

Appendix C

TABLE OF NUCLEAR PROPERTIES

The following table shows some properties of a selection of isotopes. For each element only the stable and relatively long-lived radioactive isotopes are included. Ground-state atomic masses and spin-parity assignments are shown for all isotopes; uncertain spin-parity assignments are in parentheses. Abundances are given for stable isotopes, and for radioactive isotopes the half-life and principal decay mode are shown (ϵ —electron capture, possibly including positron emission; β^- —negative beta decay; α —alpha decay; f—spontaneous fission). The masses are those of the corresponding neutral atoms and were taken from the 1983 atomic mass evaluation: A. H. Wapstra and G. Audi, *Nucl. Phys. A432*, 1 (1985). In the half-life entries, My = 10^6 y. Uncertainties in the masses are typically 10^{-5} u (10^{-4} u for some cases far from stability); uncertainties in the abundances and half-lives are typically at or below the level of the last digit tabulated.

Abundance or Half-life					Abundance or Half-life						
Z	A	Atomic mass (u)	I^π		Z	A	Atomic mass (u)	I^π			
H	1	1	1.007825	$\frac{1}{2}^+$	99.985%	10	10.012937	3^+	19.8%		
		2	2.014102	1^+	0.015%	11	11.009305	$\frac{3}{2}^-$	80.2%		
		3	3.016049	$\frac{1}{2}^+$	12.3 y (β^-)	12	12.014353	1^+	20.4 ms (β^-)		
He	2	3	3.016029	$\frac{1}{2}^+$	$1.38 \times 10^{-4}\%$	13	13.017780	$\frac{3}{2}^-$	17.4 ms (β^-)		
		4	4.002603	0^+	99.99986%	C	6	9	9.031039	$\frac{3}{2}^-$	0.13 s (ϵ)
Li	3	6	6.015121	1^+	7.5%		10	10.016856	0^+	19.2 s (ϵ)	
		7	7.016003	$\frac{3}{2}^-$	92.5%		11	11.011433	$\frac{3}{2}^-$	20.4 m (ϵ)	
		8	8.022486	2^+	0.84 s (β^-)		12	12.000000	0^+	98.89%	
Be	4	7	7.016928	$\frac{3}{2}^-$	53.3 d (ϵ)		13	13.003355	$\frac{1}{2}^-$	1.11%	
		8	8.005305	0^+	0.07 fs (α)	14	14.003242	0^+	5730 y (β^-)		
		9	9.012182	$\frac{3}{2}^-$	100%	15	15.010599	$\frac{1}{2}^+$	2.45 s (β^-)		
		10	10.013534	0^+	1.6 My (β^-)	N	7	12	12.018613	1^+	11 ms (ϵ)
		11	11.021658	$\frac{1}{2}^+$	13.8 s (β^-)		13	13.005739	$\frac{1}{2}^-$	9.96 m (ϵ)	
B	5	8	8.024606	2^+	0.77 s (ϵ)		14	14.003074	1^+	99.63%	
		9	9.013329	$\frac{3}{2}^-$	0.85 as (α)	15	15.000109	$\frac{1}{2}^-$	0.366%		
						16	16.006100	2^-	7.13 s (β^-)		

TABLE OF NUCLEAR PROPERTIES 823

Abundance or Half-life					Abundance or Half-life					
Z	A	Atomic mass (u)	I^π		Z	A	Atomic mass (u)	I^π		
	17	17.008450	$\frac{1}{2}^-$	4.17 s (β^-)		26	25.986892	5^+	0.72 My (ϵ)	
	18	18.014081	1^-	0.63 s (β^-)		27	26.981539	$\frac{5}{2}^+$	100 %	
O	8	14	14.008595	0^+	71 s (ϵ)		28	27.981910	3^+	2.24 m (β^-)
	15	15.003065	$\frac{1}{2}^-$	122 s (ϵ)		29	28.980446	$\frac{5}{2}^+$	6.6 m (β^-)	
	16	15.994915	0^+	99.76%		30	29.982940	3^+	3.7 s (β^-)	
	17	16.999131	$\frac{5}{2}^+$	0.038%	Si	14	26	25.992330	0^+	2.21 s (ϵ)
	18	17.999160	0^+	0.204%		27	26.986704	$\frac{5}{2}^+$	4.13 s (ϵ)	
	19	19.003577	$\frac{5}{2}^+$	26.9 s (β^-)		28	27.976927	0^+	92.23%	
	20	20.004076	0^+	13.5 s (β^-)		29	28.976495	$\frac{1}{2}^+$	4.67%	
F	9	17	17.002095	$\frac{5}{2}^+$	64.5 s (ϵ)		30	29.973770	0^+	3.10%
	18	18.000937	1^+	110 m (ϵ)		31	30.975362	$\frac{3}{2}^+$	2.62 h (β^-)	
	19	18.998403	$\frac{1}{2}^+$	100 %		32	31.974148	0^+	105 y (β^-)	
	20	19.999981	2^+	11 s (β^-)		33	32.997920	$(\frac{3}{2}^+)$	6.2 s (β^-)	
	21	20.999948	$\frac{5}{2}^+$	4.3 s (β^-)	P	15	29	28.981803	$\frac{1}{2}^+$	4.1 s (ϵ)
	22	22.003030	$(3,4)^+$	4.2 s (β^-)		30	29.978307	1^+	2.50 m (ϵ)	
	23	23.003600	$(\frac{3}{2}, \frac{5}{2})^+$	2.2 s (β^-)		31	30.973762	$\frac{1}{2}^+$	100 %	
Ne	10	17	17.017690	$\frac{1}{2}^-$		32	31.973907	1^+	14.3 d (β^-)	
	18	18.005710	0^+	1.7 s (ϵ)		33	32.971725	$\frac{1}{2}^+$	25.3 d (β^-)	
	19	19.001880	$\frac{1}{2}^+$	17.3 s (ϵ)		34	33.973636	1^+	12.4 s (β^-)	
	20	19.992436	0^+	90.51%	S	16	30	29.984903	0^+	1.2 s (ϵ)
	21	20.993843	$\frac{3}{2}^+$	0.27%		31	30.979554	$\frac{1}{2}^+$	2.6 s (ϵ)	
	22	21.991383	0^+	9.22%		32	31.972071	0^+	95.02%	
	23	22.994465	$\frac{3}{2}^+$	37.6 s (β^-)		33	32.971458	$\frac{3}{2}^+$	0.75%	
