*Supporting Information*

# One-Pot, Regiospecific Assembly of (*E*)-Benzamidines From δ- and γ-Amino Acids Via an Intramolecular Aminoquinazolinone Rearrangement

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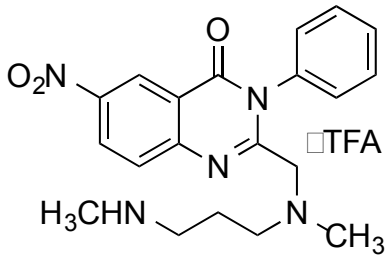
**General Methods**

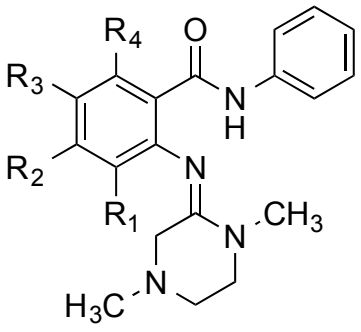
Analytical TLC experiments were performed on Hard Layer Silica Gel UNIPLATE™ (with organic binder) plates from Analtech, Inc. and analyzed with 254 nm UV light using diluted samples. All compounds were initially characterized at the University of Kansas with the following instrumentation: $^{1}H$ and $^{13}C$ NMR spectra were recorded on a Bruker Avance 400 spectrometer (operating at 400 and 101 MHz respectively) or a Bruker Avance AVIII 500 spectrometer (operating at 500 and 126 MHz, respectively) and reported with either 0.05% TMS ($^{1}H$ = $\delta$ 0.00 ppm, $^{13}C$ = $\delta$ 0.00 ppm) or residual solvent ($CHCl_3$: $^{1}H$ = $\delta$ 7.26 ppm, $^{13}C$ = $\delta$ 77.16 ppm; $CD_3SOCD_2H$: $^{1}H$ = $\delta$ 2.50 ppm, $^{13}C$ = $\delta$ 39.52 ppm) as an internal standard. Compounds **17a** and **22c** also were later characterized by $^{1}H$ and $^{13}C$ NMR at the University of Wisconsin-Madison on a Varian Unity-Inova 400 MHz NMR spectrometer (operating at 400 and 101 MHz, respectively) or a Varian Unity-Inova 500 MHz NMR spectrometer (operating at 500 and 126 MHz, respectively) in $CDCl_3$ ($CHCl_3$: $^{1}H$ = $\delta$ 7.26 ppm, $^{13}C$ = $\delta$ 77.16 ppm) which is included in this supporting information. The chemical shifts ($\delta$) reported are given in parts per million (ppm) and the coupling constants (*J*) are in Hertz (Hz). The spin multiplicities are reported as s = singlet, br s = broad singlet, d = doublet, t = triplet, q = quartet, p = pentuplet, dd = doublet of doublet, ddd = doublet of doublet of doublet, and m = multiplet. The LC-MS analysis was performed on an Agilent 1200 HPLC system with photodiode array UV detection and an Agilent 6224 TOF mass spectrometer. The chromatographic method utilized the following parameters: a Waters Acquity BEH C-18 2.1 x 50 mm, 1.7 µm column; UV detection wavelength = 214 nm; flow rate = 0.4 mL/min; gradient = 5-100% $CH_3CN$ over 3 minutes with a hold of 0.8 minutes at 100% $CH_3CN$; the aqueous mobile phase contained 0.15% $NH_4OH$. The mass spectrometer utilized the following parameters: an Agilent multimode source which simultaneously acquires ESI+/APCI+; a reference mass solution consisting of purine and hexakis(1*H*, 1*H*, 3*H*-tetrafluoropropoxy) phosphazine; and a make-up solvent of 90:10:0.1 $MeOH/H_2O/HCO_2H$ which was introduced to the LC flow prior to the source to assist ionization. Melting points were determined on a Stanford Research Systems OptiMelt apparatus. Microwave irradiated (MWI) reactions were carried out using a Biotage Initiator Classic synthesizer. Flash chromatography separations were carried out using a Teledyne Isco CombiFlash Rf 200 purification system with either silica gel columns (normal-phase) or RediSep Rf C-18 columns (reverse-phase). Unless otherwise noted, all reagents and starting materials were purchased from commercial vendors. Compounds **3a**, **3c**, **3e**, **3f**, **3h** and **7e** may be commercially available depending on the vendor; however, these compounds were prepared as described below. Chloroacylalkylchlorides **16a-b** were purchased from Sigma-Aldrich, and *N*-BOC-protected amino acid **20a** was purchased from Combi-Blocks, Inc.

Synthesis of intermediates **3a-m** and **7a-m** are described in the sequential steps for generating products **12a-m**. Characterization data for a subset of these intermediates follows the synthetic protocol.




**2-((Methyl(3-(methylamino)propyl)amino)methyl)-6-nitro-3-phenylquinazolin-4(3*H*)-one 2,2,2-trifluoroacetic acid salt (11).** BOC-protected quinazolinone **9**[1] (105 mg, 0.22 mmol) was dissolved in dry $CH_2Cl_2$ (3.4 mL) and TFA (1.4 mL). After stirring at rt for 45 min, the mixture was diluted with water (7 mL) and $CH_2Cl_2$ (7 mL). The reaction was slowly quenched to pH 10 with saturated aq. $Na_2CO_3$ (6 mL). The product was extracted with $CH_2Cl_2$ (3 x 15 mL) and dried with $Na_2SO_4$ to give **11** (106 mg, 98%) as a white solid. $^1$H NMR, $^{13}$C NMR and HRMS were in accordance with previously reported data.[1]

**General Procedure for the Synthesis of (*E*)-Benzamidines 12a-m (Table 1)**




***Step 1:*** **General Synthesis of 2-(2-Chloroacetamido)benzoic acids 3a-m.** Each anthranilic acid **2a-m** (5.0 mmol) was added to a large vial and dissolved in dry $CH_2Cl_2$ (20 mL). Triethylamine (0.77 mL, 5.5 mmol) was added to the reaction solution, followed by dropwise addition of chloroacetyl

chloride (0.44 mL, 5.5 mmol). The vial was capped and the reaction mixture was stirred at rt for 17 hours. If the product **a**) precipitated, the solvent was removed *in vacuo* and water (20 mL) was added. The product was then filtered, re-dissolved in acetone (50 mL) and concentrated to dryness to give the title analog. However, if the product **b**) did not precipitate at the end of the reaction, the mixture was diluted with $CH_2Cl_2$ (20 mL), rinsed with water (2 x 40 mL) and dried with $Na_2SO_4$ to give the title analog.

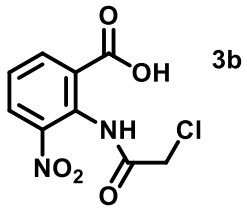
***Step 2:*** **General Synthesis of Chloromethylquinazolinones 7a-m.** Each substituted 2-(2-chloroacetamido)benzoic acid **3** (1.4 mmol) was placed in a capped MW vial. The atmosphere was replaced with argon and dry $CH_3CN$ (4 mL) was added to the vial. Phosphorus oxychloride (0.25 mL, 2.7 mmol) and a solution of aniline (0.16 mL, 1.8 mmol) in dry $CH_3CN$ (1.4 mL) were added to the mixture while stirring at rt. The mixture was heated at 150 °C with MWI for 15 min. The reaction mixture was allowed to reach rt and slowly quenched with saturated aq. $NaHCO_3$ (15 mL). The product was extracted with $CH_2Cl_2$ (3 x 20 mL) and purified by normal-phase chromatography (0-100% EtOAc/hexanes) to yield the corresponding chloromethylquinazolinone **7a-m**.

***Step 3 (Condition A):*** **General Synthesis of (*E*)-Benzamidines 12a-m.** Each chloromethylquinazolinone **7a-m** (0.20 mmol) was dissolved in dry $CH_3CN$ (1.4 mL), except **7f-i** (0.16 mmol) which were each run in $CH_3CN$ (4 mL) in order to minimize the formation of dimer side-products. Potassium carbonate (56 mg, 0.41 mmol) and *N*,*N*′-dimethyl-1,2-ethanediamine (0.03 mL, 0.28 mmol) were successively added to the reaction solution and the mixture was stirred at 50 °C for 1 hour. After reaching rt, the all of the liquid in the reaction vessel was transferred via syringe and directly injected into the reverse-phase column and purified, leaving only the solid potassium carbonate remaining in the flask. The supernatant was purified by reverse-phase chromatography (10-100% $CH_3CN$/water) to give the desired (*E*)-benzamidines **12a-m** (yields are shown in Table 1). For the synthesis of **12e-j** using Condition A, a dimer side-product was produced and was also fully characterized (data not shown).

***Step 3 (Condition B):*** **General Synthesis of (*E*)-Benzamidines 12a-m.** Each chloromethylquinazolinone **7a-m** (0.22 mmol) was dissolved in dry DMF (1.5 mL). Potassium

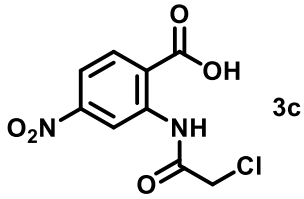
carbonate (62 mg, 0.45 mmol) and *N*,*N'*-dimethyl-1,2-ethanediamine (0.03 mL, 0.28 mmol) were successively added to the reaction solution and the mixture was stirred at rt for 2 hours. The supernatant was purified by reverse-phase chromatography (10-100% $CH_3CN$/water) to give the desired (*E*)-benzamidines **12a-g,** and **12i-m** (yields are shown in Table 1).

The synthesis and characterization of intermediate **3a** was previously disclosed.[1] Intermediates **3b-e**, and **3g-j** are described below:



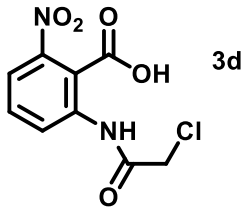

**3b**

**Isolated 2-(2-chloroacetamido)-3-nitrobenzoic acid (3b)**. Yellow solid, 91%. $^1$H NMR (400 MHz, DMSO-$d_6$) $\delta$ 13.88 (s, 1Hs), 10.96 (s, 1H), 8.18 (ddd, *J* = 16.8, 8.0, 1.6 Hz, 2H), 7.56 (t, *J* = 8.0 Hz, 1H), 4.38 (s, 2H).



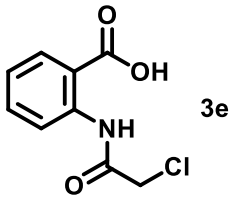

**3c**

**2-(2-chloroacetamido)-4-nitrobenzoic acid (3c)**. Yellow orange solid, 100%. $^1$H NMR (400 MHz, DMSO-$d_6$) δ 11.96 (s, 1H), 9.35 (d, *J* = 2.4 Hz, 1H), 8.25 (d, *J* = 8.7 Hz, 1H), 8.03 (dd, *J* = 8.7, 2.4 Hz, 1H), 4.53 (s, 2H).



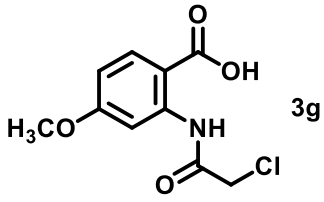

**3d**

**2-(2-chloroacetamido)-6-nitrobenzoic acid (3d)**. Orange solid, 59%. $^1$H NMR (400 MHz, DMSO-$d_6$) δ 11.31 (s, 1H), 8.28 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.72 (dd, *J* = 8.1, 1.4 Hz, 1H), 7.68 (t, *J* = 8.0 Hz, 1H), 4.43 (s, 2H).



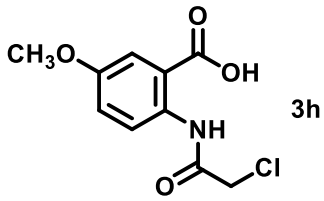

3e

**2-(2-chloroacetamido)benzoic acid (3e)**. White solid, 91%. $^1$H NMR (400 MHz, DMSO-$d_6$) δ 13.76 (s, 1H), 11.84 (s, 1H), 8.54 (dd, *J* = 8.5, 1.1 Hz, 1H), 8.03 (dd, *J* = 7.9, 1.7 Hz, 1H), 7.64 (ddd, *J* = 8.3, 7.3, 1.7 Hz, 1H), 7.23 (ddd, *J* = 7.9, 7.3, 1.2 Hz, 1H), 4.46 (s, 2H).



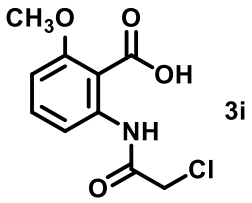

3g

**2-(2-chloroacetamido)-4-methoxybenzoic acid (3g)**: White solid, 54%. $^1$H NMR (400 MHz, DMSO-$d_6$) *δ* 13.41 (s, 1H), 12.04 (s, 1H), 8.20 (d, *J* = 2.6 Hz, 1H), 7.97 (d, *J* = 8.9 Hz, 1H), 6.77 (dd, *J* = 8.9, 2.6 Hz, 1H), 4.45 (s, 2H), 3.82 (s, 3H).



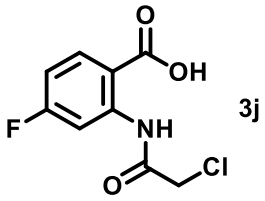

3h

**2-(2-chloroacetamido)-5-methoxybenzoic acid (3h)**. Off white solid, 93%. $^1$H NMR (400 MHz, DMSO-$d_6$) δ 13.82 (s, 1H), 11.52 (s, 1H), 8.42 (d, *J* = 9.2 Hz, 1H), 7.49 (d, *J* = 3.1 Hz, 1H), 7.25 (dd, *J* = 9.2, 3.1 Hz, 1H), 4.42 (s, 2H), 3.80 (s, 3H).




3i

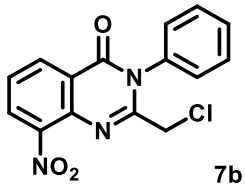
**Isolated 2-(2-chloroacetamido)-6-methoxybenzoic acid (3i)**: Off white solid, 83%. $^1$H NMR (400 MHz, DMSO-$d_6$) $\delta$ 13.25 (br s, 1 H), 10.04 (s, 1H), 7.50 – 7.40 (m, 2H), 7.00 (dd, $J$ = 7.7, 1.7 Hz, 1H), 4.38 (s, 2H), 3.86 (s, 3H).




3j

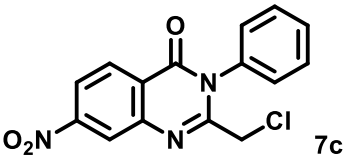
**2-(2-chloroacetamido)-4-fluorobenzoic acid (3j)**: Off white solid, 92%. $^1$H NMR (400 MHz, DMSO-$d_6$) δ 13.87 (s, 1H), 12.04 (s, 1H), 8.38 (dd, $J$ = 12.1, 2.7 Hz, 1H), 8.10 (dd, $J$ = 8.9, 6.7 Hz, 1H), 7.07 (ddd, $J$ = 8.9, 7.9, 2.7 Hz, 1H), 4.48 (s, 2H).

Compounds **7a** and **7l** have been previously described.[1] Intermediate **7e** was also reported elsewhere.[2] Intermediates **7b-k** and **7m** are described below.



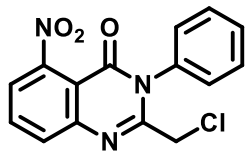

7b

**2-(chloromethyl)-8-nitro-3-phenylquinazolin-4(3H)-one** (**7b**). Pale orange solid, 56%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.42 (dd, $J$ = 8.1, 1.5 Hz, 1H), 8.04 (dd, $J$ = 7.8, 1.5 Hz, 1H), 7.57 – 7.50 (m, 4H), 7.32 – 7.25 (m, 2H), 4.21 (s, 2H).



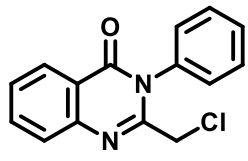

7c

**2-(chloromethyl)-7-nitro-3-phenylquinazolin-4(3H)-one (7c)**. Burnt-yellow solid, 63%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.63 (dd, $J$ = 2.2, 0.5 Hz, 1H), 8.46 (dd, $J$ = 8.8, 0.5 Hz, 1H), 8.30 (dd, $J$ = 8.7, 2.2 Hz, 1H), 7.65 – 7.57 (m, 3H), 7.41 – 7.35 (m, 2H), 4.29 (s, 2H).



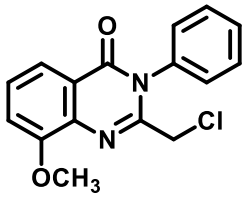
7d

**2-(chloromethyl)-5-nitro-3-phenylquinazolin-4(3H)-one (7d)**. Light-brown solid, 55%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.98 (dd, $J$ = 8.3, 1.2 Hz, 1H), 7.91 (dd, $J$ = 8.3, 7.6 Hz, 1H), 7.63 – 7.55 (m, 4H), 7.41 – 7.36 (m, 2H), 4.30 (s, 2H).



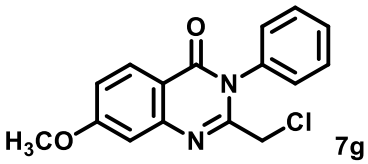
7e

**2-(chloromethyl)-3-phenylquinazolin-4(3H)-one (7e).** White solid, 72%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.31 (ddd, $J$ = 8.0, 1.5, 0.6 Hz, 1H), 7.85 – 7.76 (m, 2H), 7.62 – 7.52 (m, 4H), 7.40 – 7.34 (m, 2H), 4.27 (s, 2H). **7e** is also commercially available, CAS 22312-77-2 and is also previously described.[2]



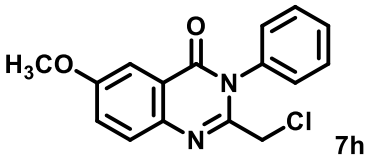
7f

**2-(chloromethyl)-8-methoxy-3-phenylquinazolin-4(3H)-one (7f).** Yellow-orange solid, 63%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.91 (dd, $J$ = 8.0, 1.3 Hz, 1H), 7.63 – 7.56 (m, 3H), 7.51 (t, $J$ = 8.0 Hz, 1H), 7.41 – 7.37 (m, 2H), 7.29 (m, 1H), 4.38 (s, 2H), 4.09 (s, 3H).



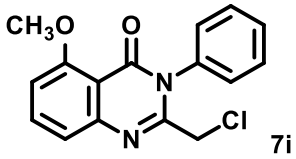

**7g**

**2-(chloromethyl)-7-methoxy-3-phenylquinazolin-4(3H)-one (7g).** Off white solid, 63%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.12 (d, $J$ = 8.8 Hz, 1H), 7.56 – 7.44 (m, 3H), 7.33 – 7.26 (m, 2H), 7.12 (d, $J$ = 2.5 Hz, 1H), 7.04 (dd, $J$ = 8.9, 2.5 Hz, 1H), 4.19 (s, 2H), 3.88 (s, 3H).



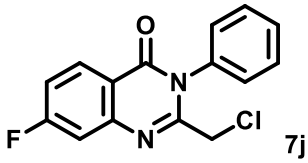

**7h**

**2-(chloromethyl)-6-methoxy-3-phenylquinazolin-4(3H)-one (7h).** Pale yellow solid, 72%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.75 (d, $J$ = 8.9 Hz, 1H), 7.69 (d, $J$ = 3.0 Hz, 1H), 7.64 – 7.57 (m, 3H), 7.43 (dd, $J$ = 8.9, 3.0 Hz, 1H), 7.41 – 7.37 (m, 2H), 4.30 (s, 2H), 3.95 (s, 3H).



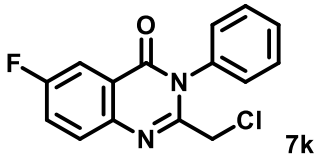

**7i**

**2-(chloromethyl)-5-methoxy-3-phenylquinazolin-4(3H)-one (7i)**. Pale yellow solid, 69%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.64 (t, $J$ = 8.2 Hz, 1H), 7.51 – 7.43 (m, 3H), 7.30 (dd, $J$ = 8.1, 1.0 Hz, 1H), 7.28 – 7.24 (m, 2H), 6.89 (dd, $J$ = 8.4, 1.0 Hz, 1H), 4.17 (s, 2H), 3.90 (s, 3H).



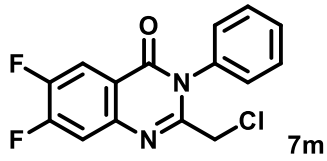

**7j**

**2-(chloromethyl)-7-fluoro-3-phenylquinazolin-4(3H)-one (7j)**. Light brown solid, 75%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.31 (dd, $J$ = 8.9, 6.0 Hz, 1H), 7.62 – 7.53 (m, 3H), 7.43 (dd, $J$ = 9.5, 2.5 Hz, 1H), 7.39 – 7.34 (m, 2H), 7.26 (m, 1H), 4.25 (s, 2H).



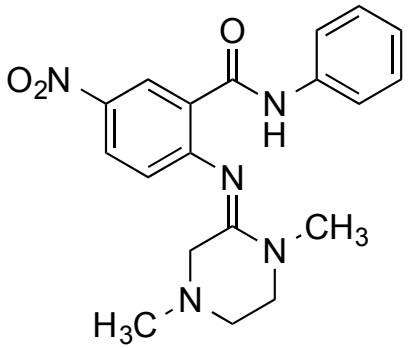
7k

**Isolated 2-(chloromethyl)-6-fluoro-3-phenylquinazolin-4(3H)-one (7k).** White solid, 70%. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.93 (dd, $J$ = 8.3, 3.0 Hz, 1H), 7.79 (dd, $J$ = 8.9, 4.8 Hz, 1H), 7.62 – 7.50 (m, 4H), 7.39 – 7.33 (m, 2H), 4.26 (s, 2H).

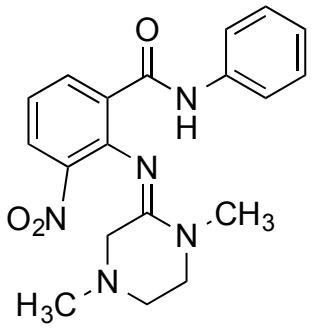


7m

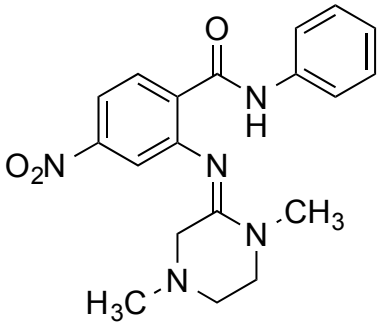
**2-(chloromethyl)-6,7-difluoro-3-phenylquinazolin-4(3H)-one (7m)**. Beige solid, 51%. $^1$H NMR (400 MHz, Chloroform-*d*) δ 8.05 (dd, $J$ = 9.8, 8.4 Hz, 1H), 7.63 – 7.54 (m, 4H), 7.38 – 7.33 (m, 2H), 4.24 (s, 2H).



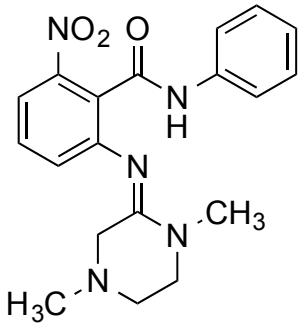

**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-5-nitro-*N*-phenylbenzamide (12a).** Yellow solid (68% over 3 steps using Condition A, 61% over 3 steps using B). $^1$H NMR, $^{13}$C NMR and HRMS were in accordance with previously reported data.[1]



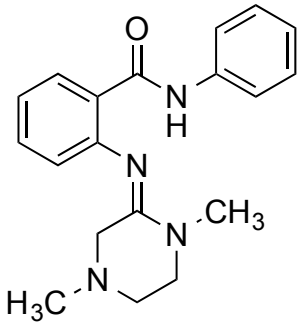
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-3-nitro-*N*-phenylbenzamide (12b).** Yellow solid (36% over 3 steps using Condition A, 49% over 3 steps using Condition B). TLC (10% MeOH/$CH_2Cl_2$): $R_f$ = 0.6. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 10.16 (s, 1H), 8.39 (dd, $J$ = 7.9, 1.7 Hz, 1H), 7.93 (dd, $J$ = 8.1, 1.7 Hz, 1H), 7.62–7.56 (m, 2H), 7.38–7.32 (m, 2H), 7.18 (t, $J$ = 8.0 Hz, 1H), 7.15–7.08 (m, 1H), 3.46–3.35 (m, 2H), 3.23 (s, 3H), 3.01 (d, $J$ = 15.7 Hz, 1H), 2.82 (d, $J$ = 15.9 Hz, 1H), 2.68–2.53 (m, 2H), 2.18 (s, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 163.4, 158.2, 143.7, 143.1, 138.3, 135.8, 129.3, 129.1, 128.0, 124.4, 122.0, 120.1, 55.3, 51.7, 49.4, 45.1, 36.9. HRMS (*m*/*z*): calcd for $C_{19}H_{22}N_5O_3$ $(M + H)^+$ 368.1717; found 368.1720.



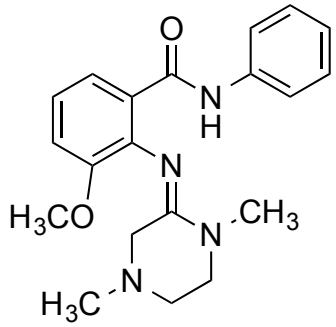
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-4-nitro-*N*-phenylbenzamide (12c).** Yellow solid (59% over 3 steps using Condition A, 54% over 3 steps using Condition B), mp 151-153 °C. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 11.06 (s, 1H), 8.39 (d, $J$ = 8.7 Hz, 1H), 7.89 (dd, $J$ = 8.7, 2.3 Hz, 1H), 7.66–7.61 (m, 2H), 7.59 (d, $J$ = 2.3 Hz, 1H), 7.39–7.32 (m, 2H), 7.15–7.09 (m, 1H), 3.44 (t, $J$ = 5.6 Hz, 2H), 3.26 (s, 3H), 3.12 (s, 2H), 2.67 (t, $J$ = 5.6 Hz, 2H), 2.25 (s, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 163.0, 156.8, 149.5, 149.0, 138.2, 132.7, 131.1, 129.1, 124.3, 120.3, 118.0, 116.6, 55.1, 51.8, 49.7, 45.3, 36.8. HRMS (*m*/*z*): calcd for $C_{19}H_{22}N_5O_3$ $(M + H)^+$ 368.1717; found 368.1722.



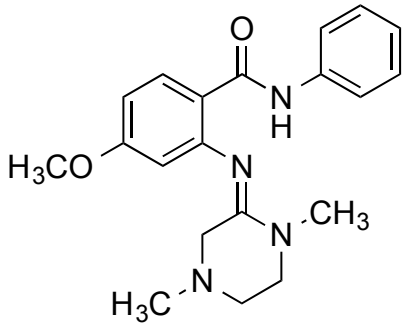
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-6-nitro-*N*-phenylbenzamide (12d).** Pale-yellow solid (24% over 3 steps using Condition A, 27% over 3 steps using Condition B), mp 144-147 °C (dec). $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.48 (s, 1H), 7.58–7.48 (m, 3H), 7.35 (t, $J$ = 8.1 Hz, 1H), 7.32–7.27 (m, 2H), 7.12–7.06 (m, 1H), 6.99 (dd, $J$ = 8.1, 1.0 Hz, 1H), 3.26 (t, $J$ = 5.6 Hz, 2H), 2.99 (s, 2H), 2.94 (s, 3H), 2.55 (t, $J$ = 5.6 Hz, 2H), 2.18 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$) $\delta$ 163.2, 155.7, 149.8, 148.6, 137.8, 130.2, 129.0, 128.2, 124.39, 124.37, 120.2, 117.6, 54.6, 51.8, 49.2, 45.2, 36.4. HRMS (*m*/*z*): calcd for $C_{19}H_{22}N_5O_3$ $(M + H)^+$ 368.1717; found 368.1726.



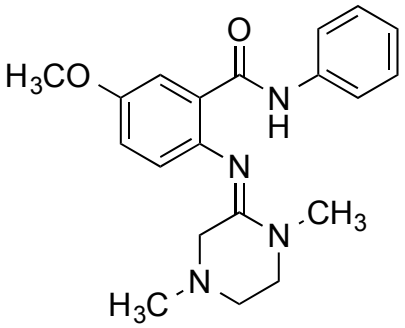
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-*N*-phenylbenzamide (12e).** White solid (38% over 3 steps using Condition A, 54% over 3 steps using Condition B). $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 11.00 (s, 1H), 8.26 (dd, $J$ = 7.9, 1.7 Hz, 1H), 7.67–7.62 (m, 2H), 7.37–7.29 (m, 3H), 7.15–7.05 (m, 2H), 6.71 (dd, $J$ = 7.9, 1.2 Hz, 1H), 3.38 (t, $J$ = 5.6 Hz, 2H), 3.23 (s, 3H), 3.07 (s, 2H), 2.62 (t, $J$ = 5.6 Hz, 2H), 2.20 (s, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 165.1, 156.1, 148.2, 139.0, 131.8, 131.4, 129.0, 125.9, 123.7, 123.4, 122.8, 120.2, 55.1, 52.2, 49.7, 45.5, 36.7. HRMS (*m*/*z*): calcd for $C_{19}H_{23}N_4O$ $(M + H)^+$ 323.1866; found 323.1869.



