

Seventh Edition

Principles *of* Instrumental Analysis

Skoog | Holler | Crouch

INTERNATIONAL ATOMIC MASSES*

Name	Symbol	Atomic Number	Atomic Mass	Name	Symbol	Atomic Number	Atomic Mass
Actinium	Ac	89	[227]	Mendelevium	Md	101	[258]
Aluminium	Al	13	26.9815385(7)	Mercury	Hg	80	200.592(3)
Americium	Am	95	[243]	Molybdenum	Mo	42	95.95(1)
Antimony	Sb	51	121.760(1)	Neodymium	Nd	60	144.242(3)
Argon	Ar	18	39.948(1)	Neon	Ne	10	20.1797(6)
Arsenic	As	33	74.921595(6)	Neptunium	Np	93	[237]
Astatine	At	85	[210]	Nickel	Ni	28	58.6934(4)
Barium	Ba	56	137.327(7)	Niobium	Nb	41	92.90637(2)
Berkelium	Bk	97	[247]	Nitrogen	N	7	14.007
Beryllium	Be	4	9.0121831(5)	Nobelium	No	102	[259]
Bismuth	Bi	83	208.98040(1)	Osmium	Os	76	190.23(3)
Bohrium	Bh	107	[270]	Oxygen	O	8	15.999
Boron	B	5	10.81	Palladium	Pd	46	106.42(1)
Bromine	Br	35	79.904	Phosphorus	P	15	30.973761998(5)
Cadmium	Cd	48	112.414(4)	Platinum	Pt	78	195.084(9)
Calcium	Ca	20	40.078(4)	Plutonium	Pu	94	[244]
Californium	Cf	98	[251]	Polonium	Po	84	[209]
Carbon	C	6	12.011	Potassium	K	19	39.0983(1)
Cerium	Ce	58	140.116(1)	Praseodymium	Pr	59	140.90766(2)
Cesium	Cs	55	132.90545196(6)	Promethium	Pm	61	[145]
Chlorine	Cl	17	35.45	Protactinium	Pa	91	231.03588(2)
Chromium	Cr	24	51.9961(6)	Radium	Ra	88	[226]
Cobalt	Co	27	58.933194(4)	Radon	Rn	86	[222]
Copernicium	Cn	112	[285]	Rhenium	Re	75	186.207(1)
Copper	Cu	29	63.546(3)	Rhodium	Rh	45	102.90550(2)
Curium	Cm	96	[247]	Roentgenium	Rg	111	[281]
Darmstadtium	Ds	110	[281]	Rubidium	Rb	37	85.4678(3)
Dubnium	Db	105	[270]	Ruthenium	Ru	44	101.07(2)
Dysprosium	Dy	66	162.500(1)	Rutherfordium	Rf	104	[267]
Einsteinium	Es	99	[252]	Samarium	Sm	62	150.36(2)
Erbium	Er	68	167.259(3)	Scandium	Sc	21	44.955908(5)
Europium	Eu	63	151.964(1)	Seaborgium	Sg	106	[269]
Fermium	Fm	100	[257]	Selenium	Se	34	78.971(8)
Flerovium	Fl	114	[289]	Silicon	Si	14	28.085
Fluorine	F	9	18.998403163(6)	Silver	Ag	47	107.8682(2)
Francium	Fr	87	[223]	Sodium	Na	11	22.98976928(2)
Gadolinium	Gd	64	157.25(3)	Strontium	Sr	38	87.62(1)
Gallium	Ga	31	69.723(1)	Sulfur	S	16	32.06
Germanium	Ge	32	72.630(8)	Tantalum	Ta	73	180.94788(2)
Gold	Au	79	196.966569(5)	Technetium	Tc	43	[97]
Hafnium	Hf	72	178.49(2)	Tellurium	Te	52	127.60(3)
Hassium	Hs	108	[270]	Terbium	Tb	65	158.92535(2)
Helium	He	2	4.002602(2)	Thallium	Tl	81	204.38
Holmium	Ho	67	164.93033(2)	Thorium	Th	90	232.0377(4)
Hydrogen	H	1	1.008	Thulium	Tm	69	168.93422(2)
Indium	In	49	114.818(1)	Tin	Sn	50	118.710(7)
Iodine	I	53	126.90447(3)	Titanium	Ti	22	47.867(1)
Iridium	Ir	77	192.217(3)	Tungsten	W	74	183.84(1)
Iron	Fe	26	55.845(2)	Ununoctium	Uuo	118	[294]
Krypton	Kr	36	83.798(2)	Ununpentium	Uup	115	[289]
Lanthanum	La	57	138.90547(7)	Ununtrium	Uut	113	[285]
Lawrencium	Lr	103	[262]	Uranium	U	92	238.02891(3)
Lead	Pb	82	207.2(1)	Vanadium	V	23	50.9415(1)
Lithium	Li	3	6.94	Xenon	Xe	54	131.293(6)
Livermorium	Lv	116	[293]	Ytterbium	Yb	70	173.045(10)
Lutetium	Lu	71	174.9668(1)	Yttrium	Y	39	88.90584(2)
Magnesium	Mg	12	24.305	Zinc	Zn	30	65.38(2)
Manganese	Mn	25	54.938044(3)	Zirconium	Zr	40	91.224(2)
Meitnerium	Mt	109	[278]				

*The 2013 values from the IUPAC website at <http://www.chem.qmul.ac.uk/iupac/AtWt/>

Numbers in parentheses indicate the uncertainty in the last digit of the atomic masses. Values enclosed in brackets, for example, [209], indicate the mass number of the longest-lived isotope of the element. From J. Meija, et al., *Pure Appl. Chem.*, **2016**, *88*, 265, DOI: 10.1515/pac-2015-0305.

IMPORTANT PHYSICAL CONSTANTS

Constant	Symbol	Value
Speed of light (<i>in vacuo</i>)	c	$2.99792 \times 10^8 \text{ ms}^{-1}$
Planck's constant	h	$6.62607 \times 10^{-34} \text{ J s}$
Avogadro's number	N	$6.022140 \times 10^{23} \text{ particles mol}^{-1}$
Faraday constant	F	$96485.33 \text{ C mol}^{-1}$
Gas constant	R	$8.31446 \text{ J K}^{-1} \text{ mol}^{-1}$
		$0.0820578 \text{ L atm K}^{-1} \text{ mol}^{-1}$
Boltzmann's constant	k	$1.38065 \times 10^{-23} \text{ J K}^{-1}$
Rest mass of the electron	m_e	$9.10938 \times 10^{-31} \text{ kg}$
Electronic charge	e	$1.602177 \times 10^{-19} \text{ C}$

ENERGY CONVERSION FACTORS

	Joules	Ergs	Calories	Liter Atmosphere	Electron Volts
1 joule =	1	10^7	2.3901×10^{-1}	9.8692×10^{-3}	6.2415×10^{18}
1 erg =	10^{-7}	1	2.3901×10^{-8}	9.8692×10^{-10}	6.2415×10^{11}
1 calorie =	4.1840	4.1840×10^7	1	4.1293×10^{-2}	2.6114×10^{19}
1 liter atmosphere =	1.0133×10^2	1.0133×10^9	24.217	1	6.3242×10^{20}
1 electron volt =	1.6022×10^{-19}	1.6022×10^{-12}	3.8293×10^{-20}	1.5812×10^{-21}	1

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We dedicate this book to Veronica Crouch (Nicky), who passed away July 11, 2016 due to metastatic pancreatic cancer. She was a valuable part of our team and will be greatly missed.

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