

PERIODIC TABLE

Atomic Properties of the Elements

Frequently used fundamental physical constants

For the most accurate values of these and other constants, visit physics.nist.gov/constants

1 second = 9 192 631 770 periods of radiation corresponding to the transition between the two hyperfine levels of the ground state of ^{133}Cs

speed of light in vacuum	c	299 792 458 m s ⁻¹	(exact)
Planck constant	h	6.6261×10^{-34} J s	($h = h/2\pi$)
elementary charge	e	1.6022×10^{-19} C	
electron mass	m_e	9.1094×10^{-31} kg	
	$m_e c^2$	0.5110 MeV	
proton mass	m_p	1.6726×10^{-27} kg	
fine-structure constant	α	1/137.036	
Rydberg constant	R_∞	$10\,973\,732$ m ⁻¹	
	$R_\infty c$	$3.289\,842 \times 10^{15}$ Hz	
	$R_\infty hc$	13.6057 eV	
Boltzmann constant	k	1.3807×10^{-23} J K ⁻¹	

Solids
Liquids
Gases
Artificially Prepared

Physics Laboratory physics.nist.gov		Standard Reference Data Group www.nist.gov/srd			
13 IIIA B Boron 10.811 1s ² 2s ² 2p 8.2980	14 IVA C Carbon 12.0107 1s ² 2s ² 2p ² 11.2603	15 VA N Nitrogen 14.0067 1s ² 2s ² 2p ³ 14.5341	16 VIA O Oxygen 15.9994 1s ² 2s ² 2p ⁴ 13.6181	17 VIIA F Fluorine 18.9984032 1s ² 2s ² 2p ⁵ 17.4228	18 VIIIa Ne Neon 20.1797 1s ² 2s ² 2p ⁶ 21.5645
13 Al Aluminum 26.981538 [Ne]3s ² 3p 5.9858	14 Si Silicon 28.0855 [Ne]3s ² 3p ² 8.1517	15 P Phosphorus 30.973761 [Ne]3s ² 3p ³ 10.4867	16 S Sulfur 32.065 [Ne]3s ² 3p ⁴ 10.3600	17 Cl Chlorine 35.453 [Ne]3s ² 3p ⁵ 12.9676	18 Ar Argon 39.948 [Ne]3s ² 3p ⁶ 15.7596
13 Ga Gallium 69.723 [Ar]3d ¹⁰ 4s ² 4p 5.9993	14 Ge Germanium 72.64 [Ar]3d ¹⁰ 4s ² 4p ² 7.8994	15 As Arsenic 74.92160 [Ar]3d ¹⁰ 4s ² 4p ³ 9.7886	16 Se Selenium 78.96 [Ar]3d ¹⁰ 4s ² 4p ⁴ 9.7524	17 Br Bromine 79.904 [Ar]3d ¹⁰ 4s ² 4p ⁵ 11.8138	18 Kr Krypton 83.798 [Ar]3d ¹⁰ 4s ² 4p ⁶ 13.9996
13 In Indium 114.818 [Kr]4d ¹⁰ 5s ² 5p 6.1082	14 Sb Antimony 121.760 [Kr]4d ¹⁰ 5s ² 5p ³ 7.3439	15 Te Tellurium 127.60 [Kr]4d ¹⁰ 5s ² 5p ⁴ 9.0096	16 I Iodine 126.90447 [Kr]4d ¹⁰ 5s ² 5p ⁵ 10.4513	17 Xe Xenon 131.293 [Kr]4d ¹⁰ 5s ² 5p ⁶ 12.1298	
13 Tl Thallium 204.3833 [Hg]6p ³ 6.1082	14 Pb Lead 207.2 [Hg]6p ² 7.4167	15 Bi Bismuth 208.98038 [Hg]6p ³ 7.2855	16 Po Polonium (209) [Hg]6p ⁴ 8.414	17 At Astatine (210) [Hg]6p ⁵	18 Rn Radon (222) [Hg]6p ⁶ 10.7485
114 Uuq Ununquadium (289)			116 Uuh Ununhexium (292)		

1 IA H Hydrogen 1.00794 1s 13.5984	2 IIA He Helium 4.002602 1s ² 24.5874
2 Li Lithium 6.941 1s ² 2s 5.3917	Be Beryllium 9.012182 1s ² 2s ² 9.3227
3 Na Sodium 22.989770 [Ne]3s 5.1391	Mg Magnesium 24.3050 [Ne]3s ² 7.6462
4 K Potassium 39.0983 [Ar]4s 4.3407	Ca Calcium 40.078 [Ar]4s ² 6.1132
5 Rb Rubidium 85.4678 [Kr]5s 4.1771	Sr Strontium 87.62 [Kr]5s ² 5.6949
6 Cs Cesium 132.90545 [Xe]6s 3.8939	Ba Barium 137.327 [Xe]6s ² 5.2117
7 Fr Francium (223) [Rn]7s 4.0727	Ra Radium (226) [Rn]7s ² 5.2784

