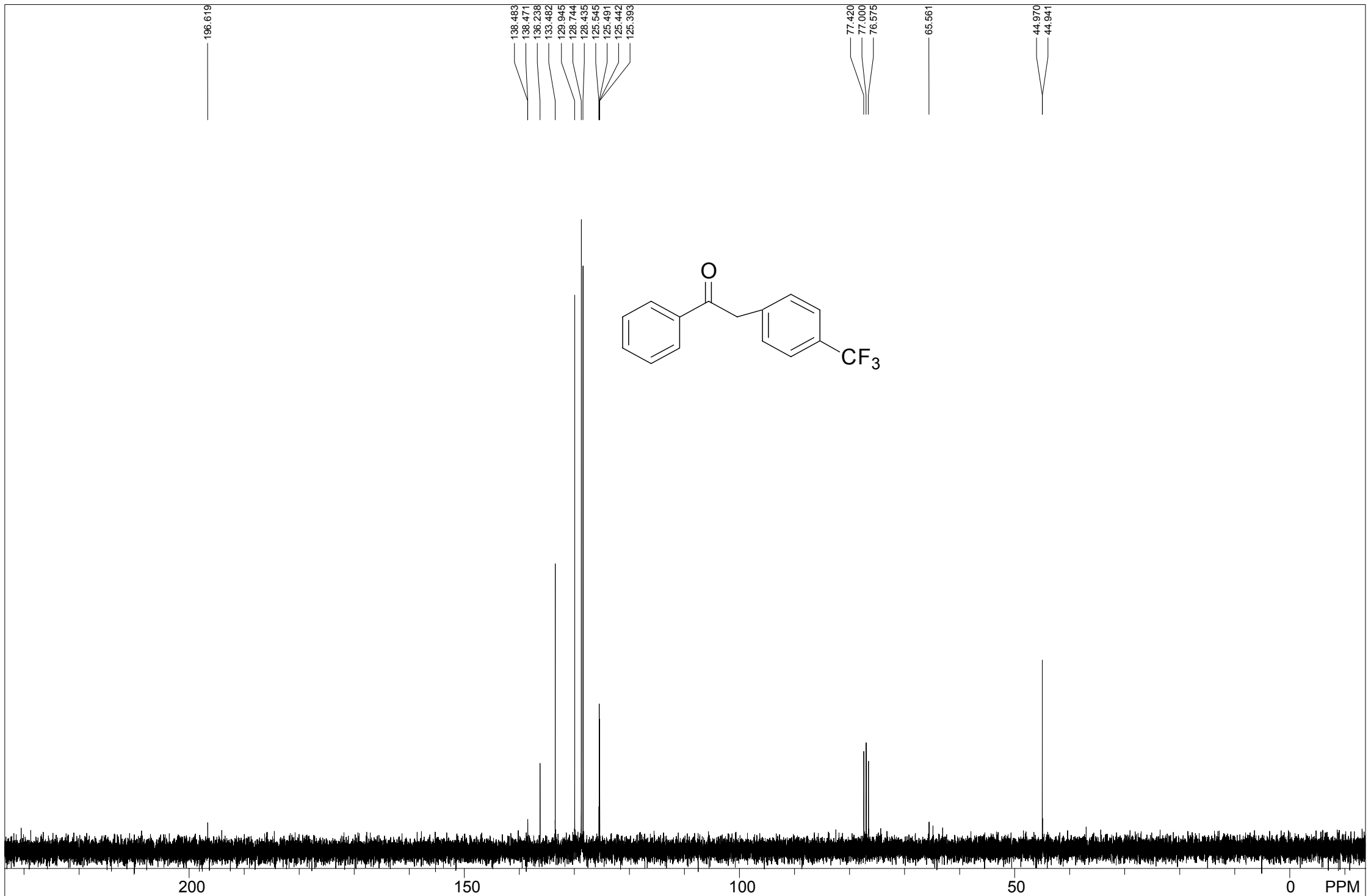
0.000



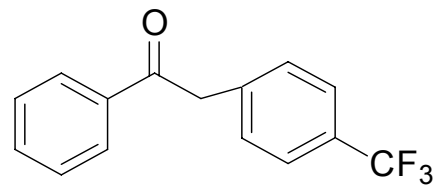
STANDARD 1H OBSERVE

USER: -- DATE: Apr 16 2003

F1: 300.030	F2: 75.450	SW1: 4803	OF1: 1800.7	PTS1d: 16384
EX: s2pul	PW: 3.7 usec	PD: 1.0 sec	NA: 18	LB: 0.0
				WinNuts - \$wdh-5-73-1-h.fid



zgg-5-25-2a-c				USER: -- DATE: Apr 16 2003			
F1: 75.450	F2: 300.029	SW1: 18657		OF1: 8290.2		PTS1d: 32768	
EX: s2pul		PW: 4.2 usec	PD: 1.0 sec	NA: 44	LB: 0.0	WinNuts - \$wdh5-73-1C.fid	



62.929  
63.785



50

0

-50

-100

-150

-200

PPM

SIOC-OMCMercuryVX-300F19 Sensitivity TestSample: 0.05% Trifluorotoluene2002

USER: -- DATE: Jul 8 2003

F1: 282.286

F2: 300.029

SW1: 84746

OF1: -22384.9

PTS1d: 65536

EX: s2pul

PW: 5.1 usec

PD: 1.5 sec

NA: 16

LB: 0.0

WinNuts - \$wdh-5-73-1-1-f.fid

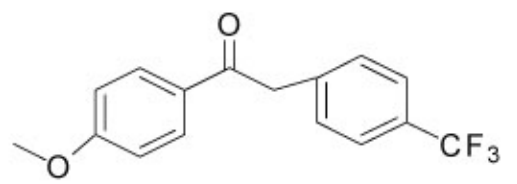
8.004  
7.997  
7.962  
7.975  
7.563  
7.566  
7.391  
7.364  
7.259  
6.963  
6.957  
6.840  
6.833

4.296

3.871

1.611

0.000



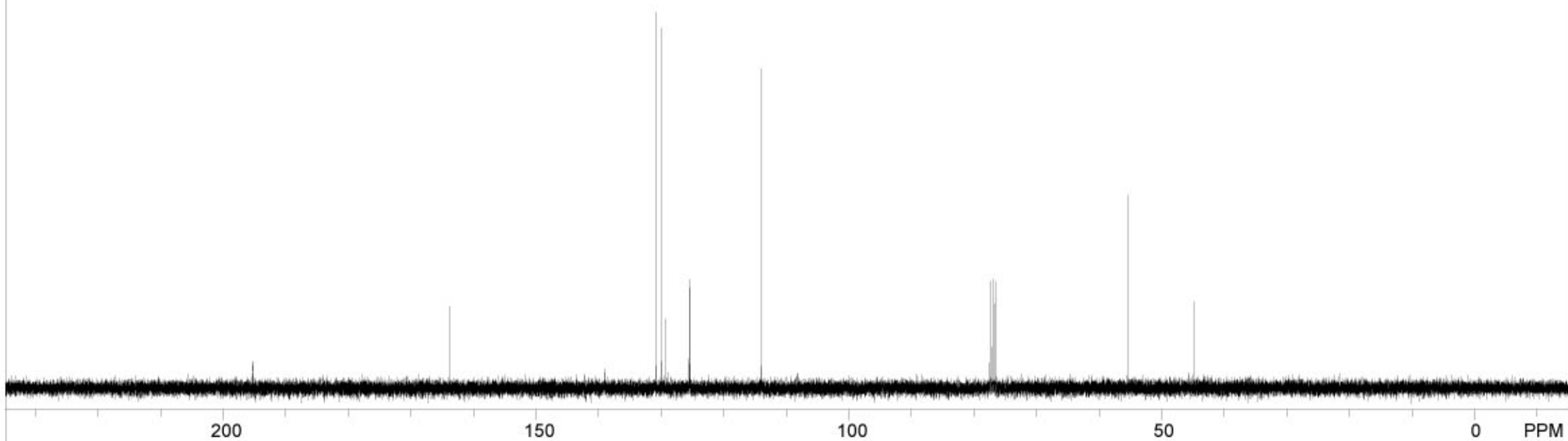
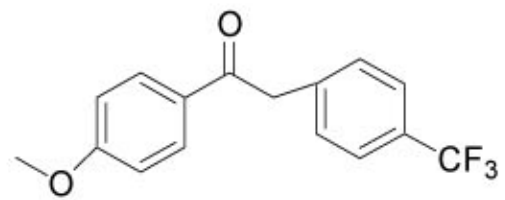
1.88  
1.81  
1.83  
1.89

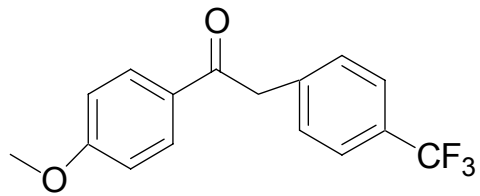
2.09

3.00

10 8 6 4 2 PPM

195.185  
187.589  
167.330  
163.774  
138.943  
138.923  
130.864  
130.855  
130.848  
130.831  
130.822  
129.862  
129.867  
129.328  
128.897  
125.542  
125.494  
125.443  
125.389  
113.944  
113.929  
113.914  
113.903  
95.937  
77.425  
77.000  
76.578  
55.491  
45.727  
44.765  
10.132





62.922



50

0

-50

-100

-150

-200

PPM

SIOC-OMCMercuryVX-300F19 Sensitivity TestSample: 0.05% Trifluorotoluene2002

USER: -- DATE: Jul 8 2003

F1: 282.286

F2: 300.029

SW1: 84746

OF1: -22384.9

PTS1d: 65536

EX: s2pul

PW: 5.1 usec

PD: 1.5 sec

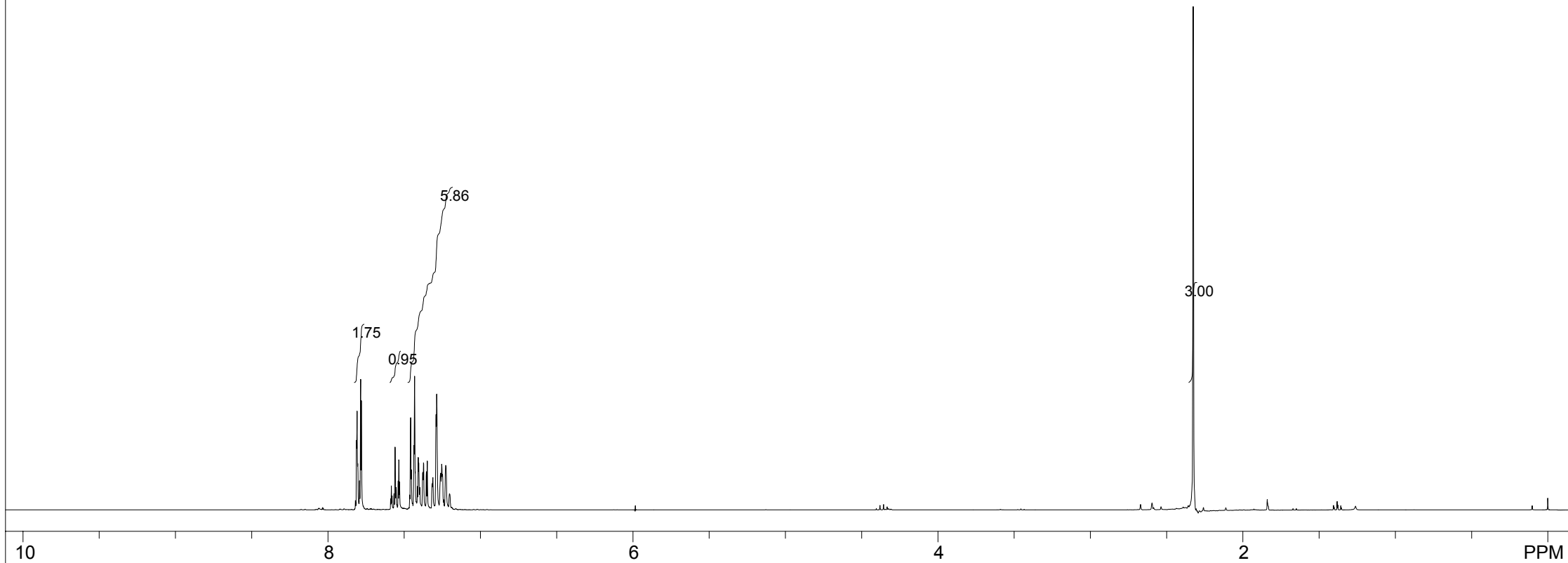
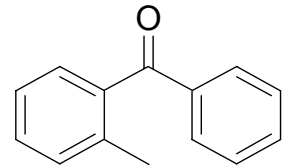
NA:

