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NUCLEAR PROPERTIES OF U^{235} FISSION PRODUCTS

Compiled by
J. O. Blomeke

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NUCLEAR PROPERTIES OF U^{235} FISSION PRODUCTS

ABSTRACT

Tables are presented that list the U^{235} fission-product decay chains and the current best single values of their fission yields and cross sections. The fission products are also tabulated according to decreasing order of half-life, thermal-neutron capture cross section, gamma energy, and beta energy.

INTRODUCTION

Data on the nuclear properties of the known fission products of U^{235} have been assembled in preparation for using the Oracle to compute the properties of fission-product mixtures over a wide range of reactor operating conditions. Because of the detailed nature of these calculations, effort was made to prepare a complete inventory of the current best single values, and these are presented with the hope that they will be found useful as a general reference work.

Since nuclear data are very well organized and abstracted in the literature, the information was collected from a relatively few major sources. The decay chains were taken chiefly from Coryell and Sugarman;[1] half-life values and decay schemes were taken from Hollander, Seaborg, and Perlman[2] and from the nuclear data collection at the Oak Ridge National Laboratory. Thermal-neutron capture cross sections were taken from *Neutron Cross Sections* and supplements.[3] The values of the absorption cross sections of Zr^{93} and Tb^{160} are those of Pomerance.[4] The majority of the fission yields were values recommended by Glendenin and Steinberg.[5]

The data are presented in seven tables. In Table 1, the fission-product decay chains from mass number 72 through mass number 161 are given. Besides containing all nuclides for which evidence of formation in fission exists, this table includes certain products which could be formed indirectly as a result of n-γ reactions. Cumulative yields are given directly below each radioactive nuclide, and independent yields of stable and shielded nuclides are denoted by a superscript a. Yield values not in parentheses are those values recommended by Glendenin and Steinberg. They were selected for their internal consistency as well as absolute accuracy and are given only to as many significant figures as their accuracy and consistency warrant. The yield values enclosed in parentheses were calculated by the equal charge displacement method of Glendenin, Coryell, and Edwards.[6] The calculated values were used in cases where the cumulative yields could be expected to be less than about 99% of the chain yield. Where no yields are given for radioactive nuclides, it should be understood that these are products of neutron capture from the preceding chain.

A summary of nuclear properties, arranged in increasing order of atomic number and mass of the nuclides, is presented in Table 2. In addition to the cumulative and chain yields, independent yields are given where known. Again, those yields calculated by the method of equal charge displacement are enclosed in parentheses. While experimental values of the decay energies were always used in this table when possible, there were many instances where none have been reported, and in such cases the energies were estimated either by use of the Q values or on the basis of mass difference. For shielding considerations, the gamma transitions were classified in four groups, depending on the energy of the transitions: group I, 0 to 0.25 Mev; group II, 0.26 to 1.00 Mev; group III, 1.01 to 1.70 Mev; group IV, 1.71 Mev and higher.

Table 2*a* is a separate listing of nuclides which may be expected to be present as products of neutron capture from the preceding chain. This table is not complete, in that only those nuclides are included which can be calculated from known values of thermal-neutron absorption cross sections.

Tables 3, 4, 5, and 6 are different correlations of the data of Table 2 and are, for the most part, self-explanatory. In these tables, the fission products are arranged in decreasing order of half-life, cross section, gamma energy, and beta energy, respectively. In Tables 3, 5, and 6, in cases where a short-lived daughter follows a much longer-lived parent, the related nuclide is enclosed in parentheses.

In the tables the symbol *a* denotes an independent fission yield, *b* shows that it is an energy value computed, by means of the *Table of Atomic Masses*,[7] from the mass change, *c* denotes a nuclide which decays in part by *K* electron capture and positron emission, and *d* denotes an energy computed from the total disintegration energy or Q value.

The compiler wishes to express his appreciation to all who have made suggestions for improvement of this report. In particular, he gratefully acknowledges the contributions of L. E. Glendenin and E. P. Steinberg, Argonne National Laboratory, not only for providing fission yields but also for their critical review of Table 1; W. H Sullivan, Oak Ridge National Laboratory, for making his very extensive collection of nuclear data available and for resolving many questions concerning these data that arose during compilation; H. S. Pomerance for checking the cross-section data; J. E. Faulkner for checking many of the calculations in Table 2; H. E. Goeller for his suggestions relating to the format of the report; and R. W. Stoughton, J. Halperin, and R. A. Charpie for their interest and encouragement.

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TABLE 1. U^{235} FISSION PRODUCT DECAY CHAINS

Mass No.	Atomic No. 30	31	32	33	34	35	36
72	49.0h Zn 1.5×10^{-5}	14.3h Ga 1.5×10^{-5}	Stable Ge				
73	<2m Zn (9.8×10^{-5})	5.0h Ga 1×10^{-4}	Stable Ge				
74			Stable Ge 3×10^{-4} [a]				
75			82m Ge 8×10^{-4}	Stable As			
76			Stable Ge 2×10^{-3} [a]	26.6h As	Stable Se		
77			52s Ge 5.4×10^{-3} 12h Ge 3.7×10^{-3}	38.8h As 9.1×10^{-3}	<2%: 17.5s Se $<2 \times 10^{-4}$ >98%: Stable Se		
78			86m Ge 0.018	91m As 0.02	Stable Se		
79				9m As 0.04	3.5m Se 0.04 6.5×10^{4}y Se 0.04	Stable Br	
80					Stable Se 0.08 [a]	4.58h Br 18m Br	Stable Kr

TABLE 1. (continued)

Mass No.	Atomic No. 33	34	35	36	37	38
81	<10m As (0.125) →	56.5m Se 0.008 → 17m Se 0.133 →	Stable Br			
82		Stable Se 0.25[a]	35.87h Br 3.8×10^{-5}[a] →	Stable Kr		
83		67s Se 0.30 ($>90\%$) → 2.4h Br 0.48; 67s Se 0.30 (<10%) → 25m Se 0.21 → 2.4h Br 0.48	2.4h Br 0.48 →	114m Kr 0.48 → Stable Kr; 2.4h Br 0.48 → Stable Kr		
84		~2m Se 1.1 →	30m Br 1.1 →	Stable Kr		
85			3.00m Br 1.5 →	4.36h Kr 1.5 (80% → Stable Rb; 20% → 10.27y Kr 0.3); 3.00m Br 1.5 → 10.27y Kr 0.3 → Stable Rb		
86				Stable Kr 2.1[a]	19.5d Rb 2.8×10^{-5}[a] →	Stable Sr

TABLE 1. (continued)

Mass No.	Atomic No. 35	36	37	38	39	40	41
86		Stable Kr					
		↑ n					
		Instant Kr					
87	55.6s Br, 2.7 → 2% → Instant Kr; 98% → 78m Kr, 2.7		6.2 × 10^{10}y Rb, 2.7	→ Stable Sr			
88	15.5s Br, (2.9)	→ 2.77h Kr, 3.7	→ 17.8m Rb, 3.7	→ Stable Sr			
		↑ n					
		Instant Kr					
89	4.51s Br	→ 3.18m Kr, (4.6)	→ 15.4m Rb, 4.8	→ 54d Sr, 4.8	→ Stable Y		
90		33s Kr, (5.2)	→ 2.74m Rb, 5.9	→ 28y Sr, 5.9	→ 64.5hY, 5.9	→ Stable Zr	
91		9.8s Kr, (3.7) → 1.67m Rb; → 14m Rb, (5.7)	1.67m Rb → 9.7h Sr, 5.9; 14m Rb → 9.7h Sr, 5.9	9.7h Sr, 5.9 → 40% → 51m Y, 2.4; → 60% → 58d Y, 5.9	51m Y, 2.4 → 58d Y, 5.9	58d Y, 5.9 → Stable Zr	
92		3.0s Kr, 2.7	→ 80s Rb, 5.5	→ 2.7h Sr, 6.1	→ 3.60h Y, 6.1	→ Stable Zr	

TABLE 1. (continued)

Mass No.	Atomic No. 36	37	38	39	40	41	42
93	2.0s Kr (1.3) →	Short Rb (4.4) →	7m Sr (6.4) →	10.0h Y 6.5 →	1.1×10^6y Zr 6.5	33% → 4.2Y Nb 2.1 → Stable Nb; 67% → Stable Nb	
94	1.4s Kr (0.6) →	Short Rb (2.9) →	2.0m Sr (5.8) →	16.5m Y 6.5 →	Stable Zr		
95	Short Kr (0.2) →	Short Rb (1.6) →	Short Sr (4.7) →	10.5m Y 6.4 →	63d Zr 6.4	1% → 90h Nb 0.06 → 35d Nb 6.4; 99% → 35d Nb 6.4 →	Stable Mo
96					Stable Zr 6.4^a	23.4h Nb 5.7×10^{-4a} →	Stable Mo
97	~1s Kr (~0) →	Short Rb (0.1) →	Short Sr (1.7) →	Short Y (4.8) →	17.0h Zr 6.2 →	60s Nb 6.2 → 72.1m Nb 6.2 →	Stable Mo

TABLE 1. (continued)

Mass No.	Atomic No. 42	43	44	45	46
98	Stable Mo 5.9[a]				
99	67h Mo 6.1	~10% → 6.04h Tc ~0.6 ↓ ~90% → 2.12×10^5y Tc 6.1	→ Stable Ru		
100	Stable Mo 6.5[a]				
101	14.6m Mo 5.0	→ 14.0m Tc 5.0	→ Stable Ru		
102	12m Mo 4.2	→ <25s Tc 4.2	→ Stable Ru		
103			41d Ru 2.9 >95% → 54m Rh 2.9 ↓ <5% → Stable Rh		
104			Stable Ru 1.8[a]	4.4m Rh ↓ 42s Rh →	Stable Pd

TABLE 1. (continued)

Mass No.	Atomic No. 42	43	44	45	46	47	48
105	~5m Mo (0.6) →	Short Tc (0.9) →	4.5h Ru 0.9 →	45s Rh 0.9 ↓ 36.5h Rh 0.9 →	Stable Pd		
106			1.0y Ru 0.38 →	30s Rh 0.38 →	Stable Pd		
107		<1.5m Tc (0.16) →	4m Ru 0.2 →	26m Rh 0.2 →	7.5×10^6y Pd 0.2 →	44.3s Ag ↓ Stable Ag	
108					Stable Pd 0.08^a		
109				<1h Rh (0.028) →	13.6h Pd 0.028 →	39.2s Ag 0.028 ↓ Stable Ag	
110					Stable Pd 0.02^a	270d Ag 2×10^{-7a} ~97% → Stable Cd; ↓ ~3% → 24.2s Ag ~6×10^{-9} → Stable Cd	

TABLE 1. (continued)

Mass No.	Atomic No. 46	47	48	49	50
111	22m Pd 0.018 →	7.6d Ag 0.018 →	Stable Cd		
112	21h Pd 0.011 →	3.2h Ag 0.011 →	Stable Cd		
113		5.3h Ag 0.01	5.1y Cd Stable Cd	Stable In	
114		2m Ag 0.01 →	Stable Cd	49d In 72s In	Stable Sn
115		20m Ag (~0.01) 9% → 91% →	43d Cd 7.1×10^{-4} 53h Cd 9.8×10^{-3}	4.50h In 9.8×10^{-3} 94% 6×10^{14}y In 9.9×10^{-3}	6% Stable Sn
116			Stable Cd 0.01[a]	54.2m In 13s In	Stable Sn

TABLE 1. (continued)

Mass No.	Atomic No. 48	49	50	51	52
117	2.9h Cd 0.010 ↓ >90% 50m Cd 0.010	<10% ↗ 1.90h In 0.010 ↓ 22% 1.1h In 0.002	78% ↘ 14.0d Sn <2×10^{-5} ↓ Stable Sn		
118	~30m Cd 0.01	4.5m In 0.01	Stable Sn		
119		17.5m In 0.01	275d Sn <0.01 ↓ Stable Sn		
120			Stable Sn 0.01[a]		
121			27.5h Sn 0.014	Stable Sb	
122			Stable Sn 0.013[a]	2.75d Sb	Stable Te
123			131d Sn 0.0012 39.5m Sn 0.014	Stable Sb	

TABLE 1. (continued)

Mass No.	Atomic No. 50	51	52	53	54
124	Stable Sn 0.02[a]	60d Sb →	Stable Te		
125	9.4d Sn 0.012 9.5m Sn 0.011 →	~2.7y Sb 0.023	14% → 58d Te 3×10^{-3} ↓ 86% → Stable Te		
126	50m Sn 0.1 →	9h Sb 0.1 →	Stable Te		
127	1.5h Sn (0.24) →	93h Sb 0.25	~16% → 90d Te 0.056 ↓ ~84% → 9.3h Te 0.25	→ Stable I	
128		1.1h Sb 0.5 →	Stable Te	24.98m I →	Stable Xe
129		4.6h Sb 1.0	~24% → 33d Te 0.34 ↓ ~76% → 72m Te 1.0	→ 1.72×10^{7}y I 1.0 →	Stable Xe 4×10^{-4}[a]
130		12m Sb 2.0 →	$>10^{15}$y Te	12.6h I →	Stable Xe

TABLE 1. (continued)

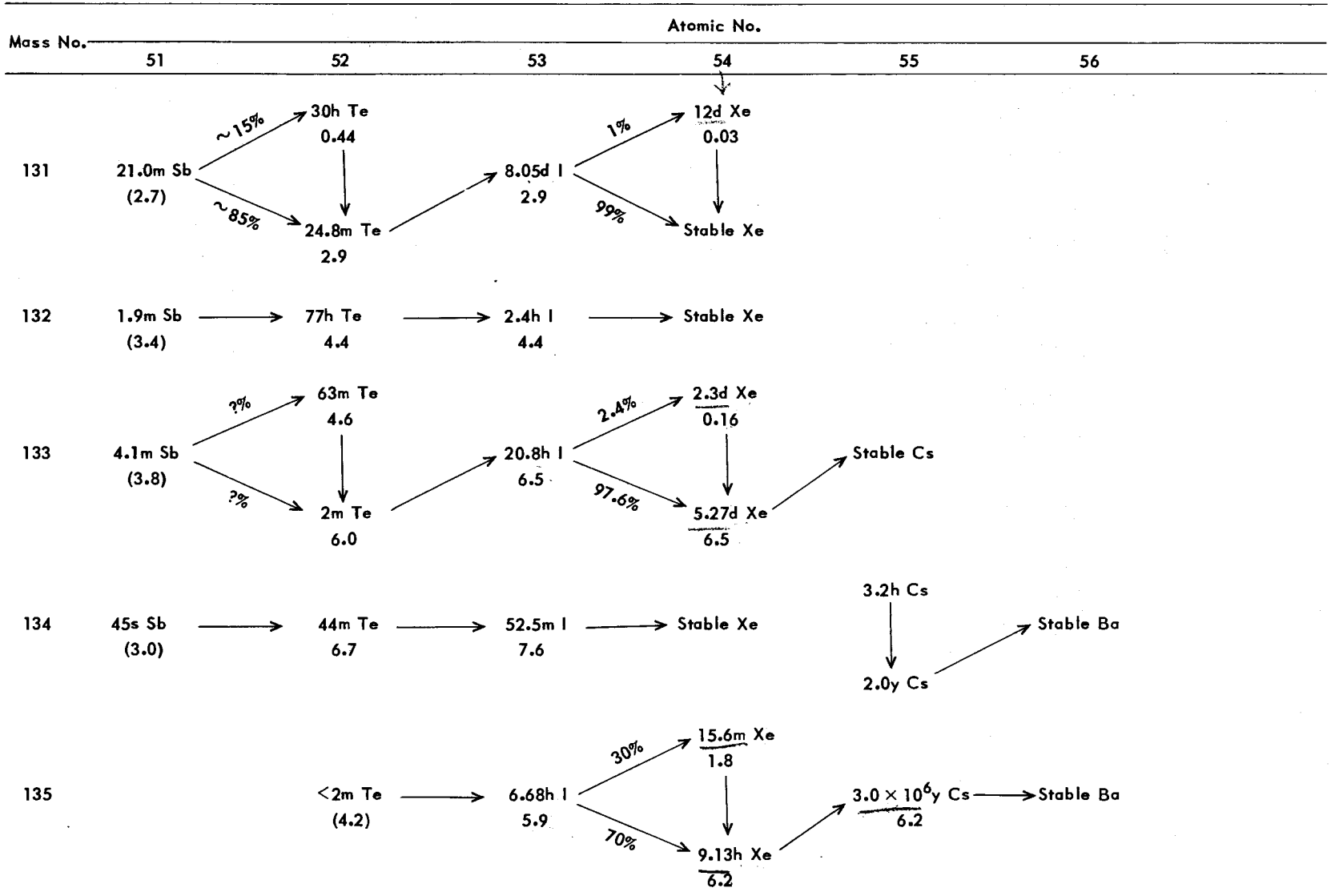

TABLE 1. (continued)