3 IIIB Sc Scandium 44.955910 [Ar]3d4s ² 6.5615	4 IVB Ti Titanium 47.867 [Ar]3d ² 4s ² 6.8281	5 VB V Vanadium 50.9415 [Ar]3d ³ 4s ² 6.7462	6 VIB Cr Chromium 51.9961 [Ar]3d ⁵ 4s 6.7665	7 VIIB Mn Manganese 54.938049 [Ar]3d ⁵ 4s ² 7.4340	8 VIII Fe Iron 55.845 [Ar]3d ⁶ 4s ² 7.9024	9 VIII Co Cobalt 58.933200 [Ar]3d ⁷ 4s ² 7.8810	10 VIII Ni Nickel 58.6934 [Ar]3d ⁸ 4s ² 7.6398	11 IB Cu Copper 63.546 [Ar]3d ¹⁰ 4s 7.7264	12 IIB Zn Zinc 65.409 [Ar]3d ¹⁰ 4s ² 9.3942
41 Nb Niobium 92.90638 [Kr]4d ⁴ 5s 6.7589	42 Mo Molybdenum 95.94 [Kr]4d ⁵ 5s 7.0924	43 Tc Technetium (98) [Kr]4d ⁵ 5s ² 7.28	44 Ru Ruthenium 101.07 [Kr]4d ⁷ 5s 7.3605	45 Rh Rhodium 102.90550 [Kr]4d ⁸ 5s 7.4589	46 Pd Palladium 106.42 [Kr]4d ¹⁰ 5s 8.3369	47 Ag Silver 107.8682 [Kr]4d ¹⁰ 5s 7.5762	48 Cd Cadmium 112.411 [Kr]4d ¹⁰ 5s ² 8.9938	49 In Indium 114.818 [Kr]4d ¹⁰ 5s ² 5p 6.1082	50 Sn Tin 118.710 [Kr]4d ¹⁰ 5s ² 5p ² 7.3439
72 Hf Hafnium 178.49 [Xe]4f ¹⁴ 5d ² 6s ² 6.8251	73 Ta Tantalum 180.9479 [Xe]4f ¹⁴ 5d ³ 6s ² 7.5496	74 W Tungsten 183.84 [Xe]4f ¹⁴ 5d ⁴ 6s ² 7.8640	75 Re Rhenium 186.207 [Xe]4f ¹⁴ 5d ⁵ 6s ² 7.8335	76 Os Osmium 190.23 [Xe]4f ¹⁴ 5d ⁶ 6s ² 8.4382	77 Ir Iridium 192.217 [Xe]4f ¹⁴ 5d ⁷ 6s ² 8.9670	78 Pt Platinum 195.078 [Xe]4f ¹⁴ 5d ⁹ 6s 8.9588	79 Au Gold 196.96655 [Xe]4f ¹⁴ 5d ¹⁰ 6s 9.2255	80 Hg Mercury 200.59 [Xe]4f ¹⁴ 5d ¹⁰ 6s ² 10.4375	
104 Rf Rutherfordium [Rn]5f ¹⁴ 6d ² 7s ² ? 6.0 ?	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (277)	109 Mt Meitnerium (268)	110 Uun Ununnilium (281)	111 Uuu Unununium (272)	112 Uub Ununbium (285)	

Atomic Number: 58
Ground-state Level: 1G₄
Symbol: **Ce**
Name: Cerium
Atomic Weight: 140.116
Ground-state Configuration: [Xe]4f5d6s²
Ionization Energy (eV): 5.5387

57 La Lanthanum 138.9055 [Xe]5d6s ² 5.5769	58 Ce Cerium 140.116 [Xe]4f5d6s ² 5.5387	59 Pr Praseodymium 140.90765 [Xe]4f ³ 6s ² 5.473	60 Nd Neodymium 144.24 [Xe]4f ⁴ 6s ² 5.5250	61 Pm Promethium (145) [Xe]4f ⁵ 6s ² 5.582	62 Sm Samarium 150.36 [Xe]4f ⁶ 6s ² 5.6437	63 Eu Europium 151.964 [Xe]4f ⁷ 6s ² 5.6704	64 Gd Gadolinium 157.25 [Xe]4f ⁷ 5d6s ² 6.1498	65 Tb Terbium 158.92534 [Xe]4f ⁹ 6s ² 5.8638	66 Dy Dysprosium 162.500 [Xe]4f ¹⁰ 6s ² 5.9389	67 Ho Holmium 164.93032 [Xe]4f ¹¹ 6s ² 6.0215	68 Er Erbium 167.259 [Xe]4f ¹² 6s ² 6.1077	69 Tm Thulium 168.93421 [Xe]4f ¹³ 6s ² 6.1843	70 Yb Ytterbium 173.04 [Xe]4f ¹⁴ 6s ² 6.2542	71 Lu Lutetium 174.967 [Xe]4f ¹⁴ 5d6s ² 5.4259
89 Ac Actinium (227) [Rn]6d7s ² 5.17	90 Th Thorium 232.0381 [Rn]6d ² 7s ² 6.3067	91 Pa Protactinium 231.03588 [Rn]5f ² 6d7s ² 5.89	92 U Uranium 238.02891 [Rn]5f ³ 6d7s ² 6.1941	93 Np Neptunium (237) [Rn]5f ⁴ 6d7s ² 6.2657	94 Pu Plutonium (244) [Rn]5f ⁶ 7s ² 6.0260	95 Am Americium (243) [Rn]5f ⁷ 7s ² 5.9738	96 Cm Curium (247) [Rn]5f ⁷ 6d7s ² 5.9914	97 Bk Berkelium (247) [Rn]5f ⁹ 7s ² 6.1979	98 Cf Californium (251) [Rn]5f ¹⁰ 7s ² 6.2817	99 Es Einsteinium (252) [Rn]5f ¹¹ 7s ² 6.42	100 Fm Fermium (257) [Rn]5f ¹² 7s ² 6.50	101 Md Mendelevium (258) [Rn]5f ¹³ 7s ² 6.58	102 No Nobelium (259) [Rn]5f ¹⁴ 7s ² 6.65	103 Lr Lawrencium (262) [Rn]5f ¹⁴ 7s ² ? 4.9 ?

[†]Based upon ¹²C. () indicates the mass number of the most stable isotope.

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