Supporting Information

Water-controlled selective preparation of α-mono or α,α'-dihalo ketones via catalytic cascade reaction of unactivated alkynes with 1,3-dihalo-5,5-dimethylhydantoin

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Characterization Data

2-bromo-1-phenylethanone (2a)[1]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.00 (d, J = 7.6 Hz, 2H), 7.63 (t, J = 7.6 Hz, 1H), 7.51 (t, J = 7.6 Hz, 2H), 4.48 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.3, 133.9,128.9,128.8, 31.0.

2-bromo-1-(p-tolyl)ethanone (2b)[2]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.89 (d, J = 8.4 Hz, 2H), 7.30 (d, J = 8.4 Hz, 2H), 4.45 (s, 2H), 2.44 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.3, 145.0, 131.4, 129.5, 129.0, 31.0, 21.8.

2-bromo-1-(4-methoxyphenyl)ethanone (2c)[3]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (d, J = 8.8 Hz, 2H), 6.97 (d, J = 8.8 Hz, 2H), 4.41 (s, 2H), 3.89 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.9, 164.1, 131.9, 126.8, 114.0, 55.6, 30.7.

1-(4-(benzyloxy)phenyl)-2-bromoethanone (2d)[4]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (d, J = 8.8 Hz, 2H), 7.45–7.38(m, 5H), 7.04 (d, J = 8.8 Hz, 2H), 5.15 (s, 2H), 4.41 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.9, 163.2, 135.9, 131.3, 128.7, 128.3, 127.5, 127.0, 114.8, 70.2, 30.7.

2-bromo-1-(4-(methylthio)phenyl)ethanone (2e)[5]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.91 (d, J = 8.8 Hz, 2H), 7.30 (d, J = 8.8 Hz, 2H), 4.43 (s, 2H), 2.55 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.3, 147.4, 129.3, 128.7, 124.9, 30.6, 14.6.

2-bromo-1-(4-fluorophenyl)ethanone (2f)[3]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05-8.02 (m, 2H), 7.18 (t, J = 8.6 Hz, 2H), 4.43 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.8, 166.0 (d, J = 254.0 Hz), 131.7 (d, J = 9.6 Hz), 130.3 (d, J = 3.0 Hz), 116.1 (d, J =21.6 Hz), 30.5.

2-bromo-1-(4-chlorophenyl)ethanone (2g)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (d, J = 8.8 Hz, 2H), 7.48 (d, J = 8.8 Hz, 2H), 4.42 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.2, 140.5, 132.2, 130.3, 129.2, 30.4.

2-bromo-1-(4-bromophenyl)ethanone (2h)[5]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86 (d, J = 8.4 Hz, 2H), 7.65 (d, J = 8.8 Hz 2H), 4.12 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.4, 132.6, 132.2, 130.4, 129.3, 30.4.

2-bromo-1-(4-iodophenyl)ethanone (2i)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 (d, J = 8.4 Hz, 2H), 7.69 (d, J = 8.4 Hz, 2H), 4.40 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.8, 138.3, 133.3, 130.3, 102.3, 30.4.

2-bromo-1-(4-(trifluoromethyl)phenyl)ethanone (2j)[7]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.11 (d, J = 8.0 Hz, 2H), 7.78 (d, J = 8.0 Hz, 2H), 4.47 (s, *2*H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.4, 136.5, 135.1 (q, J = 32.2 Hz), 129.3, 125.9 (q, J = 3.8 Hz), 123.3 (q, J = 271.8 Hz), 30.3.

2-bromo-1-(m-tolyl)ethanone (2k)[3]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80–7.77 (m, 2H), 7.44–7.36 (m, 2H), 4.46 (s, 2H), 2.43 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.4, 138.7, 134.7, 133.9, 129.3, 128.7, 126.1, 31.1, 21.3. IR: 2957, 1732, 1323, 1157, 739, 701.

2-bromo-1-(2-chlorophenyl)ethanone (2l)[3]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62–7.65 (m, 1H), 7.47–7.43 (m, 2H), 7.40–7.35 (m, 1H), 4.53 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 194.0, 136.2, 132.8, 130.6, 130.5, 130.3, 137.2, 34.7.

2-bromo-1-(4-ethynylphenyl)ethanone (2m)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.95 (d, J = 8.4 Hz, 2H), 7.60 (d, J = 8.4 Hz, 2H), 4.44 (s, 1H), 3.30 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.6, 132.5, 132.3, 128.9, 128.2, 82.5, 81.2, 30.7.

2-bromo-1-(naphthalen-2-yl)ethanone (2n)[5]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.52 (s, 1H), 8.05–7.89 (m, 4H), 7.67–7.57 (m, 2H), 4.60 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.3, 135.9, 132.3, 131.2, 131.0, 129.7, 129.0, 128.8, 127.8, 127.0, 124.1, 31.0.

1-(benzo[d][1,3]dioxol-5-yl)-2-bromoethanone (2o)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, J = 8.0 Hz, 1H), 7.43 (s, 1H), 6.86(d, J = 8.0 Hz, 1H), 6.07 (s, 2H), 4.36 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.2, 152.2, 148.2, 128.4, 125.4, 108.4, 107.9, 101.9, 30.5.

2-bromo-1-(thiophen-3-yl)ethanone (2p)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81 (d, J = 4.0 Hz, 1H), 7.72 (d, J = 4.8 Hz, 1H), 7.17 (t, J = 4.4 Hz, 1H), 4.37 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 184.4, 140.7, 135.3, 133.5, 128.4, 30.6.

2-bromo-1-(furan-2-yl)ethanone (2q)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (s, 1H), 7.34 (d, J = 3.6 Hz, 1H), 6.61–6.60 (m, 1H), 4.33 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 180.3, 150.3, 127.3, 119.1, 112.8, 30.0.

1-bromooctan-2-one (2r)[8]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.89 (s, 2H), 2.65 (t, J = 7.2 Hz, 2H), 1.61–1.58 (m, 2H), 1.29 (s, 6H), 0.88 (t, J = 7.2 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 202.3, 39.8, 34.3, 31.5, 28.7, 23.8, 22.4, 14.0.

2-bromo-1-cyclohexylethanone (2s)[3]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.98 (s, 2H), 2.74–2.67 (m, 1H), 1.90–1.85 (m, 2H), 1.82-1.78 (m, 2H), 1.44-1.19 (m, 6H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.7, 48.0, 33.4, 28.6, 25.6, 25.4.

2-bromo-1-phenylpropan-1-one (2u)[9]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.03 (d, J = 7.6 Hz, 2H), 7.60 (t, J = 7.6 Hz, 1H), 7.50 (t, J = 7.6 Hz, 2H), 5.31 (q, J = 6.8 Hz, 1H), 1.91 (d, J = 6.8 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 193.3, 133.9, 133.7, 128.9, 128.7, 41.4.

2-bromo-1,2-diphenylethanone (2v)[9]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99–7.96 (m, 2H), 7.56–7.50 (m, 3H), 7.45–7.41 (m, 2H), 7.38–7.31 (m, 3H), 6.39 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.0, 135.8, 134.9, 134.0, 133.7, 129.8, 129.1, 129.0, 128.7, 51.1.

2-chloro-1-phenylethanone (2w)[3]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (d, J = 7.6 Hz, 2H), 7.63 (t, J = 7.2 Hz, 1H), 7.51 (t, J = 7.6 Hz, 1H), 4.74 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 1191.0, 134.2, 134.0128.9, 128.5, 46.0.

2-iodo-1-phenylethanone (2x)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 (d, J = 7.6 Hz, 2H), 7.60 (t, J = 7.2 Hz, 1H), 7.49 (t, J = 7.6 Hz, 1H), 4.37 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 192.8, 133.8, 130.0, 129.0, 128.8, 52.8.

2,2-dibromo-1-phenylethanone (3a)[10]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.09 (d, J = 8.0 Hz, 2H), 7.66 (t, J = 7.6 Hz, 1H), 7.53 (t, J = 7.6 Hz, 2H), 6.73 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.9, 134.4, 130.8, 129.7, 128.9, 39.7.

2,2-dibromo-1-(p-tolyl)ethanone (3b)[11]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (d, J = 8.0 Hz, 2H), 7.31 (d, J = 8.0 Hz, 2H), 6.71 (s, 1H), 2.45 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.6, 145.7, 129.8, 129.6, 128.1, 39.9.

2,2-dibromo-1-(4-methoxyphenyl)ethanone (3c)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 (d, J = 8.8 Hz, 2H), 6.97 (d, J = 8.8 Hz, 2H), 6.68 (s, 1H), 3.90 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 184.6, 164.5, 132.2, 123.2, 114.2, 55.6, 39.9.

1-(4-(benzyloxy)phenyl)-2,2-dibromoethanone (3d)**:** White solid (mp: 91-92 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.09 (d, J = 8.8 Hz, 2H), 7.46–7.37 (m, 5H), 7.06 (d, J = 8.8 Hz, 2H), 5.17 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 184.6, 163.6, 135.7, 132.2, 128.7, 128.4, 127.5, 123.4, 115.0, 70.3, 39.9. IR (neat): 3028, 2962, 1683, 1135, 986, 847 cm^{-1}. HRMS Calcd (ESI) m/z for $C_{15}H_{12}Br_2O_2$: $[M+Na]^+$ 404.9096, found: 404.9090.

2,2-dibromo-1-(4-(methylthio)phenyl)ethanone (3e)**:** Light yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.00 (d, J = 8.8 Hz, 2H), 7.29 (d, J = 8.8 Hz, 2H), 6.66 (s, 1H), 2.55 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.0, 148.3, 130.0, 126.5, 124.9, 39.1, 14.6. IR (neat): 3034, 2989, 1675, 1211, 1076, 858 cm^{-1}. HRMS Calcd (ESI) m/z for $C_9H_8Br_2OS$: $[M+Na]^+$ 344.8555, found: 344.8549.

2,2-dibromo-1-(4-fluorophenyl)ethanone (3f)[11]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16 (dd, J = 5.6 Hz, J = 8.8 Hz, 2H), 7.19 (t, J = 8.8 Hz, 2H), 6.64 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ184.9, 166.1 (d, J = 254.2 Hz), 131.6 (d, J = 9.4 Hz), 130.2 (d, J = 3.2 Hz), 116.0 (d, J =22.0 Hz), 39.2.

2,2-dibromo-1-(4-chlorophenyl)ethanone (3g)[11]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 (d, J = 8.8 Hz, 2H), 7.50 (d, J = 8.8 Hz, 2H), 6.62 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 184.9, 141.1, 131.2, 129.3, 129.0, 39.2.

2,2-dibromo-1-(4-bromophenyl)ethanone (3h)[6]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (d, J = 8.4 Hz, 2H), 7.66 (d, J = 8.4 Hz, 2H), 6.61 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.1, 132.3, 131.2, 129.9, 129.4, 39.2.

2,2-dibromo-1-(4-iodophenyl)ethanone (3i)[11]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 (d, J = 8.8 Hz, 2H), 7.80 (d, J = 8.8 Hz, 2H), 6.62 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.3, 138.2, 130.9, 129.9, 102.9, 39.2.

2,2-dibromo-1-(4-(trifluoromethyl)phenyl)ethanone (3j)**:** White solid (mp: 99-101 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.23 (d, J = 8.0 Hz, 2H), 7.79 (d, J = 8.0 Hz, 2H), 6.64 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.0, 135.4(q, J = 33.0 Hz), 133.6, 130.2, 125.9(q, J = 4.0 Hz), 123.2 (q, J = 271.4 Hz), 39.3. IR (neat): 3036, 2971, 1681, 1132, 946, 712 cm^{-1}. HRMS Calcd (ESI) m/z for $C_9H_5Br_2F_3O$: $[M+Na]^+$ 366.8551, found: 366.8547.

2,2-dibromo-1-(m-tolyl)ethanone (3k)**:** Colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 (s, 2H), 7.47–7.38 (m, 2H), 6.74 (s, 1H), 2.44 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.1, 138.9, 135.3, 130.8, 130.1, 128.8, 126.8, 39.8. IR (neat): 3067, 2977, 1672, 1325, 1031, 842 cm^{-1}. HRMS Calcd (ESI) m/z for $C_9H_8Br_2O$: $[M+Na]^+$ 312.8834, found: 312.8828.

2,2-dibromo-1-(2-chlorophenyl)ethanone (3l)[11]**:** Light yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, J = 7.6 Hz, 1H), 7.51-7.45 (m, 2H), 7.40-7.35 (m, 1H), 6.77 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 188.8, 134.0, 133.0, 131.0, 130.9, 130.4, 127.2, 42.1.

2,2-dibromo-1-(4-ethynylphenyl)ethanone (3m)[12]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05 (d, J = 8.0 Hz, 2H), 7.60 (d, J = 8.0 Hz, 2H), 6.67 (s, 1H), 3.33 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.1, 132.4, 130.4, 129.6, 128.3, 82.3, 81.6, 39.4.

2,2-dibromo-1-(naphthalen-2-yl)ethanone (3n)[12]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.65 (s, 1H), 8.10 (d, J = 8.8 Hz, 1H), 8.01 (d, J = 8.0 Hz, 1H), 7.96-7.90 (m, 2H), 7.67 (t, J = 7.2 Hz, 1H), 7.61 (t, J = 7.2 Hz, 1H), 6.88 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.0, 136.0, 132.2, 131.8, 129.8, 129.4, 128.9, 128.0, 127.9, 127.2, 124.7, 39.8.

1-(benzo[d][1,3]dioxol-5-yl)-2,2-dibromoethanone (3o)[13]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, J = 8.0 Hz, 1H), 7.55 (s, 1H), 6.91 (d, J = 8.4 Hz, 1H), 6.65 (s, 1H),

6.10 (s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 184.3, 153.0, 148.4, 126.4, 125.0, 109.4, 108.2, 102.26, 39.5.

2,2-dibromo-1-(thiophen-3-yl)ethanone (3p)[12]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01 (d, J = 3.6 Hz, 1H), 7.79 (d, J = 5.2 Hz, 1H), 7.21 (t, J = 4.4 Hz, 1H), 6.50 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 179.8, 136.5, 136.4, 134.7, 128.5, 38.9.

2,2-dibromo-1-(furan-2-yl)ethanone (3q)[12]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (s, 1H), 7.49 (d, J = 3.6 Hz, 1H), 6.65-6.63 (m, 1H), 6.59 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.3, 147.9, 146.6, 121.2, 113.3, 38.1.

1,1-dibromooctan-2-one (3r)[10]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 5.79 (s, 1H), 2.93 (t, J = 7.2 Hz, 2H), 1.71–1.64 (m, 2H), 1.36–1.30 (m, 6H), 0.90 (t, J = 6.8 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.1, 43.0, 34.9, 31.4, 28.6, 24.3, 22.4, 14.0.

2,2-dibromo-1-cyclohexylethanone (3s)**:** Light yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 5.86 (s, 1H), 3.05 (t, J = 7.6 Hz, 1H), 1.95–1.80 (m, 4H), 1.73–1.70 (m, 1H), 1.53–1.50 (m, 1H), 1.37–1.25 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.2, 45.1, 42.4, 30.5, 25.5, 25.4. IR (neat): 2974, 1702, 1214, 1078, 937 cm^{-1}. HRMS Calcd (ESI) m/z for $C_8H_{12}Br_2O$: $[M+Na]^+$ 304.9147, found: 304.9142.

2,2-dibromo-1-phenylpropan-1-one (3u)[10]**:** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.41 (d, J = 8.0 Hz, 2H), 7.60 (t, J = 7.6 Hz, 1H), 7.48 (t, J = 7.6 Hz, 2H), 2.77 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 188.3, 133.5, 131.6, 131.4, 127.9, 57.83, 37.7.

2,2-dibromo-1,2-diphenylethanone (3v)[14]: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (d, J = 7.6 Hz, 2H), 7.65 (d, J = 7.6 Hz, 2H), 7.46–7.33 (m, 4H), 7.30–7.26 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.1, 140.9, 133.1, 131.4, 130.7, 129.7, 129.0, 128.0, 126.7, 69.5.

