



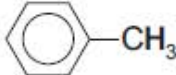
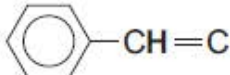
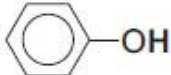
## WJEC Eduqas A LEVEL in CHEMISTRY

### Data Booklet

#### Infrared absorption values


Bond	Wavenumber (cm <sup>-1</sup> )
C—Br	500 to 600
C—Cl	650 to 800
C—O	1000 to 1300
C=C	1620 to 1670
C=O	1650 to 1750
C≡N	2100 to 2250
C—H	2800 to 3100
O—H (carboxylic acid)	2500 to 3200 (very broad)
O—H (alcohol/ phenol)	3200 to 3550 (broad)
N—H	3300 to 3500

$^1\text{H}$  NMR chemical shifts relative to TMS = 0

Type of proton	Chemical shift, $\delta$ (ppm)
$-\text{CH}_3$	0.1 to 2.0
$\text{R}-\text{CH}_3$	0.9
$\text{R}-\text{CH}_2-\text{R}$	1.3
$\text{CH}_3-\text{C}\equiv\text{N}$	2.0
$\text{CH}_3-\text{C}(=\text{O})$	2.0 to 2.5
$-\text{CH}_2-\text{C}(=\text{O})$	2.0 to 3.0
	2.2 to 2.3
$\text{R}-\text{CH}_2\text{Cl}$	3.3 to 4.3
$\text{R}-\text{OH}$	4.5 *
$-\text{C}=\text{CH}-\text{CO}$	5.8 to 6.5
	6.5 to 7.5
	7.0 *
$\text{R}-\text{C}(=\text{O})\text{H}$	9.8 *
$\text{R}-\text{C}(=\text{O})\text{OH}$	11.0 *

\*variable figure dependent on concentration and solvent

<sup>13</sup>C NMR chemical shifts relative to TMS = 0

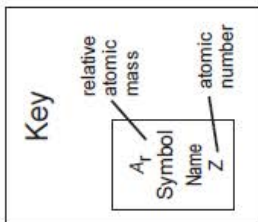
Type of carbon	Chemical shift, $\delta$ (ppm)
$\begin{array}{c}   \quad   \\ -\text{C} - \text{C}- \\   \quad   \end{array}$	5 to 40
$\begin{array}{c}   \\ \text{R}-\text{C}-\text{Cl} \\   \end{array}$	10 to 70
$\begin{array}{c}   \\ \text{R}-\text{C}-\text{C}- \\    \quad   \\ \text{O} \end{array}$	20 to 50
$\begin{array}{c}   \\ \text{R}-\text{C}-\text{N} \diagup \diagdown \\   \end{array}$	25 to 60
$\begin{array}{c}   \\ -\text{C}-\text{O}- \\   \end{array}$	50 to 90
$\begin{array}{c} \diagdown \quad \diagup \\ \text{C} = \text{C} \\ \diagup \quad \diagdown \end{array}$	90 to 150
$\text{R}-\text{C} \equiv \text{N}$	110 to 125
	110 to 160
$\begin{array}{c} \text{R}-\text{C}- \text{ (carboxylic acid / ester)} \\    \\ \text{O} \end{array}$	160 to 185
$\begin{array}{c} \text{R}-\text{C}- \text{ (aldehyde / ketone)} \\    \\ \text{O} \end{array}$	190 to 220

# THE PERIODIC TABLE

Group 1 2 3 4 5 6 7 0

Period 1 2 3 4 5 6 7

Period	1	2	3	4	5	6	7	0
1	1.01 H Hydrogen 1							4.00 He Helium 2
2	6.94 Li Lithium 3	9.01 Be Beryllium 4						19.0 F Fluorine 9
3	23.0 Na Sodium 11	24.3 Mg Magnesium 12						16.0 O Oxygen 8
4	39.1 K Potassium 19	40.1 Ca Calcium 20	54.9 Mn Manganese 25	58.9 Co Cobalt 27	58.7 Ni Nickel 28	63.5 Cu Copper 29	65.4 Zn Zinc 30	14.0 N Nitrogen 7
5	85.5 Rb Rubidium 37	87.6 Sr Strontium 38	91.2 Zr Zirconium 40	92.9 Nb Niobium 41	98.9 Ru Ruthenium 44	101 Rh Rhodium 45	108 Pd Palladium 46	112 Ag Silver 47
6	133 Cs Caesium 55	137 Ba Barium 56	179 Hf Hafnium 72	181 Ta Tantalum 73	186 Re Rhenium 75	192 Os Osmium 76	197 Au Gold 79	127 I Iodine 53
7	(223) Fr Francium 87	(226) Ra Radium 88	(227) La Lanthanum 57	(227) Ac Actinium 89				(210) Po Polonium 84
								(210) Bi Bismuth 83
								(209) Pb Lead 82
								207 Tl Thallium 81
								204 Hg Mercury 80
								201 Au Gold 79
								197 Pt Platinum 78
								195 Ir Iridium 77
								192 Cd Cadmium 48
								186 Ag Silver 47
								184 Pd Palladium 46
								181 Rh Rhodium 45
								179 Ru Ruthenium 44
								177 Co Cobalt 27
								175 Ni Nickel 28
								173 Cu Copper 29
								172 Zn Zinc 30
								170 Fe Iron 26
								169 Mn Manganese 25
								168 Cr Chromium 24
								167 V Vanadium 23
								166 Ti Titanium 22
								165 Sc Scandium 21
								164 Y Yttrium 39
								163 La Lanthanum 57
								162 Ac Actinium 89
								161 Ce Cerium 58
								160 Pr Praseodymium 59
								159 Nd Neodymium 60
								158 Pm Promethium 61
								157 Sm Samarium 62
								156 Eu Europium 63
								155 Gd Gadolinium 64
								154 Tb Terbium 65
								153 Dy Dysprosium 66
								152 Ho Holmium 67
								151 Er Erbium 68
								150 Tm Thulium 69
								149 Yb Ytterbium 70
								148 Lu Lutetium 71
								147 Ce Cerium 58
								146 Pr Praseodymium 59
								145 Nd Neodymium 60
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								96 Ho Holmium 67
								95 Er Erbium 68
								94 Tm Thulium 69
								93 Yb Ytterbium 70
								92 Lu Lutetium 71
								91 Ce Cerium 58
								90 Pr Praseodymium 59



d Block

f Block

▶ Lanthanoid elements

▶▶ Actinoid elements