

Supporting Information

Facile and Diverse Microwave-Assisted Synthesis of Secondary Propargylamines in Water Using CuCl/CuCl₂

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General Remarks.

^1H and ^{13}C NMR spectra were recorded on 300 MHz instrument. The ^1H chemical shifts are reported in ppm relative to tetramethylsilane. High-resolution mass spectra were recorded by using ion source temperature 150–250°C as required. High-resolution EI-mass spectra were performed with a resolution of 10000. For thin layer chromatography, analytical TLC plates SIL G/UV254 and 70–230 mesh silica gel were used. Reagents were used without further purification. Solvents like water, heptane and ethyl acetate were used after distillation.

Microwave Irradiation Experiments.

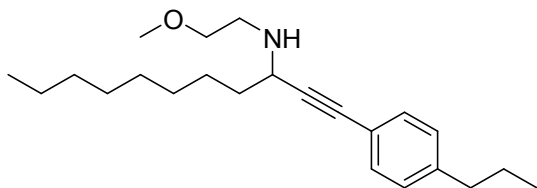
All microwave irradiation experiments were carried out in a dedicated CEM-Discover monomode microwave apparatus, operating at a frequency of 2.45GHz with continuous irradiation power from 0 to 100 W with utilization of the standard absorbance level of 100 W maximum power. The reactions were carried out in 10 mL glass tubes, sealed with Teflon septum and placed in the microwave cavity. The reaction was irradiated at a required ceiling temperature using maximum power for the stipulated time. Then it was cooled to ambient temperature with gas jet cooling.

General Procedure for the Preparation of Alkylsubstituted Propargylamines.

To a microwave vial equipped with magnetic stir bar was added amine (2.6 or 3.0 mmol), aldehyde (2.0 mmol), acetylene (3.2 mmol), CuCl (0.2 mmol), CuCl₂ (0.2 mmol) and water (3.0 mL). The microwave vial was flushed with argon. The reaction vessel was then sealed and irradiated in a cavity of CEM-Discover microwave reactor at 100 W for 25 min at a ceiling temperature of 110°C. The resulting reaction mixture was extracted with EtOAc (20mL). Organic phase was dried over anhydrous Na₂SO₄ and the solvent was removed under reduced pressure. The residue was then loaded directly onto a column and flashed on silica gel (10–15% EtOAc in heptane) to afford the product as a yellowish oil. The identity and purity of the products were confirmed by ^1H , ^{13}C NMR, and HRMS.

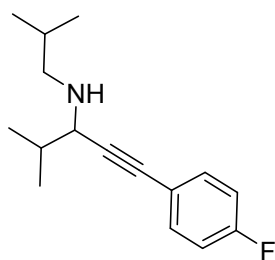
Spectroscopic data of Propargylamines.

***N*-(2-methoxyethyl)-1-(4-propylphenyl)undec-1-yn-3-amine (4a):**



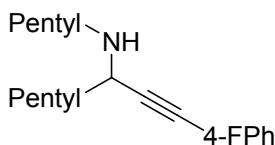
^1H NMR (300 MHz, CDCl_3): δ 7.32 (d, $J = 7.91$ Hz, 2H), 7.09 (d, $J = 7.91$ Hz, 2H), 3.58 (m, 3H), 3.36 (s, 3H), 3.15 (m, 1H), 2.80 (m, 1H), 2.56 (m, 2H), 1.63 (m, 6H), 1.28 (m, 10H), 0.90 (m, 6H). ^{13}C NMR (75,5 MHz, CDCl_3) δ 142.6, 131.6, 128.4, 120.7, 90.3, 83.9, 72.2, 58.7, 51.0, 47.0, 37.9, 36.2, 31.9, 29.6, 29.5, 29.3, 26.2, 24.4, 22.7, 14.1, 13.8. HRMS (EI) ($[\text{M}+\text{H}]^+$) Calcd. for $\text{C}_{23}\text{H}_{37}\text{NO}$: 344.2875, found 344.2884.

1-(4-Fluorophenyl)-*N*-isobutyl-4-methylpent-1-yn-3-amine (4b):



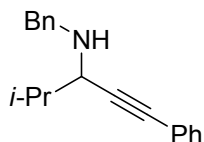
^1H NMR (300 MHz, CDCl_3): δ 7.43 (m, 2H), 7.24 (m, 2H), 2.58 (brs, 1H), 2.51 (m, 1H), 2.38 (m, 1H), 1.85 (m, 1H), 1.66 (m, 1H), 1.01 (m, 6H), 0.88 (m, 6H). ^{13}C NMR (75,5 MHz, CDCl_3) δ 162.8 (d, $J = 250.8$ Hz), 133.5, 129.3 (d, $J = 8.2$ Hz), 123.8 (d, $J = 3.84$ Hz), 115.4 (d, $J = 20.9$ Hz), 112.2 (d, $J = 15.9$ Hz), 95.9, 95.81, 57.5, 56.0, 32.9, 28.5, 20.8, 20.6, 19.8, 18.0. HRMS (EI) ($[\text{M}+\text{H}]^+$) Calcd. for $\text{C}_{16}\text{H}_{23}\text{FN}$: 248.1736, found 248.1738.

1-(4-Fluorophenyl)-*N*-pentyl-1-yn-3-amine (4c)



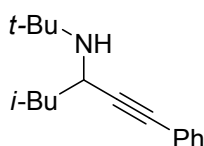
^1H NMR (CDCl_3 , 300 MHz): δ 7.38 (m, 2H), 7.38 (m, 2H), 6.98 (t, $J = 7.35$ Hz, 2H), 3.57 (m, 1H), 2.88 (m, 1H), 2.67 (m, 1H), 1.69 (m, 2H), 1.57-1.26 (br, 15H), 0.90 (8H). ^{13}C NMR (75.5 MHz, CDCl_3): δ 163.9, 160.6, 133.5, 133.4, 119.6, 119.5, 115.6, 115.3, 90.9, 90.8, 82.6, 50.9, 47.6, 36.1, 31.7, 29.7, 29.6, 25.9, 22.6, 22.5, 14.1. HRMS (ESI) ($[\text{M}]^+$) Calcd. for $\text{C}_{19}\text{H}_{28}\text{FN}$: 289.2206, found 289.2218.

***N*-Benzyl-4-methyl-1-phenylpent-1-yn-3-amine (4d)**



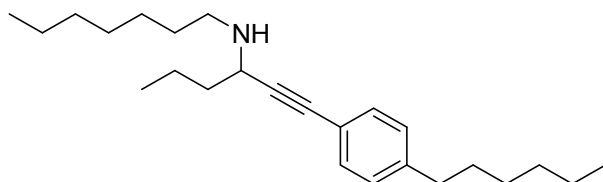
^1H NMR (300 MHz, CDCl_3): δ 7.46–7.43 (m, 2H), 7.41–7.35 (m, 3H), 7.33–7.29 (m, 5H), 4.10 (d, $J = 12.99$ Hz, 1H), 3.89 (d, $J = 12.99$ Hz, 1H), 3.40 (t, $J = 5.46$ Hz, 1H), 2.00–1.89 (m, 1H), 1.06 (d, $J = 6.78$ Hz, 6H). ^{13}C NMR (75.5 MHz, CDCl_3): δ 140.1, 131.6, 128.4, 128.3, 128.2, 127.8, 126.9, 123.5, 89.6, 84.6, 56.1, 51.7, 32.9, 19.8, 18.0. HRMS (ESI) ($[\text{M}]^+$) Calcd. for $\text{C}_{19}\text{H}_{21}\text{N}$: 263.1674, found 263.1677.

***N*-tert-butyl-5-methyl-1-phenylhex-1-yn-3-amine (4e)**



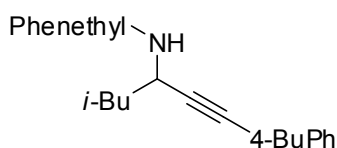
^1H NMR (300 MHz, CDCl_3): δ 7.39–7.36 (m, 2H), 7.20–7.27 (m, 3H), 3.63 (q, $J = 6.78, 8.46$ Hz, 1H), 1.97–1.88 (m, 1H), 1.64–1.54 (m, 1H), 1.49–1.44 (m, 1H), 1.20 (s, 9H), 0.95 (dd, $J = 18.9, 6.6$, 6H). ^{13}C NMR (300 MHz, CDCl_3): δ 131.3, 128.1, 127.6, 123.8, 94.4, 82.4, 51.3, 47.8, 42.7, 29.9, 25.1, 22.9, 22.1. HRMS (ESI) ($[\text{M}]^+$) Calcd for $\text{C}_{17}\text{H}_{25}\text{N}$: 243.1987, found 243.1990.

***N*-(1-(4-hexylphenyl)hex-1-yn-3-yl)heptan-1-amine (4f)**



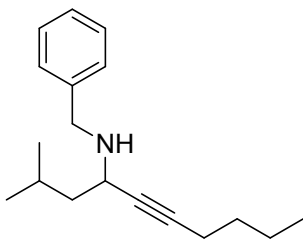
^1H NMR (300 MHz, CDCl_3) δ 7.35 (d, $J = 8.0$ Hz, 2H), 7.11 (d, $J = 8.0$ Hz, 2H), 3.57 (m, 1H), 2.89 (m, 1H), 2.64 (m, 1H), 2.58 (m, 2H), 1.72–1.43 (m, 8H), 1.28 (br, 14H), 1.13 (brs, 1H), 0.96 (m, 3H), 0.88 (m, 6H). ^{13}C NMR (75.5 MHz, CDCl_3) δ 142.9, 131.6, 128.3, 120.7, 90.7, 83.7, 50.7, 47.7, 38.5, 35.9, 31.9, 31.7, 31.3, 31.2, 30.2, 29.3, 28.9, 27.5, 22.7, 19.5, 14.1, 14.0. HRMS (EI) ($[\text{M}+\text{H}]^+$) Calcd for $\text{C}_{25}\text{H}_{42}\text{N}$: 356.3239, found 356.3245.

1-(4-Butylphenyl)-5-methyl-N-phenethylhex-1-yn-3-amine (4g):



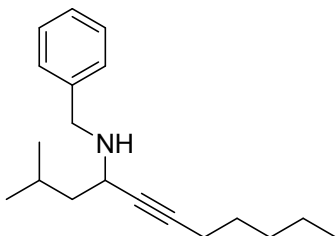
^1H NMR (CDCl_3 , 300 MHz): δ 7.33-7.05 (m, 9H), 3.61 (m, 1H), 3.26-3.16 (m, 1H), 3.01-2.76 (m, 3H), 2.58 (t, $J = 7.7$ Hz, 2H), 1.72-1.25 (m, 11H), 0.91 (t, $J = 7.2$ Hz, 6H). ^{13}C NMR (75.5 MHz, CDCl_3): δ 142.9, 140.0, 131.5, 128.8, 128.5, 128.3, 126.2, 120.5, 90.2, 83.9, 50.8, 48.6, 36.3, 35.8, 35.5, 33.4, 28.4, 22.5, 22.3, 14.0, 13.9. HRMS (ESI) ($[\text{M}]^+$) Calcd for $\text{C}_{25}\text{H}_{33}\text{N}$: 347.2613, found 347.2615.

***N*-benzyl-2-methyldec-5-yn-4-amine (4h):**



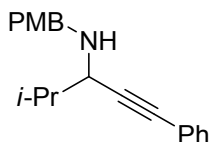
^1H NMR (300 MHz, CDCl_3) δ 7.37-7.21 (m, 5H), 4.02 (d, $J = 12.81$ Hz, 2H), 3.79 (d, $J = 12.81$ Hz, 2H), 3.39 (m, 1H), 2.23 (m, 2H), 1.89 (m, 1H), 1.57-1.26 (m, 8H), 0.9 (m, 9H). ^{13}C NMR (75.5 MHz, CDCl_3) δ 140.5, 128.4, 128.3, 126.9, 83.8, 81.7, 51.4, 48.1, 45.7, 31.2, 25.3, 23.0, 22.2, 22.0, 18.5, 13.7. HRMS (EI) ($[\text{M}+\text{H}]^+$) Calcd for $\text{C}_{18}\text{H}_{28}\text{N}$: 258.2143, found 258.2139.

***N*-benzyl-2-methylundec-5-yn-4-amine (4i):**



^1H NMR (300 MHz, CDCl_3) δ 7.37-7.24 (m, 5H), 4.02 (d, $J = 12.81$ Hz, 1H), 3.80 (d, $J = 12.81$ Hz, 1H), 3.39 (m, 1H), 2.22 (m, 2H), 1.89 (m, 1H), 1.56-1.30 (m, 8H), 0.91 (m, 9H). ^{13}C NMR (75.5 MHz, CDCl_3) δ 140.5, 128.4, 128.3, 126.9, 83.9, 81.7, 51.4, 48.1, 45.7, 31.1, 28.8, 25.2, 23.0, 18.7, 14.1. HRMS (EI) ($[\text{M}+\text{H}]^+$) Calcd for $\text{C}_{19}\text{H}_{30}\text{N}$: 272.2300, found 272.2302.

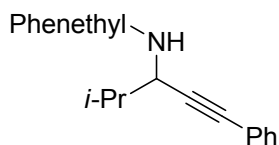
***N*-(4-methoxybenzyl)-4-methyl-1-phenylpent-1-yn-3-amine (4j):**



^1H NMR (CDCl_3 , 300 MHz): δ 7.45 (m, 2H), 7.30 (m, 4H), 6.86 (d, $J = 8.6$ Hz, 2H), 4.04 (d, $J = 12.8$ Hz, 1H), 3.86-3.77 (m, 4H), 3.39 (d, $J = 5.53$ Hz, 1H), 1.93 (m, 1H), 1.72 (br, 1H), 1.06 (d, $J = 6.87$ Hz, 6H). ^{13}C NMR (75.5 MHz, CDCl_3): δ 158.7, 132.3, 131.7, 129.6, 128.2, 127.8,

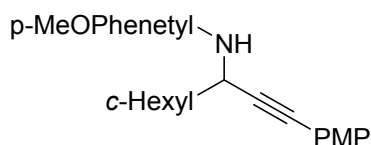
123.6, 113.8, 89.8, 84.7, 56.0, 55.2, 51.1, 32.9, 19.8, 18.0. HRMS (ESI) ($[M]^+$) Calcd for $C_{20}H_{23}NO$: 293.1780, found 293.1780.

4-Methyl-N-phenethyl-1-phenylpent-1-yn-3-amine (4k):



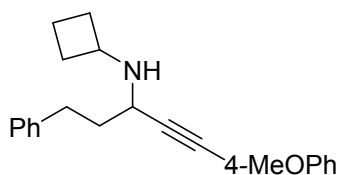
1H NMR ($CDCl_3$, 300 MHz): δ 7.40-7.19 (m, 10H), 3.44 (d, $J = 5.3$ Hz, 1H), 3.24-3.16 (m, 1H), 2.97-2.76 (m, 3H), 1.91 (m, 1H), 1.50 (br, 1H), 1.20 (m, 6H). ^{13}C NMR (75.5 MHz, $CDCl_3$): δ 140.1, 131.7, 128.7, 128.4, 128.2, 126.1, 123.5, 89.6, 84.5, 57.1, 49.2, 36.4, 32.9, 19.9, 17.8. HRMS (ESI) ($[M]^+$) Calcd for $C_{20}H_{23}N$: 277.1830, found 277.1827.

1-Cyclohexyl-N-(3-methoxyphenethyl)-3-(4-methoxyphenyl)prop-2-yn-1-amine (4l):



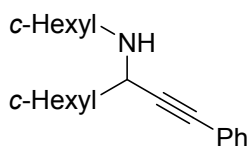
1H NMR ($CDCl_3$, 300 MHz): δ 7.33 (d, $J = 8.6$ Hz, 2H), 7.20 (m, 1H), 6.94-6.73 (m, 5H), 3.85 (s, 1H), 3.79 (s, 3H), 3.77 (s, 3H), 3.41 (d, $J = 5.6$ Hz, 1H), 3.24-3.15 (m, 1H), 2.96-2.72 (m, 3H), 1.85-1.54 (m, 7H), 1.28-1.11 (m, 5H). ^{13}C NMR (75.5 MHz, $CDCl_3$): δ 159.7, 159.2, 141.8, 133.0, 130.6, 129.4, 121.1, 115.7, 114.4, 113.8, 113.7, 111.5, 88.5, 84.3, 56.4, 55.3, 55.1, 49.0, 42.7, 36.4, 30.3, 28.6, 26.5, 26.3, 26.1. HRMS (ESI) ($[M]^+$) Calcd for $C_{25}H_{31}NO_2$: 377.2355, found 377.2361.

N-(1-(4-methoxyphenyl)-5-phenylpent-1-yn-3-yl)cyclobutanamine (4m):



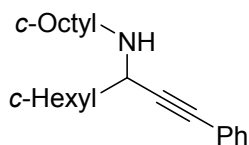
1H NMR ($CDCl_3$, 300 MHz): δ 7.36 (d, $J = 8.6$ Hz, 2H), 7.30-7.11 (m, 5H), 6.8 (d, $J = 8.6$ Hz, 2H), 3.80 (s, 3H), 3.58-3.48 (m, 1H), 2.97-2.68 (m, 3H), 2.44-2.16 (m, 2H), 2.04-1.60 (m, 5H). ^{13}C NMR (75.5 MHz, $CDCl_3$): δ 159.4, 141.7, 132.9, 128.5, 128.4, 125.9, 115.4, 113.9, 89.4, 83.7, 55.3, 52.7, 48.4, 37.8, 32.4, 32.1, 31.2, 15.3. HRMS (ESI) ($[M]^+$) Calcd for $C_{22}H_{25}NO$: 319.1936, found 319.1939.

N-(1-cyclohexyl-3-phenylprop-2-ynyl)cyclohexanamine (4n):



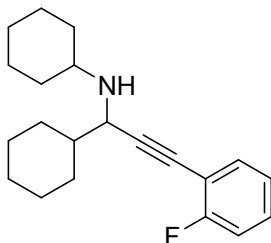
^1H NMR (CDCl_3 , 300 MHz): δ 7.42 (m, 2H), 7.29 (m, 3H), 3.52 (d, $J = 5.4$ Hz, 1H), 2.84-2.75 (m, 1H), 2.0-1.54 (m, 11H), 1.40-0.95 (m, 11H). ^{13}C NMR (75.5 MHz, CDCl_3): δ 131.7, 128.2, 127.7, 123.8, 90.8, 84.0, 54.4, 52.9, 43.0, 34.5, 32.5, 30.5, 28.3, 26.6, 26.3, 26.2, 26.1, 25.2, 24.8. HRMS (ESI) ($[\text{M}]^+$) Calcd for $\text{C}_{21}\text{H}_{29}\text{N}$: 295.2300, found 295.2301.

