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Table of Total Beta-Disintegration Energies. II.*†

L. J. LIDOFSKY
Columbia University, New York, New York

INTRODUCTION

THE "Table of Total Beta-Disintegration Energies,"[1] which appeared in 1954, has been used widely as a data summary and as a source for evaluating mass differences.[2] Since then, a great deal of new data has appeared in the literature, enough, in fact, to warrant the issuance of this report as a supplement to (I). Information available to the author up to about March 1, 1957, is included.

EXPLANATION OF TABLE I

For the purpose of continuity, the symbols and format used in (I) have been retained. As before, in the case of a complex decay, the Q value is ordinarily evaluated from the single branch which is best known. However, in those cases where several branches have been investigated by coincidence spectrometer methods, each is considered in making the final evaluation. Also, in certain cases where the decay scheme is not well established from the information on beta decay, information on the position of levels from nuclear reactions is used as a guide.

The adopted Q value is obtained by weighting the various measurements inversely as the squares of their errors. In those cases where the author did not quote a quantitative error, an estimate of the error was made. The estimates employed were in general based on criteria similar to those indicated in (I). However, in cases where there were indications of the accuracy of the experiment, errors were estimated in accord with those indications.

ACKNOWLEDGMENTS

The author wishes to acknowledge the invaluable assistance afforded by several data summaries and reviews which have appeared in the literature since 1954. These publications offered a check on the completeness of abstracting and, in addition, provided access to certain data not otherwise available to the author. Among these publications are

(i) The nuclear data summaries of Nuclear Science Abstracts which appear annually as No. 24-B of the volume for that year.

(ii) Way, King, McGinnis, and van Lieshout, "Nuclear level schemes," TID-5300 (U. S. Atomic Energy Commission, September, 1955).

(iii) F. Ajzenberg-Selove, " 'Classical' nuclear physics in the USSR," Nuovo cimento Suppl. 4, 2 (1956).

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[1] R. W. King, Revs. Modern Phys. **26**, 327 (1954), hereinafter referred to as (I).

[2] A. H. Wapstra, Physica **21**, 367 (1955); Physica **21**, 385 (1955). J. R. Huizenga, Physica **21**, 410 (1955). Mattauch, Waldman, Bieri, and Everling, Z. Naturforsch. **11A**, 525 (1956). Way, King, McGinnis, and van Lieshout, "Nuclear level schemes," TID-5300 (U. S. Atomic Energy Commission, September, 1955).

TABLE I.

