

|                            | proton                          | mult              | THF- <i>d</i> <sub>8</sub> | CD <sub>2</sub> Cl <sub>2</sub> | CDCl <sub>3</sub> | toluene- <i>d</i> <sub>8</sub> | C <sub>6</sub> D <sub>6</sub> | C <sub>6</sub> D <sub>5</sub> Cl | (CD <sub>3</sub> ) <sub>2</sub> CO | (CD <sub>3</sub> ) <sub>2</sub> SO | CD <sub>3</sub> CN | TFE- <i>d</i> <sub>3</sub> | CD <sub>3</sub> OD | D <sub>2</sub> O |  |
|----------------------------|---------------------------------|-------------------|----------------------------|---------------------------------|-------------------|--------------------------------|-------------------------------|----------------------------------|------------------------------------|------------------------------------|--------------------|----------------------------|--------------------|------------------|--|
| solvent residual signals   |                                 |                   | 1.72<br>3.58               | 5.32                            | 7.26              | 2.08<br>6.97<br>7.01<br>7.09   | 7.16                          | 6.96<br>6.99<br>7.14             | 2.05                               | 2.50                               | 1.94               | 5.02<br>3.88               | 3.31               | 4.79             |  |
| water                      | OH                              | s                 | 2.46                       | 1.52                            | 1.56              | 0.43                           | 0.40                          | 1.03                             | 2.84 <sup>b</sup>                  | 3.33 <sup>b</sup>                  | 2.13               | 3.66                       | 4.87               |                  |  |
| acetic acid                | CH <sub>3</sub>                 | s                 | 1.89                       | 2.06                            | 2.10              | 1.57                           | 1.52                          | 1.76                             | 1.96                               | 1.91                               | 1.96               | 2.06                       | 1.99               | 2.08             |  |
| acetone                    | CH <sub>3</sub>                 | s                 | 2.05                       | 2.12                            | 2.17              | 1.57                           | 1.55                          | 1.77                             | 2.09                               | 2.09                               | 2.08               | 2.19                       | 2.15               | 2.22             |  |
| acetonitrile               | CH <sub>3</sub>                 | s                 | 1.95                       | 1.97                            | 2.10              | 0.69                           | 0.58                          | 1.21                             | 2.05                               | 2.07                               | 1.96               | 1.95                       | 2.03               | 2.06             |  |
| benzene                    | CH                              | s                 | 7.31                       | 7.35                            | 7.36              | 7.12                           | 7.15                          | 7.20                             | 7.36                               | 7.37                               | 7.37               | 7.36                       | 7.33               |                  |  |
| <i>tert</i> -butyl alcohol | CH <sub>3</sub>                 | s                 | 1.15                       | 1.24                            | 1.28              | 1.03                           | 1.05                          | 1.12                             | 1.18                               | 1.11                               | 1.16               | 1.28                       | 1.40               | 1.24             |  |
|                            | OH                              | s <sup>c</sup>    | 3.16                       |                                 |                   | 0.58                           | 0.63                          | 1.30                             |                                    | 4.19                               | 2.18               | 2.20                       |                    |                  |  |
| chloroform                 | CH                              | s                 | 7.89                       | 7.32                            | 7.26              | 6.10                           | 6.15                          | 6.74                             | 8.02                               | 8.32                               | 7.58               | 7.33                       | 7.90               |                  |  |
| 18-crown-6                 | CH <sub>2</sub>                 | s                 | 3.57                       | 3.59                            | 3.67              | 3.36                           | 3.39                          | 3.41                             | 3.59                               | 3.51                               | 3.51               | 3.64                       | 3.64               | 3.80             |  |
| cyclohexane                | CH <sub>2</sub>                 | s                 | 1.44                       | 1.44                            | 1.43              | 1.40                           | 1.40                          | 1.37                             | 1.43                               | 1.40                               | 1.44               | 1.47                       | 1.45               |                  |  |
| 1,2-dichloroethane         | CH <sub>2</sub>                 | s                 | 3.77                       | 3.76                            | 3.73              | 2.91                           | 2.90                          | 3.26                             | 3.87                               | 3.90                               | 3.81               | 3.71                       | 3.78               |                  |  |
| dichloromethane            | CH <sub>2</sub>                 | s                 | 5.51                       | 5.33                            | 5.30              | 4.32                           | 4.27                          | 4.77                             | 5.63                               | 5.76                               | 5.44               | 5.24                       | 5.49               |                  |  |
| diethyl ether              | CH <sub>3</sub>                 | t, 7              | 1.12                       | 1.15                            | 1.21              | 1.10                           | 1.11                          | 1.10                             | 1.11                               | 1.09                               | 1.12               | 1.20                       | 1.18               | 1.17             |  |
|                            | CH <sub>2</sub>                 | q, 7              | 3.38                       | 3.43                            | 3.48              | 3.25                           | 3.26                          | 3.31                             | 3.41                               | 3.38                               | 3.42               | 3.58                       | 3.49               | 3.56             |  |
| diglyme                    | CH <sub>2</sub>                 | m                 | 3.43                       | 3.57                            | 3.65              | 3.43                           | 3.46                          | 3.49                             | 3.56                               | 3.51                               | 3.53               | 3.67                       | 3.61               | 3.67             |  |
