Supporting Information for

Electrochemical Enantioselective Dihydroxylation Reaction of *N*-Alkenyl nucleobases for the Construction of Chiral Acyclic Nucleosides

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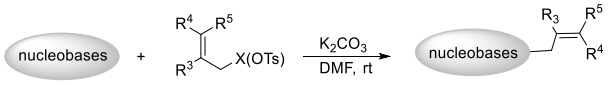
1. General information

All the electrochemical oxidations were performed in an undivided cell equipped with carbon felt anode (1.5 cm × 1.5 cm × 0.3 cm) and platinum cathode (1.5 cm × 1.5 cm × 0.2 mm) unless otherwise noted. Source (HSPY-600) was purchased from Beijing Hansheng Puyuan Technology Co., LTD. All commercial reagents were purchased from TCI, Sigma-Aldrich, laajoo and Adamas-beta of the highest purity grade and used without further purification. ^{1}H NMR and ^{13}C NMR spectra were recorded on Bruker Avance III HD 600 or Avance 400 MHz spectrometer. Chemical shifts are recorded in ppm relative to tetramethylsilane with the solvent resonance as the internal standard. Data are represented as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, dd = doublet of doublets, m = multiplet), coupling constants (*J*) are in Hertz (Hz), and integration. Enantiomer excesses were determined by chiral HPLC analysis on Chiralcel IA/ ID/OD-H/IC in comparison with the authentic racemates. Chiral HPLC analysis was recorded on Thermo Scientific Dionex Ultimate 3000 and Agilent Technologies 1260 Infinity. Optical rotations were recorded on Autopol Automatic Polarimeter, and were reported as follows: $[\alpha]_D^T$ (c: g/100 mL, in CH_3OH). High resolution mass spectra (HRMS) were recorded on an ABI/Sciex QStar Mass Spectrometer (ESI). Single crystal X-ray crystallography data were obtained on Supernova Atlas S2 CCD detector. Melting point (m.p.) data were obtained on X-5 micro melting point apparatus. For column chromatography, silica gel (200-300 mesh) was used as the stationary phase.

2. Experimental Section

2.1 Synthesis methods for starting materials[1-4]



To a mixture of nucleobases (10.0 mmol) and K_2CO_3 (2.07 g, 15.0 mmol) in DMF (20.0 mL), the solution of alkenes compounds (12.0 mmol) was added. Then, the resulting mixture was stirred at rt until the starting materials were consumed as indicated by TLC analysis. Afterwards, the resulting mixture was filtered through a Celite pad, and the brine (40 mL) was added into the filtrate. Subsequently, the mixture was extracted with ethyl acetate (30.0 mL×3). The combined

organic layers were washed with brine (100.0 mL×2), dried over anhydrous Na_2SO_4, filtered, and evaporated under reduced pressure. The residue was purified by flash column chromatography with petroleum ether: ethyl acetate (2:1) as the eluant to afford the N-alkenyl nucleobases.

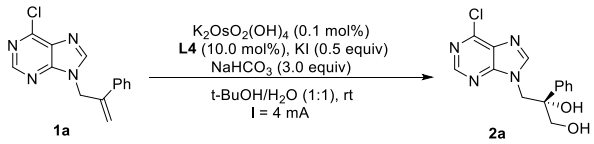
2.2 Graphical guide for the electrochemical set-up

Figure S1. Reaction set-up for milligram-scale electrolysis. The anode is carbon felt electrode (1.5 cm × 1.5 cm × 0.3 cm) while the cathode is platinum electrode (1.5 cm × 1.5 cm × 0.2 mm).

Figure S2. Reaction set-up for gram-scale electrolysis. The anode is carbon felt electrode (4.0 cm × 4.0 cm × 0.6 cm) while the cathode is platinum electrode (4.0 cm × 4.0 cm × 0.2 mm).

2.3 Optimization of reaction conditions

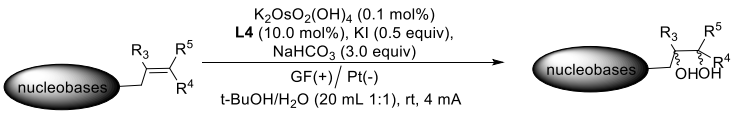
Table S1. Screening of Reaction Conditions[a]



entry	anode	cathode	yield (%)[b]	ee (%)[c]
1	Pt (1.0*1.0 cm^2)	Pt (1.0*1.0 cm^2)	33	89
2	Pt (1.5*1.0 cm^2)	Pt (1.0*1.0 cm^2)	49	90
3	Pt (1.5*1.5 cm^2)	Pt (1.0*1.0 cm^2)	56	91
4	Pt (1.5*1.5 cm^2)	Pt (1.5*1.5 cm^2)	66	91
5	Graphite Felt (1.5*1.5 cm^2)	Pt (1.5*1.5 cm^2)	94	96
6	RVC[d] (1.5*1.5 cm^2)	Pt (1.5*1.5 cm^2)	56	92
7	Carbon Rod	Pt (1.5*1.5 cm^2)	35	92
8	Ni foam (1.5*1.5 cm^2)	Pt (1.5*1.5 cm^2)	n.r.	n.r.
9	Carbon Rod	Carbon Rod	n.r.	n.r.

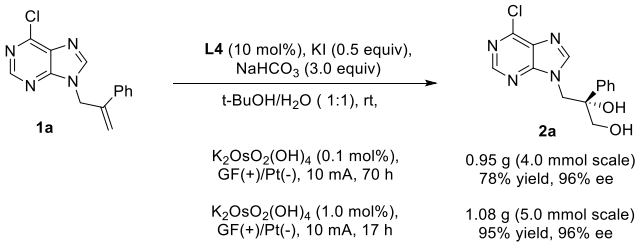
[a]Unless otherwise noted, the reaction conditions were: **1a** (1.0 mmol), $K_2OsO_2(OH)_4$ (0.1 mol%), **L4** $(DHQD)_2PHAL$ (10.0 mol%), KI (0.5 equiv), $NaHCO_3$ (3.0 equiv), t-BuOH/H_2O (20 mL, 1:1), constant current of 4 mA, rt, the reaction time of 40 h, in an undivided cell. [b]Isolated yields. [c]Determined by chiral HPLC analysis. [d]RVC: Reticulated Vitreous Carbon

2.4 General procedure for electrochemical enantioselective dihydroxylation reaction of N-alkenyl nucleobases



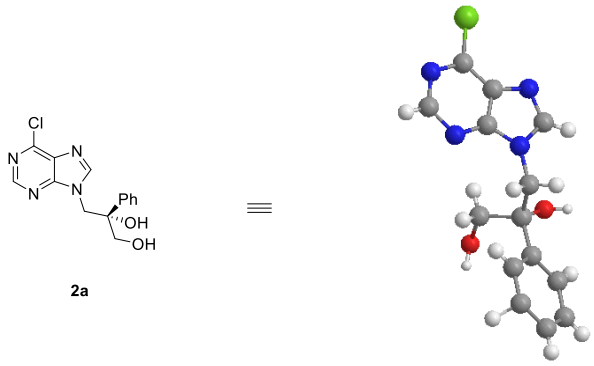
The electrocatalysis was carried out in an undivided cell under air with carbon felt anode (1.5 cm × 1.5 cm × 0.3 cm) and platinum cathode (1.5 cm × 1.5 cm × 0.2 mm). The N-alkenyl nucleobases (1.0 mmol), $K_2OsO_2(OH)_4$ (0.001 mmol), **L4** (0.1 mmol), KI (0.5 mmol), $NaHCO_3$ (3.0 mmol) were dissolved in t-BuOH/H_2O (20 mL, 1:1). Electrocatalysis was performed at rt with a constant current of 4.0 mA maintained for 40 h. After the reaction, the electrodes were washed with ethyl acetate (3×10.0 mL). The mixture was dried over anhydrous Na_2SO_4, filtered, and concentrated in vacuo. The resulting residue was purified by flash column chromatography on silica gel with CH_2Cl_2/MeOH (40/1) to afford the corresponding products.

2.5 Scale-up synthesis of model product 2a



The electrocatalysis was carried out in an undivided cell under air with carbon felt anode (4.0 cm × 4.0 cm × 0.6 cm) and platinum cathode (4.0 cm × 4.0 cm × 0.2 mm). To one vial, **1a** (4.0 mmol), $K_2OsO_2(OH)_4$ (0.004 mmol), **L4** (0.4 mmol), KI (2.0 mmol), $NaHCO_3$ (12.0 mmol) and t-BuOH/H_2O (80.0 mL, 1:1) were added. To another vial, **1a** (5.0 mmol), $K_2OsO_2(OH)_4$ (0.05 mmol), **L4** (0.5 mmol), KI (2.5 mmol), $NaHCO_3$ (15.0 mmol) and t-BuOH/H_2O (100.0 mL, 1:1) were added. Electrocatalysis was performed at rt with a constant current of 10.0 mA until the starting materials were consumed as indicated by TLC analysis. After these reactions, the electrodes were washed with ethyl acetate (3×30.0 mL). The mixture was dried over anhydrous Na_2SO_4, filtered, and concentrated in vacuo. The resulting residue was purified by flash column chromatography on silica gel with CH_2Cl_2/MeOH (40/1) afforded the product **2a**.

3. The X-ray data of 2a



The chiral product of **2a** was recrystallized by ethyl acetate/ petroleum ether/methanol (30/10/1). CCDC 2150120 (**2a**) contains the supplementary crystallographic data for this paper. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre *via* www.ccdc.cam.ac.uk/data_request/cif.

Table 1 Crystal data and structure refinement for 2a.

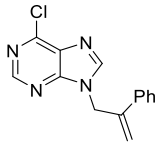
Identification code	LPX-20211213
Empirical formula	$C_{14}H_{16}ClN_4O_4$

Formula weight	339.76
Temperature/K	293 (2)
Crystal system	monoclinic
Space group	$P2_1$
a/Å	10.76520(10)
b/Å	6.84890(10)
c/Å	11.20770(10)
α/°	90
β/°	110.1070(10)
γ/°	90
Volume/$Å^3$	775.977(16)
Z	2
$\rho_{calc}g/cm^3$	1.454
μ/mm^{-1}	2.427
F(000)	354.0
Crystal size/mm^3	0.01 × 0.01 × 0.01
Radiation	Cu Kα (λ = 1.54184)
2Θ range for data collection/°	8.402 to 142.808
Index ranges	$-13 \leq h \leq 13$, $-8 \leq k \leq 7$, $-13 \leq l \leq 13$
Reflections collected	18673
Independent reflections	2824 [R_{int} = 0.0417, R_{sigma} = 0.0195]
Data/restraints/parameters	2824/1/216
Goodness-of-fit on F^2	1.149
Final R indexes [I>=2σ (I)]	R_1 = 0.0435, wR_2 = 0.1066
Final R indexes [all data]	R_1 = 0.0436, wR_2 = 0.1067
Largest diff. peak/hole / e $Å^{-3}$	0.31/-0.62
Flack parameter	0.023(11)

4. The analytical and spectral characterization data

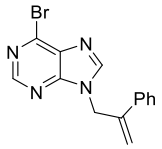
(1) The analytical and spectral characterization data of starting materials

6-chloro-9-(2-phenylallyl)-9H-purine (1a)



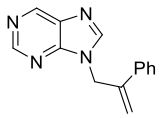
White solid, m.p. 87.0-88.5 °C, 1.48 g, 55% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.77 (s, 1H), 8.08 (s, 1H), 7.43-7.40 (m, 2H), 7.30-7.28 (m, 3H), 5.63 (s, 1H), 5.33 (s, 2H), 5.21 (s, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 152.1, 151.8, 151.0, 145.1, 141.9, 136.9, 131.3, 128.81, 128.75, 126.0, 116.9, 47.5; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{11}ClN_4$ $(M+H)^+$ requires m/z 271.0745, found m/z 271.0741.

6-bromo-9-(2-phenylallyl)-9H-purine (1b)



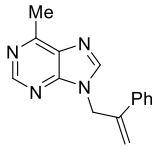
White solid, m.p. 106.7-108.6 °C, 2.01 g, 64% yield; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 8.72 (s, 1H), 8.09 (s, 1H), 7.42-7.41 (m, 2H), 7.32-7.26 (m, 3H), 5.63 (s, 1H), 5.32 (s, 2H), 5.21 (s, 1H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 152.0, 150.6, 145.0, 143.1, 141.9, 136.9, 133.9, 128.84, 128.79, 126.0, 116.9, 47.6; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{11}BrN_4$ $(M+H)^+$ requires m/z 315.0240, found m/z 315.0245.

9-(2-phenylallyl)-9H-purine (1c)



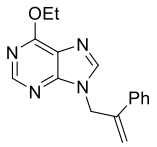
White solid, m.p. 61.9-64.0 °C, 1.26 g, 53% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.12 (s, 1H), 9.03 (s, 1H), 8.06 (s, 1H), 7.45-7.42 (m, 2H), 7.32-7.27 (m, 3H), 5.63 (s, 1H), 5.32 (s, 2H), 5.18 (s, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 152.8, 151.4, 148.6, 145.1, 142.2, 137.1, 133.8, 128.8, 128.7, 126.0, 116.5, 46.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{12}N_4$ $(M+H)^+$ requires m/z 237.1135, found m/z 237.1137.

6-methyl-9-(2-phenylallyl)-9H-purine (1d)



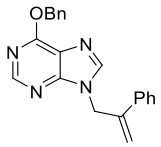
White solid, m.p. 66.5-67.2 °C, 0.78 g, 31% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.87 (s, 1H), 7.96 (s, 1H), 7.44-7.41 (m, 2H), 7.32-7.28 (m, 3H), 5.61 (s, 1H), 5.29 (s, 2H), 5.16 (s, 1H), 2.83 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 159.4, 152.6, 150.7, 143.7, 142.5, 137.3, 132.9, 128.9, 128.8, 126.1, 116.5, 47.1, 19.6; **HRMS** (ESI-TOF): exact mass calcd for $C_{15}H_{14}N_4$ $(M+H)^+$ requires m/z 251.1291, found m/z 251.1298.

6-ethoxy-9-(2-phenylallyl)-9H-purine (1f)



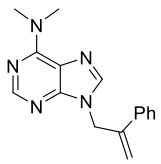
White solid, m.p. 29.2-32.1 °C, 1.54 g, 55% yield; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 8.56 (s, 1H), 7.87 (s, 1H), 7.42 (d, *J* = 7.2 Hz, 2H), 7.30-7.26 (m, 3H), 5.59 (s, 1H), 5.27 (s, 2H), 5.12 (s, 1H), 4.67-4.63 (m, 2H), 1.50 (t, *J* = 7.2 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 160.9, 152.3, 152.1, 142.5, 142.0, 137.3, 128.7, 128.6, 126.0, 121.2, 116.0, 63.2, 47.1, 14.5; **HRMS** (ESI-TOF): exact mass calcd for $C_{16}H_{16}N_4O$ $(M+Na)^+$ requires m/z 303.1216, found m/z 303.1209.

6-(benzyloxy)-9-(2-phenylallyl)-9H-purine (1g)



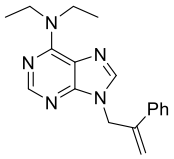
White solid, m.p. 102.9-104.3 °C, 2.01 g, 59% yield, **^{1}H NMR** (600 MHz, $CDCl_3$) δ 8.58 (s, 1H), 7.86 (s, 1H), 7.53 (d, *J* = 7.2 Hz, 2H), 7.43-7.41 (m, 2H), 7.36-7.34 (m, 2H), 7.31-7.27 (m, 4H), 5.66 (s, 2H), 5.59 (s, 1H), 5.26 (s, 2H), 5.12 (s, 1H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 160.7, 152.4, 152.2, 142.5, 142.2, 137.3, 136.2, 128.8, 128.7, 128.53, 128.45, 128.2, 126.1, 121.3, 116.2, 68.5, 47.2; **HRMS** (ESI-TOF): exact mass calcd for $C_{21}H_{18}N_4O$ $(M+H)^+$ requires m/z 343.1553, found m/z 343.1559.

N,N-dimethyl-9-(2-phenylallyl)-9H-purin-6-amine (1h)



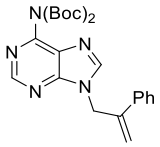
White solid, m.p. 126.5-127.5 ºC, 1.45 g, 52% yield; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 8.39 (s, 1H), 7.67 (s, 1H), 7.44 (d, *J* = 7.2 Hz, 2H), 7.31-7.27 (m, 3H), 5.58 (s, 1H), 5.20 (s, 2H), 5.08 (s, 1H), 3.51 (s, 6H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 155.0, 152.7, 150.7, 142.8, 138.2, 137.6, 128.7, 128.5, 126.1, 119.9, 115.7, 46.7, 38.6; **HRMS** (ESI-TOF): exact mass calcd for $C_{16}H_{17}N_5$ $(M+H)^+$ requires m/z 280.1557, found m/z 280.1556.

N,N-diethyl-9-(2-phenylallyl)-9H-purin-6-amine (1i)



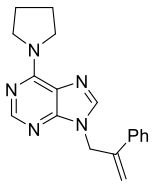
White solid, m.p. 85.7-87.6 ºC, 1.84 g, 60% yield; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 8.39 (s, 1H), 7.68 (s, 1H), 7.45 (d, *J* = 7.2 Hz, 2H), 7.32-7.26 (m, 3H), 5.58 (s, 1H), 5.19 (s, 2H), 5.07 (s, 1H), 3.97 (s, 4H), 1.28 (t, *J* = 7.2 Hz, 6H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 153.9, 152.8, 150.7, 142.8, 138.2, 137.6, 128.7, 128.4, 126.1, 119.4, 115.6, 46.6, 43.0, 13.6; **HRMS** (ESI-TOF): exact mass calcd for $C_{18}H_{21}N_5$ $(M+H)^+$ requires m/z 308.1870, found m/z 308.1864.

tert-butyl (tert-butoxycarbonyl)(9-(2-phenylallyl)-9H-purin-6-yl)carbamate (1j)



White solid, m.p. 86.4-89.0 ºC, 1.80 g, 40% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.89 (s, 1H), 8.01 (s, 1H), 7.42-7.40 (m, 2H), 7.31-7.25 (m, 3H), 5.61 (s, 1H), 5.32 (s, 2H), 5.19 (s, 1H), 1.39 (s, 18H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 153.4, 152.2, 150.4, 150.3, 144.6, 142.4, 137.1, 128.8, 128.7, 128.6, 126.1, 116.6, 83.7, 47.3, 27.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{24}H_{29}N_5O_4$ $(M+H)^+$ requires m/z 452.2292, found m/z 452.2282.

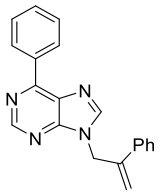
9-(2-phenylallyl)-6-(pyrrolidin-1-yl)-9H-purine (1k)



White solid, m.p. 177.7-181.6 ºC, 2.01 g, 53% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.40 (s, 1H), 7.67 (s, 1H), 7.46-7.44 (m, 2H), 7.33-7.25 (m, 3H), 5.58 (s, 1H), 5.21 (s, 2H), 5.08 (s, 1H), 4.14 (s, 2H), 3.76 (s, 2H), 2.02 (s, 4H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 153.2, 153.1, 150.3, 142.9, 138.7,

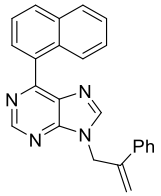
137.6, 128.8, 128.5, 126.1, 120.1, 115.7, 46.7, 26.3, 24.4; **HRMS** (ESI-TOF): exact mass calcd for $C_{18}H_{19}N_5$ $(M+H)^+$ requires m/z 306.1713, found m/z 306.1714.

6-phenyl-9-(2-phenylallyl)-9H-purine (1l)



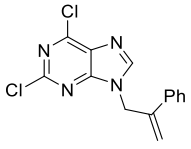
White solid, m.p. 123.8-125.4 ºC, 1.03 g, 33% yield; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.06 (s, 1H), 8.78-8.77 (m, 2H), 8.06 (s, 1H), 7.56-7.50 (m, 3H), 7.46-7.45 (m, 2H), 7.33-7.28 (m, 3H), 5.63 (s, 1H), 5.34 (s, 2H), 5.19 (s, 1H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 155.0, 152.7, 152.6, 144.3, 142.5, 137.4, 135.7, 131.1, 130.9, 129.9, 128.9, 128.8, 126.1, 116.5, 47.1; **HRMS** (ESI-TOF): exact mass calcd for $C_{20}H_{16}N_4$ $(M+H)^+$ requires m/z 313.1448, found m/z 313.1493.

6-(naphthalen-1-yl)-9-(2-phenylallyl)-9H-purine (1m)



White solid, m.p. 108.8-109.9 ºC, 1.41 g, 39% yield; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.19 (s, 1H), 8.30 (d, *J* = 7.2 Hz, 1H), 8.05-8.03 (m, 2H), 7.99 (d, *J* = 8.4 Hz, 1H), 7.92-7.91 (m, 1H), 7.62 (t, *J* = 6.6, 1H), 7.52-7.47 (m, 4H), 7.35-7.29 (m, 3H), 5.63 (s, 1H), 5.33 (s, 2H), 5.19 (s, 1H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 158.0, 152.4, 144.7, 142.3, 137.3, 134.1, 132.5, 132.4, 131.1, 130.7, 130.0, 128.8, 128.7, 128.5, 126.8, 126.10, 126.08, 125.8, 125.1, 116.4, 47.0; **HRMS** (ESI-TOF): exact mass calcd for $C_{24}H_{18}N_4$ $(M+H)^+$ requires m/z 363.1604, found m/z 363.1603.

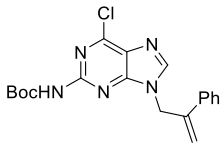
2,6-dichloro-9-(2-phenylallyl)-9H-purine (1n)



White solid, m.p. 114.8-115.6 ºC, 1.31 g, 43% yield; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 8.06 (s, 1H), 7.41-7.39 (m, 2H), 7.32-7.28 (m, 3H), 5.65 (s, 1H), 5.29 (s, 2H), 5.24, (s, 1H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 153.1, 153.0, 151.6, 145.7, 141.5, 136.6, 130.4, 128.84, 128.82, 125.9, 117.3, 47.7; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{10}Cl_2N_4$ $(M+H)^+$ requires m/z 305.0355, found m/z

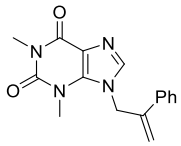
305.0346.

tert-butyl (6-chloro-9-(2-phenylallyl)-9H-purin-2-yl)carbamate (1o)



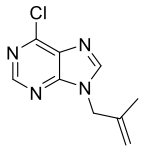
White solid, 149.5-151.9 °C, 2.50 g, 65% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.88 (s, 1H), 7.62 (s, 1H), 7.46-7.44 (m, 2H), 7.33-7.27 (m, 3H), 5.65 (s, 1H), 5.26-5.25 (m, 3H), 1.56 (s, 9H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 153.0, 152.6, 151.3, 150.3, 144.1, 142.1, 137.0, 128.9, 128.8, 127.6, 126.2, 117.2, 81.8, 47.5, 28.3; **HRMS** (ESI-TOF): exact mass calcd for $C_{19}H_{20}ClN_5O_2$ $(M+Na)^+$ requires m/z 408.1198, found m/z 408.1208.

1,3-dimethyl-9-(2-phenylallyl)-3,9-dihydro-1H-purine-2,6-dione (1p)



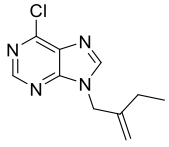
White solid, m.p. 112.3-114.3 °C, 1.94 g, 49% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.49 (s, 1H), 7.44-7.42 (m, 2H), 7.35-7.29 (m, 3H), 5.55 (s, 1H), 5.38 (s, 2H), 5.12 (s, 1H), 3.55 (d, J = 1.2 Hz, 3H), 3.41 (d, J = 1.2 Hz, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 155.4, 151.8, 148.7, 143.1, 141.3, 137.5, 128.9, 128.7, 126.3, 116.3, 107.0, 50.2, 29.9, 28.1; **HRMS** (ESI-TOF): exact mass calcd for $C_{16}H_{16}N_4O_2$ $(M+Na)^+$ requires m/z 319.1165, found m/z 319.1162.

6-chloro-9-(2-methylallyl)-9H-purine (1q)



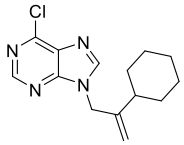
Yellow oil, 1.00 g, 48% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.64-8.62 (m, 1H), 8.07 (s, 1H), 4.91 (s, 1H), 4.75 (s, 2H), 4.68 (s, 1H), 1.64 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 152.0, 151.8, 150.8, 145.4, 139.0, 131.2, 114.6, 49.5, 19.9; **HRMS** (ESI-TOF): exact mass calcd for $C_9H_9ClN_4$ $(M+H)^+$ requires m/z 209.0589, found m/z 209.0598.

6-chloro-9-(2-methylenebutyl)-9H-purine (1r)



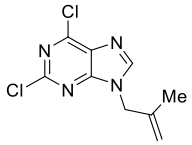
Colorless oil; 0.89 g, 40% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.72 (s, 1H), 8.09 (s, 1H), 5.01 (s, 1H), 4.84 (s, 2H), 4.79 (s, 1H), 2.00 (q, *J* = 7.6 Hz, 2H), 1.05 (t, *J* = 7.2 Hz, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 152.2, 152.0, 151.2, 145.4, 144.8, 131.5, 112.8, 48.7, 26.4, 11.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{10}H_{11}ClN_4$ $(M+H)^+$ requires m/z 223.0745, found m/z 223.0750.

6-chloro-9-(2-cyclohexylallyl)-9H-purine (1s)



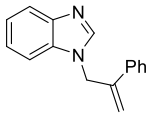
White solid, m.p. 61.4-62.7 °C, 0.74 g, 42% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.74 (s, 1H), 8.09 (s, 1H), 5.02 (s, 1H), 4.86 (s, 2H), 4.70 (s, 1H), 1.81-1.75 (m, 5H), 1.67-1.64 (m, 1H), 1.22-1.17 (m, 5H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 152.2, 152.1, 151.2, 148.7, 145.5, 131.5, 112.2, 47.7, 41.9, 32.2, 26.5, 26.1; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{17}ClN_4$ $(M+H)^+$ requires m/z 277.1215, found m/z 277.1215.

2,6-dichloro-9-(2-methylallyl)-9H-purine (1t)



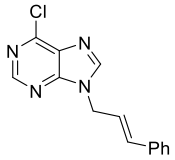
White solid, 66.6-67.1 °C, 1.52 g, 63% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.09 (s, 1H), 5.05 (s, 1H), 4.80 (s, 1H), 4.78 (s, 2H), 1.75 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 153.4, 153.3, 152.0, 146.0, 138.7, 130.7, 115.3, 49.8, 20.1; **HRMS** (ESI-TOF): exact mass calcd for $C_9H_8Cl_2N_4$ $(M+H)^+$ requires m/z 243.0199, found m/z 243.0205.

1-(2-phenylallyl)-1H-benzo[d]imidazole (1x)



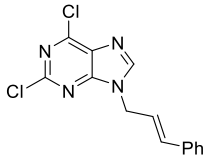
White solid, m.p. 106.4-108.4 °C, 1.24 g, 53% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.87 (s, 1H), 7.81-7.79 (m, 1H), 7.40-7.36 (m, 3H), 7.35-7.20 (m, 6H), 5.51 (s, 1H), 5.12 (s, 2H), 4.94 (s, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.9, 143.4, 142.3, 138.0, 128.8, 128.6, 126.7, 126.0, 123.1, 122.3, 120.5, 115.3, 110.1, 48.7; **HRMS** (ESI-TOF): exact mass calcd for $C_{16}H_{14}N_2$ $(M+H)^+$ requires m/z 235.1230, found m/z 235.1237.

6-chloro-9-cinnamyl-9H-purine (3a)



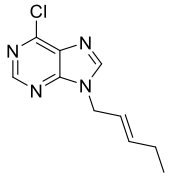
White solid, m.p. 80.1-83.6 °C, 1.70 g, 63% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.77 (s, 1H), 8.21 (s, 1H), 7.38-7.26 (m, 5H), 6.68 (d, *J* = 16.0 Hz, 1H), 6.40-6.33 (m, 1H), 5.07 (d, *J* = 6.4 Hz, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 152.1, 151.8, 151.1, 145.0, 135.5, 135.3, 131.7, 128.8, 128.7, 126.7, 121.5, 46.1; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{11}ClN_4$ $(M+Na)^+$ requires m/z 293.0564, found m/z 293.0556.

2,6-dichloro-9-cinnamyl-9H-purine (3b)



White solid, m.p. 136.8-138.0 °C, 1.52 g, 50% yield; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.17 (s, 1H), 7.39-7.28 (m, 5H), 6.70 (d, *J* = 15.6 Hz, 1H), 6.37-6.30 (m, 1H), 5.03 (d, *J* = 6.4 Hz, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 153.3, 153.1, 152.0, 145.6, 136.1, 135.2, 130.9, 128.9, 126.9, 121.0, 46.4; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{10}Cl_2N_4$ $(M+H)^+$ requires m/z 305.0355, found m/z 305.0352.

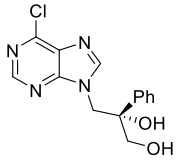
(*E*)-6-chloro-9-(pent-2-en-1-yl)-9H-purine (3c)



White solid, m.p. 26.6-29.7 °C, 0.98 g, 44% yield; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 8.69 (s, 1H), 8.08 (s, 1H), 5.80-5.76 (m, 1H), 5.58-5.54 (m, 1H), 4.88 (d, *J* = 7.2 Hz, 2H), 2.25-2.20 (m, 2H), 1.02 (t, *J* = 7.2 Hz, 2H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 151.9, 151.7, 150.9, 144.7, 138.8, 131.6, 120.9, 40.8, 20.9, 13.9; **HRMS** (ESI-TOF): exact mass calcd for $C_{10}H_{11}ClN_4$ $(M+H)^+$ requires m/z 223.0745, found m/z 223.0741.

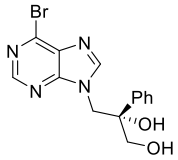
(2) The analytical and spectral characterization data of the products

(*S*)-3-(6-chloro-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2a)



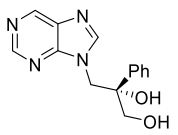
White solid, m.p. 66.2-69.2 ºC, 288.8 mg, 95% yield, 96% ee; $[\alpha]_D^{20}$ = 21.79 (c = 0.257, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 256 nm, retention time: 11.053 min, 17.538 min; **TLC**: R_f = 0.25 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.57 (s, 1H), 8.30 (s, 1H), 7.43 (d, *J* = 7.2 Hz, 2H), 7.18 (dt, *J* = 36.6, 7.8 Hz, 3H), 4.76 (s, 2H), 3.90 (d, *J* = 11.4 Hz, 1H), 3.75 (d, *J* = 11.4 Hz, 1H); **^{13}C NMR** (150 MHz, CD_3OD) δ 153.8, 152.6, 150.8, 149.1, 142.4, 131.3, 129.1, 128.6, 126.8, 77.5, 68.6, 52.0; **HRMS** (ESI-TOF)**:** exact mass calcd for $C_{14}H_{13}ClN_4O_2$ $(M+H)^+$ requires m/z 305.0800, found m/z 305.0801.

(*S*)-3-(6-bromo-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2b)



Brown oil, 327.1 mg, 94% yield, 95% ee; $[\alpha]_D^{22}$ = 22.73 (c = 0.274, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 256 nm, retention time: 12.903 min, 17.563 min; **TLC**: R_f = 0.27 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.52 (s, 1H), 8.30 (s, 1H), 7.44-7.42 (m, 2H), 7.18 (dt, *J* = 25.2, 7.2 Hz, 3H), 4.75 (s, 2H), 3.90 (d, *J* = 11.6 Hz, 1H), 3.75 (d, *J* = 11.6 Hz, 1H); **^{13}C NMR** (100 MHz, CD_3OD) δ 152.5, 148.9, 142.7, 142.4, 134.0, 129.1, 128.6, 126.8, 77.5, 68.6, 52.0; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{13}BrN_4O_2$ $(M+H)^+$ requires m/z 349.0295, found m/z 349.0292.

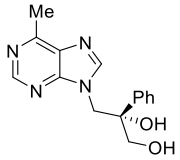
(*S*)-2-phenyl-3-(9H-purin-9-yl)propane-1,2-diol (2c)



White solid, m.p. 107.6-108.9 ºC, 72.9 mg, 27% yield, 84% ee; $[\alpha]_D^{21}$ = 56.73 (c = 0.241, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 256 nm, retention time: 10.295 min, 17.490 min; **TLC**: R_f = 0.32 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.94 (s, 1H), 8.79 (s, 1H), 8.29 (s, 1H), 7.45-7.44 (m,

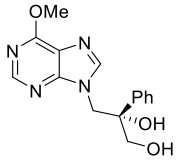
2H), 7.16 (dt , *J* = 37.8, 7.2 Hz, 3H), 4.76 (dd, *J* = 16.8, 14.4 Hz, 2H), 3.89 (d, *J* = 11.4 Hz, 1H), 3.76 (d, *J* = 11.4 Hz, 1H); **^{13}C NMR** (150 MHz, CD_3OD) δ 153.3, 152.9, 149.2, 148.1, 142.6, 134.0, 129.1, 128.5, 126.8, 77.6, 68.6, 51.4; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{14}N_4O_2$ $(M+H)^+$ requires m/z 271.1190, found m/z 271.1193.

(*S*)-3-(6-methyl-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2d)



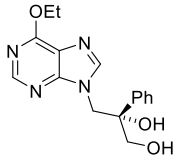
White solid, m.p. 161.9-162.9 °C, 264.2 mg, 93% yield, 94% ee; $[\alpha]_D^{20}$ = 9.49 (c = 0.260, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 9.499 min, 13.586 min; **TLC**: R_f = 0.29 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.65 (s, 1H), 8.21 (s, 1H), 7.46-7.44 (m, 2H), 7.19 (dt, *J* = 37.2, 7.2 Hz, 3H), 4.74 (s, 2H), 3.86 (d, *J* = 11.4 Hz, 1H), 3.73 (d, *J* = 11.4 Hz, 1H), 2.74 (s, 3H); **^{13}C NMR** (150 MHz, CD_3OD) δ 159.4, 152.51, 152.47, 147.9, 142.7, 132.8, 129.1, 128.5, 126.9, 77.6, 68.7, 51.6, 18.9; **HRMS** (ESI-TOF): exact mass calcd for $C_{15}H_{16}N_4O_2$ $(M+H)^+$ requires m/z 285.1346, found m/z 285.1343.

(*S*)-3-(6-methoxy-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2e)



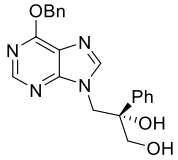
White solid, m.p. 140.9-142.6 °C, 285.1 mg, 95% yield, 96% ee; $[\alpha]_D^{22}$ = 11.27 (c = 0.284, CH_3OH); **HPLC** CHIRALCEL ID, *n*-hexane/2-propanol = 75/25, flow rate = 0.8 mL/min, λ = 254 nm, retention time: 18.705 min, 19.487 min; **TLC**: R_f = 0.28 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.37 (s, 1H), 8.01 (s, 1H), 7.46-7.44 (m, 2H), 7.23-7.14 (m, 3H), 4.68 (dd, *J* = 30.0, 21.0 Hz, 2H), 4.10 (s, 3H), 3.77 (dd, *J* = 64.2, 16.8 Hz, 2H), 3.35 (s, 2H); **^{13}C NMR** (150 MHz, CD_3OD) δ 162.0, 153.6, 152.8, 145.6, 142.7, 129.1, 128.4, 126.8, 121.0, 77.6, 68.5, 54.8, 51.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{15}H_{16}N_4O_3$ $(M+H)^+$ requires m/z 301.1295, found m/z 301.1292.

(*S*)-3-(6-ethoxy-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2f)



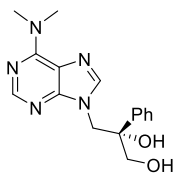
White solid, m.p. 142.9-143.8 ºC, 279.6 mg, 89% yield, 93% ee; $[\alpha]_D^{21}$ = 16.48 (c = 0.267, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 11.142 min, 23.589 min; **TLC**: R_f = 0.31 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.38 (s, 1H), 8.02 (s, 1H), 7.46 (d, *J* = 7.2 Hz, 2H), 7.20 (dt, *J* = 38.4, 7.8 Hz, 3H), 4.69 (dd, *J* = 21.6, 14.4 Hz, 2H), 4.60 (dd, *J* = 13.8, 7.2 Hz, 2H), 3.82 (d, *J* = 12.0 Hz, 2H), 3.71 (d, *J* = 12.0 Hz, 2H), 1.45 (t, *J* = 7.2 Hz, 3H); **^{13}C NMR** (150 MHz, CD_3OD) δ 161.7, 153.7, 152.8, 145.5, 142.8, 129.1, 128.5, 126.9, 121.0, 77.6, 68.6, 64.3, 51.7, 14.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{16}H_{18}N_4O_3$ $(M+H)^+$ requires m/z 315.1452, found m/z 315.1447.

(*S*)-3-(6-(benzyloxy)-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2g)



White solid, m.p. 135.3-138.1 ºC, 331.0 mg, 88% yield, 93% ee; $[\alpha]_D^{20}$ = 17.16 (c = 0.268, CH_3OH); **HPLC** CHIRALCEL IA, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 256 nm, retention time: 10.383 min, 18.422 min; **TLC**: R_f = 0.25 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.40 (s, 1H), 8.01 (s, 1H), 7.49-7.44 (m, 4H), 7.35-7.28 (m, 3H), 7.23-7.13 (m, 3H), 5.58 (s, 2H), 4.68 (dd, *J* = 21.6, 14.4 Hz, 2H), 3.76 (dd, *J* = 45.2, 11.6 Hz, 2H); **^{13}C NMR** (100 MHz, CD_3OD) δ 161.4, 153.8, 152.7, 145.7, 142.7, 137.5, 129.5, 129.4, 129.2, 129.1, 128.5, 126.8, 121.0, 77.5, 69.7, 68.5, 51.7; **HRMS** (ESI-TOF): exact mass calcd for $C_{21}H_{20}N_4O_3$ $(M+H)^+$ requires m/z 377.1608, found m/z 377.1610.

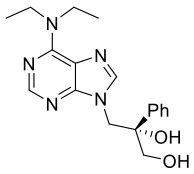
(*S*)-3-(6-(dimethylamino)-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2h)



White solid, m.p. 112.1-113.3 ºC, 291.2 mg, 93% yield, 95% ee; $[\alpha]_D^{22}$ = 21.62 (c = 0.260, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ =

256 nm, retention time: 9.975 min, 13.920 min; **TLC**: R_f = 0.32 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.13 (s, 1H), 7.74 (s, 1H), 7.50-7.48 (m, 2H), 7.22 (dt, *J* = 28.8, 7.2 Hz, 3H), 4.57 (dd, *J* = 36.4, 14.4 Hz, 2H), 3.69 (dd, *J* = 37.2, 11.2 Hz, 2H), 3.42 (s, 6H); **^{13}C NMR** (100 MHz, CD_3OD) δ 156.0, 152.6, 151.8, 143.2, 142.0, 129.1, 128.4, 126.9, 120.1, 77.6, 68.4, 51.5, 39.0; **HRMS** (ESI-TOF): exact mass calcd for $C_{16}H_{19}N_5O_2$ $(M+H)^+$ requires m/z 314.1612, found m/z 314.1609.

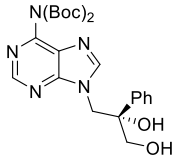
(*S*)-3-(6-(diethylamino)-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2i)



White solid, m.p. 78.3-82.0 °C, 276.4 mg, 81% yield, 92% ee; $[\alpha]_D^{22}$ = -32.68 (c = 0.284, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 256 nm, retention time: 7.002 min, 10.013 min; **TLC**: R_f = 0.32 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.15 (s, 1H), 7.75 (s, 1H), 7.52-7.49 (m, 2H), 7.30-7.19 (m, 3H), 4.59 (dd, *J* = 44.0, 14.4 Hz, 2H), 3.94 (s, 4H), 3.69 (dd, *J* = 35.6, 11.2 Hz, 2H), 1.24 (t, *J* = 6.8 Hz, 6H); **^{13}C NMR** (100 MHz, CD_3OD) δ 154.9, 152.8, 151.9, 143.3, 142.1, 129.1, 128.4, 126.9, 119.6, 77.6, 68.4, 51.4, 44.3, 13.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{18}H_{23}N_5O_2$ $(M+H)^+$ requires m/z 342.1925, found m/z 342.1926.

tert-butyl

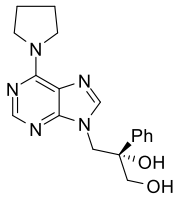
(*S*)-(tert-butoxycarbonyl)(9-(2,3-dihydroxy-2-phenylpropyl)-9H-purin-6-yl)carbamate (2j)



White solid, m.p. 145.9-149.6 °C, 470.6 mg, 97% yield, 95% ee; $[\alpha]_D^{22}$ = 29.64 (c = 0.227, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 75/25, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 9.779 min, 11.579 min; **TLC**: R_f = 0.29 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.73 (s, 1H), 8.34 (s, 1H), 7.47 (d, *J* = 7.8 Hz, 2H), 7.17 (dt, *J* = 40.2, 7.2 Hz, 3H), 4.89 (d, *J* = 14.4 Hz, 1H), 4.77 (d, *J* = 14.4 Hz, 1H), 3.93 (d, *J* = 11.4 Hz, 1H), 3.77 (d, *J* = 11.4 Hz, 1H), 1.33 (s, 18H); **^{13}C NMR** (150 MHz, CD_3OD) δ 155.4, 152.4, 151.2, 150.4, 149.0, 142.4, 129.2, 129.1, 128.5, 126.9, 85.08, 85.06, 77.6, 68.9, 51.8, 28.0;

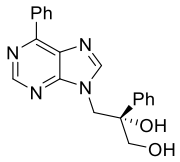
HRMS (ESI-TOF): exact mass calcd for $C_{24}H_{31}N_5O_6$ $(M+H)^+$ requires m/z 486.2347, found m/z 486.2340.

(*S*)-2-phenyl-3-(6-(pyrrolidin-1-yl)-9H-purin-9-yl)propane-1,2-diol (2k)



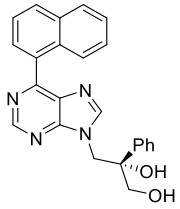
White solid, m.p. 136.7-139.4 ºC, 287.4 mg, 85% yield, 97% ee; $[\alpha]_D^{22}$ = 24.69 (c = 0.243, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 11.884 min, 16.558 min; **TLC**: R_f = 0.29 (dichloromethane: methanol = 30:1) [UV]; **^{1}H NMR** (600 MHz, **DMSO-*d*^{6}**) δ 8.17 (s, 1H), 7.87 (s, 1H), 7.51 (d, *J* = 7.8 Hz, 2H), 7.21 (dt, *J* = 45.6, 7.8 Hz, 3H), 5.76 (s, 1H), 5.32 (t, *J* = 6.0 Hz, 1H), 4.55 (dd, *J* = 39.6, 14.4 Hz, 2H), 3.99 (s, 2H), 3.86-3.46 (m, 4H), 1.90 (d, *J* = 33.0 Hz, 4H); **^{13}C NMR** (150 MHz, **DMSO-*d*^{6}**) δ 152.4, 151.8, 150.3, 142.9, 141.0, 127.6, 126.8, 126.0, 118.6, 76.0, 67.4, 49.6, 48.4, 47.0, 43.2, 25.7, 23.7; **HRMS** (ESI-TOF): exact mass calcd for $C_{18}H_{21}N_5O_2$ $(M+H)^+$ requires m/z 340.1768, found m/z 340.1763.

(*S*)-2-phenyl-3-(6-phenyl-9H-purin-9-yl)propane-1,2-diol (2l)



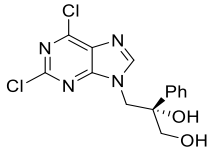
White solid, m.p. 117.0-119.9 ºC, 308.0 mg, 89% yield, 98% ee; $[\alpha]_D^{22}$ = 39.78 (c = 0.238, CH_3OH); **HPLC** CHIRALCEL IA, *n*-hexane/2-propanol = 80/20, flow rate = 0.6 mL/min, λ = 256 nm, retention time: 20.137 min, 21.135 min; **TLC**: R_f = 0.35 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.78 (s, 1H), 8.54-8.52 (m, 2H), 8.20 (s, 1H), 7.51-7.46 (m, 5H), 7.24-7.13 (m, 3H), 4.72 (dd, *J* = 22.0, 14.4 Hz, 2H), 3.80 (dd, *J* = 44.0, 11.2 Hz, 2H); **^{13}C NMR** (100 MHz, CD_3OD) δ 155.6, 154.2, 152.7, 148.3, 142.7, 136.5, 132.0, 131.1, 130.8, 129.6, 129.1, 128.5, 126.9, 77.6, 68.5, 51.5; **HRMS** (ESI-TOF): exact mass calcd for $C_{20}H_{18}N_4O_2$ $(M+H)^+$ requires m/z 347.1503, found m/z 347.1504.

(*S*)-3-(6-(naphthalen-1-yl)-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2m)



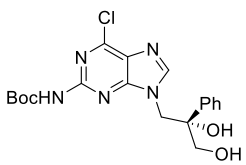
White solid, m.p. 83.3-86.0 ºC, 273.3 mg, 69% yield, 99% ee; $[\alpha]_D^{22}$ = 13.22 (c = 0.227, CH_3OH); **HPLC** CHIRALCEL ID, *n*-hexane/2-propanol = 80/20, flow rate = 0.8 mL/min, λ = 256 nm, retention time: 24.455 min, 27.318 min; **TLC**: R_f = 0.27 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.92 (s, 1H), 8.25 (s, 1H), 8.05 (d, *J* = 8.4 Hz, 1H), 7.96 (d, *J* = 7.8 Hz, 1H), 7.81-7.77 (m, 2H), 7.62 (t, *J* = 7.2 Hz, 1H), 7.53-7.48 (m, 3H), 7.45-7.42 (m, 1H), 7.24 (t, *J* = 7.8 Hz, 2H), 7.17 (t, *J* = 7.8 Hz, 1H), 4.79 (s, 2H), 3.91 (d, *J* = 11.4 Hz, 1H), 3.78 (d, *J* = 11.4 Hz, 1H); **^{13}C NMR** (150 MHz, CD_3OD) δ 158.3, 154.0, 152.7, 148.9, 142.7, 135.3, 133.6, 132.7, 132.3, 131.5, 130.1, 129.5, 129.1, 128.5, 127.7, 127.3, 126.9, 126.5, 126.2, 77.7, 68.6, 51.7; **HRMS** (ESI-TOF): exact mass calcd for $C_{24}H_{20}N_4O_2$ $(M+H)^+$ requires m/z 397.1659, found m/z 397.1660.

(*S*)-3-(2,6-dichloro-9H-purin-9-yl)-2-phenylpropane-1,2-diol (2n)



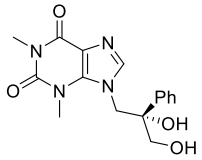
White solid, m.p. 167.8-169.3 ºC, 189.3 mg, 56% yield, 94% ee; $[\alpha]_D^{22}$ = -29.69 (c = 0.274, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 10.197 min, 14.640 min; **TLC**: R_f = 0.32 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.28 (s, 1H), 7.41-7.39 (m, 2H), 7.18 (dt, *J* = 34.2, 7.2 Hz, 3H), 4.69 (dd, *J* = 18.6, 14.4 Hz, 2H), 3.95 (d, *J* = 11.4 Hz, 1H), 3.77 (d, *J* = 11.4 Hz, 1H); **^{13}C NMR** (150 MHz, CD_3OD) δ 155.2, 153.4, 151.3, 149.7, 142.2, 130.6, 129.1, 128.6, 126.9, 77.4, 68.5, 52.4; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{12}Cl_2N_4O_2$ $(M+H)^+$ requires m/z 339.0410, found m/z 339.0401.

tert-butyl-(*S*)-(6-chloro-9-(2,3-dihydroxy-2-phenylpropyl)-9H-purin-2-yl)carbamate (2o)



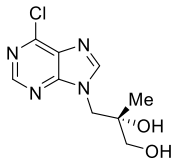
White solid, m.p. 161.7-164.3 °C, 373.0 mg, 89% yield, 98% ee; $[\alpha]_D^{22}$ = -29.76 (c = 0.336, CH_3OH); **HPLC** CHIRALCEL IA, *n*-hexane/2-propanol = 80/20, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 11.552 min, 13.834 min; **TLC**: R_f = 0.34 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 7.99 (s, 1H), 7.51 (d, *J* = 7.2 Hz, 2H), 7.24 (dt, *J* = 39.6, 7.2 Hz, 3H), 4.77 (d, *J* = 15.0 Hz, 1H), 4.67 (d, *J* = 15.0 Hz, 1H), 3.76 (d, *J* = 12.0 Hz, 1H), 3.62 (d, *J* = 11.4 Hz, 1H), 1.57 (s, 9H); **^{13}C NMR** (150 MHz, CD_3OD) δ 154.6, 154.2, 153.3, 151.4, 148.0, 143.1, 129.1, 128.5, 127.5, 127.0, 82.3, 77.2, 68.0, 51.5, 28.5; **HRMS** (ESI-TOF): exact mass calcd for $C_{19}H_{22}ClN_5O_4$ $(M+H)^+$ requires m/z 420.1433, found m/z 420.1430.

(*S*)-9-(2,3-dihydroxy-2-phenylpropyl)-1,3-dimethyl-3,9-dihydro-1H-purine-2,6-dione (2p)



White solid, m.p. 138.0-140.3 °C, 280.6 mg, 85% yield, 88% ee; $[\alpha]_D^{22}$ = 22.81 (c = 0.300, CH_3OH); **HPLC** CHIRALCEL IA, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 12.671 min, 14.628 min; **TLC**: R_f = 0.30 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 7.60 (s, 1H), 7.43 (d, *J* = 7.2 Hz, 2H), 7.26 (t, *J* = 7.2 Hz, 2H), 7.20 (t, *J* = 7.2 Hz, 2H), 4.85 (d, *J* = 13.2 Hz, 1H), 4.72 (d, *J* = 14.4 Hz, 1H), 3.82 (d, *J* = 11.4 Hz, 1H), 3.71 (d, *J* = 11.4 Hz, 1H), 3.44 (s, 3H), 3.29 (s, 3H); **^{13}C NMR** (150 MHz, CD_3OD) δ 157.1, 152.9, 149.2, 144.6, 142.5, 129.1, 128.5, 126.8, 108.7, 77.6, 68.5, 53.9, 30.1, 28.3; **HRMS** (ESI-TOF): exact mass calcd for $C_{16}H_{18}N_4O_4$ $(M+H)^+$ requires m/z 331.1401, found m/z 331.1392.

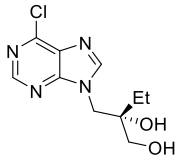
(*S*)-3-(6-chloro-9H-purin-9-yl)-2-methylpropane-1,2-diol (2q)



White solid, m.p. 128.0-130.2 °C, 222.7 mg, 92% yield, 57% ee; $[\alpha]_D^{22}$ = -10.67 (c = 0.300 CH_3OH); **HPLC** CHIRALCEL IC, *n*-hexane/2-propanol = 75/25, flow rate = 0.8 mL/min, λ = 254 nm, retention time: 13.296 min, 14.619 min; **TLC**: R_f = 0.22 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.72 (s, 1H), 8.53 (s, 1H), 4.41 (dd, *J* = 25.2, 10.8 Hz, 2H), 3.43-3.39 (m, 2H), 1.11 (s, 3H); **^{13}C NMR** (150 MHz, CD_3OD) δ 154.0, 152.9, 151.1, 149.5,

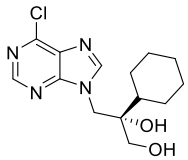
131.7, 73.3, 68.4, 51.5, 22.5; **HRMS** (ESI-TOF): exact mass calcd for $C_9H_{11}ClN_4O_2$ $(M+H)^+$ requires m/z 243.0643, found m/z 243.0644.

(*S*)-2-((6-chloro-9H-purin-9-yl)methyl)butane-1,2-diol (2r)



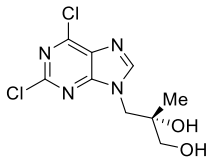
White solid, m.p. 98.7-100.7 °C, 225.3 mg, 88% yield, 84% ee; $[\alpha]_D^{21}$ = -18.59 (c = 0.283, CH_3OH); **HPLC** CHIRALCEL IC, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 11.190 min, 12.856 min; **TLC**: R_f = 0.32 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.71 (s, 1H), 8.52 (s, 1H), 4.42 (dd, *J* = 21.6, 14.4 Hz, 2H), 3.43 (d, *J* = 11.4 Hz, 1H), 3.31 (d, *J* = 11.4 Hz, 1H), 1.61-1.54 (sext, *J* = 7.2 Hz, 1H), 1.48-1.42 (sext, *J* = 7.2 Hz, 1H), 0.96 (t, *J* = 7.2 Hz, 3H); **^{13}C NMR** (150 MHz, CD_3OD) δ 154.0, 152.8, 151.1, 149.6, 131.7, 75.1, 64.9, 50.3, 28.5, 7.5; **HRMS** (ESI-TOF): exact mass calcd for $C_{10}H_{13}ClN_4O_2$ $(M+H)^+$ requires m/z 257.0800, found m/z 257.0791.

(*S*)-3-(6-chloro-9H-purin-9-yl)-2-cyclohexylpropane-1,2-diol (2s)



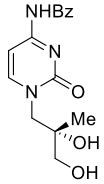
White solid, m.p. 158.8-159.3 °C, 272.9 mg, 88% yield, 75% ee; $[\alpha]_D^{22}$ = 18.45 (c = 0.300, CH_3OH); **HPLC** CHIRALCEL ID, *n*-hexane/2-propanol = 80/20, flow rate = 0.8 mL/min, λ = 256 nm, retention time: 14.102 min, 15.310 min; **TLC**: R_f = 0.36 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.73 (s, 1H), 8.53 (s, 1H), 4.49 (dd, *J* = 30.0, 14.4 Hz, 2H), 3.42 (d, *J* = 11.6 Hz, 1H), 3.34 (d, *J* = 11.2 Hz, 1H), 2.03-1.91 (m, 2H), 1.79 (s, 2H), 1.67 (s, 1H), 1.49-1.43 (m, 1H), 1.28-1.12 (m, 6H); **^{13}C NMR** (100 MHz, CD_3OD) δ 154.2, 152.8, 151.1, 149.9, 131.7, 76.3, 64.0, 44.2, 28.0, 28.0, 27.93, 27.86, 27.8, 27.5; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{19}ClN_4O_2$ $(M+H)^+$ requires m/z 311.1269, found m/z 311.1266.

(*S*)-3-(2,6-dichloro-9H-purin-9-yl)-2-methylpropane-1,2-diol (2t)



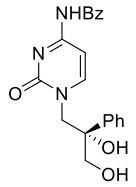
White solid, m.p. 149.1-149.9 °C, 237.4 mg, 86% yield, 68% ee; $[\alpha]_D^{20}$ = -22.31 (c = 0.260, CH_3OH); **HPLC** CHIRALCEL ID, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 7.564 min, 8.475 min; **TLC**: R_f = 0.35 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.51 (s, 1H), 4.36 (dd, *J* = 22.2, 7.8 Hz, 2H), 3.43 (dd, *J* = 14.4, 11.4 Hz, 2H), 1.11 (s, 3H); **^{13}C NMR** (150 MHz, CD_3OD) δ 155.4, 153.7, 151.7, 150.2, 131.0, 73.3, 68.4, 51.7, 22.4; **HRMS** (ESI-TOF): exact mass calcd for $C_9H_{10}Cl_2N_4O_2$ $(M+H)^+$ requires m/z 277.0254, found m/z 277.0251.

(*S*)-N-(1-(2,3-dihydroxy-2-methylpropyl)-2-oxo-1,2-dihydropyrimidin-4-yl)benzamide (2u)



White solid, m.p. 177.2-178.3 °C, 245.5 mg, 81% yield, 80% ee; $[\alpha]_D^{25}$ = -31.6 (c = 0.336, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 80/20, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 27.841 min, 31.883 min; **TLC**: R_f = 0.26 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.04 (d, *J* = 10.8 Hz, 1H), 7.98-7.96 (m, 2H), 7.65-7.51 (m, 4H), 4.05 (dd, *J* = 20.4, 14.0 Hz, 2H), 3.35 (dd, *J* = 14.4, 11.6 Hz, 2H), 1.20 (s, 3H); **^{13}C NMR** (100 MHz, CD_3OD) δ 169.1, 164.8, 159.8, 152.9, 134.7, 134.1, 129.8, 129.1, 98.2, 74.0, 68.2, 56.6, 22.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{15}H_{17}N_3O_4$ $(M+H)^+$ requires m/z 304.1292, found m/z 304.1290.

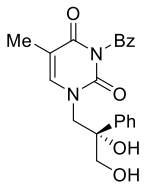
(*S*)-N-(1-(2,3-dihydroxy-2-phenylpropyl)-2-oxo-1,2-dihydropyrimidin-4-yl)benzamide (2v)



White solid, m.p. 147.5-148.2 °C, 204.4 mg, 56% yield, 95% ee; $[\alpha]_D^{25}$ = -38.3 (c = 0.283, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 18.002 min, 26.105 min; **TLC**: R_f = 0.29 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 7.96-7.94 (m, 2H), 7.87 (d, *J* = 7.6 Hz, 1H), 7.65-7.61 (m, 1H), 7.57-7.51 (m, 4H), 7.44 (d, *J* = 7.2 Hz, 1H), 7.36-7.33 (m, 2H), 7.28-7.25 (m, 1H), 4.61 (d, *J* = 14.0 Hz, 1H), 4.17 (d, *J* = 14.0 Hz, 1H), 3.78 (d, *J* = 11.6 Hz, 1H), 3.69 (d, *J* =

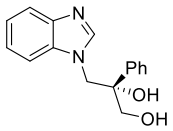
11.6 Hz, 1H); **^{13}C NMR** (100 MHz, CD_3OD) δ 164.7, 152.7, 143.3, 134.7, 134.1, 129.8, 129.3, 129.1, 128.6, 127.0, 98.0, 78.0, 68.4, 57.3; **HRMS** (ESI-TOF): exact mass calcd for $C_{20}H_{19}N_3O_4$ $(M+H)^+$ requires m/z 366.1448, found m/z 366.1446.

(*S*)-3-benzoyl-1-(2,3-dihydroxy-2-phenylpropyl)-5-methylpyrimidine-2,4(1H,3H)-dione (2w)



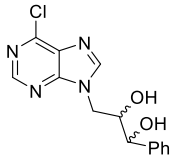
White solid, m.p. 138.4-139.2 °C, 315.5 mg, 83% yield, 98% ee; $[\alpha]_D^{25}$ = 59.5 (c = 0.600, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 17.108 min, 23.746 min; **TLC**: R_f = 0.31 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 7.67 (t, *J* = 7.8 Hz, 2H), 7.53-7.48 (m, 6H), 7.35-7.48 (m, 3H), 4.19 (s, 2H), 3.86 (d, *J* = 11.4 Hz, 1H), 3.71 (d, *J* = 11.4 Hz, 1H), 1.82 (s, 3H); **^{13}C NMR** (150 MHz, CD_3OD) δ 170.2, 164.9, 151.9, 144.6, 142.7, 136.2, 132.7, 131.3, 130.3, 129.7, 129.5, 129.21, 129.16, 128.9, 128.6, 127.0, 109.8, 78.0, 68.6, 54.83, 54.79, 12.2; **HRMS** (ESI-TOF): exact mass calcd for $C_{21}H_{20}N_2O_5$ $(M+Na)^+$ requires m/z 403.1264, found m/z 403.1261.

(*S*)-3-(1H-benzo[d]imidazol-1-yl)-2-phenylpropane-1,2-diol (2x)



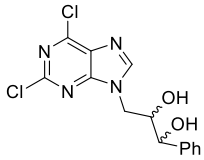
White solid, m.p. 137.7-140.2 °C, 185.0 mg, 69% yield, 85% ee; $[\alpha]_D^{22}$ = 17.20 (c = 0.283, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 9.235 min, 13.211 min; **TLC**: R_f = 0.34 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 7.82 (s, 1H), 7.56-7.54 (m, 1H), 7.41-7.37 (m, 3H), 7.25-7.13 (m, 5H), 4.58 (dd, *J* = 59.4, 14.4 Hz, 2H), 3.81 (dd, *J* = 71.4, 11.4 Hz, 2H); **^{13}C NMR** (150 MHz, CD_3OD) δ 145.7, 143.4, 143.0, 129.2, 128.5, 126.9, 123.8, 123.0, 119.5, 112.1, 77.6, 67.9, 52.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{16}H_{16}N_2O_2$ $(M+H)^+$ requires m/z 269.1285, found m/z 269.1285.

3-(6-chloro-9H-purin-9-yl)-1-phenylpropane-1,2-diol (4a)



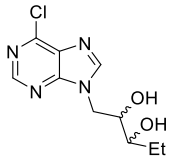
White solid, m.p. 140.0-141.7 ºC, 273.6 mg, 90% yield, >20/1 dr, 97% ee; $[\alpha]_D^{21}$ = 9.61 (c = 0.222, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 256 nm, retention time: 9.170 min, 10.773 min; **TLC**: R_f = 0.31 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.66 (s, 1H), 8.46 (s, 1H), 7.44 (d, *J* = 7.8 Hz, 2H), 7.34-7.24 (m, 3H), 4.70 (d, *J* = 4.8 Hz, 1H), 4.42 (dd, *J* = 14.4, 3.0 Hz, 1H), 4.29-4.25 (m, 1H), 4.19-4.16 (m, 1H); **^{13}C NMR** (150 MHz, CD_3OD) δ 153.34, 153.31, 152.7, 150.9, 149.2, 142.6, 132.1, 129.3, 128.8, 128.0, 76.2, 74.1, 48.5; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{13}ClN_4O_2$ $(M+H)^+$ requires m/z 305.0800, found m/z305.0791.

3-(2,6-dichloro-9H-purin-9-yl)-1-phenylpropane-1,2-diol (4b)



White solid, m.p. 63.1-65.9 ºC, 202.8 mg, 60% yield, >20/1 dr, 93% ee; $[\alpha]_D^{21}$ = 20.58 (c = 0.243, CH_3OH); **HPLC** CHIRALCEL IA, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 8.786 min, 10.319 min; **TLC**: R_f = 0.30 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (600 MHz, CD_3OD) δ 8.45 (s, 1H), 7.43 (d, *J* = 7.2 Hz, 2H), 7.29 (dt, *J* = 45.0, 7.2 Hz, 3H), 4.69 (d, *J* = 4.8 Hz, 1H), 4.37 (dd, *J* = 13.8, 3.0 Hz, 1H), 4.26-4.22 (m, 1H), 4.17-4.14 (m, 1H); **^{13}C NMR** (150 MHz, CD_3OD) δ 154.7, 153.5, 151.5, 149.8, 142.4, 131.3, 129.2, 128.7, 128.0, 76.0, 74.0; **HRMS** (ESI-TOF): exact mass calcd for $C_{14}H_{12}Cl_2N_4O_2$ $(M+H)^+$ requires m/z 339.0410, found m/z 339.0403.

