Nuclear Wallet Cards

Nuclide Z	El	A	Jπ	Δ (MeV)	T½, Γ, or Abundance	Decay Mode
0	n	1	1/2+	8.071	10.183 m *17*	β–
1	H	1	1/2+	7.289	**99.9885% *70***	
		2	1+	13.136	**0.0115% *70***	
		3	1/2+	14.950	12.32 y *2*	β–
		4	2–	24.6		n
		5	(1/2+)	32.89	5.7 MeV *21*	2n
		6	(2–)	41.9	1.6 MeV *4*	n
		7	(1/2+)	47.9	29×10^{-23} y *7*	
2	He	3	1/2+	14.931	**0.000134% *3***	
		4	0+	2.425	**99.999866% *3***	
		5	3/2–	11.23	0.60 MeV *2*	α , n
		6	0+	17.592	801 ms *10*	β–
		7	(3/2)–	26.067	150 keV *20*	n
		8	0+	31.609	119.1 ms *12*	β– , β–n 16%
		9	1/2+	39.78		n
		10	0+	48.81	300 keV *200*	n
3	Li	3		29s	unbound	p?
		4	2–	25.3	6.03 MeV	p
		5	3/2–	11.68	≈1.5 MeV	p , α
		6	1+	14.087	**7.59% *4***	
		7	3/2–	14.907	**92.41% *4***	
		8	2+	20.945	839.9 ms *9*	β– , β–α
		9	3/2–	24.954	178.3 ms *4*	β– , β–n 50.8%
		10	(1–,2–)	33.05		n
4	Be	8	0+	4.941	5.57 eV *25*	α
		9	3/2–	11.348	**100.%**	
		10	0+	12.607	1.387×10^{6} y *12*	β–
		11	1/2+	20.177	13.81 s *8*	β– , β–α 3.1%
		12	0+	25.076	21.49 ms *3*	β– , β–n≤1%
5	B	8	2+	22.921	770 ms *3*	ε , εα
		9	3/2–	12.416	0.54 keV *21*	p , 2α
		10	3+	12.050	**19.9% *7***	
		11	3/2–	8.667	**80.1% *7***	
		12	1+	13.368	20.20 ms *2*	β– , β–3α 1.58%
6	C	8	0+	35.08	230 keV *50*	p , α
		9	(3/2–)	28.909	126.5 ms *9*	ε , εp 61.6%, εα 38.4%
		10	0+	15.698	19.308 s *4*	ε
		11	3/2–	10.650	20.334 m *24*	ε
		12	0+	0.000	**98.93% *8***	
		13	1/2–	3.125	**1.07% *8***	
		14	0+	3.020	5700 y *30*	β–
		15	1/2+	9.873	2.449 s *5*	β–
		16	0+	13.694	0.747 s *8*	β– , β–n 99%
		17	3/2+	21.03	193 ms *13*	β– , β–n 32%
		18	0+	24.92	92 ms *2*	β– , β–n 31.5%
7	N	10		38.8		p
		11	1/2+	24.30	0.83 MeV *3*	p
		12	1+	17.338	11.000 ms *16*	ε
		13	1/2–	5.345	9.965 m *4*	ε
		14	1+	2.863	**99.636% *20***	
		15	1/2–	0.101	**0.364% *20***	
		16	2–	5.683	7.13 s *2*	β– , β–α 1.2×10^{-3}%
		17	1/2–	7.87	4.173 s *4*	β– , β–n 95.1%
		18	1–	13.11	620 ms *8*	β– , β–α 12.2%, β–n 7%
8	O	12	0+	32.05	0.40 MeV *25*	p
		13	(3/2–)	23.114	8.58 ms *5*	ε , εp
		14	0+	8.007	70.620 s *15*	ε
		15	1/2–	2.855	122.24 s *16*	ε
		16	0+	–4.737	**99.757% *16***	
		17	5/2+	–0.809	**0.038% *1***	
		18	0+	–0.783	**0.205% *14***	
		19	5/2+	3.333	26.88 s *5*	β–
		20	0+	3.796	13.51 s *5*	β–

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9	F	18	1+	0.873	109.77 m *5*	ε
		19	1/2+	–1.487	**100%**	
		20	2+	–0.017	11.07 s *6*	β–
10	Ne	18	0+	5.317	1.6670 s *17*	ε
		19	1/2+	1.752	17.22 s *2*	ε
		20	0+	–7.042	**90.48% *3***	
		21	3/2+	–5.731	**0.27% *1***	
		22	0+	–8.024	**9.25% *3***	
		23	5/2+	–5.154	37.24 s *12*	β–
		24	0+	–5.951	3.38 m *2*	β–
11	Na	22	3+	–5.181		ε
		23	3/2+	–9.530	**100%**	
		24	4+	–8.417	14.997 h *12*	β–
		24m	1+	–7.945	20.18 ms *10*	IT 99.95%, β–≈0.05%
12	Mg	23	3/2+	–5.473	11.317 s *11*	ε
		24	0+	–13.933	**78.99% *4***	
		25	5/2+	–13.192	**10.00% *1***	
		26	0+	–16.214	**11.01% *3***	
		27	1/2+	–14.586	9.458 m *12*	β–
13	Al	26	5+	–12.210	7.17×10^{5} y *24*	ε
		26m	0+	–11.982	6.3464 s *7*	ε
		27	5/2+	–17.196	**100%**	
		28	3+	–16.850	2.2414 m *12*	β–
14	Si	27	5/2+	–12.384	4.15 s *4*	
		28	0+	–21.493	**92.223% *19***	
		29	1/2+	–21.895	**4.685% *8***	
		30	0+	–24.432	**3.092% *11***	
		31	3/2+	–22.949	157.3 m *3*	β–
15	P	31	1/2+	–24.441	**100%**	
		32	1+	–24.304	14.262 d *14*	β–
16	S	31	1/2+	–19.043	2.572 s *13*	ε
		32	0+	–26.015	**94.99% *26***	
		33	3/2+	–26.586	**0.75% *2***	
		34	0+	–29.931	**4.25% *24***	
		35	3/2+	–28.846	87.37 d *4*	β–
		36	0+	–30.664	**0.01% *1***	
17	Cl	35	3/2+	–29.013	**75.76% *10***	
		36	2+	–29.521	3.01×10^{5} y *2*	β– 98.1%, ε 1.9%
		37	3/2+	–31.761	**24.24% *10***	
		38	2–	–29.798	37.24 m *5*	β–
		38m	5–	–29.127	715 ms *3*	IT
18	Ar	36	0+	–30.231	**0.3336% *21***	
		37	3/2+	–30.947	35.04 d *4*	ε
		38	0+	–34.714	**0.0629% *7***	
		39	7/2–	–33.242	269 y *3*	β–
		40	0+	–35.040	**99.6035% *25***	
		41	7/2–	–33.067	109.61 m *4*	β–
		42	0+	–34.422	32.9 y *11*	β–
19	K	38	3+	–28.800	7.636 m *18*	ε
		38m	0+	–28.670	924.3 ms *3*	ε 99.97%, IT 0.03%
		39	3/2+	–33.807	**93.2581% *44***	
		40	4–	–33.535	1.248×10^{9} y *3*	β– 89.28%, **0.0117% *1*** ε 10.72%
		41	3/2+	–35.560	**6.7302% *44***	
		42	2–	–35.022	12.321 h *25*	β–
20	Ca	38	0+	–22.058	440 ms *12*	ε
		39	3/2+	–27.282	859.6 ms *14*	ε
		40	0+	–34.846	$>3.0\times10^{21}$ y **96.94% *16***	2ε
		41	7/2–	–35.137	1.02×10^{5} y *7*	ε
		42	0+	–38.547	**0.647% *23***	
		43	7/2–	–38.408	**0.135% *10***	
		44	0+	–41.468	**2.09% *11***	
		45	7/2–	–40.812	162.61 d *9*	β–
		46	0+	–43.139	$>0.28\times10^{16}$ y **0.004% *3***	2β–
		47	7/2–	–42.345	4.536 d *3*	β–
		48	0+	–44.223	$>5.8\times10^{22}$ y **0.187% *21***	2β– 75%

