

## Chapter 15: Atomic Masses

Table *Chapter*15.1: Atomic Masses

Atomic Number, $Z$	Name	Atomic Mass Number, $A$	Symbol	Atomic Mass (u)	Percent Abundance or Decay Mode	Half-life, $t_{1/2}$
0	neutron	1	$n$	1.008 665	$\beta^-$	10.37 min
1	Hydrogen	1	$^1\text{H}$	1.007 825	99.985%	
	Deuterium	2	$^2\text{H}$ or D	2.014 102	0.015%	
	Tritium	3	$^3\text{H}$ or T	3.016 050	$\beta^-$	12.33 y
2	Helium	3	$^3\text{He}$	3.016 030	$1.38 \times 10^{-4}\%$	
		4	$^4\text{He}$	4.002 603	$\approx 100\%$	
3	Lithium	6	$^6\text{Li}$	6.015 121	7.5%	
		7	$^7\text{Li}$	7.016 003	92.5%	
4	Beryllium	7	$^7\text{Be}$	7.016 928	EC	53.29 d
		9	$^9\text{Be}$	9.012 182	100%	
5	Boron	10	$^{10}\text{B}$	10.012 937	19.9%	
		11	$^{11}\text{B}$	11.009 305	80.1%	
6	Carbon	11	$^{11}\text{C}$	11.011 432	EC, $\beta^+$	
		12	$^{12}\text{C}$	12.000 000	98.90%	
		13	$^{13}\text{C}$	13.003 355	1.10%	
		14	$^{14}\text{C}$	14.003 241	$\beta^-$	5730 y
7	Nitrogen	13	$^{13}\text{N}$	13.005 738	$\beta^+$	9.96 min
		14	$^{14}\text{N}$	14.003 074	99.63%	
		15	$^{15}\text{N}$	15.000 108	0.37%	
8	Oxygen	15	$^{15}\text{O}$	15.003 065	EC, $\beta^+$	122 s
		16	$^{16}\text{O}$	15.994 915	99.76%	
		18	$^{18}\text{O}$	17.999 160	0.200%	
9	Fluorine	18	$^{18}\text{F}$	18.000 937	EC, $\beta^+$	1.83 h
		19	$^{19}\text{F}$	18.998 403	100%	

Atomic Number, Z	Name	Atomic Mass Number, A	Symbol	Atomic Mass (u)	Percent Abundance or Decay Mode	Half-life, $t_{1/2}$
10	Neon	20	$^{20}\text{Ne}$	19.992 435	90.51%	
		22	$^{22}\text{Ne}$	21.991 383	9.22%	
11	Sodium	22	$^{22}\text{Na}$	21.994 434	$\beta^+$	2.602 y
		23	$^{23}\text{Na}$	22.989 767	100%	
		24	$^{24}\text{Na}$	23.990 961	$\beta^-$	14.96 h
12	Magnesium	24	$^{24}\text{Mg}$	23.985 042	78.99%	
13	Aluminum	27	$^{27}\text{Al}$	26.981 539	100%	
14	Silicon	28	$^{28}\text{Si}$	27.976 927	92.23%	2.62h
		31	$^{31}\text{Si}$	30.975 362	$\beta^-$	
15	Phosphorus	31	$^{31}\text{P}$	30.973 762	100%	
		32	$^{32}\text{P}$	31.973 907	$\beta^-$	14.28 d
16	Sulfur	32	$^{32}\text{S}$	31.972 070	95.02%	
		35	$^{35}\text{S}$	34.969 031	$\beta^-$	87.4 d
17	Chlorine	35	$^{35}\text{Cl}$	34.968 852	75.77%	
		37	$^{37}\text{Cl}$	36.965 903	24.23%	
18	Argon	40	$^{40}\text{Ar}$	39.962 384	99.60%	
19	Potassium	39	$^{39}\text{K}$	38.963 707	93.26%	
		40	$^{40}\text{K}$	39.963 999	0.0117%, EC, $\beta^-$	$1.28 \times 10^9 \text{ y}$
20	Calcium	40	$^{40}\text{Ca}$	39.962 591	96.94%	
21	Scandium	45	$^{45}\text{Sc}$	44.955 910	100%	
22	Titanium	48	$^{48}\text{Ti}$	47.947 947	73.8%	
23	Vanadium	51	$^{51}\text{V}$	50.943 962	99.75%	
24	Chromium	52	$^{52}\text{Cr}$	51.940 509	83.79%	
25	Manganese	55	$^{55}\text{Mn}$	54.938 047	100%	
26	Iron	56	$^{56}\text{Fe}$	55.934 939	91.72%	