***N*-(1-cyclohexyl-3-phenylprop-2-ynyl)cyclooctanamine (4o):**



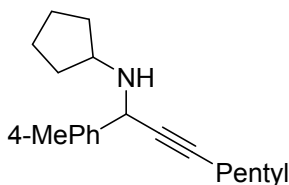
^1H NMR (CDCl_3 , 300 MHz): δ 7.40 (m, 2H), 7.28 (m, 3H), 3.46 (d, $J = 5.4$ Hz, 1H), 3.1 (m, 1H), 1.87-0.85 (m, 34H). ^{13}C NMR (75.5 MHz, CDCl_3): δ 131, 128.2, 127.7, 123.8, 90.8, 84.0, 55.3, 53.5, 43.0, 34.5, 30.8, 30.5, 28.6, 27.6, 27.2, 26.6, 26.3, 26.1, 25.8, 24.3, 23.9. HRMS (ESI) ($[\text{M}]^+$) Calcd for $\text{C}_{23}\text{H}_{33}\text{N}$: 323.2613, found 323.2616.

***N*-(1-cyclohexyl-3-(2-fluorophenyl)prop-2-ynyl)cyclohexanamine (4p)**



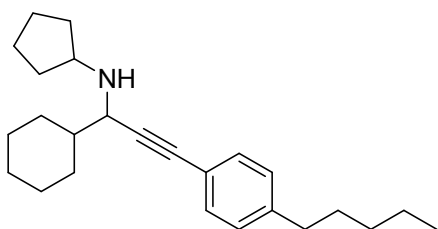
^1H NMR (300 MHz, CDCl_3) δ 7.41 (m, 1H), 7.23 (m, 1H), 7.07 (m, 2H), 3.56 (d, $J = 4.89$ Hz, 1H), 2.82 (m, 1H), 1.99-1.68 (m, 12H), 1.36-1.15 (m, 9H), 1.04 (m, 1H). ^{13}C NMR (75.5 MHz, CDCl_3) δ 162.9 (d, $J = 250.8$ Hz), 133.5, 129.4 (d, $J = 7.7$ Hz), 123.8, 115.4 (d, $J = 20.9$ Hz), 112.1 (d, $J = 15.9$ Hz), 95.8, 95.7, 54.6, 53.1, 42.6, 34.2, 32.2, 30.5, 29.2, 28.1, 26.5, 26.3, 25.6, 25.2, 24.8. HRMS (EI) ($[\text{M}+\text{H}]^+$) Calcd for $\text{C}_{21}\text{H}_{29}\text{FN}$: 314.2206, found 314.2209.

***N*-(1-*p*-tolyl-2-ynyl)cyclopentanamine (4q):**



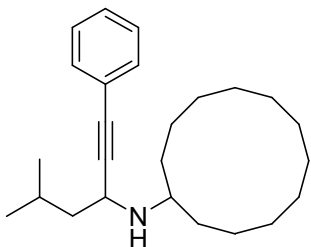
^1H NMR (CDCl_3 , 300 MHz): δ 7.41 (d, $J = 7.9\text{Hz}$, 2H), 7.14 (d, $J = 7.7\text{Hz}$, 2H), 4.60 (br, 1H), 3.32 (m, 1H), 2.44 (br, 1H), 2.32 (s, 3H), 2.30 (t, $J = 6.3\text{ Hz}$, 2H), 1.87-1.23 (m, 15H), 0.89 (t, $J = 6.5\text{Hz}$, 3H). ^{13}C NMR (75.5 MHz, CDCl_3): δ 129.9, 129.8, 129.1, 127.7, 85.9, 79.6, 57.1, 52.7, 32.9, 32.4, 31.1, 28.5, 24.1, 22.2, 21.1, 18.9, 14.0. HRMS (ESI) ($[\text{M}]^+$) Calcd for $\text{C}_{20}\text{H}_{29}\text{N}$: 283.2300, found 283.2309.

***N*-(1-cyclohexyl-3-(4-pentylphenyl)prop-2-ynyl)cyclopentanamine (4r):**



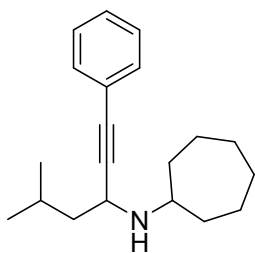
^1H NMR (300 MHz, CDCl_3) δ 7.37 (m, 2H), 7.11 (m, 2H), 3.43 (m, 1H), 3.38 (d, $J = 5.3\text{ Hz}$, 1H), 1.92-1.52 (m, 13H), 1.40-1.19 (m, 12H), 0.88 (m, 3H). ^{13}C NMR (75.5 MHz, CDCl_3) δ 142.8, 132.1, 131.6, 128.3, 120.9, 90.1, 84.1, 57.6, 55.0, 43.1, 35.8, 34.0, 32.6, 31.4, 31.0, 30.9, 30.5, 28.5, 26.6, 26.4, 26.2, 24.2, 22.6, 14.1. HRMS (EI) ($[\text{M}+\text{H}]^+$) Calcd for $\text{C}_{25}\text{H}_{38}\text{N}$: 352.2926, found 352.2922.

***N*-(5-methyl-1-phenylhex-1-yn-3-yl)cyclododecanamine (4s):**



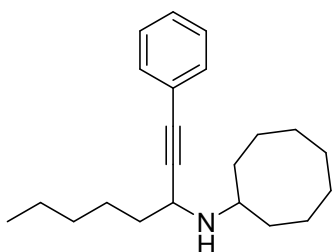
^1H NMR (300 MHz, CDCl_3) δ 7.39 (d, $J = 3.51$, 2H), 7.38–7.26 (m, 3H), 3.69 (t, $J = 6.78\text{ Hz}$, 1H), 3.09 (bs, 1H), 2.01–1.92 (m, 1H), 1.71–1.64 (m, 1H), 1.58–1.52 (m, 2H), 1.43–1.30 (m, 24H), 0.95 (q, $J = 3.39, 6.78\text{ Hz}$, 6H). ^{13}C NMR (300 MHz, CDCl_3): δ 131.5, 128.1, 127.7, 123.6, 92.0, 83.2, 51.6, 46.5, 45.8, 30.2, 29.2, 25.3, 24.6, 24.6, 24.1, 23.9, 23.8, 23.1, 22.7, 22.4, 22.1, 21.6, 20.5. HRMS (ESI) ($[\text{M}]^+$) Calcd for $\text{C}_{25}\text{H}_{39}\text{N}$: 353.3083, found 353.3099.

***N*-(5-methyl-1-phenylhex-1-yn-3-yl)cycloheptanamine (4t):**



^1H NMR (300 MHz, CDCl_3) δ 7.42–7.39 (m, 2H), 7.30–7.27 (m, 3H), 3.67 (t, $J = 6.99$ Hz, 1H), 3.09–3.06 (m, 1H), 2.01–1.94 (m, 1H), 1.89–1.79 (m, 3H), 1.54–1.36 (m, 12H), 0.95 (q, $J = 3.57, 6.6, 6.6$ Hz, 6H). ^{13}C NMR (300 MHz, CDCl_3): δ 131.6, 128.2, 127.7, 123.6, 91.7, 83.2, 56.3, 46.3, 45.9, 36.6, 33.2, 28.4, 28.1, 25.3, 24.6, 24.1, 23.1, 22.1. HRMS (ESI) ($[\text{M}]^+$) Calcd for $\text{C}_{21}\text{H}_{31}\text{N}$: 283.2300, found 283.2303.

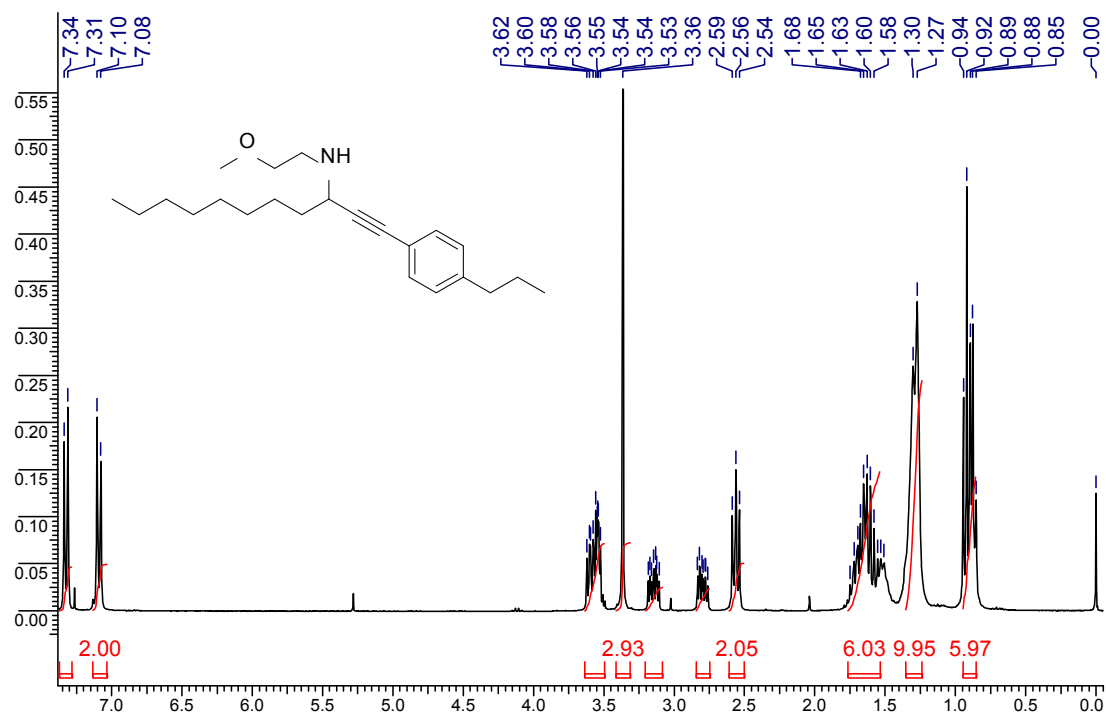
***N*-(1-Phenyl-oct-1-yn-3-yl)cyclooctanamine (4u):**



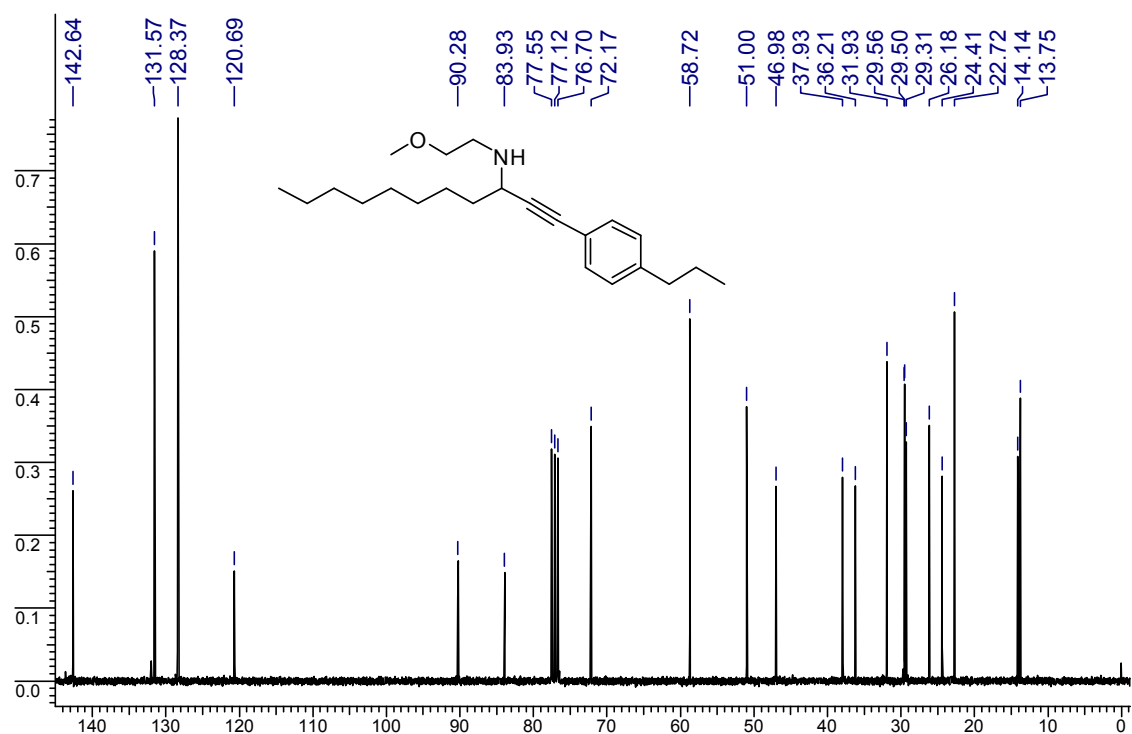
^1H NMR (300 MHz, CDCl_3) δ 7.30 (m, 2H), 7.28 (m, 3H), 3.64 (m, 1H), 3.12 (m, 1H), 1.83–1.21 (m, 22H), 0.90 (t, $J = 6.7$ Hz, 3H). ^{13}C NMR (75 MHz, CDCl_3) δ 131.7, 128.2, 127.8, 123.7, 91.7, 83.4, 55.1, 48.0, 36.6, 34.5, 31.7, 30.9, 27.6, 27.2, 26.0, 25.9, 24.3, 24.0, 22.6, 14.1. HRMS (ESI) ($[\text{M}]^+$) $\text{C}_{22}\text{H}_{33}\text{N}$, calcd 311.2613, found: 311.2622.

¹H NMR and ¹³C NMR spectra

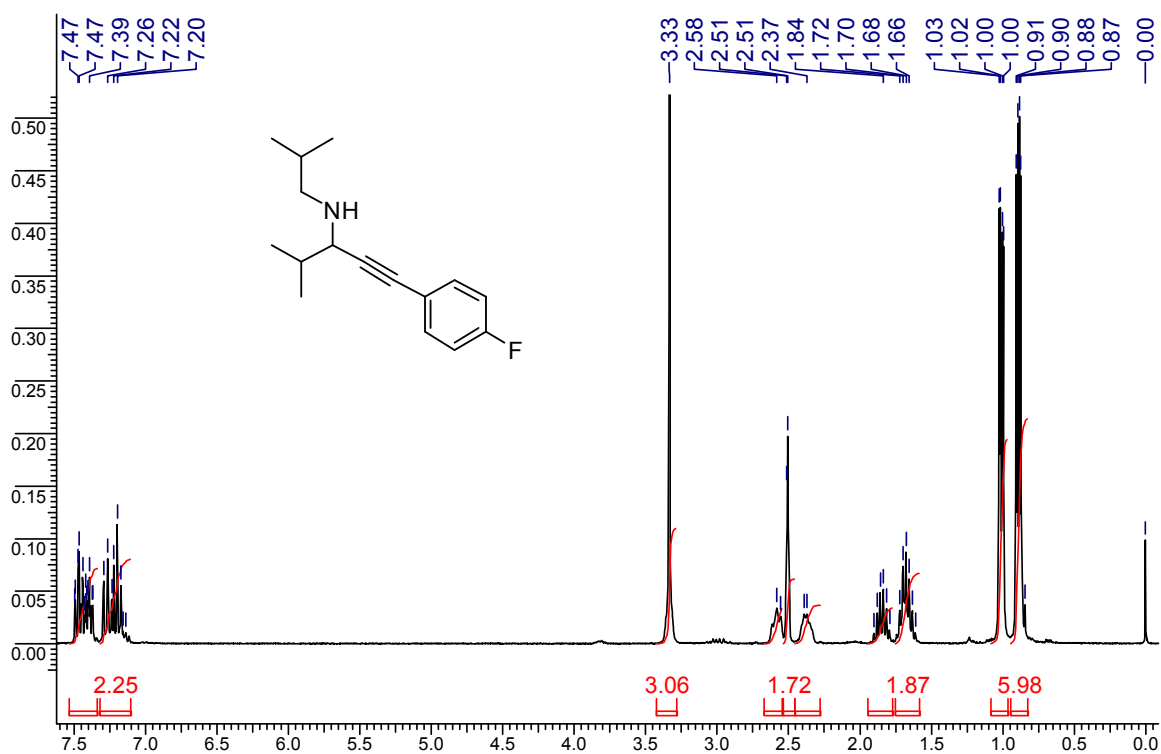
¹H NMR of *N*-(2-methoxyethyl)-1-(4-propylphenyl)undec-1-yn-3-amine (4a):



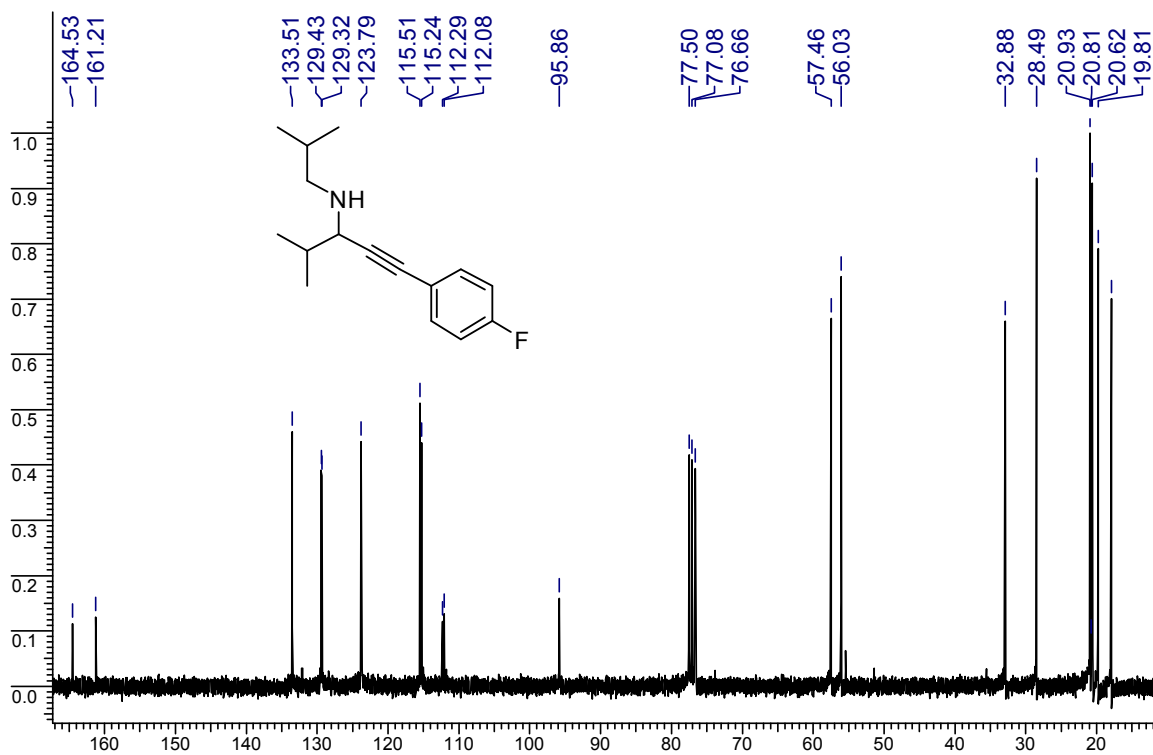
¹³C NMR of *N*-(2-methoxyethyl)-1-(4-propylphenyl)undec-1-yn-3-amine (4a):