Mass No.	Atomic No. 53	54	55	56	57	58	59	60
136	86s I 3.1 →	Stable Xe 3.2[a]	13d Cs 0.0060[a] →	Stable Ba				
137	22.0s I (4.9) ~6% →	Instant Xe ↑ n						
	~94% →	3.9m Xe (5.9) →	33y Cs 5.9 92% →	2.60m Ba 5.4 ↓				
			8% →	Stable Ba				
138	5.9s I (3.4) →	17m Xe (5.5) →	32m Cs 5.8 →	Stable Ba				
139	2.7s I (1.8) →	41s Xe (4.7) →	9.5m Cs (5.9) →	85m Ba 6.0 →	Stable La			
140		16s Xe (3.7) →	66s Cs (6.0) →	12.80d Ba 6.3 →	40.2h La 6.3 →	Stable Ce		
141		1.7s Xe (1.8) →	Short Cs (4.7) →	18m Ba 5.9 →	3.7h La 6.0 →	32d Ce 6.0 →	Stable Pr	
142			~1m Cs (3.4) →	6m Ba (5.6) →	74m La 5.9 →	Stable Ce	19.3h Pr →	Stable Nd
143		1s Xe (0.2) →	Short Cs (1.9) →	<0.5m Ba (4.9) →	19m La 6.2 →	32h Ce 6.2 →	13.7d Pr 6.2 →	Stable Nd
144		~1s Xe (~0) →	Short Cs (1.0) →	Short Ba (3.5) →	Short La (5.8) →	290d Ce 6.1 →	17.5m Pr 6.1 →	1.5×10^{15}y Nd

TABLE 1. (continued)

Mass No.	Atomic No. 58	59	60	61	62	63	64
145	3.0m Ce 4.2 →	6.0h Pr 4.2 →	Stable Nd				
146	13.9m Ce (3.2) →	24.4m Pr 3.3 →	Stable Nd				
147			11.3d Nd 2.6 →	2.6y Pm 2.6 →	1.4×10^{11}y Sm		
148			Stable Nd 1.8^a	5.3d Pm →	Stable Sm		
149			2.0h Nd 1.3 →	54h Pm 1.3 →	Stable Sm		
150			$>2 \times 10^{15}$y Nd 0.74^a		Stable Sm		
151			15m Nd (0.48) →	27.5h Pm 0.5 →	73y Sm 0.5 →	Stable Eu	
152					Stable Sm 0.3^a	9.2h Eu 13y Eu →	Stable Gd
153					47h Sm 0.15 →	Stable Eu	
154					Stable Sm 0.09^a	16y Eu →	Stable Gd

TABLE 1. (concluded)

Mass No.	Atomic No. 62	63	64	65	66
155	23.5m Sm → 0.031	1.7y Eu → 0.031	Stable Gd		
156	~10h Sm → 0.013	15.4d Eu → 0.013	Stable Gd		
157		15.4h Eu → 7.4×10^{-3}	Stable Gd		
158		60m Eu → 2×10^{-3}	Stable Gd		
159			18.0h Gd → 1.1×10^{-3}	Stable Tb	
160			Stable Gd 3×10^{-4} [a]	73.5d Tb →	Stable Dy
161			3.6m Gd → 8.0×10^{-5}	7.0d Tb → 8.0×10^{-5}	Stable Dy

TABLE 2. NUCLEAR PROPERTIES OF U^{235} FISSION PRODUCTS

Arranged According to Increasing Order of Atomic Number and Mass

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{30}Zn$	72	49h	3.93×10^{-6}	---	1.5×10^{-5}	0.3	~95	~0.122	---	---	II	~100	0.91[b]	1.03
						1.6	~5							
	73	<2m	5.75×10^{-3}	---	(9.8×10^{-5})	4.9[b]	100	1.6[b]	---	~0	---	---	~0	1.6[b]
$_{31}Ga$	72	14.3h	1.351×10^{-5}	---	1.5×10^{-5}	0.6	40	0.390	2.51	26	II	~126	2.70	3.09
						0.9	32		2.21	33	III	~12		
						1.5	11		1.87	8	IV	~67		
						2.52	8		1.59	5				
						3.15	9		1.20	<2				
									1.05	5				
									0.84	100				
									0.68	<2				
									0.63	24				
	73	5.0h	3.85×10^{-5}	---	1×10^{-4}	1.4	100	0.47	0.054	100	I	200	0.068	0.538
					$(2 \times 10^{-6})^a$				0.0135	100				
$_{32}Ge$	72	Stable	0	0.94	1.5×10^{-5}	0	0	0	0	0	---	---	0	0
	73	Stable	0	13.7	1×10^{-4}	0	0	0	0	0	---	---	0	0
	74	Stable	0	0.60	3×10^{-4a}	0	0	0	0	0	---	---	0	0
	75	82m	1.41×10^{-4}	---	8×10^{-4}	0.614	15	0.353	0.572	---	II	15	0.08[d]	0.43
						1.137	85		0.418	---				
									0.265	---				
	76	Stable	0	0.015 + 0.30	2×10^{-3a}	0	0	0	0	0	---	---	0	0
	77*m*	52s	1.340×10^{-2}	---	5.4×10^{-3}	2.7	100	0.90	0.215	100	I	200	0.384	1.27
									0.159	---				
	77	12h	1.60×10^{-5}	---	3.7×10^{-3}	0.71	23	0.523	0.26	---	I	~100	0.89[d]	1.41
						1.379	35		0.21	---	II	~100		
						2.196	42							
	78	86m	1.34×10^{-4}	---	1.8×10^{-2}	0.9	100	0.3	0	0	---	---	0	0.3
$_{33}As$	75	Stable	0	4.1	8×10^{-4}	0	0	0	0	0	---	---	0	0
	77	38.8h	4.96×10^{-6}	---	9.1×10^{-3}	0.700	~100	~0.233	0	0	---	---	0	0.233
	78	91m	1.27×10^{-4}	---	2×10^{-2}	1.4	30	1.10	0.27	---	II	~300	0.8[d]	1.90
					2×10^{-3a}	4.1	70							
	79	9m	1.28×10^{-3}	---	4×10^{-2}	2.1	100	0.7	0	0	---	---	0	0.7
	81	<10m	1.16×10^{-3}	---	(0.125)	5.1[b]	100	1.7[b]	---	~0	---	---	~0	1.7[b]
$_{34}Se$	77*m*	17.5s	3.96×10^{-2}	---	$<2 \times 10^{-4}$	0	0	0	0.162	100	I	100	0.162	0.162
	77	Stable	0	40	9.1×10^{-3}	0	0	0	0	0	---	---	0	0
	78	Stable	0	0.4	2×10^{-2}	0	0	0	0	0	---	---	0	0
	79*m*	3.9m	1.28×10^{-3}	---	4×10^{-2}	0	0	0	0.096	100	I	100	0.096	0.096
	79	6.5×10^4y	3.38×10^{-13}	---	4×10^{-2}	0.160	100	0.053	0	0	---	---	0	0.053
	80	Stable	0	0.03 + 0.5	8×10^{-2a}	0	0	0	0	0	---	---	0	0
	81*m*	56.5m	2.04×10^{-4}	---	8×10^{-3}	0	0	0	0.103	100	I	100	0.103	0.103

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{34}$Se	81	17m	6.80×10^{-4}	---	0.133	1.38	100	0.46	0	0	---	---	0	0.46
	82	Stable	0	2	0.25[a]	0	0	0	0	0	---	---	0	0
	83*m*	67s	1.03×10^{-2}	---	0.30	3.4	100	1.13	0	---	---	---	---	~1.13
	83	25m	4.62×10^{-4}	---	0.21	1.5	100	0.5	0.950	---	I	~200	~3.1[b]	~3.6
									0.176	---	II	~200		
									0.061					
									0.04					
	84	~2m	5.78×10^{-3}	---	1.1	2.94[b]	100	0.98[b]	---	~0	---	---	~0	0.98[b]
$_{35}$Br	79	Stable	0	2.6 + 7.6	3.7×10^{-2}	0	0	0	0	0	---	---	0	0
	81	Stable	0	2.6	0.133	0	0	0	0	0	---	---	0	0
	82	35.87h	5.37×10^{-6}	---	3.8×10^{-5}[a]	0.465	100	0.155	1.312	---	II	~100	3.6[b]	~3.8
									1.031	---	III	~200		
									0.823	---				
									0.766	---				
									0.692	---				
									0.608	---				
									0.547	---				
	83	2.4h	8.02×10^{-5}	---	0.48	0.940	100	0.313	0.051	100	I	100	0.051	0.364
	84	30m	3.85×10^{-4}	---	1.1	1.72	35	1.065	1.89	---	II	~150	2.4[b]	3.5
						2.53	16		0.89	---	IV	~50		
						3.56	9							
						4.68	40							
	85	3.0m	3.85×10^{-3}	---	1.5	2.5	100	0.83	0	0	---	---	0	0.83
	87	55.6s	1.25×10^{-2}	---	2.7	2.6	70	1.41	5.4	56	IV	70	~3.78[d]	~5.19
						8.0	30		~3	14				
	88	15.5s	4.47×10^{-2}	---	(2.9)	8.70[b]	100	2.90[b]	---	~0	---	---	~0	2.90[b]
	89	4.51s	1.54×10^{-2}	---	?	7.10[b]	100	2.37[b]	---	~0	---	---	~0	2.37[b]
$_{36}$Kr	82	Stable	0	45	3.5×10^{-5}	0	0	0	0	0	---	---	0	0
	83*m*	114m	1.01×10^{-4}	---	0.48	0	0	0	0.0322	100	I	200	0.0415	0.0415
									0.0093	100				
	83	Stable	0	205	0.48	0	0	0	0	0	---	---	0	0
	84	Stable	0	1.0 + 0.06	1.1	0	0	0	0	0	---	---	0	0
	85*m*	4.36h	4.41×10^{-5}	0.096	1.5	0.835	80	0.233	0.305	20	I	80	0.181	0.414
									0.1495	80	II	20		
	85	10.27y	2.14×10^{-9}	<15	0.3	0.695	99+	~0.232	0	~0	---	---	~0	0.232
	86	Stable	0	0.06	2.1[a]	0	0	0	0	0	---	---	0	0
	87	78m	1.48×10^{-4}	<470	2.7	1.27	25	1.01	2.3	<25	II	~20	0.56[d]	1.57
						3.63	75		1.89	<25	IV	~25		
									0.41	<25				
	88	2.77h	6.95×10^{-5}	---	3.7	0.52	68	0.341	0.028	68	I	68	0.019	0.36
					(0.8)[a]	0.9	12							
						2.8	20							

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total (Mev)
$_{36}$Kr	89	3.18m	3.63×10^{-3}	---	(4.6)	4.0	100	1.3	0	0	---	---	0	1.3
	90	~33s	2.10×10^{-2}	---	(5.2)	3.2	100	1.07	0	0	---	---	0	1.07
	91	9.8s	7.08×10^{-2}	---	(3.7)	3.6	100	1.20	0	0	---	---	0	1.20
	92	3.0s	0.231	---	(2.7)	5.0[b]	100	1.67[b]	---	~0	---	---	~0	1.67[b]
	93	2.0s	0.347	---	(1.3)	8.0[b]	100	2.66[b]	---	~0	---	---	~0	2.66[b]
	94	1.4s	0.495	---	(0.6)	6.4[b]	100	2.14[b]	---	~0	---	---	~0	2.14[b]
	95	Short	---	---	(0.2)	9.3[b]	100	3.1[b]	---	~0	---	---	~0	3.1[b]
	97	~1s	0.693	---	(~0)	10.6[b]	100	3.5[b]	---	~0	---	---	~0	3.5[b]
$_{37}$Rb	85	Stable	0	0.05 + 0.85	1.5	0	0	0	0	0	---	---	0	0
	86	19.5d	4.11×10^{-7}	---	2.8×10^{-5}[a]	0.68	12	0.543	1.076	12	III	12	0.130	0.673
						1.76	88							
	87	6.2×10^{10}y	3.54×10^{-19}	0.14	2.7	0.275	100	0.092	0	0	---	---	0	0.092
	88	17.8m	6.49×10^{-4}	<200	3.7	2.5	9	1.61	2.8	---	II	5	0.47[d]	2.08
						3.6	13		1.86	---	IV	22		
						5.3	78		0.9	---				
	89	15.4m	7.50×10^{-4}	---	4.8	4.5	100	1.5	0	0	---	---	0	1.5
					(0.2)[a]									
	90	2.74m	4.22×10^{-3}	---	5.9	5.7	100	1.9	0	0	---	---	0	1.9
					(0.7)[a]									
	91m	1.67m	6.93×10^{-3}	---	?	4.6	100	1.5	?	?	---	---	?	~1.5
	91	14m	8.25×10^{-4}	---	(5.7)	3.0	100	1.0	?	?	---	---	?	~1.0
					(2.0)[a]									
	92	80s	8.66×10^{-3}	---	(5.5)	7.59[b]	100	2.5[b]	---	~0	---	---	~0	2.5[b]
					(2.8)[a]									
	93	Short	---	---	(4.4)	6.04[b]	100	2.0[b]	---	~0	---	---	~0	2.0[b]
					(3.1)[a]									
	94	Short	---	---	(2.9)	8.97[b]	100	3.0[b]	---	~0	---	---	~0	3.0[b]
					(2.3)[a]									
	95	Short	---	---	(1.6)	7.43[b]	100	2.5[b]	---	~0	---	---	~0	2.5[b]
					(1.4)[a]									
	97	Short	---	---	(0.1)	8.75[b]	100	2.9[b]	---	~0	---	---	~0	2.9[b]
$_{38}$Sr	86	Stable	0	1.3 + ?	2.8×10^{-5}	0	0	0	0	0	---	---	0	0
	87	Stable	0	---	2.7	0	0	0	0	0	---	---	0	0
	88	Stable	0	0.005	3.7	0	0	0	0	0	---	---	0	0
	89	54d	1.48×10^{-7}	<130	4.8	1.463	100	0.487	0	0	---	---	0	0.487
	90	28y	7.85×10^{-10} 2.183×10^{-6} kc	~1	5.9	0.61	100	0.20	0	0	---	---	0	0.20
	91	9.7h	1.99×10^{-5}	---	5.9	0.62	7	0.533	1.413	7	II	62	0.845	1.38
					(0.2)[a]	1.09	33		1.025	33	III	40		
						1.36	29		0.747	7				
						2.03	4		0.66	22				
						2.665	27		0.64	33				