	24	23.993613	0^+	3.4 m (β^-)		34	33.967867	0^+	4.21%	
	25	24.997690	$(\frac{1}{2}, \frac{3}{2})^+$	0.60 s (β^-)		35	34.969032	$\frac{3}{2}^+$	87.4 d (β^-)	
Na	11	20	20.007344	2^+	0.45 s (ϵ)		36	35.967081	0^+	0.017%
	21	20.997651	$\frac{3}{2}^+$	22.5 s (ϵ)		37	36.971126	$\frac{7}{2}^-$	5.0 m (β^-)	
	22	21.994434	3^+	2.60 y (ϵ) β^-		38	37.971162	0^+	170 m (β^-)	
	23	22.989768	$\frac{3}{2}^+$	100 %	Cl	17	33	32.977452	$\frac{3}{2}^+$	2.51 s (ϵ)
	24	23.990961	4^+	15.0 h (β^-)		34	33.973763	0^+	1.53 s (ϵ)	
	25	24.989953	$\frac{5}{2}^+$	60 s (β^-)		35	34.968853	$\frac{3}{2}^+$	75.77%	
	26	25.992586	3^+	1.1 s (β^-)		36	35.968307	2^+	0.30 My (β^-)	
	27	26.993940	$\frac{5}{2}^+$	0.30 s (β^-)		37	36.965903	$\frac{3}{2}^+$	24.23%	
Mg	12	21	21.011716	$(\frac{3}{2}, \frac{5}{2})^+$	0.123 s (ϵ)		38	37.968011	2^-	37.3 m (β^-)
	22	21.999574	0^+	3.86 s (ϵ)		39	38.968005	$\frac{3}{2}^+$	56 m (β^-)	
	23	22.994124	$\frac{3}{2}^+$	11.3 s (ϵ)		40	39.970440	2^-	1.35 m (β^-)	
	24	23.985042	0^+	78.99%		41	40.970590	$(\frac{1}{2}, \frac{3}{2})^+$	31 s (β^-)	
	25	24.985837	$\frac{5}{2}^+$	10.00%	Ar	18	34	33.980269	0^+	0.844 s (ϵ)
	26	25.982594	0^+	11.01%		35	34.975256	$\frac{3}{2}^+$	1.78 s (ϵ)	
	27	26.984341	$\frac{1}{2}^+$	9.46 m (β^-)		36	35.967546	0^+	0.337%	
	28	27.983877	0^+	21.0 h (β^-)		37	36.966776	$\frac{3}{2}^+$	35.0 d (ϵ)	
	29	28.988480	$\frac{1}{2}^+$	1.4 s (β^-)		38	37.962732	0^+	0.063%	
Al	13	24	23.999941	4^+	2.07 s (ϵ)		39	38.964314	$\frac{7}{2}^-$	269 y (β^-)
	25	24.990429	$\frac{5}{2}^+$	7.18 s (ϵ)		40	39.962384	0^+	99.60%	
						41	40.964501	$\frac{7}{2}^-$	1.83 h (β^-)	

Z	A	Atomic mass (u)	I ^π	Abundance or Half-life	Z	A	Atomic mass (u)	I ^π	Abundance or Half-life
K	19	42	41.963050	0 ⁺	V	23	52	51.946898	0 ⁺
		43	42.965670	0 ⁺			53	52.949730	($\frac{1}{2}$) ⁻
		44	43.965365	0 ⁺			46	45.960198	0 ⁺
		37	36.973377	$\frac{1}{2}^{+}$			47	46.954906	$\frac{1}{2}^{-}$
		38	37.969080	3 ⁺			48	47.952257	4 ⁺
		39	38.963707	$\frac{1}{2}^{+}$			49	48.948517	$\frac{1}{2}^{-}$
		40	39.963999	4 ⁻			50	49.947161	6 ⁺
		41	40.961825	$\frac{1}{2}^{+}$			51	50.943962	$\frac{1}{2}^{-}$
		42	41.962402	2 ⁻			52	51.944778	3 ⁺
		43	42.960717	$\frac{1}{2}^{-}$			53	52.944340	$\frac{1}{2}^{-}$
Ca	20	44	43.961560	2 ⁻	Cr	24	54	53.946442	(3, 4, 5) ⁺
		45	44.960696	$\frac{1}{2}^{+}$			46	45.968360	0 ⁺
		46	45.961976	(2 ⁻)			47	46.962905	$\frac{1}{2}^{-}$
		47	46.961677	$\frac{1}{2}^{+}$			48	47.954033	0 ⁺
		38	37.976318	0 ⁺			49	48.951338	$\frac{1}{2}^{-}$
		39	38.970718	$\frac{1}{2}^{+}$			50	49.946046	0 ⁺
		40	39.962591	0 ⁺			51	50.944768	$\frac{1}{2}^{-}$
		41	40.962278	$\frac{1}{2}^{-}$			52	51.940510	0 ⁺
		42	41.958618	0 ⁺			53	52.940651	$\frac{1}{2}^{-}$
		43	42.958766	$\frac{1}{2}^{-}$			54	53.938882	0 ⁺
Sc	21	44	43.955481	0 ⁺	Mn	25	55	54.940842	$\frac{1}{2}^{-}$
		45	44.956185	$\frac{1}{2}^{-}$			56	55.940643	$\frac{1}{2}^{-}$
		46	45.953689	0 ⁺			50	49.954240	0 ⁺
		47	46.954543	$\frac{1}{2}^{-}$			51	50.948213	$\frac{1}{2}^{-}$
		48	47.952533	0 ⁺			52	51.945568	6 ⁺
		49	48.955672	$\frac{1}{2}^{-}$			53	52.941291	$\frac{1}{2}^{-}$
		50	49.957519	0 ⁺			54	53.940361	3 ⁺
		42	41.965514	0 ⁺			55	54.938047	$\frac{1}{2}^{-}$
		43	42.961150	$\frac{1}{2}^{-}$			56	55.938907	3 ⁺
		44	43.959404	2 ⁺			57	56.938285	$\frac{1}{2}^{-}$
Ti	22	45	44.955910	$\frac{1}{2}^{-}$	Fe	26	58	57.940060	3 ⁺
		46	45.955170	4 ⁺			51	50.956825	($\frac{1}{2}$) ⁻
		47	46.952409	$\frac{1}{2}^{-}$			52	51.948114	0 ⁺
		48	47.952235	6 ⁺			53	52.945310	$\frac{1}{2}^{-}$
		49	48.950022	$\frac{1}{2}^{-}$			54	53.939613	0 ⁺
		50	49.952186	5 ⁺			55	54.938296	$\frac{1}{2}^{-}$
		42	41.968523	$\frac{1}{2}^{-}$			56	55.934939	0 ⁺
		44	43.959690	0 ⁺			57	56.935396	$\frac{1}{2}^{-}$
		45	44.958124	$\frac{1}{2}^{-}$			58	57.933277	0 ⁺
		46	45.952629	0 ⁺			59	58.934877	$\frac{1}{2}^{-}$
Co	27	47	46.951764	$\frac{1}{2}^{-}$	Ni	28	60	59.933820	5 ⁺
		48	47.947947	0 ⁺			61	60.932478	$\frac{1}{2}^{-}$
		49	48.947871	$\frac{1}{2}^{-}$			62	61.934060	2 ⁺