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27	Cobalt	59	$^{59}\text{Co}$	58.933 198	100%	
		60	$^{60}\text{Co}$	59.933 819	$\beta^-$	5.271 y
28	Nickel	58	$^{58}\text{Ni}$	57.935 346	68.27%	
		60	$^{60}\text{Ni}$	59.930 788	26.10%	
29	Copper	63	$^{63}\text{Cu}$	62.939 598	69.17%	
		65	$^{65}\text{Cu}$	64.927 793	30.83%	
30	Zinc	64	$^{64}\text{Zn}$	63.929 145	48.6%	
		66	$^{66}\text{Zn}$	65.926 034	27.9%	
31	Gallium	69	$^{69}\text{Ga}$	68.925 580	60.1%	
32	Germanium	72	$^{72}\text{Ge}$	71.922 079	27.4%	
		74	$^{74}\text{Ge}$	73.921 177	36.5%	
33	Arsenic	75	$^{75}\text{As}$	74.921 594	100%	
34	Selenium	80	$^{80}\text{Se}$	79.916 520	49.7%	
35	Bromine	79	$^{79}\text{Br}$	78.918 336	50.69%	
36	Krypton	84	$^{84}\text{Kr}$	83.911 507	57.0%	
37	Rubidium	85	$^{85}\text{Rb}$	84.911 794	72.17%	
38	Strontium	86	$^{86}\text{Sr}$	85.909 267	9.86%	
		88	$^{88}\text{Sr}$	87.905 619	82.58%	
		90	$^{90}\text{Sr}$	89.907 738	$\beta^-$	28.8 y
39	Yttrium	89	$^{89}\text{Y}$	88.905 849	100%	
		90	$^{90}\text{Y}$	89.907 152	$\beta^-$	64.1 h
40	Zirconium	90	$^{90}\text{Zr}$	89.904 703	51.45%	
41	Niobium	93	$^{93}\text{Nb}$	92.906 377	100%	
42	Molybdenum	98	$^{98}\text{Mo}$	97.905 406	24.13%	
43	Technetium	98	$^{98}\text{Tc}$	97.907 215	$\beta^-$	$4.2 \times 10^6 \text{ y}$

