

Supporting Information

Visible-Light Promoted De Mayo Reaction by Zirconium Catalysis

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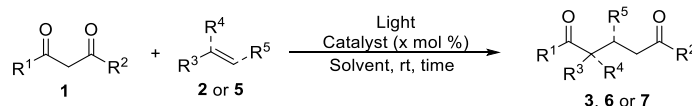
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Experimental Procedures

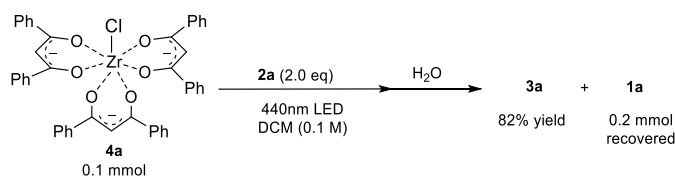
General information: Commercial reagents were purified prior to use following the guidelines of Perrin and Armarego.¹ All solvents were purified according to the method of Grubbs.² Nuclear magnetic resonance (NMR) spectra were recorded using Bruker AV-400 and Bruker AV-500 spectrometers. ¹H and ¹³C NMR spectra were measured on a NMR instrument (400 or 500 MHz for ¹H NMR, 101 or 126 MHz for ¹³C NMR). Tetramethyl silane (TMS) served as the internal standard for ¹H NMR, and CDCl₃ served as the internal standard for ¹³C NMR. HRMS was recorded on a commercial instrument (ESI and APCI Source). UV-Visible spectra were recorded using a PerkinElmer Lambda 950 UV/VIS/NIR spectrophotometer.

Materials: The 1,3-dicarbonyl compounds **1a**, **1g**, **1k** and alkenes **2a-2l**, **2o**, **2r**, **5c-5e**, **5h-5k** were commercially available. The alkenes **2m**, **2n**, **2p**, **2t**, **5a**, **5b**, **5f**, **5g**, **5l-5p** were prepared by Wittig reaction from corresponding ketones.³ The alkene **2q** was prepared from acetophenone.⁴ The alkene **2s** was prepared from **2t**.⁵ The 1,3-diketones **1b-1f**, **1h-1j** were prepared by Claisen condensation of corresponding substituted hyponone and esters.⁶ The β -keto amides **1i-1n** were prepared from corresponding substituted β -keto esters.⁷

Experimental section:



General procedure: An oven-dried 10 mL Schlenk tube was charged with **1** (0.1 mmol, 1.0 equiv) and catalyst. The tube was purged with a stream of nitrogen, then substrate **2** or **5** was dissolved in dry solvent and added into the tube *via* syringe. The resulted mixture was degassed three times, and placed approximately 1 cm to 10W 440nm LED and stirred for 6 hours (or given time in Table 2) at room temperature. The reaction solution was concentrated and the residue was purified directly by silica gel column to give the target products **3/6/7** as major product.



Stoichiometric experiment: An oven-dried 10 mL Schlenk tube was charged with **4a** (0.1 mmol, 1.0 equiv) and purged with a stream of nitrogen. Then substrate **2a** was dissolved in dry solvent and added into the tube *via* syringe. The resultant mixture was degassed three times, and placed approximately 1 cm to 10W 440nm LED and stirred at room temperature for 6 h. Then 0.1 mL of H₂O was added, and stirred for another 0.5 hour at room temperature. The reaction solution was concentrated and the residue was purified directly by silica gel column to give the target products **3a** as major product.

UV-Visible spectra experiments: UV-Visible spectra were recorded in DCM using a 1 cm path quartz cuvette contain corresponding compounds under the corresponding concentration with PerkinElmer Lambda 950 UV/VIS/NIR spectrophotometer at room temperature. All the solutions are freshly prepared in degassed DCM for UV analysis.

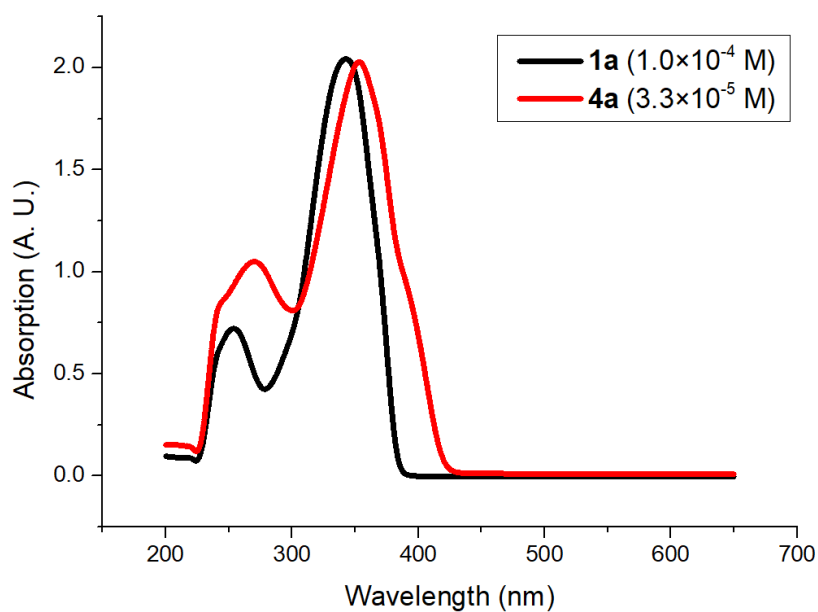


Figure S1 (Spectra in Scheme 1)^a UV-Visible spectra of **1a** and **4a** (low concentration)

^aOptical absorption spectra of **1a** and **4a**, recorded in DCM in 1 cm path quartz cuvettes, [**1a**] = 1.0×10^{-4} mol/L, [**4a**] = 3.3×10^{-5} mol/L.

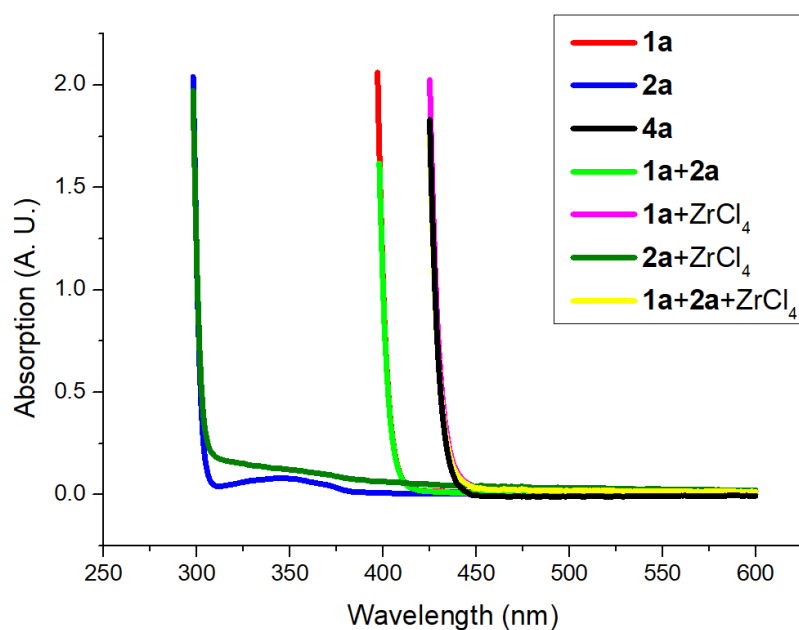
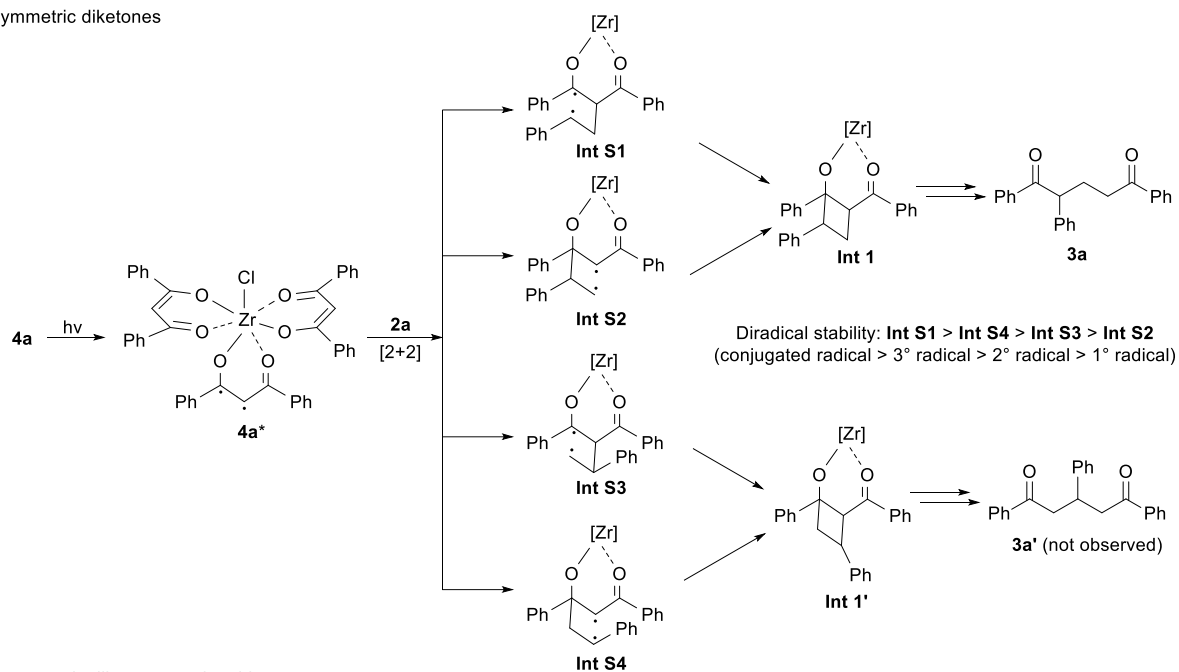


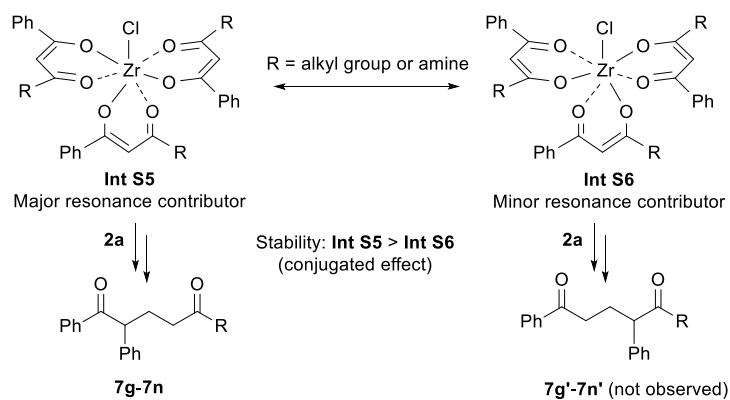
Figure S2.^a UV-Visible spectra of reaction system and **4a** (high concentration)

^aOptical absorption spectra of **1a**, **2a** and **4a**, recorded in DCM in 1 cm path quartz cuvettes, [**1a**] = 0.1 mol/L, [**2a**] = 0.2 mol/L, [**ZrCl₄**] = 2.0×10^{-3} mol/L, [**4a**] = 2.0×10^{-3} mol/L.

A) Symmetric diketones

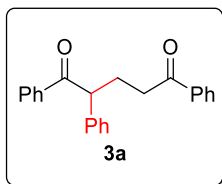


B) Asymmetric diketones and amides

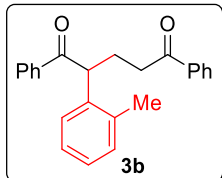


Scheme S1 Plausible explanation of regioselectivity

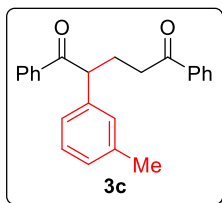
Products data



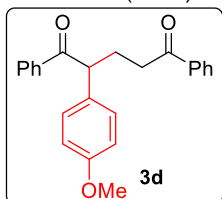
3a: 95% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.01 – 7.97 (m, 2H), 7.94 – 7.88 (m, 2H), 7.53 (d, $J = 7.4$ Hz, 1H), 7.50 – 7.36 (m, 5H), 7.35 – 7.25 (m, 4H), 7.24 – 7.19 (m, 1H), 4.79 (t, $J = 7.3$ Hz, 1H), 2.98 (qt, $J = 17.2, 6.9$ Hz, 2H), 2.60 (dq, $J = 14.3, 7.2$ Hz, 1H), 2.39 – 2.21 (m, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 199.85, 199.57, 139.11, 136.77, 136.59, 132.99, 132.88, 129.00, 128.73, 128.51, 128.47, 128.28, 127.98, 127.18, 52.40, 35.93, 28.26. IR (thin film, cm^{-1}) 3060, 3026, 2933, 1681, 1597, 1580, 1492, 447, 1409, 1367, 1275, 1222, 1178, 1001, 980, 751, 734, 698, 568, 518. HRMS (APCI) calcd for $\text{C}_{23}\text{H}_{21}\text{O}_2$: 329.1539, found 325.1539.



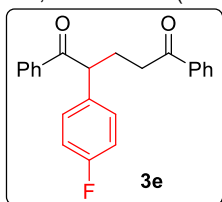
3b: 81% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.93 (dd, $J = 8.3, 1.4$ Hz, 2H), 7.85 (dd, $J = 8.4, 1.3$ Hz, 2H), 7.57 – 7.51 (m, 1H), 7.43 (dd, $J = 8.6, 7.1$ Hz, 3H), 7.35 (dd, $J = 8.4, 7.0$ Hz, 2H), 7.20 (d, $J = 6.9$ Hz, 1H), 7.15 – 7.06 (m, 3H), 4.93 (dd, $J = 8.8, 5.3$ Hz, 1H), 3.12 (dt, $J = 17.3, 6.7$ Hz, 1H), 3.01 (dt, $J = 17.3, 7.0$ Hz, 1H), 2.55 (m, 4H), 2.18 (dtd, $J = 14.1, 7.1, 5.3$ Hz, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 200.33, 200.07, 137.96, 136.95, 136.82, 135.38, 133.02, 132.80, 131.12, 128.55, 128.50, 128.43, 128.03, 127.28, 127.10, 126.63, 48.69, 36.26, 27.63, 19.76. IR (thin film, cm^{-1}) 3345, 3062, 3025, 2962, 2930, 1722, 1683, 1597, 1580, 1490, 1448, 1409, 1365, 1261, 1222, 1180, 1100, 1027, 799, 750, 731, 690, 600, 553, 454. HRMS (APCI) calcd for $\text{C}_{24}\text{H}_{23}\text{O}_2$: 343.1693, found 343.1694.



3c: 91% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.02 – 7.95 (m, 2H), 7.94 – 7.86 (m, 2H), 7.58 – 7.35 (m, 6H), 7.17 (d, $J = 7.8$ Hz, 1H), 7.10 (d, $J = 5.9$ Hz, 2H), 7.02 (d, $J = 7.5$ Hz, 1H), 4.73 (t, $J = 7.3$ Hz, 1H), 3.02 (dt, $J = 17.1, 7.2$ Hz, 1H), 2.92 (dt, $J = 17.1, 6.7$ Hz, 1H), 2.58 (dd, $J = 14.1, 7.1$ Hz, 1H), 2.29 (m, 4H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 200.00, 199.69, 139.08, 138.75, 136.91, 136.75, 133.03, 132.90, 128.90, 128.85, 128.81, 128.57, 128.52, 128.06, 128.05, 125.52, 52.45, 36.06, 28.39, 21.42. IR (thin film, cm^{-1}) 3059, 3026, 2930, 2861, 1681, 1597, 1580, 1489, 1448, 1366, 1261, 1213, 1180, 1094, 1074, 1057, 1002, 982, 796, 748, 126, 692. HRMS (APCI) calcd for $\text{C}_{24}\text{H}_{23}\text{O}_2$: 343.1693, found 343.1695.

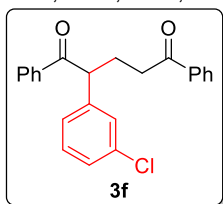


3d: 77% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.02 – 7.96 (m, 2H), 7.94 – 7.86 (m, 2H), 7.56 – 7.50 (m, 1H), 7.42 (dt, $J = 18.7, 7.7$ Hz, 5H), 7.22 (d, $J = 8.4$ Hz, 2H), 6.96 – 6.74 (m, 2H), 4.73 (t, $J = 7.4$ Hz, 1H), 3.74 (s, 3H), 3.16 – 2.85 (m, 2H), 2.56 (dd, $J = 14.0, 7.1$ Hz, 1H), 2.27 (dt, $J = 14.0, 7.0$ Hz, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 199.94, 199.79, 158.67, 136.78, 136.61, 132.98, 132.81, 131.00, 129.33, 128.70, 128.50, 128.45, 127.98, 114.40, 55.13, 51.48, 35.90, 28.22. IR (thin film, cm^{-1}) 3343, 3060, 3002, 2955, 2933, 2836, 1682, 1608, 1597, 1581, 1511, 1449, 1367, 1303, 1178, 1111, 1075, 1034, 11001, 981, 828, 750, 733, 690, 563, 532. HRMS (APCI) calcd for $\text{C}_{24}\text{H}_{23}\text{O}_3$: 359.1642, found 359.1643.

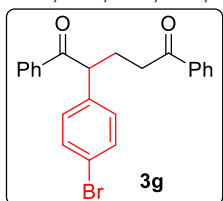


3e: 88% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.03 – 7.94 (m, 2H), 7.95 – 7.84 (m, 2H), 7.59 – 7.50 (m, 1H), 7.50 – 7.46 (m, 1H), 7.45 – 7.36 (m, 4H), 7.28 (ddd, $J = 9.7, 5.9, 3.2$ Hz, 2H), 6.98 (t, $J = 8.6$ Hz, 2H), 4.80 (t, $J = 7.4$ Hz, 1H), 3.16 – 2.81 (m, 2H), 2.59 (dd, $J = 14.1, 7.1$ Hz, 1H), 2.27 (dt, $J = 14.0, 6.9$ Hz, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 198.27, 197.98, 166.93 (d, $J = 17.3$ Hz), 164.40 (d, $J = 17.6$ Hz), 138.97, 133.23 (d, $J = 3.0$ Hz), 132.96 (d, $J = 2.9$ Hz), 131.46 (d, $J = 9.3$ Hz), 130.68 (d, $J = 9.3$ Hz),

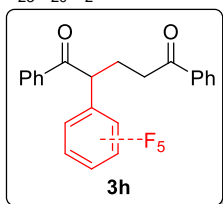
129.19, 128.26, 127.41, 115.78 (d, $J = 2.3$ Hz), 115.56 (d, $J = 2.2$ Hz), 52.44, 35.82, 28.26. ^{19}F NMR (377 MHz, Chloroform- d) δ -115.15. IR (thin film, cm^{-1}) 3347, 3064, 2932, 2857, 1967, 1898, 1683, 1597, 1580, 1507, 1448, 1417, 1367, 1277, 1224, 1179, 1158, 1098, 1074, 1001, 979, 960, 832, 752, 731, 690, 556, 516. HRMS (APCI) calcd for $\text{C}_{23}\text{H}_{20}\text{O}_2\text{F}$: 347.1442, found 347.1443.



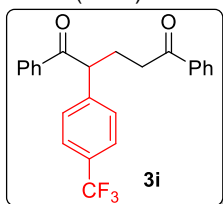
3f: >99% yield. ^1H NMR (400 MHz, Chloroform- d) δ 8.02 – 7.95 (m, 2H), 7.94 – 7.87 (m, 2H), 7.51 (dd, $J = 15.3, 7.4$ Hz, 2H), 7.41 (dt, $J = 10.5, 7.6$ Hz, 4H), 7.35 (d, $J = 2.3$ Hz, 1H), 7.21 (d, $J = 3.8$ Hz, 3H), 4.80 (t, $J = 7.3$ Hz, 1H), 2.98 (qt, $J = 17.4, 6.8$ Hz, 2H), 2.59 (dq, $J = 14.3, 7.1$ Hz, 1H), 2.27 (dq, $J = 13.9, 6.9$ Hz, 1H). ^{13}C NMR (101 MHz, Chloroform- d) δ 199.56, 198.98, 141.08, 136.63, 136.27, 134.73, 133.15, 133.08, 130.19, 128.68, 128.58, 128.53, 128.28, 127.92, 127.46, 126.53, 51.75, 35.72, 28.19. IR (thin film, cm^{-1}) 3345, 3060, 2959, 2932, 2872, 1967, 1812, 1723, 1683, 1596, 1580, 1473, 1448, 1431, 1367, 1276, 1222, 1180, 1124, 1080, 1001, 980, 884, 842, 783, 755, 718, 689, 595, 569, 548, 491. HRMS (APCI) calcd for $\text{C}_{23}\text{H}_{20}\text{O}_2\text{Cl}$: 363.1146, found 363.1148.



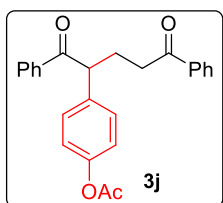
3g: 97% yield. ^1H NMR (400 MHz, Chloroform- d) δ 7.97 (d, $J = 7.7$ Hz, 2H), 7.90 (d, $J = 7.8$ Hz, 2H), 7.58 – 7.46 (m, 2H), 7.40 (dt, $J = 12.7, 7.8$ Hz, 6H), 7.20 (d, $J = 8.2$ Hz, 2H), 4.79 (t, $J = 7.4$ Hz, 1H), 2.97 (dt, $J = 10.2, 6.9$ Hz, 2H), 2.59 (dd, $J = 14.1, 7.1$ Hz, 1H), 2.34 – 2.19 (m, 1H). ^{13}C NMR (101 MHz, Chloroform- d) δ 199.54, 199.13, 138.07, 136.60, 136.25, 133.08, 133.05, 132.05, 129.97, 128.63, 128.53, 128.50, 127.89, 121.18, 51.52, 35.66, 28.03. IR (thin film, cm^{-1}) 3346, 3060, 2959, 2932, 1967, 1773, 1683, 1596, 1580, 1487, 1448, 1405, 1367, 1275, 1222, 1199, 1178, 1074, 1011, 1001, 978, 810, 754, 703, 689, 530. HRMS (APCI) calcd for $\text{C}_{23}\text{H}_{20}\text{O}_2\text{Br}$: 407.0641, found 407.0643.



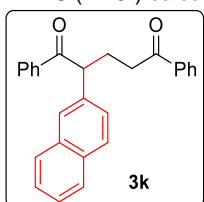
3h: 88% yield. ^1H NMR (400 MHz, Chloroform- d) δ 7.92 (t, $J = 8.7$ Hz, 4H), 7.61 – 7.50 (m, 2H), 7.44 (q, $J = 8.2$ Hz, 4H), 5.04 (t, $J = 7.3$ Hz, 1H), 3.09 (t, $J = 6.8$ Hz, 2H), 2.78 (dq, $J = 14.0, 7.0$ Hz, 1H), 2.30 (dq, $J = 14.0, 6.9$ Hz, 1H). ^{13}C NMR (101 MHz, Chloroform- d) δ 198.86, 196.05, 136.53, 135.61, 133.42, 133.29, 128.82, 128.64, 128.24, 127.91, 42.63, 35.65, 24.40. ^{19}F NMR (377 MHz, Chloroform- d) δ -140.83 – -140.98 (m), -154.31 (t, $J = 20.9$ Hz), -160.87 (td, $J = 22.1, 7.9$ Hz). IR (thin film, cm^{-1}) 3359, 3062, 2936, 2641, 2422, 1967, 1688, 1655, 1597, 1581, 1522, 1501, 1149, 1273, 1221, 1182, 1124, 1001, 970, 948, 864, 847, 723, 700, 661. HRMS (APCI) calcd for $\text{C}_{23}\text{H}_{16}\text{O}_2\text{F}_5$: 419.1065, found 419.1064.



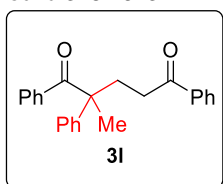
3i: 92% yield. ^1H NMR (400 MHz, Chloroform- d) δ 8.06 – 7.96 (m, 2H), 7.94 – 7.88 (m, 2H), 7.61 – 7.51 (m, 4H), 7.43 (ddd, $J = 17.7, 8.9, 6.6$ Hz, 6H), 4.91 (t, $J = 7.3$ Hz, 1H), 2.99 (q, $J = 6.9$ Hz, 2H), 2.63 (dq, $J = 14.2, 7.1$ Hz, 1H), 2.29 (dq, $J = 13.8, 6.8$ Hz, 1H). ^{13}C NMR (101 MHz, Chloroform- d) δ 199.53, 199.01, 143.19, 136.65, 136.28, 133.30, 133.18, 129.67, 129.34, 128.71, 128.59, 127.95, 125.94 (q, $J = 3.8$ Hz), 123.98 (d, $J = 272.0$ Hz), 51.92, 35.69, 28.21. IR (thin film, cm^{-1}) 3349, 3062, 2934, 1922, 1811, 1683, 1617, 1597, 1581, 1449, 1419, 1367, 1325, 1277, 11223, 1166, 1124, 1069, 1017, 1001, 977, 831, 752, 728, 699, 666, 610, 569, 528. HRMS (APCI) calcd for $\text{C}_{24}\text{H}_{20}\text{O}_2\text{F}_3$: 397.1410, found 397.1411.



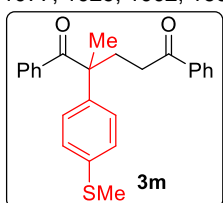
3j: >99% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.98 (d, $J = 7.6$ Hz, 2H), 7.90 (d, $J = 7.5$ Hz, 2H), 7.58 – 7.45 (m, 2H), 7.41 (dt, $J = 14.8, 7.5$ Hz, 4H), 7.33 (d, $J = 8.2$ Hz, 2H), 7.03 (d, $J = 8.3$ Hz, 2H), 4.82 (t, $J = 7.4$ Hz, 1H), 3.08 – 2.87 (m, 2H), 2.58 (dd, $J = 14.1, 7.1$ Hz, 1H), 2.34 – 2.19 (m, 4H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 199.85, 199.57, 169.32, 149.82, 136.77, 136.59, 136.52, 133.14, 129.34, 128.80, 128.64, 128.62, 128.05, 122.11, 51.57, 35.89, 28.40, 21.15. IR (thin film, cm^{-1}) 3341, 3085, 3060, 3036, 2928, 2872, 2360, 2341, 1756, 1677, 1596, 1580, 1504, 1447, 1367, 1275, 1195, 1166, 1001, 977, 959, 911, 836, 751, 688, 553. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{22}\text{O}_4$: 386.1518, found 386.1514.



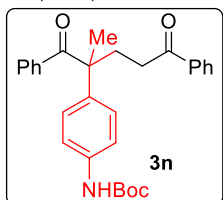
3k: >99% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.07 – 8.00 (m, 2H), 7.95 – 7.88 (m, 2H), 7.85 – 7.72 (m, 4H), 7.58 – 7.32 (m, 9H), 4.98 (t, $J = 7.3$ Hz, 1H), 3.02 (qt, $J = 17.3, 6.9$ Hz, 2H), 2.71 (dt, $J = 14.1, 7.1$ Hz, 1H), 2.43 (dt, $J = 14.0, 6.9$ Hz, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 199.95, 199.63, 136.89, 136.73, 136.71, 133.68, 133.07, 132.99, 132.60, 128.95, 128.84, 128.58, 128.06, 127.81, 127.67, 127.32, 126.28, 125.97, 52.59, 36.00, 28.35. IR (thin film, cm^{-1}) 3342, 3056, 2931, 2872, 2360, 2341, 1677, 1596, 1579, 1507, 1447, 1364, 1275, 1262, 1195, 1180, 978, 861, 815, 749, 722, 687, 478. HRMS (APCI) calcd for $\text{C}_{27}\text{H}_{22}\text{O}_2$: 378.1620, found 378.1613.



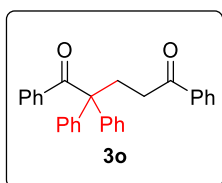
3l: 73% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.85 – 7.79 (m, 2H), 7.55 – 7.48 (m, 3H), 7.42 – 7.35 (m, 7H), 7.30 (s, 1H), 7.27 – 7.20 (m, 2H), 2.84 (ddd, $J = 14.5, 9.8, 6.0$ Hz, 2H), 2.49 (dt, $J = 10.1, 5.8$ Hz, 2H), 1.67 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 203.06, 199.90, 143.67, 136.64, 136.28, 132.92, 131.88, 129.59, 129.06, 128.48, 128.06, 128.04, 127.11, 126.22, 54.15, 34.74, 34.08, 24.33. IR (thin film, cm^{-1}) 3337, 3059, 1025, 2974, 1934, 1967, 1679, 1597, 1580, 1496, 1447, 1366, 1317, 1281, 1244, 1180, 1077, 1029, 1002, 166, 846, 761, 742, 715, 702, 690, 572. HRMS (ESI) calcd for $\text{C}_{24}\text{H}_{22}\text{O}_2\text{Na}^+$: 365.1512, found 365.1515.



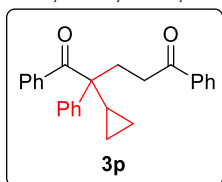
3m: >99% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.87 – 7.77 (m, 2H), 7.57 – 7.46 (m, 3H), 7.46 – 7.33 (m, 3H), 7.32 – 7.16 (m, 6H), 2.98 – 2.67 (m, 2H), 2.56 – 2.39 (m, 5H), 1.64 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 203.00, 199.86, 140.43, 137.45, 136.72, 136.32, 132.99, 131.98, 129.62, 128.54, 128.17, 128.09, 126.98, 126.78, 53.82, 34.75, 34.11, 24.37, 15.61. IR (thin film, cm^{-1}) 3338, 3058, 2979, 2921, 2360, 2341, 1902, 1673, 1596, 1578, 1559, 1492, 1446, 1365, 1276, 1240, 1179, 1100, 965, 822, 748, 689, 659, 571. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{24}\text{O}_2\text{S}$: 388.1497, found 388.1491.



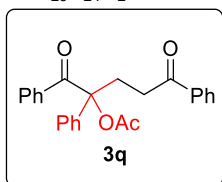
3n: 79% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.94 – 7.77 (m, 2H), 7.61 – 7.47 (m, 3H), 7.47 – 7.36 (m, 5H), 7.34 – 7.19 (m, 4H), 6.63 (s, 1H), 2.84 (ddd, $J = 13.4, 8.9, 6.9$ Hz, 2H), 2.47 (ddd, $J = 9.3, 6.6, 2.0$ Hz, 2H), 1.65 (s, 3H), 1.54 (s, 9H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 203.26, 200.02, 152.73, 137.97, 137.50, 136.71, 136.42, 132.97, 131.90, 129.62, 128.53, 128.13, 128.10, 126.92, 118.92, 80.69, 53.69, 34.78, 34.14, 28.35, 24.30. IR (thin film, cm^{-1}) 3340, 2977, 2931, 2361, 2341, 2294, 1723, 1672, 1594, 121, 1448, 1407, 1366, 1261, 12333, 1155, 1052, 977, 906, 838, 765, 749, 737, 689, 574. HRMS (APCI) calcd for $\text{C}_{29}\text{H}_{31}\text{NO}_4$: 457.2253, found 457.2242.



