## **Table of Isotopic Masses and Natural Abundances**

This table lists the mass and percent natural abundance for the stable nuclides. The mass of the longest lived isotope is given for elements without a stable nuclide. Nuclides marked with an asterisk (\*) in the abundance column indicate that it is not present in nature or that a meaningful natural abundance cannot be given. The isotopic mass data is from G. Audi, A. H. Wapstra *Nucl. Phys A.* **1993**, *565*, 1-65 and G. Audi, A. H. Wapstra *Nucl. Phys A.* **1995**, *595*, 409-480. The percent natural abundance data is from the 1997 report of the IUPAC Subcommittee for Isotopic Abundance Measurements by K.J.R. Rosman, P.D.P. Taylor *Pure Appl. Chem.* **1999**, *71*, 1593-1607.

Z	Name	Symbol	Mass of Atom (u)	% Abundance	Z	Name	Symbol	Mass of Atom (u)	% Abundance
			, ,		15	Phosphorus	<sup>31</sup> P	30.973762	100
1	Hydrogen	<sup>1</sup> H	1.007825	99.9885					
	Deuterium	<sup>2</sup> H	2.014102	0.115	16	Sulphur	<sup>32</sup> S	31.972071	94.93
	Tritium	<sup>3</sup> H	3.016049	*			<sup>33</sup> S	32.971458	0.76
							<sup>34</sup> S	33.967867	4.29
2	Helium	³He	3.016029	0.000137			<sup>36</sup> S	35.967081	0.02
		⁴He	4.002603	99.999863					
					17	Chlorine	35CI	34.968853	75.78
3	Lithium	<sup>6</sup> Li	6.015122	7.59			<sup>37</sup> CI	36.965903	24.22
		<sup>7</sup> Li	7.016004	92.41					
					18	Argon	<sup>36</sup> Ar	35.967546	0.3365
4	Beryllium	9Be	9.012182	100			<sup>38</sup> Ar	37.962732	0.0632
							<sup>40</sup> Ar	39.962383	99.6003
5	Boron	<sup>10</sup> B	10.012937	19.9					
		<sup>11</sup> B	11.009305	80.1	19	Potassium	<sup>39</sup> K	38.963707	93.2581
							<sup>40</sup> K	39.963999	0.0117
6	Carbon	<sup>12</sup> C	12.000000	98.93			<sup>41</sup> K	40.961826	6.7302
		<sup>13</sup> C	13.003355	1.07					
		<sup>14</sup> C	14.003242	*	20	Calcium	<sup>40</sup> Ca	39.962591	96.941
							<sup>42</sup> Ca	41.958618	0.647
7	Nitrogen	<sup>14</sup> N	14.003074	99.632			<sup>43</sup> Ca	42.958767	0.135
		<sup>15</sup> N	15.000109	0.368			<sup>44</sup> Ca	43.955481	2.086
							⁴6Ca	45.953693	0.004
8	Oxygen	<sup>16</sup> O	15.994915	99.757			<sup>48</sup> Ca	47.952534	0.187
		<sup>17</sup> O	16.999132	0.038					
		<sup>18</sup> O	17.999160	0.205	21	Scandium	<sup>45</sup> Sc	44.955910	100
9	Fluorine	<sup>19</sup> F	18.998403	100	22	Titanium	<sup>46</sup> Ti	45.952629	8.25
							<sup>47</sup> Ti	46.951764	7.44
10	Neon	<sup>20</sup> Ne	19.992440	90.48			<sup>48</sup> Ti	47.947947	73.72
		<sup>21</sup> Ne	20.993847	0.27			<sup>49</sup> Ti	48.947871	5.41
		<sup>22</sup> Ne	21.991386	9.25			<sup>50</sup> Ti	49.944792	5.18
11	Sodium	<sup>23</sup> Na	22.989770	100	23	Vanadium	<sup>50</sup> V	49.947163	0.250
							<sup>51</sup> V	50.943964	99.750
12	Magnesium	<sup>24</sup> Mg	23.985042	78.99					
