

Supporting Information

Stereoselective Assembly of C-Oligosaccharides via Modular Difunctionalization of Glycals.

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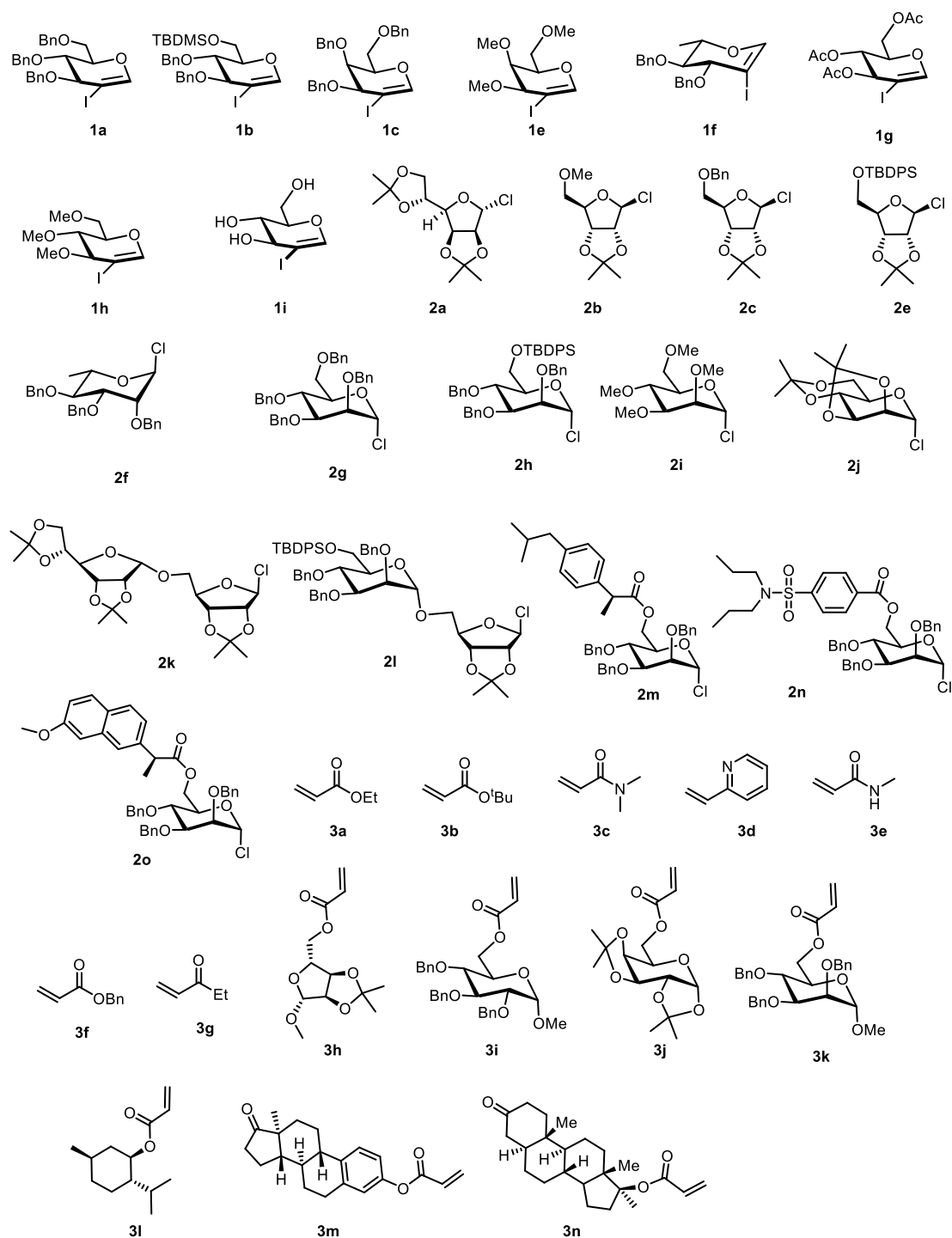
1. General Remarks

Unless otherwise noted, all of these reactions were carried out under an argon atmosphere. Solvent was freshly distilled prior to use unless otherwise noted. For column chromatography, silica gel (200-300 mesh) was employed. Analytical TLC was performed with silica gel GF254 plates. Room temperature = r.t.

Materials. Commercial reagents were purchased from Acros, Accela, Adamas, Alfa, Ark, Leyan or TCI and used as received with the following exceptions.

Instrumentation. Deuterated solvents were purchased from Cambridge Isotope Laboratories. ^1H NMR spectra were recorded on Bruker AANCE III 400, 600 with a 400 MHz and 600 MHz frequencies, and ^{13}C NMR spectra were recorded on Bruker AVANCE III 400 and 600 with 101 MHz and 125 MHz frequencies. ^{19}F NMR spectra were recorded on a Bruker AVANCE III 400 spectrometer with a ^{19}F operating frequency of 376 MHz. Chemical shifts (δ) were reported in ppm relative to the residual solvent signal (TMS δ = 0 for ^1H NMR and CDCl_3 δ = 77.0 for ^{13}C NMR). Chemical shifts (ppm) were recorded with TMS (tetramethylsilane) as the internal reference standard. Multiplicities are given as s (singlet), d (doublet), t (triplet), dd (doublet of doublets), td (triplet of doublets) or m (multiplet). HRMS obtained using a Q-TOF instrument equipped with an ESI source. Data collection for crystal structure was performed using Mo K α radiation on a Bruker APEXII diffractometer.

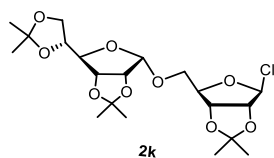
2. General Procedure for the Preparation of Starting Materials.



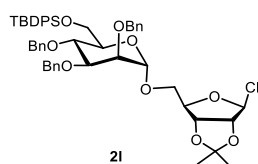
2.1 Preparation of sugar 1a-1i based on literature procedures.^[1]

2.2 Preparation of chloride donors 2a-2l based on literature procedures.^[2]

(3aR,4S,6R,6aR)-4-chloro-6-((((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)oxy)methyl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxole

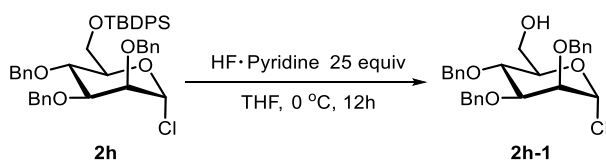


^1H NMR (600 MHz, Chloroform-*d*) δ 6.15 (s, 1H), 5.03 – 4.98 (m, 2H), 4.83 – 4.78 (m, 2H), 4.65 (d, J = 5.9 Hz, 1H), 4.47 (t, J = 7.2 Hz, 1H), 4.42 – 4.36 (m, 1H), 4.10 (dd, J = 8.6, 6.5 Hz, 1H), 4.04 (dd, J = 8.6, 4.6 Hz, 1H), 3.97 (dd, J = 7.8, 3.5 Hz, 1H), 3.87 (dd, J = 10.4, 6.4 Hz, 1H), 3.63 (dd, J = 10.4, 8.1 Hz, 1H), 1.48 (s, 3H), 1.46 (s, 3H), 1.44 (s, 3H), 1.38 (s, 3H), 1.34 (s, 3H), 1.32 (s, 3H). ^{13}C NMR (151 MHz, Chloroform-*d*) δ 113.4, 112.6, 109.2, 106.9, 98.3, 89.5, 88.1, 84.9, 81.5, 80.6, 79.4, 73.0, 67.1, 66.9, 26.8, 26.5, 25.8, 25.3, 25.2, 24.5.



^1H NMR (400 MHz, Chloroform-*d*) δ 7.72 (dd, J = 15.6, 7.5 Hz, 4H), 7.43 – 7.26 (m, 17H), 7.25 – 7.22 (m, 2H), 7.21 – 7.15 (m, 2H), 6.08 (s, 1H), 4.93 (d, J = 10.7 Hz, 1H), 4.87 (d, J = 5.5 Hz, 2H), 4.80 (d, J = 12.4 Hz, 1H), 4.74 – 4.66 (m, 4H), 4.61 (d, J = 10.7 Hz, 1H), 4.41 (t, J = 5.7 Hz, 1H), 4.12 (t, J = 9.6 Hz, 1H), 3.98 (dd, J = 11.1, 4.3 Hz, 1H), 3.91 (dd, J = 9.8, 3.1 Hz, 2H), 3.88 – 3.81 (m, 2H), 3.69 – 3.63 (m, 1H), 3.58 (dd, J = 10.7, 6.9 Hz, 1H), 1.42 (s, 3H), 1.30 (s, 3H), 1.06 (s, 9H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 138.6, 138.6, 136.0, 135.7, 134.0, 133.5, 129.6, 129.6, 128.4, 128.4, 128.4, 128.1, 127.8, 127.7, 127.7, 127.6, 127.6, 113.4, 98.8, 98.6, 89.8, 88.2, 81.6, 80.0, 75.3, 75.3, 74.7, 73.6, 72.9, 72.3, 67.5, 63.1, 26.9, 26.7, 25.5, 19.4.

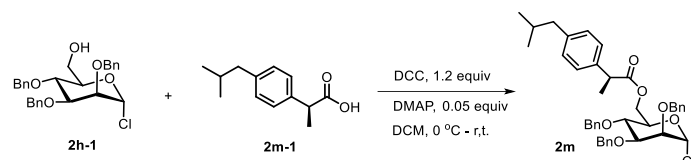
((2R,3R,4S,5S,6R)-3,4,5-tris(benzyloxy)-6-chlorotetrahydro-2H-pyran-2-yl)methanol. ^[3]



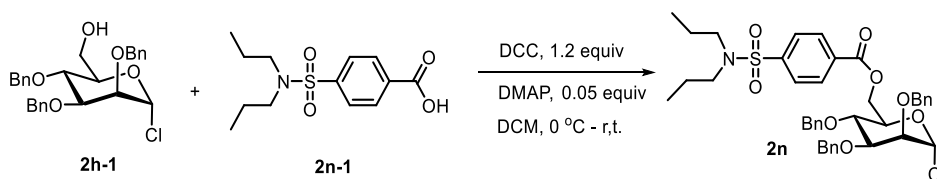
To a 50 mL round bottom flask was added compound **2h** (706 mg, 1.00 mmol, 1.00 equiv), anhydrous tetrahydrofuran (4.80 mL, 0.210 M), and HF-Py (0.66 mL, 70% HF in pyridine). The reaction mixture was stirred under nitrogen at 0 °C for 12 h. The solvent and excess HF-Py was removed by sparging N_2 gas at 0 °C and the residue was purified by silica gel column chromatography, eluting with Hexanes: EtOAc (7:1 to 3:1 (v/v)) to afford the title compound (234 mg, 0.5 mmol, 50%) as a white foam. ^1H NMR (600 MHz, Chloroform-*d*) δ 7.36 – 7.31 (m, 15H), 6.02 (s, 1H), 4.95 (d, J = 10.8 Hz, 1H), 4.74 (d, J = 12.2 Hz, 1H), 4.69 – 4.66 (m, 3H), 4.65 (s,

1H), 4.61 (d, J = 11.7 Hz, 1H), 4.19 (dd, J = 9.6, 3.1 Hz, 1H), 4.06 (t, J = 9.7 Hz, 1H), 3.90 (dt, J = 9.8, 3.2 Hz, 1H), 3.87 (dd, J = 2.9, 1.9 Hz, 1H), 3.84 (dd, J = 12.2, 2.6 Hz, 1H), 3.80 (dd, J = 12.2, 4.1 Hz, 1H). ¹³C NMR (151 MHz, Chloroform-d) δ 138.1, 138.0, 137.5, 128.5, 128.4, 128.1, 128.0, 127.9, 127.8, 127.8, 91.4, 78.3, 77.9, 75.3, 75.1, 73.8, 73.2, 72.6, 61.6.

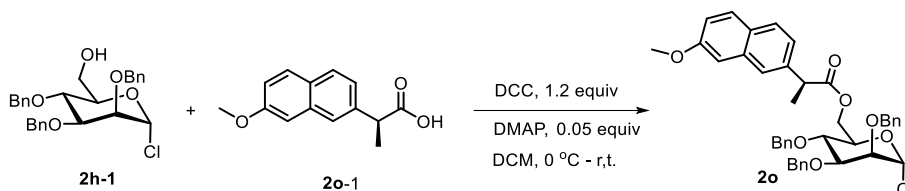
((2R,3R,4S,5S,6R)-3,4,5-tris(benzyloxy)-6-chlorotetrahydro-2H-pyran-2-yl)methyl (S)-2-(4-isobutylphenyl)propanoate (2m) ^[3]



A suspension of Ibuprofen **2m-1** (115 mg, 0.60 mmol, 1.50 equiv) and DMAP (3.00 mg, 0.0250 mmol, 5.00 mol%) in DCM (3.00 mL) was added a solution of DCC (124 mg, 0.600 mmol, 1.20 equiv) in DCM (1.00 mL) at 0 °C. After stirring for 10 min at 0 °C, **2h-1** (234 mg, 0.50 mmol, 1.00 equiv) was added. The reaction mixture was stirred at room temperature for 12 h, quenched with saturated NaHCO₃ solution (6.00 mL), and extracted with DCM (2×30 mL). The organic layer was collected, washed with brine, dried with anhydrous Na₂SO₄, and filtered. The filtrate was concentrated in vacuo. The residue was purified by flash column chromatography on silica gel, eluting with Hexanes: EtOAc to afford **2m** (420 mg, 0.320 mmol, 64%) as a white solid. ¹H NMR (600 MHz, Chloroform-d) δ 7.40 (d, J = 7.2 Hz, 2H), 7.38 – 7.28 (m, 8H), 7.26 (d, J = 8.0 Hz, 3H), 7.20 (d, J = 8.0 Hz, 2H), 7.14 – 7.05 (m, 2H), 6.99 (d, J = 7.9 Hz, 2H), 6.07 (s, 1H), 4.72 (q, J = 12.0 Hz, 2H), 4.64 (d, J = 11.7 Hz, 1H), 4.59 (d, J = 11.7 Hz, 1H), 4.55 (d, J = 10.5 Hz, 1H), 4.33 (d, J = 2.5 Hz, 2H), 4.13 (dd, J = 9.6, 2.9 Hz, 1H), 4.02 – 3.96 (m, 1H), 3.94 (d, J = 10.5 Hz, 1H), 3.91 – 3.84 (m, 2H), 3.76 (q, J = 7.1 Hz, 1H), 2.34 (dd, J = 7.1, 2.4 Hz, 2H), 1.77 – 1.67 (m, 1H), 1.49 (d, J = 7.1 Hz, 3H), 0.81 (dd, J = 6.6, 1.9 Hz, 6H). ¹³C NMR (151 MHz, Chloroform-d) δ 174.3, 140.6, 138.0, 137.9, 137.7, 137.5, 129.4, 128.5, 128.5, 128.4, 128.0, 127.9, 127.8, 127.8, 127.3, 91.3, 78.3, 78.0, 75.2, 73.6, 73.1, 72.9, 72.5, 62.5, 45.0, 44.9, 30.1, 22.4, 22.4, 17.9.

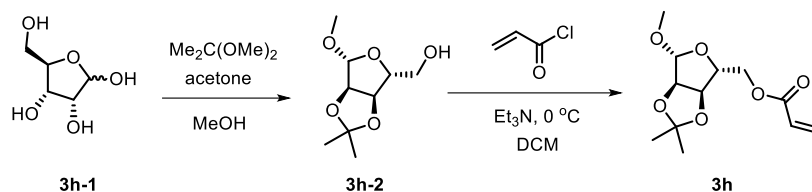


The reaction was performed according to the same procedure as synthesizing **2m**. Probenecid **2n-1** (171 mg, 0.6 mmol, 1.5 equiv) was used as the coupling partner. After work up, the reaction mixture was purified by flash column chromatography on silica gel, eluting with Hexanes: EtOAc to afford **2n** (264.6 mg, 0.36 mmol, 60%) as a white solid. ¹H NMR (600 MHz, Chloroform-d) δ 8.03 (d, J = 7.9 Hz, 2H), 7.72 (d, J = 8.2 Hz, 2H), 7.40 – 7.27 (m, 12H), 7.25 – 7.21 (m, 2H), 7.18 – 7.13 (m, 1H), 6.14 – 6.08 (m, 1H), 4.95 (d, J = 10.9 Hz, 1H), 4.75 – 4.67 (m, 3H), 4.65 (d, J = 11.8 Hz, 2H), 4.58 – 4.50 (m, 2H), 4.32 – 4.27 (m, 1H), 4.18 – 4.12 (m, 2H), 3.95 – 3.92 (m, 1H), 3.09 – 3.04 (m, 4H), 1.58 – 1.50 (m, 4H), 0.89 – 0.84 (m, 6H). ¹³C NMR (151 MHz, Chloroform-d) δ 164.8, 144.3, 137.9, 137.8, 137.7, 133.2, 130.4, 128.6, 128.6, 128.5, 128.4, 128.3, 128.1, 128.1, 128.0, 128.0, 127.8, 127.0, 91.1, 78.5, 78.0, 77.5, 77.5, 77.3, 77.3, 77.1, 75.3, 73.2, 73.0, 73.0, 72.7, 72.5, 63.3, 50.1, 22.1, 11.3.



The reaction was performed according to the same procedure as synthesizing **2m**. Naproxen **2o-1** (138 mg, 0.60 mmol, 1.50 equiv) was used as the coupling partner. After work up, the reaction mixture was purified by flash column chromatography on silica gel, eluting with Hexanes: EtOAc to afford **2n** (265 mg, 0.39 mmol, 65%) as a white solid. ¹H NMR (600 MHz, Chloroform-d) δ 7.66 (s, 1H), 7.59 (dd, J = 8.6, 5.8 Hz, 2H), 7.41 – 7.28 (m, 10H), 7.25 (d, J = 5.3 Hz, 1H), 7.20 – 7.15 (m, 3H), 7.06 (dd, J = 8.9, 2.5 Hz, 1H), 7.01 (d, J = 2.3 Hz, 1H), 6.91 (dd, J = 7.1, 2.0 Hz, 2H), 6.07 – 6.04 (m, 1H), 4.74 – 4.67 (m, 2H), 4.60 – 4.52 (m, 2H), 4.39 – 4.34 (m, 2H), 4.28 (dd, J = 12.3, 3.6 Hz, 1H), 4.10 (dd, J = 9.5, 3.0 Hz, 1H), 4.01 – 3.96 (m, 1H), 3.92 (q, J = 7.1 Hz, 1H), 3.89 – 3.82 (m, 6H), 1.57 (d, J = 7.1 Hz, 3H). ¹³C NMR (151 MHz, Chloroform-d) δ 174.3, 157.6, 138.0, 137.8, 137.7, 135.4, 133.8, 129.3, 129.0, 128.5, 128.4, 128.2, 128.0, 127.9, 127.8, 127.7, 127.6, 127.3, 126.4, 126.1, 119.0, 105.5, 91.3, 78.2, 77.9, 74.9, 73.6, 73.1, 72.8, 72.4, 62.6, 55.3, 45.3, 18.0.

2.3 Synthesis of alkene substrates.



Methyl 2,3-O-isopropylidene-5-deoxy-b-d-ribofuranoside (**3h-2**):

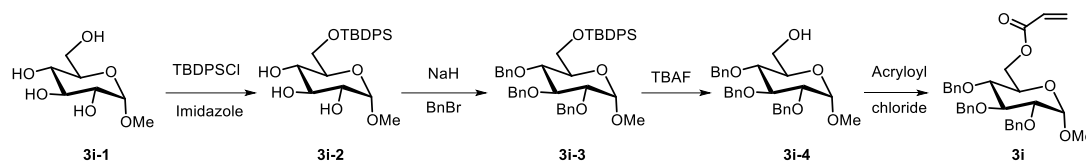
Step 1: 2,2-dimethoxy-propane (30 mL) was added to a suspension of d-ribose (**3h-1**, 12.26 g, 81.7 mmol) in acetone and methanol (120 mL, 2:1, anhydrous). After cooling to 0°C , HCl (4 M in dioxane, 6 mL) was added dropwise. The mixture was allowed to warm to room temperature under nitrogen overnight. After cooling to 0°C , the mixture was neutralized with pyridine (3.9 mL, 48.4 mmol), stirred for 30 min, and then concentrated in vacuo. The residue was dissolved in di-chloromethane (200 mL), and then washed successively with aqueous 1M HCl solution (2*50 mL), brine (50 mL), saturated NaHCO_3 aqueous solution (50 mL), brine (50 mL) and then dried over MgSO_4 . Filtration and then evaporation in vacuo gave the **3h-2** as a yellow oil (33 mmol, 12.0 g), which was used in the next step without further purification.

Step 2: ((3aR,4R,6R,6aR)-6-methoxy-2,2-dimethyltetrahydrofuro[3,4-d][1,3] dioxol-4-yl) methyl acrylate (**3h**)

The acryloyl chloride (1.5 mmol, 0.32 mL) in CH_2Cl_2 was added dropwise to a solution of **3h-2** (1.0 mmol), and triethylamine (Et_3N) (2.0 mmol, 0.72 mL) in CH_2Cl_2 at 0°C and then stirred at room temperature for 16 h. Upon completion, the reaction mixture was washed by brine (3*20 mL), dried over anhydrous Na_2SO_4 , and concentrated under vacuum. The residue was purified with column chromatography on silica gel (petroleum ether: ethyl acetate= 8:1) to yield compound **3h** as colorless liquid.

^1H NMR (400 MHz, Chloroform-d) δ 6.46 (d, J = 17.3 Hz, 1H), 6.15 (dd, J = 17.3, 10.4 Hz, 1H), 5.87 (d, J = 10.4 Hz, 1H), 4.99 (s, 1H), 4.70 (d, J = 5.8 Hz, 1H), 4.62 (d, J = 5.9 Hz, 1H), 4.42 (t, J = 6.9 Hz, 1H), 4.25 – 4.14 (m, 2H), 3.32 (s, 3H), 1.49 (s, 3H), 1.33 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-d) δ 165.7, 131.4, 128.0, 112.6, 109.4, 85.2, 84.2, 81.9, 64.7, 54.9, 26.4, 25.0.

((2R,3R,4S,5R,6S)-3,4,5-tris(benzyloxy)-6-methoxytetrahydro-2H-pyran-2-yl) methyl acrylate (3i**)**



Compound **3i-1** (25 mmol) and Imidazole (30 mmol) were dissolved in anhydrous DMF (50 mL) and the reaction mixture was cooled to 0°C. To this solution was added TBDPSCI (35 mmol) and the reaction mixture was brought to room temperature slowly with stirring. After 16 h, the reaction mixture was quenched by adding water. The resulting residue was dissolved in ethyl acetate. The organic solution was washed with water and brine, and then dried over anhydrous Na₂SO₄. After the volatiles were removed by rotary evaporation under reduced pressure, the crude product was purified by flash chromatography to yield **3i-2** as white solid. Compound **3i-2** (20 mmol) was dissolved in anhydrous DMF (80 mL) and cooled to 0°C. The solution was then carefully treated with sodium hydride (60%, 80 mmol) and stirred at 0°C for 30 min. Benzyl bromide (80 mmol) was added slowly and the reaction mixture was brought to room temperature. After overnight, the reaction mixture was quenched by adding water. The resulting residue was mixed with water and extracted with ethyl ether. The combined organic layers were dried over anhydrous Na₂SO₄. After the volatiles were removed by rotary evaporation under reduced pressure, the crude product was purified using flash chromatography to yield **3i-3**. Compound **3i-3** (6 mmol) was dissolved in anhydrous THF (20 mL) and added tetrabutylammonium fluoride solution (1.0 M in THF, 12 mL). The resulting mixture was stirred at room temperature for overnight. The reaction was quenched by adding saturated ammonium chloride solution and extracted with ethyl acetate. The combined organic layers were dried over anhydrous Na₂SO₄. After the volatiles were removed by rotary evaporation, the crude product was purified using flash chromatography to yield **3i-4** as colorless solid. According to the general procedure (**3h**, Step 2), the crude residue was purified by flash column chromatography on silica gel to yield compound **3i**. ¹H NMR (400 MHz, Chloroform-*d*) δ 7.50 – 7.05 (m, 15H), 6.52 – 6.28 (m, 1H), 6.10 (dd, *J* = 17.3, 10.4 Hz, 1H), 5.95 – 5.72 (m, 1H), 5.00 (d, *J* = 10.8 Hz, 1H), 4.94 – 4.73 (m, 3H), 4.71 – 4.49 (m, 3H), 4.35 (d, *J* = 3.3 Hz, 2H), 4.02 (t, *J* = 9.2 Hz, 1H), 3.95 – 3.77 (m, 1H), 3.61 – 3.44 (m, 2H), 3.37 (s, 3H). ¹³C NMR (101 MHz, Chloroform-*d*) δ 165.8, 138.6, 138.1,

75.9, 75.1, 73.4, 68.7, 63.1, 55.2.



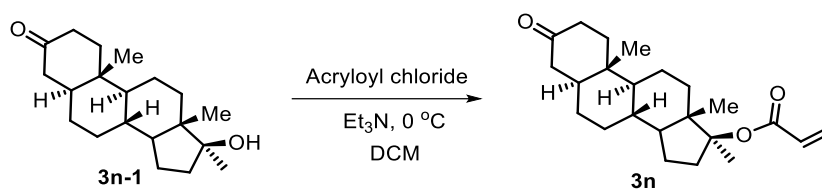
26.0, 26.0, 25.0, 24.5.



127.8, 127.7, 127.7, 98.9, 80.2, 75.2, 74.5, 74.5, 72.6, 72.1, 70.0, 63.6, 54.8.

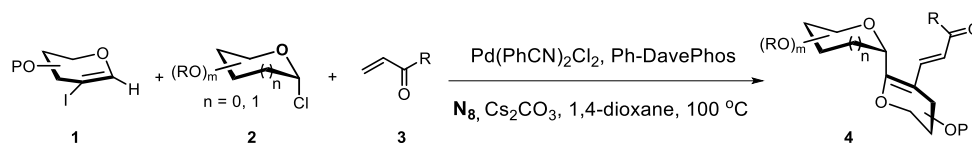


22.0, 20.7, 16.4.



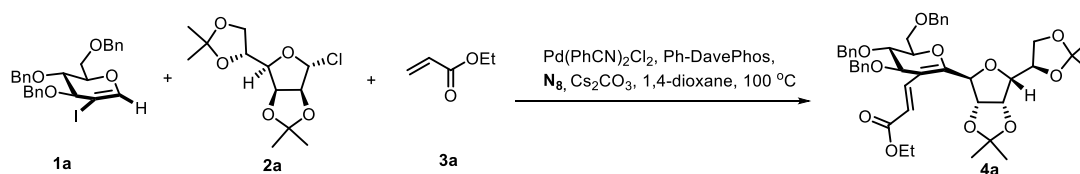
According to the general procedure (**3h**, Step 2). ^1H NMR (400 MHz, Chloroform-*d*) δ 6.38 (d, $J = 17.3$ Hz, 1H), 6.26 – 5.98 (m, 1H), 5.81 (d, $J = 10.3$ Hz, 1H), 4.90 – 4.41 (m, 1H), 2.71 (dd, $J = 14.5, 5.7$ Hz, 1H), 2.31 – 2.16 (m, 2H), 2.15 – 1.97 (m, 3H), 1.87 – 1.74 (m, 2H), 1.74 – 1.61 (m, 2H), 1.60 – 1.44 (m, 3H), 1.44 – 1.26 (m, 4H), 1.24 – 1.18 (m, 1H), 1.16 – 1.10 (m, 3H), 1.06 – 0.95 (m, 2H), 0.87 (d, $J = 7.2$ Hz, 3H), 0.86 – 0.77 (m, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 212.0, 166.2, 130.2, 128.9, 82.8, 50.7, 48.5, 45.9, 44.9, 43.0, 39.8, 39.5, 37.8, 36.8, 35.3, 31.1, 28.7, 27.5, 23.6, 20.0, 14.7, 14.4, 12.2.

3. General Procedure.



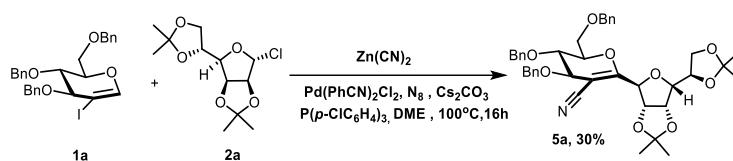
In a dried 10 ml tube equipped with a stirring bar, **1** (0.15 mmol, 1.5 equiv), **2** (0.2 mmol, 2 equiv), Pd(PhCN)₂Cl₂ (0.01 mmol, 0.1 equiv), Ph-Davephos (0.02 mmol, 0.2 equiv) and Cs₂CO₃ (0.2 mmol, 2 equiv) were added. The tube charged with argon more than three times. **3** (0.1 mmol, 1 equiv), **N**₈ (0.2 mmol, 2 equiv) and 1,4-dioxane (1.0 mL) were injected into the tube via microsyringe and plastic syringe, respectively. The resulting suspension was placed in an oil bath that had been preheated to 100 °C for 16 h, and then the mixture was cooled to r.t. The reaction mixture filtered and concentrated in vacuo. The residue was purified with chromatography column on silica gel to give **4**. (Petroleum ether/EtOAc).

4. General Procedure for gram experiment.



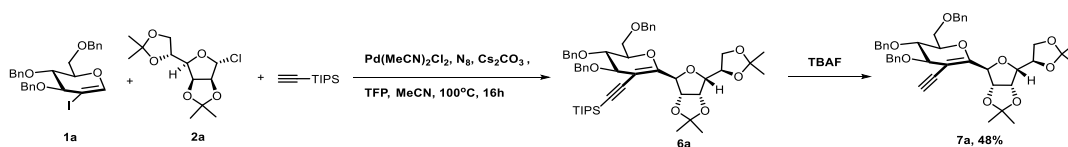
In a dried 25 ml tube equipped with a stirring bar, **1a** (1.8 mmol, 1.5 equiv, 975 mg), **2a** (2.4 mmol, 2 equiv, 667.2 mg), Pd(PhCN)₂Cl₂ (0.12 mmol, 0.1 equiv), Ph-Davephos (0.24 mmol, 0.2 equiv), and Cs₂CO₃ (2.4 mmol, 2 equiv) were added. The tube charged with argon more than three times. **3a** (1.2 mmol, 1 equiv), **N**₈ (2.4 mmol, 2 equiv) and 1,4-dioxane (12 mL) were injected into the tube via microsyringe and plastic syringe, respectively. The resulting suspension was placed in an oil bath that had been preheated to 100 °C for 16 h, and then the mixture was cooled to r.t. The reaction mixture filtered and concentrated in vacuo. The residue was purified with chromatography column on silica gel to give **4a** in 52% yield (471.7 mg). (Petroleum ether/EtOAc= 8:1-4:1).

5. Procedure for Synthesis of 5a.



In a dried 10 ml tube equipped with a stirring bar, **1a** (0.1 mmol, 1 equiv), **2a** (0.2 mmol, 2 equiv), Zn(CN)_2 (0.15 mmol, 1.5 equiv), $\text{Pd(PhCN)}_2\text{Cl}_2$ (0.01 mmol, 0.1 equiv), $\text{P}(p\text{-ClC}_6\text{H}_4)_3$ (0.02 mmol, 0.2 equiv) and Cs_2CO_3 (0.2 mmol, 2 equiv) were added. The tube charged with argon more than three times. **N**₈ (0.2 mmol, 2 equiv) and DME (1.0 mL) was injected into the tube via microsyringe and plastic syringe, respectively. The resulting suspension was placed in an oil bath that had been preheated to 100°C for 16 h, and then the mixture was cooled to r.t. The reaction mixture filtered, and concentrated in vacuo. The residue was purified with chromatography column on silica gel to give **5a** in 30% yield. (Petroleum ether/EtOAc= 8:1-4:1).

6. Procedure for Synthesis of 7a.



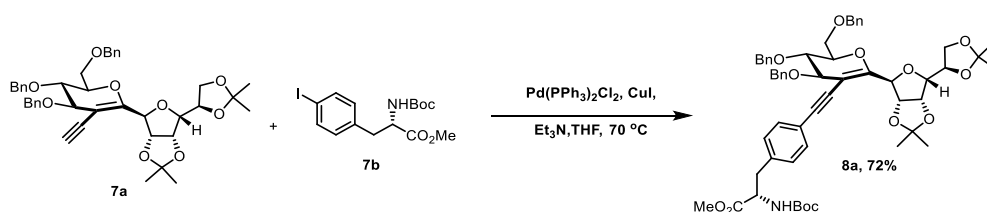
In a dried 10 ml tube equipped with a stirring bar, **1a** (0.15 mmol, 1 equiv), **2a** (0.2 mmol, 2 equiv), $\text{Pd(PhCN)}_2\text{Cl}_2$ (0.01 mmol, 0.1 equiv), TFP (0.02 mmol, 0.2 equiv) and Cs_2CO_3 (0.2 mmol, 2 equiv) were added. The tube charged with argon more than three times. **N**₈ (0.2 mmol, 2 equiv), (triisopropylsilyl)acetylene (0.1 mmol, 1 equiv) and DME (1.0 mL) were injected into the tube via microsyringe and plastic syringe, respectively. The resulting suspension was placed in an oil bath that had been preheated to 100 °C for 16 h, and then the mixture was cooled to r.t. The reaction mixture filtered, and concentrated in vacuo. The residue was purified with chromatography column on silica gel to give **6a** in 46% yield. (Petroleum ether/EtOAc= 8:1-5:1).

((((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)ethynyl)triisopropylsilane ¹H NMR (600 MHz, Chloroform-*d*) δ 7.30 (dd, *J* = 14.0, 6.9 Hz, 13H), 7.22 (d, *J* = 7.8 Hz, 2H), 5.22 (s, 1H), 4.97 (d, *J* = 11.3 Hz, 1H), 4.86 (d, *J* = 6.1 Hz, 1H), 4.76 – 4.74 (m, 1H), 4.70 (dd, *J* = 11.3, 9.1 Hz, 2H), 4.59 (d, *J* = 11.5 Hz, 1H), 4.50 –

4.49 (m, 2H), 4.33 (d, $J = 7.6$ Hz, 1H), 4.20 – 4.18 (m, 2H), 4.13 (dd, $J = 7.8, 3.8$ Hz, 1H), 4.09 – 4.07 (m, 1H), 4.05 – 4.03 (m, 1H), 3.82 – 3.80 (m, 1H), 3.78 – 3.76 (m, 1H), 3.63 (dd, $J = 10.9, 2.9$ Hz, 1H), 1.47 (s, 3H), 1.39 (s, 3H), 1.37 (s, 3H), 1.32 (s, 3H), 1.08 (s, 18H). ^{13}C NMR (151 MHz, Chloroform- d) δ 160.7, 138.2, 137.9, 137.9, 128.4, 128.3, 127.8, 127.8, 127.7, 127.6, 127.4, 112.7, 109.0, 97.2, 95.2, 84.8, 83.4, 82.4, 81.6, 73.7, 73.3, 73.0, 68.2, 67.1, 26.9, 26.3, 25.3, 25.1, 18.7, 11.4. HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{50}\text{H}_{66}\text{NaO}_9\text{Si}$ 861.4368 found 861.4355.

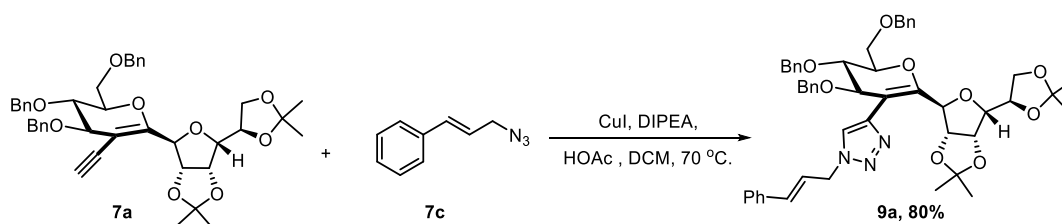
In a dry 50 mL round-bottom flask equipped with a stirring bar, **5a** (1 mmol) was dissolved in dry Et_2O (15 mL) with stirring. After a 1 M solution of $^n\text{Bu}_4\text{N}^+\text{F}^-$ in THF (1.5 mL) was added, the mixture was stirred for 20 minutes at r.t. The mixture was concentrated under vacuum, and the resulting residue was purified by column chromatography (Petroleum ether/ EtOAc = 8:1 - 5:1) to give **7a** in 98% yield.

7. Procedure for Synthesis of **8a**.



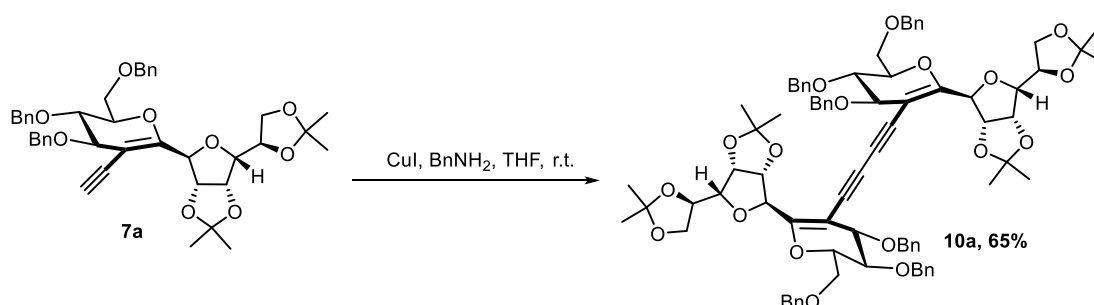
To a dried 10 mL Schlenk tube were added **7a** (68.2 mg, 0.1 mmol), methyl (S)-2-((tert-butoxycarbonyl)amino)-3-(4-iodophenyl)propanoate **7b** (44.6 mg, 0.11 mmol, 1.1 equiv), $\text{Pd}(\text{PPh}_3)_2\text{Cl}_2$ (3.5 mg, 5 mol%) and CuI (3.8 mg, 20 mol%). The tube charged with argon more than three times. Then Et_3N (15.2 mg, 0.15 mmol, 1.5 equiv) and THF (1ml) were injected into the tube via microsyringe and plastic syringe, respectively. The reaction mixture was heated to 70 °C for 12 h under vigorous stirring. Upon completion, the reaction mixture was cooled to room temperature. The reaction mixture filtered, and concentrated in vacuo. The residue was purified with chromatography column on silica gel to give **8a** in 72% yield. (Petroleum ether/ EtOAc = 5:1 - 3:1).

8. Procedure for Synthesis of 9a.



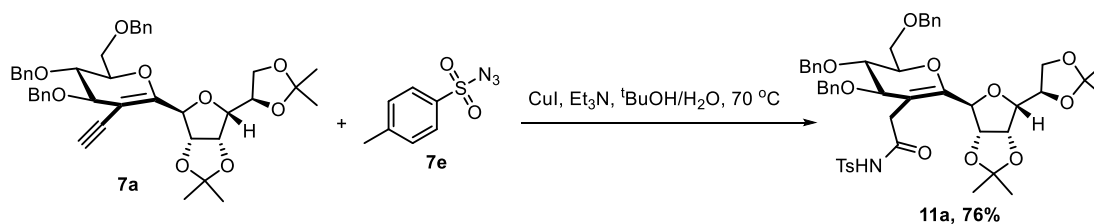
A dried 10 mL Schlenk tube was charged with **7a** (68.2 mg, 0.1 mmol), (E)-(3-azidoprop-1-en-1-yl)benzene **7c** (31.8 mg, 0.15 mmol, 1.5 equiv), N-ethyl-N-isopropylpropan-2-amine (DIEPA, 1.3mg, 10 mol%), AcOH (0.6 mg, 10 mol%) and CuI (1.9 mg, 10 mol%). The tube charged with argon more than three times. DME (1.0 mL) was injected into the tube via plastic syringe. The reaction mixture was heated to $70\text{ }^\circ\text{C}$ for 25 h under vigorous stirring. Upon completion, the reaction mixture was cooled to room temperature. The reaction mixture filtered, and concentrated in vacuo. The residue was purified with chromatography column on silica gel to give **9a** in 80% yield. (Petroleum ether/EtOAc= 4:1 - 2:1).

9. Procedure for Synthesis of 10a.



To a dried 10 mL Schlenk tube were added **7a** (68.2 mg, 0.1 mmol), CuI (1.9 mg, 10 mol%), BnNH_2 (2.2 mg, 20 mol%). The tube was evacuated and back filled with oxygen balloon. Then THF (1 ml) was injected into the tube via plastic syringe, the mixture was stirred for 16 h in r.t. The reaction mixture filtered, and concentrated in vacuo. The residue was purified with chromatography column on silica gel to give **10a** in 65% yield. (Petroleum ether/EtOAc= 5:1 - 3:1).

10. Procedure for Synthesis of 11a.



A dried 10 mL Schlenk tube was charged with *p*-toluenesulfonyl azide **7e** (0.12 mmol), **7a** (68.2 mg, 0.1 mmol) and CuI (3.8 mg, 20 mol%), and then the tube was evacuated and back filled with nitrogen (5 times). Et₃N (15.2 mg, 0.15 mmol, 1.5 equiv) and ^tBuOH / H₂O (2:1, 1 mL) were injected into the tube via microsyringe and plastic syringe, respectively. The reaction mixture was heated to 70 °C for 12 h under vigorous stirring. Upon completion, the reaction mixture was cooled to room temperature. The mixture was concentrated under vacuum, and the resulting residue was purified with chromatography column on silica gel ethyl to give **11a** in 76% yield. (Petroleum ether/EtOAc= 5:1 - 2:1).

11. Computational Details

All the structures were optimized by the B3LYP hybrid functional with the Grimme's dispersion correction at the D3 level (B3LYP-D3) including solvation effects via integral equation formalism model by using the Gaussian 09 program [4]. The 6-31G* basis set was used to C, H, O, N, P, and Cl atoms, while Lanl2DZ basis set was employed to Pd, I, and Cs atoms [5]. All of the energy minima and transition states have been verified by vibrational frequency analyses at the same level with no or only one imaginary frequency, respectively. The single point energies were revised at the PBE0-D3(BJ)/def2-TZVP level with RIJCOSX approximation by ORCA package [6]. All positive frequencies which are less than 100 cm^{-1} are set to 100 cm^{-1} for thermodynamics calculations [7]. The total Gibbs free energies include electronic energies and thermal corrections to Gibbs free energies at the experimental temperature.

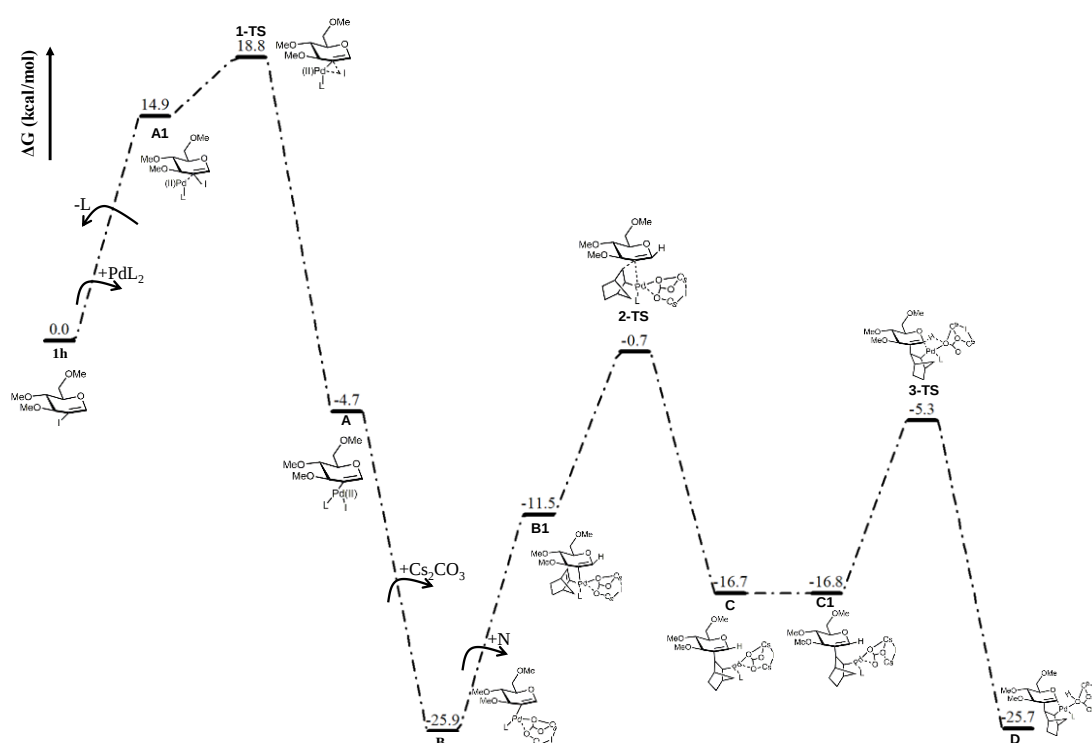


Figure S1. The free energy profile from the reactant **1h** to the intermediate **D**.

To prove that the oxocarbenium could not form during the experiments, calculations of intrinsic reaction coordinate (IRC) of transition state 4-TS (Figure S3) and scan of C-Cl bond of F- α (Figure S4) are also performed. The energy curve of scan of C-Cl bond has a maximum, and could be considered similar to the curve of IRC. The calculated results support the concerted three-membered cyclic transition state and our conclusions are also consistent with the previous study [8].

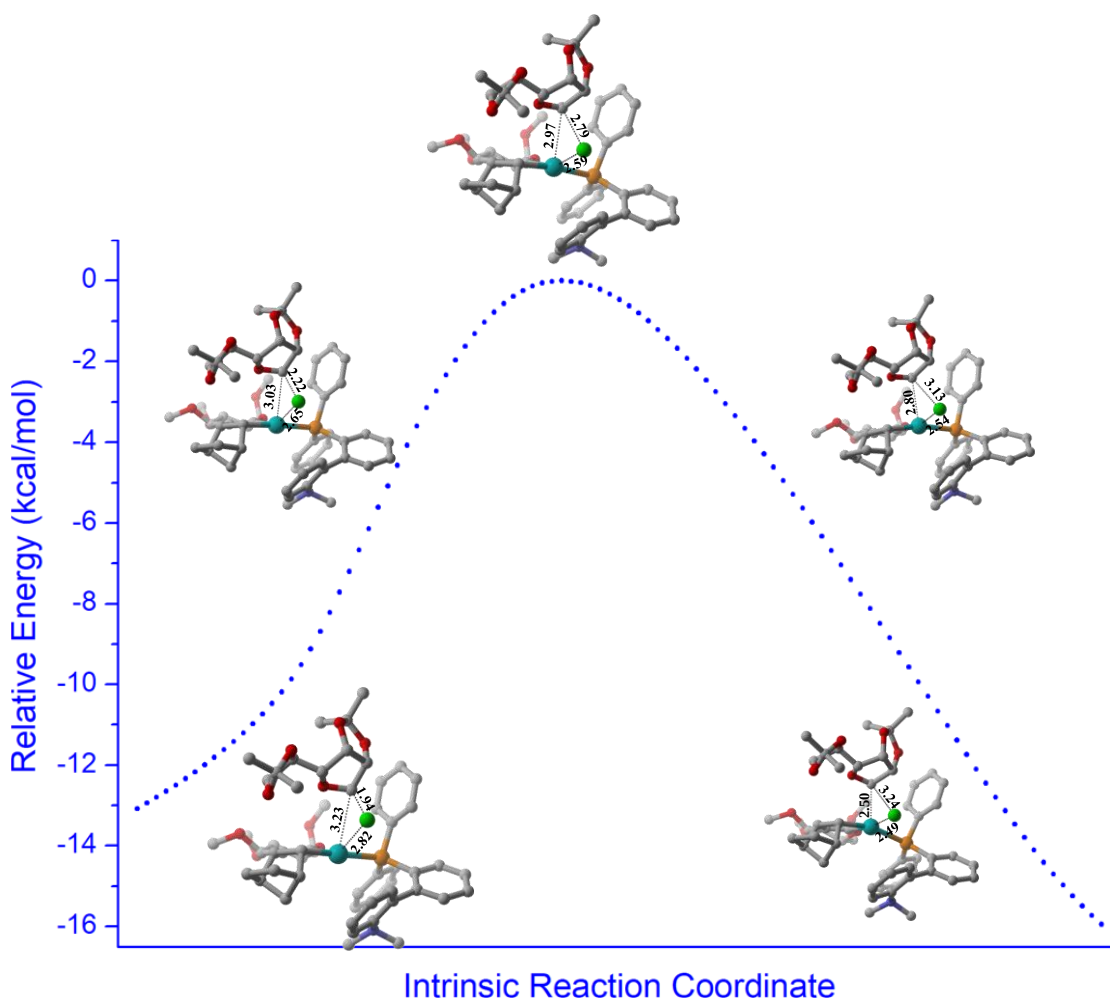


Figure S2. Intrinsic reaction coordinate (IRC) of transition state 4-TS. Some selective structures along IRC are also shown. The energy of transition state is set to zero.

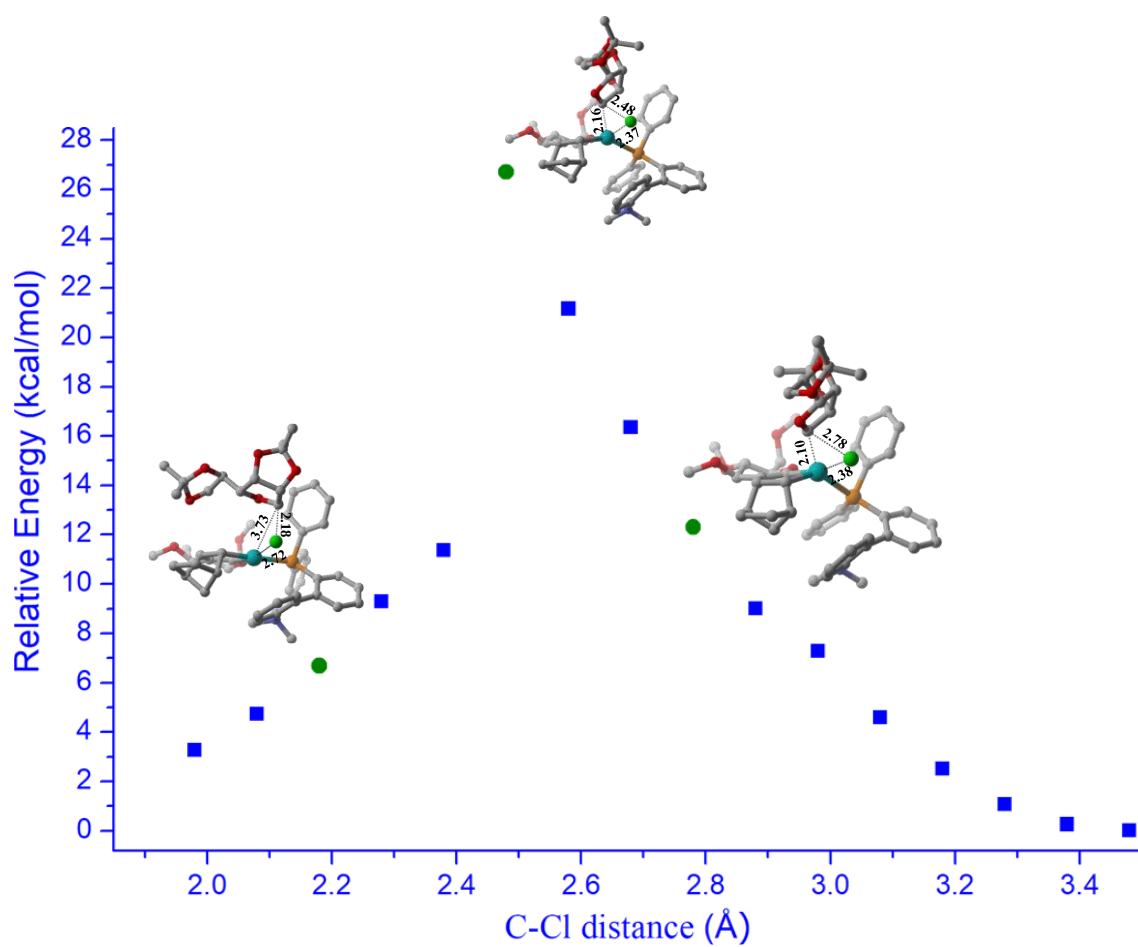


Figure S3. Relaxed scan of C-Cl bond of the intermediate F- α . The energy of F- α is set to zero.

Cartesian Coordinates

1h

C	-0.04232900	0.83703400	-0.33354500
C	-0.76825600	-0.47535700	-0.18305100
C	-0.15134600	-1.66286200	-0.23471800
C	1.89695700	-0.67408200	-0.94208100
C	1.46557200	0.58098300	-0.17968300
H	-0.65615600	-2.61405400	-0.10539100
H	-0.22426200	1.25289600	-1.33587300
H	1.64824200	-0.55043400	-2.00718200
H	1.66727000	0.43199100	0.88681500
O	1.18100200	-1.83311800	-0.45841800
O	-0.45866900	1.76639800	0.65631300
O	2.17799300	1.69859300	-0.68780100
C	3.39336300	-0.95462700	-0.82860200
H	3.91472400	-0.21294200	-1.43945600
H	3.59639900	-1.95630700	-1.23890900
C	3.00504100	2.35234400	0.27243400
H	3.50954700	3.16623700	-0.25523500
H	3.75053200	1.66254200	0.68575100
C	-0.64821100	3.08831400	0.17047000
H	0.26959100	3.49284100	-0.27450300
H	-1.45589600	3.12929000	-0.57558000
O	3.92551400	-0.82190400	0.47668300
C	3.62029500	-1.88892400	1.36678200
H	2.56246400	-1.89932900	1.65426600
H	3.86734000	-2.86325900	0.91897100
I	-2.89415300	-0.40506700	0.07857700
H	-0.93333800	3.69730000	1.03240200
H	2.40340300	2.77223600	1.09038600
H	4.23703000	-1.73717800	2.25669400

A1

C	3.37430900	0.68705000	-0.46741000
C	2.52798500	-0.52869700	-0.17452800
C	2.06563300	-0.78617700	1.11015600
C	3.15607100	1.16799100	2.01079000
C	3.05985400	1.75010700	0.59649000
H	1.70290100	-1.76152600	1.41608800
H	4.44369400	0.43276300	-0.40105600
H	4.19465300	0.84483200	2.18194200
H	2.04047300	2.10304500	0.41968900
O	2.30533600	0.01630400	2.19568800
O	3.08380300	1.19256800	-1.76142600

O	3.99236800	2.81844400	0.49664000
C	2.80206600	2.19655500	3.08403400
H	3.59795900	2.94632700	3.09604400
H	2.77689500	1.69325200	4.06306000
C	3.38779600	4.07817800	0.21598400
H	4.19675400	4.81286600	0.18015900
H	2.67286800	4.35704200	1.00116500
C	4.21714500	1.67587900	-2.47051300
H	4.71588500	2.49070600	-1.93241800
H	4.94351000	0.87034100	-2.65598100
O	1.59800200	2.90626700	2.85063200
C	0.40882900	2.18691400	3.16306800
H	0.21097600	1.39406600	2.43505700
H	0.46851200	1.73942300	4.16651400
Pd	0.42725700	-0.13683900	-0.32732800
I	2.94468700	-2.24455900	-1.49624800
N	-1.04479500	-2.48456000	3.11493900
C	-0.70342500	-1.09875200	3.43582700
H	-1.09457800	-0.42326100	2.67844300
H	-1.14517300	-0.82641500	4.40205200
H	0.38531000	-0.94683500	3.49138700
C	-0.45145800	-3.41610100	4.05934900
H	0.65360000	-3.43484400	4.02703700
H	-0.74546200	-3.11950900	5.07248100
H	-0.82190400	-4.42895500	3.87679300
C	-1.06323900	-2.86083400	1.75037700
C	-0.21713200	-3.87192700	1.26201100
C	-1.98644000	-2.25934300	0.84880700
C	-0.27808200	-4.29616500	-0.06643900
H	0.51100600	-4.32899600	1.92322900
C	-2.03791700	-2.71447800	-0.47381800
C	-1.19419800	-3.72256000	-0.94254200
H	0.40149900	-5.07127700	-0.40944800
H	-2.77334700	-2.28099600	-1.14276400
H	-1.25868400	-4.05002300	-1.97580200
C	-2.95621200	-1.21720400	1.30270200
C	-2.99868800	0.09864200	0.77297000
C	-3.87261800	-1.57078300	2.30667000
C	-3.95449300	1.00154800	1.27185700
C	-4.81565400	-0.66593000	2.78653300
C	-4.85597300	0.62895900	2.26723200
H	-3.99036800	2.01382600	0.88474100
H	-5.51383100	-0.96992200	3.56183000
H	-5.58304100	1.34850100	2.63405700

H	-3.82345400	-2.57410800	2.71653500
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C	-1.89547500	2.48983100	-0.51951400
C	-0.87999800	3.22303000	0.11354900
C	-2.93444100	3.18859700	-1.15674700
C	-0.91222600	4.61802300	0.13621800
H	-0.05449200	2.69733800	0.57819700
C	-2.96421900	4.58441500	-1.13938100
H	-3.71867100	2.64422900	-1.67434700
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C	-1.77272900	0.10259700	-3.24485100
C	-3.96441300	-0.02414700	-2.22771500
C	-2.32928700	-0.21353700	-4.48463200
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C	-4.51902200	-0.34743700	-3.46868500
H	-4.60409700	0.03741300	-1.35189300
C	-3.70363200	-0.44119000	-4.59881000
H	-1.68829800	-0.29185200	-5.35859400
H	-5.58753000	-0.52873500	-3.55020900
H	-4.13564100	-0.69653200	-5.56265700
H	2.87044100	4.06165400	-0.75292000
H	-0.41010300	2.91050600	3.13848200
H	3.84727400	2.04481900	-3.43059700

1-TS

C	-3.24492200	-1.02853000	-0.73935200
C	-2.20457200	0.02341900	-1.00882100
C	-2.33635300	1.30616600	-0.56746700
C	-4.39741200	0.82810600	0.56844300
C	-3.96027500	-0.64120000	0.56392400
H	-1.68607800	2.11320600	-0.88548700
H	-3.98844000	-1.05731600	-1.54694100
H	-5.15478700	0.96812700	-0.21624200
H	-3.25872600	-0.81786700	1.38518000
O	-3.31209300	1.74179800	0.28045400
O	-2.67323900	-2.31709800	-0.55767600
O	-5.13347000	-1.42209200	0.72043200
C	-5.01608300	1.23063700	1.90938400
H	-6.02711800	0.81868400	1.94990300
H	-5.07695600	2.32969100	1.95041100

C	-5.04849900	-2.39101100	1.76155900
H	-6.00440600	-2.92187000	1.77211000
H	-4.88992200	-1.90489000	2.73341000
C	-3.12260300	-3.30102500	-1.47948600
H	-4.20916100	-3.45071200	-1.40552200
H	-2.86030900	-3.03464000	-2.51194300
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C	-3.07342500	1.27522200	3.30877900
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C	-0.19958900	2.94911200	1.87528600
H	-1.25346300	2.78411400	1.60412400
H	0.30463700	1.98349200	1.87878800
H	-0.16082200	3.36288900	2.89020400
C	-0.24946500	5.14432700	0.87877300
H	-0.32322100	5.55627700	1.89154700
H	0.30961300	5.85185500	0.25975400
H	-1.27698600	5.06200400	0.47871200
C	0.93275700	3.33100600	-0.27223700
C	0.41845200	3.74432700	-1.51309600
C	1.99434500	2.38512900	-0.26064400
C	0.92943600	3.24756900	-2.71383400
H	-0.39984400	4.45576300	-1.54550400
C	2.49253200	1.90564200	-1.47837700
C	1.96990900	2.32355100	-2.70246500
H	0.49907200	3.57947300	-3.65474100
H	3.32430300	1.20897600	-1.46174800
H	2.37290400	1.92799100	-3.62961100
C	2.65520100	1.96993800	1.01270900
C	2.70225500	0.62855500	1.46448300
C	3.28077300	2.96450800	1.78270200
C	3.38435300	0.33327000	2.65875400
C	3.95197300	2.65713500	2.96303900
C	4.00720700	1.33298600	3.40294800
H	3.42058600	-0.69103100	3.01500300
H	4.43083100	3.44693600	3.53565900
H	4.52866200	1.07814400	4.32167700
H	3.22583400	3.99208100	1.43895100
P	1.81777900	-0.71362500	0.54039900
C	1.67436600	-2.05410500	1.80388200
C	0.57802600	-1.99500000	2.68179700

C	2.57948000	-3.11856800	1.92061800
C	0.40002300	-2.96910700	3.66320800
H	-0.14055600	-1.18384400	2.58737400
C	2.39381000	-4.10030700	2.89803400
H	3.42953900	-3.18509400	1.24900500
C	1.30775900	-4.02702600	3.77200200
H	-0.45166400	-2.90867100	4.33558300
H	3.10005100	-4.92291500	2.97398600
H	1.16502300	-4.79229000	4.53020200
C	3.09962400	-1.34881700	-0.62468200
C	2.66558400	-1.94888300	-1.81647600
C	4.47697100	-1.24563500	-0.37320800
C	3.59147900	-2.44758400	-2.73430500
H	1.60172800	-2.00516300	-2.03229200
C	5.40150000	-1.74011400	-1.29541500
H	4.82843000	-0.76949400	0.53759000
C	4.96053600	-2.34315500	-2.47646800
H	3.24221300	-2.90626700	-3.65544300
H	6.46550600	-1.65059600	-1.09281500
H	5.68148700	-2.72303400	-3.19543600
H	-2.78239400	0.94420400	4.30964900
H	-4.23768100	-3.10519600	1.57111000
H	-2.61439900	-4.23082100	-1.21157500

A

C	-2.18575400	-1.07767100	1.00755400
C	-1.16305400	-1.14198200	-0.09373200
C	-1.48311700	-1.50344200	-1.33863200
C	-3.70727100	-2.07795500	-0.72085100
C	-3.57995200	-1.00518500	0.36679800
H	-0.77355900	-1.57583500	-2.15566300
H	-2.11957600	-1.98497400	1.62563900
H	-3.49340100	-3.06220500	-0.27337300
H	-3.68942100	-0.01986100	-0.09827300
O	-2.75137300	-1.84288000	-1.76786800
O	-1.97440600	0.06556500	1.84160900
O	-4.57949100	-1.21346500	1.35985000
C	-5.10207500	-2.14111400	-1.33489700
H	-5.78304900	-2.50699600	-0.56125600
H	-5.09515400	-2.86229600	-2.16660500
C	-5.50822400	-0.14064800	1.46840200
H	-6.23249500	-0.42796200	2.23601700
H	-6.02763300	0.03257300	0.51770100
C	-2.26558400	-0.15693500	3.21431500

H	-3.30535100	-0.46739800	3.36178800
H	-1.60006600	-0.92273900	3.64116400
O	-5.61868700	-0.88833000	-1.75578200
C	-5.19469800	-0.47821300	-3.04834100
H	-4.11692800	-0.29474600	-3.08641600
H	-5.45380900	-1.23301300	-3.80764600
Pd	0.74150700	-0.72060400	0.35514800
I	1.17700500	-3.32937900	0.96947800
N	3.63873600	-0.87406800	-2.42211100
C	2.27500000	-0.88166000	-2.96041000
H	1.69794700	-0.04538900	-2.56710400
H	2.32048300	-0.77896800	-4.04965200
H	1.74522900	-1.81564600	-2.71079400
C	4.47585900	-1.88338500	-3.05711500
H	4.15283600	-2.91690600	-2.84467700
H	4.43735300	-1.73468500	-4.14100000
H	5.51437400	-1.76767100	-2.73391500
C	3.76194300	-0.72372900	-1.02427400
C	4.42676100	-1.67118400	-0.23039200
C	3.23383200	0.44040100	-0.38571400
C	4.54595100	-1.51490100	1.15066200
H	4.82058200	-2.57175600	-0.68464000
C	3.34166800	0.55684700	1.01643900
C	3.98664300	-0.41259600	1.78855800
H	5.05028000	-2.28372400	1.72829800
H	2.98054300	1.46438400	1.48944000
H	4.05609900	-0.29231600	2.86492300
C	2.81290500	1.64150000	-1.17611500
C	1.55627100	2.27451500	-1.04360300
C	3.75412700	2.19808600	-2.05887600
C	1.28397800	3.44116600	-1.77994400
C	3.47329200	3.35273400	-2.78396600
C	2.23318100	3.98071200	-2.64388100
H	0.31065100	3.91400000	-1.69663700
H	4.22107900	3.76162200	-3.45777500
H	2.00308600	4.87944400	-3.20904100
H	4.71341500	1.70494300	-2.17263400
P	0.28574600	1.53752500	0.06852900
C	-1.31210900	2.05304300	-0.65887300
C	-1.55044700	1.81219800	-2.02149400
C	-2.33814000	2.58215800	0.13422100
C	-2.78753100	2.11872500	-2.58452100
H	-0.76695200	1.39046400	-2.64436700
C	-3.58027300	2.87854000	-0.43154500

H	-2.17626500	2.74269900	1.19334000
C	-3.80785900	2.64932800	-1.78928900
H	-2.95851700	1.93433100	-3.64110800
H	-4.37114600	3.28382400	0.19342900
H	-4.77656900	2.87523800	-2.22577400
C	0.43248400	2.48874800	1.63626700
C	0.46296000	1.80084600	2.85778700
C	0.53337500	3.88878300	1.63209700
C	0.58670600	2.50330500	4.05795100
H	0.38331800	0.71909600	2.86232000
C	0.65236200	4.58829800	2.83324500
H	0.52612900	4.43579600	0.69432400
C	0.67956100	3.89678800	4.04777700
H	0.61088600	1.95984600	4.99837700
H	0.72885600	5.67199300	2.81997900
H	0.77683300	4.44313800	4.98189500
H	-2.08684000	0.79203200	3.72723300
H	-5.00587800	0.78759200	1.77745100
H	-5.73023200	0.44873300	-3.27340000