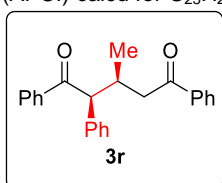
3o: 49% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 7.77 – 7.72 (m, 2H), 7.59 (d, J = 7.8 Hz, 2H), 7.52 – 7.44 (m, 1H), 7.42 (d, J = 7.8 Hz, 4H), 7.38 – 7.28 (m, 7H), 7.24 (t, J = 7.3 Hz, 2H), 7.17 (t, J = 7.7 Hz, 2H), 2.89 – 2.81 (m, 2H), 2.76 (dt, J = 10.4, 4.1 Hz, 2H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 201.29, 199.91, 141.39, 137.22, 136.78, 132.81, 131.68, 129.90, 129.20, 128.45, 128.39, 127.96, 127.78, 127.06, 64.12, 36.00, 35.20. IR (thin film, cm^{-1}) 3337, 3058, 3032, 2979, 1967, 1683, 1597, 1580, 1495, 147, 1364, 1281, 1224, 1180, 1377, 1094, 1001, 990, 968, 845, 753, 701, 653, 587. HRMS (APCI) calcd for $\text{C}_{29}\text{H}_{25}\text{O}_2$: 405.1849, found 405.1852.



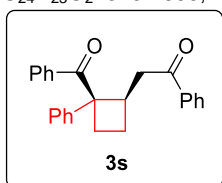
3p: 68% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 7.84 – 7.76 (m, 2H), 7.62 – 7.56 (m, 2H), 7.52 (d, J = 7.4 Hz, 1H), 7.46 – 7.37 (m, 3H), 7.37 – 7.30 (m, 4H), 7.29 – 7.23 (m, 3H), 3.14 (ddd, J = 16.0, 11.8, 4.2 Hz, 1H), 2.62 (ddd, J = 16.0, 11.8, 4.2 Hz, 1H), 2.49 (ddd, J = 13.6, 11.8, 4.2 Hz, 1H), 2.20 (ddd, J = 13.5, 11.8, 4.2 Hz, 1H), 1.69 (ddd, J = 8.6, 5.7, 2.8 Hz, 1H), 0.76 – 0.65 (m, 1H), 0.48 – 0.31 (m, 2H), 0.17 – 0.04 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 201.79, 199.94, 141.29, 136.76, 136.36, 132.92, 131.96, 130.02, 128.50, 128.47, 128.17, 128.05, 128.02, 127.25, 57.33, 34.17, 30.85, 18.03, 3.87, 0.15. IR (thin film, cm^{-1}) 3060, 3023, 2924, 2853, 2361, 2341, 1676, 1597, 1579, 1493, 1447, 1277, 1237, 1179, 1002, 972, 846, 790, 751, 704, 690, 581. HRMS (APCI) calcd for $\text{C}_{26}\text{H}_{24}\text{O}_2$: 368.1776, found 368.1768.



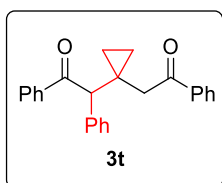
3q: 74% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 7.78 (dd, J = 8.4, 1.4 Hz, 2H), 7.73 – 7.67 (m, 2H), 7.58 (dd, J = 8.4, 1.3 Hz, 2H), 7.51 (t, J = 7.4 Hz, 1H), 7.46 – 7.31 (m, 6H), 7.25 (dd, J = 8.4, 7.1 Hz, 2H), 3.15 (ddd, J = 14.5, 9.1, 6.1 Hz, 1H), 2.96 – 2.68 (m, 3H), 1.99 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 198.98, 196.24, 169.17, 137.34, 136.75, 135.29, 132.96, 132.15, 129.11, 128.91, 128.52, 128.37, 128.08, 128.01, 125.04, 88.50, 32.54, 31.81, 21.17. IR (thin film, cm^{-1}) 3351, 3087, 3059, 3027, 2959, 2845, 2360, 2341, 1740, 1680, 1492, 1447, 1368, 1255, 1216, 1182, 1101, 1002, 881, 848, 748, 699, 689, 660, 635, 606, 578, 522. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{22}\text{O}_4$: 386.1518, found 386.1508.



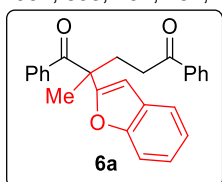
3r: 75% yield, 3.5:1 *d.r.* from *Z*-**2v**; 68% yield, 9.0:1 *d.r.* from *E*-**2v**. Major diastereoisomer: ^1H NMR (400 MHz, Chloroform-*d*) δ 8.14 – 7.11 (m, 15H), 4.61 (d, J = 9.5 Hz, 1H), 3.27 (dd, J = 15.1, 3.7 Hz, 1H), 3.10 (dtt, J = 9.8, 6.4, 3.3 Hz, 1H), 2.74 (dd, J = 15.1, 9.2 Hz, 1H), 0.83 (d, J = 6.8 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 199.97, 199.82, 137.45, 137.08, 136.94, 132.97, 128.99, 128.82, 128.62, 128.55, 128.42, 128.33, 127.98, 127.29, 59.06, 44.34, 33.54, 17.39. IR (thin film, cm^{-1}) 3337, 3060, 3057, 2965, 2933, 1966, 1680, 1597, 1580, 1492, 1517, 1363, 1278, 1214, 1179, 1074, 1001, 94, 894, 837, 751, 698, 658, 526. HRMS (APCI) calcd for $\text{C}_{24}\text{H}_{23}\text{O}_2$: 343.1693, found 343.1692.



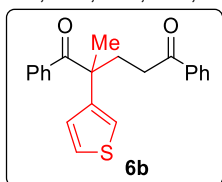
3s: 57% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 8.08 – 7.99 (m, 2H), 7.96 – 7.85 (m, 2H), 7.61 – 7.16 (m, 11H), 5.40 (s, 1H), 3.26 (d, J = 17.3 Hz, 1H), 2.98 (d, J = 17.3 Hz, 1H), 0.81 – 0.53 (m, 3H), 0.50 – 0.33 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 199.78, 199.72, 137.50, 137.36, 137.05, 133.07, 132.88, 129.84, 128.89, 128.72, 128.58, 128.55, 128.01, 127.37, 54.84, 45.33, 18.72, 9.18, 8.30. IR (thin film, cm^{-1}) 3350, 3061, 3005, 2924, 2361, 2341, 1680, 1596, 1580, 1447, 1358, 1274, 1208, 1179, 1077, 1023, 978, 833, 751, 689, 652, 599, 513. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{22}\text{O}_2$: 354.1620, found 354.1612.



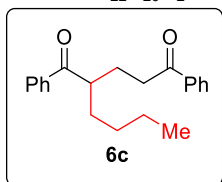
3t: 48% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.10 – 7.99 (m, 2H), 7.91 (d, $J = 7.5$ Hz, 2H), 7.54 (t, $J = 7.4$ Hz, 1H), 7.49 (t, $J = 7.3$ Hz, 1H), 7.40 (ddd, $J = 22.0, 10.7, 7.2$ Hz, 6H), 7.30 (t, $J = 7.3$ Hz, 2H), 7.26 (d, $J = 7.0$ Hz, 1H), 5.40 (s, 1H), 3.26 (d, $J = 17.2$ Hz, 1H), 2.99 (d, $J = 17.3$ Hz, 1H), 0.68 (t, $J = 6.2$ Hz, 1H), 0.64 – 0.57 (m, 2H), 0.50 – 0.35 (m, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 199.70, 199.64, 137.52, 137.38, 137.01, 132.96, 132.78, 129.78, 128.80, 128.50, 128.47, 127.95, 127.30, 54.84, 45.22, 18.73, 9.16, 8.28. IR (thin film, cm^{-1}) 3060, 3005, 2918, 236, 2341, 1680, 1596, 1580, 1596, 1580, 1491, 1447, 1358, 1266, 1208, 1178, 1001, 833, 797, 751, 733, 688, 651, 599, 512. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{22}\text{O}_2$: 354.1620, found 354.1612.



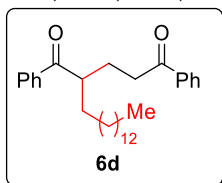
6a: 77% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.86 – 7.80 (m, 2H), 7.62 (dd, $J = 8.2, 1.4$ Hz, 2H), 7.59 – 7.55 (m, 1H), 7.50 (d, $J = 7.4$ Hz, 1H), 7.38 (td, $J = 10.0, 8.9, 6.9$ Hz, 4H), 7.29 – 7.21 (m, 4H), 6.74 (s, 1H), 3.04 (ddd, $J = 16.1, 10.8, 5.0$ Hz, 1H), 2.87 (ddd, $J = 16.4, 10.7, 5.4$ Hz, 1H), 2.75 – 2.51 (m, 2H), 1.75 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 200.21, 199.41, 159.97, 154.66, 136.73, 136.57, 133.00, 132.20, 128.75, 128.54, 128.34, 128.28, 128.08, 124.19, 123.00, 120.94, 111.40, 103.06, 51.51, 33.90, 32.76, 23.12. IR (thin film, cm^{-1}) 3085, 3060, 2981, 2933, 2360, 2341, 1679, 1596, 1578, 1449, 1365, 1251, 1239, 1212, 1169, 965, 941, 883, 750, 738, 689, 570. HRMS (APCI) calcd for $\text{C}_{26}\text{H}_{22}\text{O}_3$: 382.1569, found 382.1564.



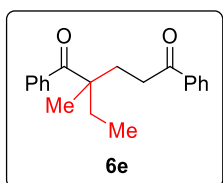
6b: 87% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.86 – 7.76 (m, 2H), 7.55 – 7.48 (m, 3H), 7.40 (t, $J = 7.6$ Hz, 3H), 7.33 (dd, $J = 5.0, 2.9$ Hz, 1H), 7.26 (t, $J = 7.8$ Hz, 2H), 7.21 (dd, $J = 3.0, 1.4$ Hz, 1H), 6.96 (dd, $J = 5.0, 1.4$ Hz, 1H), 2.85 (ddd, $J = 26.6, 10.2, 5.9$ Hz, 2H), 2.50 (ddd, $J = 10.3, 7.3, 5.5$ Hz, 2H), 1.66 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 202.97, 199.81, 144.99, 136.85, 136.74, 132.99, 131.90, 129.20, 128.55, 128.16, 128.09, 126.76, 126.64, 120.46, 52.14, 34.48, 34.10, 24.57. IR (thin film, cm^{-1}) 3062, 3025, 2974, 2931, 2360, 2341, 1673, 1596, 1579, 1447, 1365, 1280, 1242, 1211, 1179, 977, 929, 749, 714, 689, 666. HRMS (APCI) calcd for $\text{C}_{22}\text{H}_{20}\text{O}_2\text{S}$: 348.1184, found 348.1182.



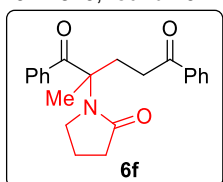
6c: 62% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.03 – 7.95 (m, 2H), 7.95 – 7.86 (m, 2H), 7.60 – 7.49 (m, 2H), 7.44 (dt, $J = 15.5, 7.6$ Hz, 4H), 3.60 (dtd, $J = 8.6, 6.5, 4.8$ Hz, 1H), 3.17 – 2.98 (m, 1H), 2.85 (ddd, $J = 17.1, 8.3, 6.6$ Hz, 1H), 2.34 – 2.14 (m, 1H), 2.14 – 1.96 (m, 1H), 1.86 – 1.73 (m, 1H), 1.53 (dd, $J = 14.6, 6.7$ Hz, 1H), 1.29 (dq, $J = 7.3, 3.9, 3.2$ Hz, 4H), 0.85 (q, $J = 5.1, 3.6$ Hz, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 204.04, 199.92, 137.26, 136.79, 133.02, 132.99, 128.69, 128.53, 128.24, 128.00, 45.12, 35.91, 32.27, 29.51, 26.09, 22.81, 13.87. IR (thin film, cm^{-1}) 3350, 3061, 2956, 2930, 2858, 173, 1683, 1597, 1580, 1448, 1345, 1270, 1224, 1180, 1124, 1074, 1001, 972, 752, 705, 689. HRMS (APCI) calcd for $\text{C}_{21}\text{H}_{25}\text{O}_2$: 309.1849, found 309.1851.



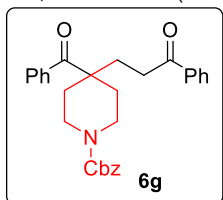
6d: 60% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.97 (d, $J = 7.7$ Hz, 2H), 7.90 (d, $J = 7.7$ Hz, 2H), 7.54 (d, $J = 9.3$ Hz, 2H), 7.47 – 7.33 (m, 4H), 3.60 (t, $J = 6.7$ Hz, 1H), 3.05 (dd, $J = 16.3, 8.0$ Hz, 1H), 2.92 – 2.77 (m, 1H), 2.31 – 2.13 (m, 1H), 2.02 (dd, $J = 13.8, 6.9$ Hz, 1H), 1.80 (dd, $J = 14.1, 7.2$ Hz, 1H), 1.51 (dt, $J = 13.8, 6.7$ Hz, 1H), 1.23 (d, $J = 13.0$ Hz, 24H), 0.88 (d, $J = 6.4$ Hz, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 204.09, 199.97, 137.28, 136.81, 133.05, 133.03, 128.72, 128.57, 128.28, 128.04, 45.19, 35.96, 32.60, 31.94, 29.77, 29.70, 29.66, 29.63, 29.57, 29.43, 29.38, 27.38, 26.10, 22.71, 14.14. IR (thin film, cm^{-1}) 2922, 2852, 2360, 2341, 1680, 1597, 1580, 1448, 1275, 1261, 1220, 972, 763, 689. HRMS (APCI) calcd for $\text{C}_{31}\text{H}_{44}\text{O}_2$: 448.3341, found 448.3340.



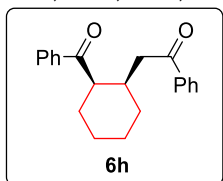
6e: >99% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.88 (dd, $J = 8.3, 1.4$ Hz, 2H), 7.81 – 7.67 (m, 2H), 7.57 – 7.50 (m, 1H), 7.47 (d, $J = 7.4$ Hz, 1H), 7.45 – 7.36 (m, 4H), 2.90 (td, $J = 10.4, 5.4$ Hz, 2H), 2.38 (ddd, $J = 14.3, 10.8, 5.4$ Hz, 1H), 2.15 – 1.91 (m, 2H), 1.74 (dd, $J = 14.3, 7.3$ Hz, 1H), 1.32 (s, 3H), 0.87 (t, $J = 7.5$ Hz, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 208.28, 199.85, 139.16, 136.72, 133.08, 131.22, 128.59, 128.35, 128.08, 127.56, 51.31, 33.99, 33.37, 32.41, 22.34, 8.88. IR (thin film, cm^{-1}) 3060, 2968, 2933, 2361, 2341, 1672, 1597, 1579, 1447, 1366, 1277, 1213, 1178, 1002, 970, 744, 717, 689, 655, 568. HRMS (APCI) calcd for $\text{C}_{20}\text{H}_{22}\text{O}_2$: 294.1620, found 294.1613.



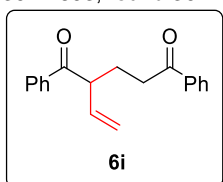
6f: 72% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.93 (ddd, $J = 8.5, 6.2, 1.8$ Hz, 4H), 7.44 (ddt, $J = 36.3, 15.5, 7.3$ Hz, 6H), 3.84 – 3.60 (m, 2H), 3.21 – 2.95 (m, 2H), 2.48 (t, $J = 7.5$ Hz, 2H), 2.28 – 2.01 (m, 4H), 1.61 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 199.78, 198.32, 175.29, 136.61, 135.78, 133.14, 132.11, 128.58, 128.29, 128.16, 127.87, 65.16, 44.21, 33.83, 31.28, 31.12, 22.36, 18.76. IR (thin film, cm^{-1}) 3350, 2983, 2920, 2360, 2341, 1675, 1596, 1579, 1447, 1411, 1276, 1261, 1179, 1147, 969, 745, 707, 690, 583, 483. HRMS (APCI) calcd for $\text{C}_{22}\text{H}_{23}\text{NO}_3$: 349.1678, found 349.1476.



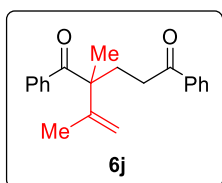
6g: 60% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.10 – 7.84 (m, 2H), 7.82 – 7.70 (m, 2H), 7.67 – 7.48 (m, 2H), 7.44 (td, $J = 7.6, 1.5$ Hz, 4H), 7.40 – 7.30 (m, 5H), 5.13 (s, 2H), 3.91 (s, 2H), 3.25 – 2.81 (m, 4H), 2.57 – 2.29 (m, 4H), 1.62 (s, 2H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 206.71, 198.95, 155.27, 138.42, 136.78, 136.53, 133.30, 131.84, 128.65, 128.58, 128.51, 128.01, 127.88, 127.72, 67.10, 50.14, 41.12, 34.03, 32.96. IR (thin film, cm^{-1}) 3058, 2923, 2872, 2360, 2341, 2278, 1684, 1597, 1430, 1360, 1277, 1215, 1146, 1092, 961, 733, 692, 456. HRMS (APCI) calcd for $\text{C}_{29}\text{H}_{29}\text{NO}_4$: 455.2097, found 455.2095.



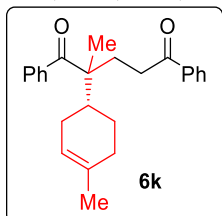
6h: 41% yield. $^1\text{H NMR}$ (500 MHz, Chloroform-*d*) δ 7.91 (dd, $J = 8.3, 1.4$ Hz, 2H), 7.80 (dd, $J = 8.3, 1.4$ Hz, 2H), 7.57 – 7.52 (m, 1H), 7.46 (dt, $J = 21.2, 7.5$ Hz, 3H), 7.35 (t, $J = 7.8$ Hz, 2H), 3.71 (dt, $J = 8.3, 4.3$ Hz, 1H), 3.09 (dd, $J = 16.9, 8.5$ Hz, 1H), 2.93 (dd, $J = 16.9, 5.1$ Hz, 1H), 2.73 (dd, $J = 7.3, 3.9$ Hz, 1H), 1.92 (ddd, $J = 14.4, 7.3, 3.8$ Hz, 2H), 1.76 (dd, $J = 7.5, 3.8$ Hz, 1H), 1.63 (d, $J = 9.0$ Hz, 3H), 1.56 – 1.37 (m, 2H). $^{13}\text{C NMR}$ (126 MHz, Chloroform-*d*) δ 203.60, 199.76, 137.06, 136.79, 132.94, 132.88, 128.71, 128.49, 128.23, 128.05, 46.50, 38.76, 33.57, 29.25, 25.74, 23.71, 22.79. IR (thin film, cm^{-1}) 3337, 3059, 29930, 2856, 1680, 1597, 1580, 1448, 1370, 1324, 1280, 1253, 1214, 1178, 1010, 981, 946, 854, 752, 700, 691, 662, 567. HRMS (APCI) calcd for $\text{C}_{21}\text{H}_{23}\text{O}_2$: 307.1693, found 307.1695.



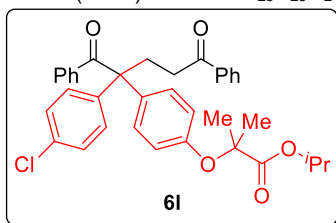
6i: 68% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.12 – 7.98 (m, 2H), 7.98 – 7.85 (m, 2H), 7.69 – 7.51 (m, 2H), 7.51 – 7.37 (m, 4H), 5.94 (ddd, $J = 17.1, 10.3, 8.7$ Hz, 1H), 5.34 – 5.09 (m, 2H), 4.25 (td, $J = 8.4, 6.6$ Hz, 1H), 3.37 – 3.06 (m, 1H), 2.99 (ddd, $J = 17.4, 7.2, 6.0$ Hz, 1H), 2.37 (dd, $J = 13.9, 6.8$ Hz, 1H), 2.12 – 1.97 (m, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 200.64, 199.75, 136.91, 136.48, 133.16, 133.09, 129.26, 128.64, 128.61, 128.19, 128.02, 118.53, 50.58, 35.51, 26.19. IR (thin film, cm^{-1}) 3060, 2922, 2852, 2360, 2341, 1678, 1634, 1596, 1579, 1447, 1364, 1276, 1278, 1179, 992, 924, 751, 699, 568. HRMS (APCI) calcd for $\text{C}_{19}\text{H}_{18}\text{O}_2$: 278.1307, found 278.1298.



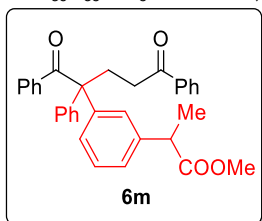
6j: 82% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.08 – 7.96 (m, 2H), 7.88 – 7.79 (m, 2H), 7.58 – 7.47 (m, 2H), 7.47 – 7.29 (m, 4H), 5.14 (dt, $J = 5.2, 1.1$ Hz, 2H), 2.94 – 2.72 (m, 2H), 2.32 (dddd, $J = 47.6, 14.2, 11.0, 5.2$ Hz, 2H), 1.78 (s, 3H), 1.42 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 203.44, 200.01, 148.00, 136.94, 136.83, 132.97, 132.33, 128.96, 128.56, 128.26, 128.07, 112.62, 55.67, 33.92, 31.63, 22.76, 20.67. IR (thin film, cm^{-1}) 34743061, 2972, 2923, 2854, 2361, 2341, 1675, 1636, 1597, 1579, 1447, 1380, 1277, 1260, 1237, 1209, 1179, 966, 896, 747, 689, 578. HRMS (APCI) calcd for $\text{C}_{21}\text{H}_{22}\text{O}_2$: 306.1620, found 306.1613.



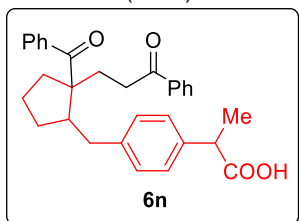
6k: >99% yield. 1.3:1 *d.r.*. Major diastereoisomer: $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.91 – 7.85 (m, 2H), 7.84 – 7.80 (m, 2H), 7.57 – 7.47 (m, 2H), 7.44 – 7.38 (m, 4H), 5.38 (dt, $J = 5.5, 1.9$ Hz, 1H), 3.01 – 2.83 (m, 2H), 2.51 – 2.25 (m, 2H), 2.23 – 1.83 (m, 5H), 1.62 (d, $J = 2.2$ Hz, 3H), 1.53 – 1.32 (m, 2H), 1.24 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 208.78, 199.87 (d, $J = 7.6$ Hz), 139.49, 136.70, 134.10, 133.10, 131.16, 128.58, 128.37, 128.08, 127.59, 120.41, 54.09, 40.59, 33.98, 31.14, 26.24, 25.26, 23.32, 18.19. IR (thin film, cm^{-1}) 3057, 2927, 2360, 2341, 1679, 1597, 1449, 1379, 1277, 1260, 1212, 1179, 976, 958, 746, 689, 591, 567, 430, 413. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{28}\text{O}_2$: 360.2089, found 360.2085.



6l: 81% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.77 – 7.70 (m, 2H), 7.58 – 7.46 (m, 3H), 7.39 – 7.17 (m, 11H), 6.81 (d, $J = 8.8$ Hz, 2H), 5.04 (p, $J = 6.3$ Hz, 1H), 2.90 – 2.65 (m, 4H), 1.59 (s, 6H), 1.14 (t, $J = 6.9$ Hz, 6H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 201.03, 199.67, 173.49, 154.70, 140.39, 137.11, 136.72, 133.88, 132.99, 132.95, 131.86, 130.62, 129.82, 128.56, 128.50, 127.98, 127.93, 118.55, 79.12, 68.99, 63.11, 35.73, 35.08, 25.44, 25.32, 21.55, 21.51. IR (thin film, cm^{-1}) 3059, 298, 2933, 2360, 2341, 1906, 1727, 1677, 1597, 1579, 1507, 1491, 1447, 13117, 1280, 1246, 1178, 1149, 1100, 1002, 972, 930, 820, 744, 691, 585. HRMS (APCI) calcd for $\text{C}_{36}\text{H}_{35}\text{ClO}_5$: 582.2173, found 582.2168.

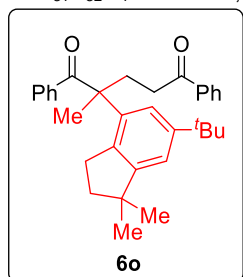


6m: >99% yield, 1.2:1 *d.r.*. Major diastereoisomer: $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.79 – 7.73 (m, 2H), 7.57 (d, $J = 7.8$ Hz, 2H), 7.53 – 7.40 (m, 3H), 7.39 – 7.23 (m, 9H), 7.24 – 7.12 (m, 3H), 3.66 (q, $J = 7.0$ Hz, 1H), 3.55 (s, 3H), 2.90 – 2.70 (m, 4H), 1.41 (d, $J = 7.2$ Hz, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 201.25, 199.89, 174.68, 141.76, 141.29, 140.72, 140.62, 137.31, 136.89, 132.86, 131.68, 129.95, 129.22, 129.02, 128.77, 128.55, 128.45, 128.02, 127.80, 127.21, 126.06, 64.32, 51.95, 45.46, 45.36, 35.22, 18.50. IR (thin film, cm^{-1}) 3057, 2982, 2937, 2360, 2341, 1733, 1676, 1597, 1580, 1489, 1434, 1263, 1222, 1168, 1068, 969, 750, 734, 700, 572. HRMS (APCI) calcd for $\text{C}_{33}\text{H}_{30}\text{O}_4$: 490.2144, found 490.2140.

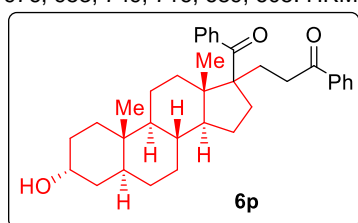


6n: 93% yield, 3.0:1 *d.r.*. Major diastereoisomer: $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.89 (d, $J = 7.6$ Hz, 2H), 7.79 (d, $J = 7.2$ Hz, 2H), 7.57 – 7.35 (m, 6H), 7.18 (d, $J = 8.0$ Hz, 2H), 7.08 (d, $J = 7.9$ Hz, 2H), 3.71 – 3.62 (m, 4H), 3.08 – 2.83 (m, 2H), 2.70 – 2.50 (m, 3H), 2.40 (t, $J = 12.5$ Hz, 1H), 2.25 – 2.04 (m, 1H), 1.71 (dddd, $J = 68.5, 12.4, 9.6, 6.6$ Hz, 4H), 1.47 (dd, $J = 7.2, 2.0$ Hz, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 206.86, 199.91, 175.14, 140.10, 138.12, 137.91, 136.69, 133.13, 131.49, 129.14, 128.61, 128.38,

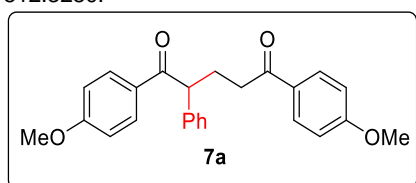
128.10, 128.01, 127.43, 61.11, 52.02, 48.81, 45.01, 35.85, 35.08, 29.93, 27.94, 22.43, 18.61. IR (thin film, cm^{-1}) 3056, 2949, 2874, 2360, 2341, 1734, 1669, 1596, 1579, 1512, 1435, 1260, 1207, 1165, 1066, 1001, 970, 859, 748, 690, 567, 538. HRMS (APCI) calcd for $\text{C}_{31}\text{H}_{32}\text{O}_4$: 468.2301, found 468.2236.



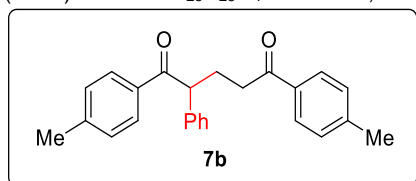
6o: >99% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 7.85 – 7.73 (m, 2H), 7.60 – 7.54 (m, 2H), 7.54 – 7.46 (m, 1H), 7.41 – 7.33 (m, 4H), 7.20 (dd, $J = 8.3, 7.4$ Hz, 2H), 7.10 (d, $J = 1.7$ Hz, 1H), 2.83 (ddd, $J = 9.6, 5.9, 4.8$ Hz, 2H), 2.63 – 2.42 (m, 4H), 1.76 – 1.64 (m, 5H), 1.38 (s, 9H), 1.11 (d, $J = 16.9$ Hz, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 203.57, 200.16, 154.09, 150.56, 139.14, 137.86, 136.79, 136.38, 132.90, 132.10, 129.19, 128.51, 128.06, 128.00, 117.61, 117.61, 54.39, 43.15, 41.39, 34.96, 33.99, 32.79, 31.71, 29.28, 28.39, 23.94. IR (thin film, cm^{-1}) 3086, 3062, 2953, 2862, 2360, 2341, 1676, 1597, 1589, 1447, 1361, 1277, 1259, 1236, 1179, 976, 953, 749, 716, 689, 605. HRMS (APCI) calcd for $\text{C}_{31}\text{H}_{38}\text{O}_2$: 466.2872, found 466.2866.



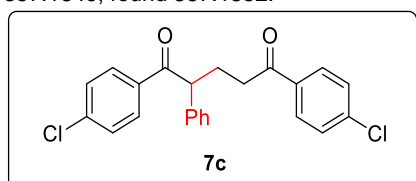
6p: 49% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 7.85 (d, $J = 8.0$ Hz, 2H), 7.62 (d, $J = 7.7$ Hz, 2H), 7.55 – 7.29 (m, 6H), 4.02 (d, $J = 7.8$ Hz, 1H), 2.79 – 2.46 (m, 3H), 2.17 – 1.09 (m, 23H), 1.00 (s, 3H), 0.84 – 0.71 (m, 4H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 208.27, 200.03, 140.71, 136.54, 133.01, 131.41, 128.51, 128.49, 128.29, 127.96, 66.50, 66.08, 53.56, 51.26, 48.19, 39.04, 36.89, 36.05, 35.85, 35.19, 34.56, 32.09, 31.99, 30.79, 28.96, 28.51, 25.17, 20.92, 16.73, 16.34, 11.17. IR (thin film, cm^{-1}) 3368, 2921, 2853, 2360, 2341, 1681, 1660, 1597, 1447, 1262, 1210, 1178, 1009, 966, 748, 691. HRMS (APCI) calcd for $\text{C}_{35}\text{H}_{44}\text{O}_3$: 512.3290, found 512.3280.



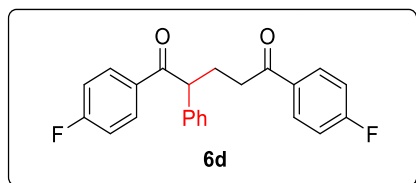
7a: >99% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 8.04 – 7.94 (m, 2H), 7.94 – 7.84 (m, 2H), 7.34 – 7.25 (m, 4H), 7.23 – 7.16 (m, 1H), 6.94 – 6.81 (m, 4H), 4.72 (t, $J = 7.3$ Hz, 1H), 3.82 (d, $J = 16.9$ Hz, 6H), 3.04 – 2.93 (m, 1H), 2.86 (dt, $J = 16.7, 6.7$ Hz, 1H), 2.58 (dt, $J = 14.0, 7.2$ Hz, 1H), 2.25 (dt, $J = 13.9, 6.9$ Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 198.53, 198.13, 163.36, 163.28, 139.65, 131.03, 130.28, 129.92, 129.64, 128.90, 128.22, 127.02, 113.64, 113.62, 55.38, 55.34, 52.10, 35.71, 28.61. IR (thin film, cm^{-1}) 3061, 2962, 2935, 2839, 1671, 1600, 1574, 1510, 1454, 1419, 1363, 1313, 1259, 1163, 1114, 1029, 982, 837, 752, 702. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{25}\text{O}_4$: 389.1747, found 389.1750.