		50	49.944792	0 ⁺			63	62.933614	($\frac{1}{2}$) ⁻
		51	50.946616	$\frac{1}{2}^{-}$			55	54.951336	$\frac{1}{2}^{-}$
		42	41.963050	0 ⁺			56	55.942134	0 ⁺
		43	42.965670	0 ⁺			57	56.939799	$\frac{1}{2}^{-}$
		44	43.965365	0 ⁺			58	57.935346	0 ⁺
		37	36.973377	$\frac{1}{2}^{+}$			59	58.934349	$\frac{1}{2}^{-}$
		38	37.969080	3 ⁺			60	59.930788	0 ⁺

Z	A	Atomic mass (u)	I ^π	Abundance or Half-life	Z	A	Atomic mass (u)	I ^π	Abundance or Half-life
Ga	31	64	63.936836	0 ⁺	Ge	32	66	65.933847	0 ⁺
		65	64.932738	$\frac{1}{2}^{-}$			67	66.932737	($\frac{1}{2}$) ⁻
		66	65.931590	0 ⁺			68	67.928096	0 ⁺
		67	66.928204	$\frac{1}{2}^{-}$			69	68.927969	$\frac{1}{2}^{-}$
		68	67.927982	1 ⁺			70	69.924250	0 ⁺
		69	68.925580	$\frac{1}{2}^{-}$			71	70.924954	$\frac{1}{2}^{-}$
		70	69.926028	1 ⁺			72	71.922079	0 ⁺
		71	70.924701	$\frac{1}{2}^{-}$			73	72.923463	$\frac{1}{2}^{+}$
		72	71.926365	3 ⁻			74	73.921177	0 ⁺
		73	72.925169	$\frac{1}{2}^{-}$			75	74.922858	$\frac{1}{2}^{-}$
Ni	28	55	54.951336	$\frac{1}{2}^{-}$	Cu	29	59	58.939503	$\frac{1}{2}^{-}$
		56	55.942134	0 ⁺			60	59.937366	2 ⁺
		57	56.939799	$\frac{1}{2}^{-}$			61	60.933461	$\frac{1}{2}^{-}$
		58	57.935346	0 ⁺			62	61.932586	1 ⁺
		59	58.934349	$\frac{1}{2}^{-}$			63	62.929599	$\frac{1}{2}^{-}$
		60	59.930788	0 ⁺			64	63.929766	1 ⁺
		61	60.931058	$\frac{1}{2}^{-}$			65	64.927793	$\frac{1}{2}^{-}$
		62	61.928346	0 ⁺			66	65.928872	1 ⁺
		63	62.929670	$\frac{1}{2}^{-}$			67	66.927747	$\frac{1}{2}^{-}$
		64	63.927968	0 ⁺			68	67.929620	1 ⁺
As	33	70	69.930929	4 ⁺	Zn	30	61	60.939514	$\frac{1}{2}^{-}$
		71	70.927114	$\frac{1}{2}^{-}$			62	61.934332	0 ⁺
		72	71.926755	2 ⁻			63	62.933214	$\frac{1}{2}^{-}$
		73	72.923827	$\frac{1}{2}^{-}$			64	63.929145	0 ⁺
		74	73.923928	2 ⁻			65	64.929243	$\frac{1}{2}^{-}$
		75	74.921594	$\frac{1}{2}^{-}$			66	65.926035	0 ⁺
		76	75.922393	2 ⁻			67	66.927129	$\frac{1}{2}^{-}$
		77	76.923548	$\frac{1}{2}^{+}$			68	67.924846	0 ⁺
		78	77.922853	0 ⁺			69	68.926552	$\frac{1}{2}^{-}$
		79	78.925360	($\frac{1}{2}$) ⁻			70	69.925325	0 ⁺
Se	34	71	70.932270	$\frac{1}{2}^{-}$	Co	27	54	53.948460	0 ⁺
		72	71.927110	0 ⁺			55	54.938296	$\frac{1}{2}^{-}$
		73	72.926768	$\frac{1}{2}^{+}$			56	55.934939	0 ⁺
		74	73.922475	0 ⁺			57	56.935396	$\frac{1}{2}^{-}$
		75	74.922522	$\frac{1}{2}^{+}$			58	57.933277	0 ⁺
		76	75.919212	0 ⁺			59	58.934877	$\frac{1}{2}^{-}$
		77	76.919913	$\frac{1}{2}^{-}$			60	59.934078	0 ⁺
		78	77.917308	0 ⁺			61	60.936748	($\frac{1}{2}, \frac{1}{2}$) ⁻
		79	78.918498	$\frac{1}{2}^{+}$			62	61.936773	0 ⁺

Abundance or Half-life					Abundance or Half-life					Abundance or Half-life					Abundance or Half-life						
Z	A	Atomic mass (u)	I ^π	Abundance or Half-life	Z	A	Atomic mass (u)	I ^π	Abundance or Half-life	Z	A	Atomic mass (u)	I ^π	Abundance or Half-life	Z	A	Atomic mass (u)	I ^π	Abundance or Half-life		
	80	79.916520	0 ⁺	49.8%		87	86.908884	4 ⁺	7.0%		96	95.904679	0 ⁻	16.7%		108	107.903895	0 ⁺	26.7%		
	81	80.917991	($\frac{1}{2}$) ⁻	18.5 m (β ⁻)		88	87.905619	0 ⁺	82.6%		97	96.906021	($\frac{5}{2}$) ⁺	9.6%		109	108.905954	($\frac{5}{2}$) ⁺	13.4 h (β ⁻)		
	82	81.916698	0 ⁺	9.2%		89	88.907450	($\frac{3}{2}$) ⁺	50.5 d (β ⁻)		98	97.905407	0 ⁻	24.1%		110	109.905167	0 ⁺	11.8%		
	83	82.919117	($\frac{3}{2}$) ⁺	22.5 m (β ⁻)		90	89.907738	0 ⁺	28.8 y (β ⁻)		99	98.907711	($\frac{1}{2}$) ⁺	66.0 h (β ⁻)		111	110.907660	($\frac{5}{2}$) ⁺	23 m (β ⁻)		
	84	83.918463	0 ⁺	3.3 m (β ⁻)		91	90.910187	($\frac{3}{2}$) ⁺	9.5 h (β ⁻)		100	99.907477	0 ⁺	9.6%		112	111.907323	0 ⁺	21.0 h (β ⁻)		
Br	35	76	75.924528	1 ⁻	16.1 h (ε)		92	91.910944	0 ⁺	2.7 h (β ⁻)		101	100.910345	($\frac{1}{2}$) ⁺	14.6 m (β ⁻)	Ag	47	103	102.908980	($\frac{7}{2}$) ⁺	65.7 m (ε)
	77	76.921378	($\frac{3}{2}$) ⁻	57.0 h (ε)		93	92.913987	($\frac{7}{2}$) ⁺	7.4 m (β ⁻)		Tc	43	94	93.909654	7 ⁻	293 m (ε)		104	103.908623	5 ⁺	69.2 m (ε)
	78	77.921144	1 ⁺	6.46 m (ε)	Y	39	84	83.920310	(5 ⁻)	39 m (ε)		95	94.907657	($\frac{9}{2}$) ⁻	20.0 h (ε)		105	104.906520	($\frac{1}{2}$) ⁻	41.3 d (ε)	