B

C	-0.58956900	1.63527300	0.44020900
C	0.13231100	0.67962000	-0.46324800
C	-0.16825900	0.57261900	-1.75953400
C	-2.22295000	1.73173200	-1.48953600
C	-1.59153800	2.50613000	-0.32755300
H	0.36416600	-0.05748700	-2.46665500
H	-1.11276500	1.05018700	1.19974200
H	-2.76892200	0.86454100	-1.08897300
H	-1.05521900	3.37376100	-0.72741900
O	-1.20070800	1.25043300	-2.38496700
O	0.35710800	2.48296500	1.11507700
O	-2.61612800	2.92584100	0.58458300
C	-3.21938100	2.55498100	-2.29751200
H	-4.12245200	2.67629900	-1.69493800
H	-3.48874500	1.98988700	-3.20244400
C	-2.85991400	4.32899400	0.59611800
H	-3.71047000	4.49725800	1.26348800
H	-3.10035400	4.70171800	-0.40526500
C	0.04802200	2.69620000	2.48680700
H	-0.89922800	3.24264300	2.60426900
H	-0.01004800	1.73738000	3.01610600
O	-2.78190900	3.86643000	-2.62944200
C	-1.79163100	3.92927700	-3.64635700

H	-0.82793000	3.52584800	-3.31488600
H	-2.10655000	3.37342400	-4.54317800
Pd	1.42721300	-0.54513000	0.45838300
N	3.08730300	-3.67153800	-1.41823700
C	2.69666100	-2.62303100	-2.36222100
H	3.06449500	-1.65064200	-2.03879600
H	3.12726600	-2.84325600	-3.34470400
H	1.59845900	-2.55052900	-2.46519300
C	2.71960400	-4.99328600	-1.90064100
H	1.62656200	-5.13961400	-1.99424900
H	3.16044800	-5.14088300	-2.89181900
H	3.11448000	-5.76246100	-1.23114600
C	2.83667100	-3.39598300	-0.05102300
C	1.99286000	-4.19499600	0.73044800
C	3.48274400	-2.28251000	0.56727600
C	1.75170600	-3.90792000	2.07693100
H	1.47992200	-5.03790400	0.28169700
C	3.20857500	-2.00421800	1.92537300
C	2.34733900	-2.80904100	2.68136400
H	1.06661800	-4.53524500	2.63890000
H	3.75637700	-1.19911300	2.40726200
H	2.14374300	-2.56163900	3.71737400
C	4.63512600	-1.57827100	-0.08521200
C	4.68092000	-0.18762900	-0.32364200
C	5.76752900	-2.35135200	-0.39615100
C	5.86234100	0.39544600	-0.81378500
C	6.92484000	-1.76580700	-0.90010500
C	6.97888100	-0.38300700	-1.10180700
H	5.89691500	1.46559700	-0.99276200
H	7.78825200	-2.38523500	-1.12665500
H	7.88191300	0.08239900	-1.48647800
H	5.72720700	-3.42259800	-0.22832400
P	3.17708600	0.83902100	-0.03236300
C	3.01916500	1.89630700	-1.51993700
C	3.48179000	1.48020600	-2.77619800
C	2.26513900	3.07801600	-1.42123500
C	3.20940600	2.24309200	-3.91473400
H	4.05829100	0.56536300	-2.87320400
C	2.00350800	3.83902500	-2.55955800
H	1.85558100	3.37627900	-0.46189100
C	2.47373300	3.42468800	-3.80935000
H	3.57684000	1.91277700	-4.88262600
H	1.42004100	4.75148100	-2.47141400
H	2.26295000	4.01690500	-4.69563500

C	3.66153300	1.98438700	1.31971800
C	3.21082300	1.71070400	2.61924400
C	4.49837100	3.08877000	1.09995200
C	3.61175500	2.51562000	3.68691400
H	2.52008600	0.88964700	2.78782200
C	4.89008500	3.89687100	2.16782700
H	4.82704400	3.33300000	0.09421300
C	4.45360100	3.60761600	3.46372000
H	3.25286800	2.29648100	4.68884600
H	5.53399300	4.75340900	1.98764300
H	4.76085300	4.23761700	4.29404200
C	-0.92074900	-1.54143700	1.87172600
O	-1.99619500	-2.21758100	1.95819500
O	-0.12778600	-1.83520800	0.81789200
O	-0.58234700	-0.60399400	2.66820000
Cs	-3.68777600	0.39292900	2.58695800
Cs	-2.25169700	-2.83149900	-1.13349200
I	-5.61151600	-0.50731100	-0.95976700
H	-1.98752400	4.87577200	0.98404100
H	0.86126700	3.29720800	2.90131300
H	-1.67682400	4.98638300	-3.90563500

B1

C	3.44891300	-1.38964500	-1.87018100
C	2.46705700	-1.41171400	-0.71918400
C	2.59812400	-2.35774700	0.21886100
C	4.50009000	-3.40512700	-0.79480400
C	4.76746900	-2.03175400	-1.42632300
H	1.91804700	-2.47197800	1.05702000
H	3.05574700	-1.97707500	-2.71611700
H	4.07007900	-4.05774200	-1.57270100
H	5.23461300	-1.37810100	-0.68523700
O	3.57838700	-3.33477900	0.29815600
O	3.64989400	-0.04601000	-2.33048500
O	5.63725800	-2.23117400	-2.54284900
C	5.77850100	-4.06793600	-0.28164400
H	6.37105800	-4.38730800	-1.14333200
H	5.49724700	-4.95810000	0.30369500
C	6.91516600	-1.62538600	-2.39338900
H	7.50080300	-1.90179700	-3.27512300
H	7.42269800	-1.97893900	-1.48777100
C	3.99852900	0.08077200	-3.69974500
H	4.97813700	-0.35042400	-3.92594600
H	3.25138000	-0.40664800	-4.34674100

O	6.62914600	-3.22044600	0.47304200
C	6.14017300	-2.85819100	1.75931800
H	5.31892900	-2.13643800	1.70424800
H	5.79404400	-3.74199400	2.31596300
Pd	0.85234500	-0.16399200	-0.51468200
N	-1.38193200	4.41919200	-0.91603300
C	-1.57204800	4.08741100	0.49560700
H	-1.22284100	3.07178600	0.68880900
H	-1.06337300	4.80150400	1.15820400
H	-2.64513900	4.11504400	0.73509400
C	-2.34057700	5.34812400	-1.47208400
H	-3.33491000	4.90219900	-1.67461000
H	-2.49752100	6.16932800	-0.76311200
H	-1.96671800	5.77602000	-2.40683500
C	-0.58908800	3.63060500	-1.75781900
C	-1.03340300	3.30315700	-3.05583300
C	0.69800300	3.17590900	-1.34906200
C	-0.26012100	2.51648100	-3.91187300
H	-1.99646500	3.66944800	-3.40084100
C	1.44453000	2.37420300	-2.21854700
C	0.97638000	2.03369900	-3.49139600
H	-0.63392400	2.28184300	-4.90586900
H	2.43077900	2.04154200	-1.91736000
H	1.58430300	1.42082600	-4.14749000
C	1.32427900	3.70377900	-0.10006800
C	1.82806200	2.95065200	0.98483400
C	1.44440800	5.10920000	-0.04157600
C	2.40255100	3.63292300	2.07866800
C	2.00966200	5.76448900	1.04371800
C	2.48875000	5.01815100	2.12315200
H	2.78946900	3.06243300	2.91661000
H	2.08344400	6.84871600	1.04521500
H	2.93335400	5.50761400	2.98508400
H	1.06699000	5.68612800	-0.87963500
P	1.85301900	1.09786200	1.13720100
C	0.96473500	0.76326500	2.71355800
C	0.03545500	1.66042500	3.25213200
C	1.14570600	-0.48503000	3.33353700
C	-0.67833400	1.32829400	4.40662700
H	-0.14192700	2.61464000	2.77051900
C	0.44738800	-0.80845600	4.49437900
H	1.84229300	-1.20208400	2.91096000
C	-0.46841600	0.10130800	5.03704200
H	-1.39920900	2.03438700	4.80968200

H	0.61623700	-1.76930400	4.97429700
H	-1.00945800	-0.14528200	5.94791200
C	3.63690900	0.85144800	1.56178800
C	4.56014300	0.93275500	0.50814300
C	4.11591200	0.68489600	2.86978600
C	5.92996900	0.85646500	0.75873700
H	4.20910500	1.02096800	-0.51389000
C	5.48933700	0.59867900	3.11618500
H	3.42532800	0.62599500	3.70404000
C	6.40056200	0.68842200	2.06384300
H	6.62928600	0.91307200	-0.07123900
H	5.84261900	0.46499400	4.13529200
H	7.46776900	0.62018300	2.25625000
C	-1.54259000	0.26573800	0.91492900
O	-1.13611000	-0.92048300	1.14522300
O	-0.83937000	1.01766800	0.04845000
O	-2.58410900	0.79448300	1.42282000
Cs	-3.89599700	1.39819800	-1.27061000
Cs	-3.39319800	-1.86212100	2.85946000
I	-5.86415000	-2.07136700	-0.46794200
C	-0.89238200	-3.22791100	-3.70868300
C	0.15945200	-2.90107200	-2.58856400
C	-1.73648700	-1.94634900	-1.80036800
C	-2.19999100	-2.56185200	-3.16555400
H	-0.58956100	-2.84131100	-4.68752400
H	-1.00874100	-4.31310700	-3.80294300
H	-2.60323600	-1.80595700	-3.84867900
C	-0.73365000	-3.02140700	-1.33448500
H	-0.23253400	-2.74282600	-0.40708300
H	-1.19344600	-4.01168500	-1.23413200
C	0.34635800	-1.39600000	-2.67699700
C	-0.79369200	-0.82123500	-2.19717500
H	1.06959500	-3.50303800	-2.62045500
H	-2.53995900	-1.70423900	-1.10674900
H	1.09133000	-0.89779400	-3.28461300
H	-1.08129100	0.20765200	-2.37443300
H	6.83448600	-0.52814100	-2.35124800
H	4.00794200	1.15229500	-3.91933000
H	6.97866000	-2.40107200	2.29213000
H	-2.99100300	-3.29735500	-2.98808200

2-TS

C	3.39873400	-1.47846300	-2.10989400
C	2.20660600	-1.67395100	-1.19174100

C	2.27917000	-2.63085200	-0.23976500
C	4.43230900	-3.42544300	-0.89843900
C	4.67848200	-2.02189500	-1.46171000
H	1.46195300	-2.85866600	0.43472200
H	3.25280400	-2.04600600	-3.04555800
H	4.16297600	-4.09109200	-1.73369700
H	4.97467500	-1.35375100	-0.65032300
O	3.34407300	-3.44014500	0.04271000
O	3.52357000	-0.09570500	-2.44761700
O	5.71265700	-2.12854500	-2.44063900
C	5.65858100	-4.01463800	-0.20351300
H	6.38850300	-4.28090100	-0.97266700
H	5.35059000	-4.93257500	0.32246800
C	6.92446300	-1.46751900	-2.09388700
H	7.66028400	-1.74265600	-2.85494100
H	7.28238500	-1.77651500	-1.10500500
C	4.09573100	0.17046200	-3.72021300
H	5.13397900	-0.16689900	-3.79275400
H	3.51670300	-0.31294100	-4.52289100
O	6.33262400	-3.13244300	0.67501200
C	5.63225700	-2.81252500	1.87224900
H	4.80551700	-2.11631800	1.69424700
H	5.23419600	-3.71801700	2.35366500
Pd	0.75115200	-0.18191600	-0.60959700
N	-1.25964500	4.50072000	-0.83222000
C	-1.49984700	4.12751300	0.56318900
H	-1.15958100	3.10687200	0.74501600
H	-1.01355500	4.82324100	1.26058100
H	-2.58060700	4.14882600	0.76493600
C	-2.19993100	5.44749600	-1.38939800
H	-3.18431900	5.00683900	-1.64507100
H	-2.38488400	6.24095900	-0.65655500
H	-1.79329300	5.91040500	-2.29358800
C	-0.47402400	3.70962400	-1.67803700
C	-0.89826800	3.43269200	-2.99434400
C	0.78759100	3.19902300	-1.25151200
C	-0.14239700	2.62674400	-3.84896300
H	-1.83531300	3.84789900	-3.35465300
C	1.51609800	2.38442600	-2.12362400
C	1.06020700	2.08075800	-3.41069200
H	-0.50411000	2.42920500	-4.85562600
H	2.48303000	2.00859200	-1.81317200
H	1.64905600	1.43900900	-4.05652900
C	1.40143800	3.66958500	0.02717700

C	1.87769100	2.86401300	1.08825100
C	1.53717100	5.06988800	0.14648700
C	2.43250000	3.49475800	2.22157000
C	2.08544300	5.67252300	1.27041000
C	2.53035500	4.87611600	2.32840800
H	2.79523000	2.88437600	3.04214300
H	2.17120300	6.75488100	1.31881800
H	2.95843800	5.32403700	3.22092500
H	1.18303700	5.68697200	-0.67281100
P	1.90525100	1.00206800	1.11496000
C	1.06361300	0.55362500	2.68995200
C	0.17532500	1.40774100	3.35214300
C	1.24248300	-0.75298000	3.17696800
C	-0.49694800	0.97574100	4.49919700
H	-0.00488500	2.40609100	2.97087000
C	0.58579000	-1.17801800	4.32887600
H	1.89996400	-1.43976500	2.65021700
C	-0.28646500	-0.31047200	4.99808500
H	-1.18502100	1.65135700	5.00068400
H	0.75023500	-2.18558400	4.70307700
H	-0.79329400	-0.63632200	5.90390000
C	3.69944800	0.76310100	1.52219500
C	4.61840900	0.88964900	0.46812200
C	4.19062600	0.57722100	2.82470600
C	5.99178900	0.85221700	0.71608000
H	4.26093200	0.99134000	-0.55182500
C	5.56516800	0.53236500	3.06824100
H	3.50175100	0.47494700	3.65655700
C	6.47077800	0.67585700	2.01609400
H	6.68909400	0.95329600	-0.11055900
H	5.92556800	0.38874600	4.08365800
H	7.54024600	0.64333500	2.20517700
C	-1.56748600	0.31983800	0.97148700
O	-1.23134600	-0.88039200	1.22249300
O	-0.83590500	1.02518100	0.08405700
O	-2.57393900	0.92175500	1.47469100
Cs	-3.68902200	1.45939300	-1.37350300
Cs	-3.56297000	-1.68577300	2.88423600
I	-5.88857400	-1.88386500	-0.53163000
C	-0.97001900	-3.41921400	-3.50234000
C	0.02528100	-3.24967200	-2.30603600
C	-1.68770400	-1.87000800	-1.76896800
C	-2.16539700	-2.48460600	-3.11778100
H	-0.51083400	-3.15683100	-4.46222700

H	-1.28645000	-4.46592200	-3.56698500
H	-2.36106800	-1.72156300	-3.88050600
C	-0.96686800	-3.07307700	-1.13739300
H	-0.51886800	-2.80666700	-0.18031900
H	-1.62481100	-3.94022200	-1.01068500
C	0.57048400	-1.83823500	-2.46823700
C	-0.51115400	-0.96636000	-2.13490300
H	0.77969300	-4.03527000	-2.22376500
H	-2.47257100	-1.43649400	-1.15200300
H	1.21677300	-1.60164600	-3.30832800
H	-0.66656600	-0.05558600	-2.71350500
H	6.79825000	-0.37465700	-2.10328200
H	4.05100900	1.25430700	-3.85713000
H	6.35507500	-2.33388800	2.53668700
H	-3.09234600	-3.04886900	-2.96934500

C

C	3.64431800	-2.23950100	-1.88176500
C	2.25301600	-2.36777200	-1.28700100
C	2.11896600	-2.56690300	0.05550400
C	4.32242000	-3.36553500	0.25042800
C	4.78430500	-2.42110500	-0.85973700
H	1.17306700	-2.64420500	0.57605500
H	3.77221200	-3.02904100	-2.64257900
H	4.01216100	-4.31903300	-0.20695000
H	5.02771000	-1.45367900	-0.41217700
O	3.16393600	-2.79493500	0.89798100
O	3.70025700	-0.96555400	-2.52869200
O	5.90903300	-2.97225900	-1.53941500
C	5.36610700	-3.69051000	1.31288100
H	6.11926900	-4.33206600	0.84524700
H	4.87298200	-4.26318900	2.11466600
C	7.16531000	-2.39512200	-1.19827400
H	7.92864100	-2.99410600	-1.70202400
H	7.34132700	-2.39823000	-0.11780700
C	4.76332900	-0.81055300	-3.45896900
H	5.73952900	-0.73657400	-2.96513300
H	4.79623500	-1.64574600	-4.17299600
O	6.06842100	-2.58447100	1.84159300
C	5.32940800	-1.78336300	2.75737700
H	4.56186100	-1.19119400	2.25171300
H	4.85096200	-2.40508000	3.52951200
Pd	0.92351100	-0.29630400	-0.50226100
N	-1.29154700	3.96196300	-1.93899600

C	-1.66574700	3.91685300	-0.52475400
H	-1.26914500	3.01570100	-0.05491400
H	-1.32679500	4.81039300	0.01683200
H	-2.76082700	3.86955200	-0.43890100
C	-2.22213300	4.65080900	-2.80593200
H	-3.12686800	4.06216200	-3.05736800
H	-2.56345500	5.56608300	-2.30925400
H	-1.73764500	4.93572900	-3.74476100
C	-0.33174000	3.10046300	-2.48283200
C	-0.55523700	2.48273700	-3.73070400
C	0.91269000	2.86479000	-1.82742900
C	0.38931700	1.62699000	-4.30139900
H	-1.48400100	2.66946700	-4.26242100
C	1.83217100	1.98903600	-2.41616800
C	1.58531400	1.36265400	-3.64072400
H	0.17648900	1.16235900	-5.26143600
H	2.79050900	1.84046800	-1.93125900
H	2.31171900	0.67093300	-4.05033900
C	1.30469900	3.66221700	-0.62755600
C	1.70672400	3.14311800	0.62443500
C	1.29122600	5.06348600	-0.79365800
C	2.04175600	4.04317900	1.65589800
C	1.62917800	5.93499200	0.23308900
C	1.99960100	5.42029700	1.47829900
H	2.33346300	3.65284400	2.62491400
H	1.60724900	7.00825500	0.06358300
H	2.25970000	6.08346200	2.29870800
H	0.98914900	5.46015900	-1.75767400
P	1.91254200	1.33299400	1.00758000
C	1.11001000	1.14227900	2.65083800
C	-0.01819700	1.89372200	3.00613700
C	1.53195400	0.10408100	3.49863900
C	-0.69105700	1.63293900	4.20183300
H	-0.39034600	2.66546400	2.34259800
C	0.85977600	-0.15431700	4.69203400
H	2.38529700	-0.50971200	3.22217200
C	-0.25276800	0.61497100	5.05123100
H	-1.56155700	2.22949200	4.46310400
H	1.20479400	-0.95397100	5.34256500
H	-0.76839000	0.42324600	5.98960400
C	3.72554900	1.31452400	1.36844600
C	4.57270500	0.98837100	0.29748500
C	4.29841700	1.67744800	2.59770300
C	5.96029200	1.04949000	0.44502400

H	4.14562900	0.66616200	-0.64880800
C	5.68516400	1.73319300	2.74468500
H	3.66250400	1.90488800	3.44769500
C	6.52033700	1.42644000	1.66708800
H	6.60237700	0.79350000	-0.39336700
H	6.11379000	2.01492700	3.70295300
H	7.59972700	1.46942900	1.78322400
C	-1.57773600	0.30307200	0.81780600
O	-1.27024800	-0.82290300	1.31408400
O	-0.82608200	0.82365800	-0.17966900
O	-2.58528700	1.01339600	1.15111600
Cs	-3.63065600	0.78349900	-1.79476900
Cs	-3.67991900	-1.06607000	3.13267600
I	-6.44275100	-1.54551200	0.05462700
C	-0.65147500	-3.72525900	-3.54702700
C	0.30039300	-3.77889600	-2.32082400
C	-1.27047000	-2.26407400	-1.69722800
C	-1.76292100	-2.70860800	-3.10386500
H	-0.13091900	-3.40919200	-4.45830200
H	-1.07871200	-4.71492700	-3.74123700
H	-1.85410000	-1.86926000	-3.80451400
C	-0.71552300	-3.60102500	-1.17208300
H	-0.28573700	-3.53174800	-0.17373000
H	-1.47228200	-4.39457500	-1.15844900
C	1.08641600	-2.43917900	-2.29423900
C	-0.01364600	-1.41577000	-1.94125600
H	0.93568800	-4.67017800	-2.28357900
H	-2.01622400	-1.80378300	-1.04929700
H	1.52712300	-2.22581700	-3.27386100
H	-0.15750800	-0.64703000	-2.70746000
H	7.23831800	-1.35737400	-1.55878700
H	4.56862500	0.11992600	-3.99871200
H	6.04483900	-1.10695100	3.22800900
H	-2.74331400	-3.19651100	-3.03854200

C1

C	0.94914300	2.27065300	3.25718000
C	0.39537700	1.03547000	2.57476800
C	-0.45784100	1.15104100	1.53573900
C	-0.81505400	3.46158700	1.94184000
C	0.61720200	3.54753000	2.48081500
H	-0.89832000	0.30594100	1.00551800
H	0.50009300	2.35877000	4.26108300
H	-1.49406600	3.26425500	2.78671500

H	1.31428100	3.62143200	1.64011700
O	-0.91217900	2.35207400	1.02626900
O	2.36379800	2.12835800	3.39351700
O	0.74898700	4.66823300	3.34936100
C	-1.30989400	4.72525500	1.25495400
H	-1.33970000	5.51503200	2.01167100
H	-2.33410800	4.56171600	0.89011800
C	1.52341500	5.73741400	2.81717500
H	1.53370000	6.52372400	3.57666100
H	1.09050600	6.13372400	1.88990700
C	2.90483700	2.67663800	4.58643700
H	2.74222000	3.75863300	4.65339800
H	2.46928300	2.19930200	5.47786100
O	-0.47027500	5.18925800	0.20541900
C	-0.83941300	4.75525800	-1.09192300
H	-0.67359000	3.67953000	-1.22087100
H	-1.89282300	4.99373900	-1.30693200
Pd	1.28422900	-0.67715000	0.37347600
N	4.31960000	-3.70935100	0.38049900
C	3.07792100	-4.04417500	-0.32933900
H	2.69658700	-3.19571300	-0.89222100
H	3.26851200	-4.87156300	-1.02244800
H	2.28214500	-4.34262000	0.37076400
C	4.76895600	-4.80512300	1.22249600
H	4.06998700	-5.04209300	2.04589500
H	4.86420700	-5.70357800	0.60307200
H	5.74971500	-4.57808600	1.65150200
C	4.41038600	-2.40422400	0.91132000
C	4.54358400	-2.17418500	2.29152400
C	4.38879300	-1.27935400	0.03675500
C	4.60183300	-0.88014400	2.81476300
H	4.56372900	-3.01573400	2.97480600
C	4.43505600	0.01010800	0.59096800
C	4.52571800	0.22182000	1.96954600
H	4.68052000	-0.74226300	3.89010400
H	4.45673000	0.86409100	-0.07797900
H	4.52539900	1.23099100	2.36355400
C	4.45350500	-1.44228600	-1.44815100
C	3.55180400	-0.83771900	-2.35818600
C	5.51450500	-2.20594100	-1.96768000
C	3.74719100	-1.01495300	-3.74032500
C	5.69528100	-2.37162200	-3.33696100
C	4.80649400	-1.77246800	-4.23216800
H	3.05309100	-0.56032800	-4.43995400

H	6.52767300	-2.96596400	-3.70402100
H	4.93375800	-1.89587000	-5.30413500
H	6.19766900	-2.67895200	-1.27107400
P	2.10721600	0.14982700	-1.76319800
C	0.94071600	0.07850800	-3.18875500
C	0.22986200	-1.12153000	-3.38348000
C	0.68941000	1.17047600	-4.03685200
C	-0.71679600	-1.21901400	-4.40462900
H	0.39133600	-1.96002200	-2.71320500
C	-0.26362800	1.06759400	-5.05733400
H	1.23676500	2.09929000	-3.90612600
C	-0.96882800	-0.12612600	-5.24313900
H	-1.26686100	-2.14742100	-4.52857800
H	-0.44475000	1.91661800	-5.71211700
H	-1.70652700	-0.20509800	-6.03761300
C	2.71659700	1.88882100	-1.79686000
C	2.04860900	2.82291300	-0.98997200
C	3.81440700	2.31168400	-2.56215800
C	2.46297400	4.15590100	-0.95297500
H	1.20446300	2.50366600	-0.38492200
C	4.23498100	3.64286200	-2.51694900
H	4.34668200	1.59965200	-3.18541700
C	3.56046100	4.56633900	-1.71398200
H	1.92386300	4.86465300	-0.33226600
H	5.09123600	3.95681900	-3.10796100
H	3.89116500	5.60091200	-1.67854600
C	-0.97915400	-2.23990300	-0.62655200
O	-1.60279100	-1.19577900	-0.20749500
O	0.34864200	-2.34002000	-0.46342800
O	-1.54249300	-3.21516900	-1.20307800
Cs	-4.07381300	-3.02211800	0.55987500
Cs	-2.63339800	1.16378700	-1.73392800
I	-6.26212200	0.38341800	-0.16402700
C	0.18461600	-2.01908900	4.97166900
C	-0.41363600	-0.88724200	4.09870100
C	-0.02240100	-2.54049600	2.59597500
C	0.43351000	-3.17228800	3.94144800
H	1.10191500	-1.70156100	5.48086600
H	-0.52838900	-2.32591100	5.74546400
H	1.47977200	-3.49616700	3.91217100
C	-1.22653200	-1.69870400	3.06730800
H	-1.66187400	-1.10542500	2.26318400
H	-2.01414400	-2.29906000	3.54538800
C	0.73685500	-0.30449800	3.22249000

C	1.01636900	-1.47352200	2.24081800
H	-0.96268100	-0.12673200	4.66400700
H	-0.19935300	-3.25990900	1.79542900
H	1.62852600	-0.12095000	3.83057800
H	2.04083600	-1.85427800	2.32294700
H	2.55685300	5.41768000	2.61856800
H	3.97860900	2.46922800	4.56489100
H	-0.20184300	5.28808400	-1.80108400
H	-0.17636500	-4.05339000	4.17971200

3-TS

C	0.68437300	0.89578900	3.84563500
C	0.42250500	-0.06630300	2.70322900
C	-0.18987500	0.28559300	1.53336800
C	-0.92429800	2.32360800	2.58842800
C	0.33858200	2.33215400	3.45573600
H	-0.85309300	-0.51185500	0.51780000
H	0.06176000	0.62181600	4.71555000
H	-1.72038700	1.79901500	3.14373500
H	1.17331400	2.73398600	2.87283700
O	-0.67067200	1.60176500	1.37099800
O	2.06448000	0.79217500	4.22203900
O	0.13186800	3.10507600	4.63824200
C	-1.45373700	3.70932500	2.25164500
H	-1.74569700	4.19148700	3.19020400
H	-2.35478900	3.61575000	1.62890500
C	0.81057100	4.35441000	4.65014200
H	0.55216900	4.84338600	5.59366800
H	0.50597100	4.99635900	3.81384000
C	2.32374000	1.03131500	5.59623900
H	2.07284000	2.05592200	5.89545500
H	1.75962500	0.33552100	6.23729900
O	-0.49066400	4.55016100	1.62332500
C	-0.63988600	4.68828900	0.22284900
H	-0.46714200	3.74017500	-0.30211200
H	-1.63753300	5.07888900	-0.03625800
Pd	1.42554100	-0.71338700	0.16224000
N	4.26106500	-3.63358200	-1.06671600
C	3.00671500	-3.60471800	-1.83128600
H	2.68795400	-2.58471900	-2.03668900
H	3.15337800	-4.12262600	-2.78539700
H	2.18756700	-4.09539300	-1.28159800
C	4.67960000	-4.99364900	-0.77032000
H	3.97633800	-5.53616700	-0.11168800

H	4.74856200	-5.55051700	-1.71074100
H	5.66743200	-4.99264500	-0.29972800
C	4.36984300	-2.68234100	-0.02896400
C	4.52172000	-3.06203300	1.31401800
C	4.32802000	-1.28918600	-0.34174100
C	4.55558800	-2.11482900	2.34407700
H	4.56827900	-4.11354400	1.57293200
C	4.32269300	-0.36215900	0.71858700
C	4.41954500	-0.76259300	2.05714200
H	4.64737000	-2.45138600	3.37334600
H	4.33479000	0.69756700	0.48731600
H	4.37415100	-0.02070900	2.84692400
C	4.47888200	-0.80719600	-1.75291800
C	3.65019600	0.16328800	-2.36729100
C	5.55993200	-1.32164400	-2.49275100
C	3.92093700	0.56820000	-3.68690400
C	5.81871900	-0.90834800	-3.79557400
C	4.99209200	0.03997000	-4.40197000
H	3.27748800	1.30331800	-4.16041000
H	6.66348900	-1.32651200	-4.33622500
H	5.17924900	0.36621700	-5.42129400
H	6.19599400	-2.06637800	-2.02824500
P	2.22418500	0.89791200	-1.45449000
C	1.09443400	1.43359300	-2.80736100
C	0.39982300	0.42967900	-3.50962800
C	0.87171600	2.78115700	-3.13556200
C	-0.48508500	0.77383500	-4.53345700
H	0.51997000	-0.61140800	-3.22418200
C	-0.02603900	3.12046200	-4.15451600
H	1.40239600	3.56523300	-2.60386400
C	-0.70108100	2.11862800	-4.85986900
H	-1.01704600	-0.01266600	-5.06105400
H	-0.18477200	4.16648100	-4.40533600
H	-1.38967800	2.38348700	-5.65821800
C	2.90405600	2.48080900	-0.80054400
C	2.22310300	3.06999100	0.27492200
C	4.05620000	3.10385300	-1.30490300
C	2.67419400	4.26911100	0.82891100
H	1.33465400	2.59005000	0.67050300
C	4.51523500	4.29569700	-0.73913500
H	4.59997000	2.65726200	-2.13150000
C	3.82503100	4.88117500	0.32586500
H	2.11554800	4.71783700	1.64462100
H	5.41308400	4.76610700	-1.13124400

H	4.18479900	5.80908500	0.76261000
C	-1.07013500	-1.61013600	-1.35192100
O	-1.61666500	-0.98042000	-0.29539700
O	0.19876900	-1.86519600	-1.35601800
O	-1.83253000	-1.92722000	-2.29848600
Cs	-4.07210300	-3.01293600	-0.33028900
Cs	-2.75020500	1.61483200	-1.42291100
I	-6.36189200	0.35095100	-0.14609100
C	0.48034900	-3.80508000	3.83262900
C	-0.20020500	-2.44061400	3.55127300
C	0.09574500	-3.30627500	1.47217600
C	0.63251000	-4.43168100	2.40364400
H	1.44475500	-3.68198200	4.33903200
H	-0.14876900	-4.43153100	4.47519300
H	1.66592200	-4.70962400	2.16930500
C	-1.07783500	-2.78117400	2.33077200
H	-1.57745800	-1.91439500	1.90124200
H	-1.82032400	-3.56030900	2.55705100
C	0.86638300	-1.50253500	2.91524100
C	1.14031200	-2.18565900	1.56170500
H	-0.71641000	-2.00744100	4.41446400
H	-0.12838900	-3.62804100	0.45406800
H	1.77741500	-1.48048300	3.52248700
H	2.15940600	-2.56985200	1.46258000
H	1.90155000	4.21511700	4.60848900
H	3.39376300	0.86034600	5.74685800
H	0.11774800	5.40091500	-0.11072600
H	0.01721300	-5.33503400	2.30104300

D

C	0.54475000	2.98194200	3.04574000
C	0.54145400	1.58354700	2.48441200
C	0.60324000	1.31124800	1.15914000
C	-0.11539500	3.54714100	0.72159700
C	0.74396500	3.99131800	1.91376000
H	-1.18079600	-0.90304100	0.31621700
H	-0.40958500	3.22227100	3.54732800
H	-1.14125200	3.36700000	1.08973200
H	1.79634700	3.96969000	1.60388500
O	0.40585600	2.30758500	0.19732400
O	1.59890700	3.05993100	4.01351500
O	0.37043100	5.29431700	2.35350000
C	-0.20454800	4.58545800	-0.39003900
H	-0.63608600	5.49006700	0.05021600

H	-0.89545700	4.24231900	-1.17605300
C	1.31821400	6.30935300	2.04212200
H	0.88966200	7.25523000	2.38493700
H	1.51674700	6.36674700	0.96463400
C	1.39753200	4.02366400	5.03426100
H	1.40112100	5.05053300	4.64892400
H	0.44376500	3.85750400	5.56026100
O	1.04668500	4.93470100	-0.95385500
C	1.35246800	4.22340100	-2.14398100
H	1.30990600	3.14278400	-1.98552000
H	0.66290600	4.50435000	-2.95836900
Pd	0.97123300	-0.55742800	0.53801200
N	3.44298200	-4.34025800	1.17616800
C	2.31480900	-4.57210200	0.26976100
H	2.21028700	-3.76728200	-0.45173600
H	2.47377000	-5.51202100	-0.27192500
H	1.36225900	-4.63091300	0.81750600
C	3.54164900	-5.38249900	2.18408000
H	2.68263300	-5.40422700	2.87984900
H	3.57873700	-6.35274500	1.67672700
H	4.46004400	-5.26478800	2.76689200
C	3.68565900	-3.01185500	1.58971300
C	3.67058200	-2.65908900	2.95149900
C	4.01753900	-2.00305000	0.63677700
C	3.96498000	-1.36277200	3.37885500
H	3.40019300	-3.40202700	3.69319300
C	4.32798700	-0.71716400	1.09837000
C	4.29225700	-0.37895700	2.45192600
H	3.92340800	-1.12820600	4.43930600
H	4.64356400	0.02656100	0.37718100
H	4.52301200	0.63383400	2.76737200
C	4.17870400	-2.30528200	-0.81912800
C	3.51039100	-1.61212500	-1.86096300
C	5.08997000	-3.31936800	-1.16697800
C	3.78181700	-1.96445600	-3.19630400
C	5.34708600	-3.65330600	-2.49227900
C	4.68679200	-2.97240100	-3.51640800
H	3.26549400	-1.45200300	-4.00128700
H	6.05917500	-4.44067300	-2.72428300
H	4.87154200	-3.22350300	-4.55733800
H	5.58837300	-3.85558300	-0.36701300
P	2.30169300	-0.23857400	-1.51902200
C	1.29756000	-0.20453400	-3.06888700
C	0.47798400	-1.32633900	-3.31426200

C	1.21923800	0.89272300	-3.94190700
C	-0.39302600	-1.34350900	-4.40389800
H	0.51158000	-2.17590400	-2.63881500
C	0.34130500	0.87293100	-5.03356500
H	1.84661800	1.76231800	-3.78163900
C	-0.46707500	-0.24280200	-5.26815900
H	-1.01867800	-2.21600200	-4.56983200
H	0.30103400	1.72775200	-5.70434300
H	-1.14399800	-0.25901900	-6.11826400
C	3.38993200	1.25538400	-1.61885900
C	3.45202400	2.12818900	-0.52208300
C	4.20427500	1.51027700	-2.73487700
C	4.28939500	3.24474400	-0.55027300
H	2.85385700	1.92632900	0.35709600
C	5.03206900	2.63335800	-2.76774400
H	4.19712700	0.82800100	-3.57983000
C	5.07405400	3.50527400	-1.67521600
H	4.32029000	3.91207300	0.30649700
H	5.65211000	2.82081500	-3.64028000
H	5.72303900	4.37655200	-1.69919400
C	-1.18351500	-2.56843900	-0.66303100
O	-1.85014000	-1.40232000	-0.20974300
O	0.04968000	-2.64788200	-0.37846200
O	-1.90774600	-3.36434700	-1.27531000
Cs	-4.57173200	-2.77450400	0.57386700
Cs	-2.23771900	1.31939000	-1.94232400
I	-5.98890000	0.82728500	-0.63594700
C	-0.72210100	-0.86048500	5.21225800
C	-0.85903400	0.28499800	4.18274300
C	-0.89058200	-1.56844900	2.88406700
C	-0.76000800	-2.14423100	4.32009300
H	0.20438100	-0.77645500	5.79176400
H	-1.55599800	-0.84802300	5.92392100
H	0.13533000	-2.76619200	4.42942900
C	-1.80111000	-0.34765000	3.13359900
H	-1.93724400	0.28332200	2.24957300
H	-2.78655400	-0.60724000	3.54384000
C	0.48270400	0.39003600	3.39199300
C	0.45444800	-0.91208200	2.52488100
H	-1.19200200	1.23129000	4.62030800
H	-1.23156200	-2.30720400	2.15550800
H	1.32826600	0.39589200	4.09269800
H	1.29717700	-1.58054400	2.73807100
H	2.26908000	6.13762300	2.56893400

H	2.21830100	3.90088000	5.74742500
H	2.37151400	4.49301000	-2.42897800
H	-1.62696200	-2.77203900	4.56683400
E- α			
C	0.28516800	4.40644200	0.10059800
C	0.02086500	2.99852100	-0.36788400
C	0.75915200	1.93866800	0.03993500
C	2.26388200	3.36692900	1.27026000
C	1.12329200	4.38703000	1.37272900
H	0.83401200	4.97613200	-0.66849200
H	2.94219700	3.68093700	0.46062100
H	0.46184100	4.09926300	2.19674300
O	1.78111900	2.04507100	0.95823200
O	-0.96246100	5.07359600	0.35306400
O	1.69259200	5.67593600	1.61189500
C	3.07287100	3.27587600	2.56435800
H	3.70507100	4.16521100	2.63569200
C	1.31660000	6.25891500	2.85269400
H	1.84333900	7.21550100	2.92355500
H	1.60119600	5.61907000	3.69679300
C	-0.98313200	6.43275500	-0.04319700
H	-0.21197200	7.02479600	0.46663000
H	-0.84093000	6.53761200	-1.13111700
O	2.29626600	3.27654400	3.75670600
C	1.53006500	2.10177300	3.98048500
H	0.68719700	2.01904100	3.28267800
H	2.14530200	1.19805600	3.88392300
Pd	0.39476400	0.11230500	-0.68162100
N	3.71373800	-0.18223000	-2.46203700
C	3.65659200	1.27522500	-2.53797500
H	2.67740100	1.62014900	-2.19867600
H	4.41350700	1.69231900	-1.86510000
H	3.86339800	1.67451900	-3.54604100
C	5.05329700	-0.68584000	-2.78227500
H	5.35625000	-0.43204300	-3.81320000
H	5.77888700	-0.24486100	-2.08963500
H	5.09251600	-1.76953100	-2.66467900
C	2.65527500	-0.88122000	-3.11734100
C	1.95521900	-0.30442600	-4.18844600
C	2.30990200	-2.19738900	-2.71564700
C	0.94829000	-0.99624500	-4.86025500
H	2.20093400	0.69951700	-4.51126200
C	1.30274000	-2.87902200	-3.41354700

C	0.61381100	-2.29201300	-4.47419300
H	0.42729400	-0.51409800	-5.68287200
H	1.05144600	-3.88726700	-3.09715000
H	-0.17340100	-2.83942000	-4.98417900
C	3.06264600	-2.96078000	-1.67454400
C	3.10786600	-2.65261600	-0.29841700
C	3.78310800	-4.08092500	-2.13639300
C	3.91344100	-3.44014900	0.54613900
C	4.55191500	-4.86651100	-1.28290700
C	4.62763800	-4.53623200	0.07084300
H	3.97449100	-3.19240500	1.60130100
H	5.09762100	-5.72046300	-1.67492600
H	5.23598700	-5.12481200	0.75193100
H	3.74420300	-4.31448900	-3.19666800
P	2.14390800	-1.26395500	0.47314400
C	3.51208500	-0.52475700	1.48275400
C	4.48861300	0.21025800	0.79554900
C	3.66813800	-0.72778700	2.86028100
C	5.59841100	0.72367200	1.46362400
H	4.37049100	0.35641300	-0.26880100
C	4.77687000	-0.20355300	3.53373000
H	2.93233700	-1.29780800	3.41761800
C	5.74677000	0.51964900	2.83949200
H	6.34581000	1.28799700	0.91166700
H	4.87944300	-0.36698600	4.60328600
H	6.60793500	0.92416200	3.36421100
H	3.71276000	2.38624800	2.51705100
C	-2.45874300	3.12729800	-3.35245500
C	-1.06924500	3.31904100	-2.70087000
C	-1.12983900	1.09214100	-3.09575300
C	-2.50510000	1.58902100	-3.62424400
H	-3.26678300	3.45701300	-2.69049300
H	-2.53524500	3.69688900	-4.28667600
H	-3.33715300	1.10139200	-3.10811900
C	-0.22147200	2.28347900	-3.46504400
H	0.78979200	2.18344900	-3.06557200
H	-0.16745000	2.47538700	-4.54496600
C	-1.13209700	2.70192300	-1.27056200
C	-1.16205400	1.17015100	-1.56052400
H	-0.70911100	4.35324800	-2.71724800
H	-0.84598000	0.11825900	-3.49661700
H	-2.05728400	3.04400700	-0.79080600
H	0.23327100	6.44606000	2.89313300
H	-1.97124400	6.82418300	0.21814300

H	1.14482800	2.17133300	5.00257100
C	-4.47325400	-2.35825100	0.00560300
C	-3.28384000	-3.35425000	0.07911100
C	-2.07028500	-2.44527900	0.36745800
C	-3.80171500	-0.98129000	0.11323800
H	-5.07427500	-2.43944800	-0.90233800
H	-3.14253700	-3.97209000	-0.80879300
H	-3.35483500	-2.17934700	2.92524200
H	-3.58199300	-0.60443200	-0.89232300
O	-2.54496100	-1.23557400	0.78937600
Cl	-1.06238100	-2.25872200	-1.23867100
O	-5.28831000	-2.68911300	1.11787700
O	-3.56620600	-4.19417800	1.17931800
C	-4.63243500	-3.63647900	1.96312700
C	-4.07794400	-2.94686000	3.20831400
H	-4.89535000	-2.48236500	3.76868400
H	-3.57822500	-3.67854900	3.84951100
H	-1.35457900	-2.84758200	1.07506900
C	-5.61445000	-4.75278200	2.28796700
H	-5.12592200	-5.52216600	2.89328000
H	-6.46606900	-4.35144900	2.84506100
H	-5.97362900	-5.20094000	1.35788300
C	-4.55982000	0.08052100	0.90140600
C	-3.86558700	1.44515700	0.85859700
H	-4.74580700	-0.28003500	1.91594300
H	-2.77754700	1.39582500	0.79826700
H	-4.15569200	2.06212300	1.72005500
C	-5.72043900	1.57262700	-0.46853000
O	-5.80909000	0.32554800	0.25733300
O	-4.36368000	1.98906600	-0.36243100
C	-6.66120600	2.58383000	0.18629400
H	-6.62993700	3.53376300	-0.35634500
H	-7.68654900	2.20180000	0.17931800
H	-6.36639000	2.76068400	1.22461600
C	-6.04014700	1.32944100	-1.93568400
H	-7.08377800	1.02069700	-2.04769100
H	-5.87435700	2.24296500	-2.51429600
H	-5.39318700	0.54056200	-2.32678800
H	-2.05475500	0.68981000	-1.15668900
C	1.13334000	-2.10618400	1.77455000
C	1.02292000	-3.49319300	1.94599700
C	0.37017300	-1.25937000	2.60193000
C	0.18952400	-4.02123900	2.93843100
H	1.57839300	-4.16928900	1.30565500

C	-0.44622800	-1.78711100	3.60047700
H	0.41459700	-0.18516600	2.44973300
C	-0.53618500	-3.17196600	3.77468800
H	0.10898200	-5.09873700	3.05309300
H	-1.02377900	-1.11814600	4.23251600
H	-1.17769700	-3.58449300	4.54769100
H	-2.60642700	1.37427400	-4.69630600

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C	-0.22474400	4.03089000	-1.28818100
C	-0.33077000	2.52787700	-1.25661000
C	0.43195800	1.74375700	-0.45837300
C	1.78920800	3.62321600	0.16016100
C	0.60591500	4.55615100	-0.11910100
H	0.26917200	4.35281600	-2.22020100
H	2.41672800	3.56284400	-0.74326200
H	-0.03647400	4.57844700	0.76864400
O	1.31824400	2.29600900	0.45854600
O	-1.54048800	4.61258600	-1.25201100
O	1.09616000	5.86310000	-0.42428000
C	2.67356600	4.10976500	1.31006700
H	3.31097600	4.91143300	0.92817200
C	0.67956800	6.87989800	0.47746000
H	1.12663100	7.81407700	0.12376200
H	1.02188500	6.67253200	1.49782900
C	-1.70162700	5.73063100	-2.10685200
H	-0.99841200	6.53943900	-1.86875000
H	-1.56701900	5.45326100	-3.16480400
O	1.97367700	4.68400100	2.40764200
C	1.34439200	3.75426800	3.27016000
H	0.56765700	3.17198000	2.75841000
H	2.07679400	3.05526100	3.70360200
Pd	0.24407300	-0.26592300	-0.55704400
N	3.88866000	-1.24527200	-2.41951700
C	4.05833300	-0.09148400	-3.29314600
H	3.11362400	0.44848500	-3.39900900
H	4.79056800	0.58162700	-2.83844500
H	4.42862700	-0.35748200	-4.29915200
C	5.19124500	-1.84558600	-2.11830800
H	5.71268900	-2.16936200	-3.03626800
H	5.81114300	-1.10128200	-1.60714000
H	5.08914900	-2.70553800	-1.46086800
C	2.81306200	-2.11816600	-2.73140100
C	2.14957000	-2.02226000	-3.97004800

C	2.35838400	-3.10092300	-1.80958100
C	1.08876400	-2.86118400	-4.30519000
H	2.47429300	-1.29089700	-4.69908400
C	1.29516200	-3.93737700	-2.17555000
C	0.65110400	-3.82942800	-3.40599800
H	0.60634900	-2.74685300	-5.27250700
H	0.95600200	-4.67371400	-1.45411700
H	-0.18354100	-4.48104300	-3.64626500
C	3.03742400	-3.41675300	-0.51423100
C	3.09698200	-2.58933400	0.62900000
C	3.67304400	-4.67512900	-0.46267300
C	3.84154500	-3.02890900	1.74067500
C	4.38667200	-5.10159800	0.65231400
C	4.48624800	-4.26147400	1.76180900
H	3.89561200	-2.40440100	2.62501400
H	4.86750900	-6.07607900	0.65025000
H	5.04978500	-4.56450800	2.63992000
H	3.61578600	-5.31116000	-1.34123200
P	2.21747000	-0.95817000	0.76894100
C	3.62854900	0.22985000	0.87805200
C	3.87271900	1.03998500	-0.23741000
C	4.47009400	0.34434100	1.99368900
C	4.96221300	1.91103800	-0.26191200
H	3.18428300	0.99870200	-1.07073500
C	5.55272700	1.22745400	1.97868600
H	4.27458500	-0.23838700	2.88833900
C	5.80988800	2.00298900	0.84549800
H	5.13513300	2.53356900	-1.13607100
H	6.19422400	1.30796000	2.85226200
H	6.65391100	2.68739500	0.83273900
H	3.31403000	3.28016100	1.64100700
C	-2.34043600	1.40273800	-4.38267100
C	-1.07380900	1.91854200	-3.66081300
C	-1.01794400	-0.30425700	-3.23984600
C	-2.31420100	-0.13187300	-4.08430600
H	-3.25034300	1.88885700	-4.01026200
H	-2.28122400	1.59910400	-5.46008400
H	-3.20431900	-0.46903500	-3.54370300
C	-0.09365900	0.74989600	-3.88541200
H	0.85042300	0.87123400	-3.34607500
H	0.11779500	0.55638400	-4.94476300
C	-1.33425400	1.83601700	-2.12347700
C	-1.28294000	0.30162500	-1.85485400
H	-0.74199500	2.90682000	-3.99700100

H	-0.65034300	-1.32986300	-3.22099200
H	-2.32664600	2.26320600	-1.91518500
H	-0.41525800	6.99032800	0.47839800
H	-2.72558500	6.09183300	-1.96859300
H	0.88840900	4.33303300	4.07892700
C	-3.72636600	-1.84671400	1.89981100
C	-2.30125900	-1.57638100	2.45799100
C	-1.80838900	-0.44920900	1.57496600
C	-3.81040500	-0.96037300	0.64813900
H	-3.91662600	-2.89069000	1.65123500
H	-1.62198900	-2.41900100	2.52045500
H	-3.83636600	1.14410200	2.86615700
H	-3.46641700	-1.51638400	-0.22514500
O	-2.75118300	0.06010700	0.85979500
Cl	-0.94148700	-2.52254000	-0.07474200
O	-4.60511400	-1.44832600	2.93814000
O	-2.50571000	-1.02032100	3.74867000
C	-3.89872500	-0.73311200	3.95531500
C	-4.14806900	0.76994300	3.84422600
H	-5.21250600	0.98346100	3.97988800
H	-3.57895100	1.29826600	4.61473300
H	-0.94382300	0.16996700	1.77685400
C	-4.29565800	-1.30427900	5.30851000
H	-3.72976400	-0.81244100	6.10487500
H	-5.36410100	-1.14588800	5.48142200
H	-4.08413900	-2.37641500	5.32471500
C	-5.13277000	-0.26644800	0.35474000
C	-5.06215000	0.64558400	-0.87397800
H	-5.51600000	0.23201200	1.24749600
H	-4.10668200	1.15430500	-1.00906200
H	-5.87259500	1.38694700	-0.84862600
C	-6.15151900	-1.27286700	-1.49086000
O	-6.05185200	-1.27972300	-0.04294400
O	-5.23131800	-0.28149800	-1.94028400
C	-7.58577600	-0.90263900	-1.86114100
H	-7.70350200	-0.89404000	-2.94892400
H	-8.28392100	-1.62764200	-1.43200400
H	-7.83229200	0.08837000	-1.46898800
C	-5.71391600	-2.61930000	-2.04760600
H	-6.36750800	-3.41116500	-1.67034000
H	-5.76610300	-2.60713500	-3.14039600
H	-4.68383100	-2.83166700	-1.74930600
H	-2.19893800	-0.09197400	-1.41423300
C	1.57765200	-1.00208100	2.49836200

C	1.13753400	-2.17869300	3.12421600
C	1.36692000	0.22734600	3.14433500
C	0.53701600	-2.12500600	4.38479100
H	1.26411200	-3.13650000	2.63090300
C	0.75973800	0.27822400	4.39904500
H	1.66791900	1.13852200	2.64265600
C	0.34870400	-0.89994600	5.02753900
H	0.20580000	-3.04477100	4.85974800
H	0.60720200	1.23914700	4.88421400
H	-0.13034600	-0.86308600	6.00152700
H	-2.24442900	-0.71532200	-5.01177400

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C	-0.49801500	3.02416600	-2.75592600
C	-0.56785400	1.71676700	-2.00682500
C	-0.00174600	1.54499300	-0.79722900
C	1.10728300	3.64938200	-0.93330300
C	-0.04607600	4.14359200	-1.81367200
H	0.22943400	2.96479200	-3.58354500
H	1.92557400	3.30636700	-1.58117100
H	-0.89312500	4.41477300	-1.17240100
O	0.68141200	2.52306500	-0.13112500
O	-1.79164100	3.30048400	-3.29931500
O	0.39735800	5.26104600	-2.57915800
C	1.66863300	4.71257700	0.00399500
H	2.21231500	5.43822100	-0.60726200
C	-0.21588100	6.49815800	-2.23080800
H	0.24501000	7.26318400	-2.86214400
H	-0.05432200	6.74450900	-1.17514200
C	-1.77504000	3.99504600	-4.53649900
H	-1.31100900	4.98482300	-4.45095100
H	-1.23576200	3.42413400	-5.30927400
O	0.68793000	5.45671800	0.70944700
C	0.14346400	4.81239800	1.85154200
H	-0.42533500	3.91151100	1.59432000
H	0.93827700	4.53269600	2.56055400
Pd	-0.25884400	-0.20891300	0.15286000
N	4.32406600	-1.71647900	-1.63899200
C	4.48458400	-0.98094900	-2.88680100
H	3.51102200	-0.68551900	-3.28451900
H	5.06044000	-0.07388200	-2.67973200
H	5.02352500	-1.55203500	-3.66394600
C	5.63787100	-1.98596800	-1.04633100
H	6.27982400	-2.56864900	-1.73013300

H	6.13112800	-1.03139700	-0.83344700
H	5.54724100	-2.53407200	-0.11198200
C	3.37115600	-2.77258600	-1.64357300
C	2.87281600	-3.28925400	-2.85427700
C	2.87087600	-3.32092400	-0.43122800
C	1.90040900	-4.28846200	-2.88362600
H	3.26007200	-2.91747600	-3.79529700
C	1.89085300	-4.32073300	-0.48538900
C	1.39219700	-4.80472600	-1.69428800
H	1.54447600	-4.65764200	-3.84202900
H	1.50190600	-4.70490600	0.45173800
H	0.61707500	-5.56488900	-1.70043700
C	3.45581600	-3.01401700	0.91098400
C	3.35564100	-1.78980700	1.60366900
C	4.19261800	-4.06006700	1.50307100
C	4.04994400	-1.63676300	2.81866300
C	4.86061700	-3.89876100	2.71267400
C	4.80589400	-2.66757700	3.36792500
H	3.97112800	-0.70413700	3.36633200
H	5.42492800	-4.72526300	3.13586200
H	5.33108300	-2.51513800	4.30665800
H	4.25477000	-5.00618300	0.97325800
P	2.27175100	-0.40227300	1.02591400
C	3.44268500	0.96908000	0.64197900
C	3.58312900	1.32681500	-0.70477600
C	4.19056700	1.66123200	1.60690400
C	4.47145100	2.33336900	-1.08838800
H	2.97795000	0.82464700	-1.45035400
C	5.07092800	2.67617100	1.22758000
H	4.07218300	1.42737200	2.65999400
C	5.21920700	3.00987600	-0.12182900
H	4.56650800	2.59801100	-2.13828300
H	5.64059100	3.20668400	1.98587900
H	5.90569500	3.79913100	-0.41585700
H	2.38202500	4.23537000	0.69329500
C	-1.46857200	-1.13275400	-4.47840200
C	-0.59793500	0.00672500	-3.89727800
C	-0.27774400	-1.67420900	-2.41435000
C	-1.23209900	-2.30753900	-3.47557000
H	-2.52390900	-0.84484200	-4.54482300
H	-1.13572000	-1.39794900	-5.48813500
H	-2.15978500	-2.68119300	-3.03119000
C	0.59352100	-0.77063400	-3.30888200
H	1.28177600	-0.14044600	-2.73856200

H	1.15988800	-1.33636800	-4.05478400
C	-1.28805800	0.54352600	-2.60058900
C	-1.16248100	-0.68528400	-1.67024100
H	-0.36362400	0.80015800	-4.61310600
H	0.22171900	-2.40777500	-1.78515400
H	-2.33427400	0.80524000	-2.79732200
H	-1.29720200	6.47514800	-2.43181800
H	-2.81789800	4.10726400	-4.84670000
H	-0.51984500	5.53634600	2.33275100
C	-3.53096900	-0.71982700	2.12713800
C	-2.31172000	0.22976400	2.27130200
C	-2.07162600	0.72634400	0.82942500
C	-3.70687700	-0.83245200	0.61213700
H	-3.38980800	-1.69845300	2.58778300
H	-1.44312500	-0.22059100	2.74218800
H	-4.51410500	2.11395500	1.21558700
H	-3.04870400	-1.63289600	0.26982100
O	-3.19952000	0.42324300	0.09690700
Cl	-0.69337200	-2.45891200	1.13102900
O	-4.60140300	-0.04141000	2.77495900
O	-2.76837200	1.29240400	3.10013400
C	-4.19712000	1.26996800	3.17785400
C	-4.80606800	2.31974700	2.24755800
H	-5.89827500	2.29349800	2.31792400
H	-4.45734000	3.31867000	2.52817200
H	-1.86127700	1.78960100	0.76015500
C	-4.58779100	1.46873800	4.63669600
H	-4.25464100	2.45034000	4.98773600
H	-5.67430200	1.40288800	4.74803800
H	-4.11686400	0.69088600	5.24368400
C	-5.10160800	-1.08176400	0.05934100
C	-5.11730100	-1.05518200	-1.47057100
H	-5.83259900	-0.41315300	0.52039000
H	-4.44788800	-0.31539400	-1.91185900
H	-6.13804500	-0.90522000	-1.85025800
C	-5.14507300	-3.24997800	-0.80290200
O	-5.46613600	-2.43394200	0.34648800
O	-4.62686500	-2.35548000	-1.79306900
C	-6.43949900	-3.89998400	-1.28786300
H	-6.24258500	-4.53542900	-2.15687300
H	-6.87416100	-4.51103700	-0.49079800
H	-7.16437800	-3.12941100	-1.56685400
C	-4.06053800	-4.26204100	-0.45735100
H	-4.41663300	-4.93421700	0.32929500

H	-3.81184000	-4.85745200	-1.34192100
H	-3.15625400	-3.75618100	-0.10851400
H	-2.09959000	-1.11276800	-1.33390900
C	1.49578700	0.12737000	2.62631900
C	1.08497300	-0.83151400	3.57066200
C	1.14599000	1.47337100	2.83857000
C	0.36998800	-0.44807800	4.70487500
H	1.30394900	-1.88006800	3.40834500
C	0.42231800	1.84987900	3.97087600
H	1.42128700	2.21696300	2.10226400
C	0.03424500	0.89329600	4.90958000
H	0.06034000	-1.20382900	5.42151700
H	0.15026900	2.89164300	4.11277400
H	-0.53932600	1.18665800	5.78392800
H	-0.71916300	-3.15075700	-3.95204200

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C	-1.14236900	2.63479700	-2.93682000
C	-0.97186200	1.33711400	-2.18439700
C	-0.29503900	1.25402900	-1.00008500
C	0.36015900	3.56696100	-1.15707400
C	-0.89432900	3.81807700	-1.99888100
H	-0.41492600	2.69866600	-3.76366500
H	1.21351000	3.43285900	-1.83862600
H	-1.75669500	3.91735100	-1.32808300
O	0.21625500	2.36615900	-0.36873900
O	-2.46548700	2.68345800	-3.47100700
O	-0.71715900	5.00405200	-2.76702200
C	0.69627000	4.71461300	-0.21171700
H	0.99649300	5.57033000	-0.82458000
C	-1.55330400	6.08839000	-2.37432600
H	-1.27501600	6.94001400	-3.00118500
H	-1.41038900	6.34694300	-1.31807400
C	-2.56776600	3.32907300	-4.73226100
H	-2.23599900	4.37269200	-4.68549000
H	-1.97543800	2.80444300	-5.49819400
O	-0.40256200	5.14308000	0.57651200
C	-0.54118000	4.46856600	1.82104000
H	-0.68656400	3.39289100	1.70095400
H	0.34169900	4.63488900	2.45838200
Pd	0.12672500	-0.58093200	-0.29361300
N	4.30124900	-0.72244200	-1.63261000
C	4.33097700	0.10558000	-2.82996600
H	3.32137600	0.23293800	-3.23141100

H	4.71715900	1.09068100	-2.55841800
H	4.97980000	-0.30161800	-3.62584800
C	5.60495300	-0.69535600	-0.96445500
H	6.40789400	-1.07062500	-1.62299100
H	5.83439600	0.33781500	-0.68334400
H	5.59713200	-1.29460500	-0.05721400
C	3.63422300	-1.96978600	-1.74528600
C	3.26930400	-2.46664300	-3.01388400
C	3.29745600	-2.74920400	-0.60554300
C	2.60421500	-3.67986500	-3.16997700
H	3.52738200	-1.90784500	-3.90421600
C	2.62752900	-3.96806800	-0.79356700
C	2.27370300	-4.44279000	-2.05335000
H	2.34477700	-4.01988900	-4.16943000
H	2.35916700	-4.53767900	0.08898700
H	1.73821800	-5.38203800	-2.15352200
C	3.74811900	-2.47804000	0.79870000
C	3.33822000	-1.42655100	1.65193500
C	4.65980300	-3.42711100	1.30744900
C	3.87217500	-1.36838600	2.95440100
C	5.17799300	-3.35261400	2.59600800
C	4.78341600	-2.30706300	3.42857300
H	3.54640500	-0.58496400	3.62916900
H	5.88043700	-4.10527500	2.94360000
H	5.16985000	-2.22398800	4.44062200
H	4.97036900	-4.23530300	0.65196400
P	2.13895900	-0.09756000	1.15643000
C	3.25403900	1.32316600	0.76762000
C	3.15368900	1.93311100	-0.48699300
C	4.20197200	1.81104800	1.68117100
C	3.96398400	3.02133200	-0.81814800
H	2.44465100	1.54431500	-1.20665100
C	5.01577600	2.89642300	1.35251400
H	4.30519000	1.34937900	2.65753600
C	4.89519200	3.50832500	0.10202300
H	3.86999000	3.48501800	-1.79684900
H	5.74220300	3.26317500	2.07269000
H	5.52558800	4.35549000	-0.15446000
H	1.55000800	4.41881400	0.41449500
C	-1.94797800	-1.51252500	-4.60569200
C	-1.07676600	-0.33465600	-4.10865100
C	-0.41148200	-2.04426400	-2.78652500
C	-1.48015500	-2.70208800	-3.70862700
H	-3.01816300	-1.29778500	-4.50539100

H	-1.75096500	-1.71206400	-5.66537300
H	-2.29567800	-3.15129400	-3.13218600
C	0.24455000	-1.04364500	-3.76066200
H	0.97743900	-0.39325000	-3.27400000
H	0.71791900	-1.52777400	-4.62247000
C	-1.60506700	0.08356200	-2.69334600
C	-1.17888300	-1.13364800	-1.82331500
H	-1.02164200	0.50335500	-4.81010400
H	0.24075800	-2.76537500	-2.29816100
H	-2.69199500	0.22546800	-2.74259600
H	-2.61355300	5.85055900	-2.54454700
H	-3.62269400	3.29164100	-5.01784700
H	-1.41926300	4.89324900	2.31466600
C	-2.72303200	-0.49915400	2.19710500
C	-1.89333700	0.77119500	1.87004000
C	-2.18565600	1.00866500	0.39751600
C	-3.22023200	-0.97610900	0.82872600
H	-2.14638400	-1.28127100	2.69097300
H	-0.84174700	0.72533300	2.11480000
H	-4.78578800	1.62473900	1.23043300
H	-2.49293100	-1.68828200	0.43924300
O	-3.15560200	0.22375500	-0.02894900
Cl	-0.09459600	-2.81194200	0.82237200
O	-3.74964300	-0.04422500	3.06821100
O	-2.49105700	1.81441300	2.62950700
C	-3.76548500	1.38291000	3.12830000
C	-4.89568600	1.94942900	2.26777700
H	-5.86230300	1.60037700	2.64389700
H	-4.87736300	3.04314700	2.29738400
H	-2.24229200	2.02588400	0.04264500
C	-3.86255600	1.80365300	4.58742800
H	-3.82062800	2.89392600	4.66884000
H	-4.80504700	1.45141600	5.01677200
H	-3.02764500	1.36847600	5.14120600
C	-4.62753200	-1.54820000	0.72022600
C	-5.00966400	-1.85834700	-0.73285600
H	-5.34541100	-0.89886000	1.22783000
H	-4.57733200	-1.17672600	-1.46687000
H	-6.10256800	-1.87786900	-0.85047200
C	-4.59121400	-3.84919200	0.30862700
O	-4.64097100	-2.83015100	1.33963400
O	-4.43693900	-3.14577200	-0.92503600
C	-5.91430200	-4.61431100	0.33869300
H	-5.91226300	-5.40039600	-0.42275700

H	-6.05839200	-5.07196800	1.32207700
H	-6.75298400	-3.93786400	0.14787600
C	-3.37765700	-4.73938500	0.51087100
H	-3.45383700	-5.25702900	1.47199100
H	-3.32968100	-5.48680600	-0.28768700
H	-2.46188600	-4.14361200	0.49766900
H	-2.01416400	-1.66076600	-1.36671700
C	1.41275600	0.37723000	2.78567700
C	0.79280000	-0.62537400	3.55642200
C	1.28501300	1.71588500	3.18596800
C	0.07420800	-0.29030900	4.70314100
H	0.84703000	-1.66021500	3.23338000
C	0.55736300	2.04655800	4.33225900
H	1.73514800	2.50533600	2.59468000
C	-0.04688900	1.04707300	5.09506500
H	-0.40192100	-1.07470800	5.28519800
H	0.45863900	3.08938100	4.62175900
H	-0.61342600	1.30648100	5.98506500
H	-1.01728300	-3.49597600	-4.30779400

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C	-0.89261500	1.13245700	2.81862000
C	0.39171200	0.62801600	2.13109800
C	0.97185400	1.43371200	1.14779800
C	-0.94419400	2.91206500	1.01176800
C	-1.18752600	2.59681600	2.47829300
H	-1.74853800	0.52036400	2.51089600
H	-1.60218200	2.31447700	0.38287100
H	-0.50230400	3.21113800	3.07409500
O	0.40522500	2.57436200	0.67870400
O	-0.76359500	1.06805300	4.23879900
O	-2.54329100	2.88113000	2.80954500
C	-1.15203200	4.37962300	0.65670100
H	-2.22154000	4.59281600	0.75410500
C	-2.70988000	3.99214700	3.68639900
H	-3.78695400	4.14432900	3.79554500
H	-2.25026400	4.90001200	3.27701200
C	-1.92002200	0.57487900	4.90433600
H	-2.80691000	1.17179000	4.66246900
H	-2.11128900	-0.47735600	4.64728600
O	-0.46108200	5.26989700	1.51589400
C	0.84520000	5.62269900	1.06884400
H	1.49490400	4.74910300	0.94740000
H	0.80109300	6.15704800	0.10747900

