

Supporting Information

For

**Cascade Synthesis of 2-Pyridones Using Acrylamides
and Ketones**

Sunil Kumar Rai, Shaziya Khanam, Ranjana S. Khanna and Ashish Tewari*

Department of Chemistry (Center of Advanced Study), Faculty of Science, Banaras Hindu University, Varanasi 221005,
India.

E-mail: tashish2002@yahoo.com

Content

1. Experimental section	1-16
2. Copies of ^1H and ^{13}C NMR spectra	17-100
3. Single Crystal X-ray data	101-104
4. References	105

1. Experimental section

General Considerations. Microwave reactions were performed in a CEM Discover BenchMate single-mode microwave reactor with a new sealed pressure regulation 10-mL pressurized vial with “snap-on” cap and teflon-coated magnetic stir bar. The standard temperature control system for the Discover System consists of a non-contact calibrated infrared sensor which monitors and controls the temperature conditions of the reaction vessel located in the instrument cavity. The glassware used in the experiments was carefully cleaned and oven dried. Completion of reaction was checked by commercially available thin layer chromatography (TLC) from Merck, made up of silica gel 60/Kieselguhr F₂₅₄ precoated on Aluminum sheets (thickness 0.2 mm). Column chromatography was performed using Merck silica gel (100-200 mesh). Visualization of spots on TLC plate was accomplished with UV light. Unless otherwise noted, all reagents were obtained from commercial suppliers and used without further purification. Products yield refer to either crude or isolated yield after column chromatography.

Synthetic procedure for Acrylamides (1-6):

Method A. (Conventional): Aldehyde (20 mmol) and cyanoacetamide (20 mmol) were taken in a round bottomed flask in equimolar amount. Distilled water was added to facilitate the stirring and reaction mixture was refluxed with stirring on oil bath for specified time. Completion of reaction was confirmed by TLC. After completion of reaction, mixture was cooled at room temperature to form precipitate. Precipitate formed was filtered and dried in air.

Method B. (Micro Wave): In a sealed pressure regulation 10-mL pressurized vial were placed aldehyde (1 mmol), Cyanoacetamide (1 mmol), 1.0 mL distilled water and a teflon coated magnetic stir bar. The vessel was closed with a snap-on cap, stirred at room temperature for 2-5 min and then placed into the MW cavity. Microwave irradiation of 60 W at a set temperature of 120°C was used and the reaction mixture was held under these conditions for the specified time. Completion of

reaction was confirmed by TLC. After completion of reaction, mixture was cooled at room temperature to form precipitate. Precipitate formed was filtered and dried in air.

Physical and spectral data of products:

2-cyano-3-phenylacrylamide (1):

Crystalline white solid; yield: 99% (MW), 98% (thermal), m.p. 102-105 °C; IR ($\nu_{\max}/\text{cm}^{-1}$) 3401, 3163, 2219, 1693, 1597; ^1H NMR (300 MHz, CDCl_3) δ_{H} 8.34 (s, 1H, Vinylic-**H**), 7.96 (d, 2H, J = 9, Ar-**H**), 7.55 (t, 3H, J = 6, Ar-**H**), 6.36 (s, 1H, **NH**₂), 6.06 (s, 1H, **NH**₂); ^{13}C NMR (75 MHz, CDCl_3) 162.2, 153.9, 132.9, 131.5, 130.7, 129.2, 116.9, 103.1. **Chemical Formula:** $\text{C}_{10}\text{H}_8\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 69.76; H, 4.68; N, 16.27; Found; C, 69.53; H, 4.70; N, 16.30.

3-(4-chlorophenyl)-2-cyanoacrylamide (2):

White solid; yield: 98% (MW), 92% (thermal), m.p. 183-185 °C; IR ($\nu_{\max}/\text{cm}^{-1}$) 3455, 3154, 2212, 1703, 1587; ^1H NMR (300 MHz, CDCl_3) δ_{H} 8.14 (s, 1H, Vinylic-**H**), 7.93 (d, 2H, J = 9, Ar-**H**), 7.78 (s, 2H, **NH**₂), 7.64 (d, 2H, J = 9, Ar-**H**); ^{13}C NMR (75 MHz, CDCl_3) 162.6, 149.3, 137.0, 131.7, 130.8, 129.4, 116.3, 107.3 **Chemical Formula:** $\text{C}_{10}\text{H}_7\text{N}_2\text{OCl}$, **Elemental Analysis:** Calculated; C, 58.13; H, 3.41; N, 13.56; Found; C, 58.05; H, 3.50; N, 13.50.

2-cyano-3-(3, 4-dimethoxyphenyl)acrylamide (3):

Green yellow solid; yield: 98% (MW), 91% (thermal), m.p. 185-188 °C; IR ($\nu_{\max}/\text{cm}^{-1}$) 3394, 3165, 2214, 1694, 1584; ^1H NMR (300 MHz, CDCl_3) δ_{H} 8.08 (s, 1H, Vinylic-**H**), 7.77 (s, 2H, **NH**₂), 7.63 (s, 1H, Ar-**H**), 7.54 (d, 1H, J = 9, Ar-**H**), 7.11 (d, 1H, J = 6, Ar-**H**), 3.83 (s, 3H, **OCH**₃), 3.78 (s, 3H, **OCH**₃); ^{13}C NMR (75 MHz, CDCl_3) 163.1, 152.5, 150.6, 148.6, 125.6, 124.4, 117.2, 112.1, 111.7, 102.7; **Chemical Formula:** $\text{C}_{12}\text{H}_{12}\text{N}_2\text{O}_3$, **Elemental Analysis:** Calculated; C, 62.06; H, 5.21; N, 12.06;. Found; C, 62.0; H, 5.18; N, 12.10.

2-cyano-3-(4-methoxyphenyl)acrylamide (4):

White solid; yield: 97% (MW), 93% (thermal), m.p. 197-199 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$) 3447, 3176, 2208, 1698, 1583; ^1H NMR (300 MHz, CDCl_3) δ_{H} 8.26 (s, 1H, Vinylic-**H**), 7.97 (d, 2H, $J = 9$, Ar-**H**), 7.01 (d, 2H, $J = 9$, Ar-**H**), 6.26 (br s, 1H NH_2), 5.65 (br s, 1H NH_2), 3.89 (s, 3H, OCH_3); ^{13}C NMR (75 MHz, CDCl_3) 163.2, 162.4, 152.3, 132.8, 124.46, 117.3, 114.2, 100.3, 55.3; **Chemical Formula:** $\text{C}_{11}\text{H}_{10}\text{N}_2\text{O}_2$, **Elemental Analysis:** Calculated; C, 65.34; H, 4.98; N, 13.85;. Found; C, 65.30; H, 5.00; N, 13.80.

2-cyano-3-(p-tolyl)acrylamide (5):

Crystalline white solid; yield: 99% (MW), 94% (thermal), m.p. 147-149 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$) 3416, 3116, 2224, 1704, 1605, 1379, 1350; ^1H NMR (300 MHz, CDCl_3) δ_{H} 8.29 (s, 1H, Vinylic-**H**), 7.87 (d, 2H, $J = 9$, Ar-**H**), 7.31 (d, 2H, $J = 9$, Ar-**H**), 6.4 (br s, 2H NH_2), 2.43 (s, 3H, CH_3); ^{13}C NMR (75 MHz, CDCl_3) 162.4, 153.9, 153.8, 144.3, 130.9, 130.8, 129.9, 128.9, 117.2, 101.6, 21.8; **Chemical Formula:** $\text{C}_{11}\text{H}_{10}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 70.95; H, 5.41; N, 15.04;. Found; C, 71.90; H, 5.38; N, 15.09.

2-cyano-3-(3-nitrophenyl)acrylamide (6):

White solid; yield: 96% (MW), 85% (thermal), m.p. 173-175 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$) 3416.40, 3116.34, 2224.57, 1704.25, 1605.05, 1526.42; ^1H NMR (300 MHz, CDCl_3) δ_{H} 8.74 (s, 1H, Vinylic-**H**), 8.37 (d, 1H, $J = 7.8$, Ar-**H**), 8.30 (d, 2H, $J = 9$, Ar-**H**), 7.98 (br s, 2H, N-**H**), 7.86 (m, 3H, Ar-**H**); ^{13}C NMR (75 MHz, CDCl_3) 162.1, 148.3, 148.0, 135.9, 133.4, 130.8, 126.2, 124.1, 115.8, 109.5; **Chemical Formula:** $\text{C}_{10}\text{H}_7\text{N}_3\text{O}_3$, **Elemental Analysis:** Calculated; C, 55.30; H, 3.25; N, 19.35;. Found; C, 55.28; H, 3.21; N, 19.37.

2-cyano-3-(2-nitrophenyl)acrylamide (7):

White solid; yield: 92% (MW), 75% (thermal), m.p. 170-172 °C; IR ($\nu_{\max}/\text{cm}^{-1}$) 3393.54, 3179.31, 2234.58, 1718.96, 1613.77, 1524.39, 1387.90, 1352.98; ^1H NMR (300 MHz, CDCl_3 + few drop of DMSO_{d_6}) δ_{H} 8.68 (s, 1H, Vinylic-H), 8.26 (d, 1H, $J = 8.4$, Ar-H), 7.83 (d, 2H, $J = 3.6$, Ar-H), 7.73 (m, 2H, Ar-H), 7.24 (s, 1H, NH_2), 7.18 (s, 1H, NH_2); ^{13}C NMR (75 MHz, CDCl_3) 160.4, 150.0, 133.8, 131.2, 129.9, 128.1, 124.7, 120.3, 114.6; **Chemical Formula:** $\text{C}_{10}\text{H}_7\text{N}_3\text{O}_3$, **Elemental Analysis:** Calculated; C, 55.30; H, 3.25; N, 19.35; Found; C, 55.29; H, 3.24; N, 19.35.

2-cyano-3-(4-nitrophenyl)acrylamide (8):

Dirty white solid; yield: 95% (MW), 80% (thermal), m.p. 234-235 °C; IR ($\nu_{\max}/\text{cm}^{-1}$) 3441.73, 3346.68, 2244.68, 1693.36, 1602.13, 1509.82, 1344.97; ^1H NMR (400 MHz, DMSO_{d_6}) δ_{H} 8.37 (s, 2H, $J = 8.8$, Ar-H), 8.28 (d, 1H, Vinylic-H), 8.16 (d, 2H, $J = 8.8$, Ar-H), 8.05 (s, 1H, NH_2), 7.89 (s, 1H, NH_2); ^{13}C NMR (100 MHz, DMSO_{d_6}) 162.5, 149.2, 148.7, 138.4, 131.4, 124.5, 116.1, 111.0; **Chemical Formula:** $\text{C}_{10}\text{H}_7\text{N}_3\text{O}_3$, **Elemental Analysis:** Calculated; C, 55.30; H, 3.25; N, 19.35; Found; C, 55.28; H, 3.26; N, 19.36.

Synthetic procedure for 2-pyridones:

Clean and freshly cut sodium metal (1.2 equivalents) was completely dissolved in dried ethanol then ketone (1.0 equivalent) was added and stirred for 30 minutes. After that acrylamide (1.0 equivalent) was added and stirring was continued for specified time. Completion of reaction was checked by TLC. After completion of the reaction water was added (to make 1:1, ethanol:water mixture) and stand at 0-5 °C for precipitate formation. Then filtered and dried in air. For isomeric mixture column chromatography was performed to isolate the isomers. Eluent ratio for separation of each isomer has been shown in table 6.

Table 6. Separation of isomeric mixtures by column chromatography.

Compound Name	Eluent ratio (Ethyl acetate:Hexane)
1b	80:20
1h	40:60
1d	60:40
1e	20:80
1f	25:75
1g	10:90
1i	05:95
2d	40:60
2e	20:80
2f	25:75
2g	10:90
4d	35:65
4e	20:80
5d	50:50
5e	20:80

Physical and spectral data of products:

6-methyl-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile (1a):

Green yellow solid; yield: 85%; mp. 265-270 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 2221.65, 1660.71, 1625.53; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.59 (br s, 1H, **NH**), 7.56 (m, 5H, **Ar-H**), 6.29 (s, 1H, **Pyridone-Ring-H**), 2.28 (s, 3H, **CH**₃); ^{13}C NMR (75 MHz, DMSO-d_6) 161.4, 160.0, 152.1, 136.0, 130.2, 128.7, 127.9, 116.6, 106.5, 97.2, 19.1; **Chemical Formula:** $\text{C}_{13}\text{H}_{10}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 74.27; H, 4.79; N, 13.33;. Found; C, 74.26; H, 4.78; N, 13.34.

2-oxo-4,6-diphenyl-1,2-dihydropyridine-3-carbonitrile (1b):

Light green yellow solid; yield: 96%; mp. 298-300 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2218.87, 1645, 1608.16; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.82 (br s, 1H NH), 7.89 (d, 2H, $J = 6$, Ar-H), 7.72 (d, 2H, $J = 6$, Ar-H), 7.55 (m, 6H, Ar-H), 6.82 (s, 1H Pyridone-Ring-H); ^{13}C NMR (75 MHz, DMSO-d_6) 162.0, 159.8, 151.4, 136.0, 132.2, 131.1, 130.4, 128.9, 128.7, 128.5, 128.2, 127.7, 116.5, 106.1; **Chemical Formula:** $\text{C}_{18}\text{H}_{12}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 79.39; H, 4.44; N, 10.29;. Found; C, 79.40; H, 4.44; N, 10.28.

6-(4-chlorophenyl)-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile (1c):

White solid; yield: 95%; mp. 270 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2222.06, 1662.48, 1613.45; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.85 (br s, 1H, NH), 7.94 (d, 2H, $J = 9$, Ar-H), 7.73 (dd, 2H, $J = 9$, Ar-H), 7.59 (m, 5H, Ar-H), 6.88 (s, 1H, Pyridone-Ring-H); ^{13}C NMR (75 MHz, DMSO-d_6) 166.7, 162.1, 159.5, 150.5, 135.9, 131.3, 130.4, 129.6, 128.8, 128.7, 128.2, 116.3, 106.8, 98.3; **Chemical Formula:** $\text{C}_{18}\text{H}_{11}\text{N}_2\text{OCl}$, **Elemental Analysis:** Calculated; C, 70.48; H, 3.61; N, 9.13;. Found; C, 70.50; H, 3.60; N, 9.10.

5,6-dimethyl-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile (1d):

Yellow green solid; yield: 89%; mp. 270-272 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2224.60, 1648.31, 1595.18; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 12.89 (br s, 1H, NH), 7.51 (m, 3H, Ar-H), 7.25 (d, 2H, $J = 6$, Ar-H), 2.40 (s, 3H, CH_3), 1.81 (s, 3H, CH_3); ^{13}C NMR (75 MHz, CDCl_3) 163.0, 162.6, 149.6, 136.0, 129.3, 128.8, 128.0, 127.6, 115.3, 106.6, 101.2, 18.7, 14.4; **Chemical Formula:** $\text{C}_{14}\text{H}_{12}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 74.98; H, 5.39; N, 12.49;. Found; C, 74.95; H, 5.40; N, 12.50.

6-ethyl-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile (1e):

Yellow green solid; yield: 11%; mp. 257-260 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2224.42, 1647.95, 1605.11; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.57 (br s, 1H, NH), 7.60 (d, 1H, J = 2.4, Ar-H), 7.58 (d, 1H, J = 3.0, Ar-H), 7.52 (t, 3H, J = 2.7, Ar-H), 6.31 (s, 1H, Pyridone-Ring-H), 2.60 (q, 2H, J = 7.2, 7.5, 7.8 -CH₂-), 1.19 (t, 3H, J = 7.5, CH₃); ^{13}C NMR (75 MHz, DMSO-d_6) 161.9, 160.8, 157.7, 136.5, 130.8, 129.2, 129.1, 128.4, 117.0, 105.5, 26.3, 12.9; **Chemical Formula:** C₁₄H₁₂N₂O, **Elemental Analysis:** Calculated; C, 74.98; H, 5.39; N, 12.49;. Found; C, 74.96; H, 5.35; N, 12.52.

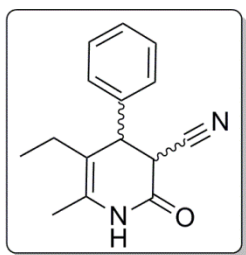
5-ethyl-6-methyl-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile (1f):

White solid; yield: 27%; mp. 272-275 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2225.40, 1644.93, 1594.03; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 13.82 (br s, 1H, NH), 7.50 (d, 2H, J = 5.1, Ar-H), 7.27 (m, 3H, J = 2.7, 4.8, Ar-H), 2.48 (s, 3H, CH₃), 2.31 (q, 2H, J = 4.8, 7.2, -CH₂-), 0.90 (t, 3H, J = 7.5, 7.2, CH₃); ^{13}C NMR (75 MHz, CDCl_3) 163.1, 162.4, 149.5, 135.8, 129.1, 128.9, 128.7, 127.2, 120.2, 115.2, 101.5, 21.4, 17.8, 14.2; **Chemical Formula:** C₁₅H₁₄N₂O, **Elemental Analysis:** Calculated; C, 75.61; H, 5.92; N, 11.76;. Found; C, 75.59; H, 5.90; N, 11.78.

2-oxo-4-phenyl-6-propyl-1,2-dihydropyridine-3-carbonitrile (1g):

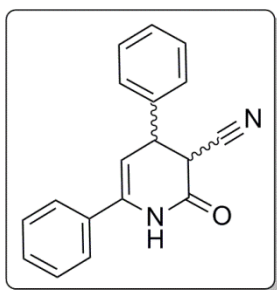
Light green yellow solid; yield: 73%; mp. 195-197 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2221.24, 1649.41, 1617.68; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 13.60 (br s, 1H, NH), 7.61- 7.49 (m, 5H, Ar-H), 6.29 (s, 1H, Pyridone-Ring-H), 2.76 (t, 2H, J = 7.2, 7.5, -CH₂-), 1.88 (sext, 2H, J = 7.2, 7.5, -CH₂-), 1.19 (t, 3H, J = 7.5, CH₃); ^{13}C NMR (75 MHz, DMSO-d_6) 161.9, 160.8, 157.7, 136.5, 130.8, 129.2, 129.1, 128.4, 117.0, 105.5, 26.3, 12.9; **Chemical Formula:** C₁₄H₁₂N₂O, **Elemental Analysis:** Calculated; C, 74.98; H, 5.39; N, 12.49;. Found; C, 74.97; H, 5.38; N, 12.52.

5-ethyl-6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyridine-3-carbonitrile (1h):



White solid; yield: 3%; mp 211-213 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 3219.66, 3107.79, 2253.32, 1698.85, 1677.36; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 8.51 (br s, 1H, NH), 7.33 – 7.15 (m, 5H, Ar-H), 4.09 (d, 0.81 x 1H, $J = 6.9$), 3.81 (d, 0.18 x 1H, $J = 2.1$), 3.68 (d, 0.82 x 1H, $J = 6.9$), 3.59 (d, 0.18 x 1H, $J = 2.7$), 2.28 – 2.12 (m, 2H, $-\text{CH}_2-$), 1.90 (s, 3H, CH_3), 0.91 (t, 3H, $J = 7.2, 7.5$, CH_3); ^{13}C NMR (75 MHz, CDCl_3) 162.2, 135.8, 129.1, 128.9, 128.3, 128.2, 12.4, 116.8, 114.9, 44.5, 41.8, 23.6, 15.3, 134; **Chemical Formula:** $\text{C}_{15}\text{H}_{16}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 74.97; H, 6.71; N, 11.66;. Found; C, 74.95; H, 6.70; N, 11.68.

2-oxo-4,6-diphenyl-1,2,3,4-tetrahydropyridine-3-carbonitrile (1i):



White solid; yield: 92%; mp 218-220 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 3475.32, 3373.49, 3351.02, 2258.57, 1698.36, 1595.78; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 8.88 (s, 1H, NH), 7.57 – 7.33 (m, 10H, Ar-H), 5.30 (s, 1H, $=\text{CH}-$), 4.94 (d, 1H, $J = 12.9$), 4.39 (d, 1H, $J = 12.9$); ^{13}C NMR (75 MHz, DMSO-d_6) 163.7, 162.9, 135.1, 134.5, 129.1, 128.6, 128.2, 127.8, 116.7, 115.3, 60.4, 46.4; **Chemical Formula:** $\text{C}_{18}\text{H}_{14}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 78.81; H, 5.14; N, 10.21;. Found; C, 78.80; H, 5.12; N, 10.24.

4-(4-chlorophenyl)-6-methyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (2a):

Chartreuse yellow solid; yield: 83%; mp (d) > 300 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 2220.95, 1661.29, 1626.27; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.64 (br s, 1H, **NH**), 7.63 (m, 4H, **Ar-H**), 6.32 (s, 1H **Pyridone-Ring-H**), 2.29 (s, 3H, **CH₃**); ^{13}C NMR (75 MHz, DMSO-d_6) 161.2, 158.8, 152.4, 135.1, 134.8, 129.8, 128.8, 116.4, 106.3, 97.3, 19.1; **Chemical Formula:** $\text{C}_{13}\text{H}_9\text{N}_2\text{OCl}$, **Elemental Analysis:** Calculated; C, 63.81; H, 3.71; N, 11.45;. Found; C, 63.79; H, 3.75; N, 11.41.

4-(4-chlorophenyl)-2-oxo-6-phenyl-1,2-dihydropyridine-3-carbonitrile (2b):

White solid; yield: 94%; mp (d) > 290 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 2219.11, 1642.89, 1607.59; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 7.90 (d, 2H, $J = 9$, **Ar-H**), 7.76 (d, 2H, $J = 9$, **Ar-H**), 7.64 (d, 2H, $J = 9$, **Ar-H**), 7.53 (d, 3H, $J = 6$, **Ar-H**), 6.82 (s, 1H, **Pyridone-Ring-H**); ^{13}C NMR (75 MHz, DMSO-d_6) 162.5, 158.3, 152.1, 135.2, 135.0, 132.7, 131.1, 130.2, 12., 128.8, 127.7, 116.6, 105.9; **Chemical Formula:** $\text{C}_{18}\text{H}_{11}\text{N}_2\text{OCl}$, **Elemental Analysis:** Calculated; C, 70.48; H, 3.61; N, 9.13;. Found; C, 70.52; H, 3.65; N, 9.05.

4,6-bis(4-chlorophenyl)-2-oxo-1,2-dihydropyridine-3-carbonitrile (2c):

Light yellow solid; yield: 97%; mp (d) 240 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 2201.47, 1657.94, 1595.73; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 7.99 (d, 2H, $J = 9$, **Ar-H**), 7.64 (d, 2H, $J = 9$, **Ar-H**), 7.56 (d, 2H, $J = 9$, **Ar-H**), 7.48 (d, 2H, $J = 9$, **Ar-H**), 6.66 (s, 1H, **Pyridone-Ring-H**); ^{13}C NMR (75 MHz, DMSO-d_6) 155.5, 154.9, 136.8, 134.1, 133.8, 133.1, 132.9, 130.0, 128.9, 128.5, 128.3, 119.5, 103.3; **Chemical Formula:** $\text{C}_{18}\text{H}_{10}\text{N}_2\text{OCl}_2$, **Elemental Analysis:** Calculated; C, 63.36; H, 2.95; N, 8.21;. Found; C, 63.30; H, 3.00; N, 8.20.

4-(4-chlorophenyl)-5,6-dimethyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (2d):

Light green yellow solid; yield: 91%; mp (d) 270 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 2223.25, 1645.16, 1606.48; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.61 (br s, 1H, **NH**), 7.58 (d, 2H, $J = 8.4$, **Ar-H**), 7.33

(d, 2H, J = 8.4, Ar-**H**), 2.30 (s, 3H, **CH**₃), 1.68 (s, 3H, **CH**₃); ¹³C NMR (75 MHz, DMSO_{d6}) 160.5, 159.9, 150.7, 135.2, 135.1, 134.9, 133.8, 129.9, 129.6, 128.8, 116.3, 116.2, 111.2, 99.7, 1.0, 13.9;

Chemical Formula: C₁₄H₁₁N₂OCl, **Elemental Analysis:** Calculated; C, 65.00; H, 4.29; N, 10.83;.

Found; C, 65.02; H, 4.30; N, 10.85.

4-(4-chlorophenyl)-6-ethyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (2e):

Yellow green solid; yield: 9%; mp 257-260 °C ; IR (ν_{max}/cm⁻¹): 2219.88, 1645.77, 1613.96; ¹H NMR (300 MHz, DMSO_{d6}, 298 K, TMS): δ_H 12.56 (br s, 1H, **NH**), 7.56 (d, 2H, J = 9, Ar-**H**), 7.52 (d, 2H, J = 8.7, Ar-**H**), 6.25 (s, 1H, Pyridone-Ring-**H**), 2.50 (q, 2H, J = 7.5, -**CH**₂-), 1.11 (t, 3H, J = 7.5, **CH**₃); ¹³C NMR (75 MHz, DMSO_{d6}) 161.4, 159.1, 157.5, 135.2, 134.9, 128.9, 116.4, 105.1, 105.0, 104.9, 97.7, 26.1, 12.7; **Chemical Formula:** C₁₄H₁₁N₂OCl, **Elemental Analysis:** Calculated; C, 65.00; H, 4.29; N, 10.83;. Found; C, 65.07; H, 4.31; N, 10.80.

4-(4-chlorophenyl)-5-ethyl-6-methyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (2f):

Green yellow solid; yield: 30%; mp 270 °C; IR (ν_{max}/cm⁻¹): 2226.47, 1650.69, 1599.76; ¹H NMR (300 MHz, DMSO_{d6}, 298 K, TMS): δ_H 12.61 (br s, 1H, **NH**), 7.58 (d, 2H, J = 8.1, Ar-**H**), 7.35 (d, 2H, J = 8.4, Ar-**H**), 2.34 (s, 3H, **CH**₃), 2.11 (q, 2H, J = 6.9, 7.5, 6.9, -**CH**₂-), 0.77 (t, 3H, J = 7.5, 7.2, **CH**₃); ¹³C NMR (75 MHz, DMSO_{d6}) 160.8, 159.7, 150.5, 135.0, 133.7, 129.4, 128.7, 117.5, 116.0, 100.3, 20.4, 17.2, 13.9; **Chemical Formula:** C₁₅H₁₃N₂OCl, **Elemental Analysis:** Calculated; C, 66.06; H, 4.80; N, 10.27;. Found; C, 66.03; H, 4.82; N, 10.30.

4-(4-chlorophenyl)-2-oxo-6-propyl-1,2-dihydropyridine-3-carbonitrile (2g):

Green yellow solid; yield: 70%; mp 225-228 °C ; IR (ν_{max}/cm⁻¹): 2221.03, 1649.66, 1614.20; ¹H NMR (300 MHz, CDCl₃, 298 K, TMS): δ_H 13.52 (br s, 1H, **NH**), 7.54 (d, 2H, J = 8.4, Ar-**H**), 7.47 (d, 2H, J = 8.1, Ar-**H**), 6.25 (s, 1H, Pyridone-Ring-**H**), 2.72 (t, 2H, J = 7.2, 7.5, -**CH**₂-), 1.81 (sext,

2H, J = 7.5, -CH₂-), 1.04 (t, 3H, J = 7.5, 7.2, CH₃); ¹³C NMR (75 MHz, CDCl₃) 164.0, 159.9, 155.7, 136.9, 134.2, 129.4, 129.2, 115.4, 107.2, 98.6, 35.5, 21.8, 13.5; **Chemical Formula:** C₁₅H₁₃N₂OCl, **Elemental Analysis:** Calculated; C, 66.06; H, 4.80; N, 10.27;. Found; C, 66.02; H, 4.79; N, 10.27

4-(3,4-dimethoxyphenyl)-6-methyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (3a):

White solid; yield: 81%; mp (d) > 280 °C ; IR (ν_{max}/cm⁻¹): 2214.76, 1667.34, 1627.43, 160.34; ¹H NMR (300 MHz, DMSO_{d6}, 298 K, TMS): δ_H 7.22 (d, 2H, J = 9, Ar-**H**), 7.10 (d, 1H, J = 9, Ar-**H**), 6.36 (s, 1H, Pyridone-Ring-**H**); ¹³C NMR (75 MHz, DMSO_{d6}) 161.7, 159.7, 151.6, 150.6, 148.5, 128.0, 121.2, 117.1, 111.5, 106.4, 96.5, 55.6, 19.2; **Chemical Formula:** C₁₅H₁₄N₂O₃, **Elemental Analysis:** Calculated; C, 66.66; H, 5.22; N, 10.36;. Found; C, 66.64; H, 5.25; N, 10.33.

4-(3,4-dimethoxyphenyl)-2-oxo-6-phenyl-1,2-dihydropyridine-3-carbonitrile (3b):

White solid; yield: 91%; mp (d) 248 °C; IR (ν_{max}/cm⁻¹): 2202.27, 1666.14, 1606.06; ¹H NMR (300 MHz, DMSO_{d6}, 298 K, TMS): δ_H 7.98 (d, 2H, J = 9, Ar-**H**), 7.40 (m, 4H, Ar-**H**), 7.18 (d, 2H, J = 9, Ar-**H**), 7.05 (s, 1H, Ar-**H**), 6.61 (s, 1H Pyridone-Ring-**H**) 3.81 (s, 3H, OCH₃) 3.80 (s, 3H, OCH₃); ¹³C NMR (75 MHz, DMSO_{d6}) 157.9, 155.1, 149.2, 148.3, 139.3, 136.5, 133.1, 131.0, 128.8, 128.2, 127.0, 120.6, 111.5, 102.8, 91.9, 55.5; **Chemical Formula:** C₂₀H₁₆N₂O₃, **Elemental Analysis:** Calculated; C, 72.28; H, 4.85; N, 8.43;. Found; C, 72.20; H, 4.87; N, 8.40.

6-(4-chlorophenyl)-4-(3,4-dimethoxyphenyl)-2-oxo-1,2-dihydropyridine-3-carbonitrile (3c):

White solid; yield: 94%; mp (d) 280 °C; IR (ν_{max}/cm⁻¹): 2203.79, 1680.65, 1595.41; ¹H NMR (300 MHz, DMSO_{d6}, 298 K, TMS): δ_H 8.26 (s, 1H, NH), 8.02 (d, 2H, J = 9, Ar-**H**), 7.44 (d, 2H, J = 9, Ar-**H**), 7.16 (d, 2H, J = 9, Ar-**H**), 7.04 (s, 1H, Ar-**H**), 6.63 (s, 1H, Pyridone-Ring-**H**), 3.80 (s, 6H, OCH₃); ¹³C NMR (75 MHz, DMSO_{d6}) 157.3, 155.0, 149.3, 148.4, 138.7, 133.5, 131.2, 128.8, 128.3,

121.2, 120.7, 111.9, 91.9, 55.7, 55.6; **Chemical Formula:** $C_{20}H_{15}N_2O_3Cl$, **Elemental Analysis:** Calculated; C, 65.49; H, 4.12; N, 7.64;. Found; C, 65.5; H, 4.15; N, 7.61.

4-(4-methoxyphenyl)-6-methyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (4a):

White solid; yield: 78%; mp (d) 242 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2219.10, 1661.89, 1608.48; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 7.60 (d, 2H, $J = 9$, Ar-**H**), 7.01 (d, 2H, $J = 9$, Ar-**H**), 6.26 (s, 1H, Pyridone-Ring-**H**), 3.86 (s, 3H, OCH_3), 2.29 (s, 3H, CH_3); ^{13}C NMR (75 MHz, CDCl_3) 164.3, 161.6, 160.7, 150.5, 129.7, 127.9, 116.1, 114.3, 108.1, 97.7, 55.4, 19.7; **Chemical Formula:** $C_{14}H_{12}N_2O_2$, **Elemental Analysis:** Calculated; C, 69.99; H, 5.03; N, 11.66;. Found; C, 69.95; H, 5.11; N, 11.71.

4-(4-methoxyphenyl)-2-oxo-6-phenyl-1,2-dihydropyridine-3-carbonitrile (4b):

White solid; yield: 85%; mp (d) 198-200 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2208.92, 1662.33, 1608.16; ^1H NMR (300 MHz, DMSO_{d_6} , 298 K, TMS): δ_{H} 7.99 (d, 2H, $J = 6$, Ar-**H**), 7.59 (d, 2H, $J = 9$, Ar-**H**), 7.39 (d, 2H, $J = 6$, Ar-**H**), 7.05 (d, 2H, $J = 9$, Ar-**H**), 6.66 (s, 1H, Pyridone-Ring-**H**), 3.81 (s, 3H, OCH_3); ^{13}C NMR (75 MHz, DMSO_{d_6}) 159.8, 157.7, 155.1, 138.8, 136.5, 131.7, 130.5, 129.4, 128.2, 17.1, 120.3, 113.8, 112.4, 103.7, 55.2; **Chemical Formula:** $C_{19}H_{14}N_2O_2$, **Elemental Analysis:** Calculated; C, 75.48; H, 4.67; N, 9.27;. Found; C, 75.45; H, 4.65; N, 9.30.

6-(4-chlorophenyl)-4-(4-methoxyphenyl)-2-oxo-1,2-dihydropyridine-3-carbonitrile (4c):

White solid; yield: 91%; mp (d) 190-195 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2208.92, 1667.69, 1610.39; ^1H NMR (300 MHz, DMSO_{d_6} , 298 K, TMS): δ_{H} 8.00 (d, 2H, $J = 9$, Ar-**H**), 7.58 (d, 2H, $J = 6$, Ar-**H**), 7.43 (d, 2H, $J = 9$, Ar-**H**), 7.05 (d, 2H, $J = 9$, Ar-**H**), 6.69 (s, 1H, Pyridone-Ring-**H**), 3.80 (s, 3H, OCH_3); ^{13}C NMR (75 MHz, DMSO_{d_6}) 159.9, 156.3, 155.4, 137.5, 133.8, 130.3, 129.5, 129.1, 128.9, 128.7, 128.5, 128.3, 120.1, 113.9, 55.2; **Chemical Formula:** $C_{19}H_{13}N_2O_2Cl$, **Elemental Analysis:** Calculated; C, 67.76; H, 3.89; N, 8.32;. Found; C, 67.75; H, 3.90; N, 8.30.

5-ethyl-4-(4-methoxyphenyl)-6-methyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (4d):

Light green yellow solid; yield: 29%; mp 280-282 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2223.20, 1651.52, 1606.64; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 13.75 (br s, 1H, NH), 7.19 (d, 2H, $J = 8.4$, Ar-H), 7.01 (d, 2H, $J = 8.7$, Ar-H), 3.86 (s, 1H, OCH_3), 2.51 (s, 3H, CH_3), 2.31 (quint, 2H, $J = 7.2$, $-\text{CH}_2-$), 0.88 (t, 3H, $J = 7.2$, 7.5, CH_3); ^{13}C NMR (75 MHz, CDCl_3) 163.1, 162.5, 160.3, 149.0, 128.8, 128.1, 120.5, 115.4, 114.3, 55.2, 21.0, 17.9, 14.2; **Chemical Formula:** $\text{C}_{16}\text{H}_{16}\text{N}_2\text{O}_2$, **Elemental Analysis:** Calculated; C, 71.62; H, 6.01; N, 10.44;. Found; C, 71.60; H, 6.00; N, 10.45.

4-(4-methoxyphenyl)-2-oxo-6-propyl-1,2-dihydropyridine-3-carbonitrile (4e):

Green yellow solid; yield: 71%; mp 180-182 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2222.77, 1654.40, 1604.79; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 7.60 (d, 2H, $J = 7.8$, Ar-H), 7.01 (d, 2H, $J = 8.1$, Ar-H), 6.26 (s, 1H, Pyridone-Ring-H), 5.99 (br s, 1H, NH), 3.87 (s, 1H, OCH_3), 2.69 (t, 2H, $-\text{CH}_2-$), 1.80 (sext, 2H, $J = 4.8$, 7.5, 7.2, $-\text{CH}_2-$), 1.03 (t, 3H, $J = 6.6$, 7.2, CH_3); ^{13}C NMR (75 MHz, CDCl_3) 164.4, 161.6, 160.7, 154.8, 129.7, 128.0, 116.1, 114.3, 107.2, 97.8, 55.4, 35.5, 21.5, 13.4; **Chemical Formula:** $\text{C}_{16}\text{H}_{16}\text{N}_2\text{O}_2$, **Elemental Analysis:** Calculated; C, 71.62; H, 6.01; N, 10.44;. Found; C, 71.63; H, 6.05; N, 10.40.

6-methyl-2-oxo-4-(p-tolyl)-1,2-dihydropyridine-3-carbonitrile (5a):

White solid; yield: 80%; mp 220-222 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2216.91, 1651.27, 1614.82; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 7.50 (d, 2H, $J = 9$, Ar-H), 7.29 (d, 2H, $J = 9$, Ar-H), 6.28 (s, 1H, Pyridone-Ring-H), 5.70 (br s, 1H, NH), 2.50 (s, 3H, CH_3), 2.41 (s, 3H, CH_3); ^{13}C NMR (75 MHz, CDCl_3) 164.2, 161.2, 150.9, 141.1, 132.8, 129.5, 127.9, 115.9, 108.3, 108.2, 98.0, 21.3, 19.7; **Chemical Formula:** $\text{C}_{14}\text{H}_{12}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 74.98; H, 5.39; N, 12.49;. Found; C, 75.03; H, 5.40; N, 12.45.

2-oxo-6-phenyl-4-(p-tolyl)-1,2-dihydropyridine-3-carbonitrile (5b):

White solid; yield: 90%; mp 215-216 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2210.42, 1672.80, 1613.78; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 8.01 (d, 2H, $J = 6$, Ar-**H**), 7.50 (d, 2H, $J = 9$, Ar-**H**), 7.38 (m, 3H, Ar-**H**), 7.29 (d, 2H, $J = 6$, Ar-**H**), 6.68 (s, 1H, Pyridone-Ring-**H**), 2.36 (s, 3H, **CH**₃); ^{13}C NMR (75 MHz, DMSO-d_6) 158.6, 155.0, 139.5, 138.1, 135.7, 128.9, 128.8, 128.1, 127.9, 127.6, 127.0, 126.4, 103.8, 91.4, 68.8, 20.8; **Chemical Formula:** $\text{C}_{19}\text{H}_{14}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 79.70; H, 4.93; N, 9.78;. Found; C, 79.72; H, 4.90; N, 9.80.

6-(4-chlorophenyl)-2-oxo-4-(p-tolyl)-1,2-dihydropyridine-3-carbonitrile (5c):

White solid; yield: 88%; mp 223-224 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2209.89, 1659.07, 1609.22; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 8.02 (d, 2H, $J = 9$, Ar-**H**), 7.50 (d, 2H, $J = 6$, Ar-**H**), 7.43 (d, 2H, $J = 9$, Ar-**H**), 7.29 (d, 2H, $J = 6$, Ar-**H**), 6.68 (s, 1H, Pyridone-Ring-**H**), 2.35 (s, 3H, **CH**₃); ^{13}C NMR (75 MHz, DMSO-d_6) 171.1, 156.5, 155.6, 138.4, 137.6, 135.4, 133.8, 129.0, 128.2, 128.0, 120.1, 103.7, 92.5, 20.8; **Chemical Formula:** $\text{C}_{19}\text{H}_{13}\text{N}_2\text{OCl}$, **Elemental Analysis:** Calculated; C, 71.14; H, 4.08; N, 8.73;. Found; C, 71.10; H, 4.10; N, 8.75.

5,6-dimethyl-2-oxo-4-(p-tolyl)-1,2-dihydropyridine-3-carbonitrile (5d):

Green yellow solid; yield: 90%; mp(d) > 290 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2225.72, 1647.27, 1599.70; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.53 (br s, 1H, **NH**), 7.31 (d, 2H, $J = 7.2$, Ar-**H**), 7.17(d, 2H, $J = 7.2$, Ar-**H**), 2.36 (s, 3H, **CH**₃), 2.29 (s, 3H, **CH**₃), 1.69 (s, 3H, **CH**₃); ^{13}C NMR (75 MHz, DMSO-d_6) 161.9, 160.0, 150.2, 138.5, 133.3, 129.1, 127.5, 116.4, 111.3, 99.7, 20.8, 17.9, 13.9; **Chemical Formula:** $\text{C}_{15}\text{H}_{14}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 75.61; H, 5.92; N, 11.76;. Found; C, 75.60; H, 5.90; N, 11.78.

6-ethyl-2-oxo-4-(p-tolyl)-1,2-dihydropyridine-3-carbonitrile (5e):

Green yellow solid; yield: 10%; mp 230 °C ; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 2217.95, 1644.75, 169.86; ^1H NMR (300 MHz, CDCl_3 , 298 K, TMS): δ_{H} 13.51 (br s, 1H, NH), 7.51 (d, 2H, $J = 7.5$, Ar-H), 7.29 (d, 2H, $J = 7.5$, Ar-H), 6.28 (s, 1H, Pyridone-Ring-H), 2.79 (q, 2H, $-\text{CH}_2-$), 2.42 (s, 3H, CH_3), 1.37 (t, 3H, CH_3); ^{13}C NMR (75 MHz, CDCl_3) 164.3, 161.4, 156.4, 141.0, 133.1, 129.5, 127.9, 115.9, 106.5, 98.3, 26.9, 21.3, 12.3; **Chemical Formula:** $\text{C}_{15}\text{H}_{14}\text{N}_2\text{O}$, **Elemental Analysis:** Calculated; C, 75.61; H, 5.92; N, 11.76; Found; C, 75.64; H, 5.95; N, 11.72.