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{38}Sr$	92	2.7h	7.13×10^{-5}	---	6.1	1.14[b]	100	0.4[b]	---	~0	---	---	~0	0.4[b]
					(0.6)[a]									
	93	7m	1.65×10^{-3}	---	(6.4)	4.13[b]	100	1.4[b]	---	~0	---	---	~0	1.4[b]
					(2.0)[a]									
	94	2.0m	5.78×10^{-3}	---	(5.8)	2.63[b]	100	0.9[b]	---	~0	---	---	~0	0.9[b]
					(2.9)[a]									
	95	Short	---	---	(4.7)	5.55[b]	100	1.8[b]	---	~0	---	---	~0	1.8[b]
					(3.1)[a]									
	97	Short	---	---	(1.7)	6.90[b]	100	2.3[b]	---	~0	---	---	~0	2.3[b]
					(1.6)[a]									
$_{39}Y$	89	Stable	0	1.4	4.8	0	0	0	0	0	---	---	0	0
	90	64.5h	2.98×10^{-6}	<6.5	5.9	2.18[d]	100	0.73	1.4	0.4	III	0.4	~0	~0.73
	91*m*	51m	2.26×10^{-4}	---	2.4	0	0	0	0.551	100	II	100	0.551	0.551
	91	58d	1.38×10^{-7}	---	5.9	1.537	~100	0.512	1.22	0.3	III	0.3	~0	~0.512
	92	3.60h	5.35×10^{-5}	---	6.1	1.3	---	~1.2[b]	0.6	---	II	---	~0	~1.2[b]
						2.7	---							
						3.6	---							
	93	10.0h	1.93×10^{-5}	---	6.5	3.1	100	1.03	0.7	100	II	100	0.7	1.73
					(0.1)[a]									
	94	16.5m	7.00×10^{-4}	---	6.5	5.4	100	1.8	1.4	100	III	100	1.4	3.2
					(0.7)[a]									
	95	10.5m	1.10×10^{-3}	---	(6.4)	3.66[b]	100	1.2	0	0	---	---	0	1.2
					(1.7)[a]									
	97	Short	---	---	(4.8)	5.06[b]	100	1.7[b]	---	~0	---	---	~0	1.7[b]
					(3.1)[a]									
$_{40}Zr$	90	Stable	0	0.1	5.9	0	0	0	0	0	---	---	0	0
	91	Stable	0	1.5	5.9	0	0	0	0	0	---	---	0	0
	92	Stable	0	0.2	6.1	0	0	0	0	0	---	---	0	0
	93	1.1×10^6y	2.31×10^{-14}	<4	6.5	0.063	100	0.021	0	0	---	---	0	0.021
	94	Stable	0	0.07	6.5	0	0	0	0	0	---	---	0	0
	95	63d	1.27×10^{-7}	---	6.4	0.364	57	0.127	0.717	98	II	99	0.733	0.860
			4.6×10^{-4} hr^{-1}			0.396	42							
						0.883	1							
	96	Stable	0	0.05	6.4[a]	0	0	0	0	0	---	---	0	0
	97	17.0h	1.13×10^{-5}	---	6.2	1.91	100	0.64	---	---	II	100	0.75[d]	1.39[d]
					(1.4)[a]									
$_{41}Nb$	93*m*	4.2y	5.24×10^{-9}	---	2.1	0	0	0	0.0292	100	I	100	0.0292	0.0292
	93	Stable	0	1.1	6.5	0	0	0	0	0	---	---	0	0
	95*m*	90h	2.14×10^{-6}	---	0.06	0	0	0	0.235	100	I	100	0.235	0.235
	95	35d	2.29×10^{-7}	---	6.4	0.160	100	0.053	0.745	100	II	100	0.745	0.798
			8.3×10^{-4} hr^{-1}											

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{41}$Nb	96	23.4h	8.23×10^{-6}	---	5.7×10^{-4} [a]	0.37	8	0.240	1.187	32	I	17	2.40	2.64
						0.750	92		1.078	52	II	210		
									0.840	16	III	84		
									0.804	6				
									0.770	100				
									0.560	61				
									0.451	27				
									0.238	10				
									0.216	7				
	97*m*	60s	1.16×10^{-2}	---	6.2	0	0	0	0.747	100	II	100	0.747	0.747
	97	72.1m	1.60×10^{-4}	---	6.2	1.267	100	0.422	0.665	100	II	100	0.665	1.087
$_{42}$Mo	95	Stable	0	13.4	6.4	0	0	0	0	0	---	---	0	0
	96	Stable	0	1	5.7×10^{-4}	0	0	0	0	0	---	---	0	0
	97	Stable	0	2	6.2	0	0	0	0	0	---	---	0	0
	98	Stable	0	0.13	5.9[a]	0	0	0	0	0	---	---	0	0
	99	67h	2.88×10^{-6}	---	6.1	0.45	~13	0.376	0.780	---	I	90	0.24[d]	0.616[d]
						1.23	~87		0.740	---	II	10		
									0.181	---				
									0.140	---				
									0.041	---				
	100	Stable	0	0.2	6.5[a]	0	0	0	0	0	---	---	0	0
	101	14.6m	7.91×10^{-4}	---	5.0	1.2	70	0.5	0.960	70	I	100	0.864	1.36
						2.2	30		0.191	100	II	70	---	
	102	12m	9.63×10^{-4}	---	4.2	0.92[b]	100	0.31[b]	---	~0	---	---	~0	0.31[b]
	105	~5m	2.31×10^{-3}	---	(0.6)	4.94[b]	100	1.65[b]	---	~0	---	---	~0	1.65[b]
$_{43}$Tc	99*m*	6.04h	3.19×10^{-5}	---	~0.6	0	0	0	0.141	100	I	100	0.141	0.141
	99	2.12×10^{5}y	1.04×10^{-13}	---	6.1	0.290	100	0.097	0	0	---	---	0	0.097
	101	14.0m	8.25×10^{-4}	---	5.0	1.20	100	0.40	0.30	100	II	100	0.30	0.70
	102	<25s	2.77×10^{-2}	---	4.2	3.31[b]	100	1.10[b]	---	~0	---	---	~0	1.1[b]
	105	Short	---	---	(0.9)	3.24[b]	100	1.08[b]	---	~0	---	---	~0	1.1[b]
				---	(0.3)[a]									
	107	<1.5m	7.7×10^{-3}	---	(0.16)	4.5[b]	100	1.5[b]	---	~0	---	---	~0	1.5[b]
$_{44}$Ru	99	Stable	0	---	6.1	0	0	0	0	0	---	---	0	0
	101	Stable	0	2.46	5.0	0	0	0	0	0	---	---	0	0
	102	Stable	0	1.2	4.2	0	0	0	0	0	---	---	0	0
	103	41d	1.96×10^{-7} 7.05×10^{-4}	---	2.9	0.217	95	0.080	0.498	95	II	95	0.473	0.567
						0.698	5							
	104	Stable	0	0.7	1.8[a]	0	0	0	0	0	---	---	0	0
	105	4.5h	4.28×10^{-5}	---	0.9	1.150	100	0.383	0.726	100	II	100	0.726	1.109
	106	1.0y	2.20×10^{-8} 7.9×10^{-5}	---	0.38	0.0392	100	0.0131	0	0	---	---	0	0.0131
	107	4m	2.89×10^{-3}	---	0.2	2.81[b]	100	0.94[b]	---	~0	---	---	~0	0.94[b]
					(0.04)[a]									

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{45}$Rh	103m	54m	2.14×10^{-4}	---	2.9	0	0	0	0.040	100	I	100	0.04	0.04
	103	Stable	0	12 + 138	2.9	0	0	0	0	0	---	---	0	0
	105m	45s	1.54×10^{-2}	---	0.9	0	0	0	0.130	100	I	100	0.130	0.130
	105	36.5h	5.27×10^{-6}	---	0.9	0.25	10	0.183	0.322	10	II	10	0.032	0.215
						0.570	90							
	106	30s	2.31×10^{-2}	---	0.38	~1.0	6	1.05	2.41	0.25	II	38	0.245	1.30
						2.0	3		1.55	0.5	III	2.5		
						2.44	12		1.045	2	IV	1		
						3.1	11		0.87	1				
						3.53	68		0.624	12				
									0.513	25				
	107	26m	4.44×10^{-4}	---	0.2	1.2	100	0.4	0	0	---	---	0	0.4
	109	<1h	1.93×10^{-4}	---	(0.028)	2.39[b]	100	0.8[b]	---	~0	---	---	~0	0.8[b]
$_{46}$Pd	105	Stable	0	---	0.9	0	0	0	0	0	---	---	0	0
	106	Stable	0	---	0.38	0	0	0	0	0	---	---	0	0
	107	7.5×10^6y	2.92×10^{-15}	---	0.2	0.04	100	0.01	0	0	---	---	0	0.01
	108	Stable	0	0.07 + 11	0.08[a]	0	0	0	0	0	---	---	0	0
	109	13.6h	1.42×10^{-5}	---	0.028	0.961	100	0.32	0	0	---	---	0	0.32
	110	Stable	0	? + 0.4	0.02[a]	0	0	0	0	0	---	---	0	0
	111	22m	5.25×10^{-4}	---	0.018	2.13	100	0.71	0.73	---	II	~0	~0[b]	0.71
									0.65	---				
									0.56	---				
									0.38	---				
	112	21h	9.17×10^{-6}	---	0.011	0.2	100	0.07	0.018	100	I	100	0.018	0.088
$_{47}$Ag	107m	44.3s	1.57×10^{-2}	---	<0.2	0	0	0	0.094	100	I	100	0.094	0.094
	107	Stable	0	30	0.2	0	0	0	0	0	---	---	0	0
	109m	39.2s	1.77×10^{-2}	---	0.028	0	0	0	0.088	100	I	100	0.088	0.088
	109	Stable	0	2 + 82	0.028	0	0	0	0	0	---	---	0	0
	110m	270d	2.98×10^{-8}	---	2×10^{-7}[a]	0.087	58	0.128	1.516	---	I	~3	~2.6[d]	2.7[d]
						0.530	35		1.389	---	II	~295		
						2.12	3		0.935	---	III	~50		
						2.86	3		0.885	---				
									0.814	---				
									0.759	---				
									0.706	---				
									0.676	---				
									0.656	---				
									0.116	---				
	110	24.2s	2.86×10^{-2}	---	6×10^{-9}	2.16	60	0.811	0.66	100	II	100	0.66	1.48
						2.84	40							
	111	7.6d	1.06×10^{-6}	---	0.018	0.70	8	0.337	0.243	1	I	1	0.030	0.367
						0.80	1		0.340	8	II	8		
						1.04	91							

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{47}$Ag	112	3.2h	6.02×10^{-5}	---	0.011	1.0	15	1.04	1.40	---	II	~0	~0[b]	1.04
						2.7	20		0.62	---	III	~0		
						3.5	40							
						4.1	25							
	113	5.3h	3.63×10^{-5}	---	0.01	2.0	100	0.67	0	0	---	---	0	0.67
	114	2m	5.78×10^{-3}	---	0.01	4.11[b]	100	1.37[b]	---	~0	---	---	~0	1.37[b]
	115	20m	5.78×10^{-4}	---	(~0.01)	3.0	100	1.0	0	0	---	---	0	1.0
$_{48}$Cd	110	Stable	0	0.2 + ?	2×10^{-7}	0	0	0	0	0	---	---	0	0
	111	Stable	0	---	0.018	0	0	0	0	0	---	---	0	0
	112	Stable	0	0.02 + ?	0.011	0	0	0	0	0	---	---	0	0
	113*m*	5.1y	4.30×10^{-9}	---	?	0.59	100	0.20	0	0	---	---	0	0.20
	113	Stable	0	25,000	0.01	0	0	0	0	0	---	---	0	0
	114	Stable	0	0.14 + 1.1	0.01	0	0	0	0	0	---	---	0	0
	115	43d	1.86×10^{-7}	---	0.00071	0.7	2	0.53	1.28	---	II	~0	0.05[d]	0.58[d]
						1.61	98		0.96	---	III	~0		
									0.50	---				
									0.46	---				
	115	53h	3.63×10^{-6}	---	0.0098	0.58	42	0.296	0.525	---	II	42	0.56[d]	0.86[d]
						1.11	58		0.50	---				
									0.360	---				
	116	Stable	0	1.4 + ?	0.01[a]	0	0	0	0	0	---	---	0	0
	117*m*	2.9h	6.66×10^{-5}	---	0.01	---	<10	---	2.00	---	II	>90	<0.79[b]	<0.79[b]
									1.55	---	III	~0		
									1.27	---	IV	~0		
									0.84	---				
									0.43	---				
									0.33	---				
									0.28	---				
									0.27	---				
	117	50m	2.31×10^{-4}	---	0.010	~1.6	---	<0.79[b]	---	~0	---	---	~0	<0.8[b]
						~3.0	---							
	118	~30m	3.85×10^{-4}	---	0.01	1.09[b]	100	0.36[b]	---	~0	---	---	~0	0.36[b]
$_{49}$In	113	Stable	0	60 + 2	?	0	0	0	0	0	---	---	0	0
	115*m*	4.50h	4.28×10^{-5}	---	0.0098	0.83	6	0.017	0.335	94	II	94	0.317	0.334
	115	6×10^{14}y	3.66×10^{-23}	145 + 52	0.0099	0.63	100	0.21	0	~0	---	---	~0	0.21
	117*m*	1.90h	1.01×10^{-4}	---	0.010	1.62	23	0.449	0.311	22	II	22	0.194	0.643
						1.77	55		0.161	78	I	78		
	117	1.1h	1.75×10^{-4}	---	2×10^{-3}	0.740	100	0.247	0.565	---	I	~10	0.09[b]	0.34[b]
									0.161	---	II	~15		
	118	4.5m	2.57×10^{-3}	---	0.01	1.5	100	0.5	?	---	---	---	?	~0.5
	119	17.5m	6.60×10^{-4}	---	0.01	2.7	100	0.9	0	0	---	---	0	0.9