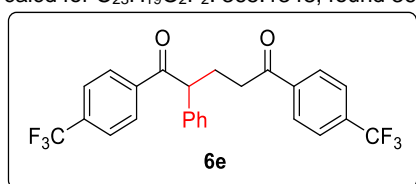
7b: 87% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 7.89 (d, $J = 8.2$ Hz, 2H), 7.81 (d, $J = 8.1$ Hz, 2H), 7.35 – 7.27 (m, 4H), 7.24 – 7.15 (m, 5H), 4.76 (t, $J = 7.3$ Hz, 1H), 3.05 – 2.82 (m, 2H), 2.59 (dt, $J = 14.1, 7.2$ Hz, 1H), 2.39 (s, 3H), 2.34 (s, 3H), 2.32 – 2.22 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 199.56, 199.21, 143.72, 143.66, 139.41, 134.35, 134.13, 129.18, 129.16, 128.93, 128.87, 128.27, 128.12, 127.07, 52.29, 35.89, 28.38, 21.56, 21.52. IR (thin film, cm^{-1}) 3337, 3060, 3029, 2925, 1923, 1679, 1606, 1572, 1492, 1453, 1408, 1365, 1277, 1227, 1179, 1119, 1072, 102, 977, 842, 790, 750, 701, 566, 519. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{25}\text{O}_2$: 357.1849, found 357.1852.



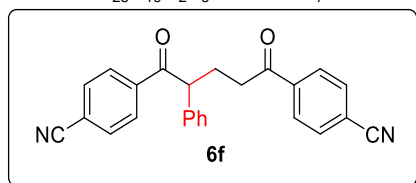
7c: 76% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 7.92 (d, $J = 8.4$ Hz, 2H), 7.85 (d, $J = 8.4$ Hz, 2H), 7.42 (d, $J = 8.4$ Hz, 2H), 7.36 (d, $J = 8.6$ Hz, 2H), 7.32 – 7.22 (m, 5H), 4.71 (t, $J = 7.3$ Hz, 1H), 3.06 – 2.82 (m, 2H), 2.58 (dd, $J = 14.1, 7.1$ Hz, 1H), 2.27 (dd, $J = 14.0, 6.9$ Hz, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 198.58, 198.27, 139.53, 139.39, 138.72, 135.04, 134.80, 130.17, 129.42, 129.18, 128.88, 128.83, 128.21, 127.43, 52.44, 35.79, 28.06. IR (thin film, cm^{-1}) 3350, 3062, 3028, 2959, 2933, 1684, 1588, 1570, 1489, 1399, 1366, 1276, 1221, 1175, 1093, 1013, 984, 827, 766, 748, 700, 569, 533, 517. HRMS (APCI) calcd for $\text{C}_{23}\text{H}_{19}\text{O}_2\text{Cl}_2$: 397.0757, found 397.0760.



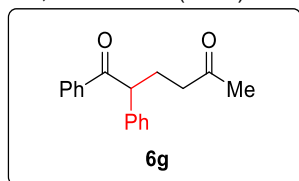
6d: 85% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.02 – 7.92 (m, 2H), 7.92 – 7.82 (m, 2H), 7.25 (d, $J = 6.4$ Hz, 4H), 7.20 – 7.15 (m, 1H), 7.03 (dt, $J = 21.6, 8.7$ Hz, 4H), 4.68 (t, $J = 7.3$ Hz, 1H), 3.05 – 2.77 (m, 2H), 2.53 (dq, $J = 14.3, 7.2$ Hz, 1H), 2.23 (dt, $J = 13.9, 7.0$ Hz, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 198.27, 197.98, 166.93 (d, $J = 17.3$ Hz), 164.40 (d, $J = 17.6$ Hz), 138.97, 133.23 (d, $J = 3.0$ Hz), 132.96 (d, $J = 2.9$ Hz), 131.46 (d, $J = 9.3$ Hz), 130.68 (d, $J = 9.3$ Hz), 129.19, 128.26, 127.41, 115.78 (d, $J = 2.3$ Hz), 115.56 (d, $J = 2.2$ Hz), 52.44, 35.82, 28.26. $^{19}\text{F NMR}$ (377 MHz, Chloroform-*d*) δ -105.15, -105.19. IR (thin film, cm^{-1}) 3345, 3064, 3029, 2933, 1683, 1597, 1506, 1454, 1409, 1367, 1272, 1230, 1156, 1099, 1012, 985, 842, 752, 702, 606, 566, 521. HRMS (APCI) calcd for $\text{C}_{23}\text{H}_{19}\text{O}_2\text{F}_2$: 365.1348, found 365.1348.



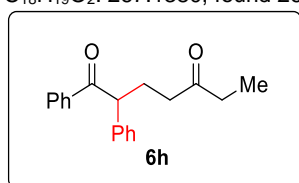
6e: 82% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.04 (d, $J = 8.1$ Hz, 2H), 7.98 (d, $J = 8.0$ Hz, 2H), 7.68 (d, $J = 8.1$ Hz, 2H), 7.62 (d, $J = 8.1$ Hz, 2H), 7.27 (dq, $J = 15.4, 7.7$ Hz, 5H), 4.74 (t, $J = 7.3$ Hz, 1H), 2.98 (q, $J = 7.0$ Hz, 2H), 2.58 (dq, $J = 14.2, 7.1$ Hz, 1H), 2.30 (dt, $J = 14.0, 7.0$ Hz, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 198.79, 198.48, 139.35, 139.18, 138.28, 134.51 (d, $J = 25.0$ Hz), 134.18 (d, $J = 25.2$ Hz), 129.37, 129.11, 128.37, 128.28, 127.69, 125.65 (q, $J = 3.7$ Hz), 125.69 (q, $J = 3.7$ Hz), 123.57 (d, $J = 272.7$ Hz), 123.51 (d, $J = 272.7$ Hz), 52.80, 36.07, 27.86. $^{19}\text{F NMR}$ (377 MHz, Chloroform-*d*) δ -63.14, -63.21. IR (thin film, cm^{-1}) 3064, 3029, 2936, 1689, 1600, 1582, 1512, 1454, 1410, 1326, 1275, 1221, 1169, 1130, 1067, 1016, 987, 856, 833, 746, 725, 600. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{19}\text{O}_2\text{F}_6$: 465.1284, found 465.1288.



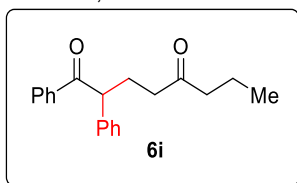
6f: 72% yield. $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.02 (d, $J = 8.1$ Hz, 2H), 7.98 (d, $J = 8.1$ Hz, 2H), 7.74 (d, $J = 8.1$ Hz, 2H), 7.67 (d, $J = 8.2$ Hz, 2H), 7.31 (t, $J = 7.1$ Hz, 2H), 7.24 (dd, $J = 9.8, 7.9$ Hz, 3H), 4.71 (t, $J = 7.3$ Hz, 1H), 2.98 (td, $J = 6.8, 3.5$ Hz, 2H), 2.57 (dd, $J = 14.1, 7.1$ Hz, 1H), 2.29 (dd, $J = 14.1, 7.1$ Hz, 1H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 198.27, 197.99, 139.51, 139.40, 137.83, 132.49, 132.37, 129.42, 129.10, 128.37, 128.19, 127.80, 117.81, 117.78, 116.44, 116.17, 52.76, 35.94, 27.60. IR (thin film, cm^{-1}) 3359, 3062, 2930, 2230, 1688, 1606, 1566, 1491, 1453, 1404, 1368, 1312, 1272, 1219, 1175, 1113, 1031, 987, 834, 739, 703, 576, 546. HRMS (APCI) calcd for $\text{C}_{25}\text{H}_{19}\text{O}_2\text{N}_2$: 379.1441, found 379.1445.



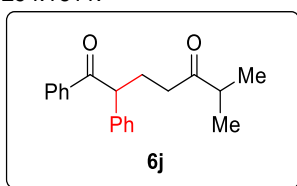
6g: 90% yield (400 nm). $^1\text{H NMR}$ (400 MHz, Chloroform-*d*) δ 8.01 – 7.93 (m, 2H), 7.51 – 7.44 (m, 1H), 7.37 (dd, $J = 8.3, 6.8$ Hz, 2H), 7.33 – 7.24 (m, 4H), 7.24 – 7.17 (m, 1H), 4.70 – 4.59 (m, 1H), 2.47 – 2.31 (m, 3H), 2.18 – 2.09 (m, 1H), 2.08 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, Chloroform-*d*) δ 208.38, 199.47, 138.96, 136.57, 132.89, 128.98, 128.68, 128.48, 128.24, 127.19, 52.18, 40.91, 29.92, 27.60. IR (thin film, cm^{-1}) 3084, 3027, 2961, 2933, 1714, 1680, 1597, 1490, 1368, 1269, 1176, 1159, 1072, 756, 699. HRMS (APCI) calcd for $\text{C}_{18}\text{H}_{19}\text{O}_2$: 267.1380, found 267.1382.



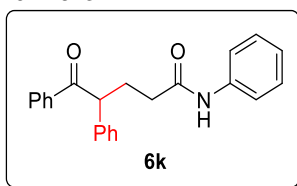
6h: 89% yield (400 nm). ^1H NMR (400 MHz, Chloroform-*d*) δ 7.95 (dd, J = 8.4, 1.4 Hz, 2H), 7.50 – 7.44 (m, 1H), 7.37 (dd, J = 8.3, 6.9 Hz, 2H), 7.28 (d, J = 5.6 Hz, 4H), 7.20 (td, J = 5.6, 3.1 Hz, 1H), 4.67 (dd, J = 8.0, 6.0 Hz, 1H), 2.56 – 2.28 (m, 5H), 2.22 – 2.03 (m, 1H), 1.02 (t, J = 7.3 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 211.15, 199.61, 139.08, 136.71, 132.91, 129.01, 128.73, 128.52, 128.33, 127.21, 52.30, 39.59, 35.93, 27.75, 7.82. IR (thin film, cm^{-1}) 3361, 3184, 3061, 2972, 2921, 2851, 2361, 2341, 1710, 1678, 1597, 1492, 1447, 1371, 1342, 1262, 1176, 1160, 1115, 1073, 982, 955, 832, 756, 666, 570, 517. HRMS (APCI) calcd for $\text{C}_{19}\text{H}_{20}\text{O}_2$: 280.1463, found 280.1458.



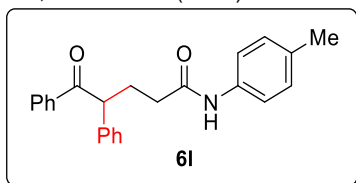
6i: 80% yield (400 nm). ^1H NMR (400 MHz, Chloroform-*d*) δ 8.02 – 7.88 (m, 2H), 7.49 – 7.42 (m, 1H), 7.37 (dd, J = 8.4, 6.9 Hz, 2H), 7.28 (d, J = 5.5 Hz, 4H), 7.23 – 7.09 (m, 1H), 4.72 – 4.61 (m, 1H), 2.49 – 2.34 (m, 3H), 2.31 (t, J = 7.3 Hz, 2H), 2.11 (d, J = 7.2 Hz, 1H), 1.56 (q, J = 7.4 Hz, 2H), 0.87 (t, J = 7.4 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 210.74, 199.63, 139.08, 136.73, 132.91, 129.00, 128.73, 128.52, 128.33, 127.21, 52.28, 44.77, 40.00, 27.71, 17.28, 13.72. IR (thin film, cm^{-1}) 3360, 3184, 2960, 2921, 2851, 2361, 2341, 1708, 1678, 1597, 1447, 1261, 1159, 1126, 959, 753, 697, 570, 517. HRMS (APCI) calcd for $\text{C}_{20}\text{H}_{22}\text{O}_2$: 294.1620, found 294.1611.



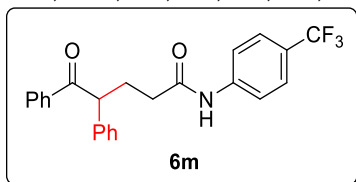
6j: 90% yield (400 nm). ^1H NMR (400 MHz, Chloroform-*d*) δ 8.05 – 7.88 (m, 2H), 7.52 – 7.43 (m, 1H), 7.37 (ddd, J = 8.2, 6.7, 1.4 Hz, 2H), 7.28 (d, J = 5.0 Hz, 4H), 7.20 (ddd, J = 6.5, 4.7, 3.4 Hz, 1H), 4.69 (t, J = 7.2 Hz, 1H), 2.73 – 2.30 (m, 4H), 2.12 (dd, J = 7.0, 5.6 Hz, 1H), 1.03 (dd, J = 7.0, 6.0 Hz, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 214.41, 199.72, 139.09, 136.76, 132.90, 128.97, 128.73, 128.52, 128.36, 127.19, 52.19, 40.83, 37.55, 27.70, 18.29, 18.23. IR (thin film, cm^{-1}) 3360, 3184, 2964, 2921, 2851, 2361, 2340, 1707, 1678, 1597, 1468, 1447, 1324, 1274, 1176, 1073, 1011, 957, 753, 697, 582, 515. HRMS (APCI) calcd for $\text{C}_{20}\text{H}_{22}\text{O}_2$: 294.1620, found 194.1613



6k: 49% yield. ^1H NMR (500 MHz, Chloroform-*d*) δ 7.87 (d, J = 7.7 Hz, 2H), 7.38 (t, J = 7.9 Hz, 3H), 7.32 – 7.18 (m, 9H), 7.13 (dq, J = 6.2, 2.7 Hz, 1H), 7.01 (t, J = 7.4 Hz, 1H), 4.69 (t, J = 7.2 Hz, 1H), 2.53 – 2.41 (m, 1H), 2.31 – 2.15 (m, 3H). ^{13}C NMR (126 MHz, Chloroform-*d*) δ 198.71, 169.69, 137.85, 136.80, 135.47, 132.02, 128.05, 127.95, 127.77, 127.53, 127.32, 126.28, 123.22, 118.84, 51.34, 33.87, 28.31. IR (thin film, cm^{-1}) 3084, 3027, 2961, 2933, 1713, 1680, 1597, 1580, 1490, 1369, 1269, 1176, 1160, 1072, 1001, 756, 699. HRMS (APCI) calcd for $\text{C}_{23}\text{H}_{21}\text{NO}_2$: 343.1572, found 343.1564.

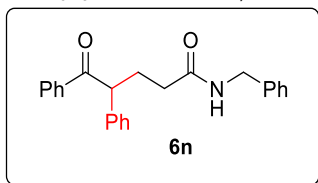


6l: 39% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 8.06 – 7.87 (m, 2H), 7.50 – 7.43 (m, 1H), 7.41 – 7.26 (m, 8H), 7.21 (dq, J = 7.8, 2.7 Hz, 1H), 7.10 (d, J = 7.9 Hz, 3H), 4.77 (t, J = 7.0 Hz, 1H), 2.54 (d, J = 7.2 Hz, 1H), 2.44 – 2.15 (m, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 199.74, 170.52, 138.93, 136.61, 135.24, 133.93, 133.00, 129.48, 129.07, 128.80, 128.55, 128.39, 127.30, 120.00, 52.39, 34.90, 29.40, 20.84. IR (thin film, cm^{-1}) 3305, 3124, 3060, 2923, 2854, 2361, 2341, 1678, 1659, 1598, 1531, 1448, 1405, 1311, 1260, 1178, 968, 817, 750, 698, 573, 507. HRMS (APCI) calcd for $\text{C}_{24}\text{H}_{23}\text{NO}_2$: 357.1729, found 357.1722.



6m: 58% yield. ^1H NMR (400 MHz, Chloroform-*d*) δ 8.01 – 7.94 (m, 2H), 7.69 – 7.56 (m, 4H), 7.55 – 7.46 (m, 2H), 7.40 (dd, J = 8.4, 7.1 Hz, 2H), 7.32 (d, J = 4.4 Hz, 4H), 7.25 (q, J = 4.5 Hz, 1H), 4.78 (t, J = 7.1 Hz, 1H), 2.60 – 2.50 (m, 1H), 2.41 (dt, J = 10.4, 6.8 Hz, 2H), 2.34 – 2.25 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 199.71, 170.99, 140.90, 138.80, 136.47, 133.15, 129.16, 128.80, 128.60, 128.28, 127.43, 126.28, 126.24, 119.31, 52.50, 35.13, 29.70, 29.26. IR (thin film, cm^{-1}) 3307, 3063, 2924, 2854, 1359, 2341,

1667, 1604, 1533, 1448, 1408, 1320, 1259, 1162, 1112, 1066, 1016, 841, 750, 697, 594, 509, 414. HRMS (APCI) calcd for $C_{24}H_{20}F_3NO_2$: 411.1446, found 411.1438.

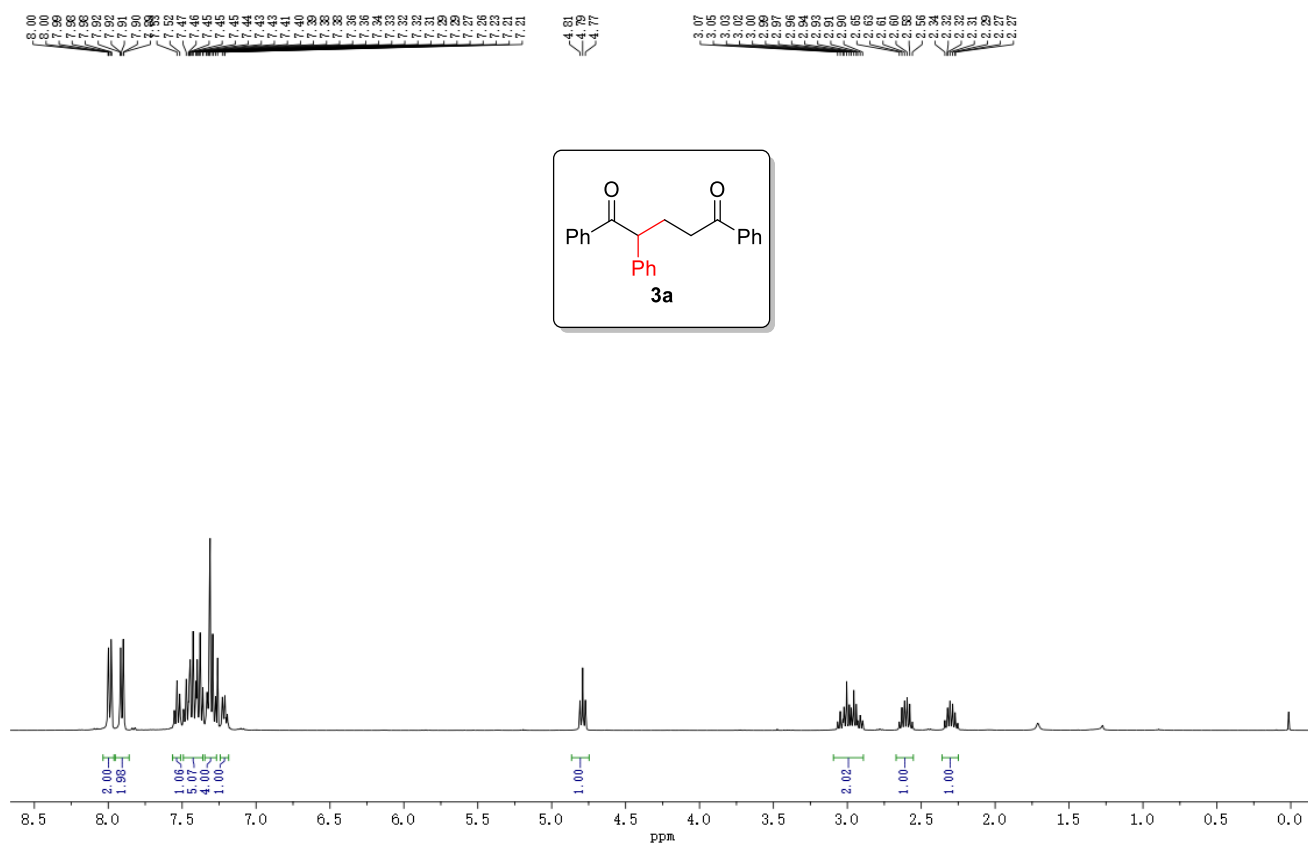


6n: 79% yield. 1H NMR (400 MHz, Chloroform-*d*) δ 7.96 (d, $J = 7.5$ Hz, 2H), 7.49 (d, $J = 7.6$ Hz, 1H), 7.40 (t, $J = 7.7$ Hz, 2H), 7.35 – 7.27 (m, 9H), 7.25 – 7.20 (m, 1H), 5.71 (d, $J = 6.3$ Hz, 1H), 4.75 (t, $J = 6.7$ Hz, 1H), 4.44 (dd, $J = 8.9, 5.7$ Hz, 2H), 2.50 (dd, $J = 9.1, 4.9$ Hz, 1H), 2.35 – 2.09 (m, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 199.76, 172.27, 139.07, 138.44, 136.78, 133.09, 129.15, 128.90, 128.87, 128.67, 128.50, 128.00, 127.69, 127.37, 52.49, 43.77, 34.10, 29.68. IR (thin film, cm^{-1}) 3292, 3062, 3005, 2922, 2853, 2361, 2340, 1676, 1644, 1597, 1579, 1539, 1493, 1448, 1356, 1301, 1275, 1260, 1228, 1158, 1077, 1029, 750, 695, 573, 504. HRMS (APCI) calcd for $C_{24}H_{23}NO_2$: 357.1729, found 357.1720.

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NMR spectra



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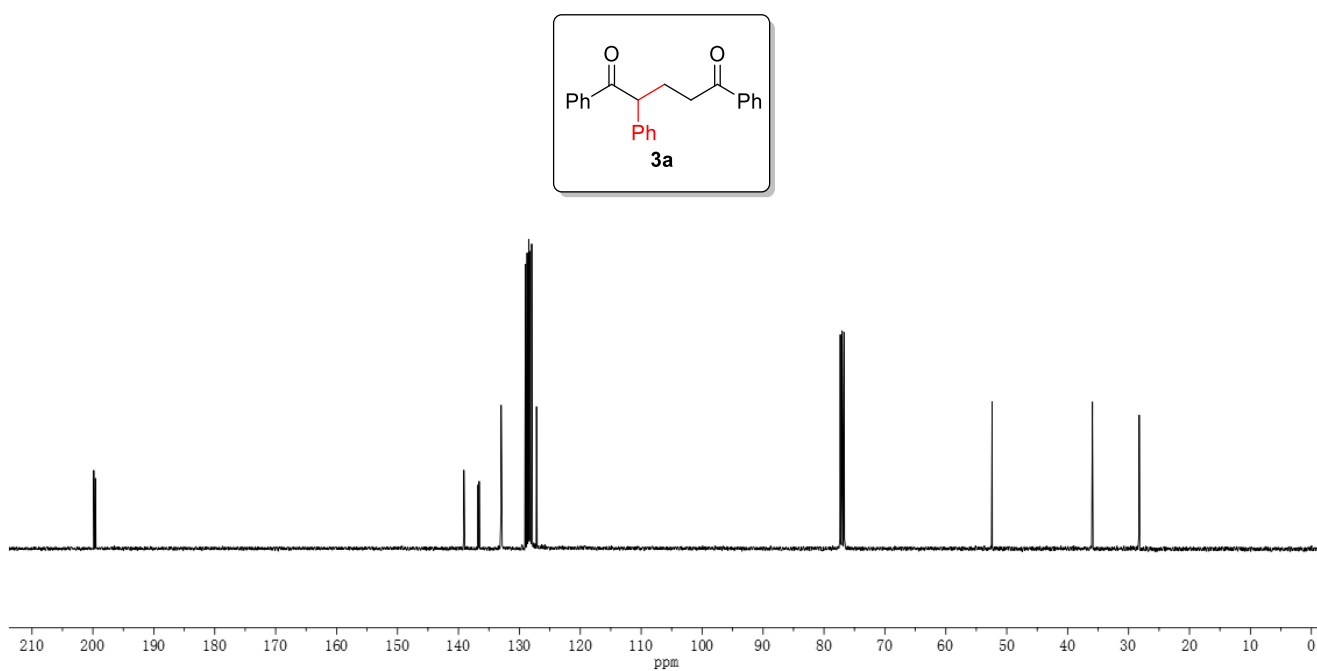
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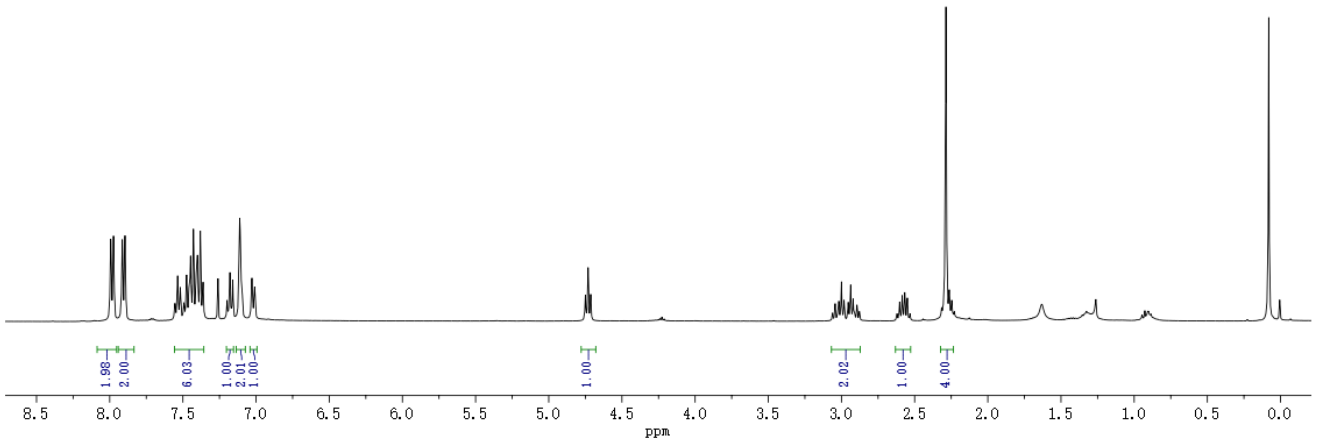
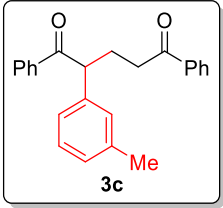
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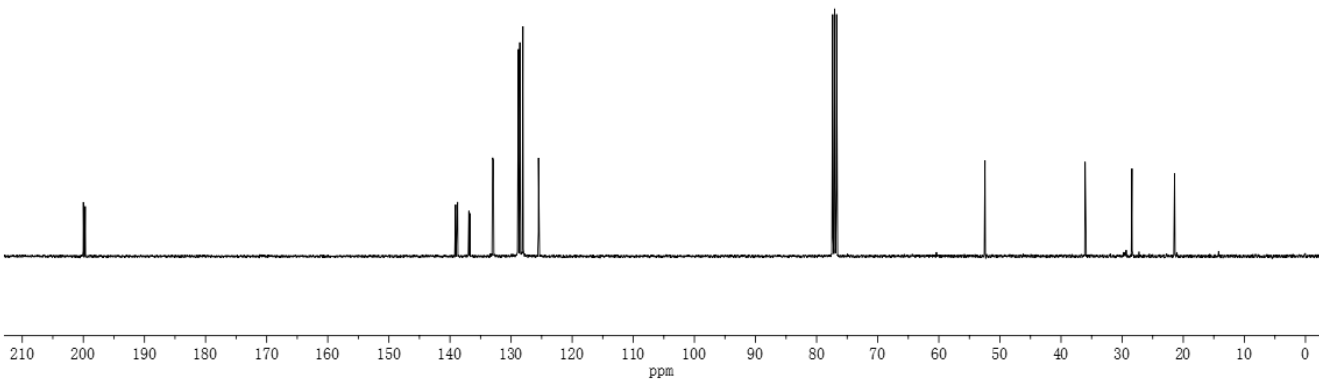
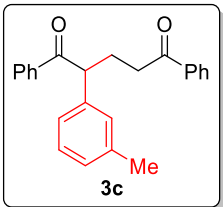
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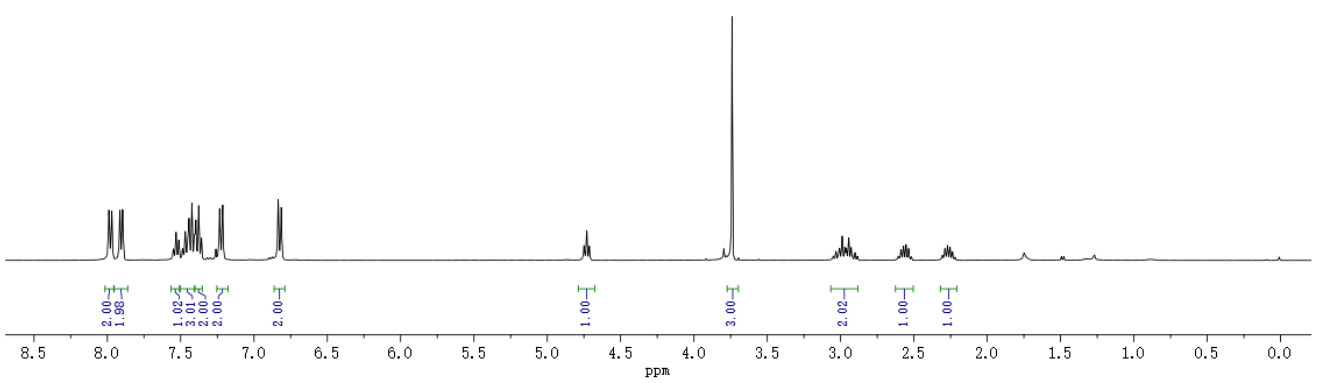
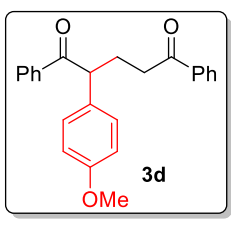
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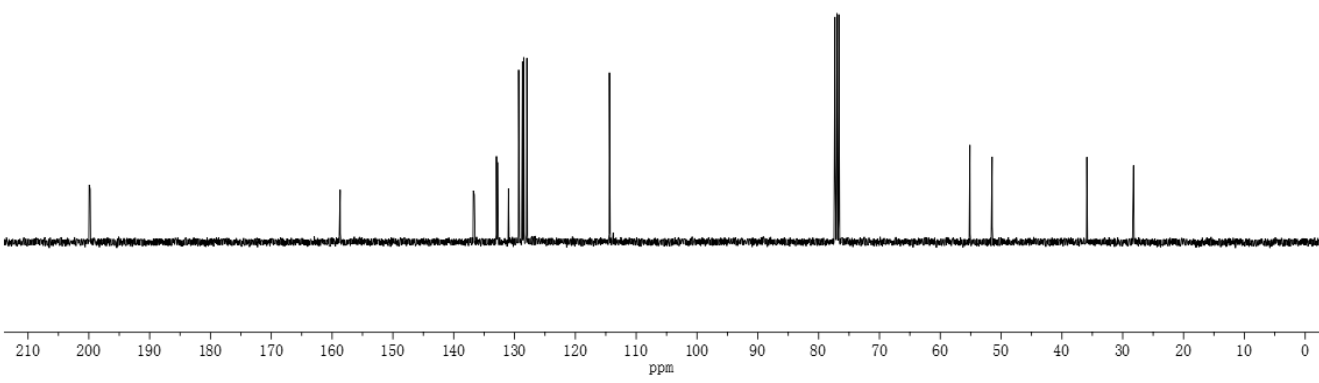
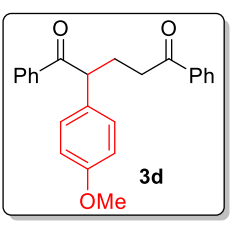
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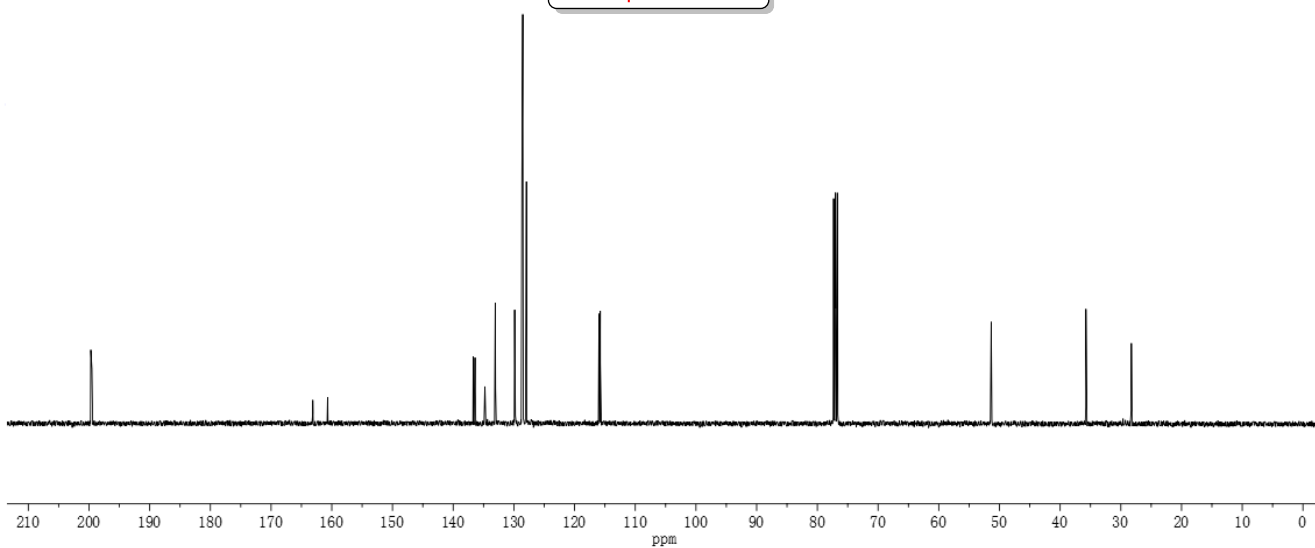
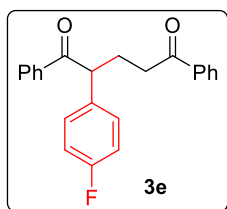
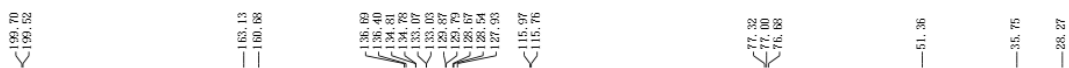
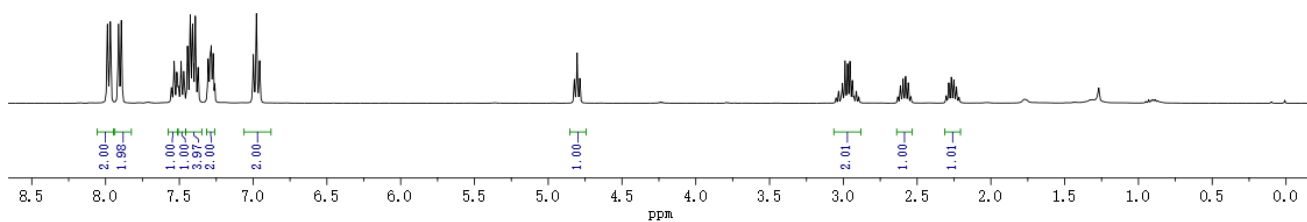
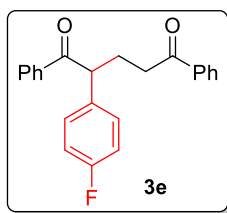
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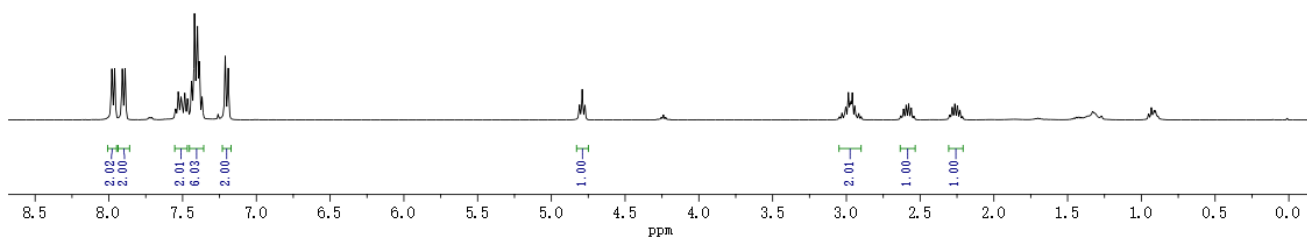
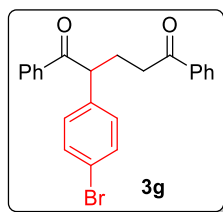