	79	78.918336	($\frac{3}{2}$) ⁻	50.69%		85	84.916437	($\frac{1}{2}$) ⁻	2.7 h (ε)		96	95.907870	7 ⁺	4.3 d (ε)		106	105.906662	1 ⁺	24.0 m (ε)		
	80	79.918528	1 ⁺	17.6 m (β ⁻)		86	85.914893	4 ⁻	14.7 h (ε)		97	96.906364	($\frac{9}{2}$) ⁺	2.6 My (ε)		107	106.905092	($\frac{1}{2}$) ⁻	51.83%		
	81	80.916289	($\frac{3}{2}$) ⁻	49.31%		87	86.910882	($\frac{1}{2}$) ⁻	80.3 h (ε)		98	97.907215	(6 ⁺)	4.2 My (β ⁻)		108	107.905952	1 ⁺	2.4 m (β ⁻)		
	82	81.916802	5 ⁻	35.3 h (β ⁻)		88	87.909508	4 ⁻	106.6 d (ε)		99	98.906254	($\frac{9}{2}$) ⁺	0.214 My (β ⁻)		109	108.904756	($\frac{1}{2}$) ⁻	48.17%		
	83	82.915179	($\frac{3}{2}$) ⁻	2.39 h (β ⁻)		89	88.905849	($\frac{1}{2}$) ⁻	100%		100	99.907657	1 ⁺	15.8 s (β ⁻)		110	109.906111	1 ⁺	24.4 s (β ⁻)		
	84	83.916503	2 ⁻	31.8 m (β ⁻)		90	89.907152	2 ⁻	64.1 h (β ⁻)							111	110.905295	($\frac{1}{2}$) ⁻	7.45 d (β ⁻)		
	85	84.915612	($\frac{3}{2}$) ⁻	2.9 m (β ⁻)		91	90.907303	($\frac{1}{2}$) ⁻	58.5 d (β ⁻)		Ru	44	94	93.911361	0 ⁺	52 m (ε)		112	111.907010	2 ⁻	3.14 h (β ⁻)
Kr	36	75	74.931029	?	4.3 m (ε)		92	91.908917	2 ⁻	3.54 h (β ⁻)		95	94.910414	($\frac{3}{2}$) ⁺	1.65 h (ε)						
	76	75.925959	0 ⁺	14.8 h (ε)		93	92.909571	($\frac{1}{2}$) ⁻	10.2 h (β ⁻)		96	95.907599	0 ⁺	5.5%	Cd	48	104	103.909851	0 ⁺	58 m (ε)	
	77	76.924610	($\frac{3}{2}$) ⁺	75 m (ε)		94	93.911597	2 ⁻	18.7 m (β ⁻)		97	96.907556	($\frac{3}{2}$) ⁺	2.88 d (ε)		105	104.909459	($\frac{5}{2}$) ⁺	56.0 m (ε)		
	78	77.920396	0 ⁺	0.356%	Zr	40	87	86.914817	($\frac{9}{2}$) ⁺	1.6 h (ε)		98	97.905287	0 ⁺	1.86%		106	105.906461	0 ⁺	1.25%	
	79	78.920084	($\frac{1}{2}$) ⁻	35.0 h (ε)		88	87.910225	0 ⁺	83.4 d (ε)		99	98.905939	($\frac{5}{2}$) ⁺	12.7%		107	106.906613	($\frac{3}{2}$) ⁺	6.50 h (ε)		
	80	79.916380	0 ⁺	2.27%		89	88.908890	($\frac{9}{2}$) ⁺	78.4 h (ε)		100	99.904219	0 ⁺	12.6%		108	107.904176	0 ⁺	0.89%		
	81	80.916590	($\frac{7}{2}$) ⁺	0.21 My (ε)		90	89.904703	0 ⁺	51.5%		101	100.905582	($\frac{5}{2}$) ⁺	17.0%		109	108.904953	($\frac{5}{2}$) ⁺	463 d (ε)		
	82	81.913482	0 ⁺	11.6%		91	90.905644	($\frac{3}{2}$) ⁺	11.2%		102	101.904348	0 ⁺	31.6%		110	109.903005	0 ⁺	12.5%		
	83	82.914135	($\frac{9}{2}$) ⁺	11.5%		92	91.905039	0 ⁺	17.1%		103	102.906323	($\frac{3}{2}$) ⁺	39.4 d (β ⁻)		111	110.904182	($\frac{1}{2}$) ⁺	12.8%		
	84	83.911507	0 ⁺	57.0%		93	92.906474	($\frac{3}{2}$) ⁺	1.5 My (β ⁻)		104	103.905424	0 ⁺	18.7%		112	111.902757	0 ⁺	24.1%		
	85	84.912531	($\frac{9}{2}$) ⁺	10.7 y (β ⁻)		94	93.906315	0 ⁺	17.4%		105	104.907744	($\frac{3}{2}$) ⁺	4.44 h (β ⁻)		113	112.904400	($\frac{1}{2}$) ⁺	12.2%		
	86	85.910616	0 ⁺	17.3%		95	94.908042	($\frac{3}{2}$) ⁺	64.0 d (β ⁻)		106	105.907321	0 ⁺	372 d (β ⁻)		114	113.903357	0 ⁺	28.7%		
	87	86.913360	($\frac{5}{2}$) ⁺	76 m (β ⁻)		96	95.908275	0 ⁺	2.80%		107	106.910130	($\frac{5}{2}$) ⁺	3.8 m (β ⁻)		115	114.905430	($\frac{1}{2}$) ⁺	53.4 h (β ⁻)		
	88	87.914453	0 ⁺	2.84 h (β ⁻)		97	96.910950	($\frac{1}{2}$) ⁺	16.9 h (β ⁻)							116	115.904755	0 ⁺	7.5%		
	89	88.917640	($\frac{5}{2}$) ⁺	3.18 m (β ⁻)		98	97.912735	0 ⁺	31 s (β ⁻)		Rh	45	98	97.910716	(2 ⁺)	8.7 m (ε)		117	116.907228	($\frac{1}{2}$) ⁺	2.4 h (β ⁻)
Rb	37	82	81.918195	1 ⁺	1.25 m (ε)		99	98.908192	($\frac{1}{2}$) ⁻	16.1 d (ε)		100	99.908116	1 ⁻	20.8 h (ε)		118	117.911700	0 ⁺	50.3 m (β ⁻)	
	83	82.915144	($\frac{3}{2}$) ⁻	86.2 d (ε)	Nb	41	89	88.913449	($\frac{1}{2}$) ⁻	2.0 h (ε)		101	100.906159	($\frac{1}{2}$) ⁻	3.3 y (ε)	In	49	110	109.907230	2 ⁺	69.1 m (ε)
	84	83.914390	2 ⁻	32.9 d (ε)		90	89.911263	8 ⁺	14.6 h (ε)		102	101.906814	6 ⁺	2.9 y (ε)		111	110.905109	($\frac{9}{2}$) ⁺	2.83 d (ε)		
	85	84.911794	($\frac{5}{2}$) ⁻	72.17%		91	90.906991	($\frac{3}{2}$) ⁺	700 y (ε)		103	102.905500	($\frac{1}{2}$) ⁻	100%		112	111.905536	1 ⁺	14.4 m (ε)		
	86	85.911172	2 ⁻	18.8 d (β ⁻)		92	91.907192	(7 ⁺)	35 My (ε)		104	103.906651	1 ⁺	42.3 s (β ⁻)		113	112.904061	($\frac{9}{2}$) ⁺	4.3%		
	87	86.909187	($\frac{3}{2}$) ⁻	27.83%		93	92.906377	($\frac{9}{2}$) ⁺	100%		105	104.905686	($\frac{7}{2}$) ⁺	35.4 h (β ⁻)		114	113.904916	1 ⁺	71.9 s (β ⁻)		
