Supporting Information

External Photocatalysts-free Visible Light Induced Aerobic Oxidation and 1, 4-Bisfunctionalization of *N*-Alkyl isoquinolinium/quinolinium Salts

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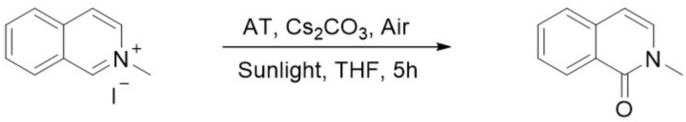


1aa
7 mmol
1.898 g

3a
890 mg
80%

Gram scale: 1aa (7 mmol, 1.898 g), base. (10.5 mmol, 3.421g), solvent (175 mL), AT: ambient temperature (≈40 ºC)

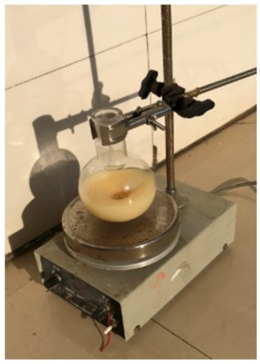
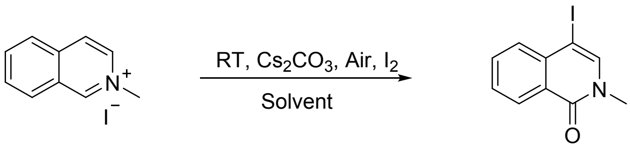


Figure S1. Apparatus and scalable visible light induced synthesis of isoquinolone 3a

Table S1. Optimization of the reaction conditions for synthesis of benzimidazole.[a]



1aa

5a

Entry	Solvent	Cs_2CO_3 (eq)	Yield[a]
1[b]	THF	1.5	57%
2	THF	1.5	35%
3	THF	2	36%
4	THF	4	45%
5	THF	6	56%
6	THF	8	62%
7	CH_3CN	8	42%
8	Toluene	8	59%
9	DCE	8	68%
10[c,e]	DCE	8	74%
11[d]	DCE	8	69%
12[b,c]	DCE	1.5	74%

Reaction conditions: 1aa (0.2 mmol), Cs_2CO_3 (1.5 - 8 equiv.), I_2 (0.6 mmol, 3 equiv.), Solvent (5.0 mL), Reaction time：5 hours under daylight and air atmosphere, RT: room temperature (≈25 ºC) [a] Isolated yield. [b] Radiation for 5 hours under 20 W Blue LEDs and air atmosphere, AT: ambient temperature (≈50 ºC). [c] DCE (2.0 mL). [d] Gram scale: 1aa (5 mmol, 1.356 g), Cs_2CO_3 (40 mmol, 13.032g), I_2 (15 mmol, 3.807g), DCE (50 mL),Yield=69% (0.983 g). [e] no light.

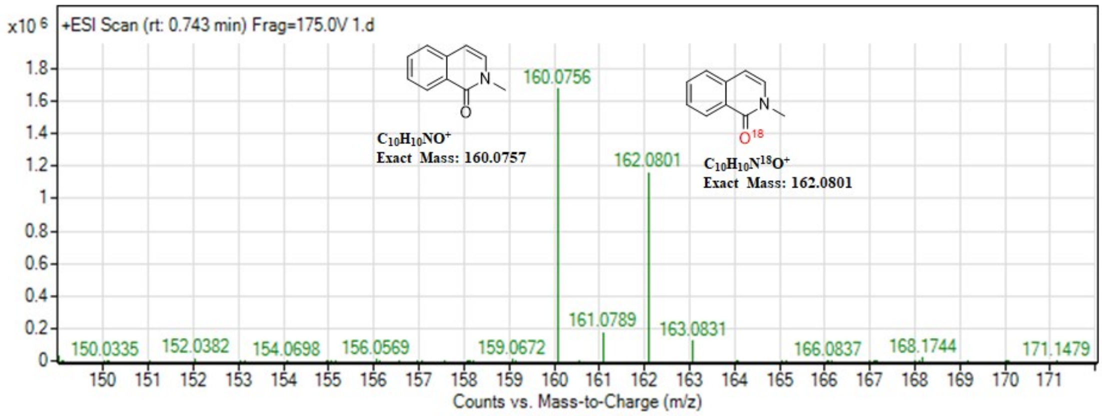


Figure S2 ESI-MS spectrum of 3a from the reaction in presence of H_2O^{18}

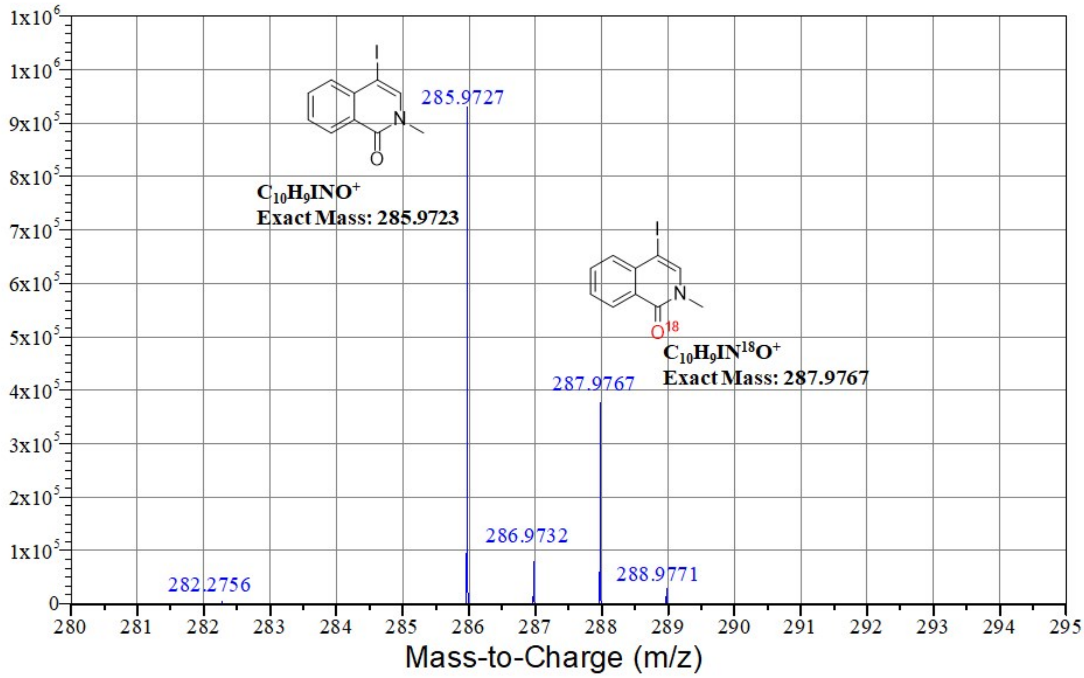
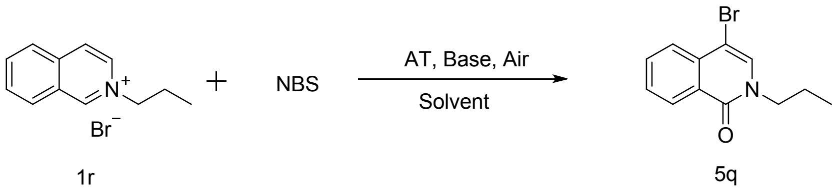


Figure S3 ESI-MS spectrum of 5a from the reaction in presence of H_2O^{18}

Table S2. Optimization of the reaction conditions for synthesis of 4-bromo-2-propylisoquinolin-1(2*H*)-one (**5q**).[a]



Entry	Solvent	NBS (eq.)	Cs_2CO_3 (eq.)	Yield[a]
1	THF	1.5	1.5	17%
2	DCE	1.5	1.5	12%
3	MeCN	1.5	1.5	Trace
4	THF	2	1.5	19%
5	THF	3	1.5	19%
6	THF	3	2	20%
7	THF	3	4	26%
8[b]	THF	--	4	Trace
9	THF	3	6	23%
10	THF	3	8	25%
11[c]	THF	3	8	Trace

Reaction conditions: 1r (0.2 mmol), Cs_2CO_3 (1.5-8 equiv.), Solvent (5.0 mL), Radiation for 5 hours under 20 W Blue LEDs and air atmosphere, AT: ambient temperature (≈50 °C); [a] Isolated yield. [b] Br_2(3 eq.) replaces NBS. [c] Under no-light conditions.

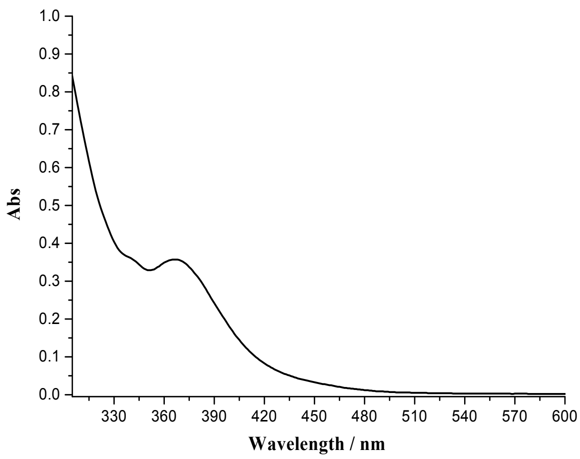


Figure S4. The absorption spectra of isoquinolinium salt **1aa** (10 µM) in THF

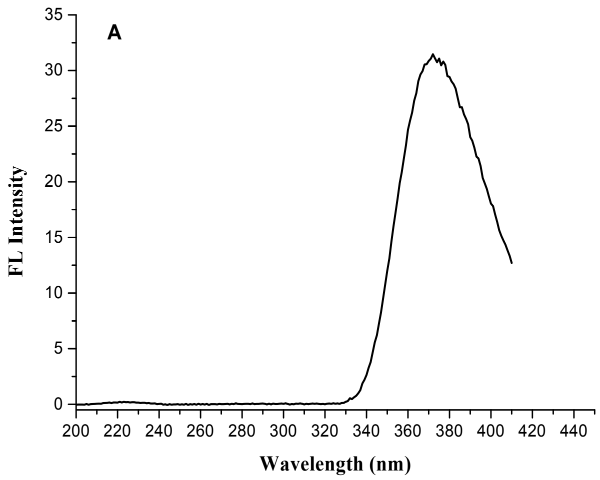


Figure S5. The emission spectrum of **1aa** in THF (10 µM, λ_{Ex} = 450 nm);

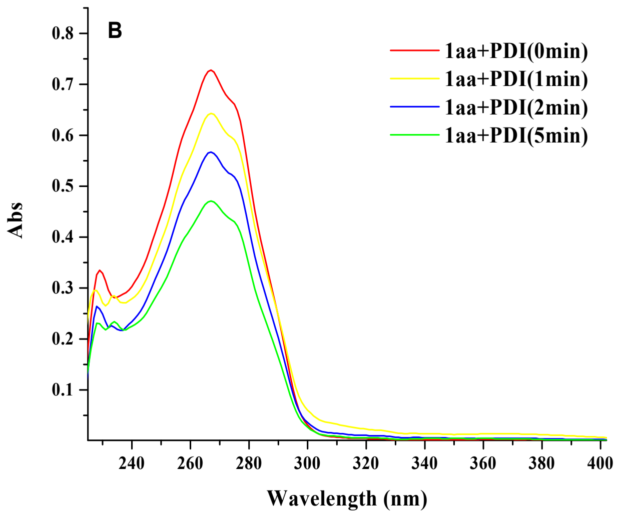


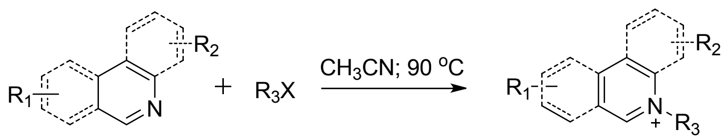
Figure S6. The absorption spectra of isoquinolinium salt **1aa** (10 µM) and PDI (10 µM) in THF under visible light irradiation (blue LED 20W)

General methods

All reagents were purchased from standard suppliers (Sigma-Aldrich, Alfa Aesar, or TCI) and were used without further purification. THF was distilled over sodium. Column chromatography was conducted with silica gel (mesh 200-300) from the Qingdao Ocean Chemicals. The ESI-MS spectra were recorded by a Finnigan 8230 instrument. High resolution mass spectrometry (HRMS) spectra analysis was performed by electrospray ionization (ESI-microTOF). Nuclear magnetic resonance (NMR) spectra were recorded on a Bruker Avance 400 spectrometer at 25 ºC operating at 400 MHz for ^{1}H-NMR and 100 MHz for ^{13}C-NMR by using $CDCl_3$ or DMSO-d_6 as solvents and TMS as an internal standard. Data are reported as following: chemical shift, multiplicity (s = singlet, d = doublet, m = multiplet, br = broad signal), coupling constant (Hz), and integration. The UV-Vis Spectra has been recorded on a Shimadazu UV 3100 UV-Vis spectrometer. The steady fluorescence spectra have been recorded on a Horiba FluoMax-plus spectrometer. Electron paramagnetic resonance (EPR) spectra were recorded on a Bruker EMXplus-9.5/12 spectrometer under visible light irradiation using mercury lamp.

Experimental Procedures

General procedure for the preparation of isoquinolinium iodide or bromide salts



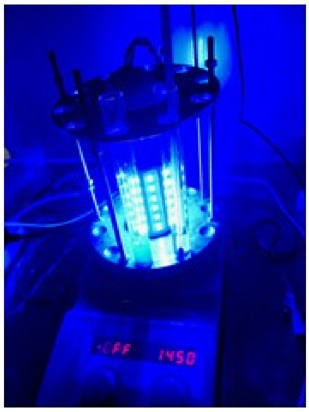
X=I, Br
1 or 2

Using **1aa** as example, isoquinoline (5 mmol, 645.7 mg), CH_3I (10 mmol, 2.0 eq.) and CH_3CN (15 mL) were added to a pressure round-bottom flask. The reaction mixture was stirred at 90 ºC with oil bath for 12 hours. After cooled to room temperature, the isoquinoline salt was precipitated by adding ethyl acetate. The pure product was obtained through filtration, washing with ethyl acetate and drying.

General procedure for the preparation of isoquinolinium tetrafluoroborate salts (1ab and 2fb)

The round-bottom flask was charged with iodide salt **1aa** (1 mmol, 271.1 mg) or **2aa** (1 mmol, 397.3 mg), $AgBF_4$ (1 mmol, 194.7 mg) and ethanol (10 ml). The reaction mixture was stirred at room temperature for 30 min. After filtering out the precipitate, the filtrate was collected. The pure product was obtained by drying under vacuum.

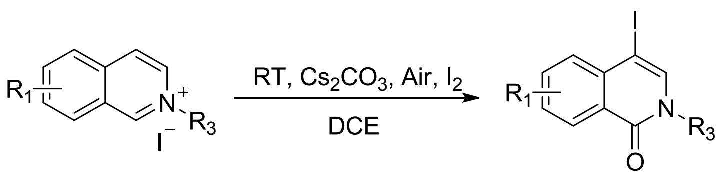
General procedure for the preparation of isoquinolones and quinolones



Reaction conditions: **1** or **2** (0.2 mmol), Cs_2CO_3 (0.3 mmol, 1.5 equiv.), THF (5.0 mL), Radiation for 5-12 hours under 20 W Blue LEDs and air atmosphere, ambient temperature (≈50 °C), Isolated yield.

Using **3a** as example, a 50 ml test tube was charged with **1aa** (0.2 mmol, 54.3 mg), Cs_2CO_3 (0.3 mmol, 97.8 mg, 1.5 eq) and THF (5 mL) with light irradiation by blue LEDs (20 W). The reaction mixture was stirred for 5 h under air. When the reaction was complete, the reaction mixture was filtered. The filtrate was collected. The pure product was obtained by column chromatography on silica gel (petroleum ether/ethyl acetate).

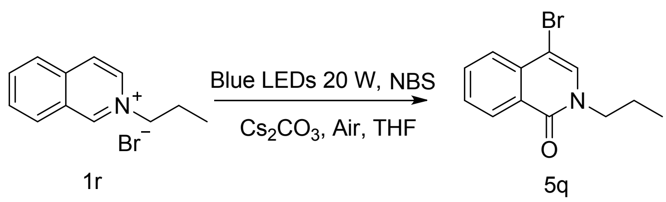
General procedure for the preparation of 4-iodoisoquinolinones 5



1 **5**

Using **5a** as example, a 10 ml test tube was charged with **1aa** (0.2 mmol, 54.3 mg), I_2 (0.6 mmol, 152.3 mg, 3 eq.), Cs_2CO_3 (1.6 mmol, 521.3 mg, 8 eq) and DCE (2 mL). The reaction mixture was stirred for 5 h under air. When the reaction was complete, the reaction mixture was poured into the saturated solution of $Na_2S_2O_3$ (15 ml) and allowed to stir for 15 min. Then, the reaction mixture was extracted with ethyl acetate for three times. The combined organic phase was dried with anhydrous $MgSO_4$. The pure product was obtained by column chromatography on silica gel (petroleum ether/ethyl acetate).

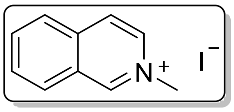
Procedure for the preparation of 4-iodoisoquinolinones 5q from isoquinolinium bromide salt 1r



A 50 ml test tube was charged with **1r** (0.2 mmol, 50.5 mg), *N*-Bromosuccinimide (0.6 mmol, 106.8 mg, 3 eq.), Cs_2CO_3 (0.8 mmol, 260.6 mg, 4 eq) and THF (5 mL) with light irradiation by blue LEDs (20 W). The reaction mixture was stirred for 5 h under air. When the reaction was complete, the reaction mixture was filtered. The filtrate was collected. The pure product was obtained by column chromatography on silica gel (petroleum ether/ethyl acetate).

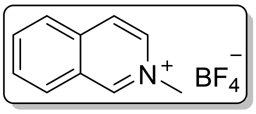
NMR data for isoquinolinium/quinolinium salts and products

2-methylisoquinolin-2-ium iodide (1aa)



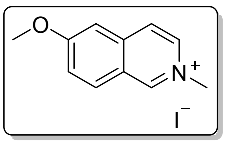
Yellow solid; 1.220 g in 5 mmol scale, 90 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.06 (s, 1 H), 8.73 (dd, *J* = 6.8, 1.1 Hz, 1 H), 8.60 (d, *J* = 6.8 Hz, 1 H), 8.50 (d, *J* = 8.3 Hz, 1 H), 8.37 (d, *J* = 8.3 Hz, 1 H), 8.32-8.20 (m, 1 H), 8.15-8.00 (m, 1 H), 4.50 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.1, 137.2, 137.1, 136.4, 131.6, 130.6, 127.7, 127.5, 125.9, 48.4 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_{10}N^+$: 140.0808, found: 140.0808.

2-methylisoquinolin-2-ium tetrafluoroborate (1ab)



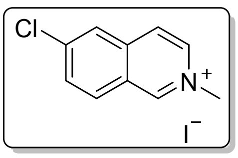
Grey solid; 0.189 g in 1 mmol scale, 82 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.97 (s, 1 H), 8.69 (d, *J* = 6.7 Hz, 1 H), 8.56 (d, *J* = 6.8 Hz, 1 H), 8.47 (d, *J* = 8.3 Hz, 1 H), 8.34 (d, *J* = 8.3 Hz, 1 H), 8.25 (t, *J* = 7.3 Hz, 1 H), 8.07 (t, *J* = 7.6 Hz, 1 H), 4.48 (s, 3H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.1, 137.2, 137.1, 136.3, 131.6, 130.6, 127.7, 127.5, 125.9, 48.4 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_{10}N^+$: 140.0808, found: 140.0807.

6-methoxy-2-methylisoquinolin-2-ium iodide (1b)



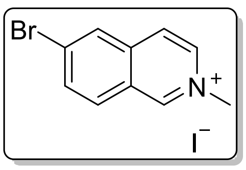
Light yellow solid;1.309 g in 5 mmol scale, 87 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.78 (s, 1 H), 8.57 (d, *J* = 6.7 Hz, 1 H), 8.36 (dd, *J* = 11.0, 8.1 Hz, 2 H), 7.76 (d, *J* = 2.1 Hz, 1 H), 7.66 (dd, *J* = 9.1, 2.3 Hz, 1 H), 4.39 (s, 3 H), 4.06 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 165.8, 149.2, 140.1, 136.6, 132.5, 124.4, 124.0, 122.9, 106.3, 57.1, 47.7 ppm; HRMS $[M+H]^+$ calculated for $C_{11}H_{12}ON^+$: 174.0913, found: 174.0913.

6-chloro-2-methylisoquinolin-2-ium iodide (1c)



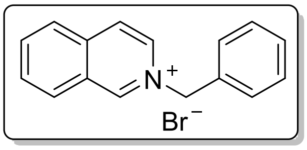
Yellow solid; 1.360 g in 5 mmol scale, 89 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.06 (s, 1 H), 8.76 (d, *J* = 6.8 Hz, 1 H), 8.52 (dd, *J* = 7.6, 4.0 Hz, 3 H), 8.11 (dd, *J* = 8.9, 1.7 Hz, 1 H), 4.48 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.2, 142.2, 138.0, 137.5, 132.8, 132.3, 126.8, 126.1, 125.0, 48.6 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9ClN^+$: 178.0418, found: 178.0419.

6-bromo-2-methylisoquinolin-2-ium iodide (1d)



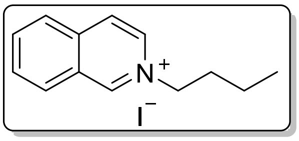
Yellow solid; 1.523 g in 5 mmol scale, 87 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.05 (s, 1 H), 8.75 (d, *J* = 6.8 Hz, 1 H), 8.70 (s, 1 H), 8.50 (d, *J* = 6.8 Hz, 1 H), 8.43 (d, *J* = 8.8 Hz, 1 H), 8.23-8.21 (m, 1 H), 4.46 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.4, 138.0, 137.5, 134.9, 132.5, 131.8, 130.0, 126.3, 124.9, 48.6 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9BrN^+$: 221.9913, found: 221.9911.

2-benzylisoquinolin-2-ium bromide (1e)



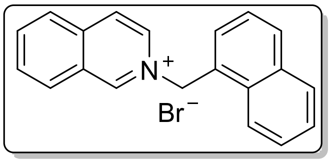
White solid; 1.260 g in 5 mmol scale, 84 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.41 (s, 1 H), 8.89 (d, *J* = 6.8 Hz, 1 H), 8.63 (d, *J* = 6.8 Hz, 1 H), 8.56 (d, *J* = 8.3 Hz, 1 H), 8.38 (d, *J* = 8.3 Hz, 1 H), 8.29 (t, *J* = 7.6 Hz, 1 H), 8.10 (t, *J* = 7.6 Hz, 1 H), 7.63 (d, *J* = 6.4 Hz, 2 H), 7.49-7.43 (m, 3 H), 6.03 (s, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.7, 137.6, 137.6, 135.3, 134.8, 131.8, 131.1, 129.8, 129.6, 129.4, 127.9, 127.8,126.8, 63.8 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{14}N^+$: 220.1121, found: 220.1123.

2-butylisoquinolin-2-ium iodide (1f)



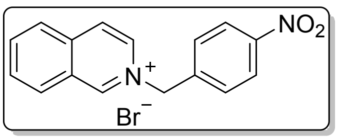
Yellow solid; 1.393 g in 5 mmol scale, 89 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.17 (s, 1H), 8.85 (d, *J* = 6.7 Hz, 1 H), 8.64 (d, *J* = 6.8 Hz, 1 H), 8.52 (d, *J* = 8.3 Hz, 1 H), 8.38 (d, *J* = 8.3 Hz, 1H), 8.28 (t, *J* = 7.5 Hz, 1H), 8.10 (t, *J* = 7.6 Hz, 1 H), 4.76 (t, *J* = 7.4 Hz, 2 H), 2.07-2.00 (m, 2 H), 1.42-1.32 (m, 2 H), 0.95 (t, *J* = 7.4 Hz, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.4, 137.4, 137.3, 135.4, 131.7, 130.8, 127.8, 127.7, 126.3, 61.0, 32.9, 19.3, 13.9 ppm; HRMS $[M+H]^+$ calculated for $C_{13}H_{16}N^+$: 186,1277, found: 186,1278.

2-(naphthalen-1-ylmethyl)isoquinolin-2-ium bromide (1g)



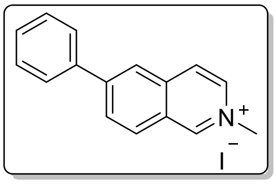
White solid; 1.365 g in 5 mmol scale, 78 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.35 (s, 1 H), 8.86 (dd, *J* = 6.8, 1.1 Hz, 1 H), 8.64 (d, *J* = 6.8 Hz, 1 H), 8.58 (d, *J* = 8.3 Hz, 1H), 8.39 (d, *J* = 8.3 Hz, 1 H), 8.31-8.27 (m, 1 H), 8.23 (d, *J* = 7.9 Hz, 1 H), 8.08 (td, *J* = 8.3, 1.3 Hz, 3 H), 7.67-7.59 (m, 4 H), 6.58 (s, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.7, 137.7, 137.7, 135.4, 134.0, 131.8, 131.2, 131.0, 130.6, 130.0, 129.5, 129.0, 128.0, 127.8, 127.8, 127.1, 126.7, 126.2, 123.4, 61.6 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{16}N^+$: 270.1277, found: 270.1273.

2-(4-nitrobenzyl)isoquinolin-2-ium bromide (1h)



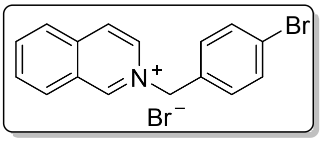
White solid; 1.466 g in 5 mmol scale, 85 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.46 (s, 1 H), 8.93 (dd, *J* = 6.8, 1.2 Hz, 1 H), 8.69 (d, *J* = 6.8 Hz, 1 H), 8.58 (d, *J* = 8.3 Hz, 1 H), 8.41 (d, *J* = 8.2 Hz, 1 H), 8.34-8.29 (m, 3 H), 8.13 (dd, *J* = 11.3, 4.0 Hz, 1 H), 7.90 (d, *J* = 8.7 Hz, 2 H), 6.24 (s, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.3, 148.4, 141.8, 137.8, 137.7, 135.4, 131.9, 131.2, 130.7, 127.9, 127.8, 126.9, 124.6, 62.5 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{13}O_2N_2^+$: 265.0972, found: 265.0973.

2-methyl-6-phenylisoquinolin-2-ium iodide (1i)



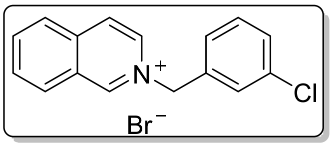
Yellow solid; 1.492 g in 5 mmol scale, 86 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.02 (s, 1 H), 8.72-8.68 (m, 2 H), 8.56 (dd, J = 7.7, 4.2 Hz, 2 H), 8.42 (dd, J = 8.7, 1.6 Hz, 1H), 7.99-7.97 (m, 2H), 7.63 (dd, J = 10.0, 4.6 Hz, 2 H), 7.58-7.55 (m, 1 H), 4.50 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.6, 147.9, 138.1, 137.7, 136.7, 131.3, 130.6, 130.2, 129.9, 128.3, 126.6, 125.9, 124.7, 48.4 ppm; HRMS [M+H]$^+$ calculated for $C_{16}H_{14}N^+$: 220.1121, found: 220.1124.

2-(4-bromobenzyl)isoquinolin-2-ium bromide (1j)



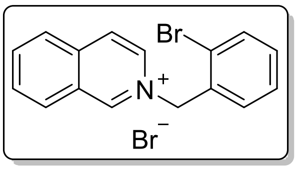
White solid; 1.497 g in 5 mmol scale, 79 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.38 (s, 1 H), 8.88 (dd, J = 6.8, 1.2 Hz, 1 H), 8.64 (d, J = 6.8 Hz, 1 H), 8.56 (d, J = 8.3 Hz, 1 H), 8.38 (d, J = 8.3 Hz, 1 H), 8.31-8.27 (m, 1 H), 8.11 (t, J = 7.6 Hz, 1 H), 7.73-7.64 (m, 2 H), 7.61 (d, J = 8.5 Hz, 2 H), 6.03 (s, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ 150.8, 137.7, 137.6, 135.3, 134.1, 132.6, 131.8, 131.7, 131.1, 127.9, 127.8, 126.8, 123.3, 62.9 ppm; HRMS [M+H]$^+$ calculated for $C_{16}H_{13}BrN^+$: 298.0226, found: 298.0231.

2-(3-chlorobenzyl)isoquinolin-2-ium bromide (1k)



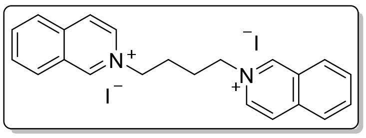
White solid; 1.236 g in 5 mmol scale, 74 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.46 (s, 1 H), 8.93 (dd, J = 6.8, 1.3 Hz, 1 H), 8.66 (d, J = 6.8 Hz, 1 H), 8.57 (d, J = 8.3 Hz, 1 H), 8.39 (d, J = 8.2 Hz, 1 H), 8.34-8.25 (m, 1 H), 8.14-8.10 (m, 1 H), 7.84 (s, 1 H), 7.66-7.63 (m, 1 H), 7.53-7.48 (m, 2 H), 6.08 (s, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.0, 137.7, 137.6, 136.9, 135.2, 134.1, 131.8, 131.5, 131.2, 129.8, 129.5, 128.3, 127.8, 126.8, 62.8 ppm; HRMS [M+H]$^+$ calculated for $C_{16}H_{13}ClN^+$: 254.0731, found: 254.0729.

2-(2-bromobenzyl)isoquinolin-2-ium bromide (1l)



White solid; 1.440 g in 5 mmol scale, 76 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.28 (s, 1 H), 8.79 (dd, J = 6.8, 1.3 Hz, 1 H), 8.68 (d, J = 6.8 Hz, 1 H), 8.61 (d, J = 8.3 Hz, 1 H), 8.42 (d, J = 8.2 Hz, 1 H), 8.34-8.30 (m, 1 H), 8.14-8.10 (m, 1 H), 7.79 (dd, J = 7.8, 0.8 Hz, 1 H), 7.54-7.42 (m, 3 H), 6.15 (s, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.3, 137.9, 137.8, 135.5, 133.9, 133.6, 132.1, 132.0, 131.9, 131.3, 129.2, 127.9, 127.7, 126.7, 124.0, 63.8 ppm; HRMS [M+H]$^+$ calculated for $C_{16}H_{13}BrN^+$: 298.0226, found: 298.0222.

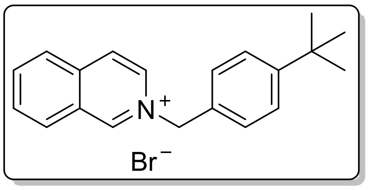
2,2'-(butane-1,4-diyl)bis(isoquinolin-2-ium) iodide (1m)



Light yellow solid; 1.789 g in 5 mmol scale, 63 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.15 (s, 1 H), 8.82 (dd, J = 6.8, 1.0 Hz, 1 H), 8.63 (d, J = 6.8 Hz, 1 H), 8.49 (d, J = 8.2 Hz, 1 H), 8.37 (d, J = 8.2 Hz, 1

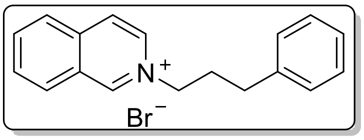
H), 8.30-8.26 (m, 1 H), 8.11-8.07 (m, 1 H), 4.79 (d, J = 23.4 Hz, 2 H), 2.12 (d, J = 27.8 Hz, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.6, 137.5, 137.4, 135.4, 131.7, 130.9, 127.8, 127.7, 126.4, 60.5, 27.5 ppm; HRMS $[M+H]^+$ calculated for $C_{22}H_{22}N_2^{2+}$: 314.1772, found: 314.1773.

2-(4-(tert-butyl)benzyl)isoquinolin-2-ium bromide (1n)



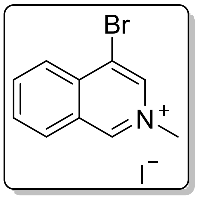
White solid; 1.317 g in 5 mmol scale, 74 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.43 (s, 1 H), 8.91 (dd, J = 6.8, 1.1 Hz, 1 H), 8.63 (d, J = 6.8 Hz, 1 H), 8.57 (d, J = 8.3 Hz, 1 H), 8.37 (d, J = 8.3 Hz, 1 H), 8.29 (dd, J = 11.2, 4.0 Hz, 1 H), 8.10 (t, J = 7.6 Hz, 1 H), 7.58 (d, J = 8.3 Hz, 2 H), 7.47 (d, J = 8.3 Hz, 2 H), 6.00 (s, 2 H), 1.26 (s, 9 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 152.4, 150.6, 137.6, 137.5, 135.3, 132.0, 131.8, 131.1, 129.2, 127.9, 127.8, 126.8, 126.4, 63.5, 34.9, 31.4 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{22}N^+$: 276.1747, found: 276.1748.

2-(3-phenylpropyl)isoquinolin-2-ium bromide (1o)



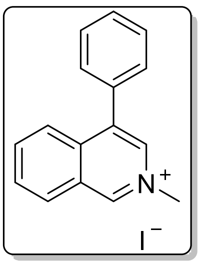
Light yellow oil; 1.115 g in 5 mmol scale, 68 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.28 (s, 1 H), 8.92 (dd, J = 6.8, 1.2 Hz, 1 H), 8.63 (d, J = 6.8 Hz, 1 H), 8.52 (d, J = 8.2 Hz, 1 H), 8.38 (d, J = 8.3 Hz, 1 H), 8.29-8.25 (m, 1 H), 8.11-8.07 (m, 1 H), 7.25 (s, 4 H), 7.18-7.13 (m, 1 H), 4.86 (t, J = 7.3 Hz, 2 H), 2.77-2.73 (m, 2 H), 2.53-2.37 (m, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.6, 140.8, 137.4, 137.2, 135.4, 131.5, 130.8, 128.8, 128.7, 127.7, 127.6, 126.5, 126.3, 61.0, 32.3, 32.2 ppm; HRMS $[M+H]^+$ calculated for $C_{18}H_{18}N^+$: 248.1434, found: 248.1430.

4-bromo-2-methylisoquinolin-2-ium iodide (1p)



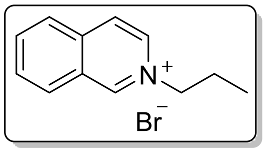
Yellow solid; 1.540 g in 5 mmol scale, 88 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.12 (s, 1 H), 9.24 (s, 1 H), 8.57 (d, J = 8.2 Hz, 1 H), 8.44-8.37 (m, 2 H), 8.18 (t, J = 7.4 Hz, 1 H), 4.47 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.2, 139.0, 137.7, 135.9, 132.5, 131.8, 127.7, 126.3, 121.4, 48.4 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9BrN^+$: 221.9913, found: 221.9913.

2-methyl-4-phenylisoquinolin-2-ium iodide (1q)



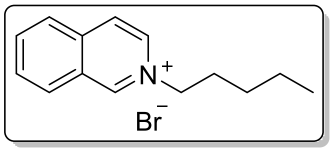
Yellow solid; 1.388 g in 5 mmol scale, 80 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.08 (s, 1 H), 8.80 (d, J = 1.1 Hz, 1 H), 8.59 (d, J = 8.2 Hz, 1 H), 8.26 (ddd, J = 8.3, 7.1, 1.2 Hz, 1 H), 8.11 (dd, J = 15.8, 7.8 Hz, 2 H), 7.72-7.64 (m, 5 H), 4.54 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.1, 137.9, 137.7, 135.7, 135.5, 133.5, 131.5, 131.4, 130.5, 130.1, 129.7, 127.9, 125.4, 48.4 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{14}N^+$: 220.1121, found: 220.1118.

2-propylisoquinolin-2-ium bromide (1r)



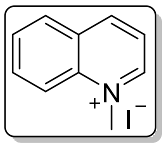
Light yellow solid; 0.932 g in 5 mmol scale, 74 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.29 (s, 1 H), 8.89 (d, *J* = 6.8 Hz, 1 H), 8.64 (d, *J* = 6.8 Hz, 1 H), 8.51 (d, *J* = 8.3 Hz, 1 H), 8.37 (d, *J* = 8.3 Hz, 1 H), 8.25 (t, *J* = 7.6 Hz, 1 H), 8.07 (t, *J* = 7.6 Hz, 1 H), 4.74 (t, *J* = 7.3 Hz, 2 H), 2.05 (dd, *J* = 14.6, 7.3 Hz, 2 H), 0.92 (t, *J* = 7.4 Hz, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.5, 137.4, 137.3, 135.4, 131.6, 130.9, 127.8, 127.7, 126.3, 62.4, 24.4, 10.8 ppm; HRMS $[M+H]^+$ calculated for $C_{12}H_{14}N^+$: 172.1121, found: 172.1123.

2-pentylisoquinolin-2-ium bromide (1s)



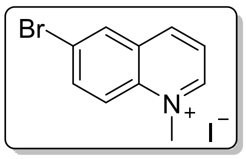
Yellow solid; 1.078 g in 5 mmol scale, 77 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.28 (s, 1 H), 8.91 (dd, *J* = 6.8, 1.0 Hz, 1 H), 8.66 (d, *J* = 6.8 Hz, 1 H), 8.54 (d, *J* = 8.3 Hz, 1 H), 8.40 (d, *J* = 8.3 Hz, 1 H), 8.31-8.27 (m, 1 H), 8.10 (t, *J* = 7.6 Hz, 1 H), 4.78 (t, *J* = 7.4 Hz, 2 H), 2.09-2.02 (m, 2 H), 1.38-1.30 (m, 4 H), 0.88 (t, *J* = 6.9 Hz, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.4, 137.4, 137.3, 135.4, 131.6, 130.8, 127.8, 127.7, 126.3, 61.1, 30.7, 28.1, 22.1, 14.2 ppm; HRMS $[M+H]^+$ calculated for $C_{14}H_{18}N^+$: 200.1434, found: 200.1439.

1-methylquinolin-1-ium iodide (2a)



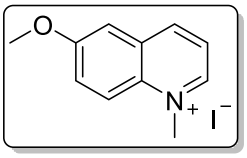
Yellow solid; 1.192 g in 5 mmol scale, 88 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.05 (s, 1 H), 8.72 (d, *J* = 6.7 Hz, 1 H), 8.59 (d, *J* = 6.7 Hz, 1 H), 8.49 (d, *J* = 8.3 Hz, 1 H), 8.36 (d, *J* = 8.3 Hz, 1 H), 8.26 (t, *J* = 7.6 Hz, 1 H), 8.08 (t, *J* = 7.6 Hz, 1 H), 4.50 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.1, 137.2, 137.1, 136.4, 131.6, 130.6, 127.7, 127.5,125.9, 48.5 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_{10}N^+$: 140.0808, found: 140.0810.

6-bromo-1-methylquinolin-1-ium iodide (2b)



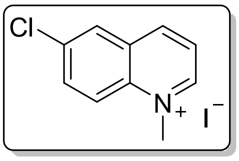
Yellow solid; 1.505 g in 5 mmol scale, 86 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.55 (d, *J* = 5.6 Hz, 1 H), 9.21 (d, *J* = 8.4 Hz, 1 H), 8.82 (d, *J* = 1.3 Hz, 1 H), 8.45 (dt, *J* = 9.4, 5.6 Hz, 2 H), 8.23 (dd, *J* = 8.3, 5.8 Hz, 1 H), 4.64 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.2, 146.5, 138.3, 137.8, 132.5, 130.9, 123.7, 123.6, 122.0, 46.1 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9BrN^+$: 221.9913, found: 221.9913.

6-methoxy-1-methylquinolin-1-ium iodide (2c)



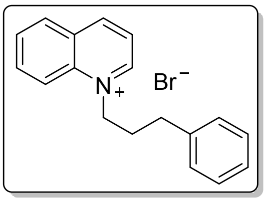
Yellow solid; 1.204 g in 5 mmol scale, 80 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.33 (d, J = 5.6 Hz, 1 H), 9.12 (d, J = 8.4 Hz, 1 H), 8.44 (d, J = 10.4 Hz, 1 H), 8.11 (dd, J = 8.3, 5.9 Hz, 1 H), 7.92 (d, J = 7.1 Hz, 2 H), 4.62 (s, 3 H), 4.02 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 159.7, 147.7, 145.6, 134.6, 131.7, 127.9, 122.9, 121.3, 108.5, 56.9, 46.0 ppm; HRMS $[M+H]^+$ calculated for $C_{11}H_{12}ON^+$: 174.0913, found: 174.0912.

6-chloro-1-methylquinolin-1-ium iodide (2d)



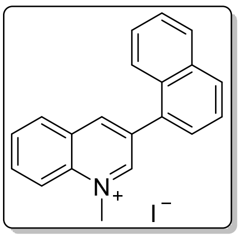
Yellow solid; 1.265 g in 5 mmol scale, 83 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.55 (d, J = 5.6 Hz, 1 H), 9.22 (d, J = 8.4 Hz, 1 H), 8.68 (d, J = 1.9 Hz, 1 H), 8.57 (d, J = 9.4 Hz, 1 H), 8.34 (dd, J = 9.4, 2.1 Hz, 1 H), 8.24 (dd, J = 8.3, 5.8 Hz, 1 H), 4.65 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.2, 146.7, 137.6, 135.8, 134.9, 130.6, 129.2, 123.8, 122.2, 46.2 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9ClN^+$: 178.0418, found: 178.0419.

1-(3-phenylpropyl)quinolin-1-ium bromide (2e)



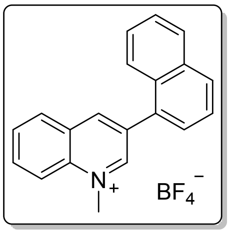
Brown oil; 1.164 g in 5 mmol scale, 71 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.80 (dd, J = 5.8, 1.0 Hz, 1 H), 9.36 (d, J = 8.3 Hz, 1 H), 8.69 (d, J = 9.0 Hz, 1H), 8.60-8.49 (m, 1 H), 8.29 (ddd, J = 8.7, 7.1, 1.3 Hz, 1 H), 8.22 (dd, J = 8.3, 5.8 Hz, 1 H), 8.07 (t, J = 7.6 Hz, 1 H), 7.28-7.23 (m, 4 H), 7.19-7.16 (m, 1 H), 5.23 (t, J = 7.5 Hz, 2 H), 2.90-2.78 (m, 2H), 2.33 (dq, J = 15.4, 7.8 Hz, 2 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.3, 147.9, 140.9, 137.9, 136.1, 131.2, 130.3, 130.2, 128.8, 128.7, 126.5, 122.6, 119.4, 57.5, 32.2, 31.5 ppm; HRMS $[M+H]^+$ calculated for $C_{18}H_{18}N^+$: 248.1434, found: 248.1434.

1-methyl-3-(naphthalen-1-yl)quinolin-1-ium iodide (2fa)



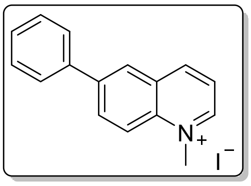
Yellow solid; 1.548 g in 5 mmol scale, 78 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.83 (d, J = 0.9 Hz, 1 H), 9.47 (s, 1 H), 8.61 (d, J = 8.9 Hz, 1 H), 8.54 (d, J = 7.9 Hz, 1 H), 8.38-8.33 (m, 1 H), 8.19 (dd, J = 6.0, 3.4 Hz, 1 H), 8.13 (t, J = 7.6 Hz, 2 H), 7.95 (d, J = 8.3 Hz, 1 H), 7.77 (q, J = 3.1 Hz, 2 H), 7.69-7.60 (m, 2 H), 4.73 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.6, 147.1, 138.1, 135.9, 133.9, 133.8, 132.8, 131.1, 131.0, 130.7, 130.4, 129.7, 129.4, 129.1, 128.0, 127.2, 126.1, 125.2, 119.5, 45.9 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{16}N^+$: 270.1277, found: 270.1277.

1-methyl-3-(naphthalen-1-yl)quinolin-1-ium tetrafluoroborate (2fb)



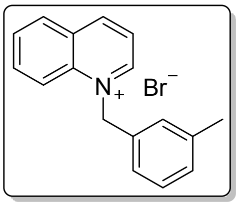
Yellow solid; 0.286 g in 1 mmol scale, 80 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.83 (s, 1 H), 9.46 (s, 1 H), 8.61 (d, J = 8.9 Hz, 1 H), 8.53 (d, J = 8.0 Hz, 1 H), 8.35 (t, J = 7.7 Hz, 1 H), 8.16 (dt, J = 15.4, 6.0 Hz, 3 H), 7.95 (d, J = 8.2 Hz, 1 H), 7.78-7.75 (m, 2 H), 7.65 (dt, J = 14.5, 6.9 Hz, 2 H), 4.72 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.6, 147.1, 138.1, 135.9, 134.0, 133.9, 132.8, 131.1, 131.0, 130.7, 130.4, 129.7, 129.3, 129.1, 128.0, 127.2, 126.1, 125.2, 119.4, 45.8 ppm; HRMS [M+H]$^+$ calculated for $C_{20}H_{16}N^+$: 270.1277, found: 270.1279.

1-methyl-6-phenylquinolin-1-ium iodide (2g)



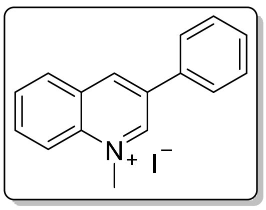
Yellow solid; 1.422 g in 5 mmol scale, 82 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.51 (d, J = 5.5 Hz, 1 H), 9.31 (d, J = 8.4 Hz, 1 H), 8.83 (d, J = 1.9 Hz, 1 H), 8.63 (dt, J = 19.3, 5.6 Hz, 2 H), 8.21 (dd, J = 8.4, 5.7 Hz, 1 H), 7.97-7.95 (m, 2H), 7.62 (dd, J = 10.2, 4.7 Hz, 2 H), 7.55-.51 (m, 1 H), 4.69 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.3, 147.5, 141.5, 138.2, 137.7, 134.6, 130.2, 129.9, 129.6, 127.9, 127.5, 122.9, 120.4), 45.9 ppm; HRMS [M+H]$^+$ calculated for $C_{16}H_{14}N^+$: 220.1121, found: 220.1124.

1-(3-methylbenzyl)quinolin-1-ium bromide (2h)



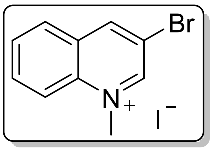
White solid; 1.114g in 5 mmol scale, 71 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.84 (dd, J = 5.8, 1.1 Hz, 1 H), 9.42 (d, J = 8.3 Hz, 1 H), 8.55 (d, J = 8.6 Hz, 2 H), 8.32 (dd, J = 8.4, 5.8 Hz, 1 H), 8.23 (ddd, J = 8.7, 7.1, 1.4 Hz, 1 H), 8.04 (t, J = 7.7 Hz, 1 H), 7.30-7.27 (m, 2 H), 7.22-7.17 (m, 2 H), 6.39 (s, 2 H), 2.27 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.9, 148.6, 139.0, 138.0, 136.2, 134.3, 131.3, 130.5, 130.4, 129.9, 129.5, 128.3, 124.9, 123.0, 119.8, 60.4, 21.4 ppm; HRMS [M+H]$^+$ calculated for $C_{17}H_{16}N^+$: 234.1277, found: 234.1281.

1-methyl-3-phenylquinolin-1-ium iodide (2i)



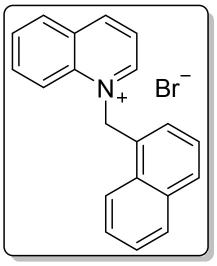
Yellow solid; 1.441 g in 5 mmol scale, 83 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 10.00 (s, 1 H), 9.66 (s, 1 H), 8.53 (t, J = 7.8 Hz, 2 H), 8.28 (ddd, J = 8.7, 7.1, 1.3 Hz, 1 H), 8.08 (dd, J = 14.9, 7.5 Hz, 3 H), 7.67 (dd, J = 10.2, 4.7 Hz, 2 H), 7.61-7.57 (m, 1 H), 4.74 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 149.7, 143.3, 137.7, 135.6, 134.0, 133.8, 131.0, 130.7, 130.3, 123.0, 129.7, 127.9, 119.4, 46.0 ppm; HRMS [M+H]$^+$ calculated for $C_{16}H_{14}N^+$: 220.1121, found: 220.1123.

3-bromo-1-methylquinolin-1-ium iodide (2j)



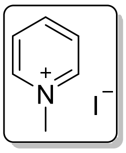
Yellow solid; 1.470 g in 5 mmol scale, 84 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.91 (d, *J* = 1.6 Hz, 1 H), 9.65 (d, *J* = 1.5 Hz, 1 H), 8.51 (d, *J* = 8.9 Hz, 1 H), 8.41 (dd, *J* = 8.3, 1.0 Hz, 1 H), 8.31 (ddd, *J* = 8.8, 7.0, 1.4 Hz, 1 H), 8.10 (t, *J* = 7.6 Hz, 1 H), 4.63 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 151.8, 148.6, 137.7, 136.1, 131.3, 130.1, 130.0, 119.7, 115.0, 45.8 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9BrN^+$: 221.9913, found: 221.9914.

1-(naphthalen-1-ylmethyl)quinolin-1-ium bromide (2k)



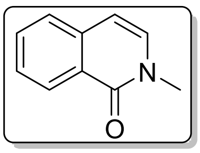
White solid; 1.190 g in 5 mmol scale, 68 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.56 (dd, *J* = 5.8, 1.1 Hz, 1 H), 9.50 (d, *J* = 8.3 Hz, 1 H), 8.62 (dd, *J* = 8.2, 1.1 Hz, 1 H), 8.44 (d, *J* = 8.9 Hz, 1 H), 8.29 (dd, *J* = 8.3, 5.8 Hz, 1 H), 8.25-8.19 (m, 2 H), 8.08 (t, *J* = 7.7 Hz, 2 H), 8.01 (d, *J* = 8.3 Hz, 1 H), 7.75-7.67 (m, 2 H), 7.42-7.39 (m, 1 H), 6.94 (s, 2 H), 6.81 (d, *J* = 7.1 Hz, 1 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 150.5, 148.9, 138.7, 136.4, 133.8, 131.4, 130.6, 130.4, 130.3, 129.8, 129.7, 129.4, 127.8, 127.2, 126.1, 125.4, 123.5, 123.1, 119.7, 58.4 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{16}N^+$: 270.1277, found: 270.1276.

1-methylpyridin-1-ium iodide (2l)



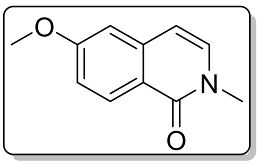
Light yellow solid; 0.950 g in 5 mmol scale, 86 % yield; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 9.02 (d, *J* = 5.8 Hz, 2 H), 8.60 (t, *J* = 7.8 Hz, 1 H), 8.15 (t, *J* = 7.0 Hz, 2 H), 4.38 (s, 3 H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6) δ = 146.0, 145.6, 128.2, 48.5 ppm; HRMS $[M+H]^+$ calculated for $C_6H_8N^+$: 94.0651, found: 94.0653.

2-methylisoquinolin-1(2*H*)-one (3a)



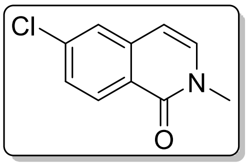
Light yellow oil; 28 mg in 0.2 mmol scale, 86% yield from iodide salt; 25 mg in 0.2 mmol scale, 78% yield from tetrafluoroborate salt; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.42 (d, *J* = 8.1 Hz, 1 H), 7.60 (t, *J* = 7.5 Hz, 1H), 7.46 (dd, *J* = 13.7, 7.7 Hz, 2 H), 7.04 (d, *J* = 7.3 Hz, 1 H), 6.45 (d, *J* = 7.3 Hz, 1 H), 3.58 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.6, 137.1, 132.4, 132.0, 127.6, 126.8, 126.1, 125.9, 106.0, 37.0 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_{10}ON^+$: 160.0757, found: 160.0758.

6-methoxy-2-methylisoquinolin-1(2*H*)-one (3b)



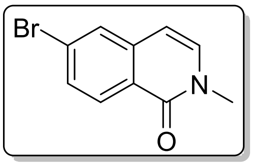
Light yellow solid; 34 mg in 0.2 mmol scale, 90% yield; m. p. 90-91 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.33 (d, *J* = 8.9 Hz, 1 H), 7.04 (dd, *J* = 6.7, 3.6 Hz, 2 H), 6.84 (s, 1 H), 6.39 (d, *J* = 7.3 Hz, 1 H), 3.89 (s, 3 H), 3.57 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.6, 162.4, 139.2, 133.1, 129.7, 120.0, 116.3 106.7, 105.7, 55.4, 36.8 ppm; HRMS $[M+H]^+$ calculated for $C_{11}H_{12}O_2N^+$: 190.0863, found: 190.0862.

6-chloro-2-methylisoquinolin-1(2*H*)-one (3c)



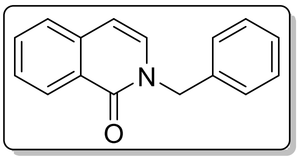
White solid; 33 mg in 0.2 mmol scale, 85% yield; m. p. 132-133 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.34 (d, *J* = 8.6 Hz, 1 H), 7.47 (d, *J* = 1.7 Hz, 1 H), 7.40 (dd, *J* = 8.6, 1.8 Hz, 1 H), 7.08 (d, *J* = 7.3 Hz, 1 H), 6.38 (d, *J* = 7.3 Hz, 1 H), 3.58 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.0, 138.5, 138.4, 133.8, 129.5, 127.3, 125.1, 124.4, 104.9, 37.0 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9OClN^+$: 194.0367, found: 194.0368.

6-bromo-2-methylisoquinolin-1(2*H*)-one (3d)



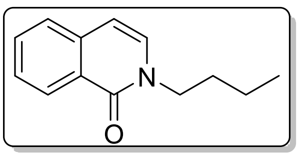
White solid; 41 mg in 0.2 mmol scale, 86% yield; m. p. 146-147 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.26 (d, *J* = 8.6 Hz, 1 H), 7.64 (s, 1 H), 7.55 (dd, *J* = 8.6, 1.6 Hz, 1 H), 7.08 (d, *J* = 7.3 Hz, 1 H), 6.37 (d, *J* = 7.3 Hz, 1 H), 3.58 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.1, 138.6, 133.8, 130.0, 129.6, 128.3, 127.1, 124.8, 104.8, 37.1 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9OBrN^+$: 237.9862, found: 237.9864.

2-benzylisoquinolin-1(2*H*)-one (3e)



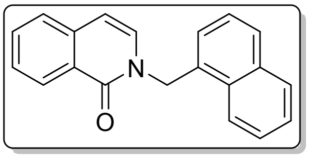
Light yellow oil; 35 mg in 0.2 mmol scale, 74% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.46 (d, *J* = 7.7 Hz, 1 H), 7.65-7.61 (m, 1 H), 7.51-7.47 (m, 2 H), 7.35 – 7.31 (m, 4 H), 7.28 (dd, *J* = 9.8, 5.6 Hz, 1H), 7.08 (d, *J* = 7.4 Hz, 1H), 6.48 (d, *J* = 7.4 Hz, 1 H), 5.22 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.3, 137.0, 136.9, 132.2, 131.3, 128.8, 128.1, 128.0, 127.8, 126.9, 126.4, 125.9, 106.5, 51.7 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{14}ON^+$: 236.1070, found: 236.1069.

2-butylisoquinolin-1(2*H*)-one (3f)



Light yellow oil; 31 mg in 0.2 mmol scale, 78% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.43 (d, *J* = 8.0 Hz, 1 H), 7.61 (dd, *J* = 10.9, 4.1 Hz, 1 H), 7.48 (dd, *J* = 14.5, 7.6 Hz, 2 H), 7.06 (d, *J* = 7.3 Hz, 1 H), 6.48 (d, *J* = 7.3 Hz, 1 H), 4.02-3.98 (m, 2 H), 1.77 (dt, *J* = 15.1, 7.5 Hz, 2 H), 1.41 (dq, *J* = 14.7, 7.4 Hz, 2 H), 0.96 (t, *J* = 7.4 Hz, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.1, 137.0, 132.0, 131.7, 127.8, 126.7, 126.4, 125.8, 105.9, 49.1, 31.4, 20.0, 13.7 ppm; HRMS $[M+H]^+$ calculated for $C_{13}H_{16}ON^+$: 202.1226, found: 202.1224.

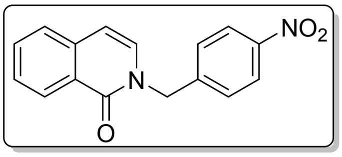
2-(naphthalen-1-ylmethyl)isoquinolin-1(2*H*)-one (3g)



White solid; 36 mg in 0.2 mmol scale, 63% yield; m. p. 122-123 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.53 (d, *J* = 8.0 Hz, 1 H), 8.07-8.05 (m, 1 H), 7.87-7.82 (m, 2H), 7.64-7.60 (m, 1 H), 7.52-7.48 (m, 3 H), 7.43 (dd, *J* = 15.4, 8.1

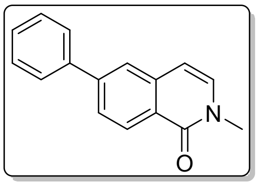
Hz, 2 H), 7.33 (d, J = 7.0 Hz, 1 H), 6.96 (d, J = 7.4 Hz, 1 H), 6.38 (d, J = 7.4 Hz, 1 H), 5.68 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.2, 136.9, 133.9, 132.3, 132.2, 131.4, 130.4, 129.0, 128.8, 128.2, 127.1, 126.9, 126.2, 126.1, 126.0, 125.3, 123.5, 106.4, 48.8 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{16}ON^+$: 286.1226, found: 286.1226.

2-(4-nitrobenzyl)isoquinolin-1(2*H*)-one (3h)



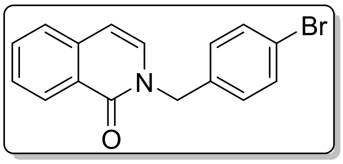
Brown solid; 17 mg in 0.2 mmol scale, 30% yield; m. p. 153-154 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.44 (d, J = 7.9 Hz, 1 H), 8.18 (d, J = 8.4 Hz, 2 H), 7.67 (t, J = 7.5 Hz, 1H), 7.55-7.46 (m, 4 H), 7.09 (d, J = 7.3 Hz, 1 H), 6.56 (d, J = 7.3 Hz, 1 H), 5.30 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.2, 144.2, 137.0, 132.6, 131.0, 128.5, 128.1, 127.3, 126.2, 126.1, 124.0, 107.1, 51.6 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{13}O_3N_2^+$: 281.0921, found: 281.0920.

2-methyl-6-phenylisoquinolin-1(2*H*)-one (3i)



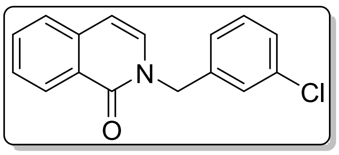
White solid; 22 mg in 0.2 mmol scale, 47% yield; m. p. 139-140 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.48 (d, J = 8.3 Hz, 1 H), 7.72-7.65 (m, 4 H), 7.49-7.45 (m, 2 H), 7.42-7.38 (m, 1 H), 7.08 (d, J = 7.3 Hz, 1 H), 6.52 (d, J = 7.3 Hz, 1 H), 3.61 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.5, 144.8, 140.5, 137.6, 132.8, 128.9, 128.3, 128.1, 127.5, 126.1, 125.0, 124.0, 106.1, 37.0 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{14}ON^+$: 236.1070, found: 236.1073.

2-(4-bromobenzyl)isoquinolin-1(2*H*)-one (3j)



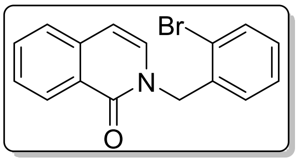
White solid; 42 mg in 0.2 mmol scale, 67% yield; m. p. 159-160 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.49-8.40 (m, 1 H), 7.66-7.61 (m, 1 H), 7.51-7.43 (m, 4 H), 7.20 (d, J = 8.4 Hz, 2 H), 7.05 (d, J = 7.4 Hz, 1 H), 6.49 (d, J = 7.4 Hz, 1 H), 5.15 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.2, 129.7, 128.1, 127.1, 126.3, 126.0, 121.9, 106.7, 51.3 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{13}BrON^+$: 314.0175, found: 314.0172.

2-(3-chlorobenzyl)isoquinolin-1(2*H*)-one (3k)



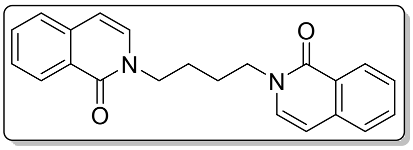
White solid; 41 mg in 0.2 mmol scale, 76% yield; m. p. 95-96 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.37 (d, J = 8.0 Hz, 1 H), 7.56 (t, J = 7.5 Hz, 1 H), 7.41 (t, J = 7.5 Hz, 2 H), 7.22 (s, 1 H), 7.14 (dt, J = 8.9, 4.7 Hz, 3 H), 6.98 (d, J = 7.4 Hz, 1 H), 6.42 (d, J = 7.4 Hz, 1 H), 5.10 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.2, 139.0, 137.0, 134.7, 132.4, 131.1, 130.1, 128.1, 128.0, 127.9, 127.1, 126.3, 126.1, 126.0, 106.7, 51.3 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{13}ClON^+$: 270.0680, found: 270.0687.

2-(2-bromobenzyl)isoquinolin-1(2*H*)-one (3l)



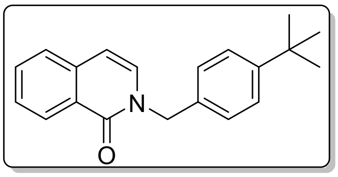
Light yellow solid; 33 mg in 0.2 mmol scale, 53% yield; m. p. 87-88 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.47 (d, *J* = 8.0 Hz, 1 H), 7.67-7.63 (m, 1 H), 7.59 (d, *J* = 8.0 Hz, 1 H), 7.53-7.48 (m, 2 H), 7.23 (dd, *J* = 11.9, 5.3 Hz, 1 H), 7.18-7.07 (m, 3 H), 6.51 (d, *J* = 7.4 Hz, 1 H), 5.33 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.4, 137.1, 136.0, 133.0, 132.4, 131.5, 129.5, 129.3, 128.1, 127.9, 127.0, 126.3, 126.0, 123.4, 106.5, 51.7 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{13}BrON^+$: 314.0175, found: 314.0175.

2,2'-(butane-1,4-diyl)bis(isoquinolin-1(2*H*)-one) (3m)



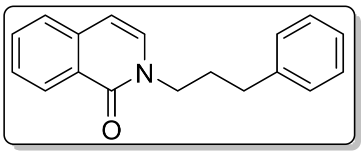
White solid; 18 mg in 0.1 mmol scale, 51% yield; m. p. 185-186 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.34 (d, *J* = 8.0 Hz, 2 H), 7.53 (t, *J* = 7.5 Hz, 2 H), 7.41-7.37 (m, 4 H), 6.98 (d, *J* = 7.3 Hz, 2 H), 6.39 (d, *J* = 7.2 Hz, 2H), 3.98 (s, 4 H), 1.78 (s, 4 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.2, 137.1, 132.1, 131.7, 127.8, 126.8, 126.2, 125.9, 106.2, 48.6, 26.3 ppm; HRMS $[M+H]^+$ calculated for $C_{22}H_{21}O_2N_2^+$: 345.1598, found: 345.1597.

2-(4-(tert-butyl)benzyl)isoquinolin-1(2*H*)-one (3n)



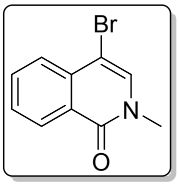
Light yellow oil; 33 mg in 0.2 mmol scale, 57% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.39 (d, *J* = 7.7 Hz, 1 H), 7.56-7.52 (m, 1 H), 7.40 (dd, *J* = 11.3, 4.3 Hz, 2 H), 7.28-7.26 (m, 2 H), 7.20-7.17 (m, 2 H), 7.02 (d, *J* = 7.4 Hz, 1 H), 6.40 (d, *J* = 7.4 Hz, 1 H), 5.11 (s, 2 H), 1.21 (s, 9 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.3, 150.8, 137.0, 133.9, 132.2, 131.4, 128.1, 127.8, 126.9, 126.4, 125.9, 125.7, 106.3, 51.5, 34.5, 31.3 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{22}ON^+$: 292.1696, found: 292.1694.

2-(3-phenylpropyl)isoquinolin-1(2*H*)-one (3o)



Light yellow oil; 18 mg in 0.2 mmol scale, 34% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.44 (d, *J* = 8.0 Hz, 1 H), 7.61 (dd, *J* = 10.5, 4.5 Hz, 1 H), 7.50-7.45 (m, 2 H), 7.27 (dd, *J* = 12.7, 5.5 Hz, 2 H), 7.19 (dd, *J* = 10.3, 7.5 Hz, 3 H), 6.99 (d, *J* = 7.3 Hz, 1 H), 6.47 (d, *J* = 7.3 Hz, 1 H), 4.04-4.00 (m, 2 H), 2.73-2.69 (m, 2 H), 2.13 (dt, *J* = 14.9, 7.6 Hz, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.2, 141.0, 137.0 132.1, 131.6, 128.5, 128.4, 127.9, 126.8, 126.4, 126.1, 125.9, 106.0, 49.0, 32.9, 30.6 ppm; HRMS $[M+H]^+$ calculated for $C_{18}H_{18}ON^+$: 264.1383, found: 264.1382.

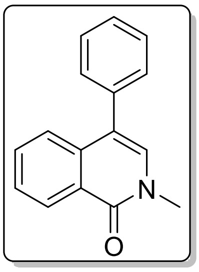
4-bromo-2-methylisoquinolin-1(2*H*)-one (3p)



White solid; 41 mg in 0.2 mmol scale, 88% yield; m. p. 127-128 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.34 (d, *J* = 8.0 Hz, 1 H), 7.70 (d, *J* = 8.0 Hz, 1 H), 7.63 (t, *J* = 7.6 Hz, 1 H), 7.45 (t, *J* = 7.5 Hz, 1 H), 7.26 (s, 1 H), 3.50 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ =

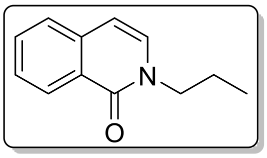
161.7, 135.5, 133.0, 132.8, 128.1, 127.8, 126.3, 125.8, 99.5, 36.9 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9BrON^+$: 237.9862, found: 237.9861.

2-methyl-4-phenylisoquinolin-1(2*H*)-one (3q)



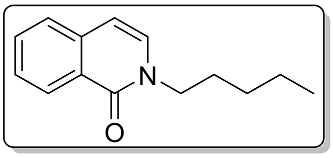
White solid; 25 mg in 0.2 mmol scale, 53% yield; m. p. 174-175 °C; ^1H NMR (400 MHz, $CDCl_3$) δ = 8.53 (d, *J* = 7.9 Hz, 1H), 7.59-7.50 (m, 3 H), 7.43 (dd, *J* = 20.5, 6.9 Hz, 5 H), 7.04 (s, 1 H), 3.65 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.2, 136.4, 136.3, 132.0, 131.5, 130.0, 128.7, 128.1, 127.7, 126.9, 125.9, 124.6, 119.6, 37.0 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{14}ON^+$: 236.1070, found: 236.1072.

