

Supporting Information

Multicomponent reactions (MCRs) for the facile access of coumarin fused dihydroquinolines and quinolines : Synthesis and photophysical studies

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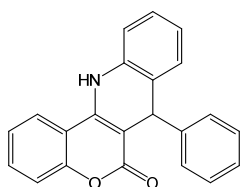
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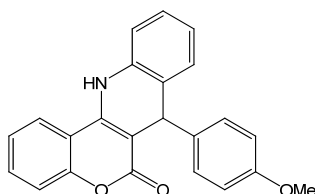
Experimental

General

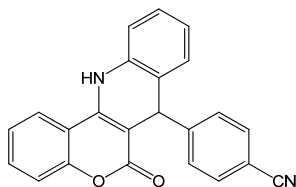
All reagents were used without further purification and procured from the commercial sources. Microwave irradiation was carried out with Initiator 2.5 Microwave Synthesizers from Biotage, Uppsala, Sweden. Shimadzu FTIR spectrophotometer was used for recording IR spectra. ^1H NMR and ^{13}C NMR spectra were recorded on a Jeol 500, Varian 400 and Bruker 300/400/500 MHz spectrometers in CDCl_3 and $\text{DMSO-}d_6$ using TMS as internal reference. Elemental analyses were carried out in a Perkin Elmer 2400 automatic CHN analyzer or Elementer Vario EL III. X-ray crystallographic analysis was performed with a Siemens SMART CCD and a Siemens P4 diffractometer. All compounds were characterized by their melting points, ^1H NMR and ^{13}C NMR spectra and elemental analysis. The UV-Vis absorption spectra were recorded on Shimadzu UV-Vis spectrophotometer UV-2550 and fluorescence spectra was recorded at Horiba Jobin Yuon fluoromax-4 spectrofluorometer.



7-phenyl-7,12-dihydro-6*H*-chromeno[4,3-*b*]quinolin-6-one (**4a**): White solid; Yield: 82%, m.p. 234-236 °C; IR (KBr): 3312, 3065, 3021, 2918, 1659, 1618, 1528, 1482, 1444, 1389, 1257, 1055 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm) : 9.73 (s, 1H, NH), 8.27 (s, 1H, Ar-H), 7.51-6.61 (m, 12H, Ar-H), 5.18 (s, 1H, -CH-); ¹³C NMR (100 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 160.5, 152.3, 147.3, 143.7, 135.5, 131.3, 129.2, 128.1, 127.1, 126.0, 124.2, 123.5, 123.4, 122.7, 116.6, 116.2, 113.5, 96.4, 41.1; Anal. calcd. for C₂₂H₁₅NO₂: C, 81.21; H, 4.65; N, 4.30 %. Found: C, 81.24; H, 4.67; N, 4.36 %.

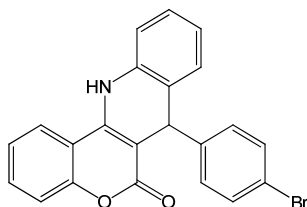


7-(4-methoxyphenyl)-7,12-dihydro-6*H*-chromeno[4,3-*b*]quinolin-6-one (**4b**): White solid; Yield: 89%, m.p. 236-238 °C; IR (KBr): 3323, 3077, 2923, 2830, 1657, 1621, 1529, 1488, 1447, 1376, 1258, 1176, 1038 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆) δ (ppm) : 9.93 (s, 1H, NH), 8.35 (dd, *J* = 8.2, 1.2 Hz, 1H, Ar-H), 7.65 (t, *J* = 8.3 Hz, 1H, Ar-H), 7.46 (t, *J* = 8.1 Hz, 1H, Ar-H), 7.43-7.36 (m, 4H, Ar-H), 7.25-7.21 (m, 4H, Ar-H), 6.98 (t, *J* = 7.8 Hz, 1H, Ar-H), 5.27 (s, 1H, -CH-), 3.69 (s, 3H, -OCH₃); ¹³C NMR (100 MHz, DMSO-*d*₆) δ (ppm) : 160.4, 152.3, 146.7, 143.8, 135.4, 131.9, 131.2, 129.4, 129.3, 127.6, 123.9, 123.7, 123.6, 122.8, 119.3, 116.9, 116.4, 113.3, 95.8, 56.7, 40.3; Anal. calcd. for C₂₃H₁₇NO₃: C, 77.73; H, 4.82; N, 3.94 %. Found: C, 77.75; H, 4.84; N, 3.98 %.

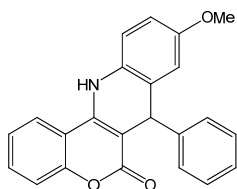


4-(6-oxo-7,12-dihydro-6*H*-chromeno[4,3-*b*]quinolin-7-yl)benzotrile (**4c**): Light yellow solid; Yield: 87%, m.p. 306-308 °C; IR (KBr): 3313, 3077, 2923, 2235, 1661, 1617, 1530, 1483, 1444, 1253, 1059 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆) δ (ppm) : 9.97 (s, 1H, NH), 8.36 (dd, *J* = 8.1, 1.1 Hz, 1H, Ar-H), 7.70 (d, *J* = 8.3 Hz, 2H, Ar-H), 7.68-7.63 (m, 1H, Ar-H), 7.49-7.47 (m, 1H, Ar-H), 7.46 (d, *J* = 8.3 Hz, 2H, Ar-H), 7.38 (d, *J* = 8.4 Hz, 2H, Ar-H), 7.25-7.21 (m, 2H, Ar-H), 7.00 (t, *J* = 8.5 Hz, 1H,

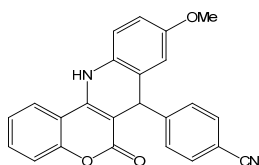
Ar-H), 5.39 (s, 1H, CH); ^{13}C NMR (100 MHz, DMSO- d_6) δ (ppm) : 160.4, 152.5, 152.3, 144.1, 135.4, 132.4, 132.0, 129.5, 128.2, 127.9, 124.0, 123.8, 123.0, 122.9, 118.8, 116.9, 116.5, 113.3, 109.1, 95.3, 41.1; Anal. calcd. for $\text{C}_{23}\text{H}_{14}\text{N}_2\text{O}_2$: C, 78.84; H, 4.03; N, 8.00 %. Found: C, 78.87; H, 4.06; N, 8.05 %.



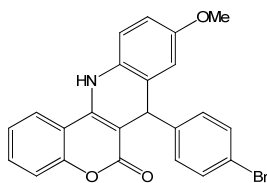
7-(4-bromophenyl)-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4d**): White solid; Yield: 90%, m.p. 293-295 $^{\circ}\text{C}$; IR (KBr): 3324, 3051, 2929, 1665, 1618, 1529, 1482, 1449, 1392, 1294, 1256, 1058, 1016 cm^{-1} ; ^1H NMR (400 MHz, DMSO- d_6) δ (ppm) : 9.92 (s, 1H, NH), 8.35 (dd, $J = 8.1, 1.1$ Hz, 1H, Ar-H), 7.65 (t, $J = 8.4$ Hz, 1H, Ar-H), 7.46 (t, $J = 8.2$ Hz, 1H, Ar-H), 7.42-7.35 (m, 4H, Ar-H), 7.24-7.20 (m, 4H, Ar-H), 6.99 (t, $J = 7.7$ Hz, 1H, Ar-H), 5.27 (s, 1H, CH); ^{13}C NMR (100 MHz, DMSO- d_6) δ (ppm) : 160.4, 152.3, 146.7, 143.8, 135.4, 131.9, 131.2, 129.4, 129.3, 127.6, 123.9, 123.8, 123.7, 122.8, 119.3, 116.9, 116.4, 113.3, 95.8, 40.4; Anal. calcd. for $\text{C}_{22}\text{H}_{14}\text{BrNO}_2$: C, 65.36; H, 3.49; N, 3.46 %. Found: C, 65.37; H, 3.52; N, 3.49 %.



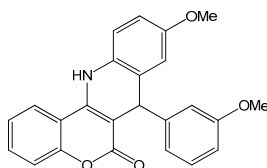
9-methoxy-7-phenyl-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4e**): Light yellow solid; Yield: 87%, m.p. 294-296 $^{\circ}\text{C}$; IR (KBr): 3312, 3065, 2988, 2915, 2831, 1660, 1612, 1532, 1502, 1316, 1240, 1205, 1052 cm^{-1} ; ^1H NMR (400 MHz, DMSO- d_6 + CDCl_3) δ (ppm): 9.80 (s, 1H, NH), 8.30 (d, $J = 8.0$ Hz, 1H, Ar-H), 7.60 (t, $J = 7.7$ Hz, 1H, Ar-H), 7.41 (t, $J = 7.7$ Hz, 1H, Ar-H), 7.33-7.29 (m, 2H, Ar-H), 7.26-7.18 (m, 4H, Ar-H), 7.10 (t, 1H, Ar-H), 6.81-6.77 (m, 2H, Ar-H), 5.23 (s, 1H, -CH-), 3.67 (s, 3H, - OCH_3); ^{13}C NMR (100 MHz, DMSO d_6 + CDCl_3) δ (ppm): 160.5, 155.8, 152.2, 147.3, 143.5, 131.5, 129.0, 128.2, 127.0, 126.1, 125.5, 123.5, 122.6, 117.3, 116.8, 114.0, 113.5, 113.1, 94.9, 55.1, 41.3; Anal. calcd. for $\text{C}_{23}\text{H}_{17}\text{NO}_3$: C, 77.73; H, 4.82; N, 3.94%. Found: C, 77.75; H, 4.85; N, 3.97%.



4-(9-methoxy-6-oxo-7,12-dihydro-6H-chromeno[4,3-b]quinolin-7-yl)benzonitrile (**4f**): White solid; Yield: 88%, m.p. 300-302 °C; IR (KBr): 3300, 3034, 2997, 2934, 2902, 2835, 2232, 1656, 1613, 1534, 1499, 1394, 1247, 1207, 1127, 1058 cm^{-1} ; ^1H NMR (400 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 9.87 (s, 1H, NH), 8.28 (dd, $J = 8.1, 1.1$ Hz, 1H, Ar-H), 7.65 (d, $J = 8.3$ Hz, 2H, Ar-H), 7.62-7.58 (m, 1H, Ar-H), 7.46 (d, $J = 8.3$ Hz, 2H, Ar-H), 7.43-7.39 (m, 1H, Ar-H), 7.35-7.30 (m, 2H, Ar-H), 6.82 (dd, $J = 8.8, 2.8$ Hz, 1H, Ar-H), 6.75 (d, $J = 2.7$ Hz, 1H, Ar-H), 5.36 (s, 1H, -CH-), 3.68 (s, 3H, -OCH₃); ^{13}C NMR (100 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 160.5, 155.9, 152.3, 152.2, 143.8, 132.2, 131.5, 128.9, 128.2, 124.1, 123.5, 122.7, 118.6, 117.6, 116.7, 114.0, 113.6, 113.4, 109.2, 93.9, 55.1, 41.5; Anal. calcd. for $\text{C}_{24}\text{H}_{16}\text{N}_2\text{O}_3$: C, 75.78; H, 4.24; N, 7.36 %. Found: C, 75.79; H, 4.27; N, 7.38%.

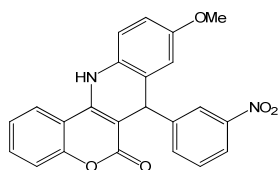


7-(4-bromophenyl)-9-methoxy-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4g**): White solid; Yield: 89%, m.p. 298-300 °C; IR (KBr): 3309, 3062, 3000, 2959, 2910, 2829, 1659, 1611, 1533, 1506, 1482, 1317, 1239, 1206, 1053 cm^{-1} ; ^1H NMR (400 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 9.78 (s, 1H, NH), 8.29 (dd, $J = 7.9, 0.7$ Hz, 1H, Ar-H), 7.56 (dt, $J = 8.3, 1.1$ Hz, 1H, Ar-H), 7.39-7.27 (m, 3H+2H, Ar-H), 7.21 (d, $J = 8.4$, 2H, Ar-H), 6.78 (dd, $J = 8.7, 2.7$ Hz, 1H, Ar-H), 6.71 (d, $J = 2.7$, 1H, Ar-H), 5.24 (s, 1H, -CH-), 3.68 (s, 3H, -OCH₃); ^{13}C NMR (100 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 160.6, 155.8, 152.2, 146.4, 143.5, 131.3, 131.0, 129.3, 128.9, 124.7, 123.3, 122.6, 119.4, 117.4, 116.6, 113.8, 113.5, 113.3, 94.5, 55.0, 40.9; Anal. calcd. for $\text{C}_{23}\text{H}_{16}\text{BrNO}_3$: C, 63.61; H, 3.71; N, 3.23 %. Found: C, 63.64; H, 3.74; N, 3.28%.

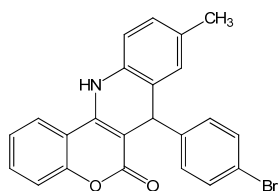


9-methoxy-7-(3-methoxyphenyl)-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4h**): White solid; Yield: 88%, m.p. 273-275 °C; IR (KBr): 3309, 3053, 3000, 2950, 2911, 2834, 1738, 1652, 1616,

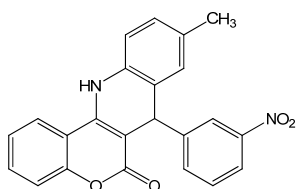
1529, 1503, 1488, 1411, 1243, 1227, 1176 cm^{-1} ; ^1H NMR (400 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 9.78 (s, 1H, NH), 8.29 (dd, $J = 8.1, 1.2$ Hz, 1H, Ar-H), 7.56 (t, $J = 7.7$ Hz, 1H, Ar-H), 7.39 (t, $J = 7.6$ Hz, 1H, Ar-H), 7.32-7.28 (m, 2H, Ar-H), 7.10 (t, $J = 7.9$ Hz, 1H, Ar-H), 6.83-6.78 (m, 4H, Ar-H), 6.68-6.65 (m, 1H, Ar-H), 5.20 (s, 1H, -CH-), 3.68 (s, 3H, -OCH₃), 3.67 (s, 3H, -OCH₃); ^{13}C NMR (100 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm) : 160.5, 159.1, 155.8, 152.2, 148.7, 143.5, 131.4, 129.2, 129.0, 125.3, 123.4, 122.6, 119.3, 117.3, 116.7, 113.9, 113.5, 113.4, 113.1, 110.8, 94.8, 55.1, 54.8, 41.2; Anal. calcd. for $\text{C}_{24}\text{H}_{19}\text{NO}_4$: C, 74.79; H, 4.97; N, 3.63 %. Found: C, 74.81; H, 4.99; N, 3.67%.



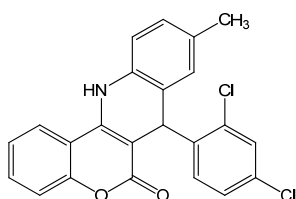
9-methoxy-7-(3-nitrophenyl)-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4i**): Yellow solid; Yield: 92%, m.p. 308-310 $^{\circ}\text{C}$; IR (KBr): 3342, 3091, 2989, 2929, 2836, 1658, 1613, 1531, 1510, 1348, 1244, 1204, 1116, 1054 cm^{-1} ; ^1H NMR (500 MHz, $\text{DMSO-}d_6$) δ (ppm) 9.94 (s, 1H, NH), 8.29 (d, $J = 8.0$ Hz, 1H, Ar-H), 8.07 (s, 1H, Ar-H), 7.96 (d, $J = 7.2$ Hz, 1H, Ar-H), 7.68 (d, $J = 7.7$ Hz, 1H, Ar-H), 7.60 (t, $J = 7.8$ Hz, 1H, Ar-H), 7.49 (t, $J = 8.0$ Hz, 1H, Ar-H), 7.42 (t, $J = 7.4$ Hz, 1H, Ar-H), 7.33-7.31(m, 2H, Ar-H), 6.84-6.82 (m, 2H, Ar-H), 5.43 (s, 1H, -CH-), 3.63 (s, 3H, -OCH₃); ^{13}C NMR (125 MHz, $\text{DMSO-}d_6$) δ (ppm): 161.0, 156.6, 152.8, 149.7, 148.3, 144.4, 134.6, 132.5, 130.5, 129.5, 124.9, 124.4, 123.4, 122.2, 122.0, 118.3, 117.5, 114.8, 114.4, 113.9, 94.6, 55.8, 41.4 ; Anal. calcd. for $\text{C}_{23}\text{H}_{16}\text{N}_2\text{O}_5$: C, 69.00; H, 4.03; N, 7.00 %. Found: C, 69.03; H, 4.07; N, 7.04%.



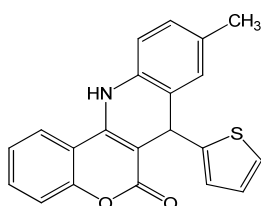
7-(4-bromophenyl)-9-methyl-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4j**): White solid; Yield: 92%, m.p. 294-296 $^{\circ}\text{C}$; IR (KBr): 3323, 3033, 2997, 2913, 2858, 1653, 1614, 1567, 1525, 1481, 1405, 1288, 1197, 1052, 1009 cm^{-1} ; ^1H NMR (400 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 9.73 (s, 1H, NH), 8.30 (d, $J = 7.8$ Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.38-7.36 (m, 1H, Ar-H), 7.33 (d, $J = 8.3$ Hz, 2H, Ar-H), 7.28-7.24 (m, 2H, Ar-H), 7.19 (d, $J = 8.4$ Hz, 2H, Ar-H), 6.98 (d, $J = 8.2$ Hz, 1H, Ar-H), 6.91 (s, 1H, Ar-H), 5.21 (s, 1H, -CH-), 2.22 (s, 3H, -CH₃); ^{13}C NMR (100 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 160.7, 152.2, 146.5, 143.6, 133.0, 132.8, 131.2, 130.9, 129.4, 129.2, 127.9, 123.3, 123.2, 122.6, 119.4, 116.6, 116.2, 113.5, 95.6, 40.7, 20.4; Anal. calcd. for $\text{C}_{23}\text{H}_{16}\text{BrNO}_2$: C, 66.04; H, 3.86; N, 3.35 %. Found: C, 66.07; H, 3.89; N, 3.38 %.



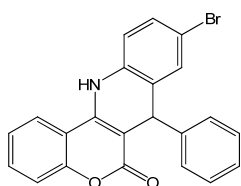
9-methyl-7-(3-nitrophenyl)-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4k**): Light yellow solid; Yield: 89%, m.p. 328-330 °C; IR (KBr): 3338, 3091, 3002, 2900, 1659, 1612, 1531, 1481, 1344, 1197, 1057 cm^{-1} ; ^1H NMR (400 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 9.90 (s, 1H, NH), 8.33 (dd, $J = 8.1, 1.2$ Hz, 1H, Ar-H), 8.07 (t, $J = 1.9$, 1H, Ar-H), 7.97 (ddd, $J = 8.1, 2.2, 0.8$ Hz, 1H, Ar-H), 7.70 (d, $J = 7.8$ Hz, 1H, Ar-H), 7.61-7.57 (m, 1H), 7.49 (t, $J = 7.9$ Hz, 1H, Ar-H), 7.42-7.38 (m, 1H, Ar-H), 7.32-7.29 (m, 2H, Ar-H), 7.03 (dd, $J = 8.2, 1.5$ Hz, 1H, Ar-H), 6.97 (s, 1H, Ar-H), 5.42 (s, 1H, -CH-), 2.22 (s, 3H, -CH₃); ^{13}C NMR (100 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 160.6, 152.3, 149.2, 147.7, 143.8, 133.9, 133.1, 131.5, 129.6, 129.4, 128.4, 123.4, 122.8, 122.7, 121.8, 121.1, 116.7, 116.4, 113.4, 95.2, 40.9, 20.4; Anal. calcd. for $\text{C}_{23}\text{H}_{16}\text{N}_2\text{O}_4$: C, 71.87; H, 4.20; N, 7.29 %. Found: C, 71.89; H, 4.24; N, 7.32 %.



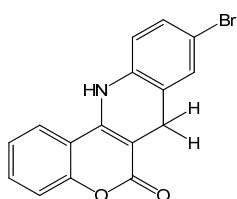
7-(2,4-dichlorophenyl)-9-methyl-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4l**): White solid; Yield: 93%, m.p. 292-294 °C; IR (KBr): 3323, 3036, 2923, 1662, 1611, 1534, 1509, 1483, 1391, 1207, 1054 cm^{-1} ; ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ (ppm): 9.88 (s, 1H, NH), 8.32 (d, $J = 8.0$ Hz, 1H, Ar-H), 7.65-7.62 (m, 1H, Ar-H), 7.52-7.51 (m, 1H, Ar-H), 7.46-7.43 (m, 1H, Ar-H), 7.35 (d, $J = 8.0$ Hz, 1H, Ar-H), 7.28-7.21 (m, 3H, Ar-H), 6.99 (d, $J = 7.5$ Hz, 1H, Ar-H), 6.92 (s, 1H, Ar-H), 5.70 (s, 1H, -CH-), 2.15 (s, 3H, CH₃); ^{13}C NMR (100 MHz, $\text{DMSO-}d_6$) δ (ppm): 160.7, 152.8, 144.9, 144.8, 133.4, 133.2, 132.4, 132.3, 132.2, 131.9, 129.2, 129.1, 129.0, 128.4, 124.2, 123.5, 123.3, 117.4, 117.1, 113.7, 95.4, 38.1, 20.9; Anal. calcd. for $\text{C}_{23}\text{H}_{15}\text{Cl}_2\text{NO}_2$: C, 67.66; H, 3.70; N, 3.43 %. Found: C, 67.68; H, 3.73; N, 3.46 %.



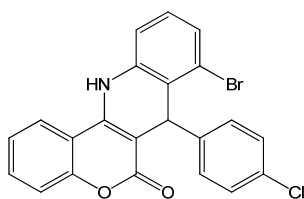
9-methyl-7-(thiophen-2-yl)-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4m**): Brown solid; Yield: 93%, m.p. 284-286°C; IR (KBr): 3314, 3070, 2911, 1661, 1613, 1571, 1529, 1505, 1482, 1256, 1199, 1058 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 9.80 (s, 1H, NH), 8.22 (dd, *J* = 8.0, 0.9 Hz, 1H, Ar-H), 7.53-7.48 (m, 1H, Ar-H), 7.30 (t, *J* = 7.4 Hz, 1H, Ar-H), 7.24 (d, *J* = 8.2 Hz, 1H, Ar-H), 7.18 (d, *J* = 8.1 Hz, 1H, Ar-H), 7.06-7.02 (m, 2H, Ar-H), 6.96 (d, *J* = 8.2 Hz, 1H, Ar-H), 6.75-6.71 (m, 2H, Ar-H), 5.44 (s, 1H, -CH-), 2.19 (s, 3H, -CH₃); ¹³C NMR (100 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 160.6, 152.2, 150.9, 143.5, 133.1, 132.8, 131.4, 129.3, 128.2, 126.3, 123.8, 123.4, 123.3, 123.1, 122.7, 116.7, 116.2, 113.5, 95.6, 36.1, 20.5; Anal. calcd. for C₂₁H₁₅NO₂S: C, 73.02; H, 4.38; N, 4.06 %. Found: C, 73.05; H, 4.40; N, 4.09 %.



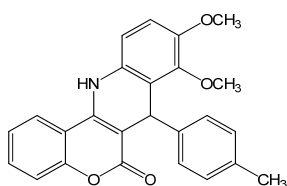
9-bromo-7-phenyl-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4n**): White solid; Yield: 90%, m.p. 335-337 °C; IR (KBr): 3323, 3097, 1663, 1624, 1570, 1528, 1479, 1406, 1323, 1293, 1255, 1206, 1183, 1054 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 9.78 (s, 1H, NH), 8.27 (dd, *J* = 8.0, 1.0 Hz, 1H, Ar-H), 7.57-7.53 (m, 1H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.31-7.20 (m, 8H, Ar-H), 7.14-7.10 (m, 1H, Ar-H), 5.24 (s, 1H, -CH); ¹³C NMR (100 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 160.6, 152.2, 146.6, 143.4, 134.8, 131.5, 131.2, 129.8, 128.1, 127.1, 126.3, 126.2, 123.2, 122.4, 118.0, 116.6, 115.1, 113.3, 96.5, 41.0; Anal. calcd. for C₂₂H₁₄BrNO₂: C, 65.36; H, 3.49; N, 3.46 %. Found: C, 65.38; H, 3.51; N, 3.49 %.



