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A-level  
**CHEMISTRY**

7405

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Data Booklet

This Data Booklet is provided with AQA A-level Chemistry question papers.

# The Periodic Table of the Elements

	1	2	3	4	5	6	7	0		
(1)	6.9 <b>Li</b> lithium 3	9.0 <b>Be</b> beryllium 4	(2)	10.8 <b>B</b> boron 5	12.0 <b>C</b> carbon 6	14.0 <b>N</b> nitrogen 7	16.0 <b>O</b> oxygen 8	19.0 <b>F</b> fluorine 9	(17)	20.2 <b>Ne</b> neon 10
(2)	23.0 <b>Na</b> sodium 11	24.3 <b>Mg</b> magnesium 12	(3)	27.0 <b>Al</b> aluminium 13	28.1 <b>Si</b> silicon 14	31.0 <b>P</b> phosphorus 15	32.1 <b>S</b> sulfur 16	35.5 <b>Cl</b> chlorine 17	(16)	39.9 <b>Ar</b> argon 18
(3)	39.1 <b>K</b> potassium 19	40.1 <b>Ca</b> calcium 20	(4)	69.7 <b>Ga</b> gallium 31	72.6 <b>Ge</b> germanium 32	74.9 <b>As</b> arsenic 33	79.0 <b>Se</b> selenium 34	79.9 <b>Br</b> bromine 35	(15)	83.8 <b>Kr</b> krypton 36
(4)	85.5 <b>Rb</b> rubidium 37	87.6 <b>Sr</b> strontium 38	(5)	114.8 <b>In</b> indium 49	118.7 <b>Sn</b> tin 50	121.8 <b>Sb</b> antimony 51	127.6 <b>Te</b> tellurium 52	126.9 <b>I</b> iodine 53	(14)	131.3 <b>Xe</b> xenon 54
(5)	132.9 <b>Cs</b> caesium 55	137.3 <b>Ba</b> barium 56	(6)	200.6 <b>Hg</b> mercury 80	204.4 <b>Tl</b> thallium 81	207.2 <b>Pb</b> lead 82	209.0 <b>Po</b> polonium 84	[210] <b>At</b> astatine 85	(13)	[222] <b>Rn</b> radon 86
(6)	[223] <b>Fr</b> francium 87	[226] <b>Ra</b> radium 88	(7)	[280] <b>Rg</b> roentgenium 111	[281] <b>Ds</b> darmstadtium 110	[276] <b>Mt</b> meitnerium 109	[270] <b>Hs</b> hassium 108	[272] <b>Bh</b> bohrium 107	(12)	Elements with atomic numbers 112-116 have been reported but not fully authenticated
(7)	[227] <b>Ac</b> † actinium 89	[227] <b>La</b> * lanthanum 57	(8)	[276] <b>Mt</b> meitnerium 109	[281] <b>Ds</b> darmstadtium 110	[270] <b>Hs</b> hassium 108	[272] <b>Bh</b> bohrium 107	[272] <b>Bh</b> bohrium 107	(11)	
(8)	[227] <b>Ac</b> † actinium 89	[227] <b>La</b> * lanthanum 57	(9)	150.4 <b>Sm</b> samarium 62	152.0 <b>Eu</b> europium 63	157.3 <b>Gd</b> gadolinium 64	158.9 <b>Tb</b> terbium 65	162.5 <b>Dy</b> dysprosium 66	(10)	
(9)	[227] <b>Ac</b> † actinium 89	[227] <b>La</b> * lanthanum 57	(10)	164.9 <b>Ho</b> holmium 67	167.3 <b>Er</b> erbium 68	173.1 <b>Yb</b> ytterbium 70	175.0 <b>Lu</b> lutetium 71	[251] <b>Cf</b> californium 98	(13)	
(10)	[227] <b>Ac</b> † actinium 89	[227] <b>La</b> * lanthanum 57	(11)	168.9 <b>Tm</b> thulium 69	168.9 <b>Tm</b> thulium 69	168.9 <b>Tm</b> thulium 69	168.9 <b>Tm</b> thulium 69	[258] <b>Md</b> mendelevium 101	(16)	
(11)	[227] <b>Ac</b> † actinium 89	[227] <b>La</b> * lanthanum 57	(12)	173.1 <b>Yb</b> ytterbium 70	173.1 <b>Yb</b> ytterbium 70	173.1 <b>Yb</b> ytterbium 70	173.1 <b>Yb</b> ytterbium 70	[259] <b>No</b> nobelium 102	(17)	
(12)	[227] <b>Ac</b> † actinium 89	[227] <b>La</b> * lanthanum 57	(13)	175.0 <b>Lu</b> lutetium 71	175.0 <b>Lu</b> lutetium 71	175.0 <b>Lu</b> lutetium 71	175.0 <b>Lu</b> lutetium 71	[262] <b>Lr</b> lawrencium 103	(18)	