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{50}$Sn	115	Stable	0	---	0.01	0	0	0	0	0	---	---	0	0
	117m	14.0d	5.73×10^{-7}	---	$<2 \times 10^{-5}$	0	0	0	0.162	100	I	200	0.321	0.321
									0.159	100				
	117	Stable	0	---	0.010	0	0	0	0	0	---	---	0	0
	118	Stable	0	0.01 + ?	0.01	0	0	0	0	0	---	---	0	0
	119m	275d	2.91×10^{-8}	---	<0.01	0	0	0	0.0653	100	I	200	0.0895	0.09
									0.0242	100				
	119	Stable	0	---	0.01	0	0	0	0	0	---	---	0	0
	120	Stable	0	~0.001 + 0.03	0.01[a]	0	0	0	0	0	---	---	0	0
	121	27.5h	7.00×10^{-6}	1.2×10^{-2}	0.014	0.383	100	0.128	0	0	---	---	0	0.128
	122	Stable	0	0.001 + 0.1	0.013[a]	0	0	0	0	0	---	---	0	0
	123	131d	6.12×10^{-8}	---	0.0012	1.42	100	0.47	0	0	---	---	0	0.47
	123	39.5m	2.92×10^{-4}	---	0.014	1.26	100	0.42	0.153	100	I	100	0.153	0.57
	124	Stable	0	0.75	0.02[a]	0	0	0	0	0	---	---	0	0
	125	9.4d	8.53×10^{-7}	---	0.012	0.40	5	0.76	1.90	5	IV	5	0.095	0.86
						2.37	95							
	125	9.5m	1.22×10^{-3}	---	0.011	0.51	---	~0.7	0.326	100	II	100	0.326	~1.03
						1.17	---							
						2.04	~100							
	126	50m	2.31×10^{-4}	---	0.1	2.55[b]	100	0.85[b]	---	~0	---	---	~0	0.85[b]
	127	1.5h	1.28×10^{-4}	---	(0.24)	4.84[b]	100	1.61[b]	---	~0	---	---	~0	1.61[b]
$_{51}$Sb	121	Stable	0	5.7	0.014	0	0	0	0	0	---	---	0	0
	123	Stable	0	0.03 + 0.03 + 2.5	0.015	0	0	0	0	0	---	---	0	0
	125	2.7y	8.14×10^{-9}	---	0.023	0.125	29	0.102	0.637	---	I	28	0.46[d]	0.56[d]
						0.300	45		0.601	---	II	72		
						0.414	12		0.465	---				
						0.612	14		0.425	---				
									0.175	---				
									0.110	---				
									0.035	---				
	126	9h	2.14×10^{-5}	---	0.10	1.0	100	0.33	0.90	100	II	200	1.3	1.63
									0.4	100				
	127	93h	2.07×10^{-6}	---	0.25	1.2	100	0.4	0.72	100	II	100	0.72	1.12
					(0.01)[a]									
	128	1.1h	1.75×10^{-4}	---	0.5	5.68[b]	100	1.9[b]	---	~0	---	---	~0	1.9[b]
	129	4.6h	4.32×10^{-5}	---	1.0	4.42[b]	100	1.5[b]	---	~0	---	---	~0	1.5[b]
	130	12m	9.63×10^{-4}	---	2.0	6.68[b]	100	2.2[b]	---	~0	---	---	~0	2.2[b]
	131	21.0m	5.50×10^{-4}	---	(2.7)	5.44[b]	100	1.8[b]	---	~0	---	---	~0	1.8[b]
	132	1.9m	6.08×10^{-3}	---	(3.4)	7.64[b]	100	2.6[b]	---	~0	---	---	~0	2.6[b]
	133	4.1m	2.82×10^{-3}	---	(3.8)	6.41[b]	100	2.1[b]	---	~0	---	---	~0	2.1[b]
	134	45s	1.54×10^{-2}	---	(3.0)	8.57[b]	100	2.9[b]	---	~0	---	---	~0	2.9[b]

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles: E_b (Mev)	(%)	Av. E_b (Mev)	Gamma Transitions: E_g (Mev)	(%)	Shielding: Group	(%)	Total E_g (Mev)	Total E (Mev)
$_{52}Te$	125m	58d	1.38×10^{-7}	---	3×10^{-3}	0	0	0	0.110	100	I	100	0.110	0.110
	125	Stable	0	1.5	0.023	0	0	0	0	0	---	---	0	0
	126	Stable	0	0.07 + 0.7	0.10	0	0	0	0	0	---	---	0	0
	127m	90d	8.82×10^{-8}	---	0.056	0	0	0	0.0885	100	I	100	0.09	0.09
	127	9.3h	2.07×10^{-5}	---	0.25	0.7	100	0.23	0	0	---	---	0	0.23
	128	Stable	0	0.016 + 0.14	0.5	0	0	0	0	0	---	---	0	0
	129m	33d	2.43×10^{-7}	---	0.34	0	0	0	0.106	100	I	100	0.106	0.106
	129	72m	1.60×10^{-4}	---	1.0	1.8	100	0.6	0.8	100	II	200	1.1	1.7
									0.3	100				
	130	$> 10^{15}$y	~0	<0.01 + 0.3	2.0	0	0	0	0	0	---	---	0	0
	131m	30h	6.42×10^{-5}	---	0.44	0	0	0	0.177	100	I	100	0.177	0.177
	131	24.8m	4.66×10^{-4}	---	2.9	1.4	45	0.577	0.7	45	I	100	0.475	1.052
					(0.2)[a]	2.0	55		0.16	100	II	45		
	132	77h	2.50×10^{-6}	---	4.4	0.22	100	0.073	0.231	100	I	100	0.231	0.961
					(1.0)[a]									
	133m	63m	1.83×10^{-4}	---	4.6	0	0	0	0.4	100	II	100	0.4	0.4
	133	2m	5.78×10^{-3}	---	6.0	1.3	70	0.54	1.0	70	II	170	1.3	1.84
					(2.2)[a]	2.4	30		0.6	100				
	134	44m	2.63×10^{-4}	---	6.7	3.80[b]	100	1.27[b]	---	~0	---	---	~0	1.27[b]
					(3.7)[a]									
	135	<2m	5.78×10^{-3}	---	(4.2)	5.98[b]	100	2.0[b]	---	~0	---	---	~0	2.0[b]
$_{53}I$	127	Stable	0	6.1	0.25	0	0	0	0	0	---	---	0	0
	129	1.72×10^{7}y	1.28×10^{-15}	11	1.0	0.15	100	0.05	0.039	100	I	100	0.04	0.09
	131	8.05d	9.96×10^{-7}	600	2.9	0.250	2.8	0.191	0.722	3	II	97.3	0.39	0.58
						0.335	9.3		0.637	9				
						0.608	87.2		0.364	80				
						0.815	0.7		0.284	5.3				
	132	2.4h	8.02×10^{-5}	---	4.4	0.7	15	0.434	2.2	2	II	226	1.992	2.43
						0.9	20		1.96	5	III	19		
						1.16	23		1.40	11	IV	7		
						1.53	24		1.16	8				
						2.12	18		0.96	20				
									0.777	75				
									0.673	100				
									0.624	6				
									0.528	25				
	133	20.8h	9.25×10^{-6}	---	6.5	0.5	6	0.45	1.4	1	II	99	0.555	1.01
					0.5[a]	1.4	94		0.85	5	III	1		
									0.53	94				
	134	52.5m	2.20×10^{-4}	---	7.6	1.5	70	0.60	1.78	~35	II	3	~1.27	~1.92
					0.9[a]	2.5	30		1.10	~35	III	35		
									0.86	~30	IV	35		
									0.20	~0				
									0.12	~0				

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{53}$I	135	6.68h	2.89×10^{-5}	---	5.9	0.5	35	0.308	1.8	~50	III	~50	1.54	1.85
					(1.7)[a]	1.0	40		1.27	~50	IV	~50		
						1.4	25							
	136	86s	8.06×10^{-3}	---	3.1	3.6	---	~2.1	2.9	---	III	~0	~0	~2.1
						5.0	---		1.38	---	IV	~0		
						6.4	~100		1.38	---				
	137	22.0s	3.15×10^{-2}	---	(4.9)	0.56	100	0.19	0	0	---	---	0	0.19
	138	5.9s	1.17×10^{-1}	---	(3.4)	7.69[b]	100	2.56[b]	---	~0	---	---	~0	2.56[b]
	139	2.7s	2.57×10^{-1}	---	(1.8)	6.48[b]	100	2.16[b]	---	~0	---	---	~0	2.16[b]
$_{54}$Xe	129	Stable	0	45	1.0	0	0	0	0	0	---	---	0	0
					4×10^{-4}[a]									
	131m_2	12.0d	6.68×10^{-7}	---	0.03	0	0	0	0.163	100	I	100	0.163	0.163
	131	Stable	0	120	2.9	0	0	0	0	0	---	---	0	0
	132	Stable	0	? + 0.2	4.4	0	0	0	0	0	---	---	0	0
	133m	2.3d	3.49×10^{-6}	---	0.16	0	0	0	0.233	100	I	100	0.233	0.233
	133	5.270d	1.52×10^{-6}	---	6.5	0.345	100	0.115	0.081	100	I	100	0.081	0.196
	134	Stable	0	? + 0.2	7.6	0	0	0	0	0	---	---	0	0
	135m	15.6m	7.40×10^{-4}	---	1.8	0	0	0	0.52	100	II	100	0.52	0.52
	135	9.13h	2.11×10^{-5}	3.5×10^{6}	6.2	0.548	5	0.302	0.60	4	I	96	0.268	0.570
					0.3[a]	0.910	95		0.37	1	II	5		
									0.250	96				
	136	Stable	0	0.15	6.3	0	0	0	0	0	---	---	0	0
					3.2[a]									
	137	3.9m	2.96×10^{-3}	---	(5.9)	4.0	100	1.33	0	0	---	---	0	1.33
					(1.3)[a]									
	138	17m	6.79×10^{-4}	---	(5.5)	3.02[b]	100	1.0[b]	---	~0	---	---	~0	1.0[b]
					(2.1)[a]									
	139	41s	1.69×10^{-2}	---	(4.7)	5.15[b]	100	1.7[b]	---	~0	---	---	~0	1.7[b]
					(2.9)[a]									
	140	16s	4.33×10^{-2}	---	(3.7)	3.97[b]	100	1.3[b]	---	~0	---	---	~0	1.3[b]
	141	1.7s	4.08×10^{-1}	---	(1.8)	6.07[b]	100	2.0[b]	---	~0	---	---	~0	2.0[b]
	143	1s	6.93×10^{-1}	---	(0.2)	6.95[b]	100	2.3[b]	---	~0	---	---	~0	2.3[b]
	144	1s	6.93×10^{-1}	---	(~0)	5.78[b]	100	1.9[b]	---	~0	---	---	~0	1.9[b]
$_{55}$Cs	133	Stable	0	0.16 + 26	6.5	0	0	0	0	0	---	---	0	0
	135	3.0×10^{6}y	7.33×10^{-15}	15	6.2	0.21	100	0.07	0	0	---	---	0	0.07
	136	13d	6.17×10^{-7}	---	6×10^{-3}[a]	0.35	100	0.12	0.9	100	II	100	0.9	1.02
	137	33y	6.66×10^{-10}	<2	5.9	0.523	92	0.192	0	0	---	---	0	0.19
						1.17	8							
	138	32m	3.62×10^{-4}	8.7	5.8	2.0	33	1.08	1.44	100	II	100	2.01	3.09
						2.9	10		0.98	43	III	100		
						3.4	67		0.463	33				
	139	9.5m	1.22×10^{-3}	---	(5.9)	3.82[b]	100	1.3[b]	---	~0	---	---	~0	1.3[b]
					(1.2)[a]									

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{55}$Cs	140	66s	1.05×10^{-2}	0.63	(6.0)	5.93[b]	100	2.0[b]	---	~0	---	---	~0	2.0[b]
					(2.3)[a]									
	141	Short	---	---	(4.7)	4.75[b]	100	1.6[b]	---	~0	---	---	~0	1.6[b]
					(2.9)[a]									
	142	~1m	1.16×10^{-2}	1.76	(3.4)	6.83[b]	100	2.3[b]	---	~0	---	---	~0	2.3[b]
	143	Short	---	---	(1.9)	5.66[b]	100	1.9[b]	0.29	~0	I	~0	~0	1.9[b]
					(1.7)[a]				0.12	~0	II	~0		
	144	Short	---	---	(1.0)[a]	7.72	100	2.6[b]	---	~0	---	---	~0	2.6[b]
$_{56}$Ba	135	Stable	0	5.6	6.2	0	0	0	0	0	---	---	0	0
	136	Stable	0	0.4	6×10^{-3}	0	0	0	0	0	---	---	0	0
	137m	2.60m	4.44×10^{-3}	---	5.4	0	0	0	0.661	100	II	100	0.661	0.661
	137	Stable	0	4.9	5.9	0	0	0	0	0	---	---	0	0
	138	Stable	0	0.68	5.8	0	0	0	0	0	---	---	0	0
	139	85m	1.36×10^{-4}	4	6.0	0.82	19	0.220	1.43	19	I	66	0.380	0.600
			4.9×10^{-1} hr^{-1}		(0.1)[a]	2.23	66		0.163	66	III	19		
						2.38	15							
	140	12.80d	6.27×10^{-7}	---	6.3	0.480	40	0.268	0.54	30	I	110	0.237	0.505
					(0.3)[a]				0.30	10	II	40		
						1.022	60		0.16	10				
									0.03	100				
	141	18m	6.42×10^{-4}	---	5.9	2.8	100	0.93	0	0	---	---	0	0.93
					(1.2)[a]									
	142	6m	1.93×10^{-3}	---	(5.6)	2.26[b]	100	0.75[b]	---	~0	---	---	~0	0.75[b]
					(2.2)[a]									
	143	30s	2.31×10^{-2}	---	(4.9)	4.34[b]	100	1.5[b]	---	~0	---	---	~0	1.5[b]
					(3.0)[a]									
	144	Short	---	---	(3.5)	3.18[b]	100	1.1[b]	---	~0	---	---	~0	1.1[b]
					(2.5)[a]									
$_{57}$La	139	Stable	0	8.9	6.0	0	0	0	0	0	---	---	0	0
	140	40.2h	4.79×10^{-6}	3	6.3	1.32	70	0.495	3.0	1	I	1.8	2.11	2.61
						1.67	20		2.5	5.4	II	73.4		
						2.26	10		1.596	94	III	94		
									0.8151	29	IV	6.4		
									0.4867	39				
									0.3286	5.4				
									0.093	1.8				
	141	3.7h	5.20×10^{-5}	---	6.0	0.9	5	0.785	1.5	5	III	5	0.075	0.86
					0.1[a]	2.43	95							
	142	74m	1.56×10^{-4}	---	5.9	2.5	100	0.83	0.87	10	II	100	0.66	1.49
					(0.3)[a]				0.63	90				
	143	19m	6.08×10^{-4}	---	6.2	3.05[b]	100	1.0[b]	---	~0	---	---	~0	1.0[b]
					(1.3)[a]									
	144	Short	---	---	(5.8)	5.12[b]	100	1.7[b]	---	~0	---	---	~0	1.7[b]
					(2.3)[a]									