LB: 0.0

WinNuts - \$wdh-5-74-1-1-f.fid

7.813  
7.809  
7.803  
7.792  
7.785  
7.780  
7.584  
7.566  
7.559  
7.553  
7.539  
7.534  
7.530  
7.457  
7.452  
7.436  
7.431  
7.426  
7.413  
7.407  
7.404  
7.397  
7.377  
7.372  
7.354  
7.349  
7.317  
7.311  
7.291  
7.285  
7.260  
7.258  
7.254  
7.248  
7.227  
7.203  
7.201

2.326

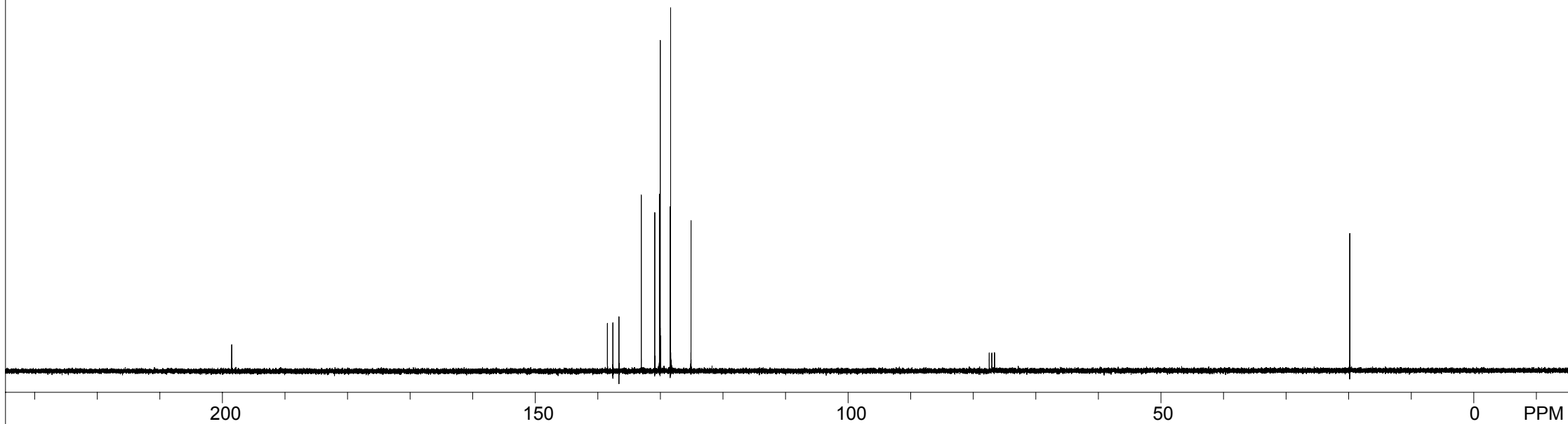
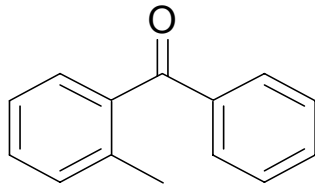


txf-6-80				USER: -- DATE: May 29 2003			
F1: 300.030	F2: 75.450	SW1: 4803		OF1: 1795.7		PTS1d: 16384	
EX: s2pul		PW: 3.7 usec	PD: 1.0 sec	NA: 8	LB: 0.0	WinNuts - \$wdh-6-25-1-2.fid	

198.504

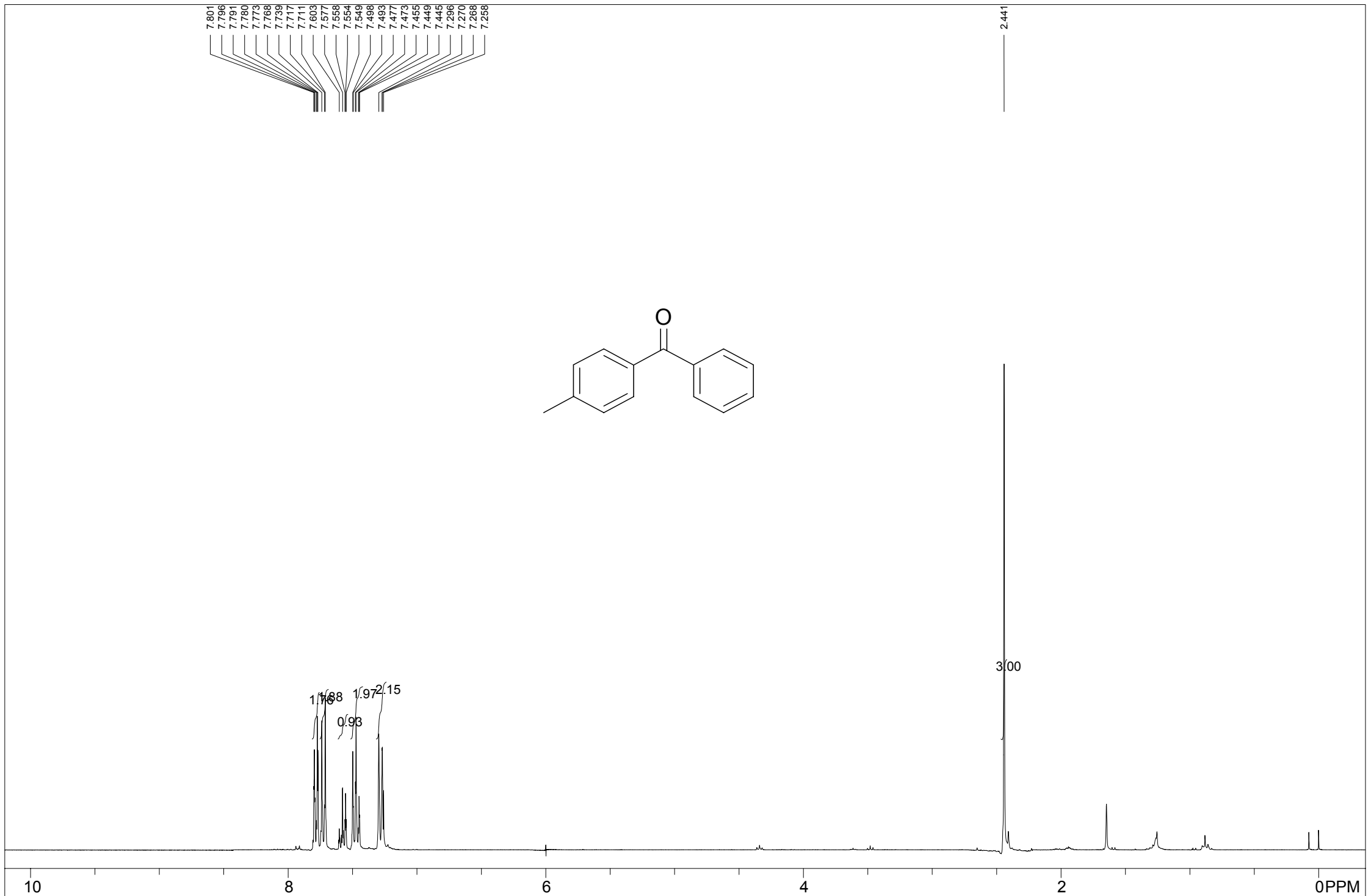
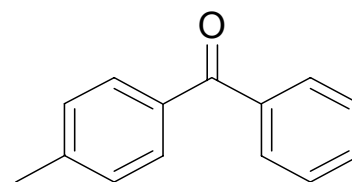
138.464  
137.583  
136.615  
133.042  
130.891  
130.144  
130.027  
130.019  
130.009  
129.999  
128.414  
128.403  
128.352  
125.087

19.894



7.801  
7.796  
7.791  
7.780  
7.773  
7.768  
7.739  
7.717  
7.711  
7.603  
7.577  
7.558  
7.554  
7.549  
7.498  
7.493  
7.477  
7.473  
7.455  
7.449  
7.445  
7.296  
7.270  
7.268  
7.258

2.441



STANDARD 1H OBSERVE

USER: -- DATE: May 22 2003

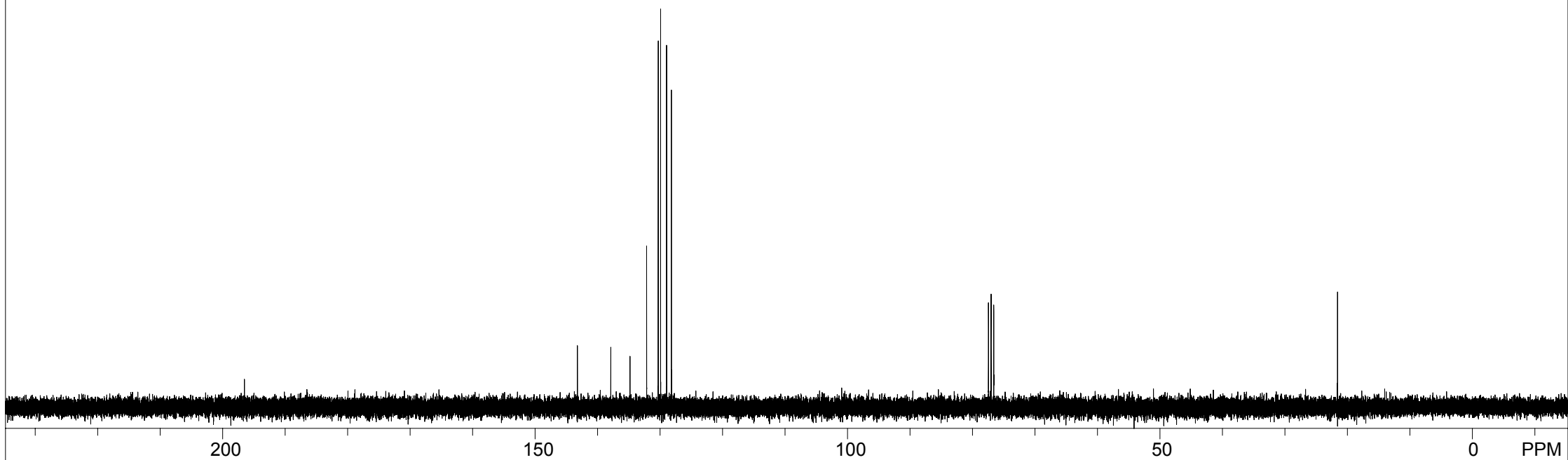
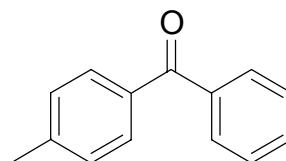
F1: 300.030	F2: 75.450	SW1: 4803	OF1: 1800.2	PTS1d: 16384
EX: s2pul	PW: 3.7 usec	PD: 1.0 sec	NA: 4	LB: 0.0
				WinNuts - \$wdh-6-26-1.fid

196.518

143.227  
137.887  
134.807  
132.139  
130.287  
129.909  
128.894  
128.943  
128.189  
128.175  
128.169

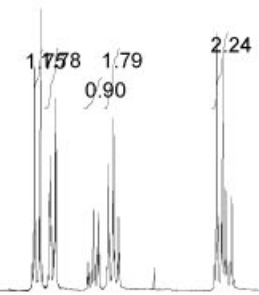
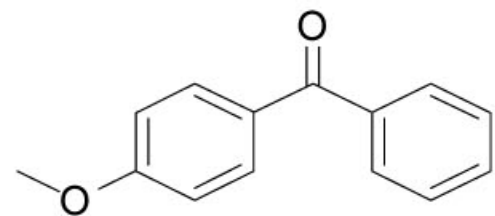
77.428  
77.000  
76.581  
76.559

21.662  
21.648



zgg-7-03c				USER: -- DATE: May 22 2003			
F1: 75.450	F2: 300.029	SW1: 18868	PD: 1.0 sec	OF1: 8279.1	NA: 64	PTS1d: 65536	
EX: s2pul		PW: 4.2 usec		LB: 0.0		WinNuts - \$wdh-6-26-1c.fid	

7.838  
7.831  
7.816  
7.809  
7.766  
7.761  
7.756  
7.738  
7.733  
7.556  
7.532  
7.487  
7.484  
7.480  
7.464  
7.459  
7.436  
6.969  
6.962  
6.946  
6.939  
6.925  
6.895



10 8 6 4 2 0PPM

STANDARD 1H OBSERVE

USER: -- DATE: May 22 2003

F1: 300.030	F2: 75.450	SW1: 4803	OF1: 1803.0	PTS1d: 16384
EX: s2pul	PW: 3.7 usec	PD: 1.0 sec	NA: 6	LB: 0.0

WinNuts - \$wdh-6-27-1.fid

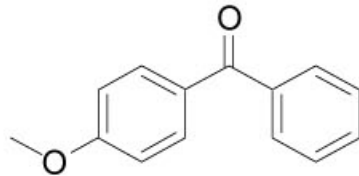
195.425

163.082

138.112  
132.435  
132.422  
131.785  
131.438  
129.958  
129.608  
129.594  
129.590  
128.078  
128.063  
128.060  
113.491  
113.425

