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SUPPORTING INFORMATION

Synthesis of diverse isatins via ring contraction of 3-diazoquinoline-2,4-diones

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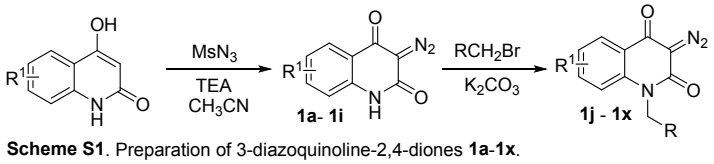

Scheme S1. Preparation of 3-diazoquinoline-2,4-diones **1a-1x**.

1) The preparation of 3-diazoquinoline-2,4-diones 1a-1i[1]

To a solution of 4 hydroxyl quinoline-2-ones (2 mmol) in CH_3CN (20 ml) at room temperature, MsN_3 (266 mg, 2.2 mmol) was added under N_2 atmosphere. Then, the reaction mixture was cooled to 0 ^oC and TEA (306 mg, 3 mmol) was added dropwise. Next, the reaction mixture was stirred at room temperature for 8 h. After completion of the reaction as indicated by TLC analysis, the reaction mixture was quenched by addition of water (50 mL). The reaction mixture was extracted with EtOAc (50 mL x 3), the volatiles were removed in *vacuo*, and the residue was purified by silica gel column chromatography on silica gel using hexane/EtOAc (4:1) as the eluent to afford the desired products **1a-1i** in 60-75% yields.

2) The preparation of *N*-substituted 3-diazoquinoline-2,4-diones (1j-1x)

To a solution of diazo compounds **1a, 1b, 1c** or **1g** (2 mmol) and K_2CO_3 (828 mg, 6 mmol) in DMF (20 mL), the corresponding alkyl bromides (2.2 mmol) were added at 0 ^oC. Then, the reaction mixture was stirred at room temperature for 6 h. After completion of the reaction as indicated by TLC analysis, the reaction mixture was quenched with addition of water (50 mL), and extracted with EtOAc (50 mL x 3), and dried over anhydrous Na_2SO_4. The organic layer was removed in *vacuo* and the residue was purified by column chromatography on silica gel using hexane/EtOAc (4:1) as the eluent to afford the corresponding products **1j-1x** in 55-69% yields.

II. Characterization data of the synthesized diazo compounds 1a-1x

3-Diazoquinoline-2,4(1*H*,3*H*)-dione (1a)[2]: Yield 75%; white solid; mp 241-243 ^oC. IR (ATR): 3197, 2988, 2936, 2158, 1665, 1611, 1418, 1321, 1257, 1121, 969, 875, 749, 709, 666, 549, 494, 417 cm^{-1}. ^1H NMR (600 MHz, DMSO-d_6): δ 11.35 (1H, s), 7.86 (1H, dd, J = 7.2, 1.8 Hz), 7.62 (1H, t, J = 7.8 Hz), 7.20-7.16 (2H, m).^{13}C NMR (150 MHz, DMSO-d_6): δ 175.9, 159.1, 140.3, 135.1, 125.1, 122.5, 118.6, 116.8, 78.7.

3-Diazo-6-methylquinoline-2,4(1*H*,3*H*)-dione (1b): Yield 71%; light yellow solid; mp 225-227 ^{o}C. IR (ATR): 3328, 3256, 2914, 2137, 1670, 1575, 1501, 1412, 1294, 1135, 982, 875, 820, 763, 667, 522, 480, 425 cm.$^{-1}$.^{1}H NMR (600 MHz, DMSO-d_6): δ 11.24 (1H, s), 7.64 (1H, s), 7.42 (1H, d, J = 8.4 Hz), 7.08 (1H, d, J = 8.4 Hz), 2.30 (3H, s).^{13}C NMR (150 MHz, DMSO-d_6): δ 175.8, 159.0, 138.1, 136.0, 131.7, 124.5, 118.4, 116.7, 78.5, 20.1.

3-Diazo-8-methylquinoline-2,4(1*H*,3*H*)-dione (1c): Yield 73%; light yellow solid; mp 196-198 ^{o}C. IR (ATR): 3176, 2988, 2923, 2157, 1738, 1622, 1509, 1468, 1425, 1378, 1281, 1035, 916, 839, 788, 721, 688, 595, 433 cm^{-1}. ^{1}H NMR (300 MHz, DMSO-d_6): δ 11.23 (1H, s), 7.44 (1H, t, J = 8.1 Hz), 7.05 (1H, d, J = 8.1 Hz), 6.94 (1H, d, J = 7.5 Hz), 2.66 (3H, s) .^{13}C NMR (150 MHz, DMSO-d_6): δ 177.61, 158.8, 141.7, 140.0, 133.8, 125.6, 116.8, 115.1, 22.4.

3-Diazo-6-isopropylquinoline-2,4(1*H*,3*H*)-dione (1d): Yield 67%; white solid; mp 208-210 ^{o}C. IR (ATR): 3198, 3133, 2961, 2173, 2143, 1746, 1672, 1598, 1503, 1426, 1361, 1266, 1229, 829, 749, 700, 666, 518, 423 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 11.26 (1H, s), 7.70 (1H, s), 7.54 (1H, d, J = 7.8 Hz), 7.14 (1H, d, J = 8.4 Hz), 2.94-2.90 (1H, m), 1.20 (6H, d, J = 7.2 Hz) .^{13}C NMR (150 MHz, DMSO-d_6): δ 175.9, 159.0, 142.6, 138.5, 133.7, 121.8, 118.4, 116.9, 78.5, 43.1, 32.6, 23.7.

3-Diazo-6-methoxyquinoline-2,4(1*H*,3*H*)-dione (1e): Yield 60%; light brown solid; mp 248-250 ^{o}C. IR (ATR): 3403, 3155, 2917, 2166, 1786, 1597, 1508, 1455, 1278, 1130, 970, 810, 789, 775, 621, 502, 471, 402 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 7.52 (1H, d, J = 8.4 Hz), 7.38 (2H, d, J = 9.0 Hz), 6.74 (1H, s), 3.87 (3H, s) .^{13}C NMR (150 MHz, DMSO-d_6): δ 174.8, 160.9, 158.6, 139.2, 127.2, 120.2, 119.3, 114.3, 79.3, 56.1.

5-Chloro-3-diazoquinoline-2,4(1*H*,3*H*)-dione (1f): Yield 69%; white solid; mp 230-232 ^{o}C. IR (ATR): 2942, 2886, 2809, 2160, 1750, 1682, 1591, 1467, 1423, 1368, 1331, 1233, 915, 838, 793, 712, 561, 413 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 11.45 (1H, s), 7.52 (1H, t, J = 7.8 Hz), 7.19-7.16 (2H, m).^{13}C NMR (150 MHz, DMSO-d_6):δ 174.4, 158.6, 142.9, 134.6, 132.5, 125.5, 116.3, 115.1, 80.1.

6-Chloro-3-diazoquinoline-2,4(1*H*,3*H*)-dione (1g)[3]: Yield 73%; light brown solid; mp > 300 ^{0}C. IR (ATR): 3034, 2929, 2875, 2180, 1725, 1635, 1479, 1419, 1360, 1243, 1169, 1075, 897, 764, 699, 671, 551, 441 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 11.47 (1H, s), 7.77 (1H, d, J = 2.4 Hz), 7.66 (1H, dd, J = 9.0, 2.4 Hz), 7.21 (1H, d, J = 9.0 Hz).^{13}C NMR (150 MHz, DMSO-d_6): δ 174.7, 158.8, 139.1, 134.6, 126.7, 124.1, 119.8, 119.0, 79.3.

7-Chloro-3-diazoquinoline-2,4(1*H*,3*H*)-dione (1h): Yield 68%; white solid; mp 230-231 ^{o}C. IR (ATR): 2853, 2921, 2155, 1745, 1634, 1571, 1401, 1460, 1356, 1288, 1231, 1188, 1022, 859, 806, 762, 738, 567, 465 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 11.45 (1H, s), 7.80 (1H, d, J = 9.0 Hz), 7.24-7.22 (2H, m).^{13}C NMR (150 MHz, DMSO-d_6): δ 174.9, 159.1, 141.3, 139.3, 127.1, 122.6, 117.5, 116.1, 79.0.

6-Bromo-3-diazoquinoline-2,4(1*H*,3*H*)-dione (1i): Yield 71%; light brown solid; mp > 300 °C. IR (ATR): 3010, 2929, 2852, 2177, 1765, 1635, 1419, 1358, 1294, 1164, 1060, 897, 838, 762, 697, 672, 548, 441 cm^{-1}. ^1H NMR (600 MHz, DMSO-d_6): δ 11.39 (1H, s), 7.90 (1H, d, J = 2.4 Hz), 7.78 (1H, dd, J = 8.4, 2.4 Hz) 7.15 (1H, d, J = 9.0 Hz).^{13}C NMR (150 MHz, DMSO-d_6): δ 174.6, 158.8, 139.4, 137.4, 127.0, 120.2, 119.2, 114.3, 79.3.

3-Diazo-1-methylquinoline-2,4(1*H*,3*H*)-dione (1j): Yield 67%; light yellow solid; mp 110-112 °C. IR (ATR): 3083, 2988, 2939, 2161, 1754, 1624, 1477, 1419, 1360, 1274, 1224, 1181, 1024, 868, 752, 666, 605, 493, 416 cm^{-1}. ^1H NMR (600 MHz, DMSO-d_6): δ 7.94 (1H, dd, J = 7.8, 1.8 Hz), 7.73 (1H, dt, J = 9.0, 1.8 Hz), 7.42 (1H, d, J = 8.4 Hz), 7.25 (1H, t, J = 7.2 Hz), 3.43 (3H, s).^{13}C NMR (150 MHz, DMSO-d_6): δ 174.7, 158.3, 141.2, 135.3, 125.3, 122.7, 119.8, 116.0, 79.2, 29.0.

3-Diazo-1-ethylquinoline-2,4(1*H*,3*H*)-dione (1k)[2]: Yield 64%; red solid; mp 143-144 °C. IR (ATR): 2986, 2930, 2638, 2154, 2105, 1745, 1627, 1592, 1464, 1327, 1249, 1159, 1038, 858, 754, 729, 663, 515, 422 cm^{-1}. ^1H NMR (600 MHz, DMSO-d_6): δ 8.01 (1H, d, J = 7.2 Hz), 7.75 (1H, t, J = 7.8 Hz), 7.52 (1H, d, J = 8.4 Hz), 7.28 (1H, t, J = 7.8 Hz), 4.16 (2H, q, J = 7.2 Hz), 1.19 (3H, t, J = 7.2 Hz).^{13}C NMR (150 MHz, DMSO-d_6): δ 174.8, 158.2, 140.1, 135.5, 125.7, 122.6, 120.1, 115.8, 36.6, 12.6.

3-Diazo-1-(3-methylbut-2-en-1-yl)quinoline-2,4(1*H*,3*H*)-dione (1l): Yield 58%; red solid; mp 170-172 °C. IR (ATR): 2966, 2933, 2868, 2135, 1711, 1628, 1469, 1357, 1340, 1299, 1227, 1158, 1050, 924, 753, 659, 547, 432 cm^{-1}. ^1H NMR (600 MHz, DMSO-d_6): δ 8.01 (1H, dd, J = 7.8, 1.2 Hz), 7.74 (1H, dt, J = 7.2, 1.2 Hz), 7.34 (1H, d, J = 8.4 Hz), 7.28 (1H, t, J = 7.2 Hz), 5.09 (1H, t, J = 6.0 Hz), 4.74 (2H, d, J = 5.4 Hz), 1.81 (3H, s), 1.67 (3H, s) ^{13}C NMR (150 MHz, DMSO-d_6):δ 174.8, 158.4, 140.4, 136.1, 125.7, 122.8, 120.2, 119.1, 118.8, 116.1, 79.4, 37.1, 25.4, 18.1.

1-(But-3-en-1-yl)-3-diazoquinoline-2,4(1*H*,3*H*)-dione (1m): Yield 57%; brown solid; mp 77-79 °C. IR (ATR): 3079, 2991, 2951, 2154, 1753, 1624, 1595, 1466, 1368, 1327, 1262, 1169, 999, 920, 788, 728, 655, 546, 421 cm^{-1}.^1H NMR (300 MHz, $CDCl_3$): δ 8.12 (1H, dd, J = 8.1, 1.8 Hz), 7.75 (1H, dt, J = 8.4, 1.8 Hz), 7.18-7.14 (2H, m), 5.86-5.73 (1H, m), 5.04 (2H, t, J = 6.6 Hz), 4.15 (2H, t, J = 7.5 Hz), 2.43-2.36 (2H, m) ^{13}C NMR (75 MHz, $CDCl_3$): δ 175.4, 159.0, 140.4, 135.2, 133.8, 126.8, 122.8, 120.8, 117.7, 115.0, 41.3, 31.6.

1-Cinnamyl-3-diazoquinoline-2,4(1*H*,3*H*)-dione (1n): Yield 55%; yellow solid; mp 145-147 °C. IR (ATR): 3028, 2954, 2803, 2162, 1689, 1596, 1466, 1368, 1325, 1266, 1162, 1066, 957, 791, 748, 688, 561, 416 cm^{-1}. ^1H NMR (600 MHz, DMSO-d_6): δ 8.03 (1H, dd, J = 7.8, 1.8 Hz), 7.72 (1H, dt, J = 9.0, 1.8 Hz), 7.40 (1H, d, J = 7.8 Hz), 7.39 (2H, t, J = 6.6 Hz), 7.30-7.21 (3H, m), 7.21 (1H, t, J = 7.2 Hz), 6.55 (1H, d, J = 16.2 Hz), 6.38-6.34 (1H, m), 4.93 (2H, d, J = 4.2 Hz). ^{13}C NMR (150 MHz, DMSO-d_6): δ 174.9, 158.5, 140.4, 136.0, 135.3, 131.2, 128.6, 127.6, 126.3, 125.6, 123.7, 122.8, 120.2, 116.4, 79.4, 43.2

1-Benzyl-3-diazoquinoline-2,4(1*H*,3*H*)-dione (1o)[2]: Yield 69%; yellow solid; mp 160-162 ^{0}C. IR (ATR): 3050, 2966, 2145, 1747, 1635, 1602, 1466, 1363, 1270, 1233, 1190, 1002, 857, 726, 684, 530, 456 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 8.01 (1H, dd, J = 7.8, 1.2 Hz), 7.61 (1H, dt, J = 7.2, 1.2 Hz), 7.34-7.29 (5H, m), 7.25-7.22 (2H, m), 5.39 (2H, s). ^{13}C NMR (150 MHz, DMSO-d_6): δ 174.7, 159.0, 140.3, 136.2, 135.2, 128.6, 127.2, 126.4, 125.6, 122.8, 120.2, 116.4, 79.6, 44.6.

3-Diazo-1-(3-methylbenzyl)quinoline-2,4(1*H*,3*H*)-dione (1p): Yield 67%; red solid; mp 163-165 ^{o}C. IR (ATR): 3028, 2874, 2822, 2156, 1768, 1682, 1591, 1423, 1374, 1328, 1168, 915, 793, 718, 666, 558, 410 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 8.02 (1H, d, J = 7.8 Hz), 7.62 (1H, t, J = 6.6 Hz), 7.28 (1H, d, J = 8.4 Hz), 7.24 (1H, t, J = 7.2 Hz), 7.21 (1H, t, J = 6.0 Hz), 7.12 (1H, s), 7.08-7.04 (2H, m), 5.35 (2H, s), 2.52 (3H, s). ^{13}C NMR (150 MHz, DMSO-d_6):δ 174.8, 159.0, 140.4, 137.9, 136.2, 135.2, 128.5, 127.9, 126.9, 125.6, 123.5, 122.8, 120.2, 116.4, 79.6, 44.6, 21.0.

3-Diazo-1-(3,5-dimethoxybenzyl)quinoline-2,4(1*H*,3*H*)-dione (1q): Yield 63% red solid; mp 155-157 ^{o}C. IR (ATR): 3503, 2935, 2839, 2191, 2147, 1733, 1629, 1595, 1463, 1361, 1200, 1148, 1054, 992, 830, 757, 633, 517, 425 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 8.02 (1H, d, J = 6.0 Hz), 7.63 (1H, t, J = 6.6 Hz), 7.28-7.24 (2H, m), 6.43 (2H, s), 6.38 (1H, s), 5.11 (2H, s), 3.69 (6H, s). ^{13}C NMR (150 MHz, DMSO-d_6): δ 174.8, 160.8, 159.0, 140.4, 138.7, 135.3, 125.6, 122.9, 120.2, 116.4, 104.6, 98.4, 55.2, 44.6.

1-(4-Chlorobenzyl)-3-diazoquinoline-2,4(1*H*,3*H*)-dione (1r): Yield 64%; light red solid; mp 175-177 ^{o}C. IR (ATR): 3045, 2901, 2810, 2158, 1734, 1619, 1568, 1484, 1433, 1341, 1279, 1214, 1081, 1008, 860, 754, 612, 531, 435 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 8.02 (1H, d, J = 7.8 Hz), 7.63 (1H, t, J = 8.4 Hz), 7.39 (2H, d, J = 9.0 Hz), 7.34 (2H, d, J = 9.0 Hz), 7.28-7.25 (2H, m), 5.39 (2H, s). ^{13}C NMR (150 MHz, DMSO-d_6): δ 174.8, 159.1, 140.2, 135.4, 131.9, 128.6, 128.5, 128.4, 125.7, 123.0, 120.3, 116.4, 79.7, 44.0.

1-(But-3-en-1-yl)-3-diazo-6-methylquinoline-2,4(1*H*,3*H*)-dione (1s): Yield 59%; light yellow solid; mp 101-103 ^{o}C. IR (ATR) : 3083, 2929, 2865, 2163, 2106, 1717, 1628, 1493, 1332, 1305, 1265, 1210, 1125, 995, 914, 817, 766, 674, 615, 432 cm^{-1}. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.95 (1H, s), 7.44 (1H, d, J = 7.2 Hz), 7.11 (1H, d, J = 9.0 Hz), 5.88-5.81 (1H, m), 5.07 (2H, t, J = 7.2 Hz), 4.18 (2H, t, J = 7.8 Hz), 2.45-2.42 (2H, m), 2.37 (3H, s). ^{13}C NMR (150 MHz, $CDCl_3$): δ 175.5, 158.9, 138.3, 136.1, 133.9, 132.6, 126.6, 120.6, 117.6, 114.9, 79.5, 41.3, 31.7, 20.3.

1-(3-Chloropropyl)-3-diazo-6-methylquinoline-2,4(1*H*,3*H*)-dione (1t): Yield 61%; white solid; mp 130-132 ^{o}C. IR (ATR): 3019, 2923, 2856, 2143, 1758, 1620, 1571, 1499, 1435, 1347, 1298, 1072, 950, 886, 768, 710, 616, 556, 419 cm^{-1}. ^{1}H NMR (600 MHz, $CDCl_3$-d_6): δ 7.95 (1H, s), 7.45 (1H, d, J = 9.6 Hz), 7.20 (1H, d, J = 9.0 Hz), 4.27 (2H, t, J = 7.2 Hz), 3.65 (2H, t, J = 6.0 Hz), 2.18 (3H, s), 2.21-2.13 (2H, m). ^{13}C NMR (150 MHz, $CDCl_3$): δ 175.5, 159.1, 138.3, 136.3, 133.0, 126.7, 120.6, 114.7, 42.3, 40.0, 30.2, 20.3.

(*E*)-3-Diazo-1-(3,7-dimethylocta-2,6-dien-1-yl)-6-methylquinoline-2,4(1*H*,3*H*)-dione (1u): Yield 57%; light red; mp 119-121 ^{o}C. IR (ATR): 2966, 2918, 2856, 2132, 1630, 1568, 1497, 1294, 1346, 1222, 1105, 880, 811, 765, 678, 715, 587, 556, 421 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 7.74 (1H, s), 7.50 (1H, d, J = 7.8 Hz), 7.15 (1H, d, J = 8.4 Hz), 5.01-4.67 (4H, m), 2.31 (3H, s), 1.98-1.94 (4H, m), 1.78 (3H, s), 1.52-1.48 (6H, m). ^{13}C NMR (150 MHz, DMSO-d_6): δ 175.0, 158.3, 139.3, 138.4, 136.3, 132.3, 131.1, 123.8, 120.1, 119.2, 116.2, 79.4, 38.9, 25.9, 25.5, 20.0, 17.6, 16.4.

3-Diazo-1-(3,5-dimethoxybenzyl)-8-methylquinoline-2,4(1*H*,3*H*)-dione (1v): Yield 64%; white solid; mp 165-167 ^{o}C. IR (ATR): 2979, 2929, 2840, 2148, 1632, 1593, 1467, 1428, 1351, 1298, 1204, 1158, 1060, 924, 857, 788, 681, 546, 420 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 7.45 (1H, t, J = 8.4 Hz), 7.12 (1H, d, J = 7.8 Hz), 7.03 (1H, d, J = 7.2 Hz), 6.41 (2H, s), 638 (1H, s), 5.30 (2H, s), 3.69 (6H, s), 2.72 (3H, s). ^{13}C NMR (150 MHz, DMSO-d_6): 176.7, 160.8, 159.0, 141.9, 140.7, 138.8, 126.5, 118.5, 114.8, 104.5, 98.3, 80.3, 55.1, 45.1, 23.1.

1-(4-Chlorobenzyl)-3-diazo-6-methylquinoline-2,4(1*H*,3*H*)-dione (1w): Yield 63%; light brown solid; mp 195-197 ^{o}C. IR (ATR): 3019, 2922, 2855, 2151, 1756, 1622, 1570, 1493, 1432, 1349, 1297, 1218, 1093, 1012, 882, 765, 614, 549, 477 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 7.82 (1H, s), 7.44 (1H, d, J = 7.8 Hz), 7.38 (2H, d, J = 8.4 Hz), 7.31 (2H, d, J = 7.2 Hz), 7.31 (1H, d, J = 7.2 Hz), 5.37 (2H, s), 2.31 (3H, s).^{13}C NMR (150 MHz, DMSO-d_6): 175.3, 159.4, 138.5, 136.6, 135.9, 132.9, 132.3, 129.6, 129.0, 125.8, 120.6, 116.8, 80.0, 44.4, 20.3.

6-Chloro-3-diazo-1-(3,5-dimethoxybenzyl)quinoline-2,4(1*H*,3*H*)-dione (1x): Yield 66%; white solid; mp 172-174 ^{o}C. IR (ATR): 3309, 2943, 2835, 2198, 2132, 1721, 1617, 1556, 1455, 1355, 1212, 1246, 1047, 980, 835, 745, 630, 505, 435 cm^{-1}. ^{1}H NMR (600 MHz, DMSO-d_6): δ 7.93 (1H, d, J = 3.0 Hz), 7.70 (1H, dd, J = 9.6, 3.0 Hz), 7.29 (1H, d, J = 9.6 Hz), 6.42 (2H, d, J = 2.4 Hz), 6.39 (1H, d, J = 2.4 Hz), 5.30 (2H, s), 3.69 (6H, s).^{13}C NMR (150 MHz, DMSO-d_6): δ 173.7, 160.8, 158.8, 139.2, 138.3, 134.6, 127.4, 124.5, 121.6, 118.7, 104.6, 98.4, 80.4, 55.1, 44.8.

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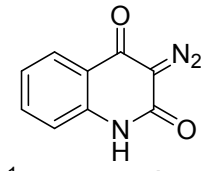
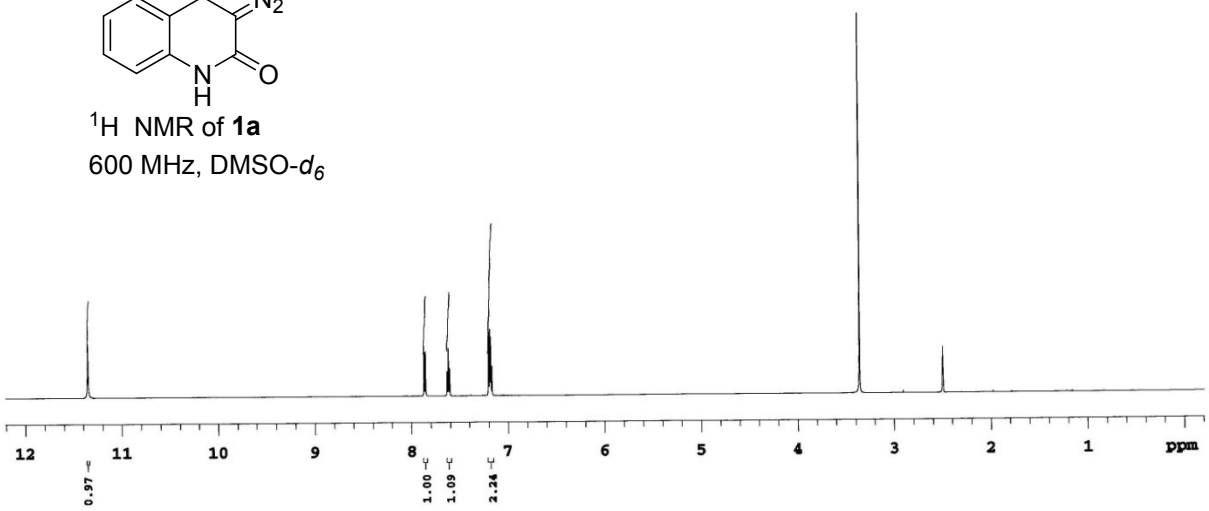
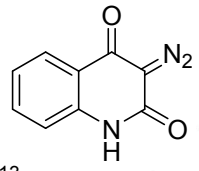
III. ^{1}H and ^{13}C NMR data of diazo compounds 1a-1x