2,2-dichloro-1-phenylethanone (3w)[10]: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (d, J = 7.6 Hz, 2H), 7.67 (t, J = 7.6 Hz, 1H), 7.54 (t, J = 8.0 Hz, 2H), 6.70 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.9, 134.6, 131.3, 129.7, 128.9, 29.7.

2,2-diiodo-1-phenylethanone (3x)[10]: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.03 (d, J = 7.6 Hz, 2H), 7.62 (t, J = 7.6 Hz, 1H), 7.48 (t, J = 7.6 Hz, 2H), 6.54 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 188.2, 134.1, 129.4, 129.0, 128.5, 1.9.

(E)-1,3-diphenylprop-2-en-1-one (4a)[6]: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, J = 7.6 Hz, 2H), 7.83 (d, J = 16.0 Hz, 2H), 7.68–7.65 (m, 2H), 7.63–7.51 (m, 4H), 7.45–7.43 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.5, 144.8, 138.2, 134.8, 132.8, 130.5, 128.9, 128.6, 128.5, 128.4, 122.0.

benzamide (4b)[12]: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83 (d, J = 7.2 Hz, 2H), 7.55 (t, J = 7.2 Hz, 1H), 7.46 (t, J = 7.2 Hz, 2H), 6.16 (brs, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.5, 133.3, 132.0, 128.6, 127.3.

benzo[d]oxazol-2-yl(phenyl)methanone (5a)[15]: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.55 (d, J = 7.2 Hz, 2H), 7.95 (d, J = 8.0 Hz, 2H), 7.73–7.67 (m, 2H), 7.59–7.46 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 180.5, 157.0, 150.4, 140.7, 134.9, 134.3, 131.0, 128.6, 128.4, 125.7, 122.3, 111.8.

benzo[d]thiazol-2-yl(phenyl)methanone (5b)[15]: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.58 (d, J = 7.6 Hz, 2H), 8.26 (d, J = 8.0 Hz, 1H), 8.03 (d, J = 8.0 Hz, 1H), 7.69 (t, J = 7.2 Hz, 1H), 7.62–7.54 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.4, 167.2, 153.9, 135.0, 133.9, 131.3, 129.1, 128.5, 127.7, 127.0, 125.8, 122.2.

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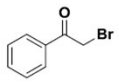
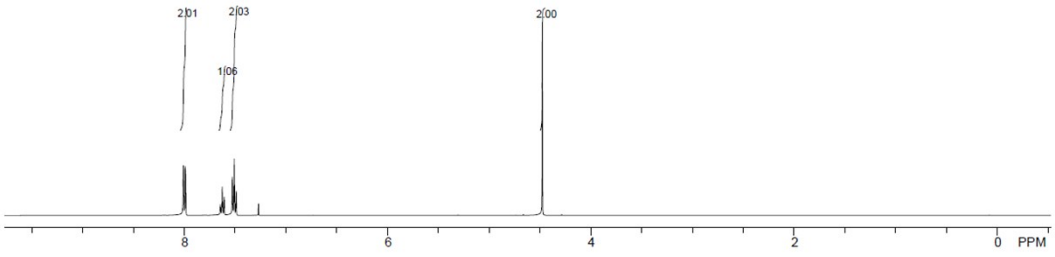
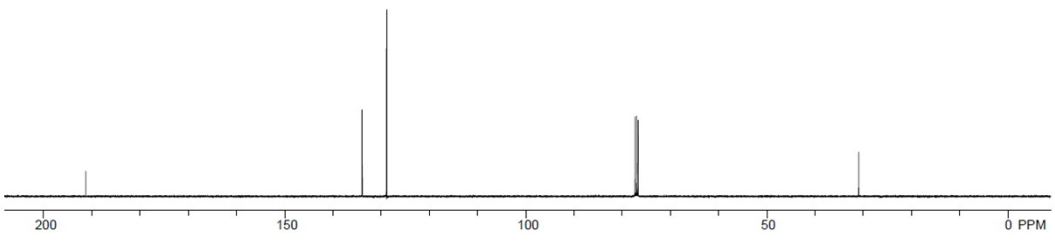
^{1}H and ^{13}C NMR spectra

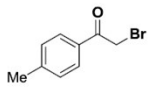
2-bromo-1-phenylethanone (2a)

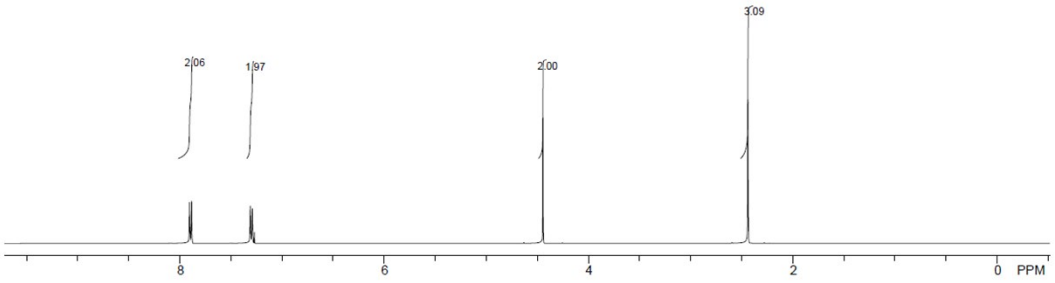


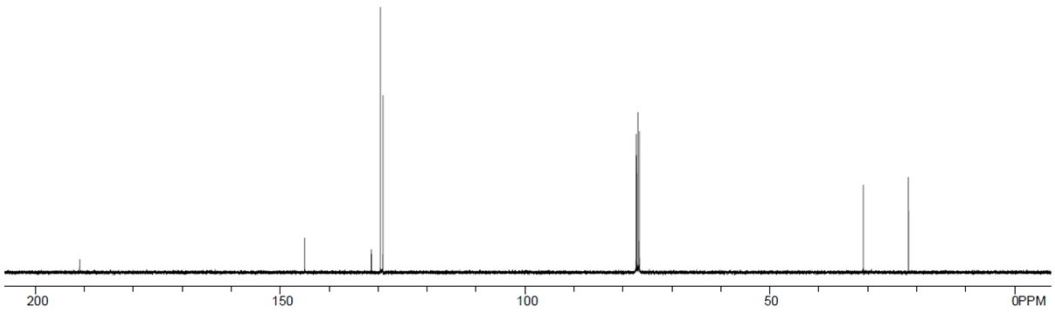




2-bromo-1-(p-tolyl)ethanone (2b)







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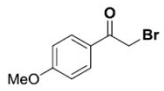

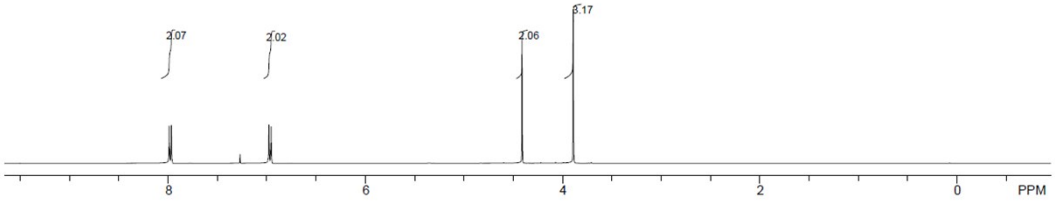

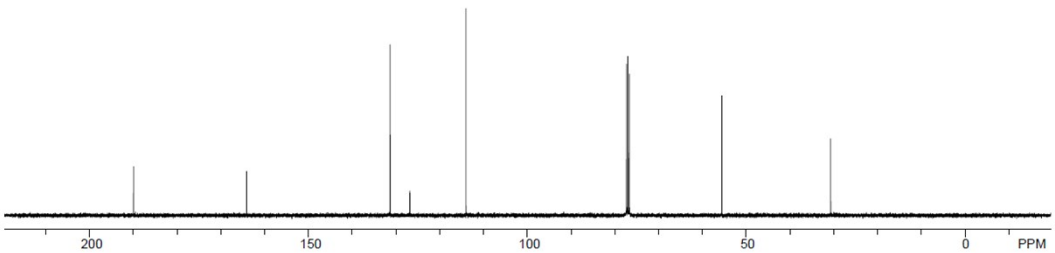

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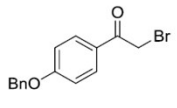

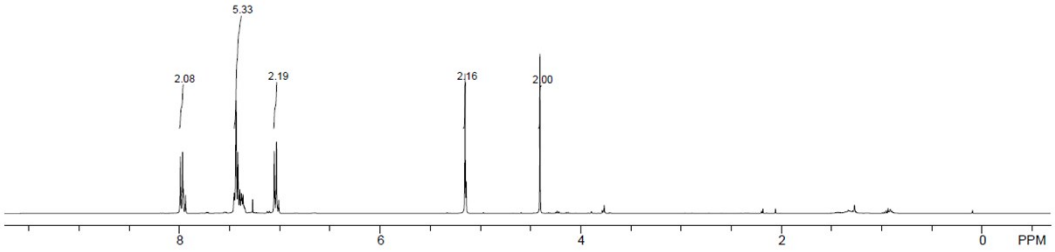

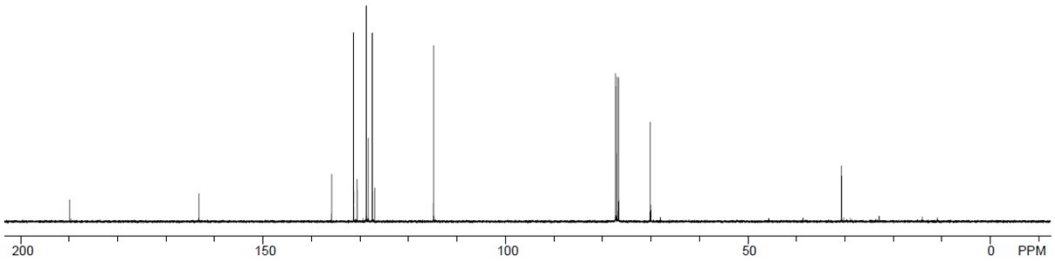

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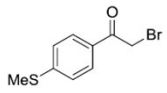

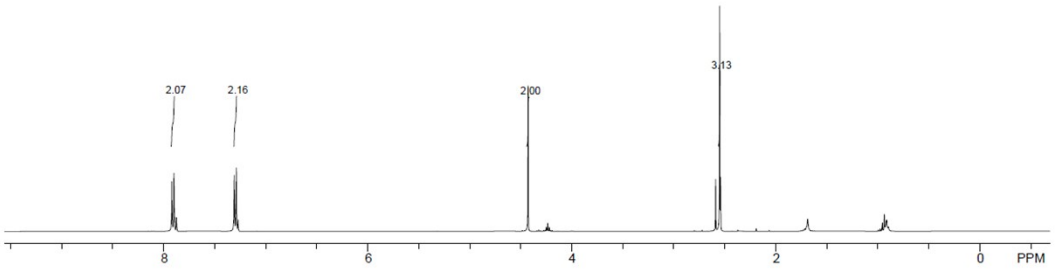

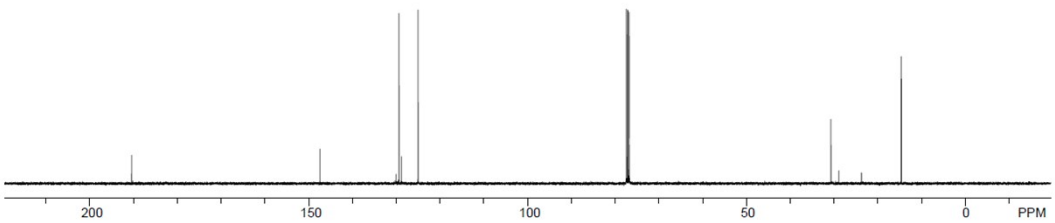

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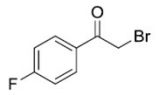

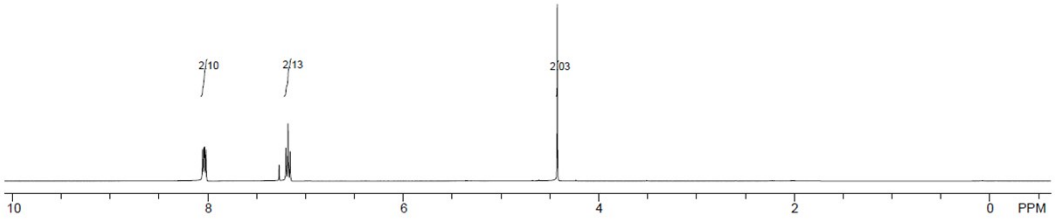

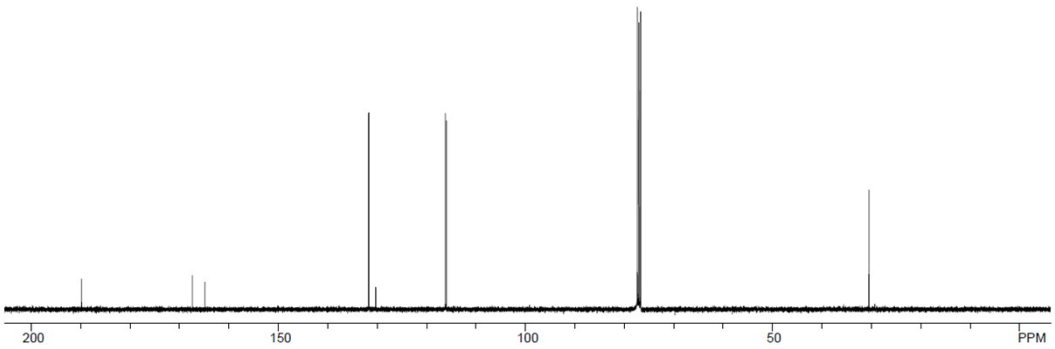

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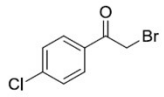
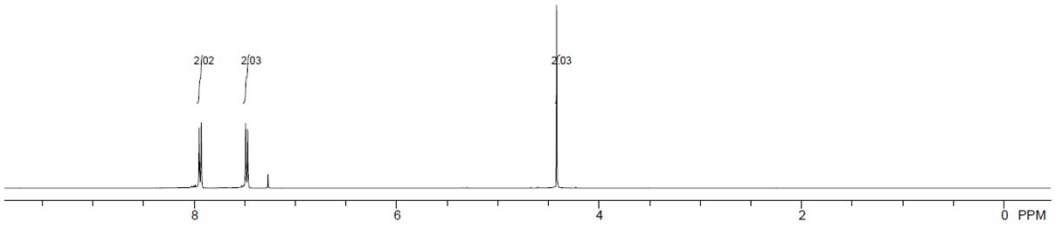
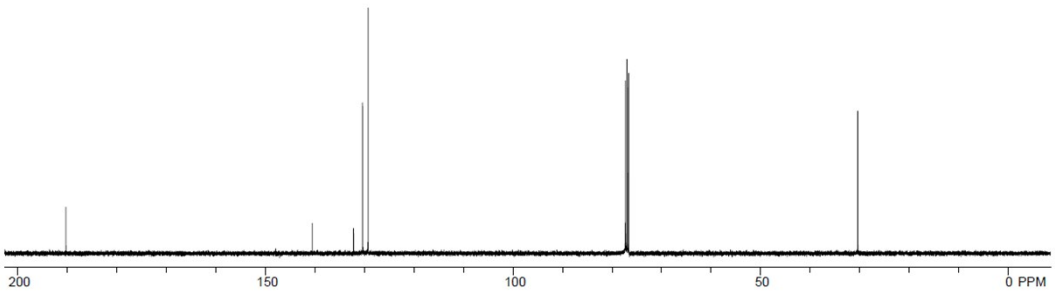
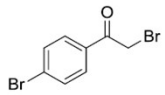
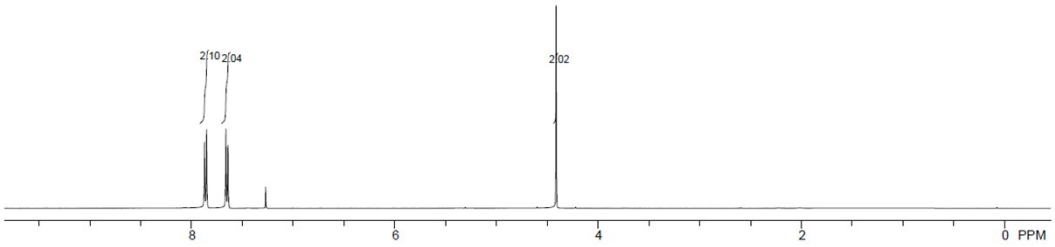