6-methyl-4-(3-nitrophenyl)-2-oxo-1,2-dihydropyridine-3-carbonitrile (6a):

White solid; yield: 88%; mp (d) > 300 °C; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 2221.75, 1663.75, 1624.77; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.74 (br s, 1H, NH), 8.39(d, 2H, $J = 9$, Ar-H), 8.07 (d, 1H, $J = 6$, Ar-H), 7.86 (t, 1H, $J = 9, 6$, Ar-H), 6.44 (s, 1H, Pyridone-Ring-H), 2.32 (s, 3H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) 161.1, 157.6, 152.9, 147.7, 137.4, 134.5, 130.5, 124.9, 122.7, 16.2, 106.4, 97.8, 19.2; **Chemical Formula:** $\text{C}_{13}\text{H}_9\text{N}_3\text{O}_3$, **Elemental Analysis:** Calculated; C, 61.18; H, 3.55; N, 16.46; Found; C, 61.15; H, 3.52; N, 16.50.

4-(3-nitrophenyl)-2-oxo-6-phenyl-1,2-dihydropyridine-3-carbonitrile (6b):

White solid; yield: 88%; mp (d) > 300 °C ; IR ($\nu_{\text{max}}/\text{cm}^{-1}$): 2222.55, 1651.66, 1604.35; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.95 (br s, 1H, NH), 8.55(s, 1H, Ar-H), 8.41 (d, 1H, $J = 6$, Ar-H), 8.20 (d, 1H, $J = 9$, Ar-H), 7.92 (m, 3H, Ar-H), 7.56 (t, 3H, $J = 4.5, 6.9$, Ar-H) 6.98 (s, 1H, Pyridone-Ring-H); ^{13}C NMR (75 MHz, DMSO-d_6) 161.8, 157.4, 151.3, 147.8, 139.3, 138.3, 137.4, 134.9, 131.3, 130.4, 128.9, 127.8, 124.9, 123.2, 116.1, 106.0; **Chemical Formula:** $\text{C}_{18}\text{H}_{11}\text{N}_3\text{O}_3$, **Elemental Analysis:** Calculated; C, 68.14; H, 3.49; N, 13.24; Found; C, 68.12; H, 3.50; N, 13.24.

6-(4-chlorophenyl)-4-(3-nitrophenyl)-2-oxo-1,2-dihydropyridine-3-carbonitrile (6c):

White solid; yield: 88%; mp (d) > 300 °C; IR ($\nu_{\max}/\text{cm}^{-1}$): 2226.48, 1632.65, 1603.72; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.97 (br s, 1H, **NH**), 8.54(s, 1H, **Ar-H**), 8.41 (d, 1H, $J = 9$, **Ar-H**), 8.19 (d, 1H, $J = 9$, **Ar-H**), 7.96 (d, 2H, $J = 6$, **Ar-H**), 7.88 (t, 1H, $J = 7.8$, 8.1, **Ar-H**) 7.60 (d, 2H, $J = 7.8$, **Ar-H**), 7.05 (s, 1H, **Pyridone-Ring-H**); ^{13}C NMR (75 MHz, DMSO-d_6) 161.0, 157.1, 147.8, 137.3, 136.1, 134.9, 133.6, 132.7, 130.4, 129.6, 128.9, 124.9, 123.2, 115.9, 105.7; **Chemical Formula:** $\text{C}_{18}\text{H}_{10}\text{ClN}_3\text{O}_3$, **Elemental Analysis:** Calculated; C, 61.46; H, 2.87; N, 11.95; Found; C, 61.48; H, 2.88; N, 11.92.

4-(2-nitrophenyl)-2-oxo-6-phenyl-1,2-dihydropyridine-3-carbonitrile (7a):

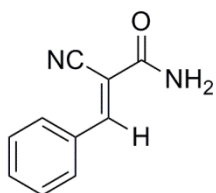
Yellow crystalline solid; yield: 60%; mp 275-277 °C ; IR ($\nu_{\max}/\text{cm}^{-1}$): 2218.22, 1651.03, 1528.05, 1502.88, 1353.39; ^1H NMR (400 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 8.29(d, 1H, $J = 1.0$, **Ar-H**), 7.97-7.87 (m, 1H, **Ar-H**), 7.85 (t, 3H, $J = 7.0$, **Ar-H**), 7.73-7.70 (m, 1H, **Ar-H**), 7.57-7.50 (m, 3H, **Ar-H**) 6.90 (s, 1H, **Pyridone-Ring-H**); ^{13}C NMR (100 MHz, DMSO-d_6) 161.8, 158.8, 152.5, 146.9, 135.0, 132.4, 131.9, 131.7, 131.7, 131.4, 129.5, 128.1, 125.6, 115.9, 106.3; **Chemical Formula:** $\text{C}_{18}\text{H}_{11}\text{N}_3\text{O}_3$, **Elemental Analysis:** Calculated; C, 68.14; H, 3.49; N, 13.24; Found; C, 68.13; H, 3.49; N, 13.23.

4-(4-nitrophenyl)-2-oxo-6-phenyl-1,2-dihydropyridine-3-carbonitrile (8a):

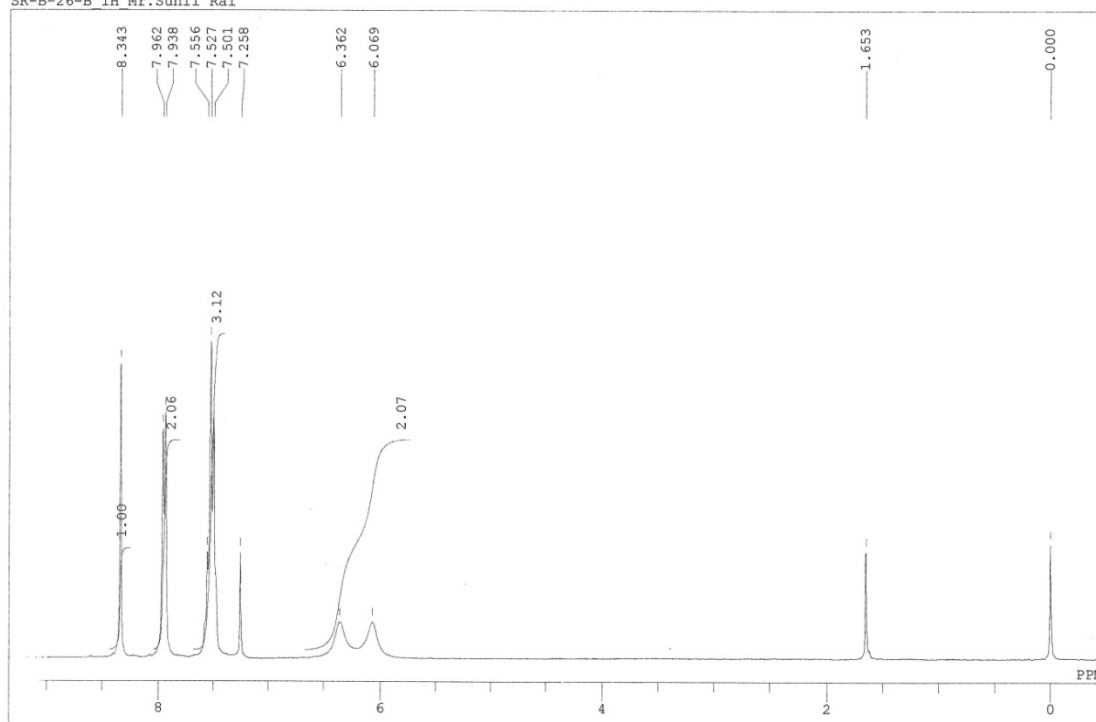
Green solid; yield: 87%; mp (d) > 300 °C ; IR ($\nu_{\max}/\text{cm}^{-1}$): 2219.64, 1658.52, 1607.07, 1515.58, 1352.46; ^1H NMR (300 MHz, DMSO-d_6 , 298 K, TMS): δ_{H} 12.97 (br s, 1H, **NH**), 8.38(d, 2H, $J = 8.1$, **Ar-H**), 8.01-7.89 (m, 4H, **Ar-H**), 7.56-7.53 (m, 3H, **Ar-H**), 6.92 (s, 1H, **Pyridone-Ring-H**); ^{13}C NMR (75 MHz, DMSO-d_6) 148.3, 142.2, 131.3, 129.8, 128.9, 127.8, 123.7, 115.9; **Chemical Formula:** $\text{C}_{18}\text{H}_{11}\text{N}_3\text{O}_3$, **Elemental Analysis:** Calculated; C, 68.14; H, 3.49; N, 13.24; Found; C, 68.15; H, 3.48; N, 13.22.

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

Compound (1): ^1H NMR



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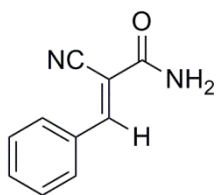


JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

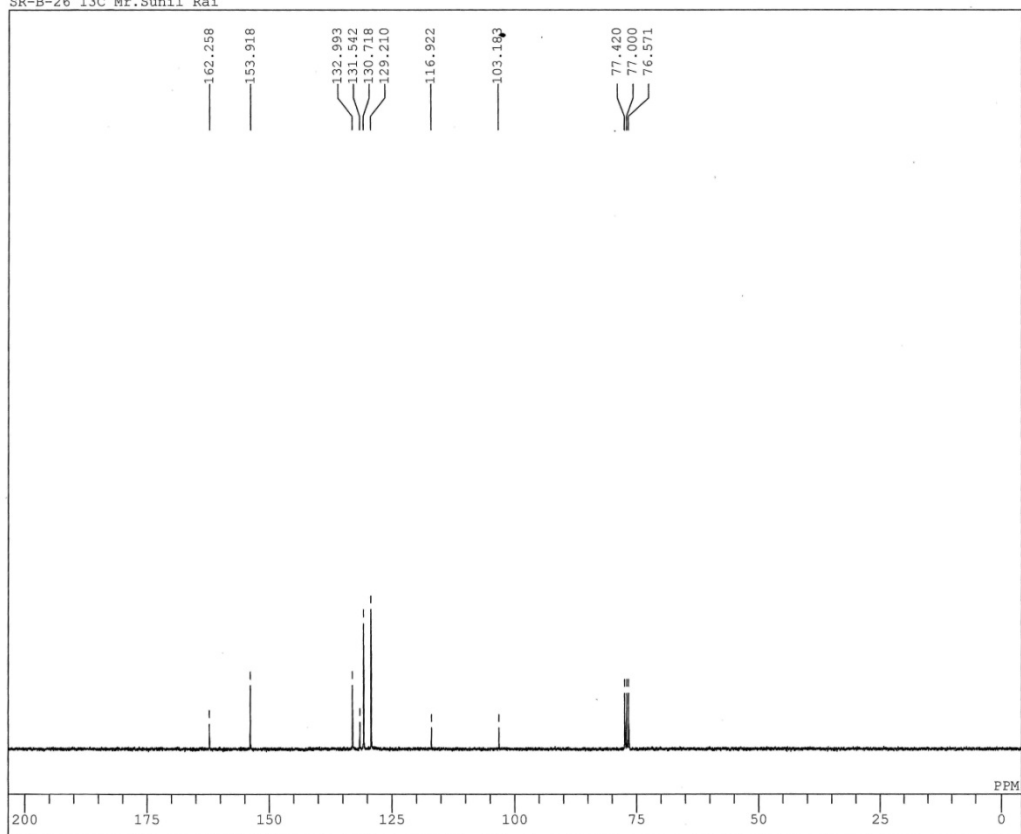
Operator : Nagendra Kuma
Shishir Singh

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BF 1.20 Hz
RGAIN 17

Compound (1): ^{13}C NMR



C:\WINNMR98\COMMON\DEFAULT.ALS
SR-B-26 ^{13}C Mr.Sunil Rai

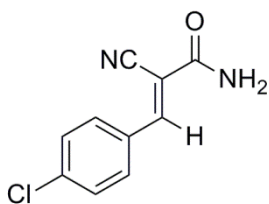


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VARANASI-221005

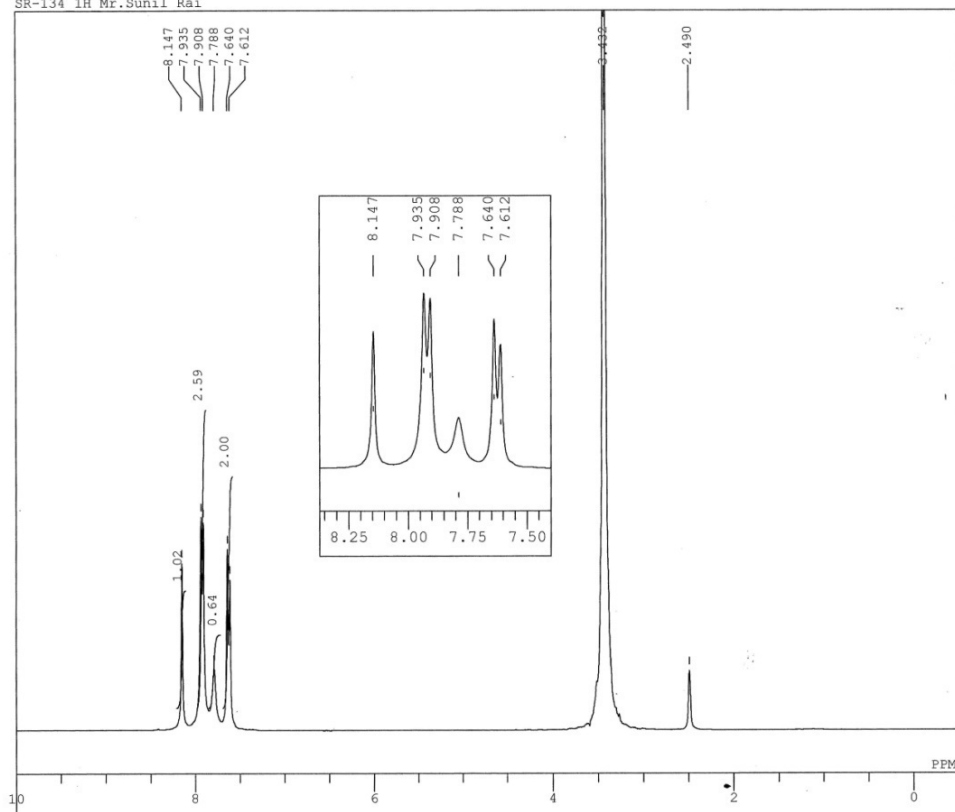
Operator : Nagendra Kumar
Shishir Singh

DFILE C:\WINNMR98\COMMON\DE
COMNT SR-B-26 ^{13}C Mr.Sunil R
DATIM Thu Dec 20 14:48:29 20
OBNUC ^{13}C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 183
ACQTM 1.606 sec
PD 1.394 sec
FWL 6.0 us
IRNUC 1H
CTEMP 23.1 c
SIVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 24

Compound (2): ^1H NMR



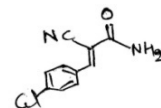
C:\Sunil Rai\SR-134_1H.als
SR-134 1H Mr.Sunil Rai



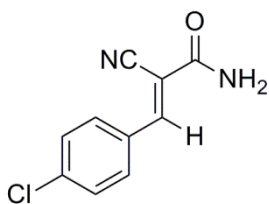
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

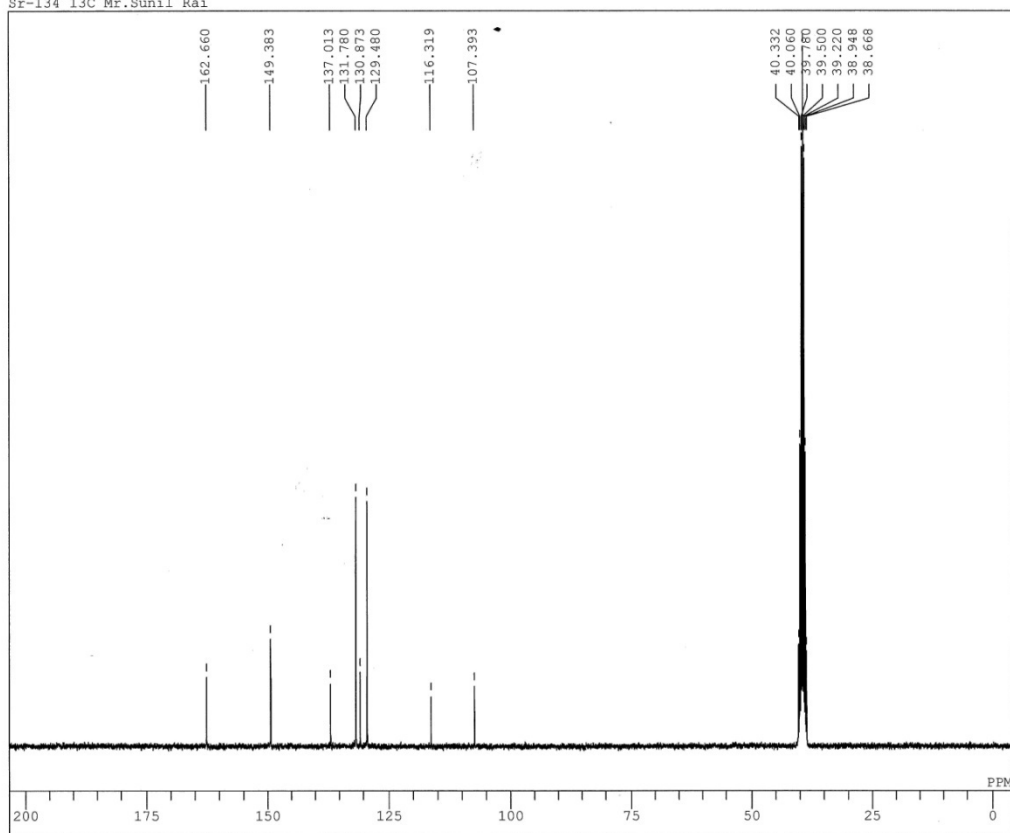
DFILE C:\Sunil Rai\SR-134_1H.als
COMNT SR-134 1H Mr.Sunil Rai
DATIM Tue Nov 27 11:27:24 2012
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 26
ACQTM 3.447 sec
PD 1.547 sec
PWI 5.2 us
IRNUC 1H
CTEMP 22.7 c
SLVNT DMSO
EXREF 2.49 ppm
BF 3.00 Hz
RGAIN 12



Compound (2): ^{13}C NMR



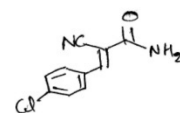
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Sr-134 13C Mr.Sunil Rai



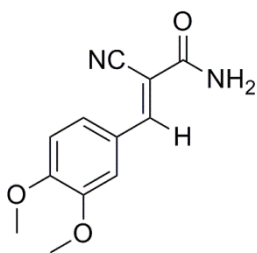
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

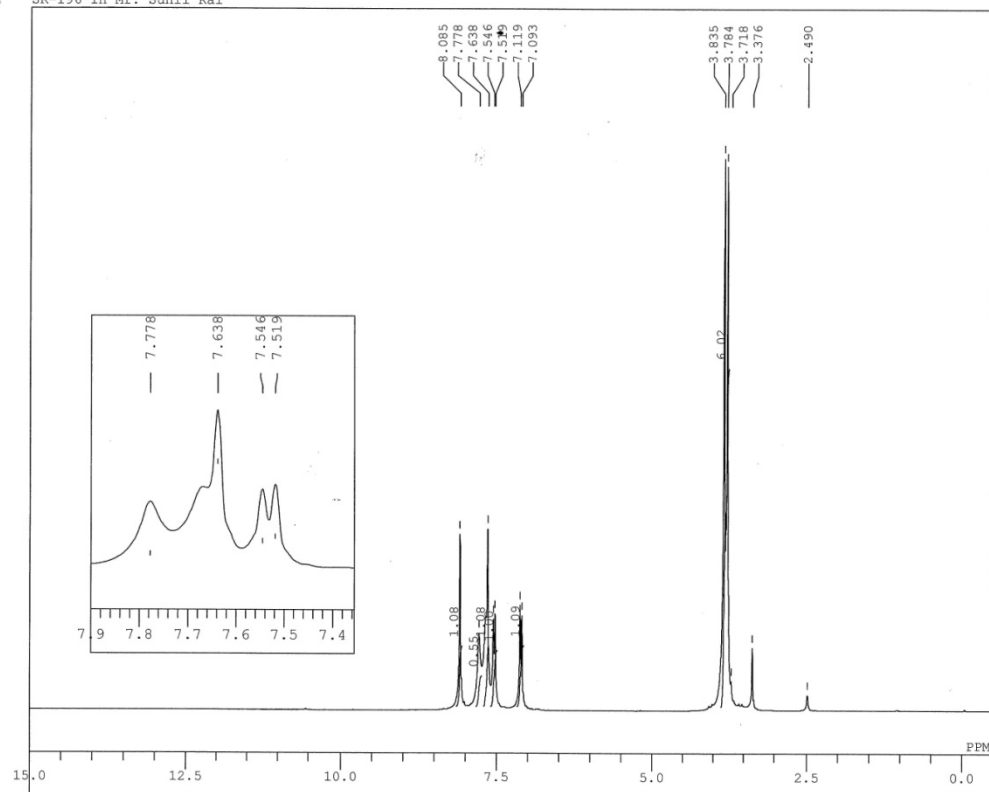
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COMNT Sr-134_13C Mr.Sunil Ra
DATIM Tue Dec 04 04:08:55 20
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
FWL 6.0 us
IRNUC 1H
CTEMP 20.5 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 25



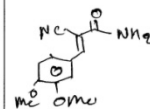
Compound (3): ^1H NMR



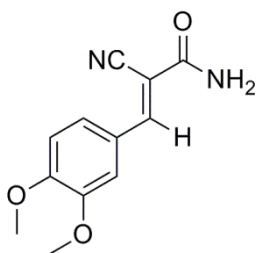
C:\Sunil Rai\SR-196 1HDMSO.als
SR-196 1H Mr. Sunil Rai



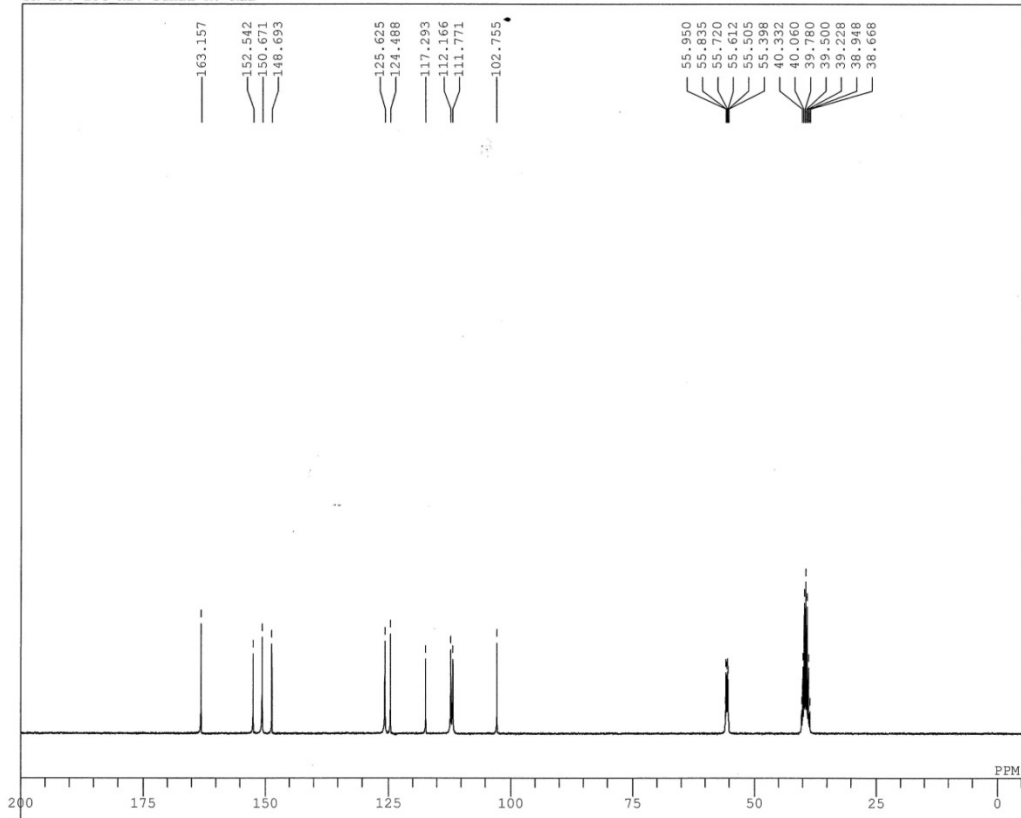
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005
Operator : Nagendra Kumar
Shishir Singh
DFILE C:\Sunil Rai\SR-196
COMNT SR-196 1H Mr. Sunil
DATIM Thu Sep 12 11:52:08
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 23
ACQTM 3.447 sec
PD 1.547 sec
PW1 5.2 us
IRNUC 1H
CTEMP 19.9 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 11



Compound (3): ^{13}C NMR



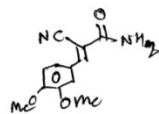
C:\WINNMR98\Data\SR-196_13C1BCM_E5.als
SR-196 13C Mr. Sunil K. Rai



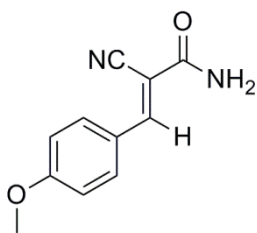
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

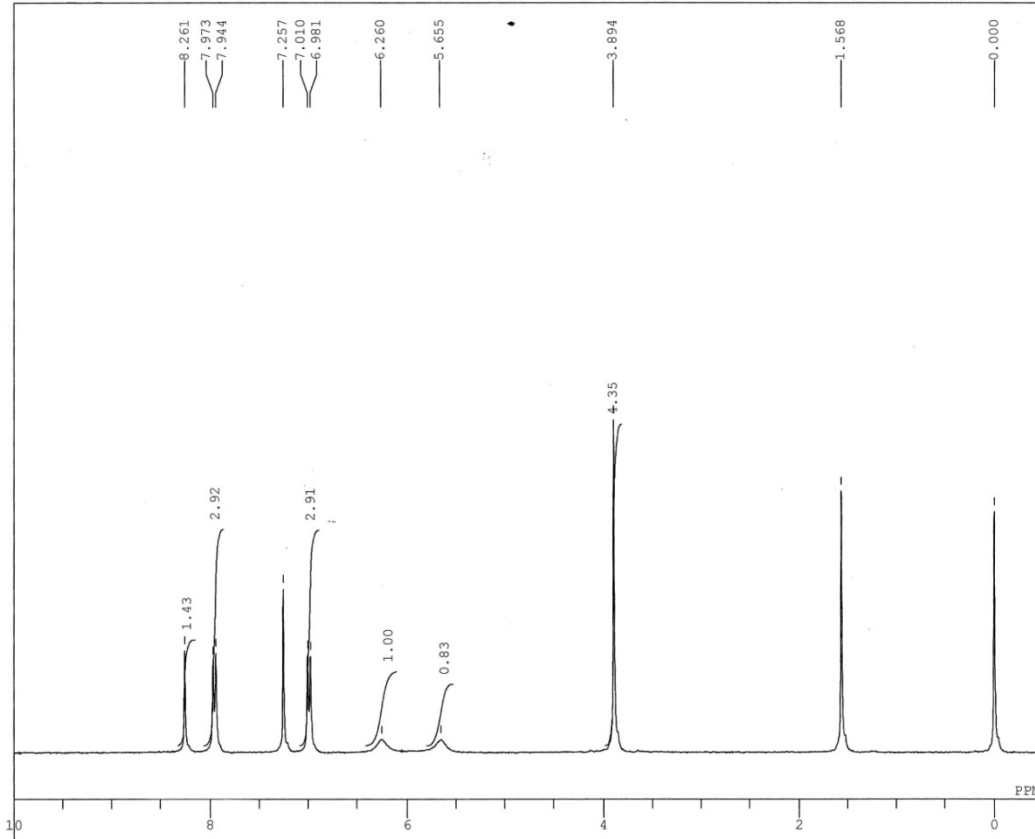
DFILE C:\WINNMR98\Data\SR-196_13C1BCM_E5.als
COMNT SR-196 13C Mr. Sunil K. Rai
DATIM Fri Sep 13 03:17:36 2003
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 21.2 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 21



Compound (4): ^1H NMR



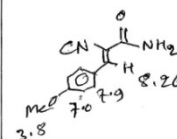
C:\WINNMR98\COMMON\DEFAULT.ALS
SR-197 1H Mr. Sunil Rai



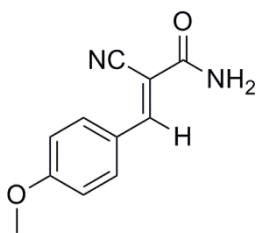
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

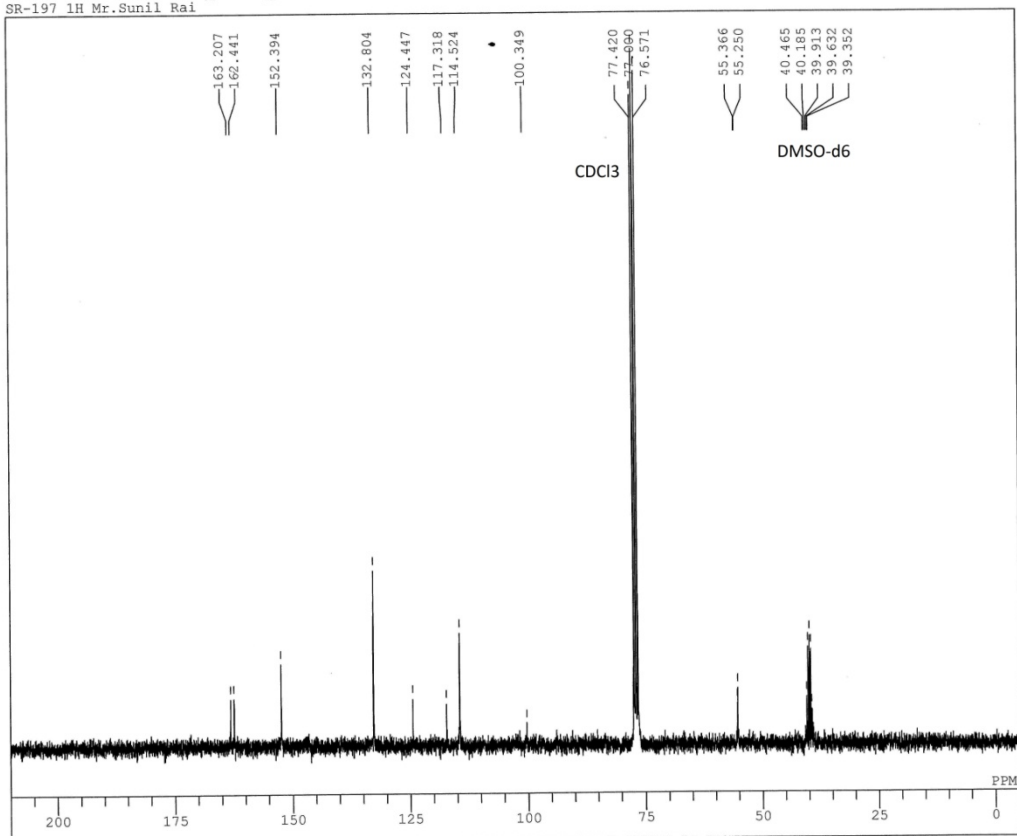
DEFILE C:\WINNMR98\COMMON\DEI
COMNT SR-197 1H Mr. Sunil Rai
DATIM Wed Sep 04 16:04:42 20:
OBNOC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 32
ACQTM 3.447 sec
PD 1.547 sec
FW1 5.2 us
IRNUC 1H
CTEMP 24.2 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 25



Compound (4): ^{13}C NMR



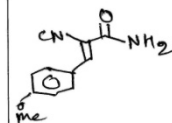
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SR-197 1H Mr.Sunil Rai



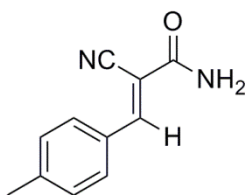
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

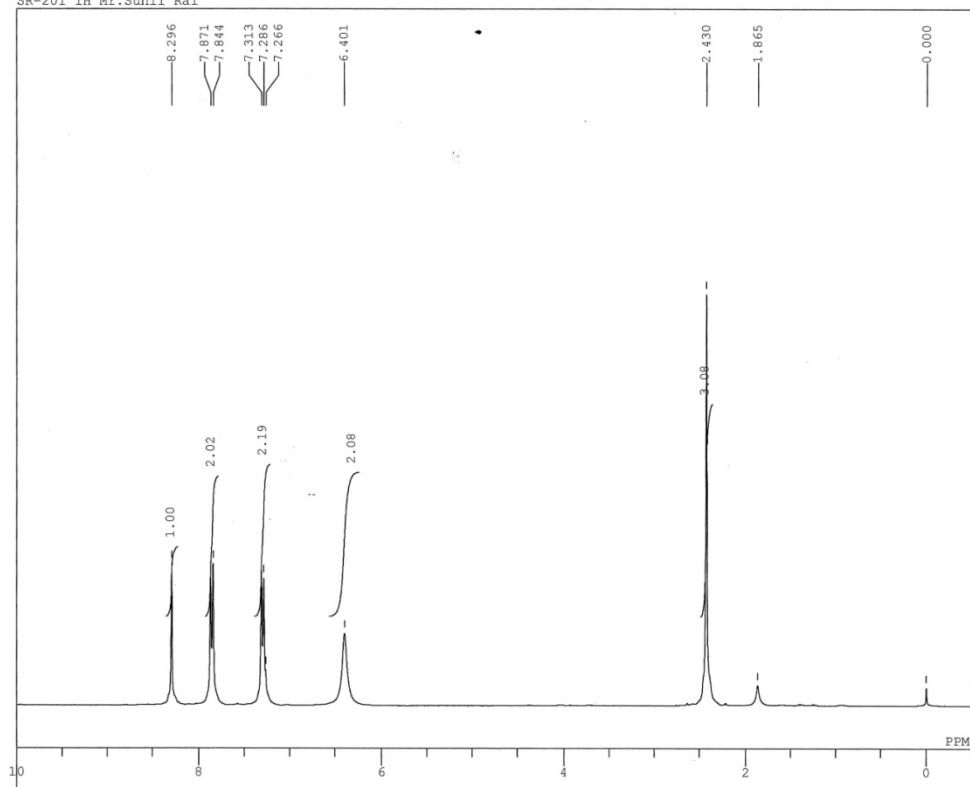
DFILE C:\WINNMR98\Data\SR-197_1H1BCM_E1.als
COMNT SR-197 1H Mr.Sunil Rai
DATIM Wed Sep 11 19:53:00 2008
OBNUC 13C
EXMOD BCM
OBERQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
AQTM 1.606 sec
PD 1.394 sec
PWL 5.9 us
IRNUC 1H
CTEMP 50.2 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 23



Compound (5): ^1H NMR



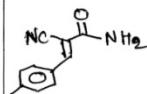
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SR-201 1H Mr.Sunil Rai



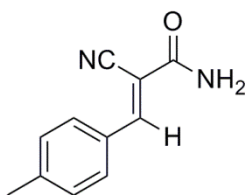
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

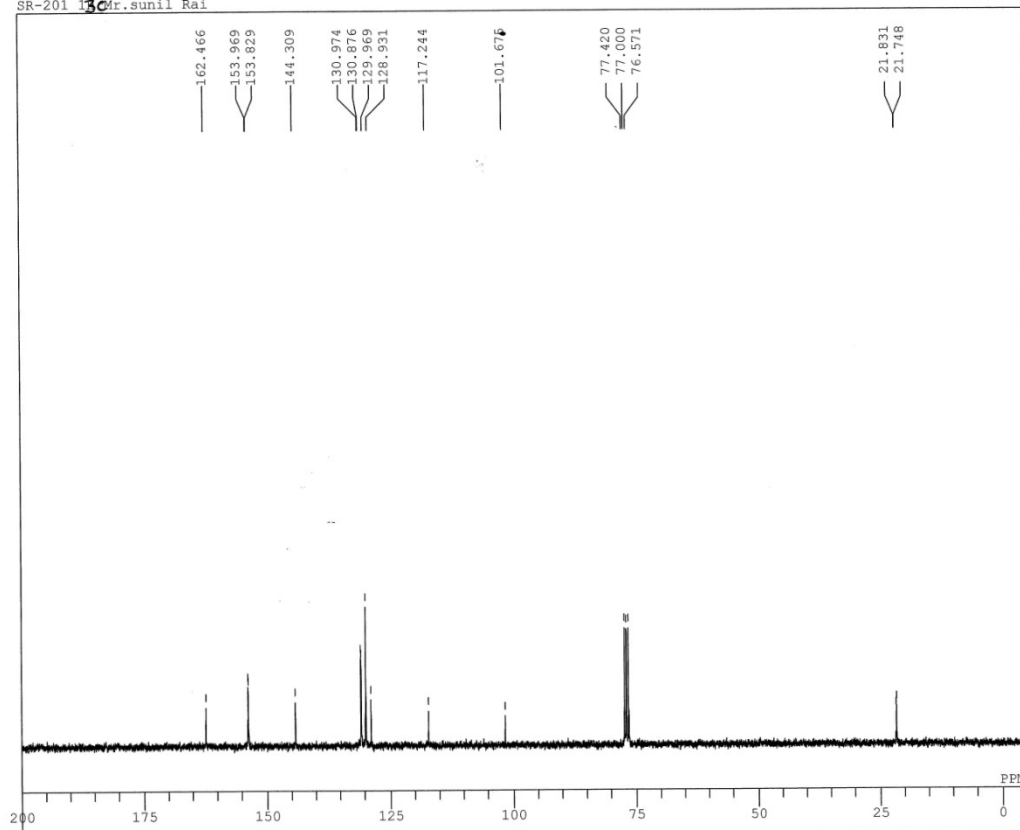
DFILE C:\WINNMR98\Data\SR-201_1H1NON_E5.als
COMNT SR-201 1H Mr.Sunil Rai
DATIM Mon Sep 09 13:39:16 2009
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
PW1 5.6 us
IRNUC 1H
CTEMP 21.1 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 16



Compound (5): ^{13}C NMR



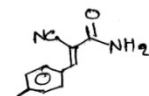
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SR-201 13C Mr. sunil Rai



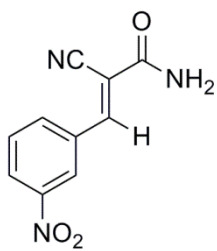
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

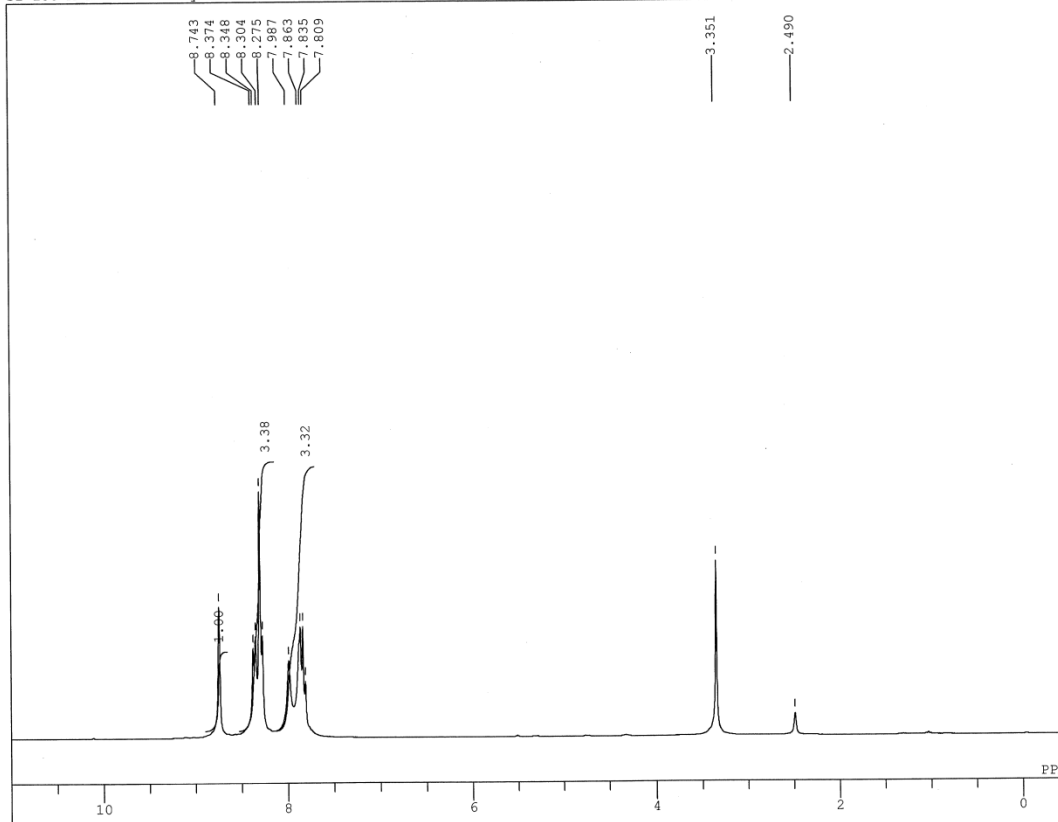
DFILE C:\WINNMR98\Data\SR-20
COMNT SR-201_1H Mr. sunil Rai
DATIM Mon Sep 09 13:49:38 20
OBNUC 13C
EXMOD BCM
OBFQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 200
ACQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 22.8 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 24



Compound (6): ^1H NMR



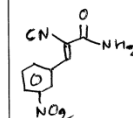
C:\R.S.Khanna\SZ-135-A_1H.als
SZ-135-A 1H Ms. Shaziya