	88	87.911326	2 ⁻	17.8 m (β ⁻)		94	93.907281	6 ⁺	0.020 My (β ⁻)		106	105.907279	1 ⁺	29.8 s (β ⁻)		115	114.903882	($\frac{9}{2}$) ⁺	95.7%		
	89	88.912278	($\frac{3}{2}$) ⁻	15.2 m (β ⁻)		95	94.906835	($\frac{9}{2}$) ⁺	35.0 d (β ⁻)							116	115.905264	1 ⁺	14.1 s (β ⁻)		
	90	89.914811	(1 ⁻)	153 s (β ⁻)		96	95.908100	6 ⁺	23.4 h (β ⁻)		Pd	46	99	98.911763	($\frac{3}{2}$) ⁻	21.4 m (ε)		117	116.904517	($\frac{9}{2}$) ⁺	43.8 m (β ⁻)
						97	96.908097	($\frac{9}{2}$) ⁺	72 m (β ⁻)		100	99.908527	0 ⁺	3.6 d (ε)							
Sr	38	81	80.923270	($\frac{1}{2}$) ⁻	22 m (ε)	Mo	42	90	89.913933	0 ⁺	5.67 h (ε)	101	100.908287	($\frac{3}{2}$) ⁻	8.5 h (ε)	Sn	50	109	108.911294	($\frac{7}{2}$) ⁺	18.0 m (ε)
	82	81.918414	0 ⁺	25.0 d (ε)		91	90.911755	($\frac{9}{2}$) ⁺	15.5 m (ε)		102	101.905634	0 ⁺	1.0%		110	109.907858	0 ⁺	4.1 h (ε)		
	83	82.917566	($\frac{7}{2}$) ⁺	32.4 d (ε)		92	91.906808	0 ⁺	14.8%		103	102.906114	($\frac{5}{2}$) ⁺	17.0 d (ε)		111	110.907741	($\frac{7}{2}$) ⁺	35 m (ε)		
	84	83.913430	0 ⁺	0.56%		93	92.906813	($\frac{5}{2}$) ⁺	3500 y (ε)		104	103.904029	0 ⁺	11.0%		112	111.904826	0 ⁺	1.01%		
	85	84.912937	($\frac{9}{2}$) ⁺	64.8 d (ε)		94	93.905085	0 ⁺	9.3%		105	104.905079	($\frac{5}{2}$) ⁺	22.2%		113	112.905176	($\frac{1}{2}$) ⁺	115.1 d (ε)		
	86	85.909267	0 ⁺	9.8%		95	94.905841	($\frac{3}{2}$) ⁺	15.9%		106	105.903478	0 ⁺	27.3%		114	113.902784	0 ⁺	0.67%		
											107	106.905127	($\frac{5}{2}$) ⁺	6.5 My (β ⁻)		115	114.903348	($\frac{1}{2}$) ⁺	0.38%		

Abundance or Half-life					Abundance or Half-life					Abundance or Half-life					Abundance or Half-life						
Z	A	Atomic mass (u)	I ⁿ	Abundance or Half-life	Z	A	Atomic mass (u)	I ⁿ	Abundance or Half-life	Z	A	Atomic mass (u)	I ⁿ	Abundance or Half-life	Z	A	Atomic mass (u)	I ⁿ	Abundance or Half-life		
	116	115.901747	0 ⁺	14.6%	Xe 54	129	128.904986	2 ⁻	16 My (β ⁻)	La 57	135	134.906953	5 ⁺	19.5 h (ε)	Sm 62	145	144.912743	5 ⁺	17.7 y (ε)		
	117	116.902956	1 ⁺	7.75%		130	129.906713	5 ⁺	12.4 h (β ⁻)		136	135.907630	1 ⁺	9.87 m (ε)		146	145.914708	3 ⁺	5.5 y (ε)		
	118	117.901609	0 ⁺	24.3%		131	130.906114	2 ⁻	8.04 d (β ⁻)		137	136.906460	2 ⁺	0.06 My (ε)		147	146.915135	2 ⁻	2.62 y (β ⁻)		
	119	118.903311	1 ⁺	8.6%		132	131.907987	4 ⁻	2.30 h (β ⁻)		138	137.907105	5 ⁺	0.089%		148	147.917473	1 ⁺	5.37 d (β ⁻)		
	120	119.902199	0 ⁺	32.4%		121	120.911450	(1 ⁺)	40.1 m (ε)		139	138.906347	2 ⁺	99.911%		149	148.918332	2 ⁺	53.1 h (β ⁻)		
	121	120.904239	3 ⁺	27.1 h (β ⁻)		122	121.908170	0 ⁻	20.1 h (ε)		140	139.909471	3 ⁺	40.3 h (β ⁻)		150	149.920981	(1 ⁻)	2.68 h (β ⁻)		
	122	121.903440	0 ⁺	4.56%		123	122.908469	(1 ⁺)	2.08 h (ε)		141	140.910896	2 ⁺	3.90 h (β ⁻)		Eu 63	142	141.915206	0 ⁺	72.5 m (ε)	
	123	122.905722	11 ⁻	129 d (β ⁻)		124	123.905894	0 ⁻	0.096%		142	141.914090	2 ⁻	91.1 m (β ⁻)			143	142.914626	3 ⁺	8.83 m (ε)	
	124	123.905274	0 ⁺	5.64%		125	124.906397	(1 ⁺)	17 h (ε)		Ce 58	133	132.911360	1 ⁺			5.4 h (ε)	144	143.911998	0 ⁺	3.1%
	125	124.907785	11 ⁻	9.62 d (β ⁻)		126	125.904281	0 ⁻	0.090%			134	133.908890	0 ⁺			76 h (ε)	145	144.913409	2 ⁻	340 d (ε)
126	125.907654	0 ⁺	0.1 My (β ⁻)	127	126.905182	(1 ⁺)	36.4 d (ε)	135	134.909117	1 ⁺		17.6 h (ε)	146	145.913053	0 ⁺		103 My (α)				
127	126.910355	(11 ⁻)	2.1 h (β ⁻)	128	127.903531	0 ⁺	1.92%	136	135.907140	0 ⁺		0.190%	147	146.914894	2 ⁻		15.1%				
Sb 51	118	117.905534	1 ⁺	3.6 m (ε)	129	128.904780	1 ⁺	26.4%	137	136.907780		1 ⁺	9.0 h (ε)	148	147.914819		0 ⁺	11.3%			
	119	118.903948	5 ⁺	38.0 h (ε)	130	129.903509	0 ⁻	4.1%	138	137.905985		0 ⁺	0.254%	149	148.917180		2 ⁻	13.9%			
	120	119.905077	1 ⁺	15.8 m (ε)	131	130.905072	3 ⁺	21.2%	139	138.906631		3 ⁺	137.2 d (ε)	150	149.917273		0 ⁺	7.4%			
	121	120.903821	5 ⁺	57.3%	132	131.904144	0 ⁺	26.9%	140	139.905433		0 ⁺	88.5%	151	150.919929		5 ⁺	90 y (β ⁻)			
	122	121.905179	2 ⁻	2.70 d (β ⁻)	133	132.905888	3 ⁺	5.25 d (β ⁻)	141	140.908271		2 ⁻	32.5 d (β ⁻)	152	151.919728	0 ⁻	26.6%				
	123	122.904216	7 ⁺	42.7%	134	133.905395	0 ⁻	10.4%	142	141.909241		0 ⁺	11.1%	153	152.922094	3 ⁺	46.8 h (β ⁻)				