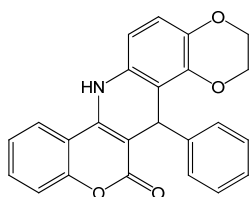
9-bromo-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4o**): White solid; Yield: 94%, m.p. 332-334 °C; IR (KBr): 3343, 3056, 2913, 2863, 1672, 1626, 1570, 1529, 1488, 1406, 1324, 1294, 1217, 1176, 1059 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 9.53 (s, 1H, NH), 8.17 (d, *J* = 8.1 Hz, 1H, Ar-H), 7.59 (t, *J* = 7.1 Hz, 1H, Ar-H), 7.41-7.28 (m, 4H, Ar-H), 7.13 (d, *J* = 8.5 Hz, 1H, Ar-H), 3.84 (s, 2H, -CH₂-); ¹³C NMR (125 MHz, DMSO-*d*₆) δ (ppm): 161.8, 152.4, 145.1, 137.0, 131.3, 128.4, 127.1, 123.4, 123.0, 122.1, 118.5, 116.7, 116.3, 113.1, 92.0, 25.3; Anal. calcd. for C₁₆H₁₀BrNO₂: C, 58.56; H, 3.07; N, 4.27 %. Found: C, 58.59; H, 3.05; N, 4.30 %.



8-bromo-7-(4-chlorophenyl)-7,12-dihydro-6*H*-chromeno[4,3-*b*]quinolin-6-one (**4p**): White solid; Yield: 89%, m.p. 324-326 °C; IR (KBr): 3323, 3077, 2923, 1672, 1631, 1611, 1524, 1483, 1412, 1284, 1212, 1054, 1018 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm) : 9.88 (s, 1H, NH), 8.26 (dd, *J* = 8.1, 1.1 Hz, 1H, Ar-H), 7.60 (td, *J* = 8.4, 1.3 Hz, 1H, Ar-H), 7.56 (d, *J* = 1.0 Hz, 1H, Ar-H), 7.41 (td, *J* = 8.1, 1.0 Hz, 1H, Ar-H), 7.31 (dd, *J* = 8.2, 0.9 Hz, 1H, Ar-H), 7.27-7.20 (m, 4H, Ar-H), 7.09 (s, 2H, Ar-H), 5.25 (s, 1H, -CH-); ¹³C NMR (125 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 161.3, 152.7, 145.7, 144.1, 137.4, 132.0, 131.4, 129.2, 128.6, 126.7, 124.1, 123.2, 122.9, 120.7, 119.3, 117.2, 113.7, 97.1, 40.7; Anal. calcd. for C₂₂H₁₃BrClNO₂: C, 60.23; H, 2.99; N, 3.19 %. Found: C, 60.26; H, 3.01; N, 3.23 %.

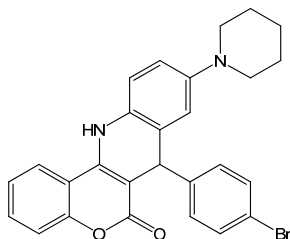


8,9-dimethoxy-7-*p*-tolyl-7,12-dihydro-6*H*-chromeno[4,3-*b*]quinolin-6-one (**4q**): Yellow solid; Yield: 92%, m.p. 278-280 °C; IR (KBr): 3286, 3061, 2995, 2911, 2854, 1693, 1628, 1571, 1543, 1515, 1326, 1213, 1124, 1044 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 9.63 (s, 1H, NH), 8.22 (d, *J* = 7.7 Hz, 1H, Ar-H), 7.54 (t, *J* = 7.4 Hz, 1H, Ar-H), 7.38 (t, *J* = 7.5 Hz, 1H, Ar-H), 7.27 (d, *J* = 8.2 Hz, 1H, Ar-H), 7.11 (d, *J* = 8.0 Hz, 2H, Ar-H), 6.98-6.96 (m, 2H + 1H, Ar-H), 6.66 (s, 1H, Ar-H), 5.13 (s, 1H, -CH-), 3.80 (s, 3H, -OCH₃), 3.67 (s, 3H, -OCH₃), 2.18 (s, 3H, -CH₃); ¹³C NMR (100 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 160.6, 152.2, 148.0, 145.5, 144.6, 143.2, 134.9, 131.1, 128.9, 128.6, 126.9, 123.3, 122.4, 116.6, 115.7, 113.6, 112.2, 100.6, 95.6, 55.8, 55.4, 40.5, 20.5; Anal. calcd. for C₂₅H₂₁NO₄: C, 75.17; H, 5.30; N, 3.51 %. Found: C, 75.19; H, 5.33; N, 3.55 %.

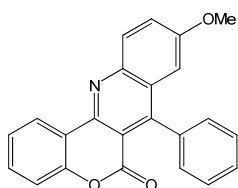


14-phenyl-7,14-dihydro-2*H*-chromeno[4,3-*b*][1,4]dioxino[2,3-*f*]quinolin-13(3*H*)-one (**4r**): Yellow solid; Yield: 90%, m.p. 340-342 °C; IR (KBr): 3324, 3066, 3026, 2974, 2912, 2868, 1665, 1618,

1571, 1538, 1500, 1425, 1322, 1303, 1242, 1204, 1194, 1067, 1048 cm^{-1} ; ^1H NMR (400 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 9.54 (s, 1H, NH), 8.18 (d, $J = 8.2$ Hz, 1H, Ar-H), 7.48 (t, $J = 8.4$ Hz, 1H, Ar-H), 7.29 (t, $J = 8.1$ Hz, 1H, Ar-H), 7.21-7.13 (m, 5H, Ar-H), 7.03-6.99 (m, 1H, Ar-H), 6.82 (s, 1H, Ar-H), 6.54 (s, 1H, Ar-H), 5.06 (s, 1H, -CH-), 4.16-4.08 (m, 4H, 2- CH_2 -); ^{13}C NMR (100 MHz, $\text{DMSO-}d_6 + \text{CDCl}_3$) δ (ppm): 160.6, 152.2, 147.5, 143.4, 142.3, 139.9, 131.1, 129.2, 128.0, 127.0, 125.9, 123.2, 122.5, 117.5, 116.8, 116.6, 113.5, 104.4, 95.4, 64.1, 63.8, 40.7; Anal. calcd. for $\text{C}_{24}\text{H}_{17}\text{NO}_4$: C, 75.19; H, 4.47; N, 3.65 %. Found: C, 75.21; H, 4.50; N, 3.67 %.

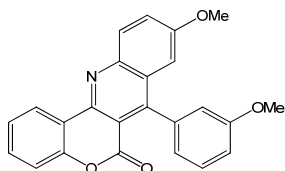


7-(4-bromophenyl)-9-(piperidin-1-yl)-7,12-dihydro-6H-chromeno[4,3-b]quinolin-6-one (**4s**): Light yellow solid; Yield: 91%, m.p. 212-214 $^\circ\text{C}$; IR (KBr): 3313, 3020, 2943, 2851, 1667, 1626, 1529, 1509, 1396, 1202, 1166, 1110, 1069, 1013 cm^{-1} ; ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ (ppm): 9.82 (s, 1H, NH), 8.30 (d, $J = 7.4$ Hz, 1H, Ar-H), 7.62-7.58 (m, 1H, Ar-H), 7.44 (d, $J = 8.3$ Hz, 2H, Ar-H), 7.42-7.34 (m, 3H, Ar-H), 7.21 (d, $J = 8.4$ Hz, 2H, Ar-H), 6.84 (dd, $J = 8.8, 2.5$ Hz, 1H, Ar-H), 6.79 (d, $J = 2.4$ Hz, 1H, Ar-H), 5.22 (s, 1H, -CH-), 3.02-2.99 (m, 4H, 2- CH_2 -), 1.57-1.55 (m, 4H, 2- CH_2 -), 1.49-1.47 (m, 2H, - CH_2 -); ^{13}C NMR (100 MHz, $\text{DMSO-}d_6$) δ (ppm): 160.9, 152.0, 146.9, 143.4, 139.3, 131.1, 131.0, 130.4, 129.4, 127.6, 124.3, 119.2, 117.1, 116.8, 116.6, 115.7, 113.5, 103.6, 94.4, 50.0, 40.9, 28.6, 25.2; Anal. calcd. for $\text{C}_{27}\text{H}_{23}\text{BrN}_2\text{O}_2$: C, 66.54; H, 4.76; N, 5.75%; Found: C, 66.56; H, 4.79; N, 5.78%.

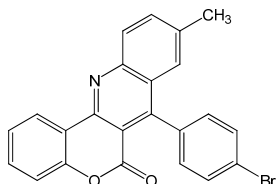


9-methoxy-7-phenyl-6H-chromeno[4,3-b]quinolin-6-one (**5e**): Yellow solid; Yield: 98%, m.p. 308-310 $^\circ\text{C}$; IR (KBr): 3077, 2974, 2940, 1739, 1626, 1555, 1498, 1468, 1412, 1268, 1233, 1176, 1100 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ (ppm): 8.83 (d, $J = 7.5$ Hz, 1H, Ar-H), 8.17 (d, $J = 9.0$ Hz, 1H, Ar-H), 7.62-7.53 (m, 5H, Ar-H), 7.41 (t, $J = 7.5$ Hz, 1H, Ar-H), 7.33-7.28 (m, 3H, Ar-H), 6.72 (s, 1H, Ar-H), 3.69 (s, 3H, - OCH_3); ^{13}C NMR (125 MHz, CDCl_3) δ (ppm): 159.6, 158.1, 153.4, 152.4, 147.9, 146.9, 137.3, 131.7, 131.0, 129.2, 128.4, 128.1, 127.8, 126.1, 125.3, 124.5, 120.0, 116.9,

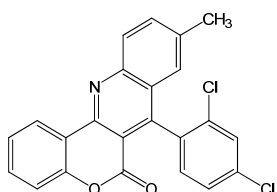
113.3, 105.0, 55.4; Anal. calcd. for C₂₃H₁₅NO₃: C, 78.17; H, 4.28; N, 3.96 %. Found: C, 78.20; H, 4.31; N, 3.99 %.



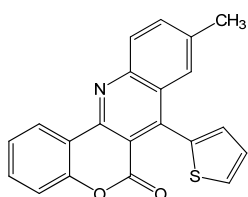
9-methoxy-7-(3-methoxyphenyl)-6*H*-chromeno[4,3-*b*]quinolin-6-one (**5h**): Yellow solid; Yield: 99 %, m.p. 254-256 °C; IR (KBr): 3056, 2998, 2974, 2938, 2842, 1744, 1621, 1544, 1493, 1412, 1360, 1222, 1176, 1115, 1054 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ (ppm): 8.79 (d, *J* = 8.0 Hz, 1H, Ar-H), 8.14 (d, *J* = 8.0 Hz, 1H, Ar-H), 7.56-7.38 (m, 4H, Ar-H), 7.30 (t, *J* = 8.0 Hz, 1H, Ar-H), 7.07 (d, *J* = 8.0 Hz, 1H, Ar-H), 6.88 (d, *J* = 8.0 Hz, 1H, Ar-H), 6.83 (d, *J* = 4.0 Hz, 1H, Ar-H), 6.76 (d, *J* = 4.0 Hz, 1H, Ar-H), 3.86 (s, 3H, -OCH₃), 3.70 (s, 3H, -OCH₃); ¹³C NMR (100 MHz, CDCl₃) δ (ppm): 159.4, 158.1, 153.0, 152.3, 147.9, 146.8, 138.6, 133.4, 131.7, 130.9, 129.5, 129.0, 126.1, 125.3, 124.6, 120.3, 120.0, 116.9, 115.7, 114.7, 113.7, 105.0, 55.4, 55.3; Anal. calcd. for C₂₄H₁₇NO₄: C, 75.19; H, 4.47; N, 3.65 %. Found: C, 75.21; H, 4.49; N, 3.70 %.



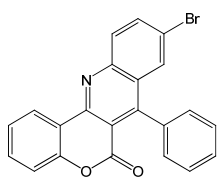
7-(4-bromophenyl)-9-methyl-6*H*-chromeno[4,3-*b*]quinolin-6-one (**5j**): Light yellow solid; Yield: 98%, m.p. 274-276 °C; IR (KBr): 3079, 2964, 1750, 1599, 1543, 1486, 1458, 1364, 1181, 1101 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ (ppm) : 8.81 (d, *J* = 8.0 Hz, 1H, Ar-H), 8.13 (d, *J* = 9.0 Hz, 1H, Ar-H), 7.74-7.67 (m, 3H, Ar-H), 7.57-7.54 (m, 1H, Ar-H), 7.42-7.39 (m, 1H, Ar-H), 7.31 (d, *J* = 8.0 Hz, 1H, Ar-H), 7.20 (bs, 1H, Ar-H), 7.17 (d, *J* = 8.0 Hz, 2H, Ar-H), 2.43 (s, 3H, -CH₃); ¹³C NMR (125 MHz, CDCl₃) δ (ppm): 159.6, 153.1, 152.5, 149.2, 149.0, 137.7, 136.1, 135.4, 132.1, 131.6, 129.7, 129.3, 127.6, 126.3, 125.5, 124.6, 122.3, 119.8, 116.9, 113.0, 21.9; Anal. calcd. for C₂₃H₁₄BrNO₂: C, 66.36; H, 3.39; N, 3.36%. Found: C, 66.39; H, 3.42; N, 3.40 %.



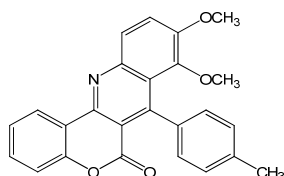
7-(2,4-dichlorophenyl)-9-methyl-6*H*-chromeno[4,3-*b*]quinolin-6-one (**5l**): White solid; Yield: 99%, m.p. 282-284 °C; IR (KBr): 3080, 2920, 1736, 1595, 1552, 1463, 1364, 1185, 1110, 1058 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ (ppm) : 8.84 (d, *J* = 8.0 Hz, 1H, Ar-H), 8.19 (d, *J* = 8.0 Hz, 1H, Ar-H), 7.75 (d, *J* = 8.0 Hz, 1H, Ar-H), 7.63-7.56 (m, 2H, Ar-H), 7.47-7.41 (m, 2H, Ar-H), 7.34 (d, *J* = 8.0 Hz, 1H, Ar-H), 7.29-7.14 (m, 2H, Ar-H), 2.47 (s, 3H, -CH₃); ¹³C NMR (125 MHz, DMSO+CDCl₃) δ (ppm): 159.2, 152.2, 149.7, 149.3, 149.0, 138.1, 135.7, 134.7, 134.6, 133.0, 132.2, 130.1, 129.4, 129.3, 127.3, 126.8, 125.4, 125.3, 124.7, 119.6, 116.8, 113.4, 21.8; Anal. calcd. for C₂₃H₁₃Cl₂NO₂: C, 68.00; H, 3.23; N, 3.45 %. Found: C, 68.03; H, 3.26; N, 3.49 %.



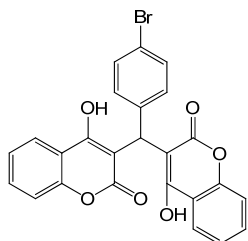
9-methyl-7-(thiophen-2-yl)-6*H*-chromeno[4,3-*b*]quinolin-6-one (**5m**): Brown solid; Yield: 97%, m.p. 252-254 °C; IR (KBr): 3080, 2920, 1736, 1552, 1468, 1185, 1096 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ (ppm): 8.79 (d, *J* = 8.0 Hz, 1H, Ar-H), 8.13 (d, *J* = 8.0 Hz, 1H, Ar-H), 7.72 (s, 1H, Ar-H), 7.55-7.53 (m, 3H, Ar-H), 7.48-7.42 (m, 1H, Ar-H), 7.31 (d, *J* = 8.0 Hz, 1H, Ar-H), 7.21 (d, *J* = 4.0 Hz, 1H, Ar-H), 6.82 (d, *J* = 4.0 Hz, 1H, Ar-H), 2.48 (s, 3H, -CH₃); ¹³C NMR (125 MHz, CDCl₃) δ (ppm): 158.9, 152.4, 149.1, 148.9, 138.2, 138.1, 135.7, 132.3, 130.0, 129.2, 128.6, 127.8, 126.0, 125.5, 124.9, 124.7, 119.6, 116.9, 114.5, 113.7, 22.0; Anal. calcd. for C₂₁H₁₃NO₂S: C, 73.45; H, 3.82; N, 4.08 %. Found: C, 73.48; H, 3.85; N, 4.13 %.



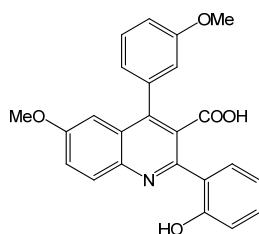
9-bromo-7-phenyl-6*H*-chromeno[4,3-*b*]quinolin-6-one (**5n**): Light yellow solid; Yield: 99%, m.p. 264-266 °C; IR (KBr): 3061, 1750, 1618, 1548, 1482, 1176, 1105 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ (ppm): 8.79 (d, *J* = 7.5 Hz, 1H, Ar-H), 8.08 (d, *J* = 9.0 Hz, 1H, Ar-H), 7.90 (d, *J* = 8.5 Hz, 1H, Ar-H), 7.65-7.56 (m, 5H, Ar-H), 7.43-7.39 (m, 1H, Ar-H), 7.31-7.25 (m, 3H, Ar-H); ¹³C NMR (125 MHz, CDCl₃) δ (ppm): 159.0, 154.7, 152.7, 150.4, 148.8, 136.2, 136.1, 132.6, 131.1, 130.1, 129.1, 128.5, 127.9, 125.7, 124.7, 121.5, 119.5, 117.0, 113.8; Anal. calcd. for C₂₂H₁₂BrNO₂: C, 65.69; H, 3.01; N, 3.48 %. Found: C, 65.71; H, 3.04; N, 3.52 %.



8,9-dimethoxy-7-*p*-tolyl-6*H*-chromeno[4,3-*b*]quinolin-6-one (**5q**) : Yellow solid; Yield: 98%, m.p. 290-292 °C; IR (KBr): 3004, 2948, 2883, 2835, 1731, 1618, 1548, 1496, 1421, 1275, 1246, 1223, 1152, 1105, 1016 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ (ppm): 8.77 (bs, 1H, Ar-H), 7.52-7.48 (m, 2H, Ar-H), 7.40-7.30 (m, 4H, Ar-H), 7.20-7.19 (m, 1H, Ar-H), 7.18-7.16 (m, 1H, Ar-H), 6.74-6.72 (m, 1H, Ar-H), 4.12 (s, 3H, -OCH₃), 3.73 (s, 3H, -OCH₃), 2.50 (s, 3H, -CH₃); ¹³C NMR (100 MHz, CDCl₃) δ (ppm): 159.8, 155.4, 152.7, 152.4, 150.1, 148.5, 148.4, 137.6, 134.5, 131.5, 129.1, 127.8, 125.1, 124.3, 124.1, 120.0, 116.8, 111.6, 107.4, 105.0, 56.5, 55.8, 21.6; Anal. calcd. for C₂₅H₁₉NO₄: C, 75.55; H, 4.82; N, 3.52 %. Found: C, 75.57; H, 4.86; N, 3.57 %.

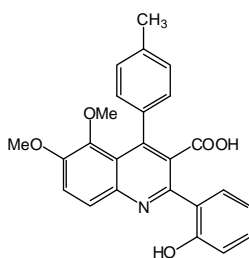


3-((4-bromophenyl)(4-hydroxy-2-oxo-4a,8a-dihydro-2*H*-chromen-3-yl)methyl)-4-hydroxy-2*H*-chromen-2-one (**6**): White solid; Yield: 98%, m.p. 268 °C; IR (KBr): 3279, 3058, 2825, 1769, 1667, 1605, 1560, 1481, 1451 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm) : 8.62-9.31 (broad, 2H, -OH), 7.96 (dd, *J* = 7.96, 1.48 Hz, 2H, Ar-H), 7.63-7.59 (m, 2H, Ar-H), 7.43-7.32 (m, 6H, Ar-H), 7.15 (dd, *J* = 7.56, 1.80 Hz, 2H, Ar-H), 6.39 (s, 1H, -CH-); ¹³C NMR (100 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm): 164.9, 164.8, 152.1, 138.6, 132.0, 130.8, 128.9, 123.8, 123.8, 118.8, 117.3, 115.9, 103.9, 35.5; Anal. calcd. for C₂₅H₁₅BrO₆: C, 61.12; H, 3.08%; Found: C, 61.14; H, 3.06%.



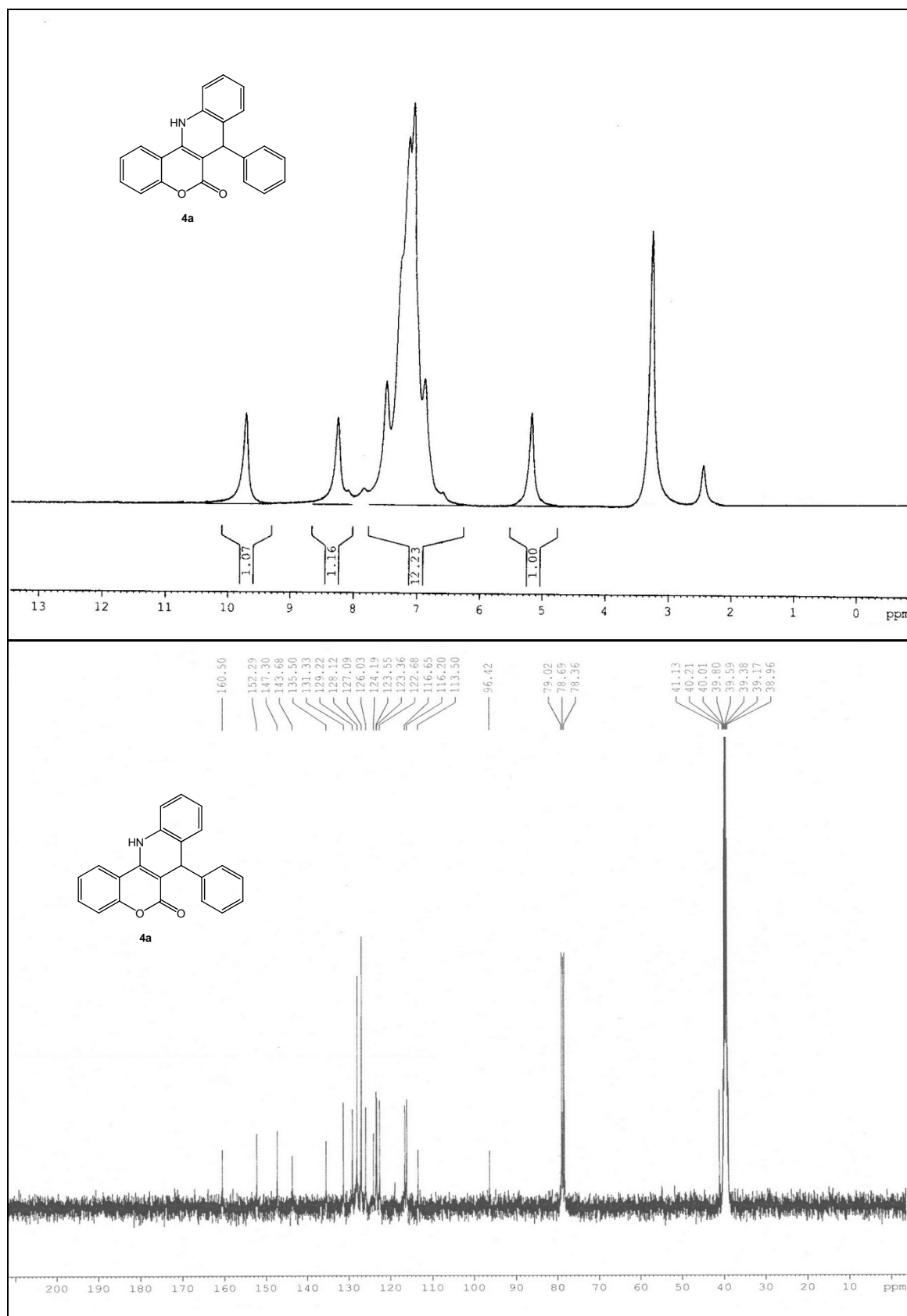
2-(2-hydroxyphenyl)-6-methoxy-4-(3-methoxyphenyl)quinoline-3-carboxylic acid (**7h**): Light yellow brown solid; Yield: 54%, m.p. 250-252 °C; IR (KBr): 3523, 3243-3100 (broad band), 3004, 2946, 2839, 1741, 1647, 1622, 1585, 1503, 1454, 1413, 1372, 1240 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ +

CDCl₃) δ (ppm): 12.75 (brs, 1H, -COOH), 10.98 (brs, 1H, -OH), 8.02 (d, $J = 8.0$ Hz, 1H, Ar-H), 7.53 (dd, $J = 7.7, 1.5$ Hz, 1H, Ar-H), 7.49-7.43 (m, 2H, Ar-H), 7.25 (td, $J = 8.4, 1.6$ Hz, 1H, Ar-H), 7.07-7.04 (m, 1H, Ar-H), 7.00-6.94 (m, 3H, Ar-H), 6.89-6.85 (m, 1H, Ar-H), 6.83 (d, $J = 2.7$ Hz, 1H, Ar-H), 3.83 (s, 3H, -OCH₃), 3.72 (s, 3H, -OCH₃); ¹³C NMR (125 MHz, DMSO-*d*₆) δ (ppm): 169.1, 159.4, 158.3, 156.1, 152.2, 144.3, 142.7, 137.3, 131.0, 130.5, 130.4, 130.0, 129.3, 126.4, 126.3, 122.9, 122.0, 119.0, 116.5, 115.3, 114.5, 104.8, 55.8, 55.6; Anal. calcd. for C₂₄H₁₉NO₅: C, 71.81; H, 4.77; N, 3.49 %. Found: C, 71.83; H, 4.79; N, 3.52 %.