Pd	-0.00585700	-0.66242500	0.26611500
N	-4.39726900	-1.56789400	0.39059700
C	-4.89582000	-1.07474600	1.66674500
H	-4.06445400	-0.86529000	2.34732700
H	-5.43410600	-0.14090100	1.49082400
H	-5.59014500	-1.77555600	2.16318400
C	-5.47719200	-1.60982000	-0.59943100
H	-6.29912700	-2.27218600	-0.27655300
H	-5.87125800	-0.59749800	-0.73458000
H	-5.11243900	-1.95826500	-1.56312100
C	-3.51064600	-2.67325200	0.44450100
C	-3.33862700	-3.38473400	1.65047000
C	-2.76375400	-3.09386800	-0.68958200
C	-2.48750100	-4.48235000	1.74687900
H	-3.90337900	-3.09898500	2.52867900
C	-1.92244600	-4.21131200	-0.56397800
C	-1.77493000	-4.91043400	0.63071100
H	-2.39298600	-5.00144000	2.69721400
H	-1.34408100	-4.50694900	-1.43166200
H	-1.09992800	-5.75925100	0.68740300
C	-2.87831600	-2.54405300	-2.08108400
C	-2.48609100	-1.26021400	-2.53255900
C	-3.36528500	-3.45947400	-3.03619700
C	-2.58996300	-0.96356400	-3.90404200
C	-3.47257600	-3.14562200	-4.38771300
C	-3.07817200	-1.88408900	-4.82770700
H	-2.25749700	0.00298500	-4.26618400
H	-3.85415000	-3.88385700	-5.08777300
H	-3.14129700	-1.61556300	-5.87856400
H	-3.66792900	-4.44351100	-2.69050900
P	-1.86736600	0.06654900	-1.39543900
C	-3.40322900	1.08587300	-1.15460400
C	-3.78654000	1.47123400	0.13430100
C	-4.18367400	1.52068000	-2.23926200
C	-4.89127400	2.29907100	0.34390800
H	-3.23011000	1.12016500	0.99273600
C	-5.30203800	2.32957400	-2.03454200
H	-3.92050000	1.23044100	-3.25044100
C	-5.65529600	2.72887400	-0.74179200
H	-5.14223300	2.59979200	1.35683300
H	-5.89370200	2.65387800	-2.88642300
H	-6.51935700	3.36893500	-0.58518300
H	-0.85946500	4.53345800	-0.39093500
C	1.81819600	-2.41082500	4.23953500

C	0.71247600	-1.37560800	3.89171300
C	0.65959500	-2.82106800	2.14527300
C	1.75737700	-3.43331800	3.05985900
H	2.80251800	-1.93876200	4.34045700
H	1.59027900	-2.89270000	5.19672900
H	2.71095200	-3.54846500	2.53476800
C	-0.33061000	-2.27317200	3.19605900
H	-1.17236800	-1.73196400	2.75389600
H	-0.73369800	-3.05551600	3.84893200
C	1.26485500	-0.52313700	2.71930300
C	1.29387300	-1.55512500	1.57963400
H	0.38340300	-0.79639500	4.74892700
H	0.26447600	-3.50482500	1.39618600
H	2.25032900	-0.12637900	2.97310700
H	-2.27237600	3.78339000	4.67252800
H	-1.71510800	0.64352800	5.97604900
H	1.26346100	6.29010600	1.82702900
C	3.52982800	0.87510000	-1.40289900
C	2.54142300	1.91691000	-0.83579400
C	2.42903900	1.57836900	0.67971600
C	3.67719000	-0.15737800	-0.28378500
H	3.17945400	0.40522800	-2.32388600
H	1.57099900	1.91339700	-1.32299600
H	5.01802600	2.44533100	0.78506100
H	2.96098300	-0.95962700	-0.48084800
O	3.32481800	0.52389400	0.94145300
Cl	0.69377400	-2.30806000	-1.42240700
O	4.71005600	1.61955100	-1.69474000
O	3.15075500	3.17285500	-1.08412700
C	4.55569800	2.97402800	-1.26488800
C	5.32093000	3.19008200	0.04429700
H	6.39583400	3.07987400	-0.13143700
H	5.12715200	4.19316700	0.43715700
C	5.01583900	3.89875800	-2.38225900
H	4.87825400	4.94433800	-2.08963500
H	6.07378100	3.72828200	-2.60193700
H	4.42428500	3.69614100	-3.27900700
C	5.06884900	-0.75369700	-0.08495500
C	5.15633200	-1.64340900	1.16035300
H	5.81342500	0.04670400	-0.08613700
H	4.49286200	-1.33992300	1.97067700
H	6.18944300	-1.69394900	1.53417700
C	5.22104700	-3.01328700	-0.66656800
O	5.35690700	-1.65841100	-1.15035000

O	4.72004000	-2.90556100	0.66724300
C	6.60525000	-3.66425000	-0.67506000
H	6.54033800	-4.69609700	-0.31569300
H	7.01043300	-3.66656700	-1.69159600
H	7.29391800	-3.10723800	-0.03259900
C	4.20168700	-3.76518900	-1.50509000
H	4.54192200	-3.81580000	-2.54411600
H	4.08340500	-4.78492200	-1.12434900
H	3.23556800	-3.25718600	-1.46553700
H	2.23754000	-1.72857200	1.07729700
C	-0.87373600	1.16607200	-2.51101700
C	0.18264600	0.61799900	-3.26294200
C	-1.03679600	2.56028500	-2.50326700
C	1.04382600	1.44562800	-3.98389100
H	0.33961800	-0.45491900	-3.26258700
C	-0.15598700	3.38728500	-3.20542400
H	-1.85690000	3.00961800	-1.95401900
C	0.88895500	2.83442000	-3.94654600
H	1.85099400	1.00228700	-4.56093900
H	-0.29247700	4.46505500	-3.17267900
H	1.57655300	3.47751300	-4.48844400
H	2.77730800	2.45336100	1.24475000
H	1.44407400	-4.42617100	3.40554000

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C	-1.95382500	4.33897700	-0.11217800
C	-1.14787200	3.07259600	0.00983200
C	-1.69158600	1.83455200	-0.06739800
C	-3.90108300	2.75880400	-0.02680500
C	-3.34592600	4.04161400	-0.65897300
H	-2.07501400	4.81211100	0.87775600
H	-3.95996500	2.90739000	1.06422300
H	-3.26026600	3.90076700	-1.74170400
O	-3.03983600	1.62807300	-0.27240700
O	-1.25764200	5.25758000	-0.96847300
O	-4.22736500	5.12499200	-0.35597700
C	-5.29820700	2.41467500	-0.53849300
H	-6.00732300	3.10972800	-0.08031500
C	-4.88692600	5.68749800	-1.48366100
H	-5.54086600	6.47722100	-1.10131200
H	-5.48455900	4.93788700	-2.01488400
C	-1.39586600	6.61795600	-0.59871800
H	-2.44074300	6.95203900	-0.62053500
H	-0.99425400	6.80353000	0.41088600

O	-5.47924900	2.56555400	-1.93804000
C	-4.77037200	1.63223800	-2.74685400
H	-3.68999300	1.82122800	-2.74576100
H	-4.93911400	0.60496800	-2.41188300
Pd	-0.54953500	0.21025000	0.17801800
N	-2.89800500	-0.95299200	2.79970100
C	-3.30467800	0.44767500	2.86640400
H	-2.60194600	1.05942600	2.29861400
H	-4.29071900	0.54954900	2.40147500
H	-3.38402700	0.83139600	3.89895100
C	-3.85778500	-1.82337400	3.48617500
H	-3.92952300	-1.59103200	4.56313800
H	-4.84896700	-1.69050400	3.03855700
H	-3.57605900	-2.87092200	3.37407200
C	-1.53228400	-1.22116700	3.10874400
C	-0.77606000	-0.34195800	3.90136200
C	-0.91001800	-2.40400500	2.63267000
C	0.54927000	-0.61602600	4.23538800
H	-1.22964900	0.56823800	4.27352200
C	0.42043600	-2.66462000	2.98911400
C	1.15757000	-1.78488800	3.78077100
H	1.09991400	0.08949600	4.85154700
H	0.88298100	-3.57327500	2.61482300
H	2.18905400	-2.01189300	4.03694700
C	-1.63744300	-3.45713100	1.86236700
C	-2.18487300	-3.29892900	0.57093100
C	-1.77536000	-4.70481200	2.50327000
C	-2.88371300	-4.37722400	-0.00416800
C	-2.45118100	-5.76759000	1.91111000
C	-3.02010500	-5.59934200	0.64821600
H	-3.32033500	-4.25973100	-0.99092800
H	-2.54174600	-6.71412200	2.43697400
H	-3.56334000	-6.41092300	0.17219600
H	-1.35413400	-4.82017000	3.49804200
P	-1.99200800	-1.75283600	-0.44718600
C	-3.72422700	-1.64023700	-1.08335900
C	-4.71980300	-1.26208000	-0.17034100
C	-4.10157400	-2.01868800	-2.37929300
C	-6.06472000	-1.28604000	-0.53622800
H	-4.42699300	-0.96534000	0.82884400
C	-5.45078400	-2.03188700	-2.74825900
H	-3.34936500	-2.31786000	-3.10165500
C	-6.43615200	-1.67307800	-1.82766300
H	-6.82445600	-0.99690800	0.18534400

H	-5.72744200	-2.32841900	-3.75654700
H	-7.48405400	-1.68741500	-2.11400700
H	-5.54462100	1.39187600	-0.22247700
C	2.24636400	4.00488300	1.64229300
C	0.70907200	3.83733300	1.60261100
C	1.43971600	1.71850000	1.88600500
C	2.75390000	2.54613700	1.87722100
H	2.63630900	4.43638000	0.71320900
H	2.54812800	4.66742700	2.46207400
H	3.45505300	2.22402100	1.10544900
C	0.48872800	2.69277200	2.61115800
H	-0.54498000	2.33901300	2.63651400
H	0.81431800	2.93961500	3.63015500
C	0.32441000	3.14610200	0.25900600
C	0.87263800	1.69791700	0.45140600
H	0.16147600	4.76598800	1.79241500
H	1.54703500	0.73784700	2.35216300
H	0.81761300	3.67160100	-0.57061400
H	-4.16625100	6.13420600	-2.18527300
H	-0.81404400	7.20205300	-1.31848000
H	-5.15737700	1.75029000	-3.76362100
C	5.44195500	-1.39559000	0.22257000
C	4.19666900	-2.19507200	0.69958900
C	3.05032900	-1.14977700	0.57963200
C	4.89887000	0.02852500	0.00194200
H	6.27972700	-1.40208400	0.92406000
H	4.25610400	-2.57003400	1.72453100
H	3.52632300	-1.59682500	-2.21049200
H	4.99675900	0.59283300	0.94023200
O	3.50442700	-0.14567600	-0.29279700
Cl	1.52439400	-1.82538300	-0.07936300
O	5.84416100	-2.04667100	-0.97124800
O	4.11048400	-3.29622300	-0.16920500
C	4.88539600	-3.04356800	-1.35065900
C	4.00555100	-2.53569200	-2.49078600
H	4.61814000	-2.37250700	-3.38354400
H	3.22475400	-3.26608000	-2.71997200
H	2.79751200	-0.73218400	1.55984500
C	5.63095800	-4.32315800	-1.69848200
H	4.91921200	-5.11625900	-1.94624800
H	6.28468600	-4.15346000	-2.55884100
H	6.23597700	-4.63652700	-0.84366200
C	5.54947600	0.82455400	-1.12709100
C	4.86214400	2.16579200	-1.39246300

H	5.62499100	0.19786400	-2.01851800
H	3.78530200	2.16049600	-1.21971200
H	5.06774800	2.51130800	-2.41526100
C	6.83338900	2.60027000	-0.31940500
O	6.86104500	1.20885500	-0.71352700
O	5.47380500	3.01382300	-0.42391400
C	7.72388500	3.38610100	-1.28119800
H	7.73545800	4.44536200	-1.00638200
H	8.74635800	2.99758600	-1.24900700
H	7.35070300	3.28947100	-2.30493700
C	7.26281700	2.73702700	1.13459800
H	8.28878000	2.37817700	1.25893000
H	7.21384600	3.78537500	1.44421200
H	6.59838600	2.15053500	1.77464000
H	1.63583700	1.42468900	-0.28374400
C	-1.05317400	-2.34503100	-1.93159000
C	-0.49486300	-3.62396100	-2.06436900
C	-0.79031800	-1.38668000	-2.93014000
C	0.29967800	-3.94096500	-3.17049800
H	-0.66217500	-4.37537400	-1.30092500
C	-0.00893500	-1.70895400	-4.03794100
H	-1.18728700	-0.38026100	-2.82683700
C	0.54226500	-2.98869700	-4.16023800
H	0.73008100	-4.93565200	-3.25213200
H	0.18101700	-0.95696500	-4.79898500
H	1.16195500	-3.23649700	-5.01781100
H	3.26684800	2.45758800	2.84478200

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C	3.43816500	-3.55164300	-0.02036800
C	2.13711300	-2.80230300	0.12440700
C	1.99239800	-1.49226000	-0.18229500
C	4.35481700	-1.27832100	-0.56714900
C	4.41256000	-2.77283500	-0.90116900
H	3.91203200	-3.68742200	0.96752000
H	4.63366000	-1.14363700	0.48951100
H	4.11353300	-2.91764800	-1.94507500
O	3.02015000	-0.76174000	-0.73885000
O	3.18391300	-4.84890000	-0.57810300
O	5.74386100	-3.24317900	-0.68179200
C	5.31305800	-0.43862400	-1.41236200
H	6.32326400	-0.58475500	-1.02052800
C	6.40861100	-3.70703800	-1.85045700
H	7.41268300	-4.01121500	-1.53916200

H	6.48080400	-2.91893000	-2.60853900
C	4.00617300	-5.87818900	-0.05757800
H	5.07196000	-5.69318300	-0.24171300
H	3.85864800	-6.00148500	1.02797900
O	5.38634100	-0.80323900	-2.78373500
C	4.27153800	-0.40787200	-3.56744800
H	3.35797600	-0.95066700	-3.29386700
H	4.07839800	0.67033800	-3.46763600
Pd	0.16221700	-0.58185200	-0.01132100
N	1.42966000	1.67599300	3.48386500
C	2.24816200	0.62957900	4.08633000
H	2.03902600	-0.33946300	3.63017100
H	3.29901200	0.86904200	3.90664400
H	2.10239300	0.54960100	5.17705100
C	1.95288900	2.99518500	3.85866200
H	1.98511900	3.11255300	4.95465700
H	2.96785500	3.09370500	3.46137100
H	1.35343700	3.80012200	3.44500800
C	0.03726700	1.47419400	3.47379200
C	-0.53184900	0.36727000	4.14251700
C	-0.85334600	2.36390400	2.80230600
C	-1.90890000	0.18153500	4.23191300
H	0.10867400	-0.35806100	4.62522700
C	-2.23517800	2.20436200	3.00060300
C	-2.78062500	1.12387600	3.69011900
H	-2.29235500	-0.69004600	4.75512600
H	-2.89766300	2.95034000	2.57005100
H	-3.85643900	1.02013500	3.79333800
C	-0.42480400	3.54371400	1.98684700
C	0.34332400	3.51318500	0.79387900
C	-0.83349800	4.79603600	2.49475200
C	0.74196800	4.74768400	0.24298900
C	-0.46690400	5.99825500	1.90175400
C	0.35109300	5.97307900	0.77354100
H	1.36848400	4.75667500	-0.63929000
H	-0.79583100	6.94062600	2.33084300
H	0.68307400	6.89532400	0.30518000
H	-1.42049500	4.80844900	3.40854500
P	0.92102900	1.96685000	-0.11677800
C	2.75181200	2.17508500	0.10885600
C	3.38547400	1.41097900	1.09545200
C	3.51788400	3.09378500	-0.62360200
C	4.73185900	1.61142100	1.40137300
H	2.81970300	0.63805800	1.59518900

C	4.87006300	3.28803300	-0.32934700
H	3.07147200	3.64945300	-1.44200900
C	5.47670900	2.56219400	0.69787200
H	5.20561400	1.00723700	2.17102500
H	5.44804500	4.00435300	-0.90713500
H	6.52719300	2.71578800	0.92949400
H	5.04242900	0.62011000	-1.30301800
C	-0.25421200	-4.93704700	2.30723500
C	0.96277000	-4.01967300	2.06054700
C	-0.76144600	-2.55527500	2.05762500
C	-1.45047400	-3.93310000	2.29932900
H	-0.34549100	-5.71080600	1.53656800
H	-0.17217000	-5.44490400	3.27541100
H	-2.19173800	-4.16621900	1.52807400
C	0.56125800	-2.74716300	2.82706100
H	1.26300100	-1.92571800	2.66470700
H	0.42183700	-2.90597800	3.90373200
C	0.91166600	-3.52193000	0.58148300
C	-0.29698700	-2.54279900	0.59116600
H	1.92330700	-4.46949300	2.33025000
H	-1.38844800	-1.71881200	2.36302300
H	0.73208300	-4.37788100	-0.08194900
H	5.89368800	-4.57741500	-2.28402300
H	3.70780000	-6.80460300	-0.55778400
H	4.52469300	-0.63082600	-4.60817800
C	-4.36222400	0.92040800	-0.42549800
C	-2.92788000	1.44648400	-0.13859400
C	-2.21571500	0.23408500	0.44390800
C	-4.37219600	-0.54015700	0.06553800
H	-5.12891800	1.50750400	0.09266100
H	-2.91369500	2.22068800	0.63342700
H	-2.66504400	0.75820300	-3.68437700
H	-5.07733100	-0.68766100	0.88540900
O	-3.06077400	-0.74476800	0.69609000
Cl	-1.43162400	-0.82835100	-1.95625100
O	-4.49052800	1.04499000	-1.82433600
O	-2.46480700	1.97929900	-1.35010900
C	-3.58309700	2.06195500	-2.25630300
C	-3.13789100	1.73973700	-3.66787600
H	-4.00903500	1.74669700	-4.33025500
H	-2.41788700	2.48435500	-4.01120100
H	-1.43860500	0.32885100	1.20681300
C	-4.22380600	3.44702000	-2.12898900
H	-3.49946500	4.21514900	-2.41627600

H	-5.10014500	3.52059200	-2.77994500
H	-4.53732300	3.63906500	-1.09724200
C	-4.64258400	-1.60203500	-1.00804100
C	-4.49090000	-3.02676000	-0.47117800
H	-4.03637400	-1.40476200	-1.88964500
H	-3.73582600	-3.12923600	0.30905000
H	-4.26380500	-3.72649700	-1.28659200
C	-6.72363900	-2.63162000	-0.73957800
O	-6.02880300	-1.51798400	-1.34118300
O	-5.77334100	-3.27857200	0.10101100
C	-7.20238700	-3.56116000	-1.85494400
H	-7.74108600	-4.41506600	-1.43218900
H	-7.86752000	-3.01951900	-2.53423000
H	-6.34949800	-3.92985100	-2.43198700
C	-7.86006400	-2.11409200	0.13064400
H	-8.57512100	-1.55600800	-0.48070100
H	-8.38019400	-2.94845700	0.61095500
H	-7.46118500	-1.45312700	0.90524300
H	-1.08531200	-2.80705900	-0.11491700
C	0.73838600	2.39757800	-1.90751300
C	-0.03449100	3.43590400	-2.44064900
C	1.40769600	1.53219800	-2.78952900
C	-0.08483600	3.64260700	-3.82207100
H	-0.61274000	4.07970300	-1.78934000
C	1.34451500	1.73113200	-4.16702400
H	1.97374500	0.69836900	-2.38903600
C	0.60691200	2.79662300	-4.68996500
H	-0.67734200	4.46408500	-4.21763100
H	1.86920500	1.05004600	-4.83173300
H	0.56156200	2.95765500	-5.76369000
H	-1.97407300	-3.92441600	3.26347800

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C	-3.95873900	-2.43642700	-1.37208300
C	-2.58885300	-1.88988200	-1.05050400
C	-2.33876700	-1.06563800	-0.01403600
C	-4.69736200	-0.85174600	0.41303900
C	-4.87751500	-2.25878800	-0.16351900
H	-4.41367500	-1.89782700	-2.22220900
H	-4.92296100	-0.11288200	-0.37087000
H	-4.59269400	-2.99670600	0.59524500
O	-3.33479100	-0.64588700	0.83336500
O	-3.82936500	-3.81702800	-1.72764500
O	-6.23896400	-2.43006900	-0.55823100

C	-5.60499300	-0.56424700	1.60482200
H	-6.63011500	-0.47331200	1.23474100
C	-6.95407700	-3.39161700	0.20966200
H	-7.98222800	-3.38976000	-0.16444000
H	-6.94963000	-3.13807400	1.27632100
C	-4.77994700	-4.27437100	-2.67427000
H	-5.80828600	-4.19825800	-2.30204000
H	-4.71189100	-3.70864300	-3.61820600
O	-5.64197500	-1.57933900	2.59321300
C	-4.47898000	-1.67406100	3.40668500
H	-3.61062400	-2.04701500	2.85295600
H	-4.22230000	-0.69352000	3.83758800
Pd	-0.28770800	-0.58087600	0.28366800
N	0.53007200	3.06495300	-3.15230100
C	0.19899700	2.52499600	-4.46939000
H	0.32462500	1.44540400	-4.49526300
H	-0.85286900	2.74400300	-4.67706100
H	0.80587300	2.96997000	-5.27682700
C	0.21705900	4.50244200	-3.14490500
H	0.81819500	5.04824500	-3.89102800
H	-0.84171800	4.62863300	-3.39212600
H	0.38514100	4.95126200	-2.17180300
C	1.77141100	2.65596300	-2.58900600
C	2.68369600	1.88322200	-3.33712800
C	2.13587700	2.98238800	-1.25091200
C	3.91393300	1.48098400	-2.81867500
H	2.44705200	1.60559300	-4.35620600
C	3.40711500	2.62603200	-0.77905500
C	4.29891700	1.87405800	-1.53972900
H	4.57852400	0.87984900	-3.43266200
H	3.68164100	2.93420700	0.22593000
H	5.26815100	1.59687600	-1.13686000
C	1.30012000	3.84283200	-0.36386100
C	0.05163200	3.50985700	0.19914000
C	1.81458100	5.13888300	-0.13780900
C	-0.68203200	4.52716400	0.84827700
C	1.09931100	6.11350900	0.54651700
C	-0.18052400	5.81253900	1.01482600
H	-1.65747000	4.29887300	1.26342300
H	1.52575000	7.10197400	0.69161800
H	-0.77751100	6.56267100	1.52503700
H	2.78398400	5.37991000	-0.56362300
P	-0.75196700	1.82442700	0.41095800
C	-2.43955300	2.24895700	-0.17675600

C	-2.57340400	2.46953200	-1.55642300
C	-3.55568400	2.38114900	0.65617400
C	-3.81711800	2.79444000	-2.09713200
H	-1.69855700	2.40039600	-2.19804500
C	-4.79816100	2.71363500	0.11037900
H	-3.46274600	2.22418200	1.72468500
C	-4.93431900	2.91260500	-1.26519100
H	-3.91292700	2.95673300	-3.16735100
H	-5.66084700	2.81249400	0.76363100
H	-5.90403800	3.16347300	-1.68586700
H	-5.30471100	0.39897900	2.04699300
C	-0.48864700	-2.37288700	-4.28373000
C	-1.68152500	-1.89192900	-3.42370300
C	-0.01379300	-0.51402700	-2.77490700
C	0.65496700	-1.38738000	-3.88665000
H	-0.23348600	-3.41729900	-4.07441300
H	-0.72232600	-2.29786200	-5.35137100
H	1.56391900	-1.88543900	-3.53565900
C	-1.44367200	-0.37489700	-3.34122400
H	-2.13321800	0.12313400	-2.65883800
H	-1.47316800	0.12238800	-4.31621400
C	-1.43738600	-2.30578500	-1.93379200
C	-0.17180800	-1.49662800	-1.63135200
H	-2.65641800	-2.21567200	-3.79470300
H	0.54547100	0.38639800	-2.53362400
H	-1.25638100	-3.38163300	-1.83731900
H	-6.53032700	-4.39859700	0.08028100
H	-4.54218900	-5.32285300	-2.87690200
H	-4.72172000	-2.36615700	4.21790300
C	3.82439400	-0.49830600	1.62401400
C	2.44658300	0.22400700	1.55065300
C	1.82262400	-0.27935600	0.25632000
C	3.87827400	-1.28146200	0.30450600
H	4.68087600	0.17695300	1.73708400
H	2.51927400	1.31780800	1.56550600
H	1.55710900	-2.67768000	3.50476400
H	4.37362200	-0.65092700	-0.45032100
O	2.51896800	-1.48804900	-0.06718200
Cl	-0.06881400	-2.77204500	1.19262800
O	3.71079500	-1.36406300	2.74458100
O	1.75013600	-0.22303400	2.71232200
C	2.67458400	-0.85641500	3.58596800
C	1.97941600	-2.02100600	4.26797300
H	2.69080000	-2.57293700	4.89017700

H	1.16865700	-1.64561300	4.90018600
H	2.00515800	0.44179800	-0.54695600
C	3.25754500	0.16234600	4.57313000
H	2.45961200	0.58291300	5.19130700
H	4.00171600	-0.31610100	5.21761900
H	3.74138000	0.98192600	4.03052400
C	4.58497300	-2.62916900	0.36329000
C	4.63240900	-3.31237600	-1.00358400
H	4.13128400	-3.24441900	1.14270500
H	3.77045500	-3.08059800	-1.63170900
H	4.73331500	-4.40255500	-0.90455100
C	6.73605000	-2.53763300	-0.54306000
O	5.97091800	-2.43052600	0.66974300
O	5.79599500	-2.73402100	-1.59686900
C	7.67434000	-3.73849000	-0.41599400
H	8.28379000	-3.84405700	-1.31923800
H	8.33441700	-3.61124700	0.44769500
H	7.09146400	-4.65300500	-0.27193300
C	7.47609600	-1.23144100	-0.80523000
H	8.17700200	-1.02593100	0.00932600
H	8.03303800	-1.29109300	-1.74564200
H	6.75548900	-0.41137000	-0.87057700
H	0.72422600	-2.05997600	-1.38640900
C	-0.75473600	1.73086600	2.26318000
C	0.19232200	2.44941200	3.01508100
C	-1.58986200	0.81420700	2.92962900
C	0.27968000	2.28015300	4.39441000
H	0.87311200	3.13981200	2.53183800
C	-1.48946100	0.64600700	4.31189900
H	-2.31480600	0.22856400	2.37804000
C	-0.56007700	1.37790600	5.05006100
H	1.01648500	2.84813000	4.95553600
H	-2.13978000	-0.06900200	4.80744000
H	-0.48475700	1.24249500	6.12557500
H	0.93995700	-0.74268300	-4.72704600

PdL₂

Pd	0.09593000	-0.20711200	0.12788600
N	1.53173500	3.30557400	2.46671600
C	1.47773300	1.99986700	3.12443700
H	1.79722900	1.21180500	2.44368300
H	2.14174500	1.99821600	3.99726400
H	0.45718900	1.75325000	3.46570500
C	1.00270200	4.36296300	3.30894200

H	-0.07418900	4.25373100	3.53589800
H	1.54123700	4.35484400	4.26360000
H	1.15749200	5.33622200	2.83418600
C	1.21241600	3.34545500	1.08487300
C	0.10932600	4.06672300	0.60096600
C	2.04474000	2.67081600	0.15382300
C	-0.18747100	4.10425800	-0.76146900
H	-0.54927300	4.57393700	1.29697600
C	1.71423900	2.70578200	-1.20698200
C	0.60575200	3.41218600	-1.67277400
H	-1.06123400	4.65058600	-1.10452200
H	2.35593300	2.18662100	-1.91241600
H	0.35870300	3.41019400	-2.72899200
C	3.32690200	2.03591900	0.58214200
C	3.62719500	0.66393100	0.41395600
C	4.30185300	2.87631900	1.14836100
C	4.90068200	0.19378100	0.78809000
C	5.55290700	2.39529100	1.52111800
C	5.85816000	1.04501000	1.33313600
H	5.14152400	-0.85634300	0.65873200
H	6.28764300	3.07068700	1.95151400
H	6.83324800	0.65514900	1.61300700
H	4.05710000	3.92384700	1.29095700
P	2.34933000	-0.52662000	-0.21330200
C	2.98059000	-2.13218200	0.45506400
C	2.67279300	-2.42430300	1.79479800
C	3.67948200	-3.08247700	-0.30161700
C	3.06737600	-3.63156000	2.36842200
H	2.09362900	-1.71112800	2.37615100
C	4.05934500	-4.30140600	0.26924900
H	3.92312000	-2.87697000	-1.33950200
C	3.75779800	-4.57824400	1.60365100
H	2.82204700	-3.84210600	3.40636100
H	4.59337300	-5.03300200	-0.33166400
H	4.05282600	-5.52638900	2.04506500
C	2.74064600	-0.65720200	-2.01685300
C	1.83657700	-1.35896000	-2.83313400
C	3.87361500	-0.07902100	-2.60621100
C	2.05919100	-1.47703800	-4.20442500
H	0.95078500	-1.80130200	-2.38476300
C	4.08841000	-0.18443800	-3.98404200
H	4.58695100	0.46214800	-1.99217700
C	3.18381400	-0.88194900	-4.78587800
H	1.34995400	-2.02380300	-4.82049300

H	4.96539100	0.27971500	-4.42775100
H	3.35138600	-0.96115900	-5.85670100
P	-2.11361000	0.30014800	-0.42441800
C	-3.46308300	-0.94505000	-0.73189200
C	-4.32520300	-0.83526900	-1.83277300
C	-3.71556900	-1.94211000	0.23930000
C	-5.44360800	-1.66269700	-1.96087500
H	-4.13511200	-0.08108700	-2.58928000
C	-4.86821500	-2.72829800	0.12282200
C	-5.73098100	-2.59676100	-0.96725100
H	-6.09670400	-1.55742500	-2.82325500
H	-5.08445200	-3.45721300	0.89979700
H	-6.61581800	-3.22360500	-1.03873500
C	-2.78735900	-2.14054700	1.39482400
C	-3.00495000	-1.44222800	2.58721200
C	-1.64285000	-2.96578200	1.26697600
C	-2.09076300	-1.50720100	3.64098700
H	-3.87698500	-0.79903000	2.66352000
C	-0.73227900	-3.02217000	2.33257300
C	-0.94526800	-2.28920200	3.50175900
H	-2.26641500	-0.93766400	4.54933100
H	0.16042100	-3.62977500	2.24150700
H	-0.21663600	-2.34315500	4.30735100
C	-2.11526200	1.25752400	-2.00831400
C	-2.85776100	2.42612200	-2.22629000
C	-1.27757200	0.78880200	-3.03402300
C	-2.75959500	3.11247500	-3.44036800
H	-3.50446800	2.81450200	-1.44597000
C	-1.19185000	1.46304600	-4.25082500
H	-0.66680100	-0.09159700	-2.86189500
C	-1.92984600	2.63325900	-4.45621500
H	-3.33287100	4.02399600	-3.58970400
H	-0.53167900	1.08603400	-5.02771500
H	-1.85362500	3.17018100	-5.39811700
C	-3.00340700	1.39708600	0.77612500
C	-4.39216700	1.60474400	0.75494100
C	-2.24606000	2.00145000	1.78929800
C	-5.00479500	2.40539000	1.72134500
H	-5.00047800	1.12812600	-0.00813700
C	-2.85747000	2.80056300	2.75644000
H	-1.17506000	1.83192700	1.81614200
C	-4.23885600	3.00410500	2.72565800
H	-6.08102400	2.55547400	1.69371300
H	-2.25555200	3.25396700	3.53994600

H	-4.71808200	3.61968100	3.48251700
N	-1.43128000	-3.68545400	0.05239300
C	-2.23959000	-4.89776900	-0.07970100
H	-2.15406500	-5.27709600	-1.10422100
H	-1.91181500	-5.69532700	0.61292600
H	-3.29041700	-4.68348300	0.11295400
C	-0.04083400	-3.94226400	-0.30278300
H	0.43859500	-4.73407900	0.30174100
H	0.00022700	-4.25594300	-1.35225100
H	0.53376300	-3.02319600	-0.19257100

L

N	-3.63394000	-1.33300700	-0.47324300
C	-2.68105100	-2.25198600	-1.09722700
H	-1.66151600	-2.01352100	-0.79539500
H	-2.90115100	-3.27502100	-0.77268900
H	-2.73458100	-2.21541600	-2.19948600
C	-5.00856800	-1.68390600	-0.79558000
H	-5.24088500	-1.62765400	-1.87498600
H	-5.19060500	-2.71469800	-0.47221500
H	-5.69903300	-1.02796400	-0.25760200
C	-3.29276400	0.04441700	-0.52429600
C	-4.06141300	0.96942800	-1.24945900
C	-2.16921600	0.51843100	0.20274800
C	-3.73955600	2.32762700	-1.26415400
H	-4.91631600	0.62611200	-1.82178400
C	-1.86074300	1.88378500	0.16677700
C	-2.63122100	2.79201700	-0.56078000
H	-4.35580800	3.01618200	-1.83681300
H	-1.01404600	2.24002800	0.74511000
H	-2.37165700	3.84671900	-0.56326100
C	-1.36841600	-0.38089800	1.08796100
C	0.00397700	-0.64358600	0.86521000
C	-2.00346200	-0.95522600	2.19983000
C	0.69731100	-1.45352100	1.78209500
C	-1.30361000	-1.75829200	3.09653900
C	0.05558700	-2.00371900	2.88998900
H	1.74978300	-1.66369400	1.61955700
H	-1.81579600	-2.18888300	3.95294800
H	0.61378200	-2.62562900	3.58499500
H	-3.06098600	-0.76161200	2.34950400
P	0.80521900	-0.00285700	-0.68728700
C	2.29711700	-1.09770900	-0.79596200
C	2.10700900	-2.37343300	-1.35536200

C	3.58813100	-0.73013300	-0.38852800
C	3.17172900	-3.26393400	-1.48554700
H	1.11538600	-2.67182200	-1.68948000
C	4.65808400	-1.61766800	-0.53112500
H	3.76065200	0.25017700	0.04466600
C	4.45350800	-2.88656500	-1.07523000
H	3.00369600	-4.24845600	-1.91442800
H	5.65240800	-1.31606200	-0.21147500
H	5.28670000	-3.57581500	-1.18366000
C	1.54896300	1.59660200	-0.12416800
C	1.87621900	2.53887900	-1.11185900
C	1.79170900	1.91791100	1.22073400
C	2.44315300	3.76684200	-0.76711600
H	1.67891800	2.31177400	-2.15685000
C	2.34834000	3.15076000	1.56706400
H	1.53975200	1.20432900	1.99984500
C	2.67788500	4.07674600	0.57435700
H	2.69181400	4.48460200	-1.54442000
H	2.52618700	3.38680400	2.61314600
H	3.11039800	5.03620300	0.84532200

N

C	-1.19011900	-0.78070700	-0.51843000
C	0.08709400	-1.12840600	0.32363200
C	0.08813600	1.12841000	0.32333700
C	-1.18924500	0.78147600	-0.51904200
H	-1.14296400	-1.20751800	-1.52463500
H	-2.08758500	-1.17681900	-0.02972700
H	-1.14157200	1.20784800	-1.52548200
C	0.03719300	0.00024700	1.38108300
H	0.90493000	-0.00020500	2.04862800
H	-0.88502200	0.00076100	1.97588000
C	1.27984100	-0.67105800	-0.50578600
C	1.28086200	0.66979200	-0.50531300
H	0.11779100	-2.15728200	0.69038900
H	0.11954400	2.15743400	0.68956200
H	1.91839800	-1.33048000	-1.08569000
H	1.92032600	1.32864500	-1.08486500
H	-2.08642900	1.17909200	-0.03094300

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C	0.91493400	-0.17455800	-1.02146400
C	2.30617200	0.42362800	-0.67416300
C	1.99098400	1.43014000	0.45486100

C	-0.05737100	0.63098500	-0.14121200
H	0.64498500	-0.10751400	-2.07731000
H	2.83122900	0.88995400	-1.50857800
H	2.73023000	1.45637600	1.25219900
H	-0.42275600	1.49849200	-0.70584100
O	0.75230300	1.10494900	0.96267800
Cl	1.97550600	3.16622300	-0.25844800
O	1.01429000	-1.54399500	-0.66699600
O	3.07270400	-0.66291500	-0.19893800
C	2.22472300	-1.79435700	0.05417000
C	1.94461500	-1.92548600	1.55017500
H	1.27507800	-2.77214100	1.73075600
H	2.88007000	-2.09245100	2.09280400
H	1.47331200	-1.01461400	1.92537100
C	2.88965100	-3.02738700	-0.53818700
H	3.84447700	-3.21767800	-0.03949700
H	2.24265000	-3.89980800	-0.40854900
H	3.06612400	-2.86648300	-1.60475800
C	-1.24168100	-0.12544100	0.42716300
C	-2.12717600	0.70593000	1.35961500
H	-0.89808700	-1.04159900	0.92118900
H	-2.11140800	1.77048200	1.08063500
H	-1.86567400	0.61025200	2.41506900
C	-3.47974500	-0.26367900	-0.21793000
O	-2.11558400	-0.44332700	-0.65336100
O	-3.41031700	0.12767600	1.15293800
C	-4.21822000	-1.59133800	-0.29423500
H	-5.23825100	-1.47947900	0.08603200
H	-4.26230600	-1.93853900	-1.33067200
H	-3.69160300	-2.33472500	0.31019200
C	-4.11224100	0.83429000	-1.07044100
H	-4.07689500	0.55689100	-2.12839200
H	-5.15518900	0.98882300	-0.77747500
H	-3.56462400	1.77251500	-0.94022500

2a'

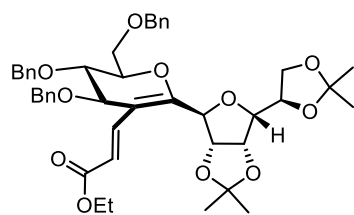
C	-0.64519000	0.47359000	-1.21209500
C	-2.06327400	-0.16175600	-1.26365900
C	-1.84237800	-1.55320200	-0.60141800
C	0.23402100	-0.63753200	-0.60486600
H	-0.25975000	0.79914100	-2.18125900
H	-2.47098900	-0.28841300	-2.26974600
H	0.66672800	-1.23167900	-1.42586400
O	-0.66037800	-1.46257900	0.16165800

O	-0.79328100	1.61153000	-0.38096300
O	-2.89153700	0.72894000	-0.55969100
C	-2.09133900	1.62189300	0.22807600
C	-2.00617400	1.14759900	1.67645300
H	-1.38199200	1.83683600	2.25405600
H	-3.00620900	1.11582000	2.11867000
H	-1.57029000	0.14815200	1.71869900
C	-2.67615300	3.01883200	0.08938700
H	-3.69082200	3.04358100	0.49723500
H	-2.05850200	3.73921700	0.63337300
H	-2.70590100	3.29642400	-0.96742100
C	1.35510100	-0.17712300	0.30666100
C	2.15679400	-1.31295600	0.94483900
H	0.95535900	0.50038700	1.06977300
H	2.19352100	-2.19438400	0.28628000
H	1.78640500	-1.61573800	1.92589800
C	3.64169100	0.15571800	-0.00520300
O	2.32705400	0.49240400	-0.49425000
O	3.44185100	-0.72290000	1.10277600
C	4.33634600	1.40945600	0.50524800
H	5.31052200	1.15408200	0.93357800
H	4.48421400	2.11898500	-0.31419400
H	3.71963700	1.87778600	1.27697400
C	4.40129400	-0.54708000	-1.12807300
H	4.46887900	0.10551500	-2.00389200
H	5.41204200	-0.80627300	-0.79845900
H	3.87633300	-1.46278300	-1.41660900
Cl	-3.18730300	-2.09499900	0.45819400
H	-1.73914100	-2.32545600	-1.37471700

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13. Characterization Data



4a

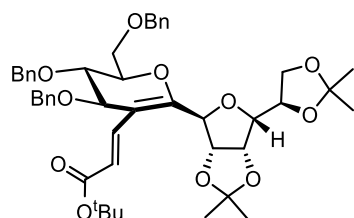
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 49.1 mg, 64%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.70 (d, J = 15.6 Hz, 1H), 7.37 – 7.29 (m, 11H), 7.27 – 7.26 (m, 1H), 7.26 – 7.24 (m, 1H), 7.20 (dd, J = 7.4, 2.1 Hz, 2H), 5.78 (d, J = 15.6 Hz, 1H), 5.14 (s, 1H), 4.92 (d, J = 6.1 Hz, 1H), 4.82 (dd, J = 6.0, 4.0 Hz, 1H), 4.66 (d, J = 2.3 Hz, 2H), 4.46 (d, J = 4.7 Hz, 2H), 4.44 – 4.40 (m, 3H), 4.35 – 4.31 (m, 1H), 4.26 (dd, J = 3.5, 1.4 Hz, 1H), 4.19 (q, J = 7.1 Hz, 2H), 4.09 – 4.06 (m, 2H), 4.01 (dd, J = 8.7, 4.8 Hz, 1H), 3.95 (t, J = 3.9 Hz, 1H), 3.76 (dd, J = 10.6, 7.1 Hz, 1H), 3.57 (dd, J = 10.6, 4.1 Hz, 1H), 1.53 (s, 3H), 1.40 (s, 3H), 1.37 (s, 3H), 1.32 (s, 3H), 1.28 (t, J = 7.1 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.2, 157.9, 139.1, 137.6, 137.6, 137.2, 128.6, 128.5, 128.0, 128.0, 128.0, 127.9, 127.7, 127.6, 115.8, 112.7, 109.1, 108.7, 84.0, 83.4, 81.6, 80.1, 75.8, 73.5, 73.3, 71.8, 71.8, 70.3, 70.2, 68.0, 67.1, 60.1, 26.9, 26.1, 25.2, 24.5, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{44}\text{H}_{52}\text{NaO}_{11}$ 779.3402 found 779.3373.



4b

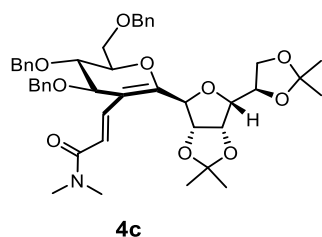
tert-butyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 54.9mg, 70%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (400 MHz, Chloroform-*d*) δ 7.61 (d, J = 15.6 Hz, 1H), 7.36 – 7.27 (m, 13H), 7.23 – 7.20 (m, 2H), 5.72 (d, J = 15.5 Hz, 1H), 5.14 (s, 1H), 4.91 (d, J = 6.0 Hz, 1H), 4.83 – 4.79 (m, 1H), 4.67 (s, 2H), 4.47 (d, J = 2.3 Hz, 2H), 4.44 – 4.40 (m, 3H), 4.35 – 4.30 (m, 1H), 4.28 – 4.24 (m, 1H), 4.10 – 4.06 (m, 2H), 4.01 (dd, J = 8.6, 4.8 Hz, 1H), 3.95 (t, J = 3.8 Hz, 1H), 3.76 (dd, J = 10.4, 7.1 Hz, 1H), 3.57 (dd, J = 10.5, 3.8 Hz, 1H), 1.52 (s, 3H), 1.48 (s, 9H), 1.40 (s, 3H), 1.37 (s, 3H), 1.32 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.5, 157.6, 137.9, 137.6, 137.5, 137.2, 128.5, 128.4, 128.1, 128.0, 127.9, 127.8, 127.8, 127.7, 127.6, 117.6, 112.7, 109.0, 108.6, 84.0, 83.4, 81.6, 80.1, 79.8, 77.2, 75.7, 73.5, 73.3, 71.9, 71.7, 70.3, 70.0, 68.0, 67.1, 28.2, 26.8, 26.1, 25.2, 24.6.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{46}\text{H}_{56}\text{NaO}_{11}$ 807.3715 found 807.3703.



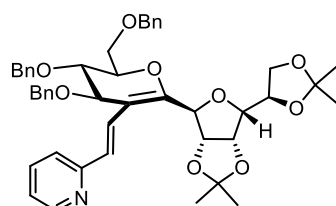
(E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)-N,N-dimethylacrylamide

Colorless liquid, 40 mg, 53%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 1:1-1:3 (v/v).

^1H NMR (400 MHz, Chloroform-*d*) δ 7.65 (d, J = 15.0 Hz, 1H), 7.35 – 7.26 (m, 13H), 7.25 – 7.21 (m, 2H), 6.36 (d, J = 15.0 Hz, 1H), 5.20 (s, 1H), 4.93 (d, J = 6.0 Hz, 1H), 4.84 – 4.79 (m, 1H), 4.72 (q, J = 11.7 Hz, 2H), 4.54 – 4.47 (m, 2H), 4.44 – 4.36 (m, 3H), 4.35 – 4.30 (m, 1H), 4.28 – 4.23 (m, 1H), 4.10 – 3.99 (m, 4H), 3.78 (dd, J = 10.5, 6.1 Hz, 1H), 3.64 (dd, J = 10.6, 3.1 Hz, 1H), 2.97 (s, 3H), 2.85 (s, 3H), 1.52 (s, 3H), 1.39 (s, 3H), 1.37 (s, 3H), 1.33 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.9, 158.0, 137.7, 137.6, 137.6, 136.4, 128.5, 128.4, 128.4, 127.9, 127.8, 127.8, 127.7, 127.7, 127.6, 115.8, 112.7, 109.3, 109.0, 84.1, 83.4, 81.7, 80.1, 76.1, 74.3, 73.5, 73.3, 72.3, 70.9, 68.4, 68.0, 67.0, 37.1, 35.8, 26.9, 26.2, 25.2, 24.7.

HRMS (ESI) m/z : $[M + Na]^+$ Calcd for $C_{44}H_{53}NNaO_{10}$ 778.3562 found 778.3580.



4d

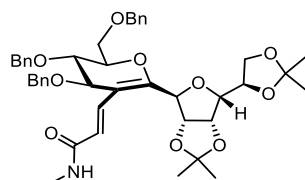
2-((E)-2-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)vinyl)pyridine

Yellow liquid, 28.9 mg, 38%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

1H NMR (400 MHz, Chloroform- d) δ 8.52 (d, J = 4.1 Hz, 1H), 7.64 – 7.53 (m, 2H), 7.37 – 7.26 (m, 15H), 7.15 (d, J = 7.9 Hz, 1H), 7.08 – 7.04 (m, 1H), 6.61 (d, J = 15.7 Hz, 1H), 5.27 (s, 1H), 4.97 (d, J = 6.0 Hz, 1H), 4.87 – 4.82 (m, 1H), 4.76 – 4.67 (m, 2H), 4.55 – 4.47 (m, 5H), 4.37 – 4.30 (m, 2H), 4.12 (dd, J = 7.8, 3.9 Hz, 1H), 4.08 – 3.98 (m, 3H), 3.80 (dd, J = 10.4, 6.8 Hz, 1H), 3.62 (dd, J = 10.5, 3.3 Hz, 1H), 1.54 (s, 3H), 1.39 (s, 3H), 1.37 (s, 3H), 1.34 (s, 3H).

^{13}C NMR (101 MHz, Chloroform- d) δ 156.1, 154.8, 149.4, 137.8, 137.8, 137.7, 136.2, 128.5, 128.4, 128.4, 128.3, 128.1, 127.9, 127.8, 127.8, 127.7, 127.6, 127.0, 126.4, 121.5, 121.4, 112.4, 110.3, 109.0, 84.0, 83.3, 81.7, 80.0, 75.8, 73.6, 73.3, 71.9, 71.1, 69.3, 68.3, 67.1, 26.9, 26.1, 25.3, 24.4.

HRMS (ESI) m/z : $[M + H]^+$ Calcd for $C_{46}H_{52}NO_9$ 762.3637 found 762.3650.



4e

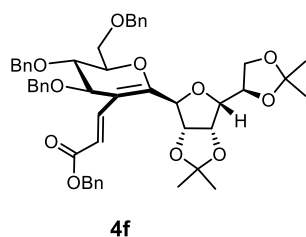
(E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)-N-methylacrylamide

White solid, 38.5 mg, 52%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 1:1-1:3 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.55 (d, J = 15.2 Hz, 1H), 7.38 – 7.27 (m, 13H), 7.23 (d, J = 6.4 Hz, 2H), 5.52 (d, J = 15.2 Hz, 1H), 5.16 (s, 1H), 5.13 – 5.08 (m, 1H), 4.92 (d, J = 6.0 Hz, 1H), 4.83 – 4.78 (m, 1H), 4.70 (s, 2H), 4.54 – 4.47 (m, 2H), 4.41 (d, J = 11.4 Hz, 1H), 4.36 – 4.31 (m, 3H), 4.29 (d, J = 3.8 Hz, 1H), 4.10 – 4.04 (m, 2H), 4.03 – 3.97 (m, 2H), 3.78 (dd, J = 10.5, 6.5 Hz, 1H), 3.63 (dd, J = 10.5, 3.8 Hz, 1H), 2.81 (d, J = 4.9 Hz, 3H), 1.52 (s, 3H), 1.39 (s, 3H), 1.36 (s, 3H), 1.33 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 166.7, 157.6, 137.7, 137.7, 137.5, 134.7, 128.5, 128.5, 128.5, 127.9, 127.8, 127.8, 127.6, 118.7, 112.7, 109.0, 108.5, 84.0, 83.3, 81.6, 80.1, 75.8, 73.5, 73.3, 72.5, 72.0, 70.6, 68.9, 68.0, 67.0, 26.9, 26.3, 26.2, 25.2, 24.6.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{43}\text{H}_{51}\text{NaO}_{10}$ 764.3405 found 764.3415.



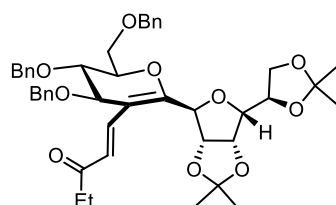
benzyl (E)-3-((2R,3S,4R)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d] [1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 49.1 mg, 60%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.77 (d, J = 15.6 Hz, 1H), 7.37 – 7.29 (m, 15H), 7.27 – 7.25 (m, 3H), 7.19 – 7.17 (m, 2H), 5.81 (d, J = 15.6 Hz, 1H), 5.18 (s, 2H), 5.13 (s, 1H), 4.91 (d, J = 6.0 Hz, 1H), 4.81 (dd, J = 5.9, 4.1 Hz, 1H), 4.67 – 4.63 (m, 2H), 4.49 – 4.45 (m, 2H), 4.44 – 4.43 (m, 1H), 4.42 – 4.40 (m, 2H), 4.34 – 4.31 (m, 1H), 4.24 (d, J = 2.3 Hz, 1H), 4.08 – 4.05 (m, 2H), 4.00 (dd, J = 8.7, 4.8 Hz, 1H), 3.95 (t, J = 3.8 Hz, 1H), 3.76 (dd, J = 10.5, 7.2 Hz, 1H), 3.57 (dd, J = 10.5, 4.1 Hz, 1H), 1.52 (s, 3H), 1.39 (s, 3H), 1.37 (s, 3H), 1.32 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.0, 158.3, 139.7, 137.6, 137.5, 137.0, 136.4, 128.5, 128.5, 128.4, 128.4, 128.1, 128.1, 128.0, 127.8, 127.7, 127.6, 115.1, 112.7, 109.1, 108.6, 84.0, 83.4, 81.5, 80.1, 75.8, 73.4, 73.3, 71.7, 71.6, 70.2, 70.2, 68.0, 67.1, 65.8, 26.8, 26.1, 25.2, 24.5.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{49}\text{H}_{54}\text{NaO}_{11}$ 841.3558 found 841.3555.



4g

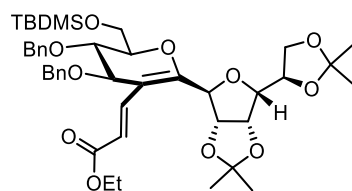
(E)-1-((2R,3S,4R)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)pent-1-en-3-one

Colorless liquid, 46.6 mg, 63%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.59 (d, J = 15.7 Hz, 1H), 7.34 – 7.27 (m, 13H), 7.21 – 7.19 (m, 2H), 6.05 (d, J = 15.7 Hz, 1H), 5.14 (s, 1H), 4.93 (d, J = 6.0 Hz, 1H), 4.83 – 4.81 (m, 1H), 4.70 – 4.65 (m, 2H), 4.47 (d, J = 5.0 Hz, 2H), 4.46 – 4.44 (m, 1H), 4.43 (d, J = 5.1 Hz, 2H), 4.35 – 4.32 (m, 1H), 4.27 – 4.24 (m, 1H), 4.09 – 4.05 (m, 2H), 4.01 – 3.97 (m, 2H), 3.77 (dd, J = 10.4, 7.2 Hz, 1H), 3.59 (dd, J = 10.5, 4.1 Hz, 1H), 2.48 (q, J = 7.3 Hz, 2H), 1.53 (s, 3H), 1.40 (s, 3H), 1.37 (s, 3H), 1.32 (s, 3H), 1.07 (t, J = 7.3 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 200.5, 158.6, 137.6, 137.5, 137.1, 137.0, 128.6, 128.5, 128.5, 128.2, 128.1, 128.0, 127.9, 127.7, 127.6, 123.7, 112.7, 109.1, 108.7, 83.9, 83.3, 81.5, 80.1, 75.8, 73.4, 73.3, 71.8, 71.5, 70.1, 70.1, 68.0, 67.0, 33.8, 26.8, 26.1, 25.2, 24.5, 8.3.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{44}\text{H}_{52}\text{NaO}_{10}$ 763.3453 found 763.3430.



4h

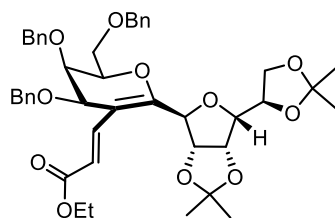
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-(((tert-butyldimethylsilyl)oxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 14.4 mg, 18%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

¹H NMR (600 MHz, Chloroform-*d*) δ 7.69 (d, *J* = 15.6 Hz, 1H), 7.36 (d, *J* = 7.1 Hz, 2H), 7.33 – 7.29 (m, 6H), 7.24 (d, *J* = 7.3 Hz, 2H), 5.82 (d, *J* = 15.6 Hz, 1H), 5.14 (s, 1H), 4.94 (d, *J* = 6.0 Hz, 1H), 4.85 (d, *J* = 5.2 Hz, 1H), 4.70 (d, *J* = 2.8 Hz, 2H), 4.49 – 4.44 (m, 2H), 4.36 – 4.34 (m, 1H), 4.33 – 4.31 (m, 1H), 4.19 (q, *J* = 7.1 Hz, 3H), 4.10 – 4.06 (m, 2H), 4.03 – 4.01 (m, 2H), 3.92 (dd, *J* = 11.3, 5.8 Hz, 1H), 3.71 (dd, *J* = 11.3, 3.8 Hz, 1H), 1.54 (s, 3H), 1.43 (s, 3H), 1.38 (s, 3H), 1.34 (s, 3H), 1.28 (t, *J* = 7.1 Hz, 3H), 0.89 (s, 9H), 0.05 (s, 3H), 0.03 (s, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ 167.2, 158.4, 139.0, 137.7, 137.4, 128.6, 128.5, 128.0, 128.0, 127.9, 127.7, 116.0, 112.7, 109.1, 109.0, 83.9, 83.4, 81.6, 80.1, 78.0, 73.5, 72.6, 72.2, 70.6, 70.0, 67.1, 61.1, 60.1, 26.9, 26.1, 25.8, 25.8, 25.2, 24.4, 18.2, 14.4, -5.4, -5.5.

HRMS (ESI) *m/z*: [M + Na]⁺ Calcd for C₄₃H₆₀NaO₁₁Si 803.3797 found 803.3785.



4i

ethyl (E)-3-((2R,3R)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

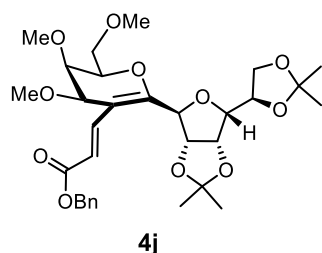
Colorless liquid, 46.9 mg, 62%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

¹H NMR (600 MHz, Chloroform-*d*) δ 7.62 (d, *J* = 15.6 Hz, 1H), 7.32 – 7.28 (m, 13H), 7.23 – 7.20 (m, 2H), 5.76 (d, *J* = 15.5 Hz, 1H), 5.09 (s, 1H), 5.01 (d, *J* = 10.8 Hz, 1H), 4.81 – 4.80 (m, 2H), 4.75 – 4.72 (m, 2H), 4.64 (d, *J* = 10.7 Hz, 1H), 4.62 – 4.60 (m, 1H), 4.46 (s, 2H), 4.33 – 4.31 (m, 2H), 4.21 – 4.17 (m, 2H), 4.14 (dd, *J* = 7.4, 3.7 Hz, 1H), 4.06 – 4.04 (m, 2H), 4.03 – 4.01

(m, 1H), 3.98 – 3.94 (m, 1H), 3.84 (dd, $J = 11.4, 2.0$ Hz, 1H), 1.50 (s, 3H), 1.44 (s, 3H), 1.36 (s, 3H), 1.28 – 1.25 (m, 6H).

^{13}C NMR (151 MHz, Chloroform- d) δ 167.0, 156.7, 139.1, 137.9, 137.9, 137.5, 128.6, 128.4, 128.3, 128.1, 128.0, 127.8, 127.7, 127.7, 127.5, 115.5, 112.7, 110.1, 109.0, 84.3, 83.5, 81.6, 80.1, 75.3, 74.6, 74.5, 73.7, 73.3, 72.4, 69.4, 68.0, 66.7, 60.1, 26.8, 26.1, 25.1, 24.3, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{44}\text{H}_{52}\text{NaO}_{11}$ 779.3402 found 779.3388.



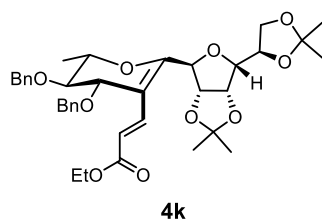
benzyl (E)-3-((2R,3R)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dimethoxy-2-(methoxymethyl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 37.8 mg, 64 %. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 3:1-1:1 (v/v).

^1H NMR (600 MHz, Chloroform- d) δ 7.71 (d, $J = 15.6$ Hz, 1H), 7.41 – 7.34 (m, 4H), 7.34 – 7.30 (m, 1H), 5.85 (d, $J = 15.5$ Hz, 1H), 5.20 (q, $J = 12.4$ Hz, 2H), 5.10 (s, 1H), 4.87 – 4.82 (m, 2H), 4.42 (dt, $J = 7.3, 3.0$ Hz, 1H), 4.35 – 4.30 (m, 1H), 4.12 – 4.08 (m, 2H), 4.06 (dd, $J = 8.7, 6.3$ Hz, 1H), 4.02 (dd, $J = 8.7, 4.7$ Hz, 1H), 3.77 (t, $J = 4.1$ Hz, 1H), 3.73 (dd, $J = 11.2, 8.5$ Hz, 1H), 3.64 (dd, $J = 11.2, 3.0$ Hz, 1H), 3.57 (s, 3H), 3.54 (s, 3H), 3.38 (s, 3H), 1.51 (s, 3H), 1.44 (s, 3H), 1.37 (s, 3H), 1.33 (s, 3H).

^{13}C NMR (151 MHz, Chloroform- d) δ 167.0, 157.5, 139.9, 136.3, 128.5, 128.2, 128.1, 115.0, 112.7, 109.8, 109.0, 84.2, 83.4, 81.6, 80.1, 75.7, 75.4, 73.7, 71.2, 69.9, 66.7, 66.0, 59.8, 59.0, 58.8, 26.9, 26.1, 25.1, 24.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{31}\text{H}_{42}\text{NaO}_{11}$ 613.2619 found 613.2615.



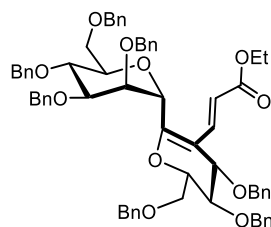
ethyl (E)-3-((2S,3S,4S)-3,4-bis(benzyloxy)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-2-methyl-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 32.5 mg, 50%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.71 (d, J = 15.6 Hz, 1H), 7.39 – 7.36 (m, 2H), 7.34 – 7.31 (m, 5H), 7.30 – 7.28 (m, 1H), 7.26 – 7.23 (m, 2H), 5.77 (d, J = 15.6 Hz, 1H), 5.15 (s, 1H), 4.93 (d, J = 6.0 Hz, 1H), 4.84 (dd, J = 5.9, 4.0 Hz, 1H), 4.68 – 4.64 (m, 2H), 4.49 – 4.44 (m, 2H), 4.41 – 4.37 (m, 1H), 4.34 (ddd, J = 7.9, 6.2, 4.7 Hz, 1H), 4.24 – 4.17 (m, 3H), 4.09 – 4.05 (m, 2H), 3.99 (dd, J = 8.7, 4.6 Hz, 1H), 3.69 (t, J = 3.2 Hz, 1H), 1.54 (s, 3H), 1.42 (s, 3H), 1.38 – 1.34 (m, 9H), 1.29 (t, J = 7.1 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.2, 157.2, 139.4, 137.6, 137.4, 128.6, 128.5, 128.1, 128.0, 127.9, 127.7, 115.5, 112.7, 109.1, 108.3, 83.8, 83.4, 81.6, 80.1, 73.5, 73.5, 73.4, 71.6, 71.4, 70.2, 67.1, 60.1, 26.9, 26.1, 25.2, 24.5, 16.5, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{37}\text{H}_{46}\text{NaO}_{10}$ 673.2983 found 673.2972.



4I

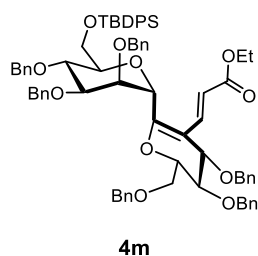
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((2S,3S,4S,5R,6R)-3,4,5-tris(benzyloxy)-6-((benzyloxy)methyl)tetrahydro-2H-pyran-2-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Yellow liquid, 42.4 mg, 41%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-5:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.88 (d, J = 15.7 Hz, 1H), 7.28 – 7.20 (m, 33H), 7.17 – 7.15 (m, 2H), 5.77 (d, J = 15.6 Hz, 1H), 5.11 (d, J = 4.1 Hz, 1H), 4.70 (d, J = 11.3 Hz, 1H), 4.64 (d, J = 11.9 Hz, 2H), 4.60 – 4.56 (m, 5H), 4.55 – 4.49 (m, 4H), 4.38 – 4.35 (m, 3H), 4.35 – 4.32 (m, 2H), 4.29 (s, 1H), 4.17 – 4.14 (m, 2H), 3.99 (s, 1H), 3.94 (s, 1H), 3.85 (s, 1H), 3.81 – 3.77 (m, 1H), 3.73 – 3.68 (m, 1H), 3.64 (d, J = 4.9 Hz, 2H), 1.25 (t, J = 6.9 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.2, 157.3, 139.6, 138.5, 138.5, 138.4, 138.2, 137.8, 137.6, 137.3, 128.5, 128.3, 128.2, 128.2, 128.2, 128.0, 128.0, 127.9, 127.8, 127.7, 127.7, 127.5, 115.1, 109.4, 75.9, 75.3, 74.7, 73.9, 73.6, 73.3, 73.2, 72.1, 72.1, 71.7, 69.8, 69.6, 68.8, 67.8, 59.9, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{66}\text{H}_{68}\text{NaO}_{11}$ 1059.4654 found 1059.4634.



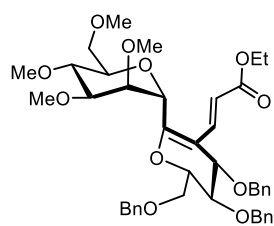
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((2S,3S,4S,5R,6R)-3,4,5-tris(benzyloxy)-6-(((tert-butyldiphenylsilyl)oxy)methyl)tetrahydro-2H-pyran-2-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 58 mg, 49%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-5:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.8 (d, J = 15.7 Hz, 1H), 7.7 (d, J = 6.8 Hz, 2H), 7.6 (d, J = 6.8 Hz, 2H), 7.4 – 7.3 (m, 3H), 7.3 – 7.3 (m, 5H), 7.3 – 7.2 (m, 12H), 7.2 – 7.2 (m, 14H), 7.2 – 7.1 (m, 2H), 5.7 (d, J = 16.0 Hz, 1H), 5.1 (d, J = 4.5 Hz, 1H), 4.7 (d, J = 11.4 Hz, 1H), 4.6 – 4.6 (m, 7H), 4.4 – 4.3 (m, 5H), 4.2 (s, 1H), 4.1 – 4.1 (m, 3H), 4.1 (dd, J = 10.8, 7.1 Hz, 1H), 4.0 (dd, J = 7.2, 2.8 Hz, 1H), 4.0 (dd, J = 10.4, 4.0 Hz, 2H), 3.9 (dd, J = 10.7, 4.7 Hz, 1H), 3.8 – 3.7 (m, 1H), 3.6 (d, J = 6.0 Hz, 2H), 1.2 (t, J = 7.1 Hz, 3H), 1.0 (s, 9H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.1, 157.7, 139.6, 138.6, 138.5, 138.4, 137.8, 137.6, 137.4, 135.8, 135.6, 133.8, 133.4, 129.5, 129.4, 128.5, 128.4, 128.3, 128.2, 128.2, 128.0, 127.9, 127.9, 127.8, 127.8, 127.6, 127.6, 127.5, 127.5, 115.1, 109.2, 76.5, 75.9, 74.6, 74.3, 73.7, 73.2, 72.2, 72.1, 71.8, 71.7, 69.7, 67.9, 62.8, 59.8, 26.8, 19.2, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{75}\text{H}_{80}\text{NaO}_{11}\text{Si}$ 1207.5362 found 1207.5304.