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{58}Ce$	140	Stable	0	0.6	6.3	0	0	0	0	0	---	---	0	0
	141	32d	2.51×10^{-7} 9.05×10^{-4} hr^{-1}	---	6.0	0.442	67	0.163	0.145	67	I	67	0.097	0.260
						0.581	33							
	142	Stable	0	1.8	5.9	0	0	0	0	0	---	---	0	0
	143	32h	6.01×10^{-6}	---	6.2	0.71	30	0.355	0.660	15.2	I	12.1	0.334	0.689
						1.09	40		0.356	12.1	II	87.9		
						1.39	30		0.289	60.6				
									0.126	12.1				
	144	290d	2.76×10^{-8}	---	6.1	0.170	30	0.087	0.134	~10	I	~50	0.043[d]	0.130[d]
					(0.3)[a]	0.300	70		0.100	~10				
									0.0807	~10				
									0.054	~10				
									0.0337	~10				
	145	3.0m	3.85×10^{-3}	---	4.2	2.67[b]	100	0.89[b]	---	~0	---	---	~0	0.9[b]
	146	13.9m	8.31×10^{-4}	---	(3.2)	0.7	100	0.23	0.32	12	I	72	0.327	0.56
									0.27	24	II	64		
									0.22	36				
									0.142	7				
									0.110	~57				
$_{59}Pr$	141	Stable	0	11	6.0	0	0	0	0	0	---	---	0	0
	143	13.7d	5.85×10^{-7}	---	6.2	0.932	100	0.311	0	0	---	---	0	0.31
	144	17.5m	6.60×10^{-4}	---	6.1	0.8	3	0.97	2.185	1	II	4	0.08	1.05
						2.3	2		1.480	2	III	2		
						2.98	95		0.695	4	IV	1		
	145	6.0h	3.21×10^{-5}	---	4.2	~1.7	100	~0.6	---	~0	---	---	~0	~0.6
	146	24.4m	4.73×10^{-4}	---	3.3	2.2	44	1.01	1.49	33	II	122	1.12	2.13
					(0.1)[a]	3.7	56		0.75	22	III	33		
									0.46	100				
$_{60}Nd$	143	Stable	0	290	6.2	0	0	0	0	0	---	---	0	0
	144	1.5×10^{15}y	~0	4.8	6.1	0	0	0	0	0	---	---	0	0
	145	Stable	0	52	4.2	0	0	0	0	0	---	---	0	0
	146	Stable	0	9.8	3.3	0	0	0	0	0	---	---	0	0
	147	11.3d	7.10×10^{-7}	---	2.6	0.38	25	0.228	0.532	25	I	60	0.236	0.464
						0.60	15		0.318	15	II	40		
						0.83	60		0.092	60				
	148	Stable	0	3.3	1.8[a]	0	0	0	0	0	---	---	0	0
	149	2.0h	9.63×10^{-5}	---	1.3	0.95	---	~0.5	0.650	---	I	~0	~0	~0.5
						1.1	---		0.538	---	II	~0		
						1.5	~100		0.424	---				
									0.266	---				
									0.240	---				

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles E_b (Mev)	Beta Particles (%)	Beta Particles Av. E_b (Mev)	Gamma Transitions E_g (Mev)	Gamma Transitions (%)	Shielding Group	Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{60}$Nd (continued)														
									0.226	---				
									0.211	---				
									0.198	---				
									0.188	---				
									0.124	---				
									0.114	---				
									0.112	---				
									0.097	---				
									0.030	---				
	150	$>2\times10^{15}$y	~0	2.9	0.74[a]	0	0	0	0	0	---	---	0	0
	151	15m	7.7×10^{-4}	---	(0.48)	1.93	100	0.64	1.14	---	I	~150	0.91[b]	1.55[b]
									0.73	---	II	~100		
									0.421	---	III	~50		
									0.117	---				
									0.110	---				
									0.085	---				
$_{61}$Pm	147	2.6y	8.46×10^{-9} 3.1×10^{-9} sec^{-1}	60 + ?	2.6	0.223	100	0.074	0	0	---	---	0	0.074
	149	54h	3.56×10^{-6}	---	1.3	1.05	100	0.35	0.285	100	II	100	0.285	0.635
	151	27.5h	7.00×10^{-6}	---	0.5	1.1	100	0.37	0.715	---	I	~100	0.5[b]	0.87[b]
					(0.02)[a]				0.340	---	II	~100		
									<0.25	---				
									0.177	---				
$_{62}$Sm	147	1.4×10^{11}y	~0	---	2.6	0	0	0	0	0	---	---	0	0
	149	Stable	0	50,000	1.3	0	0	0	0	0	---	---	0	0
	151	73y	3.01×10^{-10}	7000	0.5	0.076	100	0.025	0.019	100	I	100	0.019	0.044
	152	Stable	0	150	0.3[a]	0	0	0	0	0	---	---	0	0
	153	47h	4.10×10^{-6}	---	0.15	0.26	10	0.219	0.538	10	I	~102	0.149	0.368
						0.64	29		0.1717	~0	II	10		
						0.70	44		0.1026	73				
						0.81	17		0.0691	29				
	154	Stable	0	5.5	0.09[a]	0	0	0	0	0	---	---	0	0
	155	23.5m	4.91×10^{-4}	---	0.031	1.8	100	0.6	0.246	100	I	200	0.35	0.95
									0.105	100				
	156	~10h	1.93×10^{-5}	---	0.013	0.9	100	0.3	?	?	---	---	?	0.3 ?
$_{63}$Eu	151	Stable	0	1400 + 7000	0.5	0	0	0	0	0	---	---	0	0
	153	Stable	0	400	0.15	0	0	0	0	0	---	---	0	0
	155	1.7y	1.29×10^{-8}	14,000	0.031	0.152	84	0.056	0.1368	---	I	~500	0.7[b]	0.76[b]
						0.252	16		0.1309	---				
									0.1045	---				
									0.0858	---				
									0.0593	---				
									0.0187	---				

TABLE 2. (continued)

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Yield, Y (%)	Energy of Radiation: Beta Particles: E_b (Mev)	Beta Particles: (%)	Beta Particles: Av. E_b (Mev)	Gamma Transitions: E_g (Mev)	Gamma Transitions: (%)	Gamma Transitions: Shielding: Group	Gamma Transitions: Shielding: (%)	Gamma Transitions: Total E_g (Mev)	Total E (Mev)
$_{63}$Eu	156	15.4d	5.21×10^{-7}	---	0.013	0.5	60	0.43	2.0	~60	IV	~60	1.2	1.63
						2.4	40							
	157	15.4h	1.25×10^{-5}	---	0.0074	1.0	75	0.392	0.60	100	I	100	0.8	1.19
						1.7	25		0.2	100	II	100		
	158	60m	1.93×10^{-4}	---	0.002	2.6	100	0.87	---	---	---	---	1.1[b]	2.0[b]
$_{64}$Gd	155	Stable	0	70,000	0.031	0	0	0	0	0	---	---	0	0
	156	Stable	0	---	0.013	0	0	0	0	0	---	---	0	0
	157	Stable	0	160,000	0.0074	0	0	0	0	0	---	---	0	0
	158	Stable	0	4	0.002	0	0	0	0	0	---	---	0	0
	159	18.0h	1.07×10^{-5}	---	1.1×10^{-3}	0.9	100	0.3	0.38	100	I	100	0.46	0.76
									0.055	100	II	100		
	160	Stable	0	1.5	3×10^{-4}[a]	0	0	0	0	0	---	---	0	0
	161	3.6m	3.21×10^{-3}	---	8.0×10^{-5}	1.6	100	0.5	0.36	---	I	100	0.7[b]	1.2[b]
									0.316	---	II	200		
									0.102	---				
$_{65}$Tb	159	Stable	0	44	1.1×10^{-3}	0	0	0	0	0	---	---	0	0
	161	7.0d	1.15×10^{-6}	---	8×10^{-5}	0.5	100	0.17	0.05	100	I	100	0.05	0.22
$_{66}$Dy	161	Stable	0	---	8×10^{-5}	0	0	0	0	0	---	---	0	0

[a] Independent fission yield.
[b] Energy value computed from the mass change.
[c] Nuclide which decays in part by K electron capture and positron emission.
[d] Energy computed from total disintegration energy or Q value.

TABLE 2*a*. PRODUCTS OF NEUTRON CAPTURE BY U^{234} FISSION PRODUCTS

Arranged According to Increasing Order of Atomic Number and mass

Nuclide	Mass Number, A	Half-life, $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Energy of Radiation: Beta Particles: E_b (Mev)	Beta Particles: (%)	Beta Particles: Av. E_b (Mev)	Gamma Transitions: E_g (Mev)	Gamma Transitions: (%)	Gamma Transitions: Shielding Group	Gamma Transitions: Shielding (%)	Total E_g (Mev)	Total E (Mev)
$_{33}As$	76	26.6h	7.24×10^{-6}	---	0.35	3	0.842	2.06	2.3	II	49.1	0.460	1.302
					1.20	6		1.41	0.7	III	11.1		
					1.75	6		1.21	10.4	IV	2.3		
					2.40	32		0.648	4.1				
					2.96	53		0.555	45				
$_{34}Se$	76	Stable	0	7 + 75	0	0	0	0	0	---	---	0	0
$_{35}Br$	80*m*	4.58h	4.20×10^{-5}	---	0	0	0	0.049	100	I	200	0.086	0.086
								0.037	100				
	80[c]	18m	6.42×10^{-4}	---	1.38	14	0.58	>0.6	14	II	14	0.08	0.66
					2.0	78							
$_{36}Kr$	80	Stable	0	90	0	0	0	0	0	---	---	0	0
$_{45}Rh$	104*m*	4.4m	2.63×10^{-3}	---	0	0	0	0.052	100	I	100	0.052	0.052
	104	425s	1.65×10^{-2}	---	2.6	100	0.87	0.95	100	I	100	1.06	1.93
								0.18	50	II	100		
								0.04	50				
$_{46}Pd$	104	Stable	0	---	0	0	0	0	0	---	---	0	0
$_{49}In$	114*m*	49d	1.64×10^{-7}	---	0	0	0	0.190	100	I	100	0.190	0.190
	114[c]	72s	9.63×10^{-3}	---	1.984	97	0.642	0	0	---	---	0	0.642
	116*m*	54.2m	2.13×10^{-4}	---	0.60	21	0.293	2.090	25	I	3	2.52	2.81
					0.87	28		1.487	21	II	25		
					1.00	51		1.274	75	III	150		
								1.085	54	IV	25		
								0.406	25				
								0.137	3				
	116	13s	4.33×10^{-2}	---	3.29	100	1.10	0	0	---	---	0	1.10
$_{50}Sn$	114	Stable	0	---	0	0	0	0	0	---	---	0	0
	116	Stable	0	0.006 + ?	0	0	0	0	0	---	---	0	0

TABLE 2*a*. (continued)

Nuclide	Mass Number, A	Half-life $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Energy of Radiation: Betal Particles E_b (Mev)	(%)	Av. E_b (Mev)	Gamma Transitions E_g (Mev)	(%)	Shielding Group	(%)	Total E_g (Mev)	Total E (Mev)
$_{51}$Sb	122	2.75d	2.91×10^{-6}	---	0.45	8	0.51	0.566	8	I	36	0.389	0.90
					1.40	56		0.553	56	II	64		
					2.00	36		0.095	36				
	124	60d	1.34×10^{-7}	---	0.5	39	0.346	2.04	---	I	10	1.86[d]	2.21[d]
					0.68	26		1.708	---	II	150		
					0.95	7		0.730	---	IV	50		
					1.69	7		0.565	---				
					2.291	21		0.607	45				
								0.121	---				
$_{52}$Te	122	Stable	0	1.0 + 1.7	0	0	0	0	0	---	---	0	0
	124	Stable	0	6	0	0	0	0	0	---	---	0	0
$_{53}$I	128[c]	24.98m	4.62×10^{-4}	---	1.59	6.7	0.63	0.428	6.7	II	6.7	0.03	0.66
					2.02	88.3				II	292	2.15	2.42
	130	12.6h	1.53×10^{-5}	---	0.597	54	0.264	1.15	31	III	31		
					1.02	46		0.744	69				
								0.660	100				
								0.528	100				
								0.409	23				
$_{54}$Xe	128	Stable	0	5	0	0	0	0	0	---	---	0	0
	130	Stable	0	<5	0	0	0	0	0	---	---	0	0
$_{55}$Cs	134*m*	3.2h	6.03×10^{-5}	---	0	0	0	0.128	100	I	100	0.128	0.128
	134	2.0y	1.10×10^{-8}	---	0.09	25	0.170	1.365	4	II	206	1.53	1.70
					0.648	75		1.037	6	III	10		
								0.794	96				
								0.601	75				
								0.567	15				
								0.561	20				
$_{56}$Ba	134	Stable	0	2	0	0	0	0	0	---	---	0	0
$_{59}$Pr	142	19.3h	9.97×10^{-6}	18	0.64	7	0.70	1.59	7	III	7	0.11	0.81
					2.15	93		0.135	~0				
$_{60}$Nd	142	Stable	0	18	0	0	0	0	0	---	---	0	0
$_{61}$Pm	148	5.3d	1.51×10^{-6}	---	2.5	100	0.83	0.8	100	II	100	0.8	1.63

TABLE 2*a*. (continued)

Nuclide	Mass Number, A	Half-life $t_{1/2}$	Decay Constant, λ (sec^{-1})	Absorption Cross Section σ_a (barns)	Energy of Radiation: Beta Particles: E_b (Mev)	(%)	Av. E_b (Mev)	Gamma Transitions: E_g (Mev)	(%)	Shielding: Group	(%)	Total E_g (Mev)	Total E (Mev)
$_{62}$Sm	148	Stable	0	---	0	0	0	0	0	---	---	0	0
	150	Stable	0	---	0	0	0	0	0	---	---	0	0
$_{63}$Eu	152[c]	9.2h	2.09×10^{-5}	---	1.880	100	0.63	0.344	~50	I	~50	~0.23	0.86
								0.122	~50	II	~50		
	152[c]	13y	1.69×10^{-9}	5000	1.58	26	0.137	1.086	---	I	---	---	>0.14
								0.964		II	---	---	
								0.720		III	---	---	
								0.344					
								0.244					
								0.123					
								0.122					
	154[c]	16y	1.38×10^{-9}	1000	0.3	50	0.21	1.116	~50	II	100	1.0[b]	1.2[b]
					0.7	40		0.778	~50	III	50		
					1.9	10		0.336	~50				
$_{64}$Gd	152	Stable	0	<120	0	0	0	0	0	---	---	0	0
	154	Stable	0	---	0	0	0	0	0	---	---	0	0
$_{65}$Tb	160	73.5d	1.09×10^{-7}	400	0.396	16	0.216	0.962	---	II	150	1.5[b]	1.72[b]
					0.521	41		0.876	---				
					0.860	43		0.410	---				
								0.391	---				
								0.375	---				
								0.298	---				
								0.282	---				
								0.215	---				
								0.196	---				
								0.176	---				
								0.093	---				
								0.087	---				
$_{66}$Dy	160	Stable	0	---	0	0	0	0	0	---	---	0	0