77.419  
77.000  
76.573

55.371  
55.303



200

150

100

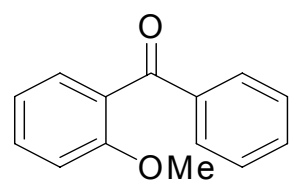
50

0

PPM

zgg-7-03c							USER: -- DATE: May 22 2003	
F1: 75.450	F2: 300.029	SW1: 18868		OF1: 8272.2		PTS1d: 65536		
EX: s2pul		PW: 4.2 usec	PD: 1.0 sec	NA: 32	LB: 0.0		WinNuts - \$wdh-6-27-1c.fid	

7.846  
7.842  
7.839  
7.827  
7.819  
7.815  
7.593  
7.576  
7.569  
7.561  
7.549  
7.542  
7.539  
7.516  
7.511  
7.492  
7.488  
7.487  
7.481  
7.475  
7.468  
7.464  
7.457  
7.448  
7.443  
7.439  
7.425  
7.420  
7.415  
7.394  
7.387  
7.368  
7.363  
7.276  
7.083  
7.080  
7.059  
7.057  
7.034  
7.030  
7.025  
6.996



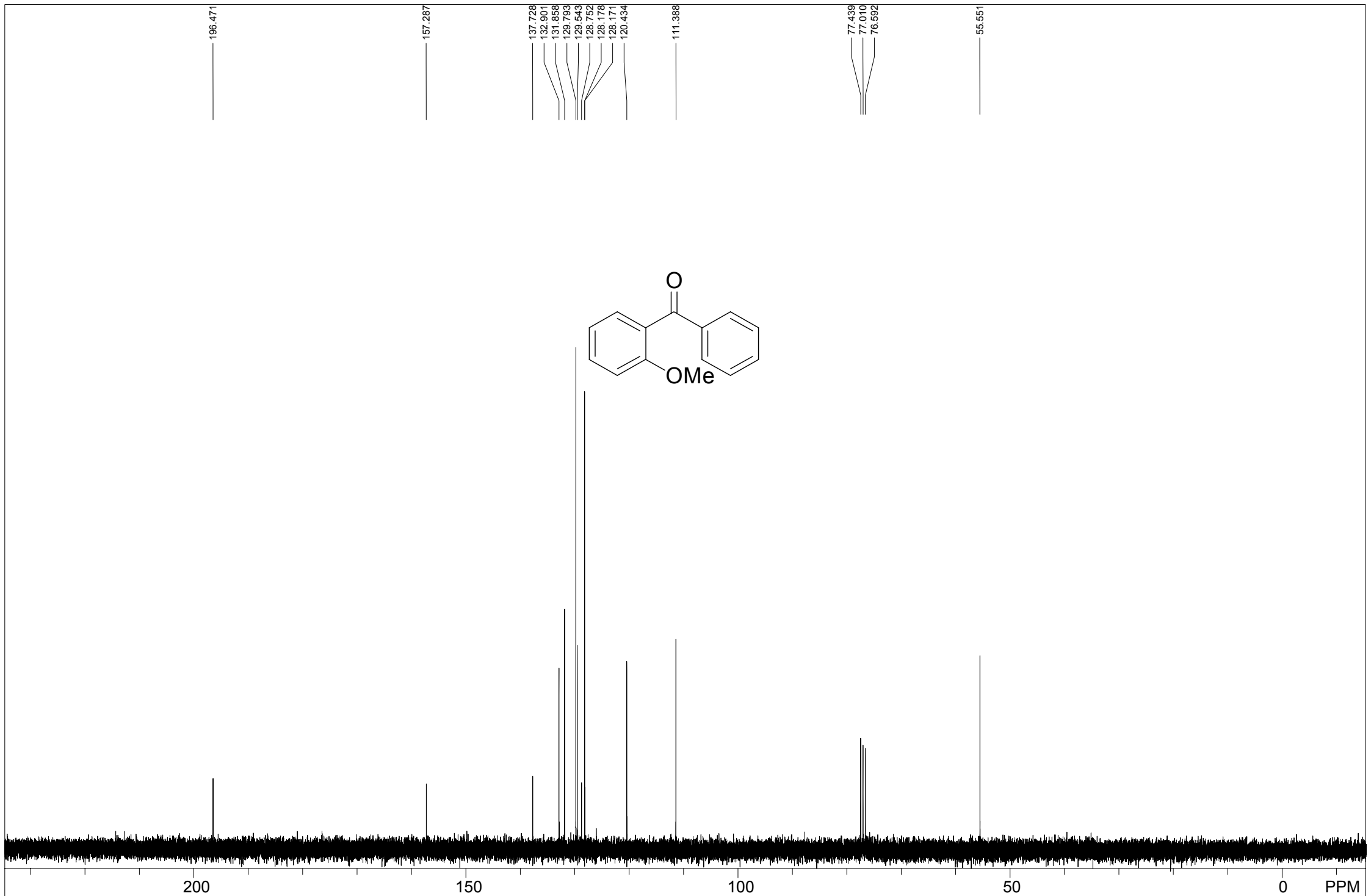
3.738

4.74  
1.77  
1.89

3.00

10 8 6 4 2 PPM

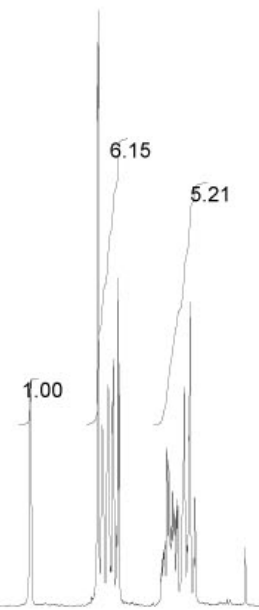
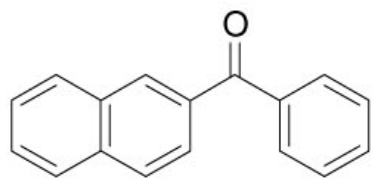
txf-6-77-b				USER: -- DATE: May 28 2003			
F1: 300.030	F2: 75.450	SW1: 6667	OF1: 1805.7	PTS1d: 16384			
EX: s2pul	PW: 3.7 usec	PD: 1.0 sec	NA: 4	LB: 0.0	WinNuts - \$wdh-6-28-1.fid		



zgg-7-18c												USER: -- DATE: May 28 2003						
F1: 75.450			F2: 300.029			SW1: 18868			OF1: 8278.5			PTS1d: 65536						
EX: s2pul			PW: 4.2 usec			PD: 1.0 sec			NA: 48			LB: 0.0			WinNuts - \$wdh-6-28-1-c.fid			

8.263  
 7.946  
 7.942  
 7.924  
 7.896  
 7.877  
 7.872  
 7.857  
 7.850  
 7.844  
 7.630  
 7.619  
 7.611  
 7.603  
 7.599  
 7.593  
 7.589  
 7.588  
 7.579  
 7.573  
 7.567  
 7.536  
 7.523  
 7.514  
 7.511  
 7.486  
 7.249

0.000



6.15

5.21

1.00

10

8

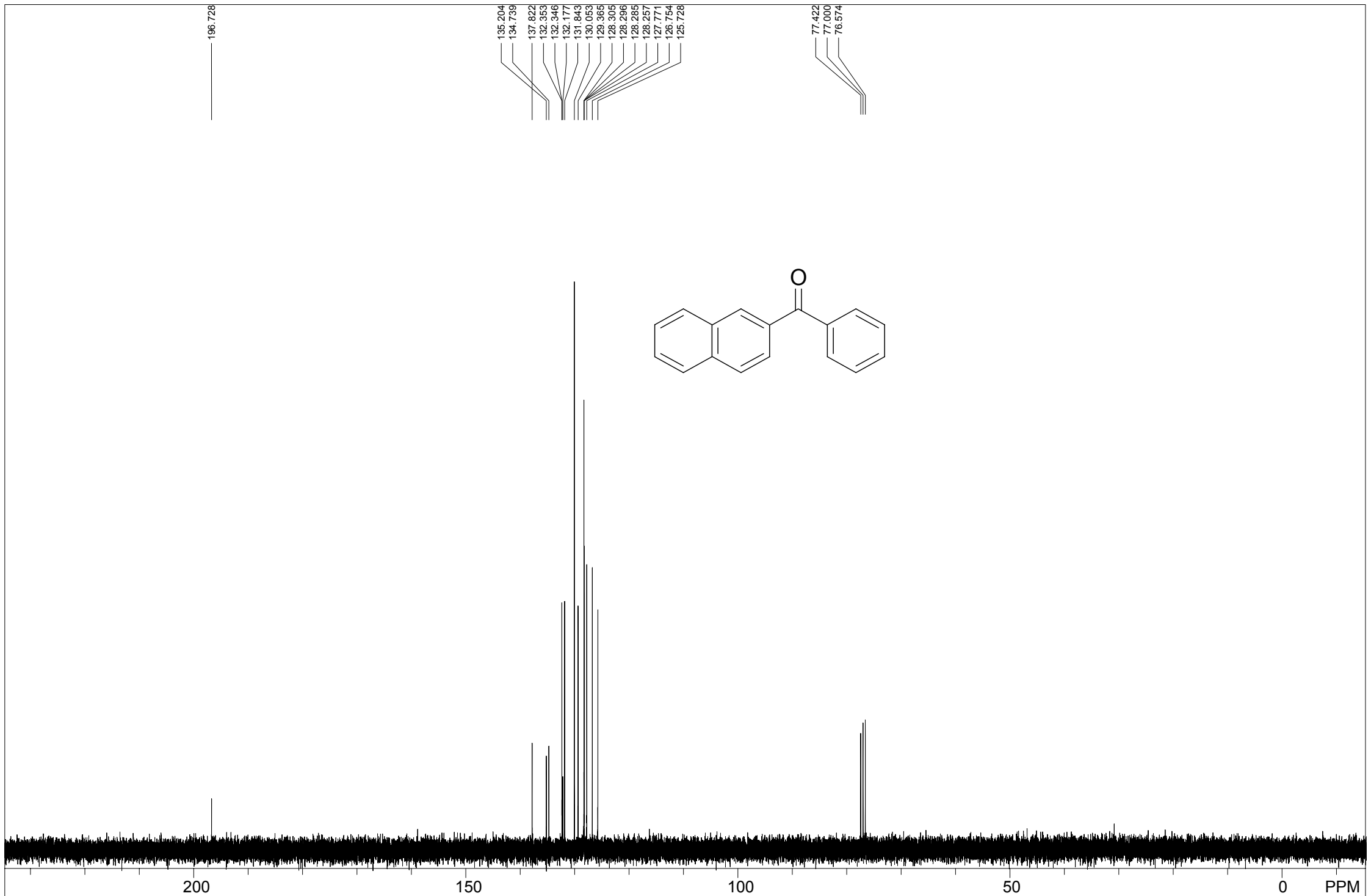
6

4

2

PPM

txf-6-77-b				USER: -- DATE: May 28 2003			
F1: 300.030	F2: 75.450	SW1: 6667	PD: 1.0 sec	OF1: 1797.6	NA: 4	PTS1d: 16384	
EX: s2pul		PW: 3.7 usec		LB: 0.0			WinNuts - \$wdh-6-29-1.fid