2-propylisoquinolin-1(2*H*)-one (3r)



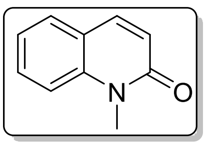
Colorless oil; 24 mg in 0.2 mmol scale, 65% yield; ^1H NMR (400 MHz, $CDCl_3$) δ = 8.44 (d, *J* = 8.0 Hz, 1 H), 7.61 (dd, *J* = 11.0, 3.9 Hz, 1 H), 7.48 (dd, *J* = 14.7, 7.5 Hz, 2 H), 7.06 (d, *J* = 7.3 Hz, 1 H), 6.48 (d, *J* = 7.3 Hz, 1 H), 3,99-3.95 (m, 2 H), 1.82 (dd, *J* = 14.7, 7.4 Hz, 2 H), 0.98 (t, *J* = 7.4 Hz, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1, 137.0, 132.0, 131.8, 127.9, 126.7, 126.4, 125.8, 105.8, 51.0, 22.6, 11.2 ppm; HRMS $[M+H]^+$ calculated for $C_{12}H_{14}ON^+$: 188.1070, found: 188.1074.

2-pentylisoquinolin-1(2*H*)-one (3s)



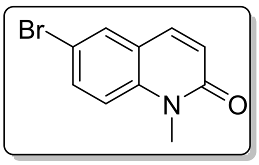
Light yellow oil; 22 mg in 0.2 mmol scale, 50% yield; ^1H NMR (400 MHz, $CDCl_3$) δ = 8.44 (d, *J* = 8.0 Hz, 1 H), 7.66-7.57 (m, 1 H), 7.48 (dd, *J* = 14.6, 7.4 Hz, 2 H), 7.06 (d, *J* = 7.3 Hz, 1 H), 6.48 (d, *J* = 7.3 Hz, 1 H), 4.00-3.97 (m, 2 H), 1.81-1.74 (m, 2 H), 1.39-1.33 (m, 4 H), 0.90 (t, *J* = 6.8 Hz, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.1, 137.0, 132.0, 131.7, 127.8, 126.7, 126.3, 125.8, 105.9, 49.4, 29.0, 28.9, 22.4, 14.0 ppm; HRMS $[M+H]^+$ calculated for $C_{14}H_{18}ON^+$: 216.1383, found: 216.1381.

1-methylquinolin-2(1*H*)-one (4a)



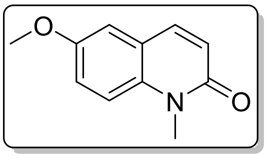
Light yellow oil; 25 mg in 0.2 mmol scale, 78% yield; ^1H NMR (400 MHz, $CDCl_3$) δ = 7.67 (d, *J* = 9.5 Hz, 1 H), 7.58 (dd, *J* = 12.7, 4.4 Hz, 2 H), 7.37 (d, *J* = 8.4 Hz, 1 H), 7.27-7.22 (m, 1 H), 6.72 (d, *J* = 9.5 Hz, 1 H), 3.72 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.4, 140.1, 139.0, 130.6, 128.8, 122.1, 121.7, 120.7, 114.1, 29.4 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_{10}ON^+$: 160.0757, found: 160.0758.

6-bromo-1-methylquinolin-2(1*H*)-one (4b)



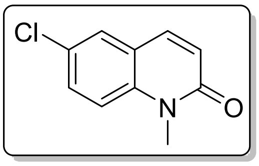
White solid; 36 mg in 0.2 mmol scale, 77% yield; m. p. 141-142 °C; ^1H NMR (400 MHz, $CDCl_3$) δ = 7.67-7.61 (m, 2 H), 7.57 (d, J = 9.5 Hz, 1 H), 7.23 (d, J = 8.9 Hz, 1 H), 6.72 (d, J = 9.5 Hz, 1 H), 3.68 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.8, 139.0, 137.7, 133.3, 130.8, 123.0, 122.1, 115.8, 114.9, 29.5 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9OBrN^+$: 237.9862, found: 237.9861.

6-methoxy-1-methylquinolin-2(1*H*)-one (4c)



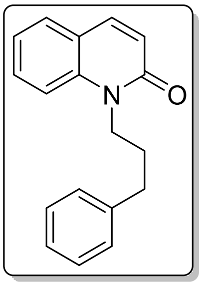
Light yellow solid; 33 mg in 0.2 mmol scale, 89% yield; m. p. 70-71 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.61 (d, J = 9.4 Hz, 1 H), 7.29 (t, J = 7.4 Hz, 1 H), 7.19 (dd, J = 9.2, 2.5 Hz, 1 H), 7.00 (d, J = 2.4 Hz, 1 H), 6.72 (d, J = 9.4 Hz, 1 H), 3.87 (s, 3 H), 3.71 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.0, 154.7, 138.4, 134.6, 122.3, 121.4, 119.2, 115.4, 110.5, 55.7, 29.5 ppm; HRMS $[M+H]^+$ calculated for $C_{11}H_{12}O_2N^+$: 190.0863, found: 190.0864.

6-chloro-1-methylquinolin-2(1*H*)-one (4d)



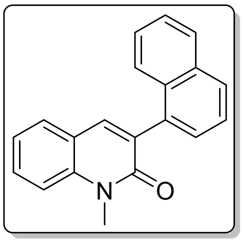
Off-white solid; 31 mg in 0.2 mmol scale, 80% yield; m. p. 145-146 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.58 (d, J = 9.5 Hz, 1 H), 7.51 (d, J = 10.4 Hz, 2 H), 7.29 (d, J = 8.6 Hz, 1 H), 6.73 (d, J = 9.5 Hz, 1 H), 3.69 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.9, 138.6, 137.8, 130.6, 127.8, 127.6, 123.1, 121.7, 115.6, 29.6 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9OClN^+$: 194.0367, found: 194.0367.

1-(3-phenylpropyl)quinolin-2(1*H*)-one (4e)



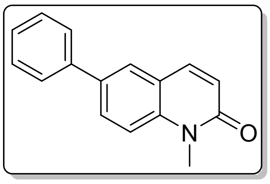
Yellow oil; 19 mg in 0.2 mmol scale, 36% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.64 (d, J = 9.4 Hz, 1 H), 7.54 (d, J = 7.7 Hz, 1 H), 7.47 (dd, J = 8.5, 7.3 Hz, 1 H), 7.30-7.29 (m, 2 H), 7.25-7.17 (m, 4 H), 7.12 (d, J = 8.6 Hz, 1 H), 6.69 (d, J = 9.4 Hz, 1 H), 4.33-4.29 (m, 2 H), 2.80 (t, J = 7.6 Hz, 2 H), 2.12-2.04 (m, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.1, 141.2, 139.2, 139.0, 130.5, 129.0, 128.5, 128.4, 126.1, 121.9, 121.8, 121.0, 114.0, 41.8, 33.2, 28.8 ppm; HRMS $[M+H]^+$ calculated for $C_{18}H_{18}ON^+$: 264.1383, found: 264.1375.

1-methyl-3-(naphthalen-1-yl)quinolin-2(1*H*)-one (4f)



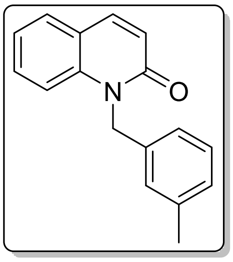
Yellow solid; 50 mg in 0.2 mmol scale, 88% yield from iodide salt; 46 mg in 0.2 mmol scale, 81% yield from tetrafluoroborate salt; m. p. 161-162 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.85 (d, J = 7.7 Hz, 2 H), 7.75-7.72 (m, 2 H), 7.58-7.50 (m, 3 H), 7.45 (ddd, J = 6.1, 4.8, 2.5 Hz, 2 H), 7.42-7.37 (m, 2 H), 7.24-7.19 (m, 1 H), 3.78 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.9, 140.1, 139.1, 135.2, 133.7, 132.8, 132.1, 130.6, 128.9, 128.7, 128.4, 127.5, 126.2, 125.8, 125.4, 122.3, 120.6, 114.2, 30.1 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{16}ON^+$: 286.1226, found: 286.1227.

1-methyl-6-phenylquinolin-2(1*H*)-one (4g)



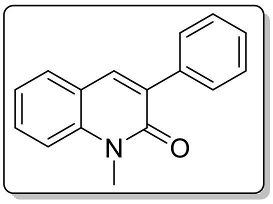
Grey solid; 20 mg in 0.2 mmol scale, 43% yield; m. p. 136-137 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.73 (dd, *J* = 8.7, 2.0 Hz, 1 H), 7.66 (dd, *J* = 13.3, 5.7 Hz, 2 H), 7.54 (d, *J* = 7.5 Hz, 2 H), 7.35 (ddd, *J* = 25.7, 14.9, 7.4 Hz, 4 H), 6.67 (d, *J* = 9.5 Hz, 1 H), 3.67 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.3, 139.7, 139.4, 139.0, 135.2, 129.6, 129.0, 127.5, 126.9, 126.8, 122.2, 121.0, 114.6, 29.5 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{14}ON^+$: 236.1070, found: 236.1064.

1-(3-methylbenzyl)quinolin-2(1*H*)-one (4h)



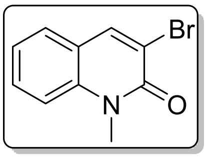
Light yellow oil; 32 mg in 0.2 mmol scale, 64% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.73 (d, *J* = 9.5 Hz, 1 H), 7.55 (d, *J* = 7.7 Hz, 1H), 7.41 (t, *J* = 7.9 Hz, 1 H), 7.27 (d, *J* = 8.6 Hz, 1 H), 7.17 (t, *J* = 7.6 Hz, 2 H), 7.02 (t, *J* = 8.0 Hz, 3 H), 6.80 (d, *J* = 9.5 Hz, 1 H), 5.52 (s, 2 H), 2.28 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.5, 139.6, 139.5, 138.5, 136.3, 130.6, 128.8, 128.7, 128.1, 127.2, 123.7, 122.2, 121.7, 121.0, 115.1, 46.0, 21.4 ppm; HRMS $[M+H]^+$ calculated for $C_{17}H_{16}ON^+$: 250.1226, found: 250.1224.

1-methyl-3-phenylquinolin-2(1*H*)-one (4i)



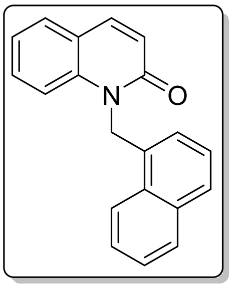
Yellow solid; 29 mg in 0.2 mmol scale, 62% yield; m. p. 127-128 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.79 (s, 1 H), 7.72-7.70 (m, 2 H), 7.61-7.57 (m, 1 H), 7.56-7.54 (m, 1 H), 7.45-7.41 (m, 2 H), 7.38-7.34 (m, 2 H), 7.26-7.22 (m, 1 H), 3.79 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.6, 139.7, 136.8, 136.7, 132.5, 130.3, 129.0, 128.9, 128.2, 128.1, 122.2, 120.8, 114.0, 30.0 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{14}ON^+$: 236.1070, found: 236.1074.

3-bromo-1-methylquinolin-2(1*H*)-one (4j)



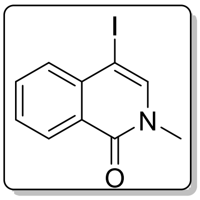
White solid; 27 mg in 0.2 mmol scale, 58% yield; m. p. 144-145 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.12 (s, 1 H), 7.60 (ddd, *J* = 8.6, 7.3, 1.5 Hz, 1 H), 7.52 (dd, *J* = 7.8, 1.2 Hz, 1 H), 7.36 (d, *J* = 8.5 Hz, 1 H), 7.26 (dd, *J* = 8.8, 6.2 Hz, 1 H), 3.80 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 158.5, 140.6, 139.4, 130.9, 128.1, 122.7, 120.5, 117.6, 114.4, 31.1 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9BrON^+$: 237.9862, found: 237.9864.

1-(naphthalen-1-ylmethyl)quinolin-2(1*H*)-one (4k)



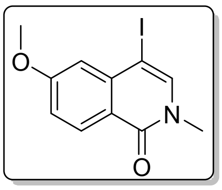
Grey solid; 43 mg in 0.2 mmol scale, 75% yield; m. p. 186-187 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.14 (d, *J* = 8.3 Hz, 1 H), 7.90 (d, *J* = 8.1 Hz, 1 H), 7.80-7.78 (m, 1 H), 7.72 (d, *J* = 8.1 Hz, 1 H), 7.64-7.53 (m, 3 H), 7.31-7.21 (m, 2 H), 7.16 (t, *J* = 7.5 Hz, 1 H), 7.02 (d, *J* = 8.4 Hz, 1 H), 6.84 (dd, *J* = 9.5, 2.1 Hz, 1 H), 6.78 (d, *J* = 7.1 Hz, 1 H), 5.99 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.5, 139.7, 139.6, 133.9, 130.8, 130.7, 130.6, 129.1, 128.8, 127.7, 126.5, 125.9, 125.6, 122.4, 122.3, 121.7, 121.0, 115.3, 43.9 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{16}ON^+$: 286.1226, found: 286.1219.

4-iodo-2-methylisoquinolin-1(2*H*)-one (5a)



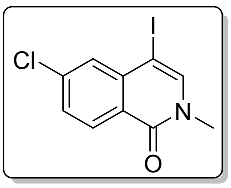
White solid; 42 mg in 0.2 mmol scale, 74% yield; 45 mg in 0.2 mmol scale, 79% yield from tetrafluoroborate salt; m. p. 123-124 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.37 (d, *J* = 8.0 Hz, 1 H), 7.69 (t, *J* = 7.5 Hz, 1 H), 7.62 (d, *J* = 8.0 Hz, 1 H), 7.52-7.49 (m, 2 H), 3.58 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.9, 138.7, 137.2, 133.1, 130.3, 128.0, 127.8, 126.4, 71.4, 36.8 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_9OIN^+$: 285.9723, found: 285.9725.

4-iodo-6-methoxy-2-methylisoquinolin-1(2*H*)-one (5b)



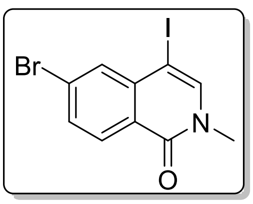
White solid; 44 mg in 0.2 mmol scale, 70% yield; m. p. 177-178 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.31 (d, *J* = 8.8 Hz, 1 H), 7.51 (s, 1 H), 7.07-7.03 (m, 2 H), 3.95 (s, 3 H), 3.57 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 163.5, 161.6, 139.4, 139.3, 130.4, 120.2, 116.8, 112.1, 71.0, 55.6, 36.6 ppm; HRMS $[M+H]^+$ calculated for $C_{11}H_{11}O_2IN^+$: 315.9829, found: 315.9829.

6-chloro-4-iodo-2-methylisoquinolin-1(2*H*)-one (5c)



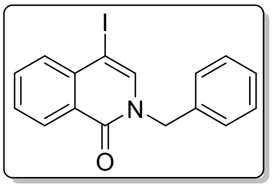
White solid; 50 mg in 0.2 mmol scale, 78% yield; m. p. 213-214 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.31 (d, *J* = 8.6 Hz, 1 H), 7.64 (d, *J* = 1.9 Hz, 1 H), 7.54 (s, 1H), 7.44 (dd, *J* = 8.6, 2.0 Hz, 1 H), 3.58 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.3, 140.0, 139.9, 138.7, 130.0, 129.8, 128.3, 124.7, 69.3, 36.9 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_8ClOIN^+$: 319.9334, found: 319.9336.

6-bromo-4-iodo-2-methylisoquinolin-1(2*H*)-one (5d)



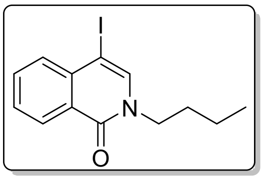
White solid; 53 mg in 0.2 mmol scale, 73% yield; m. p. 208-209 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.24 (d, *J* = 8.5 Hz, 1 H), 7.83 (d, *J* = 1.6 Hz, 1 H), 7.61 (dd, *J* = 8.5, 1.6 Hz, 1 H), 7.55 (s, 1 H), 3.59 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.5, 139.9, 138.8, 133.0, 131.2, 130.0, 128.7, 125.1, 69.2, 36.9 ppm; HRMS $[M+H]^+$ calculated for $C_{10}H_8BrOIN^+$: 363.8828, found: 363.8831.

2-benzyl-4-iodoisoquinolin-1(2*H*)-one (5e)



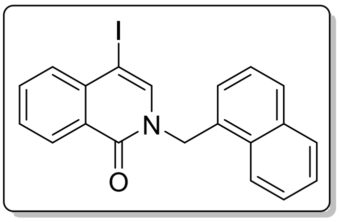
Light yellow solid; 50 mg in 0.2 mmol scale, 69% yield; m. p. 91-92 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.42 (dd, *J* = 8.0, 0.5 Hz, 1 H), 7.71-7.62 (m, 2 H), 7.53-7.49 (m, 2 H), 7.34-7.28 (m, 5 H), 5.18 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.6, 137.6, 137.1, 136.4, 133.3, 130.5, 129.0, 128.5, 128.1, 128.0, 127.9, 126.7, 72.1, 51.7 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{13}OIN^+$: 362.0036, found: 362.0037.

2-butyl-4-iodoisoquinolin-1(2*H*)-one (5f)



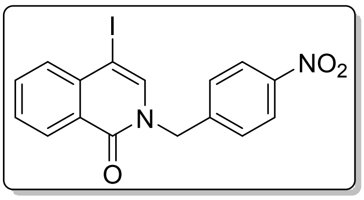
Light yellow oil; 52 mg in 0.2 mmol scale, 80% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.32 (d, *J* = 8.0 Hz, 1 H), 7.65-7.57 (m, 2 H), 7.46-7.42 (m, 2 H), 3.90 (t, *J* = 7.4 Hz, 2 H), 1.68 (dt, *J* = 15.1, 7.5 Hz, 2 H), 1.33 (dq, *J* = 14.8, 7.4 Hz, 2 H), 0.89 (t, *J* = 7.4 Hz, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.5, 138.0, 137.1, 133.1, 130.3, 128.2, 127.7, 126.7, 71.4, 49.1, 31.5, 20.0, 13.7 ppm; HRMS $[M+H]^+$ calculated for $C_{13}H_{15}OIN^+$: 328.0193, found: 328.0189.

4-iodo-2-(naphthalen-1-ylmethyl)isoquinolin-1(2*H*)-one (5g)



Off-white solid; 48 mg in 0.2 mmol scale, 58% yield; m. p. 137-138 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.41 (dd, *J* = 8.0, 0.7 Hz, 1 H), 7.99-7.94 (m, 1 H), 7.79-7.71 (m, 2 H), 7.63-7.57 (m, 1 H), 7.52 (d, *J* = 7.6 Hz, 1 H), 7.46-7.39 (m, 3 H), 7.36-7.32 (m, 2 H), 7.24 (d, *J* = 6.9 Hz, 1 H), 5.56 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.5, 137.1, 136.8, 134.0, 133.4, 131.6, 131.3, 130.5, 129.3, 128.9, 128.6, 127.9, 127.2, 127.1, 126.6, 126.3, 125.4, 123.3, 72.4, 48.7 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{15}OIN^+$: 412.0193, found: 412.0194.

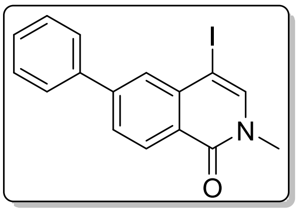
4-iodo-2-(4-nitrobenzyl)isoquinolin-1(2*H*)-one (5h)



Yellow solid; 39 mg in 0.2 mmol scale, 48% yield; m. p. 166-167 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.40 (d, *J* = 8.0 Hz, 1 H), 8.18 (d, *J* = 8.6 Hz, 2 H), 7.75 (t, *J* = 7.6 Hz, 1 H), 7.68 (d, *J* = 7.9 Hz, 1 H), 7.58-7.55 (m, 2 H), 7.48 (d, *J* = 8.6 Hz, 2 H), 5.26 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.5, 155.6, 147.7, 143.6, 137.1, 133.7, 130.7, 128.6, 128.4, 128.3, 126.4, 124.1, 72.9, 51.4 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{12}O_3IN_2^+$: 406.9887, found: 406.9893.

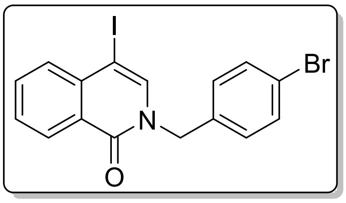
4-iodo-2-methyl-6-phenylisoquinolin-1(2*H*)-one (5i)

Orange solid; 55 mg in 0.2 mmol scale, 76% yield; m. p. 170-171 °C; ^{1}H NMR (400



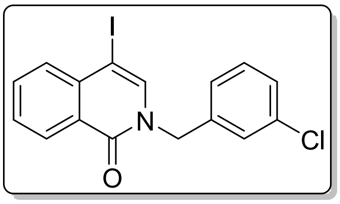
MHz, $CDCl_3$) δ = 8.42 (d, *J* = 8.3 Hz, 1 H), 7.80 (d, *J* = 1.5 Hz, 1 H), 7.70 (ddd, *J* = 8.6, 7.8, 3.5 Hz, 3 H), 7.52-7.47 (m, 3H), 7.42 (ddd, *J* = 7.3, 3.7, 1.1 Hz, 1 H), 3.58 (s, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.8, 145.9, 139.8, 139.1, 137.5, 129.0, 128.8, 128.6, 128.4, 127.6, 126.9, 125.3, 71.6, 36.8 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{13}OIN^+$: 362.0036, found: 362.0034.

2-(4-bromobenzyl)-4-iodoisoquinolin-1(2*H*)-one (5j)



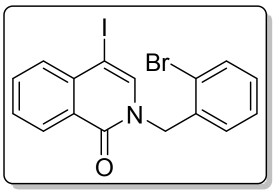
White solid; 67 mg in 0.2 mmol scale, 76% yield; m. p. 114-115 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.41 (dd, *J* = 8.0, 0.8 Hz, 1H), 7.74-7.69 (m, 1 H), 7.65 (d, *J* = 7.4 Hz, 1 H), 7.55-7.50 (m, 2 H), 7.47-7.44 (m, 2 H), 7.21 (d, *J* = 8.4 Hz, 2 H), 5.12 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.6, 137.3, 137.1, 135.4, 133.4, 132.1, 130.6, 129.7, 128.4, 128.1, 126.6, 122.2, 72.4, 51.3 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{12}BrOIN^+$: 439.9141, found: 439.9149.

2-(3-chlorobenzyl)-4-iodoisoquinolin-1(2*H*)-one (5k)



Off-white solid; 43 mg in 0.2 mmol scale, 54% yield; m. p. 97-98 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.42 (d, *J* = 8.0 Hz, 1 H), 7.74-7.70 (m, 1 H), 7.65 (d, *J* = 8.0 Hz, 1H), 7.55-7.51 (m, 2 H), 7.32 (s, 1 H), 7.26 (d, *J* = 5.2 Hz, 2 H), 7.21 (dd, *J* = 8.8, 3.5 Hz, 1 H), 5.14 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.6, 138.4, 137.3, 137.1, 134.8, 133.5, 130.6, 130.2, 128.5, 128.4, 128.1, 128.0, 126.6 126.1, 72.5, 51.3 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{12}ClOIN^+$: 395.9647, found: 395.9654.

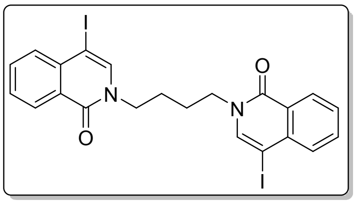
2-(2-bromobenzyl)-4-iodoisoquinolin-1(2*H*)-one (5l)



Grey solid; 43 mg in 0.2 mmol scale, 49% yield; m. p. 169-170 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.43 (dd, *J* = 8.0, 0.8 Hz, 1 H), 7.72 (ddd, *J* = 19.2, 13.1, 4.3 Hz, 2 H), 7.61-7.52 (m, 3 H), 7.28-7.24 (m, 1 H), 7.19-7.14 (m, 2 H), 5.30 (s, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.7, 137.7, 137.2, 135.4, 133.4, 133.1, 130.6, 129.6, 129.5, 128.5, 128.0, 126.6, 123.3, 72.2, 51.6 ppm; HRMS $[M+H]^+$ calculated for $C_{16}H_{12}BrOIN^+$: 439.9141, found: 439.9142.

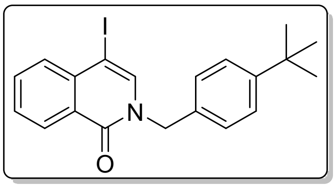
2,2'-(butane-1,4-diyl)bis(4-iodoisoquinolin-1(2*H*)-one) (5m)

Light yellow solid; 14 mg in 0.1 mmol scale, 23% yield; m. p. 237-238 °C; ^{1}H NMR



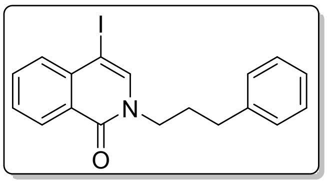
(400 MHz, $CDCl_3$) δ = 8.41 (d, *J* = 8.0 Hz, 1 H), 7.72 (t, *J* = 7.5 Hz, 1 H), 7.66 (d, *J* = 8.0 Hz, 1 H), 7.58-7.51 (m, 2 H), 4.08 (t, *J* = 6.0 Hz, 2 H), 1.86 (t, *J* = 6.4 Hz, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.6, 137.8, 137.1, 133.2, 130.4, 128.2, 127.9, 126.6, 71.9, 48.3, 26.3 ppm; HRMS $[M+H]^+$ calculated for $C_{22}H_{19}O_2I_2N_2^+$: 596.9530, found: 596.9526.

2-(4-(tert-butyl)benzyl)-4-iodoisoquinolin-1(2*H*)-one (5n)



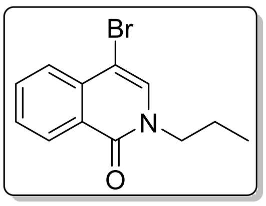
White solid; 56 mg in 0.2 mmol scale, 67% yield; m. p. 176-177 °C; ^1H NMR (400 MHz, $CDCl_3$) δ = 8.43 (d, *J* = 8.0 Hz, 1 H), 7.71-7.67 (m, 1 H), 7.63 (d, *J* = 7.6 Hz, 1 H), 7.52 (dd, *J* = 14.2, 6.3 Hz, 2 H), 7.36 (d, *J* = 8.4 Hz, 2 H), 7.28-7.24 (m, 2 H), 5.15 (s, 2 H), 1.29 (s, 9 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.6, 151.1, 137.7, 137.1, 133.4, 133.2, 130.4, 128.5, 127.9, 127.8, 126.8, 125.9, 72.0, 51.5, 34.6, 31.3 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{21}OIN^+$: 418.0662, found: 418.0665.

4-iodo-2-(3-phenylpropyl)isoquinolin-1(2*H*)-one (5o)



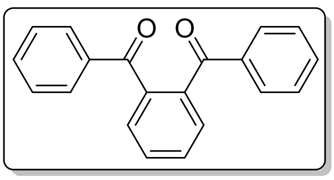
yellow oil; 51 mg in 0.2 mmol scale, 66% yield; ^1H NMR (400 MHz, $CDCl_3$) δ = 8.39 (d, *J* = 8.0 Hz, 1 H), 7.70-7.62 (m, 2 H), 7.50 (t, *J* = 7.4 Hz, 1 H), 7.41 (s, 1 H), 7.27 (t, *J* = 7.4 Hz, 2 H), 7.19 (d, *J* = 7.3 Hz, 3 H), 3.98 (t, *J* = 7.3 Hz, 2 H), 2.70 (t, *J* = 7.6 Hz, 2 H), 2.15-2.08 (m, 2 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.5, 140.7, 138.0, 137.1, 133.1, 130.3, 128.6, 128.4, 128.2, 127.8, 126.7, 126.2, 71.5, 49.0, 32.9, 30.5 ppm; HRMS $[M+H]^+$ calculated for $C_{18}H_{17}OIN^+$: 390.0349, found: 390.0349.

4-bromo-2-propylisoquinolin-1(2*H*)-one (5q)



Colorless liquid; 14 mg in 0.2 mmol scale, 26% yield; ^1H NMR (400 MHz, $CDCl_3$) δ = 8.46-8.44 (m, 1 H), 7.81 (d, *J* = 7.8 Hz, 1 H), 7.76-7.72 (m, 1 H), 7.57-7.53 (m, 1 H), 7.35 (s, 1 H), 3.98-3.94 (m, 2 H), 1.82 (dd, *J* = 14.8, 7.4 Hz, 2 H), 0.99 (t, *J* = 7.4 Hz, 3 H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.2, 135.4, 132.8, 132.3, 128.3, 127.7, 126.6, 125.8, 99.6, 51.0, 22.6, 11.2 ppm; HRMS $[M+Na]^+$ calculated for $C_{12}H_{13}{}^{79}BrNNaO^+$: 287.9994 and $C_{12}H_{13}{}^{81}BrNNaO^+$: 289.9979 found: 287.9994 and 289.9974.

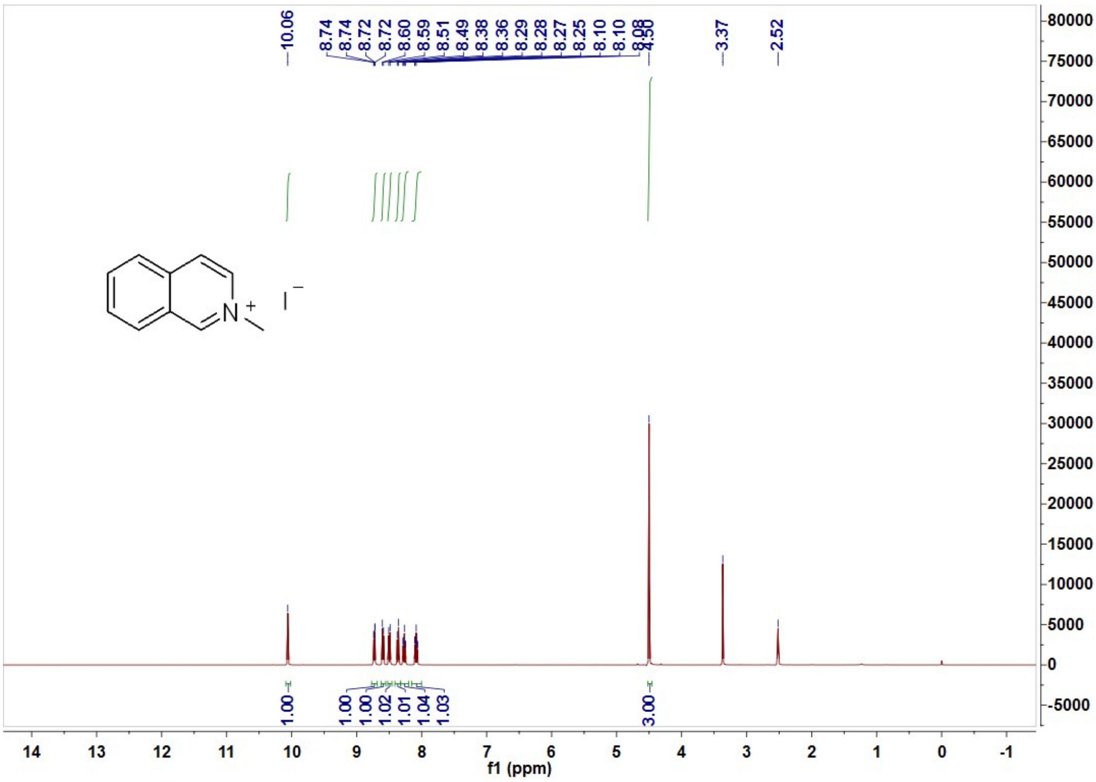
1,2-phenylenebis(phenylmethanone)

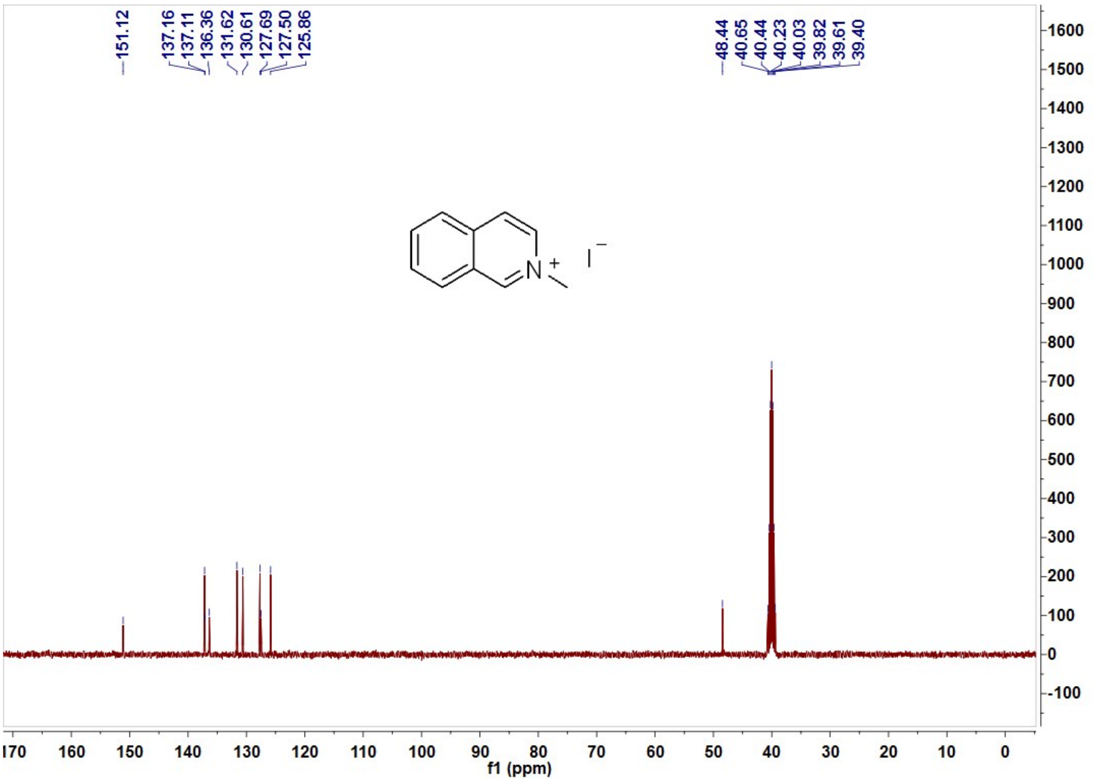


yellow solid; ^1H NMR (400 MHz, $CDCl_3$) δ = 7.70 (d, *J* = 7.7 Hz, 4 H), 7.61 (s, 4 H), 7.50 (t, *J* = 7.4 Hz, 2 H), 7.36 (t, *J* = 7.7 Hz, 4H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$) δ = 196.6, 140.1, 137.2, 133.0, 130.4, 129.8, 129.7, 128.3 ppm; HRMS $[M+H]^+$ calculated for $C_{20}H_{15}O_2^+$: 287.1067, found: 287.1070.

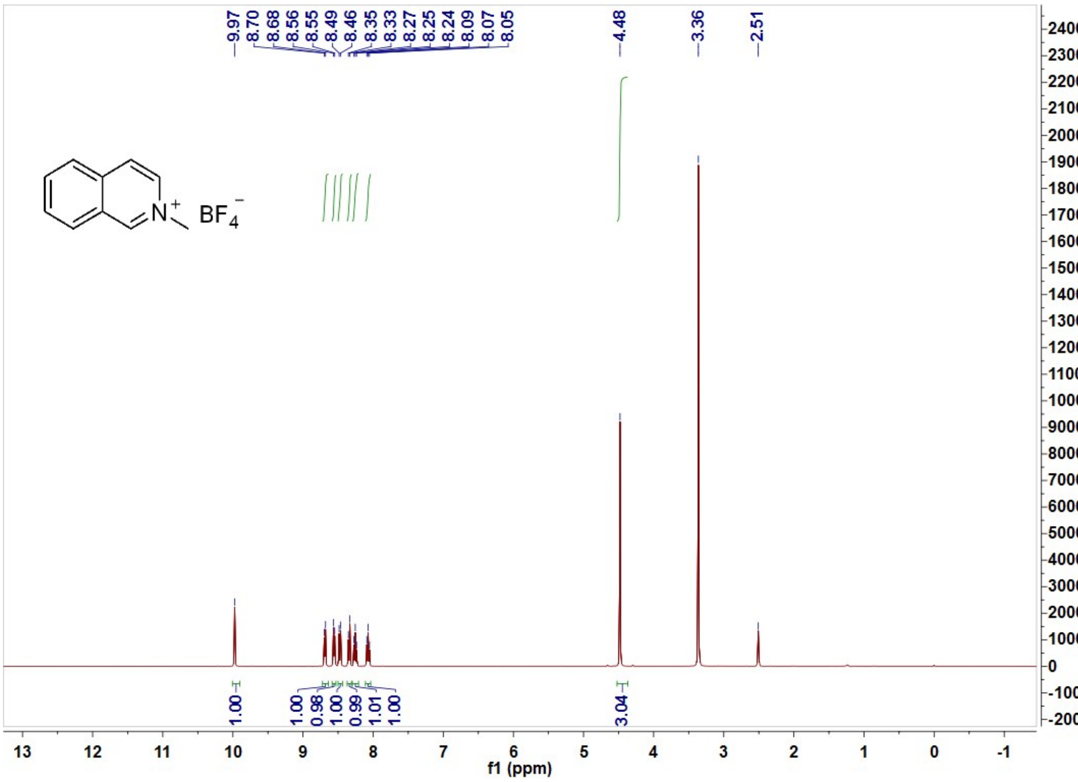
NMR spectra of all compounds

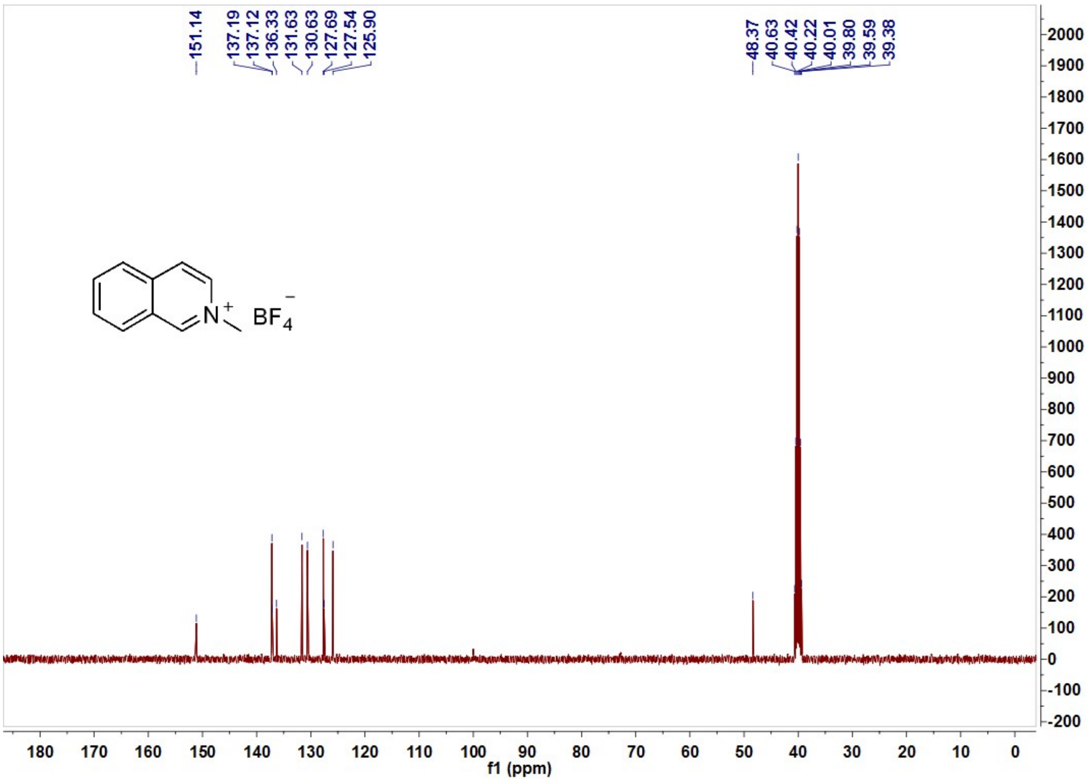
The ^{1}H NMR and ^{13}C NMR spectra of 1aa



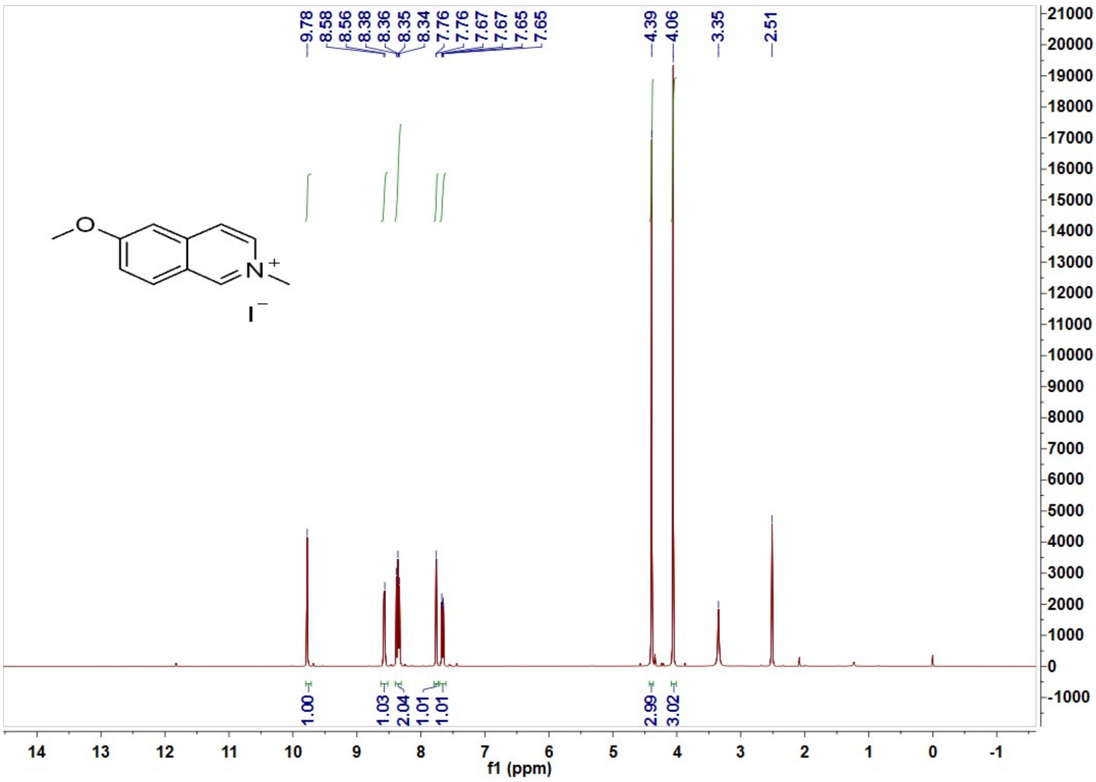


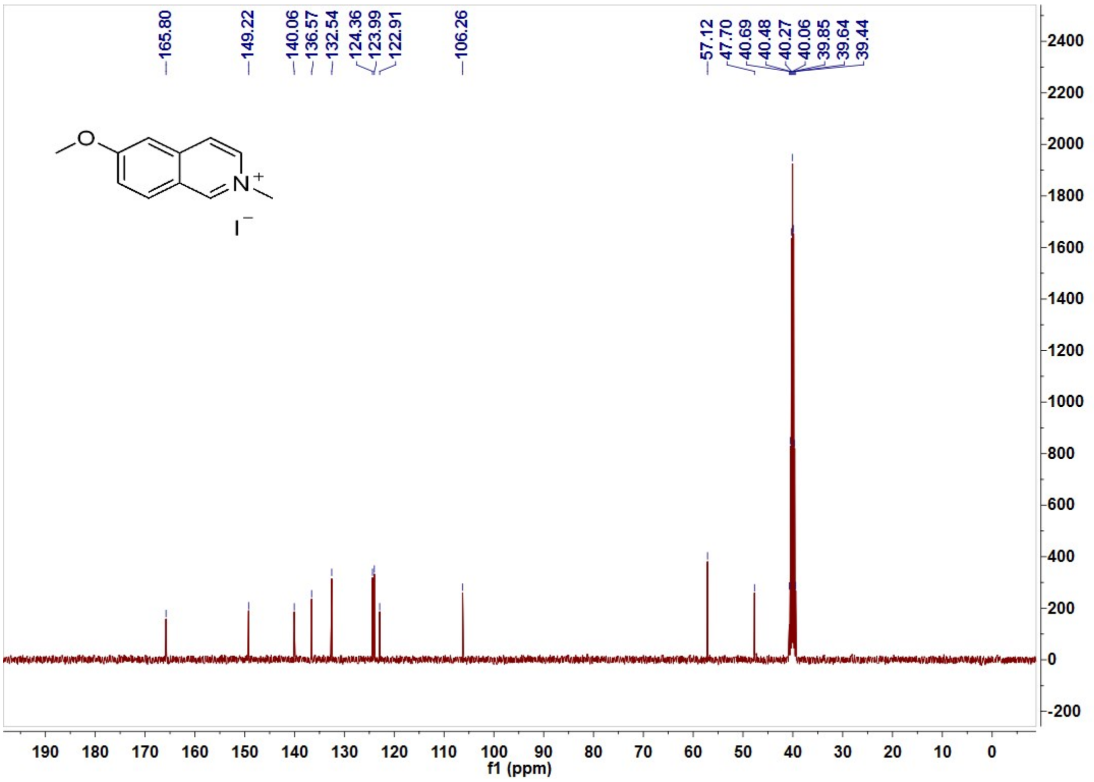
The ^{1}H NMR and ^{13}C NMR spectra of 1ab



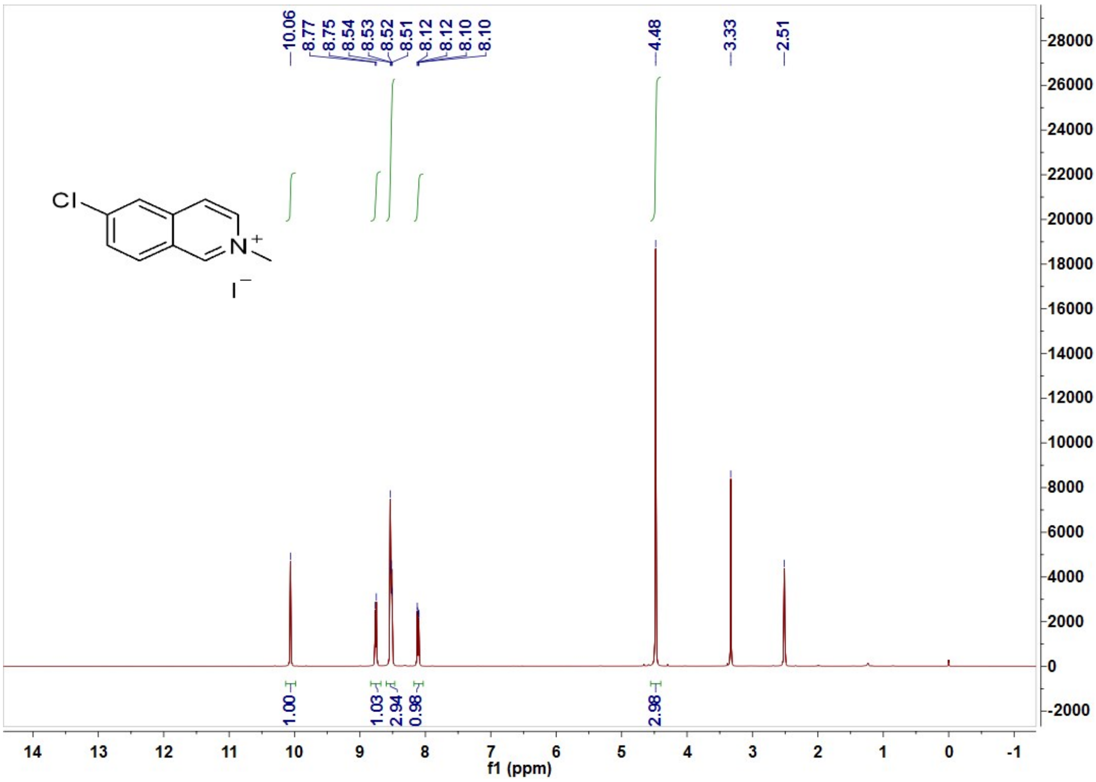


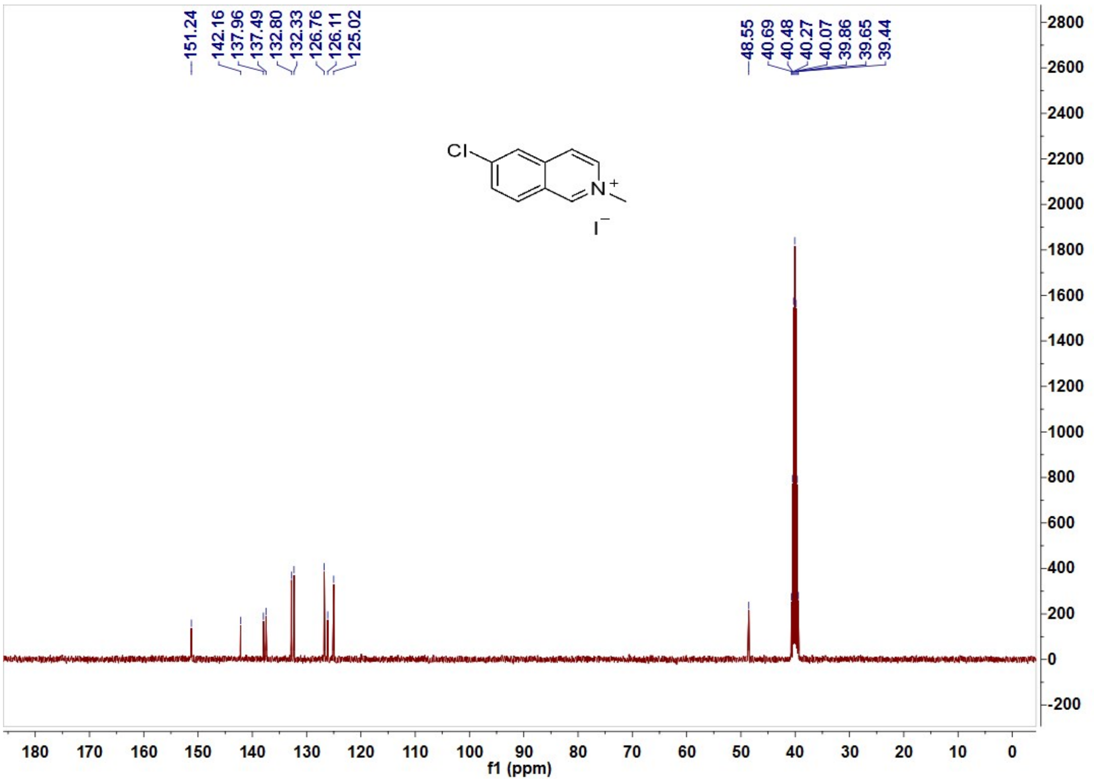
The [1]H NMR and [13]C NMR spectra of 1b



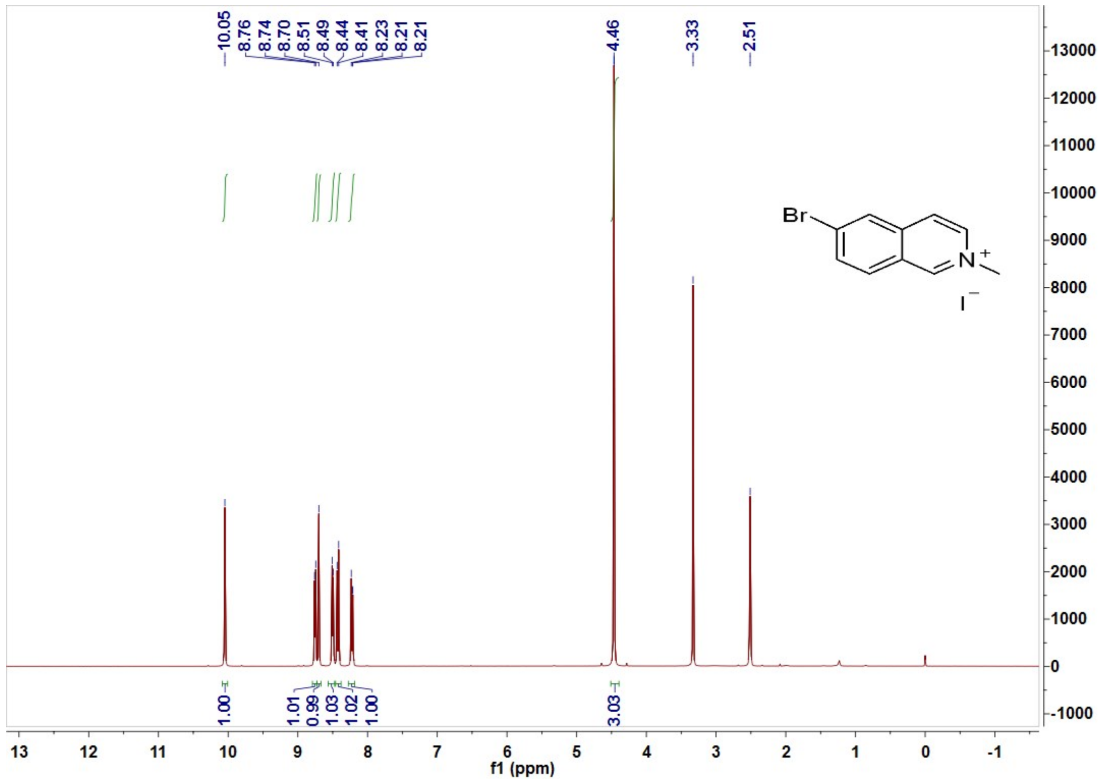


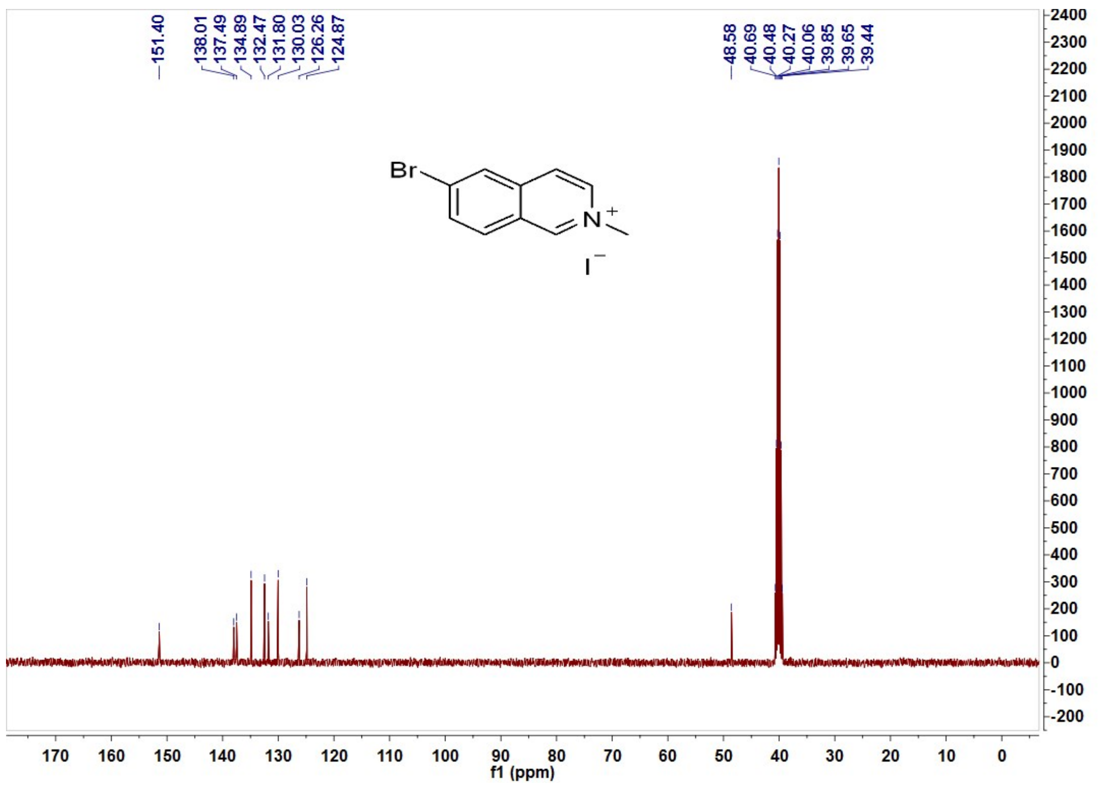
The ^{1}H NMR and ^{13}C NMR spectra of 1c



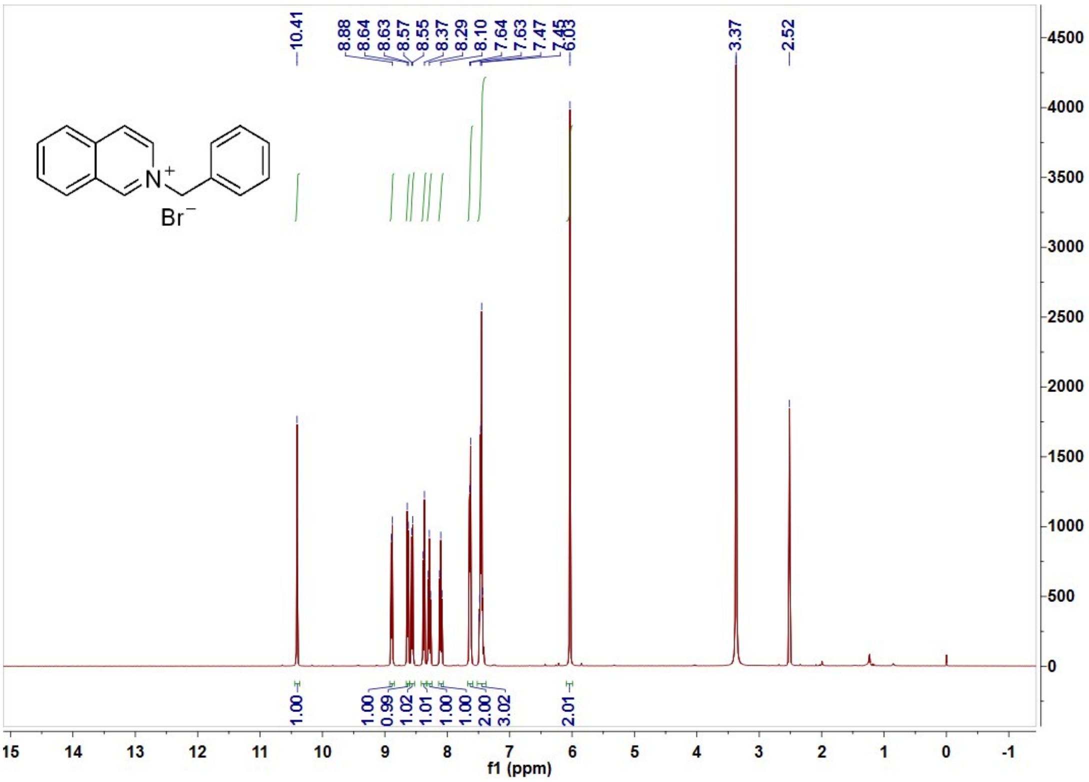


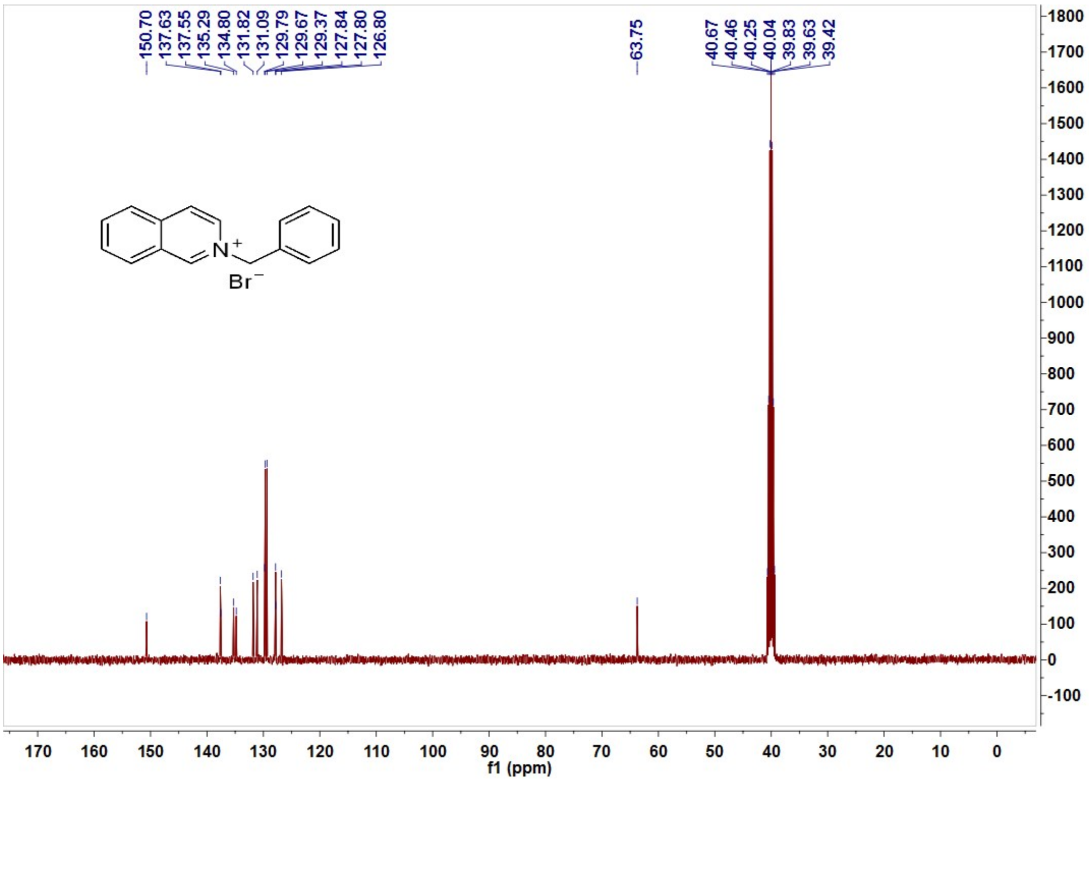
The ^{1}H NMR and ^{13}C NMR spectra of 1d



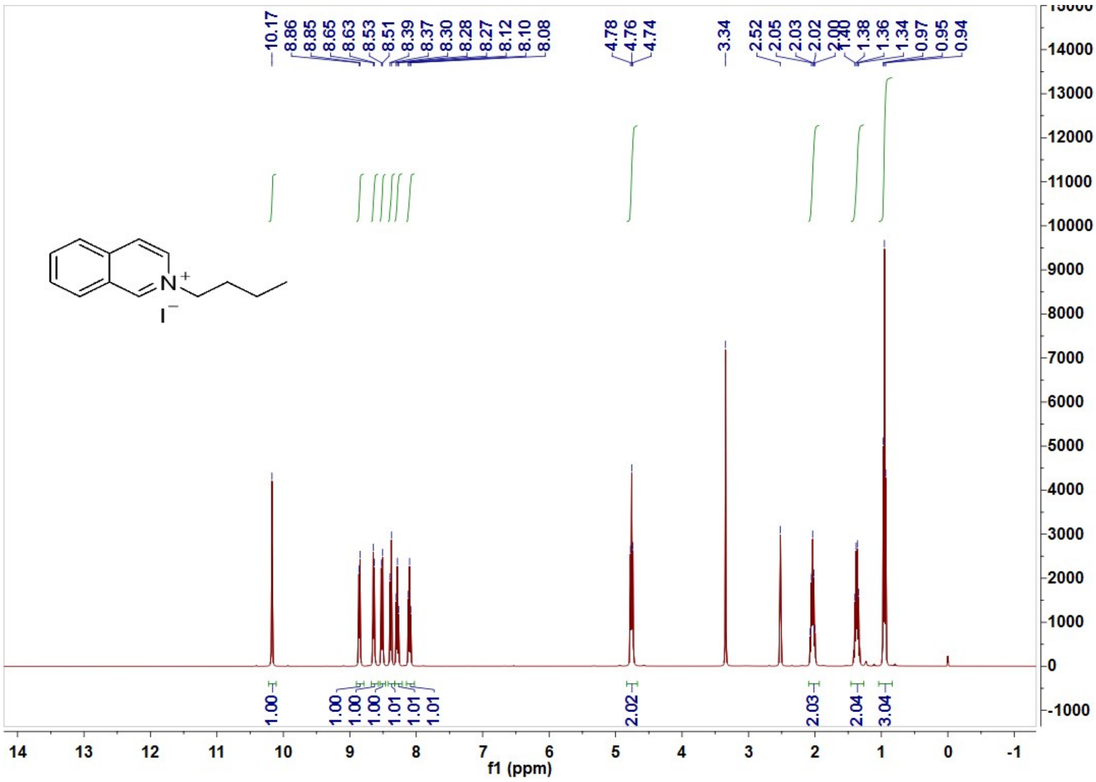


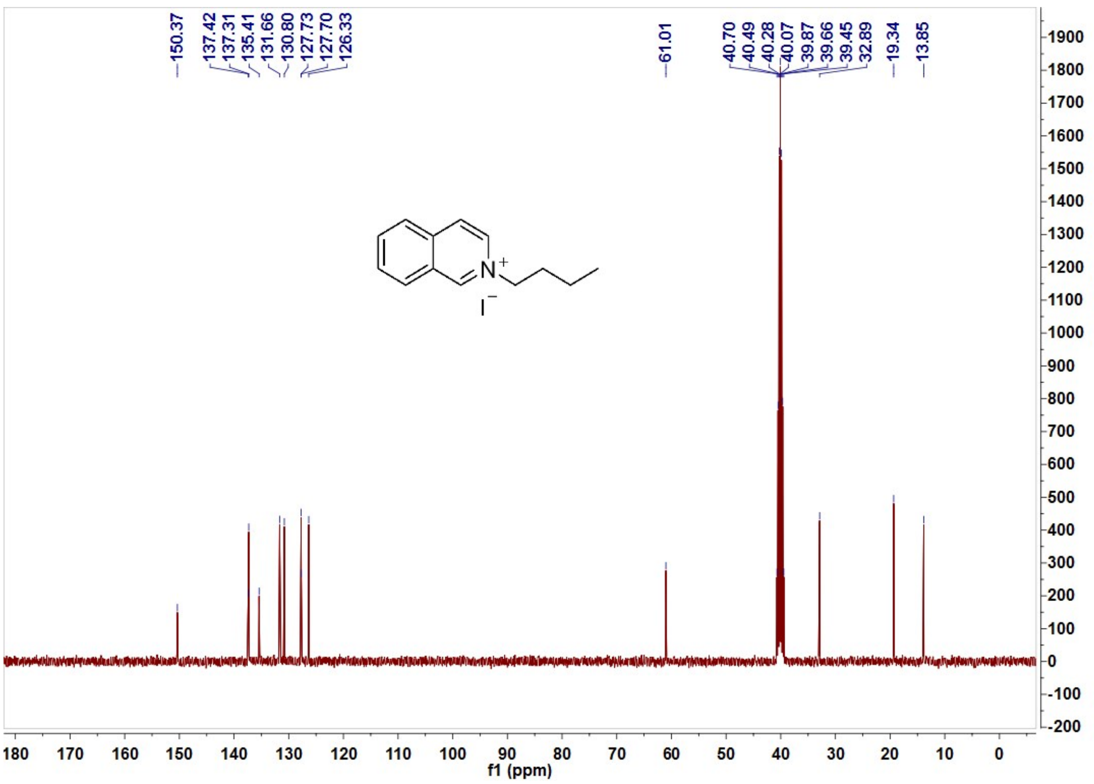
The ^{1}H NMR and ^{13}C NMR spectra of 1e