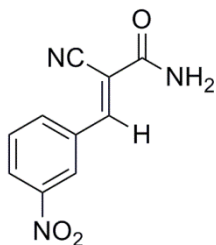
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kuma
Shishir Singh

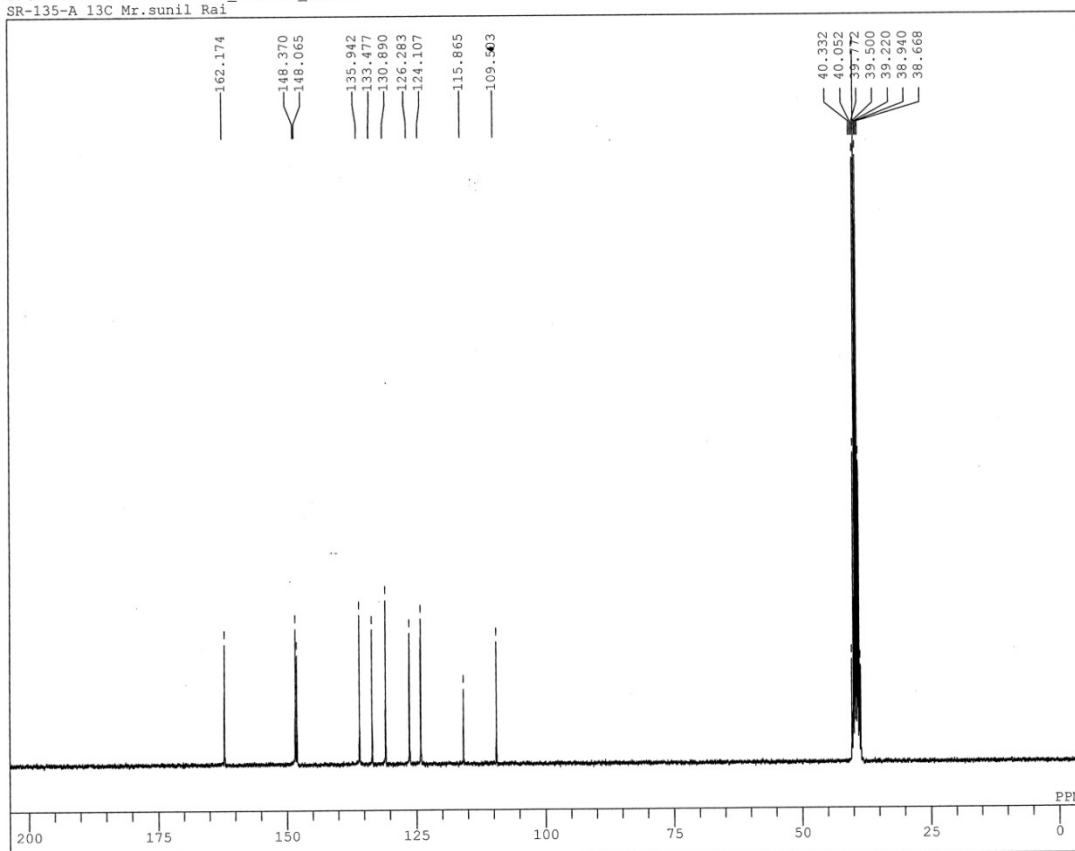
DFILE C:\R.S.Khanna\SZ-
COMNT SZ-135-A_1H Ms. S
DATIM Fri Dec 21 12:58:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 16
ACQTM 3.447 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 23.6 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 15



Compound (6): ^{13}C NMR



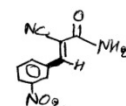
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SR-135-A 13C Mr.sunil Rai



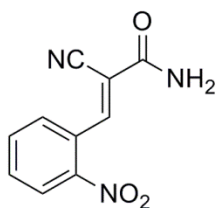
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

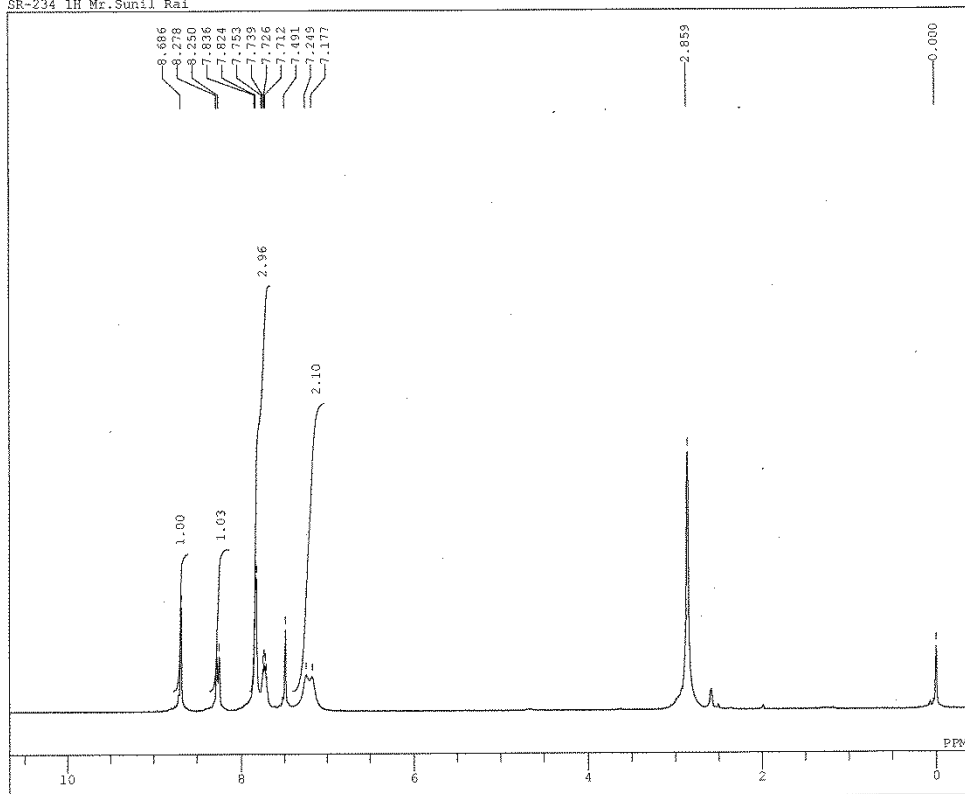
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COMNT SR-135-A 13C Mr..
DATIM Tue Dec 25 17:41
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 3000
ACQTM 1.606 sec
PD 1.394 sec
PWL 6.0 us
IRNUC 1H
CTEMP 19.4 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 25



Compound (7): ^1H NMR



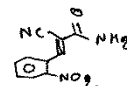
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SR-234 1H Mr.Sunil Rai



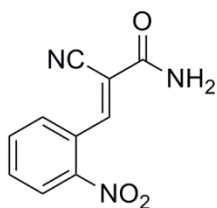
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kum
Shishir Sing.

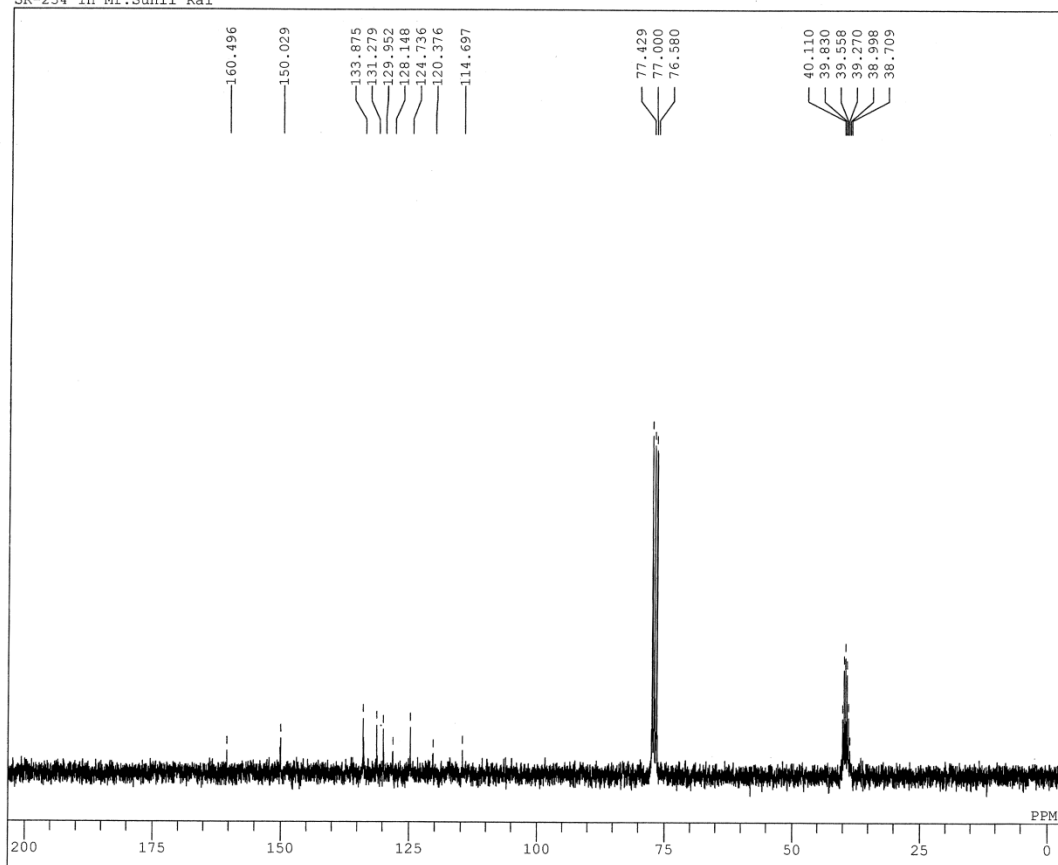
DFILE C:\WINNMR98\Data
COMNT SR-234_1H Mr.Sun
DATIM Tue Aug 19 13:30
ORNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 23.4 c
SLVNT CDCL3
EXREF *fu du* 0.00 ppm
BF *DMSO* 1.20 Hz
RGAIN *DMSO* 22



Compound (7): ^{13}C NMR



C:\WINNMR98\Data\SR-234_1H2BCM_E1.als
SR-234 1H Mr.Sunil Rai

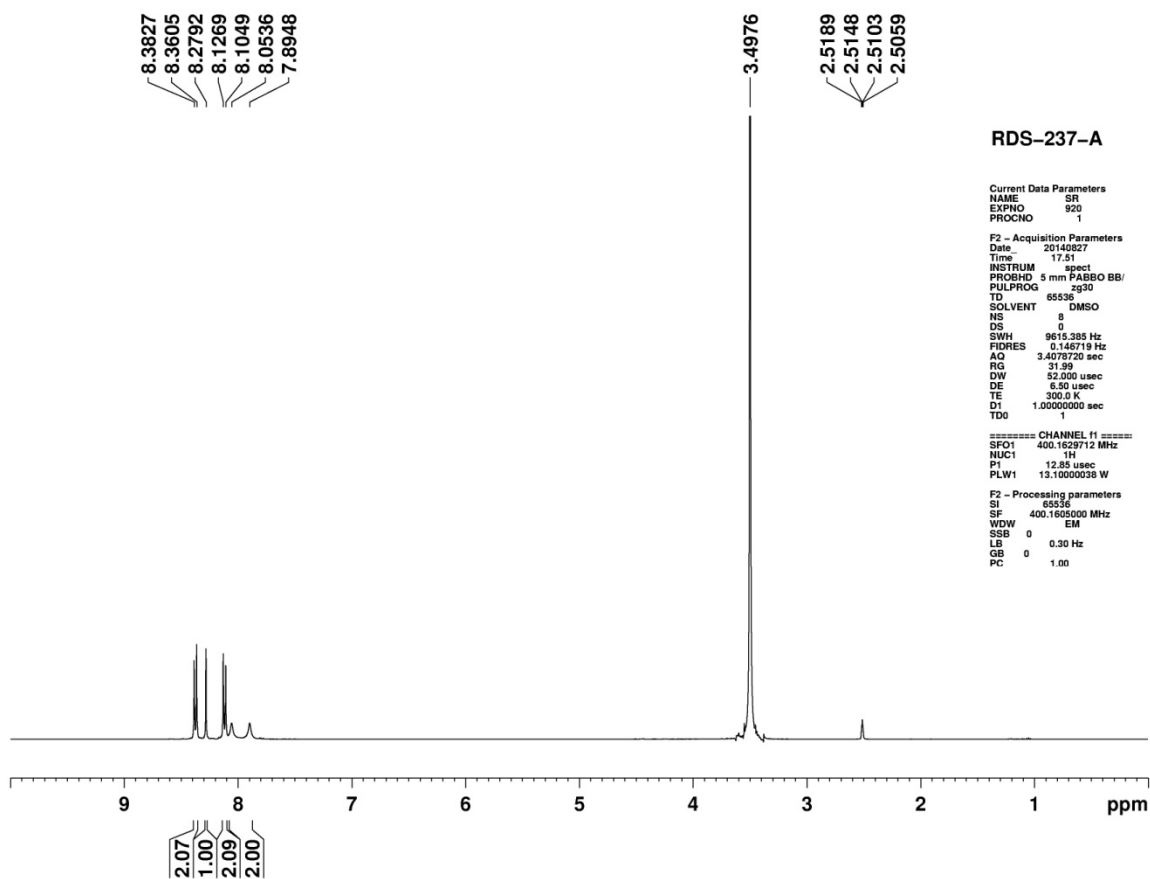
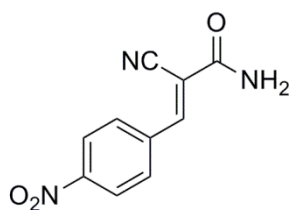


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CHEMISTRY DEPARTMENT
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VARANASI-221005

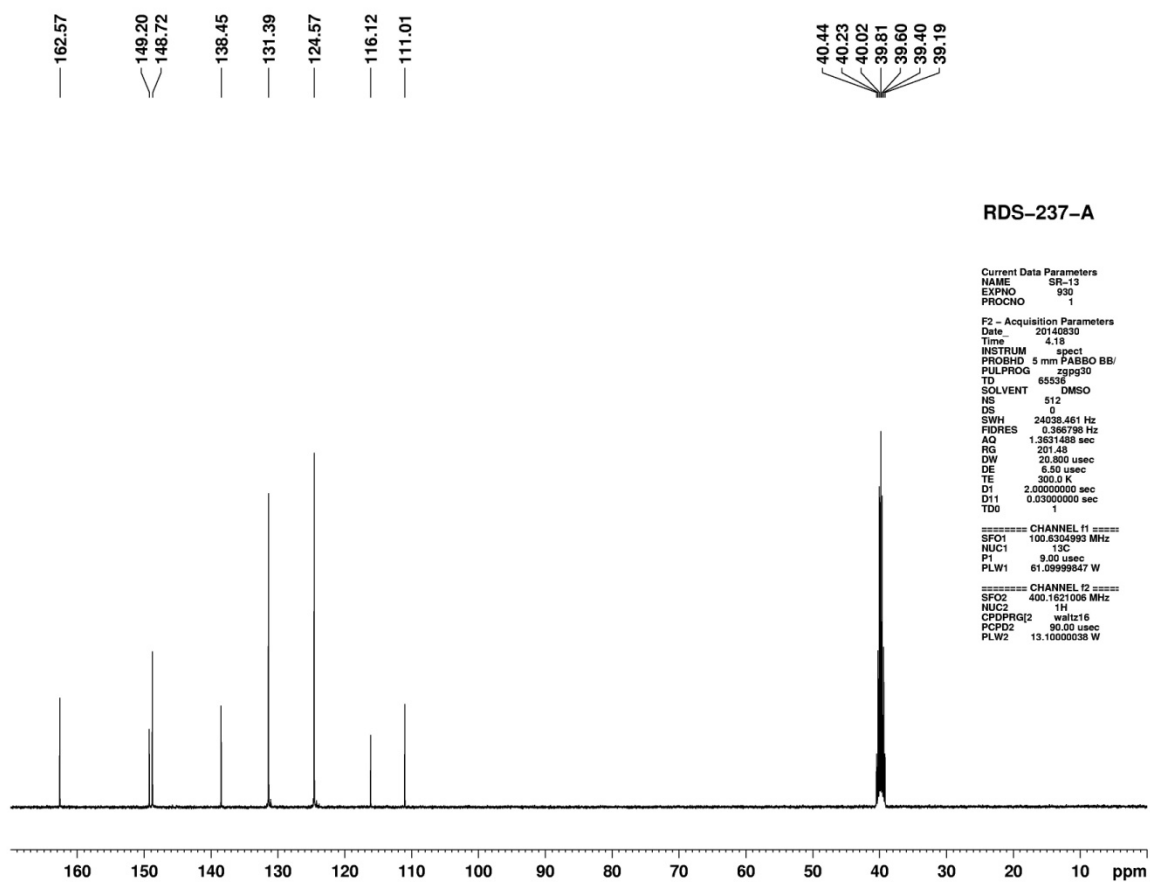
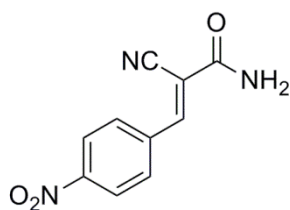
Operator : Nagendra Kum
Shishir Sing

DFILE C:\WINNMR98\Data
COMNT SR-234_1H Mr.Sun
DATIM Tue Aug 19 13:46
OBNUC ^{13}C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 300
ACQTM 1.606 sec
PD 1.394 sec
PWL 6.0 us
IRNUC 1H
CTEMP 25.0 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 23

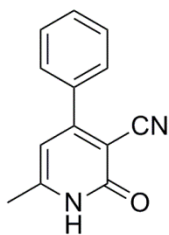
Compound (8): ^1H NMR



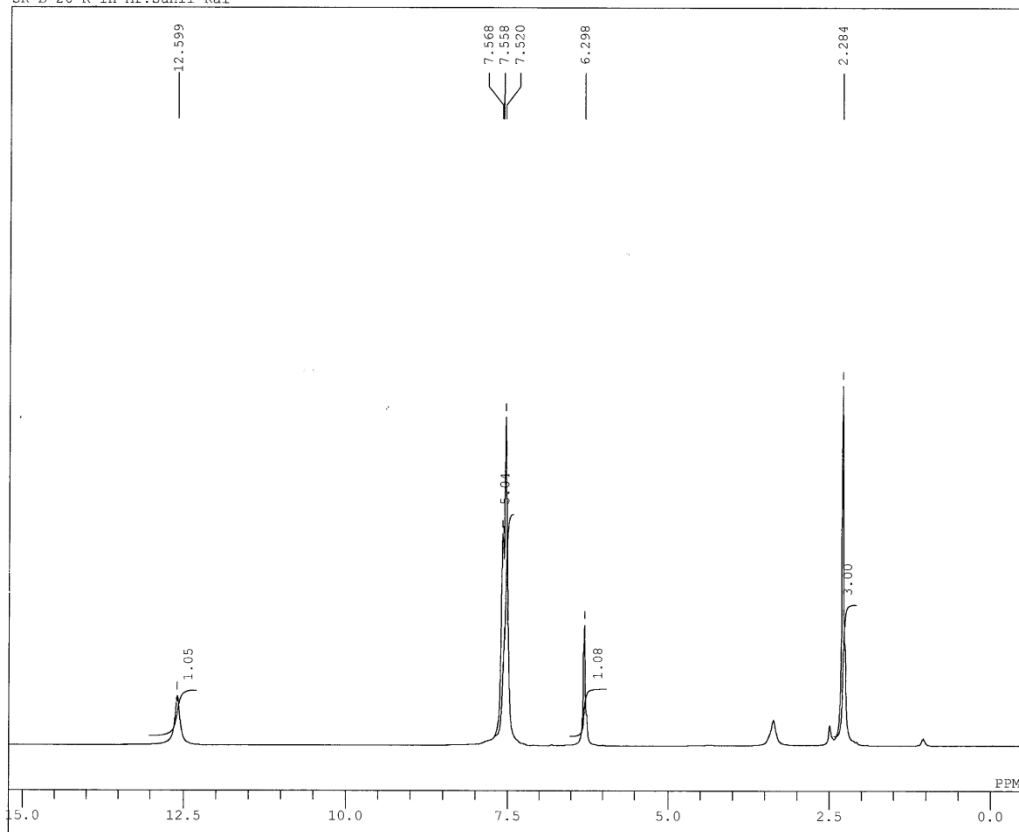
Compound (8): ^{13}C NMR



Compound (1a): ^1H NMR



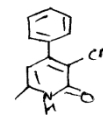
C:\Sunil Rai\SR-B-26-R 1H.als
SR-B-26-R 1H Mr.Sunil Rai



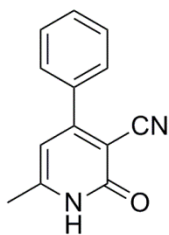
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

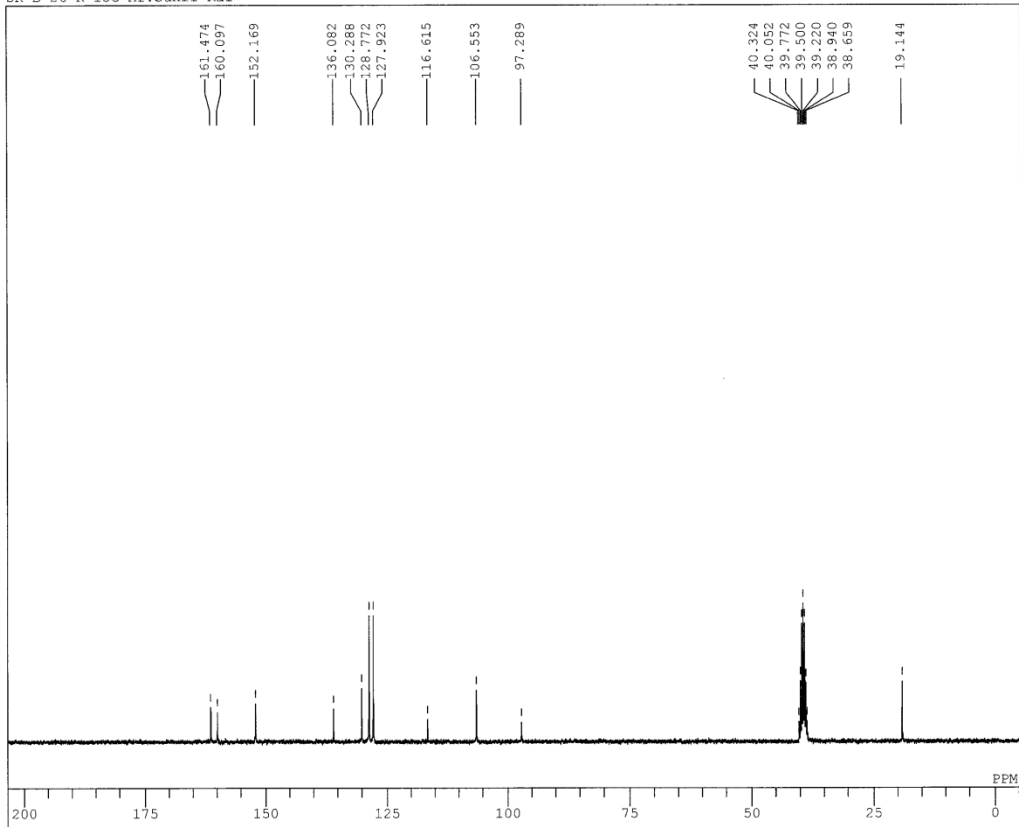
DFILE C:\Sunil Rai\SR-B-26-R
COMNT SR-B-26-R 1H Mr.Sunil
DATIM Wed Nov 07 12:50:29 20
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 44
ACQTM 3.447 sec
PD 1.547 sec
PWI 5.2 us
IRNUC 1H
CTEMP 18.3 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 13



Compound (1a):¹³C NMR



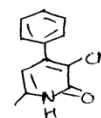
C:\WINNMR98\COMMON\DEFAULT.ALS
SR-B-26-R 13C Mr.Sunil Rai



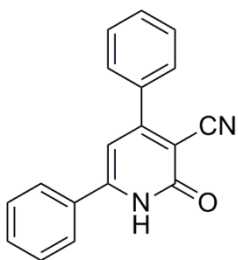
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

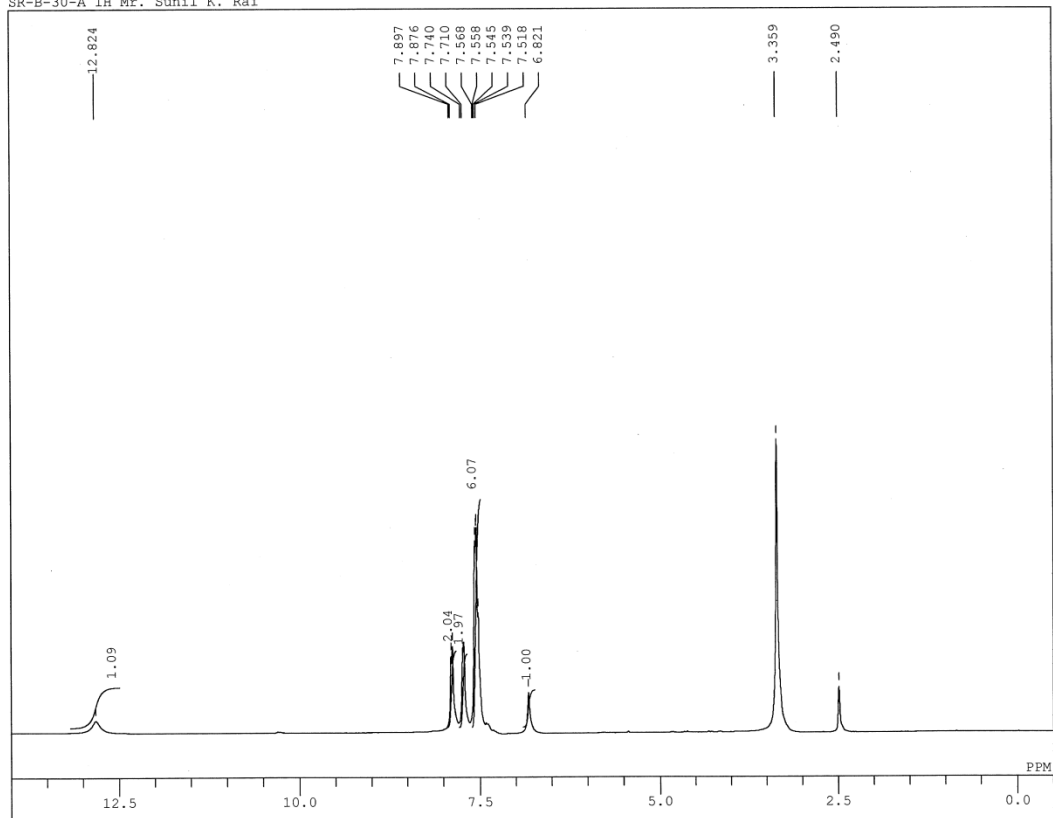
DFILE C:\WINNMR98\COMMON\DEI
COMNT SR-B-26-R 13C Mr.Sunil
DATIM Wed Nov 07 12:34:04 20:
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 205
ACQTM 1.606 sec
PD 1.394 sec
PWL 6.0 us
IRNUC 1H
CTEMP 19.6 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 23



Compound (1b): ^1H NMR



C:\Sunil Rai\SR-B-30-A 1H.als
SR-B-30-A 1H Mr. Sunil K. Rai

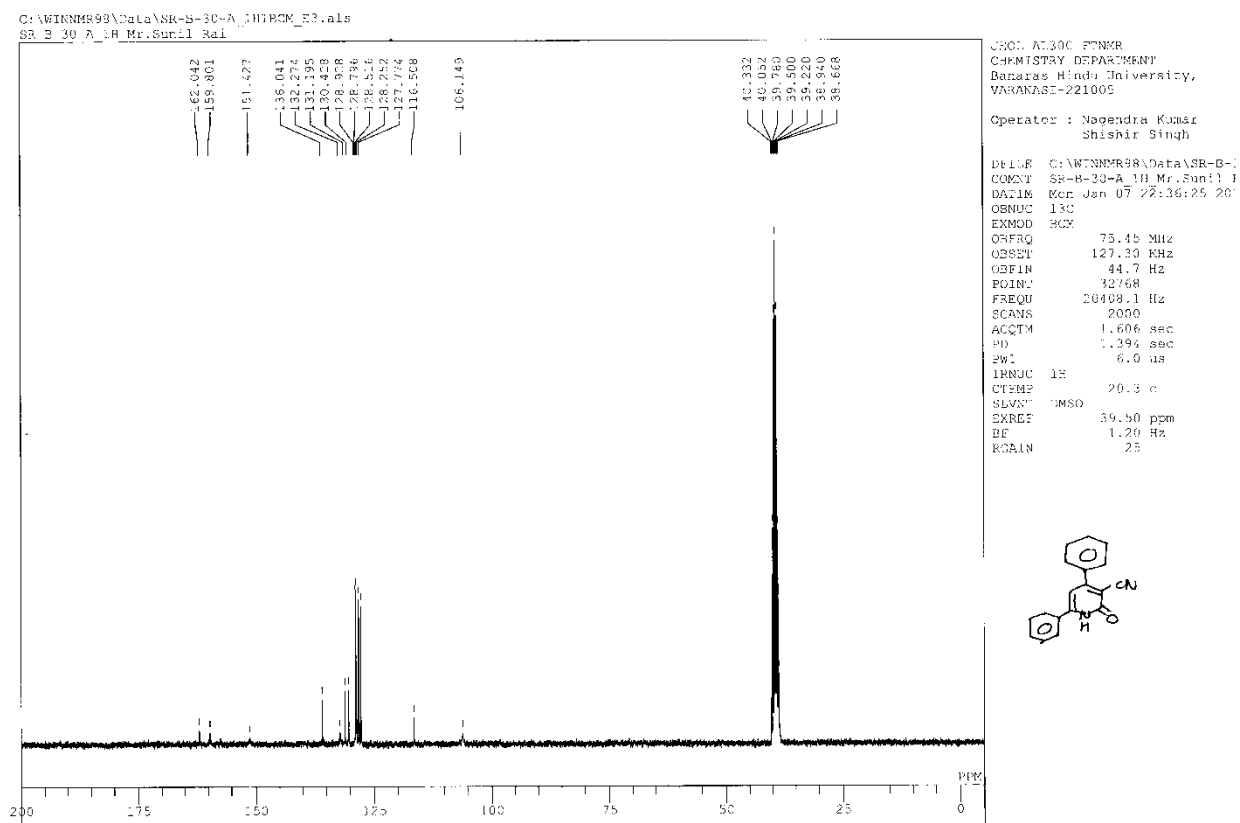
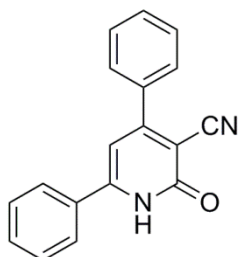


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CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

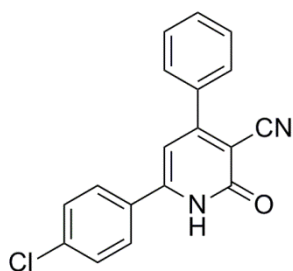
Operator : Nagendra Kuma
Shishir Singh

DFILE C:\Sunil Rai\SR-B-
COMNT SR-B-30-A 1H Mr.
DATIM Mon Jan 07 15:18:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 32
ACQTM 5.446 sec
PD 1.547 sec
PW1 5.2 us
IRNUC 1H
CTEMP 18.4 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 17

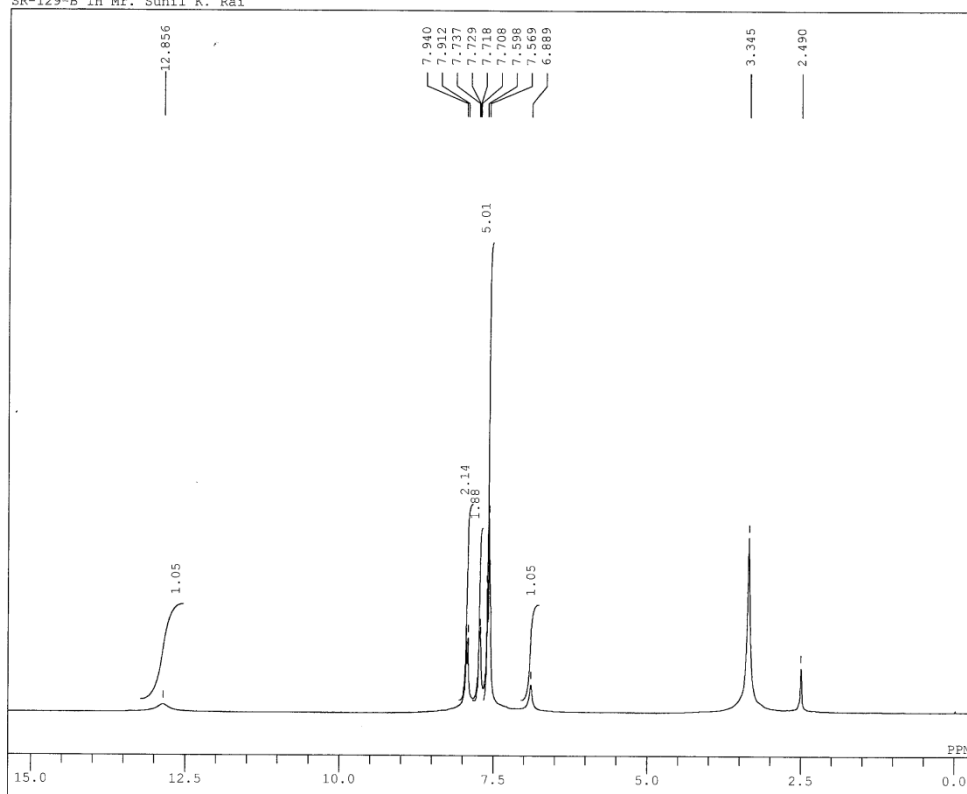
Compound (1b): ^{13}C NMR



Compound (1c): ¹H NMR



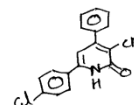
C:\Sunil Rai\SR-129-B 1H.als
SR-129-B 1H Mr. Sunil K. Rai



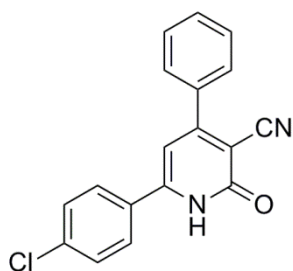
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

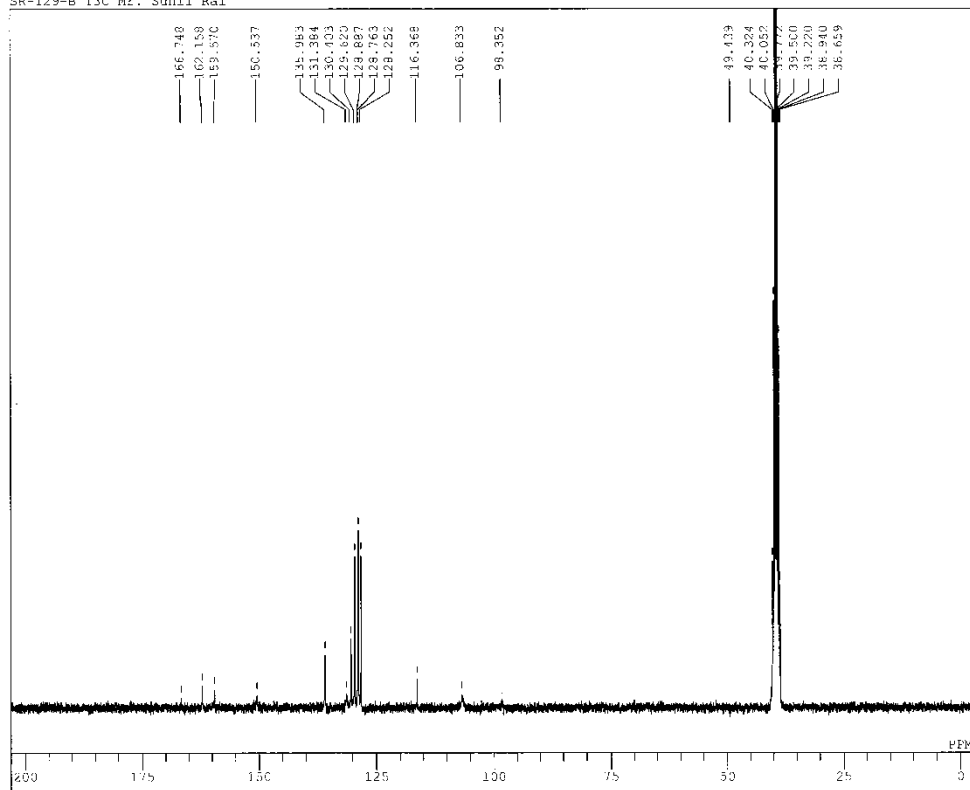
DFILE C:\Sunil Rai\SR-129-B
COMNT SR-129-B 1H Mr. Sunil
DATIM Thu Jan 17 11:43:34 21
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 20
ACQTM 3.447 sec
PD 1.547 sec
PW1 5.2 us
IRNUC 1H
CTEMP 21.3 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 17



Compound (1c): ¹³C NMR



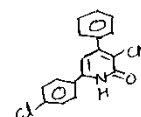
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SR-129-B 13C Mr. Sunil Rai



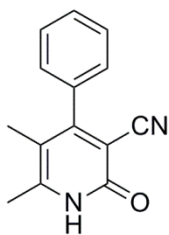
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

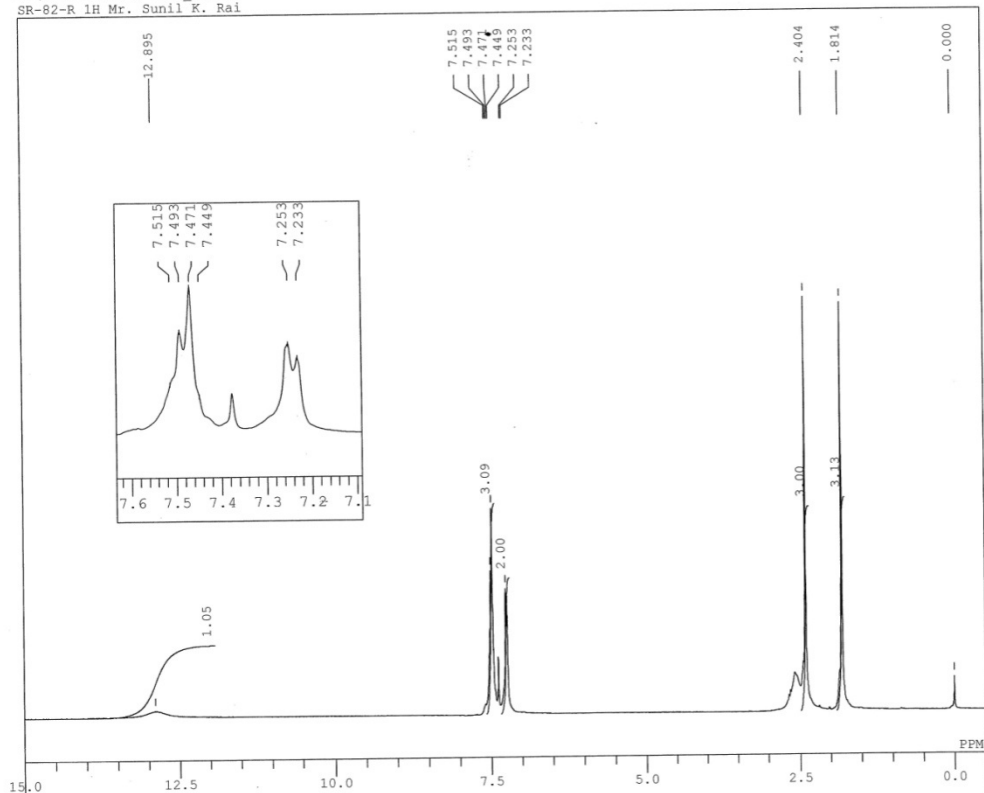
DFILE C:\Sunil Rai\SR-129-B.1
COMNT SR-129-B 13C Mr. Sunil
DATE Tue Jan 22 01:02:53 20
OSNUC 13C
EXMOD RCM
OSFRQ 75.45 MHz
OSRST 127.30 KHz
OSFIN 44.7 Hz
PCINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PG 1.394 sec
PWL 6.0 us
LSNOC 1H
CYCNP 22.7 c
SIVNO DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGATN 23