	124	123.905938	3 ⁻	60.2 d (β ⁻)	135	134.907130	3 ⁺	9.1 h (β ⁻)	143	142.912383	3 ⁺	33.0 h (β ⁻)	154	153.922205	0 ⁺	22.6%					
	125	124.905252	7 ⁺	2.7 y (β ⁻)	136	135.907214	0 ⁺	8.9%	144	143.913643	0 ⁺	284 d (β ⁻)	155	154.924636	1 ⁺	22.4 m (β ⁻)					
	126	125.907250	8 ⁻	12.4 d (β ⁻)	137	136.911557	2 ⁻	3.82 m (β ⁻)	145	144.917230	3 ⁺	2.98 m (β ⁻)	Gd 64	148	147.918125	5 ⁻	54.5 d (ε)				
	127	126.906919	7 ⁺	3.85 d (β ⁻)	Cs 55	130	129.906753	1 ⁺	29.2 m (ε)	Pr 59	138	137.910748		1 ⁺	1.45 m (ε)	149	148.917926	5 ⁺	93.1 d (ε)		
Te 52	117	116.908630	1 ⁺	62 m (ε)		131	130.905444	3 ⁺	9.69 d (ε)		139	138.908917		5 ⁺	4.4 h (ε)	150	149.919702	0 ⁻	36 y (ε)		
	118	117.905908	0 ⁺	6.00 d (ε)		132	131.906431	2 ⁻	6.47 d (ε)		140	139.909071		1 ⁺	3.39 m (ε)	151	150.919847	5 ⁺	47.9%		
	119	118.906411	1 ⁺	16.0 h (ε)		133	132.905429	2 ⁺	100%		141	140.907647		5 ⁺	100%	152	151.921742	3 ⁻	13 y (ε)		
	120	119.904048	0 ⁺	0.091%		134	133.906696	4 ⁺	2.06 y (β ⁻)		142	141.910039		2 ⁻	19.2 h (β ⁻)	153	152.921225	5 ⁺	52.1%		
	121	120.904947	1 ⁺	16.8 d (ε)		135	134.905885	2 ⁺	3 My (β ⁻)		143	142.910814		2 ⁺	13.6 d (β ⁻)	154	153.922975	3 ⁻	8.5 y (β ⁻)		
	122	121.903050	0 ⁺	2.5%		136	135.907289	5 ⁺	13.1 d (β ⁻)		144	143.913301		0 ⁻	17.3 m (β ⁻)	155	154.922889	5 ⁺	4.9 y (β ⁻)		
	123	122.904271	1 ⁺	0.89%		137	136.907073	2 ⁻	30.2 y (β ⁻)		Nd 60	139		138.911920	3 ⁺	29.7 m (ε)	156	155.924752	0 ⁺	15 d (β ⁻)	
	124	123.902818	0 ⁺	4.6%		138	137.911004	3 ⁻	32.2 m (β ⁻)			140		139.909306	0 ⁺	3.37 d (ε)	157	156.925418	5 ⁺	15 h (β ⁻)	
	125	124.904429	1 ⁺	7.0%		Ba 56	127	126.911130	(1 ⁺)			12.7 m (ε)	141	140.909594	3 ⁺	2.5 h (ε)	Tb 65	149	148.919344	7 ⁻	9.4 d (ε)
	126	125.903310	0 ⁺	18.7%	128		127.908237	0 ⁺	2.43 d (ε)	142		141.907719	0 ⁺	27.2%	150	149.918662		0 ⁺	1.8 My (α)		
127	126.905221	3 ⁺	9.4 h (β ⁻)	129	128.908642		1 ⁻	2.2 h (ε)	143	142.909810		2 ⁻	12.2%	151	150.920346	7 ⁻		120 d (ε)			
128	127.904463	0 ⁺	31.7%	130	129.906282		0 ⁻	0.106%	144	143.910083		0 ⁺	23.8%	152	151.919786	0 ⁺		0.20%			
129	128.906594	3 ⁺	69 m (β ⁻)	131	130.906902		1 ⁺	12.0 d (ε)	145	144.912570		2 ⁻	8.3%	153	152.921745	3 ⁺		242 d (ε)			
130	129.906229	0 ⁺	34.5%	132	131.905042		0 ⁻	0.101%	146	145.913113		0 ⁺	17.2%	154	153.920861	0 ⁺		2.1%			
131	130.908528	3 ⁺	25.0 m (β ⁻)	133	132.905988		1 ⁺	10.7 y (ε)	147	146.916097		5 ⁺	11.0 d (β ⁻)	155	154.922618	1 ⁺		14.8%			
132	131.908517	0 ⁻	78.2 h (β ⁻)	134	133.904486		0 ⁻	2.42%	148	147.916889		0 ⁺	5.7%	156	155.922118	0 ⁻		20.6%			
133	132.910910	(3 ⁺)	12.5 m (β ⁻)	135	134.905665		2 ⁺	6.59%	149	148.920145	5 ⁻	1.73 h (β ⁻)	157	156.923956	1 ⁺	15.7%					
I 53	123	122.905594	5 ⁺	13.2 h (ε)	136		135.904553	0 ⁻	7.85%	150	149.920887	0 ⁺	5.6%	158	157.924099	0 ⁻		24.8%			
	124	123.906207	2 ⁻	4.18 d (ε)	137	136.905812	3 ⁺	11.2%	151	150.923825	(1 ⁺)	12.4 m (β ⁻)	159	158.926384	1 ⁺	18.6 h (β ⁻)					
	125	124.904620	5 ⁺	60.2 d (ε)	138	137.905232	0 ⁻	71.7%	152	151.924680	0 ⁺	11.4 m (β ⁻)	160	159.927049	0 ⁻	21.8%					
	126	125.905624	2 ⁻	13.0 d (ε)	139	138.908826	2 ⁻	82.9 m (β ⁻)	Pm 61	142	141.912970	1 ⁺	40.5 s (ε)	161	160.929664	5 ⁻	3.7 m (β ⁻)				
	127	126.904473	5 ⁺	100%	140	139.910581	0 ⁻	12.7 d (β ⁻)		143	142.910930	5 ⁺	265 d (ε)	Tb 65	156	155.924742	3 ⁻	5.34 d (ε)			
	128	127.905810	1 ⁺	25.0 m (β ⁻)	141	140.914363	3 ⁺	18.3 m (β ⁻)		144	143.912588	5 ⁻	349 d (ε)		157	156.924023	1 ⁺	150 y (ε)			

Abundance or Half-life				Abundance or Half-life				Abundance or Half-life				Abundance or Half-life			
Z	A	Atomic mass (u)	I ⁿ	Z	A	Atomic mass (u)	I ⁿ	Z	A	Atomic mass (u)	I ⁿ	Z	A	Atomic mass (u)	I ⁿ
	158	157.925411	3	Yb 70	166	165.933875	0 ⁺		184	183.950928	0 ⁺		198	197.967869	0 ⁺
	159	158.925342	3		167	166.934946	5/2 ⁻		185	184.953416	1/2 ⁻		199	198.970552	(5/2 ⁺)
	160	159.927163	3		168	167.933894	0 ⁺		186	185.954357	0 ⁺		200	199.971417	0 ⁺
	161	160.927566	3/2 ⁺		169	168.935186	7/2 ⁺		187	186.957153	3/2 ⁻				
	162	161.929510	1 ⁻		170	169.934759	0 ⁺		188	187.958480	0 ⁺	Au 79	194	193.965348	1
Dy 66	153	152.925769	7/2 ⁻		171	170.936323	1/2 ⁻	Re 75	182	181.951210	2 ⁺		195	194.965013	3/2 ⁺
