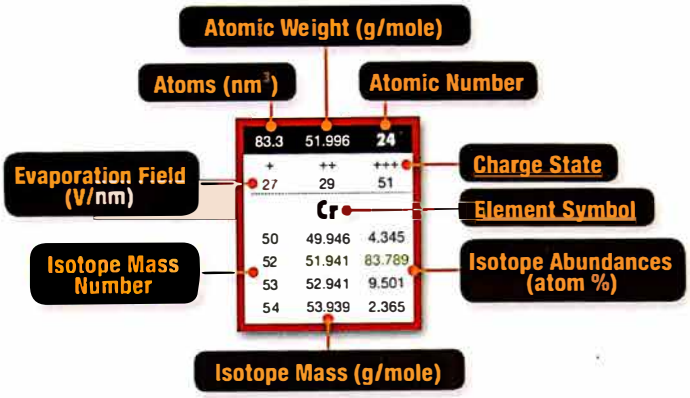
Periodic Table of the Isotopes



COLOR KEY:
Most probable charge state
Most abundant isotope
Most stable isotope
Half life (years)

Ia	IIa	IIIb	IVb	Vb	VIb	VIIb	VIII	VIII	VIII
52.7 1.0079 **1**									
+									
H									
1 1.0078 99.985									
2 2.0141 0.0115									
46.3 6.9410 **3**	124.2 9.0122 **4**	40.2 44.956 **21**	56.6 47.867 **22**	72.4 50.942 **23**	83.3 51.996 **24**	81.9 54.938 **25**	85.0 55.845 **26**	90.3 58.933 **27**	
+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	
14 520 1000	53 46 770		41 26 43	44 30 49	27 29 51	30 30 49	42 33 54	43 37 63	
Li	**Be**	**Sc**	**Ti**	**V**	**Cr**	**Mn**	**Fe**	**Co**	
6 6.0151 7.6	9 9.0122 100.0	45 44.956 100.0	46 45.953 8.25	50 49.947 0.25	50 49.946 4.345	55 54.938 100.0	54 53.940 5.845	59 58.933 100.0	
7 7.0160 92.4			47 46.952 7.44	51 50.944 99.75	52 51.941 83.789		56 55.935 91.754		
			48 47.948 73.72		53 52.941 9.501		57 56.935 2.119		
			49 48.948 5.41		54 53.939 2.365		58 57.933 0.282		
			50 49.945 5.18						
25.3 22.990 **11**	43.0 24.305 **12**								
+ ++ +++	+ ++ +++								
11 210 360	21 25 220								
Na	**Mg**								
23 22.990 100.0	24 23.985 78.99								
	25 24.986 10.00								
	26 25.983 11.01								
13.1 39.098 **19**	23.0 40.078 **20**								
+ ++ +++	+ ++ +++								
7 87 150	19 18 100								
K	**Ca**								
39 38.964 93.258	40 39.963 96.941								
40 39.964 0.0117	42 41.959 0.647								
41 40.962 6.730	43 42.959 0.135								
	44 43.955 2.086								
	46 45.954 0.004								
	48 47.953 0.187								
10.8 85.468 **37**	17.7 87.620 **38**	30.3 88.906 **39**	43.0 91.224 **40**	55.6 92.906 **41**	64.2 95.940 **42**	63.8 [98] **43**	73.7 101.07 **44**	72.7 102.91 **45**	
+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	
6 69 110		40 24	56 28 35	74 37 45	65 41 51		62 41 54	46 41 59	
Rb	**Sr**	**Y**	**Zr**	**Nb**	**Mo**	**Tc**	**Ru**	**Rh**	
85 84.912 72.165	84 83.913 0.56	89 88.906 100.0	90 89.905 51.45	93 92.906 100.0	92 91.907 14.77	98 97.907 4.2E6	96 95.908 5.54	103 102.91 100.0	
87 86.909 27.835	86 85.909 9.86		91 90.906 11.22		94 93.905 9.22	99 98.906 2.11E5	98 97.905 1.87		
	87 86.909 7.00		92 91.905 17.15		95 94.906 15.90		99 98.906 12.8		
	88 87.906 82.58		94 93.906 17.38		96 95.905 16.68		100 99.904 12.6		
			96 95.908 2.80		97 96.906 9.56		101 100.91 17.1		
					98 97.905 24.20		102 101.90 31.6		
					100 99.907 9.67		104 103.91 18.6		
8.5 132.91 **55**	15.8 137.33 **56**	44.8 178.49 **72**	55.5 180.95 **73**	63.6 183.84 **74**	68.0 186.21 **75**	71.5 190.23 **76**	70.7 192.22 **77**		
+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++		
5 55 85	15 13	67 39 43	96 48 44	102 57 52	82 45 49	86 48 50	80 44 50		
Cs	**Ba**	**Hf**	**Ta**	**W**	**Re**	**Os**	**Ir**		
133 132.91 100.0	130 129.91 0.106	174 173.94 0.16	180 179.95 0.012	180 179.95 0.12	185 184.95 37.40	184 183.95 0.020	191 190.96 37.3		
	132 131.91 0.101	176 175.94 5.26	181 180.95 99.988	182 181.95 26.50	187 186.96 62.60	186 185.95 1.59	193 192.96 62.7		
	134 133.90 2.417	177 176.94 18.60		183 182.95 14.34		187 186.96 1.96			
	135 134.91 6.592	178 177.94 27.28		184 183.95 30.64		188 187.96 13.24			
	136 135.90 7.854	179 178.95 13.62		186 185.95 28.43		189 188.96 16.15			
	137 136.91 11.23	180 179.95 35.08				190 189.96 26.26			
	138 137.91 71.70					192 191.96 40.78			
no data [223] **87**	no data [226] **88**								
+ ++ +++	+ ++ +++								
Fr	**Ra**								
223 223.02 0.00004	226 226.03 1600								