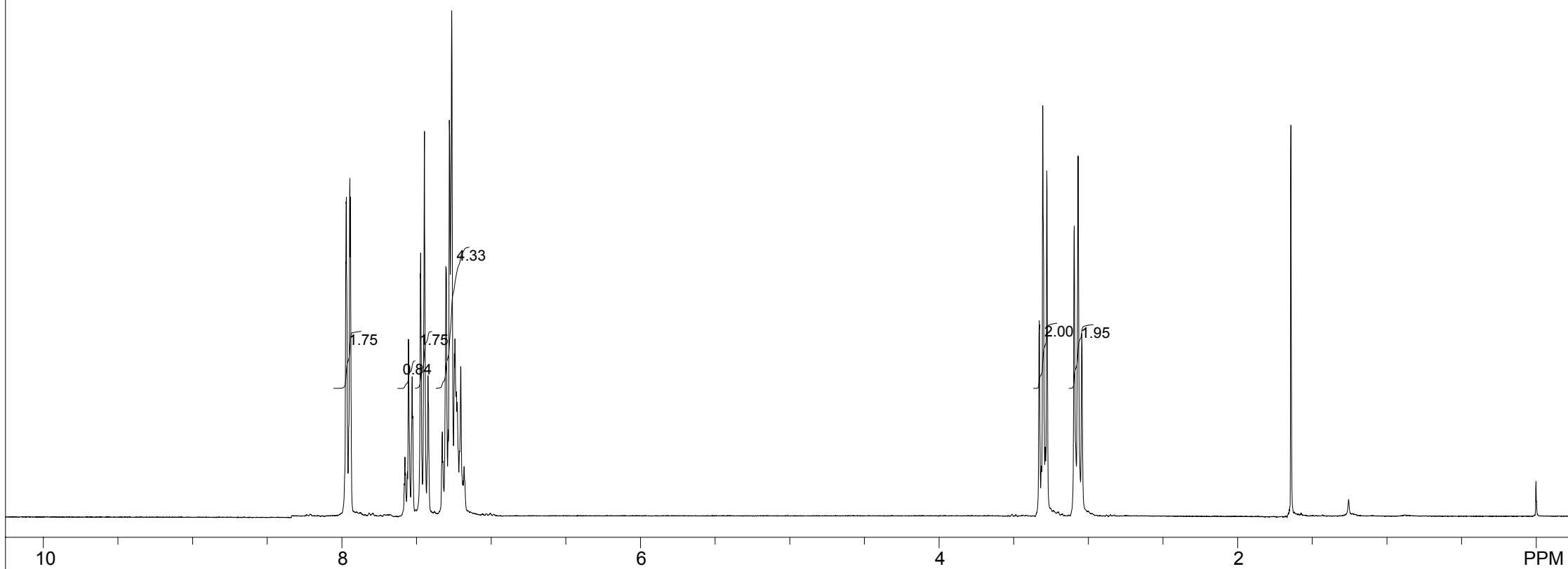
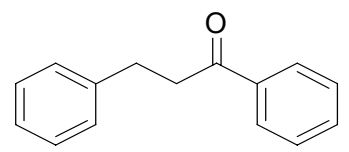
zgg-7-18c				USER: -- DATE: May 28 2003			
F1: 75.450	F2: 300.029	SW1: 18868	OF1: 8277.1	PTS1d: 65536			
EX: s2pul	PW: 4.2 usec	PD: 1.0 sec	NA: 52	LB: 0.0	WinNuts - \$wdh-6-29-1-c.fid		

7.973  
7.971  
7.969  
7.945  
7.941  
7.581  
7.577  
7.575  
7.560  
7.553  
7.528  
7.526  
7.474  
7.472  
7.446  
7.423  
7.326  
7.323  
7.303  
7.288  
7.279  
7.264  
7.246  
7.241  
7.235  
7.233  
7.227  
7.211  
7.203  
7.189  
7.180

3.329  
3.327  
3.315  
3.305  
3.289  
3.278  
3.094  
3.068  
3.043

1.642

-0.000



txf-7-14				USER: -- DATE: Jul 7 2003			
F1: 300.030	F2: 75.450	SW1: 5495	OF1: 1807.5	PTS1d: 16384			
EX: s2pul	PW: 3.8 usec	PD: 1.0 sec	NA: 4	LB: 0.0	WinNuts - \$wdh-6-30-1-3-h.fid		

199.206

141.235

136.781

133.027

128.561

128.484

128.379

127.991

126.090

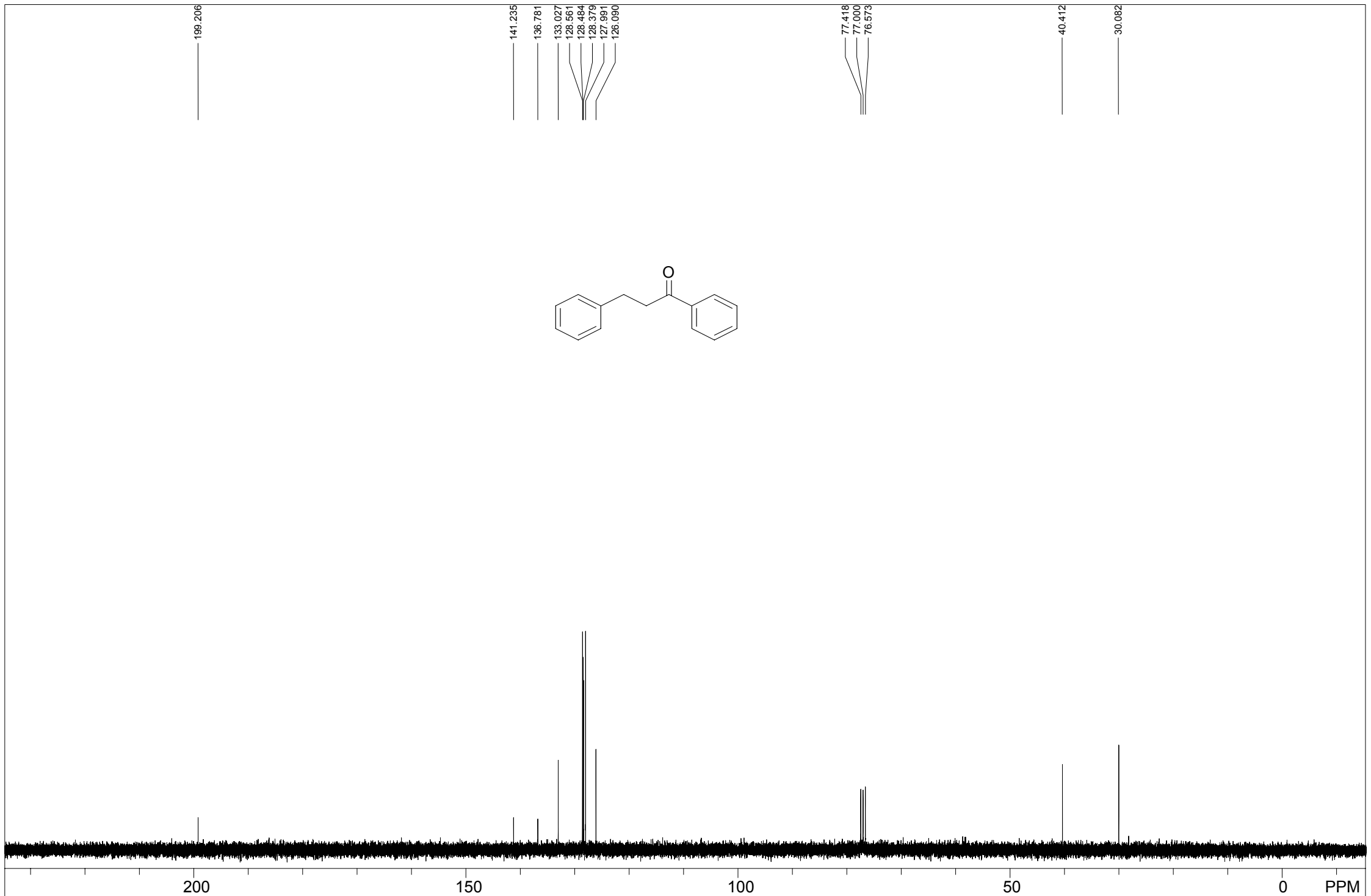
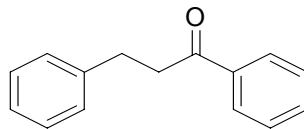
77.418

77.000

76.573

40.412

30.082



200

150

100

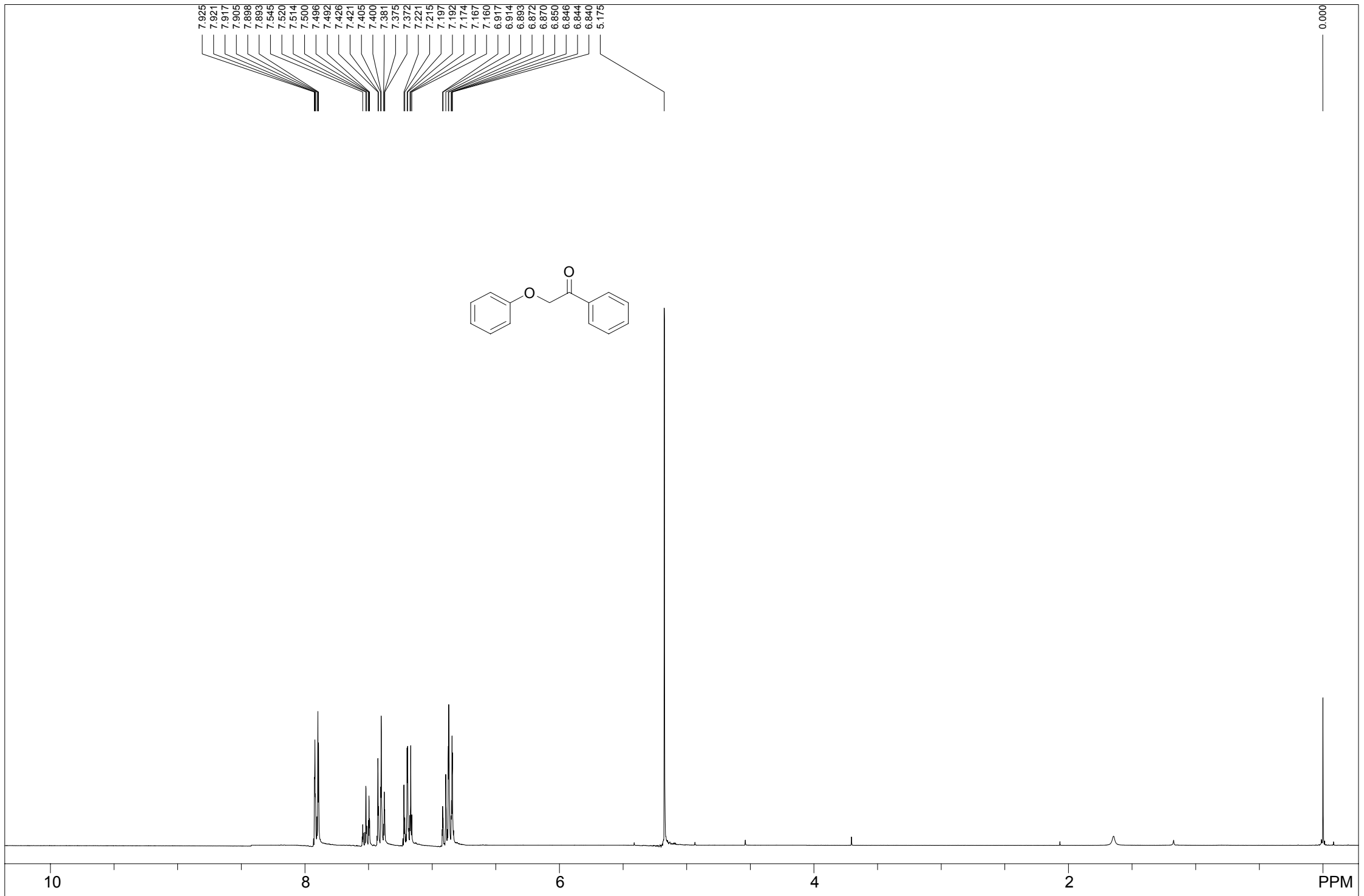
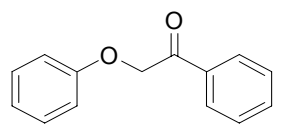
50

0

PPM

zgg-7-73c							USER: -- DATE: Jul 7 2003	
F1: 75.450	F2: 300.029	SW1: 18868	PD: 1.0 sec	OF1: 8277.9	LB: 0.0	PTS1d: 65536		
EX: s2pul		PW: 4.2 usec		NA: 44		WinNuts - \$wdh-6-30-1-3-c.fid		

7.925  
7.921  
7.917  
7.905  
7.898  
7.893  
7.845  
7.820  
7.814  
7.500  
7.496  
7.492  
7.426  
7.421  
7.405  
7.400  
7.381  
7.375  
7.372  
7.221  
7.215  
7.197  
7.192  
7.174  
7.167  
7.160  
7.100  
6.917  
6.914  
6.893  
6.872  
6.870  
6.850  
6.846  
6.844  
6.840  
5.175



txf-7-14				USER: -- DATE: Jul 7 2003			
F1: 300.030	F2: 75.450	SW1: 5495	OF1: 1781.6	PTS1d: 16384			
EX: s2pul	PW: 3.8 usec	PD: 1.0 sec	NA: 4	LB: 0.0	WinNuts - \$wdh-6-31-1-3-h.fid		

