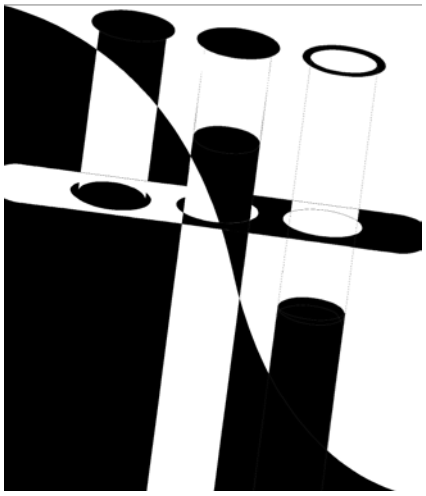
Chemistry Data Booklet



CfE Level 4

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Periodic Table of the Elements

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3 Lithium **Li**	4 Beryllium **Be**										5 Boron **B**	6 Carbon **C**	7 Nitrogen **N**	8 Oxygen **O**	9 Fluorine **F**	10 Neon **Ne**
11 Sodium **Na**	12 Magnesium **Mg**										13 Aluminium **Al**	14 Silicon **Si**	15 Phosphorus **P**	16 Sulfur **S**	17 Chlorine **Cl**	18 Argon **Ar**
19 Potassium **K**	20 Calcium **Ca**	21 Scandium **Sc**		22 Titanium **Ti**	23 Vanadium **V**	24 Chromium **Cr**	25 Manganese **Mn**	26 Iron **Fe**	27 Cobalt **Co**	28 Nickel **Ni**	29 Copper **Cu**	30 Zinc **Zn**	31 Gallium **Ga**	32 Germanium **Ge**	33 Arsenic **As**	34 Selenium **Se**	35 Bromine **Br**	36 Krypton **Kr**
37 Rubidium **Rb**	38 Strontium **Sr**	39 Yttrium **Y**		40 Zirconium **Zr**	41 Niobium **Nb**	42 Molybdenum **Mo**	43 Technetium **Tc**	44 Ruthenium **Ru**	45 Rhodium **Rh**	46 Palladium **Pd**	47 Silver **Ag**	48 Cadmium **Cd**	49 Indium **In**	50 Tin **Sn**	51 Antimony **Sb**	52 Tellurium **Te**	53 Iodine **I**	54 Xenon **Xe**
55 Caesium **Cs**	56 Barium **Ba**	57 Lanthanum **La**	58–71 ●	72 Hafnium **Hf**	73 Tantalum **Ta**	74 Tungsten **W**	75 Rhenium **Re**	76 Osmium **Os**	77 Iridium **Ir**	78 Platinum **Pt**	79 Gold **Au**	80 Mercury **Hg**	81 Thallium **Tl**	82 Lead **Pb**	83 Bismuth **Bi**	84 Polonium **Po**	85 Astatine **At**	86 Radon **Rn**
87 Francium **Fr**	88 Radium **Ra**	89 Actinium **Ac**	90–103 ■	104 Rutherfordium **Rf**	105 Dubnium **Db**	106 Seaborgium **Sg**	107 Bohrium **Bh**	108 Hassium **Hs**	109 Meitnerium **Mt**	110 Darmstadtium **Ds**	111 Roentgenium **Rg**	112 Copernicium **Cn**		114 Flerovium **Fl**		116 Livermorium **Lv**		

Key

Atomic Number
Name of Element
Symbol

TRANSITION METALS

●	58 Cerium **Ce**	59 Praseodymium **Pr**	60 Neodymium **Nd**	61 Promethium **Pm**	62 Samarium **Sm**	63 Europium **Eu**	64 Gadolinium **Gd**	65 Terbium **Tb**	66 Dysprosium **Dy**	67 Holmium **Ho**	68 Erbium **Er**	69 Thulium **Tm**	70 Ytterbium **Yb**	71 Lutetium **Lu**
■	90 Thorium **Th**	91 Protactinium **Pa**	92 Uranium **U**	93 Neptunium **Np**	94 Plutonium **Pu**	95 Americium **Am**	96 Curium **Cm**	97 Berkelium **Bk**	98 Californium **Cf**	99 Einsteinium **Es**	100 Fermium **Fm**	101 Mendelevium **Md**	102 Nobelium **No**	103 Lawrencium **Lr**

Elements below the dark line are metals.

