

ATOMIC MASSES AND ABUNDANCES

This table lists the mass (in atomic mass units, symbol u) and the natural abundance (in percent) of the stable nuclides and a few important radioactive nuclides. A complete table of all nuclides may be found in Section 11 ("Table of the Isotopes").

The atomic masses were taken from the 1995 evaluation of Audi and Wapstra (References 2, 3). Mass values were rounded in accordance with the stated uncertainty. The number in parentheses following the mass value is the uncertainty (specifically, the rounded value of the estimated standard deviation) in the last digit given.

Natural abundance values are also followed by uncertainties in the last digit(s) of the stated values. This uncertainty includes both the estimated measurement uncertainty and the reported range of variation in different terrestrial sources of the element. A * in the Abundance column indicates a radioactive nuclide not present in nature or an element whose isotopic composition varies so widely that a meaningful natural abundance cannot be defined. See Reference 5 for the most recent updates and further details on natural abundance.

REFERENCES

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- IUPAC Commission on Atomic Weights and Isotopic Abundances, *Pure Appl. Chem.*, 63, 991, 1991.
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Z	Isotope	Mass in u	Abundance in %	Z	Isotope	Mass in u	Abundance in %
1	¹ H	1.007 825 032(1)	99.985(1)	18	³⁸ Ar	37.962 732 2(5)	0.063(1)
1	² H	2.014 101 778(1)	0.015(1)	18	³⁹ Ar	38.964 313(5)	*
1	³ H	3.016 049 268(1)	*	18	⁴⁰ Ar	39.962 383 123(3)	99.600(3)
2	³ He	3.016 029 310(1)	0.000137(3)	19	³⁹ K	38.963 706 8(3)	93.2581(44)
2	⁴ He	4.002 603 250(1)	99.999863(3)	19	⁴⁰ K	39.963 998 7(3)	0.0117(1)
3	⁶ Li	6.015 122 3(5)	7.5(2)	19	⁴¹ K	40.961 826 0(3)	6.7302(44)
3	⁷ Li	7.016 004 0(5)	92.5(2)	20	⁴⁰ Ca	39.962 591 1(3)	96.941(18)
4	⁹ Be	9.012 182 1(4)	100	20	⁴² Ca	41.958 618 3(4)	0.647(9)