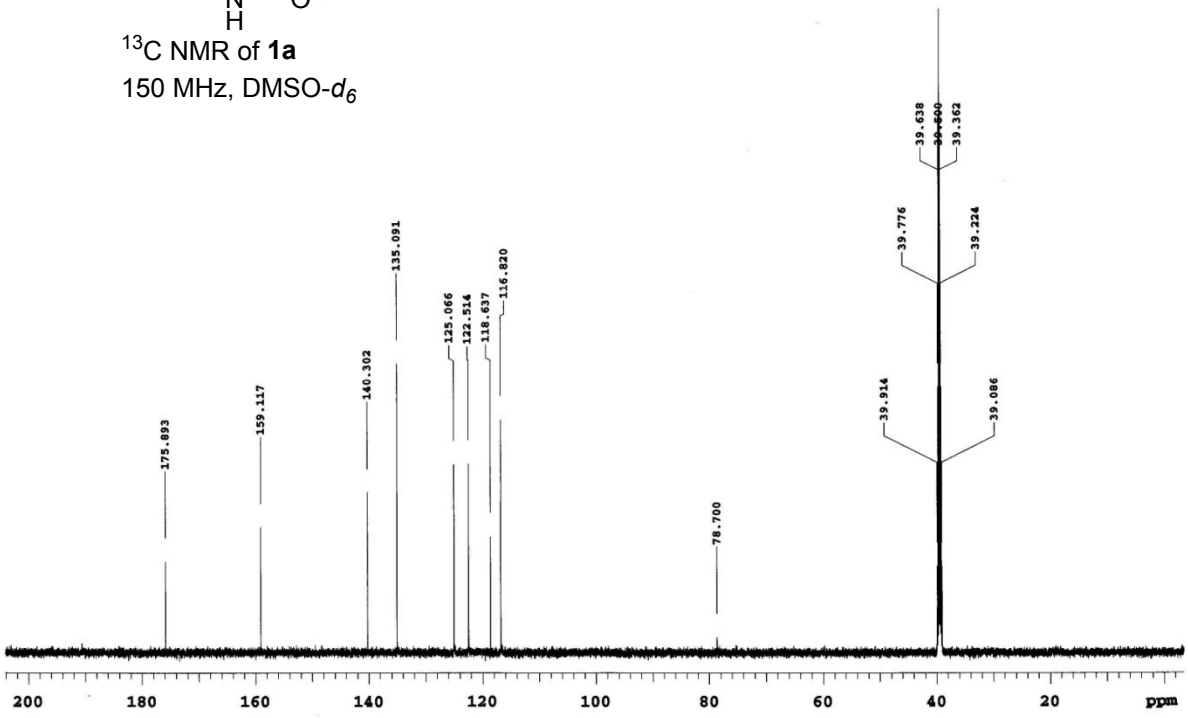


^{1}H NMR of **1a**
600 MHz, DMSO-d_6

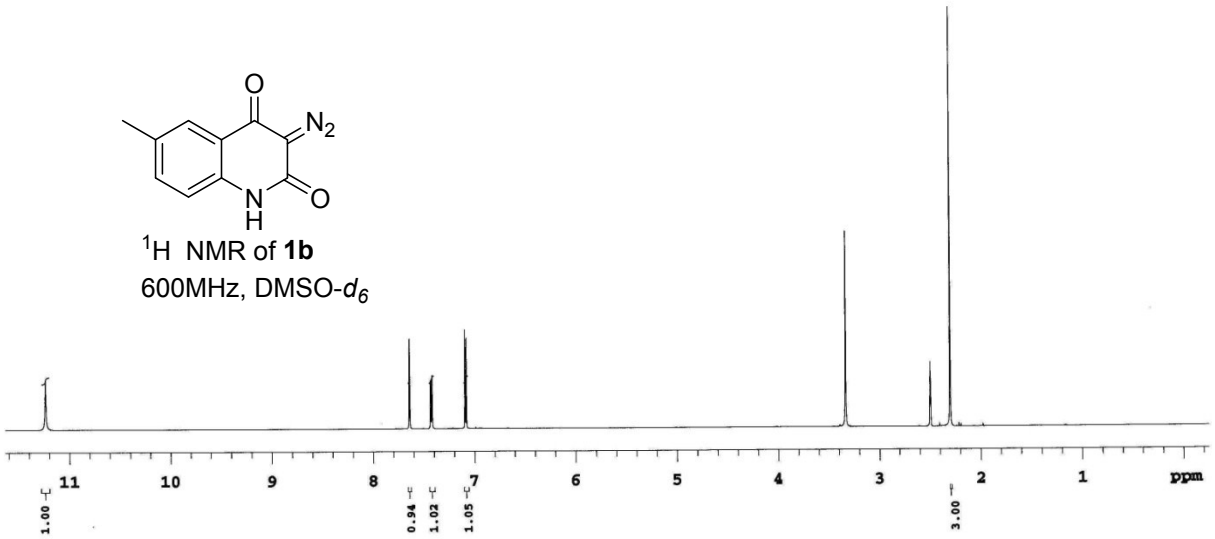


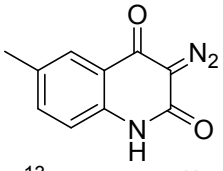


^{13}C NMR of **1a**
150 MHz, DMSO-d_6

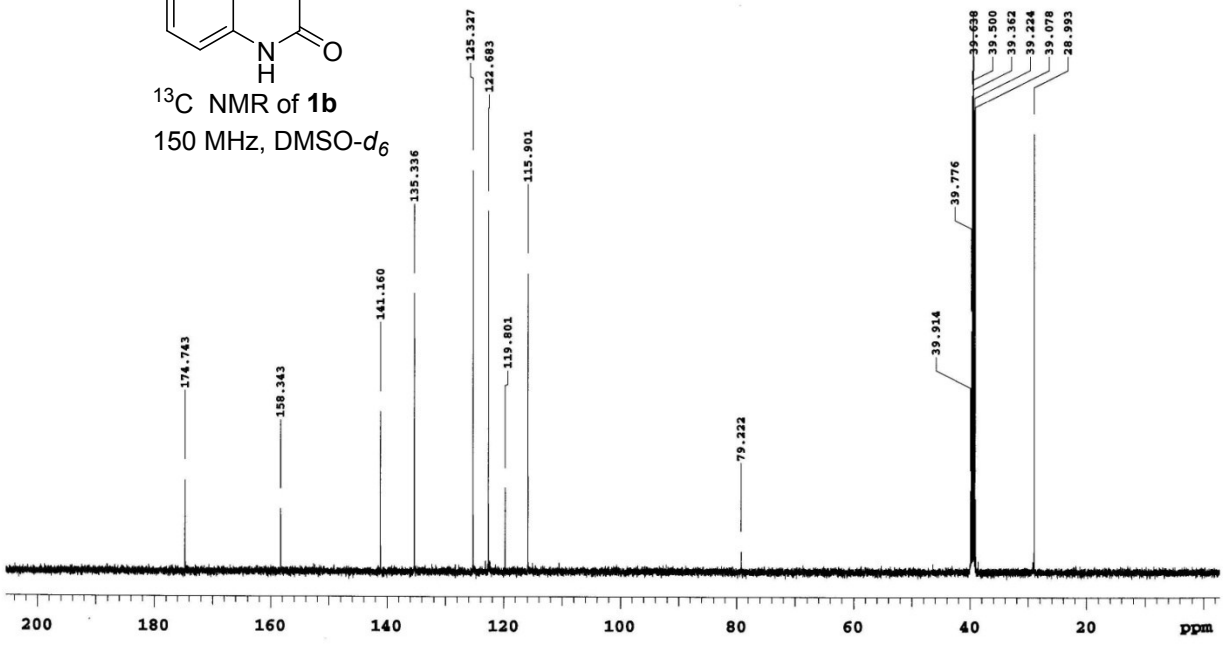


^{1}H NMR of **1b**
600MHz, DMSO-d_6

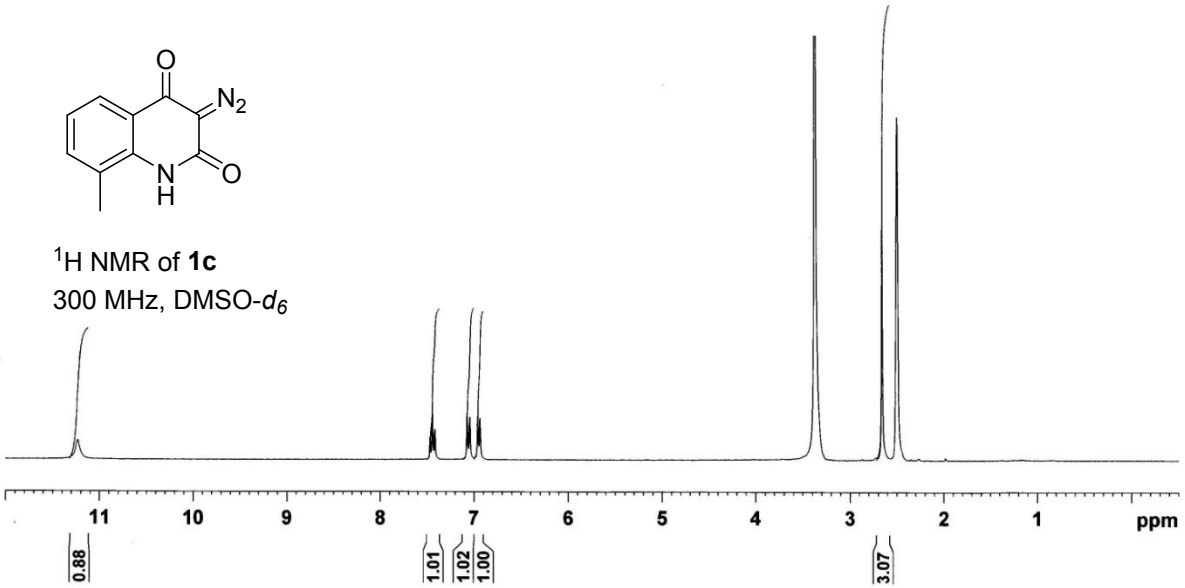


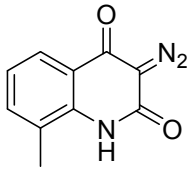


^{13}C NMR of **1b**
150 MHz, DMSO-d_6

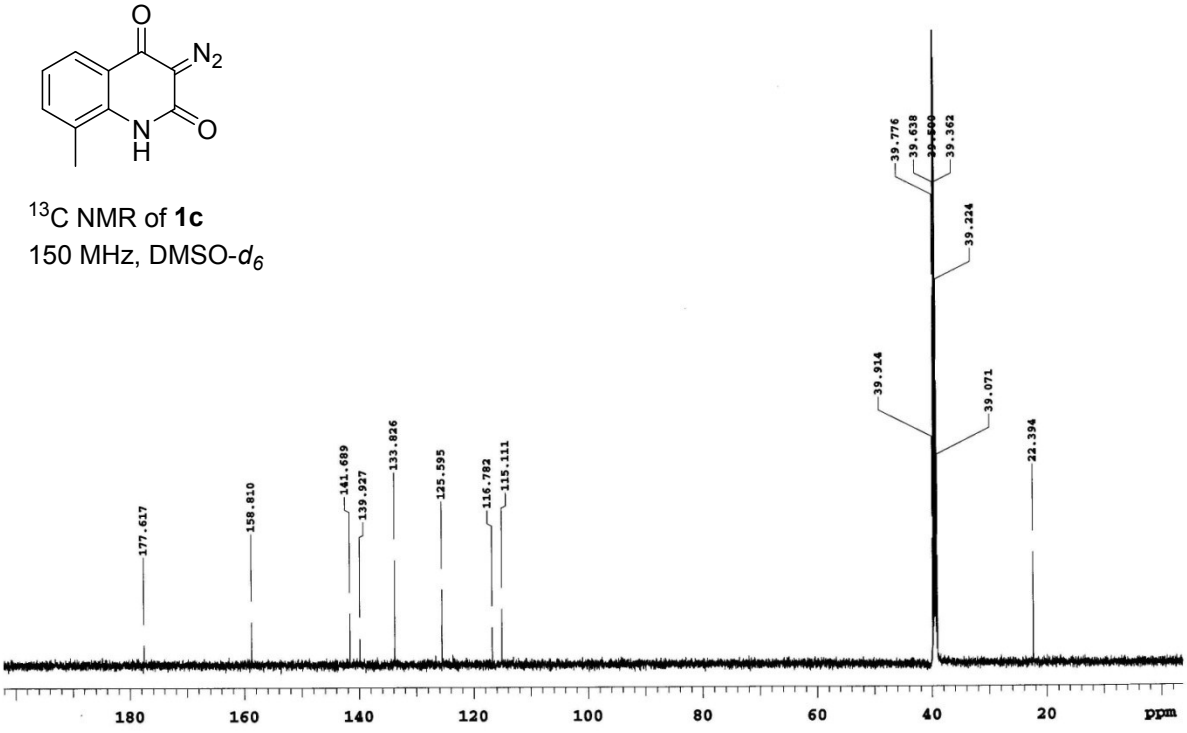


^{1}H NMR of **1c**
300 MHz, DMSO-d_6

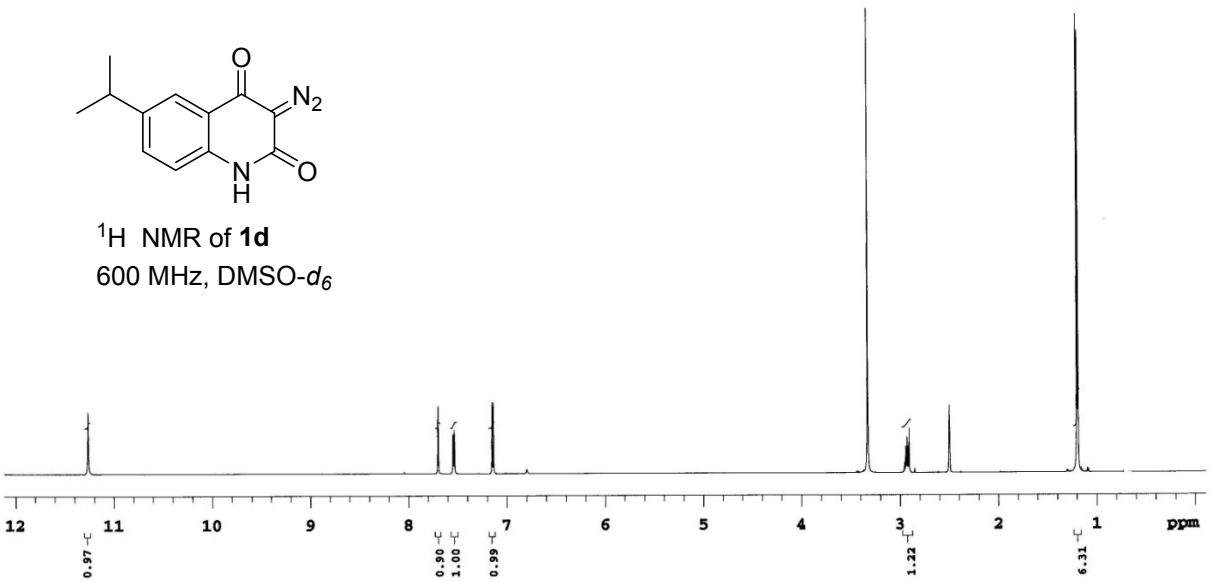


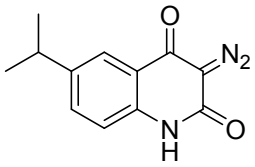


^{13}C NMR of **1c**
150 MHz, DMSO-d_6

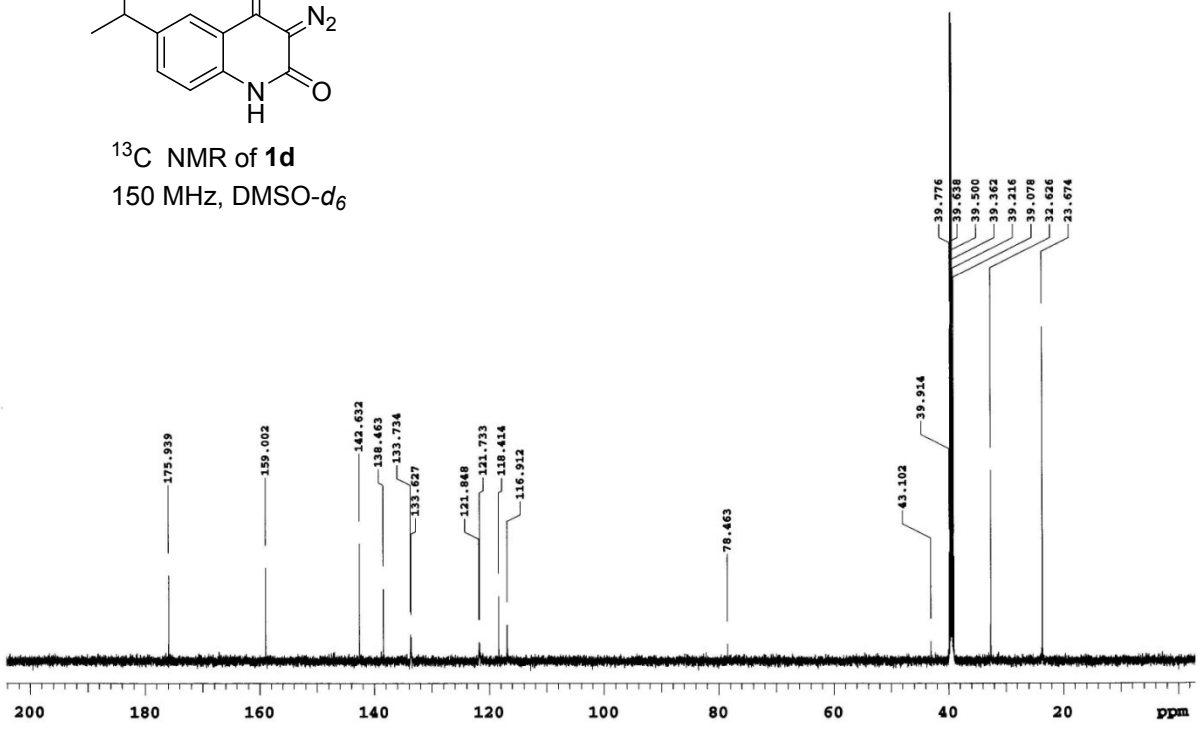


^{1}H NMR of **1d**
600 MHz, DMSO-d_6

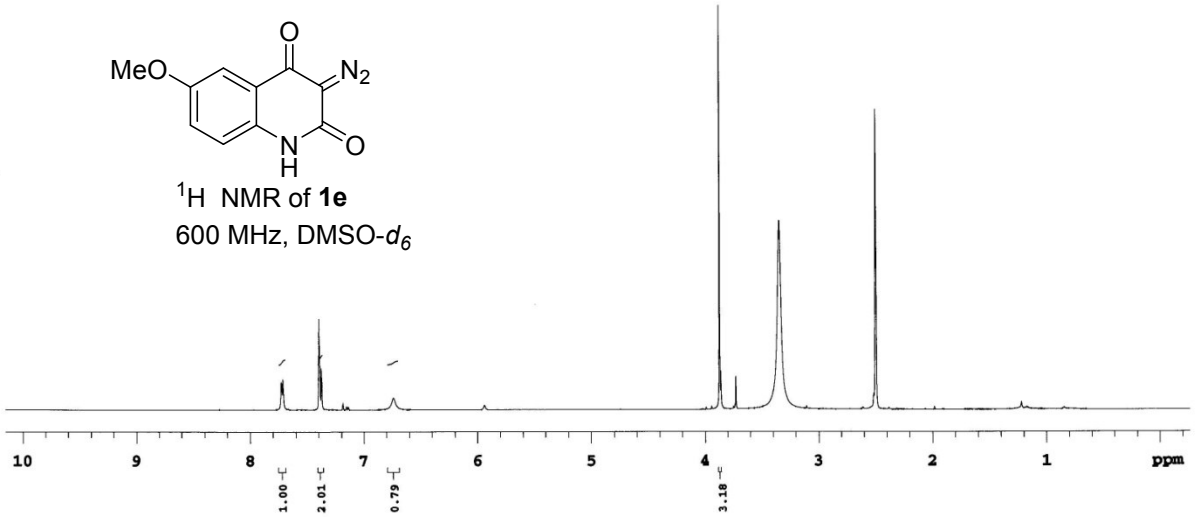




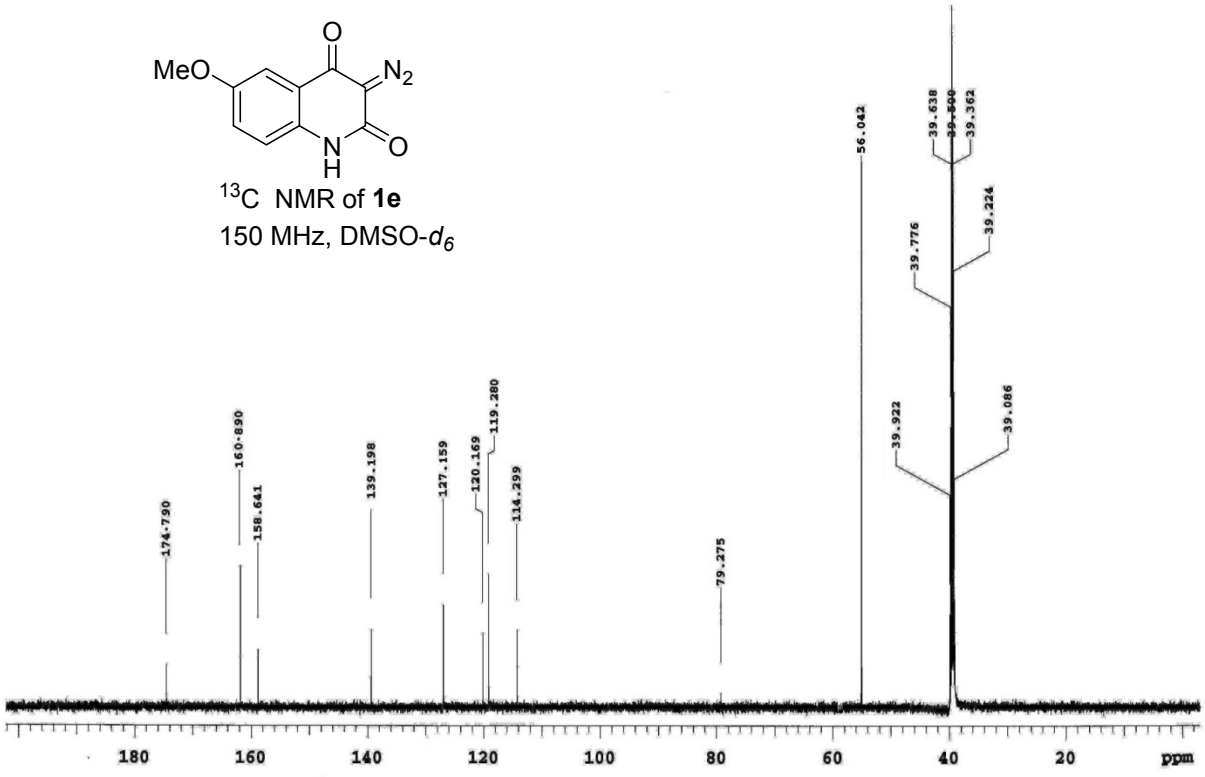
^{13}C NMR of **1d**
150 MHz, DMSO-d_6



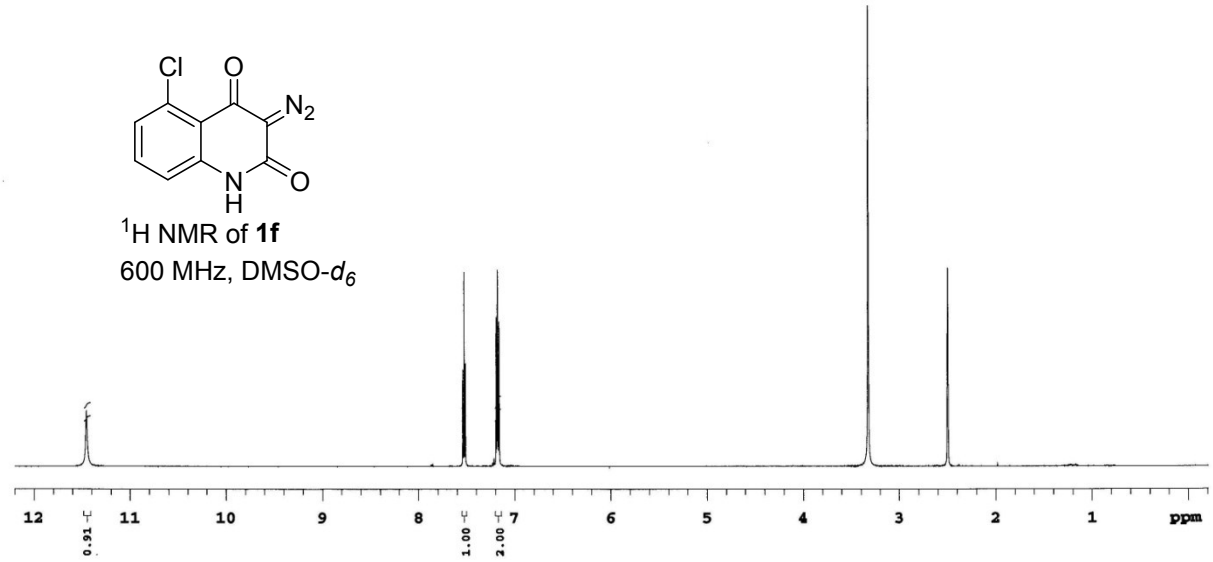
^{1}H NMR of **1e**
600 MHz, DMSO-d_6

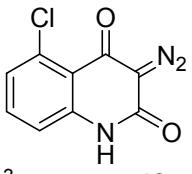


^{13}C NMR of **1e**
150 MHz, DMSO-d_6

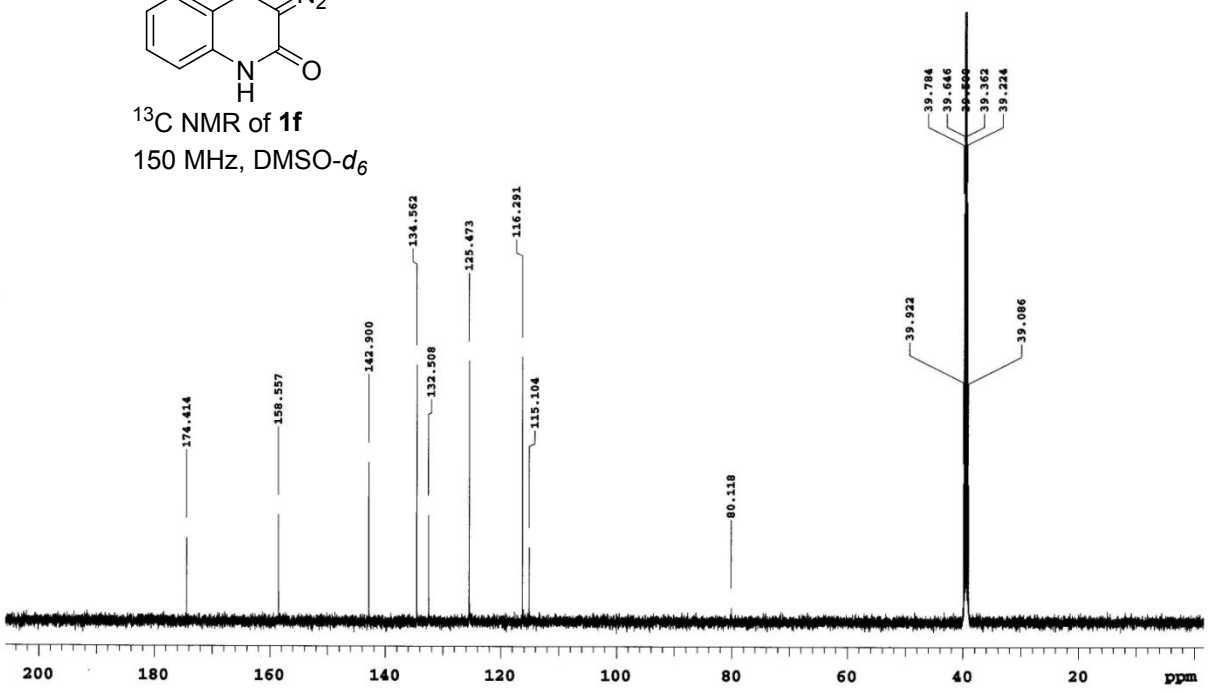


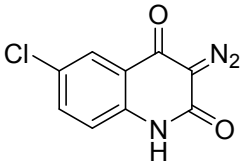
^{1}H NMR of **1f**
600 MHz, DMSO-d_6





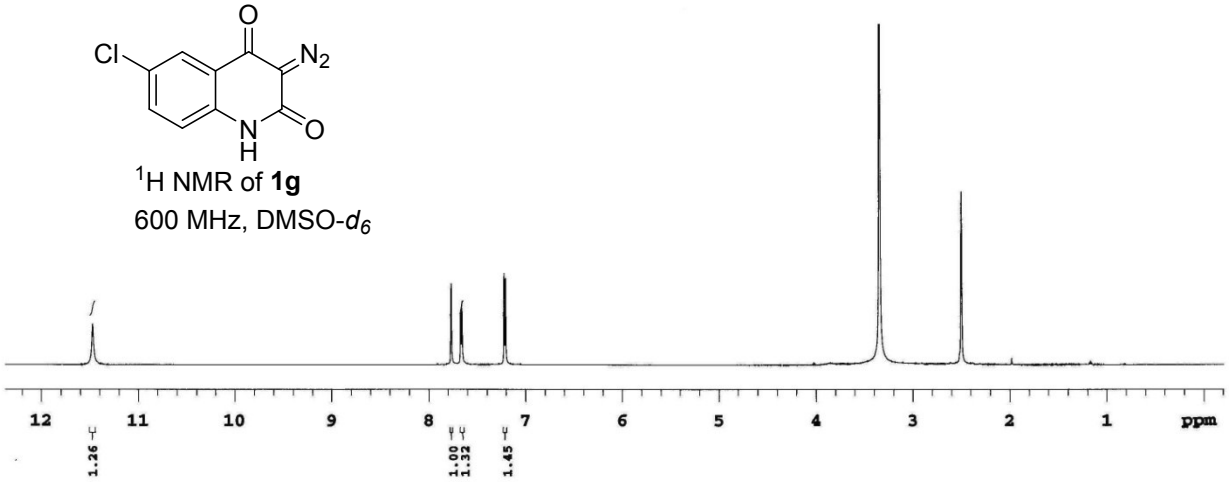
^{13}C NMR of **1f**
150 MHz, DMSO-d_6





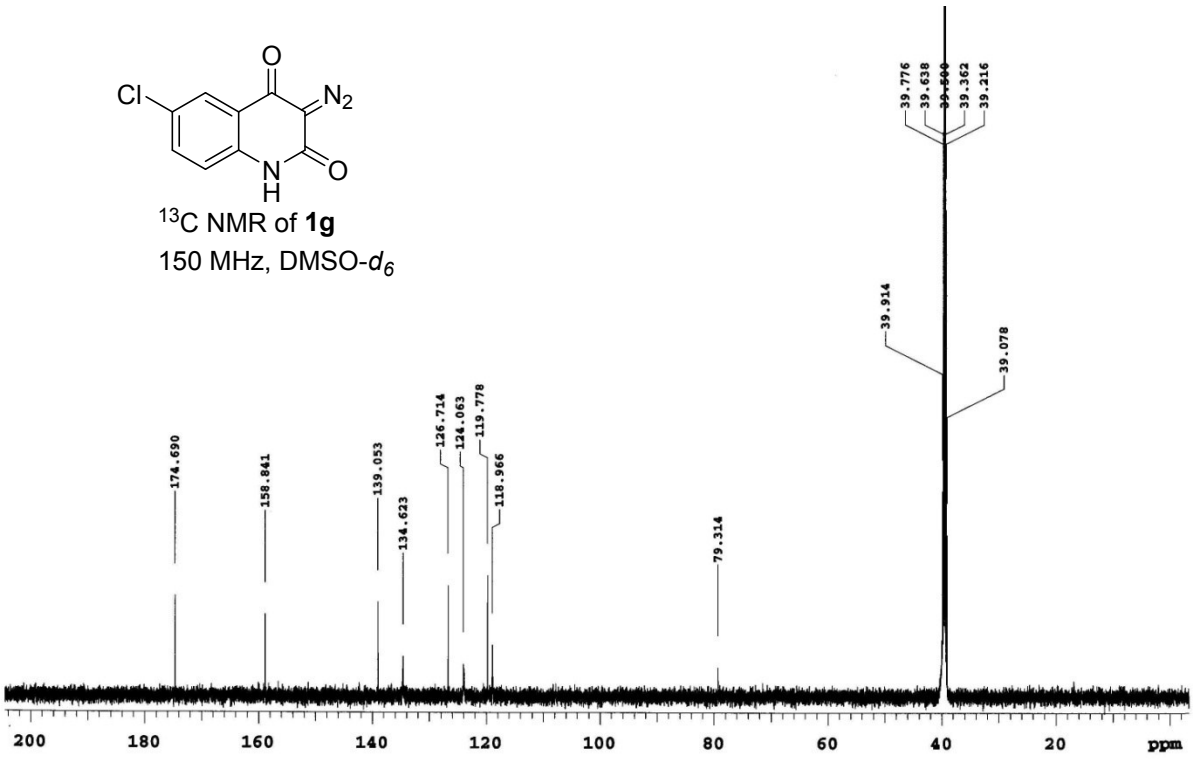
^{1}H NMR of **1g**

600 MHz, DMSO-d_6

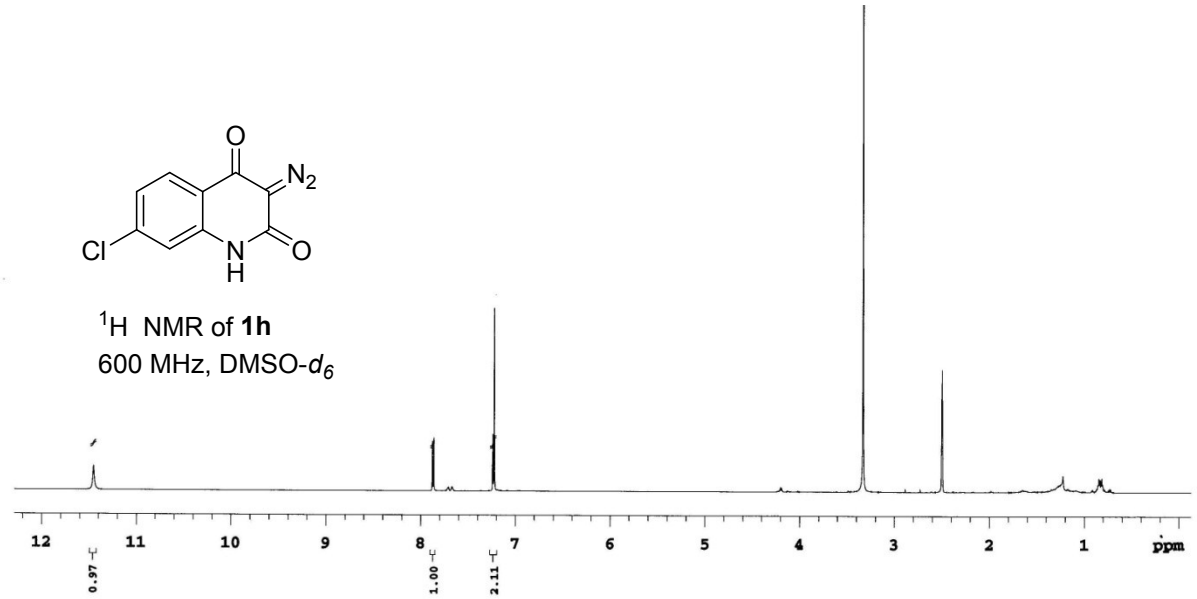


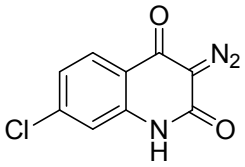
^{13}C NMR of **1g**

150 MHz, DMSO-d_6

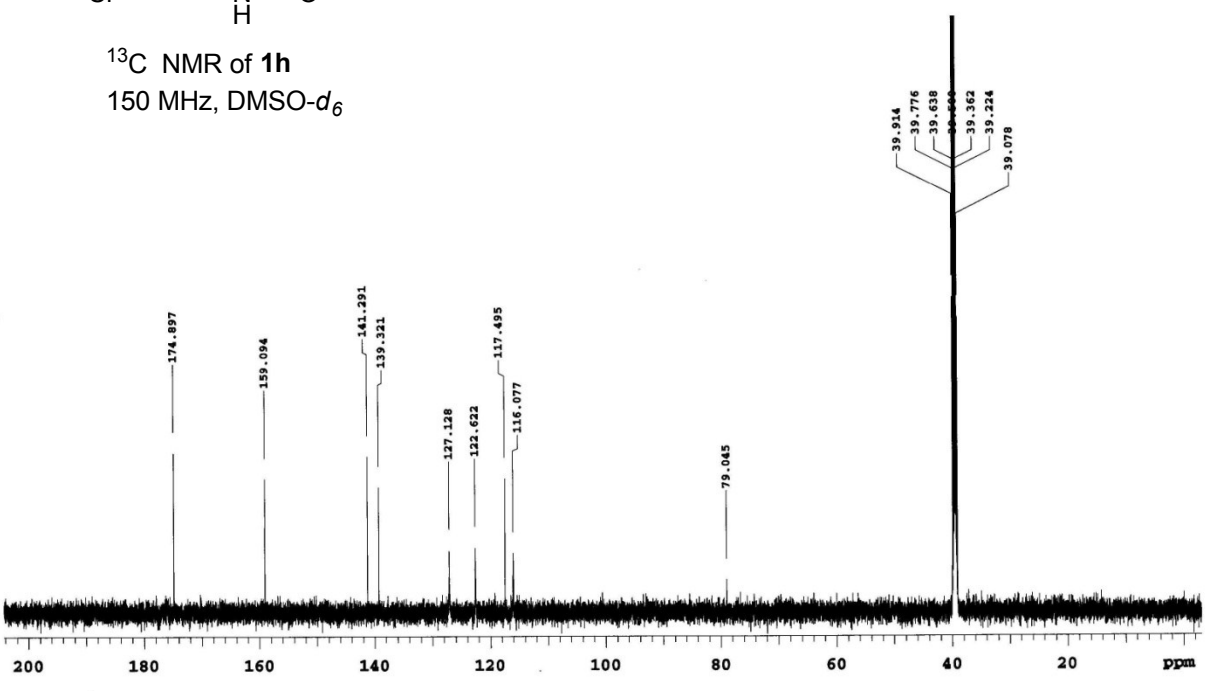