	154	153.924429	0 ⁺		172	171.936378	0 ⁺		183	182.950817	(5/2 ⁺)		196	195.966544	2 ⁻
	155	154.925747	3/2 ⁻		173	172.938208	5/2 ⁻		184	183.952530	3 ⁻		197	196.966543	3/2 ⁺
	156	155.924277	0 ⁺		174	173.938859	0 ⁺		185	184.952951	5/2 ⁺		198	197.968217	2 ⁻
	157	156.925460	3/2 ⁻		175	174.941273	7/2 ⁻		186	185.952951	5/2 ⁺		199	198.968740	3/2 ⁺
	158	157.924403	0 ⁺		176	175.942564	0 ⁺		187	186.955744	5/2 ⁺		200	199.970670	1 ⁻
	159	158.925735	1/2 ⁻		177	176.945253	9/2 ⁺		188	187.958106	1 ⁻	Hg 80	193	192.966560	1/2 ⁻
	160	159.925193	0 ⁺		178	177.946639	0 ⁺		189	188.959219	(5/2 ⁺)		194	193.965391	0 ⁺
	161	160.926930	5/2 ⁺	Lu 71	172	171.939085	(4 ⁻)						195	194.966640	1/2 ⁻
	162	161.926795	0 ⁺		173	172.938929	7/2 ⁺	Os 76	182	181.952120	0 ⁺		196	195.965807	0 ⁺
	163	162.928728	5/2 ⁻		174	173.940336	1 ⁻		183	182.953290	(5/2 ⁺)		197	196.967187	1/2 ⁻
	164	163.929171	0 ⁺		175	174.940770	7/2 ⁺		184	183.952488	0 ⁺		198	197.966743	0 ⁺
	165	164.931700	7/2 ⁺		176	175.942679	7 ⁻		185	184.954041	1/2 ⁻		199	198.968254	1/2 ⁻
	166	165.932803	0 ⁺		177	176.943752	7/2 ⁺		186	185.953830	0 ⁺		200	199.968300	0 ⁺
					178	177.945963	1 ⁺		187	186.955741	1/2 ⁻		201	200.970277	3/2 ⁻
Ho 67	162	161.929092	1 ⁺	Hf 72	171	170.940490	(7/2 ⁺)		188	187.955830	0 ⁺		202	201.970617	0 ⁺
	163	162.928731	(7/2 ⁻)		172	171.939460	0 ⁺		189	188.958137	3/2 ⁻		203	202.972848	5/2 ⁻
	164	163.930285	1 ⁺		173	172.940650	1/2 ⁻		190	189.958436	0 ⁺		204	203.973467	0 ⁺
	165	164.930319	7/2 ⁻		174	173.940044	0 ⁺		191	190.960920	9/2 ⁻		205	204.976047	1/2 ⁻
	166	165.932281	0 ⁻		175	174.941507	5/2 ⁻		192	191.961467	0 ⁺	Tl 81	200	199.970934	2 ⁻
	167	166.933127	(7/2 ⁻)		176	175.941406	0 ⁺		193	192.964138	1/2 ⁻		201	200.970794	1/2 ⁺
Er 68	160	159.929080	0 ⁺		177	176.943217	7/2 ⁻		194	193.965173	0 ⁺		202	201.972085	2 ⁻
	161	160.929996	3/2 ⁻		178	177.943696	0 ⁺	Ir 77	188	187.958830	(2 ⁻)		203	202.972320	1/2 ⁺
	162	161.928775	0 ⁺		179	178.945812	9/2 ⁺		189	188.958712	3/2 ⁺		204	203.973839	2 ⁻
	163	162.930030	5/2 ⁻		180	179.946546	0 ⁺		190	189.960580	(4 ⁺)		205	204.974401	1/2 ⁺
	164	163.929198	0 ⁺		181	180.949096	1/2 ⁻		191	190.960584	3/2 ⁺		206	205.976084	0 ⁻
	165	164.930723	5/2 ⁻		182	181.950550	0 ⁺		192	191.962580	4 ⁻				
	166	165.930290	0 ⁺		183	182.953530	(3/2 ⁻)		193	192.962917	1/2 ⁺	Pb 82	201	200.972830	3/2 ⁻
	167	166.932046	7/2 ⁺						194	193.965069	1 ⁻		202	201.972134	0 ⁺
	168	167.932368	0 ⁺	Ta 73	178	177.945750	1 ⁺		195	194.965966	(5/2 ⁺)		203	202.973365	5/2 ⁻
	169	168.934588	1/2 ⁻		179	178.945930	(7/2 ⁺)						204	203.973020	0 ⁺
	170	169.935461	0 ⁺		180	179.947462	1 ⁺	Pt 78	187	186.960470	3/2 ⁻		205	204.974458	5/2 ⁻
	171	170.938027	5/2 ⁻		181	180.947992	7/2 ⁺		188	187.959386	0 ⁺		206	205.974440	0 ⁺
	172	171.939353	0 ⁻		182	181.950149	3 ⁻		189	188.960817	1/2 ⁻		207	206.975872	1/2 ⁻
Tm 69	166	165.933561	2 ⁺		183	182.951369	7/2 ⁺		190	189.959917	0 ⁻		208	207.976627	0 ⁺
	167	166.932848	1/2 ⁺	W 74	178	177.945840	0 ⁺		191	190.961665	3/2 ⁺		209	208.981065	9/2 ⁺
	168	167.934170	3 ⁺		179	178.947067	(7/2 ⁻)		192	191.961019	0 ⁺		210	209.984163	0 ⁺
	169	168.934212	1/2 ⁺		180	179.946701	0 ⁺		193	192.962977	(5/2 ⁺)		211	210.988735	(9/2 ⁺)
	170	169.935798	1 ⁻		181	180.948192	9/2 ⁺		194	193.962655	0 ⁺		212	211.991871	0 ⁺
	171	170.936427	1/2 ⁺		182	181.948202	0 ⁺		195	194.964766	1/2 ⁻	Bi 83	206	205.978478	6 ⁺
	172	171.938397	2 ⁻		183	182.950220	1/2 ⁻		196	195.964926	0 ⁺		207	206.978446	9/2 ⁻
									197	196.967315	1/2 ⁻				

Abundance or Half-life					Abundance or Half-life					Abundance or Half-life					Abundance or Half-life						
Z	A	Atomic mass (u)	I ^π	Half-life	Z	A	Atomic mass (u)	I ^π	Half-life	Z	A	Atomic mass (u)	I ^π	Half-life	Z	A	Atomic mass (u)	I ^π	Half-life		
	208	207.979717	(5 ⁺)	0.368 My (ε)		232	232.038051	0 ⁺	100 %		100	256.091767	0 ⁺	2.63 h (f)		103	260.105320		180 s (α)		
	209	208.980374	$\frac{9}{2}^{+}$	100 %		233	233.041577	($\frac{1}{2}^{+}$)	22.3 m (β ⁻)			257	257.095099	($\frac{9}{2}^{+}$)	100 d (α)		104	261.108690		65 s (α)	