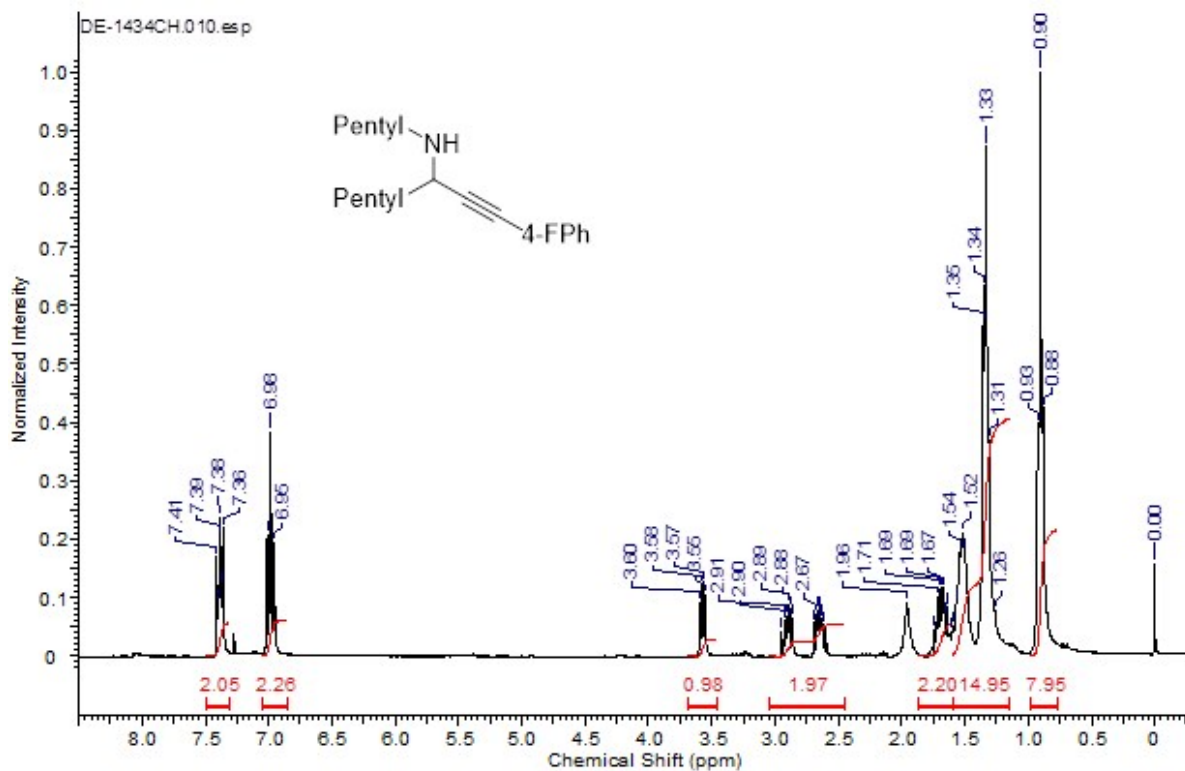
¹H NMR of 1-(4-Fluorophenyl)-*N*-isobutyl-4-methylpent-1-yn-3-amine(4b):



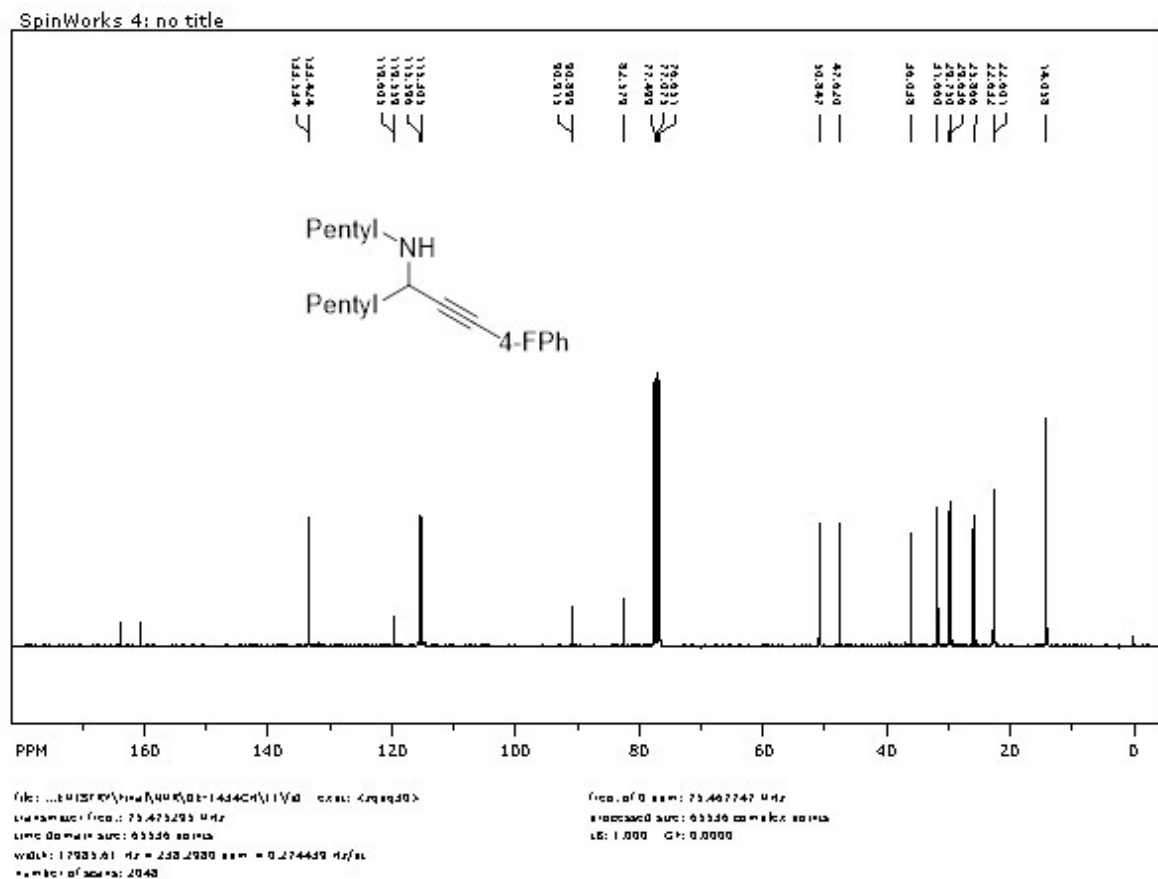
¹³C NMR of 1-(4-Fluorophenyl)-*N*-isobutyl-4-methylpent-1-yn-3-amine (4b):



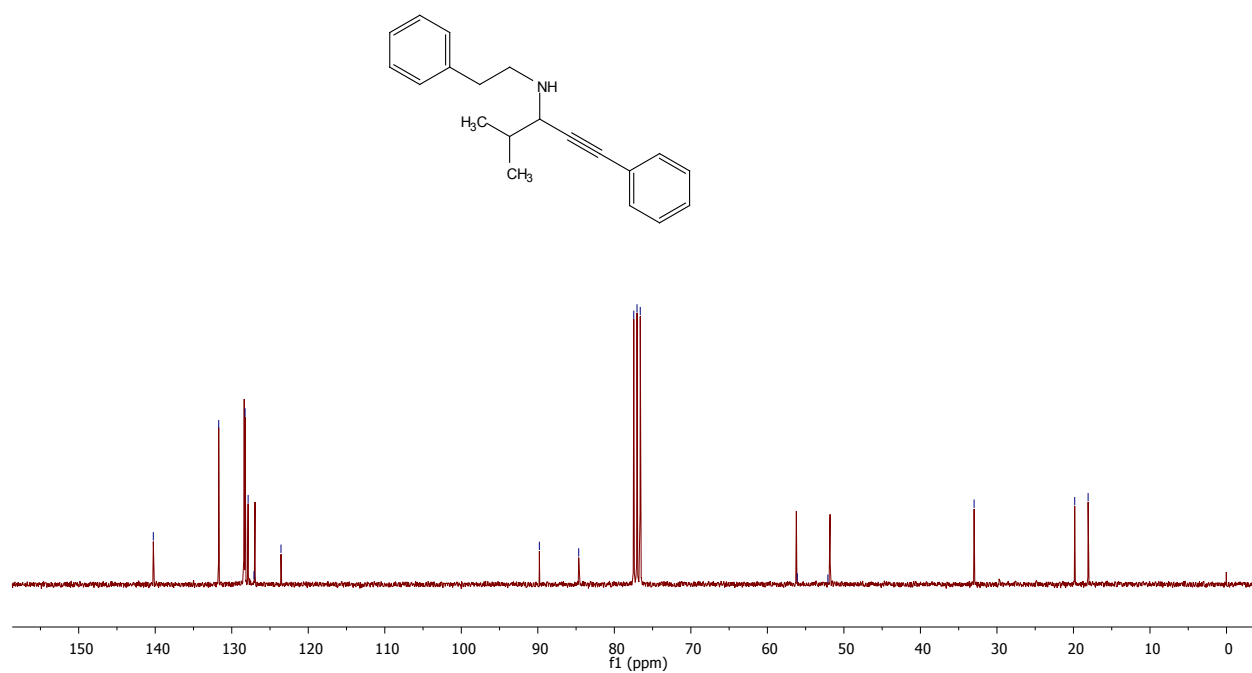
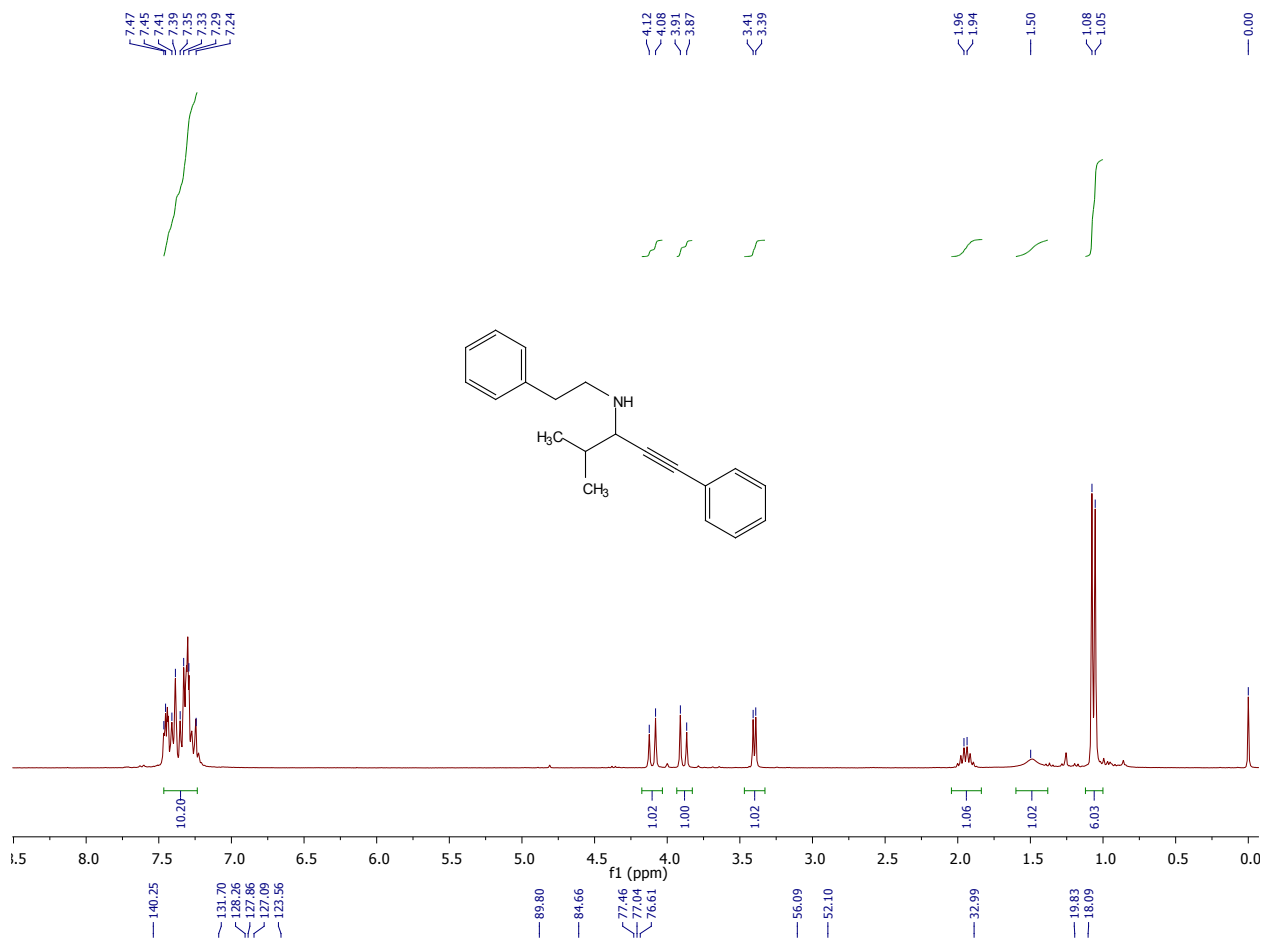
¹H NMR of 1-(4-Fluorophenyl)-N-pentyl-3-yn-1-amine (4c)



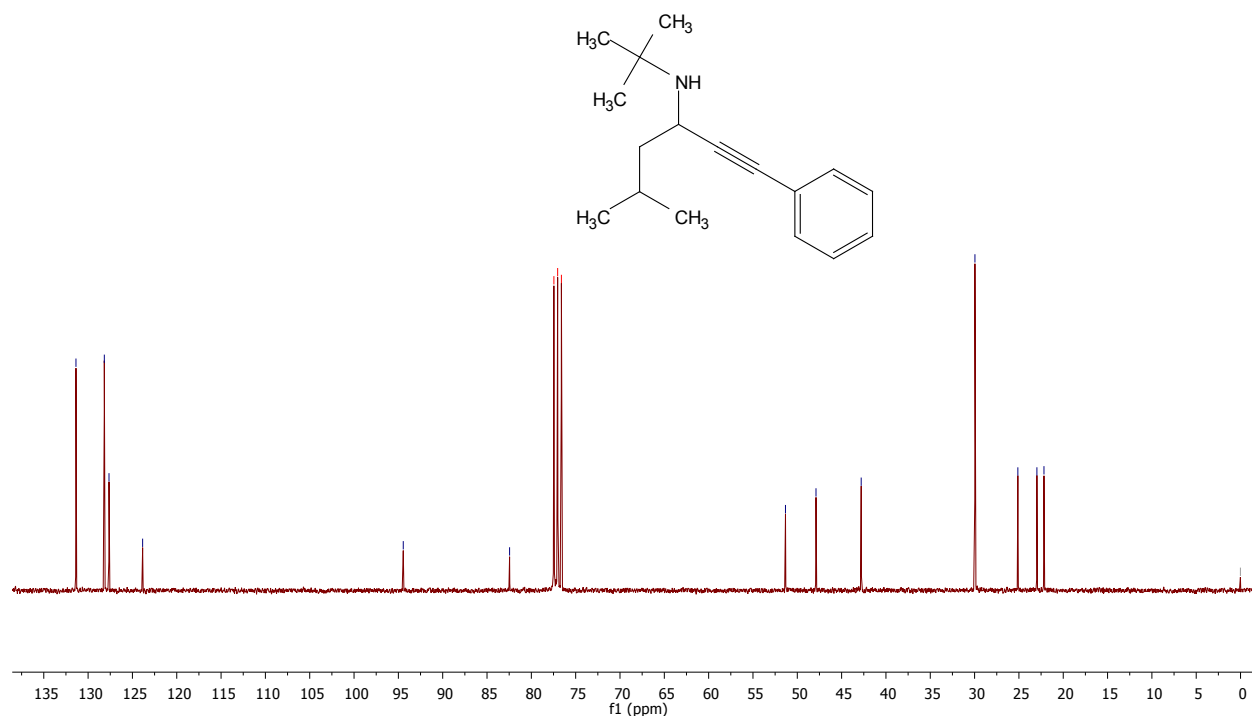
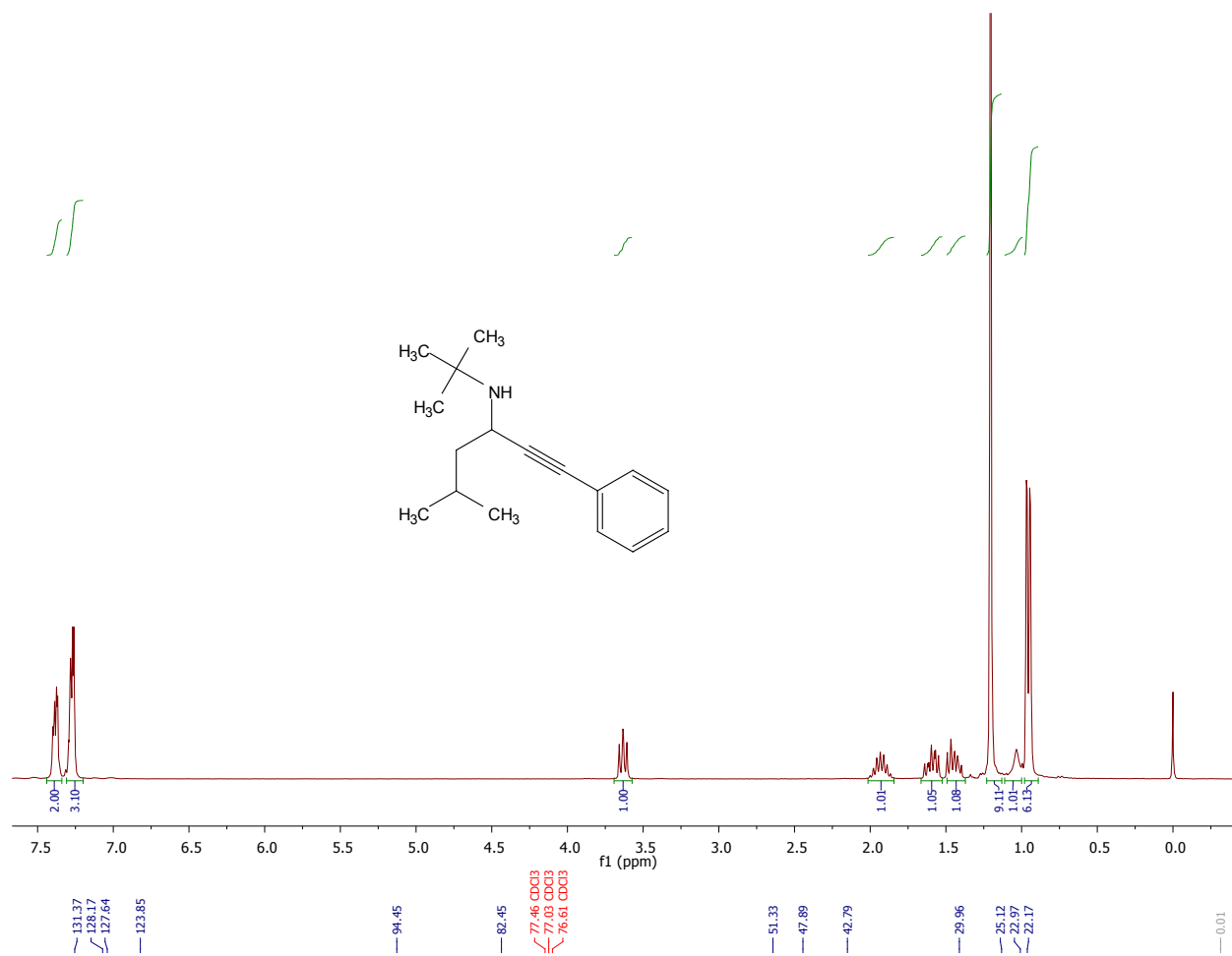
¹³C NMR of 1-(4-Fluorophenyl)-N-pentyl-3-yn-1-amine (4c)