194.457

157.908

134.474

133.803

129.516

129.503

128.781

128.771

128.762

128.046

121.572

114.721

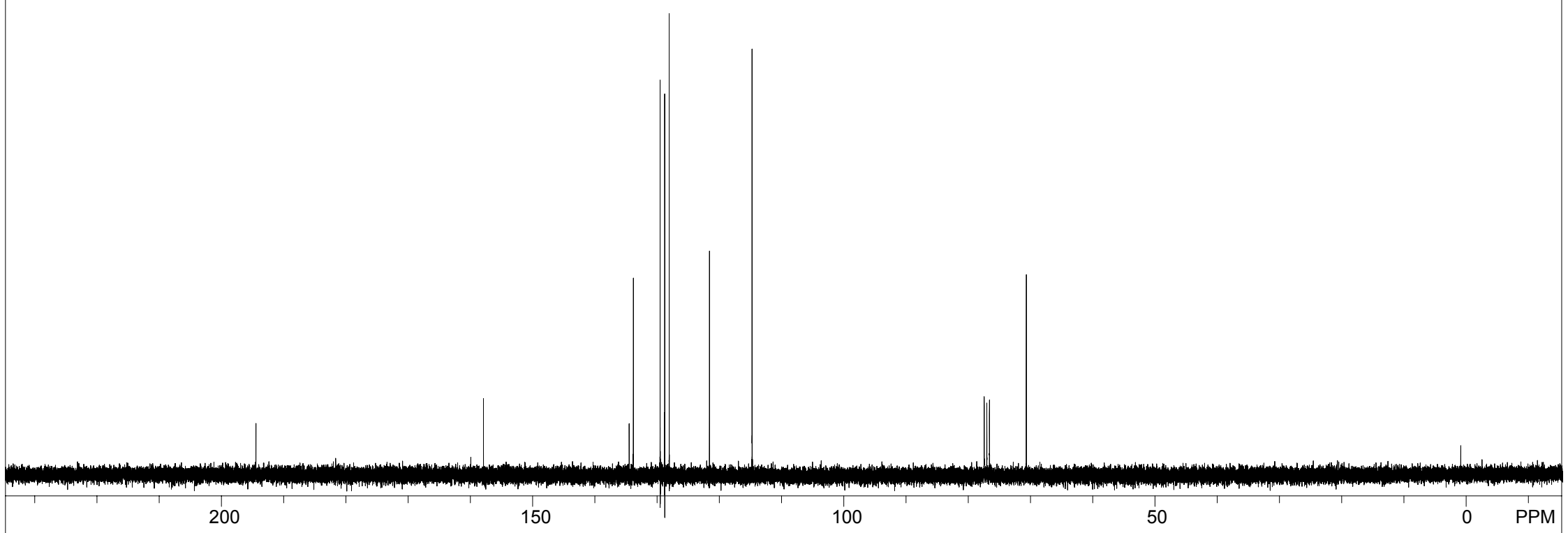
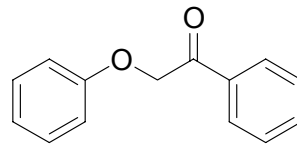
114.712

77.425

77.000

76.573

70.664



200

150

100

50

0

PPM

zgg-7-73c

USER: -- DATE: Jul 7 2003

F1: 75.450

F2: 300.029

SW1: 18868

OF1: 8275.1

PTS1d: 65536

EX: s2pul

PW: 4.2 usec

PD: 1.0 sec

NA: 16

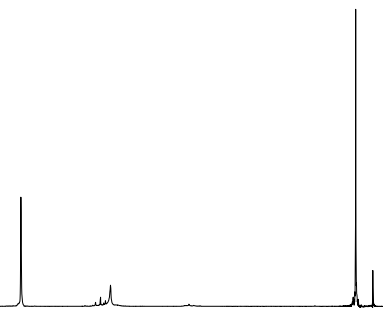
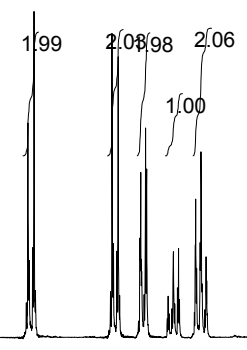
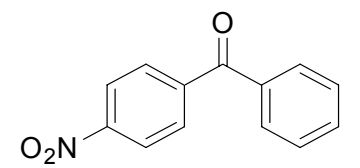
LB: 0.0

WinNuts - \$wdh-6-31-1-3-c.fid

8.368  
8.362  
8.359  
8.353  
8.337  
8.331  
8.324  
7.965  
7.958  
7.951  
7.935  
7.928  
7.921  
7.825  
7.820  
7.818  
7.815  
7.804  
7.797  
7.792  
7.689  
7.684  
7.672  
7.664  
7.658  
7.644  
7.640  
7.635  
7.563  
7.558  
7.553  
7.538  
7.532  
7.527  
7.513  
7.508  
7.505  
7.501  
7.272

1.683

0.083  
0.078  
-0.000



10 8 6 4 2 PPM

STANDARD 1H OBSERVE				USER: -- DATE: May 28 2003			
F1: 300.030	F2: 75.450	SW1: 4803	OF1: 1804.8	PTS1d: 16384			
EX: s2pul	PW: 3.7 usec	PD: 1.0 sec	NA: 6	LB: 0.0	WinNuts - \$wdh-6-33-1.fid		

194.771

142.806

136.193

133.440

130.656

130.054

128.647

128.632

128.627

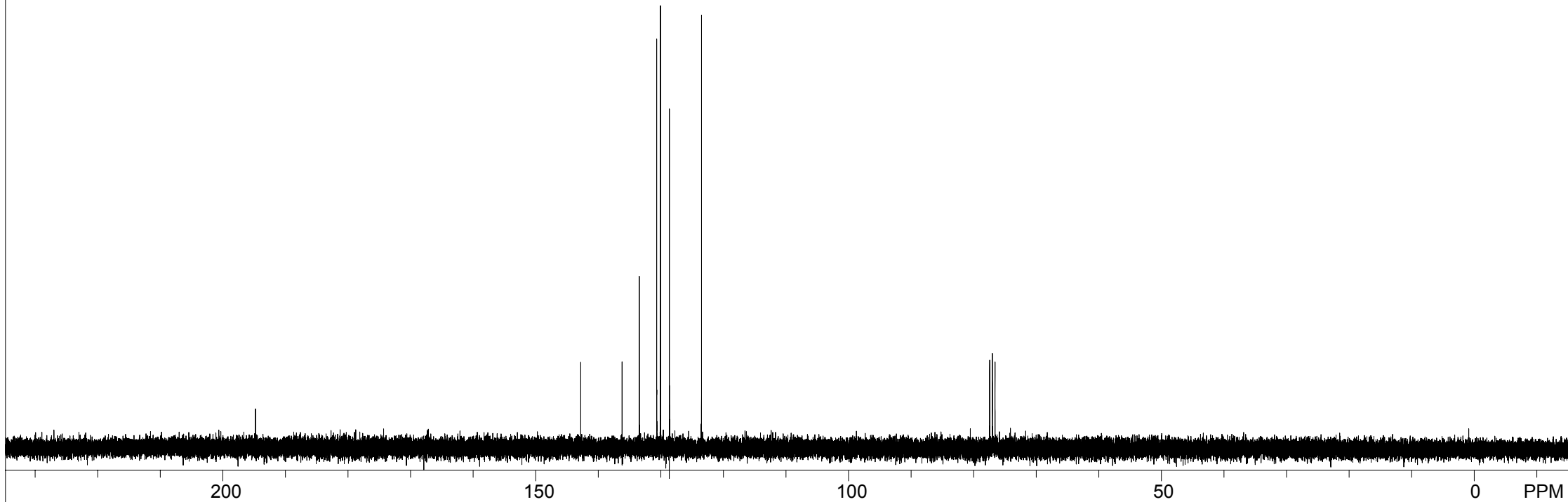
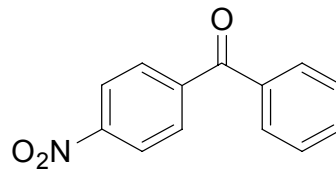
128.619

123.494

77.426

77.002

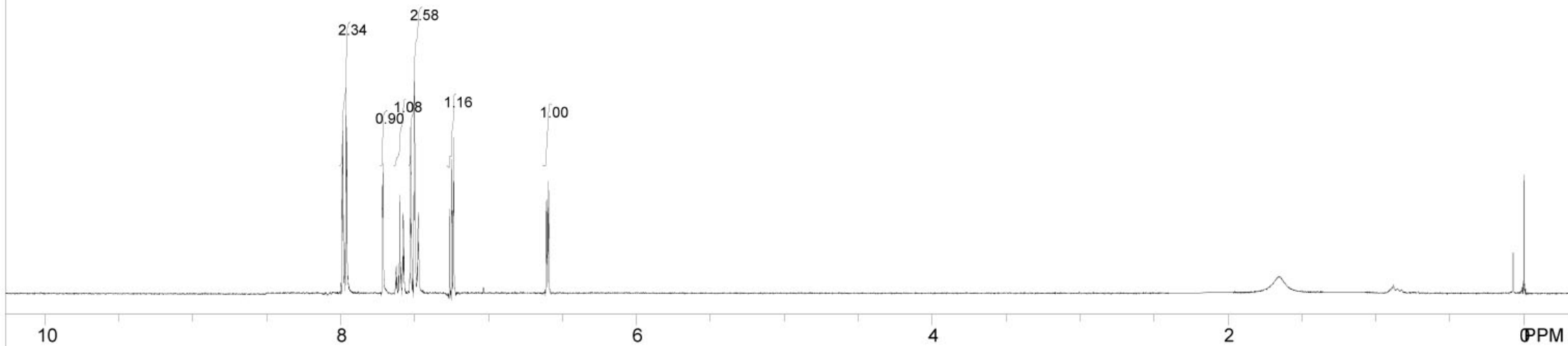
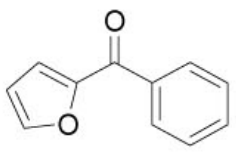
76.579

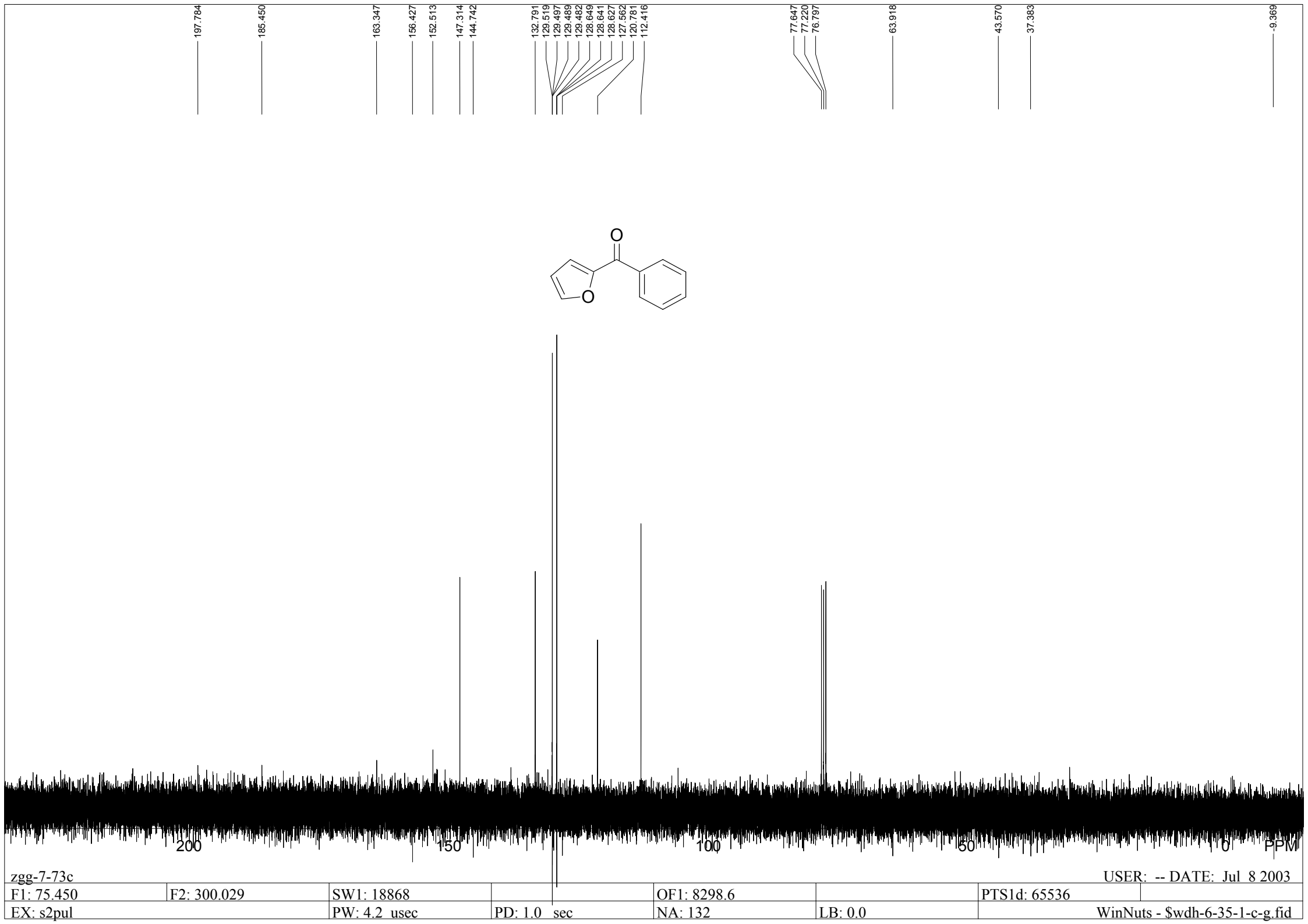


zgg-7-19c				USER: -- DATE: May 28 2003			
F1: 75.450	F2: 300.029	SW1: 18868		OF1: 8278.0		PTS1d: 65536	
EX: s2pul		PW: 4.2 usec	PD: 1.0 sec	NA: 28	LB: 0.0	WinNuts - \$wdh-6-33-1c.fid	