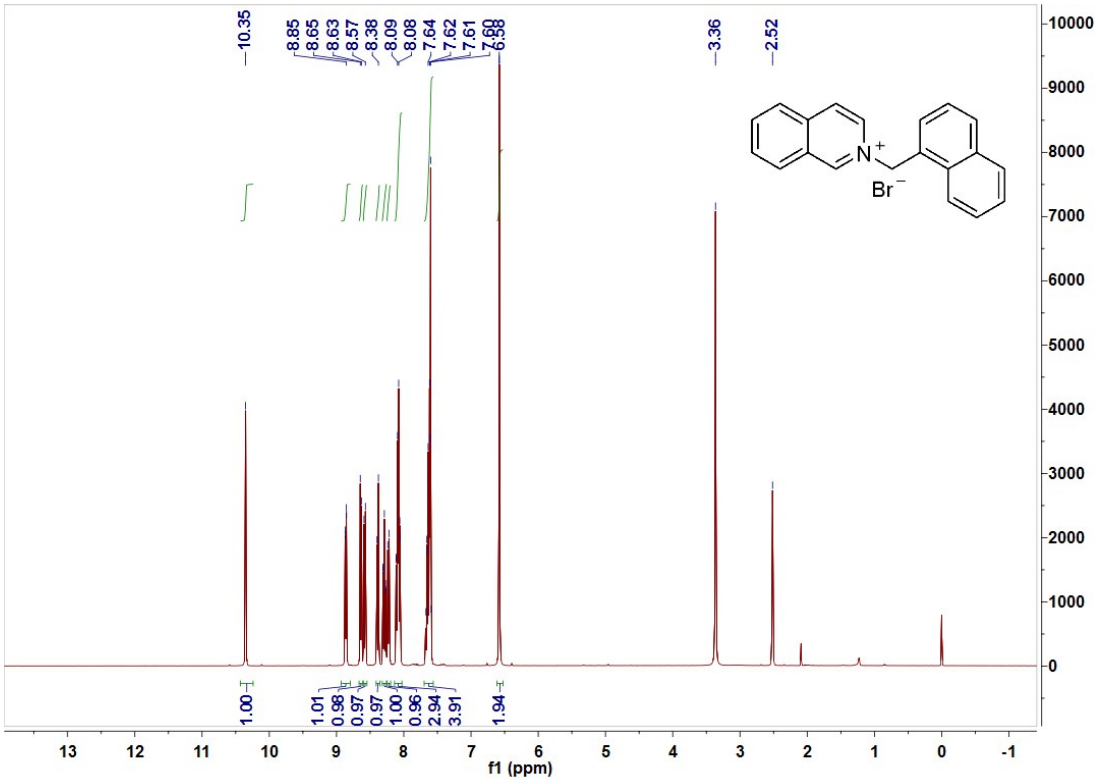


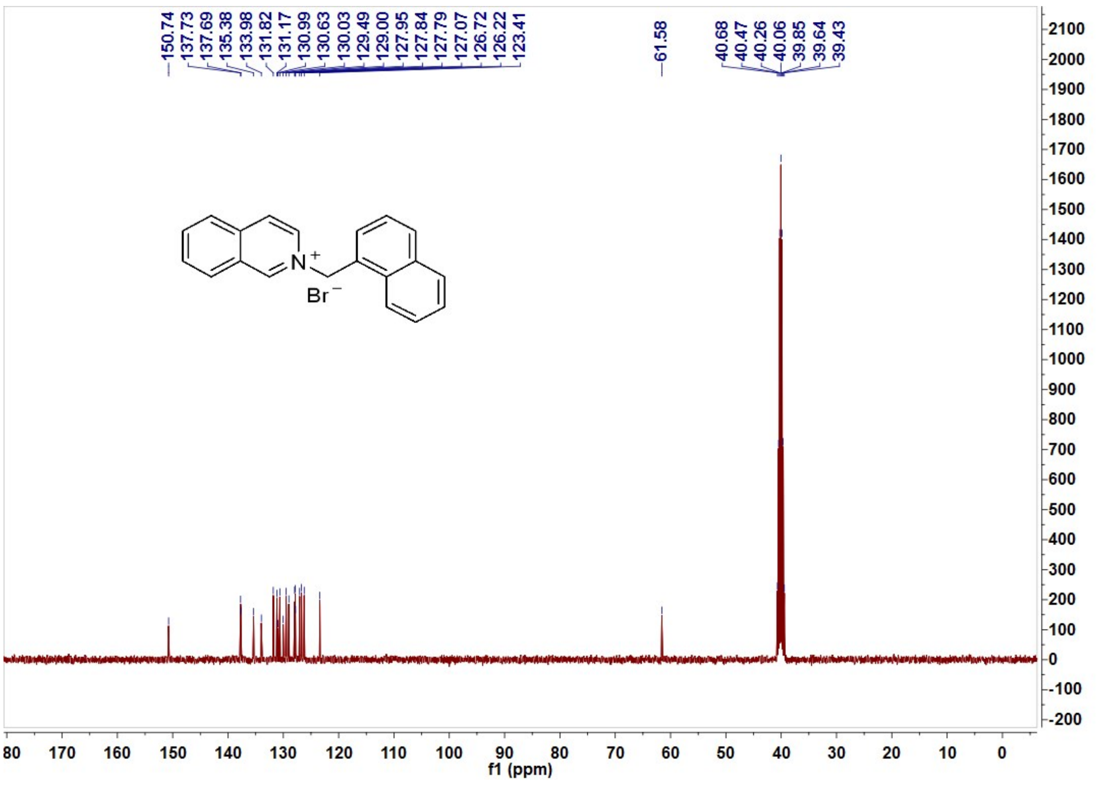
The ^{1}H NMR and ^{13}C NMR spectra of 1f



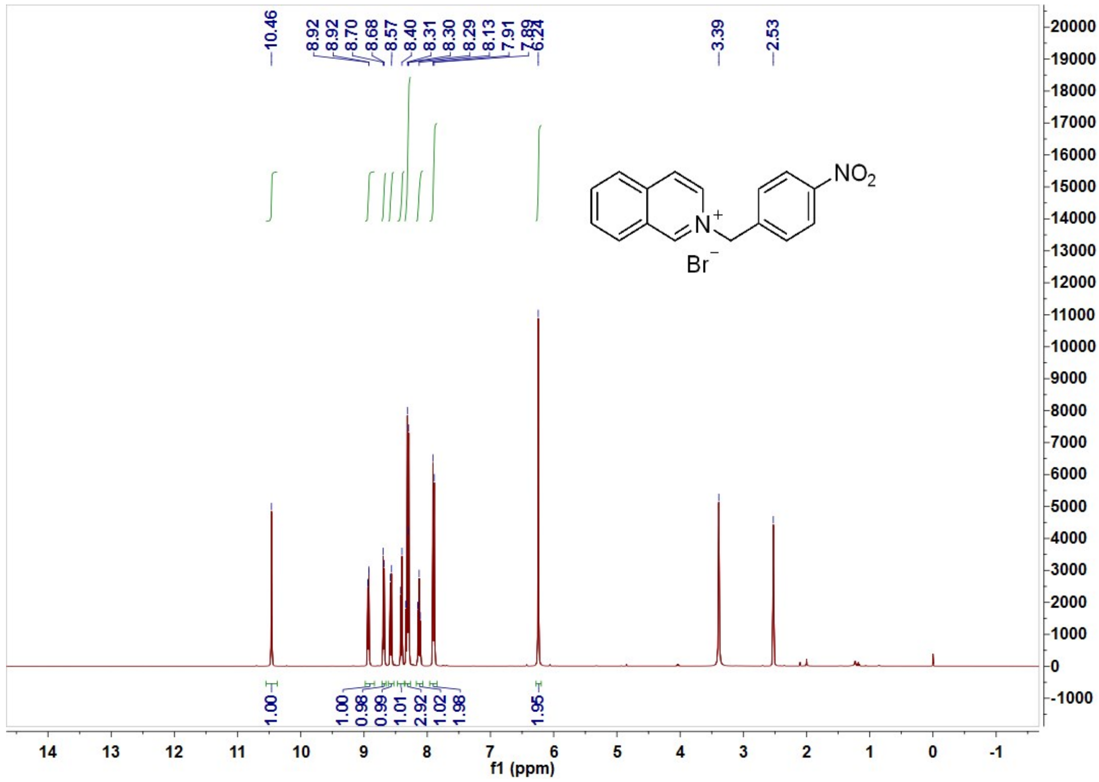


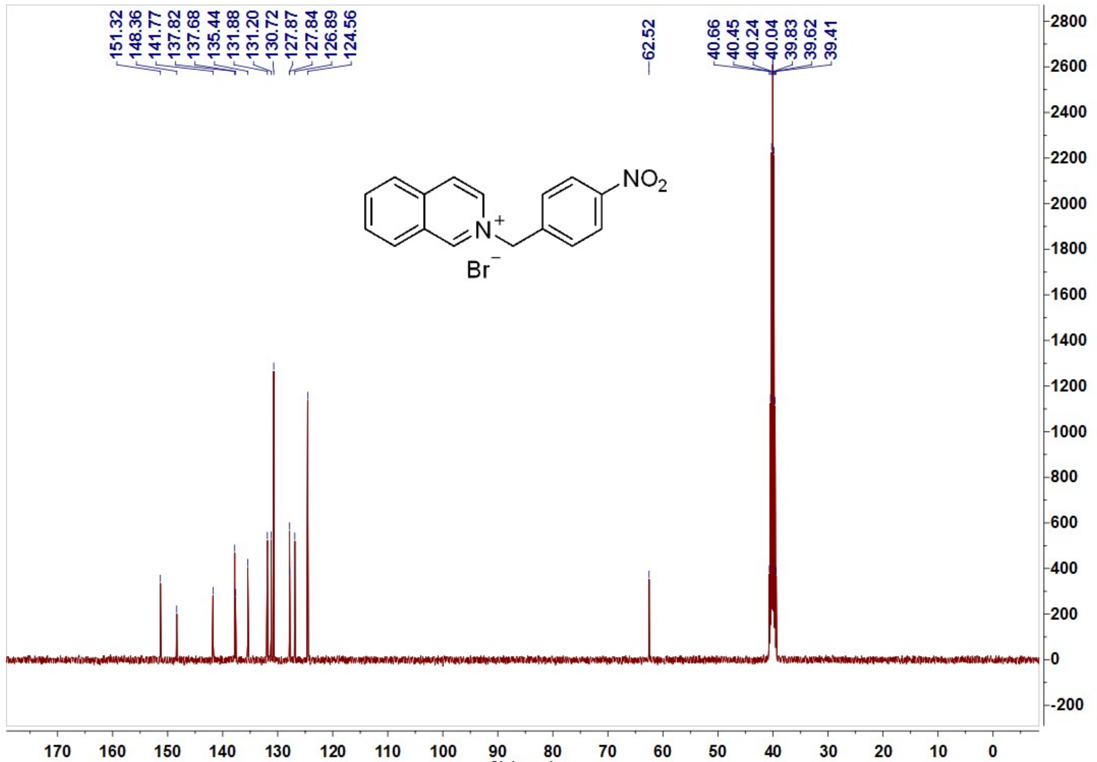
The ^{1}H NMR and ^{13}C NMR spectra of 1g



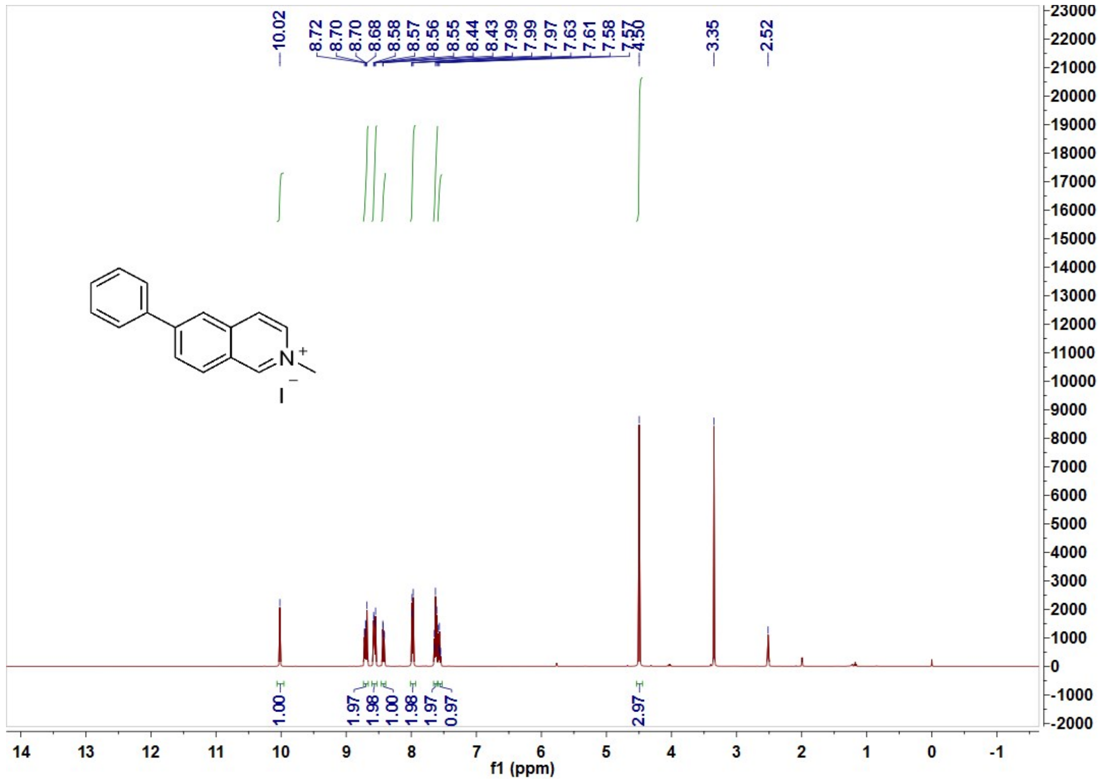


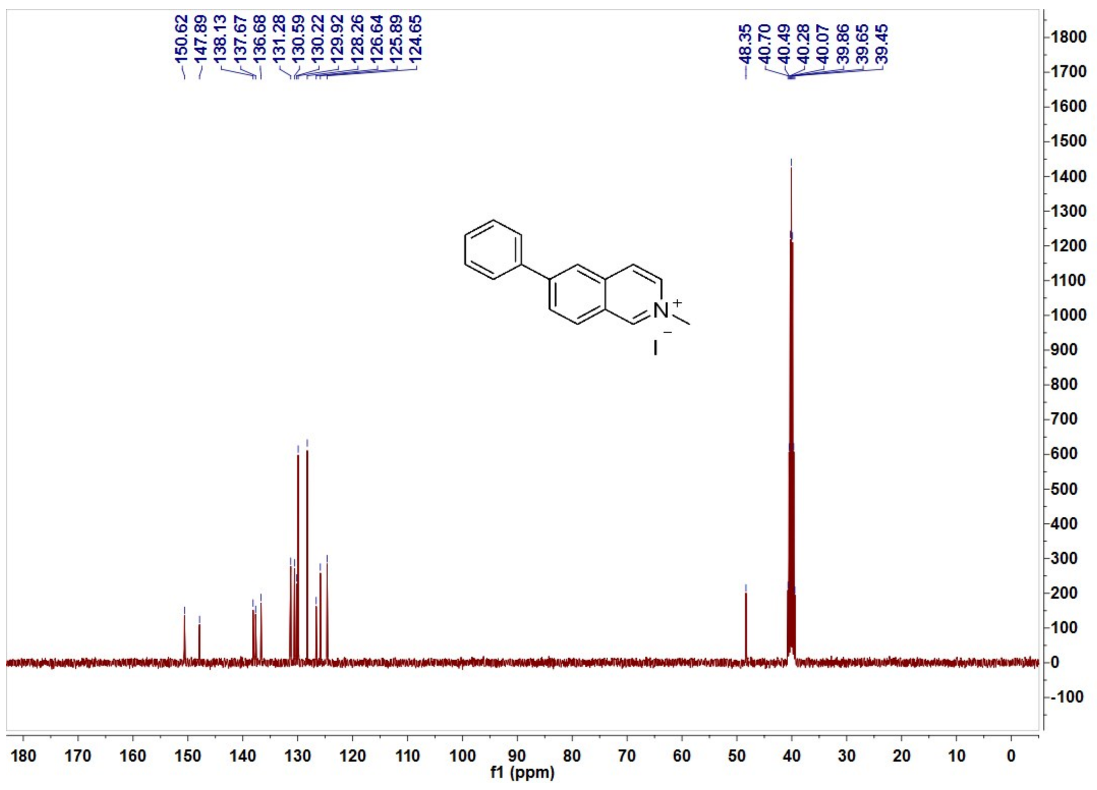
The ^{1}H NMR and ^{13}C NMR spectra of 1h



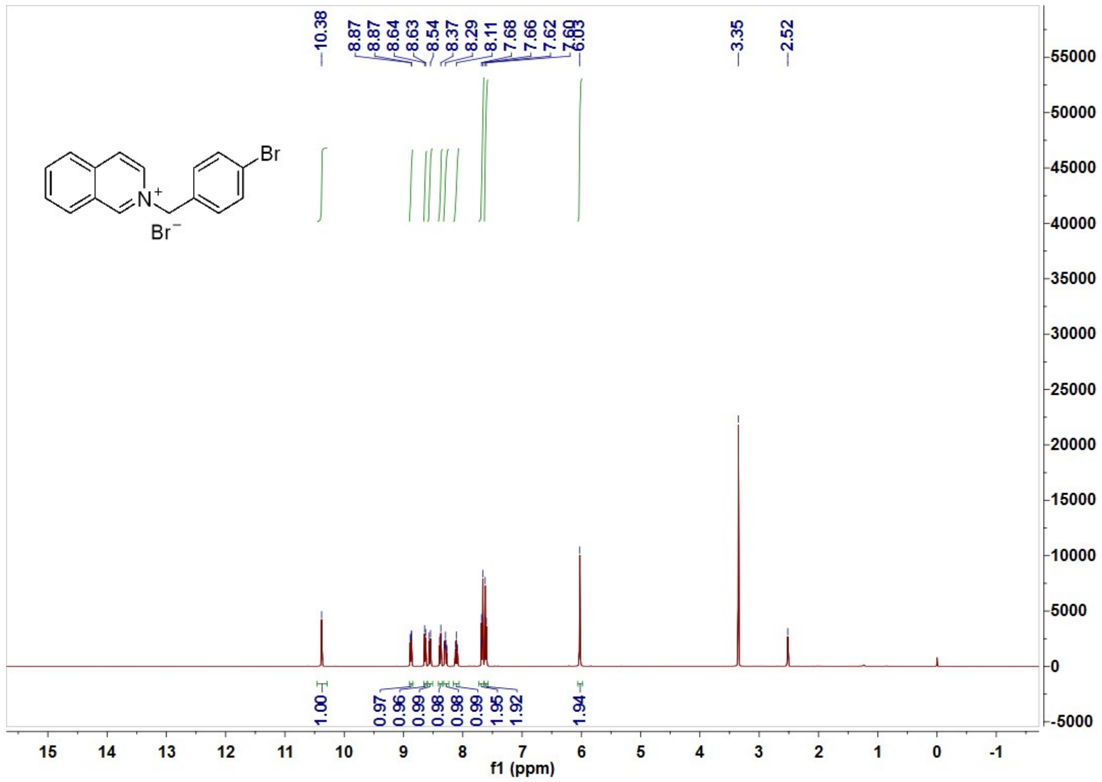


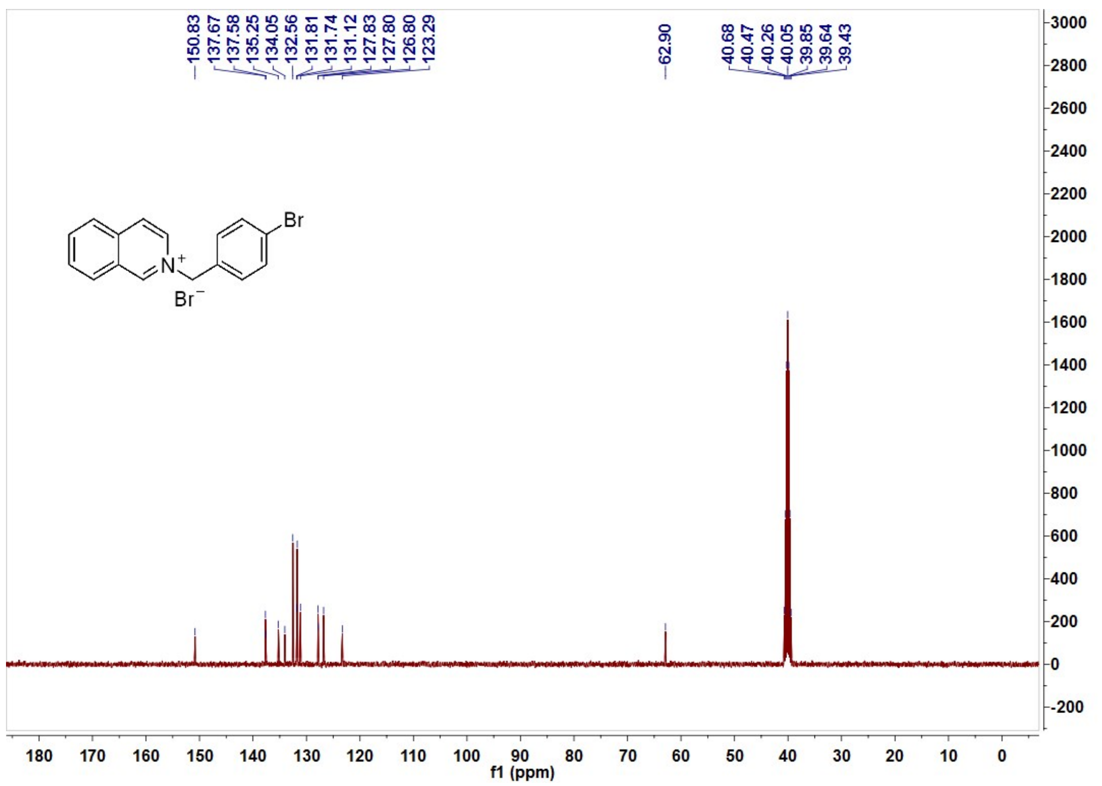
The ^{1}H NMR and ^{13}C NMR spectra of 1i



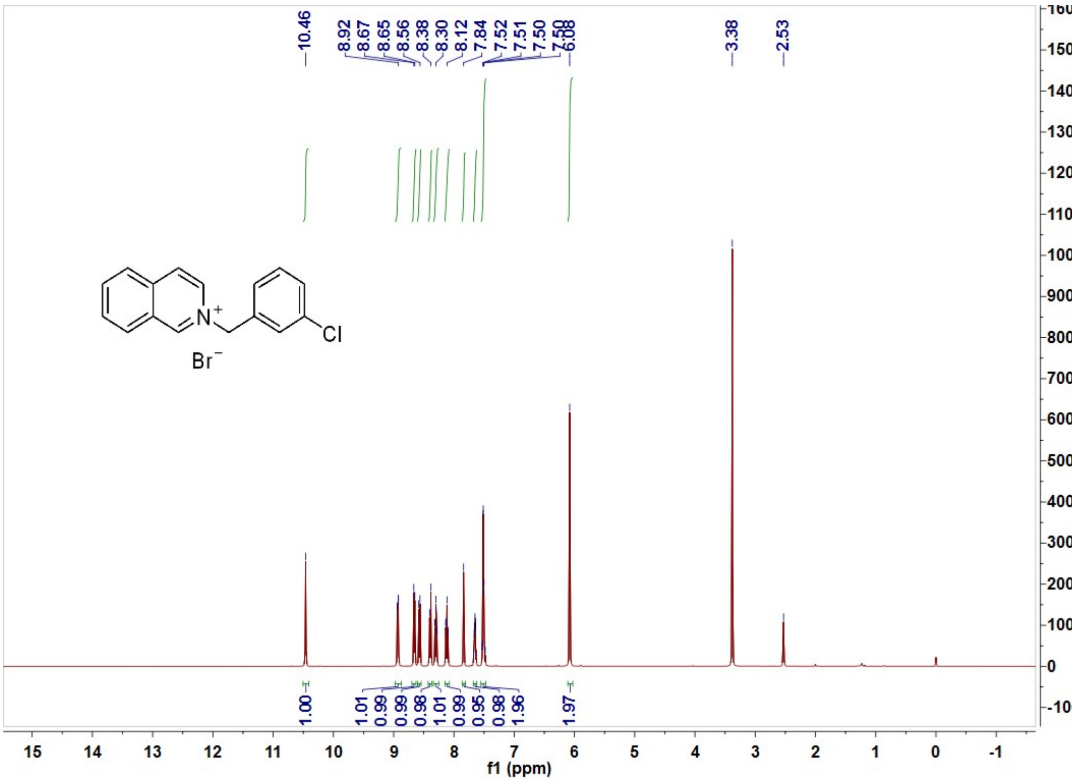


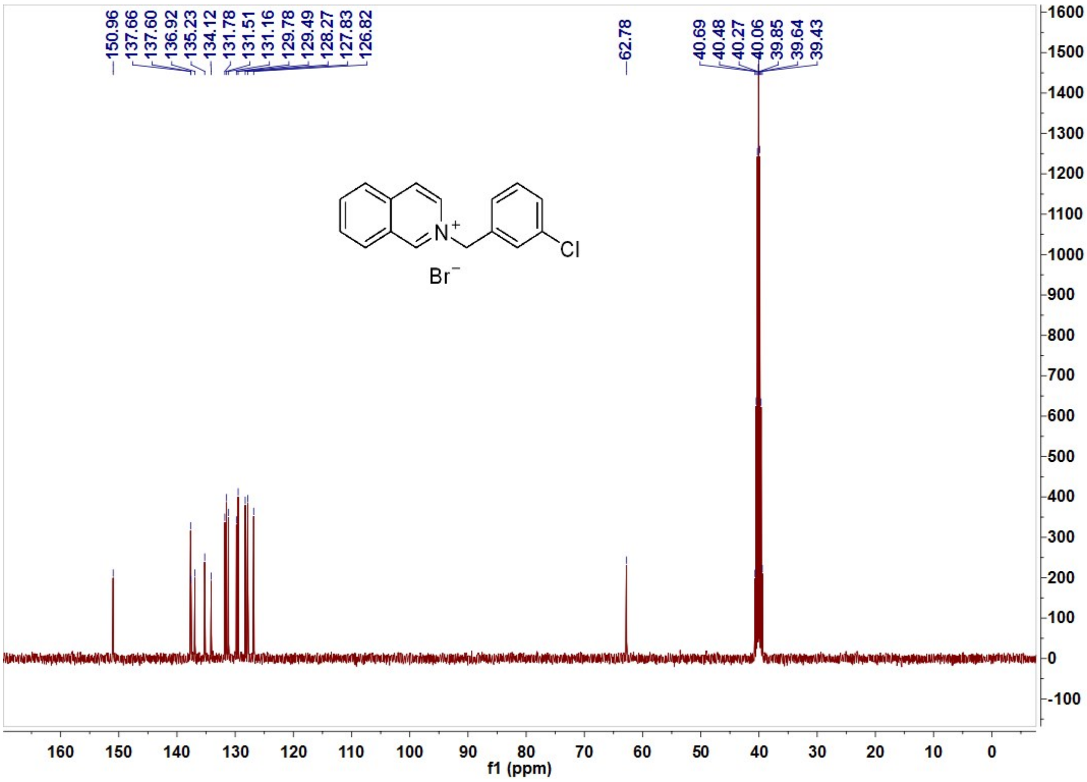
The ^{1}H NMR and ^{13}C NMR spectra of 1j



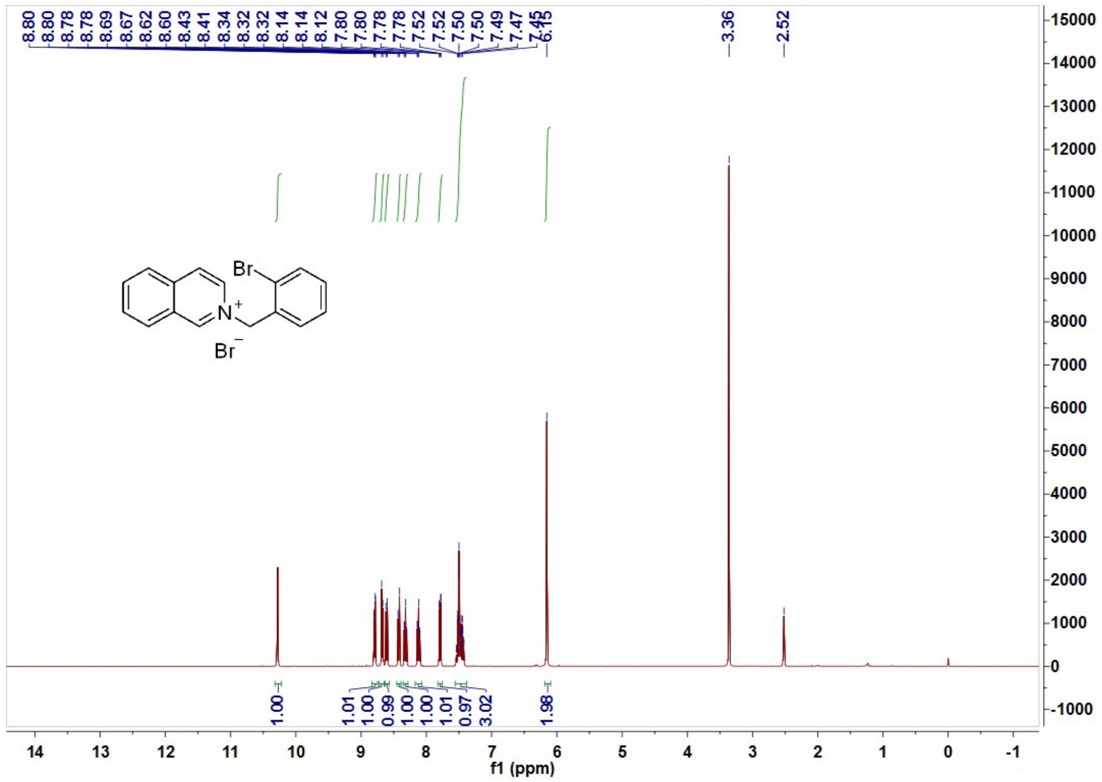


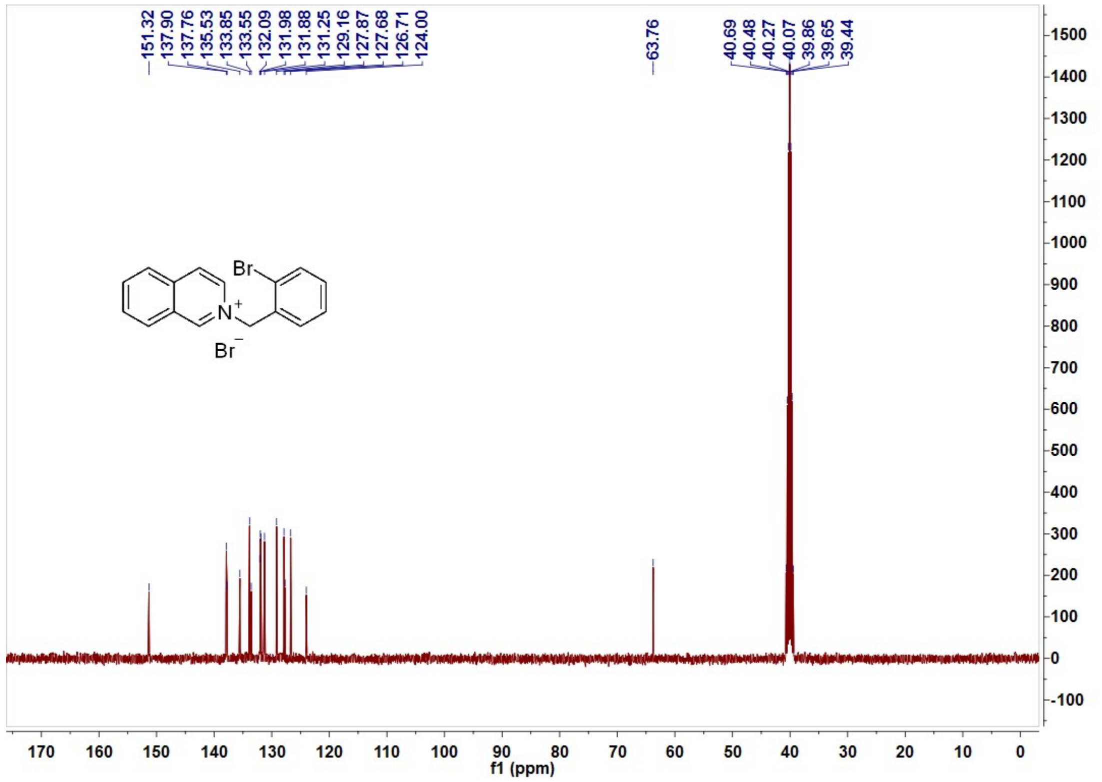
The ^{1}H NMR and ^{13}C NMR spectra of 1k



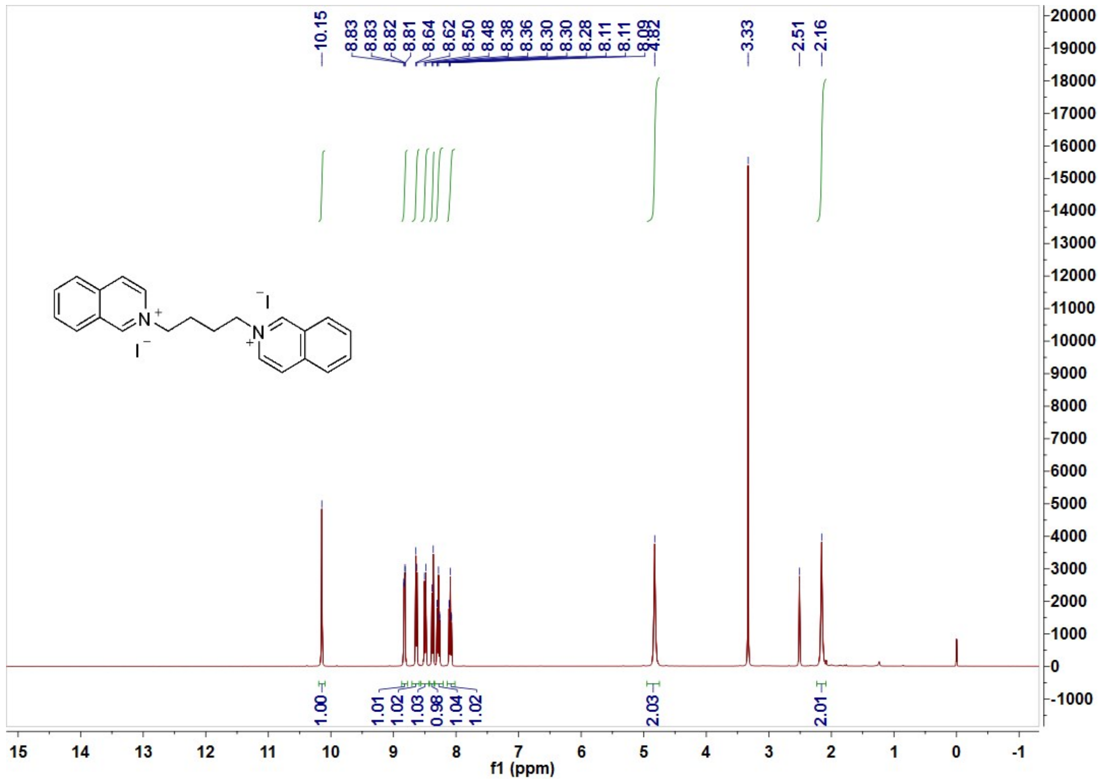


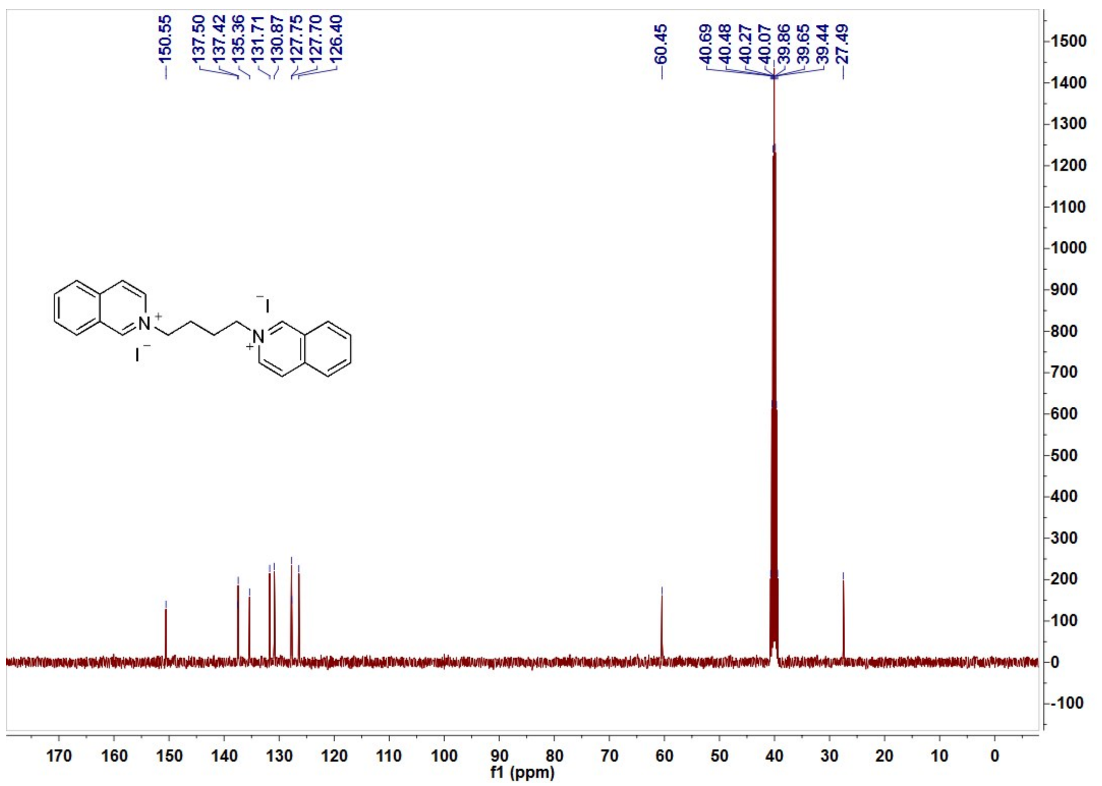
The ^{1}H NMR and ^{13}C NMR spectra of 1l



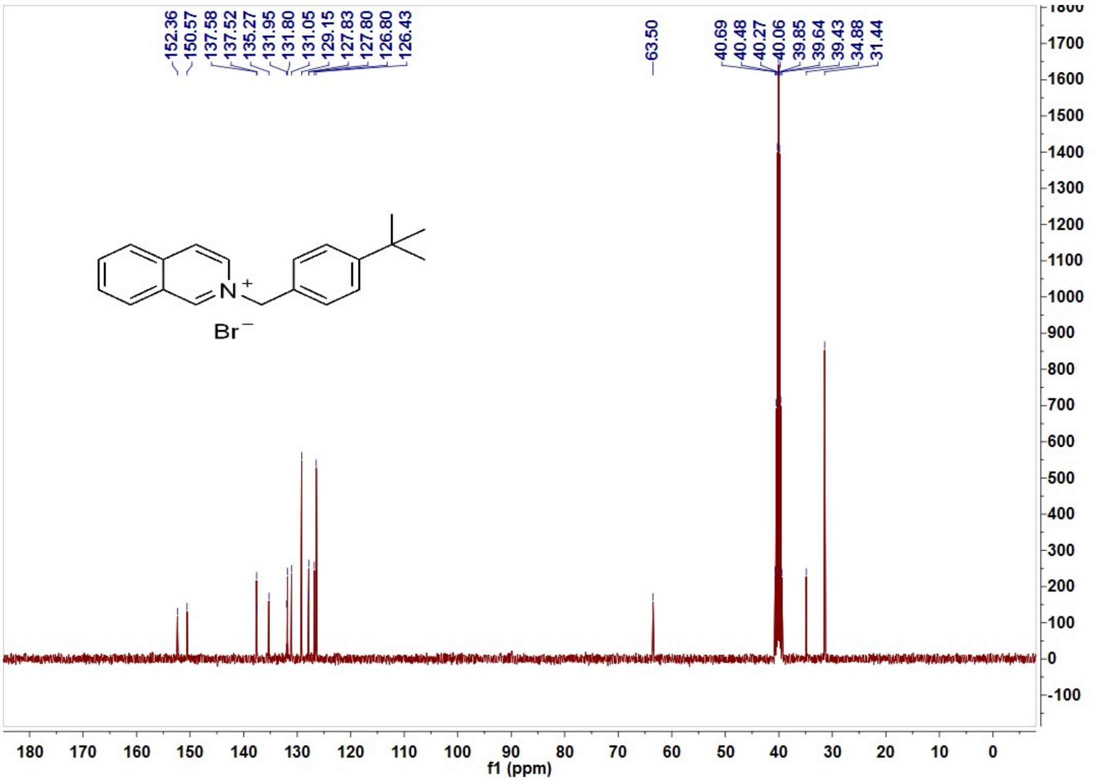


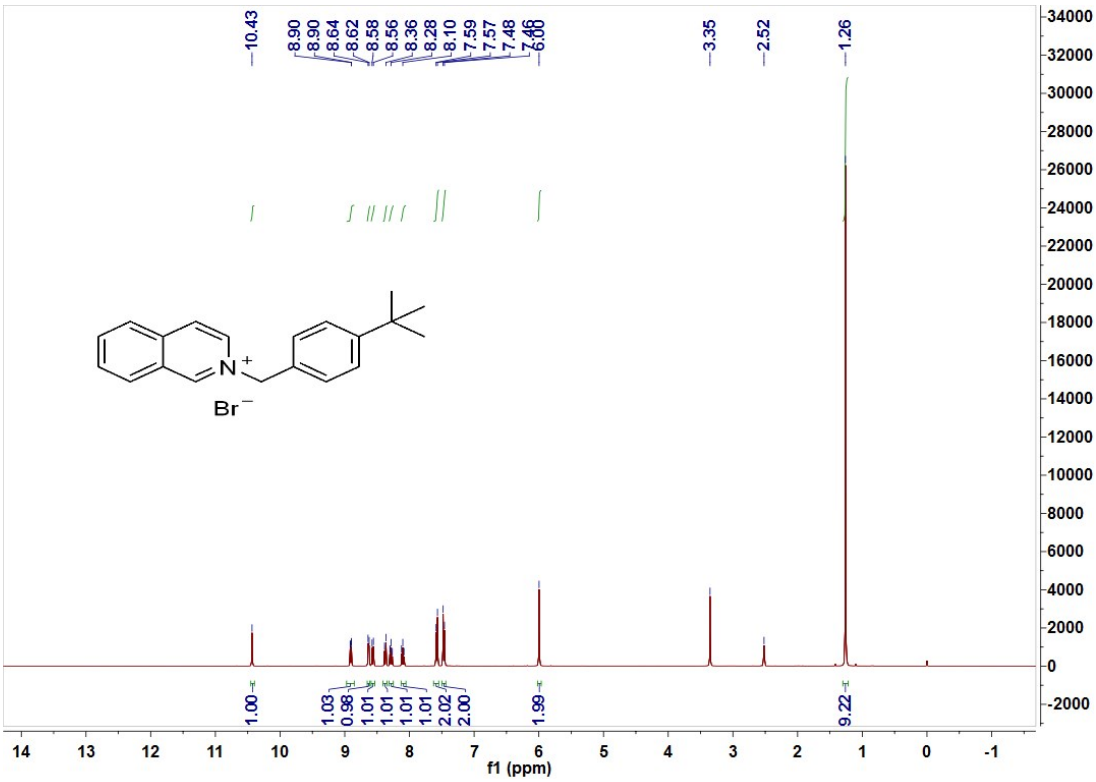
The ^{1}H NMR and ^{13}C NMR spectra of 1m



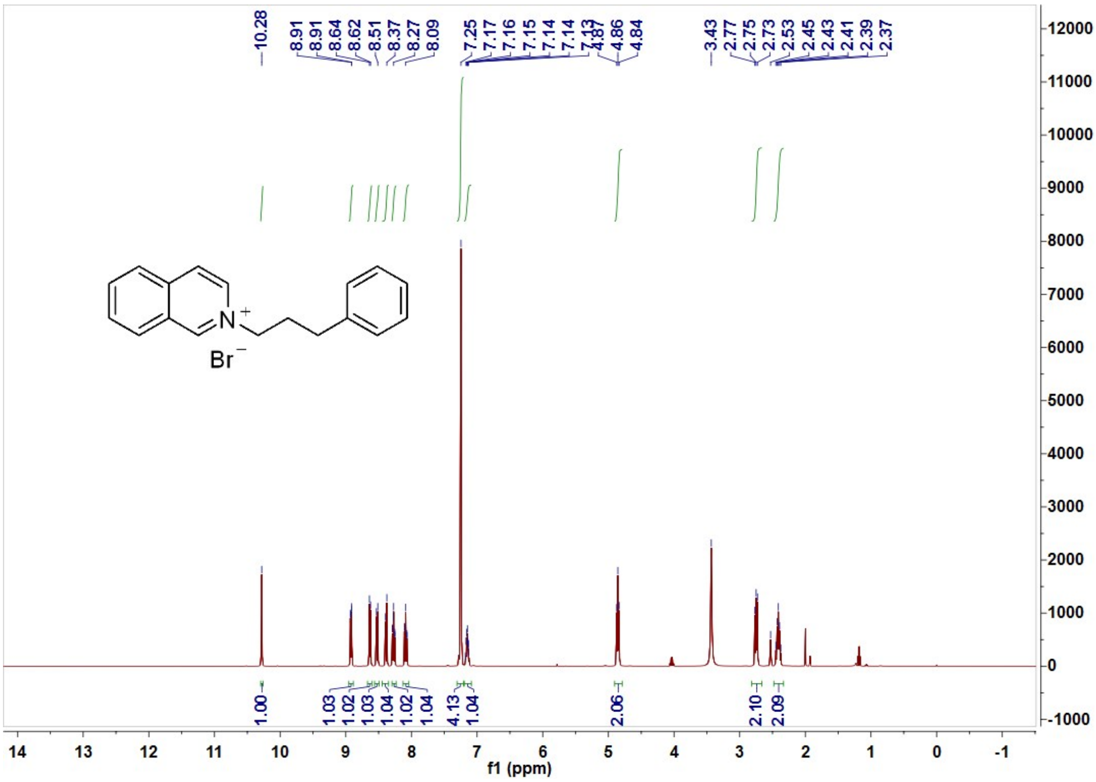


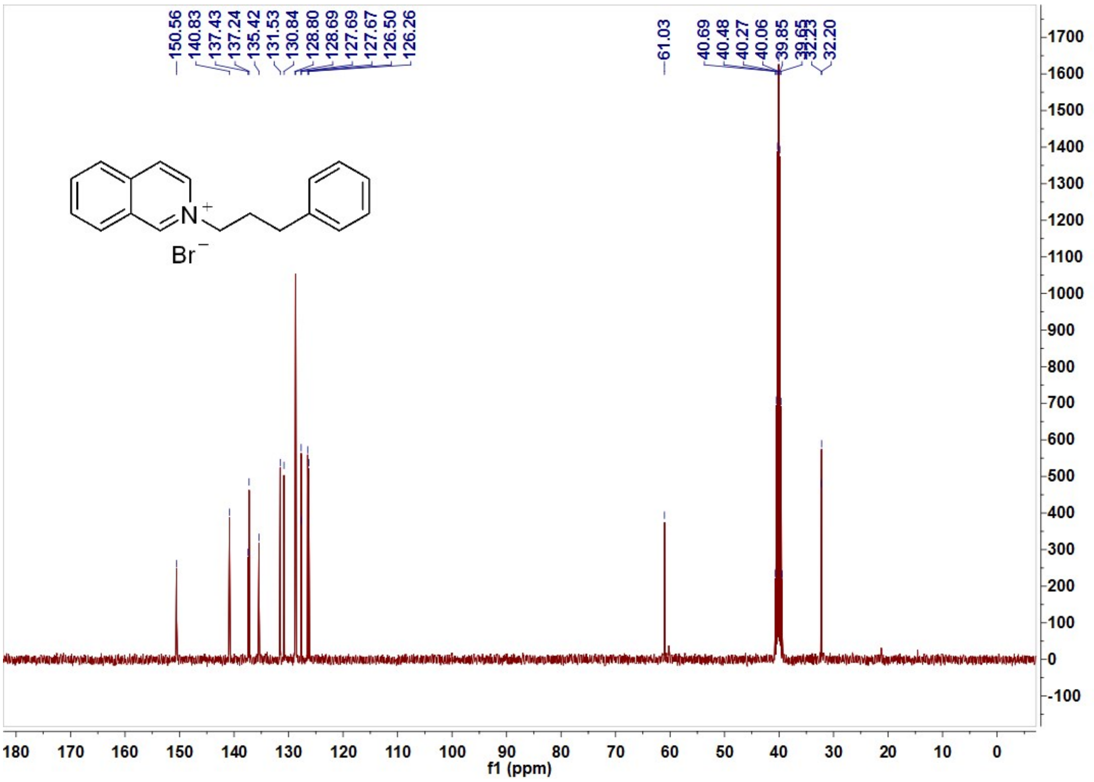
The ^{1}H NMR and ^{13}C NMR spectra of 1n



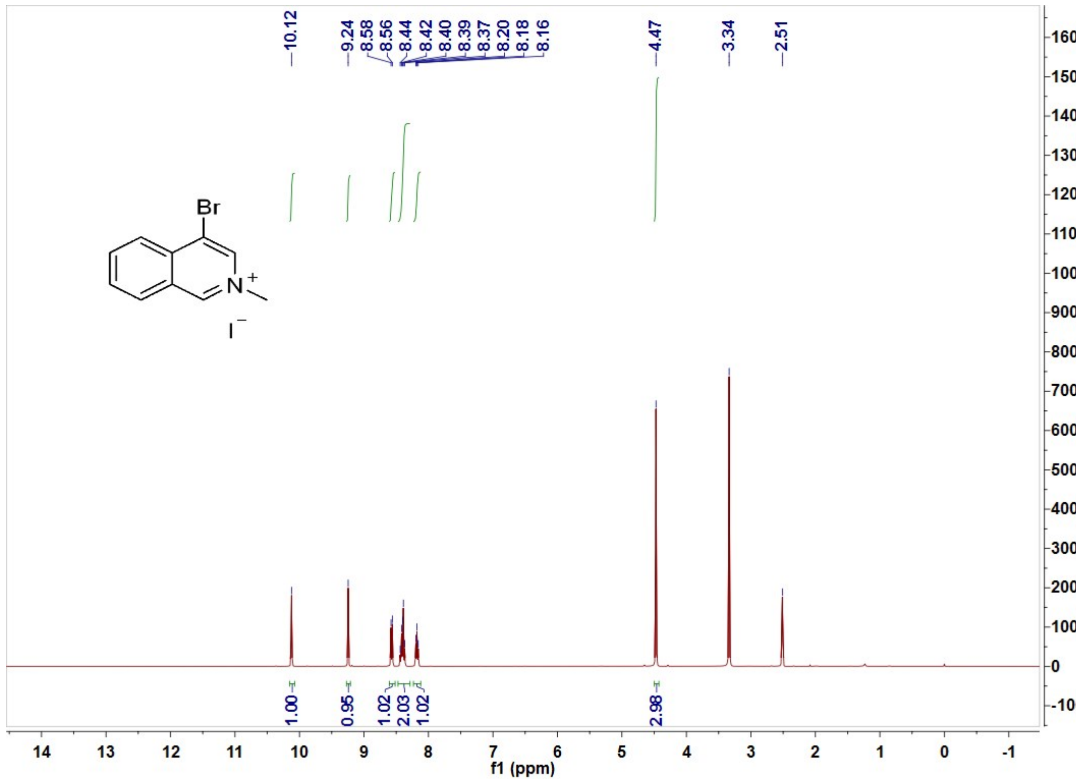


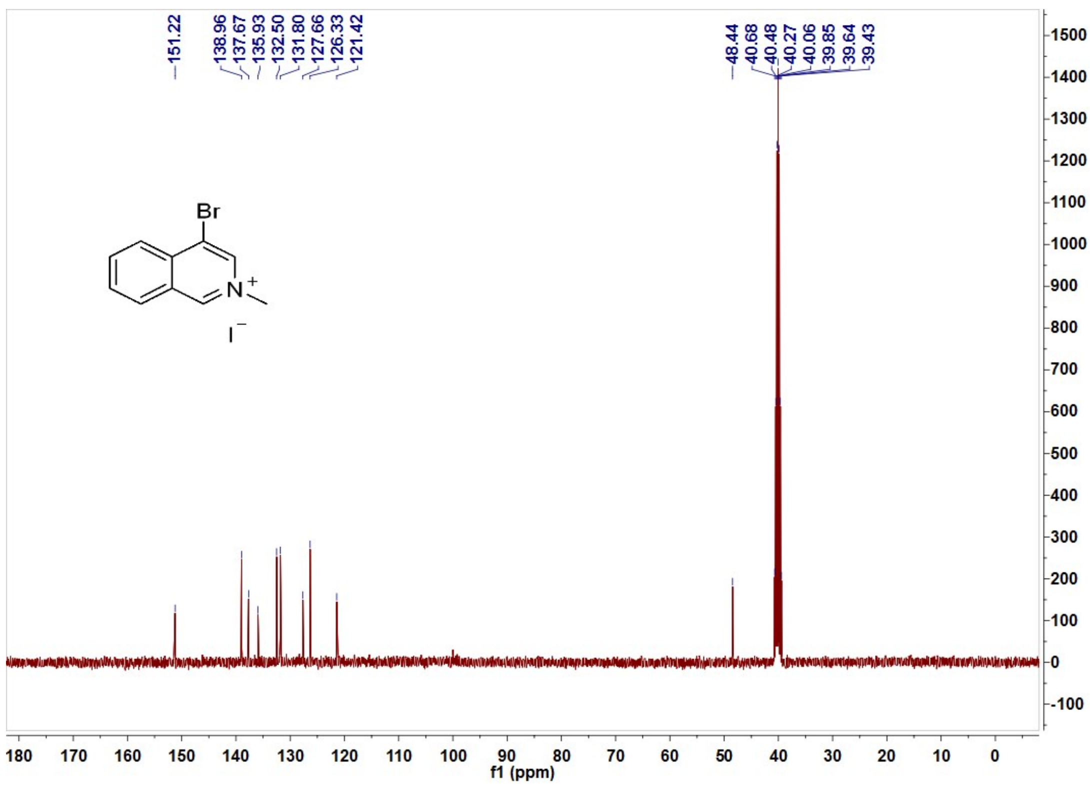
The ^{1}H NMR and ^{13}C NMR spectra of 1o



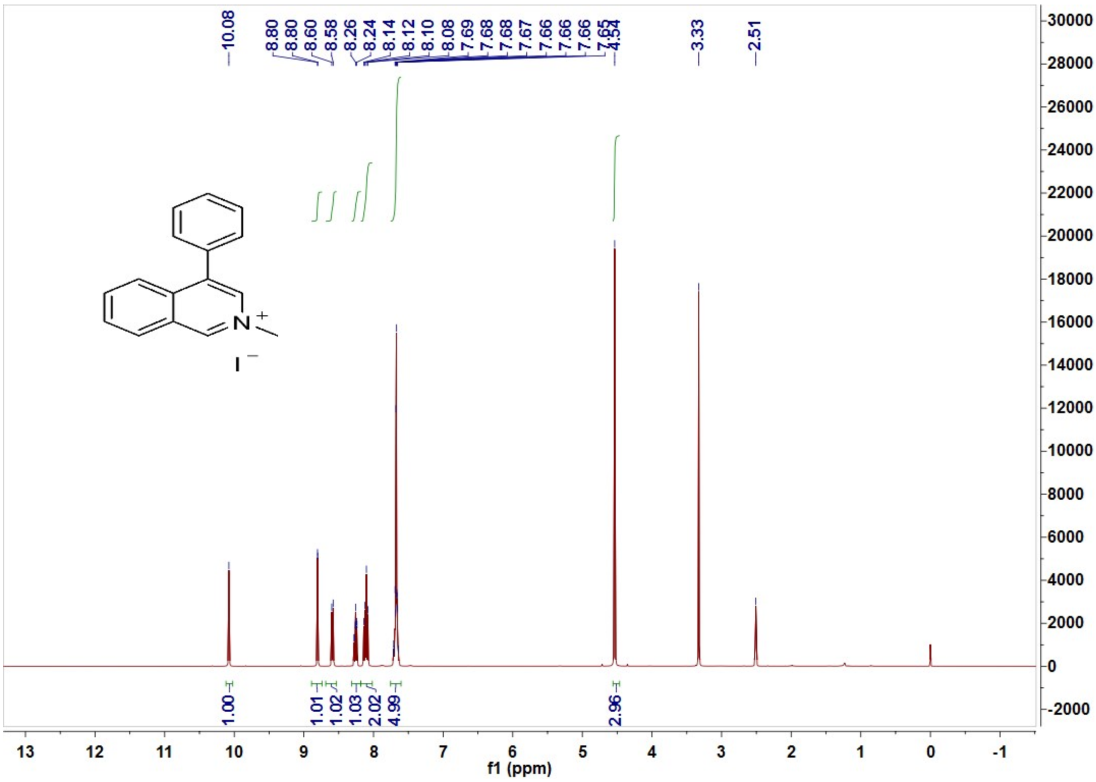


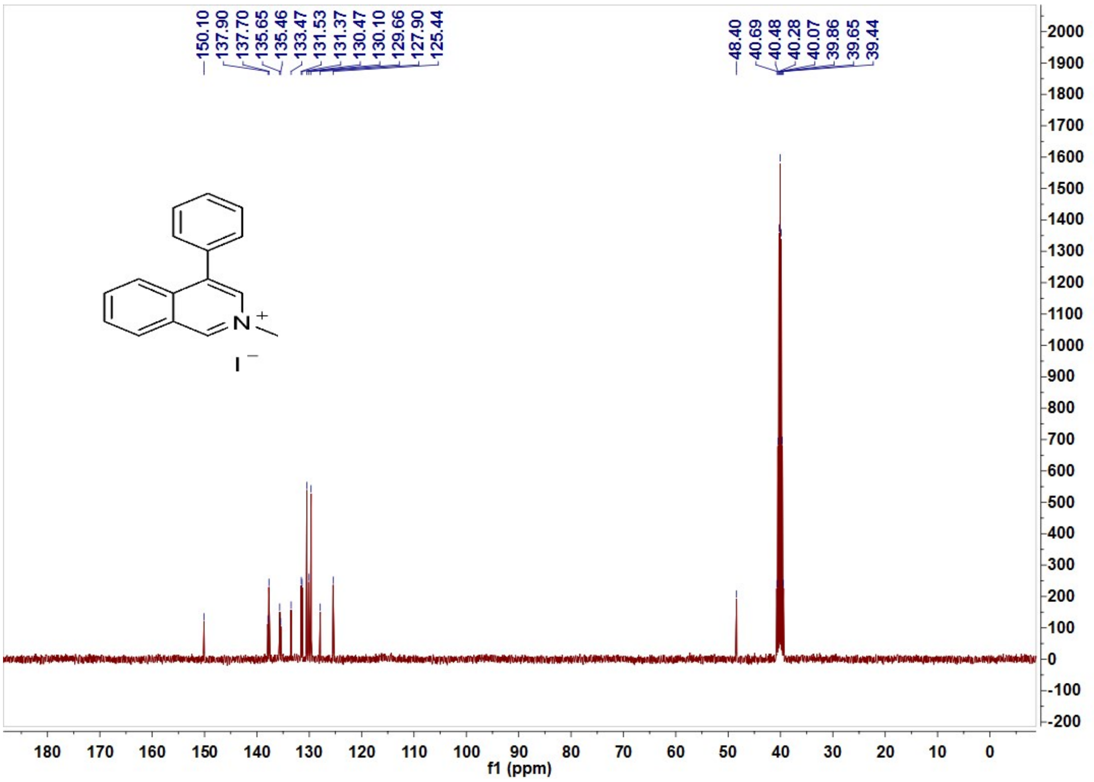
The [1]H NMR and [13]C NMR spectra of 1p



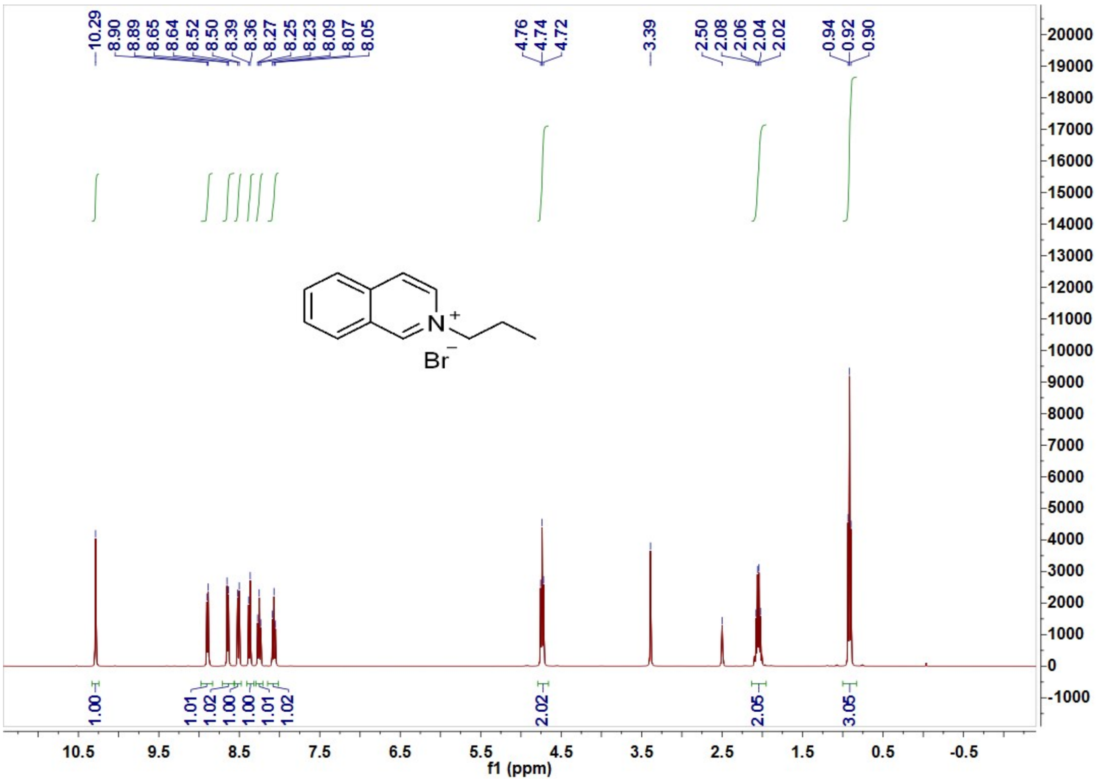


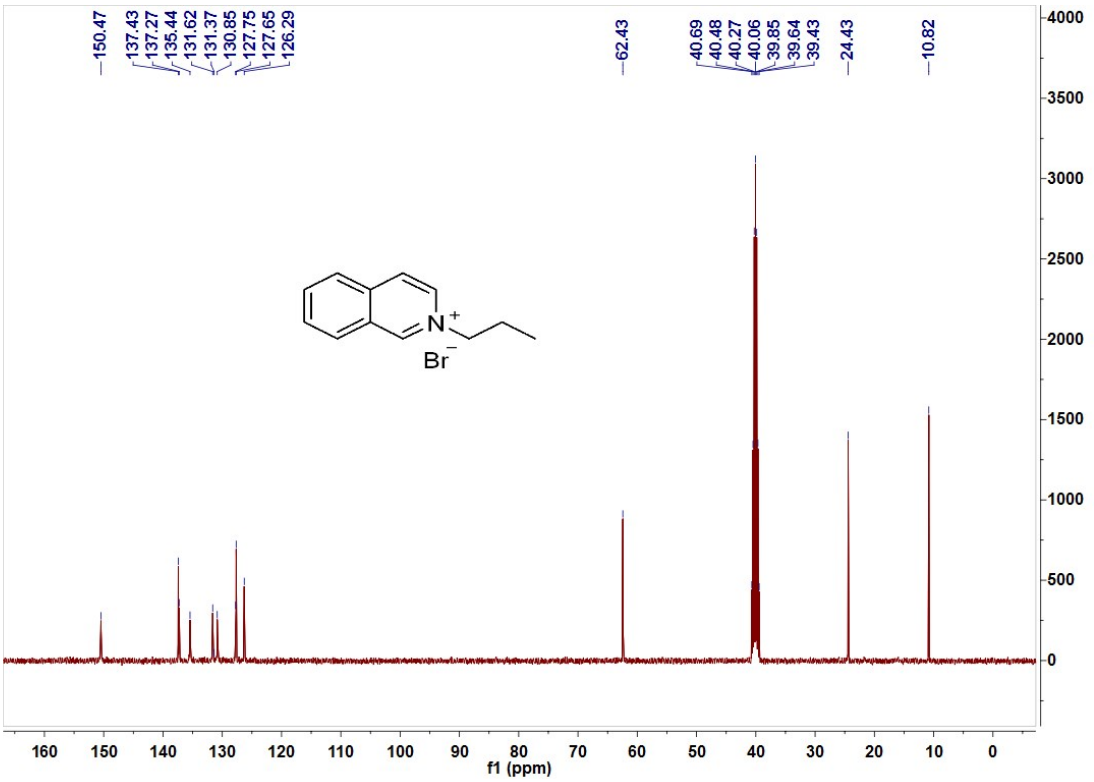
The ^{1}H NMR and ^{13}C NMR spectra of 1q