Nuclear Wallet Cards

Nuclide Z	El	A	Jπ	Δ (MeV)	T½, Γ, or Abundance	Decay Mode
21	**Sc**	44	2+	–37.816	3.97 h *4*	ε
		44m	6+	–37.545	58.61 h *10*	IT 98.8%, ε 1.2%
		45	7/2–	–41.070	**100%**	
		45m	3/2+	–41.058	318 ms *7*	IT
		46	4+	–41.759	83.79 d *4*	β–
		46m	1–	–41.617	18.75 s *4*	IT
22	**Ti**	46	0+	–44.127	***8.25% 3***	
		47	5/2–	–44.936	***7.44% 2***	
		48	0+	–48.491	***73.72% 3***	
		49	7/2–	–48.562	***5.41% 2***	
		50	0+	–51.430	***5.18% 2***	
23	**V**	50	6+	–49.224	$>2.1\times10^{17}$ y ***0.250% 2***	ε>92.9%, β–<7.1%
		51	7/2–	–52.203	***99.750% 2***	
		52	3+	–51.443	3.743 m *5*	β–
24	**Cr**	50	0+	–50.261	$>1.3\times10^{18}$ y ***4.345% 13***	2ε
		51	7/2–	–51.451	27.7025 d *24*	ε
		52	0+	–55.418	***83.789% 18***	
		53	3/2–	–55.285	***9.501% 17***	
		54	0+	–56.933	***2.365% 7***	
25	**Mn**	54	3+	–55.556	312.12 d *6*	ε , β–<2.9×10^{-4}%
		55	5/2–	–57.711	**100%**	
		56	3+	–56.910	2.5789 h *1*	β–
26	**Fe**	52m	12+	–41.374	45.9 s *6*	ε , IT<4.0×10^{-3}%
		53	7/2–	–50.946	8.51 m *2*	ε
		53m	19/2–	–47.906	2.54 m *2*	IT
		54	0+	–56.253	***5.845% 35***	
		55	3/2–	–57.480	2.744 y *9*	ε
		56	0+	–60.606	***91.754% 36***	
		57	1/2–	–60.181	***2.119% 10***	
		58	0+	–62.154	***0.282% 4***	
		59	3/2–	–60.664	44.495 d *9*	β–
		60	0+	–61.412	2.62×10^{6} y *4*	β–
27	**Co**	59	7/2–	–62.229	**100%**	
		60	5+	–61.649	1925.28 d *14*	β–
		60m	2+	–61.590	10.467 m *6*	IT 99.76%, β– 0.24%
		61	7/2–	–62.897	1.650 h *5*	β–
		62	2+	–61.43	1.50 m *4*	β–
		62m	5+	–61.41	13.91 m *5*	β–>99%, IT<1%
28	**Ni**	56	0+	–53.906	6.075 d *10*	ε
		57	3/2–	–56.083	35.60 h *6*	ε
		58	0+	–60.228	***68.077% 9***	
		59	3/2–	–61.156	7.6×10^{4} y *5*	ε
		60	0+	–64.472	***26.223% 8***	
		61	3/2–	–64.221	***1.1399% 13***	
		62	0+	–66.745	***3.6346% 40***	
		63	1/2–	–65.512	101.2 y *15*	β–
		64	0+	–67.098	***0.9255% 19***	
		65	5/2–	–65.125	2.5175 h *5*	β–
		66	0+	–66.006	54.6 h *3*	β–
29	**Cu**	60	2+	–58.344	23.7 m *4*	ε
		61	3/2–	–61.983	3.333 h *5*	ε
		62	1+	–62.786	9.673 m *8*	ε
		63	3/2–	–65.579	***69.15% 15***	
		64	1+	–65.424	12.701 h *2*	ε 61.5%, β– 38.5%
		65	3/2–	–67.263	***30.85% 15***	
		66	1+	–66.257	5.120 m *14*	β–
		67	3/2–	–67.318	61.83 h *12*	β–
		68	1+	–65.567	30.9 s *6*	β–
		68m	(6–)	–64.845	3.75 m *5*	IT 84%, β– 16%
30	**Zn**	64	0+	–66.003	$\geq7.0\times10^{20}$ y ***49.17% 75***	2ε
		65	5/2–	–65.911	243.93 d *9*	ε
		66	0+	–68.899	***27.73% 98***	
		67	5/2–	–67.880	***4.04% 16***	
		68	0+	–70.006	***18.45% 63***	
		69	1/2–	–68.417	56.4 m *9*	β–
		69m	9/2+	–67.978	13.76 h *2*	IT 99.97%, β– 0.03%
		70	0+	–69.564	$\geq2.3\times10^{17}$ y ***0.61% 10***	2β–

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31	**Ga**	68	1+	–67.085	67.71 m *9*	ε
		69	3/2–	–69.327	***60.108% 9***	
		70	1+	–68.910	21.14 m *3*	β– 99.59%, ε 0.41%
		71	3/2–	–70.139	***39.892% 9***	
		72	3–	–68.588	14.10 h *2*	β–
32	**Ge**	70	0+	–70.561	***20.57% 27***	β–
		71	1/2–	–69.906	11.43 d *3*	β–
		71m	9/2+	–69.708	20.41 ms *18*	
		72	0+	–72.585	***27.45% 32***	ε
		73	9/2+	–71.297	***7.75% 12***	IT
		73m	1/2–	–71.230	0.499 s *11*	
		74	0+	–73.422	***36.50% 20***	
		75	1/2–	–71.856	82.78 m *4*	IT
		75m	7/2+	–71.716	47.7 s *5*	
		76	0+	–73.212	***7.73% 12***	β–
33	**As**	75	3/2–	–73.033	**100%**	IT 99.97%, β– 0.03%
		75m	9/2+	–72.729	17.62 ms *23*	IT
34	**Se**	74	0+	–72.212	***0.89% 4***	
		75	5/2+	–72.169	119.79 d *4*	ε
		76	0+	–75.251	***9.37% 29***	
		77	1/2–	–74.599	***7.63% 16***	
		77m	7/2+	–74.437	17.4 s *8*	IT
		78	0+	–77.025	***23.77% 28***	
		79	7/2+	–75.917	2.95×10^{5} y *38*	β–
		79m	1/2–	–75.821	3.92 m *1*	IT 99.94%, β– 0.06%
		80	0+	–77.759	***49.61% 41***	
		81	1/2–	–76.389	18.45 m *12*	β–
		81m	7/2+	–76.286	57.28 m *2*	IT 99.95%, β– 0.05%
		82	0+	–77.594	***8.73% 22***	
35	**Br**	79	3/2–	–76.068	***50.69% 7***	
		79m	9/2+	–75.860	5.1 s *4*	IT
		80	1+	–75.889	17.68 m *2*	β– 91.7%, ε 8.3%
		80m	5–	–75.803	4.4205 h *8*	IT
		81	3/2–	–77.975	***49.31% 7***	
36	**Kr**	78	0+	–74.179	$\geq1.5\times10^{21}$ y ***0.355% 3***	2ε
		79	1/2–	–74.442	35.04 h *10*	ε
		79m	7/2+	–74.312	50 s *3*	IT
		80	0+	–77.892	***2.286% 10***	
		81	7/2+	–77.694	2.29×10^{5} y *11*	ε
		81m	1/2–	–77.503	13.10 s *3*	IT , ε 2.5×10^{-3}%
		82	0+	–80.590	***11.593% 31***	
		83	9/2+	–79.990	***11.500% 19***	
		83m	1/2–	–79.948	1.85 h *3*	IT
		84	0+	–82.439	***56.987% 15***	
		85	9/2+	–81.480	10.752 y *25*	β–
		85m	1/2–	–81.175	4.480 h *8*	β– 78.6%, IT 21.4%
		86	0+	–83.266	***17.279% 41***	
37	**Rb**	*85*	5/2–	–82.167	***72.17% 2***	
		86	2–	–82.747	18.642 d *18*	β– 99.99%, ε 5.2×10^{-3}%
		86m	6–	–82.191	1.017 m *3*	IT , β–<0.3%
		87	3/2–	–84.597	4.81×10^{10} y ***27.83% 2***	β–
38	**Sr**	84	0+	–80.649	***0.56% 1***	
		85	9/2+	–81.103	64.850 d *7*	ε
		85m	1/2–	–80.864	67.63 m *4*	IT 86.6%, ε 13.4%
		86	0+	–84.523	***9.86% 1***	
		87	9/2+	–84.880	***7.00% 1***	
		87m	1/2–	–84.492	2.815 h *12*	IT 99.7%, ε 0.3%
		88	0+	–87.921	***82.58% 1***	
39	**Y**	89	1/2–	–87.709	**100%**	
40	**Zr**	90	0+	–88.774	***51.45% 40***	
		90m	5–	–86.455	809.2 ms *20*	IT
		91	5/2+	–87.897	***11.22% 5***	
		92	0+	–88.460	***17.15% 8***	
		93	5/2+	–87.123	1.61×10^{6} y *5*	β–
		94	0+	–87.272	***17.38% 28***	
		95	5/2+	–85.663	64.032 d *6*	β–
		96	0+	–85.447	2.35×10^{19} y *21*	2β–