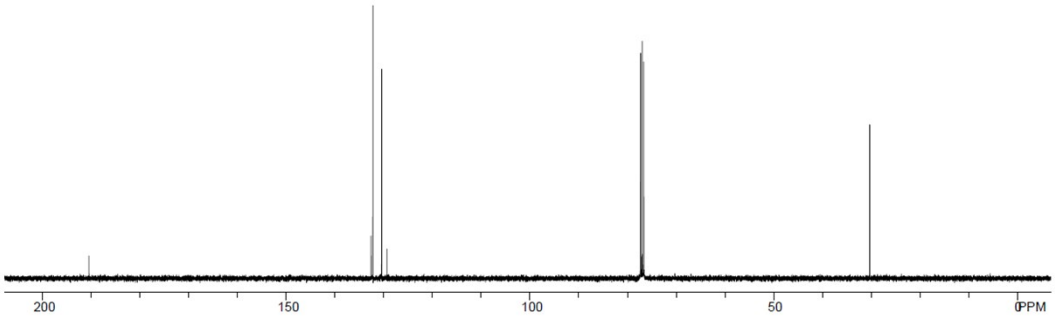




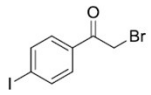
2-bromo-1-(4-bromophenyl)ethanone (2h)

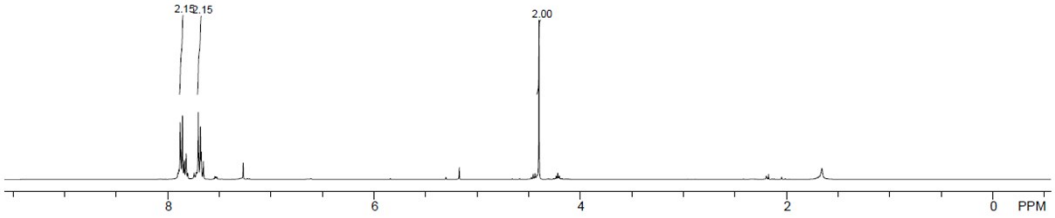


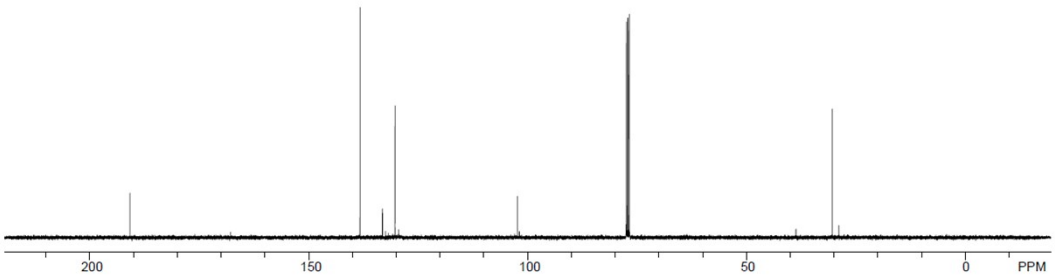




2-bromo-1-(4-iodophenyl)ethanone (2i)







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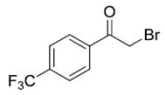

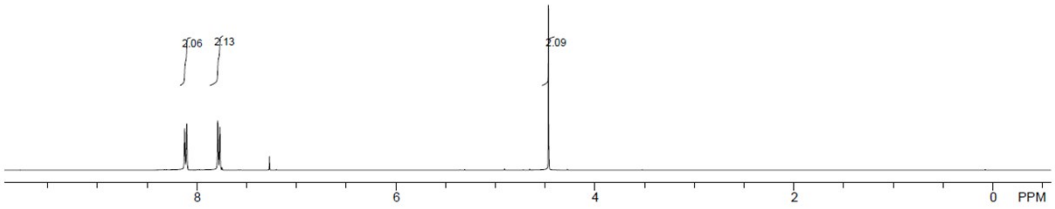

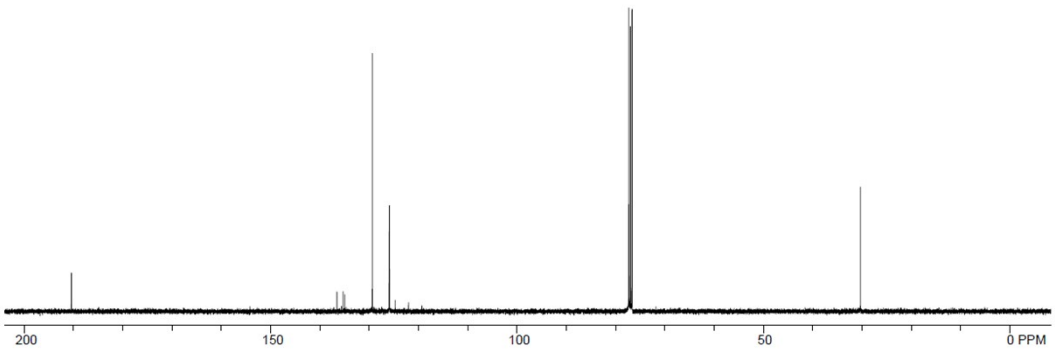

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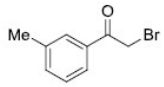

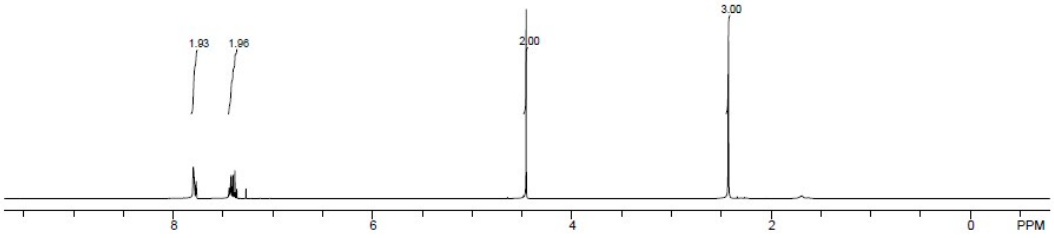

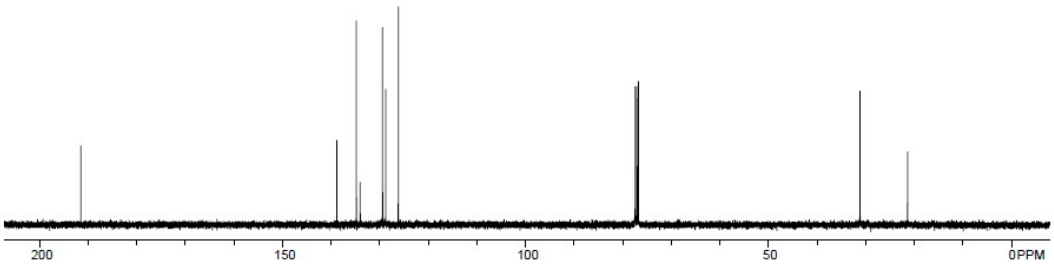

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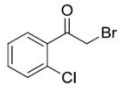
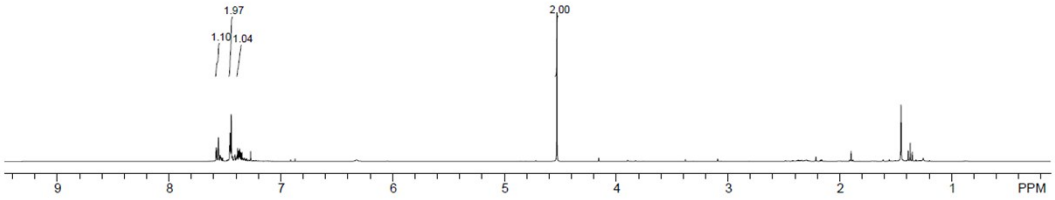
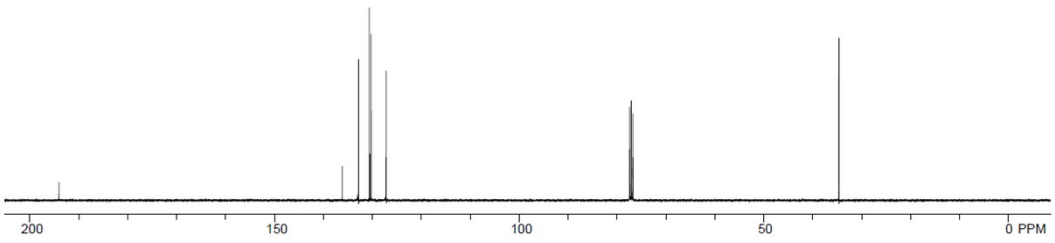
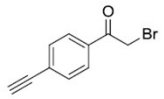
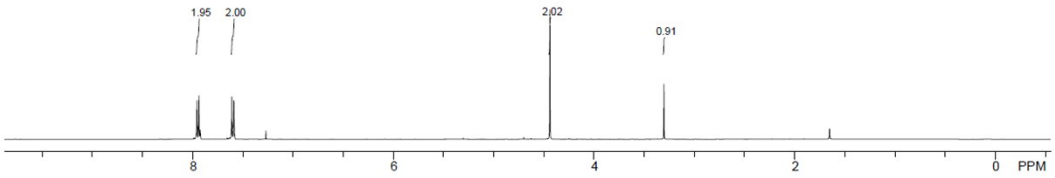


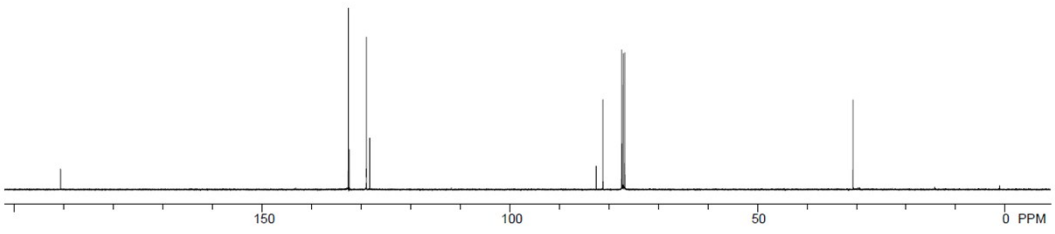




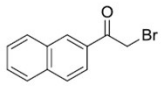
2-bromo-1-(4-ethynylphenyl)ethanone (2m)

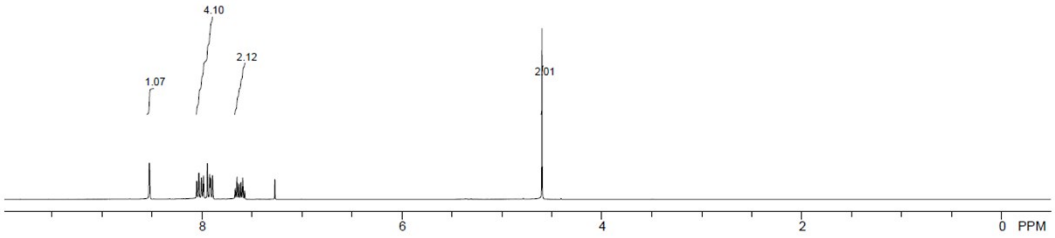


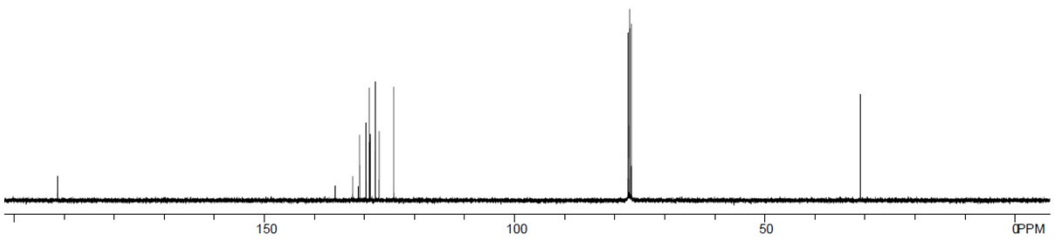




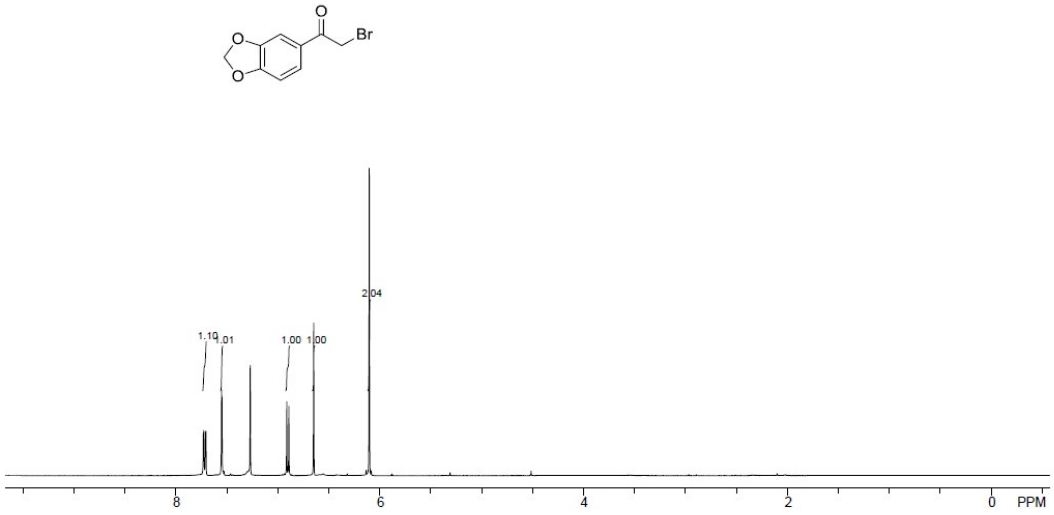
2-bromo-1-(naphthalen-2-yl)ethanone (2n)