7.991  
7.990  
7.987  
7.985  
7.983  
7.964  
7.959  
7.957  
7.719  
7.716  
7.713  
7.600  
7.577  
7.574  
7.529  
7.527  
7.524  
7.521  
7.505  
7.501  
7.499  
7.475  
7.263  
7.250  
7.249  
7.246  
7.238  
7.236  
7.234  
6.610  
6.604  
6.600  
6.598  
6.594  
6.592

0.000





zgg-7-73c

USER: -- DATE: Jul 8 2003

F1: 75.450

F2: 300.029

SW1: 18868

OF1: 8298.6

PTS1d: 65536

EX: s2pul

PW: 4.2 usec

PD: 1.0 sec

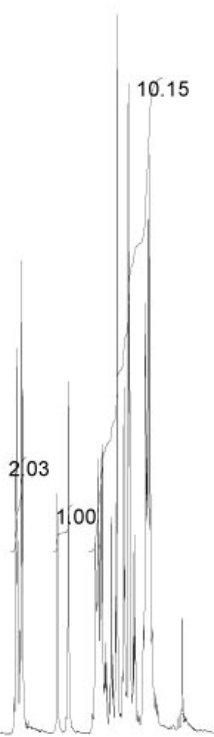
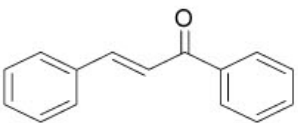
NA: 132

LB: 0.0

WinNuts - \$wdh-6-35-1-c-g.fid

8.040  
8.036  
8.030  
8.019  
8.012  
8.007  
7.843  
7.791  
7.664  
7.655  
7.651  
7.647  
7.639  
7.631  
7.589  
7.570  
7.565  
7.562  
7.529  
7.525  
7.509  
7.505  
7.482  
7.477  
7.438  
7.430  
7.427  
7.423  
7.417  
7.407  
7.397  
7.395  
7.255

1.682  
1.675



10 8 6 4 2 PPM

txf-7-14		USER: -- DATE: Jul 7 2003	
F1: 300.030	F2: 75.450	SW1: 5495	OF1: 1809.5
EX: s2pul	PW: 3.8 usec	PD: 1.0 sec	NA: 16
		PTS1d: 16384	LB: 0.0
		WinNuts - \$wdh-6-38-1-2-h.fid	

190.553

144.837

138.158

134.832

132.769

130.527

128.968

128.930

128.598

128.589

128.500

128.484

128.474

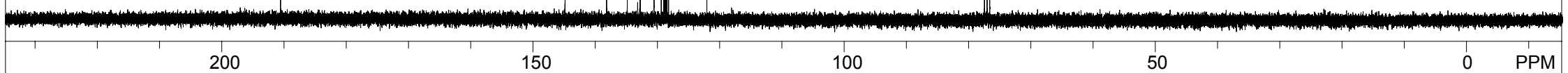
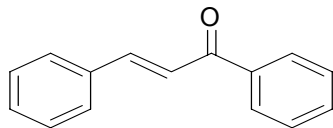
128.423

122.037

77.430

77.006

76.582



200

150

100

50

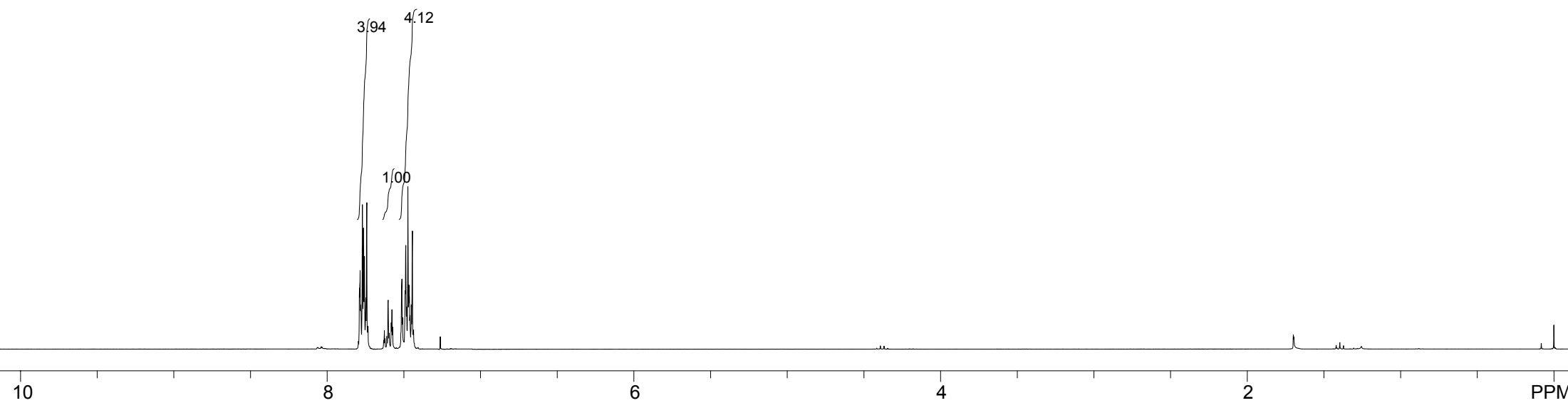
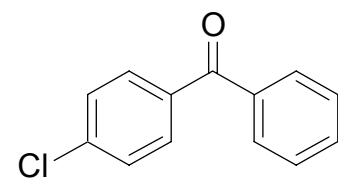
0

PPM

zgg-7-73c				USER: -- DATE: Jul 7 2003			
F1: 75.450	F2: 300.029	SW1: 18868		OF1: 8278.8		PTS1d: 65536	
EX: s2pul		PW: 4.2 usec	PD: 1.0 sec	NA: 60	LB: 0.0	WinNuts - \$wdh-6-38-1-2-c.fid	

7.789  
7.785  
7.781  
7.777  
7.770  
7.762  
7.756  
7.748  
7.741  
7.734  
7.734  
7.627  
7.610  
7.602  
7.594  
7.582  
7.577  
7.573  
7.512  
7.508  
7.491  
7.487  
7.481  
7.473  
7.467  
7.464  
7.459  
7.451  
7.444  
7.436  
7.262

1.700  
1.695  
-0.000

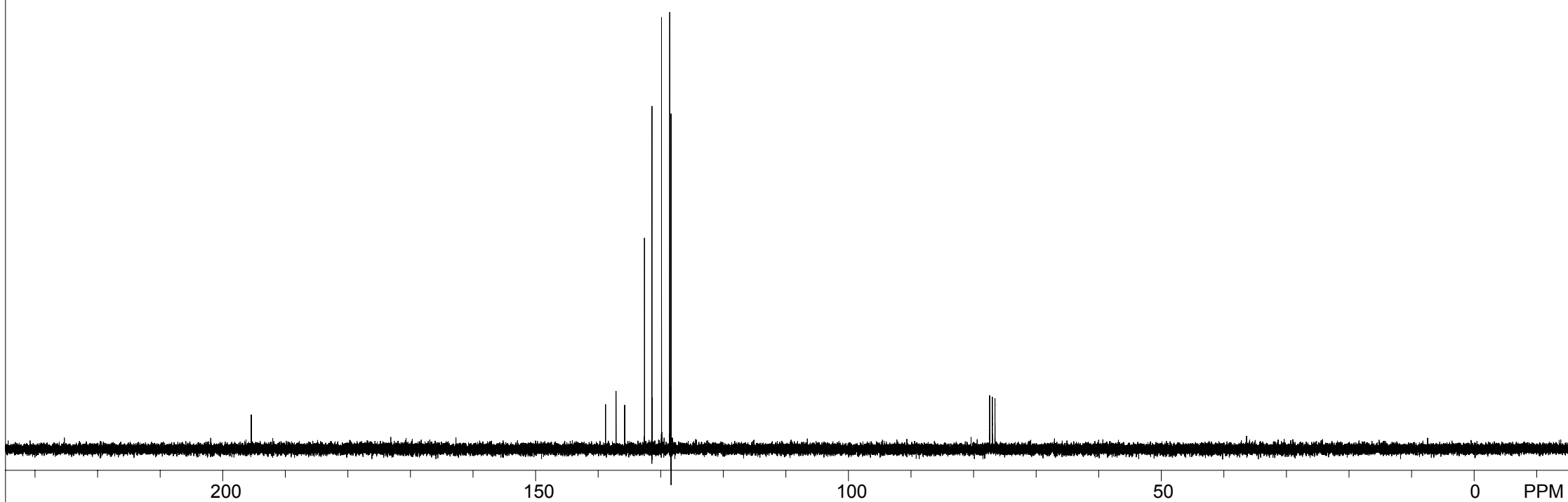
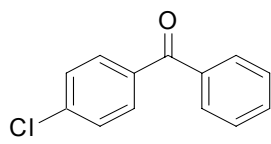


wf-6-19-3						USER: -- DATE: Jun 3 2003	
F1: 300.030	F2: 75.450	SW1: 4803	PD: 1.0 sec	OF1: 1801.9	PTS1d: 16384		
EX: s2pul	PW: 3.7 usec	NA: 8	LB: 0.0	WinNuts - \$wdh-6-39-1.fid			

195.442

138.825  
137.144  
135.772  
132.599  
131.429  
131.421  
131.410  
131.400  
129.874  
128.573  
128.541  
128.336  
128.330

77.419  
76.995  
76.572

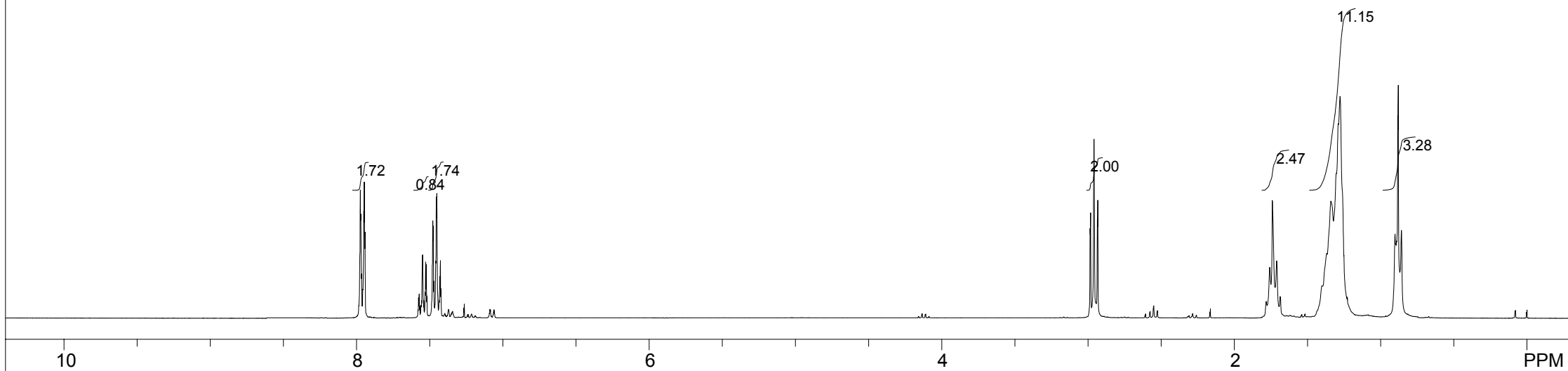
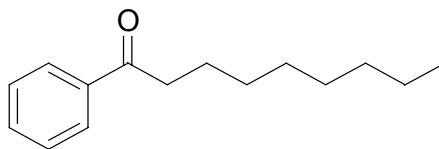


zgg-7-26c		USER: -- DATE: Jun 3 2003					
F1: 75.450	F2: 300.029	SW1: 18868	OF1: 8277.1	PTS1d: 65536			
EX: s2pul	PW: 4.2 usec	PD: 1.0 sec	NA: 60	LB: 0.0	WinNuts - \$wdh-6-39-1c.fid		

7.974  
7.971  
7.965  
7.957  
7.950  
7.947  
7.941  
7.576  
7.572  
7.548  
7.531  
7.527  
7.523  
7.517  
7.478  
7.476  
7.471  
7.458  
7.454  
7.451  
7.430  
7.426  
7.423