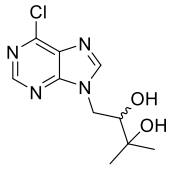
1-(6-chloro-9H-purin-9-yl)pentane-2,3-diol (4c)



White solid, m.p. 72.4-75.1 ºC, 227.9 mg, 89% yield, >20/1 dr, 53% ee; $[\alpha]_D^{22}$ = -23.35 (c = 0.260, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 250 nm, retention time: 6.624 min, 7.814 min; **TLC**: R_f = 0.38 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.73 (s, 1H), 8.53 (s, 1H), 4.71 (dd, *J* = 14.4, 3.2 Hz, 1H),

4.34-4.28 (m, 1H), 3.80-3.76 (m, 1H), 3.41-3.37 (m, 1H), 1.83-1.76 (m, 1H), 1.51-1.43 (s, 1H), 1.02 (t, J = 7.2 Hz, 3H); **^{13}C NMR** (100 MHz, CD_3OD) δ 153.6, 152.8, 151.0, 149.4, 132.2, 75.6, 73.5, 27.3, 10.3; **HRMS** (ESI-TOF): exact mass calcd for $C_{10}H_{13}ClN_4O_2$ $(M+H)^+$ requires m/z 257.0800, found m/z 257.0806.

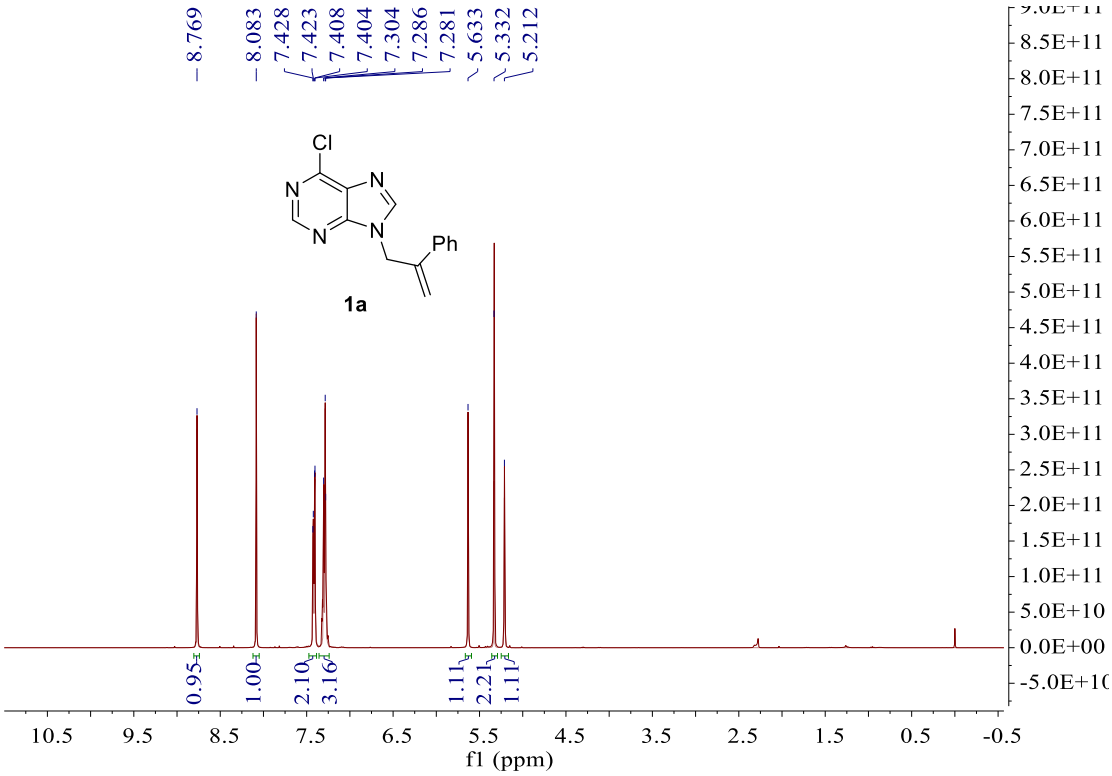
1-(6-chloro-9H-purin-9-yl)-3-methylbutane-2,3-diol (4d)

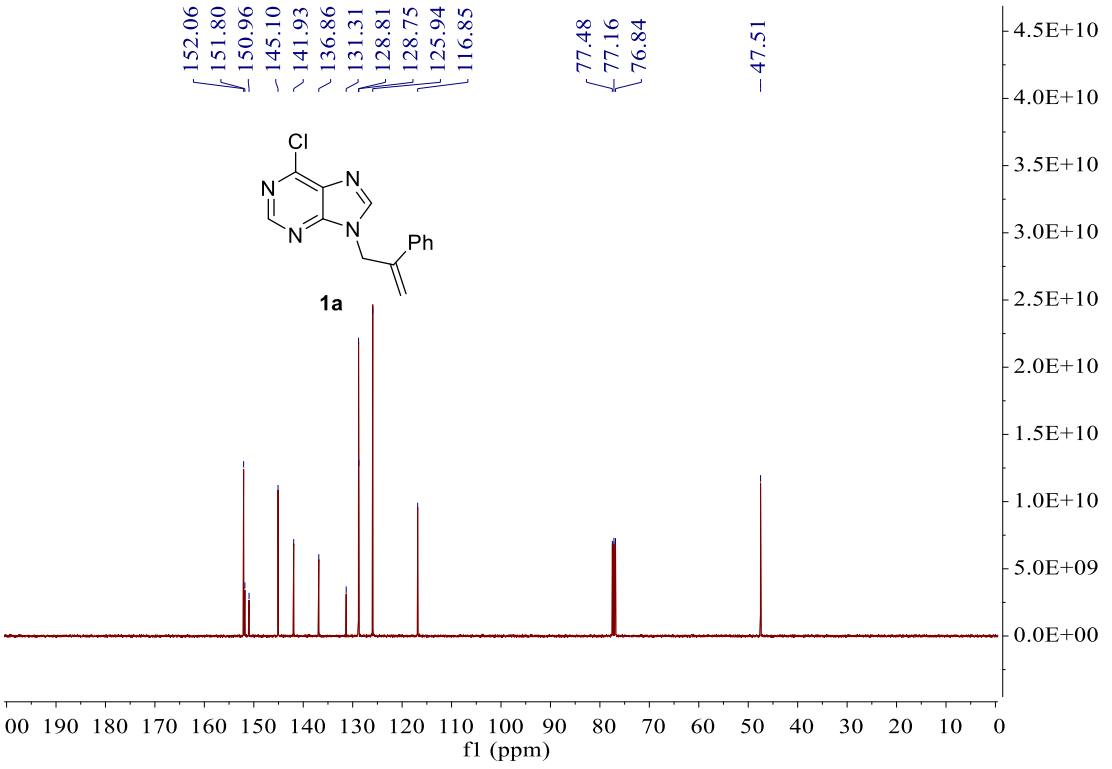


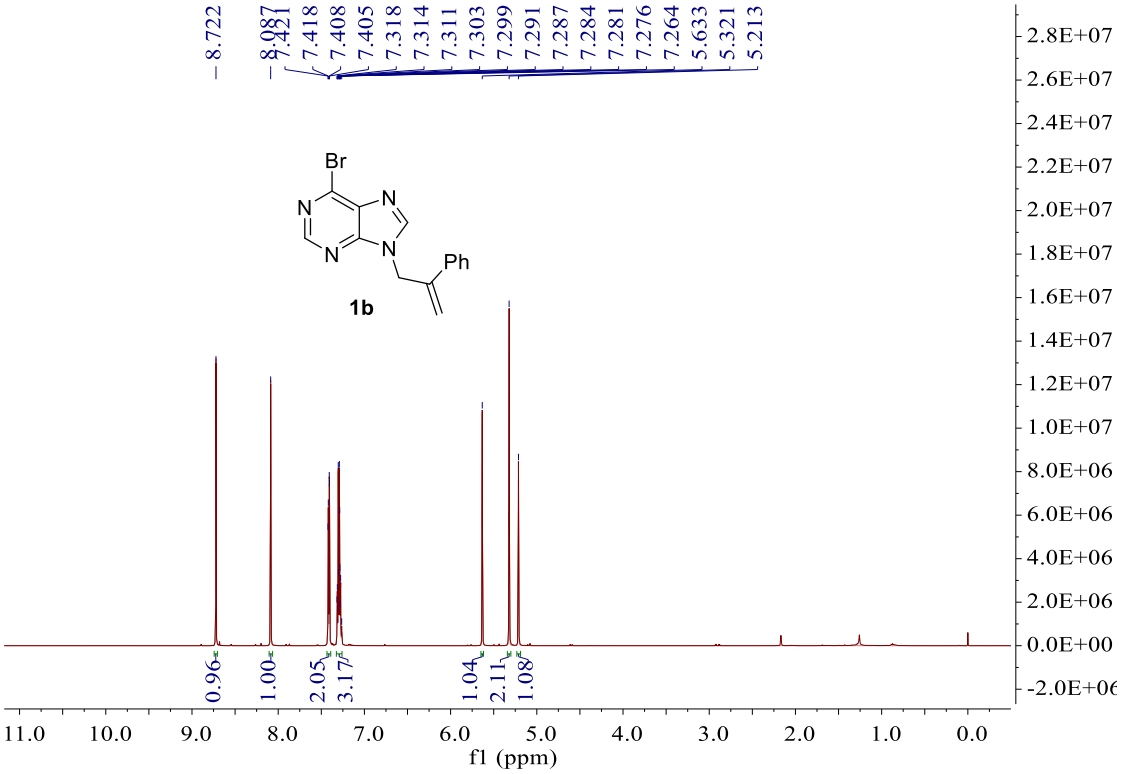
White solid, m.p. 98.1-100.2 ºC, 197.2 mg, 77% yield, 92% ee; $[\alpha]_D^{22}$ = 37.77 (c = 0.274, CH_3OH); **HPLC** CHIRALCEL OD-H, *n*-hexane/2-propanol = 70/30, flow rate = 0.8 mL/min, λ = 254 nm, retention time: 7.685 min, 8.924 min; **TLC**: R_f = 0.23 (dichloromethane: methanol = 20:1) [UV]; **^{1}H NMR** (400 MHz, CD_3OD) δ 8.73 (s, 1H), 8.54 (s, 1H), 4.74 (dd, J = 14.0, 2.4 Hz, 1H), 4.26-4.20 (m, 1H), 3.72 (dd, J = 10.4, 2.4 Hz, 1H), 1.30 (d, J = 6.8 Hz, 6H); **^{13}C NMR** (100 MHz, CD_3OD) δ 153.5, 152.8, 150.9, 149.4, 132.2, 76.8, 72.8, 47.5, 26.7, 24.8; **HRMS** (ESI-TOF): exact mass calcd for $C_{10}H_{13}ClN_4O_2$ $(M+H)^+$ requires m/z 257.0800, found m/z 257.0807.

5. Copies of ^{1}H and ^{13}C NMR spectra

(1) Copies of NMR spectra of starting materials



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7.299
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7.287
7.284
7.281
7.276
7.264
5.633
5.321
5.213
Br
N
N
N
N
Ph
1b
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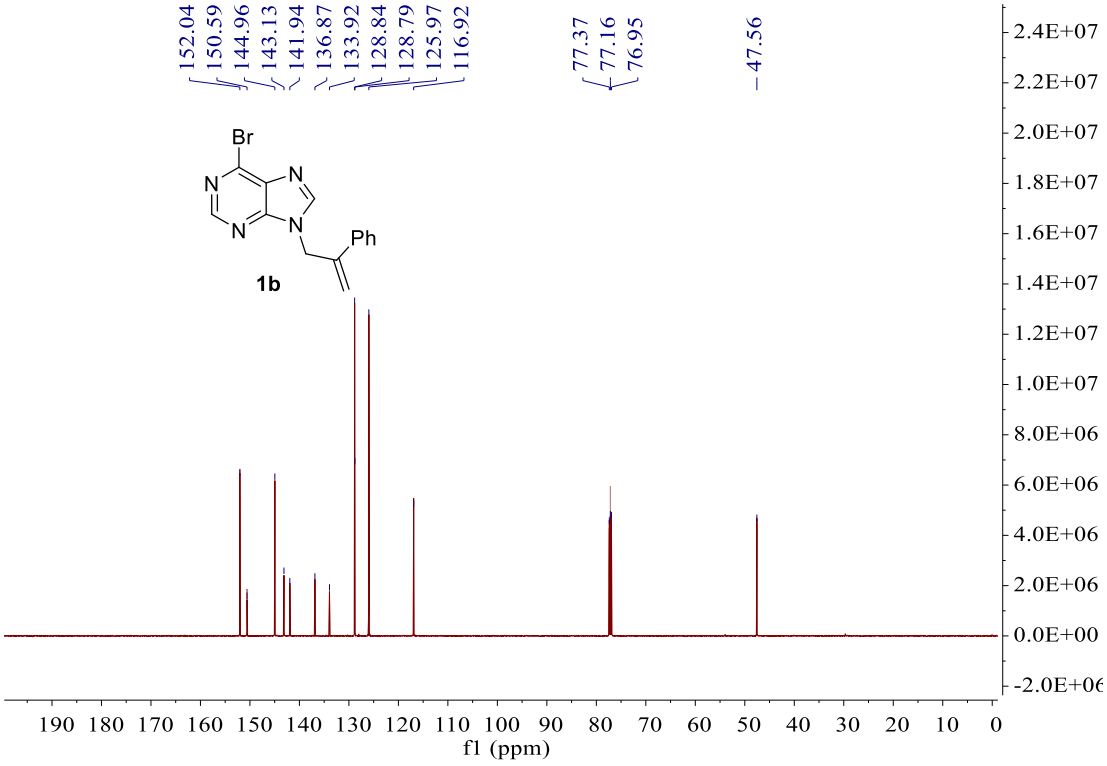
1.00
2.05
3.17
1.04
2.11
1.08
f1 (ppm)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N
N
N
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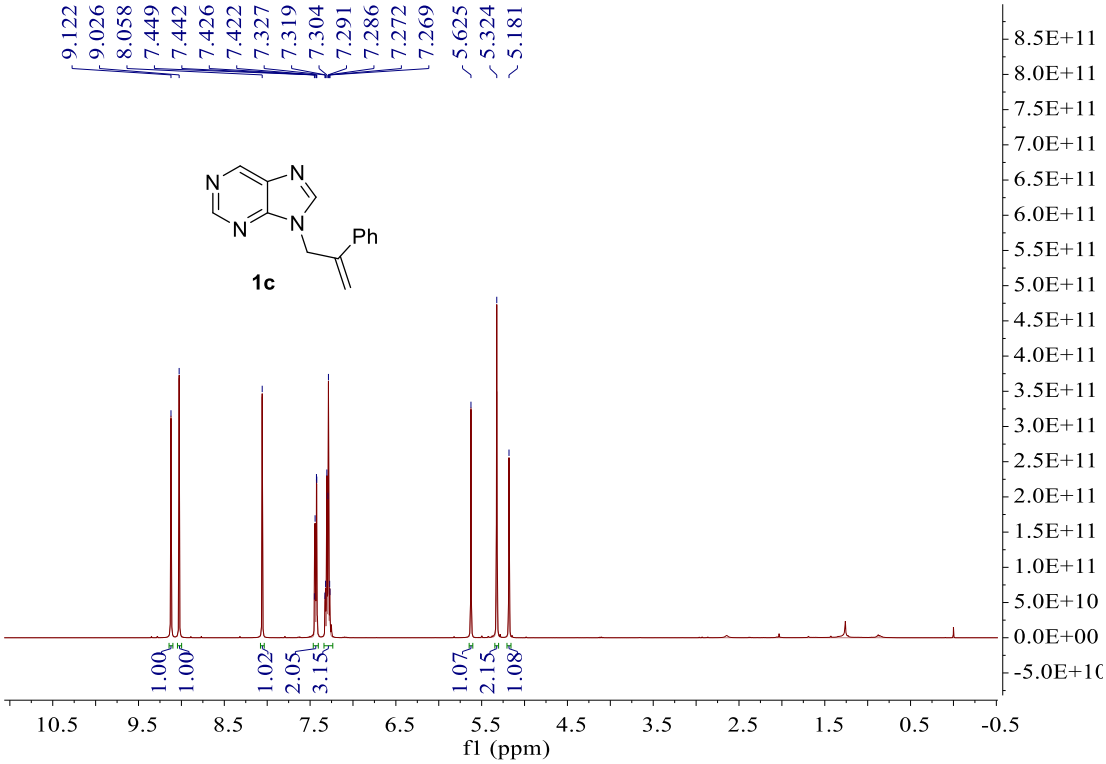
Ph
1b
f1 (ppm)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7.272
7.269
5.625
5.324
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1.00
1.02
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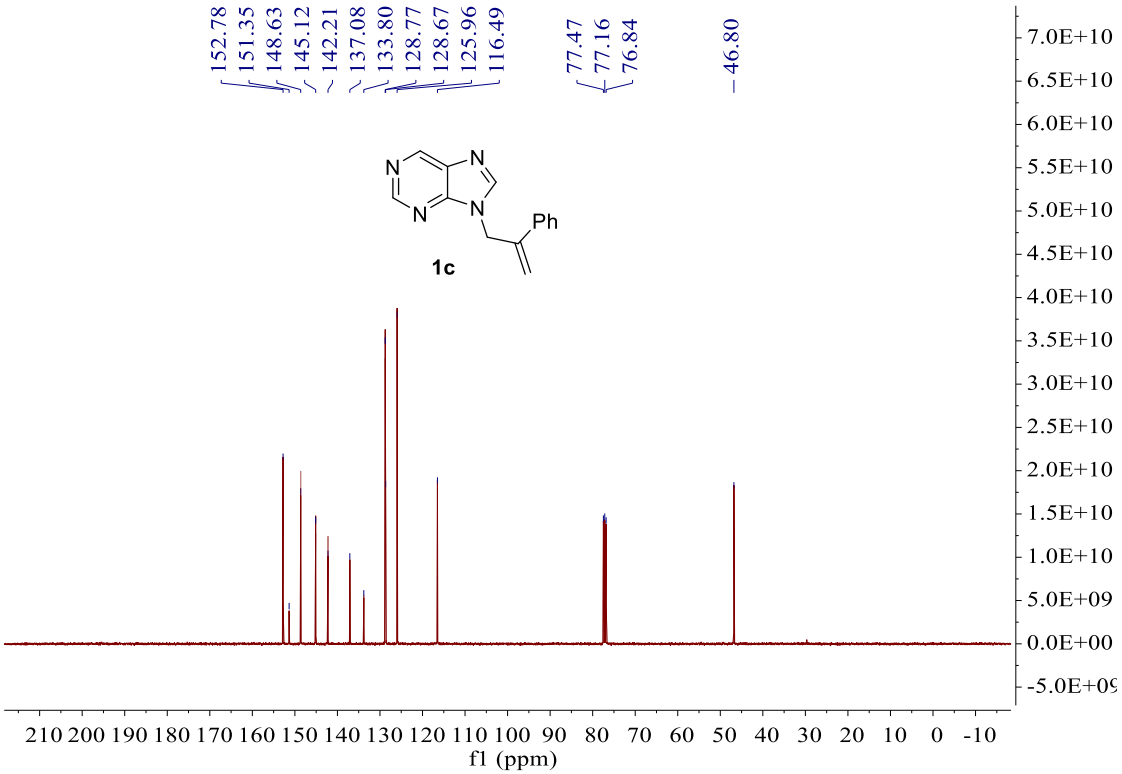
3.15
1.07
2.15
1.08
f1 (ppm)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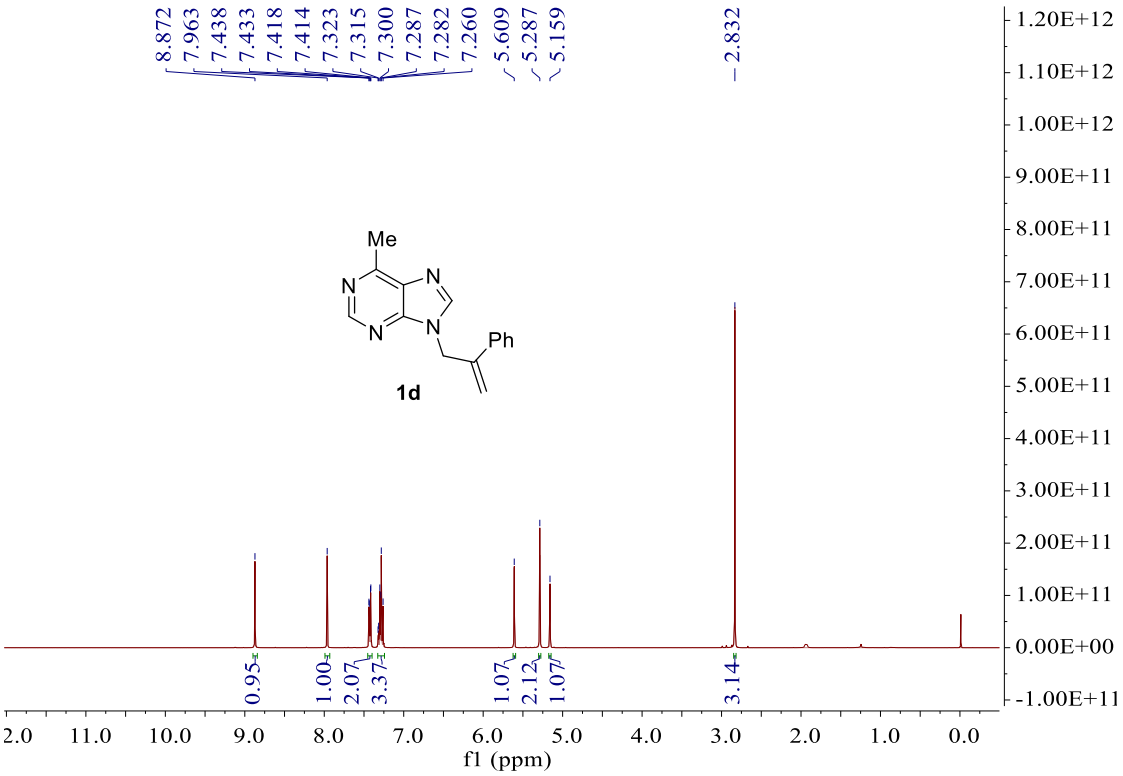
Ph
1c
f1 (ppm)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5.287
5.159
2.832
Me
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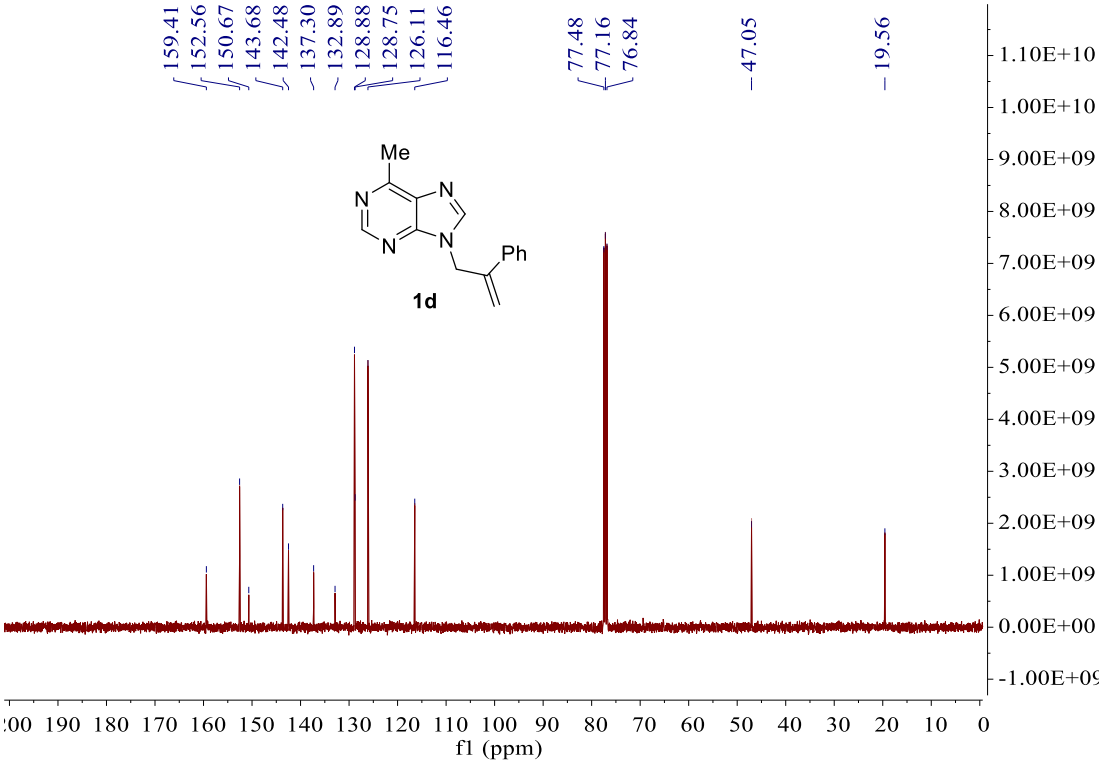
3.14
f1 (ppm)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47.05
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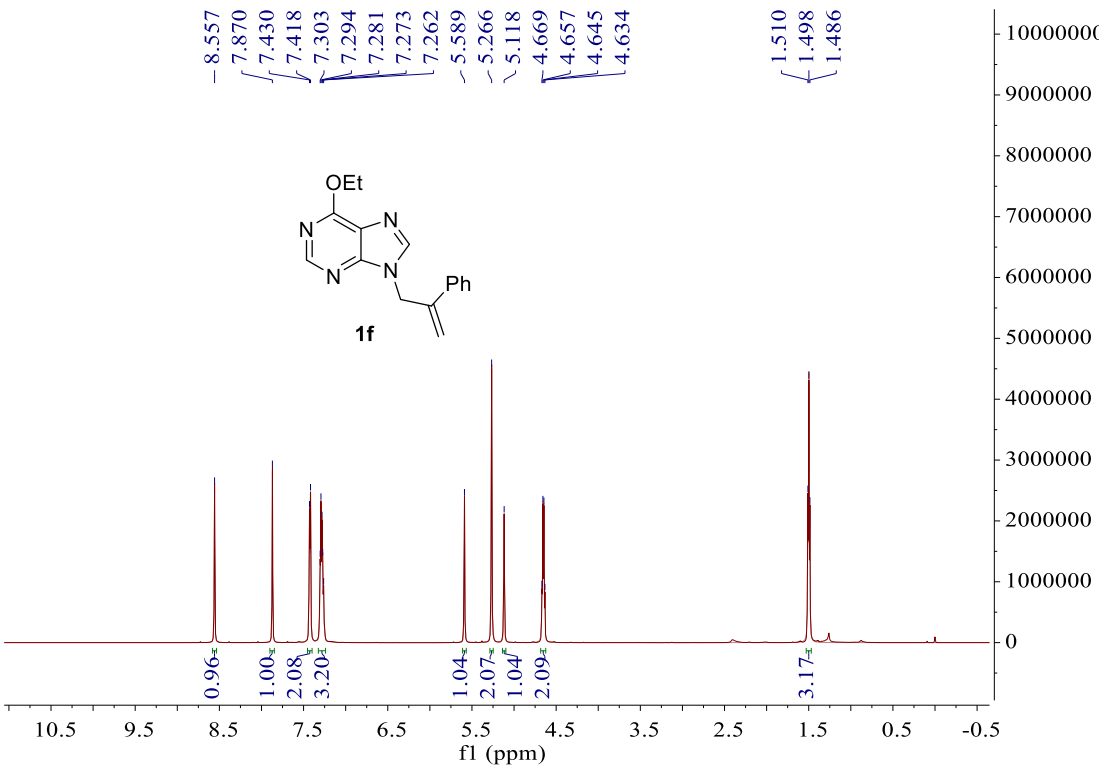
N
N
N
N
Ph
1d
f1 (ppm)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4.645
4.634
1.510
1.498
1.486
OEt
N
N
N
N
Ph
1f
0.96
1.00
2.08
3.20
1.04
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1.04
2.09
3.17
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6000000
5000000
4000000
3000000
2000000
1000000
0
10.5
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6.5
5.5
4.5
3.5
2.5
1.5
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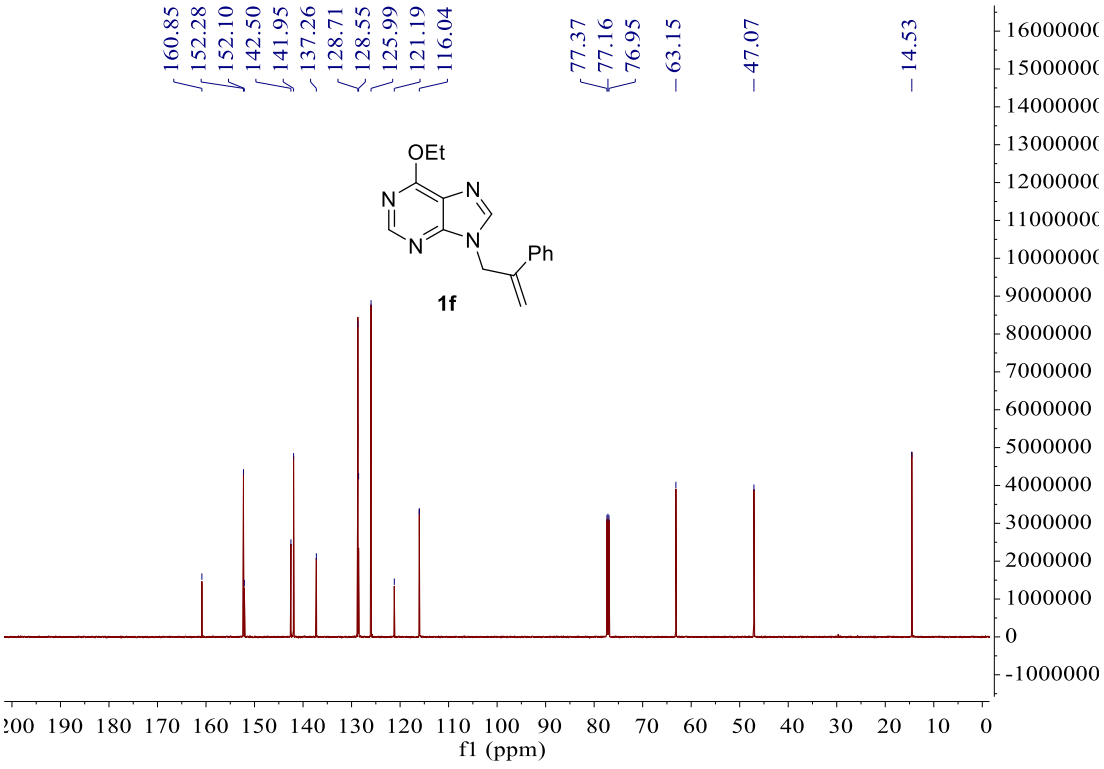
f1 (ppm)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14.53
OEt
N
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N
N
Ph
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13000000
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10000000
9000000
8000000
7000000
6000000
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3000000
2000000
1000000
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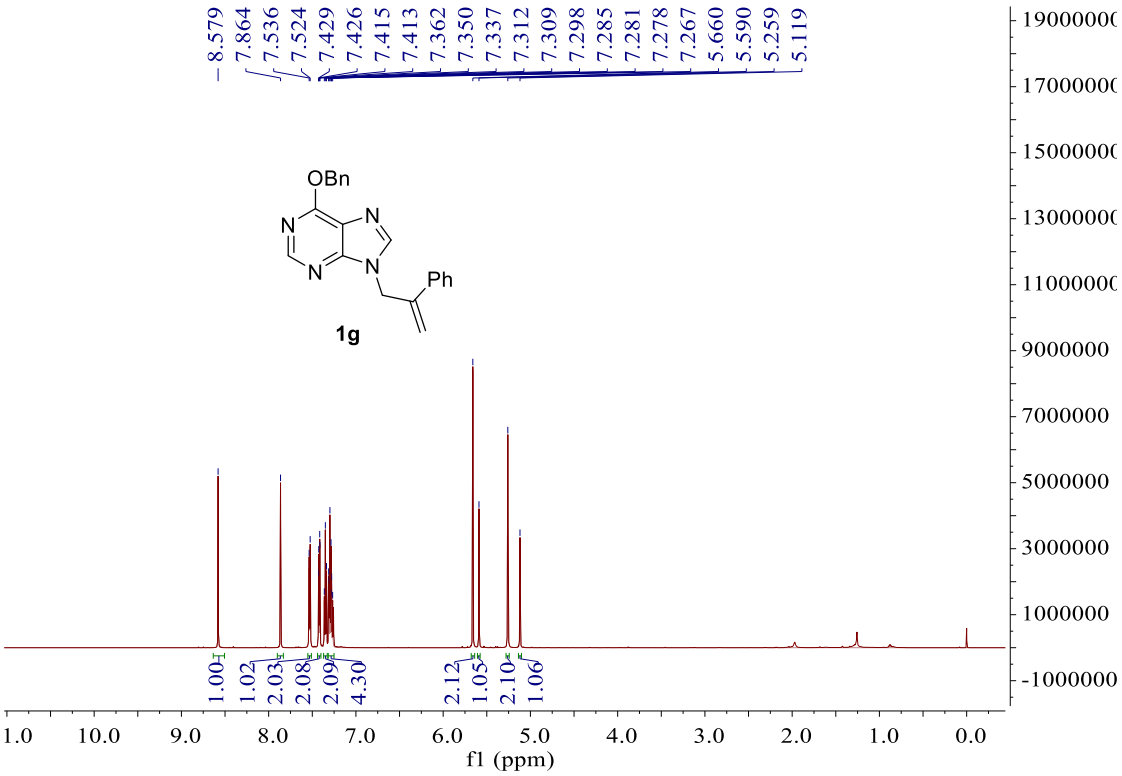
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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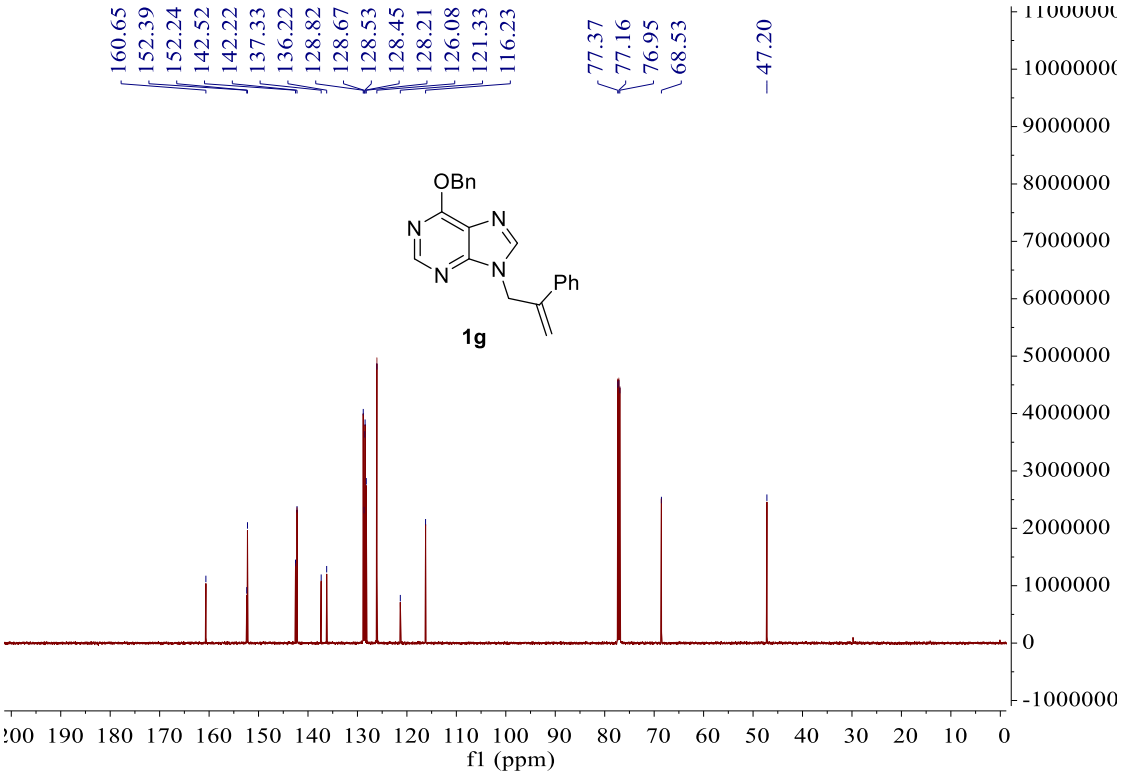
7.864
7.536
7.524
7.429
7.426
7.415
7.413
7.362
7.350
7.337
7.312
7.309
7.298
7.285
7.281
7.278
7.267
5.660
5.590
5.259
5.119
OBn
N
N
N
N
Ph
1g
1.00
1.02
2.03
2.08
2.09
4.30
2.12
1.05
2.10
1.06
f1 (ppm)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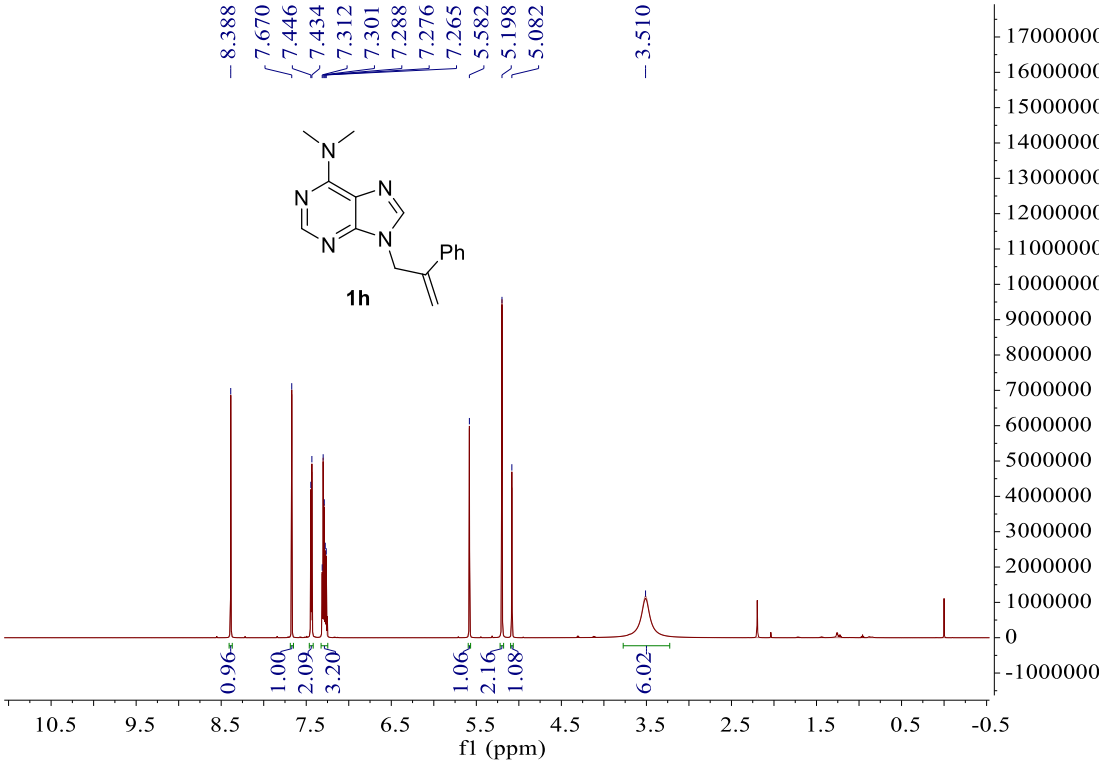
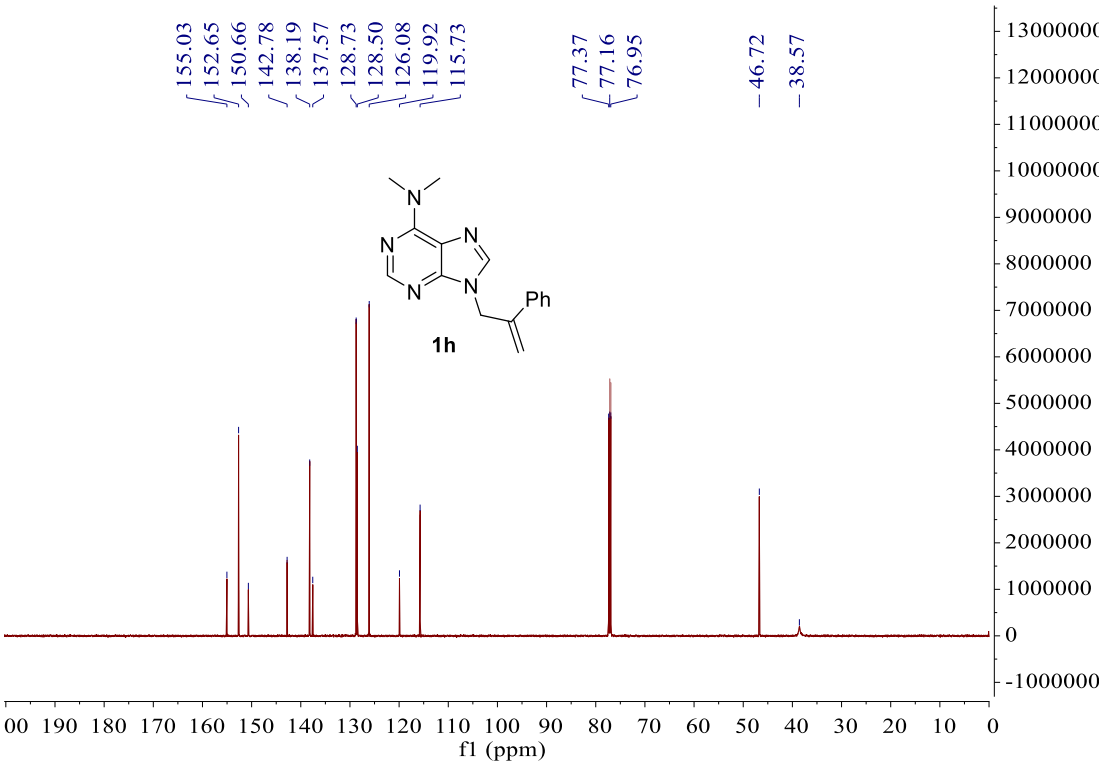
152.39
152.24
142.52
142.22
137.33
136.22
128.82
128.67
128.53
128.45
128.21
126.08
121.33
116.23
77.37
77.16
76.95
68.53
47.20
OBn
N
N
N
N
Ph
1g
f1 (ppm)


8.388
7.670
7.446
7.434
7.312
7.301
7.288
7.276
7.265
5.582
5.198
5.082
3.510
N
N
N
N
N
Ph
1h
0.96
1.00
2.09
3.20
1.06
2.16
1.08
6.02
f1 (ppm)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152.65
150.66
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138.19
137.57
128.73
128.50
126.08
119.92
115.73
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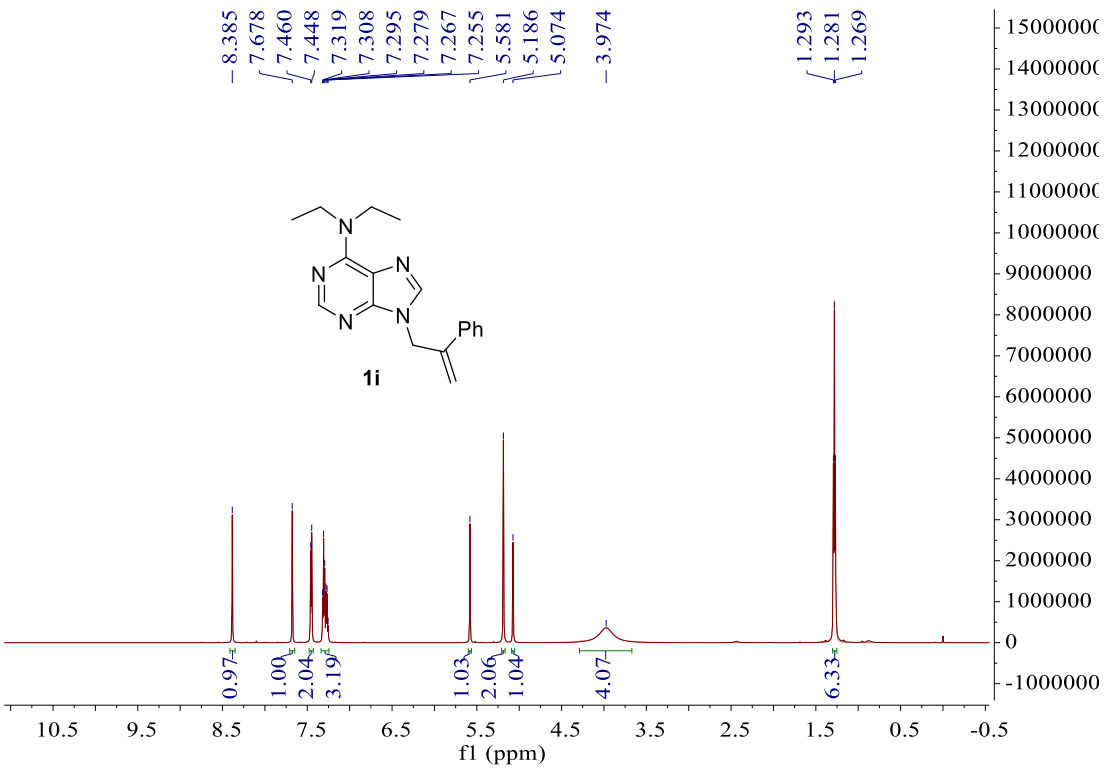
77.16
76.95
46.72
38.57
N
N
N
N
N
Ph
1h
f1 (ppm)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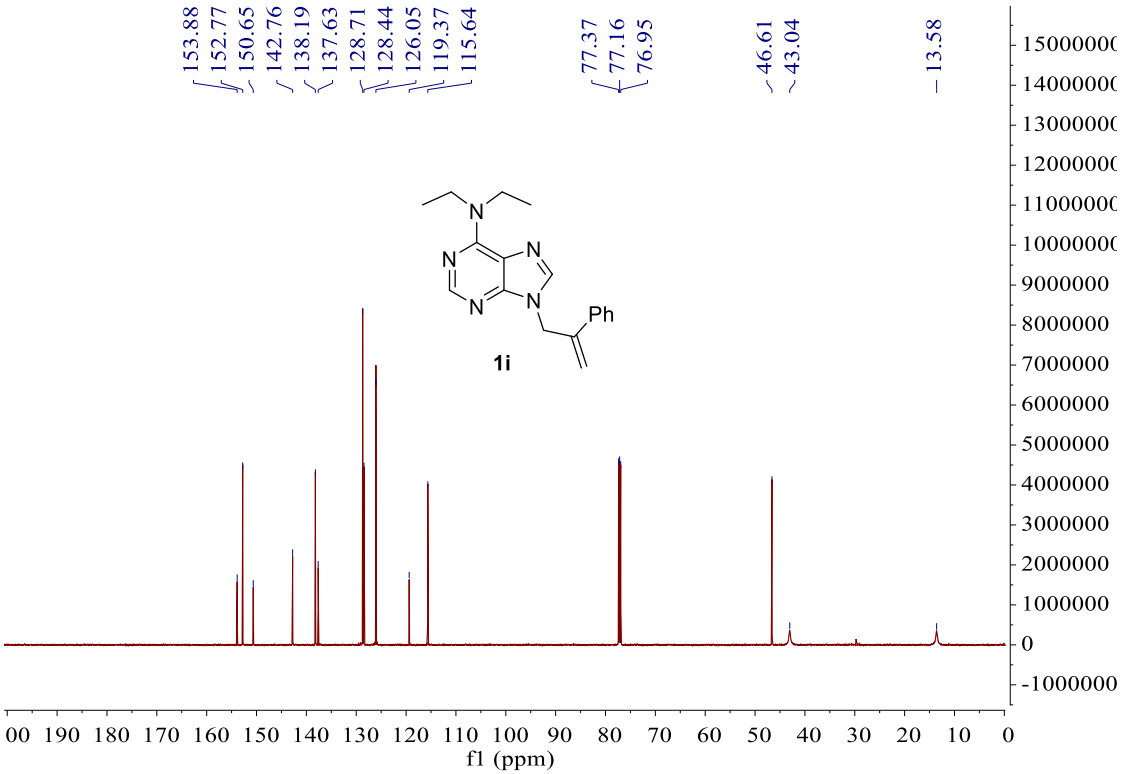
7.678
7.460
7.448
7.319
7.308
7.295
7.279
7.267
7.255
5.581
5.186
5.074
3.974
1.293
1.281
1.269
Ph
1i
0.97
1.00
2.04
3.19
1.03
2.06
1.04
4.07
6.33
f1 (ppm)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152.77
150.65
142.76
138.19
137.63
128.71
128.44
126.05
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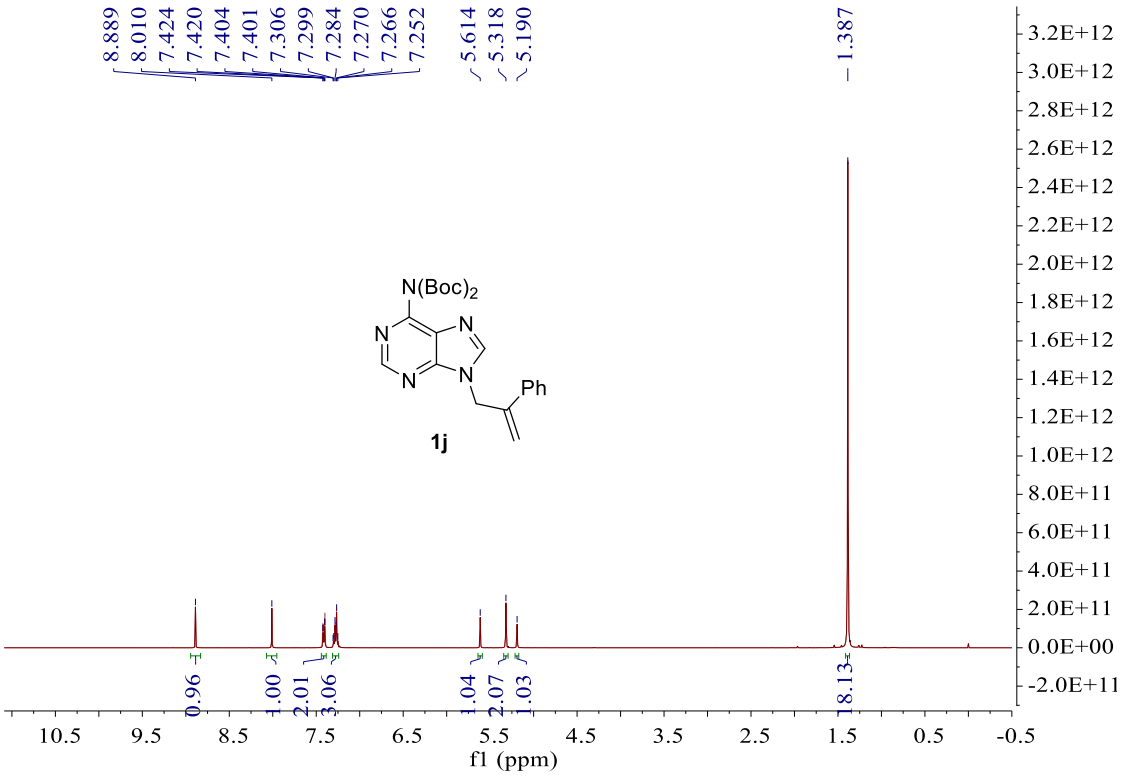
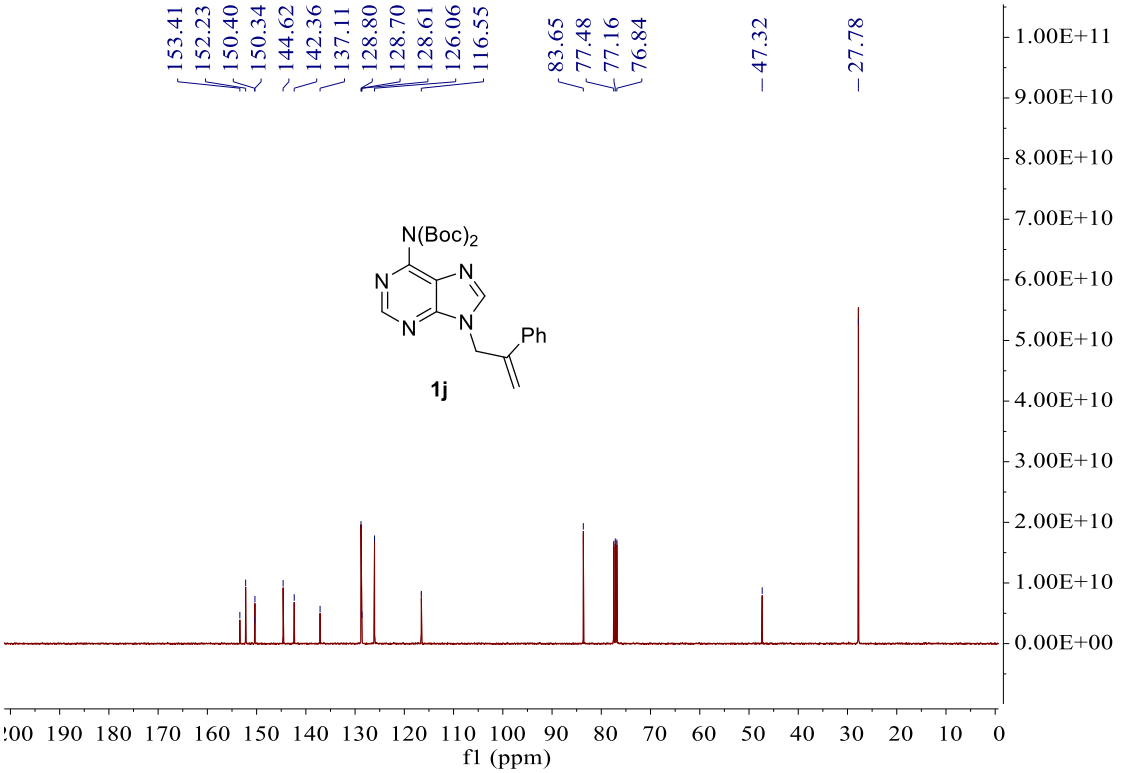
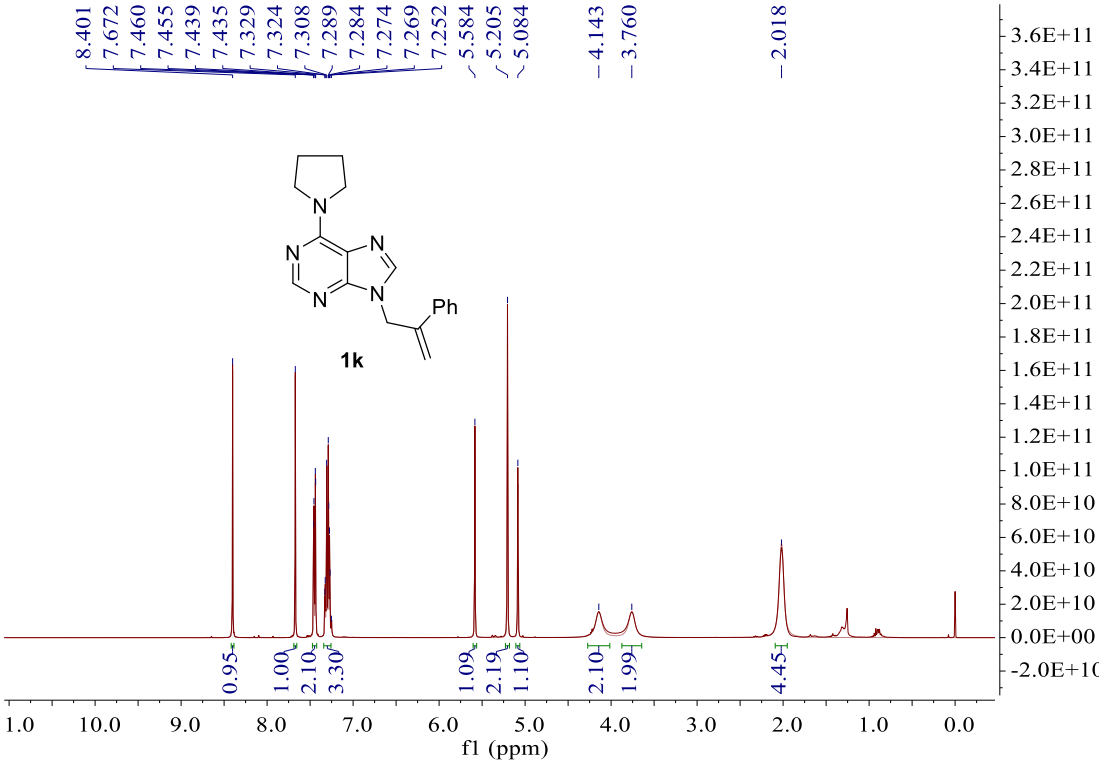
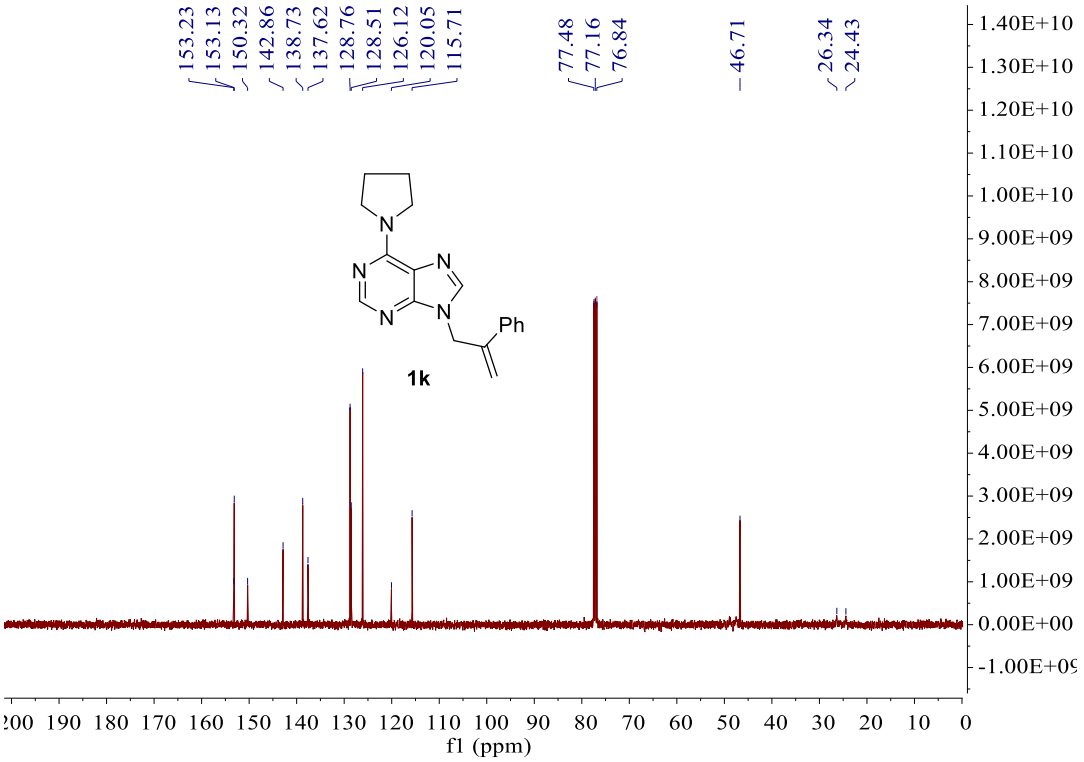
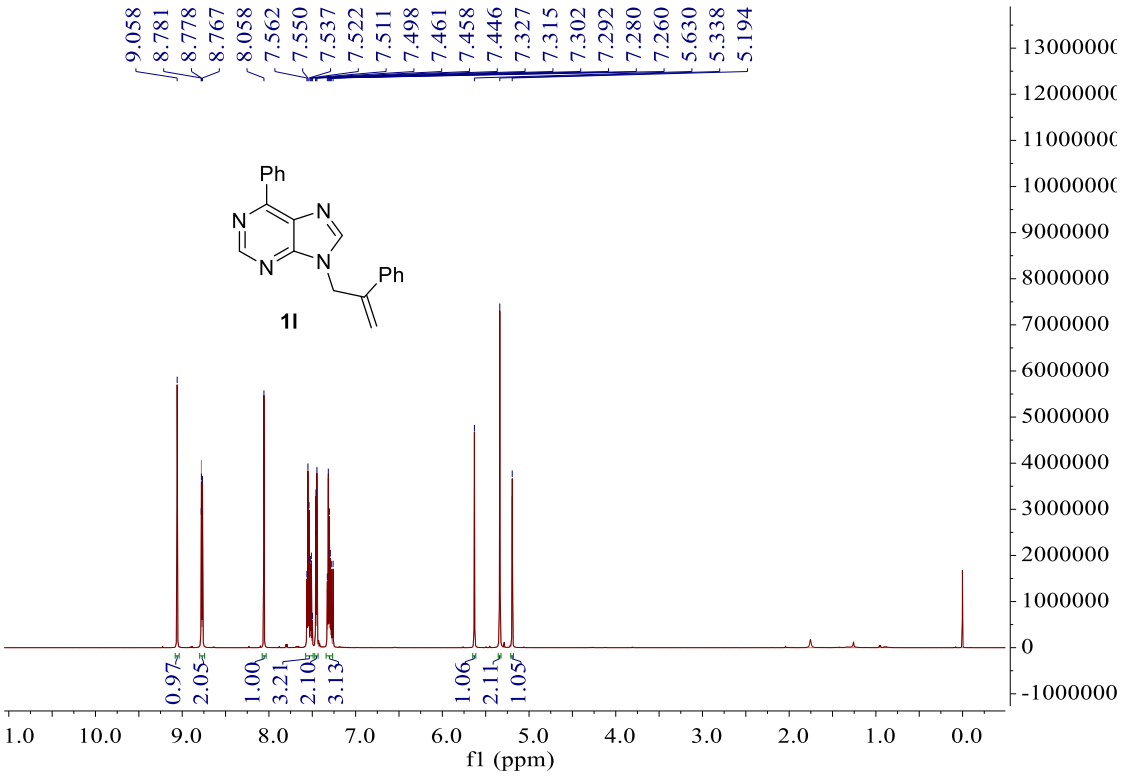
115.64
77.37
77.16
76.95
46.61
43.04
13.58
Ph
1i
f1 (ppm)