Compound (1d): ^1H NMR



C:\Sunil Rai\SR-82-R 1H.als
SR-82-R 1H Mr. Sunil K. Rai

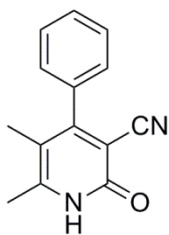


JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

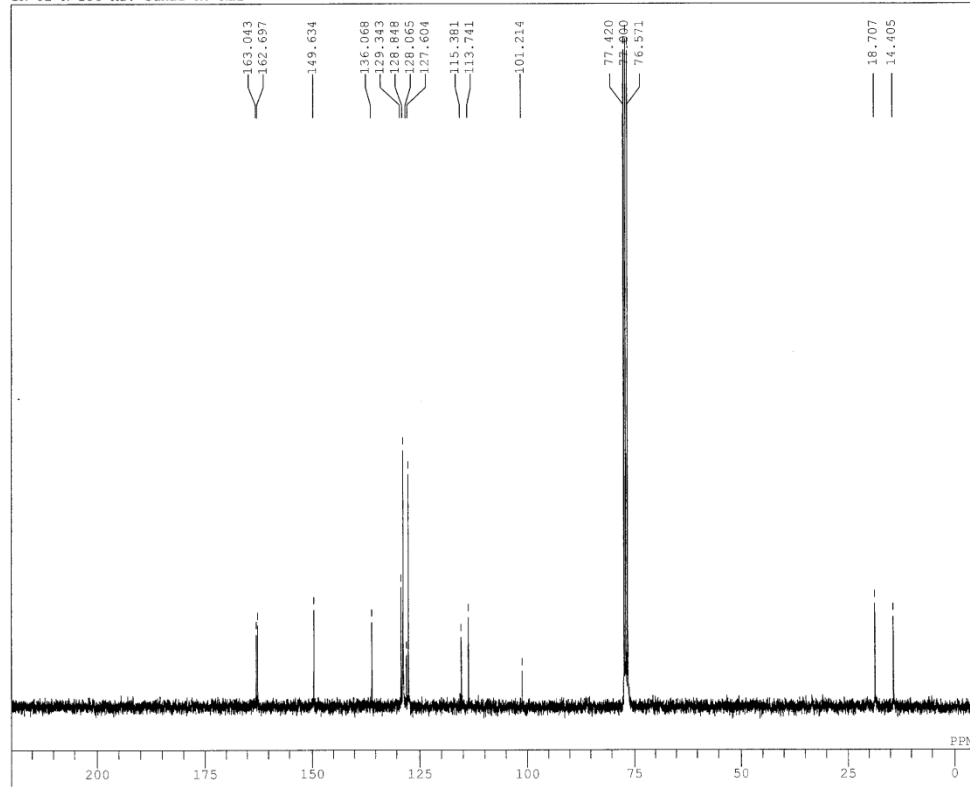
Operator : Nagendra Kumar
Shishir Singh

DFILE C:\Sunil Rai\SR-82-R 1H
COMNT SR-82-R 1H Mr. Sunil K.
DATIM Wed Aug 22 15:03:22 20.
CNUC 1H
EXMOD NON
OBFQ 300.40 MHz
OBSF 130.00 KHz
OBFN 1150.0 Hz
POINT 32768
FREQ 9505.7 Hz
SCANS 32
ACQTM 3.447 sec
PD 1.547 sec
PWI 5.2 us
IRNUC 1H
CTEMP 21.9 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 19

Compound (1d): ¹³C NMR



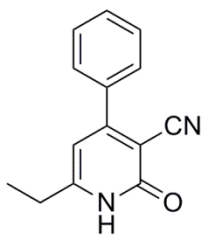
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SR-82-R 13C Mr. Sunil K. Rai



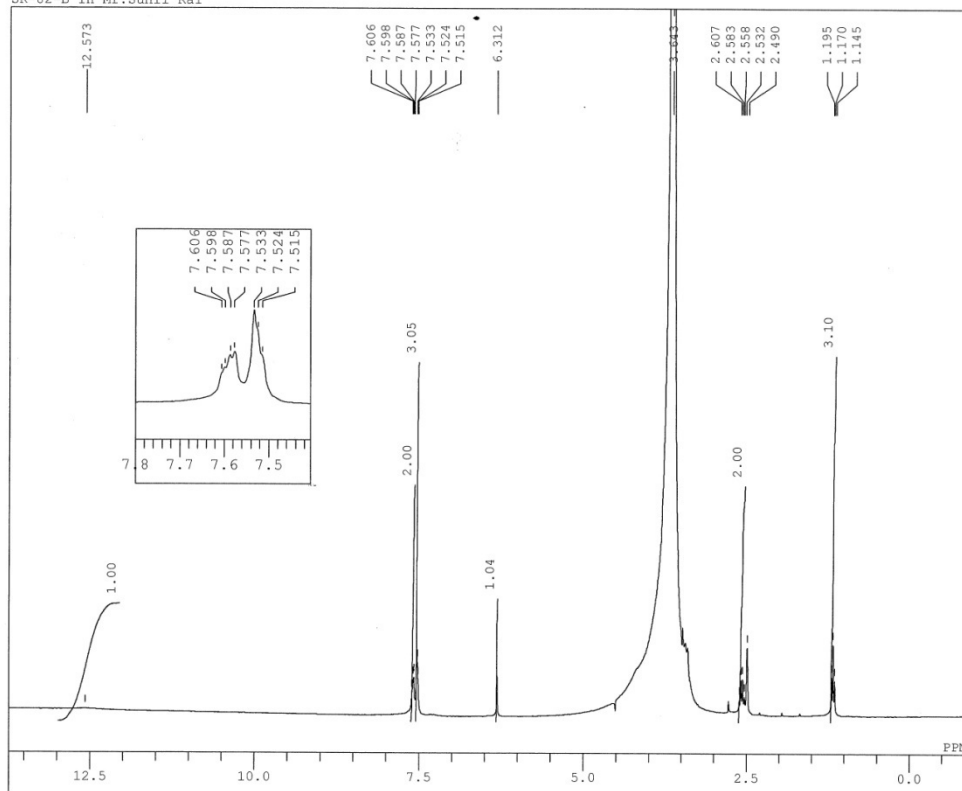
JEOAL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005
Operator : Nagendra Kumar
Shishir Singh
DEFILE C:\WINNMR98\Data\SR-82-
COMNT SR-82-R_13C Mr. Sunil K.
DATIM Thu Nov 14 00:48:37 20:
GBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 40.4 c
SLVNT CDCL3
EXREF 77.00 ppm
BP 1.20 Hz
RGAIN 23



Compound (1e): ^1H NMR



C:\Sunil Rai\SR-82-B 1H.als
SR-82-B 1H Mr.Sunil Rai



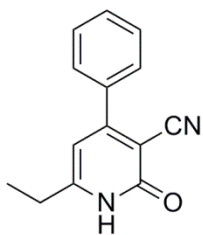
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

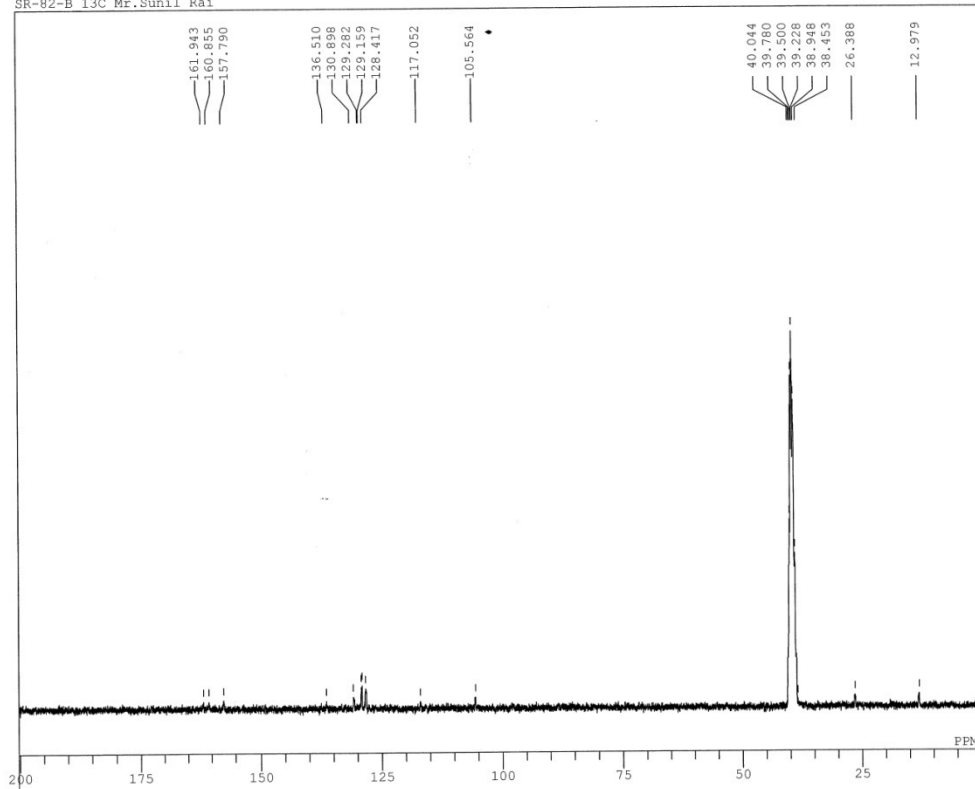
DFILE C:\Sunil Rai\SR-82-B 1H
COMNT SR-82-B 1H Mr.Sunil Rai
DATIM Mon Apr 15 15:00:59 20
CNUC 1H
EXMOD NON
OBFREQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 32
ACQTM 5.446 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 21.2 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 9



Compound (1e): ^{13}C NMR



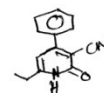
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SR-82-B 13C Mr.Sunil Rai



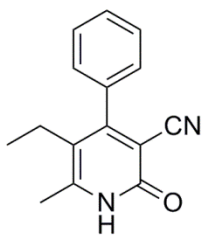
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

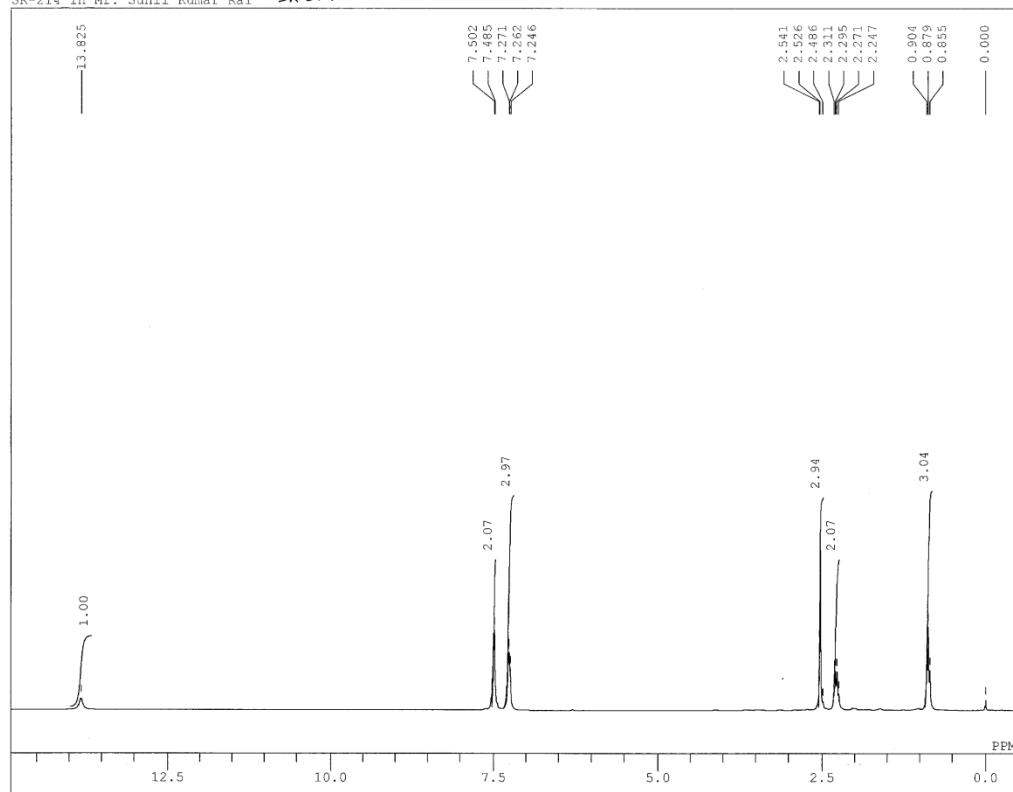
DFILE C:\Sunil Rai\SR-82-B 13C.als
COMNT SR-82-B 13C Mr.Sunil Rai
DATIM Mon Apr 15 20:15:09 2015
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2500
ACQTM 1.606 sec
PD 1.394 sec
PW1 6.0 us
IRNUC 1H
CTEMP 21.9 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 23



Compound (1f): ^1H NMR



C:\Sunil Rai\SR-214L_1H.als
SR-214 1H Mr. Sunil Kumar Rai SR-214-L



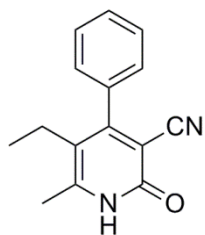
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kuma
Shishir Singh

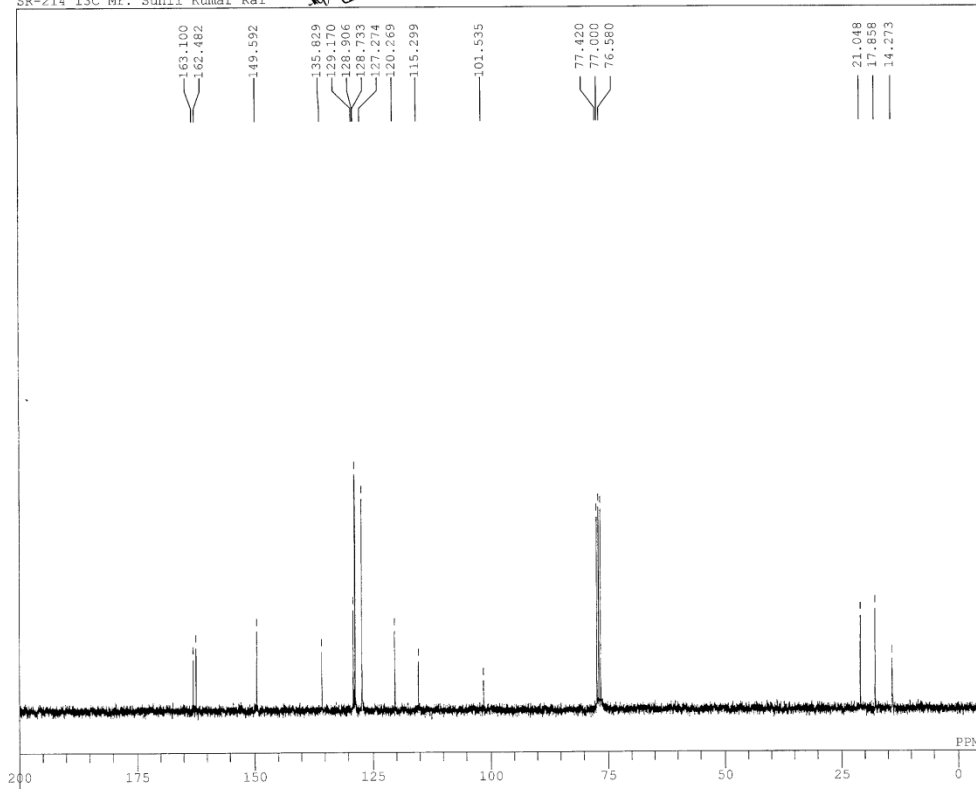
DFILE C:\Sunil Rai\SR-2
COMNT SR-214 1H Mr. Sun
DATIM Wed Nov 27 14:46:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
FW1 5.6 us
IRNUC 1H
CTEMP 22.0 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 16



Compound (1f): ¹³C NMR



C:\WINNMR98\Data\SR-214_1H2BCM_E6.als
SR-214 13C Mr. Sunil Kumar Rai



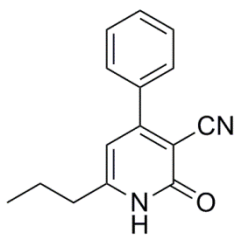
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

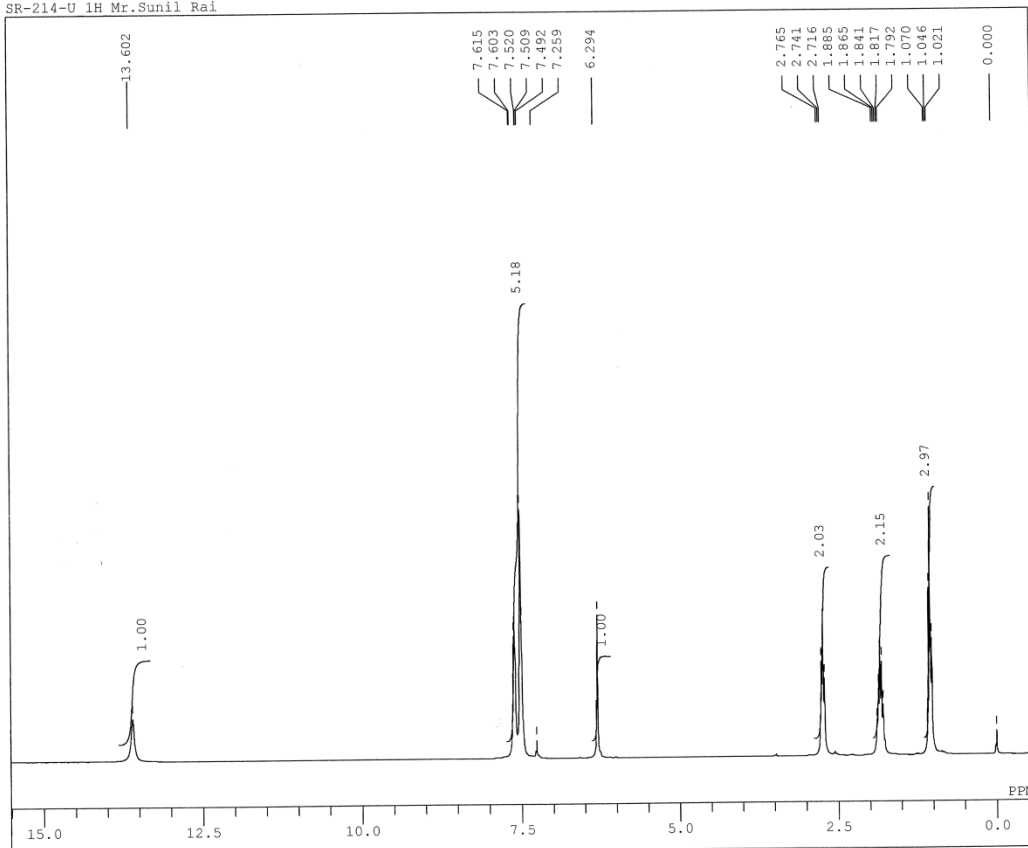
DEFILE C:\WINNMR98\Data\SR-214_1H2BCM_E6.als
COMNT SR-214 13C Mr. Sunil Kumar Rai
DATIM Wed Nov 27 14:56:22 2003
CNUC 13C
EXMOD BCM
OBFREQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 200
AQTM 1.606 sec
PD 1.394 sec
FW 5.9 us
TANUC 1H
CTEMP 23.7 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 24



Compound (1g): ^1H NMR



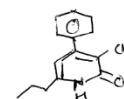
C:\Sunil Rai\SR-214-U_1H.als
SR-214-U_1H Mr.Sunil Rai



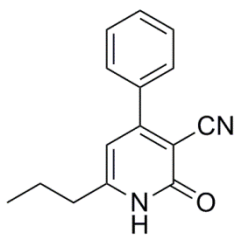
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

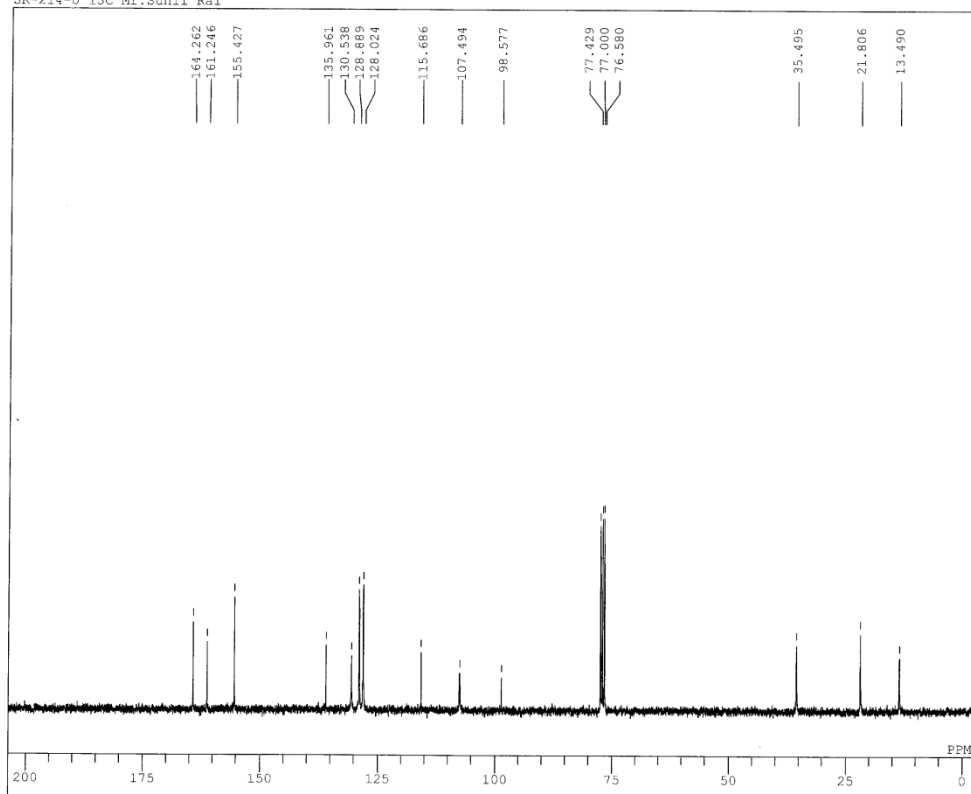
DFILE C:\Sunil Rai\SR-214-U
COMNT SR-214-U_1H Mr.Sunil
DATIM Tue Nov 19 15:18:50 2
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 54
ACQTM 3.447 sec
PD 1.547 sec
FWL 5.2 us
IRNUC 1H
CTEMP 19.0 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 16



Compound (1g): ^{13}C NMR



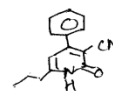
C:\WINNMR98\COMMON\DEFAULT.ALS
SR-214-U ^{13}C Mr.Sunil Rai



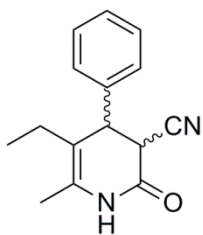
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

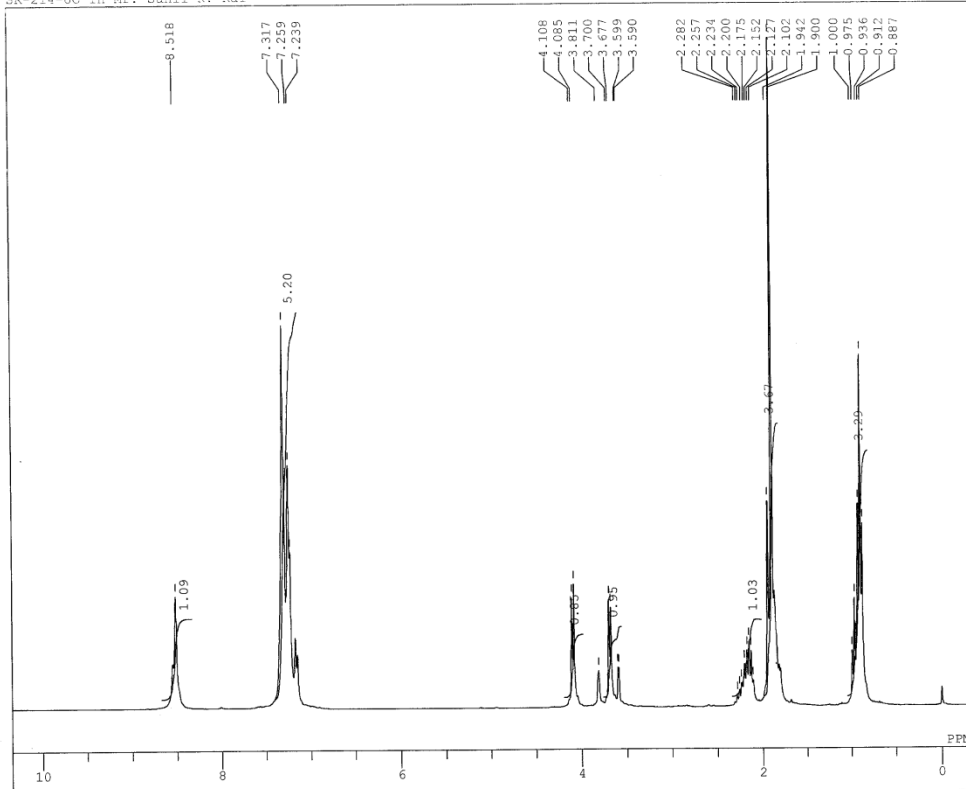
DFILE C:\WINNMR98\COMMON\DEI
COMNT SR-214-U ^{13}C Mr.Sunil Rai
DATIM Tue Nov 19 15:42:53 2001
OBNUC ^{13}C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 374
AQTM 1.606 sec
PD 1.394 sec
PWL 5.9 us
IRNUC 1H
CTEMP 21.5 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 18



Compound (1h): ^1H NMR



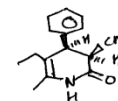
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SR-214-UO 1H Mr. Sunil K. Rai



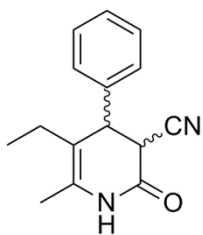
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

DFILE C:\WINNMR98\Data\SR-214-
COMNT SR-214-UO 1H Mr. Sunil
DATIM Thu Nov 21 12:57:16 20
CENUC 1H
EXMOD NON
OBFREQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
PWL 5.6 us
IRNUC 1H
CTEMP 19.2 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 15

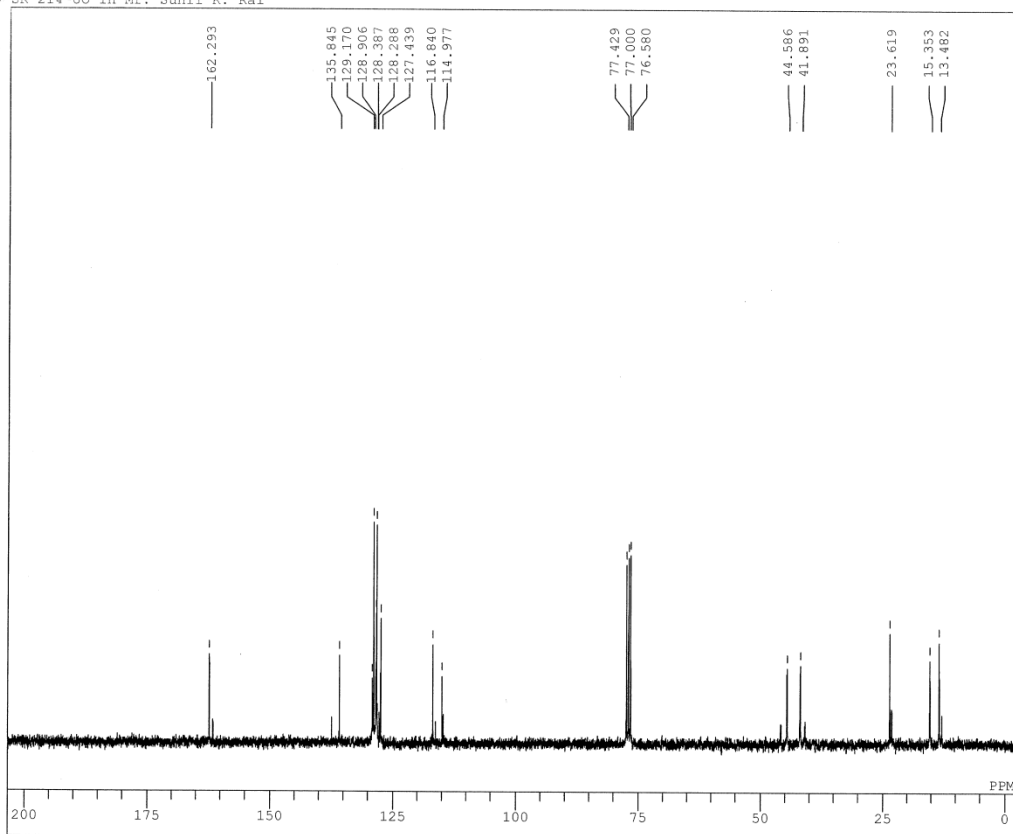


Compound (1h): ^{13}C NMR



WINNMR98\Data\SR-214-UO_1H2BCM_E5.als
SR-214-UO 1H Mr. Sunil K. Rai

1h

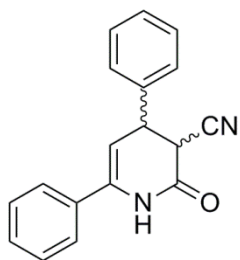


JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
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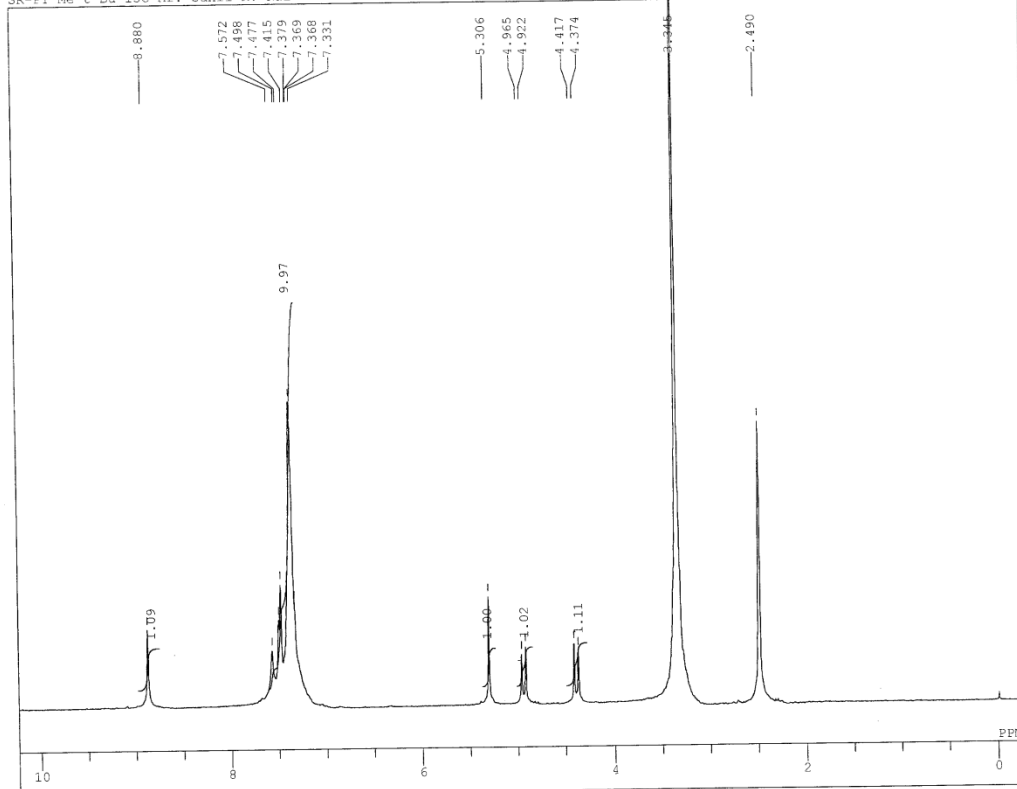
Operator : Nagendra Kumar
Shishir Singh

DFILE C:\WINNMR98\Data\SR-214-UO_1H2BCM_E5.als
COMNT SR-214-UO 1H Mr. Sunil
DATIM Thu Nov 21 13:07:38 2013
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 200
ACQTM 1.606 sec
PD 1.394 sec
FW1 5.9 us
IRNUC 1H
CTEMP 21.7 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 24

Compound (1i): ¹H NMR



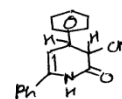
C:\WINNMR98\Data\SR-PY-Me-t-Bu_13C2NON_E8.als
SR-PY-Me-t-Bu_13C Mr. Sunil K. Rai



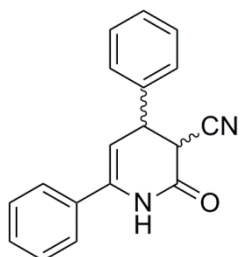
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kuma
Shishir Singh

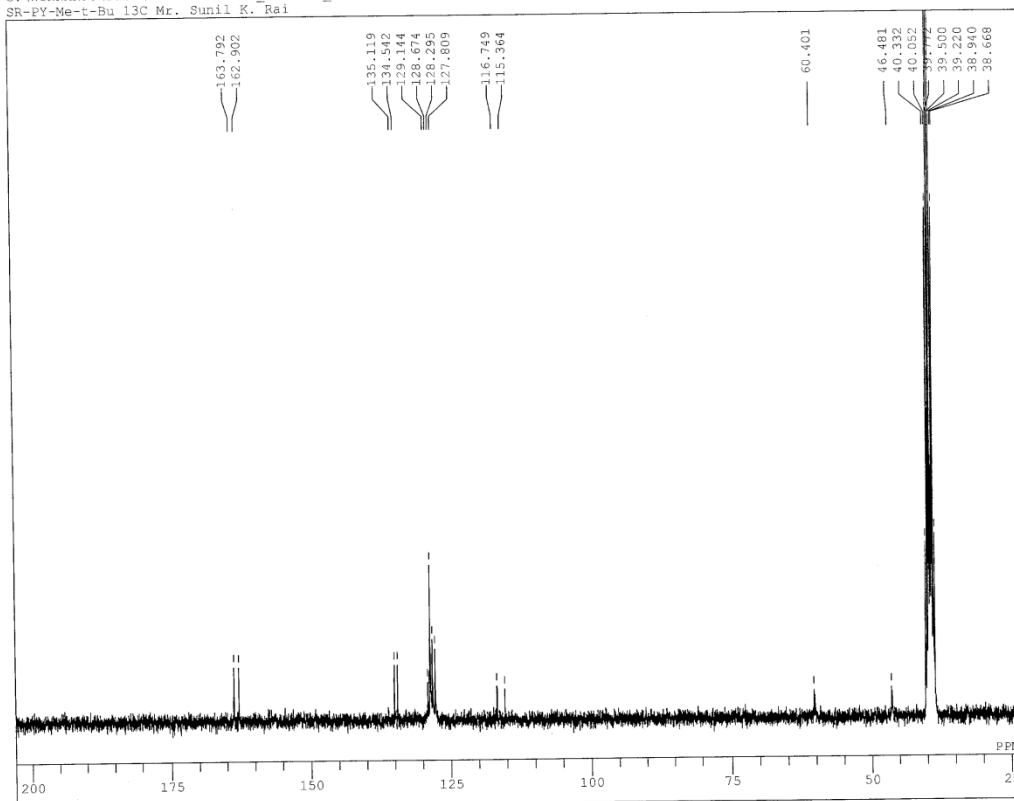
DFILE C:\WINNMR98\Data\
COMNT SR-PY-Me-t-Bu_13C
DATIM Fri Dec 20 08:01:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
FwI 5.6 us
IRNUC 1H
CTEMP 19.3 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 18



Compound (1i): ^{13}C NMR



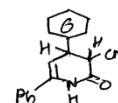
C:\WINNMR98\Data\SR-PY-Me-t-Bu_13C1BCM_E8.als
SR-PY-Me-t-Bu 13C Mr. Sunil K. Rai



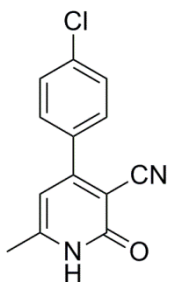
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kuma
Shishir Singh

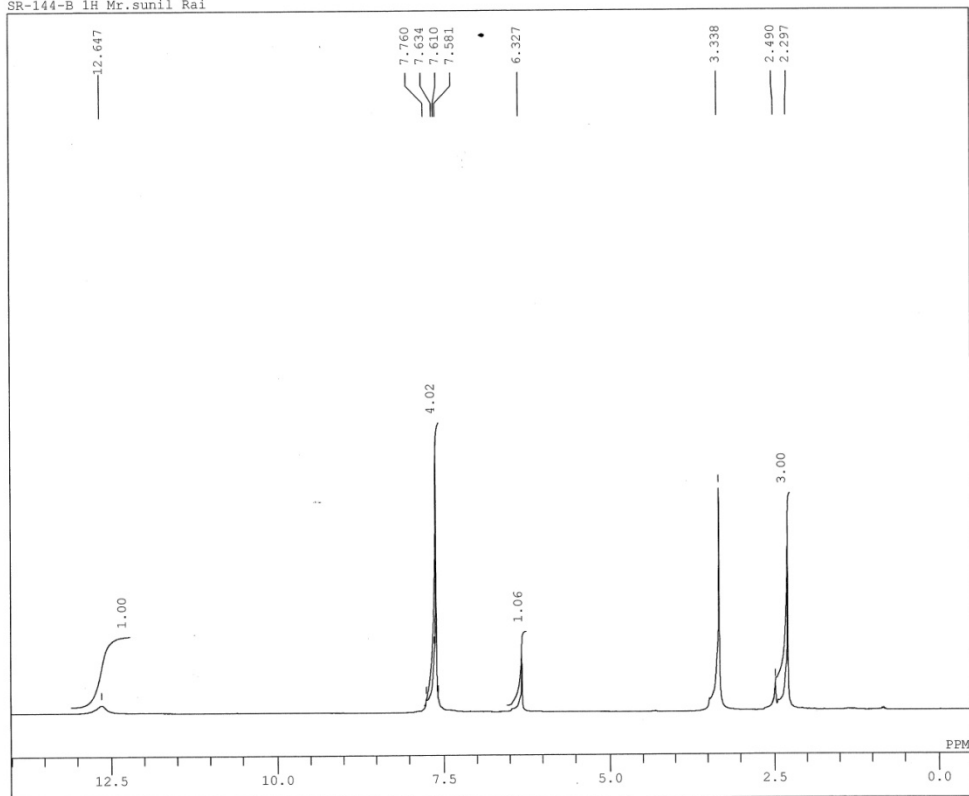
DFILE C:\WINNMR98\Data\
COMNT SR-PY-Me-t-Bu_13C
DATIM Fri Dec 20 07:58:
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBTIN 1940.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
FW1 5.9 us
IRNUC 1H
CTEMP 21.1 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 24



Compound (2a): ^1H NMR



C:\Sunil Rai\SR-144-B 1H.als
SR-144-B 1H Mr.sunil Rai

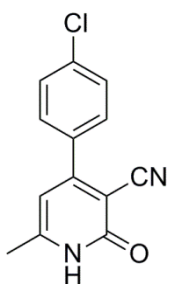


JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

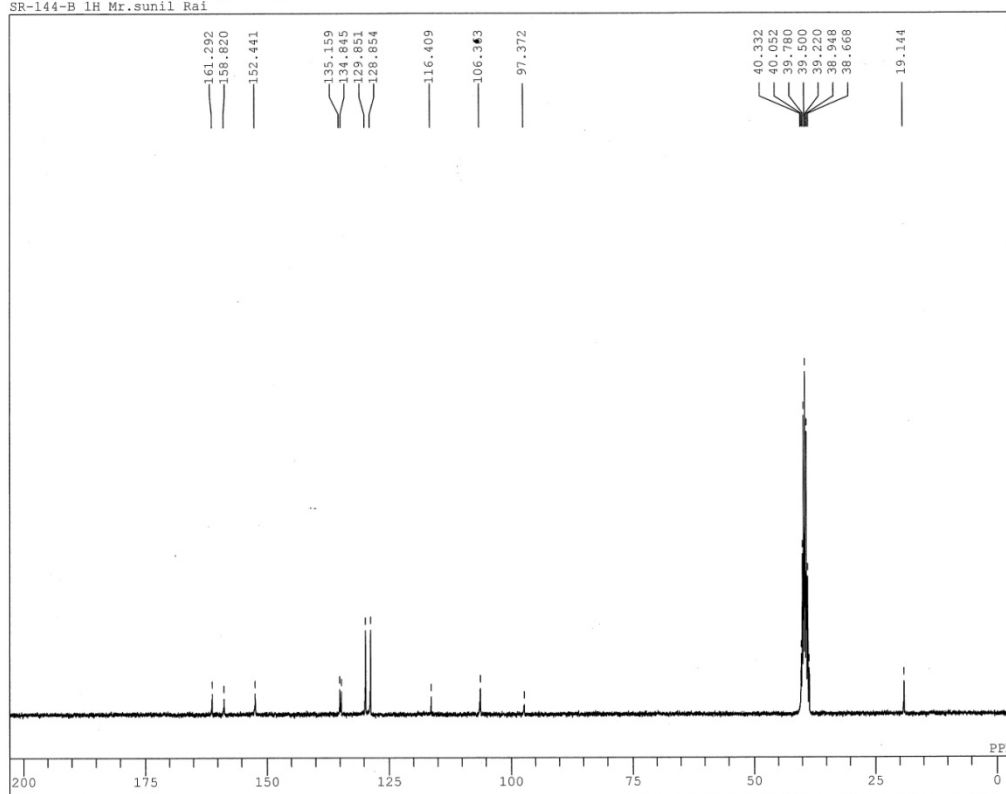
Operator : Nagendra Kumar
Shishir Singh

DFILE C:\Sunil Rai\SR-144-B
COMNT SR-144-B 1H Mr.sunil Rai
DATIM Mon Dec 31 17:24:21 20:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 32
ACQTM 5.446 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 20.0 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 18

Compound (2a): ^{13}C NMR



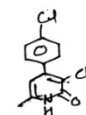
C:\WINNMR98\Data\SR-144-B_1H2BCM_E1.als
SR-144-B 1H Mr.sunil Rai



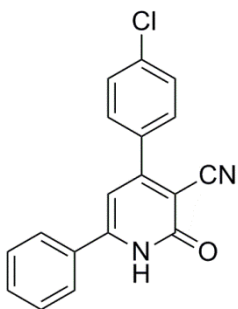
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kuma
Shishir Singh