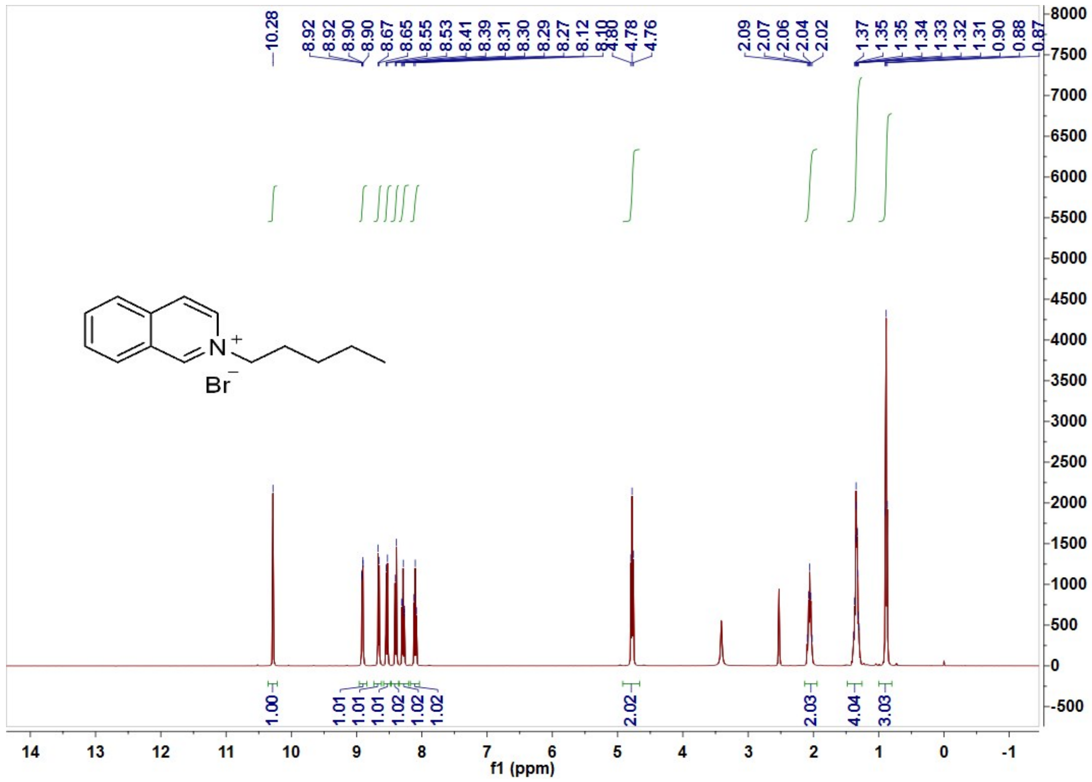


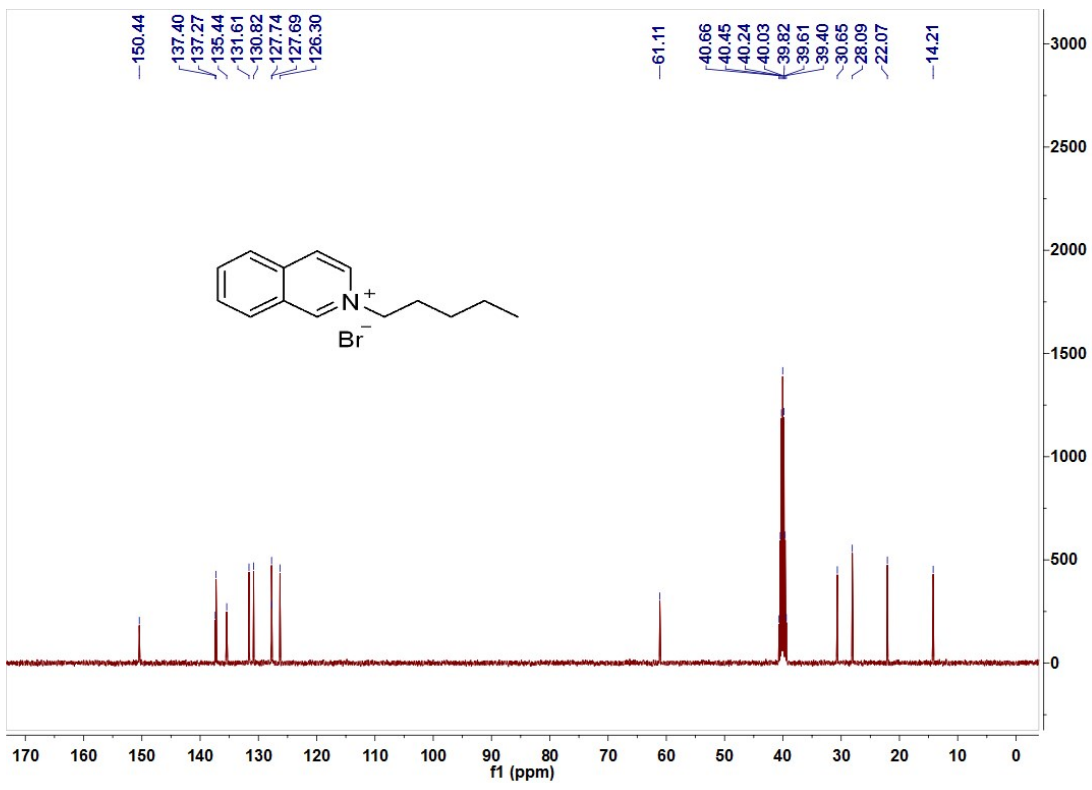
The ^{1}H NMR and ^{13}C NMR spectra of 1r



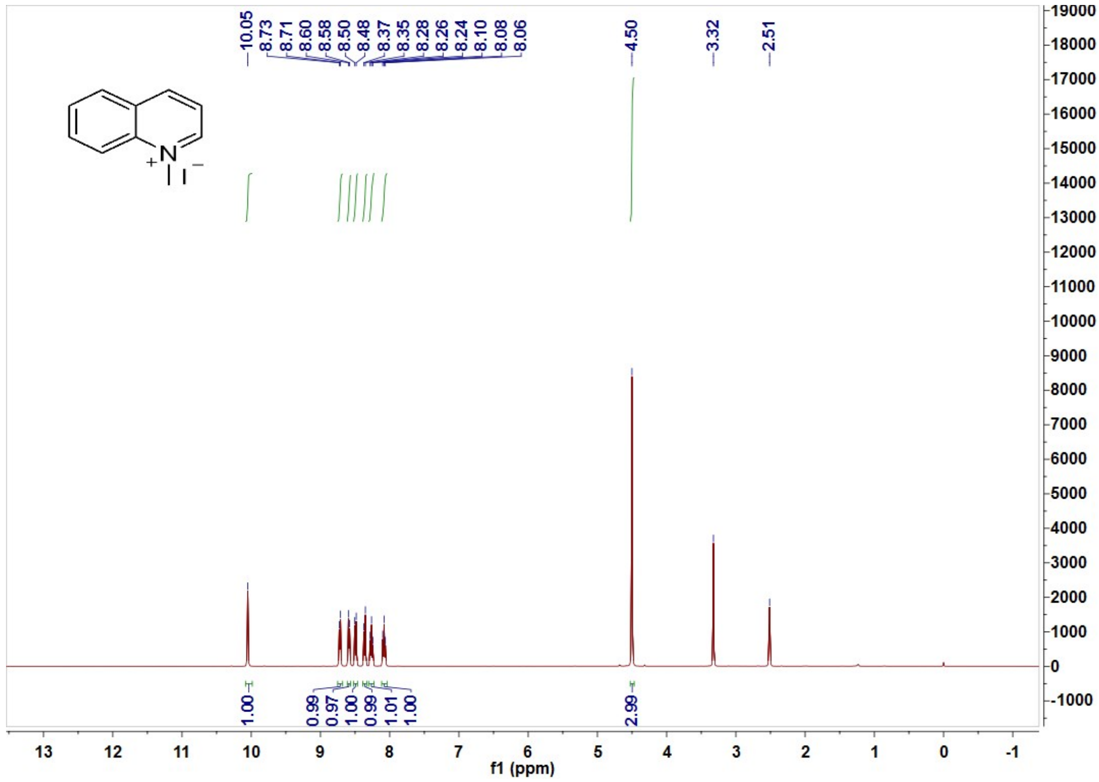


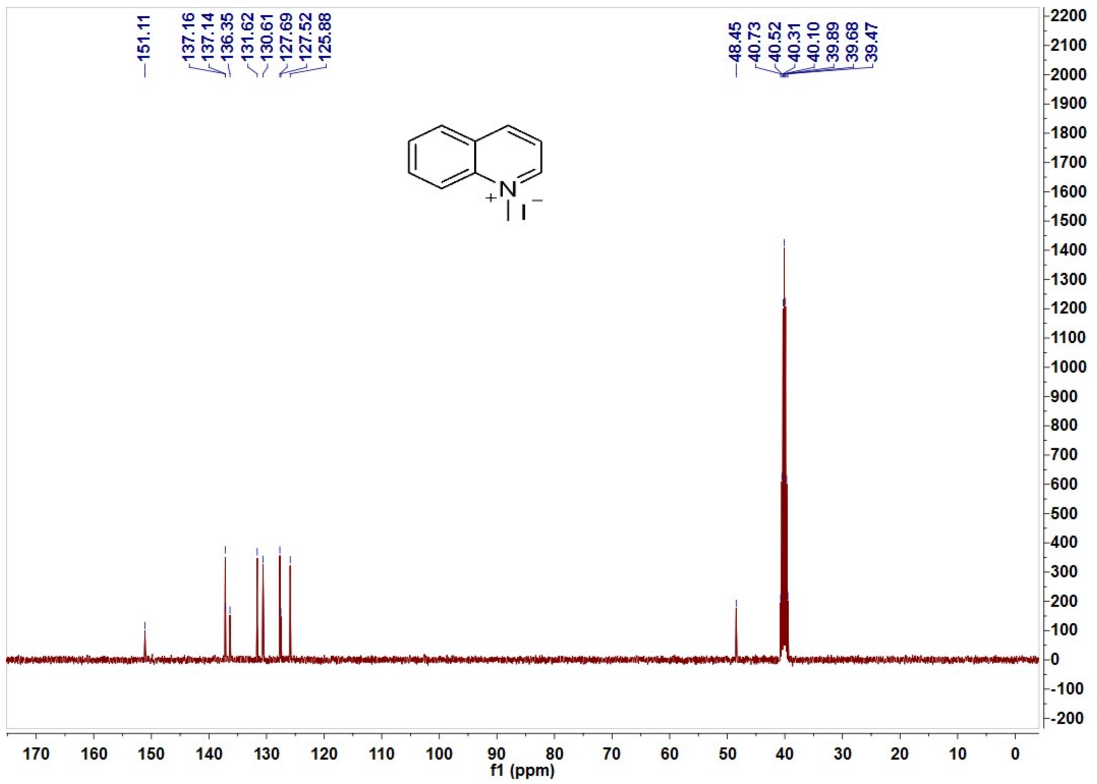
The ^{1}H NMR and ^{13}C NMR spectra of 1s



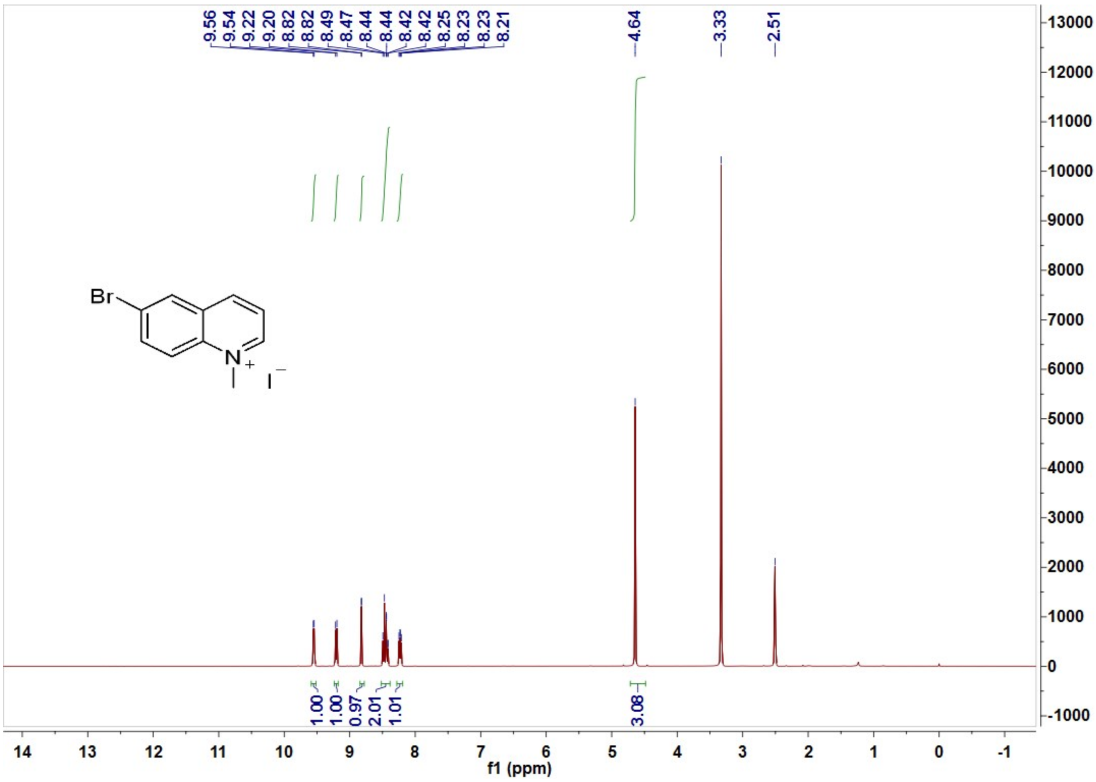


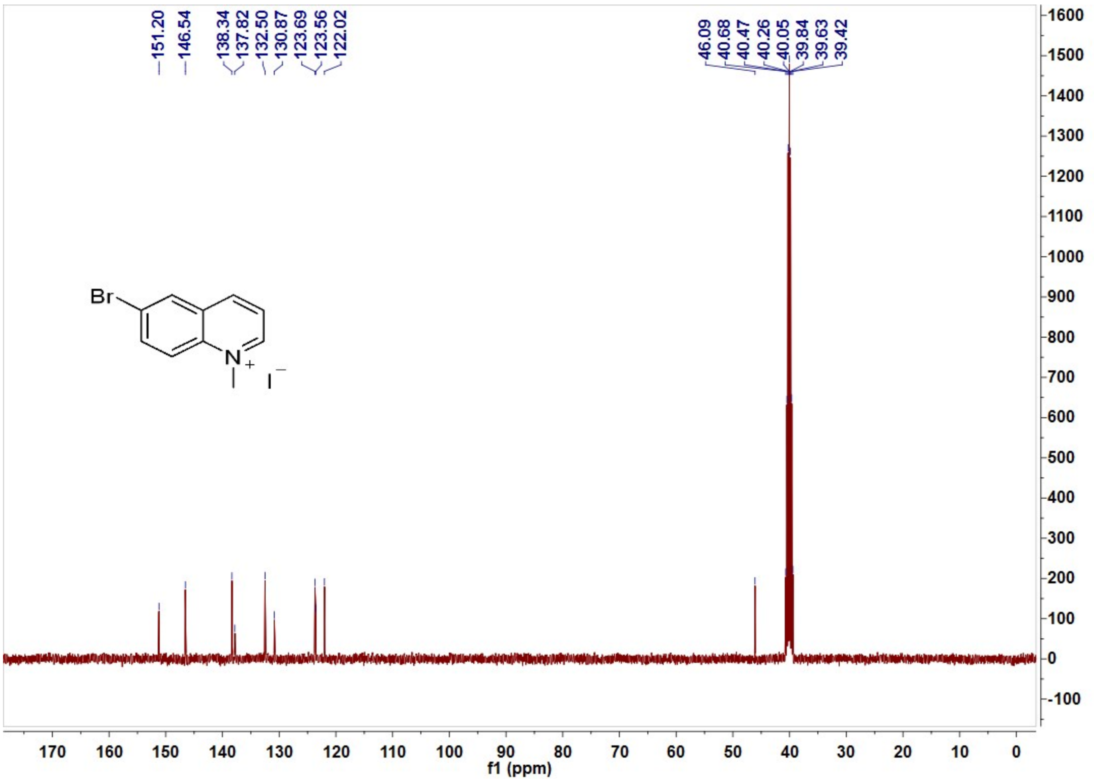
The ^{1}H NMR and ^{13}C NMR spectra of 2a



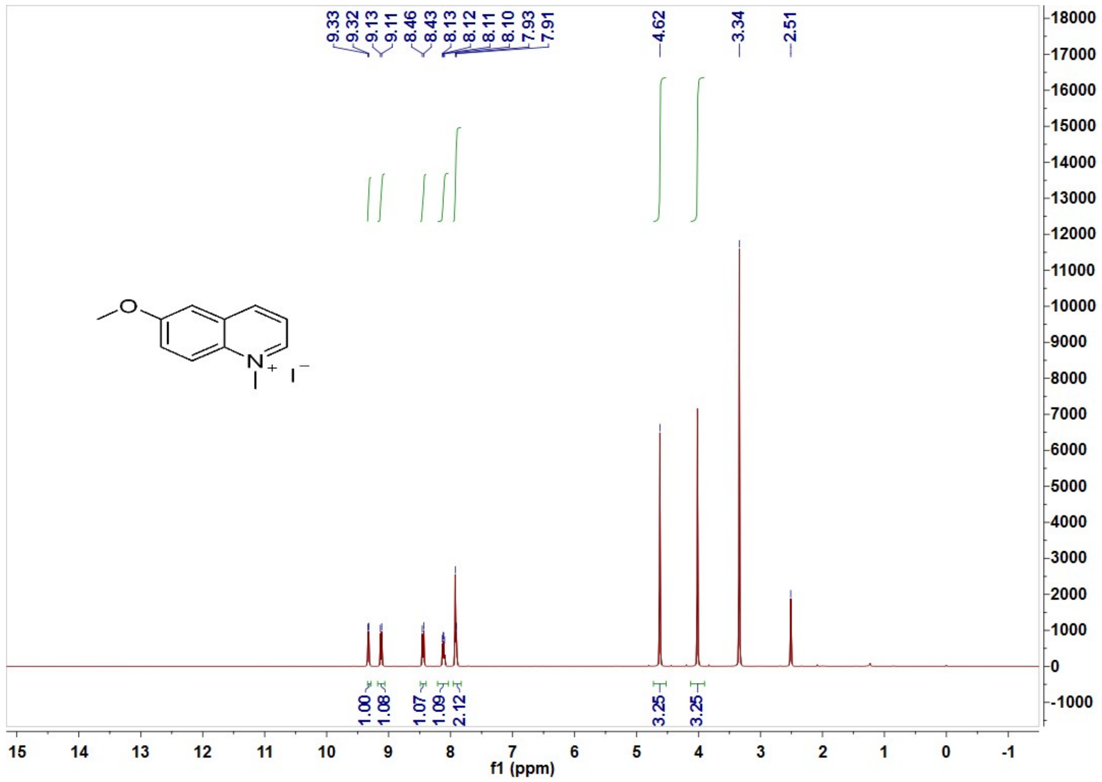


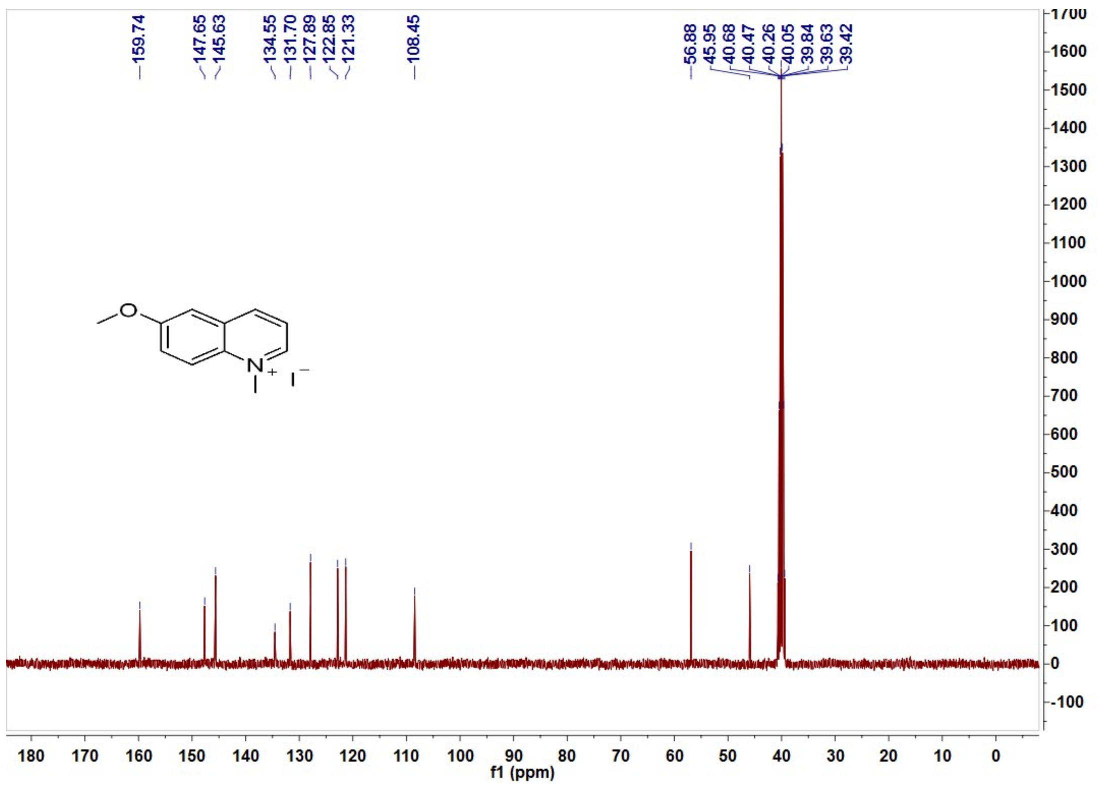
The ^{1}H NMR and ^{13}C NMR spectra of 2b



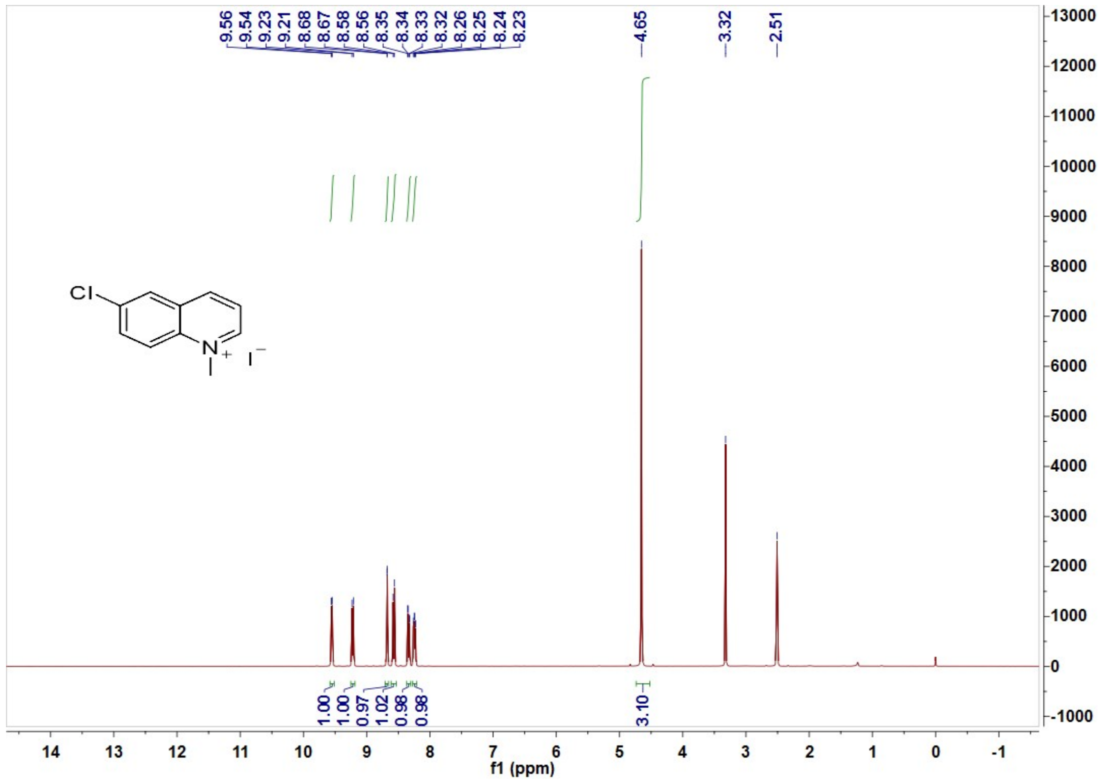


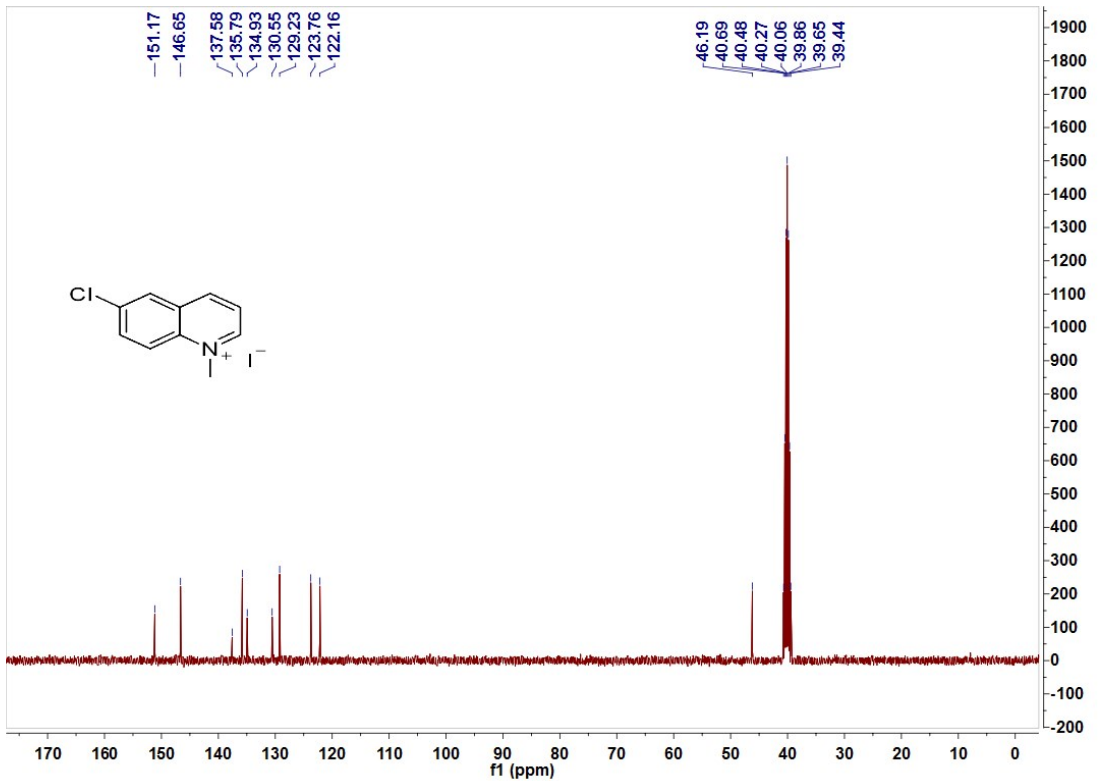
The ^{1}H NMR and ^{13}C NMR spectra of 2c



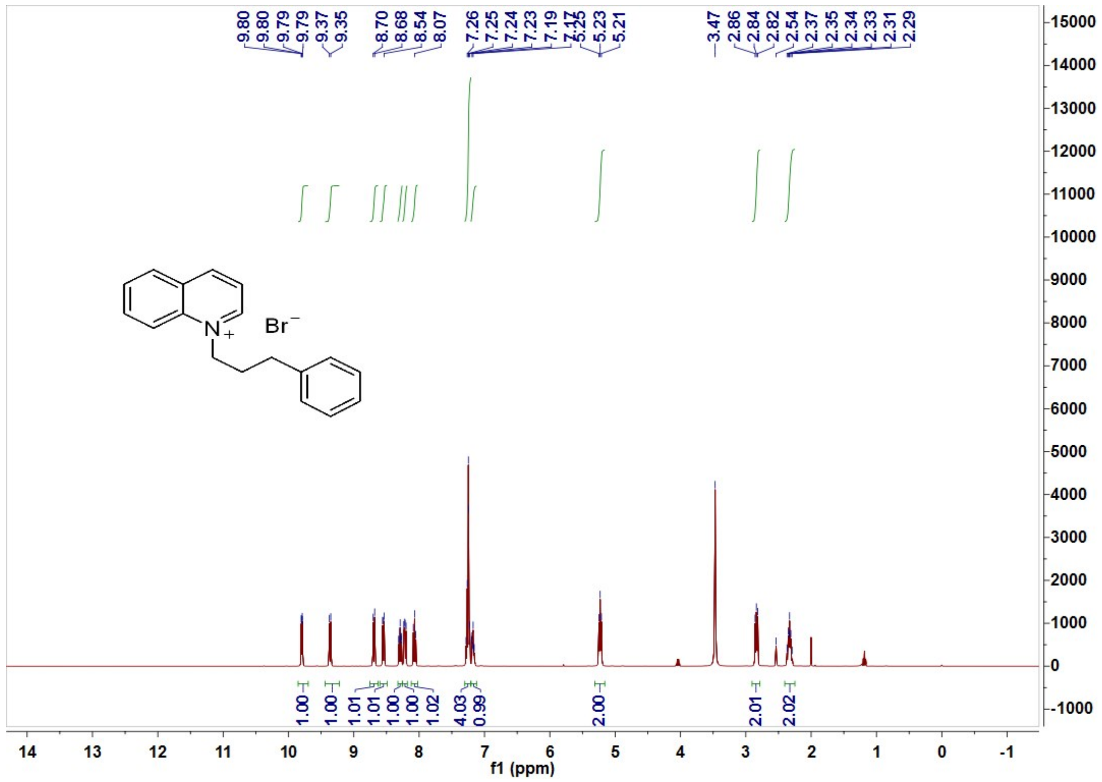


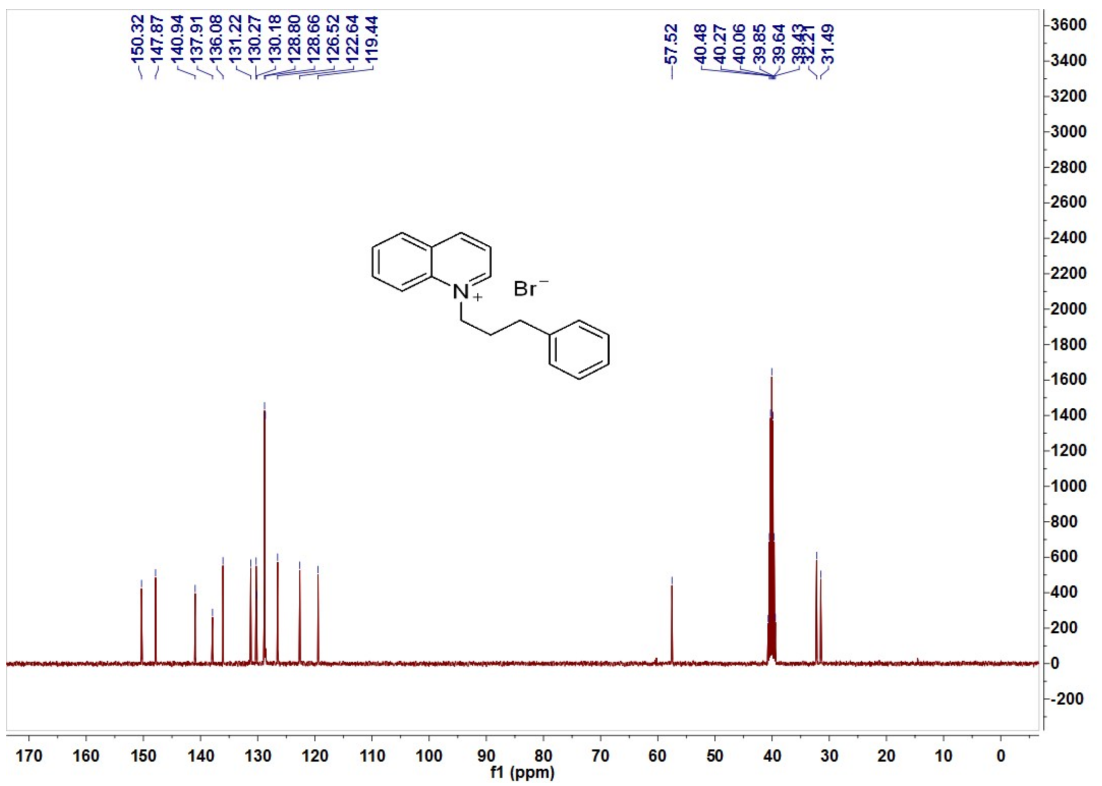
The ^{1}H NMR and ^{13}C NMR spectra of 2d



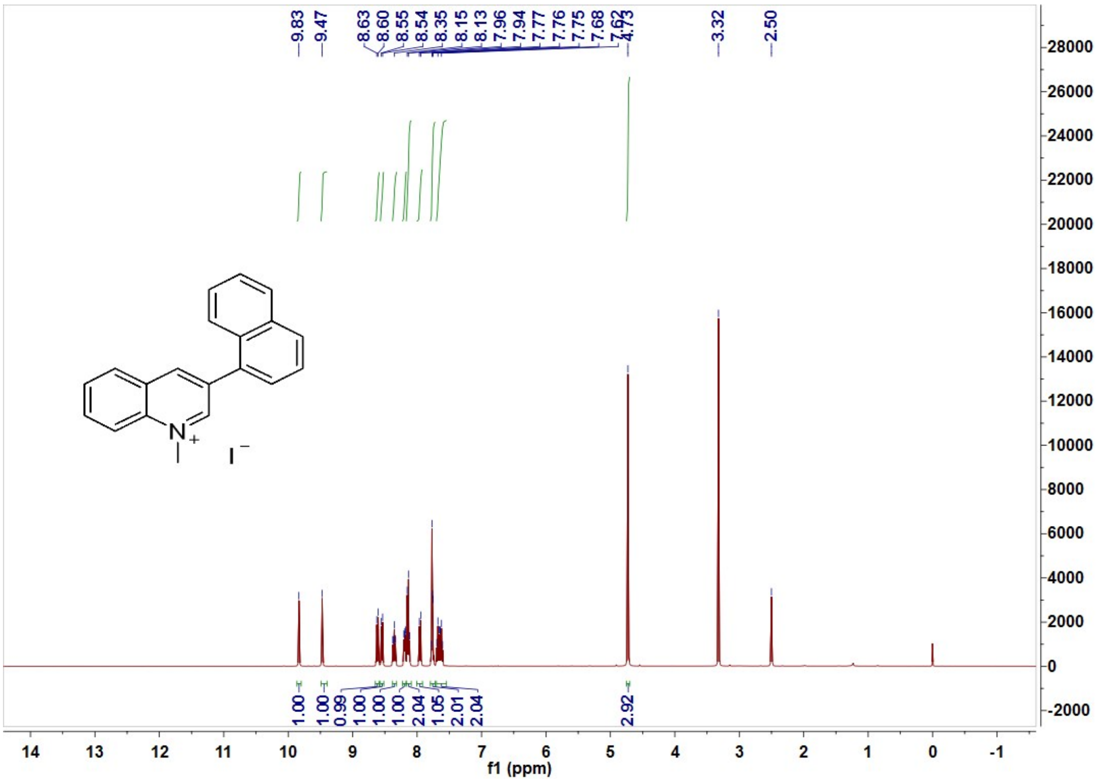


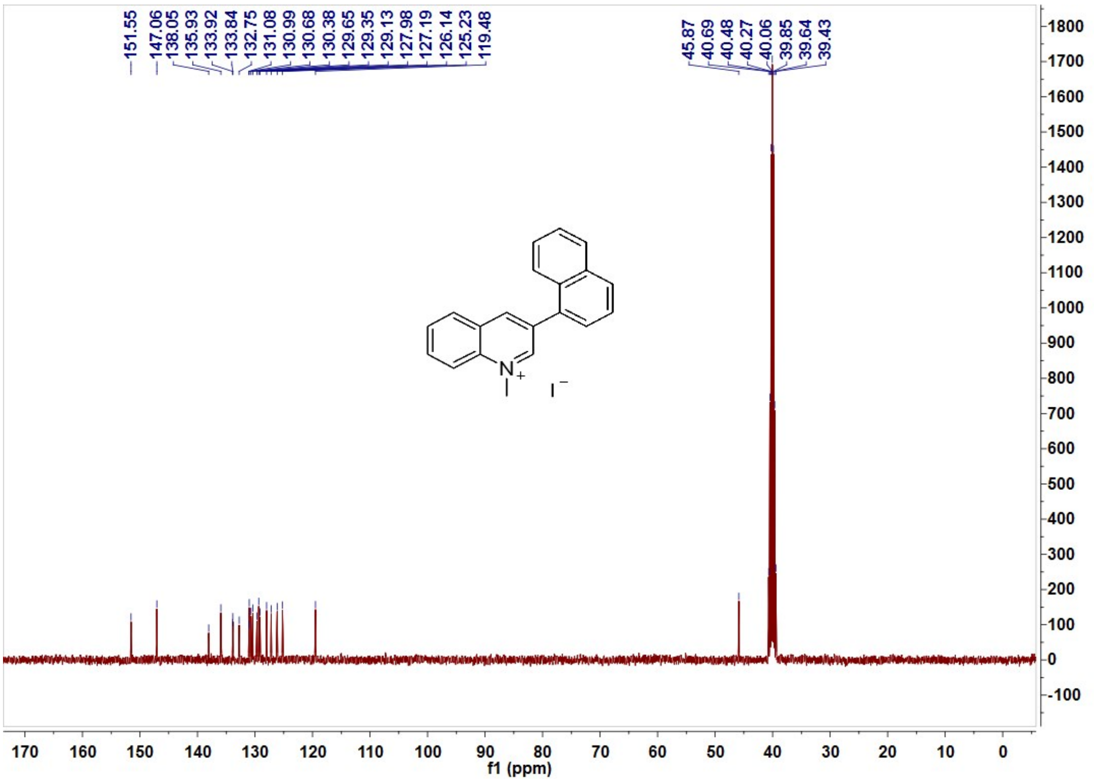
The ^{1}H NMR and ^{13}C NMR spectra of 2e



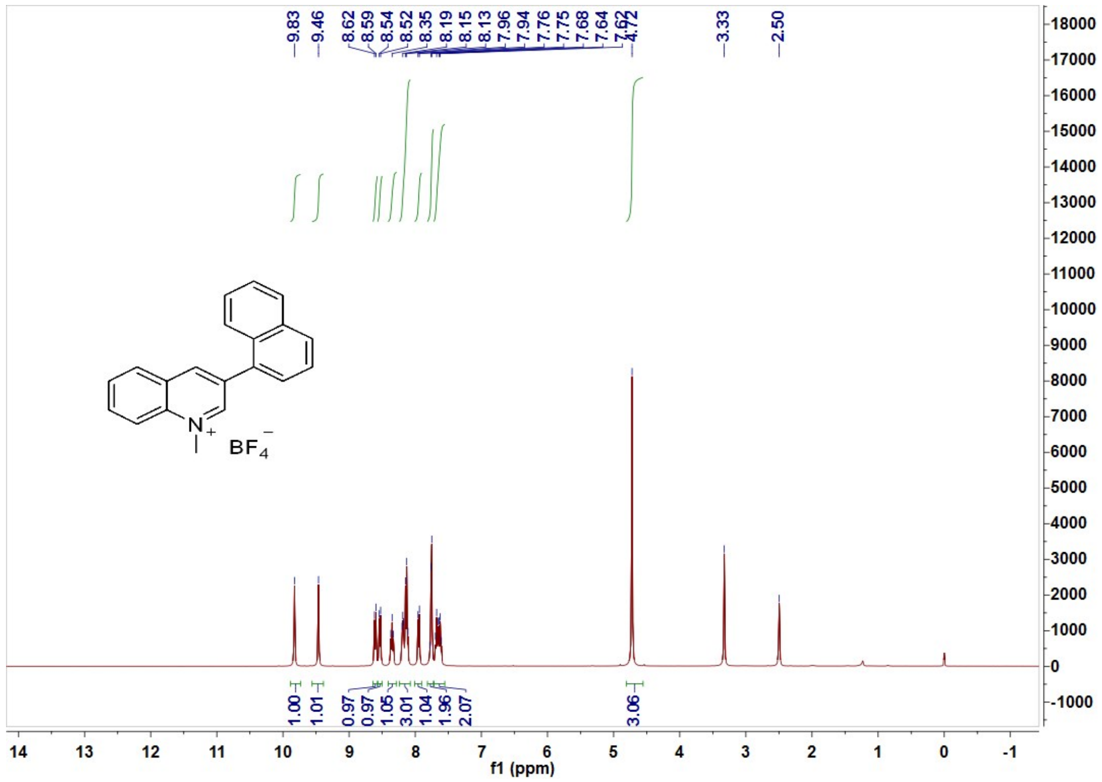


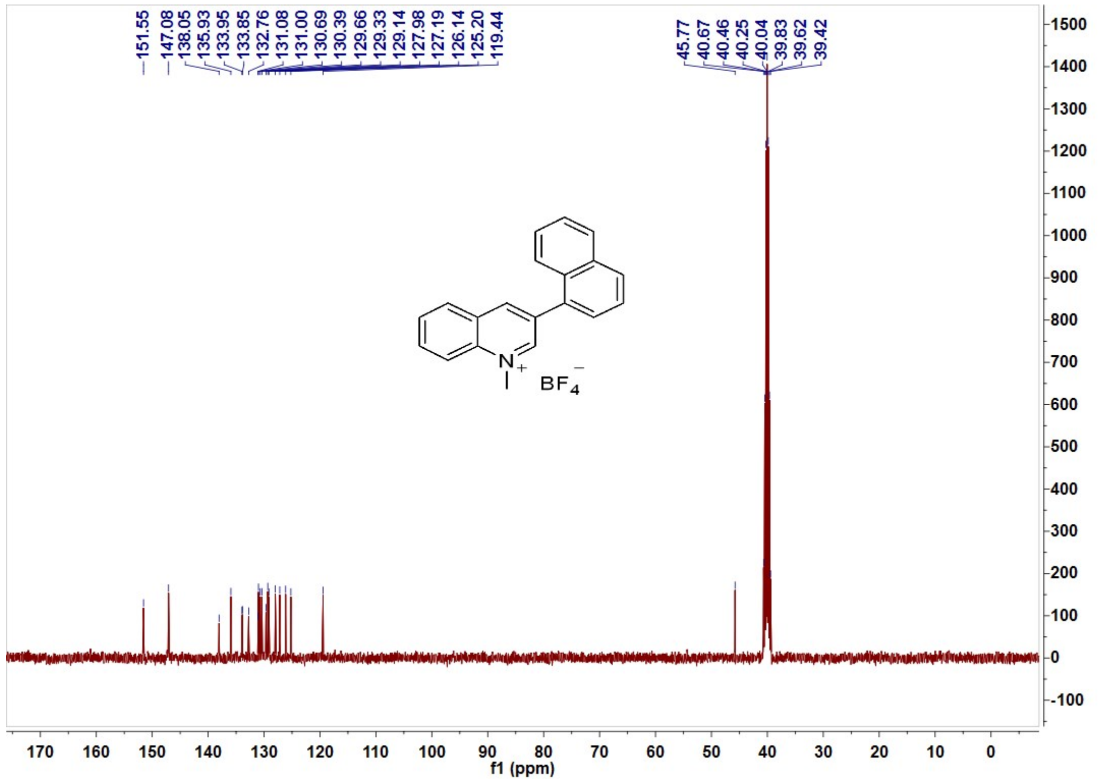
The ^{1}H NMR and ^{13}C NMR spectra of 2fa



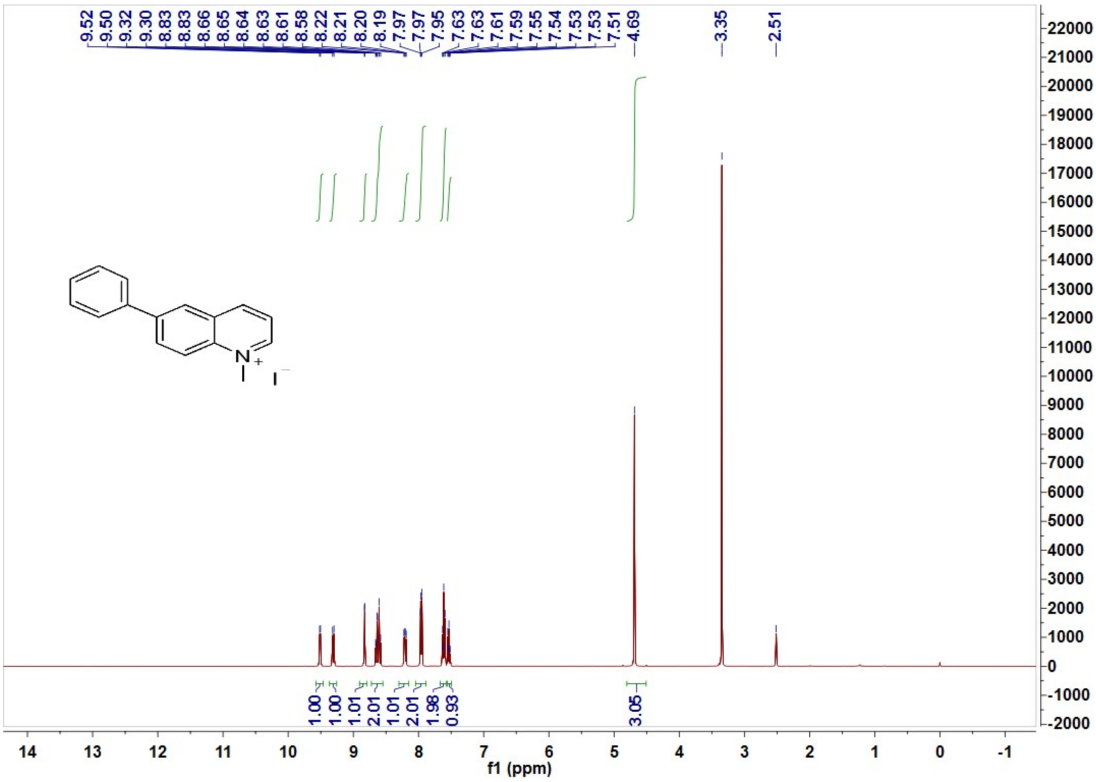


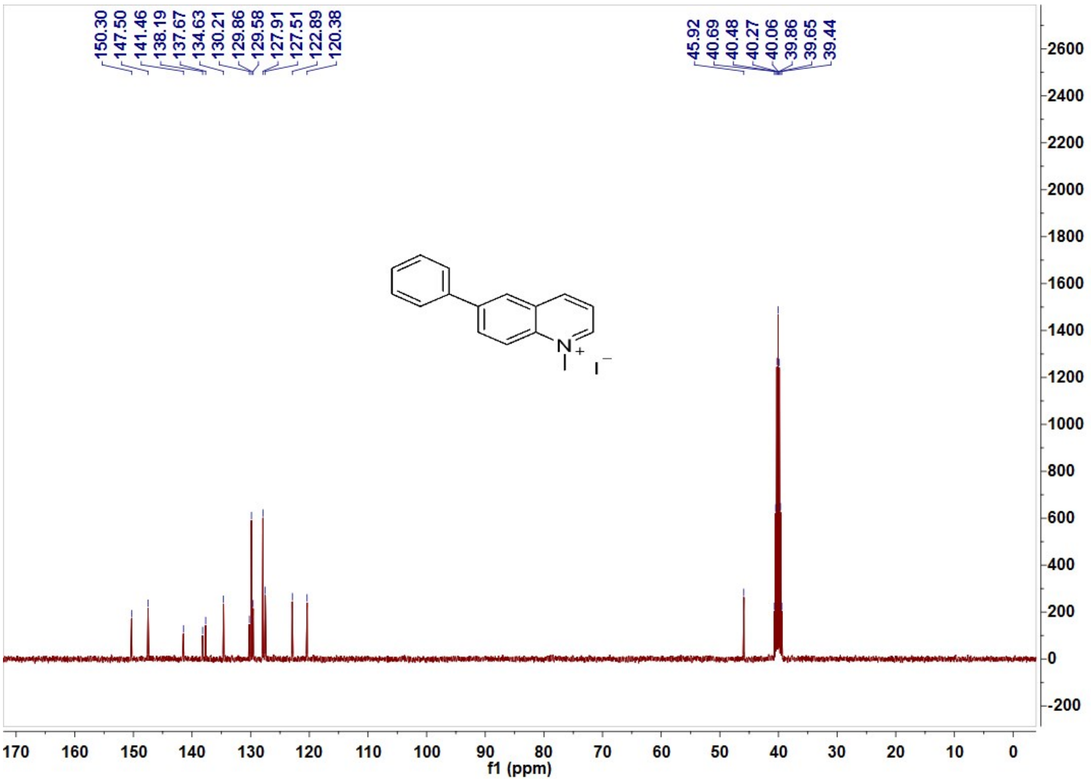
The ^{1}H NMR and ^{13}C NMR spectra of 2fb



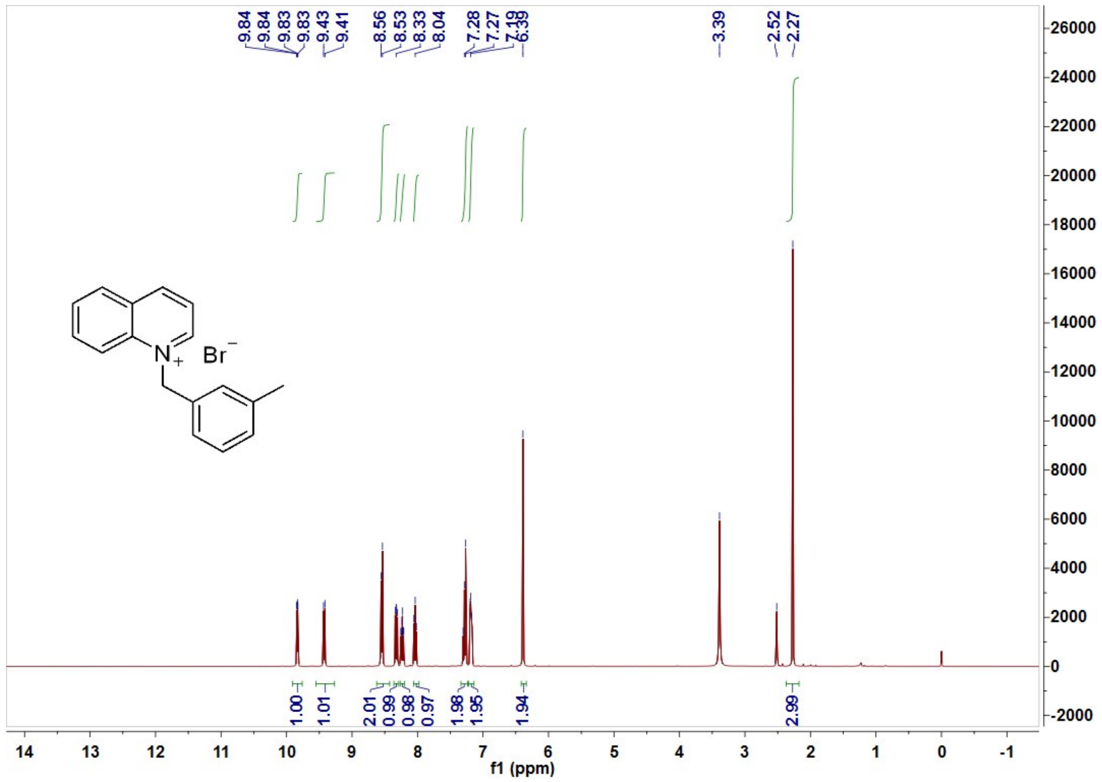


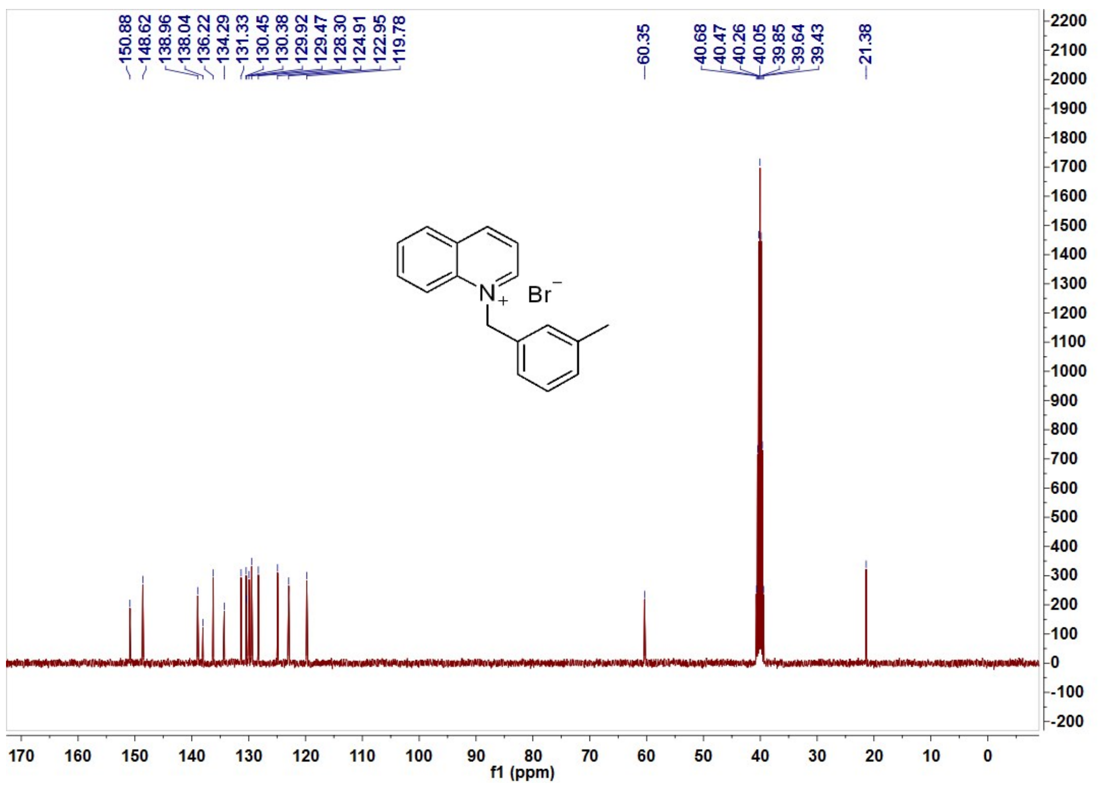
The ^{1}H NMR and ^{13}C NMR spectra of 2g



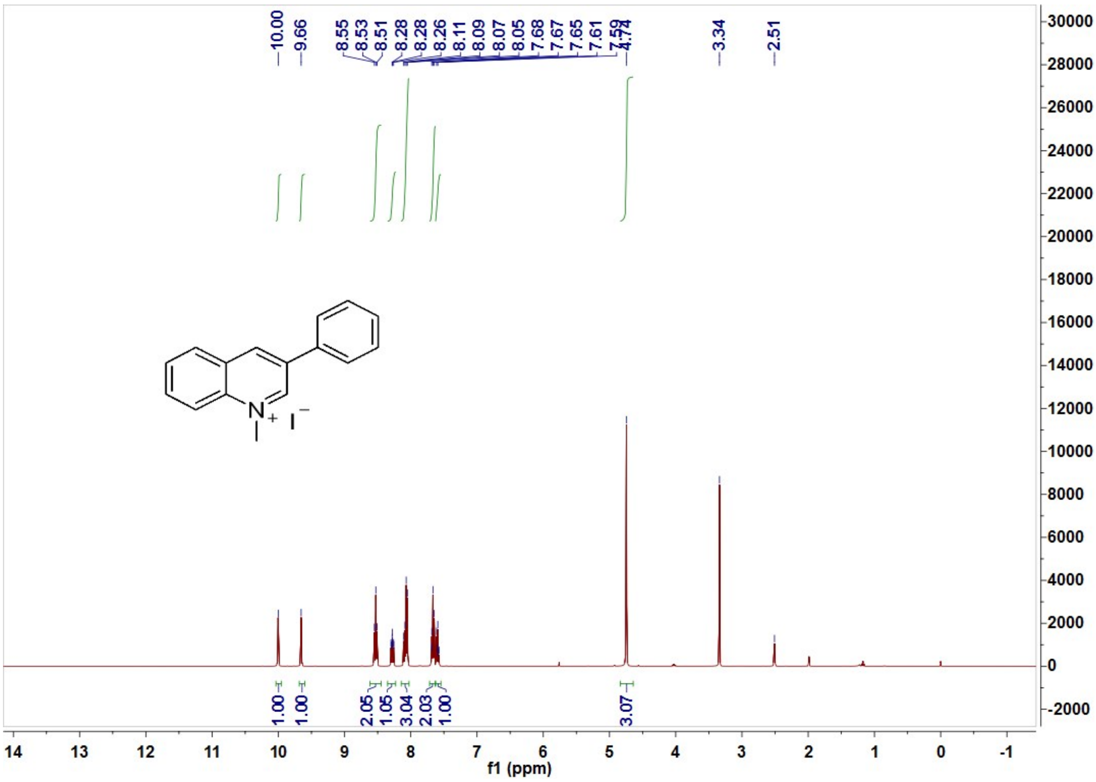


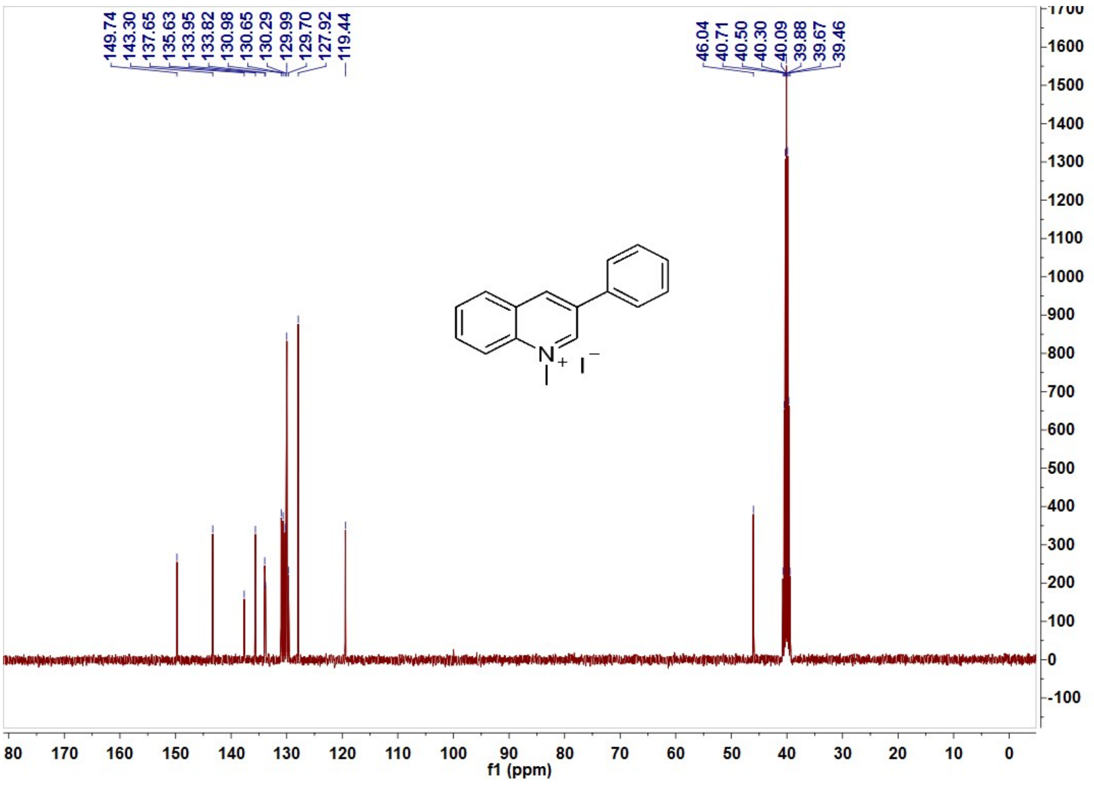
The ^{1}H NMR and ^{13}C NMR spectra of 2h



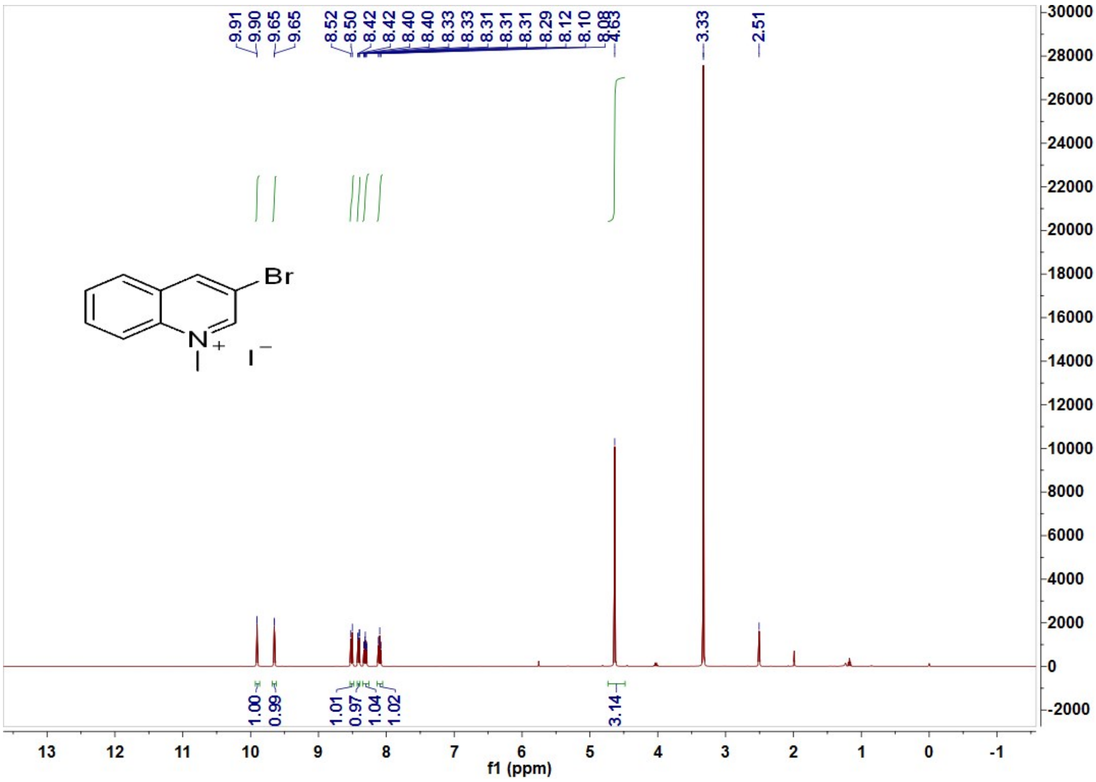


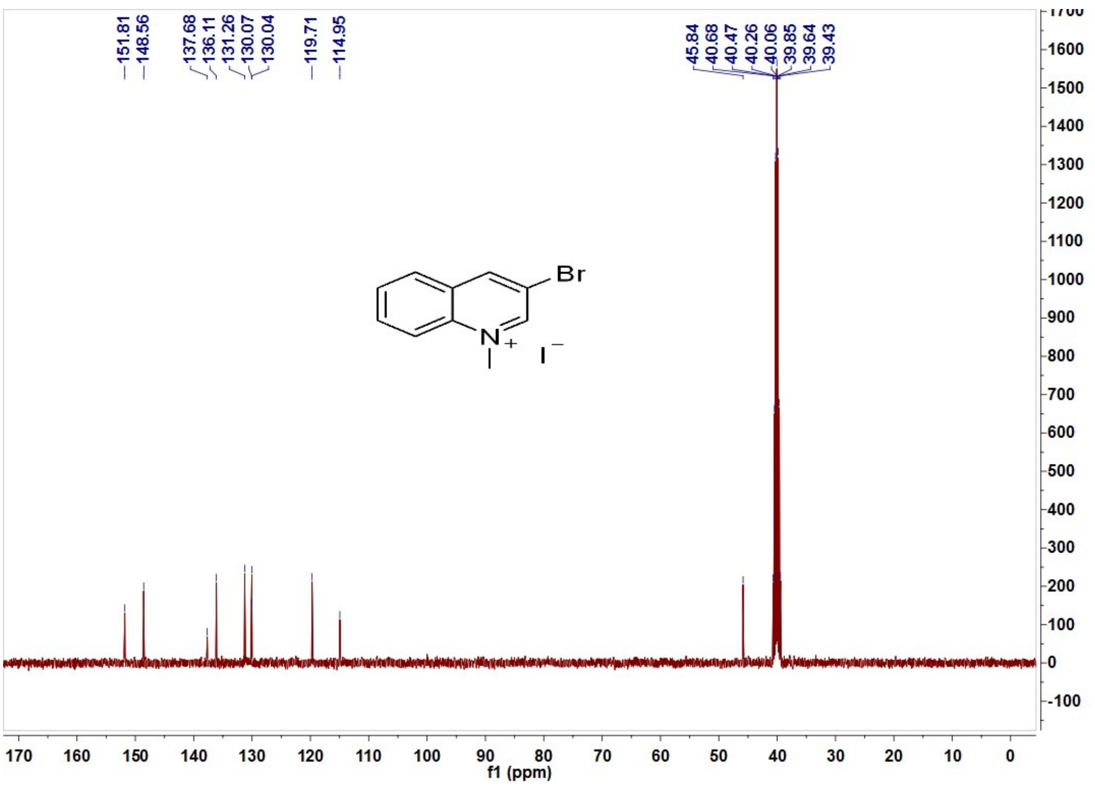
The ^{1}H NMR and ^{13}C NMR spectra of 2i