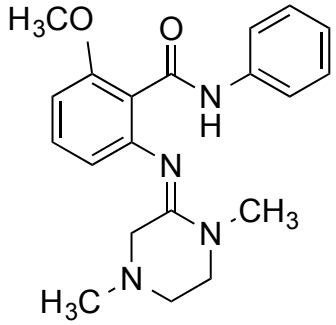
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-3-methoxy-*N*-phenylbenzamide (12f).** White solid (5% over 3 steps using Condition A, 13% over 3 steps using Condition B). $^{1}$H NMR (500 MHz, $CDCl_3$) $\delta$ 10.94 (s, 1H), 7.85 (dd, $J$ = 8.0, 1.4 Hz, 1H), 7.66–7.62 (m, 2H), 7.36–7.30 (m, 2H), 7.10–7.05 (m, 2H), 6.98 (dd, $J$ = 8.0, 1.4 Hz, 1H), 3.82 (s, 3H), 3.41–3.36 (m, 2H), 3.26 (s, 3H), 2.90 (q, $J$ = 15.5 Hz, 2H), 2.68–2.56 (m, 2H), 2.17 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$) $\delta$ 165.3, 157.6, 150.9, 139.0, 137.8, 129.1, 127.0, 123.7, 123.3, 122.7, 120.2, 114.2, 56.2, 54.9, 52.2, 49.5, 45.4, 36.6. HRMS (*m*/*z*): calcd for $C_{20}H_{25}N_4O_2$ $(M + H)^+$ 353.1972; found 353.1976.



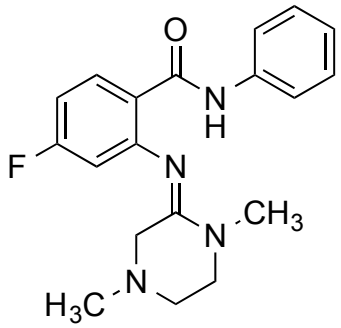
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-4-methoxy-*N*-phenylbenzamide (12g).** White solid (19% over 3 steps using Condition A, 29% over 3 steps using Condition B). $^{1}$H NMR (500 MHz, $CDCl_3$) $\delta$ 10.74 (s, 1H), 8.20 (d, $J$ = 8.8 Hz, 1H), 7.63–7.59 (m, 2H), 7.35–7.29 (m, 2H), 7.08–7.04 (m, 1H), 6.68 (dd, $J$ = 8.8, 2.6 Hz, 1H), 6.21 (d, $J$ = 2.6 Hz, 1H), 3.82 (s, 3H), 3.39 (t, $J$ = 5.6 Hz, 2H), 3.23 (s, 3H), 3.09 (s, 2H), 2.62 (t, $J$ = 5.6 Hz, 2H), 2.22 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$) $\delta$ 164.9, 162.3, 156.1, 149.9, 139.1, 133.2, 129.1, 123.5, 120.2, 119.0, 108.7, 108.2, 55.5, 55.0, 52.2, 49.7, 45.5, 36.7. HRMS (*m*/*z*): calcd for $C_{20}H_{25}N_4O_2$ $(M + H)^+$ 353.1972; found 353.1963.



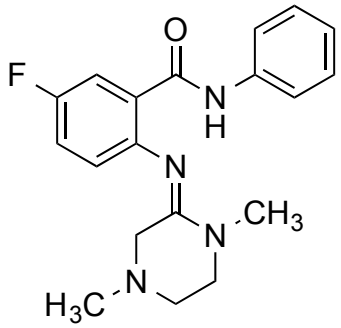
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-5-methoxy-*N*-phenylbenzamide (12h).** Clear, colorless oil (11% over 3 steps using Condition A). $^{1}$H NMR (500 MHz, $CDCl_3$) $\delta$ 11.12 (s, 1H), 7.81 (d, $J$ = 3.1 Hz, 1H), 7.66–7.62 (m, 2H), 7.36–7.31 (m, 2H), 7.11–7.06 (m, 1H), 6.93 (dd, $J$ = 8.6, 3.1 Hz, 1H), 6.64 (d, $J$ = 8.6 Hz, 1H), 3.85 (s, 3H), 3.38 (t, $J$ = 5.6 Hz, 2H), 3.23 (s, 3H), 3.06 (s, 2H), 2.62 (t, $J$ = 5.6 Hz, 2H), 2.21 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$) $\delta$ 164.9, 156.5, 155.5, 141.5, 138.9, 129.1, 128.4, 124.6, 123.8, 120.3, 119.6, 113.9, 55.8, 55.2, 52.3, 49.8, 45.6, 36.7. HRMS (*m*/*z*): calcd for $C_{20}H_{25}N_4O_2$ $(M + H)^+$ 353.1972; found 353.1981.



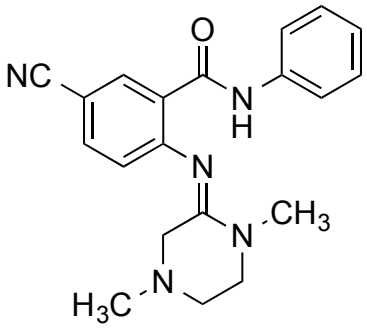
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-6-methoxy-*N*-phenylbenzamide (12i).** Clear, colorless oil (25% over 3 steps using Condition A, 56% over 3 steps using Condition B). $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.89 (s, 1H), 7.59 (d, $J$ = 7.8 Hz, 2H), 7.34–7.26 (m, 2H), 7.21 (t, $J$ = 8.1 Hz, 1H), 7.10–7.03 (m, 1H), 6.59 (d, $J$ = 8.3 Hz, 1H), 6.40 (d, $J$ = 7.9 Hz, 1H), 3.82 (s, 3H), 3.23 (t, $J$ = 5.6 Hz, 2H), 3.06 (s, 2H), 2.90 (s, 3H), 2.56 (t, $J$ = 5.6 Hz, 2H), 2.19 (s, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 165.3, 157.8, 155.2, 149.1, 138.7, 130.7, 129.0, 123.8, 120.1, 119.8, 115.6, 105.1, 55.9, 54.4, 52.2, 49.4, 45.4, 36.5. HRMS (*m*/*z*): calcd for $C_{20}H_{25}N_4O_2$ $(M + H)^+$ 353.1972; found 353.1971.



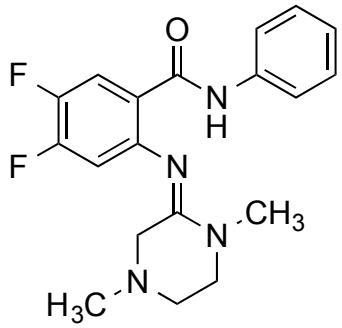
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-4-fluoro-*N*-phenylbenzamide (12j).** White solid (44% over 3 steps using Condition A, 50% over 3 steps using Condition B), mp 110-112 °C. $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 10.85 (s, 1H), 8.26 (dd, *J* = 8.9, 6.9 Hz, 1H), 7.65–7.58 (m, 2H), 7.37–7.30 (m, 2H), 7.11–7.06 (m, 1H), 6.81 (ddd, *J* = 8.8, 7.8, 2.6 Hz, 1H), 6.42 (dd, *J* = 10.1, 2.6 Hz, 1H), 3.39 (t, *J* = 5.6 Hz, 2H), 3.22 (s, 3H), 3.09 (s, 2H), 2.63 (t, *J* = 5.6 Hz, 2H), 2.23 (s, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 165.7, 164.1, 163.2, 156.3, 150.2, 150.1, 138.7, 133.7, 133.6, 129.0, 123.7, 122.3, 122.2, 120.2, 110.0, 109.8, 109.7, 109.6, 54.9, 52.0, 49.6, 45.4, 36.6. HRMS (*m*/*z*): calcd for $C_{19}H_{22}FN_4O$ $(M + H)^+$ 341.1772; found 341.1777.



**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-5-fluoro-*N*-phenylbenzamide (12k).** Clear, colorless oil (49% over 3 steps using Condition A, 40% over 3 steps using Condition B). $^{1}$H NMR (500 MHz, $CDCl_3$) $\delta$ 11.04 (s, 1H), 7.96 (dd, *J* = 9.9, 3.1 Hz, 1H), 7.65–7.60 (m, 2H), 7.37–7.31 (m, 2H), 7.12–7.07 (m, 1H), 7.05 (ddd, *J* = 8.7, 7.5, 3.2 Hz, 1H), 6.67 (dd, *J* = 8.7, 4.9 Hz, 1H), 3.39 (t, *J* = 5.6 Hz, 2H), 3.23 (s, 3H), 3.05 (s, 2H), 2.63 (t, *J* = 5.6 Hz, 2H), 2.22 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$) $\delta$ 163.84, 163.82, 159.8, 157.9, 156.6, 144.27, 144.25, 138.7, 129.2, 127.3, 127.2, 124.7, 124.6, 124.0, 120.3, 119.0, 118.8, 117.6, 117.4, 55.2, 52.2, 49.7, 45.5, 36.8. HRMS (*m*/*z*): calcd for $C_{19}H_{22}FN_4O$ $(M + H)^+$ 341.1772; found 341.1776.

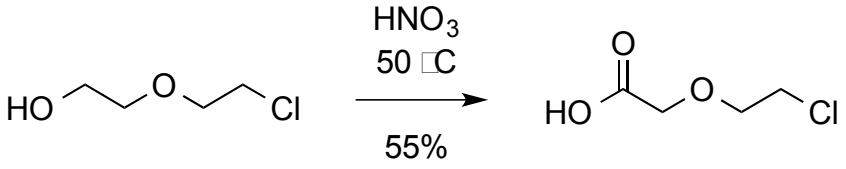


**(*E*)-5-Cyano-2-((1,4-dimethylpiperazin-2-ylidene)amino)-*N*-phenylbenzamide (12l).** Pale-yellow solid (56% over 3 steps using Condition A, 56% over 3 steps using Condition B). *In reference 1, the proton data reported for this compound (listed as compound **63** in reference 1) contains a typographical error. The signal reported in reference 1 at 8.08 ppm should be 8.57 ppm as listed below.* $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 11.00 (s, 1H), 8.57 (d, *J* = 2.1 Hz, 1H), 7.63–7.57 (m, 2H), 7.54 (dd, *J* = 8.3, 2.1 Hz, 1H), 7.38–7.31 (m, 2H), 7.14–7.08 (m, 1H), 6.78 (d, *J* = 8.2 Hz, 1H), 3.44 (t, *J* = 5.6 Hz, 2H), 3.25 (s, 3H), 3.10 (s, 2H), 2.67 (t, *J* = 5.6 Hz, 2H), 2.24 (s, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 162.9, 156.4, 152.2, 138.3, 136.0, 134.5, 129.1, 126.6, 124.22, 124.20, 120.3, 119.0, 105.7, 55.1, 51.9, 49.7, 45.3, 36.9. HRMS (*m*/*z*): calcd for $C_{20}H_{22}N_5O$ $(M + H)^+$ 348.1819; found 348.1790; melting point: 167-169 °C.



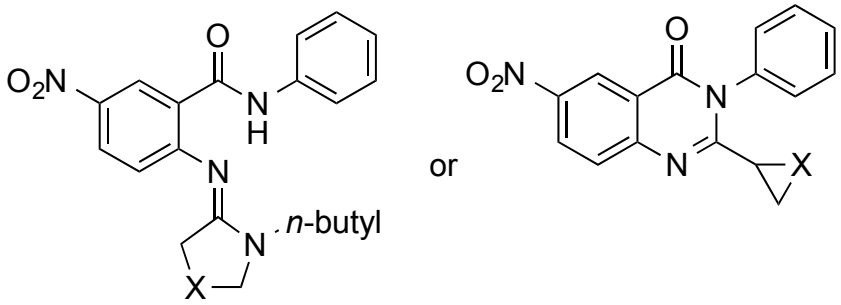
**(*E*)-2-((1,4-Dimethylpiperazin-2-ylidene)amino)-4,5-difluoro-*N*-phenylbenzamide (12m).** White solid (35% over 3 steps using Condition A, 34% over 3 steps using Condition B), mp 127-129 °C. $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 10.93 (s, 1H), 8.09 (dd, *J* = 11.8, 9.3 Hz, 1H), 7.63–7.56 (m, 2H), 7.37–7.30 (m, 2H), 7.12–7.06 (m, 1H), 6.53 (dd, *J* = 11.2, 6.9 Hz, 1H), 3.40 (t, *J* = 5.6 Hz, 2H), 3.22 (s, 3H), 3.07 (s, 2H), 2.63 (t, *J* = 5.6 Hz, 2H), 2.24 (s, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 163.1, 156.8, 153.1, 153.0, 150.6, 150.5, 147.6, 147.5, 145.23, 145.20, 145.16, 145.1, 145.0, 138.5, 129.1, 124.0,

122.6, 122.52, 122.51, 122.48, 120.3, 119.88, 119.86, 119.69, 119.67, 111.8, 111.6, 55.0, 52.0, 49.7, 45.4, 36.7. HRMS (*m*/*z*): calcd for $C_{19}H_{21}F_2N_4O$ $(M + H)^+$ 359.1678; found 359.1683.




**2-(2-Chloroethoxy)acetic acid.** The synthesis of the title compound was adapted from a previously reported procedure.[3] 2-(2-Chloroethoxy)ethanol (2 mL, 19 mmol) was slowly added dropwise to 70% (15.8 M) nitric acid (10.6 mL) at rt. The mixture was stirred at 50 °C for 2 hours, then it was stirred at rt for 16 hours, and then finally stirred at 50 °C again for an additional 4 hours. After the reaction mixture reached rt, ice-water (50 mL) was added to it. The product was extracted with $CH_2Cl_2$ (3 x 50 mL) and dried with $Na_2SO_4$ to give the title compound (1.437 g, 55%) as a clear, pale-yellow-green oil. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.79 (br s, 1H), 4.23 (s, 2H), 3.85 (t, $J$ = 5.6 Hz, 2H), 3.68 (t, $J$ = 5.6 Hz, 2H).

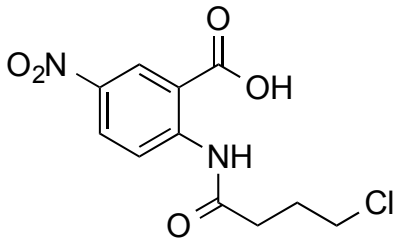
**General Procedure for the Synthesis of 18b-c, 19a (Scheme 5)**



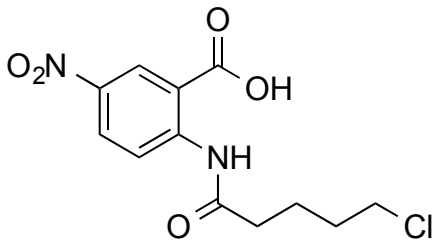

**18a,** X = $CH_2$, 0%
**18b**, X = $(CH_2)_2$, 62%
**18c**, X = $OCH_2$, 23%

**19a,** X = $CH_2$, 65%
**19b**, X = $(CH_2)_2$, 0%
**19c**, X = $OCH_2$, 0%

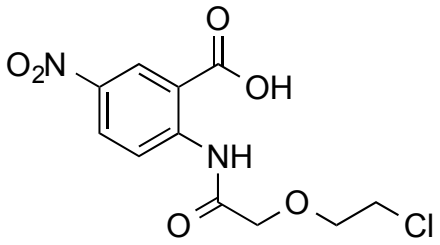
***Step 1:*** **Synthesis of Chloroacetamidobenzoic acids.**




**2-(4-Chlorobutanamido)-5-nitrobenzoic acid.** Triethylamine (2.5 mL, 17.9 mmol) was added to a solution of 5-nitroanthranilic acid (2.95 g, 16.2 mmol) in dry $CH_2Cl_2$ (50 mL), followed by dropwise addition of 4-chlorobutyryl chloride (2 mL, 17.9 mmol) to the mixture. The reaction mixture was stirred at rt for 3 hours. TLC analysis showed that the reaction was complete. The mixture was diluted with $CH_2Cl_2$ (50 mL), rinsed with water (2 x 50 mL) and dried with $Na_2SO_4$ to give the title compound (4.70 g, 100%) as a white solid, which was used in the next step without further purification. $^1$H NMR (400 MHz, DMSO-$d_6$) $\delta$ 12.12 (s, 1H), 8.72 (d, $J$ = 2.9 Hz, 1H), 8.68 (d, $J$ = 9.3 Hz, 1H), 8.37 (dd, $J$ = 9.3, 2.9 Hz, 1H), 3.72 (t, $J$ = 6.5 Hz, 2H), 2.62 (t, $J$ = 7.3 Hz, 2H), 2.08 (p, $J$ = 6.9 Hz, 2H).



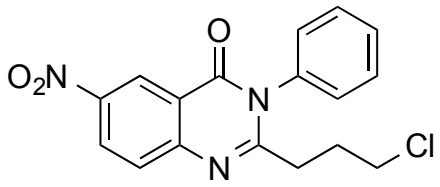

**2-(5-Chloropentanamido)-5-nitrobenzoic acid.** Using 5-chlorovaleryl chloride and following the same procedure used to make 2-(4-chlorobutanamido)-5-nitrobenzoic acid, the title compound (100%) was isolated as a pale-yellow solid and used in the next step without further purification. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 12.12 (s, 1H), 10.37 (br s, 1H), 8.96 (d, $J$ = 2.2 Hz, 1H), 8.88 (d, $J$ = 9.3 Hz, 1H), 8.31 (dd, $J$ = 9.1, 2.8 Hz, 1H), 3.58 (t, $J$ = 6.0 Hz, 2H), 2.56 (t, $J$ = 6.9 Hz, 2H), 1.97–1.85 (m, 4H).



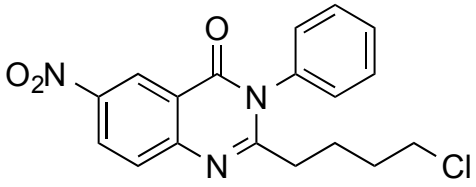
**2-(2-(2-Chloroethoxy)acetamido)-5-nitrobenzoic acid.** A catalytic amount of dry DMF (5 drops) was added to a solution of 2-(2-chloroethoxy)acetic acid (0.569 g, 4.11 mmol) in dry $CH_2Cl_2$ (10 mL) under an atmosphere of argon. Oxalyl chloride (0.38 mL, 4.5 mmol) was slowly added to the mixture. The mixture was stirred at rt for 30 min. and then slowly added to the following mixture at rt: 5-nitroanthranilic acid (0.823 g, 4.5 mmol) and pyridine (0.67 mL, 8.3 mmol) dissolved in dry $CH_2Cl_2$ (10 mL) under an atmosphere of nitrogen. The reaction mixture was stirred at rt for another 4 hours. The solvent was removed *in vacuo* and EtOAc (50 mL) was added to the remaining residue. The mixture was washed with 1 M aq. HCl (50 mL) and the aq. layer was extracted with more EtOAc (50 mL). The org. extracts were combined and dried with $Na_2SO_4$ to give the title compound (1.34 g, 100%) as a yellow solid, which was used in the next step without further purification. $^1$H NMR (400 MHz, DMSO-$d_6$) $\delta$ 12.25 (s, 1H), 8.89 (d, $J$ = 9.3 Hz, 1H), 8.75 (d, $J$ = 2.8 Hz, 1H), 8.48 (dd, $J$ = 9.3, 2.9 Hz, 1H), 4.25 (s, 2H), 3.91–3.83 (m, 4H).

***Step 2:*** **General Synthesis of Chloroalkylquinazolinones 17a-c.** Each chloroacetamido-5-nitrobenzoic acid (0.50 mmol) was placed in a capped MW vial. The atmosphere was replaced with Ar and dry $CH_3CN$ (1.4 mL) was added to the vial. Phosphorus oxychloride (0.10 mL, 1.1 mmol) and a solution of aniline (0.06 mL, 0.7 mmol) in dry $CH_3CN$ (0.6 mL) were added to the mixture while stirring at rt. The mixture was heated with MWI for the duration of time indicated and at the temperature given for each example. [Both *2-(4-chlorobutanamido)-5-nitrobenzoic acid* and *2-(2-(2-chloroethoxy)acetamido)-5-nitrobenzoic acid* led to the production of the alternative lactam products, *5-nitro-2-(2-oxopyrrolidin-1-yl)-N-phenylbenzamide* and *5-nitro-2-(3-oxomorpholino)-N-phenylbenzamide*, respectively, when the reaction was performed at 150 °C. This alternative pathway presumably occurs *via* intramolecular displacement of the terminal chloride ion by the quinazolinone core nitrogen to produce a quaternary iminium salt that subsequently hydrolyzes to the corresponding lactam upon aq. work-up. This could be avoided

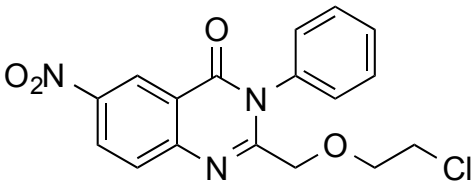
by running the reaction at 75 °C and closely monitoring the reaction by TLC.] When the reaction was complete, it was allowed to reach rt, and was slowly quenched with saturated aq. $NaHCO_3$ (5 mL). The product was extracted with $CH_2Cl_2$ (3 x 20 mL) and dried with $Na_2SO_4$. The product was purified by normal-phase chromatography (0-80% EtOAc/hexanes) to give the corresponding chloroalkylquinazolinones **17a-c**.




**2-(3-Chloropropyl)-6-nitro-3-phenylquinazolin-4(3*H*)-one (17a).** The MWI reaction was performed at 75 °C for 20 min. Isolated **17a** (50%) as a white solid. TLC (50% EtOAc/hexanes): $R_f$ = 0.7. $^1$H NMR (500 MHz, $CDCl_3$) δ 9.08 (d, *J* = 2.6 Hz, 1H), 8.53 (dd, *J* = 9.0, 2.6 Hz, 1H), 7.80 (d, *J* = 9.0 Hz, 1H), 7.65 – 7.53 (m, 3H), 7.29 – 7.26 (m, 2H), 3.63 (t, *J* = 6.2 Hz, 2H), 2.61 (t, *J* = 7.1 Hz, 2H), 2.33 – 2.22 (m, 2H). $^{13}$C NMR (126 MHz, $CDCl_3$) δ 161.40, 159.47, 151.62, 145.87, 136.47, 130.60, 130.19, 129.07, 128.81, 128.20, 123.96, 121.31, 44.24, 32.96, 28.92.

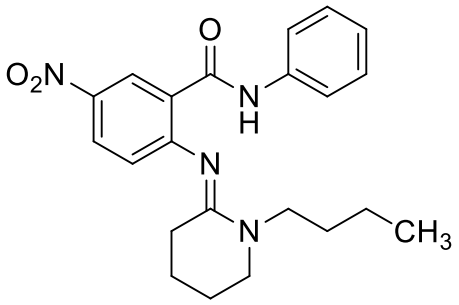



**2-(4-Chlorobutyl)-6-nitro-3-phenylquinazolin-4(3*H*)-one (17b).** The MWI reaction was performed at 150 °C for 10 min. Isolated **17b** (53%) as a pale-yellow solid. TLC (40% EtOAc/hexanes): $R_f$ = 0.7. $^1$H NMR (400 MHz, $CDCl_3$) *δ* 9.02 (d, *J* = 2.6 Hz, 1H), 8.46 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.74 (d, *J* = 8.9 Hz, 1H), 7.56–7.46 (m, 3H), 7.22–7.16 (m, 2H), 3.41 (t, *J* = 6.4 Hz, 2H), 2.41 (t, *J* = 7.5 Hz, 2H), 1.89–1.78 (m, 2H), 1.74–1.64 (m, 2H). $^{13}$C NMR (101 MHz, $CDCl_3$) *δ* 161.3, 160.1, 151.6, 145.7, 136.5, 130.4, 130.0, 128.9, 128.7, 128.1, 123.8, 121.1, 44.5, 35.3, 31.9, 23.9.

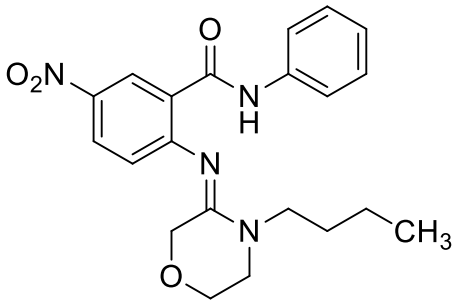


**2-((2-Chloroethoxy)methyl)-6-nitro-3-phenylquinazolin-4(3*H*)-one (17c).** The MWI reaction was performed at 75 °C for 40 min. Isolated **17c** (44%) as a yellow solid. TLC (50% EtOAc/hexanes): $R_f$ = 0.4. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.99 (d, $J$ = 2.6 Hz, 1H), 8.46 (dd, $J$ = 9.0, 2.7 Hz, 1H), 7.82 (d, $J$ = 9.0 Hz, 1H), 7.54–7.45 (m, 3H), 7.28–7.22 (m, 2H), 4.22 (s, 2H), 3.63–3.57 (m, 2H), 3.52–3.46 (m, 2H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 161.0, 155.8, 151.1, 146.2, 135.2, 130.1, 130.0, 129.4, 128.7, 128.3, 123.6, 121.6, 71.6, 71.1, 42.6.

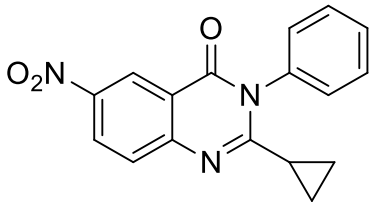
***Step 3:*** **General Synthesis of Rearranged Products 18b-c, 19a.** Each chloroalkylquinazolinone **17a-c** (0.08 mmol) and *n*-butylamine (0.04 mL, 0.4 mmol) were dissolved in dry DMF (0.8 mL). The mixture was stirred at 70 °C for 15 hours. After reaching rt, the product was purified by reverse-phase chromatography (5-100% $CH_3CN$/water) to give the corresponding rearranged product **18b-c, 19a**.



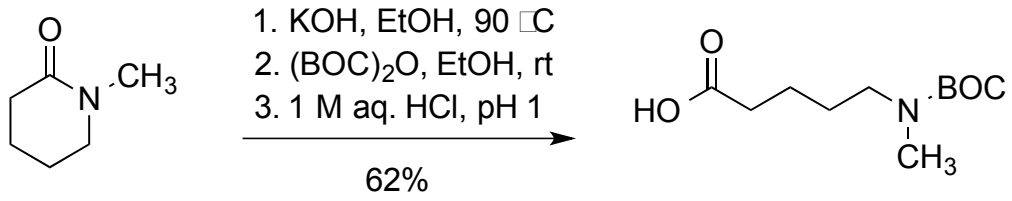

**(*E*)-2-((1-Butylpiperidin-2-ylidene)amino)-5-nitro-*N*-phenylbenzamide (18b).** Isolated **18b** (62%) as a pale-yellow solid. $^1$H NMR (400 MHz, $CDCl_3$) δ 11.00 (s, 1H), 9.13 (d, $J$ = 2.8 Hz, 1H), 8.11 (dd, $J$ = 8.8, 2.8 Hz, 1H), 7.65–7.57 (m, 2H), 7.38–7.29 (m, 2H), 7.14–7.08 (m, 1H), 6.71 (d, $J$ = 8.8 Hz, 1H), 3.71 (t, $J$ = 7.6 Hz, 2H), 3.41 (t, $J$ = 6.2 Hz, 2H), 2.41 (t, $J$ = 6.5 Hz, 2H), 1.93–1.81 (m, 2H), 1.77–1.60 (m, 4H), 1.45–1.31 (m, 2H), 0.92 (t, $J$ = 7.4 Hz, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 163.1, 160.0, 155.6, 142.2, 138.4, 129.1, 127.7, 126.3, 125.6, 124.3, 123.9, 120.6, 49.3, 48.2, 29.3, 27.8, 23.0, 20.3, 20.2, 13.9. HRMS ($m/z$): calcd for $C_{22}H_{27}N_4O_3$ $(M + H)^+$ 395.2078; found 395.2081.



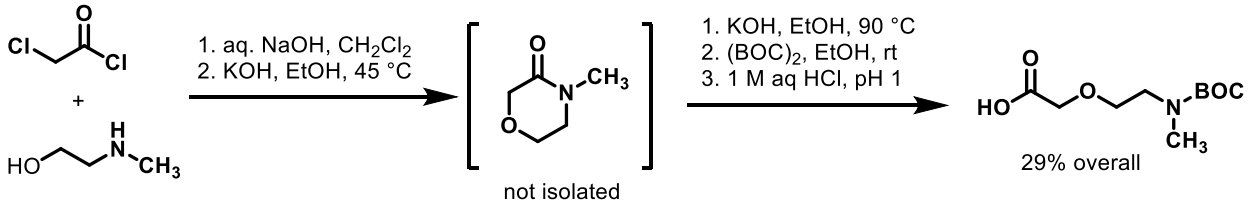
**(*E*)-2-((4-Butylmorpholin-3-ylidene)amino)-5-nitro-*N*-phenylbenzamide (18c).** Isolated **18c** (23%) as a pale-yellow solid, mp 120-123 °C. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 10.50 (s, 1H), 9.11 (d, *J* = 2.8 Hz, 1H), 8.14 (dd, *J* = 8.7, 2.8 Hz, 1H), 7.63–7.56 (m, 2H), 7.40–7.32 (m, 2H), 7.17–7.10 (m, 1H), 6.78 (d, *J* = 8.7 Hz, 1H), 4.28 (s, 2H), 3.94–3.87 (m, 2H), 3.75–3.67 (m, 2H), 3.49–3.42 (m, 2H), 1.76–1.65 (m, 2H), 1.48–1.37 (m, 2H), 0.96 (t, *J* = 7.3 Hz, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 162.8, 155.9, 153.8, 143.1, 138.2, 129.2, 127.9, 126.6, 126.2, 124.6, 123.6, 120.6, 65.4, 64.3, 48.9, 46.3, 29.0, 20.3, 13.9. HRMS (*m*/*z*): calcd for $C_{21}H_{25}N_4O_4$ $(M + H)^+$ 397.1870; found 397.1867.