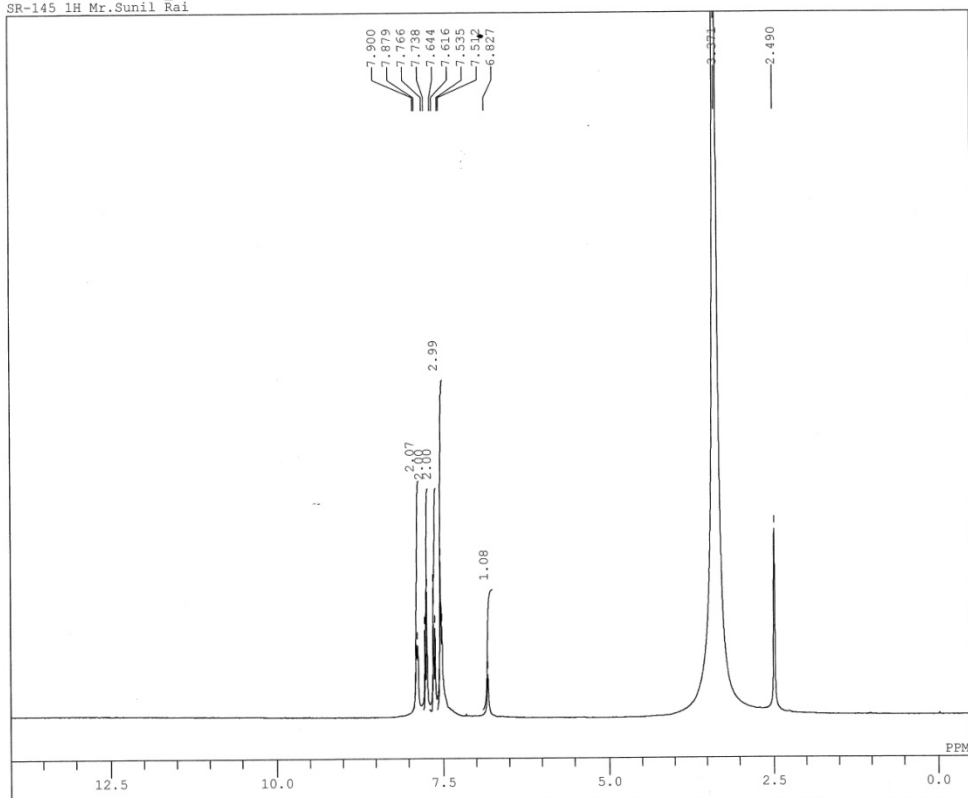
DFILE C:\WINNMR98\Data\
COMNT SR-144-B 1H Mr.su
DATIM Mon Dec 31 18:54:
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 1800
ACQTM 1.606 sec
PD 1.394 sec
PW1 6.0 us
IRNUC 1H
CTEMP 21.2 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 25



Compound (2b): ^1H NMR



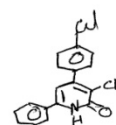
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SR-145_1H Mr.Sunil Rai



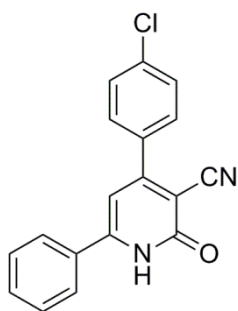
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

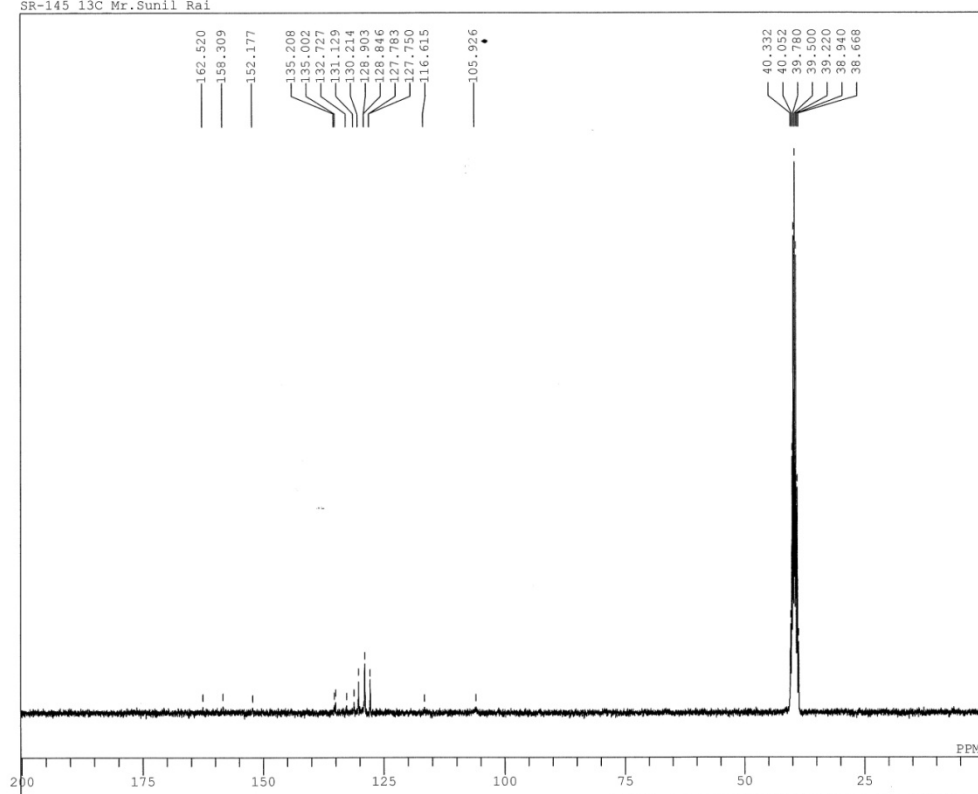
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COMNT SR-145_1H Mr.Sunil Rai
DATIM Tue Dec 11 15:34:53 20:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 32
ACQTM 5.446 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 19.6 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 16



Compound (2b): ^{13}C NMR



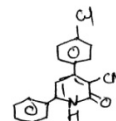
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SR-145 13C Mr.Sunil Rai



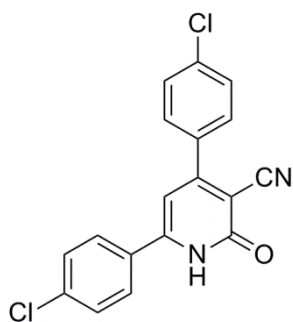
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

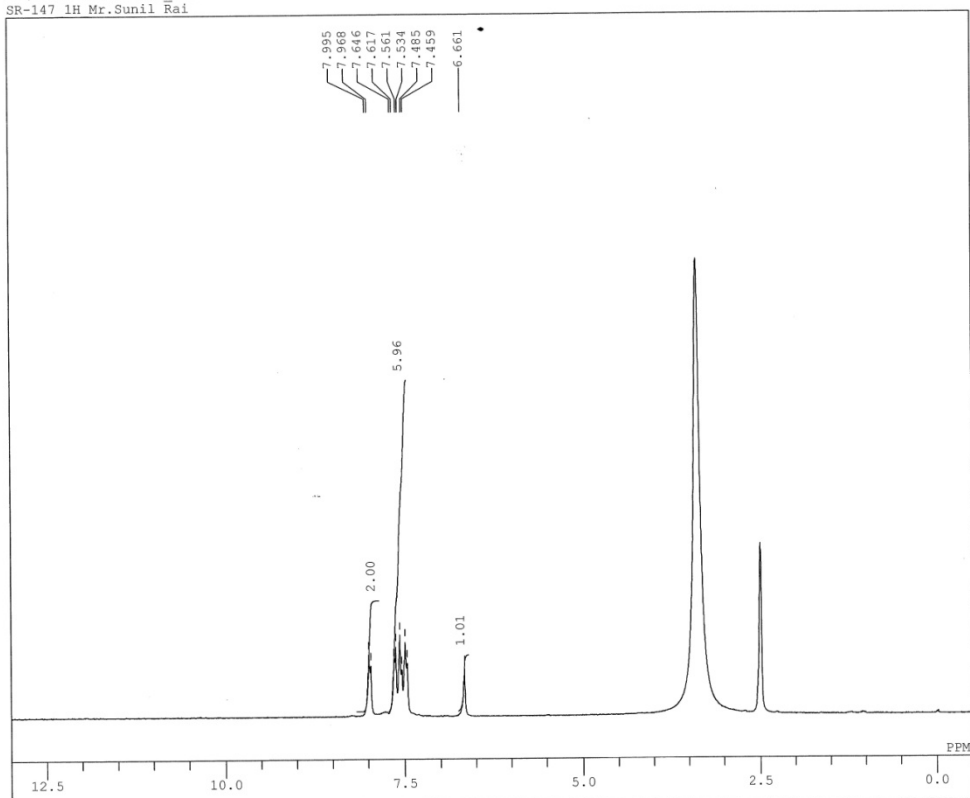
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COMNT SR-145_13C Mr.Sunil Rai
DATIM Wed Dec 12 10:25:02 2012
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
FWI 6.0 us
TRNUC 1H
CTEMP 21.5 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 25



Compound (2c): ^1H NMR



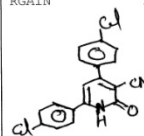
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SR-147 1H Mr.Sunil Rai



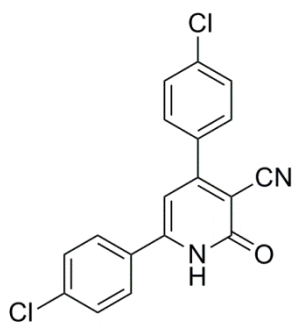
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

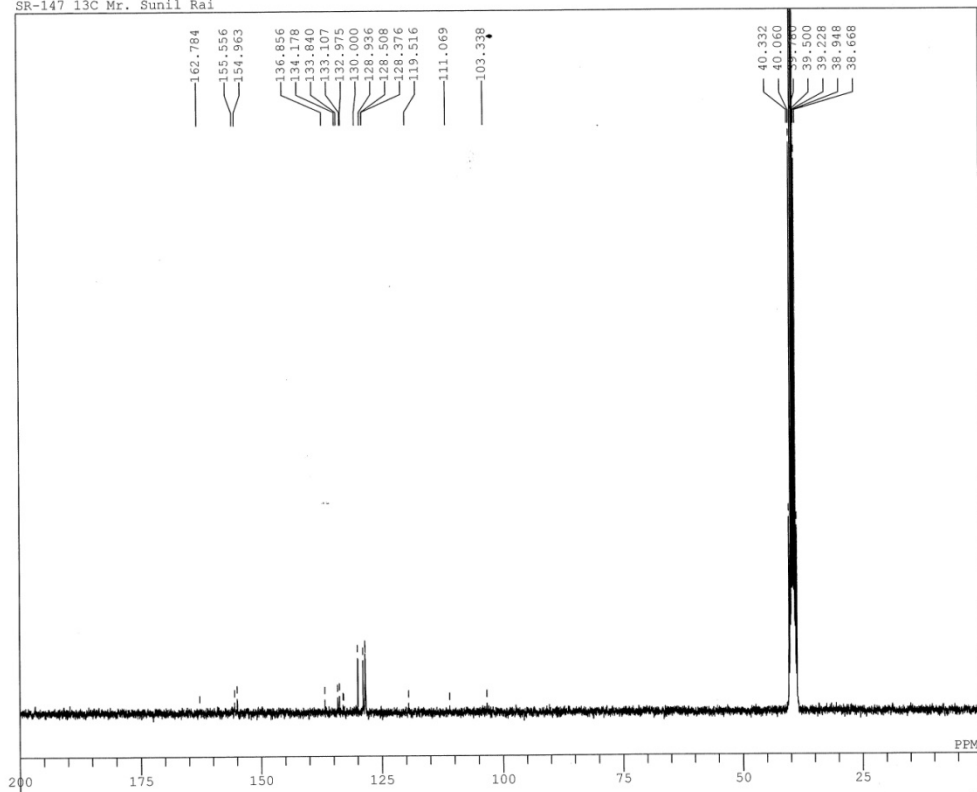
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COMNT SR-147 1H Mr.Sunil Rai
DATIM Thu Dec 13 11:32:17 20:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 24
ACQTM 3.447 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 23.3 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 19



Compound (2c): ^{13}C NMR



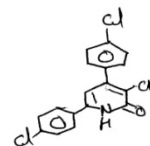
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SR-147 13C Mr. Sunil Rai



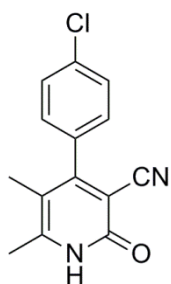
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

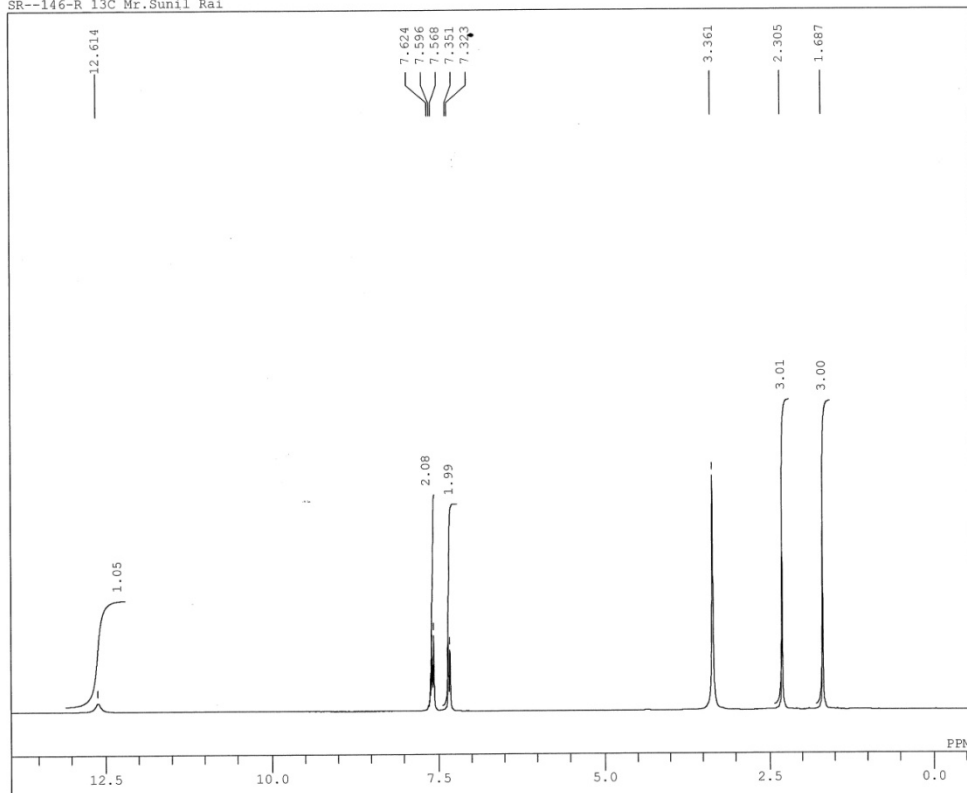
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COMNT SR-147 13C Mr. Sunil Rai
DATIM Fri Dec 14 10:06:04 201
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 3000
ACQTM 1.606 sec
PD 1.394 sec
PWL 6.0 us
IRNUC 1H
CTEMP 21.3 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 25



Compound (2d): ¹H NMR



C:\Sunil Rai\SR--146-R 1H.als
SR--146-R 13C Mr.Sunil Rai

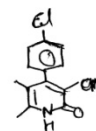


JEOL AL300 FTNMR

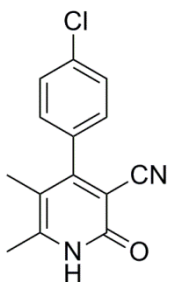
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

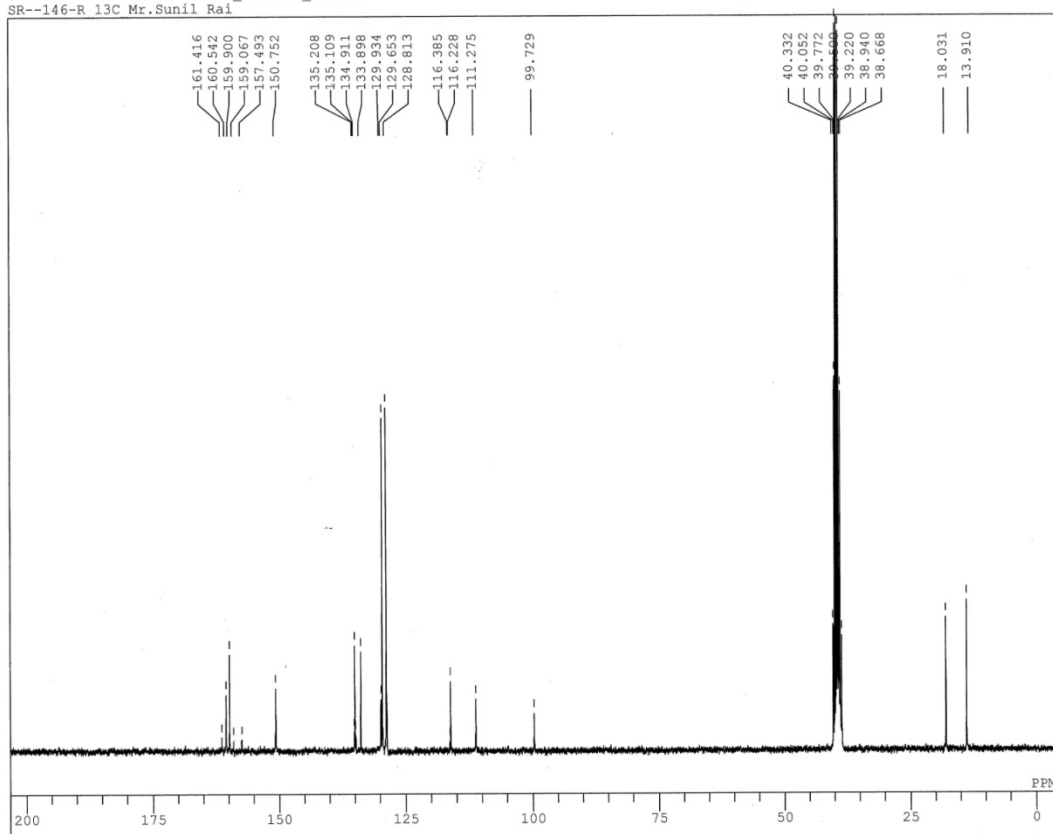
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COMNT SR--146-R 13C Mr.Sunil
DATIM Sat Jan 05 09:14:49 20
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 32
ACQTM 5.446 sec
PD 1.547 sec
FW1 5.2 us
IRNUC 1H
CTEMP 20.1 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 15



Compound (2d): ^{13}C NMR



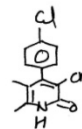
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SR--146-R 13C Mr.Sunil Rai



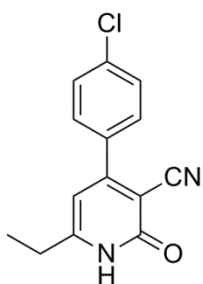
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kuma
Shishir Singh

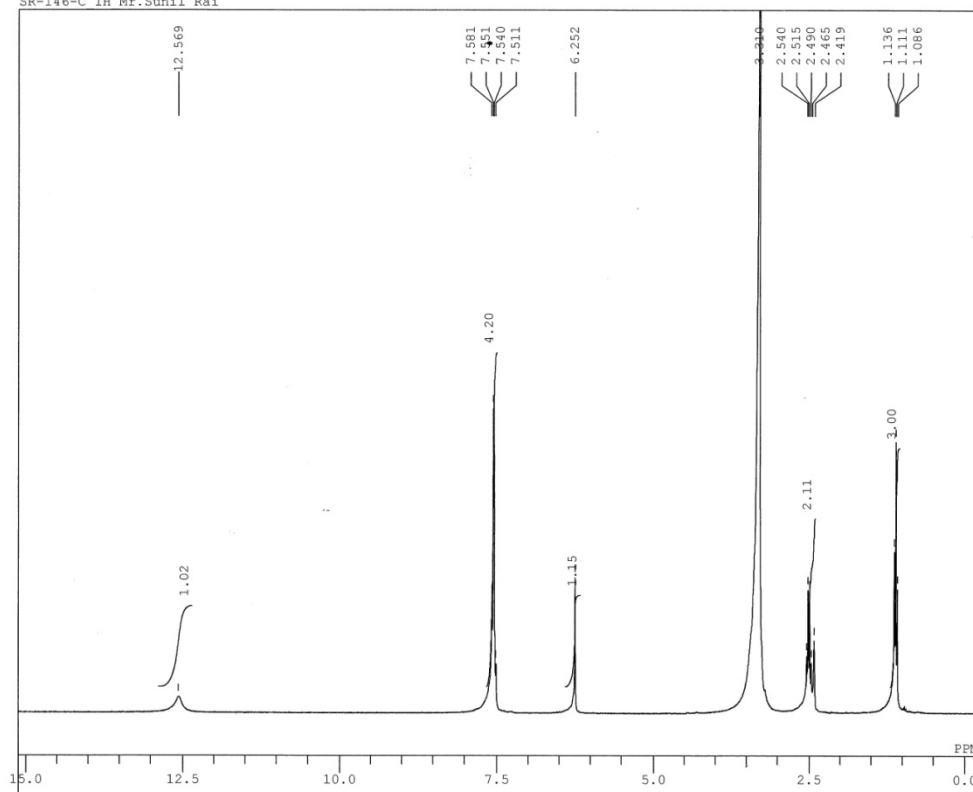
DFILE C:\WINNMR98\Data\
COMNT SR--146-R 13C Mr.
DATIM Sat Jan 05 09:10:
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
PWL 6.0 us
IRNUC 1H
CTEMP 21.5 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 25



Compound (2e): ¹H NMR



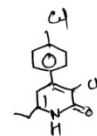
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SR-146-C 1H Mr.Sunil Rai



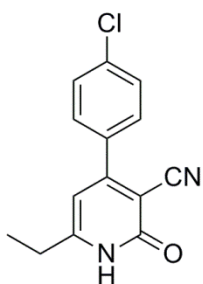
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

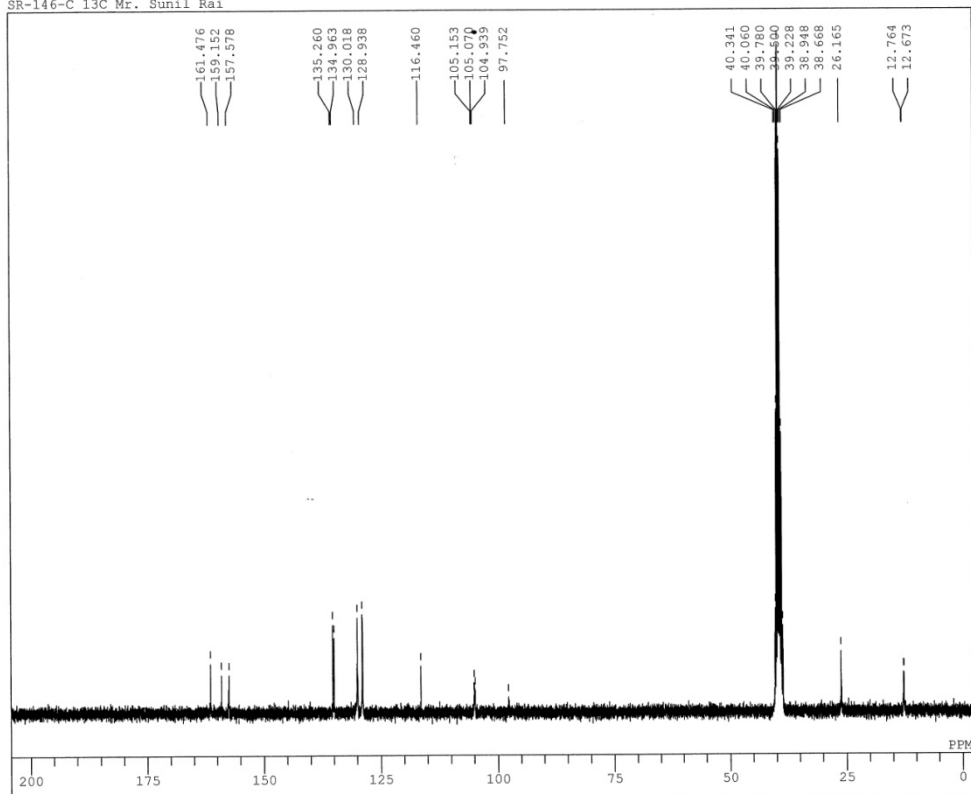
DFILE C:\WINNMR98\COMMON\DEI
COMNT SR-146-C 1H Mr.Sunil R
DATIM Tue Jun 11 16:10:15 20
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 32
ACQTM 3.447 sec
PD 1.547 sec
PW1 5.2 us
IRNUC 1H
CTEMP 22.8 c
SLVNT DMSO
EXREF 2.49 ppm
BF 0.12 Hz
RGAIN 14



Compound (2e): ^{13}C NMR



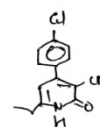
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SR-146-C 13C Mr. Sunil Rai



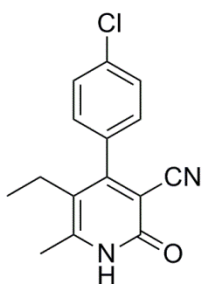
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

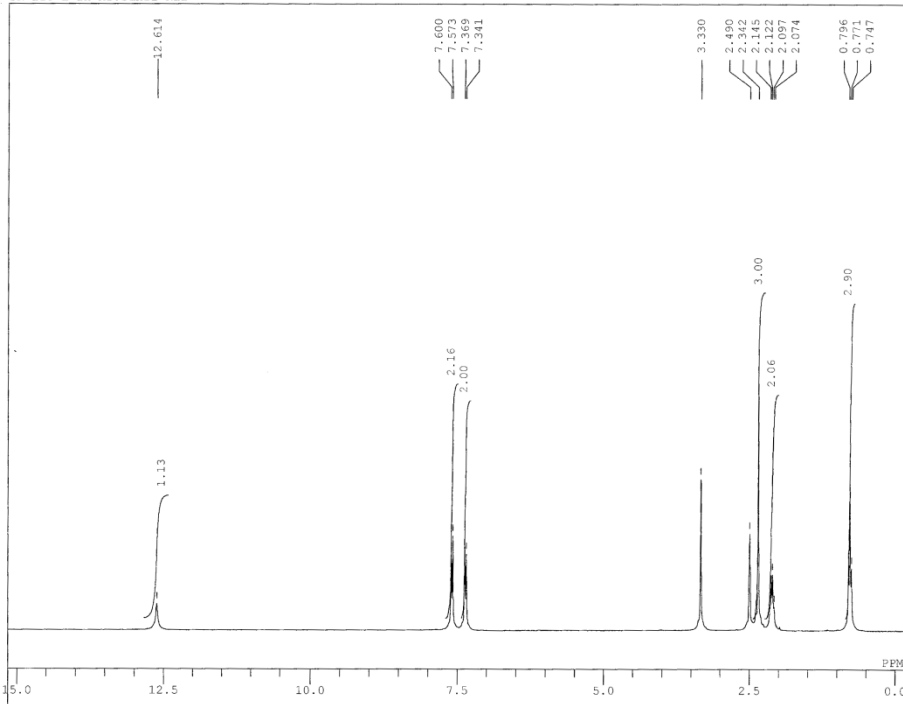
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COMNT SR-146-C 13C Mr. Sunil
DATIM Wed Jun 12 00:43:36 20:
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2500
ACQTM 1.606 sec
PD 1.394 sec
FW1 5.9 us
IRNUC 1H
CTEMP 20.1 c
SLVNT DMSO
EXREF 39.50 ppm
BF 0.12 Hz
RGAIN 22



Compound (2f): ¹H NMR



C:\WINNMR98\COMMON\DEFAULT.ALS
SR-218-L 1H Mr. Sunil Rai



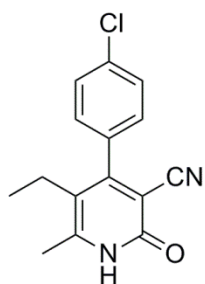
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Ku
Shishir Sin

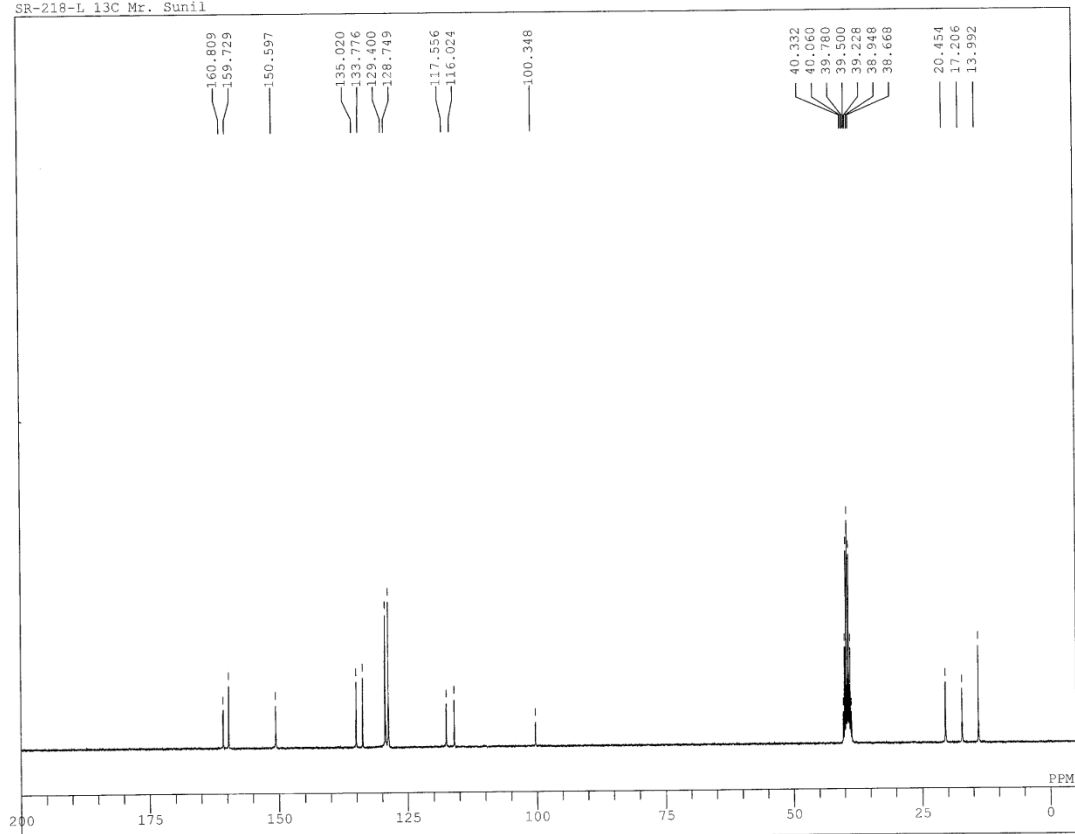
DFILE C:\WINNMR98\COM
COMNT SR-218-L 1H Mr.
DATIM Fri Dec 13 17:0
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 26
ACQTM 3.447 sec
PD 1.547 sec
PWI 5.2 us
IRNUC 1H
CTEMP 21.8 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 21



Compound (2f): ¹³C NMR



C:\WINNMR98\Data\SR-218-L_13C1BCM_E5.als
SR-218-L_13C Mr. Sunil

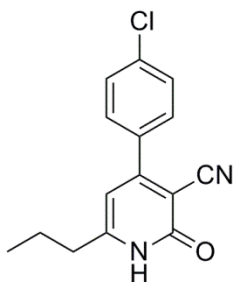


JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

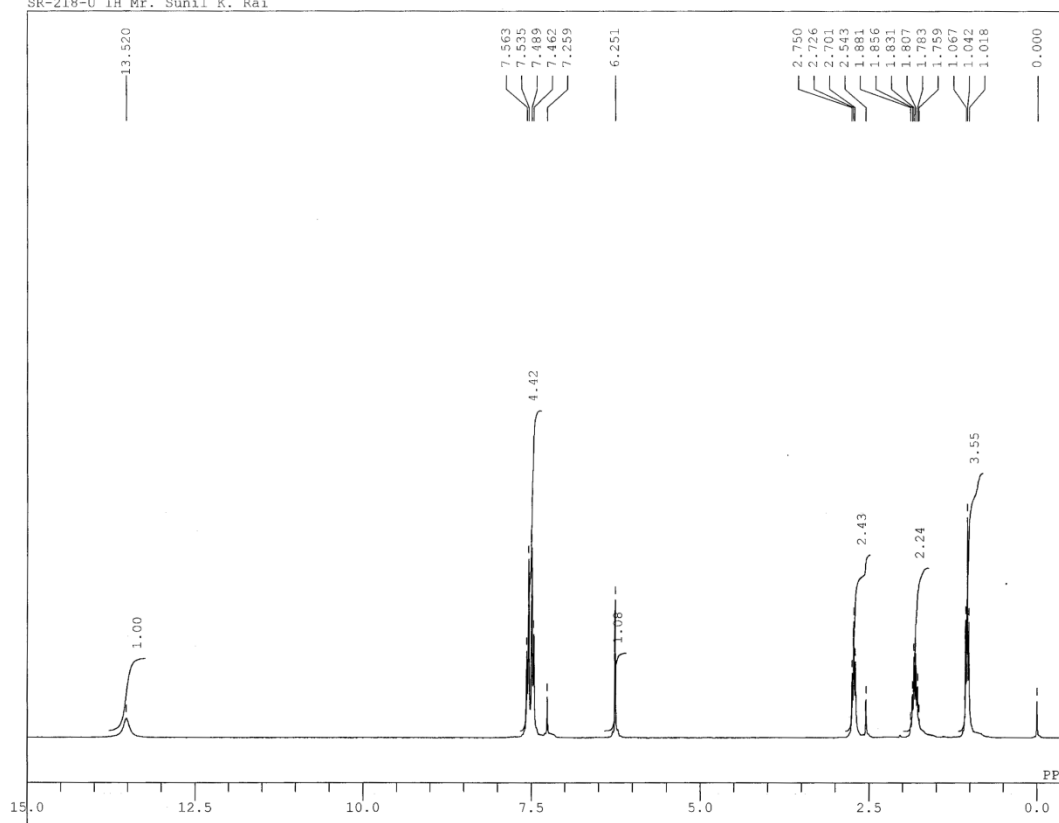
Operator : Nagendra Kumar
Shishir Singh

DFILE C:\WINNMR98\Data
COMNT SR-218-L_13C Mr.
DATIM Tue Dec 17 00:32
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
PWL 5.9 us
IRNUC 1H
CTEMP 24.3 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 22

Compound (2g): ^1H NMR



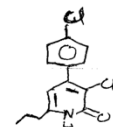
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SR-218-U 1H Mr. Sunil K. Rai



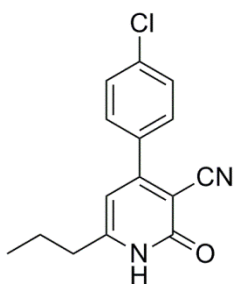
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

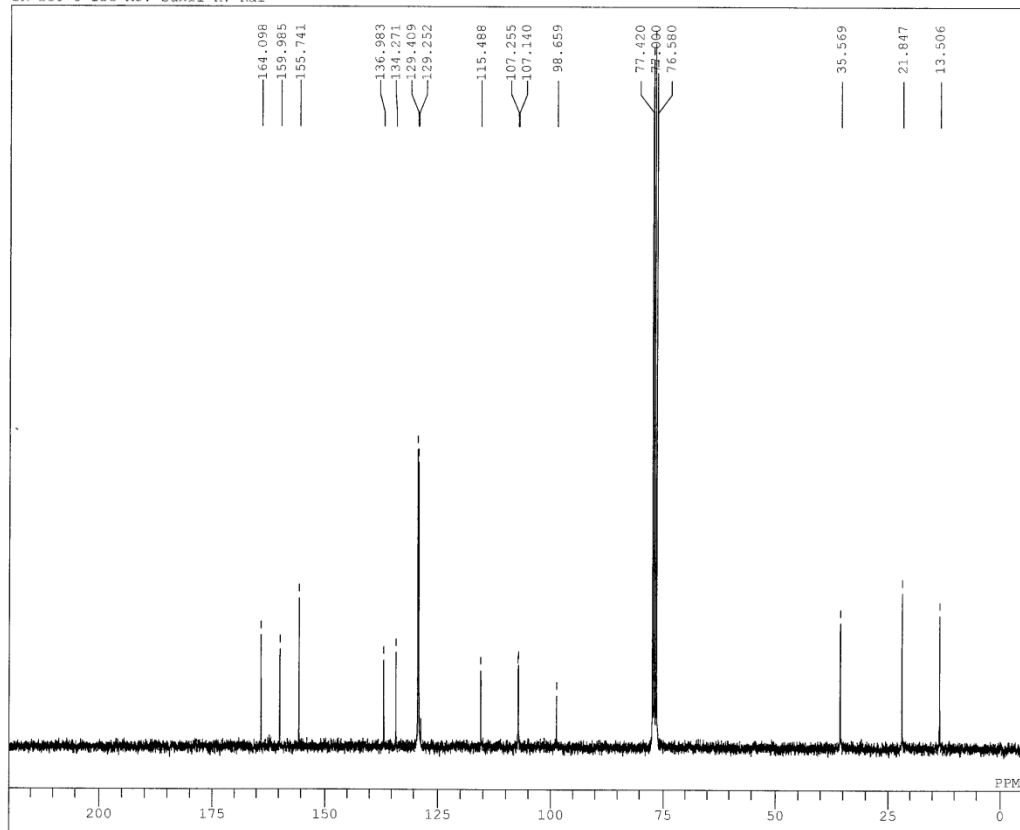
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COMNT SR-218-U 1H Mr. Sunil K. Rai
DATIM Wed Nov 20 17:35:00
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 8
ACQTM 3.447 sec
PD 1.547 sec
FW1 5.2 us
IRNUC 1H
CTEMP 21.7 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 19



Compound (2g): ^{13}C NMR



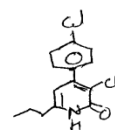
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SR-218-U 13C Mr. Sunil K. Rai



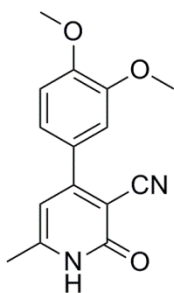
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

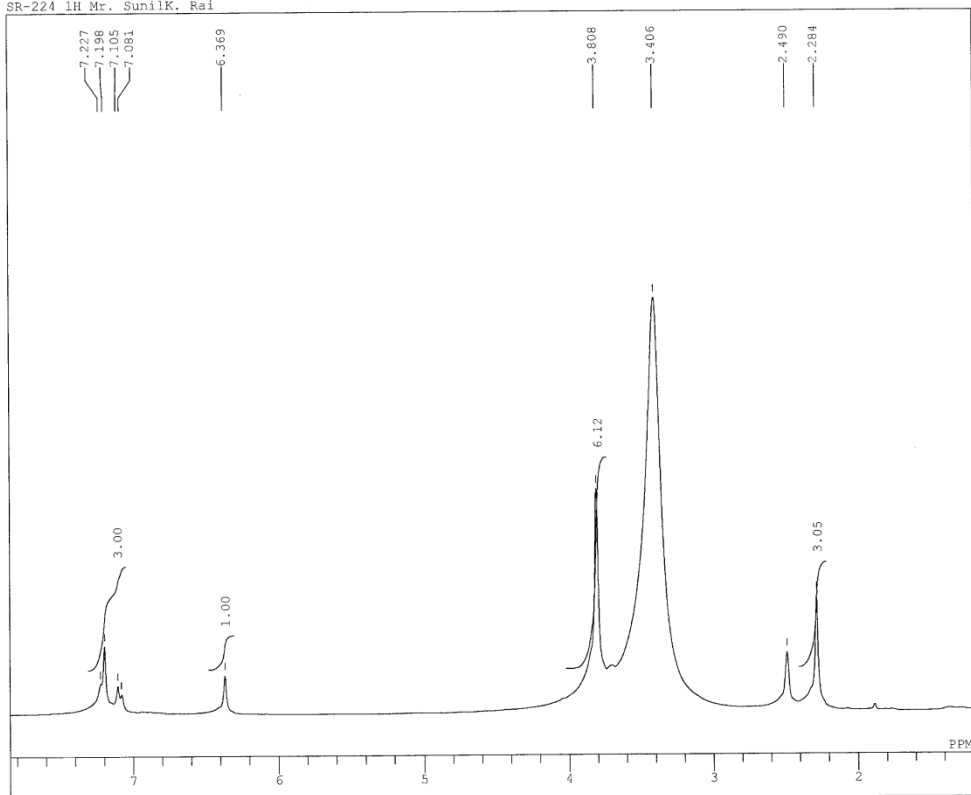
DFILE C:\WINNMR98\Data\SR-2
COMNT SR-218-U 13C Mr. Suni
DATIM Thu Nov 21 05:22:11 2
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2200
ACQTM 1.606 sec
PD 1.394 sec
FW1 5.9 us
IRNUC 1H
CTEMP 21.9 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 24



Compound (3a): ¹H NMR



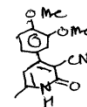
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SR-224 1H Mr. SunilK. Rai



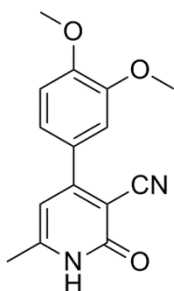
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