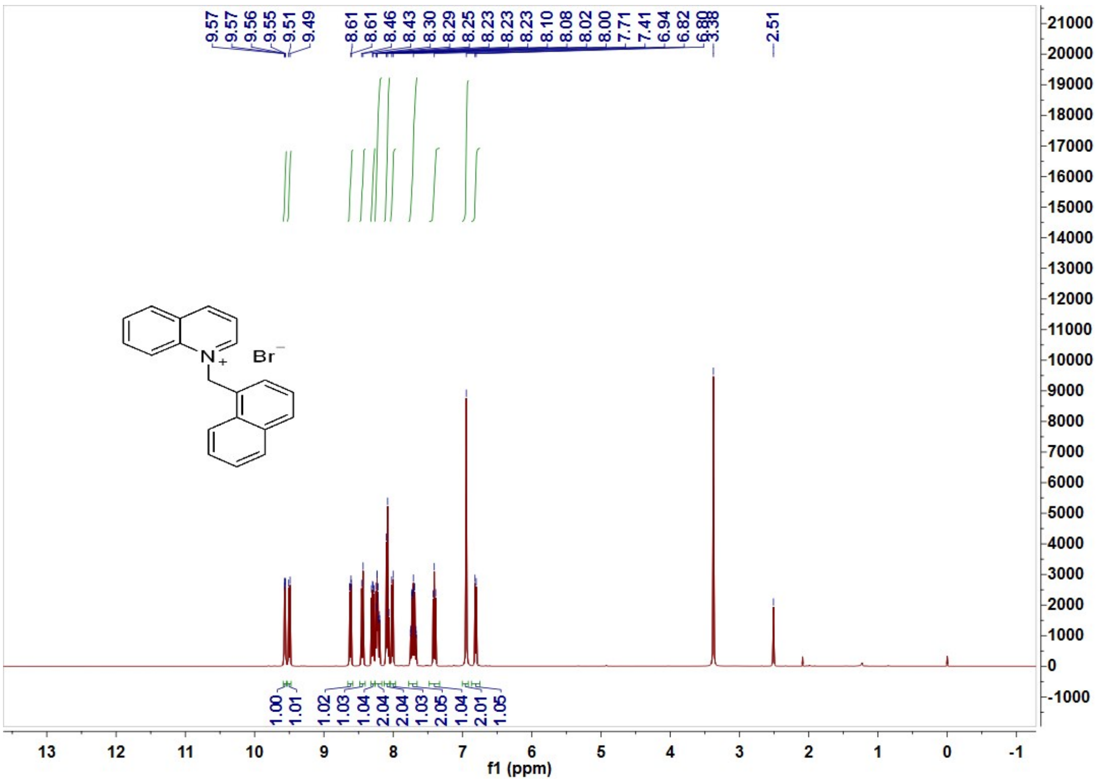


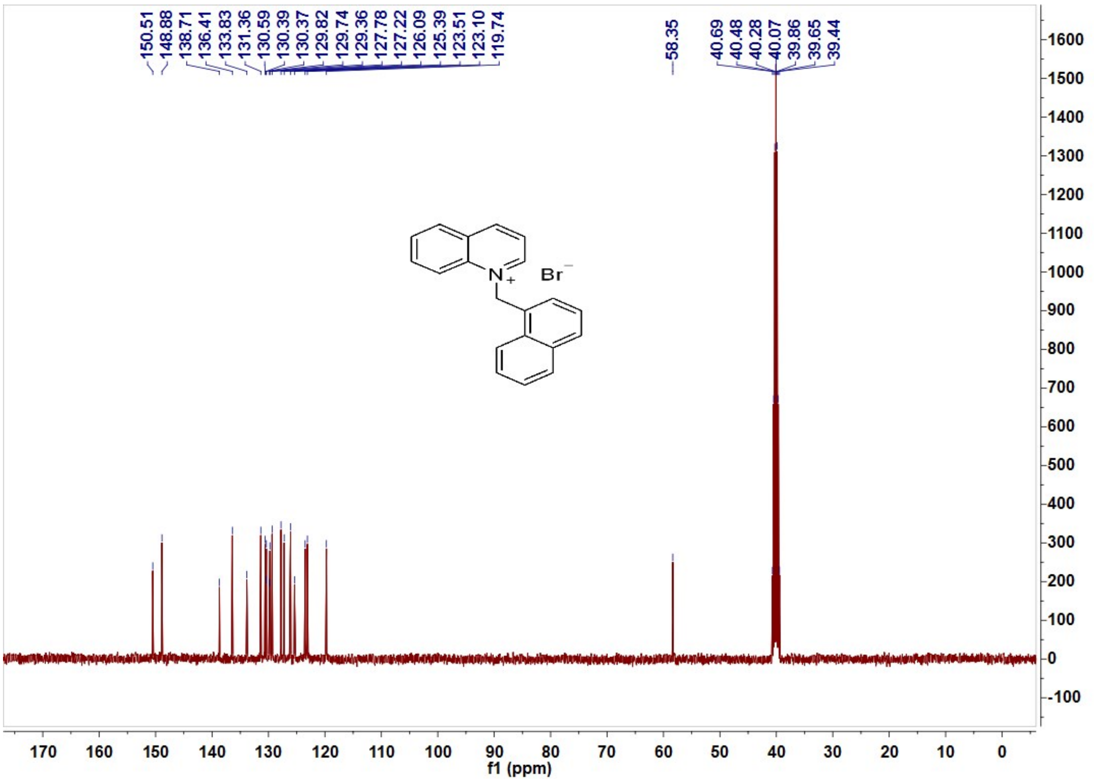
The ^{1}H NMR and ^{13}C NMR spectra of 2j



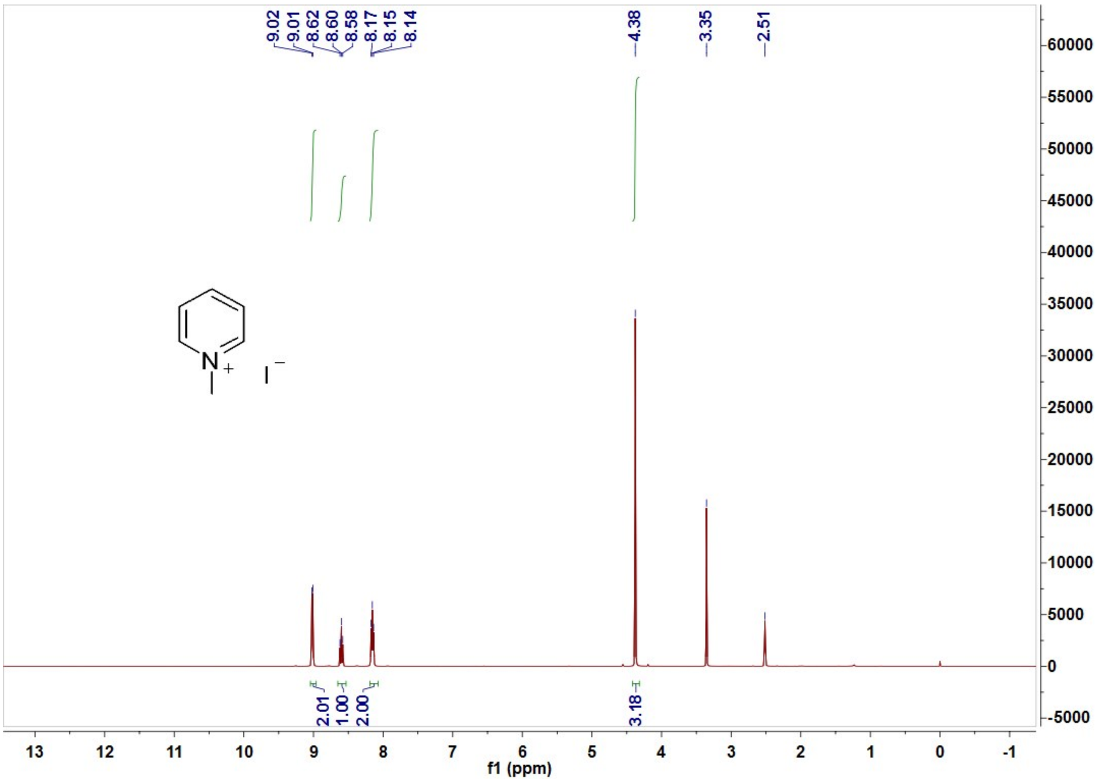


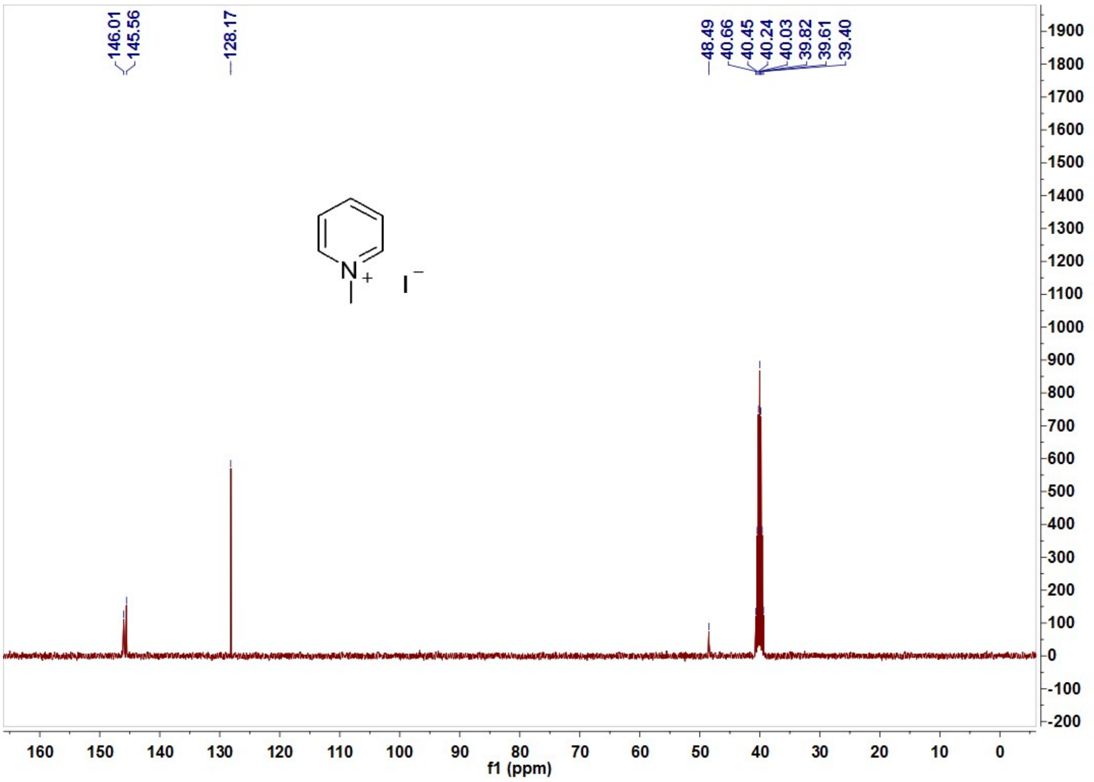
The ^{1}H NMR and ^{13}C NMR spectra of 2k



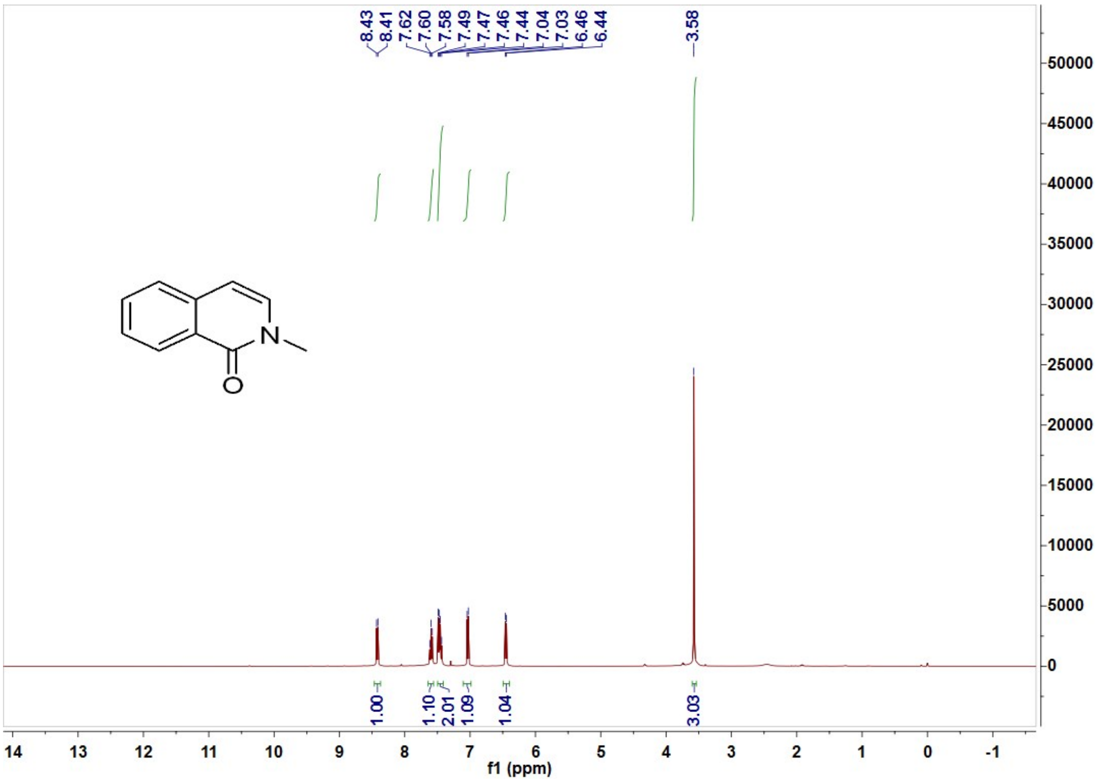


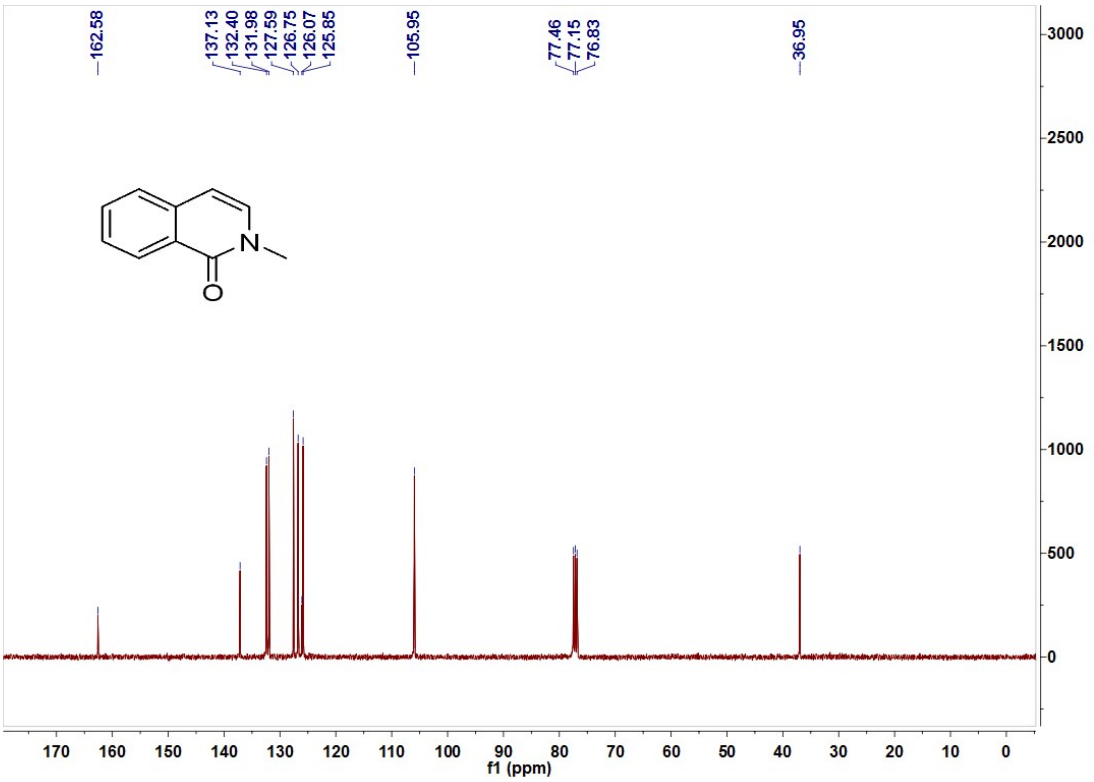
The ^{1}H NMR and ^{13}C NMR spectra of 2l



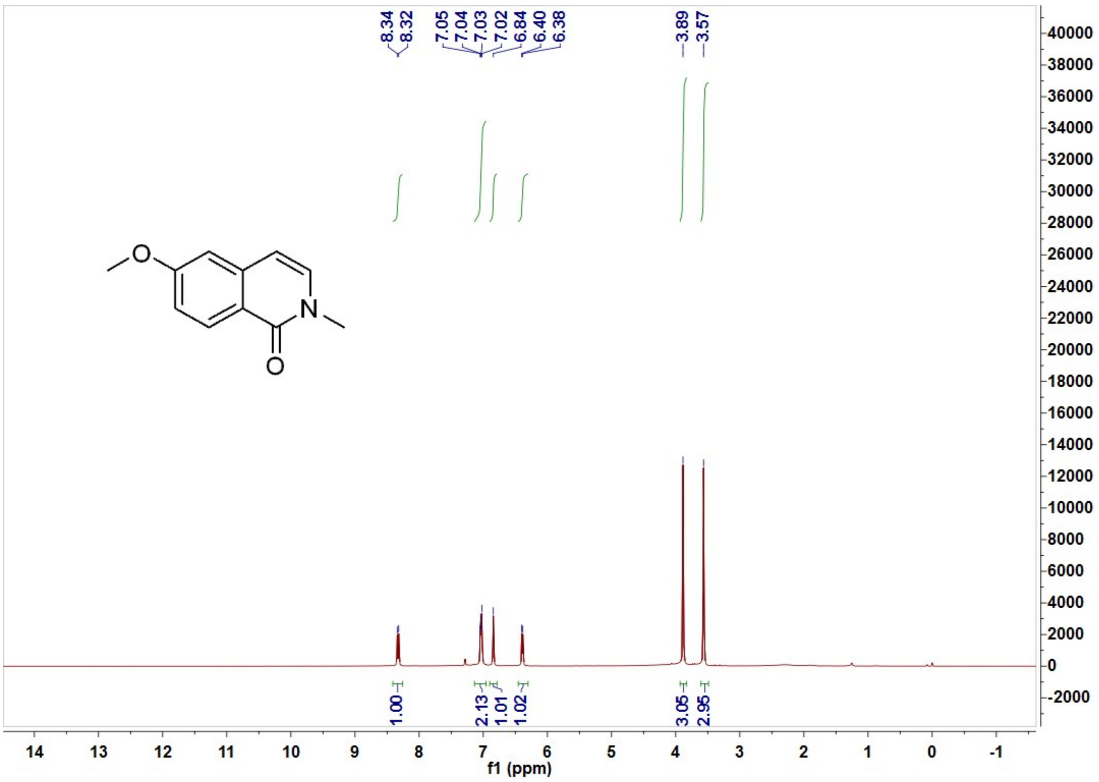


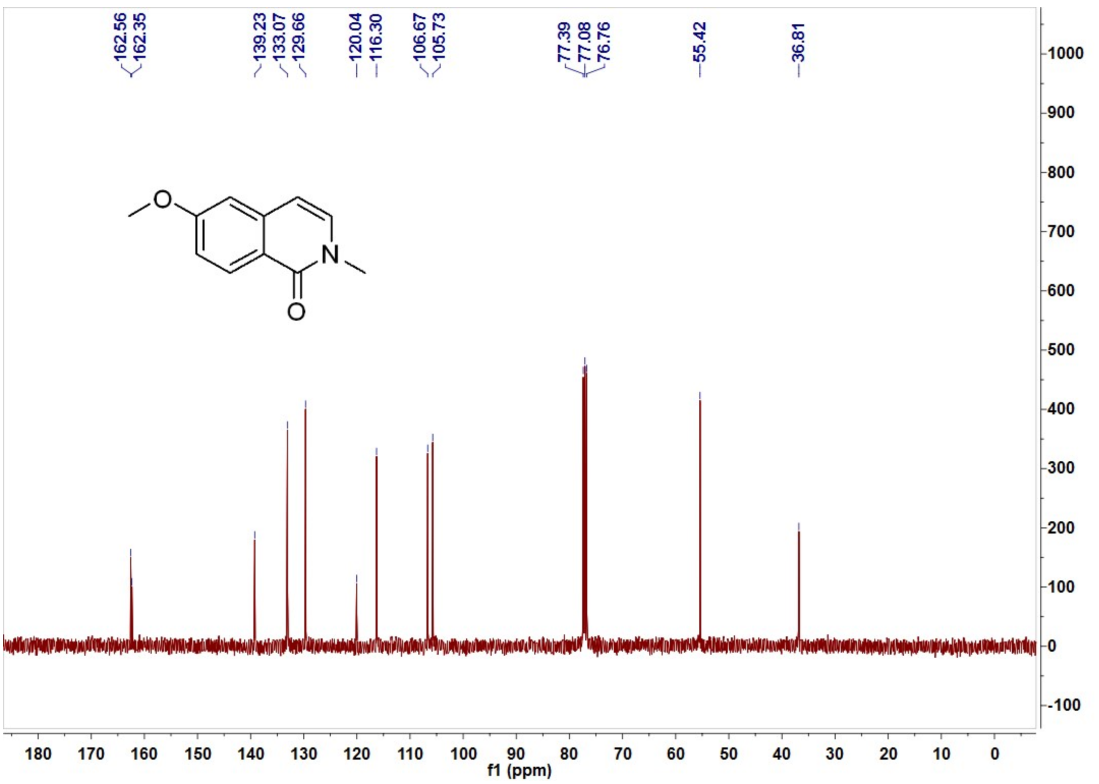
The [1]H NMR and [13]C NMR spectra of 3a



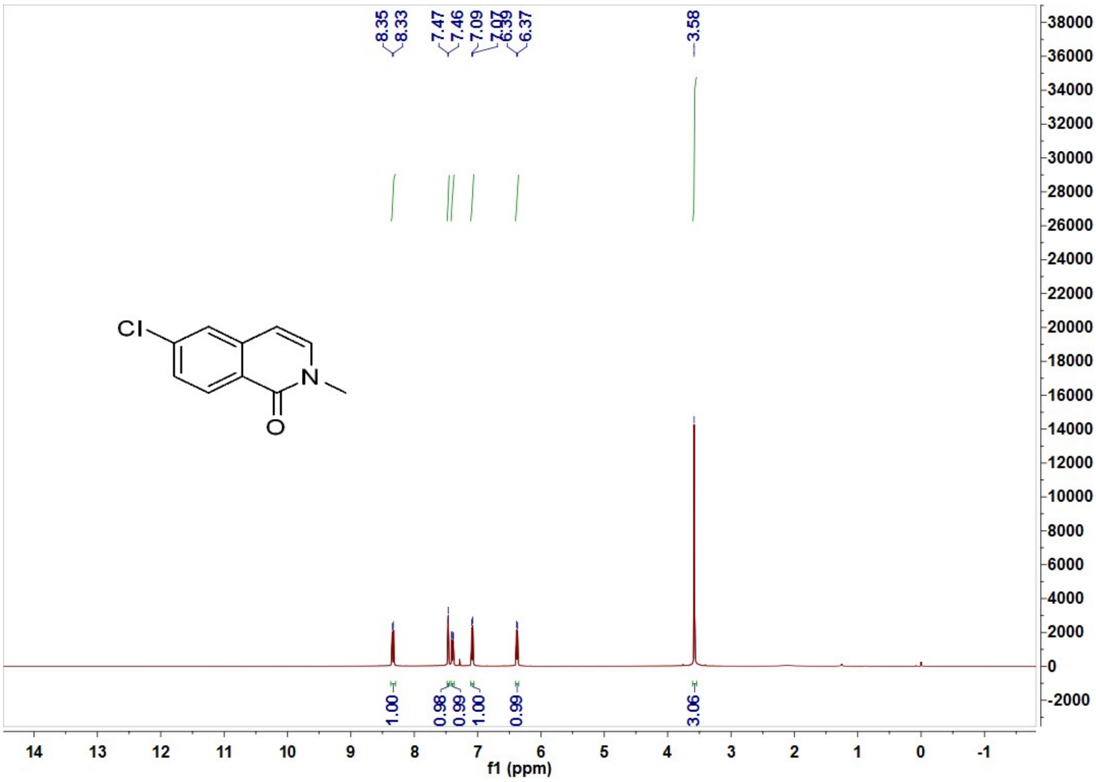


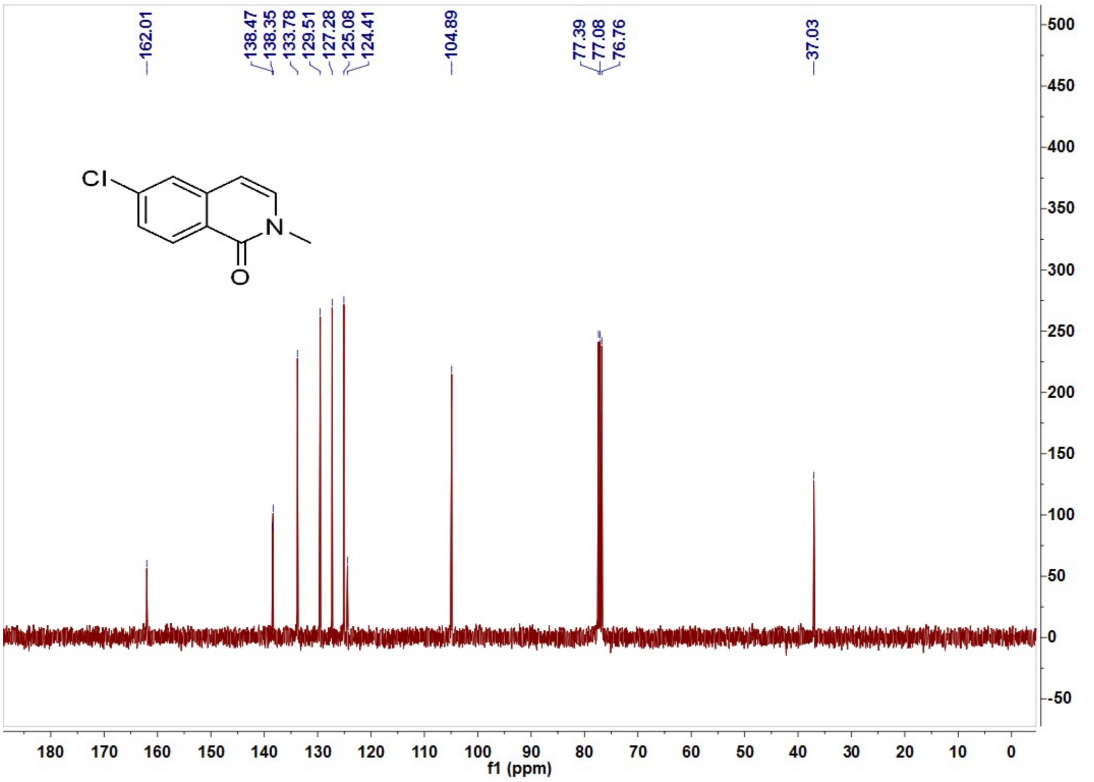
The ^{1}H NMR and ^{13}C NMR spectra of 3b



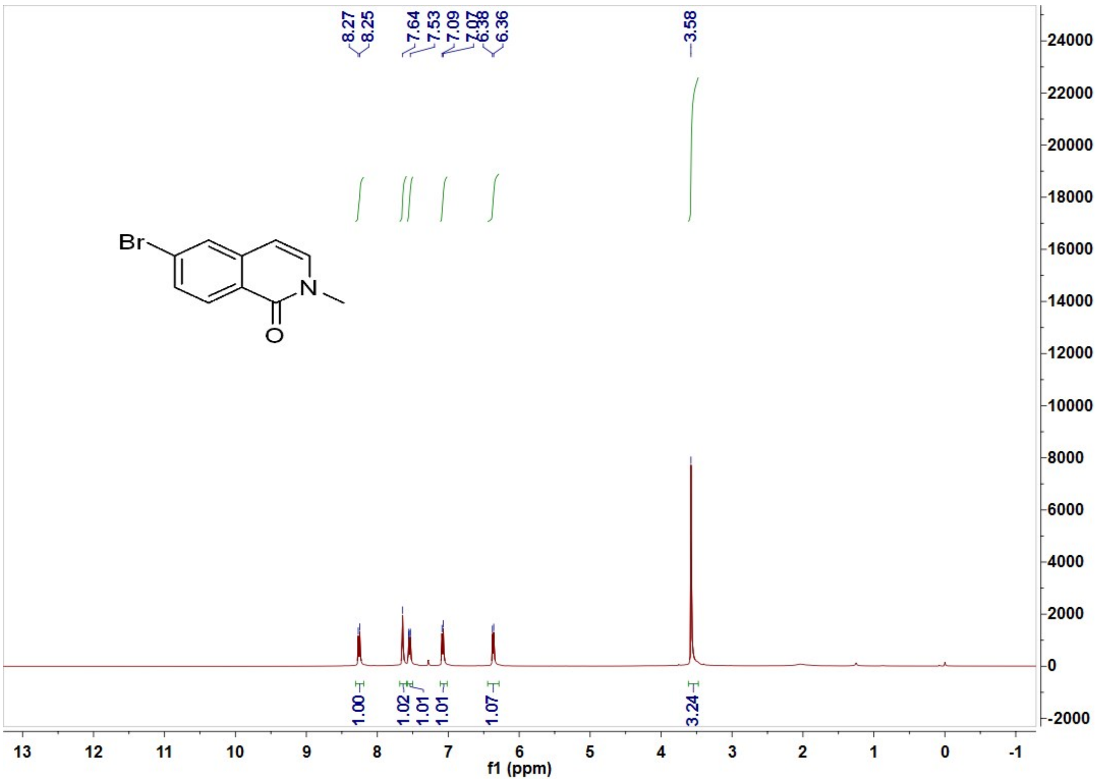


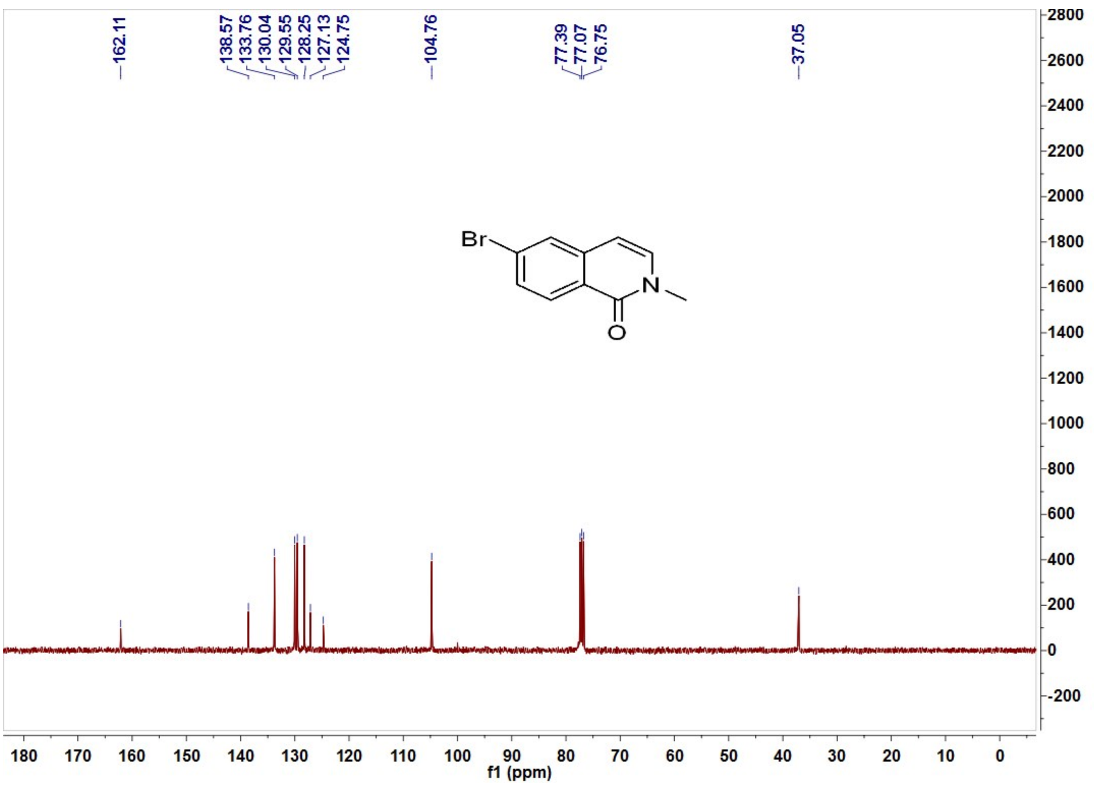
The [1]H NMR and [13]C NMR spectra of 3c



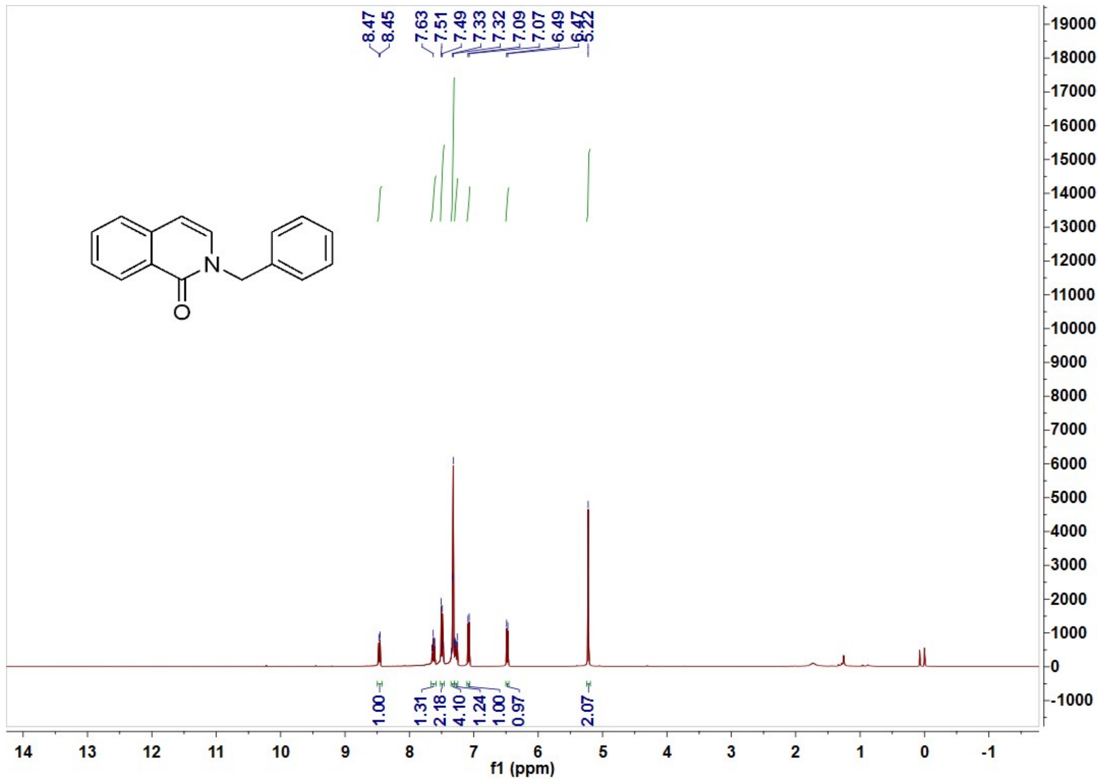


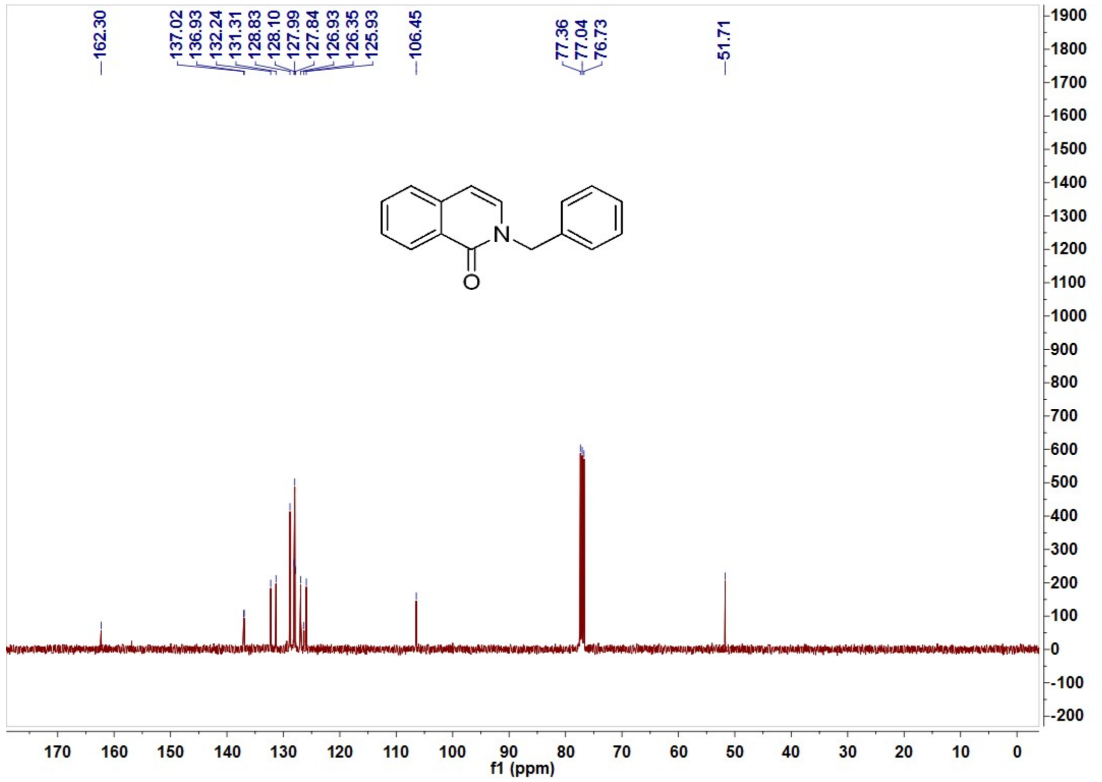
The ^{1}H NMR and ^{13}C NMR spectra of 3d



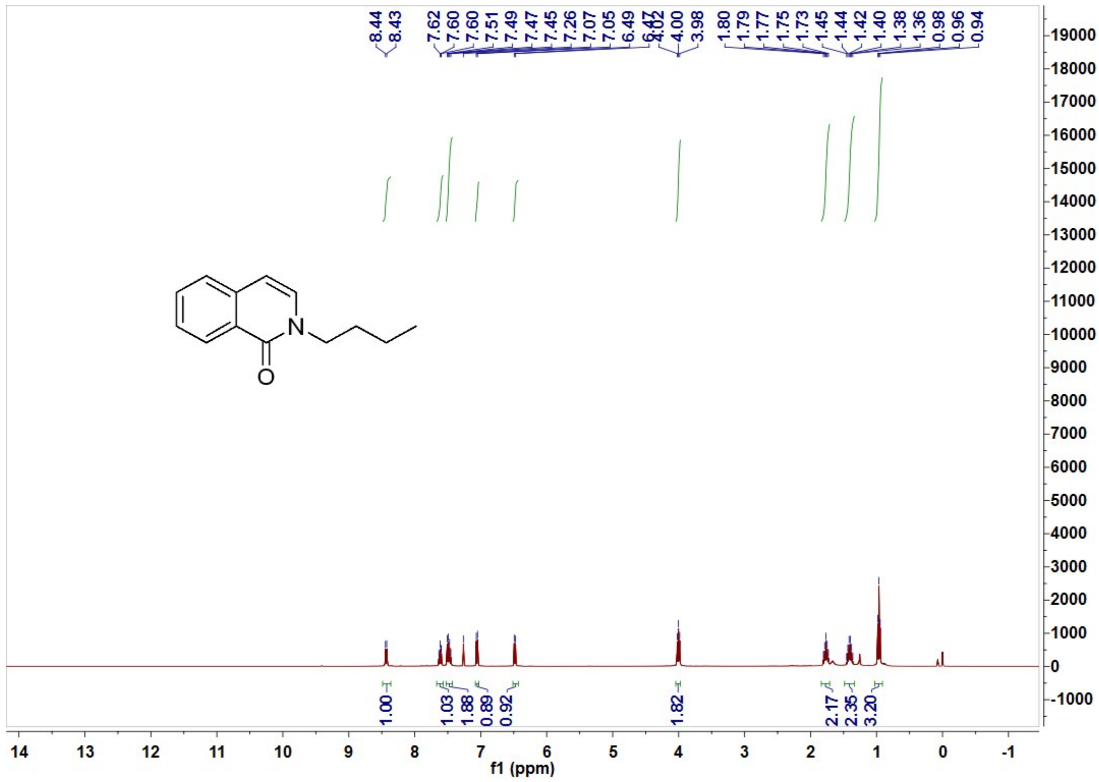


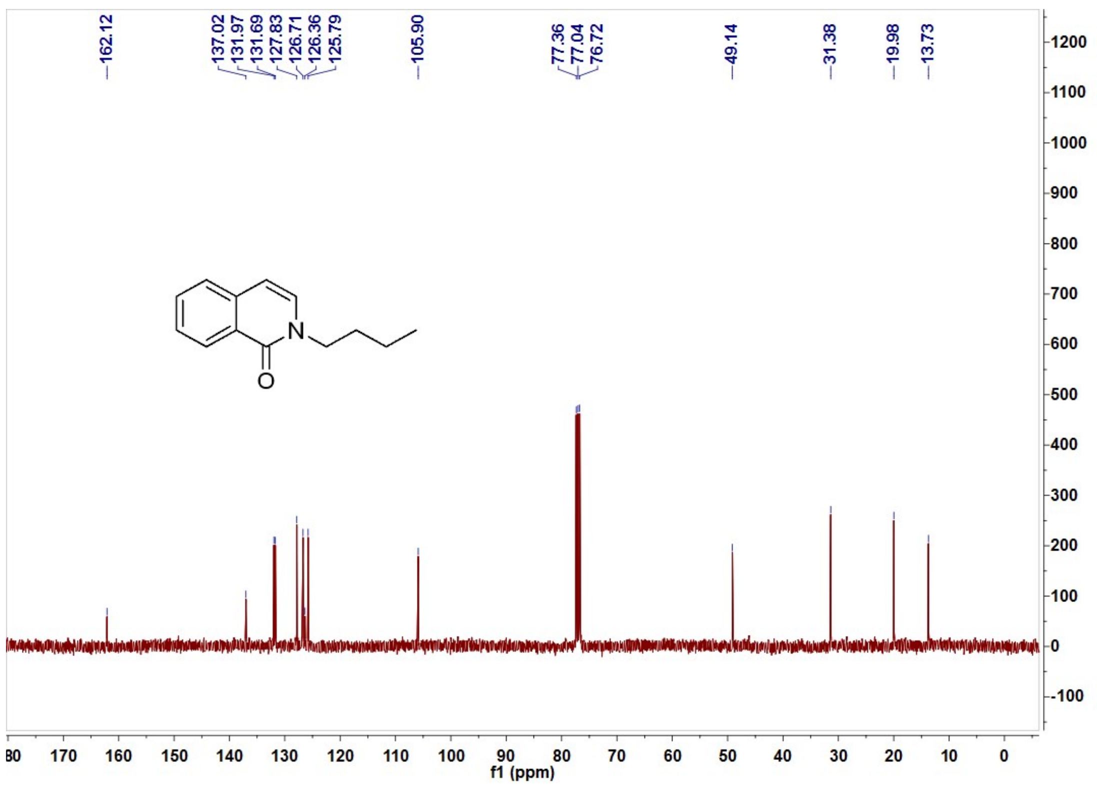
The ^{1}H NMR and ^{13}C NMR spectra of 3e



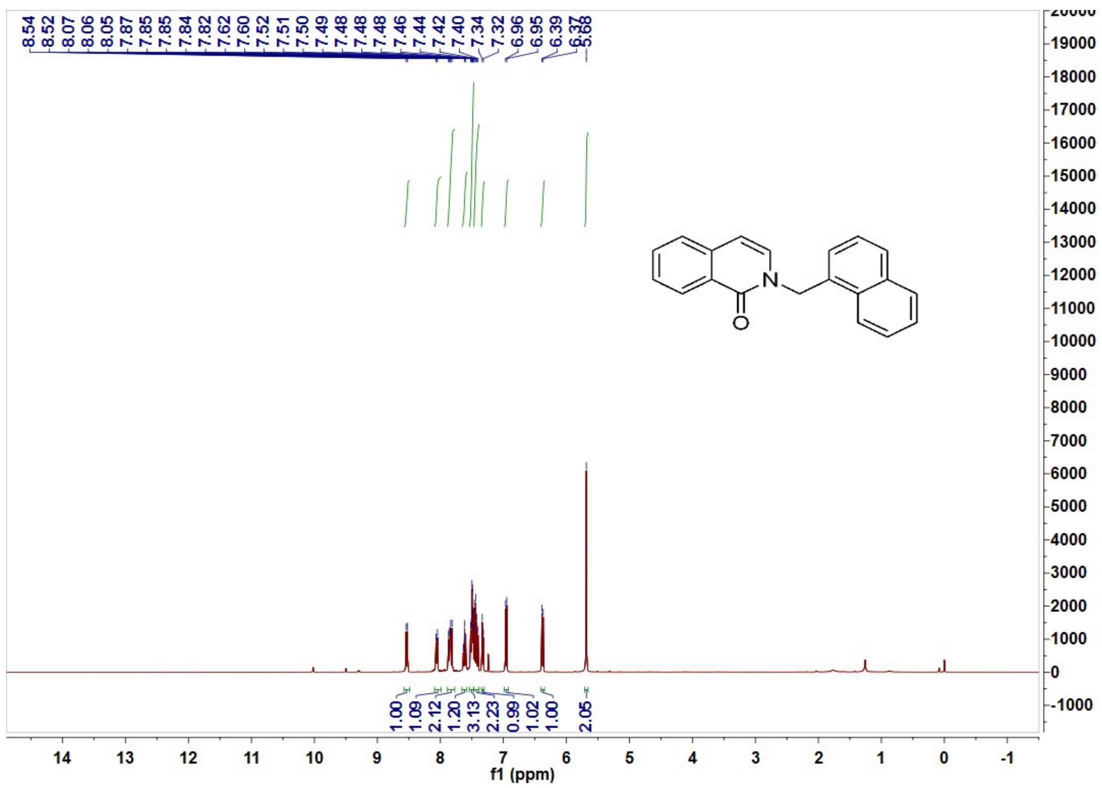


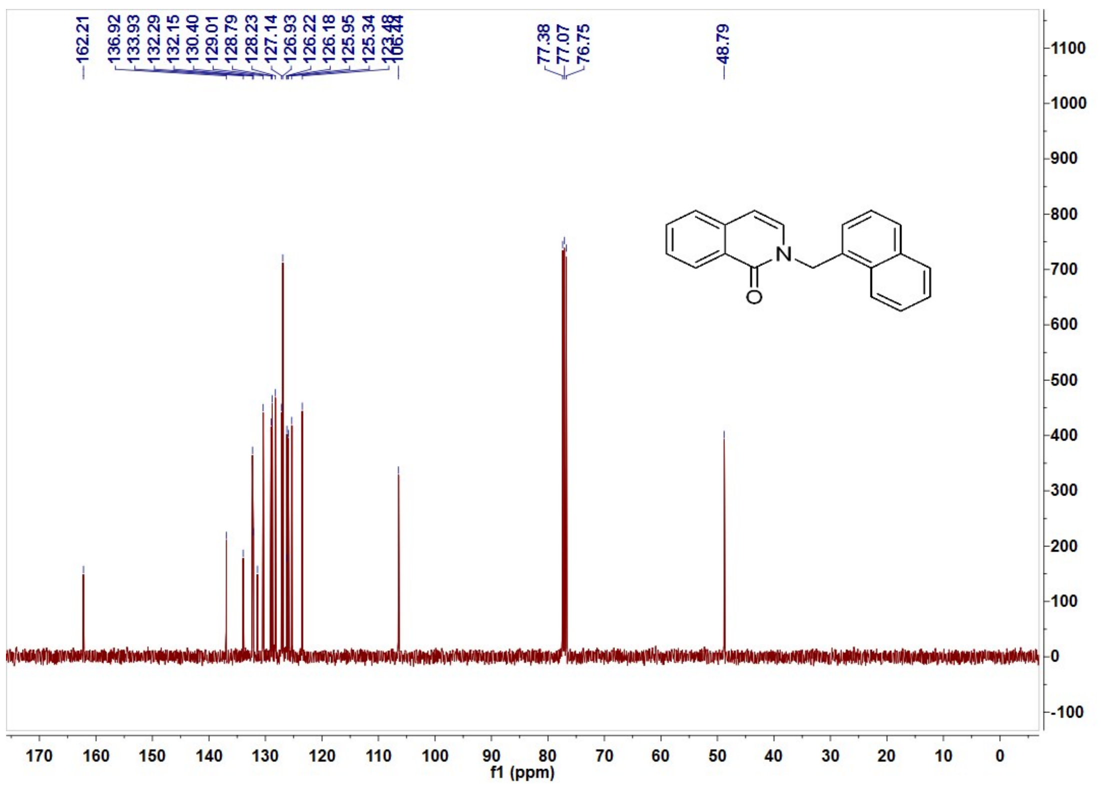
The ^{1}H NMR and ^{13}C NMR spectra of 3f



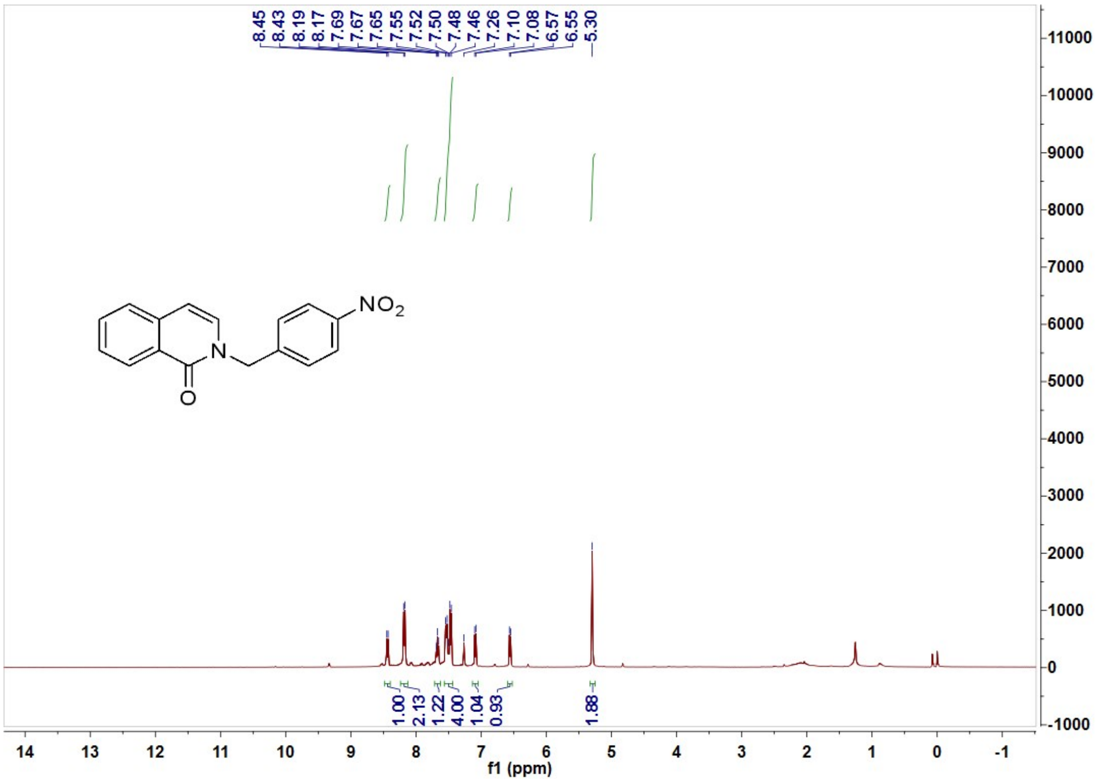


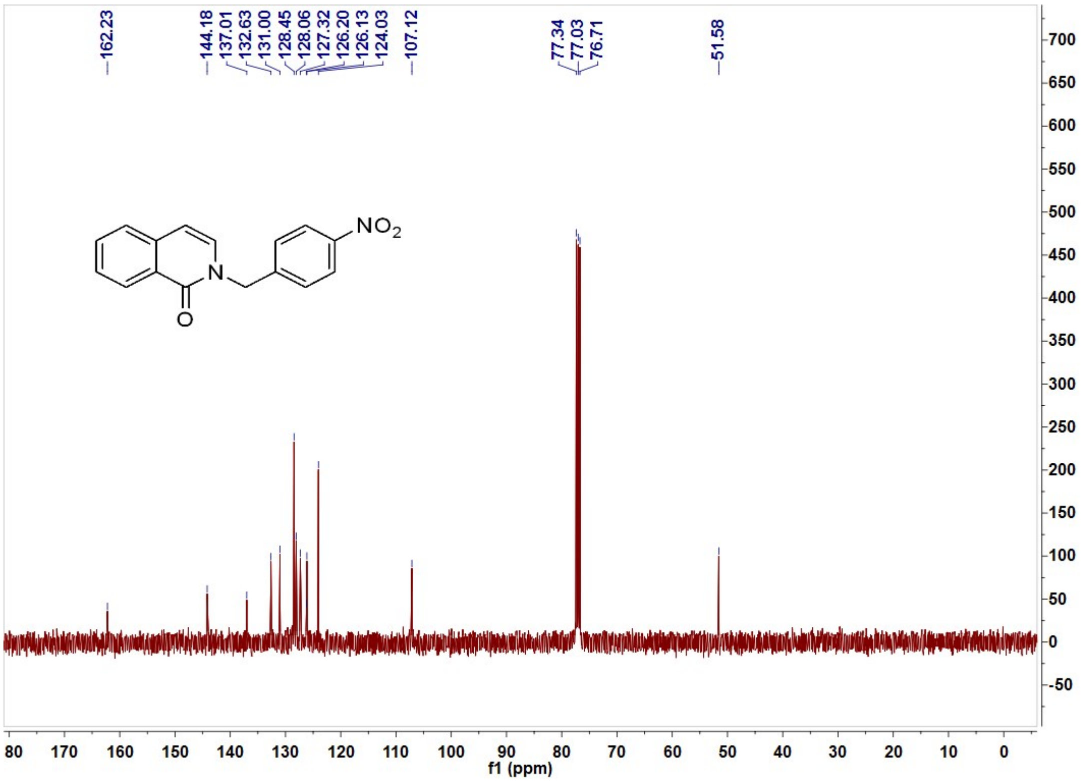
The ^{1}H NMR and ^{13}C NMR spectra of 3g



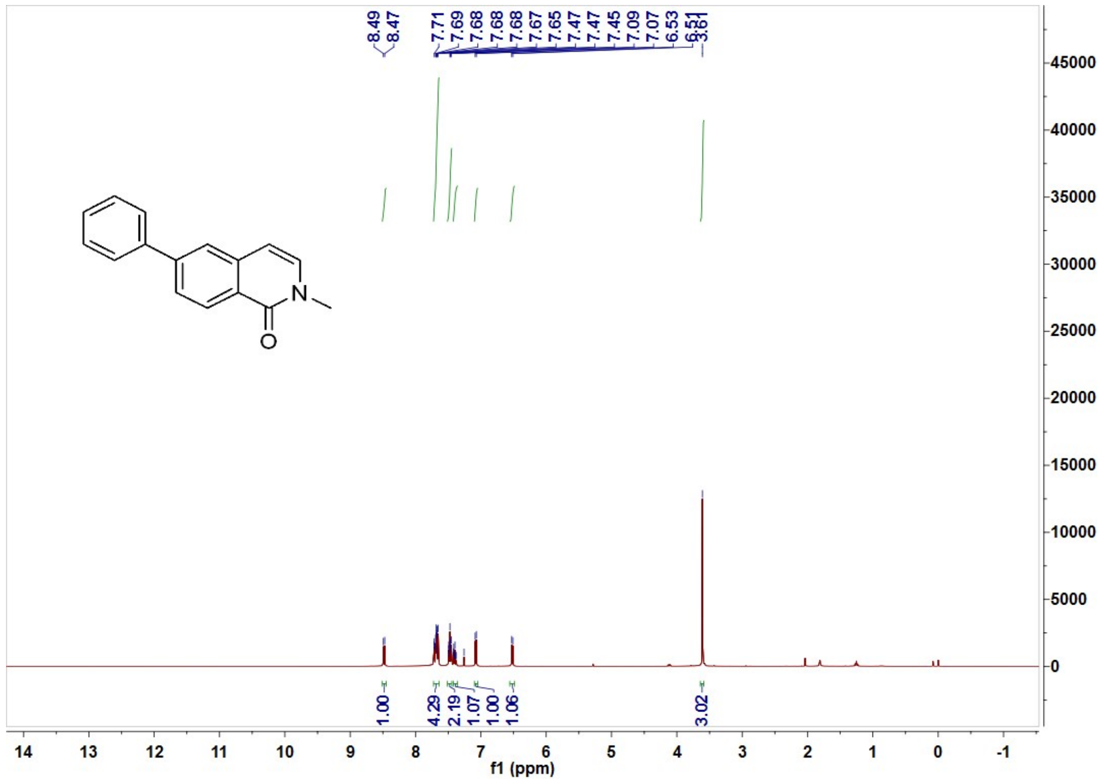


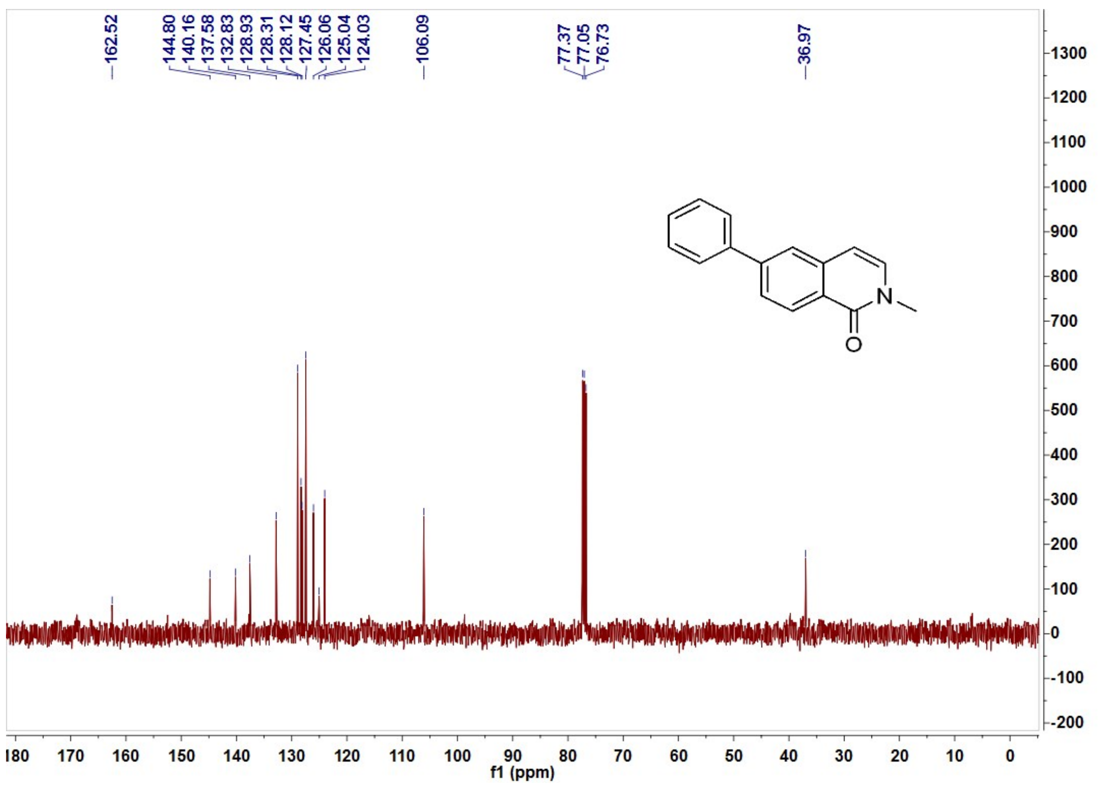
The ^{1}H NMR and ^{13}C NMR spectra of 3h



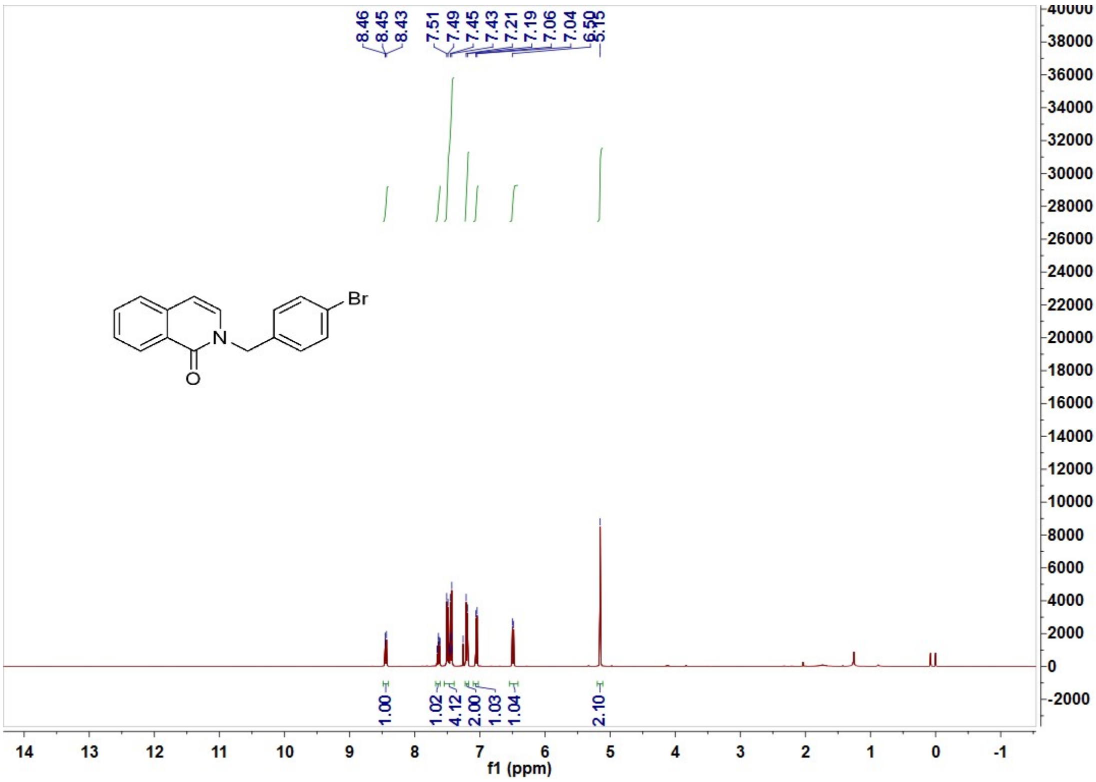


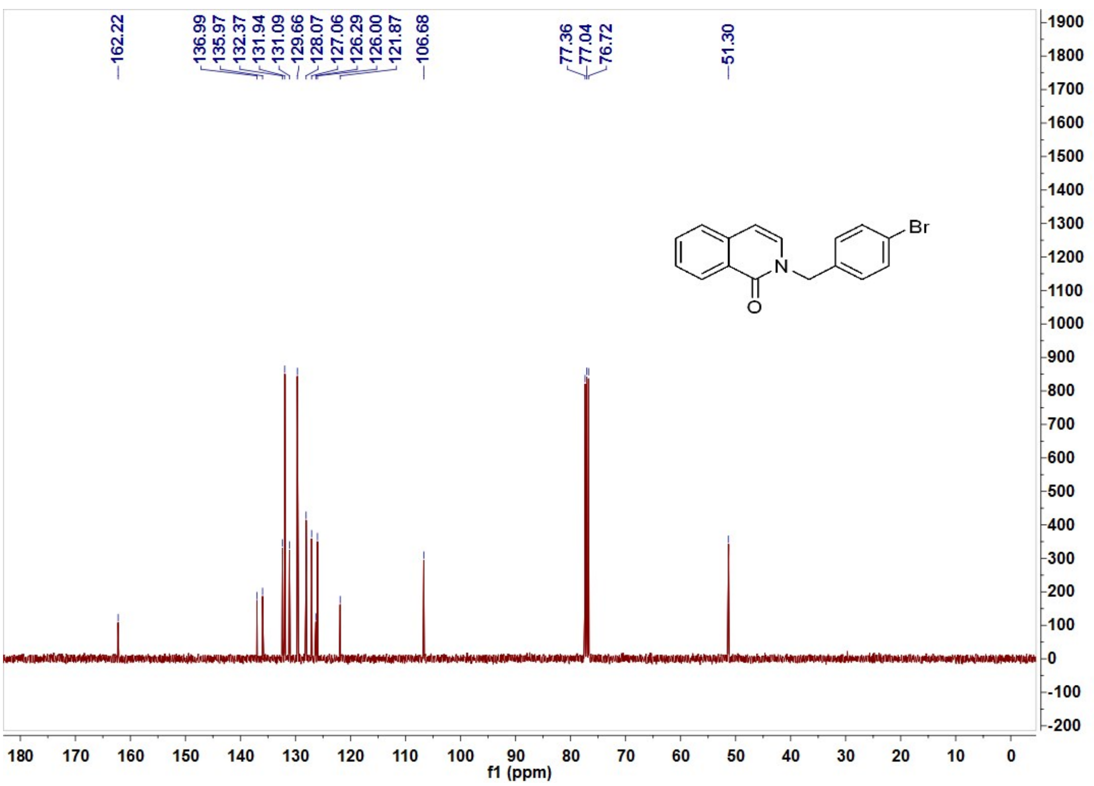
The ^{1}H NMR and ^{13}C NMR spectra of 3i



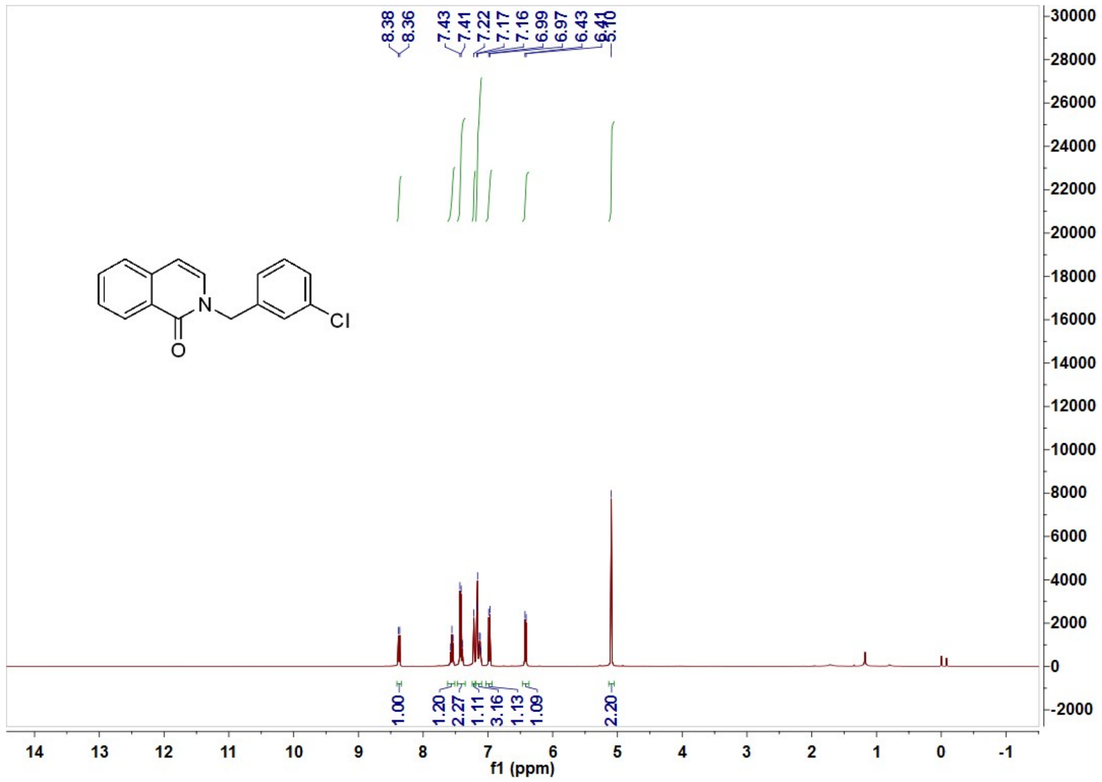


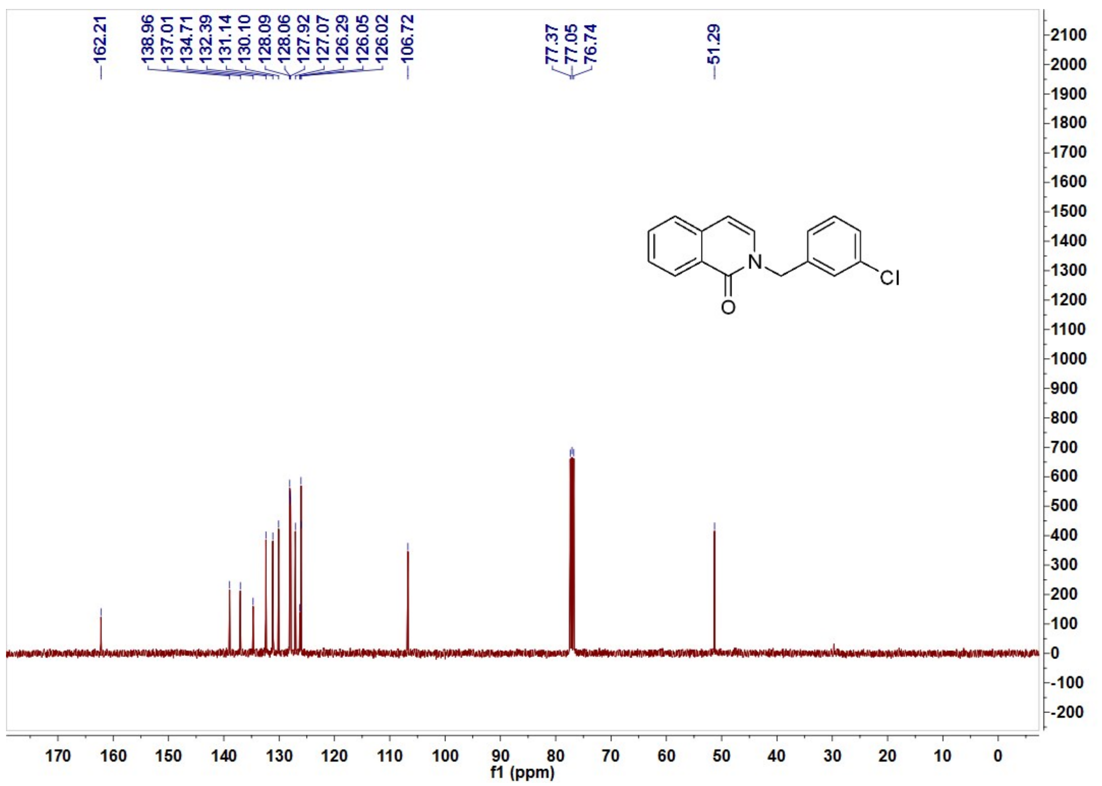
The ^{1}H NMR and ^{13}C NMR spectra of 3j