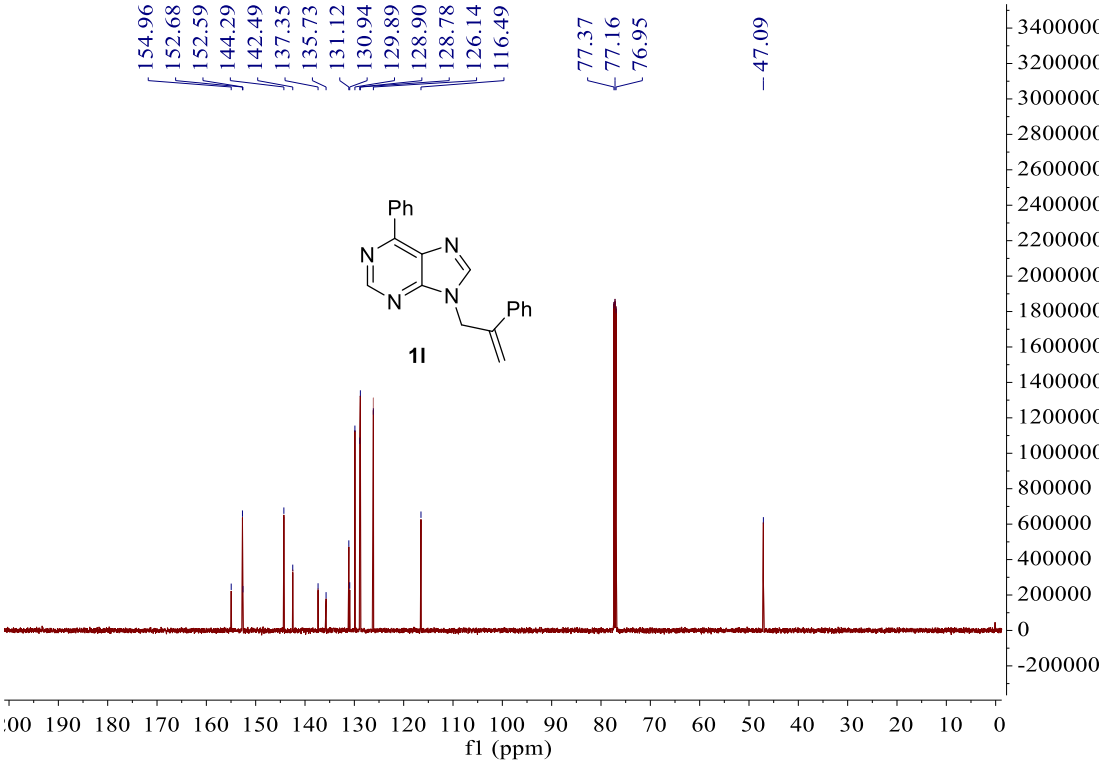

8.889
8.010
7.424
7.420
7.404
7.401
7.306
7.299
7.284
7.270
7.266
7.252
5.614
5.318
5.190
1.387
N(Boc)2
Ph
1j
0.96
1.00
2.01
3.06
1.04
2.07
1.03
18.13
fl (ppm)


153.41
152.23
150.40
150.34
144.62
142.36
137.11
128.80
128.70
128.61
126.06
116.55
83.65
77.48
77.16
76.84
47.32
27.78
N(Boc)2
Ph
1j
fl (ppm)


8.401
7.672
7.460
7.455
7.439
7.435
7.329
7.324
7.308
7.289
7.284
7.274
7.269
7.252
5.584
5.205
5.084
4.143
3.760
2.018
Ph
1k
0.95
1.00
2.10
3.30
1.09
2.19
1.10
2.10
1.99
4.45
f1 (ppm)


153.23
153.13
150.32
142.86
138.73
137.62
128.76
128.51
126.12
120.05
115.71
77.48
77.16
76.84
46.71
26.34
24.43
Ph
1k
f1 (ppm)


9.058
8.781
8.778
8.767
8.058
7.562
7.550
7.537
7.522
7.511
7.498
7.461
7.458
7.446
7.327
7.315
7.302
7.292
7.280
7.260
5.630
5.338
5.194
Ph
N
N
N
N
Ph
1l
0.97
2.05
1.00
3.21
2.10
3.13
1.06
2.11
1.05
fl (ppm)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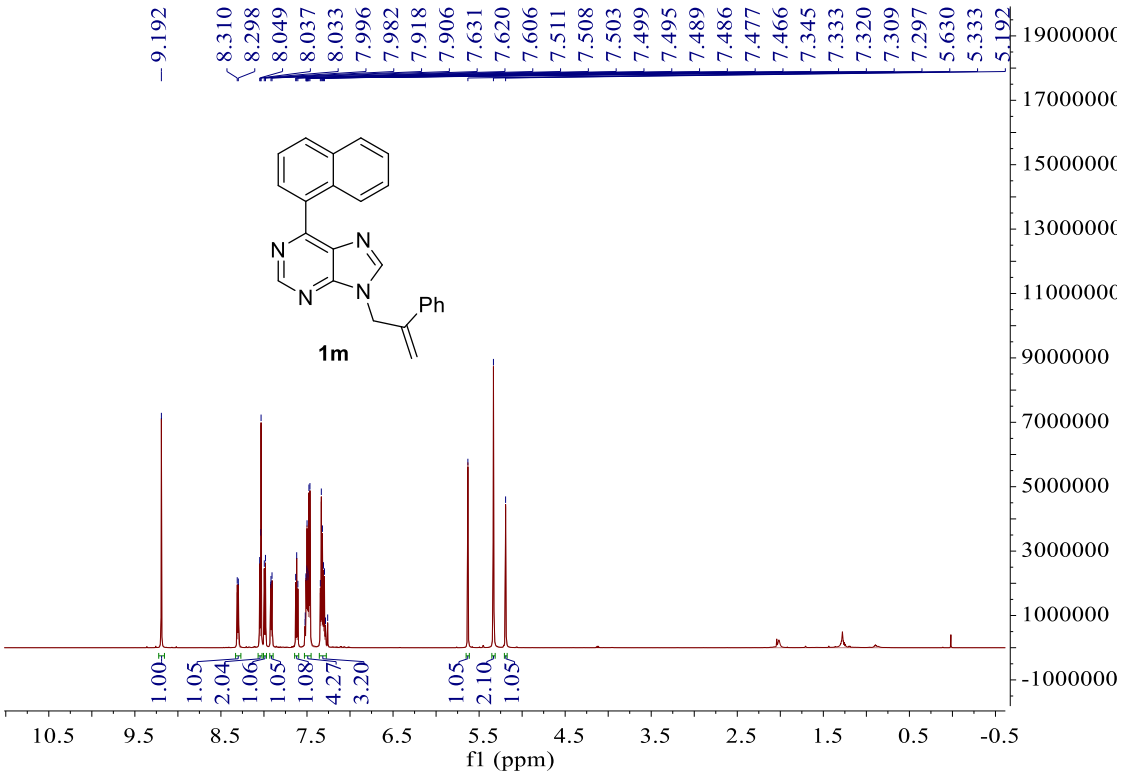
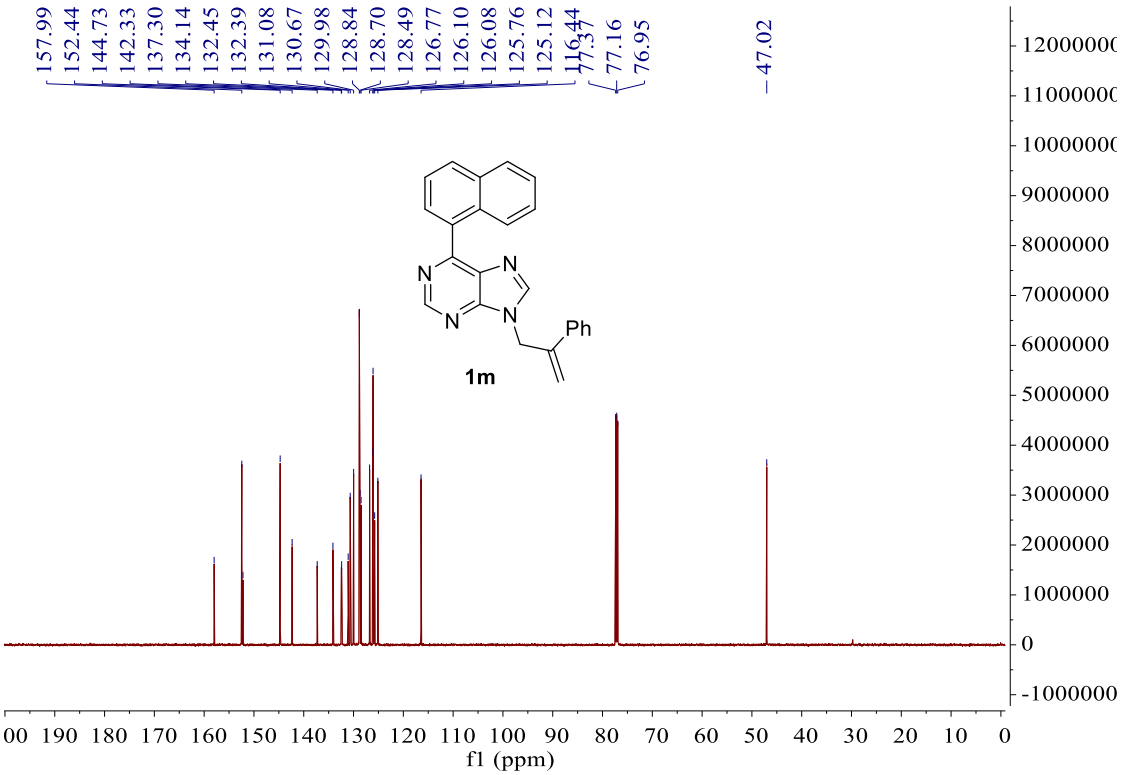
152.68
152.59
144.29
142.49
137.35
135.73
131.12
130.94
129.89
128.90
128.78
126.14
116.49
77.37
77.16
76.95
47.09
Ph
N
N
N
N
Ph
1l
fl (ppm)


9.192
8.310
8.298
8.049
8.037
8.033
7.996
7.982
7.918
7.906
7.631
7.620
7.606
7.511
7.508
7.503
7.499
7.495
7.489
7.486
7.477
7.466
7.345
7.333
7.320
7.309
7.297
5.630
5.333
5.192
1m
1.00
1.05
2.04
1.06
1.05
1.08
4.27
3.20
1.05
2.10
1.05
f1 (ppm)


157.99
152.44
144.73
142.33
137.30
134.14
132.45
132.39
131.08
130.67
129.98
128.84
128.70
128.49
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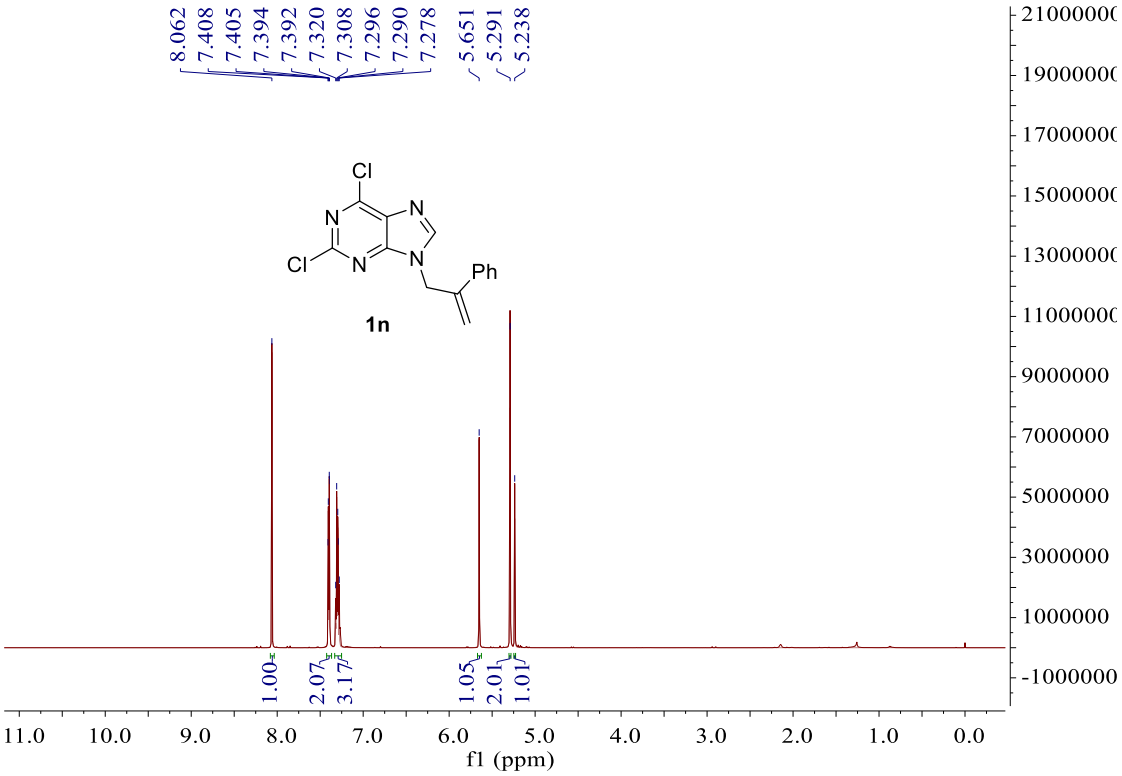
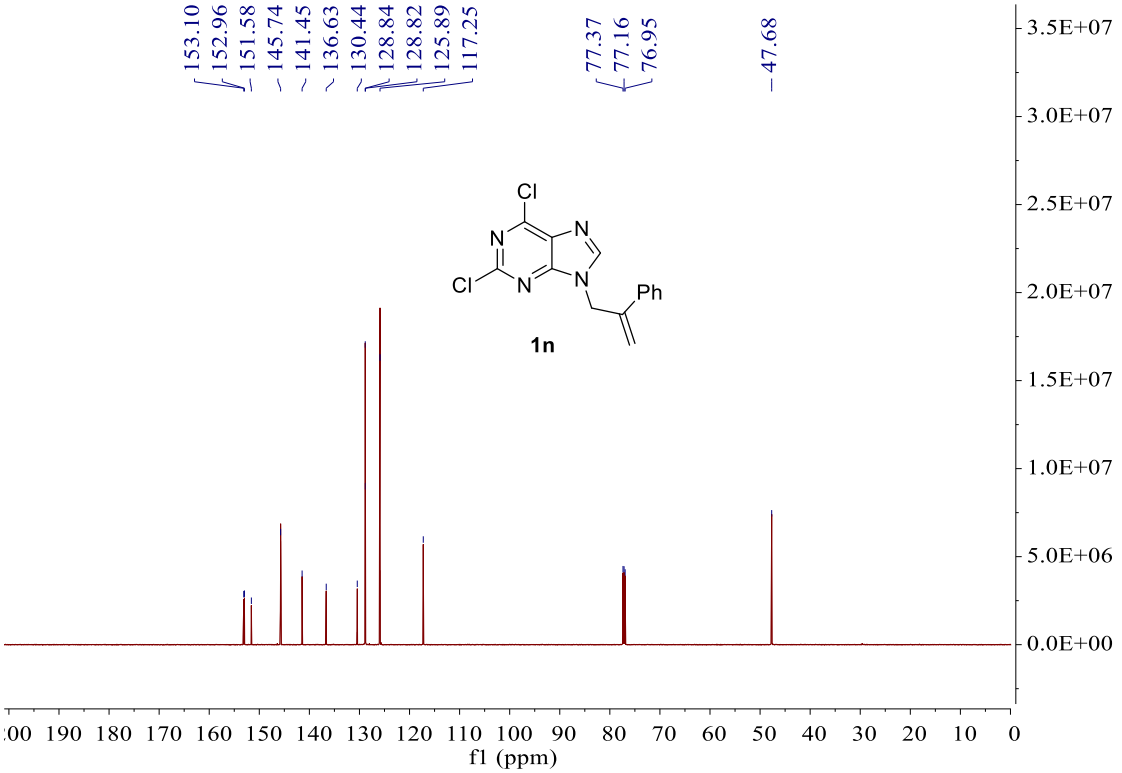
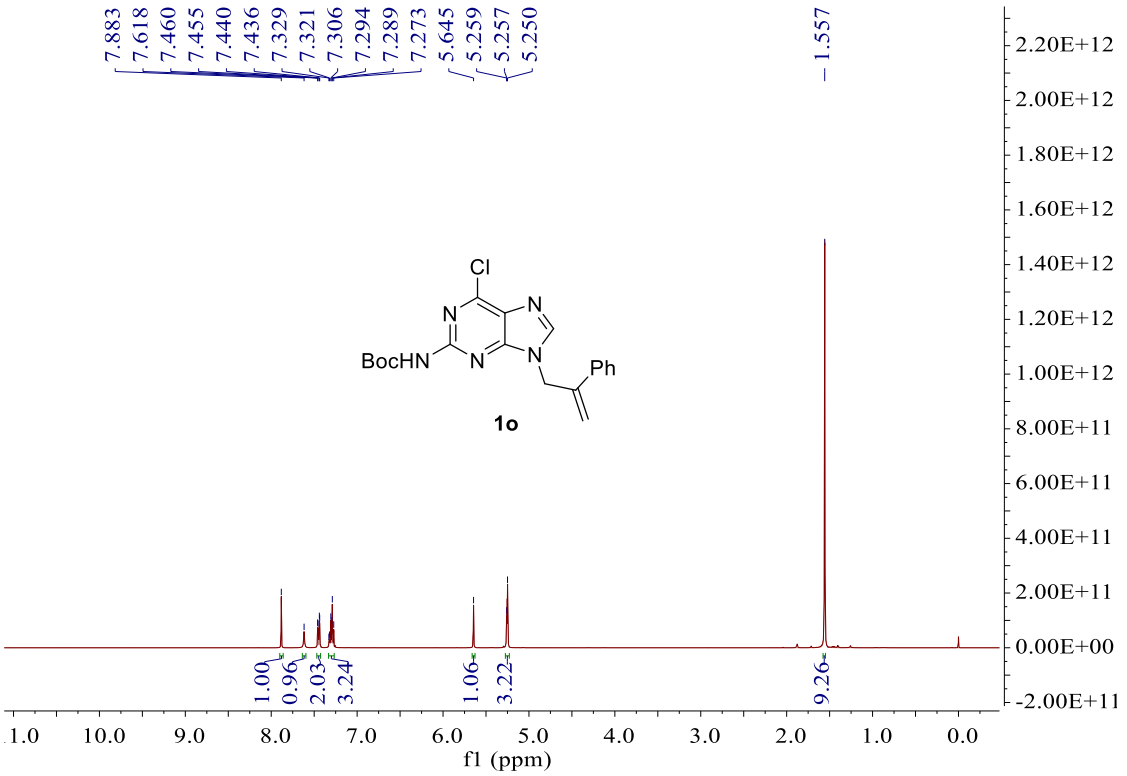
77.16
76.95
47.02
1m
f1 (ppm)


8.062
7.408
7.405
7.394
7.392
7.320
7.308
7.296
7.290
7.278
5.651
5.291
5.238
Cl
N
N
Cl
N
N
Ph
1n
1.00
2.07
3.17
1.05
2.01
1.01
f1 (ppm)


153.10
152.96
151.58
145.74
141.45
136.63
130.44
128.84
128.82
125.89
117.25
77.37
77.16
76.95
47.68
Cl
N
N
Cl
N
N
Ph
1n
f1 (ppm)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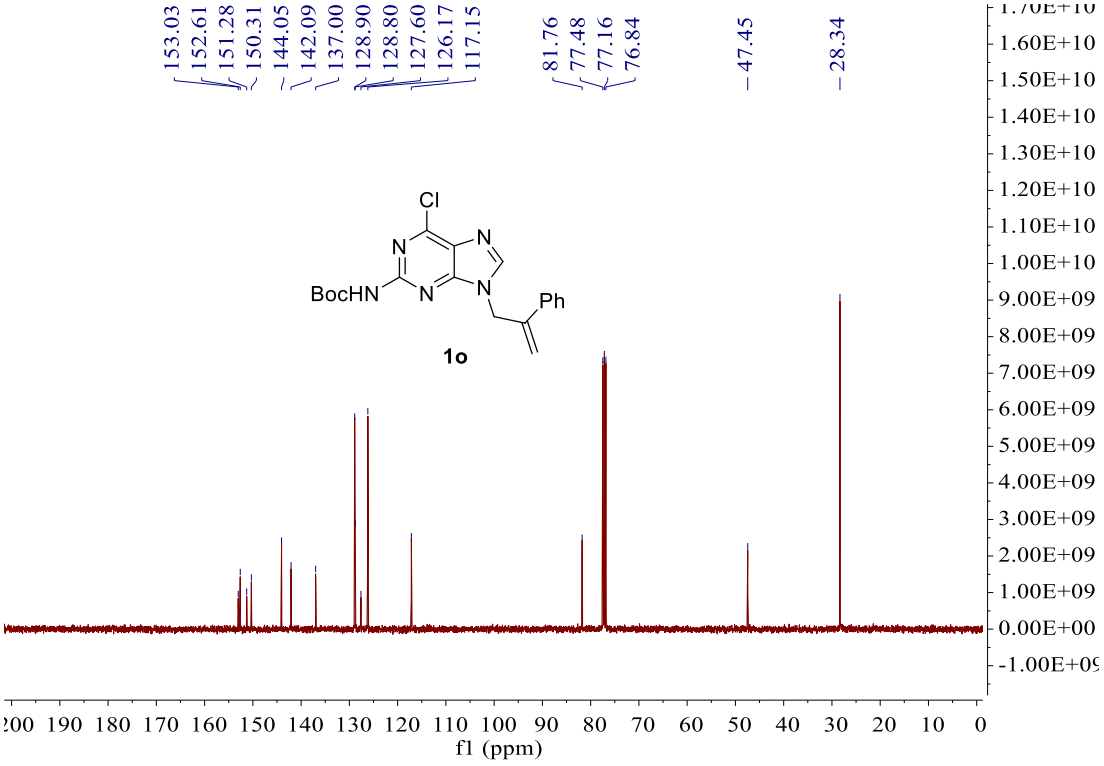
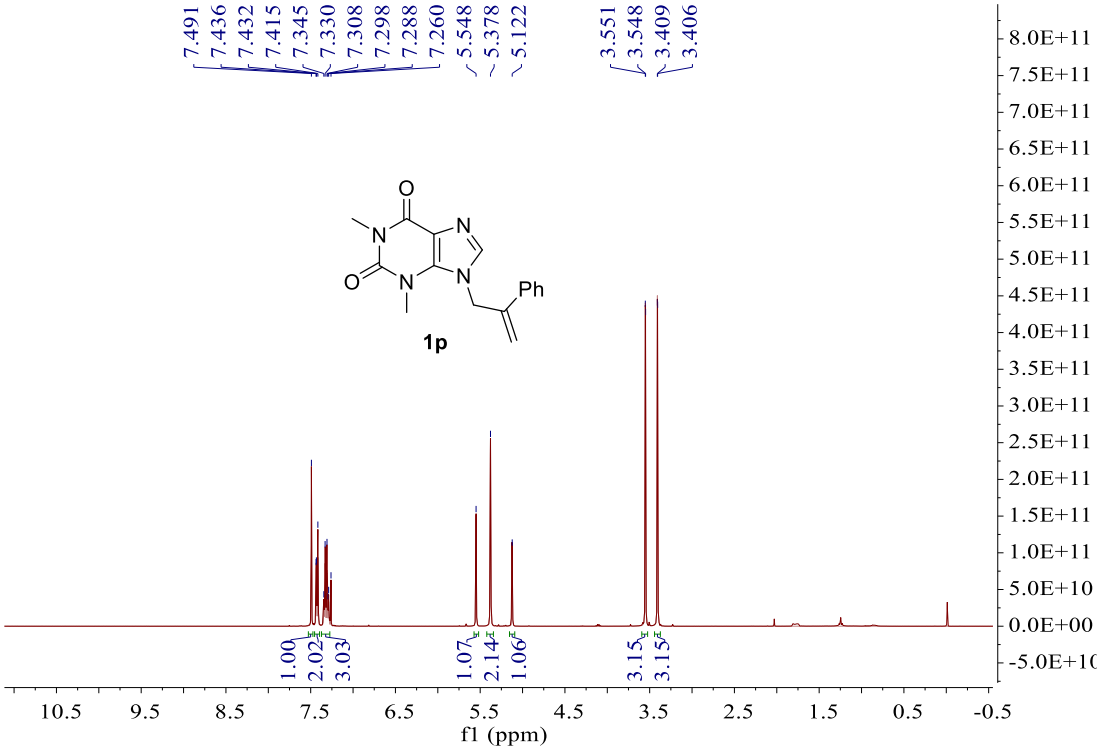
7.329
7.321
7.306
7.294
7.289
7.273
5.645
5.259
5.257
5.250
1.557
Cl
N
N
BocHN
N
N
Ph
1o
1.00
0.96
2.03
3.24
1.06
3.22
9.26
f1 (ppm)


153.03
152.61
151.28
150.31
144.05
142.09
137.00
128.90
128.80
127.60
126.17
117.15
81.76
77.48
77.16
76.84
47.45
28.34
Cl
N
N
BocHN
N
N
Ph
1o
f1 (ppm)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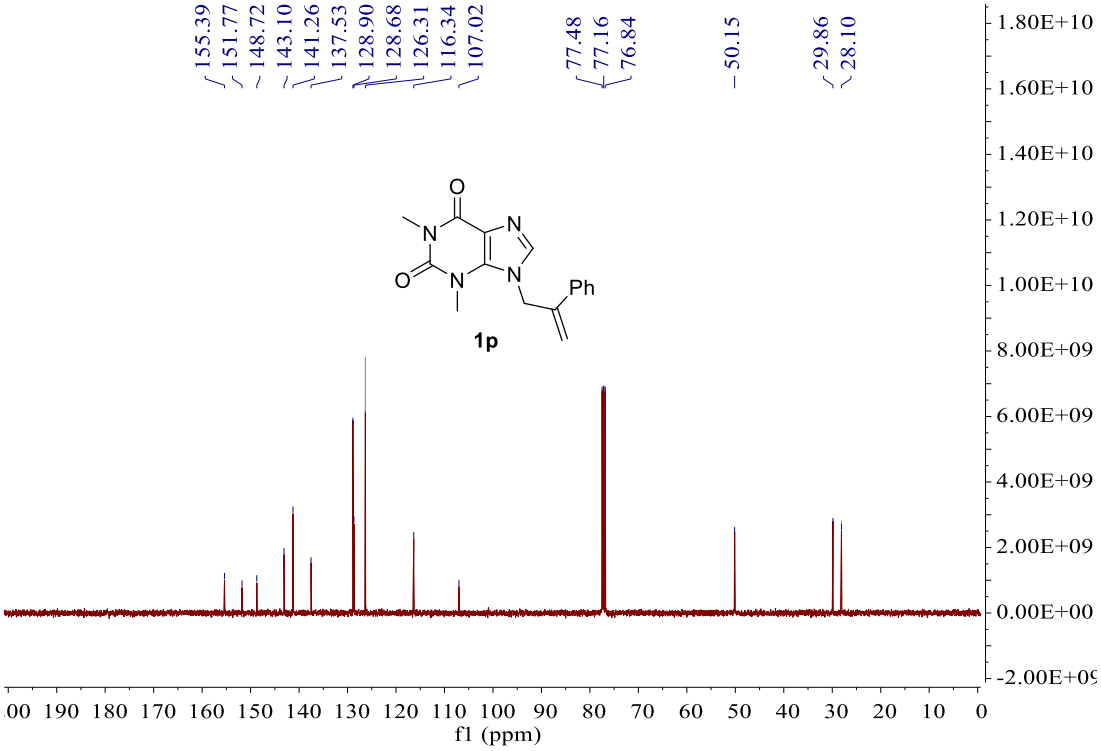
7.436
7.432
7.415
7.345
7.330
7.308
7.298
7.288
7.260
5.548
5.378
5.122
3.551
3.548
3.409
3.406
1p
1.00
2.02
3.03
1.07
2.14
1.06
3.15
3.15
fl (ppm)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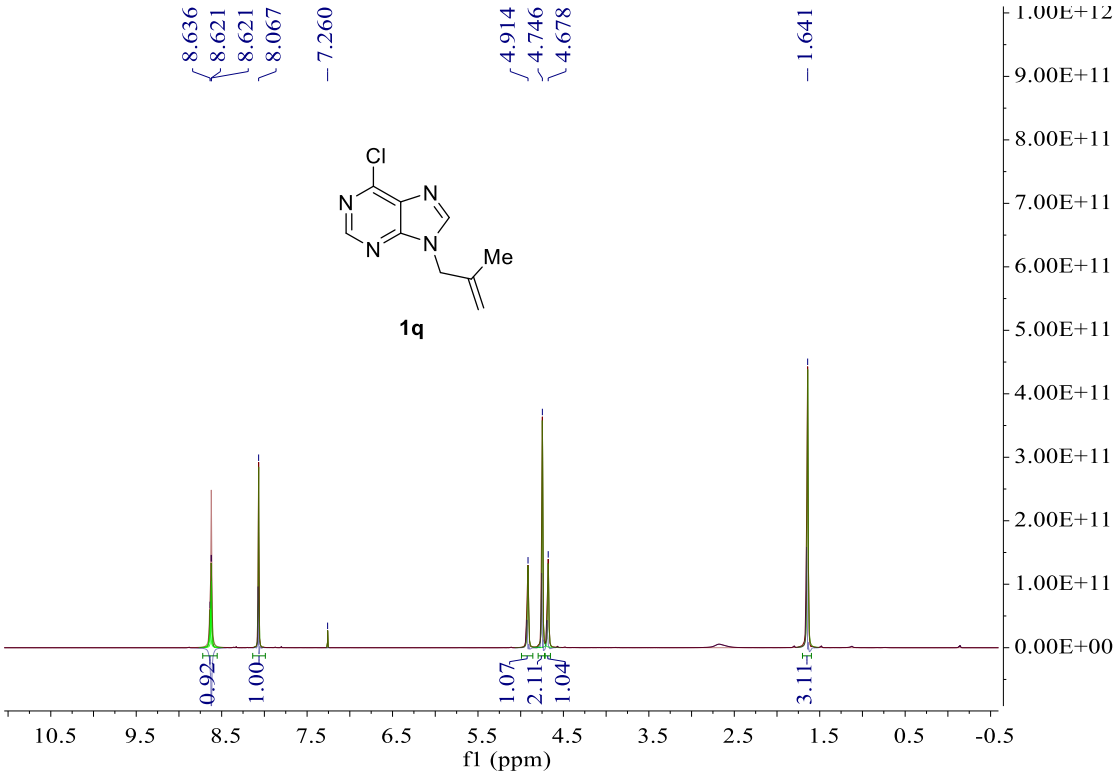
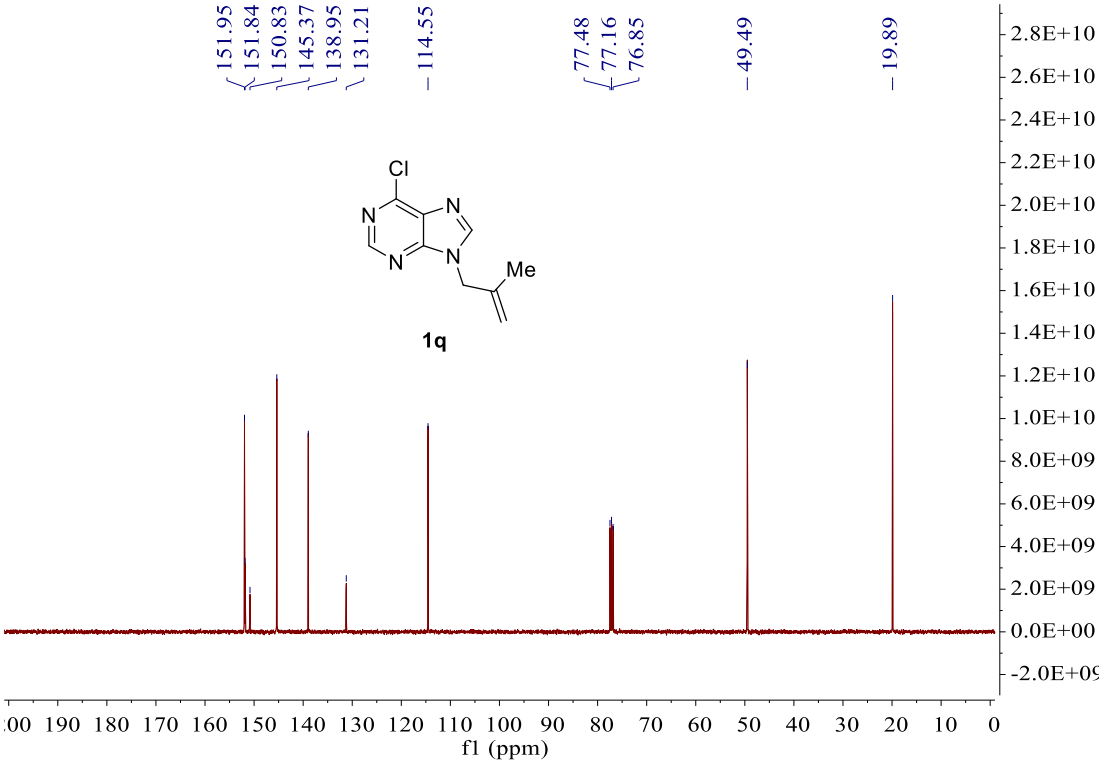
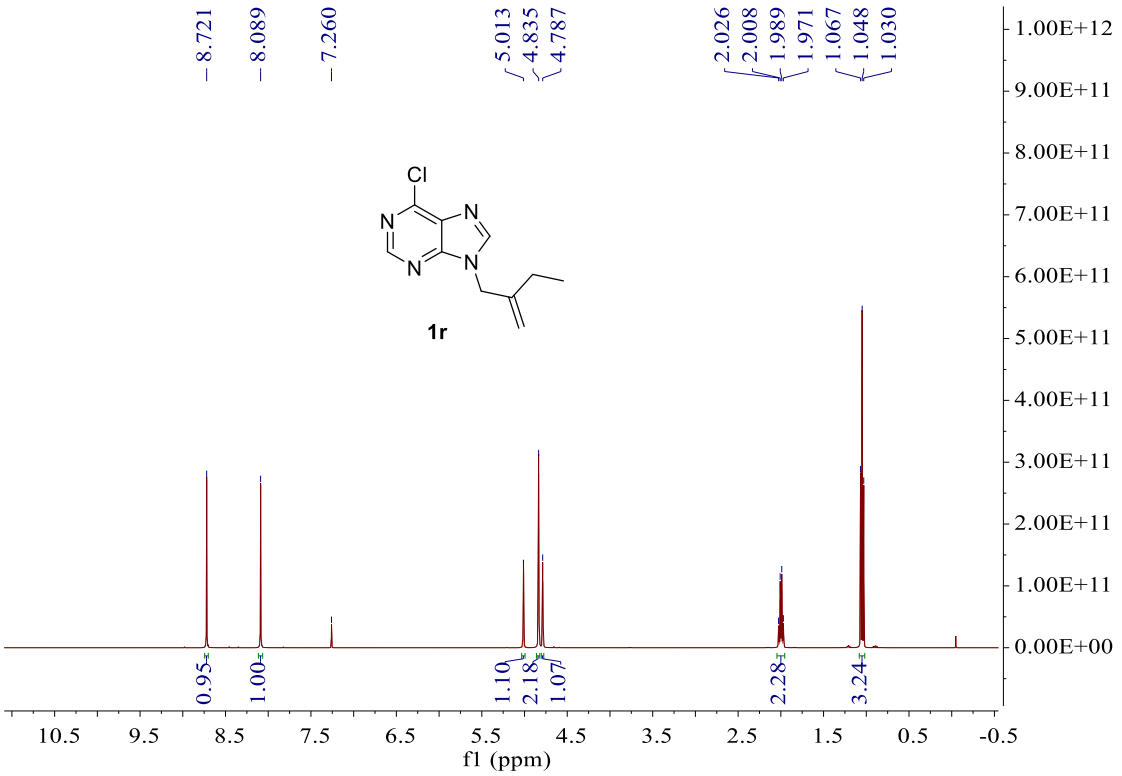
151.77
148.72
143.10
141.26
137.53
128.90
128.68
126.31
116.34
107.02
77.48
77.16
76.84
50.15
29.86
28.10
1p
fl (ppm)


8.636
8.621
8.621
8.067
7.260
4.914
4.746
4.678
1.641
Cl
N
N
N
N
Me
1q
0.92
1.00
1.07
2.11
1.04
3.11
fl (ppm)


151.95
151.84
150.83
145.37
138.95
131.21
114.55
77.48
77.16
76.85
49.49
19.89
Cl
N
N
N
N
Me
1q
fl (ppm)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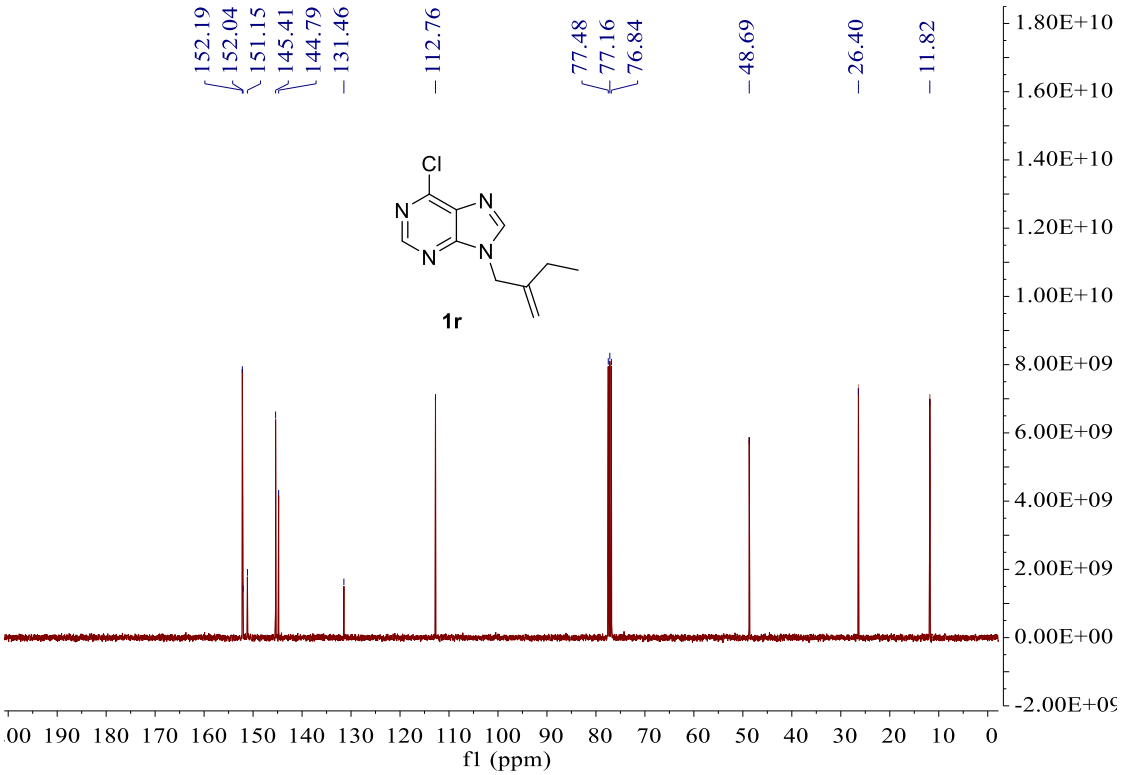
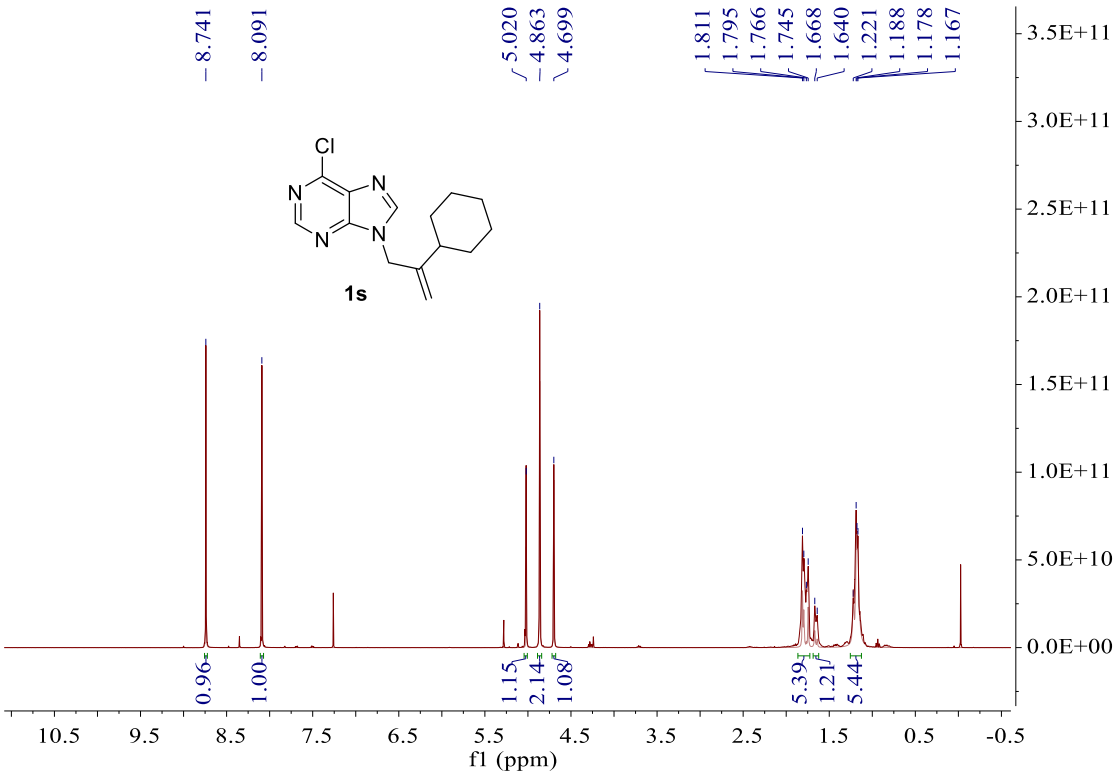
8.089
7.260
5.013
4.835
4.787
2.026
2.008
1.989
1.971
1.067
1.048
1.030
Cl
N
N
N
N
1r
0.95
1.00
1.10
2.18
1.07
2.28
3.24
1.00E+12
9.00E+11
8.00E+11
7.00E+11
6.00E+11
5.00E+11
4.00E+11
3.00E+11
2.00E+11
1.00E+11
0.00E+00
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)


152.19
152.04
151.15
145.41
144.79
131.46
112.76
77.48
77.16
76.84
48.69
26.40
11.82
Cl
N
N
N
N
1r
1.80E+10
1.60E+10
1.40E+10
1.20E+10
1.00E+10
8.00E+09
6.00E+09
4.00E+09
2.00E+09
0.00E+00
-2.00E+09
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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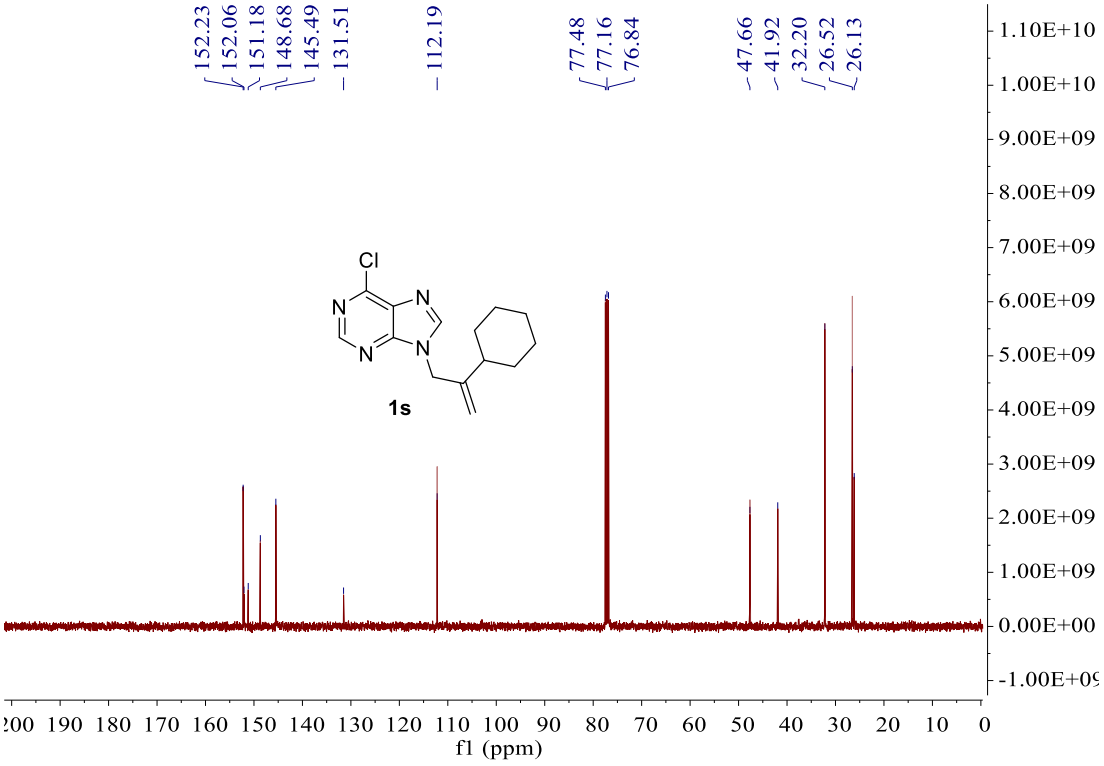
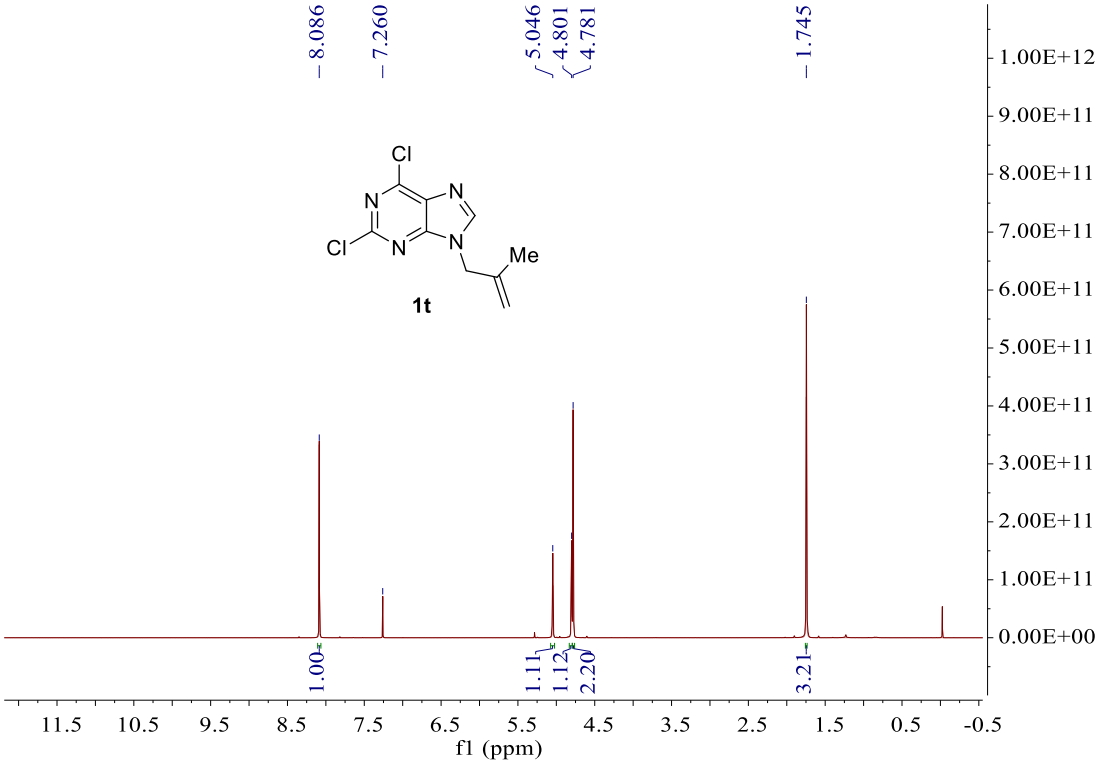
8.091
5.020
4.863
4.699
1.811
1.795
1.766
1.745
1.668
1.640
1.221
1.188
1.178
1.167
Cl
N
N
N
N
1s
0.96
1.00
1.15
2.14
1.08
5.39
1.21
5.44
3.5E+11
3.0E+11
2.5E+11
2.0E+11
1.5E+11
1.0E+11
5.0E+10
0.0E+00
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)


152.23
152.06
151.18
148.68
145.49
131.51
112.19
77.48
77.16
76.84
47.66
41.92
32.20
26.52
26.13
Cl
N
N
N
N
1s
1.10E+10
1.00E+10
9.00E+09
8.00E+09
7.00E+09
6.00E+09
5.00E+09
4.00E+09
3.00E+09
2.00E+09
1.00E+09
0.00E+00
-1.00E+09
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.086
7.260
5.046
4.801
4.781
1.745
Cl
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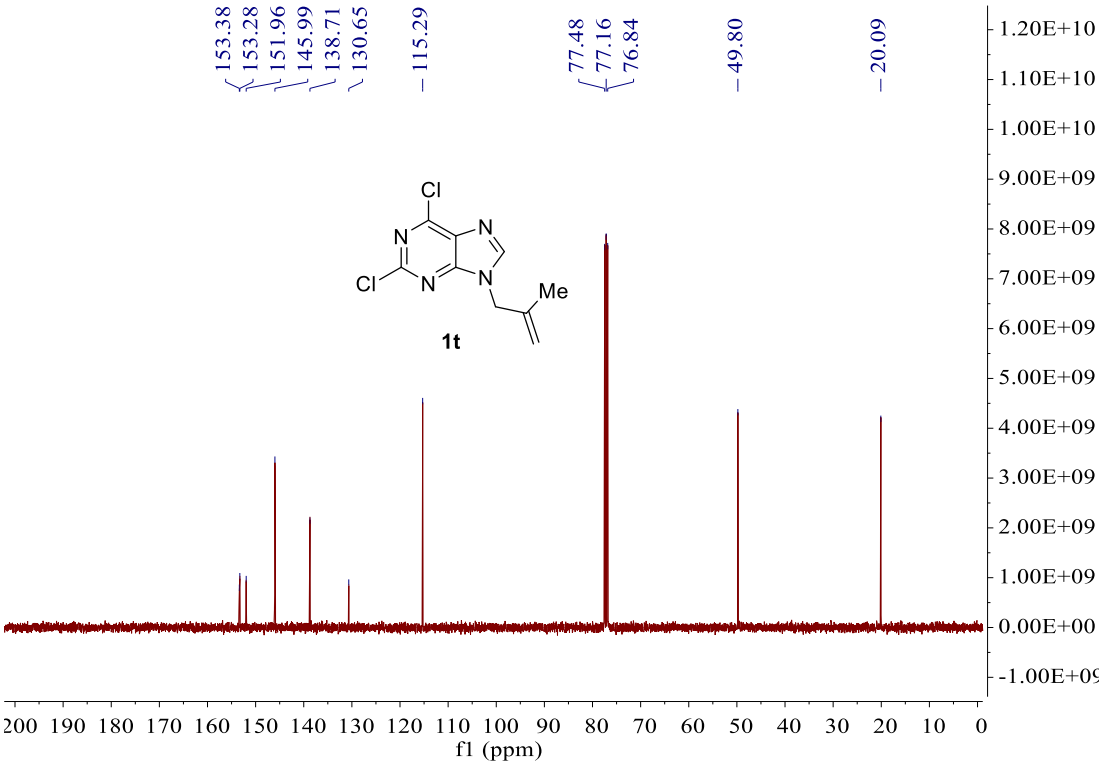
N
Cl
N
N
Me
1t
1.00
1.11
1.12
2.20
3.21
f1 (ppm)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153.28
151.96
145.99
138.71
130.65
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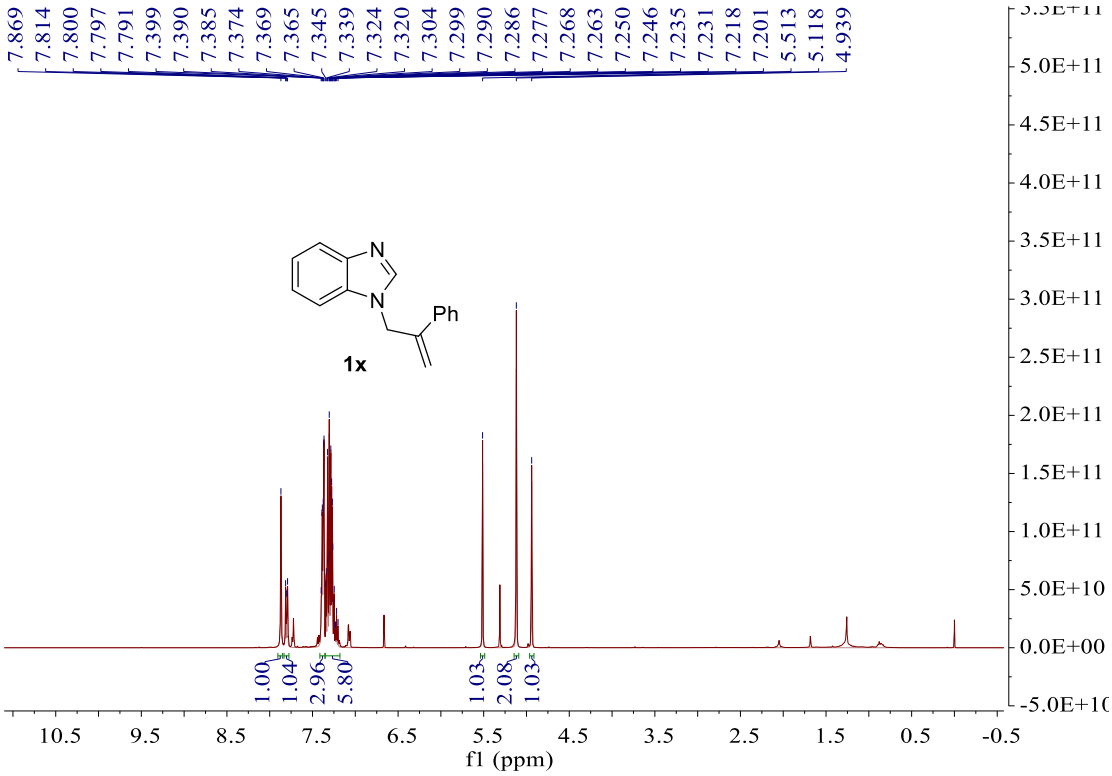
77.16
76.84
49.80
20.09
Cl
N
N
Cl
N
N
Me
1t
f1 (ppm)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7.814
7.800
7.797
7.791
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7.385
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7.369
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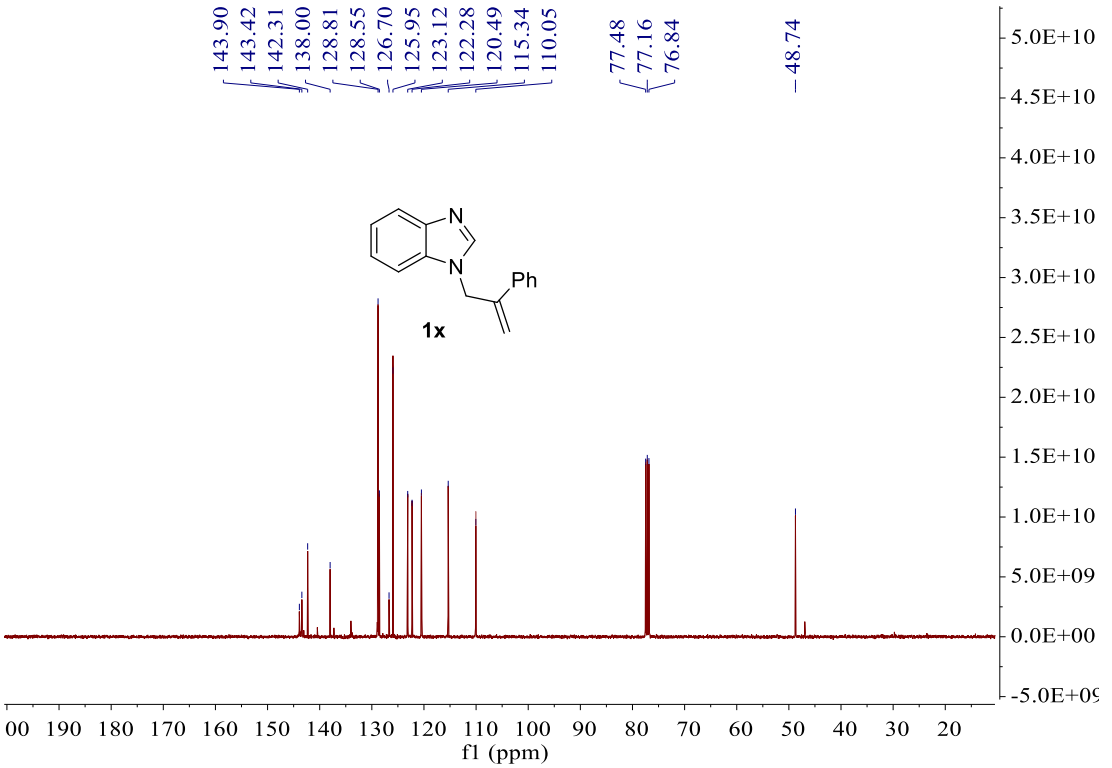
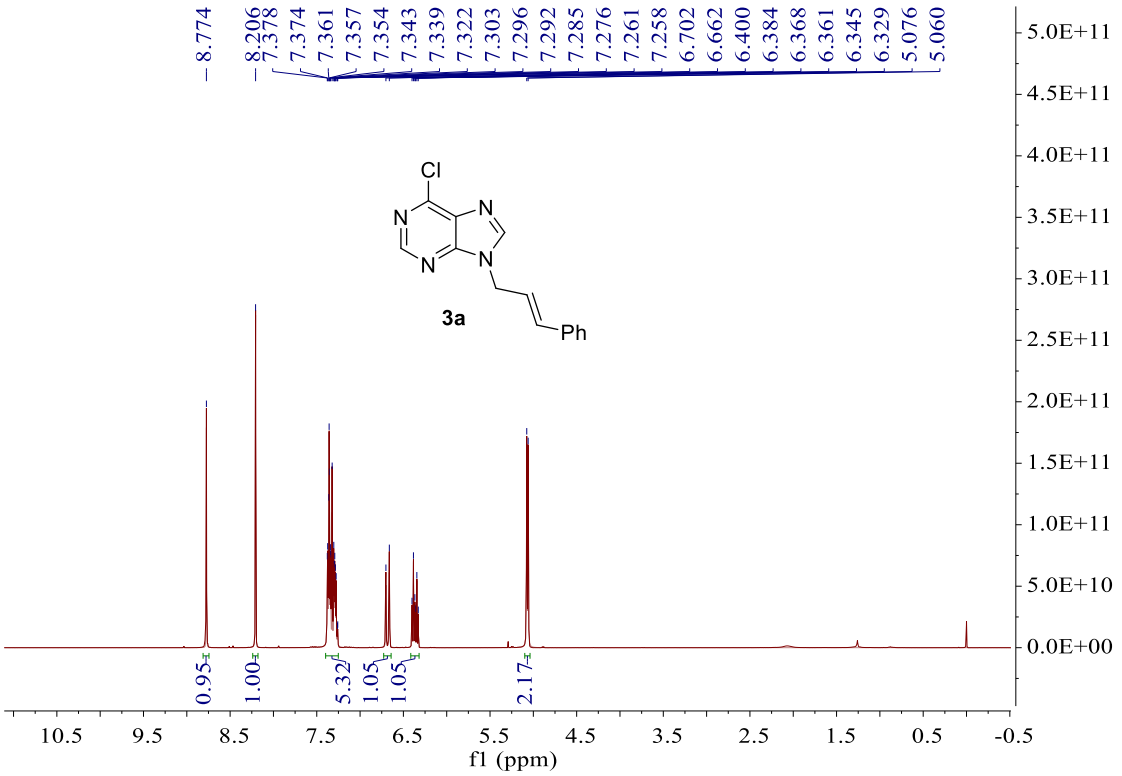
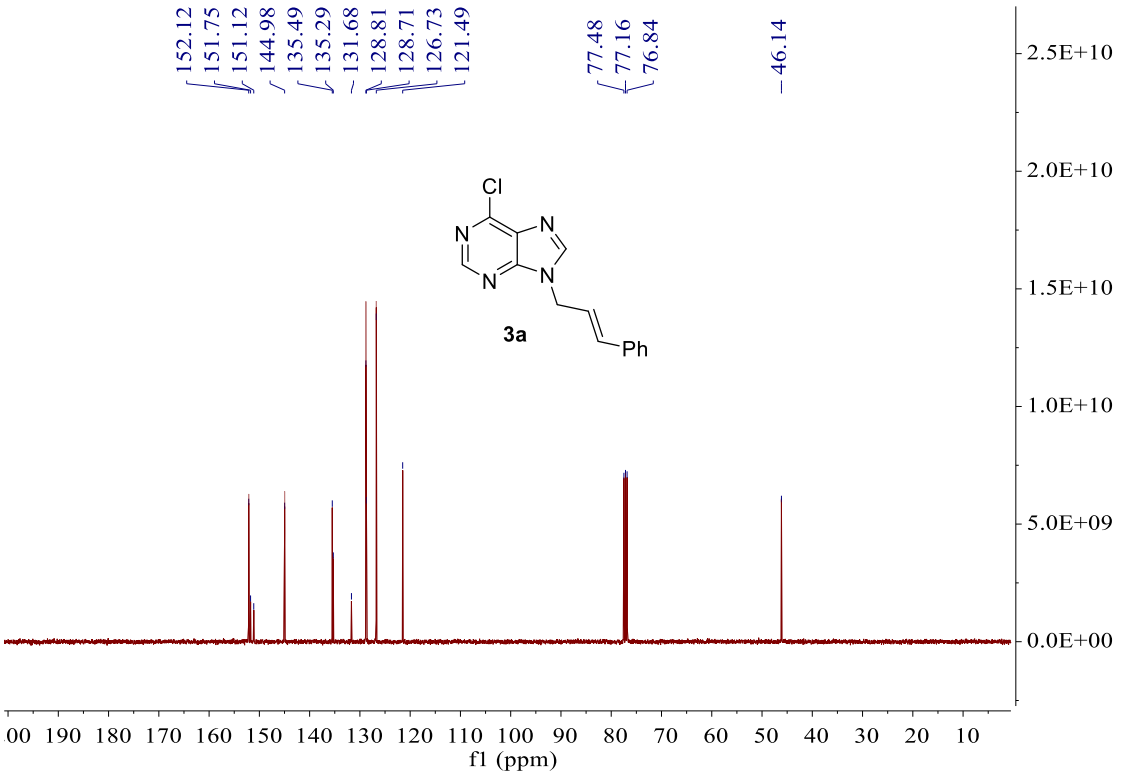
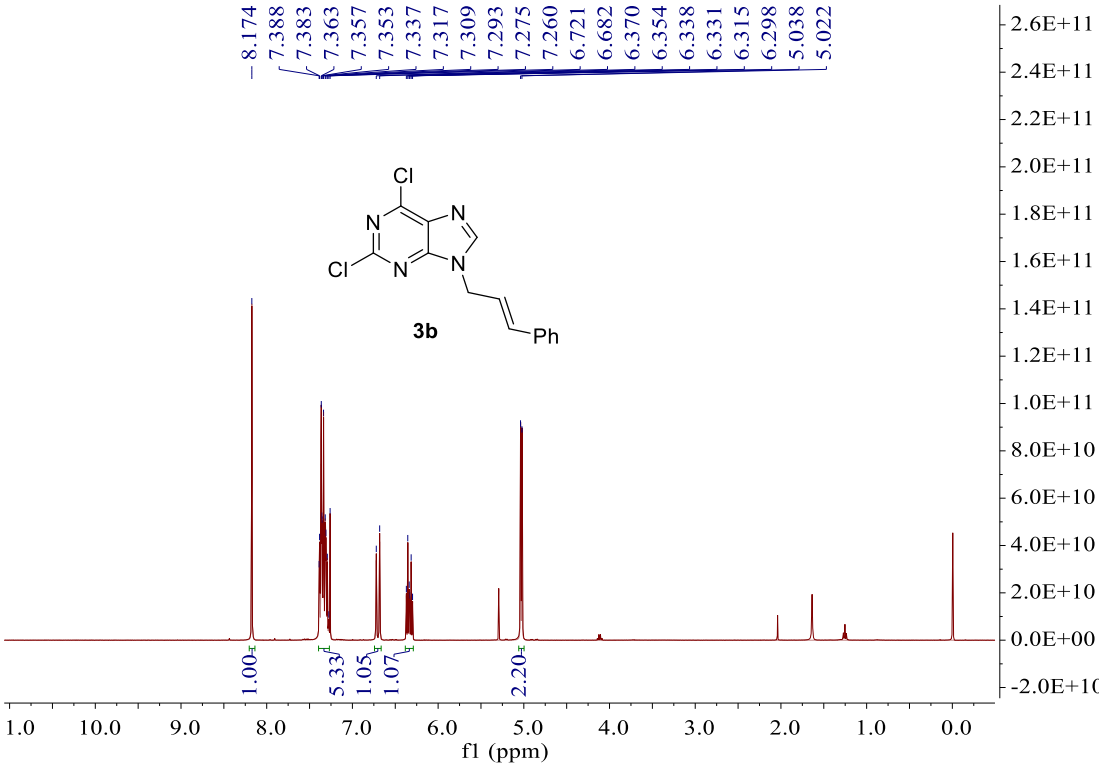
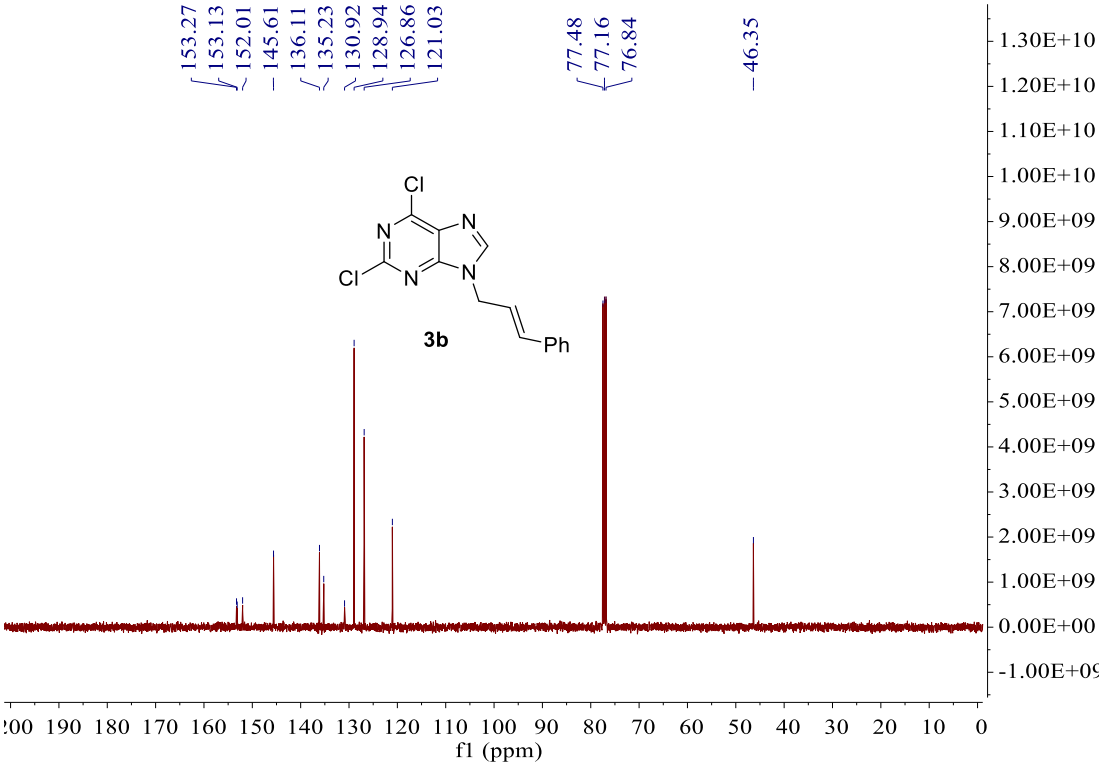
7.339
7.324
7.320
7.304
7.299
7.290
7.286
7.277
7.268
7.263
7.250
7.246
7.235
7.231
7.218
7.201
5.513
5.118
4.939
N
N
Ph
1x
1.00
1.04
2.96
5.80
1.03
2.08
1.03
5.0E+11
4.5E+11
4.0E+11
3.5E+11
3.0E+11
2.5E+11
2.0E+11
1.5E+11
1.0E+11
5.0E+10
0.0E+00
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)