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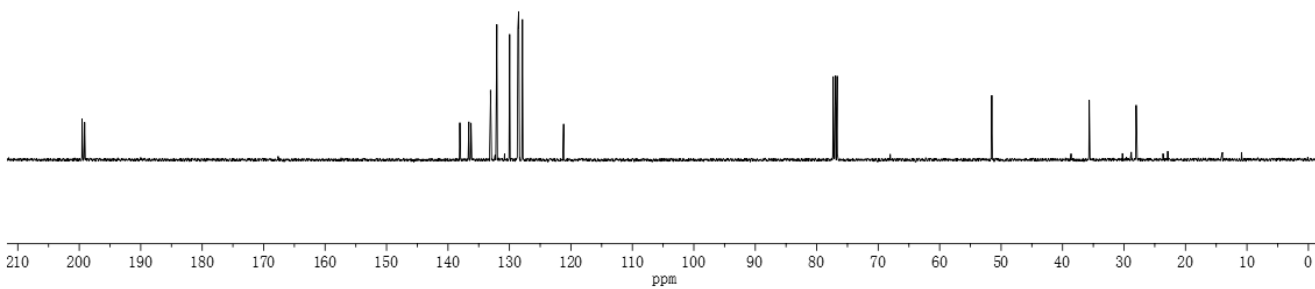
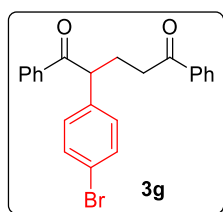
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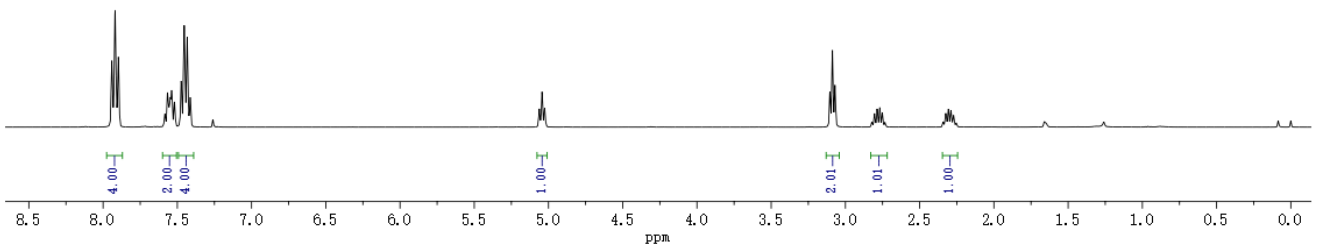
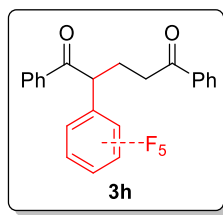
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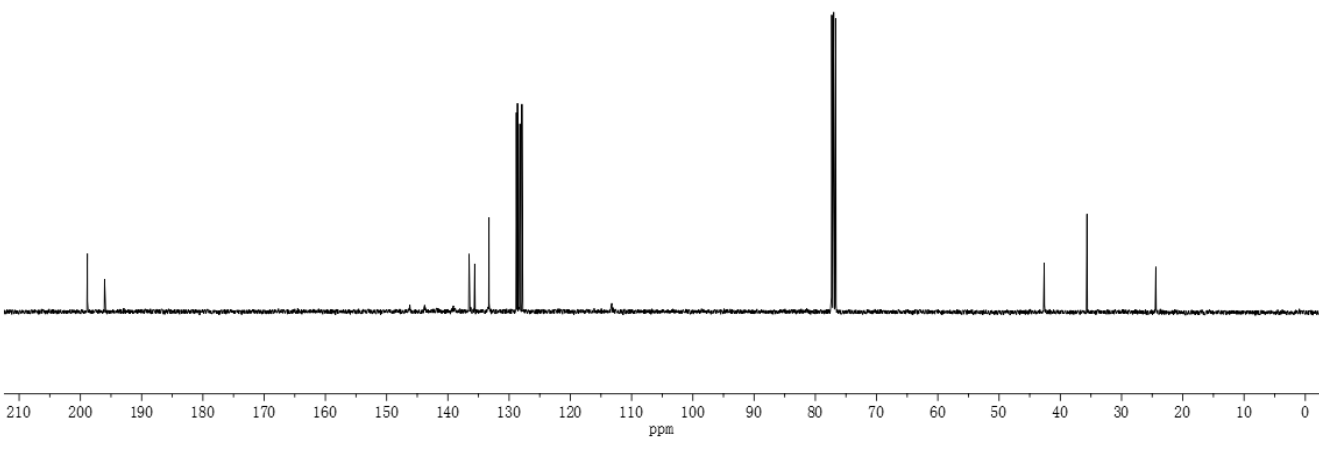
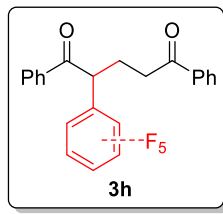
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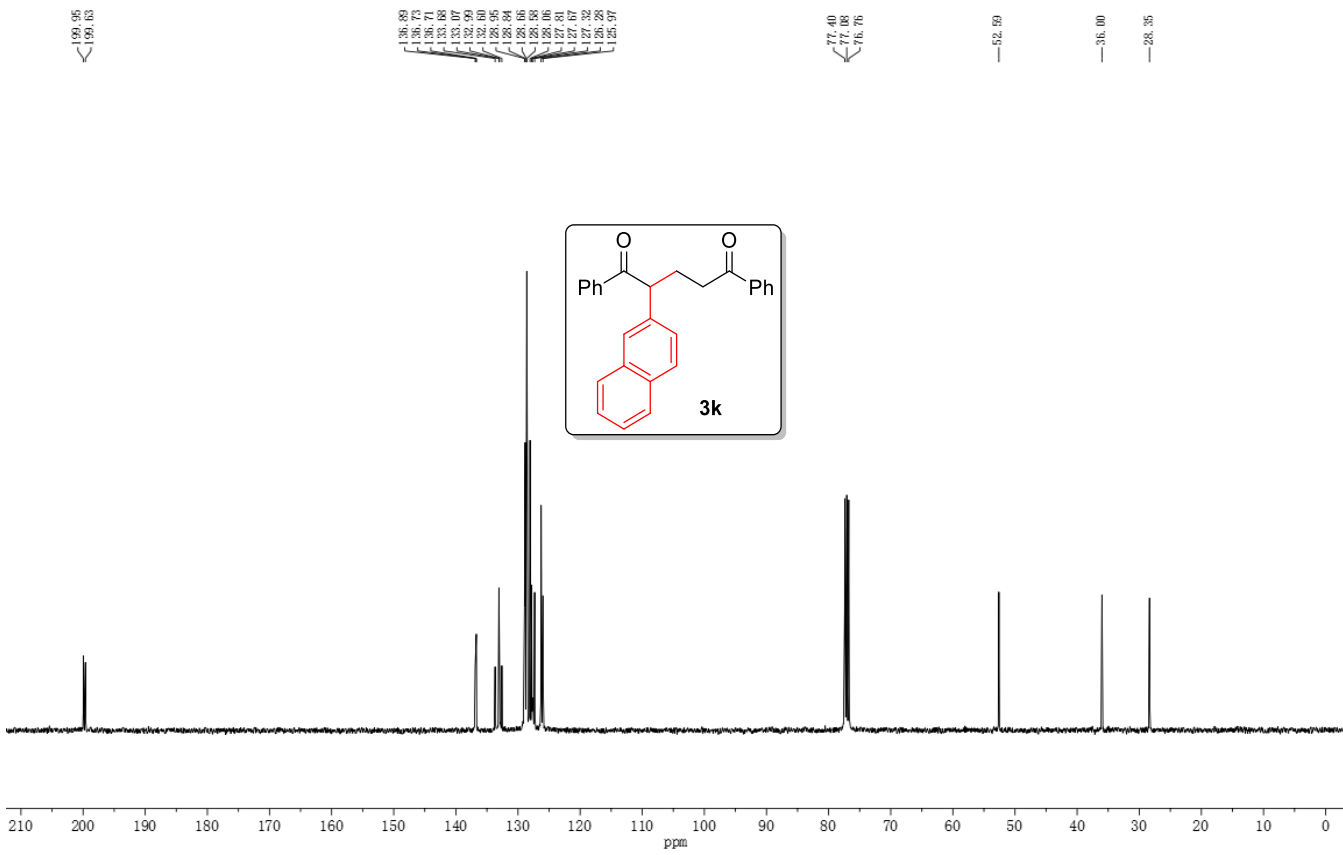
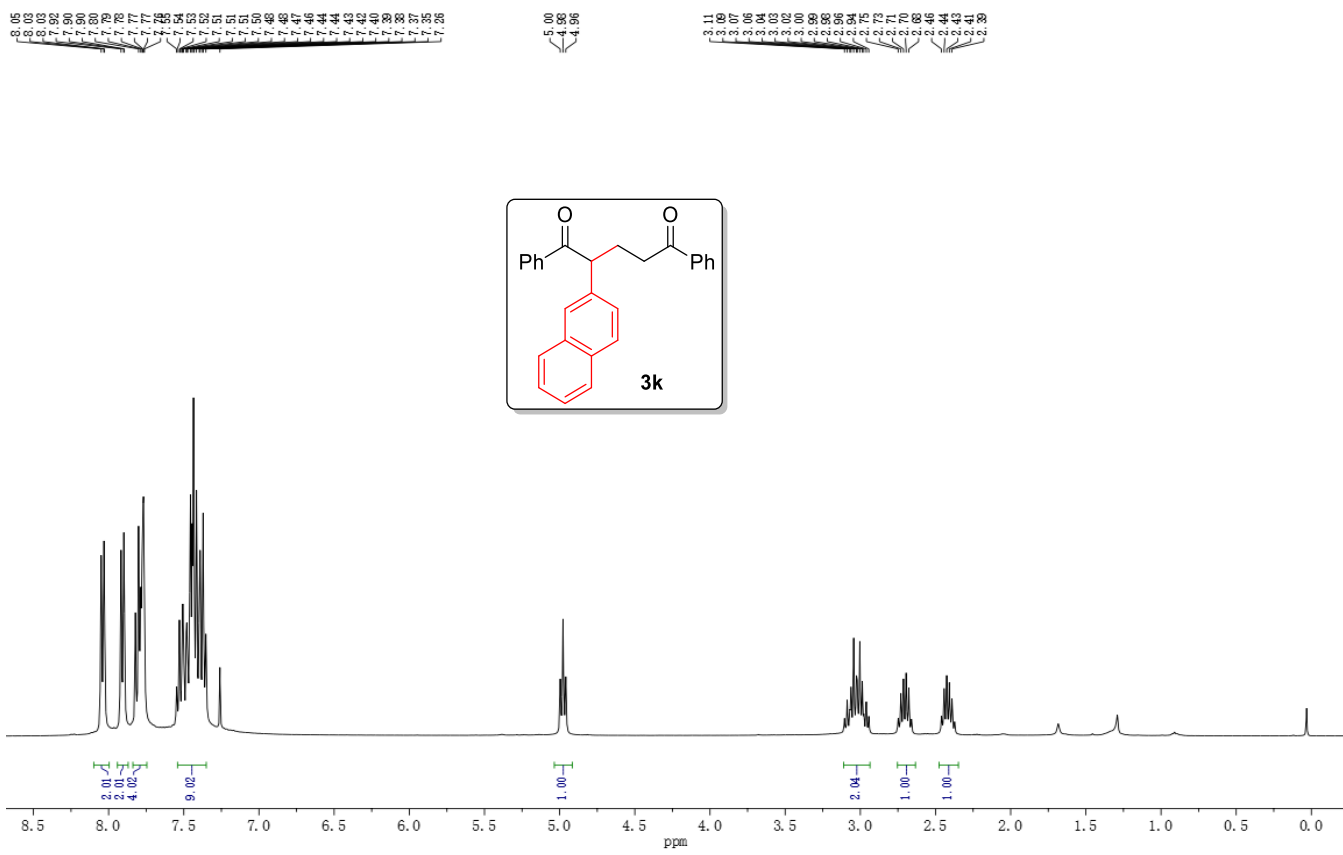
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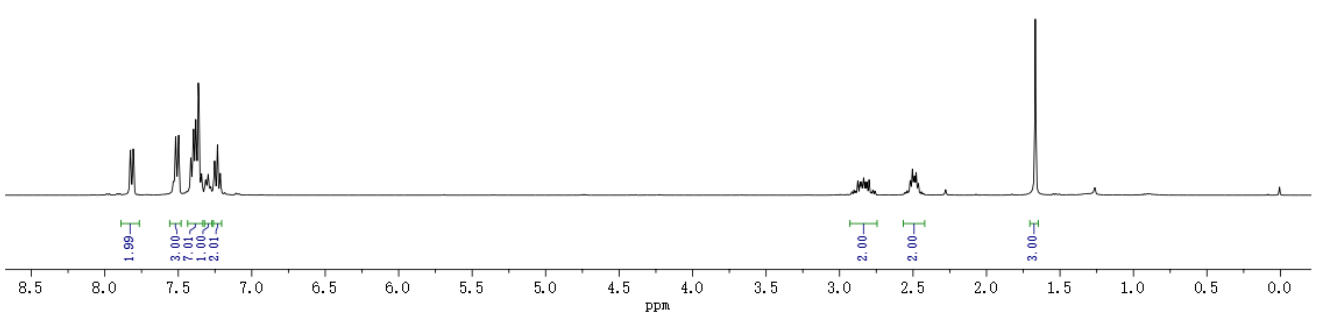
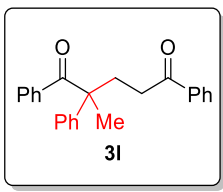




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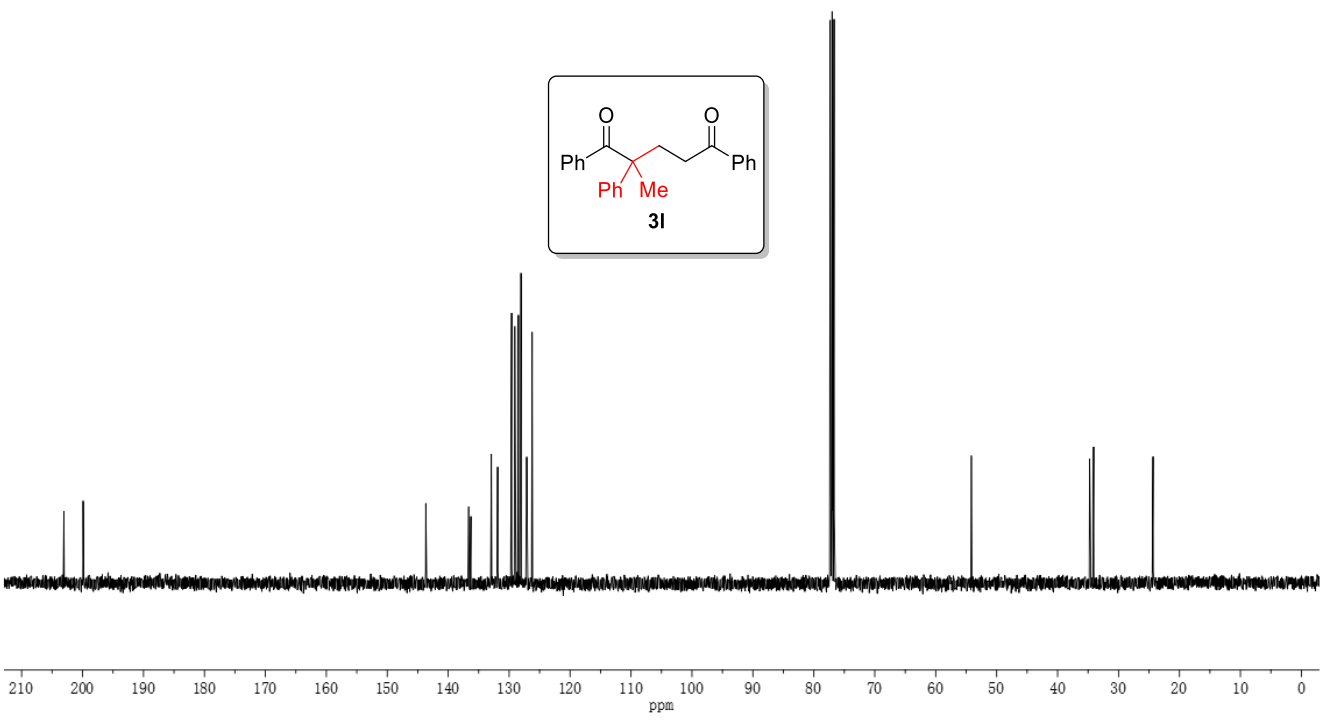
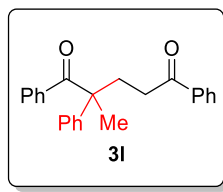
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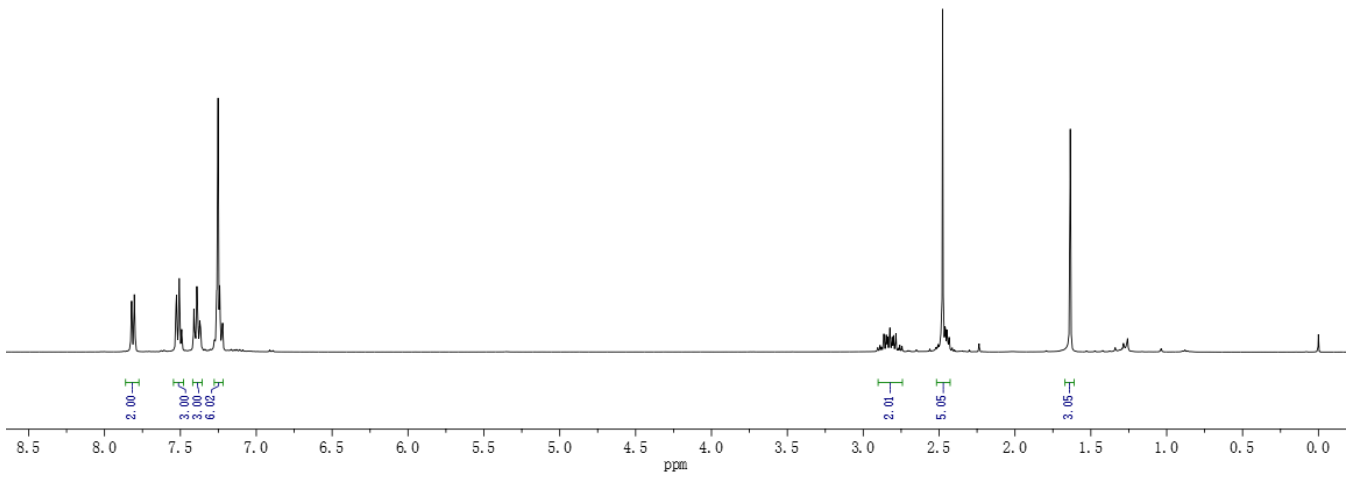
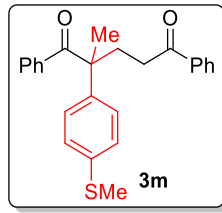
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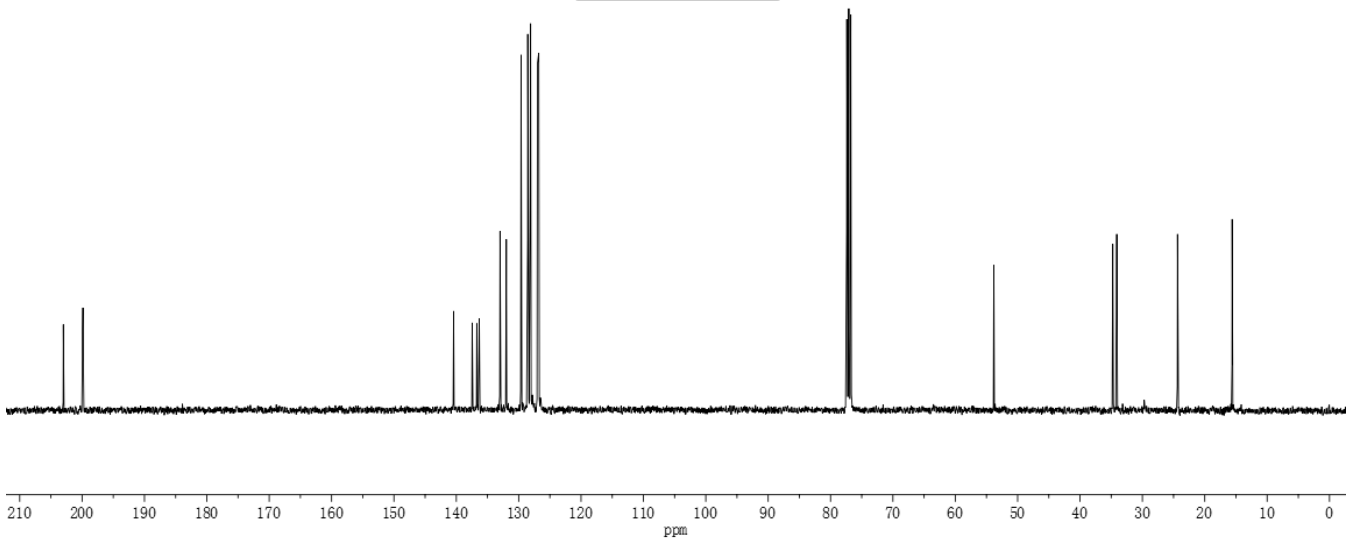
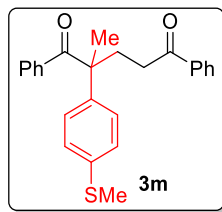
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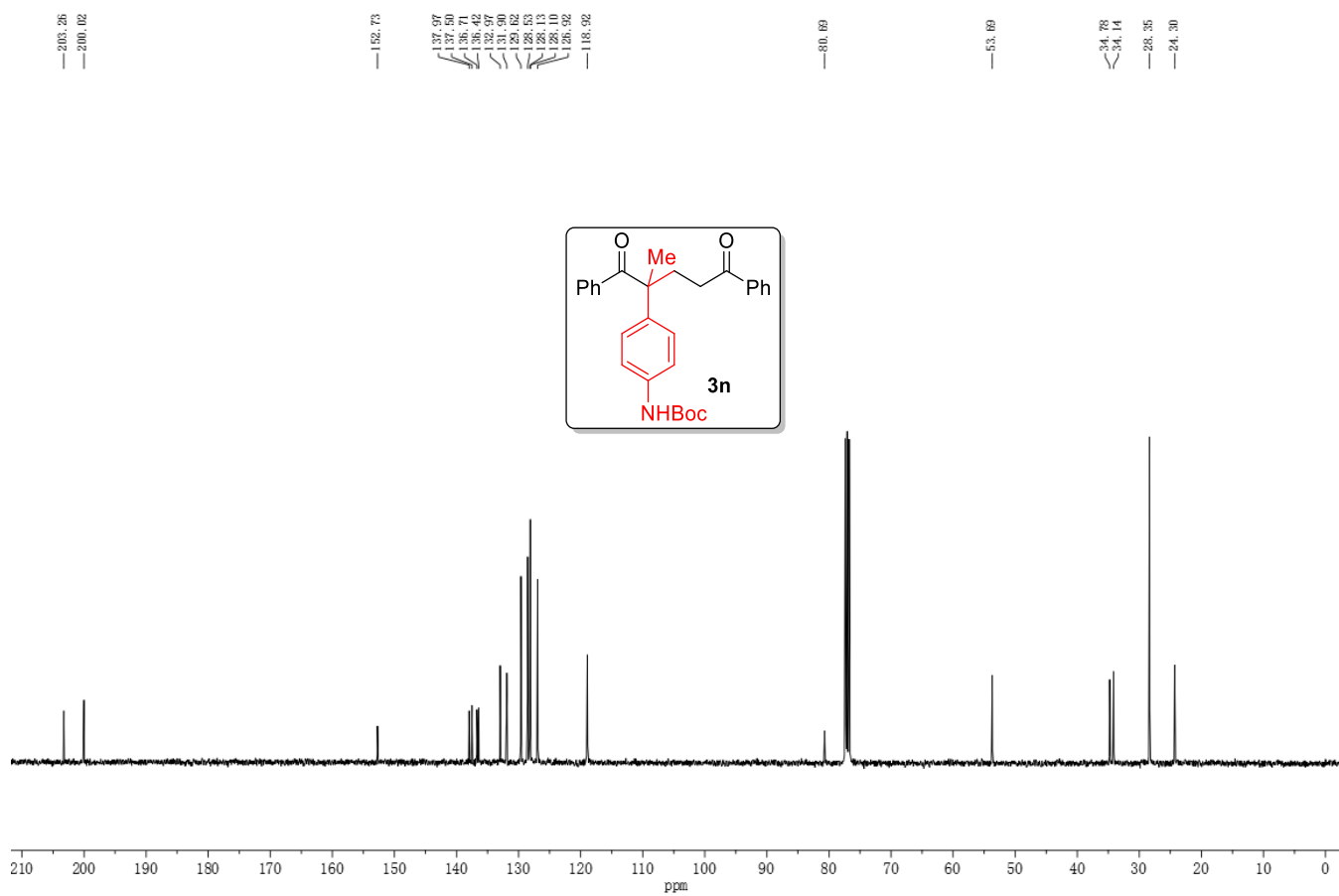
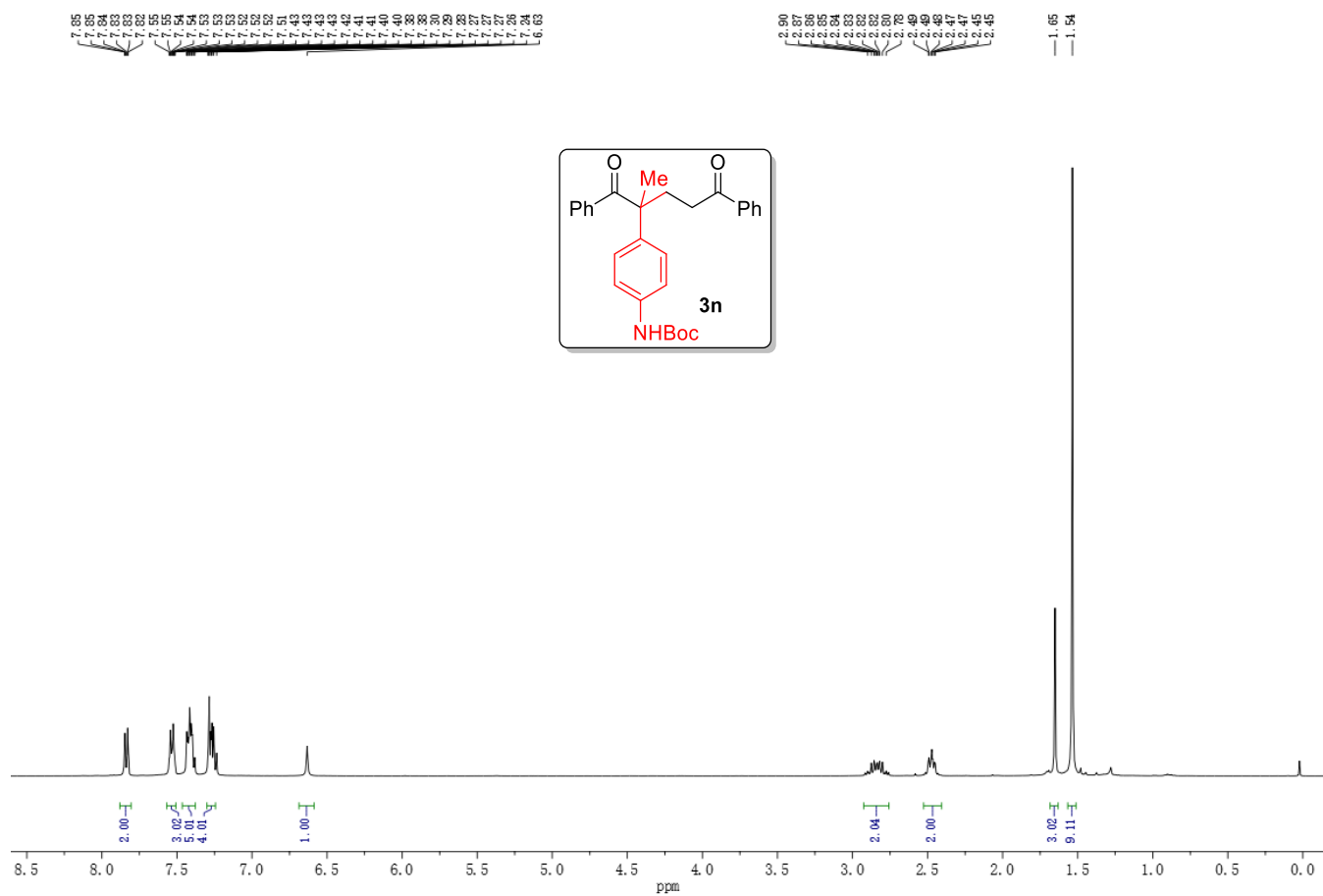
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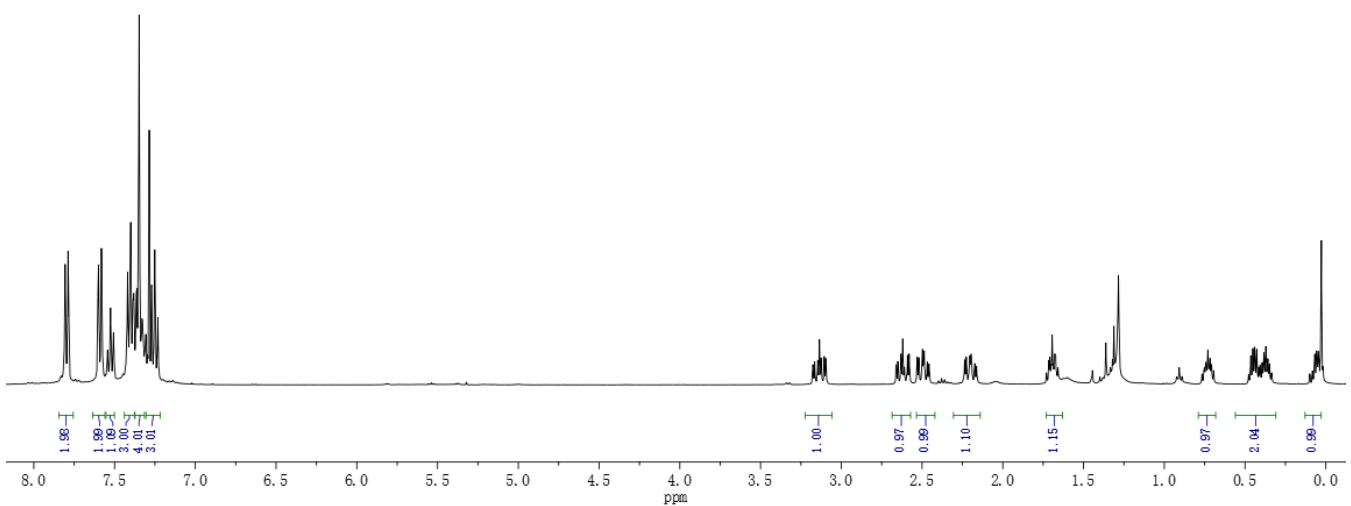
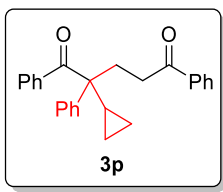
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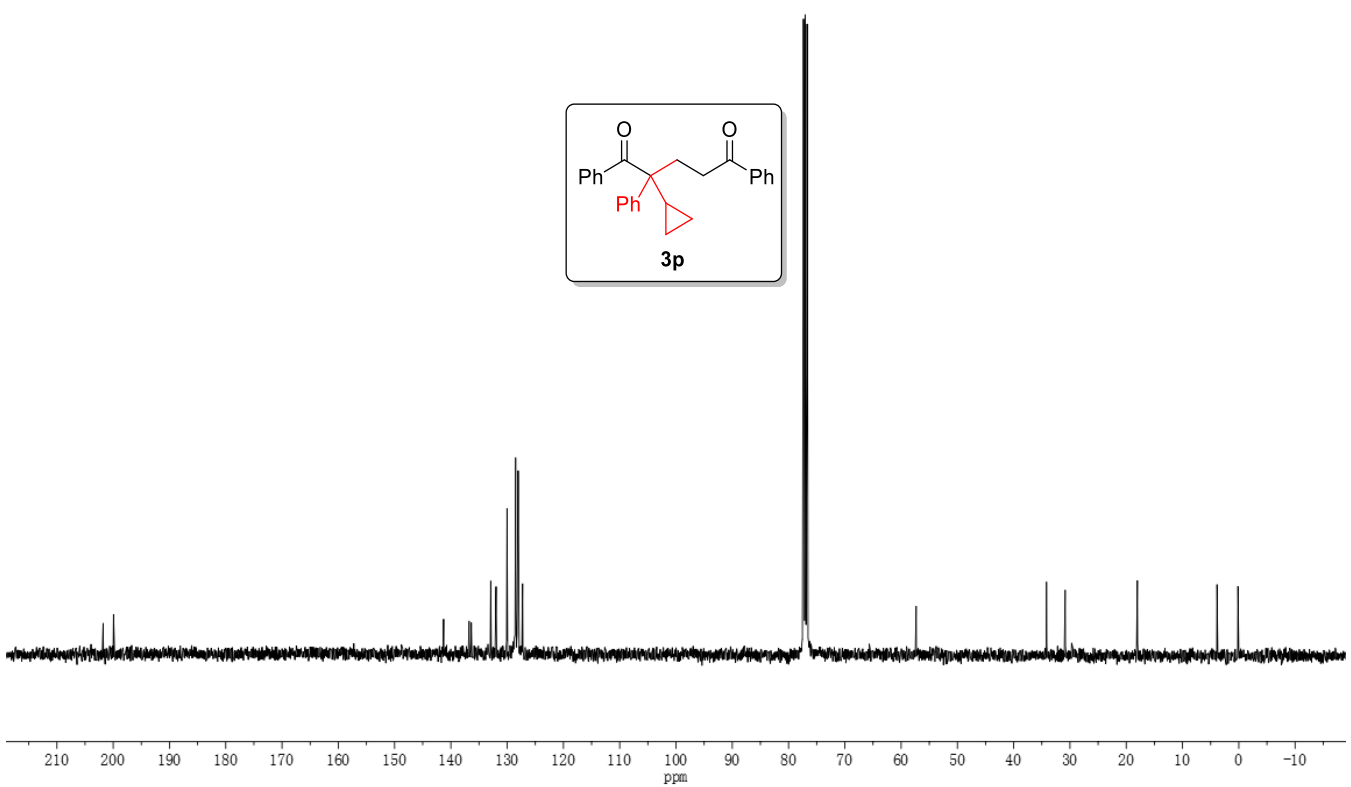
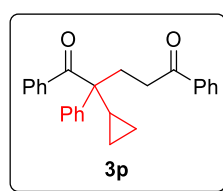
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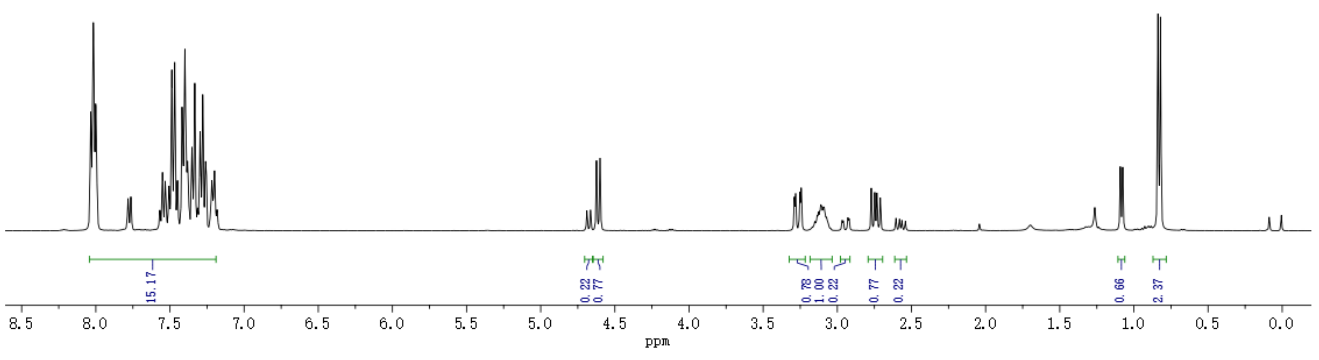
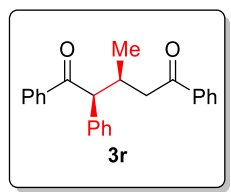