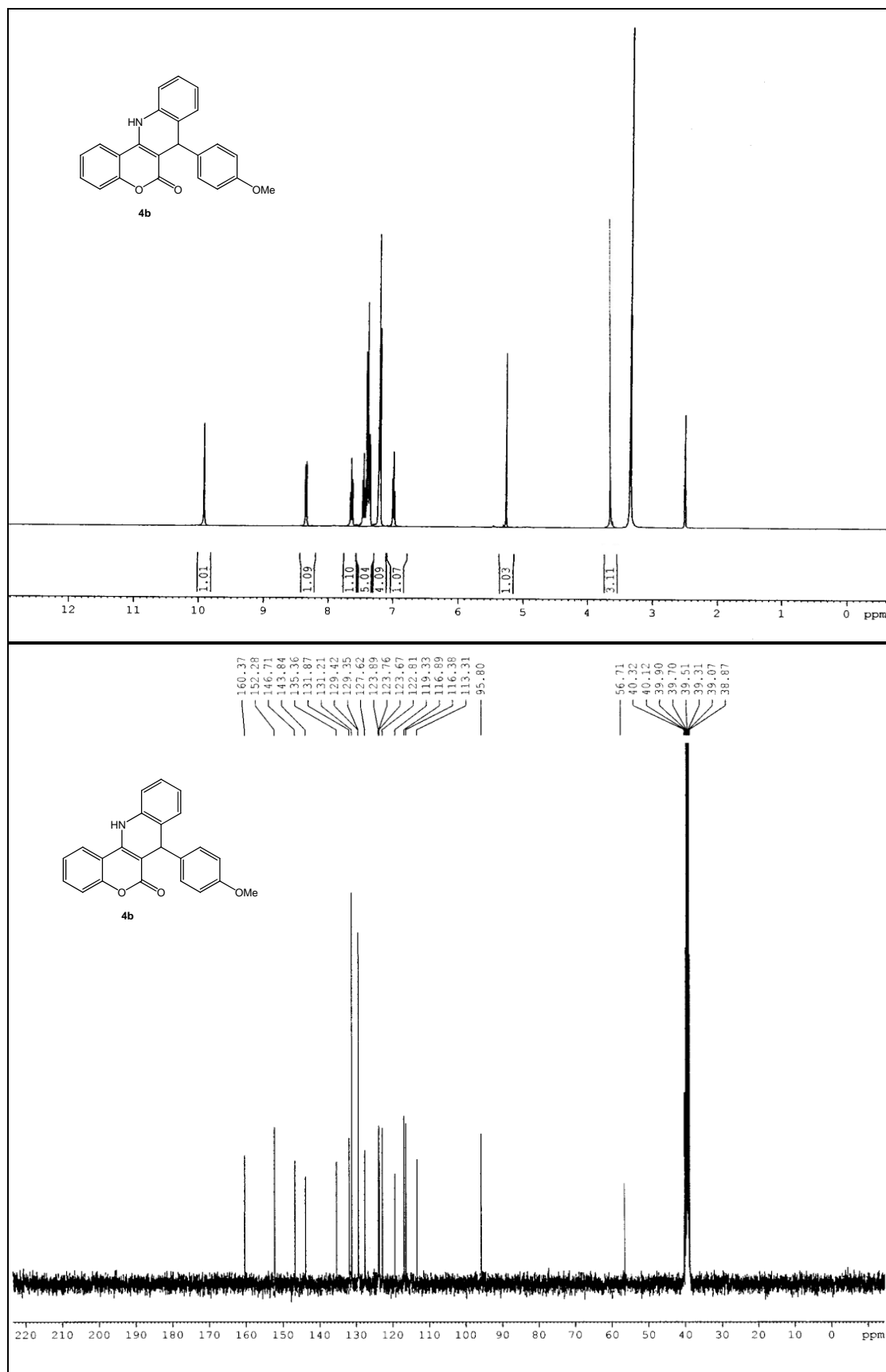


2-(2-hydroxyphenyl)-5,6-dimethoxy-4-*p*-tolylquinoline-3-carboxylic acid (**7q**): Yellow solid; Yield: 60%, m.p. 265-267 °C; IR (KBr): 3498, 3327-3120 (broad band), 3020, 2948, 2846, 1731, 1628, 1598, 1505, 1417, 1260 cm⁻¹; ¹H NMR (400 MHz, DMSO-*d*₆ + CDCl₃) δ (ppm) : 7.53 (dd, $J = 7.7, 1.5$ Hz, 1H, Ar-H), 7.49 (s, 1H, Ar-H), 7.34 (d, $J = 8.0$ Hz, 2H, Ar-H), 7.29 (d, $J = 8.0$ Hz, 2H, Ar-H), 7.25 (td, $J = 8.0, 1.5$ Hz, 1H, Ar-H), 6.95 (d, $J = 7.3$ Hz, 1H, Ar-H), 6.86 (t, $J = 7.5$ Hz, 1H, Ar-H), 6.75 (s, 1H, Ar-H), 3.99 (s, 3H, -OCH₃), 3.69 (s, 3H, -OCH₃), 2.44 (s, 3H, -CH₃); ¹³C NMR (125 MHz, DMSO-*d*₆) δ (ppm): 169.5, 156.4, 153.4, 152.1, 150.4, 144.6, 143.7, 138.1, 133.3, 130.4, 130.2, 129.5, 129.4, 127.3, 125.8, 120.7, 119.0, 116.7, 108.0, 104.0, 56.4, 55.8, 21.4; Anal. calcd. for C₂₅H₂₁NO₅: C, 72.28; H, 5.10; N, 3.37 %. Found: C, 72.31; H, 5.14; N, 3.40 %.

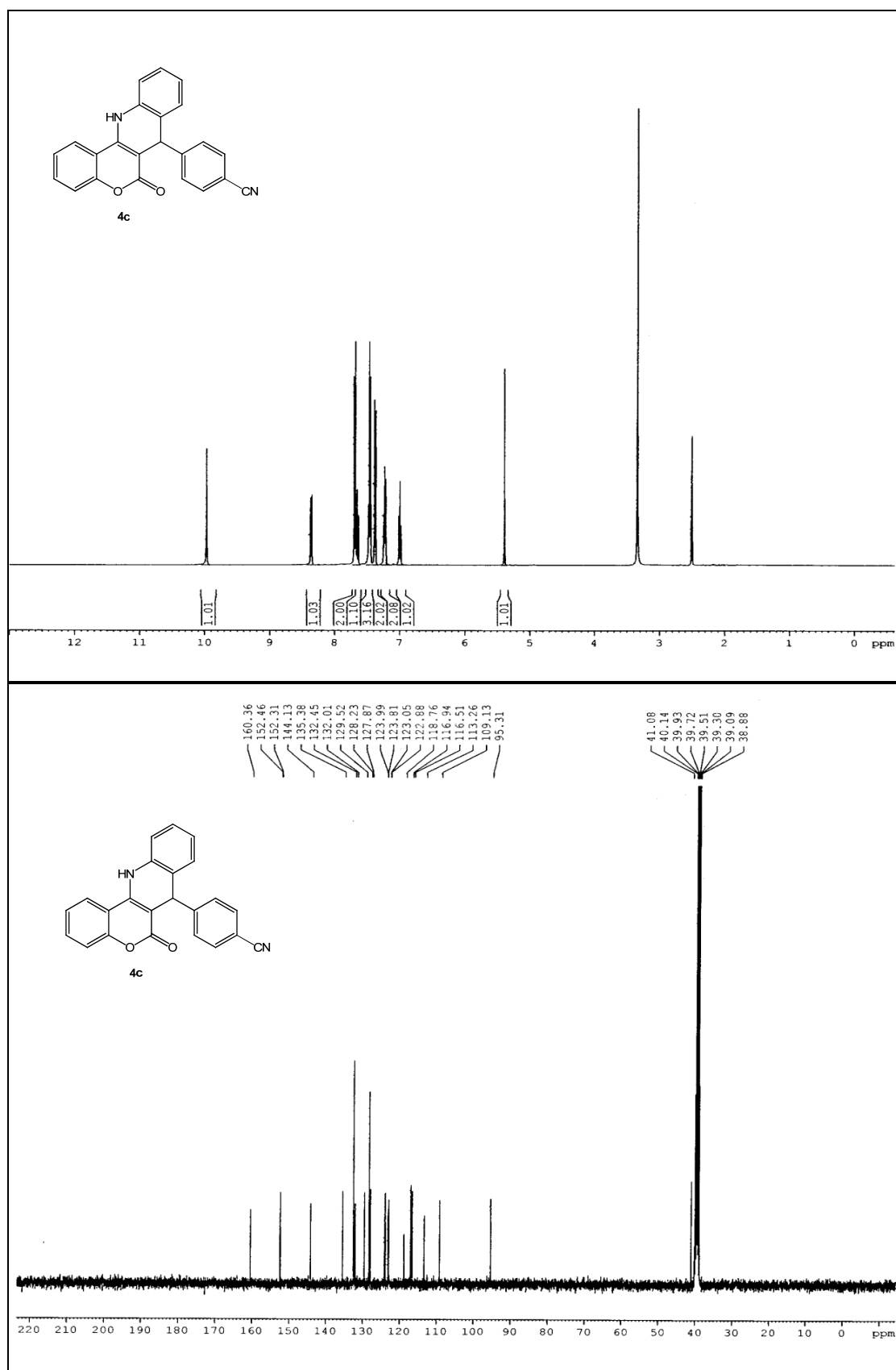
^1H and ^{13}C NMR spectra for **4a**



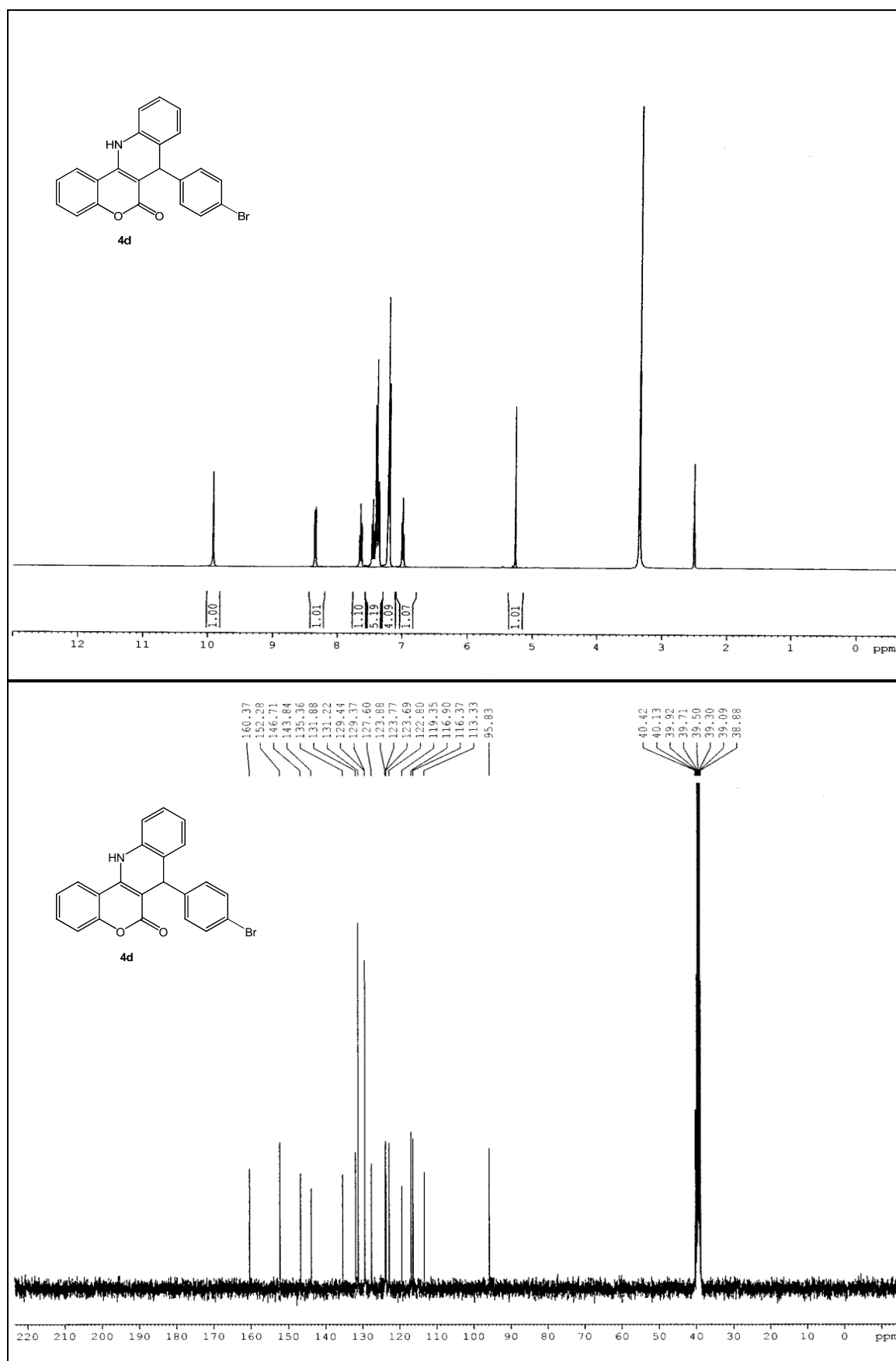
^1H and ^{13}C NMR spectra for **4b**



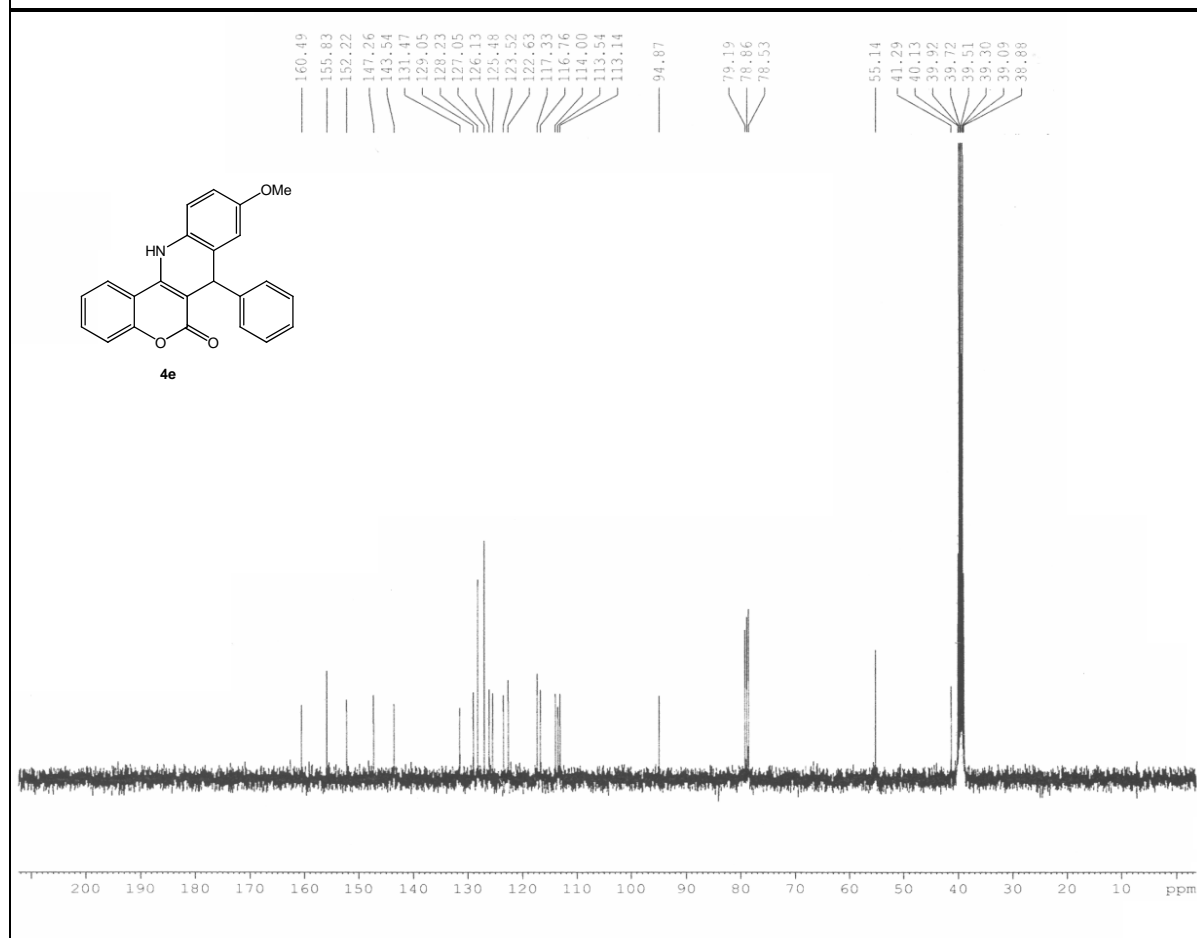
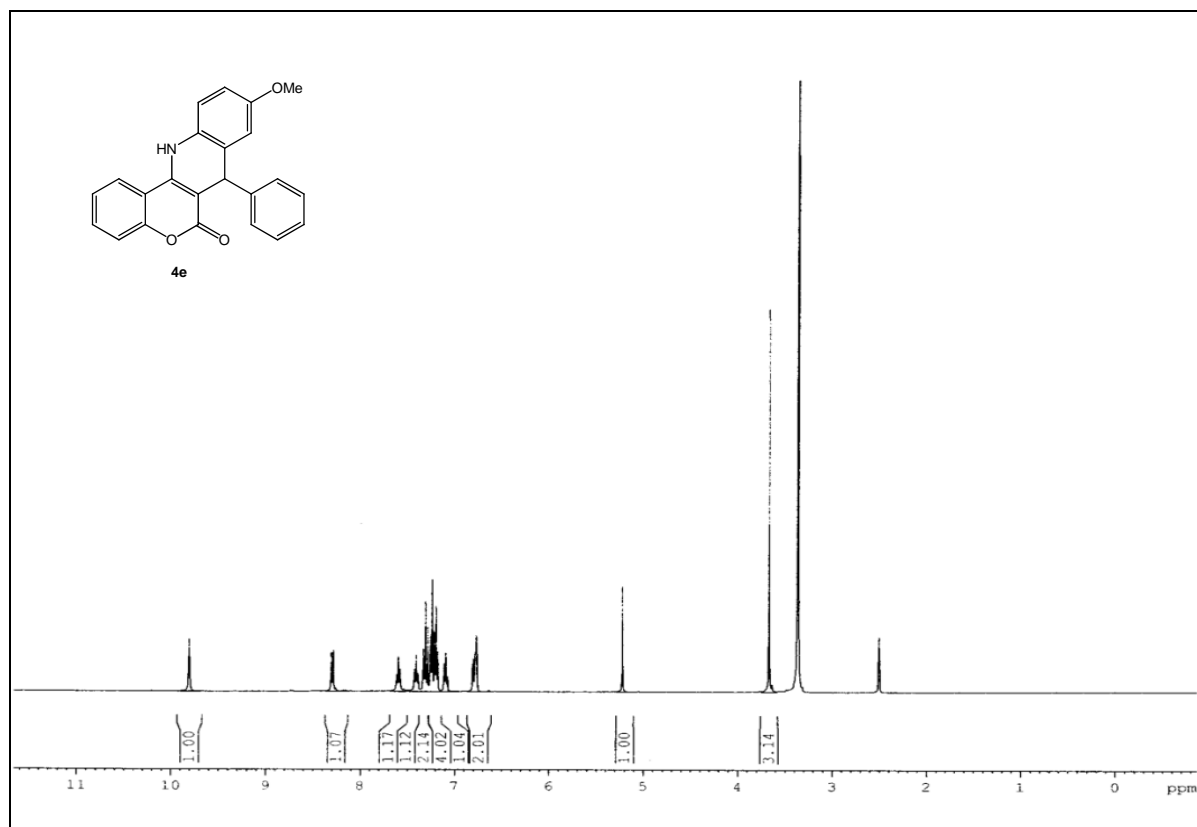
^1H and ^{13}C NMR spectra for **4c**