26.9 138.91 **57**	29.1 140.12 **58**	29.0 140.91 **59**	29.3 144.24 **60**	29.8 [145] **61**	30.1 150.36 **62**				
+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++				
32 18 24									
La	**Ce**	**Pr**	**Nd**	**Pm**	**Sm**				
138 137.91 0.090	136 135.91 0.185	141 140.91 100	142 141.91 27.2	145 144.91 17.7	144 143.91 3.07				
139 138.91 99.91	138 137.91 .251		143 142.91 12.2		147 146.91 14.99				
	140 139.91 88.45		144 143.91 13.8		148 147.91 11.24				
	142 141.91 11.11		145 144.91 8.30		149 148.92 13.82				
			148 145.91 17.2		150 149.92 7.38				
			148 147.92 5.7		152 151.92 26.75				
			150 149.92 5.6		154 153.92 22.75				
26.7 [227] **89**	30.4 232.04 **90**	39.7 231.04 **91**	48.2 238.03 **92**	52.0 [237] **93**	49.0 [244] **94**				
+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++	+ ++ +++				
			31						
Ac	**Th**	**Pa**	**U**	**Np**	**Pu**				
227 227.03 21.773	232 232.04 100	231 231.04 32760	234 234.04 0.0054	237 237.05 2.144E6	244 244.06 8E7				
			235 235.04 0.720						
			238 238.05 99.2745						

for Atom Probe Tomography

GAS	IONIZATION ENERGY (eV)	BEST IMAGE FIELD (V nm^{-1})	CONDENSATION TEMPERATURE (K)
Xenon	12.1	12	161
Krypton	14.0	15	116
Nitrogen	15.6	17	53
Argon	15.8	22	83
Hydrogen	15.4	22	14
Neon	21.6	35	25
Helium	24.6	44	4

Molar volumes and atomic weights from C.N. Singman, Journal of Chemical Education, *61 (1984) 137.*

Evaporation fields from T. T. Tsong, Surface Science, *70 (1978) 211-233.*

Isotope Masses and abundances from J. R. de Laeter, J. K. Böhlke, P. De Bièvre, H. Hidaka, H. S. Peiser, K. J. R. Rosman, and P. D. P. Taylor, "Atomic weights of the elements: Review 2000," Pure Applied Chemistry *(2003) 75, 683-800.*

Inert Gases		
28.7	4.0026	2
+	++	
He		
3	3.0160	0.00013
4	4.0026	99.9999

IIIa			IVa			Va			VIa			VIIa					
137.2	10.811	5	113.9	12.011	6	44.5	14.007	7	34.7	15.999	8	53.8	18.998	9	45.5	20.180	10
+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++
64	79	103	142	**103**	155												
B			**C**			**N**			**O**			**F**			**Ne**		
10	10.013	19.9	**12**	12.000	98.89	**14**	14.003	99.636	**16**	15.995	99.757	**19**	18.998	100.0	**20**	19.992	90.48
11	11.009	80.1	13	13.003	1.07	15	15.000	0.364	17	16.999	0.038				21	20.994	0.27
									18	17.999	0.205				22	21.991	9.25
60.2	26.982	13	49.9	28.086	14	35.4	30.974	15	38.8	32.065	16	34.6	35.453	17	26.7	39.948	18
+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++
19	35	50	45	**33**	60												
Al			**Si**			**P**			**S**			**Cl**			**Ar**		
27	26.982	100.0	**28**	27.977	92.22	**31**	30.974	100.0	**32**	31.972	94.99	**35**	34.969	75.76	36	35.968	0.3365
			29	28.976	4.69				33	32.971	0.75	37	36.966	24.24	38	37.963	0.0632
			30	29.974	3.09				34	33.968	4.25				**40**	39.962	99.6003
									36	35.967	0.01						