5	¹⁰ B	10.012 937 0(3)	19.9(2)	20	⁴³ Ca	42.958 766 8(5)	0.135(6)
5	¹¹ B	11.009 305 5(5)	80.1(2)	20	⁴⁴ Ca	43.955 481 1(9)	2.086(12)
6	¹² C	12 by definition	98.90(3)	20	⁴⁶ Ca	45.953 693(3)	0.004(3)
6	¹³ C	13.003 354 838(1)	1.10(3)	20	⁴⁸ Ca	47.952 534(4)	0.187(4)
6	¹⁴ C	14.003 241 988(4)	*	21	⁴⁵ Sc	44.955 910(1)	100
7	¹⁴ N	14.003 074 005(1)	99.634(9)	22	⁴⁶ Ti	45.952 629(1)	8.0(1)
7	¹⁵ N	15.000 108 898(1)	0.366(9)	22	⁴⁷ Ti	46.951 764(1)	7.3(1)
8	¹⁶ O	15.994 914 622(2)	99.762(15)	22	⁴⁸ Ti	47.947 947(1)	73.8(1)
8	¹⁷ O	16.999 131 5(2)	0.038(3)	22	⁴⁹ Ti	48.947 871(1)	5.5(1)
8	¹⁸ O	17.999 160 4(9)	0.200(12)	22	⁵⁰ Ti	49.944 792(1)	5.4(1)
9	¹⁹ F	18.998 403 21(8)	100	23	⁵⁰ V	49.947 163(1)	0.250(2)
10	²⁰ Ne	19.992 440 176(2)	90.48(3)	23	⁵¹ V	50.943 964(1)	99.750(2)
10	²¹ Ne	20.993 846 74(4)	0.27(1)	24	⁵⁰ Cr	49.946 050(1)	4.345(13)
10	²² Ne	21.991 385 5(2)	9.25(3)	24	⁵² Cr	51.940 512(2)	83.789(18)
11	²³ Na	22.989 769 7(2)	100	24	⁵³ Cr	52.940 654(2)	9.501(17)
12	²⁴ Mg	23.985 041 9(2)	78.99(3)	24	⁵⁴ Cr	53.938 885(1)	2.365(7)
12	²⁵ Mg	24.985 837 0(2)	10.00(1)	25	⁵⁵ Mn	54.938 050(1)	100
12	²⁶ Mg	25.982 593 0(2)	11.01(2)	26	⁵⁴ Fe	53.939 615(1)	5.8(1)
13	²⁷ Al	26.981 538 4(1)	100	26	⁵⁶ Fe	55.934 942(1)	91.72(30)
14	²⁸ Si	27.976 926 533(2)	92.23(1)	26	⁵⁷ Fe	56.935 399(1)	2.1(1)
14	²⁹ Si	28.976 494 72(3)	4.67(1)	26	⁵⁸ Fe	57.933 280(1)	0.28(1)
14	³⁰ Si	29.973 770 22(5)	3.10(1)	27	⁵⁹ Co	58.933 200(2)	100
15	³¹ P	30.973 761 5(2)	100	28	⁵⁸ Ni	57.935 348(2)	68.077(9)
16	³² S	31.972 070 7(1)	95.02(9)	28	⁶⁰ Ni	59.930 791(2)	26.223(8)
16	³³ S	32.971 458 5(1)	0.75(4)	28	⁶¹ Ni	60.931 060(2)	1.140(1)
16	³⁴ S	33.967 866 8(1)	4.21(8)	28	⁶² Ni	61.928 349(2)	3.634(2)
16	³⁶ S	35.967 080 9(3)	0.02(1)	28	⁶⁴ Ni	63.927 970(2)	0.926(1)
17	³⁵ Cl	34.968 852 71(4)	75.77(7)	29	⁶³ Cu	62.929 601(2)	69.17(3)
17	³⁷ Cl	36.965 902 60(5)	24.23(7)	29	⁶⁵ Cu	64.927 794(2)	30.83(3)
18	³⁶ Ar	35.967 546 3(3)	0.337(3)	30	⁶⁴ Zn	63.929 147(2)	48.6(3)
18	³⁷ Ar	36.966 775 9(3)	*	30	⁶⁶ Zn	65.926 037(2)	27.9(2)