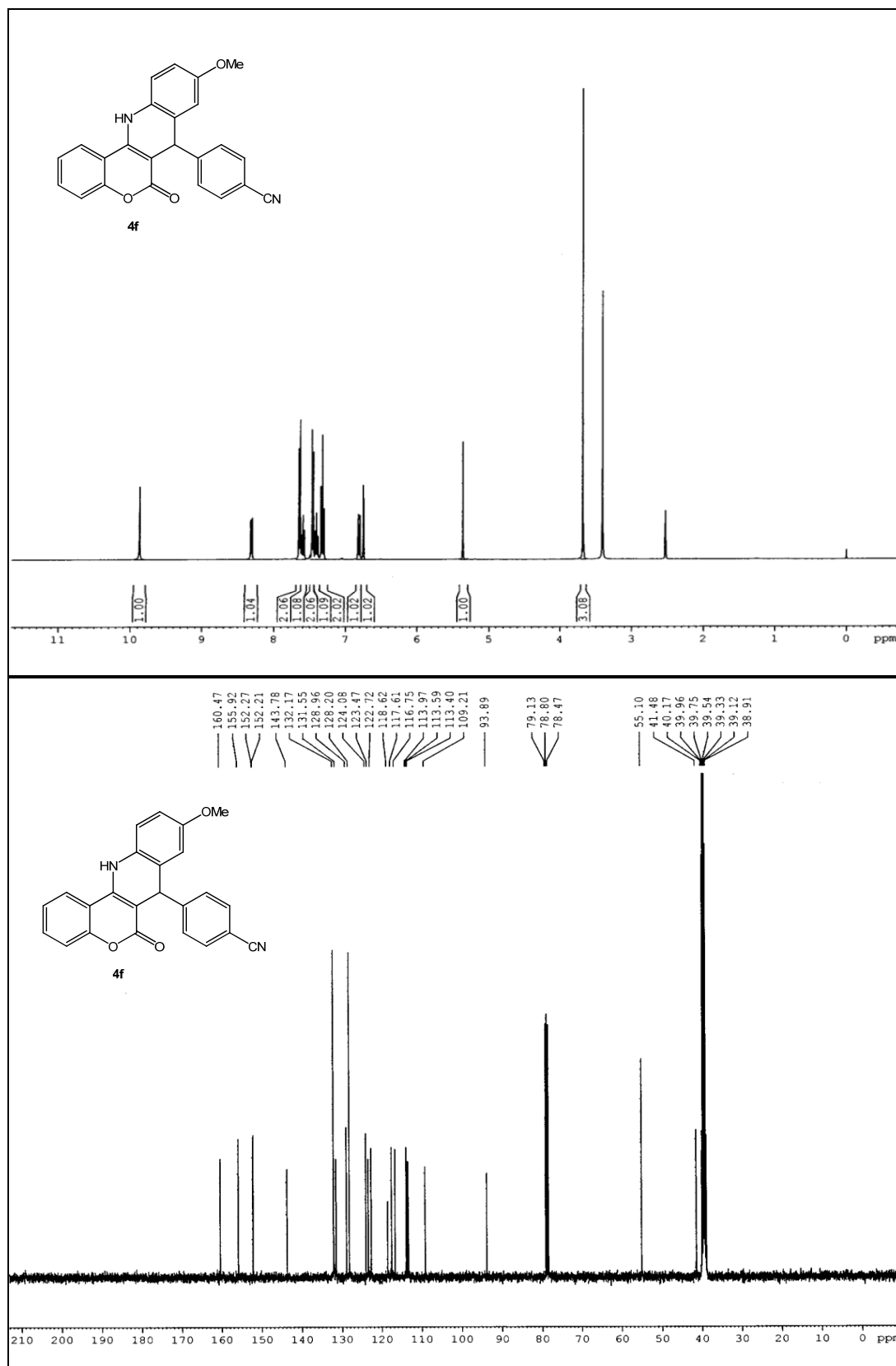
^1H and ^{13}C NMR spectra for **4d**



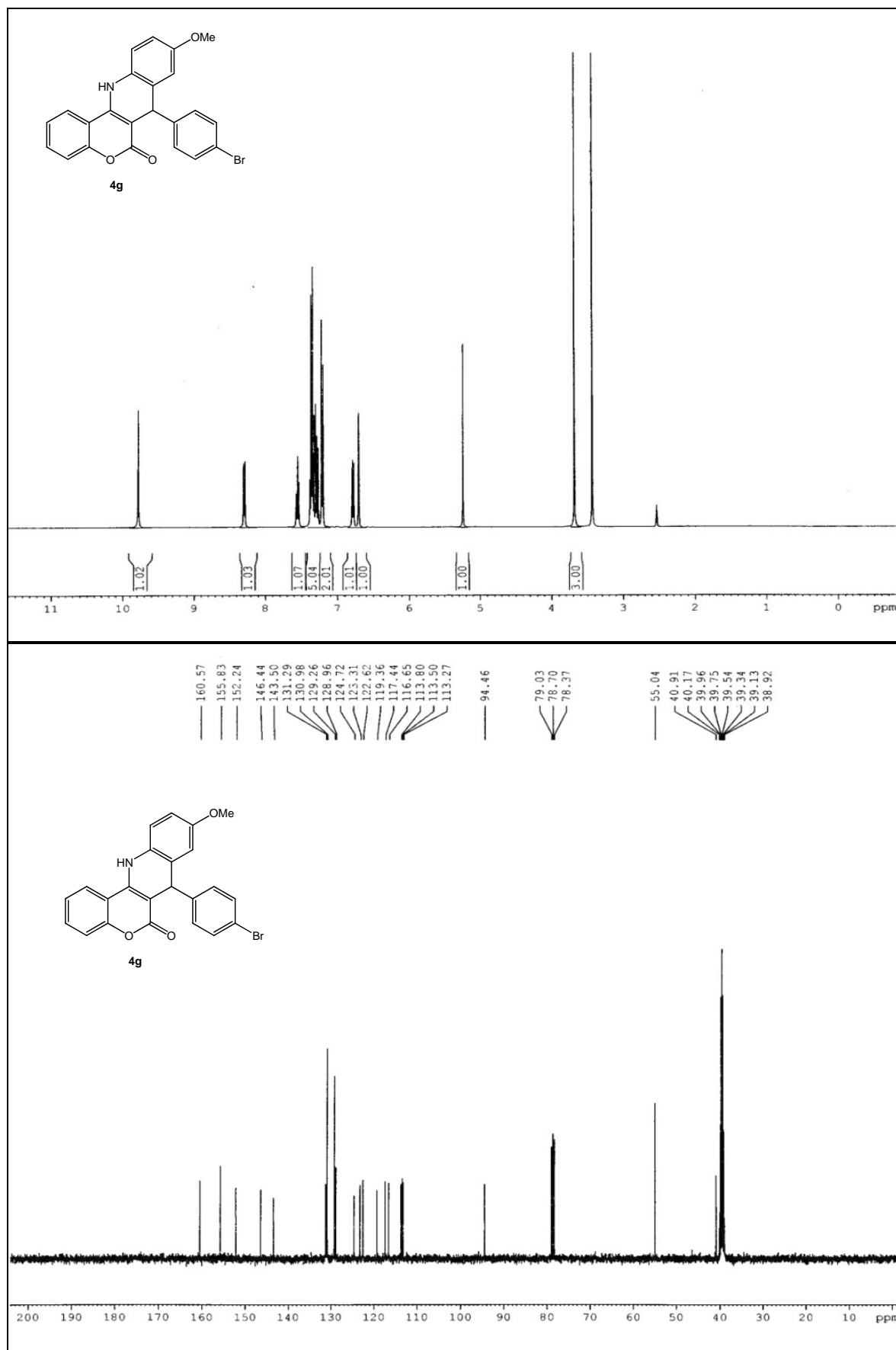
^1H and ^{13}C NMR spectra for **4e**



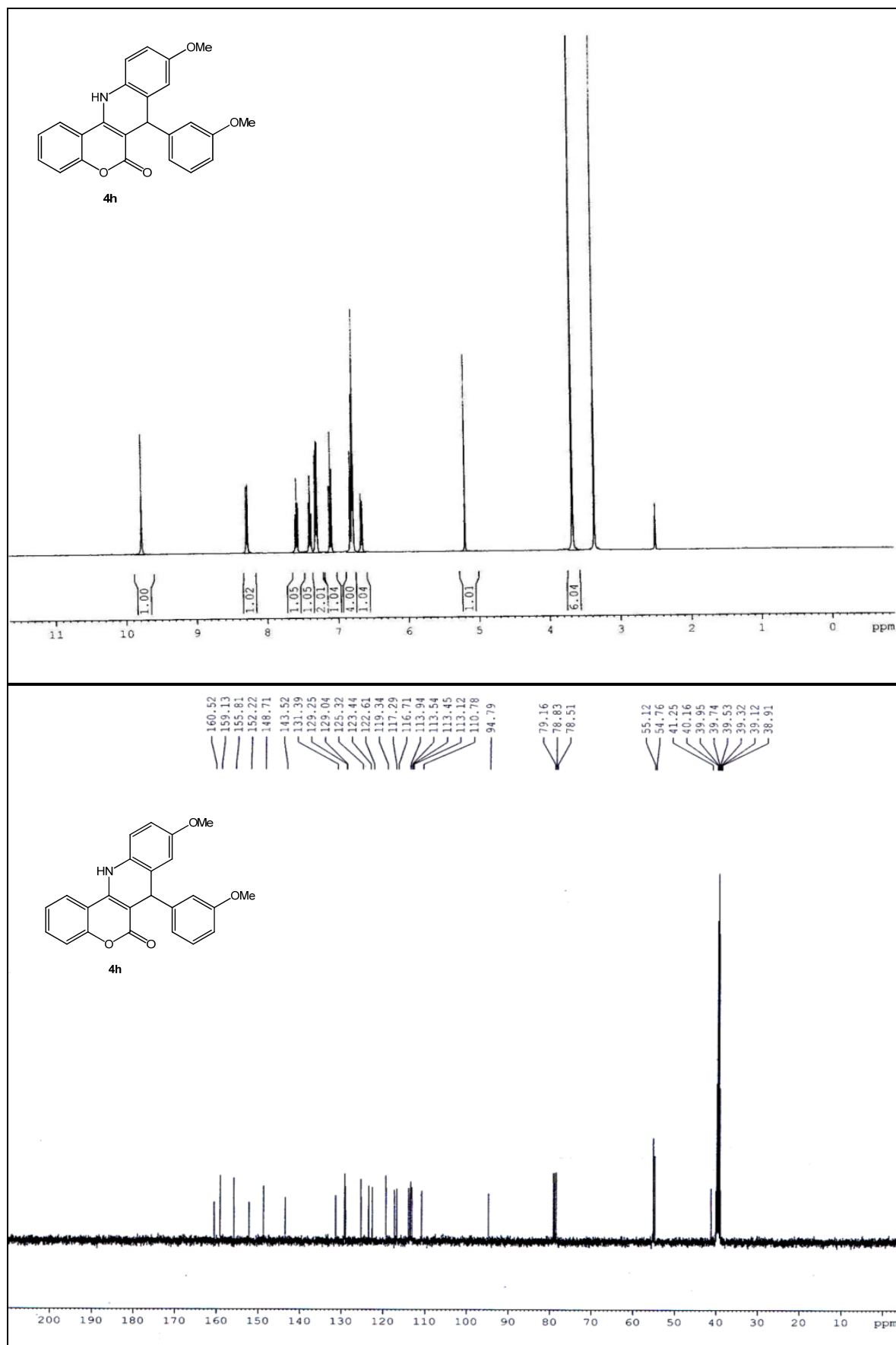
^1H and ^{13}C NMR spectra for **4f**



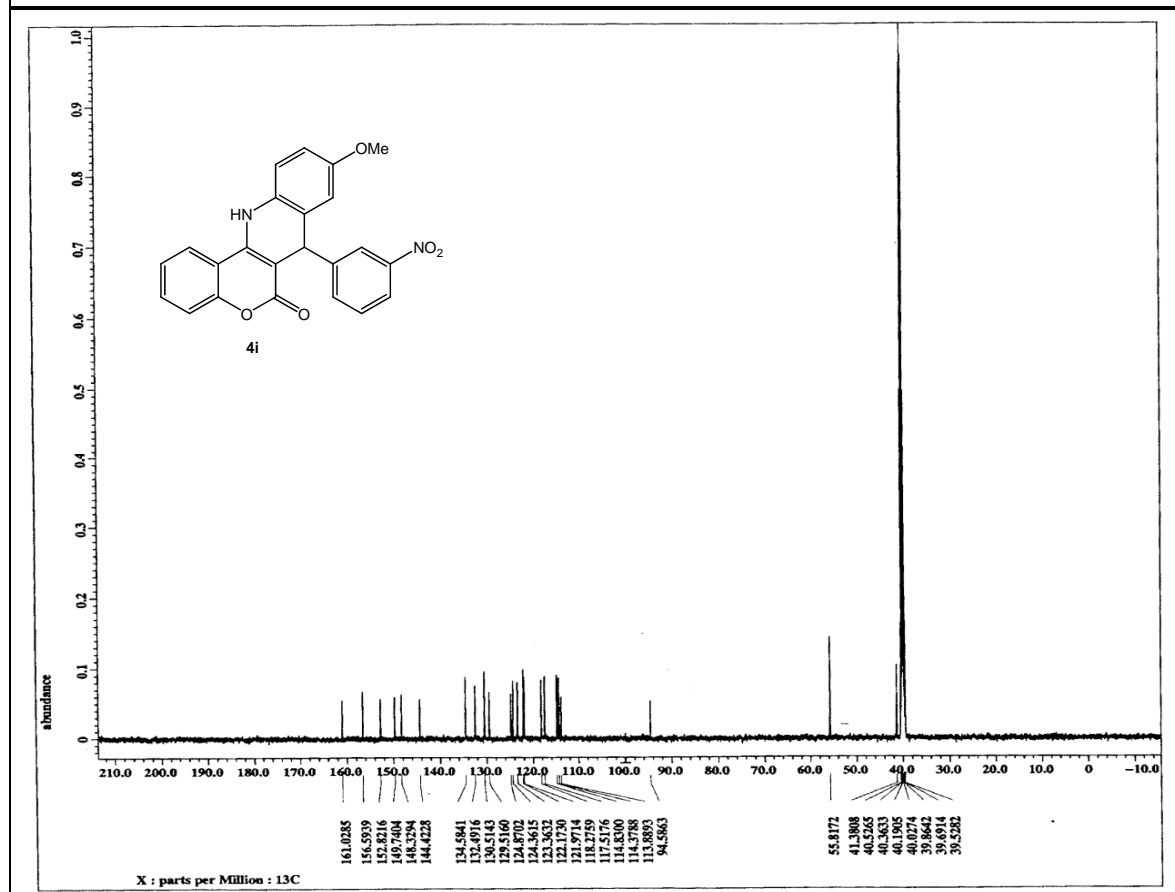
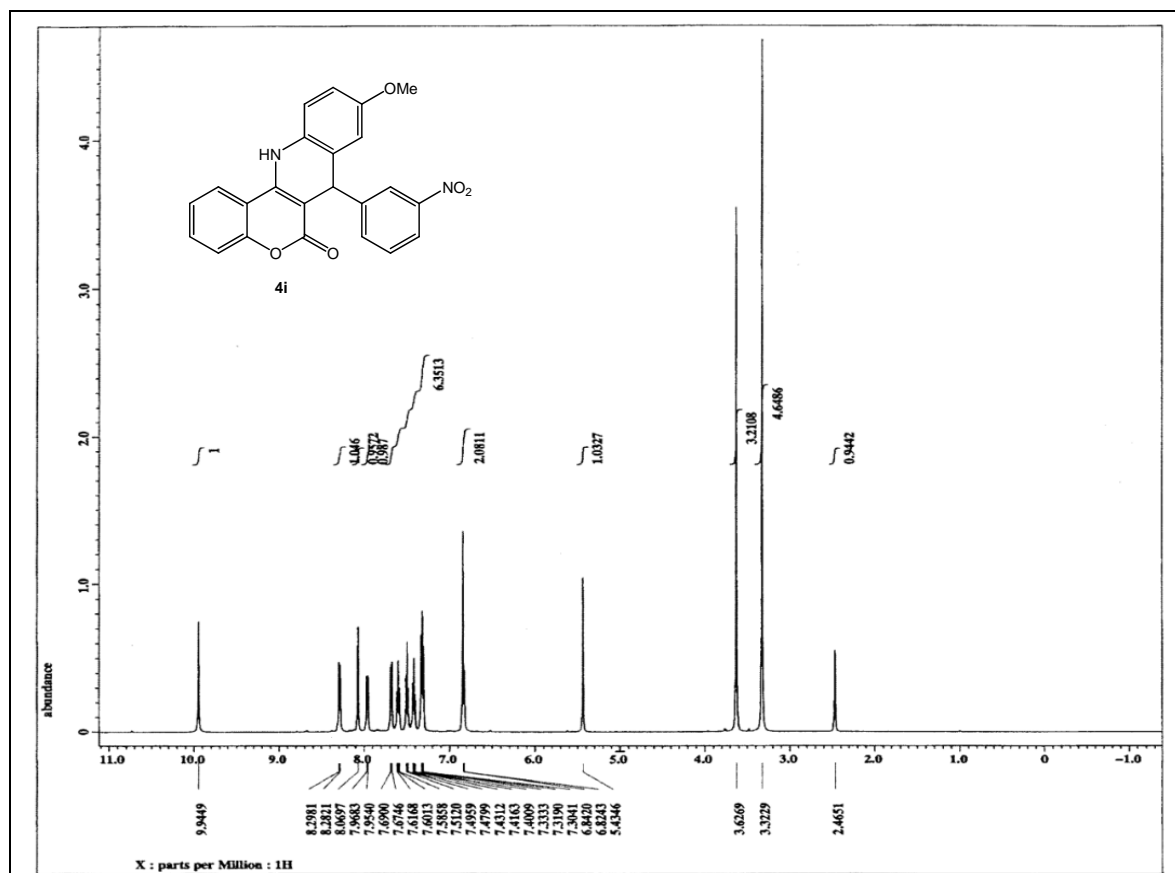
^1H and ^{13}C NMR spectra for **4g**



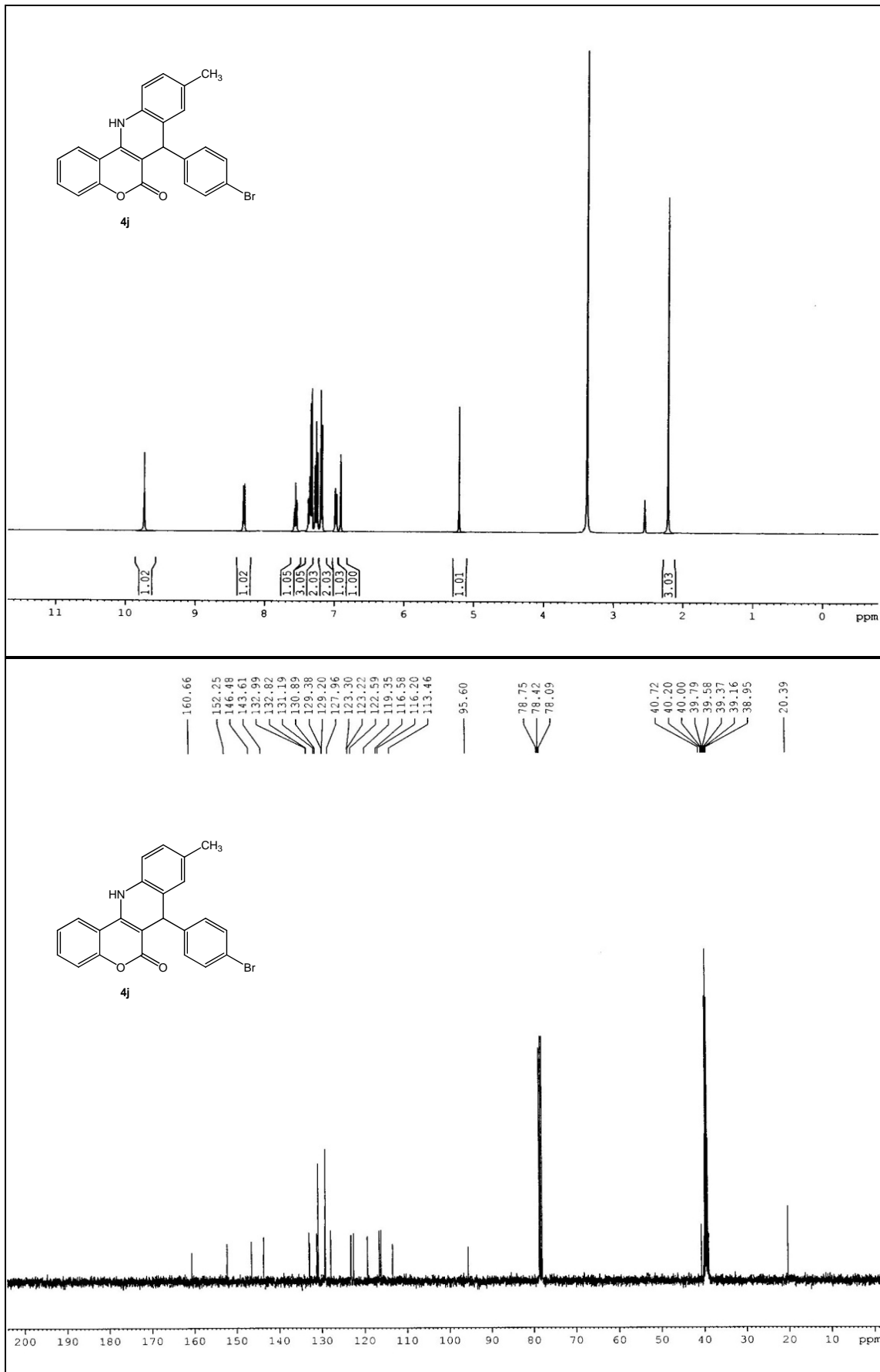
^1H and ^{13}C NMR spectra for **4h**



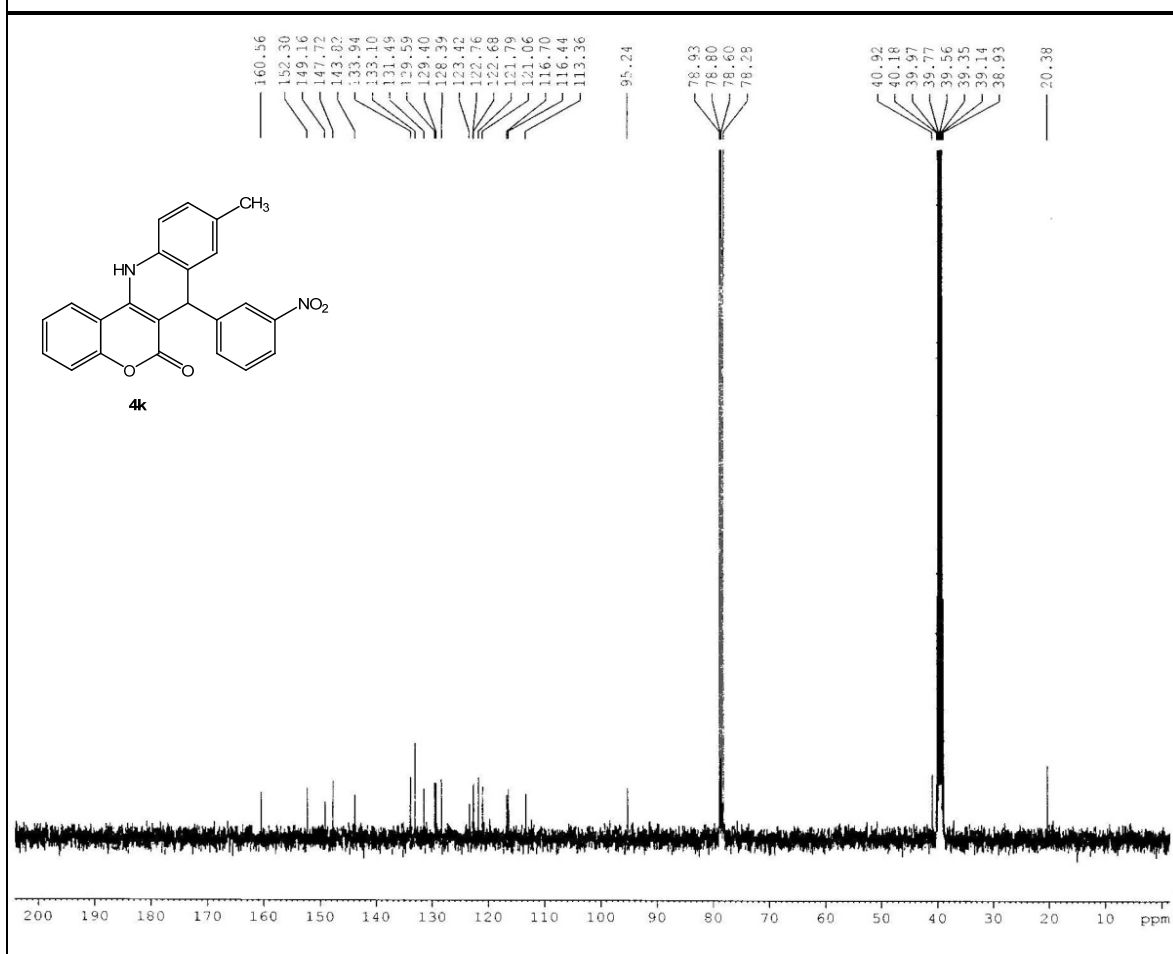
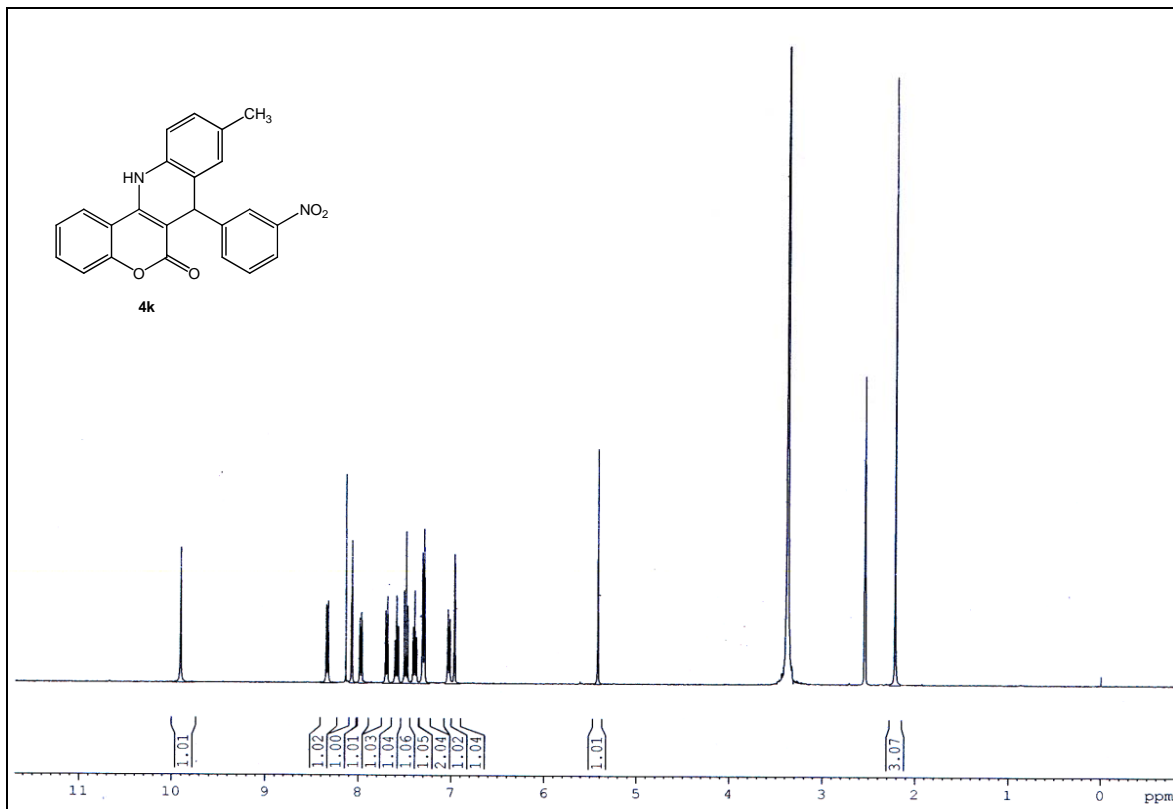
^1H and ^{13}C NMR spectra for **4i**