TABLE 3. RADIOACTIVE U^{235} FISSION PRODUCTS

Arranged in Decreasing Order of Half-life

Nuclide	Half-life	Yield (%)	Nuclide	Half-life	Yield (%)
Nd^{150}	$>2 \times 10^{15}$y	0.74[a]	Zr^{95}	63d	6.4
Nd^{144}	1.5×10^{15}y	6.1	(Nb^{95m})	90h	0.06
Te^{130}	$>10^{15}$y	2.0	(Nb^{95})	35d	6.4
In^{115}	6×10^{14}y	0.0099	Y^{91}	58d	5.9
Sm^{147}	1.4×10^{11}y	2.6	Te^{125m}	58d	3×10^{-3}
Rb^{87}	6.2×10^{10}y	2.7	Sr^{89}	54d	4.8
I^{129}	1.72×10^{7}y	1.0	Cd^{115}	43d	7.1×10^{-4}
Pd^{107}	7.5×10^{6}y	0.2	Ru^{103}	41d	2.9
Cs^{135}	3.0×10^{6}y	6.2	(Rh^{103m})	54m	2.9
Zr^{93}	1.1×10^{6}y	6.5	Nb^{95}	35d	6.4
(Nb^{93m})	4.2y	2.1	Te^{129m}	33d	0.34
Tc^{99}	2.12×10^{5}y	6.1	(Te^{129})	72m	1.0
Se^{79}	6.5×10^{4}y	0.04	Ce^{141}	32d	6.0
Sm^{151}	73y	0.5	Rb^{86}	19.5d	2.8×10^{-5}[a]
Cs^{137}	33y	5.9	Eu^{156}	15.4d	0.013
(Ba^{137m})	2.60m	5.4	Sn^{117m}	14.0d	$<2 \times 10^{-5}$
Sr^{90}	28y	5.9	Pr^{143}	13.7d	6.2
(Y^{90})	64.5h	5.9	Cs^{136}	13d	6×10^{-3}[a]
Kr^{85}	10.27y	0.3	Ba^{140}	12.80d	6.3
Cd^{113m}	5.1y	?	(La^{140})	40.2h	6.3
Nb^{93m}	4.2y	2.1	Xe^{131m2}	12.0d	0.03
Sb^{125}	~2.7y	0.023	Nd^{147}	11.3d	2.6
(Te^{125m})	58d	3×10^{-3}	Sn^{125}	9.4d	0.012
Pm^{147}	2.6y	2.6	I^{131}	8.05d	2.9
Eu^{155}	1.7y	0.031	Ag^{111}	7.6d	0.018
Ru^{106}	1.0y	0.38	Tb^{161}	7.0d	8.0×10^{-5}
(Rh^{106})	30s	0.38	Xe^{133}	5.27d	6.5
Ce^{144}	290d	6.1	Sb^{127}	93h	0.25
Pr^{144}	17.5m	6.1	(Te^{127})	9.3h	0.25
Ag^{110m}	270d	2×10^{-7}[a]	Nb^{95m}	90h	0.06
(Ag^{110})	24.2s	6×10^{-9}	Te^{132}	77h	4.4
Sn^{119m}	275d	<0.01	(I^{132})	2.4h	4.4
Sn^{123}	131d	0.0012	Mo^{99}	67h	6.1
Te^{127m}	90d	0.056	(Tc^{99m})	6.04h	~0.6
(Te^{127})	9.3h	0.25	Y^{90}	64.5h	5.9

TABLE 3. (continued)

Nuclide	Half-life	Yield (%)	Nuclide	Half-life	Yield (%)
Xe^{133m}	2.3d	0.16	Sb^{126}	9h	0.10
Pm^{149}	54h	1.3	I^{135}	6.68h	5.9
Cd^{115}	53h	9.8×10^{-3}	(Xe^{135m})	15.6m	1.8
(In^{115m})	4.5h	9.8×10^{-3}	Tc^{99m}	6.04h	~0.6
Zn^{72}	49h	1.5×10^{-5}	Pr^{145}	6.0h	4.2
(Ga^{72})	14.3h	1.5×10^{-5}	Ag^{113}	5.3h	0.01
Sm^{153}	47h	0.15	Ga^{73}	5.0h	1×10^{-4}
La^{140}	40.2h	6.3	Sb^{129}	4.6h	1.0
As^{77}	38.8h	9.1×10^{-3}	(Te^{129})	72m	1.0
(Se^{77m})	17.5s	$<2 \times 10^{-4}$	Ru^{105}	4.5h	0.9
Rh^{105}	36.5h	0.9	(Rh^{105m})	45s	0.9
Br^{82}	35.87h	3.8×10^{-5} [a]	In^{115m}	4.5h	9.8×10^{-3}
Ce^{143}	32h	6.2	Kr^{85m}	4.36h	1.5
Te^{131m}	30h	0.44	La^{141}	3.7h	6.0
(Te^{131})	24.8m	2.9	Y^{92}	3.60h	6.1
Sn^{121}	27.5h	0.014	Ag^{112}	3.2h	0.011
Pm^{151}	27.5h	0.5	Cd^{117m}	2.9h	0.010
Nb^{96}	23.4h	5.7×10^{-4} [a]	(Cd^{117})	50m	0.010
Pd^{112}	21h	0.011	Kr^{88}	2.77h	3.7
(Ag^{112})	3.2h	0.011	(Rb^{88})	17.8m	3.7
I^{133}	20.8h	6.5	Sr^{92}	2.7h	6.1
Gd^{159}	18.0h	1.1×10^{-3}	Br^{83}	2.4h	0.48
Zr^{97}	17.0h	6.2	I^{132}	2.4h	4.4
(Nb^{97m})	60s	6.2	Nd^{149}	2.0h	1.3
(Nb^{97})	72.1m	6.2	In^{117m}	1.90h	0.010
Eu^{157}	15.4h	0.0074	Kr^{83m}	114m	0.48
Ga^{72}	14.3h	1.5×10^{-5}	As^{78}	91m	2×10^{-2}
Pd^{109}	13.6h	0.028	Sn^{127}	1.5h	(0.24)
(Ag^{109m})	39.2s	0.028	Ge^{78}	86m	1.8×10^{-2}
Ge^{77}	12h	3.7×10^{-3}	Ba^{139}	85m	6.0
Y^{93}	10.0h	6.5	Ge^{75}	82m	8×10^{-4}
Sm^{156}	~10h	0.013	Kr^{87}	78m	2.7
Sr^{91}	9.7h	5.9	La^{142}	74m	5.9
(Y^{91m})	51m	2.4	Nb^{97}	72.1m	6.2
Te^{127}	9.3h	0.25	Te^{129}	72m	1.0
Xe^{135}	9.2h	6.2	In^{117}	1.1h	2×10^{-3}

TABLE 3. (continued)

Nuclide	Half-life	Yield (%)	Nuclide	Half-life	Yield (%)
Sb^{128}	1.1h	0.5	Nd^{151}	15m	(0.48)
Te^{133m}	63m	4.6	Mo^{101}	14.6m	5.0
(Te^{133})	2m	6.0	Rb^{91}	14m	(5.7)
Eu^{158}	60m	0.002	Tc^{101}	14.0m	5.0
Rh^{109}	<1h	(0.028)	Ce^{146}	13.9m	(3.2)
Se^{81m}	56.5m	8×10^{-3}	Mo^{102}	12m	4.2
(Se^{81})	17m	0.133	Sb^{130}	12m	2.0
Rh^{103m}	54m	2.9	Y^{95}	10.5m	6.4
I^{134}	52.5m	7.6	As^{81}	<10m	(0.125)
Y^{91m}	51m	2.4	Sn^{125}	9.5m	0.011
Cd^{117}	50m	0.010	Cs^{139}	9.5m	(5.9)
Sn^{126}	50m	0.1	As^{79}	9m	0.04
Te^{134}	44m	6.7	(Se^{79m})	3.5m	0.04
Sn^{123}	39.5m	0.014	Sr^{93}	7m	(6.4)
Cs^{138}	32m	5.8	Ba^{142}	6m	(5.6)
Br^{84}	30m	1.1	Mo^{105}	~5m	(0.6)
Cd^{118}	~30m	0.01	In^{118}	4.5m	0.01
(In^{118})	4.5m	0.01	Sb^{133}	4.1m	(3.8)
Rh^{107}	26m	0.2	Ru^{107}	4m	0.2
Se^{83}	25m	0.21	Xe^{137}	3.9m	5.9
Te^{131}	24.8m	2.9	Gd^{161}	3.6m	8×10^{-3}
Pr^{146}	24.4m	3.3	Se^{79m}	3.5m	0.04
Sm^{155}	23.5m	0.031	Kr^{89}	3.18m	(4.6)
Pd^{111}	22m	0.018	Br^{85}	3m	1.5
Sb^{131}	21.0m	(2.7)	Ce^{145}	3.0m	4.2
Ag^{115}	20m	(~0.01)	Rb^{90}	2.74m	5.9
La^{143}	19m	6.2	Ba^{137m}	2.60m	5.4
Ba^{141}	18m	5.9	Se^{84}	~2m	1.1
Rb^{88}	17.8m	3.7	Sr^{94}	2.0m	(5.8)
In^{119}	17.5m	0.01	Ag^{114}	2m	0.01
Pr^{144}	17.5m	6.1	Te^{133}	2m	6.0
Se^{81}	17m	0.133	Te^{135}	<2m	(4.2)
Xe^{138}	17m	(5.5)	Zn^{73}	<2m	(9.8×10^{-5})
Y^{94}	16.5m	6.5	Sb^{132}	1.9m	(3.4)
Xe^{135m}	15.6m	1.8	Rb^{91}	1.67m	?
Rb^{89}	15.4m	4.8	Tc^{107}	<1.5m	(0.16)

TABLE 3. (continued)

Nuclide	Half-life	Yield (%)	Nuclide	Half-life	Yield (%)
I^{136}	86s	3.1	Br^{89}	4.51s	?
Rb^{92}	80s	(5.5)	Kr^{92}	3.0s	(2.7)
Se^{83m}	67s	0.30	I^{139}	2.7s	(1.8)
Cs^{140}	66s	(6.0)	Kr^{93}	2.0s	(1.3)
Nb^{97m}	60s	6.2	Xe^{141}	1.7s	(1.8)
Cs^{142}	~1m	(3.4)	Kr^{94}	1.4s	(0.6)
Br^{87}	55.6s	2.7	Xe^{143}	1s	(0.2)
Ge^{77m}	52s	5.4×10^{-3}	Xe^{144}	1s	(~0)
Sb^{134}	45s	(3.0)	Kr^{97}	~1s	(~0)
Rh^{105m}	45s	0.9	Kr^{95}	Short	(0.2)
Ag^{107m}	44.3s	?	Rb^{93}	Short	(4.4)
Xe^{139}	41s	(4.7)	Rb^{94}	Short	(2.9)
Ag^{109m}	39.2s	0.028	Rb^{95}	Short	(1.6)
Kr^{90}	~33s	(5.2)	Rb^{97}	Short	(0.1)
Rh^{106}	30s	0.38	Sr^{95}	Short	(4.7)
Ba^{143}	<30s	(4.9)	Sr^{97}	Short	(1.7)
Tc^{102}	<25s	4.2	Y^{97}	Short	(4.8)
Ag^{110}	24.2s	6×10^{-9}	Tc^{105}	Short	(0.9)
I^{137}	22.0s	4.9	Cs^{141}	Short	(4.7)
Se^{77m}	17.5s	$<2 \times 10^{-4}$	Cs^{143}	Short	(1.9)
Xe^{140}	16s	(3.7)	Cs^{144}	Short	(1.0)
Br^{88}	15.5s	(2.9)	Ba^{144}	Short	(3.5)
Kr^{91}	9.8s	(3.7)	La^{144}	Short	(5.8)
I^{138}	5.9s	(3.4)			

TABLE 4. U^{235} FISSION PRODUCTS

Arranged in Decreasing Order of Thermal Neutron Capture Cross Section

Nuclide	Half-life	Yield (%)	Cross Section (barns)	Nuclide	Half-life	Yield (%)	Cross Section (barns)
Xe^{135}	9.13h	6.2	3.5×10^{6}	Br^{79}	Stable	3.7×10^{-2}	2.6 + 7.6
Gd^{157}	Stable	7.4×10^{-3}	160,000	I^{129}	1.72×10^{7}y	1.0	11
Gd^{155}	Stable	0.031	70,000	Pr^{141}	Stable	6.0	11
Sm^{149}	Stable	1.3	50,000	Nd^{146}	Stable	3.3	9.8
Cd^{113}	Stable	0.01	25,000	La^{139}	Stable	6.0	8.8
Eu^{155}	1.7y	0.031	14,000	Cs^{138}	32m	5.8	8.7
Eu^{151}	Stable	0.5	1400 + 7000	Y^{90}	64.5h	5.9	<6.5
Sm^{151}	73y	0.5	7000	I^{127}	Stable	0.25	6.1
I^{131}	8.05d	2.9	600	Sb^{121}	Stable	0.014	5.7
Eu^{153}	Stable	0.15	400	Ba^{135}	Stable	6.2	5.6
Kr^{87}	78m	2.7	<400	Sm^{154}	Stable	0.09^{a}	5.5
Nd^{143}	Stable	6.2	290	Ba^{137}	Stable	5.9	4.9
Kr^{83}	Stable	0.48	205	Nd^{144}	Stable	6.1	4.8
Rb^{88}	17.8m	3.7	<200	As^{75}	Stable	8×10^{-4}	4.1
In^{115}	6×10^{14}y	0.0099	145 + 52	Ba^{139}	85m	6.0	4
Sm^{152}	Stable	0.3^{a}	150	Gd^{158}	Stable	0.002	4
Rh^{103}	Stable	2.9	12 + 138	Zr^{93}	1.1×10^{6}y	6.5	<4
Sr^{89}	54d	4.8	<130	Nd^{148}	Stable	1.8^{a}	3.3
Xe^{131}	Stable	2.9	120	La^{140}	40.2h	6.3	3
Ag^{109}	Stable	0.028	2 + 82	Nd^{150}	$>2 \times 10^{15}$y	0.74^{a}	2.9
In^{113}	Stable	?	60 + 2	Br^{81}	Stable	0.133	2.6
Pm^{147}	2.6y	2.6	60 + ?	Sb^{123}	Stable	0.018	0.03 + 0.03 + 2.5
Nd^{145}	Stable	4.2	52	Ru^{101}	Stable	5.0	2.46
Xe^{129}	Stable	1.0	45	Se^{82}	Stable	0.25^{a}	2
Tb^{159}	Stable	1.1×10^{-3}	44	Mo^{97}	Stable	6.2	2
Se^{77}	Stable	9.1×10^{-3}	40	Cs^{137}	33y	5.9	<2
Kr^{82}	Stable	3.5×10^{-5}	45	Ce^{142}	Stable	5.9	1.8
Ag^{107}	Stable	0.2	30	Cs^{142}	~1m	(3.4)	1.76
Cs^{133}	Stable	6.5	0.016 + 26	Zr^{91}	Stable	5.9	1.5
Cs^{135}	3.0×10^{6}y	6.2	15	Te^{125}	Stable	0.023	1.5
Kr^{85}	10.27y	0.3	<15	Y^{89}	Stable	4.8	1.4
Ge^{73}	Stable	1×10^{-4}	13.7	Gd^{160}	Stable	3×10^{-4a}	1.5
Mo^{95}	Stable	6.4	13.4	Cd^{116}	Stable	0.01^{a}	1.4 + ?
Pd^{108}	Stable	0.08^{a}	0.07 + 11	Sr^{86}	Stable	2.8×10^{-5}	1.3 + ?