4n

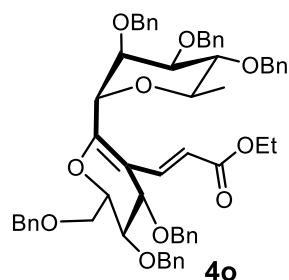
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((2S,3S,4S,5R,6R)-3,4,5-trimethoxy-6-(methoxymethyl)tetrahydro-2H-pyran-2-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 46.1 mg, 63%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 3:1-1:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.84 (d, J = 15.7 Hz, 1H), 7.33 – 7.28 (m, 13H), 7.20 (dd, J = 7.3, 1.9 Hz, 2H), 5.77 (d, J = 15.7 Hz, 1H), 5.06 (d, J = 4.2 Hz, 1H), 4.66 (d, J = 3.9 Hz, 1H), 4.47 (s, 2H), 4.43 (s, 2H), 4.30 (d, J = 2.5 Hz, 1H), 4.19 (q, J = 7.1 Hz, 2H), 4.01 (t, J = 3.9 Hz, 1H), 3.87 – 3.85 (m, 1H), 3.80 – 3.77 (m, 1H), 3.75 – 3.74 (m, 1H), 3.67 – 3.65 (m, 1H), 3.62 – 3.59 (m, 1H), 3.56 – 3.55 (m, 1H), 3.50 – 3.48 (m, 5H), 3.45 – 3.44 (m, 4H), 3.43 – 3.42 (m, 4H), 3.36 (s, 3H), 1.28 (d, J = 7.1 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.1, 157.1, 139.4, 137.7, 137.6, 137.3, 128.5, 128.4, 128.3, 128.0, 127.9, 127.8, 127.7, 127.7, 127.5, 115.2, 109.3, 80.1, 77.2, 76.3, 76.1, 76.0, 74.7, 73.2, 71.7, 71.0, 70.1, 70.0, 69.9, 67.9, 59.9, 59.5, 59.1, 58.2, 57.9, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{42}\text{H}_{52}\text{NaO}_{11}$ 755.3402 found 755.3410.



4o

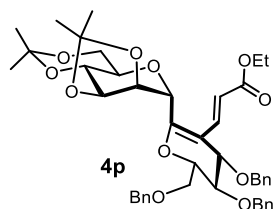
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((2R,3R,4R,5S,6S)-3,4,5-tris(benzyloxy)-6-methyltetrahydro-2H-pyran-2-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 53.9 mg, 58%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-5:1 (v/v).

¹H NMR (600 MHz, Chloroform-*d*) δ 7.94 (d, *J* = 15.8 Hz, 1H), 7.34 – 7.19 (m, 30H), 5.75 (d, *J* = 15.7 Hz, 1H), 5.13 – 5.08 (m, 1H), 4.74 (d, *J* = 11.1 Hz, 1H), 4.67 (d, *J* = 12.1 Hz, 1H), 4.64 – 4.57 (m, 4H), 4.55 – 4.53 (m, 1H), 4.51 (d, *J* = 12.2 Hz, 1H), 4.40 (dq, *J* = 36.4, 12.0 Hz, 5H), 4.25 (d, *J* = 14.8 Hz, 1H), 4.22 – 4.14 (m, 3H), 3.96 – 3.92 (m, 2H), 3.79 – 3.74 (m, 1H), 3.73 – 3.68 (m, 1H), 3.60 (dd, *J* = 10.2, 3.8 Hz, 1H), 3.57 – 3.53 (m, 1H), 1.31 (d, *J* = 5.9 Hz, 3H), 1.28 – 1.26 (m, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ 167.3, 157.4, 140.0, 138.7, 138.5, 138.4, 137.8, 137.5, 137.3, 128.5, 128.4, 128.3, 128.3, 128.2, 128.0, 127.9, 127.9, 127.7, 127.7, 114.9, 109.1, 80.4, 79.2, 74.6, 74.1, 73.4, 72.6, 72.2, 71.8, 71.7, 71.5, 71.3, 70.0, 69.9, 68.3, 60.0, 18.2, 14.4, 14.1.

HRMS (ESI) *m/z*: [M + Na]⁺ Calcd for C₅₉H₆₂NaO₁₀ 953.4235 found 953.4242.



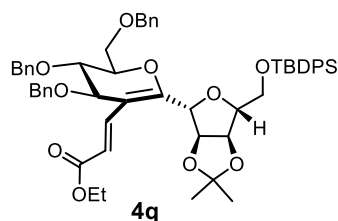
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,5aR,9aR,9bS)-2,2,8,8-tetramethylhexahydro-[1,3]dioxolo[4',5':4,5]pyrano[3,2-d][1,3]dioxin-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

White liquid, 46.9 mg, 62%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

¹H NMR (600 MHz, Chloroform-*d*) δ 7.71 (d, *J* = 15.6 Hz, 1H), 7.36 – 7.33 (m, 3H), 7.31 – 7.26 (m, 10H), 7.21 (d, *J* = 6.5 Hz, 2H), 5.79 (d, *J* = 15.6 Hz, 1H), 5.14 (s, 1H), 4.92 (d, *J* = 5.9 Hz, 1H), 4.83 – 4.80 (m, 1H), 4.66 (s, 2H), 4.49 – 4.43 (m, 5H), 4.35 – 4.32 (m, 1H), 4.27 – 4.25 (m, 1H), 4.19 (q, *J* = 7.1 Hz, 2H), 4.09 – 4.06 (m, 2H), 4.01 (dd, *J* = 8.6, 4.8 Hz, 1H), 3.95 (t, *J* = 3.7 Hz, 1H), 3.76 (dd, *J* = 10.4, 7.2 Hz, 1H), 3.57 (dd, *J* = 10.5, 4.0 Hz, 1H), 1.53 (s, 3H), 1.40 (s, 3H), 1.37 (s, 3H), 1.32 (s, 3H), 1.28 (t, *J* = 7.1 Hz, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ 167.1, 157.9, 139.0, 137.6, 137.5, 137.2, 128.5, 128.4, 128.0, 128.0, 127.9, 127.8, 127.7, 127.6, 115.7, 112.7, 109.1, 108.7, 84.0, 83.4, 81.5, 80.1, 75.8, 73.5, 73.3, 71.8, 71.7, 70.3, 70.2, 68.0, 67.1, 60.0, 26.8, 26.1, 25.2, 24.5, 14.4.

HRMS (ESI) *m/z*: [M + Na]⁺ Calcd for C₄₄ H₅₂NaO₁₁ 779.3402 found 779.3385.



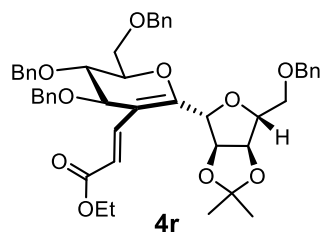
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aR,4R,6R,6aR)-6-(((tert-butylidiphenylsilyl)oxy)methyl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 48.9 mg, 53%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.8 (d, J = 15.6 Hz, 1H), 7.7 (d, J = 6.6 Hz, 4H), 7.3 – 7.3 (m, 11H), 7.3 – 7.2 (m, 6H), 7.2 – 7.1 (m, 2H), 7.1 – 7.0 (m, 2H), 5.7 (d, J = 15.6 Hz, 1H), 5.1 (d, J = 3.6 Hz, 1H), 4.8 (dd, J = 6.1, 3.8 Hz, 1H), 4.7 (dd, J = 6.2, 3.9 Hz, 1H), 4.6 (q, J = 12.2 Hz, 2H), 4.4 – 4.4 (m, 3H), 4.2 – 4.1 (m, 6H), 4.0 (t, J = 2.9 Hz, 1H), 3.8 – 3.7 (m, 2H), 3.6 (dd, J = 9.7, 7.0 Hz, 1H), 3.4 (dd, J = 9.8, 6.5 Hz, 1H), 1.6 (s, 3H), 1.3 (s, 3H), 1.3 (t, J = 7.1 Hz, 3H), 1.0 (s, 9H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.3, 156.1, 139.6, 137.9, 137.6, 137.2, 135.6, 135.6, 133.4, 133.3, 129.6, 129.6, 128.5, 128.3, 128.2, 128.0, 128.0, 127.9, 127.8, 127.7, 127.6, 127.5, 127.4, 115.1, 113.8, 108.9, 85.5, 82.8, 82.5, 80.0, 75.5, 73.0, 71.4, 70.6, 70.4, 69.3, 67.5, 64.1, 60.0, 27.6, 26.7, 25.6, 19.2, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{56}\text{H}_{64}\text{NaO}_{10}\text{Si}$ 947.4161 found 947.4134.



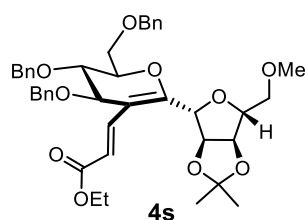
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aR,4R,6R,6aR)-6-((benzyloxy)methyl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 52 mg, 67%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.76 (d, J = 15.6 Hz, 1H), 7.38 – 7.34 (m, 2H), 7.33 – 7.23 (m, 14H), 7.20 (d, J = 6.8 Hz, 2H), 7.16 (dd, J = 6.4, 2.8 Hz, 2H), 5.72 (d, J = 15.6 Hz, 1H), 5.14 (d, J = 3.1 Hz, 1H), 4.83 (dd, J = 6.3, 3.2 Hz, 1H), 4.67 – 4.60 (m, 3H), 4.52 – 4.45 (m, 3H), 4.42 – 4.31 (m, 4H), 4.23 – 4.16 (m, 4H), 3.98 (t, J = 2.7 Hz, 1H), 3.67 – 3.61 (m, 2H), 3.60 – 3.55 (m, 2H), 1.58 (s, 3H), 1.33 (s, 3H), 1.28 (t, J = 7.1 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.2, 155.9, 139.5, 138.1, 137.9, 137.6, 137.2, 128.6, 128.4, 128.3, 128.3, 128.0, 128.0, 127.9, 127.8, 127.6, 127.6, 127.5, 127.5, 115.2, 114.0, 108.9, 84.5, 83.2, 82.9, 80.2, 76.0, 73.3, 73.2, 71.4, 70.6, 70.5, 69.7, 68.0, 60.0, 27.5, 25.6, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{47}\text{H}_{52}\text{NaO}_{10}$ 799.3453 found 799.3440.



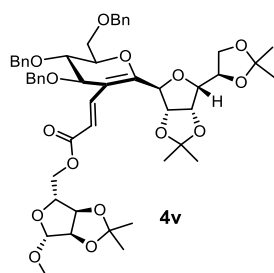
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aR,4R,6R,6aR)-6-(methoxymethyl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 40.6 mg, 58%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.75 (d, J = 15.6 Hz, 1H), 7.38 – 7.35 (m, 2H), 7.34 – 7.29 (m, 5H), 7.29 – 7.26 (m, 4H), 7.23 (d, J = 7.0 Hz, 2H), 7.17 (dd, J = 6.6, 2.6 Hz, 2H), 5.72 (d, J = 15.6 Hz, 1H), 5.14 (d, J = 3.0 Hz, 1H), 4.83 (dd, J = 6.4, 3.0 Hz, 1H), 4.65 (q, J = 12.1 Hz, 2H), 4.58 – 4.52 (m, 2H), 4.48 (d, J = 11.9 Hz, 1H), 4.43 – 4.38 (m, 3H), 4.22 – 4.14 (m, 4H), 3.98 (t, J = 2.8 Hz, 1H), 3.73 (dd, J = 10.5, 7.0 Hz, 1H), 3.64 (dd, J = 10.6, 5.1 Hz, 1H), 3.49 (dd, J = 5.8, 2.4 Hz, 2H), 3.28 (s, 3H), 1.58 (s, 3H), 1.33 (s, 3H), 1.29 (t, J = 7.1 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.2, 155.8, 139.5, 137.9, 137.6, 137.2, 128.6, 128.4, 128.3, 128.0, 127.9, 127.9, 127.8, 127.6, 127.5, 115.2, 114.1, 108.9, 84.2, 83.2, 82.9, 80.2, 76.2, 73.3, 73.0, 71.4, 70.6, 70.5, 69.8, 68.1, 60.0, 59.3, 27.5, 25.5, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{41}\text{H}_{48}\text{NaO}_{10}$ 723.3140 found 723.3134.



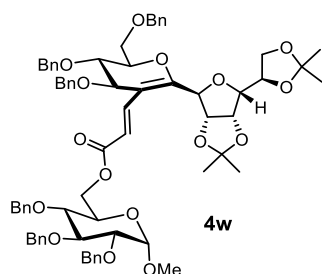
**((3aR,4R,6R,6aR)-6-methoxy-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)methyl
(E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate**

Colorless liquid, 59.4 mg, 65%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.8 (d, J = 15.6 Hz, 1H), 7.4 – 7.3 (m, 12H), 7.3 – 7.3 (m, 1H), 7.2 (d, J = 7.7 Hz, 2H), 5.8 (d, J = 15.5 Hz, 1H), 5.2 (s, 1H), 5.0 (s, 1H), 4.9 (d, J = 6.0 Hz, 1H), 4.8 – 4.8 (m, 1H), 4.7 (d, J = 5.5 Hz, 1H), 4.7 (d, J = 6.0 Hz, 1H), 4.6 (d, J = 5.9 Hz, 1H), 4.5 – 4.4 (m, 7H), 4.4 – 4.3 (m, 1H), 4.3 – 4.2 (m, 1H), 4.2 – 4.1 (m, 2H), 4.1 – 4.1 (m, 2H), 4.0 (dd, J = 8.7, 4.8 Hz, 1H), 4.0 (t, J = 3.7 Hz, 1H), 3.8 (dd, J = 10.5, 7.2 Hz, 1H), 3.6 (dd, J = 10.5, 4.1 Hz, 1H), 3.3 (s, 3H), 1.5 (s, 3H), 1.5 (s, 3H), 1.4 (s, 3H), 1.4 (s, 3H), 1.3 (d, J = 3.2 Hz, 6H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 166.7, 158.5, 140.1, 137.6, 137.5, 137.0, 128.6, 128.5, 128.4, 128.1, 128.0, 128.0, 127.8, 127.7, 127.6, 114.6, 112.7, 112.4, 109.4, 109.1, 108.6, 85.2, 84.3, 84.0, 83.4, 81.8, 81.6, 80.1, 75.8, 73.4, 73.3, 71.7, 71.5, 70.2, 70.1, 68.0, 67.1, 64.3, 54.8, 26.8, 26.4, 26.1, 25.2, 24.9, 24.6.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{51}\text{H}_{62}\text{NaO}_{15}$ 937.3981 found 937.3978.



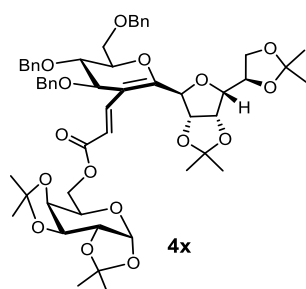
((2R,3R,4S,5R,6S)-3,4,5-tris(benzyloxy)-6-methoxytetrahydro-2H-pyran-2-yl)methyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 72.8 mg, 62%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

¹H NMR (600 MHz, Chloroform-*d*) δ 8.25 (d, *J* = 15.5 Hz, 1H), 7.88 – 7.77 (m, 28H), 7.71 – 7.69 (m, 2H), 6.33 (d, *J* = 15.5 Hz, 1H), 5.63 (s, 1H), 5.52 (d, *J* = 10.8 Hz, 1H), 5.43 (d, *J* = 6.0 Hz, 1H), 5.37 (dd, *J* = 18.8, 10.8 Hz, 2H), 5.34 – 5.29 (m, 2H), 5.20 – 5.16 (m, 3H), 5.12 – 5.08 (m, 2H), 5.01 – 4.97 (m, 2H), 4.95 – 4.90 (m, 4H), 4.85 – 4.79 (m, 2H), 4.77 (d, *J* = 2.9 Hz, 1H), 4.59 – 4.56 (m, 2H), 4.55 – 4.50 (m, 2H), 4.48 (t, *J* = 3.9 Hz, 1H), 4.37 (dd, *J* = 9.8, 4.0 Hz, 1H), 4.28 (dd, *J* = 10.5, 7.1 Hz, 1H), 4.07 (ddd, *J* = 20.2, 10.1, 3.7 Hz, 2H), 3.99 (t, *J* = 9.4 Hz, 1H), 3.87 (s, 3H), 2.02 (s, 3H), 1.91 (s, 3H), 1.88 (s, 3H), 1.83 (s, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ 166.8, 158.5, 139.9, 138.6, 138.0, 137.8, 137.6, 137.5, 137.1, 128.5, 128.5, 128.4, 128.4, 128.4, 128.0, 128.0, 128.0, 128.0, 127.9, 127.9, 127.9, 127.8, 127.7, 127.6, 127.6, 114.8, 112.7, 109.0, 108.7, 97.8, 83.9, 83.4, 82.0, 81.5, 80.1, 79.9, 79.6, 77.6, 75.9, 75.7, 75.1, 73.4, 73.3, 73.2, 71.8, 71.7, 70.2, 70.0, 68.8, 68.0, 67.0, 62.8, 55.1, 26.8, 26.1, 25.2, 24.5.

HRMS (ESI) *m/z*: [M + Na]⁺ Calcd for C₇₀H₇₈NaO₁₆ 1197.5182 found 1197.5168.



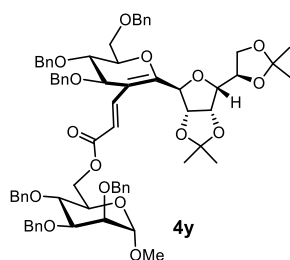
((3aR,5R,5aS,8aS,8bR)-2,2,7,7-tetramethyltetrahydro-5H-bis([1,3]dioxolo)[4,5-b:4',5'-d]pyran-5-yl)methyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Yellow solid, 69.8 mg, 72%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.74 (d, J = 15.6 Hz, 1H), 7.35 – 7.27 (m, 13H), 7.21 – 7.18 (m, 2H), 5.84 (d, J = 15.5 Hz, 1H), 5.55 (d, J = 4.9 Hz, 1H), 5.13 (s, 1H), 4.91 (d, J = 6.0 Hz, 1H), 4.81 (dd, J = 5.9, 4.1 Hz, 1H), 4.66 (s, 2H), 4.62 (dd, J = 7.9, 2.4 Hz, 1H), 4.46 (d, J = 5.7 Hz, 2H), 4.44 – 4.40 (m, 3H), 4.34 – 4.30 (m, 3H), 4.29 – 4.25 (m, 3H), 4.09 – 4.05 (m, 3H), 4.00 (dd, J = 8.7, 4.8 Hz, 1H), 3.95 (t, J = 3.8 Hz, 1H), 3.76 (dd, J = 10.6, 7.1 Hz, 1H), 3.56 (dd, J = 10.6, 4.0 Hz, 1H), 1.53 – 1.50 (m, 6H), 1.46 (s, 3H), 1.39 (s, 3H), 1.37 (s, 3H), 1.35 (s, 3H), 1.33 – 1.31 (m, 6H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 166.9, 158.3, 139.8, 137.6, 137.5, 137.1, 128.5, 128.5, 128.4, 128.0, 128.0, 127.9, 127.8, 127.7, 127.6, 115.0, 112.7, 109.5, 109.1, 108.7, 108.7, 96.2, 83.9, 83.4, 81.5, 80.0, 75.9, 73.4, 73.3, 71.7, 71.6, 71.0, 70.6, 70.5, 70.2, 70.1, 68.0, 67.1, 66.0, 63.1, 26.8, 26.1, 26.1, 25.9, 25.2, 25.0, 24.5, 24.5.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{54}\text{H}_{66}\text{NaO}_{16}$ 993.4243 found 993.4249.



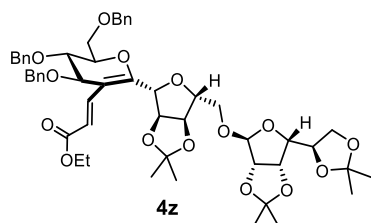
((2R,3R,4S,5S,6S)-3,4,5-tris(benzyloxy)-6-methoxytetrahydro-2H-pyran-2-yl)methyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Yellow liquid, 81 mg, 69%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.74 (d, J = 15.6 Hz, 1H), 7.37 – 7.28 (m, 26H), 7.26 (s, 2H), 7.18 (d, J = 6.7 Hz, 2H), 5.84 (d, J = 15.5 Hz, 1H), 5.12 (s, 1H), 4.93 – 4.89 (m, 2H), 4.81 (dd, J = 5.9, 4.1 Hz, 1H), 4.73 – 4.70 (m, 3H), 4.65 (s, 2H), 4.61 – 4.58 (m, 3H), 4.48 – 4.45 (m, 3H), 4.41 (d, J = 13.4 Hz, 3H), 4.35 (dd, J = 11.8, 6.3 Hz, 1H), 4.29 (ddd, J = 7.9, 6.2, 4.9 Hz, 1H), 4.25 (d, J = 2.6 Hz, 1H), 4.07 – 4.02 (m, 2H), 3.98 (dd, J = 8.7, 4.8 Hz, 1H), 3.94 (t, J = 3.9 Hz, 1H), 3.91 – 3.88 (m, 2H), 3.83 – 3.80 (m, 1H), 3.78 – 3.74 (m, 2H), 3.55 (dd, J = 10.6, 4.0 Hz, 1H), 3.28 (s, 3H), 1.49 (s, 3H), 1.38 (s, 3H), 1.35 (s, 3H), 1.30 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.0, 158.3, 139.7, 138.4, 138.2, 138.1, 137.6, 137.5, 137.1, 128.6, 128.5, 128.5, 128.4, 128.3, 128.3, 128.1, 128.0, 127.9, 127.8, 127.7, 127.7, 127.6, 127.6, 115.1, 112.7, 109.1, 108.8, 98.8, 83.9, 83.4, 81.6, 80.2, 80.0, 75.9, 75.2, 74.8, 74.2, 73.4, 73.3, 72.5, 72.0, 71.7, 71.7, 70.3, 70.1, 68.1, 67.1, 63.6, 54.7, 26.9, 26.1, 25.2, 24.5.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{70}\text{H}_{78}\text{NaO}_{16}$ 1197.5182 found 1197.5173.



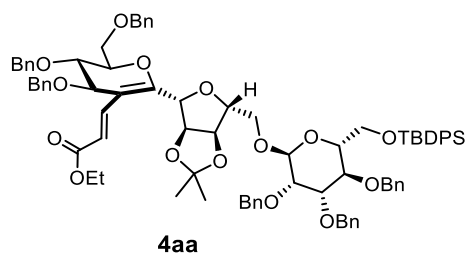
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aR,4R,6R,6aR)-6-(((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)oxy)methyl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 61.2 mg, 66%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-3:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.73 (d, J = 15.6 Hz, 1H), 7.36 – 7.26 (m, 13H), 7.17 – 7.14 (m, 2H), 5.72 (d, J = 15.5 Hz, 1H), 5.14 – 5.11 (m, 1H), 5.02 (s, 1H), 4.84 – 4.82 (m, 1H), 4.75 – 4.73 (m, 1H), 4.65 – 4.63 (m, 2H), 4.62 – 4.59 (m, 2H), 4.57 – 4.55 (m, 1H), 4.49 (d, J = 11.9 Hz, 1H), 4.41 (s, 2H), 4.37 – 4.34 (m, 2H), 4.21 – 4.17 (m, 4H), 4.07 – 4.05 (m, 1H), 4.02 – 3.99 (m, 2H), 3.92 (dd, J = 7.5, 3.2 Hz, 1H), 3.71 – 3.65 (m, 3H), 3.62 – 3.59 (m, 1H), 1.59 (s, 3H), 1.44 (s, 3H), 1.41 (s, 3H), 1.36 (s, 3H), 1.34 (s, 3H), 1.30 – 1.27 (m, 6H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.2, 155.9, 139.4, 137.9, 137.6, 137.2, 128.5, 128.4, 128.3, 128.0, 128.0, 127.9, 127.8, 127.7, 127.6, 127.5, 115.3, 113.9, 112.5, 109.1, 108.9, 107.0, 85.0, 84.2, 83.2, 83.0, 80.5, 80.4, 79.5, 75.9, 73.2, 73.1, 71.4, 70.7, 70.4, 69.6, 67.9, 67.7, 67.0, 60.0, 27.5, 26.8, 25.9, 25.5, 25.2, 24.5, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{52}\text{H}_{64}\text{NaO}_{15}$ 951.4137 found 951.4128.



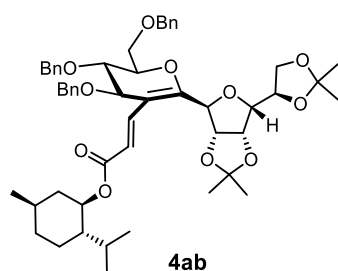
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aR,4R,6R,6aR)-2,2-dimethyl-6-((((2S,3S,4S,5R,6R)-3,4,5-tris(benzyloxy)-6-(((tert-butyldiphenylsilyl)oxy)methyl)tetrahydro-2H-pyran-2-yl)oxy)methyl)tetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 81.4 mg, 60%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.8 (d, J = 15.6 Hz, 1H), 7.7 – 7.7 (m, 2H), 7.7 – 7.7 (m, 2H), 7.3 (dd, J = 13.1, 6.5 Hz, 9H), 7.3 – 7.3 (m, 13H), 7.2 – 7.2 (m, 9H), 7.2 – 7.1 (m, 2H), 7.1 – 7.1 (m, 3H), 5.7 (d, J = 15.6 Hz, 1H), 5.1 (d, J = 3.4 Hz, 1H), 4.9 – 4.9 (m, 2H), 4.8 – 4.8 (m, 1H), 4.8 – 4.7 (m, 1H), 4.7 – 4.6 (m, 4H), 4.6 (dd, J = 12.4, 7.3 Hz, 3H), 4.5 (dd, J = 6.3, 4.0 Hz, 2H), 4.4 (d, J = 11.0 Hz, 3H), 4.2 (d, J = 11.9 Hz, 1H), 4.2 – 4.1 (m, 4H), 4.1 (d, J = 9.5 Hz, 1H), 4.0 (t, J = 2.6 Hz, 1H), 3.9 – 3.9 (m, 2H), 3.9 – 3.9 (m, 1H), 3.8 – 3.8 (m, 1H), 3.7 (dd, J = 10.9, 5.4 Hz, 1H), 3.7 – 3.6 (m, 1H), 3.6 (d, J = 5.7 Hz, 1H), 3.6 – 3.6 (m, 1H), 1.5 (s, 3H), 1.3 (s, 3H), 1.3 (t, J = 7.3 Hz, 3H), 1.0 (s, 9H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.2, 155.7, 139.5, 138.7, 138.6, 137.8, 137.5, 137.1, 135.9, 135.6, 133.9, 133.4, 129.4, 128.6, 128.4, 128.3, 128.3, 128.2, 128.2, 128.0, 127.9, 127.8, 127.7, 127.6, 127.5, 127.4, 127.3, 115.2, 114.0, 108.9, 98.0, 83.7, 83.2, 83.0, 80.3, 80.2, 76.0, 75.6, 75.1, 74.6, 73.3, 73.2, 72.7, 72.2, 71.4, 70.6, 70.4, 69.6, 67.9, 67.3, 63.1, 60.0, 29.7, 27.5, 26.8, 25.6, 19.3, 14.4, 14.1.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{83}\text{H}_{92}\text{NaO}_{15}\text{Si}$ 1379.6098 found 1379.6085.



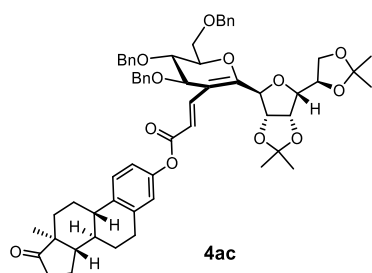
(1R,2S,5R)-2-isopropyl-5-methylcyclohexyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 48.5 mg, 56%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.71 (d, J = 15.6 Hz, 1H), 7.36 – 7.26 (m, 13H), 7.22 – 7.19 (m, 2H), 5.82 (d, J = 15.5 Hz, 1H), 5.15 (s, 1H), 4.91 (d, J = 6.0 Hz, 1H), 4.83 – 4.80 (m, 1H), 4.76 (dt, J = 10.9, 5.4 Hz, 1H), 4.68 (s, 2H), 4.50 – 4.44 (m, 2H), 4.44 – 4.39 (m, 3H), 4.35 – 4.31 (m, 1H), 4.28 (d, J = 3.0 Hz, 1H), 4.10 – 4.06 (m, 2H), 4.03 – 3.97 (m, 2H), 3.76 (dd, J = 10.5, 7.0 Hz, 1H), 3.59 (dd, J = 10.5, 4.1 Hz, 1H), 2.01 (d, J = 11.4 Hz, 1H), 1.92 – 1.86 (m, 1H), 1.71 – 1.66 (m, 2H), 1.55 – 1.49 (m, 4H), 1.43 – 1.39 (m, 4H), 1.37 (s, 3H), 1.32 (s, 3H), 1.08 (qd, J = 13.7, 3.9 Hz, 1H), 1.01 – 0.96 (m, 1H), 0.92 – 0.86 (m, 7H), 0.76 (d, J = 6.9 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 166.7, 158.0, 138.9, 137.6, 137.5, 137.1, 128.5, 128.4, 128.2, 128.0, 128.0, 127.8, 127.7, 127.6, 116.1, 112.7, 109.1, 108.7, 84.0, 83.4, 81.6, 80.0, 75.8, 73.7, 73.5, 73.3, 72.1, 71.7, 70.1, 70.1, 68.0, 67.1, 47.1, 41.0, 34.3, 31.3, 26.8, 26.2, 26.1, 25.2, 24.6, 23.5, 22.0, 20.8, 16.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{52}\text{H}_{66}\text{NaO}_{11}$ 889.4497 found 889.4480.



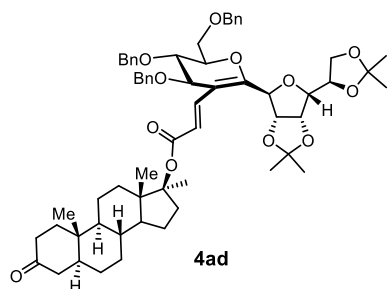
(8R,9S,13S,14S)-13-methyl-17-oxo-7,8,9,11,12,13,14,15,16,17-decahydro-6H-cyclopenta[a]phenanthren-3-yl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 41.1 mg, 42%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.88 (d, J = 15.6 Hz, 1H), 7.39 – 7.36 (m, 2H), 7.34 – 7.29 (m, 10H), 7.28 – 7.26 (m, 2H), 7.24 – 7.22 (m, 2H), 6.88 (dd, J = 8.4, 2.2 Hz, 1H), 6.85 – 6.82 (m, 1H), 5.90 (d, J = 15.5 Hz, 1H), 5.15 (s, 1H), 4.94 (d, J = 6.0 Hz, 1H), 4.83 (dd, J = 5.9, 4.1 Hz, 1H), 4.70 – 4.66 (m, 2H), 4.51 – 4.47 (m, 5H), 4.35 – 4.32 (m, 1H), 4.30 – 4.28 (m, 1H), 4.09 – 4.07 (m, 2H), 4.02 (dd, J = 8.7, 4.7 Hz, 1H), 3.98 (t, J = 3.6 Hz, 1H), 3.78 (dd, J = 10.5, 7.2 Hz, 1H), 3.59 (dd, J = 10.5, 4.2 Hz, 1H), 2.94 – 2.90 (m, 2H), 2.53 – 2.48 (m, 1H), 2.43 – 2.40 (m, 1H), 2.30 (td, J = 11.6, 11.1, 4.1 Hz, 1H), 2.17 – 2.13 (m, 1H), 2.08 (d, J = 4.3 Hz, 1H), 1.99 – 1.96 (m, 1H), 1.64 – 1.62 (m, 1H), 1.62 – 1.59 (m, 1H), 1.53 – 1.51 (m, 4H), 1.49 (d, J = 4.1 Hz, 1H), 1.47 – 1.45 (m, 2H), 1.41 (s, 3H), 1.38 – 1.35 (m, 4H), 1.32 (s, 3H), 0.91 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 141.0, 137.5, 128.6, 128.5, 128.5, 128.1, 128.1, 128.0, 127.9, 127.7, 127.6, 126.3, 121.7, 118.9, 114.5, 112.7, 109.1, 83.9, 83.4, 81.5, 80.1, 77.2, 75.9, 73.4, 73.3, 71.7, 71.4, 70.4, 70.1, 68.0, 67.1, 50.4, 47.9, 44.1, 38.0, 35.8, 31.5, 29.4, 26.9, 26.3, 26.1, 25.7, 25.2, 24.5, 21.6, 13.8.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{60}\text{H}_{68}\text{NaO}_{12}$ 1003.4603 found 1003.4646.



(5S,8R,9S,10S,13S,17S)-10,13,17-trimethyl-3-oxohexadecahydro-1H-cyclopenta[a]phenanthren-17-yl **(E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate**

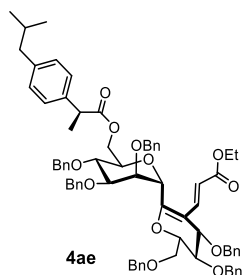
White solid, 72 mg, 71%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 5:1-3:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.69 (d, J = 15.6 Hz, 1H), 7.36 – 7.29 (m, 13H), 7.22 – 7.21 (m, 2H), 5.79 (d, J = 15.5 Hz, 1H), 5.13 (s, 1H), 4.91 (d, J = 6.0 Hz, 1H), 4.82 – 4.80 (m, 1H), 4.69 – 4.65 (m, 3H), 4.47 (d, J = 4.3 Hz, 2H), 4.43 (d, J = 5.9 Hz, 2H), 4.35 – 4.32 (m, 1H), 4.27 (d, J = 2.9 Hz, 1H), 4.08 (dd, J = 8.1, 4.9 Hz, 2H), 4.01 (dd, J = 8.6, 4.7 Hz, 1H), 3.98 (t, J = 3.8 Hz, 1H), 3.77 (dd, J = 10.5, 7.0 Hz, 1H), 3.58 (dd, J = 10.5, 4.0 Hz, 1H), 2.69 (dd, J = 14.6, 6.0

Hz, 1H), 2.26 – 2.19 (m, 2H), 2.14 – 2.12 (m, 1H), 2.09 – 2.06 (m, 2H), 2.01 – 1.97 (m, 1H), 1.83 – 1.79 (m, 1H), 1.79 – 1.74 (m, 2H), 1.71 – 1.69 (m, 1H), 1.66 – 1.63 (m, 1H), 1.54 – 1.50 (m, 5H), 1.48 – 1.44 (m, 3H), 1.41 – 1.40 (m, 3H), 1.38 – 1.36 (m, 6H), 1.33 – 1.31 (m, 4H), 1.12 (s, 3H), 0.87 (d, $J = 7.2$ Hz, 4H), 0.84 (s, 3H).

^{13}C NMR (151 MHz, Chloroform- d) δ 212.1, 167.2, 158.1, 138.8, 137.6, 137.5, 137.0, 128.5, 128.4, 128.4, 128.2, 128.0, 127.9, 127.8, 127.7, 127.5, 115.8, 112.7, 109.0, 108.5, 84.1, 83.4, 82.3, 81.5, 80.2, 75.7, 73.4, 73.2, 71.8, 71.7, 70.2, 70.1, 67.9, 67.0, 50.6, 48.4, 45.8, 44.9, 42.9, 39.8, 39.4, 37.7, 36.7, 35.2, 31.0, 28.6, 27.6, 26.8, 26.2, 25.2, 24.6, 23.5, 20.0, 14.6, 14.4, 12.2.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{62}\text{H}_{78}\text{NaO}_{12}$ 1037.5385 found 1037.5345.



ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((2S,3S,4S,5R,6R)-3,4,5-tris(benzyloxy)-6-(((S)-2-(4-isobutylphenyl)propanoyl)oxy)methyl)tetrahydro-2H-pyran-2-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

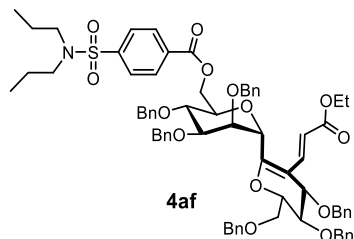
Colorless liquid, 38.6 mg, 34%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (400 MHz, Chloroform- d) δ 7.86 (d, $J = 15.7$ Hz, 1H), 7.38 – 7.36 (m, 2H), 7.25 – 7.20 (m, 2H), 7.07 – 7.04 (m, 2H), 6.99 – 6.96 (m, 2H), 5.72 (d, $J = 15.7$ Hz, 1H), 5.12 (d, $J = 3.6$ Hz, 1H), 4.68 – 4.65 (m, 2H), 4.54 – 4.52 (m, 3H), 4.51 (s, 1H), 4.39 – 4.37 (m, 2H), 4.36 – 4.34 (m, 3H), 4.32 – 4.30 (m, 1H), 4.28 (d, $J = 3.7$ Hz, 1H), 4.22 – 4.21 (m, 1H), 4.20 – 4.16 (m, 2H), 4.12 – 4.10 (m, 1H), 4.02 – 3.98 (m, 1H), 3.95 – 3.92 (m, 2H), 3.90 – 3.89 (m, 1H), 3.79 – 3.75 (m, 3H), 3.61 – 3.58 (m, 2H), 2.33 – 2.31 (m, 2H), 1.73 – 1.70 (m, 1H), 1.45 (d, $J = 7.1$ Hz, 3H), 1.26 (t, $J = 7.1$ Hz, 3H), 0.80 (d, $J = 6.6$ Hz, 3H).

^{13}C NMR (101 MHz, Chloroform- d) δ 174.5, 167.0, 156.4, 140.4, 139.4, 138.4, 138.2, 137.7, 137.7, 137.5, 137.2, 129.3, 128.5, 128.4, 128.4, 128.3, 128.2, 128.2, 128.2, 128.1, 128.0, 127.9, 127.9, 127.8, 127.8, 127.7, 127.7, 127.7, 127.5, 127.3, 115.2, 109.2, 78.8, 75.8, 74.5, 74.4,

74.0, 73.5, 73.2, 72.5, 72.0, 71.5, 71.3, 70.2, 69.7, 67.8, 63.3, 60.0, 44.9, 30.0, 29.7, 22.4, 22.3, 18.0, 14.4.

HRMS (ESI) m/z : $[M + Na]^+$ Calcd for $C_{72}H_{78}NaO_{12}$ 1157.5385 found 1157.5389.



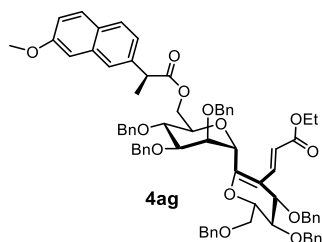
((2R,3R,4S,5S,6S)-3,4,5-tris(benzyloxy)-6-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-5-((E)-3-ethoxy-3-oxoprop-1-en-1-yl)-3,4-dihydro-2H-pyran-6-yl)tetrahydro-2H-pyran-2-yl)methyl 4-(N,N-dipropylsulfamoyl)benzoate

Colorless liquid, 38.8 mg, 32%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

1H NMR (600 MHz, Chloroform- d) δ 8.02 (d, J = 8.5 Hz, 2H), 7.87 (d, J = 15.7 Hz, 1H), 7.73 (d, J = 8.5 Hz, 2H), 7.36 (dd, J = 6.5, 2.9 Hz, 2H), 7.30 – 7.24 (m, 19H), 7.23 – 7.21 (m, 7H), 7.18 (dd, J = 6.6, 2.9 Hz, 2H), 5.70 (d, J = 15.7 Hz, 1H), 5.14 (d, J = 3.8 Hz, 1H), 4.80 (d, J = 11.3 Hz, 1H), 4.68 – 4.63 (m, 3H), 4.59 – 4.50 (m, 5H), 4.45 (dd, J = 11.8, 2.3 Hz, 1H), 4.43 – 4.38 (m, 5H), 4.22 (s, 1H), 4.18 (t, J = 3.3 Hz, 1H), 4.11 (qt, J = 7.1, 3.9 Hz, 2H), 4.03 (dd, J = 7.6, 2.9 Hz, 1H), 3.98 – 3.93 (m, 2H), 3.93 – 3.89 (m, 1H), 3.67 – 3.60 (m, 2H), 3.10 – 3.05 (m, 4H), 1.53 (dt, J = 14.9, 7.5 Hz, 4H), 1.22 (t, J = 7.1 Hz, 3H), 0.87 (t, J = 7.4 Hz, 6H).

^{13}C NMR (151 MHz, Chloroform- d) δ 167.0, 164.9, 156.3, 143.9, 139.6, 138.2, 138.1, 138.0, 137.7, 137.4, 137.1, 133.4, 130.3, 128.5, 128.5, 128.4, 128.4, 128.3, 128.3, 128.1, 128.0, 128.0, 127.9, 127.8, 127.8, 127.7, 127.7, 127.7, 127.6, 126.8, 115.1, 109.3, 75.9, 74.4, 74.2, 74.1, 73.5, 73.3, 72.5, 72.1, 71.6, 71.2, 70.3, 69.7, 67.9, 64.1, 60.0, 50.0, 22.0, 14.3, 11.2.

HRMS (ESI) m/z : $[M + Na]^+$ Calcd for $C_{72}H_{79}NNaO_{14}S$ 1236.5113 found 1236.5111.



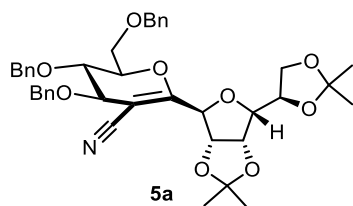
ethyl (E)-3-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((2S,3S,4S,5R,6R)-3,4,5-tris(benzyloxy)-6-(((S)-2-(7-methoxynaphthalen-2-yl)propanoyl)oxy)methyl)tetrahydro-2H-pyran-2-yl)-3,4-dihydro-2H-pyran-5-yl)acrylate

Colorless liquid, 34.7 mg, 30%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.84 (d, J = 15.7 Hz, 1H), 7.66 (s, 1H), 7.58 (t, J = 8.6 Hz, 2H), 7.41 – 7.39 (m, 1H), 7.35 (d, J = 6.5 Hz, 2H), 7.27 – 7.24 (m, 13H), 7.22 – 7.20 (m, 6H), 7.17 – 7.15 (m, 7H), 7.06 – 7.05 (m, 1H), 6.99 (d, J = 2.3 Hz, 1H), 6.87 (d, J = 6.7 Hz, 2H), 5.74 (d, J = 15.7 Hz, 1H), 5.11 (d, J = 3.9 Hz, 1H), 4.64 (d, J = 16.7 Hz, 2H), 4.54 – 4.53 (m, 2H), 4.48 – 4.43 (m, 2H), 4.37 – 4.34 (m, 4H), 4.29 – 4.26 (m, 2H), 4.25 – 4.22 (m, 2H), 4.20 (s, 2H), 4.19 (dd, J = 7.1, 1.9 Hz, 1H), 4.10 – 4.08 (m, 1H), 3.94 – 3.93 (m, 1H), 3.91 (d, J = 7.1 Hz, 1H), 3.86 – 3.85 (m, 4H), 3.82 (d, J = 11.2 Hz, 1H), 3.76 – 3.72 (m, 2H), 3.60 – 3.57 (m, 2H), 1.53 (d, J = 7.1 Hz, 3H), 1.26 (t, J = 7.1 Hz, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 174.4, 167.1, 157.5, 156.5, 139.4, 138.3, 138.2, 138.1, 137.7, 137.5, 137.2, 135.7, 133.6, 129.3, 128.9, 128.5, 128.5, 128.4, 128.4, 128.4, 128.4, 128.3, 128.3, 128.3, 128.2, 128.2, 128.2, 128.0, 128.0, 128.0, 128.0, 127.9, 127.8, 127.8, 127.7, 127.7, 127.7, 127.7, 127.7, 127.6, 127.6, 127.5, 127.5, 127.4, 127.3, 127.2, 126.4, 126.0, 118.8, 115.2, 109.3, 105.5, 75.8, 74.5, 74.2, 73.7, 73.4, 73.2, 72.4, 72.0, 71.6, 70.0, 69.7, 67.8, 63.4, 60.0, 55.2, 55.2, 45.2, 18.0, 14.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{73}\text{H}_{74}\text{NaO}_{13}$ 1181.5022 found 1181.5038.



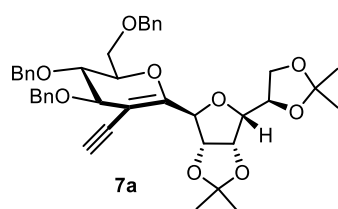
(2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-carbonitrile

Colorless liquid, 20.5 mg, 30%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.36 – 7.29 (m, 13H), 7.23 (d, J = 7.2 Hz, 2H), 4.91 (s, 1H), 4.82 (dd, J = 17.6, 8.5 Hz, 2H), 4.77 – 4.75 (m, 1H), 4.65 (dd, J = 19.2, 11.4 Hz, 2H), 4.58 (d, J = 11.6 Hz, 1H), 4.49 – 4.45 (m, 2H), 4.35 (dd, J = 12.3, 5.8 Hz, 2H), 4.16 (d, J = 4.7 Hz, 1H), 4.11 – 4.07 (m, 3H), 3.81 (t, J = 5.5 Hz, 1H), 3.75 (dd, J = 10.7, 6.0 Hz, 1H), 3.62 (dd, J = 10.8, 3.1 Hz, 1H), 1.52 (s, 3H), 1.41 (s, 3H), 1.37 (s, 3H), 1.33 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 166.2, 137.5, 137.2, 137.0, 128.6, 128.5, 128.5, 128.2, 128.1, 127.9, 127.8, 127.6, 116.9, 113.3, 109.1, 87.2, 84.2, 83.6, 82.8, 81.2, 77.8, 73.4, 73.4, 73.3, 73.2, 73.1, 71.9, 67.3, 66.9, 26.9, 26.3, 25.2, 24.8.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{40}\text{H}_{45}\text{NaO}_9$ 706.2987 found 706.3018.



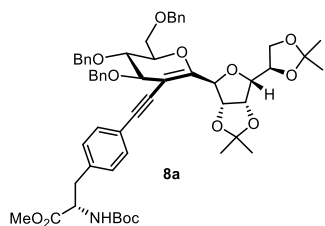
(3aS,4S,6R,6aS)-4-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-5-ethynyl-3,4-dihydro-2H-pyran-6-yl)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxole

Colorless liquid, 30.7 mg, 45%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (400 MHz, Chloroform-*d*) δ 7.33 – 7.23 (m, 15H), 5.16 (s, 1H), 4.89 – 4.83 (m, 2H), 4.78 (dd, J = 5.9, 4.2 Hz, 1H), 4.74 – 4.66 (m, 2H), 4.65 – 4.58 (m, 2H), 4.50 – 4.47 (m, 2H), 4.36 – 4.31 (m, 1H), 4.18 (d, J = 5.7 Hz, 1H), 4.15 (dd, J = 7.9, 4.0 Hz, 1H), 4.08 – 4.03 (m, 2H), 3.82 – 3.74 (m, 2H), 3.61 (dd, J = 10.8, 2.8 Hz, 1H), 3.12 (s, 1H), 1.52 (s, 3H), 1.40 (s, 3H), 1.36 (s, 3H), 1.32 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 160.4, 137.9, 137.7, 137.7, 128.4, 128.3, 128.0, 127.8, 127.7, 127.7, 127.4, 112.6, 108.9, 96.0, 84.3, 83.3, 81.8, 81.7, 81.4, 76.7, 76.2, 73.6, 73.2, 73.1, 72.9, 72.8, 67.9, 66.9, 26.9, 26.0, 25.2, 24.4.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{41}\text{H}_{46}\text{NaO}_9$ 705.3034 found 705.3029.



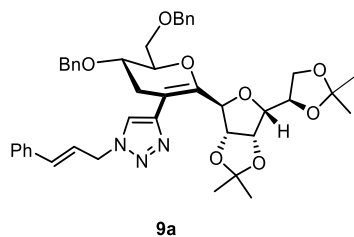
methyl (2S)-3-(4-(((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)ethynyl)phenyl)-2-((tert-butoxycarbonyl)amino)propanoate

White solid, 69 mg, 72%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 5:1-3:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.36 – 7.26 (m, 17H), 7.05 (d, J = 7.7 Hz, 2H), 5.21 (s, 1H), 4.98 (d, J = 7.8 Hz, 1H), 4.93 – 4.88 (m, 2H), 4.81 – 4.78 (m, 1H), 4.74 (dd, J = 14.9, 11.4 Hz, 2H), 4.63 (d, J = 11.5 Hz, 1H), 4.58 (q, J = 6.7 Hz, 1H), 4.54 – 4.50 (m, 2H), 4.36 – 4.32 (m, 1H), 4.26 (d, J = 5.7 Hz, 1H), 4.25 – 4.22 (m, 1H), 4.18 (dd, J = 7.8, 4.1 Hz, 1H), 4.10 – 4.05 (m, 2H), 3.87 – 3.85 (m, 1H), 3.80 (dd, J = 10.9, 5.4 Hz, 1H), 3.70 (s, 3H), 3.65 (dd, J = 10.8, 2.6 Hz, 1H), 3.07 (ddd, J = 40.1, 13.8, 5.9 Hz, 2H), 1.53 (s, 3H), 1.43 – 1.40 (m, 12H), 1.37 (s, 3H), 1.33 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 172.1, 159.0, 138.0, 137.8, 137.8, 135.9, 131.3, 129.1, 128.4, 128.4, 128.3, 128.0, 127.8, 127.7, 127.7, 127.4, 112.6, 109.0, 97.1, 93.3, 84.5, 83.4, 81.9, 81.4, 76.6, 73.7, 73.3, 73.0, 72.9, 68.1, 67.0, 52.2, 28.2, 26.9, 26.1, 25.2, 24.5.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{56}\text{H}_{65}\text{NaO}_{13}$ 982.4348 found 982.4273.



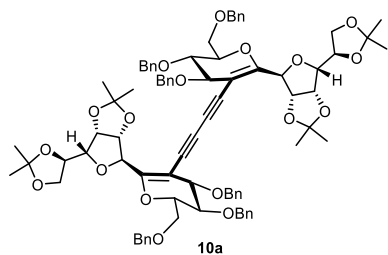
4-((2R,3S)-3-(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)-1-cinnamyl-1H-1,2,3-triazole

Colorless liquid, 67.3 mg, 80%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 5:1-2:1 (v/v).

^1H NMR (600 MHz, Chloroform-*d*) δ 7.46 (s, 1H), 7.36 – 7.27 (m, 15H), 7.21 – 7.16 (m, 3H), 7.09 – 7.05 (m, 2H), 6.63 (d, J = 15.8 Hz, 1H), 6.31 – 6.26 (m, 1H), 5.07 (d, J = 6.6 Hz, 2H), 4.98 (s, 1H), 4.88 (d, J = 6.0 Hz, 1H), 4.82 – 4.79 (m, 1H), 4.73 (d, J = 11.7 Hz, 1H), 4.66 (d, J = 11.8 Hz, 1H), 4.56 (d, J = 4.6 Hz, 1H), 4.52 (d, J = 11.1 Hz, 3H), 4.45 (d, J = 11.1 Hz, 1H), 4.38 – 4.35 (m, 1H), 4.31 – 4.27 (m, 1H), 4.23 – 4.19 (m, 1H), 4.05 – 4.01 (m, 2H), 3.95 (t, J = 5.4 Hz, 1H), 3.86 (dd, J = 10.7, 6.1 Hz, 1H), 3.66 (dd, J = 10.7, 2.8 Hz, 1H), 1.41 – 1.38 (m, 6H), 1.35 (s, 3H), 1.26 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 152.9, 143.3, 138.0, 137.9, 137.9, 135.5, 135.3, 128.7, 128.5, 128.4, 128.2, 127.9, 127.8, 127.8, 127.7, 127.6, 127.5, 126.7, 122.5, 121.9, 112.6, 109.0, 103.2, 84.7, 83.5, 81.7, 81.2, 76.1, 76.0, 73.7, 73.3, 73.2, 72.5, 71.9, 68.2, 67.1, 52.2, 26.9, 26.1, 25.3, 24.5.

HRMS (ESI) m/z : $[\text{M} + \text{Na}]^+$ Calcd for $\text{C}_{50}\text{H}_{55}\text{N}_3\text{NaO}_9$ 864.3831 found 864.3809.



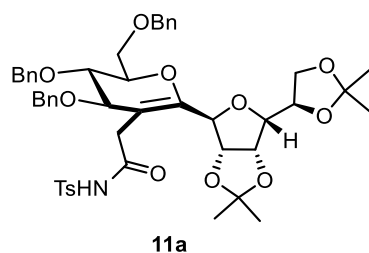
1,4-bis((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)buta-1,3-diyne

White solid, 88.5 mg, 65%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 8:1-4:1 (v/v).

^1H NMR (400 MHz, Chloroform-*d*) δ 7.33 – 7.23 (m, 30H), 5.14 (s, 2H), 4.83 (d, J = 9.6 Hz, 4H), 4.79 – 4.76 (m, 2H), 4.72 (d, J = 11.5 Hz, 2H), 4.61 (dd, J = 16.9, 11.3 Hz, 4H), 4.51 – 4.46 (m, 4H), 4.33 (q, J = 5.8 Hz, 2H), 4.26 – 4.22 (m, 2H), 4.18 – 4.12 (m, 4H), 4.10 – 4.04 (m, 4H), 3.77 (dt, J = 10.7, 5.9 Hz, 4H), 3.61 (d, J = 10.7 Hz, 2H), 1.50 (s, 6H), 1.40 (s, 6H), 1.37 (s, 6H), 1.30 (s, 6H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 162.0, 137.7, 137.7, 137.6, 128.4, 128.4, 128.3, 127.8, 127.8, 127.8, 127.5, 112.7, 109.0, 96.6, 84.2, 83.5, 81.9, 81.5, 78.7, 77.8, 75.9, 73.7, 73.3, 73.3, 73.2, 72.9, 68.0, 67.0, 26.9, 26.1, 25.2, 24.4.

HRMS (ESI) m/z : $[M + Na]^+$ Calcd for $C_{82}H_{90}NaO_{18}$ 1385.6019 found 1385.6018.



2-((2R,3S)-3,4-bis(benzyloxy)-2-((benzyloxy)methyl)-6-((3aS,4S,6R,6aS)-6-((R)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[3,4-d][1,3]dioxol-4-yl)-3,4-dihydro-2H-pyran-5-yl)-N-tosylacetamide

Colorless liquid, 66 mg, 76%. Purified by chromatography on silicagel, eluting with petroleum ether/ethyl acetate 5:1-2:1 (v/v).

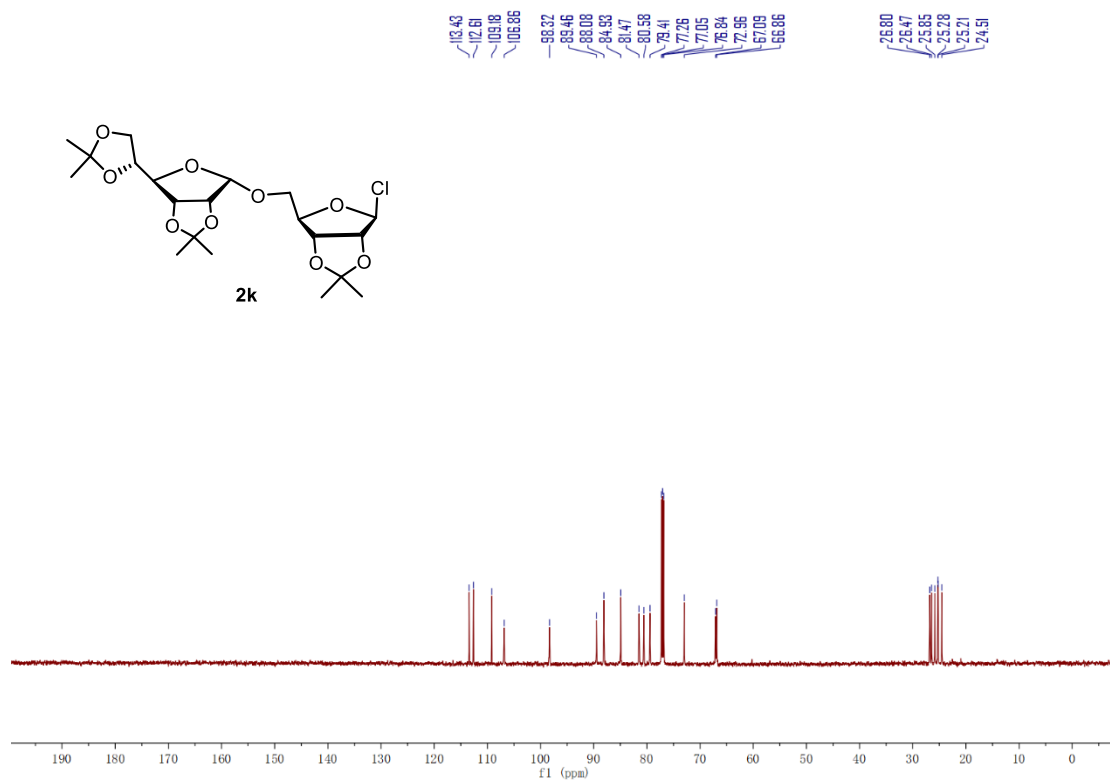
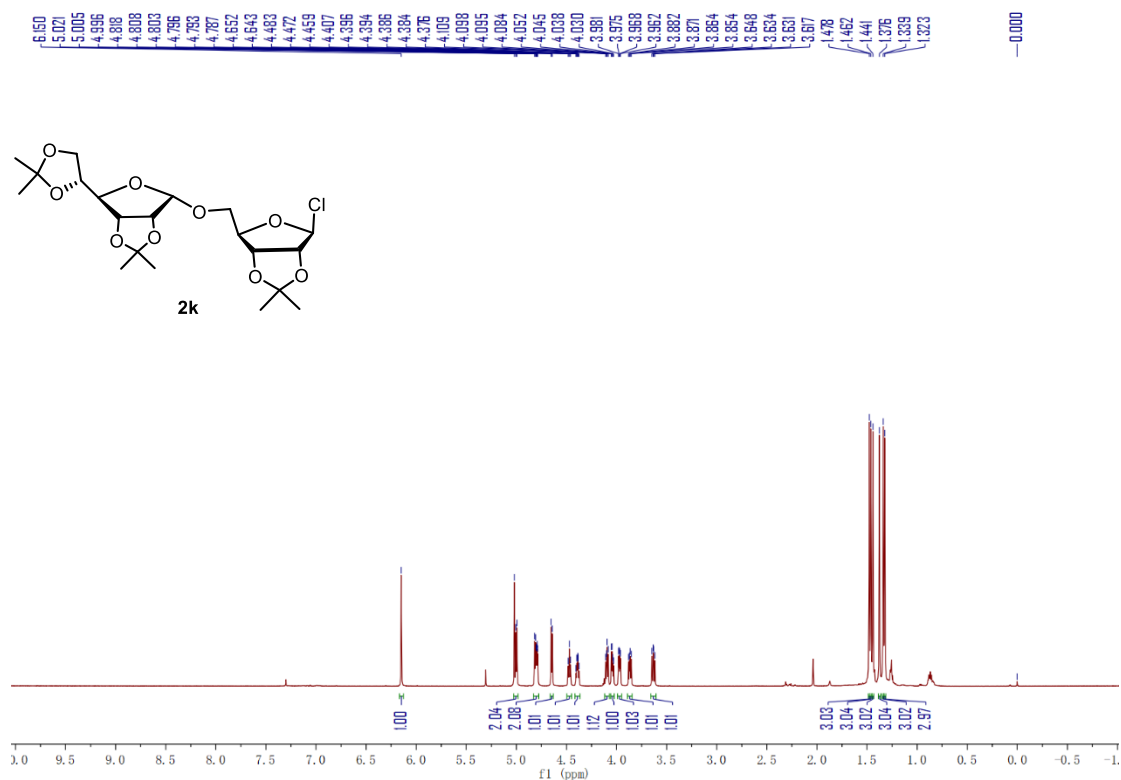
1H NMR (600 MHz, Chloroform- d) δ 9.54 (s, 1H), 7.79 (dd, J = 15.2, 8.2 Hz, 3H), 7.37 – 7.35 (m, 3H), 7.33 – 7.31 (m, 5H), 7.30 – 7.27 (m, 4H), 7.21 (d, J = 7.8 Hz, 4H), 4.97 (s, 1H), 4.80 (d, J = 6.0 Hz, 1H), 4.77 – 4.74 (m, 1H), 4.68 – 4.66 (m, 2H), 4.64 (d, J = 13.8 Hz, 1H), 4.55 – 4.49 (m, 2H), 4.46 (d, J = 11.3 Hz, 1H), 4.32 – 4.28 (m, 1H), 4.24 (q, J = 5.7 Hz, 1H), 4.08 – 4.03 (m, 3H), 3.88 – 3.86 (m, 1H), 3.83 (d, J = 4.6 Hz, 1H), 3.74 (dd, J = 10.6, 6.0 Hz, 1H), 3.58 (dd, J = 10.6, 3.6 Hz, 1H), 3.08 (d, J = 16.1 Hz, 1H), 2.75 (d, J = 16.1 Hz, 1H), 2.37 (s, 3H), 1.47 (s, 3H), 1.40 (s, 3H), 1.36 (s, 3H), 1.31 (s, 3H).

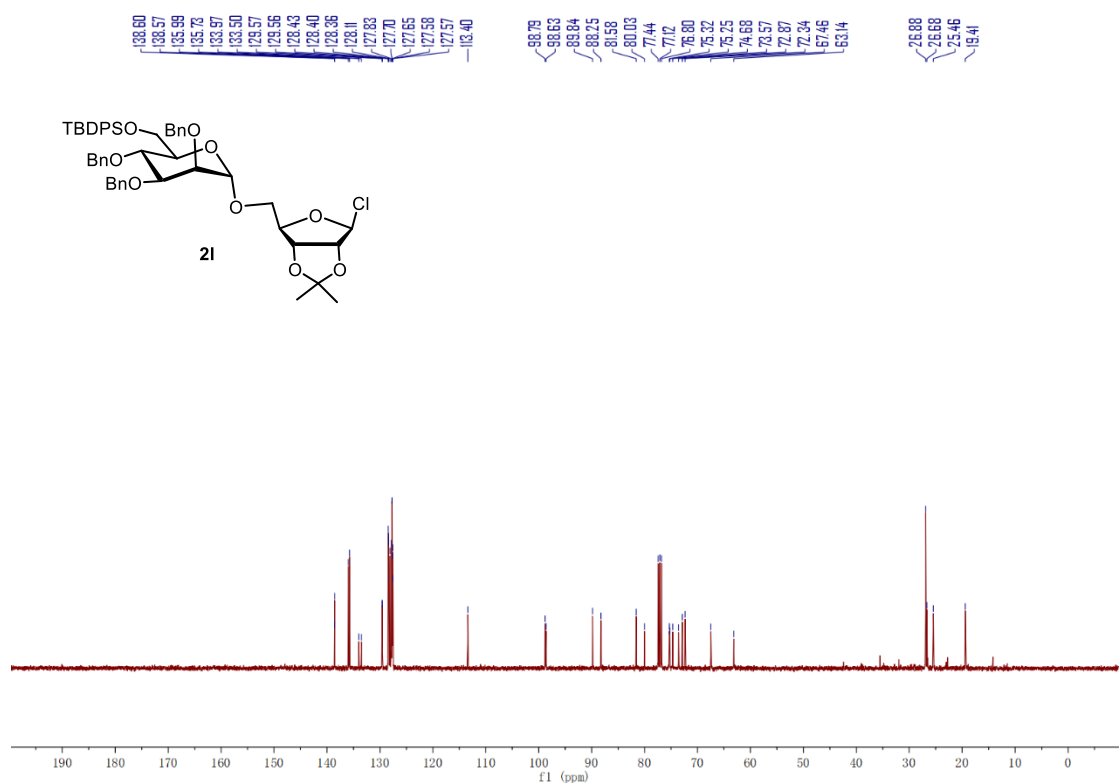
^{13}C NMR (151 MHz, Chloroform- d) δ 168.4, 152.4, 144.5, 143.4, 139.2, 137.6, 137.4, 136.6, 135.9, 129.6, 129.3, 128.7, 128.6, 128.5, 128.4, 128.4, 128.2, 128.1, 127.9, 127.8, 127.6, 126.4, 112.5, 108.9, 103.1, 83.2, 82.9, 81.4, 80.2, 76.5, 75.5, 73.5, 73.4, 73.3, 73.3, 72.7, 67.5, 66.9, 37.2, 26.9, 26.1, 25.2, 24.5, 21.6.

HRMS (ESI) m/z : $[M + Na]^+$ Calcd for $C_{48}H_{55}NNaO_{12}S$ 892.3337 found 892.3324.