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41	Nb	93	9/2+	−87.214	**100%**	
42	Mo	92	0+	−86.809	**14.53%** ***30***	
		93	5/2+	−86.807	4.0×10^{3} y *8*	ε
		93m	21/2+	−84.382	6.85 h *7*	IT 99.88%, ε 0.12%
		94	0+	−88.414	**9.15%** ***9***	
		95	5/2+	−87.711	**15.84%** ***11***	
		96	0+	−88.794	**16.67%** ***15***	
		97	5/2+	−87.544	**9.60%** ***14***	
		98	0+	−88.116	**24.39%** ***37***	
		99	1/2+	−85.970	65.976 h *24*	β−
		100	0+	−86.187	7.3×10^{18} y *4*	2β−
					9.82% ***31***	
43	Tc	97	9/2+	−87.224	4.21×10^{6} y *16*	ε
		97m	1/2−	−87.127	91.0 d *6*	IT 96.06%, ε 3.94%
		98	(6)+	−86.431	4.2×10^{6} y *3*	β−
		99	9/2+	−87.327	2.111×10^{5} y *12*	β−
		99m	1/2−	−87.184	6.0067 h *5*	IT, β− 3.7×10^{-3}%
44	Ru	96	0+	−86.080	**5.54%** ***14***	
		97	5/2+	−86.120	2.83 d *23*	ε
		98	0+	−88.224	**1.87%** ***3***	
		99	5/2+	−87.620	**12.76%** ***14***	
		100	0+	−89.222	**12.60%** ***7***	
		101	5/2+	−87.952	**17.06%** ***2***	
		102	0+	−89.101	**31.55%** ***14***	
		103	3/2+	−87.262	39.247 d *13*	β−
		104	0+	−88.092	**18.62%** ***27***	
45	Rh	103	1/2−	−88.025	**100%**	
46	Pd	102	0+	−87.928	**1.02%** ***1***	
		103	5/2+	−87.482	16.991 d *19*	ε
		104	0+	−89.393	**11.14%** ***8***	
		105	5/2+	−88.416	**22.33%** ***8***	
		106	0+	−89.905	**27.33%** ***3***	
		107	5/2+	−88.370	6.5×10^{6} y *3*	β−
		107m	11/2−	−88.155	21.3 s *5*	IT
		108	0+	−89.521	**26.46%** ***9***	
		109	5/2+	−87.603	13.7012 h *24*	β−
		109m	11/2−	−87.414	4.696 m *3*	IT
		110	0+	−88.348	**11.72%** ***9***	
47	Ag	107	1/2−	−88.405	**51.839%** ***8***	
		107m	7/2+	−88.312	44.3 s *2*	IT
		108	1+	−87.605	2.382 m *11*	β− 97.15%, ε 2.85%
		108m	6+	−87.495	438 y *9*	ε 91.3%, IT 8.7%
		109	1/2−	−88.719	**48.161%** ***8***	
		109m	7/2+	−88.631		IT
48	Cd	106	0+	−87.130	$>3.6\times10^{20}$ y	2ε
					1.25% ***6***	
		107	5/2+	−86.990	6.50 h *2*	ε
		108	0+	−89.252	$>1.9\times10^{18}$ y	2ε
					0.89% ***3***	
		109	5/2+	−88.504	461.4 d *12*	ε
		110	0+	−90.350	**12.49%** ***18***	
		111	1/2+	−89.254	**12.80%** ***12***	
		111m	11/2−	−88.858	48.50 m *9*	IT
		112	0+	−90.577	**24.13%** ***21***	
		113	1/2+	−89.046	8.00×10^{15} y *26*	β−
					12.22% ***12***	
		113m	11/2−	−88.783	14.1 y *5*	β− 99.86%, IT 0.14%
		114	0+	−90.018	$>2.1\times10^{18}$ y	2β−
					28.73% ***42***	
		115	1/2+	−88.087	53.46 h *5*	β−
		115m	(11/2)−	−87.906	44.56 d *24*	β−
		116	0+	−88.716	3.3×10^{19} y *4*	2β−
					7.49% ***18***	
49	In	113	9/2+	−89.368	**4.29%** ***5***	
		113m	1/2−	−88.976	99.476 m *23*	IT
		114	1+	−88.570	71.9 s *1*	β− 99.5%, ε 0.5%
		114m	5+	−88.380	49.51 d *1*	IT 96.75%, ε 3.25%
		115	9/2+	−89.536	4.41×10^{14} y *25*	β−
					95.71% ***5***	
50	Sn	112	0+	−88.657	$<1.3\times10^{21}$ y	2ε
					0.97% ***1***	
		113	1/2+	−88.330	115.09 d *3*	ε
		113m	7/2+	−88.253	21.4 m *4*	IT 91.1%, ε 8.9%
		114	0+	−90.559	**0.66%** ***1***	
		115	1/2+	−90.033	**0.34%** ***1***	
		116	0+	−91.525	**14.54%** ***9***	
		117	1/2+	−90.397	**7.68%** ***7***	
		117m	11/2−	−90.082	13.76 d *4*	IT
		118	0+	−91.652	**24.22%** ***9***	
		119	1/2+	−90.065	**8.59%** ***4***	
		119m	11/2−	−89.976	293.1 d *7*	IT
		120	0+	−91.098	**32.58%** ***9***	
		121	3/2+	−89.197	27.03 h *4*	β−
		121m	11/2−	−89.191	43.9 y *5*	IT 77.6%, β− 22.4%
		122	0+	−89.942	**4.63%** ***3***	
		123	11/2−	−87.817	129.2 d *4*	β−
		123m	3/2+	−87.792	40.06 m *1*	β−
		124	0+	−88.237	$>1.2\times10^{21}$ y	2β−
					5.79% ***5***	
51	Sb	121	5/2+	−89.599	**57.21%** ***5***	
		122	2−	−88.334	2.7238 d *2*	β− 97.59%, ε 2.41%
		122m	(8)−	−88.170	4.191 m *3*	IT
		123	7/2+	−89.226	**42.79%** ***5***	
52	Te	120	0+	−89.369	**0.09%** ***1***	
		121	1/2+	−88.54	19.17 d *4*	ε
		121m	11/2−	−88.25	164.2 d *8*	IT 88.6%, ε 11.4%
		122	0+	−90.315	**2.55%** ***12***	
		123	1/2+	−89.173	$>9.2\times10^{16}$ y	ε
					0.89% ***3***	
		123m	11/2−	−88.925	119.2 d *1*	IT
		124	0+	−90.526	**4.74%** ***14***	
		125	1/2+	−89.024	**7.07%** ***15***	
		125m	11/2−	−88.879	57.40 d *15*	IT
		126	0+	−90.066	**18.84%** ***25***	
		127	3/2+	−88.283	9.35 h *7*	β−
		127m	11/2−	−88.195	106.1 d *7*	IT 97.6%, β− 2.4%
		128	0+	−88.993	2.41×10^{24} y *39*	2β−
					31.74% ***8***	
		129	3/2+	−87.004	69.6 m *3*	β−
		129m	11/2−	−86.898	33.6 d *1*	IT 63%, β− 37%
		130	0+	−87.352	$\geq3.0\times10^{24}$ y	2β−
					34.08% ***62***	
53	I	124	2−	−87.367	4.1760 d *3*	ε
		125	5/2+	−88.838	59.407 d *10*	ε
		126	2−	−87.912	12.93 d *5*	ε 52.7%, β− 47.3%
		127	5/2+	−88.984	**100%**	
		128	1+	−87.739	24.99 m *2*	β− 93.1%, ε 6.9%
		129	7/2+	−88.507	1.57×10^{7} y *4*	β−
54	Xe	124	0+	−87.661	$\geq1.6\times10^{14}$ y	2ε
					0.0952% ***3***	
		125	1/2(+)	−87.193	16.9 h *2*	ε
		125m	9/2(−)	−86.940	57 s *1*	IT
		126	0+	−89.146	**0.0890%** ***2***	
		127	1/2+	−88.322	36.346 d *3*	ε
		127m	9/2−	−88.025	69.2 s *9*	IT
		128	0+	−89.860	**1.9102%** ***8***	
		129	1/2+	−88.696	**26.4006%** ***82***	
		129m	11/2−	−88.460	8.88 d *2*	IT
		130	0+	−89.880	**4.0710%** ***13***	
		131	3/2+	−88.413	**21.232%** ***30***	
		131m	11/2−	−88.249	11.84 d *4*	IT
		132	0+	−89.279	**26.9086%** ***33***	
		132m	(10+)	−86.527	8.39 ms *11*	IT
		133	3/2+	−87.643	5.2475 d *5*	β−
		133m	11/2−	−87.410	2.198 d *13*	IT
		134	0+	−88.124	$>5.8\times10^{22}$ y	2β−
					10.4357% ***21***	
		134m	7−	−86.159	290 ms *17*	IT
		135	3/2+	−86.417	9.14 h *2*	β−
		135m	11/2−	−85.890	15.29 m *5*	IT>99.4%, β−<0.6%
		136	0+	−86.429	$>2.4\times10^{21}$ y	2β−
					8.8573% ***44***	

