

## GCE Chemistry Data Sheet

**Table 1**

Infrared absorption data

| Bond              | Wavenumber<br>/cm <sup>-1</sup> |
|-------------------|---------------------------------|
| N—H<br>(amines)   | 3300 – 3500                     |
| O—H<br>(alcohols) | 3230 – 3550                     |
| C—H               | 2850 – 3300                     |
| O—H<br>(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   |
| $\text{R}-\text{C}(\text{O})-\text{H}$                                       | 2.1–2.6   |
| $\text{R}-\text{O}-\text{C}-\text{H}$                                        | 3.1–3.9   |
| RCH <sub>2</sub> Cl or Br                                                    | 3.1–4.2   |
| $\text{R}-\text{C}(\text{O})-\text{O}-\text{C}-\text{H}$                     | 3.7–4.1   |
| $\text{R}-\text{C}(\text{H})=\text{C}(\text{H})-\text{C}(\text{O})-\text{H}$ | 4.5–6.0   |
| $\text{R}-\text{C}(\text{O})-\text{H}$                                       | 9.0–10.0  |
| $\text{R}-\text{C}(\text{O})-\text{O}-\text{H}$                              | 10.0–12.0 |

**Table 3**

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

| Type of carbon                                                                      | δ/ppm   |
|-------------------------------------------------------------------------------------|---------|
| $-\text{C}-$                                                                        | 5–40    |
| $\text{R}-\text{C}-\text{Cl}$ or Br                                                 | 10–70   |
| $\text{R}-\text{C}(\text{O})-$                                                      | 20–50   |
| $\text{R}-\text{C}-\text{N}-$                                                       | 25–60   |
| $-\text{C}-\text{O}-$<br>alcohols,<br>ethers or<br>esters                           | 50–90   |
| $\text{C}=\text{C}$                                                                 | 90–150  |
| $\text{R}-\text{C}\equiv\text{N}$                                                   | 110–125 |
|  | 110–160 |
| $\text{R}-\text{C}(\text{O})-$<br>esters or<br>acids                                | 160–185 |
| $\text{R}-\text{C}(\text{O})-$<br>aldehydes<br>or ketones                           | 190–220 |

**AQA** 