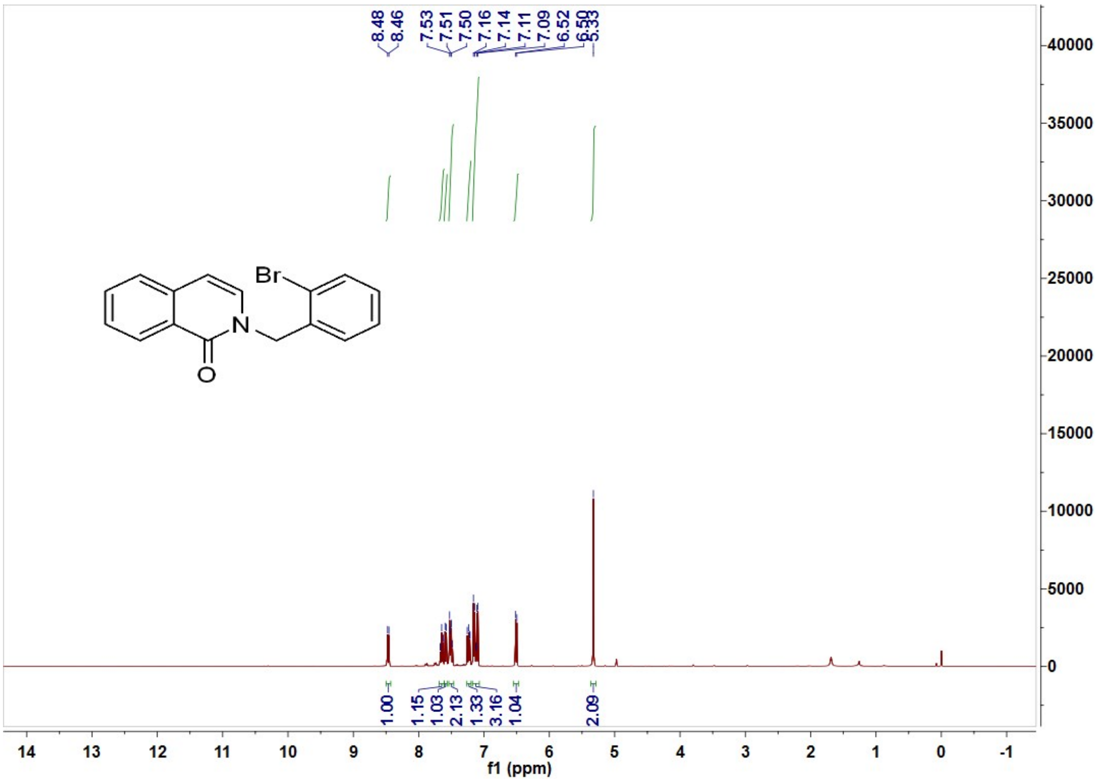


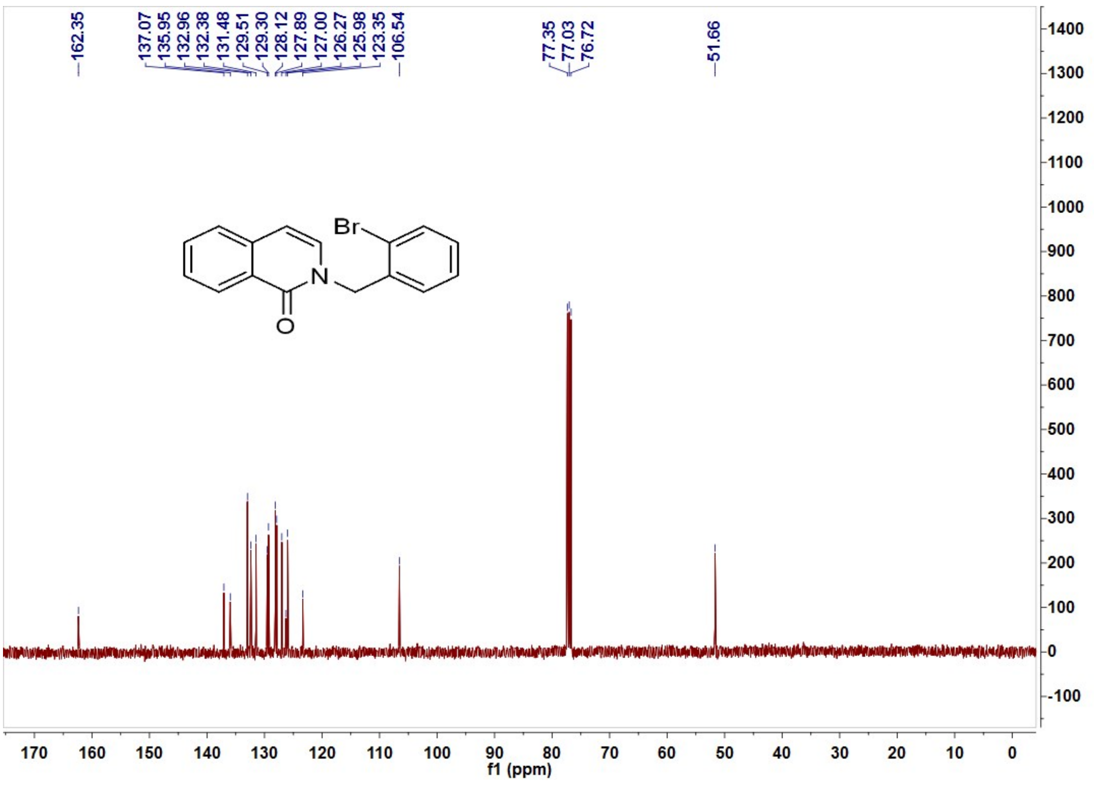
The ^{1}H NMR and ^{13}C NMR spectra of 3k



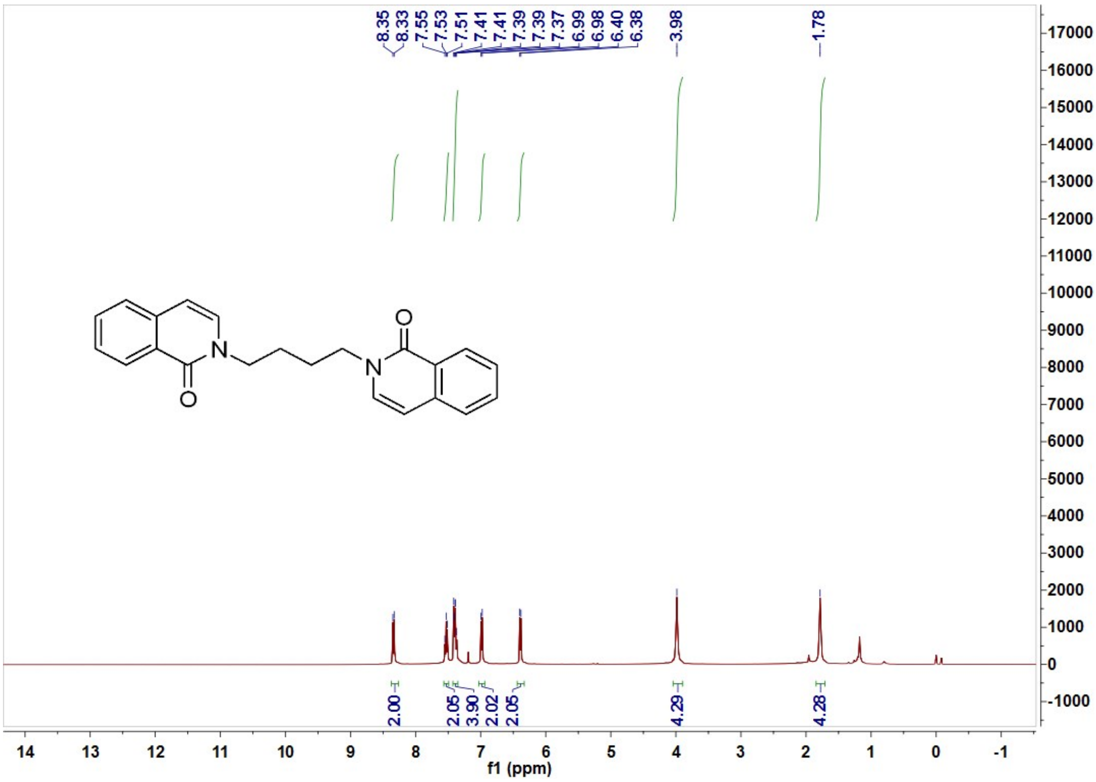


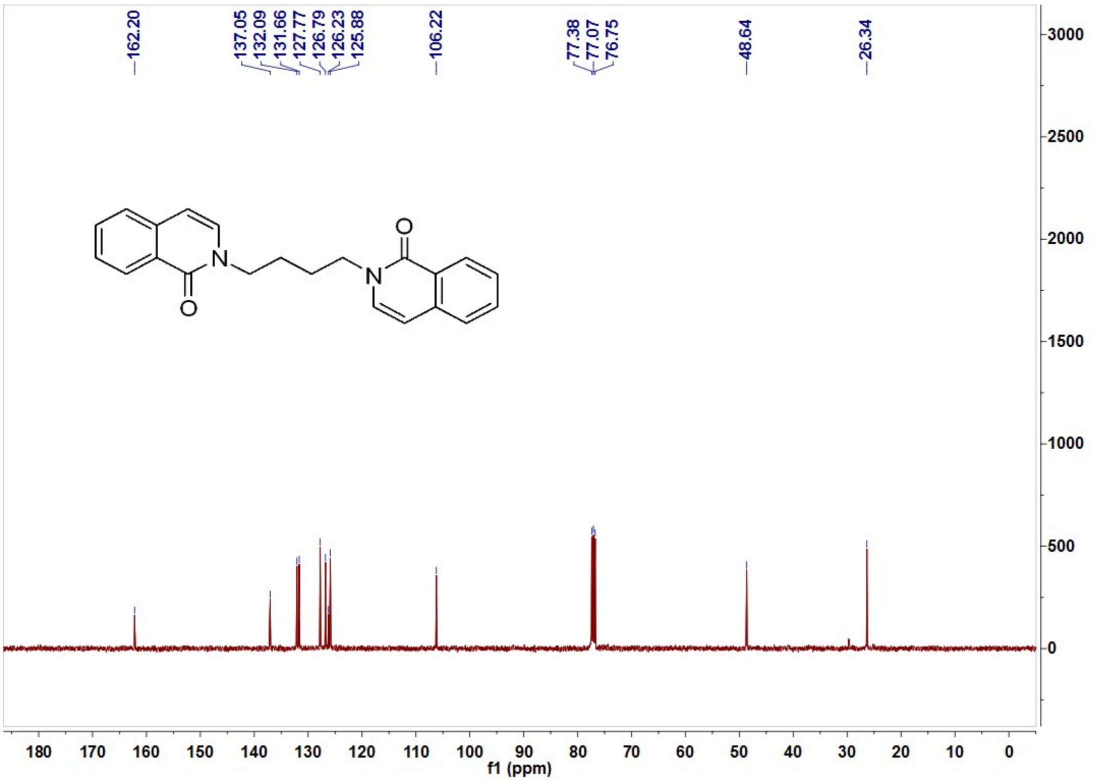
The ^{1}H NMR and ^{13}C NMR spectra of 3l



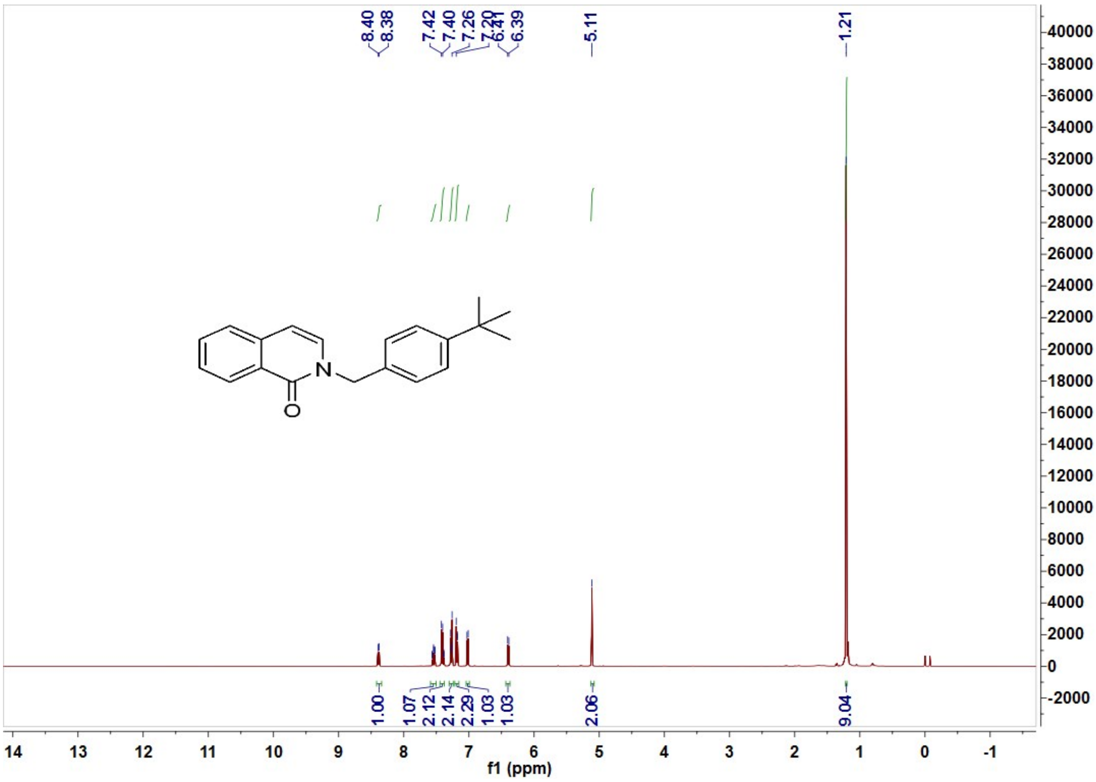


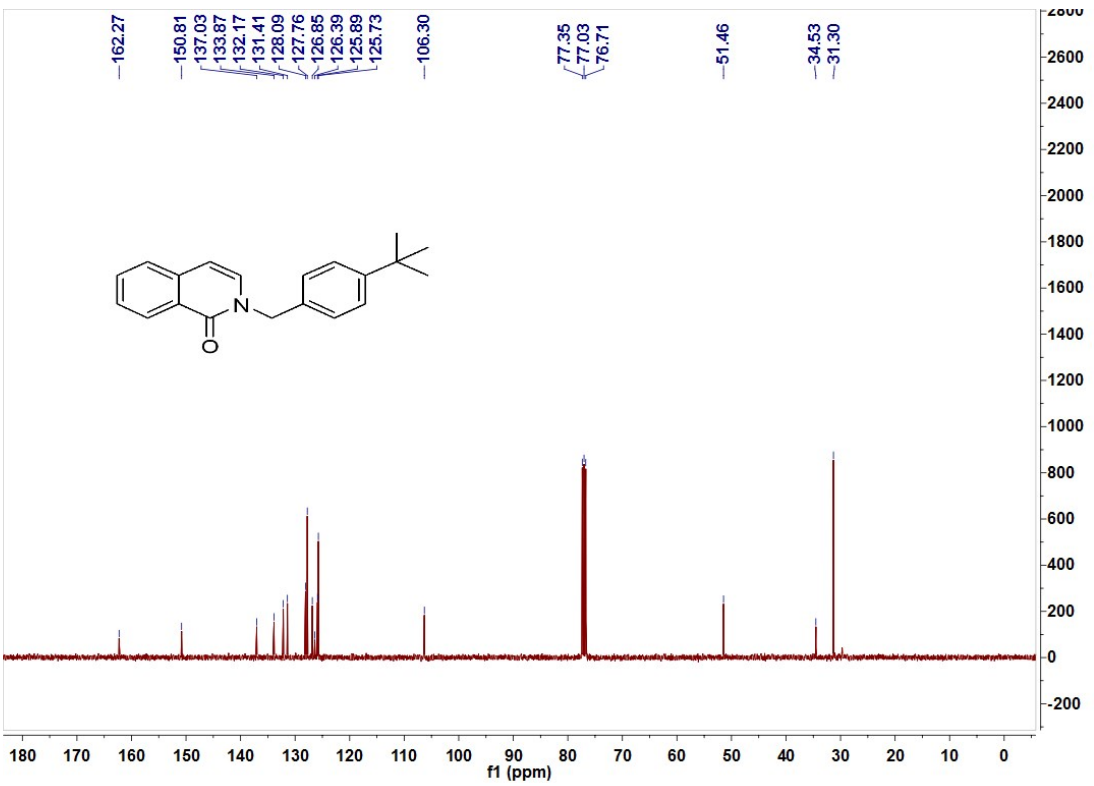
The ^{1}H NMR and ^{13}C NMR spectra of 3m



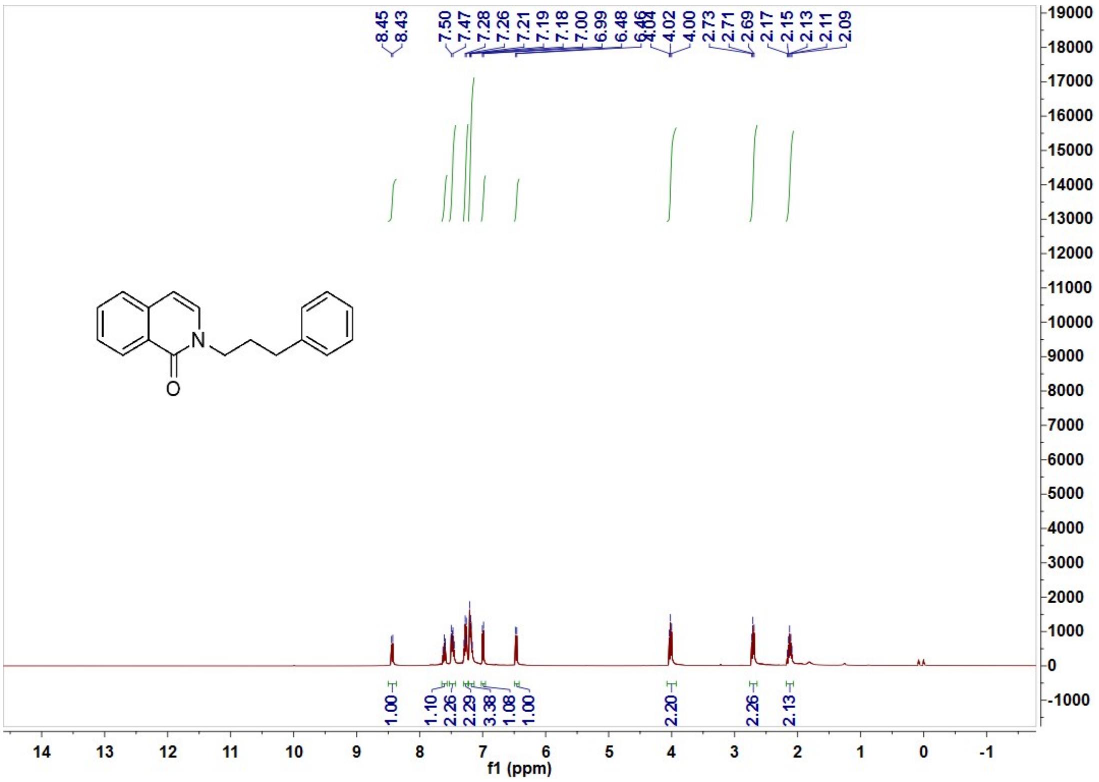


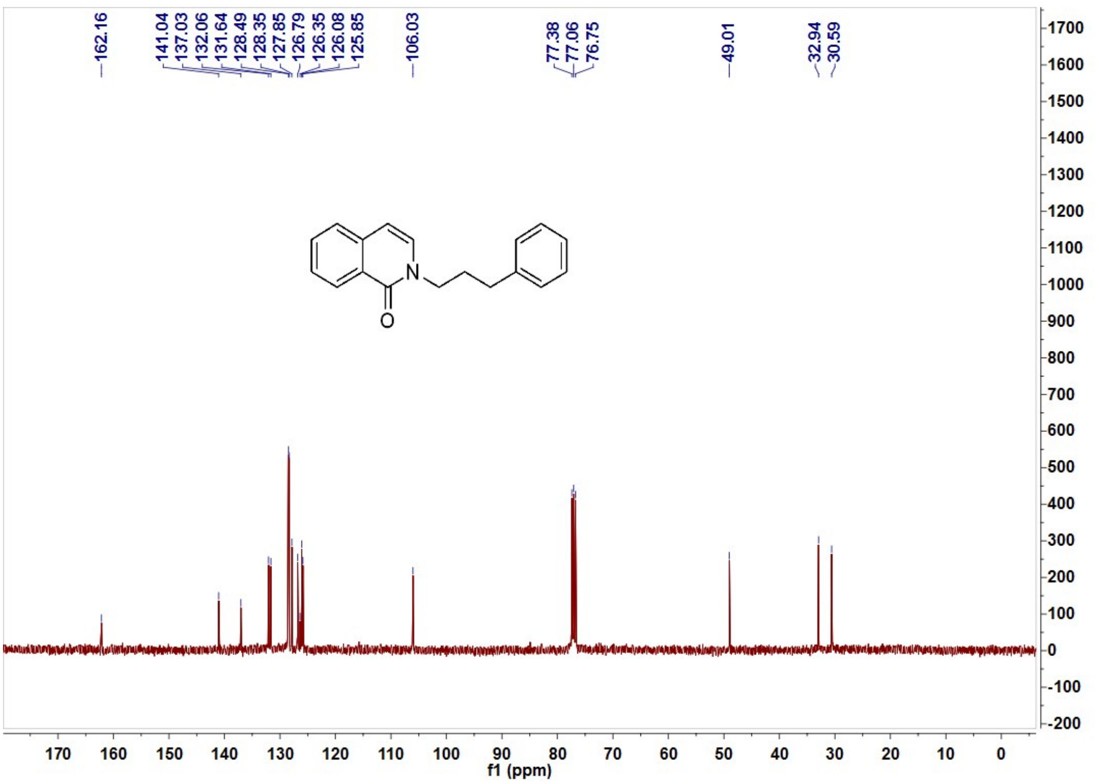
The [1]H NMR and [13]C NMR spectra of 3n



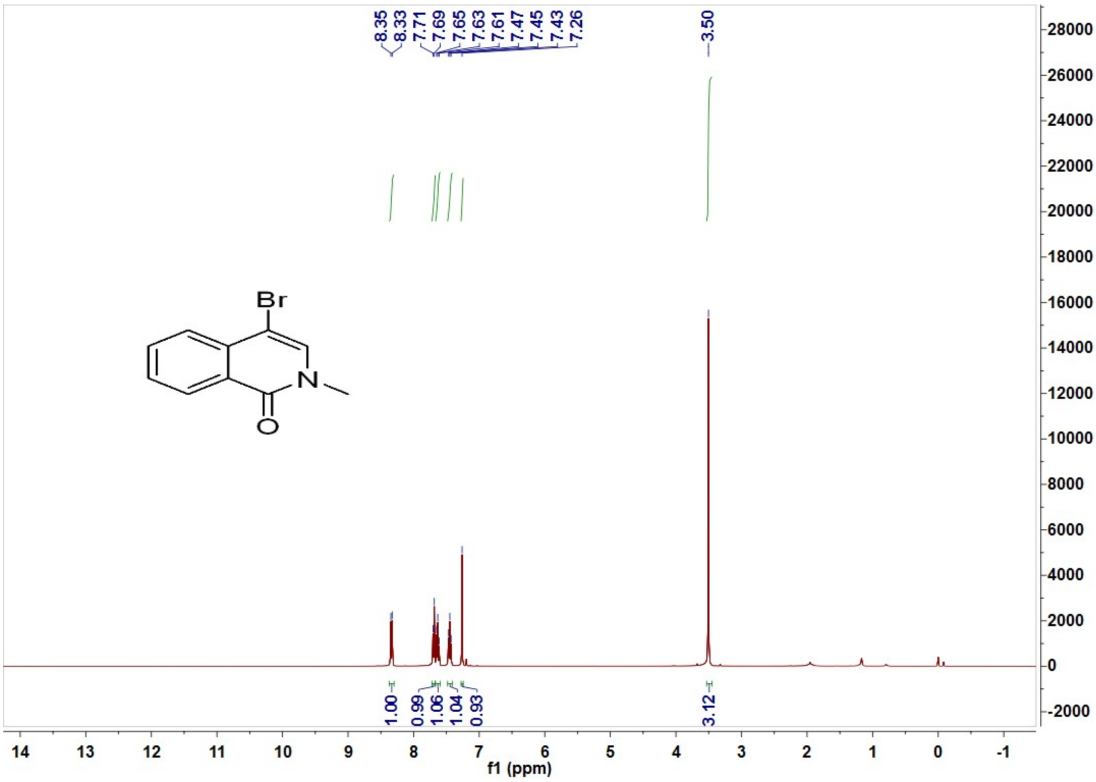


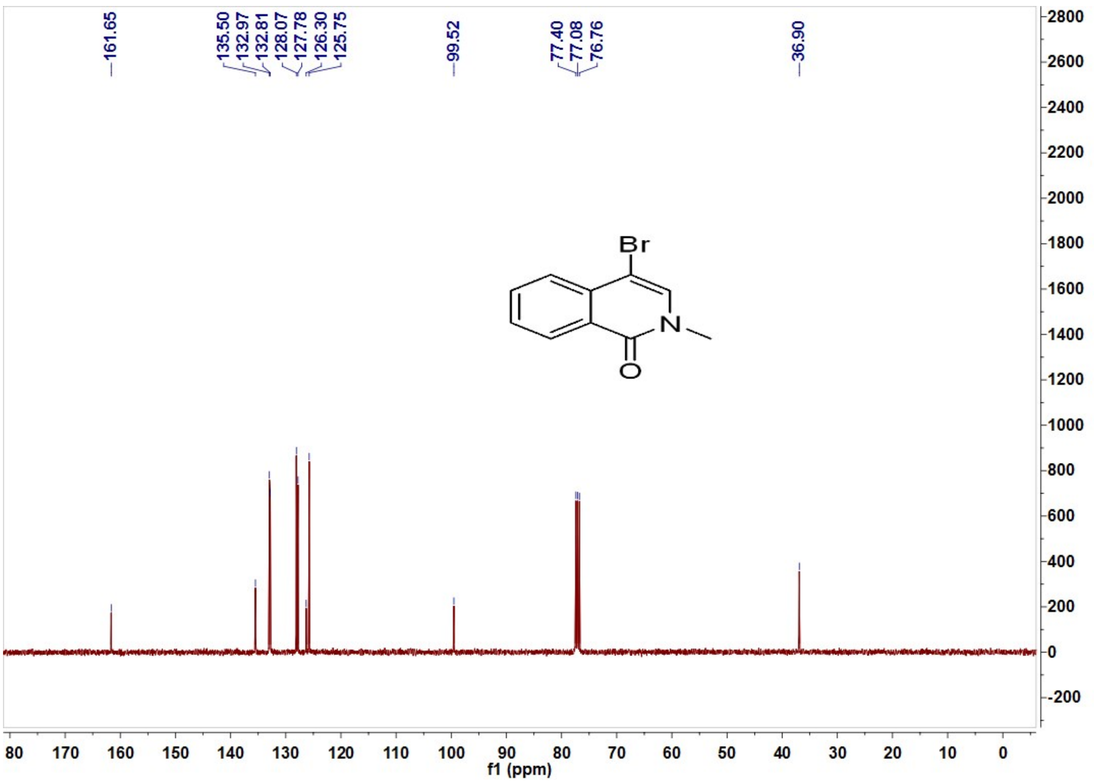
The ^{1}H NMR and ^{13}C NMR spectra of 3o



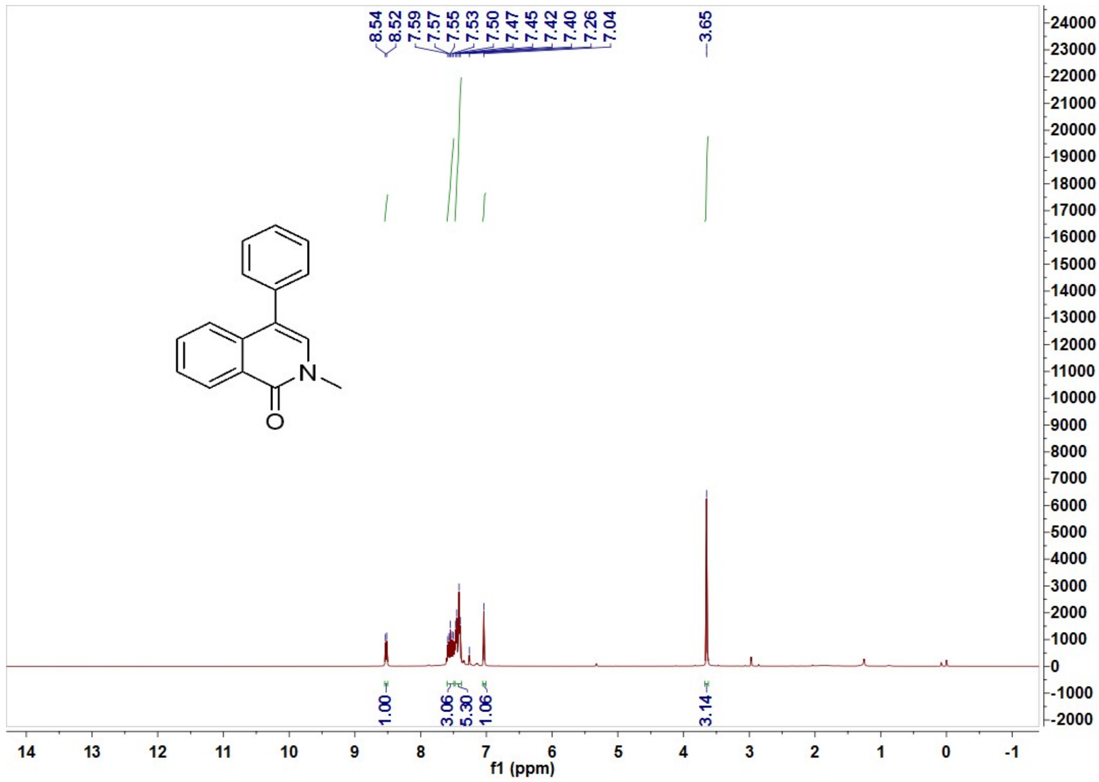


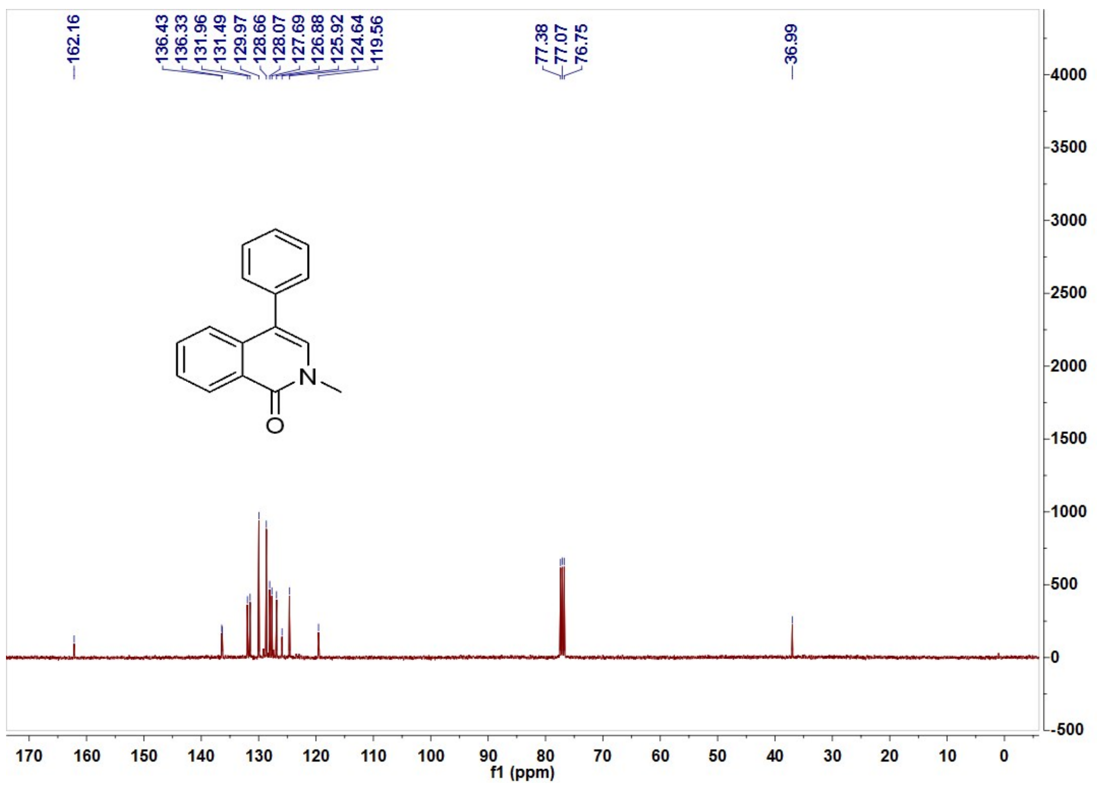
The ^{1}H NMR and ^{13}C NMR spectra of 3p



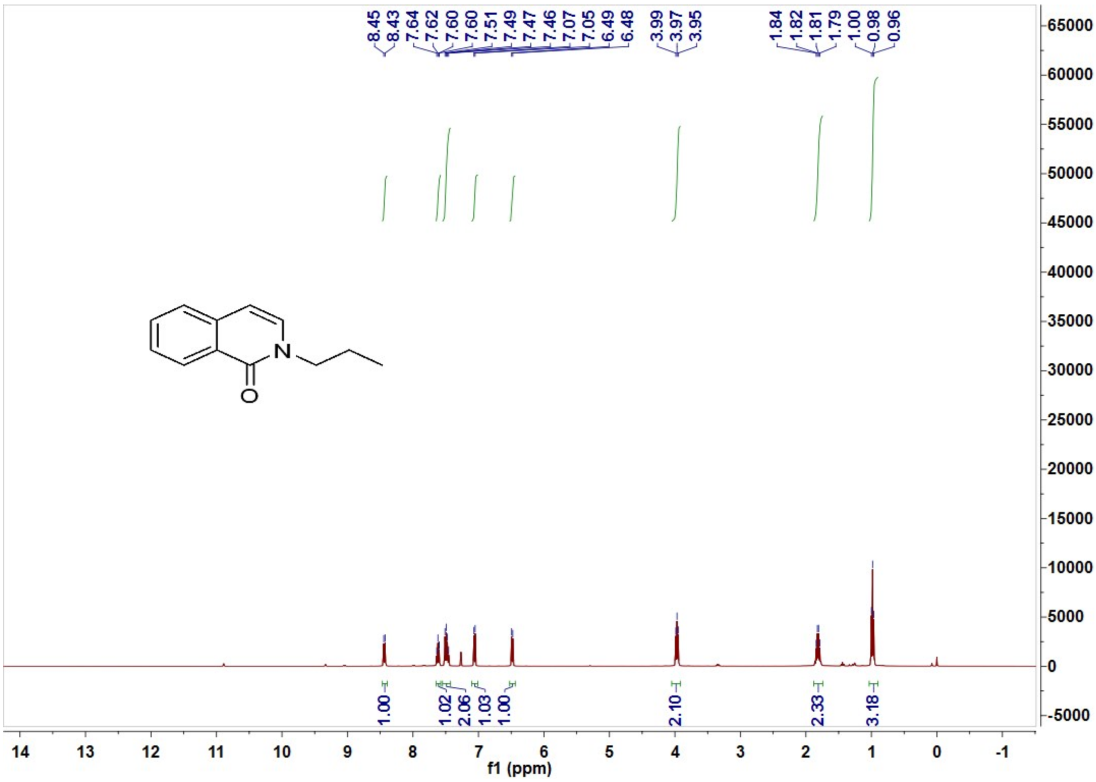


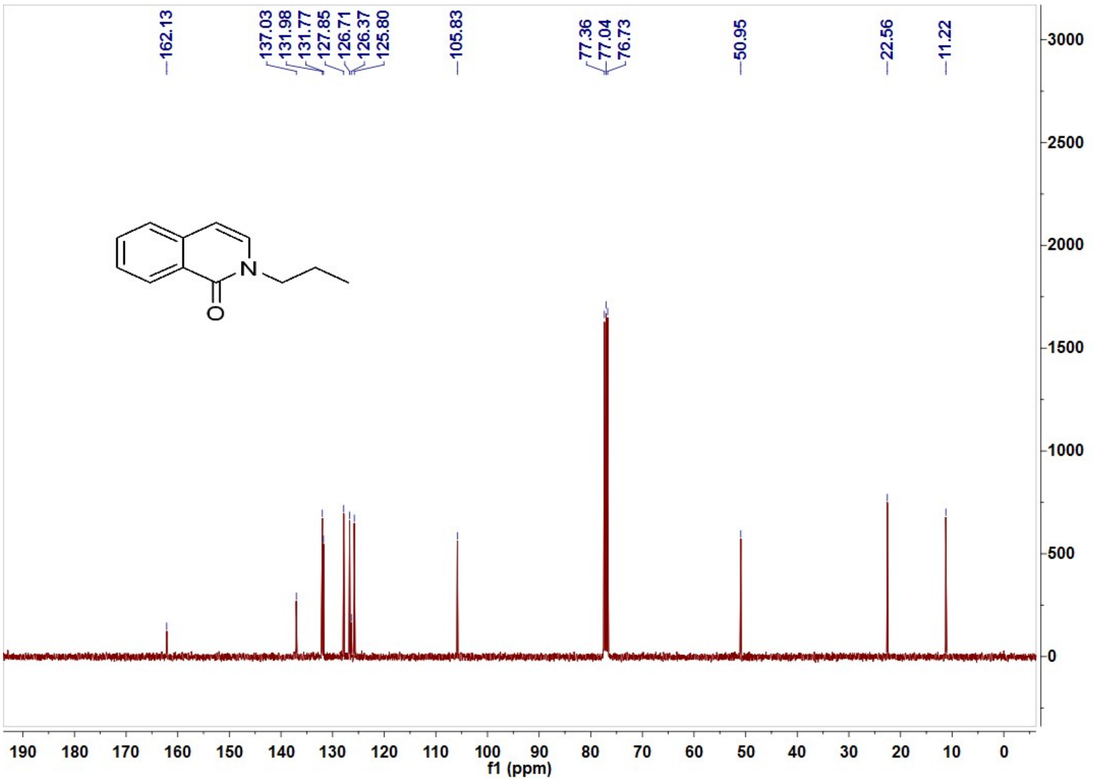
The ^{1}H NMR and ^{13}C NMR spectra of 3q



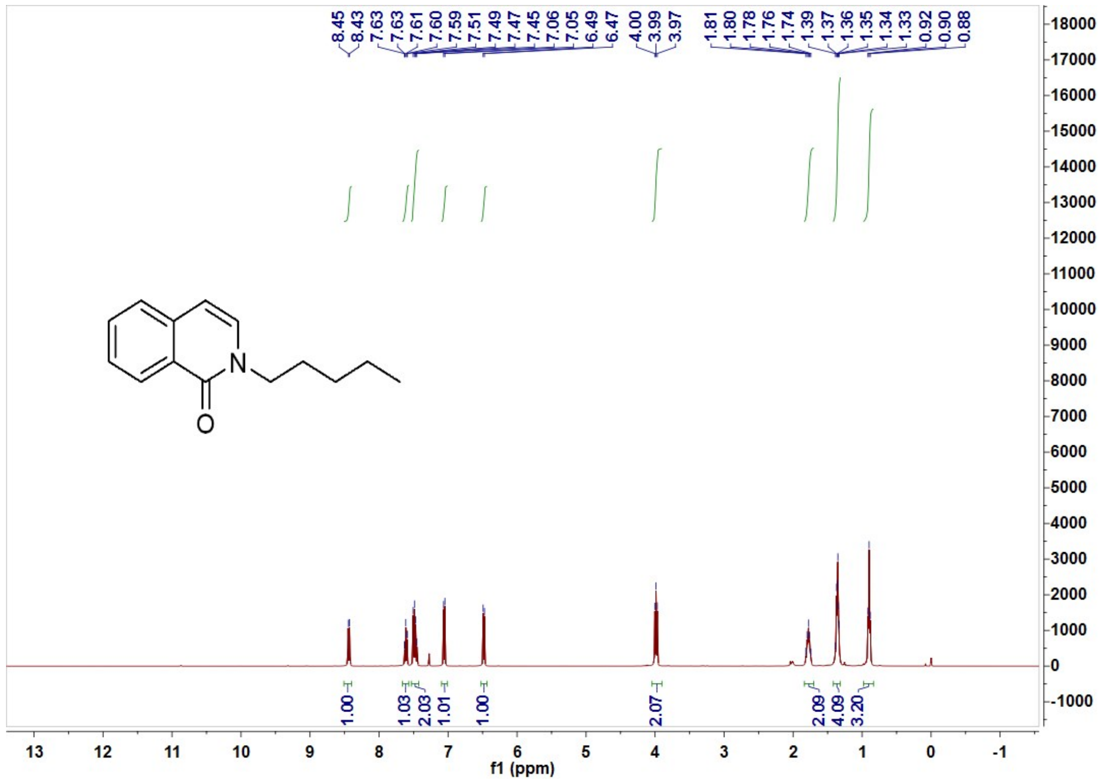


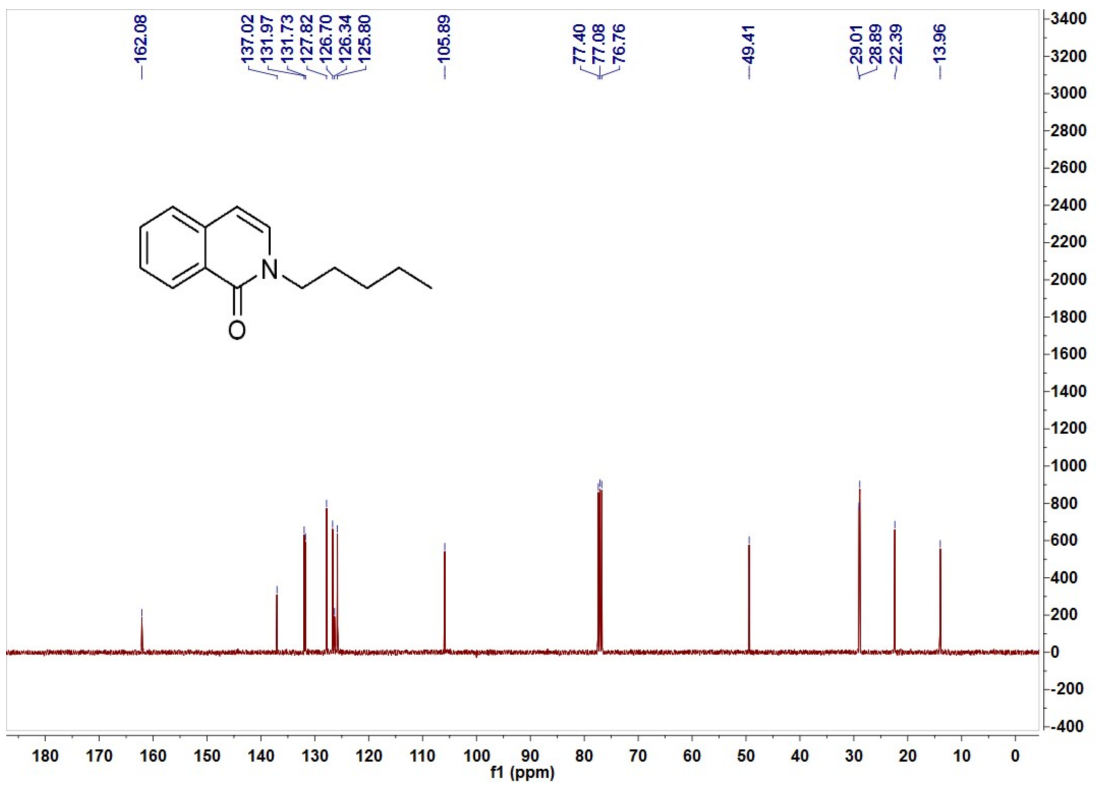
The ^{1}H NMR and ^{13}C NMR spectra of 3r



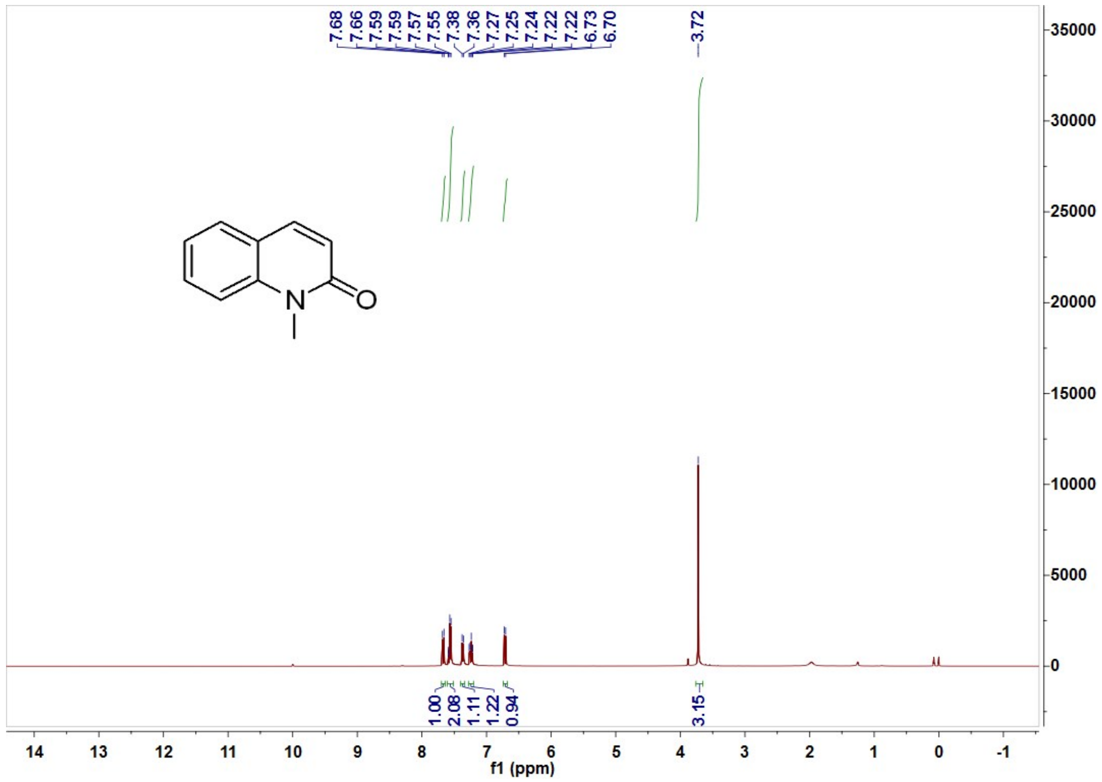


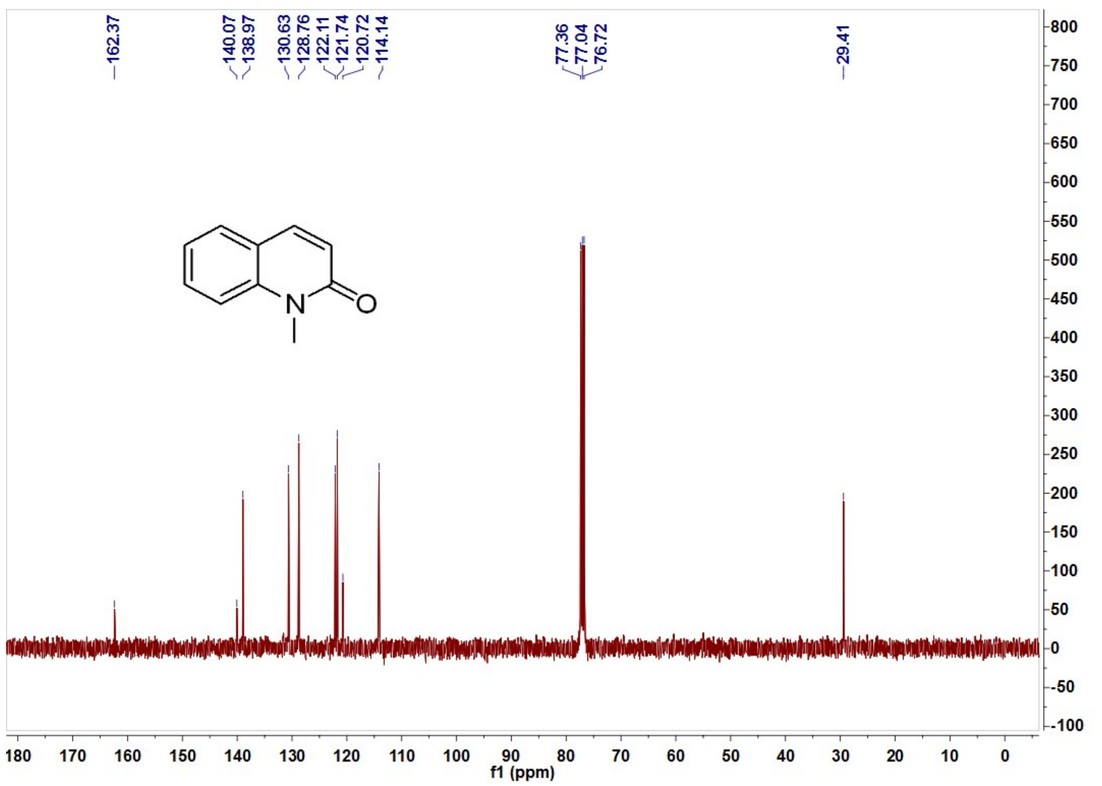
The [1]H NMR and [13]C NMR spectra of 3s



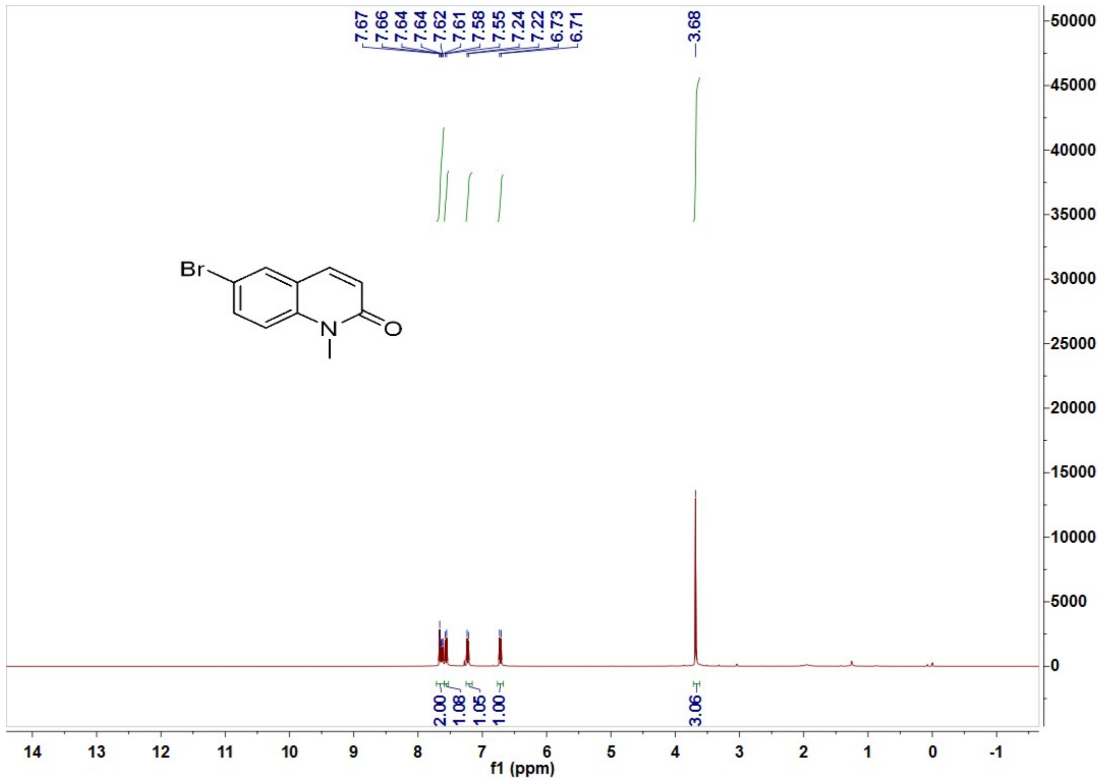


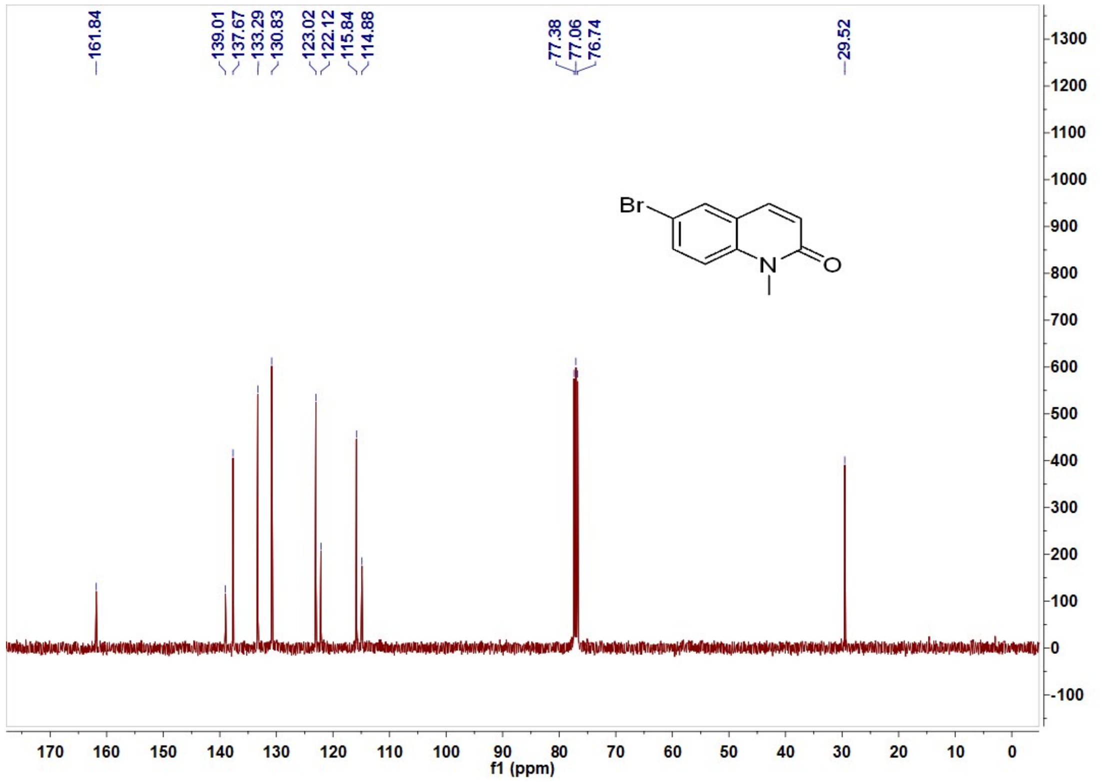
The ^{1}H NMR and ^{13}C NMR spectra of 4a



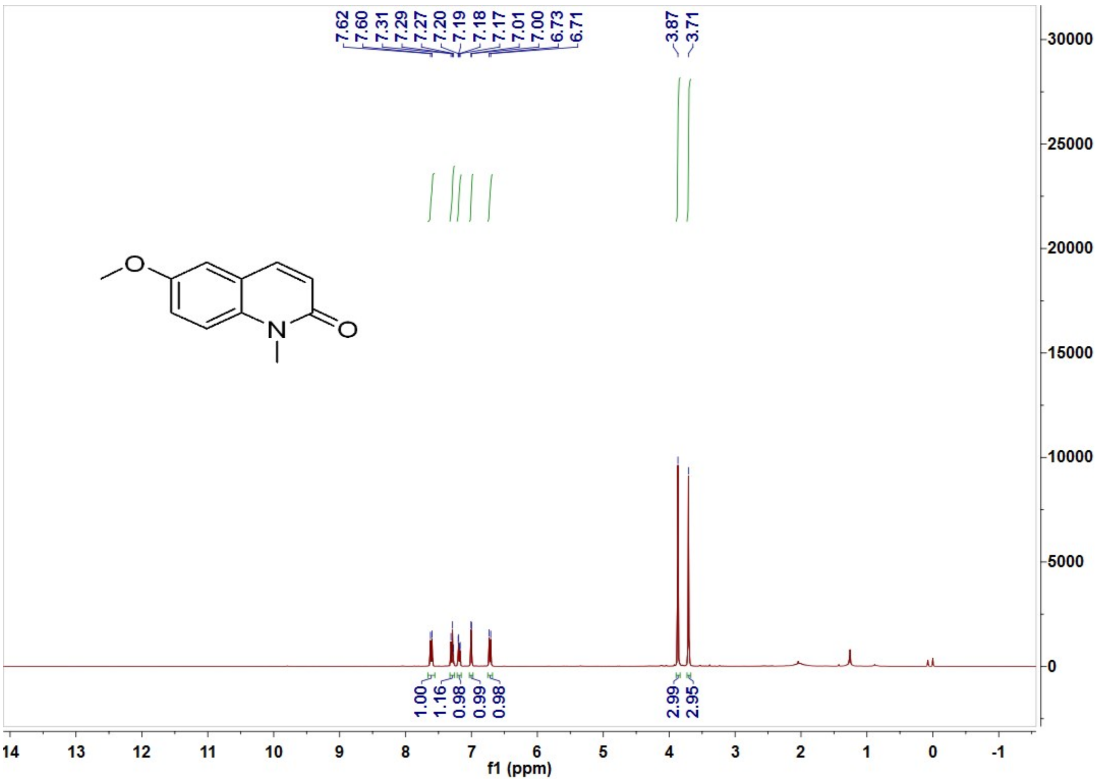


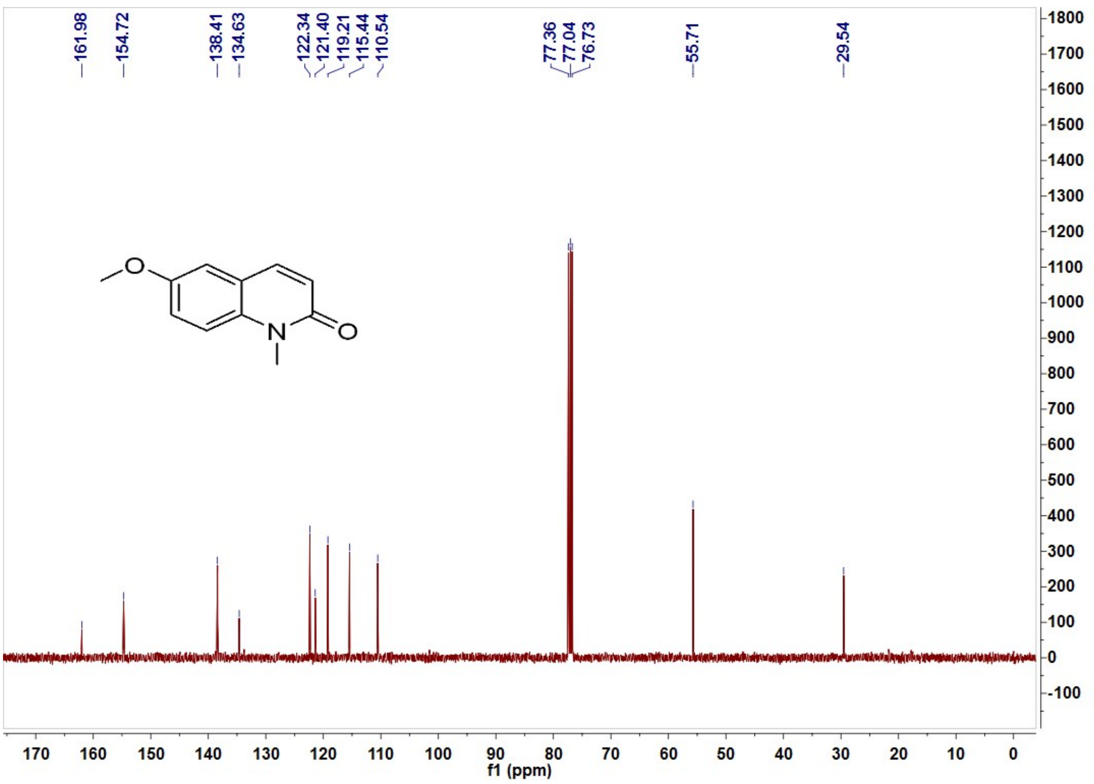
The ^{1}H NMR and ^{13}C NMR spectra of 4b



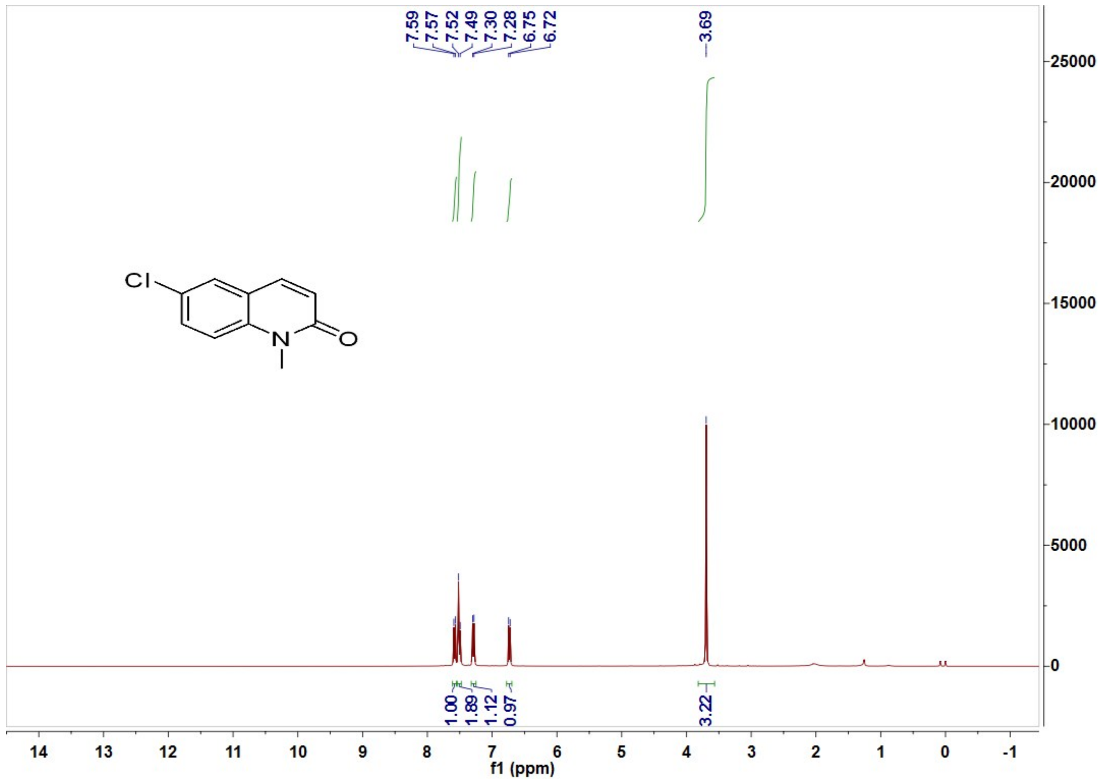


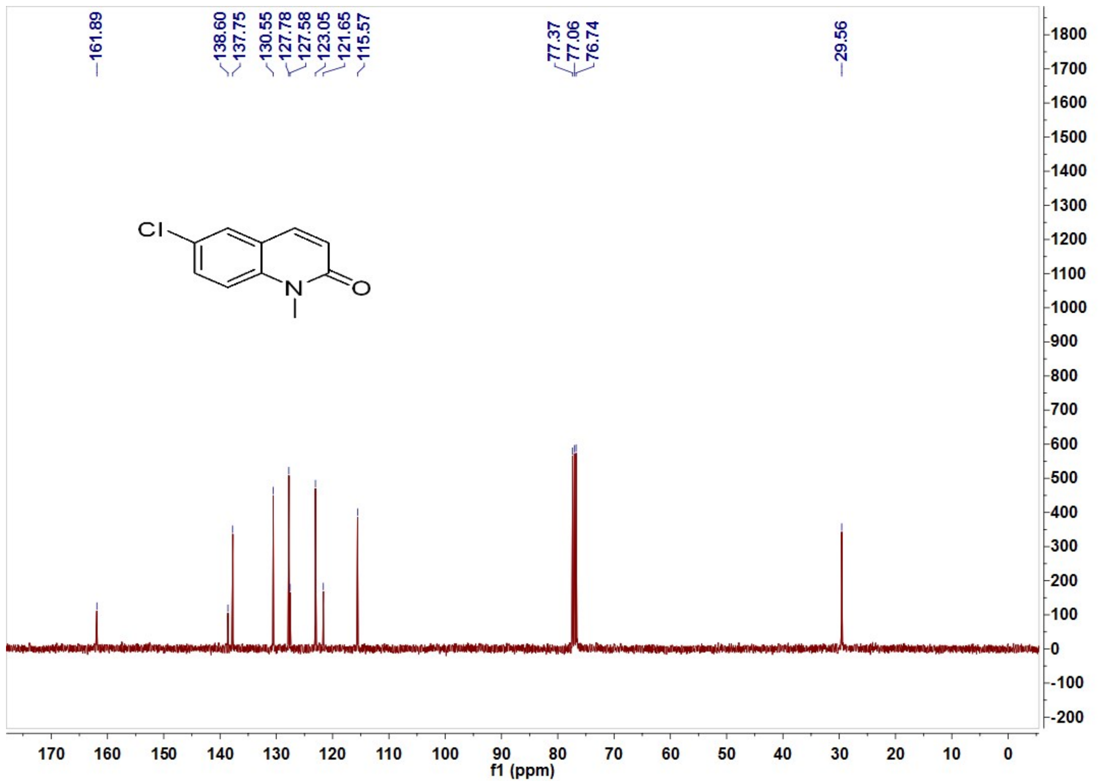
The [1]H NMR and [13]C NMR spectra of 4c