|                            | CH <sub>2</sub>                 | m                 | 3.53                       | 3.50                            | 3.57              | 3.31                           | 3.34                          | 3.37                             | 3.47                               | 3.38                               | 3.45               | 3.62                       | 3.58               | 3.61             |  |
| dimethylformamide          | OCH <sub>3</sub>                | s                 | 3.28                       | 3.33                            | 3.39              | 3.12                           | 3.11                          | 3.16                             | 3.28                               | 3.24                               | 3.29               | 3.41                       | 3.35               | 3.37             |  |
|                            | CH                              | s                 | 7.91                       | 7.96                            | 8.02              | 7.57                           | 7.63                          | 7.73                             | 7.96                               | 7.95                               | 7.92               | 7.86                       | 7.97               | 7.92             |  |
|                            | CH <sub>3</sub>                 | s                 | 2.88                       | 2.91                            | 2.96              | 2.37                           | 2.36                          | 2.51                             | 2.94                               | 2.89                               | 2.89               | 2.98                       | 2.99               | 3.01             |  |
|                            | CH <sub>3</sub>                 | s                 | 2.76                       | 2.82                            | 2.88              | 1.96                           | 1.86                          | 2.30                             | 2.78                               | 2.73                               | 2.77               | 2.88                       | 2.86               | 2.85             |  |
| 1,4-dioxane                | CH <sub>2</sub>                 | s                 | 3.56                       | 3.65                            | 3.71              | 3.33                           | 3.35                          | 3.45                             | 3.59                               | 3.57                               | 3.60               | 3.76                       | 3.66               | 3.75             |  |
| DME                        | CH <sub>3</sub>                 | s                 | 3.28                       | 3.34                            | 3.40              | 3.12                           | 3.12                          | 3.17                             | 3.28                               | 3.24                               | 3.28               | 3.40                       | 3.35               | 3.37             |  |
|                            | CH <sub>2</sub>                 | s                 | 3.43                       | 3.49                            | 3.55              | 3.31                           | 3.33                          | 3.37                             | 3.46                               | 3.43                               | 3.45               | 3.61                       | 3.52               | 3.60             |  |
| ethane                     | CH <sub>3</sub>                 | s                 | 0.85                       | 0.85                            | 0.87              | 0.81                           | 0.80                          | 0.79                             | 0.83                               | 0.82                               | 0.85               | 0.85                       | 0.85               | 0.82             |  |
| ethanol                    | CH <sub>3</sub>                 | t, 7              | 1.10                       | 1.19                            | 1.25              | 0.97                           | 0.96                          | 1.06                             | 1.12                               | 1.06                               | 1.12               | 1.22                       | 1.19               | 1.17             |  |
|                            | CH <sub>2</sub>                 | q, 7 <sup>d</sup> | 3.51                       | 3.66                            | 3.72              | 3.36                           | 3.34                          | 3.51                             | 3.57                               | 3.44                               | 3.54               | 3.71                       | 3.60               | 3.65             |  |
|                            | OH                              | s <sup>c,d</sup>  | 3.30                       | 1.33                            | 1.32              | 0.83                           | 0.50                          | 1.39                             | 3.39                               | 4.63                               | 2.47               |                            |                    |                  |  |
| ethyl acetate              | CH <sub>3</sub> CO              | s                 | 1.94                       | 2.00                            | 2.05              | 1.69                           | 1.65                          | 1.78                             | 1.97                               | 1.99                               | 1.97               | 2.03                       | 2.01               | 2.07             |  |
|                            | CH <sub>2</sub> CH <sub>3</sub> | q, 7              | 4.04                       | 4.08                            | 4.12              | 3.87                           | 3.89                          | 3.96                             | 4.05                               | 4.03                               | 4.06               | 4.14                       | 4.09               | 4.14             |  |
|                            | CH <sub>2</sub> CH <sub>3</sub> | t, 7              | 1.19                       | 1.23                            | 1.26              | 0.94                           | 0.92                          | 1.04                             | 1.20                               | 1.17                               | 1.20               | 1.26                       | 1.24               | 1.24             |  |
| ethylene                   | CH <sub>2</sub>                 | s                 | 5.36                       | 5.40                            | 5.40              | 5.25                           | 5.25                          | 5.29                             | 5.38                               | 5.41                               | 5.41               | 5.40                       | 5.39               | 5.44             |  |
| ethylene glycol            | CH <sub>2</sub>                 | s <sup>e</sup>    | 3.48                       | 3.66                            | 3.76              | 3.36                           | 3.41                          | 3.58                             | 3.28                               | 3.34                               | 3.51               | 3.72                       | 3.59               | 3.65             |  |
| H grease <sup>f</sup>      | CH <sub>3</sub>                 | m                 | 0.85–0.91                  | 0.84–0.90                       | 0.84–0.87         | 0.89–0.96                      | 0.90–0.98                     | 0.86–0.92                        | 0.90                               | 0.82–0.88                          |                    | 0.88–0.94                  | 0.86–0.93          |                  |  |