**2-Cyclopropyl-6-nitro-3-phenylquinazolin-4(3*H*)-one (19a).** Isolated **19a** (65%) as a pale-yellow solid, mp 172-174 °C. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.99 (d, *J* = 2.7 Hz, 1H), 8.40 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.59 (d, *J* = 9.1 Hz, 1H), 7.56–7.43 (m, 3H), 7.31–7.23 (m, 2H), 1.43–1.34 (m, 1H), 1.32–1.26 (m, 2H), 0.92–0.85 (m, 2H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 162.5, 161.4, 152.3, 145.1, 136.7, 130.2, 129.7, 128.5, 128.44, 128.42, 123.9, 120.7, 15.2, 11.8. HRMS (*m*/*z*): calcd for $C_{17}H_{14}N_3O_3$ $(M + H)^+$ 308.1030; found 308.0988.



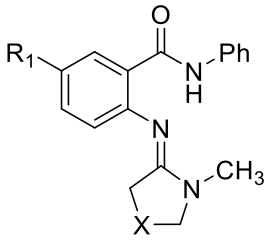

**5-((*tert*-Butoxycarbonyl)(methyl)amino)pentanoic acid (20b).** *N*-BOC-protected amino acid **20b** was prepared by closely following a previously reported procedure.[4] After purification by normal-phase chromatography (0-55% EtOAc/hexanes), the product **20b** (62%) was isolated as a clear, yellow oil. TLC (40% EtOAc/hexanes; $KMnO_4$ stain): $R_f$ = 0.0-0.3 (streak). $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 11.03 (s, 1H), 3.23 (t, $J$ = 6.3 Hz, 2H), 2.84 (s, 3H), 2.38 (t, $J$ = 6.9 Hz, 2H), 1.67–1.54 (m, 4H), 1.45 (s, 9H).




**2-(2-((*tert*-Butoxycarbonyl)(methyl)amino)ethoxy)acetic acid (20c).** The synthesis of **20c** was adapted from a previously reported procedure.[5] A solution of NaOH pellets (2 g, 50 mmol) in water (50 mL) was added to a solution of 2-methylaminoethanol (4 mL, 50 mmol) in $CH_2Cl_2$ (50 mL). To this mixture, a solution of chloroacetyl chloride (4 mL, 50 mmol) in dry $CH_2Cl_2$ (80 mL) was added dropwise over the course of 30 min. using a syringe pump. The reaction mixture was stirred at rt for an additional 20 hours. The biphasic mixture was separated and the org. layer was concentrated down to a clear, colorless oil, which was subsequently redissolved in EtOH (75 mL). Potassium hydroxide powder (2.8 g, 50 mmol) was added to the mixture and the reaction was stirred at 45 °C for 10 hours. A second portion of KOH (2.8 g, 50 mmol) was added to the mixture and the reaction was heated at 90 °C under a reflux condenser for 15 hours. The mixture was allowed to reach rt before it was diluted and transferred to a larger flask using EtOH (75 mL). To this mixture, $(BOC)_2O$ (22 g, 100 mmol) was added in two portions. The reaction was stirred at rt for 5 hours. The solids were filtered off and the filtrate was concentrated. The remaining residue was adjusted to pH 1 with 1 M aq. HCl (50 mL). The product was extracted with EtOAc (2 x 125

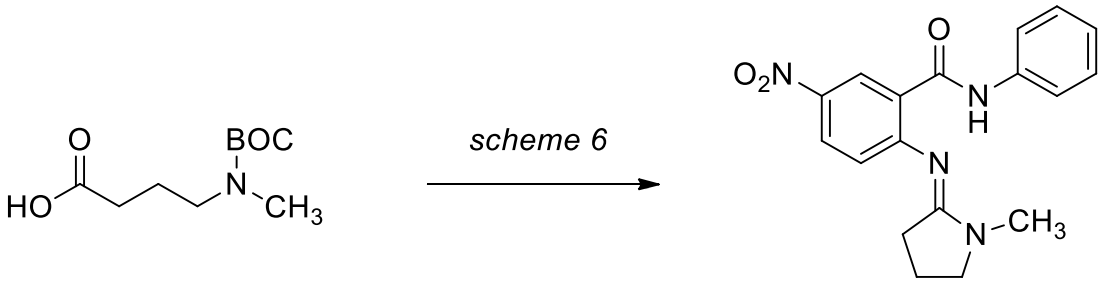
mL) and dried with $Na_2SO_4$. The product was purified by normal-phase chromatography (0-10% MeOH/$CH_2Cl_2$) to give **20c** (3.327 g, 29%) as a clear, colorless oil. TLC (50% EtOAc/hexanes; $KMnO_4$ stain): $R_f$ = 0.1-0.4 (streak). $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 11.10 (s, 1H), 4.13 (s, 2H), 3.73–3.65 (m, 2H), 3.50–3.40 (m, 2H), 2.93 (s, 3H), 1.46 (s, 9H).

**General Procedure for the One Pot Synthesis of (*E*)-Benzamidines 24a-d**



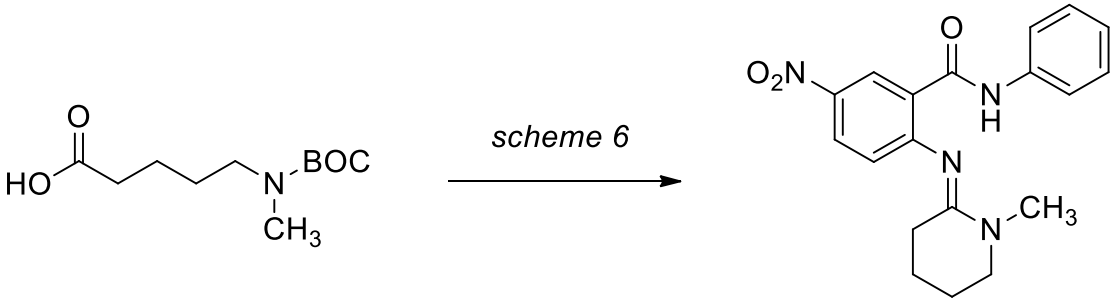

**24a**, X = $CH_2$, $R_1$ = $NO_2$
**24b**, X = $(CH_2)_2$, $R_1$ = $NO_2$
**24c**, X = $OCH_2$, $R_1$ = $NO_2$
**24d**, X = $CH_2$, $R_1$ = H

***Representative Synthesis of (E)-Benzamidine 24a***



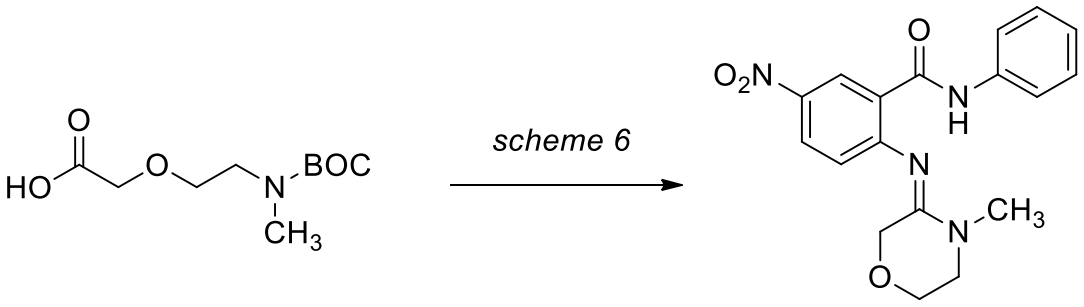

**(*E*)-2-((1-Methylpyrrolidin-2-ylidene)amino)-5-nitro-*N*-phenylbenzamide (24a).** 5-Nitroanthranilic acid (91 mg, 0.50 mmol) and 4-((*tert*-butoxycarbonyl)(methyl)amino)butanoic acid (**20a**, 217 mg, 1.00 mmol) were dissolved in dry pyridine (1.0 mL). Triphenyl phosphite (0.40 mL, 1.5 mmol) was added to the mixture and the reaction mixture was heated at 100 °C with MWI for 1 min. and slowly allowed to cool down to rt over a period of 10 min. This MWI heating process (100 °C for 1 min. with slow cool-down) was repeated two more times. [This heating protocol was used in order to achieve full conversion to the desired benzoxazinone, *tert-butyl methyl(3-(6-nitro-4-oxo-4H-benzo[d][1,3]oxazin-2-yl)propyl)carbamate*, while minimizing the production of the unwanted, side-product, *phenyl 2-(4-((tert-butoxycarbonyl)(methyl)amino)butanamido)-5-nitrobenzoate*.] TLC analysis (50% EtOAc/hexanes) showed the disappearance of starting material (5-nitroanthranilic acid) at $R_f$ =

0.2 and the presence of the corresponding benzoxazinone at $R_f$ = 0.5. Aniline (0.18 mL, 2.0 mmol) was added to the mixture and the reaction mixture was heated at 100 °C with MWI for 1 min. and slowly allowed to cool down to rt over a period of 10 min. TLC analysis showed the disappearance of the benzoxazinone ($R_f$ = 0.5) and the presence of the corresponding quinazolinone ($R_f$ = 0.4). Pyridine was removed *in vacuo* and the resulting clear, yellow oil was redissolved in dry $CH_3CN$ (9 mL) and TFA (5.8 mL). The mixture was stirred at rt for 1-2 hours until the BOC-protected quinazolinone ($R_f$ = 0.4) was consumed. The mixture was diluted with $CH_3CN$ (30 mL) and slowly quenched to pH 10 with saturated aq. $Na_2CO_3$ (50 mL). The reaction mixture was stirred at 50 °C for 1 hour. The mixture was allowed to reach rt and water (30 mL) was added. The product was extracted with $CH_2Cl_2$ (3 x 100 mL), with minimal shaking in order to avoid an emulsion. The org. extracts were combined and concentrated *in vacuo* to give a clear, yellow oil, which was purified by reverse-phase chromatography (10-100% $CH_3CN$/water) yielding **24a** (135 mg, 80%) as a yellow solid, mp 180-182 °C. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 11.62 (s, 1H), 9.17 (d, $J$ = 2.8 Hz, 1H), 8.16 (dd, $J$ = 8.8, 2.9 Hz, 1H), 7.69–7.64 (m, 2H), 7.38–7.32 (m, 2H), 7.15–7.09 (m, 1H), 6.85 (d, $J$ = 8.8 Hz, 1H), 3.56 (t, $J$ = 7.0 Hz, 2H), 3.22 (s, 3H), 2.64 (t, $J$ = 7.8 Hz, 2H), 2.10 (p, $J$ = 7.4 Hz, 2H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 164.3, 162.8, 155.8, 142.7, 138.5, 129.1, 127.5, 126.4, 126.3, 124.1, 123.2, 120.2, 51.7, 31.9, 28.8, 20.0. HRMS ($m/z$): calcd for $C_{18}H_{19}N_4O_3$ $(M + H)^+$ 339.1452; found 339.1449.

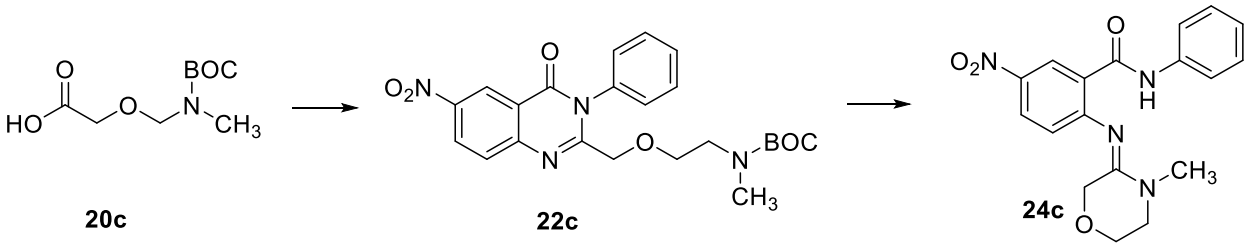



**(*E*)-2-((1-Methylpiperidin-2-ylidene)amino)-5-nitro-*N*-phenylbenzamide (24b).** Following the same procedure used to synthesize **24a**, compound **24b** (109 mg, 62%) was isolated as a yellow solid, mp 160-162 °C. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 11.27 (s, 1H), 9.14 (d, $J$ = 2.8 Hz, 1H), 8.11 (dd, $J$ = 8.8, 2.9 Hz, 1H), 7.66–7.61 (m, 2H), 7.38–7.32 (m, 2H), 7.14–7.08 (m, 1H), 6.75 (d, $J$ = 8.8 Hz, 1H), 3.43 (t, $J$ = 6.2 Hz, 2H), 3.28 (s, 3H), 2.42 (t, $J$ = 6.4 Hz, 2H), 1.93–1.85 (m, 2H), 1.76–1.68 (m,

2H). $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 163.0, 160.1, 155.0, 142.3, 138.4, 129.1, 127.5, 126.2, 125.9, 124.1, 124.0, 120.2, 50.7, 37.8, 27.8, 23.0, 20.5. HRMS (*m*/*z*): calcd for $C_{19}H_{21}N_4O_3$ $(M + H)^+$ 353.1608; found 353.1583.



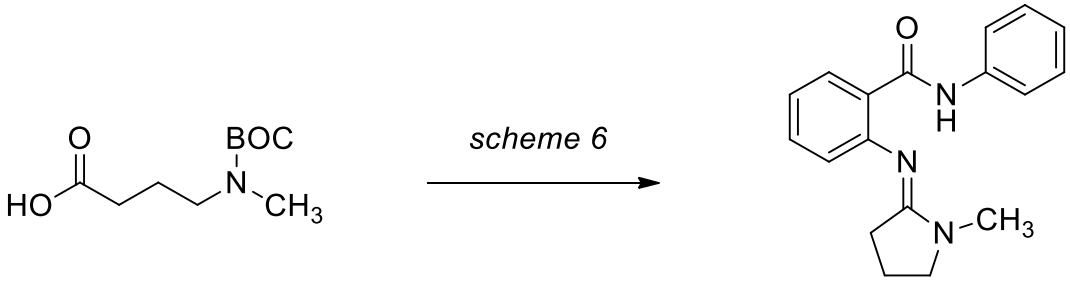

**(*E*)-2-((4-Methylmorpholin-3-ylidene)amino)-5-nitro-*N*-phenylbenzamide (24c).** The same procedure used to synthesize **24a** was used to synthesize **24c** with the following exceptions: *step 1)* pyridine (5 mL) for 20 min; *step 4)* $CH_3CN$/aq. $Na_2CO_3$ at 40 °C for 1.5 hours. Purification is detailed below.




***tert*-Butyl-methyl(2-((6-nitro-4-oxo-3-phenyl-3,4-dihydroquinazolin-2-yl)methoxy)ethyl)carbamate (22c).** 5-Nitroanthranilic acid (91 mg, 0.50 mmol) and **20c** (233 mg, 1.00 mmol) were dissolved in dry pyridine (5 mL). Triphenyl phosphite (0.40 mL, 1.5 mmol) was added to the mixture and the reaction mixture was heated at 100 °C with MWI for 20 min. and slowly allowed to cool down to rt over a period of 10 min. Aniline (0.18 mL, 2.0 mmol) was added to the mixture and the reaction mixture was heated at 100 °C with MWI for 1 min. and slowly allowed to cool down to rt over a period of 10 min. Pyridine was removed *in vacuo* and the product was purified by normal-phase chromatography (0-50% EtOAc/hexanes) to give the title compound (174 mg, 77%) as a white solid. TLC (75% EtOAc/hexanes): $R_f$ = 0.5. $^1$H NMR (400 MHz,

$CDCl_3$) $\delta$ 9.14 (d, $J$ = 2.5 Hz, 1 H), 8.58 (dd, $J$ = 9.0, 2.4 Hz, 1H), 7.93 (d, $J$ = 9.0 Hz, 1 H), 7.30 (d, $J$ = 8.1 Hz, 2H), 4.23 (s, 2 H), 3.49 (br s, 2H), 3.34 (br s, 2H), 2.88 (s, 3H), 1.42 (s, 9H); $^{13}$C NMR (125 MHz, $CDCl_3$) $\delta$ 161.2, 151.5, 146.4, 135.4, 130.3, 130.2, 129.7, 128.9, 128.4, 123.4, 121.8, 79.8, 71.1, 70.3, 48.9, 36.1, 28.8.

**(*E*)-2-((4-Methylmorpholin-3-ylidene)amino)-5-nitro-*N*-phenylbenzamide (24c).** TFA (1.2 mL) was added to a solution of *tert*-butyl-methyl(2-((6-nitro-4-oxo-3-phenyl-3,4-dihydroquinazolin-2-yl)methoxy)ethyl)carbamate (56 mg, 0.12 mmol) in dry $CH_3CN$ (3 mL). The mixture was stirred at rt for 1.5 hours and then diluted with $CH_3CN$ (5 mL). The reaction was slowly quenched to pH 10 with saturated aq. $Na_2CO_3$ (9 mL). The reaction mixture was stirred at 40 °C for 2 hours and monitored by TLC until the reaction was complete. Water (10 mL) was added to the mixture. The product was extracted with $CH_2Cl_2$ (3 x 50 mL) and dried with $Na_2SO_4$ to give **24c** (44 mg, 100%) as a pale-yellow solid. TLC (75% EtOAc/hexanes): $R_f$ = 0.4. After reverse-phase purification, the $CH_3CN$ in the fractions containing the product was removed *in vacuo* and the product was extracted from the remaining aq. layer (in order to avoid unwanted hydrolysis of product) with $CH_2Cl_2$ (3 x 75 mL) and dried with $Na_2SO_4$ to give **24c** (43 mg, 24%) as a pale-yellow solid. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 10.76 (s, 1H), 9.14 (d, $J$ = 2.8 Hz, 1H), 8.17 (dd, $J$ = 8.8, 2.8 Hz, 1H), 7.67–7.61 (m, 2H), 7.40–7.34 (m, 2H), 7.17–7.11 (m, 1H), 6.80 (d, $J$ = 8.8 Hz, 1H), 4.30 (s, 2H), 3.93 (t, $J$ = 5.4 Hz, 2H), 3.48 (t, $J$ = 5.4 Hz, 2H), 3.31 (s, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$ / acetone-$d_6$) $\delta$ 162.6, 156.1, 153.2, 143.2, 138.2, 129.2, 127.8, 126.43, 126.37, 124.3, 123.4, 120.1, 65.2, 64.1, 48.7, 37.1. HRMS ($m/z$): calcd for $C_{18}H_{19}N_4O_4$ $(M + H)^+$ 355.1401; found 355.1395.




**(*E*)-2-((1-Methylpyrrolidin-2-ylidene)amino)-*N*-phenylbenzamide (24d).** Following the same procedure used to synthesize **24a**, compound **24d** (130 mg, 89%) was isolated as a white solid, mp 115-116 °C. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 11.67 (s, 1H), 8.27 (dd, $J$ = 7.9, 1.8 Hz, 1H), 7.73–7.66

(m, 2H), 7.38–7.29 (m, 3H), 7.13–7.04 (m, 2H), 6.77 (dd, *J* = 8.0, 1.2 Hz, 1H), 3.43 (t, *J* = 6.9 Hz, 2H), 3.15 (s, 3H), 2.50 (t, *J* = 7.8 Hz, 2H), 1.96 (p, *J* = 7.3 Hz, 2H). $^{13}$C NMR (101 MHz, $CDCl_3$) *δ* 165.1, 163.7, 150.2, 139.2, 131.7, 131.0, 129.0, 125.8, 123.4, 123.0, 122.5, 120.0, 51.4, 31.6, 28.2, 19.9. HRMS (*m*/*z*): calcd for $C_{18}H_{20}N_3O$ $(M + H)^+$ 294.1601; found 294.1620.

**References**

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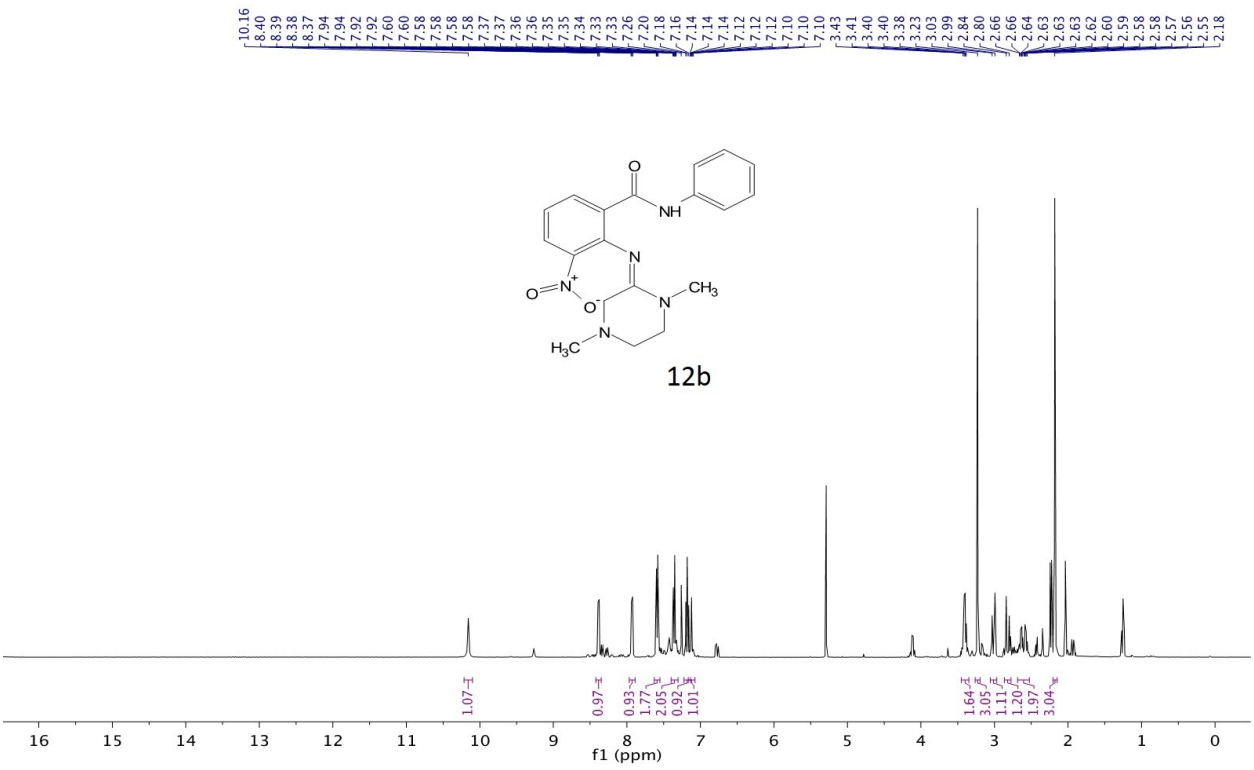
[2] Yamada, Y.; Oine, T.; Inoue, I. *Chem. Pharm. Bull.***1974**, *22*, 601-609.

[3] He, H.; Jenkins, K.; Lin, C. *Anal. Chim. Acta.,* **2008**, *611*, 197-204.

[4] Glinka, T. W.; Zhang, J. Water-soluble prodrugs of florfenicol and its analogs. WO 2008076259 A1, 2008.

[5] Allerton, C. M. N.; Bull, D. J.; Bunnage, M. E.; Maguire, R. J.; Steele, J. 3-(Imidazolyl)-2-alkoxypropanoic acids as tafia inhibitors. WO 2003061652 A1, 2003.

## NMR Spectra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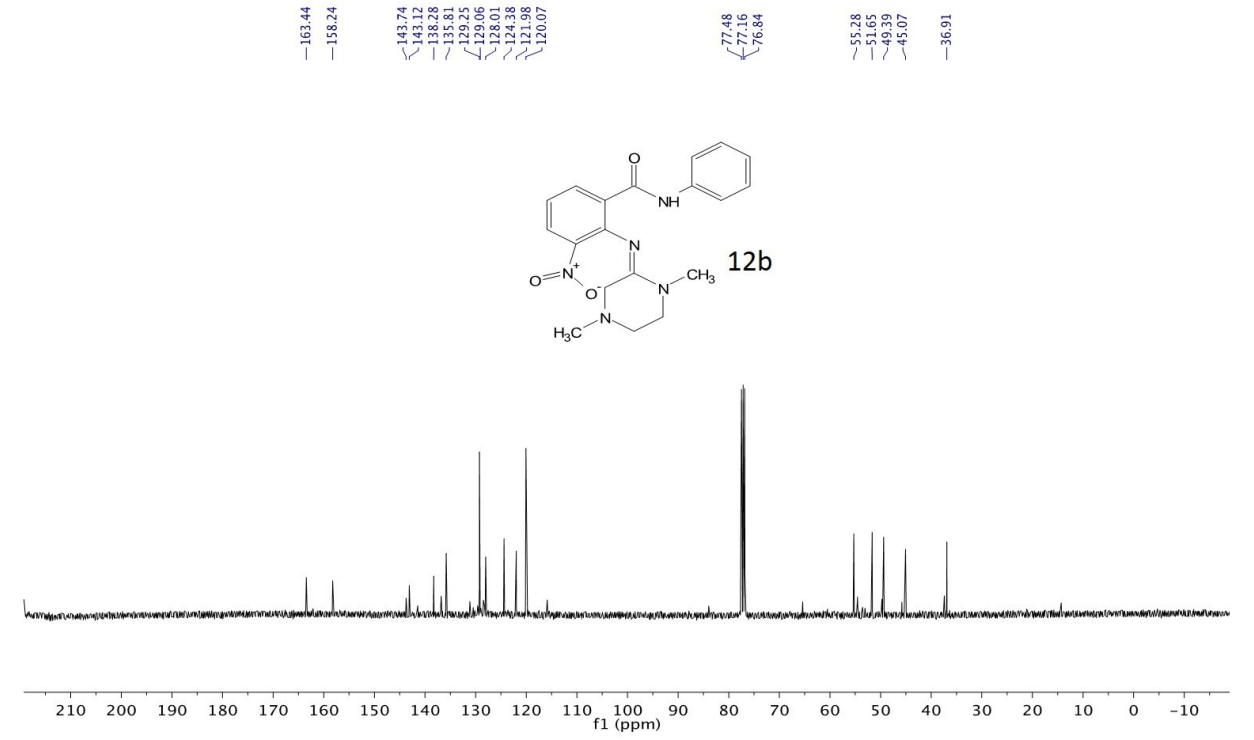
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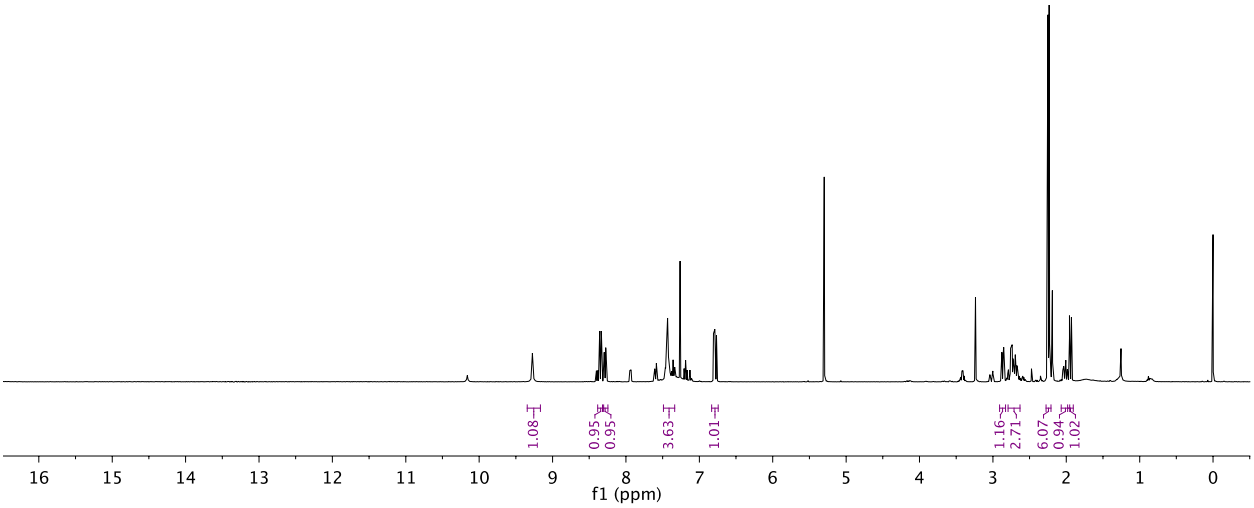