		<sup>25</sup> M g	24.985837	10.00	24	Chromium	<sup>50</sup> Cr	49.946050	4.345
		<sup>26</sup> Mg	25.982593	11.01			<sup>52</sup> Cr	51.940512	83.789
							<sup>53</sup> Cr	52.940654	9.501
13	Aluminum	<sup>27</sup> AI	26.981538	100			<sup>54</sup> Cr	53.938885	2.365
14	Silicon	<sup>28</sup> Si	27.976927	92.2297	25	Manganese	<sup>55</sup> Mn	54.938050	100
		<sup>29</sup> Si	28.976495	4.6832					
		<sup>30</sup> Si	29.973770	3.0872	26	Iron	<sup>54</sup> Fe	53.939615	5.845
							<sup>56</sup> Fe	55.934942	91.754

Z	Name	Symbol	Mass of Atom	% Abundance	z	Name	Symbol	Mass of Atom	% Abundance
		<sup>57</sup> Fe	56.935399	2.119				, ,	
		<sup>58</sup> Fe	57.933280	0.282	38	Strontium	<sup>84</sup> Sr	83.913425	0.56
							<sup>86</sup> Sr	85.909262	9.86
27	Cobalt	<sup>59</sup> Co	58.933200	100			<sup>87</sup> Sr	86.908879	7.00
							<sup>88</sup> Sr	87.905614	82.58
28	Nickel	<sup>58</sup> Ni	57.935348	68.0769					
		<sup>60</sup> Ni	59.930791	26.2231	39	Yttrium	<sup>89</sup> Y	88.905848	100
		<sup>61</sup> Ni	60.931060	1.1399					
		<sup>62</sup> Ni	61.928349	3.6345	40	Zirconium	90Zr	89.904704	51.45
		<sup>64</sup> Ni	63.927970	0.9256			<sup>91</sup> Zr	90.905645	11.22
							<sup>92</sup> Zr	91.905040	17.15
29	Copper	<sup>63</sup> Cu	62.929601	69.17			<sup>94</sup> Zr	93.906316	17.38
		<sup>65</sup> Cu	64.927794	30.83			<sup>96</sup> Zr	95.908276	2.80
30	Zinc	<sup>64</sup> Zn	63.929147	48.63	41	Niobium	93Nb	92.906378	100
		<sup>66</sup> Zn	65.926037	27.90					
		<sup>67</sup> Zn	66.927131	4.10	42	Molybdenum	<sup>92</sup> Mo	91.906810	14.84
		<sup>68</sup> Zn	67.924848	18.75		•	<sup>94</sup> Mo	93.905088	9.25
		<sup>70</sup> Zn	69.925325	0.62			<sup>95</sup> Mo	94.905841	15.92
							<sup>96</sup> Mo	95.904679	16.68
31	Gallium	<sup>69</sup> Ga	68.925581	60.108			<sup>97</sup> Mo	96.906021	9.55
		<sup>71</sup> Ga	70.924705	39.892			<sup>98</sup> Mo	97.905408	24.13
							<sup>100</sup> Mo	99.907477	9.63
32	Germanium	<sup>70</sup> Ge	69.924250	20.84					
-	<b>C</b> oa	<sup>72</sup> Ge	71.922076	27.54	43	Technetium	<sup>98</sup> Tc	97.907216	*
		<sup>73</sup> Ge	72.923459	7.73	10	roomodam	10	07.007210	
		<sup>74</sup> Ge	73.921178	36.28	44	Ruthenium	<sup>96</sup> Ru	95.907598	5.54
		<sup>76</sup> Ge	75.921403	7.61			98Ru	97.905287	1.87
		00	70.021100	7.01			99Ru	98.905939	12.76
33	Arsenic	<sup>75</sup> As	74.921596	100			<sup>100</sup> Ru	99.904220	12.60
00	7.11.001.11.0	7.0		.00			<sup>101</sup> Ru	100.905582	17.06
34	Selenium	<sup>74</sup> Se	73.922477	0.89			<sup>102</sup> Ru	101.904350	31.55
0.	Coloniani	<sup>76</sup> Se	75.919214	9.37			104Ru	103.905430	18.62
		™Se	76.919915	7.63			itu	100.000 100	10.02
		<sup>78</sup> Se	77.917310	23.77	45	Rhodium	<sup>103</sup> Rh	102.905504	100
		<sup>80</sup> Se	79.916522	49.61	10	ranodidin	1411	102.000001	100
		<sup>82</sup> Se	81.916700	8.73	46	Palladium	<sup>102</sup> Pd	101.905608	1.02
