

GCE Chemistry Data Sheet

Table 1

Infrared absorption data

Bond	Wavenumber /cm ⁻¹
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

¹H n.m.r. chemical shift data

Type of proton	δ/ppm
ROH	0.5 – 5.0
RCH ₃	0.7 – 1.2
RNH ₂	1.0 – 4.5
R ₂ CH ₂	1.2 – 1.4
R ₃ 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 ₂ 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
$\begin{array}{c} \text{H} \\ \\ \text{R}-\text{C}=\text{C}- \\ \\ \text{H} \end{array}$	4.5 – 6.0
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{H} \end{array}$	9.0 – 10.0
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{O}-\text{H} \end{array}$	10.0 – 12.0

Table 3

¹³C n.m.r. chemical shift data

Type of carbon	δ/ppm
$\begin{array}{c} \\ -\text{C}-\text{C}- \\ \end{array}$	5 – 40
$\begin{array}{c} \\ \text{R}-\text{C}-\text{Cl} \text{ or } \text{Br} \\ \end{array}$	10 – 70
$\begin{array}{c} \\ \text{R}-\text{C}-\text{C}- \\ \quad \\ \text{O} \end{array}$	20 – 50
$\begin{array}{c} \\ \text{R}-\text{C}-\text{N}- \\ \end{array}$	25 – 60
$\begin{array}{c} \\ -\text{C}-\text{O}- \\ \end{array}$ alcohols, ethers or esters	50 – 90
$\begin{array}{c} \diagup \\ \text{C}=\text{C} \\ \diagdown \end{array}$	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



The Periodic Table of the Elements

1	2	3	4	5	6	7	0	
6.9 Li lithium 3	9.0 Be beryllium 4	10.8 B boron 5	12.0 C carbon 6	14.0 N nitrogen 7	16.0 O oxygen 8	19.0 F fluorine 9	20.2 Ne neon 10	
23.0 Na sodium 11	24.3 Mg magnesium 12	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18	
39.1 K potassium 19	40.1 Ca calcium 20	69.7 Ga gallium 31	72.6 Ge germanium 32	74.9 As arsenic 33	79.0 Se selenium 34	79.9 Br bromine 35	83.8 Kr krypton 36	
85.5 Rb rubidium 37	87.6 Sr strontium 38	114.8 In indium 49	118.7 Sn tin 50	121.8 Sb antimony 51	127.6 Te tellurium 52	126.9 I iodine 53	131.3 Xe xenon 54	
132.9 Cs caesium 55	137.3 Ba barium 56	204.4 Tl thallium 81	207.2 Pb lead 82	209.0 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86	
[223] Fr francium 87	[226] Ra radium 88	Elements with atomic numbers 112-116 have been reported but not fully authenticated					[222] Rn radon 86	

1.0 H hydrogen 1

Key
relative atomic mass
symbol
name
atomic (proton) number

140.1 Ce cerium 58	140.9 Pr praseodymium 59	144.2 Nd neodymium 60	150.4 Sm samarium 62	157.3 Gd gadolinium 64	162.5 Dy dysprosium 66	164.9 Ho holmium 67	167.3 Er erbium 68	168.9 Tm thulium 69	173.1 Yb ytterbium 70	175.0 Lu lutetium 71
232.0 Th thorium 90	231.0 Pa protactinium 91	238.0 U uranium 92	[244] Pu plutonium 94	[243] Am americium 95	[251] Cf californium 98	[252] Es einsteinium 99	[257] Fm fermium 100	[258] Md mendelevium 101	[259] No nobelium 102	[262] Lr lawrencium 103

* 58 – 71 Lanthanides

+ 90 – 103 Actinides