

Data Sheet for Chemistry

GCE Advanced level and Advanced Subsidiary

Chemistry 3882, 7882

Chemistry units 2811 – 2816

These data are for the use of candidates following Chemistry 3882 or 7882.

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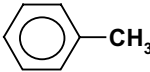
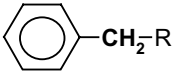
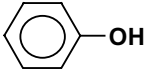
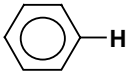
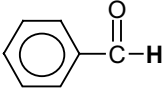
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Characteristic infra-red absorptions in organic molecules

bond	location	wavenumber
C–O	alcohols, esters	1000 – 1300 cm ⁻¹
C=O	aldehydes, ketones, carboxylic acids, esters	1680 – 1750 cm ⁻¹
O–H	hydrogen bonded in carboxylic acids	2500 – 3300 cm ⁻¹ (broad)
N–H	primary amines	3100 – 3500 cm ⁻¹
O–H	hydrogen bonded in alcohols, phenols	3230 – 3550 cm ⁻¹
O–H	free	3580 – 3670 cm ⁻¹

Chemical shifts for some types of protons in n.m.r. spectra

- Chemical shifts are for hydrogen relative to TMS (tetramethylsilane)
- Chemical shifts are typical values and can vary slightly depending on the solvent, concentration and substituents.

type of proton	chemical shift, δ
R-CH ₃	0.7–1.6
R-CH ₂ -R	1.2–1.4
R ₃ CH	1.6–2.0
$\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{CH}_3 \end{array}$ $\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{CH}_2-\text{R} \end{array}$	2.0–2.9
 	2.3–2.7
$-\text{O}-\text{CH}_3$ $-\text{O}-\text{CH}_2-\text{R}$	3.3–4.3
R-OH	3.5–5.5
	6.5–7.0
	7.1–7.7
$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}-\text{C}-\text{H} \end{array}$ 	9.5–10
$\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{OH} \end{array}$	11.0–11.7

The Periodic Table of the Elements

		Group																																																																																																				
1	2	3	4	5	6	7	8	9	10	11	12																																																																																											
		1.0 H hydrogen 1																																																																																																				
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		atomic symbol																																																																																																				
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		atomic number																																																																																																				
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	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulphur 16	35.5 Cl chlorine 17	39.9 Ar argon 18	40.1 Ca calcium 20	45.0 Sc scandium 21	47.9 Ti titanium 22	50.9 V vanadium 23	52.0 Cr chromium 24	54.9 Mn manganese 25	55.8 Fe iron 26	58.9 Co cobalt 27	58.7 Ni nickel 28	63.5 Cu copper 29	65.4 Zn zinc 30	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	88.9 Y yttrium 39	91.2 Zr zirconium 40	92.9 Nb niobium 41	95.9 Mo molybdenum 42	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	127 I iodine 53	131 Xe xenon 54	133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	210 Rn radon 86	223 Fr francium 87	226 Ra radium 88	227 Ac actinium 89	238 U uranium 92	232 Th thorium 90	231 Pa protactinium 91	237 Np neptunium 93	244 Pu plutonium 94	247 Am americium 95	251 Cm curium 96	252 Bk berkelium 97	257 Cf californium 98	261 Es einsteinium 99	267 Fm fermium 100	271 Md mendelevium 101	277 No nobelium 102	285 Lw lawrencium 103	289 Uuh ununhexium 116	289 Uuq ununquadium 114	289 Uub ununbium 112	289 Uuu unununium 111	289 Uun ununnilium 110	289 Mt meitnerium 109	289 Sg seaborgium 106	289 Bh bohrium 107	289 Hs hassium 108	289 Ds dubnium 105	289 Rf rutherfordium 104	289 Db dubnium 105	289 Sg seaborgium 106	289 Bh bohrium 107	289 Hs hassium 108	289 Mt meitnerium 109	289 Uun ununnilium 110	289 Uuu unununium 111	289 Uub ununbium 112	289 Uuh ununhexium 116	289 Uuo ununoctium 118

lanthanides *

actinides *

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	147 Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	163 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
289 Uuo ununoctium 118	289 Uuh ununhexium 116	289 Uuq ununquadium 114	289 Uub ununbium 112	289 Uuu unununium 111	289 Uun ununnilium 110	289 Uuh ununhexium 116	289 Uuo ununoctium 118	289 Uuh ununhexium 116	289 Uuo ununoctium 118	289 Uuh ununhexium 116	289 Uuo ununoctium 118	289 Uuo ununoctium 118	289 Uuo ununoctium 118

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