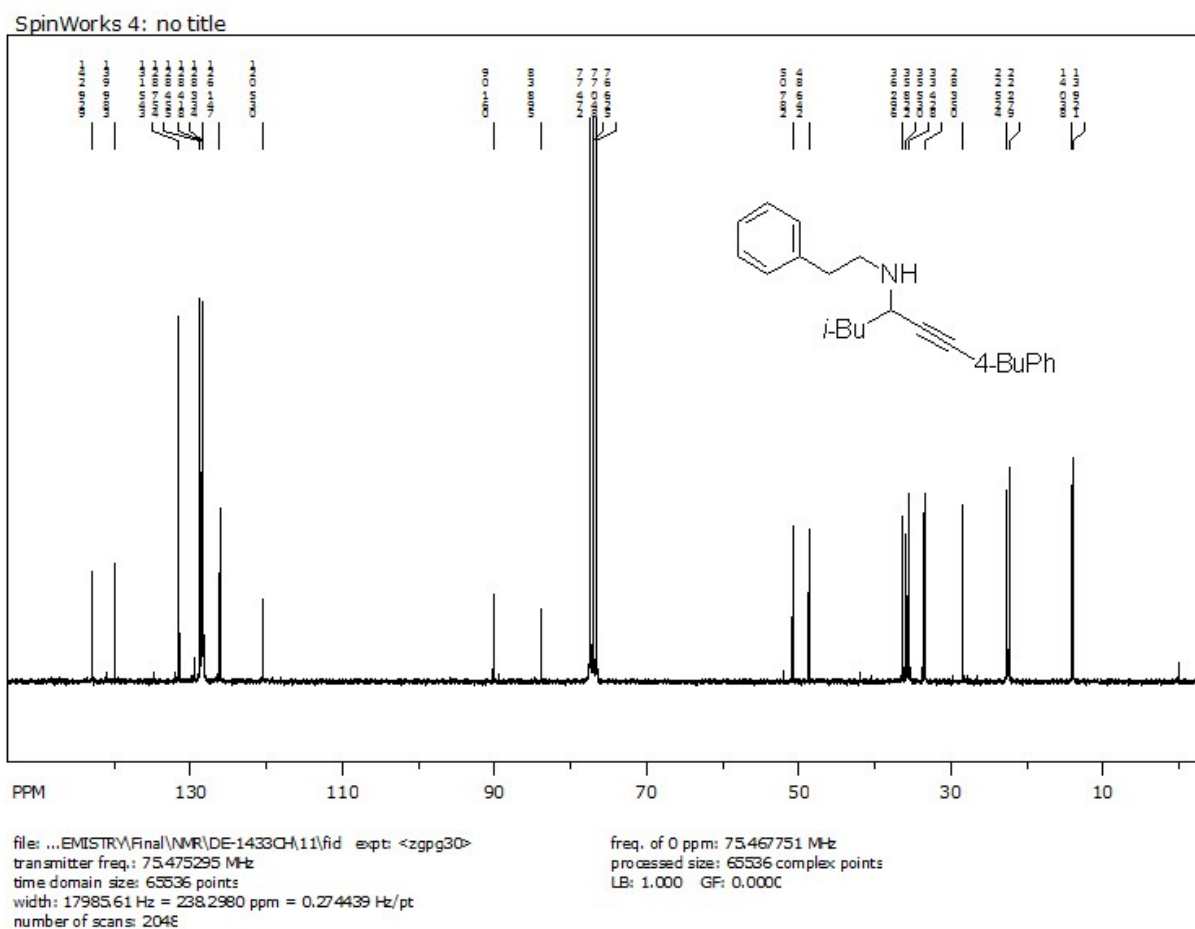
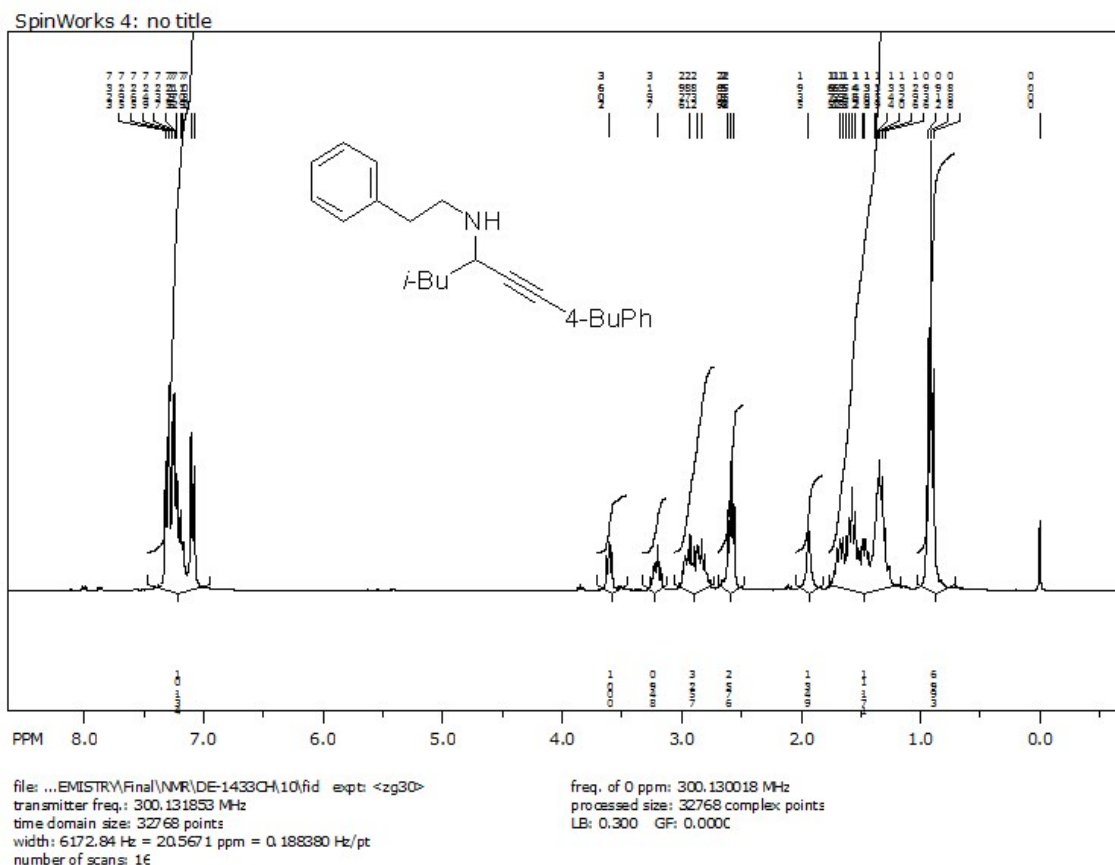
¹H and ¹³C NMR of *N*-Benzyl-4-methyl-1-phenylpent-1-yn-3-amine (4d)



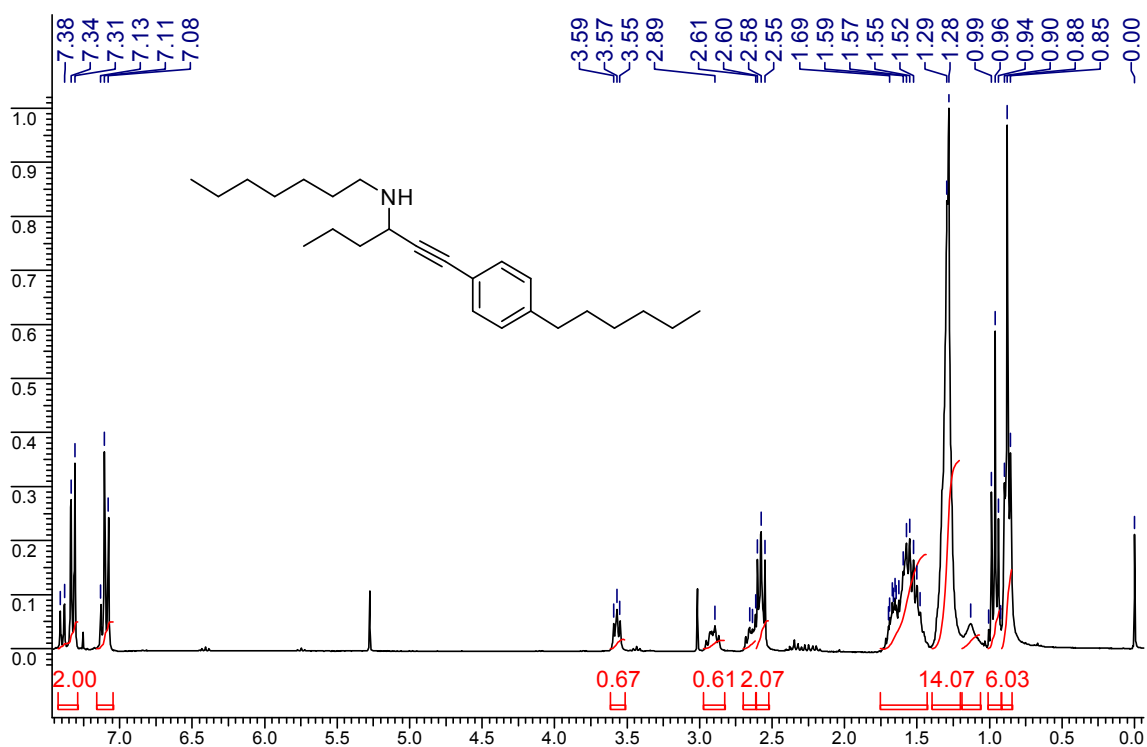
^1H and ^{13}C NMR of *N*-*tert*-butyl-5-methyl-1-phenylhex-1-yn-3-amine (4e)



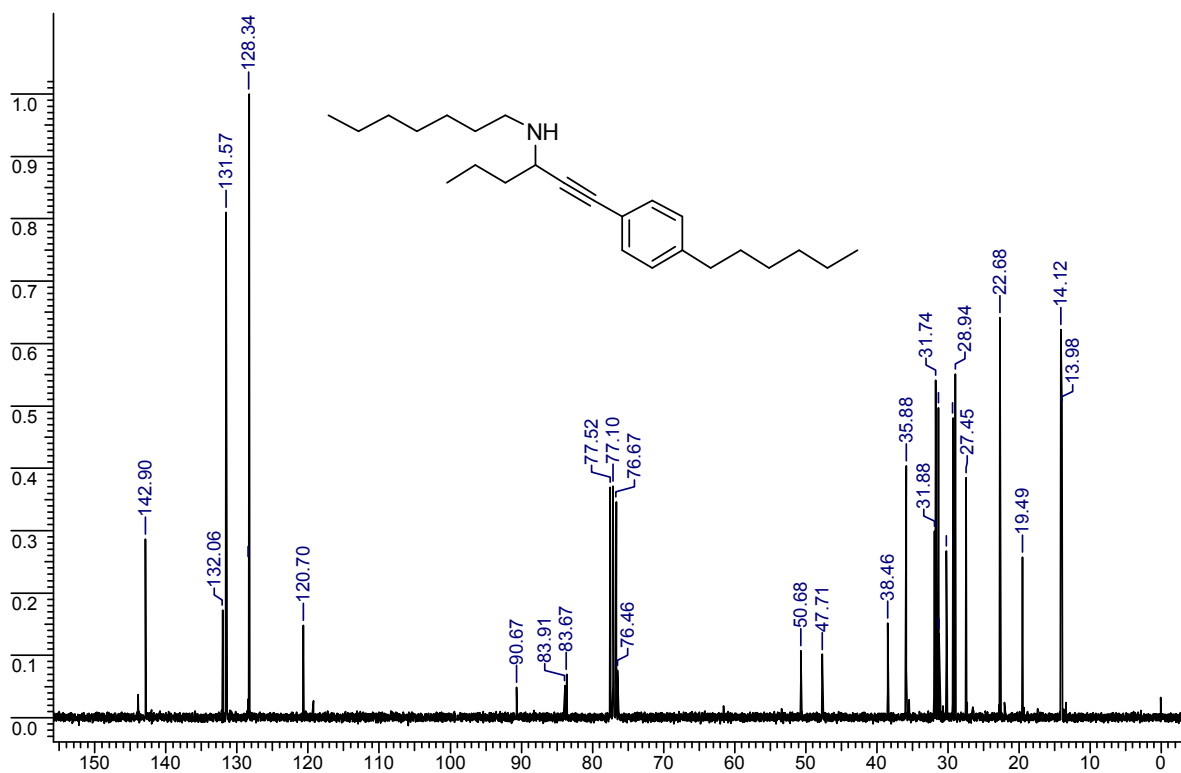
¹H and ¹³C NMR of 1-(4-Butylphenyl)-5-methyl-N-phenethylhex-1-yn-3-amine (4g)



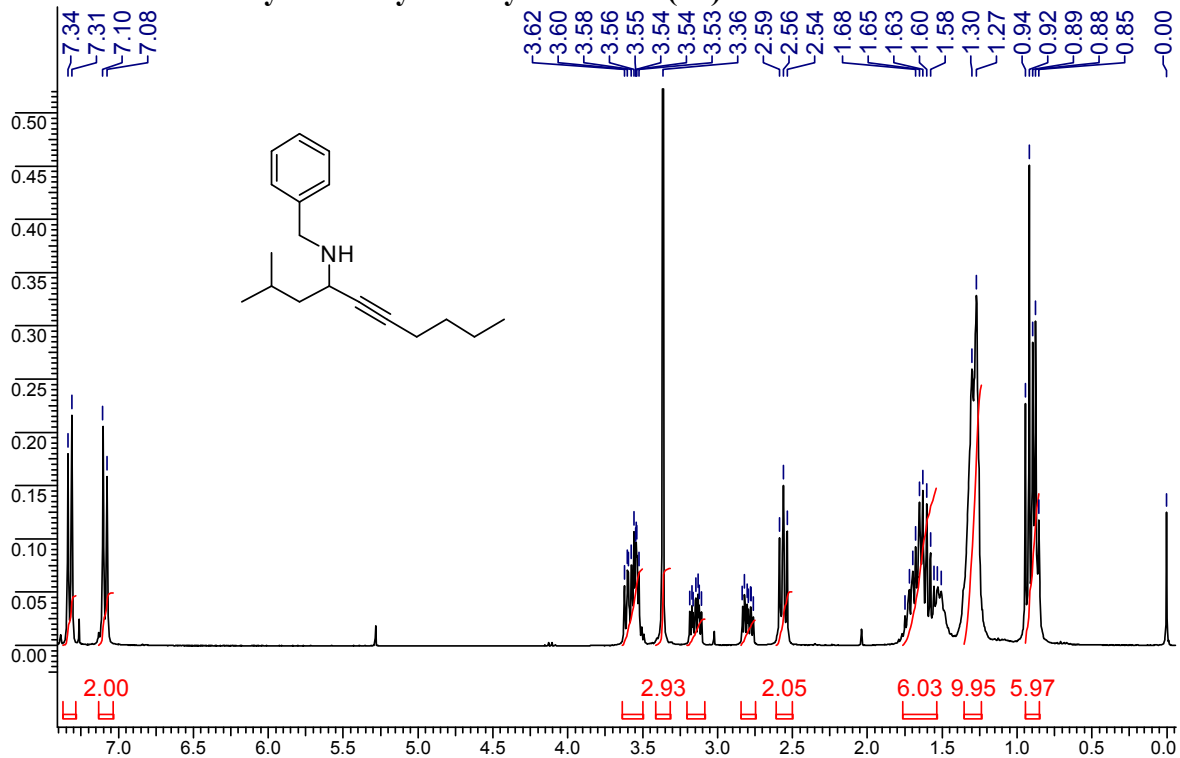
¹H NMR of *N*-(1-(4-hexylphenyl)hex-1-yn-3-yl)heptan-1-amine (4f)