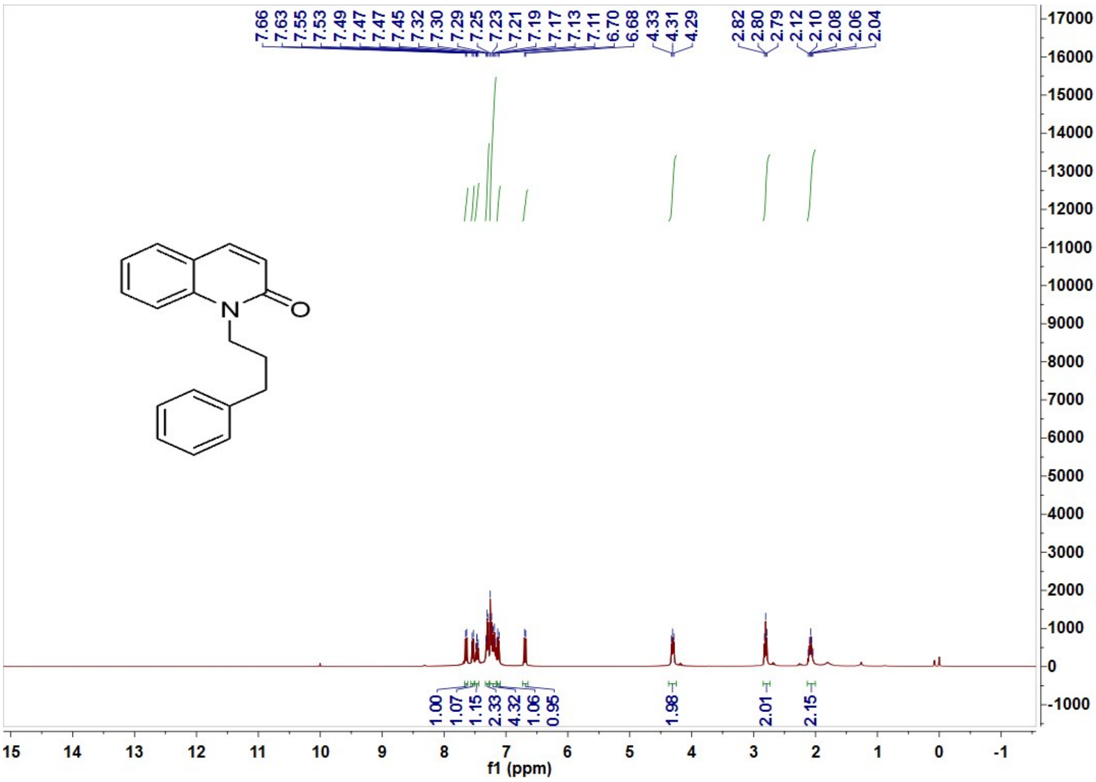


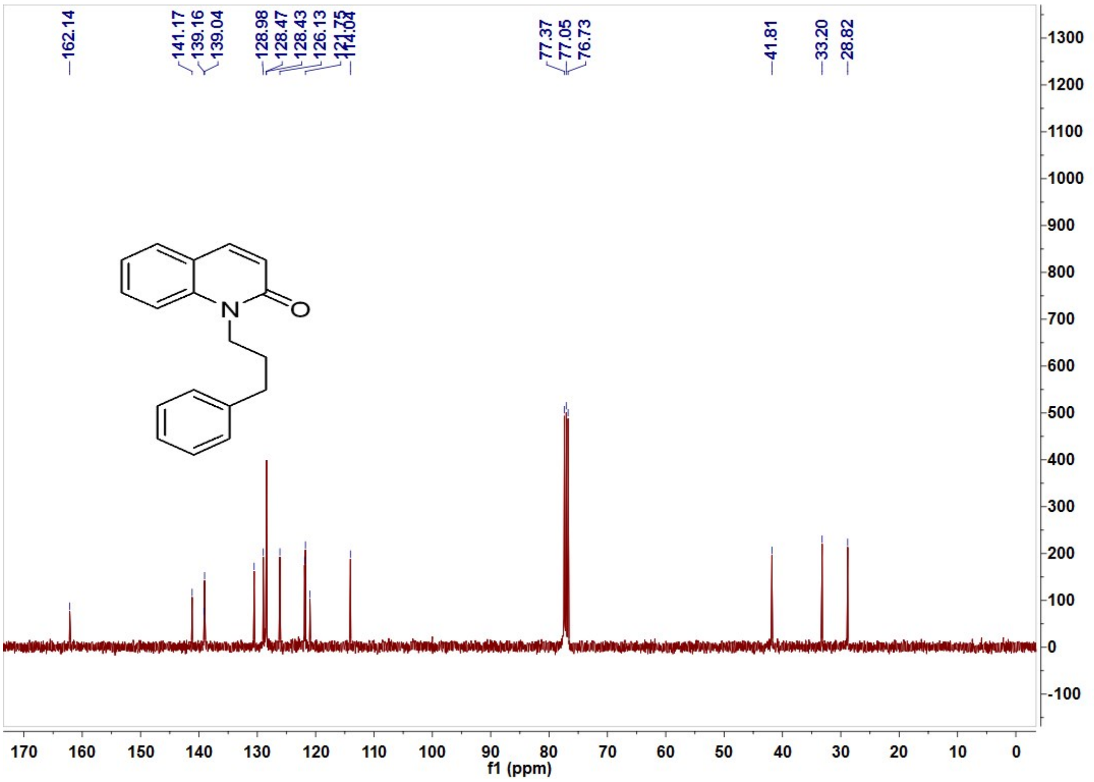
The ^{1}H NMR and ^{13}C NMR spectra of 4d



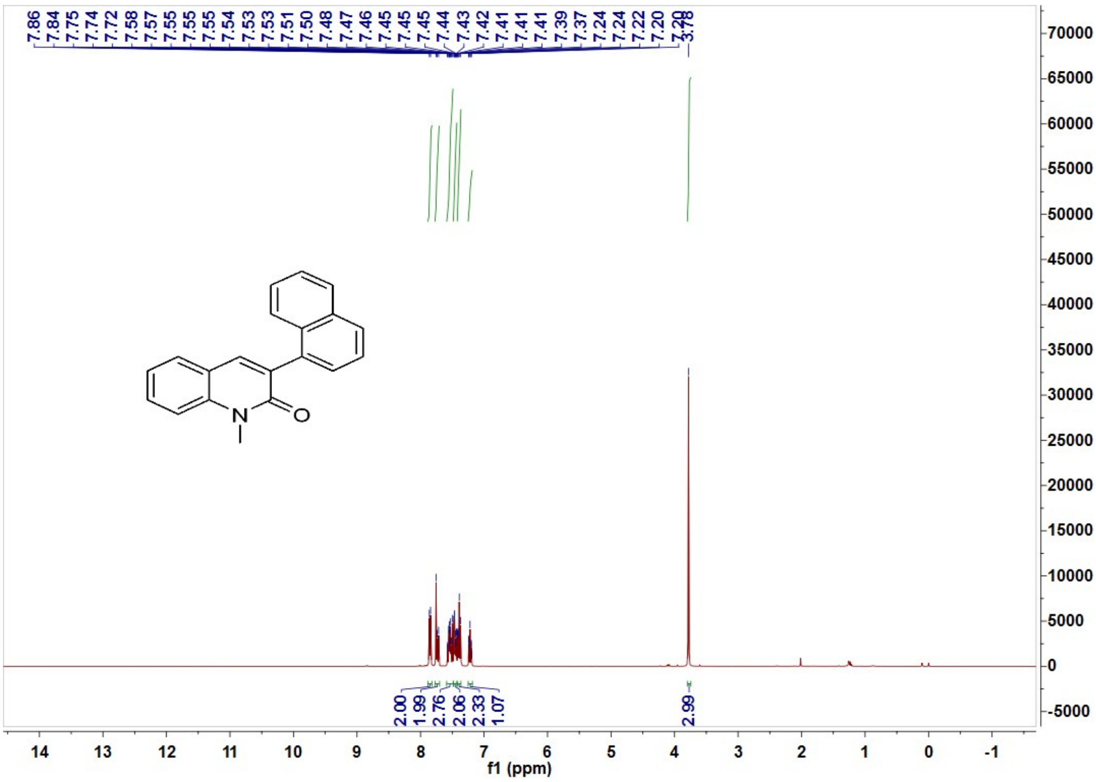


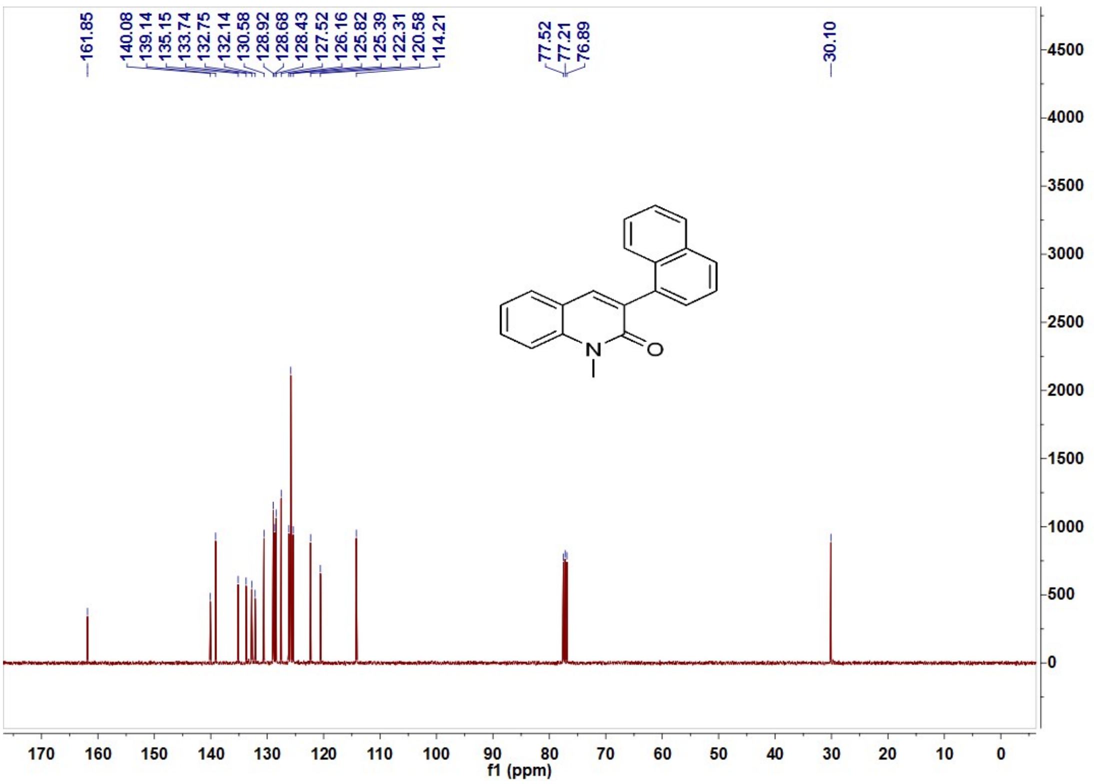
The ^{1}H NMR and ^{13}C NMR spectra of 4e


7.66
7.63
7.55
7.53
7.49
7.47
7.45
7.32
7.30
7.29
7.25
7.23
7.21
7.19
7.17
7.13
7.11
6.70
6.68
4.33
4.31
4.29
2.82
2.80
2.79
2.12
2.10
2.08
2.06
2.04
1.00
1.07
1.15
2.33
4.32
1.06
0.95
1.98
2.01
2.15
f1 (ppm)

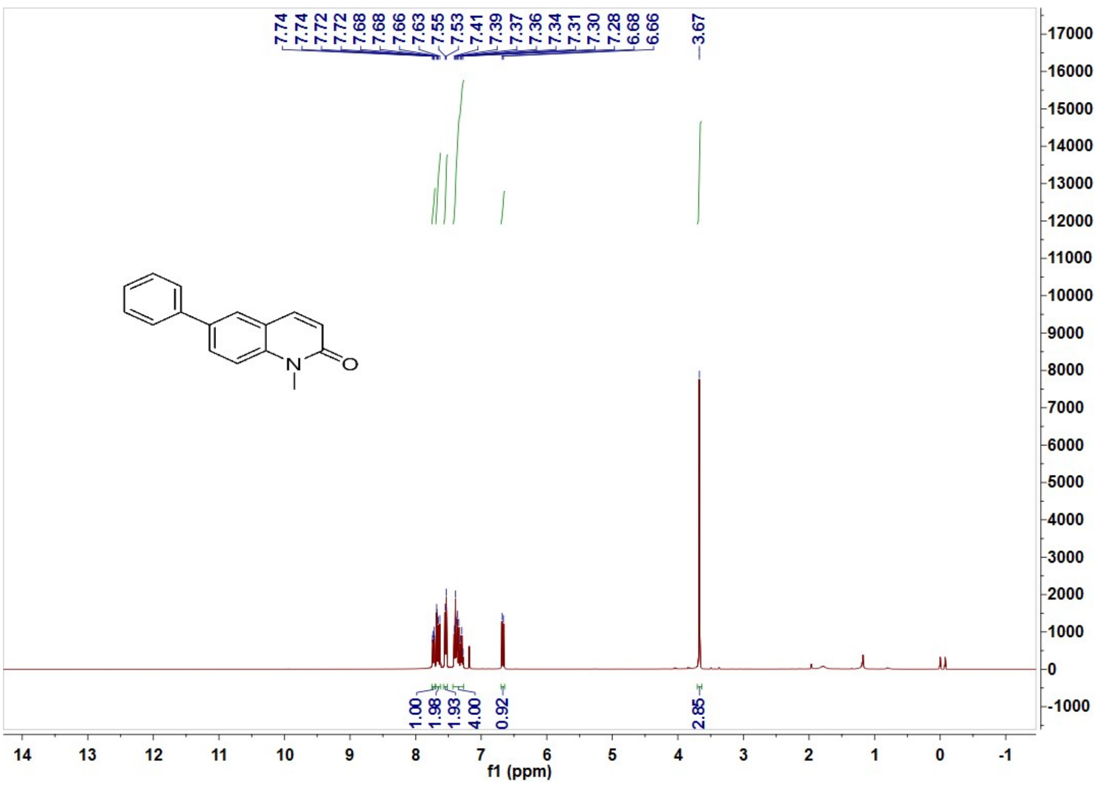

162.14
141.17
139.16
139.04
128.98
128.47
128.43
126.13
121.75
114.04
77.37
77.05
76.73
41.81
33.20
28.82
f1 (ppm)

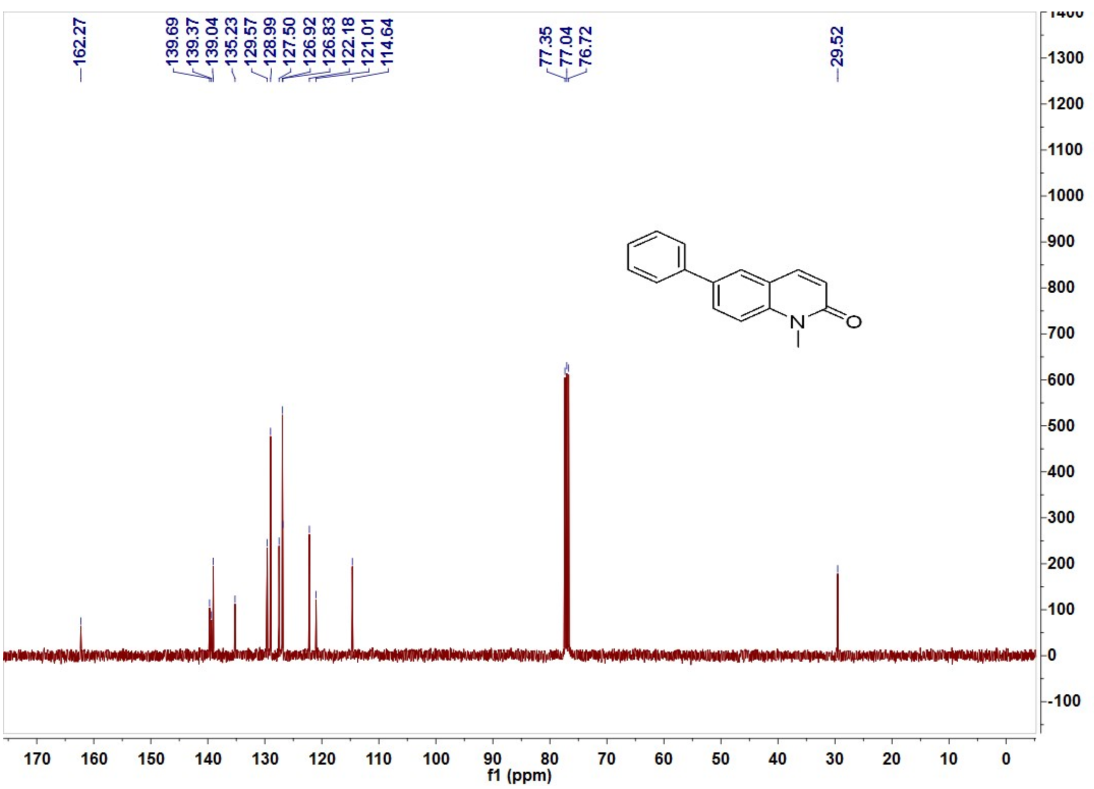
The ^{1}H NMR and ^{13}C NMR spectra of 4f



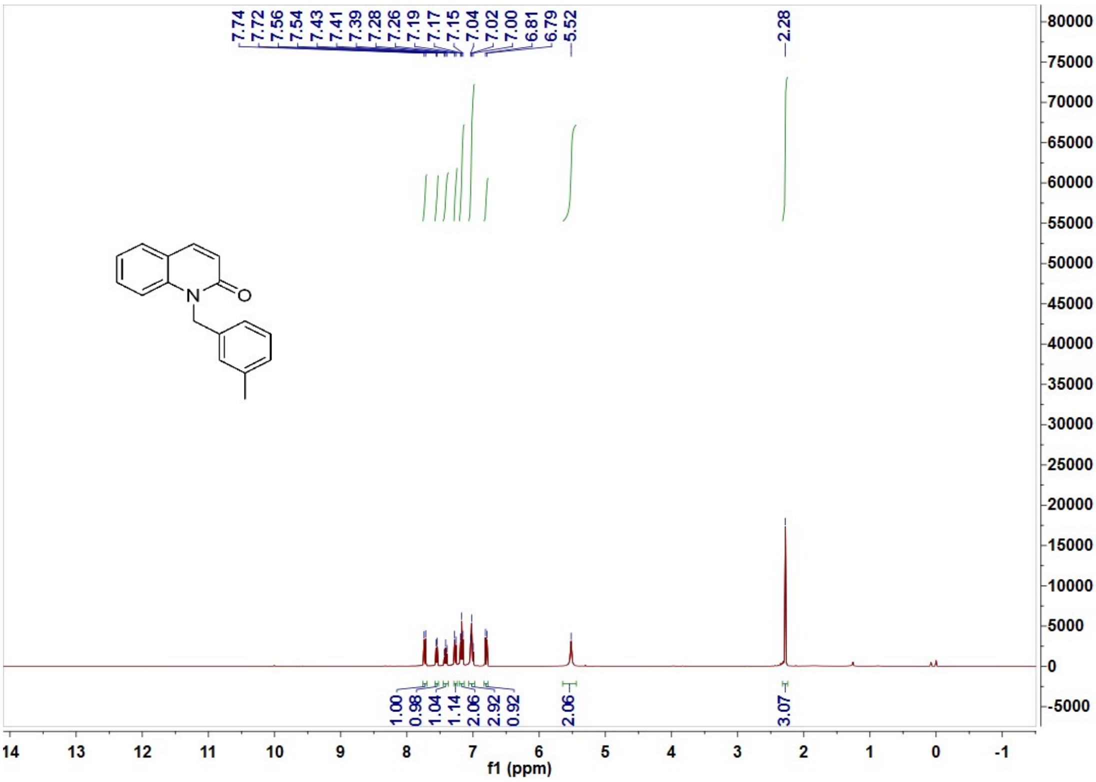


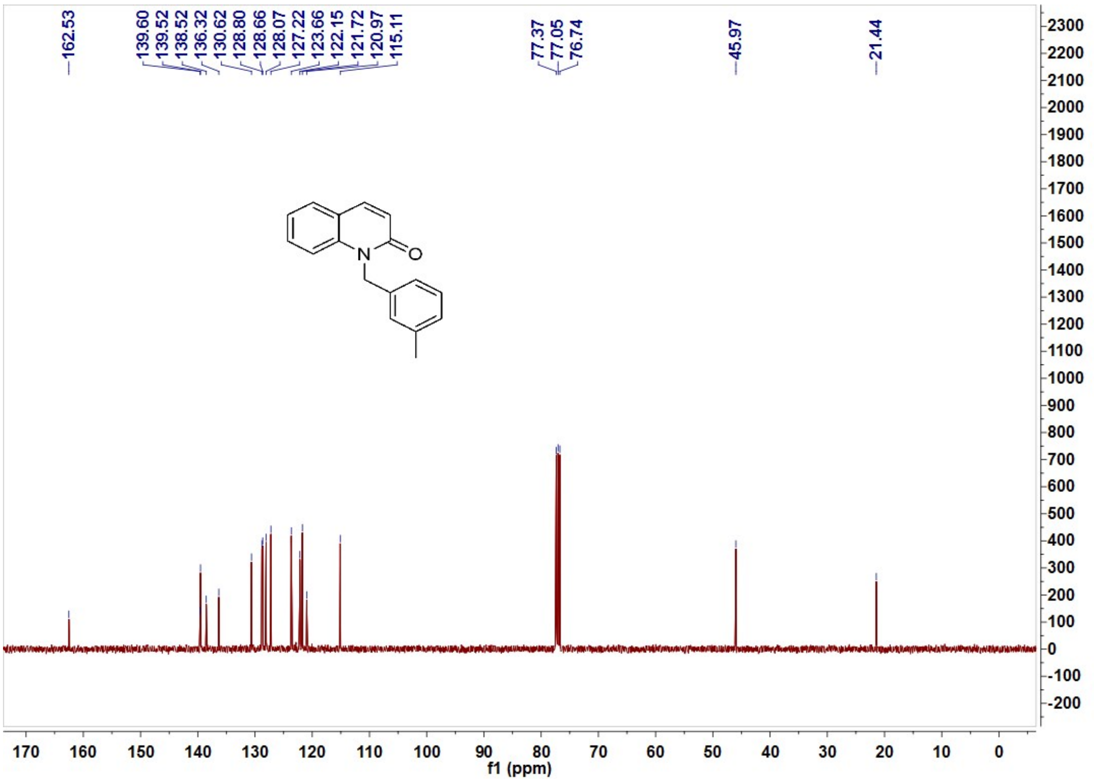
The ^{1}H NMR and ^{13}C NMR spectra of 4g



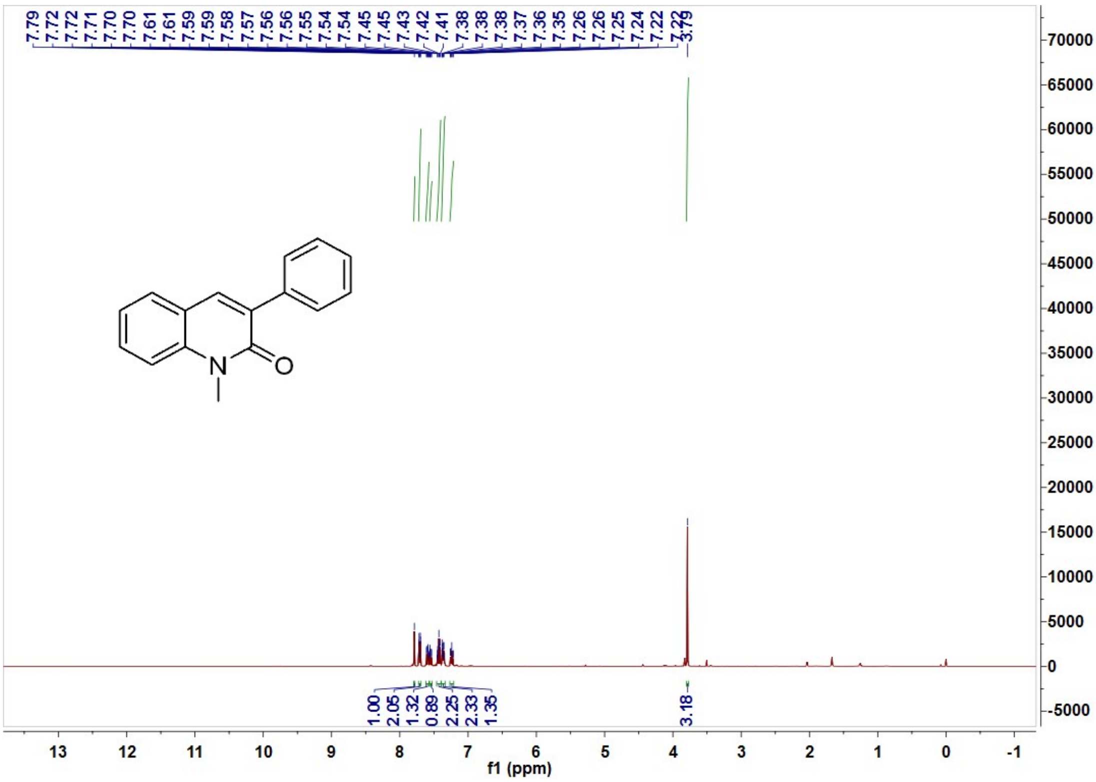


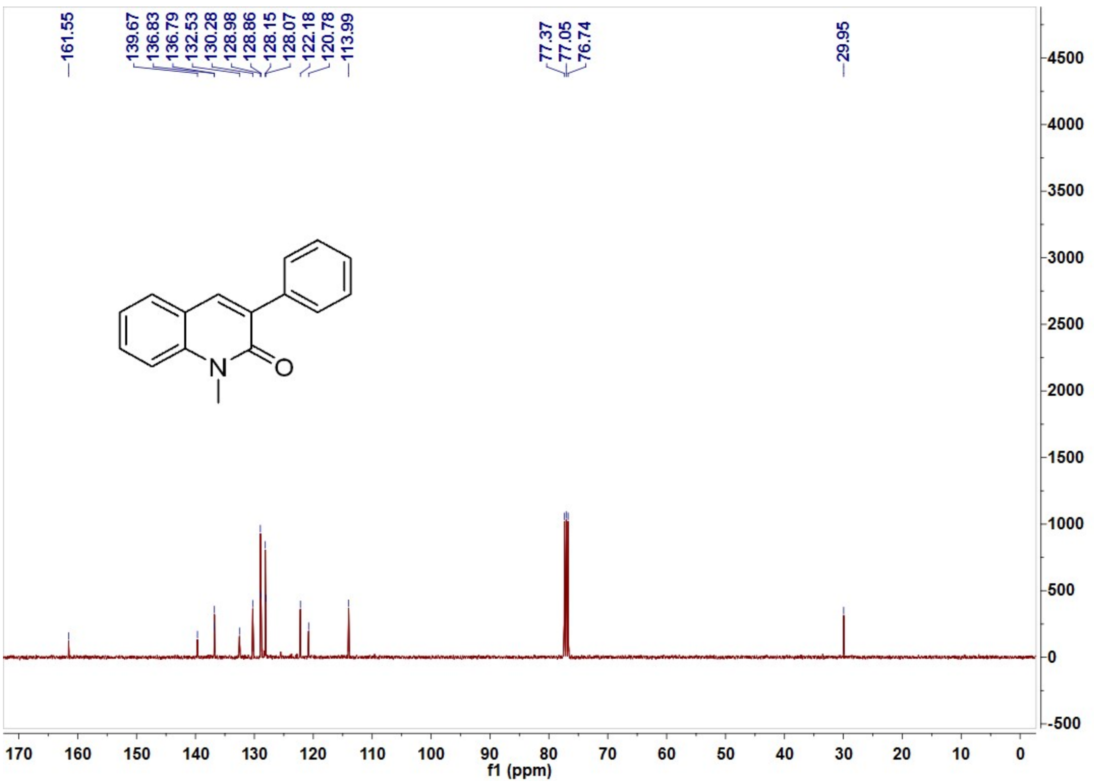
The ^{1}H NMR and ^{13}C NMR spectra of 4h



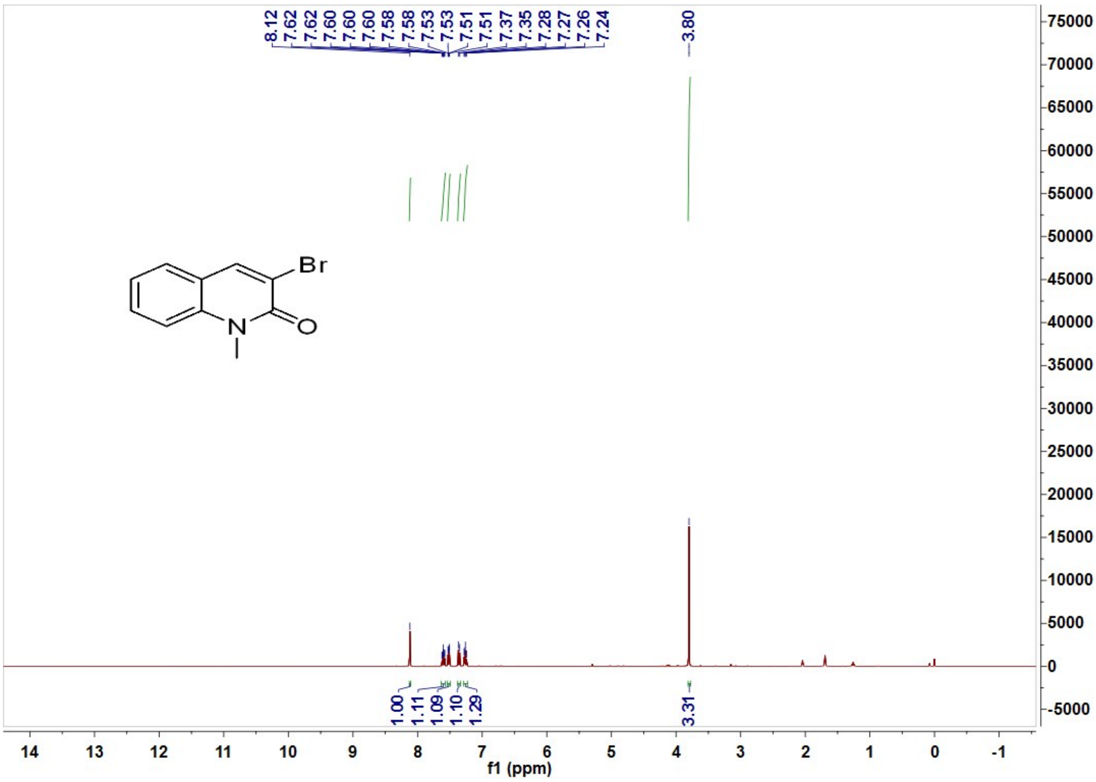


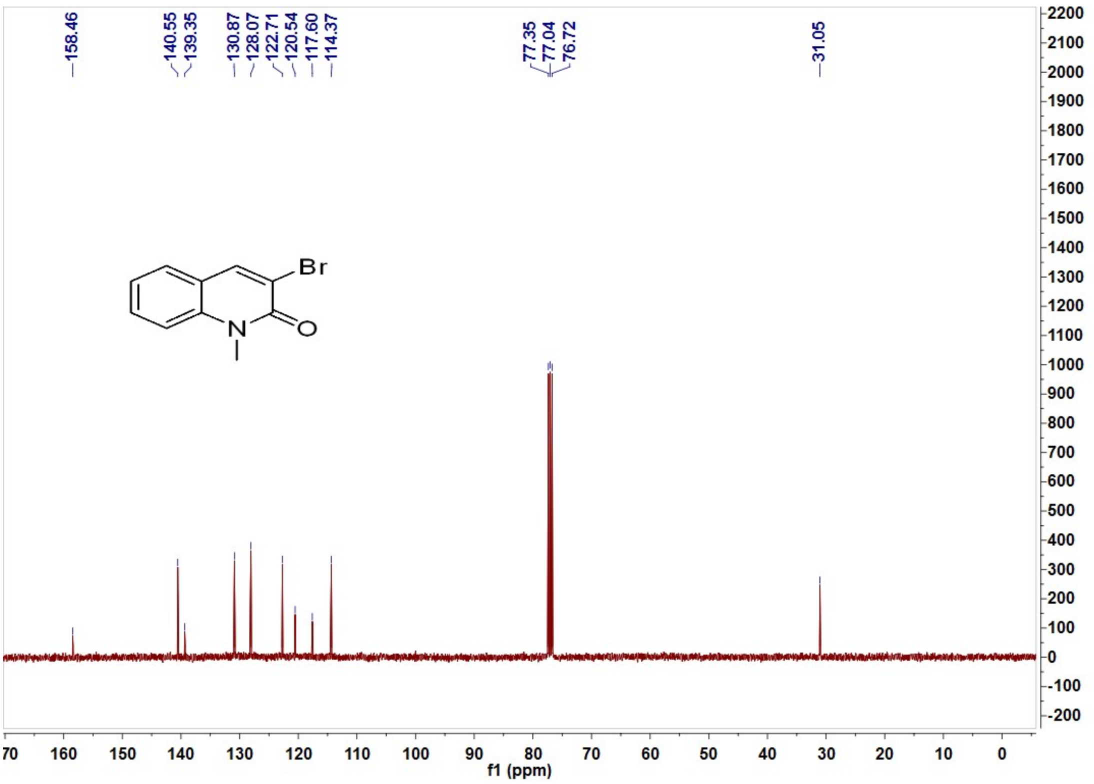
The ^{1}H NMR and ^{13}C NMR spectra of 4i



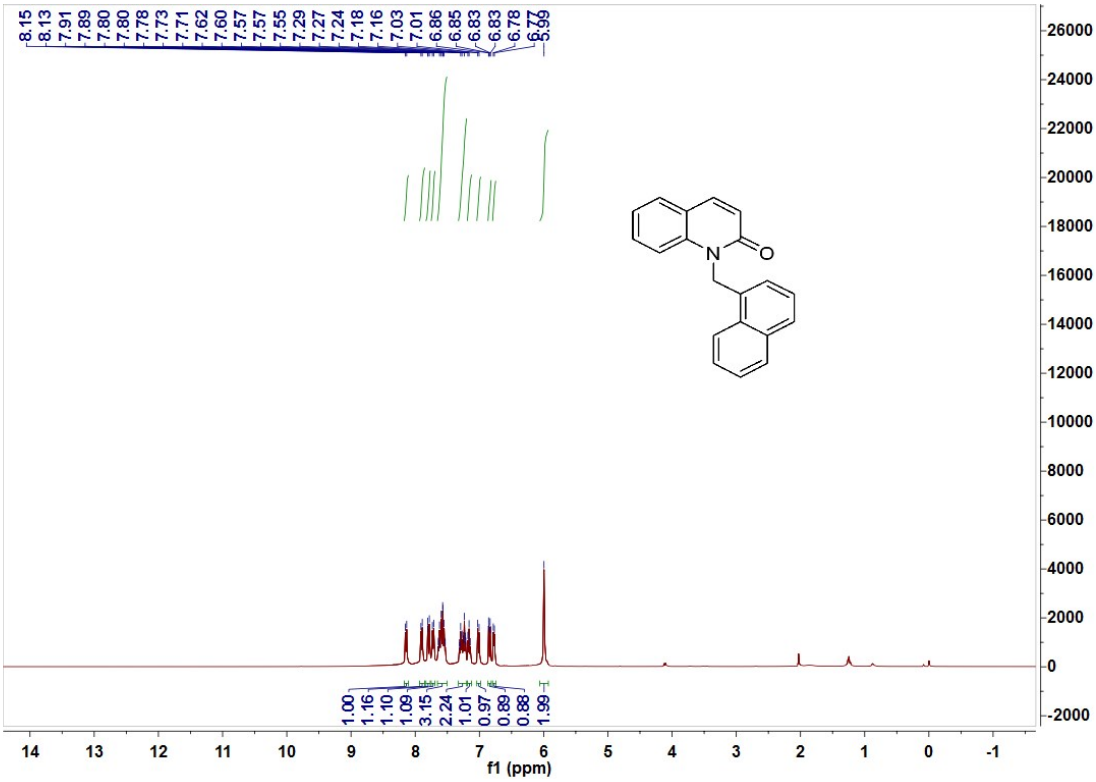


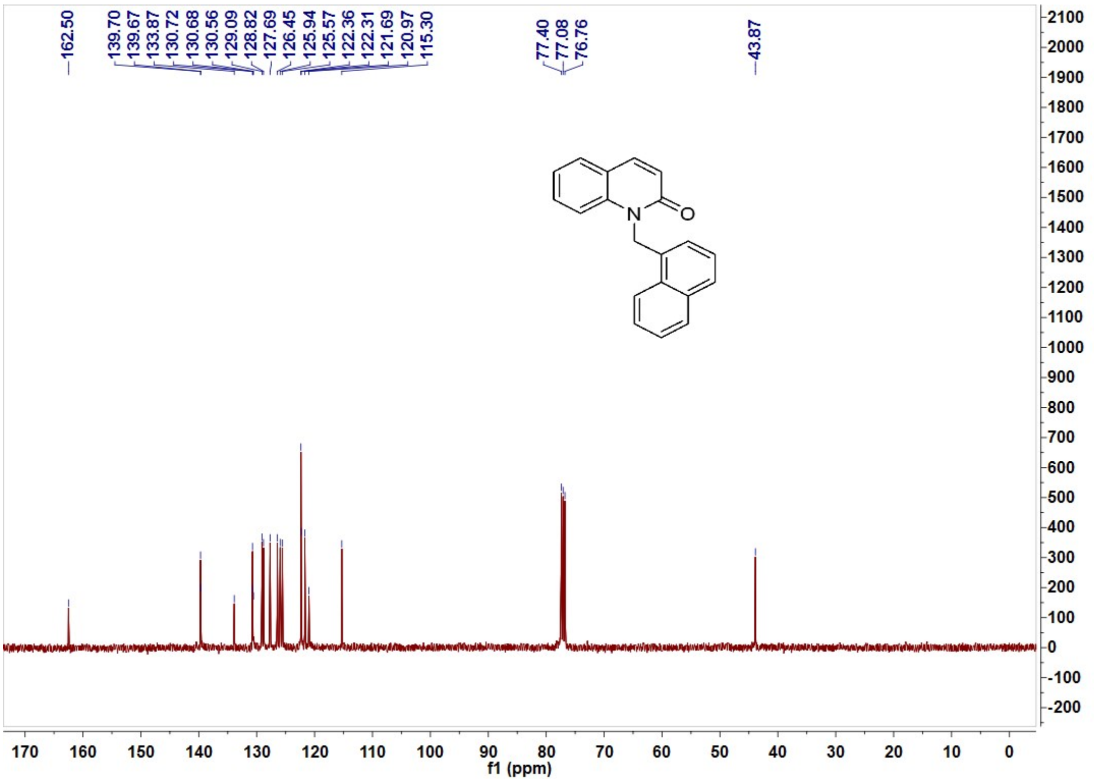
The ^{1}H NMR and ^{13}C NMR spectra of 4j



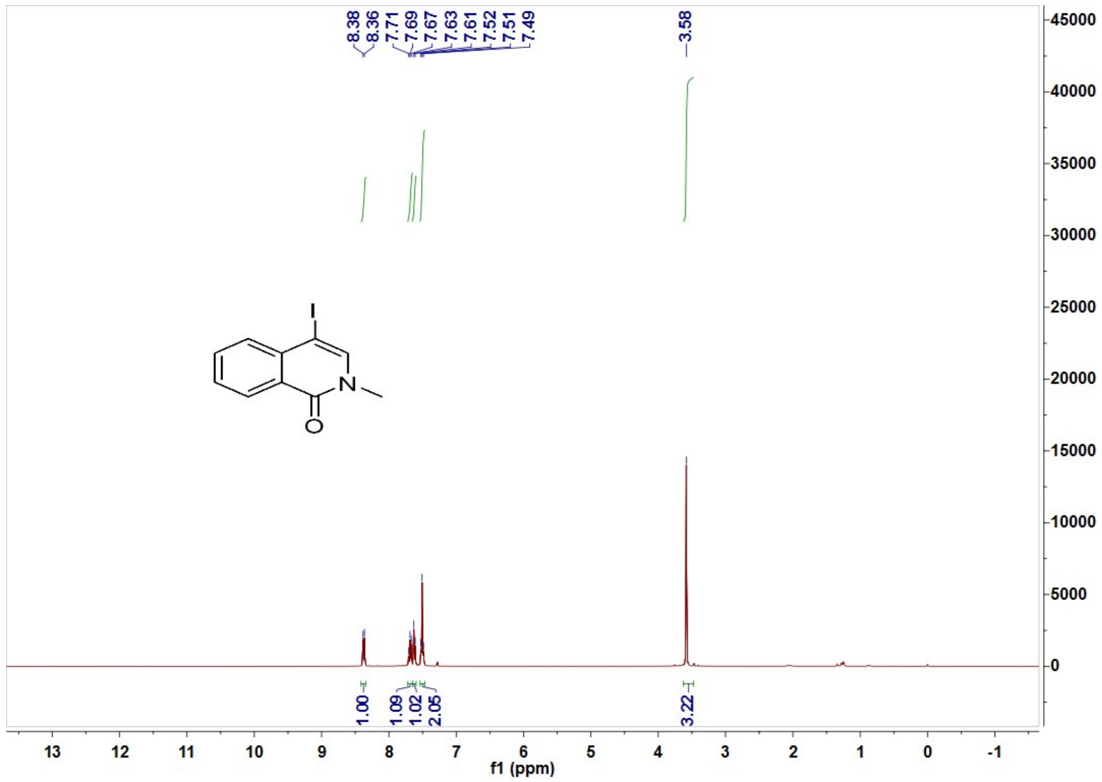


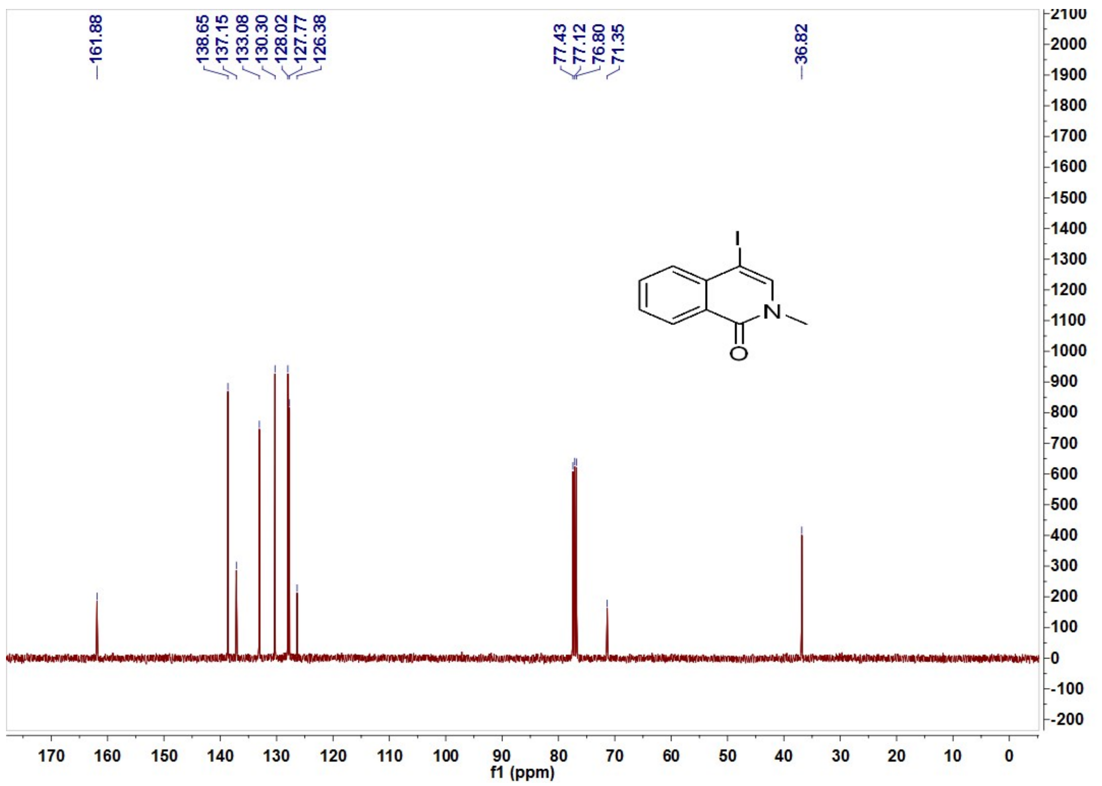
The ^{1}H NMR and ^{13}C NMR spectra of 4k



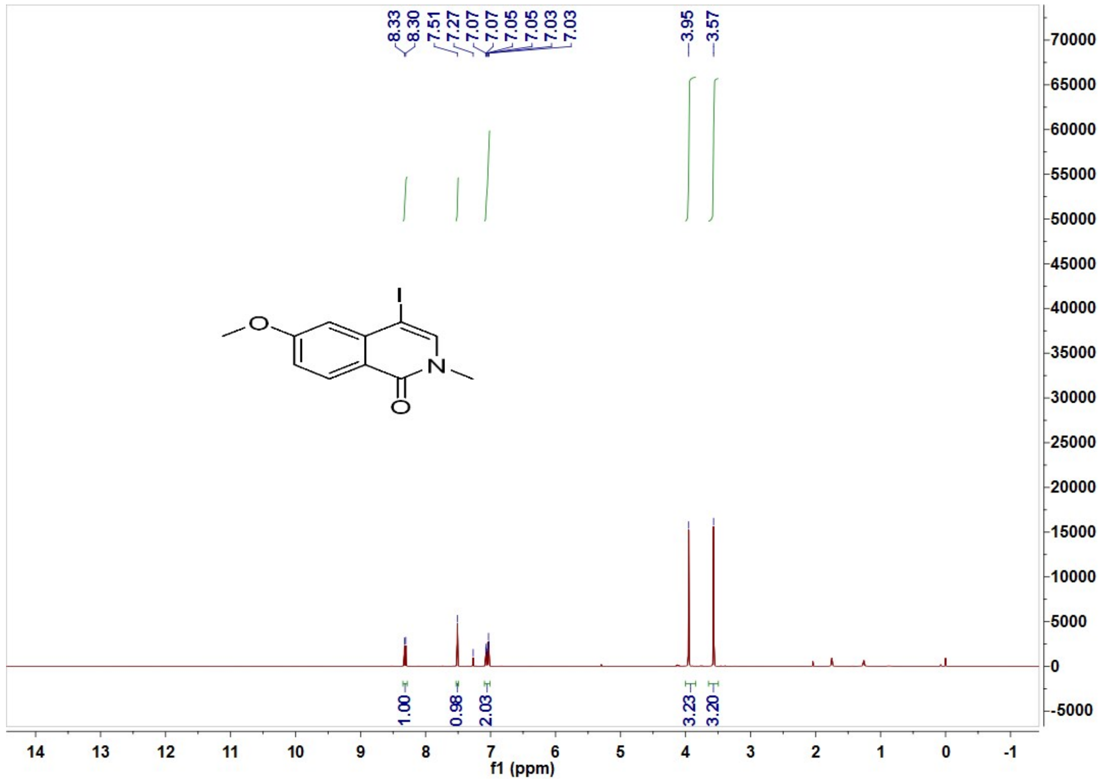


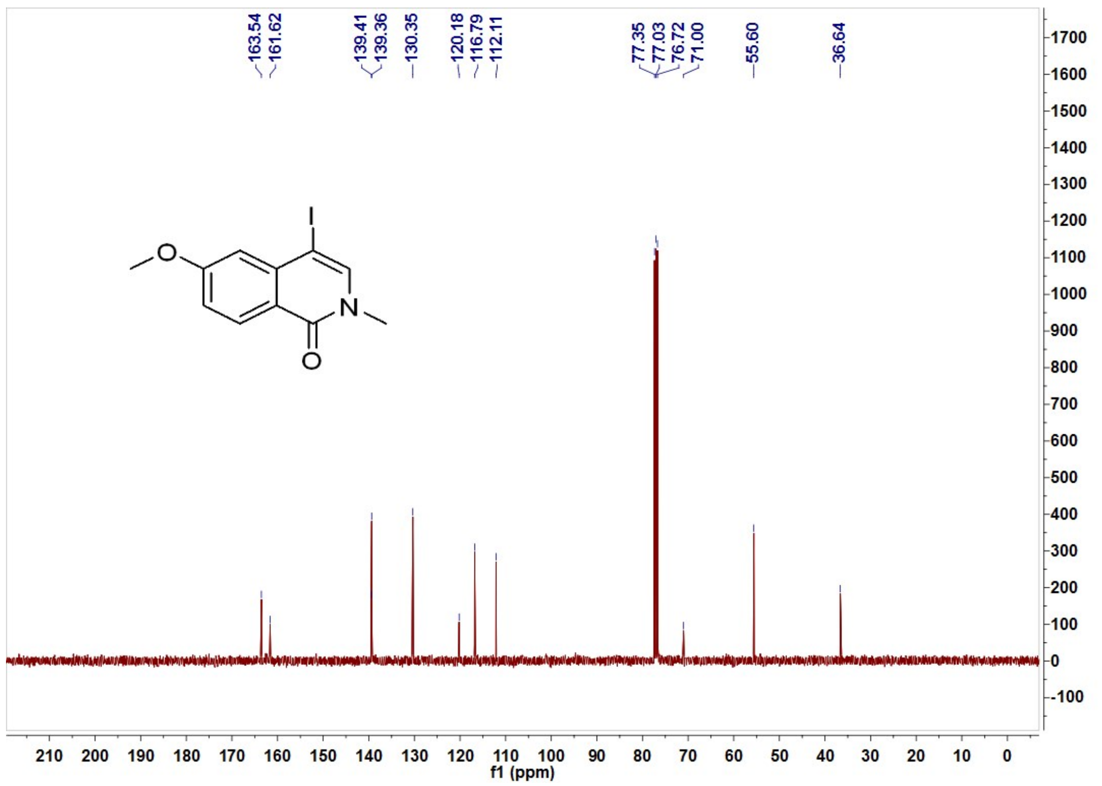
The ^1H NMR and ^{13}C NMR spectra of 5a



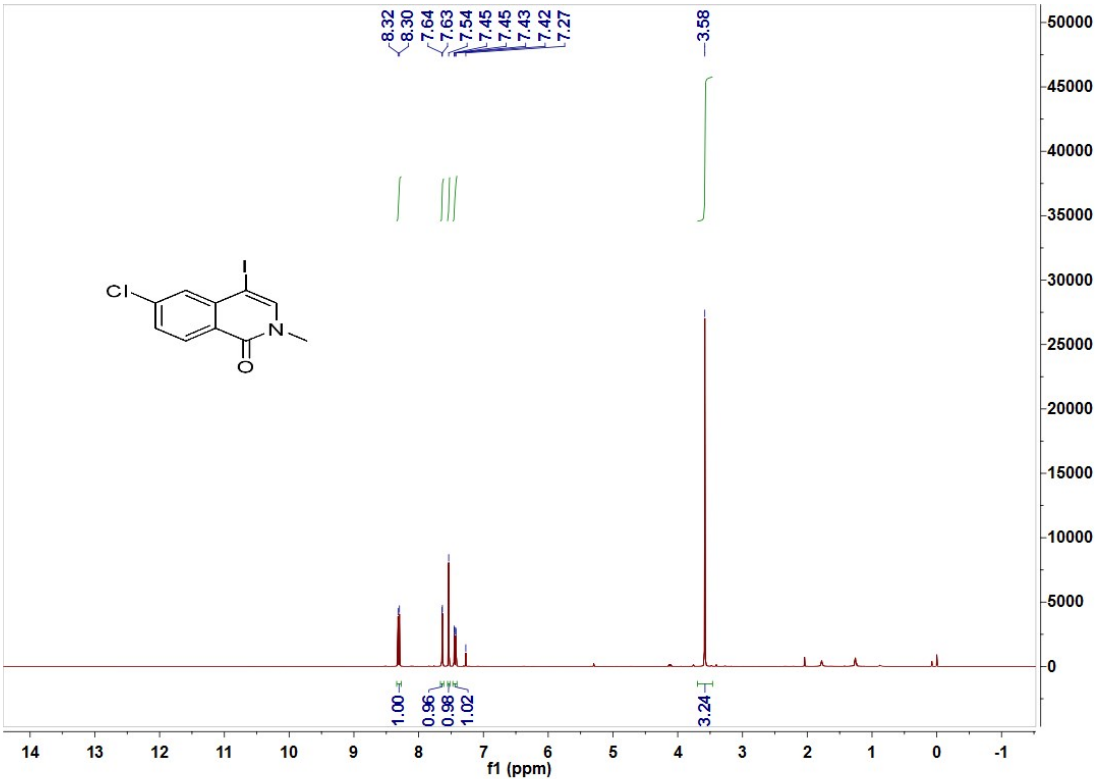


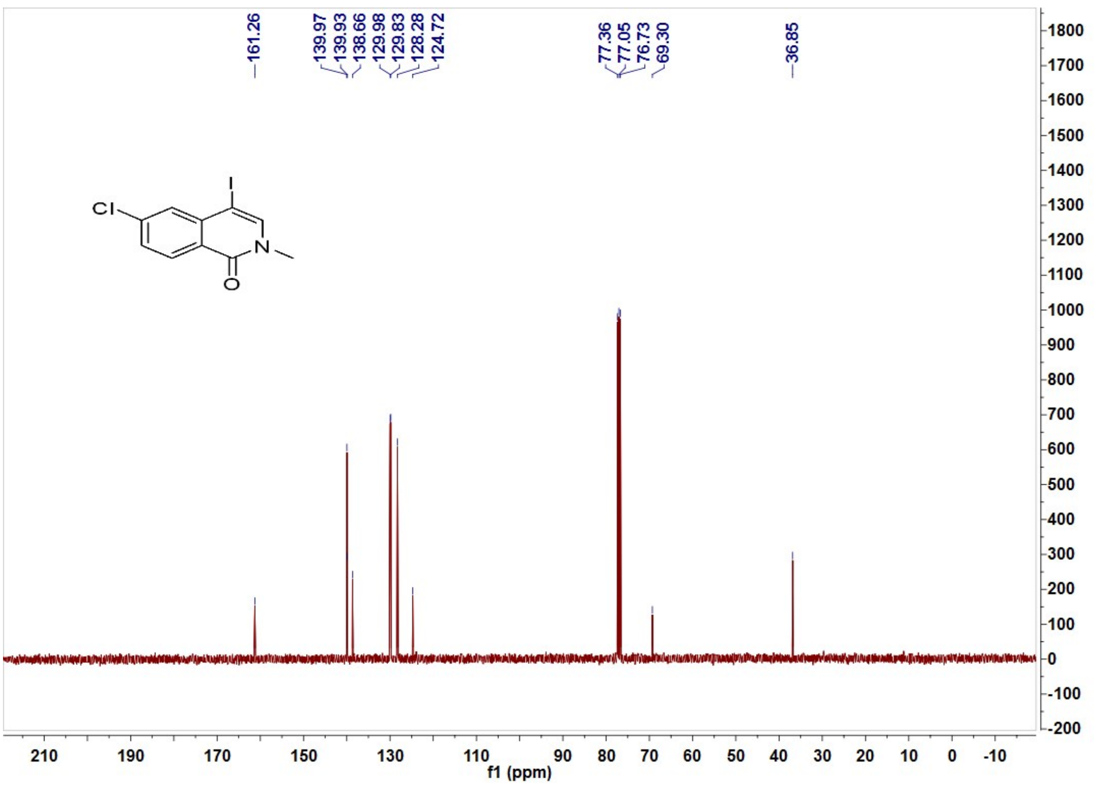
The ^{1}H NMR and ^{13}C NMR spectra of 5b



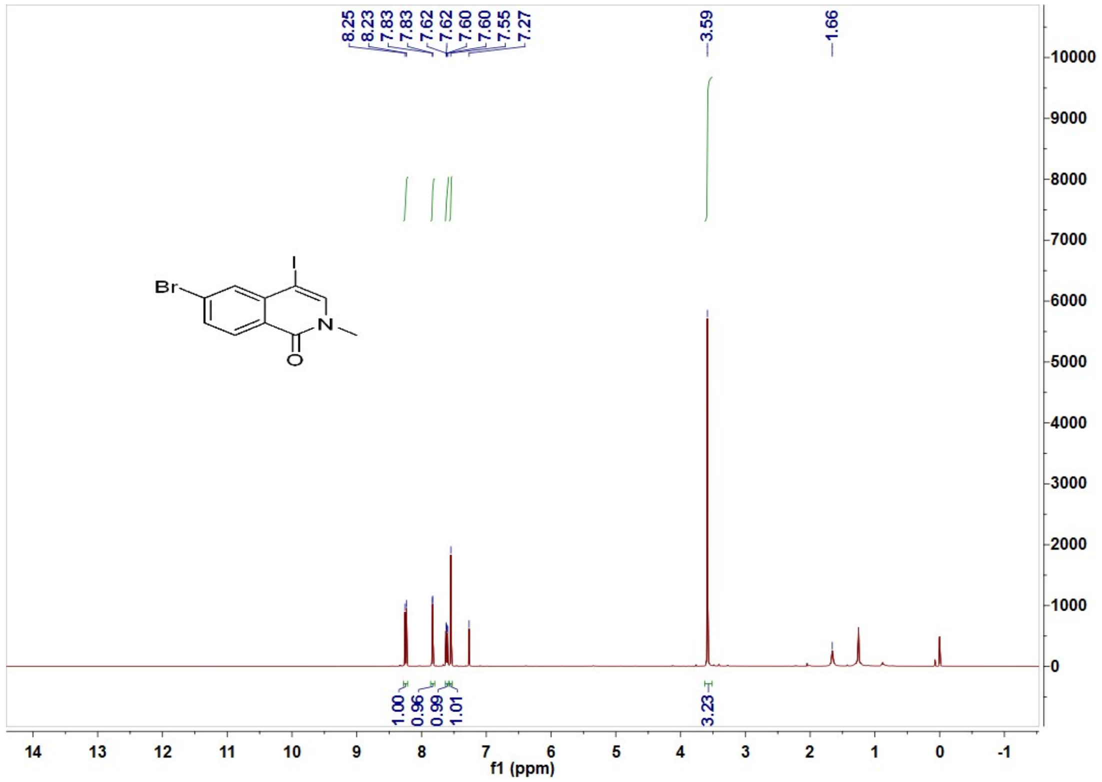


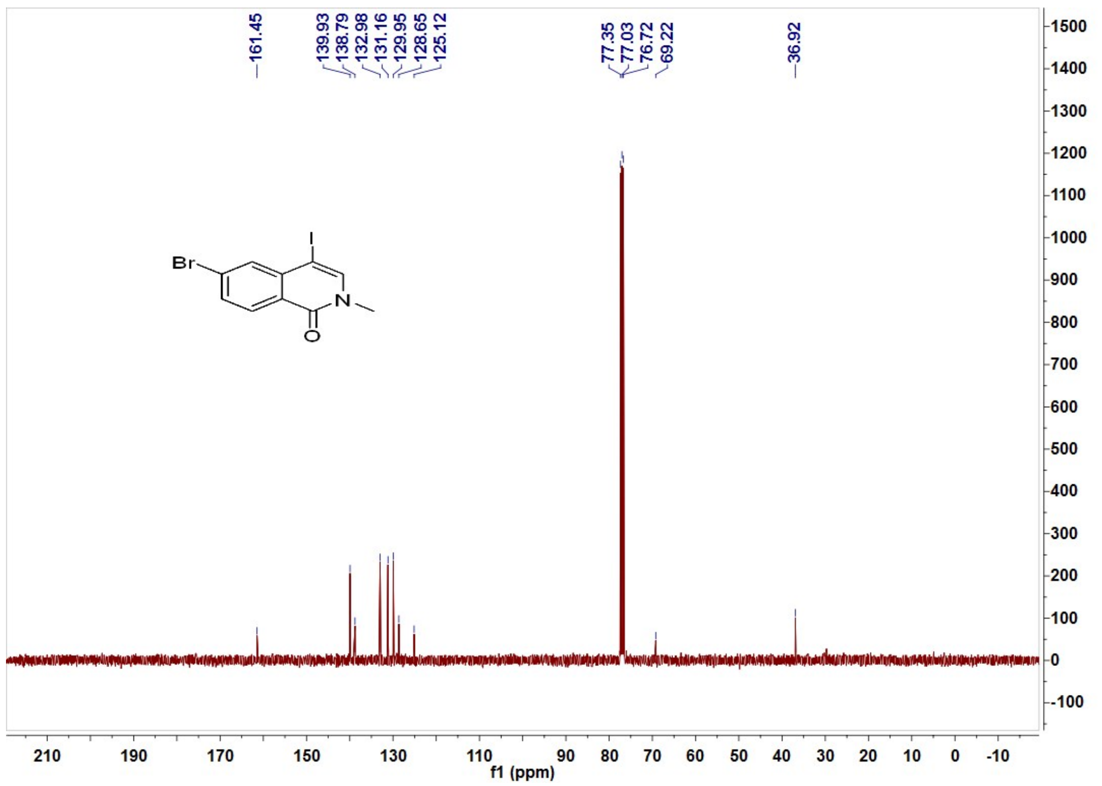
The [1]H NMR and [13]C NMR spectra of 5c



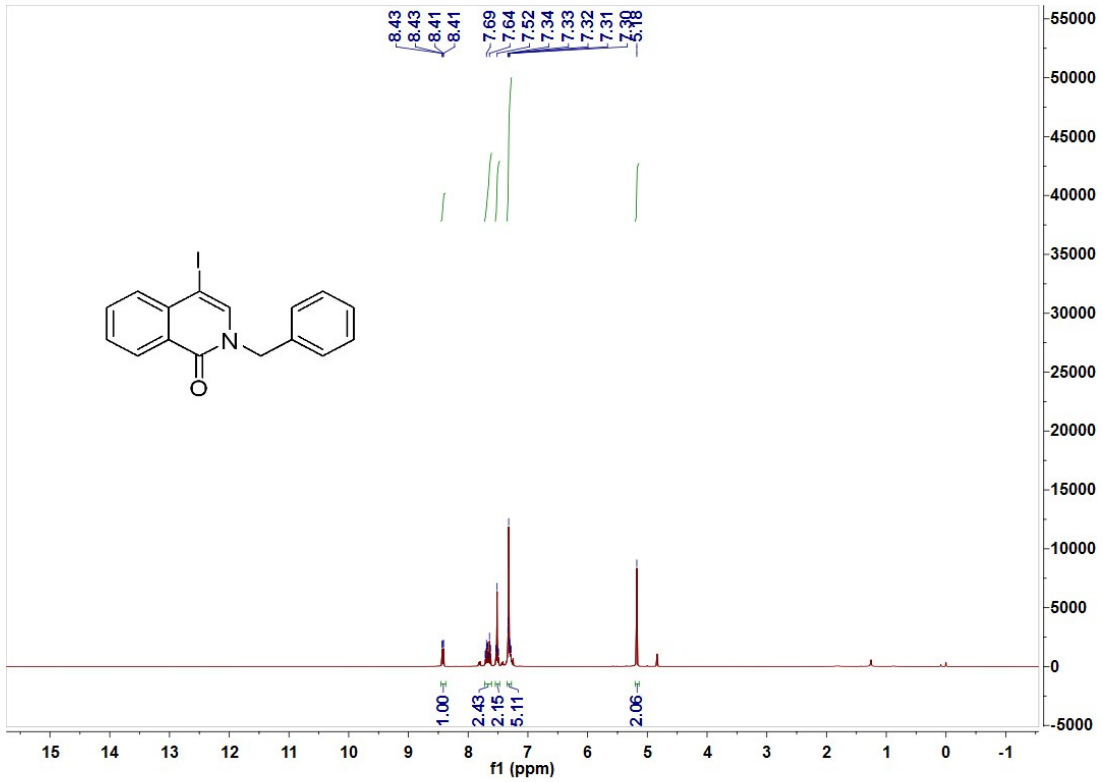


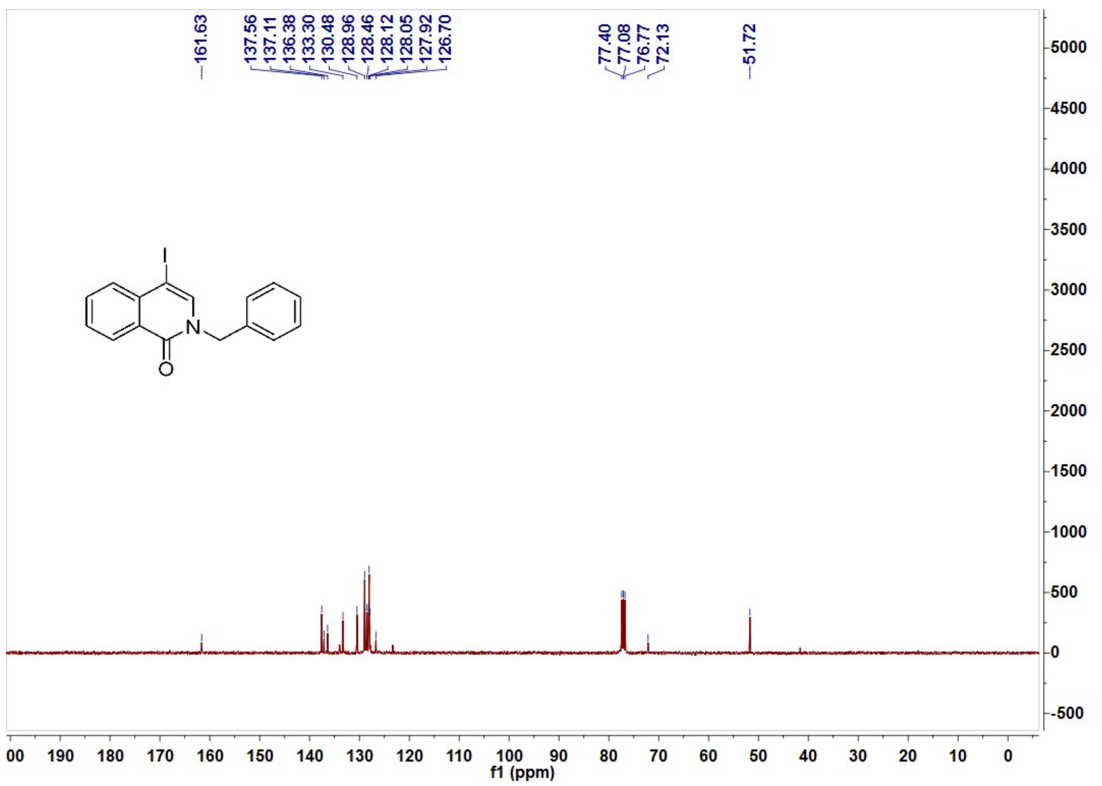
The ^{1}H NMR and ^{13}C NMR spectra of 5d