| hexamethylbenzene          | CH <sub>2</sub>                 | br s              | 1.29                       | 1.27                            | 1.25              | 1.33                           | 1.32                          | 1.30                             | 1.29                               | 1.24                               |                    | 1.33                       | 1.29               |                  |  |
| n-hexane                   | CH <sub>3</sub>                 | s                 | 2.18                       | 2.20                            | 2.24              | 2.10                           | 2.13                          | 2.10                             | 2.17                               | 2.14                               | 2.19               | 2.24                       | 2.19               |                  |  |
|                            | CH <sub>3</sub>                 | t, 7              | 0.89                       | 0.89                            | 0.88              | 0.88                           | 0.89                          | 0.85                             | 0.88                               | 0.86                               | 0.89               | 0.91                       | 0.90               |                  |  |
| HMDSO                      | CH <sub>3</sub>                 | m                 | 1.29                       | 1.27                            | 1.26              | 1.22                           | 1.24                          | 1.19                             | 1.28                               | 1.25                               | 1.28               | 1.31                       | 1.29               |                  |  |
| HMPA                       | CH <sub>3</sub>                 | d, 9.5            | 2.58                       | 2.60                            | 2.65              | 2.42                           | 2.40                          | 2.47                             | 2.59                               | 2.53                               | 2.57               | 2.63                       | 2.64               | 2.61             |  |
| hydrogen                   | H <sub>2</sub>                  | s                 | 4.55                       | 4.59                            | 4.62              | 4.50                           | 4.47                          | 4.49                             | 4.54                               | 4.61                               | 4.57               | 4.53                       | 4.56               |                  |  |
| imidazole                  | CH(2)                           | s                 | 7.48                       | 7.63                            | 7.67              | 7.30                           | 7.33                          | 7.53                             | 7.62                               | 7.63                               | 7.57               | 7.61                       | 7.67               | 7.78             |  |
|                            | CH(4,5)                         | s                 | 6.94                       | 7.07                            | 7.10              | 6.86                           | 6.90                          | 7.01                             | 7.04                               | 7.01                               | 7.01               | 7.03                       | 7.05               | 7.14             |  |
| methane                    | CH <sub>4</sub>                 | s                 | 0.19                       | 0.21                            | 0.22              | 0.17                           | 0.16                          | 0.15                             | 0.17                               | 0.20                               | 0.20               | 0.18                       | 0.20               | 0.18             |  |
| methanol                   | CH <sub>3</sub>                 | s <sup>g</sup>    | 3.27                       | 3.42                            | 3.49              | 3.03                           | 3.07                          | 3.25                             | 3.31                               | 3.16                               | 3.28               | 3.44                       | 3.34               | 3.34             |  |
|                            | OH                              | s <sup>c,g</sup>  | 3.02                       | 1.09                            | 1.09              |                                |                               | 1.30                             | 3.12                               | 4.01                               | 2.16               |                            |                    |                  |  |
| nitromethane               | CH <sub>3</sub>                 | s                 | 4.31                       | 4.31                            | 4.33              | 3.01                           | 2.94                          | 3.59                             | 4.43                               | 4.42                               | 4.31               | 4.28                       | 4.34               | 4.40             |  |
| n-pentane                  | CH <sub>3</sub>                 | t, 7              | 0.89                       | 0.89                            | 0.88              | 0.87                           | 0.87                          | 0.84                             | 0.88                               | 0.86                               | 0.89               | 0.90                       | 0.90               |                  |  |
|                            | CH <sub>2</sub>                 | m                 | 1.31                       | 1.30                            | 1.27              | 1.25                           | 1.23                          | 1.23                             | 1.27                               | 1.27                               | 1.29               | 1.33                       | 1.29               |                  |  |
| propane                    | CH <sub>3</sub>                 | t, 7.3            | 0.90                       | 0.90                            | 0.90              | 0.89                           | 0.86                          | 0.84                             | 0.88                               | 0.87                               | 0.90               | 0.90                       | 0.91               | 0.88             |  |
|                            | CH <sub>2</sub>                 | sept, 7.3         | 1.33                       | 1.32                            | 1.32              | 1.32                           | 1.26                          | 1.26                             | 1.31                               | 1.29                               | 1.33               | 1.33                       | 1.34               | 1.30             |  |
| 2-propanol                 | CH <sub>3</sub>                 | d, 6              | 1.08                       | 1.17                            | 1.22              | 0.95                           | 0.95                          | 1.04                             | 1.10                               | 1.04                               | 1.09               | 1.20                       | 1.50               | 1.17             |  |
|                            | CH                              | sept, 6           | 3.82                       | 3.97                            | 4.04              | 3.65                           | 3.67                          | 3.82                             | 3.90                               | 3.78                               | 3.87               | 4.05                       |                    |                  |  |