^{1}H NMR of **1h**
600 MHz, DMSO-d_6

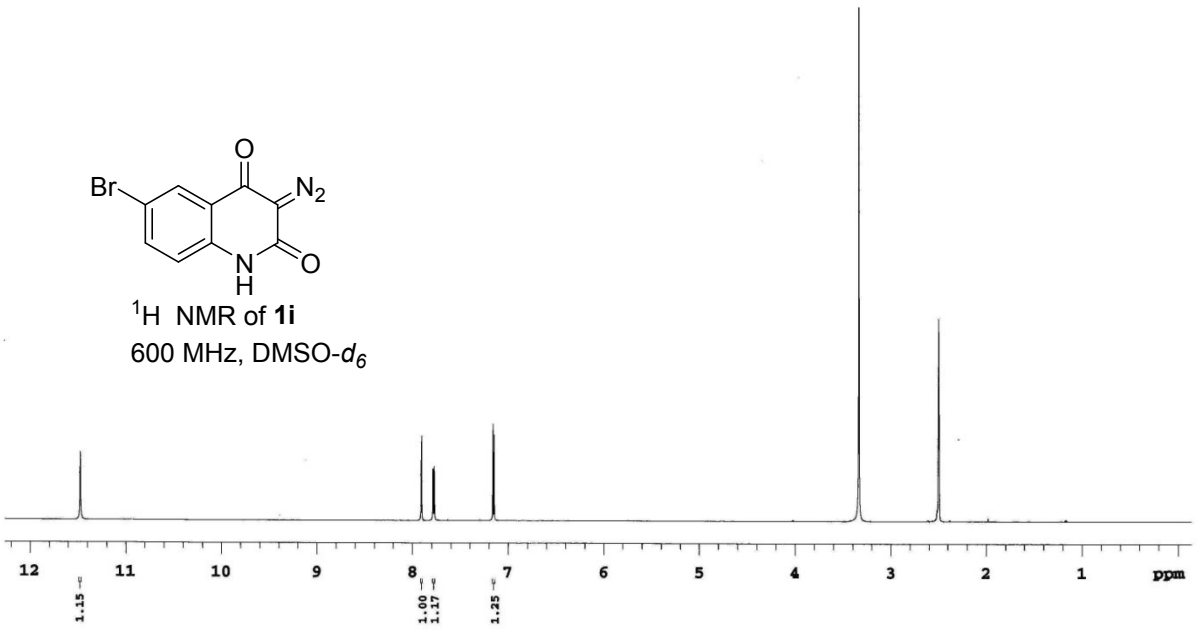




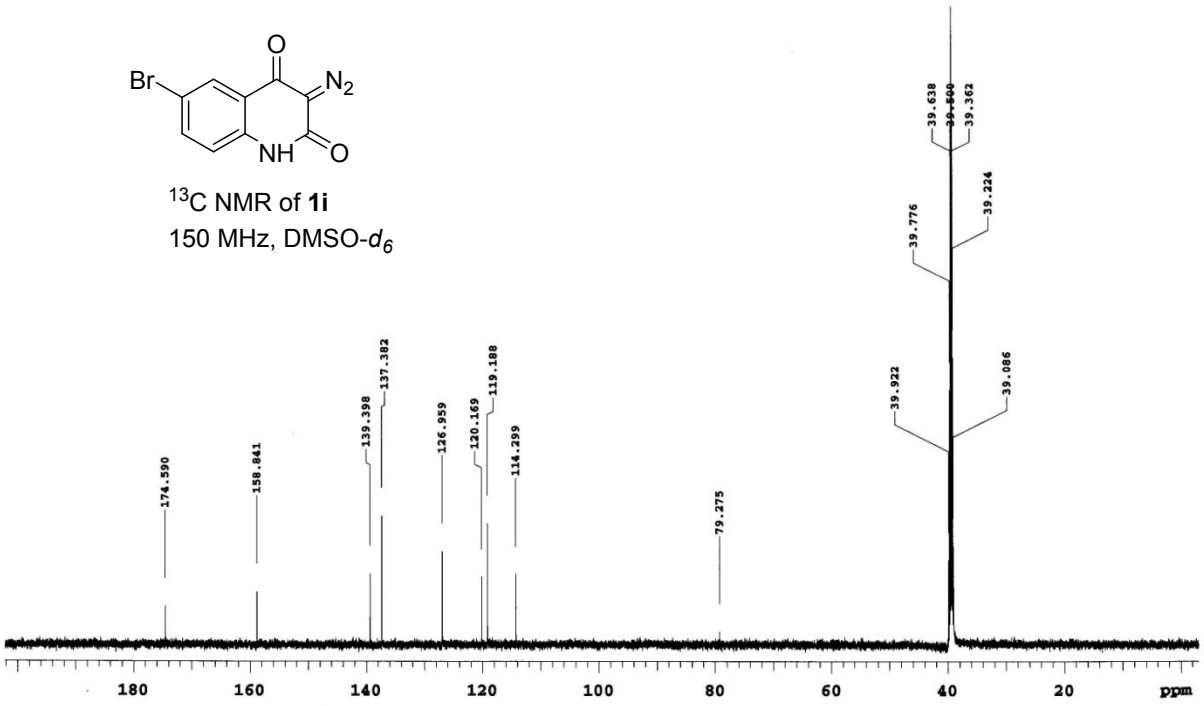
^{13}C NMR of **1h**
150 MHz, DMSO-d_6

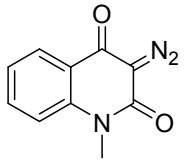


^{1}H NMR of **1i**
600 MHz, DMSO-d_6

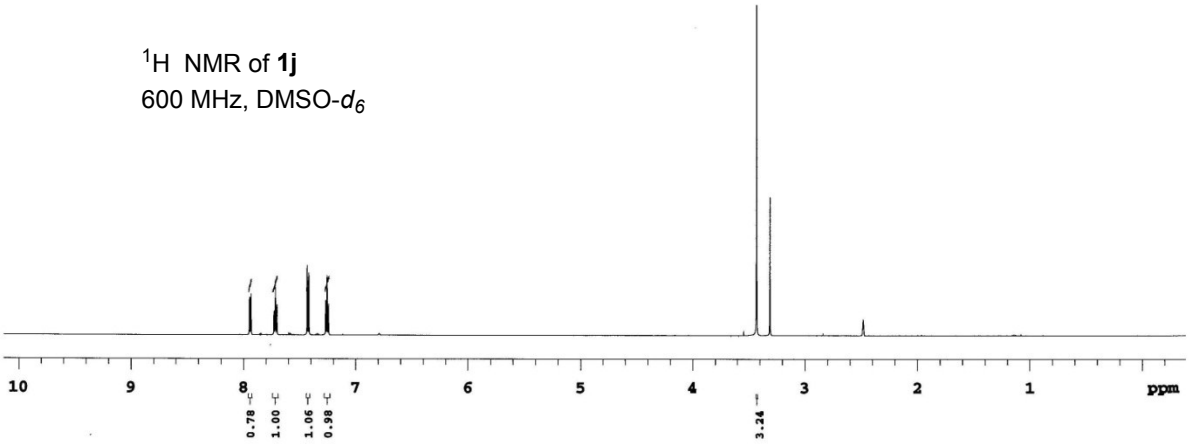


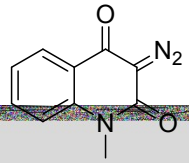
^{13}C NMR of **1i**
150 MHz, DMSO-d_6





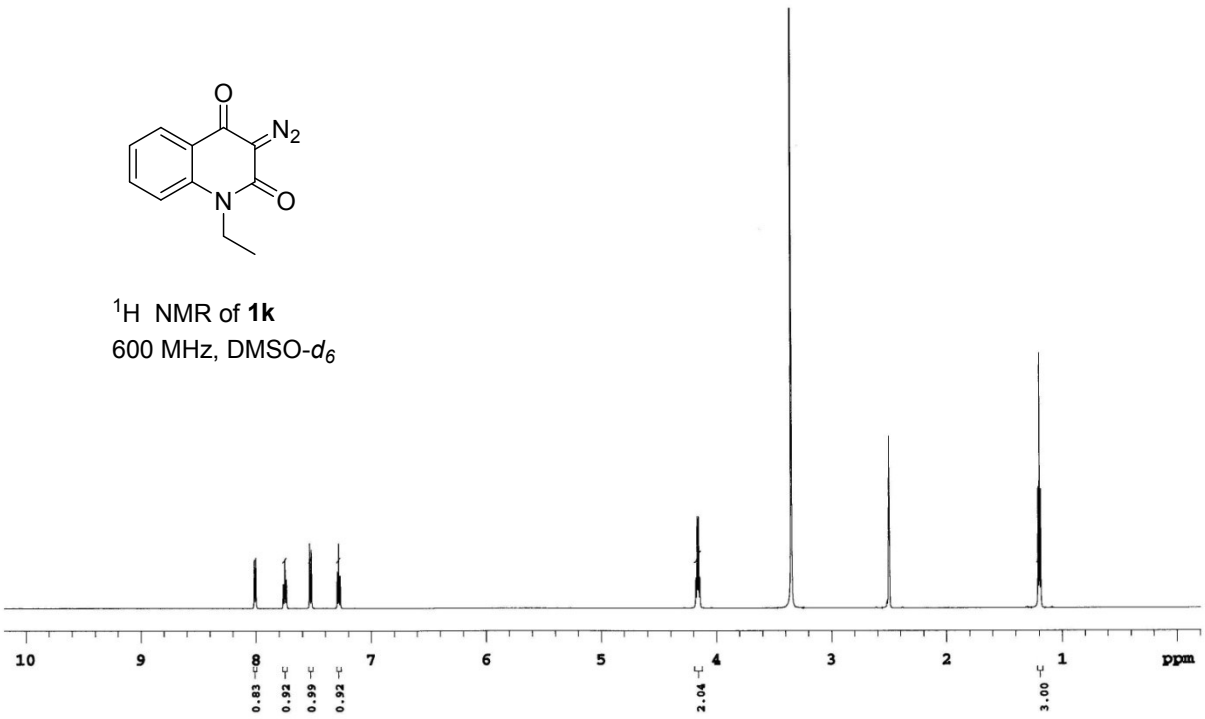
^{1}H NMR of **1j**
600 MHz, DMSO-d_6

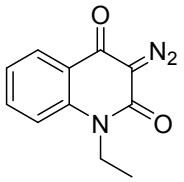




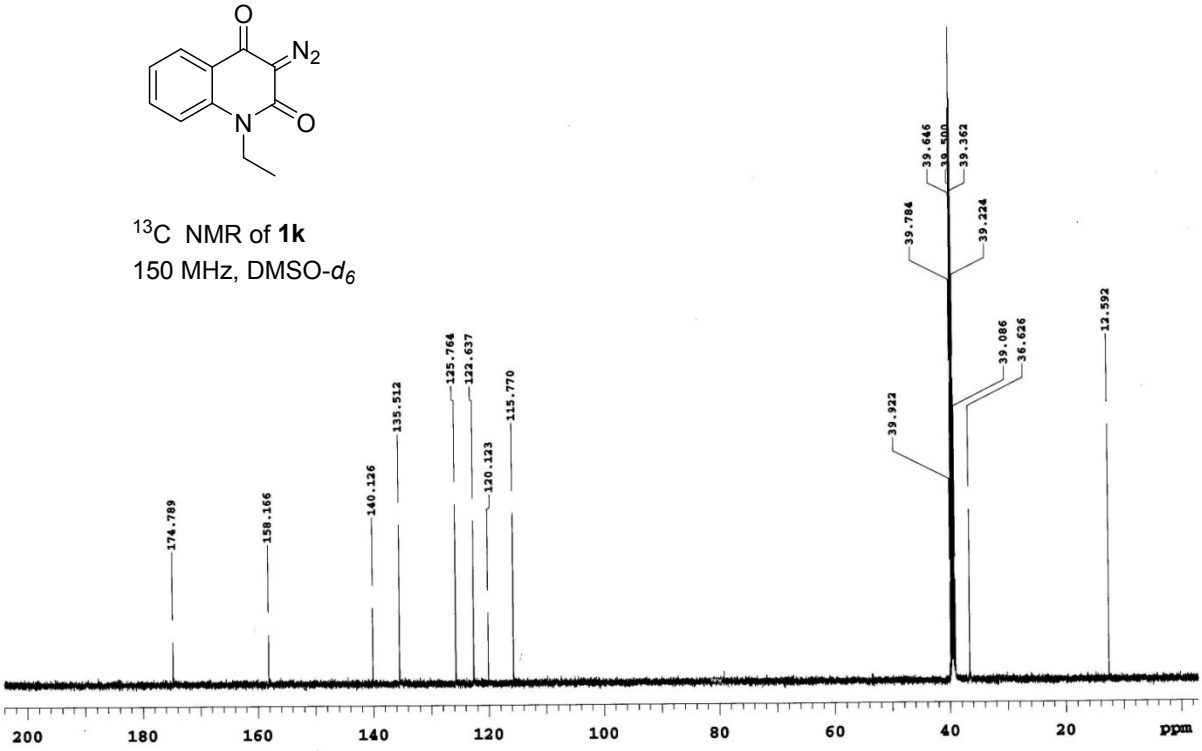
^{13}C NMR of **1j**
150 MHz, DMSO-d_6

^{1}H NMR of **1k**
600 MHz, DMSO-d_6

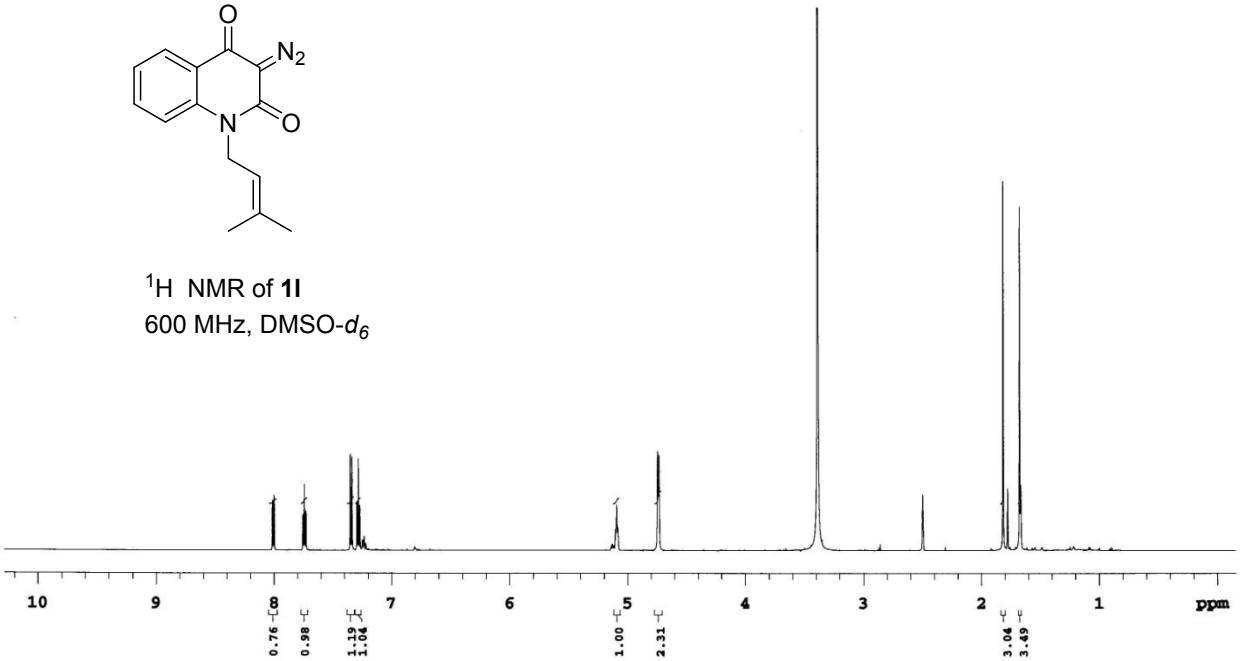


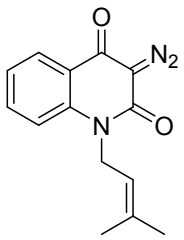


^{13}C NMR of **1k**
150 MHz, DMSO-d_6

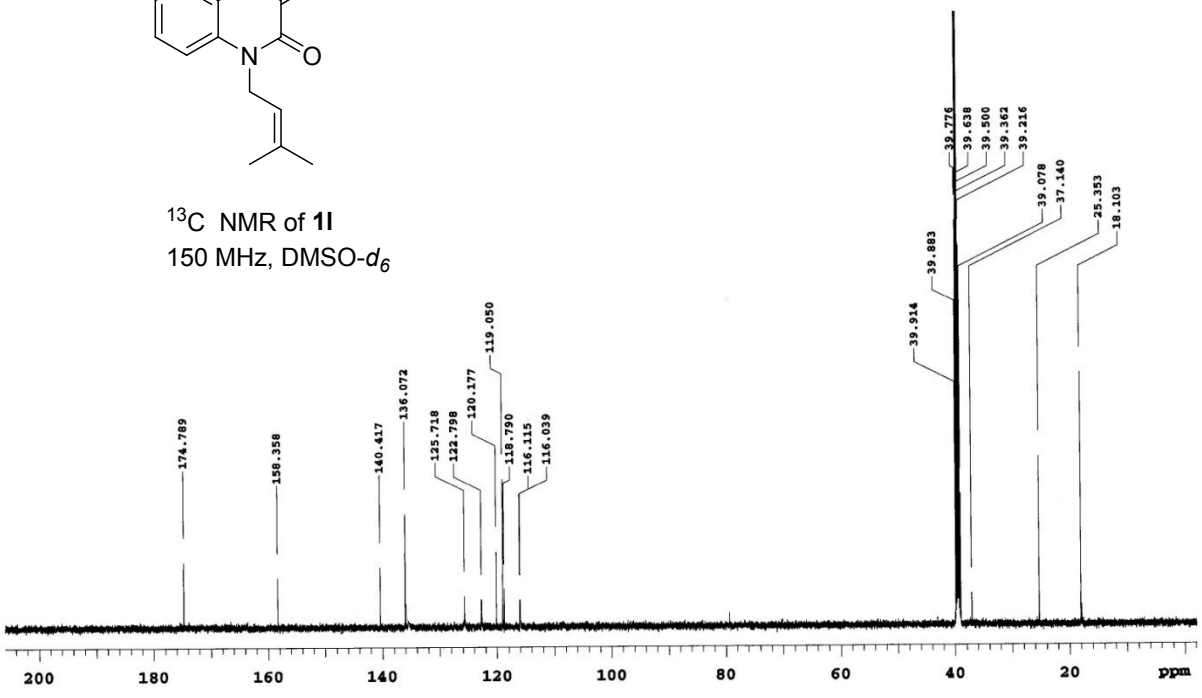


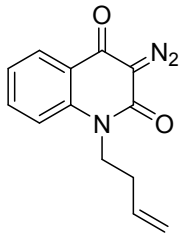
^{1}H NMR of **1l**
600 MHz, DMSO-d_6



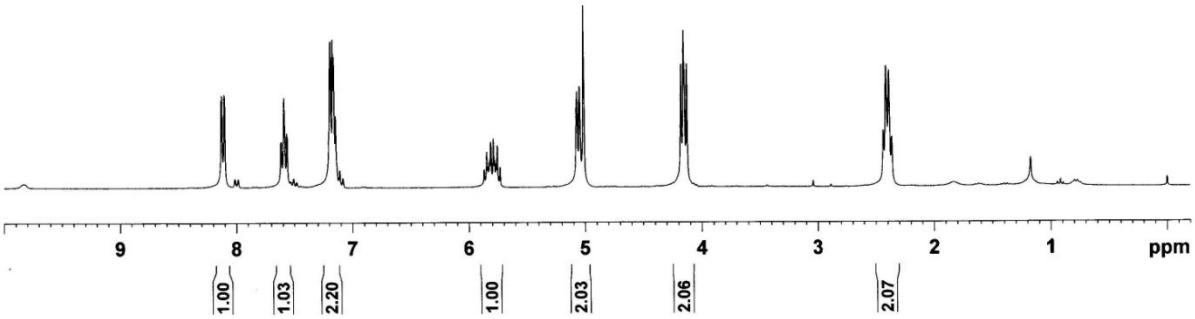


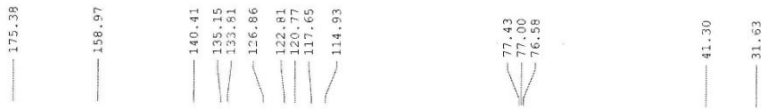
^{13}C NMR of **1l**
150 MHz, DMSO-d_6

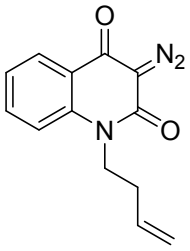




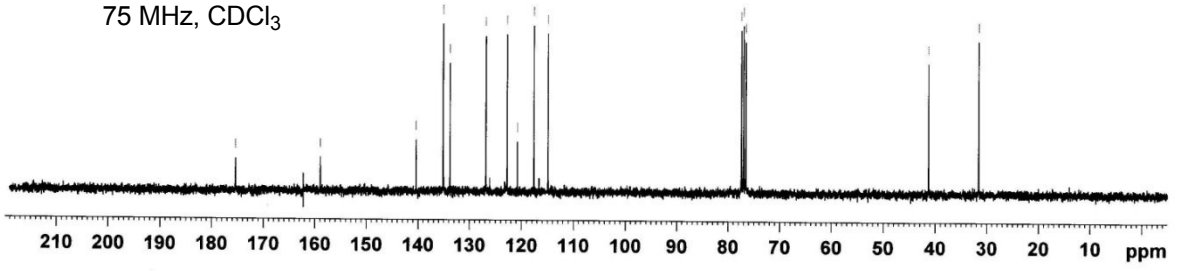
^{1}H NMR of **1m**
300 MHz, $CDCl_3$

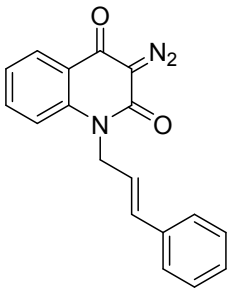




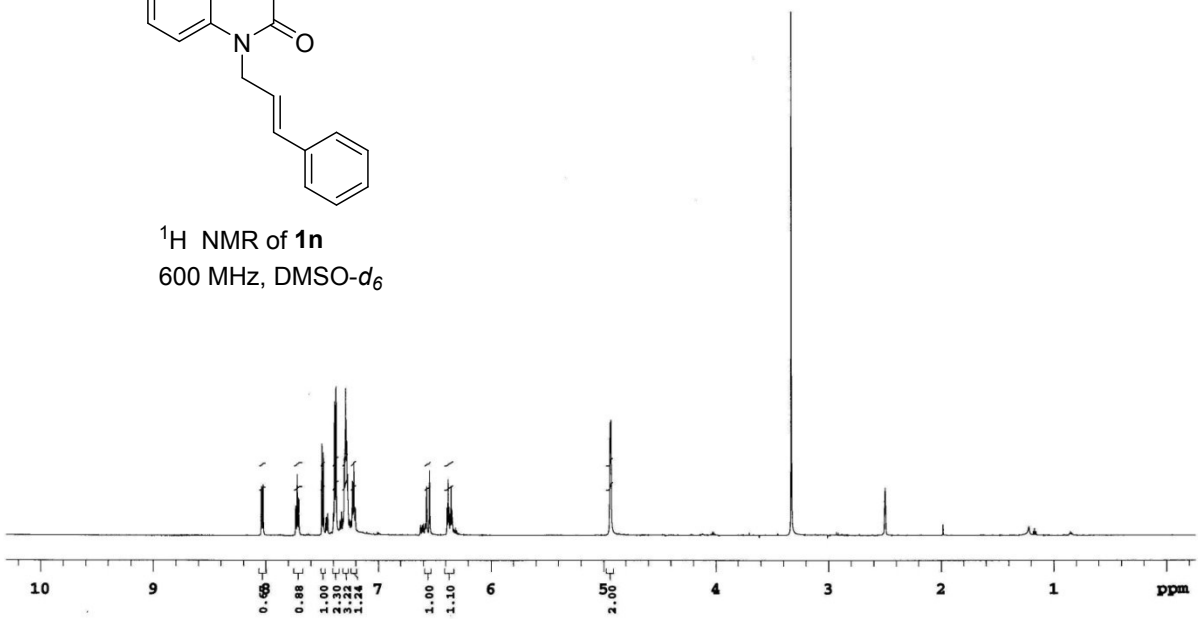


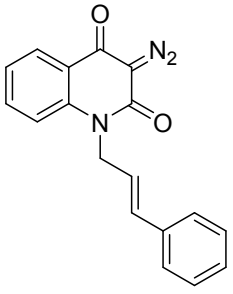
^{13}C NMR of **1m**
75 MHz, $CDCl_3$



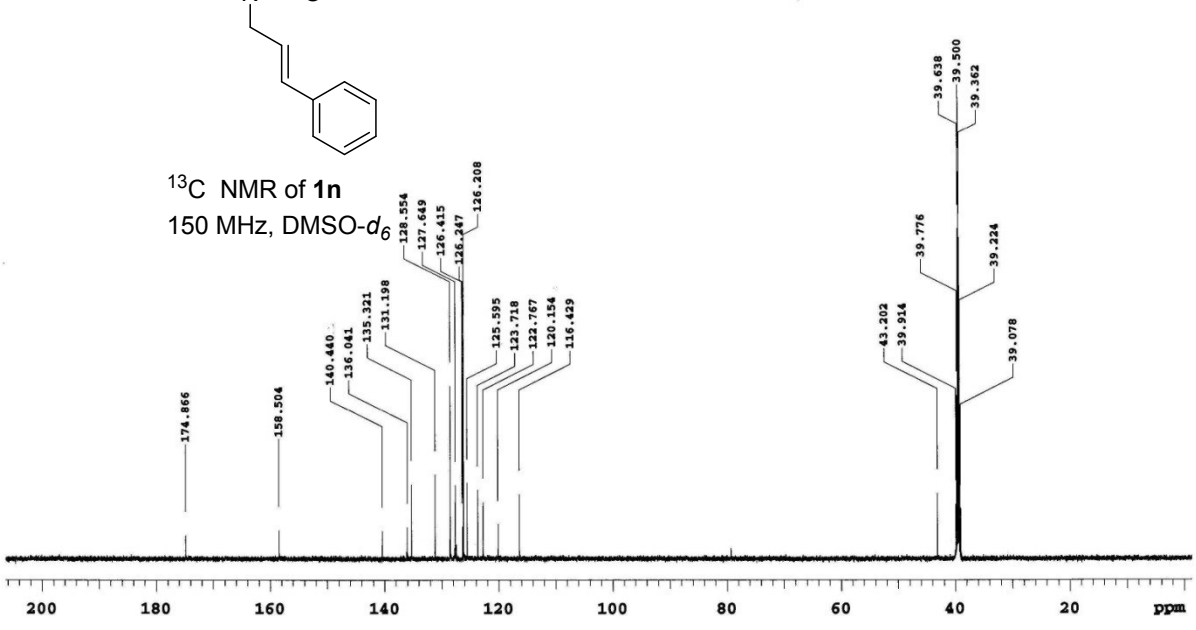


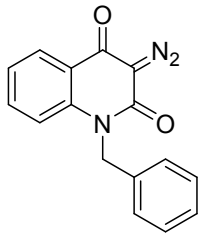
^{1}H NMR of **1n**
600 MHz, DMSO-d_6



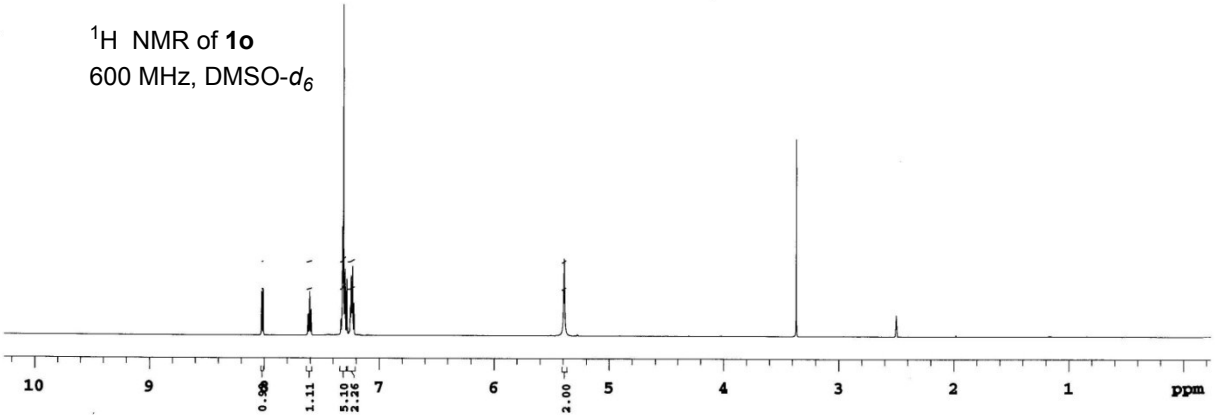