MELTING POINTS, BOILING POINTS AND DENSITIES OF SELECTED ELEMENTS

Name	Density in density units	Melting point in °C	Boiling point in °C
Aluminium	2 70	660	2519
Bromine	3 12	-7	59
Calcium	1 55	842	1484
Chlorine	0 0032	-101	-34
Gold	19 3	1064	2856
Helium	0 0002	-272	-269
Iodine	4 93	114	184
Iron	7 87	1538	2861
Lithium	0 53	181	1347
Magnesium	1 74	650	1090
Mercury	13 5	-39	357
Nickel	8 90	1455	2913
Nitrogen	0 0013	-210	-196
Oxygen	0 0014	-219	-183
Potassium	0 86	64	759
Silicon	2 33	1414	3265
Silver	10 5	962	2212
Sodium	0 97	98	883
Sulphur	2 07	113	445
Tin	7 31	232	2602

MELTING AND BOILING POINTS OF SELECTED IONIC COMPOUNDS

Compound	Melting point in °C	Boiling point in °C
sodium bromide	747	1390
magnesium chloride	714	1412
calcium oxide	2614	2850
lithium iodide	469	1171
potassium fluoride	858	1502

MELTING AND BOILING POINTS OF SELECTED MOLECULAR COMPOUNDS

Compound	Melting point in °C	Boiling point in °C
water	0	100
methane	-182	-162
phenol	41	182
cyclohexane	7	81
naphthalene	80	218
ethene	-169	-104

SOLUBILITIES OF SELECTED COMPOUNDS IN WATER

The table shows how some compounds behave in water:

	carbonate	chloride	nitrate	phosphate	sulphate
calcium	insoluble	very soluble	very soluble	insoluble	soluble
copper	insoluble	very soluble	very soluble	insoluble	very soluble
iron	insoluble	very soluble	very soluble	insoluble	very soluble
magnesium	insoluble	very soluble	very soluble	insoluble	very soluble
potassium	very soluble	very soluble	very soluble	very soluble	very soluble
sodium	very soluble	very soluble	very soluble	very soluble	very soluble

Electron Arrangements of Main Group Elements

KEY:
Atomic Number
Name of Element
Symbol
Electron Arrangement

Atomic Number Name of Element Symbol
Electron arrangement

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 0
							2 Helium He 2
1 Hydrogen H 1		5 Boron B 2,3	6 Carbon C 2,4	7 Nitrogen N 2,5	8 Oxygen O 2,6	9 Fluorine F 2,7	10 Neon Ne 2,8
3 Lithium Li 2,1	4 Beryllium Be 2,2	13 Aluminium Al 2,8,3	14 Silicon Si 2,8,4	15 Phosphorus P 2,8,5	16 Sulfur S 2,8,6	17 Chlorine Cl 2,8,7	18 Argon Ar 2,8,8
11 Sodium Na 2,8,1	12 Magnesium Mg 2,8,2	31 Gallium Ga 2,8,18,3	32 Germanium Ge 2,8,18,4	33 Arsenic As 2,8,18,5	34 Selenium Se 2,8,18,6	35 Bromine Br 2,8,18,7	36 Krypton Kr 2,8,18,8
19 Potassium K 2,8,8,1	20 Calcium Ca 2,8,8,2	49 Indium In 2,8,18, 18,3	50 Tin Sn 2,8,18, 18,4	51 Antimony Sb 2,8,18, 18,5	52 Tellurium Te 2,8,18, 18,6	53 Iodine I 2,8,18, 18,7	54 Xenon Xe 2,8,18, 18,8
37 Rubidium Rb 2,8,18, 8,1	38 Strontium Sr 2,8,18, 8,2	81 Thallium Tl 2,8,18, 32,18,3	82 Lead Pb 2,8,18, 32,18,4	83 Bismuth Bi 2,8,18, 32,18,5	84 Polonium Po 2,8,18, 32,18,6	85 Astatine At 2,8,18, 32,18,7	86 Radon Rn 2,8,18, 32,18,8
55 Caesium Cs 2,8,18, 18,8,1	56 Barium Ba 2,8,18, 18,8,2						
87 Francium Fr 2,8,18,32, 18,8,1	88 Radium Ra 2,8,18,32, 18,8,2						

The elements on this side of the dark line are metals

The elements on this side of the dark line are non-metals

Flame Colours

Element	Ion	Flame colour
barium	Ba^{2+}	green
calcium	Ca^{2+}	orange-red
copper	Cu^{2+}	blue-green
lithium	Li^{+}	red