		36	01.910700	0.75	40	i allauluiti	<sup>104</sup> Pd	103.904035	11.14
35	Bromine	<sup>79</sup> Br	78.918338	50.69			<sup>105</sup> Pd	104.905084	22.33
33	Bromine	81Br					<sup>106</sup> Pd		
		ы	80.916291	49.31			<sup>108</sup> Pd	105.903483	27.33
20	l/m m to m	<sup>78</sup> Kr	77 020200	0.25			<sup>110</sup> Pd	107.903894	26.46
36	Krypton	<sup>80</sup> Kr	77.920386	0.35			Pu	109.905152	11.72
		Kr <sup>82</sup> Kr	79.916378	2.28	47	Cilver	<sup>107</sup> Ag	400 005002	F4 000
		<sup>83</sup> Kr	81.913485	11.58	47	Silver	Ag <sup>109</sup> Ag	106.905093	51.839
			82.914136	11.49			Ag	108.904756	48.161
		<sup>84</sup> Kr	83.911507	57.00	40	Codesi	<sup>106</sup> Cd	405 000450	4.05
		<sup>86</sup> Kr	85.910610	17.30	48	Cadmium		105.906458	1.25
		85_	_,				<sup>108</sup> Cd	107.904183	0.89
37	Rubidium	<sup>85</sup> Rb	84.911789	72.17			<sup>110</sup> Cd	109.903006	12.49
		<sup>87</sup> Rb	86.909183	27.83			<sup>111</sup> Cd	110.904182	12.80

z	Name	Symbol	Mass of Atom (u)	% Abundance	Z	Name	Symbol	Mass of Atom (u)	% Abundance
		<sup>112</sup> Cd	111.902757	24.13			<sup>137</sup> Ba	136.905821	11.232
		<sup>113</sup> Cd	112.904401	12.22			<sup>138</sup> Ba	137.905241	71.698
		<sup>114</sup> Cd	113.903358	28.73					
		<sup>116</sup> Cd	115.904755	7.49	57	Lanthanum	<sup>138</sup> La	137.907107	0.090
							<sup>139</sup> La	138.906348	99.910
49	Indium	<sup>113</sup> ln	112.904061	4.29					
		<sup>115</sup> ln	114.903878	95.71	58	Cerium	<sup>136</sup> Ce	135.907144	0.185
							<sup>138</sup> Ce	137.905986	0.251
50	Tin	<sup>112</sup> Sn	111.904821	0.97			<sup>140</sup> Ce	139.905434	88.450
		<sup>114</sup> Sn	113.902782	0.66			<sup>142</sup> Ce	141.909240	11.114
		<sup>115</sup> Sn	114.903346	0.34					
		<sup>116</sup> Sn	115.901744	14.54	59	Praseodymium	<sup>141</sup> Pr	140.907648	100
		<sup>117</sup> Sn	116.902954	7.68					
		<sup>118</sup> Sn	117.901606	24.22	60	Neodymium	<sup>142</sup> Nd	141.907719	27.2
		<sup>119</sup> Sn	118.903309	8.59			<sup>143</sup> Nd	142.909810	12.2
		<sup>120</sup> Sn	119.902197	32.58			<sup>144</sup> Nd	143.910083	23.8
		<sup>122</sup> Sn	121.903440	4.63			<sup>145</sup> Nd	144.912569	8.3
		<sup>124</sup> Sn	123.905275	5.79			<sup>146</sup> Nd	145.913112	17.2
							<sup>148</sup> Nd	147.916889	5.7
51	Antimony	<sup>121</sup> Sb	120.903818	57.21			<sup>150</sup> Nd	149.920887	5.6
		<sup>123</sup> Sb	122.904216	42.79					
					61	Promethium	<sup>145</sup> Pm	144.912744	*
52	Tellurium	<sup>120</sup> Te	119.904020	0.09					
		<sup>122</sup> Te	121.903047	2.55	62	Samarium	<sup>144</sup> Sm	143.911995	3.07
		<sup>123</sup> Te	122.904273	0.89			<sup>147</sup> Sm	146.914893	14.99
		<sup>124</sup> Te	123.902819	4.74			<sup>148</sup> Sm	147.914818	11.24
		<sup>125</sup> Te	124.904425	7.07			<sup>149</sup> Sm	148.917180	13.82