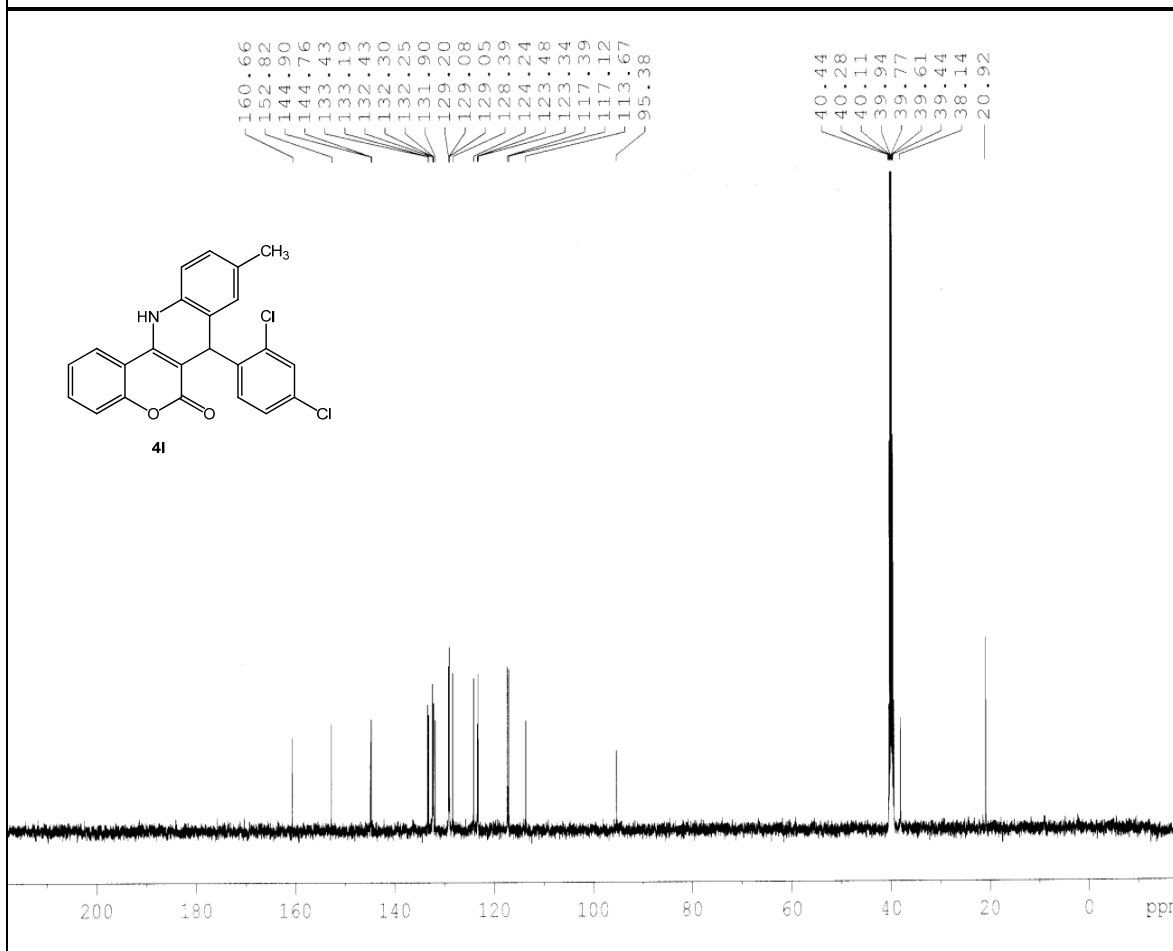
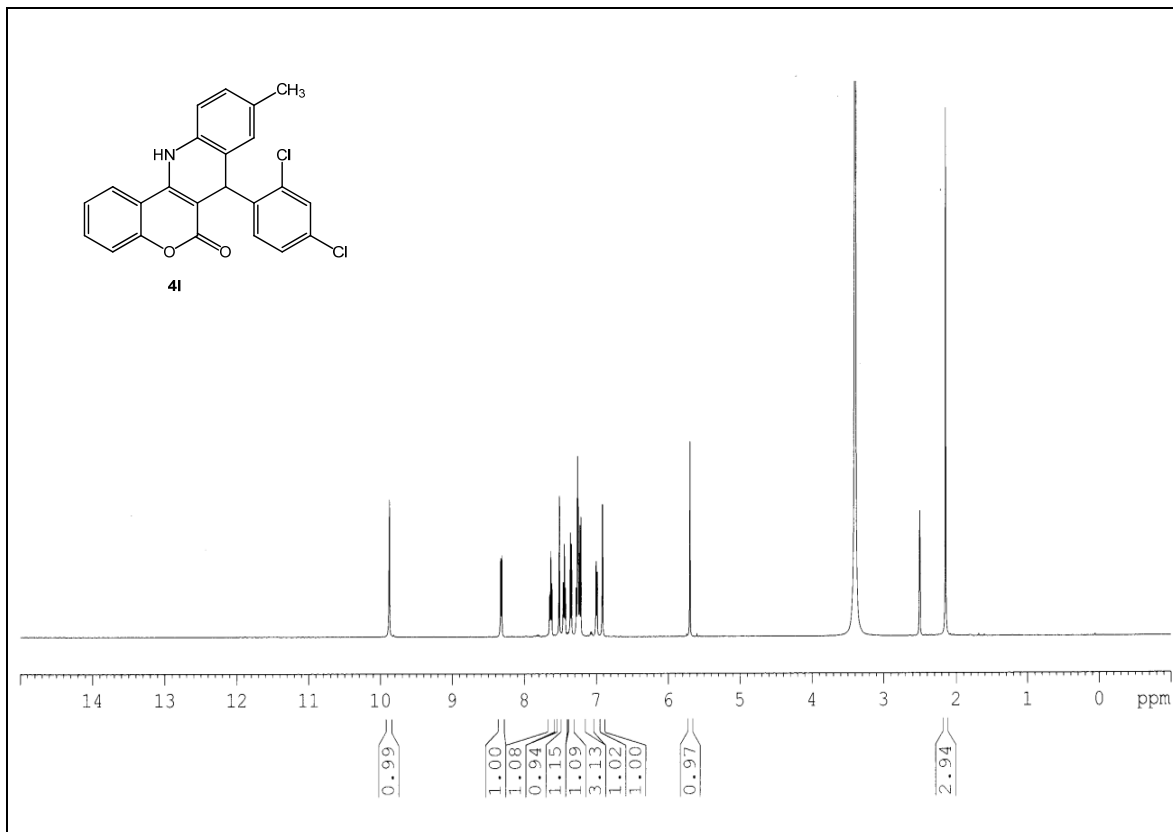
^1H and ^{13}C NMR spectra for **4j**



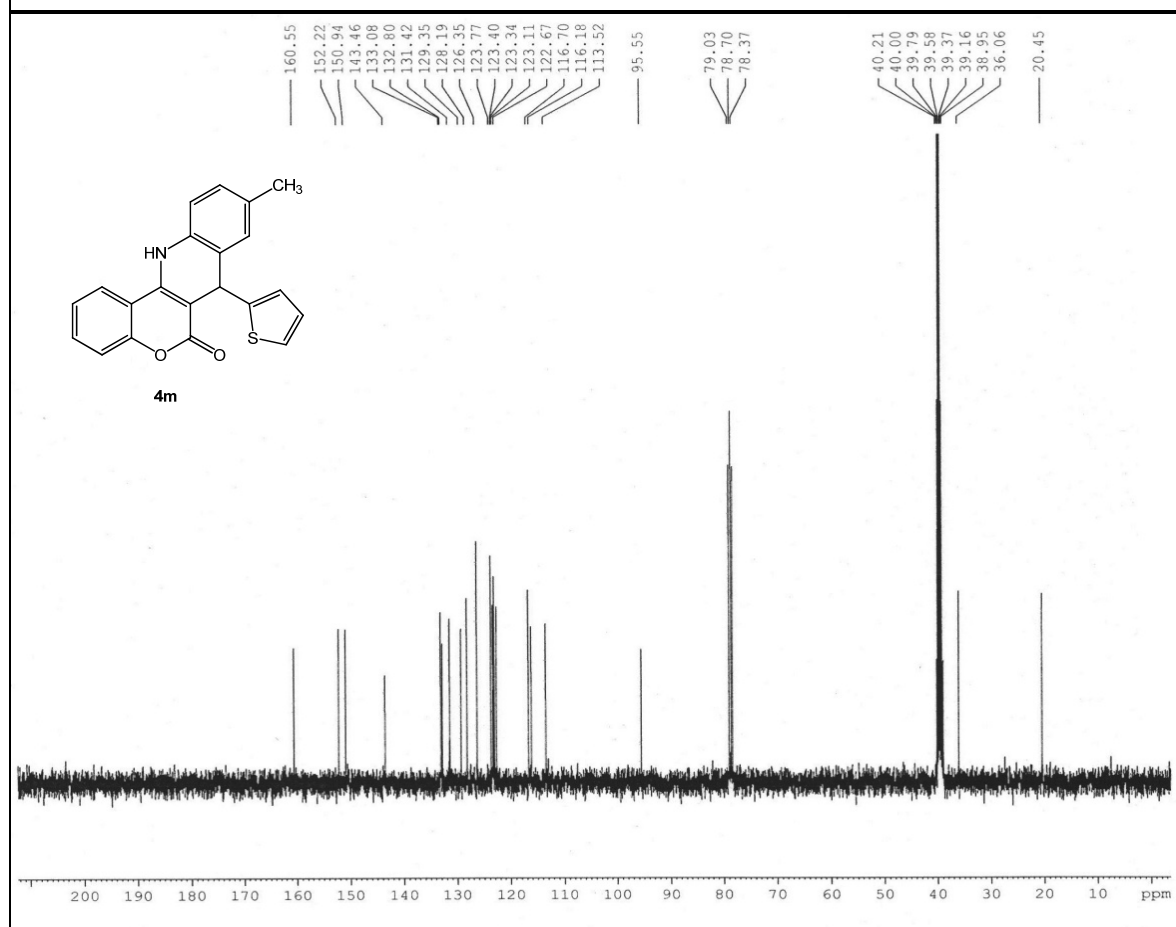
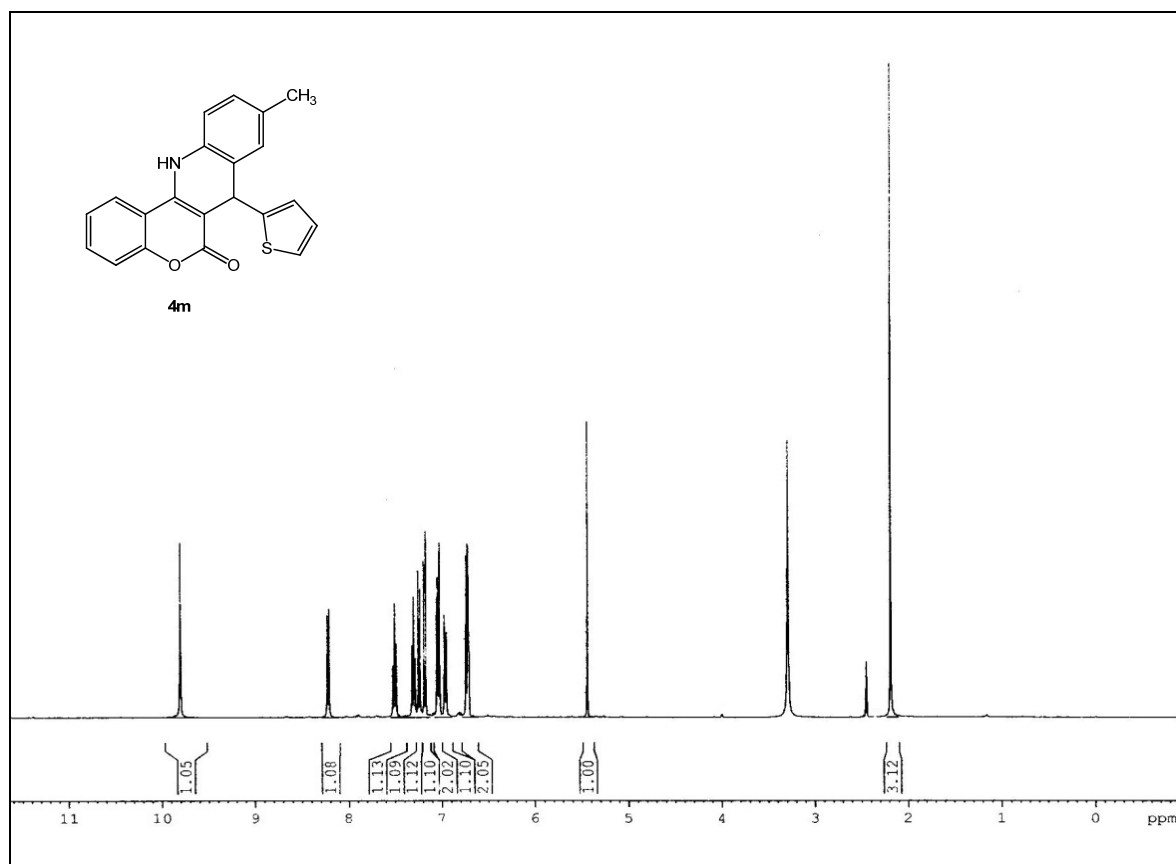
^1H and ^{13}C NMR spectra for **4k**



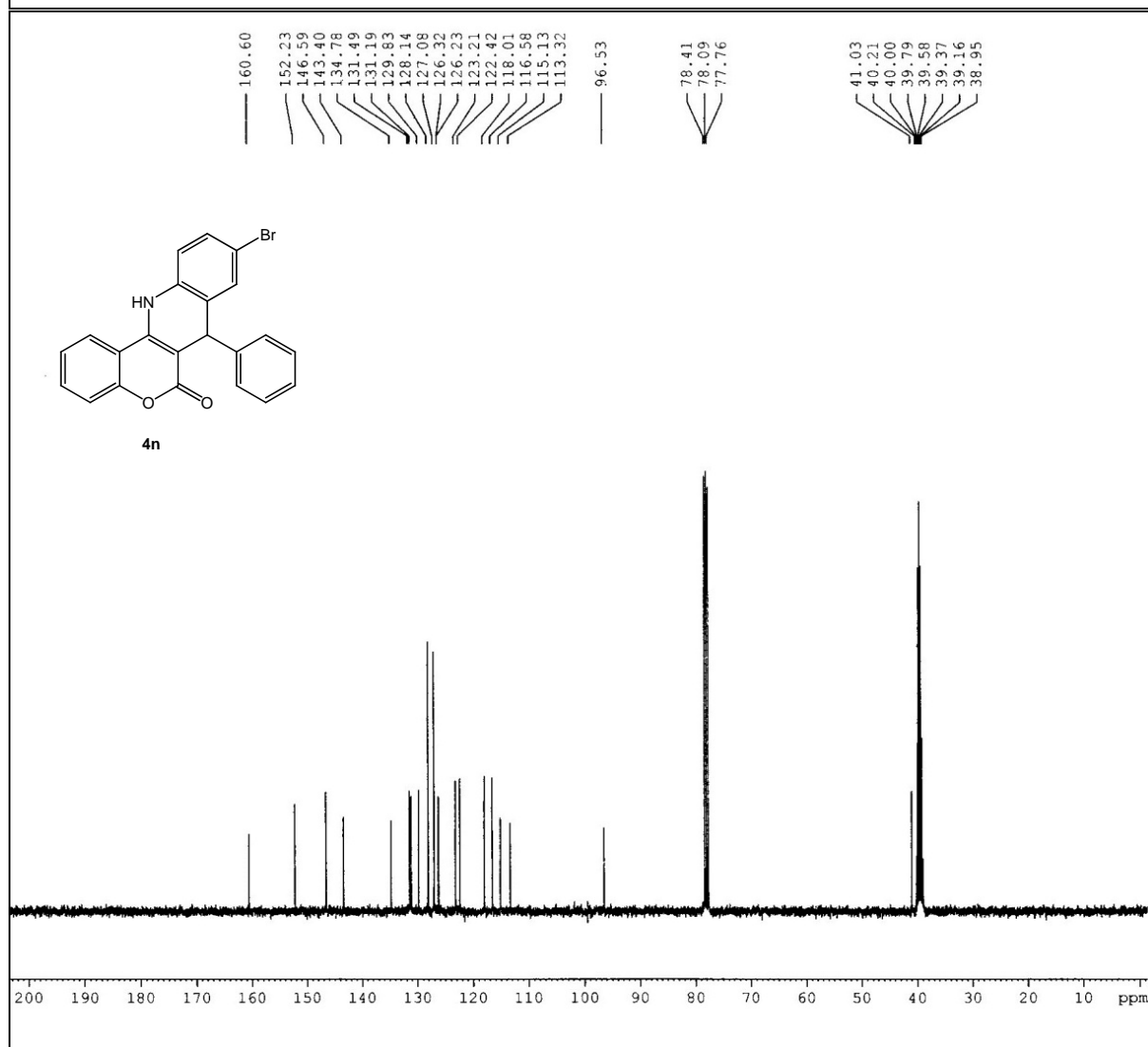
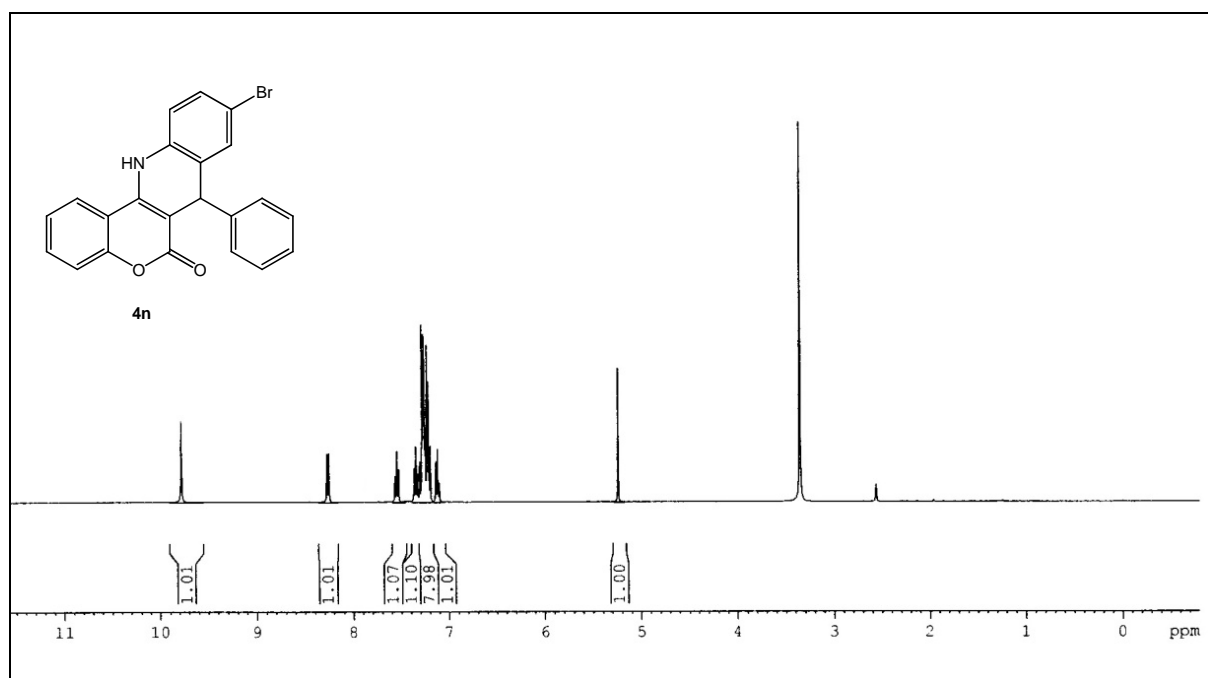
^1H and ^{13}C NMR spectra for **4I**