VIII									Ib			IIb					
91.4	58.693	28	51.0	69.723	31	44.2	72.641	32	46.5	74.922	33	36.7	78.963	34	30.4	79.904	35	21.5	83.798	36
+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++
35	36	65	**15**	39	56	35	**29**	58	46	**42**	54									
Ni			**Ga**			**Ge**			**As**			**Se**			**Br**			**Kr**		
58	57.935	68.077	**69**	68.926	60.108	70	69.924	20.38	**75**	74.922	100.0	74	73.922	0.89	**79**	78.918	50.69	79	78.920	0.355
60	59.931	26.223	71	70.925	39.892	72	71.922	27.31				76	75.919	9.37	81	80.916	49.31	80	79.916	2.29
61	60.931	1.140				73	72.923	7.76				77	76.920	7.64				82	81.913	11.6
62	61.928	3.635				**74**	73.921	36.72				78	77.917	23.77				83	82.914	11.5
64	63.928	0.926				76	75.921	7.83				**80**	79.917	49.61				**84**	83.912	57.0
												82	81.917	8.73				86	85.911	17.3
70.4	106.42	46	38.2	114.82	49	37.0	118.71	50	33.1	121.76	51	29.4	127.60	52	23.4	126.90	53	16.8	131.29	54
+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++
37	41	63	**12**	31	46	26	**23**	46	32	**30**	40									
Pd			**In**			**Sn**			**Sb**			**Te**			**I**			**Xe**		
102	101.91	1.02	113	112.90	4.29	112	111.90	0.97	**121**	120.90	57.21	120	119.90	0.09	**127**	126.90	100	124	123.91	.095
104	103.90	11.14	**115**	114.90	95.71	114	113.90	0.66	123	122.90	42.79	122	121.90	2.55				126	125.90	.089
105	104.91	22.33				115	114.90	0.34				123	122.90	.89				128	127.90	1.91
106	105.90	27.33				116	115.90	14.54				124	123.90	4.74				129	128.90	26.40
108	107.90	26.46				117	116.90	7.68				125	124.90	7.07				130	129.90	4.071
110	109.91	11.72				118	117.90	24.22				126	125.90	18.84				131	130.91	21.232
						119	118.90	8.59				128	127.90	31.74				**132**	131.90	26.909
						120	119.90	32.58				**130**	129.91	34.08				134	133.91	10.436
						122	121.90	4.63										136	135.91	8.857
						124	123.91	5.79												
66.3	195.08	78	35.0	204.38	81	32.9	207.20	82	28.3	208.98	83	26.2	[209]	84	no data	[210]	85	11.9	[222]	86
+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++
63	**45**	53	**13**	38	57	**20**	23	52	**18**	27	39									
Pt			**Tl**			**Pb**			**Bi**			**Po**			**At**			**Rn**		
190	189.96	.014	203	202.97	29.52	*204	203.97	1.4	**209**	208.98	100.0	**209**	208.98	102	**210**	209.99	0.0009	**222**	222.02	0.010
192	191.96	.782	**205**	204.97	70.47	206	205.97	24.1												
194	193.96	32.967				207	206.98	22.1												
195	194.96	33.832				**208**	207.98	52.4												
196	195.96	25.242																		
198	197.97	7.163																		

20.8	151.96	63	30.3	157.25	64	31.2	158.93	65	31.7	162.50	66	32.1	164.93	67	32.6	167.26	68	31.5	168.93	69	24.2	173.04	70	33.9	174.97	71
+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++
Eu			**Gd**			**Tb**			**Dy**			**Ho**			**Er**			**Tm**			**Yb**			**Lu**		
151	150.92	47.8	152	151.92	0.20	**159**	158.93	100.0	156	155.92	0.06	**165**	164.93	100	162	161.93	0.139	**169**	168.93	100.0	168	167.93	0.13	**175**	174.94	97.41
153	152.92	52.2	154	153.92	2.18				158	157.92	0.10				164	163.93	1.601				170	169.93	3.04	176	175.94	2.59
			155	154.92	14.80				160	159.93	2.33				**166**	165.93	33.503				171	170.94	14.28			
			156	155.92	20.47				161	160.93	18.89				167	166.93	22.869				172	171.94	21.83			
			157	156.92	15.65				162	161.93	25.48				168	167.93	26.978				173	172.94	16.13			
			158	157.92	24.84				163	162.93	24.90				170	169.94	14.910				**174**	173.94	31.83			
			160	159.93	21.86				**164**	163.93	28.26										176	175.94	12.76			

34.2	[243]	95	33.4	[247]	96	35.8	[247]	97	36.5	[251]	98	21.1	[252]	99	no data	[257]	100	no data	[258]	101	no data	[259]	102	no data	[262]	103
+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++	+	++	+++
Am			**Cm**			**Bk**			**Cf**			**Es**			**Fm**			**Md**			**No**			**Lw**		
243	243.06	7370	**247**	247.07	15.6E6	**247**	247.07	1380	**251**	251.08	898	**252**	252.08	0.755	**257**	257.10	0.275	**258**	258.10	0.00011	**259**	259.10	0.00011	**262**	262.11	4.1E-4