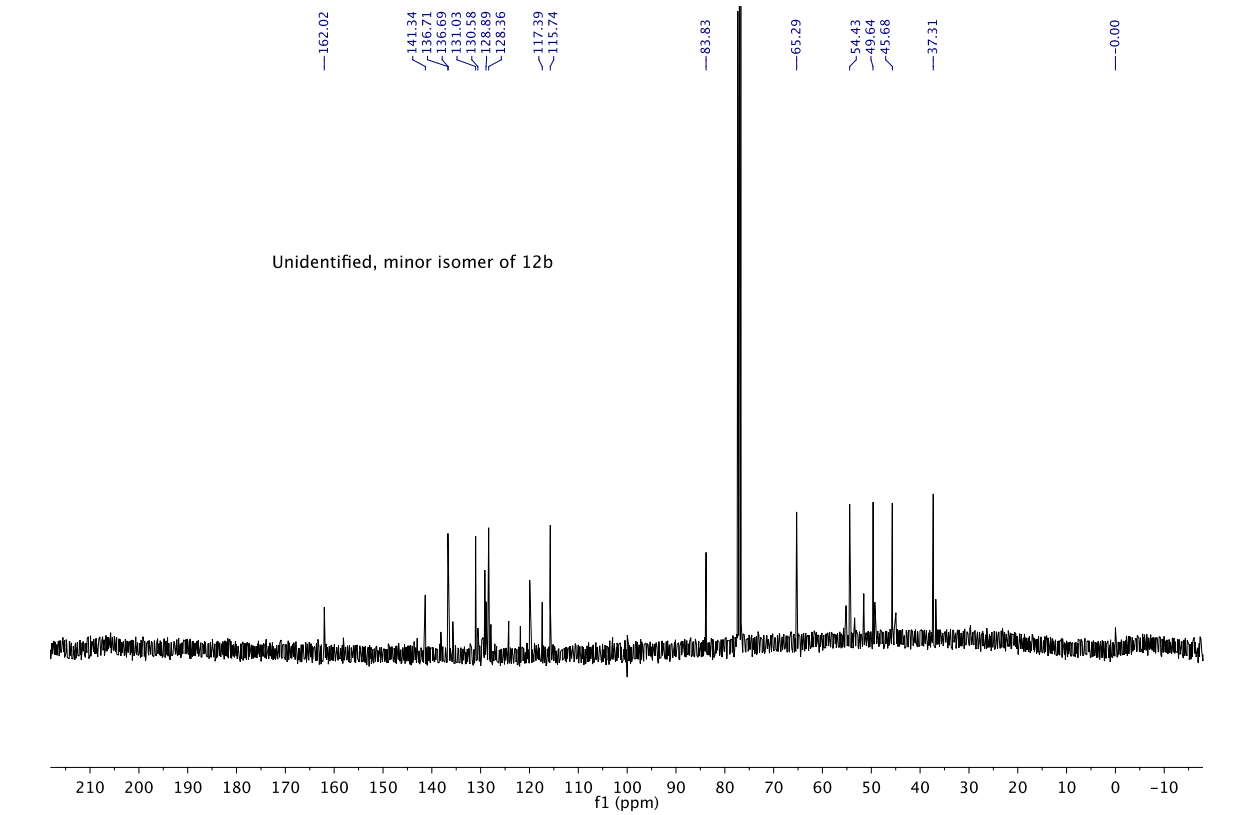


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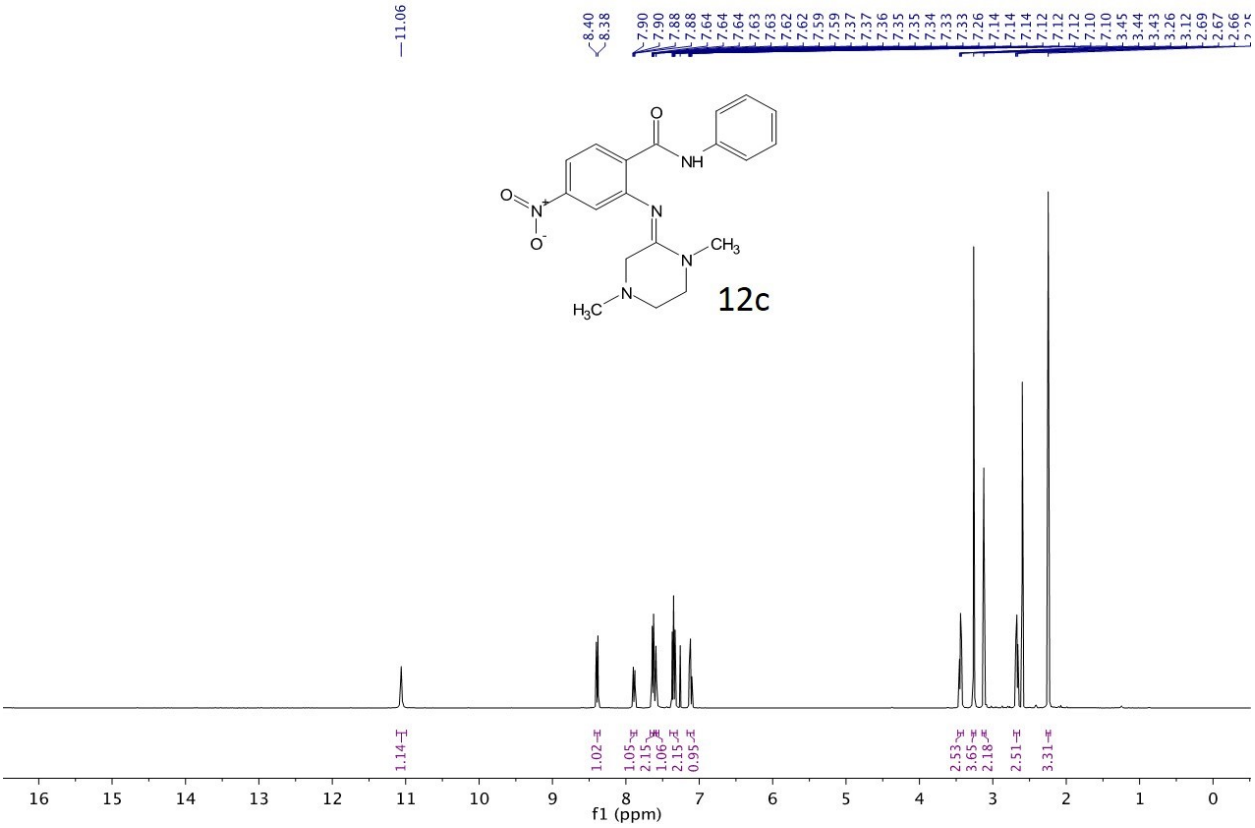
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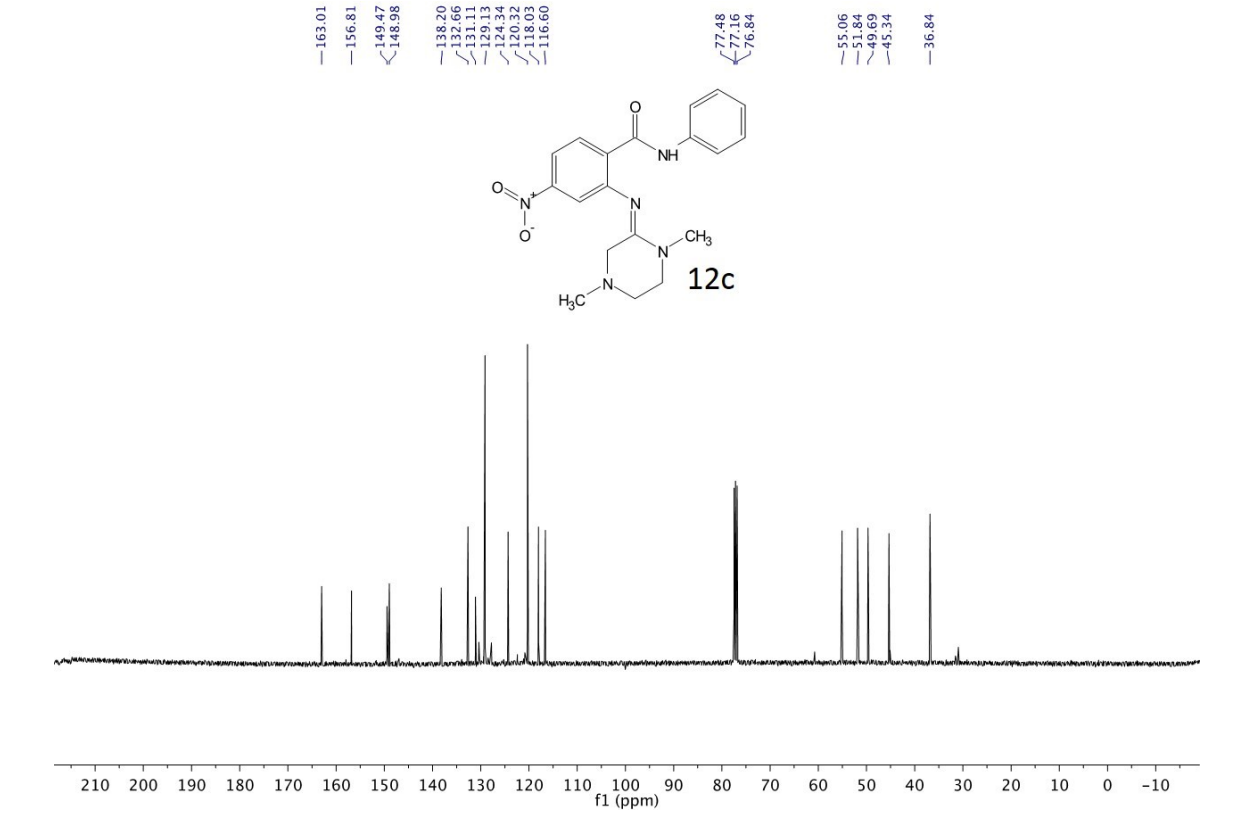
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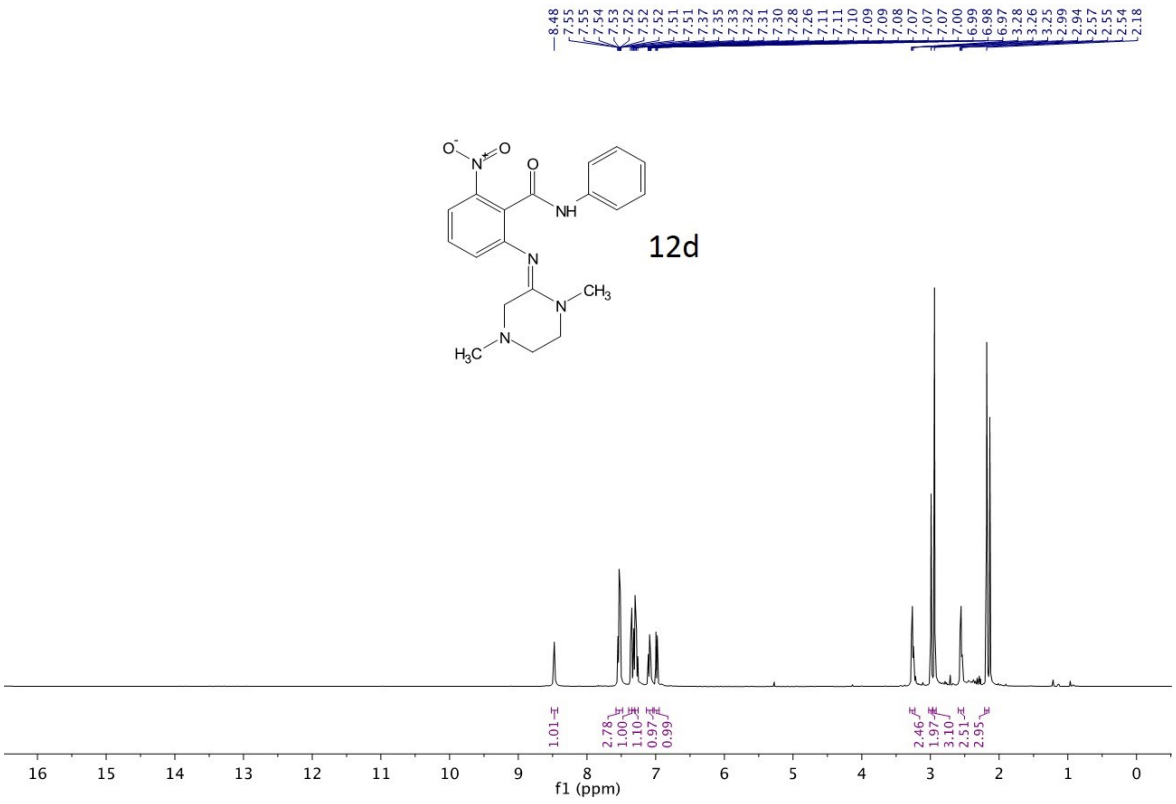
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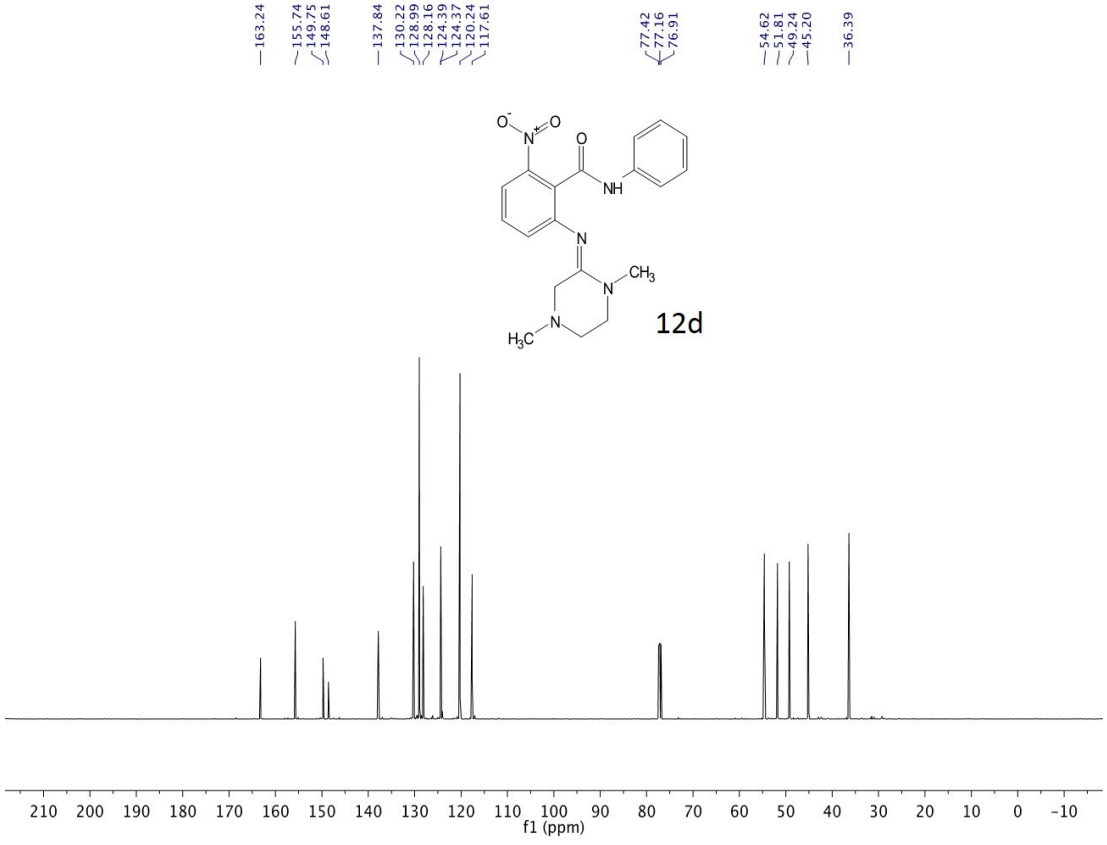
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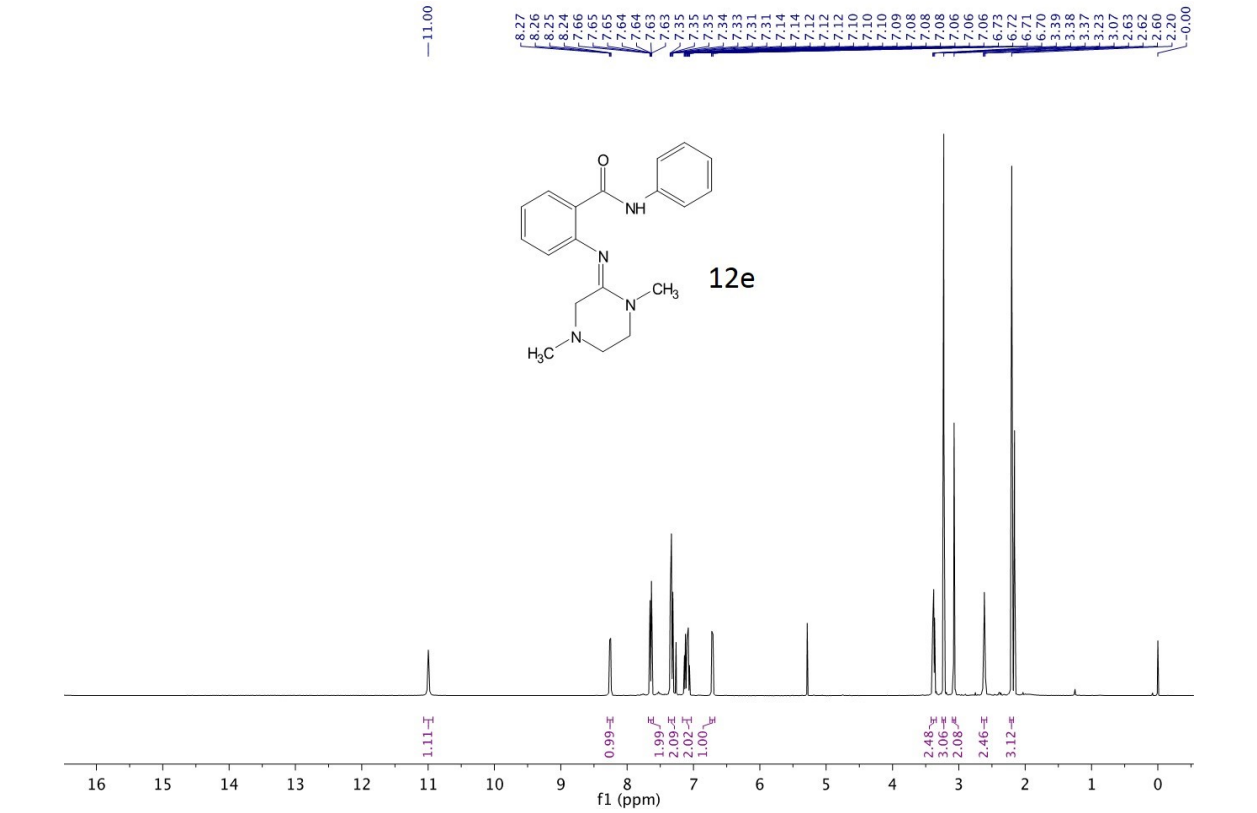
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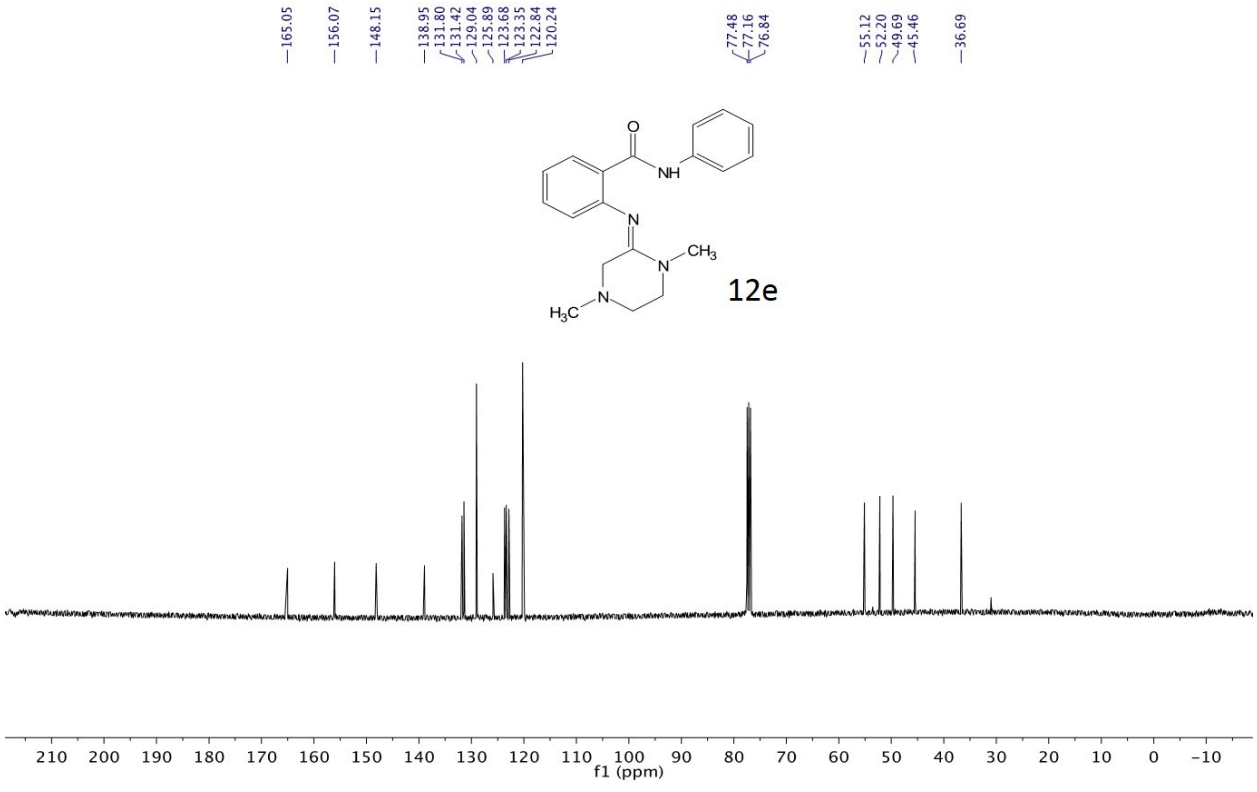
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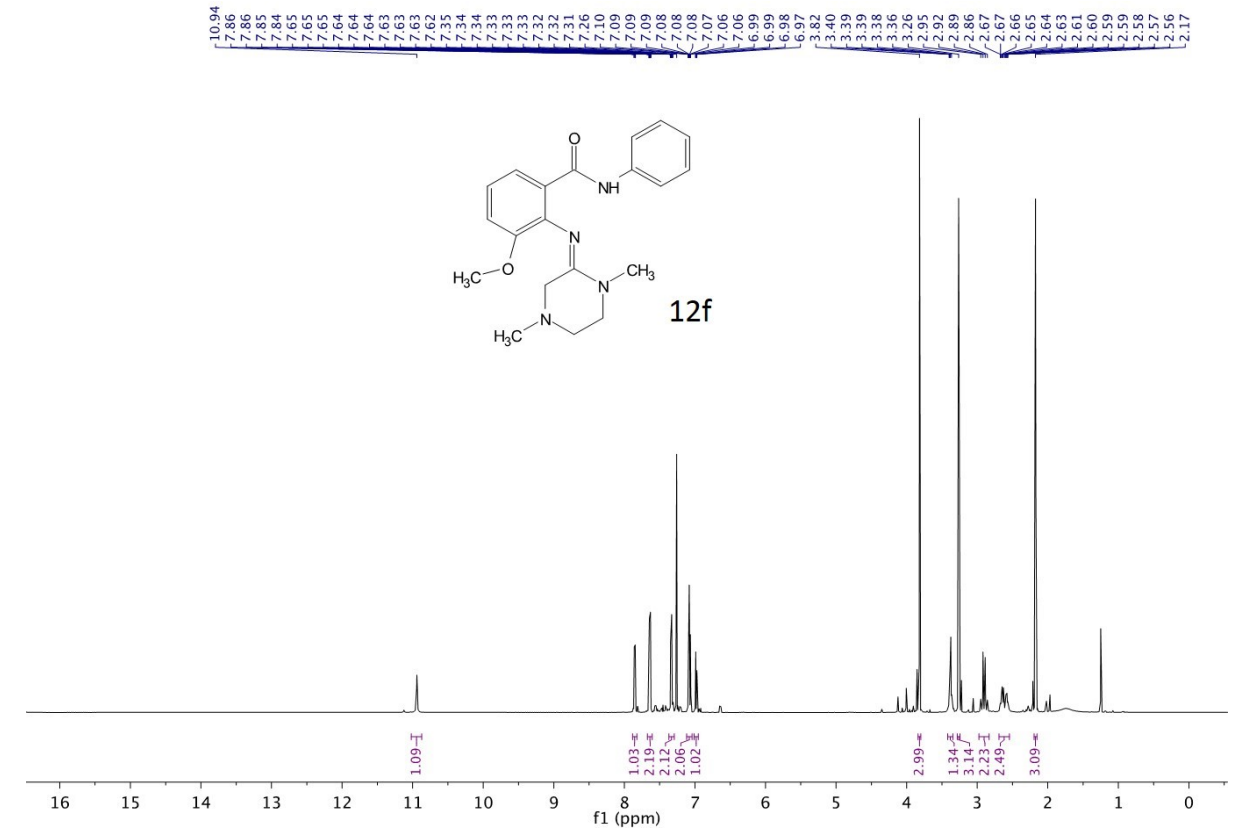
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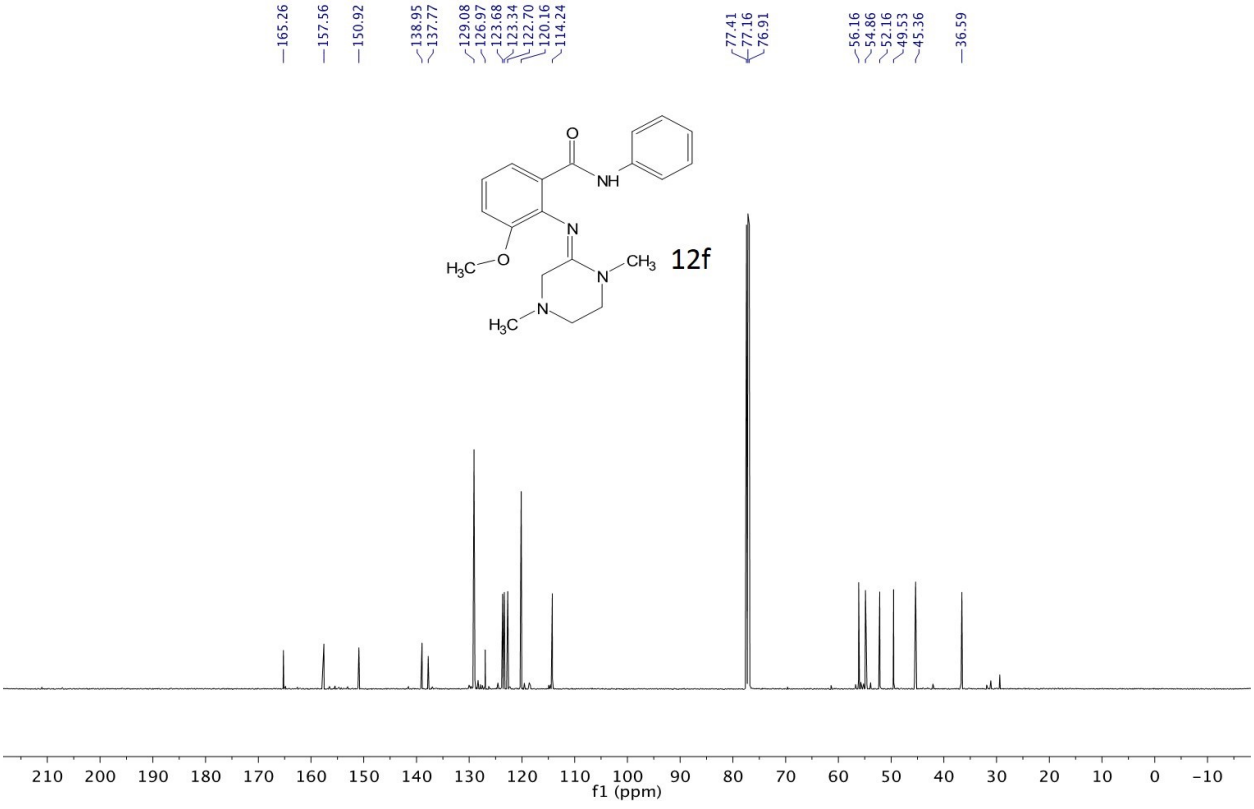
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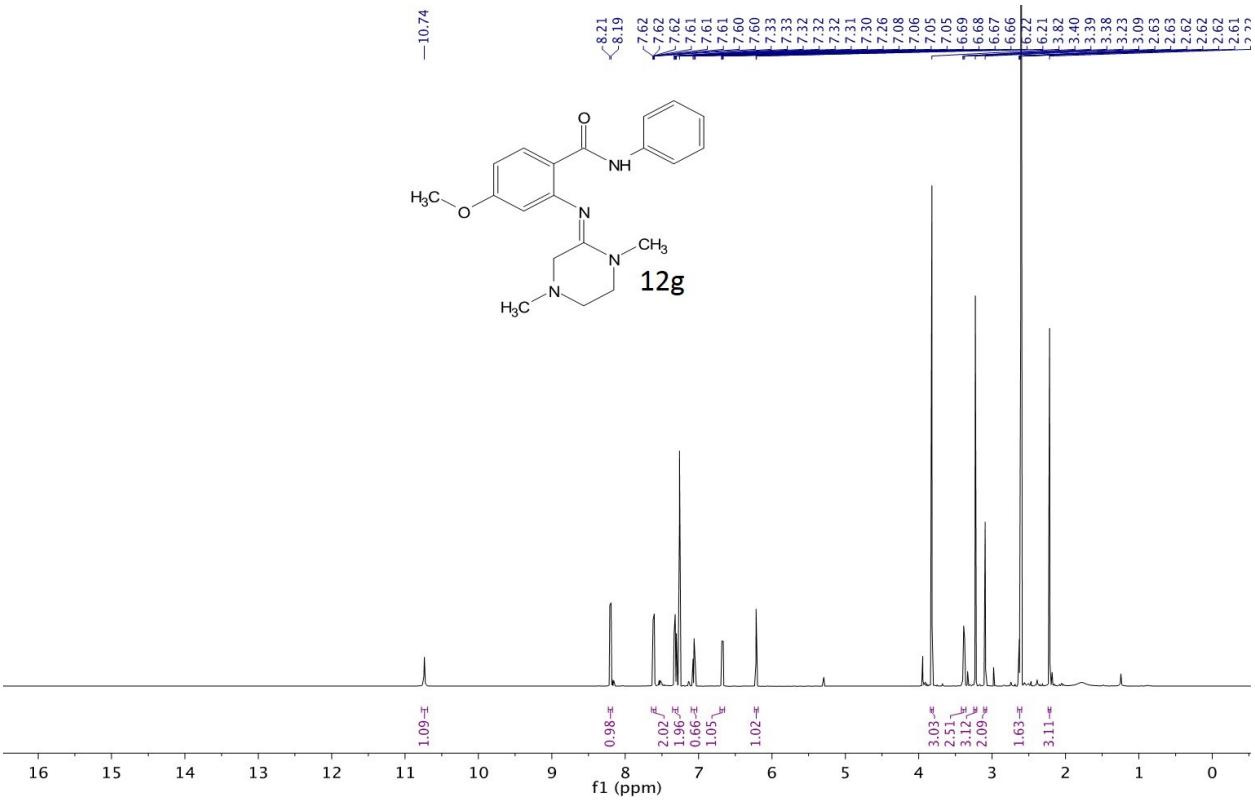
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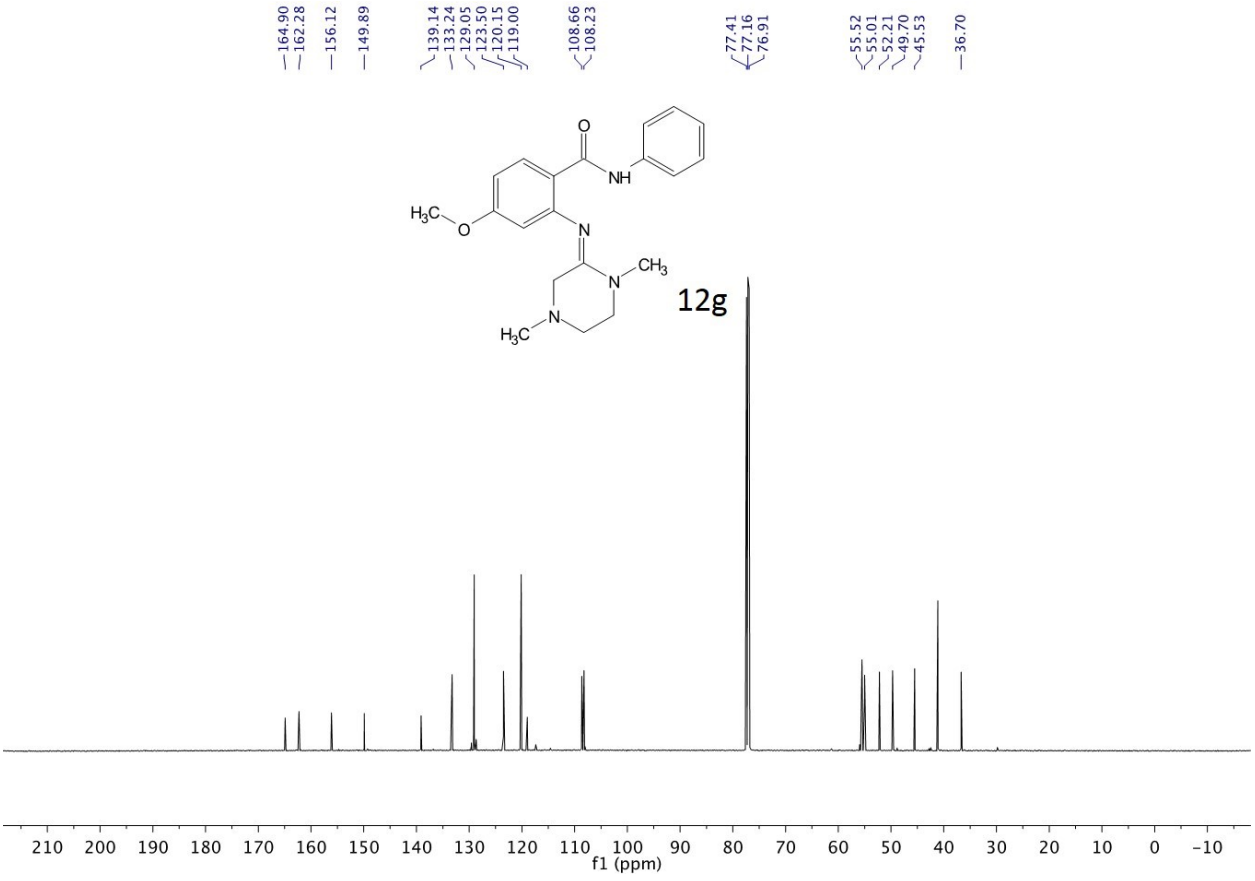
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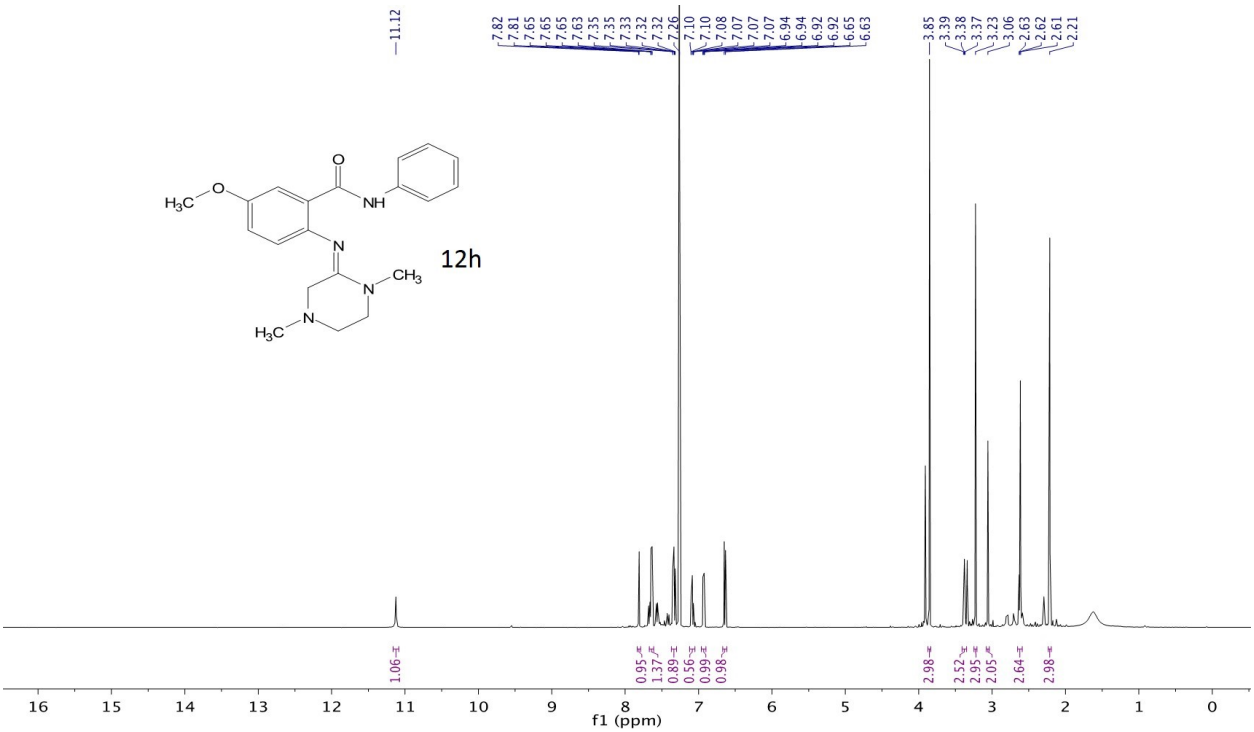
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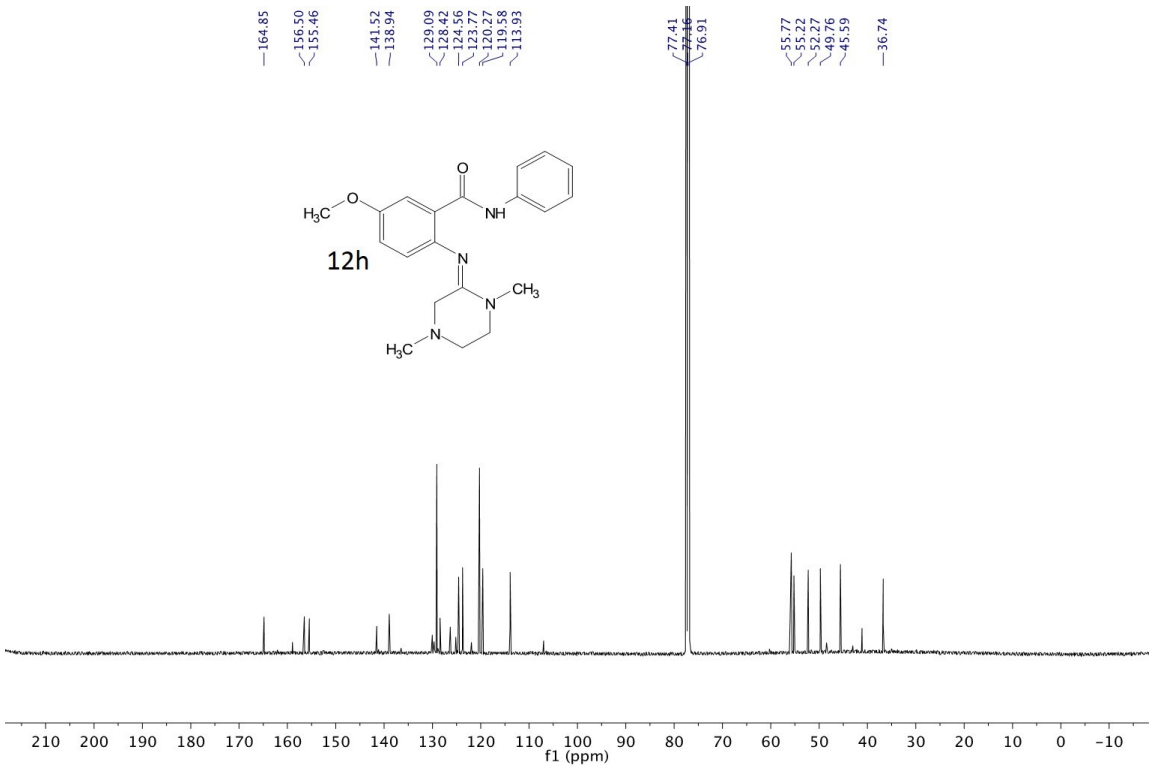
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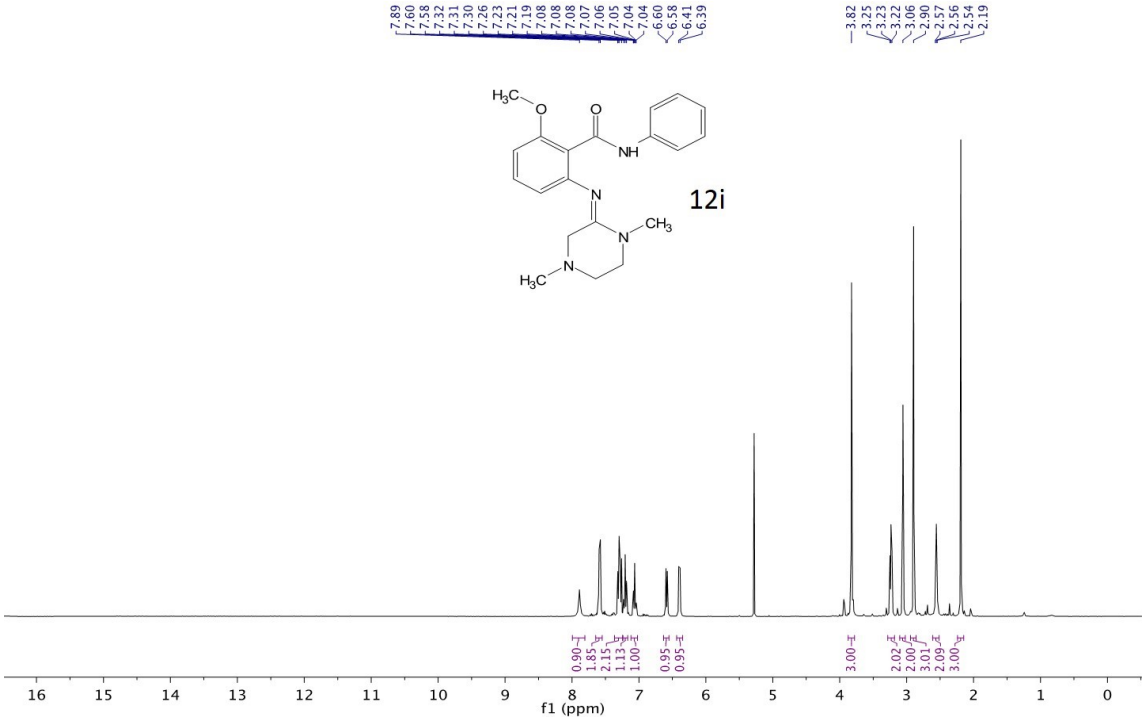
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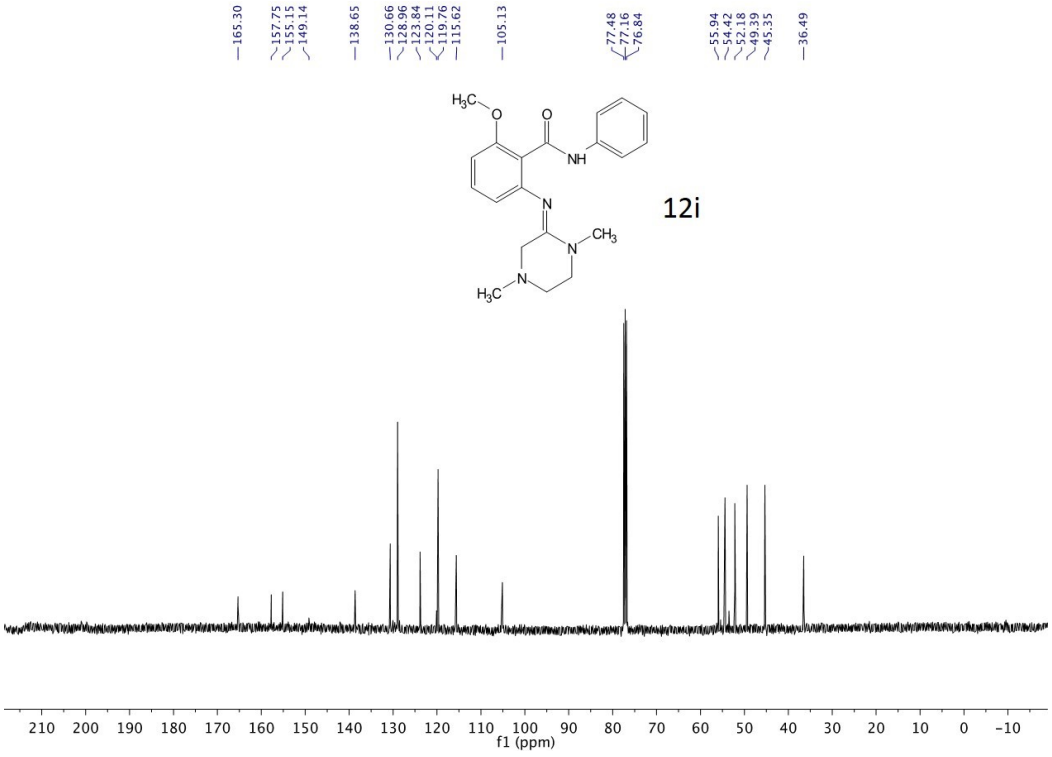
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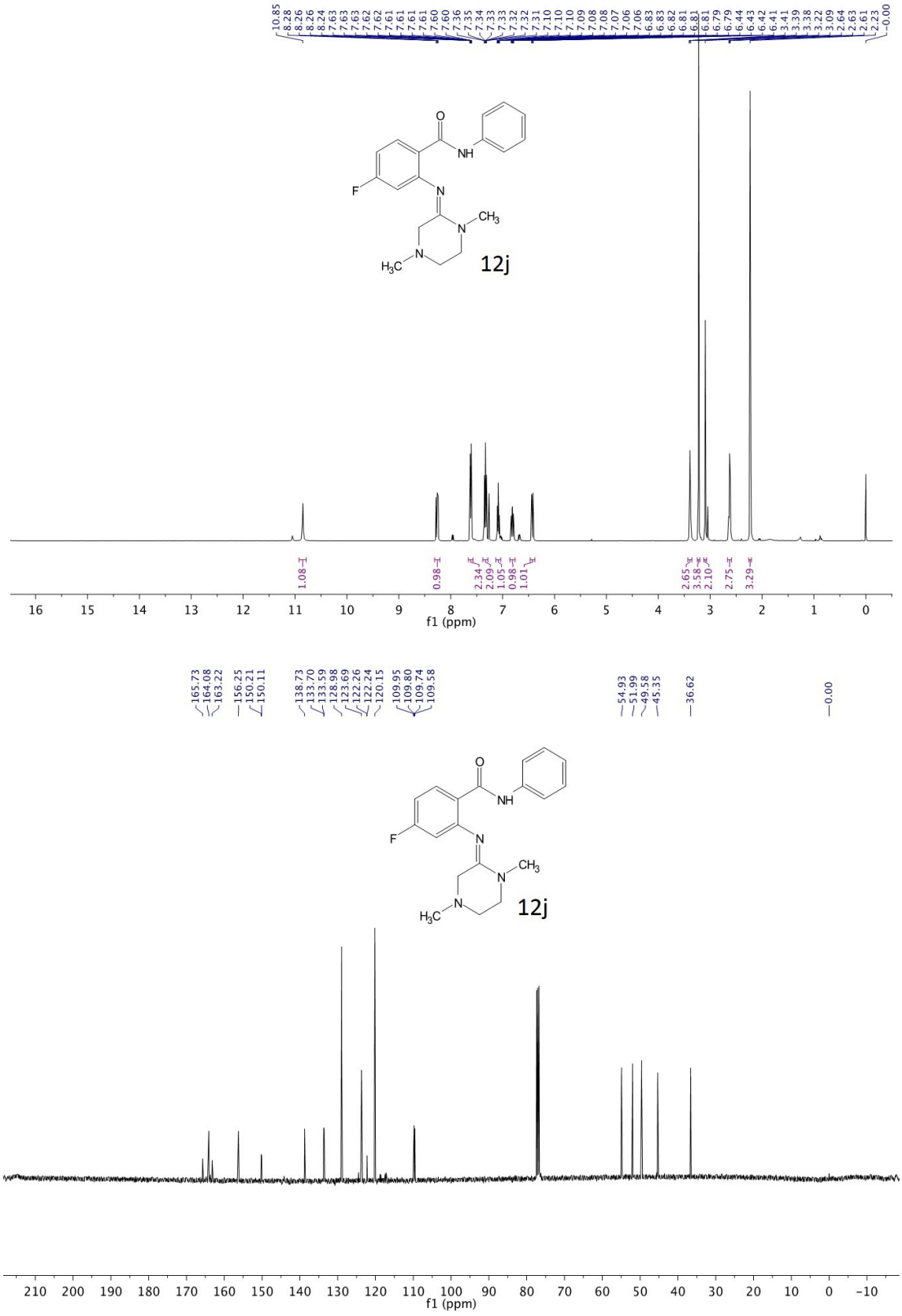