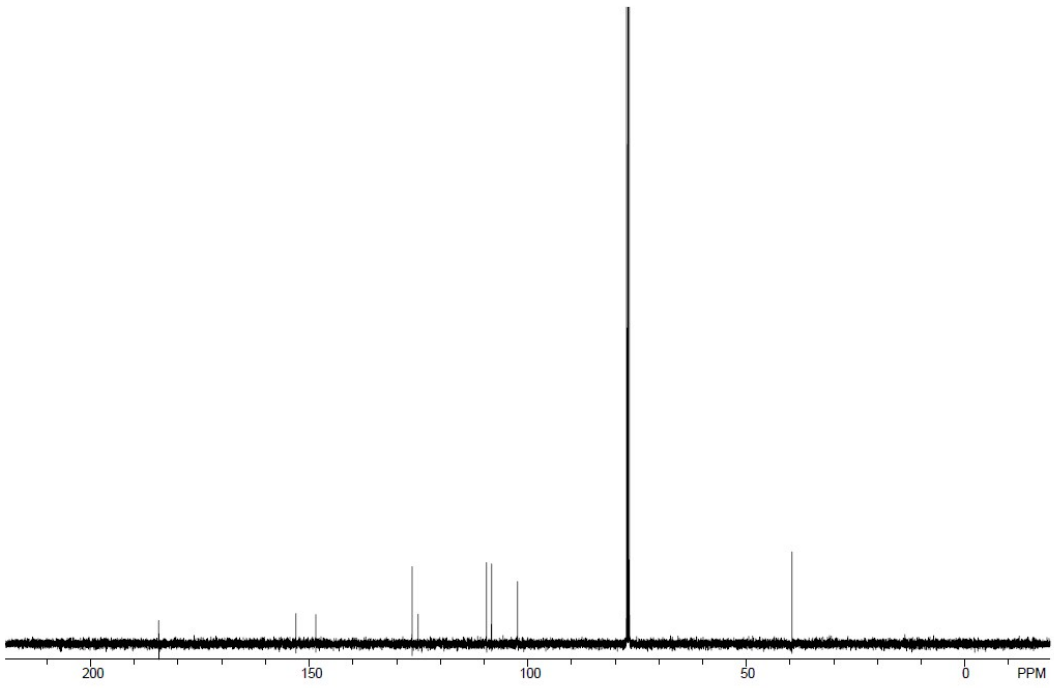




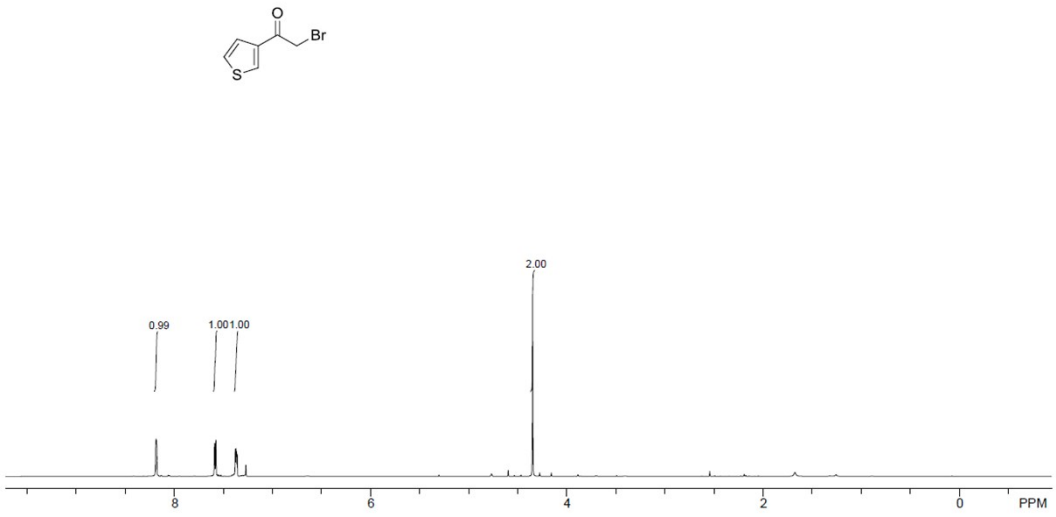


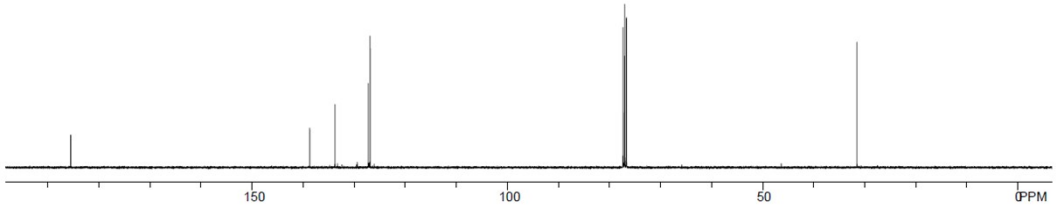
1-(benzo[d][1,3]dioxol-5-yl)-2-bromoethanone (2o)



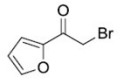


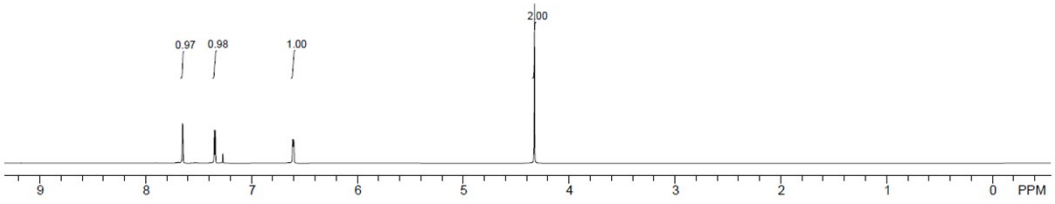
2-bromo-1-(thiophen-3-yl)ethanone (2p)

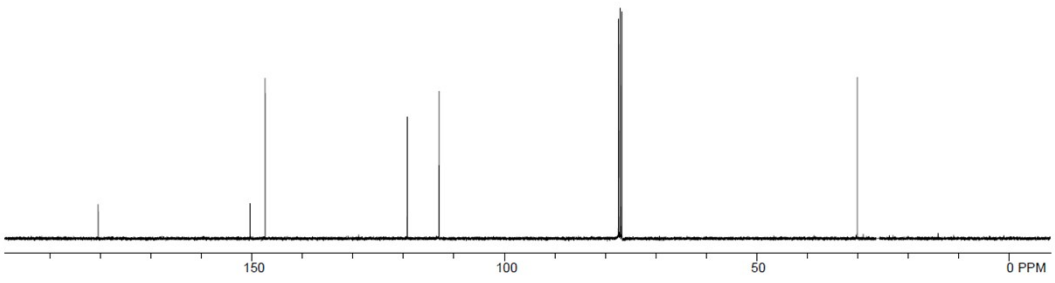




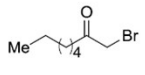
2-bromo-1-(furan-2-yl)ethanone (2q)

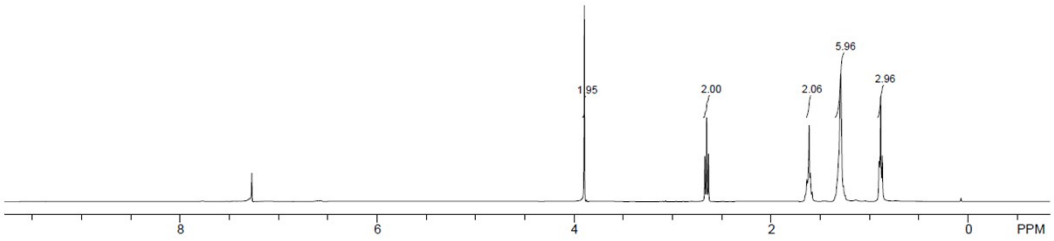


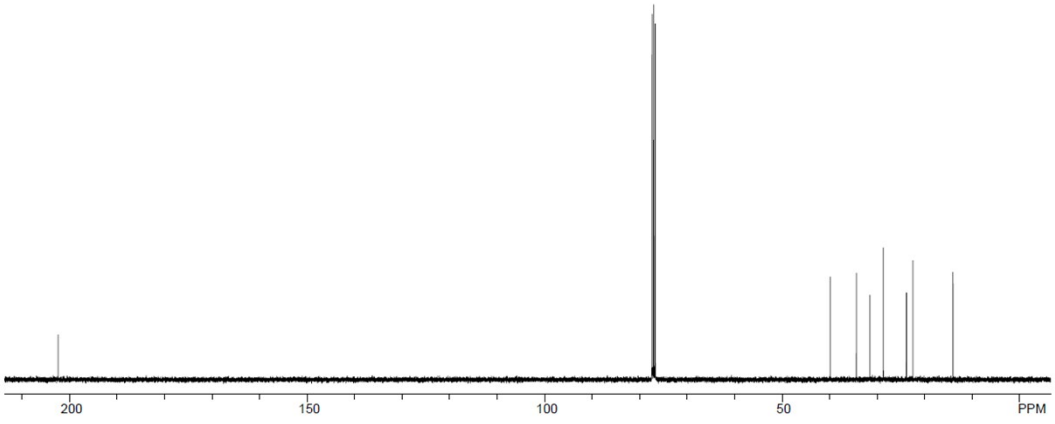




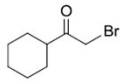
1-bromooctan-2-one (2r)

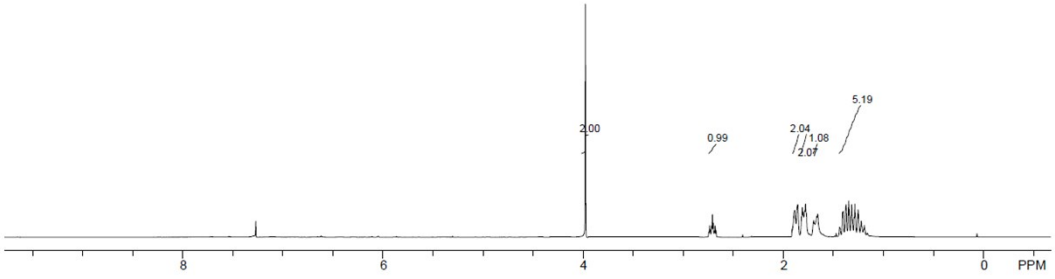


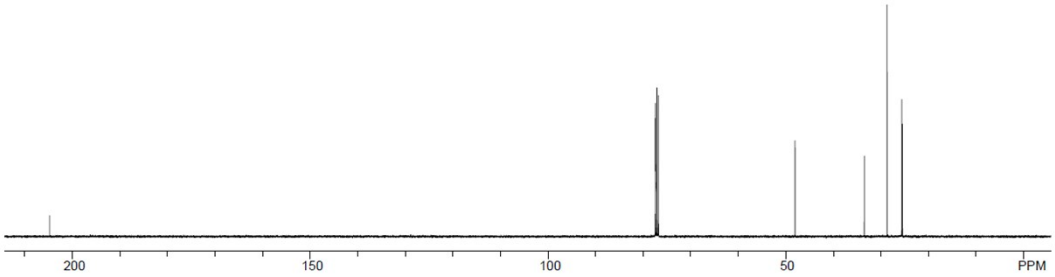




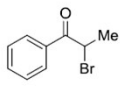
2-bromo-1-cyclohexylethanone (2s)

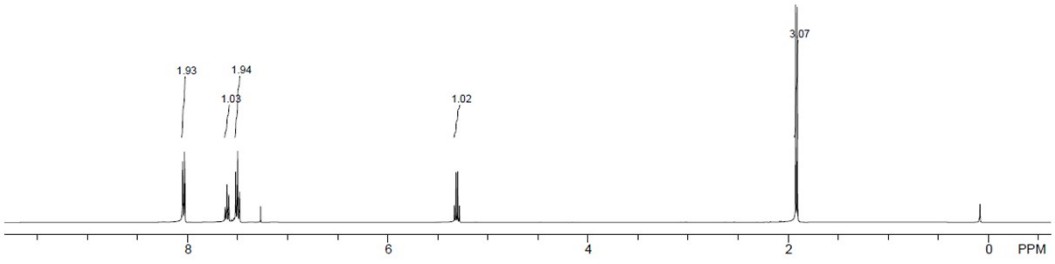


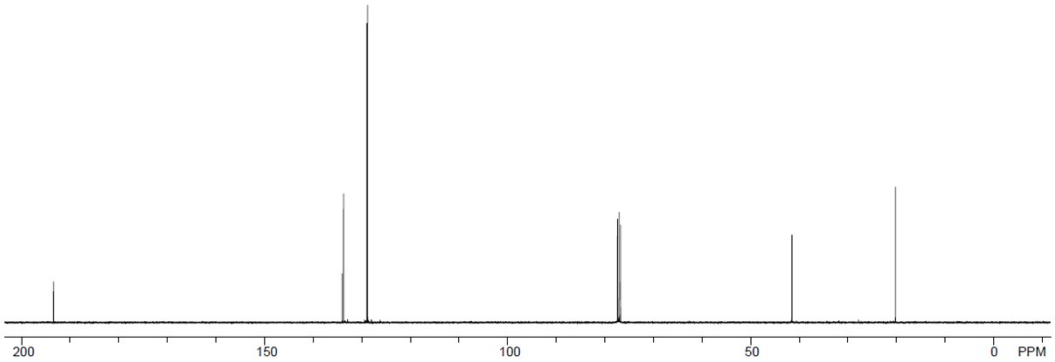




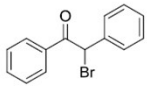
2-bromo-1-phenylpropan-1-one (2u)

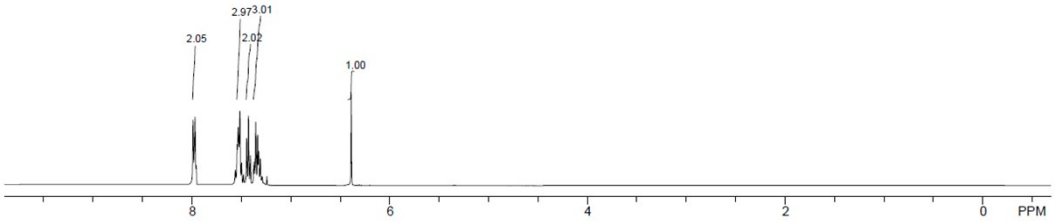


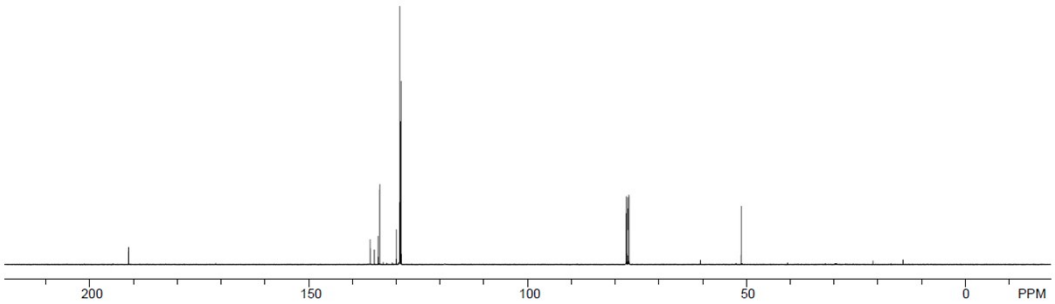




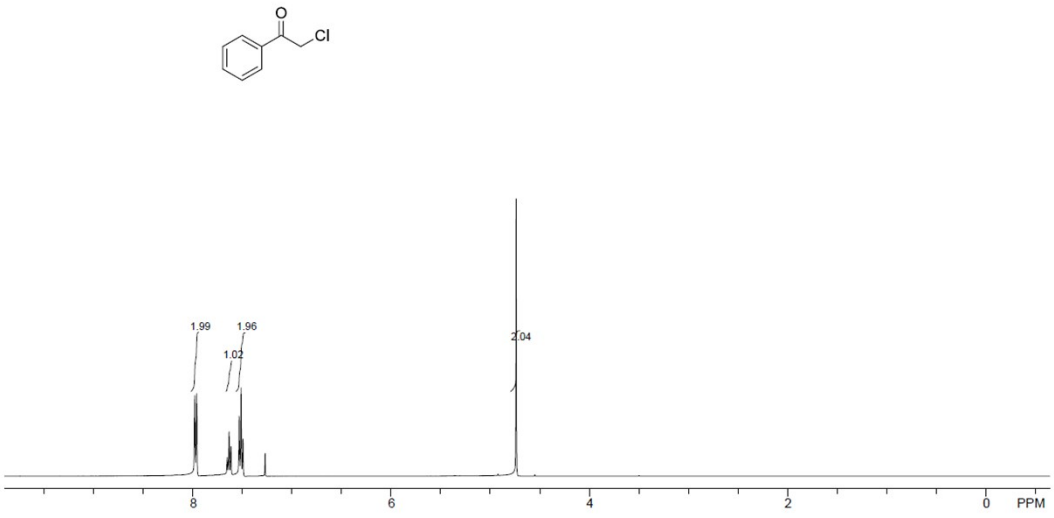
2-bromo-1,2-diphenylethanone (2v)