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44	Ruthenium	102	$^{102}\text{Ru}$	101.904 348	31.6%	
45	Rhodium	103	$^{103}\text{Rh}$	102.905 500	100%	
46	Palladium	106	$^{106}\text{Pd}$	105.903 478	27.33%	
47	Silver	107	$^{107}\text{Ag}$	106.905 092	51.84%	
		109	$^{109}\text{Ag}$	108.904 757	48.16%	
48	Cadmium	114	$^{114}\text{Cd}$	113.903 357	28.73%	
49	Indium	115	$^{115}\text{In}$	114.903 880	95.7%, $\beta^-$	$4.4 \times 10^{14}\text{y}$
50	Tin	120	$^{120}\text{Sn}$	119.902 200	32.59%	
51	Antimony	121	$^{121}\text{Sb}$	120.903 821	57.3%	
52	Tellurium	130	$^{130}\text{Te}$	129.906 229	33.8%, $\beta^-$	$2.5 \times 10^{21}\text{y}$
53	Iodine	127	$^{127}\text{I}$	126.904 473	100%	
		131	$^{131}\text{I}$	130.906 114	$\beta^-$	8.040 d
54	Xenon	132	$^{132}\text{Xe}$	131.904 144	26.9%	
		136	$^{136}\text{Xe}$	135.907 214	8.9%	
55	Cesium	133	$^{133}\text{Cs}$	132.905 429	100%	
		134	$^{134}\text{Cs}$	133.906 696	EC, $\beta^-$	2.06 y
56	Barium	137	$^{137}\text{Ba}$	136.905 812	11.23%	
		138	$^{138}\text{Ba}$	137.905 232	71.70%	
57	Lanthanum	139	$^{139}\text{La}$	138.906 346	99.91%	
58	Cerium	140	$^{140}\text{Ce}$	139.905 433	88.48%	
59	Praseodymium	141	$^{141}\text{Pr}$	140.907 647	100%	
60	Neodymium	142	$^{142}\text{Nd}$	141.907 719	27.13%	
61	Promethium	145	$^{145}\text{Pm}$	144.912 743	EC, $\alpha$	17.7 y
62	Samarium	152	$^{152}\text{Sm}$	151.919 729	26.7%	
63	Europium	153	$^{153}\text{Eu}$	152.921 225	52.2%	

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64	Gadolinium	158	$^{158}\text{Gd}$	157.924 099	24.84%	
65	Terbium	159	$^{159}\text{Tb}$	158.925 342	100%	
66	Dysprosium	164	$^{164}\text{Dy}$	163.929 171	28.2%	
67	Holmium	165	$^{165}\text{Ho}$	164.930 319	100%	
68	Erbium	166	$^{166}\text{Er}$	165.930 290	33.6%	
69	Thulium	169	$^{169}\text{Tm}$	168.934 212	100%	
70	Ytterbium	174	$^{174}\text{Yb}$	173.938 859	31.8%	
71	Lutecium	175	$^{175}\text{Lu}$	174.940 770	97.41%	
72	Hafnium	180	$^{180}\text{Hf}$	179.946 545	35.10%	
73	Tantalum	181	$^{181}\text{Ta}$	180.947 992	99.98%	
74	Tungsten	184	$^{184}\text{W}$	183.950 928	30.67%	
75	Rhenium	187	$^{187}\text{Re}$	186.955 744	62.6%, $\beta^-$	$4.6 \times 10^{10}\text{y}$
76	Osmium	191	$^{191}\text{Os}$	190.960 920	$\beta^-$	15.4 d
		192	$^{192}\text{Os}$	191.961 467	41.0%	
77	Iridium	191	$^{191}\text{Ir}$	190.960 584	37.3%	
		193	$^{193}\text{Ir}$	192.962 917	62.7%	
78	Platinum	195	$^{195}\text{Pt}$	194.964 766	33.8%	
79	Gold	197	$^{197}\text{Au}$	196.966 543	100%	
		198	$^{198}\text{Au}$	197.968 217	$\beta^-$	2.696 d
80	Mercury	199	$^{199}\text{Hg}$	198.968 253	16.87%	
		202	$^{202}\text{Hg}$	201.970 617	29.86%	
81	Thallium	205	$^{205}\text{Tl}$	204.974 401	70.48%	
82	Lead	206	$^{206}\text{Pb}$	205.974 440	24.1%	
		207	$^{207}\text{Pb}$	206.975 872	22.1%	
		208	$^{208}\text{Pb}$	207.976 627	52.4%	