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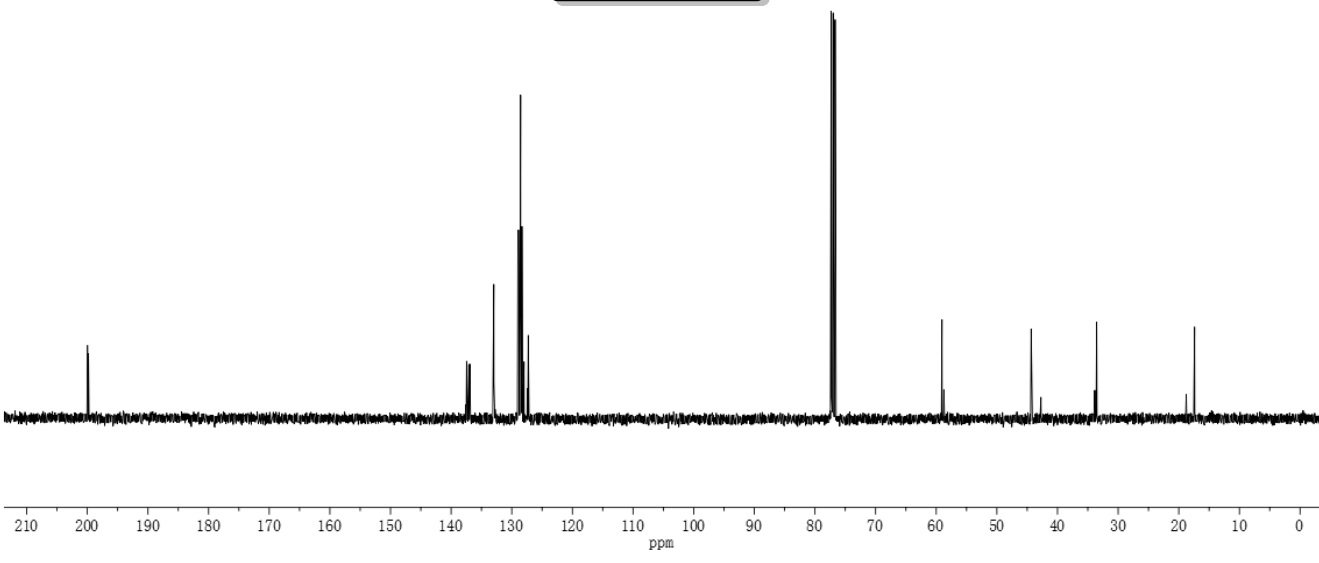
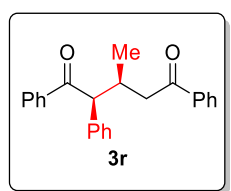
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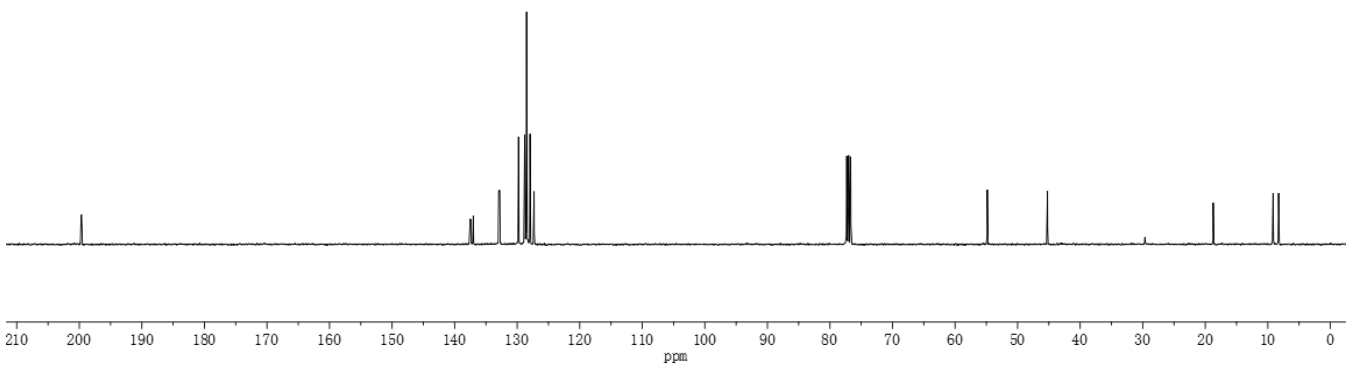
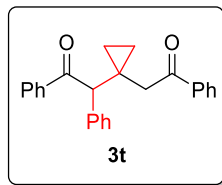
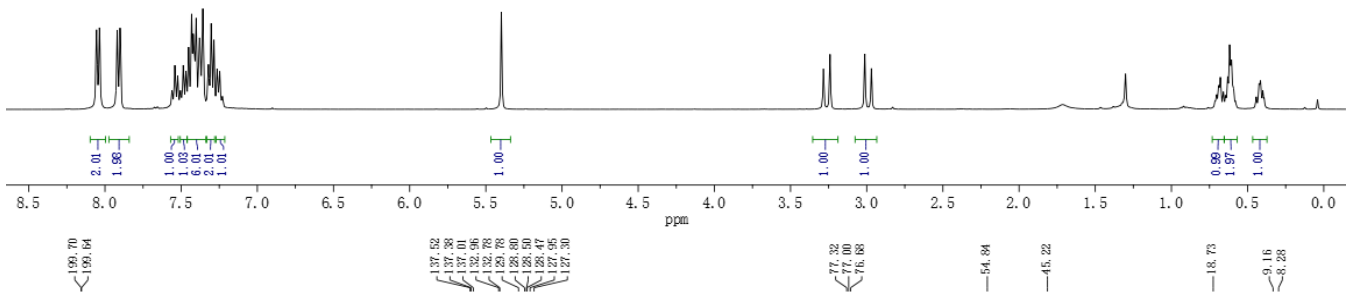
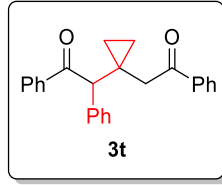


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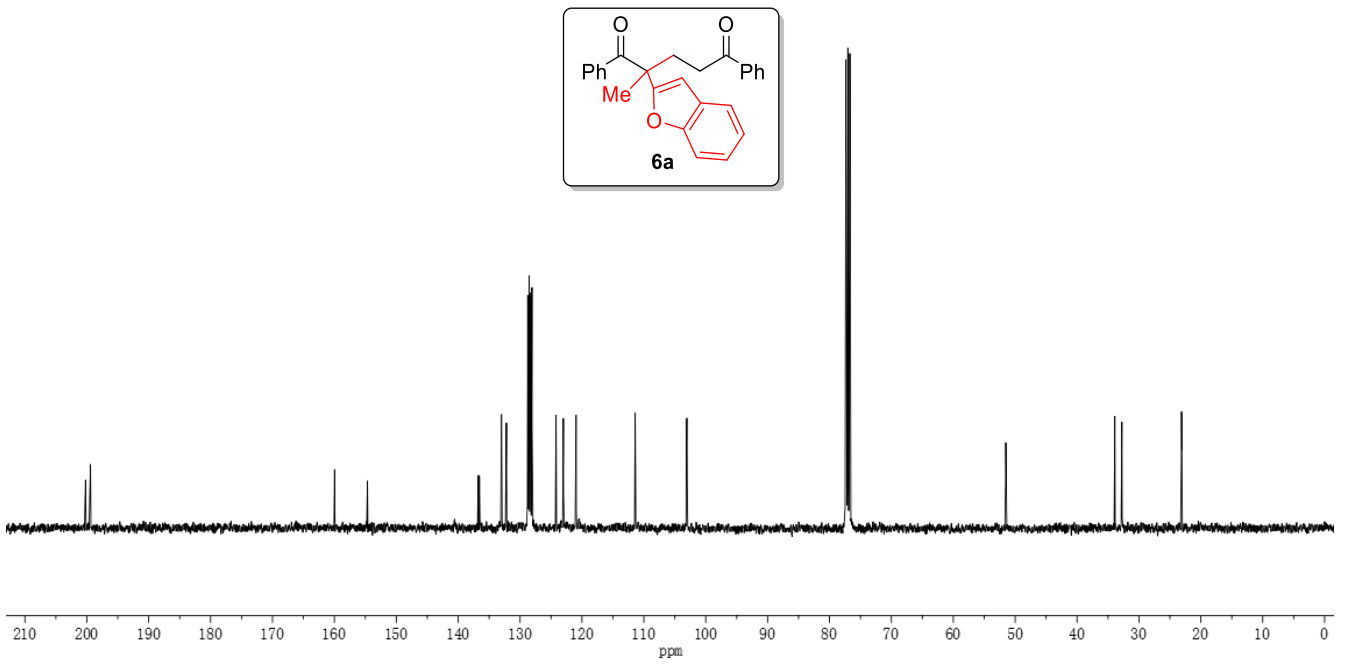
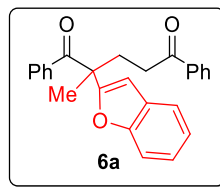
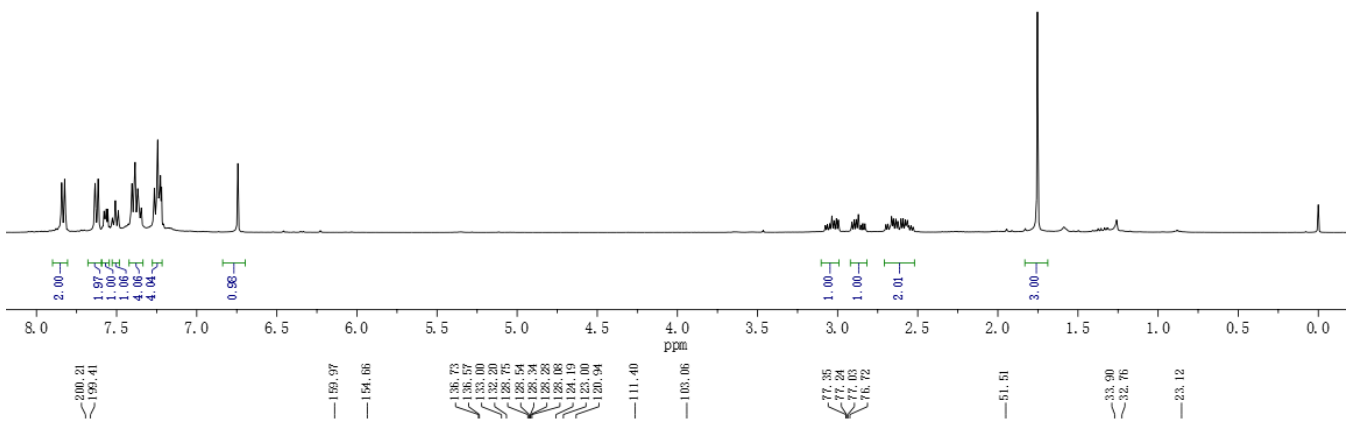
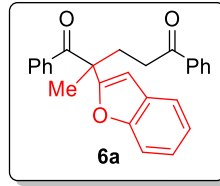
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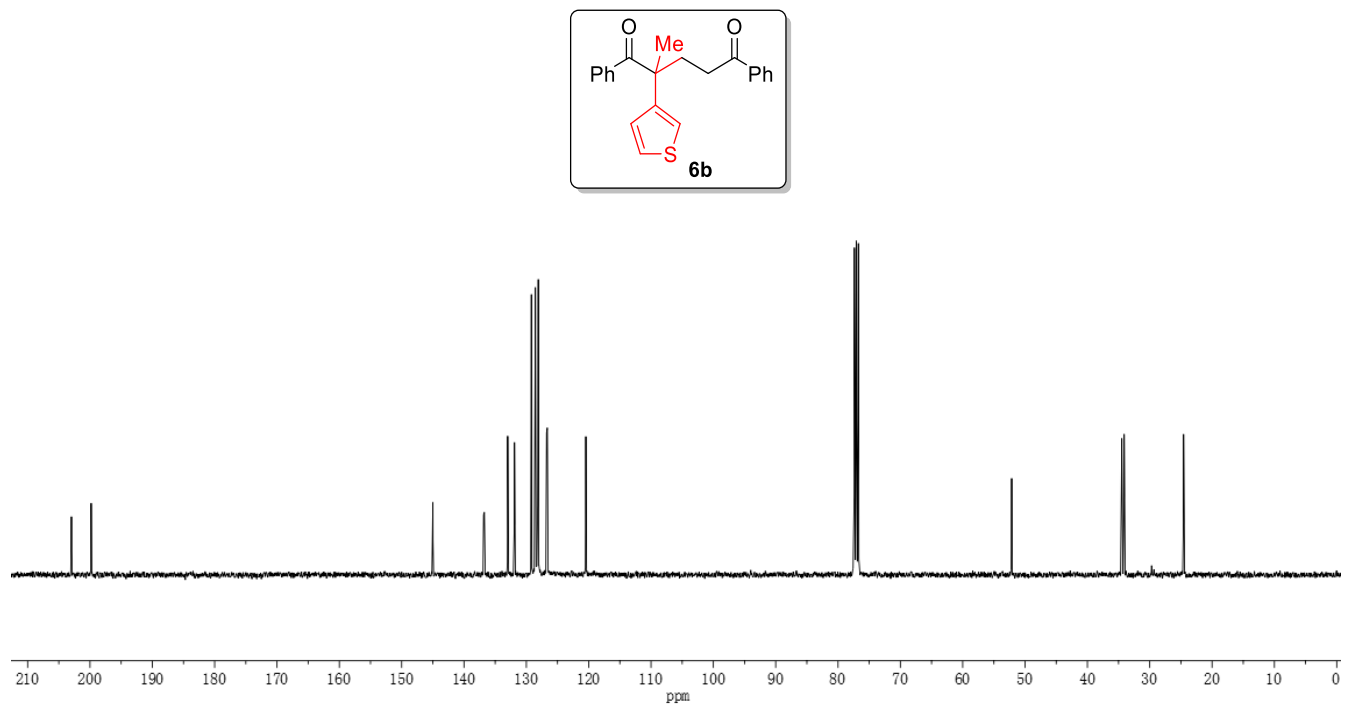
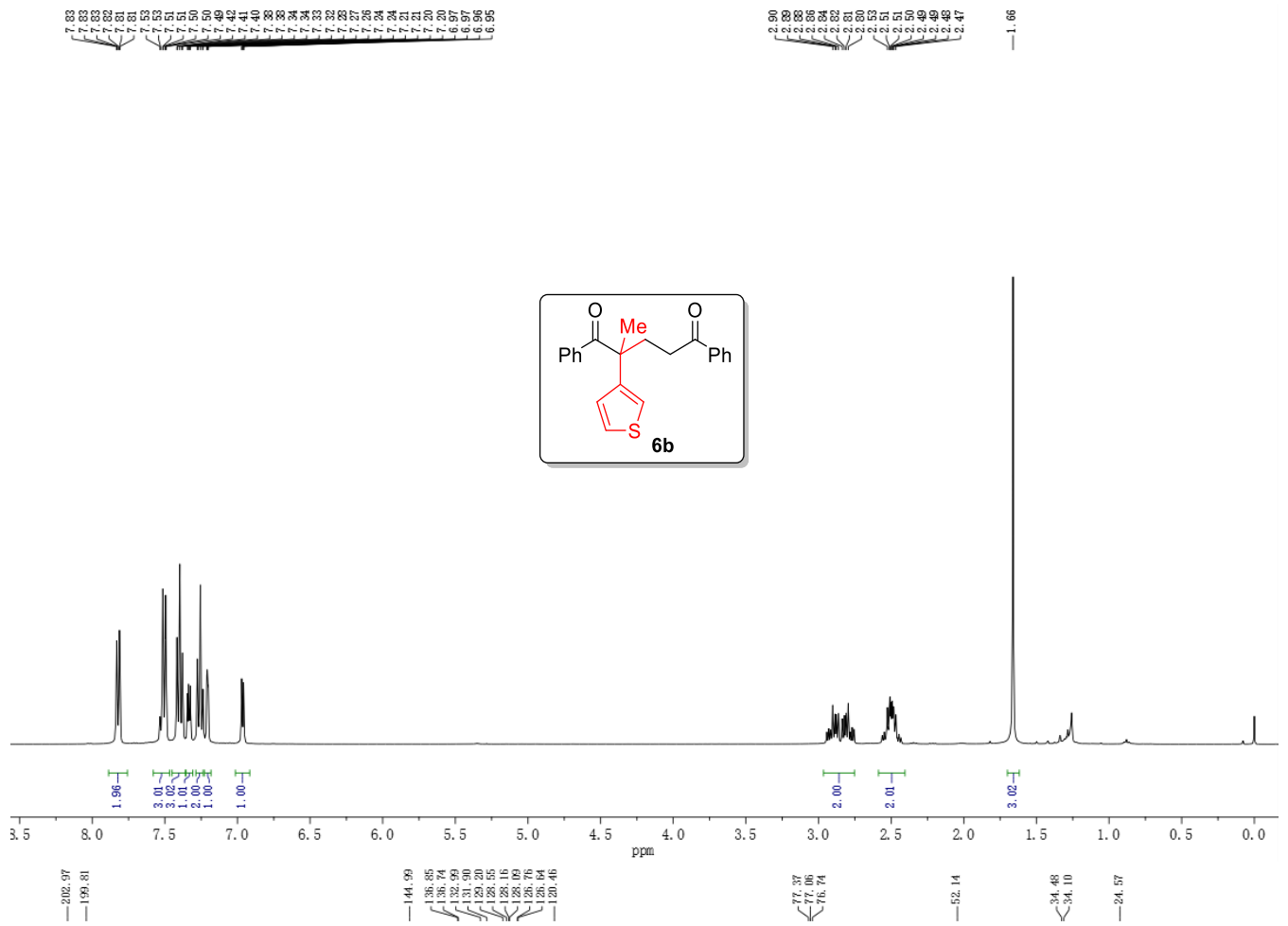
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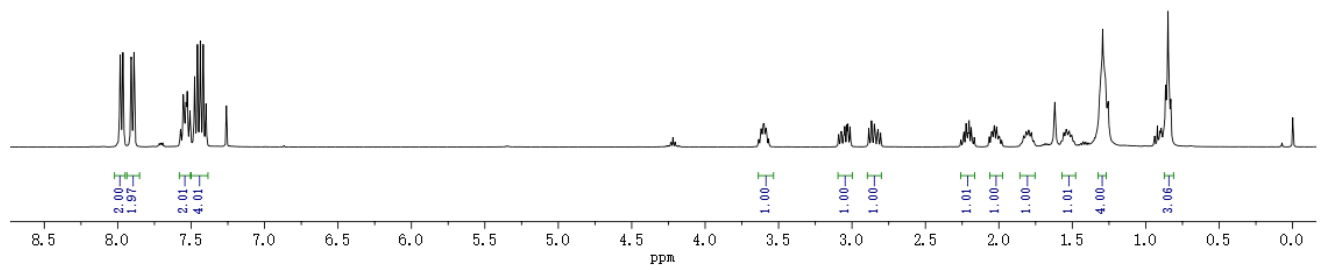
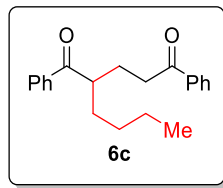
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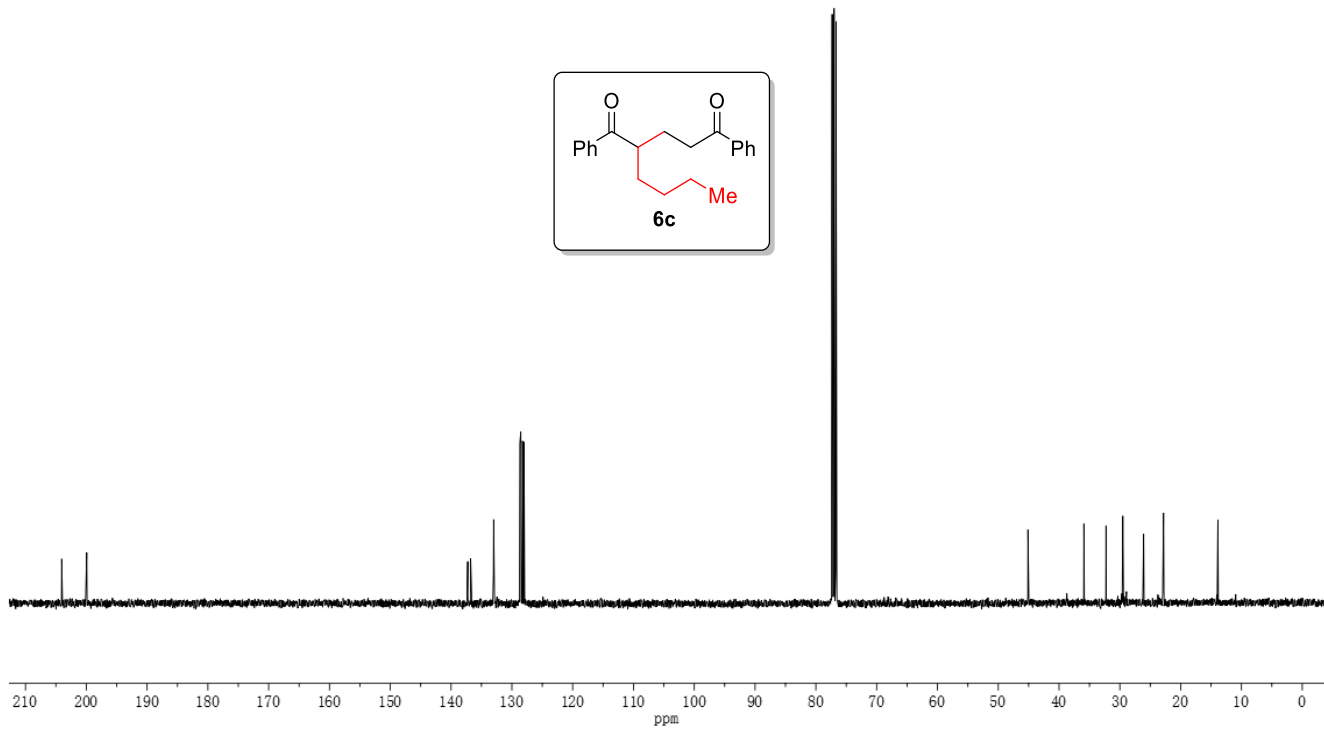
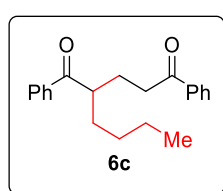