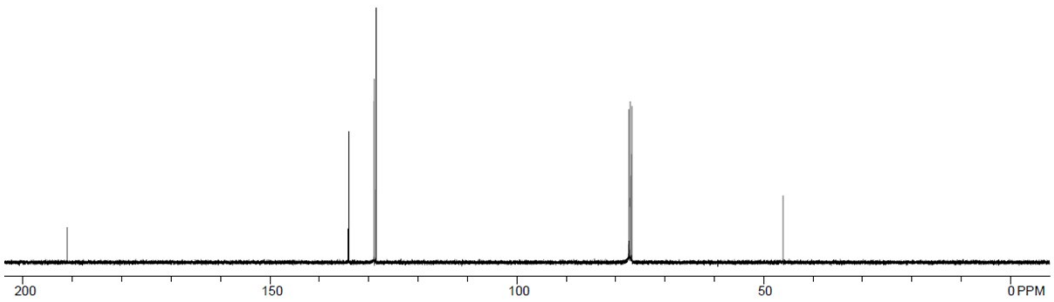




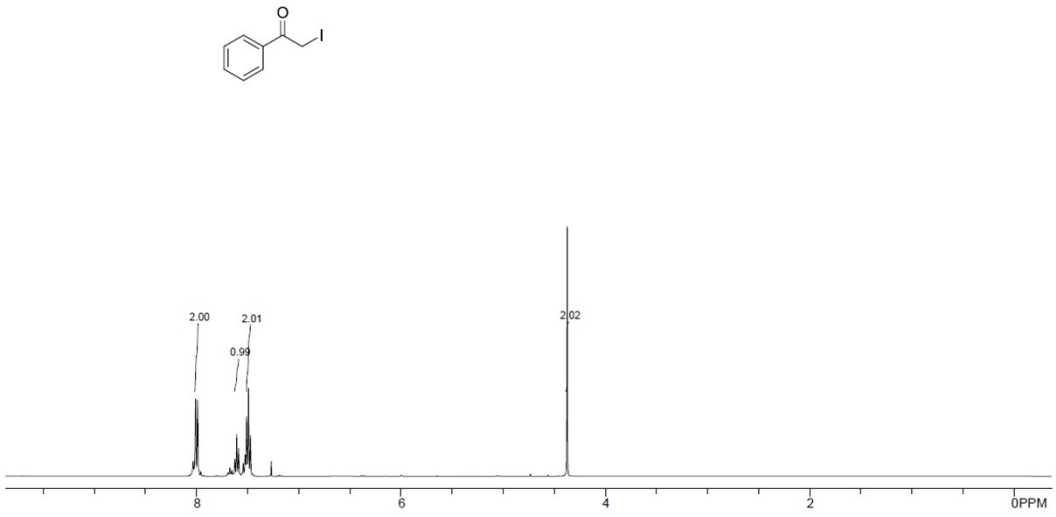


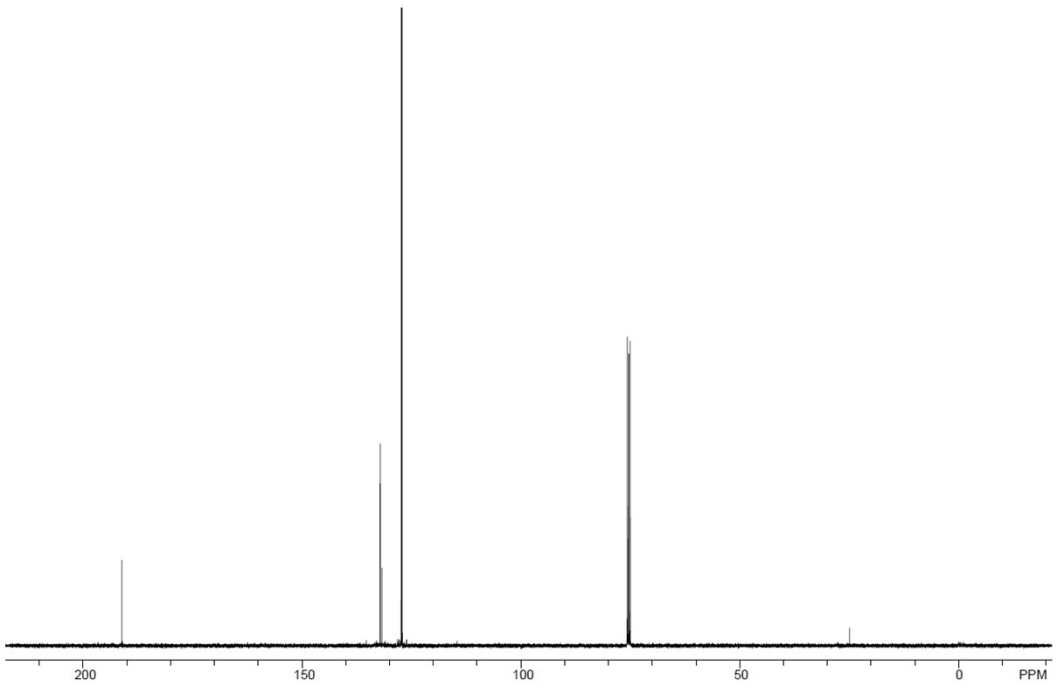
2-chloro-1-phenylethanone (2w)



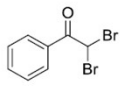


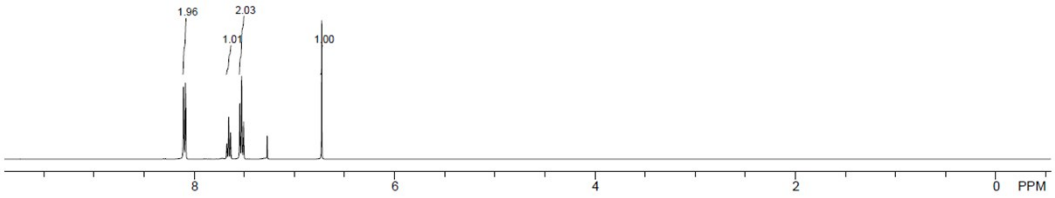
2-iodo-1-phenylethanone (2x)

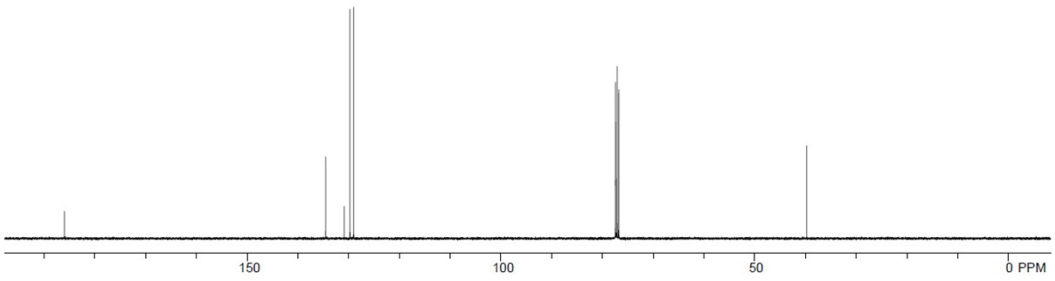




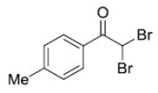
2,2-dibromo-1-phenylethanone (3a)

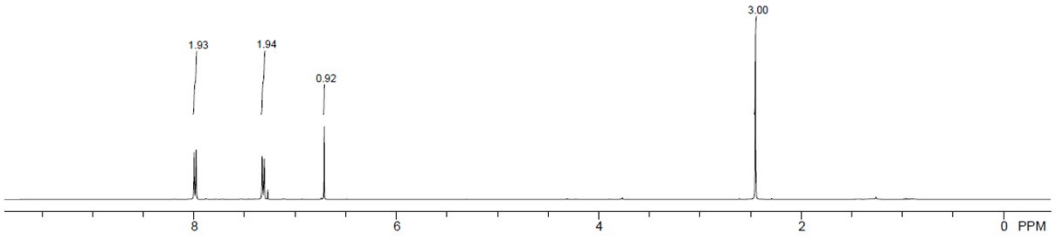


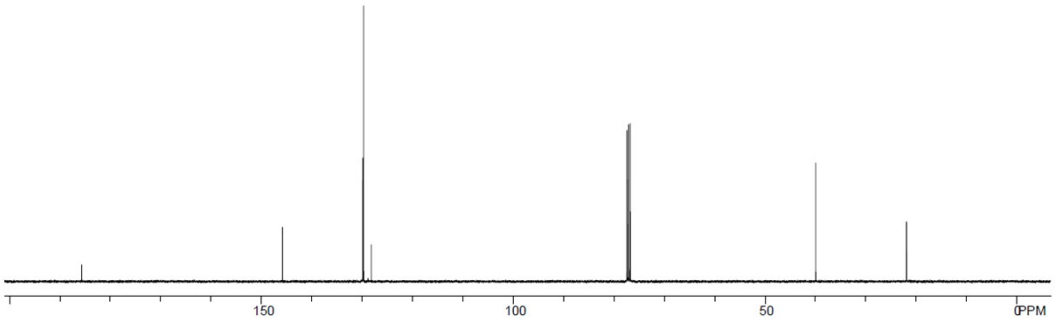




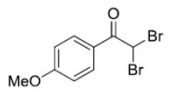
2,2-dibromo-1-(p-tolyl)ethanone (3b)

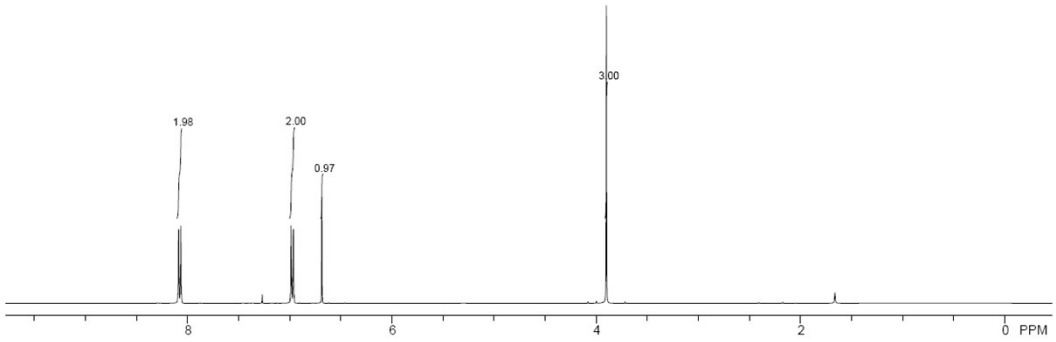


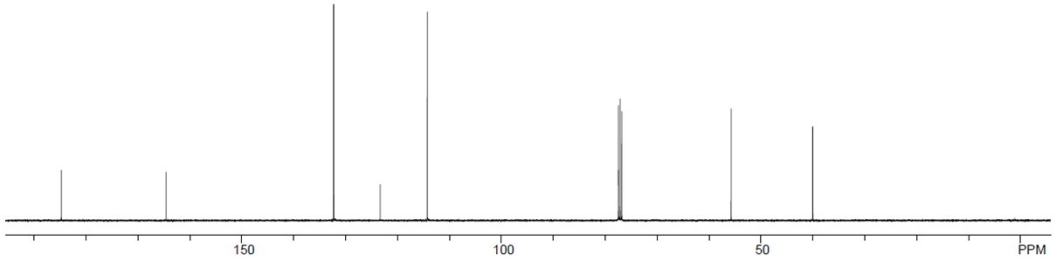




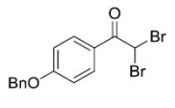
2,2-dibromo-1-(4-methoxyphenyl)ethanone (3c)

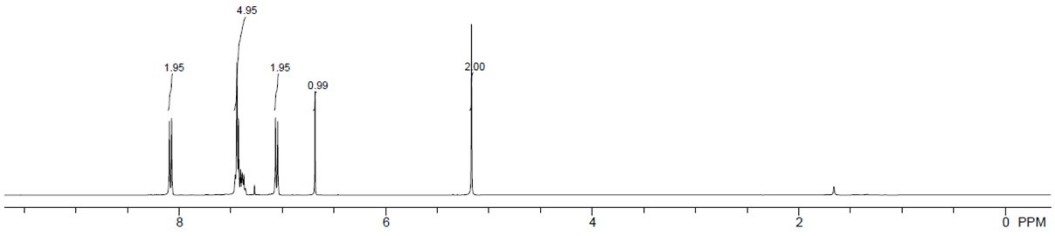


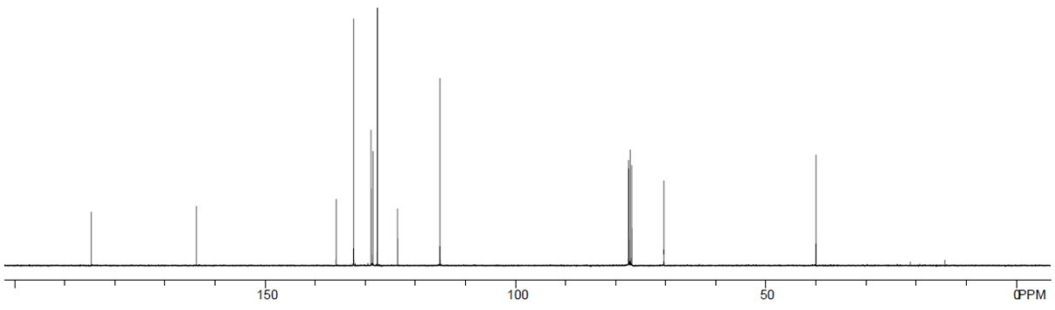




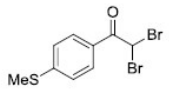
1-(4-(benzyloxy)phenyl)-2,2-dibromoethanone (3d)

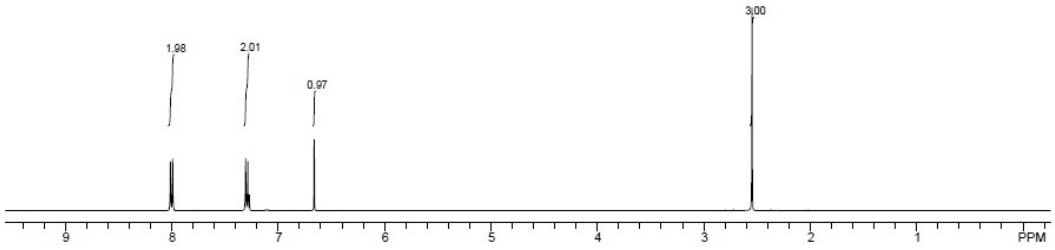


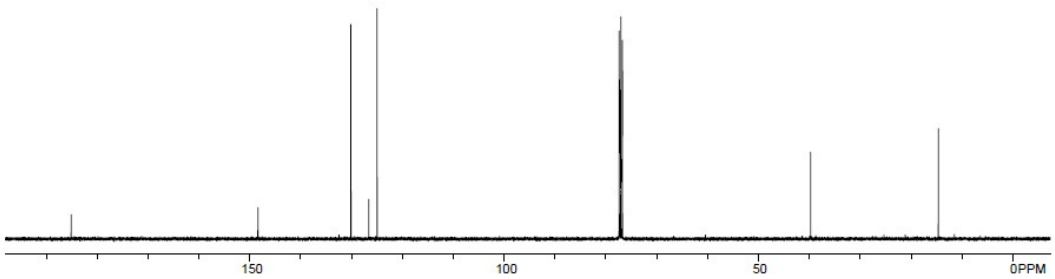




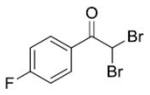
2,2-dibromo-1-(4-(methylthio)phenyl)ethanone (3e)