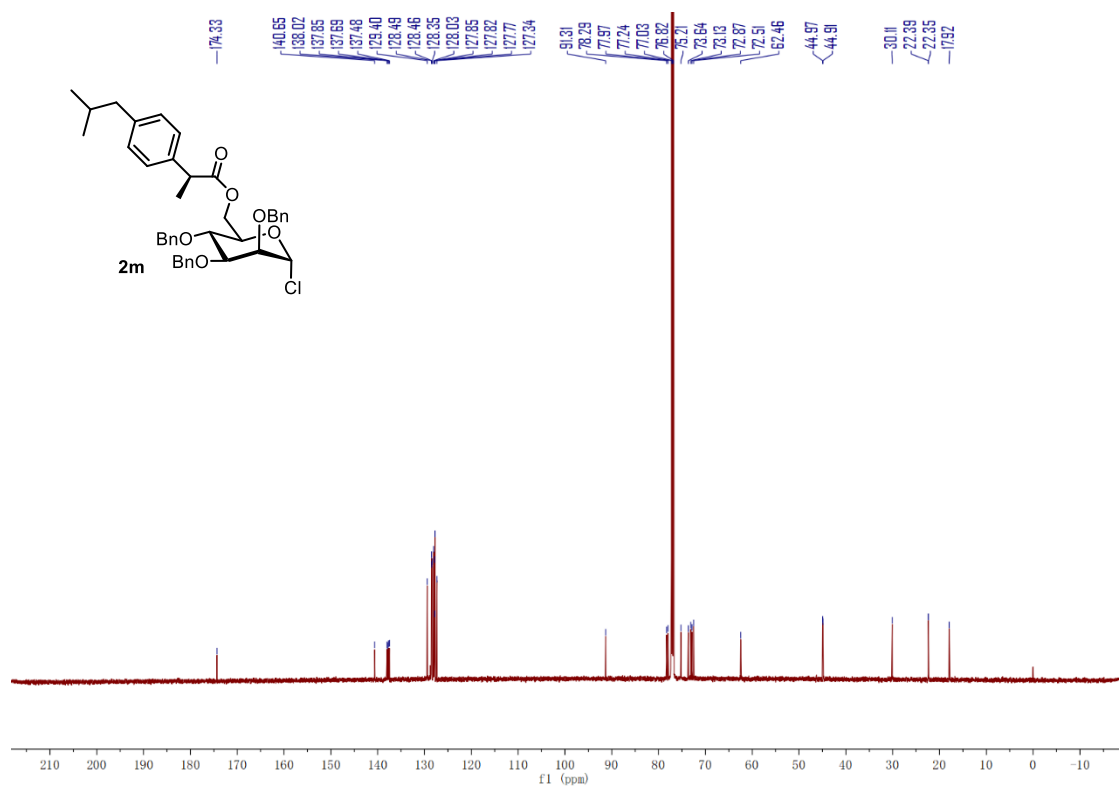
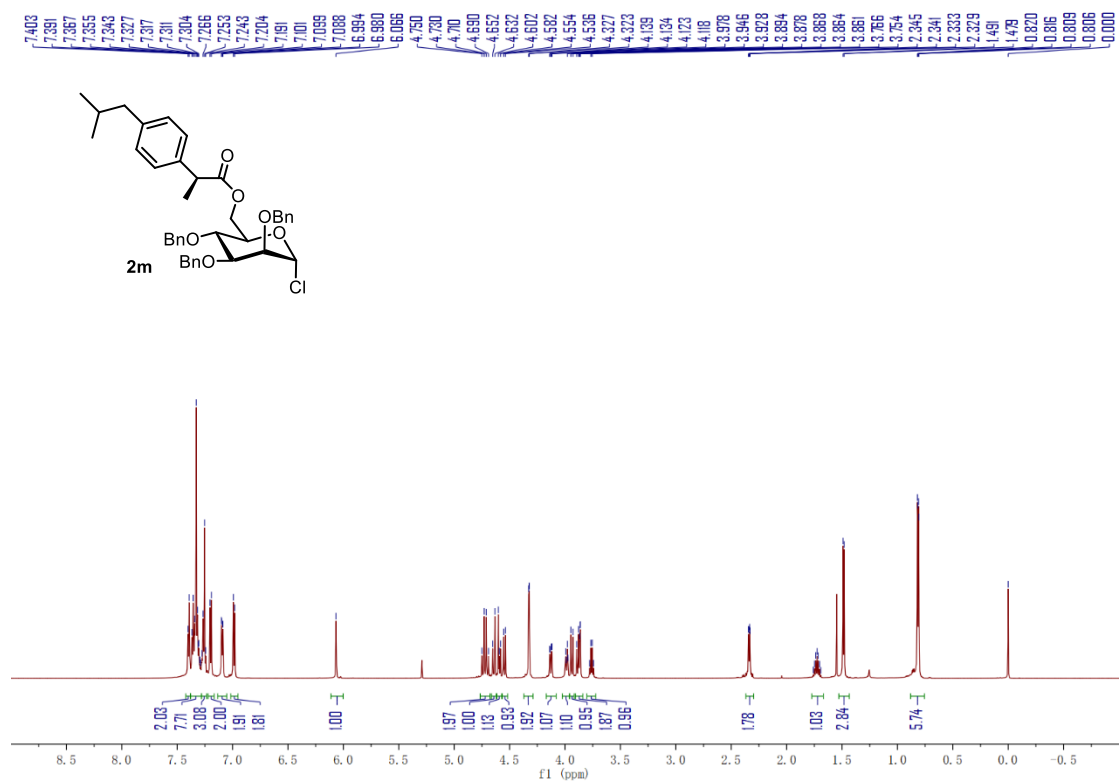
14. NMR Spectroscopic Data

(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)

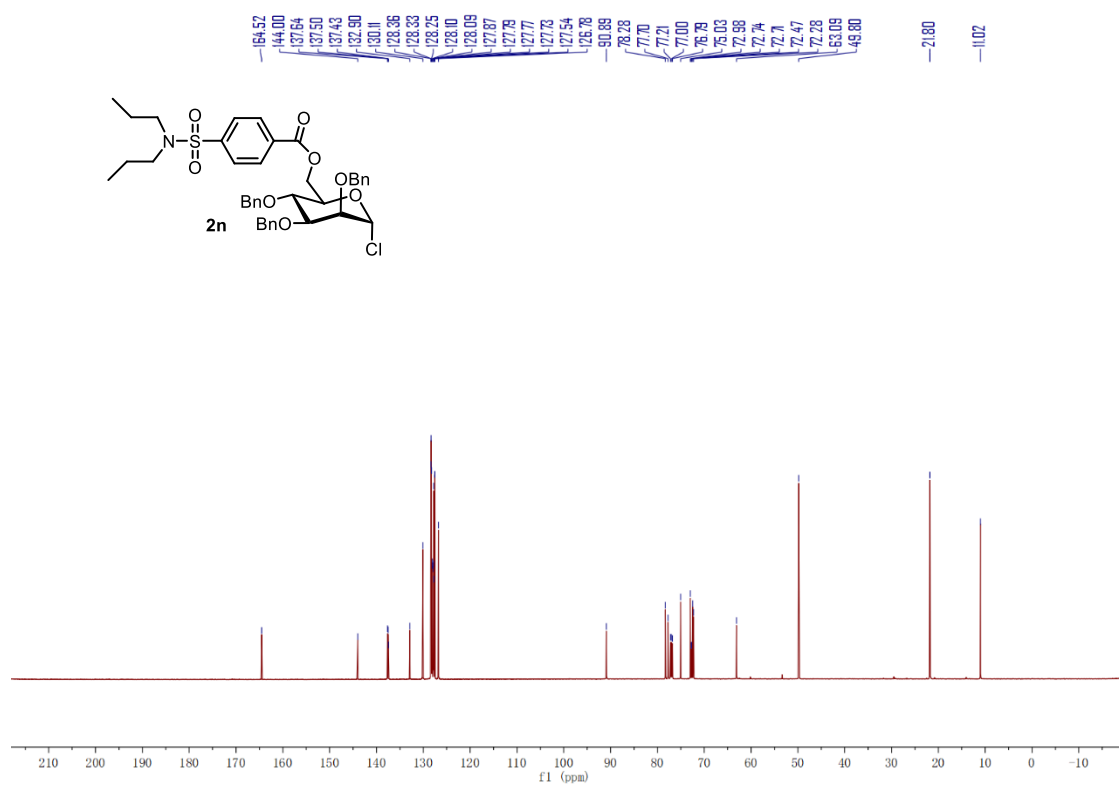
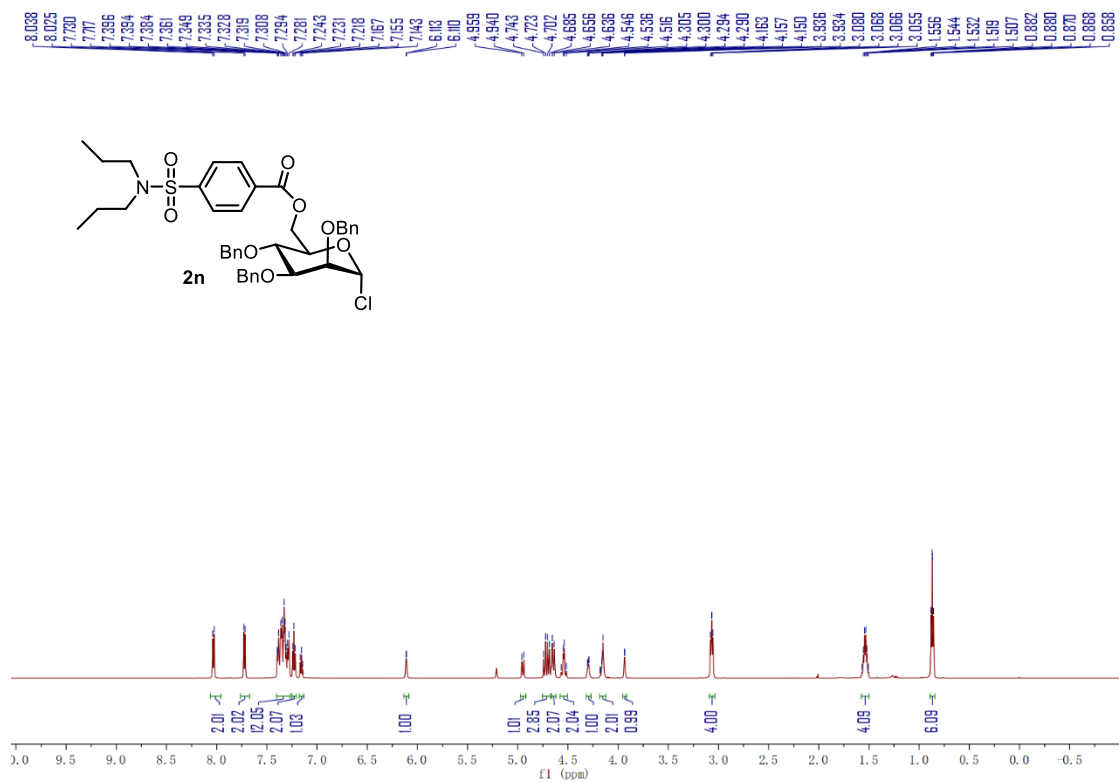


[illegible]

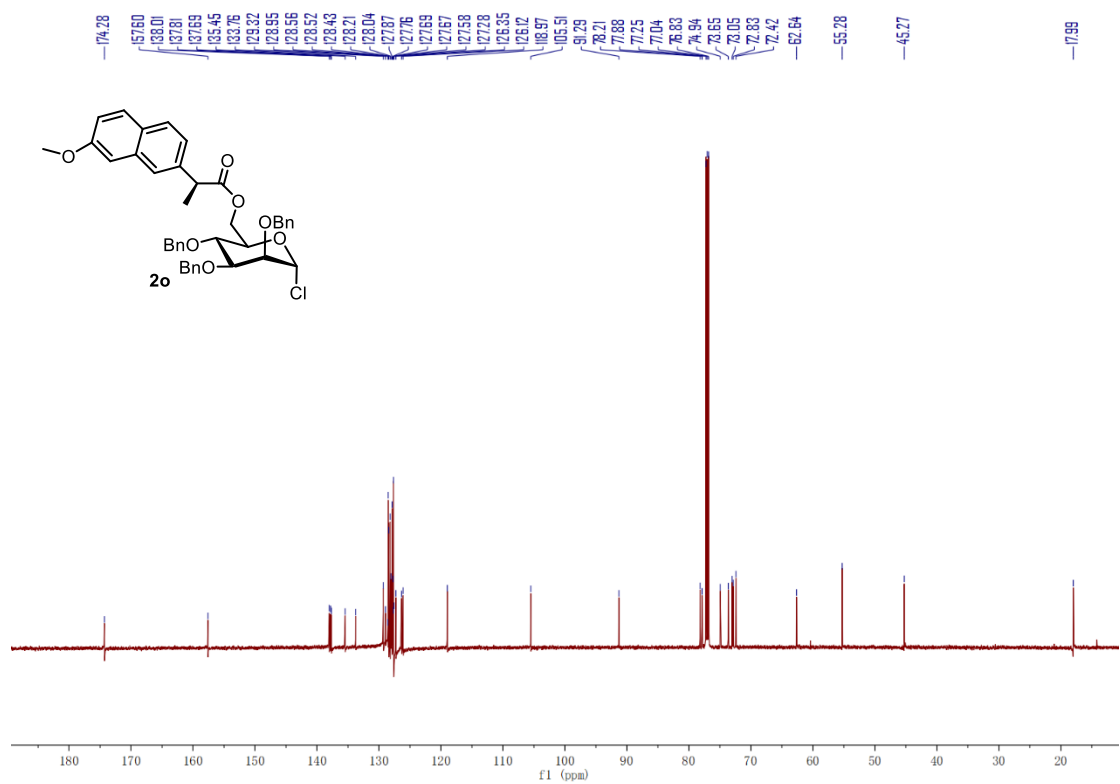
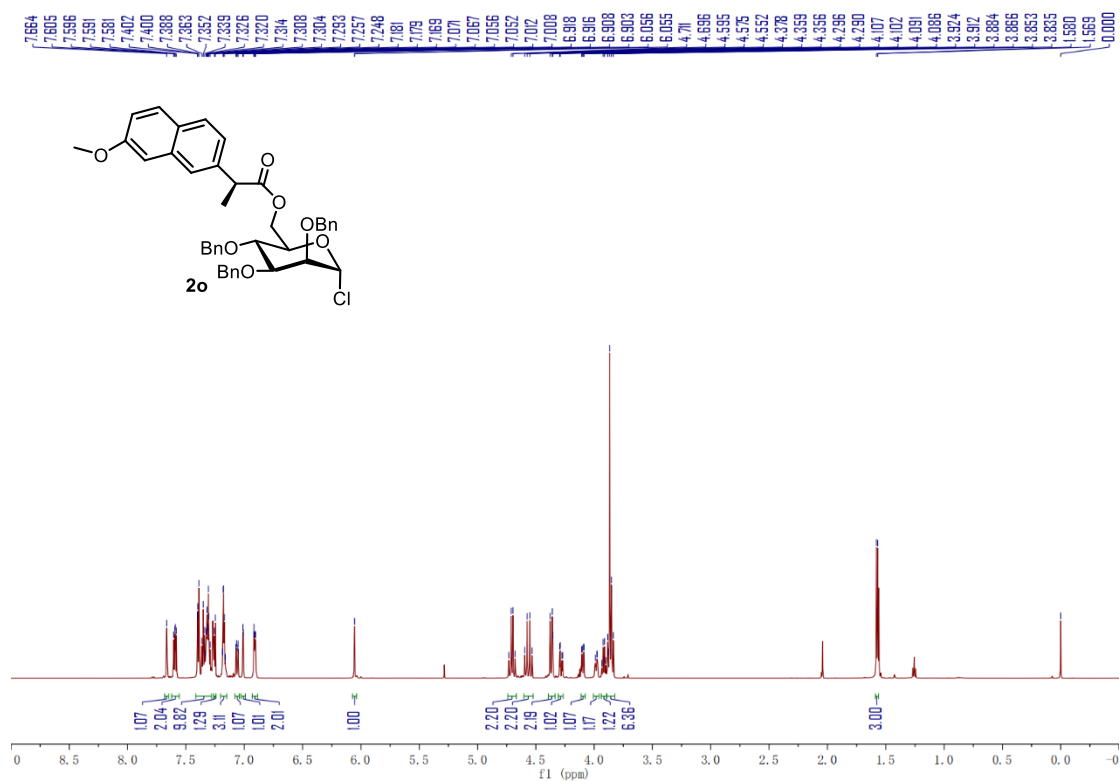
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



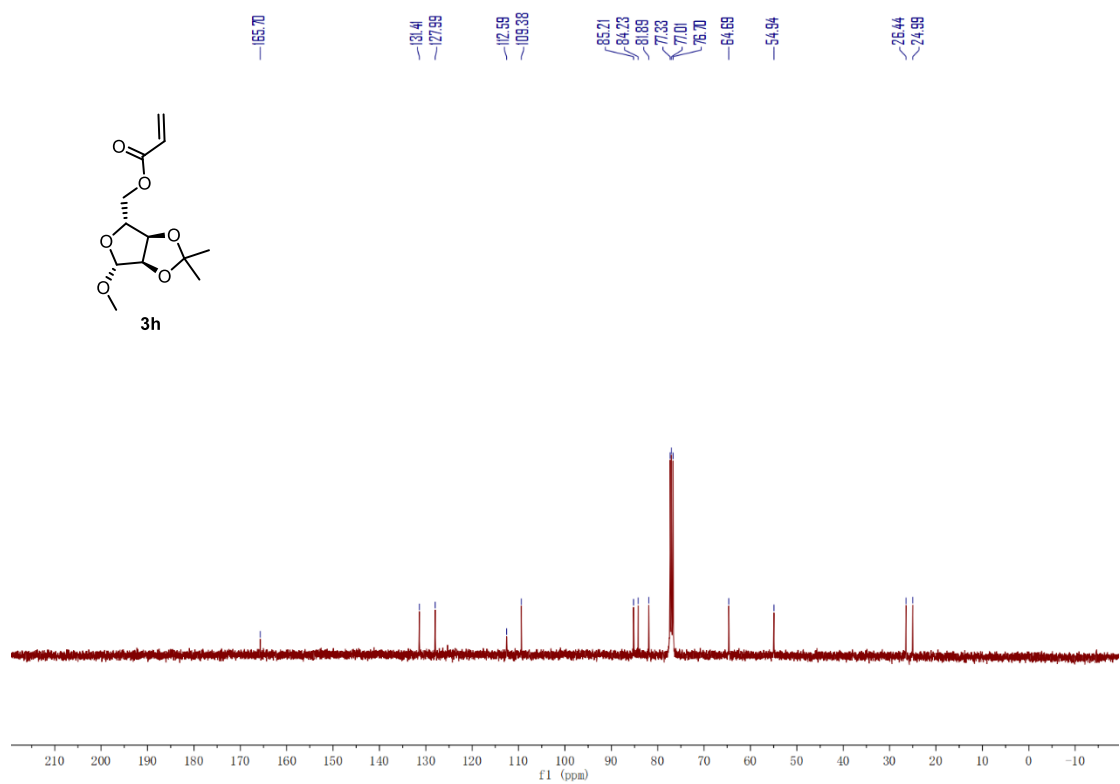
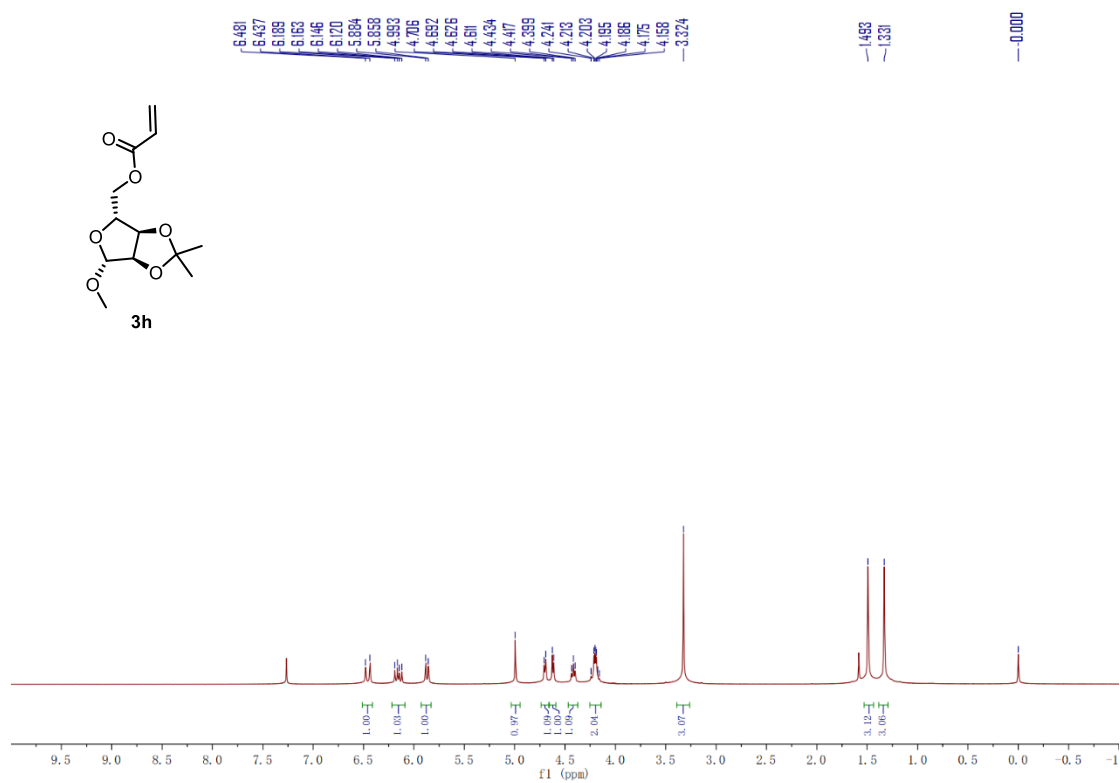
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



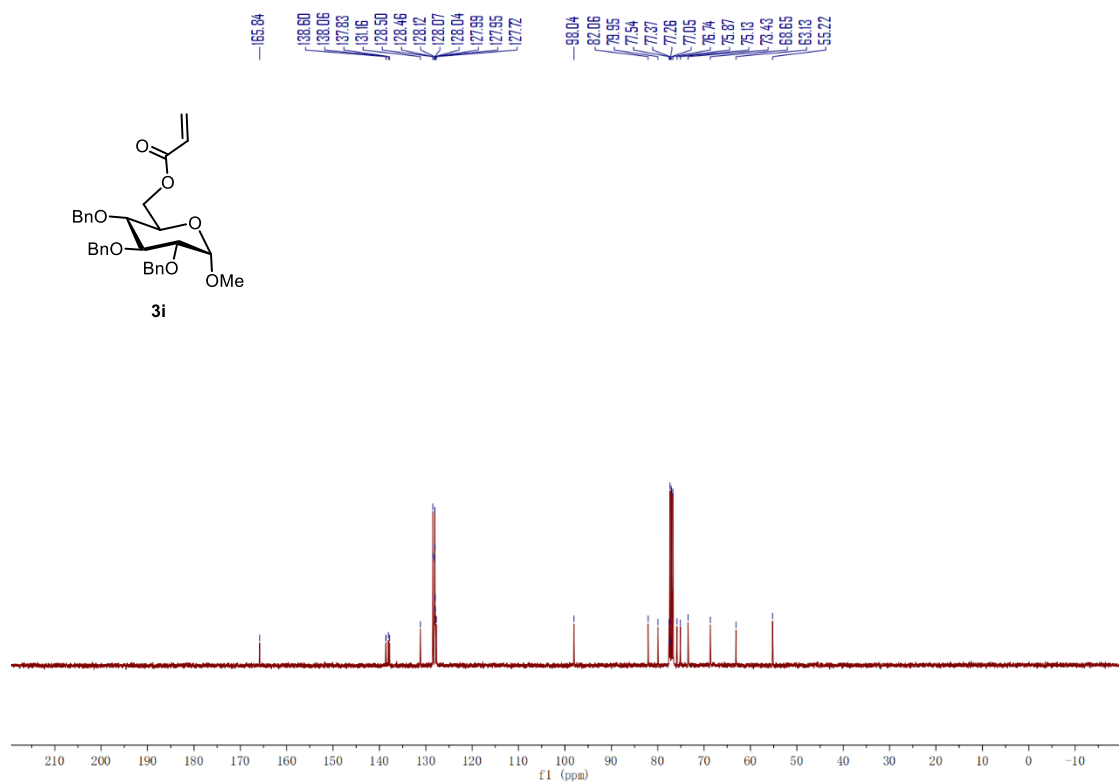
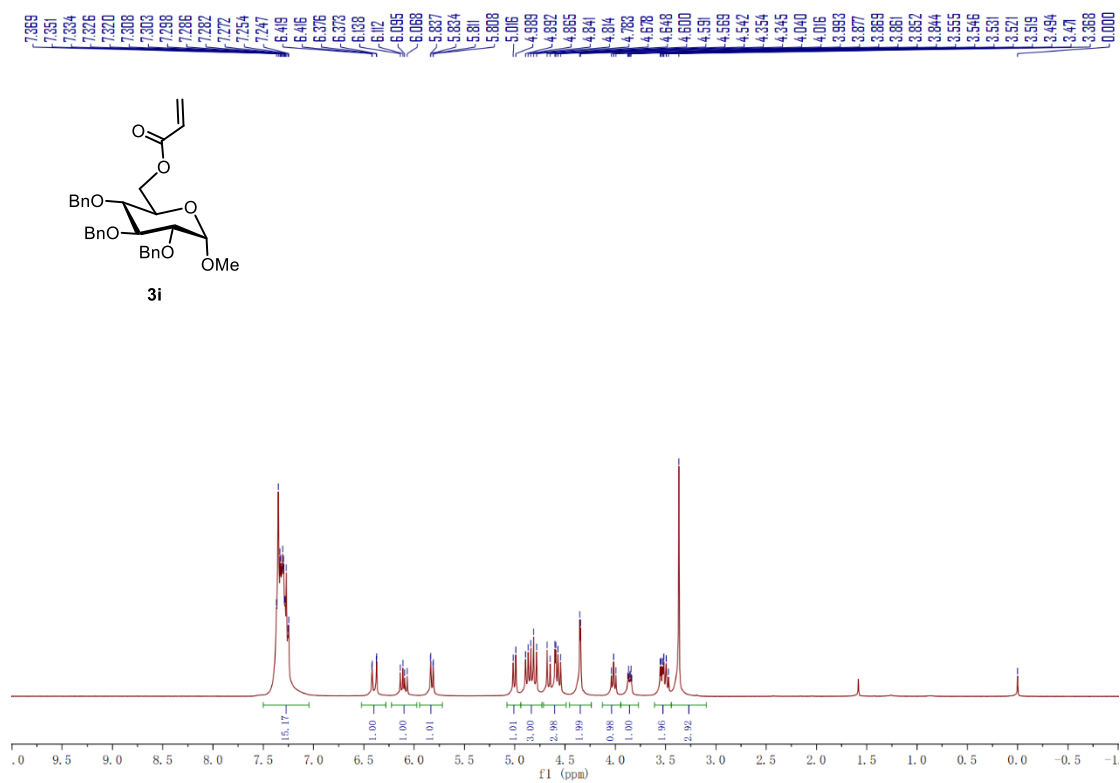
(¹H NMR, 600 MHz, CDCl₃; ¹³C {¹H} NMR, 151 MHz, CDCl₃)



(^1H NMR, 400 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 101 MHz, CDCl_3)



(^1H NMR, 400 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 101 MHz, CDCl_3)



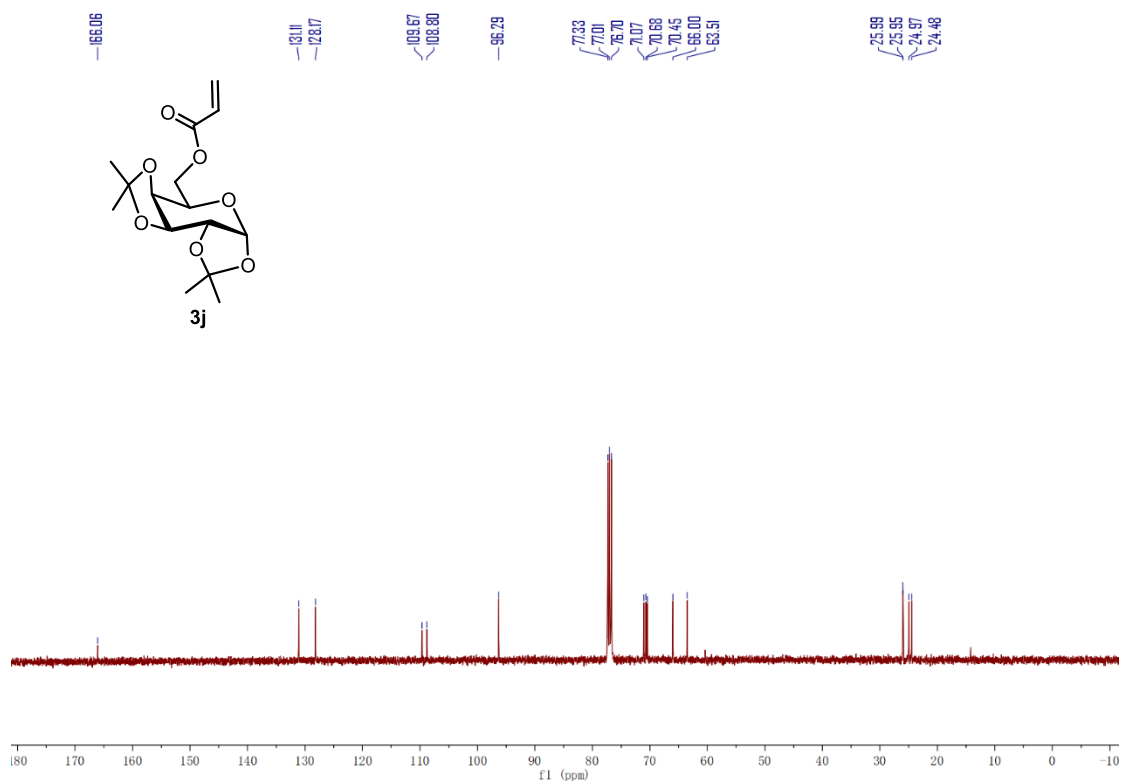
3j

C=CC(=O)O[C@H]1C[C@@H](OC(C)(C)C)[C@H](OC(C)(C)C)[C@@H](OC(C)(C)C)[C@H]1O

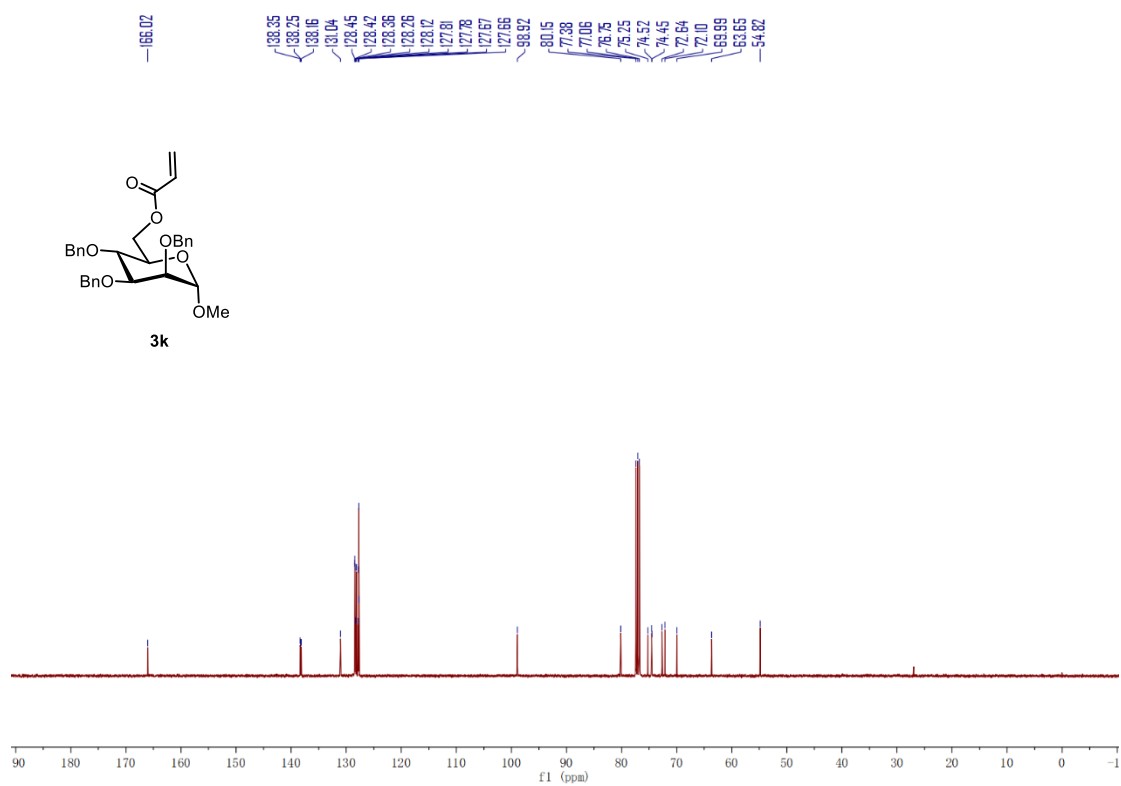
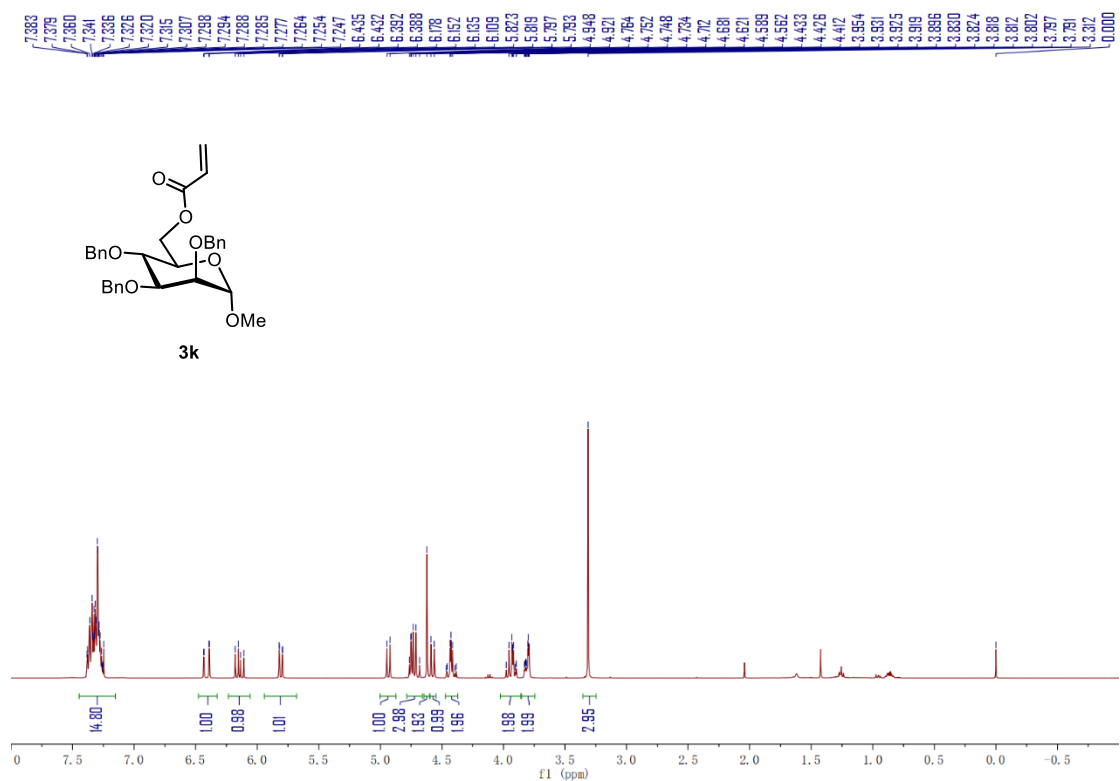
6.462
6.449
6.206
6.180
6.162
6.07
5.956
5.830
5.558
5.546
4.646
4.626
4.406
4.398
4.355
4.378
4.368
4.366
4.347
4.340
4.334
4.328
4.299
4.280
4.270
4.261
4.256
4.150
4.122
4.114
4.090
4.078
4.075
4.060
1.516
1.464
1.349
1.338
0.000

1.00
0.99
1.00
0.96
1.02
0.96
1.96
0.98
5.99
6.00

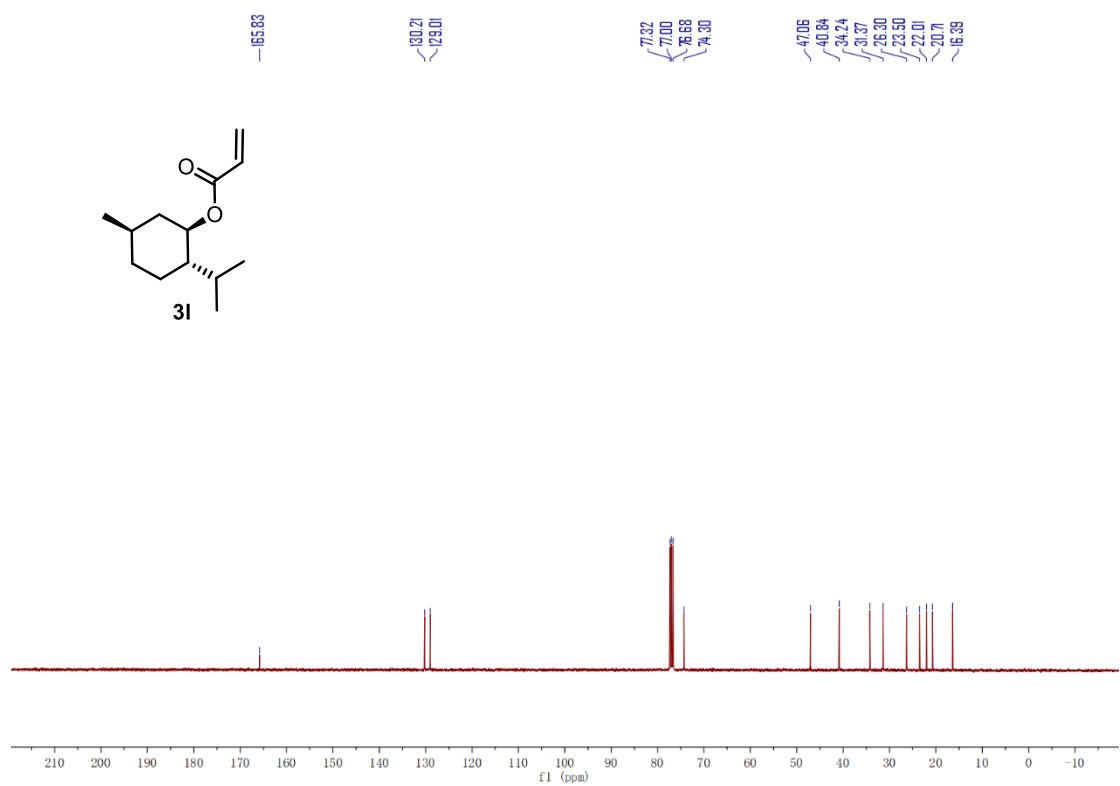
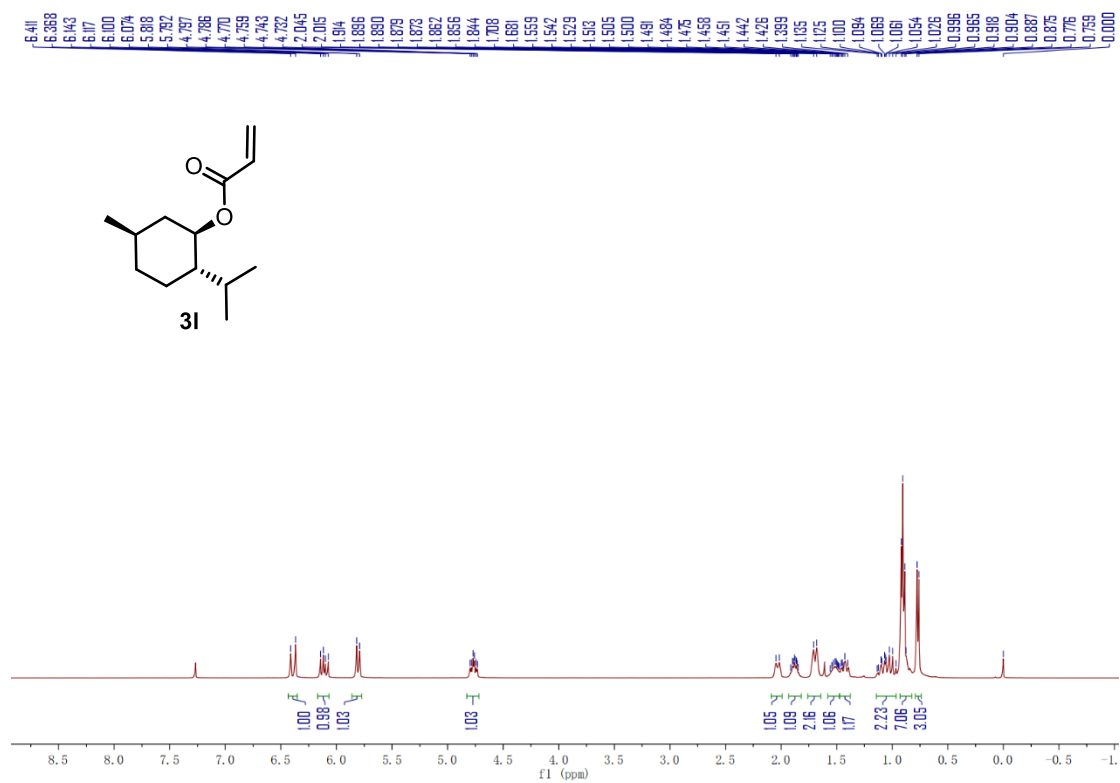
f1 (ppm)



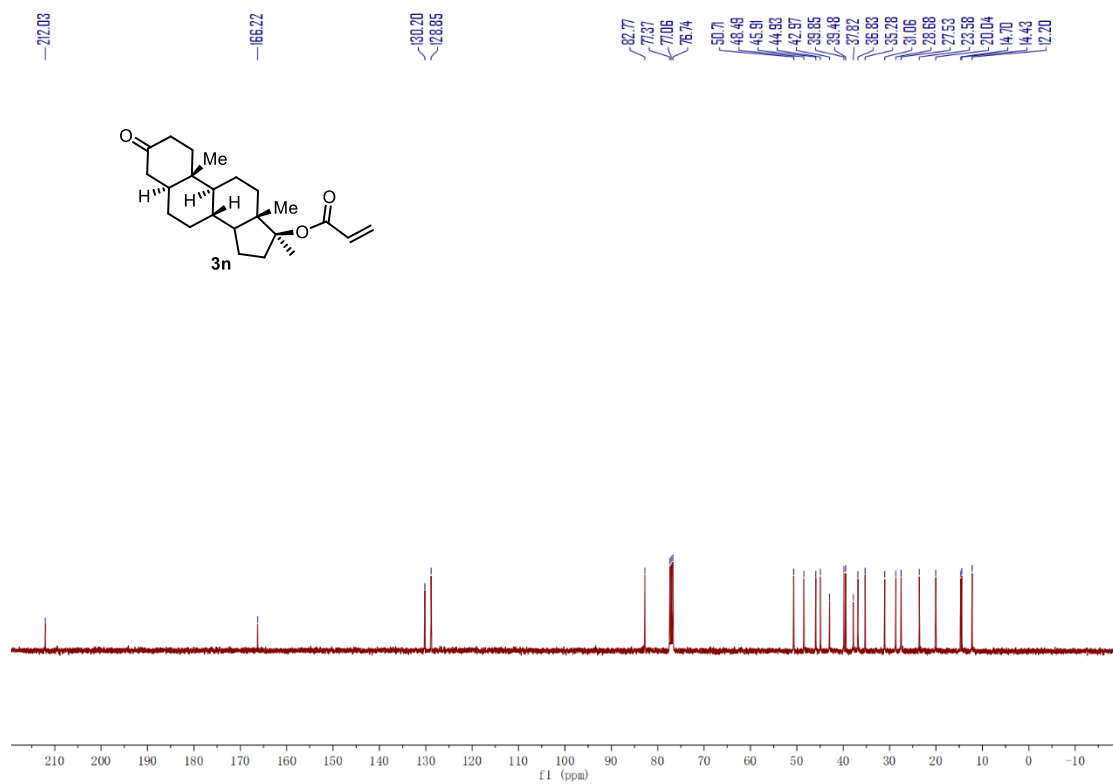
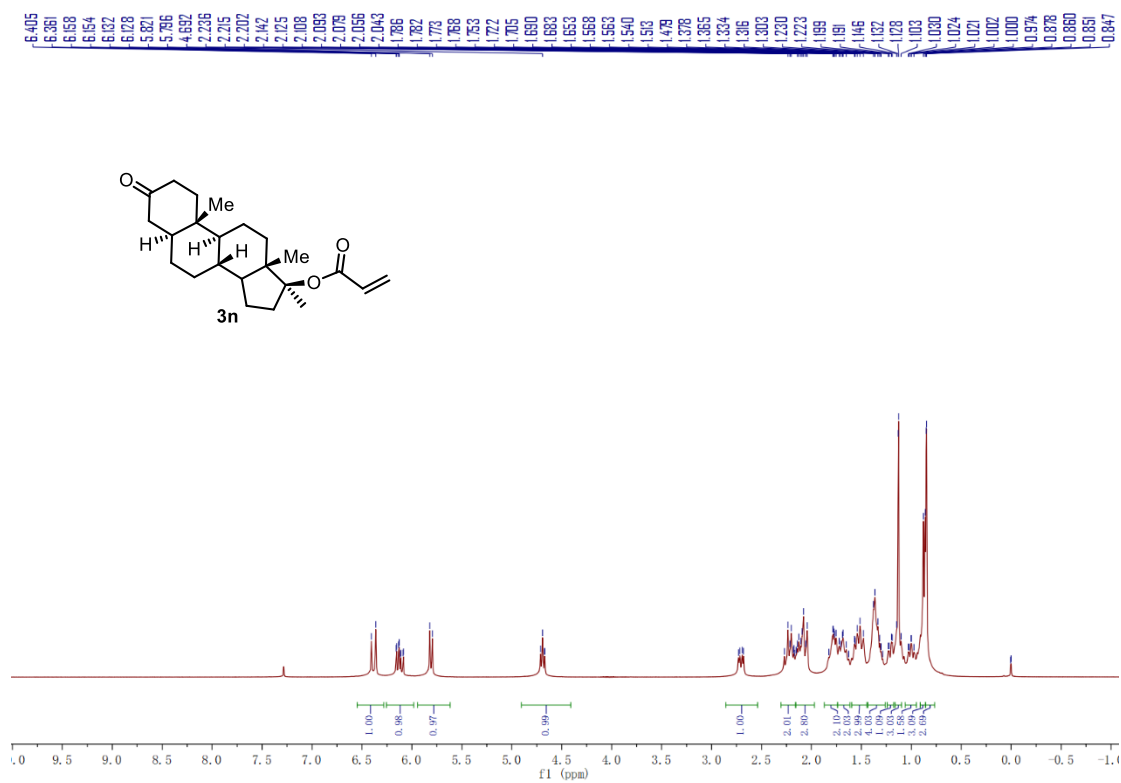
(^1H NMR, 400 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 101 MHz, CDCl_3)



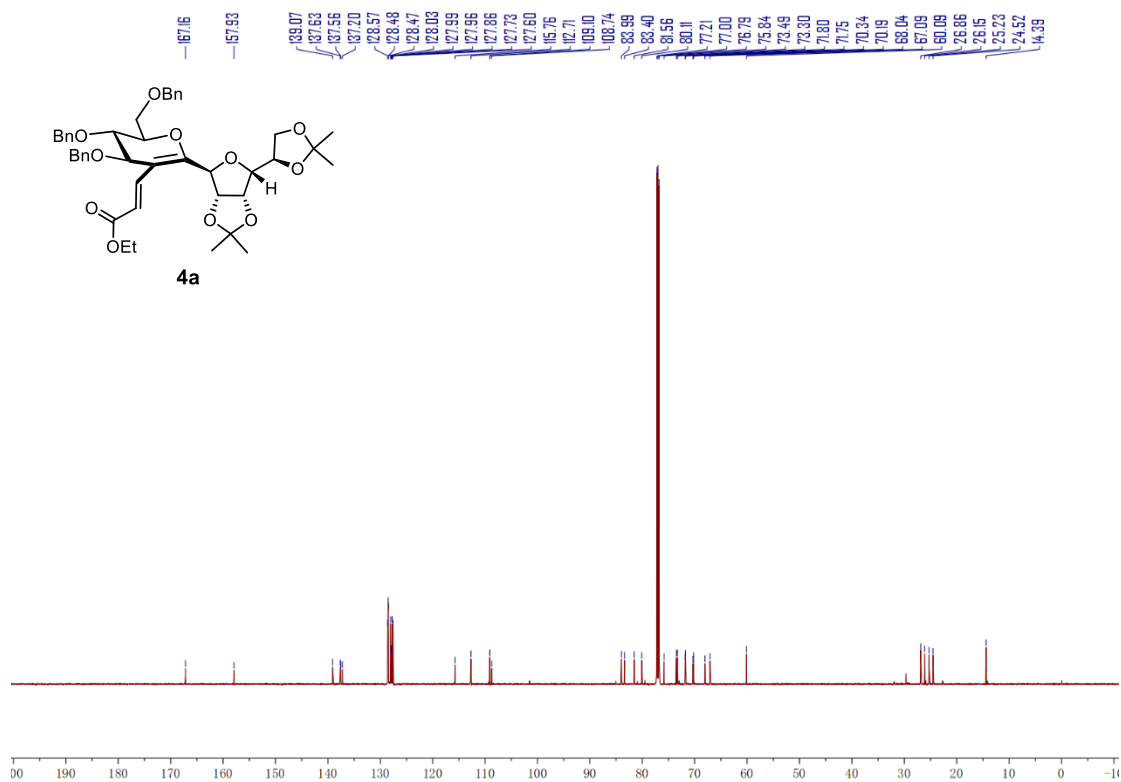
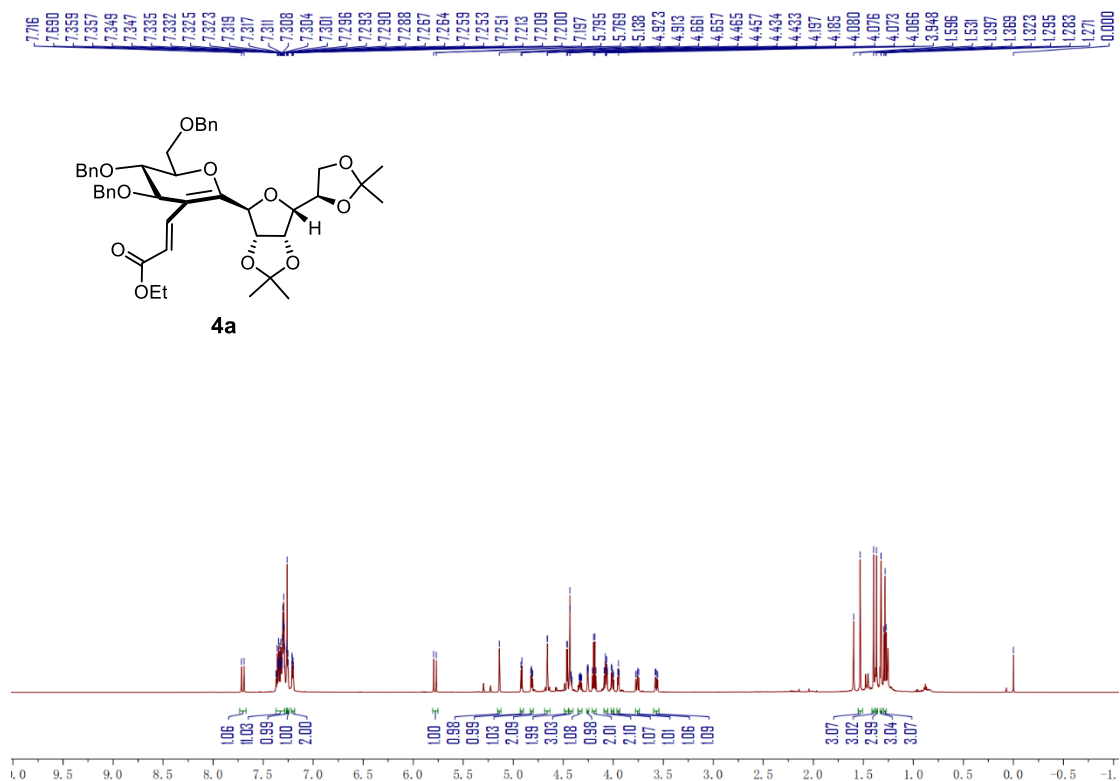
(^1H NMR, 400 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 101 MHz, CDCl_3)



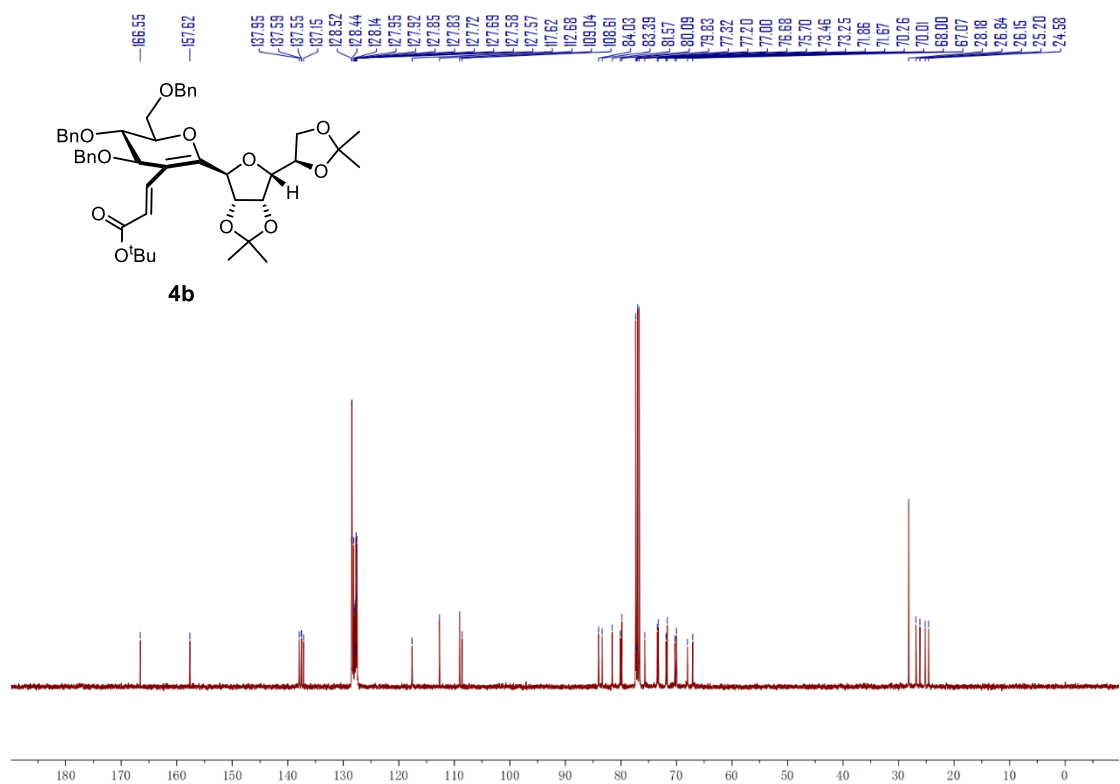
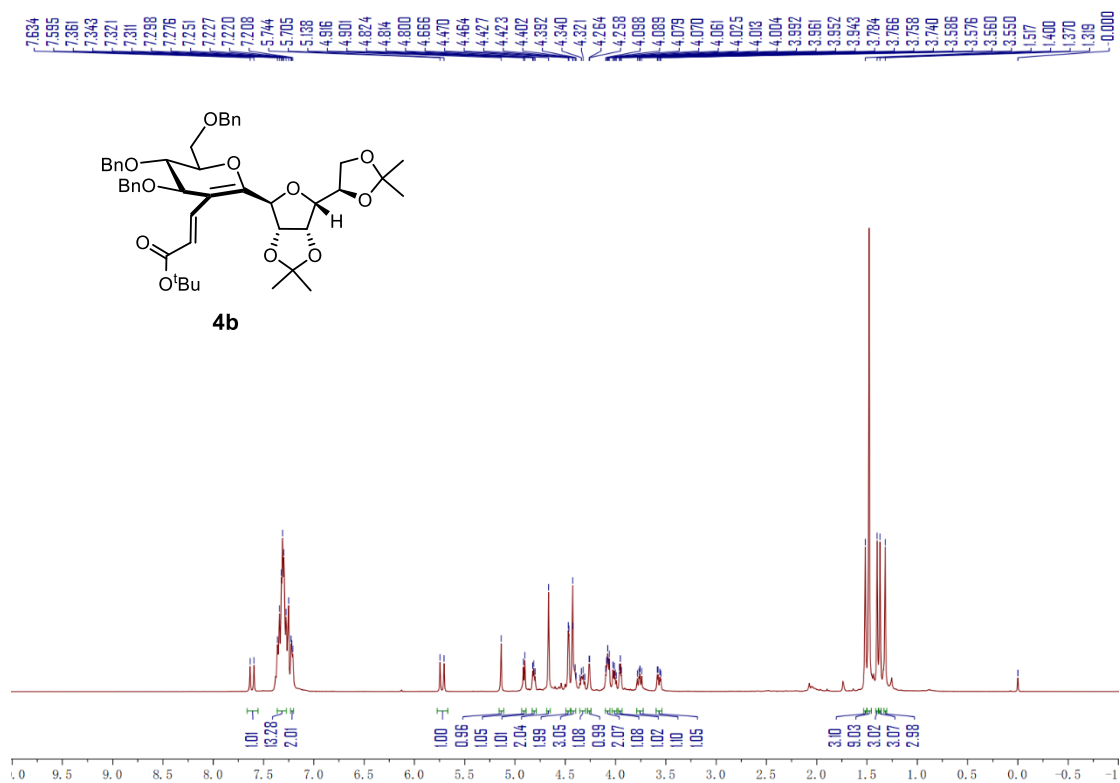
(¹H NMR, 400 MHz, CDCl₃; ¹³C {¹H} NMR, 101 MHz, CDCl₃)



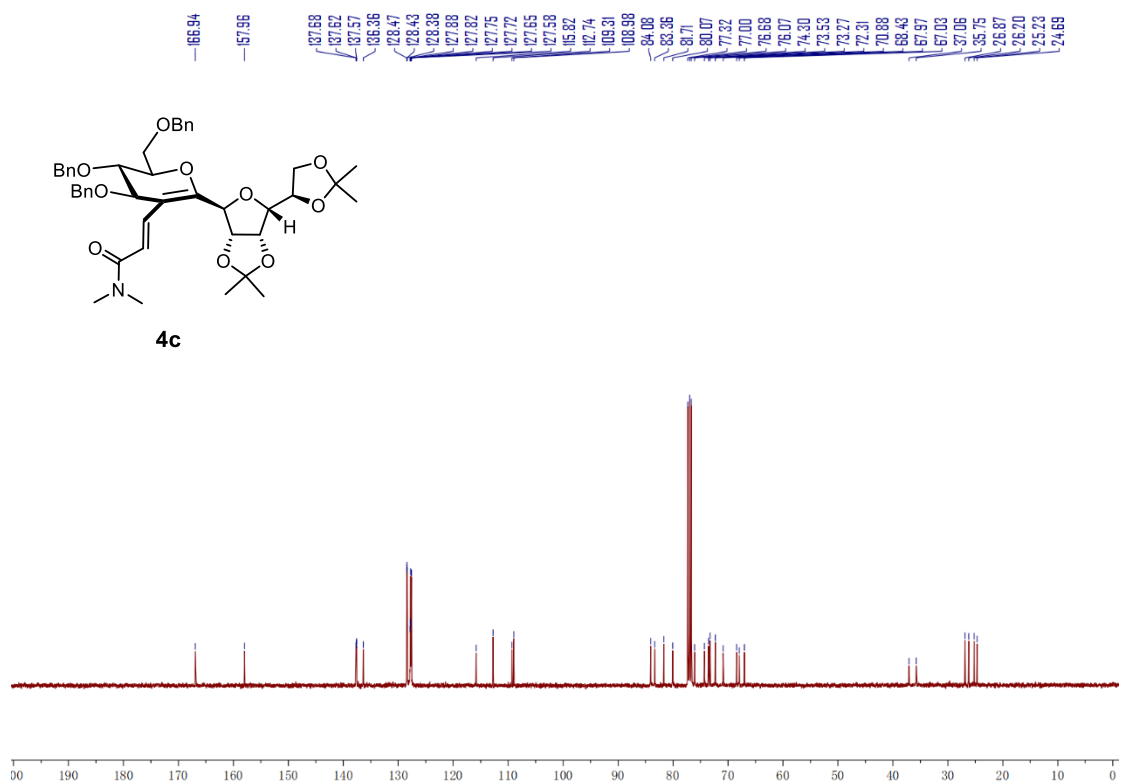
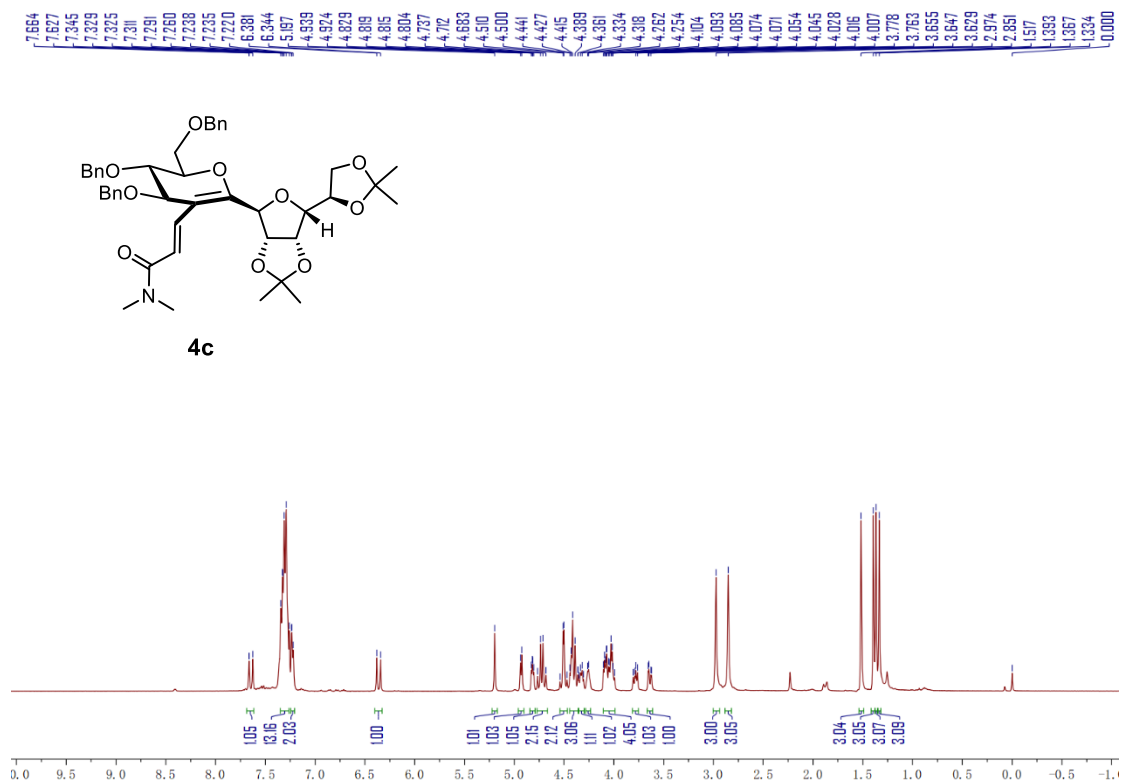
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