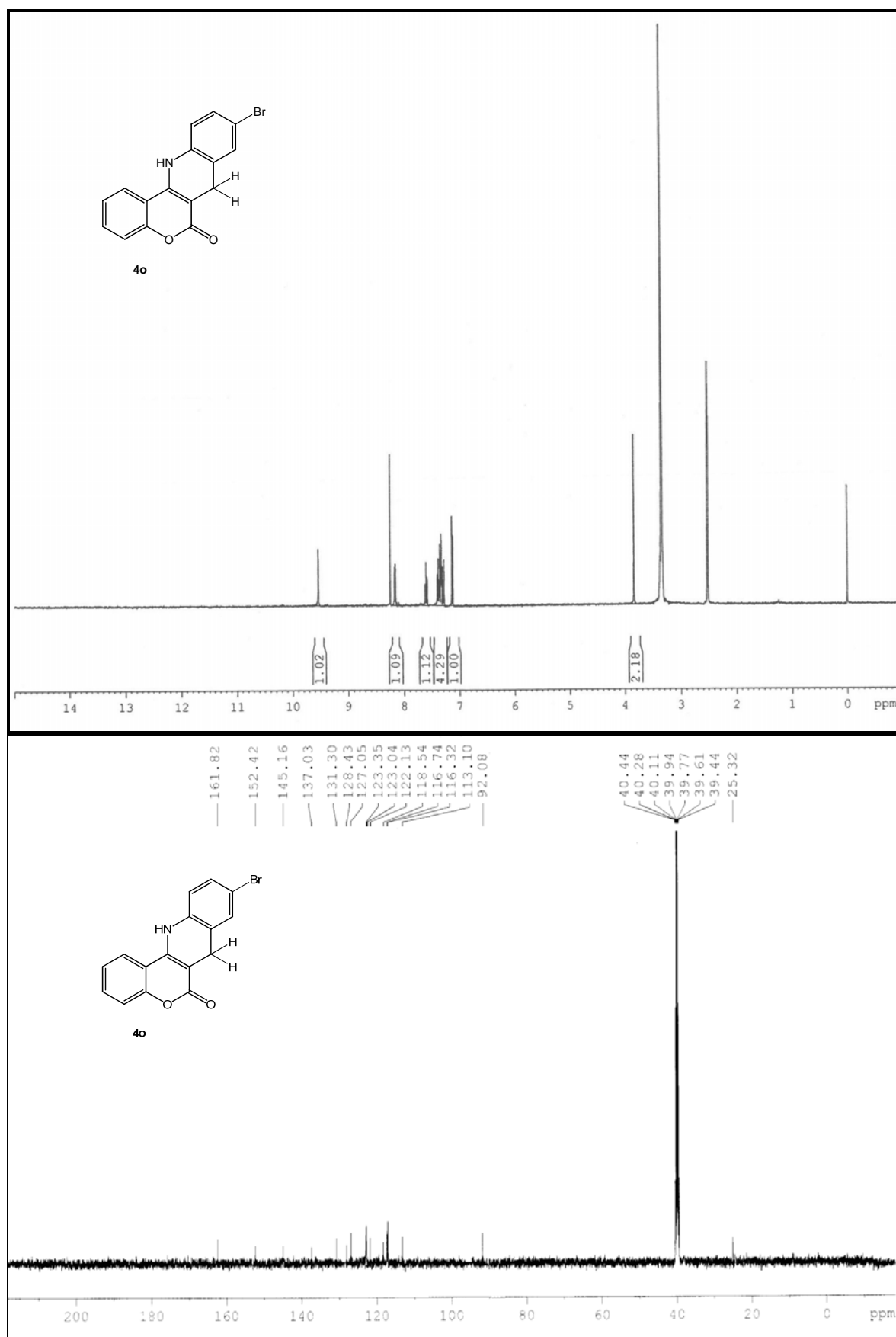
^1H and ^{13}C NMR spectra for **4m**



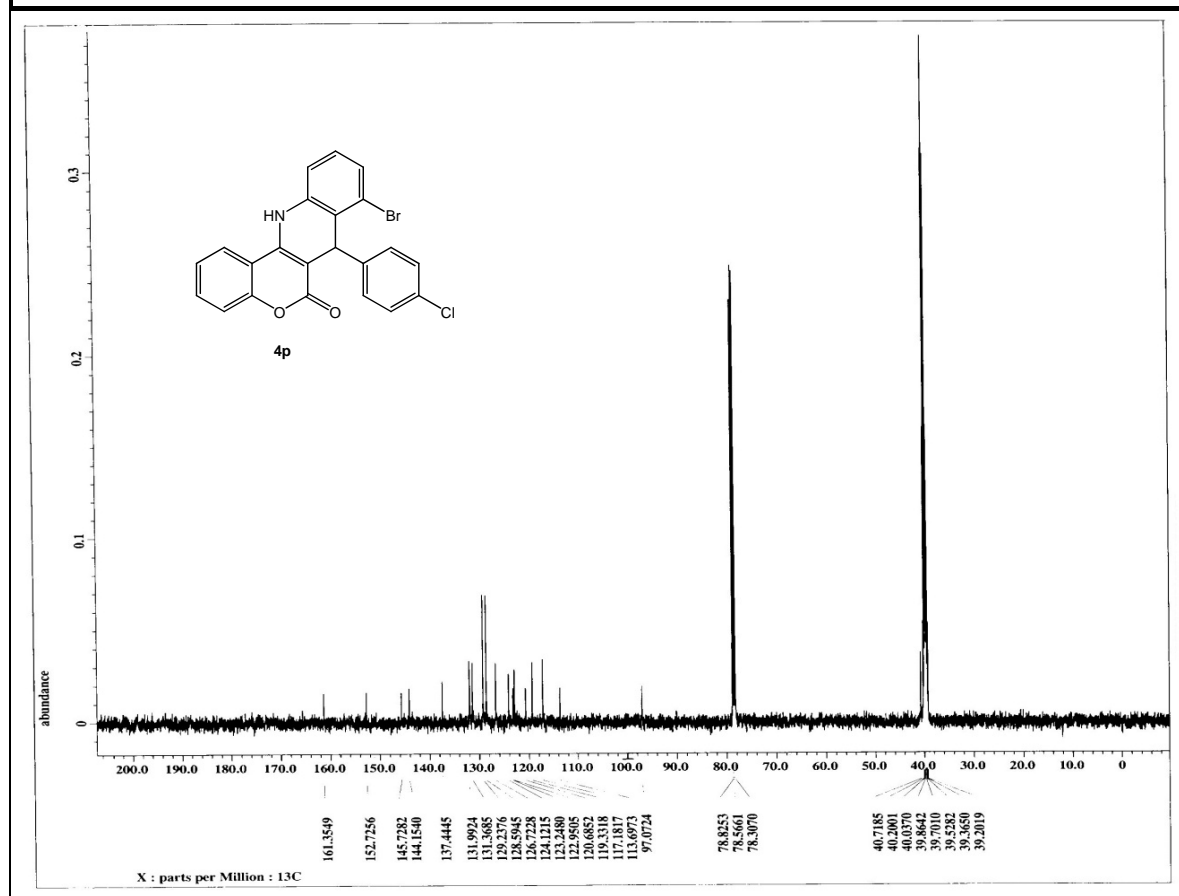
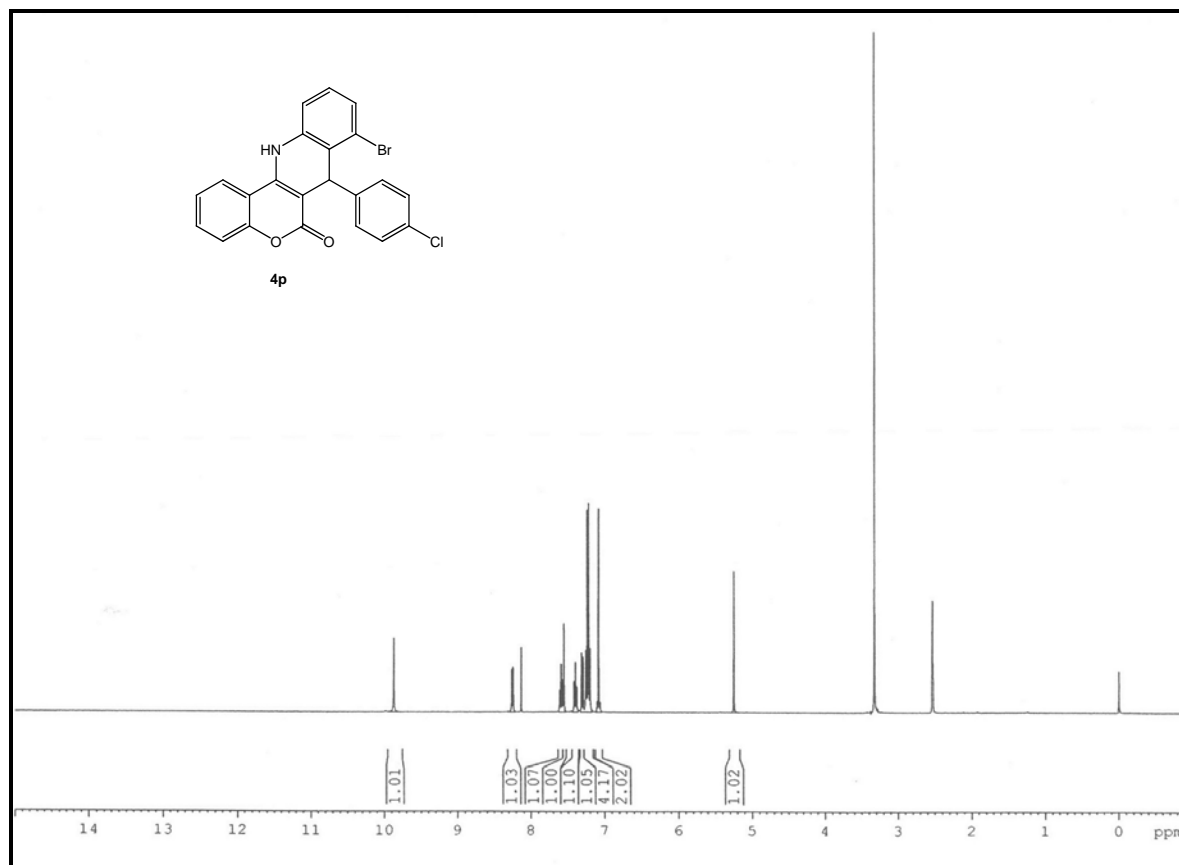
^1H and ^{13}C NMR spectra for **4n**