Nuclear Wallet Cards

Nuclide Z	El	A	Jπ	Δ (MeV)	T½, Γ, or Abundance	Decay Mode
55	**Cs**	132	2+	–87.155	6.480 d *6*	ε 98.13%, β– 1.87%
		133	7/2+	–88.070	**100%**	
		134	4+	–86.891	2.0652 y *4*	β–, ε 3.0×10^{-4}%
		134m	8–	–86.752	2.912 h *2*	IT
56	**Ba**	130	0+	–87.261	**0.106%** ***1***	
		130m	8–	–84.786	9.4 ms *4*	IT
		131	1/2+	–86.684	11.50 d *6*	ε
		131m	9/2–	–86.496	14.6 m *2*	IT
		132	0+	–88.434	$>3.0\times10^{21}$ y	2ε
					0.101% ***1***	
		133	1/2+	–87.553	10.551 y *11*	ε
		133m	11/2–	–87.265	38.93 h *10*	IT 99.99%, ε 0.01%
		134	0+	–88.950	**2.417%** ***18***	
		135	3/2+	–87.850	**6.592%** ***12***	
		135m	11/2–	–87.582	28.7 h *2*	IT
		136	0+	–88.887	**7.854%** ***24***	
		136m	7–	–86.856	0.3084 s *19*	IT
		137	3/2+	–87.721	**11.232%** ***24***	
		137m	11/2–	–87.059	2.552 m *1*	IT
		138	0+	–88.261	**71.698%** ***42***	
57	**La**	138	5+	–86.521	1.02×10^{11} y *1*	ε 65.6%,
					0.08881% ***71***	β– 34.4%
		139	7/2+	–87.228	**99.9119%** ***71***	
58	**Ce**	136	0+	–86.47	$>0.7\times10^{14}$ y	2ε
					0.185% ***2***	
		137	3/2+	–85.88	9.0 h *3*	ε
		137m	11/2–	–85.63	34.4 h *3*	IT 99.21%, ε 0.79%
		138	0+	–87.56	$\geq0.9\times10^{14}$ y	2ε
					0.251% ***2***	
		138m	7–	–85.43	8.65 ms *20*	IT
		139	3/2+	–86.949	137.641 d *20*	ε
		139m	11/2–	–86.195	54.8 s *10*	IT
		140	0+	–88.078	**88.450%** ***51***	
		141	7/2–	–85.435	32.508 d *13*	β–
		142	0+	–84.532	$>5\times10^{16}$ y	2β–
					11.114% ***51***	
59	**Pr**	141	5/2+	–86.015	**100%**	
60	**Nd**	142	0+	–85.949	**27.152%** ***40***	
		143	7/2–	–84.001	**12.174%** ***26***	
		144	0+	–83.747	2.29×10^{15} y *16*	α
					23.798% ***19***	
		145	7/2–	–81.431	**8.293%** ***12***	
		146	0+	–80.925	**17.189%** ***32***	
		147	5/2–	–78.146	10.98 d *1*	β–
		148	0+	–77.406	**5.756%** ***21***	
		149	5/2–	–74.374	1.728 h *1*	β–
		150	0+	–73.683	0.79×10^{19} y *7*	
					5.638% ***28***	
61	**Pm**	143	5/2+	–82.960	265 d *7*	ε
		144	5–	–81.415	363 d *14*	ε
		145	5/2+	–81.267	17.7 y *4*	ε, α 2.8×10^{-7}%
		146	3–	–79.453	5.53 y *5*	ε 66%, β– 34%
		147	7/2+	–79.041	2.6234 y *2*	β–
62	**Sm**	144	0+	–81.965	**3.07%** ***7***	
		145	7/2–	–80.651	340 d *3*	ε
		146	0+	–80.995	10.3×10^{7} y *5*	α
		147	7/2–	–79.265	1.060×10^{11} y *11*	α
					14.99% ***18***	
		148	0+	–79.335	7×10^{15} y *3*	α
					11.24% ***10***	
		149	7/2–	–77.135	**13.82%** ***7***	
		150	0+	–77.050	**7.38%** ***1***	
		151	5/2–	–74.575	90 y *8*	β–
		152	0+	–74.762	**26.75%** ***16***	
		153	3/2+	–72.559	46.284 h *4*	β–
		153m	11/2–	–72.461	10.6 ms *3*	IT
		154	0+	–72.454	**22.75%** ***29***	
63	**Eu**	151	5/2+	–74.651	$\geq1.7\times10^{18}$ y	α
					47.81% ***3***	
		152	3–	–72.887	13.528 y *14*	ε 72.1%, β– 27.9%
		152m	0–	–72.841	9.3116 h *13*	β– 72%, ε 28%
		152m	8–	–72.739	96 m *1*	IT
		153	5/2+	–73.366	**52.19%** ***6***	