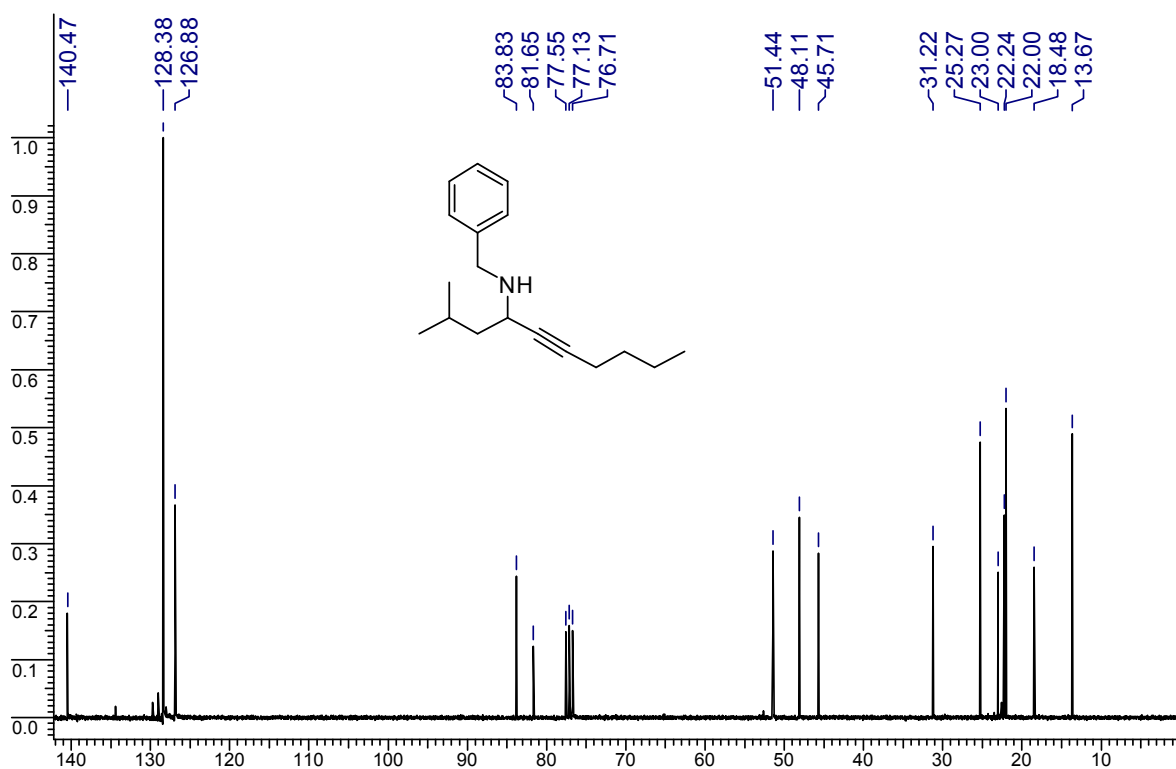
¹³C NMR of *N*-(1-(4-hexylphenyl)hex-1-yn-3-yl)heptan-1-amine (4g)



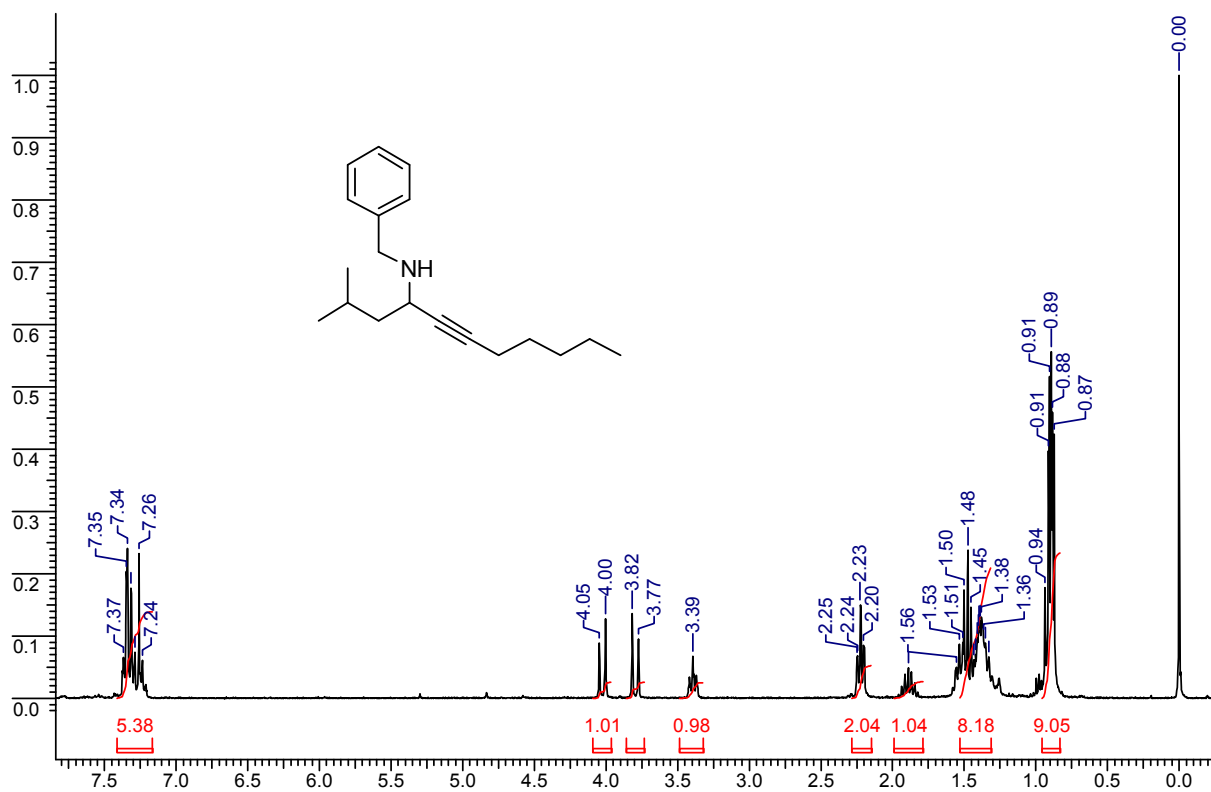
¹H NMR of *N*-benzyl-2-methyldec-5-yn-4-amine (4h):



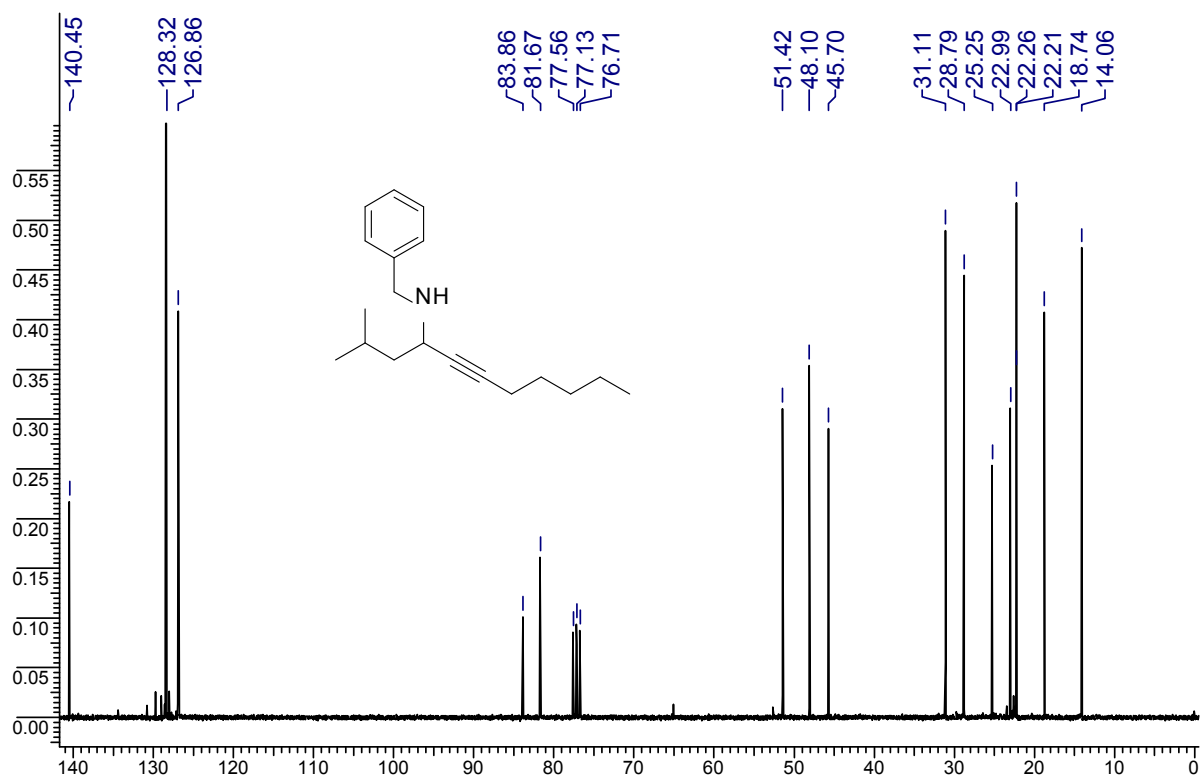
¹³C NMR of *N*-benzyl-2-methyldec-5-yn-4-amine (4h):



¹H NMR of *N*-benzyl-2-methylundec-5-yn-4-amine (4i)

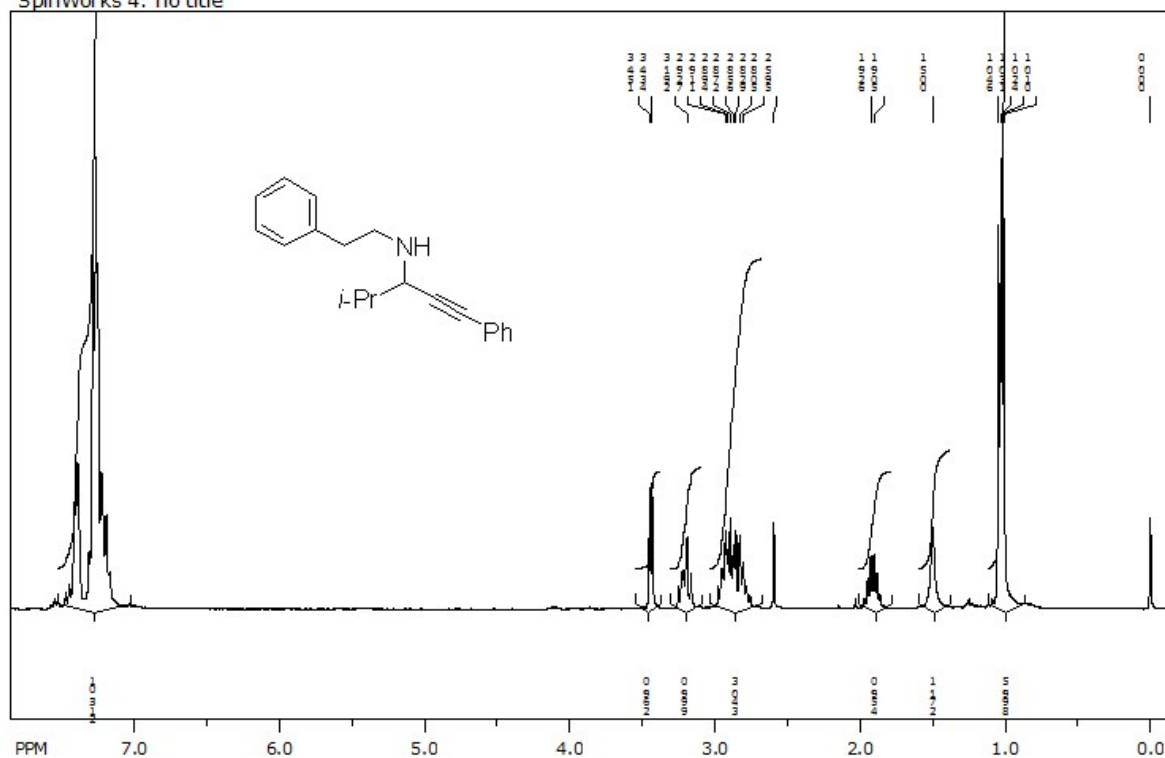


¹³C NMR of *N*-benzyl-2-methylundec-5-yn-4-amine (4i)



¹H NMR and ¹³C of 4-methyl-N-phenethyl-1-phenylpent-1-yn-3-amine (4k)

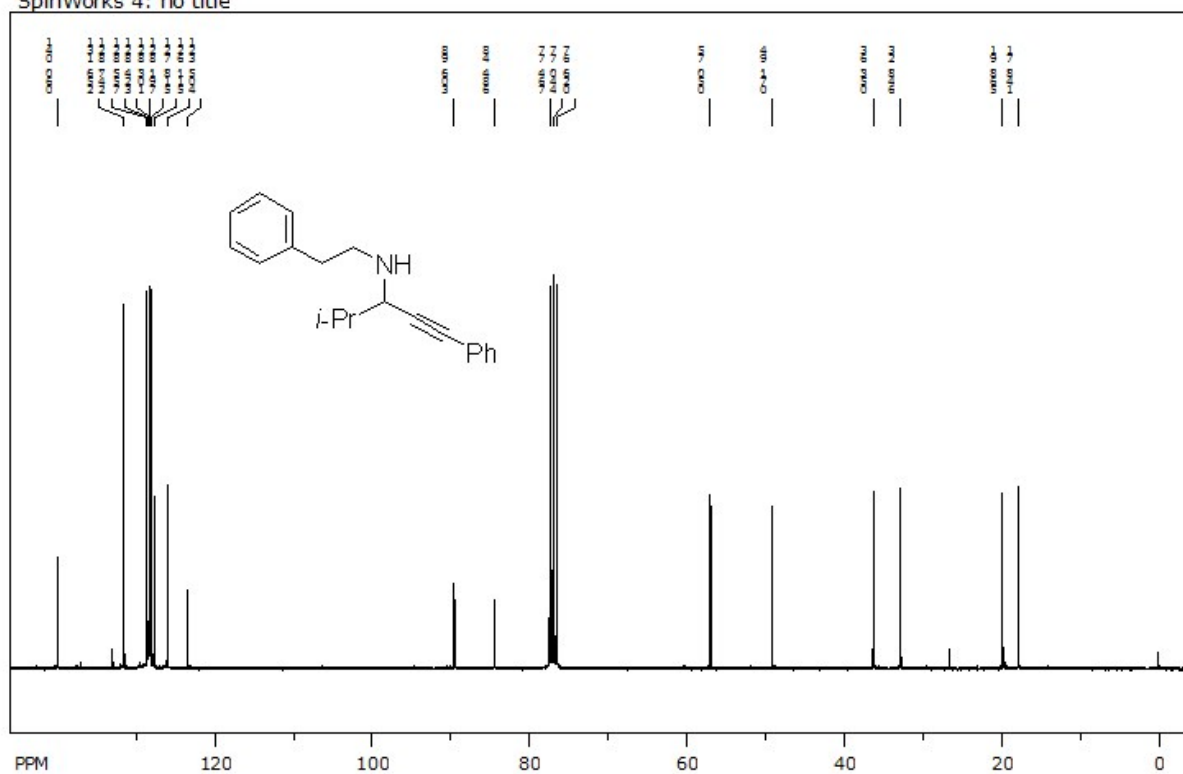
SpinWorks 4: no title



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 width: 6172.84 Hz = 20.5671 ppm = 0.188380 Hz/pt

freq. of 0 ppm: 300.130018 MHz
 processed size: 32768 complex points
 LB: 0.300 GF: 0.000C