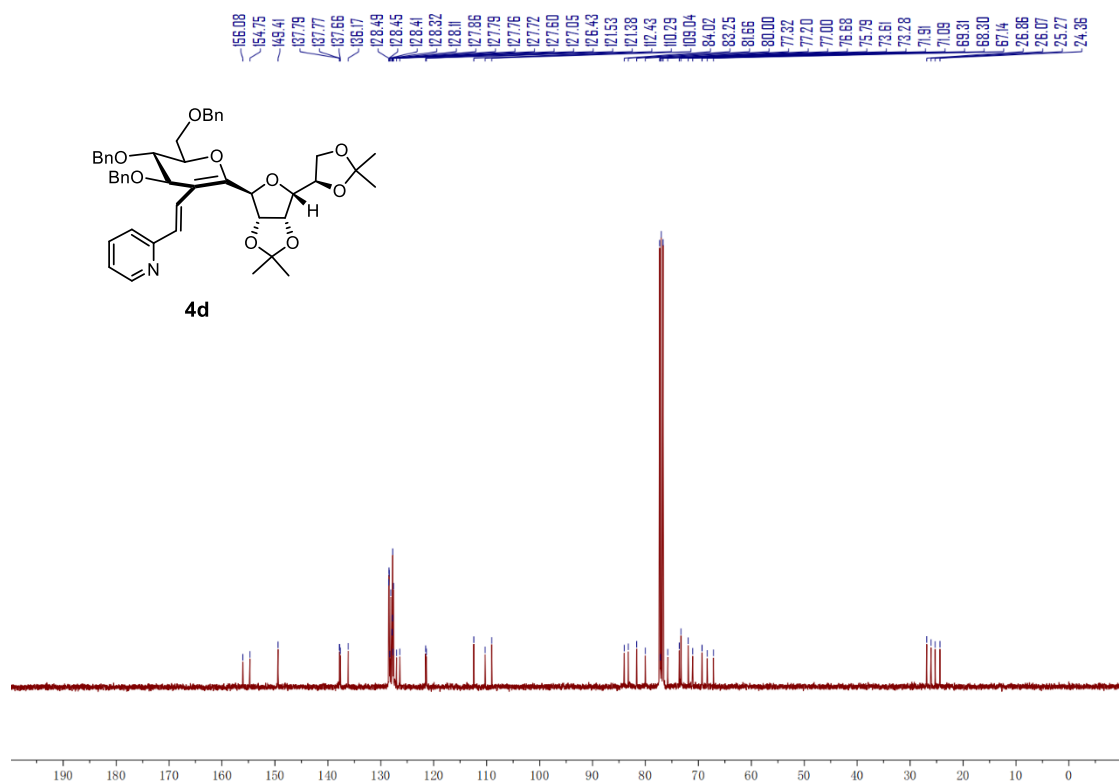
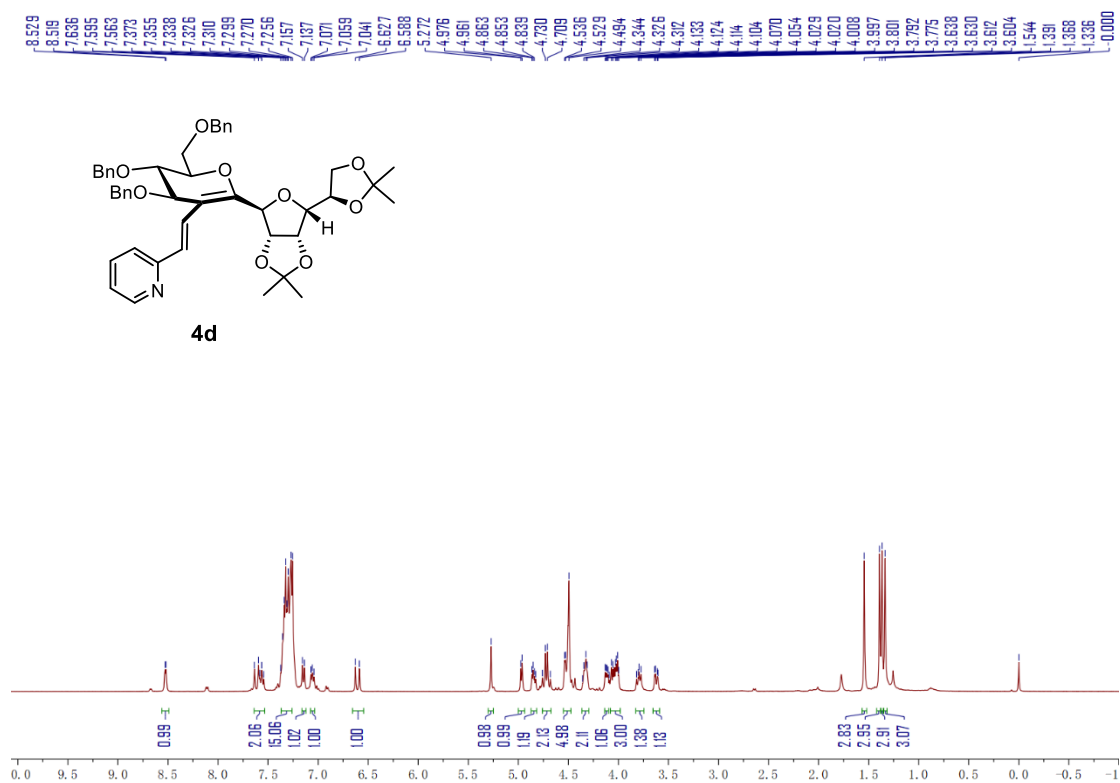
(^1H NMR, 400 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 101 MHz, CDCl_3)



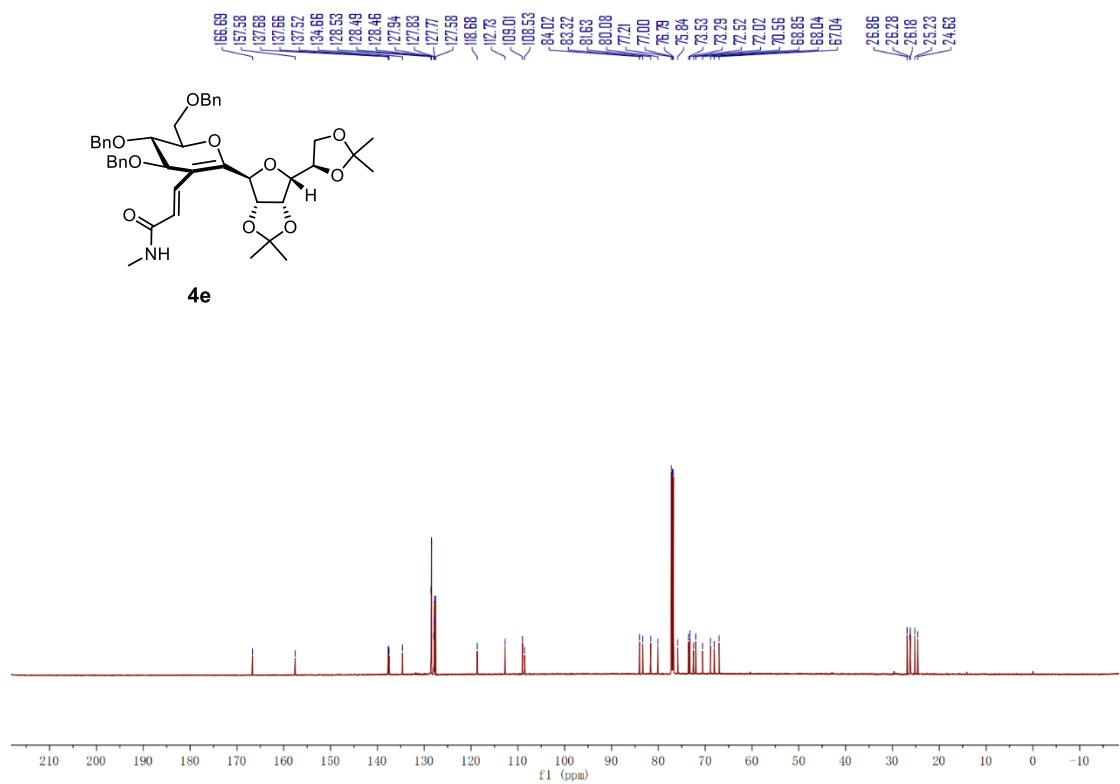
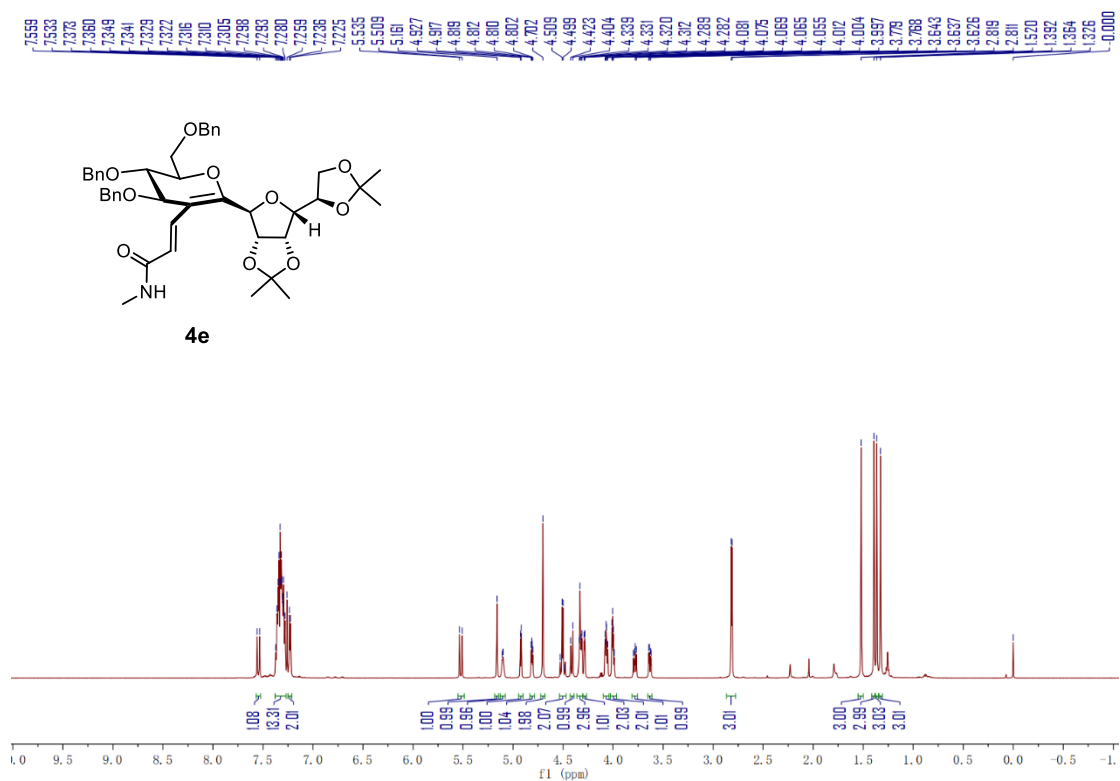
(^1H NMR, 400 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 101 MHz, CDCl_3)



(^1H NMR, 400 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 101 MHz, CDCl_3)



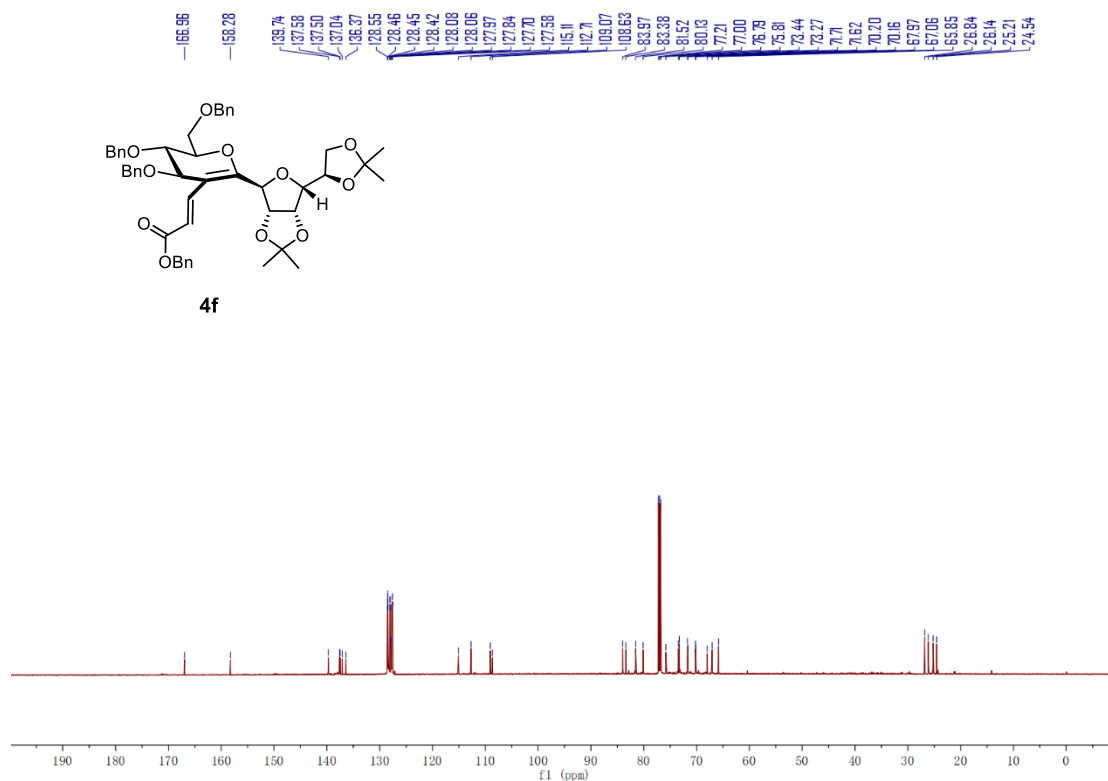
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



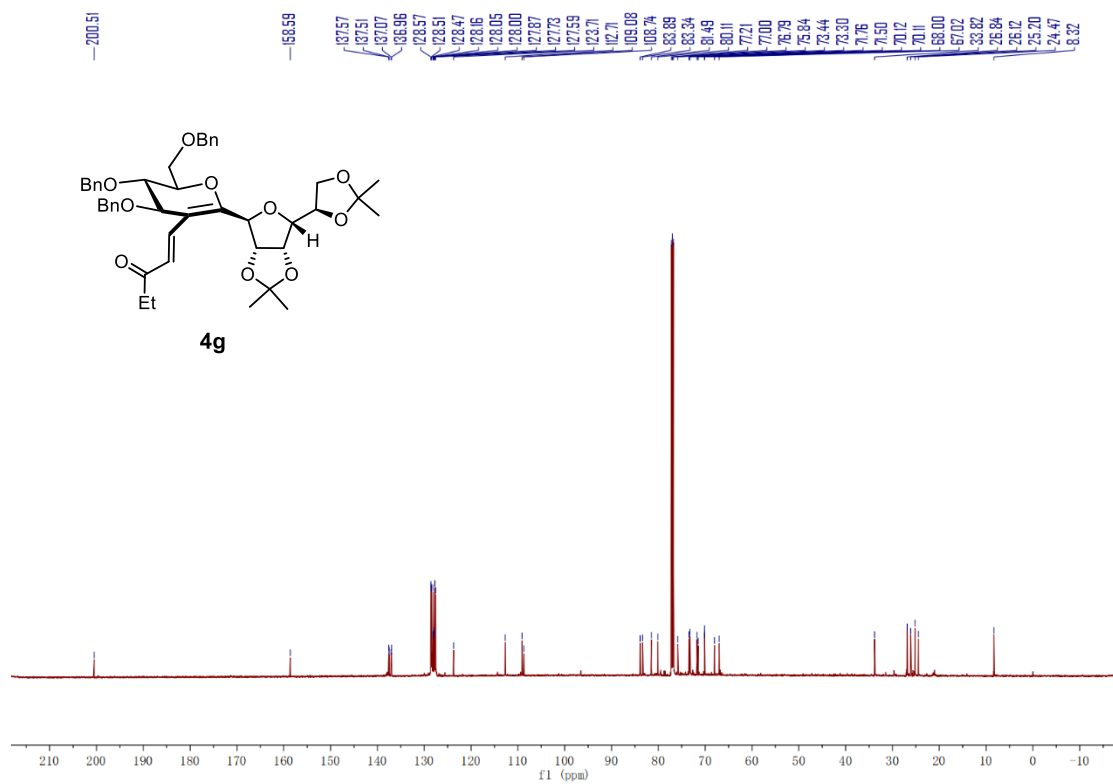
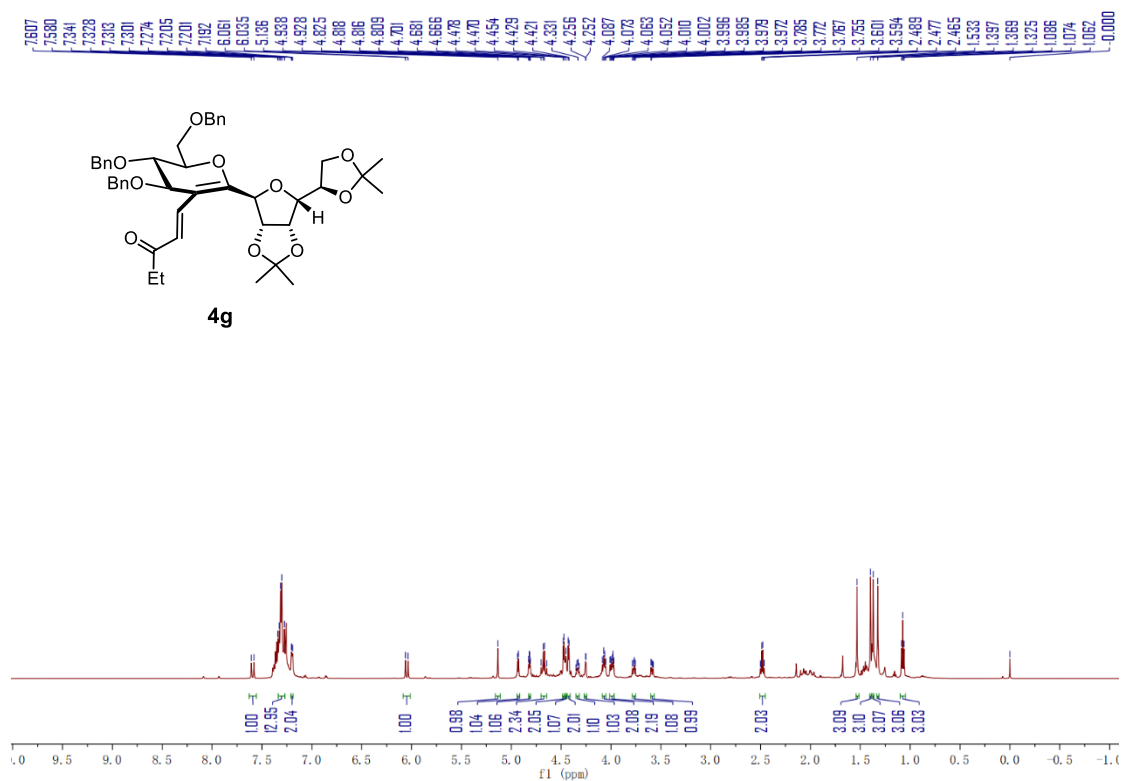
4f

COC1(C)OC2C(C1OC2C3C(C(C3)OC(=O)OBn)OC(=O)OBn)OC(=O)OBn

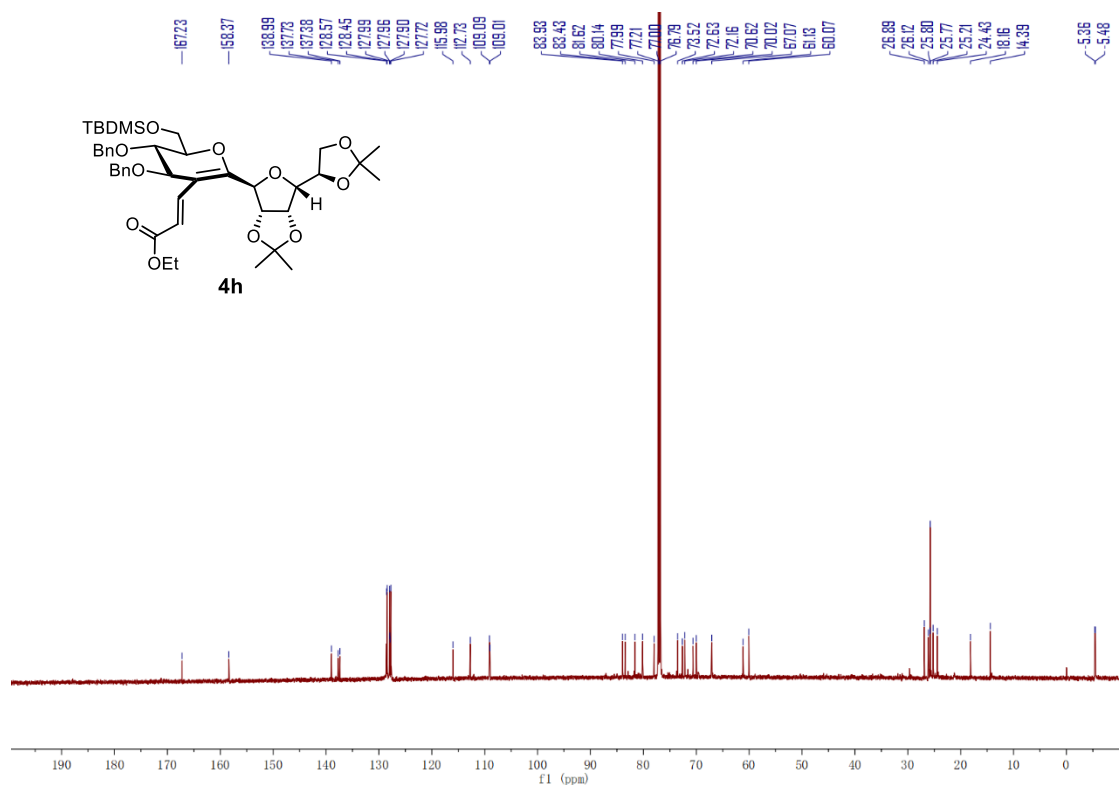
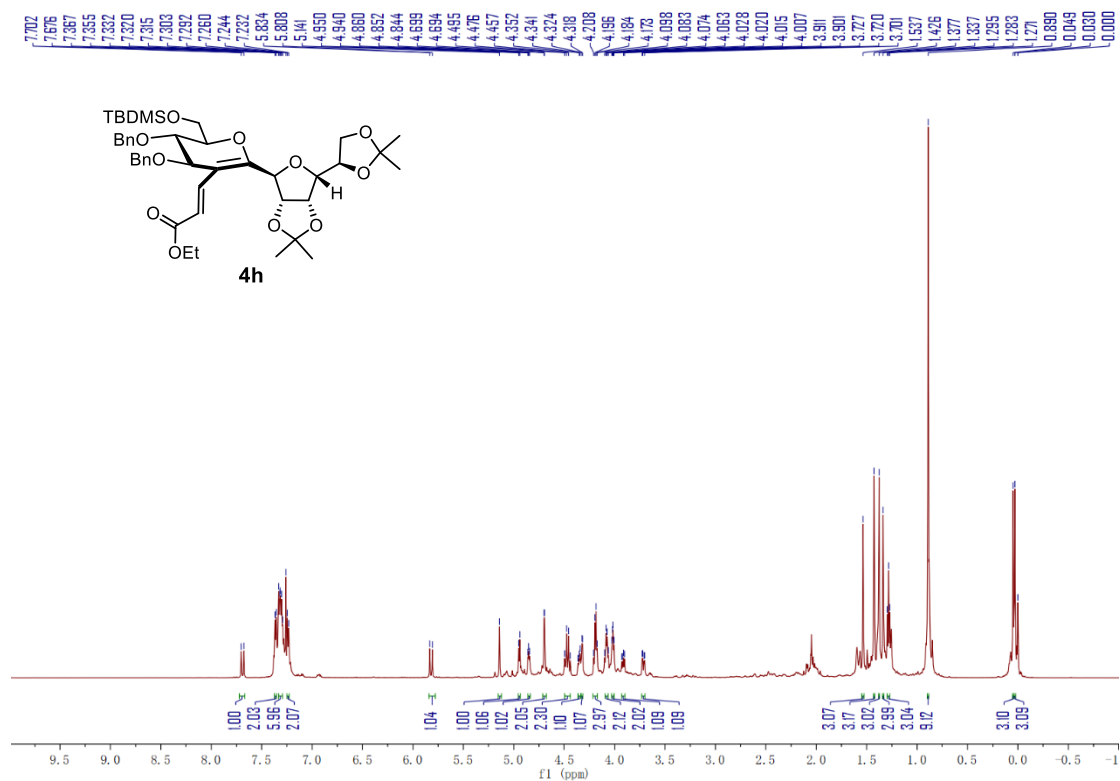
1H NMR spectrum (CDCl₃) of compound **4f**. The spectrum shows peaks from 0.00 to 7.78 ppm. Integration values are provided below the baseline: 1.00, 15.15, 3.18, 2.11, 1.00, 2.01, 0.94, 1.19, 2.07, 2.30, 1.00, 2.12, 1.35, 1.02, 2.22, 1.28, 1.06, 1.30, 1.03, 3.11, 3.28, 3.02, 3.24.



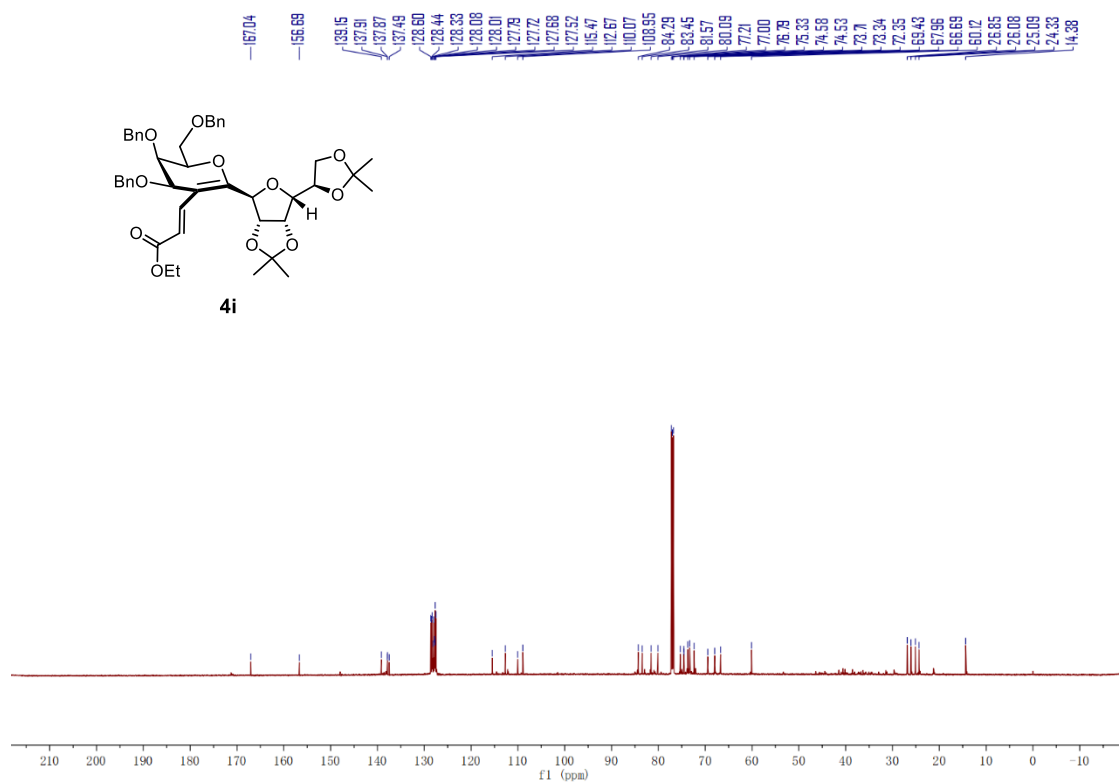
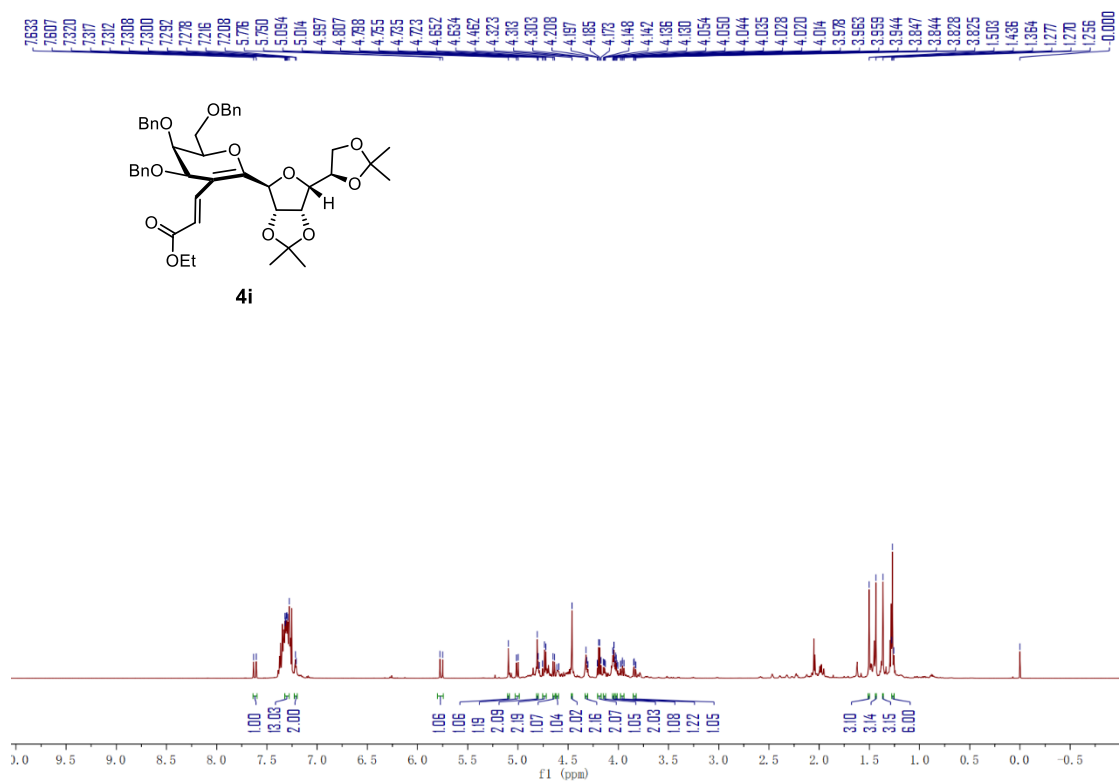
(¹H NMR, 600 MHz, CDCl₃; ¹³C {¹H} NMR, 151 MHz, CDCl₃)



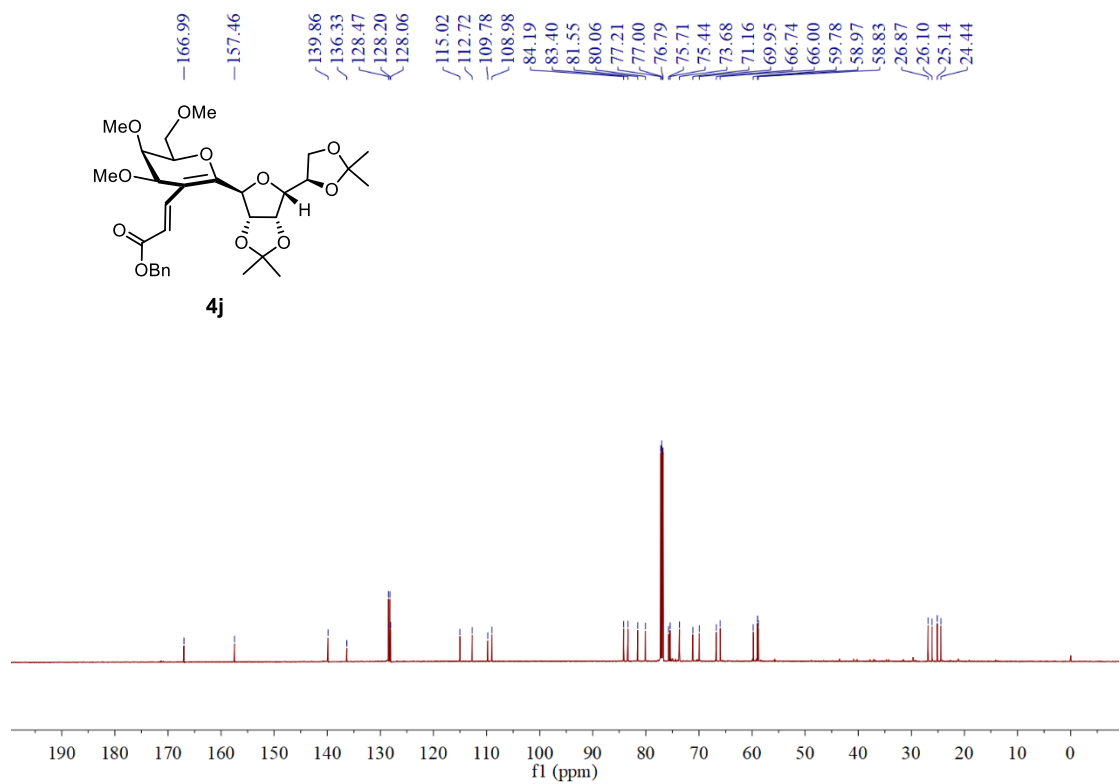
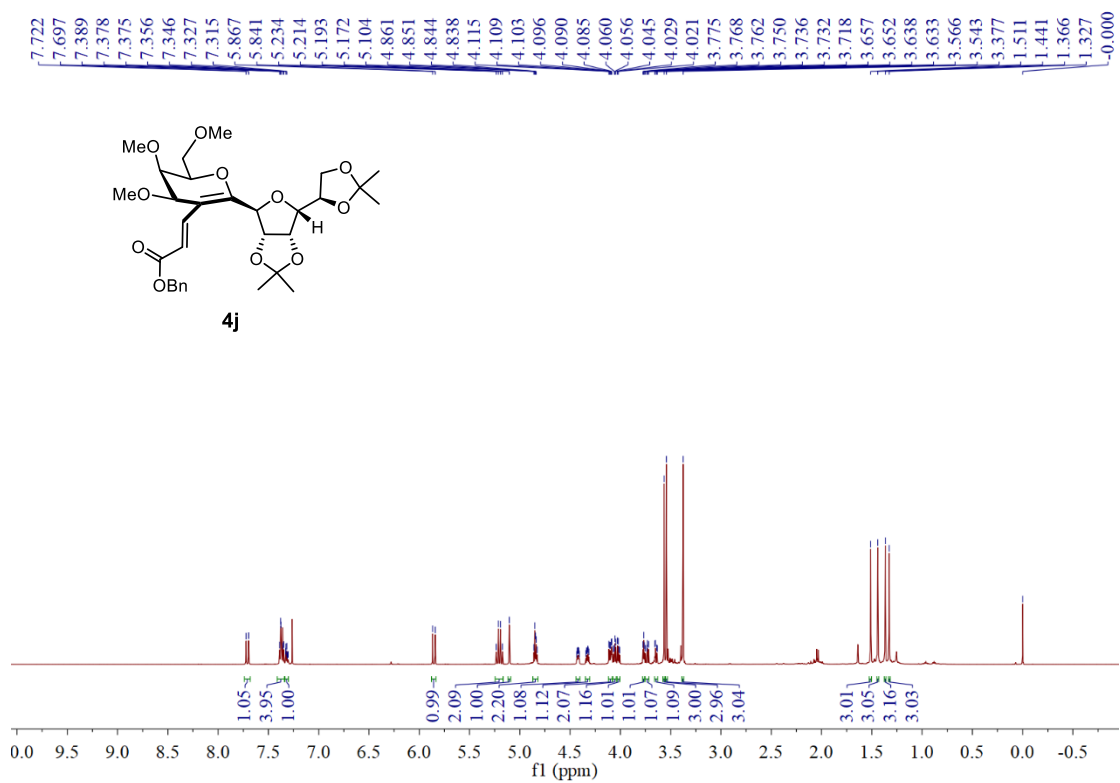
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)

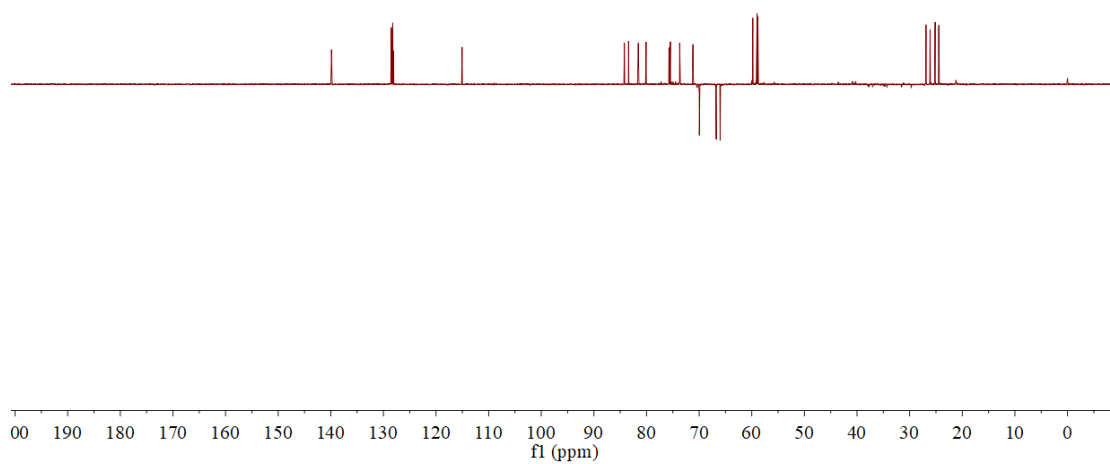


(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)

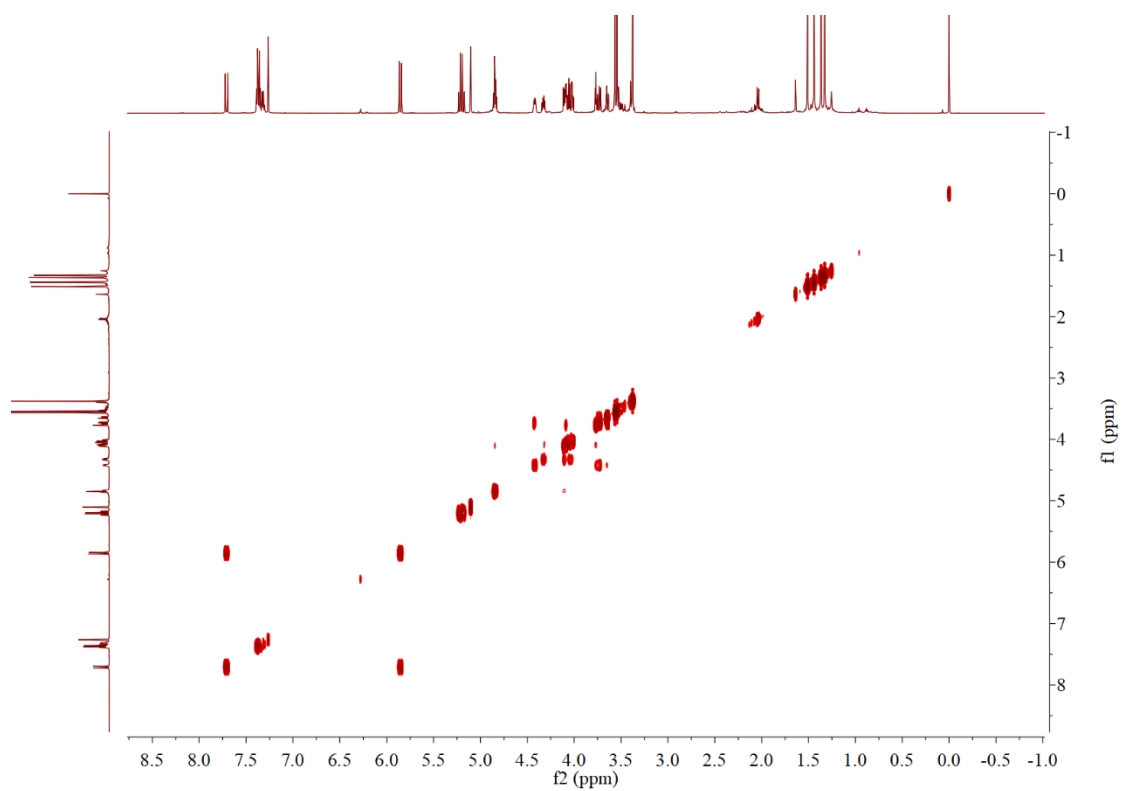


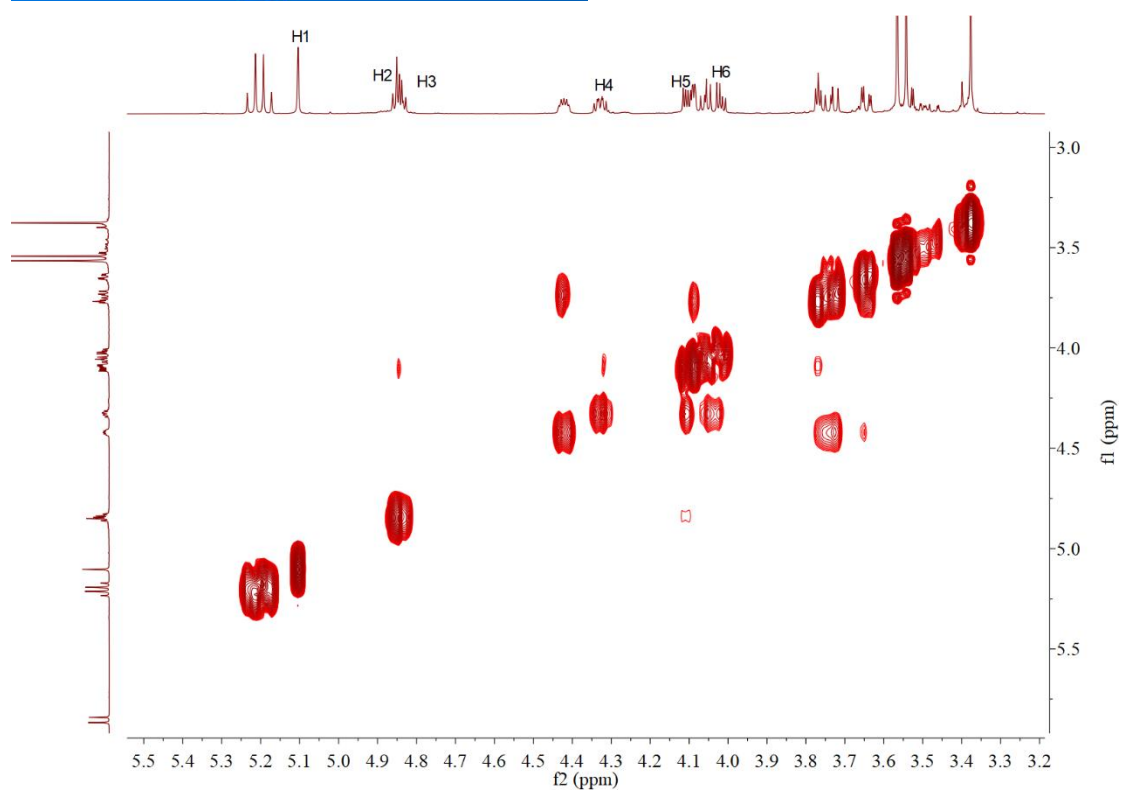
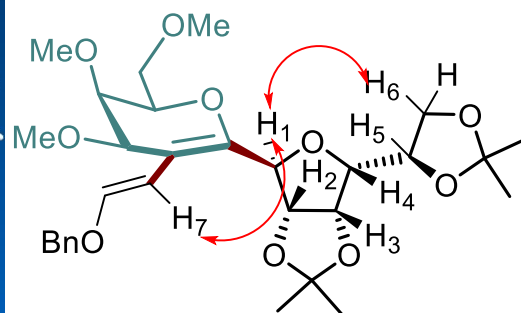
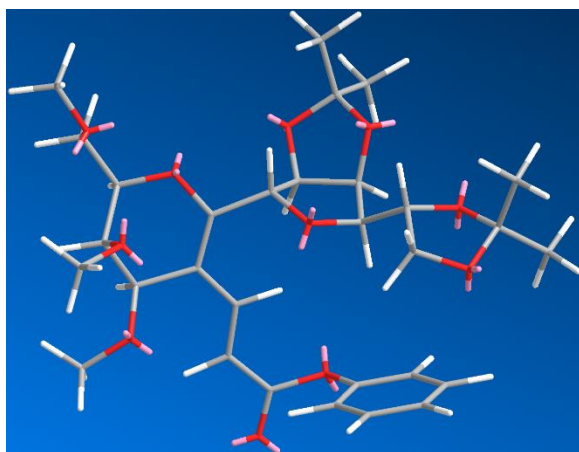
(¹H NMR, 600 MHz, CDCl₃; ¹³C {¹H} NMR, 151 MHz, CDCl₃)



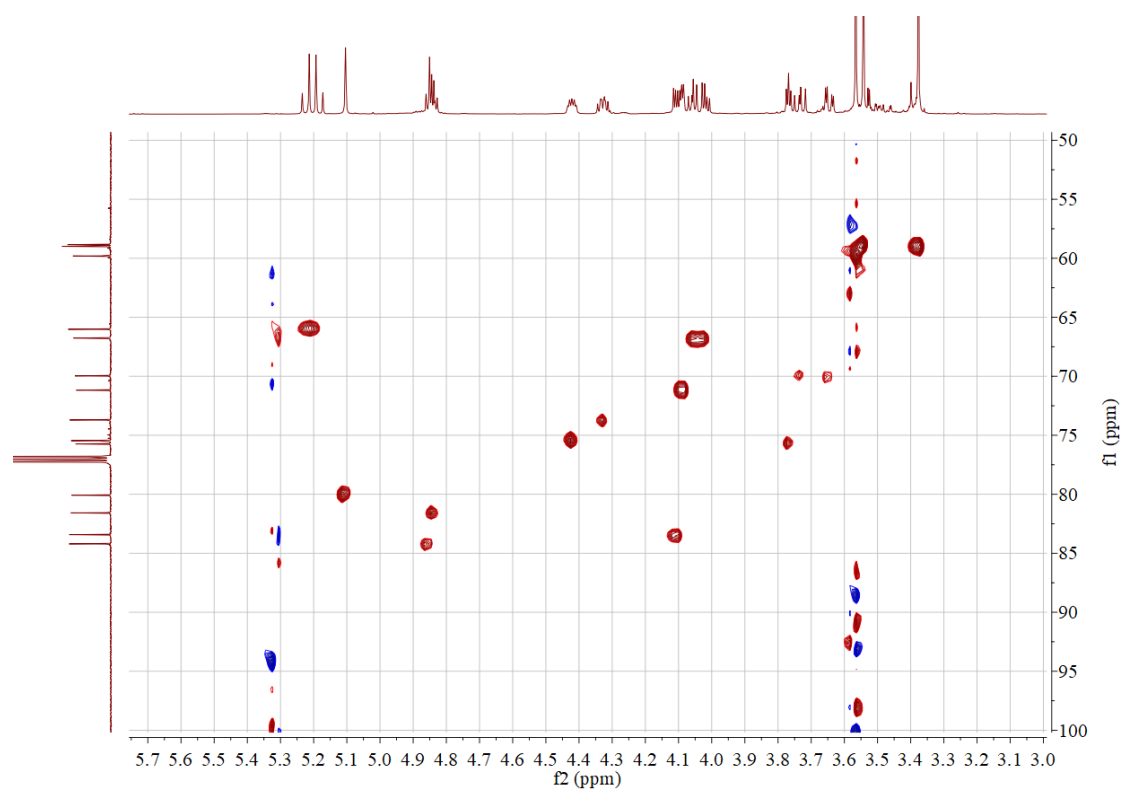


COSY spectrum of compound 4j

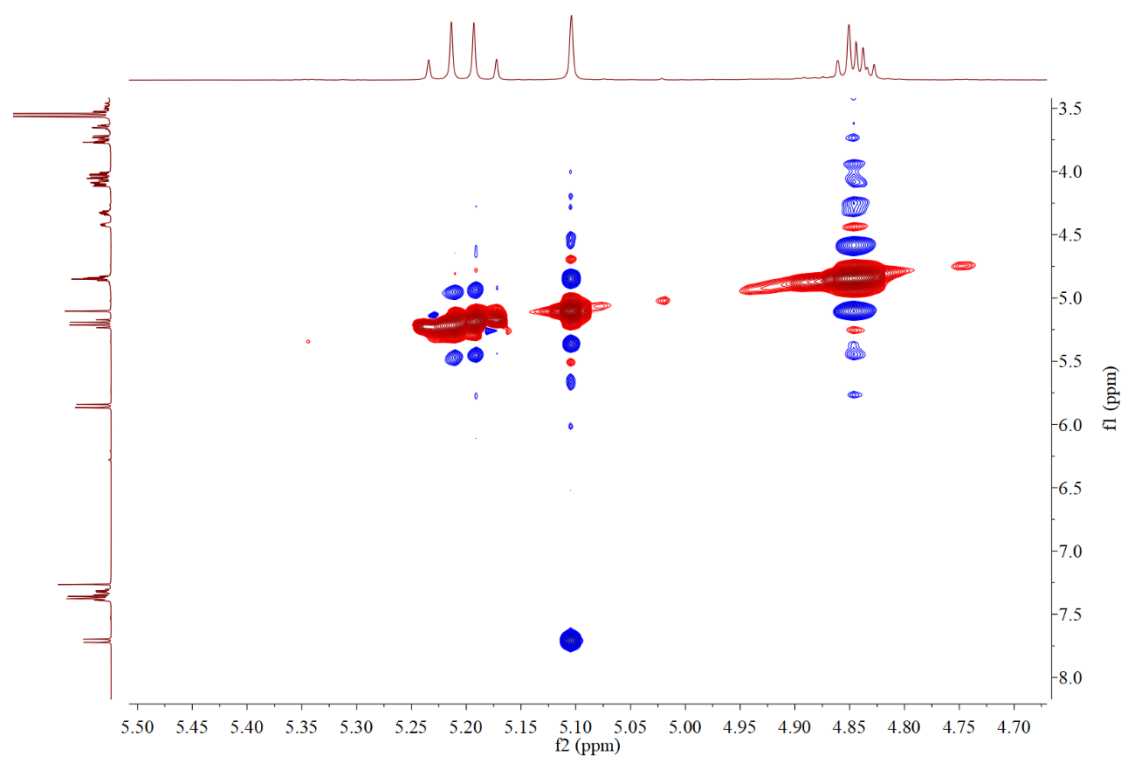


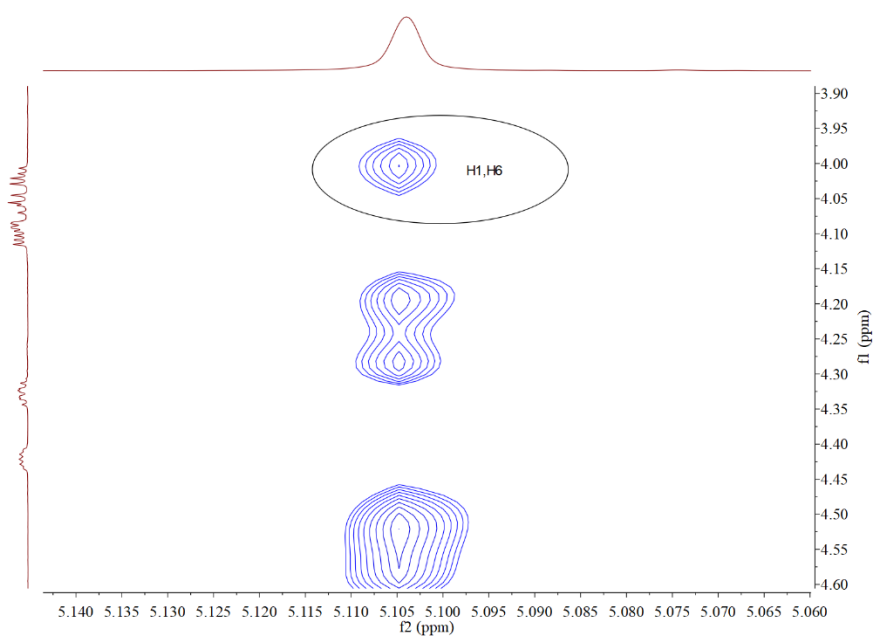
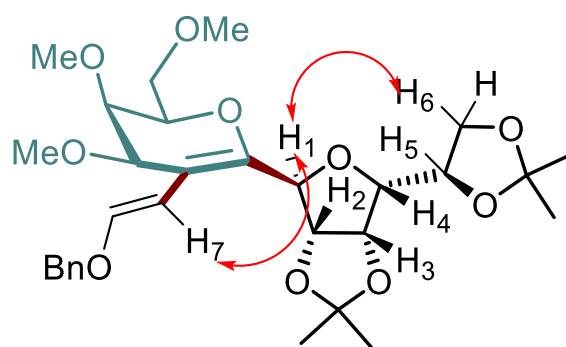
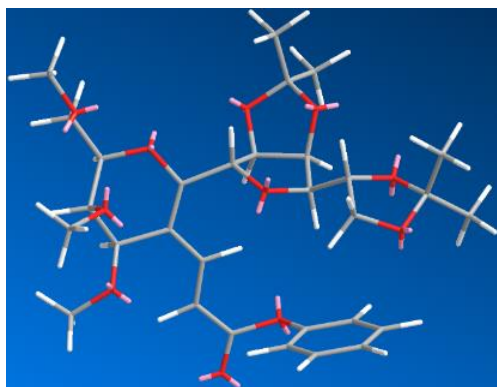


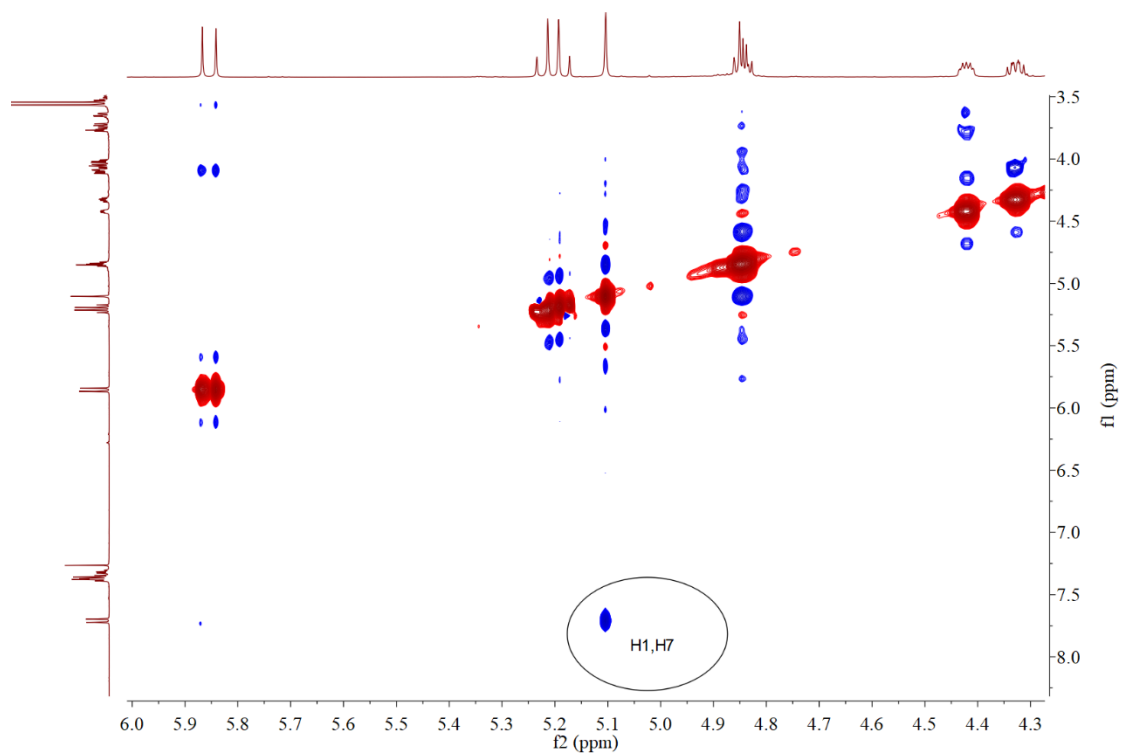
HMBC



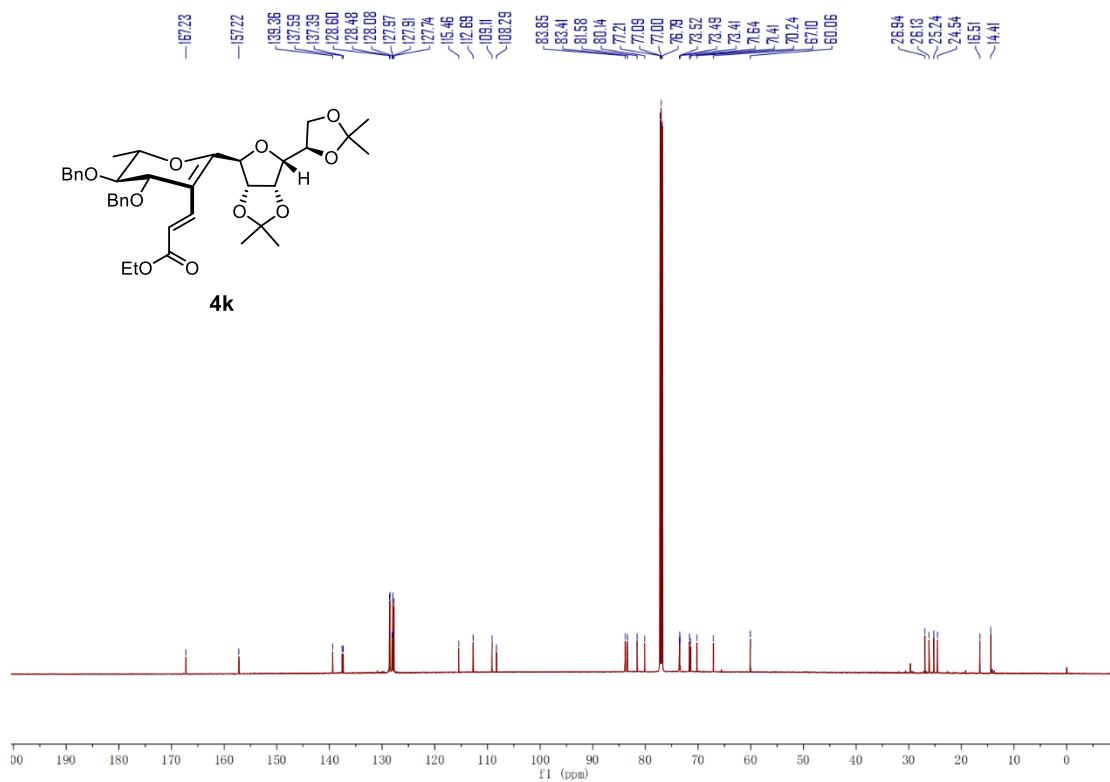
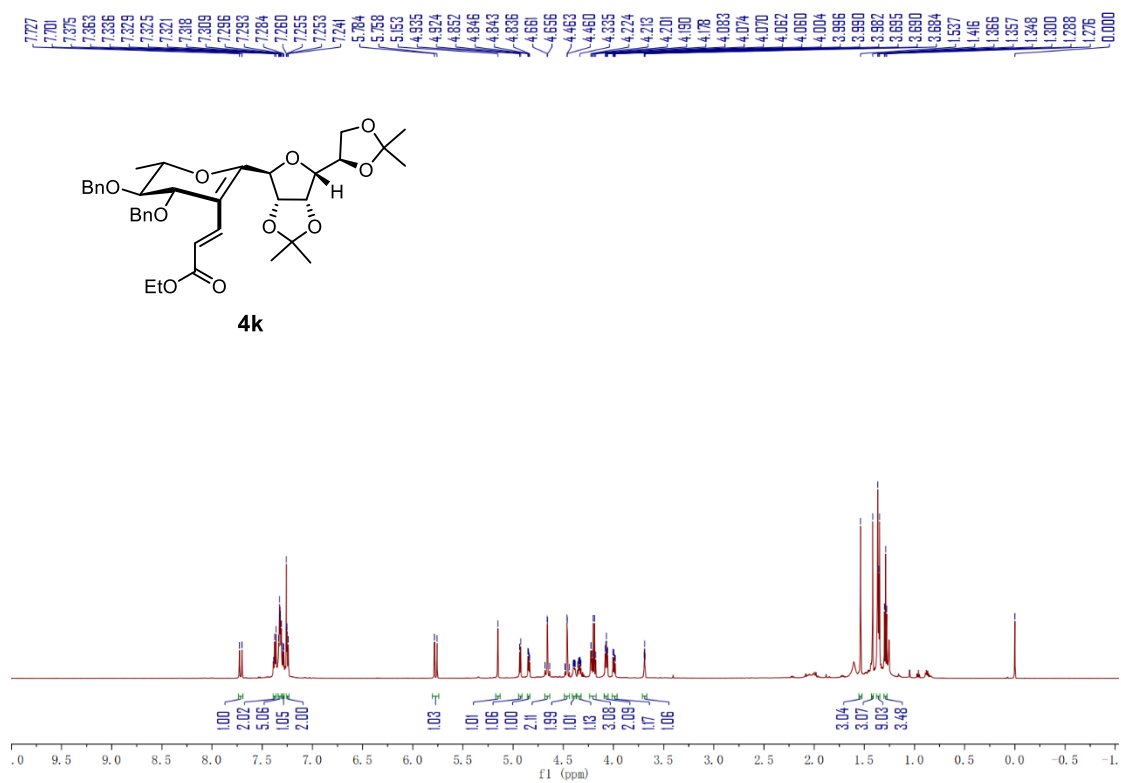
NOESY



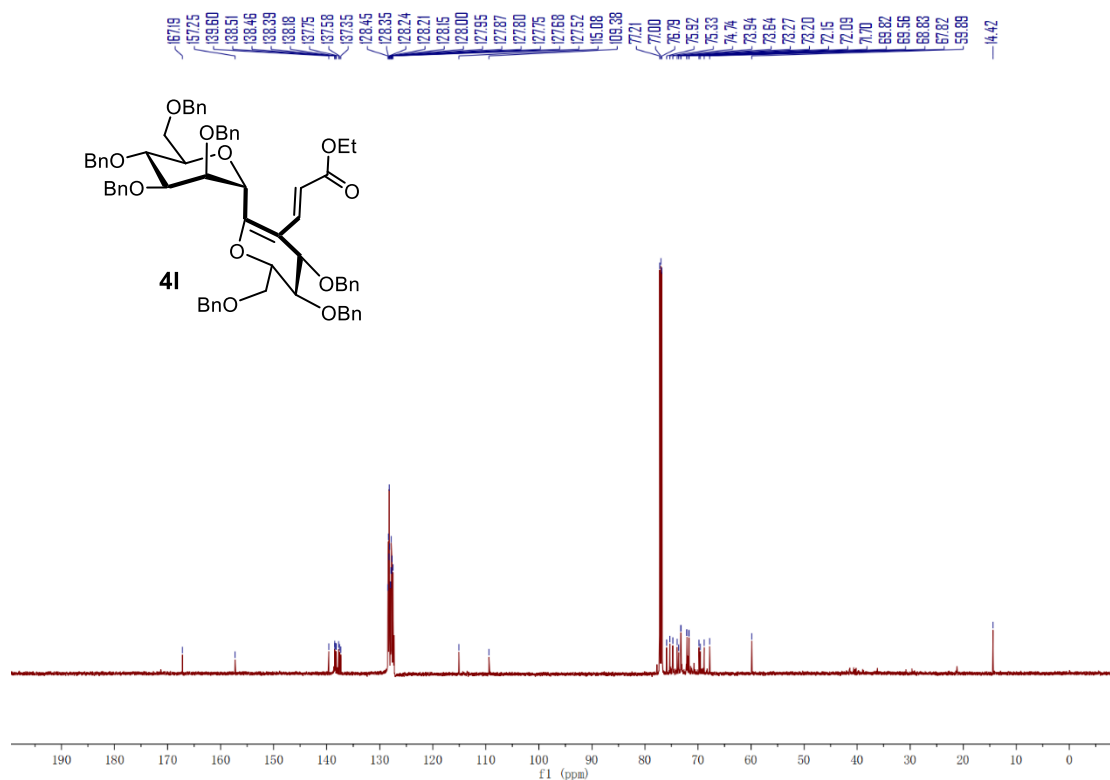
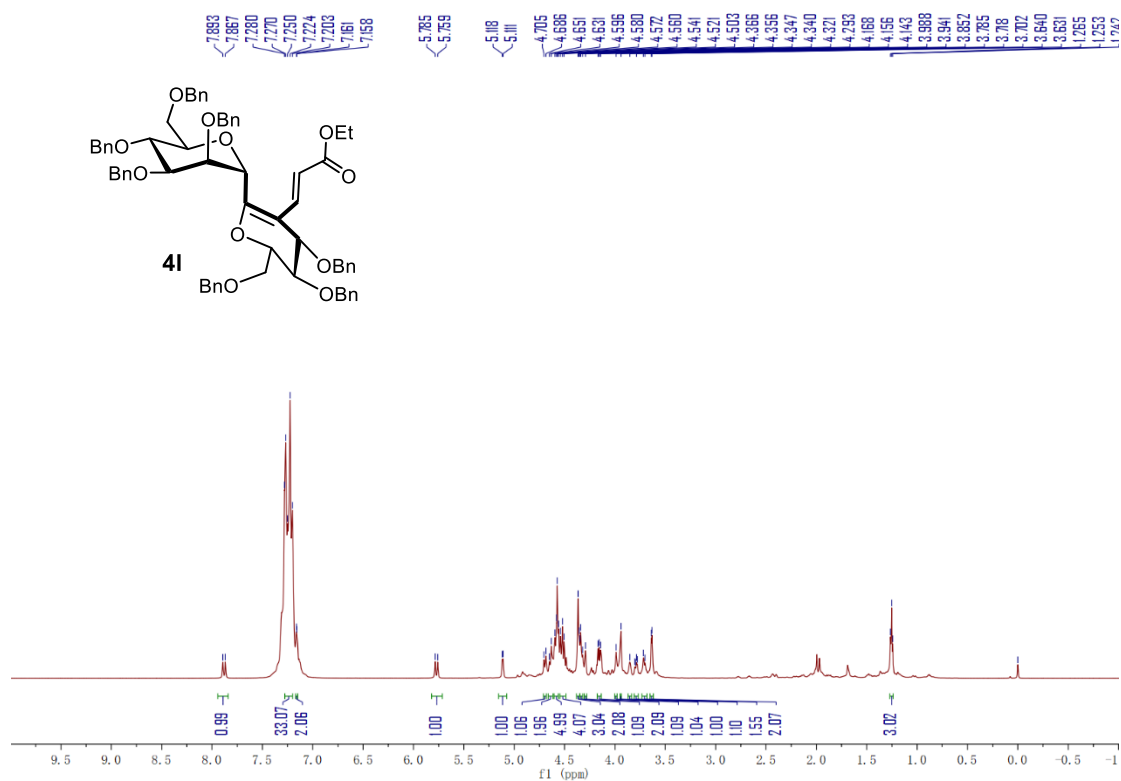