Nuclide Z	El	A	Jπ	Δ (MeV)	T½, Γ, or Abundance	Decay Mode
64	**Gd**	152	0+	–74.706	1.08×10^{14} y *8*	α
					0.20% ***1***	
		153	3/2–	–72.882	240.4 d *10*	ε
		154	0+	–73.705	**2.18%** ***3***	
		155	3/2–	–72.069	**14.80%** ***12***	
		155m	11/2–	–71.948	31.97 ms *27*	IT
		156	0+	–72.534	**20.47%** ***9***	
		157	3/2–	–70.823	**15.65%** ***2***	
		158	0+	–70.689	**24.84%** ***7***	
		159	3/2–	–68.560	18.479 h *4*	β–
		160	0+	–67.940	$>3.1\times10^{19}$ y	2β–
					21.86% ***19***	
65	**Tb**	159	3/2+	–69.531	**100%**	
66	**Dy**	156	0+	–70.522	**0.056%** ***3***	
		157	3/2–	–69.420	8.14 h *4*	ε
		157m	11/2–	–69.221	21.6 ms *16*	IT
		158	0+	–70.404	**0.095%** ***3***	
		159	3/2–	–69.166	144.4 d *2*	ε
		160	0+	–69.671	**2.329%** ***18***	
		161	5/2+	–68.054	**18.889%** ***42***	
		162	0+	–68.179	**25.475%** ***36***	
		163	5/2–	–66.379	**24.896%** ***42***	
		164	0+	–65.966	**28.260%** ***54***	
67	**Ho**	165	7/2–	–64.897	**100%**	
68	**Er**	162	0+	–66.332	**0.139%** ***5***	
		163	5/2–	–65.166	75.0 m *4*	ε
		164	0+	–65.941	**1.601%** ***3***	
		165	5/2–	–64.520	10.36 h *4*	ε
		166	0+	–64.924	**33.503%** ***36***	
		167	7/2+	–63.289	**22.869%** ***9***	
		167m	1/2–	–63.081	2.269 s *6*	IT
		168	0+	–62.989	**26.978%** ***18***	
		169	1/2–	–60.921	9.392 d *18*	β–
		170	0+	–60.108	**14.910%** ***36***	
69	**Tm**	169	1/2+	–61.274	**100%**	
70	**Yb**	168	0+	–61.580	**0.123%** ***3***	
		169	7/2+	–60.376	32.018 d *5*	ε
		169m	1/2–	–60.352	46 s *2*	IT
		170	0+	–60.763	**2.982%** ***39***	
		171	1/2–	–59.306	**14.09%** ***14***	
		171m	7/2+	–59.211	5.25 ms *24*	IT
		172	0+	–59.255	**21.68%** ***13***	
		173	5/2–	–57.551	**16.103%** ***63***	
		174	0+	–56.944	**32.026%** ***80***	
		175	(7/2–)	–54.695	4.185 d *1*	β–
		175m	1/2–	–54.180	68.2 ms *3*	IT
		176	0+	–53.488	**12.996%** ***83***	
		176m	8–	–52.438	11.4 s *3*	IT
71	**Lu**	175	7/2+	–55.166	**97.401%** ***13***	
		176	7–	–53.382	3.76×10^{10} y *7*	β–
					2.599% ***13***	
72	**Hf**	174	0+	–55.845	2.0×10^{15} y *4*	α
					0.16% ***1***	
		175	5/2(–)	–54.482	70 d *2*	ε
		176	0+	–54.576	**5.26%** ***7***	
		177	7/2–	–52.885	**18.60%** ***9***	
		177m	23/2+	–51.569	1.09 s *5*	IT
		177m	37/2–	–50.145	51.4 m *5*	IT
		178	0+	–52.439	**27.28%** ***7***	
		178m	8–	–51.292	4.0 s *2*	IT
		178m	16+	–49.993	31 y *1*	IT
		179	9/2+	–50.467	**13.62%** ***2***	
		179m	1/2–	–50.092	18.67 s *4*	IT
		179m	25/2–	–49.361	25.05 d *25*	IT
		180	0+	–49.783	**35.08%** ***16***	
		180m	8–	–48.641	5.47 h *4*	IT 99.7%, β– 0.3%
73	**Ta**	180	1+	–48.936	8.154 h *6*	ε 86%, β–
		180m	9–	–48.859	$>1.2\times10^{15}$ y	14%ε ?
					0.01201% ***32***	
		180m	9–	–48.859	$>1.2\times10^{15}$ y	β– ?
					0.01201% ***32***	
		181	7/2+	–48.441	**99.98799%** ***32***	

Nuclear Wallet Cards

Nuclide Z	El	A	Jπ	Δ (MeV)	T½, Γ, or Abundance	Decay Mode
74	**W**	180	0+	−49.636	≥6.6×10^{17} y	2ε
					0.12% ***1***	
		181	9/2+	−48.253	121.2 d *2*	ε
		182	0+	−48.247	**26.50%** ***16***	
		183	1/2−	−46.367	>1.3×10^{19} y	α
					14.31% ***4***	
		184	0+	−45.707	**30.64%** ***2***	
		185	3/2−	−43.389	75.1 d *3*	β−
		185m	11/2+	−43.192	1.67 m *3*	IT
		186	0+	−42.510	>2.3×10^{19} y	2β−
					28.43% ***19***	
		186m	(16+)	−38.967	>3 ms	IT
		187	3/2−	−39.906	24.000 h *4*	β−
		188	0+	−38.669	69.78 d *5*	β−
75	**Re**	185	5/2+	−43.822	**37.40%** ***2***	
		186	1−	−41.930	3.7186 d *5*	β− 92.53%, ε 7.47%
		186m	(8+)	−41.781	2.0×10^{5} y	IT
		187	5/2+	−41.218	4.33×10^{10} y *7*	β−,
					62.60% ***2***	α<1.0×10^{-4}%
76	**Os**	184	0+	−44.256	>5.6×10^{13} y	α
					0.02% ***1***	
		185	1/2−	−42.809	93.6 d *5*	ε
		186	0+	−43.002	2.0×10^{15} y *11*	α
					1.59% ***3***	
		187	1/2−	−41.220	**1.96%** ***2***	
		188	0+	−41.139	**13.24%** ***8***	
		189	3/2−	−38.988	**16.15%** ***5***	
		189m	9/2−	−38.957	5.81 h *6*	IT
		190	0+	−38.709	**26.26%** ***2***	
		190m	(10)−	−37.004	9.9 m *1*	IT
		191	9/2−	−36.396	15.4 d *1*	β−
		191m	3/2−	−36.322	13.10 h *5*	IT
		192	0+	−35.883	**40.78%** ***19***	
		192m	(10−)	−33.868	5.9 s *1*	IT>87%, β−<13%
77	**Ir**	191	3/2+	−36.710	**37.3%** ***2***	
		191m	11/2−	−36.539	4.899 s *23*	IT
		191m		−34.663	5.5 s *7*	IT
		192	4+	−34.837	73.829 d *11*	β− 95.24%, ε 4.76%
		192m	1−	−34.780	1.45 m *5*	IT 99.98%, β− 0.02%
		192m	(11−)	−34.669	241 y *9*	IT
		193	3/2+	−34.538	**62.7%** ***2***	
		193m	11/2−	−34.458	10.53 d *4*	IT
78	**Pt**	190	0+	−37.325	6.5×10^{11} y *3*	α
					0.012% ***2***	
		191	3/2−	−35.701	2.83 d *2*	ε
		192	0+	−36.292	**0.782%** ***24***	
		193	1/2−	−34.481	50 y *6*	ε
		193m	13/2+	−34.331	4.33 d *3*	IT
		194	0+	−34.762	**32.86%** ***40***	
		195	1/2−	−32.796	**33.78%** ***24***	
		195m	13/2+	−32.537	4.010 d *5*	IT
		196	0+	−32.646	**25.21%** ***34***	
		197	1/2−	−30.421	19.8915 h *19*	β−
		197m	13/2+	−30.021	95.41 m *18*	IT 96.7%, β− 3.3%
		198	0+	−29.905	**7.36%** ***13***	
79	**Au**	197	3/2+	−31.140	**100%**	
		197m	11/2−	−30.731	7.73 s *6*	IT
80	**Hg**	196	0+	−31.826	**0.15%** ***1***	
		197	1/2−	−30.540	64.14 h *5*	ε
		197m	13/2+	−30.241	23.8 h *1*	IT 91.4%, ε 8.6%
		198	0+	−30.954	**9.97%** ***20***	
		199	1/2−	−29.546	**16.87%** ***22***	
		199m	13/2+	−29.014	42.67 m *9*	IT
		200	0+	−29.503	**23.10%** ***19***	
		201	3/2−	−27.662	**13.18%** ***9***	
		202	0+	−27.345	**29.86%** ***26***	
		203	5/2−	−25.269	46.594 d *12*	β−
		204	0+	−24.690	**6.87%** ***15***	
81	**Tl**	203	1/2+	−25.762	**29.524%** ***1***	
		204	2−	−24.346	3.783 y *12*	β− 97.08%, ε 2.92%
		205	1/2+	−23.821	**70.48%** ***1***	