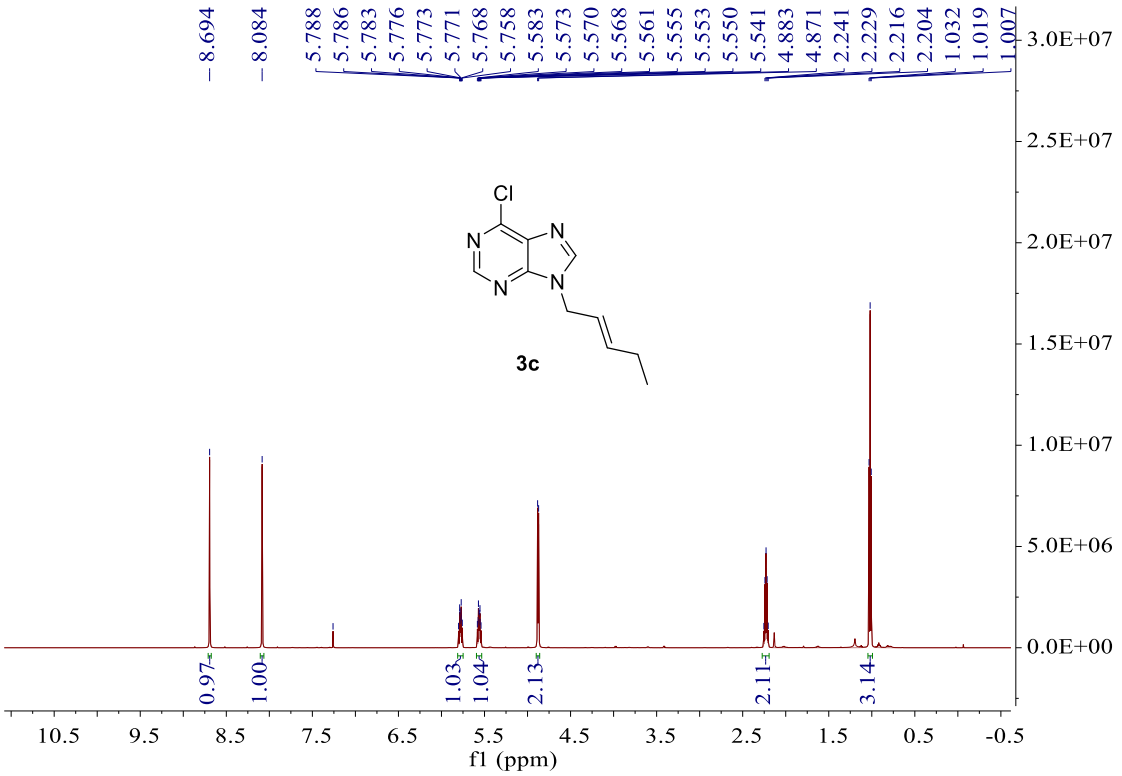

143.90
143.42
142.31
138.00
128.81
128.55
126.70
125.95
123.12
122.28
120.49
115.34
110.05
77.48
77.16
76.84
48.74
N
N
Ph
1x
5.0E+10
4.5E+10
4.0E+10
3.5E+10
3.0E+10
2.5E+10
2.0E+10
1.5E+10
1.0E+10
5.0E+09
0.0E+00
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20
f1 (ppm)

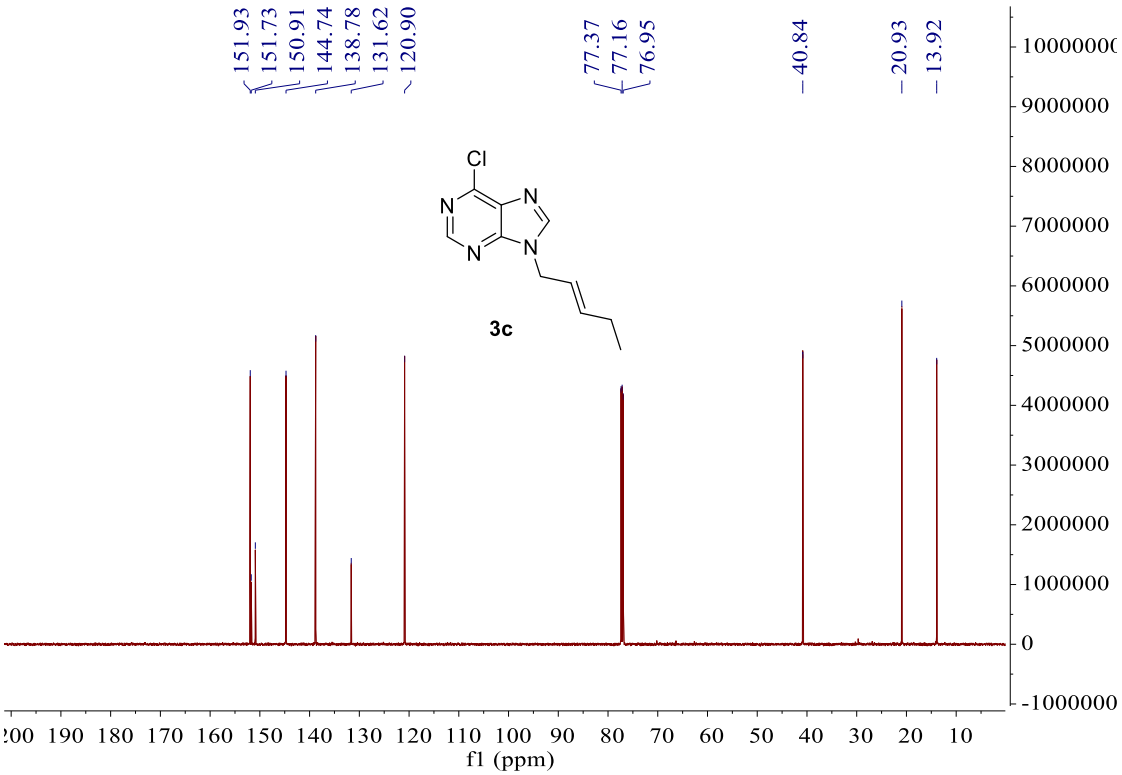

8.774
8.206
7.378
7.374
7.361
7.357
7.354
7.343
7.339
7.322
7.303
7.296
7.292
7.285
7.276
7.261
7.258
6.702
6.662
6.400
6.384
6.368
6.361
6.345
6.329
5.076
5.060
Cl
N
N
N
N
3a
Ph
0.95
1.00
5.32
1.05
1.05
2.17
5.0E+11
4.5E+11
4.0E+11
3.5E+11
3.0E+11
2.5E+11
2.0E+11
1.5E+11
1.0E+11
5.0E+10
0.0E+00
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)


152.12
151.75
151.12
144.98
135.49
135.29
131.68
128.81
128.71
126.73
121.49
77.48
77.16
76.84
46.14
Cl
N
N
N
N
3a
Ph
2.5E+10
2.0E+10
1.5E+10
1.0E+10
5.0E+09
0.0E+00
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

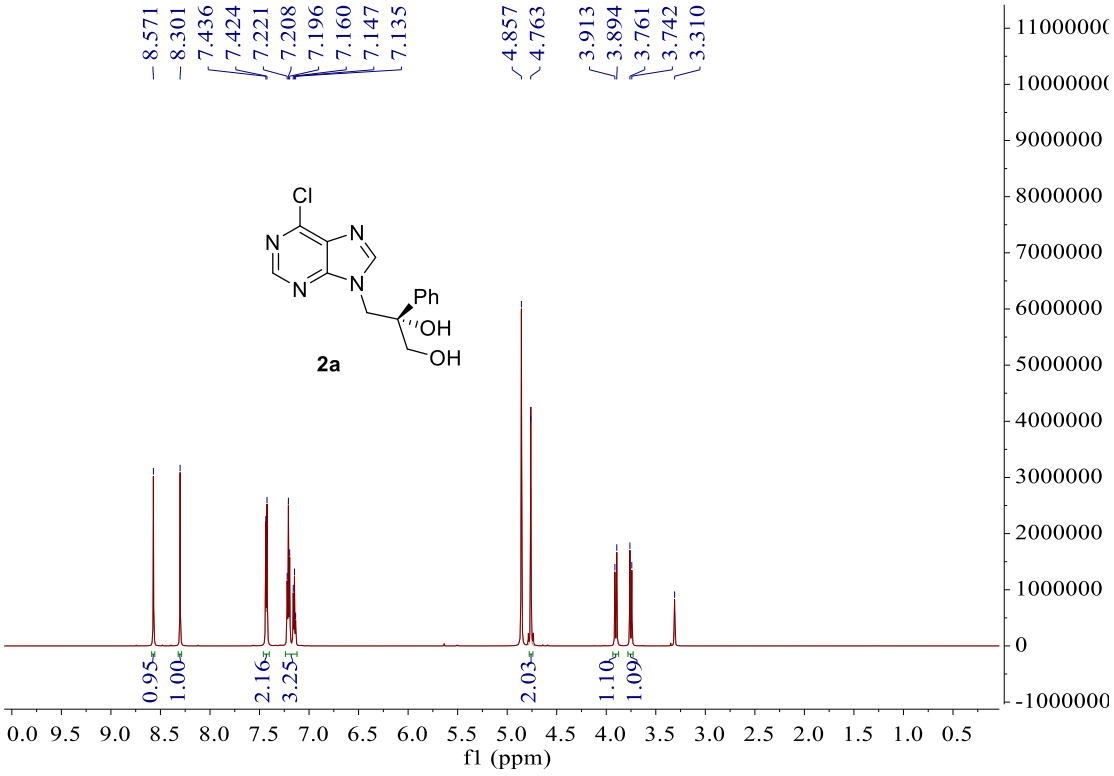

8.174
7.388
7.383
7.363
7.357
7.353
7.337
7.317
7.309
7.293
7.275
7.260
6.721
6.682
6.370
6.354
6.338
6.331
6.315
6.298
5.038
5.022
Cl
N
N
Cl
N
N
Ph
3b
1.00
5.33
1.05
1.07
2.20
f1 (ppm)

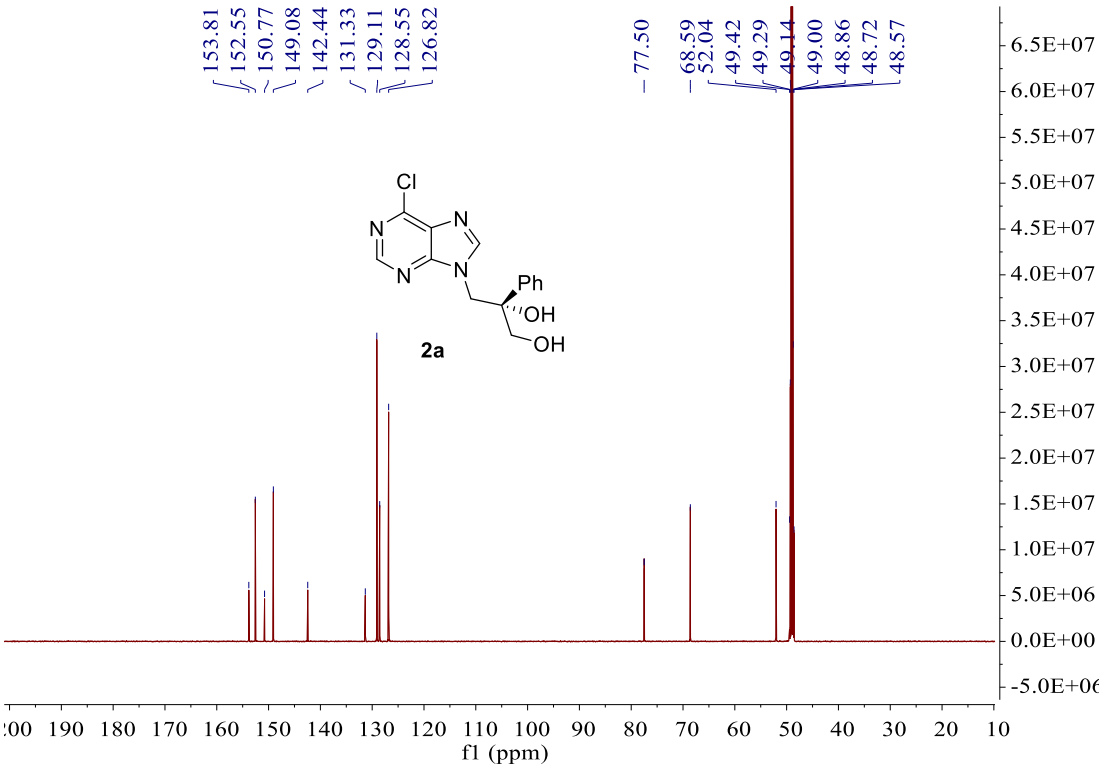

153.27
153.13
152.01
145.61
136.11
135.23
130.92
128.94
126.86
121.03
77.48
77.16
76.84
46.35
Cl
N
N
Cl
N
N
Ph
3b
f1 (ppm)

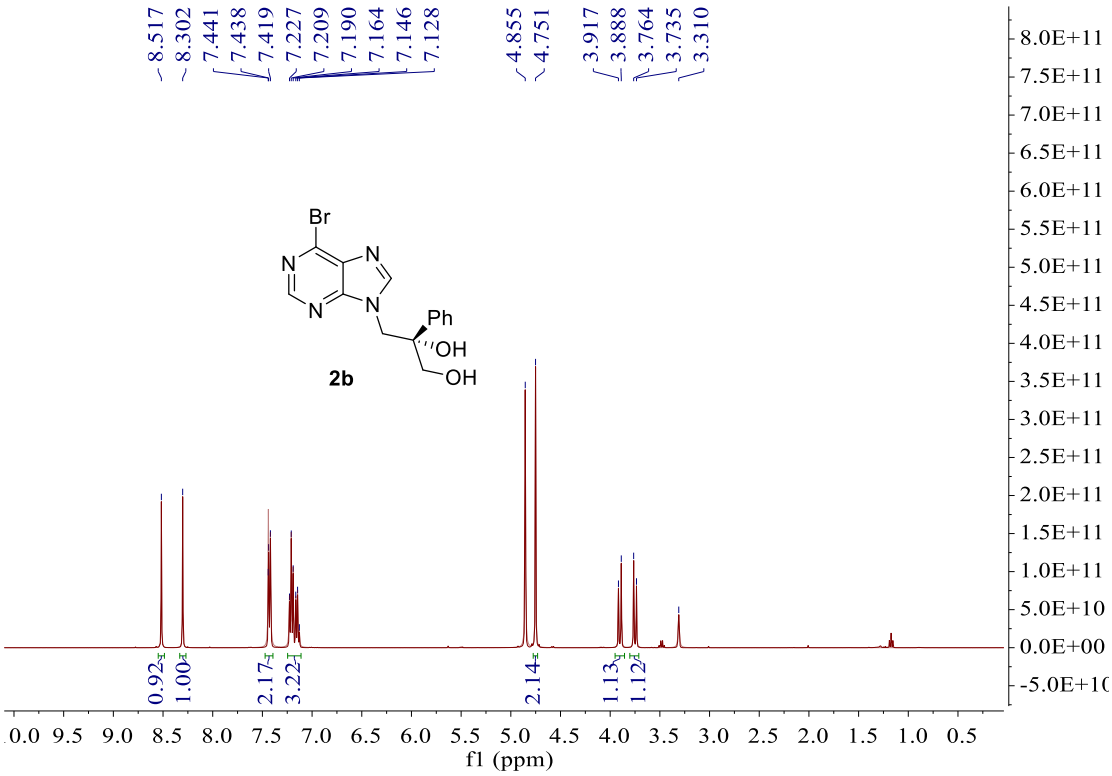

8.694
8.084
5.788
5.786
5.783
5.776
5.773
5.771
5.768
5.758
5.583
5.573
5.570
5.568
5.561
5.555
5.553
5.550
5.541
4.883
4.871
2.241
2.229
2.216
2.204
1.032
1.019
1.007
Cl
N
N
N
N
3c
0.97
1.00
1.03
1.04
2.13
2.11
3.14
3.0E+07
2.5E+07
2.0E+07
1.5E+07
1.0E+07
5.0E+06
0.0E+00
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)

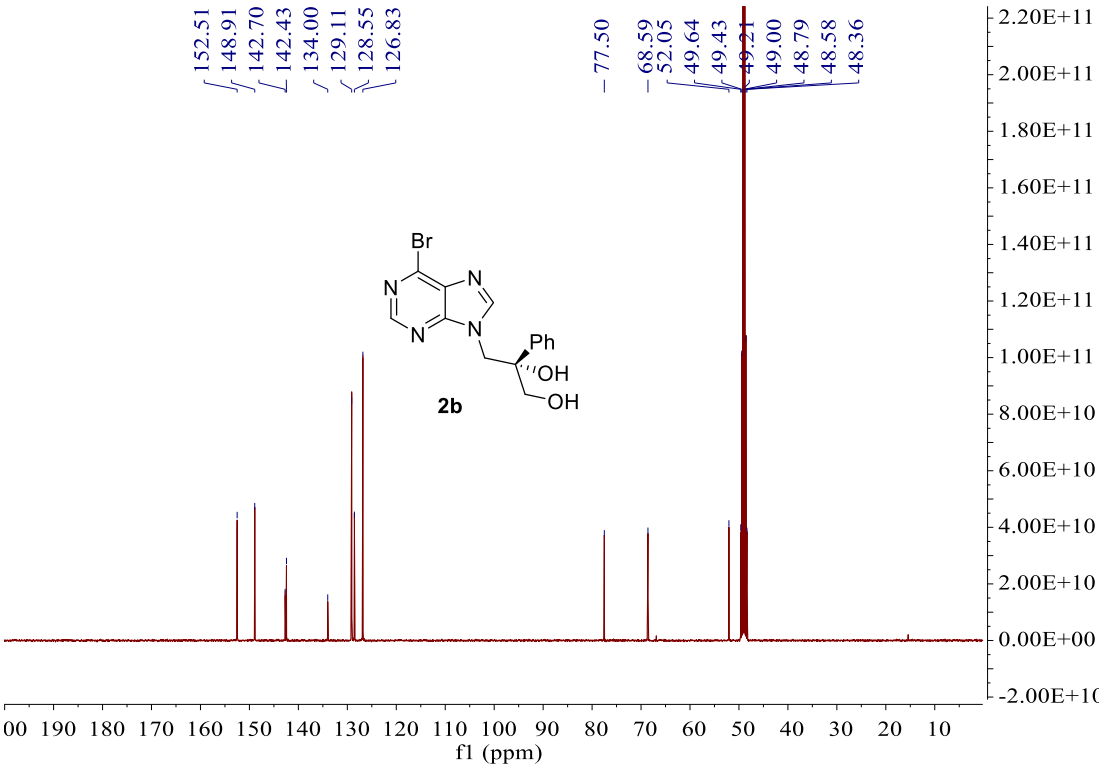

151.93
151.73
150.91
144.74
138.78
131.62
120.90
77.37
77.16
76.95
40.84
20.93
13.92
Cl
N
N
N
N
3c
10000000
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
-1000000
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

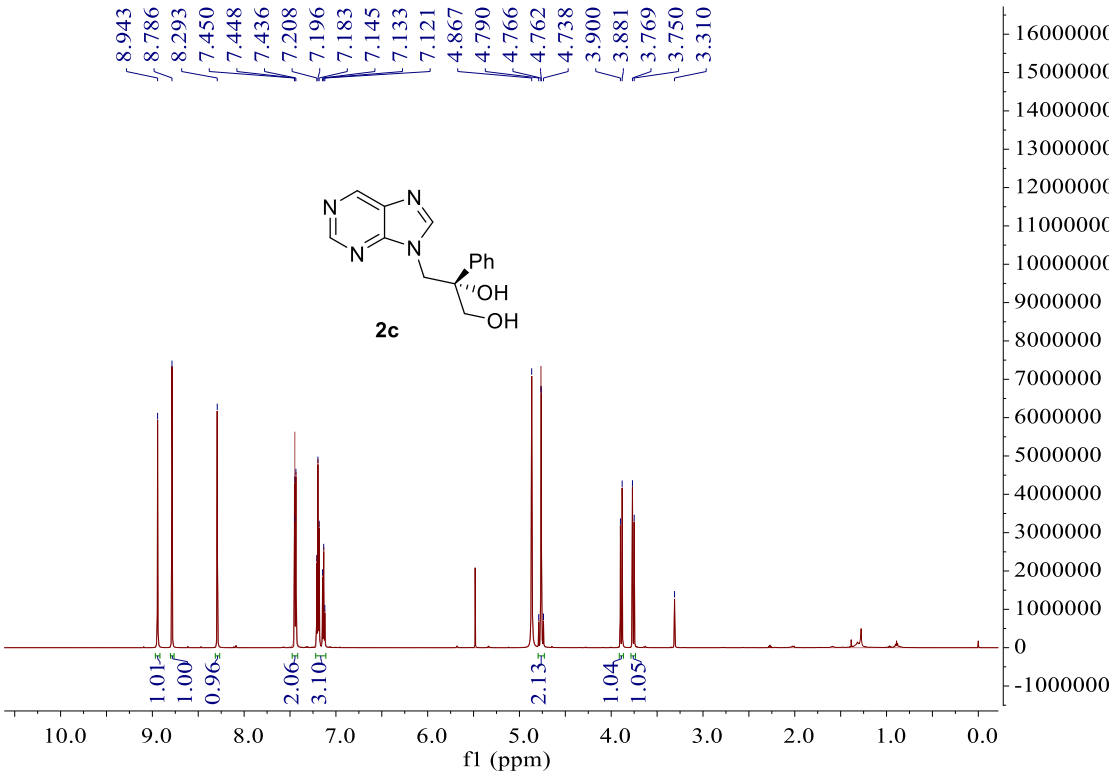
(2) Copies of NMR spectra of products

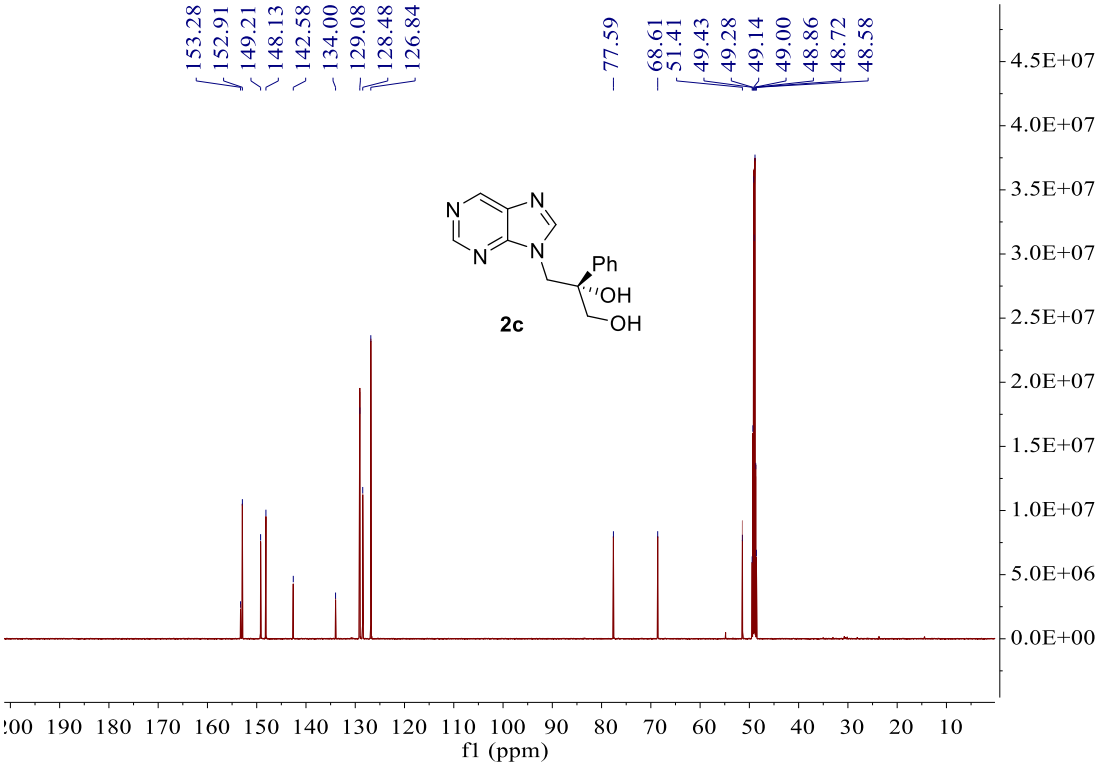


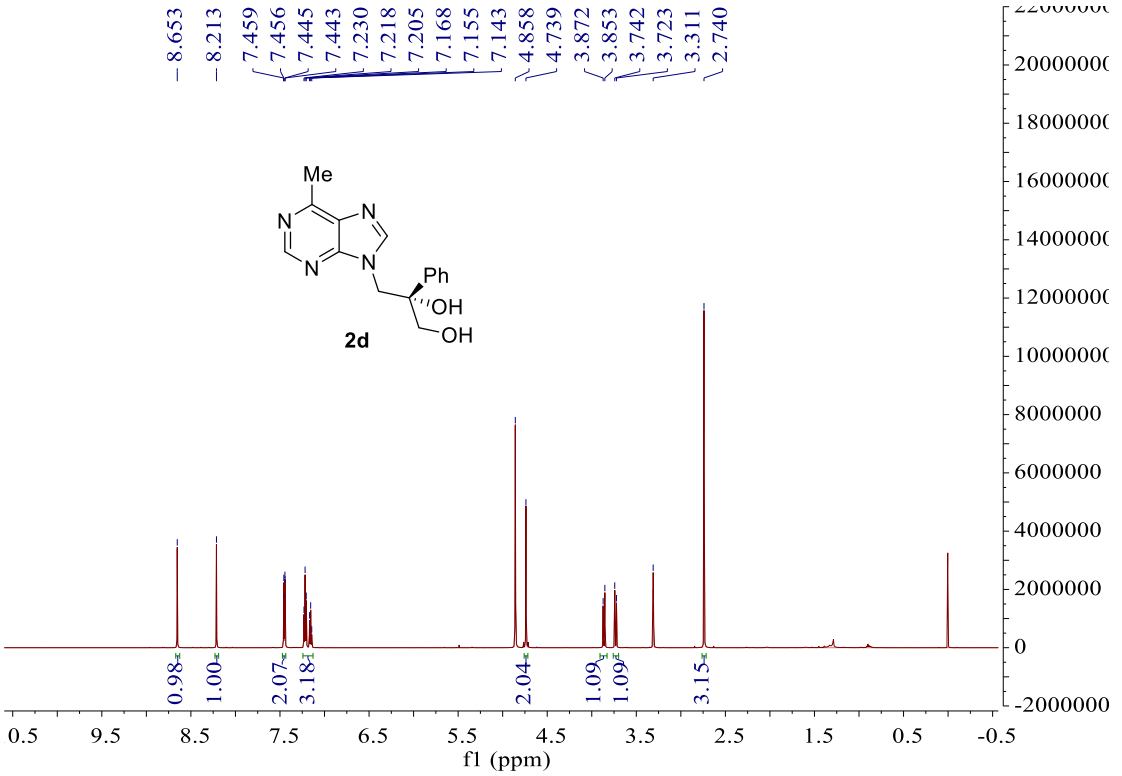


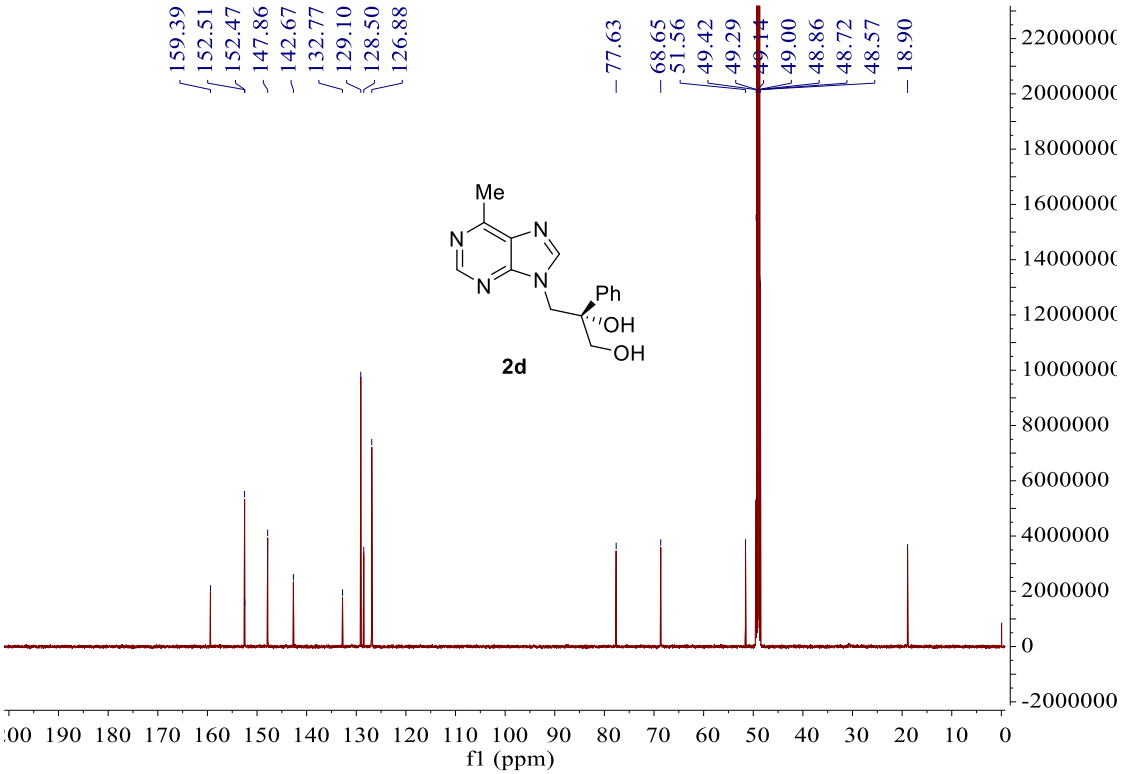

8.517
8.302
7.441
7.438
7.419
7.227
7.209
7.190
7.164
7.146
7.128
4.855
4.751
3.917
3.888
3.764
3.735
3.310
Br
N
N
N
N
Ph
OH
OH
2b
0.92
1.00
2.17
3.22
2.14
1.13
1.12
f1 (ppm)

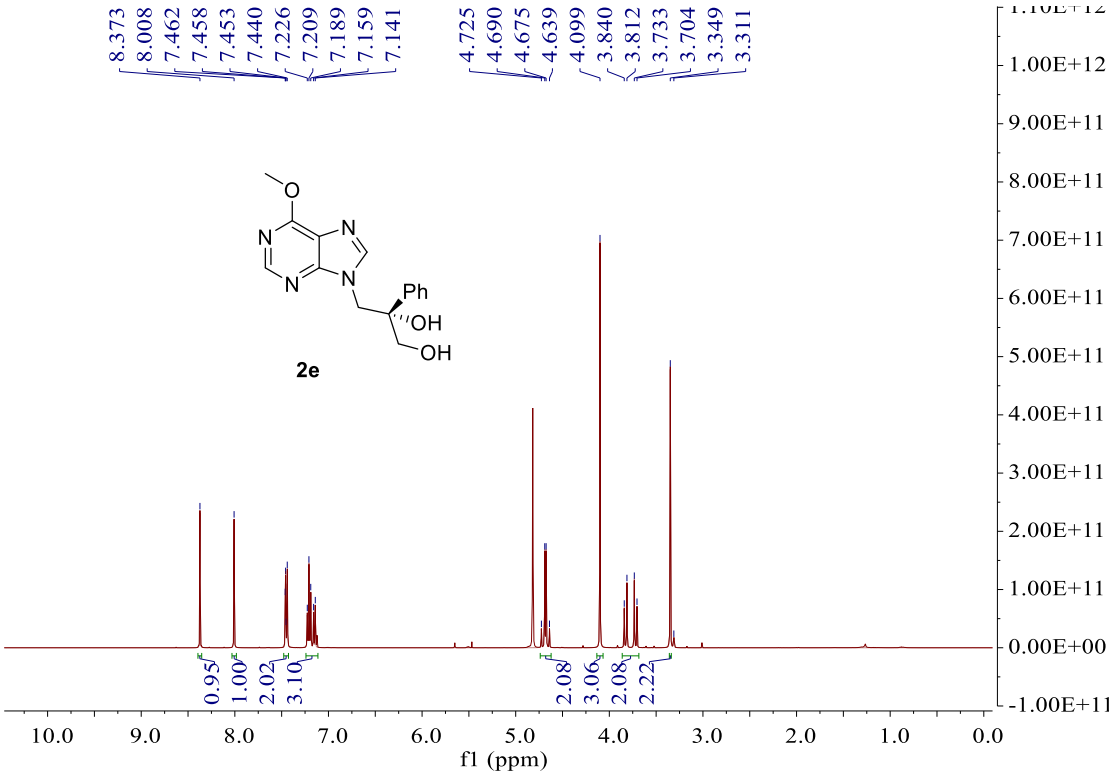

152.51
148.91
142.70
142.43
134.00
129.11
128.55
126.83
77.50
68.59
52.05
49.64
49.43
49.21
49.00
48.79
48.58
48.36
Br
N
N
N
N
Ph
OH
OH
2b
f1 (ppm)

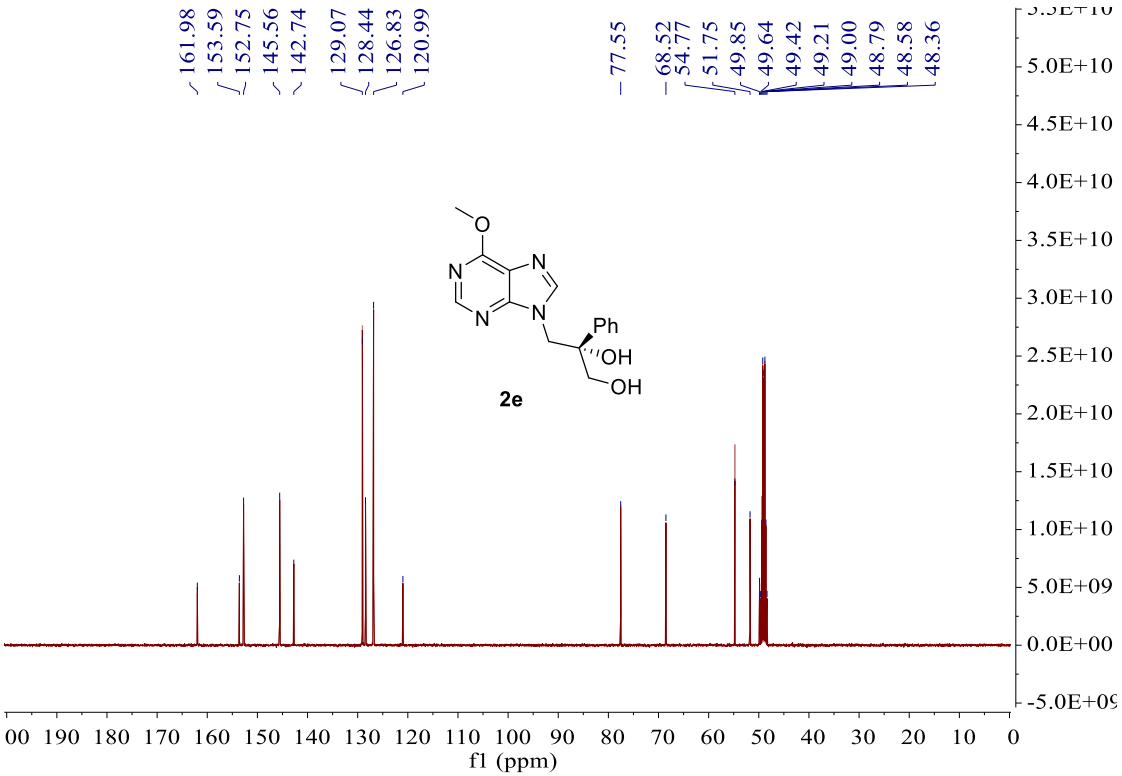

8.943
8.786
8.293
7.450
7.448
7.436
7.208
7.196
7.183
7.145
7.133
7.121
4.867
4.790
4.766
4.762
4.738
3.900
3.881
3.769
3.750
3.310
Ph
OH
OH
2c
1.01
1.00
0.96
2.06
3.10
2.13
1.04
1.05
f1 (ppm)

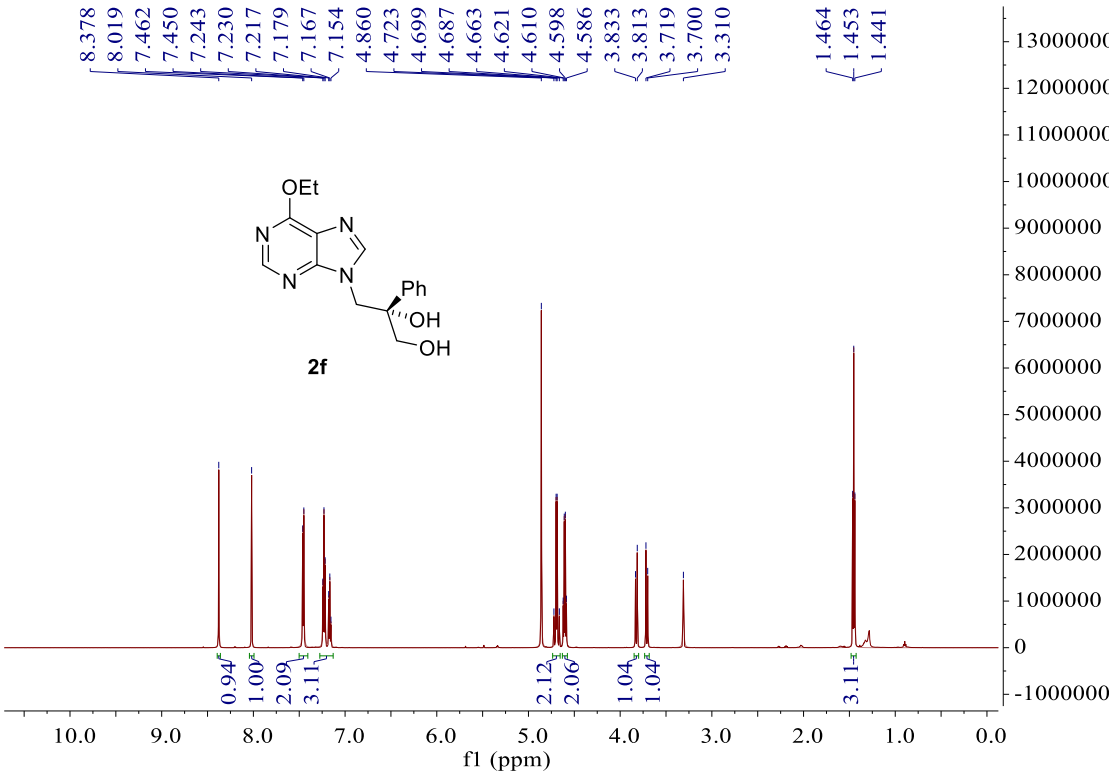

153.28
152.91
149.21
148.13
142.58
134.00
129.08
128.48
126.84
77.59
68.61
51.41
49.43
49.28
49.14
49.00
48.86
48.72
48.58
Ph
OH
OH
2c
f1 (ppm)

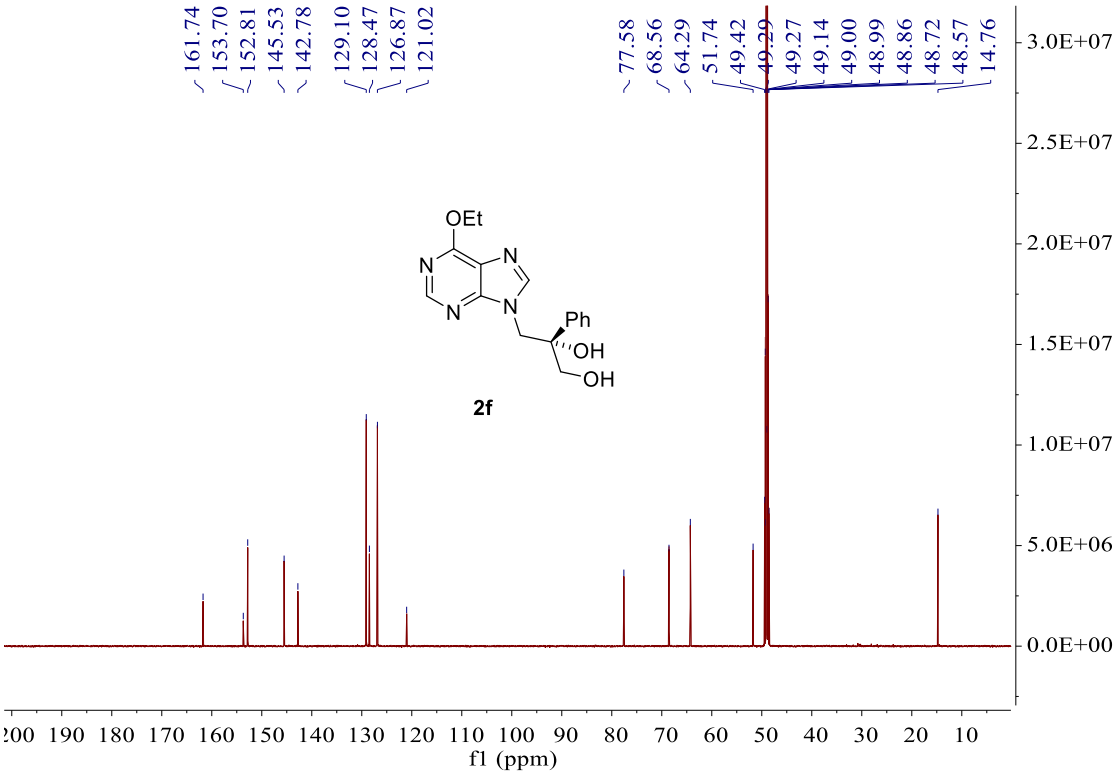

8.653
8.213
7.459
7.456
7.445
7.443
7.230
7.218
7.205
7.168
7.155
7.143
4.858
4.739
3.872
3.853
3.742
3.723
3.311
2.740
Me
N
N
N
N
Ph
OH
OH
2d
0.98
1.00
2.07
3.18
2.04
1.09
1.09
3.15
f1 (ppm)

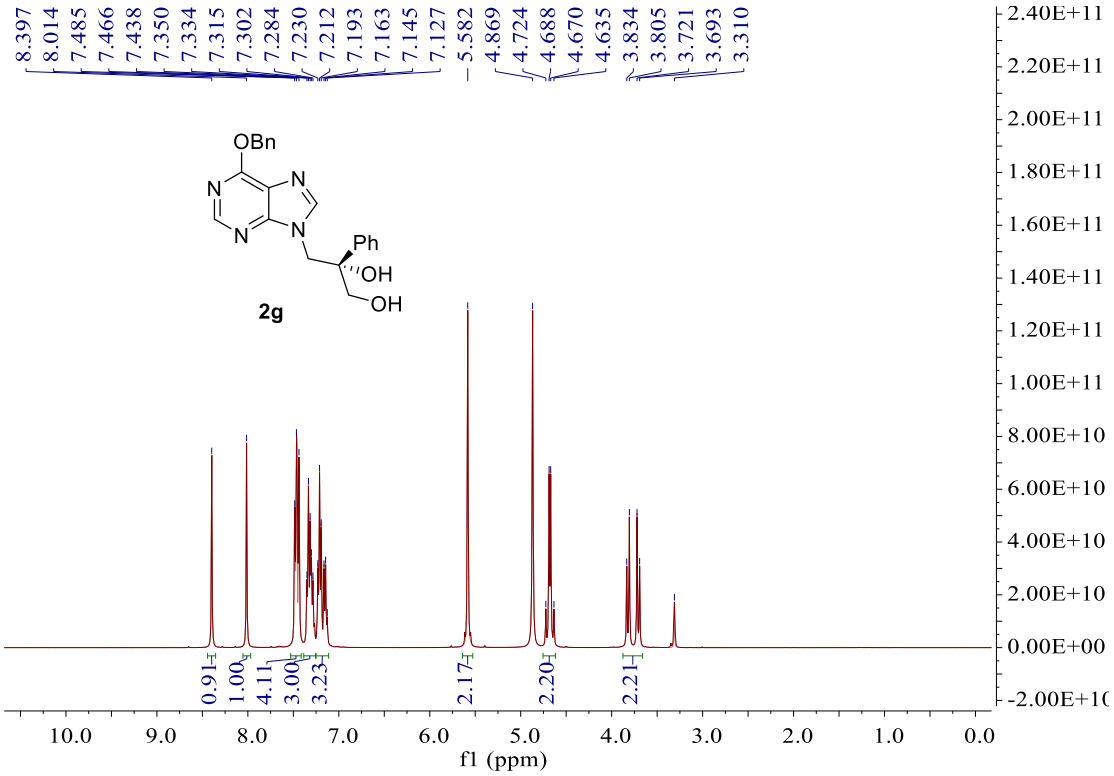

159.39
152.51
152.47
147.86
142.67
132.77
129.10
128.50
126.88
77.63
68.65
51.56
49.42
49.29
49.14
49.00
48.86
48.72
48.57
18.90
Me
N
N
N
N
Ph
OH
OH
2d
f1 (ppm)


8.373
8.008
7.462
7.458
7.453
7.440
7.226
7.209
7.189
7.159
7.141
4.725
4.690
4.675
4.639
4.099
3.840
3.812
3.733
3.704
3.349
3.311
O
N
N
N
N
Ph
OH
OH
2e
0.95
1.00
2.02
3.10
2.08
3.06
2.08
2.22
fl (ppm)


161.98
153.59
152.75
145.56
142.74
129.07
128.44
126.83
120.99
77.55
68.52
54.77
51.75
49.85
49.64
49.42
49.21
49.00
48.79
48.58
48.36
O
N
N
N
N
Ph
OH
OH
2e
fl (ppm)


8.378
8.019
7.462
7.450
7.243
7.230
7.217
7.179
7.167
7.154
4.860
4.723
4.699
4.687
4.663
4.621
4.610
4.598
4.586
3.833
3.813
3.719
3.700
3.310
1.464
1.453
1.441
OEt
N
N
N
N
Ph
OH
OH
2f
0.94
1.00
2.09
3.11
2.12
2.06
1.04
1.04
3.11
f1 (ppm)


161.74
153.70
152.81
145.53
142.78
129.10
128.47
126.87
121.02
77.58
68.56
64.29
51.74
49.42
49.29
49.27
49.14
49.00
48.99
48.86
48.72
48.57
14.76
OEt
N
N
N
N
Ph
OH
OH
2f
f1 (ppm)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7.466
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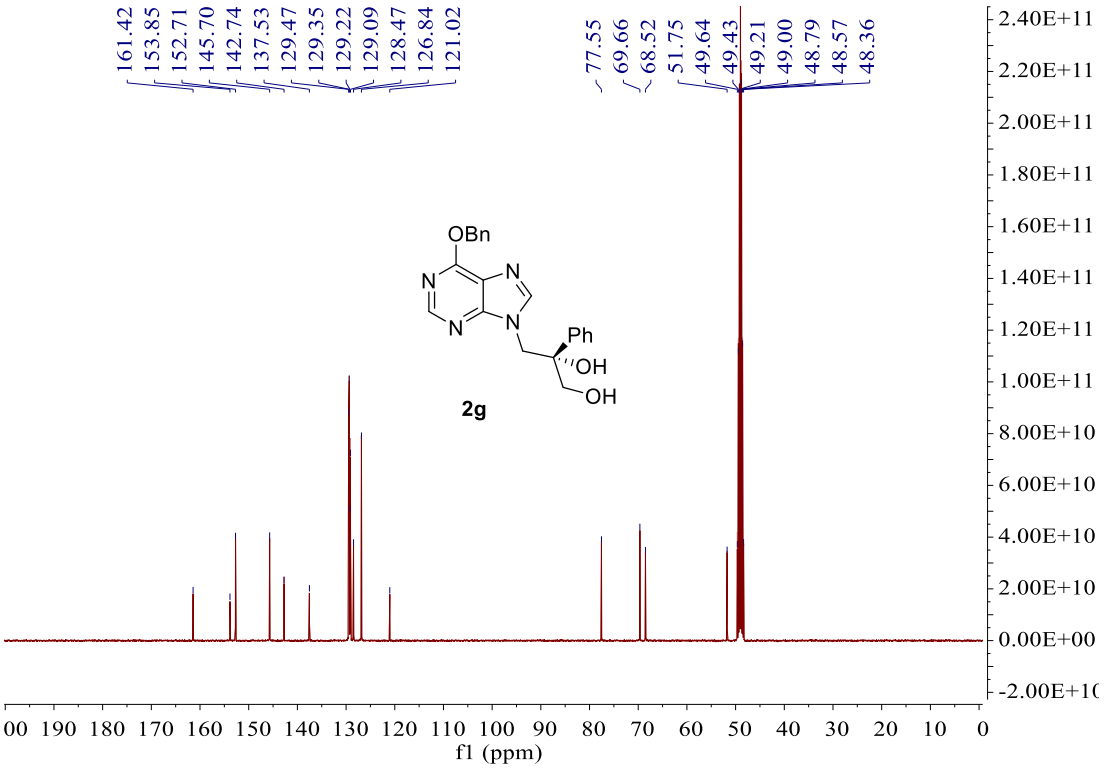
7.350
7.334
7.315
7.302
7.284
7.230
7.212
7.193
7.163
7.145
7.127
5.582
4.869
4.724
4.688
4.670
4.635
3.834
3.805
3.721
3.693
3.310
OBn
N
N
N
N
Ph
OH
OH
2g
0.91
1.00
4.11
3.00
3.23
2.17
2.20
2.21
2.40E+11
2.20E+11
2.00E+11
1.80E+11
1.60E+11
1.40E+11
1.20E+11
1.00E+11
8.00E+10
6.00E+10
4.00E+10
2.00E+10
0.00E+00
-2.00E+10
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
f1 (ppm)


161.42
153.85
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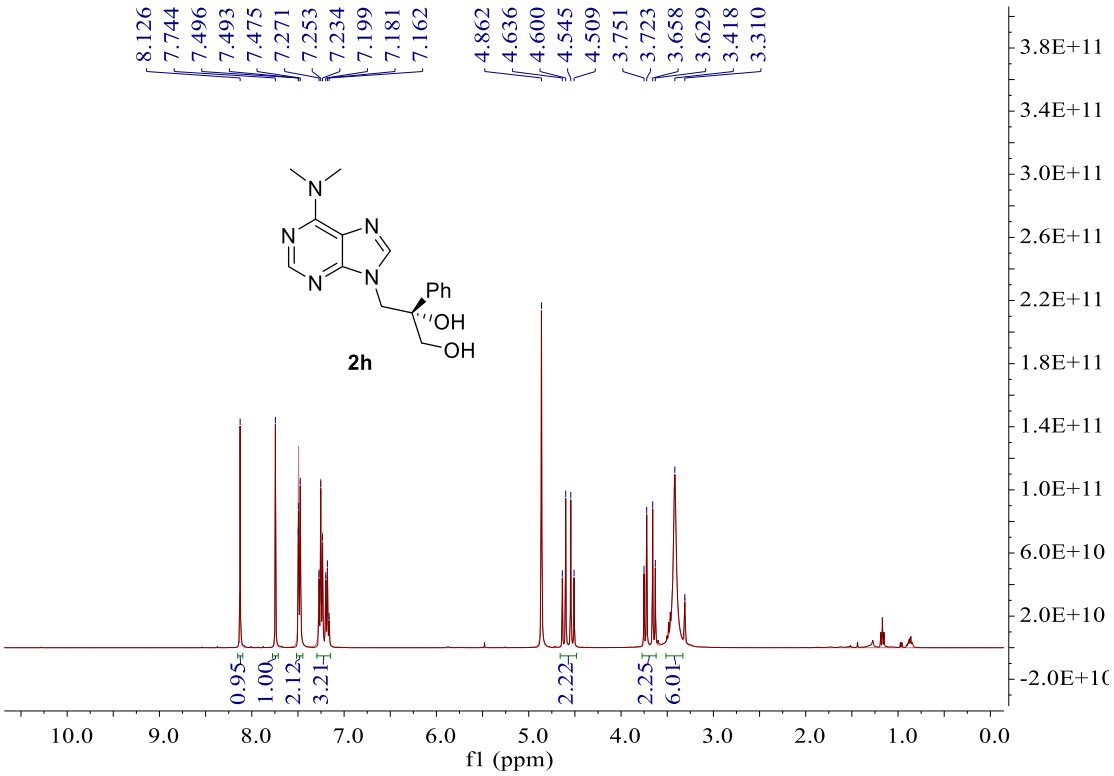
142.74
137.53
129.47
129.35
129.22
129.09
128.47
126.84
121.02
77.55
69.66
68.52
51.75
49.64
49.43
49.21
49.00
48.79
48.57
48.36
OBn
N
N
N
N
Ph
OH
OH
2g
2.40E+11
2.20E+11
2.00E+11
1.80E+11
1.60E+11
1.40E+11
1.20E+11
1.00E+11
8.00E+10
6.00E+10
4.00E+10
2.00E+10
0.00E+00
-2.00E+10
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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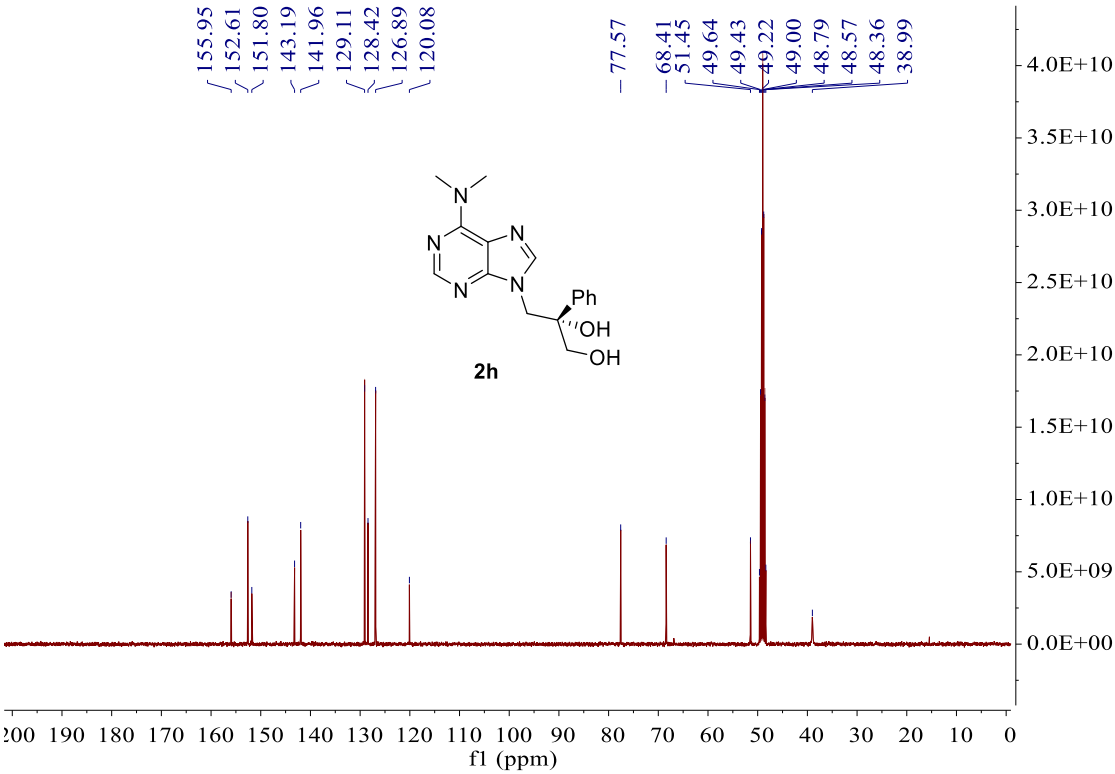
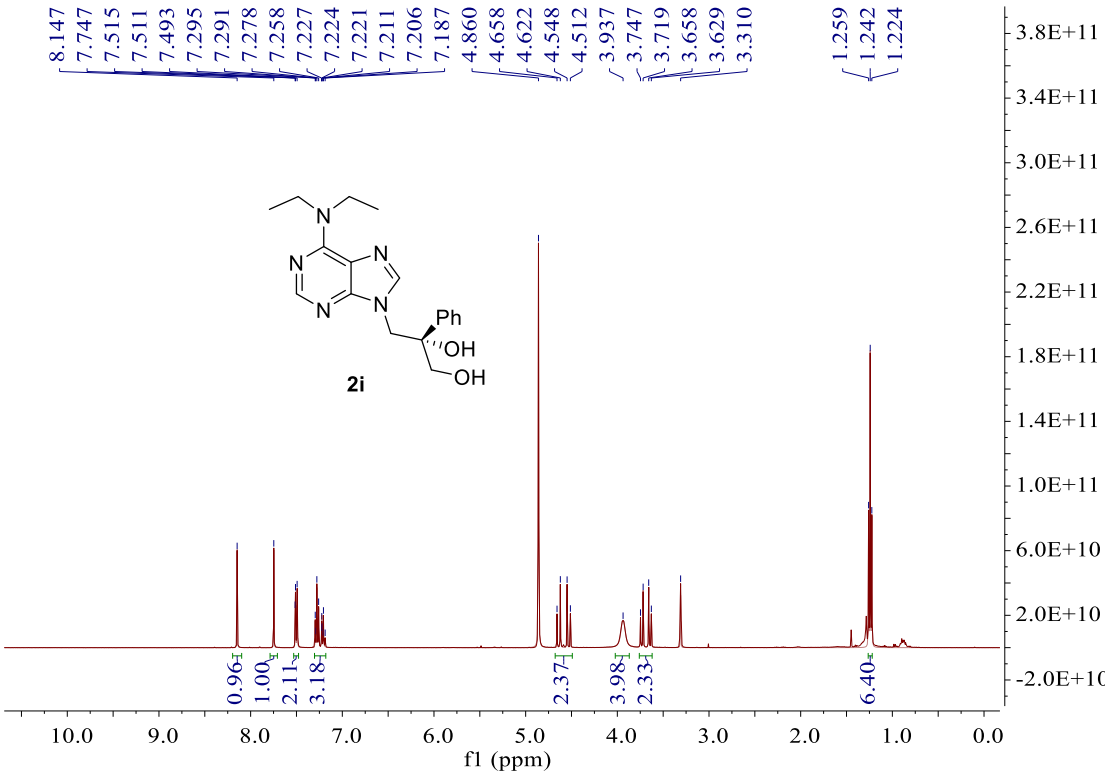
7.493
7.475
7.271
7.253
7.234
7.199
7.181
7.162
4.862
4.636
4.600
4.545
4.509
3.751
3.723
3.658
3.629
3.418
3.310
Ph
OH
OH
2h
0.95
1.00
2.12
3.21
2.22
2.25
6.01
f1 (ppm)