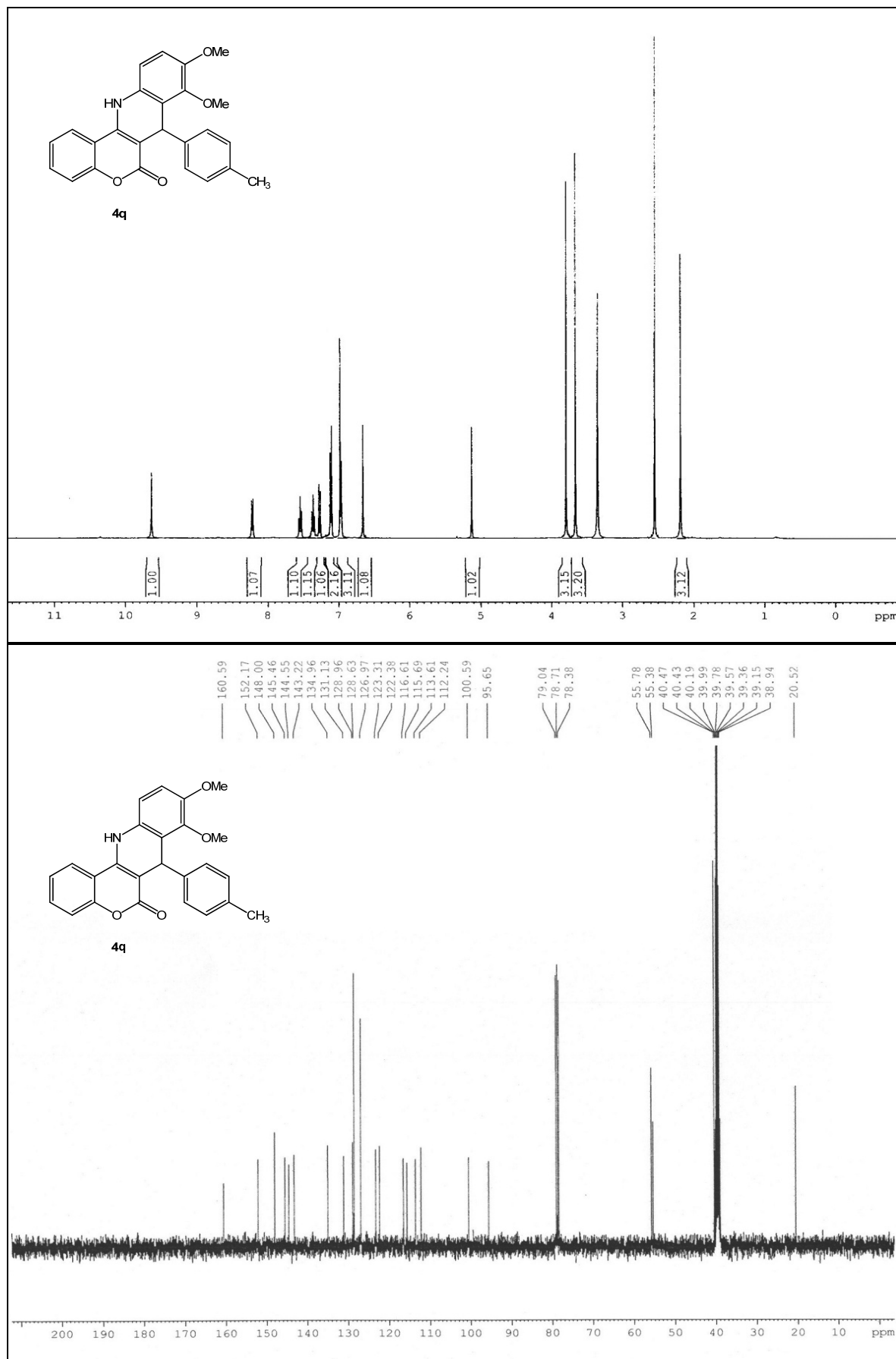
^1H and ^{13}C NMR spectra for **4o**



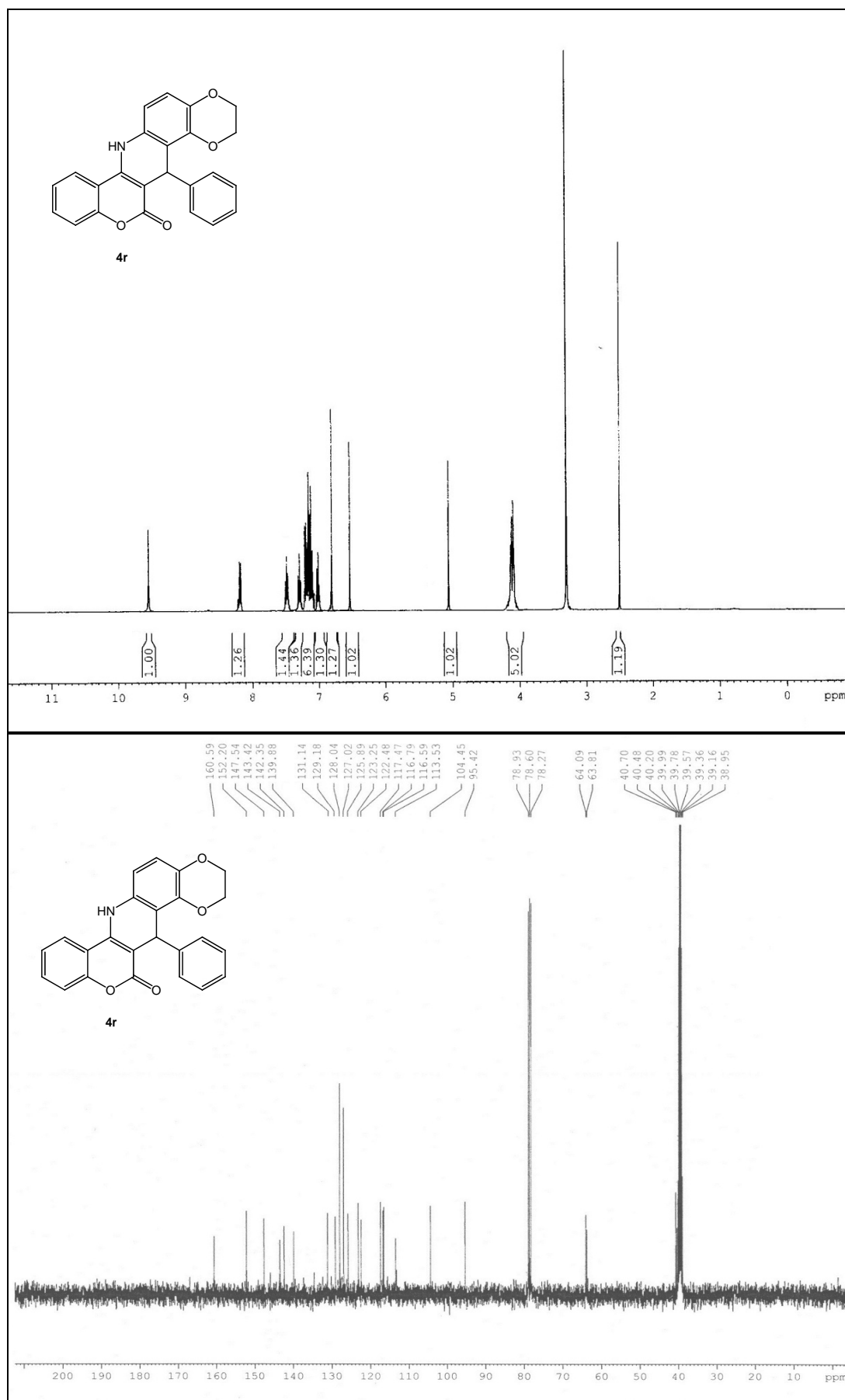
^1H and ^{13}C NMR spectra for **4p**



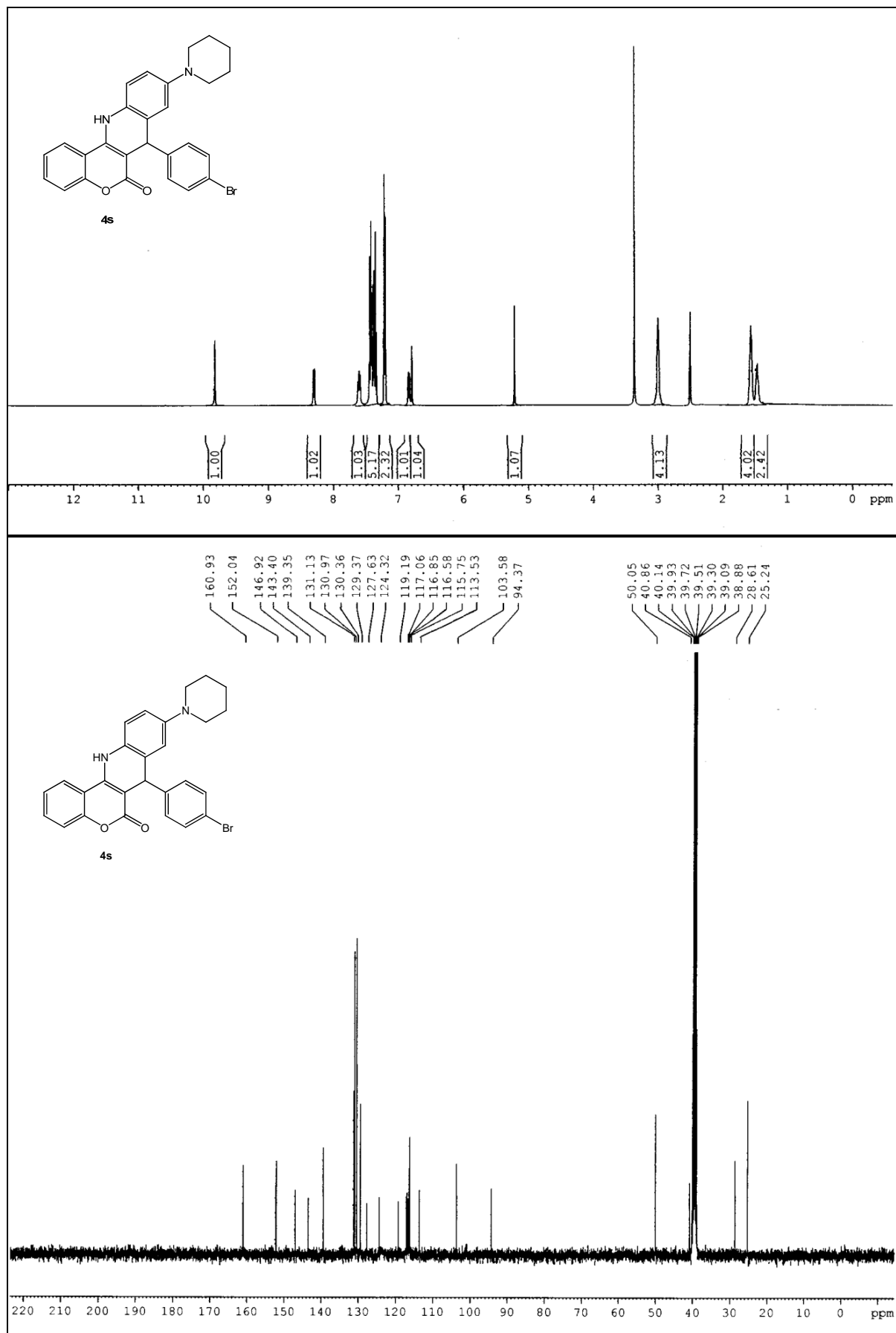
^1H and ^{13}C NMR spectra for **4q**



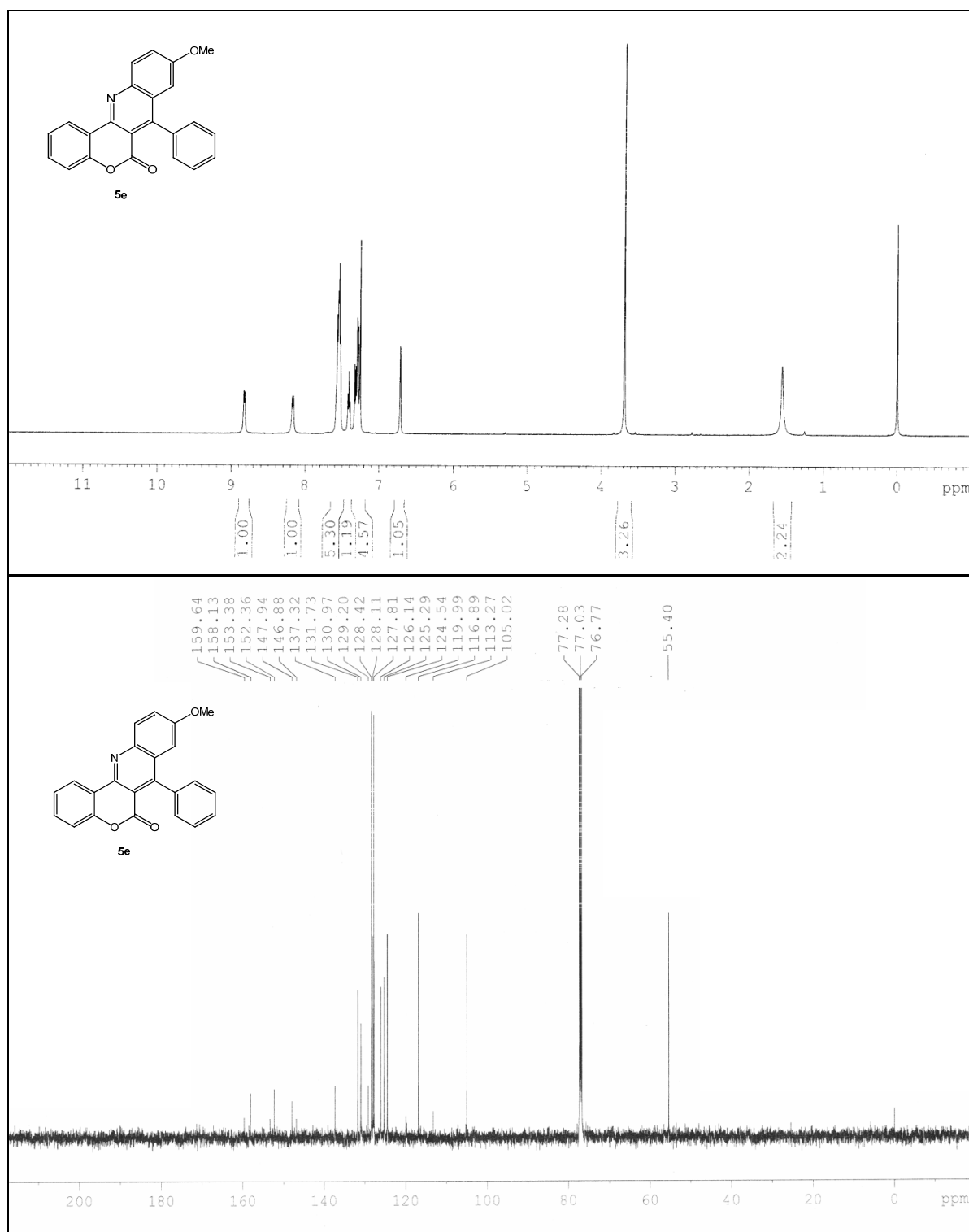
^1H and ^{13}C NMR spectra for **4r**



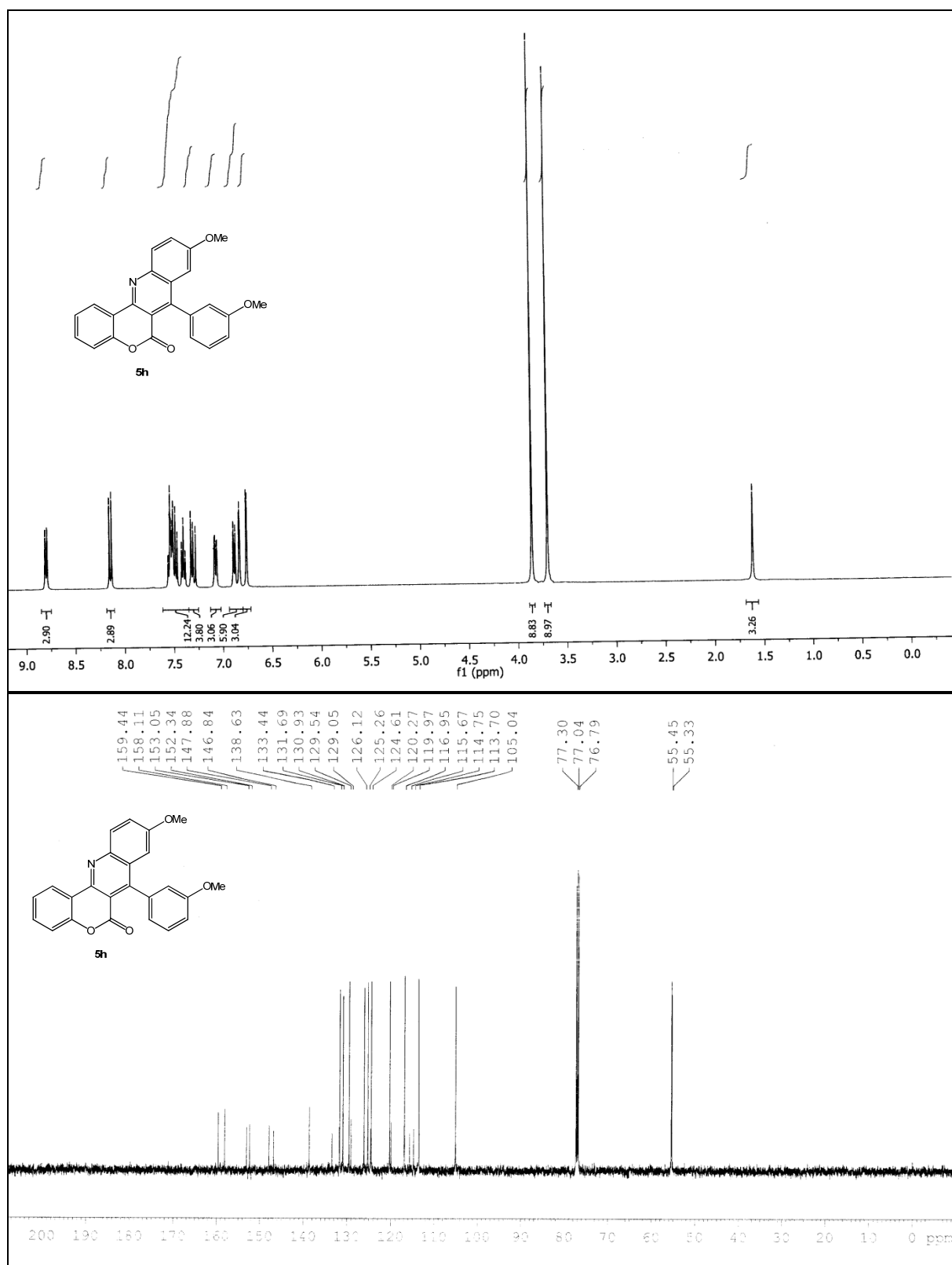
^1H and ^{13}C NMR spectra for **4s**



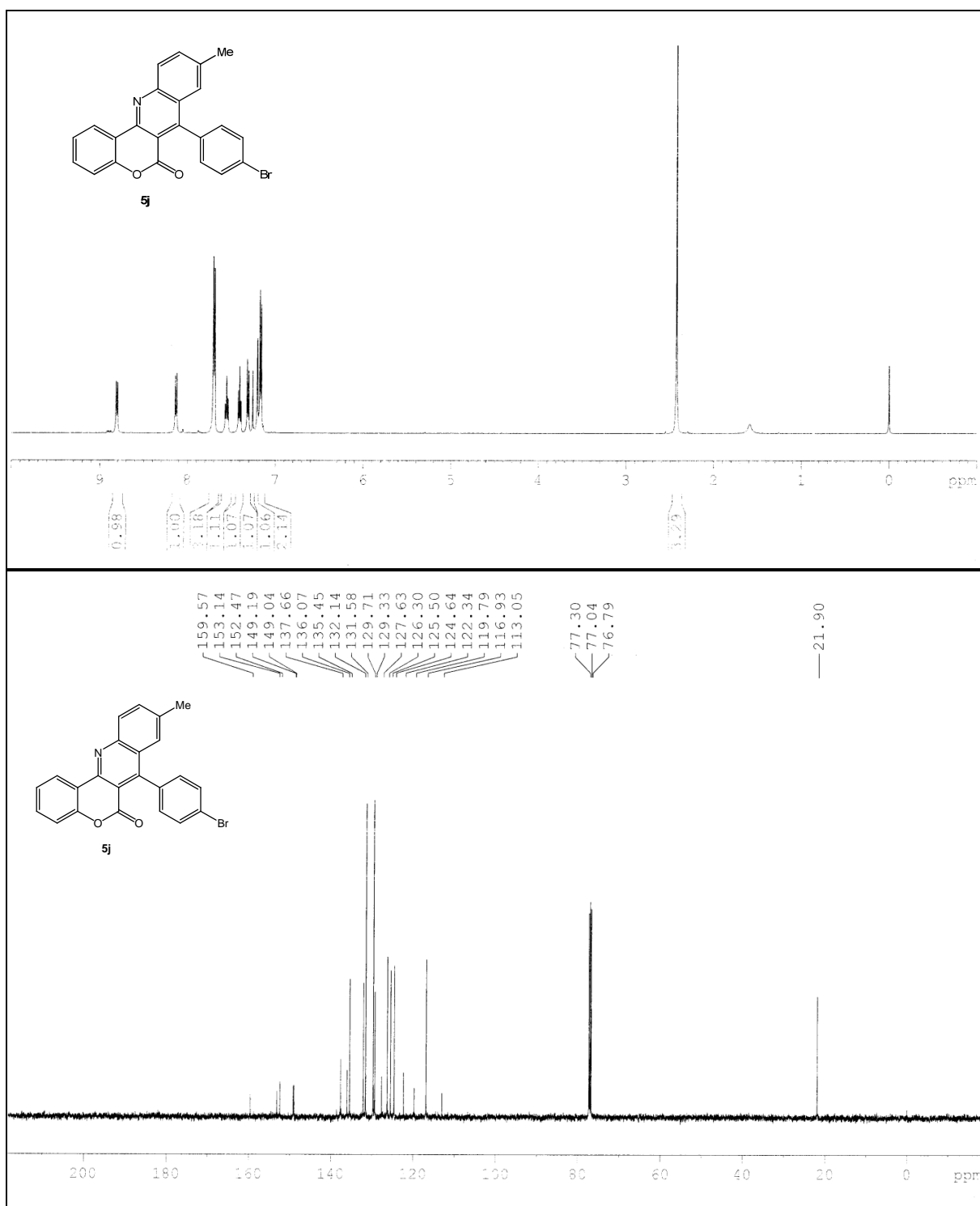
^1H and ^{13}C NMR spectra for **5e**



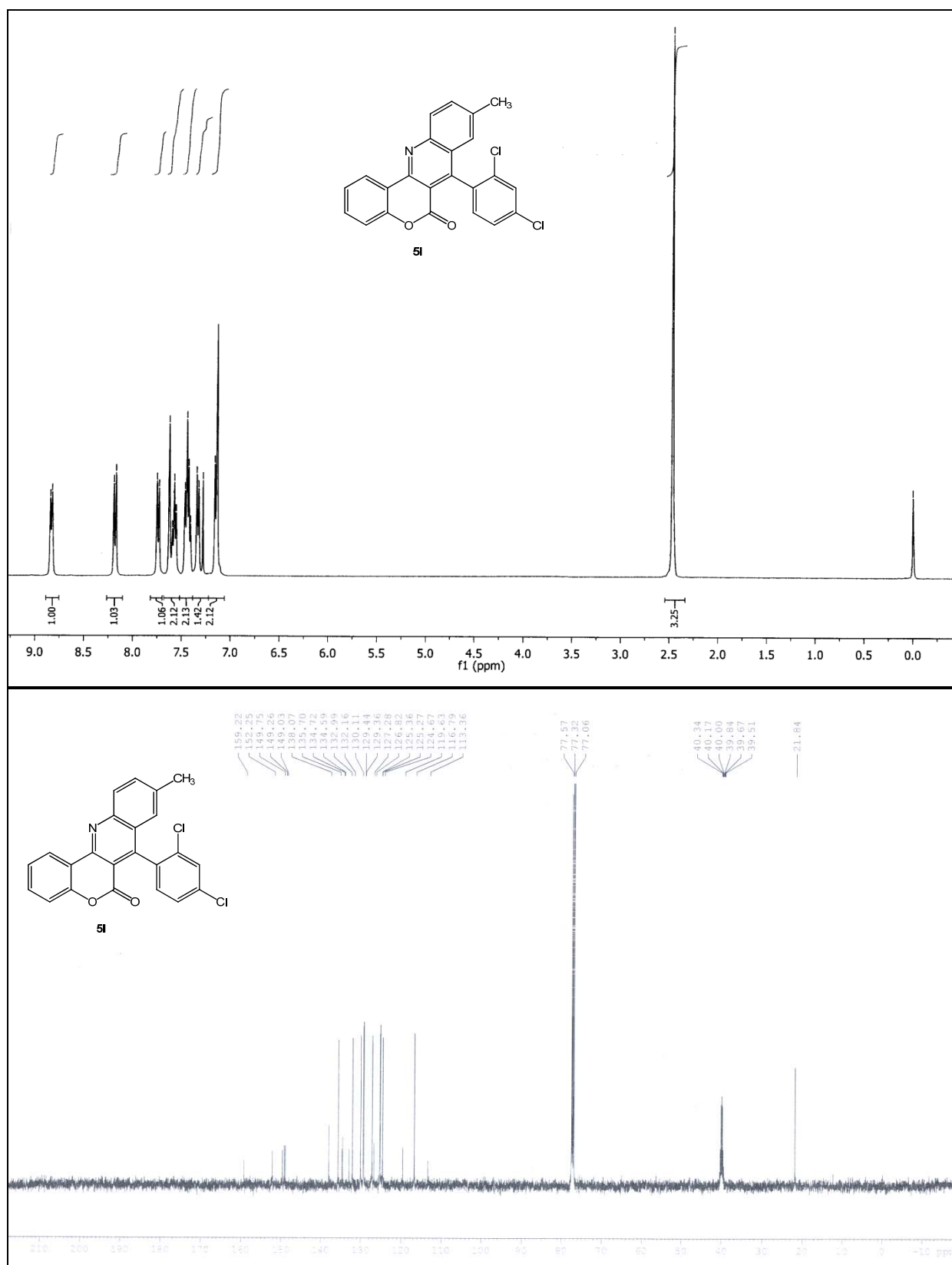
^1H and ^{13}C NMR spectra for **5h**



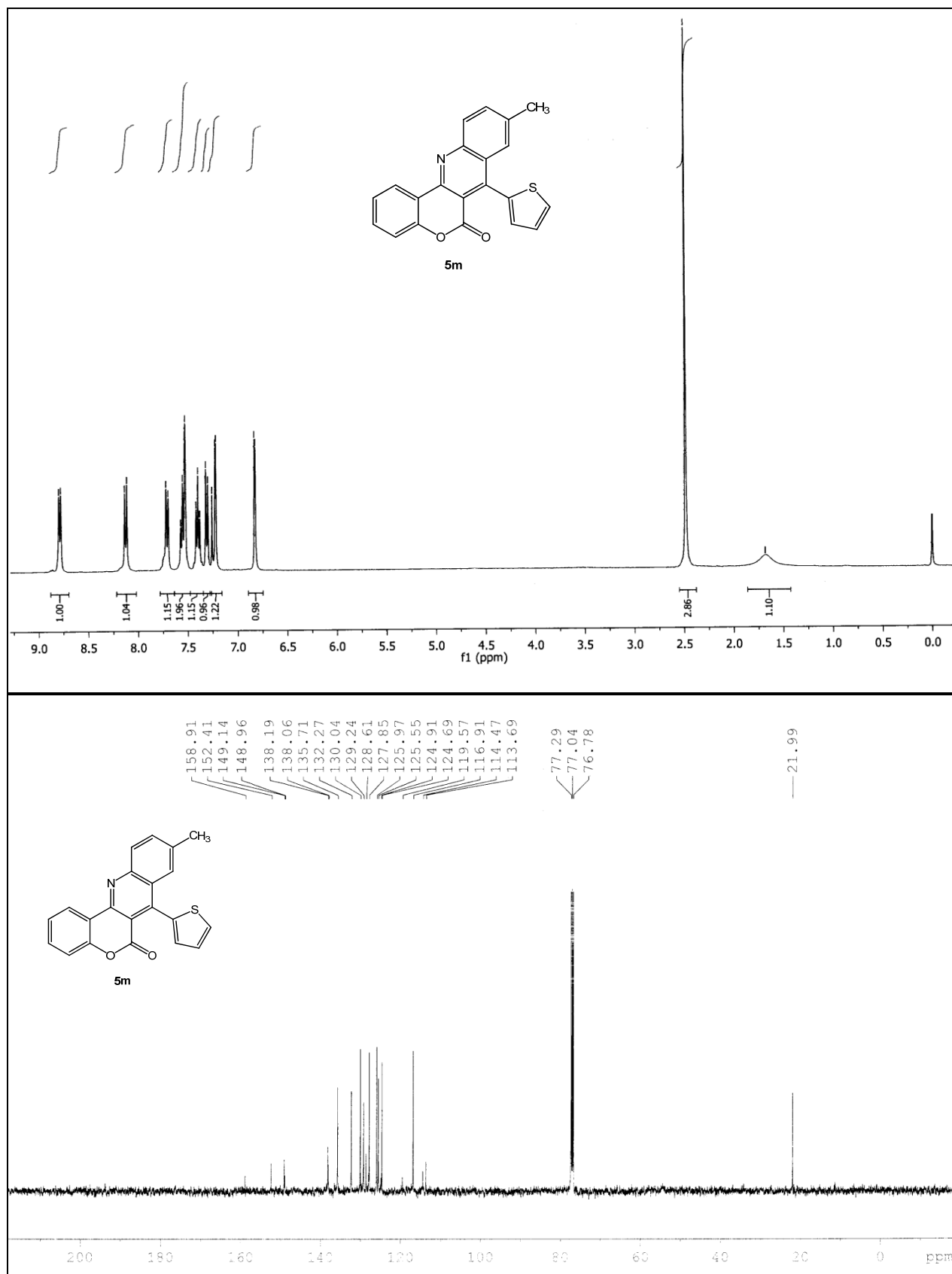
^1H and ^{13}C NMR spectra for **5j**



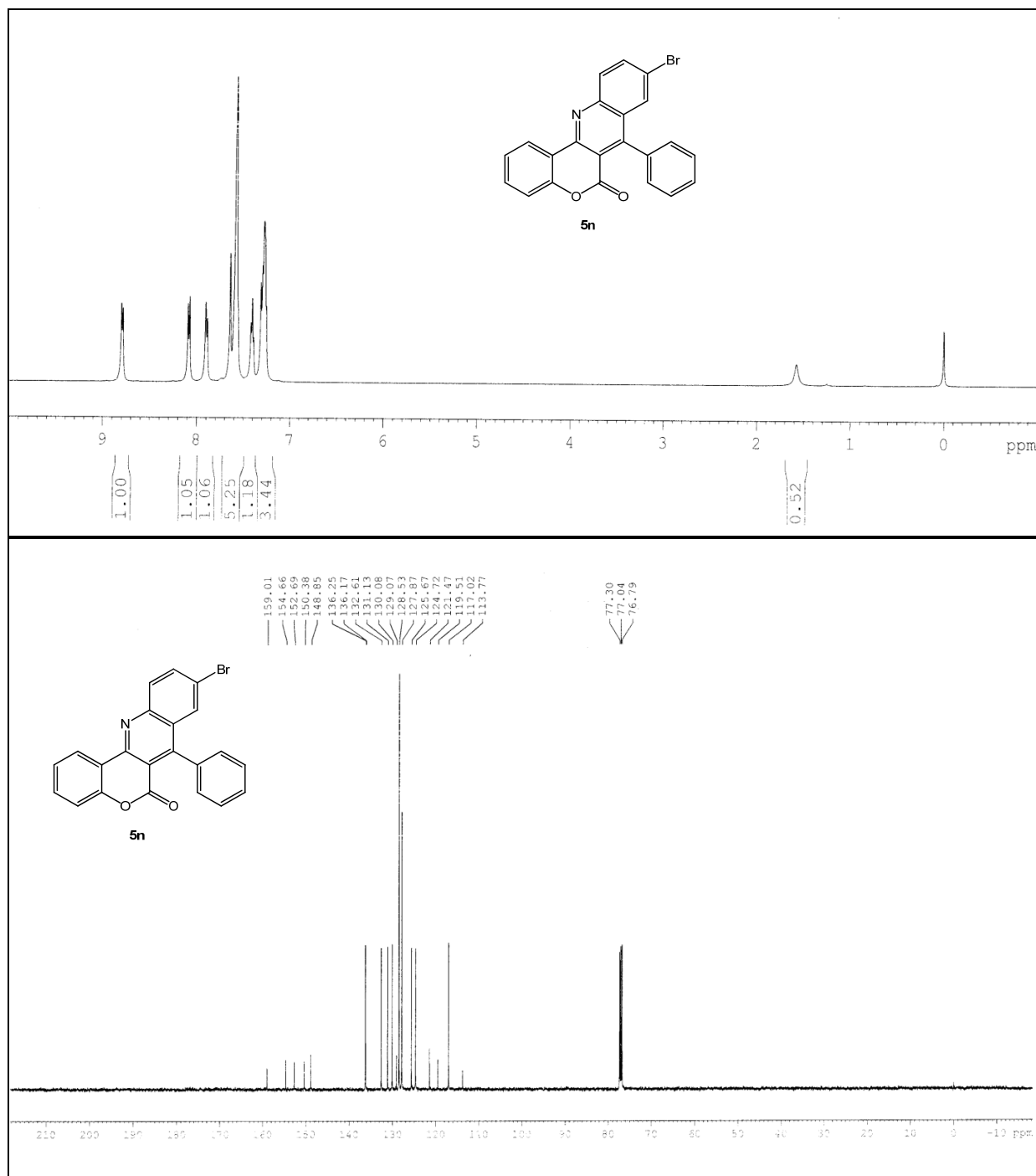
^1H and ^{13}C NMR spectra for **51**



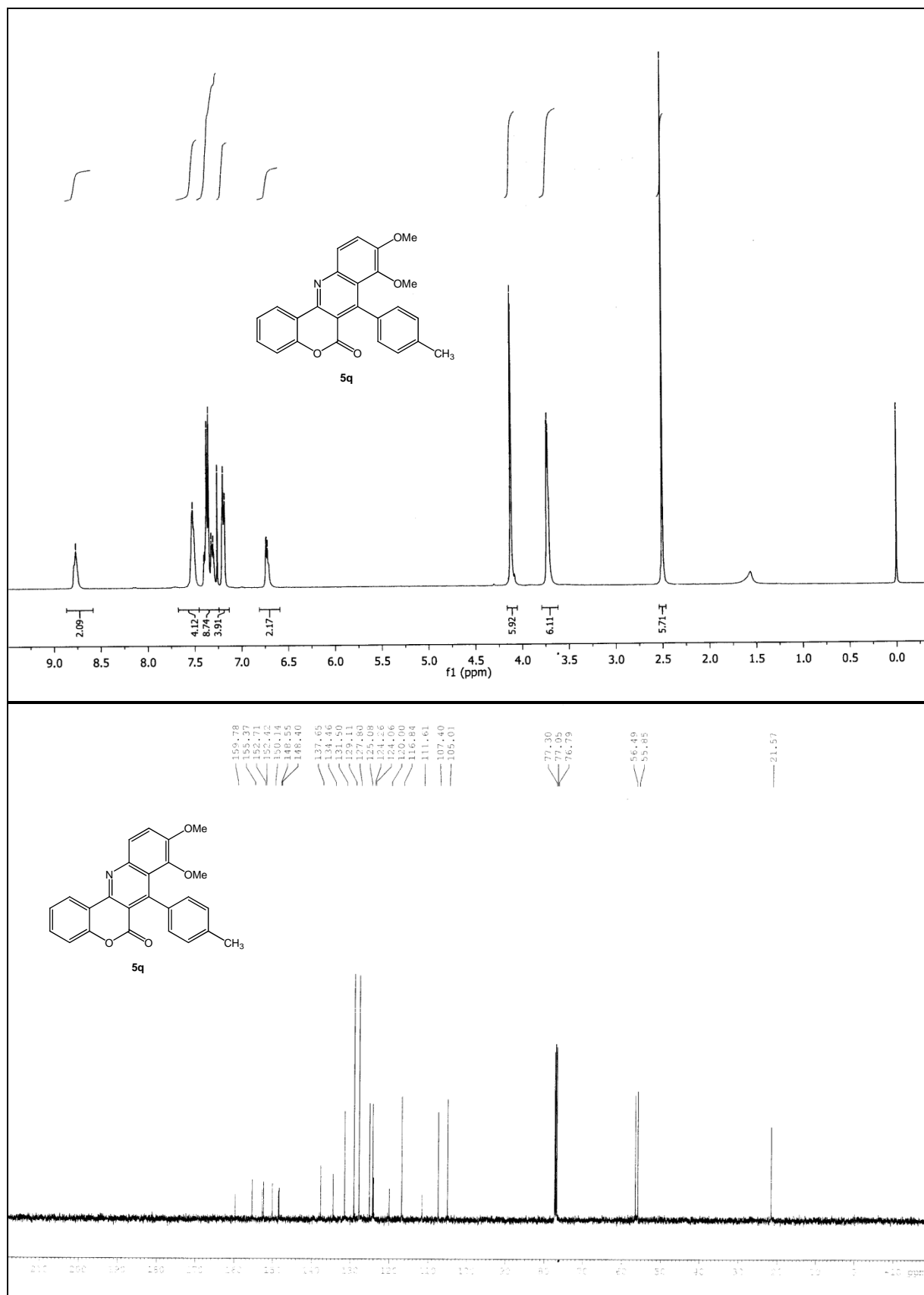
^1H and ^{13}C NMR spectra for **5m**



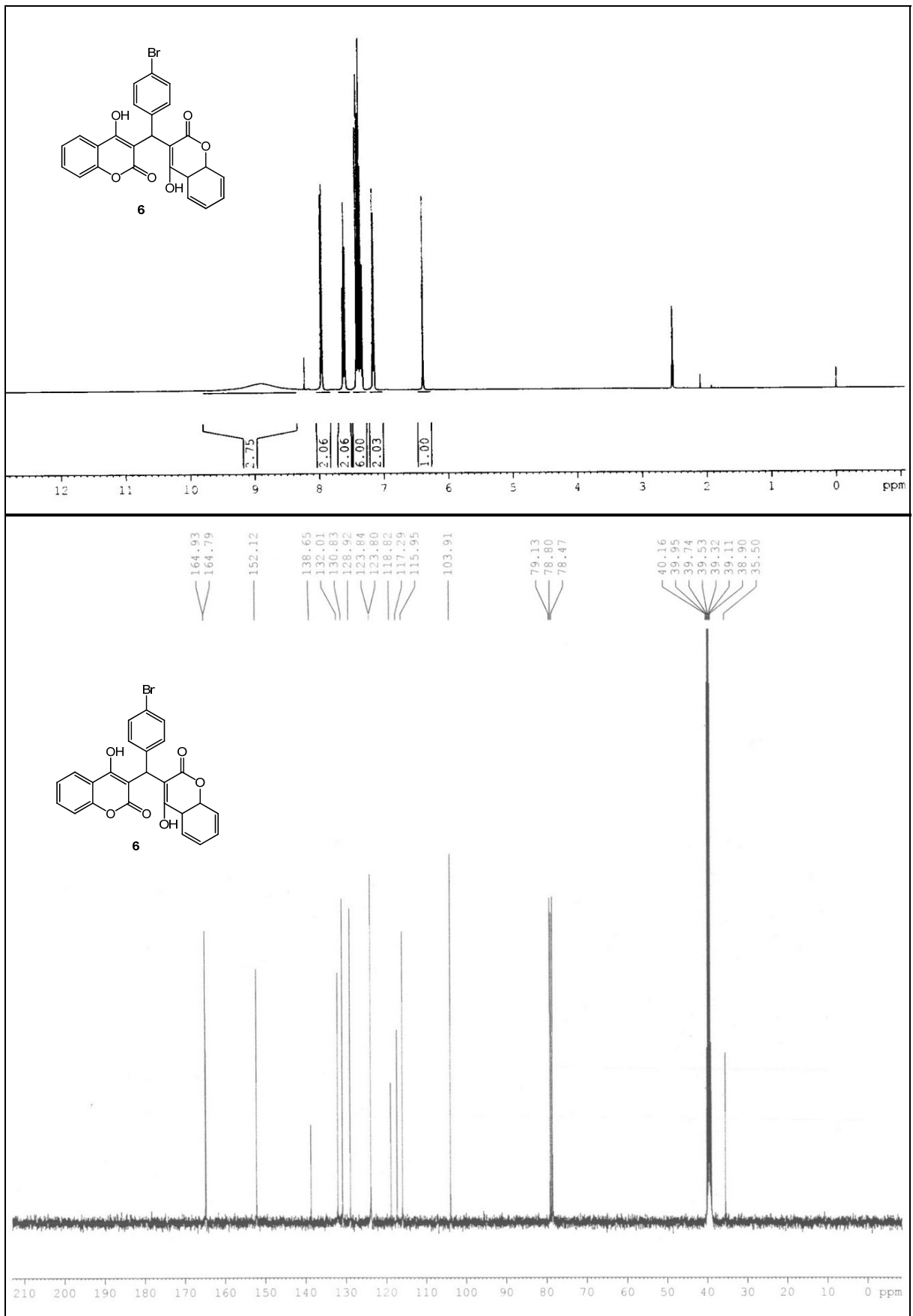
^1H and ^{13}C NMR spectra for **5n**



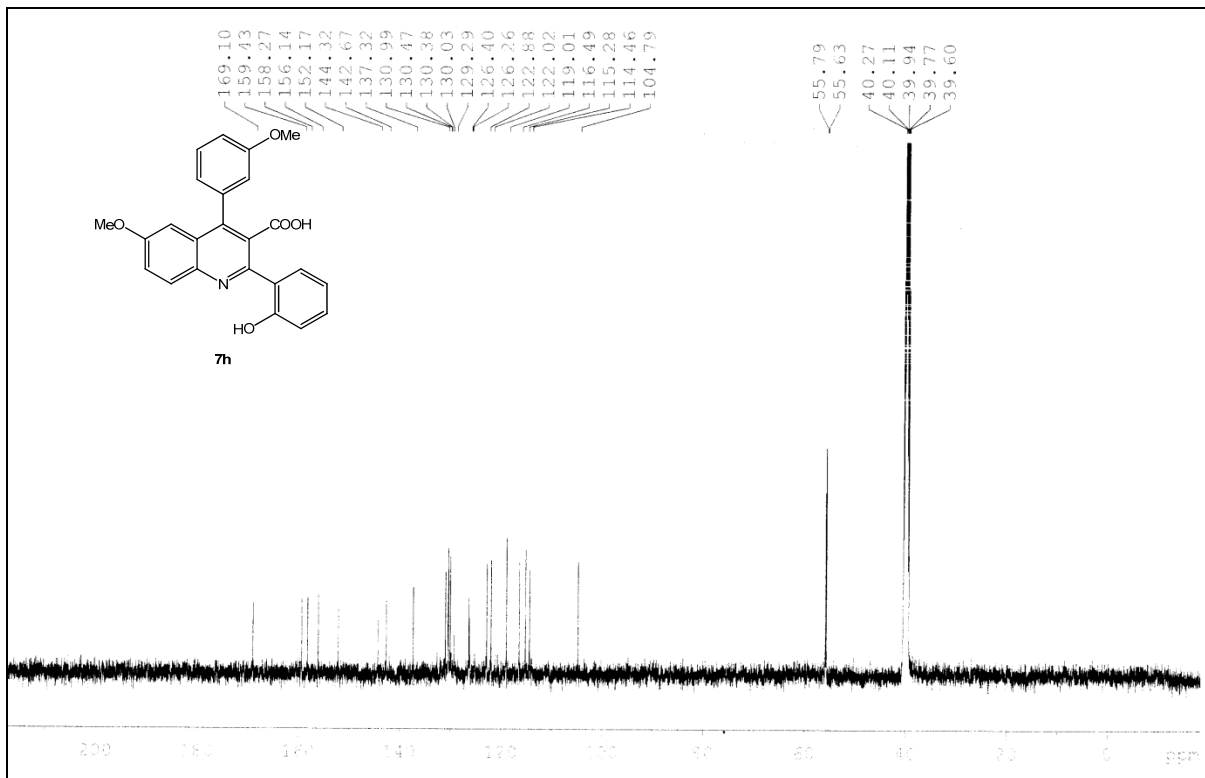
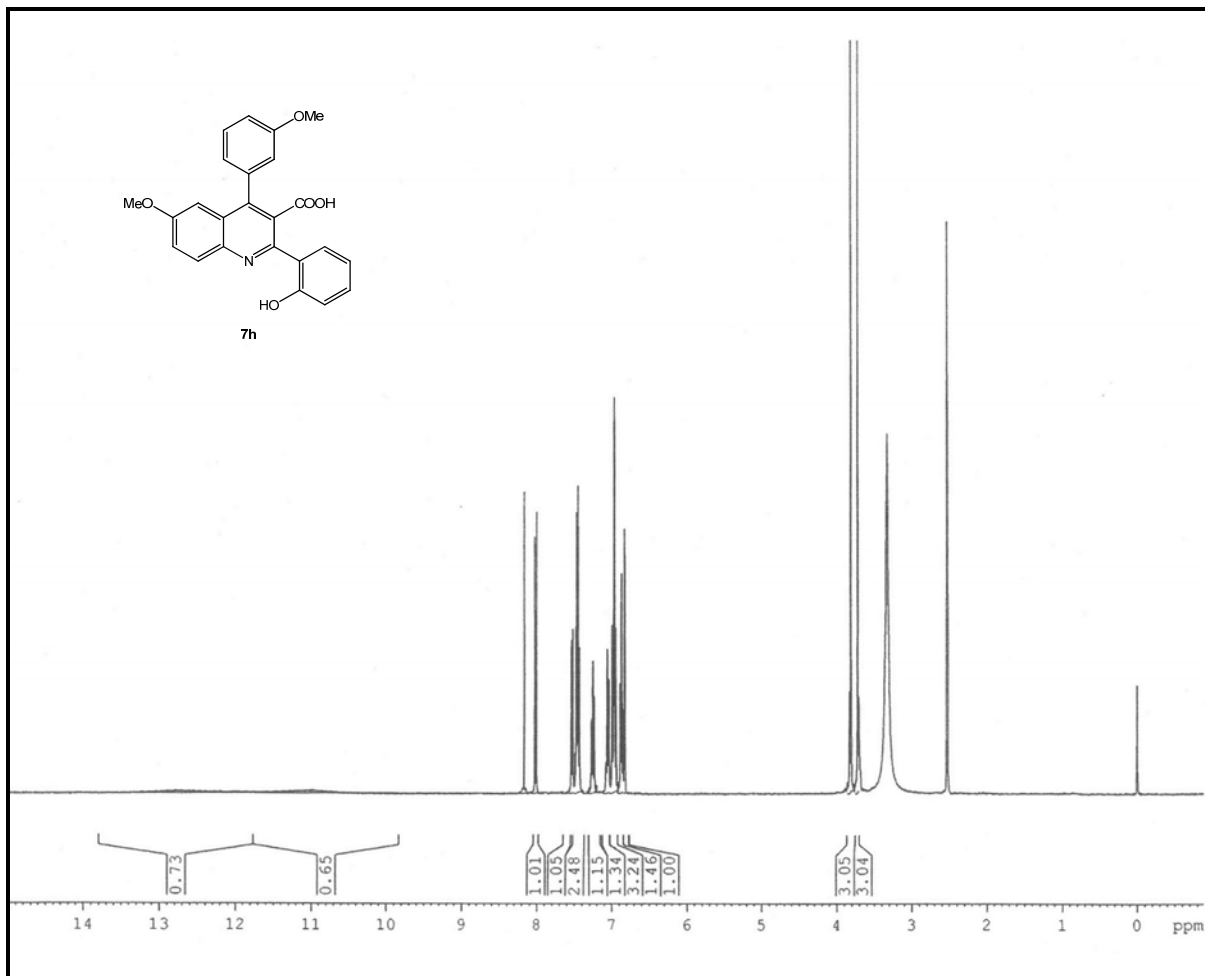
^1H and ^{13}C NMR spectra for **5q**



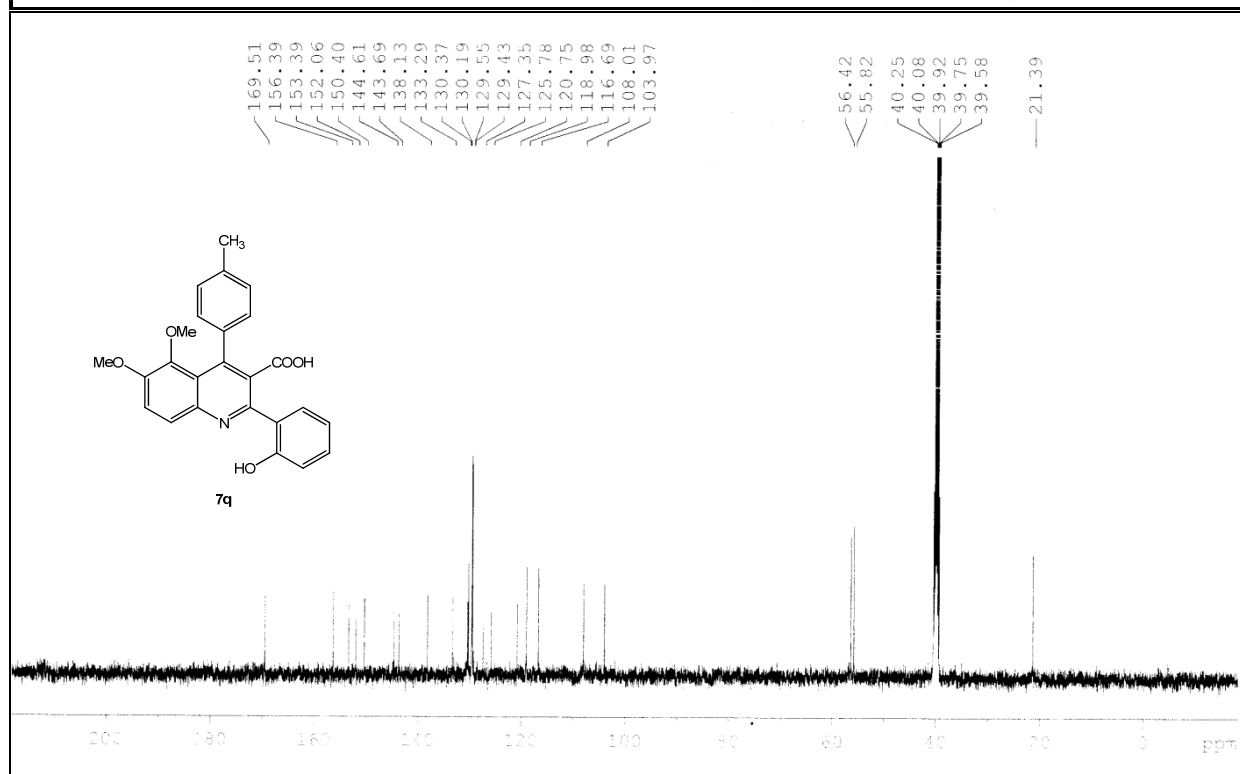
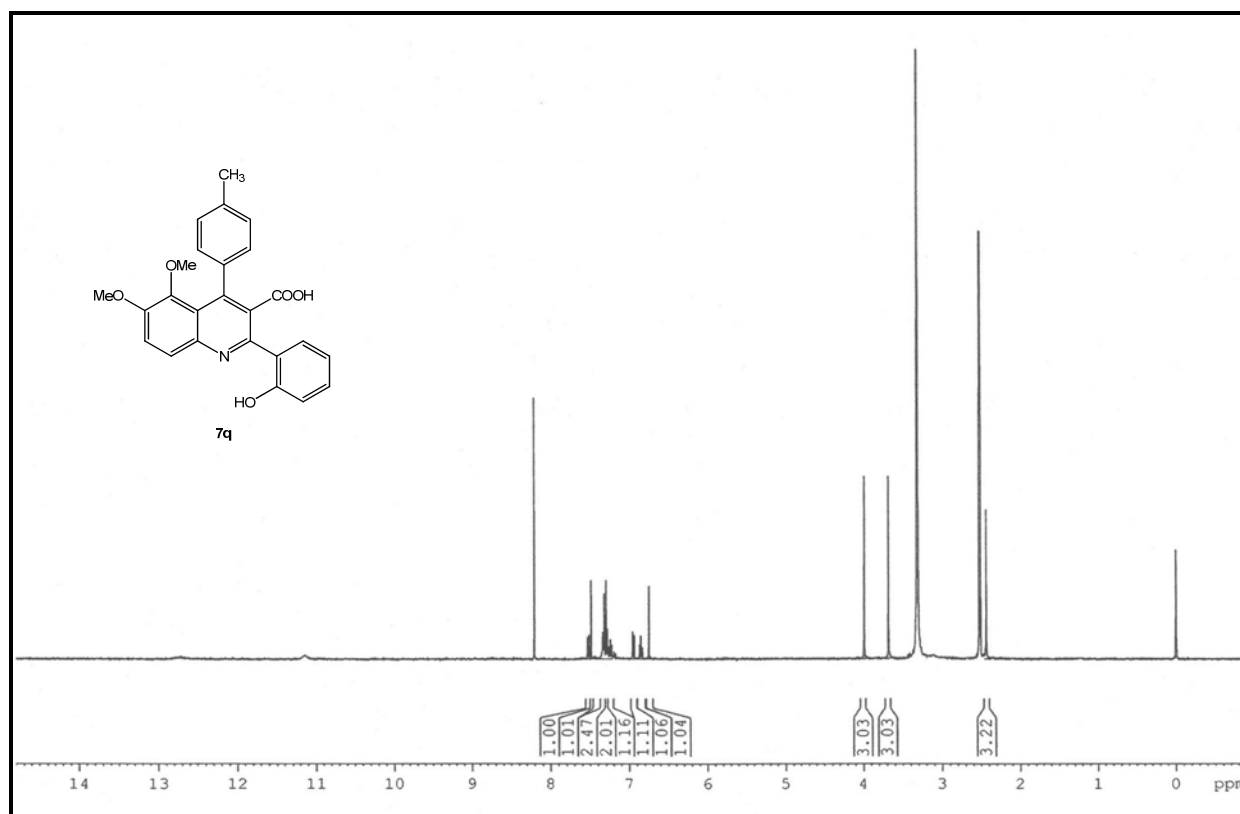
^1H and ^{13}C NMR spectra for **6**



^1H and ^{13}C NMR spectra for **7h**



^1H and ^{13}C NMR spectra for **7q**



Fluorescence quantum yield of coumarin fused quinoline (CFDQ)/quinoline (CFQ) derivatives (4a-4s and 5e, 5h, 5j, 5l, 5m, 5n and 5q) in different solvents:

Quantum yields were calculated with respect to quinine sulphate dihydrate in water¹.

Φ_f = Quantum yield

$\lambda_{\max}^{\text{abs}}$ = Absorbance maxima

$\lambda_{\max}^{\text{em}}$ = Fluorescence maxima

Fluorescence quantum yields (Φ_f) were calculated according to the equation.

$$\Phi_{\text{unk}} = \Phi_{\text{std}} \times [I_{\text{unk}} / I_{\text{std}}] \times [A_{\text{std}} / A_{\text{unk}}] \times [\eta_{\text{unk}} / \eta_{\text{std}}]^2$$

Where, Φ_{unk} is the fluorescence quantum yield of the sample, Φ_{std} is the quantum yield of the standard ($\Phi_f = 0.55$, quinine sulphate dihydrate in 0.1 N H₂SO₄), I_{unk} and I_{std} are the integrated emission intensities of the sample and the standard, respectively, A_{unk} and A_{std} are the absorbance of the sample and the standard at the excitation wavelength, respectively, and η_{unk} and η_{std} are the refractive index of the medium taken.

References:

1. G. A. Crosby and J. N. Demas, *J. Phys. Chem.*, 1971, **75**, 991.

TABLE 4: UV-Vis- Fluorescence Data

Product	DMSO				THF				CH ₃ CN				MeOH				DCM				CHCl ₃			
	Ex (nm)	E _m (nm)	Δ $\bar{\nu}$ (cm ⁻¹)	Ø _f ^a	Ex (nm)	E _m (nm)	Δ $\bar{\nu}$ (cm ⁻¹)	Ø _f ^a	Ex (nm)	E _m (nm)	Δ $\bar{\nu}$ (cm ⁻¹)	Ø _f ^a	Ex (nm)	E _m (nm)	Δ $\bar{\nu}$ (cm ⁻¹)	Ø _f ^a	Ex (nm)	E _m (nm)	Δ $\bar{\nu}$ (cm ⁻¹)	Ø _f ^a	Ex (nm)	E _m (nm)	Δ $\bar{\nu}$ (cm ⁻¹)	Ø _f ^a
4a	342	430	5984	0.34	349	416	4615	0.28	332	422	6424	0.20	346	431	5700	0.37	343	412	4883	0.18	337	413	5460	0.29