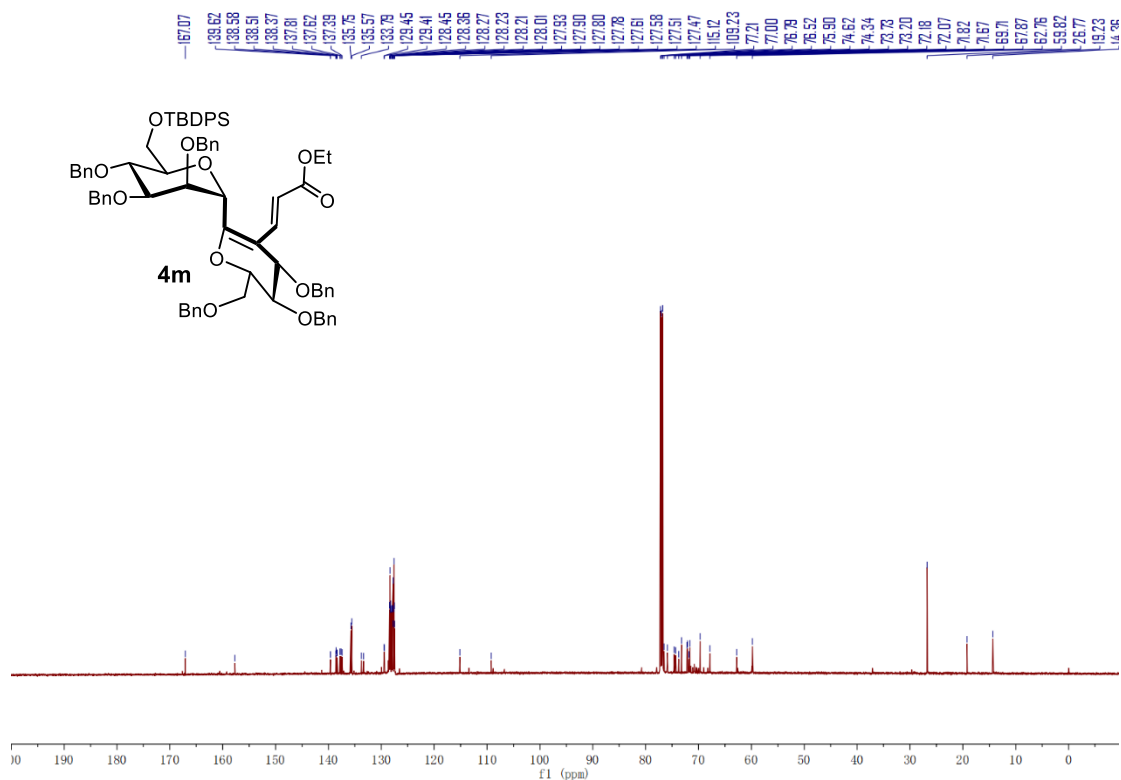
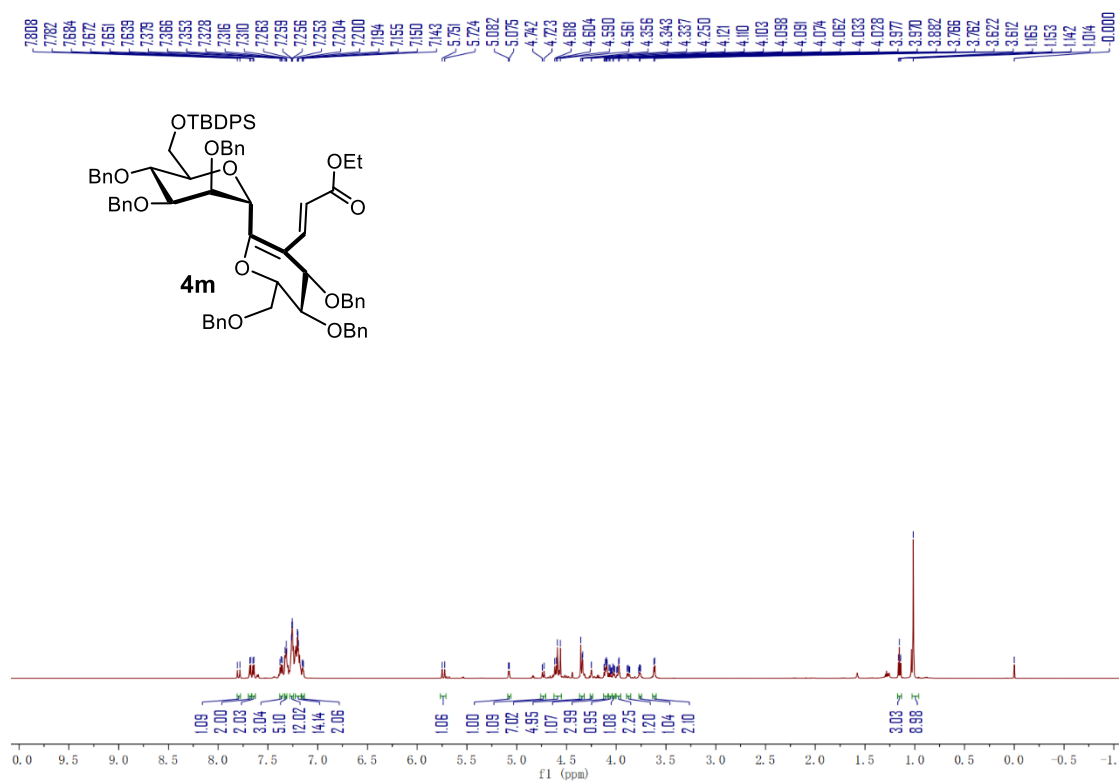
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



7857	7826	7823	7820	7818	7816	7814	7812	7810	7808	7806	7804	7802	7800	7798	7796	7794	7792	7790	7788	7786	7784	7782	7780	7778	7776	7774	7772	7770	7768	7766	7764	7762	7760	7758	7756	7754	7752	7750	7748	7746	7744	7742	7740	7738	7736	7734	7732	7730	7728	7726	7724	7722	7720	7718	7716	7714	7712	7710	7708	7706	7704	7702	7700	7698	7696	7694	7692	7690	7688	7686	7684	7682	7680	7678	7676	7674	7672	7670	7668	7666	7664	7662	7660	7658	7656	7654	7652	7650	7648	7646	7644	7642	7640	7638	7636	7634	7632	7630	7628	7626	7624	7622	7620	7618	7616	7614	7612	7610	7608	7606	7604	7602	7600	7598	7596	7594	7592	7590	7588	7586	7584	7582	7580	7578	7576	7574	7572	7570	7568	7566	7564	7562	7560	7558	7556	7554	7552	7550	7548	7546	7544	7542	7540	7538	7536	7534	7532	7530	7528	7526	7524	7522	7520	7518	7516	7514	7512	7510	7508	7506	7504	7502	7500	7498	7496	7494	7492	7490	7488	7486	7484	7482	7480	7478	7476	7474	7472	7470	7468	7466	7464	7462	7460	7458	7456	7454	7452	7450	7448	7446	7444	7442	7440	7438	7436	7434	7432	7430	7428	7426	7424	7422	7420	7418	7416	7414	7412	7410	7408	7406	7404	7402	7400	7398	7396	7394	7392	7390	7388	7386	7384	7382	7380	7378	7376	7374	7372	7370	7368	7366	7364	7362	7360	7358	7356	7354	7352	7350	7348	7346	7344	7342	7340	7338	7336	7334	7332	7330	7328	7326	7324	7322	7320	7318	7316	7314	7312	7310	7308	7306	7304	7302	7300	7298	7296	7294	7292	7290	7288	7286	7284	7282	7280	7278	7276	7274	7272	7270	7268	7266	7264	7262	7260	7258	7256	7254	7252	7250	7248	7246	7244	7242	7240	7238	7236	7234	7232	7230	7228	7226	7224	7222	7220	7218	7216	7214	7212	7210	7208	7206	7204	7202	7200	7198	7196	7194	7192	7190	7188	7186	7184	7182	7180	7178	7176	7174	7172	7170	7168	7166	7164	7162	7160	7158	7156	7154	7152	7150	7148	7146	7144	7142	7140	7138	7136	7134	7132	7130	7128	7126	7124	7122	7120	7118	7116	7114	7112	7110	7108	7106	7104	7102	7100	7098	7096	7094	7092	7090	7088	7086	7084	7082	7080	7078	7076	7074	7072	7070	7068	7066	7064	7062	7060	7058	7056	7054	7052	7050	7048	7046	7044	7042	7040	7038	7036	7034	7032	7030	7028	7026	7024	7022	7020	7018	7016	7014	7012	7010	7008	7006	7004	7002	7000	6998	6996	6994	6992	6990	6988	6986	6984	6982	6980	6978	6976	6974	6972	6970	6968	6966	6964	6962	6960	6958	6956	6954	6952	6950	6948	6946	6944	6942	6940	6938	6936	6934	6932	6930	6928	6926	6924	6922	6920
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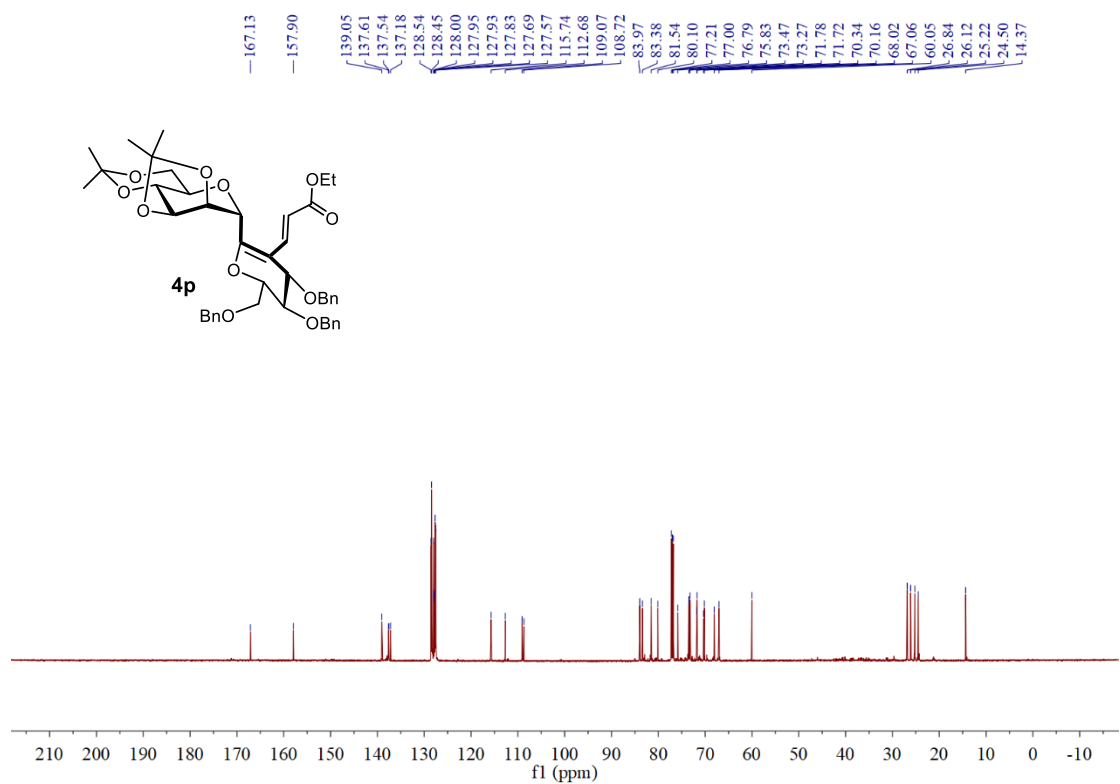
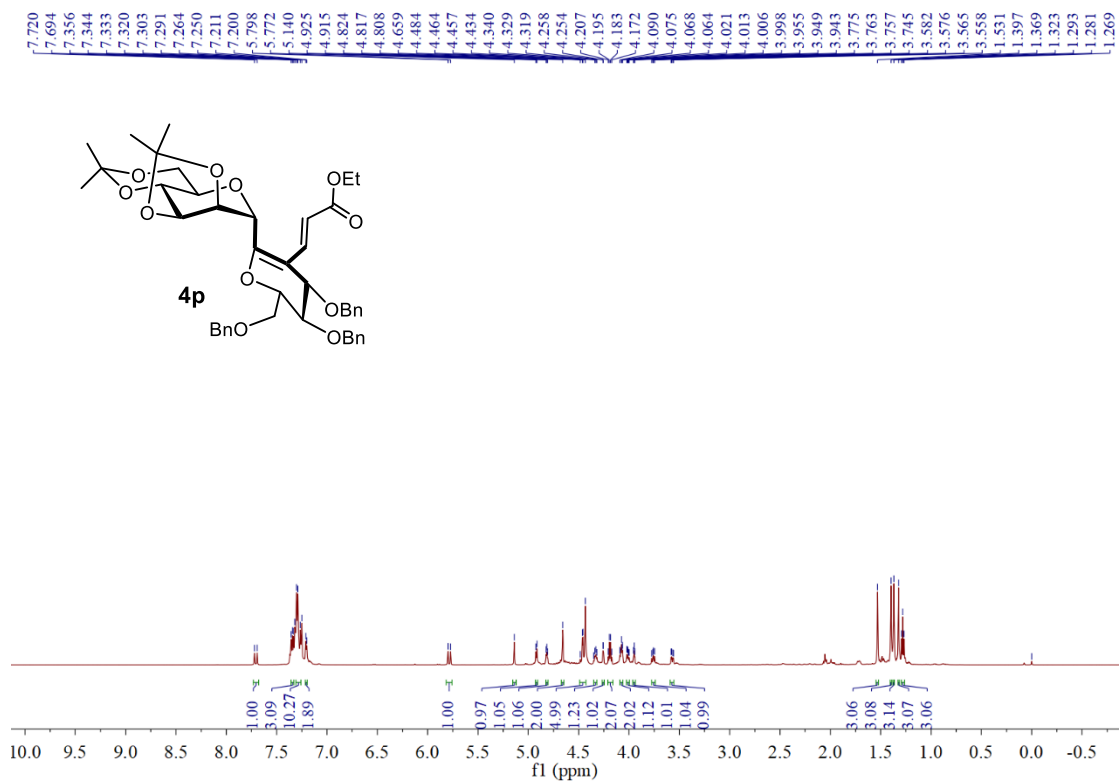
Chemical structure of 4o: CCOC(=O)/C=C/[C@H]1O[C@@H](OC(=O)c2ccccc2)[C@H](OC(=O)c3ccccc3)[C@H](OC(=O)c4ccccc4)[C@H](OC(=O)c5ccccc5)[C@H]1O

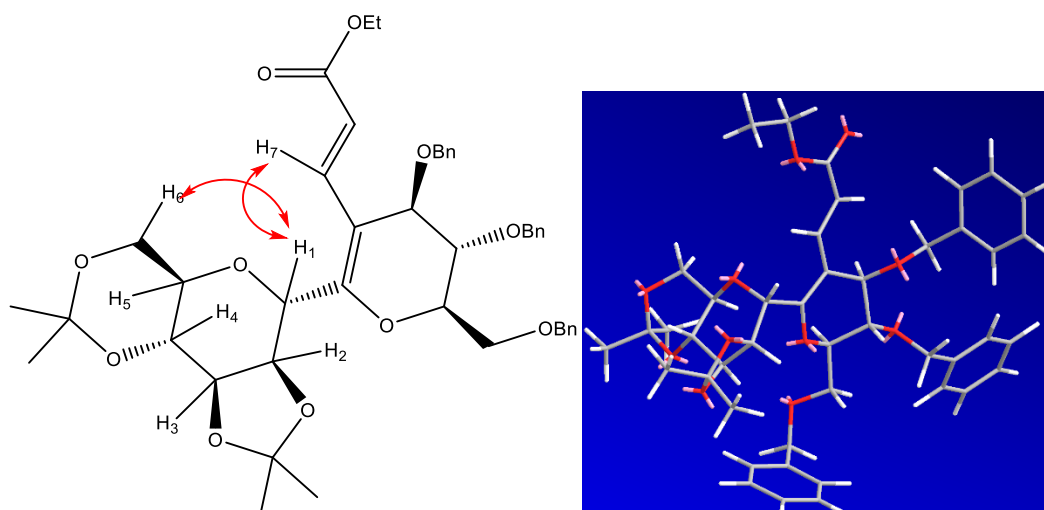
¹H NMR spectrum (CDCl₃):

Chemical Shift (ppm)	Integration
7.950, 7.924, 7.924, 7.328, 7.307, 7.221, 7.209, 7.188, 5.767, 5.741, 5.104, 5.100, 4.746, 4.727, 4.682, 4.662, 4.614, 4.598, 4.579, 4.552, 4.544, 4.534, 4.518, 4.498, 4.457, 4.437, 4.424, 4.406, 4.391, 4.365, 4.345, 4.266, 4.242, 4.190, 4.176, 3.958, 3.938, 3.774, 3.763, 3.753, 3.721, 3.705, 3.693, 3.608, 3.601, 3.591, 3.584, 3.564, 3.552, 3.540, 3.540, 1.310, 1.300, 1.284, 1.272, 1.257, 0.000	1.00, 30.20, 1.02, 0.99, 1.00, 3.98, 1.13, 1.00, 5.01, 1.07, 3.00, 2.09, 1.04, 0.96, 1.01, 1.05, 3.02, 3.14

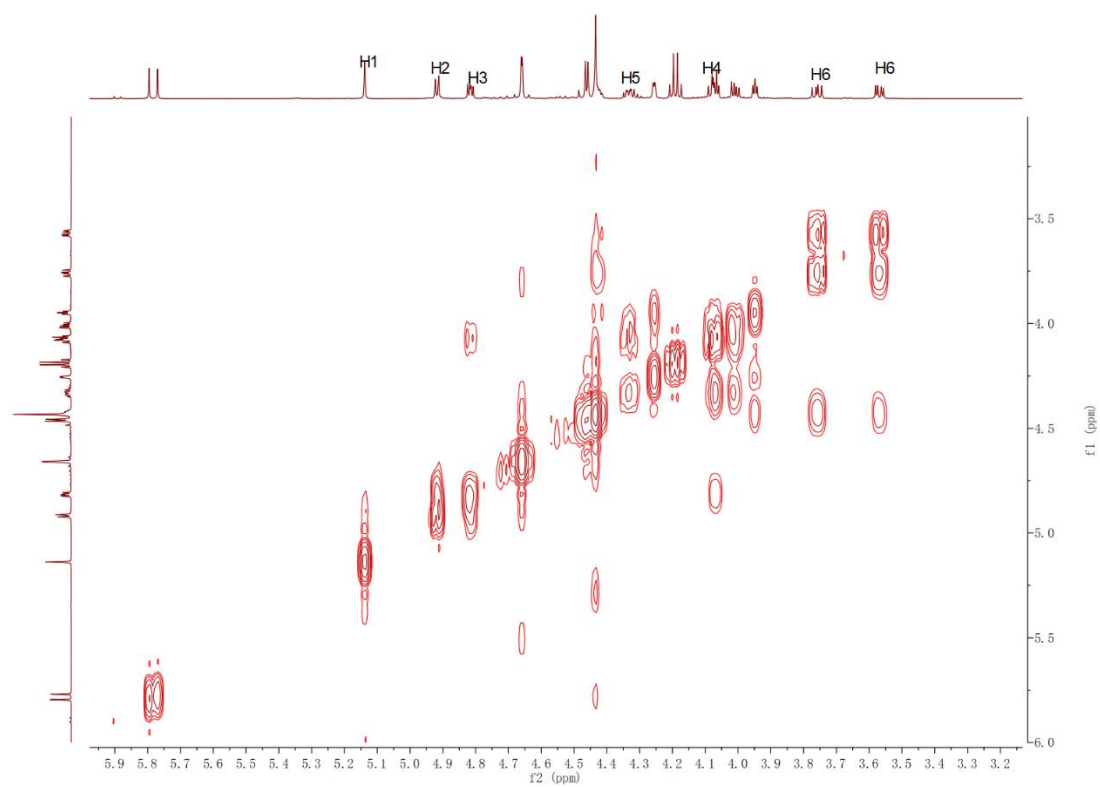


(¹H NMR, 600 MHz, CDCl₃; ¹³C {¹H} NMR, 151 MHz, CDCl₃)

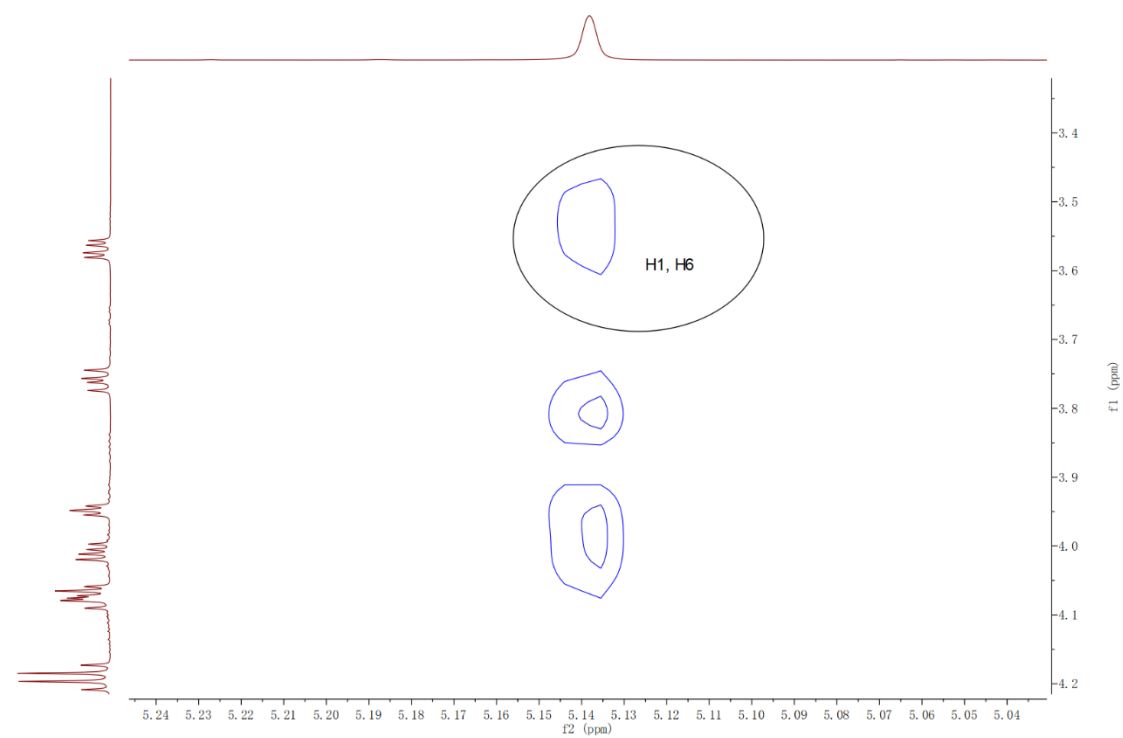
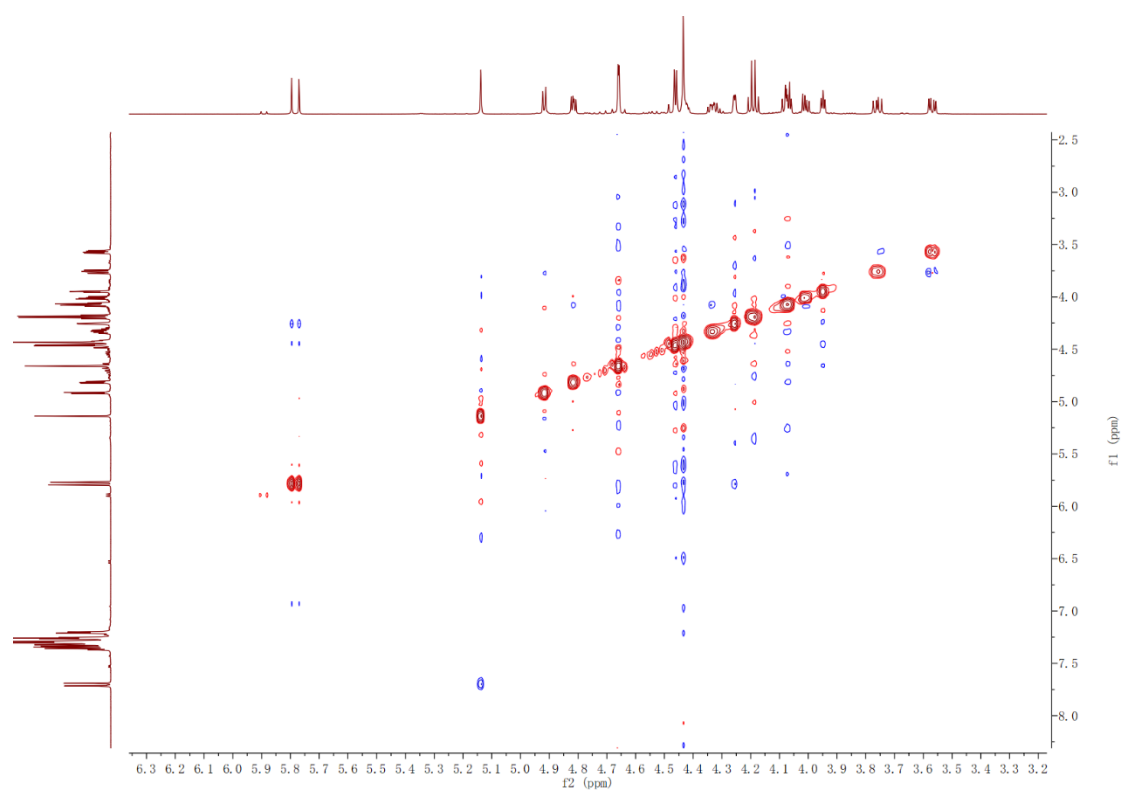


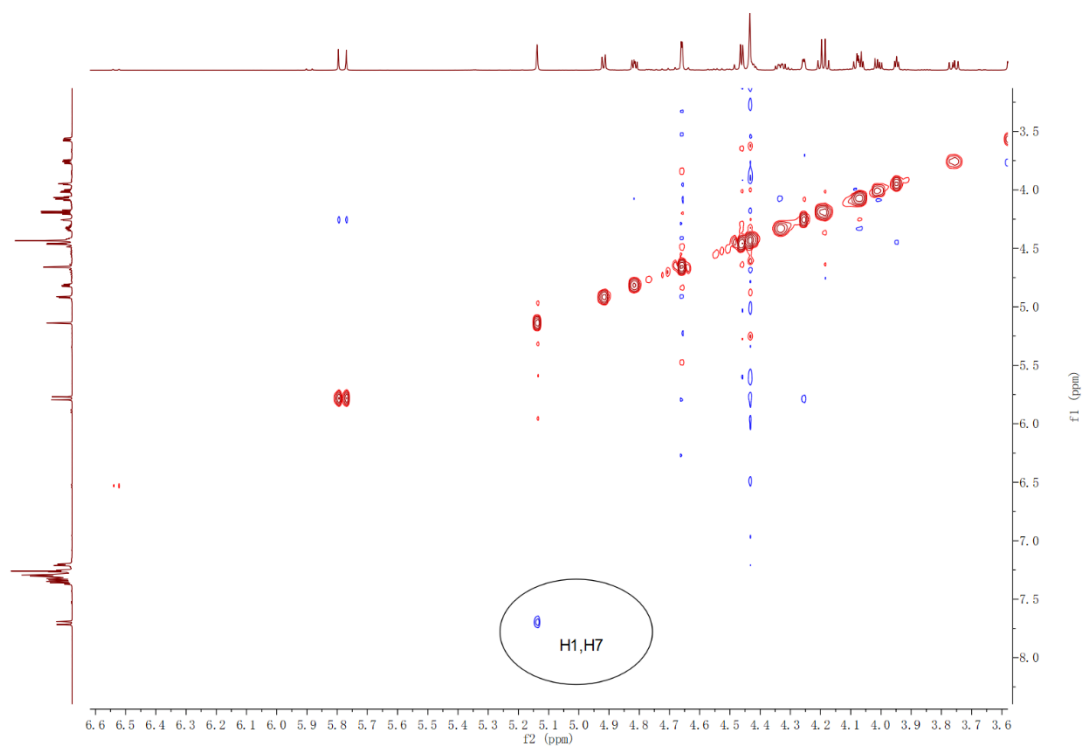


COSY spectrum of compound 4p

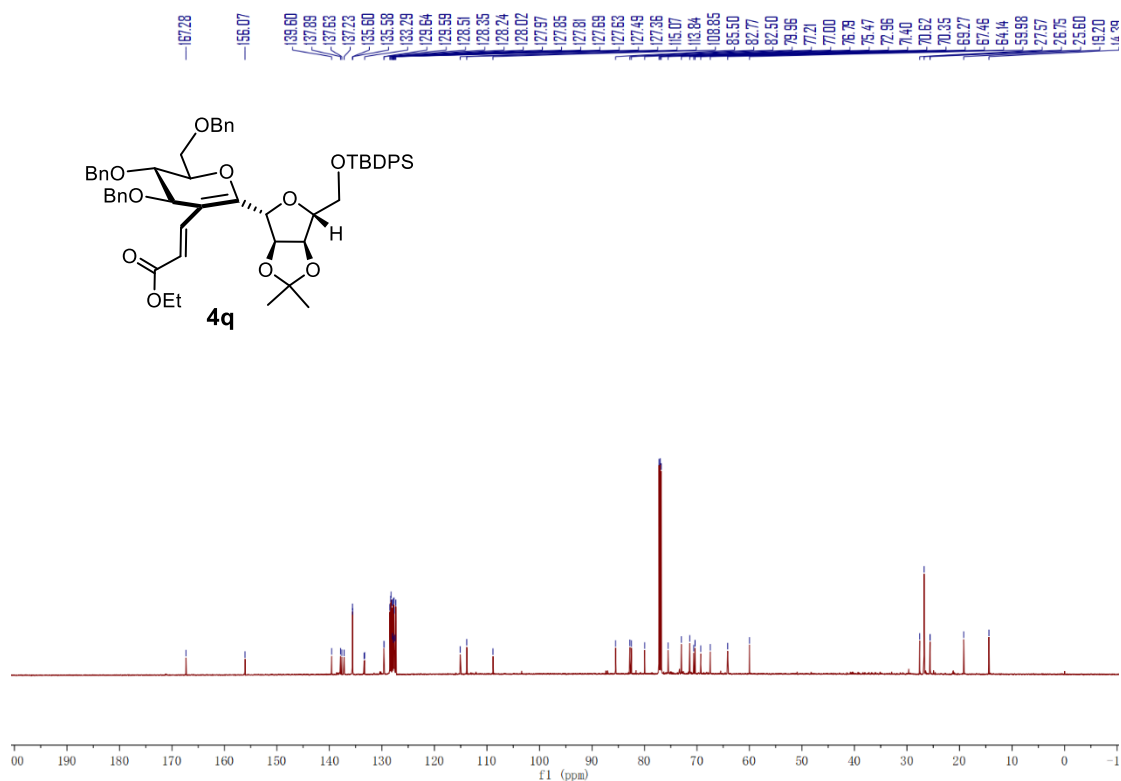
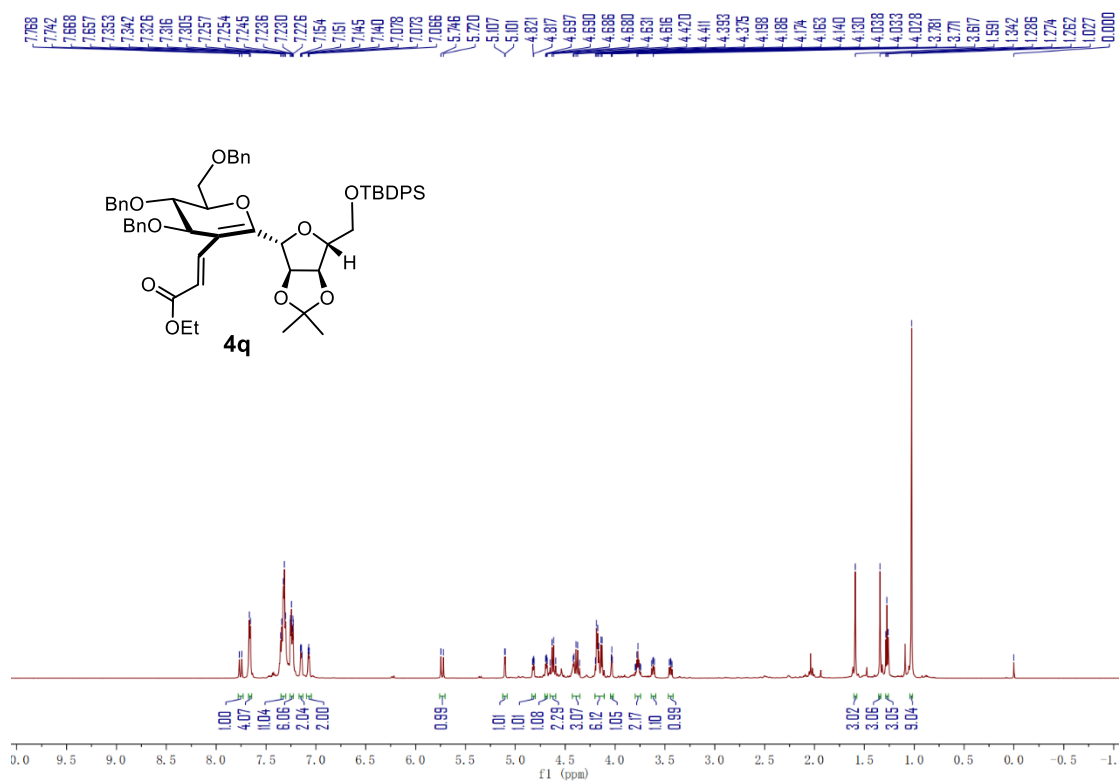


NOESY

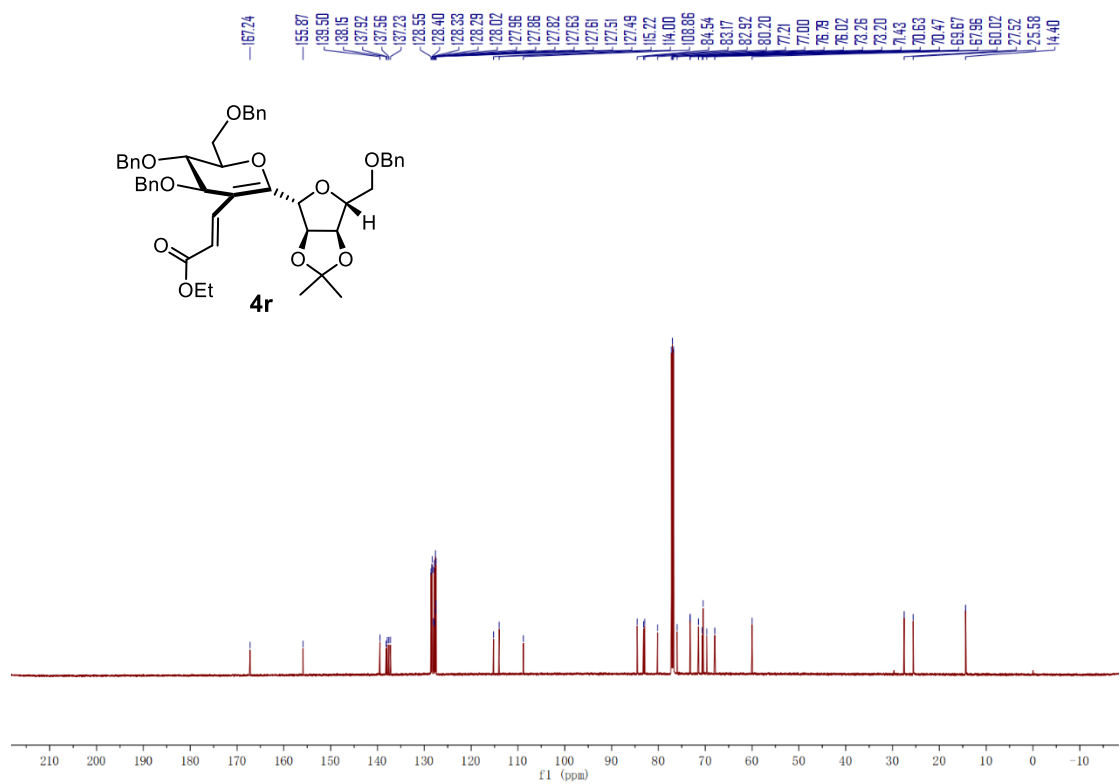
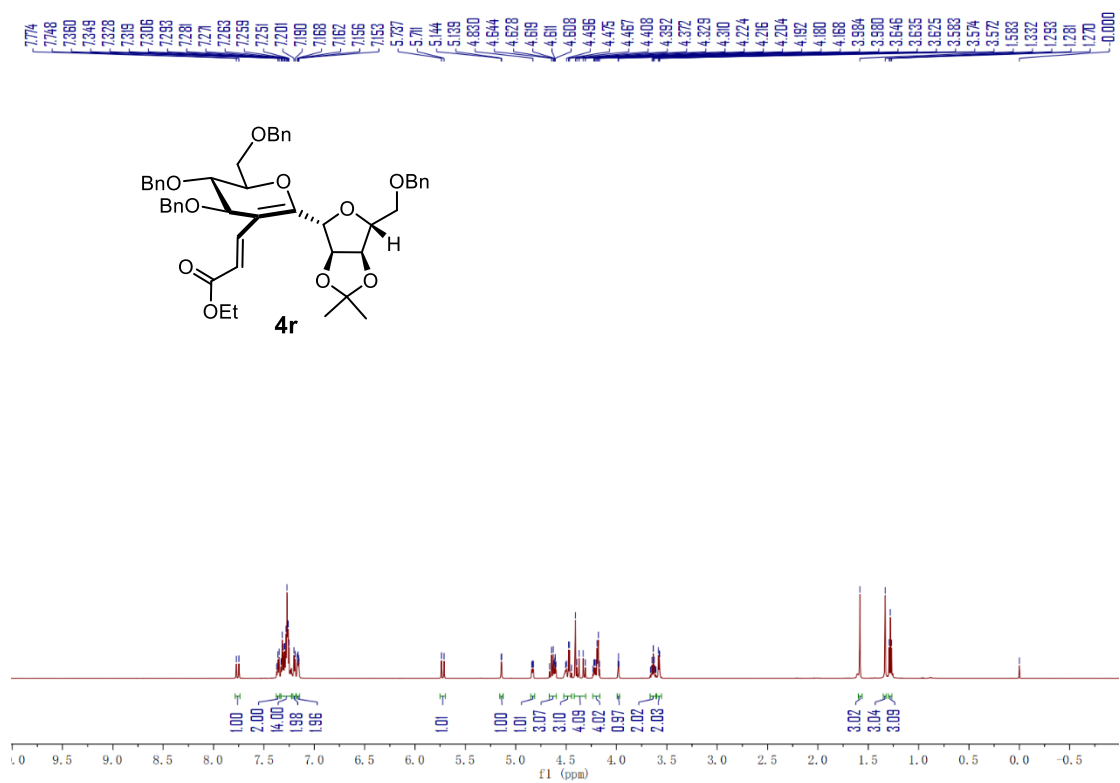




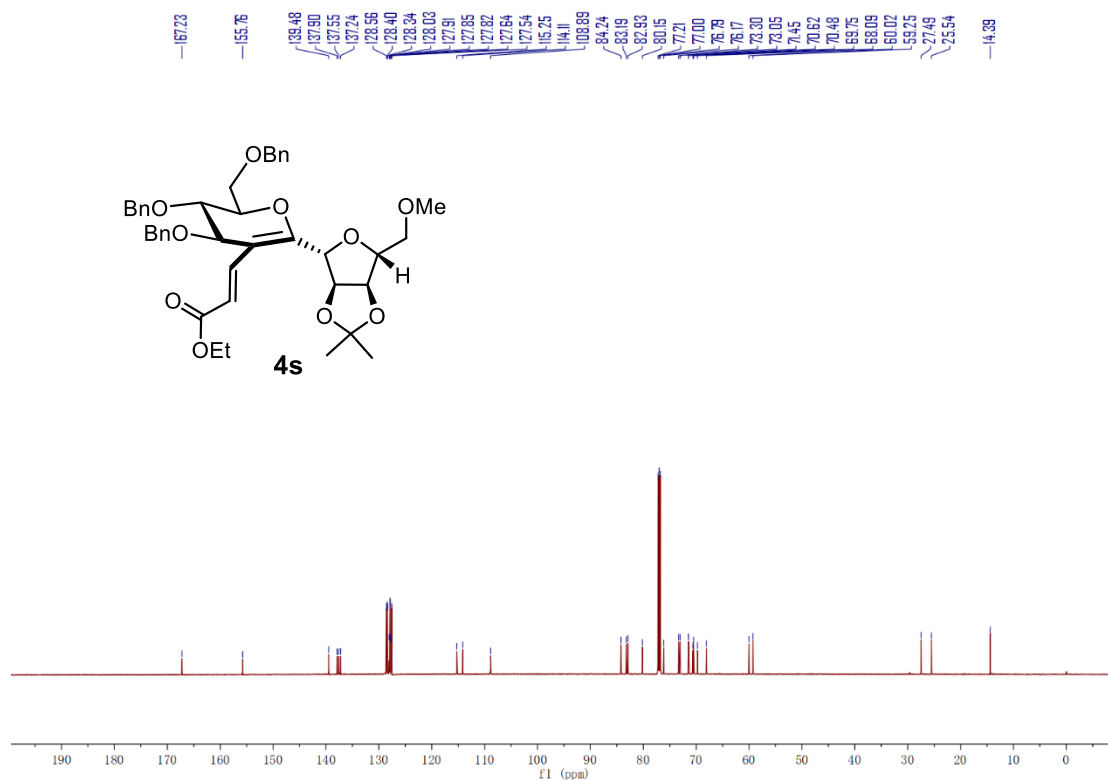
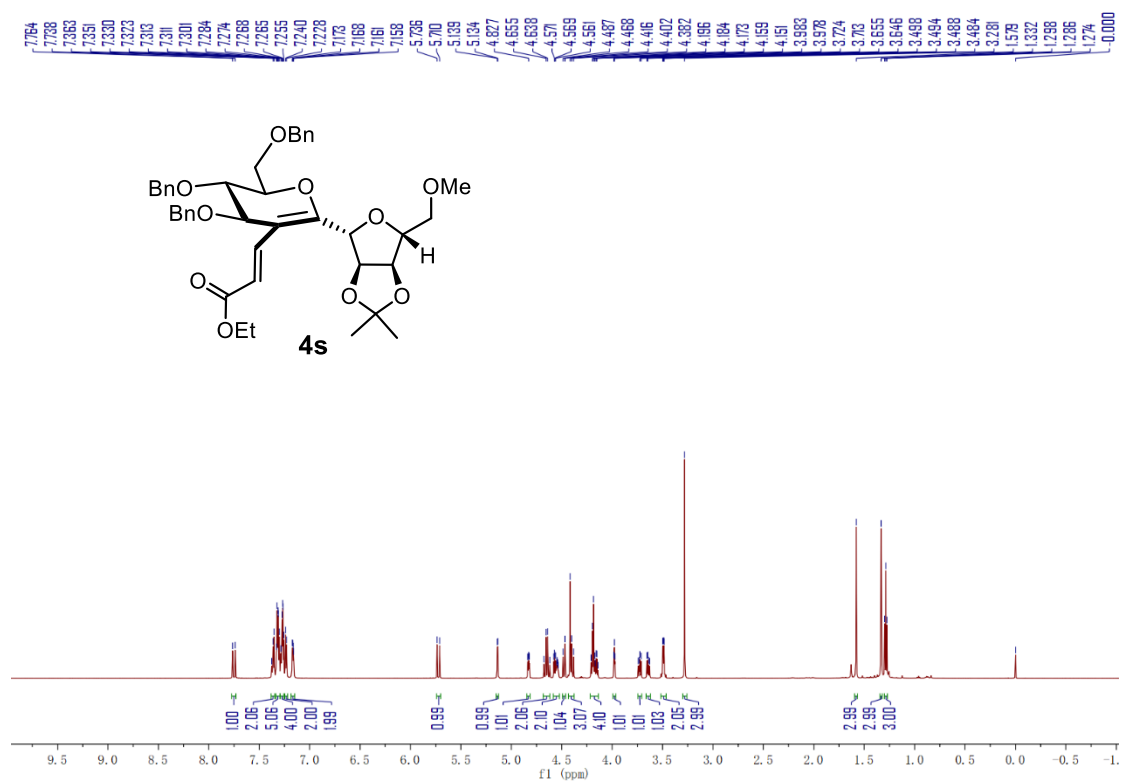
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



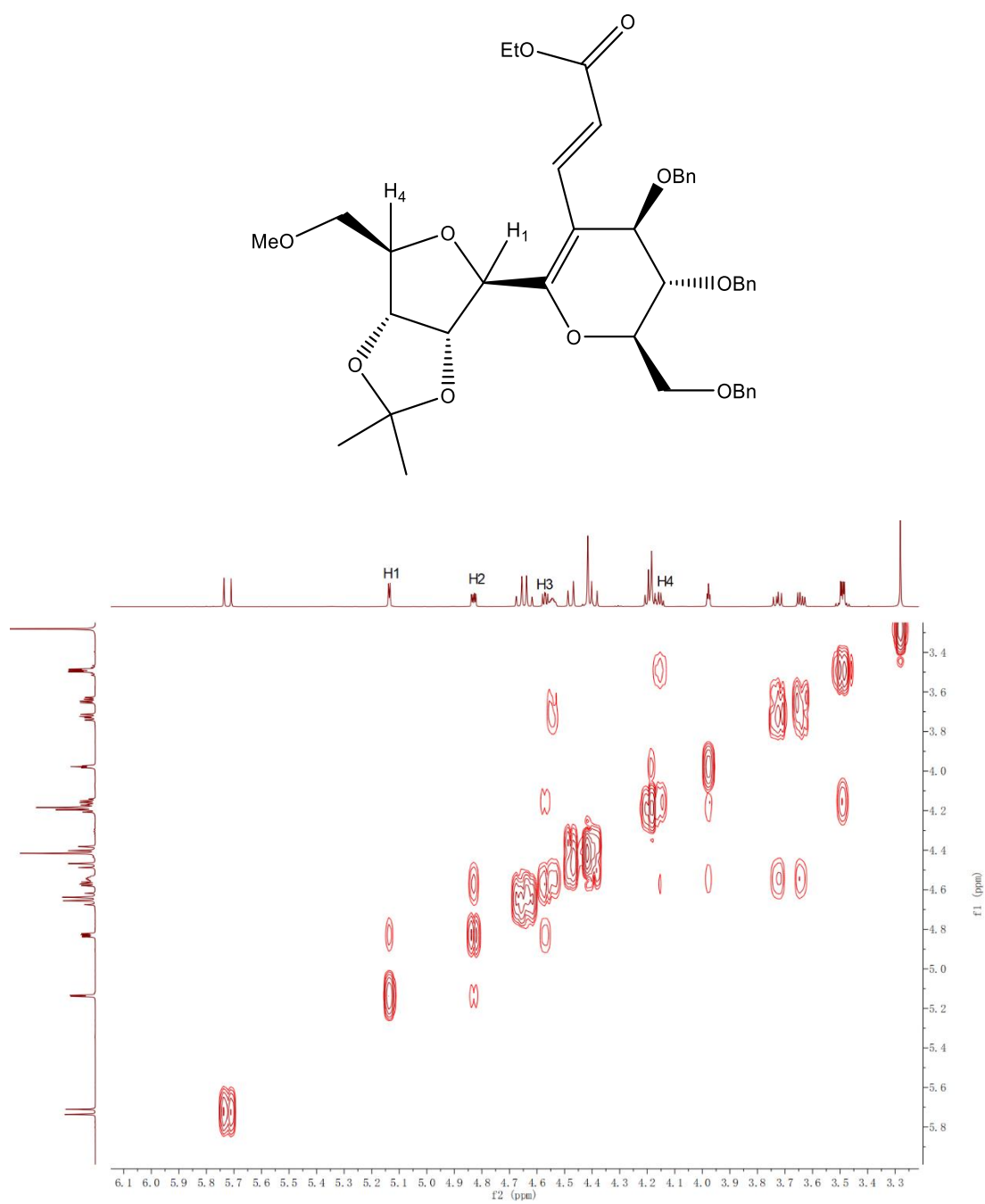
(¹H NMR, 600 MHz, CDCl₃; ¹³C {¹H} NMR, 151 MHz, CDCl₃)



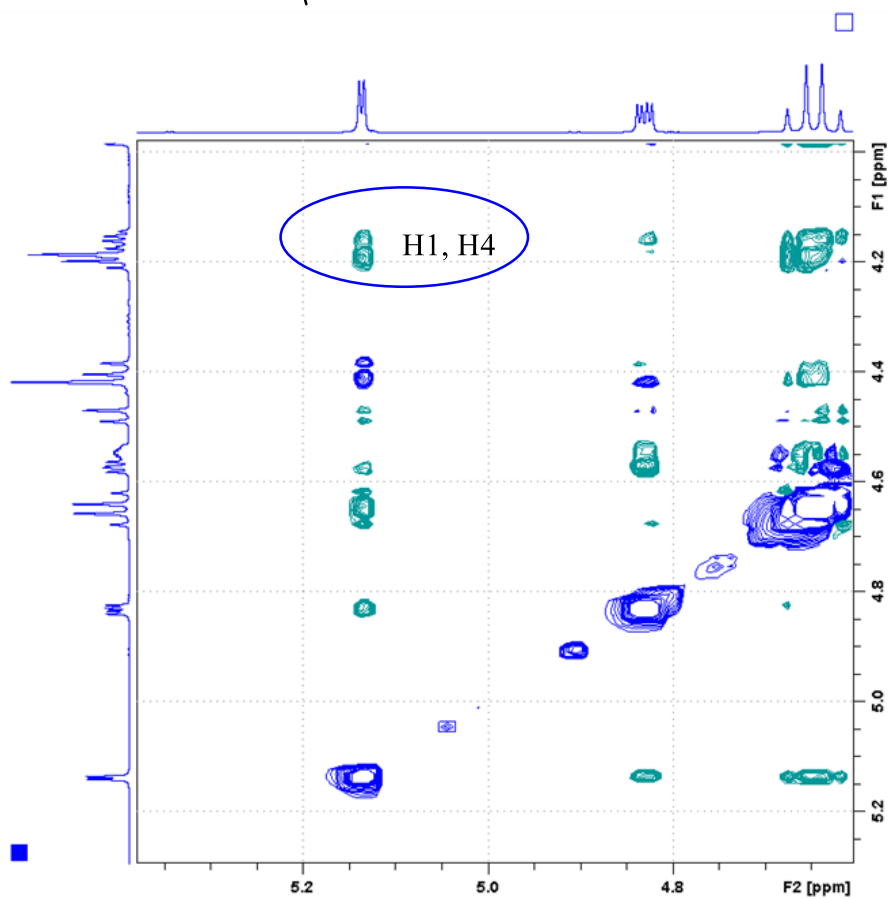
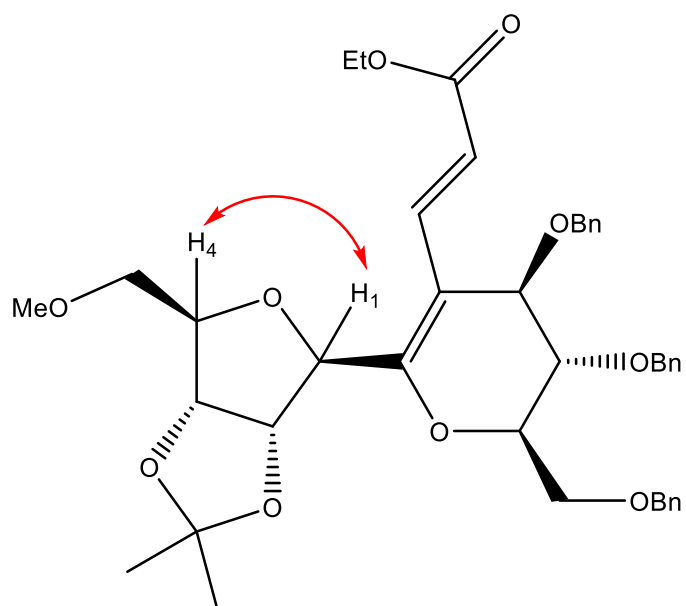
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



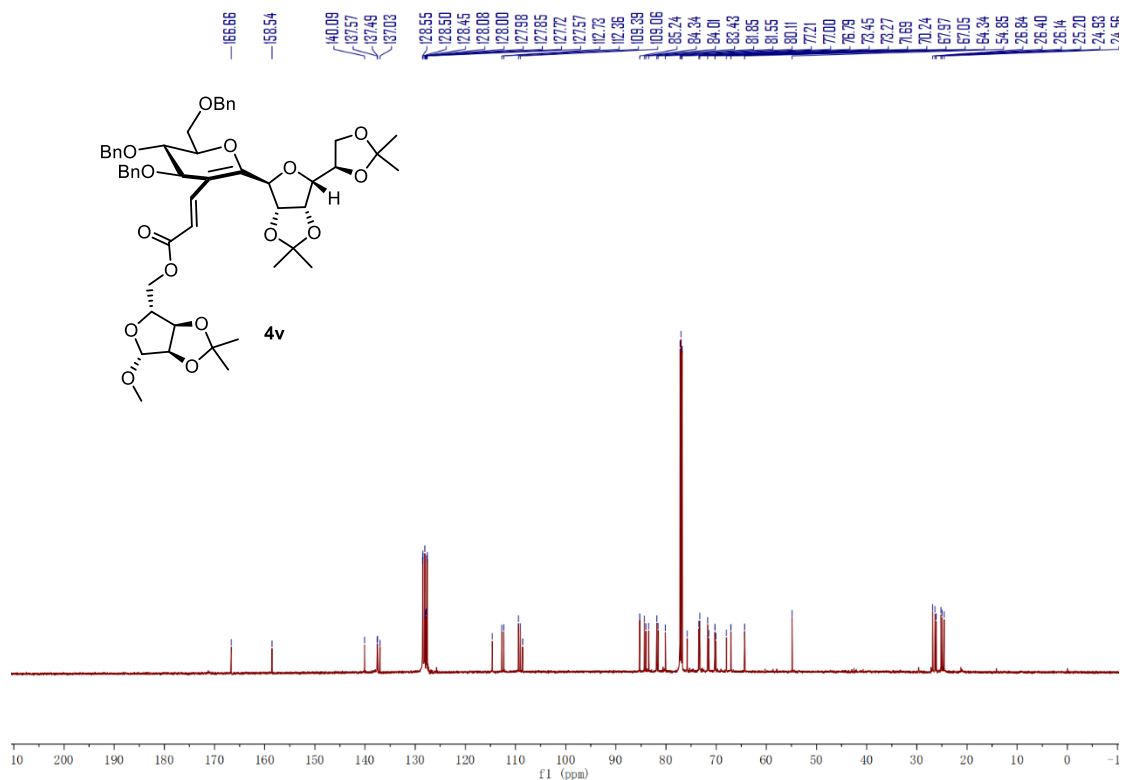
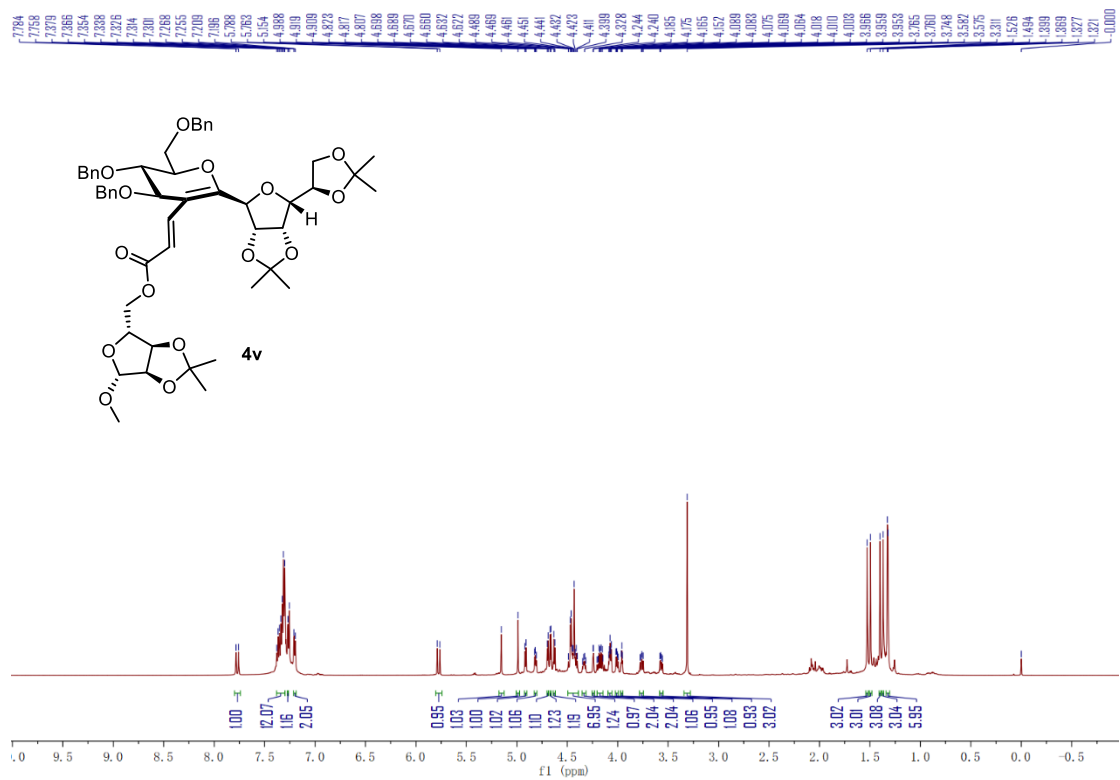
COSY spectrum of compound 4s



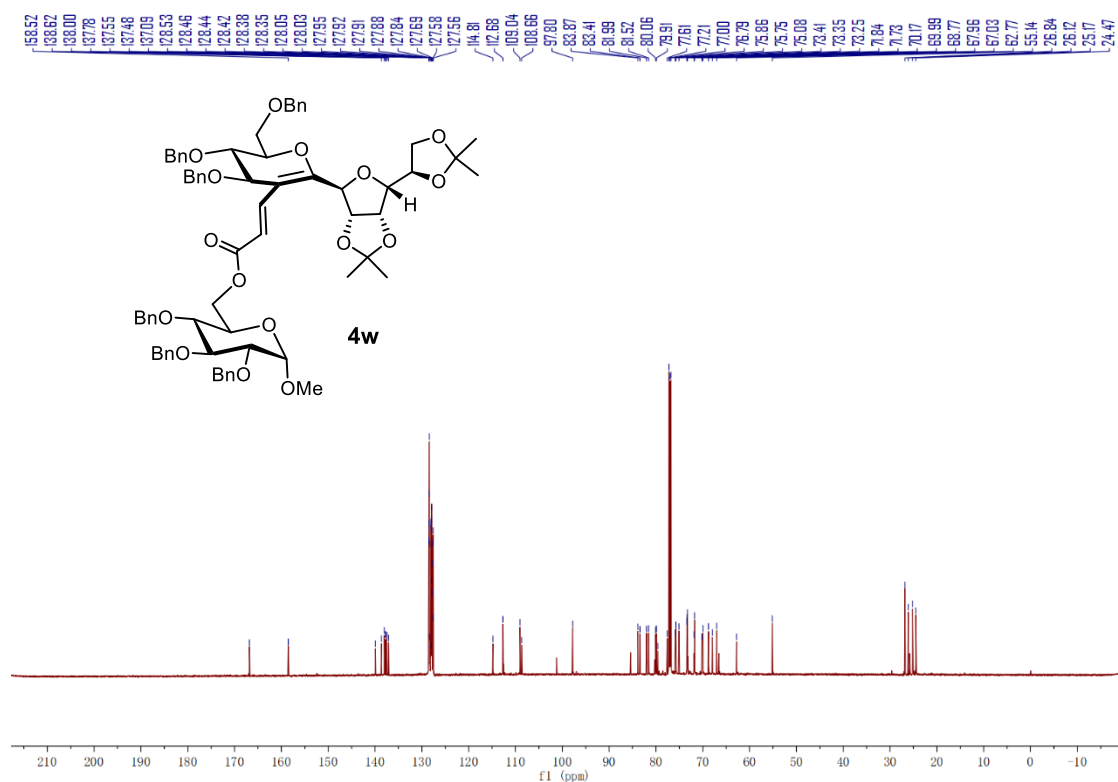
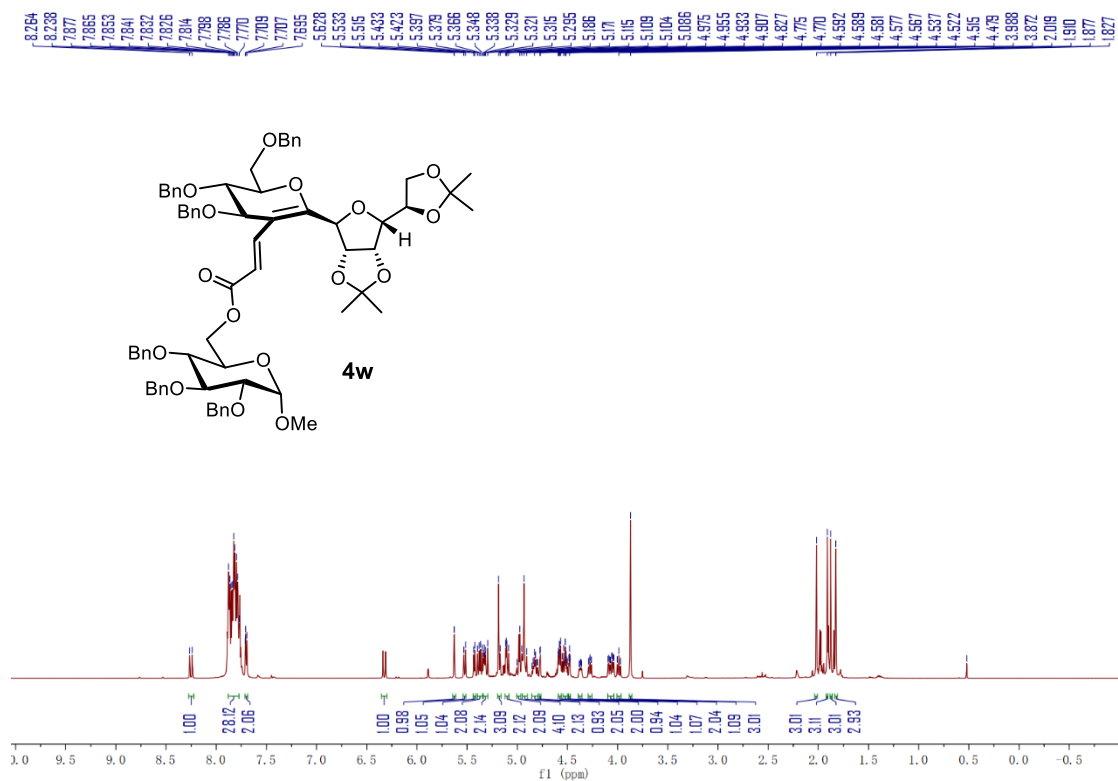
NOESY



(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



Chemical structure of compound **4x** is shown above the spectrum. The structure is a complex molecule featuring a central furanose ring substituted with a benzylidene-protected diol, a benzylidene-protected diol, and a benzylidene-protected diol.

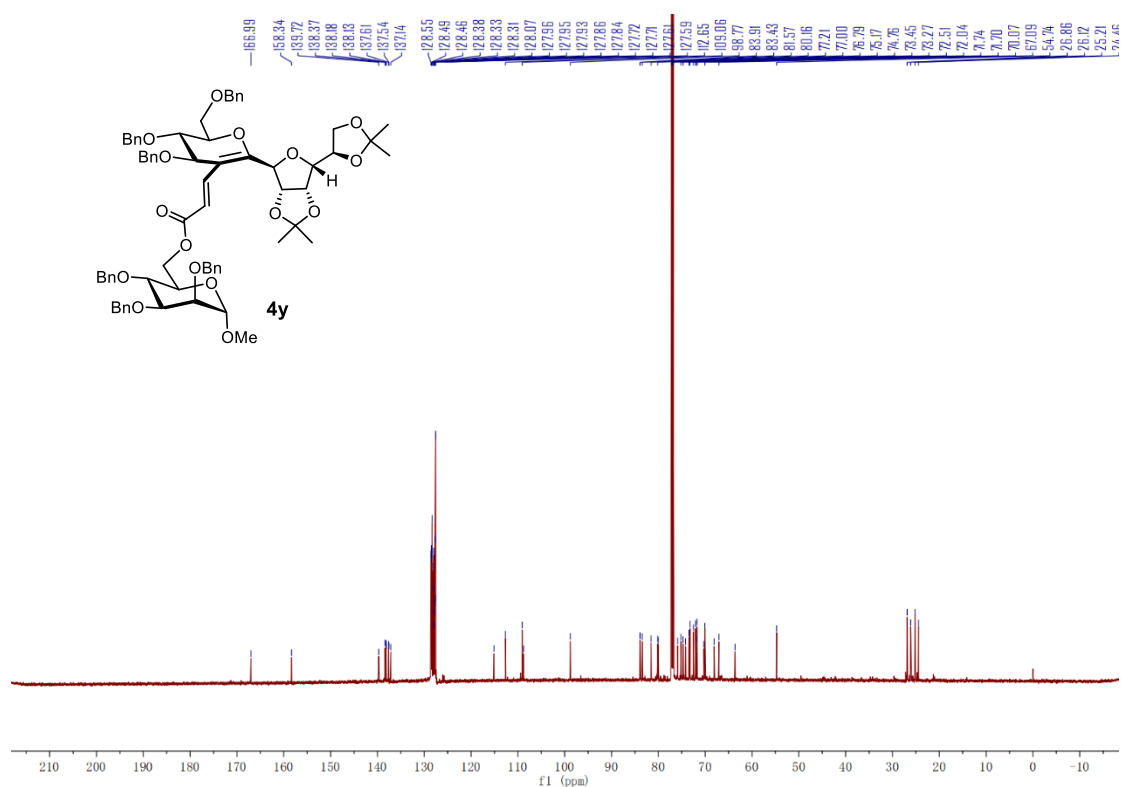
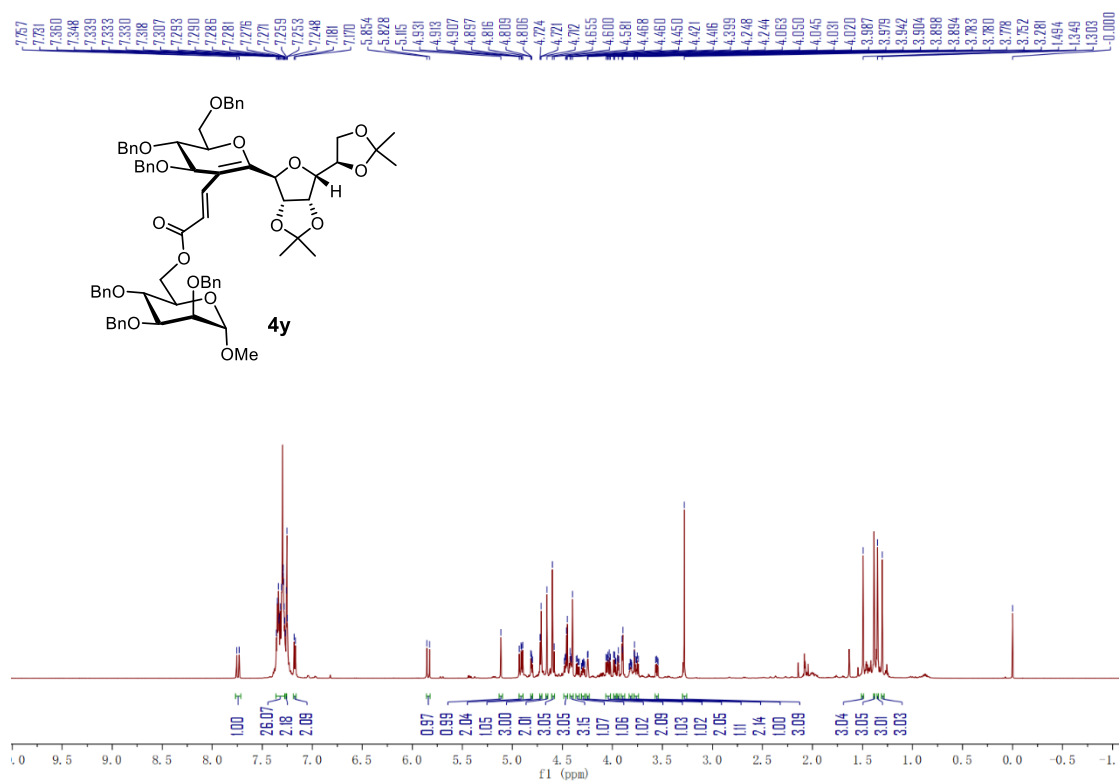
¹H NMR spectrum (CDCl₃) of compound **4x**. The x-axis represents the chemical shift in ppm, ranging from 0.0 to 10.0. The spectrum shows several peaks, with integrations provided below the baseline. A list of chemical shifts (δ) is provided at the top of the image.