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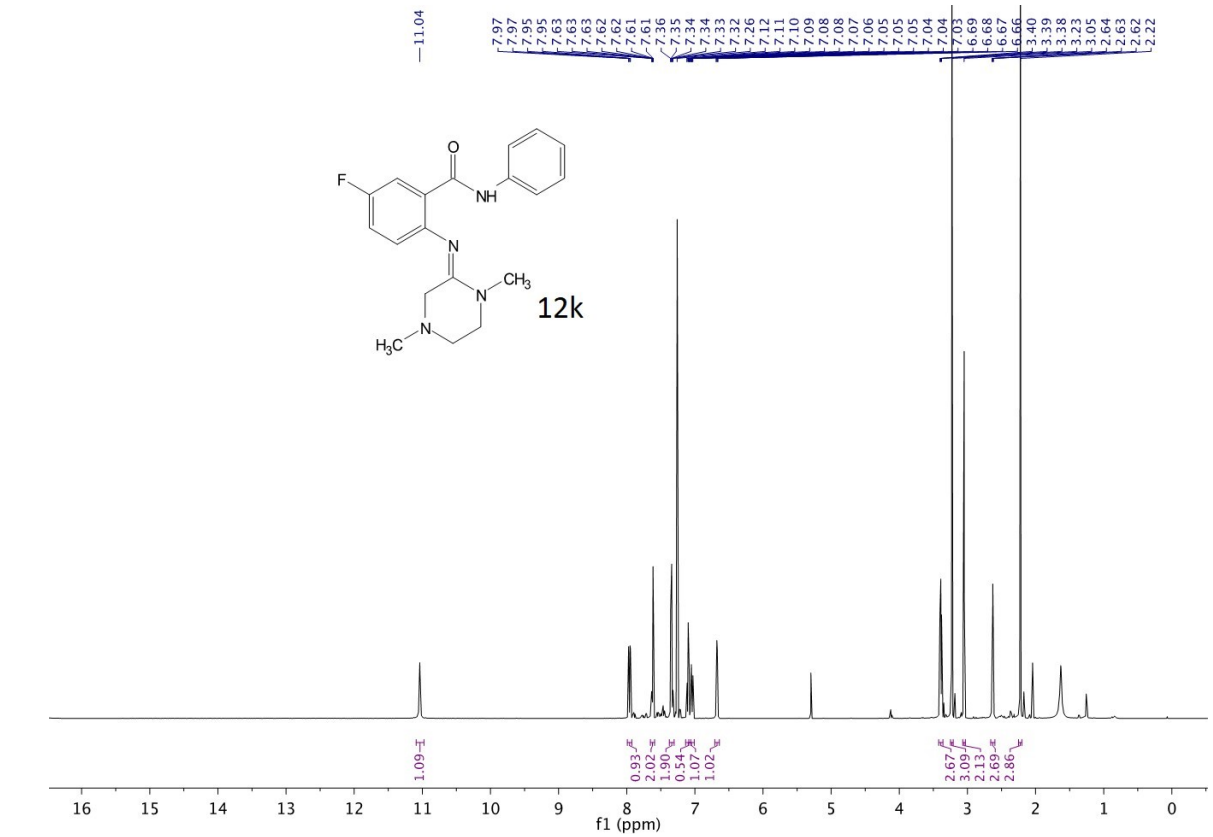
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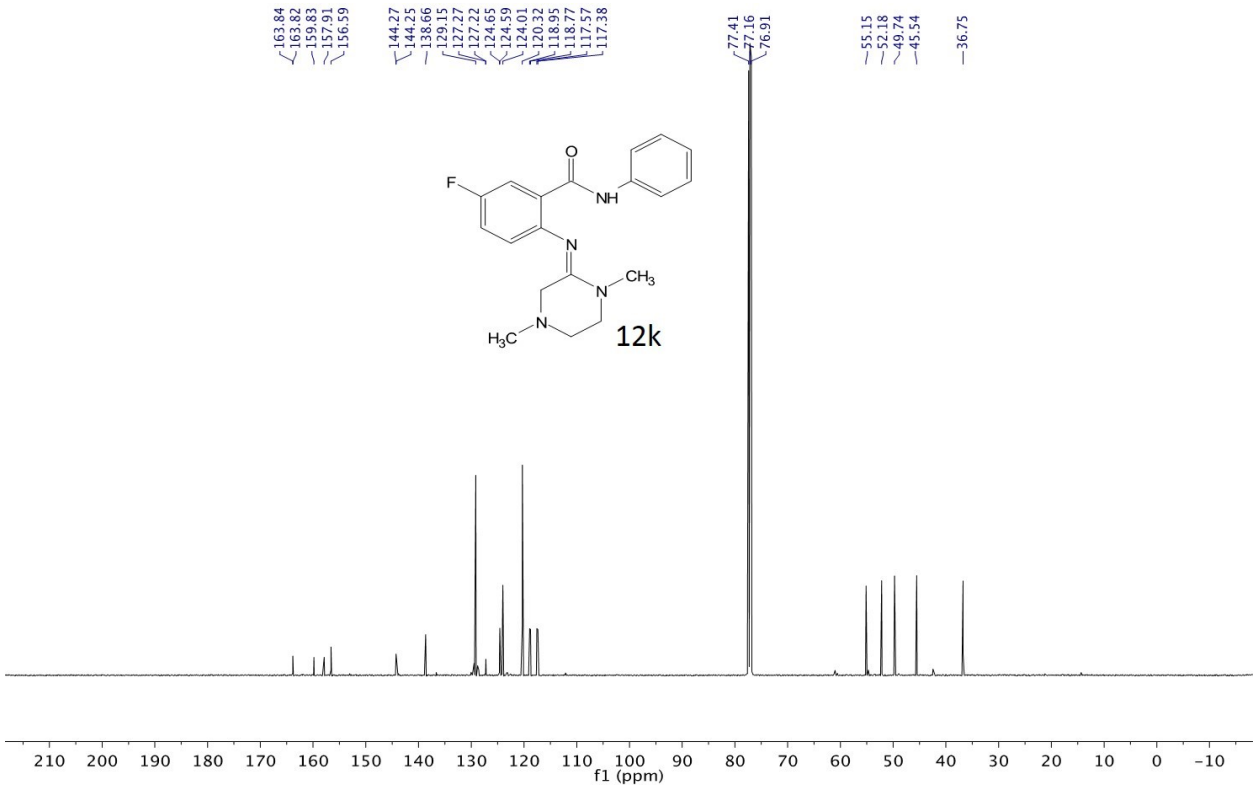
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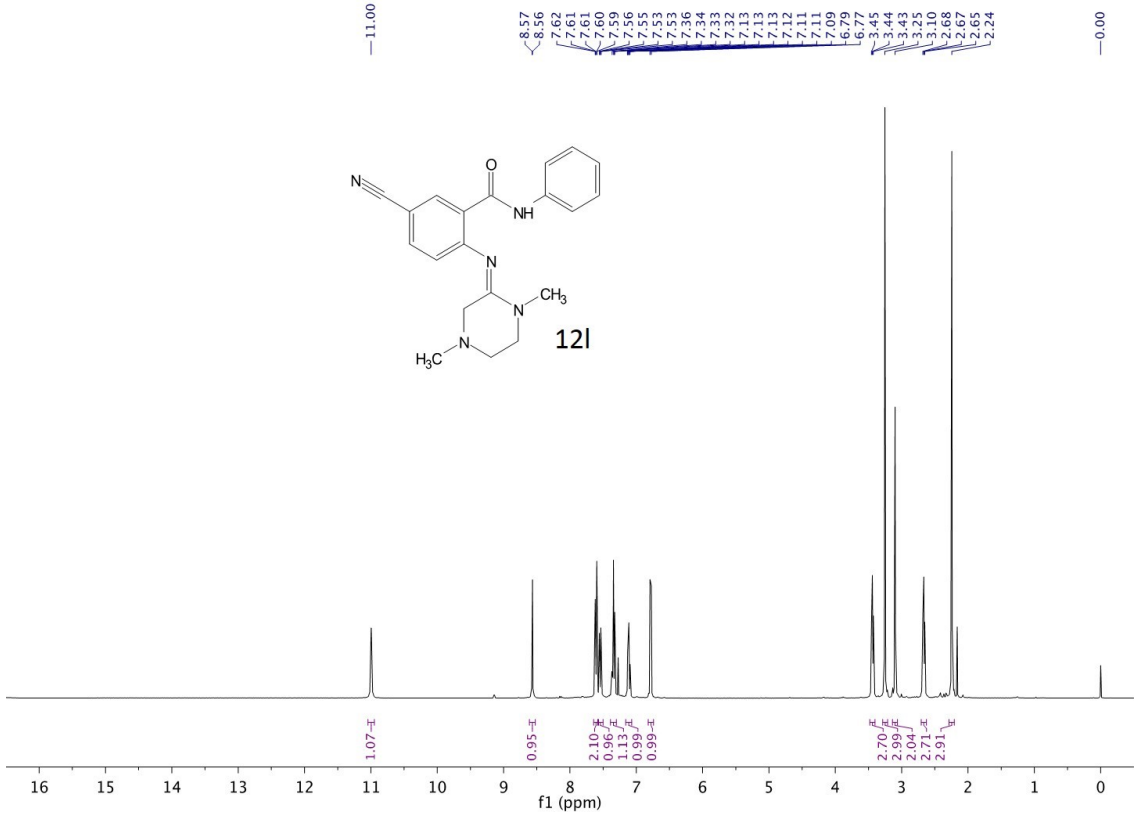
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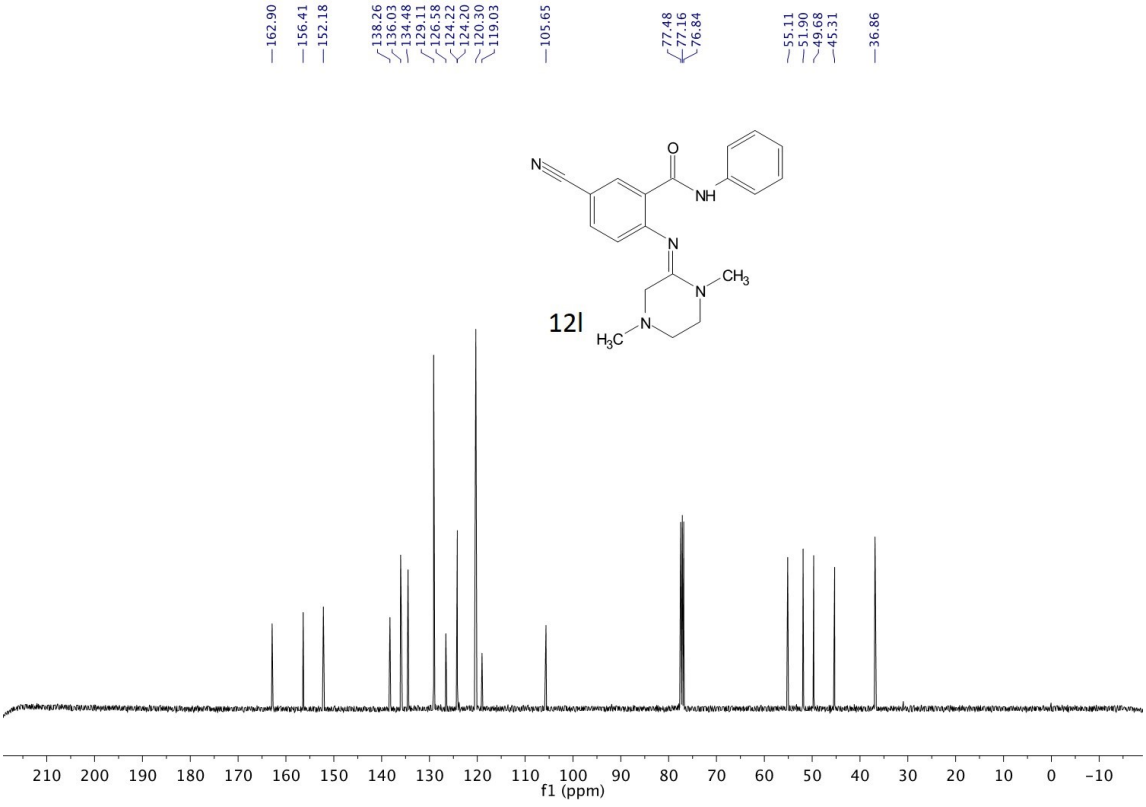
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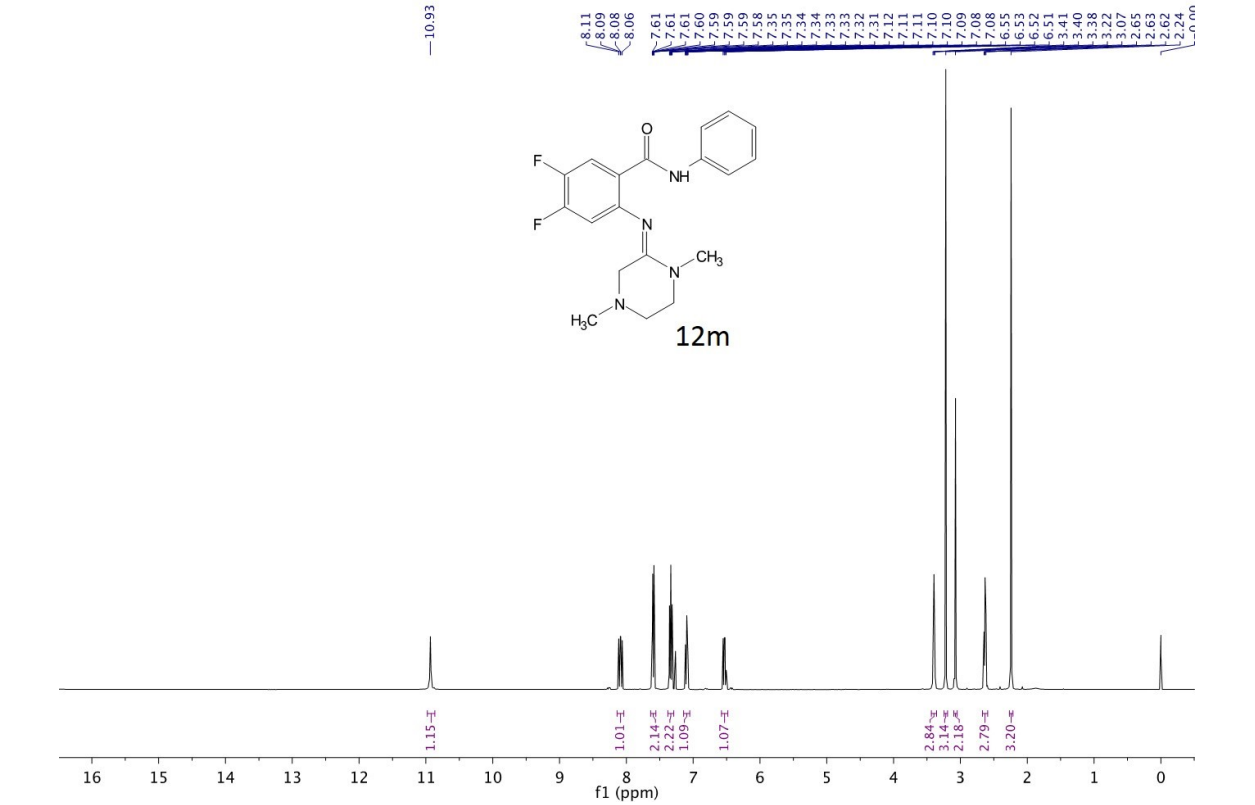
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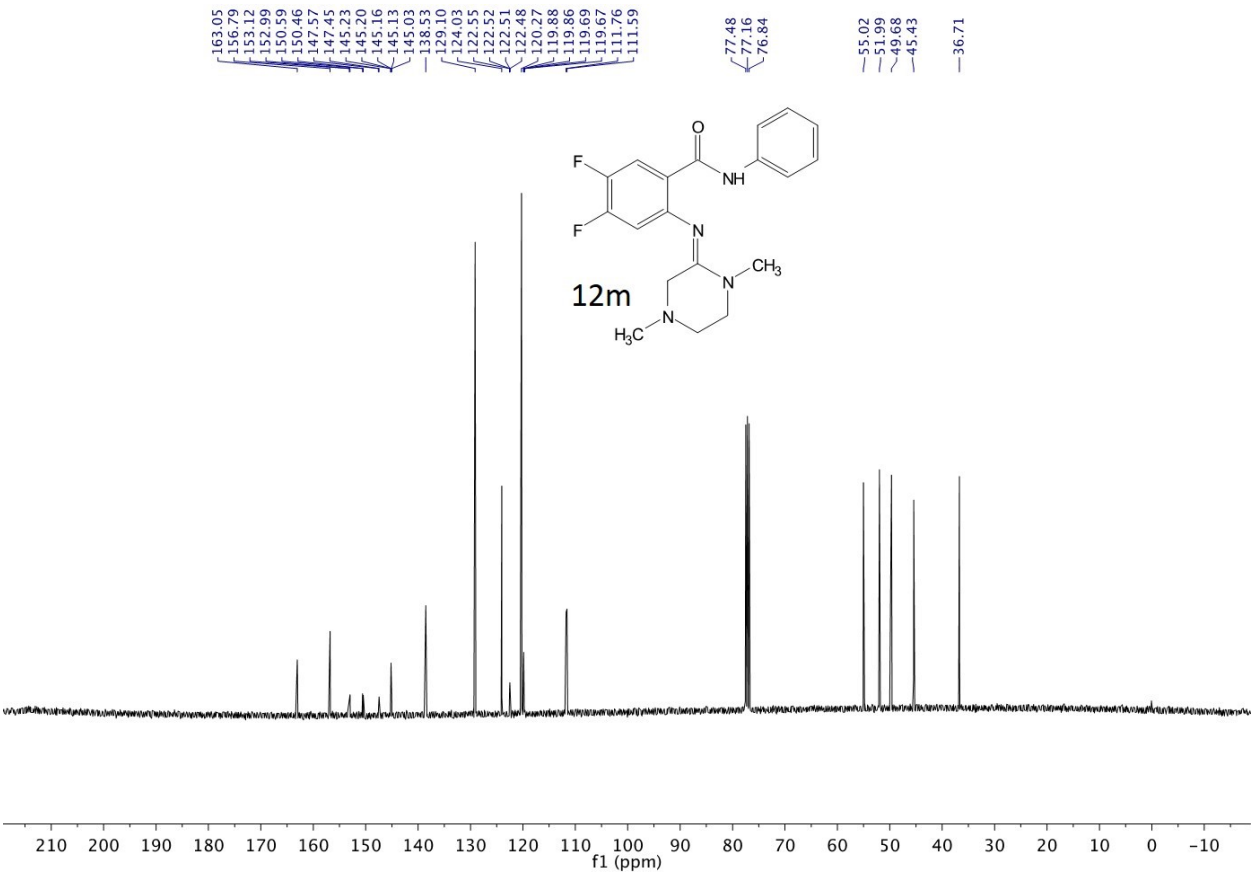
H3C
12m
1.15
1.01
2.14
2.22
1.09
1.07
2.84
3.14
2.18
2.79
3.20
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
f1 (ppm)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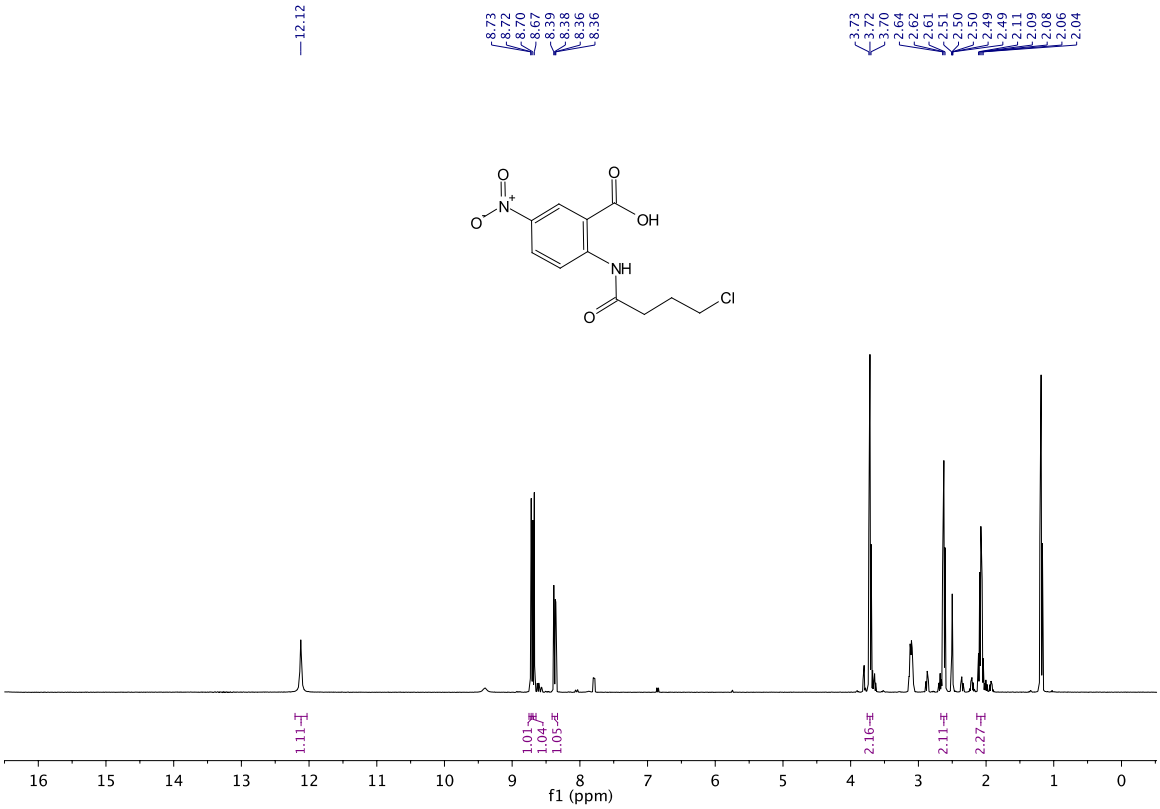
156.79
153.12
152.99
150.59
150.46
147.57
147.45
145.23
145.20
145.16
145.13
145.03
138.53
129.10
124.03
122.55
122.52
122.51
122.48
120.27
119.88
119.86
119.69
119.67
111.76
111.59
77.48
77.16
76.84
55.02
51.99
49.68
45.43
36.71
F
F
O
NH
N
N
CH3
N
H3C
12m
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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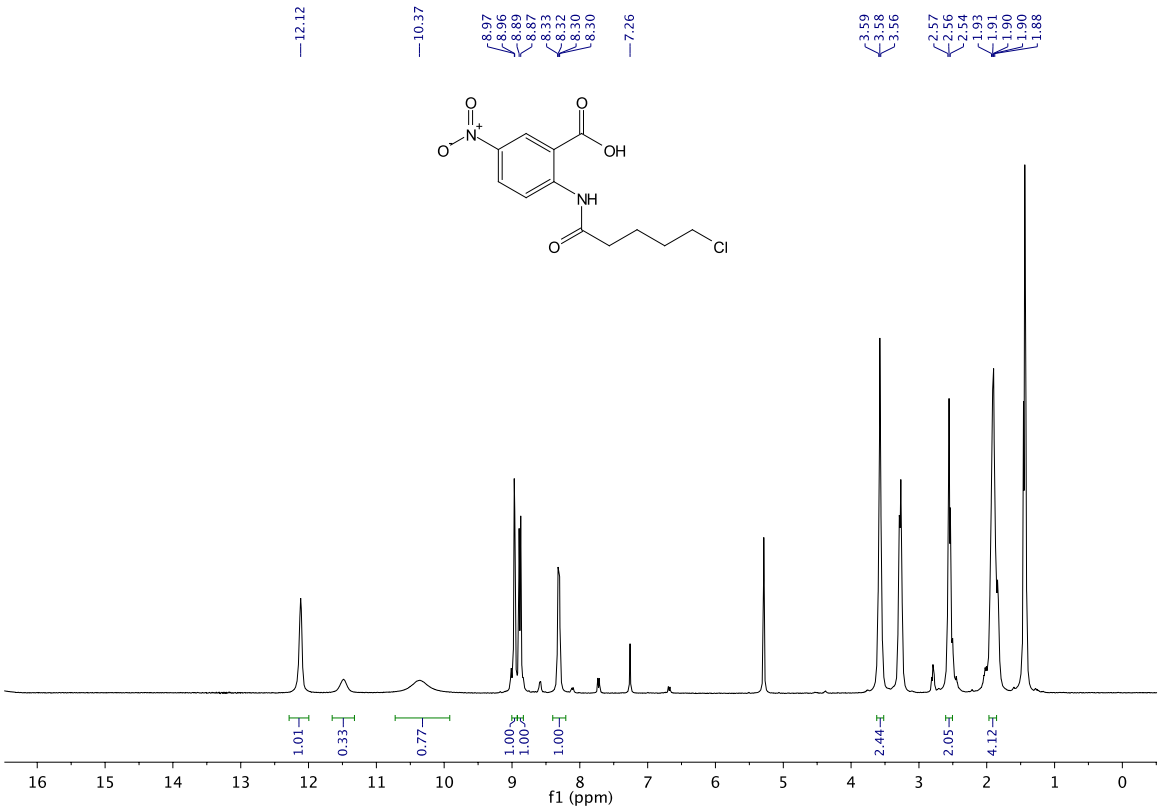
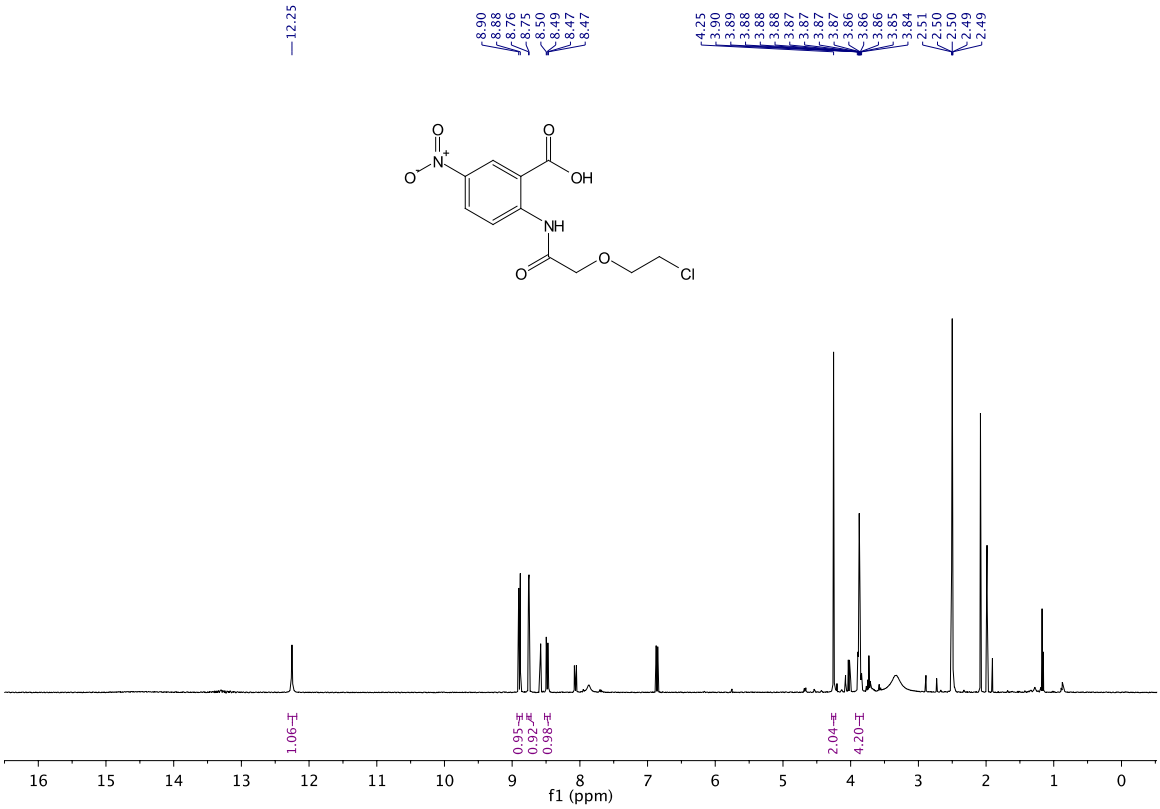
8.73
8.72
8.70
8.67
8.39
8.38
8.36
8.36
3.73
3.72
3.70
2.64
2.62
2.61
2.51
2.50
2.50
2.49
2.11
2.09
2.08
2.06
2.04
O
O
N+
O
OH
NH
Cl
O
1.11
1.01
1.04
1.05
2.16
2.11
2.27
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
f1 (ppm)


