GCE

Rewarding Learning

CHEMISTRY DATA SHEET
GCE A/AS EXAMINATIONS
CHEMISTRY

Including the Periodic Table of the Elements

For the use of candidates taking
Advanced Subsidiary and Advanced Level
Chemistry Examinations

Copies must be free from notes or additions of any kind. No other type of data booklet or information sheet is authorised for use in the examinations.

For first teaching from September 2016
For first award of AS level in Summer 2017
For first award of A level in Summer 2018
Subject Code: 1110

THE PERIODIC TABLE OF ELEMENTS

Group	I	II											III	IV	V	VI	VII	O
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H Hydrogen 1																	4 He Helium 2
2	7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
3	23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
4	39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
5	85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	[98] Tc Technetium 43	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	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
6	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	[209] Po Polonium 84	[210] At Astatine 85	[222] Rn Radon 86
7	[223] Fr Francium 87	[226] Ra Radium 88	[227] Ac† Actinium 89	[261] Rf Rutherfordium 104	[262] Db Dubnium 105	[266] Sg Seaborgium 106	[264] Bh Bohrium 107	[277] Hs Hassium 108	[268] Mt Meitnerium 109	[271] Ds Darmstadtium 110	[272] Rg Roentgenium 111							

Elements with atomic numbers 112-118 have been reported

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	145 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	[231] Pa Protactinium 91	238 U Uranium 92	[237] Np Neptunium 93	[242] Pu Plutonium 94	[243] Am Americium 95	[247] Cm Curium 96	[245] Bk Berkelium 97	[251] Cf Californium 98	[254] Es Einsteinium 99	[253] Fm Fermium 100	[256] Md Mendelevium 101	[254] No Nobelium 102	[257] Lr Lawrencium 103

* 58 – 71 Lanthanum series

† 90 – 103 Actinium series

a
b x

a = relative atomic mass (approx)
x = atomic symbol
b = atomic number

General Information

1 tonne = 10^6 g
1 metre = 10^9 nm
One mole of any gas at 293K and a pressure of 1 atmosphere (10^5 Pa) occupies a volume of 24dm^3
Avogadro Constant = 6.02 x 10^{23} mol^{-1}
Planck Constant = 6.63 x 10^{-34} Js
Specific Heat Capacity of water = 4.2 J g^{-1} K^{-1}
Speed of Light = 3 x 10^8 ms^{-1}

Characteristic absorptions in IR spectroscopy

Wavenumber/cm^{-1}	**Bond**	**Compound**
550 – 850	C – X (X=Cl, Br, I)	Haloalkanes
750 – 1100	C – C	Alkanes, alkyl groups
1000 – 1300	C – O	Alcohols, esters, carboxylic acids
1450 – 1650	C = C	Arenes
1600 – 1700	C = C	Alkenes
1650 – 1800	C = O	Carboxylic acids, esters, aldehydes, ketones, amides, acyl chlorides
2200 – 2300	C ≡ N	Nitriles
2500 – 3200	O – H	Carboxylic acids
2750 – 2850	C – H	Aldehydes
2850 – 3000	C – H	Alkanes, alkyl groups, alkenes, arenes
3200 – 3600	O – H	Alcohols
3300 – 3500	N – H	Amines, amides

Proton Chemical Shifts in Nuclear Magnetic Resonance Spectroscopy (relative to TMS)

Chemical Shift	**Structure**	
0.5 – 2.0	–C**H**	Saturated alkanes
0.5 – 5.5	–O**H**	Alcohols
1.0 – 3.0	–N**H**	Amines
2.0 – 3.0	–CO–C**H**	Ketones
	–N–C**H**	Amines
	C_6H_5–C**H**	Arene (aliphatic on ring)
2.0 – 4.0	X–C**H**	X = Cl or Br (3.0 – 4.0)
		X = I (2.0 – 3.0)
4.5 – 6.0	–C=C**H**	Alkenes
5.5 – 8.5	RCON**H**	Amides
6.0 – 8.0	–C_6**H**$_5$	Arenes (on ring)
9.0 – 10.0	–C**H**O	Aldehydes
10.0 – 12.0	–COO**H**	Carboxylic acids

These chemical shifts are concentration and temperature dependent and may be outside the ranges indicated above.

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