2.985  
2.982  
2.959  
2.936  
2.933

1.758  
1.739  
1.709  
1.686  
1.401  
1.368  
1.340  
1.303  
1.290  
1.277  
1.250  
1.231  
1.227  
0.902  
0.891  
0.882  
0.879  
0.858



txf-7-14				USER: -- DATE: Jul 7 2003			
F1: 300.030	F2: 75.450	SW1: 5495		OF1: 1812.9		PTS1d: 16384	
EX: s2pul		PW: 3.8 usec	PD: 1.0 sec	NA: 8	LB: 0.0	WinNuts - \$wdh-6-49-1-h.fid	

200.561

137.027

132.803

128.481

128.000

77.423

77.000

76.576

38.569

31.801

29.407

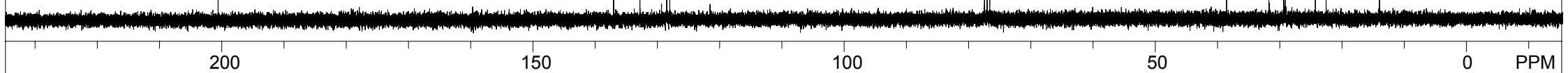
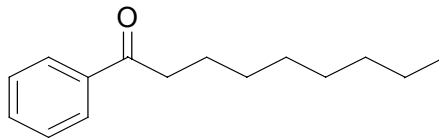
29.343

29.138

24.342

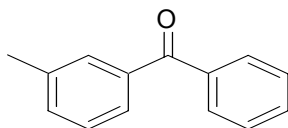
22.619

14.061



zgg-7-73c		F1: 75.450		F2: 300.029		SW1: 18868		OF1: 8278.7		PTS1d: 65536		USER: -- DATE: Jul 7 2003	
EX: s2pul		PW: 4.2 usec		PD: 1.0 sec		NA: 20		LB: 0.0		WinNuts - \$wdh-6-49-1-c.fid			

7.816  
7.812  
7.807  
7.795  
7.788  
7.783  
7.629  
7.627  
7.610  
7.593  
7.586  
7.578  
7.565  
7.560  
7.556  
7.502  
7.497  
7.481  
7.476  
7.458  
7.452  
7.449  
7.393  
7.388  
7.378  
7.355  
7.329  
7.256



2.418

1.660

-0.000

1.83  
2.74  
1.96  
1.85

3.00

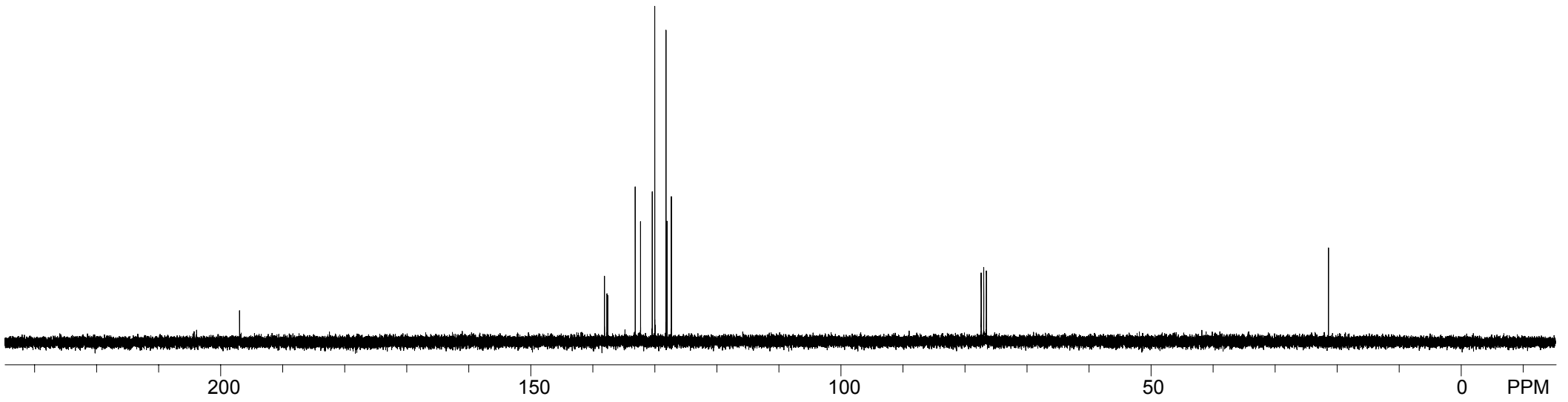
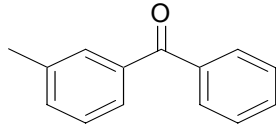
10 8 6 4 2 PPM

196.947

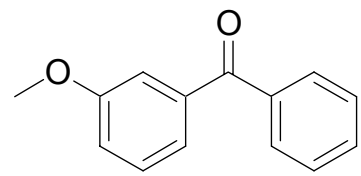
138.117  
137.704  
137.579  
133.157  
132.292  
130.417  
130.001  
128.196  
128.045  
127.325

77.422  
77.000  
76.575

21.330



wdh-6-81-1



7.823  
7.818  
7.816  
7.814  
7.803  
7.796  
7.791  
7.585  
7.565  
7.559  
7.502  
7.498  
7.495  
7.478  
7.473  
7.451  
7.446  
7.379  
7.378  
7.369  
7.365  
7.360  
7.353  
7.350  
7.345  
7.340  
7.150  
7.144  
7.141  
7.124  
7.118  
7.116  
7.110

1.69  
0.87  
1.81  
2.70  
0.89

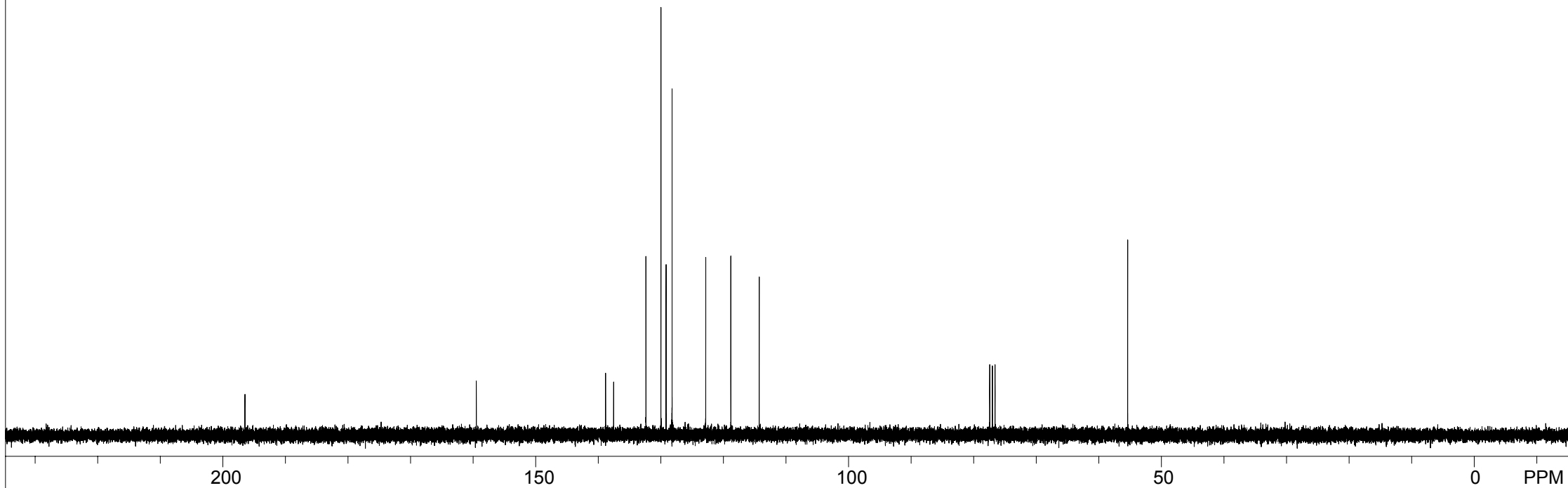
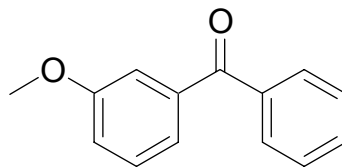
3.853  
1.709  
0.000

300

10 8 6 4 2 0PPM

gmj-9-70-2				USER: -- DATE: Aug 26 2003			
F1: 300.030	F2: 75.450	SW1: 4803		OF1: 1800.8		PTS1d: 16384	
EX: s2pul		PW: 3.7 usec	PD: 1.0 sec	NA: 22	LB: 0.0	WinNuts - \$wdh-6-81-1.fid	

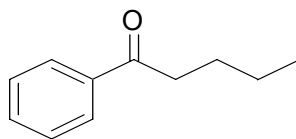
196.470  
159.509  
138.831  
137.549  
132.380  
129.985  
129.159  
128.204  
122.813  
118.805  
114.268  
77.425  
77.000  
76.572  
55.414



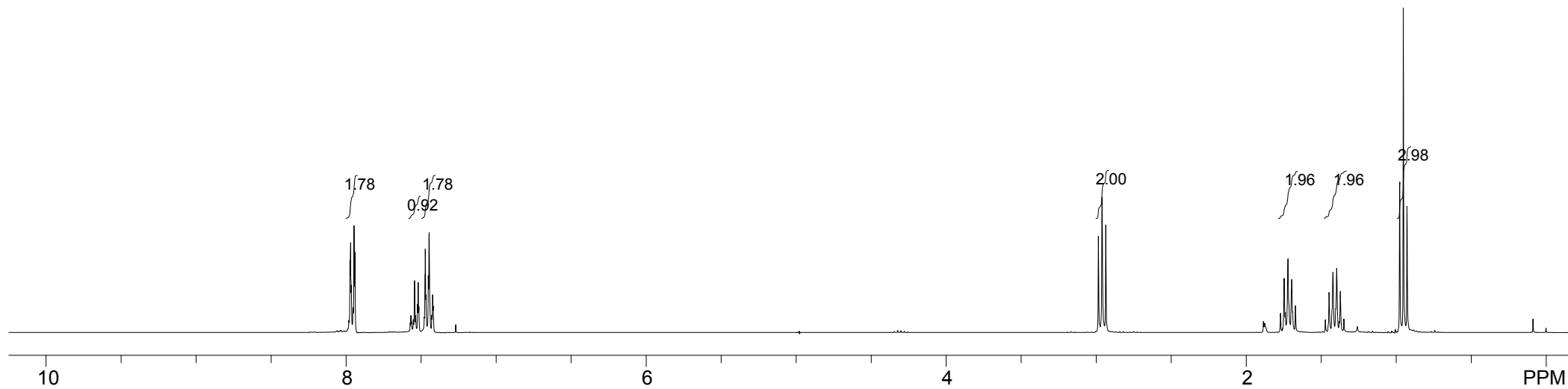
7.974  
7.969  
7.965  
7.952  
7.947  
7.941  
7.567  
7.543  
7.535  
7.524  
7.519  
7.514  
7.478  
7.472  
7.467  
7.451  
7.445  
7.428  
7.422  
7.419

2.985  
2.961  
2.936

1.770  
1.747  
1.739  
1.721  
1.696  
1.689  
1.671  
1.447  
1.422  
1.402  
1.397  
1.372  
0.975  
0.952  
0.928