Element	Ion	Flame colour
potassium	K^{+}	lilac
sodium	Na^{+}	yellow
strontium	Sr^{2+}	red

Names, Symbols and Relative Atomic Masses

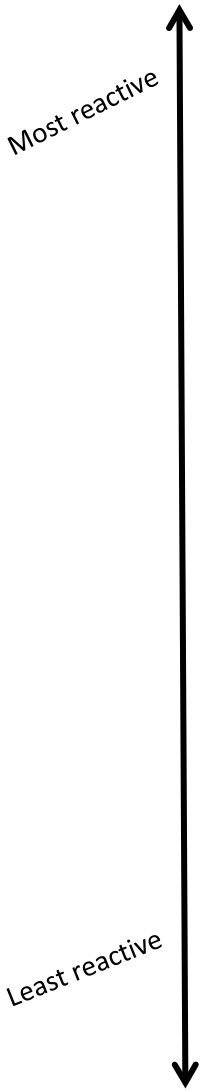
(Relative atomic masses, also known as average atomic masses, have been rounded to the nearest 0·5)

Element	Symbol	Relative atomic mass
Actinium	Ac	227
Aluminium	Al	27
Americium	Am	243
Antimony	Sb	122
Argon	Ar	40
Arsenic	As	75
Astatine	At	210
Barium	Ba	137·5
Berkelium	Bk	247
Beryllium	Be	9
Bismuth	Bi	209
Boron	B	11
Bromine	Br	80
Cadmium	Cd	112·5
Calcium	Ca	40
Californium	Cf	251
Carbon	C	12
Cerium	Ce	140
Caesium	Cs	133
Chlorine	Cl	35·5
Chromium	Cr	52
Cobalt	Co	59
Copper	Cu	63·5
Curium	Cm	247
Dysprosium	Dy	162·5
Einsteinium	Es	252
Erbium	Er	167·5
Europium	Eu	152
Fluorine	F	19
Francium	Fr	223
Gadolinium	Gd	157
Gallium	Ga	69·5
Germanium	Ge	72·5
Gold	Au	197
Hafnium	Hf	178·5
Helium	He	4
Holmium	Ho	165
Hydrogen	H	1
Indium	In	115
Iodine	I	127
Iridium	Ir	192
Iron	Fe	56
Krypton	Kr	84
Lanthanum	La	139
Lead	Pb	207
Lithium	Li	7
Lutetium	Lu	175
Magnesium	Mg	24·5

*The density of carbon as graphite is 2·27 g cm^{-3}
The density of carbon as diamond is 3·51 g cm^{-3}

Element	Symbol	Relative atomic mass
Manganese	Mn	55
Mercury	Hg	200·5
Molybdenum	Mo	96
Neodymium	Nd	144
Neon	Ne	20
Neptunium	Np	237
Nickel	Ni	58·5
Niobium	Nb	93
Nitrogen	N	14
Osmium	Os	190
Oxygen	O	16
Palladium	Pd	106·5
Phosphorus	P	31
Platinum	Pt	195
Plutonium	Pu	244
Polonium	Po	209
Potassium	K	39
Praseodymium	Pr	141
Promethium	Pm	145
Protactinium	Pa	231
Radium	Ra	226
Radon	Rn	222
Rhenium	Re	186
Rhodium	Rh	103
Rubidium	Rb	85·5
Ruthenium	Ru	101
Samarium	Sm	150·5
Scandium	Sc	45
Selenium	Se	79
Silicon	Si	28
Silver	Ag	108
Sodium	Na	23
Strontium	Sr	87·5
Sulfur	S	32
Tantalum	Ta	181
Technetium	Tc	98
Tellurium	Te	127·5
Terbium	Tb	159
Thallium	Tl	204·5
Thorium	Th	232
Thulium	Tm	169
Tin	Sn	118·5
Titanium	Ti	48
Tungsten	W	184
Uranium	U	238
Vanadium	V	51
Xenon	Xe	131·5
Ytterbium	Yb	173
Yttrium	Y	89
Zinc	Zn	65·5
Zirconium	Zr	91

Reactivity series of Metals



Potassium
Sodium
Lithium
Calcium
Magnesium
Aluminium
Zinc
Iron
Tin
Lead
Copper
Mercury
Silver
Gold

Electrochemical Series

Lithium
Potassium
Calcium
Sodium
Magnesium
Aluminium
Zinc
Iron
Nickel
Tin
Lead
Copper
Silver
Mercury
Gold