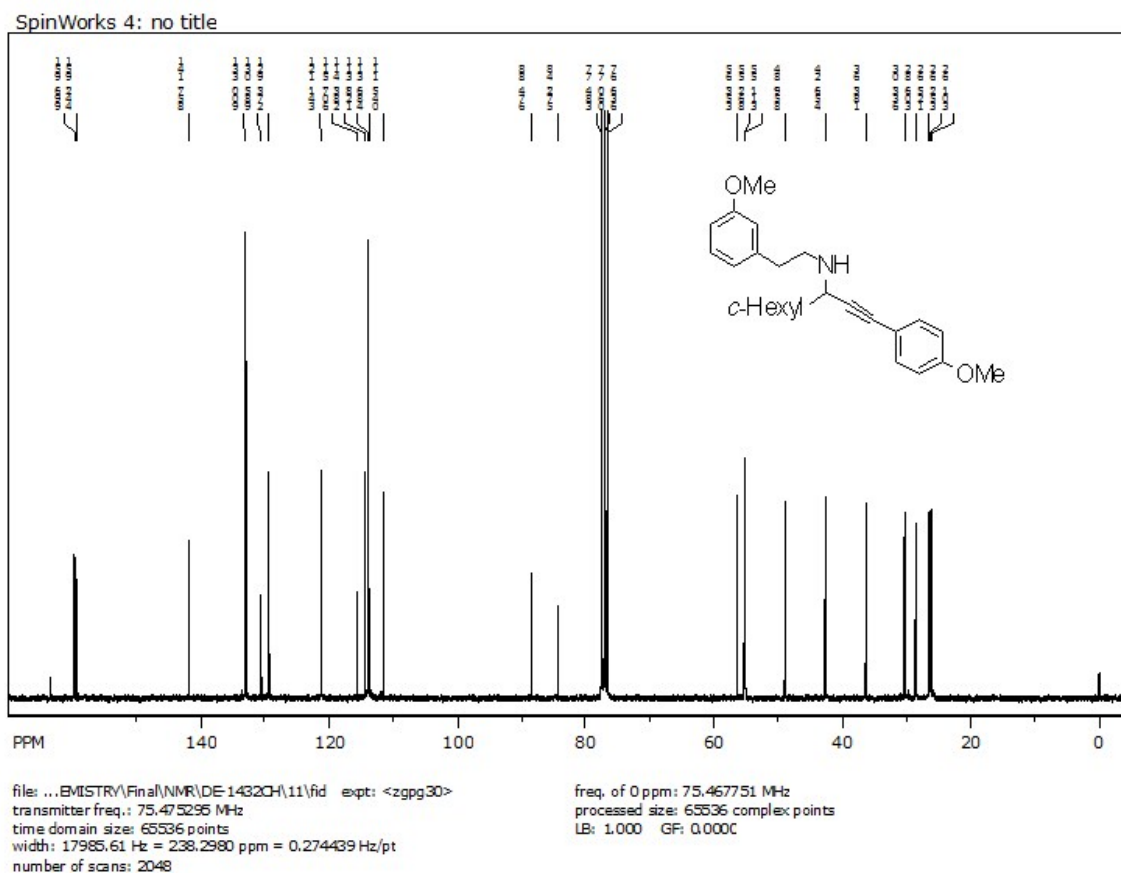
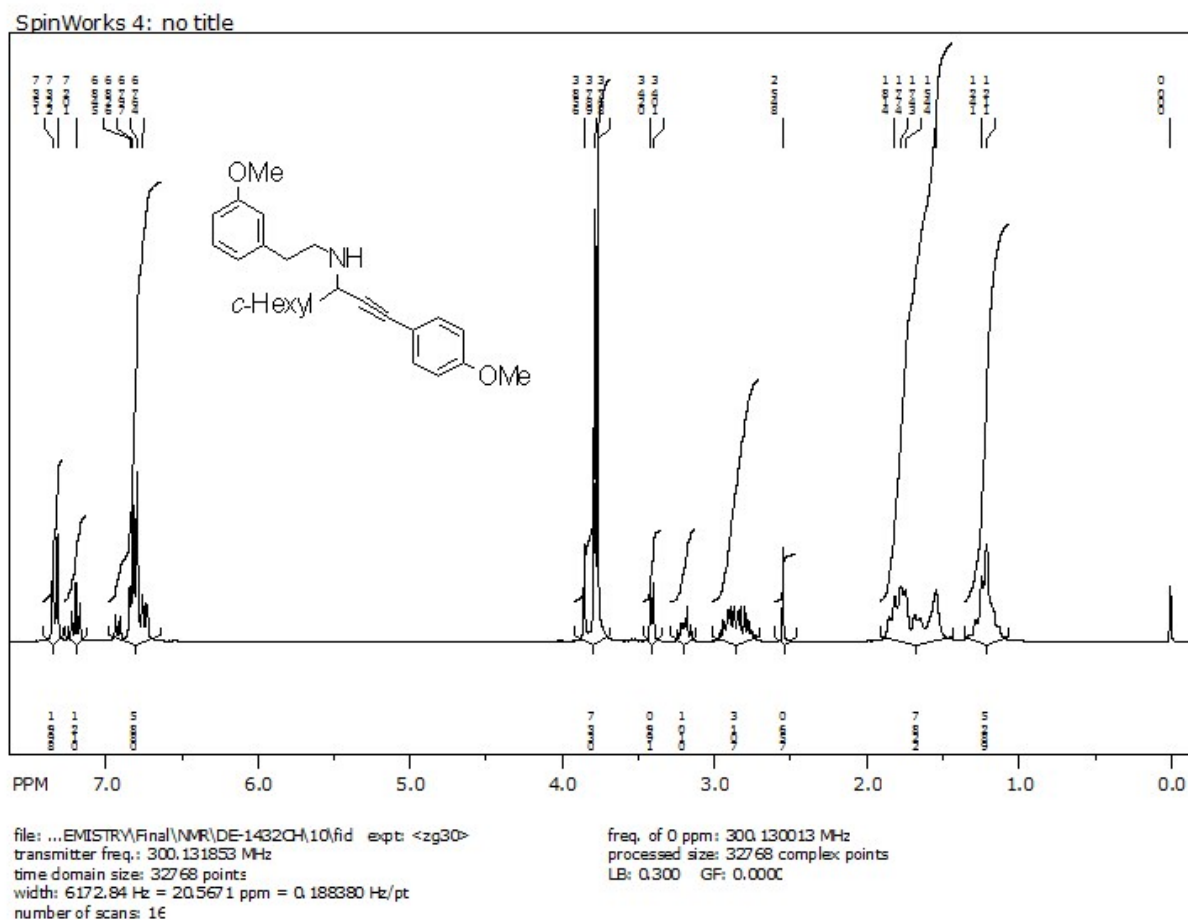
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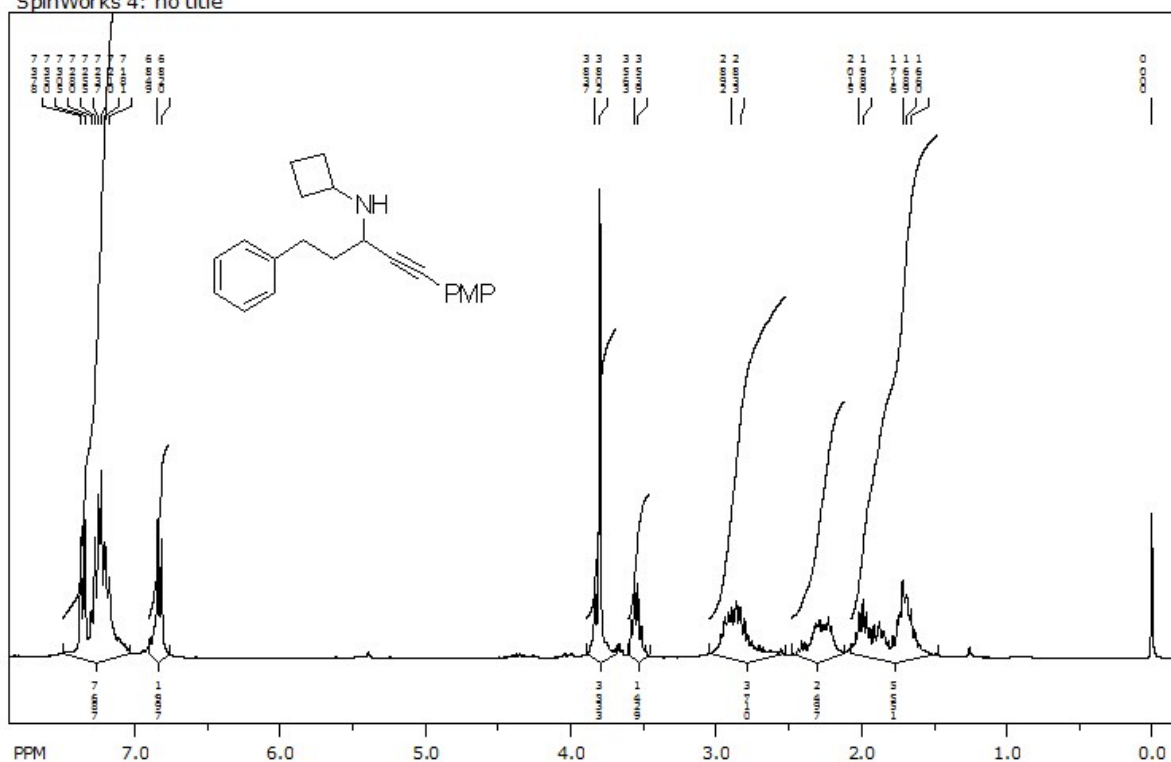
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 LB: 1.000 GF: 0.000C

¹H NMR and ¹³C of 1-Cyclohexyl-N-(3-methoxyphenethyl)-3-(4-methoxyphenyl)prop-2-yn-1-amine (4l)



¹H NMR and ¹³C of *N*-(1-(4-methoxyphenyl)-5-phenylpent-1-yn-3-yl)cyclobutanamine (4m)

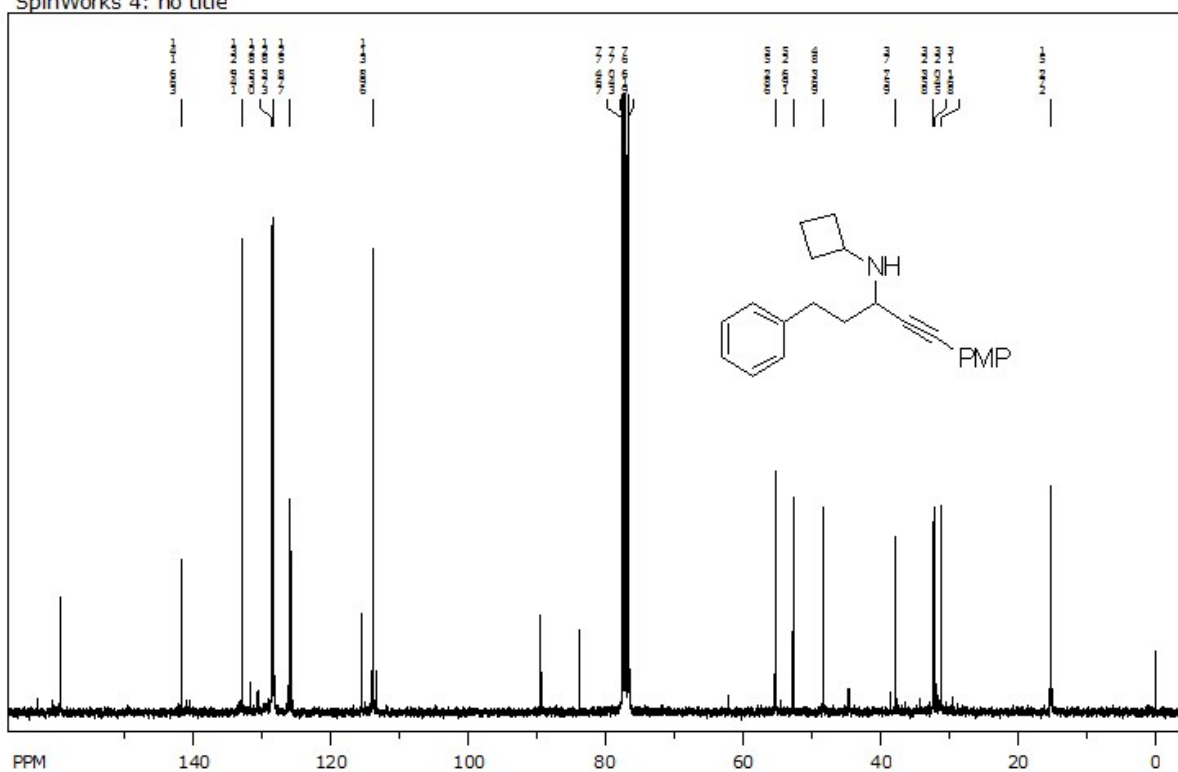
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freq. of 0 ppm: 300.130013 MHz
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 LB: 0.300 GF: 0.000C

SpinWorks 4: no title

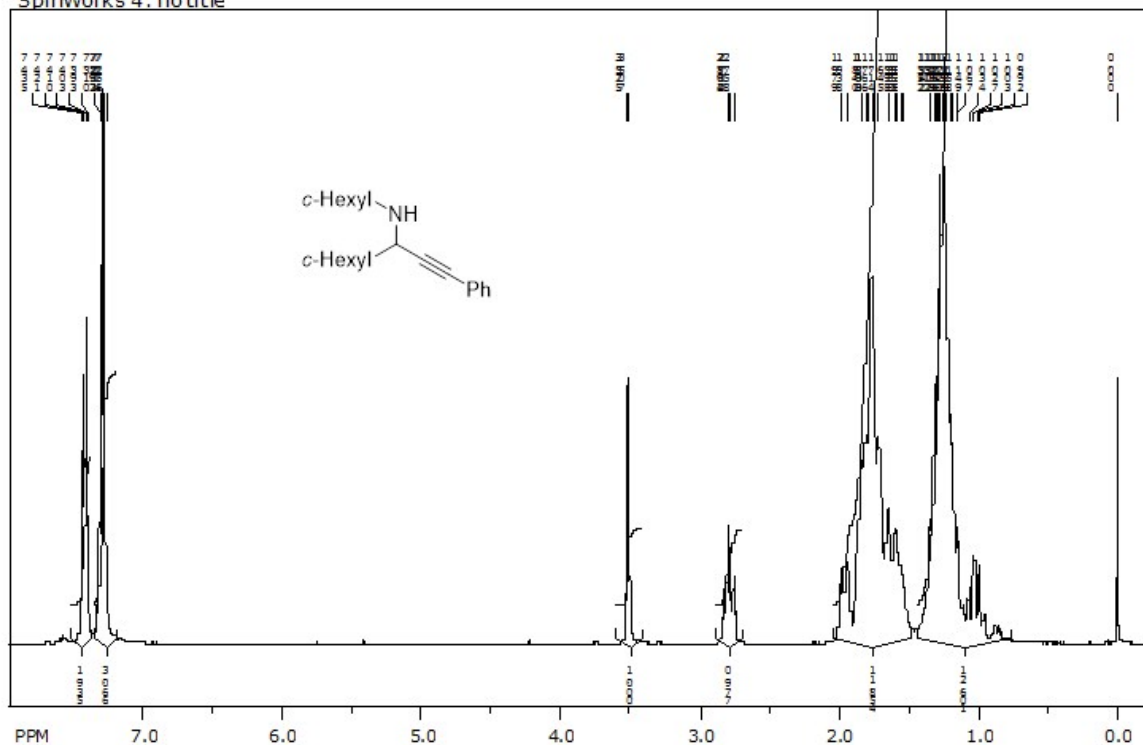


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 time domain size: 65536 points
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 number of scans: 3072

freq. of 0 ppm: 75.467751 MHz
 processed size: 65536 complex points
 LB: 1.000 GF: 0.000C

¹H NMR and ¹³C of *N*-(1-cyclohexyl-3-phenylprop-2-ynyl)cyclohexanamine (4n)