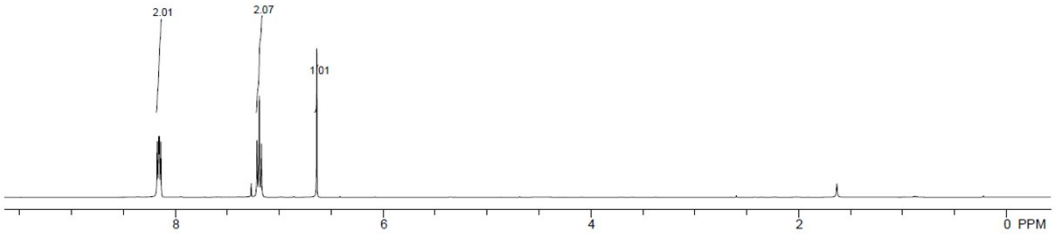


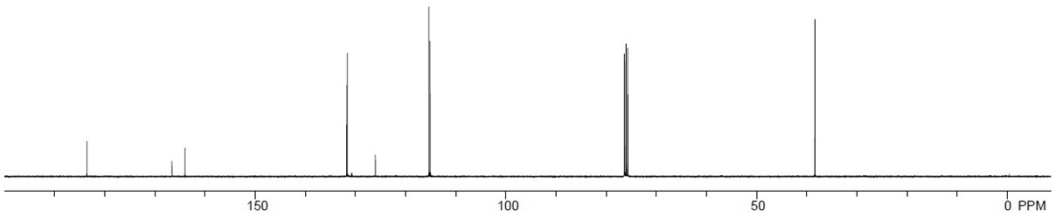




2,2-dibromo-1-(4-fluorophenyl)ethanone (3f)







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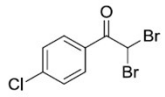

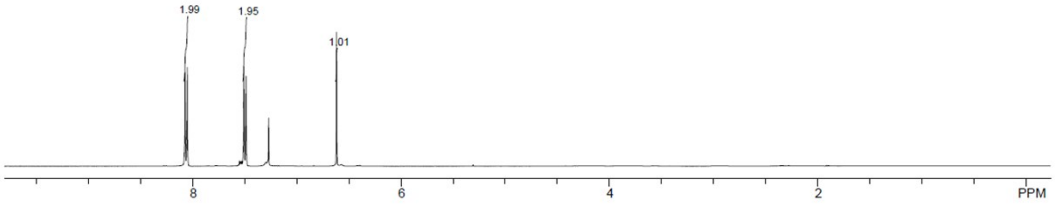

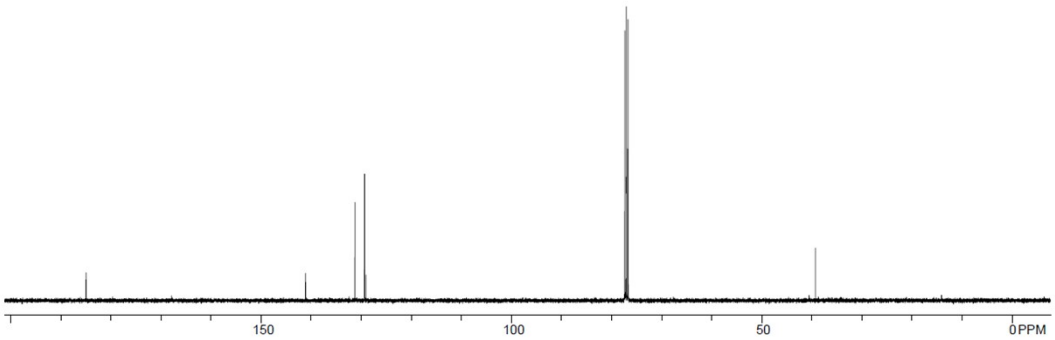

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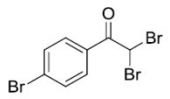

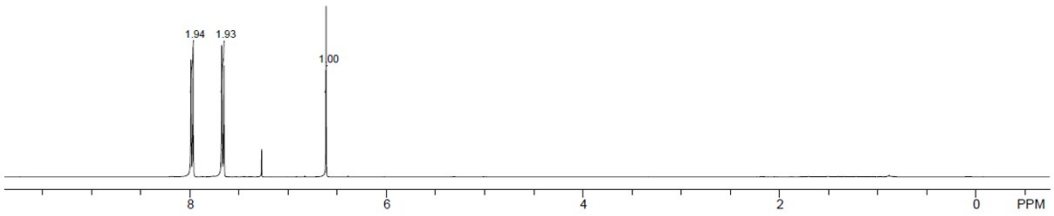

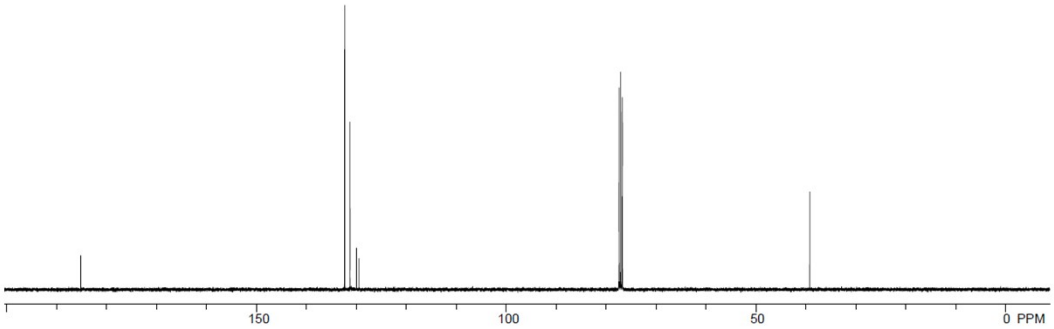

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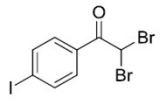

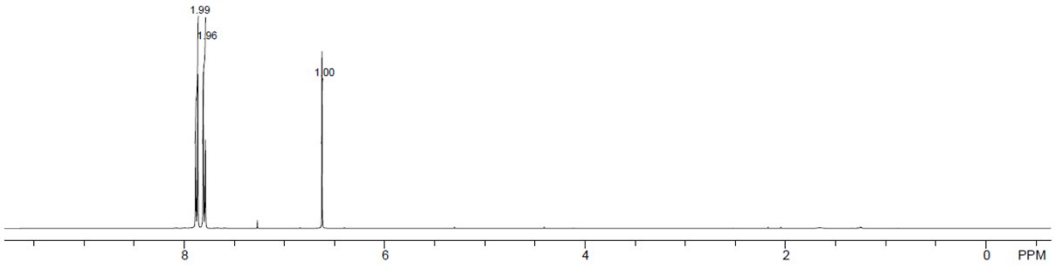

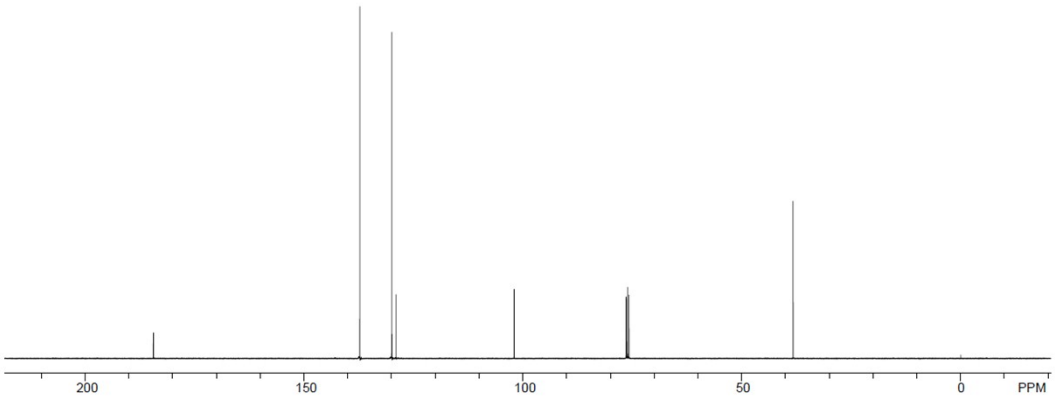

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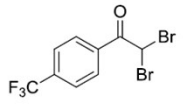

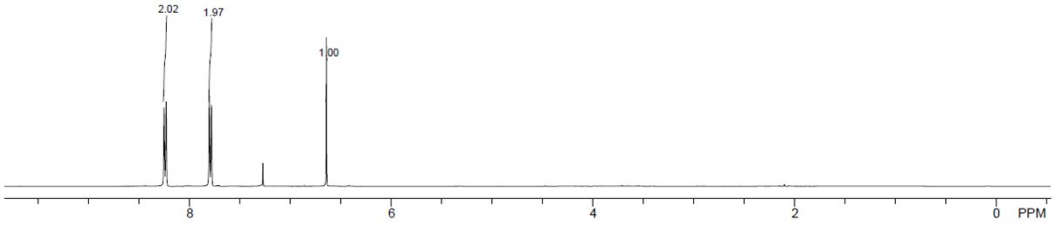

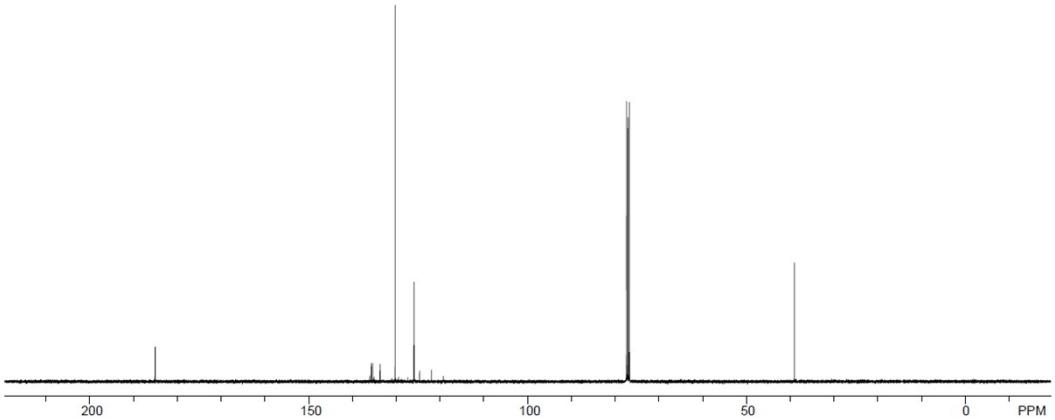

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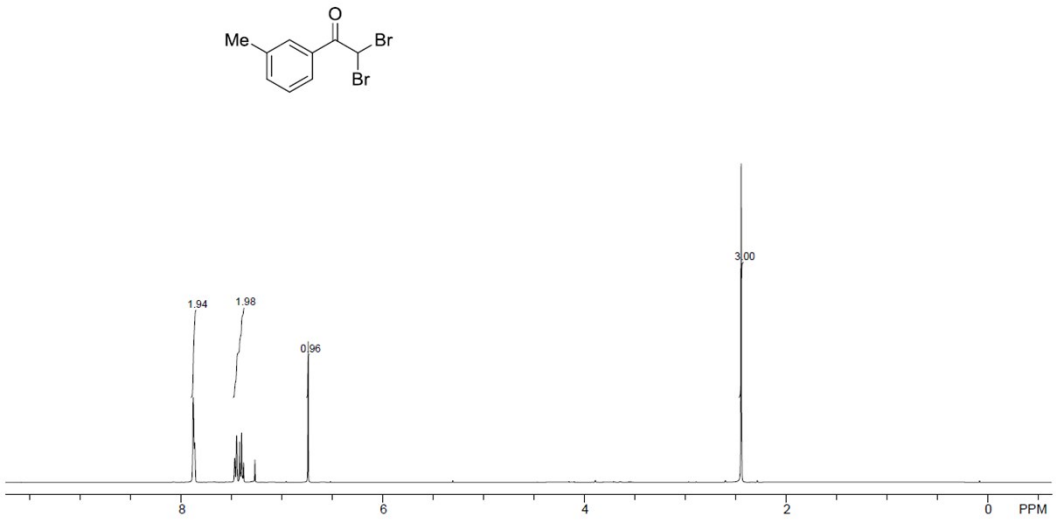

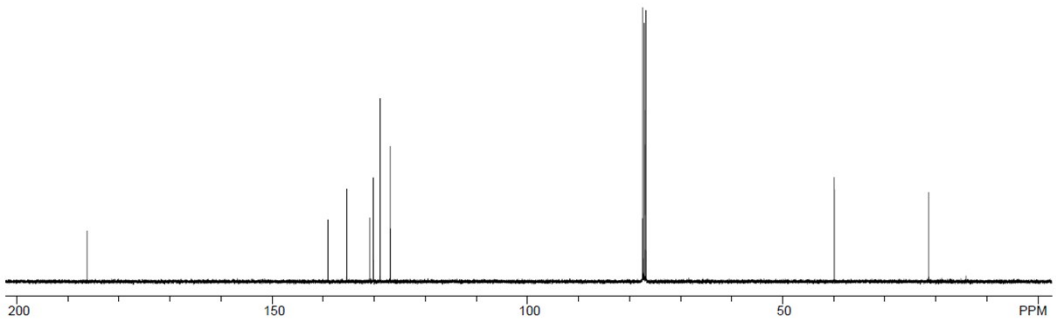

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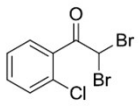

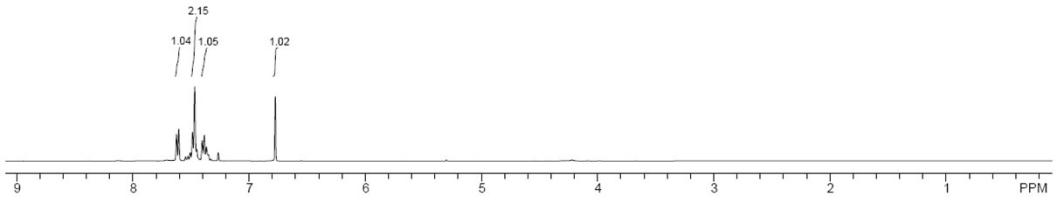

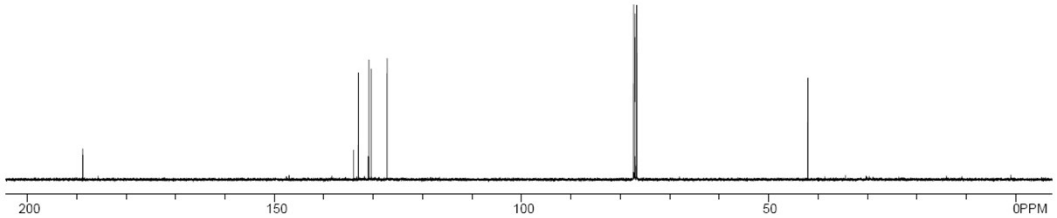

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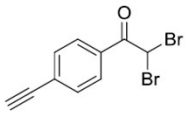
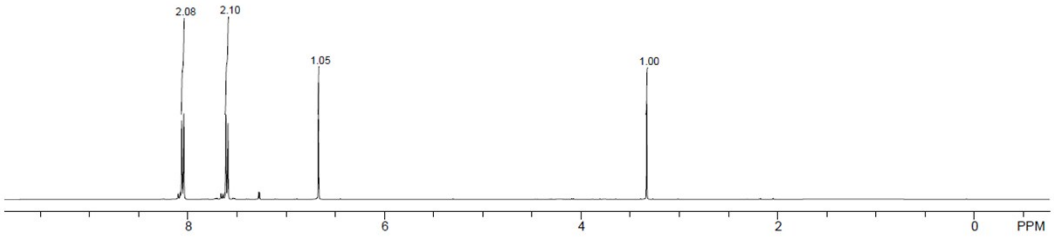
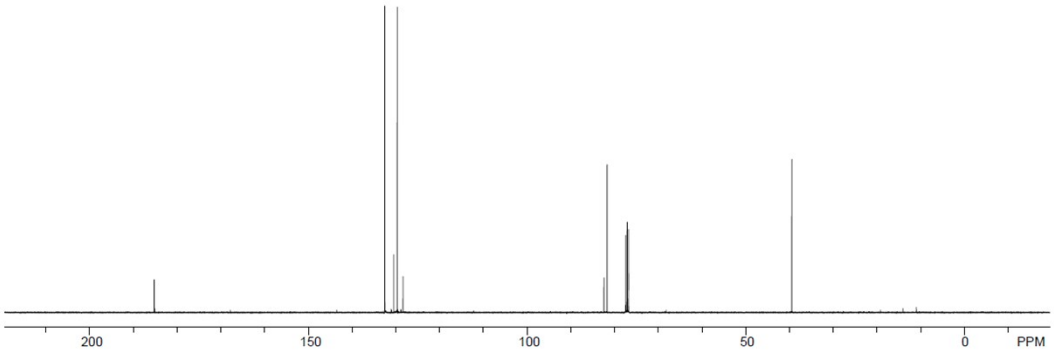
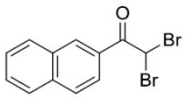
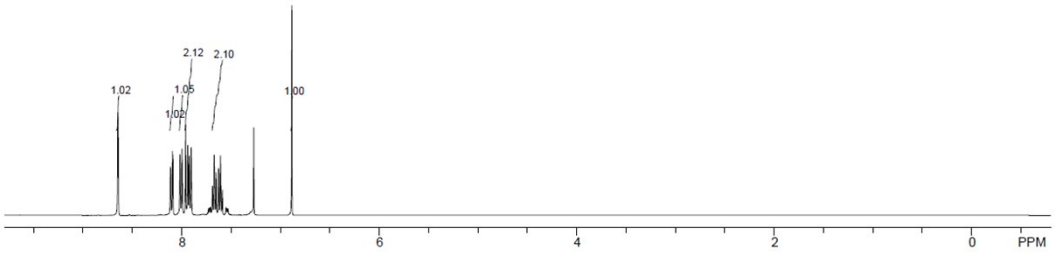