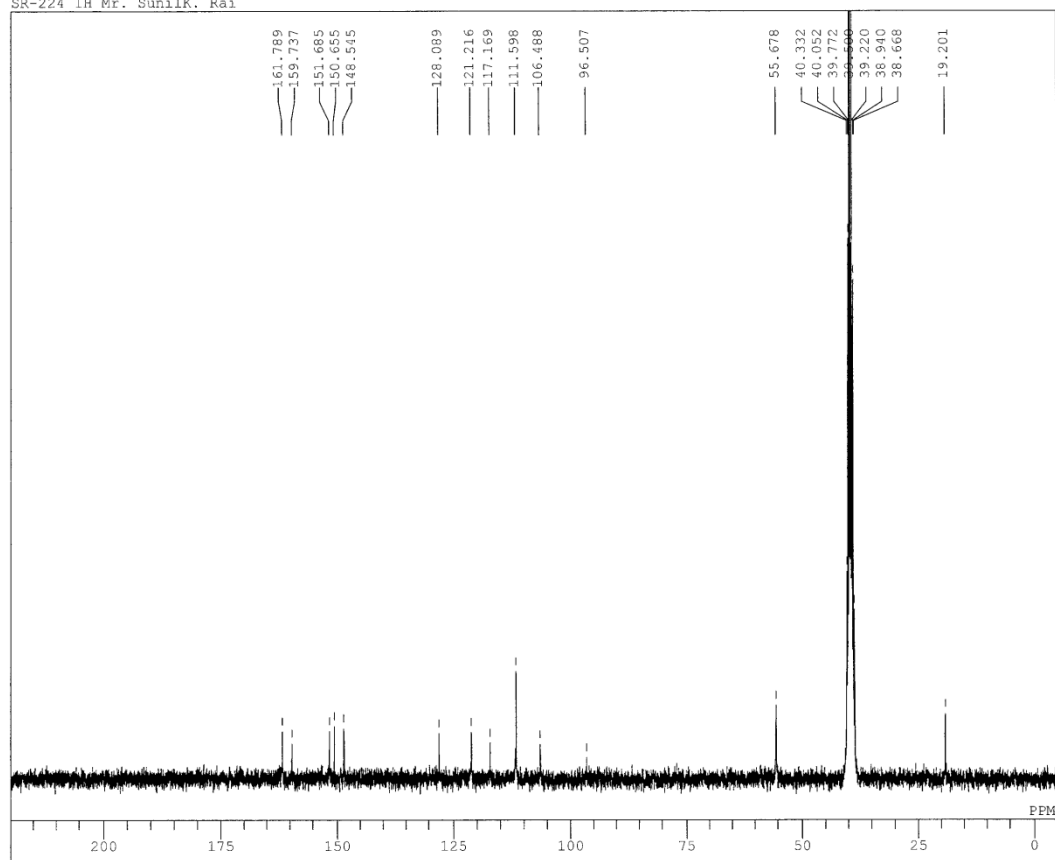
DFILE C:\Sunil Rai\SR-224 1H.
COMNT SR-224 1H Mr. SunilK. Rai
DATIM Fri Nov 29 13:23:51 201
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 32
ACQTM 5.446 sec
PD 1.547 sec
PW1 5.6 us
IRNUC 1H
CTEMP 18.4 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 14



Compound (3a): ^{13}C NMR



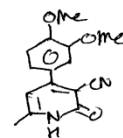
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SR-224 1H Mr. Sunilk. Rai



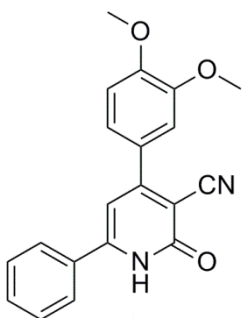
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

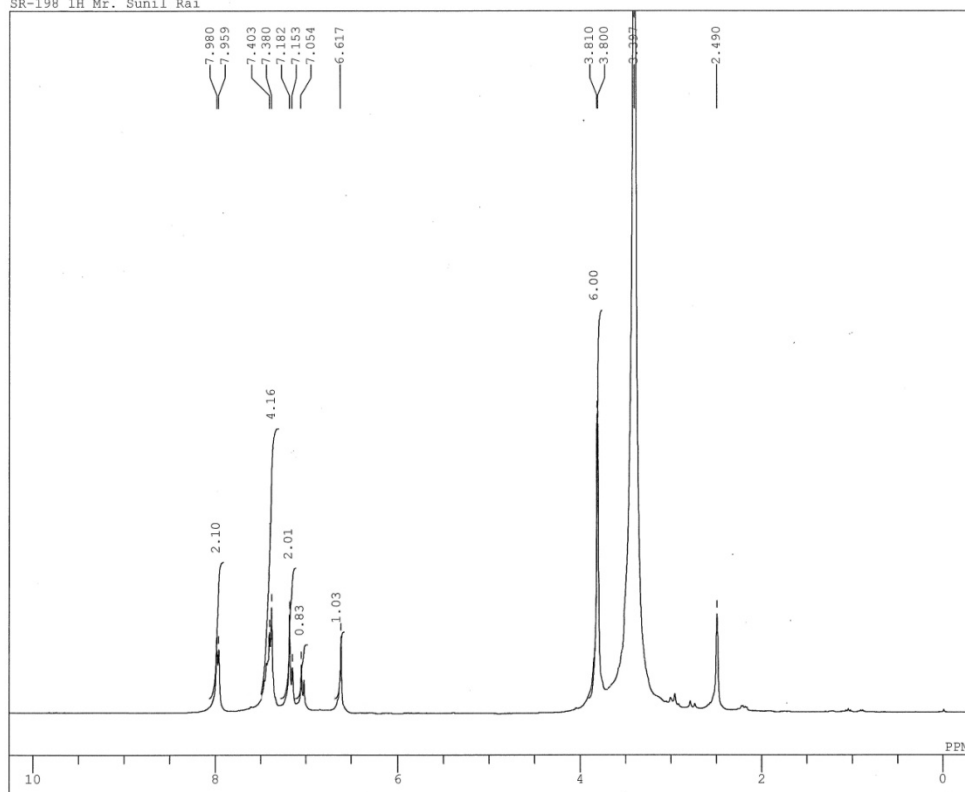
DFILE C:\WINNMR98\Data\SR-224_1H2BCM_E3.als
COMNT SR-224 1H Mr. Sunilk. Rai
DATIM Fri Nov 29 14:14:13 2001
OBNUC ^{13}C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 1000
ACQTM 1.606 sec
PD 1.394 sec
PWL 5.9 us
IRNUC 1H
CTEMP 20.9 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 23



Compound (3b): ^1H NMR



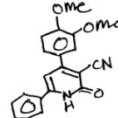
C:\Sunil Rai\SR-198_1H.als
SR-198 1H Mr. Sunil Rai



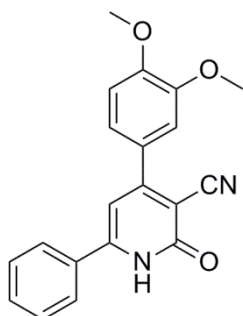
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

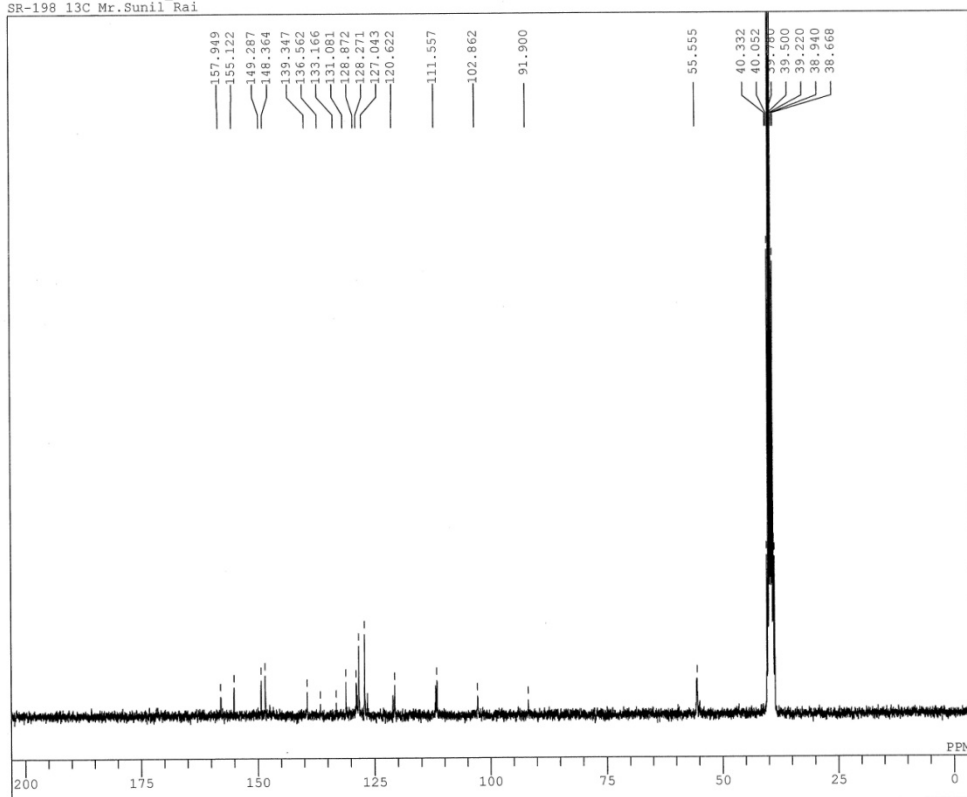
DFILE C:\Sunil Rai\SR-198_1H.
COMNT SR-198_1H Mr. Sunil Rai
DATIM Tue Sep 10 12:25:23 20:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 65
ACQTM 3.447 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 20.8 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 16



Compound (3b): ^{13}C NMR



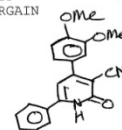
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SR-198 13C Mr.Sunil Rai



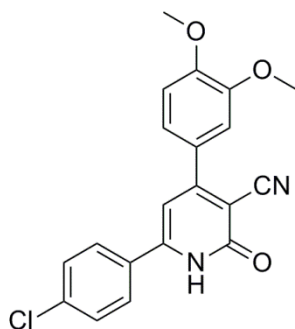
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

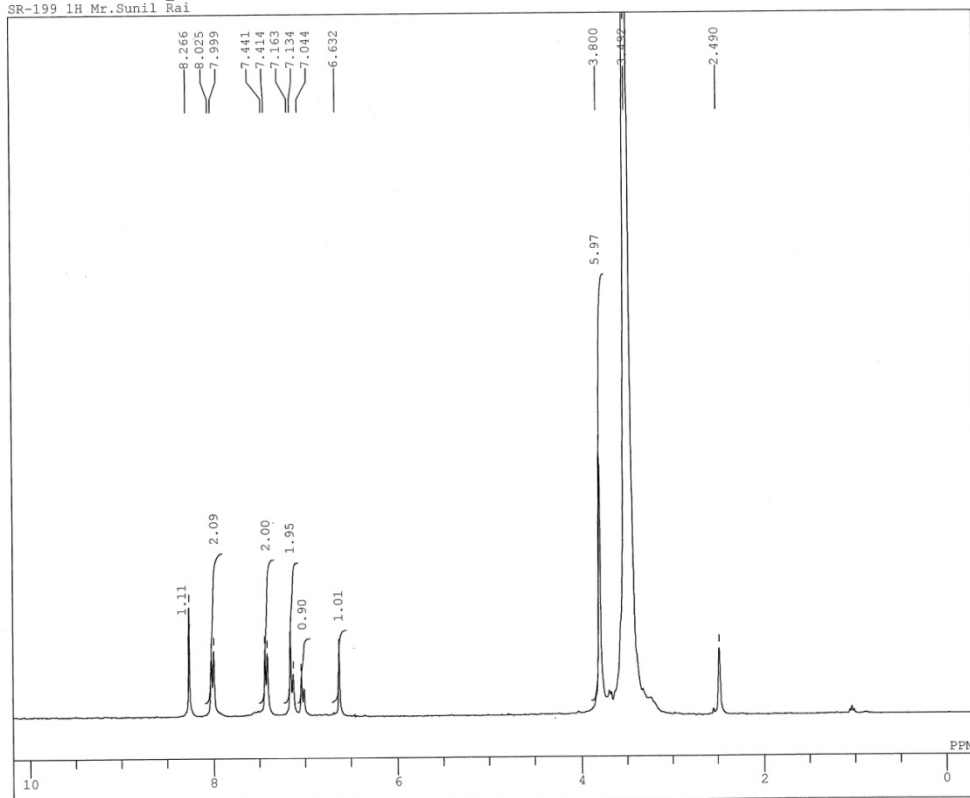
DFILE C:\Sunil Rai\SR-198
COMNT SR-198 13C Mr.Sunil E
DATIM Wed Sep 11 05:35:46
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
FWL 5.9 us
IRNUC 1H
CTEMP 20.7 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 23



Compound (3c): ^1H NMR



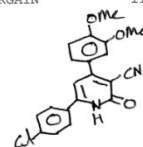
C:\Sunil Rai\SR-199 1H.als
SR-199 1H Mr.Sunil Rai



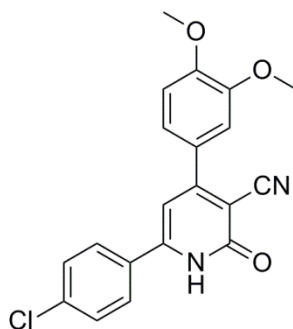
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

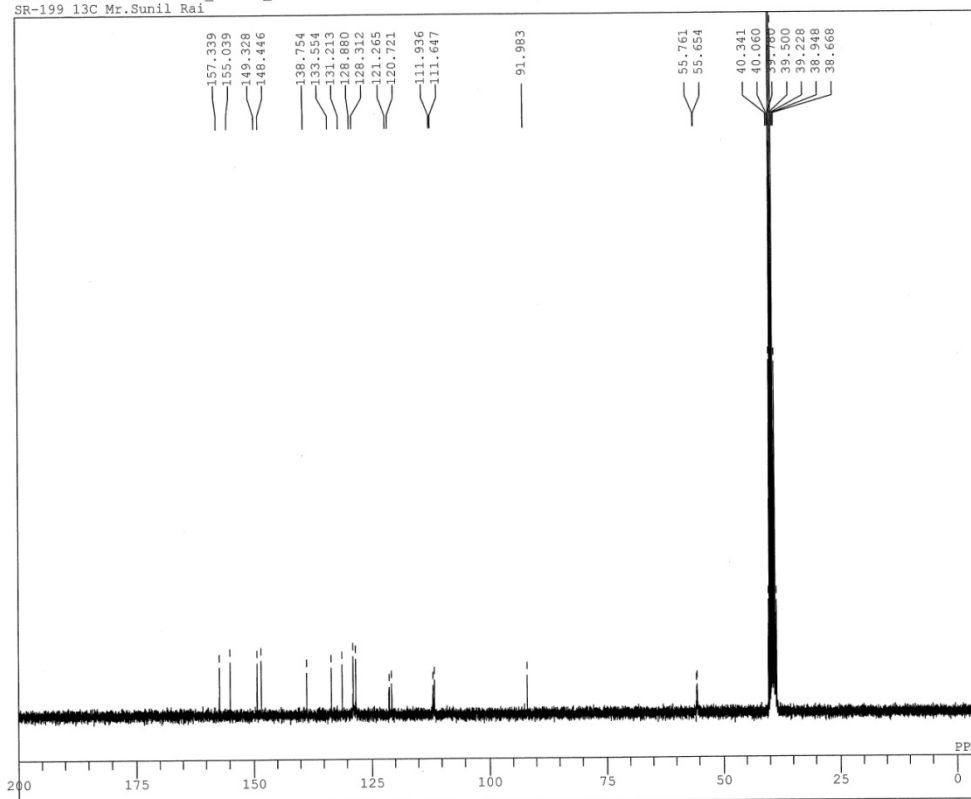
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COMNT SR-199 1H Mr.Sunil Rai
DATIM Wed Sep 11 14:33:04 20:
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 20
ACQTM 3.447 sec
PD 1.547 sec
PW1 5.2 us
IRNUC 1H
CTEMP 22.6 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 11



Compound (3c): ^{13}C NMR



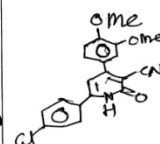
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SR-199 ^{13}C Mr.Sunil Rai



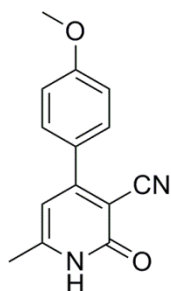
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

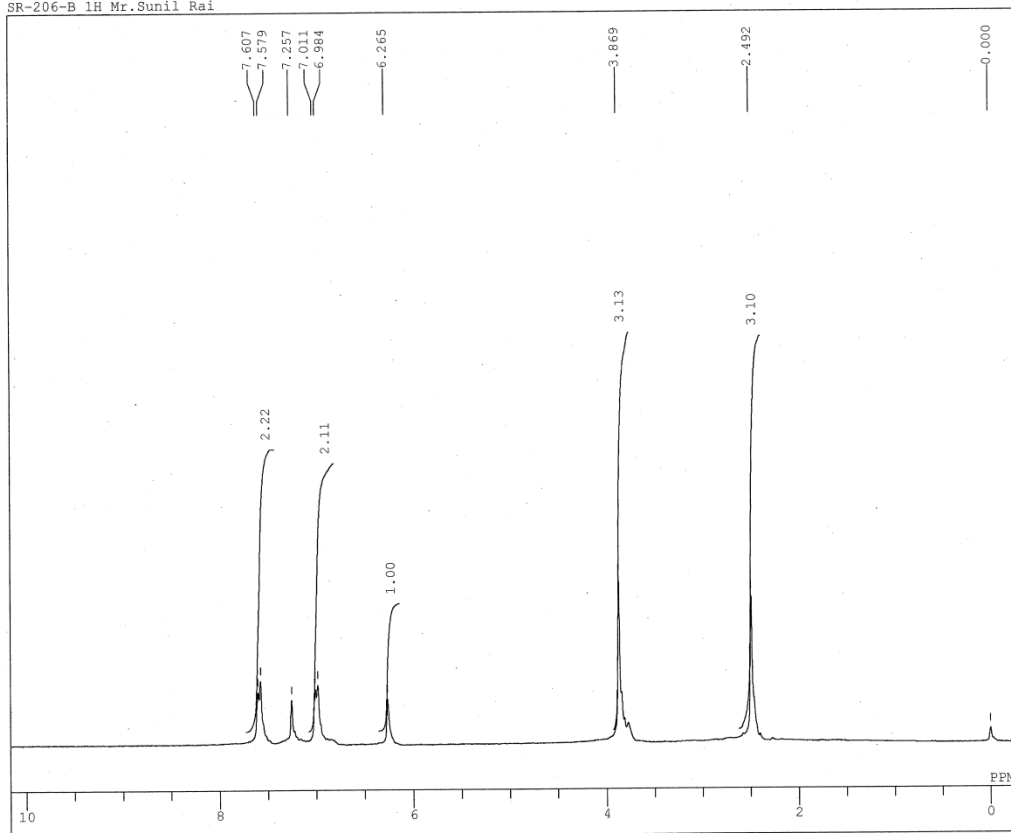
DFILE C:\WINNMR98\Data\SR-199_1H2BCM_E7.als
COMNT SR-199_13C_Mr.Sunil Rai
DATIM Tue Sep 10 07:41:47 2008
OBNUC ^{13}C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFTN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
AQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 20.9 c
SLVNT DMSO
EXREF 39.50 ppm
BF 0.12 Hz
RGAIN 24



Compound (4a): ^1H NMR



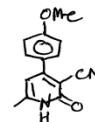
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SR-206-B 1H Mr.Sunil Rai



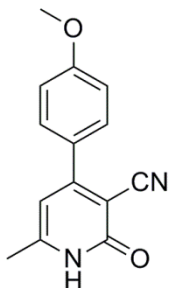
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

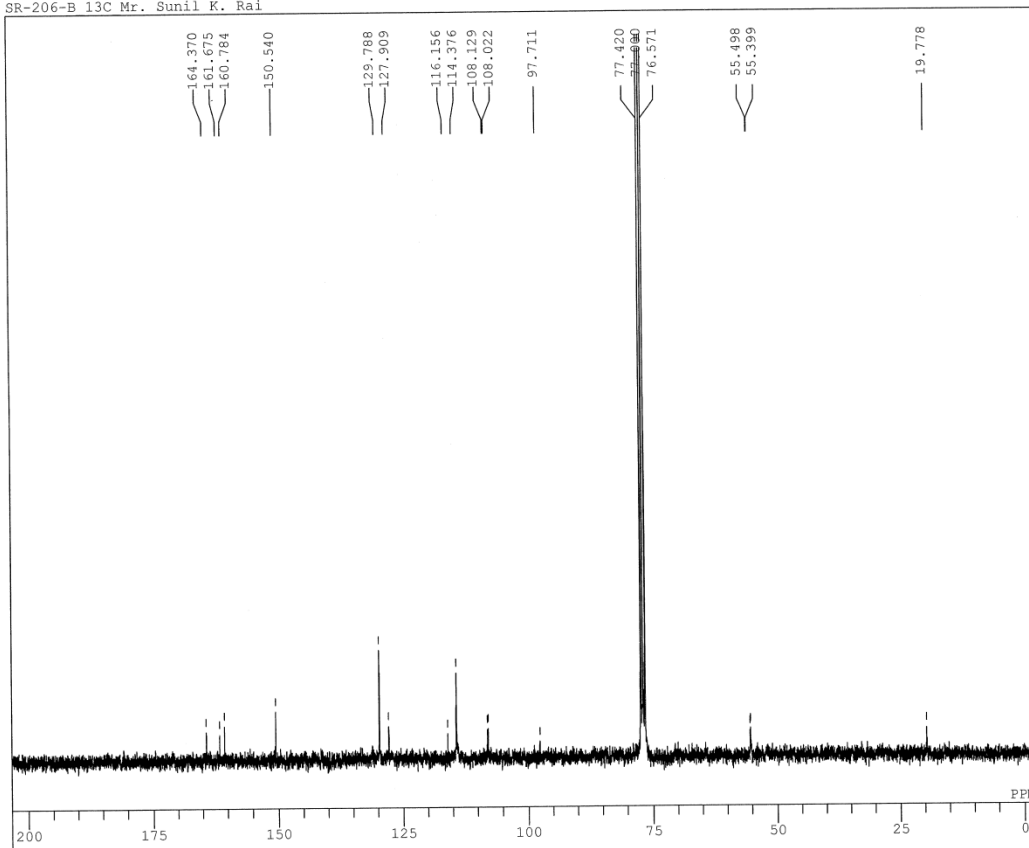
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COMNT SR-206-B 1H Mr.Sunil Rai
DATIM Tue Nov 05 16:12:15 2005
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
FW1 5.6 us
IRNUC 1H
CTEMP 24.3 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 23



Compound (4a): ^{13}C NMR



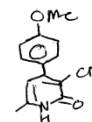
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SR-206-B 13C Mr. Sunil K. Rai



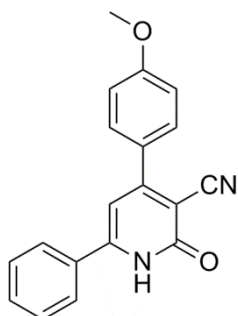
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

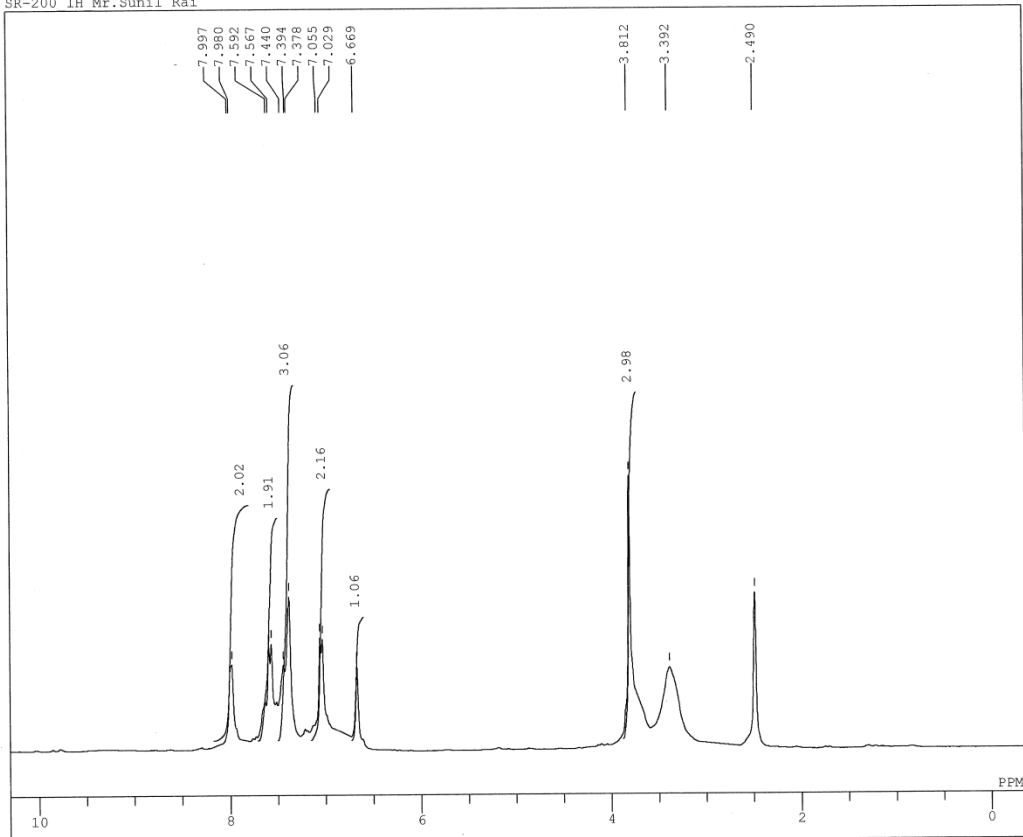
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DATIM Wed Nov 06 23:12:47 20
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 23.5 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 24



Compound (4b): ^1H NMR



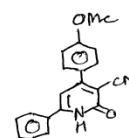
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SR-200_1H Mr.Sunil Rai



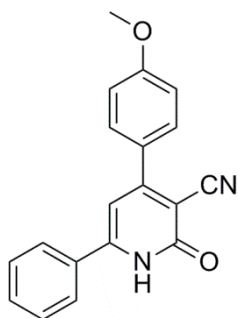
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

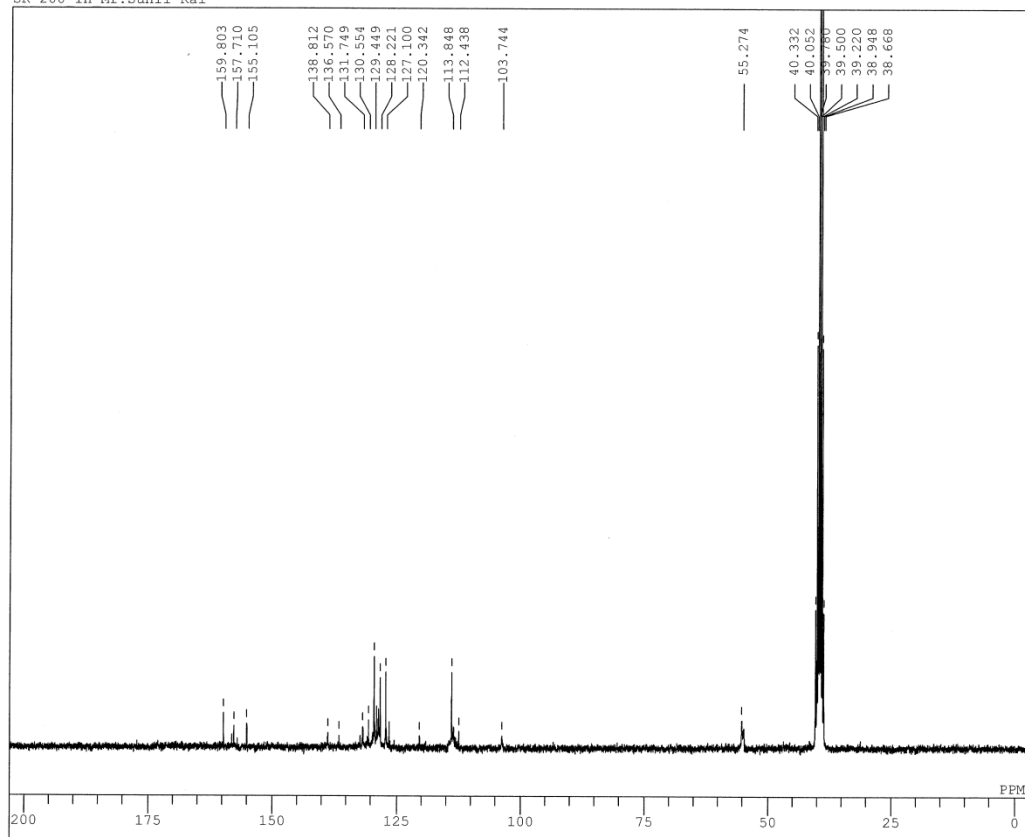
DFILE C:\Sunil Rai\SR-200_1H
COMNT SR-200_1H Mr.Sunil Rai
DATIM Tue Nov 12 07:45:34 20
OBNUC 1H
EXMOD NON
OBFRO 300.40 MHz
OBSEF 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 32
ACQTM 5.446 sec
PD 1.547 sec
PW1 5.6 us
IRNUC 1H
CTEMP 26.2 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 17



Compound (4b): ^{13}C NMR



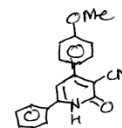
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SR-200 1H Mr.Sunil Rai



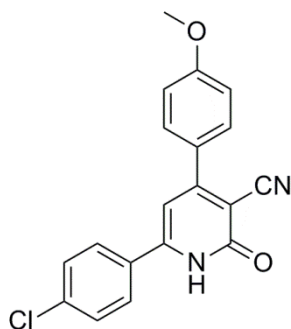
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

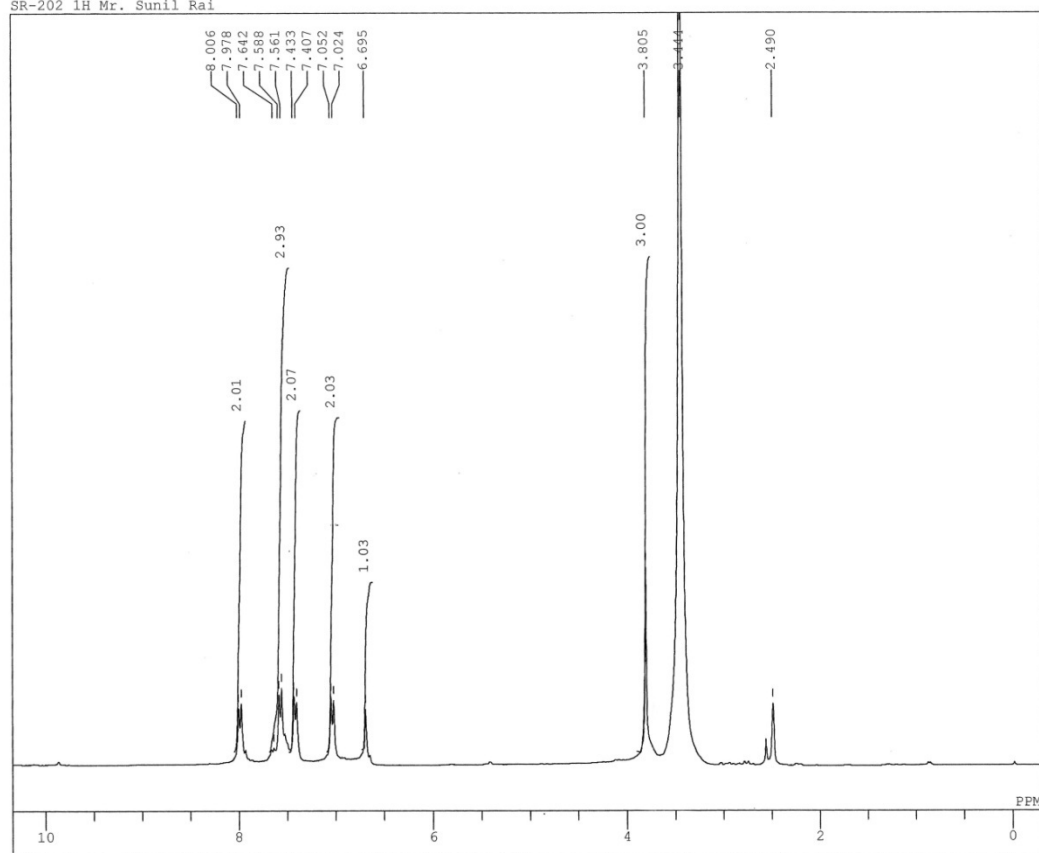
DFILE C:\Sunil Rai\SR-200_13
COMNT SR-200_1H Mr.Sunil Rai
DATIM Tue Nov 12 09:25:56 20
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 23.3 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 24



Compound (4c): ¹H NMR



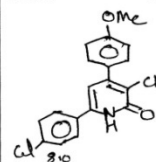
C:\Sunil Rai\SR-202_1H.als
SR-202_1H Mr. Sunil Rai



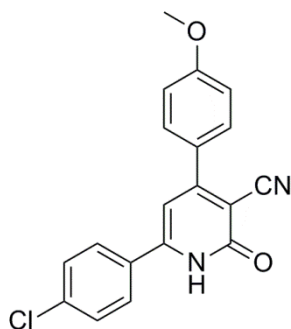
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

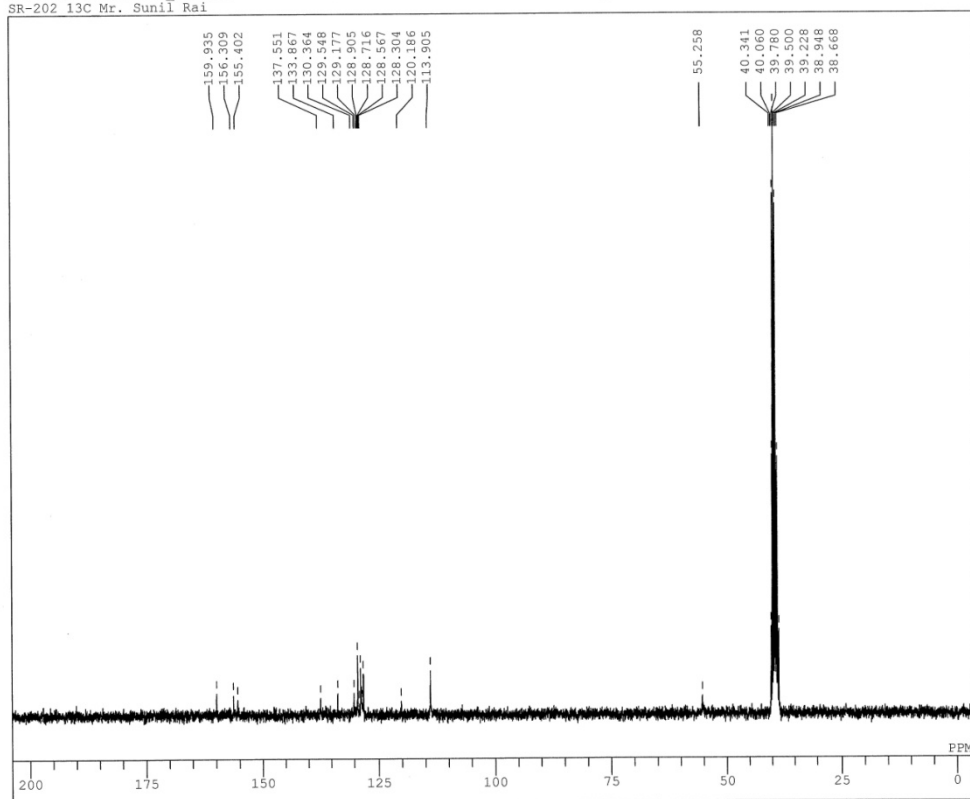
DFILE C:\Sunil Rai\SR-202
COMNT SR-202_1H Mr. Sunil
DATIM Thu Sep 12 13:12:29
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 49
ACQTM 3.447 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 21.6 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 15



Compound (4c): ^{13}C NMR



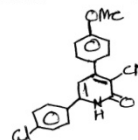
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SR-202_13C Mr. Sunil Rai



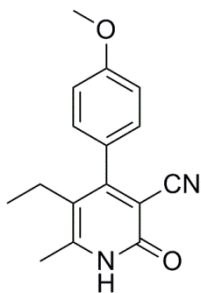
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

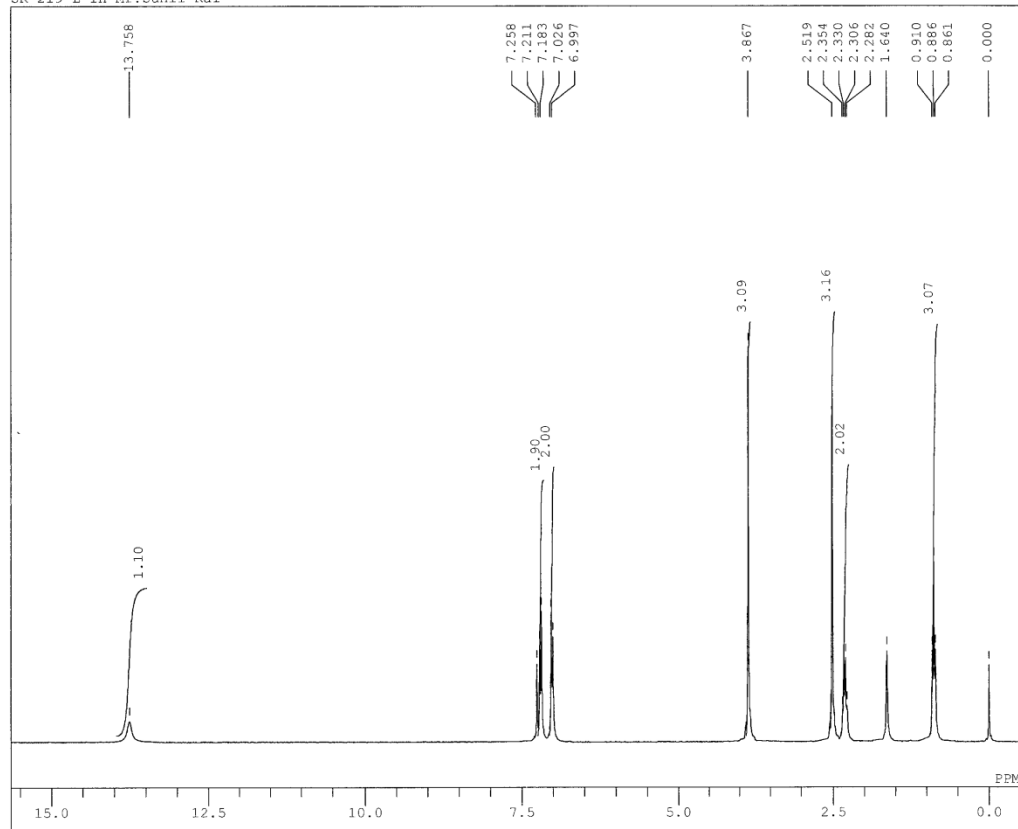
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COMNT SR-202_13C Mr. Sunil Rai
DATIM Thu Sep 12 13:35:30 20:
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 358
ACQTM 1.606 sec
PD 1.394 sec
PWL 5.9 us
IRNUC 1H
CTEMP 24.8 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 22



Compound (4d): ^1H NMR



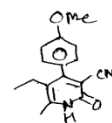
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SR-219-L 1H Mr.Sunil Rai



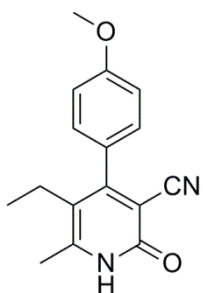
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

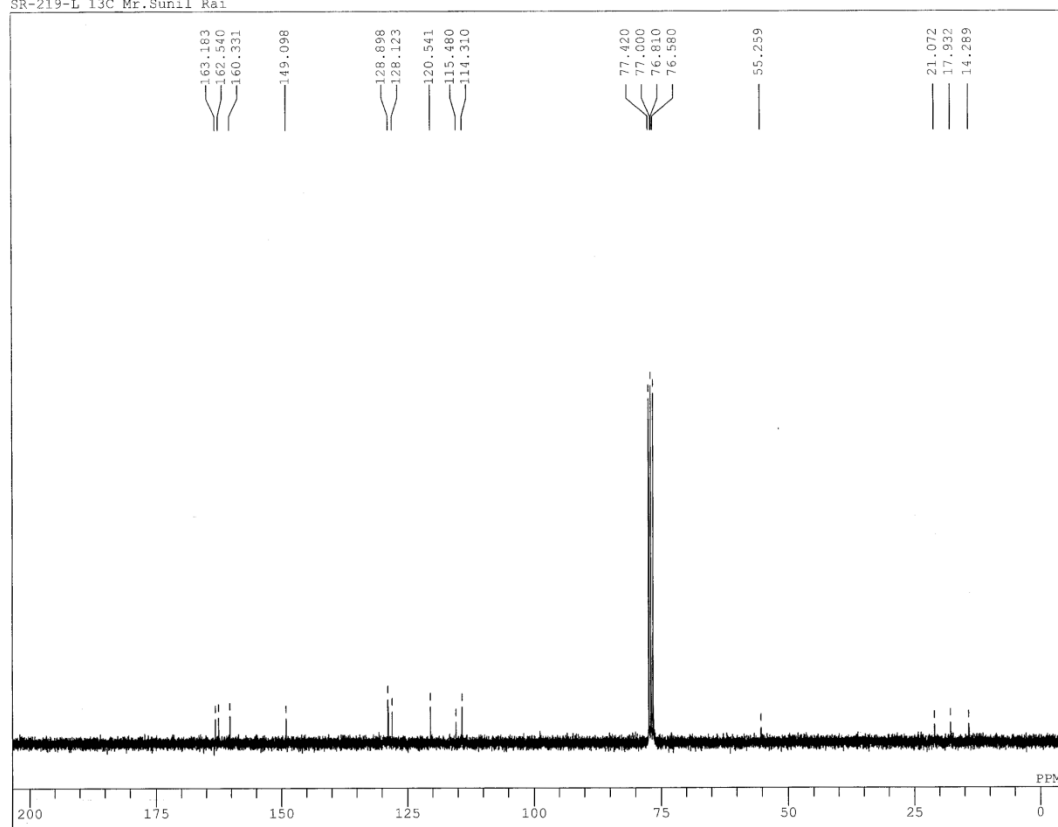
DFILE C:\WINNMR98\COMMON\ DF
COMNT SR-219-L 1H Mr.Sunil F
DATIM Tue Nov 19 12:32:40 20
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 8
ACQTM 3.447 sec
PD 1.547 sec
PW1 5.2 us
IRNUC 1H
CTEMP 20.7 c
SLVNT CDCl_3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 20