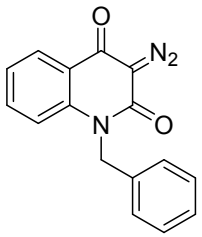
^{13}C NMR of **1n**
150 MHz, DMSO-d_6



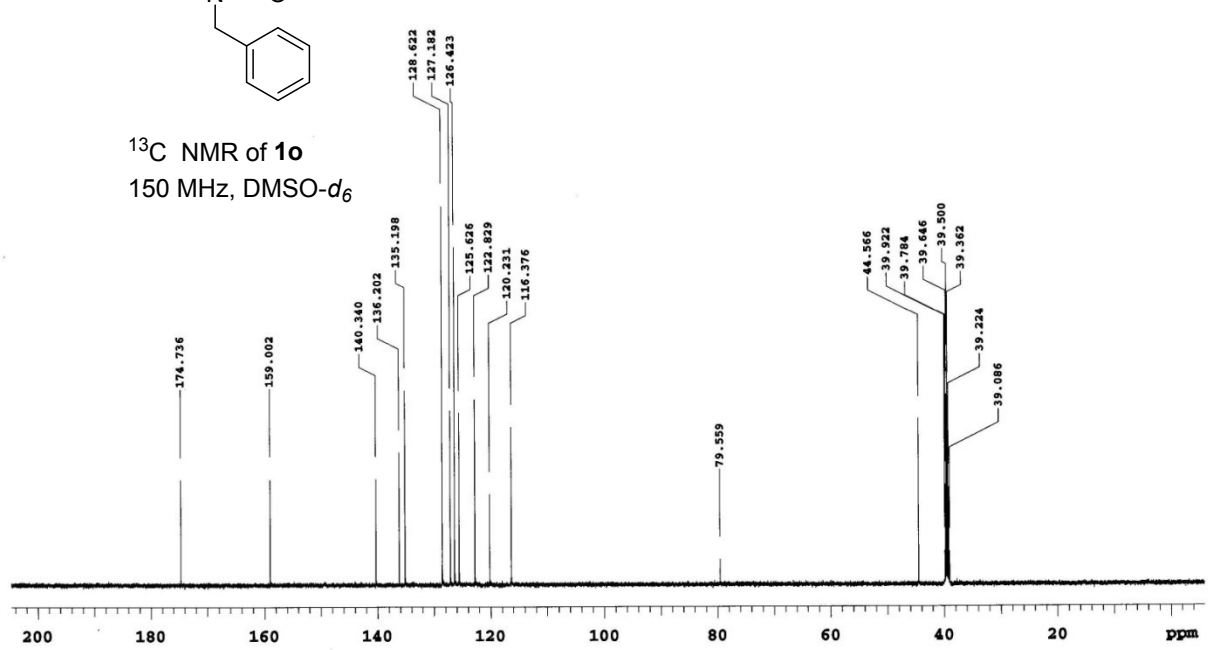


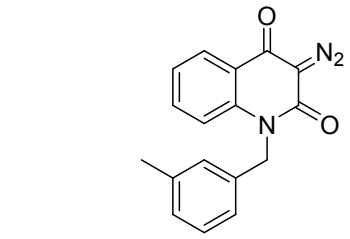
^{1}H NMR of **1o**
600 MHz, DMSO-d_6



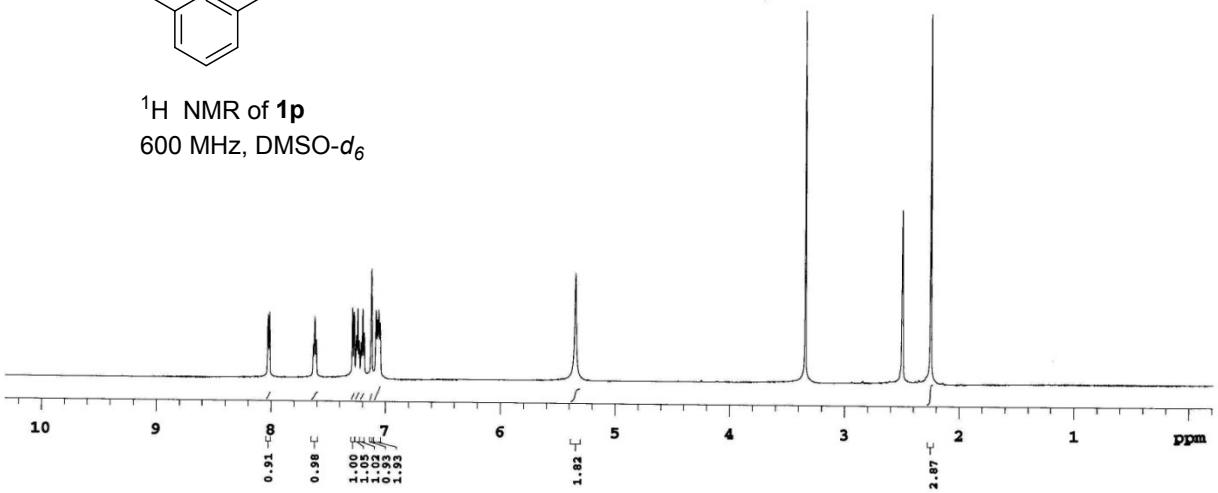


^{13}C NMR of **1o**
150 MHz, DMSO-d_6

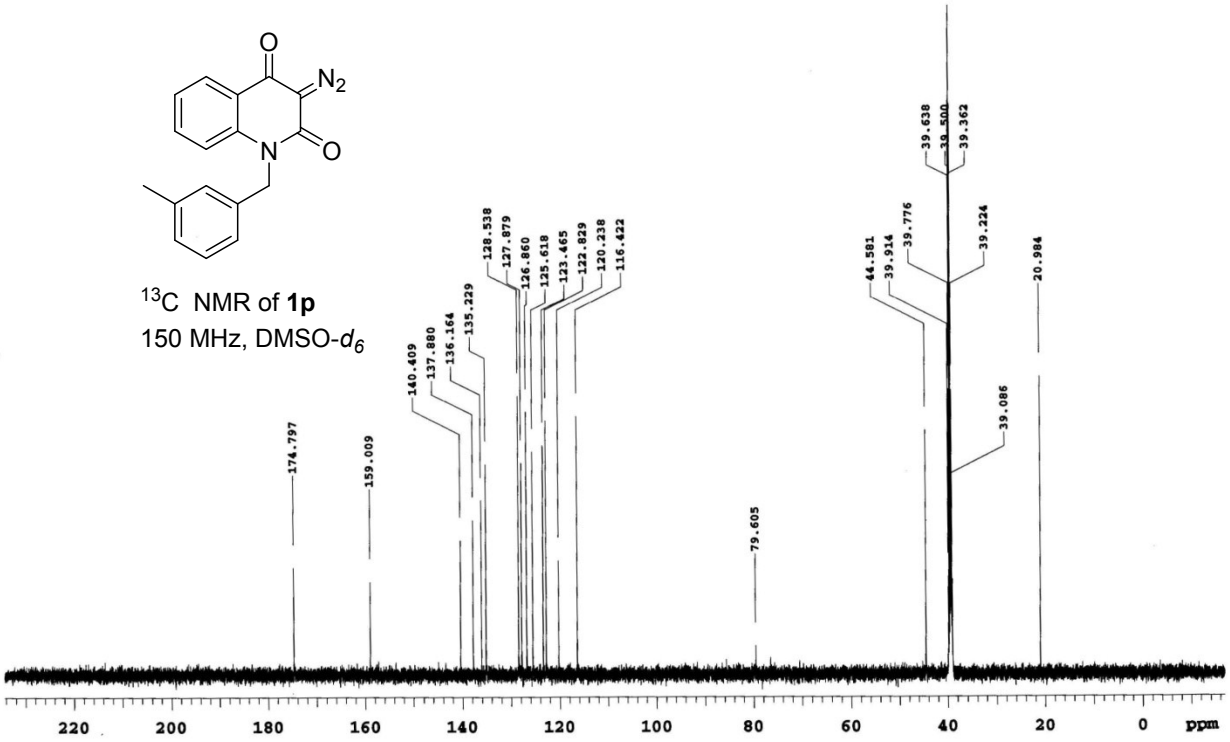


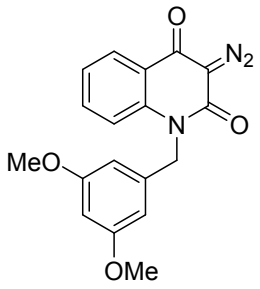


^{1}H NMR of **1p**
600 MHz, DMSO-d_6

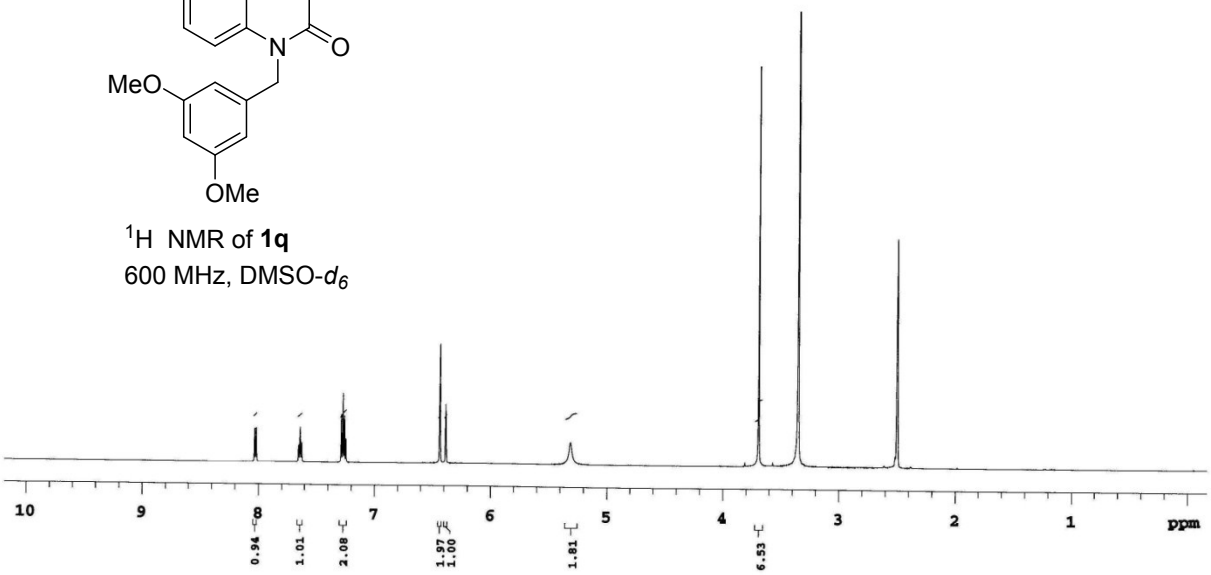


^{13}C NMR of **1p**
150 MHz, DMSO-d_6

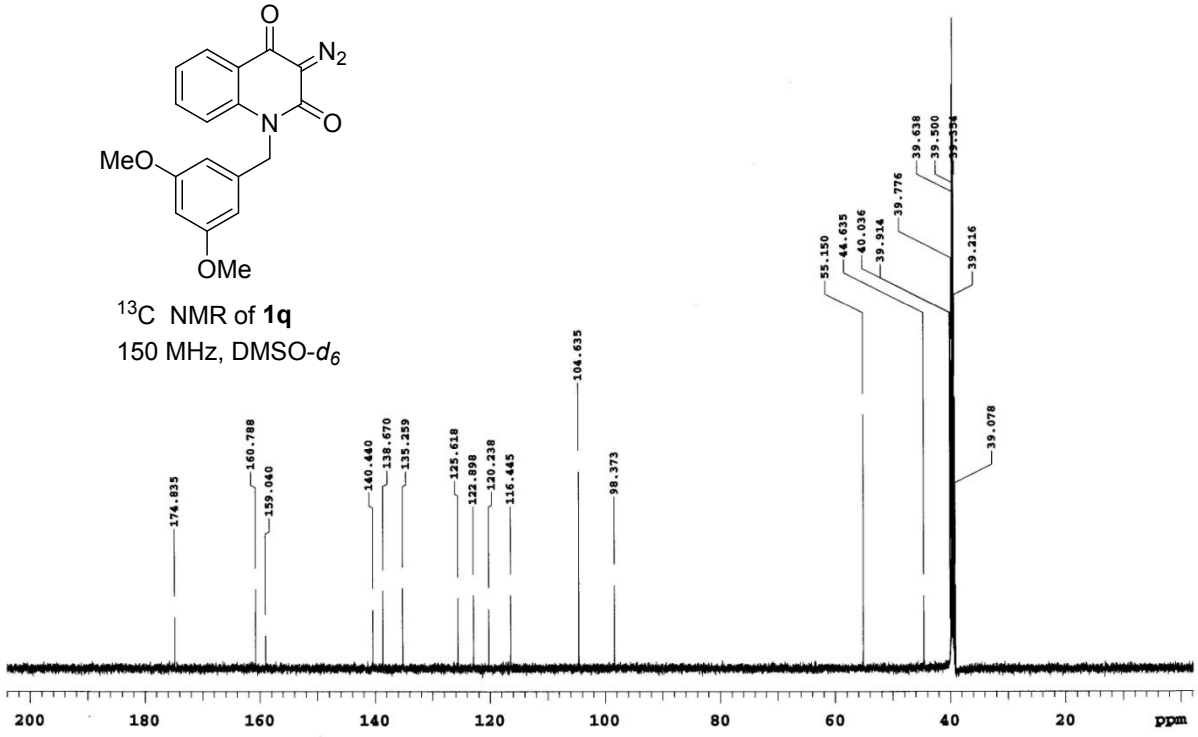


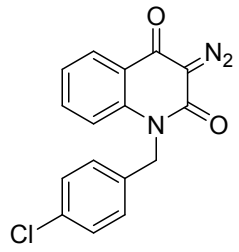


^{1}H NMR of **1q**
600 MHz, DMSO-d_6

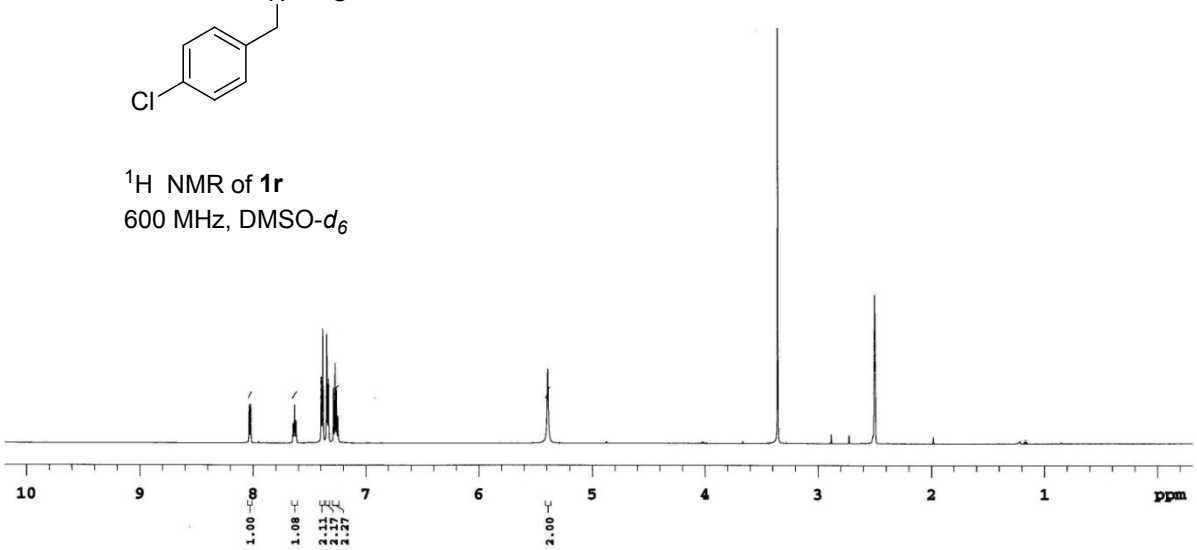


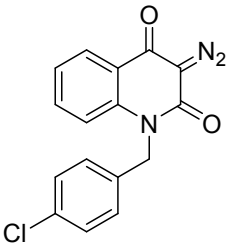
^{13}C NMR of **1q**
150 MHz, DMSO-d_6



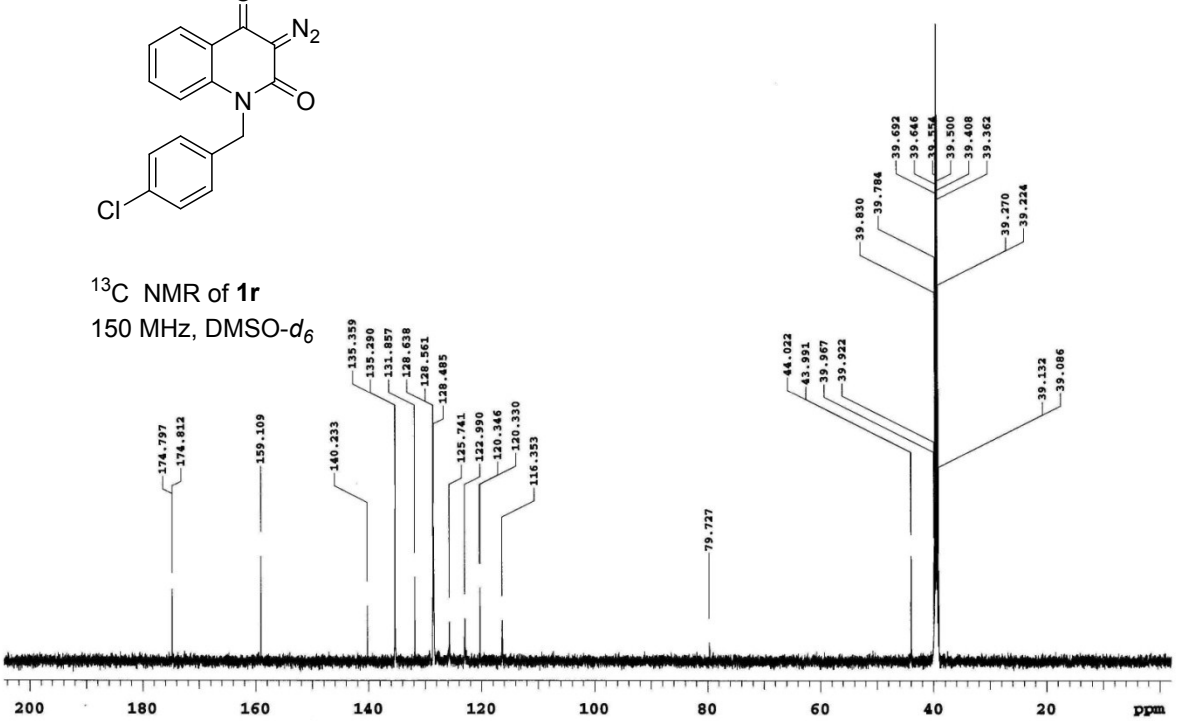


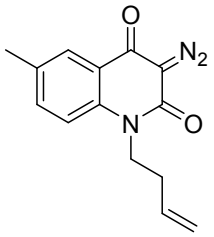
^{1}H NMR of **1r**
600 MHz, DMSO-d_6



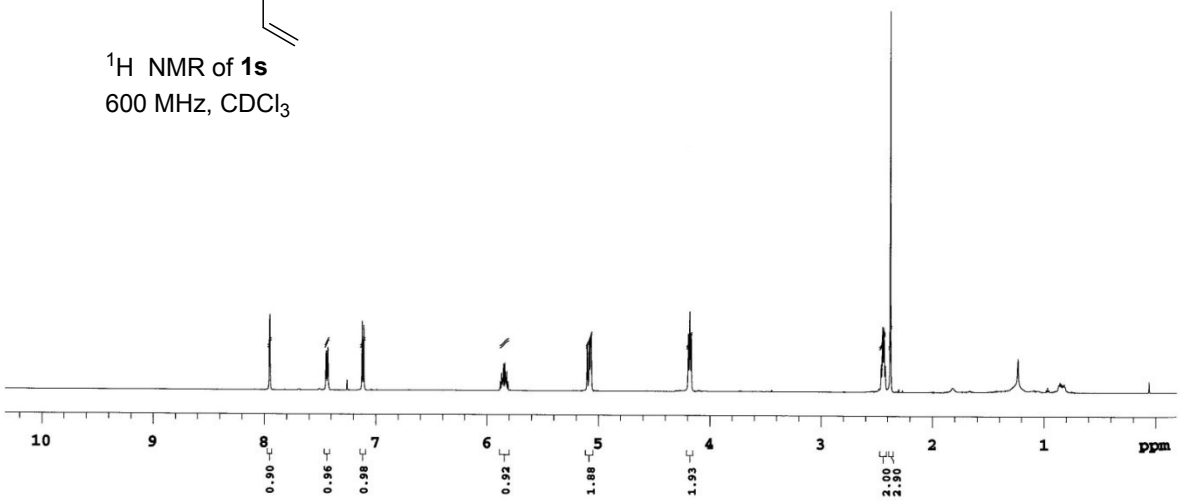


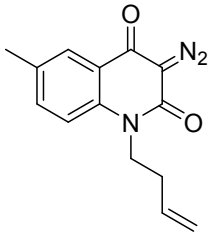
^{13}C NMR of **1r**
150 MHz, DMSO-d_6



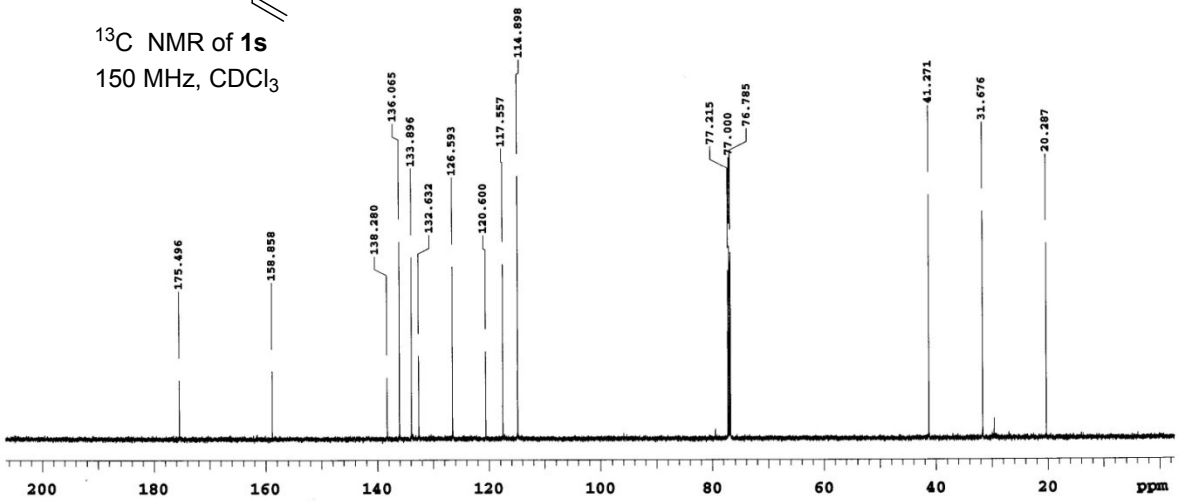


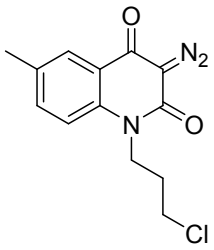
^{1}H NMR of **1s**
600 MHz, $CDCl_3$



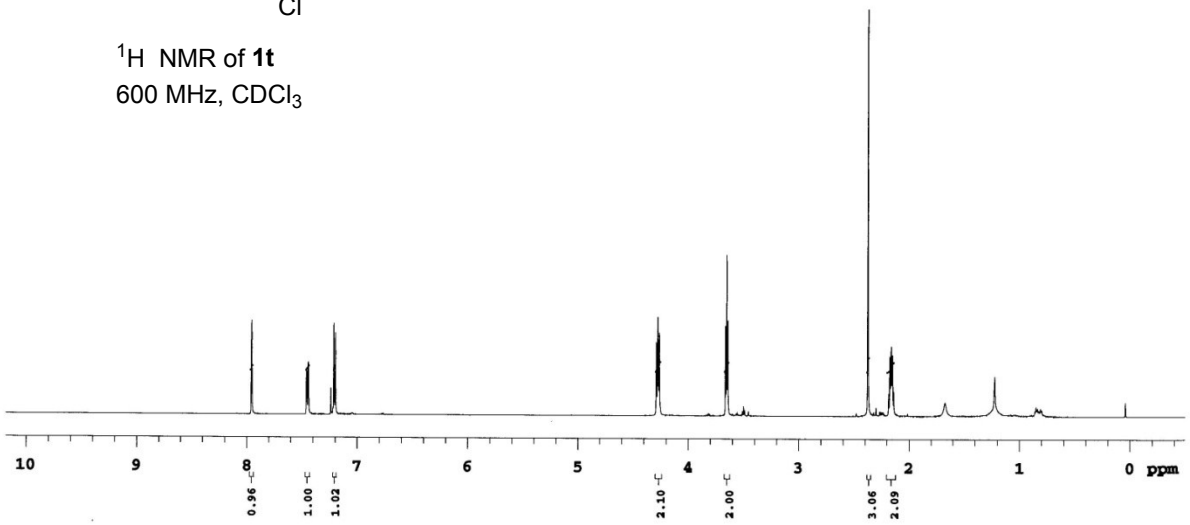


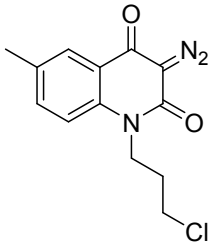
^{13}C NMR of **1s**
150 MHz, $CDCl_3$



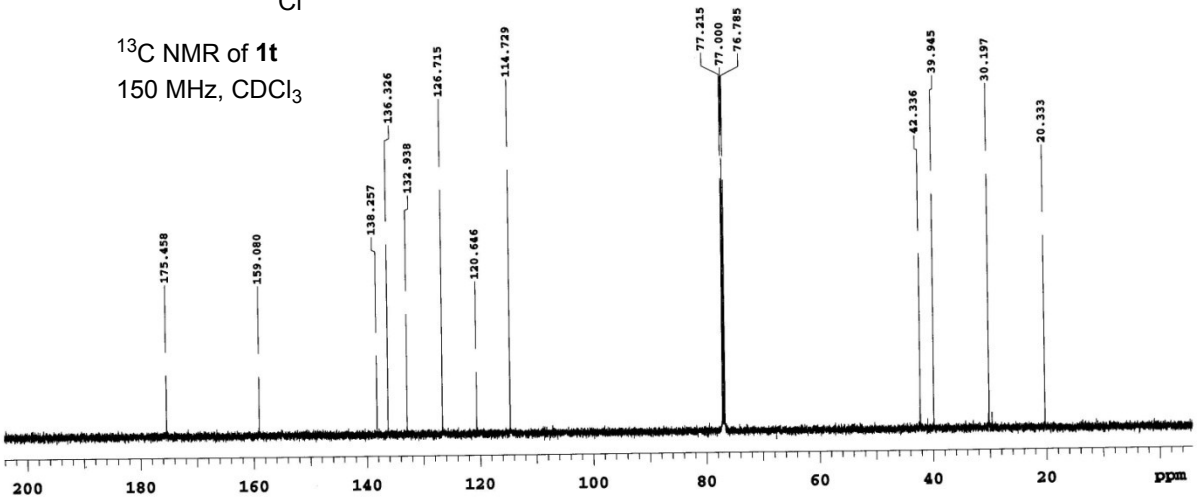


^{1}H NMR of **1t**
600 MHz, $CDCl_3$

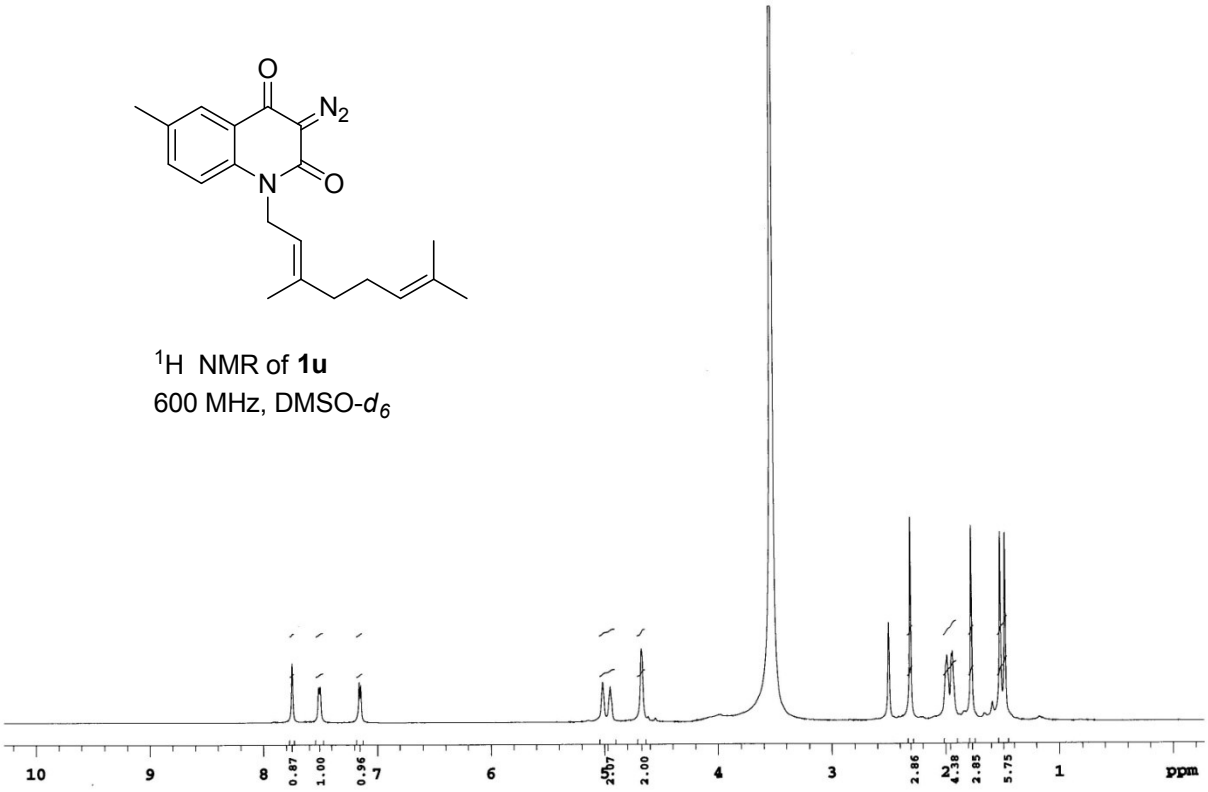


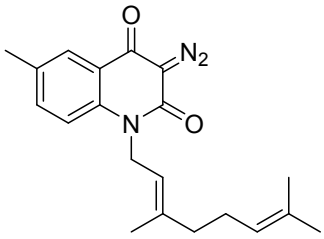


^{13}C NMR of **1t**
150 MHz, $CDCl_3$