TABLE 4. (continued)

Nuclide	Half-life	Yield (%)	Cross Section (barns)	Nuclide	Half-life	Yield (%)	Cross Section (barns)
Cd^{114}	Stable	0.01	0.14 + 1.1	Xe^{132}	Stable	4.4	? + 0.2
Ru^{102}	Stable	4.2	1.2	Xe^{134}	Stable	7.6	? + 0.2
Nb^{93}	Stable	6.5	1.1	Zr^{92}	Stable	6.1	0.2
Mo^{96}	Stable	5.7×10^{-4}	1	Mo^{100}	Stable	6.5^{a}	0.2
Sr^{90}	28y	5.9	~1	Kr^{84}	Stable	1.1	0.1 + 0.06
Ge^{72}	Stable	1.5×10^{-5}	0.94	Te^{128}	Stable	0.5	0.016 + 0.14
Rb^{85}	Stable	1.5	0.05 + 0.85	Xe^{136}	Stable	6.3	0.15
Te^{126}	Stable	0.10	0.07 + 0.7	Rb^{87}	6.2×10^{10}y	2.7	0.14
Sn^{124}	Stable	0.02^{a}	0.75	Mo^{98}	Stable	5.9^{a}	0.13
Ru^{104}	Stable	1.8^{a}	0.7	Sn^{122}	Stable	0.013^{a}	0.001 + 0.1
Ba^{138}	Stable	5.8	0.68	Zr^{90}	Stable	5.9	0.1
Cs^{140}	66s	(6.0)	0.63	Kr^{85m}	4.36h	1.5	0.096
Ge^{74}	Stable	3×10^{-4a}	0.6	Zr^{94}	Stable	6.5	0.07
Ce^{140}	Stable	6.3	0.6	Kr^{86}	Stable	2.1^{a}	0.06
Se^{80}	Stable	8×10^{-2a}	0.03 + 0.5	Zr^{96}	Stable	6.4^{a}	0.05
Pd^{110}	Stable	0.02^{a}	? + 0.4	Sn^{120}	Stable	0.01^{a}	~0.001 + 0.03
Se^{78}	Stable	1.8×10^{-2}	0.4	Cd^{112}	Stable	0.011	0.03 + ?
Ba^{136}	Stable	6×10^{-3}	0.4	Sn^{121}	27.5h	0.014	0.012
Ge^{76}	Stable	2×10^{-3a}	0.015 + 0.30	Sn^{118}	Stable	0.01	0.01 + ?
Te^{130}	$>10^{15}$y	2.0	<0.01 + 0.3	Sr^{88}	Stable	3.7	0.005

TABLE 5. U^{235} FISSION PRODUCTS

Arranged in Decreasing Order of Gamma Energy

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding	
						Group	(%)
$_{35}Br$	87	55.6s	2.7	5.4	56	IV	70
				~3	14		
$_{57}La$	140	40.2h	6.3	3.0	1	IV	6.4
($_{56}Ba^{140}$)				2.5	5.4	III	94
				1.596	94	II	73.4
				0.8151	29	I	1.8
				0.4867	39		
				0.3286	5.4		
				0.093	1.8		
$_{53}I$	136	86s	3.1	2.9	---	IV	~0
				1.38	---	III	~0
				1.38	---		
$_{37}Rb$	88	17.8m	3.7	2.8	---	IV	22
($_{36}Kr^{88}$)				1.86	---	II	5
				0.9			
$_{31}Ga$	72	14.3h	1.5×10^{-5}	2.51	26	IV	~67
				2.21	33	III	~12
				1.87	8	II	~126
				1.59	5		
				1.20	<2		
				1.05	5		
				0.84	100		
				0.68	<2		
				0.63	24		
$_{45}Rh$	106	30s	0.38	2.41	0.25	IV	1
($_{44}Ru^{106}$)				1.55	0.5	III	2.5
				1.045	2	II	38
				0.87	1		
				0.624	12		
				0.513	25		
$_{36}Kr$	87	78m	2.7	2.3	<25	IV	~25
				1.89	<25	II	~20
				0.41	<25		
$_{53}I$	132	2.33h	4.4	2.2	2	IV	7
($_{52}Te^{132}$)				1.96	5	III	19
				1.40	11	II	226
				1.16	8		
				0.96	20		

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding Group	Shielding (%)
($_{52}Te^{132}$)				0.777	75		
				0.673	100		
				0.624	6		
				0.528	25		
$_{59}Pr$	144	17.5m	6.1	2.185	1	IV	1
($_{58}Ce^{144}$)				1.480	2	III	2
				0.695	4	II	4
$_{48}Cd$	117*m*	2.9h	0.01	2.00	---	II	>90
				1.55	---	III	~0
				1.27	---	IV	~0
				0.84	---		
				0.43	---		
				0.33	---		
				0.28	---		
				0.27	---		
$_{63}Eu$	156	15.4d	0.013	2.0	~60	IV	~60
$_{50}Sn$	125	9.4d	0.012	1.90	5	IV	5
$_{35}Br$	84	30m	1.1	1.89	---	IV	~50
				0.89	---	II	~150
$_{53}I$	135	6.68h	5.9	1.8	~50	IV	~50
($_{54}Xe^{135m}$)				1.27	~50	III	~50
$_{53}I$	134	52.5m	7.6	1.78	35	IV	35
				1.10	35	III	35
				0.86	3	II	3
$_{47}Ag$	110*m*	270d	2×10^{-7} [a]	1.516	---	IV	~50
($_{47}Ag^{110}$)				1.389	---	II	~295
				0.935	---	I	~3
				0.885	---		
				0.814	---		
				0.759	---		
				0.706	---		
				0.676	---		
				0.656	---		
				0.116	~3		
$_{57}La$	141	3.7h	5.9	1.5	5	III	5
$_{59}Pr$	146	24.4m	3.3	1.49	33	III	33
				0.75	22	II	122
				0.46	100		

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding Group	Shielding (%)
$_{55}Cs$	138	32m	5.8	1.44	100	III	100
				0.98	66.7	II	100
				0.463	33.3		
$_{56}Ba$	139	85m	6.0	1.43	19	III	19
				0.163	66	I	66
$_{38}Sr$	91	9.7h	6.0	1.413	7	III	40
($_{39}Y^{91m}$)				1.025	33	II	62
				0.747	7		
				0.66	22		
				0.64	33		
$_{39}Y$	90	64.5h	5.9	1.4	0.4	III	0.4
($_{38}Sr^{90}$)							
$_{39}Y$	94	16.5m	6.5	1.4	100	III	100
$_{53}I$	133	20.8h	6.5	1.4	1	III	1
				0.85	5	II	99
				0.53	94		
$_{47}Ag$	112	3.2h	0.011	1.40	---	III	~0
				0.62	---	II	~0
$_{35}Br$	82	35.87h	3.5×10^{-5} [a]	1.312	---	III	~200
				1.031	---	II	~100
				0.823	---		
				0.766	---		
				0.692	---		
				0.608	---		
				0.547	---		
$_{48}Cd$	115	43d	0.00071	1.28	---	III	~0
				0.96	---	II	~0
				0.50	---		
				0.46	---		
$_{39}Y$	91	58d	5.9	1.22	0.3	III	0.3
$_{41}Nb$	96	23.4h	5.7×10^{-4} [a]	1.187	32	III	84
				1.078	52	II	210
				0.840	16	I	17
				0.804	6		
				0.770	100		
				0.560	61		

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding	
						Group	(%)
$_{41}Nb$				0.451	27		
				0.238	10		
				0.216	7		
$_{60}Nd$	151	15m	0.48	1.14	---	III	~50
				0.73	---	II	~100
				0.421	---	I	~150
				0.117	---		
				0.110	---		
				0.085	---		
$_{37}Rb$	86	19.5d	2.8×10^{-5a}	1.076	12	III	12
$_{52}Te$	133	2m	6.0	1.0	70	II	170
($_{52}Te^{133m}$)				0.6	100		
$_{42}Mo$	101	14.6m	5.0	0.96	70	II	70
				0.191	100	I	100
$_{34}Se$	83	25m	0.21	0.950	---	II	~200
				0.176	---	I	~200
				0.061	---		
				0.04	---		
$_{51}Sb$	126	9h	0.10	0.90	100	II	200
				0.4	100		
$_{55}Cs$	136	13d	6×10^{-3a}	0.9	100	II	100
$_{57}La$	142	74m	5.9	0.87	10	II	100
				0.63	90		
$_{52}Te$	129	72m	1.0	0.8	100	II	200
($_{51}Sb^{129}$)				0.3	100		
$_{42}Mo$	99	67h	6.1	0.780	---	II	10
				0.740	---	I	90
($_{43}Tc^{99m}$)				0.181	---		
				0.140	---		
				0.041	---		
$_{41}Nb$	97*m*	60s	6.2	0.747	100	II	100
($_{40}Zr^{97}$)							

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding Group	Shielding (%)
$_{41}Nb$ ($_{40}Zr^{95}$) ($_{41}Nb^{95m}$)	95	35d	6.4	0.745	100	II	100
$_{46}Pd$	111	22m	0.018	0.73	---	II	~0
				0.65	---		
				0.56	---		
				0.38	---		
$_{44}Ru$ ($_{45}Rh^{105m}$)	105	4.5h	0.9	0.726	100	II	100
$_{53}I$	131	8.05d	2.9	0.722	3	II	97.3
				0.637	9		
				0.364	80		
				0.284	5.3		
$_{51}Sb$	127	93h	0.25	0.72	100	II	100
$_{40}Zr$ ($_{41}Nb^{95}$) ($_{41}Nb^{95m}$)	95	63d	6.4	0.717	99	II	99
$_{61}Pm$	151	27.5h	0.5	0.715	---	II	~100
				0.340	---	I	~100
				<0.25	---		
				0.177	---		
$_{39}Y$	93	10.0h	6.5	0.7	100	II	100
$_{40}Zr$	97	17.0h	6.2	---	---	II	100
$_{52}Te$ ($_{52}Te^{131m}$)	131	24.8m	2.9	0.7	45	II	45
				0.16	100	I	100
$_{41}Nb$ ($_{40}Zr^{97}$)	97	72.1m	6.2	0.665	100	II	100
$_{56}Ba$ ($_{55}Cs^{137}$)	137m	2.60m	5.4	0.661	100	II	100
$_{58}Ce$	143	32h	6.2	0.660	15.2	II	87.9
				0.356	12.1	I	12.1
				0.289	60.6		
				0.126	12.1		
$_{47}Ag$ ($_{47}Ag^{110m}$)	110	24.2s	6×10^{-9}	0.66	100	II	100

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding Group	Shielding (%)
$_{60}Nd$	149	2.0h	1.3	0.650	---	II	~0
				0.538	---	I	~0
				0.424	---		
				0.266	---		
				0.240	---		
				0.226	---		
				0.211	---		
				0.198	---		
				0.188	---		
				0.124	---		
				0.114	---		
				0.112	---		
				0.097	---		
				0.030	---		
$_{51}Sb$	125	~2.7y	0.023	0.637	---	II	72
				0.601	---	I	28
($_{52}Te^{125m}$)				0.465	---		
				0.425	---		
				0.175	---		
				0.110	---		
				0.035	---		
$_{54}Xe$	135	9.13h	6.2	0.60	4	II	5
				0.37	1	I	96
				0.250	96		
$_{63}Eu$	157	15.4h	0.0074	0.60	100	II	100
				0.2	100	I	100
$_{39}Y$	92	3.60h	6.1	0.6	---	II	---
$_{32}Ge$	75	82m	8×10^{-4}	0.572	---	II	15
				0.418	---		
				0.265	---		
$_{49}In$	117	1.1h	0.002	0.565	---	II	~15
				0.161	---	I	~10
$_{39}Y$	91*m*	51m	2.4	0.551	100	II	100
($_{38}Sr^{91}$)							
$_{56}Ba$	140	12.80d	6.3	0.54	30	II	40
				0.30	10	I	110
($_{57}La^{140}$)				0.16	10		
				0.03	100		

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding	
						Group	(%)
$_{62}Sm$	153	47h	0.15	0.538	10	II	10
				0.172	~0	I	~102
				0.103	73		
				0.069	29		
$_{60}Nd$	147	11.3d	2.6	0.532	25	II	40
				0.318	15	I	60
				0.092	60		
$_{48}Cd$	115	53h	0.0098	0.525	---	II	42
($_{49}In^{115m}$)				0.50	---		
				0.360	---		
$_{54}Xe$	135*m*	15.6m	1.8	0.52	100	II	100
($_{53}I^{135}$)							
$_{44}Ru$	103	41d	2.9	0.498	95	II	95
($_{45}Rh^{103m}$)							
$_{52}Te$	133*m*	63m	4.6	0.4	100	II	100
($_{52}Te^{133}$)							
$_{64}Gd$	159	18.0h	1.1×10^{-5}	0.38	100	II	100
				0.055	100	I	100
$_{47}Ag$	111	7.6d	0.018	0.340	8	II	8
				0.243	1	I	1
$_{49}In$	115*m*	4.5h	0.0098	0.335	94	II	94
($_{48}Cd^{115}$)							
$_{50}Sn$	125	9.5m	0.011	0.326	100	II	100
$_{45}Rh$	105	36.5h	0.9	0.322	10	II	10
$_{58}Ce$	146	13.9m	(3.2)	0.32	12	II	64
				0.27	24	I	72
				0.22	36		
				0.142	7		
				0.110	~57		
$_{49}In$	117*m*	1.90h	0.010	0.311	22	II	22
				0.161	78	I	78

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding	
						Group	(%)
$_{43}Tc$	101	14.0m	5.0	0.30	100	II	100
$_{36}Kr$	85*m*	4.36h	1.5	0.305	20	II	20
				0.1495	80	I	80
$_{55}Cs$	143	Short	(1.9)	0.29	~0	II	~0
				0.12	~0	I	~0
$_{61}Pm$	149	54h	1.3	0.285	100	II	100
$_{33}As$	78	91m	0.02	0.27	---	II	~300
$_{32}Ge$	77	12h	3.7×10^{-3}	0.26	---	II	~100
				0.21	---	I	~100
$_{30}Zn$	72	49h	1.5×10^{-5}	---	---	II	~100
$_{62}Sm$	155	23.5m	0.031	0.246	100	I	200
				0.105	100		
$_{41}Nb$	95*m*	90h	0.06	0.235	100	I	100
($_{41}Nb^{95}$)							
($_{40}Zr^{95}$)							
$_{54}Xe$	133*m*	2.3d	0.16	0.233	100	I	100
$_{52}Te$	132	77h	4.4	0.231	100	I	100
($_{53}I^{132}$)							
$_{32}Ge$	77*m*	52s	5.4×10^{-3}	0.215	100	I	200
				0.159	100		
$_{52}Te$	131*m*	30h	0.44	0.177	100	I	100
($_{52}Te^{131}$)							
$_{54}Xe$	$131m_2$	12.0d	0.03	0.163	100	I	100
$_{34}Se$	77*m*	17.5s	$<2 \times 10^{-4}$	0.162	100	I	100
($_{33}As^{77}$)							
$_{50}Sn$	117*m*	14.0d	$<2 \times 10^{-5}$	0.162	100	I	200
				0.159	100		
$_{50}Sn$	123	39.5m	0.014	0.153	100	I	100
$_{58}Ce$	141	32d	6.0	0.145	67	I	67

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding	
						Group	(%)
$_{43}Tc$ ($_{42}Mo^{99}$)	99*m*	6.04h	~0.6	0.141	100	I	100
$_{63}Eu$	155	1.7y	0.031	0.137	---	I	~500
				0.131	---		
				0.105	---		
				0.086	---		
				0.059	---		
				0.019	---		
$_{58}Ce$ ($_{59}Pr^{144}$)	144	290d	6.1	0.134	10	I	50
				0.100	10		
				0.0807	10		
				0.054	10		
				0.0337	10		
$_{45}Rh$ ($_{44}Ru^{105}$)	105*m*	45s	0.9	0.130	100	I	100
$_{52}Te$ ($_{51}Sb^{125}$)	125*m*	58d	0.023	0.110	100	I	100
$_{52}Te$	129*m*	33d	0.34	0.106	100	I	100
$_{34}Se$ ($_{34}Se^{81}$)	81*m*	56.5m	0.008	0.103	100	I	100
$_{34}Se$	79*m*	3.9m	4×10^{-2}	0.096	100	I	100
$_{47}Ag$	107*m*	44.3s	<0.2	0.094	100	I	100
$_{52}Te$ ($_{52}Te^{127}$)	127*m*	90d	0.056	0.0885	100	I	100
$_{47}Ag$ ($_{46}Pd^{109}$)	109*m*	39.2s	0.028	0.088	100	I	100
$_{54}Xe$	133	5.270d	6.5	0.081	100	I	100
$_{50}Sn$	119*m*	275d	<0.01	0.0653	100	I	200
				0.0242	100		