		<sup>126</sup> Te	125.903306	18.84			<sup>150</sup> Sm	149.917271	7.38
		<sup>128</sup> Te	127.904461	31.74			<sup>152</sup> Sm	151.919728	26.75
		<sup>130</sup> Te	129.906223	34.08			<sup>154</sup> Sm	153.922205	22.75
53	Iodine	<sup>127</sup>	126.904468	100	63	Europium	<sup>151</sup> Eu	150.919846	47.81
							<sup>153</sup> Eu	152.921226	52.19
54	Xenon	<sup>124</sup> Xe	123.905896	0.09					
		<sup>126</sup> Xe	125.904269	0.09	64	Gadolinium	<sup>152</sup> Gd	151.919788	0.20
		<sup>128</sup> Xe	127.903530	1.92			<sup>154</sup> Gd	153.920862	2.18
		<sup>129</sup> Xe	128.904779	26.44			<sup>155</sup> Gd	154.922619	14.80
		<sup>130</sup> Xe	129.903508	4.08			<sup>156</sup> Gd	155.922120	20.47
		<sup>131</sup> Xe	130.905082	21.18			<sup>157</sup> Gd	156.923957	15.65
		<sup>132</sup> Xe	131.904154	26.89			<sup>158</sup> Gd	157.924101	24.84
		<sup>134</sup> Xe	133.905395	10.44			<sup>160</sup> Gd	159.927051	21.86
		<sup>136</sup> Xe	135.907220	8.87					
		7.0	.00.00.220	0.0.	65	Terbium	<sup>159</sup> Tb	158.925343	100
55	Cesium	<sup>133</sup> Cs	132.905447	100	00	Toroidin	15	100.020010	100
					66	Dysprosium	<sup>156</sup> Dy	155.924278	0.06
56	Barium	<sup>130</sup> Ba	129.906310	0.106			<sup>158</sup> Dy	157.924405	0.10
		<sup>132</sup> Ba	131.905056	0.101			<sup>160</sup> Dy	159.925194	2.34
		<sup>134</sup> Ba	133.904503	2.417			<sup>161</sup> Dy	160.926930	18.91
		<sup>135</sup> Ba	134.905683	6.592			<sup>162</sup> Dy	161.926795	25.51
		<sup>136</sup> Ba	135.904570	7.854			<sup>163</sup> Dy	162.928728	24.90

Z	Name	Symbol 164Dy	Mass of Atom (u)	% Abundance	Z	Name	Symbol	Mass of Atom (u)	% Abundance
		Бу	163.929171	28.18		1 - 12	<sup>191</sup> lr	100 000501	07.0
67	Holmium	<sup>165</sup> Ho	164 020210	100	77	Iridium	193 Ir	190.960591 192.962924	37.3
67	Holmium	по	164.930319	100			"	192.902924	62.7
68	Erbium	<sup>162</sup> Er	161.928775	0.14	78	Platinum	<sup>190</sup> Pt	189.959930	0.014
		<sup>164</sup> Er	163.929197	1.61			<sup>192</sup> Pt	191.961035	0.782
		<sup>166</sup> Er	165.930290	33.61			<sup>194</sup> Pt	193.962664	32.967
		<sup>167</sup> Er	166.932045	22.93			<sup>195</sup> Pt	194.964774	33.832
		<sup>168</sup> Er	167.932368	26.78			<sup>196</sup> Pt	195.964935	25.242
		<sup>170</sup> Er	169.935460	14.93			<sup>198</sup> Pt	197.967876	7.163
69	Thulium	<sup>169</sup> Tm	168.934211	100	79	Gold	<sup>197</sup> Au	196.966552	100
70	Ytterbium	<sup>168</sup> Yb	167.933894	0.13	80	Mercury	<sup>196</sup> Hg	195.965815	0.15
		<sup>170</sup> Yb	169.934759	3.04			<sup>198</sup> Hg	197.966752	9.97
		<sup>171</sup> Yb	170.936322	14.28			<sup>199</sup> Hg	198.968262	16.87
		<sup>172</sup> Y b	171.936378	21.83			<sup>200</sup> Hg	199.968309	23.10
		<sup>173</sup> Y b	172.938207	16.13			<sup>201</sup> Hg	200.970285	13.18
		<sup>174</sup> Y b	173.938858	31.83			<sup>202</sup> Hg	201.970626	29.86