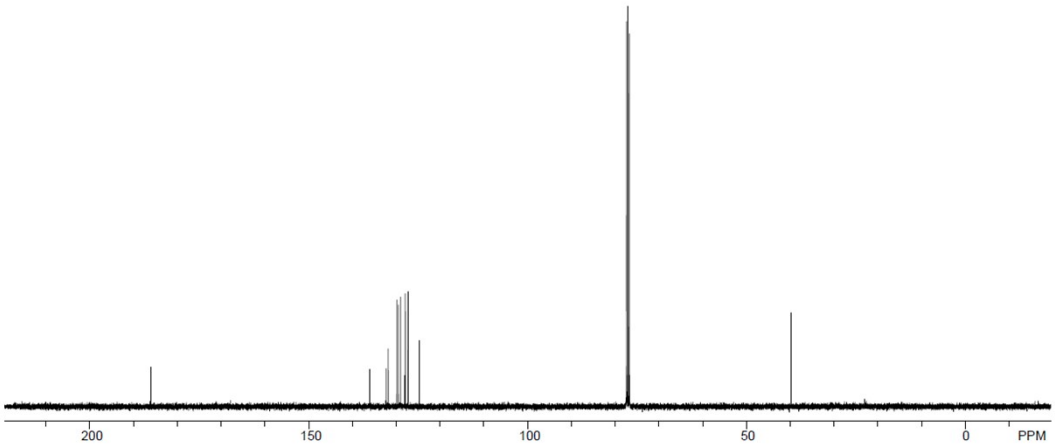




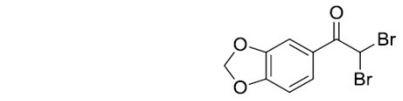
2,2-dibromo-1-(naphthalen-2-yl)ethanone (3n)

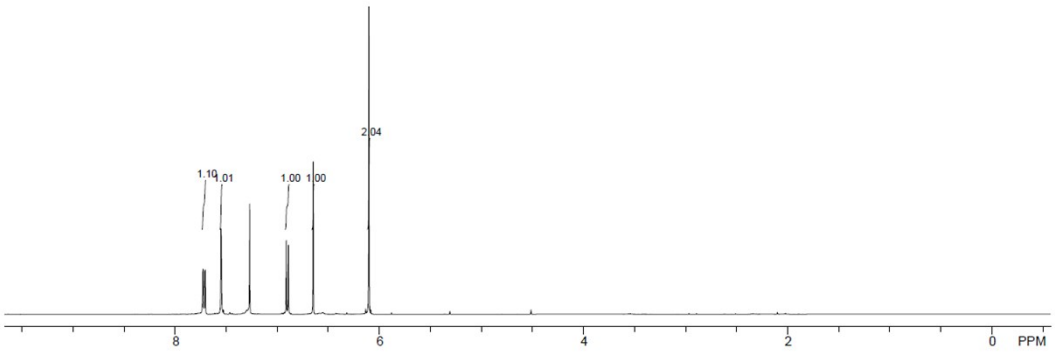


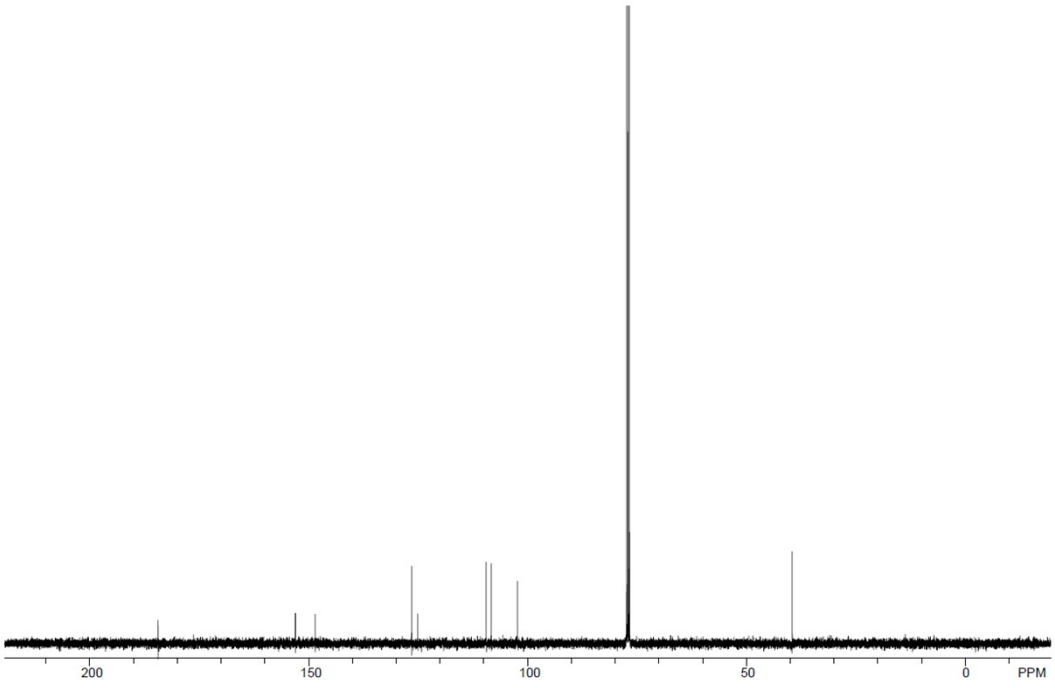




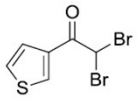
1-(benzo[d][1,3]dioxol-5-yl)-2,2-dibromoethanone (3o)

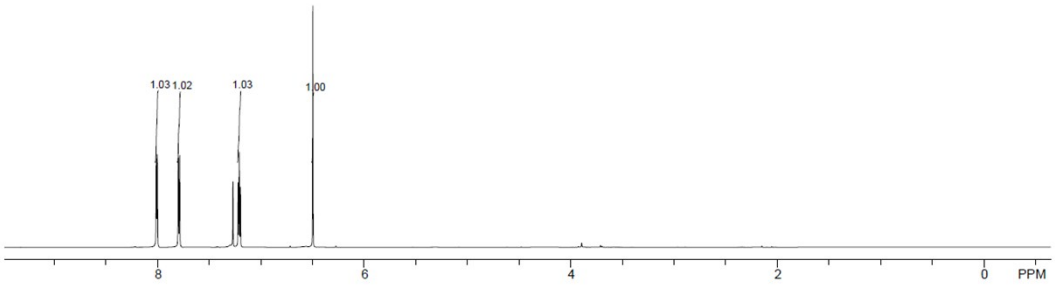


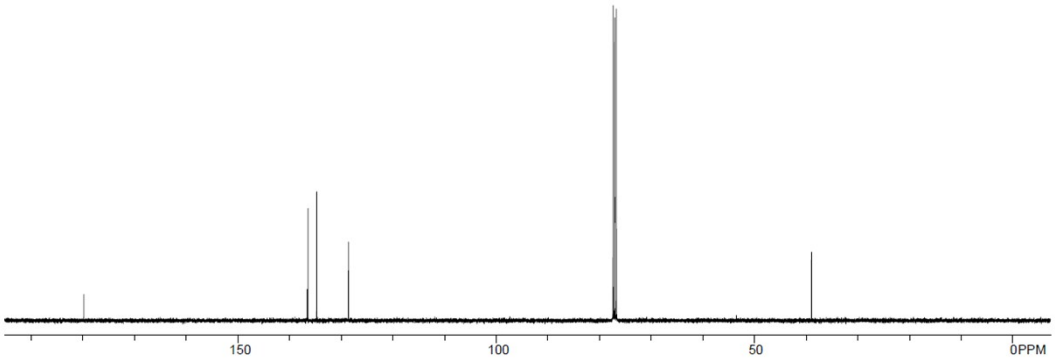




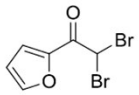
2,2-dibromo-1-(thiophen-3-yl)ethanone (3p)

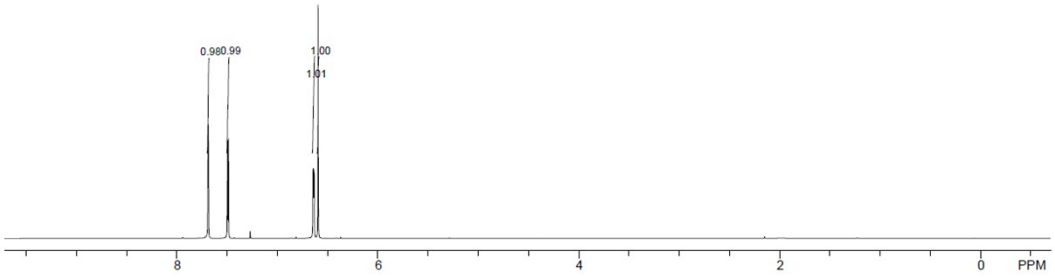


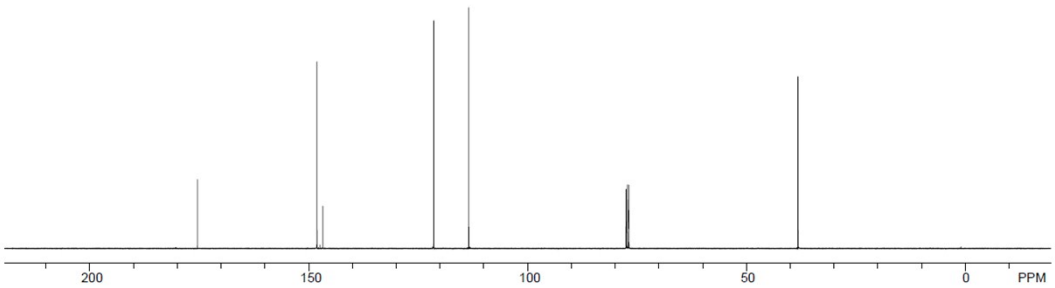




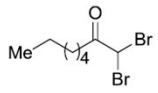
2,2-dibromo-1-(furan-2-yl)ethanone (3q)

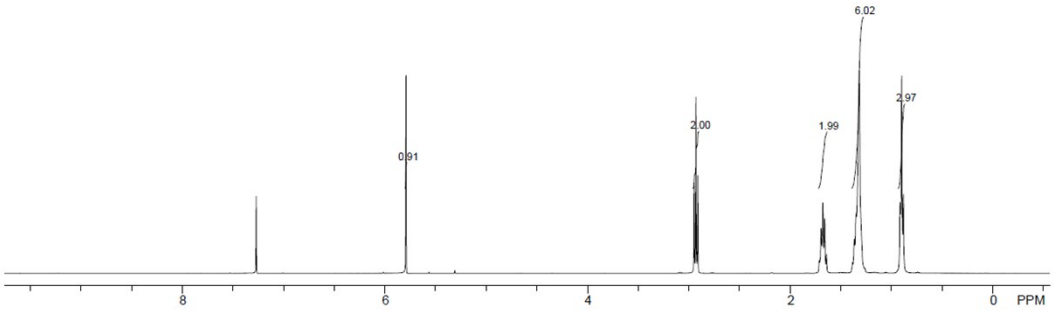


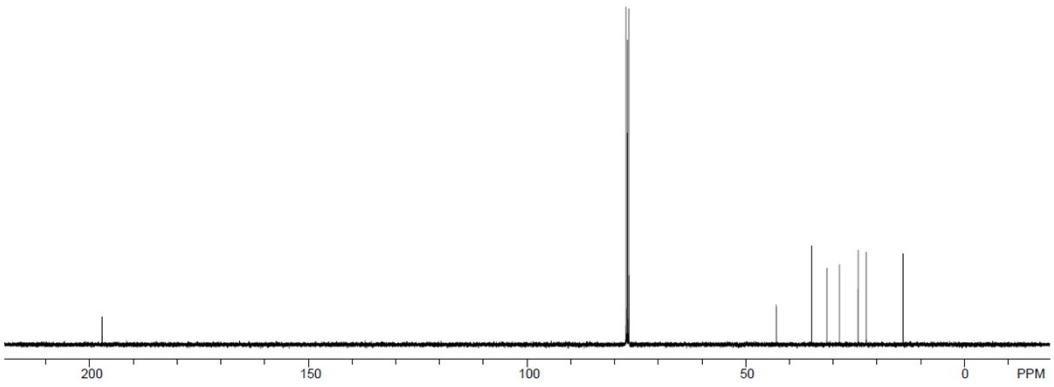




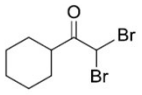
1,1-dibromooctan-2-one (3r)

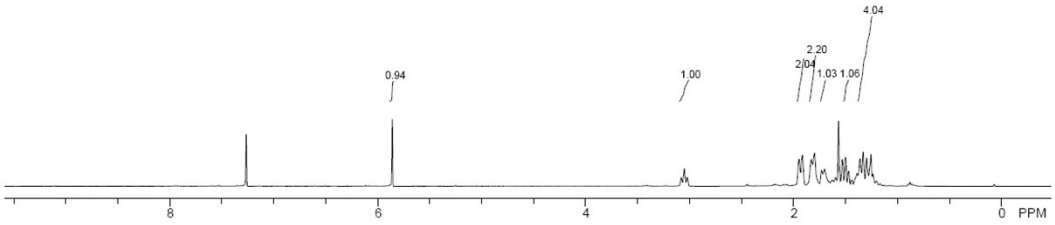


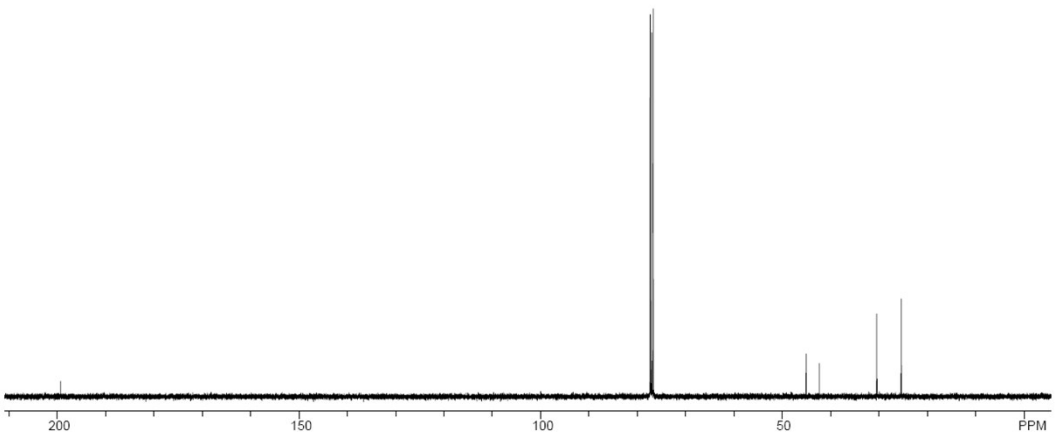




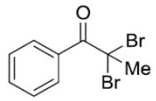
2,2-dibromo-1-cyclohexylethanone (3s)