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		210	$^{210}\text{Pb}$	209.984 163	$\alpha, \beta^-$	22.3 y
		211	$^{211}\text{Pb}$	210.988 735	$\beta^-$	36.1 min
		212	$^{212}\text{Pb}$	211.991 871	$\beta^-$	10.64 h
83	Bismuth	209	$^{209}\text{Bi}$	208.980 374	100%	
		211	$^{211}\text{Bi}$	210.987 255	$\alpha, \beta^-$	2.14 min
84	Polonium	210	$^{210}\text{Po}$	209.982 848	$\alpha$	138.38 d
85	Astatine	218	$^{218}\text{At}$	218.008 684	$\alpha, \beta^-$	1.6 s
86	Radon	222	$^{222}\text{Rn}$	222.017 570	$\alpha$	3.82 d
87	Francium	223	$^{223}\text{Fr}$	223.019 733	$\alpha, \beta^-$	21.8 min
88	Radium	226	$^{226}\text{Ra}$	226.025 402	$\alpha$	$1.60 \times 10^3 \text{ y}$
89	Actinium	227	$^{227}\text{Ac}$	227.027 750	$\alpha, \beta^-$	21.8 y
90	Thorium	228	$^{228}\text{Th}$	228.028 715	$\alpha$	1.91 y
		232	$^{232}\text{Th}$	232.038 054	100%, $\alpha$	$1.41 \times 10^{10} \text{ y}$
91	Protactinium	231	$^{231}\text{Pa}$	231.035 880	$\alpha$	$3.28 \times 10^4 \text{ y}$
92	Uranium	233	$^{233}\text{U}$	233.039 628	$\alpha$	$1.59 \times 10^3 \text{ y}$
		235	$^{235}\text{U}$	235.043 924	0.720%, $\alpha$	$7.04 \times 10^8 \text{ y}$
		236	$^{236}\text{U}$	236.045 562	$\alpha$	$2.34 \times 10^7 \text{ y}$
		238	$^{238}\text{U}$	238.050 784	99.2745%, $\alpha$	$4.47 \times 10^9 \text{ y}$
		239	$^{239}\text{U}$	239.054 289	$\beta^-$	23.5 min
93	Neptunium	239	$^{239}\text{Np}$	239.052 933	$\beta^-$	2.355 d
94	Plutonium	239	$^{239}\text{Pu}$	239.052 157	$\alpha$	$2.41 \times 10^4 \text{ y}$
95	Americium	243	$^{243}\text{Am}$	243.061 375	$\alpha$ , fission	$7.37 \times 10^3 \text{ y}$
96	Curium	245	$^{245}\text{Cm}$	245.065 483	$\alpha$	$8.50 \times 10^3 \text{ y}$
97	Berkelium	247	$^{247}\text{Bk}$	247.070 300	$\alpha$	$1.38 \times 10^3 \text{ y}$
98	Californium	249	$^{249}\text{Cf}$	249.074 844	$\alpha$	351 y

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99	Einsteinium	254	$^{254}\text{Es}$	254.088 019	$\alpha, \beta^-$	276 d
100	Fermium	253	$^{253}\text{Fm}$	253.085 173	EC, $\alpha$	3.00 d
101	Mendelevium	255	$^{255}\text{Md}$	255.091 081	EC, $\alpha$	27 min
102	Nobelium	255	$^{255}\text{No}$	255.093 260	EC, $\alpha$	3.1 min
103	Lawrencium	257	$^{257}\text{Lr}$	257.099 480	EC, $\alpha$	0.646 s
104	Rutherfordium	261	$^{261}\text{Rf}$	261.108 690	$\alpha$	1.08 min
105	Dubnium	262	$^{262}\text{Db}$	262.113 760	$\alpha$ , fission	34 s
106	Seaborgium	263	$^{263}\text{Sg}$	263.11 86	$\alpha$ , fission	0.8 s
107	Bohrium	262	$^{262}\text{Bh}$	262.123 1	$\alpha$	0.102 s
108	Hassium	264	$^{264}\text{Hs}$	264.128 5	$\alpha$	0.08 ms
109	Meitnerium	266	$^{266}\text{Mt}$	266.137 8	$\alpha$	3.4 ms

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