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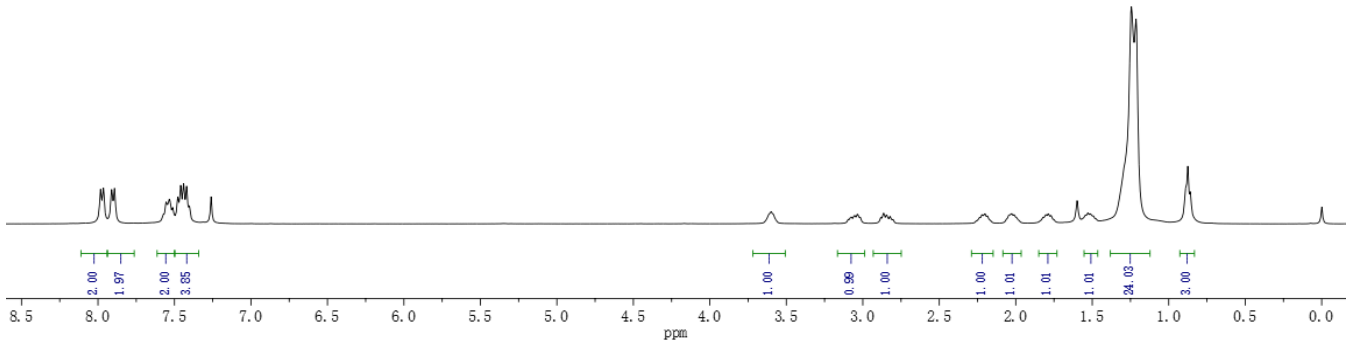
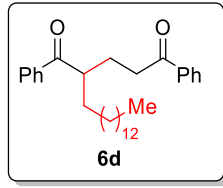


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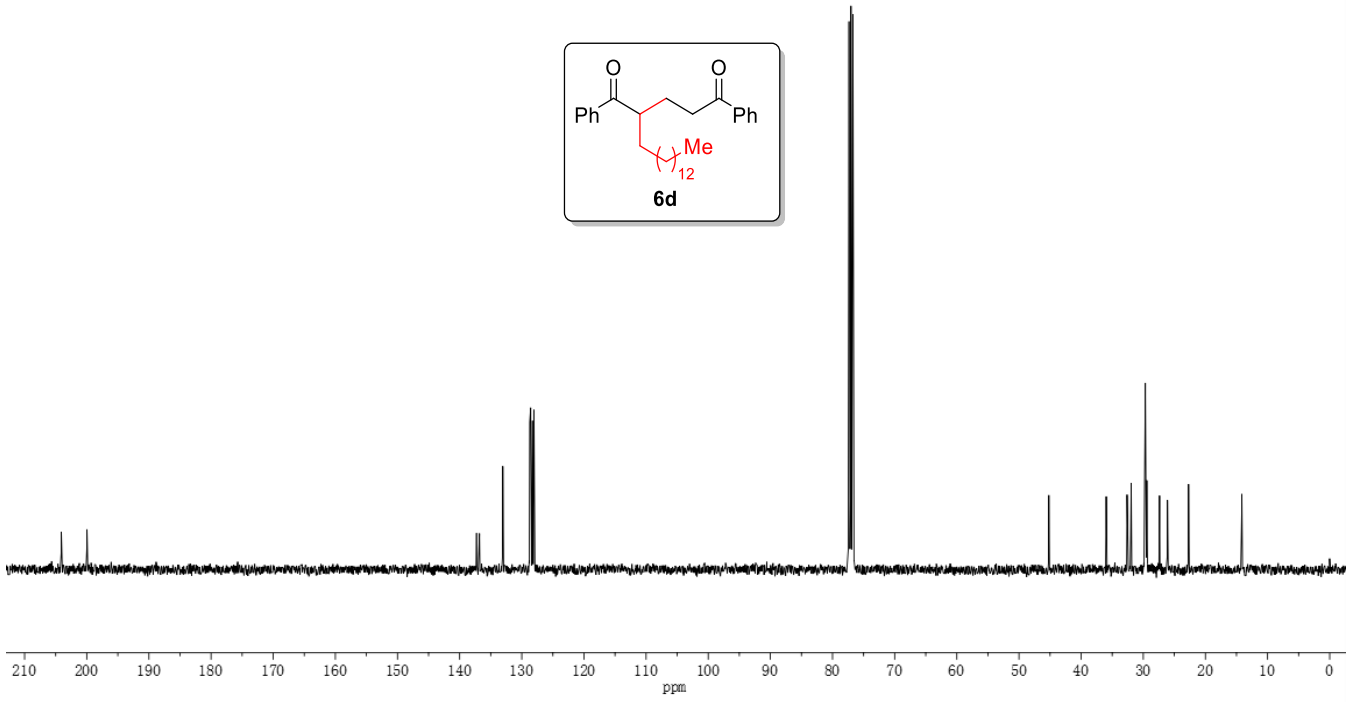
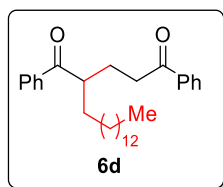


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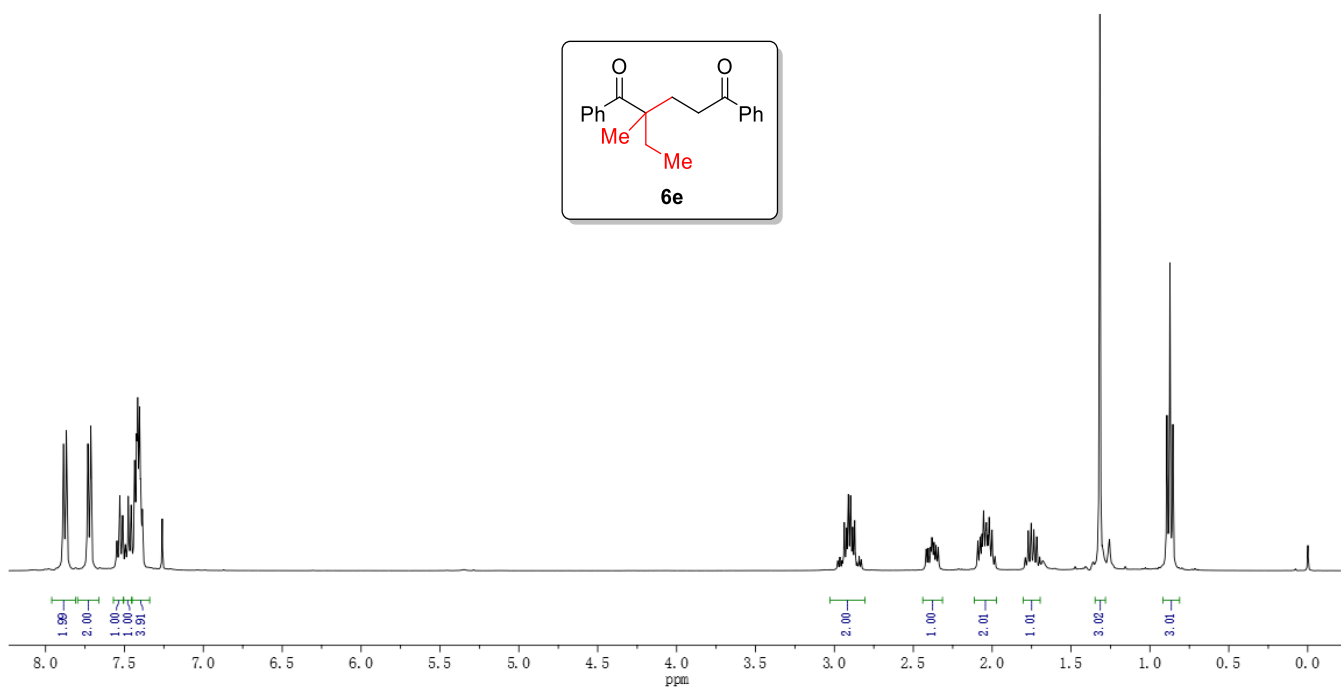
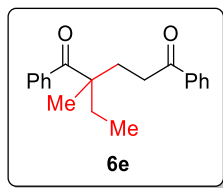
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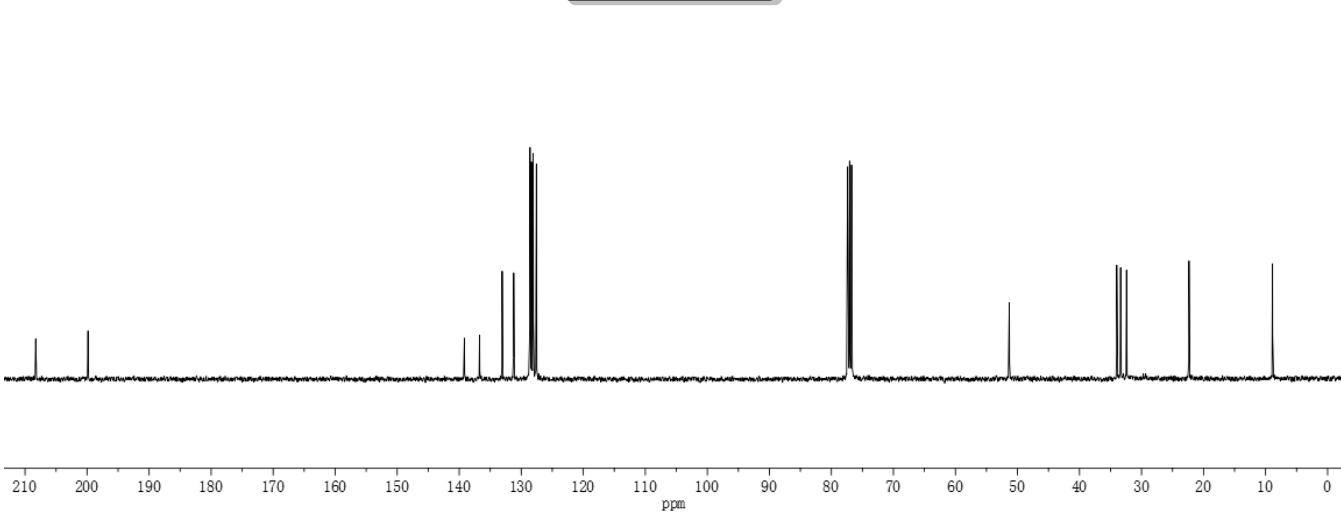
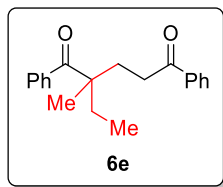
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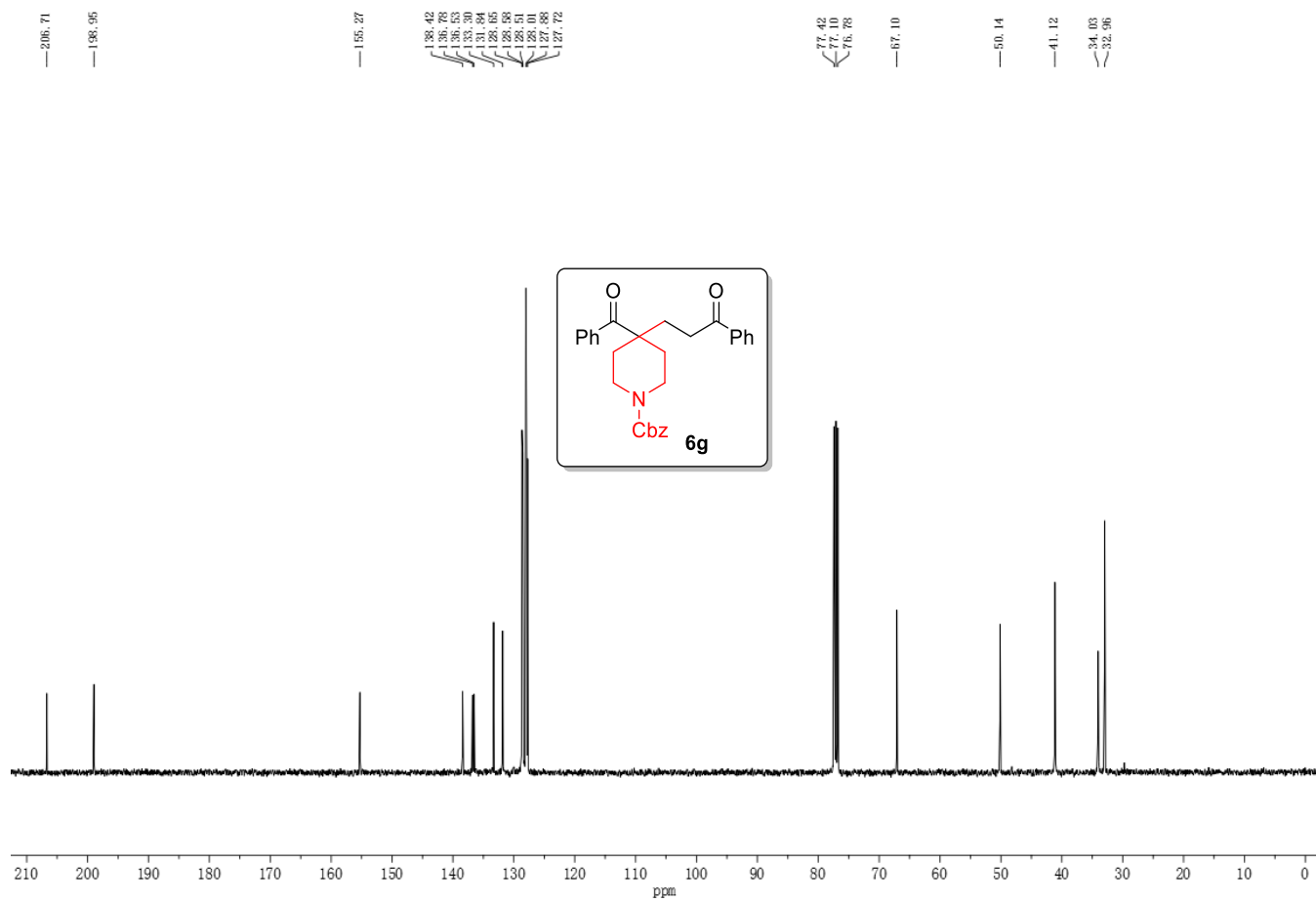
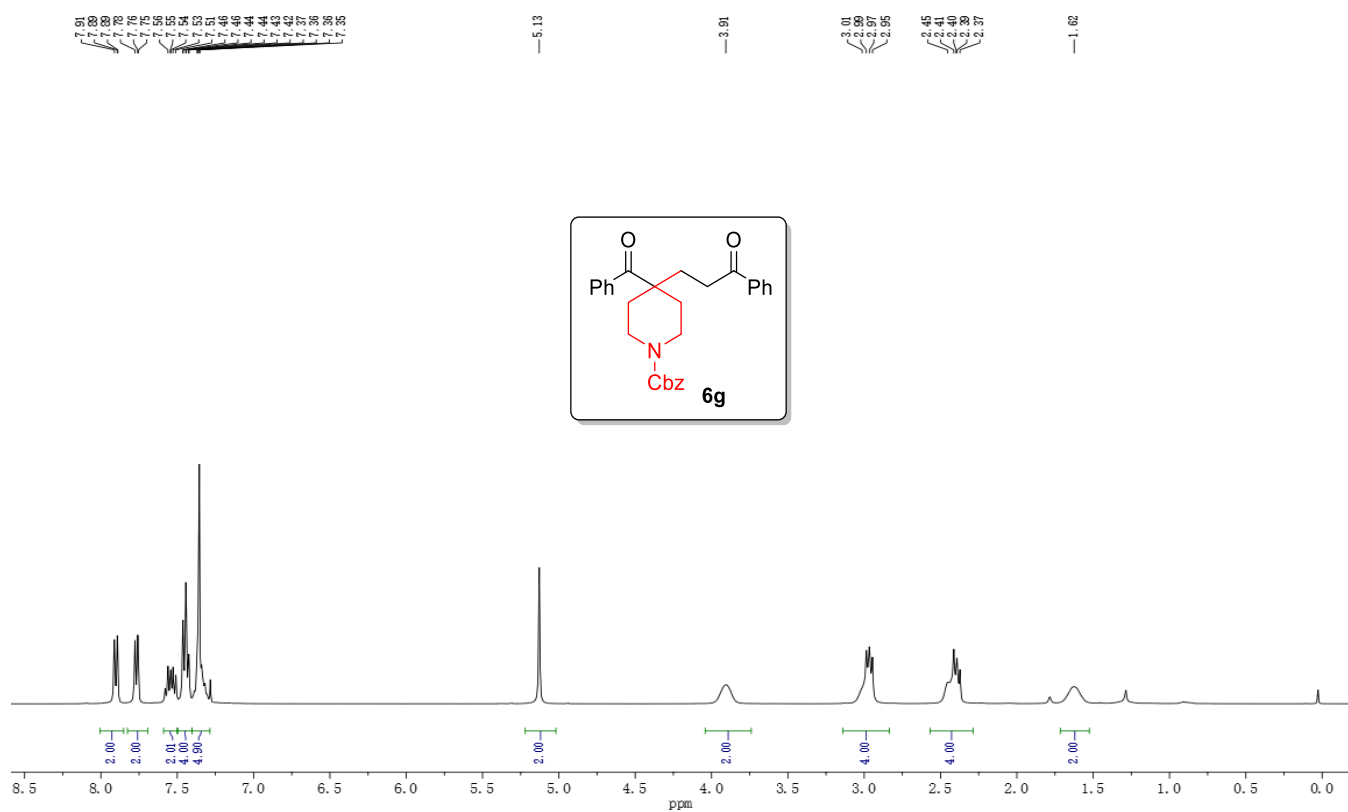
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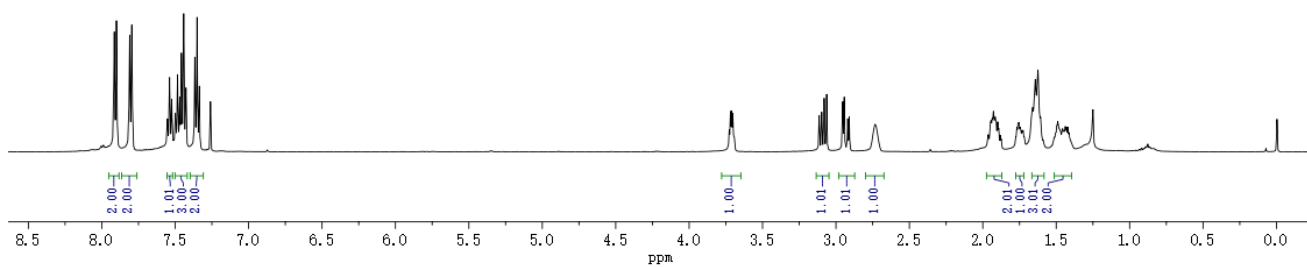
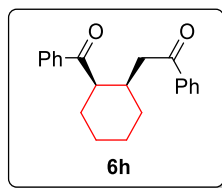
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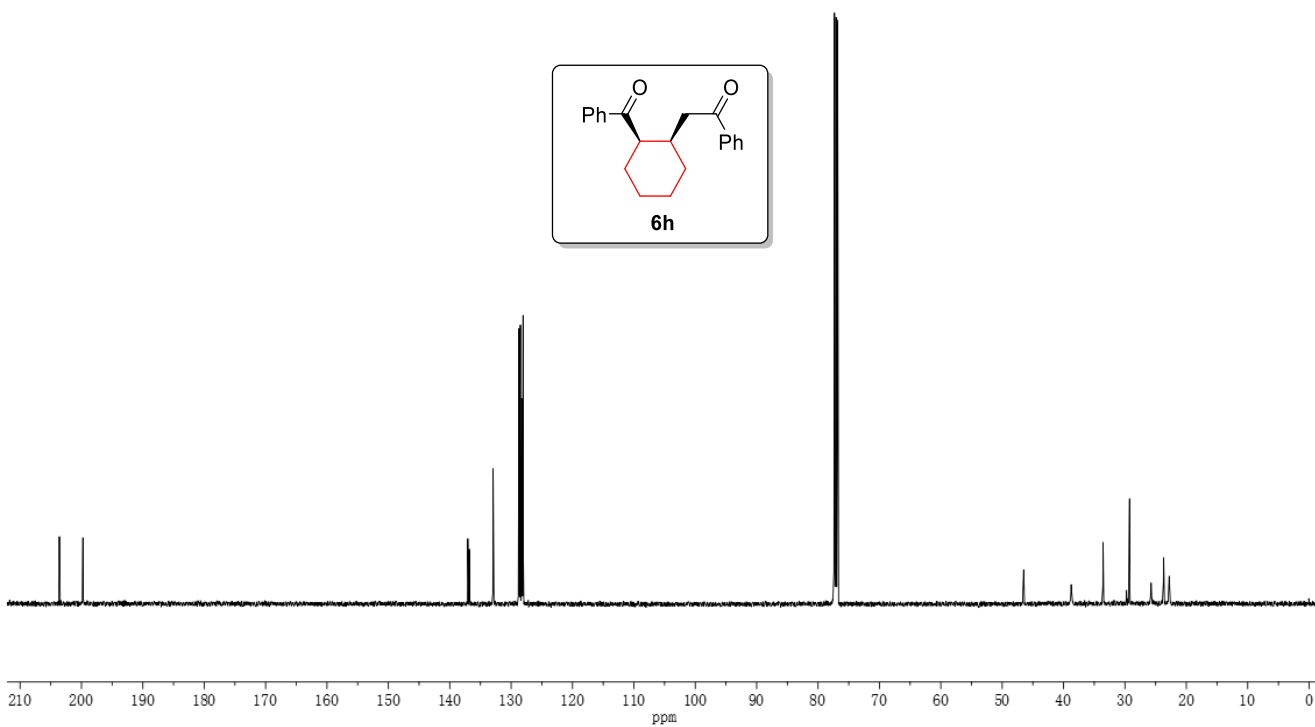
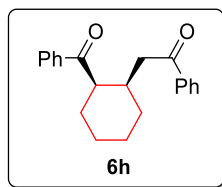


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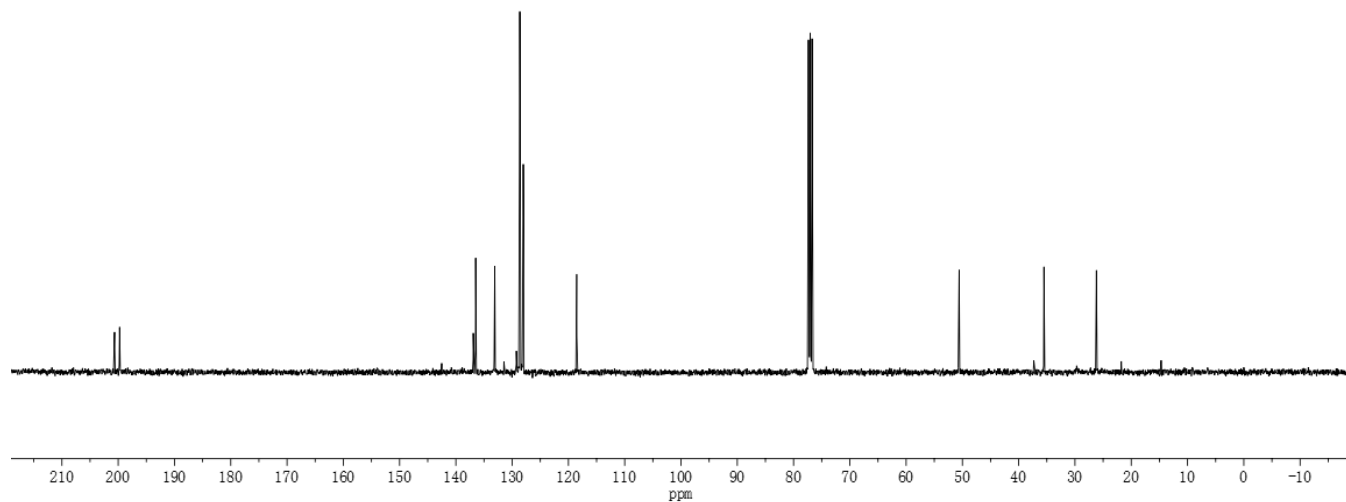
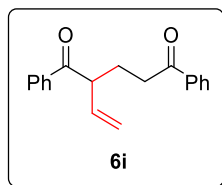
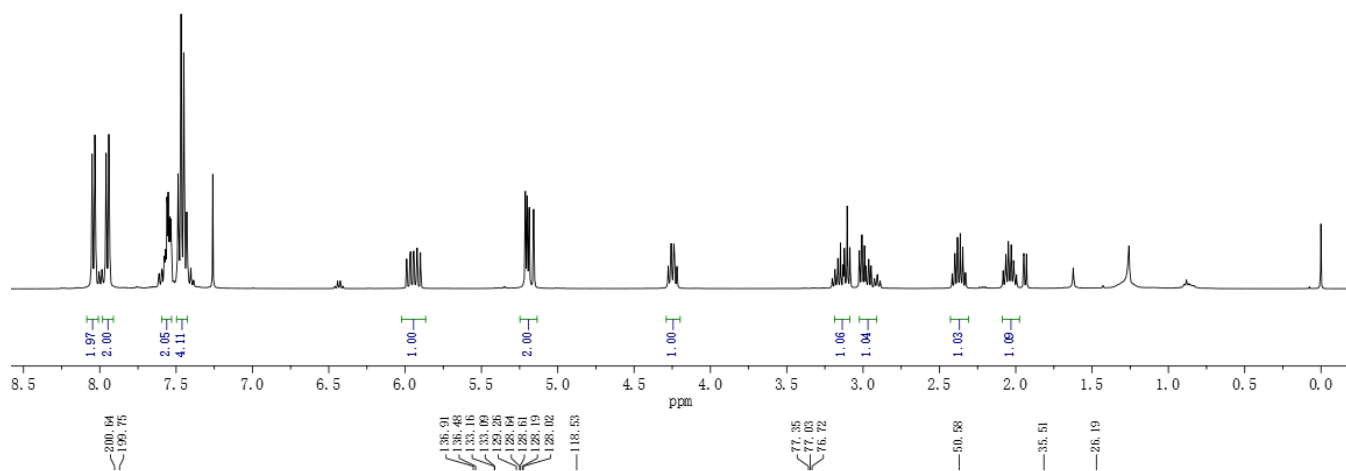
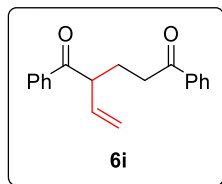
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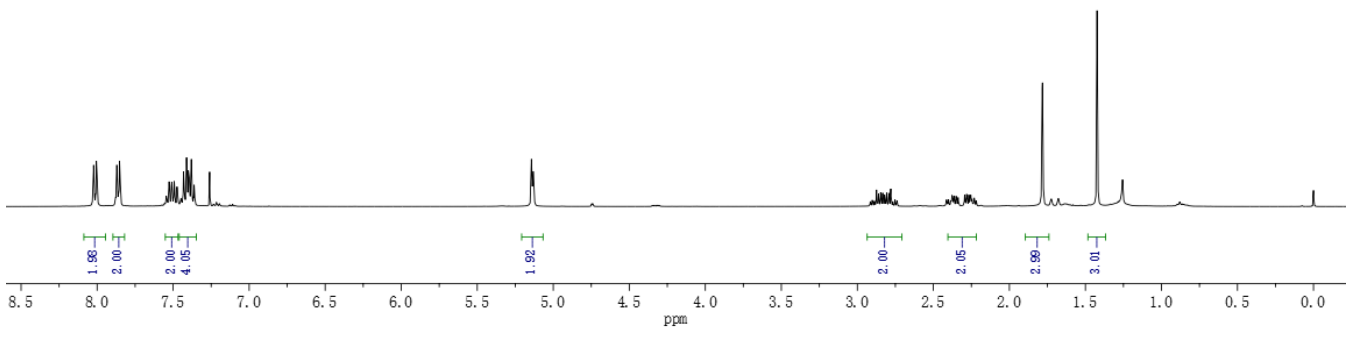
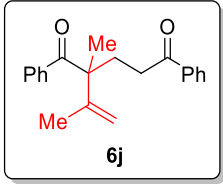