1.0 <b>H</b> hydrogen 1
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Key
relative atomic mass
symbol
name
atomic (proton) number

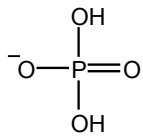
\* 58 – 71 Lanthanides

† 90 – 103 Actinides

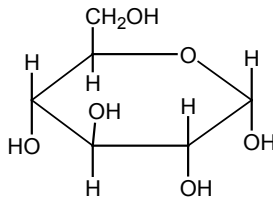
## Data Sheet

Infrared absorption data		<sup>1</sup> H NMR chemical shift data		<sup>13</sup> C NMR chemical shift data	
Bond	Wavenumber /cm <sup>-1</sup>	Type of proton	δ/ppm	Type of carbon	δ/ppm
N—H (amines)	3300 – 3500	ROH	0.5–5.0	$\begin{array}{c}   \\ -C- \\   \end{array}$	5–40
O—H (alcohols)	3230 – 3550	RCH <sub>3</sub>	0.7–1.2	$\begin{array}{c}   \\ R-C-Cl \text{ or } Br \\   \end{array}$	10–70
C—H	2850 – 3300	RNH <sub>2</sub>	1.0–4.5	$\begin{array}{c}   \\ R-C-C- \\    \quad   \\ O \end{array}$	20–50
O—H (acids)	2500 – 3000	R <sub>2</sub> CH <sub>2</sub>	1.2–1.4	$\begin{array}{c}   \\ R-C-N \\   \end{array}$	25–60
C≡N	2220 – 2260	R <sub>3</sub> CH	1.4–1.6	$\begin{array}{c}   \\ -C-O- \\   \end{array}$	50–90
C=O	1680 – 1750	$\begin{array}{c}   \\ R-C-C- \\    \quad   \\ O \end{array}$	2.1–2.6	$\begin{array}{c} \diagup \\ C=C \\ \diagdown \end{array}$	90–150
C=C	1620 – 1680	R—O—C—H	3.1–3.9	$R-C \equiv N$	110–125
C—O	1000 – 1300	RCH <sub>2</sub> Cl or Br	3.1–4.2		110–160
C—C	750 – 1100	$\begin{array}{c}   \\ R-C-O-C- \\    \quad   \\ O \end{array}$	3.7–4.1	$\begin{array}{c}   \\ R-C- \\    \\ O \end{array}$	160–185
		$\begin{array}{c} H \\   \\ R-C=C- \\   \end{array}$	4.5–6.0	$\begin{array}{c}   \\ R-C- \\    \\ O \end{array}$	190–220
		$\begin{array}{c} O \\    \\ R-C-H \\   \\ O-H \end{array}$	9.0–10.0		
		$\begin{array}{c} O \\    \\ R-C-O-H \end{array}$	10.0–12.0		

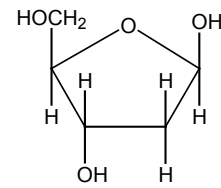
alcohols,  
ethers or  
estersesters or  
acidsaldehydes  
or  
ketones

**Phosphate and sugars**

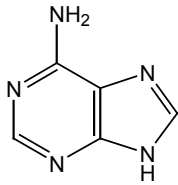
phosphate



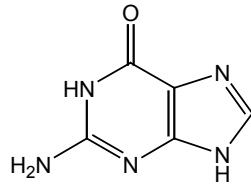
glucose



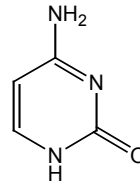
2-deoxyribose

**Bases**

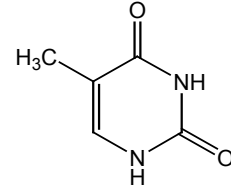
adenine



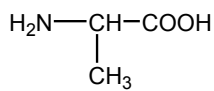
guanine



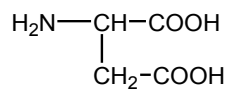
cytosine



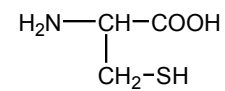
thymine

**Amino acids**

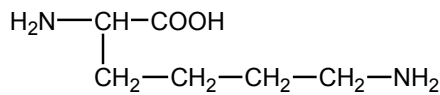
alanine



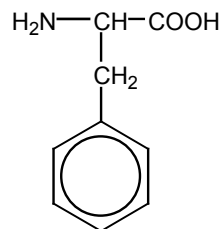
aspartic acid



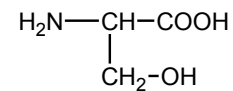
cysteine



lysine



phenylalanine



serine

**Haem B**