155.95
152.61
151.80
143.19
141.96
129.11
128.42
126.89
120.08
77.57
68.41
51.45
49.64
49.43
49.22
49.00
48.79
48.57
48.36
38.99
Ph
OH
OH
2h
f1 (ppm)


8.147
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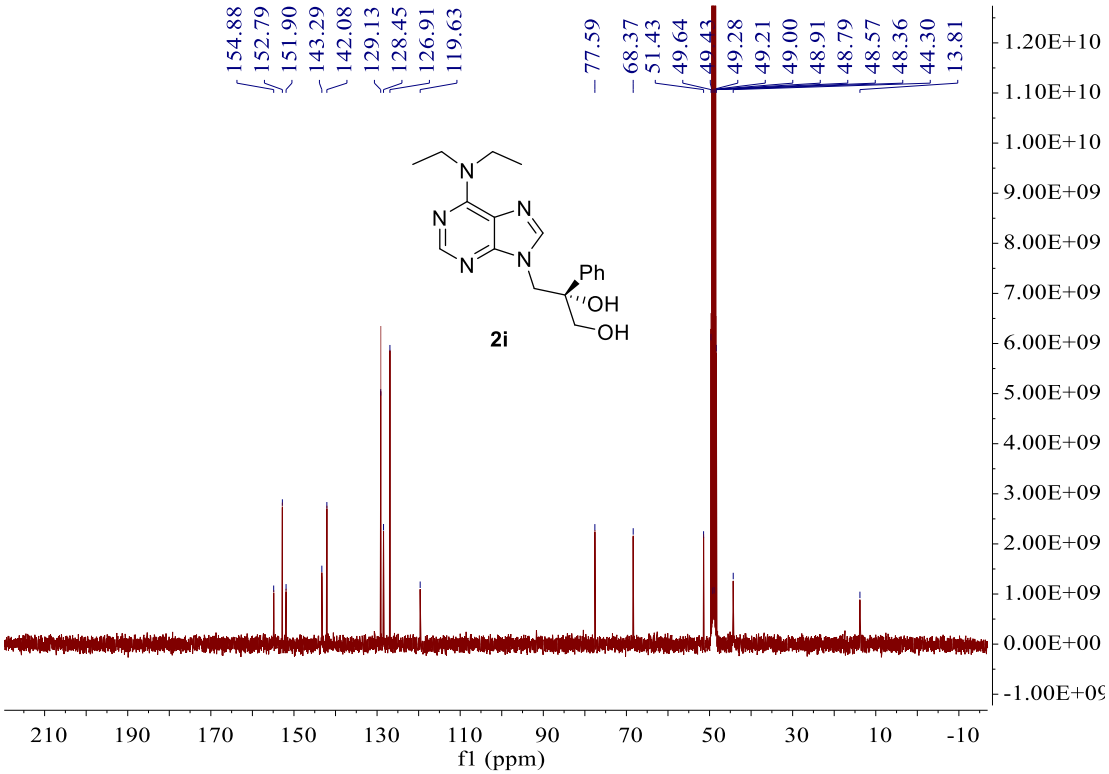
7.515
7.511
7.493
7.295
7.291
7.278
7.258
7.227
7.224
7.221
7.211
7.206
7.187
4.860
4.658
4.622
4.548
4.512
3.937
3.747
3.719
3.658
3.629
3.310
1.259
1.242
1.224
Ph
OH
OH
2i
0.96
1.00
2.11
3.18
2.37
3.98
2.33
6.40
f1 (ppm)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152.79
151.90
143.29
142.08
129.13
128.45
126.91
119.63
77.59
68.37
51.43
49.64
49.43
49.28
49.21
49.00
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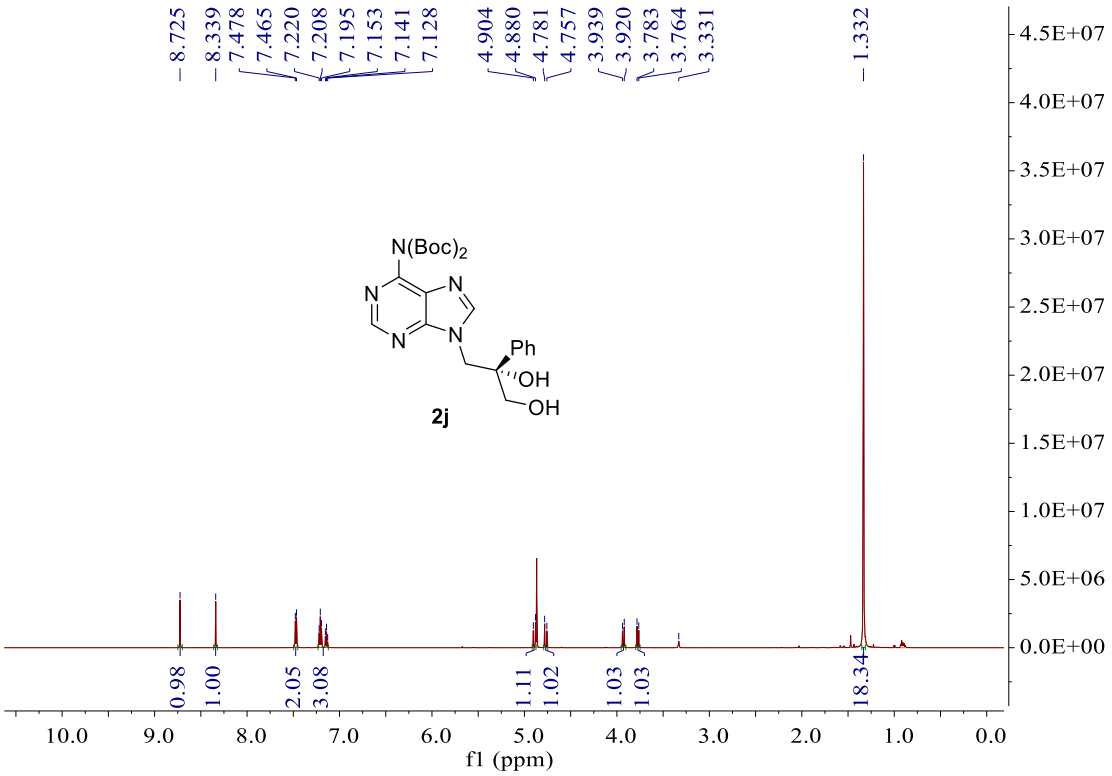
48.79
48.57
48.36
44.30
13.81
Ph
OH
OH
2i
f1 (ppm)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7.220
7.208
7.195
7.153
7.141
7.128
4.904
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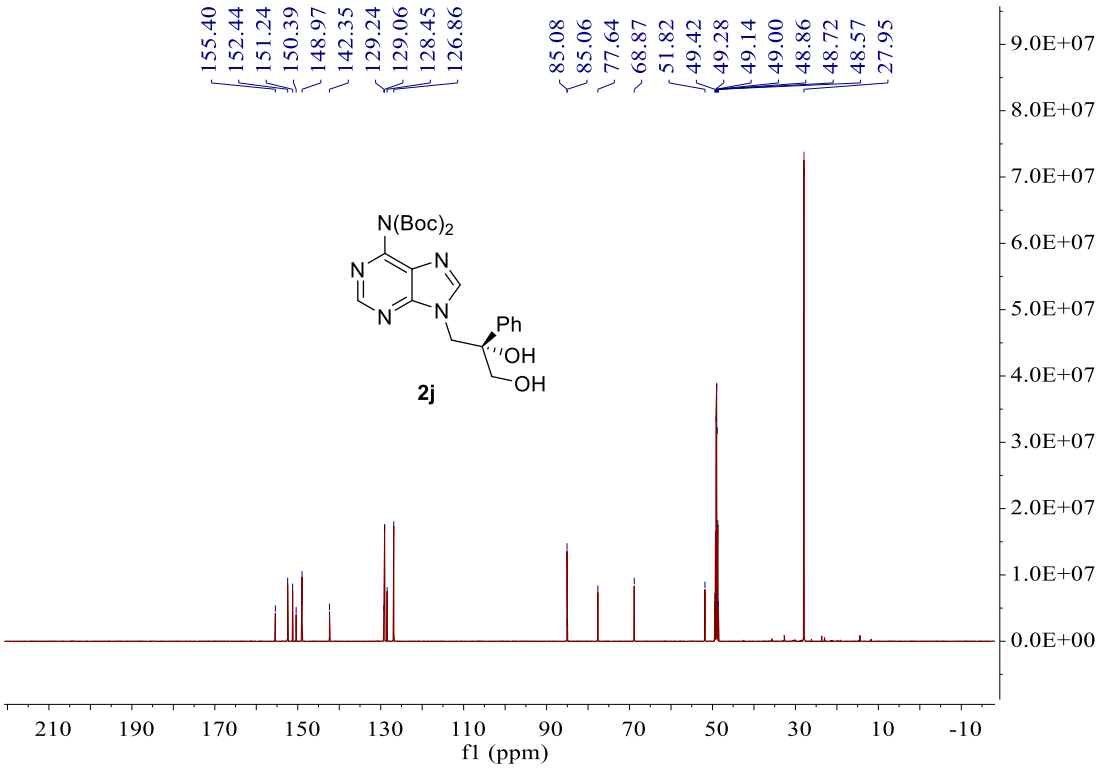
4.781
4.757
3.939
3.920
3.783
3.764
3.331
1.332
N(Boc)2
Ph
OH
OH
2j
0.98
1.00
2.05
3.08
1.11
1.02
1.03
1.03
18.34
f1 (ppm)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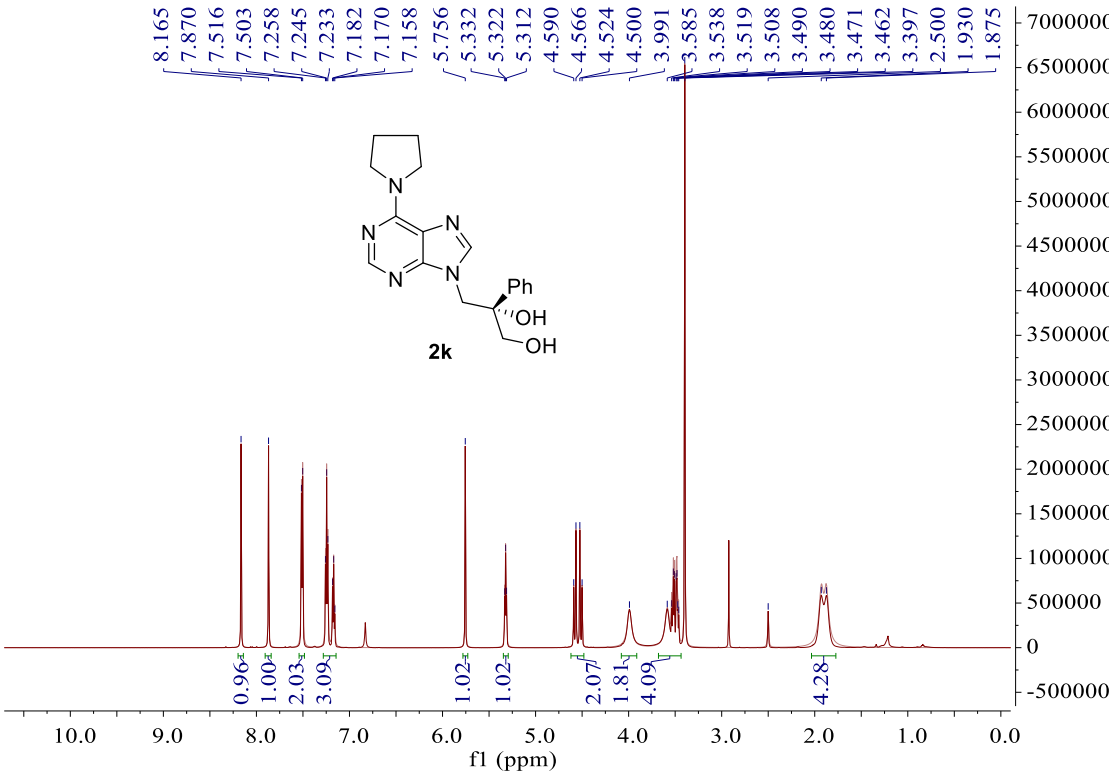
152.44
151.24
150.39
148.97
142.35
129.24
129.06
128.45
126.86
85.08
85.06
77.64
68.87
51.82
49.42
49.28
49.14
49.00
48.86
48.72
48.57
27.95
N(Boc)2
Ph
OH
OH
2j
f1 (ppm)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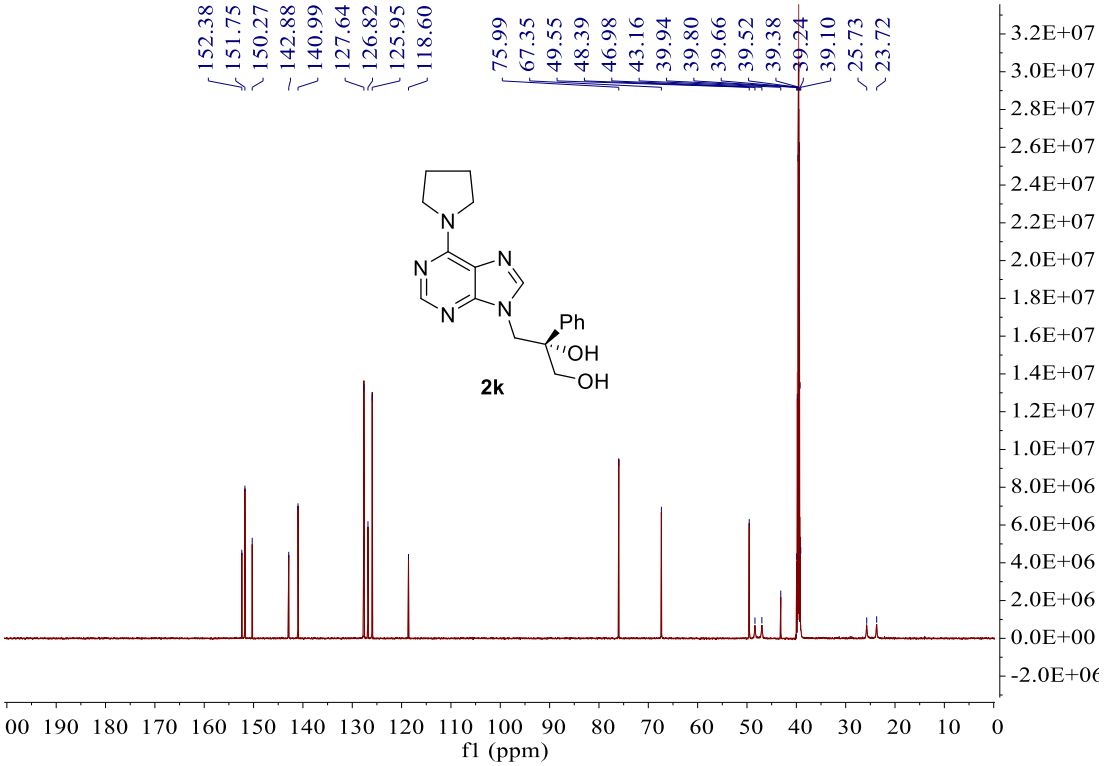
7.870
7.516
7.503
7.258
7.245
7.233
7.182
7.170
7.158
5.756
5.332
5.322
5.312
4.590
4.566
4.524
4.500
3.991
3.585
3.538
3.519
3.508
3.490
3.480
3.471
3.462
3.397
2.500
1.930
1.875
Ph
OH
OH
2k
0.96
1.00
2.03
3.09
1.02
1.02
2.07
1.81
4.09
4.28
f1 (ppm)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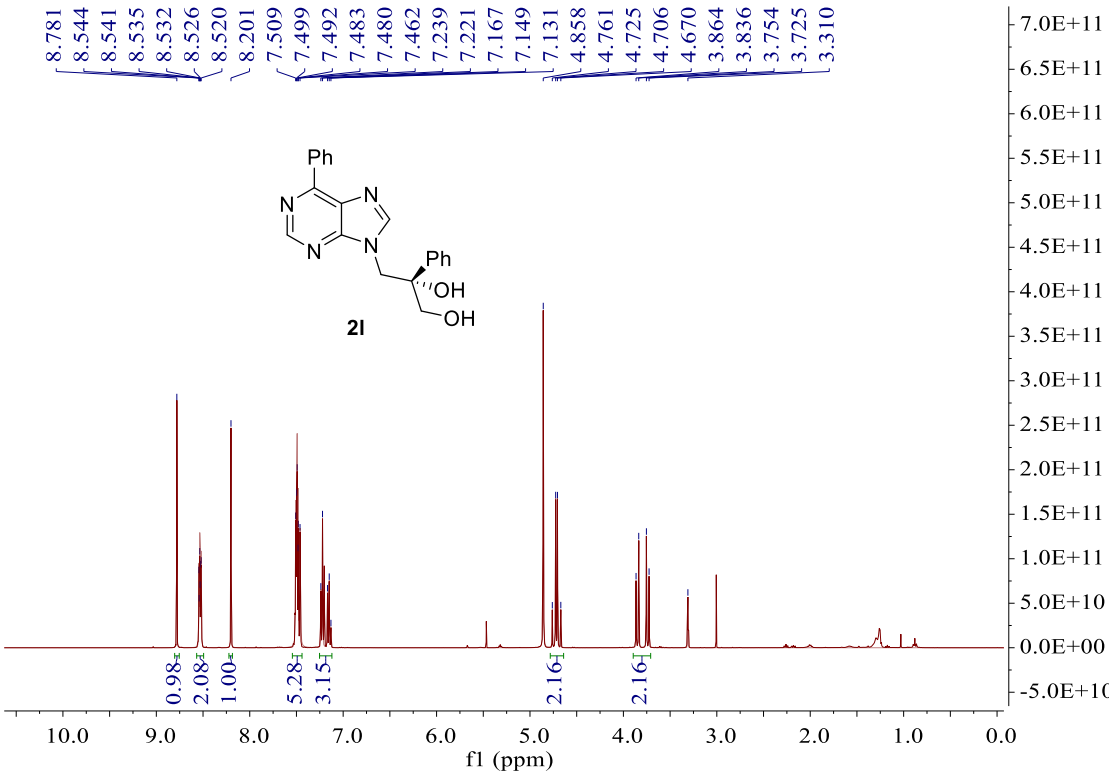
151.75
150.27
142.88
140.99
127.64
126.82
125.95
118.60
75.99
67.35
49.55
48.39
46.98
43.16
39.94
39.80
39.66
39.52
39.38
39.24
39.10
25.73
23.72
Ph
OH
OH
2k
f1 (ppm)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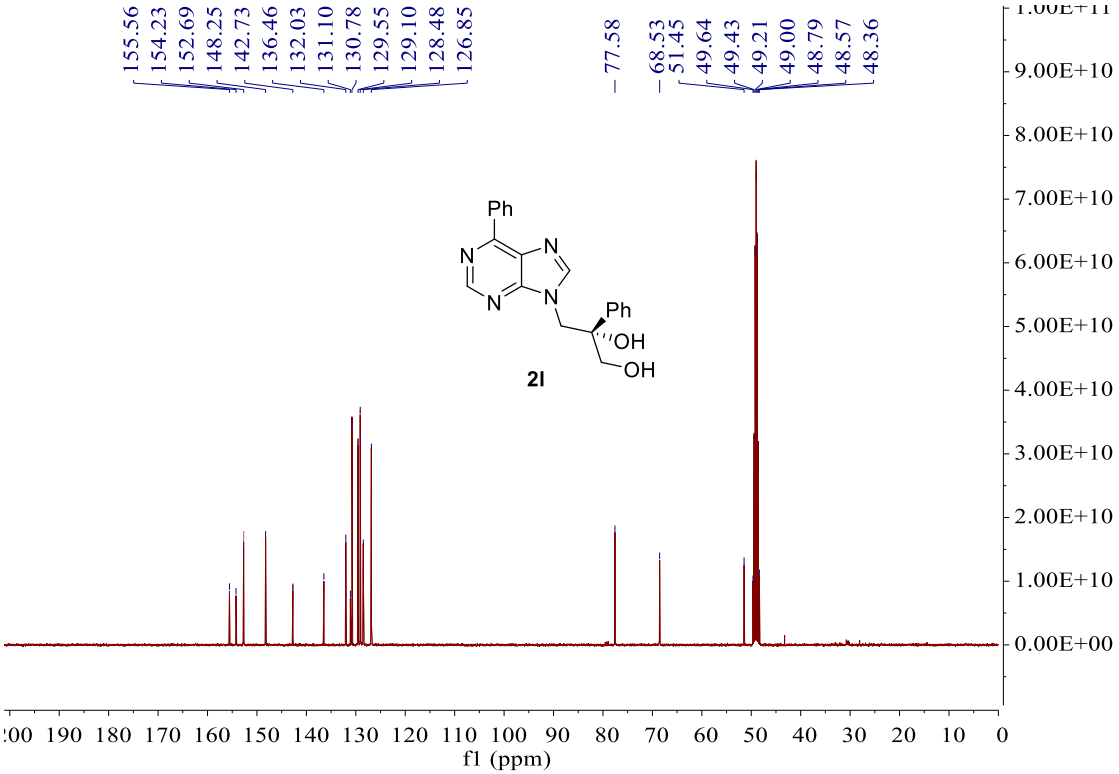
8.544
8.541
8.535
8.532
8.526
8.520
8.201
7.509
7.499
7.492
7.483
7.480
7.462
7.239
7.221
7.167
7.149
7.131
4.858
4.761
4.725
4.706
4.670
3.864
3.836
3.754
3.725
3.310
Ph
N
N
N
N
Ph
OH
OH
2l
0.98
2.08
1.00
5.28
3.15
2.16
2.16
f1 (ppm)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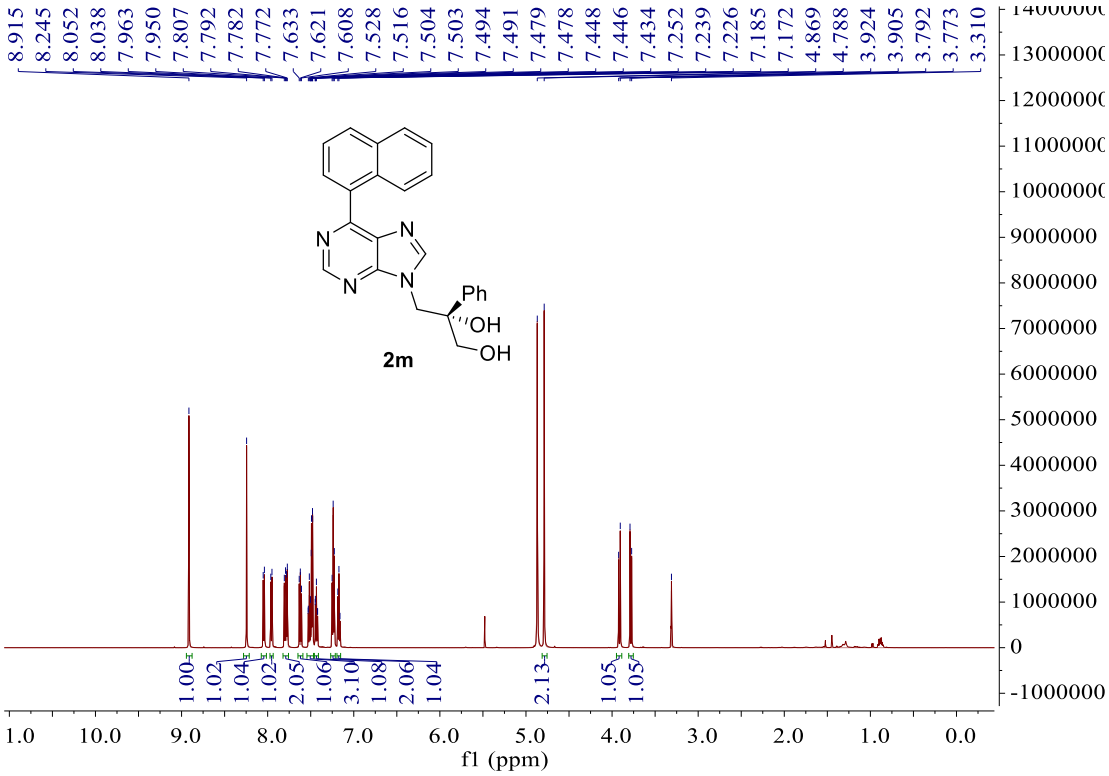
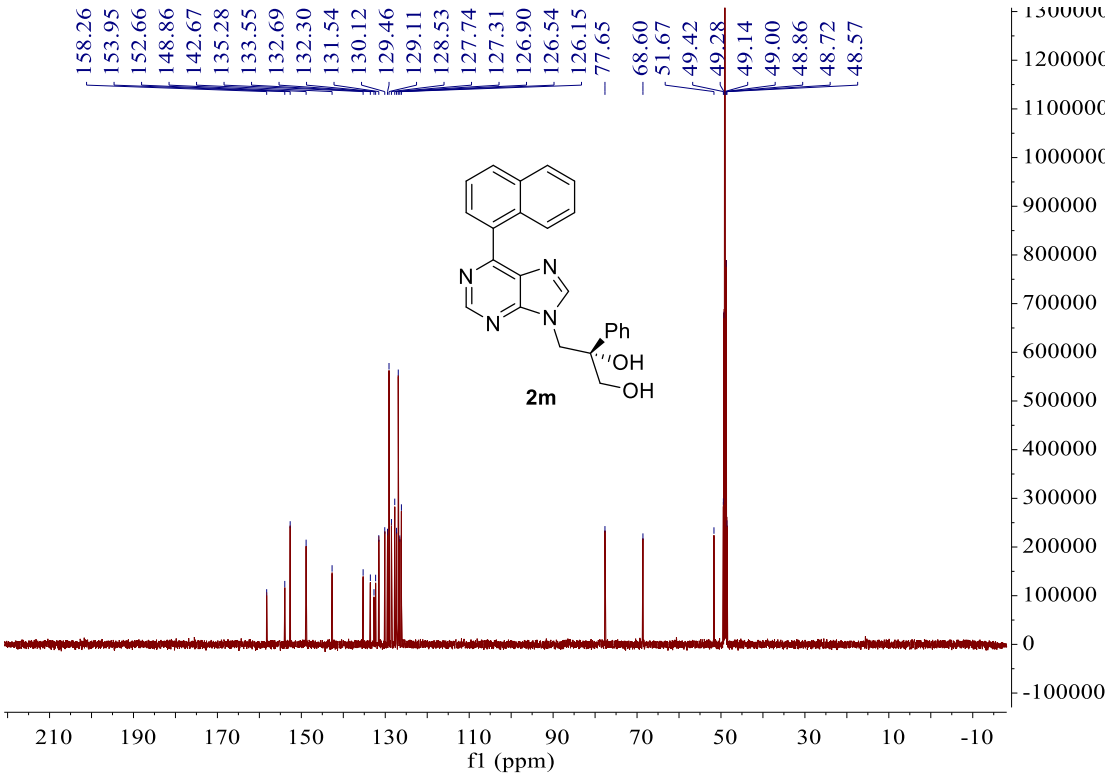
154.23
152.69
148.25
142.73
136.46
132.03
131.10
130.78
129.55
129.10
128.48
126.85
77.58
68.53
51.45
49.64
49.43
49.21
49.00
48.79
48.57
48.36
Ph
N
N
N
N
Ph
OH
OH
2l
f1 (ppm)


8.915
8.245
8.052
8.038
7.963
7.950
7.807
7.792
7.782
7.772
7.633
7.621
7.608
7.528
7.516
7.504
7.503
7.494
7.491
7.479
7.478
7.448
7.446
7.434
7.252
7.239
7.226
7.185
7.172
4.869
4.788
3.924
3.905
3.792
3.773
3.310
Ph
OH
OH
2m
1.00
1.02
1.04
1.02
2.05
1.06
3.10
1.08
2.06
1.04
2.13
1.05
1.05
f1 (ppm)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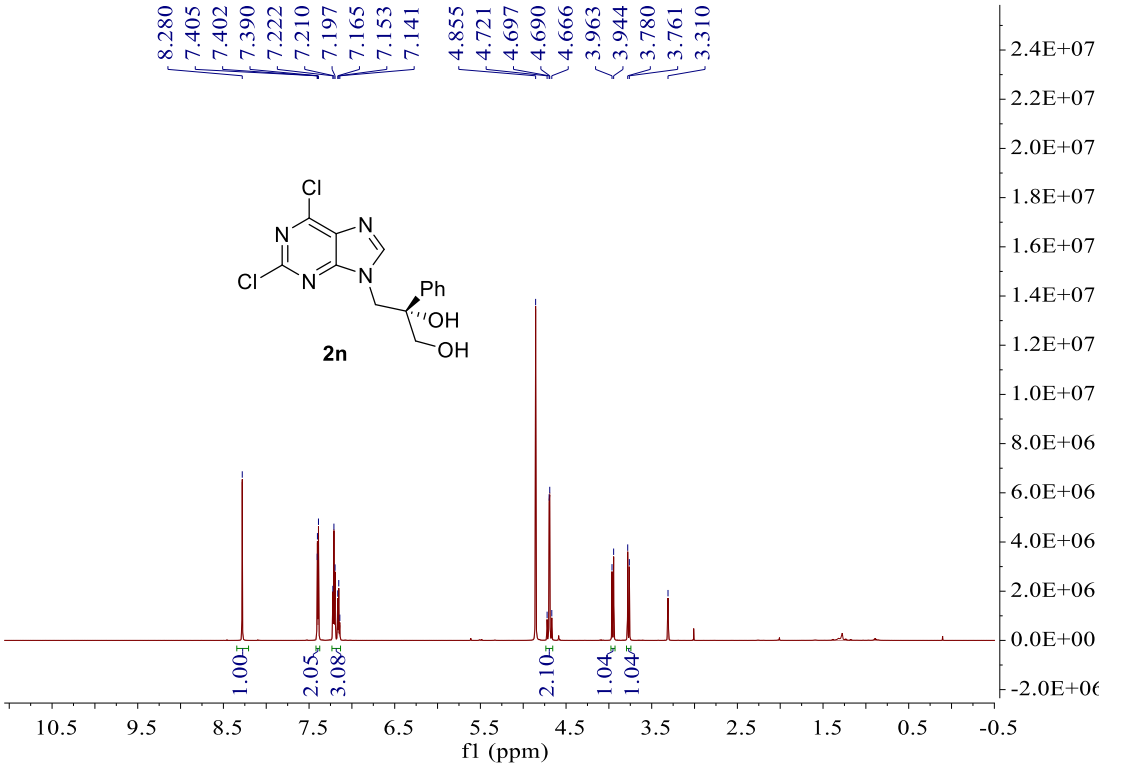
153.95
152.66
148.86
142.67
135.28
133.55
132.69
132.30
131.54
130.12
129.46
129.11
128.53
127.74
127.31
126.90
126.54
126.15
77.65
68.60
51.67
49.42
49.28
49.14
49.00
48.86
48.72
48.57
Ph
OH
OH
2m
f1 (ppm)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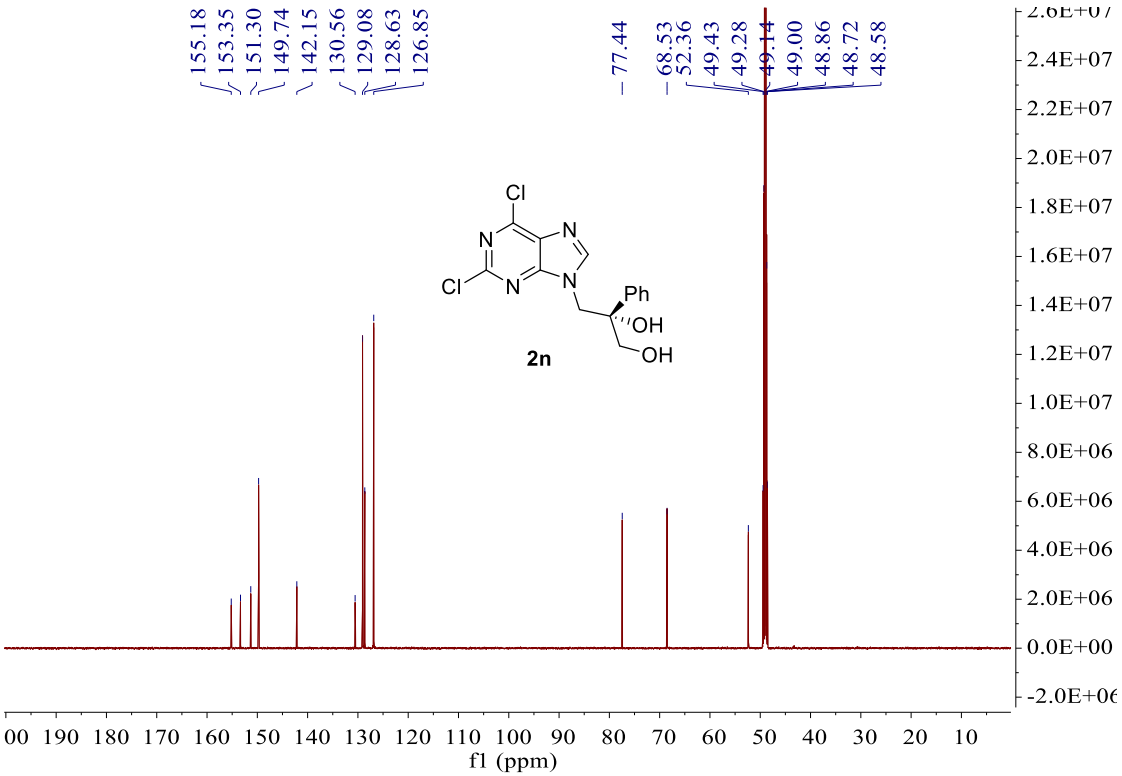
7.405
7.402
7.390
7.222
7.210
7.197
7.165
7.153
7.141
4.855
4.721
4.697
4.690
4.666
3.963
3.944
3.780
3.761
3.310
Cl
N
N
Cl
N
N
Ph
OH
OH
2n
1.00
2.05
3.08
2.10
1.04
1.04
f1 (ppm)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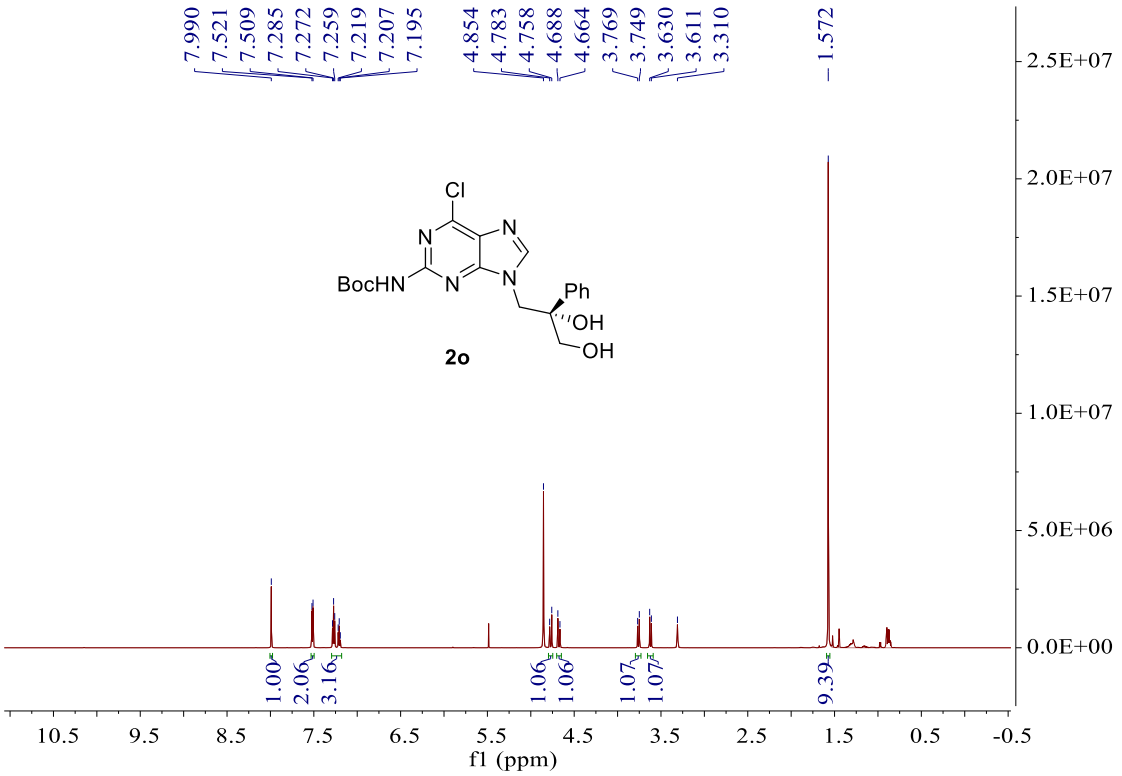
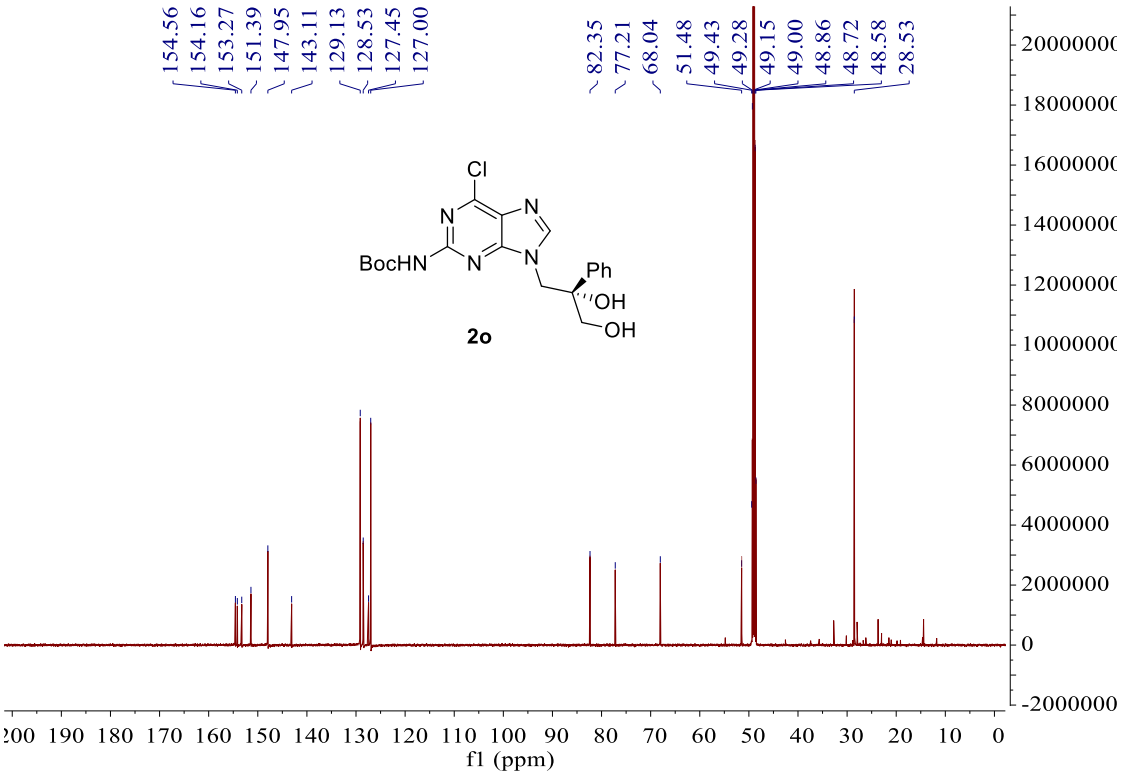
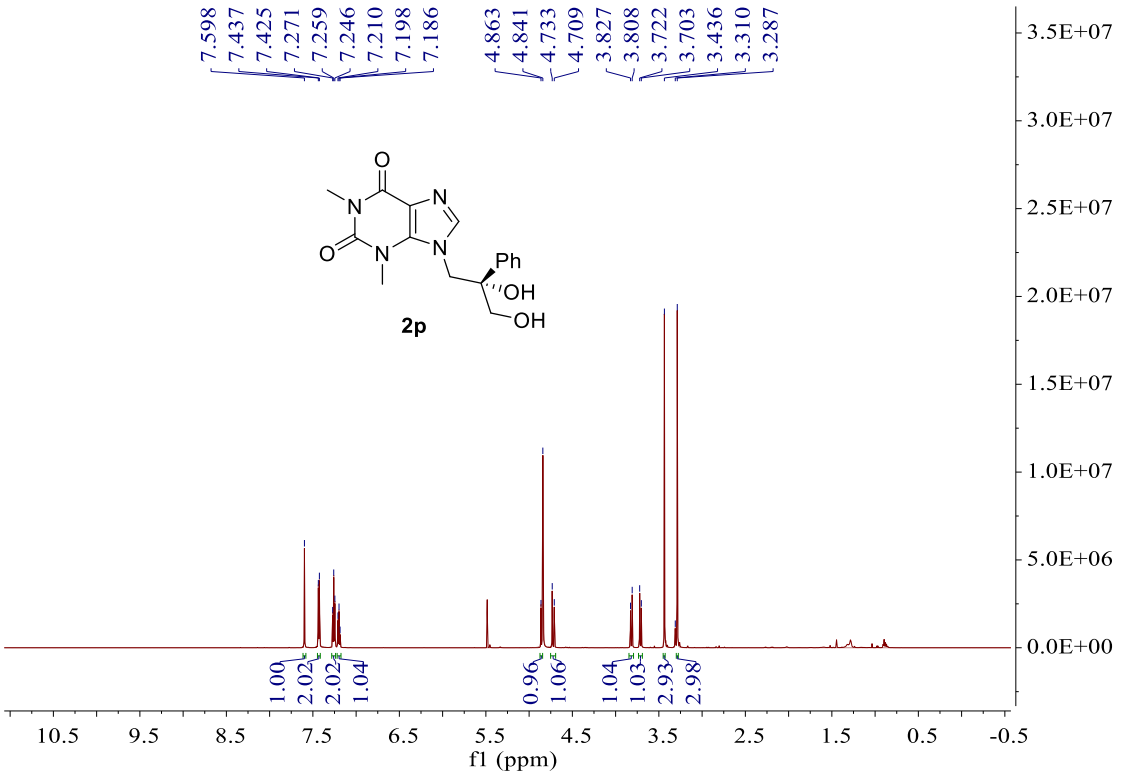
153.35
151.30
149.74
142.15
130.56
129.08
128.63
126.85
77.44
68.53
52.36
49.43
49.28
49.14
49.00
48.86
48.72
48.58
Cl
N
N
Cl
N
N
Ph
OH
OH
2n
f1 (ppm)


7.990
7.521
7.509
7.285
7.272
7.259
7.219
7.207
7.195
4.854
4.783
4.758
4.688
4.664
3.769
3.749
3.630
3.611
3.310
1.572
Cl
N
N
N
N
BocHN
Ph
OH
OH
2o
2.5E+07
2.0E+07
1.5E+07
1.0E+07
5.0E+06
0.0E+00
1.00
2.06
3.16
1.06
1.06
1.07
1.07
9.39
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)


154.56
154.16
153.27
151.39
147.95
143.11
129.13
128.53
127.45
127.00
82.35
77.21
68.04
51.48
49.43
49.28
49.15
49.00
48.86
48.72
48.58
28.53
Cl
N
N
N
N
BocHN
Ph
OH
OH
2o
2000000
1800000
1600000
1400000
1200000
1000000
8000000
6000000
4000000
2000000
0
-2000000
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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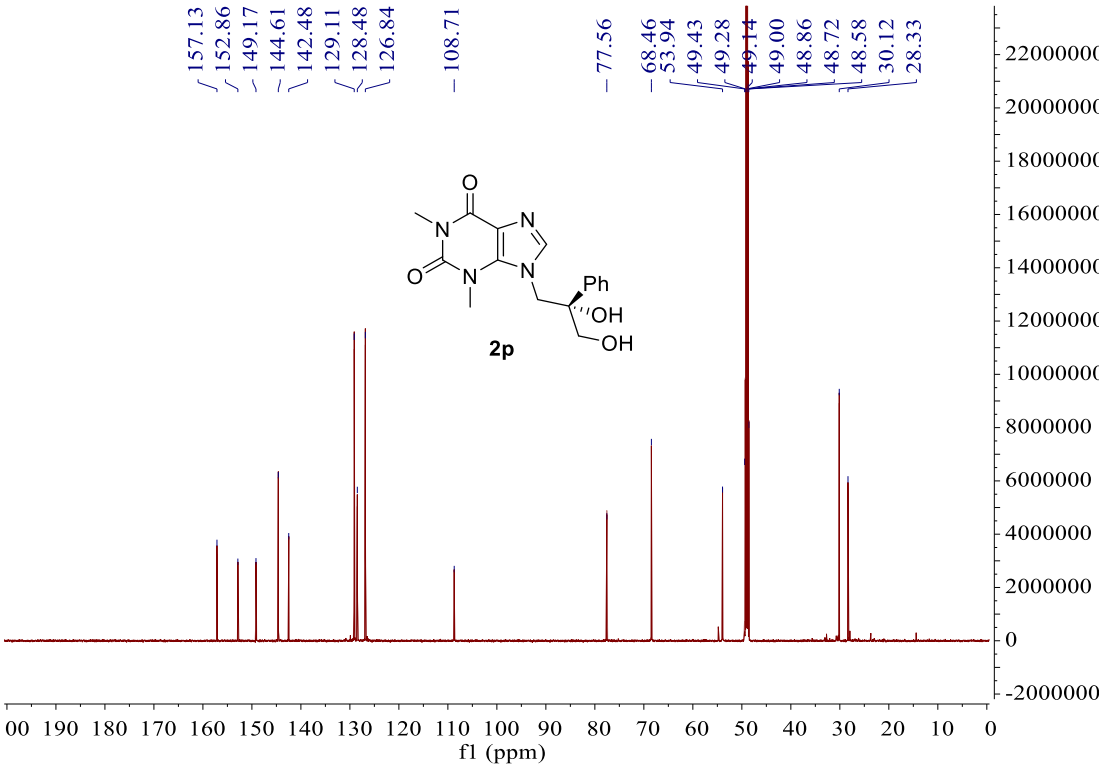
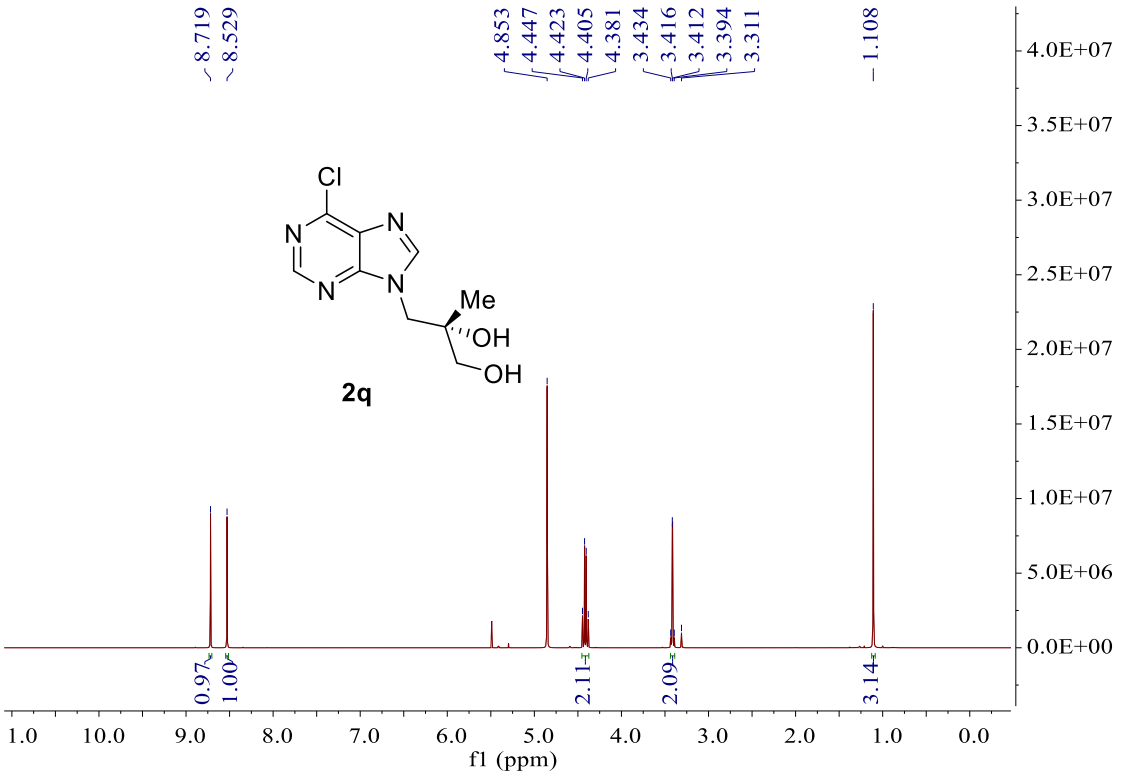
7.271
7.259
7.246
7.210
7.198
7.186
4.863
4.841
4.733
4.709
3.827
3.808
3.722
3.703
3.436
3.310
3.287
Ph
OH
OH
2p
1.00
2.02
2.02
1.04
0.96
1.06
1.04
1.03
2.93
2.98
fl (ppm)


157.13
152.86
149.17
144.61
142.48
129.11
128.48
126.84
108.71
77.56
68.46
53.94
49.43
49.28
49.14
49.00
48.86
48.72
48.58
30.12
28.33
Ph
OH
OH
2p
fl (ppm)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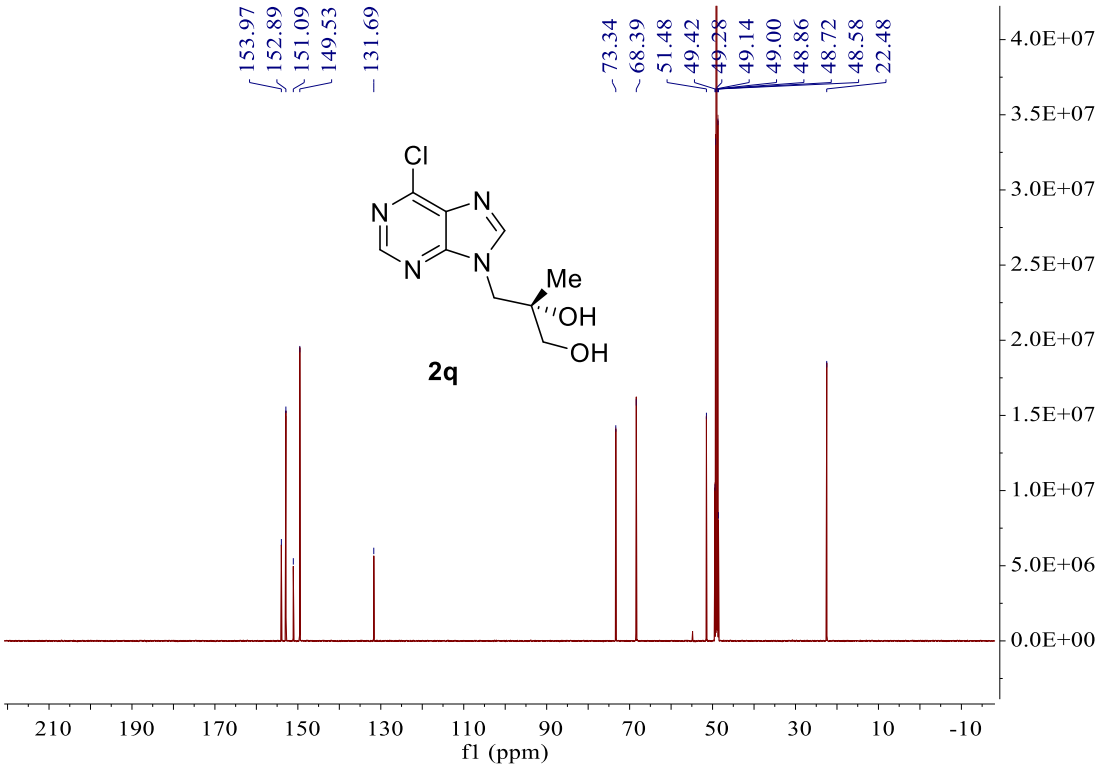
8.529
4.853
4.447
4.423
4.405
4.381
3.434
3.416
3.412
3.394
3.311
1.108
Cl
N
N
N
N
Me
OH
OH
2q
0.97
1.00
2.11
2.09
3.14
4.0E+07
3.5E+07
3.0E+07
2.5E+07
2.0E+07
1.5E+07
1.0E+07
5.0E+06
0.0E+00
1.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
f1 (ppm)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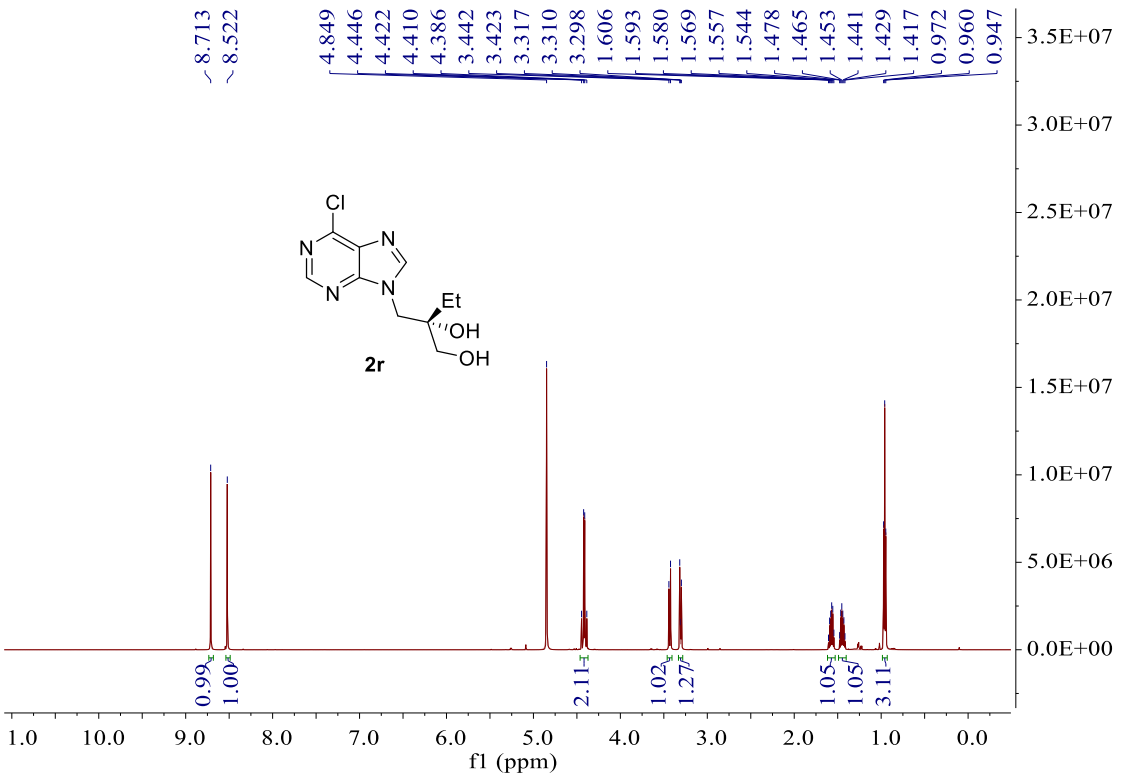
152.89
151.09
149.53
131.69
73.34
68.39
51.48
49.42
49.28
49.14
49.00
48.86
48.72
48.58
22.48
Cl
N
N
N
N
Me
OH
OH
2q
4.0E+07
3.5E+07
3.0E+07
2.5E+07
2.0E+07
1.5E+07
1.0E+07
5.0E+06
0.0E+00
210
190
170
150
130
110
90
70
50
30
10
-10
f1 (ppm)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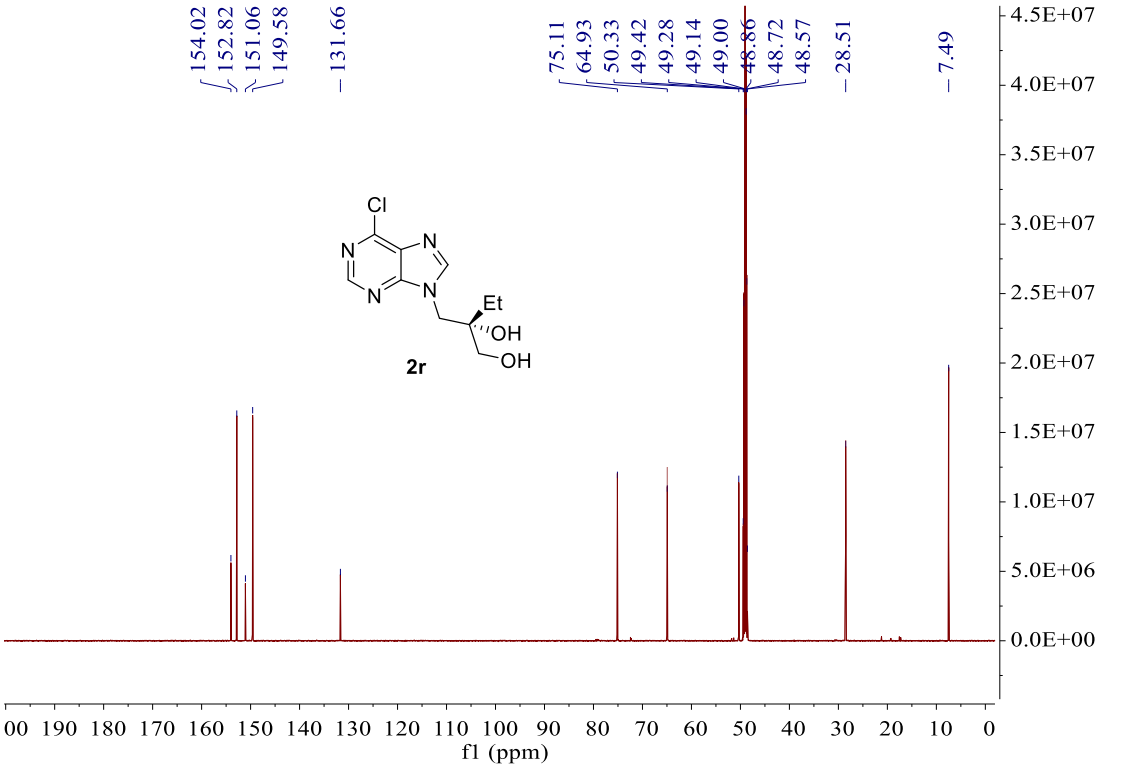
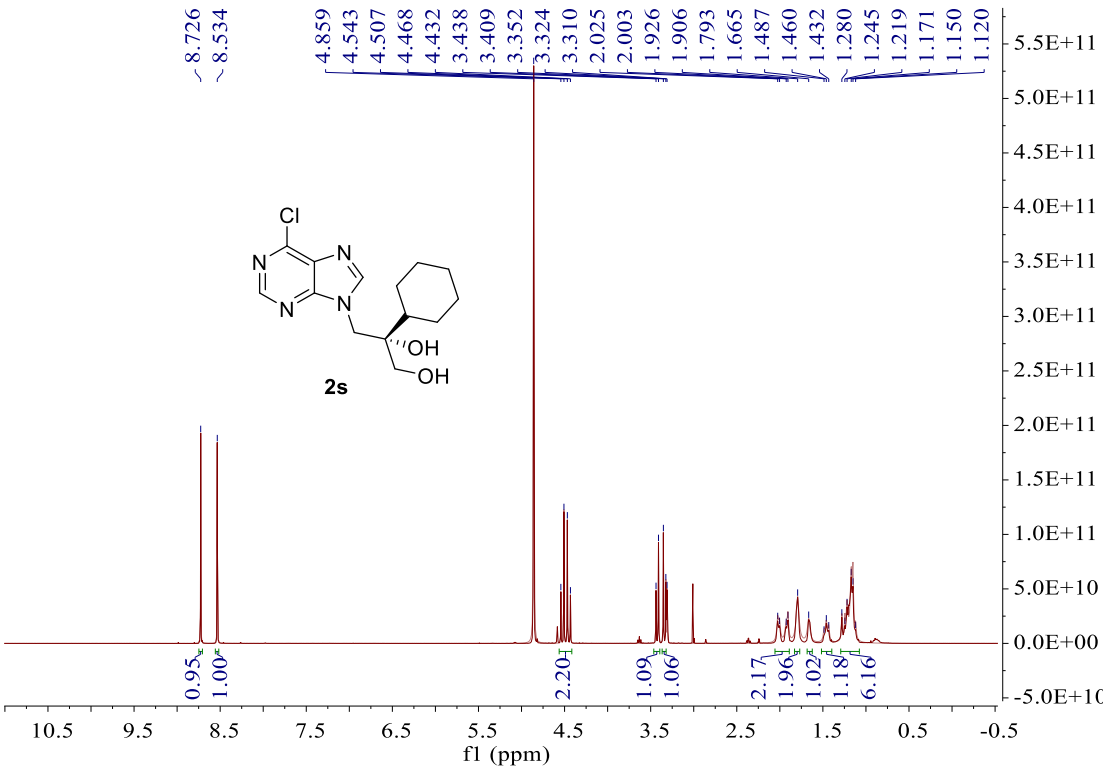
4.446
4.422
4.410
4.386
3.442
3.423
3.317
3.310
3.298
1.606
1.593
1.580
1.569
1.557
1.544
1.478
1.465
1.453
1.441
1.429
1.417
0.972
0.960
0.947
Cl
N
N
N
N
Et
OH
OH
2r
0.99
1.00
2.11
1.02
1.27
1.05
1.05
3.11
3.5E+07
3.0E+07
2.5E+07
2.0E+07
1.5E+07
1.0E+07
5.0E+06
0.0E+00
1.0 10.0 9.0 8.0 7.0 6.0 5.0 4.0 3.0 2.0 1.0 0.0
f1 (ppm)


