

PERIODIC TABLE

Atomic Properties of the Elements

Group	1											13	14	15	16	17	18																																																																		
IA	2											IIIA	IVA	VA	VIA	VIIA	VIIIA																																																																		
1	2											3	4	5	6	7	8																																																																		
1A	IIA											IIIA	IVA	VA	VIA	VIIA	0																																																																		
1	H Hydrogen 1.008* 1s 13.5984	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;">Frequently used fundamental physical constants</p> <p>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 ¹³³Cs</p> <table style="font-size: small; width: 100%;"> <tr><td>speed of light in vacuum</td><td><i>c</i></td><td>299 792 458 m s⁻¹</td><td>(exact)</td></tr> <tr><td>Planck constant</td><td><i>h</i></td><td>6.626 07 x 10⁻³⁴ J s</td><td>(<i>h</i> = <i>h</i>/2π)</td></tr> <tr><td>elementary charge</td><td><i>e</i></td><td>1.602 177 x 10⁻¹⁹ C</td><td></td></tr> <tr><td>electron mass</td><td><i>m_e</i></td><td>9.109 38 x 10⁻³¹ kg</td><td></td></tr> <tr><td></td><td><i>m_ec²</i></td><td>0.511 999 MeV</td><td></td></tr> <tr><td>proton mass</td><td><i>m_p</i></td><td>1.672 622 x 10⁻²⁷ kg</td><td></td></tr> <tr><td>fine-structure constant</td><td><i>α</i></td><td>1/137.035 999</td><td></td></tr> <tr><td>Rydberg constant</td><td><i>R_∞</i></td><td>10 973 731.569 m⁻¹</td><td></td></tr> <tr><td></td><td><i>R_∞c</i></td><td>3.289 841 960 x 10¹⁵ Hz</td><td></td></tr> <tr><td></td><td><i>R_∞hc</i></td><td>13.605 69 eV</td><td></td></tr> <tr><td>Boltzmann constant</td><td><i>k</i></td><td>1.380 6 x 10⁻²³ J K⁻¹</td><td></td></tr> </table> </div>										speed of light in vacuum	<i>c</i>	299 792 458 m s ⁻¹	(exact)	Planck constant	<i>h</i>	6.626 07 x 10 ⁻³⁴ J s	(<i>h</i> = <i>h</i> /2π)	elementary charge	<i>e</i>	1.602 177 x 10 ⁻¹⁹ C		electron mass	<i>m_e</i>	9.109 38 x 10 ⁻³¹ kg			<i>m_ec²</i>	0.511 999 MeV		proton mass	<i>m_p</i>	1.672 622 x 10 ⁻²⁷ kg		fine-structure constant	<i>α</i>	1/137.035 999		Rydberg constant	<i>R_∞</i>	10 973 731.569 m ⁻¹			<i>R_∞c</i>	3.289 841 960 x 10 ¹⁵ Hz			<i>R_∞hc</i>	13.605 69 eV		Boltzmann constant	<i>k</i>	1.380 6 x 10 ⁻²³ J K ⁻¹		5	B Boron 10.81* 1s ² 2s ² 2p 11.2603	6	C Carbon 12.011* 1s ² 2s ² 2p ² 14.5341	7	N Nitrogen 14.007* 1s ² 2s ² 2p ³ 14.5341	8	O Oxygen 15.999* 1s ² 2s ² 2p ⁴ 17.4228	9	F Fluorine 18.99840316 1s ² 2s ² 2p ⁵ 17.4228	10	Ne Neon 20.1797 1s ² 2s ² 2p ⁶ 21.5645	11	Na Sodium 22.98976928 [Ne]3s 5.1391	12	Mg Magnesium 24.305* [Ne]3s ² 7.6462	13	Al Aluminum 26.9815385 [Ne]3s ² 3p 5.9858	14	Si Silicon 28.085* [Ne]3s ² 3p ² 8.1517	15	P Phosphorus 30.97376200 [Ne]3s ² 3p ³ 10.4867	16	S Sulfur 32.06* [Ne]3s ² 3p ⁴ 10.3600	17	Cl Chlorine 35.45* [Ne]3s ² 3p ⁵ 12.9676	18	Ar Argon 39.948 [Ne]3s ² 3p ⁶ 15.7596
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7	Fr Francium (223) [Rn]7s 4.0727	Ra Radium (226) [Rn]7s ² 5.2784	Rf Rutherfordium (261) [Rn]5f ¹⁴ 6d ² 7s ² 6.01	Db Dubnium (268) [Rn]5f ¹⁴ 6d ³ 7s ² 6.8	Sg Seaborgium (266) [Rn]5f ¹⁴ 6d ⁴ 7s ² 7.8	Bh Bohrium (272) [Rn]5f ¹⁴ 6d ⁵ 7s ² 7.7	Hs Hassium (277) [Rn]5f ¹⁴ 6d ⁶ 7s ² 7.6	Mt Meitnerium (276) [Rn]5f ¹⁴ 6d ⁷ 7s ² 7.7	Ds Darmstadtium (281) [Rn]5f ¹⁴ 6d ⁸ 7s ² 7.8	Rg Roentgenium (280) [Rn]5f ¹⁴ 6d ⁹ 7s ² 7.9	Cn Copernicium (285) [Rn]5f ¹⁴ 6d ¹⁰ 7s ² 8.0	Uut Ununtrium (284) [Rn]5f ¹⁴ 6d ¹¹ 7s ² 8.1	Fl Flerovium (289) [Rn]5f ¹⁴ 6d ¹² 7s ² 8.2	Uup Ununpentium (288) [Rn]5f ¹⁴ 6d ¹³ 7s ² 8.3	Lv Livermorium (293) [Rn]5f ¹⁴ 6d ¹⁴ 7s ² 8.4	Uus Ununseptium (294) [Rn]5f ¹⁴ 6d ¹⁵ 7s ² 8.5	Uuo Ununoctium (294) [Rn]5f ¹⁴ 6d ¹⁶ 7s ² 8.6	87	Fr Francium (223) [Rn]7s 4.0727	88	Ra Radium (226) [Rn]7s ² 5.2784	89	Ac Actinium (227) [Rn]6d ¹ 7s ² 5.3802	90	Th Thorium 232.0377 [Rn]6d ² 7s ² 6.3067	91	Pa Protactinium 231.03688 [Rn]5f ² 6d ¹ 7s ² 5.89	92	U Uranium 238.02891 [Rn]5f ³ 6d ¹ 7s ² 6.1941	93	Np Neptunium (237) [Rn]5f ⁴ 6d ¹ 7s ² 6.2655	94	Pu Plutonium (244) [Rn]5f ⁶ 7s ² 6.0258	95	Am Americium (243) [Rn]5f ⁷ 7s ² 5.9738	96	Cm Curium (247) [Rn]5f ⁷ 6d ¹ 7s ² 5.9914	97	Bk Berkelium (247) [Rn]5f ⁹ 7s ² 6.1978	98	Cf Californium (251) [Rn]5f																																										

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The Hubbard Chart of the Atoms, ca. 1924

Henry D. Hubbard, the designer of the “Chart of the Atoms,” was the first secretary of the National Institute of Standards and Technology (then-called the National Bureau of Standards) and served continuously in that capacity from 1901 until his retirement in 1938. Secretary Hubbard made a contribution to instruction in physics that is still in use today, his modernization of Mendeleev’s periodic table. First constructed in the 1920s, it has been frequently revised and reprinted.