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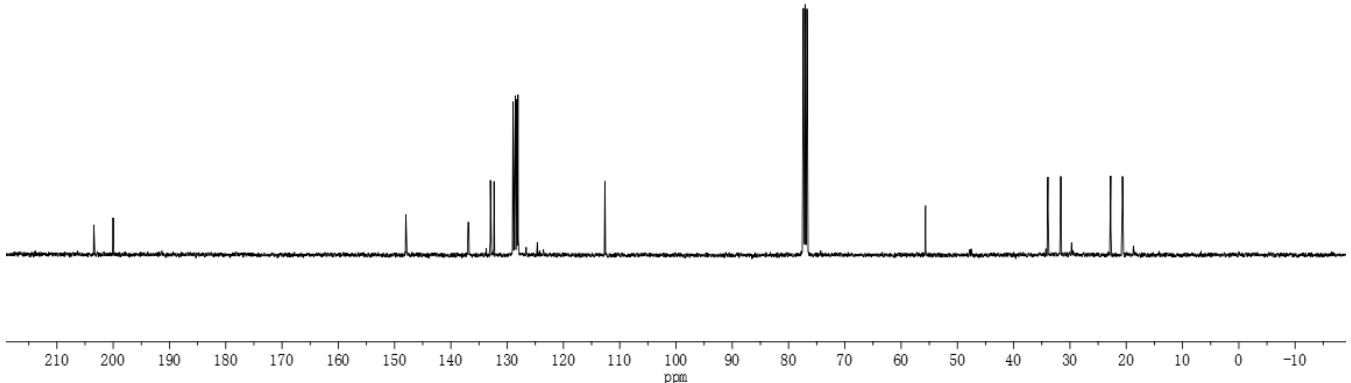
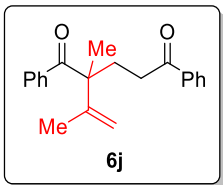
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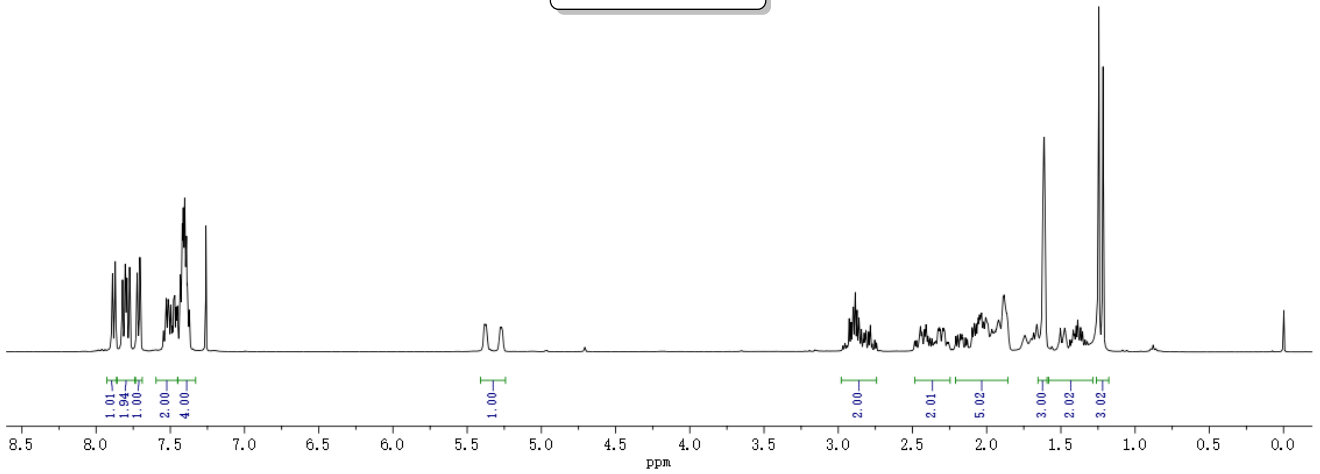
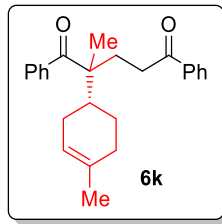
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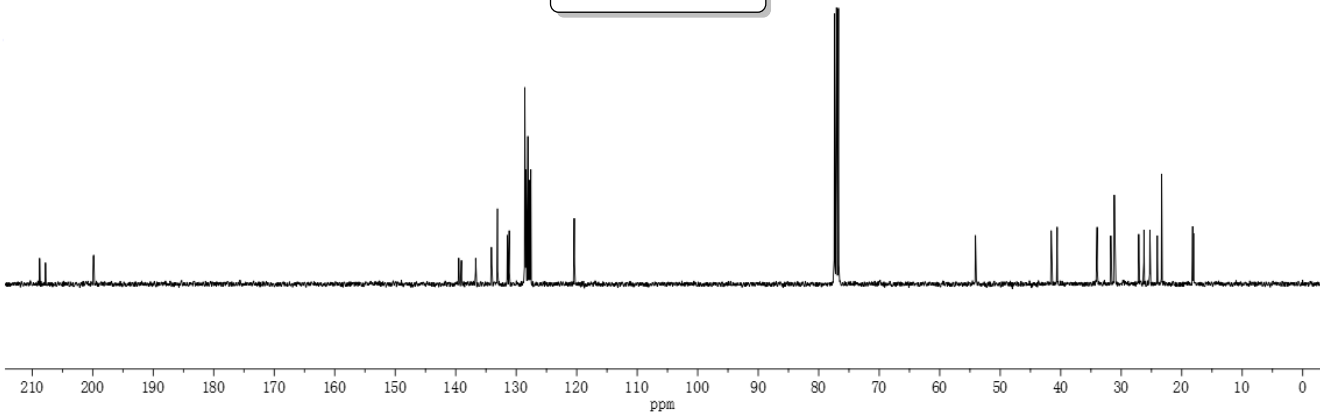
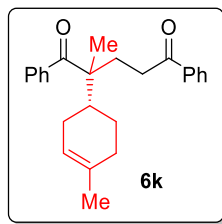
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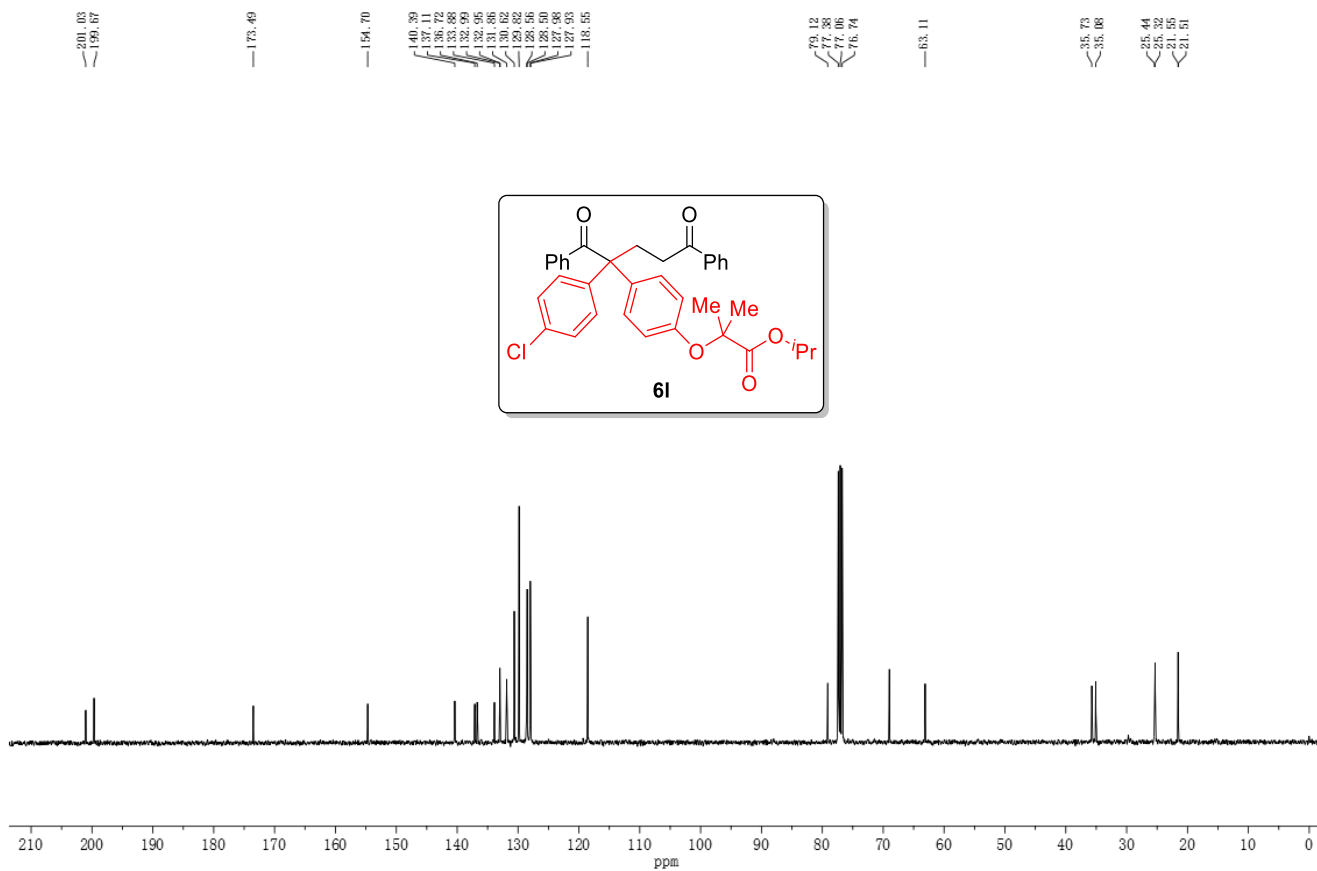
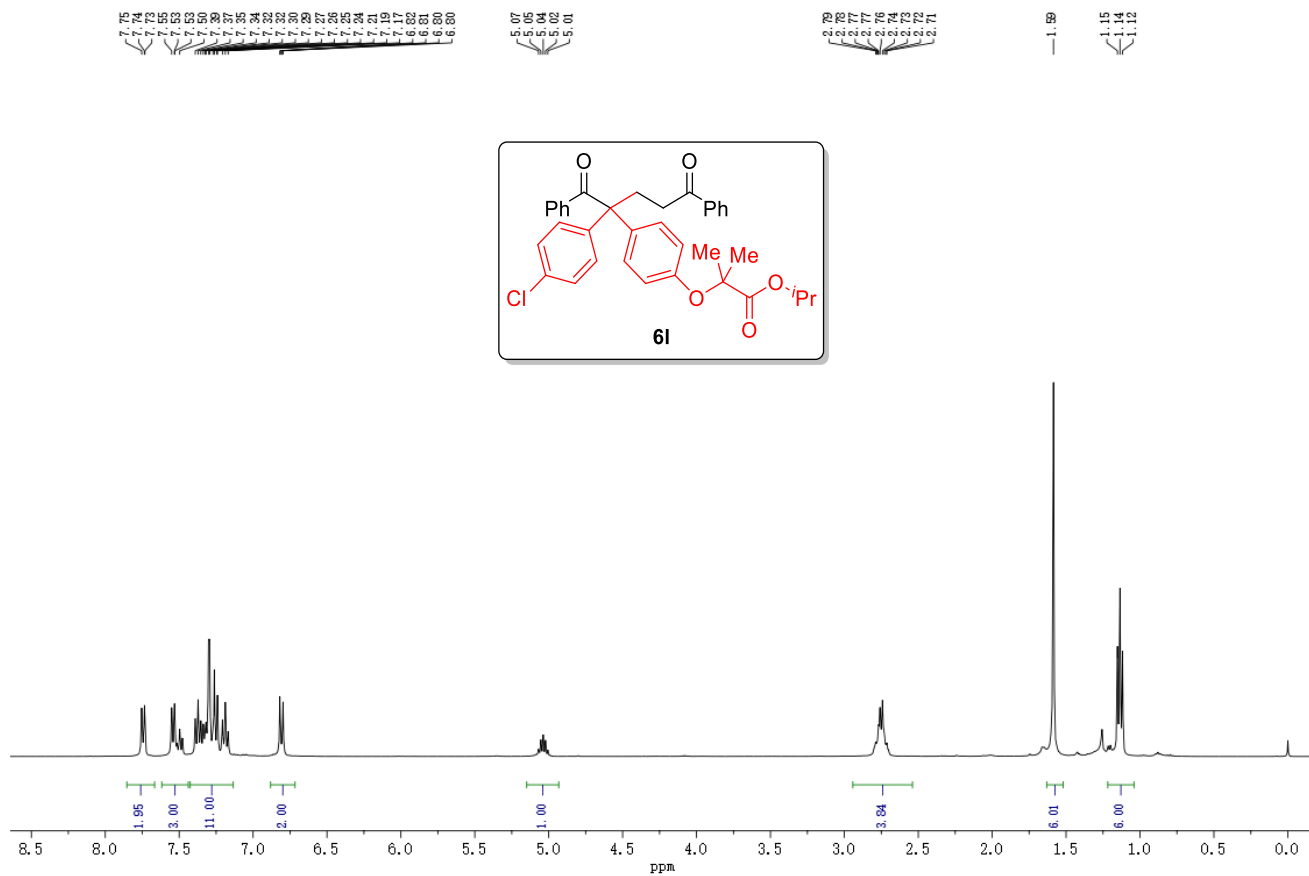
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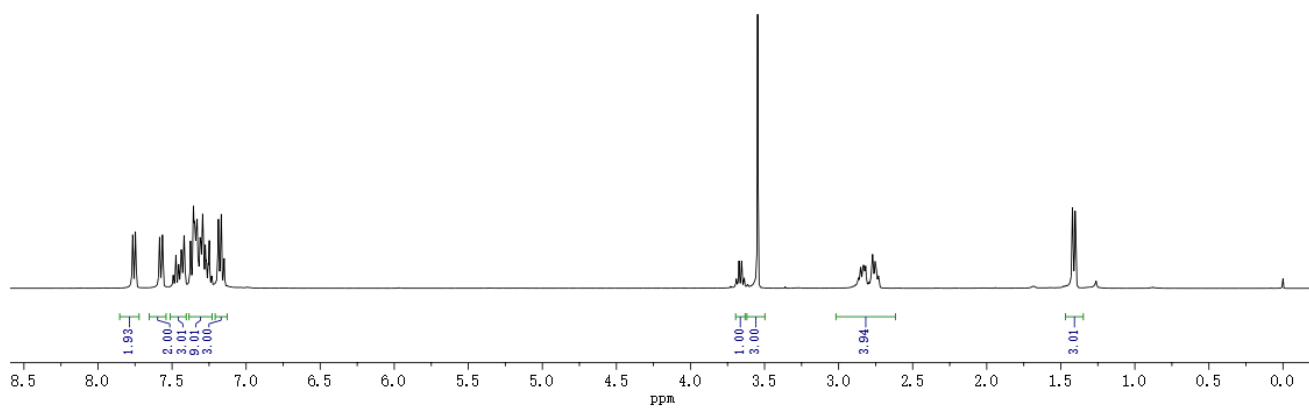
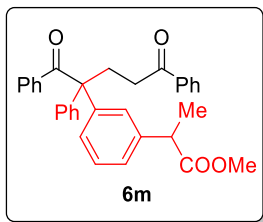




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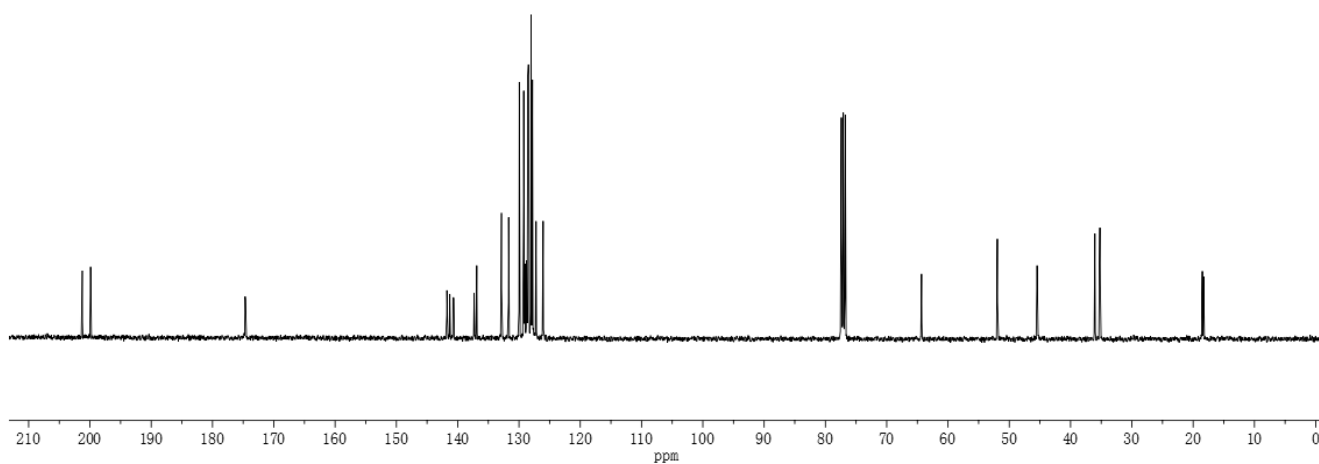
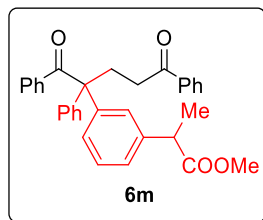
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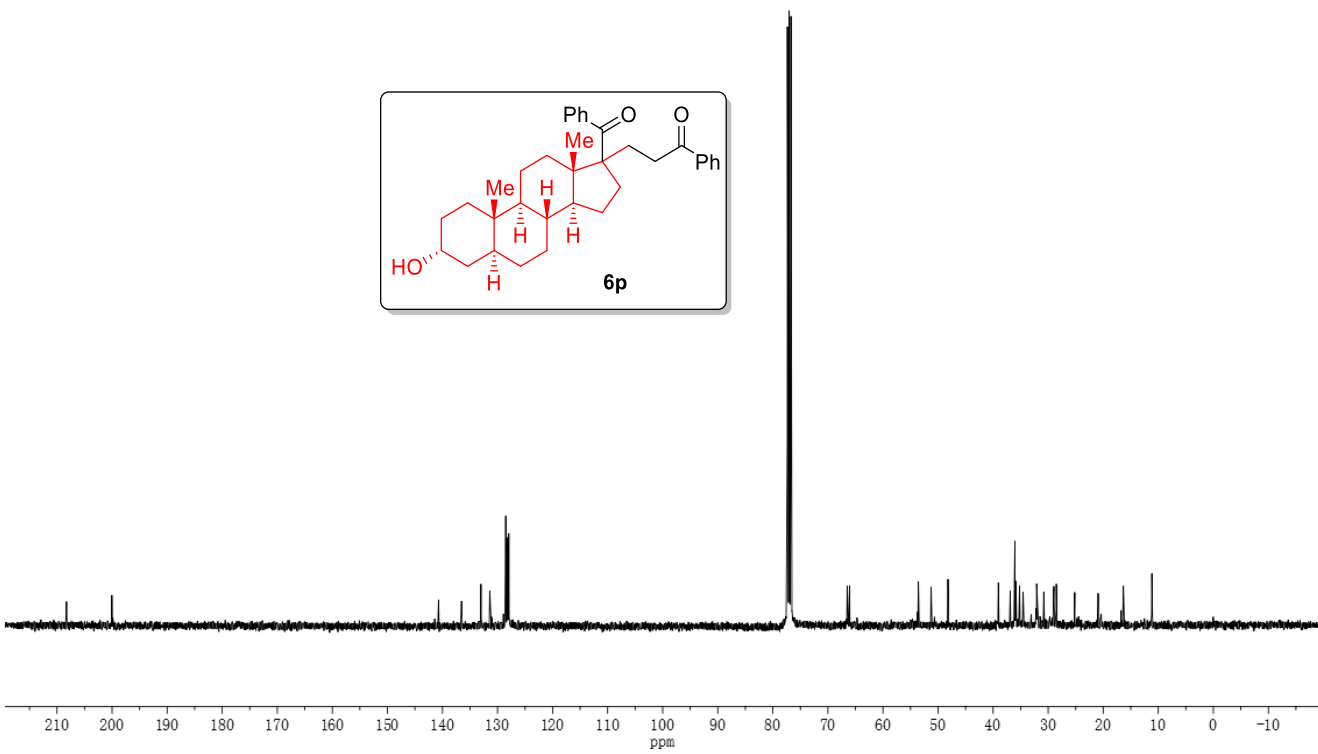
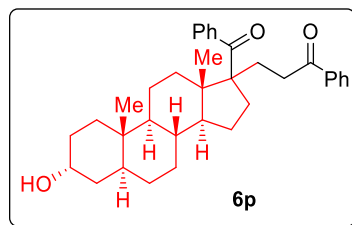
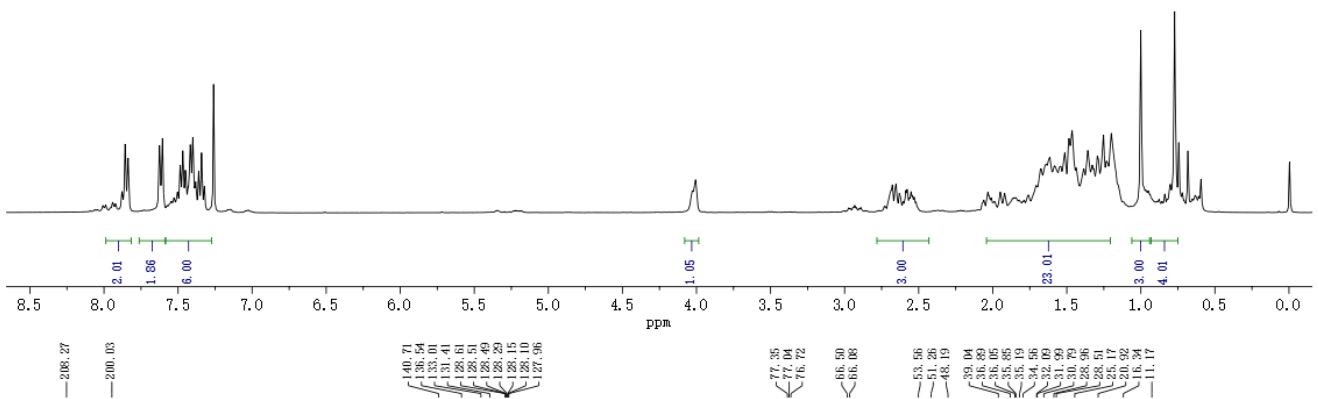
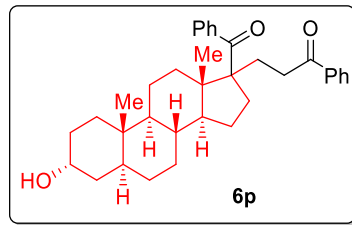
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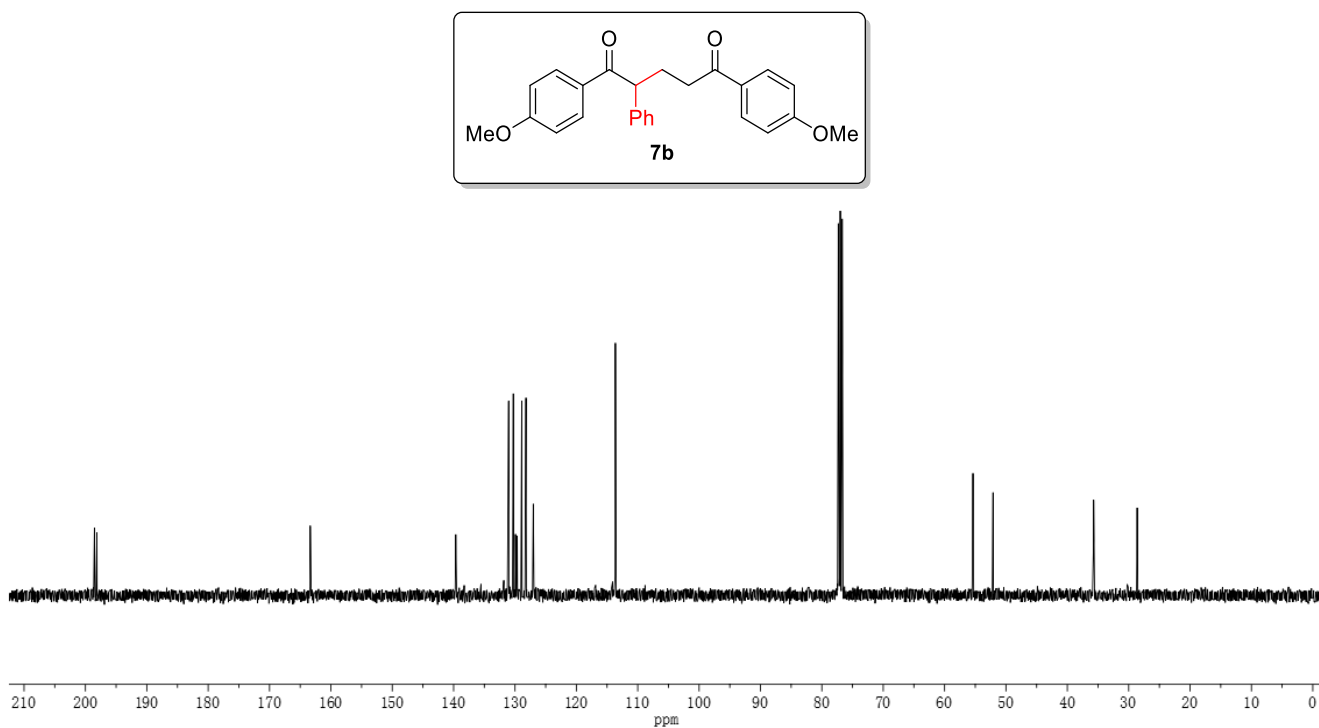
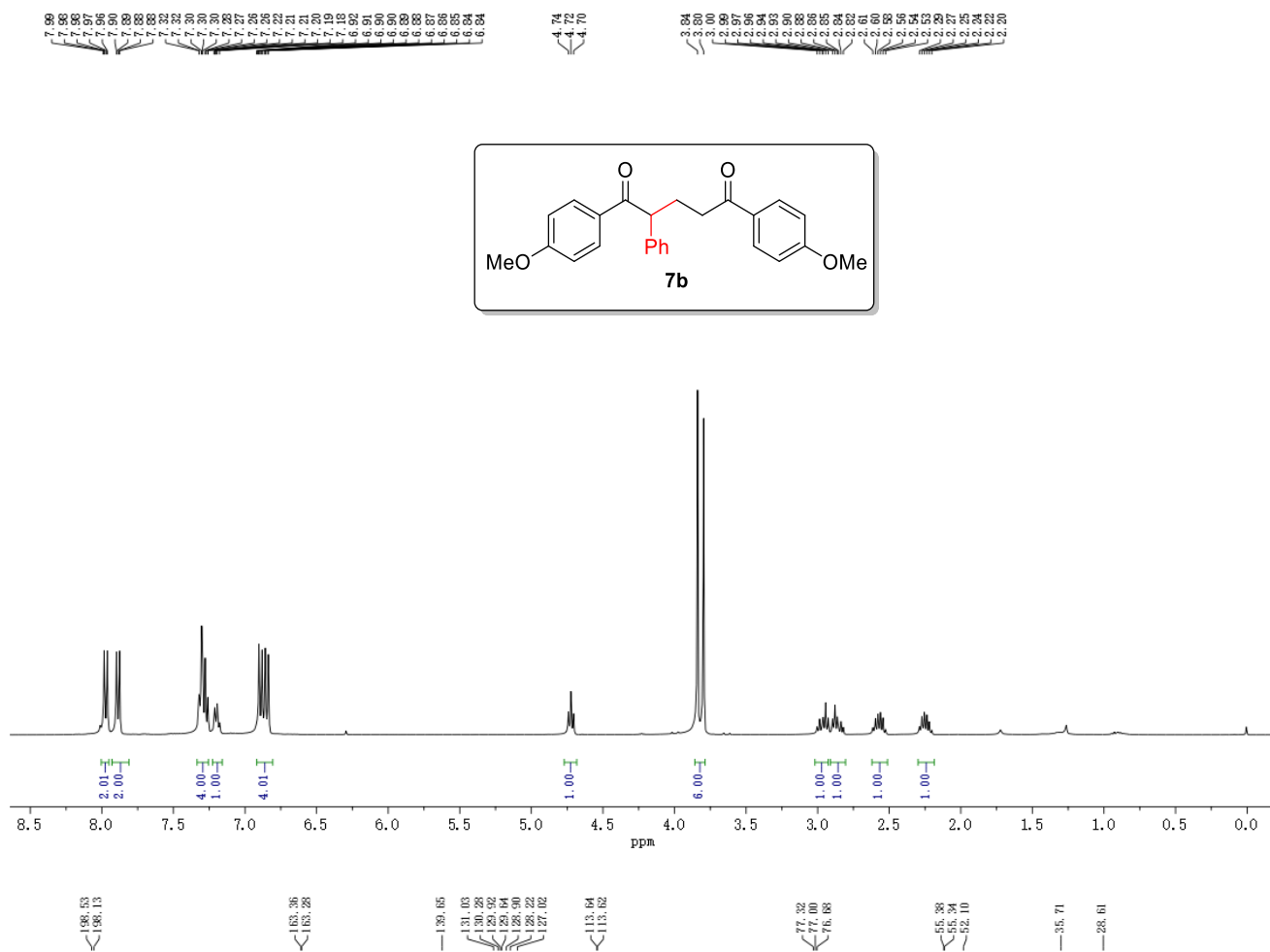


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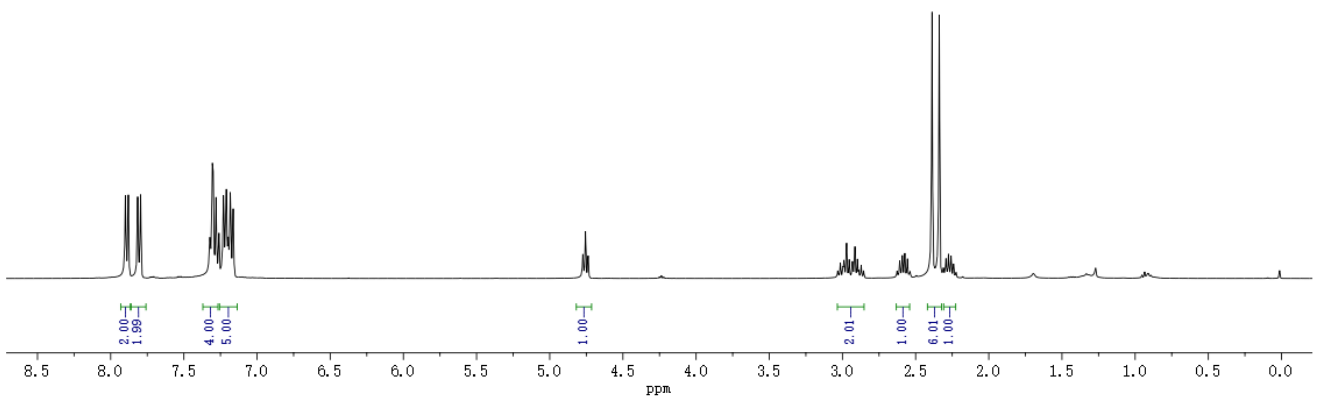
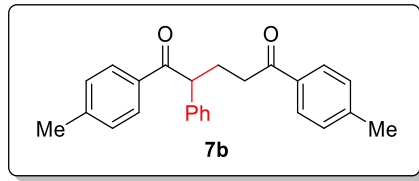