154.02
152.82
151.06
149.58
131.66
75.11
64.93
50.33
49.42
49.28
49.14
49.00
48.86
48.72
48.57
28.51
7.49
Cl
N
N
N
N
Et
OH
OH
2r
4.5E+07
4.0E+07
3.5E+07
3.0E+07
2.5E+07
2.0E+07
1.5E+07
1.0E+07
5.0E+06
0.0E+00
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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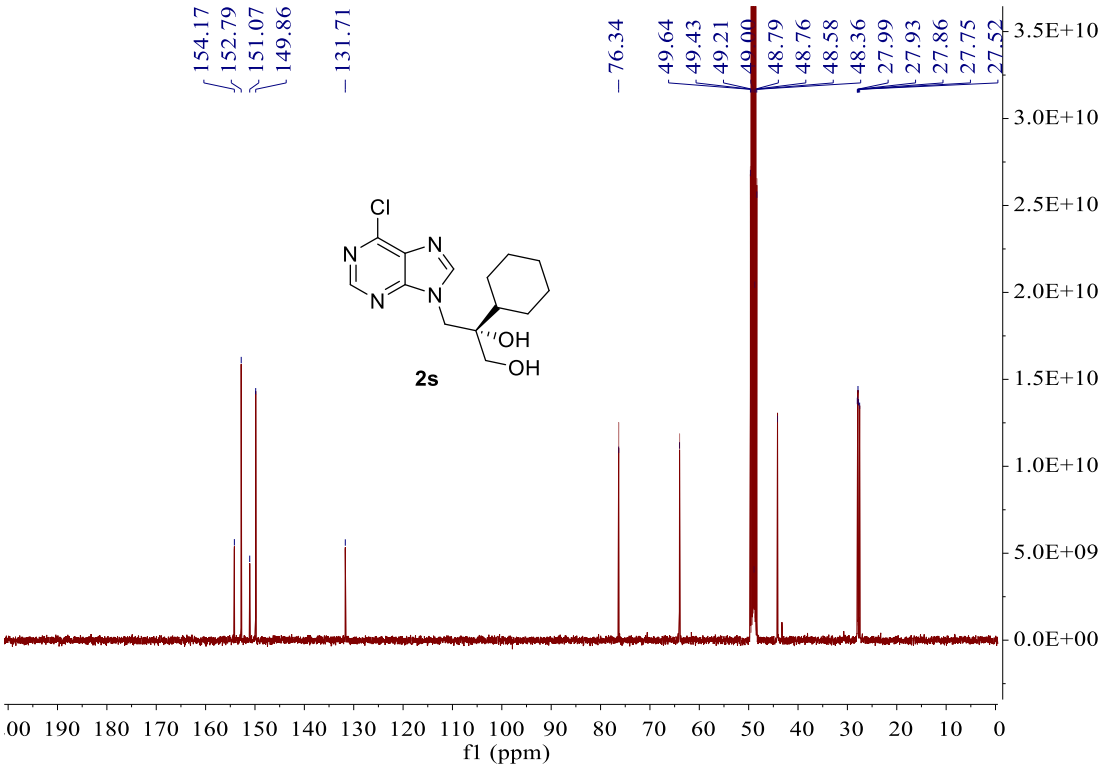
4.543
4.507
4.468
4.432
3.438
3.409
3.352
3.324
3.310
2.025
2.003
1.926
1.906
1.793
1.665
1.487
1.460
1.432
1.280
1.245
1.219
1.171
1.150
1.120
Cl
N
N
N
N
OH
OH
2s
0.95
1.00
2.20
1.09
1.06
2.17
1.96
1.02
1.18
6.16
5.5E+11
5.0E+11
4.5E+11
4.0E+11
3.5E+11
3.0E+11
2.5E+11
2.0E+11
1.5E+11
1.0E+11
5.0E+10
0.0E+00
-5.0E+10
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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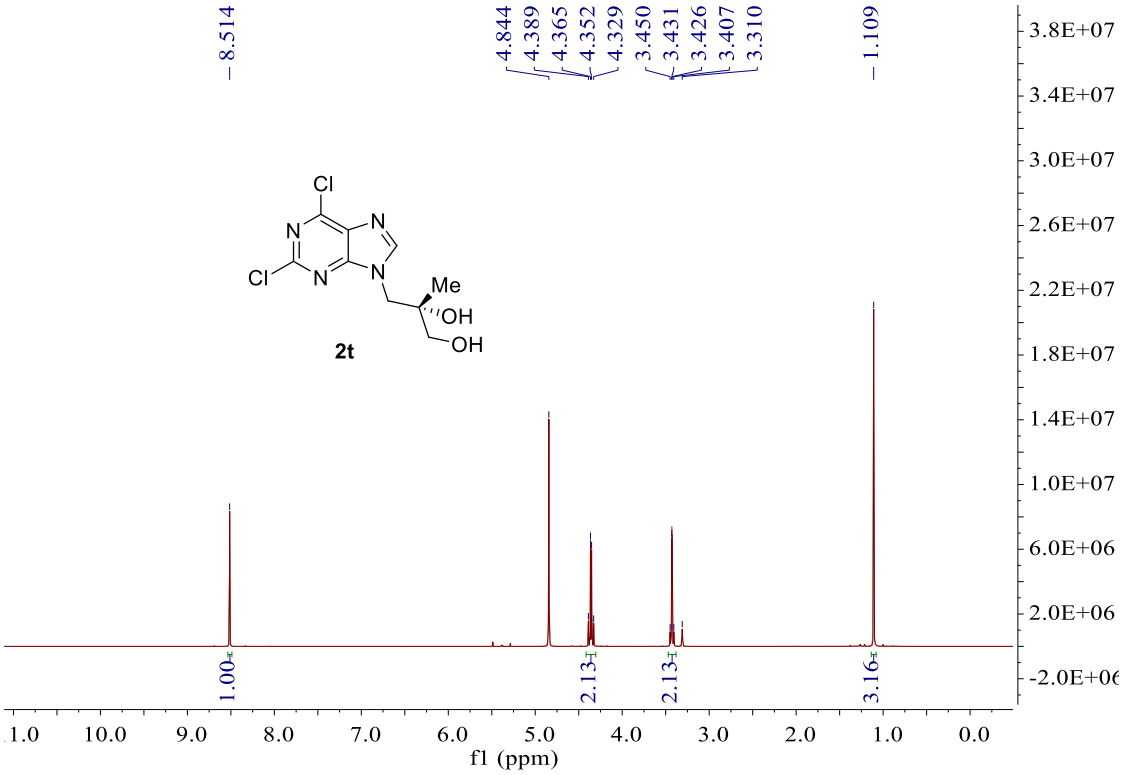
152.79
151.07
149.86
131.71
76.34
49.64
49.43
49.21
49.00
48.79
48.76
48.58
48.36
27.99
27.93
27.86
27.75
27.52
Cl
N
N
N
N
OH
OH
2s
3.5E+10
3.0E+10
2.5E+10
2.0E+10
1.5E+10
1.0E+10
5.0E+09
0.0E+00
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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4.389
4.365
4.352
4.329
3.450
3.431
3.426
3.407
3.310
1.109
Cl
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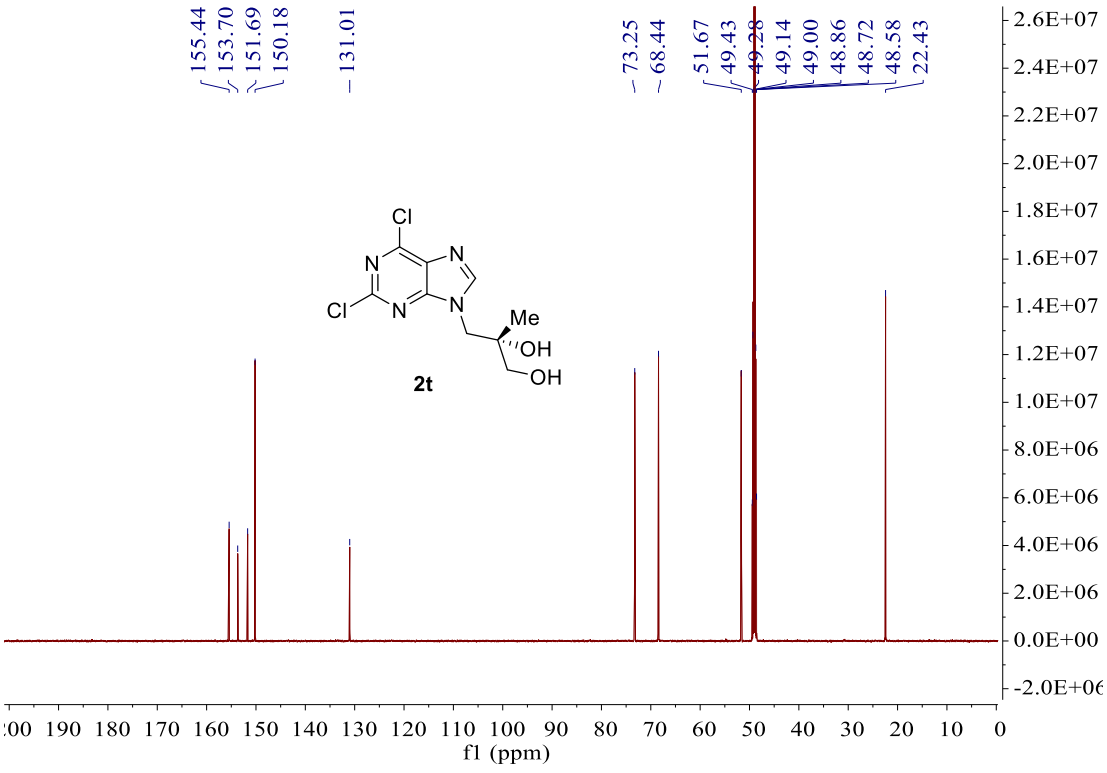
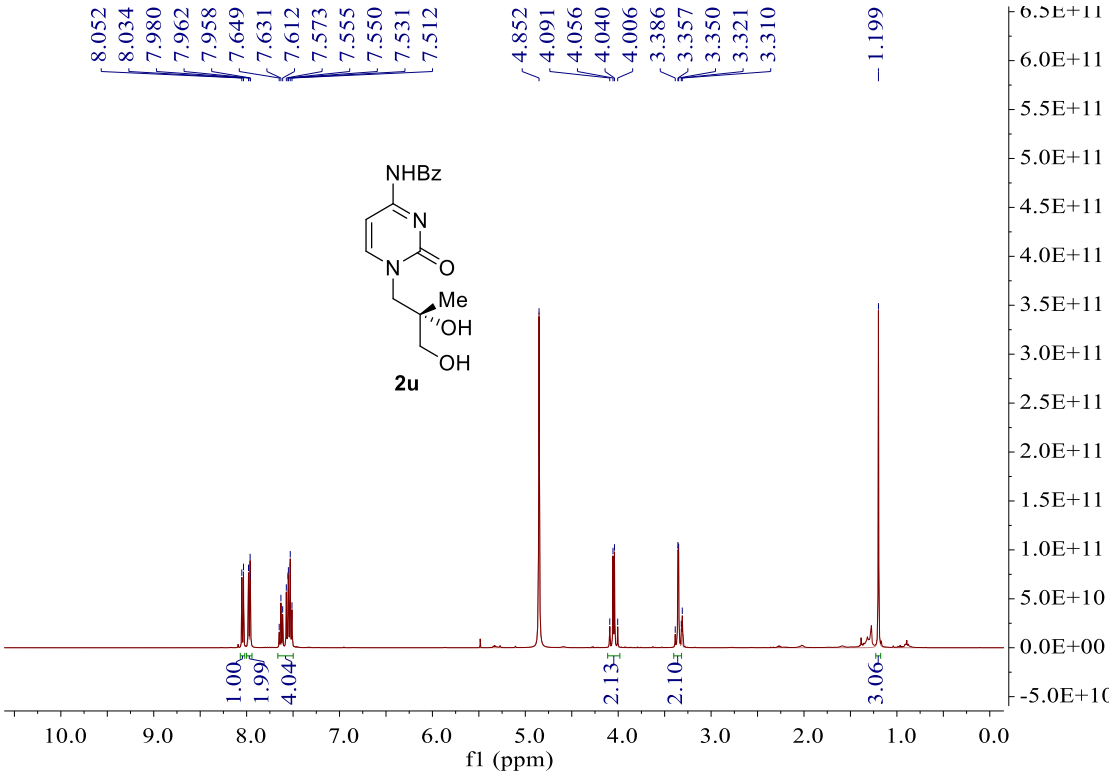
N
Cl
N
N
Me
OH
OH
2t
1.00
2.13
2.13
3.16
fl (ppm)


155.44
153.70
151.69
150.18
131.01
73.25
68.44
51.67
49.43
49.28
49.14
49.00
48.86
48.72
48.58
22.43
Cl
N
N
Cl
N
N
Me
OH
OH
2t
fl (ppm)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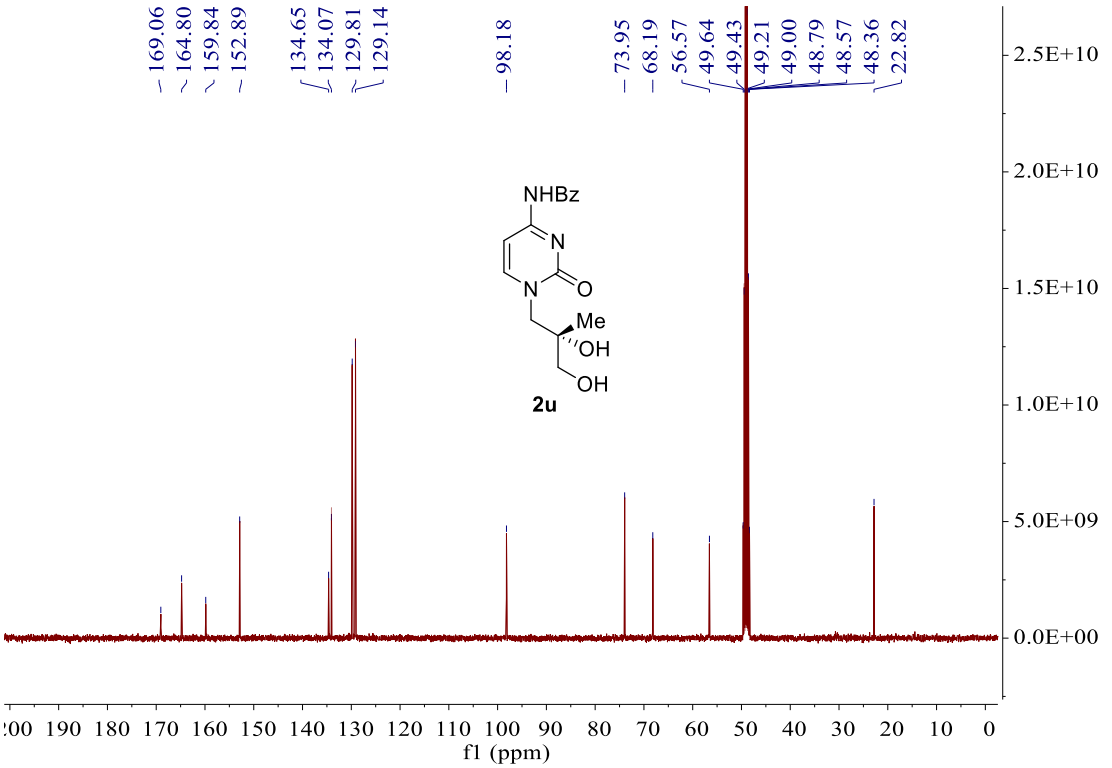
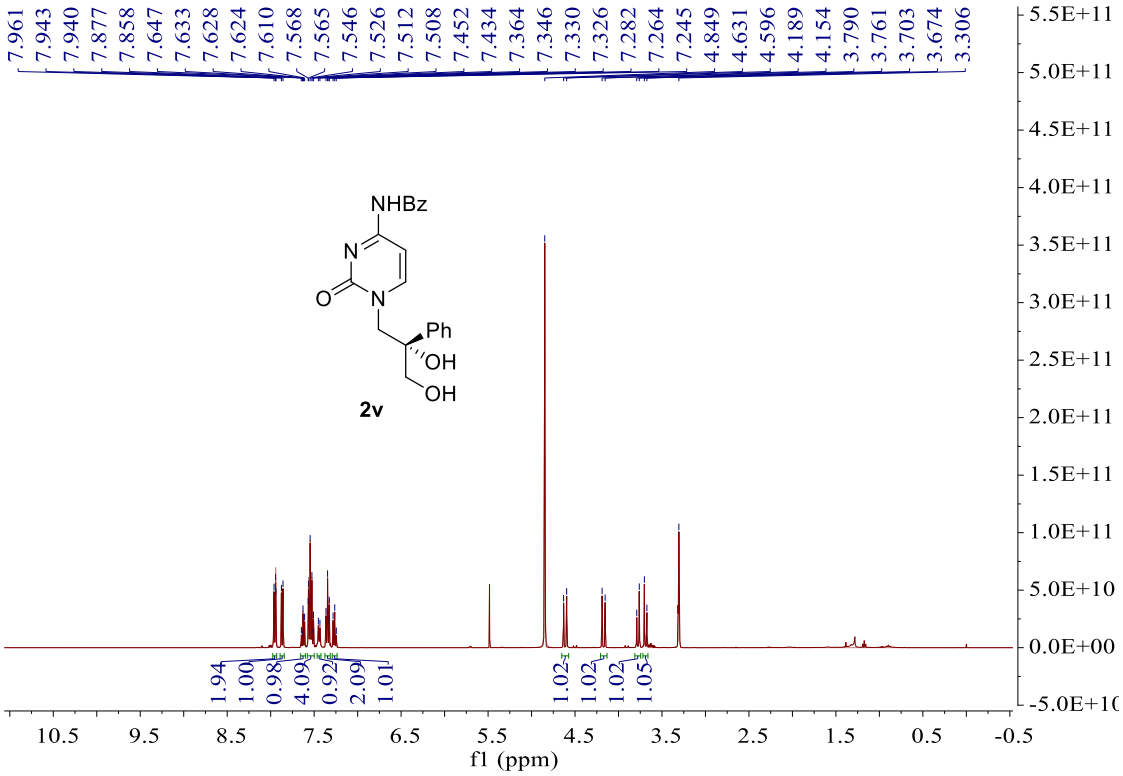
7.958
7.649
7.631
7.612
7.573
7.555
7.550
7.531
7.512
4.852
4.091
4.056
4.040
4.006
3.386
3.357
3.350
3.321
3.310
1.199
NHBz
N
N
O
Me
OH
OH
2u
1.00
1.99
4.04
2.13
2.10
3.06
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
f1 (ppm)


169.06
164.80
159.84
152.89
134.65
134.07
129.81
129.14
98.18
73.95
68.19
56.57
49.64
49.43
49.21
49.00
48.79
48.57
48.36
22.82
NHBz
N
N
O
Me
OH
OH
2u
f1 (ppm)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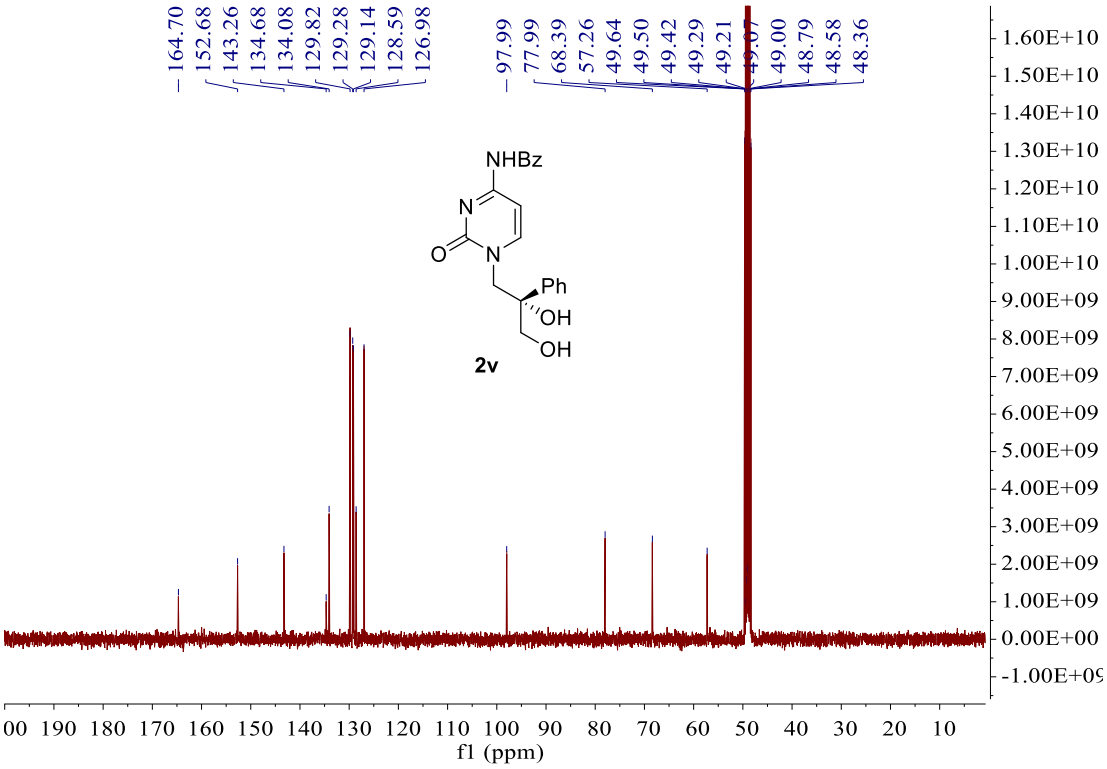
7.940
7.877
7.858
7.647
7.633
7.628
7.624
7.610
7.568
7.565
7.546
7.526
7.512
7.508
7.452
7.434
7.364
7.346
7.330
7.326
7.282
7.264
7.245
4.849
4.631
4.596
4.189
4.154
3.790
3.761
3.703
3.674
3.306
NHBz
N
O
N
Ph
OH
OH
2v
1.94
1.00
0.98
4.09
0.92
2.09
1.01
1.02
1.02
1.02
1.05
5.5E+11
5.0E+11
4.5E+11
4.0E+11
3.5E+11
3.0E+11
2.5E+11
2.0E+11
1.5E+11
1.0E+11
5.0E+10
0.0E+00
-5.0E+10
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)


164.70
152.68
143.26
134.68
134.08
129.82
129.28
129.14
128.59
126.98
97.99
77.99
68.39
57.26
49.64
49.50
49.42
49.29
49.21
49.07
49.00
48.79
48.58
48.36
NHBz
N
O
N
Ph
OH
OH
2v
1.60E+10
1.50E+10
1.40E+10
1.30E+10
1.20E+10
1.10E+10
1.00E+10
9.00E+09
8.00E+09
7.00E+09
6.00E+09
5.00E+09
4.00E+09
3.00E+09
2.00E+09
1.00E+09
0.00E+00
-1.00E+09
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
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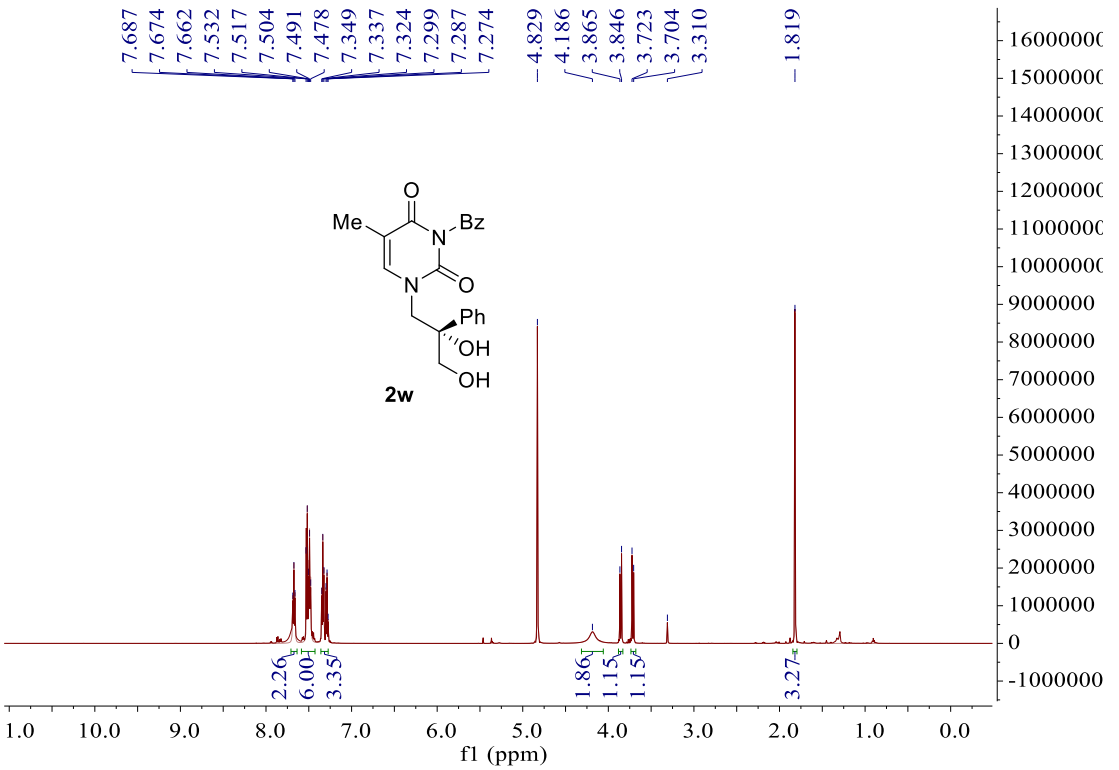
30
20
10
f1 (ppm)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7.504
7.491
7.478
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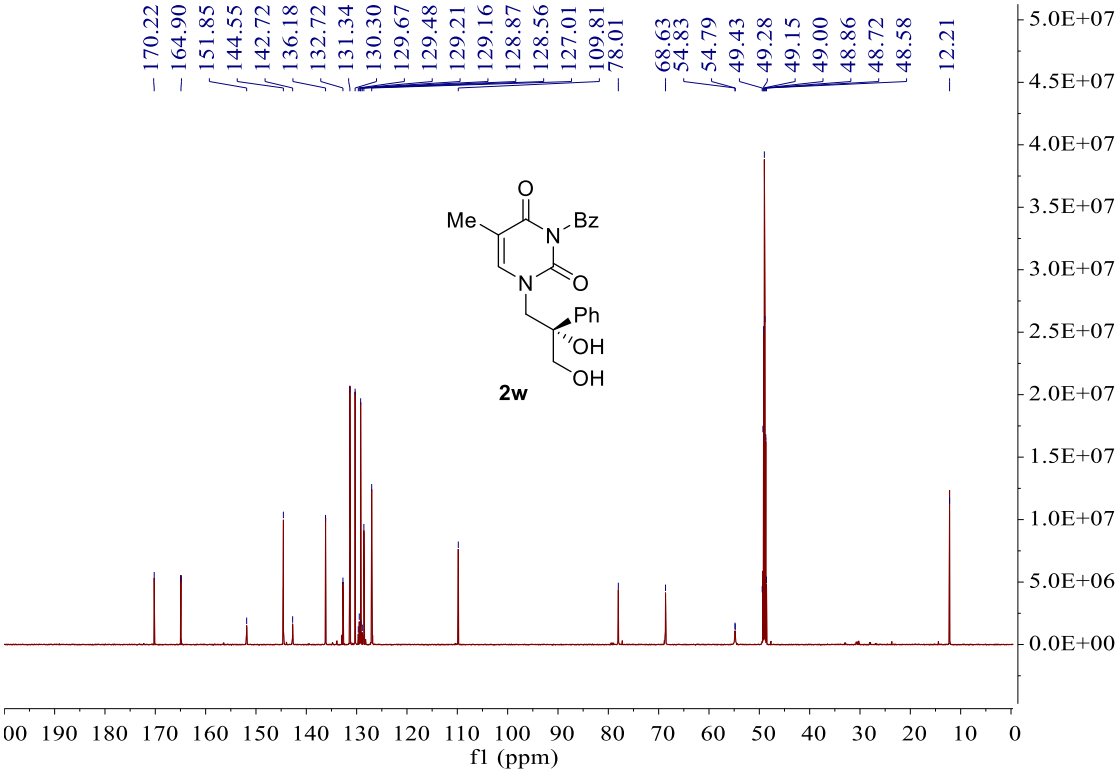
7.337
7.324
7.299
7.287
7.274
4.829
4.186
3.865
3.846
3.723
3.704
3.310
1.819
Me
Bz
Ph
OH
OH
2w
2.26
6.00
3.35
1.86
1.15
1.15
3.27
fl (ppm)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136.18
132.72
131.34
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129.67
129.48
129.21
129.16
128.87
128.56
127.01
109.81
78.01
68.63
54.83
54.79
49.43
49.28
49.15
49.00
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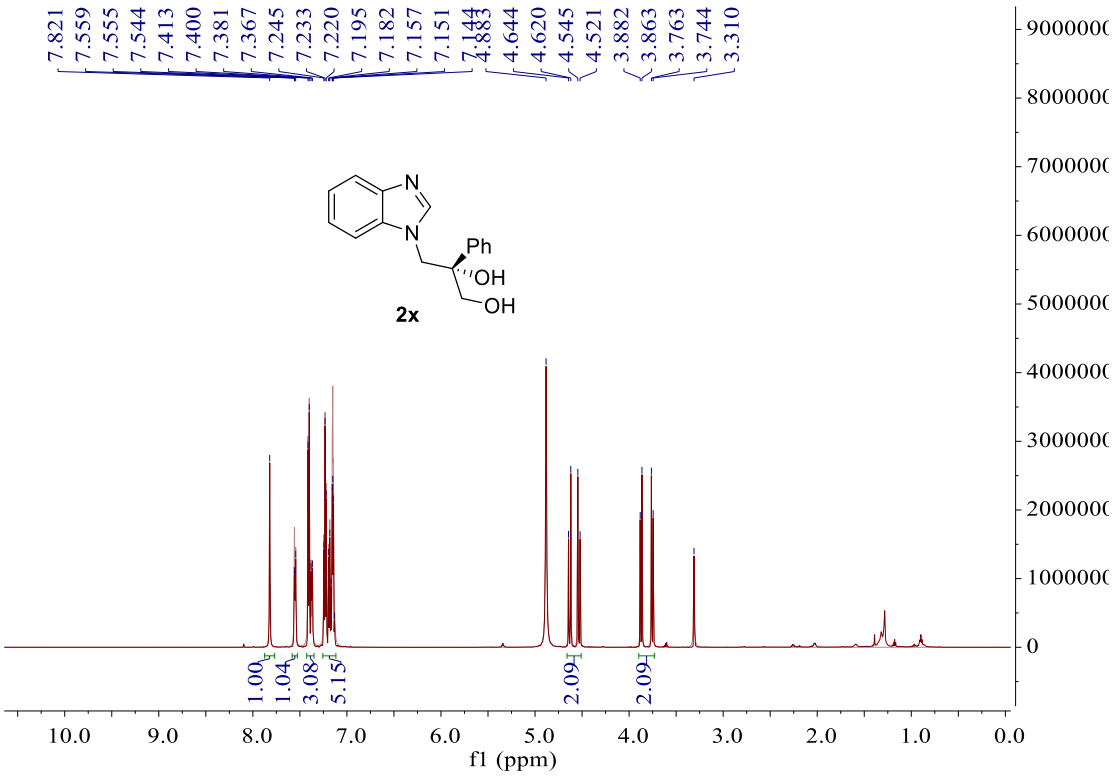
Me
Bz
Ph
OH
OH
2w
fl (ppm)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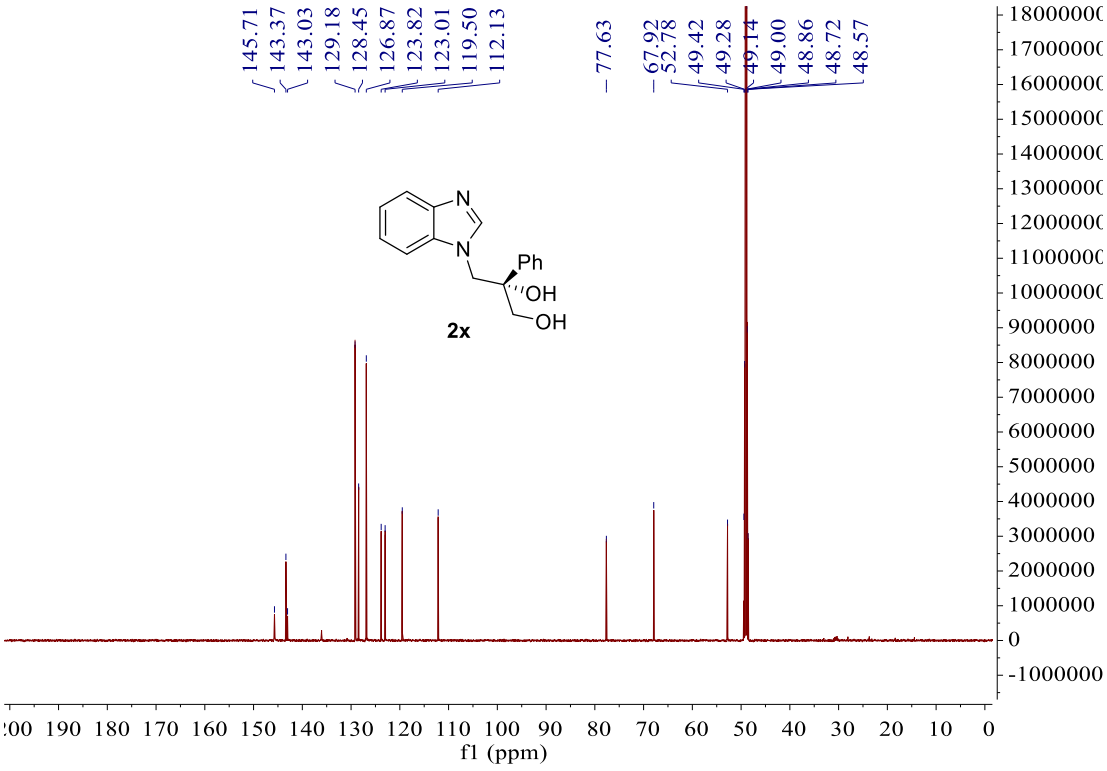
7.555
7.544
7.413
7.400
7.381
7.367
7.245
7.233
7.220
7.195
7.182
7.157
7.151
7.144
4.883
4.644
4.620
4.545
4.521
3.882
3.863
3.763
3.744
3.310
Ph
OH
OH
2x
1.00
1.04
3.08
5.15
2.09
2.09
f1 (ppm)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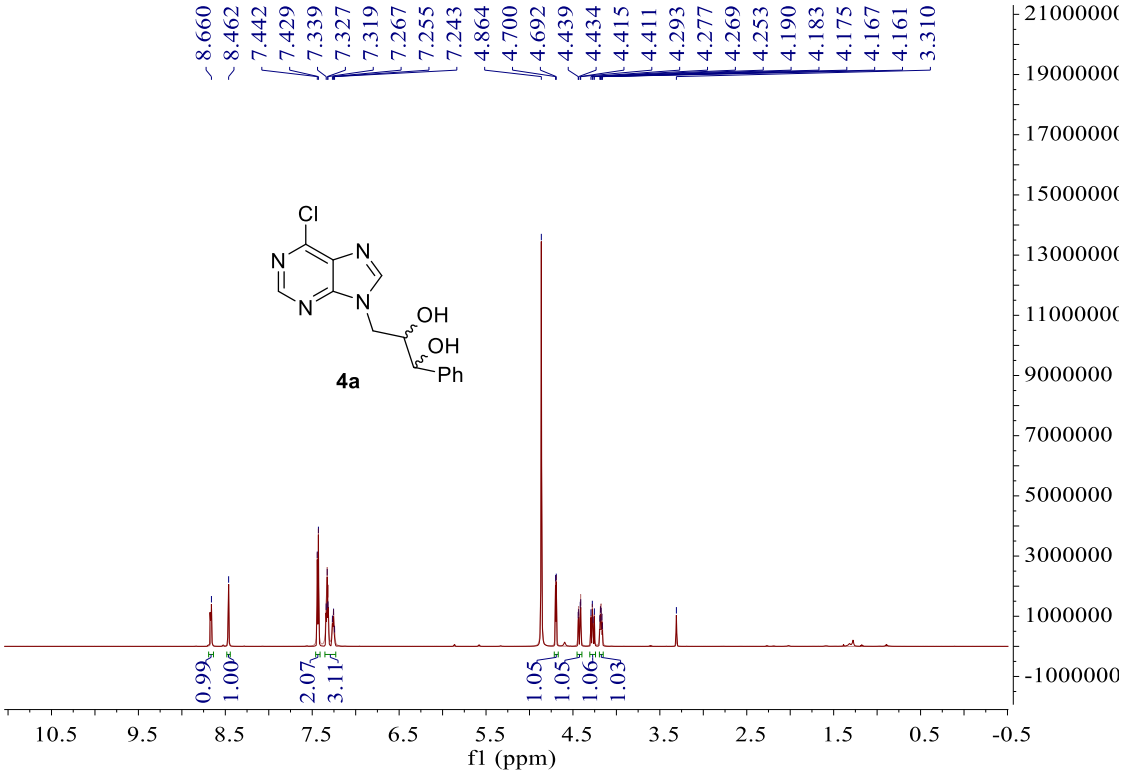
143.37
143.03
129.18
128.45
126.87
123.82
123.01
119.50
112.13
77.63
67.92
52.78
49.42
49.28
49.14
49.00
48.86
48.72
48.57
Ph
OH
OH
2x
f1 (ppm)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7.327
7.319
7.267
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7.243
4.864
4.700
4.692
4.439
4.434
4.415
4.411
4.293
4.277
4.269
4.253
4.190
4.183
4.175
4.167
4.161
3.310
Cl
N
N
N
N
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OH
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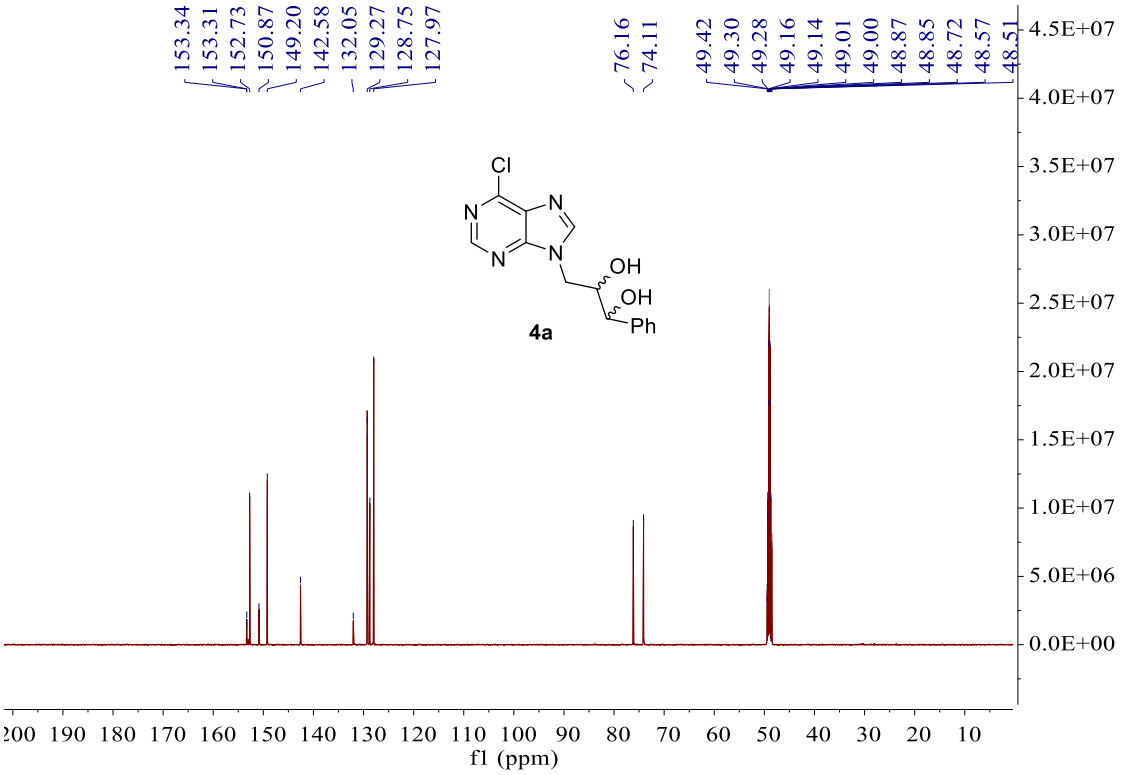
4a
0.99
1.00
2.07
3.11
1.05
1.05
1.06
1.03
f1 (ppm)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152.73
150.87
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142.58
132.05
129.27
128.75
127.97
76.16
74.11
49.42
49.30
49.28
49.16
49.14
49.01
49.00
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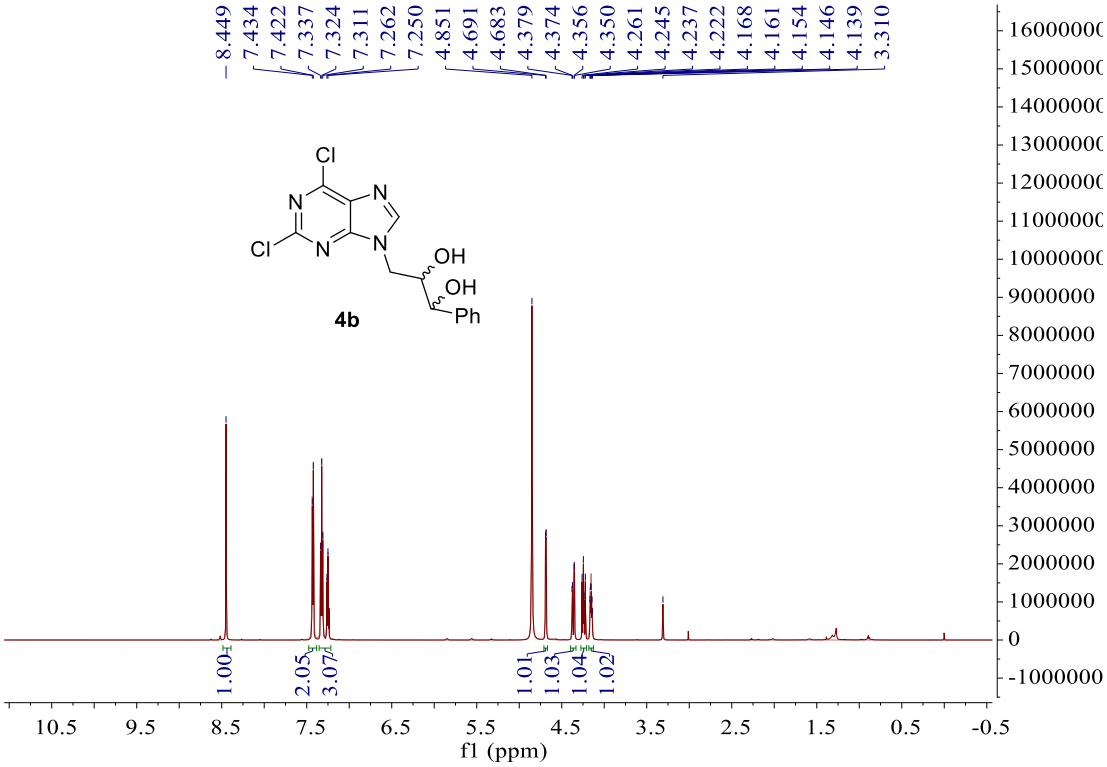
48.85
48.72
48.57
48.51
Cl
N
N
N
N
OH
OH
Ph
4a
f1 (ppm)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7.324
7.311
7.262
7.250
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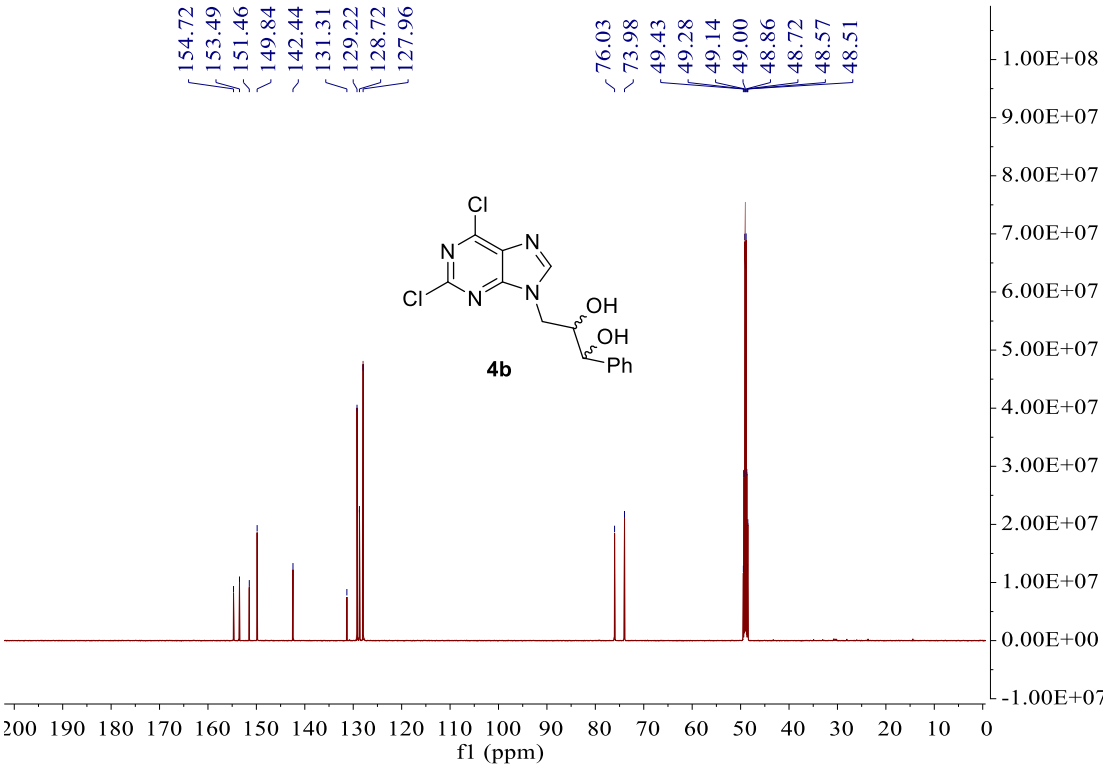
4.691
4.683
4.379
4.374
4.356
4.350
4.261
4.245
4.237
4.222
4.168
4.161
4.154
4.146
4.139
3.310
Cl
N
N
Cl
N
N
OH
OH
Ph
4b
1.00
2.05
3.07
1.01
1.03
1.04
1.02
f1 (ppm)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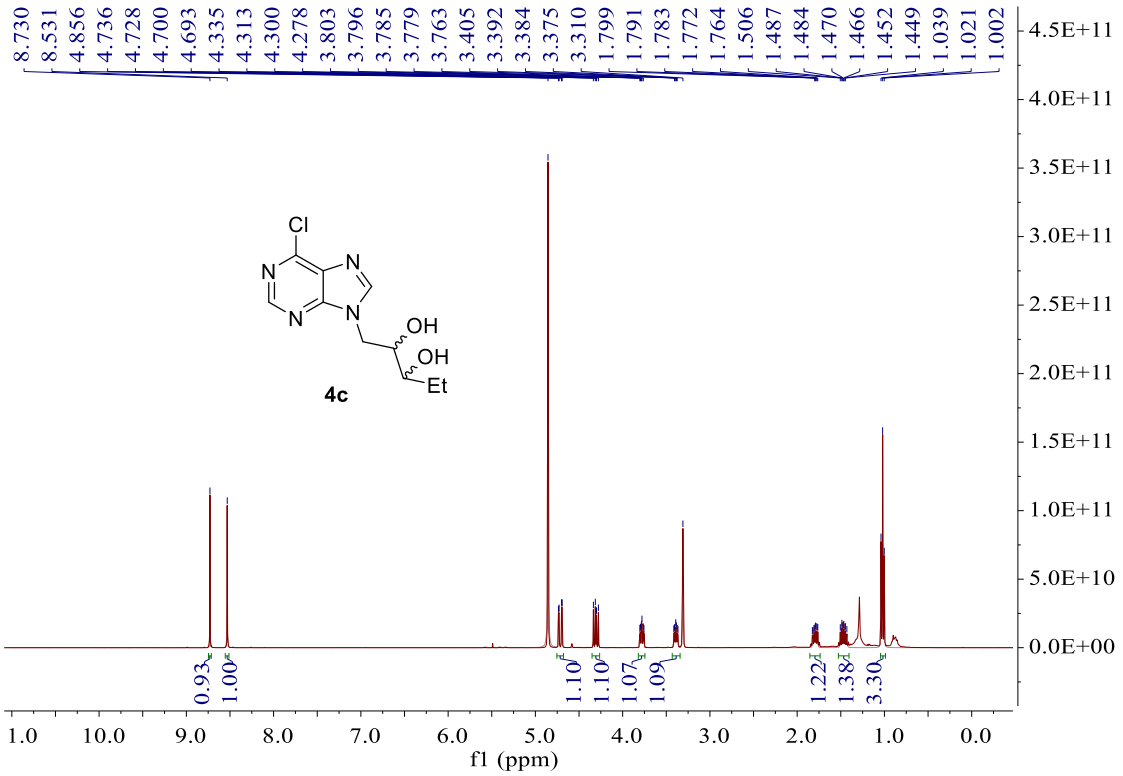
142.44
131.31
129.22
128.72
127.96
76.03
73.98
49.43
49.28
49.14
49.00
48.86
48.72
48.57
48.51
Cl
N
N
Cl
N
N
OH
OH
Ph
4b
f1 (ppm)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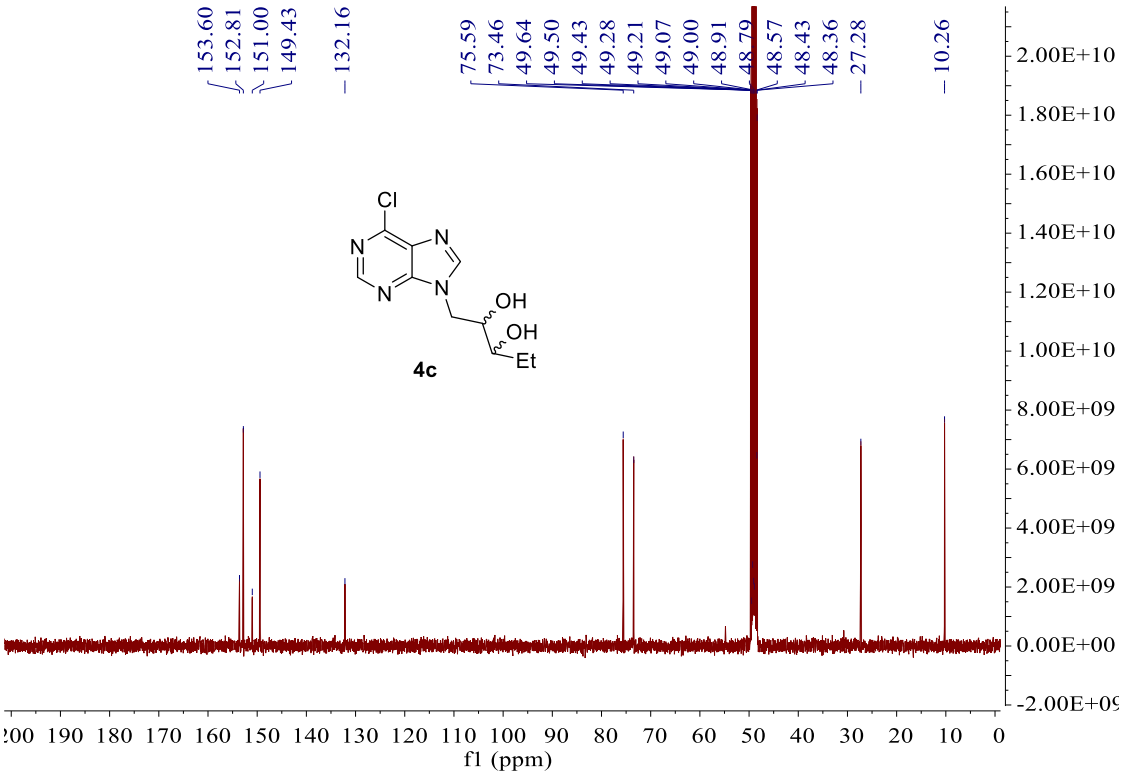
4.728
4.700
4.693
4.335
4.313
4.300
4.278
3.803
3.796
3.785
3.779
3.763
3.405
3.392
3.384
3.375
3.310
1.799
1.791
1.783
1.772
1.764
1.506
1.487
1.484
1.470
1.466
1.452
1.449
1.039
1.021
1.002
Cl
N
N
N
N
OH
OH
Et
4c
0.93
1.00
1.10
1.10
1.07
1.09
1.22
1.38
3.30
f1 (ppm)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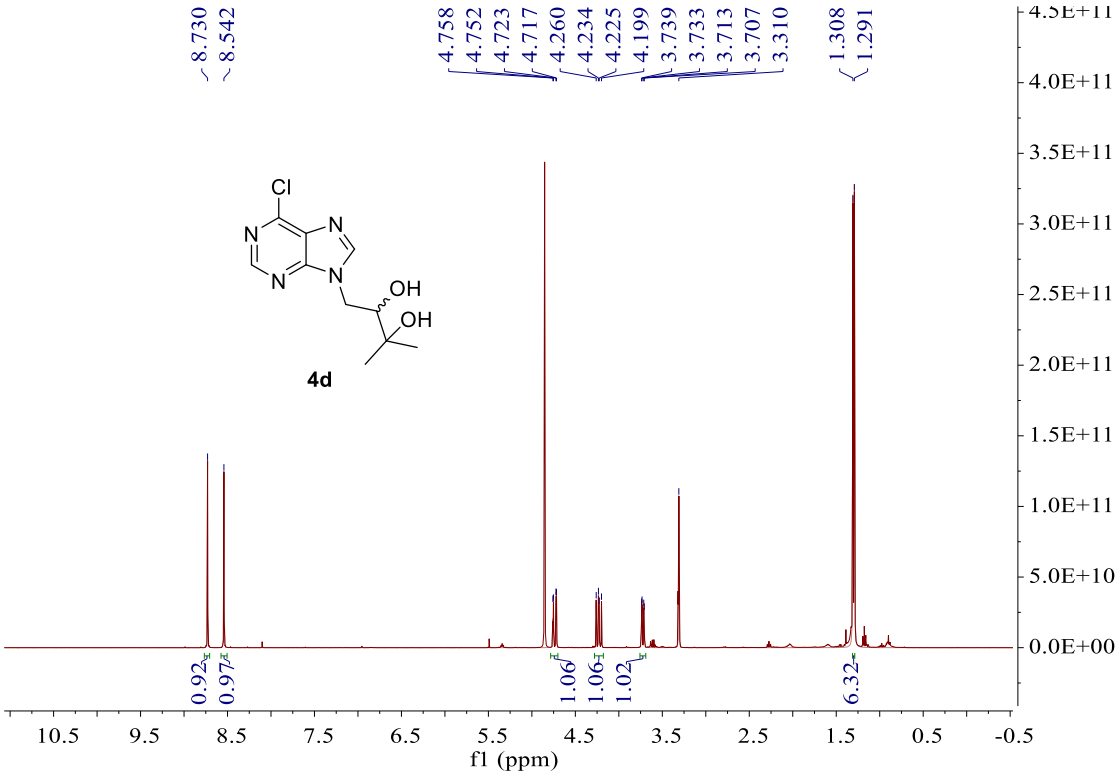
132.16
75.59
73.46
49.64
49.50
49.43
49.28
49.21
49.07
49.00
48.91
48.79
48.57
48.43
48.36
27.28
10.26
Cl
N
N
N
N
OH
OH
Et
4c
f1 (ppm)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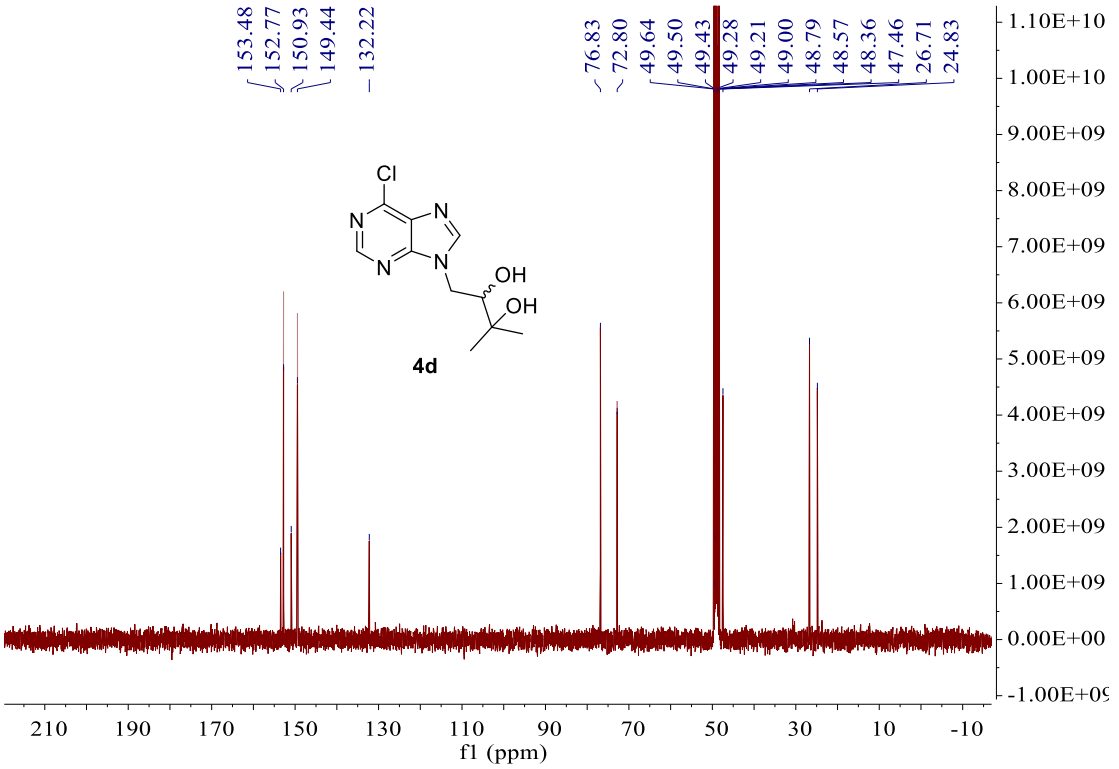
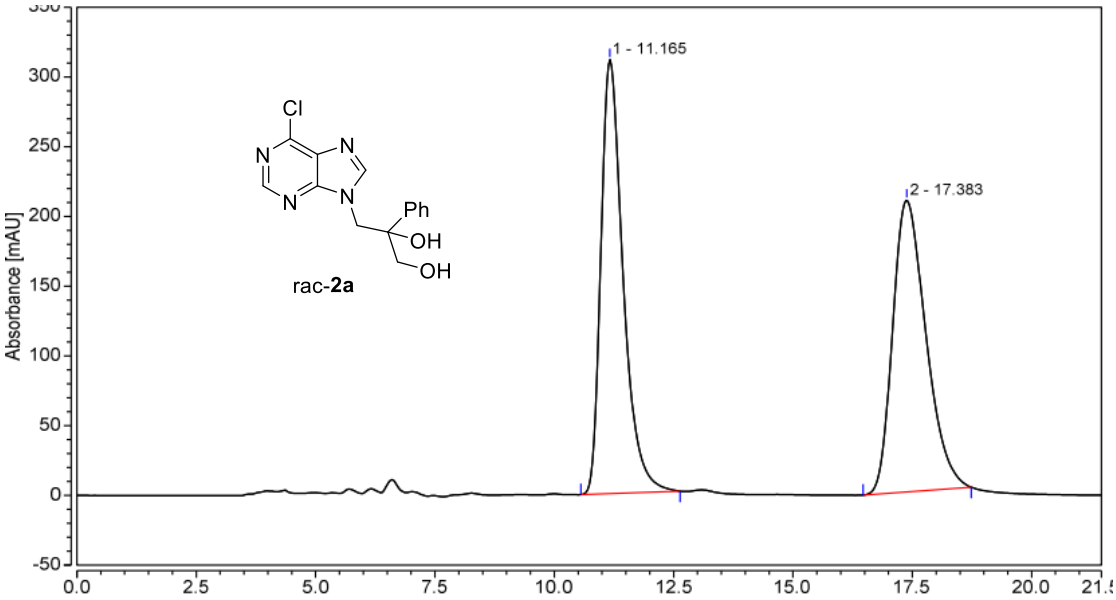
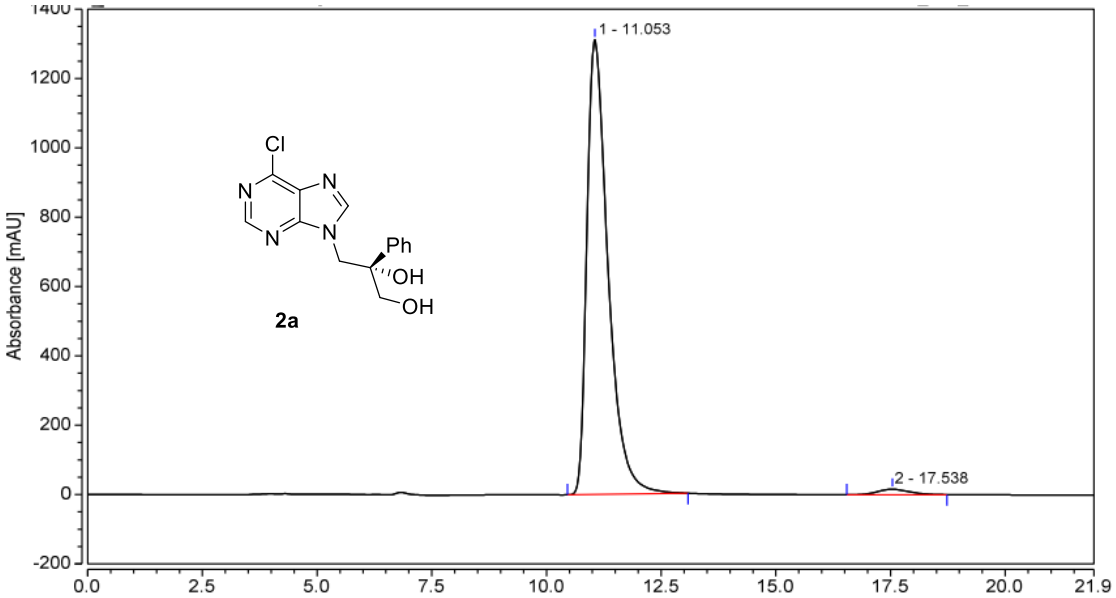
4.717
4.260
4.234
4.225
4.199
3.739
3.733
3.713
3.707
3.310
1.308
1.291
Cl
N
N
N
N
OH
OH
4d
0.92
0.97
1.06
1.06
1.02
6.32
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)
4.5E+11
4.0E+11
3.5E+11
3.0E+11
2.5E+11
2.0E+11
1.5E+11
1.0E+11
5.0E+10
0.0E+00


