

## GCE Chemistry Data Sheet


**Table 1**  
Infrared absorption data

Bond	Wavenumber /cm <sup>-1</sup>
N-H (amines)	3300–3500
O-H (alcohols)	3230–3550
C-H	2850–3300
O-H (acids)	2500–3000
C≡N	2220–2260
C=O	1680–1750
C=C	1620–1680
C-O	1000–1300
C-C	750–1100

**Table 2**  
<sup>1</sup>H n.m.r. chemical shift data

Type of proton	δ/ppm
ROH	0.5–5.0
RCH <sub>3</sub>	0.7–1.2
RNH <sub>2</sub>	1.0–4.5
R <sub>2</sub> CH <sub>2</sub>	1.2–1.4
R <sub>3</sub> CH	1.4–1.6
$\begin{array}{c}   \\ \text{R}-\text{C}-\text{C}- \\    \quad   \\ \text{O} \quad \text{H} \end{array}$	2.1–2.6
$\begin{array}{c}   \\ \text{R}-\text{O}-\text{C}- \\   \\ \text{H} \end{array}$	3.1–3.9
RCH <sub>2</sub> Cl or Br	3.1–4.2
$\begin{array}{c}   \\ \text{R}-\text{C}-\text{O}-\text{C}- \\    \quad   \\ \text{O} \quad \text{H} \end{array}$	3.7–4.1
$\begin{array}{c} \text{R} \quad \text{H} \\ \diagdown \quad / \\ \text{C}=\text{C} \\ / \quad \diagdown \end{array}$	4.5–6.0
$\begin{array}{c} \text{O} \\ // \\ \text{R}-\text{C} \\ \diagdown \\ \text{H} \end{array}$	9.0–10.0
$\begin{array}{c} \text{O} \\ // \\ \text{R}-\text{C} \\ \diagdown \\ \text{O}-\text{H} \end{array}$	10.0–12.0

**Table 3**  
<sup>13</sup>C n.m.r. chemical shift data

Type of carbon	δ/ppm
$\begin{array}{c}   \quad   \\ -\text{C}-\text{C}- \\   \quad   \end{array}$	5–40
$\begin{array}{c}   \\ \text{R}-\text{C}-\text{Cl or Br} \\   \end{array}$	10–70
$\begin{array}{c}   \\ \text{R}-\text{C}-\text{C}- \\    \quad   \\ \text{O} \quad   \end{array}$	20–50
$\begin{array}{c}   \\ \text{R}-\text{C}-\text{N} \\   \quad \diagdown \end{array}$	25–60
$\begin{array}{c}   \\ -\text{C}-\text{O}- \\   \end{array}$ alcohols, ethers or esters	50–90
$\begin{array}{c} \diagdown \quad / \\ \text{C}=\text{C} \\ / \quad \diagdown \end{array}$	90–150
R-C≡N	110–125
	110–160
$\begin{array}{c} \text{O} \\ // \\ \text{R}-\text{C}- \end{array}$ esters or acids	160–185
$\begin{array}{c} \text{O} \\ // \\ \text{R}-\text{C}- \end{array}$ aldehydes or ketones	190–220