Nuclide Z	El	A	Jπ	Δ (MeV)	T½, Γ, or Abundance	Decay Mode
82	**Pb**	178	0+	3.57	0.12 ms +*22−5*	α
		179	(9/2−)	2.05	3.5 ms +*14−8*	α
		180	0+	−1.93	4.2 ms *5*	α
		181	(9/2−)	−3.10	36 ms *2*	α
		181m	(13/2+)	−3.10	45 ms *20*	α<100%
		182	0+	−6.82	55 ms *5*	α≈98%, ε≈2%
		183	(3/2−)	−7.57	535 ms *30*	α≈90%
		183m	(13/2+)	−7.47	415 ms *20*	α
		184	0+	−11.05	490 ms *25*	α 80%, ε 20%
		185	3/2−	−11.54	6.3 s *4*	ε, α 34%
		185m	13/2+	−11.54	4.3 s *2*	α 50%, ε
		186	0+	−14.68	4.82 s *3*	ε 60%, α 40%
		187	(13/2+)	−14.990	18.3 s *3*	ε 88%, α 12%
		187m	(3/2−)	−14.957	15.2 s *3*	ε 90.5%, α 9.5%
		188	0+	−17.82	25.1 s *1*	ε 90.7%, α 9.3%
		189	(3/2−)	−17.88	39 s *8*	ε, α<1%
		189m	(13/2+)	−17.84	50 s *3*	ε, α<1%
		190	0+	−20.42	71 s *1*	ε 99.6%, α 0.4%
		191	(3/2−)	−20.25	1.33 m *8*	ε 99.99%, α 0.01%
		191m	(13/2+)	−20.25	2.18 m *8*	ε, α≈0.02%
		192	0+	−22.56	3.5 m *1*	ε 99.99%, α 5.9×10^{-3}%
		193	(3/2−)	−22.19		ε
		193m	(13/2+)	−22.19	5.8 m *2*	ε
		194	0+	−24.21	10.7 m *6*	ε, α 7.3×10^{-6}%
		195	3/2−	−23.71	≈15 m	ε
		195m	13/2+	−23.51	15.0 m *12*	ε
		196	0+	−25.36	37 m *3*	ε, α≤3.0×10^{-5}%
		197	3/2−	−24.748	8.1 m *17*	ε
		197m	13/2+	−24.429	42.9 m *9*	ε 81%, IT 19%
		198	0+	−26.05	2.4 h *1*	ε
		199	3/2−	−25.231	90 m *10*	ε
		199m	(13/2+)	−24.806	12.2 m *3*	IT≈93%, ε≈7%
		200	0+	−26.25	21.5 h *4*	ε
		201	5/2−	−25.26	9.33 h *3*	ε
		201m	13/2+	−24.63	60.8 s *18*	IT
		202	0+	−25.937	52.5×10^{3} y *28*	ε
		202m	9−	−23.767	3.54 h *2*	IT 90.5%, ε 9.5%
		203	5/2−	−24.787	51.92 h *3*	ε
		203m	13/2+	−23.962	6.21 s *11*	IT
		203m	29/2−	−21.838	480 ms *7*	IT
		204	0+	−25.110	≥1.4×10^{17} y	α
					1.4% ***1***	
		204m	9−	−22.924	66.93 m *10*	IT
		205	5/2−	−23.770	1.73×10^{7} y *7*	ε
		205m	13/2+	−22.756	5.55 ms *2*	IT
		206	0+	−23.786	**24.1%** ***1***	
		207	1/2−	−22.452	**22.1%** ***1***	
		207m	13/2+	−20.819	0.806 s *5*	IT
		208	0+	−21.749	**52.4%** ***1***	
		209	9/2+	−17.615	3.253 h *14*	β−
		210	0+	−14.729	22.20 y *22*	β−, α 1.9×10^{-6}%
		211	9/2+	−10.491	36.1 m *2*	β−
		212	0+	−7.553	10.64 h *1*	β−
		213	(9/2+)	−3.200	10.2 m *3*	β−
		214	0+	−0.181	26.8 m *9*	β−
		215		4.5s	147 s *12*	β−
		216	0+	7.7s	>300 ns	β−
		217		12.4s	>300 ns	β−
		218	0+	15.6s	>300 ns	β−
		219		20.5s	>300 ns	β−
		220	0+	23.9s	>300 ns	β−
83	**Bi**	209	9/2−	−18.259	**100%**	
84	**Po**	208	0+	−17.470	2.898 y *2*	α, ε 4.0×10^{-3}%
		209	1/2−	−16.366	102 y *5*	α 99.52%, ε 0.48%
		210	0+	−15.953	138.376 d *2*	α
85	**At**	210	(5)+	−11.972	8.1 h *4*	ε 99.82%, α 0.18%
		211	9/2−	−11.648	7.214 h *7*	ε 58.2%, α 41.8%
		212	(1−)	−8.628	0.314 s *2*	α, ε<0.03%, β−<2.0×10^{-6}%
		212m	(9−)	−8.405	0.119 s *3*	α>99%, IT<1%