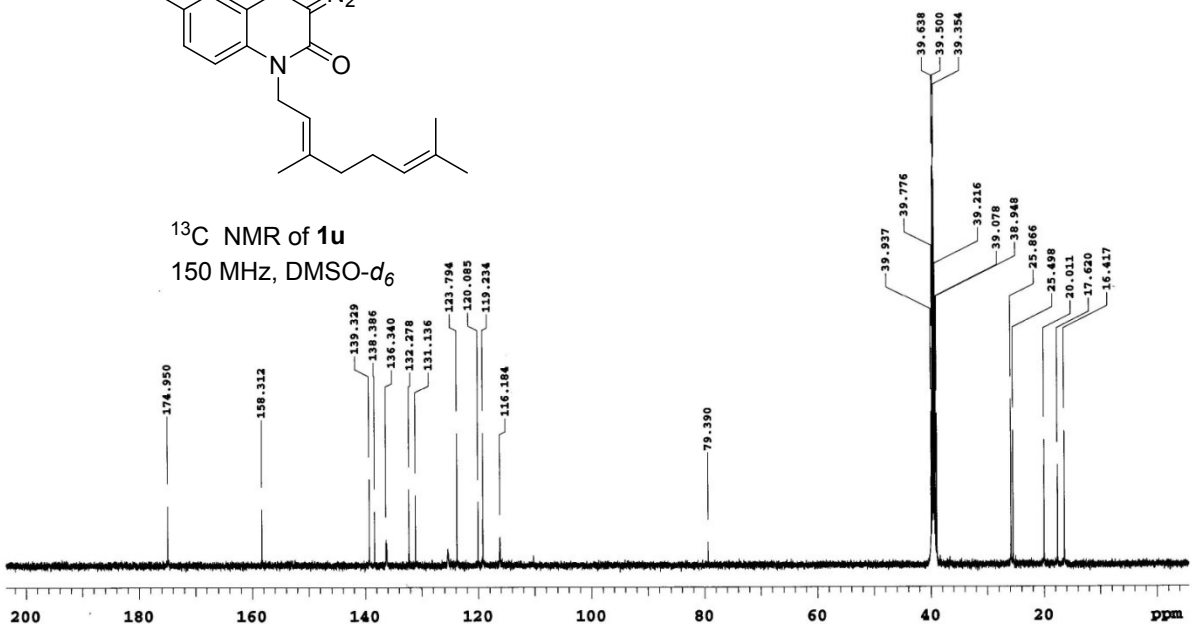


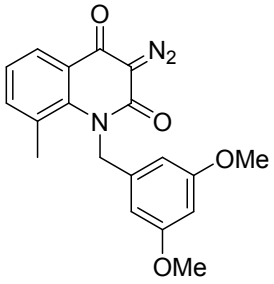
^{1}H NMR of **1u**
600 MHz, DMSO-d_6



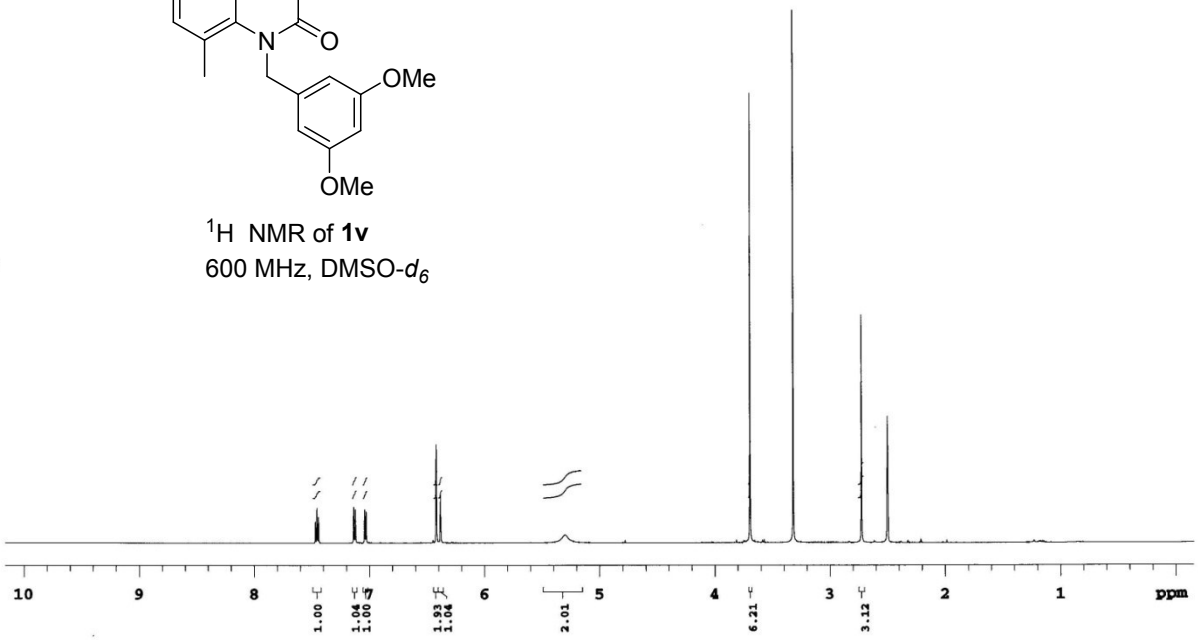


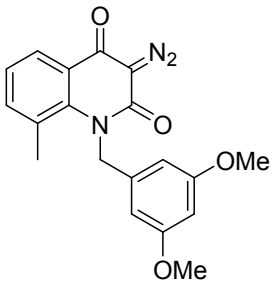
^{13}C NMR of **1u**
150 MHz, DMSO-d_6



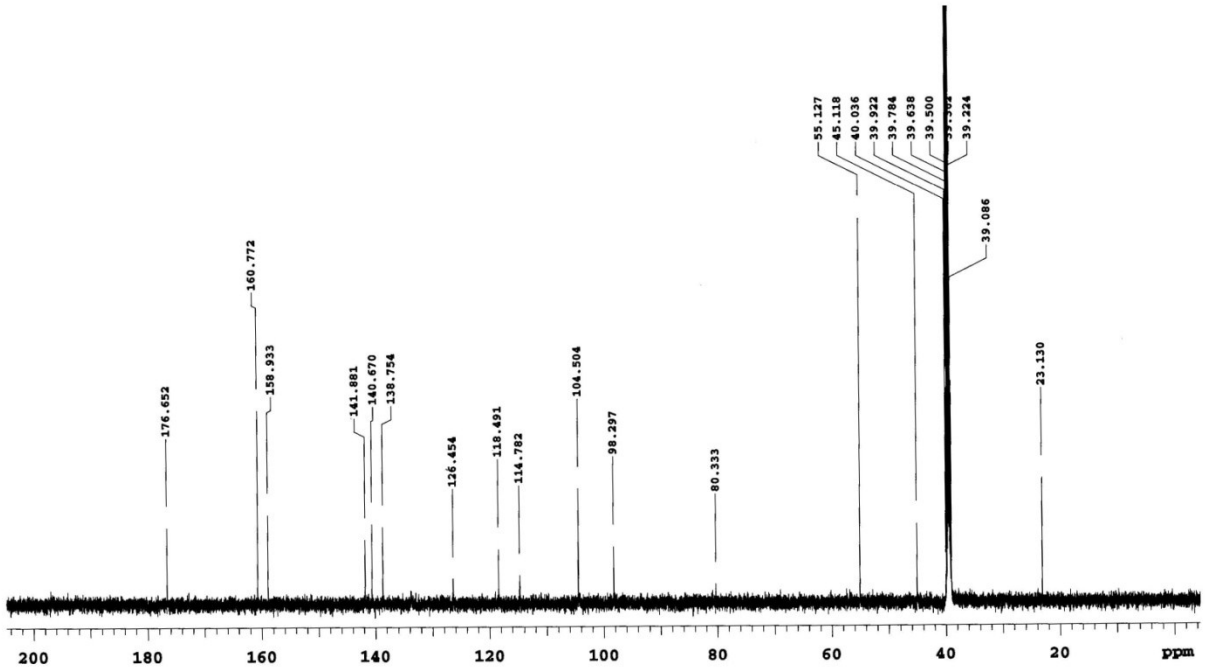


^{1}H NMR of **1v**
600 MHz, DMSO-d_6

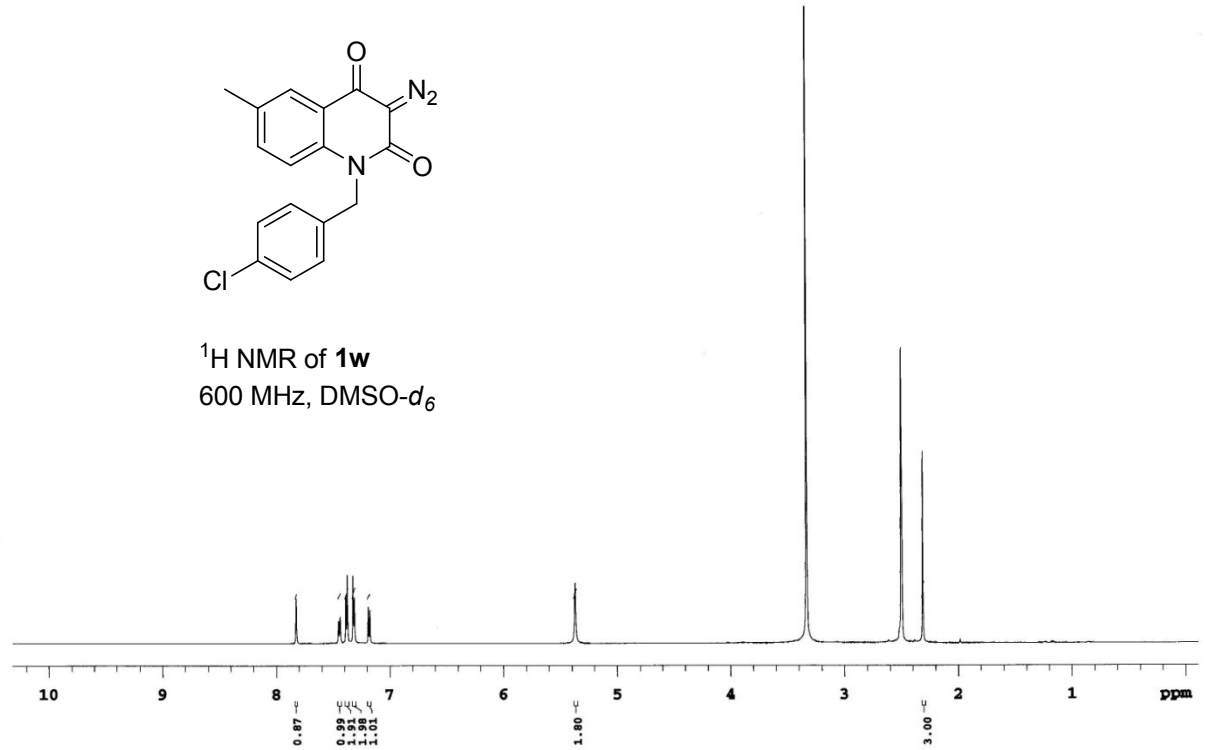


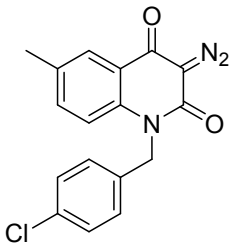


^{13}C NMR of **1v**
150 MHz, DMSO-d_6

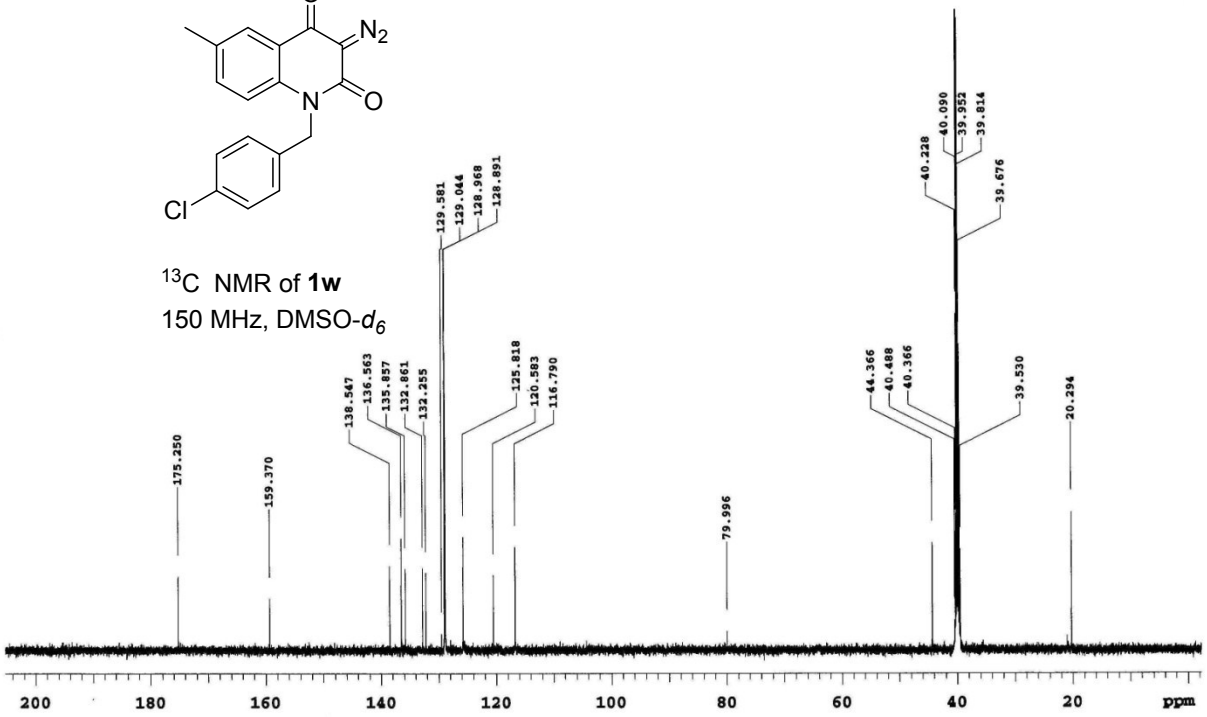


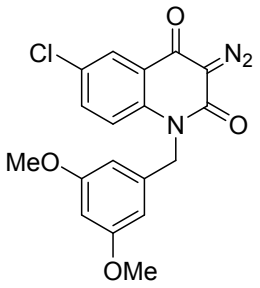
^{1}H NMR of **1w**
600 MHz, DMSO-d_6



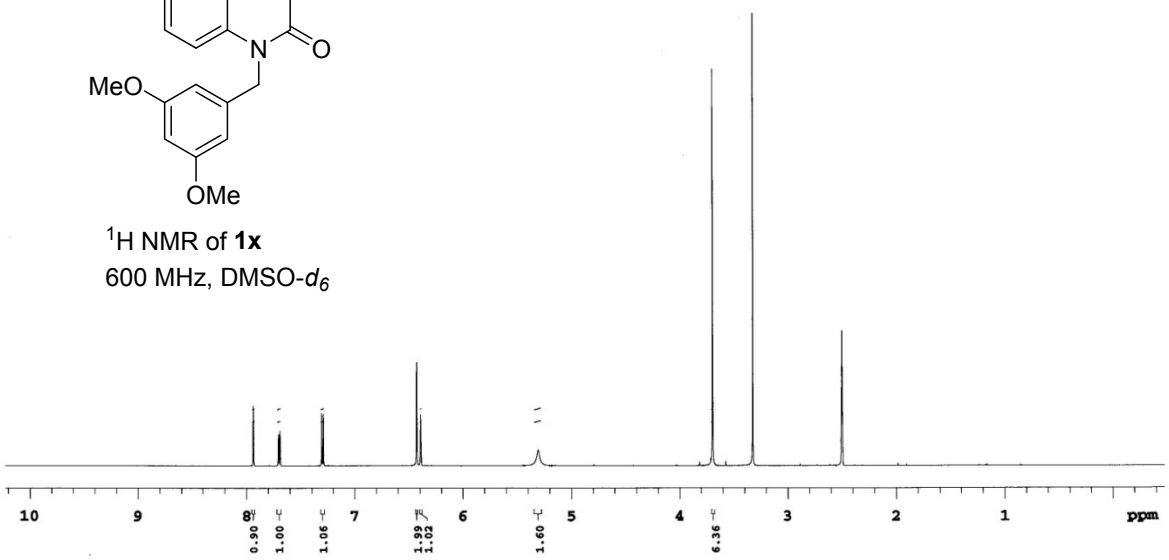


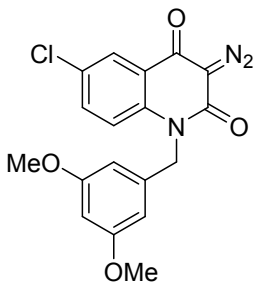
^{13}C NMR of **1w**
150 MHz, DMSO-d_6

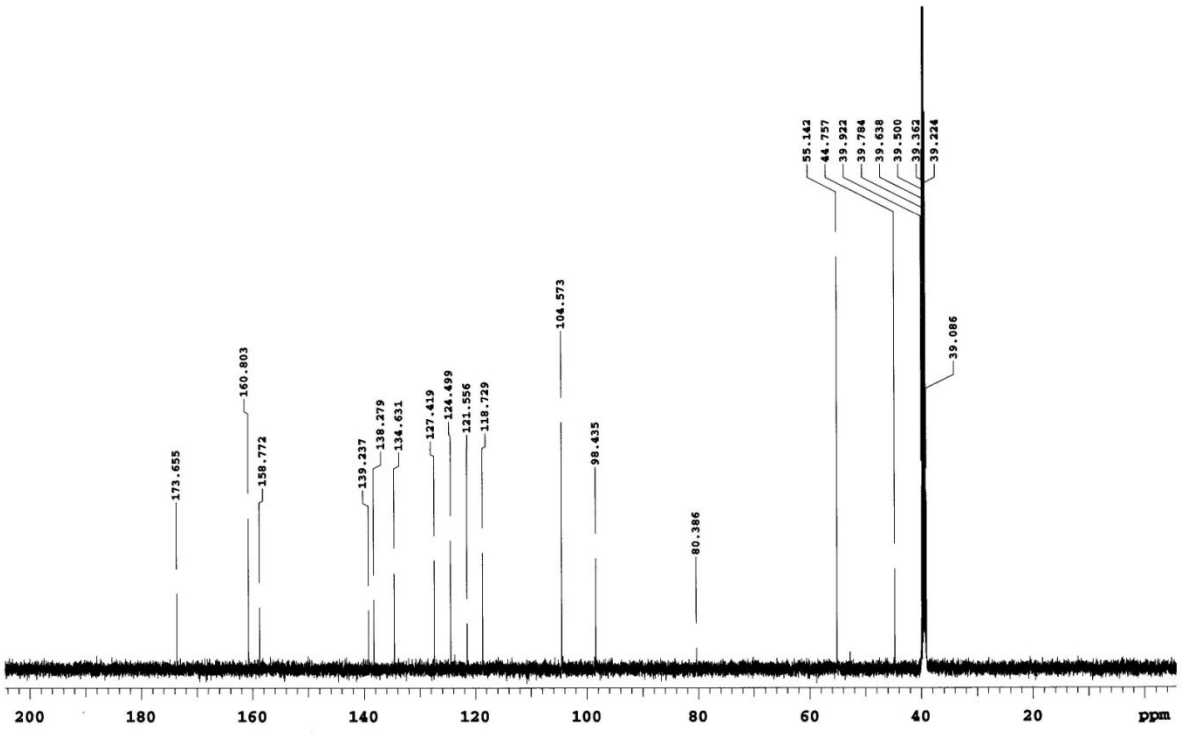




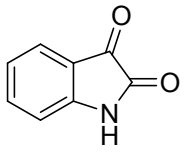
^{1}H NMR of **1x**
600 MHz, DMSO-d_6



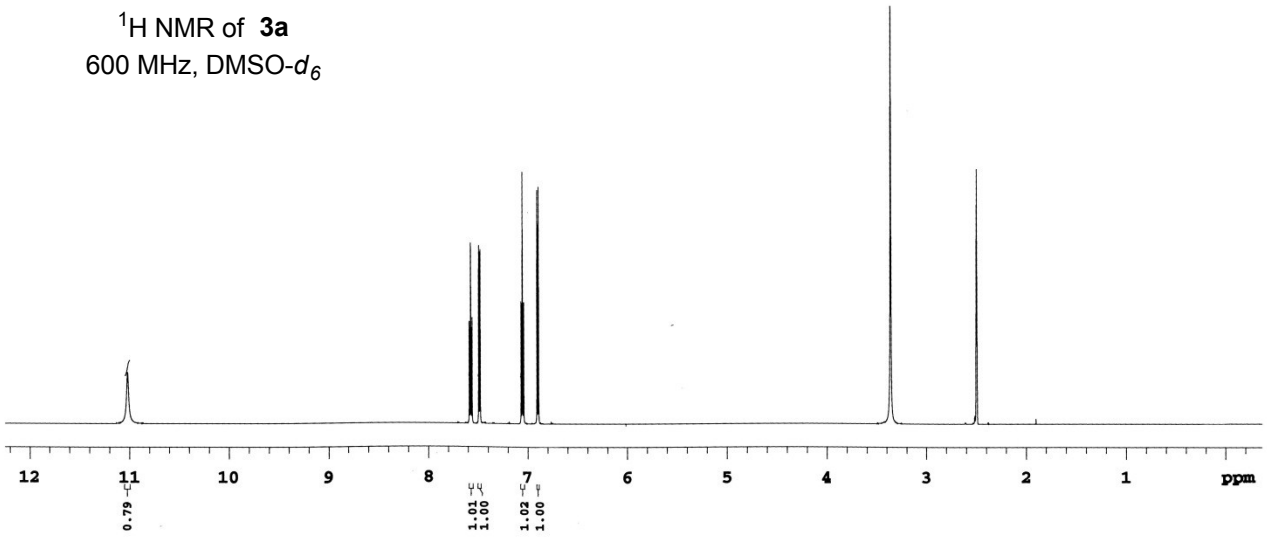


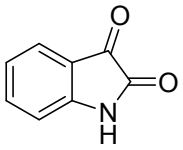


IV. ^{1}H and ^{13}C NMR Spectra of synthesized compounds 3a-x.

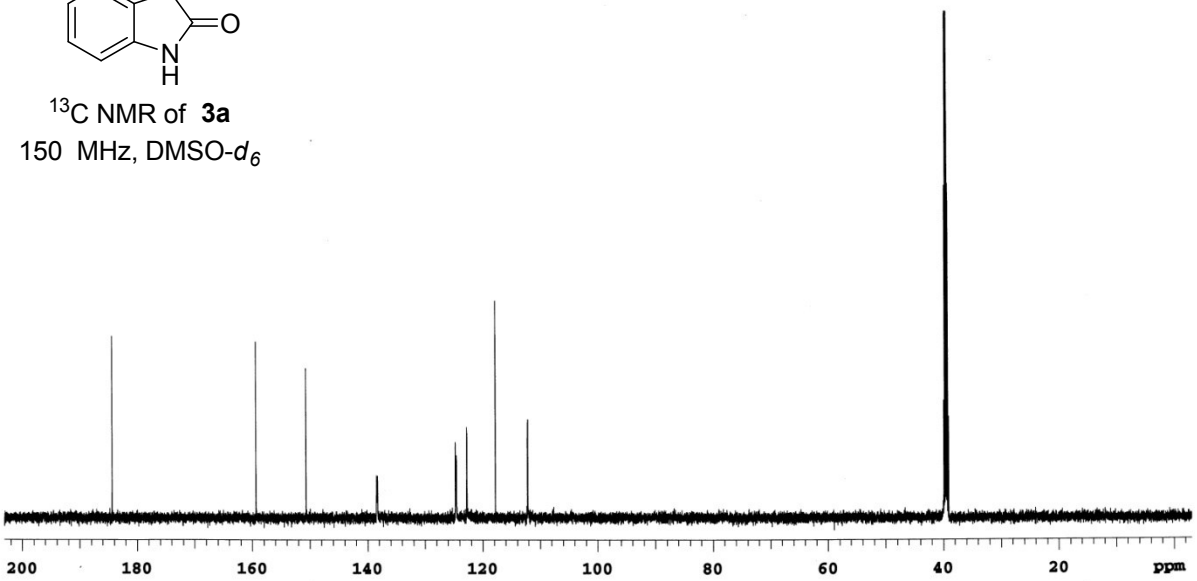


^{1}H NMR of **3a**
600 MHz, DMSO-d_6

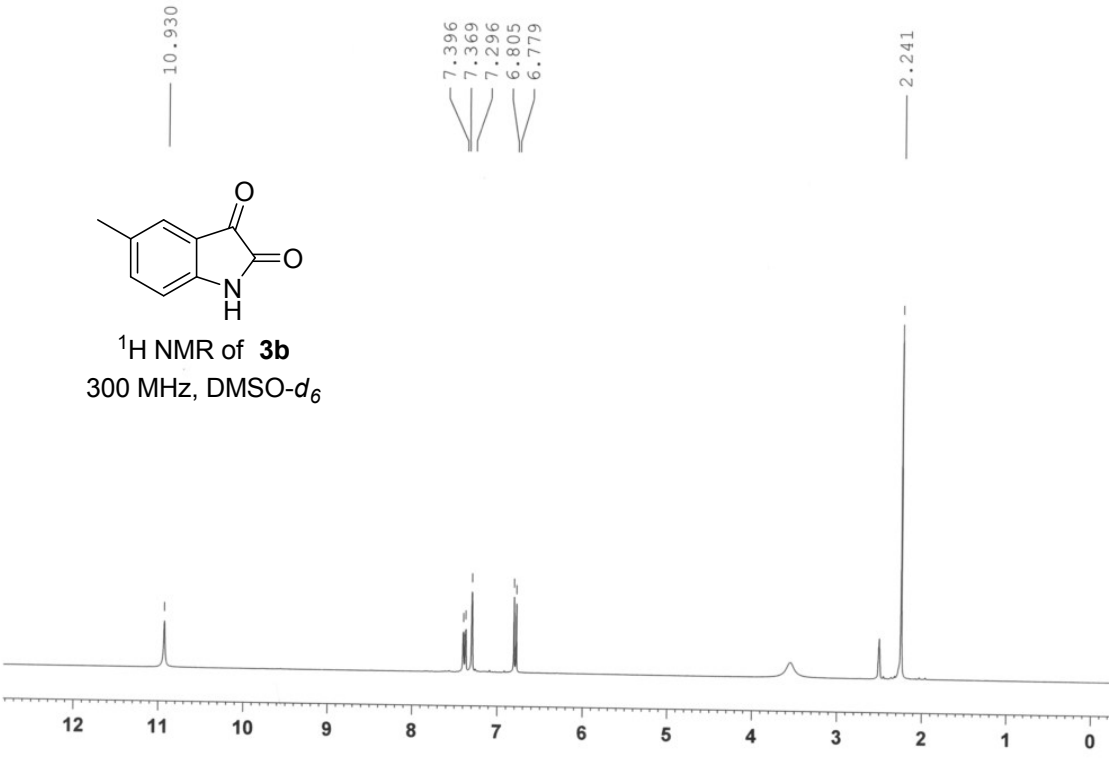


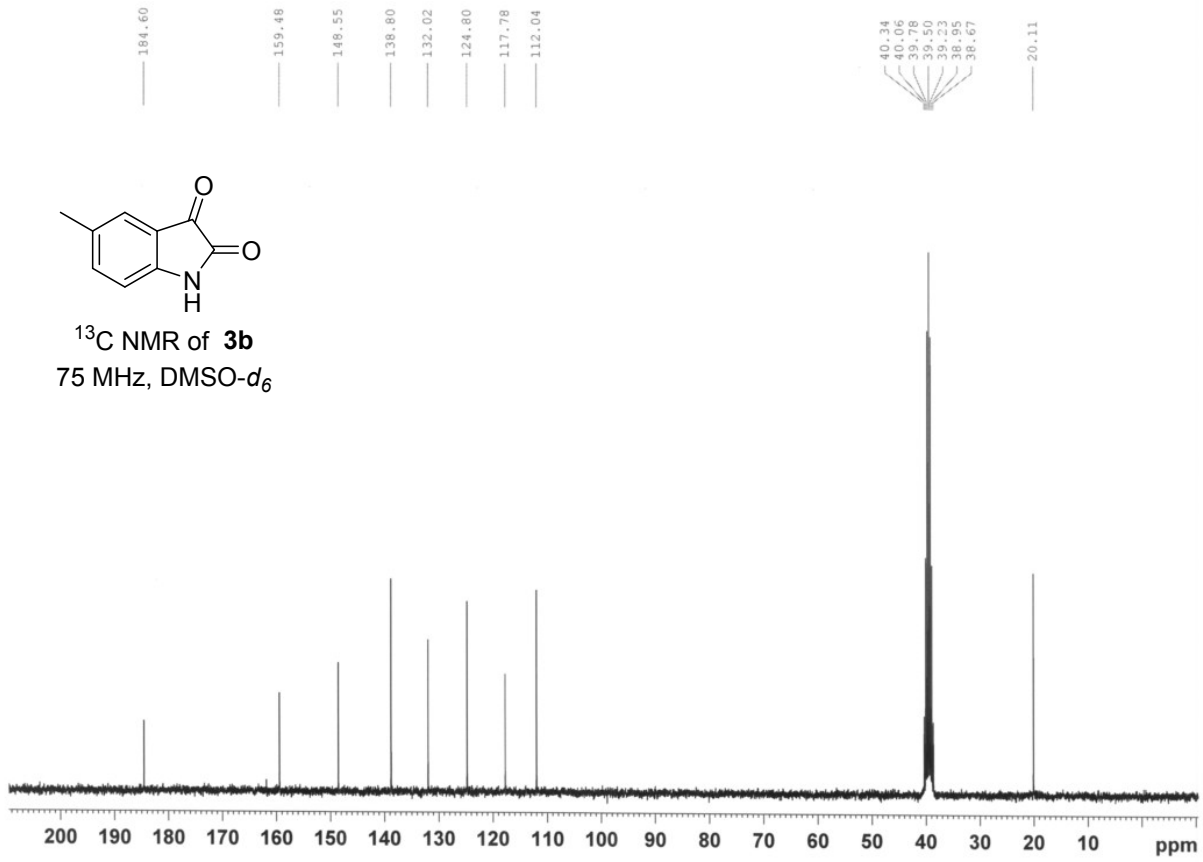


^{13}C NMR of **3a**
150 MHz, DMSO-d_6

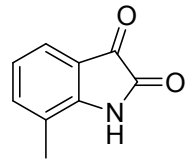


^{1}H NMR of **3b**
300 MHz, DMSO-d_6

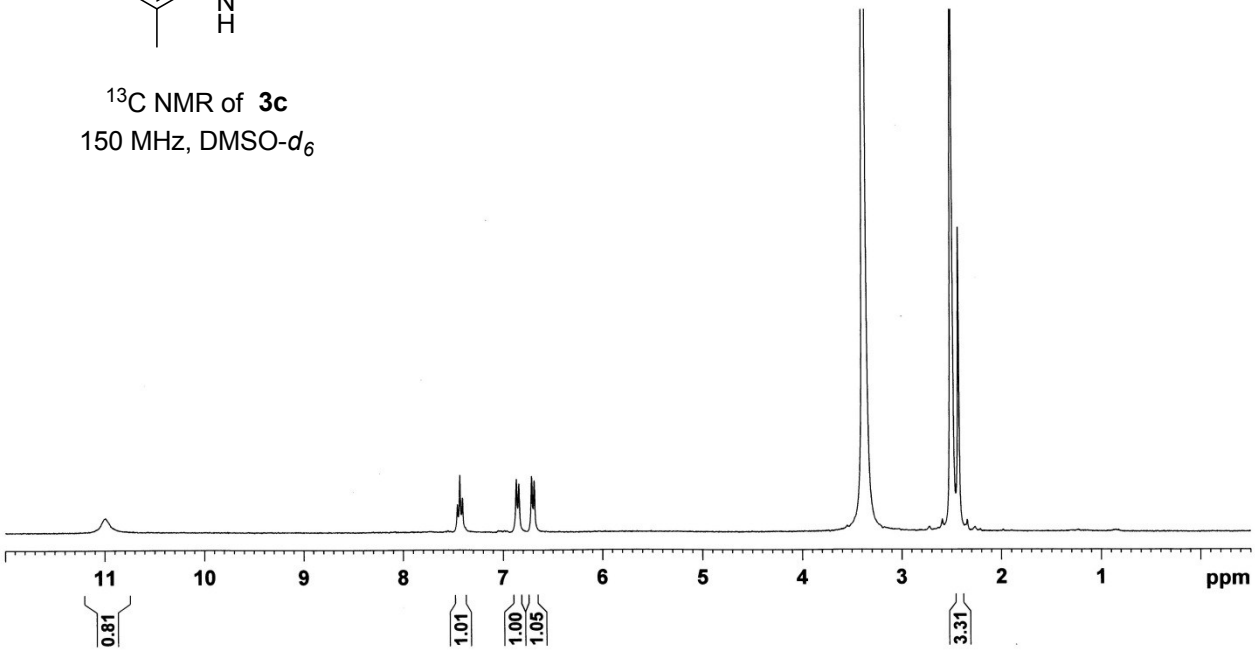


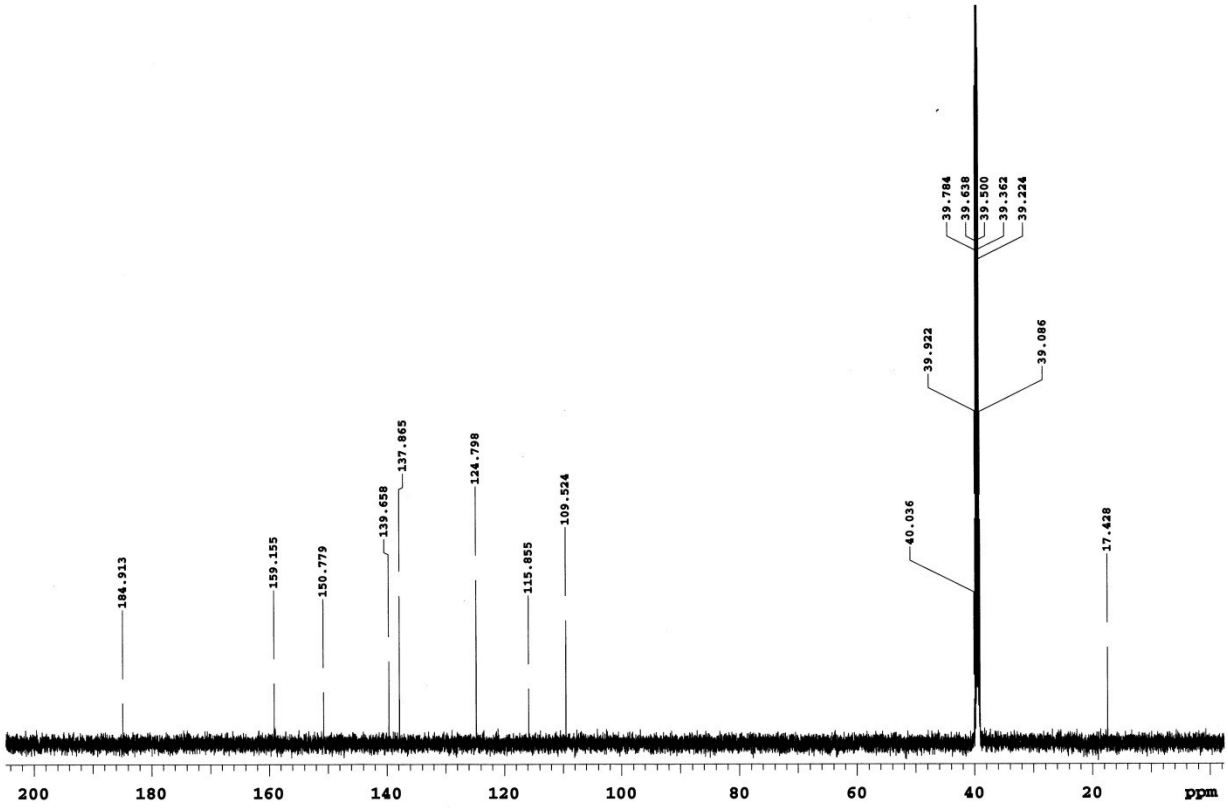


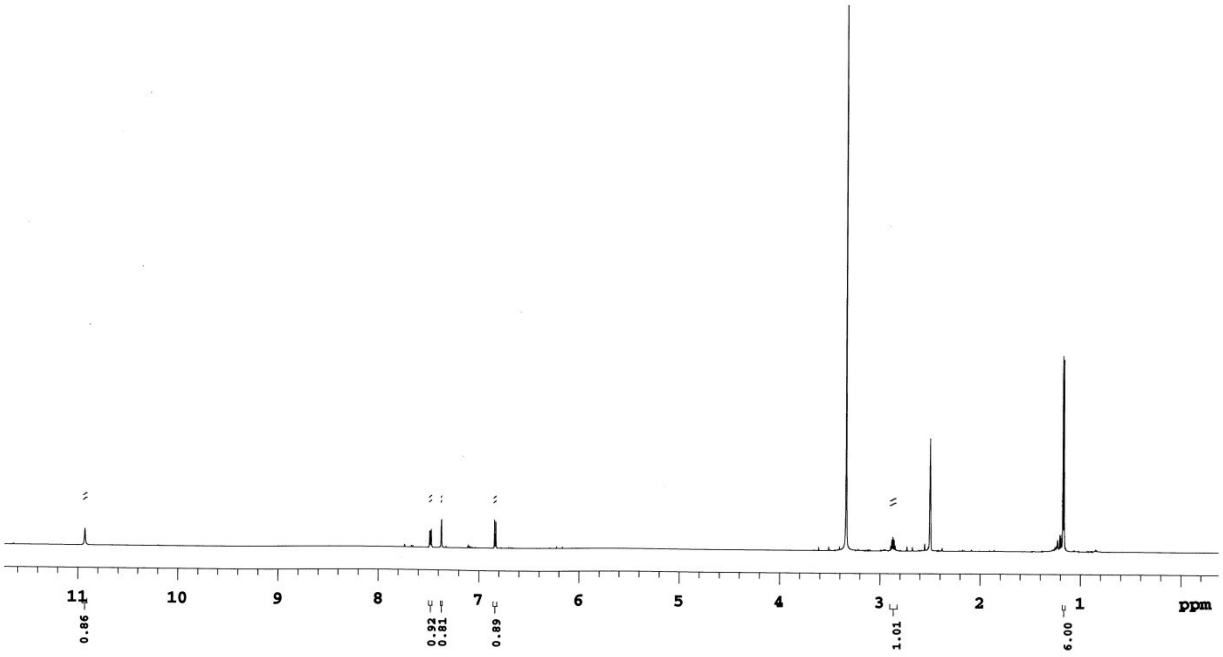
^{13}C NMR of **3b**
75 MHz, DMSO-d_6



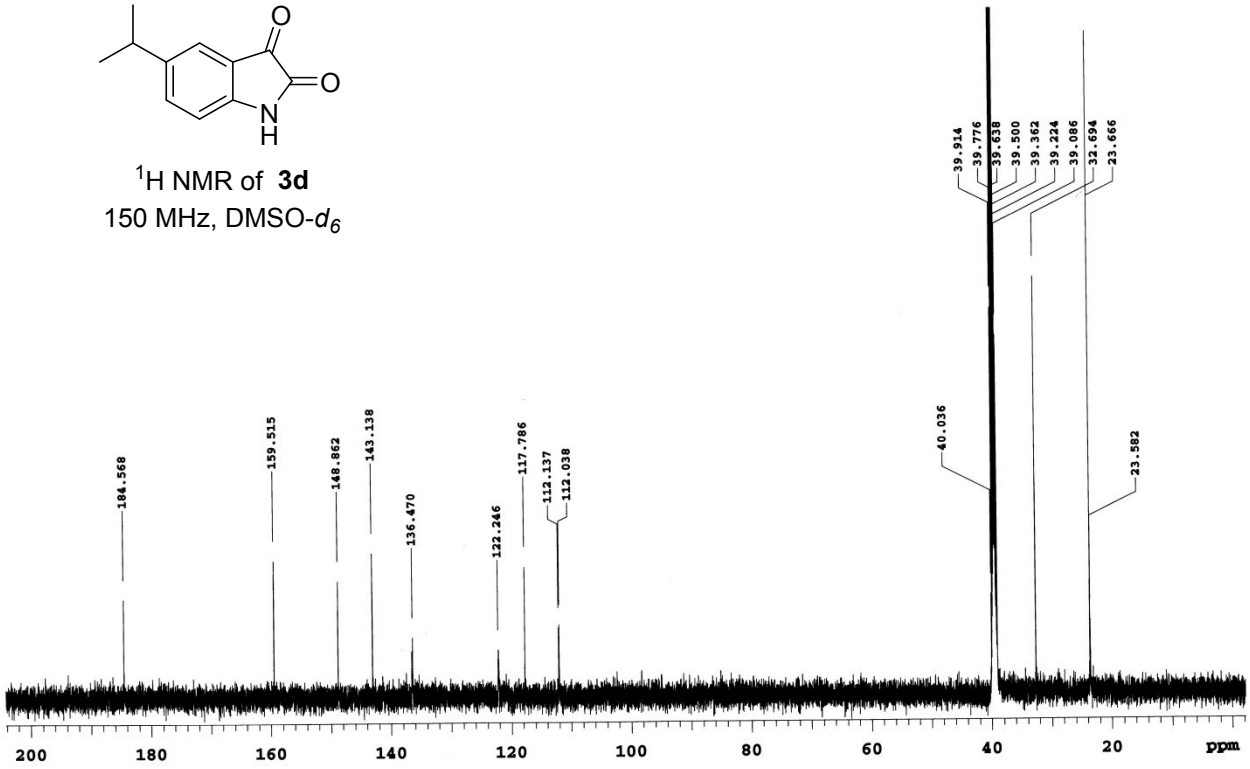