Compound (4d): ^{13}C NMR



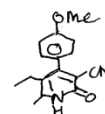
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SR-219-L 13C Mr.Sunil Rai



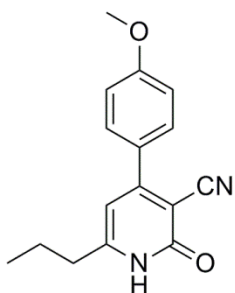
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kuma
Shishir Singh

DFILE C:\Sunil Rai\SR-2
COMNT SR-219-L 13C Mr.S
DATIM Fri Nov 22 04:19:
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2500
ACQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 40.3 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 23

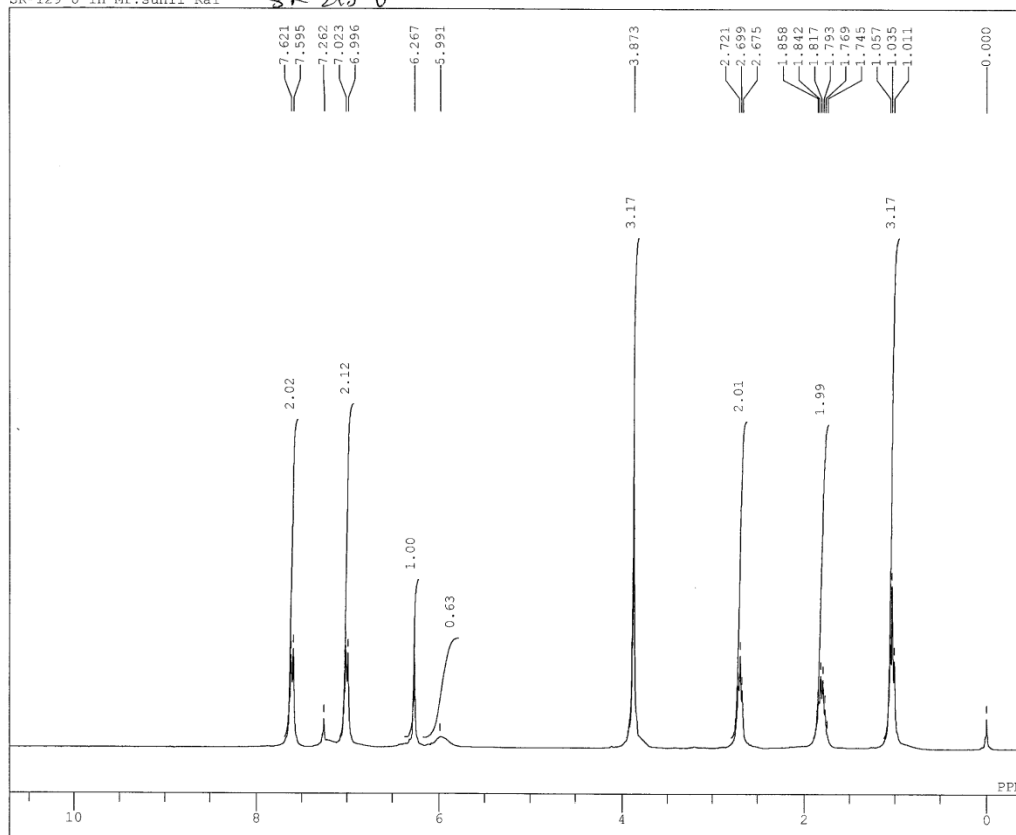


Compound (4e): ¹H NMR



C:\Sunil Rai\SR-129 U 1H.als
SR-129 U 1H Mr. sunil Rai

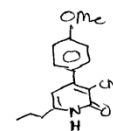
SR-129-U



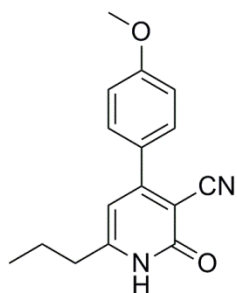
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

DFILE C:\Sunil Rai\SR-129 U
COMNT SR-129 U 1H Mr. sunil Rai
DATIM Mon Nov 18 15:47:31 20
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
PWL 5.6 us
IRNUC 1H
CTEMP 21.7 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 19

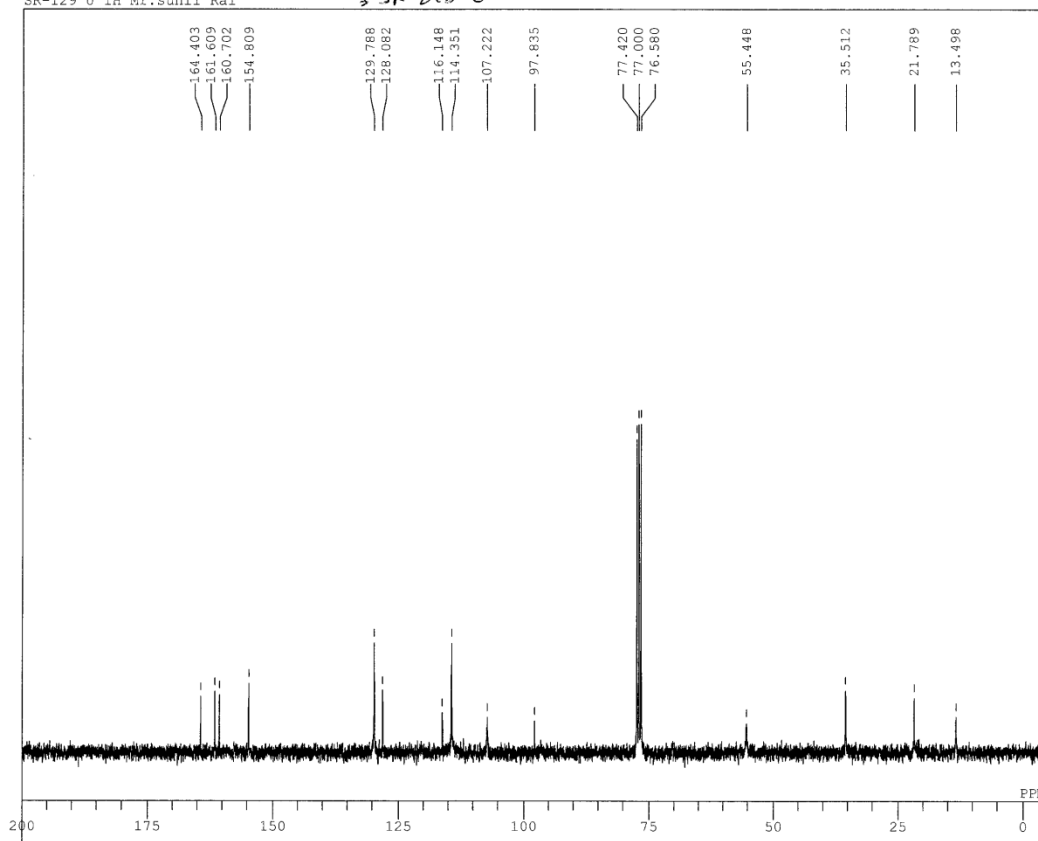


Compound (4e): ^{13}C NMR



C:\WINNMR98\Data\SR-129_U_1H2BCM_E7.als
SR-129 U 1H Mr.sunil Rai

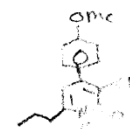
SR-129-U



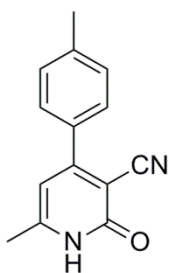
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

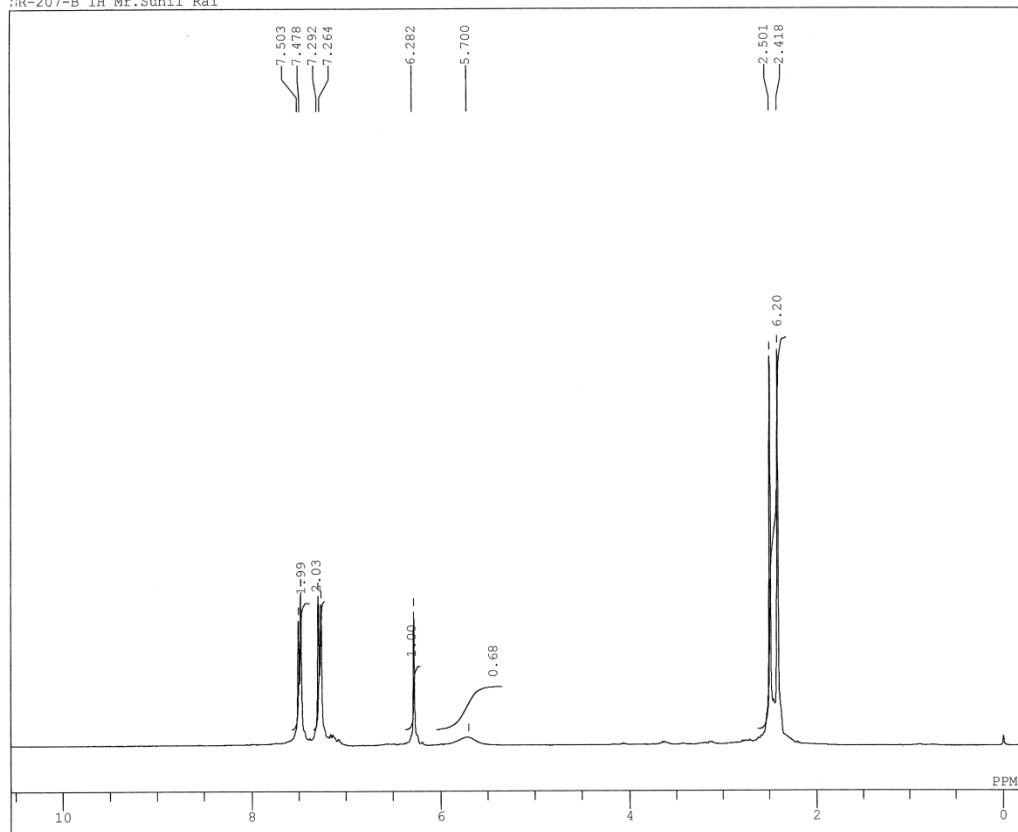
DFILE C:\WINNMR98\Data\SR-1
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DATIM Mon Nov 18 16:12:56 2
OBNUC ^{13}C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 500
ACQTM 1.606 sec
PD 1.394 sec
PWL 5.9 us
IRNUC 1H
CTEMP 23.9 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 22



Compound (5a): ^1H NMR



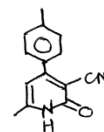
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SR-207-B 1H Mr.Sunil Rai



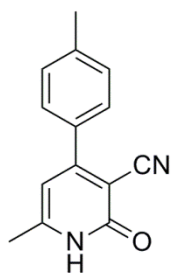
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

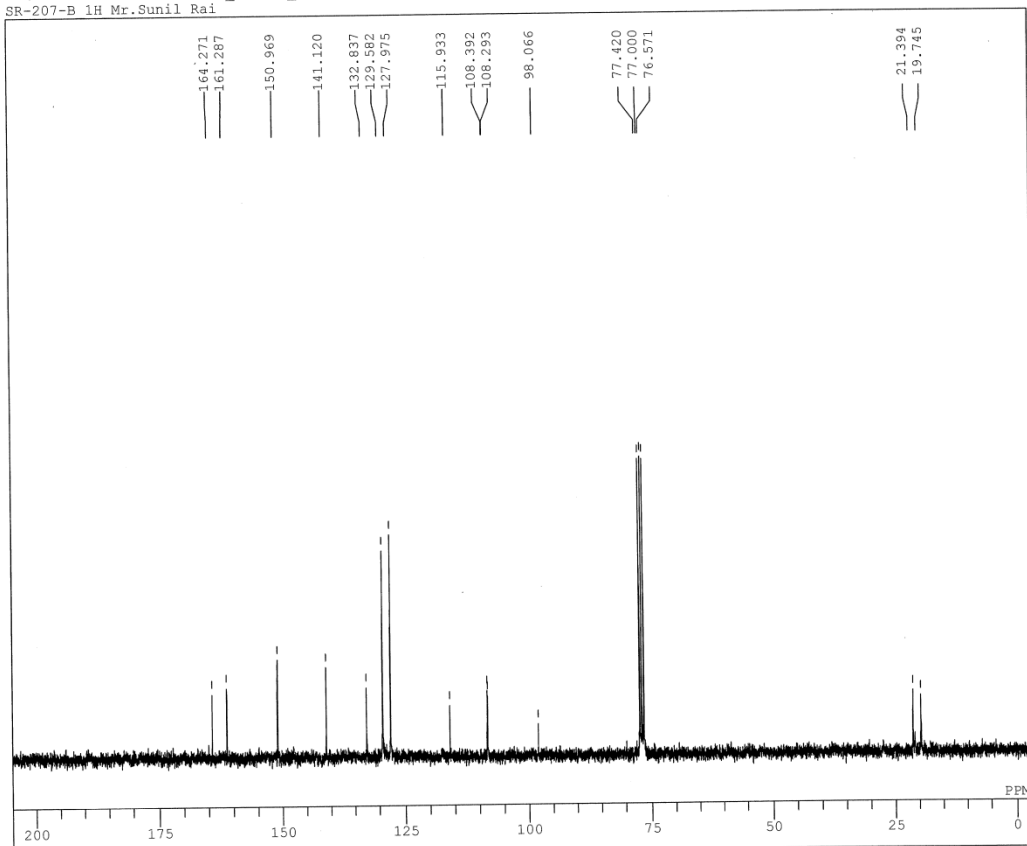
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DATIM Tue Nov 05 14:05:08 2005
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
PW1 5.6 us
IRNUC 1H
CTEMP 21.9 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 19



Compound (5a): ^{13}C NMR



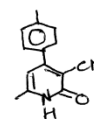
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SR-207-B 1H Mr.Sunil Rai



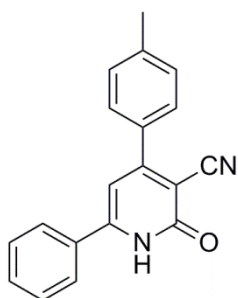
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

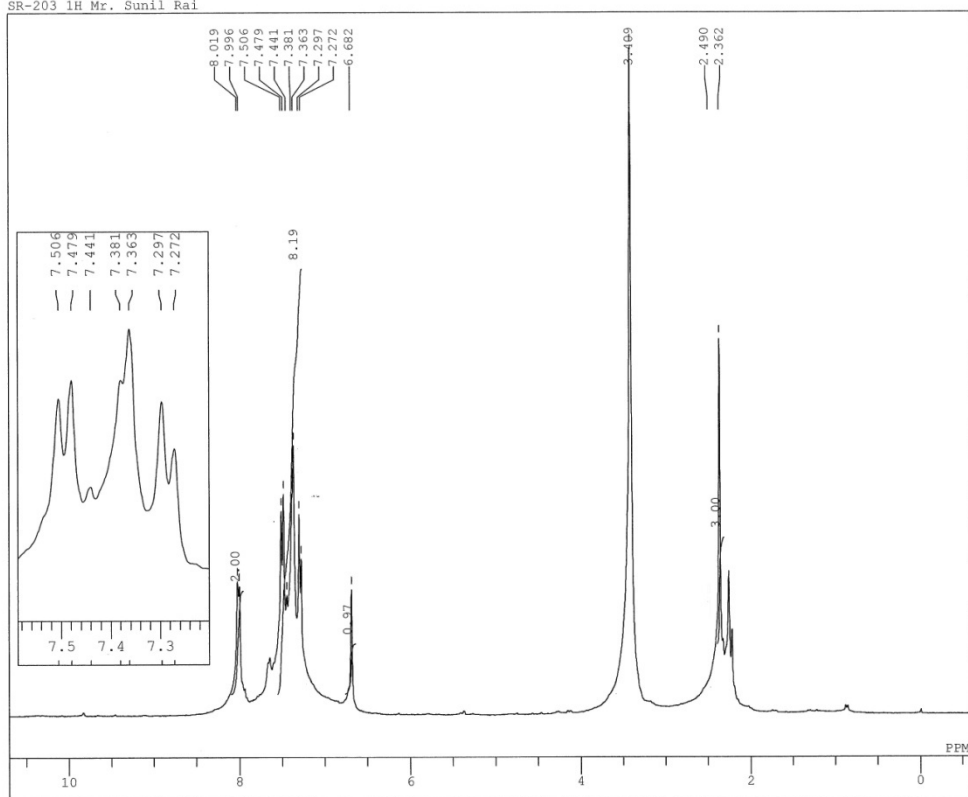
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COMNT SR-207-B 1H Mr.Sunil Rai
DATIM Tue Nov 05 14:23:31 2005
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 360
ACQTM 1.606 sec
PD 1.394 sec
FW1 5.9 us
IRNUC 1H
CTEMP 23.5 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 1.20 Hz
RGAIN 24



Compound (5b): ^1H NMR



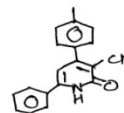
C:\Sunil Rai\SR-203_1H.als
SR-203 1H Mr. Sunil Rai



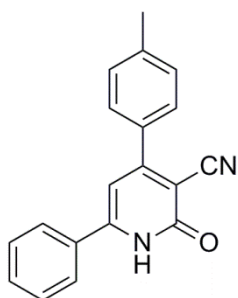
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

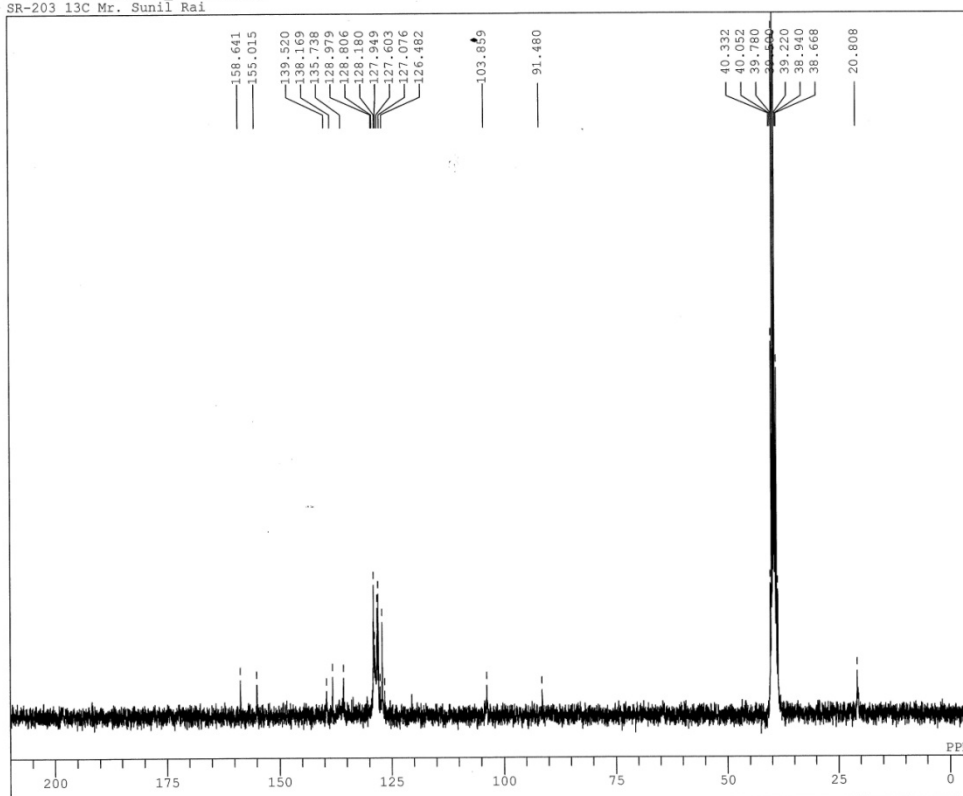
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COMNT SR-203_1H Mr. Sunil Rai
DATIM Thu Sep 12 11:16:08 20
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 16
ACQTM 3.447 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 25.1 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 16



Compound (5b): ^{13}C NMR



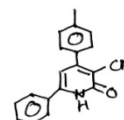
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SR-203 13C Mr. Sunil Rai



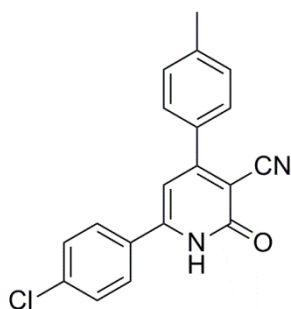
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

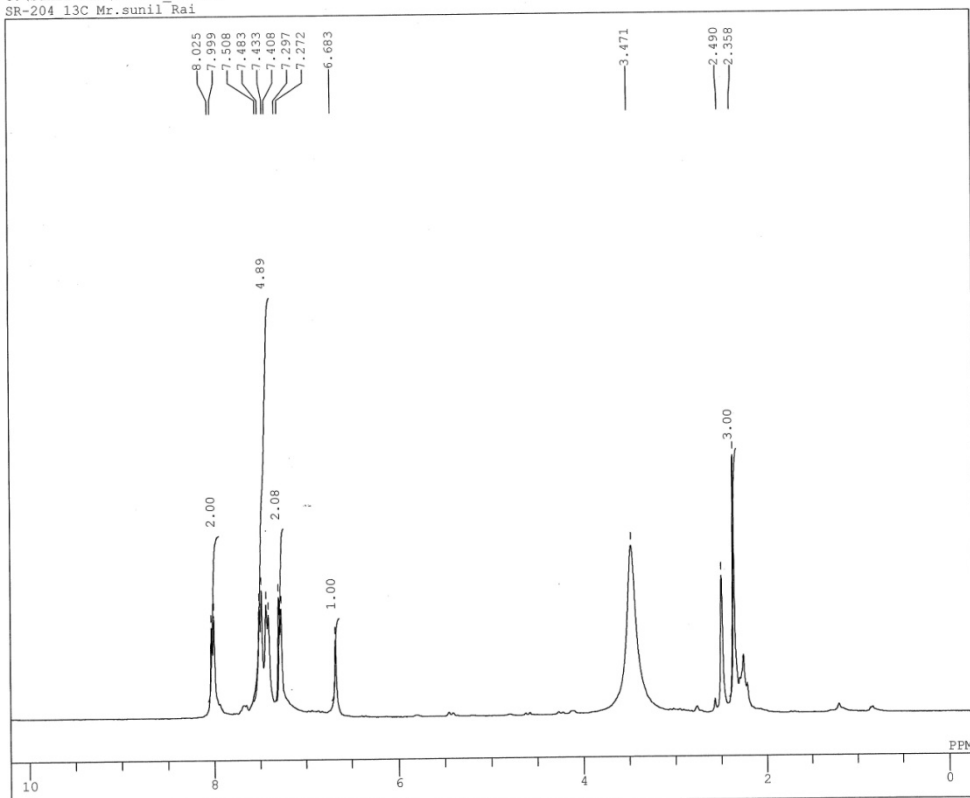
DFILE C:\WINNMR98\COMMON\DEI
COMNT SR-203 13C Mr. Sunil Rai
DATIM Thu Sep 12 11:11:16 20:
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 420
ACQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 23.5 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 22



Compound (5c): ^1H NMR



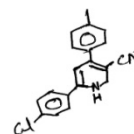
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SR-204 13C Mr.sunil Rai



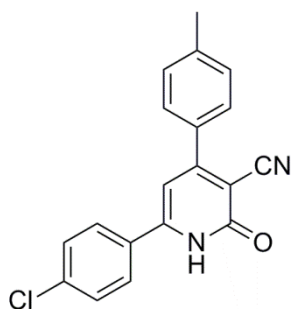
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

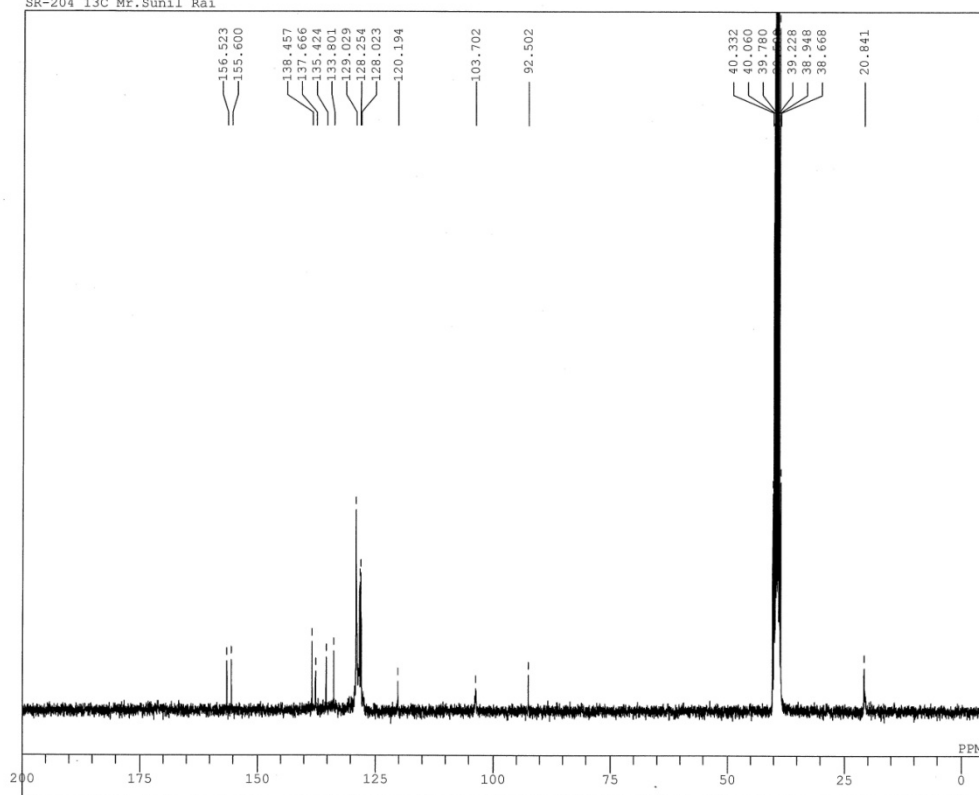
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COMNT SR-204 13C Mr.sunil Ra
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EXMOD NON
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OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 32
AQTM 5.446 sec
PD 1.547 sec
PWL 5.6 us
IRNUC 1H
CTEMP 17.7 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 17



Compound (5c): ¹³C NMR



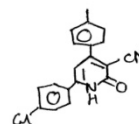
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SR-204 13C Mr.Sunil Rai



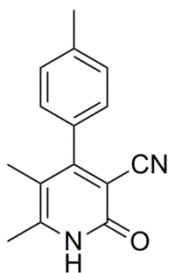
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

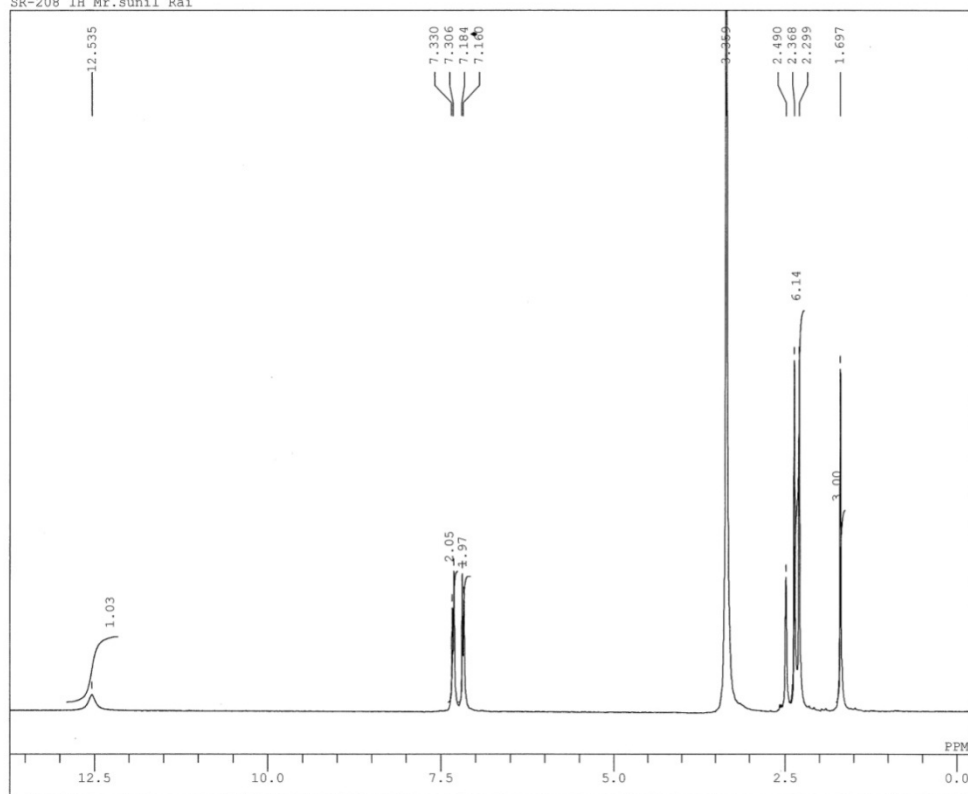
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DATIM Wed Sep 18 23:37:22 20
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
PW1 5.9 us
IRNUC 1H
CTEMP 19.0 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 21



Compound (5d): ^1H NMR



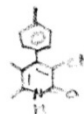
C:\WINNMR98\Data\SR-208_1H1NON_E2.als
SR-208 1H Mr.sunil Rai



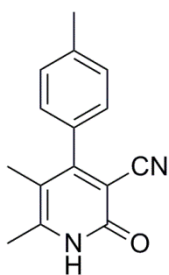
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

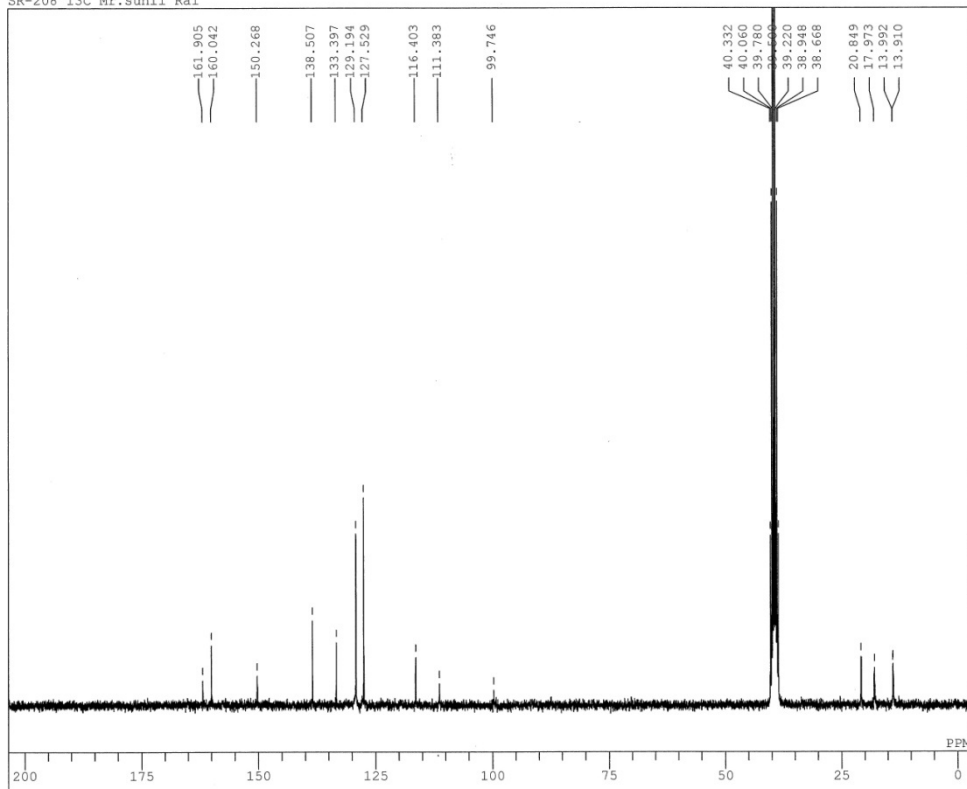
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DATIM Tue Oct 29 17:38:54 20
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EXMOD NON
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OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
FW1 5.6 us
IRNUC 1H
CTEMP 20.1 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.22 Hz
RGAIN 18



Compound (5d): ^{13}C NMR



C:\Sunil Rai\SR-208_13C.als
SR-208_13C Mr.sunil Rai

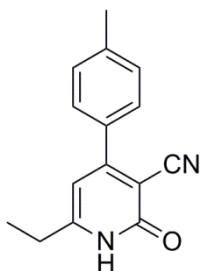


JEOL AL300 FTNMR
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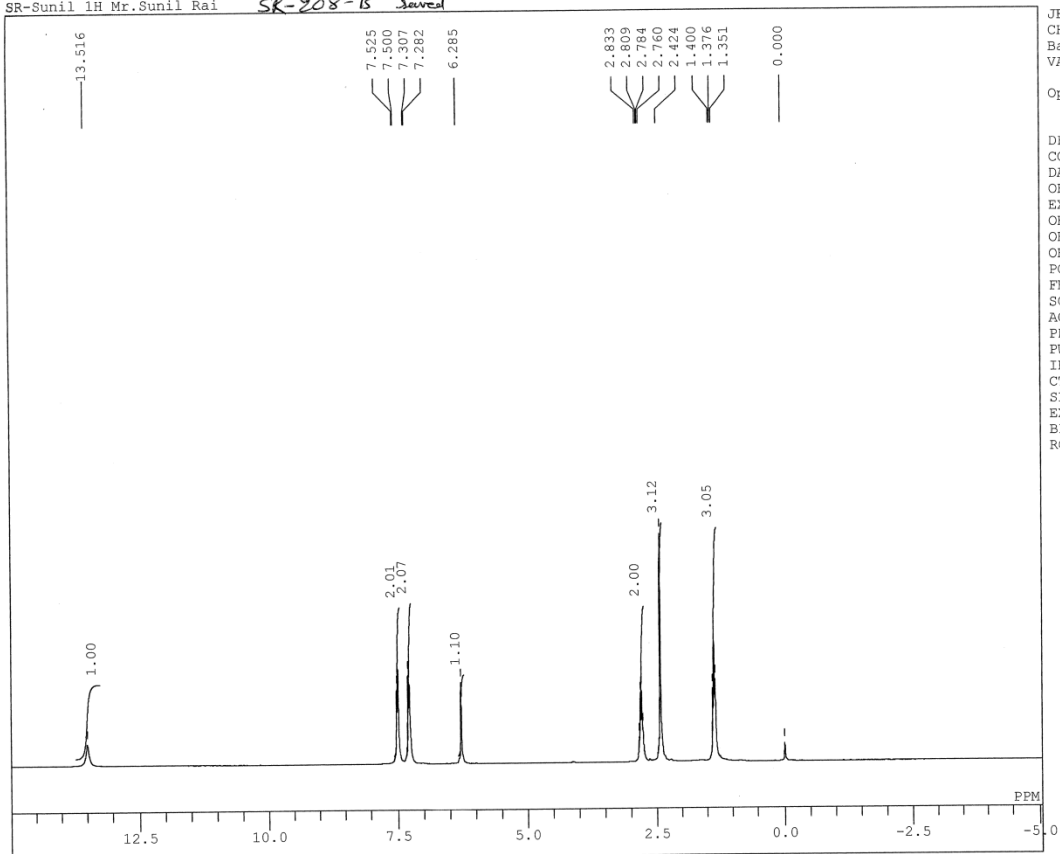
Operator : Nagendra Kumar
Shishir Singh

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OBNUC ^{13}C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
PWL 5.9 us
IRNUC 1H
CTEMP 25.2 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.22 Hz
RGAIN 22

Compound (5e): ^1H NMR



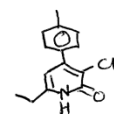
SR-Sunil Rai\SR-Sunil_1H.als
SR-Sunil 1H Mr.Sunil Rai SR-208-B saved



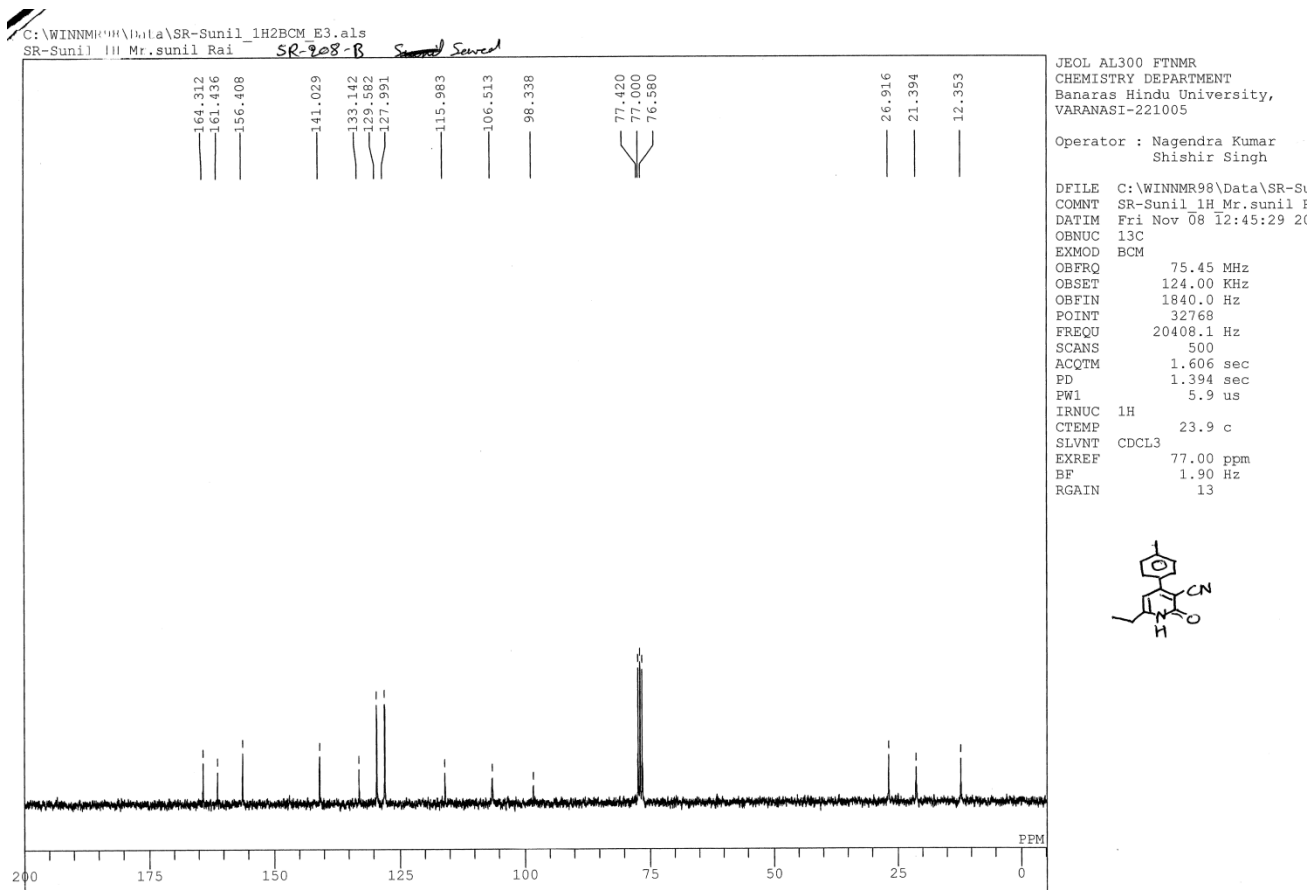
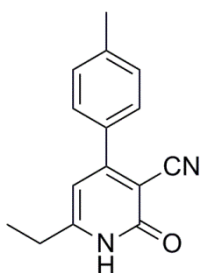
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

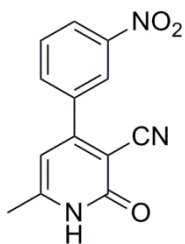
DFILE C:\Sunil Rai\SR-Sunil_1H.als
COMNT SR-Sunil 1H Mr.Sunil Rai
DATIM Fri Nov 08 12:20:10 2008
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
FW1 5.6 us
IRNUC 1H
CTEMP 22.2 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.90 Hz
RGAIN 19