Nuclear Wallet Cards

Nuclide Z	El	A	Jπ	Δ (MeV)	T½, Γ, or Abundance	Decay Mode
86	Rn	220	0+	10.607	55.6 s *1*	α
		221	7/2+	14.473	25 m *2*	β– 78%, α 22%
		222	0+	16.373	3.8235 d *3*	α
		223	7/2	20.40	24.3 m *4*	β–
		224	0+	22.43	107 m *3*	β–
87	Fr	222	2–	16.35		β–
		223	3/2(–)	18.384		β– 99.99%, α 6.0×10^{-3}%
88	Ra	224	0+	18.821	3.6319 d *23*	α, ^{14}C 4.0×10^{-9}%
		225	1/2+	21.995	14.9 d *2*	β–
		226	0+	23.668	1600 y *7*	α, ^{14}C 3.2×10^{-9}%
		227	3/2+	27.178	42.2 m *5*	β–
		228	0+	28.946	5.75 y *3* 4.0	β–
89	Ac	226	(1)	24.309	29.37 h *12*	β– 83%, ε 17%, α 6.0×10^{-3}%
		227	3/2–	25.851	21.772 y *3*	β– 98.62%, α 1.38%β–
		228	3+	28.900	6.15 h *2*	
90	Th	230	0+	30.863	7.54×10^{4} y *3*	α, ^{24}Ne 6×10^{-11}%, SF ≤ 4×10^{-12}%
		231	5/2+	33.816	25.52 h *1*	β–, α ≈ 4×10^{-11}%
		232	0+	35.452	1.40×10^{10} y *1* **100%**	α, SF 1.1×10^{-9}%
91	Pa	230	(2–)	32.173	17.4 d *5*	ε 92.2%, β– 7.8%, α 3.2×10^{-3}%
		231	3/2–	33.425	3.276×10^{4} y *11*	α, SF ≤ 2×10^{-11}%
		232	(2–)	35.941	1.32 d *2*	β–, ε
92	U	230	0+	31.613		α, SF < 1×10^{-10}%, ^{22}Ne 5×10^{-12}%
		231	(5/2–)	33.807	4.2 d *1*	ε, α ≈ 4.0×10^{-3}%
		232	0+	34.604	68.9 y *4*	α, SF 3×10^{-12}%
		233	5/2+	36.921	1.592×10^{5} y *2*	α, ^{24}Ne 9×10^{-10}%, SF < 6×10^{-11}%, ^{28}Mg < $1.\times10^{-13}$%
		234	0+	38.148	2.455×10^{5} y *6* **0.0054% *5***	α, SF 1.6×10^{-9}%, Mg 1×10^{-11}%, Ne 9×10^{-12}%
		235	7/2–	40.921	7.04×10^{8} y *1* **0.7204% *6***	α, SF 7.0×10^{-9}%, ^{28}Mg $8.\times10^{-10}$%, Ne ≈ $8.\times10^{-10}$%
		235m	1/2+	40.921	≈26 m	IT
		236	0+	42.447	2.342×10^{7} y *4*	α, SF 9.4×10^{-8}%
		237	1/2+	45.393	6.75 d *1*	β–
		238	0+	47.310	4.468×10^{9} y *3* **99.2742% *10***	α, SF 5.5×10^{-5}%
		239	5/2+	50.575	23.45 m *2*	β–
		240	0+	52.716	14.1 h *1*	β–
93	Np	234	(0+)	39.957	4.4 d *1*	ε
		235	5/2+	41.045	396.1 d *12*	ε, α 2.6×10^{-3}%
		236	(6–)	43.37	153×10^{3} y *5*	ε 86.3%, β– 13.5%, α 0.16%
		236m	1	43.37	22.5 h *4*	β– 50%, ε 50%
		237	5/2+	44.874	2.144×10^{6} y *7*	α, SF ≤ 2×10^{-10}%
		238	2+	47.457	2.117 d *2*	β–
94	Pu	238	0+	46.166	87.7 y *1*	α, SF 1.9×10^{-7}%
		239	1/2+	48.591	24110 y *30*	α, SF $3.\times10^{-10}$%
		240	0+	50.128	6561 y *7*	α, SF 5.7×10^{-6}%
		241	5/2+	52.958	14.325 y *6*	β–, α 2.5×10^{-3}%, SF < 2×10^{-14}%
		242	0+	54.719	3.75×10^{5} y *2*	α, SF 5.5×10^{-4}%
95	Am	241	5/2–	52.937	432.6 y *6*	α, SF 4×10^{-10}%
		242	1–	55.471	16.02 h *2*	β– 82.7%, ε 17.3%IT
		242m	5–	55.520	141 y *2*	99.55%, α 0.45%, SF < 4.7×10^{-9}%
		242m	(2+,3–)	57.671	14.0 ms *10*	SF, IT, α < 5.0×10^{-3}%
		243	5/2–	57.177	7370 y *40*	α, SF 3.7×10^{-9}%
96	Cm	246	0+		4706 y *40*	α 99.97%, SF 0.03%
		247	9/2–	65.535	1.56×10^{7} y *5*	α
		248	0+	67.393	3.48×10^{5} y *6*	α 91.61%, SF 8.39%
97	Bk	247	(3/2–)	65.491	1380 y *250*	α ≤ 100%
98	Cf	250	0+	71.173	13.08 y *9*	α 99.92%, SF 0.
		251	1/2+	74.137	898 y *44*	08%α, SF
		252	0+	76.035	2.645 y *8*	α 96.91%, SF 3.
99	Es	252	(5–)	77.29	471.7 d *19*	α 78%, ε 22%
		253	7/2+	79.015	20.47 d *3*	SF 8.7×10^{-6}%, α
		254	(7+)	81.993	275.7 d *5*	α, β– 1.7×10^{-4}%, SF < 3.0×10^{-6}%
100	Fm	256	0+	85.487	157.6 m *13*	SF 91.9%, α 8.1%
		257	(9/2+)	88.590	100.5 d *2*	α 99.79%, SF 0.21%
		258	0+	90.4s	370 μs *43*	SF ≤ 100%
101	Md	258m		91.689	57.0 m *9*	ε ≥ 70%, SF
102	No	259		94.1s	58 m *5*	α 75%, ε 25%, SF < 10%
103	Lr	260		98.3s	180 s *30*	α 80%, ε < 40%, SF < 10%
104	Rf	260	0+	99.2s	21 ms *1*	SF ≤ 100%, α?
		261m		101.32	1.9 s *4*	SF 73%, α 27%
		261m		101.32	78 s *+11–6*	α > 74%, ε < 15%, SF < 11%
105	Db	262		106.3s	35 s *5*	α ≈ 67%, SF
		263		107.1s	27 s *+10–7*	SF 55%, α 41%, ε 3%
106	Sg	262	0+	108.4s	6.9 ms *+38–18*	SF ≥ 78%, α ≤ 22%
		263		110.19s	1.0 s *2*	α > 70%, SF < 30%
		263m		110.19s	0.12 s	IT, α
107	Bh	262m		114.5s	22 ms *4*	α < 100%
		262m		114.5s	83 ms *14*	α < 100%
		263		114.5s		α?
		264		115.7s	0.44 s *+60–16*	α ≤ 100%
		265		116.4s	0.9 s *+7–3*	α
		266m		118.2s	1.7 s *+82–8*	α
		267m		118.9s	17 s *+14–6*	α
108	Hs	269			3.6 s *+8–14*	α
		269m			9.7 s *+97–33*	α
		270	0+	125.1s	22 s	α
109	Mt	268m		128.9s	21 ms *+8–5*	α
		269		129.3s		
		270m		130.8s	5.0 ms *+24–3*	α
110	Ds	270	0+	134.7s	0.10 ms *+14–4*	α, SF < 0.2%
		270m		135.9s	6.0 ms *+82–22*	α > 70%, IT ≤ 30%
		271		135.95s	1.63 ms *+44–29*	α
		271m		135.95s	69 ms *+56–21*	α > 0%, IT?
		272	0+	136.0s		SF
		273		138.4s	0.17 ms *+17–6*	α
111	Rg	274m		144.7s	6.4 ms *+307–29*	α
112	Cn	282m		158.2s	0.50 ms *+33–14*	SF
		283m		160.7s	4.0 s *+13–7*	α ≥ 90%, SF ≤ 10%
		283m		160.7s	6.9 s *+69–23*	SF 50%, α 50%
		284m		161.5s	101 ms *+41–22*	SF
		285		164.1s	30 s *+30–10*	α