^{13}C NMR of **3c**
150 MHz, DMSO-d_6

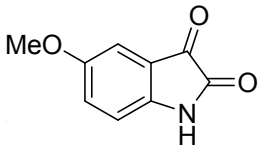




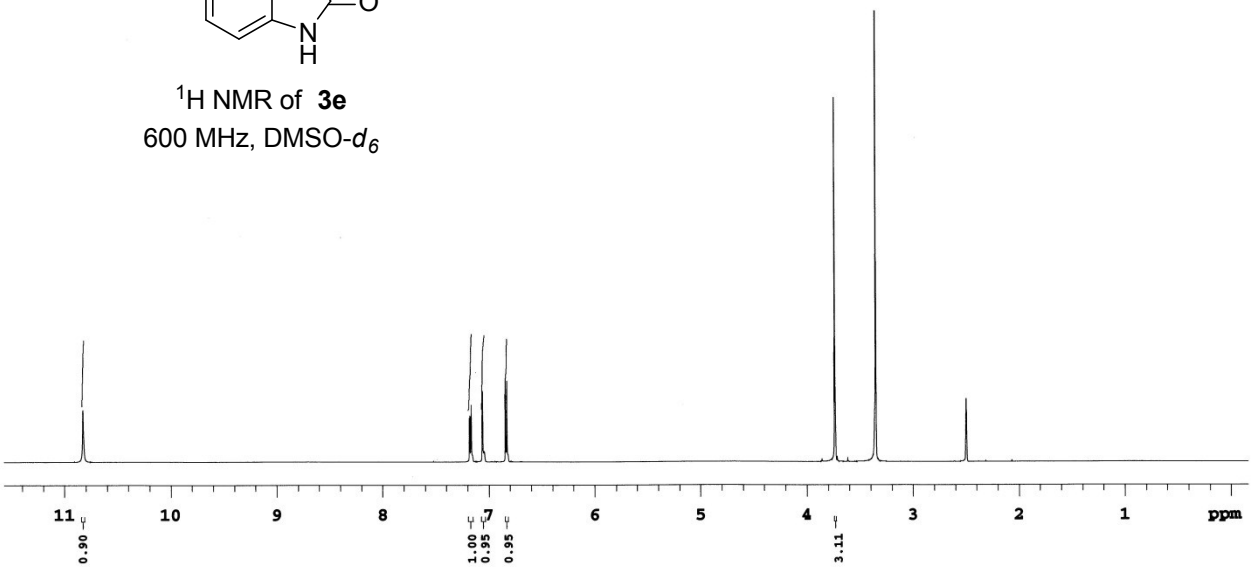


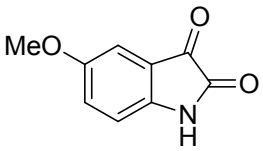
^{1}H NMR of **3d**
150 MHz, DMSO-d_6



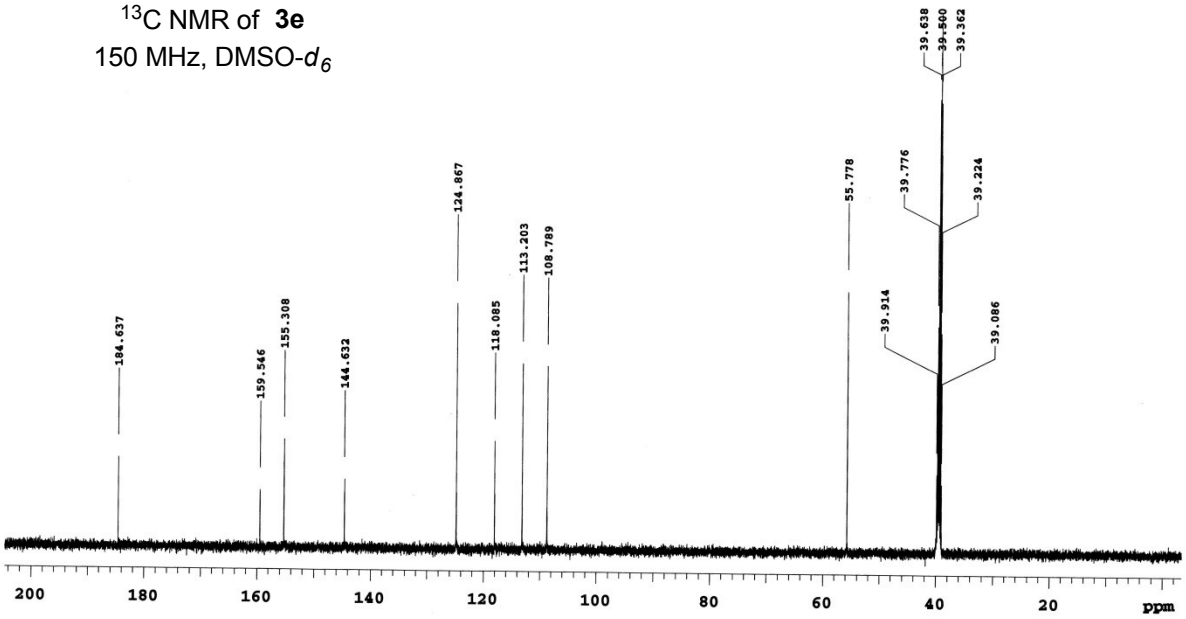


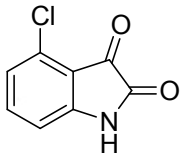
^{1}H NMR of **3e**
600 MHz, DMSO-d_6



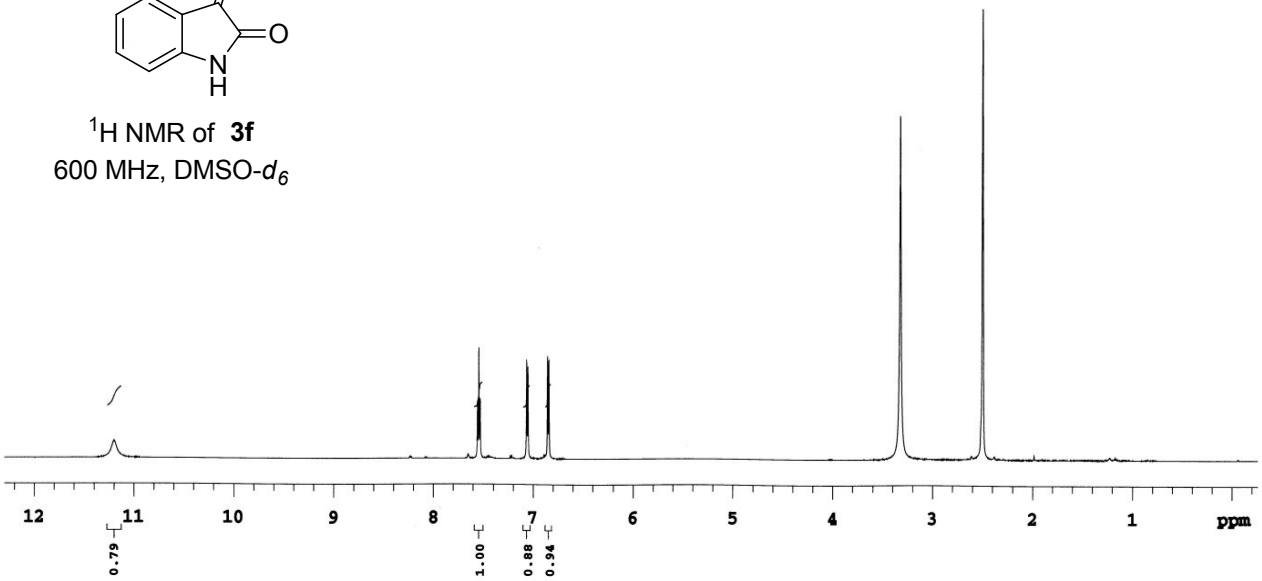


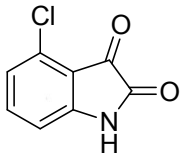
^{13}C NMR of **3e**
150 MHz, DMSO-d_6



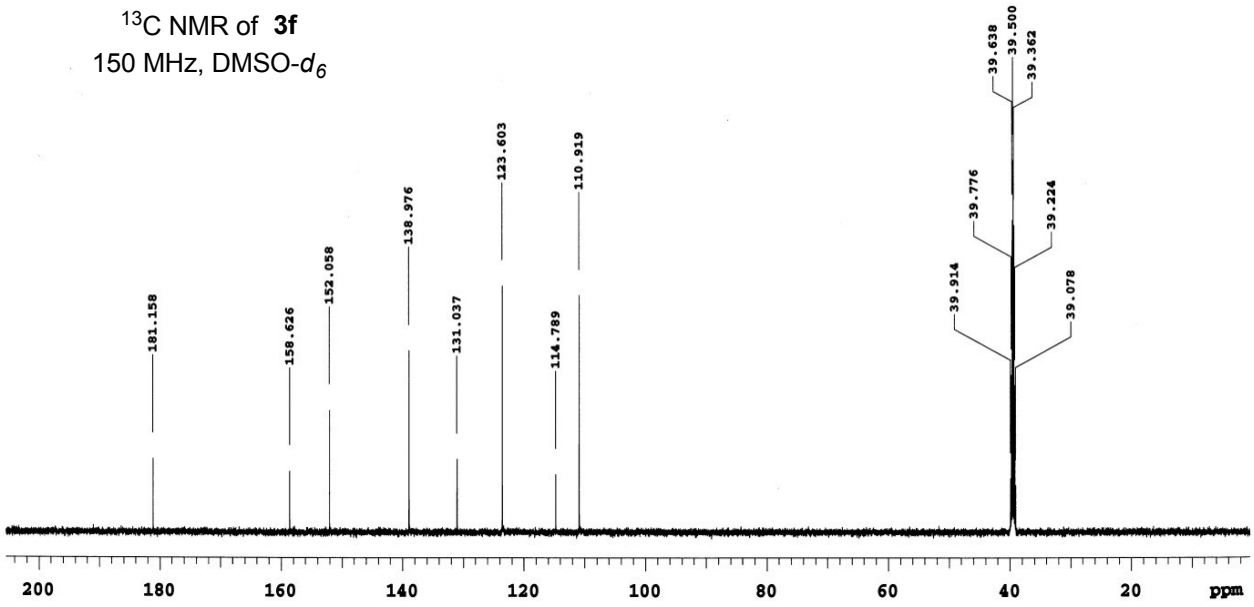


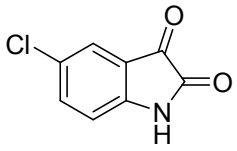
^{1}H NMR of **3f**
600 MHz, DMSO-d_6



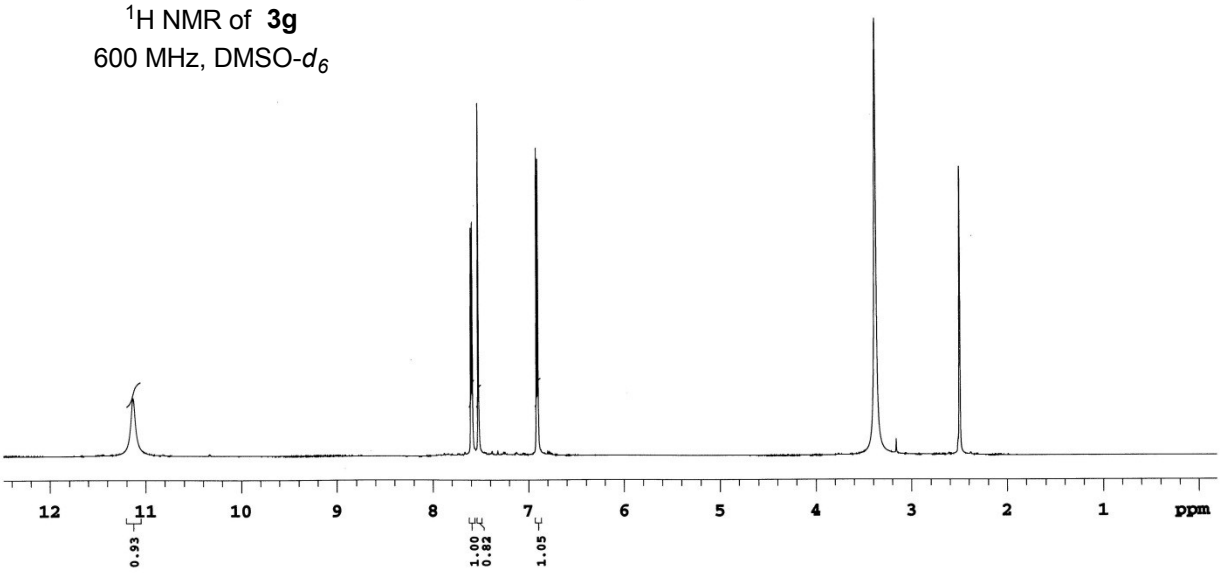


^{13}C NMR of **3f**
150 MHz, DMSO-d_6

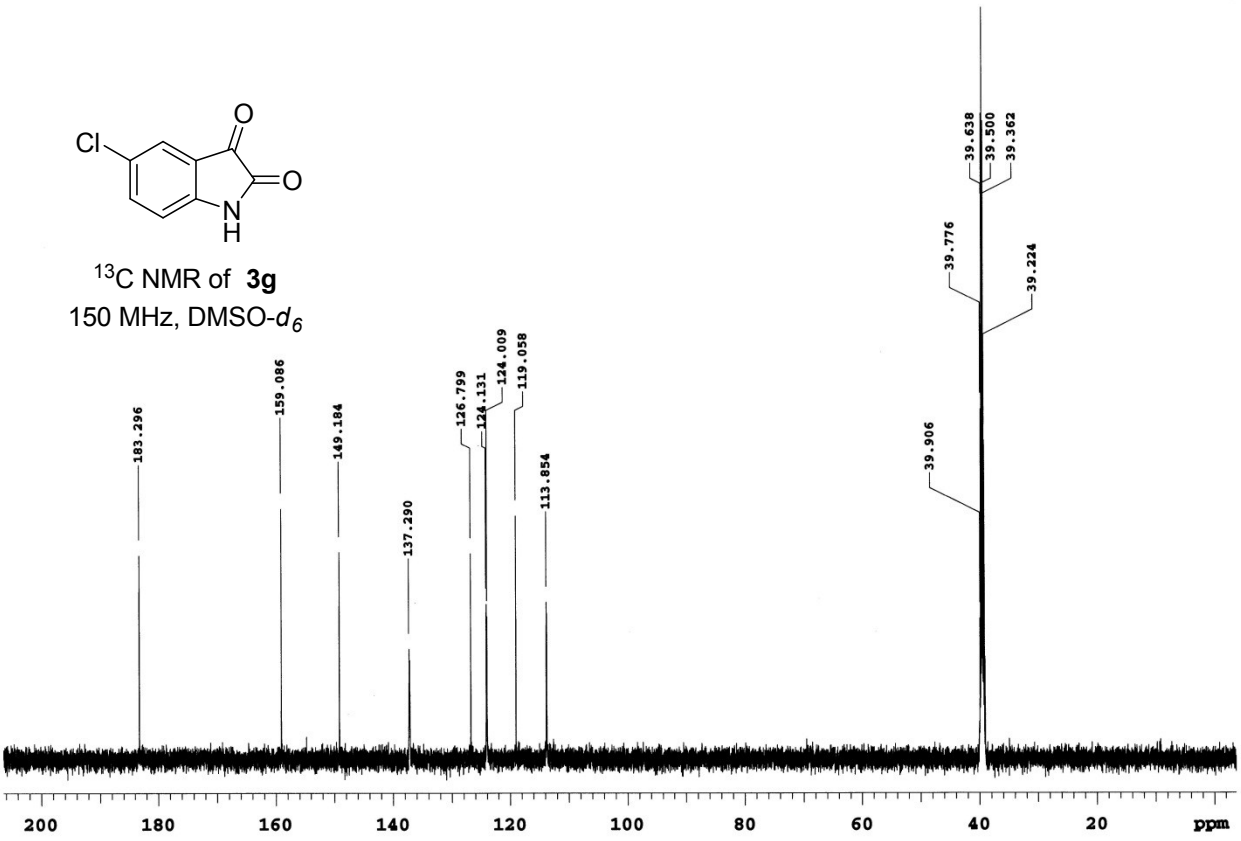


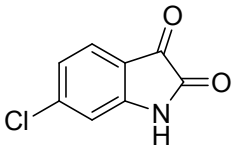


^{1}H NMR of **3g**
600 MHz, DMSO-d_6

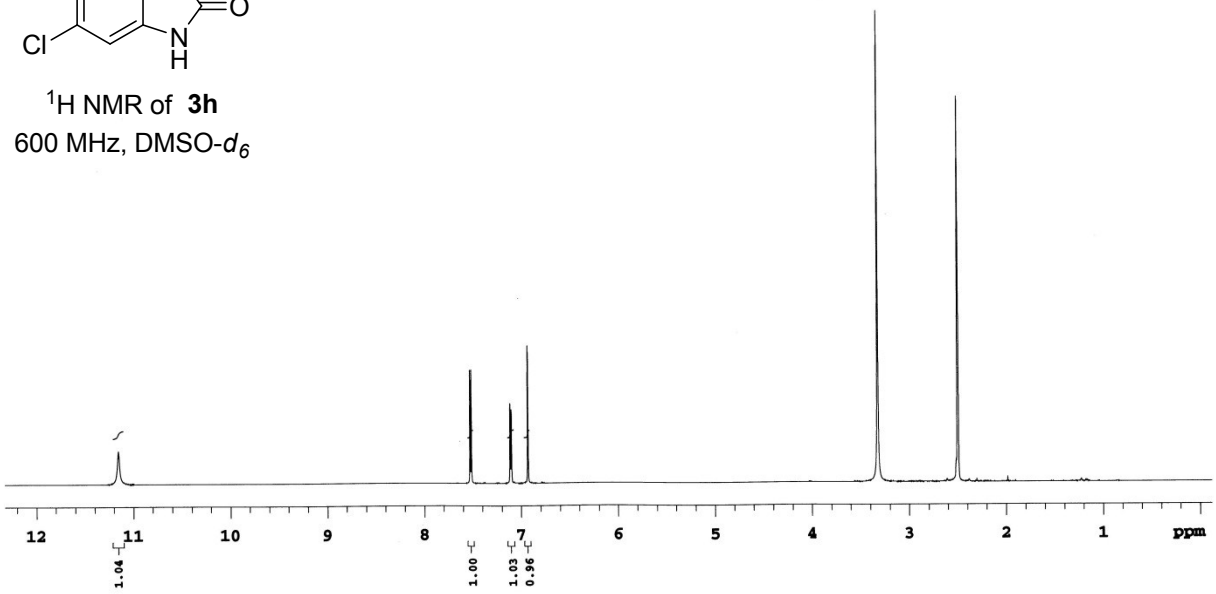


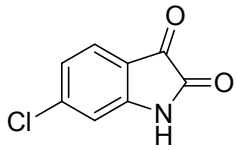
^{13}C NMR of **3g**
150 MHz, DMSO-d_6



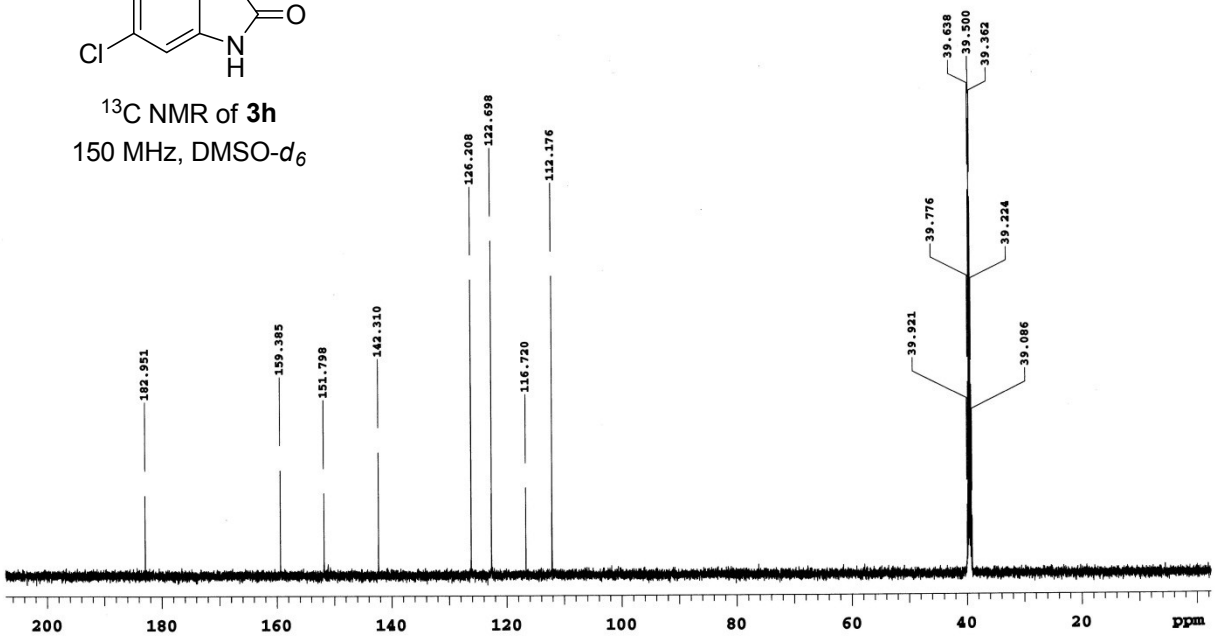


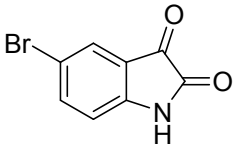
^{1}H NMR of **3h**
600 MHz, DMSO-d_6



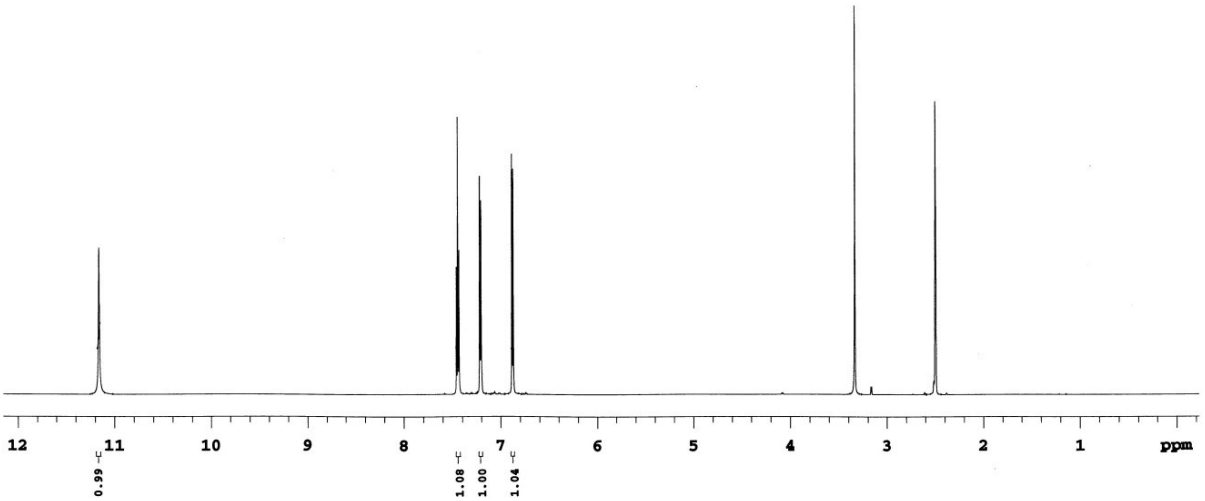


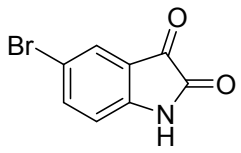
^{13}C NMR of **3h**
150 MHz, DMSO-d_6



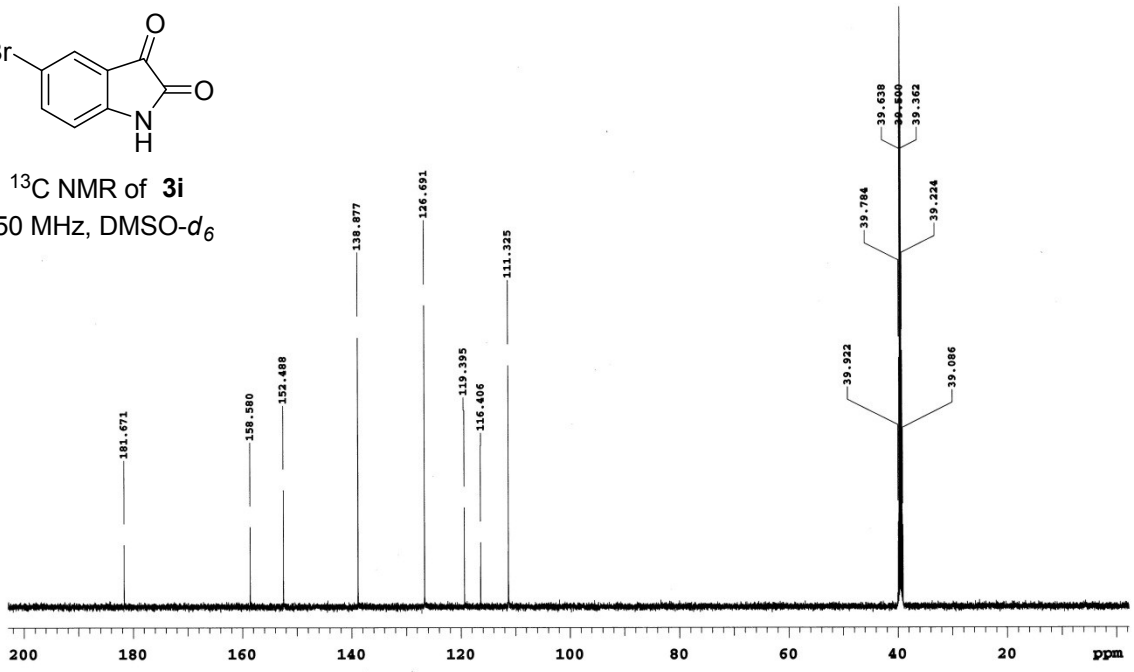


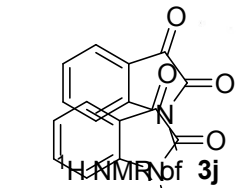
^{1}H NMR of **3i**





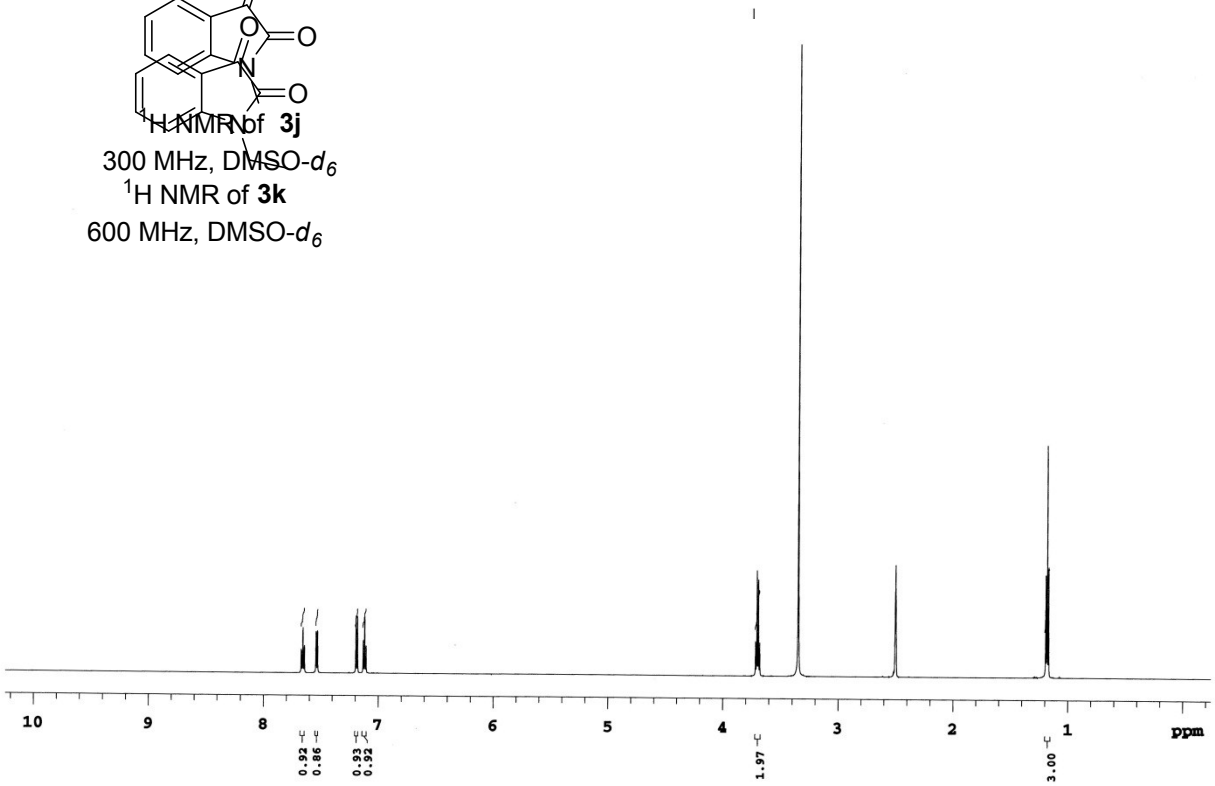
^{13}C NMR of **3i**
150 MHz, DMSO-d_6





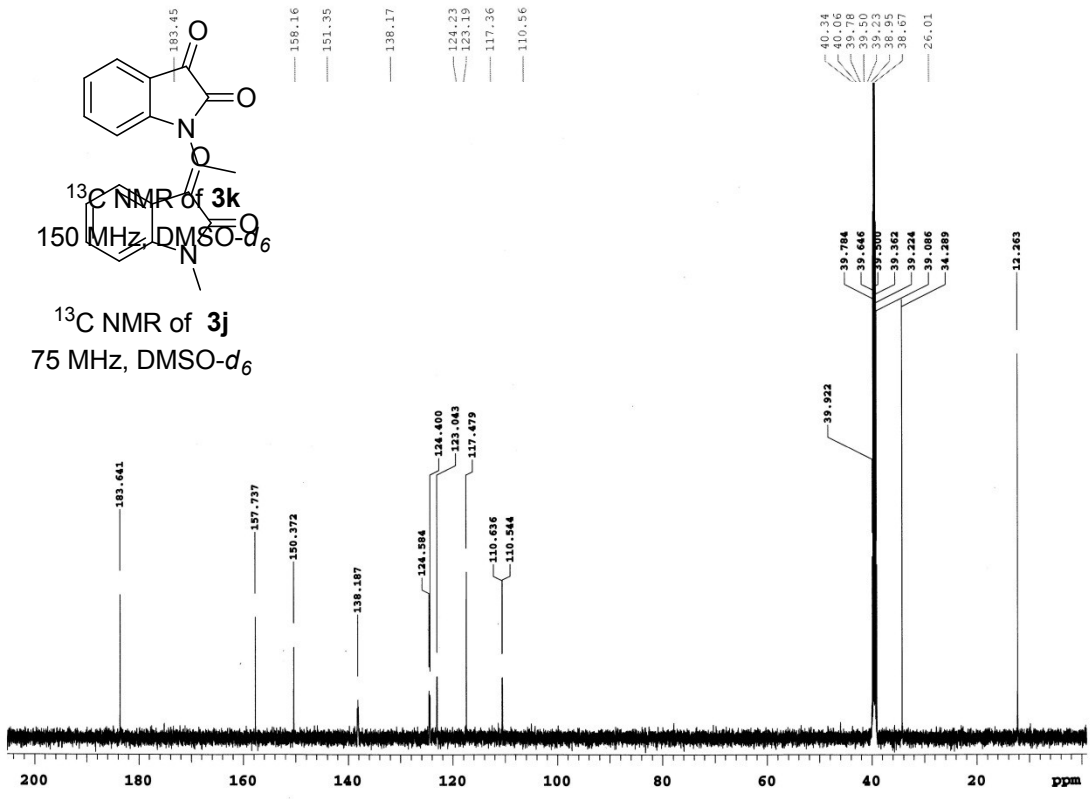
^{1}H NMR of **3j**
300 MHz, DMSO-d_6