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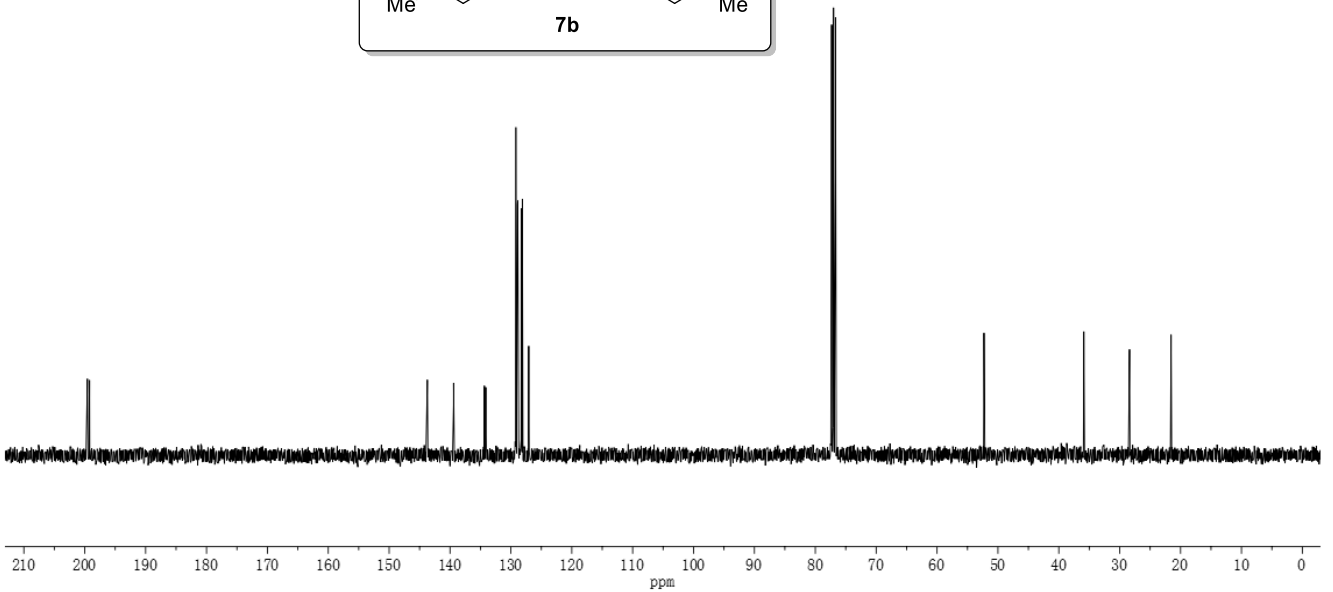
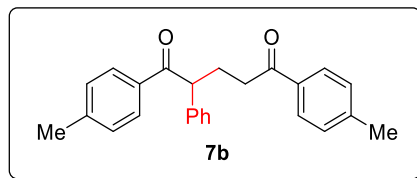
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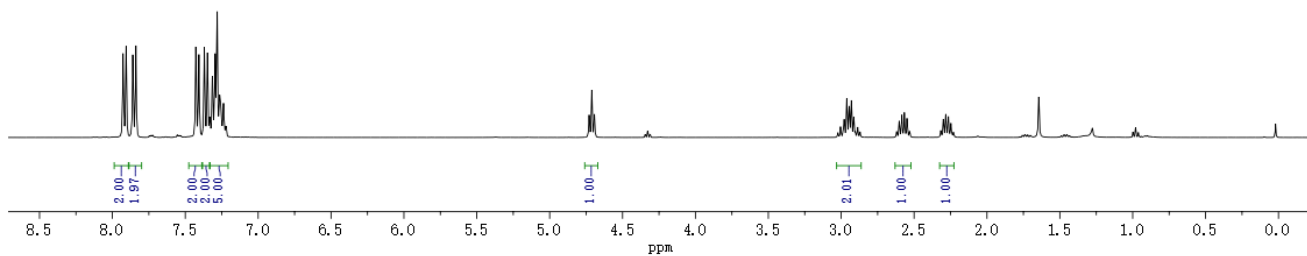
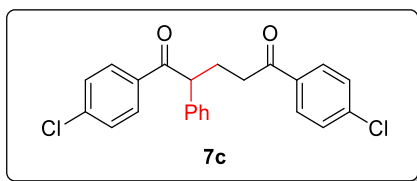
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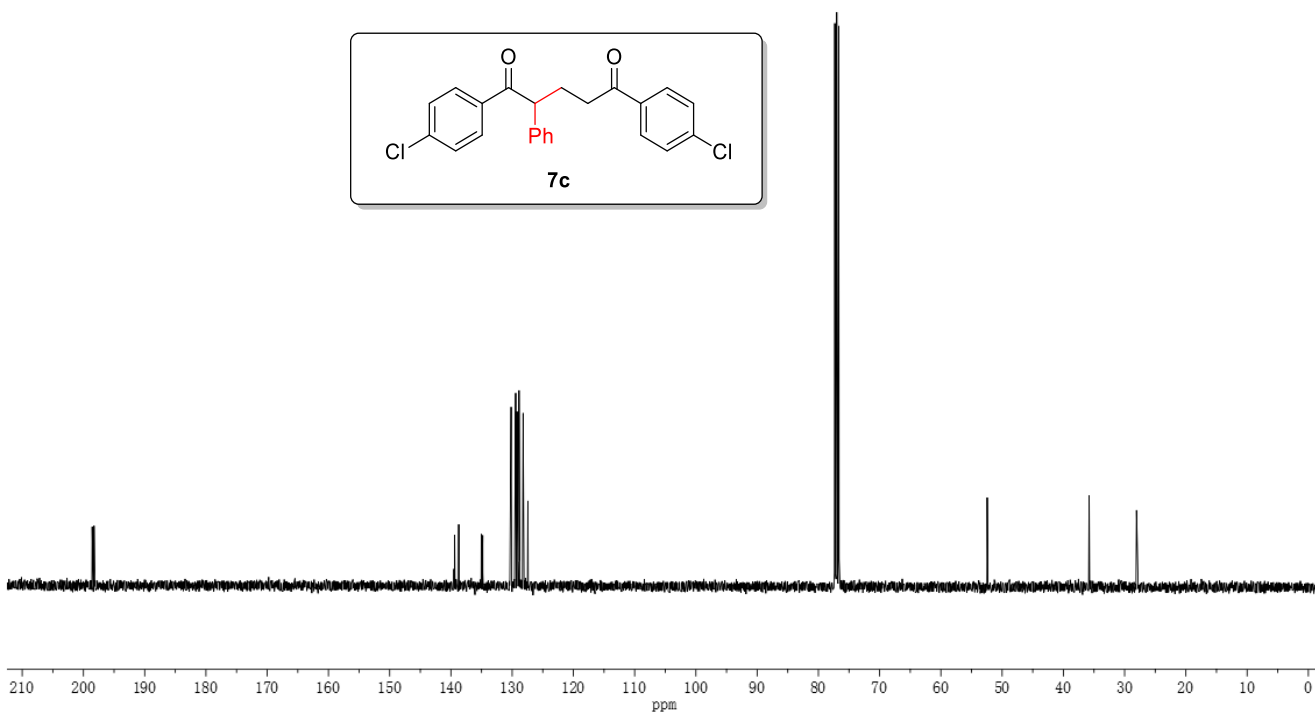
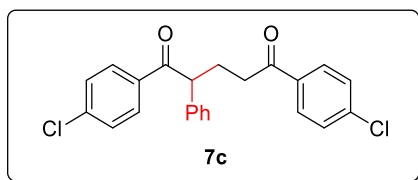
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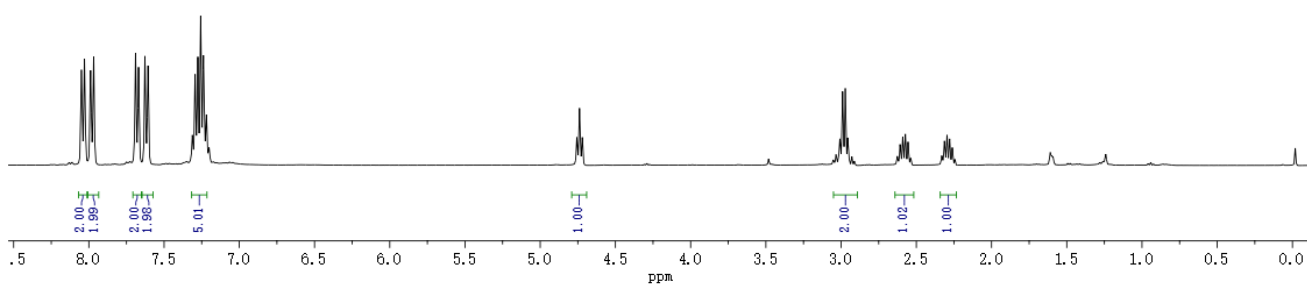
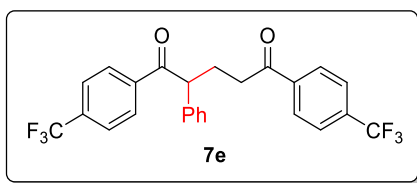
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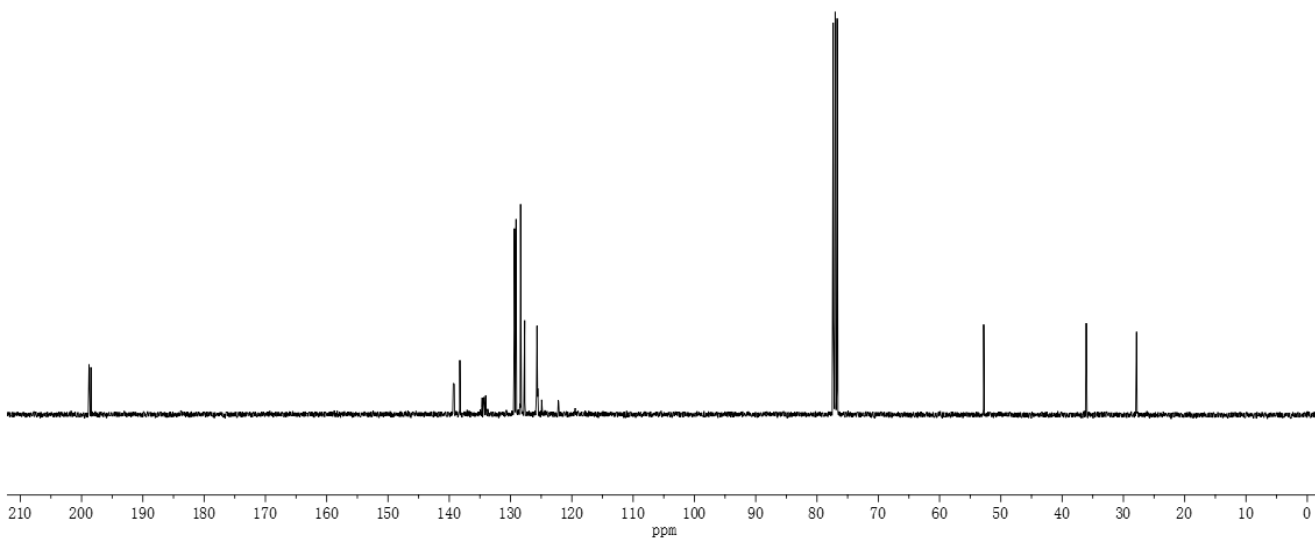
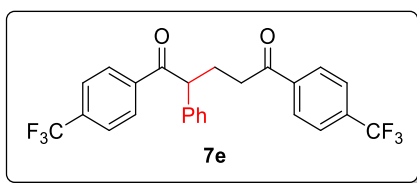
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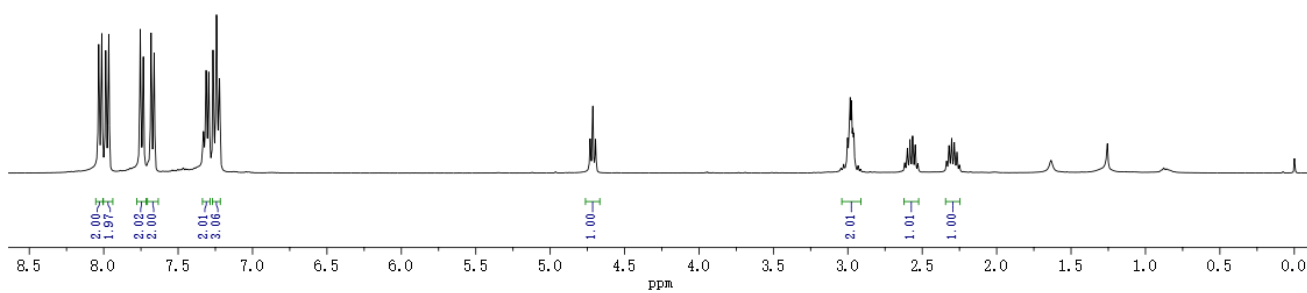
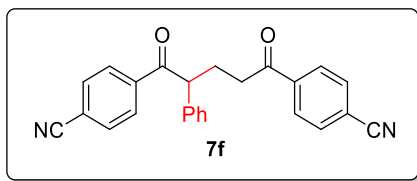
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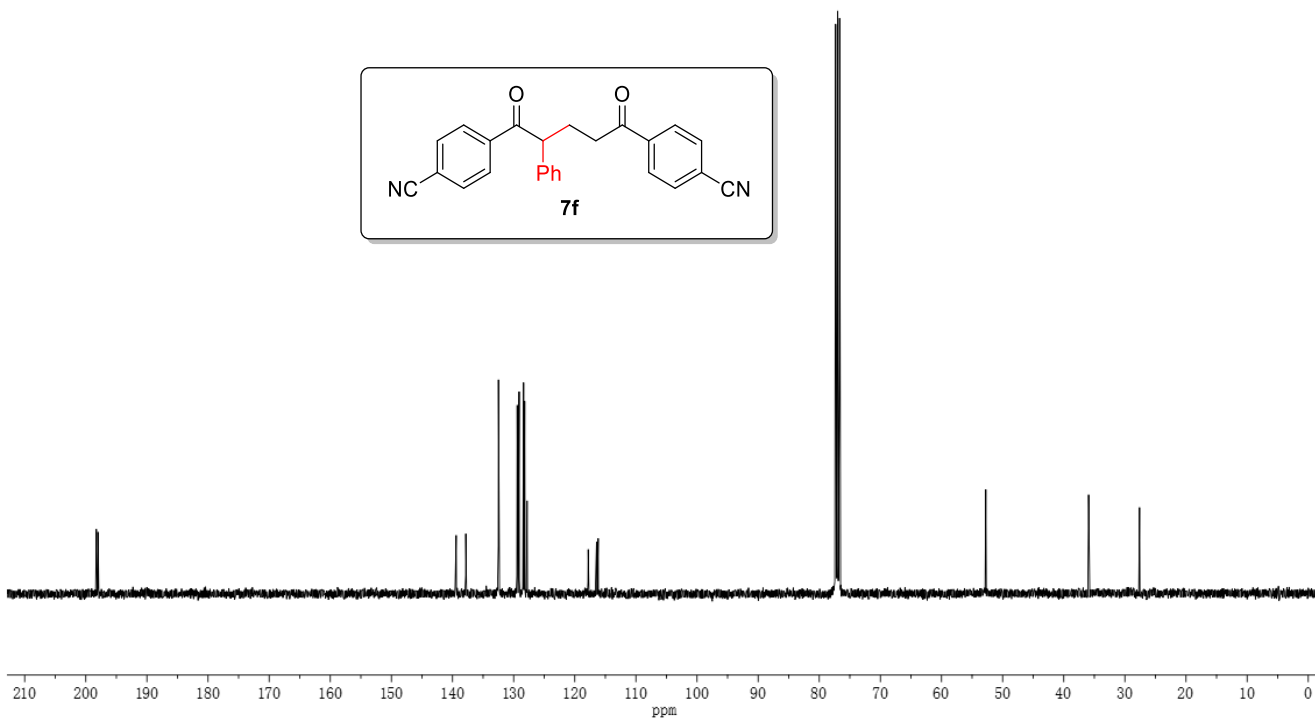
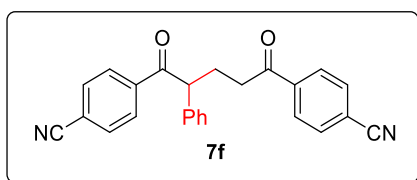
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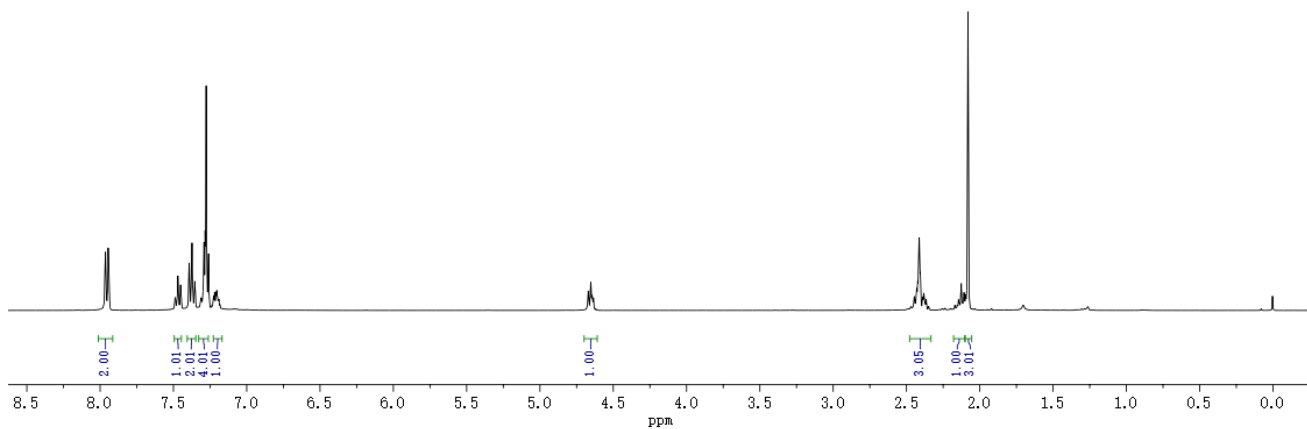
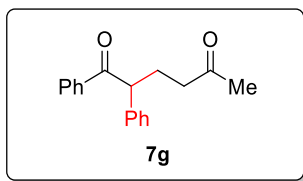
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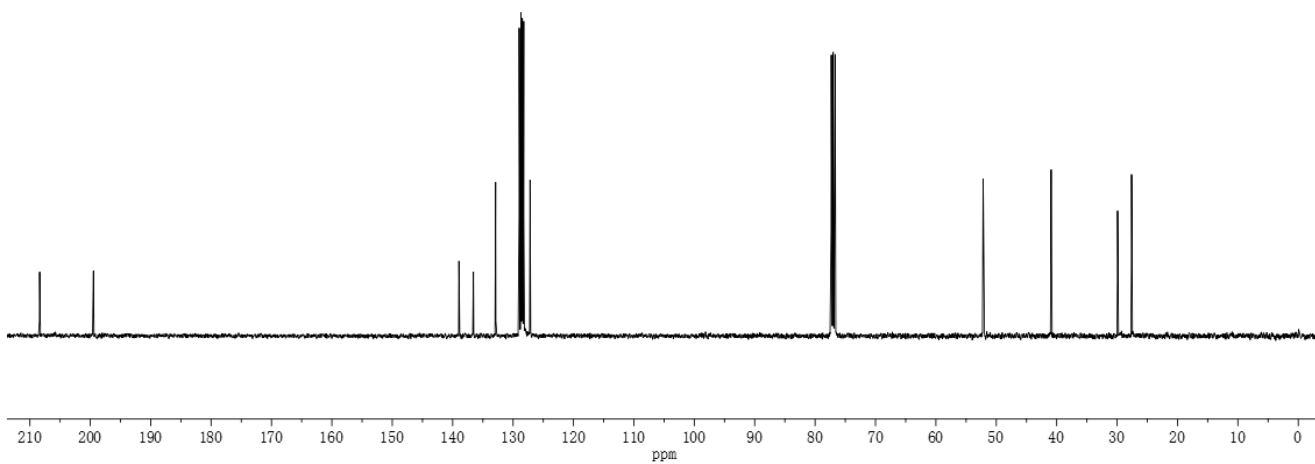
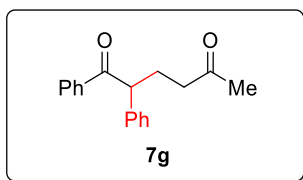
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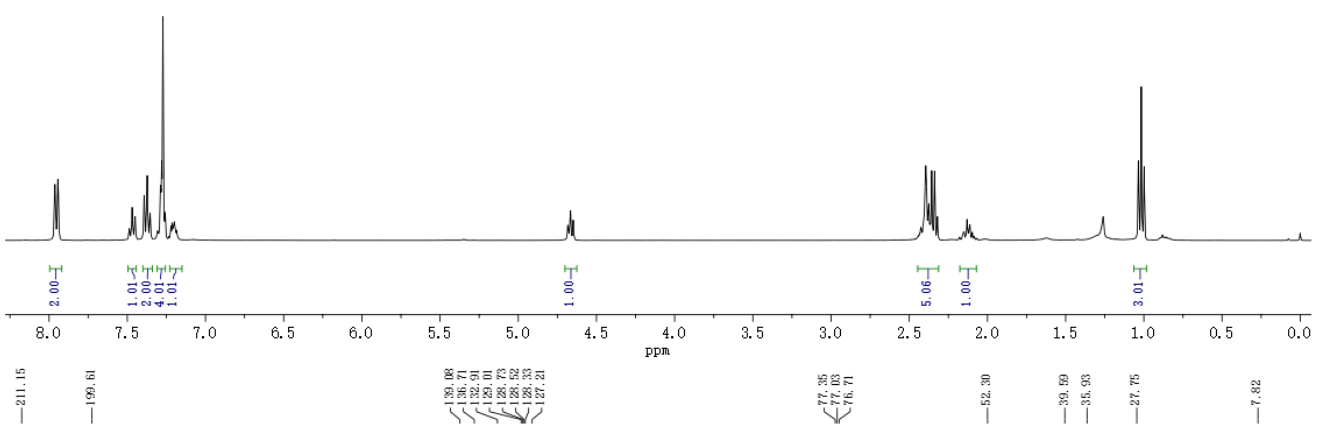
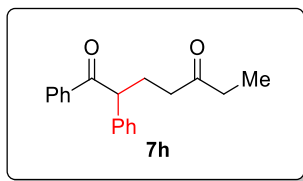
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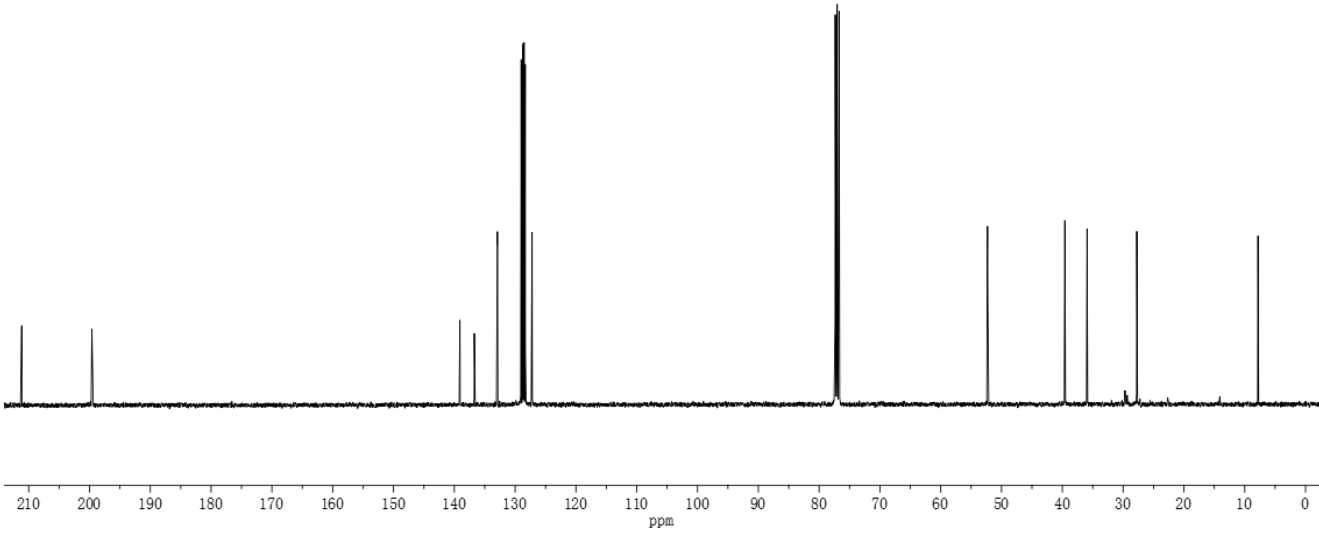
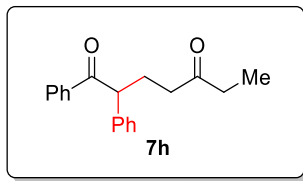
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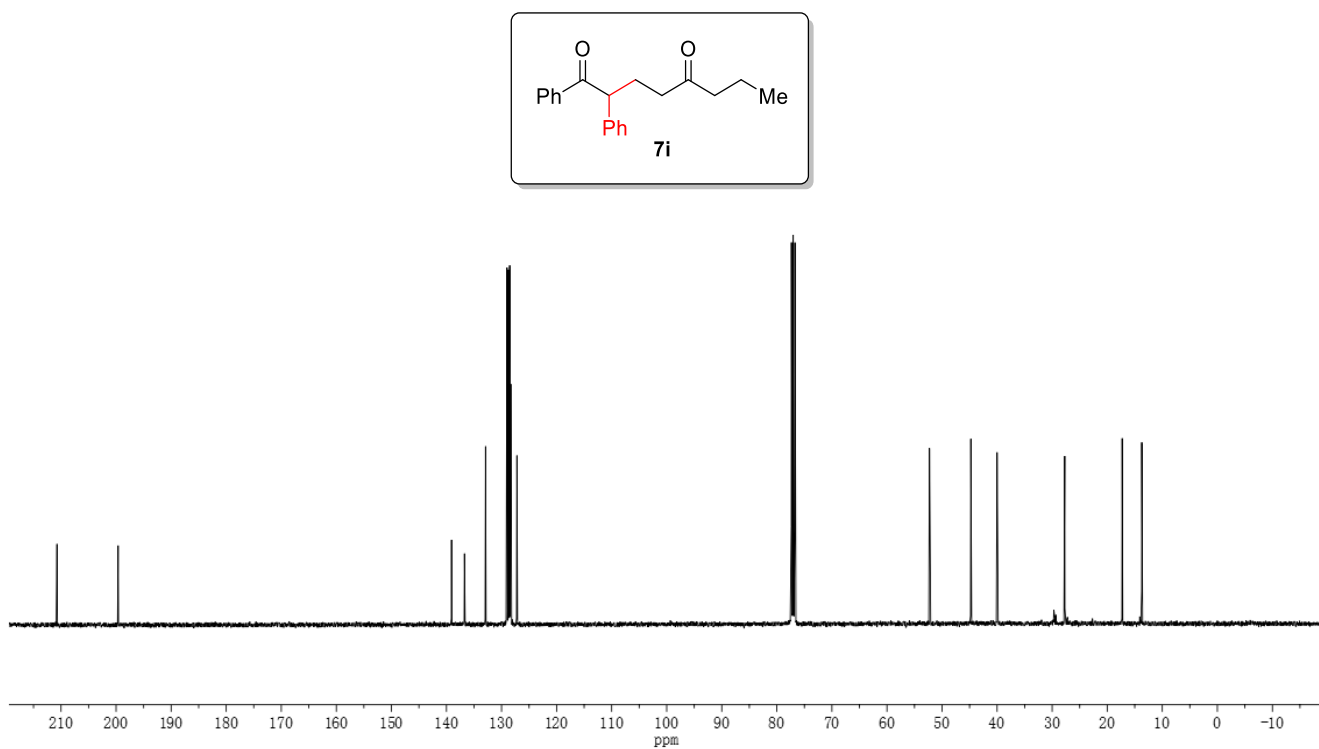
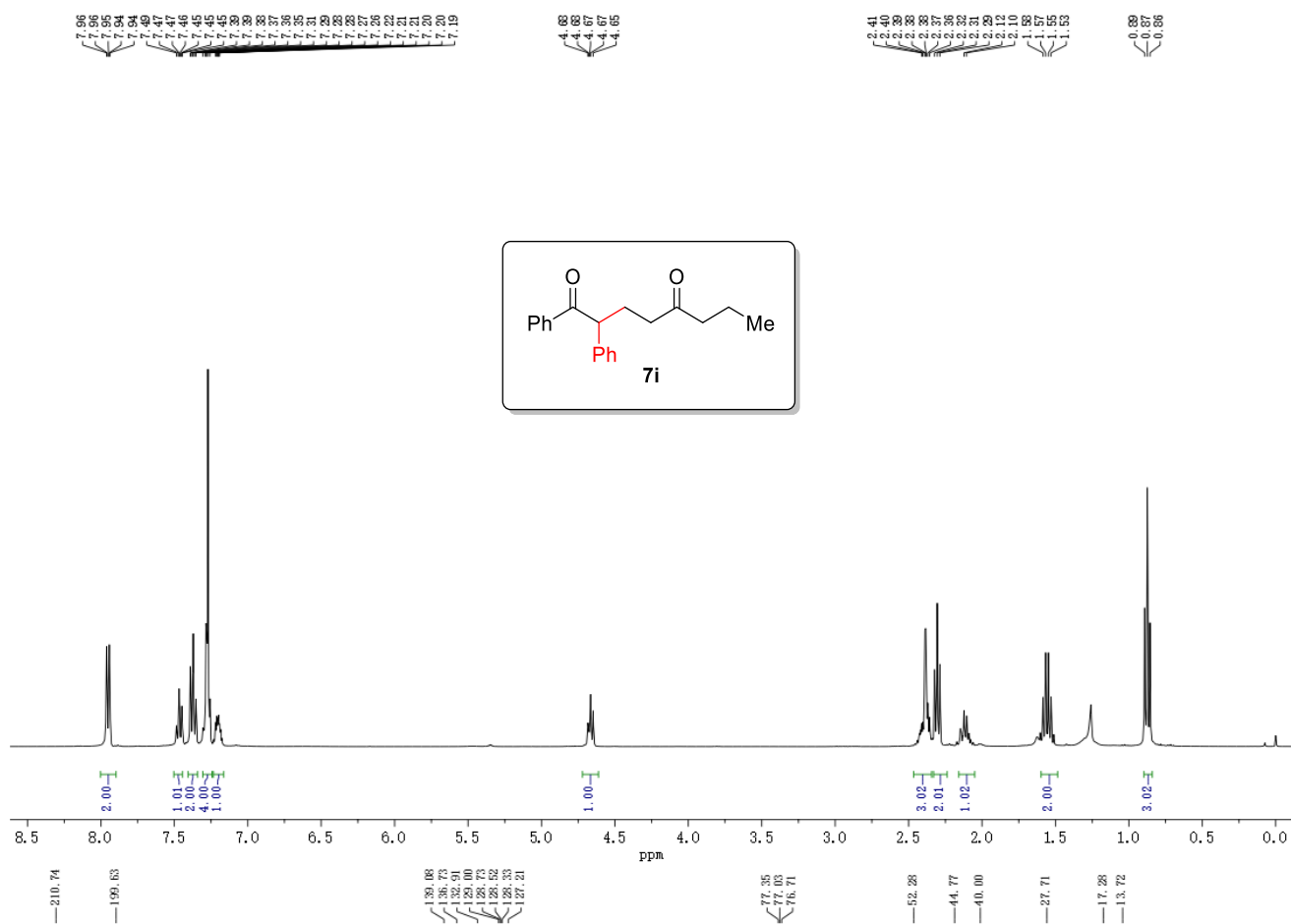
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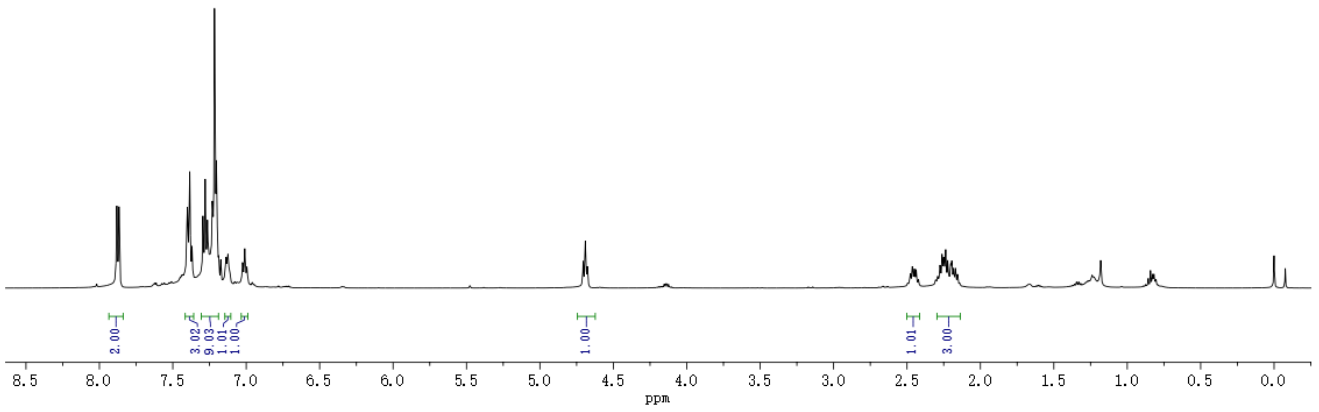
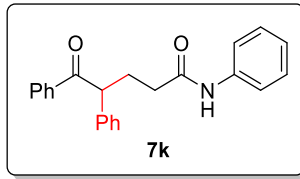




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