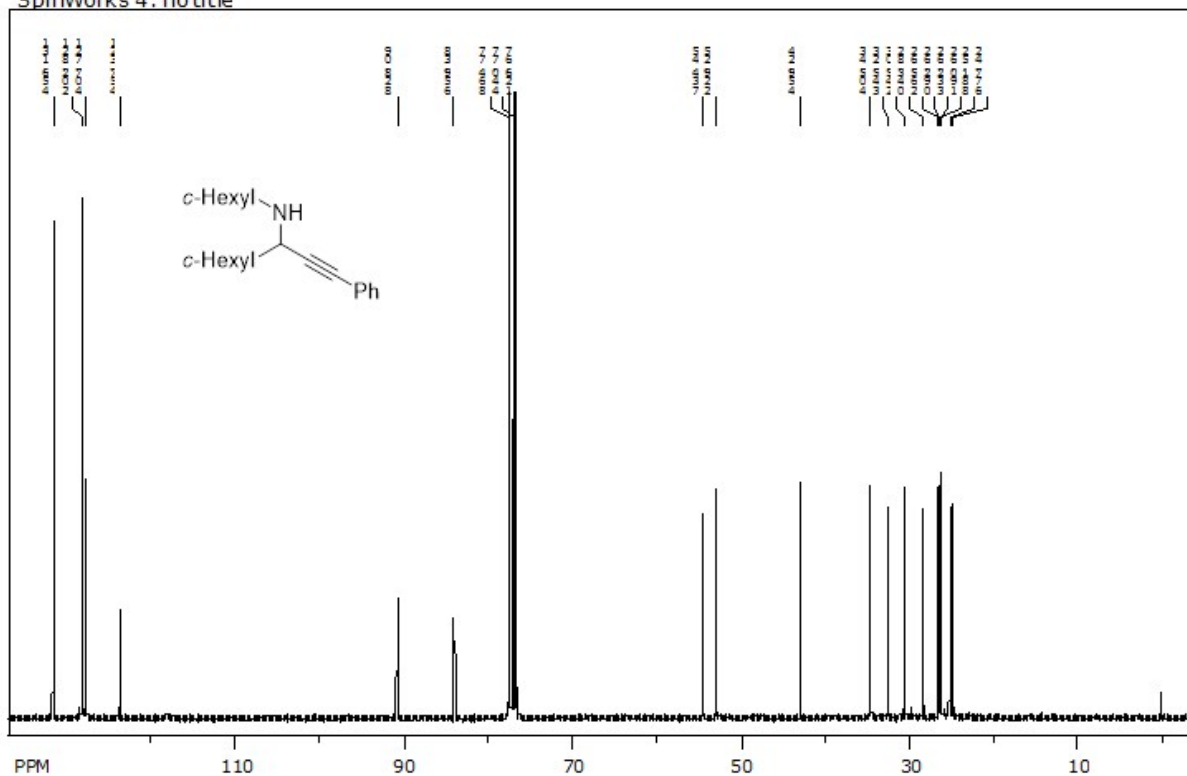
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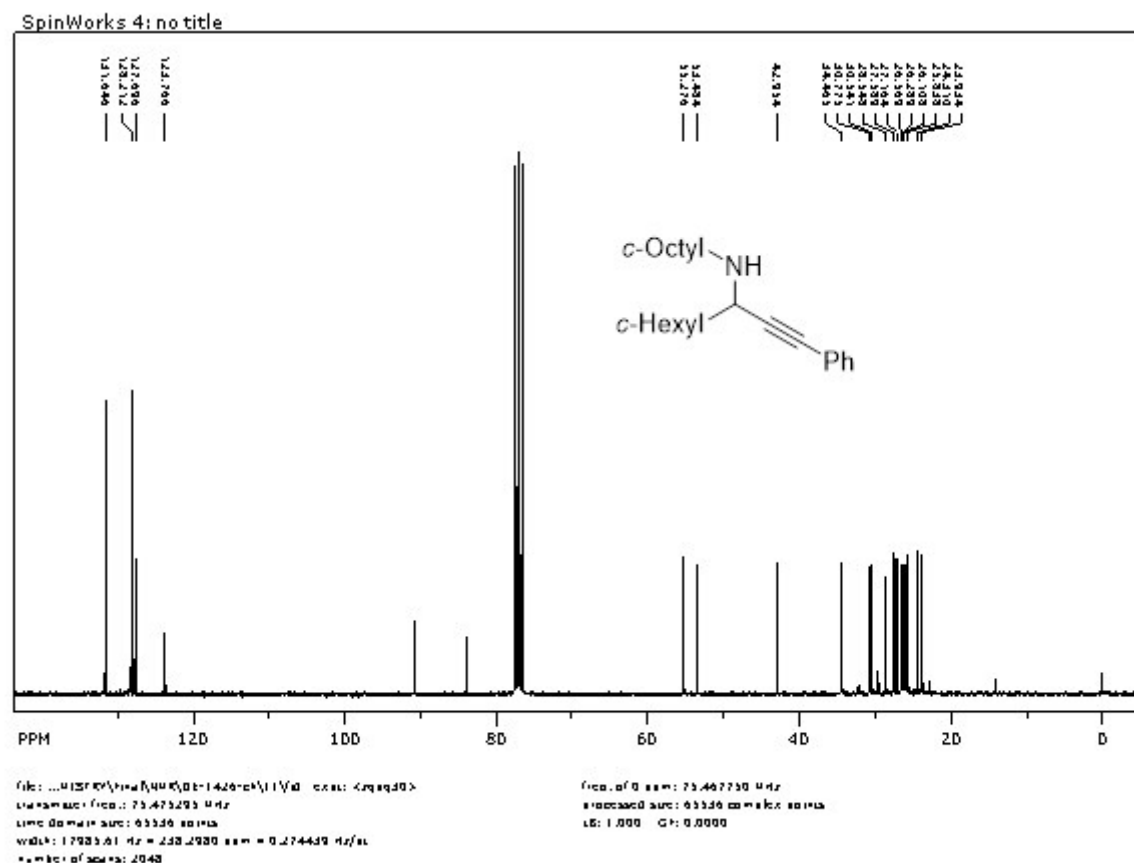
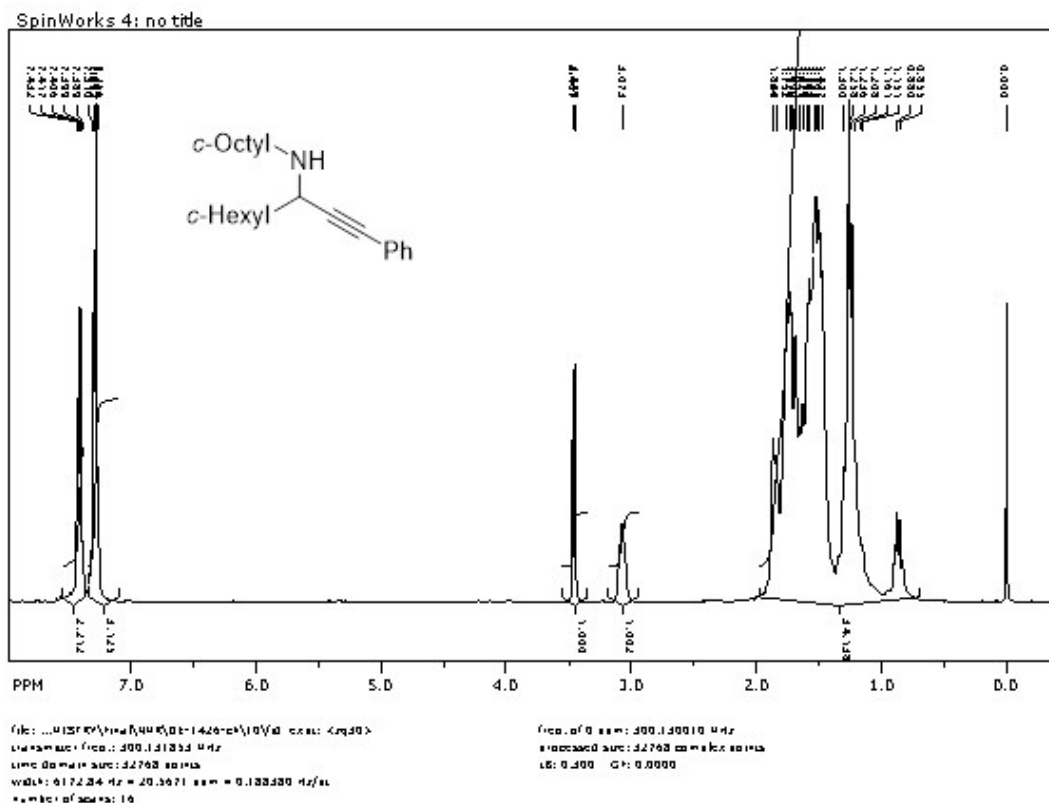
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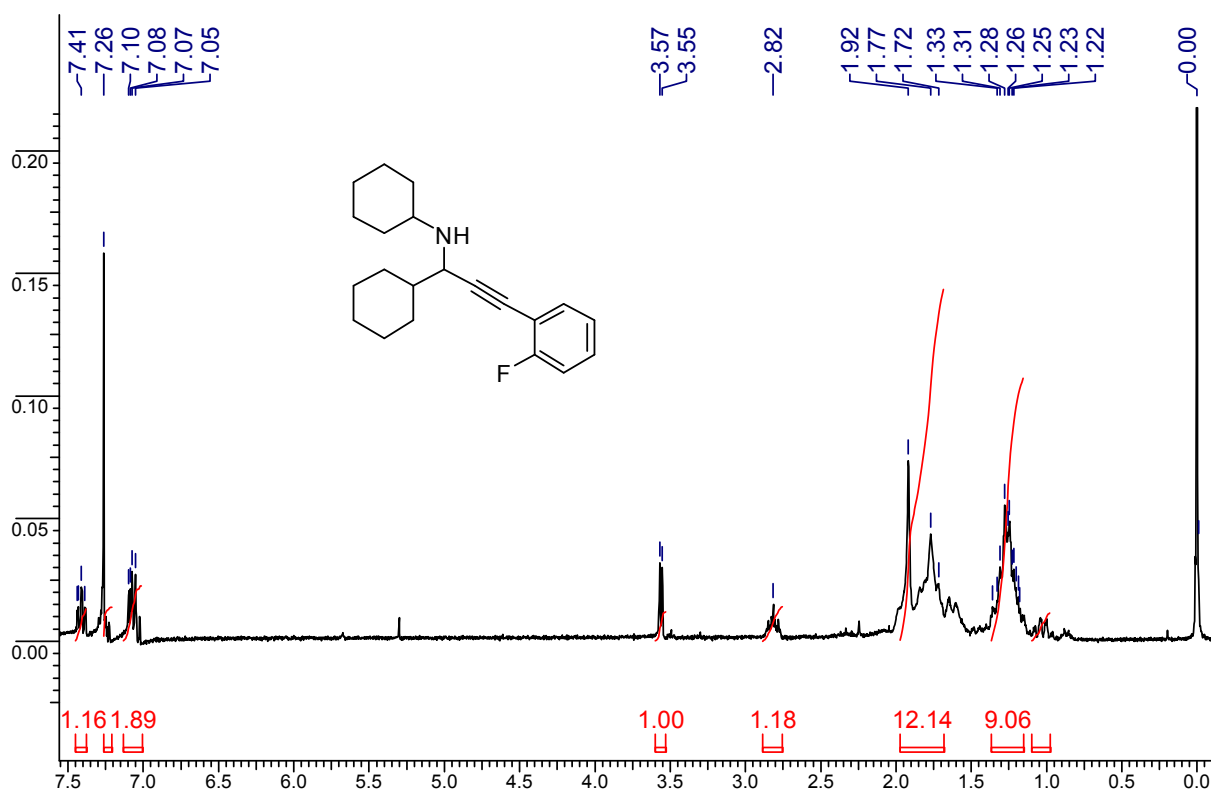
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number of scans: 2048

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LB: 1.000 GF: 0.0000

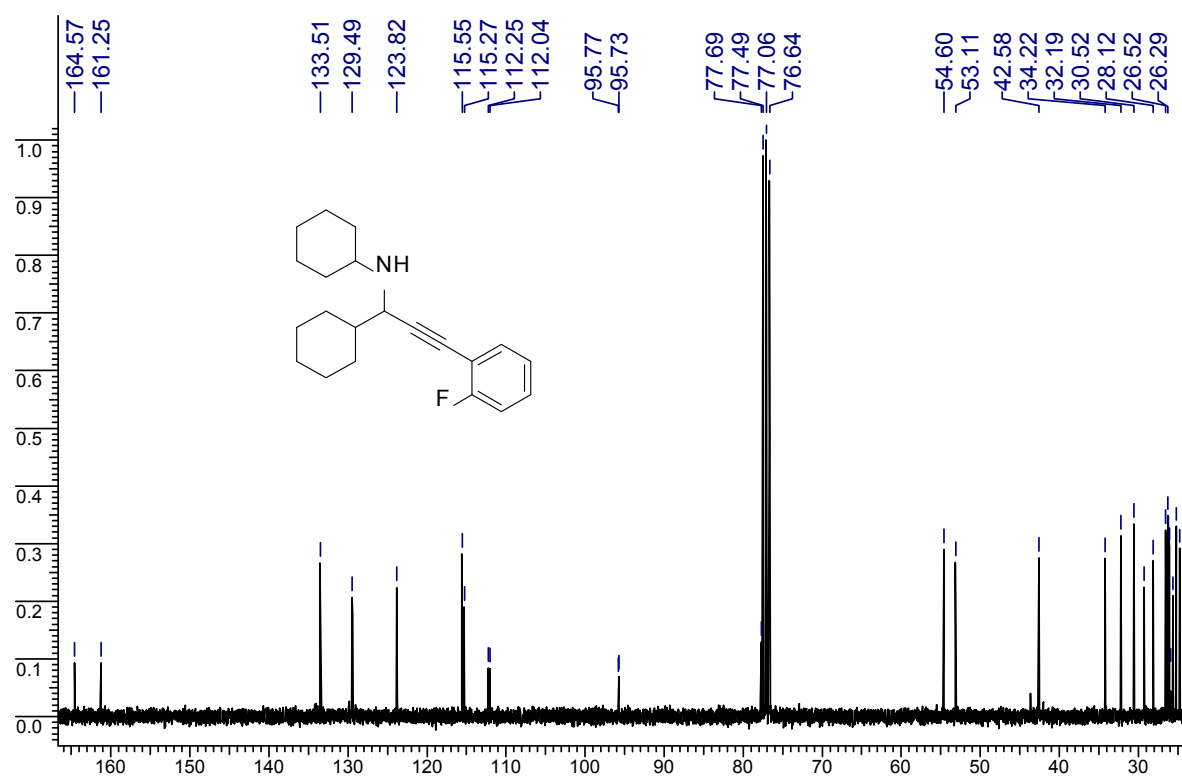
¹H NMR and ¹³C of *N*-(1-cyclohexyl-3-phenylprop-2-ynyl)cyclooctanamine (4o)



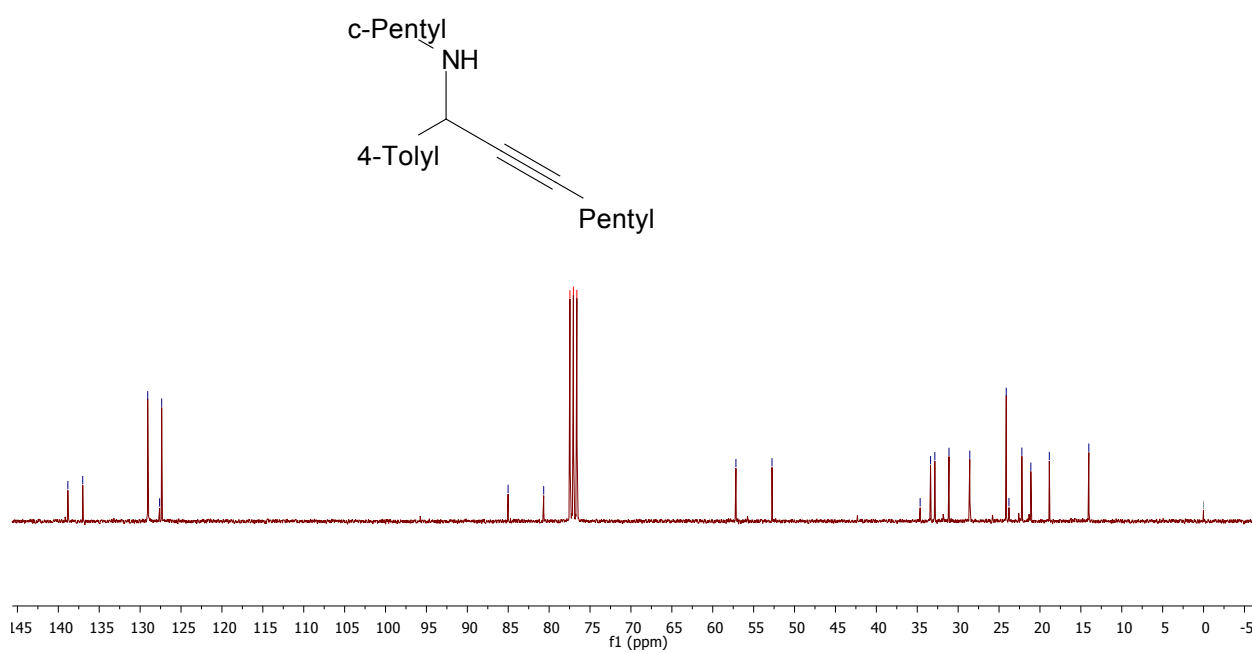
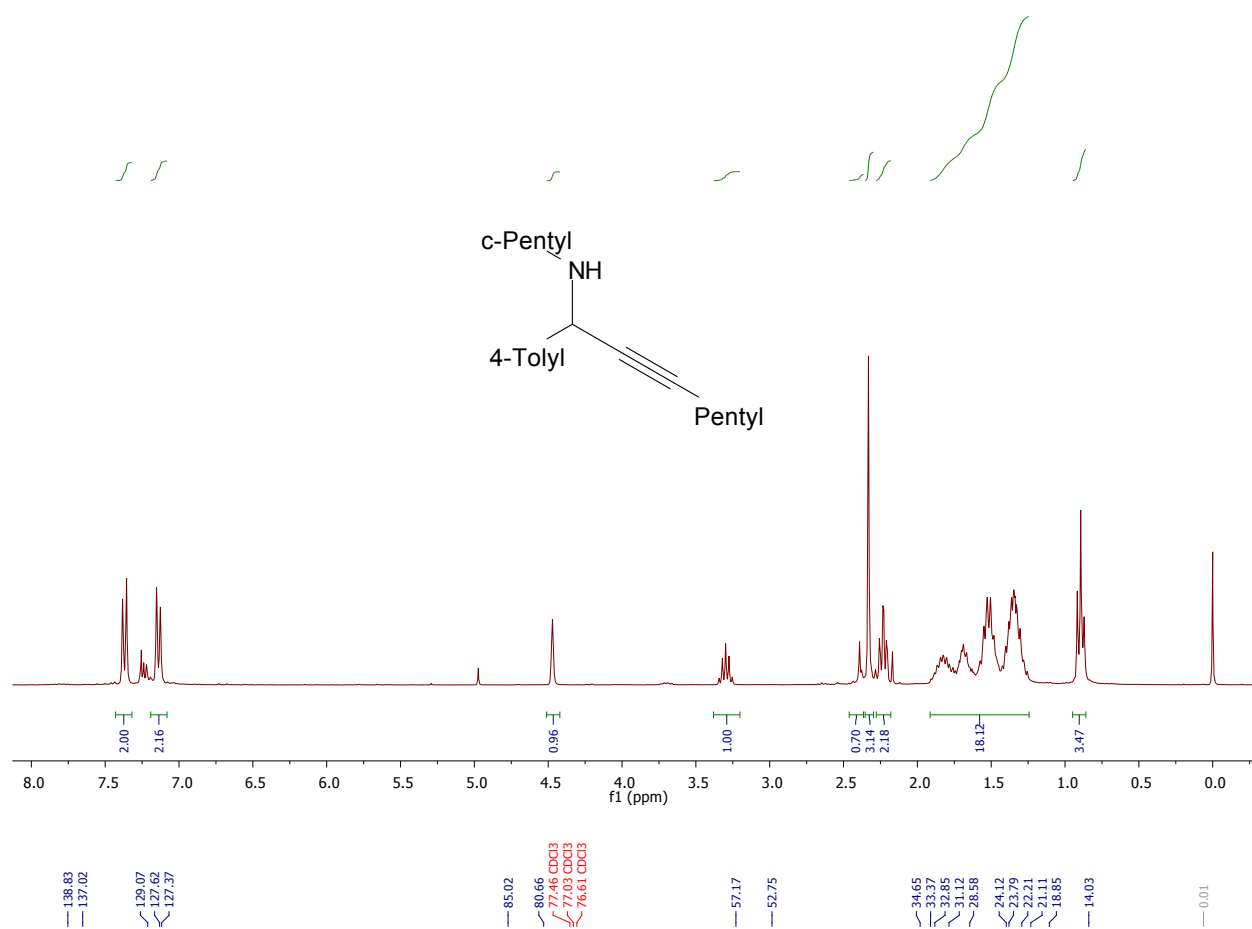
¹H NMR of *N*-(1-cyclohexyl-3-(2-fluorophenyl)prop-2-ynyl)cyclohexanamine (4p)



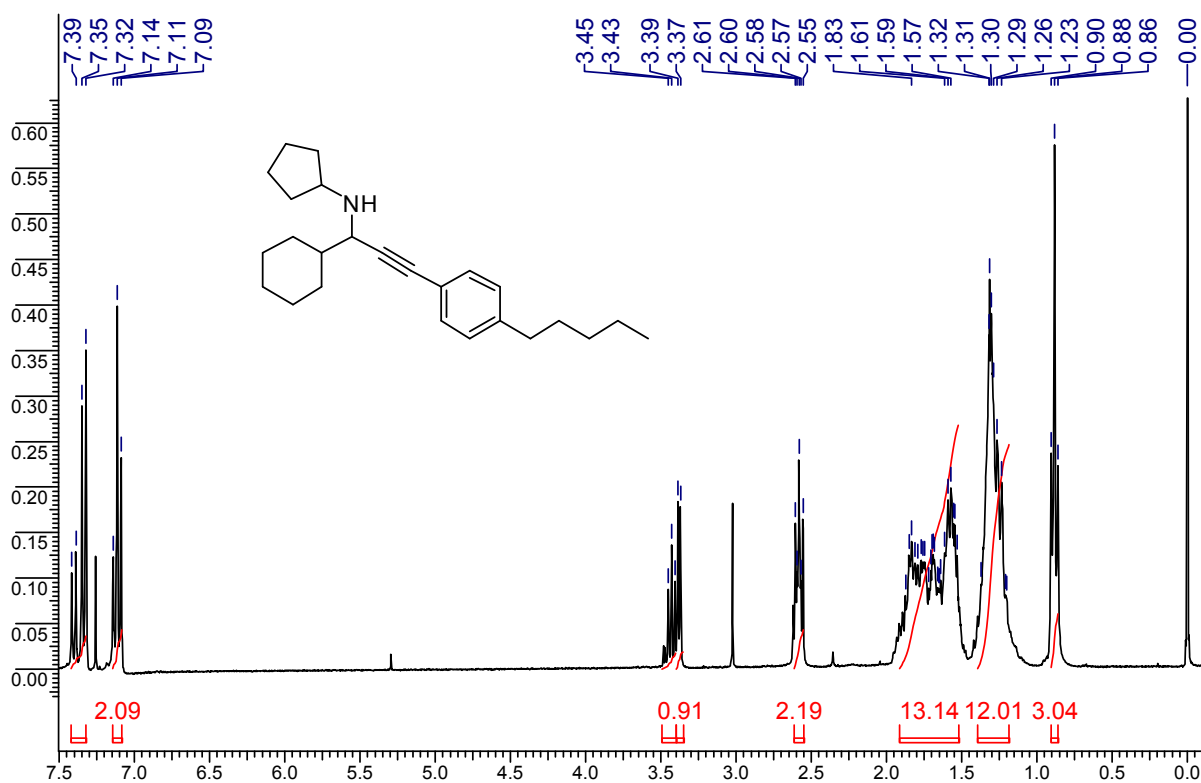
¹³C NMR of *N*-(1-cyclohexyl-3-(2-fluorophenyl)prop-2-ynyl)cyclohexanamine (4p)