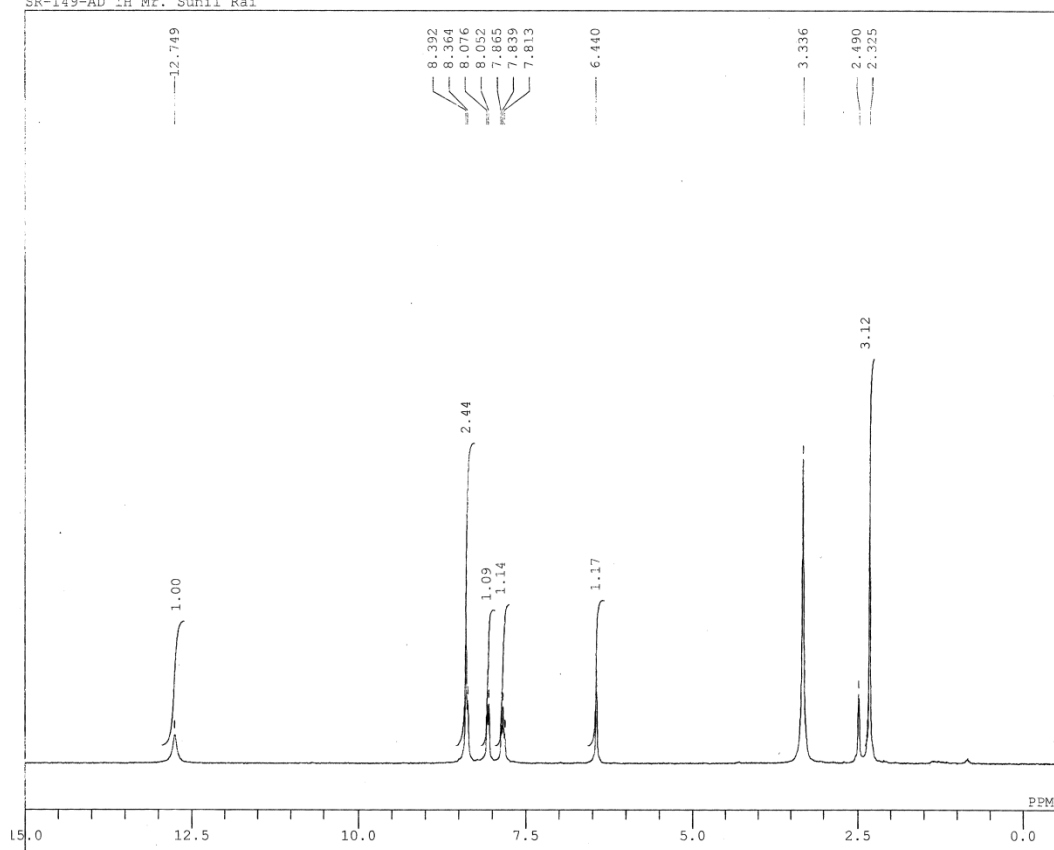
Compound (5e): ¹³C NMR



Compound (6a): ^1H NMR



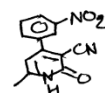
C:\WINNMR98\COMMON\DEFAULT.ALS
SR-149-AD 1H Mr. Sunil Rai



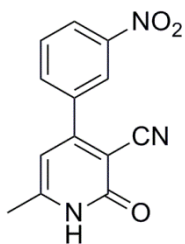
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

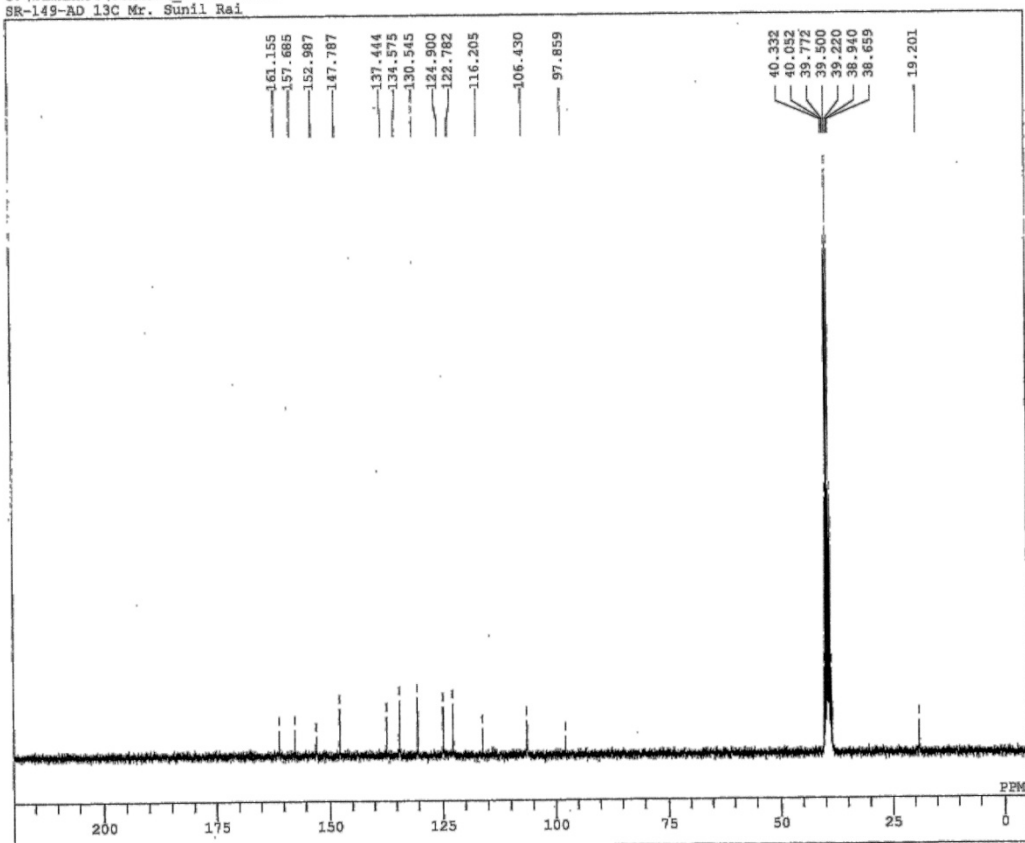
DFILE C:\WINNMR98\COMMON\
COMNT SR-149-AD 1H Mr. Sun.
DATIM Tue Nov 26 10:05:54
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 16
ACQTM 3.447 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 23.5 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 23



Compound (6a): ^{13}C NMR



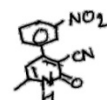
C:\WINNMR98\COMMON\DEFAULT.ALS
SR-149-AD 13C Mr. Sunil Rai



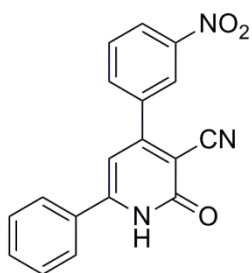
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

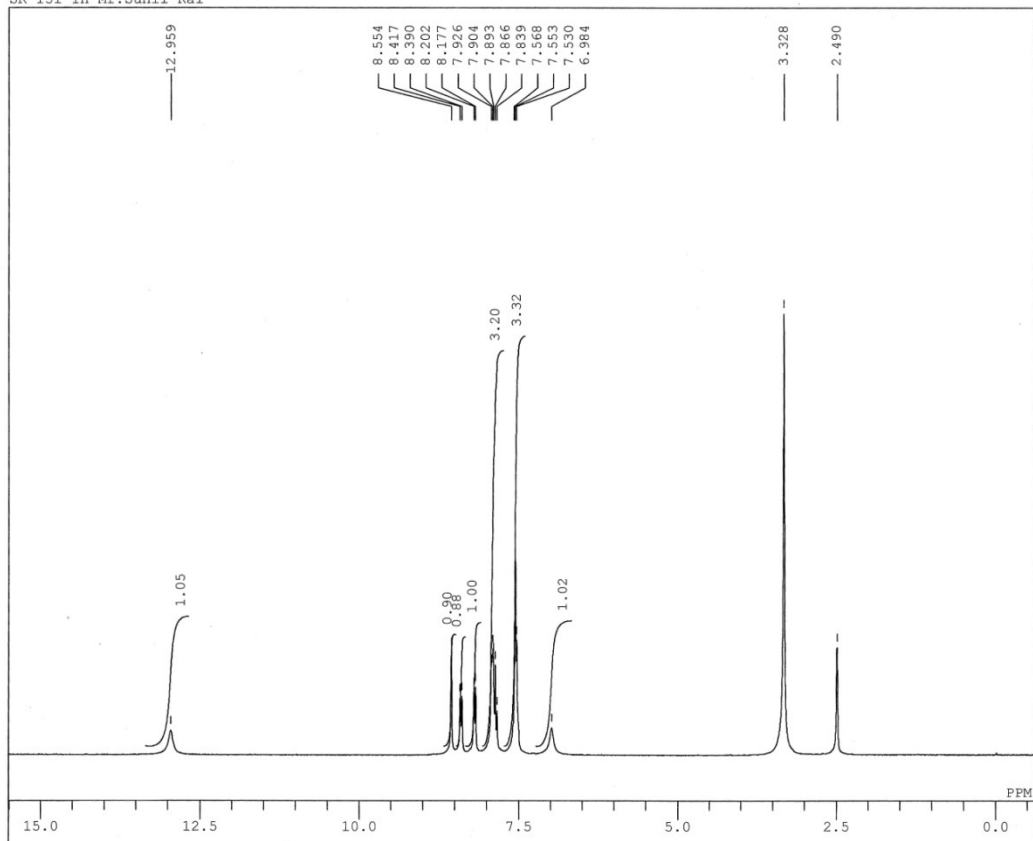
DFILE C:\WINNMR98\COMMON\DI
COMNT SR-149-AD 13C Mr. Suni
DATIM Tue Nov 26 10:23:45 20
OBNJC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 317
ACQTM 1.606 sec
PD 1.394 sec
FWL 5.9 us
IRNUC 1H
CTEMP 22.1 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 23



Compound (6b): ^1H NMR



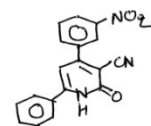
C:\Sunil Rai\SR-151_1H.als
SR-151_1H Mr.Sunil Rai



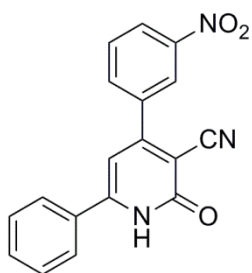
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

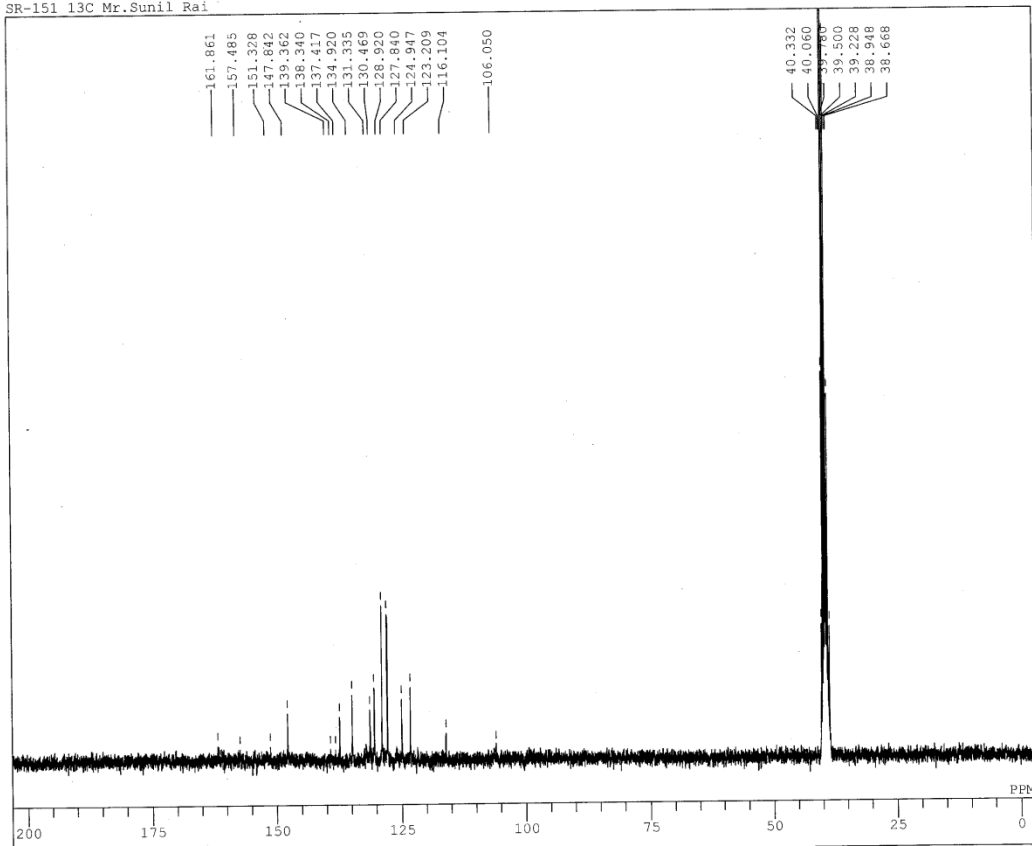
DFILE C:\Sunil Rai\SR-151_1
COMNT SR-151_1H Mr.Sunil Rai
DATIM Fri Dec 21 11:28:41 2
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 8
ACQTM 3.447 sec
PD 1.547 sec
PWL 5.2 us
IRNUC 1H
CTEMP 20.6 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 19



Compound (6b): ¹³C NMR



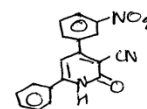
C:\Sunil Rai\SR-151_13C_als
SR-151 13C Mr.Sunil Rai



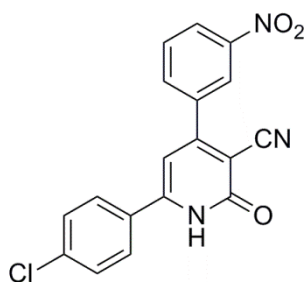
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

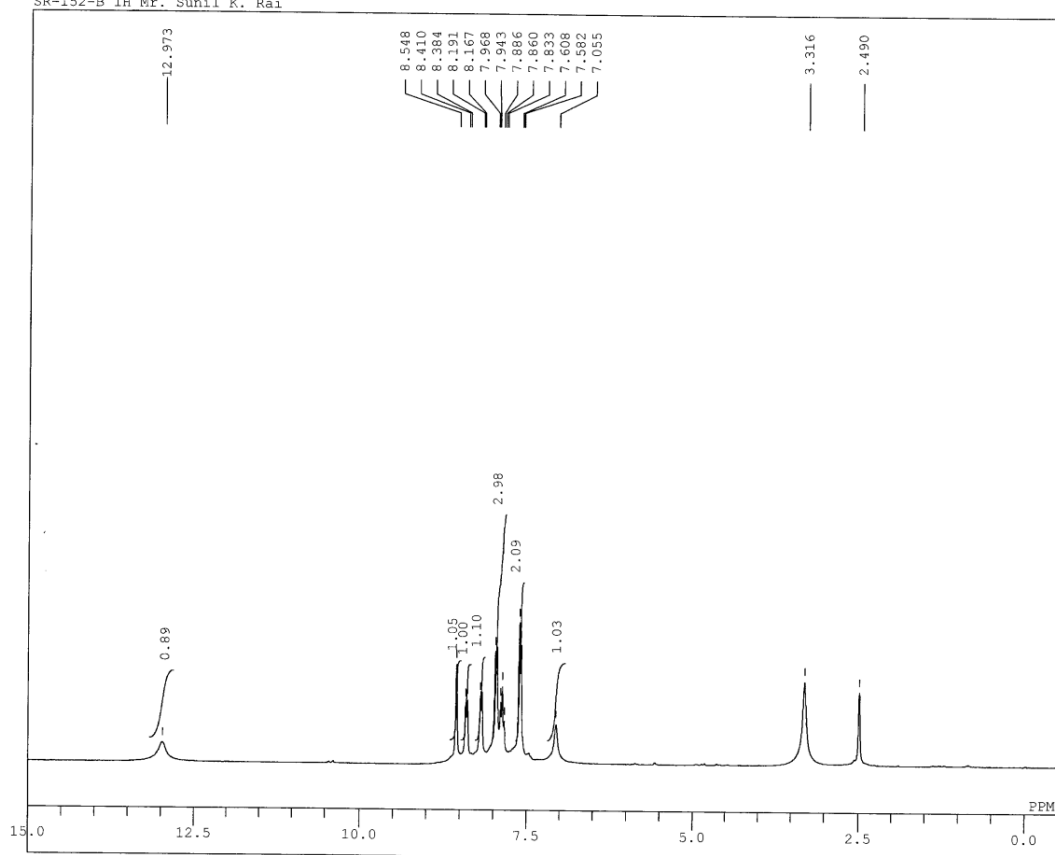
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COMNT SR-151_13C Mr.Sunil Ra
DATIM Fri Dec 21 11:58:24 20
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 534
ACQTM 1.606 sec
PD 1.394 sec
FW1 6.0 us
IRNUC 1H
CTEMP 24.5 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 22



Compound (6c): ^1H NMR



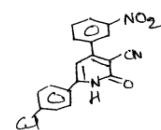
C:\Sunil Rai\SR-152-B 1H.als
SR-152-B 1H Mr. Sunil K. Rai



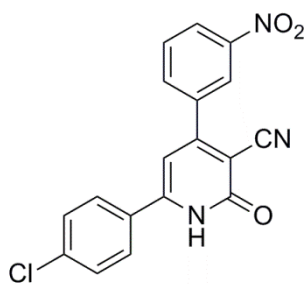
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

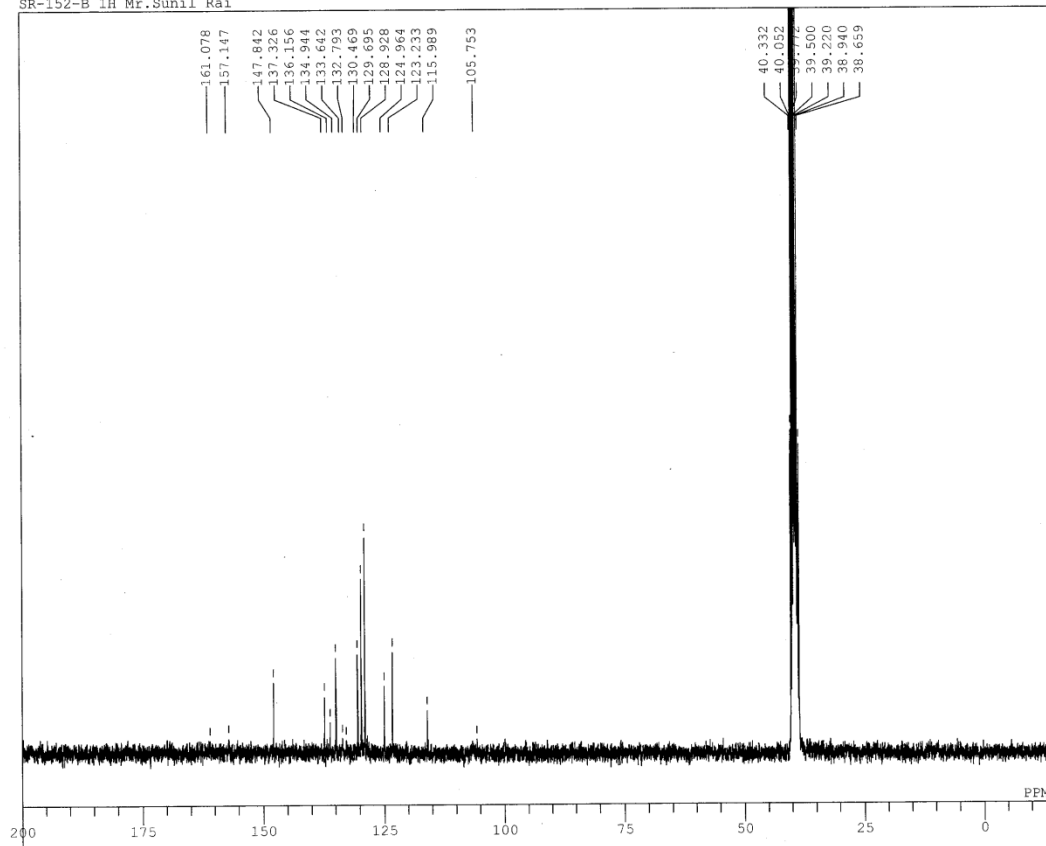
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COMNT SR-152-B 1H Mr. Sun
DATIM Mon Dec 17 16:08:15
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 9505.7 Hz
SCANS 16
ACQTM 3.447 sec
PD 1.547 sec
PW1 5.2 us
IRNUC 1H
CTEMP 25.0 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 19



Compound (6c): ^{13}C NMR



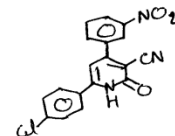
C:\Sunil Rai\SR-152-B_1H.als
SR-152-B 1H Mr.Sunil Rai



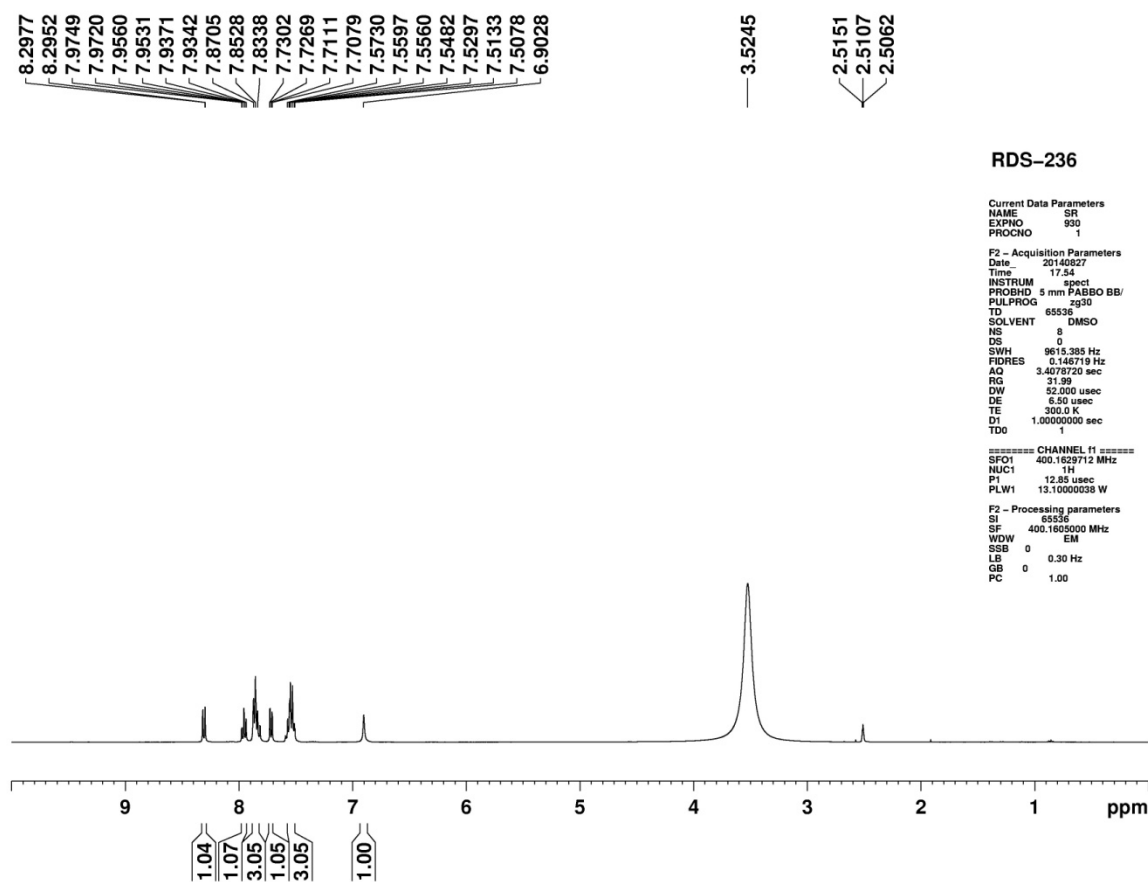
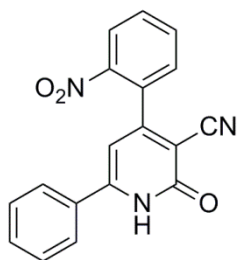
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

DFILE C:\Sunil Rai\SR-152-B
COMNT SR-152-B 1H Mr.Sunil
DATIM Tue Dec 18 06:10:53
OBNUC 13C
EXMOD BCM
OBFRQ 75.45 MHz
OBSET 127.30 KHz
OBFIN 44.7 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
FWL 6.0 us
IRNUC 1H
CTEMP 21.1 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 24



Compound (7a): ¹H NMR



RDS-236

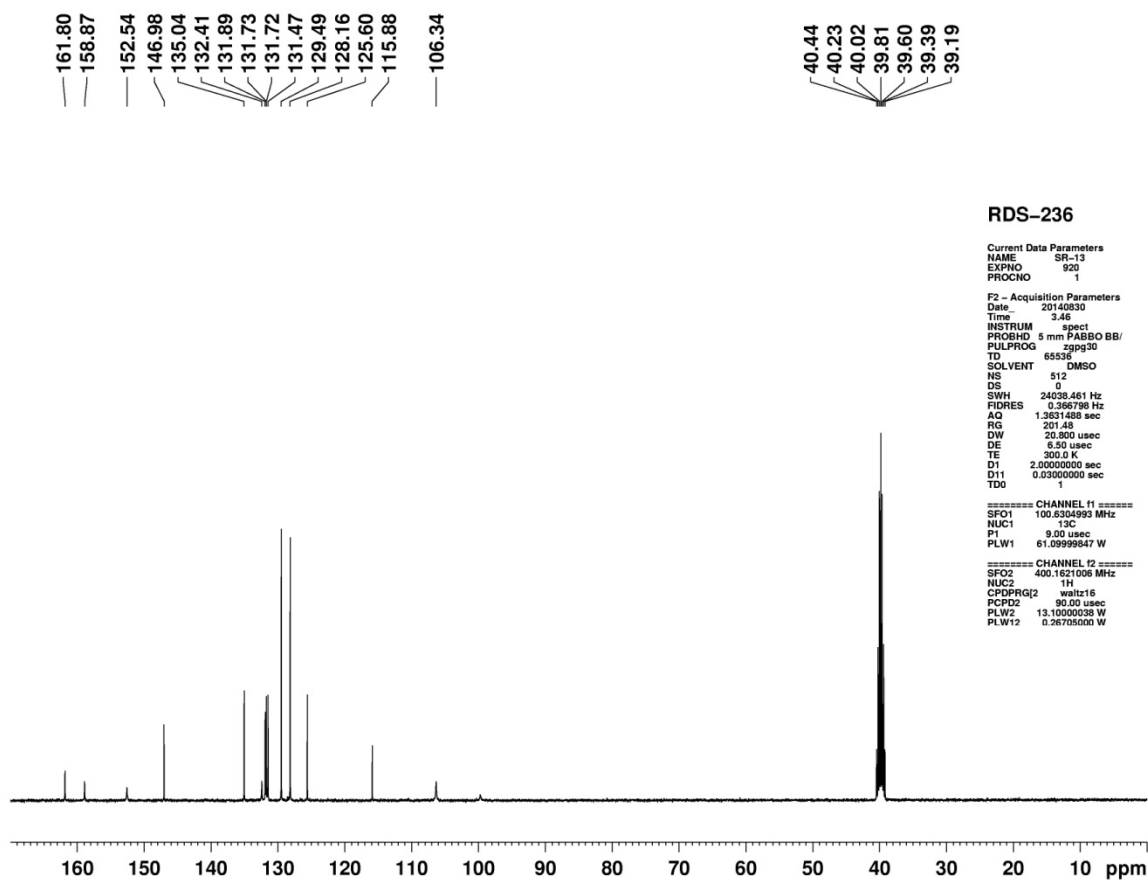
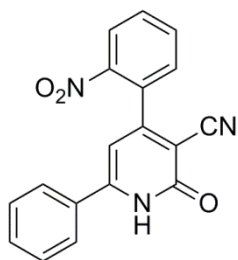
Current Data Parameters
NAME SR
EXPNO 830
PROCNO 1

F2 - Acquisition Parameters
Date_ 20140827
Time 17.54
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT DMSO
NS 8
DS 0
SWH 9615.385 Hz
FIDRES 0.146719 Hz
AQ 3.4078720 sec
RG 31.99
DW 52.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1

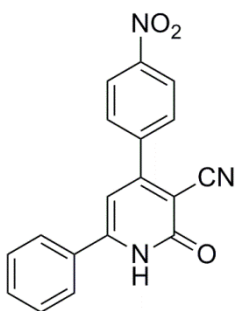
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SFO1 400.1629712 MHz
NUC1 1H
P1 12.85 usec
PLW1 13.10000038 W

F2 - Processing parameters
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SF 400.1605000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

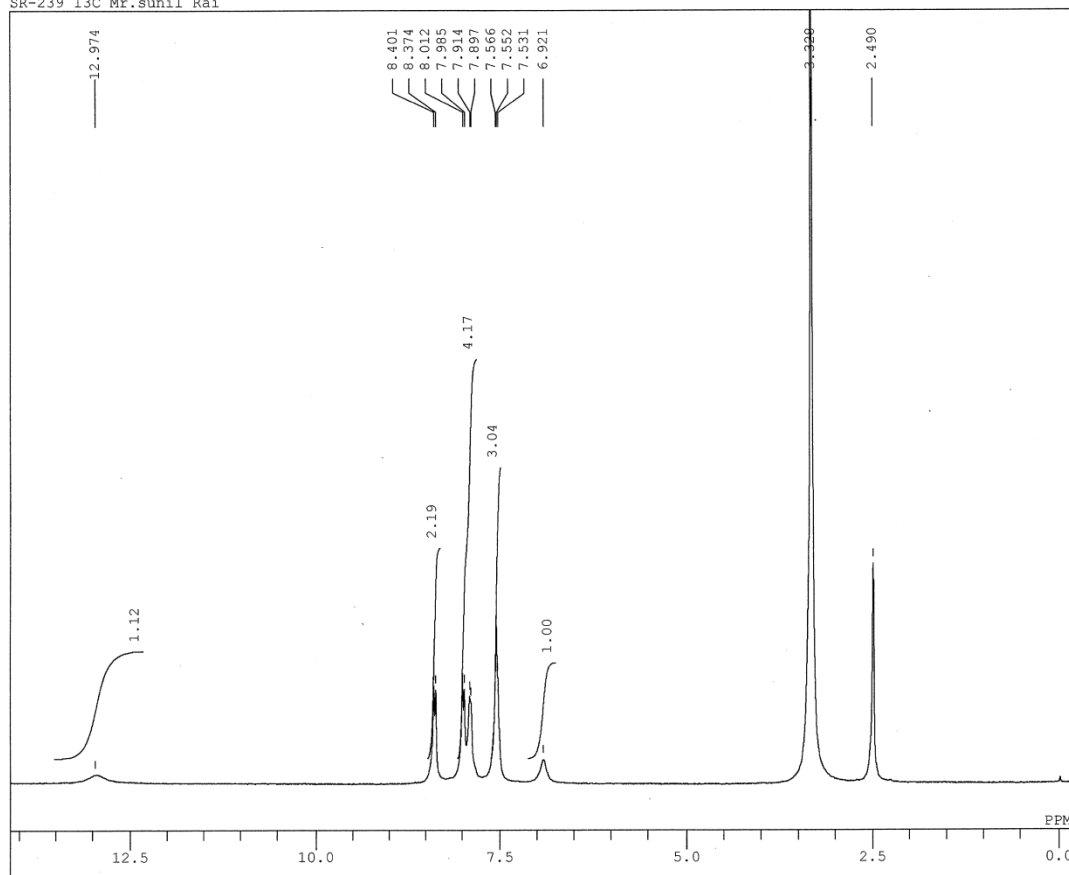
Compound (7a): ^{13}C NMR



Compound (8a): ^1H NMR



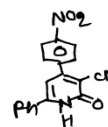
C:\WINNMR98\Data\SR-239_13C1NON_E6.als
SR-239 13C Mr.sunil Rai



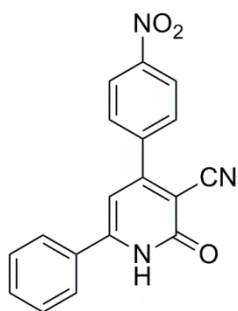
JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kum
Shishir Sing

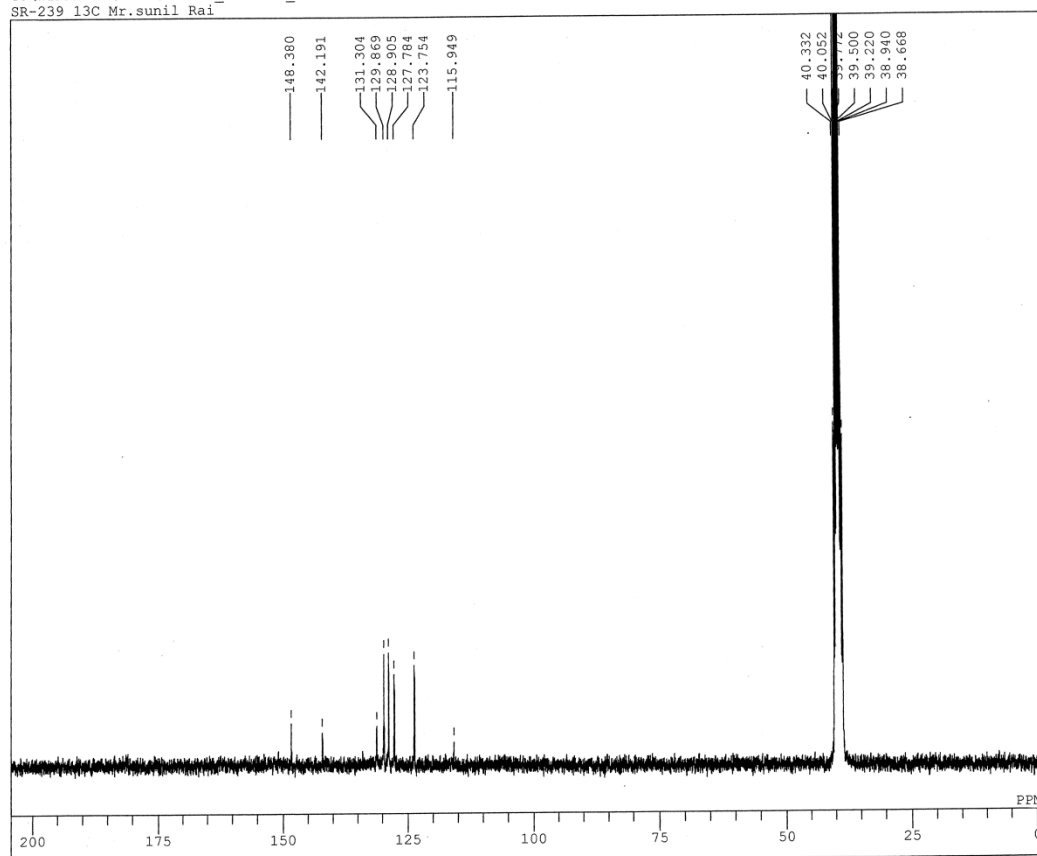
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COMNT SR-239 13C Mr.su
DATIM Tue Aug 19 03:10
OBNUC 1H
EXMOD NON
OBFRQ 300.40 MHz
OBSET 130.00 KHz
OBFIN 1150.0 Hz
POINT 32768
FREQU 6016.8 Hz
SCANS 16
ACQTM 5.446 sec
PD 1.547 sec
PW1 5.2 us
IRNUC 1H
CTEMP 22.5 c
SLVNT DMSO
EXREF 2.49 ppm
BF 1.20 Hz
RGAIN 19



Compound (8a): ^{13}C NMR



C:\WINNMR98\Data\SR-239_13C2BCM_E6.als
SR-239 13C Mr.sunil Rai



JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University
VARANASI-221005

Operator : Nagendra Kum
Shishir Sing

DFILE C:\WINNMR98\Data
COMNT SR-239_13C_Mr.su
DATIM Tue Aug 19 04:51
OBNUC 13C
EXMOD BCM
OBFREQ 75.45 MHz
OBSET 124.00 KHz
OBFIN 1840.0 Hz
POINT 32768
FREQU 20408.1 Hz
SCANS 2000
ACQTM 1.606 sec
PD 1.394 sec
FW1 6.0 us
IRNUC 1H
CTEMP 23.7 c
SLVNT DMSO
EXREF 39.50 ppm
BF 1.20 Hz
RGAIN 22

3. Single Crystal X-ray data:

The X-ray diffraction data of compounds **1d**, **1e**, **1g** and **2d** was collected on Bruker SMART APEX CCD area detector diffractometer. The structure was solved and refined by using SHELXS program.¹ Molecular graphics were designed by using Mercury version-3.2.²

Table S1. Crystal data and structure refinement parameters for compound **1d**.

compound name	<i>5,6-dimethyl-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile</i>
CCDC Number	981162
empirical Formula	C ₁₄ H ₁₂ N ₂ O
formula weight	224.26
temperature	293 K
wavelength	0.71073 Å
crystal system	Triclinic
space group	P-1
unit cell dimensions	a = 7.4066 (7) Å, α = 116.399 (13) ° b = 9.4392 (12) Å, β = 97.846 (9) ° c = 9.7203 (13) Å, γ = 90.409 (9) °
cell volume	601.24 (12) Å ³
D _{calculated}	1.239 mg/ m ³
F(000)	236
crystal size	0.40 × 0.38 × 0.36 mm
Z	2
R factor (%)	6.31
theta range	3.4 to 32.6°
limiting Indices	-10 ≤ h ≤ 10, -14 ≤ k ≤ 14, -14 ≤ l ≤ 14
μ(Mo KR)/mm-1	0.08
R _{int}	0.021
measured reflections	6568
independent refln	3913
reflections with $I > 2\sigma(I)$	2298
parameters	158
goodness of fit	1.0

$R[F^2 > 2\sigma(F^2)]$	0.063
wR(F ²)	0.200

Table S2. Crystal data and structure refinement parameters for compound **1e**.

compound name	<i>(6-ethyl-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile)</i>
CCDC Number	981163
empirical Formula	C ₁₄ H ₁₂ N ₂ O
formula weight	224.26
temperature	293 K
wavelength	0.71073 Å
crystal system	Monoclinic
space group	P2 ₁ /c
unit cell dimensions	a = 7.3809 (6) Å, α = 90 ° b = 8.0626 (6) Å, β = 98.378 (6)° c = 19.9265 (12) Å, γ = 90°
cell volume	1173.16 (15) Å ³
D _{calculated}	1.270 mg/ m ³
F(000)	472
crystal size	0.45 × 0.43 × 0.41 mm
Z	4
R factor (%)	6.83
theta range	3.2 to 29.0°
limiting Indices	-10 ≤ h ≤ 10, -11 ≤ k ≤ 11, -27 ≤ l ≤ 27
μ(Mo KR)/mm-1	0.08
R _{int}	0.022
measured reflections	5083
independent refln	2686
reflections with $I > 2\sigma(I)$	1537
parameters	158
goodness of fit	1.02

$R[F^2 > 2\sigma(F^2)]$	0.068
wR(F ²)	0.191

Table S3. Crystal data and structure refinement parameters for compound **1g**.

compound name	<i>2-oxo-4-phenyl-6-propyl-1,2-dihydropyridine-3-carbonitrile</i>
CCDC Number	981430
empirical Formula	C ₁₅ H ₁₄ N ₂ O
formula weight	238.28
temperature	293 K
wavelength	0.71073 Å
crystal system	Triclinic
space group	P-1
unit cell dimensions	a = 9.7064 (10) Å, α = 82.404 (8)° b = 9.7294 (10) Å, β = 77.082 (9)° c = 14.4315 (14) Å, γ = 75.690 (9)°
cell volume	1282.9 (2) Å ³
D _{calculated}	1.234 mg/ m ³
F(000)	504
crystal size	0.52 × 0.50 × 0.48 mm
Z	4
R factor (%)	5.74
theta range	3.3 to 29.1°
limiting Indices	-13 ≤ h ≤ 13, -13 ≤ k ≤ 13, -19 ≤ l ≤ 19
μ(Mo KR)/mm-1	0.08
R _{int}	0.022
measured reflections	10237
independent refln	5798
reflections with $I > 2\sigma(I)$	2362
parameters	335
goodness of fit	1.03

$R[F^2 > 2\sigma(F^2)]$	0.057
wR(F ²)	0.156

Table S4. Crystal data and structure refinement parameters for compound **2d**.

compound name	<i>4-(4-chlorophenyl)-5,6-dimethyl-2-oxo-1,2-dihydropyridine-3-carbonitrile</i>
CCDC Number	981164
empirical Formula	C ₁₄ H ₁₁ ClN ₂ O
formula weight	258.70
temperature	293 K
wavelength	0.71073 Å
crystal system	Triclinic
space group	P-1
unit cell dimensions	a = 9.3937 (10) Å, α = 61.217 (12)° b = 17.428 (2) Å, β = 78.071 (9)° c = 18.0482 (18) Å, γ = 87.092 (9)°
cell volume	2529.7 (5) Å ³
D _{calculated}	1.359mg/ m ³
F(000)	1072
crystal size	0.54 × 0.53 × 0.52 mm
Z	8
R factor (%)	9.09
theta range	3.2 to 29.2°
limiting Indices	-12 ≤ h ≤ 12, -23 ≤ k ≤ 23, -24 ≤ l ≤ 24
μ(Mo KR)/mm-1	0.08
R _{int}	0.040
measured reflections	21373
independent refln	11464
reflections with $I > 2\sigma(I)$	5232
parameters	665
goodness of fit	1.00
$R[F^2 > 2\sigma(F^2)]$	0.091
wR(F ²)	0.250

4. References

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