ATOMIC MASSES AND ABUNDANCES (continued)

Z	Isotope	Mass in u	Abundance in %	Z	Isotope	Mass in u	Abundance in %
30	⁶⁷ Zn	66.927 131(2)	4.1(1)	46	¹⁰⁸ Pd	107.903 894(4)	26.46(9)
30	⁶⁸ Zn	67.924 848(2)	18.8(4)	46	¹¹⁰ Pd	109.905 15(1)	11.72(9)
30	⁷⁰ Zn	69.925 325(4)	0.6(1)	47	¹⁰⁷ Ag	106.905 093(6)	51.839(7)
31	⁶⁹ Ga	68.925 581(3)	60.108(9)	47	¹⁰⁹ Ag	108.904 756(3)	48.161(7)
31	⁷¹ Ga	70.924 705(2)	39.892(9)	48	¹⁰⁶ Cd	105.906 458(6)	1.25(4)
32	⁷⁰ Ge	69.924 250(2)	21.23(4)	48	¹⁰⁸ Cd	107.904 183(6)	0.89(2)
32	⁷² Ge	71.922 076(2)	27.66(3)	48	¹¹⁰ Cd	109.903 006(3)	12.49(12)
32	⁷³ Ge	72.923 459(2)	7.73(1)	48	¹¹¹ Cd	110.904 182(3)	12.80(8)
32	⁷⁴ Ge	73.921 178(2)	35.94(2)	48	¹¹² Cd	111.902 757(3)	24.13(14)
32	⁷⁶ Ge	75.921 403(2)	7.44(2)	48	¹¹³ Cd	112.904 401(3)	12.22(8)
33	⁷⁵ As	74.921 596(2)	100	48	¹¹⁴ Cd	113.903 358(3)	28.73(28)
34	⁷⁴ Se	73.922 477(2)	0.89(2)	48	¹¹⁶ Cd	115.904 755(3)	7.49(12)
34	⁷⁶ Se	75.919 214(2)	9.36(11)	49	¹¹³ In	112.904 061(4)	4.3(2)
34	⁷⁷ Se	76.919 915(2)	7.63(6)	49	¹¹⁵ In	114.903 878(5)	95.7(2)
34	⁷⁸ Se	77.917 310(2)	23.78(9)	50	¹¹² Sn	111.904 821(5)	0.97(1)
34	⁸⁰ Se	79.916 522(2)	49.61(10)	50	¹¹⁴ Sn	113.902 782(3)	0.65(1)
34	⁸² Se	81.916 700(2)	8.73(6)	50	¹¹⁵ Sn	114.903 346(3)	0.34(1)
35	⁷⁹ Br	78.918 338(2)	50.69(7)	50	¹¹⁶ Sn	115.901 744(3)	14.53(1)
35	⁸¹ Br	80.916 291(3)	49.31(7)	50	¹¹⁷ Sn	116.902 954(3)	7.68(7)
36	⁷⁸ Kr	77.920 386(7)	0.35(2)	50	¹¹⁸ Sn	117.901 606(3)	24.23(11)
36	⁸⁰ Kr	79.916 378(4)	2.25(2)	50	¹¹⁹ Sn	118.903 309(3)	8.59(4)
36	⁸² Kr	81.913 485(3)	11.6(1)	50	¹²⁰ Sn	119.902 197(3)	32.59(10)
36	⁸³ Kr	82.914 136(3)	11.5(1)	50	¹²² Sn	121.903 440(3)	4.63(3)
36	⁸⁴ Kr	83.911 507(3)	57.0(3)	50	¹²⁴ Sn	123.905 275(1)	5.79(5)
36	⁸⁶ Kr	85.910 610(1)	17.3(2)	51	¹²¹ Sb	120.903 818(2)	57.36(8)
37	⁸⁵ Rb	84.911 789(3)	72.165(20)	51	¹²³ Sb	122.904 216(2)	42.64(8)
37	⁸⁷ Rb	86.909 183(3)	27.835(20)	52	¹²⁰ Te	119.904 02(1)	0.096(2)
38	⁸⁴ Sr	83.913 425(4)	0.56(1)	52	¹²² Te	121.903 047(2)	2.603(4)