Chemical shifts (δ) listed at the top: 7.752, 7.726, 7.362, 7.349, 7.335, 7.323, 7.306, 7.293, 7.266, 7.257, 7.202, 7.200, 7.189, 5.854, 5.828, 5.551, 5.543, 5.535, 4.97, 4.907, 4.85, 4.812, 4.659, 4.633, 4.629, 4.620, 4.616, 4.467, 4.457, 4.437, 4.426, 4.423, 4.337, 4.331, 4.327, 4.324, 4.319, 4.287, 4.275, 4.258, 4.256, 4.086, 4.076, 4.072, 4.066, 4.061, 4.010, 4.002, 3.950, 1.573, 1.53, 1.465, 1.394, 1.368, 1.349, 1.326, 1.307.

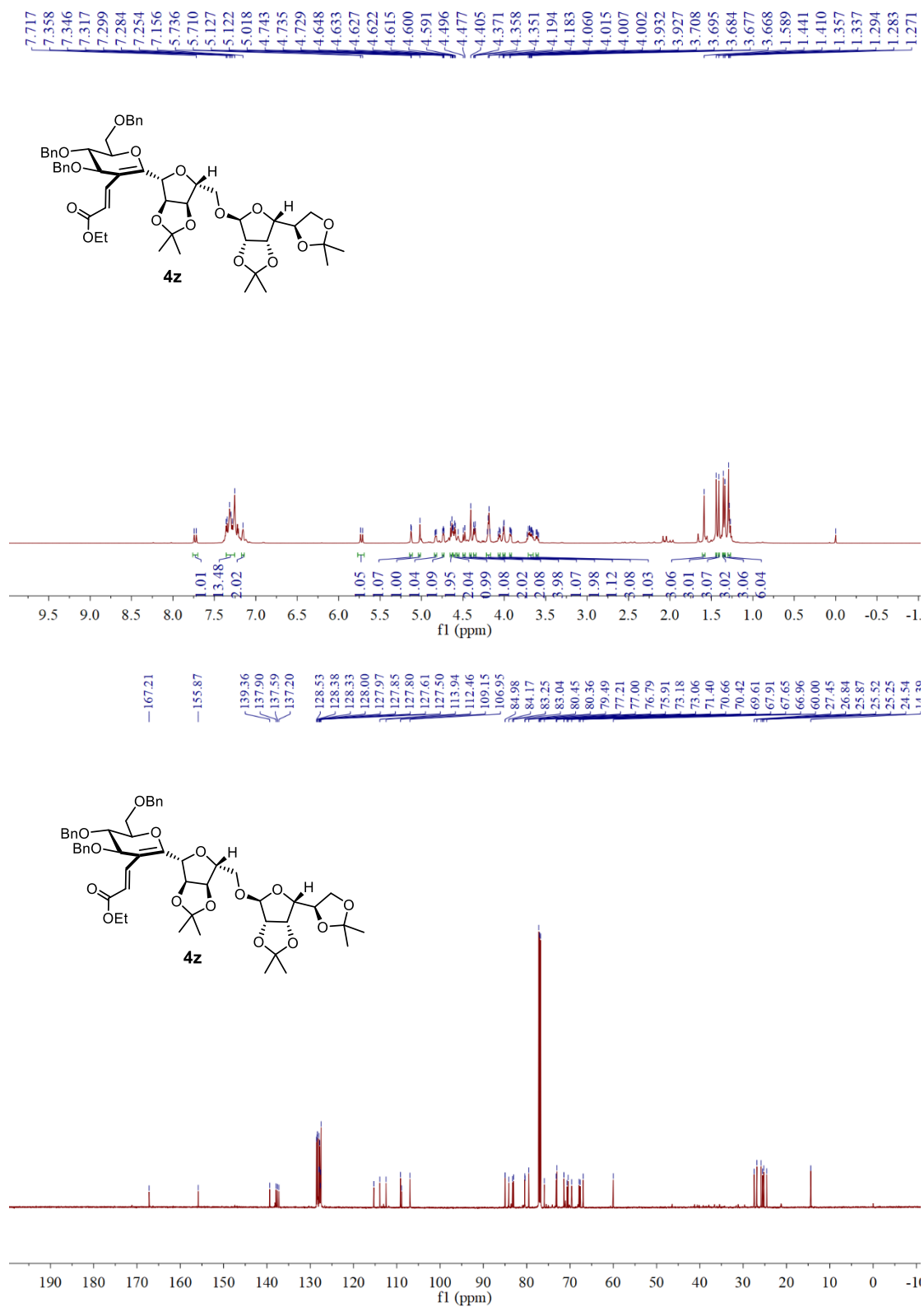
Integrations (from left to right): 1.00, 13.09, 2.03, 1.02, 0.94, 0.97, 1.09, 2.03, 1.06, 2.01, 3.05, 3.06, 2.99, 3.08, 1.00, 1.03, 1.06, 6.08, 3.09, 3.10, 3.08, 3.19, 6.03.



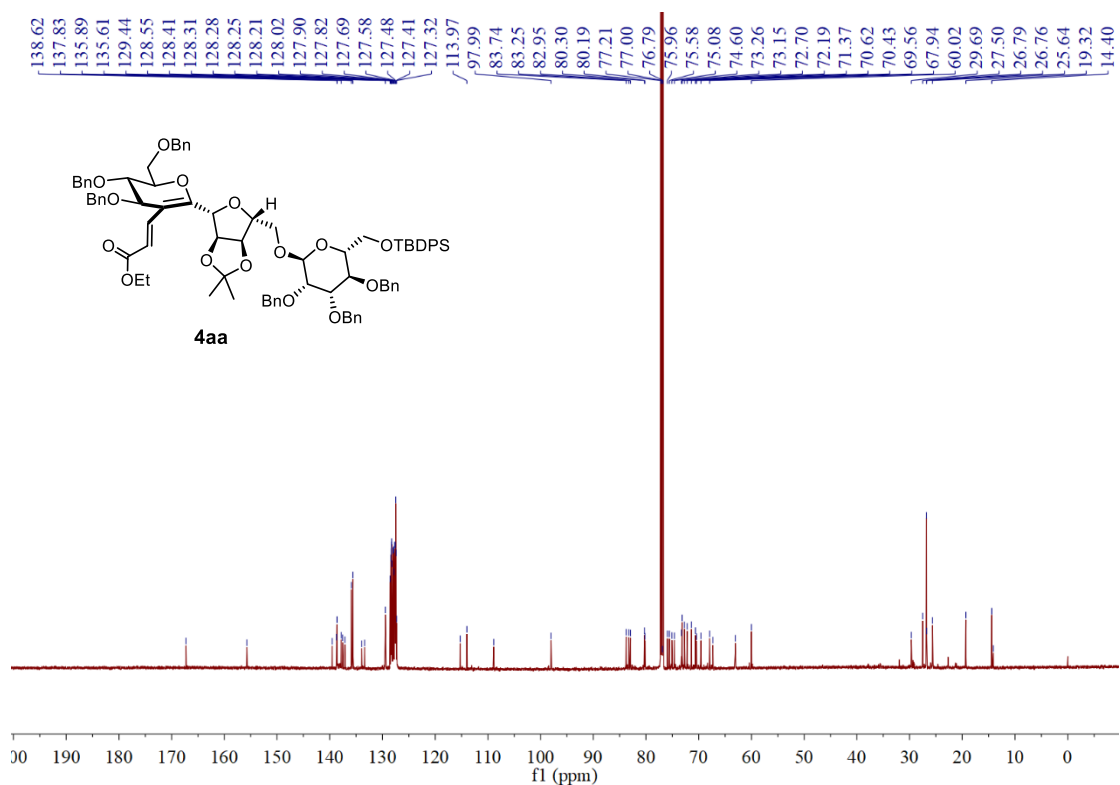
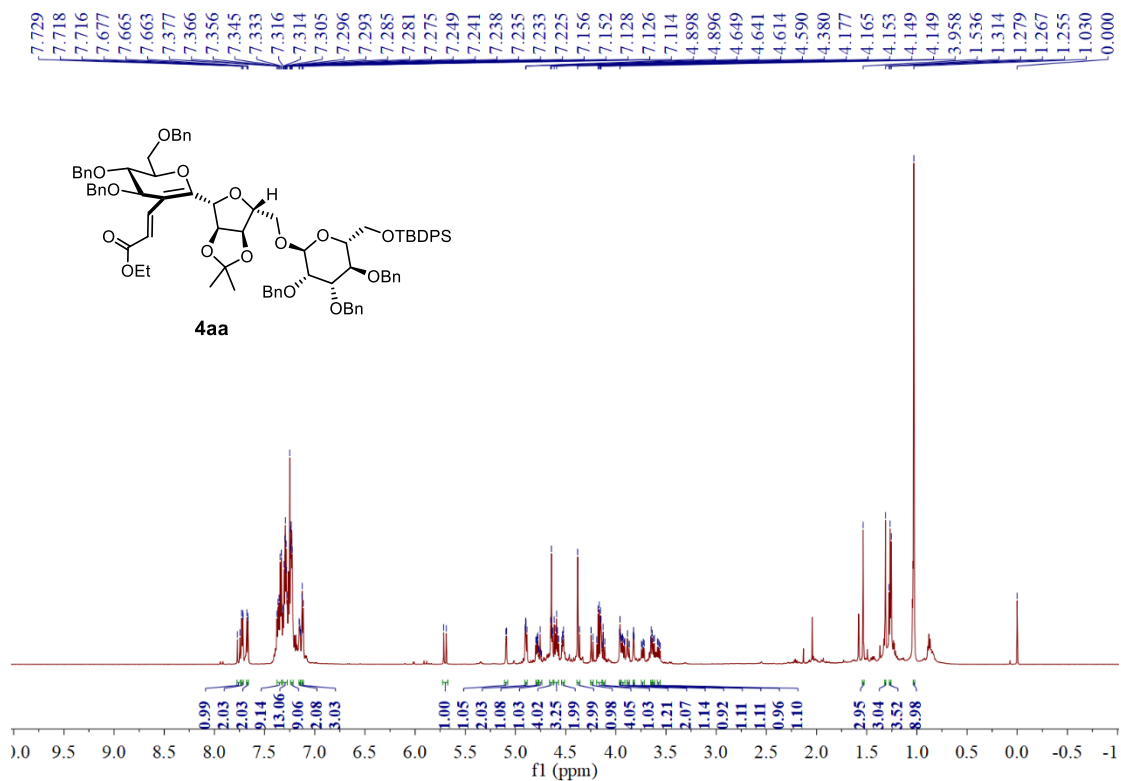
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



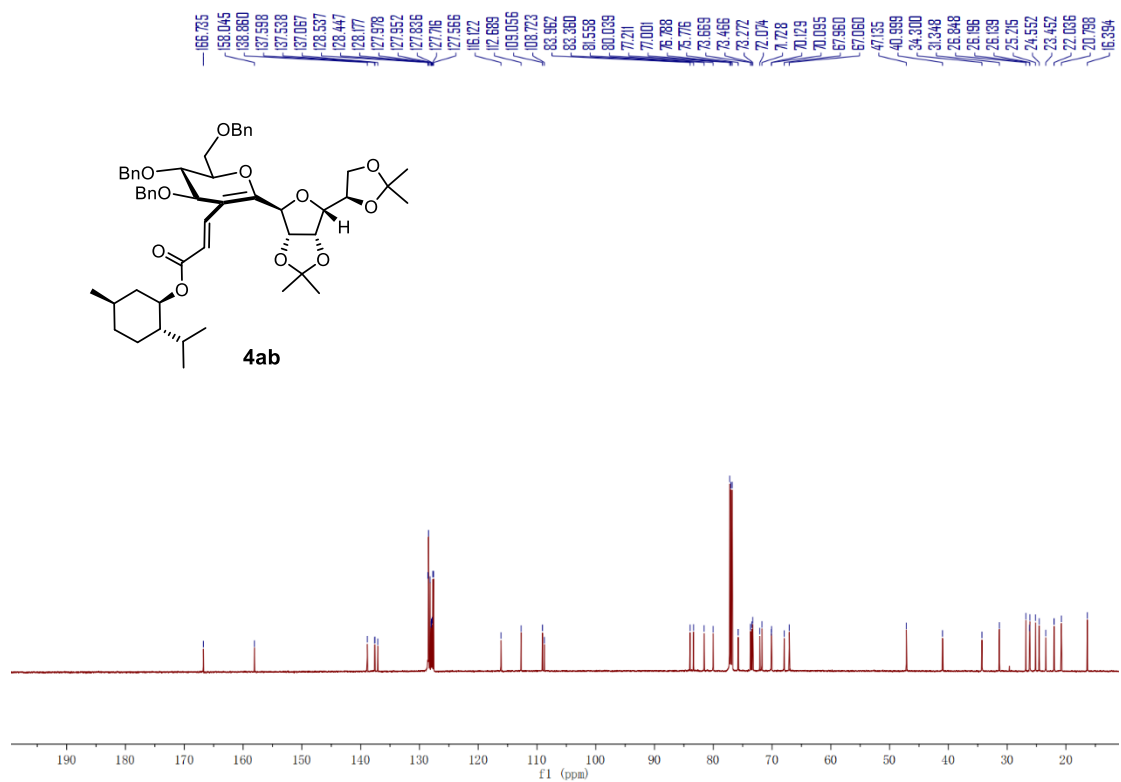
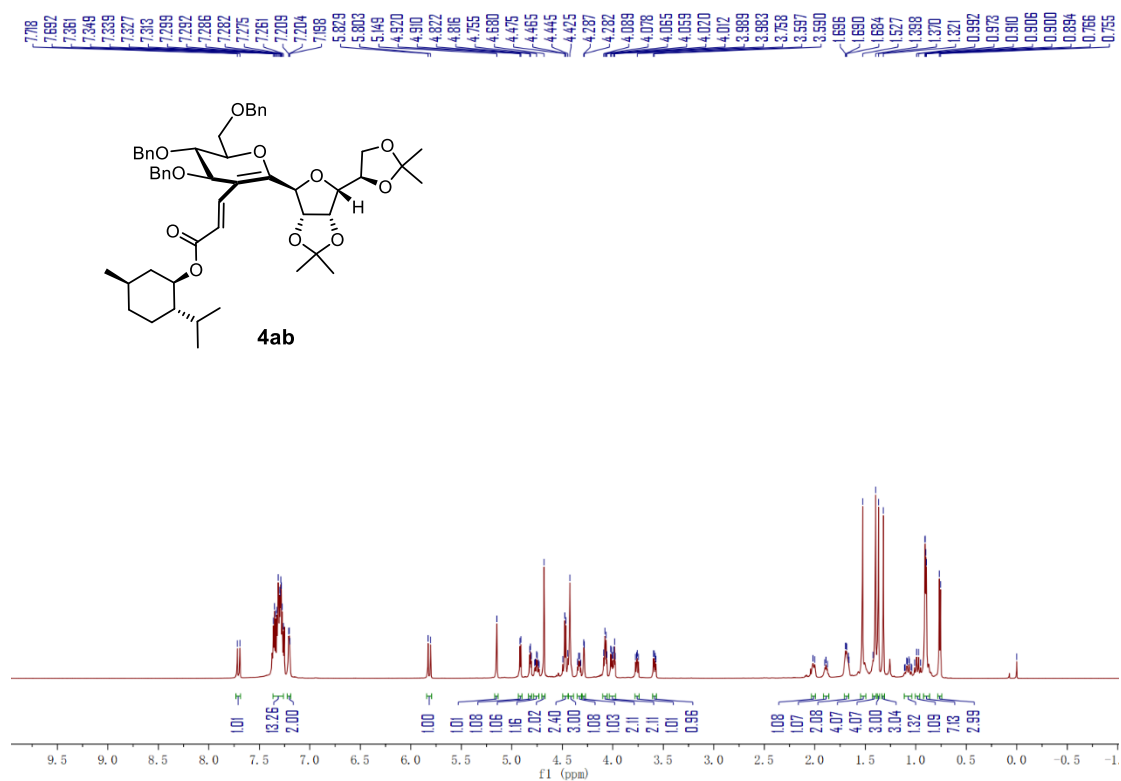
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



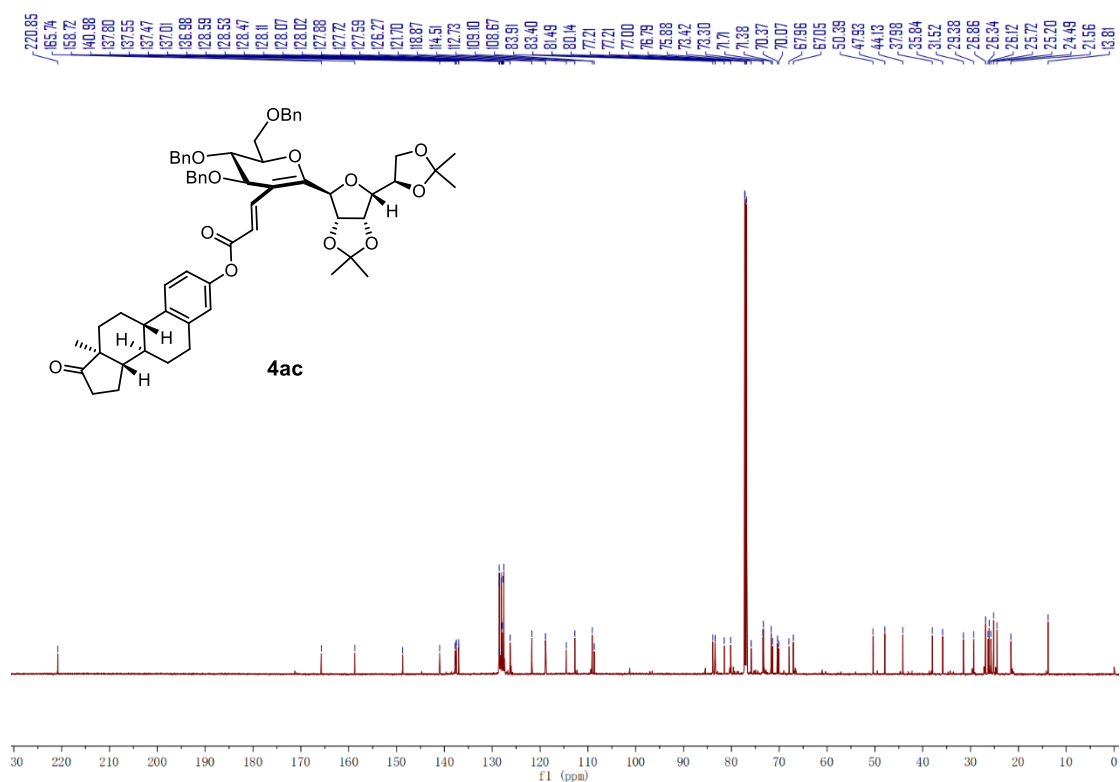
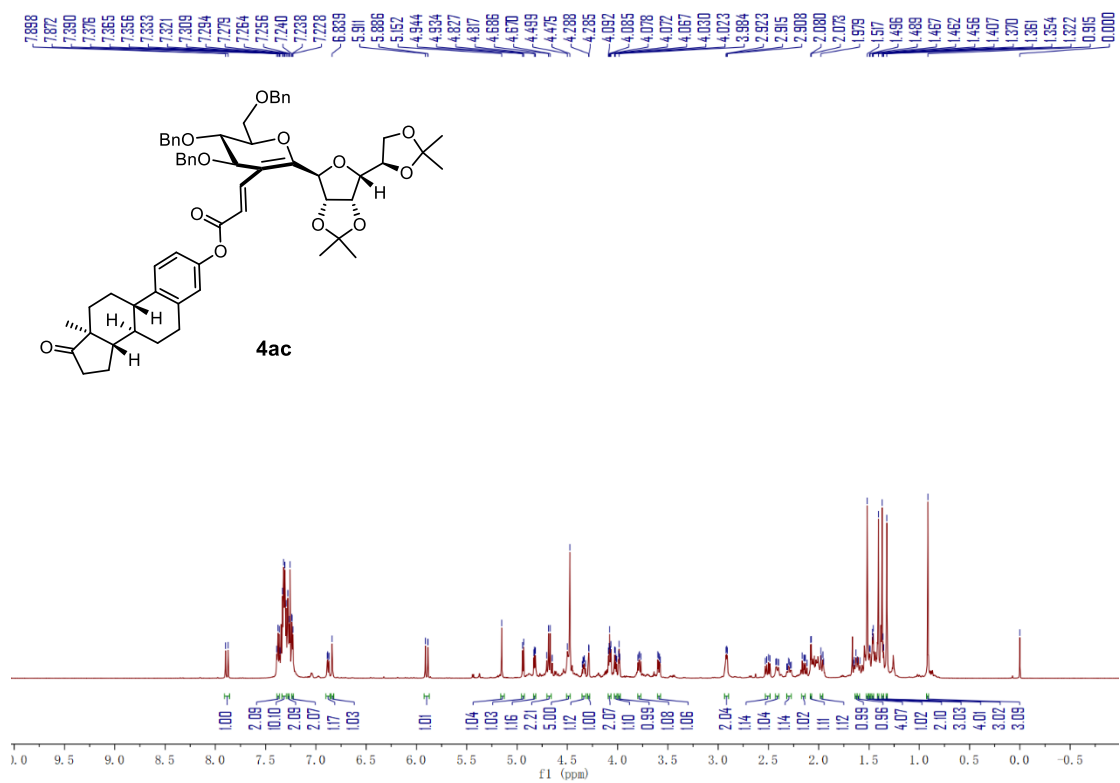
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



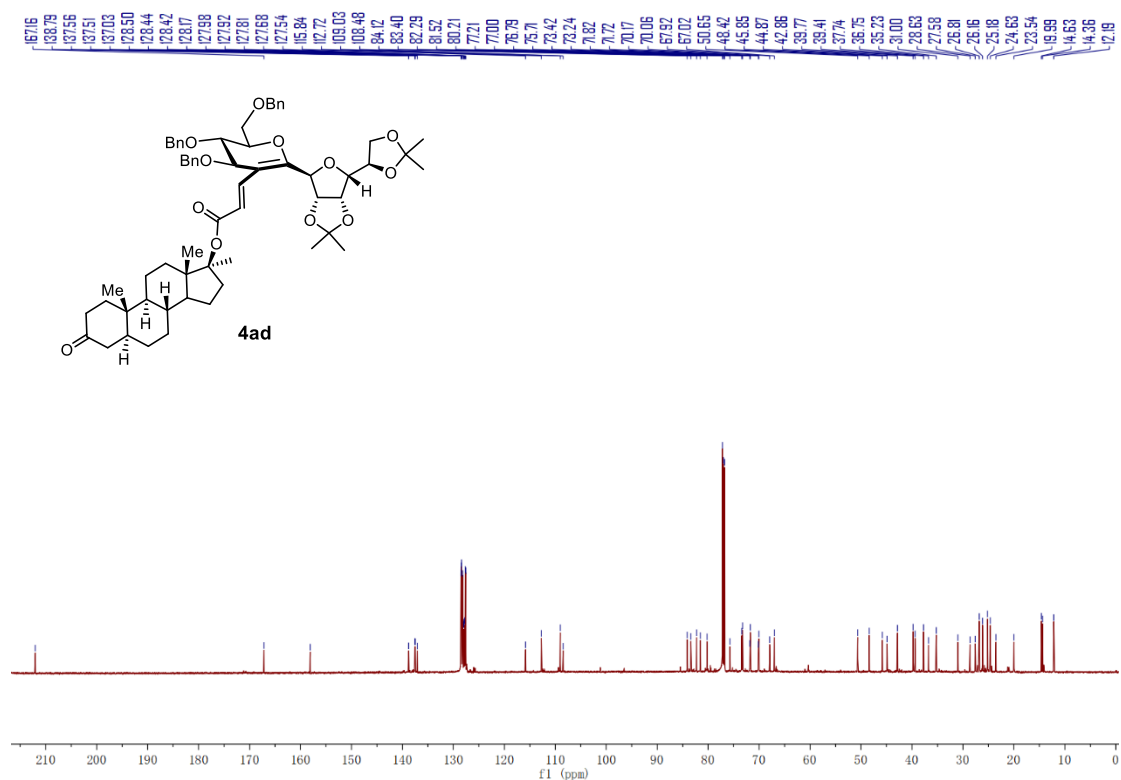
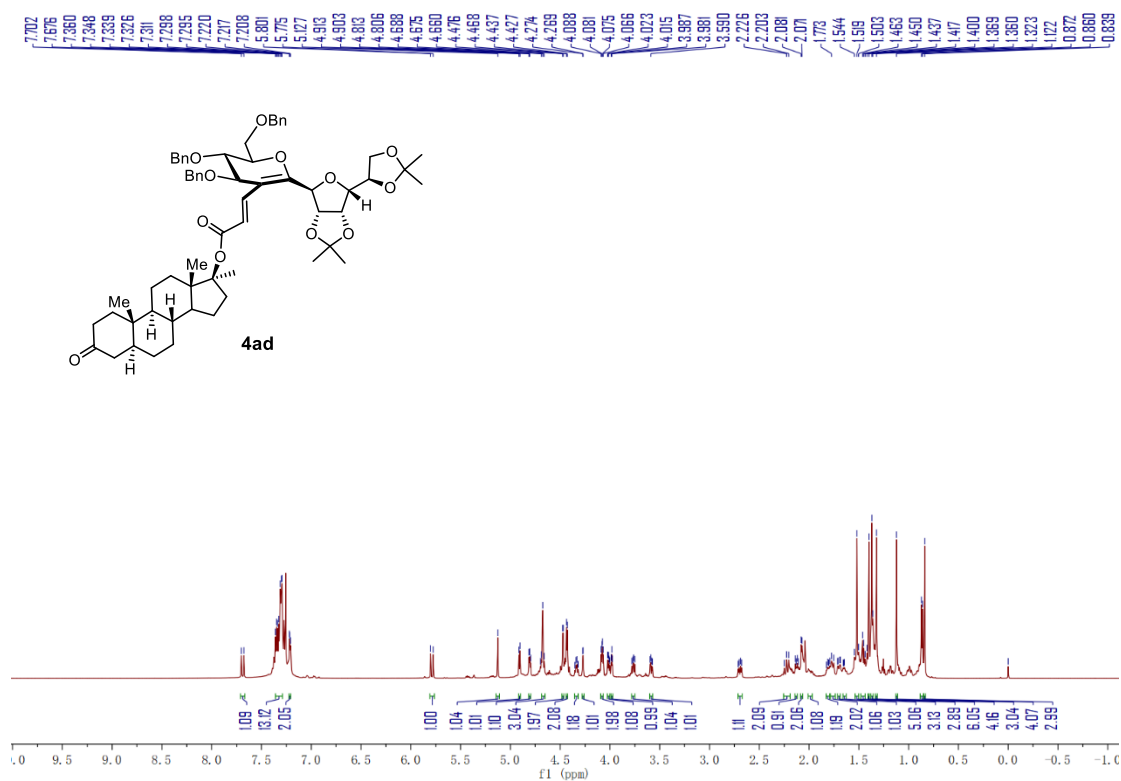
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



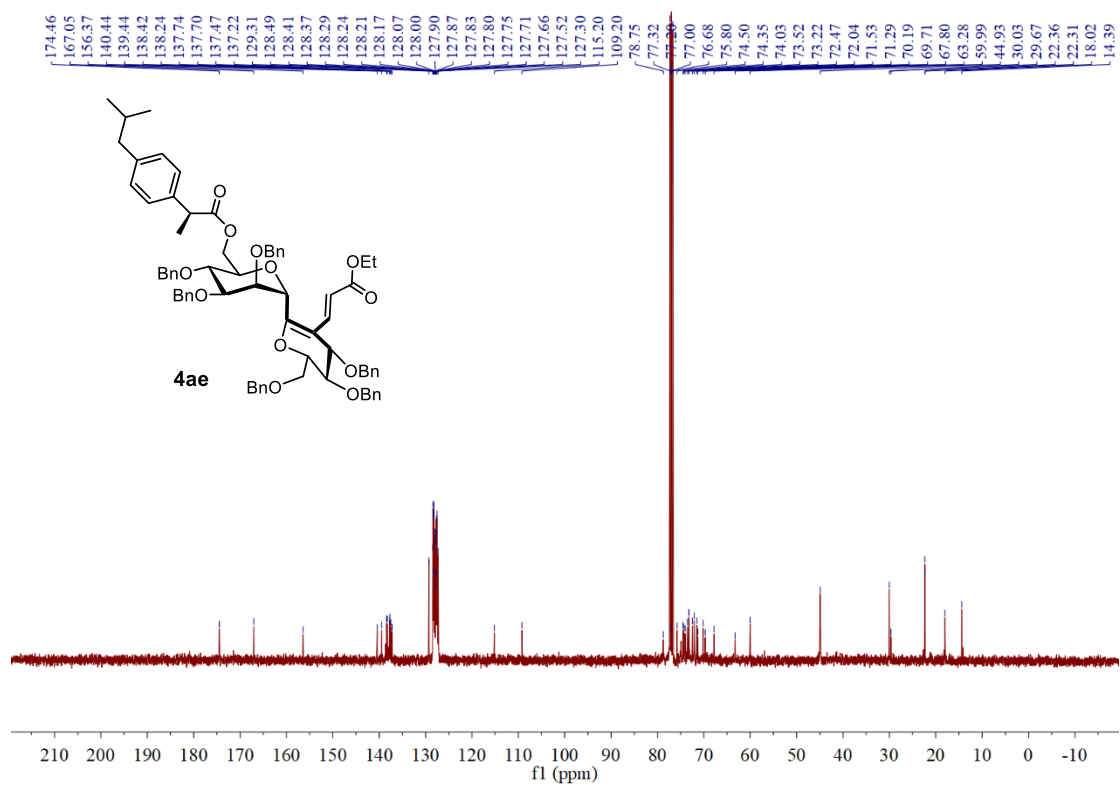
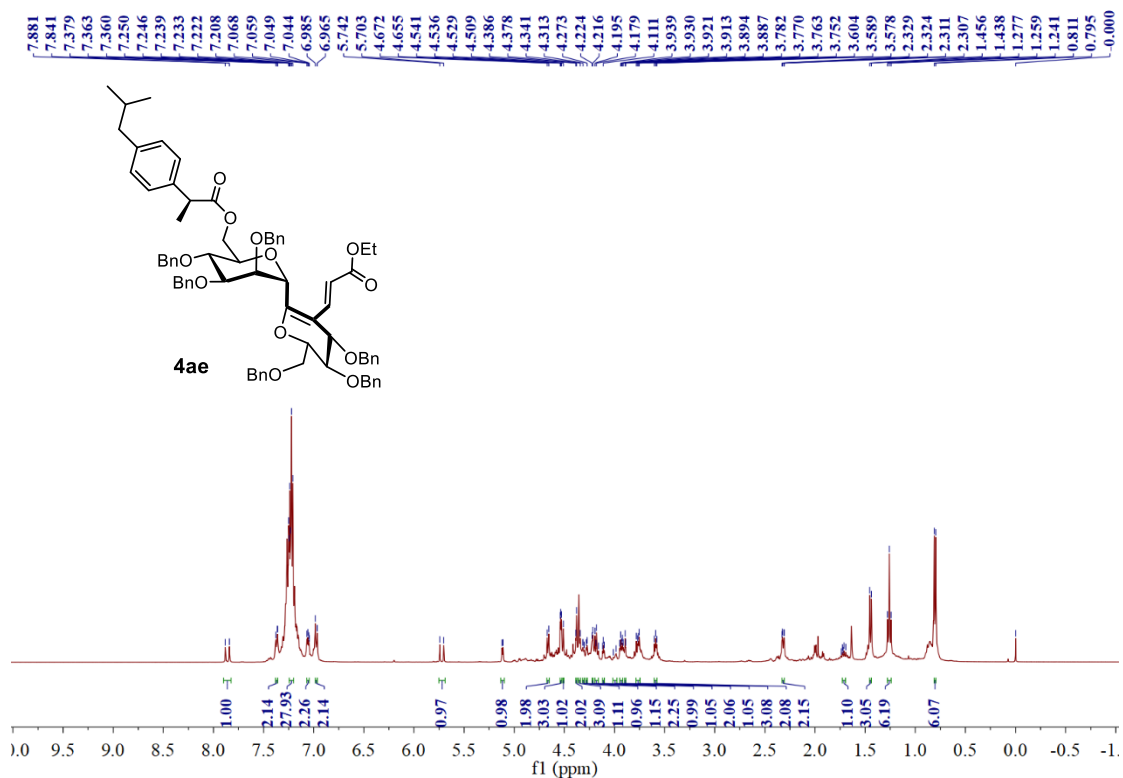
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



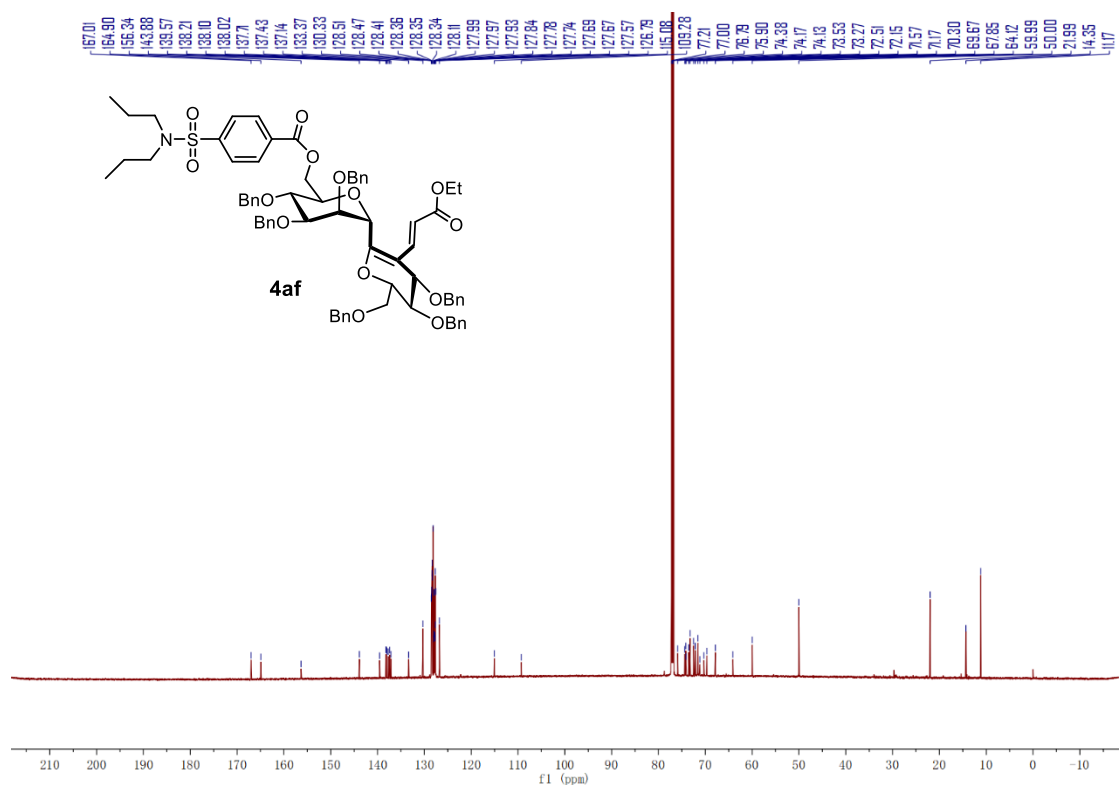
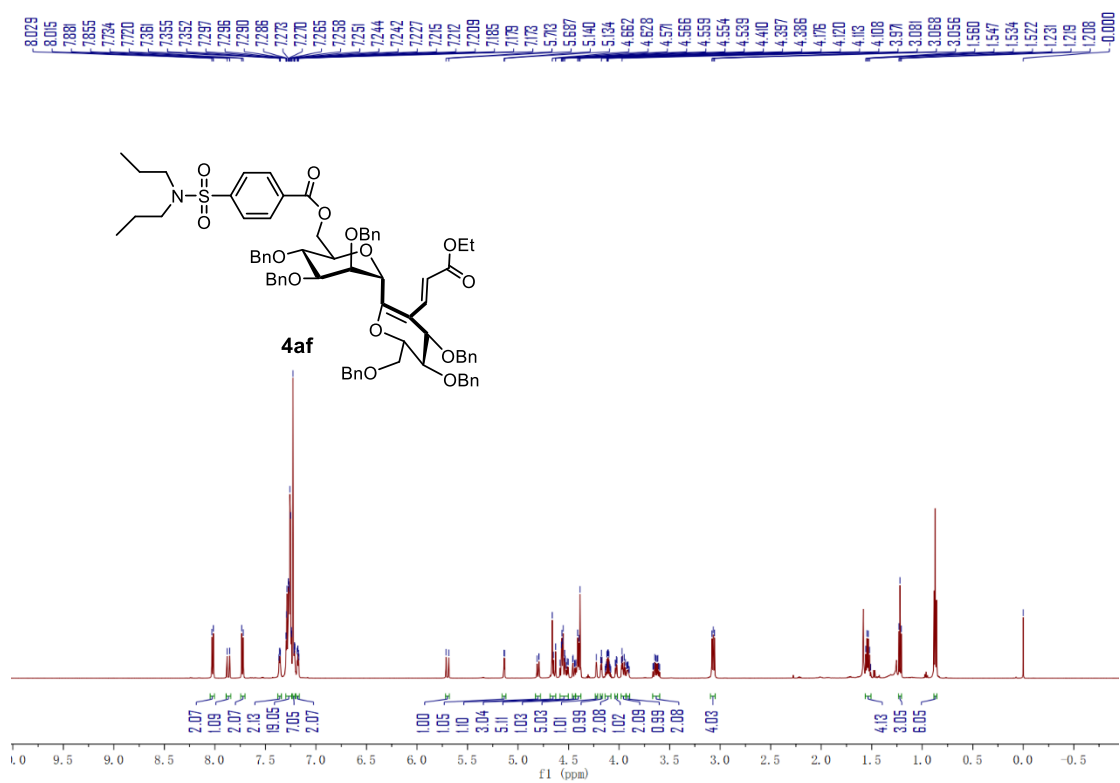
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



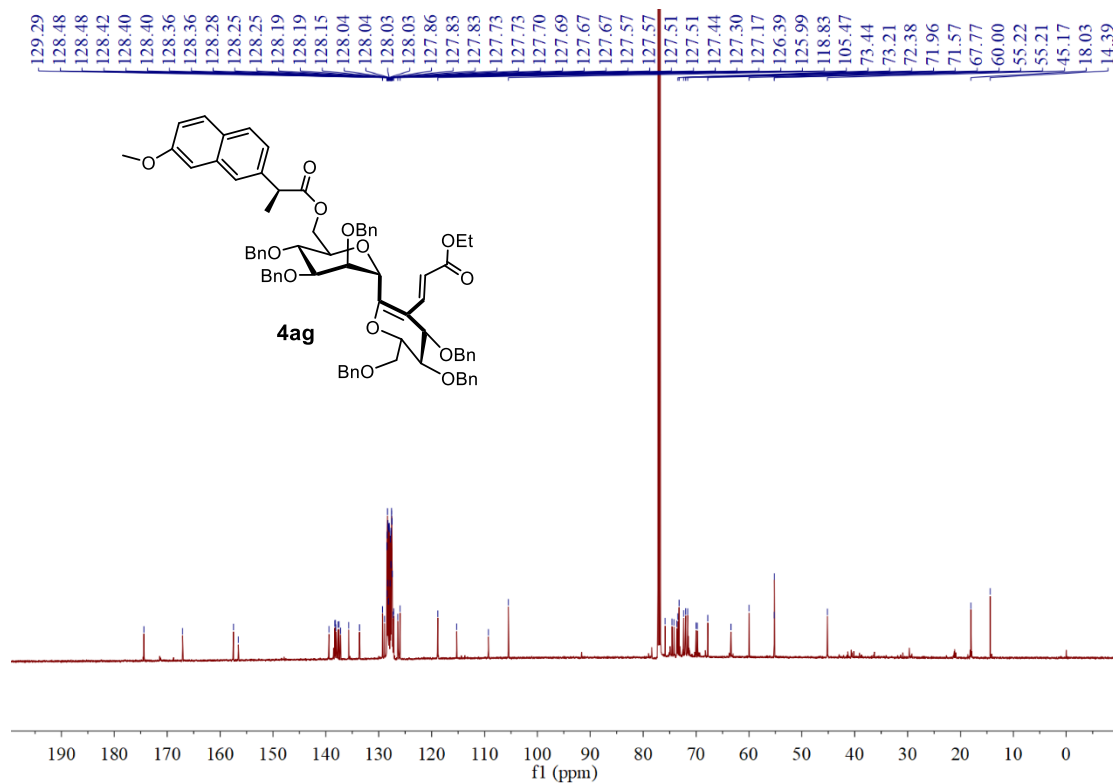
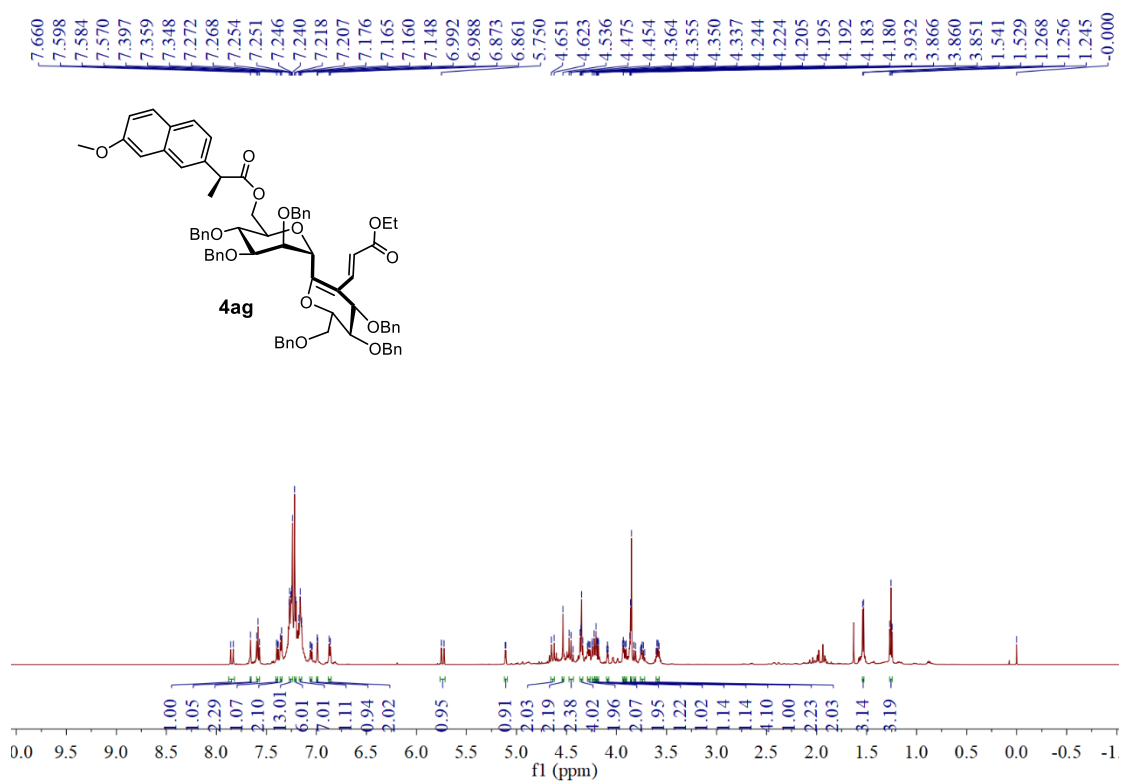
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



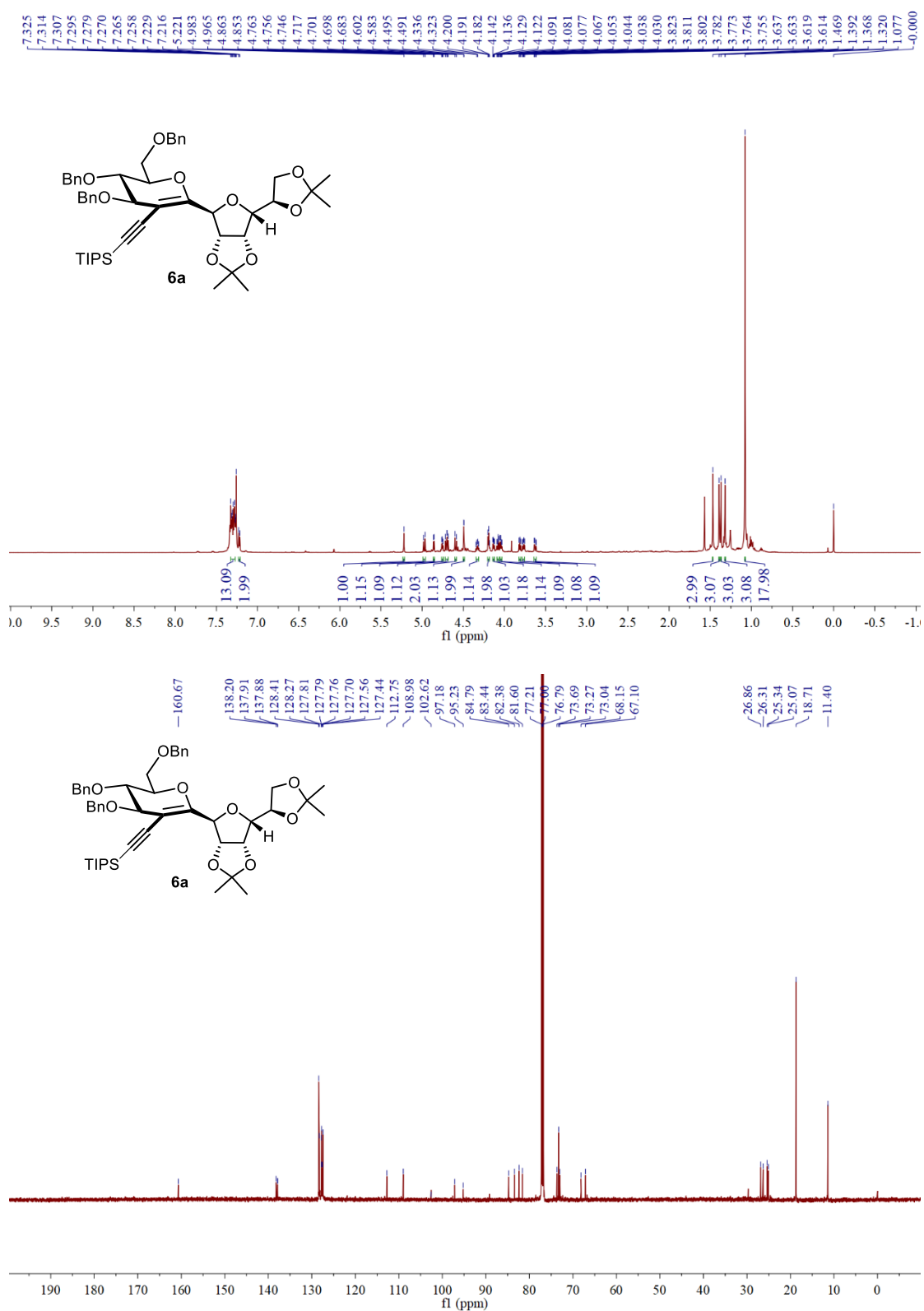
(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)



(¹H NMR, 600 MHz, CDCl₃; ¹³C {¹H} NMR, 151 MHz, CDCl₃)



[illegible]



Chemical structure of compound **7a** is shown above the spectrum. The structure is a complex molecule featuring a central carbon atom bonded to a benzyl group, a benzyl ether, a benzyl ether, a benzyl ether, a benzyl ether, a benzyl ether, a benzyl ether, a benzyl ether, a benzyl ether, and a benzyl ether.

The ^1H NMR spectrum (CDCl₃) shows the following peaks (ppm):

- 7.327, 7.320, 7.312, 7.302, 7.293, 7.284, 7.276, 7.266, 7.250, 7.226, 5.163, 4.881, 4.853, 4.847, 4.831, 4.789, 4.778, 4.774, 4.763, 4.732, 4.704, 4.674, 4.646, 4.612, 4.583, 4.492, 4.355, 4.342, 4.335, 4.327, 4.322, 4.308, 4.189, 4.175, 4.165, 4.154, 4.145, 4.135, 4.075, 4.070, 4.061, 3.815, 3.800, 3.797, 3.783, 3.770, 3.757, 3.743, 3.631, 3.624, 3.604, 3.597, 3.125, 3.125, 1.519, 1.515, 1.404, 1.364, -0.000.

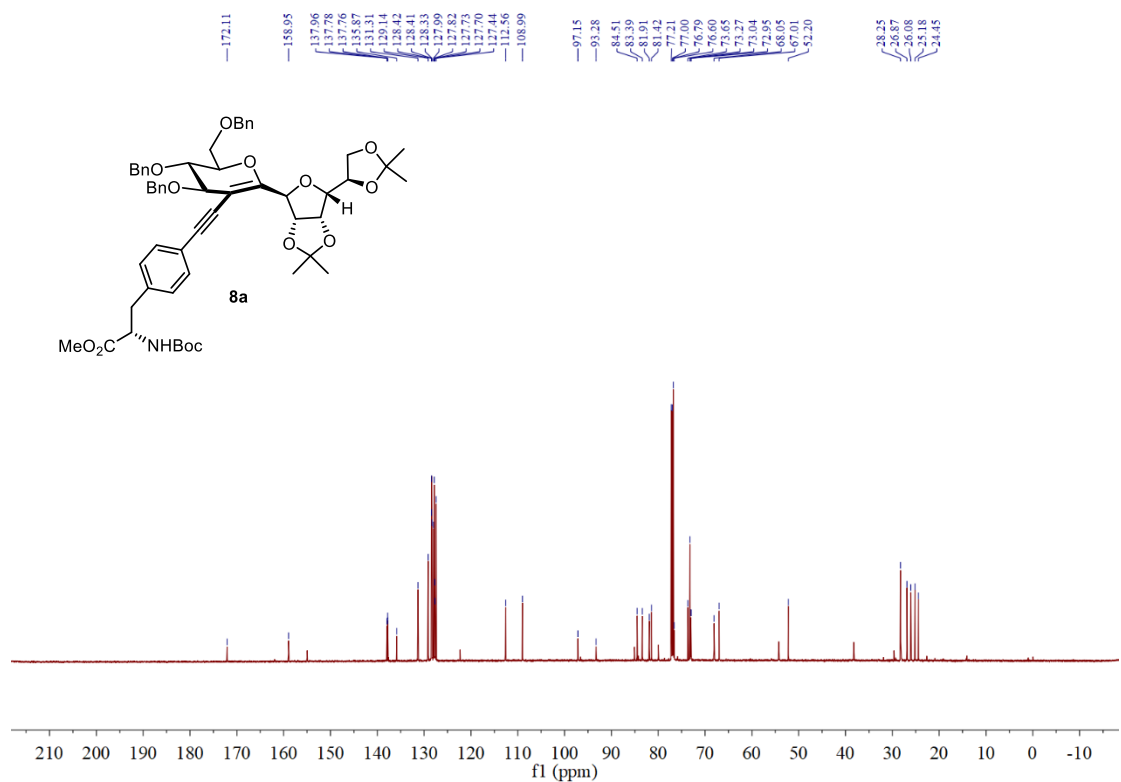
Integration values are provided below the baseline:

- 15.17
- 1.00, 2.06, 1.10, 2.01, 2.00, 1.06, 1.15, 1.11, 1.99, 2.25, 1.02
- 0.94
- 3.07, 3.03, 3.00, 3.03

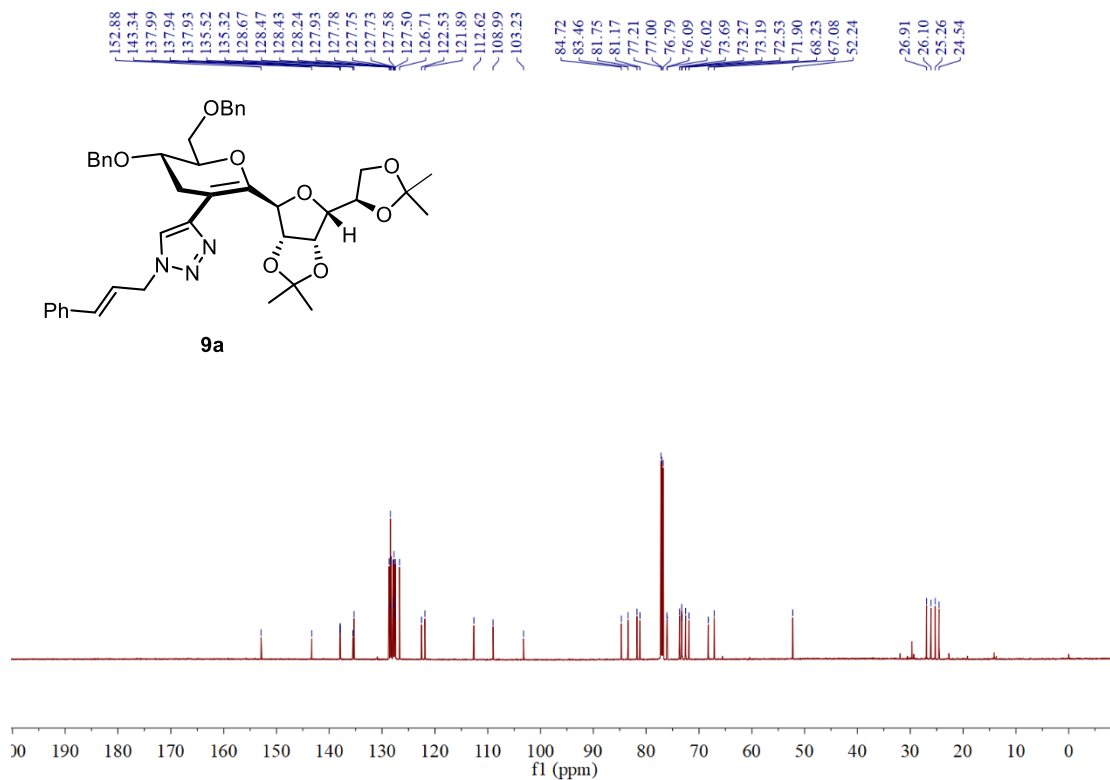
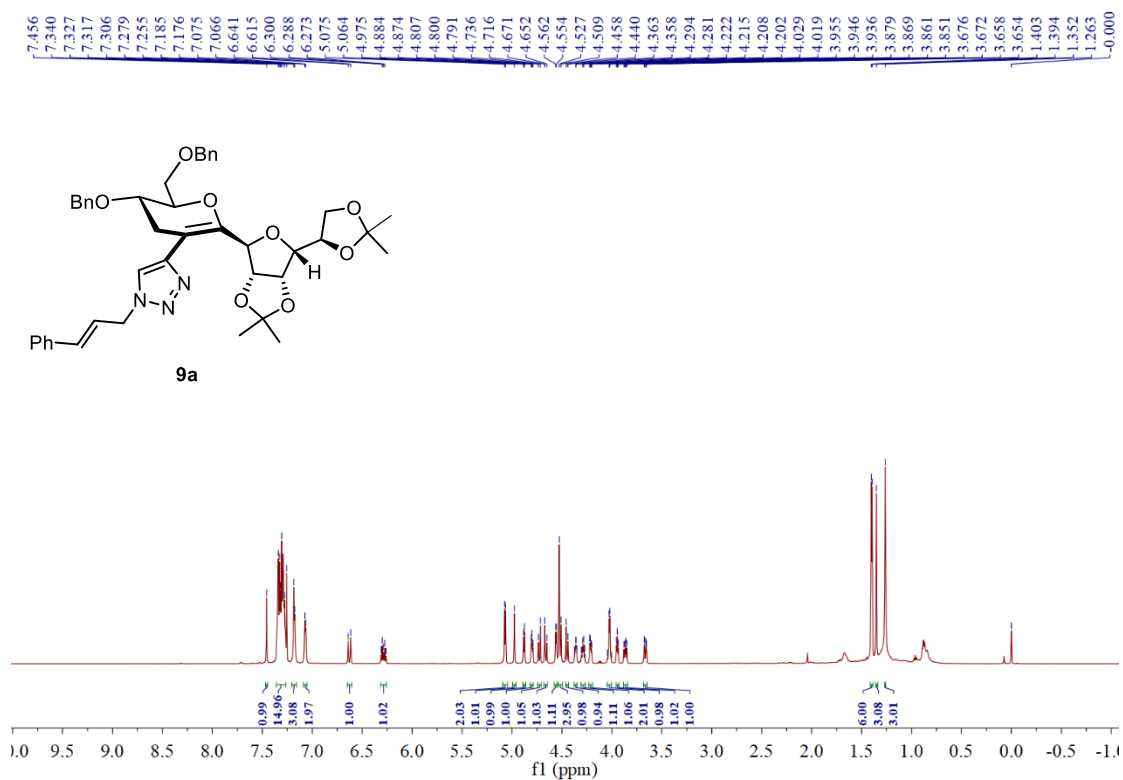
7a

¹³C NMR (CDCl₃) peaks (ppm): 160.40, 137.88, 137.72, 137.70, 128.37, 128.27, 128.00, 127.78, 127.73, 127.69, 127.40, 112.56, 108.94, 96.04, 84.29, 83.32, 81.76, 81.71, 81.37, 77.32, 77.00, 76.74, 76.68, 76.21, 73.60, 73.20, 73.13, 72.91, 72.84, 67.93, 66.95, 26.85, 26.03, 25.16, 24.40.

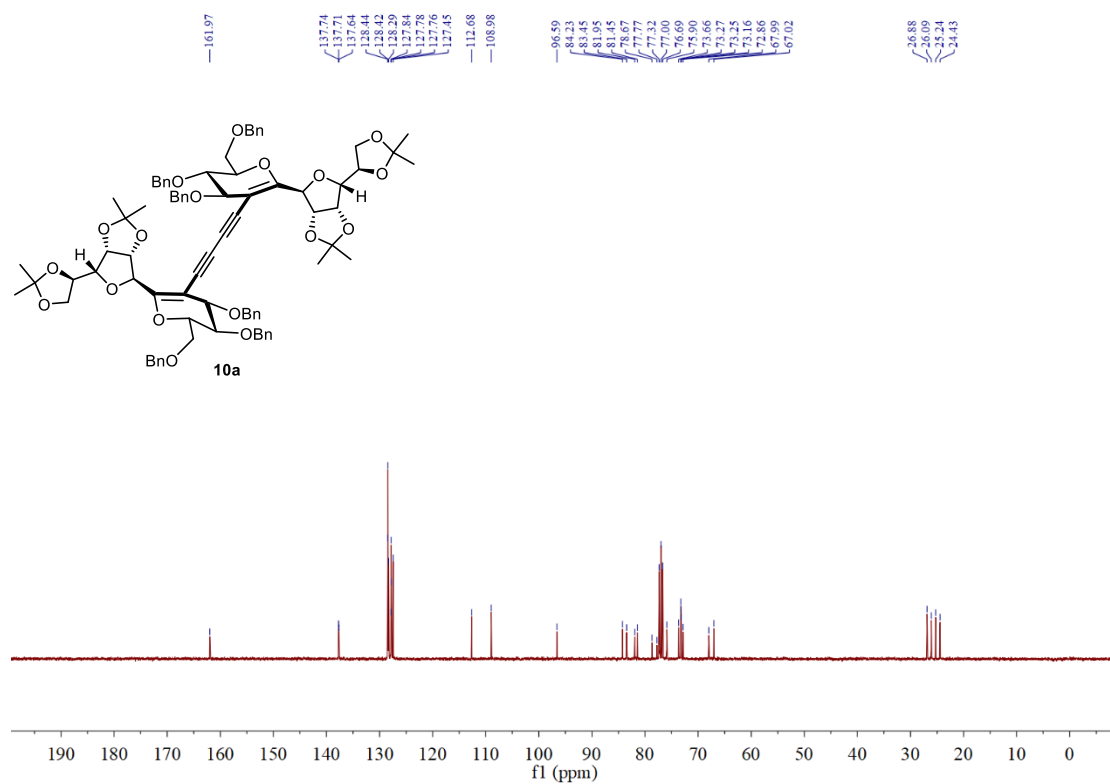
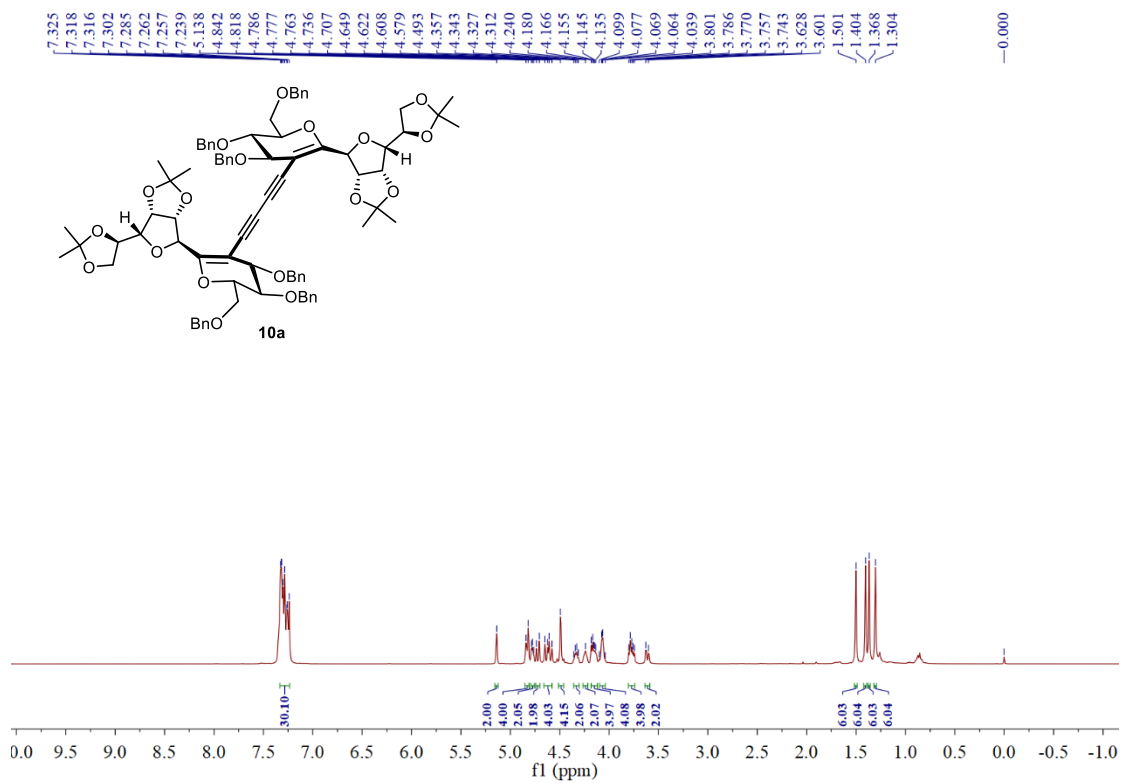
S154



(¹H NMR, 600 MHz, CDCl₃; ¹³C {¹H} NMR, 151 MHz, CDCl₃)



(^1H NMR, 400 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 101 MHz, CDCl_3)



(^1H NMR, 600 MHz, CDCl_3 ; ^{13}C { ^1H } NMR, 151 MHz, CDCl_3)