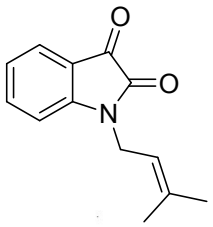
^{1}H NMR of **3k**
600 MHz, DMSO-d_6



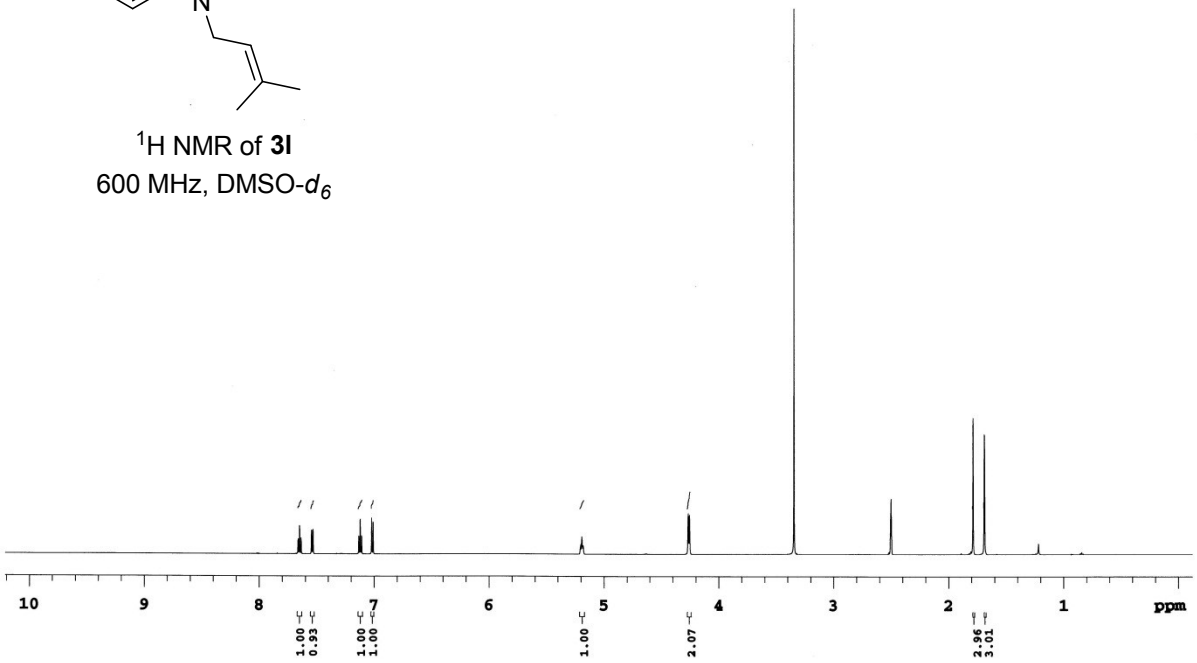
^{13}C NMR of **3k**
150 MHz, DMSO-d_6

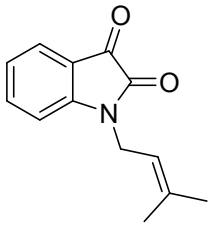
^{13}C NMR of **3j**
75 MHz, DMSO-d_6



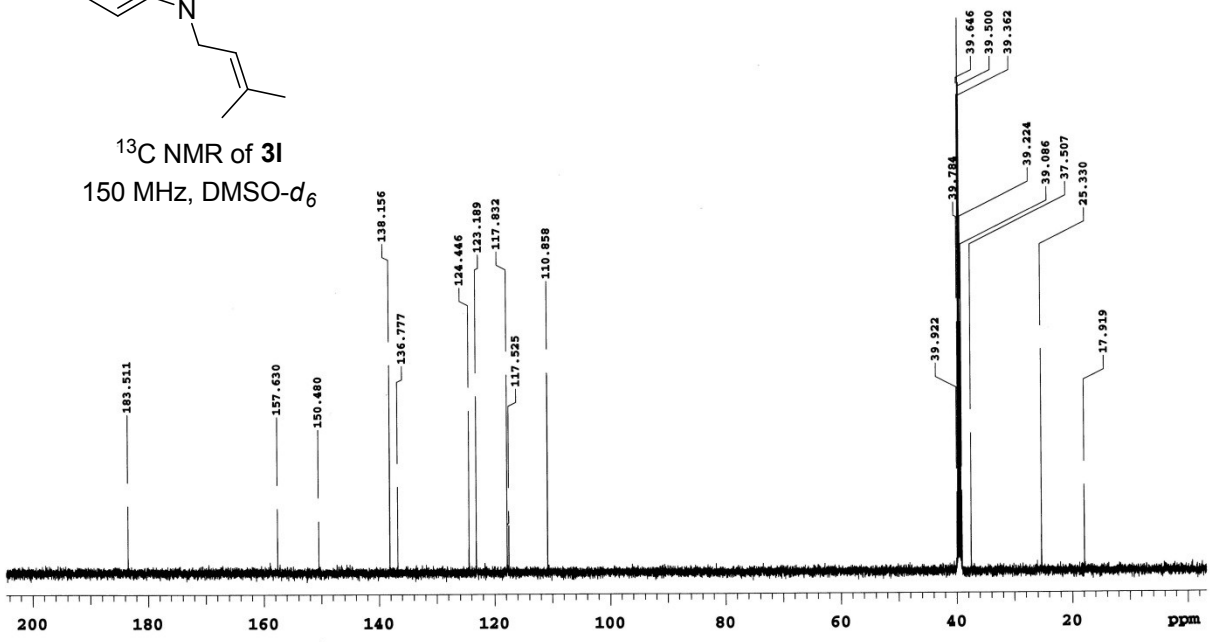


^{1}H NMR of **3l**
600 MHz, DMSO-d_6

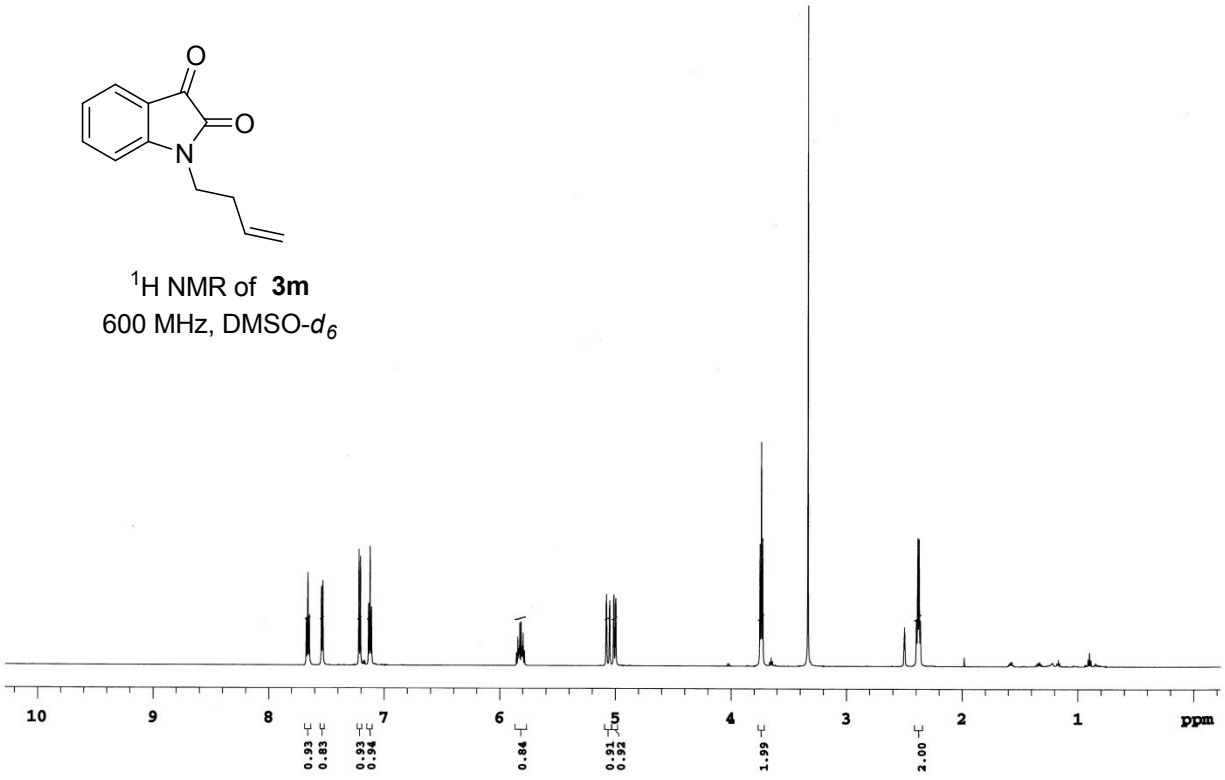




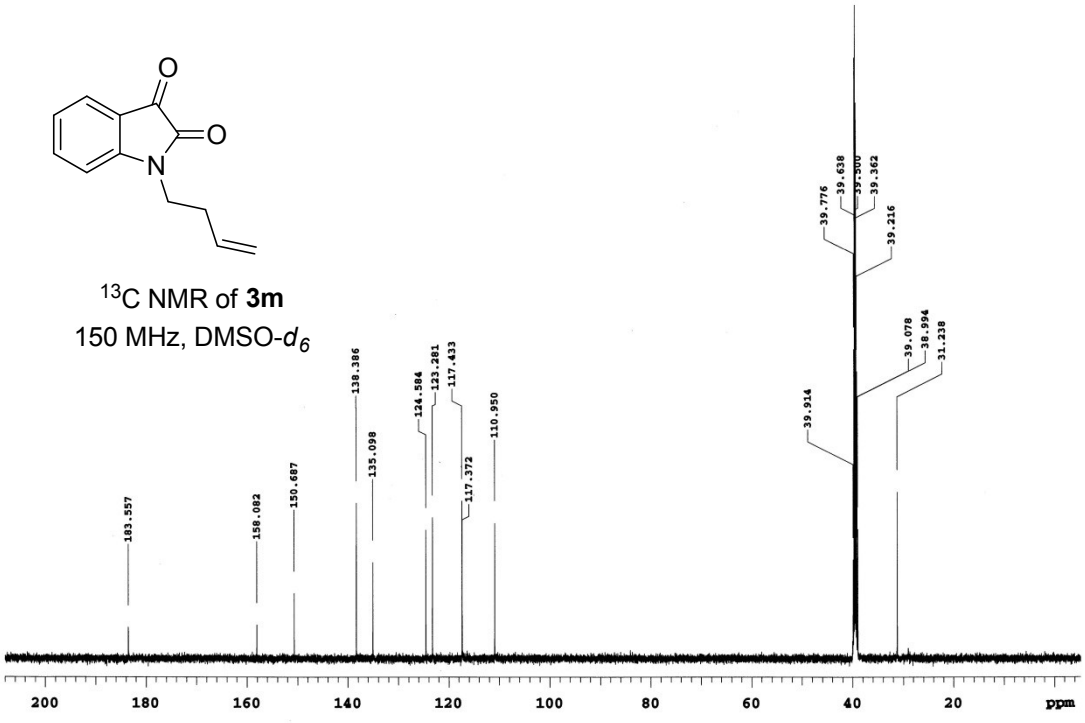
^{13}C NMR of **3l**
150 MHz, DMSO-d_6

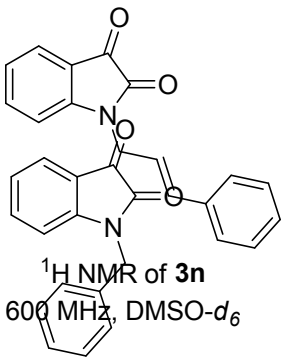


^{1}H NMR of **3m**
600 MHz, DMSO-d_6



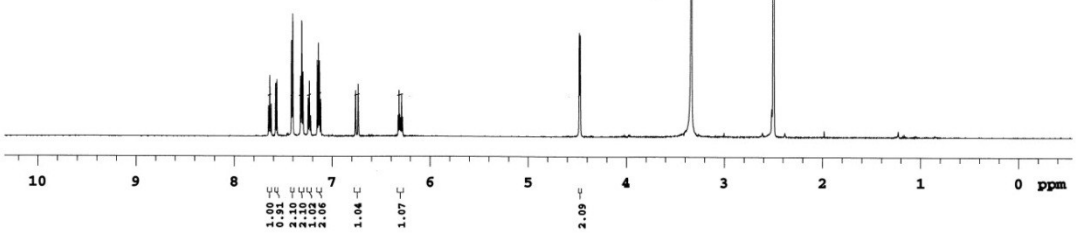
^{13}C NMR of **3m**
150 MHz, DMSO-d_6



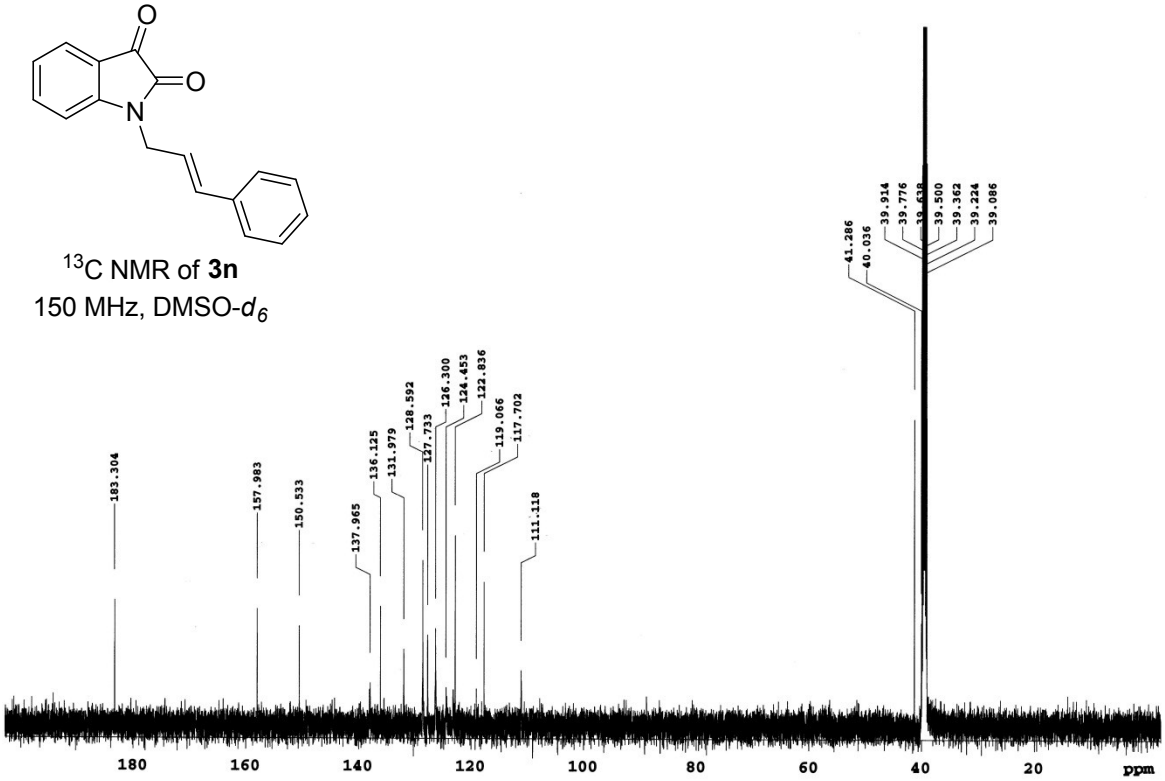


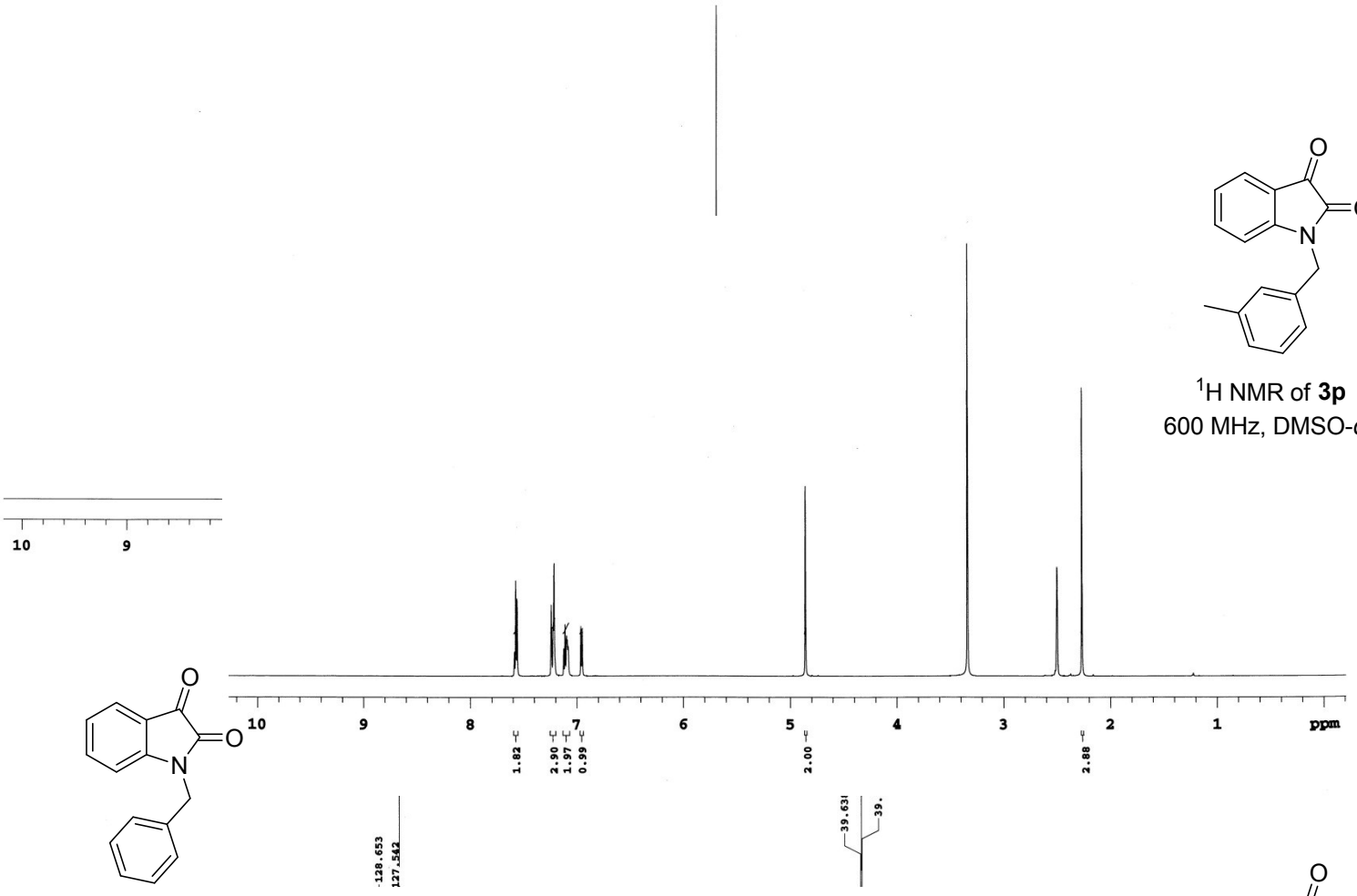
^{1}H NMR of **3n**
600 MHz, DMSO-d_6

^{1}H NMR of **3o**
600 MHz, DMSO-d_6

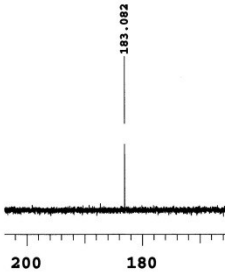


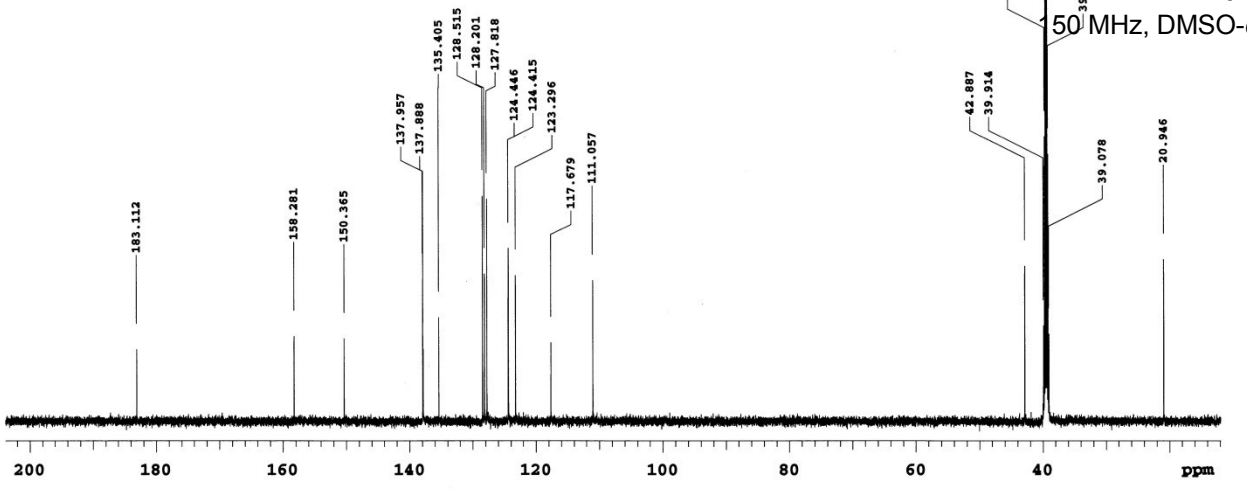
^{13}C NMR of **3n**
150 MHz, DMSO-d_6

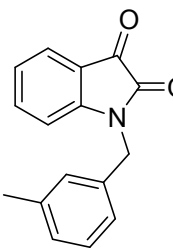




^{1}H NMR of **3o**
600 MHz, DMSO-d_6





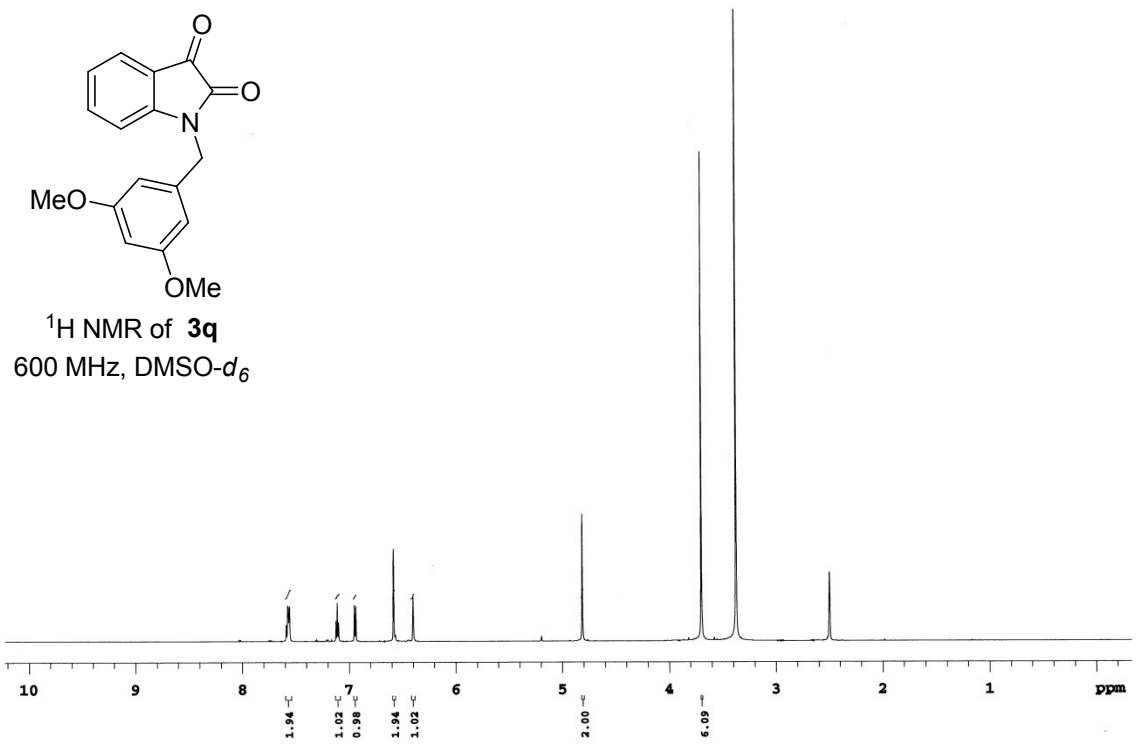


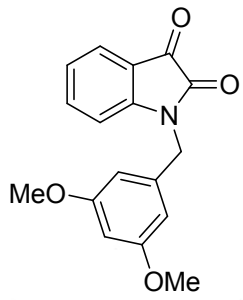
^{13}C NMR of **3o**
150 MHz, DMSO-d_6

^{1}H NMR of **3p**
600 MHz, DMSO-d

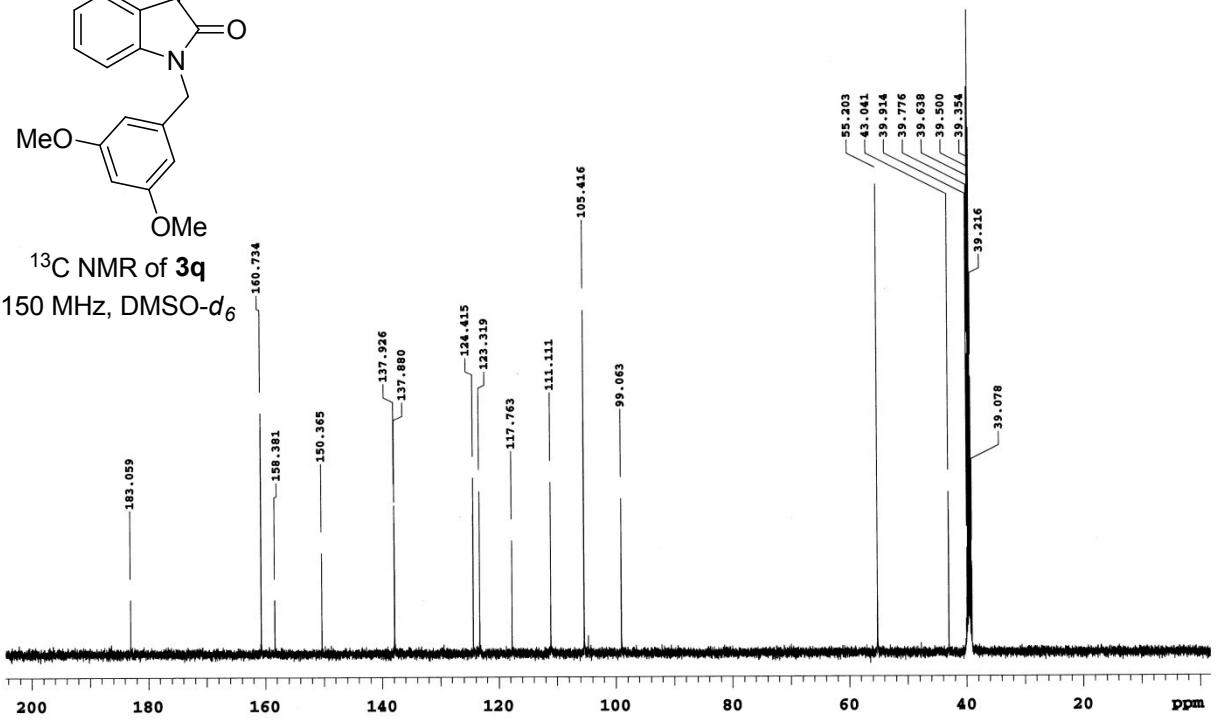
^{13}C NMR of **3p**
150 MHz, DMSO-d

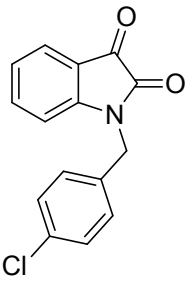
^{1}H NMR of **3q**
600 MHz, DMSO-d_6



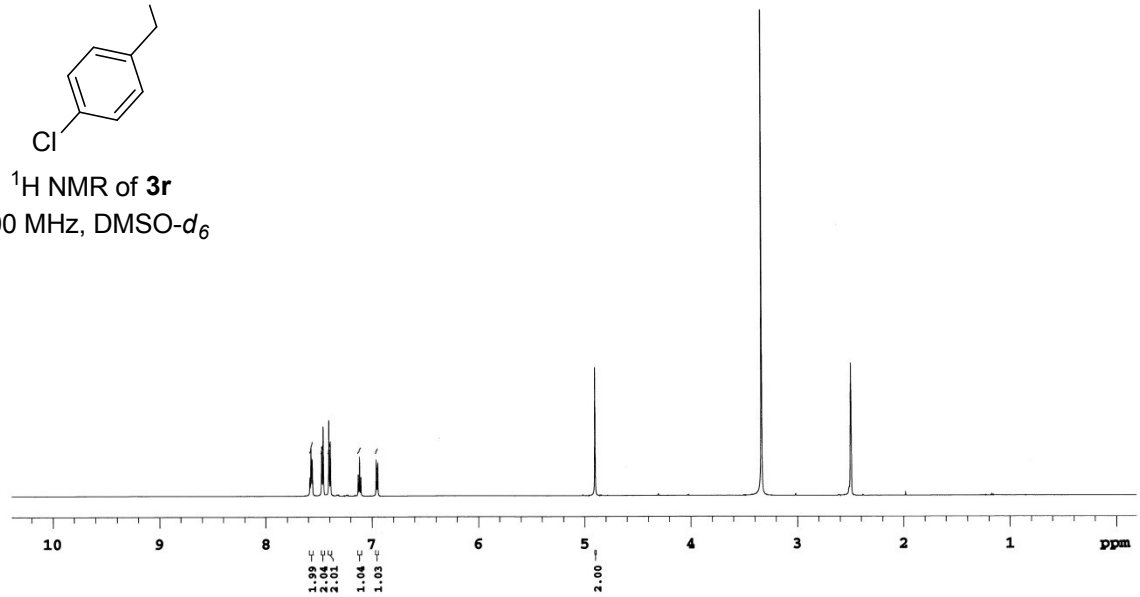


^{13}C NMR of **3q**
150 MHz, DMSO-d_6

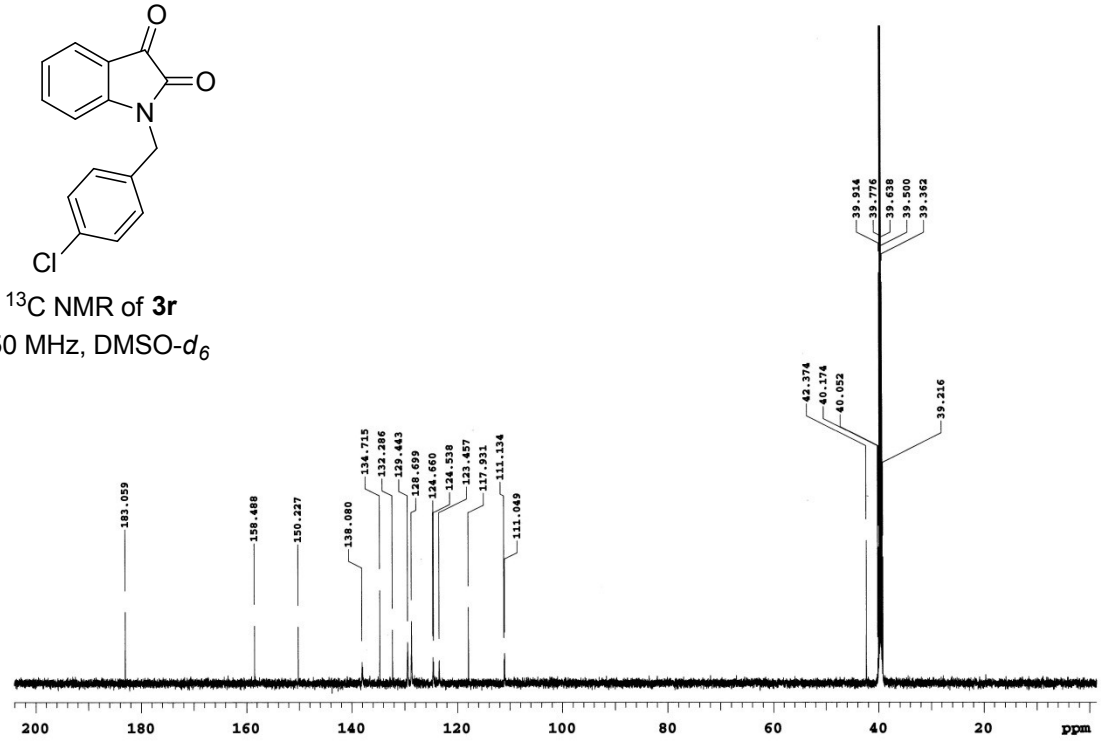


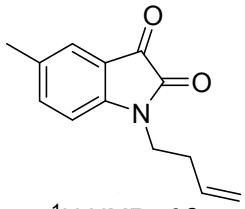