38	⁸⁶ Sr	85.909 262(2)	9.86(1)	52	¹²³ Te	122.904 273(2)	0.908(2)
38	⁸⁷ Sr	86.908 879(2)	7.00(1)	52	¹²⁴ Te	123.902 819(2)	4.816(6)
38	⁸⁸ Sr	87.905 614(2)	82.58(1)	52	¹²⁵ Te	124.904 425(2)	7.139(6)
39	⁸⁹ Y	88.905 848(3)	100	52	¹²⁶ Te	125.903 306(2)	18.95(1)
40	⁹⁰ Zr	89.904 704(2)	51.45(3)	52	¹²⁸ Te	127.904 461(2)	31.69(1)
40	⁹¹ Zr	90.905 645(2)	11.22(4)	52	¹³⁰ Te	129.906 223(2)	33.80(1)
40	⁹² Zr	91.905 040(2)	17.15(2)	53	¹²⁷ I	126.904 468(4)	100
40	⁹⁴ Zr	93.906 316(3)	17.38(4)	54	¹²⁴ Xe	123.905 896(2)	0.10(1)
40	⁹⁶ Zr	95.908 276(3)	2.80(2)	54	¹²⁶ Xe	125.904 269(7)	0.09(1)
41	⁹³ Nb	92.906 378(2)	100	54	¹²⁸ Xe	127.903 530(2)	1.91(3)
42	⁹² Mo	91.906 810(4)	14.84(4)	54	¹²⁹ Xe	128.904 779 4(9)	26.4(6)
42	⁹⁴ Mo	93.905 088(2)	9.25(3)	54	¹³⁰ Xe	129.903 508(1)	4.1(1)
42	⁹⁵ Mo	94.905 841(2)	15.92(5)	54	¹³¹ Xe	130.905 082(1)	21.2(4)
42	⁹⁶ Mo	95.904 679(2)	16.68(5)	54	¹³² Xe	131.904 154(1)	26.9(5)
42	⁹⁷ Mo	96.906 021(2)	9.55(3)	54	¹³⁴ Xe	133.905 394 5(9)	10.4(2)
42	⁹⁸ Mo	97.905 408(2)	24.13(7)	54	¹³⁶ Xe	135.907 220(8)	8.9(1)
42	¹⁰⁰ Mo	99.907 477(6)	9.63(3)	55	¹³³ Cs	132.905 447(3)	100
43	⁹⁸ Tc	97.907 216(4)	*	56	¹³⁰ Ba	129.906 310(7)	0.106(2)
43	⁹⁹ Tc	98.906 255(2)	*	56	¹³² Ba	131.905 056(3)	0.101(2)
44	⁹⁶ Ru	95.907 598(8)	5.52(6)	56	¹³⁴ Ba	133.904 503(3)	2.417(27)
44	⁹⁸ Ru	97.905 287(7)	1.88(6)	56	¹³⁵ Ba	134.905 683(3)	6.592(18)
44	⁹⁹ Ru	98.905 939(2)	12.7(1)	56	¹³⁶ Ba	135.904 570(3)	7.854(36)
44	¹⁰⁰ Ru	99.904 220(2)	12.6(1)	56	¹³⁷ Ba	136.905 821(3)	11.23(4)
44	¹⁰¹ Ru	100.905 582(2)	17.0(1)	56	¹³⁸ Ba	137.905 241(3)	71.70(7)
44	¹⁰² Ru	101.904 350(2)	31.6(2)	57	¹³⁸ La	137.907 107(4)	0.0902(2)
44	¹⁰⁴ Ru	103.905 430(4)	18.7(2)	57	¹³⁹ La	138.906 348(3)	99.9098(2)
45	¹⁰³ Rh	102.905 504(3)	100	58	¹³⁶ Ce	135.907 14(5)	0.19(1)
46	¹⁰² Pd	101.905 608(3)	1.02(1)	58	¹³⁷ Ce	136.907 78(5)	*
46	¹⁰⁴ Pd	103.904 035(5)	11.14(8)	58	¹³⁸ Ce	137.905 99(1)	0.25(1)
46	¹⁰⁵ Pd	104.905 084(5)	22.33(8)	58	¹³⁹ Ce	138.906 647(8)	*
46	¹⁰⁶ Pd	105.903 483(5)	27.33(3)	58	¹⁴⁰ Ce	139.905 434(3)	88.48(10)