Appendix–I Table of Elemental Properties

Z	El	Atomic Weight[a]	Density (g/cc)[b]	Melting Pt. (°C)[b]	Boiling Pt. (°C)[b]	Valence[b]
1	H	1.008	8.988×10^{-5}[d]	–259.34	–252.87	1
2	He	4.002602 *2*	1.785×10^{-4}[f]	<–272.2 (26 atm)	–268.93	0
3	Li	6.94	0.534[c]	180.5	1342	1
4	Be	9.012182 *3*	1.848[c]	1287	2471 (5 mm)	2
5	B	10.81	2.34[h]	2075	4000 (subl.)	3
6	C	12.011	1.8 to 2.1[i]	≈3550	4827	2,3,4
7	N	14.007	0.0012506[j]	–210.00	–195.798	3,5
8	O	15.999	0.001308[k]	–218.79	–182.953	2
9	F	18.9984032 *5*	0.001696	–219.67[g]	–188.12[g]	1
10	Ne	20.1797 *6*	8.9990×10^{-4}	–248.609	–246.053[g]	0
11	Na	22.98976928 *2*	0.971[c]	97.80	883	1
12	Mg	24.3050 *6*	1.738[c]	650	1090	2
13	Al	26.9815386 *8*	2.6989[c]	660.32	2519	3
14	Si	28.085	2.33[e]	1414	3265	4
15	P	30.973762 *2*	1.82[l]	44.15[l]	280.5[l]	3,5
16	S	32.06	2.07[cm]	115.21[m]	444.61	2,4,6
17	Cl	35.45	0.003214	–101.5	–34.04	1,3,5,7
18	Ar	39.948	0.0017837	–189.36	–185.85	0
19	K	39.0983	0.89	63.5	759	1
20	Ca	40.078 *4*	1.54[c]	842	1484	2
21	Sc	44.955912 *6*	2.989[e]	1541	2836	3
22	Ti	47.867	4.51	1668	3287	2 to 4
23	V	50.9415	6.0 (18.7°C)	1910	3407	2 to 5
24	Cr	51.9961 *6*	7.15[c]	1907	2671	2,3,6
25	Mn	54.938045 *5*	7.21 to 7.44[n]	1246	2061	1 to 4,6,7
26	Fe	55.845 *2*	7.874[c]	1538	2861	2,3,4,6
27	Co	58.933195 *5*	8.9[c]	1495	2927	2,3
28	Ni	58.6934 *2*	8.902[e]	1455	2913	0 to 3
29	Cu	63.546 *3*	8.96[c]	1084.62	2562	1,2
30	Zn	65.38 *2*	7.134[e]	419.53	907	2
31	Ga	69.723	5.904 (29.6°C)	29.76	2204	2,3
32	Ge	72.63	5.323[e]	938.25	2833	2,4
33	As	74.92160 *2*	5.75[o]	817[o] (28 atm)	616[o] (subl.)	0,±3,5
34	Se	78.96 *3*	4.79[p]	221[p]	685[p]	–2,4,6
35	Br	79.904	3.12[u]	–7.2	58.8	1,3,5,7
36	Kr	83.798 *2*	0.003733	–157.36	–153.34	0
37	Rb	85.4678 *3*	1.532[c]	39.30	688	1
38	Sr	87.62	2.64	777	1382	2
39	Y	88.90585 *2*	4.469[e]	1522	3345	3
40	Zr	91.224 *2*	6.52[c]	1855	4409	2 to 4
41	Nb	92.90638 *2*	8.57[c]	2477	4744	2,3,4?,5
42	Mo	95.96 *2*	10.22[c]	2623	4639	2 to 6
43	Tc	(98)	11.50[t]	2157	4265	0,2,4 to 7
44	Ru	101.07 *2*	12.1[c]	2334	4150	0 to 8
45	Rh	102.90550 *2*	12.41[c]	1964	3695	3
46	Pd	106.42	12.02[c]	1554.9	2963	2 to 4
47	Ag	107.8682 *2*	10.50[c]	961.78	2162	1
48	Cd	112.411 *8*	8.69[c]	321.07	767	2
49	In	114.818 *3*	7.31[c]	156.60	2072	1 to 3
50	Sn	118.710 *7*	5.77[q]	231.93	2602	2,4
51	Sb	121.760	6.68[c]	630.63	1587	0,±3,5
52	Te	127.60 *3*	6.23[c]	449.51	988	2,4,6
53	I	126.90447 *3*	4.93[v]	113.7	184.4	1,3,5,7
54	Xe	131.293 *6*	0.005887[w]	–111.74	–108.09	0
55	Cs	132.9054519 *2*	1.873[c]	28.44	671	1
56	Ba	137.327 *7*	3.62[c]	727	1897	2
57	La	138.90547 *7*	6.145[e]	920	3464	3
58	Ce	140.116	6.770[e]	799	3443	3,4
59	Pr	140.90765 *2*	6.773[r] 6.64[s]	931	3520	3
60	Nd	144.242 *3*	7.008	1016	3074	3
61	Pm	(145)	7.264[e]	1042	3000	3
62	Sm	150.36 *2*	7.520[r] 7.40[s]	1072	1794	2,3
63	Eu	151.964	5.244[e]	822	1596	2,3
64	Gd	157.25 *3*	7.901[e]	1313	3273	3
65	Tb	158.92534 *2*	8.230	1356	3230	3,4

Appendix–I Table of Elemental Properties

Z	El	Atomic Weight[a]	Density (g/cc)[b]	Melting Pt. (°C)[b]	Boiling Pt. (°C)[b]	Valence[b]
66	Dy	162.500	8.551[e]	1412	2567	3
67	Ho	164.93032 *2*	8.795[e]	1472	2700	3
68	Er	167.259 *3*	9.066[e]	1529	2868	3
69	Tm	168.93421 *2*	9.321[e]	1545	1950	3
70	Yb	173.054 *5*	6.903[r] 6.966[s]	824	1196	2,3
71	Lu	174.9668	9.841[e]	1663	3402	3
72	Hf	178.49 *2*	13.31[c]	2233	4603	4
73	Ta	180.94788 *2*	16.4	3017	5458	2?,3,4?,5
74	W	183.84	19.3[c]	3422	5555	2 to 6
75	Re	186.207	20.8[c]	3185	5596	4,6,7
76	Os	190.23 *3*	22.587	3033	5012	0 to 8
77	Ir	192.217 *3*	22.562[c]	2446	4428	3,4
78	Pt	195.084 *9*	21.45[c]	1768.2	3825	1?,2,3
79	Au	196.966569 *4*	≈19.3[c]	1064.18	2856	1,3
80	Hg	200.59 *2*	13.546[c]	–38.83	356.62	1,2
81	Tl	204.38	11.85[c]	304	1473	1,3
82	Pb	207.2	11.35[c]	327.46	1749	2,4
83	Bi	208.98040	9.747[c]	271.4	1564	3,5
84	Po	(209)	9.20	254	962	0,±2,3?,4,6
85	At	(210)		302		1,3,5,7
86	Rn	(222)	0.00973[x]	–71	–61.7	0
87	Fr	(223)		27		1
88	Ra	(226)	5	696		2
89	Ac	(227)	10.07[t]	1050	3198	3
90	Th	232.03806 *2*	11.72	1750	4788	2?,3?,4
91	Pa	231.03588 *2*	15.37[t]	1572		4,5
92	U	238.02891 *3*	19.1	1135	4131	2 to 6
93	Np	(237)	20.25[c]	644	3902	3 to 6
94	Pu	(244)	19.84[e]	640	3228	3,to 6
95	Am	(243)	12[c]	1176	2011	2 to 6
96	Cm	(247)	13.51[t]	1345		3,4
97	Bk	(247)	14[t]	996		3,4
98	Cf	(251)	15.1	900		3
99	Es	(252)		860[t]		3
100	Fm	(257)		1527		3
101	Md	(258)		827		2,3
102	No	(259)		827		2,3
103	Lr	(262)		1627		3?

c) At 20°C.

d) For gas; density (liquid)=0.0708 g/cc at b.p.; density (solid)=0.0706 g/cc at –262°C.

e) At 25°C.

f) For gas; density (liquid)=0.125 g/cc at b.p.

g) At 1 atm.

h) For crystal form; density (amorphous)=2.37 g/cc.

i) For amorphous carbon; density (graphite)=1.9 to 2.3 g/cc; density (gem diamond)=3.513 g/cc at 25° C; density (other diamond)=3.15 to 3.53 g/cc.

j) For gas; density (liquid)=0.808 g/cc at b.p.; density (solid)=1.026 g/cc at –252°C.

k) For gas; density (liquid)=1.14 g/cc at b.p.
For Ozone: density=0.001962; m.p.=–193, b.p.=–111.35

l) For white phosphorus; density (red)=2.20 g/cc; density (black)=2.25 to 2.69 g/cc.

m) For rhombic sulfur; melting point (monoclinic) =119.0°C; density (monoclinic)=2.00 g/cc at 20°C.

n) Depending on allotropic form.

o) For gray arsenic; density (yellow)=1.97 g/cc.

p) For gray selenium; density (vitreous)=4.28 g/cc.

q) For gray tin; density (white)=7.29 g/cc.

r) For α modification.

s) For β modification.

t) Calculated.

u) For liquid at 20°C; 0.00759 g/cc for gas.

v) For solid at 20°C; 0.01127 g/cc for gas.

w) For gas; density (liquid)=2.95 g/cc at –109°C.

x) For gas; density (liquid)=4.4 g/cc at –62°C.