153.48
152.77
150.93
149.44
132.22
76.83
72.80
49.64
49.50
49.43
49.28
49.21
49.00
48.79
48.57
48.36
47.46
26.71
24.83
Cl
N
N
N
N
OH
OH
4d
210
190
170
150
130
110
90
70
50
30
10
-10
f1 (ppm)
1.10E+10
1.00E+10
9.00E+09
8.00E+09
7.00E+09
6.00E+09
5.00E+09
4.00E+09
3.00E+09
2.00E+09
1.00E+09
0.00E+00
-1.00E+09

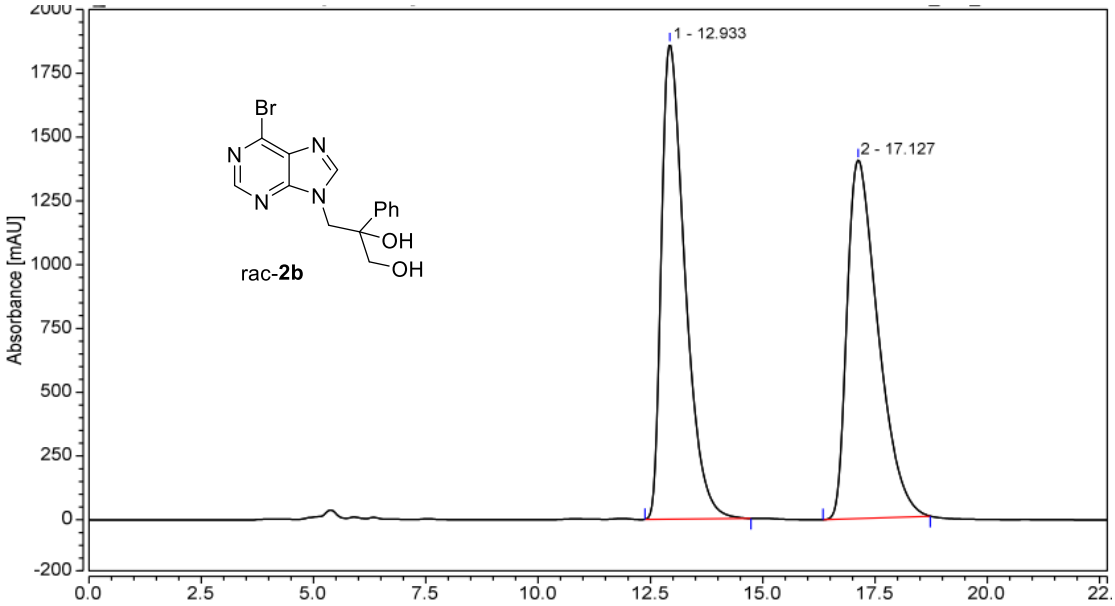
6. Copies of HPLC spectra for racemic and chiral products



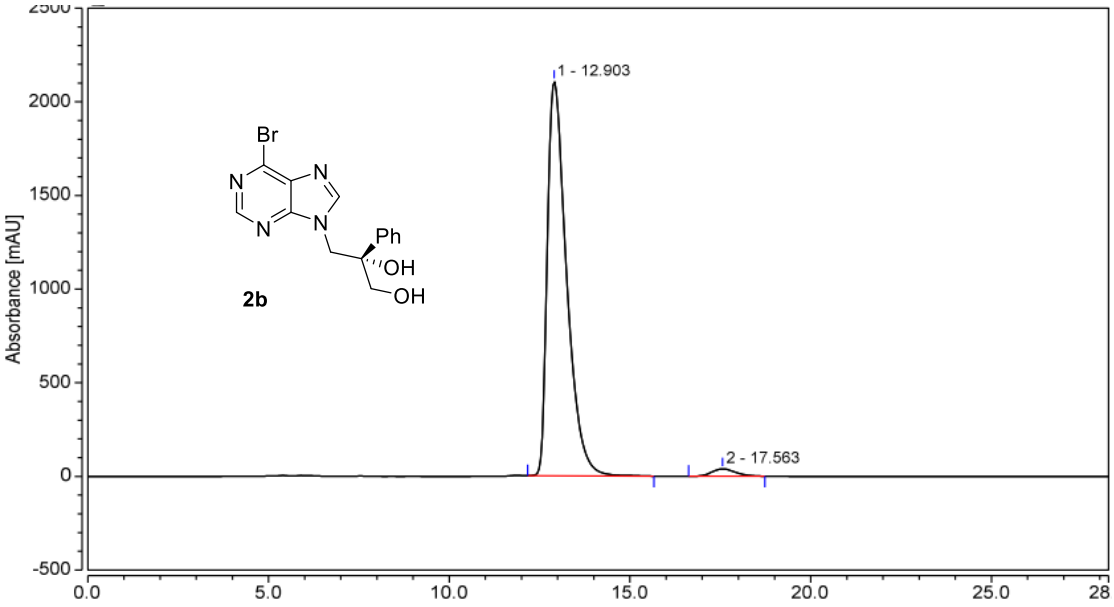
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	11.165	167.352	311.121	49.82	59.80
2	17.383	168.594	209.119	50.18	40.20
Total:		**335.946**	**520.240**	**100.00**	**100.00**



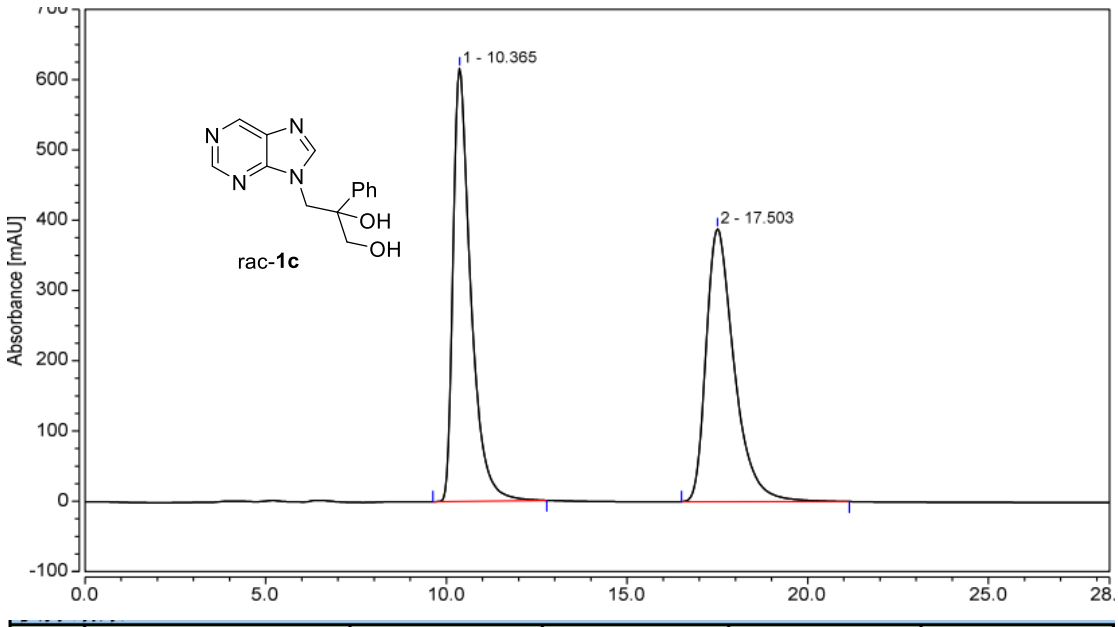
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	11.053	701.300	1311.749	98.23	98.80
2	17.538	12.660	15.895	1.77	1.20
Total:		**713.960**	**1327.644**	**100.00**	**100.00**



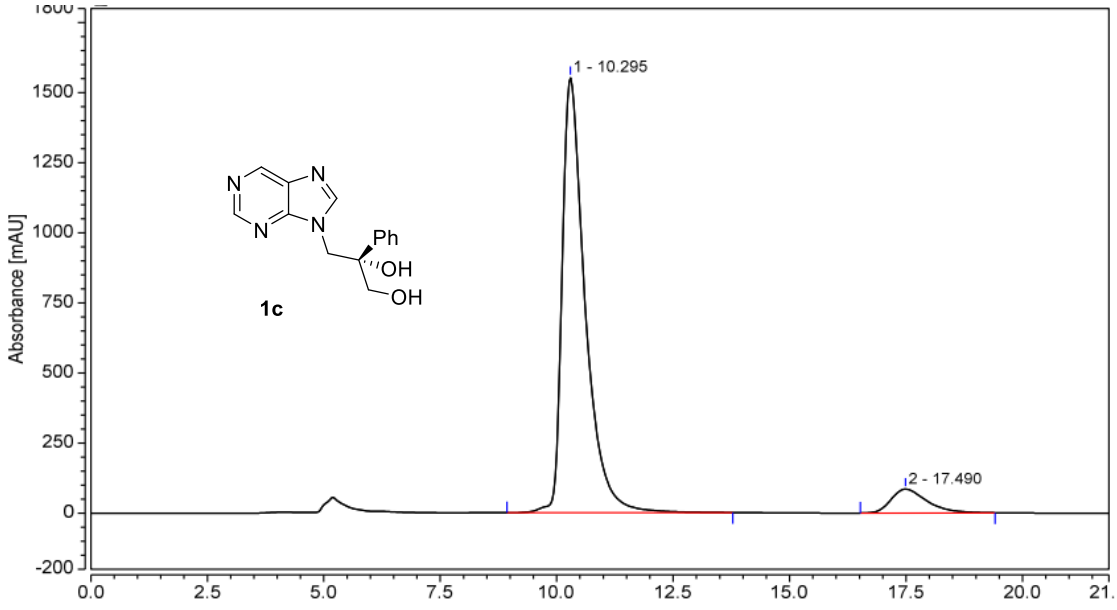
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	12.933	1136.935	1862.039	50.26	56.99
2	17.127	1125.214	1405.105	49.74	43.01
Total:		**2262.149**	**3267.144**	**100.00**	**100.00**



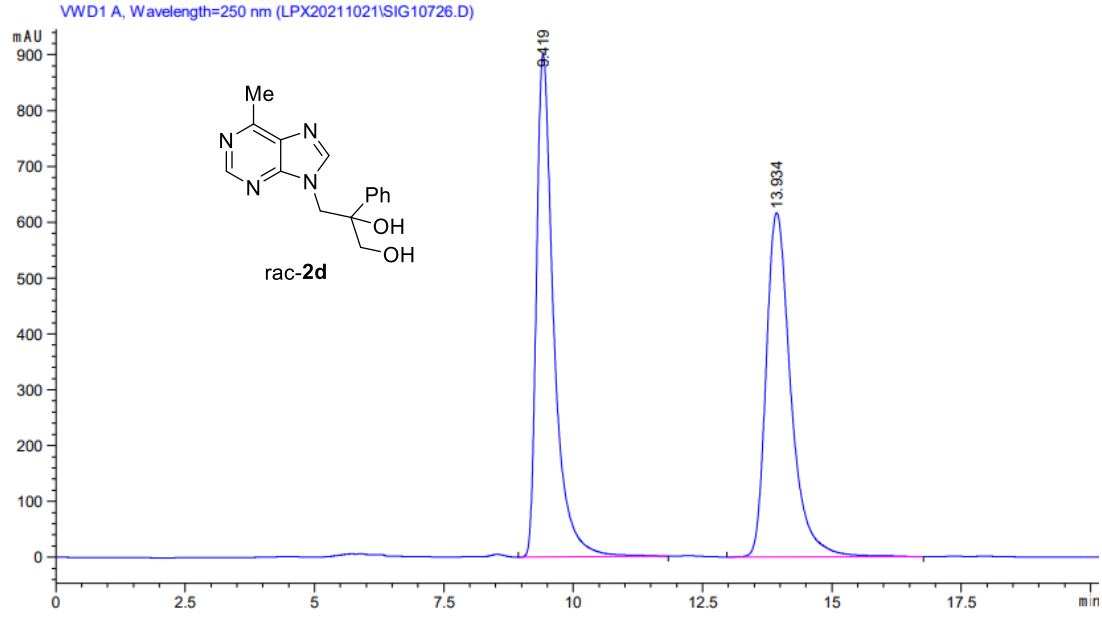
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	12.903	1299.200	2106.591	97.74	98.18
2	17.563	30.009	39.047	2.26	1.82
Total:		**1329.210**	**2145.638**	**100.00**	**100.00**



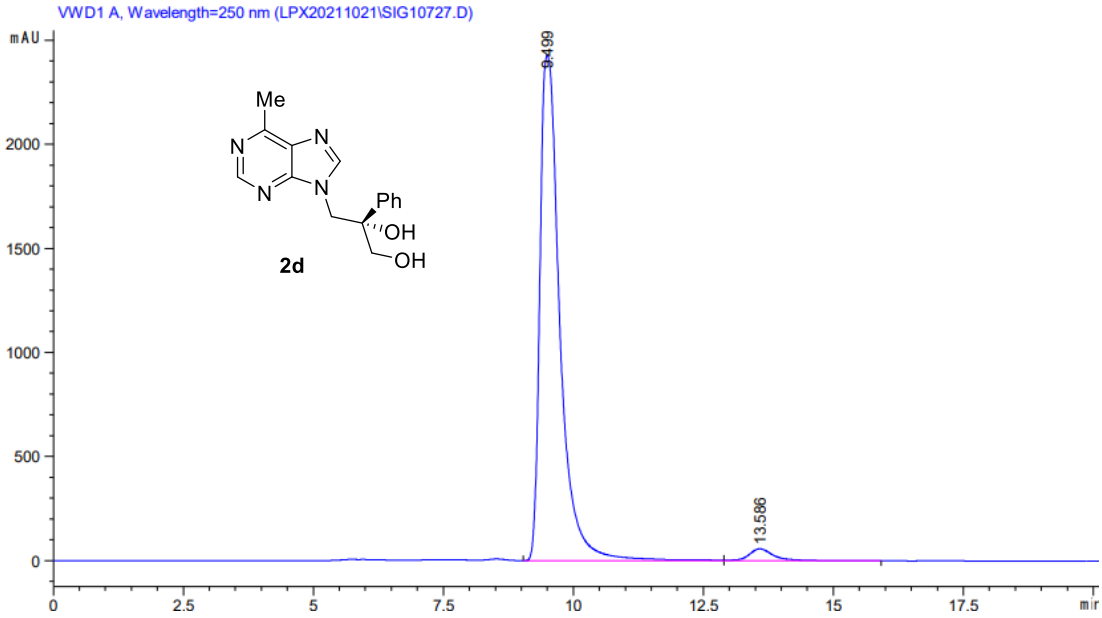
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	10.365	350.900	616.267	50.01	61.36
2	17.503	350.772	388.160	49.99	38.64
Total:		**701.672**	**1004.427**	**100.00**	**100.00**



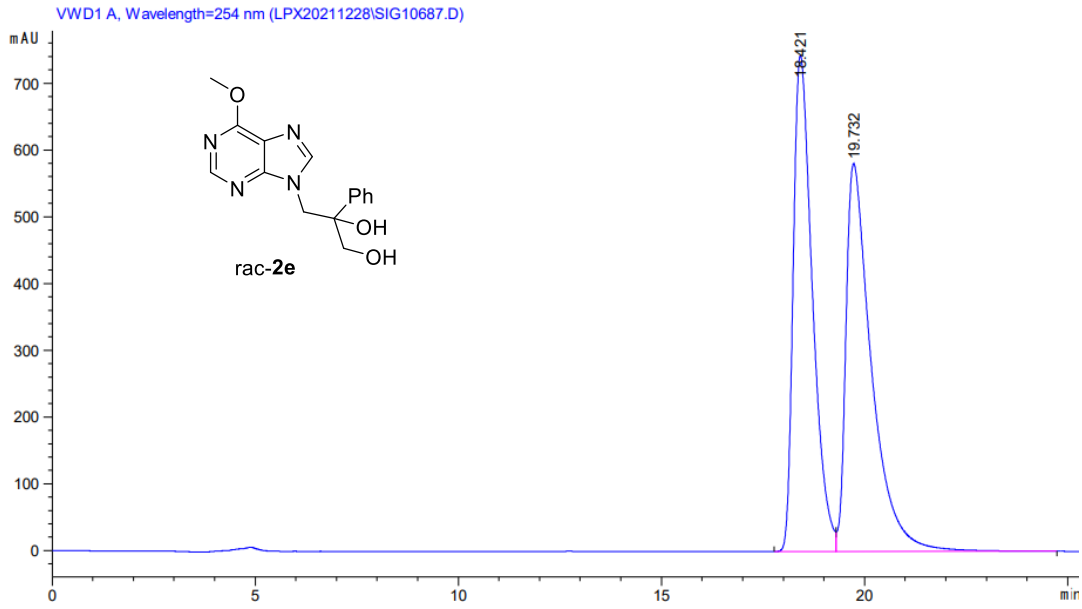
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	10.295	890.426	1552.128	92.17	94.80
2	17.490	75.681	85.071	7.83	5.20
Total:		**966.107**	**1637.199**	**100.00**	**100.00**



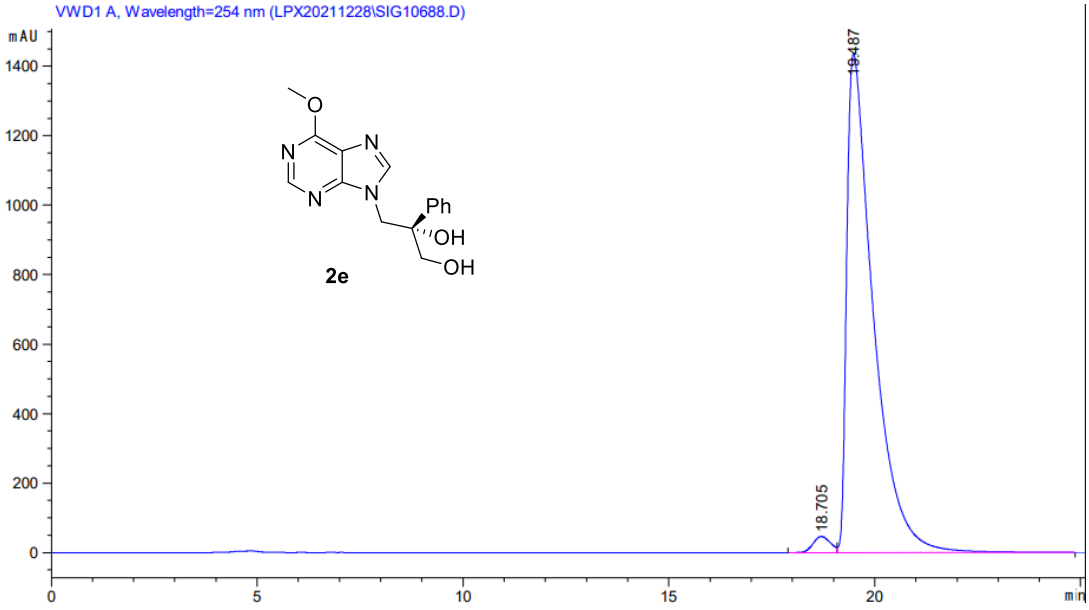
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.419	BB	0.3492	2.10025e4	900.87622	50.6758
2	13.934	BB	0.5019	2.04424e4	616.66986	49.3242



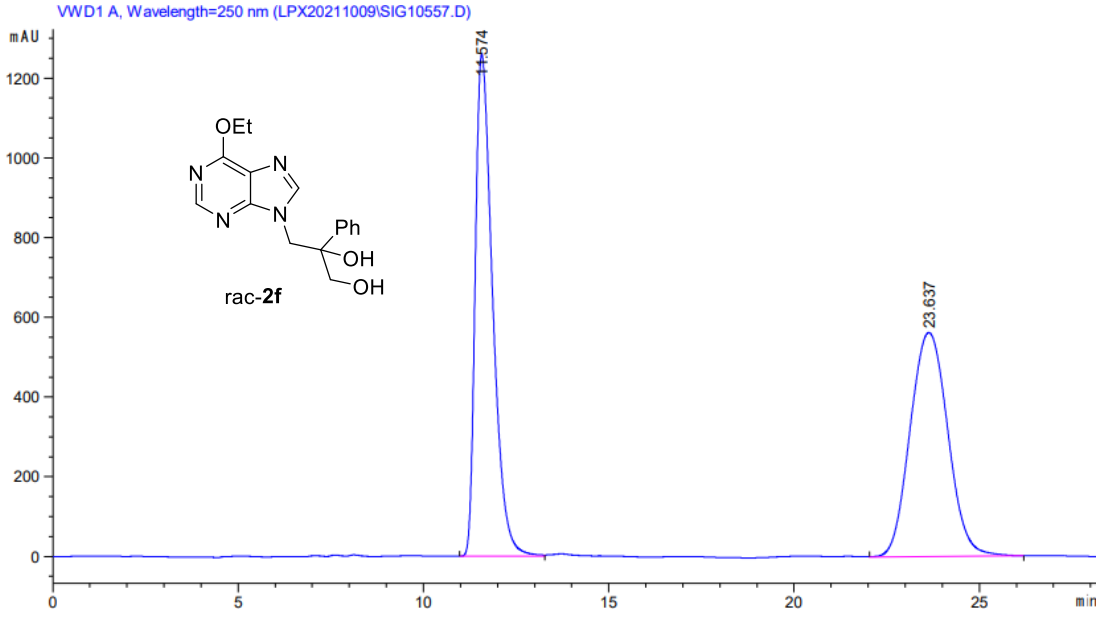
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.499	BV	0.4028	6.50035e4	2427.77441	97.0294
2	13.586	VB	0.5024	1990.09985	57.57198	2.9706



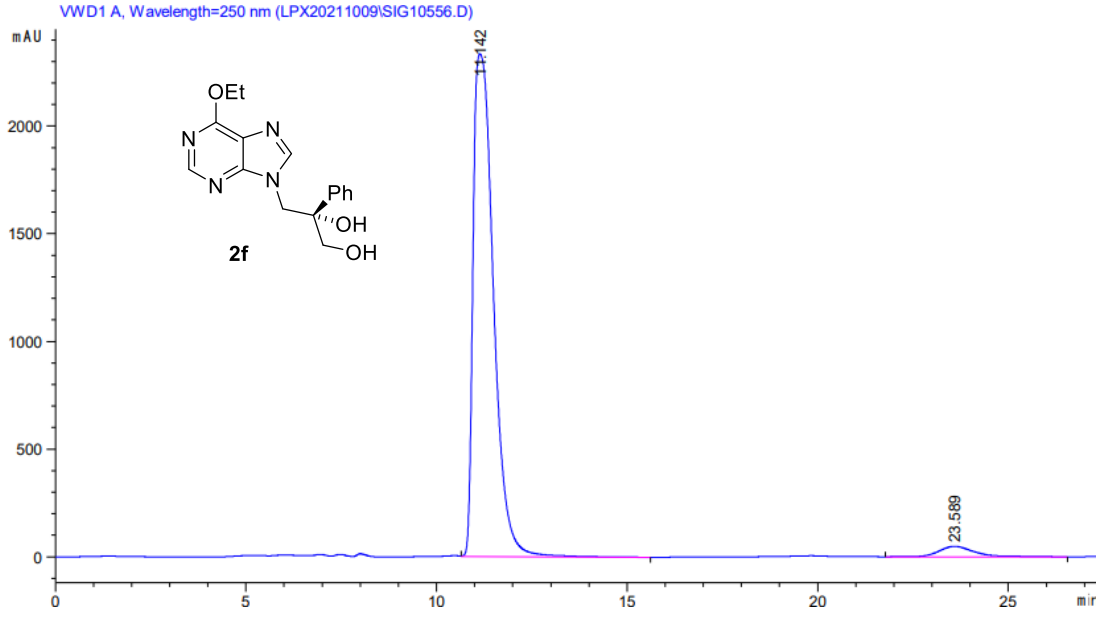
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.421	BV	0.5020	2.43653e4	743.31049	48.8697
2	19.732	VB	0.6429	2.54924e4	581.16443	51.1303



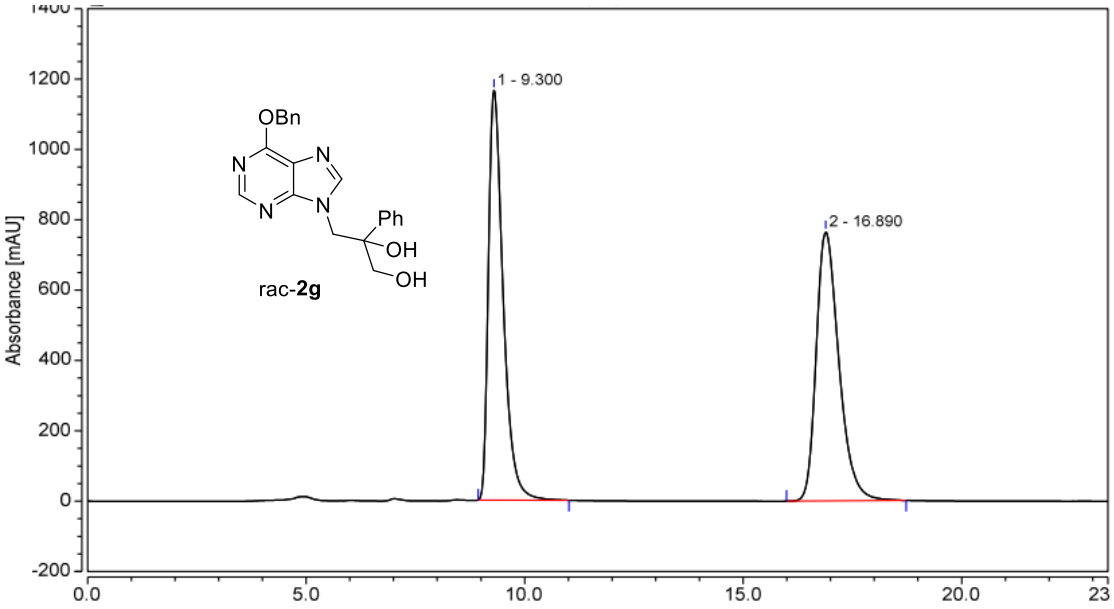
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.705	BV	0.4531	1344.50562	46.41127	2.0501
2	19.487	VB	0.6528	6.42378e4	1436.74744	97.9499



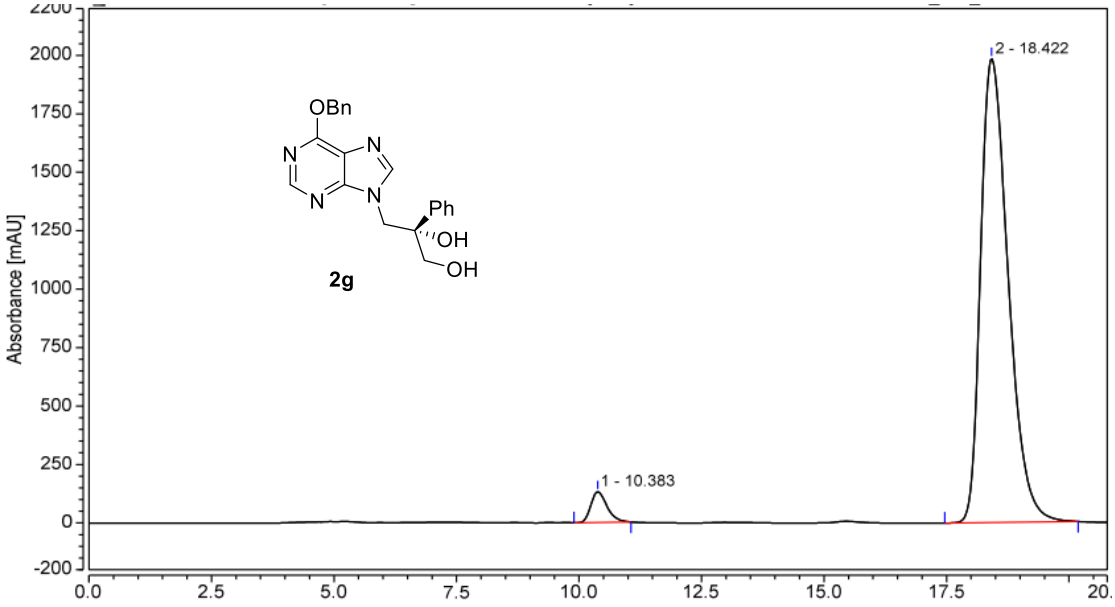
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.574	BV	0.4934	4.09975e4	1259.80493	50.7454
2	23.637	VB	1.0798	3.97931e4	561.97565	49.2546



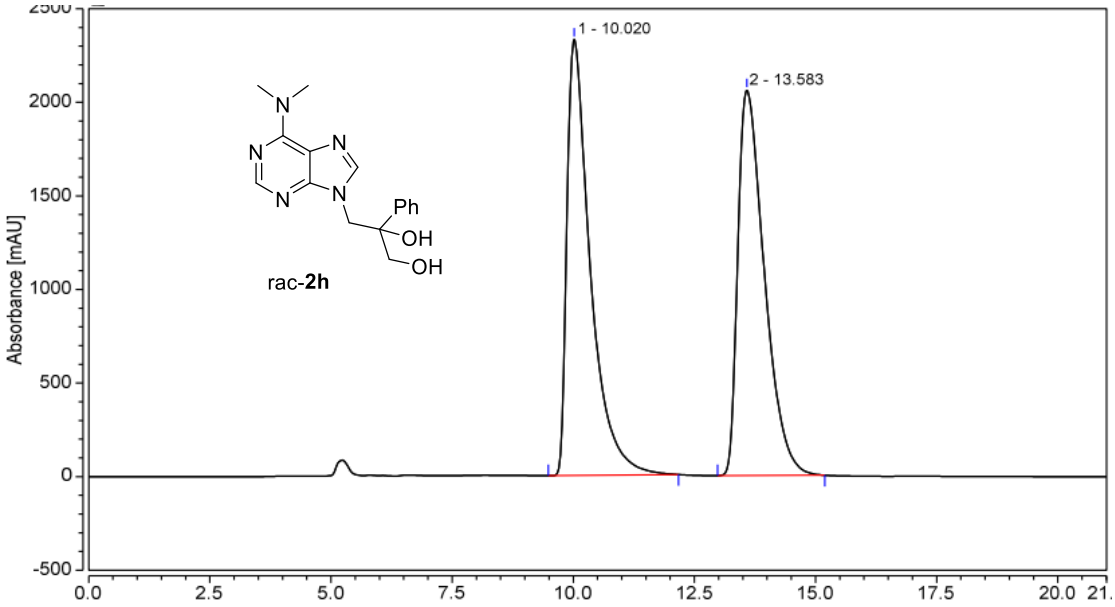
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.142	VB	0.5744	8.66354e4	2334.20801	96.4463
2	23.589	BB	0.9708	3192.19116	48.38729	3.5537



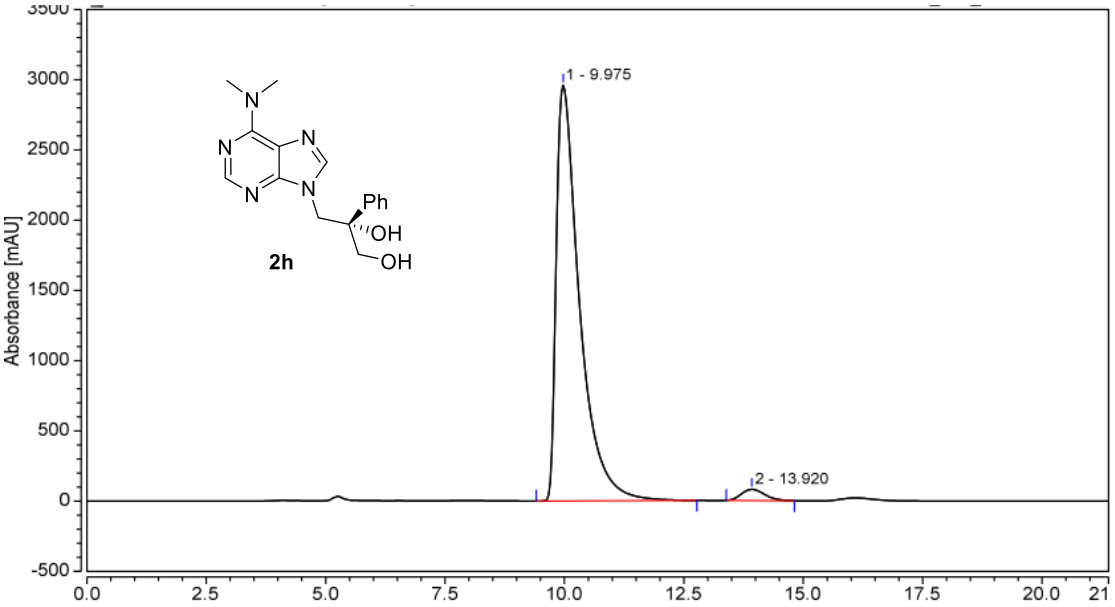
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	9.300	450.531	1165.175	49.51	60.35
2	16.890	459.428	765.490	50.49	39.65
Total:		**909.960**	**1930.665**	**100.00**	**100.00**



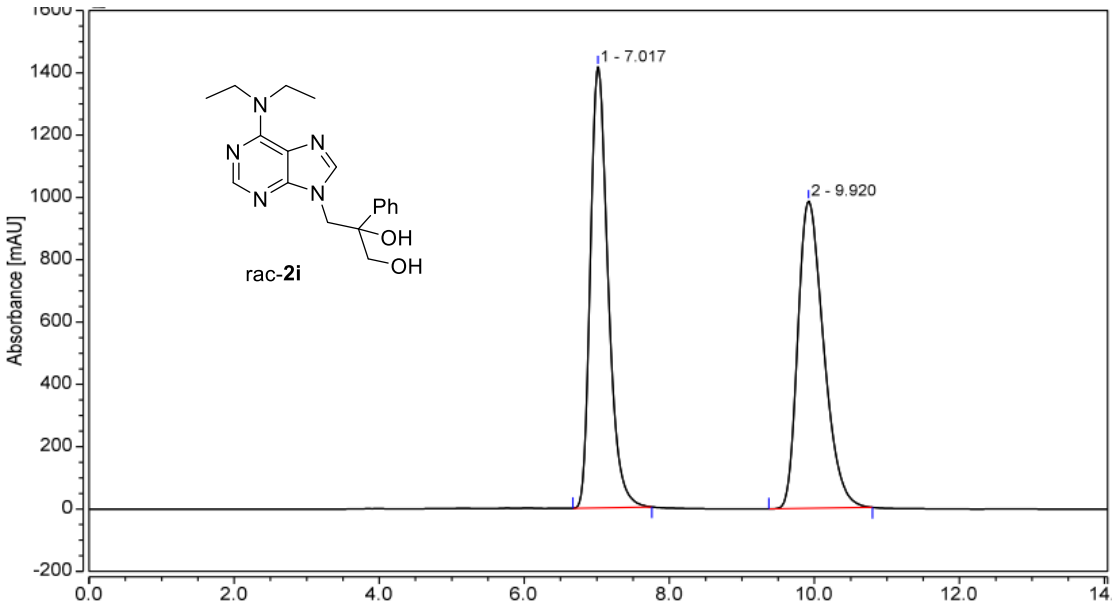
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	10.383	50.304	131.164	3.74	6.20
2	18.422	1293.865	1983.993	96.26	93.80
Total:		**1344.168**	**2115.157**	**100.00**	**100.00**



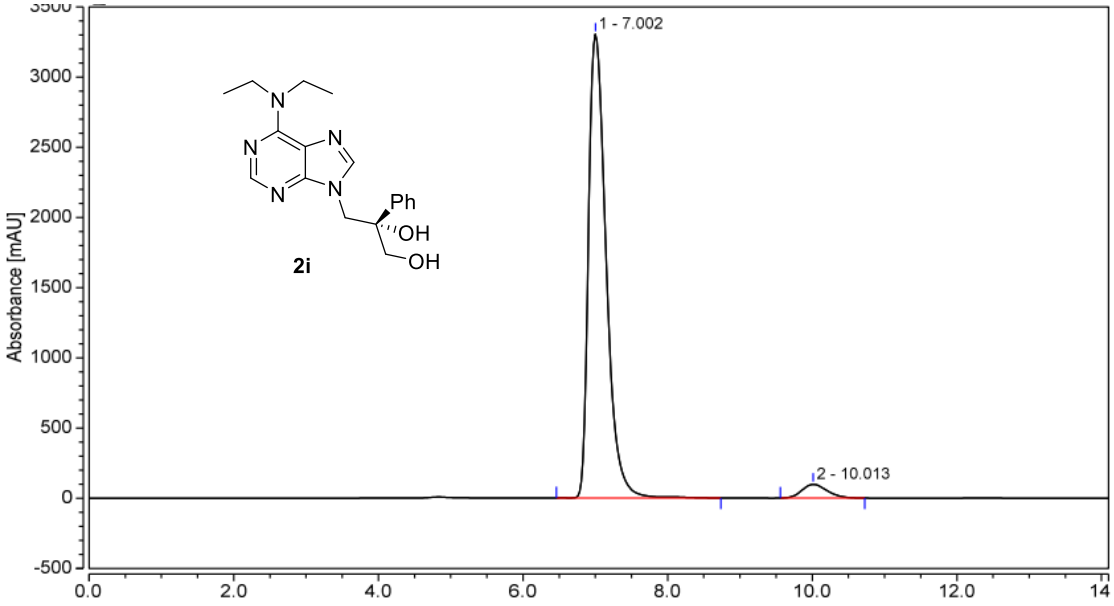
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	10.020	1303.164	2330.252	49.93	53.08
2	13.583	1307.052	2060.051	50.07	46.92
Total:		**2610.216**	**4390.303**	**100.00**	**100.00**



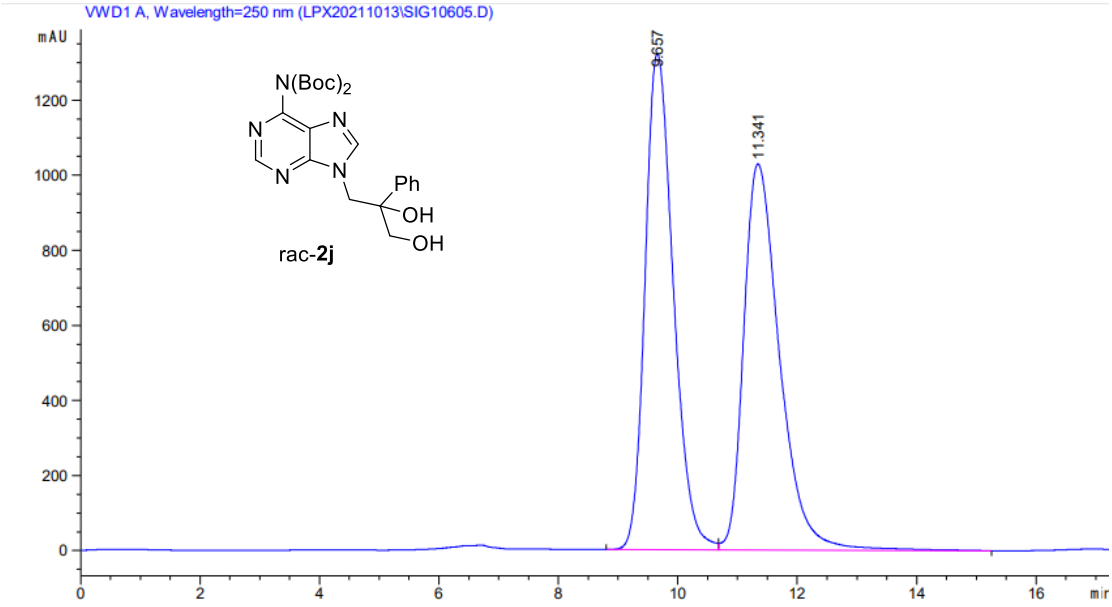
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	9.975	1671.614	2959.782	97.39	97.38
2	13.920	44.731	79.707	2.61	2.62
Total:		**1716.345**	**3039.489**	**100.00**	**100.00**



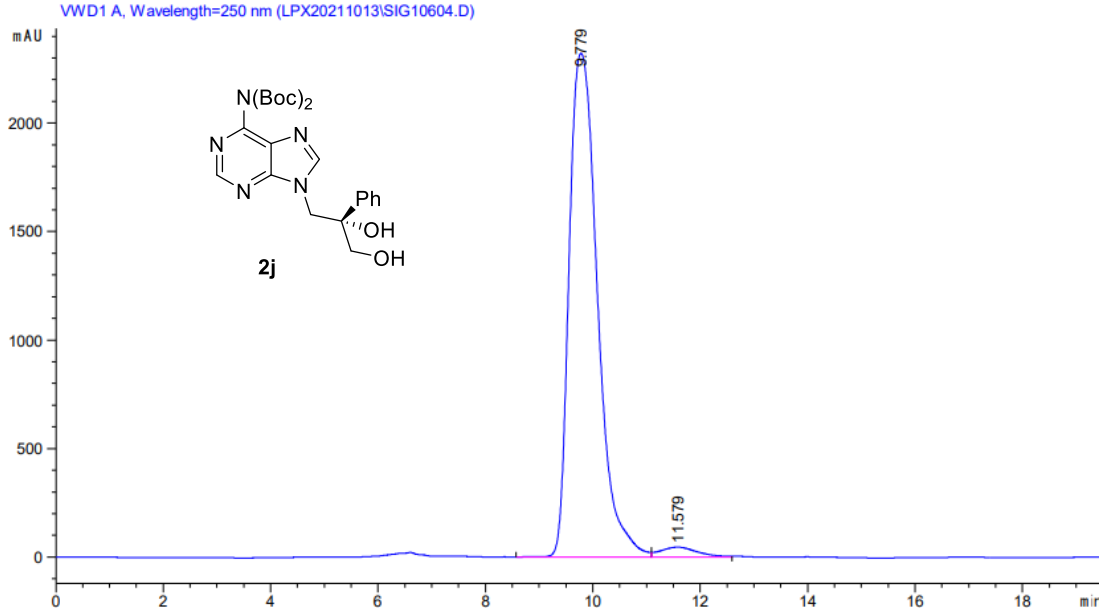
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	7.017	401.605	1415.680	49.72	58.95
2	9.920	406.101	985.818	50.28	41.05
Total:		**807.706**	**2401.498**	**100.00**	**100.00**



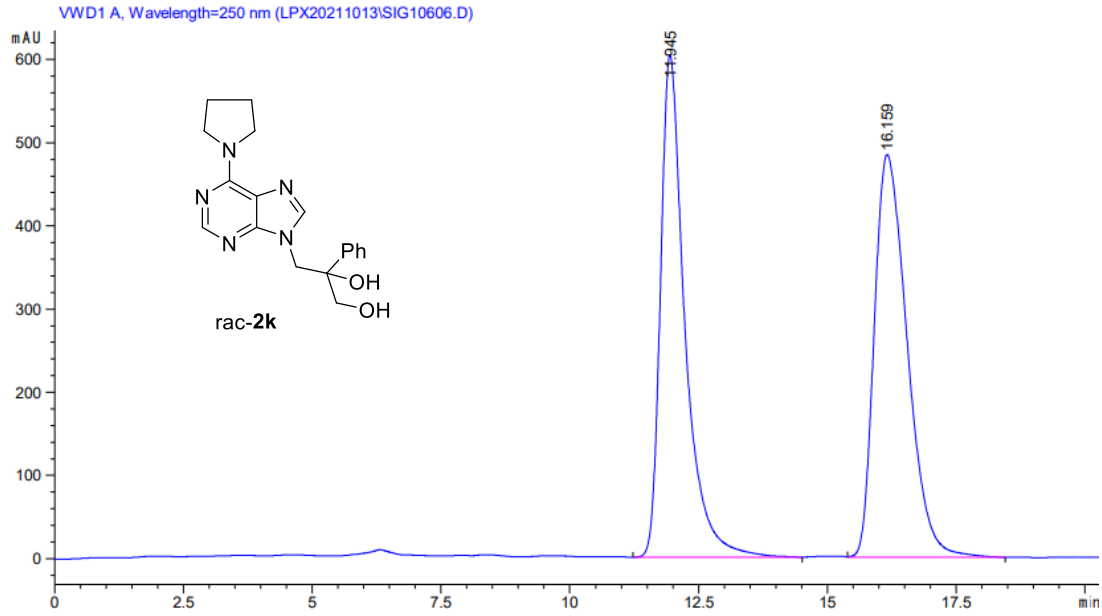
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	7.002	929.340	3303.169	95.90	97.13
2	10.013	39.770	97.676	4.10	2.87
Total:		**969.110**	**3400.845**	**100.00**	**100.00**



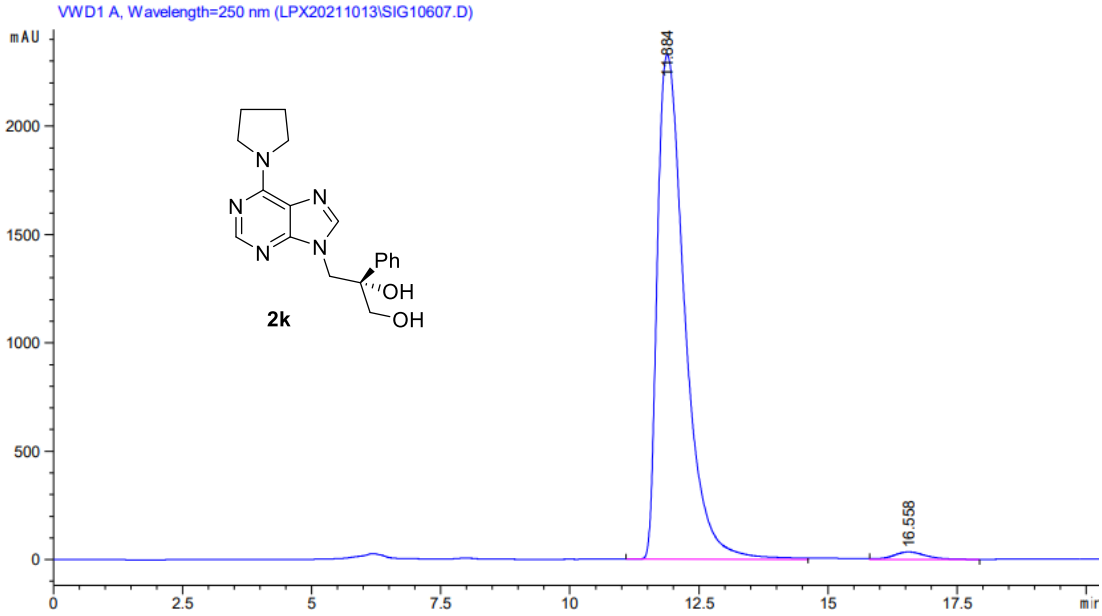
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.657	BV	0.4904	4.34701e4	1320.88953	50.2978
2	11.341	VB	0.5966	4.29554e4	1028.43506	49.7022



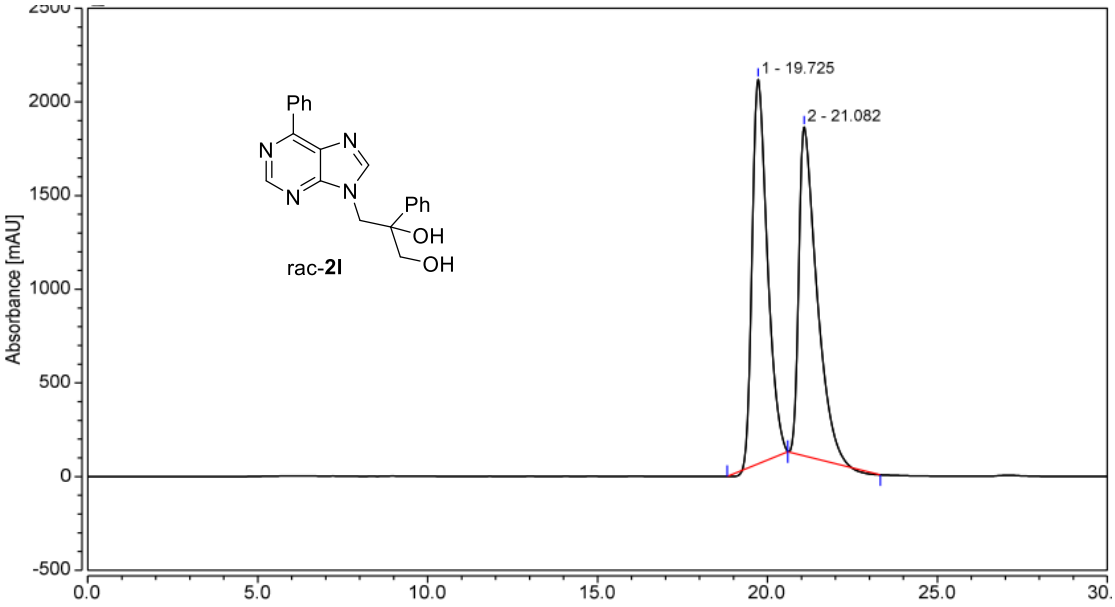
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.779	BV	0.5631	8.50632e4	2321.15674	97.4949
2	11.579	VV	0.6976	2185.71631	45.48796	2.5051



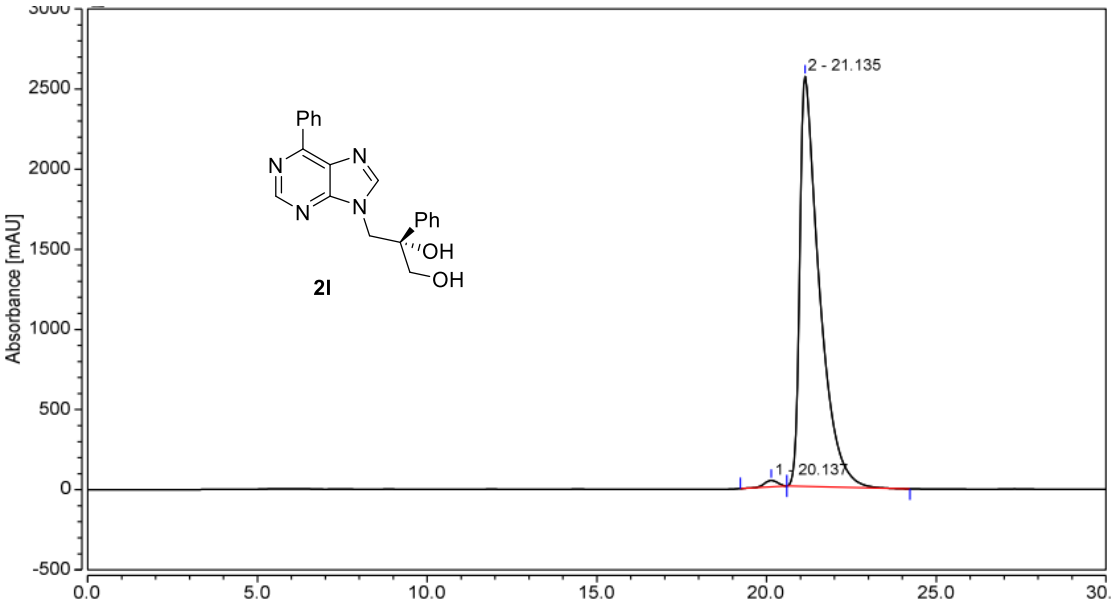
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.945	BB	0.4923	1.98802e4	603.32727	48.1989
2	16.159	VB	0.6405	2.13659e4	483.91974	51.8011



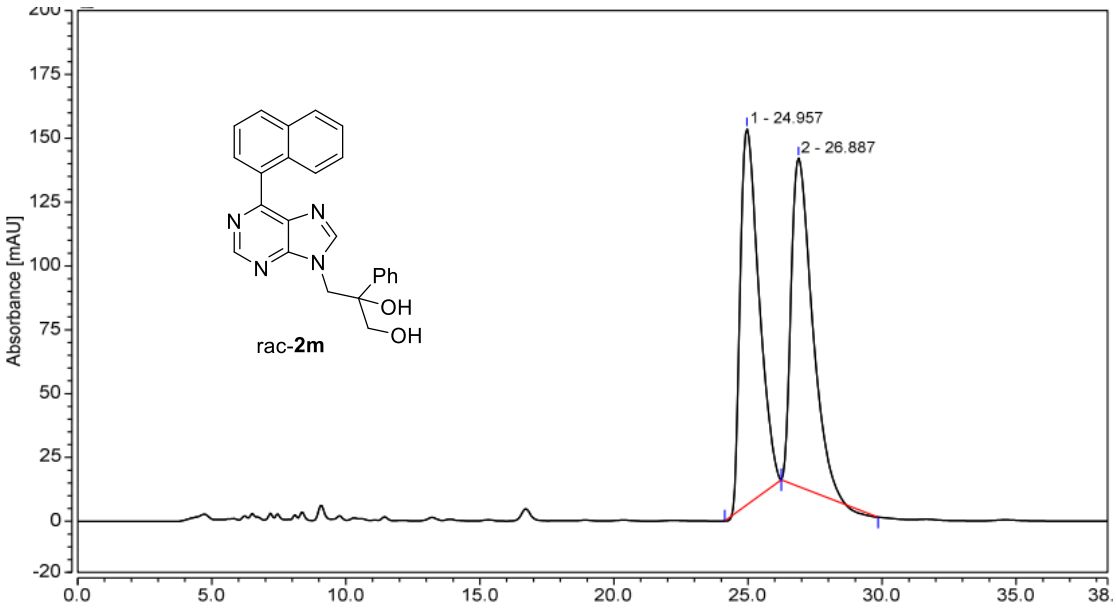
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.884	BV	0.5552	8.58271e4	2329.73047	98.2824
2	16.558	VB	0.6496	1499.92749	34.33687	1.7176



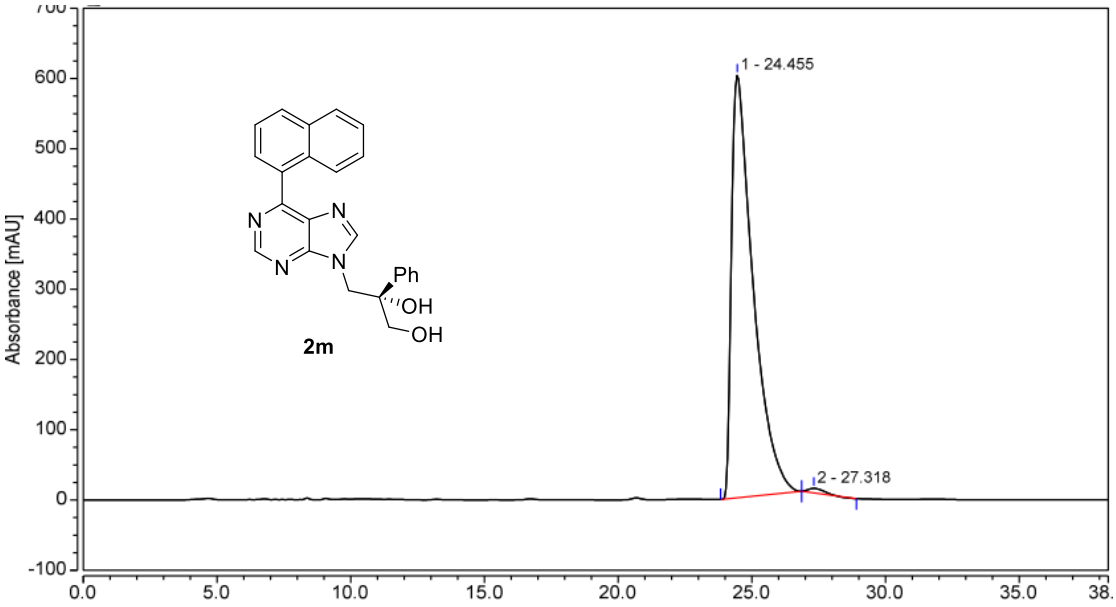
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	19.725	1061.623	2052.494	49.69	53.91
2	21.082	1074.802	1754.904	50.31	46.09
Total:		**2136.425**	**3807.398**	**100.00**	**100.00**



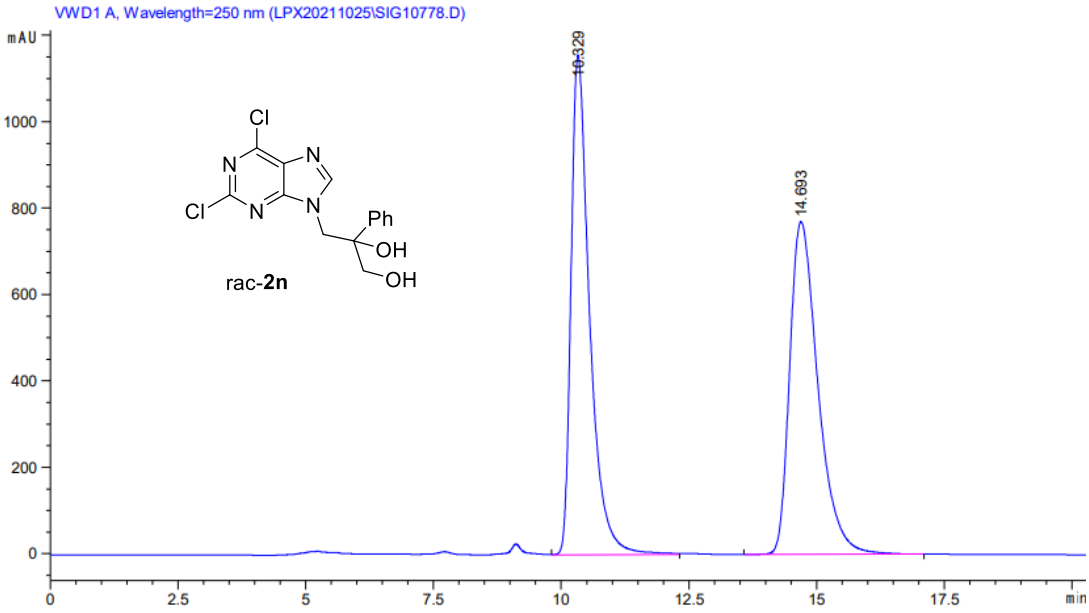
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	20.137	18.209	40.109	1.06	1.54
2	21.135	1705.939	2559.155	98.94	98.46
Total:		**1724.148**	**2599.264**	**100.00**	**100.00**



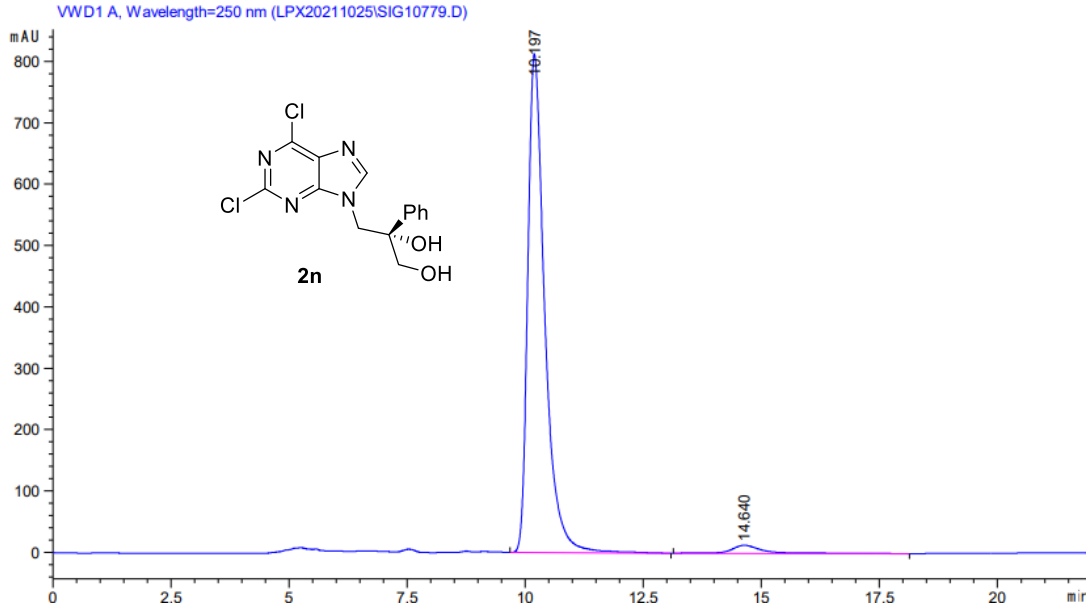
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	24.957	118.682	147.294	50.40	53.39
2	26.887	116.793	128.605	49.60	46.61
Total:		**235.475**	**275.899**	**100.00**	**100.00**



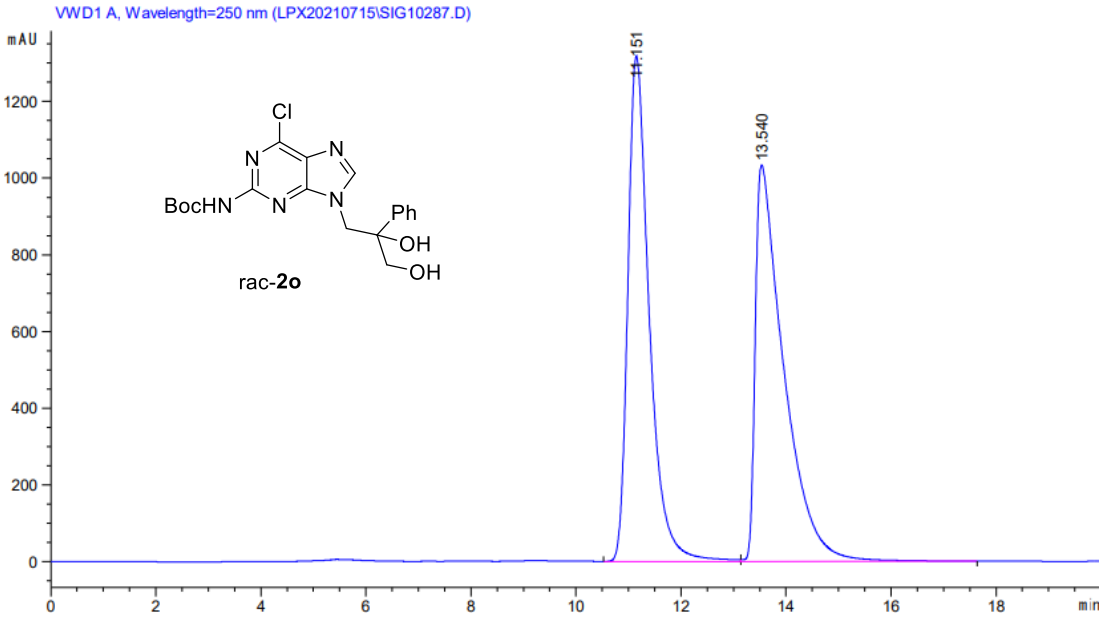
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	24.455	563.081	601.969	99.25	98.93
2	27.318	4.277	6.500	0.75	1.07
Total:		**567.358**	**608.469**	**100.00**	**100.00**