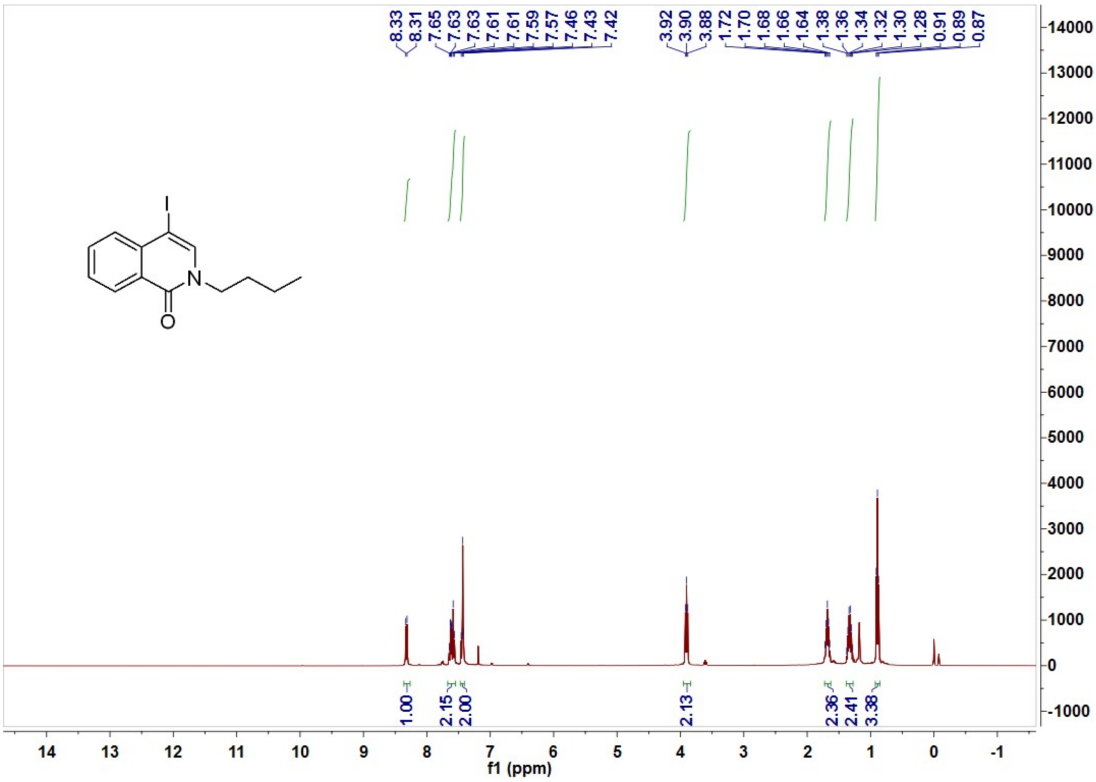


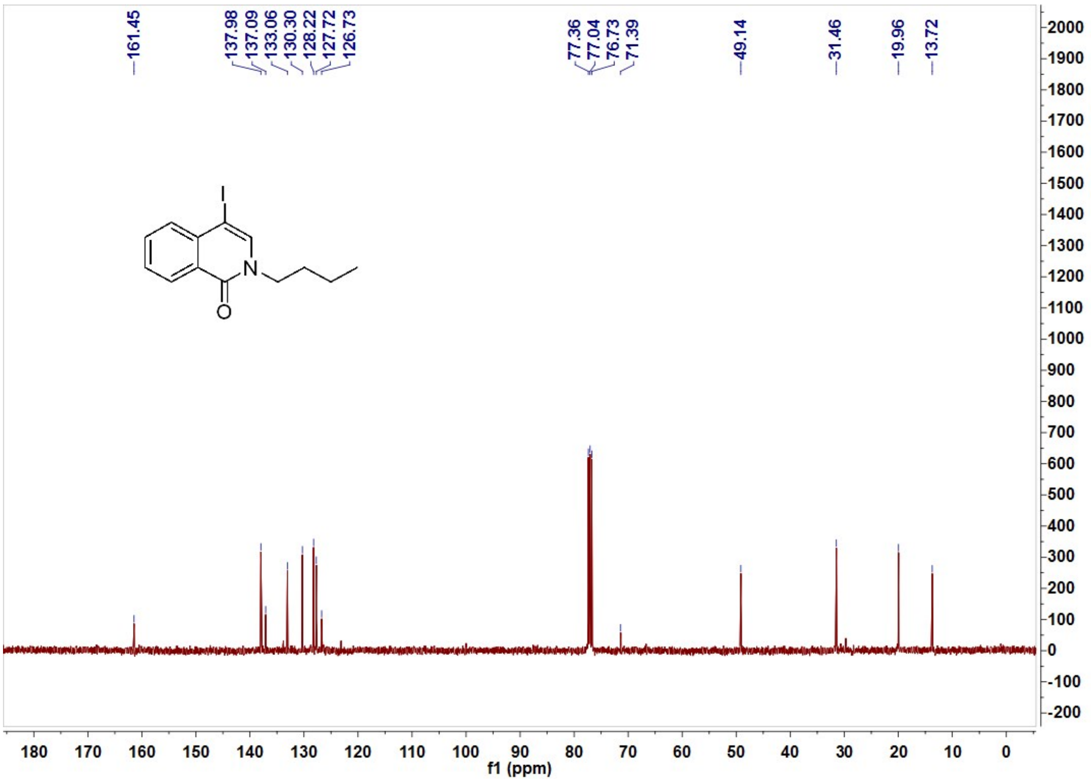
The ^{1}H NMR and ^{13}C NMR spectra of 5e



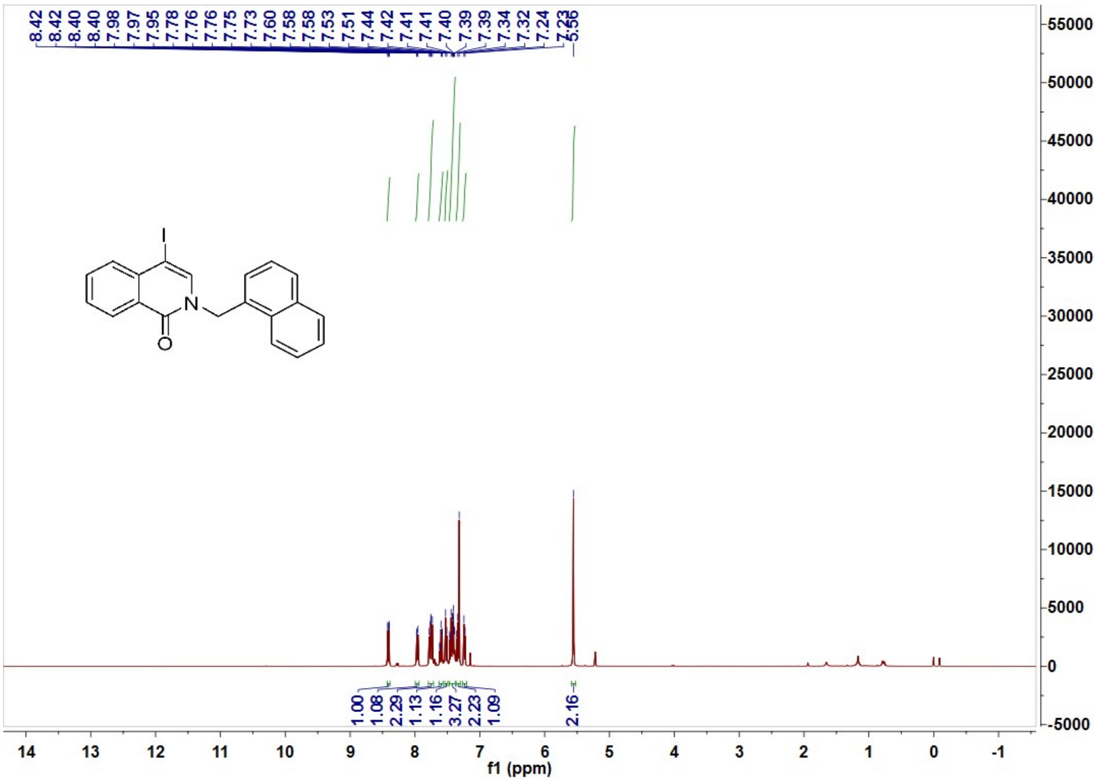


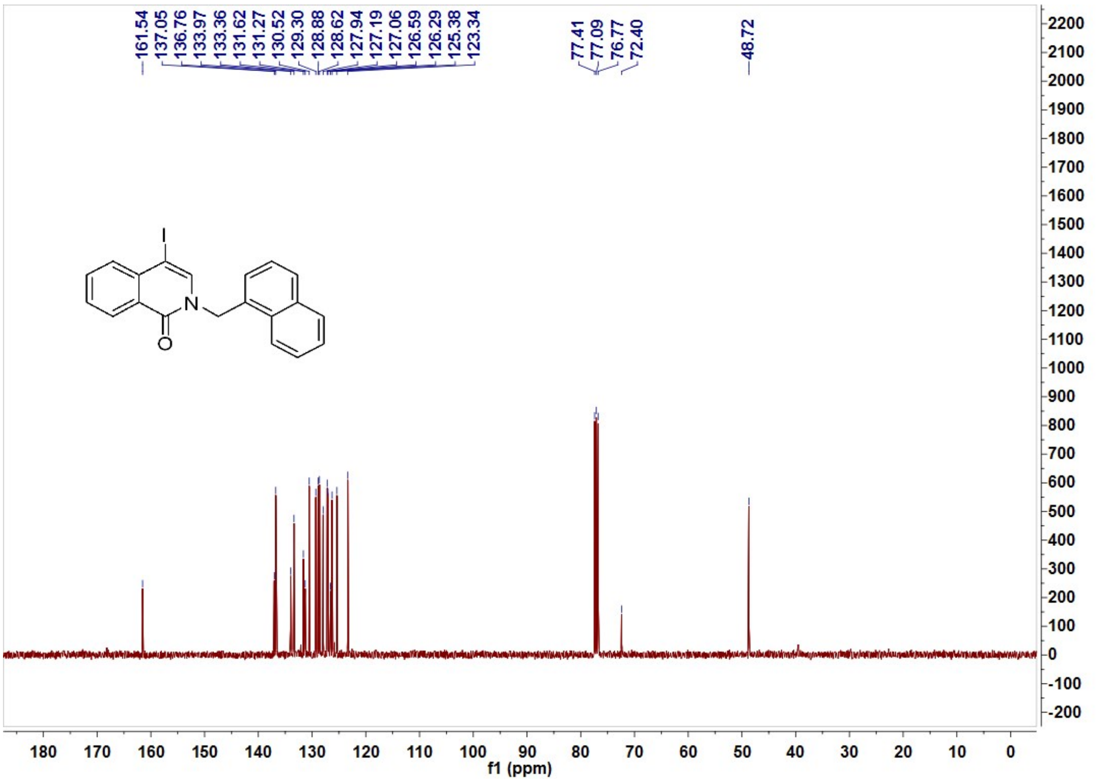
The ^{1}H NMR and ^{13}C NMR spectra of 5f



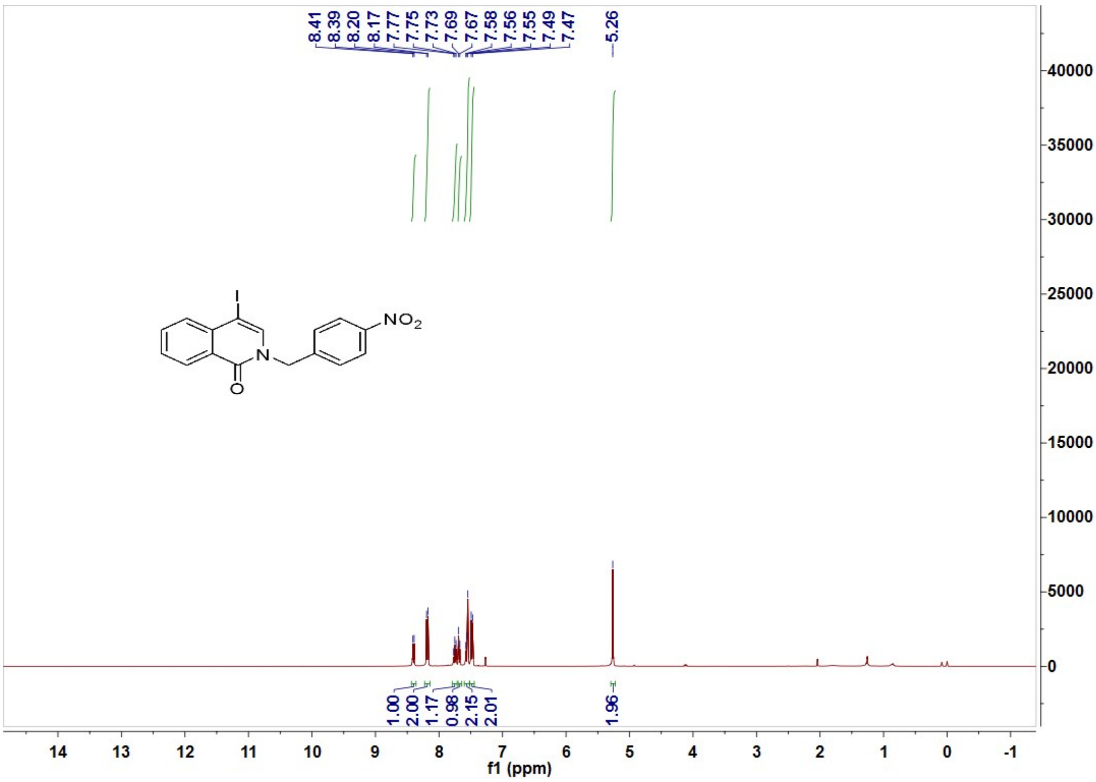


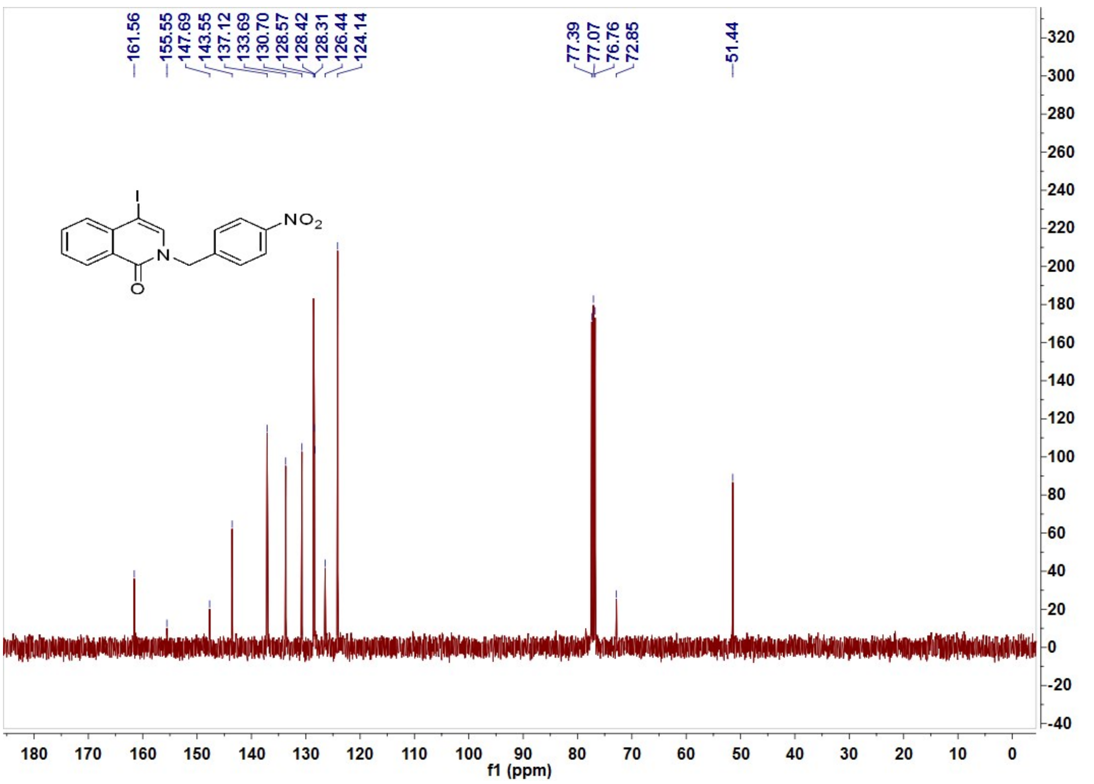
The ^{1}H NMR and ^{13}C NMR spectra of 5g



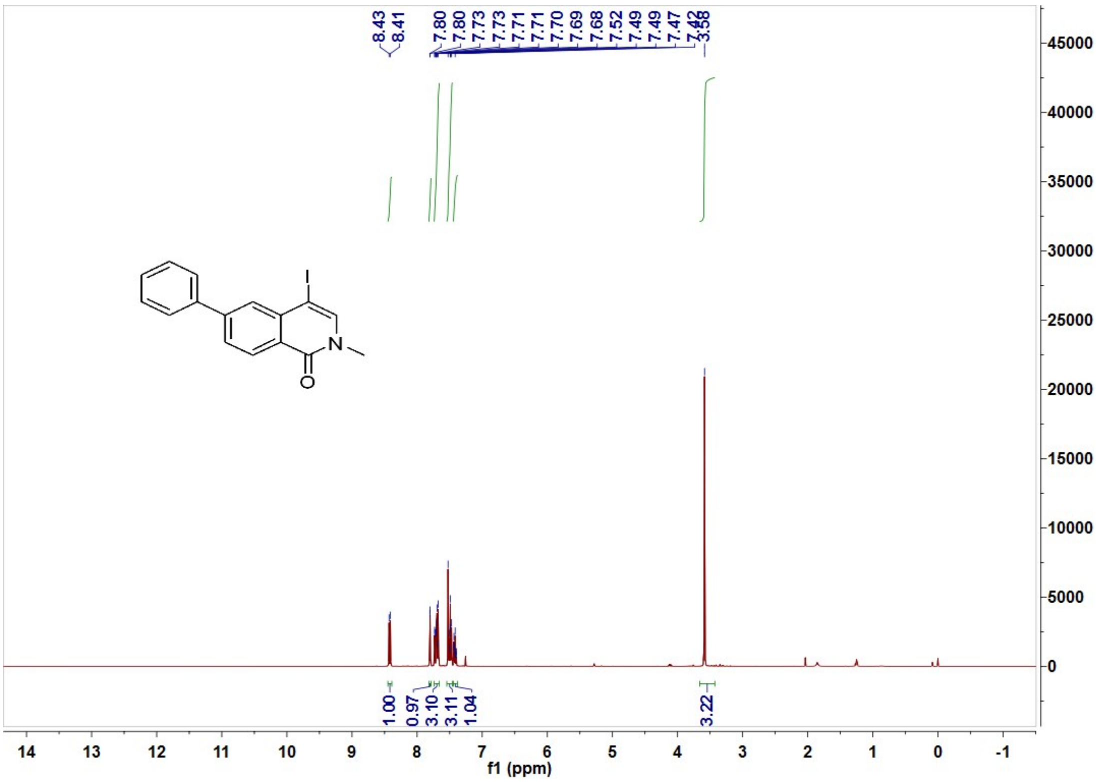


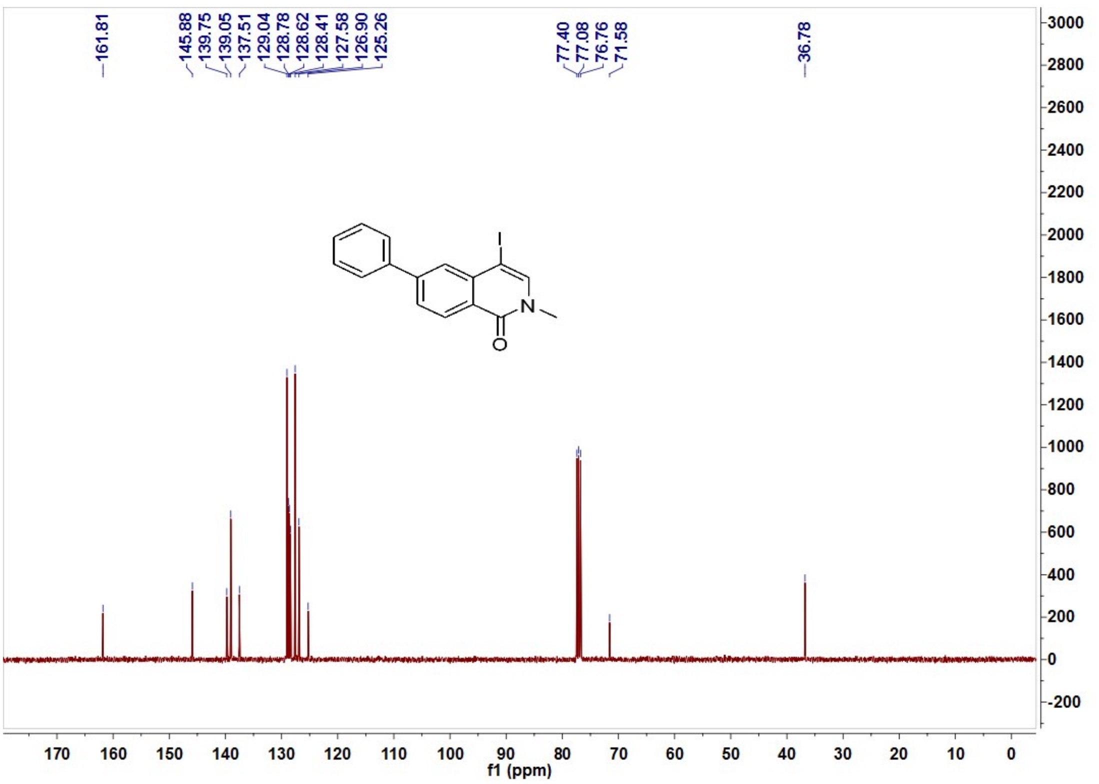
The ^{1}H NMR and ^{13}C NMR spectra of 5h



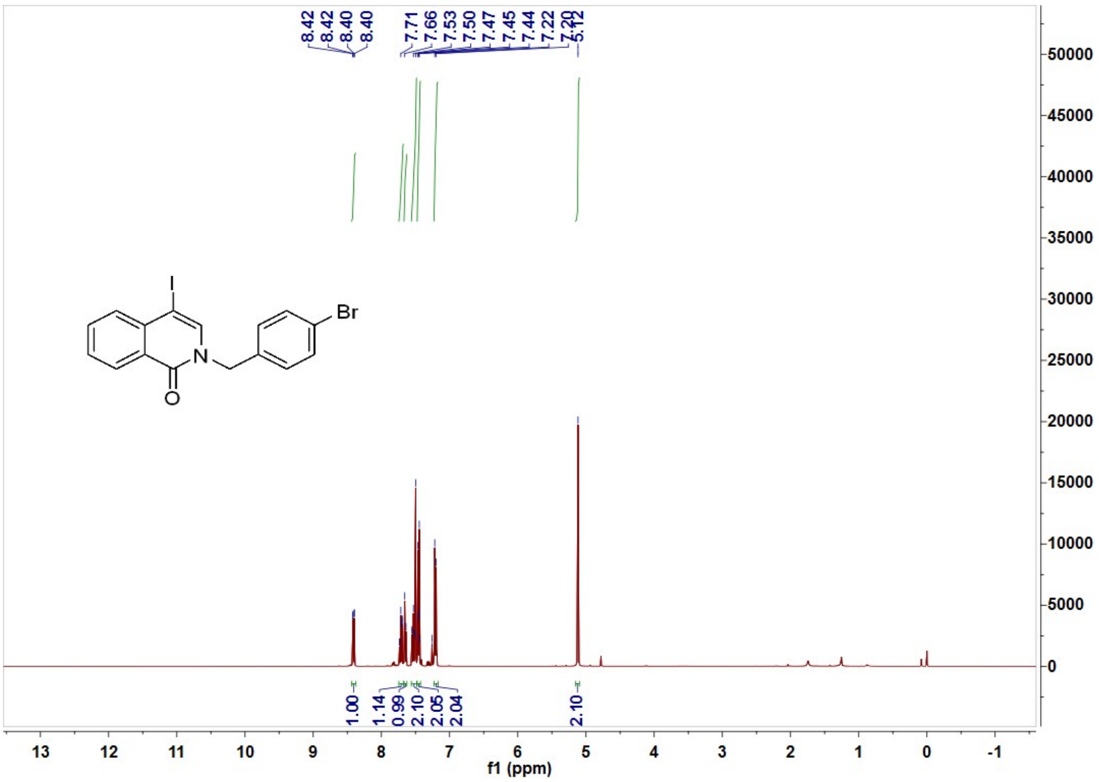


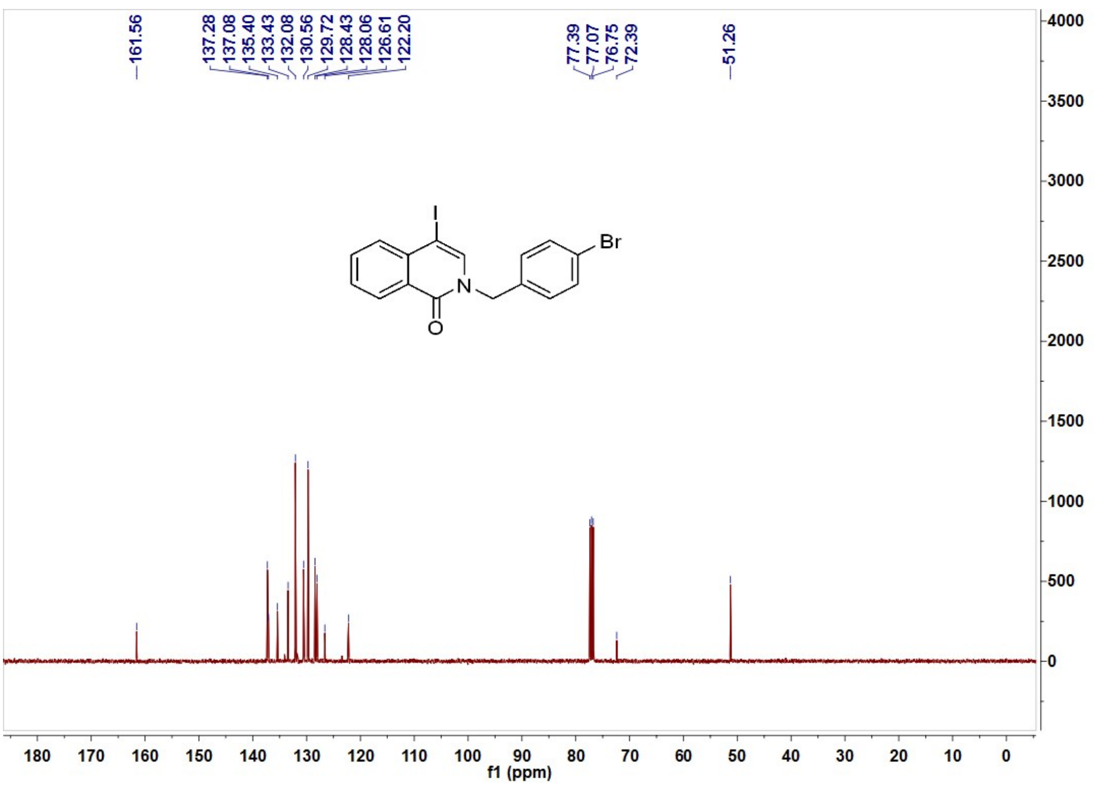
The ^{1}H NMR and ^{13}C NMR spectra of 5i



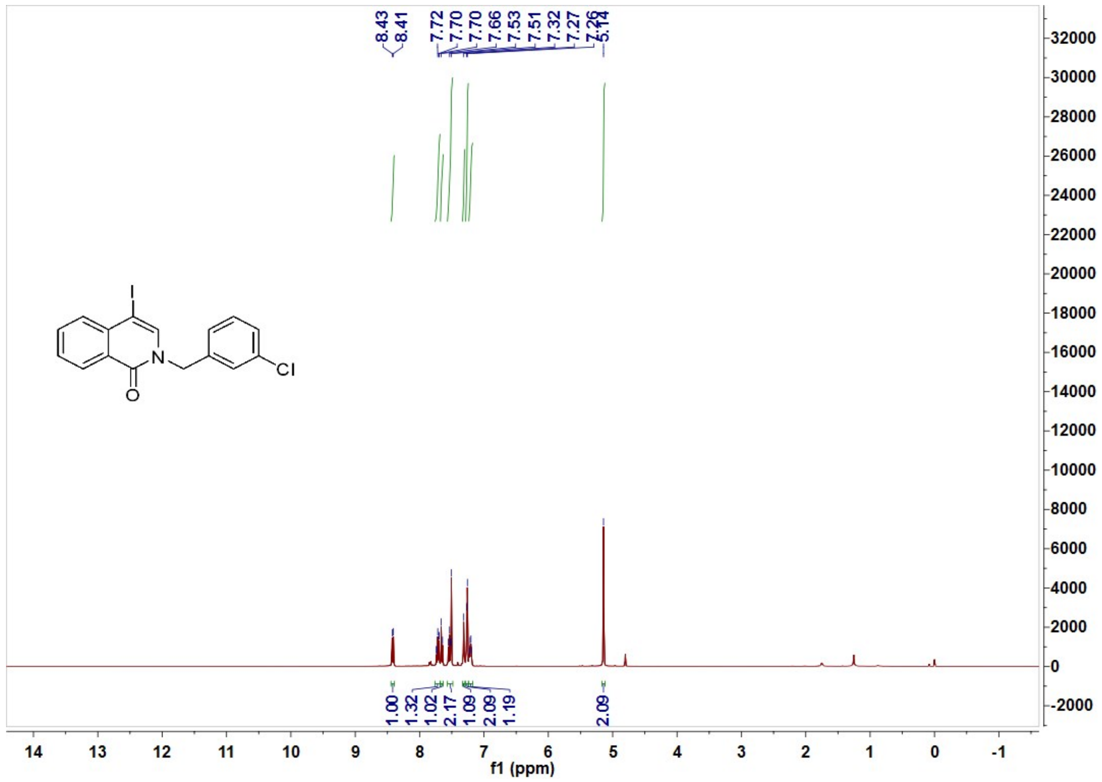


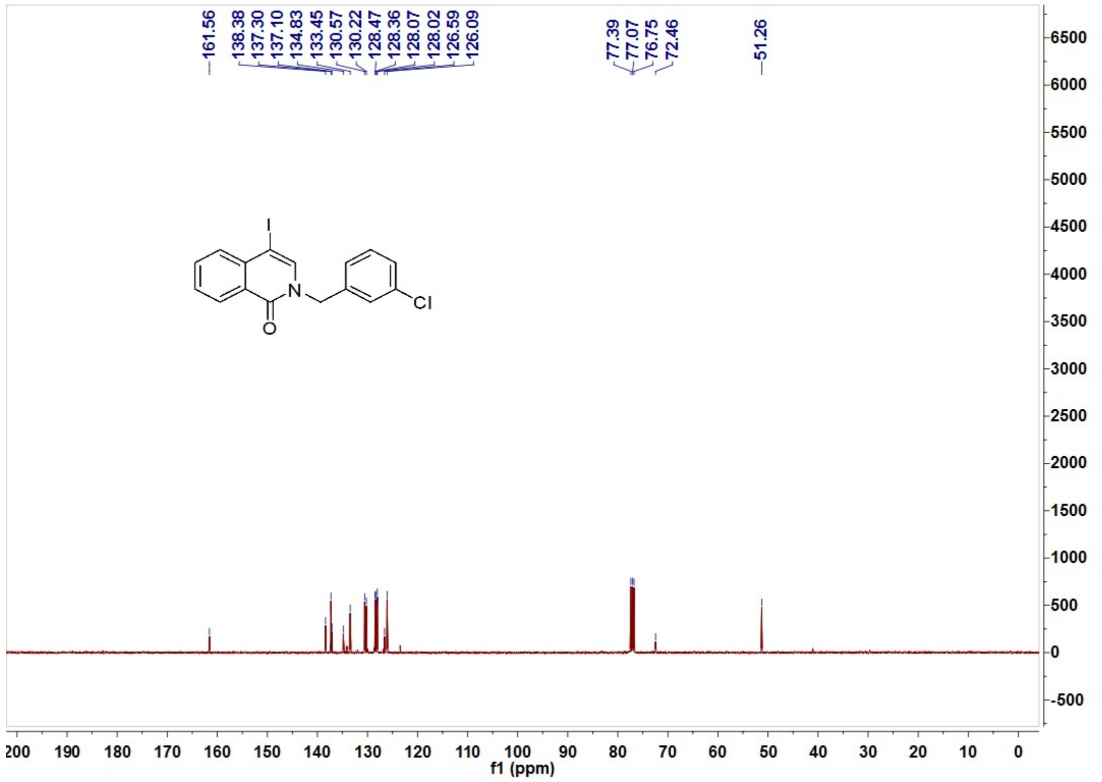
The [1]H NMR and [13]C NMR spectra of 5j



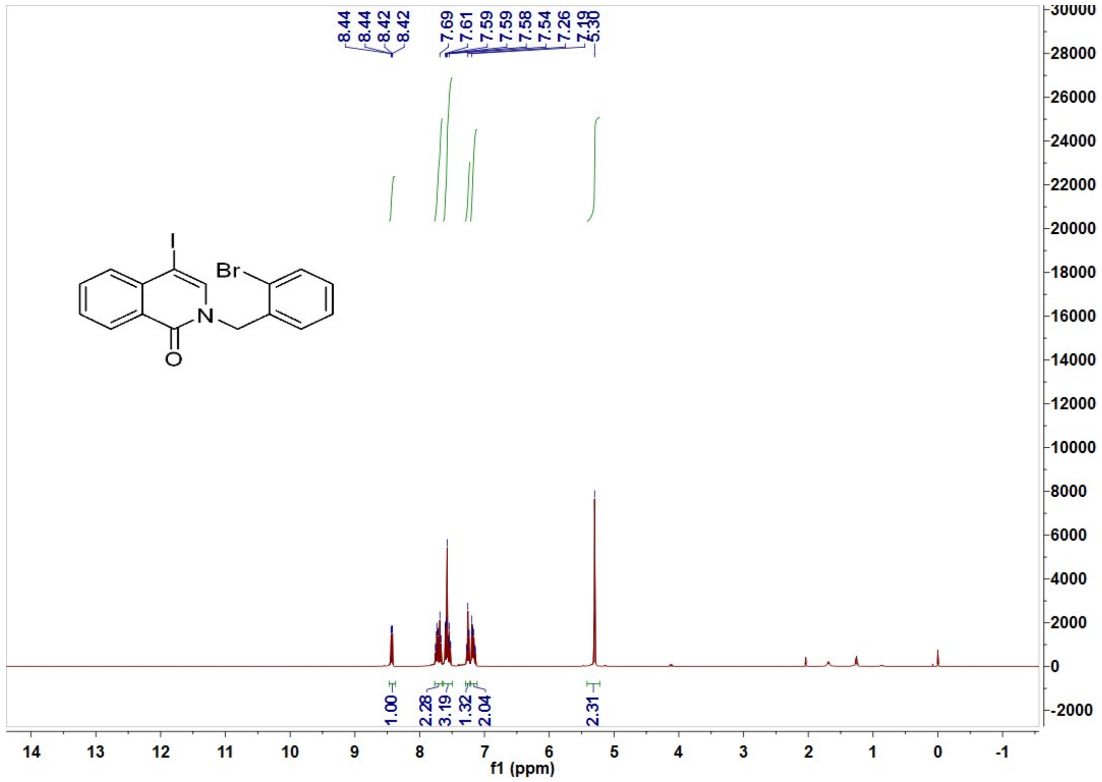


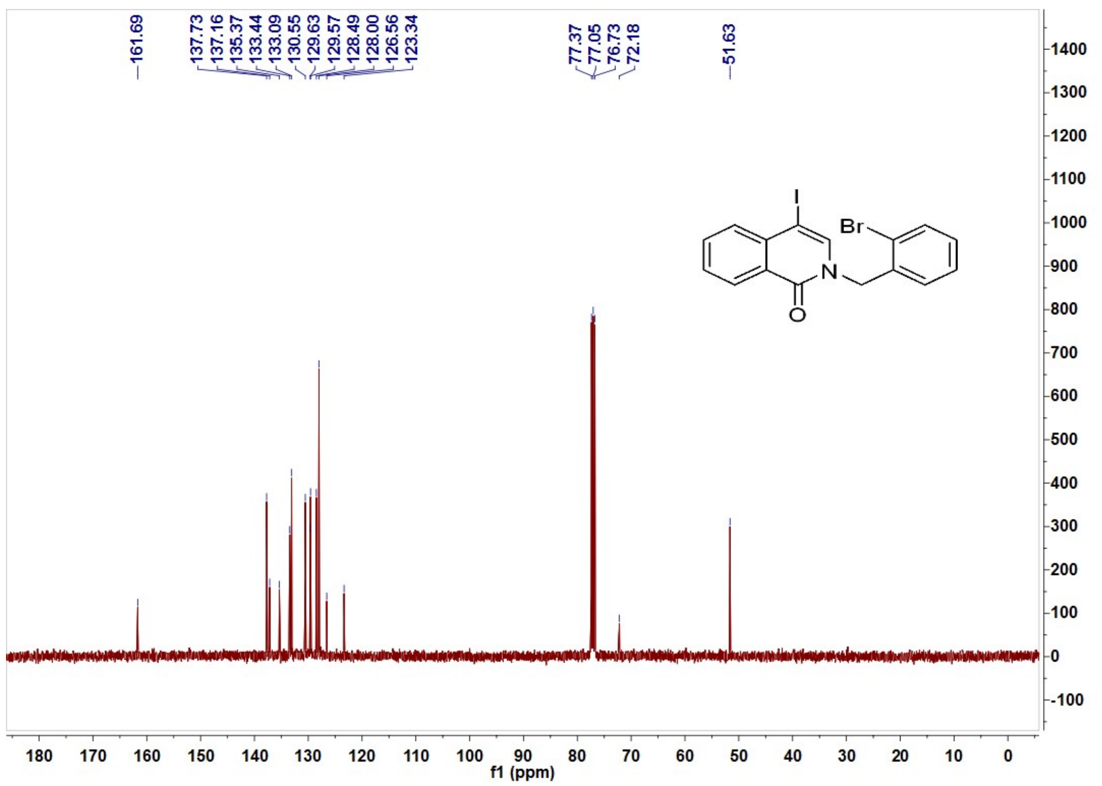
The ^{1}H NMR and ^{13}C NMR spectra of 5k



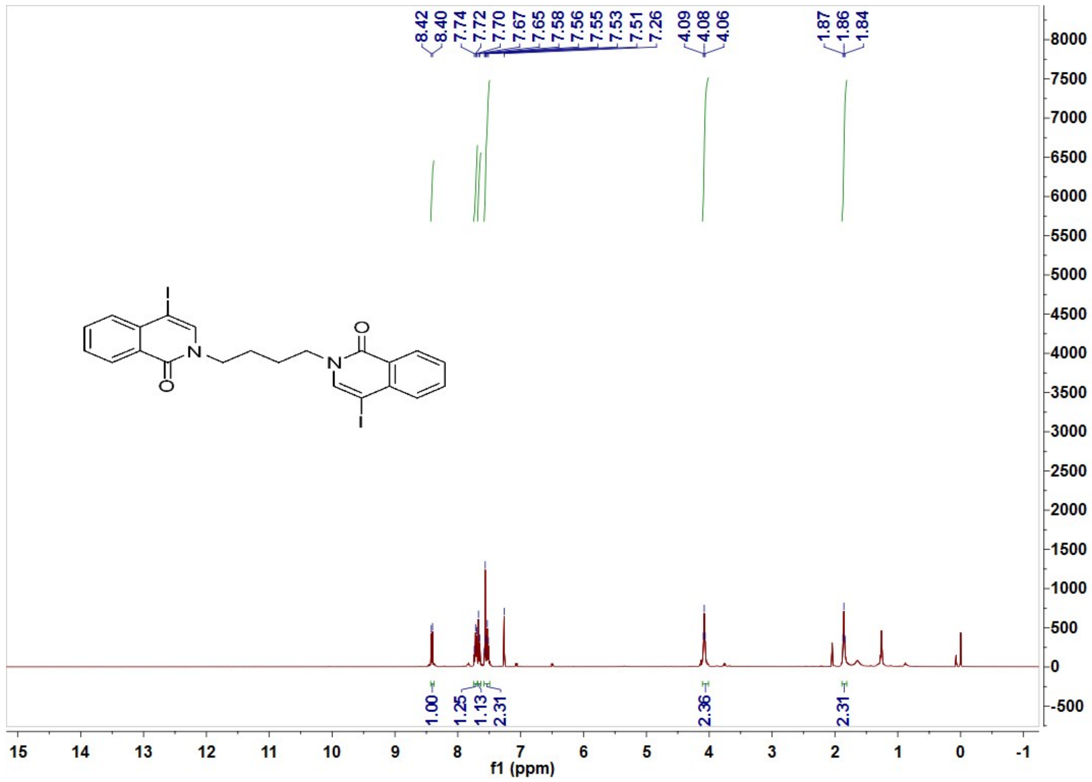


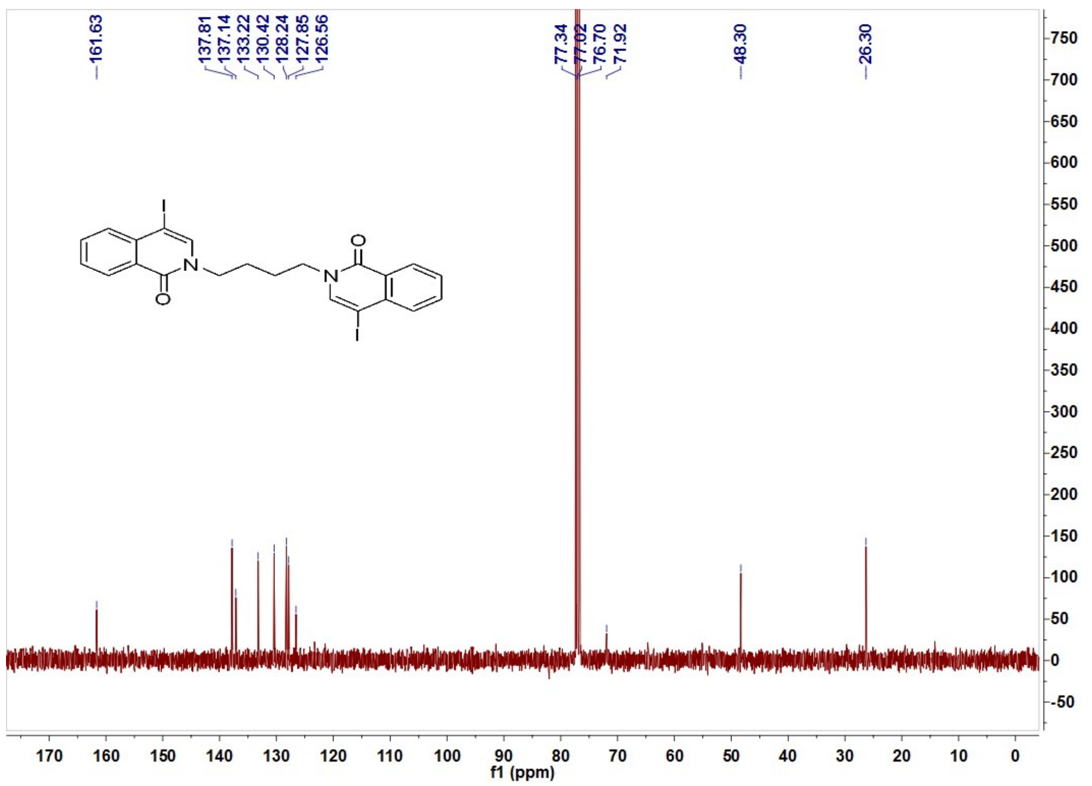
The ^{1}H NMR and ^{13}C NMR spectra of 5l



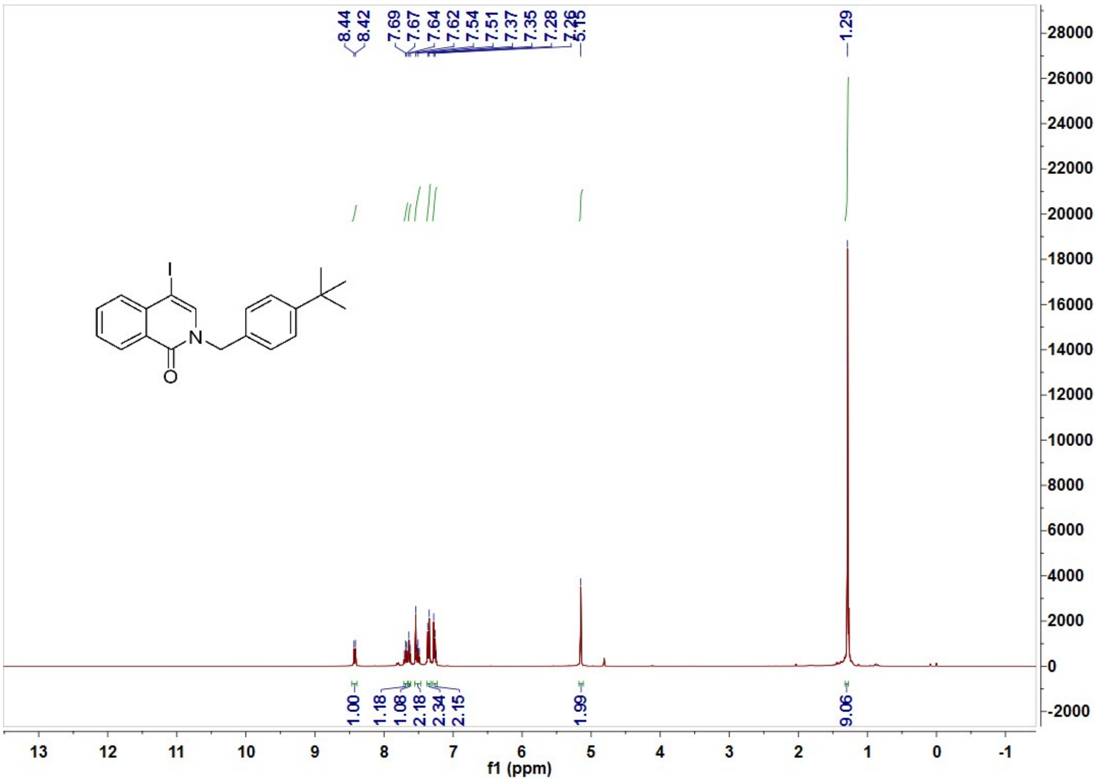


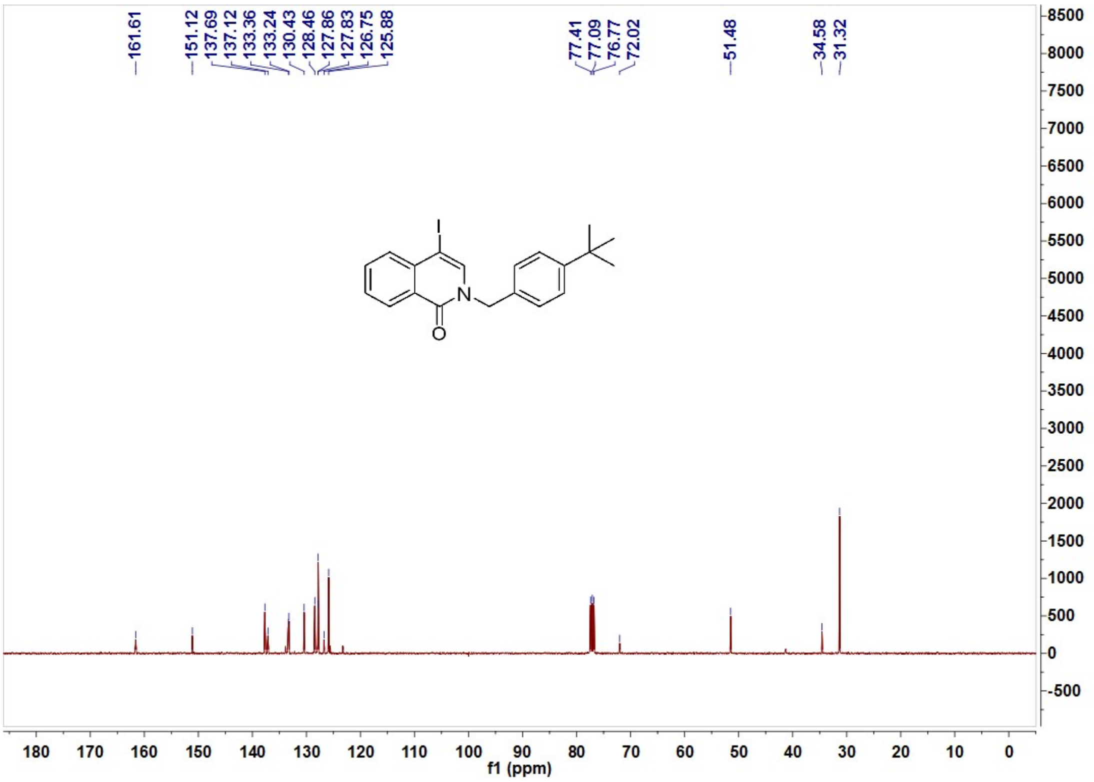
The ^{1}H NMR and ^{13}C NMR spectra of 5m



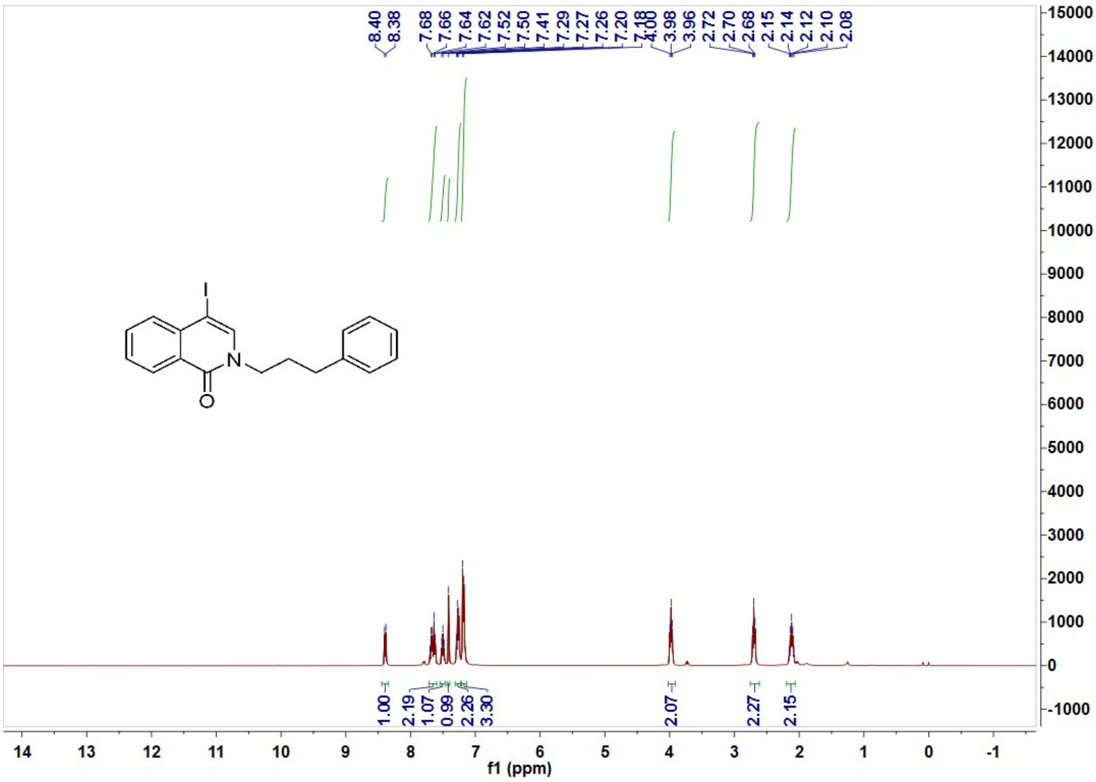


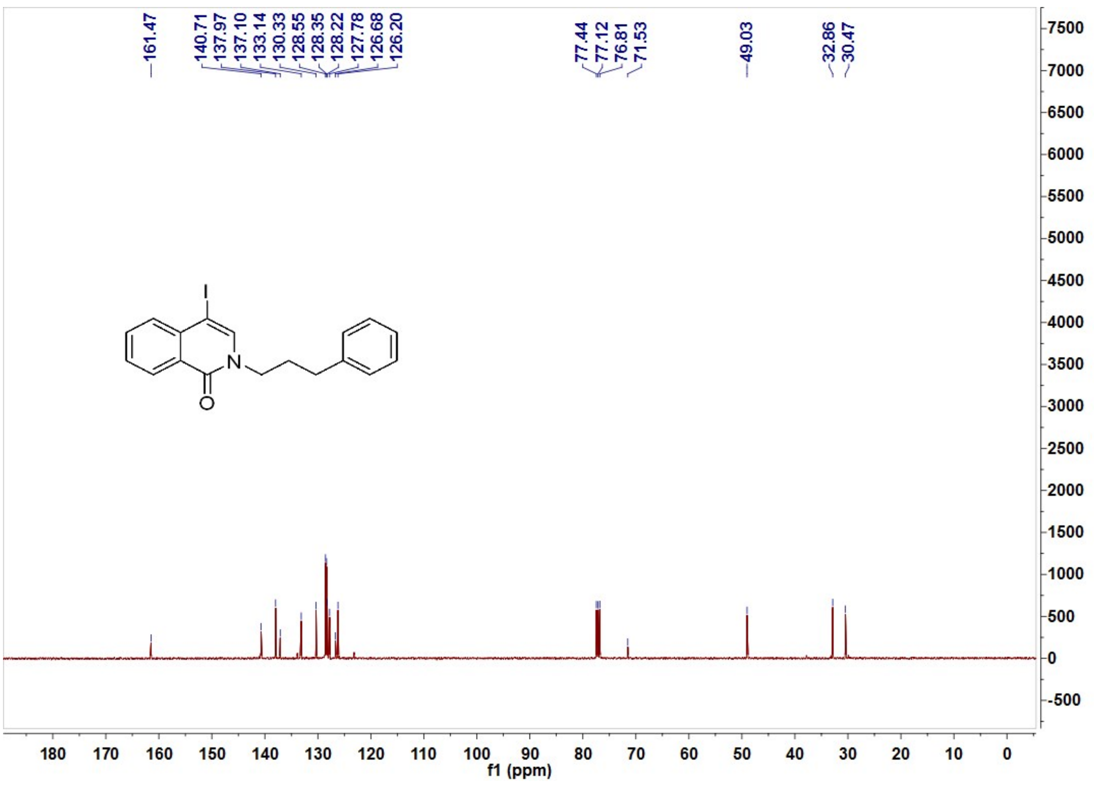
The ^{1}H NMR and ^{13}C NMR spectra of 5n



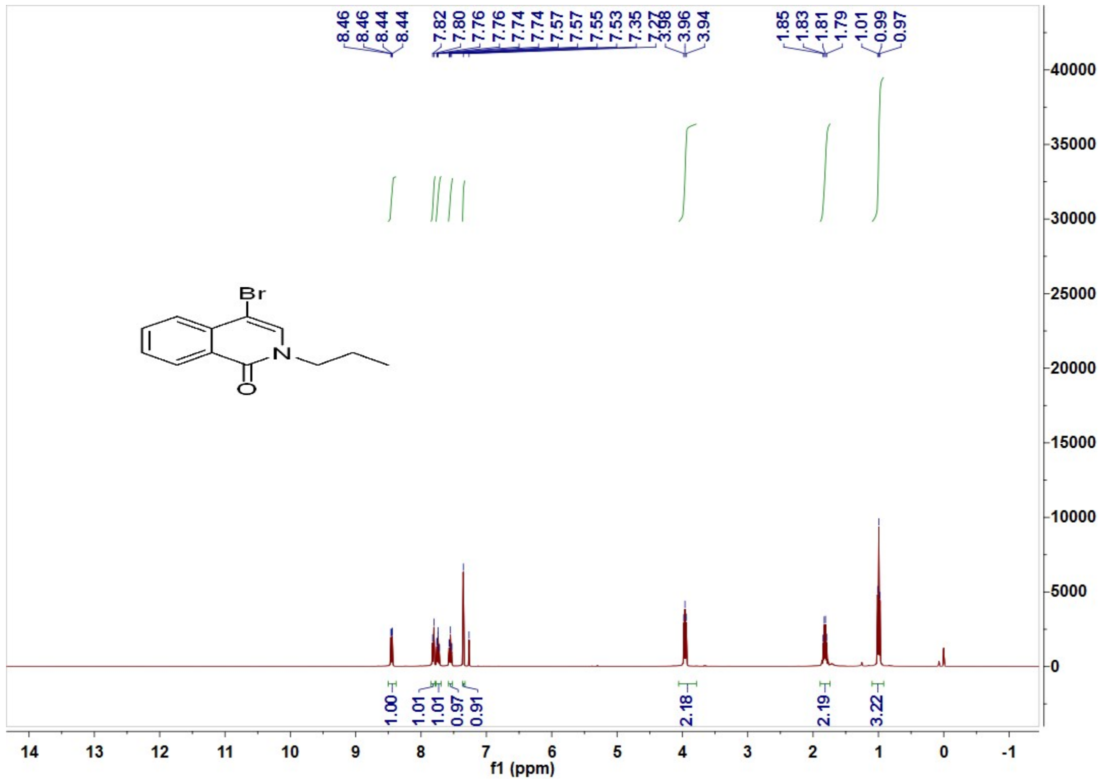


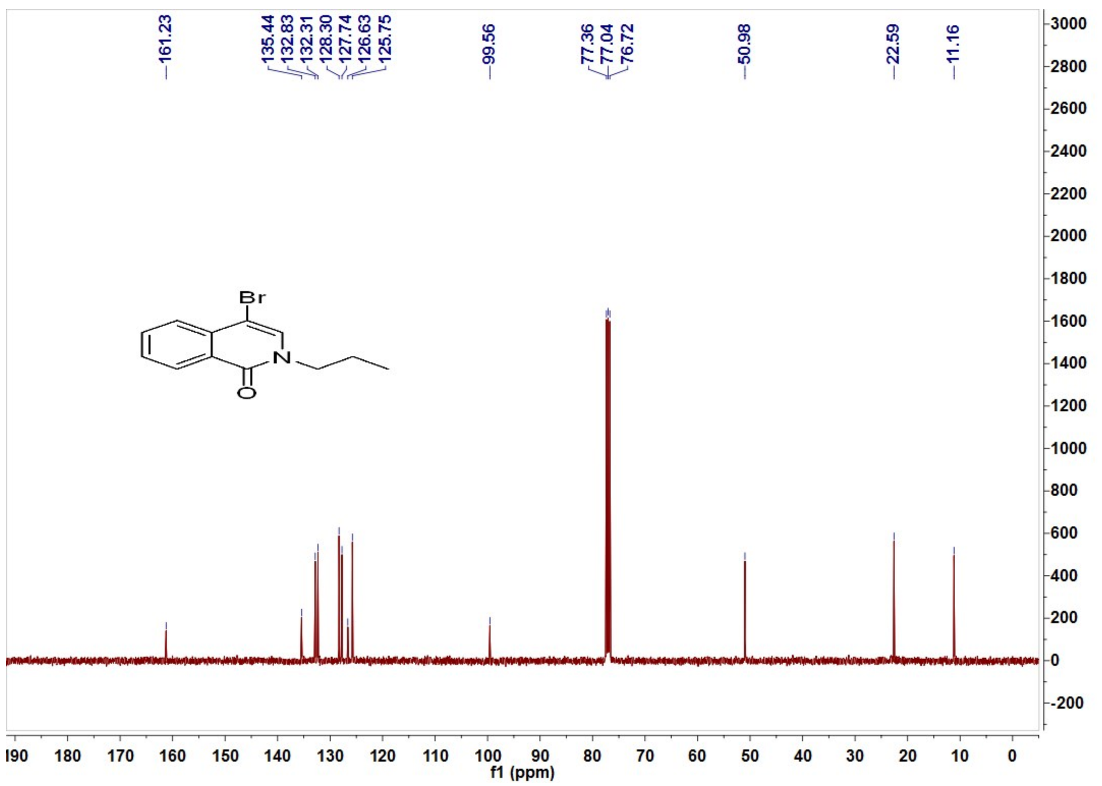
The ^{1}H NMR and ^{13}C NMR spectra of 5o



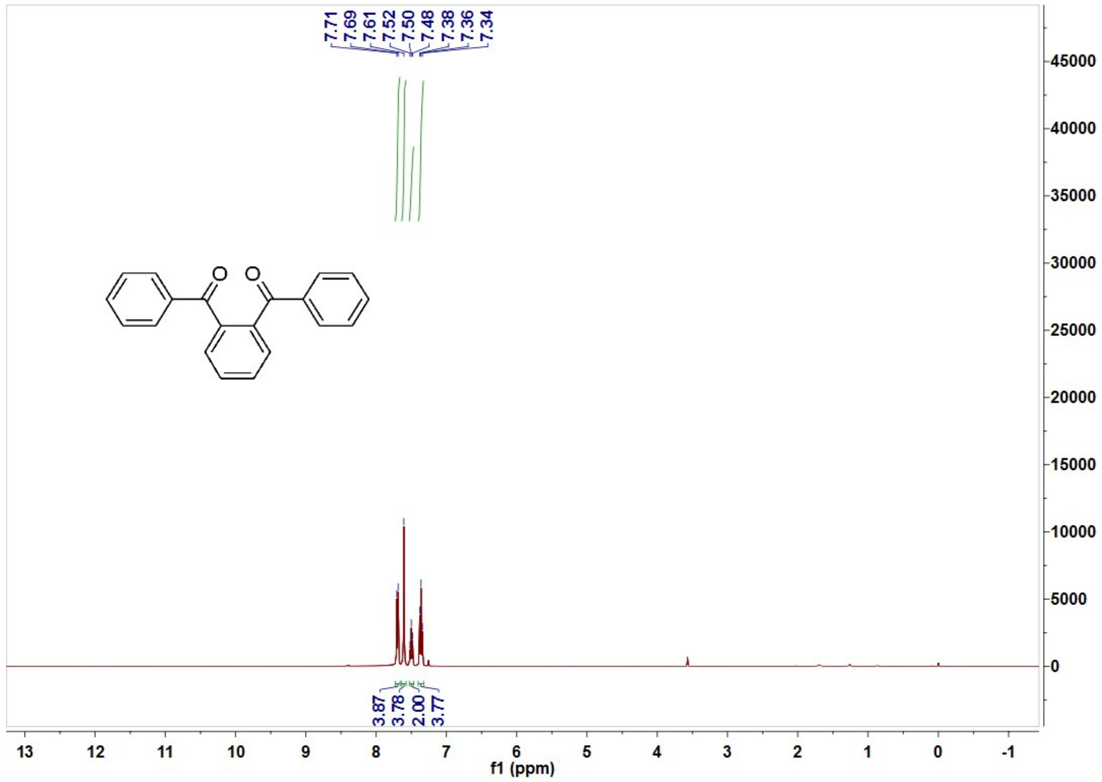


The ^{1}H NMR and ^{13}C NMR spectra of 5q





The ^{1}H NMR and ^{13}C NMR spectra of 1, 2-dibenzoylbenzene


7.71
7.69
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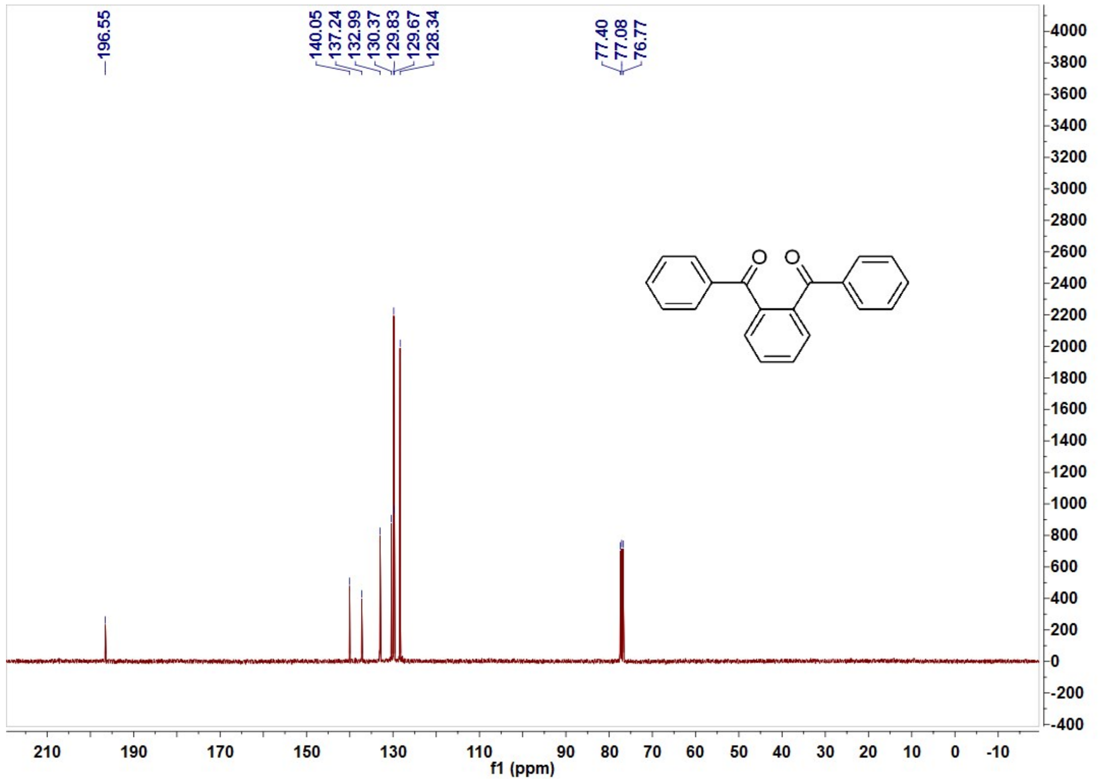
7.48
7.38
7.36
7.34
3.87
3.78
2.00
3.77
f1 (ppm)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132.99
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129.83
129.67
128.34
77.40
77.08
76.77
f1 (ppm)