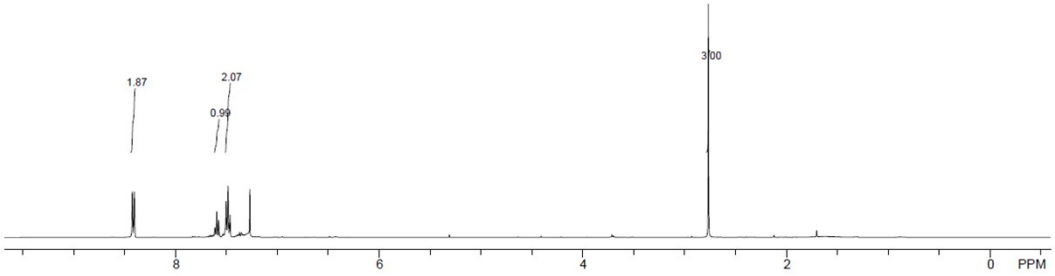


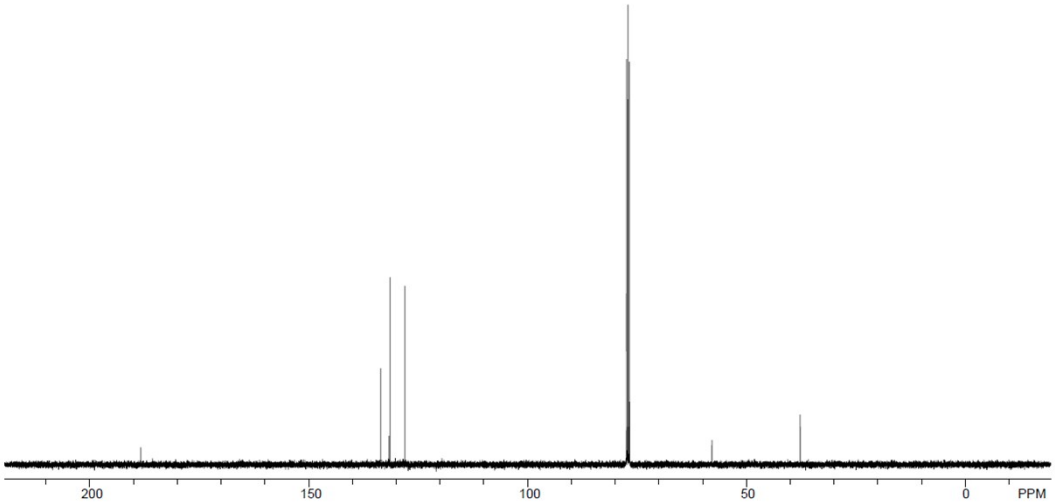




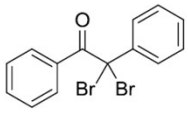
2,2-dibromo-1-phenylpropan-1-one (3u)

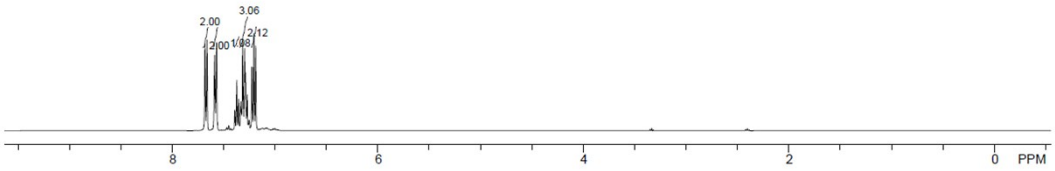


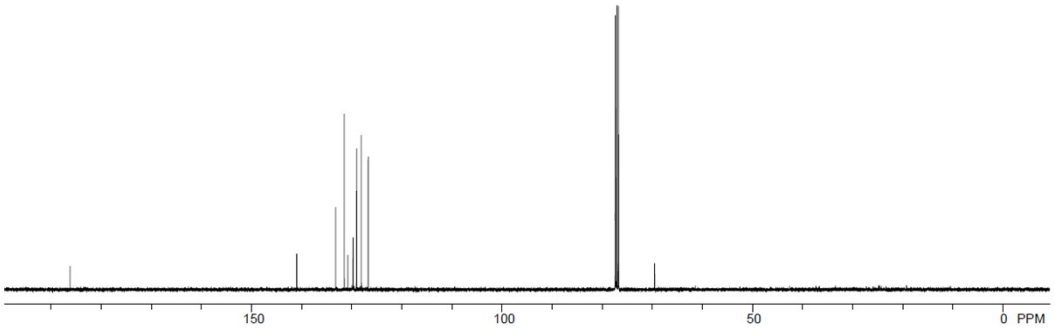




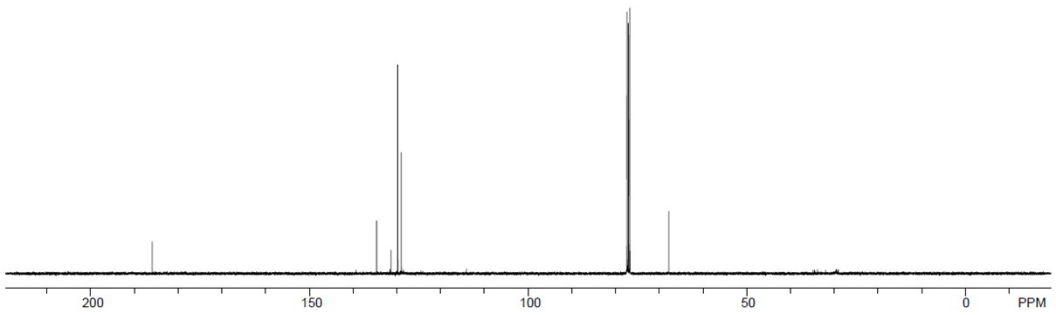
2,2-dibromo-1,2-diphenylethanone (3v)



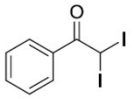


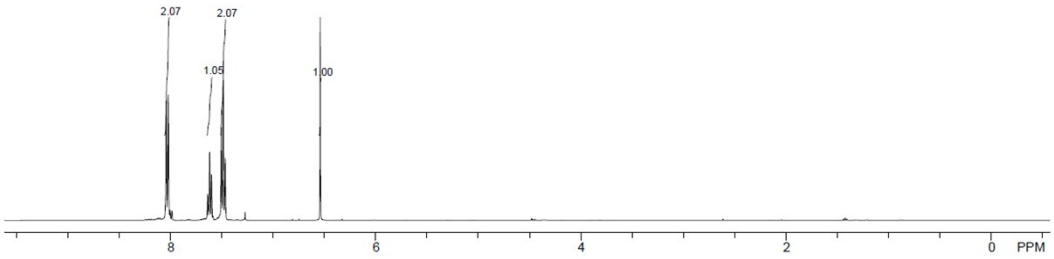


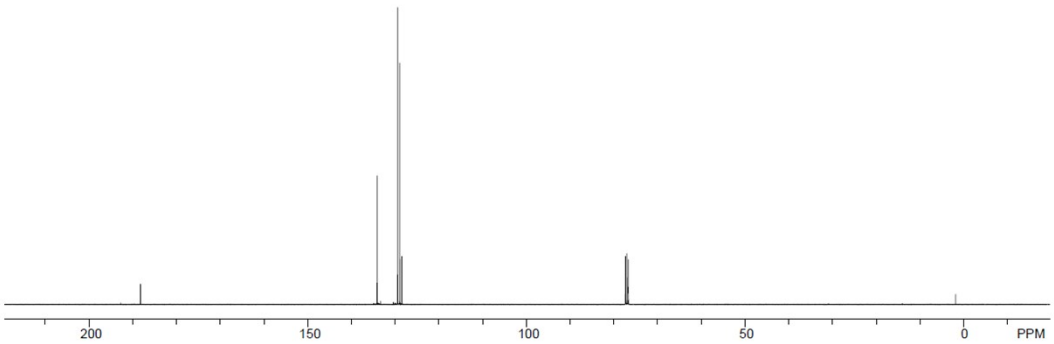
2,2-dichloro-1-phenylethanone (3w)



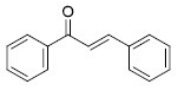
2,2-diiodo-1-phenylethanone (3x)

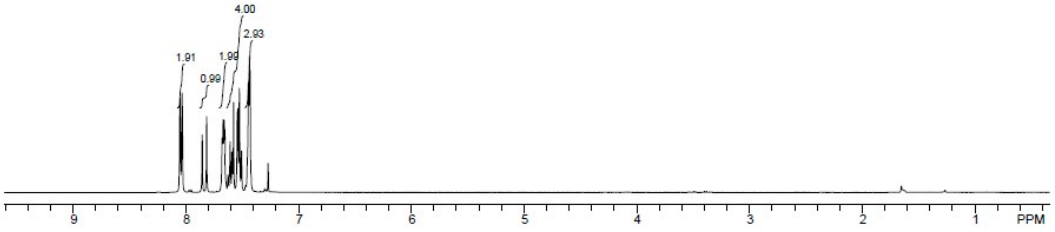


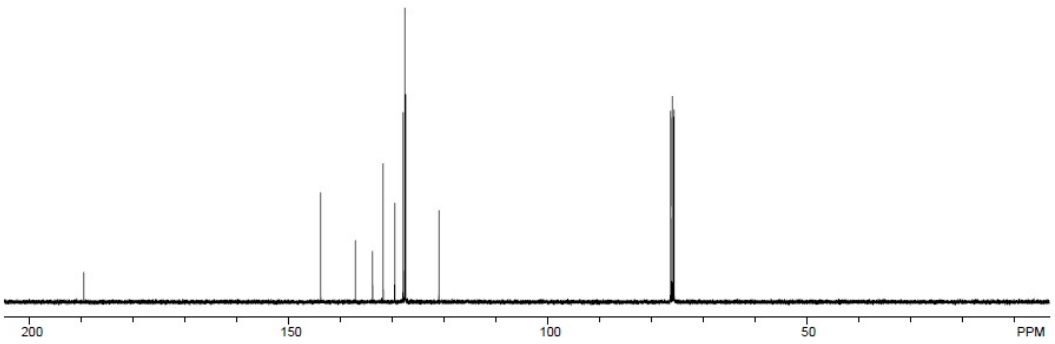




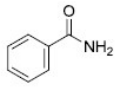
(E)-chalcone (4a)

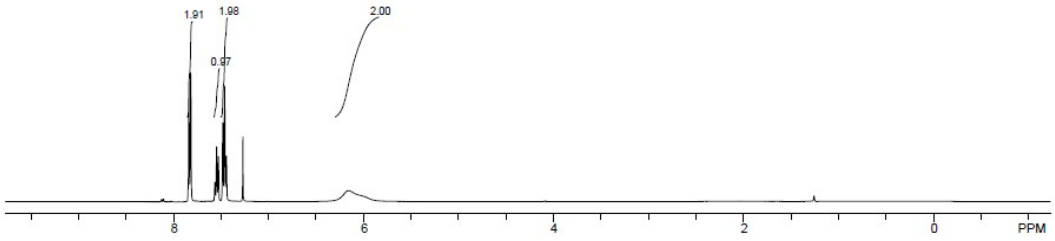


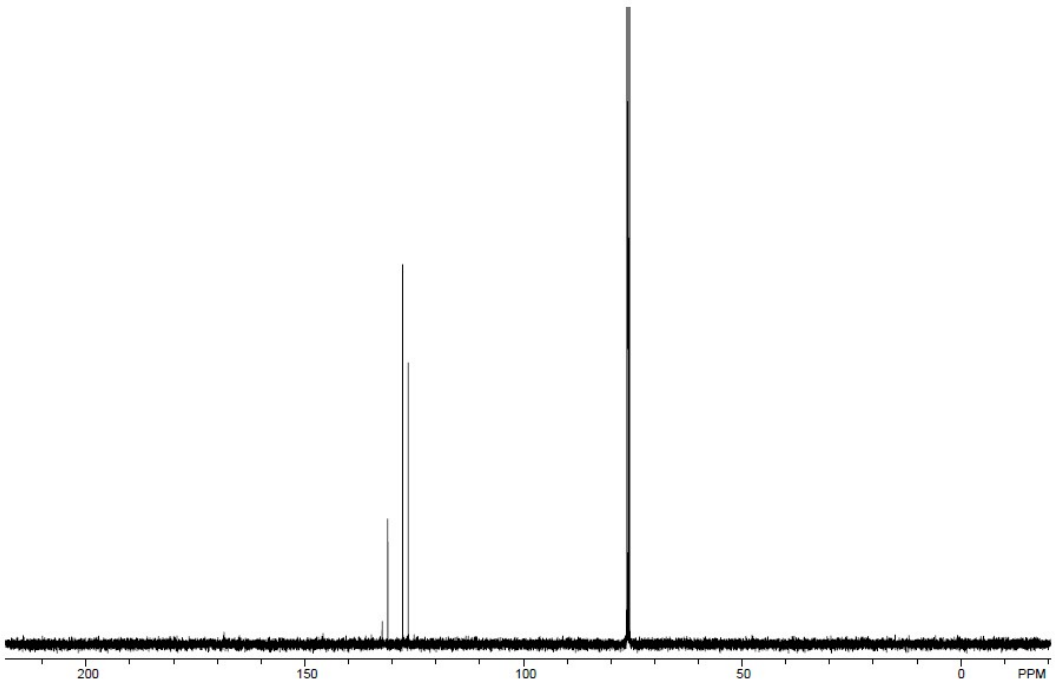




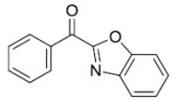
Benzamide (4b)

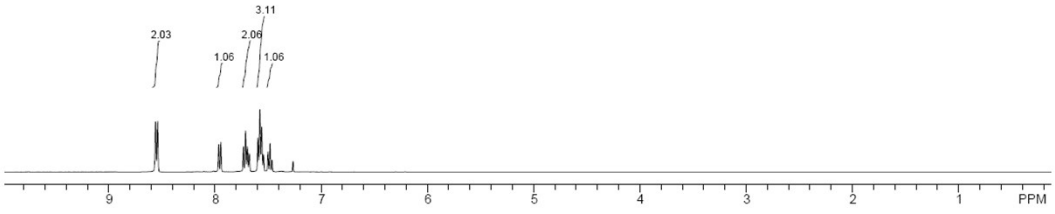


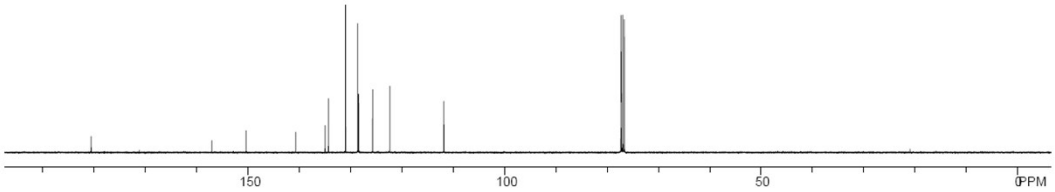




Benzo[d]oxazol-2-yl(phenyl)methanone (5a)







Benzo[d]thiazol-2-yl(phenyl)methanone (5b)