ATOMIC MASSES AND ABUNDANCES (continued)

Z	Isotope	Mass in u	Abundance in %	Z	Isotope	Mass in u	Abundance in %
58	¹⁴¹ Ce	140.908 271(3)	*	72	¹⁸⁰ Hf	179.946 549(3)	35.100(7)
58	¹⁴² Ce	141.909 240(4)	11.08(10)	73	¹⁸⁰ Ta	179.947 466(3)	0.012(2)
59	¹⁴¹ Pr	140.907 648(3)	100	73	¹⁸¹ Ta	180.947 996(3)	99.988(2)
60	¹⁴² Nd	141.907 719(3)	27.13(12)	74	¹⁸⁰ W	179.946 706(5)	0.13(4)
60	¹⁴³ Nd	142.909 810(3)	12.18(6)	74	¹⁸² W	181.948 206(3)	26.3(2)
60	¹⁴⁴ Nd	143.910 083(3)	23.80(12)	74	¹⁸³ W	182.950 224(3)	14.3(1)
60	¹⁴⁵ Nd	144.912 569(3)	8.30(6)	74	¹⁸⁴ W	183.950 933(3)	30.67(15)
60	¹⁴⁶ Nd	145.913 112(3)	17.19(9)	74	¹⁸⁶ W	185.954 362(3)	28.6(2)
60	¹⁴⁸ Nd	147.916 889(3)	5.76(3)	75	¹⁸⁵ Re	184.952 956(3)	37.40(2)
60	¹⁵⁰ Nd	149.920 887(4)	5.64(3)	75	¹⁸⁷ Re	186.955 751(3)	62.60(2)
61	¹⁴³ Pm	142.910 928(4)	*	76	¹⁸⁴ Os	183.952 491(3)	0.02(1)
61	¹⁴⁵ Pm	144.912 744(4)	*	76	¹⁸⁶ Os	185.953 838(3)	1.58(30)
61	¹⁴⁷ Pm	146.915 134(3)	*	76	¹⁸⁷ Os	186.955 748(3)	1.6(3)
62	¹⁴⁴ Sm	143.911 995(4)	3.1(1)	76	¹⁸⁸ Os	187.955 836(3)	13.3(7)
62	¹⁴⁷ Sm	146.914 893(3)	15.0(2)	76	¹⁸⁹ Os	188.958 145(3)	16.1(8)
62	¹⁴⁸ Sm	147.914 818(3)	11.3(1)	76	¹⁹⁰ Os	189.958 445(3)	26.4(12)
62	¹⁴⁹ Sm	148.917 180(3)	13.8(1)	76	¹⁹² Os	191.961 479(4)	41.0(8)
62	¹⁵⁰ Sm	149.917 271(3)	7.4(1)	77	¹⁹¹ Ir	190.960 591(3)	37.3(5)
62	¹⁵² Sm	151.919 728(3)	26.7(2)	77	¹⁹³ Ir	192.962 924(3)	62.7(5)
62	¹⁵⁴ Sm	153.922 205(3)	22.7(2)	78	¹⁹⁰ Pt	189.959 930(7)	0.01(1)
63	¹⁵¹ Eu	150.919 846(3)	47.8(15)	78	¹⁹² Pt	191.961 035(4)	0.79(6)
63	¹⁵³ Eu	152.921 226(3)	52.2(15)	78	¹⁹⁴ Pt	193.962 664(3)	32.9(6)
64	¹⁵² Gd	151.919 788(3)	0.20(1)	78	¹⁹⁵ Pt	194.964 774(3)	33.8(6)
64	¹⁵⁴ Gd	153.920 862(3)	2.18(3)	78	¹⁹⁶ Pt	195.964 935(3)	25.3(6)
64	¹⁵⁵ Gd	154.922 619(3)	14.80(5)	78	¹⁹⁸ Pt	197.967 876(5)	7.2(2)
64	¹⁵⁶ Gd	155.922 120(3)	20.47(4)	79	¹⁹⁷ Au	196.966 552(3)	100
64	¹⁵⁷ Gd	156.923 957(3)	15.65(3)	80	¹⁹⁶ Hg	195.965 815(4)	0.15(1)
64	¹⁵⁸ Gd	157.924 101(3)	24.84(12)	80	¹⁹⁸ Hg	197.966 752(3)	9.97(8)