12.12
10.37
8.97
8.96
8.89
8.87
8.33
8.32
8.30
8.30
7.26
3.59
3.58
3.56
2.57
2.56
2.54
1.93
1.91
1.90
1.90
1.88
O
O
N+
O
OH
NH
Cl
O
1.01
0.33
0.77
1.00
1.00
2.44
2.05
4.12
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
f1 (ppm)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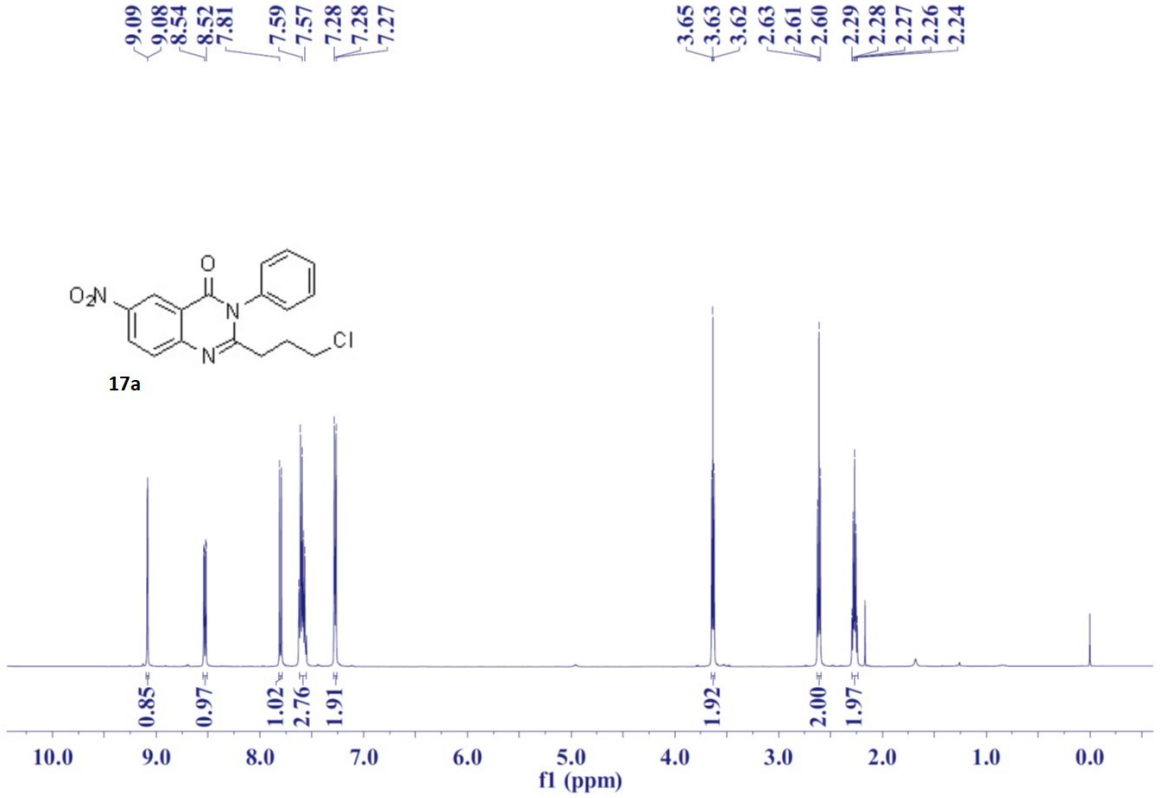
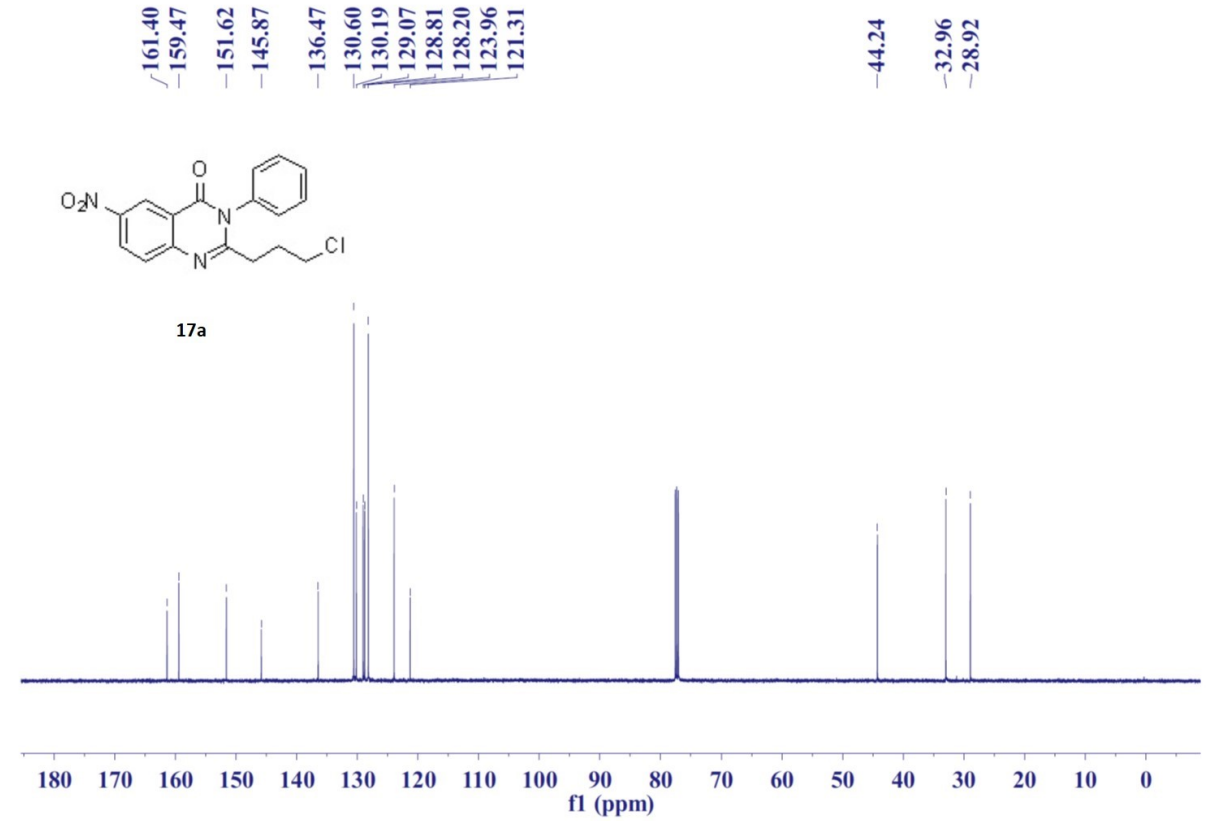
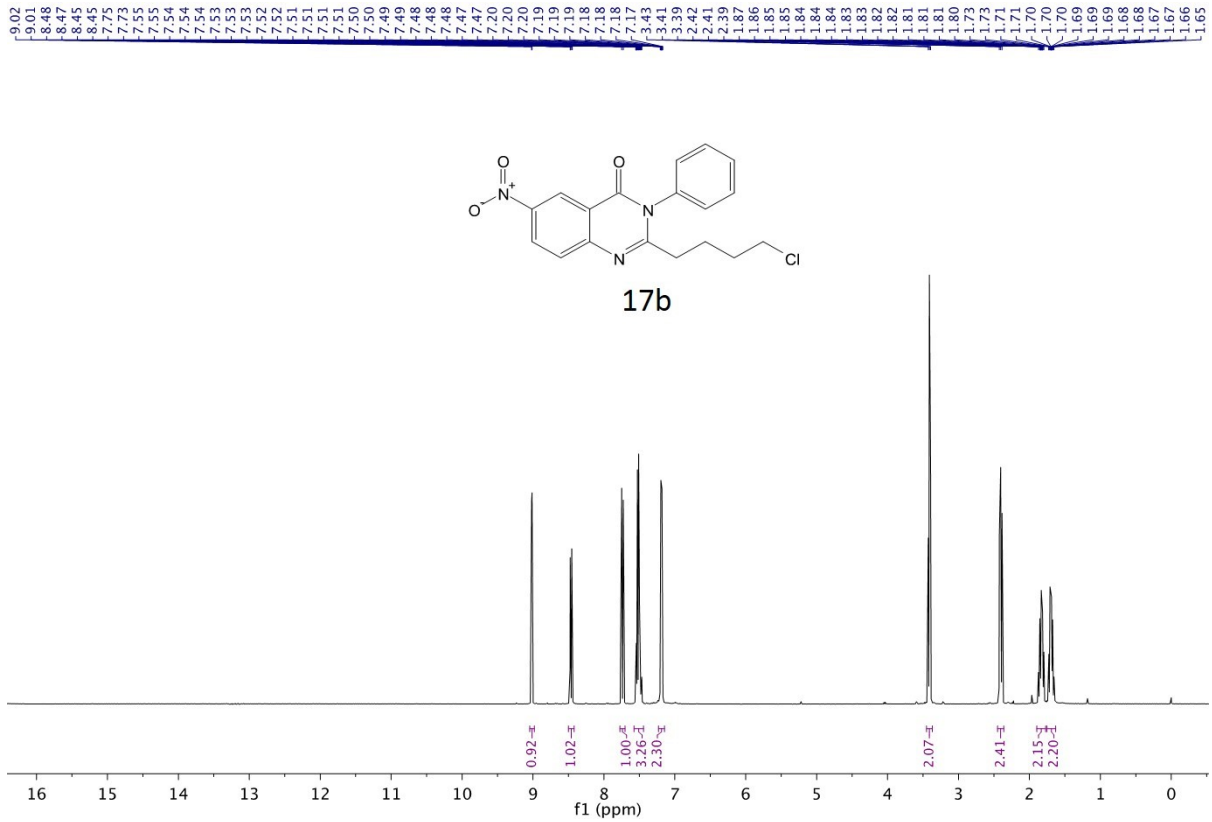
8.90
8.88
8.76
8.75
8.50
8.49
8.47
8.47
4.25
3.90
3.89
3.88
3.88
3.87
3.87
3.87
3.87
3.86
3.86
3.85
3.84
2.51
2.50
2.50
2.49
2.49
OH
NH
O
Cl
1.06
0.95
0.92
0.98
2.04
4.20
f1 (ppm)

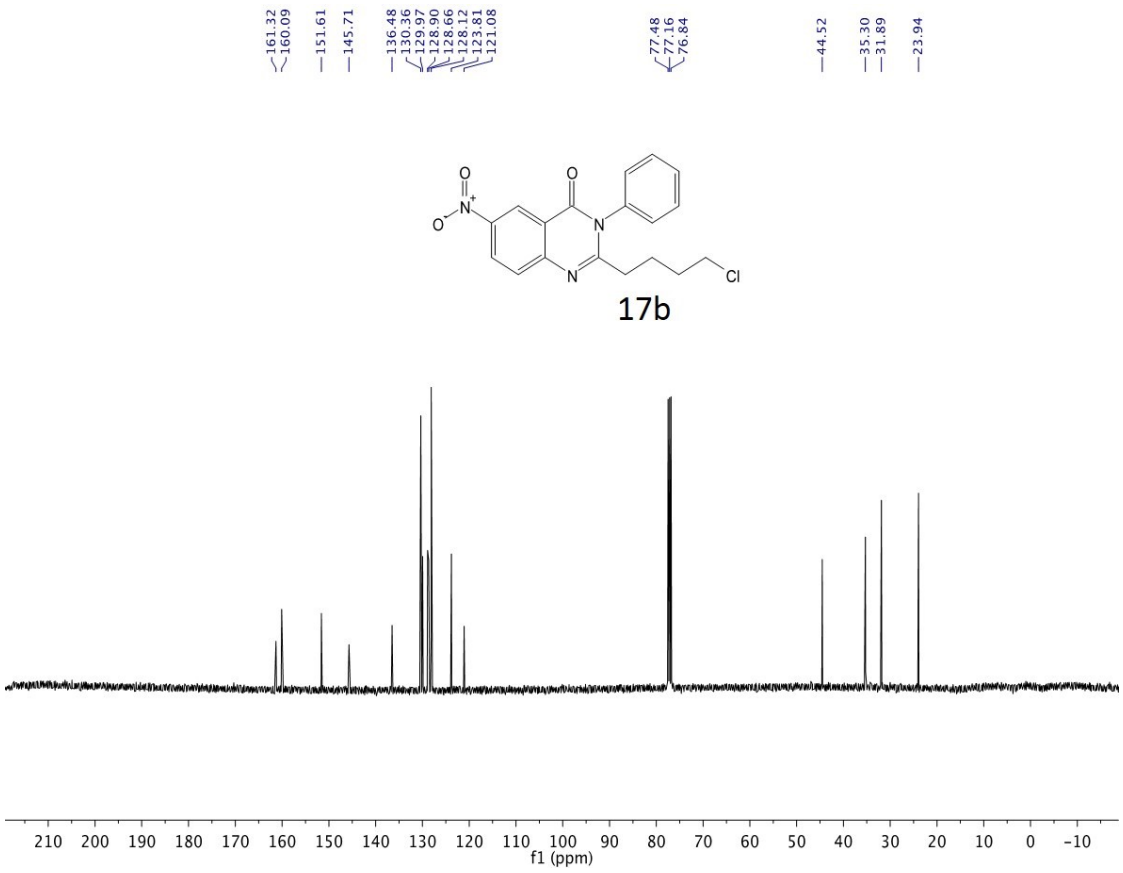

9.09
9.08
8.54
8.52
7.81
7.59
7.57
7.28
7.28
7.27
3.65
3.63
3.62
2.63
2.61
2.60
2.29
2.28
2.27
2.26
2.24
O2N
Cl
17a
0.85
0.97
1.02
2.76
1.91
1.92
2.00
1.97
f1 (ppm)