		<sup>176</sup> Y b	175.942568	12.76			<sup>204</sup> Hg	203.973476	6.87
71	Lutetium	<sup>175</sup> Lu	174.940768	97.41	81	Thallium	<sup>203</sup> ∏	202.972329	29.524
		<sup>176</sup> Lu	175.942682	2.59			<sup>205</sup> ∏	204.974412	70.476
72	Hafnium	<sup>174</sup> Hf	173.940040	0.16	82	Lead	<sup>204</sup> Pb	203.973029	1.4
		<sup>176</sup> Hf	175.941402	5.26			<sup>206</sup> Pb	205.974449	24.1
		<sup>177</sup> Hf	176.943220	18.60			<sup>207</sup> Pb	206.975881	22.1
		<sup>178</sup> Hf	177.943698	27.28			<sup>208</sup> Pb	207.976636	52.4
		<sup>179</sup> Hf	178.945815	13.62					
		<sup>180</sup> Hf	179.946549	35.08	83	Bismuth	<sup>209</sup> Bi	208.980383	100
73	Tantalum	<sup>180</sup> Ta	179.947466	0.012	84	Polonium	<sup>209</sup> Po	208.982416	*
		<sup>181</sup> Ta	180.947996	99.988					
	_	180			85	Astatine	<sup>210</sup> At	209.987131	*
74	Tungsten	<sup>180</sup> W	179.946706	0.12			222		
		<sup>182</sup> W	181.948206	26.50	86	Radon	<sup>222</sup> Rn	222.017570	*
		<sup>183</sup> W	182.950224	14.31			222		
		<sup>184</sup> W	183.950933	30.64	87	Francium	<sup>223</sup> Fr	223.019731	*
		<sup>186</sup> W	185.954362	28.43	88	Radium	<sup>226</sup> Ra	226.025403	*
75	Rhenium	<sup>185</sup> Re	184.952956	37.40					
		<sup>187</sup> R e	186.955751	62.60	89	Actinium	<sup>227</sup> Ac	227.027747	*
76	Osmium	<sup>184</sup> Os	183.952491	0.02	90	Thorium	<sup>232</sup> Th	232.038050	100
		<sup>186</sup> Os	185.953838	1.59		•			-
		<sup>187</sup> Os	186.955748	1.96	91	Protactinium	<sup>231</sup> Pa	231.035879	100
		188 Os	187.955836	13.24	J1	. rotadiiiidiii	ıu	201.000070	100
		<sup>189</sup> Os	188.958145	16.15	92	Uranium	<sup>234</sup> U	234.040946	0.0055
		<sup>190</sup> Os	189.958445	26.26			<sup>235</sup> U	235.043923	0.7200

z	Name	Symbol	Mass of Atom	% Abundance
93	Neptunium	<sup>237</sup> Np	237.048167	*
94	Plutonium	<sup>244</sup> Pu	244.064198	*
95	Americium	<sup>243</sup> Am	243.061373	*
96	Curium	<sup>247</sup> Cm	247.070347	*
97	Berkelium	<sup>247</sup> Bk	247.070299	*
98	Californium	<sup>251</sup> Cf	251.079580	*
99	Einsteinium	<sup>252</sup> Es	252.082972	*
100	Fermium	<sup>257</sup> Fm	257.095099	*
101	Mendelevium	<sup>258</sup> Md	258.098425	*
102	Nobelium	<sup>259</sup> No	259.101024	*
103	Lawrencium	<sup>262</sup> Lr	262.109692	*
104	Rutherfordium	<sup>263</sup> Rf	263.118313	*
105	Dubnium	<sup>262</sup> Db	262.011437	*
106	Seaborgium	<sup>266</sup> Sg	266.012238	*
107	Bohrium	<sup>264</sup> Bh	264.012496	*
108	Hassium	<sup>269</sup> Hs	269.001341	*
109	Meitnerium	<sup>268</sup> Mt	268.001388	*
110	Ununnilium	<sup>272</sup> Uun	272.001463	*
111	Unununium	<sup>272</sup> Uuu	272.001535	*
112	Ununbium	<sup>277</sup> Uub	(277)	*
114	Ununquadium	<sup>289</sup> Uuq	(289)	*
116	Ununhexium	<sup>289</sup> Uuh	(289)	*
118	Ununoctium	<sup>293</sup> Uuo	(293)	*