



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.

Clean copies of this sheet must be issued to candidates in the examination room, and must be given up to the invigilator at the end of the examination.

Copies of this sheet may be used for teaching.

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
$\text{R}-\text{CH}_3$	0.7 – 1.6
$\text{R}-\text{CH}_2-\text{R}$	1.2 – 1.4
R_3CH	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
$\text{C}_6\text{H}_5-\text{CH}_3$ $\text{C}_6\text{H}_5-\text{CH}_2-\text{R}$	2.3 – 2.7
$-\text{O}-\text{CH}_3$ $-\text{O}-\text{CH}_2-\text{R}$	3.3 – 4.3
$\text{R}-\text{OH}$	3.5 – 5.5
$\text{C}_6\text{H}_5-\text{OH}$	6.5 – 7.0
$\text{C}_6\text{H}_5-\text{H}$	7.1 – 7.7
$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}-\text{C}-\text{H} \end{array}$ $\begin{array}{c} \text{O} \\ \parallel \\ \text{C}_6\text{H}_5-\text{C}-\text{H} \end{array}$	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	Key					3	4	5	6	7	0
		<div>1.0 H hydrogen 1</div>										
		<div>relative atomic mass atomic symbol name atomic number</div>										
6.9 Li lithium 3	9.0 Be beryllium 4											
23.0 Na sodium 11	24.3 Mg magnesium 12	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					
39.1 K potassium 19	40.1 Ca calcium 20	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					
85.5 Rb rubidium 37	87.6 Sr strontium 38	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					
133 Cs caesium 55	137 Ba barium 56	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54					
–	–	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86					
Fr francium 87	Ra radium 88	–	Uuq ununquadium 114	–	Uuh ununhexium 116	–	Uuo ununoctium 118					

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