64	¹⁶⁰ Gd	159.927 051(3)	21.86(4)	80	¹⁹⁹ Hg	198.968 262(3)	16.87(10)
65	¹⁵⁹ Tb	158.925 343(3)	100	80	²⁰⁰ Hg	199.968 309(3)	23.10(16)
66	¹⁵⁶ Dy	155.924 278(7)	0.06(1)	80	²⁰¹ Hg	200.970 285(3)	13.18(8)
66	¹⁵⁸ Dy	157.924 405(4)	0.10(1)	80	²⁰² Hg	201.970 626(3)	29.86(20)
66	¹⁶⁰ Dy	159.925 194(3)	2.34(6)	80	²⁰⁴ Hg	203.973 476(3)	6.87(4)
66	¹⁶¹ Dy	160.926 930(3)	18.9(2)	81	²⁰³ Tl	202.972 329(3)	29.524(14)
66	¹⁶² Dy	161.926 795(3)	25.5(2)	81	²⁰⁵ Tl	204.974 412(3)	70.476(14)
66	¹⁶³ Dy	162.928 728(3)	24.9(2)	82	²⁰⁴ Pb	203.973 029(3)	1.4(1)
66	¹⁶⁴ Dy	163.929 171(3)	28.2(2)	82	²⁰⁶ Pb	205.974 449(3)	24.1(1)
67	¹⁶⁵ Ho	164.930 319(3)	100	82	²⁰⁷ Pb	206.975 881(3)	22.1(1)
68	¹⁶² Er	161.928 775(4)	0.14(1)	82	²⁰⁸ Pb	207.976 636(3)	52.4(1)
68	¹⁶⁴ Er	163.929 197(4)	1.61(2)	83	²⁰⁹ Bi	208.980 383(3)	100
68	¹⁶⁶ Er	165.930 290(3)	33.6(2)	84	²⁰⁹ Po	208.982 416(3)	*
68	¹⁶⁷ Er	166.932 045(3)	22.95(15)	85	²¹⁰ At	209.987 131(9)	*
68	¹⁶⁸ Er	167.932 368(3)	26.8(2)	86	²¹¹ Rn	210.990 585(8)	*
68	¹⁷⁰ Er	169.935 460(3)	14.9(2)	86	²²² Rn	222.017 570(3)	*
69	¹⁶⁹ Tm	168.934 211(3)	100	87	²²³ Fr	223.019 731(3)	*
70	¹⁶⁸ Yb	167.933 894(5)	0.13(1)	88	²²³ Ra	223.018 497(3)	*
70	¹⁷⁰ Yb	169.934 759(3)	3.05(6)	88	²²⁵ Ra	225.023 604(3)	*
70	¹⁷¹ Yb	170.936 322(3)	14.3(2)	88	²²⁶ Ra	226.025 403(3)	*
70	¹⁷² Yb	171.936 378(3)	21.9(3)	89	²²⁷ Ac	227.027 747(3)	*
70	¹⁷³ Yb	172.938 207(3)	16.12(21)	90	²²⁹ Th	229.031 755(3)	*
70	¹⁷⁴ Yb	173.938 858(3)	31.8(4)	90	²³² Th	232.038 050(2)	100
70	¹⁷⁶ Yb	175.942 568(3)	12.7(2)	91	²³¹ Pa	231.035 879(3)	*
71	¹⁷⁵ Lu	174.940 768(3)	97.41(2)	92	²³⁴ U	234.040 946(2)	0.0055(5)
71	¹⁷⁶ Lu	175.942 682(3)	2.59(2)	92	²³⁵ U	235.043 923(2)	0.7200(12)
72	¹⁷⁴ Hf	173.940 040(3)	0.162(3)	92	²³⁸ U	238.050 783(2)	99.2745(60)
72	¹⁷⁶ Hf	175.941 402(3)	5.206(5)	93	²³⁷ Np	237.048 167(2)	*
72	¹⁷⁷ Hf	176.943 220(3)	18.606(4)	94	²³⁹ Pu	239.052 157(2)	*
72	¹⁷⁸ Hf	177.943 698(3)	27.297(4)	94	²⁴⁴ Pu	244.064 198(5)	*
72	¹⁷⁹ Hf	178.945 815(3)	13.629(6)				