4b	346	428	5537	0.53	354	417	4268	0.42	337	418	5750	0.49	345	427	5566	0.56	334	422	6243	0.34	340	415	5315	0.38
4c	353	426	4854	0.58	351	424	4905	0.42	356	423	4449	0.31	342	432	6091	0.36	351	442	5865	0.33	350	432	5423	0.27
4d	352	431	5207	0.57	348	428	5371	0.59	351	437	5607	0.58	349	432	5505	0.57	338	421	5824	0.48	347	429	5508	0.41
4e	359	460	6116	0.47	351	445	6018	0.40	354	460	6509	0.37	359	466	6396	0.36	355	447	5798	0.40	353	441	5653	0.41
4f	356	449	5818	0.00	358	446	5511	0.16	355	469	6847	0.24	365	462	5752	0.39	358	444	5410	0.31	354	445	5776	0.37
4g	358	466	6474	0.45	352	448	6088	0.56	356	456	6160	0.42	358	467	6519	0.45	355	439	5390	0.40	353	437	5445	0.51
4h	358	469	6611	0.45	355	445	5697	0.48	354	458	6414	0.41	358	466	6474	0.49	355	448	5847	0.47	352	443	5836	0.37
4i	354	433	5199	0.00	353	---	---	ND	355	---	---	ND	358	---	---	ND	357	430	4755	0.05	348	435	5747	0.06
4j	357	441	5335	0.65	349	426	5179	0.62	346	435	5913	0.56	353	440	5601	0.57	347	427	5399	0.45	345	422	5289	0.51
4k	351	435	5501	0.02	350	---	---	ND	344	---	---	ND	355	---	---	ND	347	428	5454	0.09	345	433	5891	0.04
4l	354	439	5469	0.55	353	429	5019	0.44	353	434	5287	0.50	355	437	5286	0.51	353	425	4799	0.42	353	422	4632	0.52
4m	347	440	6091	0.38	352	424	4824	0.29	344	435	6085	0.46	351	441	5814	0.42	355	427	4750	0.28	345	420	5176	0.33
4n	351	428	5125	0.31	351	418	4566	0.15	346	420	5092	0.23	351	429	5180	0.32	350	415	4475	0.19	345	410	4595	0.13
4o	358	444	5410	0.09	360	423	4137	0.29	358	426	4459	0.36	360	443	5204	0.17	358	425	4403	0.09	358	430	4677	0.07
4p	351	424	4905	0.20	344	408	4560	0.24	342	415	5143	0.35	345	422	5289	0.44	349	405	3962	0.18	340	409	4962	0.21
4q	359	489	7405	0.16	358	463	6334	0.16	355	487	7635	0.16	362	494	7381	0.09	355	427	4750	0.21	364	431	4270	0.17
4r	359	484	7194	0.27	359	446	5434	0.35	356	466	6631	0.32	364	472	6286	0.41	353	459	6542	0.38	354	451	6075	0.36
4s	384	576	8680	0.04	387	516	6460	0.10	378	414	2300	0.17	378	550	8273	0.05	384	528	7102	0.16	352	546	10094	0.21
5e	380	456	4386	0.02	375	440	3939	0.03	378	449	4183	0.00	377	450	4303	0.01	378	448	4133	0.08	380	445	3844	0.13
5h	381	435	3258	0.01	377	424	2940	0.00	377	450	4303	0.00	378	460	4716	0.00	376	430	3340	0.00	381	432	3098	0.00
5j	358	437	5049	0.05	377	423	2884	0.00	357	433	4916	0.07	356	431	4888	0.10	358	430	4677	0.04	360	424	4193	0.09
5l	367	433	4153	0.00	365	426	3923	0.00	365	417	3416	0.00	365	429	4087	0.00	366	424	3737	0.00	369	420	3291	0.00
5m	373	444	4287	0.00	370	---	---	ND	370	---	---	ND	373	418	2886	0.00	375	431	3465	0.00	376	436	3660	0.00
5n	364	436	4537	0.00	364	---	---	ND	363	403	2734	0.00	364	---	---	ND	365	408	2887	0.00	367	430	3992	0.00
5q	377	432	3377	0.00	378	422	2758	0.00	375	416	2628	0.01	378	430	3199	0.01	378	424	2870	0.00	380	428	2951	0.00

Quantum yield was calculated with respect to quinine sulphate dihydrate in water.

Ø_f = Quantum yield

E_x (λ^{abs}_{max}) = Absorbance maxima

E_m (λ^{em}_{max}) = Fluorescence maxima

Δ $\bar{\nu}$ = Stoke's shift