^{1}H NMR of **3r**
600 MHz, DMSO-d_6

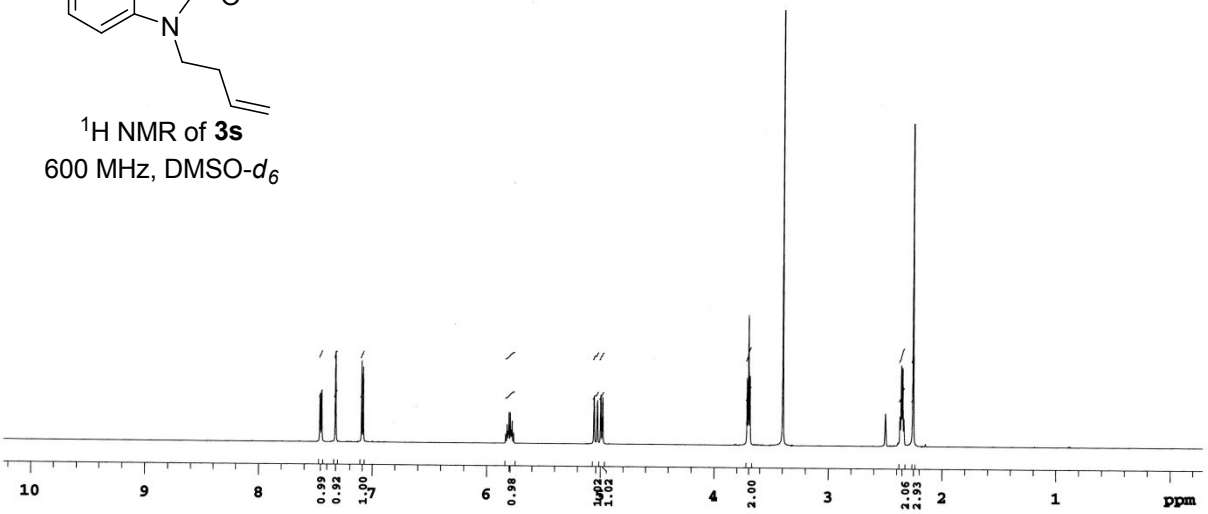


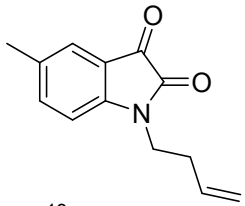
^{13}C NMR of **3r**
150 MHz, DMSO-d_6



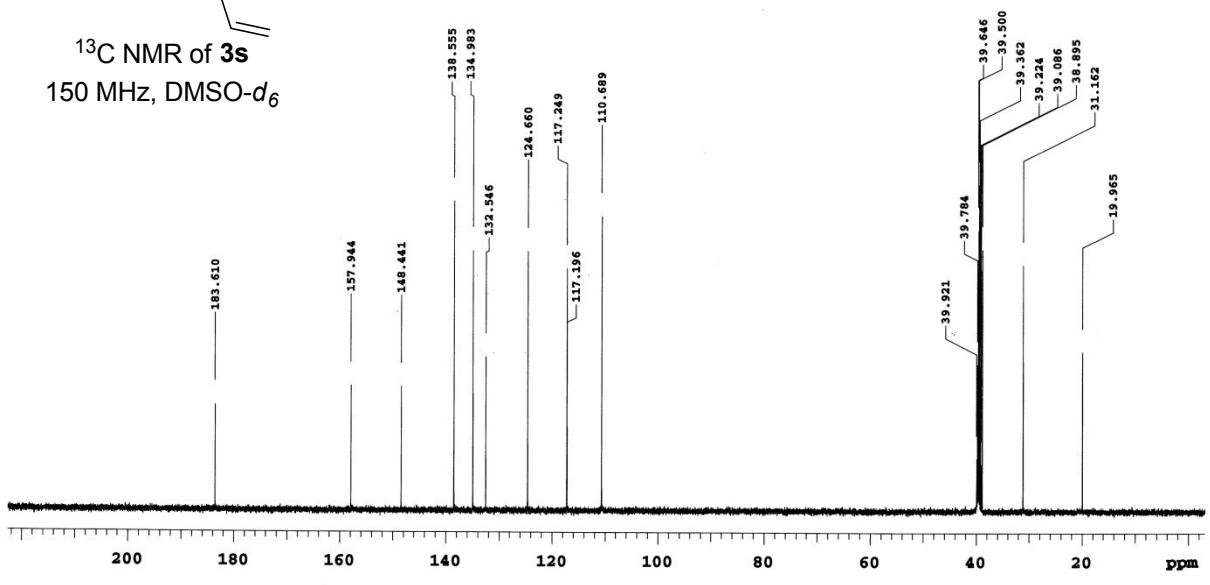


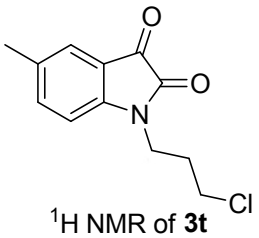
^{1}H NMR of **3s**
600 MHz, DMSO-d_6





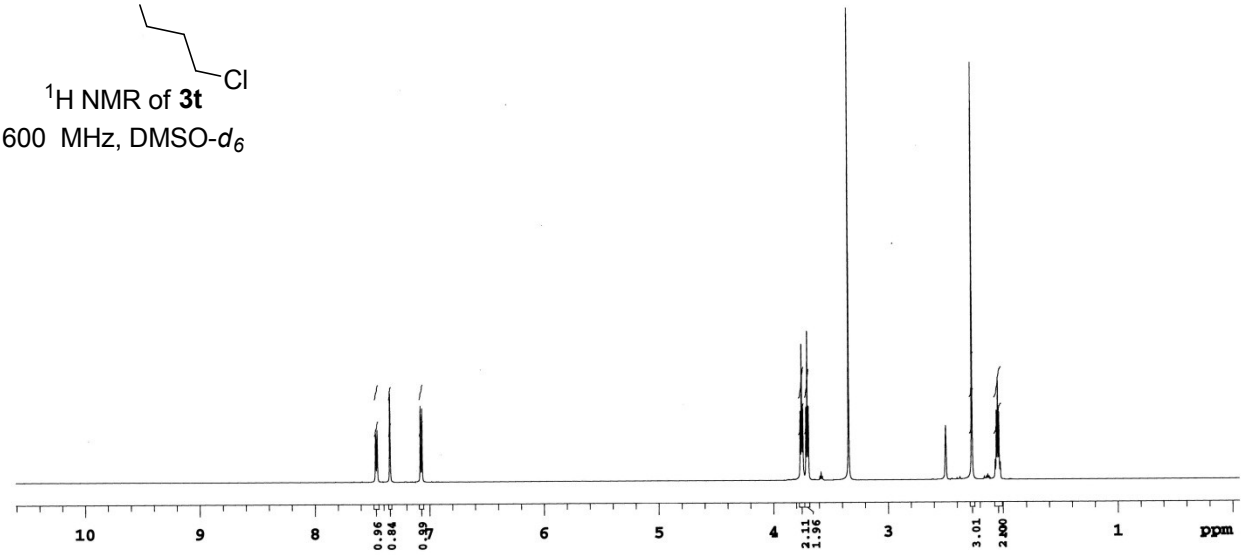
^{13}C NMR of **3s**
150 MHz, DMSO-d_6

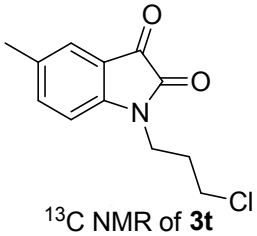




^{1}H NMR of **3t**

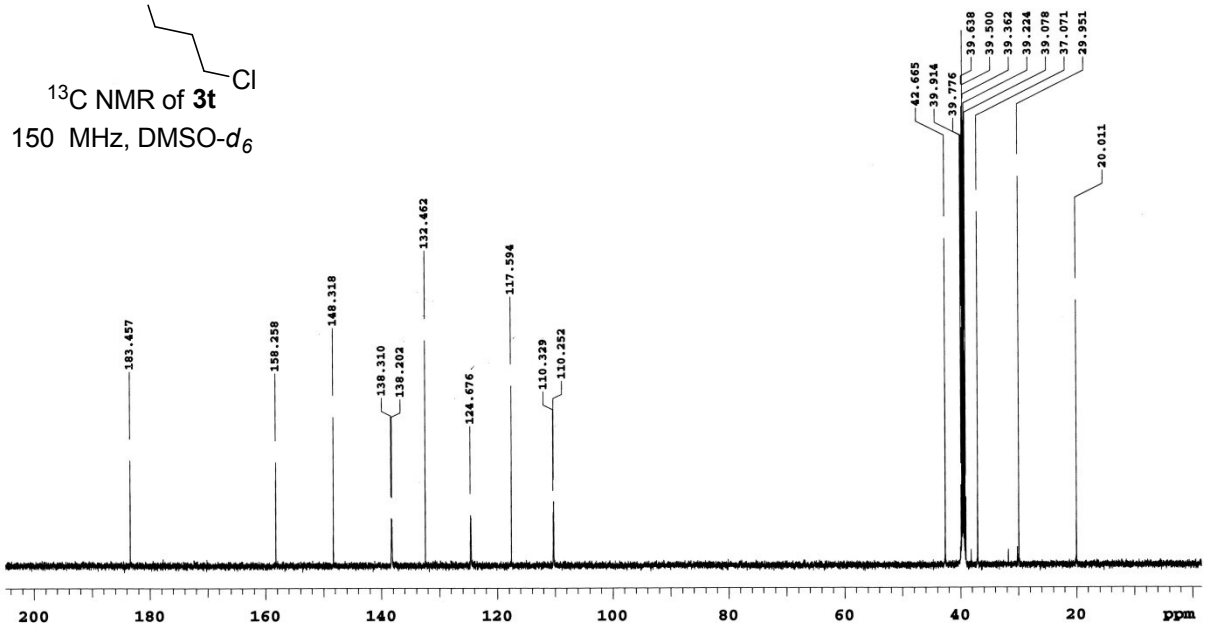
600 MHz, DMSO-d_6

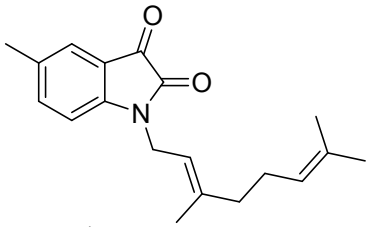




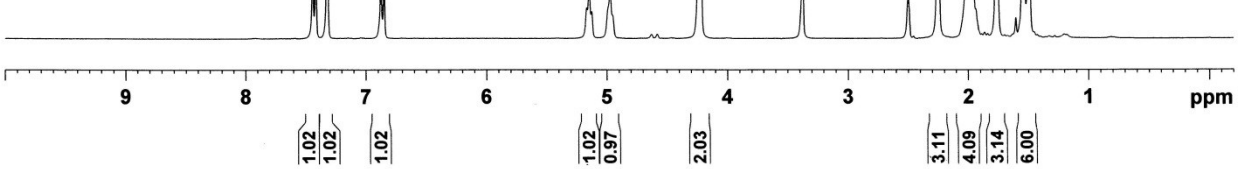
^{13}C NMR of **3t**

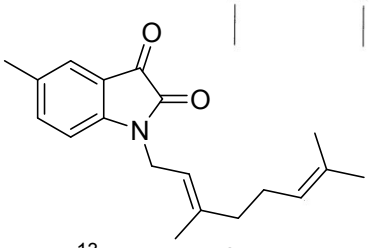
150 MHz, DMSO-d_6



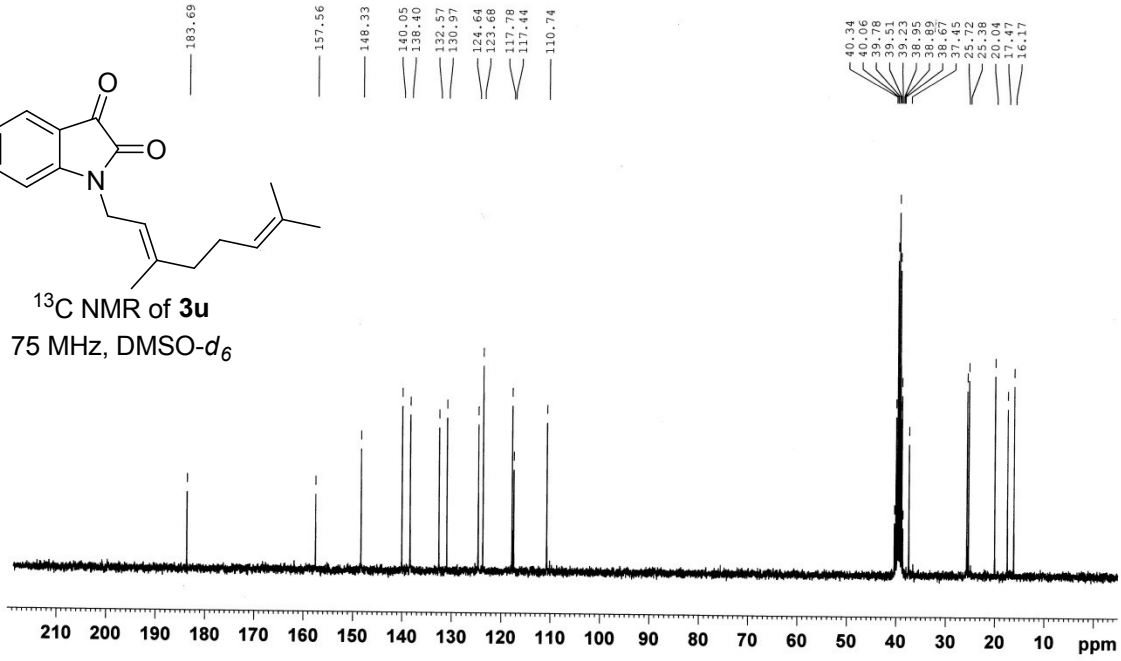


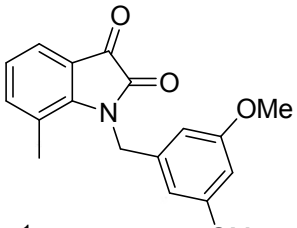
^{1}H NMR of **3u**
300 MHz, DMSO-d_6





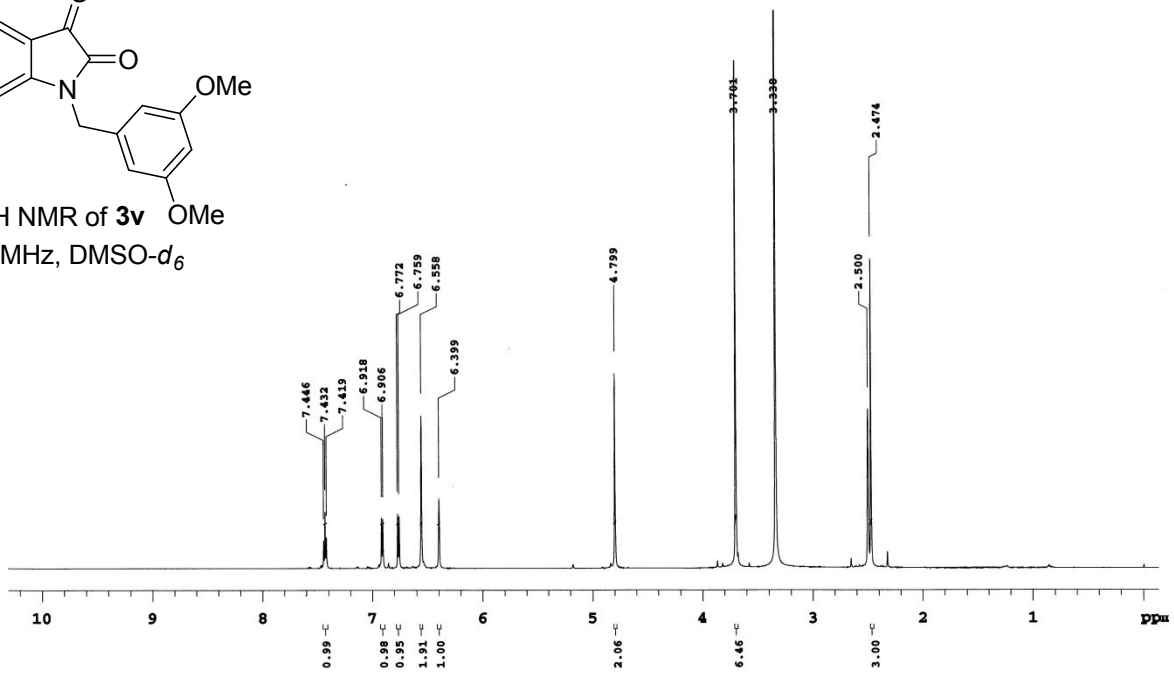
^{13}C NMR of **3u**
75 MHz, DMSO-d_6

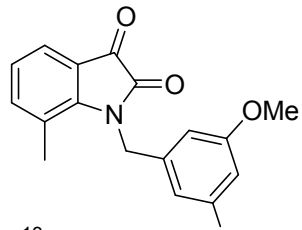




^{1}H NMR of **3v**

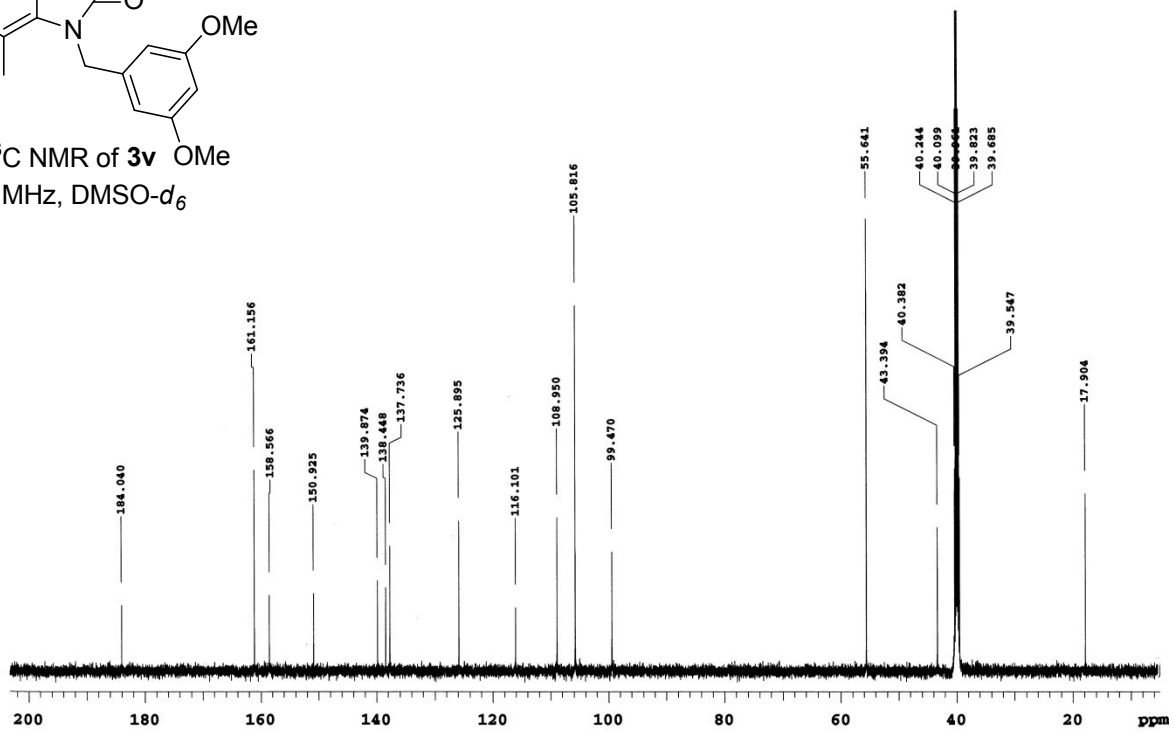
600 MHz, DMSO-d_6



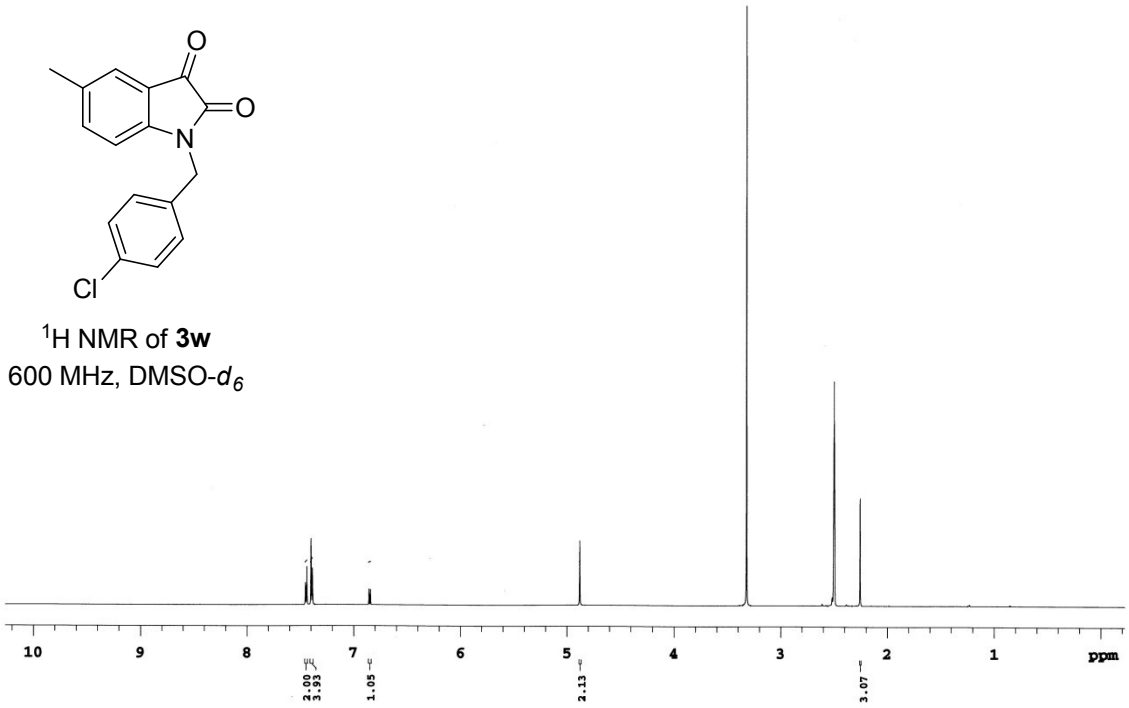


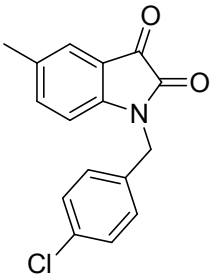
^{13}C NMR of **3v**

150 MHz, DMSO-d_6

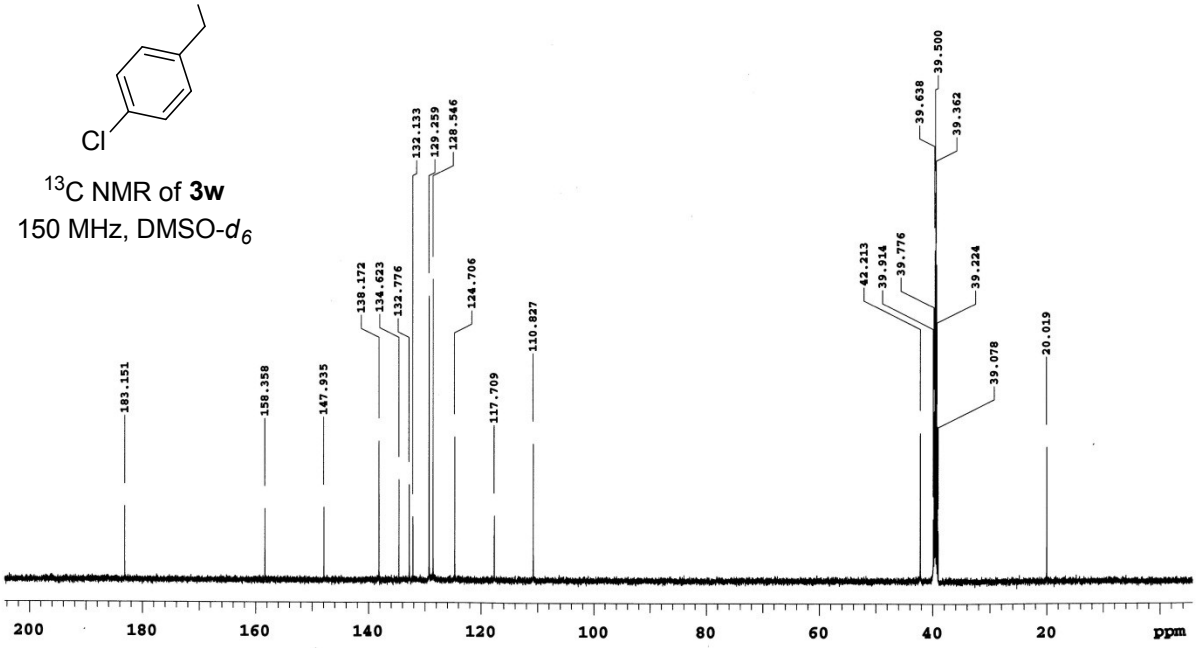


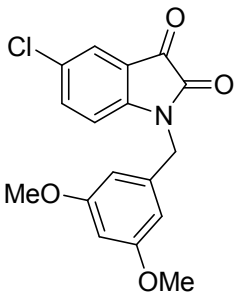
^{1}H NMR of **3w**
600 MHz, DMSO-d_6



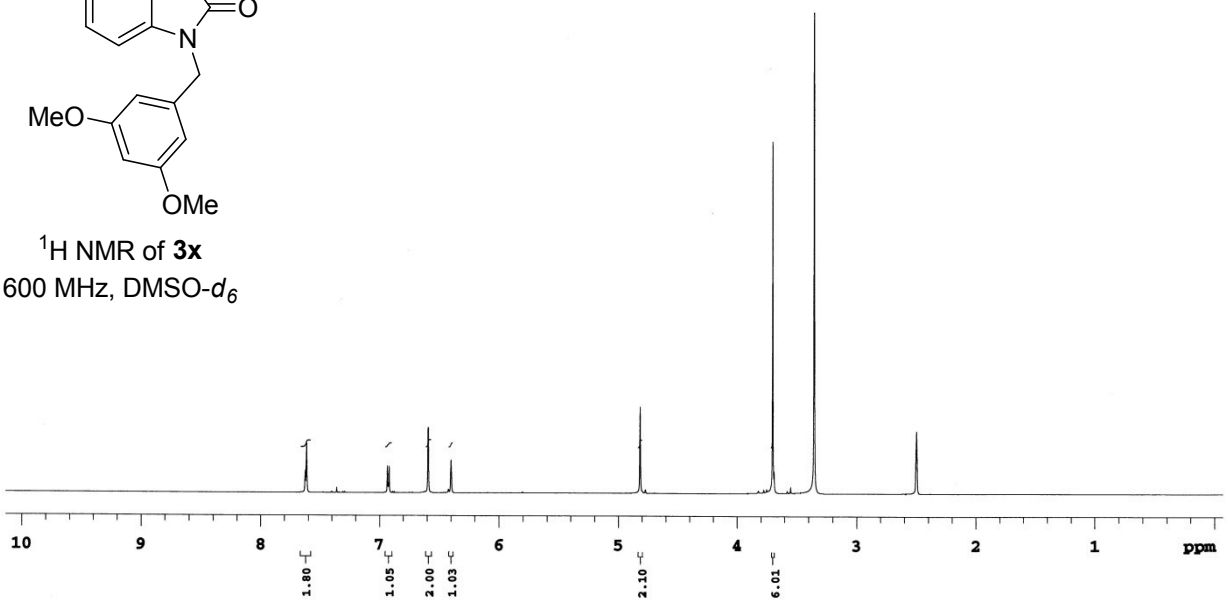


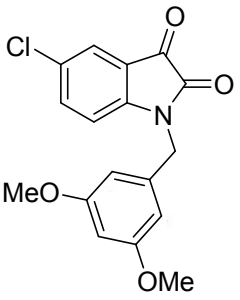
^{13}C NMR of **3w**
150 MHz, DMSO-d_6





^{1}H NMR of **3x**
600 MHz, DMSO-d_6





^{13}C NMR of **3x**
150 MHz, DMSO-d_6