

Physical constants

Avogadro constant (L) $6.02 \times 10^{23} \text{ mol}^{-1}$

Elementary charge (e) $1.60 \times 10^{-19} \text{ C}$

Gas constant (R) $8.31 \text{ J mol}^{-1} \text{ K}^{-1}$

Molar volume of ideal gas:

at r.t.p. $24 \text{ dm}^3 \text{ mol}^{-1}$

Specific heat capacity of water $4.18 \text{ J g}^{-1} \text{ K}^{-1}$

$1 \text{ dm}^3 = 1\,000 \text{ cm}^3 = 0.001 \text{ m}^3$

Pauling electronegativities

Pauling electronegativity index

								H										He
								2.1										
Li	Be											B	C	N	O	F		Ne
1.0	1.5											2.0	2.5	3.0	3.5	4.0		
Na	Mg											Al	Si	P	S	Cl		Ar
0.9	1.2											1.5	1.9	2.1	2.5	3.0		
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br		Kr
0.8	1.0	1.3	1.5	1.6	1.6	1.5	1.8	1.8	1.8	1.9	1.6	1.6	2.0	2.0	2.4	2.8		
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I		Xe
0.8	1.0	1.2	1.3	1.6	2.1	1.9	2.2	2.2	2.2	1.9	1.6	1.7	1.9	1.9	2.1	2.5		
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At		Rn
0.7	0.9	1.1	1.3	1.5	2.3	1.9	2.2	2.2	2.2	2.5	2.0	1.6	1.8	1.9	2.0	2.2		

Relation in electronegativity difference, ΔN_e and ionic character $P/\%$

Electronegativity difference ΔN_e	0.1	0.3	0.5	0.7	1.0	1.3	1.5	1.7	2.0	2.5	3.0
Percentage ionic character $P/\%$	0.5	2	6	12	22	34	43	51	63	79	89

Infrared spectroscopy

Correlation of infrared absorption wavenumbers with molecular structure

Group	Wavenumber range/cm ⁻¹
C-H stretching vibrations	
Alkane	2962-2853
Alkene	3095-3010
Alkyne	3300
Arene	3030
Aldehyde	2900-2820 and 2775-2700
C-H bending variations	
Alkane	1485-1365
Arene 5 adjacent hydrogen atoms	750 and 700
4 adjacent hydrogen atoms	750
3 adjacent hydrogen atoms	780
2 adjacent hydrogen atoms	830
1 adjacent hydrogen atom	880
N-H stretching vibrations	
Amine	3500-3300
Amide	3500-3140
O-H stretching vibrations	
Alcohols and phenols	3750-3200
Carboxylic acids	3300-2500
C=C stretching vibrations	
Isolated alkene	1669-1645
Arene	1600, 1580, 1500, 1450
C=O stretching vibrations	
Aldehydes, saturated alkyl	1740-1720
Ketones, alkyl	1720-1700
Ketones, aryl	1700-1680
Carboxylic acids, alkyl	1725-1700
Carboxylic acids, aryl	1700-1680
Carboxylic acid anhydrides	1850-1800 and 1790-1740
Acyl halides, chlorides	1795
Acyl halides, bromides	1810
Esters, saturated	1750-1735
Amides	1700-1630
Triple bond stretching vibrations	
C≡N	2260-2215
C≡C	2260-2100

The Periodic Table of Elements

	1	2	3	4	5	6	7	0 (8)
	1.0 H hydrogen 1							
								4.0 He helium 2
(1)	6.9 Li lithium 3	9.0 Be beryllium 4						
(2)	23.0 Na sodium 11	24.3 Mg magnesium 12						20.2 Ne neon 10
(3)	39.1 K potassium 19	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
(4)	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	[98] Tc technetium 43	101.1 Ru ruthenium 44
(5)	132.9 Cs caesium 55	137.3 Ba barium 56	138.9 La* lanthanum 57	178.5 Hf hafnium 72	178.5 Ta tantalum 73	183.8 W tungsten 74	186.2 Re rhenium 75	190.2 Os osmium 76
(6)	[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
(7)								
(8)								
(9)								
(10)								
(11)								
(12)								
(13)	10.8 B boron 5	27.0 Al aluminium 13	28.1 Si silicon 14	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18
(14)	12.0 C carbon 6	12.0 C carbon 6	72.6 Ge germanium 32	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
(15)	14.0 N nitrogen 7	14.0 N nitrogen 7	114.8 In indium 49	114.8 In indium 49	121.8 Sb antimony 51	127.6 Te tellurium 52	126.9 I iodine 53	131.3 Xe xenon 54
(16)	16.0 O oxygen 8	16.0 O oxygen 8	200.6 Hg mercury 80	200.6 Hg mercury 80	204.4 Pb lead 82	209.0 Po polonium 84	[210] At astatine 85	[222] Rn radon 86
(17)	19.0 F fluorine 9	19.0 F fluorine 9	159 Tb terbium 65	159 Tb terbium 65	163 Dy dysprosium 66	167 Er erbium 68	173 Yb ytterbium 70	175 Lu lutetium 71
(18)			157 Gd gadolinium 64	157 Gd gadolinium 64	152 Eu europium 63	157 Gd gadolinium 64	169 Tm thulium 69	175 Lu lutetium 71
			232 Th thorium 90	232 Th thorium 90	238 U uranium 92	238 U uranium 92	254 No nobelium 102	257 Lr lawrencium 103
			231 Pa protactinium 91	231 Pa protactinium 91	237 Np neptunium 93	237 Np neptunium 93	256 Md mendelevium 101	257 Lr lawrencium 103
			140 Ce cerium 58	140 Ce cerium 58	144 Nd neodymium 60	144 Nd neodymium 60	165 Ho holmium 67	175 Lu lutetium 71
			141 Pr praseodymium 59	141 Pr praseodymium 59	147 Pm promethium 61	147 Pm promethium 61	169 Tm thulium 69	175 Lu lutetium 71
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