161.40
159.47
151.62
145.87
136.47
130.60
130.19
129.07
128.81
128.20
123.96
121.31
44.24
32.96
28.92
O
O2N
N
N
Cl
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

17a


O
O
N+
O
N
N
Cl
0.92
1.02
1.00
3.26
2.30
2.07
2.41
2.15
2.20
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
f1 (ppm)

17b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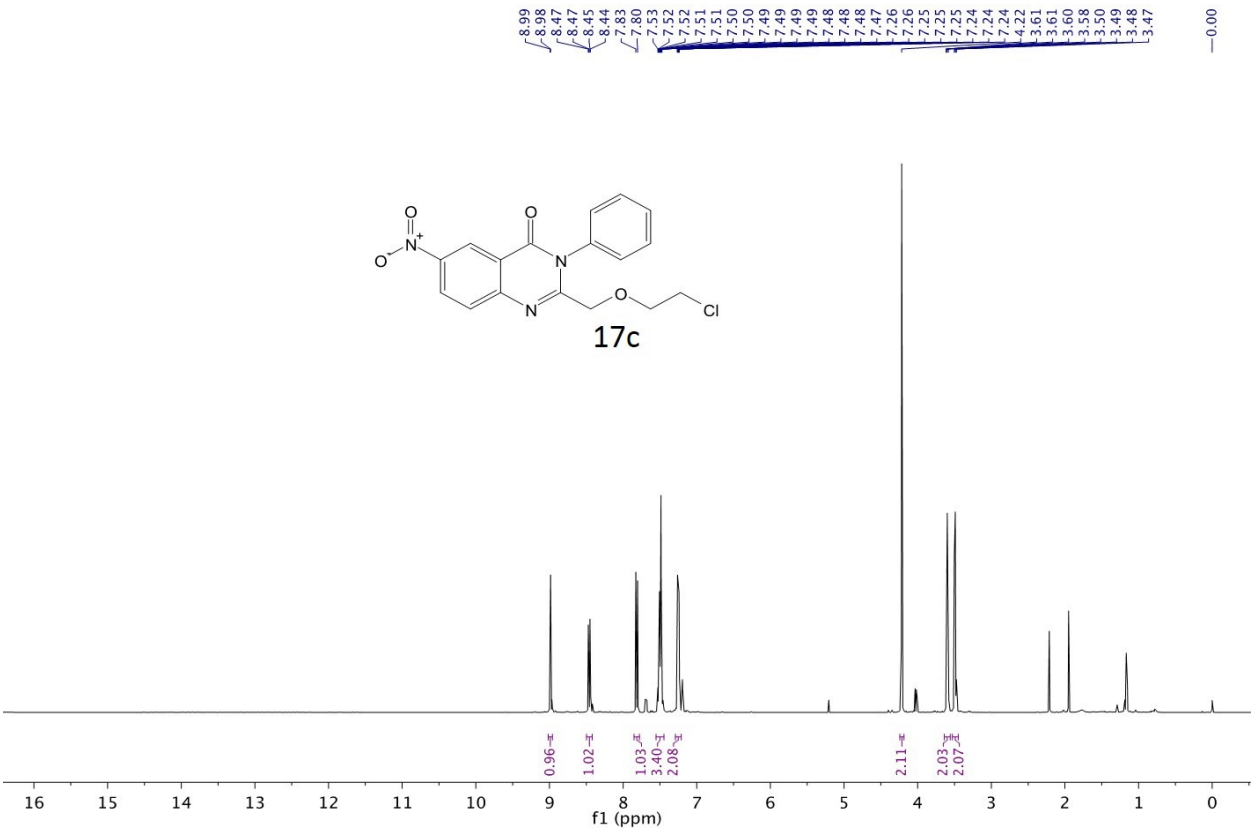
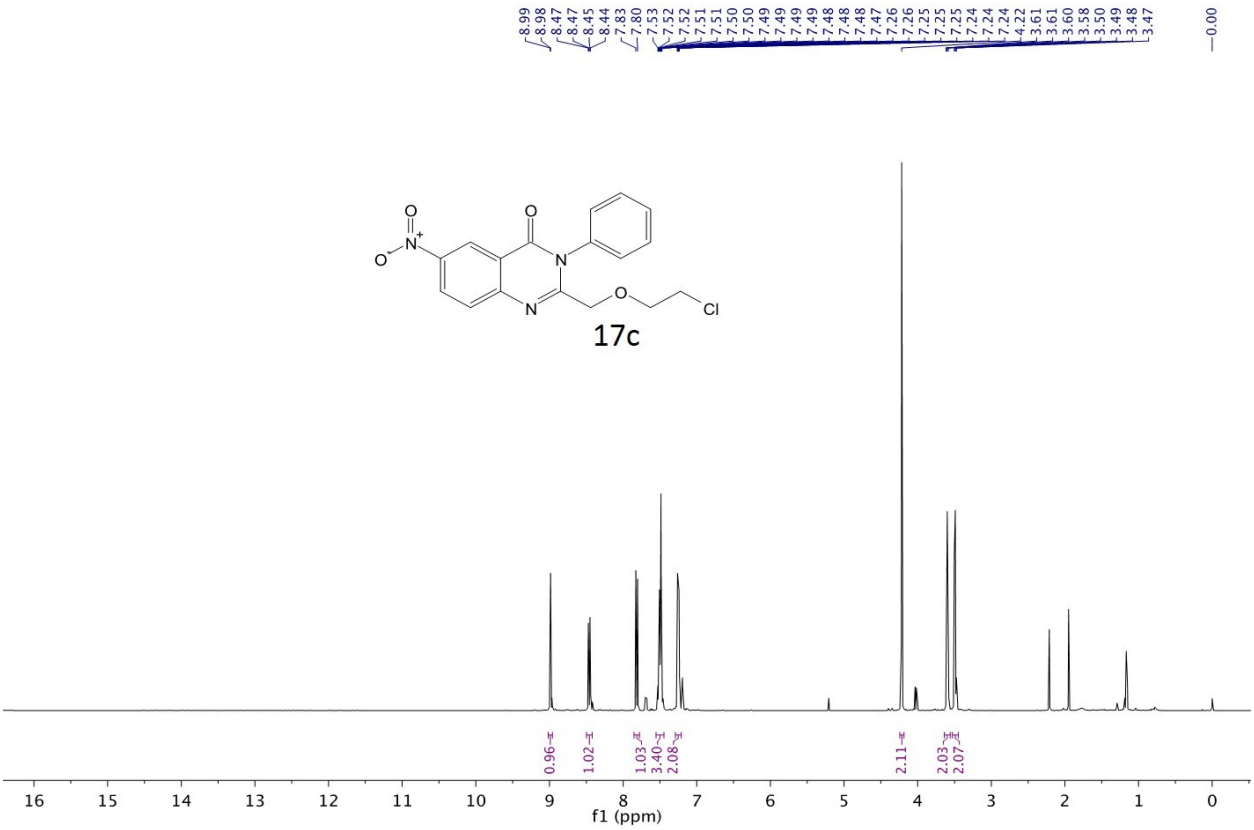
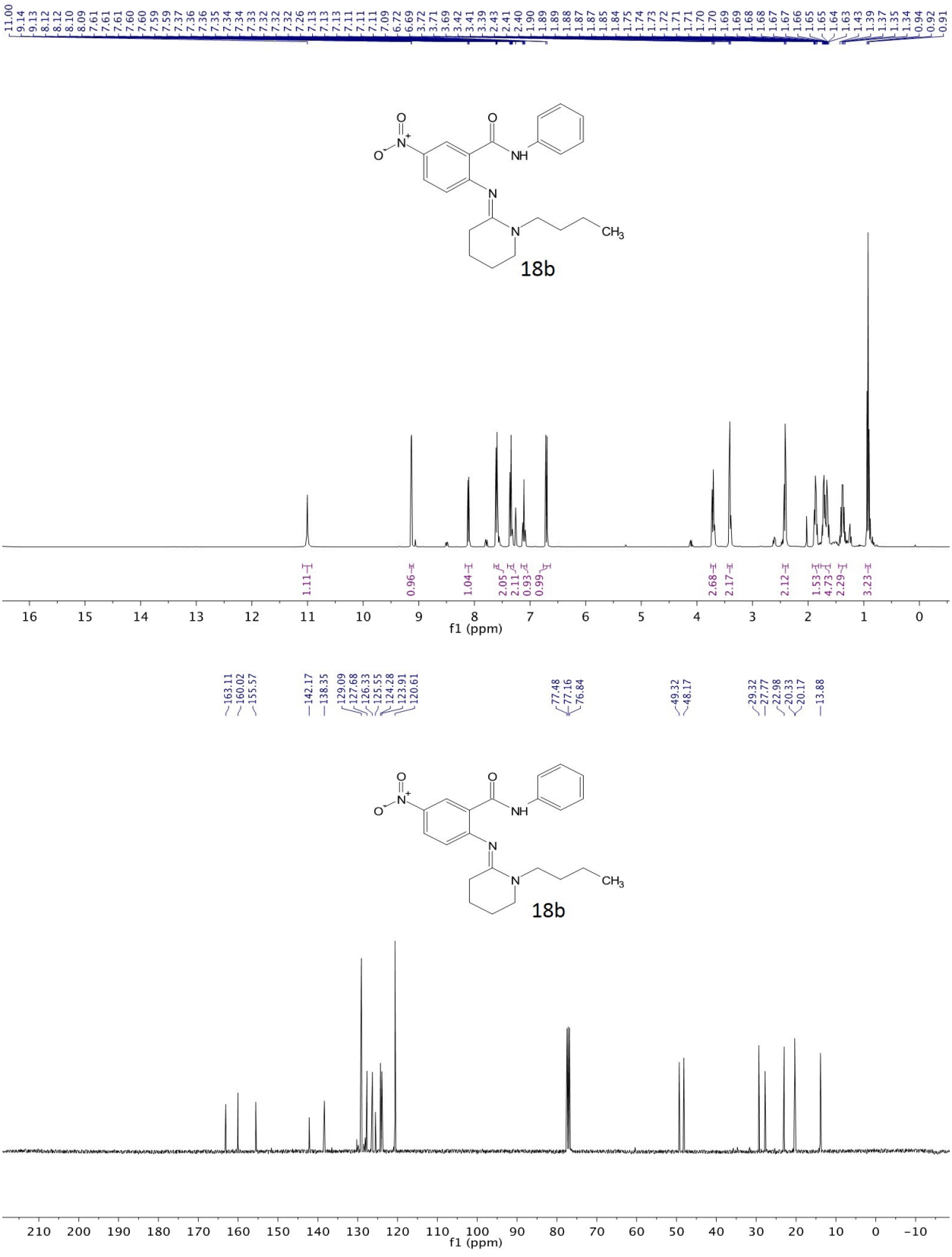
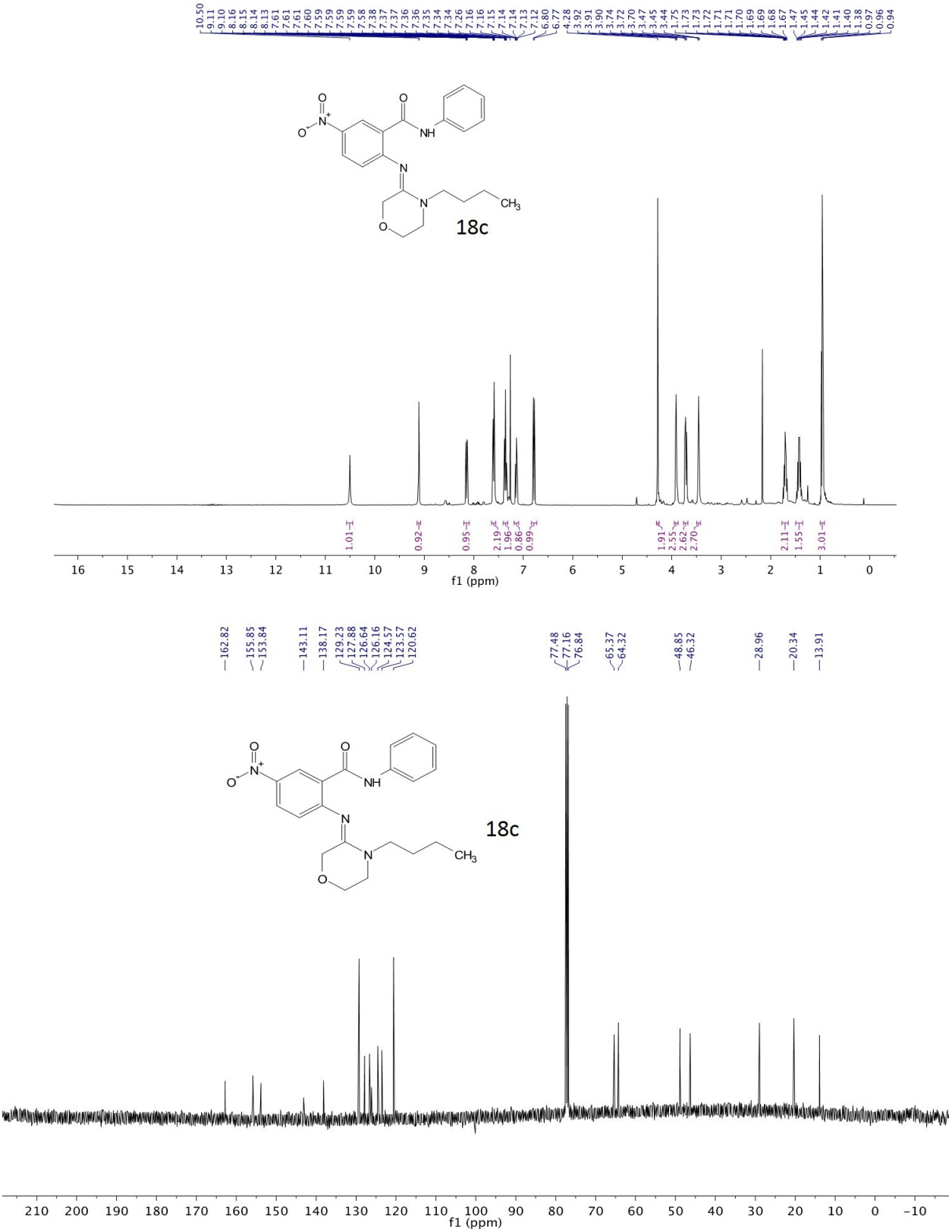
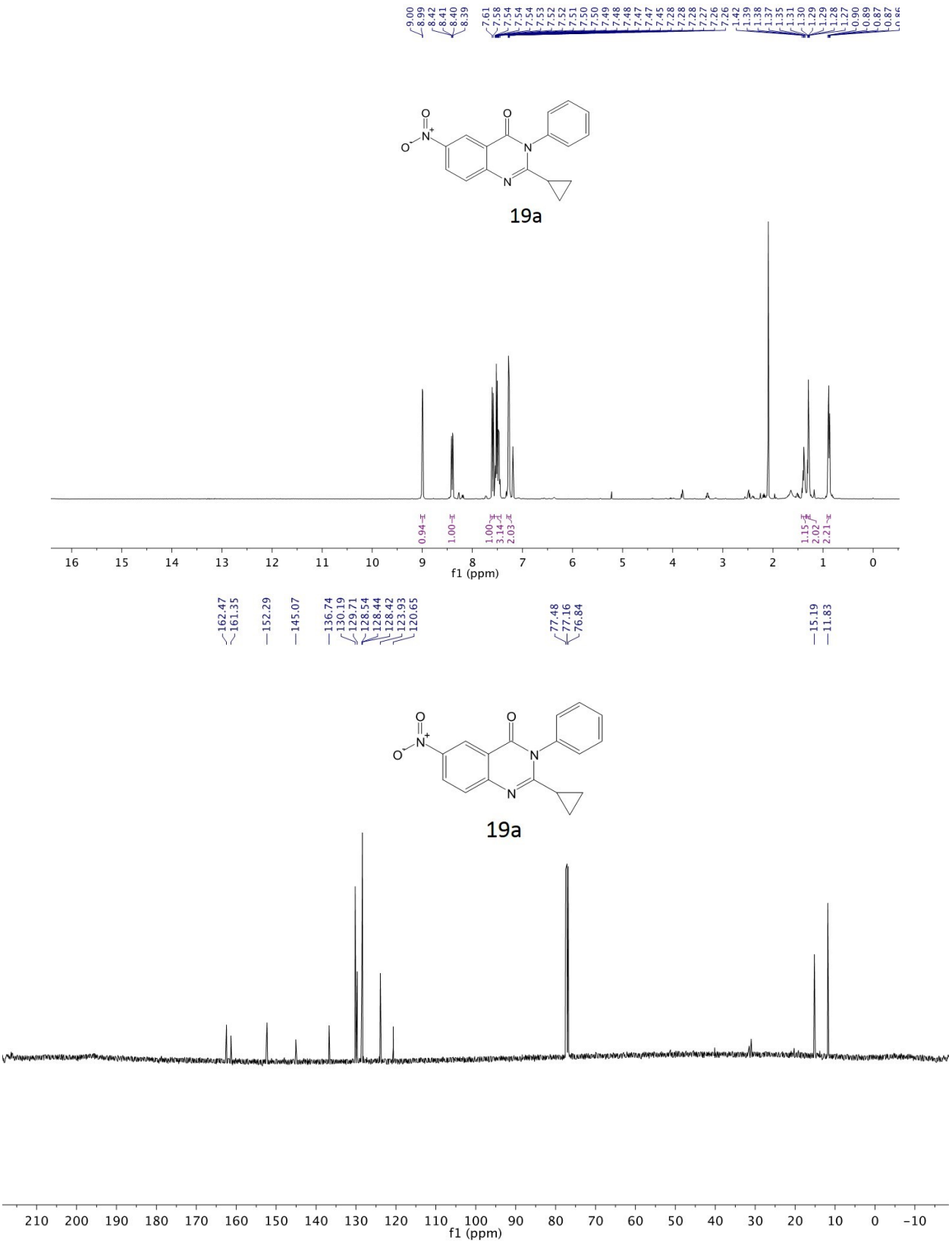
160.09
151.61
145.71
136.48
130.36
129.97
128.90
128.66
128.12
123.81
121.08
77.48
77.16
76.84
44.52
35.30
31.89
23.94
O
O
N+
O-
N
N
Cl
17b
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

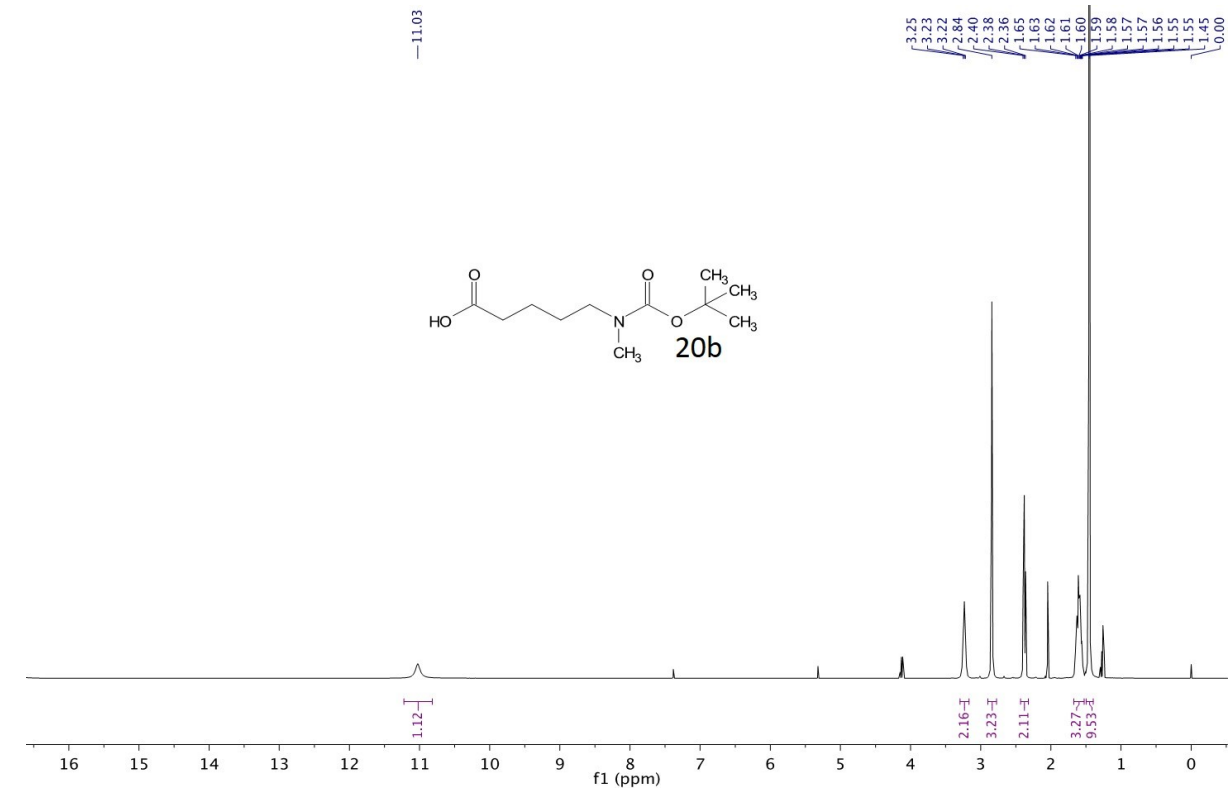

8.99
8.98
8.47
8.47
8.45
8.44
7.83
7.80
7.53
7.52
7.52
7.51
7.51
7.50
7.50
7.49
7.49
7.49
7.49
7.48
7.48
7.48
7.47
7.47
7.26
7.26
7.25
7.25
7.25
7.24
7.24
7.24
4.22
3.61
3.61
3.60
3.58
3.50
3.49
3.48
3.47
0.00
17c
0.96
1.02
1.03
3.40
2.08
2.11
2.03
2.07
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
f1 (ppm)

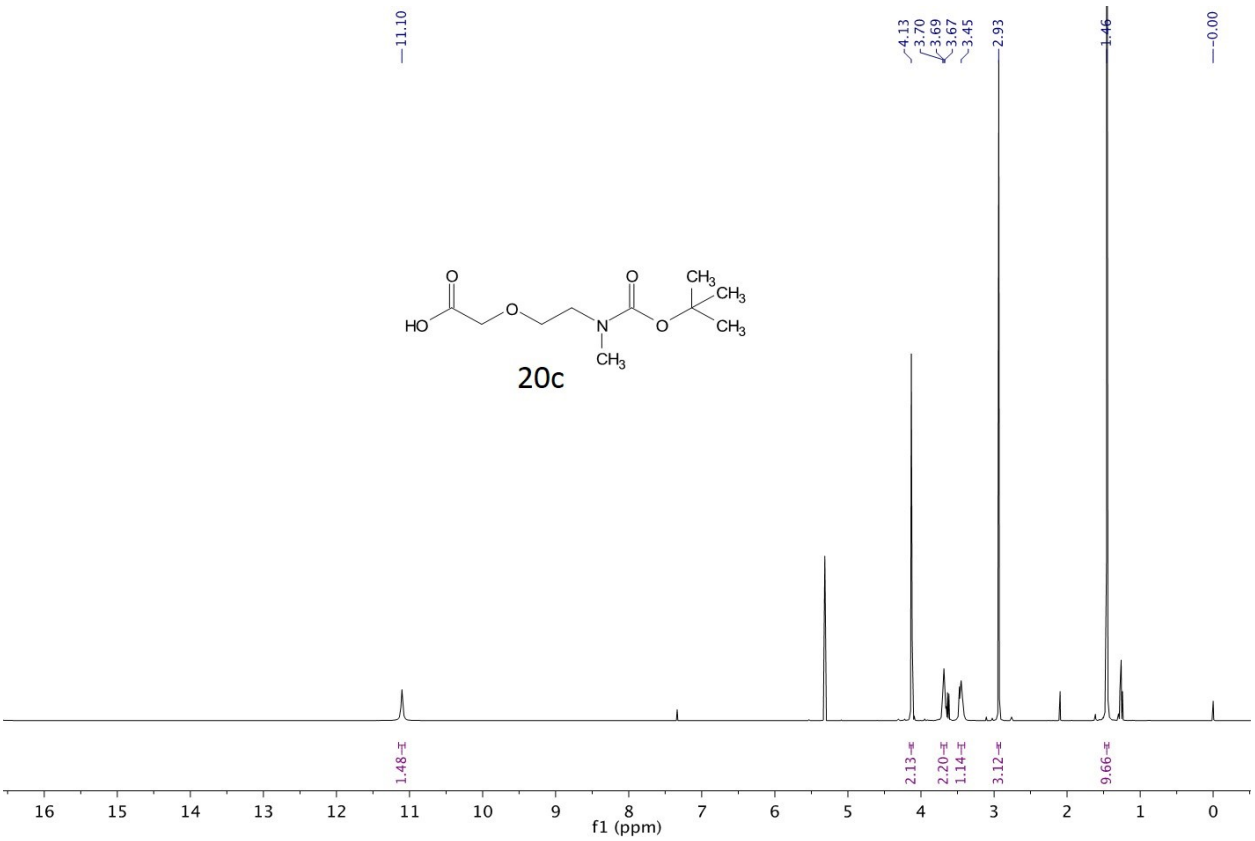

8.99
8.98
8.47
8.47
8.45
8.44
7.83
7.80
7.53
7.52
7.52
7.51
7.51
7.50
7.50
7.49
7.49
7.49
7.49
7.48
7.48
7.48
7.47
7.47
7.26
7.26
7.25
7.25
7.25
7.24
7.24
7.24
4.22
3.61
3.61
3.60
3.58
3.50
3.49
3.48
3.47
0.00
17c
0.96
1.02
1.03
3.40
2.08
2.11
2.03
2.07
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
f1 (ppm)

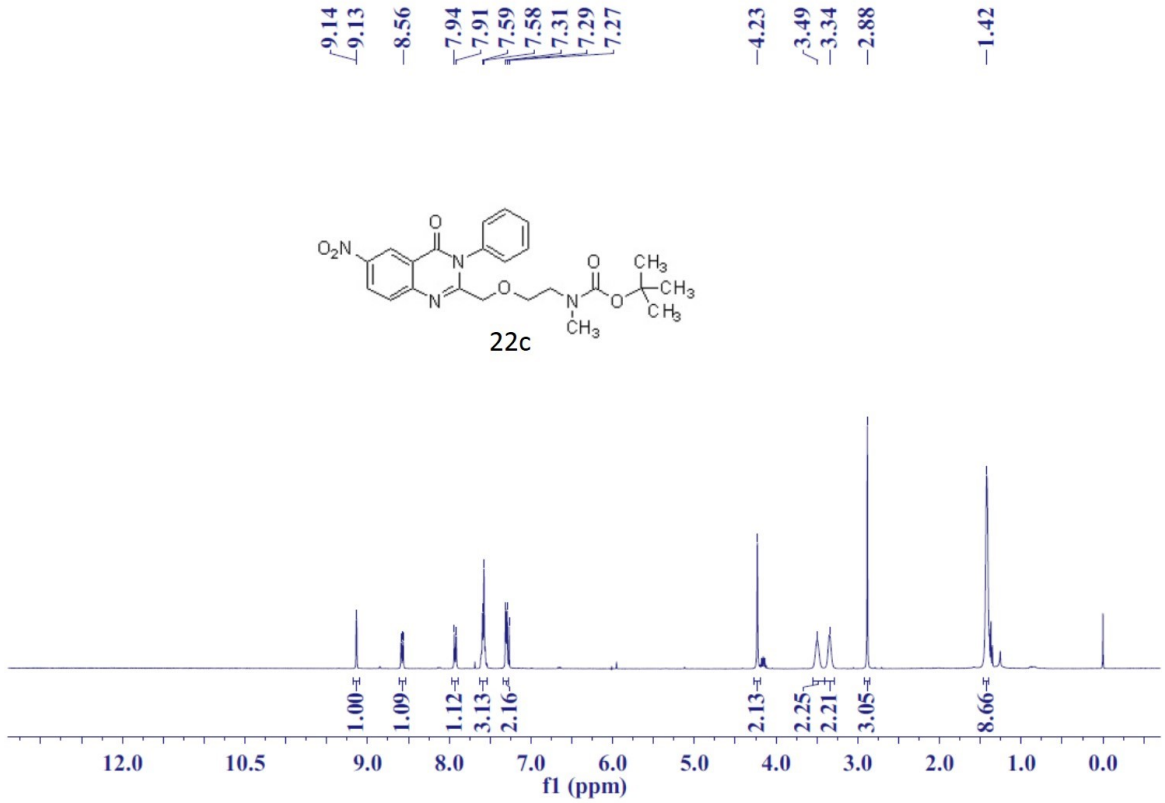

18b
f1 (ppm)
18b
f1 (ppm)