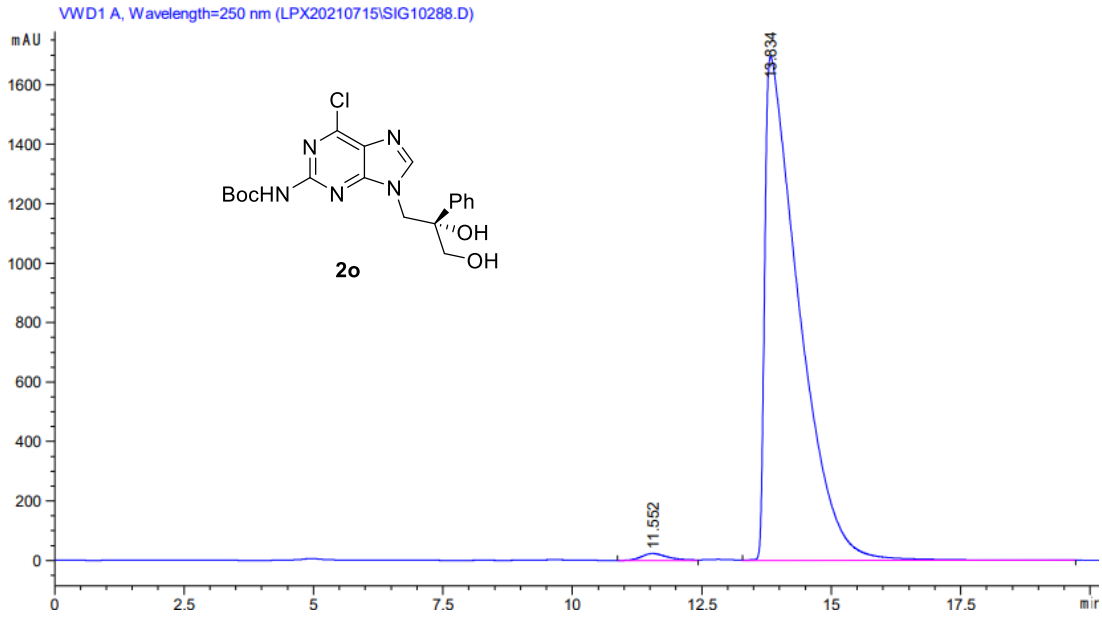
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.329	VV	0.3740	2.92691e4	1156.42456	49.7311
2	14.693	BB	0.5897	2.95857e4	770.00256	50.2689



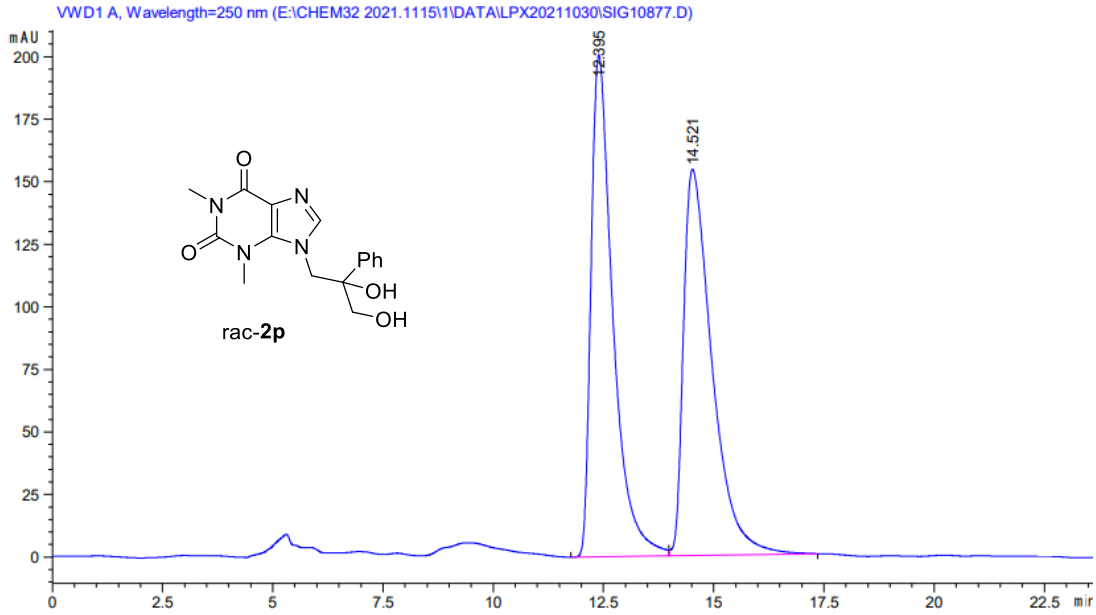
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.197	BB	0.3807	2.03163e4	812.36597	96.9384
2	14.640	BB	0.6606	641.63995	13.19451	3.0616



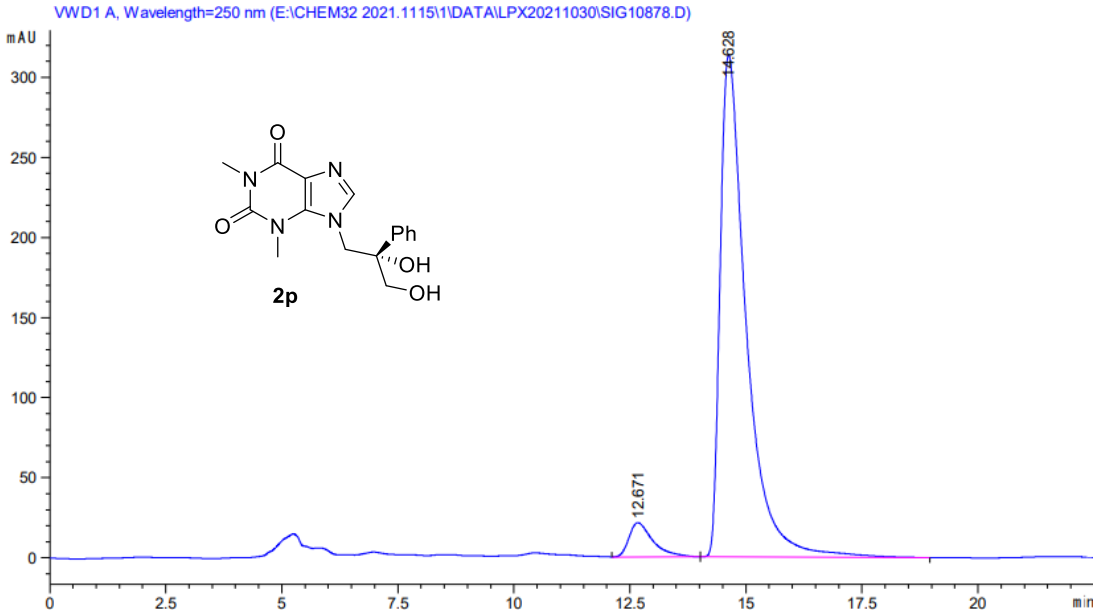
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.151	BV	0.4234	3.72838e4	1317.62488	48.9701
2	13.540	VB	0.5318	3.88520e4	1033.64636	51.0299



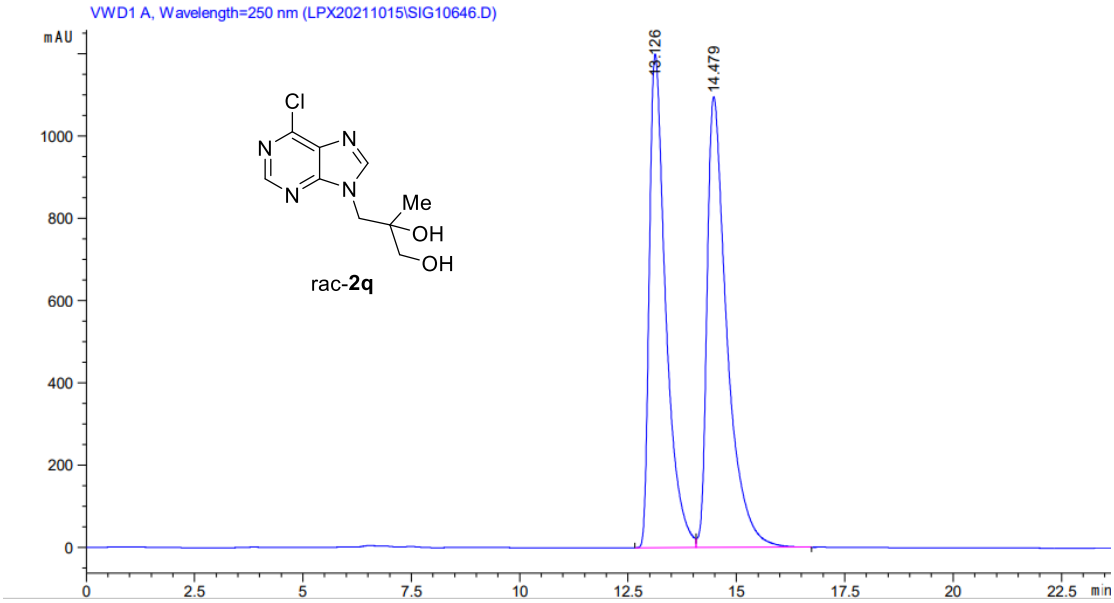
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.552	BV	0.5297	815.19586	23.02249	1.0393
2	13.834	VB	0.6856	7.76255e4	1695.80798	98.9607



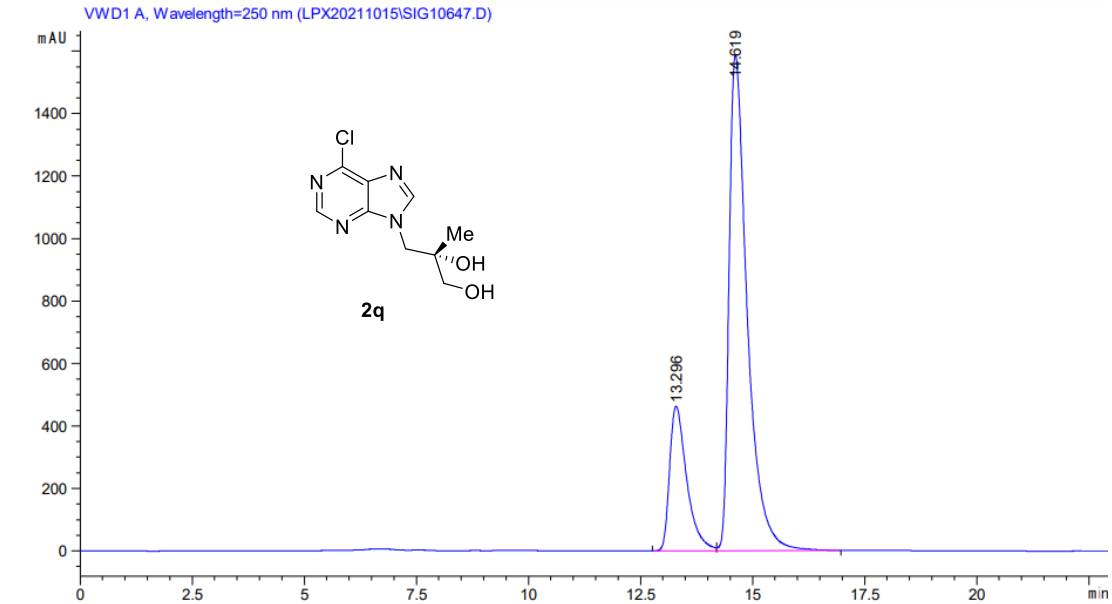
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.395	BV	0.4998	6911.91650	200.52036	49.9130
2	14.521	VB	0.6833	6936.00879	154.31325	50.0870



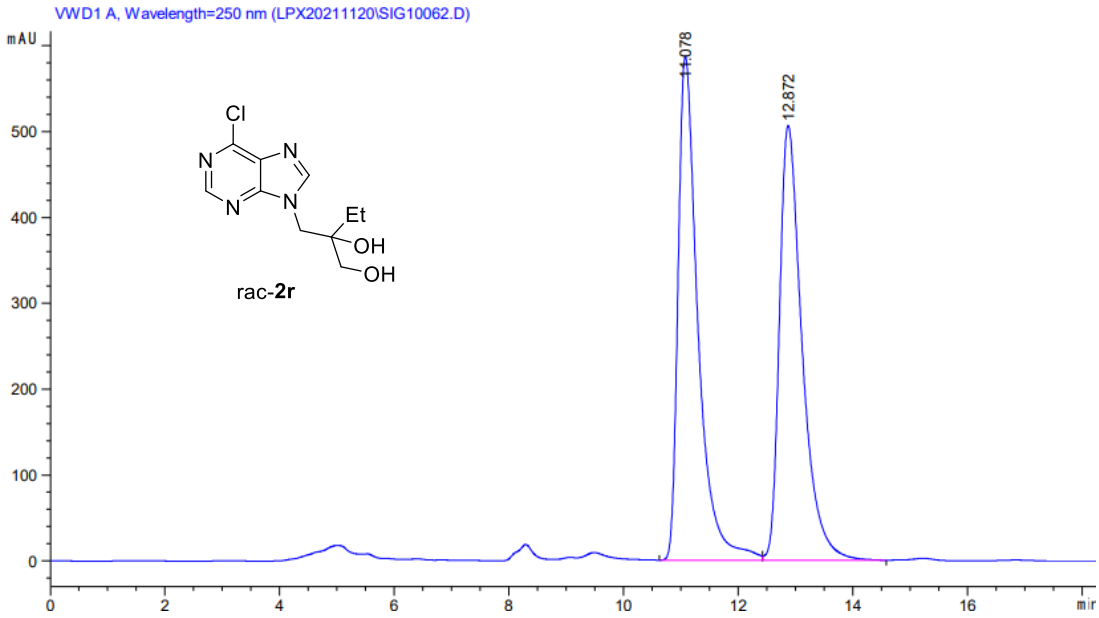
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.671	BB	0.5331	761.29742	21.39980	5.8446
2	14.628	BB	0.5806	1.22644e4	313.28702	94.1554



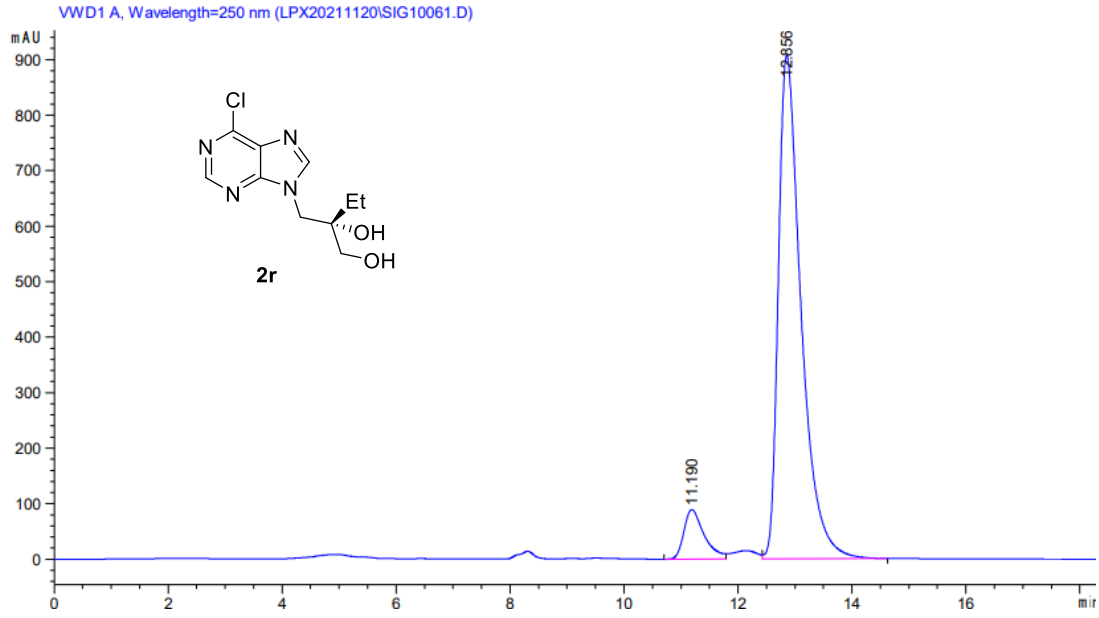
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.126	BV	0.3895	3.16624e4	1199.65710	47.5489
2	14.479	VB	0.4737	3.49267e4	1096.47461	52.4511



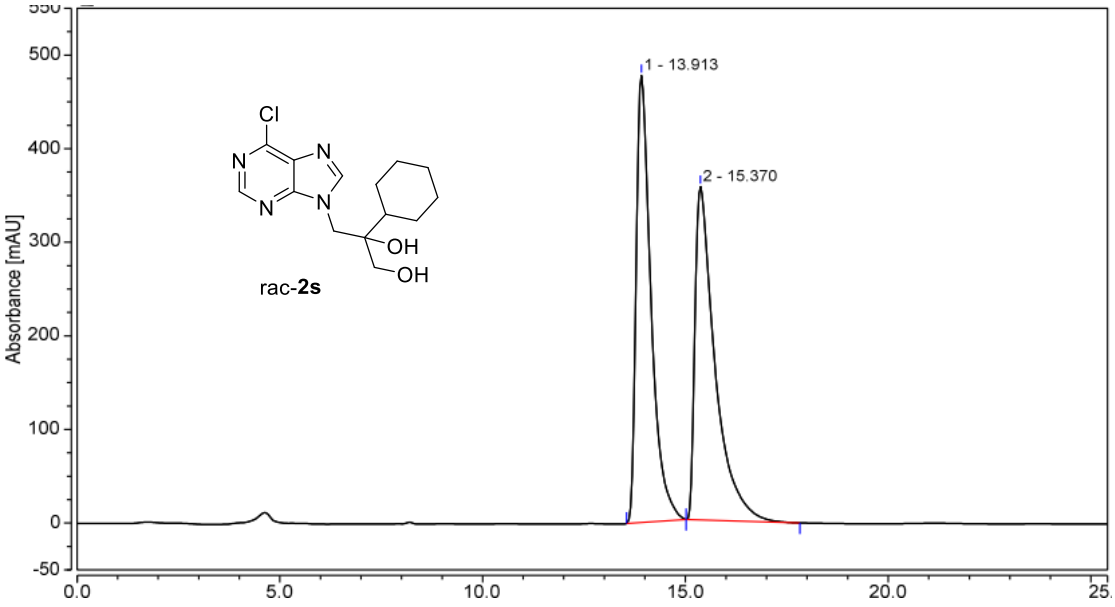
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.296	BV	0.4033	1.23562e4	462.89117	21.6555
2	14.619	VB	0.4236	4.47018e4	1585.82190	78.3445



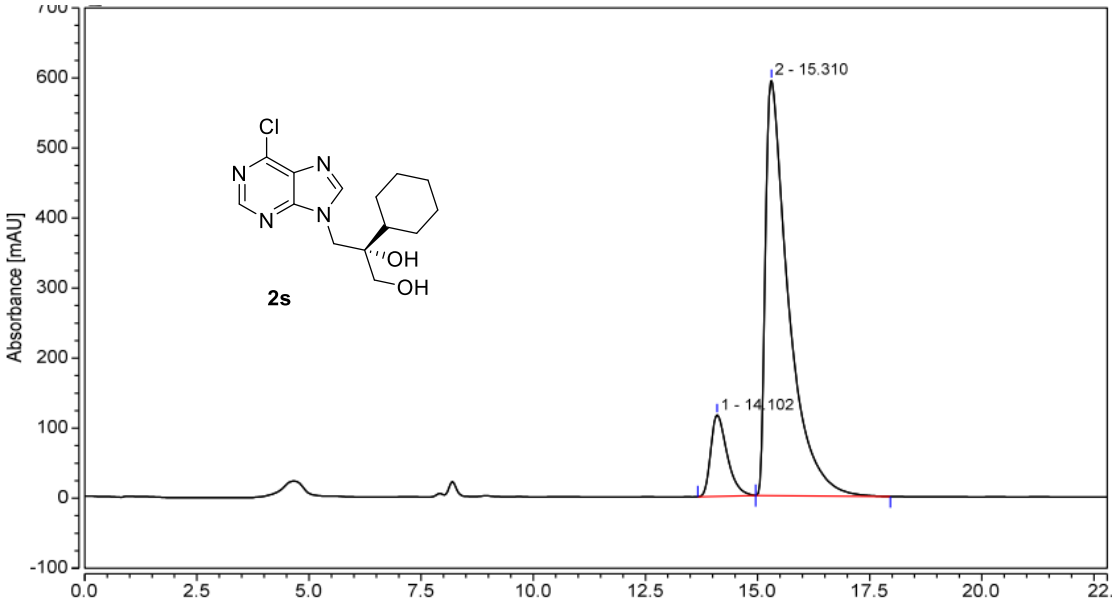
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.078	BV	0.3591	1.41757e4	586.84216	50.4630
2	12.872	VB	0.4138	1.39155e4	506.46262	49.5370



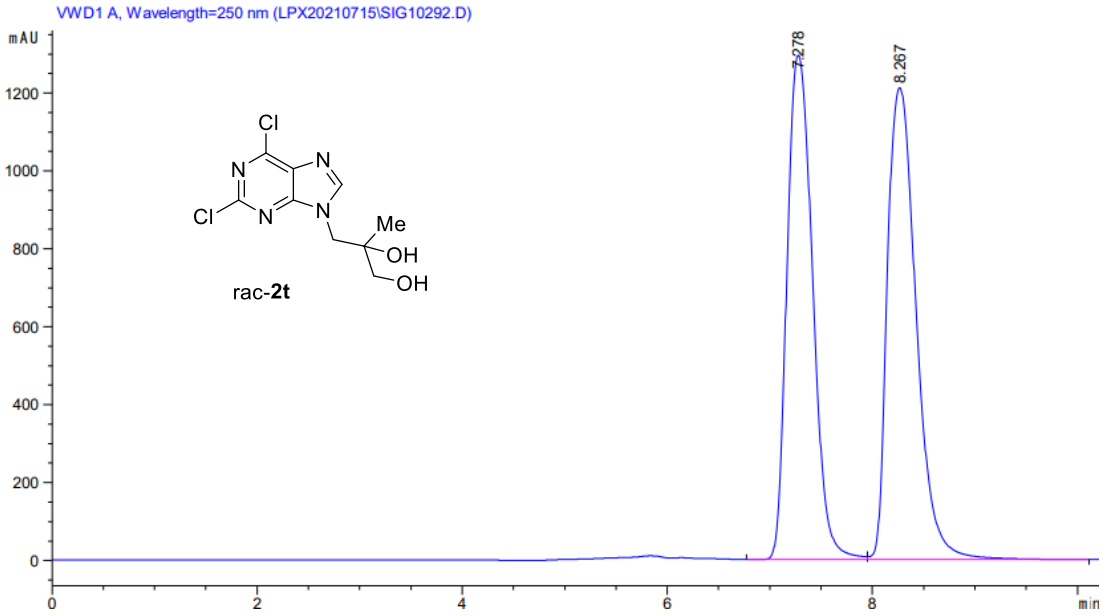
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.190	BV	0.3678	2200.48511	89.26616	8.0497
2	12.856	VB	0.4194	2.51356e4	907.34790	91.9503



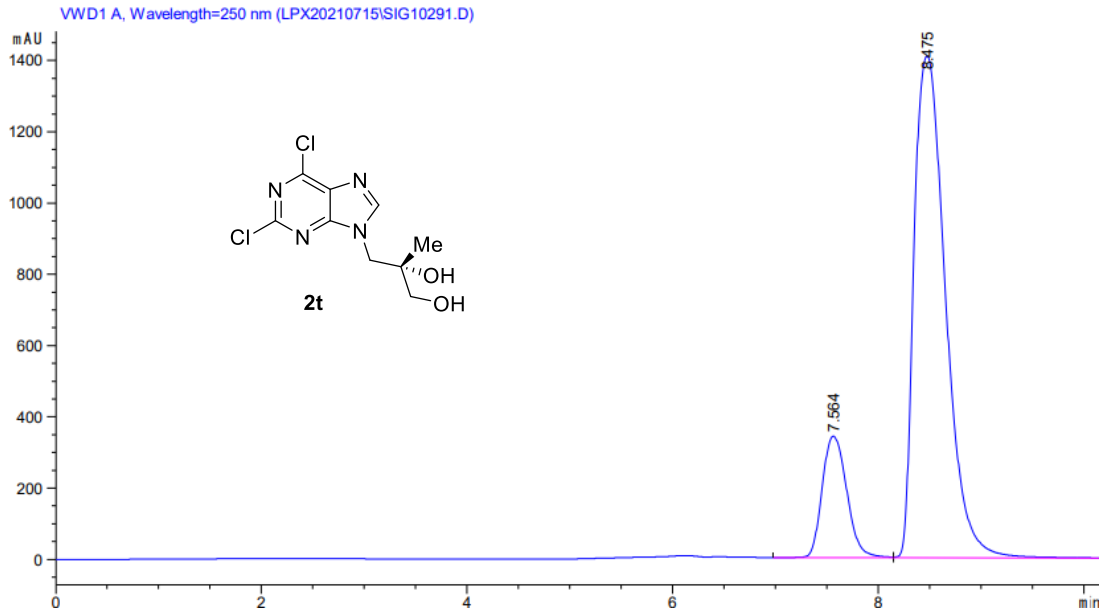
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	13.913	203.332	477.435	49.94	57.27
2	15.370	203.801	356.205	50.06	42.73
Total:		**407.133**	**833.640**	**100.00**	**100.00**



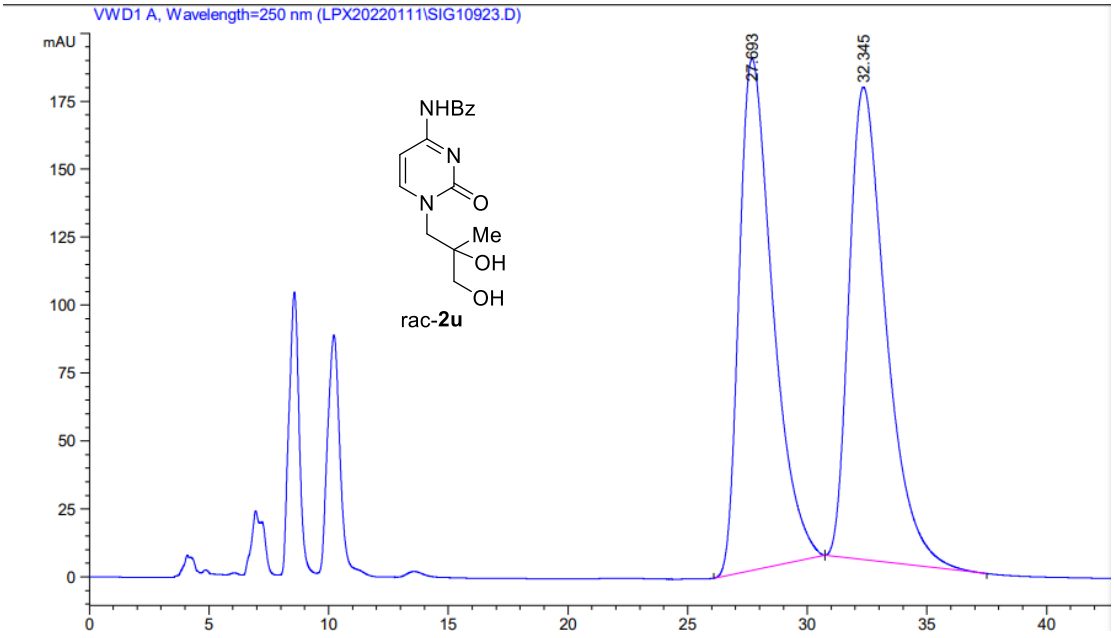
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	14.102	49.529	116.176	12.26	16.39
2	15.310	354.383	592.584	87.74	83.61
Total:		**403.911**	**708.760**	**100.00**	**100.00**



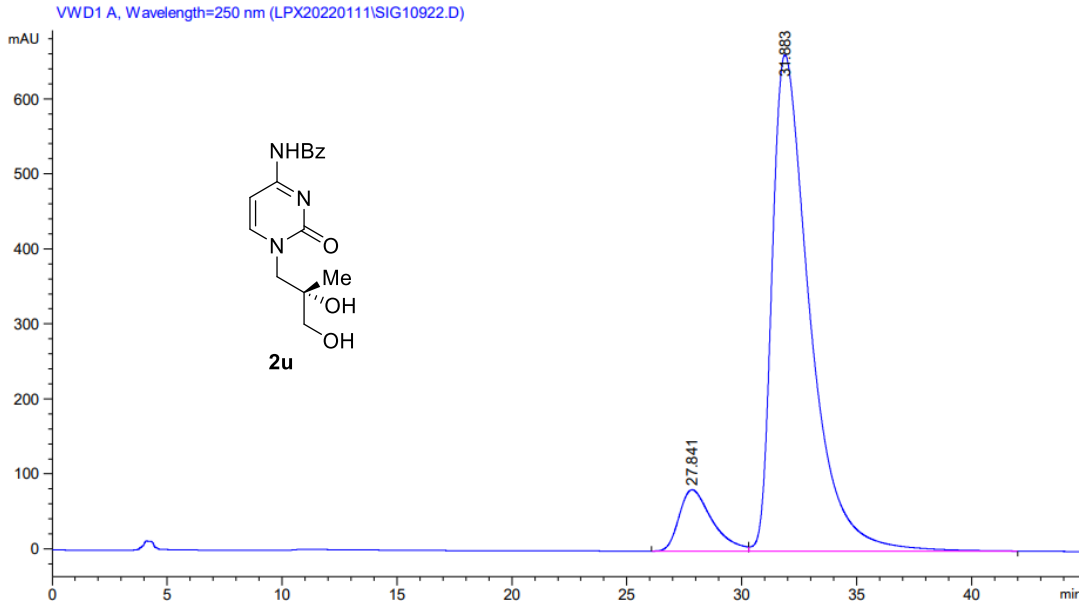
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.278	BV	0.2794	2.24277e4	1294.50317	48.6813
2	8.267	VB	0.3093	2.36428e4	1211.66931	51.3187



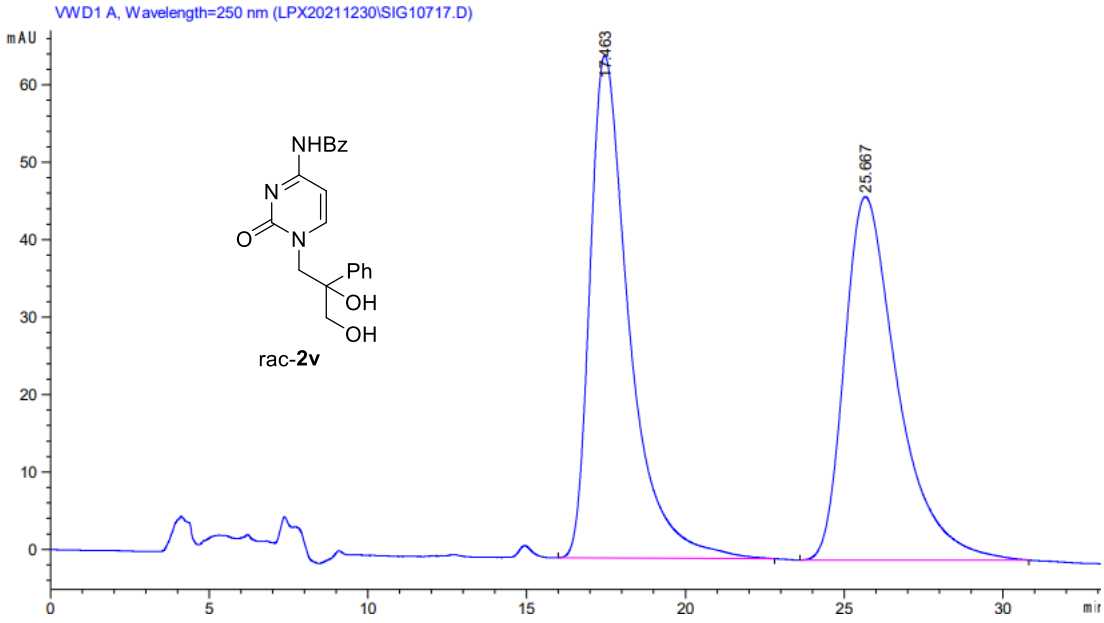
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.564	BV	0.2688	5682.79639	340.98703	16.0153
2	8.475	VBA	0.3388	2.98007e4	1407.68237	83.9847



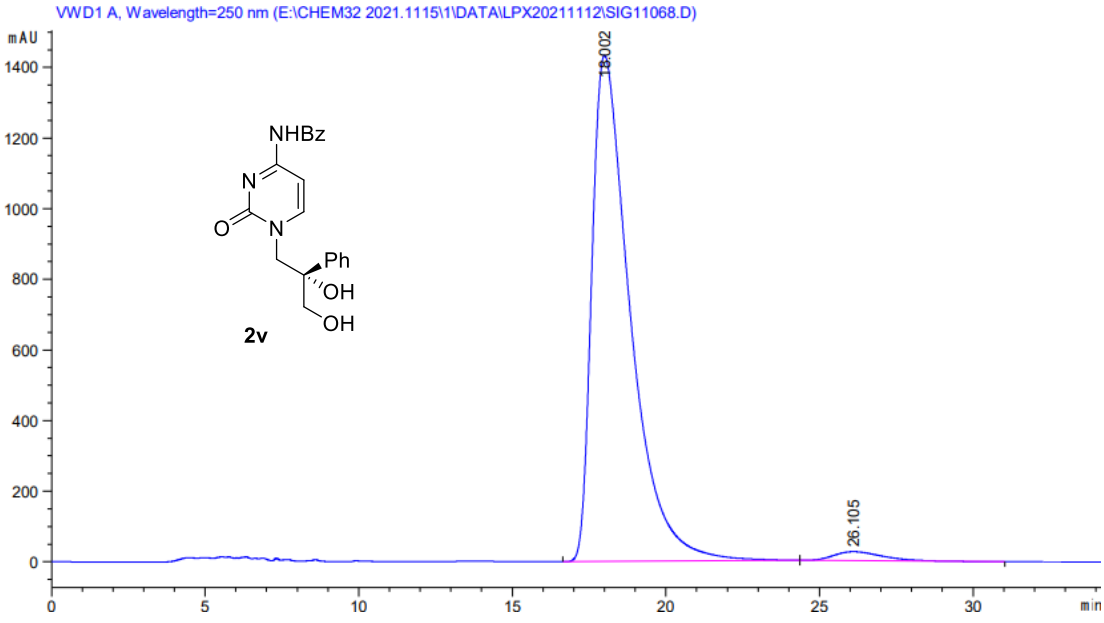
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	27.693	BB	1.4536	1.83490e4	188.22507	49.5682
2	32.345	BB	1.6094	1.86686e4	173.92896	50.4318



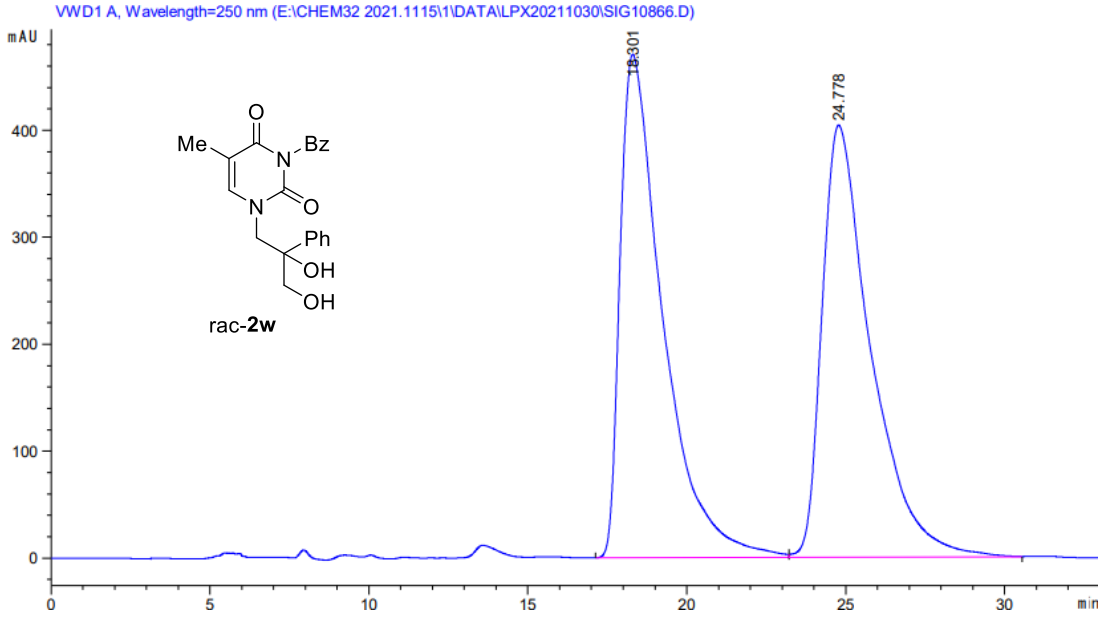
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	27.841	BV	1.4463	8154.69824	81.76841	9.7952
2	31.883	VB	1.6846	7.50977e4	661.45398	90.2048



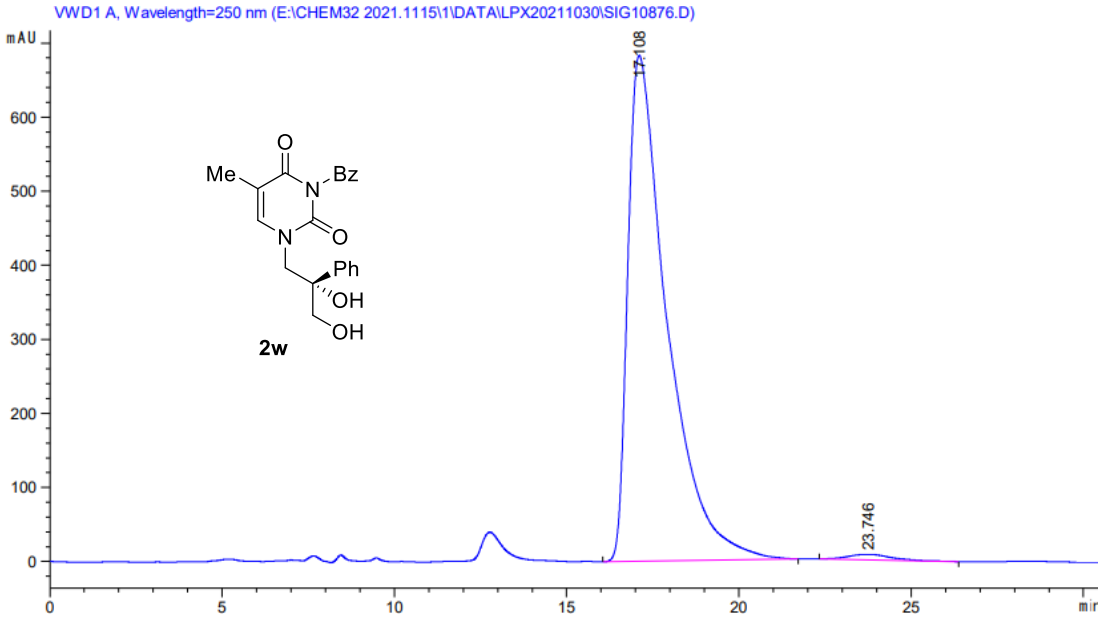
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.463	BB	1.2704	5564.44482	64.87069	50.5149
2	25.667	BB	1.6410	5450.99854	46.92464	49.4851



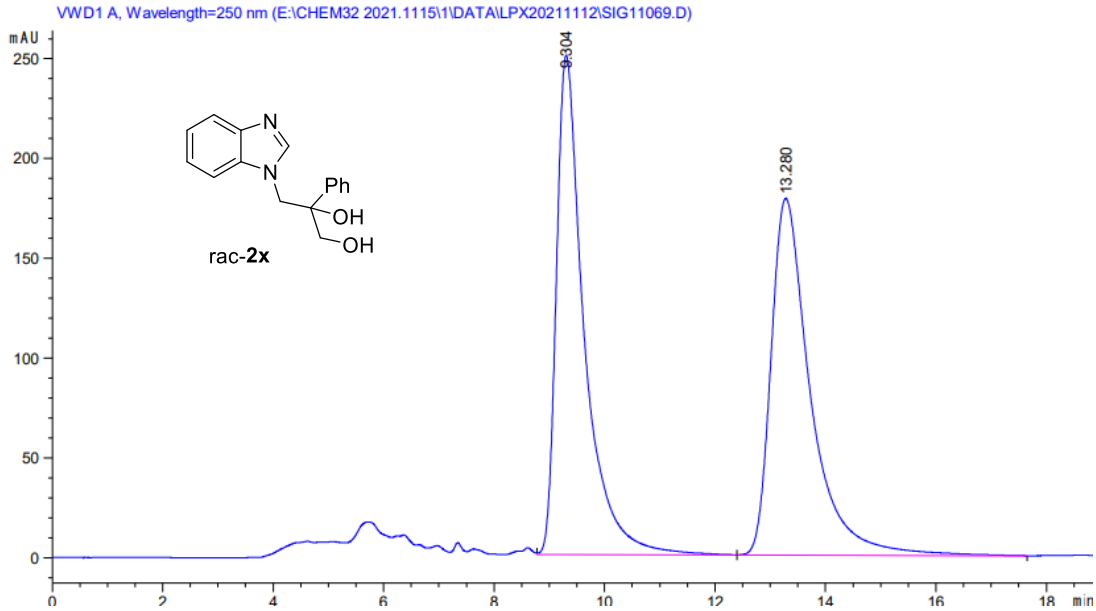
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.002	BB	1.2774	1.24310e5	1432.99890	97.7409
2	26.105	BB	1.4521	2873.26172	25.69012	2.2591



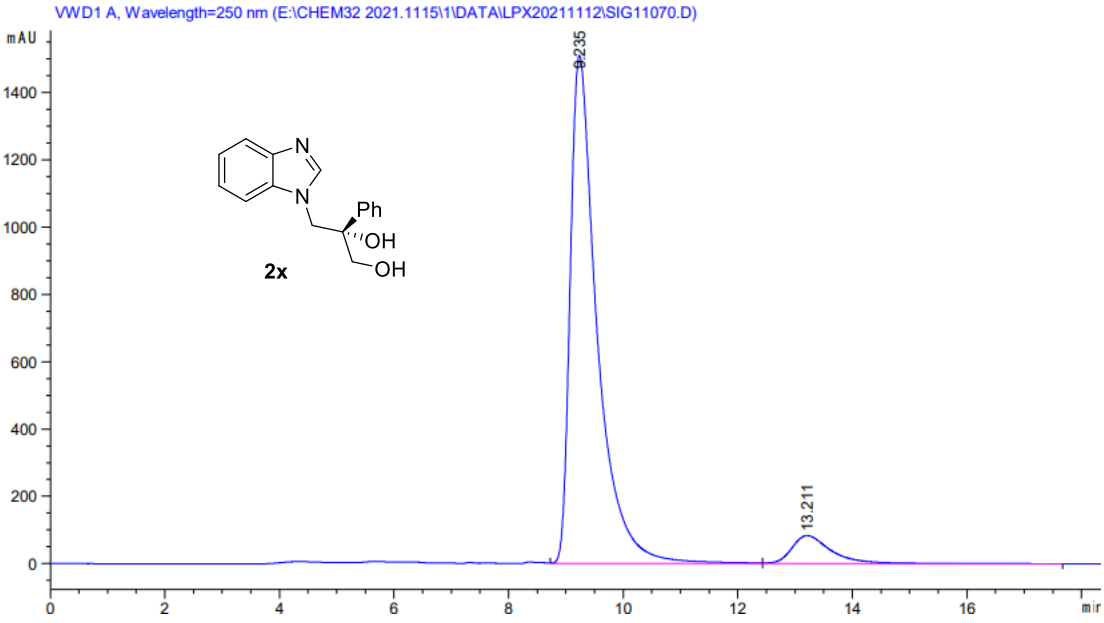
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.301	BV	1.3087	4.39089e4	470.57538	50.4935
2	24.778	VB	1.4477	4.30507e4	403.88101	49.5065



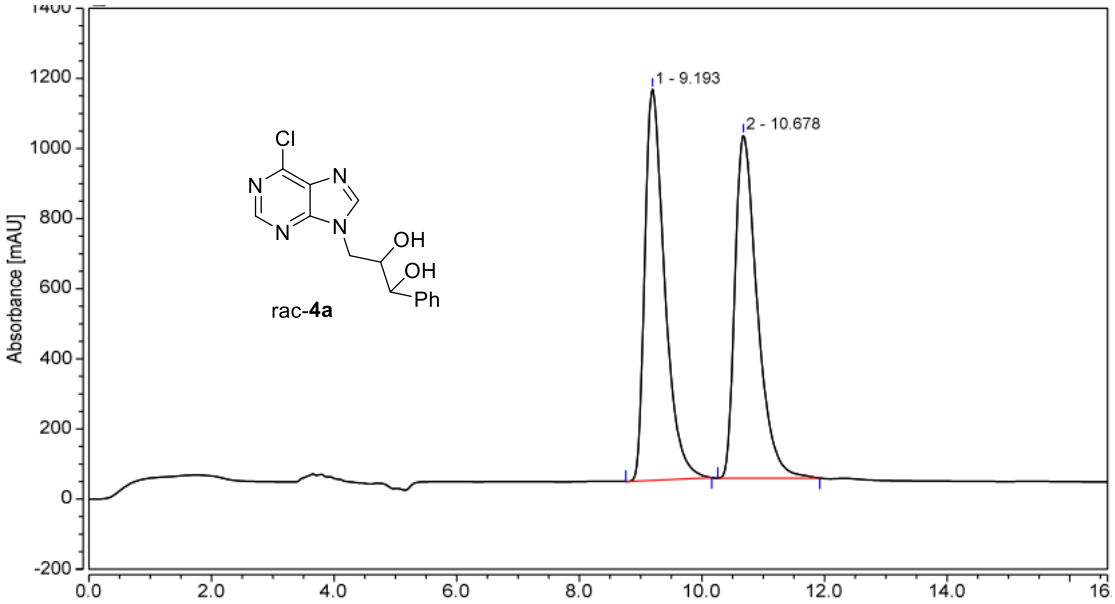
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.108	BB	1.1171	5.42141e4	682.96106	98.8418
2	23.746	BB	1.0193	635.24866	7.33352	1.1582



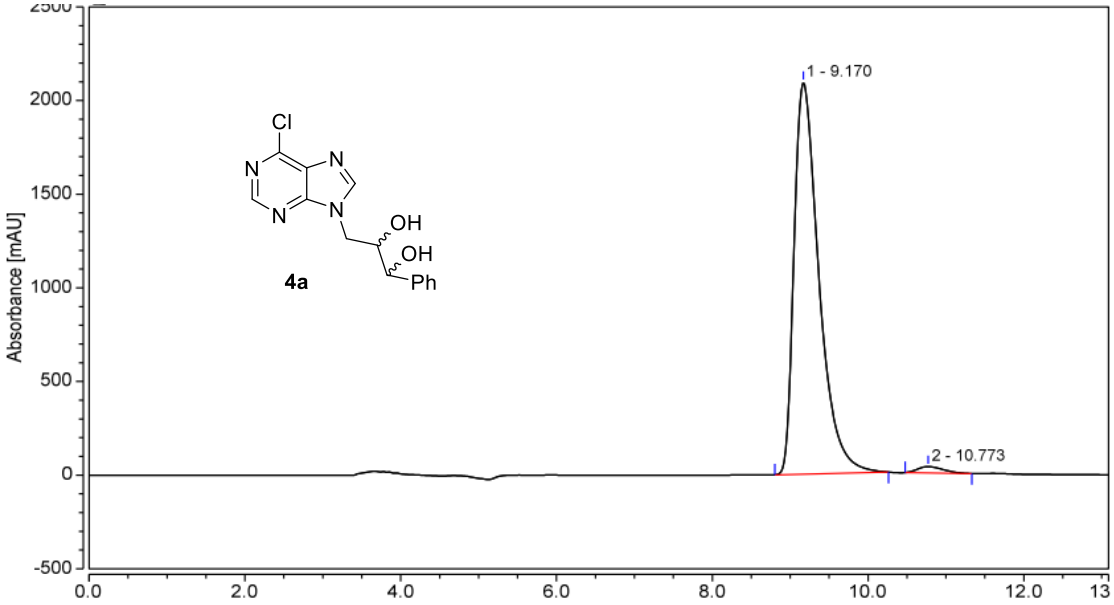
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.304	VB	0.5137	8765.43262	250.20529	49.7839
2	13.280	BB	0.7335	8841.51953	178.61765	50.2161



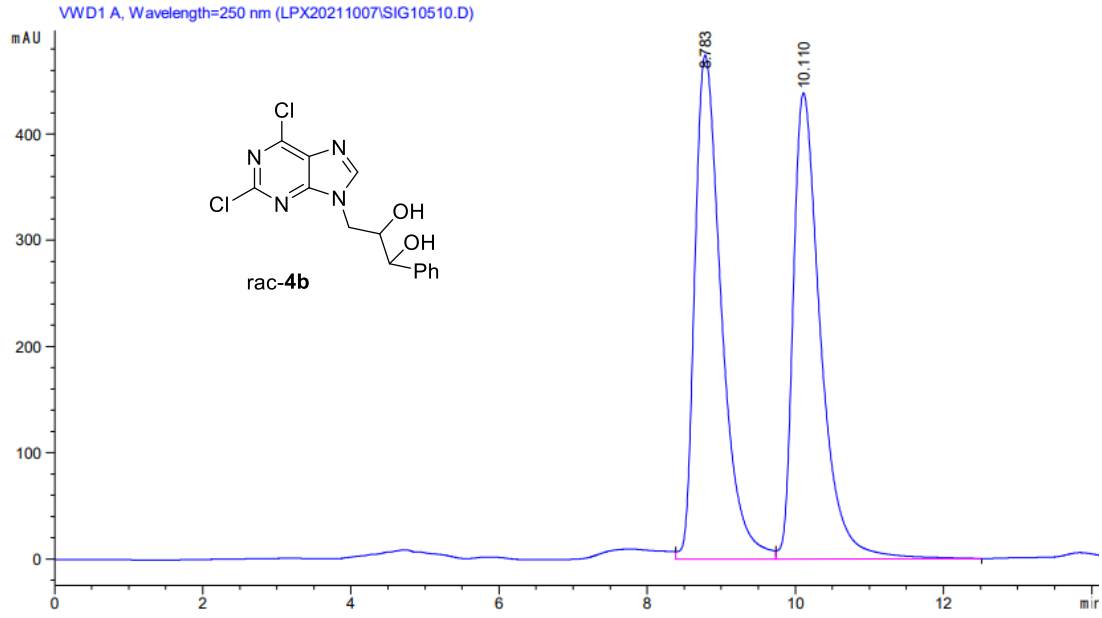
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.235	VV	0.4771	4.92790e4	1509.29028	92.3818
2	13.211	VB	0.7139	4063.72998	83.44592	7.6182



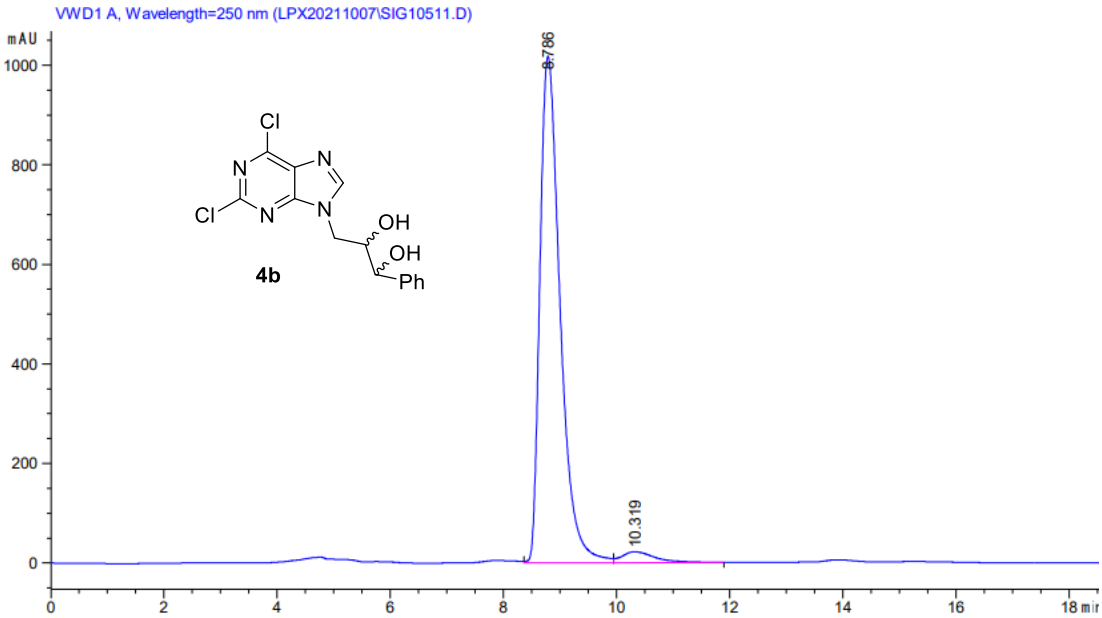
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	9.193	417.867	1115.152	50.32	53.26
2	10.678	412.481	978.590	49.68	46.74
Total:		**830.347**	**2093.742**	**100.00**	**100.00**



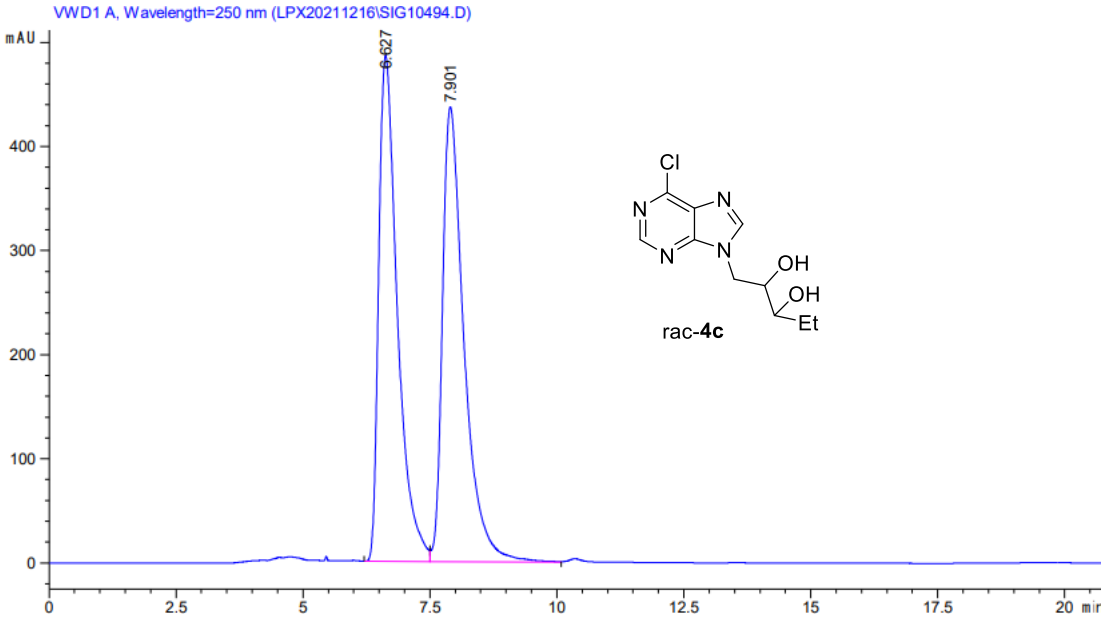
Peak	Retention Time min	Area mAU*min	Height mAU	Area %	Height %
1	9.170	772.286	2091.808	98.36	98.42
2	10.773	12.844	33.542	1.64	1.58
Total:		**785.130**	**2125.350**	**100.00**	**100.00**



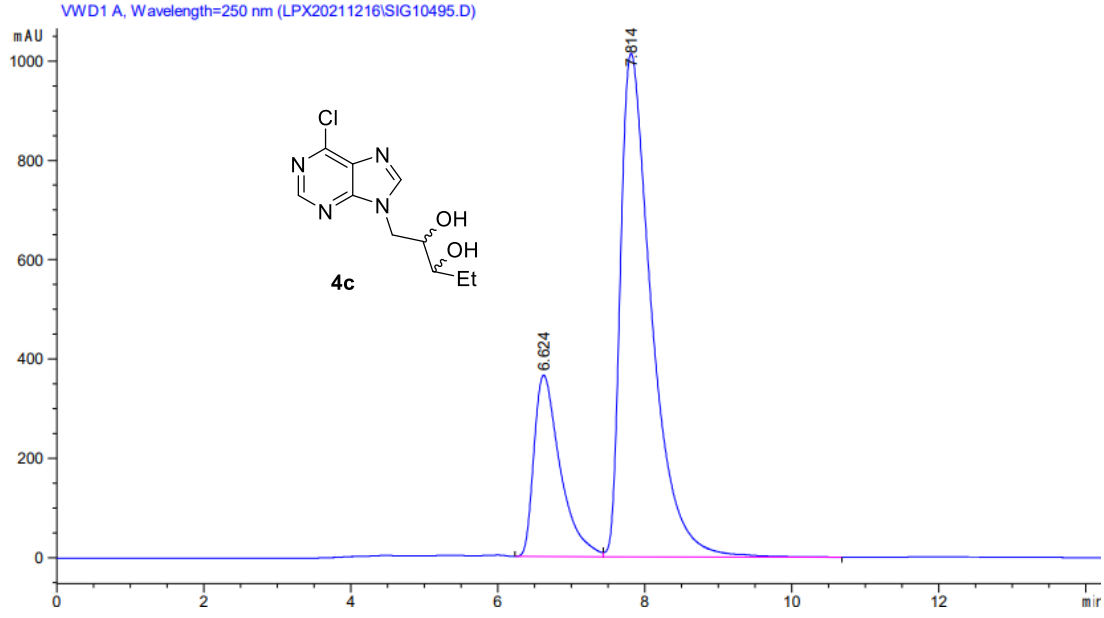
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.783	VV	0.3810	1.18173e4	474.33664	51.3591
2	10.110	VB	0.3881	1.11918e4	438.57565	48.6409



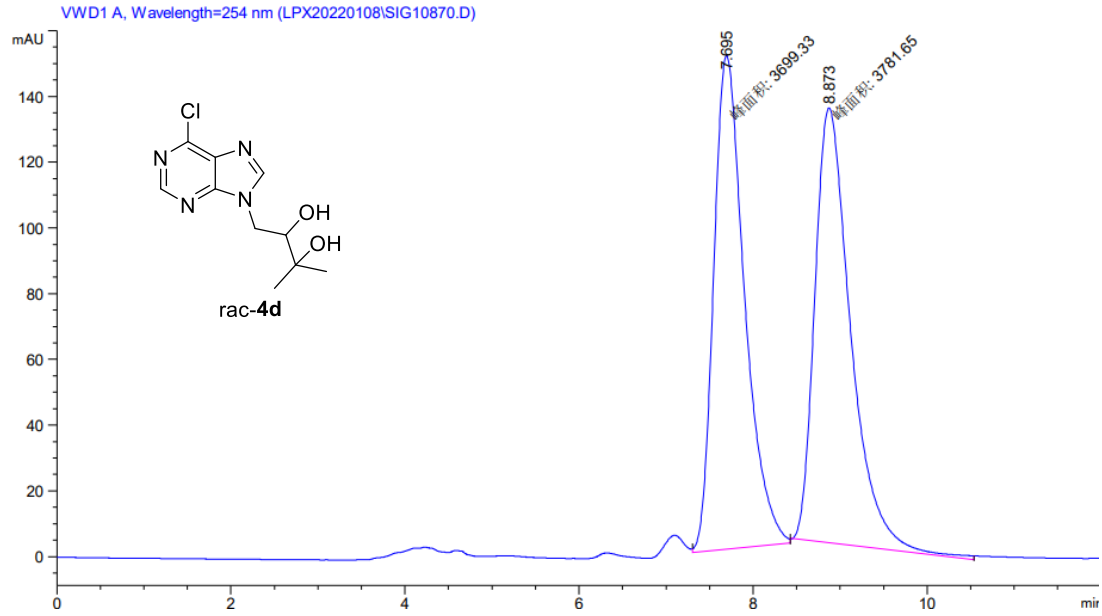
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.786	VV	0.3822	2.52016e4	1017.67035	96.6210
2	10.319	VB	0.6016	881.35272	21.72488	3.3790



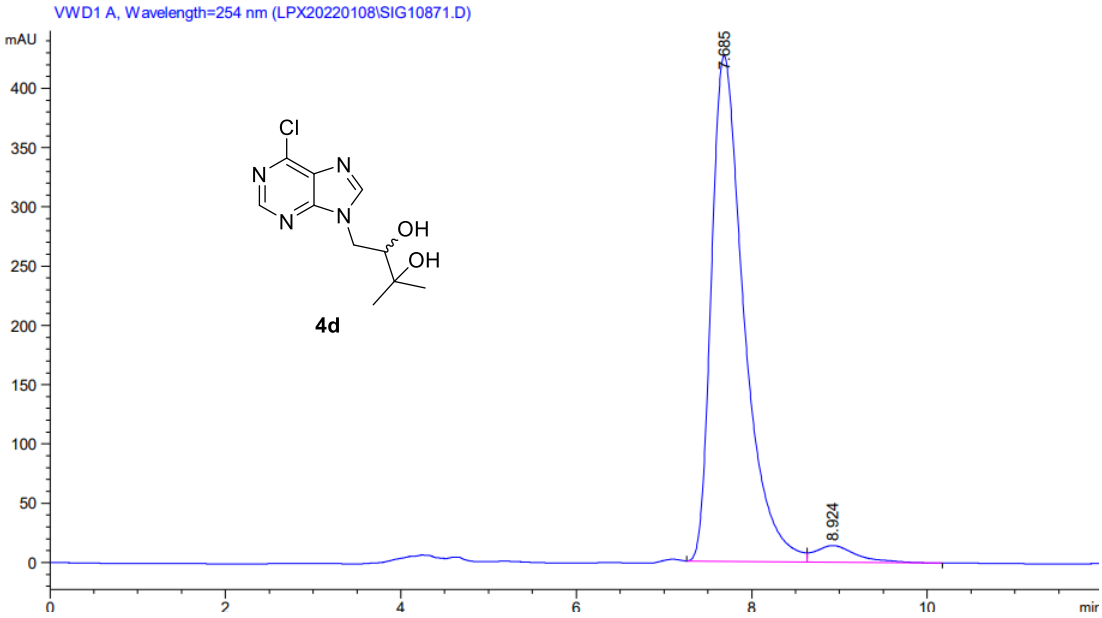
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.627	BV	0.3861	1.24438e4	486.19571	49.0469
2	7.901	VV	0.4415	1.29274e4	436.84125	50.9531



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.624	BV	0.3751	9092.62207	365.16281	23.4317
2	7.814	VB	0.4425	2.97121e4	1013.84821	76.5683



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.695	MM	0.4106	3699.33228	150.17282	49.4498
2	8.873	MM	0.4763	3781.65088	132.33917	50.5502



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.685	BV	0.3893	1.09823e4	426.52240	95.9770
2	8.924	VB	0.4742	460.33224	14.04662	4.0230

7. References

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