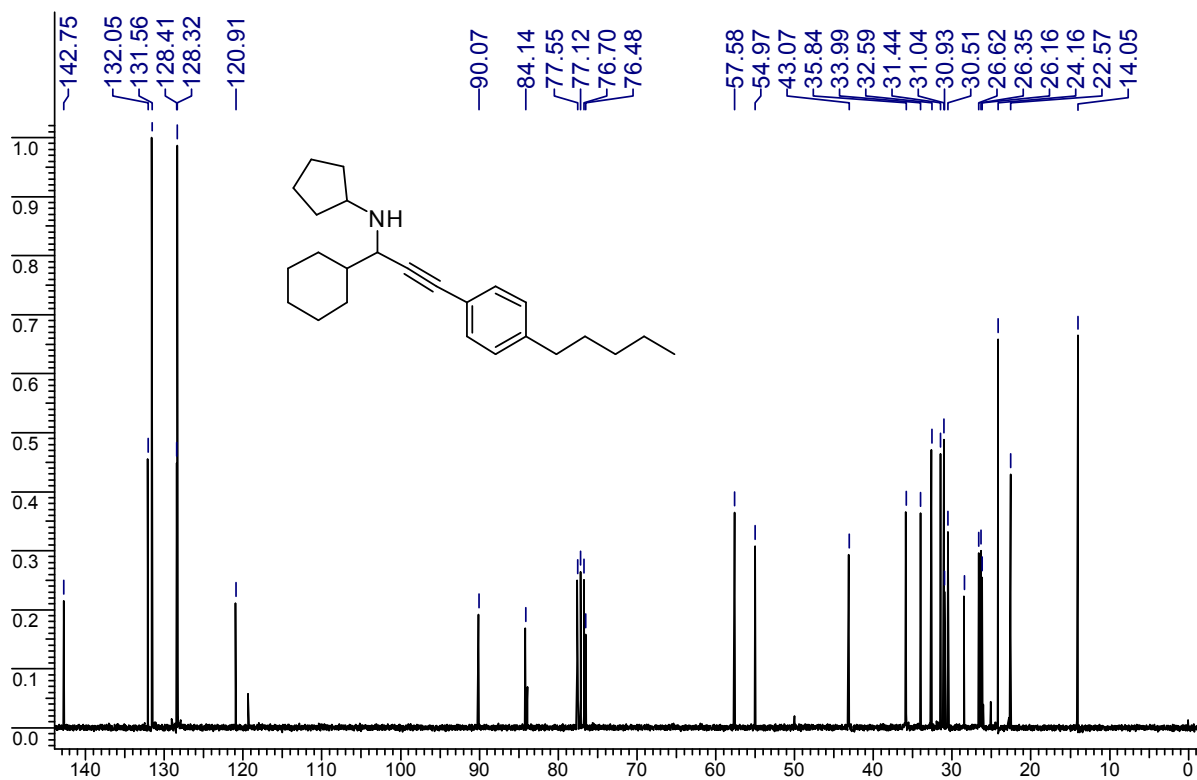
^1H NMR and ^{13}C of *N*-(1-*p*-tolyl-oct-2-ynyl)cyclopentanamine (4q)



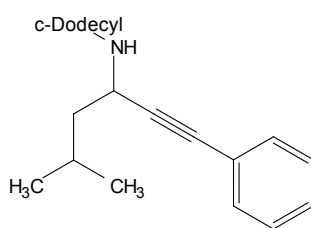
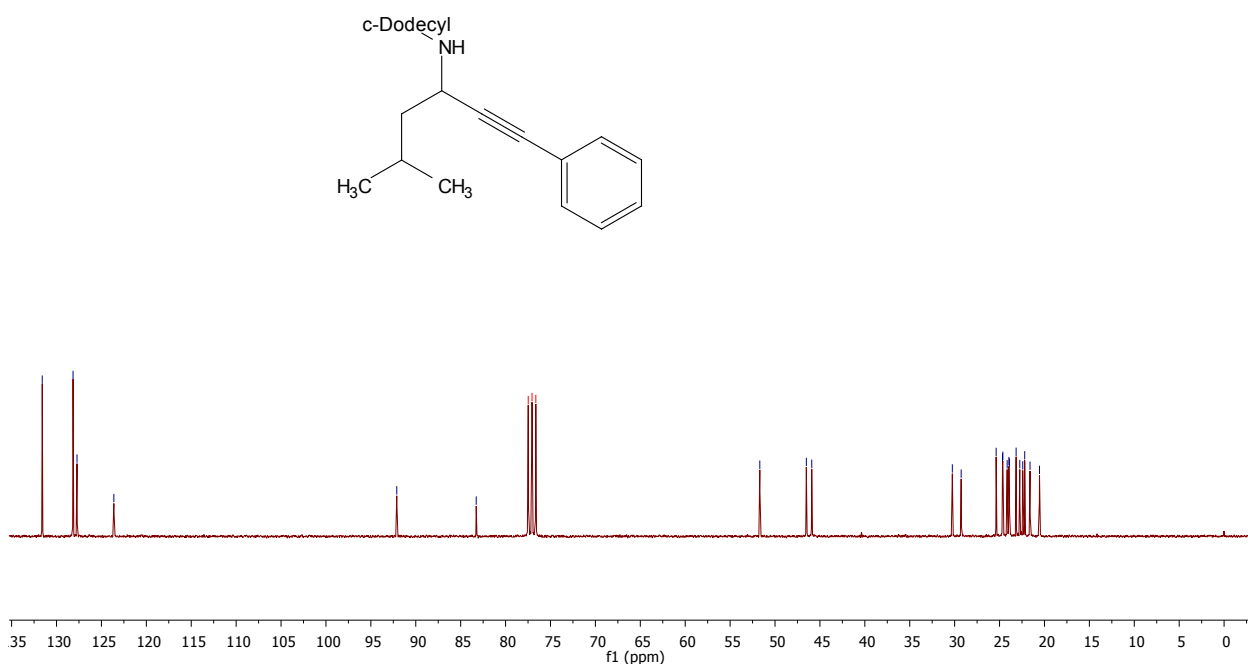
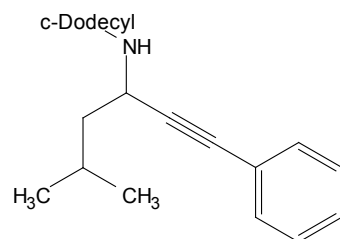
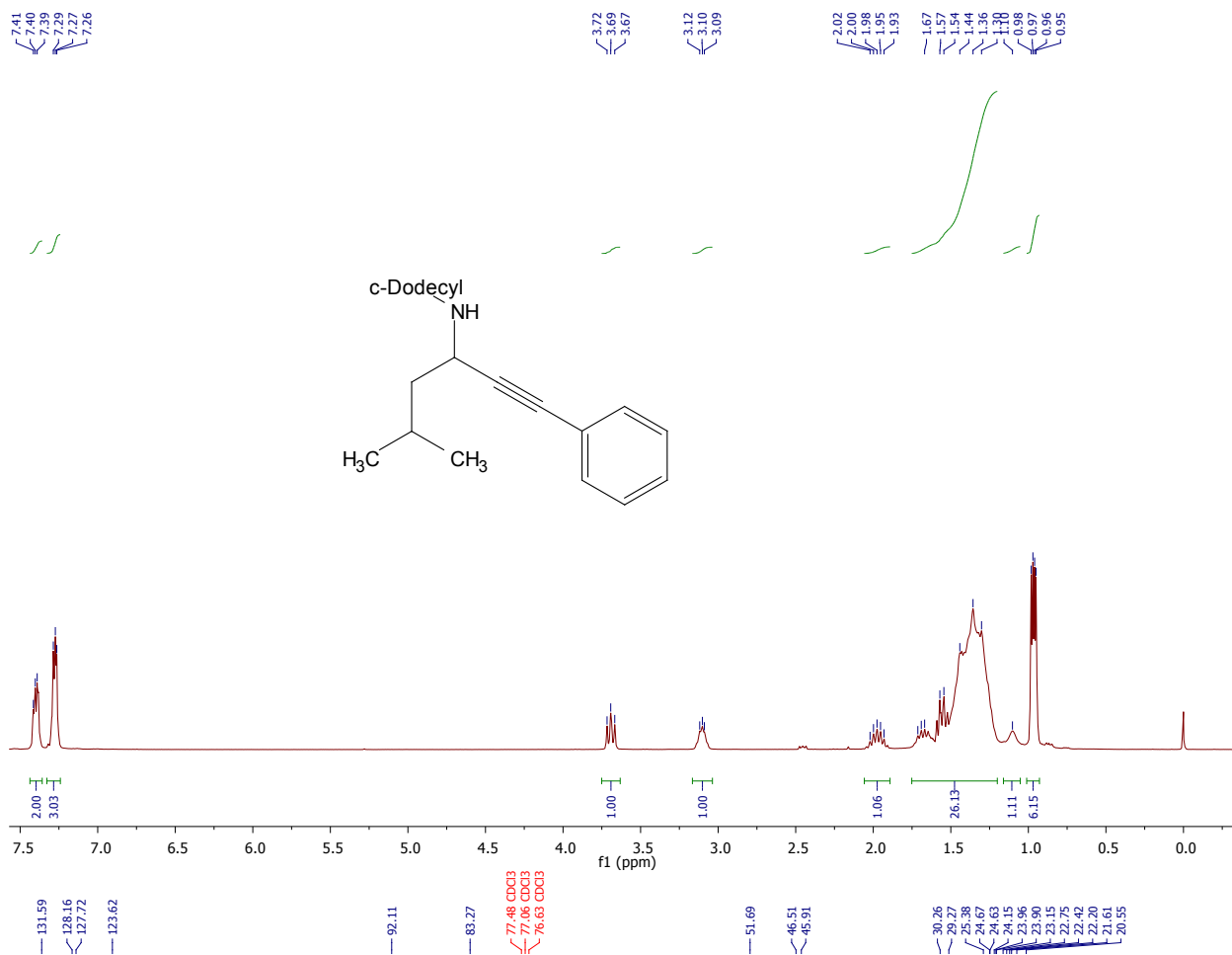
¹H NMR of *N*-(1-cyclohexyl-3-(4-pentylphenyl)prop-2-ynyl)cyclopentanamine (4r)



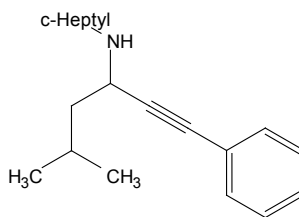
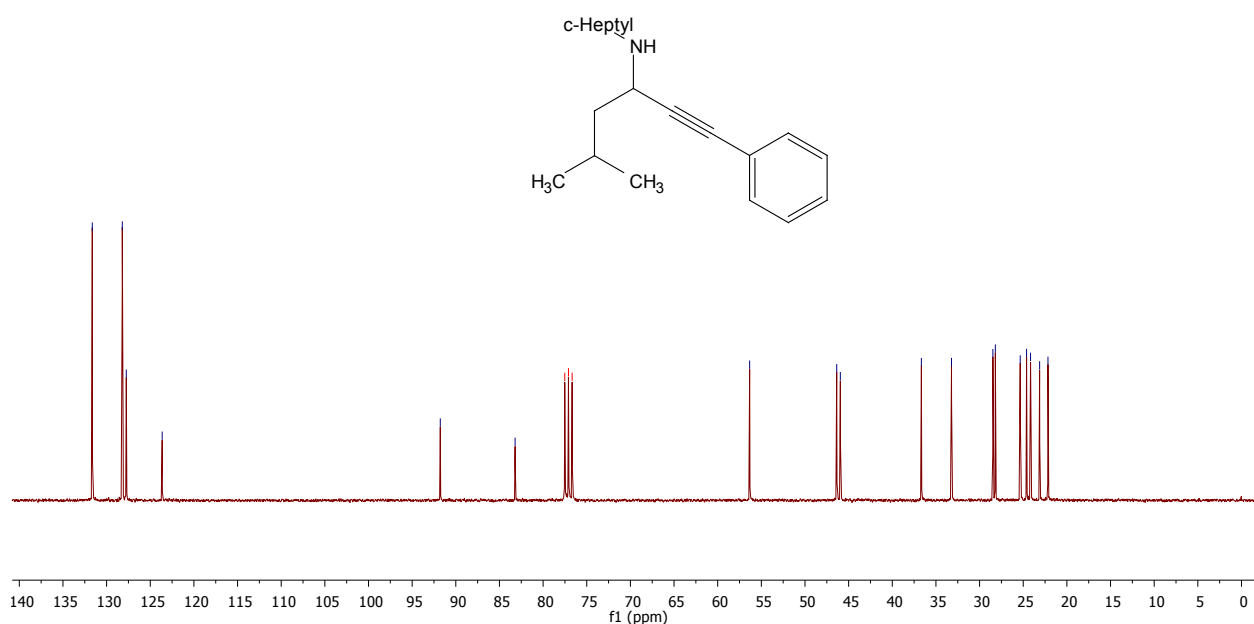
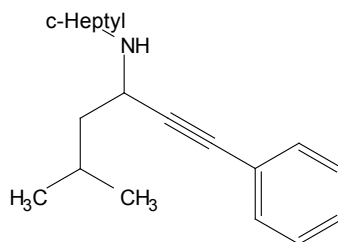
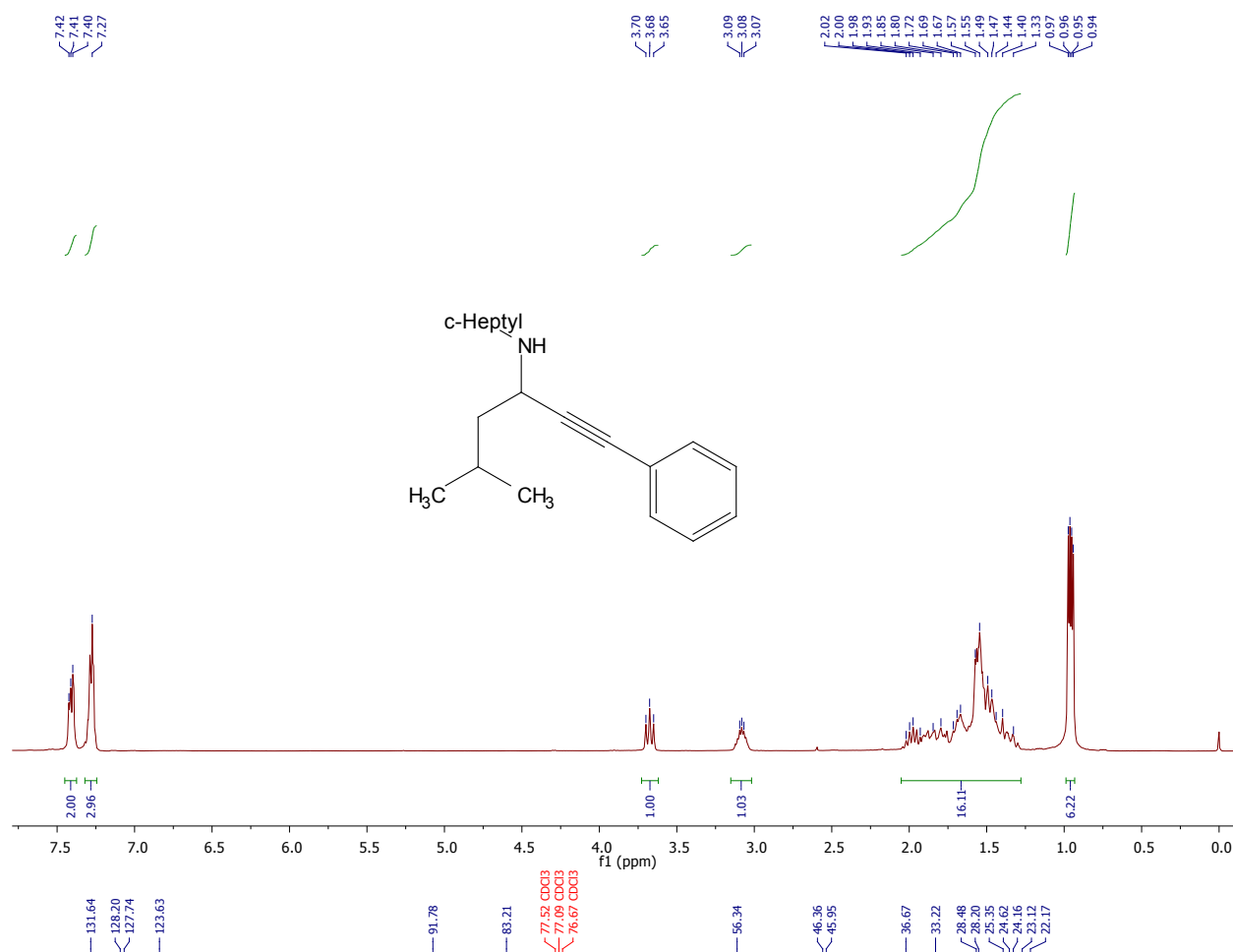
¹³C NMR of *N*-(1-cyclohexyl-3-(4-pentylphenyl)prop-2-ynyl)cyclopentanamine (4r)



¹H NMR and ¹³C of *N*-(5-methyl-1-phenylhex-1-yn-3-yl)cyclododecanamine (4s)



¹H NMR and ¹³C of *N*-(5-methyl-1-phenylhex-1-yn-3-yl)cycloheptanamine (4t)



^1H NMR and ^{13}C of *N*-(1-Phenyl-oct-1-yn-3-yl)cyclooctanamine (4u)