	210	209.984095	1 ⁻	5.01 d (β ⁻)																	
	211	210.987255	$\frac{9}{2}^{+}$	2.15 m (α)	Pa	91	229.032073	($\frac{5}{2}^{+}$)	1.4 d (ε)		Md	101	257.095580	($\frac{7}{2}^{-}$)	5.2 h (ε)		105	261.111820		1.8 s (α)	
	212	211.991255	1 ⁻	60.6 m (β ⁻)		230	230.034527	(2 ⁻)	17.7 d (ε)			258	258.098570	(8 ⁻)	55 d (α)		262	262.113760		34 s (f)	
						231	231.035880	$\frac{3}{2}^{-}$	32.800 y (α)							106	263.118220		0.8 s (f)		
Po	84	206	205.980456	0 ⁺	8.8 d (ε)		232	232.038565	(2 ⁻)	1.31 d (β ⁻)		No	102	258.098150	0 ⁺	1.2 ms (f)					
	207	206.981570	$\frac{5}{2}^{-}$	5.8 h (ε)		233	233.040243	$\frac{1}{2}^{-}$	27.0 d (β ⁻)			259	259.100931	($\frac{9}{2}^{+}$)	60 m (α)		107	262.122930		115 ms (α)	
	208	207.981222	0 ⁺	2.90 y (α)																	
	209	208.982404	$\frac{1}{2}^{-}$	102 y (α)	U	92	233.039628	$\frac{5}{2}^{+}$	0.1592 My (α)												
	210	209.982848	0 ⁺	138.4 d (α)		234	234.040947	0 ⁺	0.245 My (α)												
	211	210.986627	$\frac{9}{2}^{+}$	0.52 s (α)		235	235.043924	$\frac{7}{2}^{-}$	0.720 %												
						236	236.045563	0 ⁺	23.42 My (α)												
At	85	208	207.986510	6 ⁺	1.63 h (ε)		237	237.048725	$\frac{1}{2}^{+}$	6.75 d (β ⁻)											
	209	208.986149	$\frac{9}{2}^{-}$	5.4 h (ε)		238	238.050785	0 ⁺	99.275 %												
	210	209.987126	5 ⁺	8.3 h (ε)		239	239.054290	$\frac{5}{2}^{+}$	23.5 m (β ⁻)												
	211	210.987469	$\frac{9}{2}^{-}$	7.21 h (ε)																	
	212	211.990725	(1 ⁻)	0.31 s (α)	Np	93	236.046550	(6 ⁻)	0.11 My (ε)												
	213	212.992911	$\frac{9}{2}^{-}$	0.11 μs (α)		237	237.048168	$\frac{5}{2}^{+}$	2.14 My (α)												
						238	238.050941	2 ⁺	2.117 d (β ⁻)												
Rn	86	207	206.990690	$\frac{5}{2}^{-}$	9.3 m (ε)		239	239.052933	$\frac{5}{2}^{+}$	2.36 d (β ⁻)											
	210	209.989669	0 ⁺	2.4 h (α)																	
	211	210.990576	$\frac{1}{2}^{-}$	14.6 h (ε)	Pu	94	237.048401	$\frac{7}{2}^{-}$	45.3 d (ε)												
	212	211.990697	0 ⁺	24 m (α)		238	238.049555	0 ⁺	87.74 y (α)												
	218	218.005580	0 ⁺	35 ms (α)		239	239.052158	$\frac{1}{2}^{+}$	24,100 y (α)												
	222	222.017571	0 ⁺	3.82 d (α)		240	240.053808	0 ⁺	6570 y (α)												
	224		0 ⁺	107 m (β ⁻)		241	241.056846	$\frac{5}{2}^{+}$	14.4 y (β ⁻)												
						242	242.058737	0 ⁺	0.376 My (α)												
Fr	87	209	208.995870	$\frac{9}{2}^{-}$	50 s (α)		243	243.061998	$\frac{7}{2}^{+}$	4.96 h (β ⁻)											
	212	211.996130	5 ⁺	20 m (ε)																	
	215	215.000310	$\frac{9}{2}^{-}$	0.12 μs (α)																	
	220	220.012293	1	27.4 s (α)	Am	95	240.055278	(3 ⁻)	50.9 h (ε)												
	223	223.019733	($\frac{3}{2}$)	21.8 m (β ⁻)		241	241.056824	$\frac{5}{2}^{-}$	433 y (α)												
						242	242.059542	1 ⁻	16.0 h (β ⁻)												
Ra	88	222	222.015353	0 ⁺	38 s (α)		243	243.061375	$\frac{5}{2}^{-}$	7370 y (α)											
	223	223.018501	$\frac{1}{2}^{+}$	11.4 d (α)		244	244.064279	(6 ⁻)	10.1 h (β ⁻)												
	224	224.020186	0 ⁺	3.66 d (α)																	
	225	225.023604	($\frac{3}{2}$) ⁺	14.8 d (β ⁻)																	
	226	226.025403	0 ⁺	1602 y (α)	Cm	96	246.067218	0 ⁺	4700 y (α)												
	227	227.029171	($\frac{3}{2}$) ⁺	42 m (β ⁻)		247	247.070347	$\frac{9}{2}^{-}$	16 My (α)												
						248	248.072343	0 ⁺	0.34 My (α)												
Ac	89	224	224.021685	(0 ⁻)	2.9 h (ε)		249	249.075948	$\frac{1}{2}^{+}$	64 m (β ⁻)											
	225	225.023205	($\frac{3}{2}$) ⁻	10.0 d (α)																	
	226	226.026084	(1 ⁻)	29 h (β ⁻)	Bk	97	246.068720	2 ⁻	1.8 d (ε)												
	227	227.027750	$\frac{3}{2}^{-}$	21.77 y (β ⁻)		247	247.070300	($\frac{3}{2}$) ⁻	1380 y (α)												
	228	228.031015	(3 ⁺)	6.1 h (β ⁻)																	
Th	90	228	228.028715	0 ⁺	1.91 y (α)	Cf	98	251.079580	$\frac{1}{2}^{+}$	898 y (α)											
	229	229.031755	$\frac{5}{2}^{+}$	7300 y (α)		252	252.081621	0 ⁺	2.64 y (α)												
	230	230.033128	0 ⁺	75,400 y (α)	Es	99	252.082944	(4 ⁺ , 5 ⁻)	472 d (α)												
	231	231.036299	$\frac{5}{2}^{+}$	25.52 h (β ⁻)		253	253.084818	$\frac{7}{2}^{+}$	20.5 d (α)												