TABLE 5. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Gamma Energy (Mev)	Disintegrations (%)	Shielding	
						Group	(%)
$_{31}Ga$	73	5.0h	1×10^{-4}	0.054 0.0135	100 100	I	200
$_{35}Br$	83	2.4h	0.48	0.051	100	I	100
$_{65}Tb$	161	7.0d	8×10^{-5}	0.05	100	I	100
$_{45}Rh$ ($_{44}Ru^{103}$)	103*m*	57m	2.9	0.040	100	I	100
$_{53}I$	129	1.72×10^{7}y	1.0	0.039	100	I	100
$_{36}Kr$	83*m*	114m	0.48	0.0322 0.0093	100 100	I	200
$_{41}Nb$ ($_{40}Zr^{93}$)	93*m*	4.2y	2.1	0.0292	100	I	100
$_{36}Kr$ ($_{37}Rb^{88}$)	88	2.77h	3.7	0.028	68	I	68
$_{62}Sm$	151	73y	0.5	0.019	100	I	100
$_{46}Pd$ ($_{47}Ag^{112}$)	112	21h	0.011	0.018	100	I	100

TABLE 6. U^{235} FISSION PRODUCTS

Arranged in Decreasing Order of Beta Energy

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{35}Br$	87	55.6s	2.7	8.0 2.6	30 70	1.41
$_{53}I$	136	86s	3.1	6.4 5.0 3.6	~100 --- ---	2.1
$_{37}Rb$	90	2.74m	5.9	5.7	100	1.9
$_{39}Y$	94	16.5m	6.5	5.4	100	1.8
$_{37}Rb$ $(_{36}Kr^{88})$	88	17.8m	3.7	5.3 3.6 2.5	78 13 9	1.61
$_{35}Br$	84	30m	1.1	4.68 3.56 2.53 1.72	40 9 16 35	1.065
$_{37}Rb$	91*m*	1.67m	?	4.6	100	1.0
$_{37}Rb$	89	15.4m	4.8	4.5	100	1.5
$_{47}Ag$ $(_{46}Pd^{112})$	112	3.2h	0.011	4.1 3.5 2.7 1.0	25 40 20 15	1.04
$_{33}As$	78	91m	2×10^{-2}	4.1 1.4	70 30	1.10
$_{54}Xe$	137	3.9m	(5.9)	4.0	100	1.33
$_{36}Kr$	89	3.18m	(4.6)	4.0	100	1.3
$_{59}Pr$	146	24.4m	3.3	3.7 2.2	56 44	1.01
$_{36}Kr$	87	78m	2.7	3.63 1.27	75 25	1.01

TABLE 6. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{39}Y$	92	3.60h	6.1	3.6	---	~1.2[b]
				2.7	---	
				1.3	---	
$_{36}Kr$	91	9.8s	(3.7)	3.6	100	1.20
$_{45}Rh$	106	30s	0.38	3.53	68	1.05
($_{44}Ru^{106}$)				3.1	11	
				2.44	12	
				2.0	3	
				~1.0	6	
$_{55}Cs$	138	32m	5.8	3.4	67	1.08
				2.9	10	
				2.0	33	
$_{34}Se$	83*m*	67s	0.30	3.4	100	1.13
$_{36}Kr$	90	~33s	(5.2)	3.2	100	1.07
$_{31}Ga$	72	14.3h	1.5×10^{-5}	3.15	9	0.390
($_{30}Zn^{72}$)				2.52	8	
				1.5	11	
				0.9	32	
				0.6	40	
$_{39}Y$	93	10.0h	6.5	3.1	100	1.03
$_{37}Rb$	91	14m	(5.7)	3.0	100	1.0
$_{47}Ag$	115	20m	(~0.01)	3.0	100	1.0
$_{48}Cd$	117	50m	0.01	3.0	---	0.79[b]
($_{48}Cd^{117m}$)				1.6	---	
$_{59}Pr$	144	17.5m	5.1	2.98	95	0.97
($_{58}Ce^{144}$)				2.3	2	
				0.8	3	
$_{47}Ag$	110*m*	270d	2×10^{-7}[a]	2.86	3	0.128
($_{47}Ag^{110}$)				2.12	3	
				0.530	35	
				0.087	58	

TABLE 6. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{47}Ag$	110	24.2s	6×10^{-9}	2.84 2.16	40 60	0.811
$_{56}Ba$	141	18m	5.9	2.8	100	0.93
$_{36}Kr$ ($_{37}Rb^{88}$)	88	2.77h	3.7	2.8 0.9 0.52	20 12 68	0.341
$_{49}In$	119	17.5m	0.01	2.7	100	0.90
$_{32}Ge$	77*m*	52s	5.4×10^{-3}	2.7	100	0.90
$_{38}Sr$ ($_{39}Y^{91m}$)	91	9.7h	5.9	2.665 2.03 1.36 1.09 0.62	27 4 29 33 7	0.533
$_{63}Eu$	158	60m	2×10^{-3}	2.6	100	0.87
$_{57}La$	142	74m	5.9	2.5	100	0.83
$_{53}I$	134	52.5m	7.6	2.5 1.5	30 70	0.60
$_{35}Br$	85	3.0m	1.5	2.5	100	0.83
$_{57}La$	141	3.7h	6.0	2.43 0.9	95 5	0.785
$_{52}Te$ ($_{52}Te^{133m}$)	133	2m	6.0	2.4 1.3	30 70	0.54
$_{63}Eu$	156	15.4d	0.013	2.4 0.5	40 60	0.43
$_{56}Ba$	139	85m	6.0	2.38 2.23 0.82	15 66 19	0.220
$_{50}Sn$	125	9.4d	0.012	2.37 0.40	95 5	0.76

TABLE 6. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{57}La$	140	40.22h	6.3	2.26	10	0.495
($_{56}Ba^{140}$)				1.67	20	
				1.32	70	
$_{42}Mo$	101	14.6m	5.0	2.2	30	0.50
				1.2	70	
$_{32}Ge$	77	12h	3.7×10^{-3}	2.196	42	0.523
				1.379	35	
				0.71	23	
$_{46}Pd$	111	22m	0.018	2.13	100	0.71
$_{53}I$	132	2.33h	4.4	2.12	18	0.434
				1.53	24	
				1.16	23	
				0.9	20	
				0.7	15	
$_{33}As$	79	9m	4×10^{-2}	2.1	100	0.7
$_{50}Sn$	125	9.5m	0.011	2.04	100	~0.7
				1.17	---	
				0.51	---	
$_{52}Te$	131	24.8m	2.9	2.0	55	0.577
($_{52}Te^{131m}$)				1.4	45	
$_{47}Ag$	113	5.3h	0.01	2.0	100	0.67
$_{60}Nd$	151	15m	(0.48)	1.93	100	0.64
$_{40}Zr$	97	17.0h	6.2	1.91	100	0.64
($_{41}Nb^{97m}$)						
$_{52}Te$	129	72m	1.0	1.8	100	0.6
($_{52}Te^{129m}$)						
$_{62}Sm$	155	23.5m	0.031	1.8	100	0.6
$_{49}In$	117m	1.90h	0.010	1.77	55	0.449
				1.62	23	

TABLE 6. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{37}Rb$	86	19.5d	2.8×10^{-5a}	1.76 0.68	88 12	0.543
$_{63}Eu$	157	15.4h	7.4×10^{-3}	1.7 1.0	25 75	0.392
$_{59}Pr$	145	6.0h	4.2	~1.7	100	~0.6
$_{48}Cd$	115	43d	7.1×10^{-4}	1.61 0.7	98 2	0.53
$_{30}Zn$ $(_{31}Ga^{72})$	72	49h	1.5×10^{-5}	1.6 0.3	~5 ~95	~0.122
$_{64}Gd$	161	3.6m	8.0×10^{-5}	1.6	100	0.5
$_{39}Y$	91	58d	5.9	1.537	~100	0.512
$_{60}Nd$	149	2.0h	1.3	1.5 1.1 0.95	~100 --- ---	~0.5
$_{34}Se$	83	25m	0.21	1.5	100	0.5
$_{49}In$	118	4.5m	0.01	1.5	100	0.5
$_{38}Sr$	89	54d	4.8	1.463	100	0.487
$_{50}Sn$	123	131d	1.2×10^{-3}	1.42	100	0.47
$_{53}I$ $(_{54}Xe^{135m})$	135	6.68h	5.9	1.4 1.0 0.5	25 40 35	0.308
$_{53}I$	133	20.8h	6.5	1.4 0.5	94 6	0.45
$_{31}Ga$	73	5.0h	1×10^{-4}	1.4	100	0.47
$_{58}Ce$	143	32h	6.2	1.39 1.09 0.71	30 40 30	0.355

TABLE 6. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{34}Se$ ($_{34}Se^{81m}$)	81	17m	0.133	1.38	100	0.46
$_{41}Nb$	97	72.1m	6.2	1.267	100	0.422
$_{50}Sn$	123	39.5m	0.014	1.26	100	0.42
$_{42}Mo$ ($_{43}Tc^{99m}$)	99	67h	6.1	1.23 0.45	~87 ~13	0.376
$_{43}Tc$	101	14.0m	5.0	1.20	100	0.40
$_{51}Sb$ ($_{52}Te^{127}$)	127	93h	0.25	1.2	100	0.4
$_{45}Rh$	107	26m	0.2	1.2	100	0.4
$_{55}Cs$	137	33y	5.9	1.17 0.523	8 92	0.192
$_{44}Ru$ ($_{45}Rh^{105m}$)	105	4.5h	0.9	1.150	100	0.383
$_{32}Ge$	75	82m	8×10^{-4}	1.137 0.614	85 15	0.353
$_{48}Cd$	115	53h	9.8×10^{-3}	1.11 0.58	58 42	0.296
$_{61}Pm$	151	27.5h	0.5	1.1	100	0.37
$_{61}Pm$	149	54h	1.3	1.05	100	0.35
$_{47}Ag$ ($_{48}Cd^{111m}$)	111	7.6d	0.018	1.04 0.80 0.70	91 1 8	0.337
$_{56}Ba$ ($_{57}La^{140}$)	140	12.80d	6.3	1.022 0.480	60 40	0.268
$_{51}Sb$	126	9h	0.10	1.0	100	0.33

TABLE 6. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{46}Pd$ ($_{47}Ag^{109m}$)	109	13.6h	0.028	0.961	100	0.32
$_{35}Br$	83	2.4h	0.48	0.940	100	0.313
$_{59}Pr$	143	13.7d	6.2	0.932	100	0.311
$_{54}Xe$	135	9.13h	6.2	0.910 0.548	95 5	0.302
$_{62}Sm$	156	~10h	0.013	0.9	100	0.3
$_{32}Ge$	78	86m	1.8×10^{-2}	0.9	100	0.3
$_{64}Gd$	159	18.0h	1.1×10^{-3}	0.9	100	0.3
$_{40}Zr$ ($_{41}Nb^{95m}$) ($_{41}Nb^{95}$)	95	63d	6.4	0.883 0.396 0.364	1 42 57	0.131
$_{36}Kr$	85*m*	4.36h	1.5	0.835	80	0.233
$_{60}Nd$	147	11.3d	2.6	0.83 0.60 0.38	60 15 25	0.228
$_{49}In$ ($_{48}Cd^{115}$)	115*m*	4.50h	9.8×10^{-3}	0.83	6	0.017
$_{53}I$	131	8.05d	2.9	0.815 0.608 0.335 0.250	0.7 87.2 9.3 2.8	0.191
$_{62}Sm$	153	47h	0.15	0.81 0.70 0.64 0.26	17 44 29 10	0.219
$_{41}Nd$	96	23.4h	5.7×10^{-4} [a]	0.750 0.37	92 8	0.240
$_{49}In$	117	1.1h	2×10^{-3}	0.740	100	0.247

TABLE 6. (continued)

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{52}Te$ ($_{52}Te^{127m}$)	127	9.3h	0.25	0.7	100	0.23
$_{58}Ce$	146	13.9m	(3.2)	0.7	100	0.23
$_{33}As$ ($_{34}Se^{77m}$)	77	38.8h	9.1×10^{-3}	0.700	~100	~0.23
$_{44}Ru$ ($_{45}Rh^{103m}$)	103	41d	2.9	0.698 0.217	5 95	0.080
$_{36}Kr$	85	10.27y	0.3	0.695	99+	~0.232
$_{49}In$	115	6×10^{14}y	9.9×10^{-3}	0.63	100	0.21
$_{51}Sb$ ($_{52}Te^{125m}$)	125	2.7y	0.023	0.612 0.414 0.300 0.125	14 12 45 29	0.102
$_{38}Sr$ ($_{39}Y^{90}$)	90	28y	5.9	0.61	100	0.20
$_{48}Cd$	113*m*	5.1y	?	0.59	100	0.20
$_{58}Ce$	141	32d	6.0	0.581 0.442	33 67	0.163
$_{45}Rh$	105	36.5h	0.9	0.570 0.25	90 10	0.183
$_{53}I$	137	22.0s	(4.9)	0.56	100	0.19
$_{65}Tb$	161	7.0d	8×10^{-5}	0.5	100	0.17
$_{35}Br$	82	35.87h	3.5×10^{-5} [a]	0.465	100	0.155
$_{50}Sn$	121	27.5h	0.014	0.383	100	0.128
$_{55}Cs$	136	13d	6×10^{-3} [a]	0.35	100	0.12
$_{54}Xe$	133	5.270d	6.5	0.345	100	0.115

TABLE 6. (concluded)

Nuclide	Mass Number	Half-life	Yield (%)	Beta Energy (Mev)	Disintegrations (%)	Average Beta Energy (Mev)
$_{58}Ce$ ($_{59}Pr^{144}$)	144	282d	6.1	0.300 0.170	70 30	0.087
$_{44}Tc$	99	2.12×10^5y	6.1	0.290	100	0.097
$_{37}Rb$	87	6.2×10^{10}y	2.7	0.275	100	0.092
$_{63}Eu$	155	1.7y	0.031	0.252 0.152	16 84	0.056
$_{61}Pm$	147	2.6y	2.6	0.223	100	0.074
$_{52}Te$	132	77h	4.4	0.22	100	0.073
$_{55}Cs$	135	3.0×10^6y	6.2	0.21	100	0.07
$_{46}Pd$ ($_{47}Ag^{112}$)	112	21h	0.011	0.2	100	0.07
$_{41}Nb$ ($_{40}Zr^{95}$) ($_{41}Nb^{95m}$)	95	35d	6.4	0.160	100	0.053
$_{34}Se$	79	6.5×10^4y	4×10^{-2}	0.160	100	0.053
$_{53}I$	129	1.72×10^7y	1.0	0.15	100	0.05
$_{62}Sm$	151	73y	0.5	0.076	100	0.025
$_{40}Zr$	93	1.1×10^6y	6.5	0.063	100	0.021
$_{46}Pd$	107	7.5×10^6y	0.2	0.04	100	0.01
$_{44}Ru$ ($_{45}Rh^{106}$)	106	1.0y	0.38	0.0392	100	0.0131