**3t**



200.481

136.975

132.765

128.444

127.946

77.421

77.000

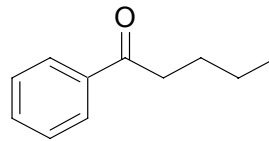
76.576

38.228

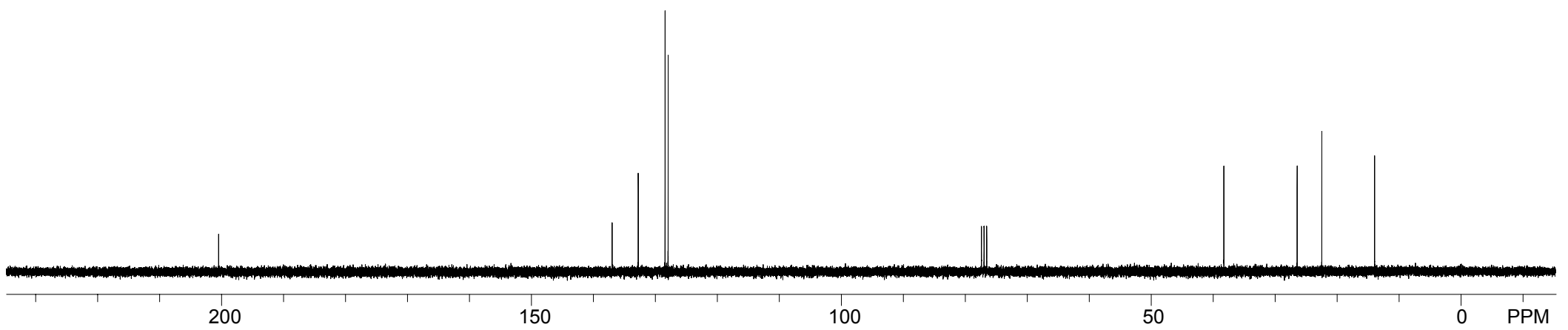
26.384

22.399

13.866



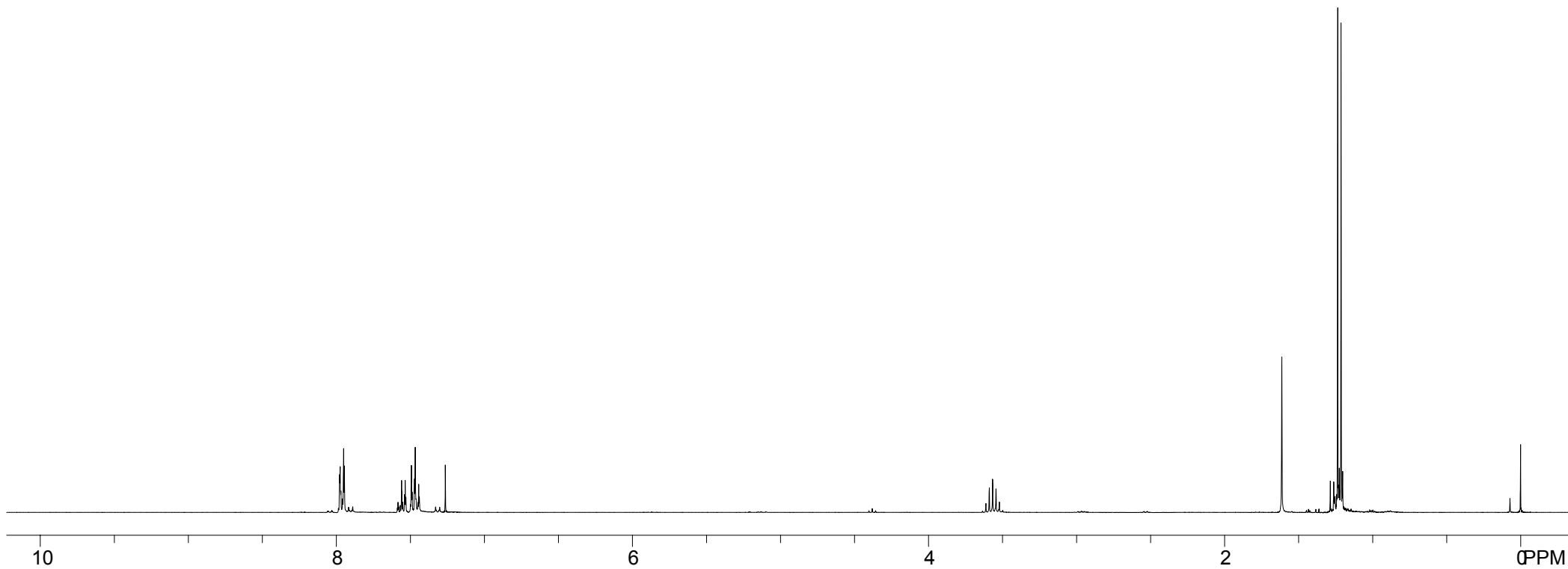
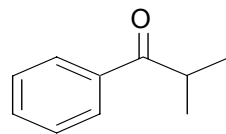
wdh-6-73-1



7.978  
7.974  
7.969  
7.957  
7.951  
7.946  
7.983  
7.559  
7.552  
7.540  
7.535  
7.530  
7.494  
7.493  
7.488  
7.472  
7.467  
7.462  
7.449  
7.444  
7.439  
7.264

3.612  
3.589  
3.566  
3.542  
3.520

1.285  
1.262  
1.612  
1.252  
1.243  
1.241  
1.235  
1.231  
1.228  
1.226  
1.224  
1.221  
1.219  
1.213  
1.207  
1.202  
0.071  
0.000



204.539

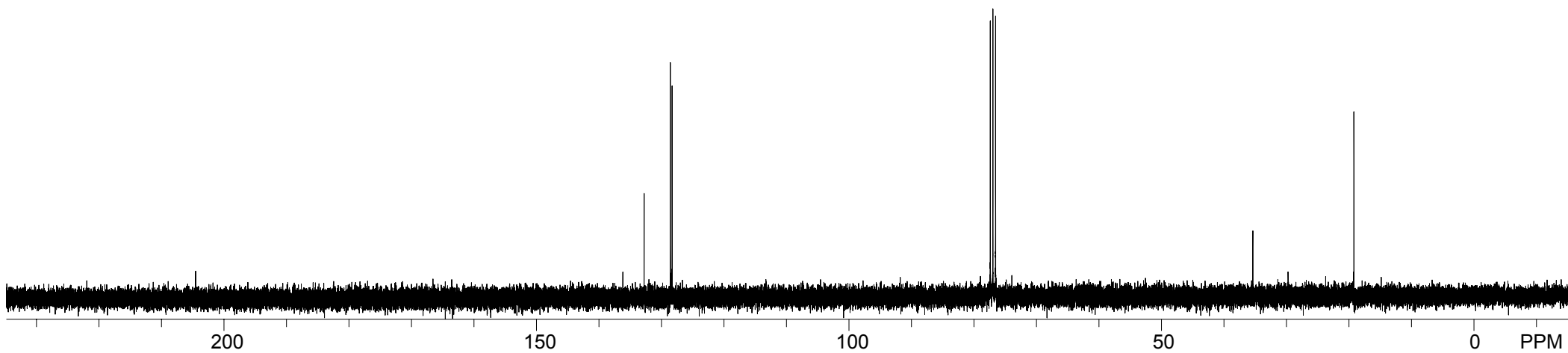
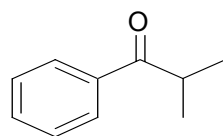
136.177  
132.773  
128.562  
128.302  
128.293

77.420  
77.387  
77.000  
76.577

35.341

29.692

19.138

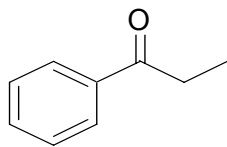


7.990  
7.983  
7.979  
7.975  
7.963  
7.956  
7.951  
7.577  
7.562  
7.553  
7.546  
7.534  
7.528  
7.524  
7.487  
7.481  
7.475  
7.460  
7.455  
7.436  
7.432  
7.428  
7.262

3.045  
3.021  
2.996  
2.973

1.680  
1.251  
1.237  
1.235  
1.228  
1.204

-0.003



1.80

0.90

1.84

2.02

3.00

10

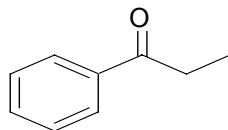
8

6

4

2

PPM



200.834

136.859

132.841

128.527

128.513

127.932

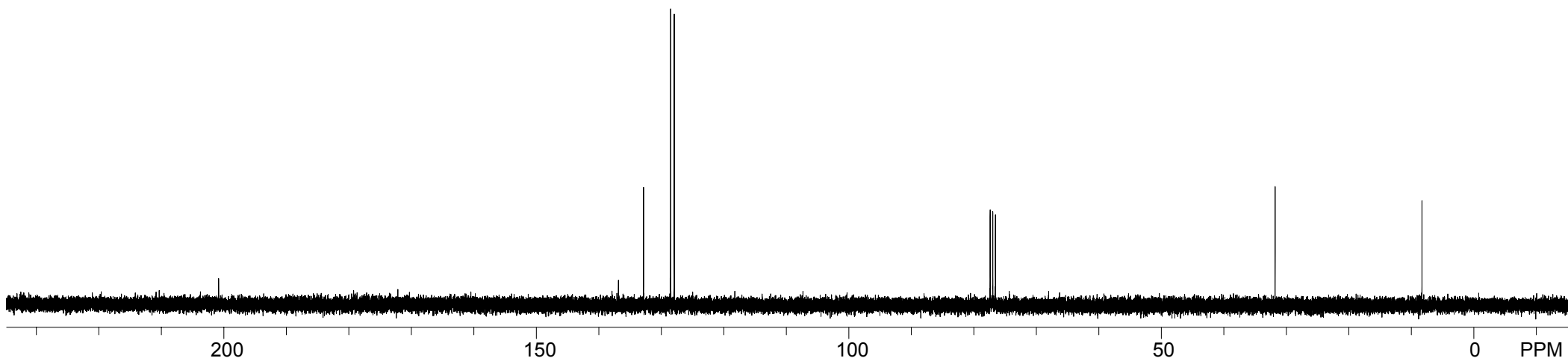
77.421

77.000

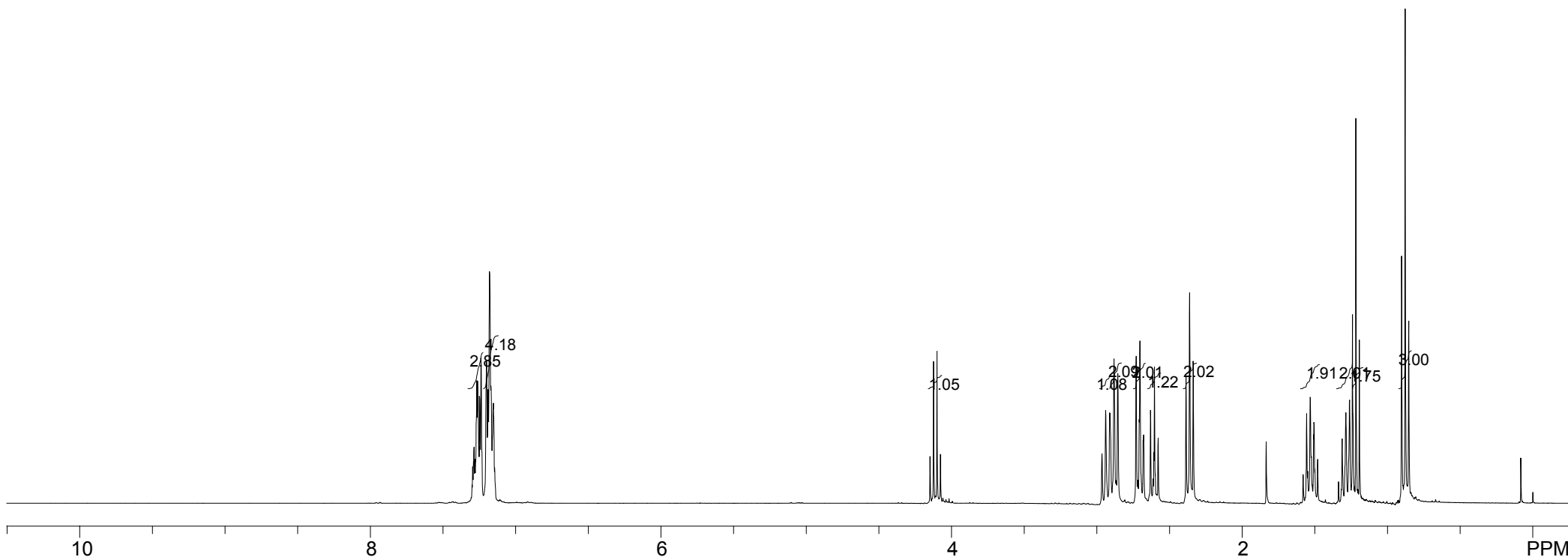
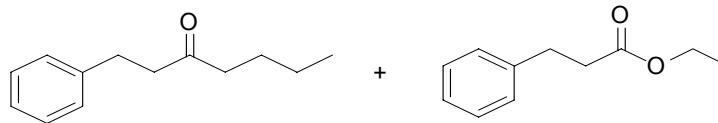
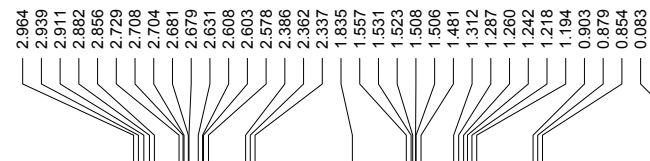
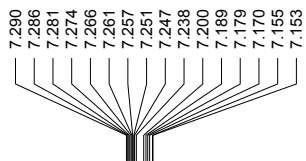
76.573

31.755

8.211



wdh-6-97-1



210.159

172.755

141.066  
140.455

128.337  
128.205  
128.189  
128.175  
126.095  
125.928

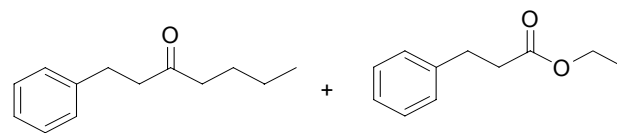
77.425  
77.000  
76.574

60.266

44.107  
42.625

35.825  
30.850  
29.893  
29.671  
25.764  
22.200

14.086  
13.742



wdh-6-97-1-C