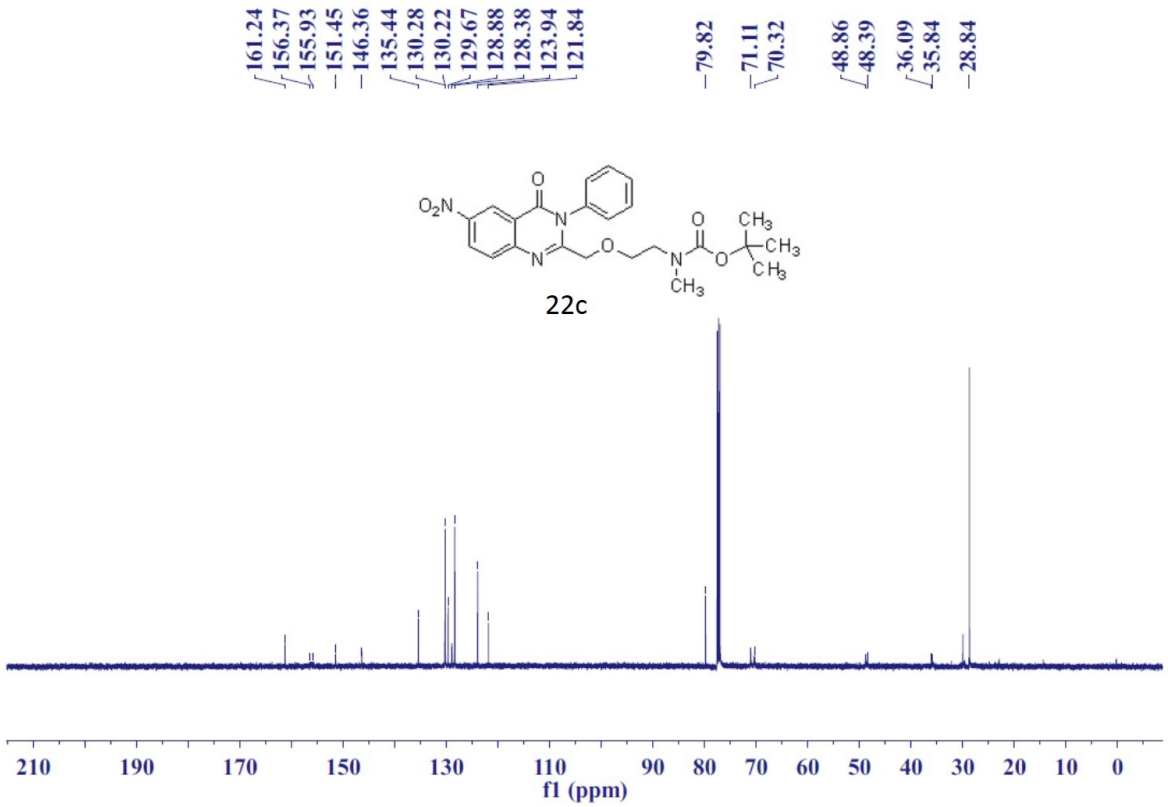

18c
f1 (ppm)
18c
f1 (ppm)


19a
f1 (ppm)
19a
f1 (ppm)


11.03
3.25
3.23
3.22
2.84
2.40
2.38
2.36
1.65
1.63
1.62
1.61
1.60
1.59
1.58
1.57
1.57
1.56
1.55
1.55
1.45
0.00
HO
O
O
N
O
CH3
CH3
CH3
CH3
20b
1.12
2.16
3.23
2.11
3.27
9.53
f1 (ppm)


11.10
4.13
3.70
3.69
3.67
3.45
2.93
1.46
0.00
HO
O
O
O
N
O
CH3
CH3
CH3
CH3
20c
1.48
2.13
2.20
1.14
3.12
9.66
f1 (ppm)


9.14
9.13
8.56
7.94
7.91
7.59
7.58
7.31
7.29
7.27
4.23
3.49
3.34
2.88
1.42
22c
1.00
1.09
1.12
3.13
2.16
2.13
2.25
2.21
3.05
8.66
12.0
10.5
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
f1 (ppm)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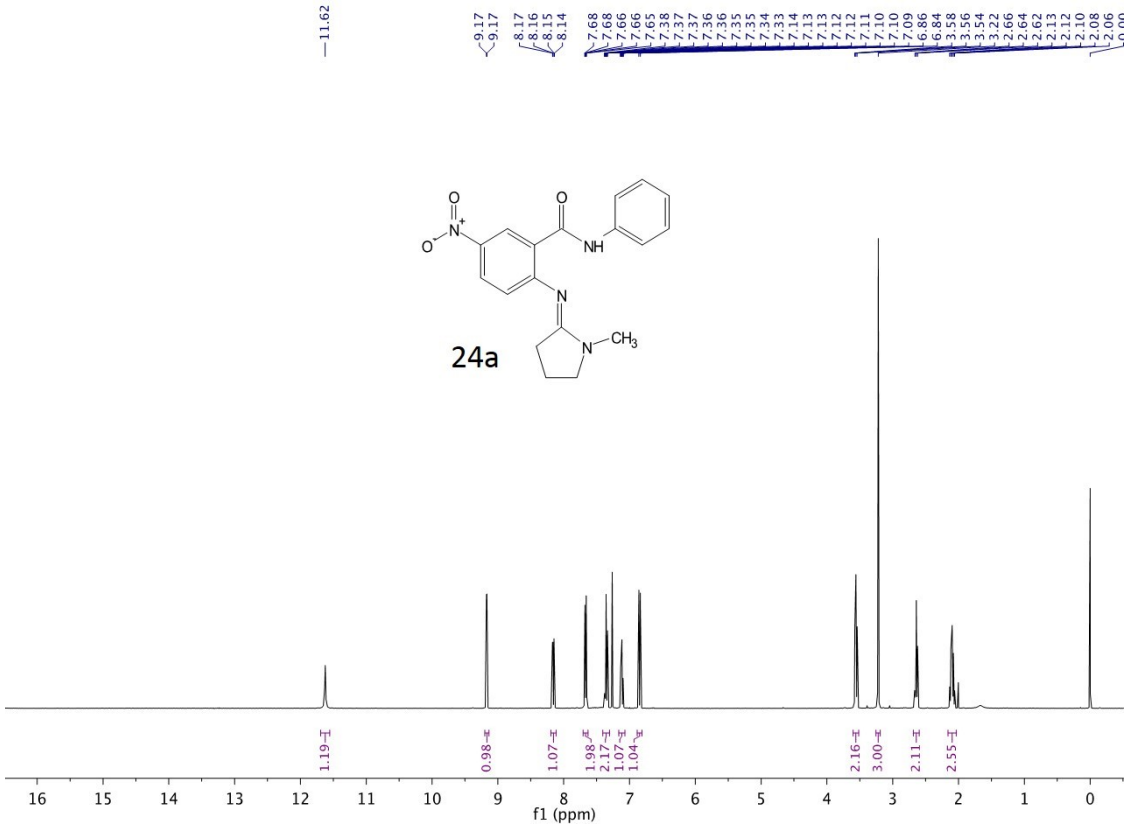
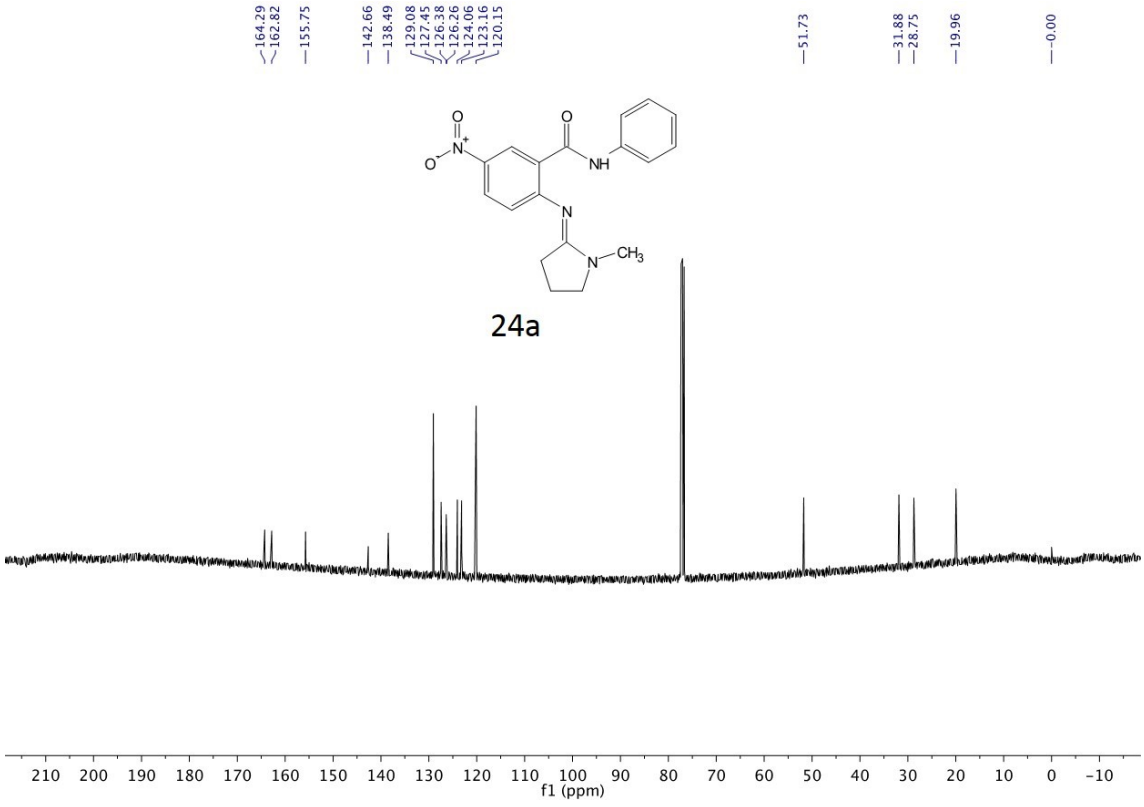
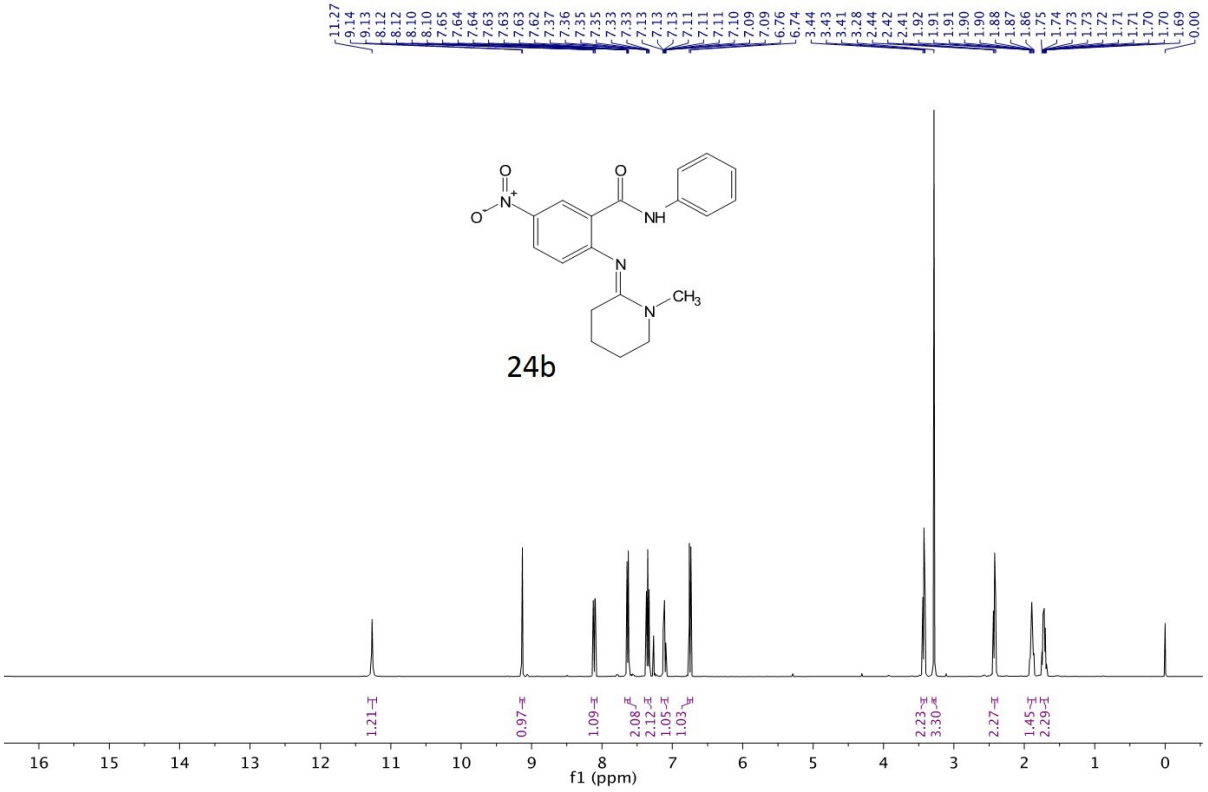
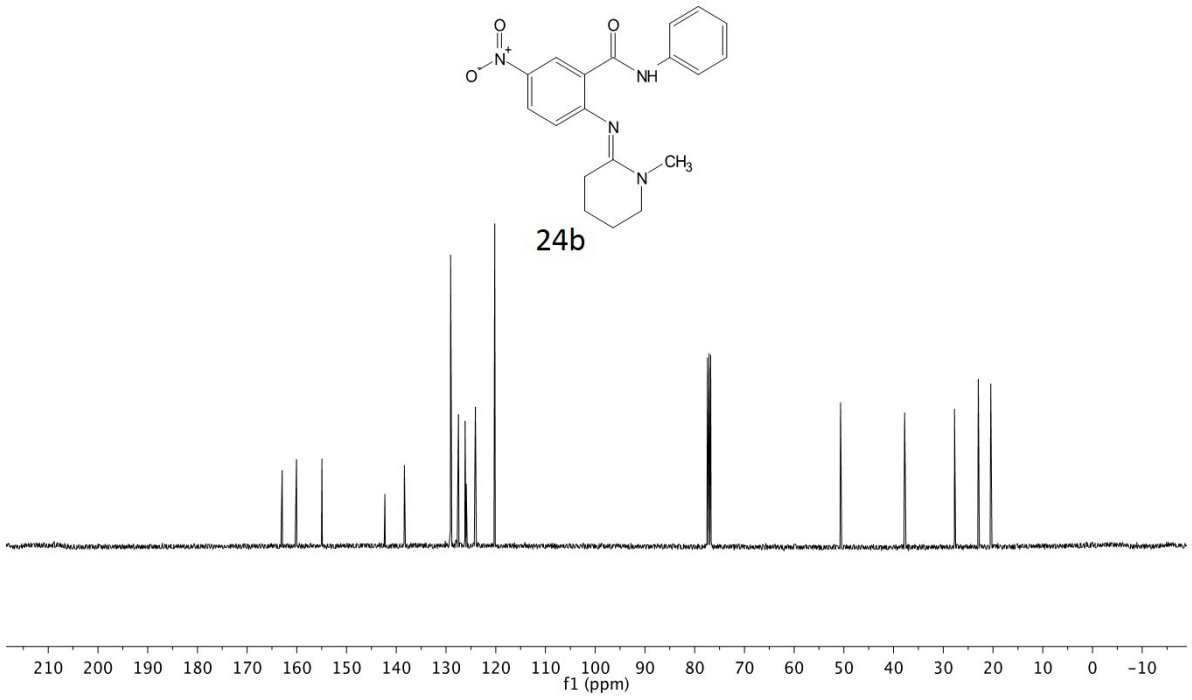
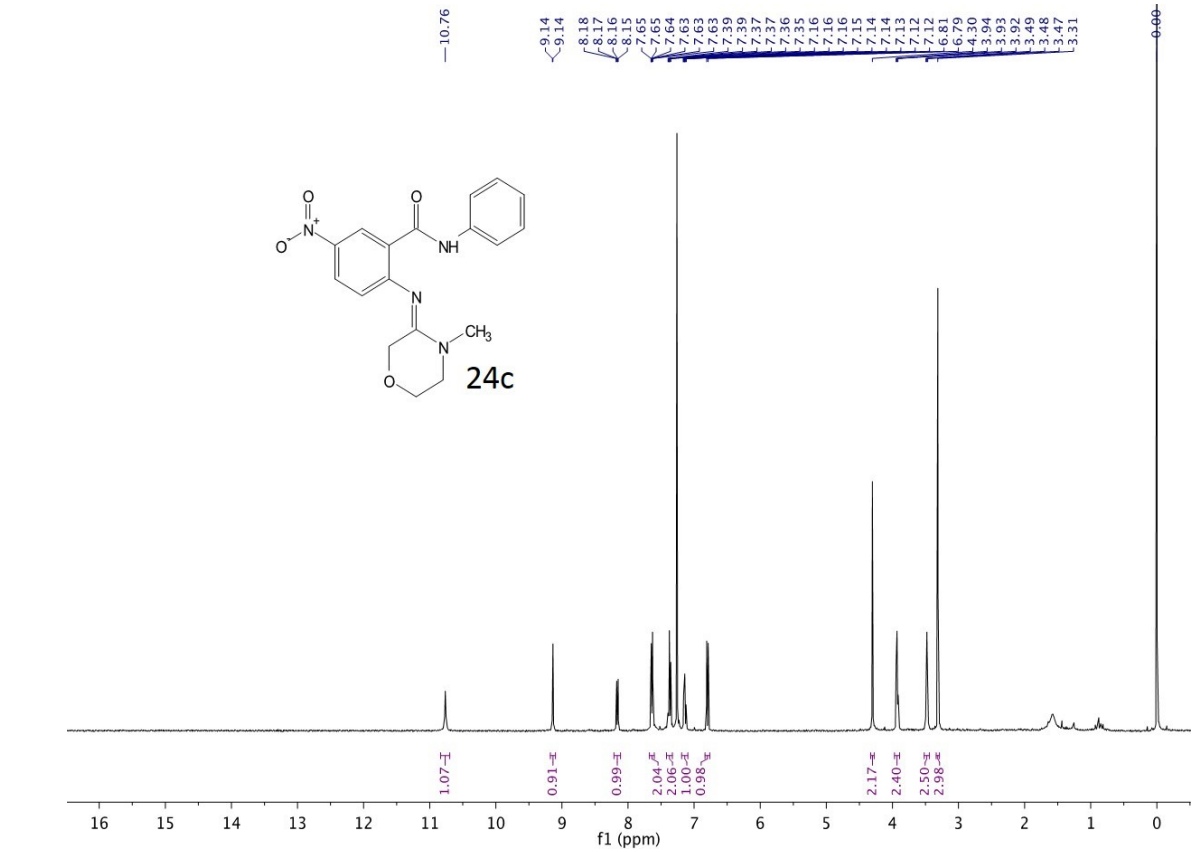
155.93
151.45
146.36
135.44
130.28
130.22
129.67
128.88
128.38
123.94
121.84
79.82
71.11
70.32
48.86
48.39
36.09
35.84
28.84
22c
210
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


24a
f1 (ppm)


24a
f1 (ppm)


24b
f1 (ppm)


24b
f1 (ppm)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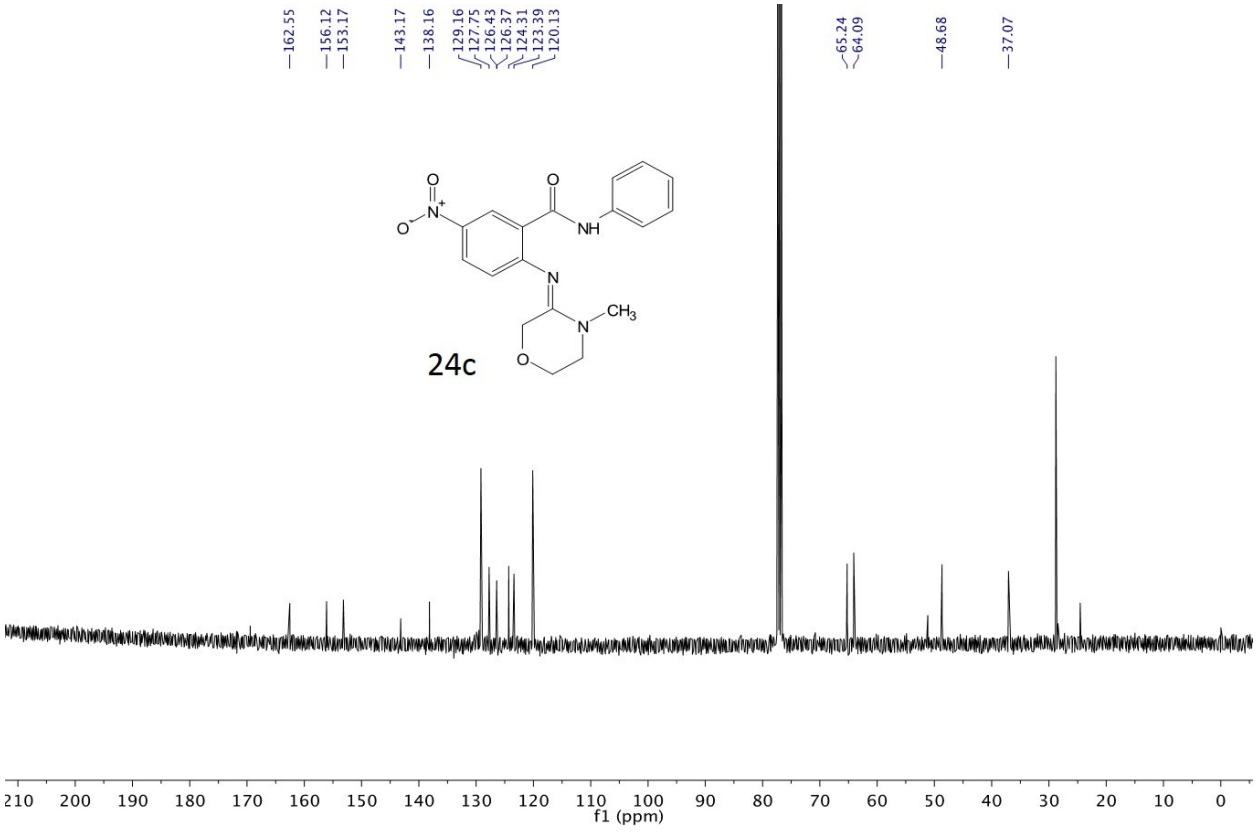
8.16
8.15
7.65
7.64
7.63
7.63
7.63
7.39
7.39
7.37
7.37
7.36
7.35
7.16
7.16
7.15
7.14
7.14
7.13
7.12
7.12
6.81
6.79
4.30
3.94
3.93
3.92
3.49
3.48
3.47
3.31
0.00
1.07
0.91
0.99
2.04
2.06
1.00
0.98
2.17
2.40
2.50
2.98
f1 (ppm)
24c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143.17
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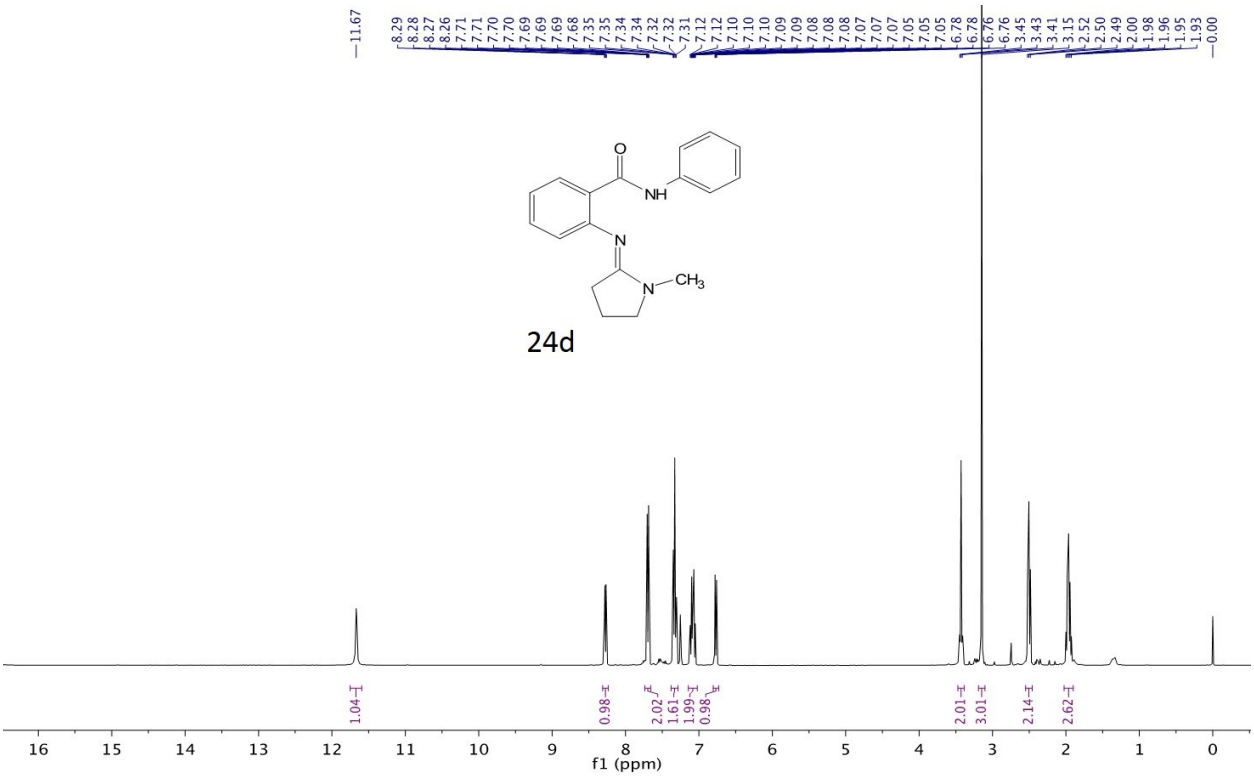
129.16
127.75
126.43
126.37
124.31
123.39
120.13
65.24
64.09
48.68
37.07
f1 (ppm)
24c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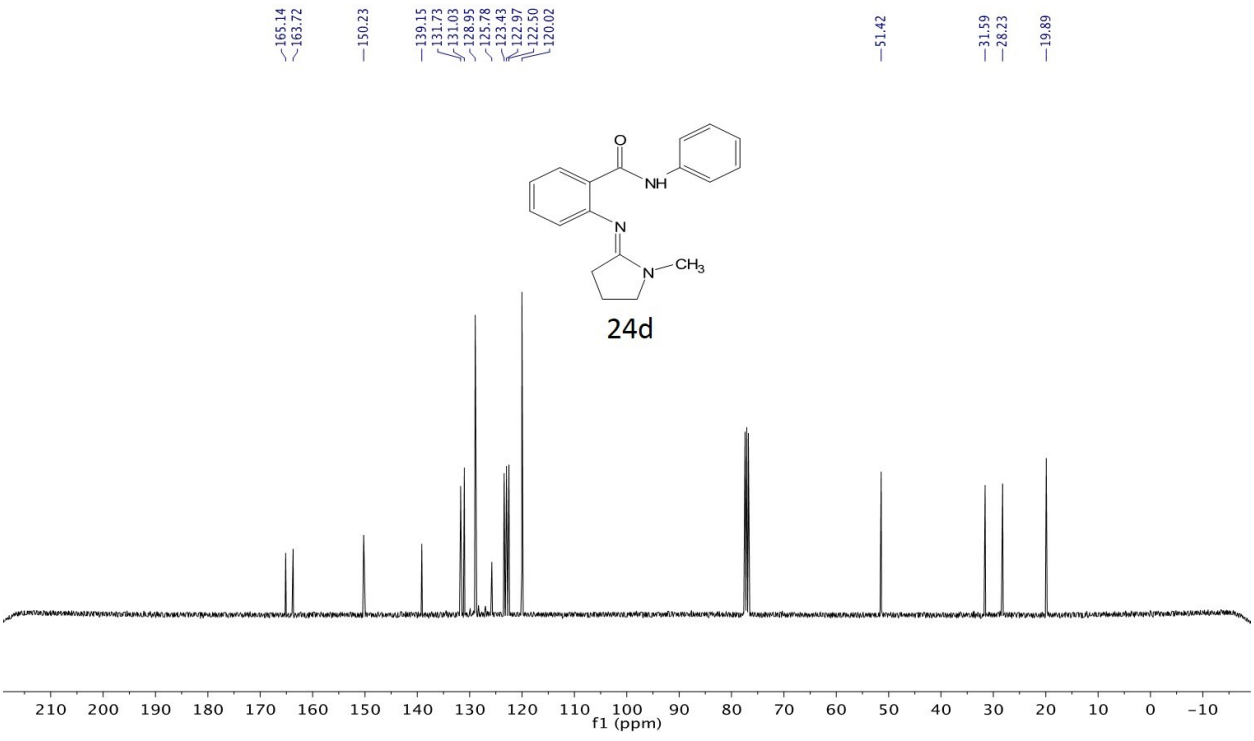
7.71
7.70
7.70
7.69
7.69
7.69
7.68
7.35
7.35
7.34
7.34
7.32
7.32
7.31
7.12
7.10
7.10
7.09
7.09
7.08
7.08
7.08
7.07
7.07
7.07
7.05
7.05
7.05
6.78
6.78
6.76
6.76
3.45
3.43
3.41
3.15
2.52
2.50
2.49
2.00
1.98
1.96
1.95
1.93
0.00
O
NH
N
N
CH3
24d
1.04
0.98
2.02
1.61
1.99
0.98
2.01
3.01
2.14
2.62
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
f1 (ppm)


165.14
163.72
150.23
139.15
131.73
131.03
128.95
125.78
123.43
122.97
122.50
120.02
51.42
31.59
28.23
19.89
O
NH
N
N
CH3
24d
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)