DISINTEGRATION	ADOPTED Q		HALF-LIFE	DECAY DATA						COMMENTS
	MEV	ERROR		TYPE	MEV	ERROR	%	METHOD	REF.	
$He_{2\,4} \xrightarrow{6} Li_{3\,3}$ 0^+ 2.9 $\underline{1^+}$	3.50	2	0.80^s	β_0^-	3.50	2		s	56S1	F-K plot linear to 0.250
$C_{6\,5} \xrightarrow{11} B_{5\,6}$ 3/2 3.2 $\underline{3/2^-}$	1.994	6	20.4^m	β_0^+	0.968	8		s	54W1	
$B_{5\,7} \xrightarrow{12} C_{6\,6}$ 1^+ 4.2 0^+	13.43	6	$.018^s$	β_0^-	13.37	20*		scin	56T1	
$B_{5\,8} \xrightarrow{13} C_{6\,7}$ $3/2^-$ $\underline{1/2^-}$	~ 13		$.035^s$	β^-				scin	56N1	β^- with E_{max} ~ E_{max} from B^{12} seen following $Li^7(Li^7,p)B^{13}$
$C_{6\,8} \xrightarrow{14} N_{7\,7}$ $\underline{0^+}$ 9.0 $\underline{1^+}$	0.156	1	$\sim 5600^y$	β_0^-	0.1585 0.156 0.155 0.155 0.157	5 2 1 1 2		s pc s s pc	55P1 54M1 54F1 53W1 53M1	F-K plot linear
$O_{8\,6} \xrightarrow{14} N_{7\,7}$ 0^+ 3.5 0^+ $\underline{1^+}$	5.15	4	72^s	β^+ β_0^+	1.835 1.830 (4.1)	8 * 30 	 ~.6%	s scin 	54G1 54P1 56S2	β^+ decay to 2.3 level in N^{14}
$C_{6\,9} \xrightarrow{15} N_{7\,8}$ $5/2^+$ 3.9 $3/2^-$ 8.2 $\underline{1/2^-}$	9.7	3	2.3^s	β^- β_0^- γ	4.3 9.8 5.3	1* 2* 1*	80% 20% 	scin scin scin	56D1 56D1 56D1	
$O_{8\,7} \xrightarrow{15} N_{7\,8}$ $1/2^-$ 3.9 $\underline{1/2^-}$	2.855	10	124^s	β_0^+	1.837 1.823	10 5		s s	57K1 57K1	
$F_{9\,8} \xrightarrow{17} O_{8\,9}$ $5/2^+$ 3.4 $\underline{5/2^+}$	2.770	6	66^s	β_0^+	1.748	6		s	54W1	
$O_{8\,11} \xrightarrow{19} F_{9\,10}$ $5/2^+$ 5.6 $5/2^+$ $\underline{1/2^+}$	4.7	3	29.4^s	γ	0.200	2		scin	54J1	4.5 β^- to 0.200 level in F^{19} (54J1)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Ne --23--> Na 10 13 11 12 $5/2^+$ $5/2^+$ 5.3 $3/2^+$	4.39	4	38^s	β_0^-	4.39	5	67	scin	57P1	(β 3.95)(γ 0.436) confirm decay scheme (57P1)
				β^-	3.9 3.95	3 5	 32	scin scin	56G1 57P1	
				γ	.436 .440	4 5		scin scin	57P1 56G1	
Ne --24--> Na 10 14 11 13 0^+ 4.4 1^+ 1^+ 4^+	2.45	4	3.38^m	β^-	1.98	5	92	scin	56D2	(β 1.98)(γ 0.472) and (β 1.10)(γ 0.472)(γ 0.878) observed (56D2)
				β^-	1.10	5	8	scin	56D2	
				γ	.472	5		scin	56D2	
				γ	.878	5		scin	56D2	
Na --24--> Mg 11 13 12 12 4^+ 6.1 4^+ 12.7 2^+ 0^+	5.512	5	14.9^h	β^-	1.400	15		s	55D1	
Al --24--> Mg 13 11 12 12 4^+ ? >4.1 0^+	14	1	2.1^s	β^+ ~ 8.5			weak	scin	55G1	β^+ presumably goes to ~4.22 mev state (55G1)
				several γ rays observed				55G1		
Na --25--> Mg 11 14 12 13 $5/2^+$ $1/2^+$ 5.3 $5/2^+$	3.8	2	62^s	β_0^-	4.0 3.8 3.65	2 2 25	65	scin scin a	55M1 54M3 54N1	(β)(γ) confirm ~ 3.8 β^- as ground state transition
				γ other γ's	0.576	10		scin scin	55M1 55M1	
Al --26--> Mg 13 13 12 14 5^+ >14 2^+ 0^+	2.99	10	$\sim 10^{6y}$	β^+	1.13 1.17 1.30 ~1	6* 5 15		scin scin a a	57J1 55L1 55H1 54S1	$(\beta^+)(1.8\gamma)$ and $(\gamma\pm)(1.8\gamma)$ observed (55L1), (55H1). ΔJ = 3, no shape (55L1),(57J1)
				γ	1.84 1.76 1.82 1.9	10* 10* 10 1		scin scin scin scin	57J1 55L1 55H1 54S1	
Mg --27--> Al 12 15 13 14 $1/2^+$ 4.8 $3/2^+$ 4.8 $1/2^+$ $5/2^+$	2.595	10	9.5^m	β_1^-	1.78	1		s	54M2	$(\beta_1)(\gamma_1)$ and $(\beta_2)(\gamma_2)$ (56L1), (54M2)
				β_2	1.592 1.5	22 1		s scin	54D1 54M2	
				γ_1	0.834 0.834	10 8		scin s	56L1 54D1	
				γ_2	1.015 1.015	10 7		scin s	56L1 54D1	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Si $\xrightarrow{27}$ Al 14 13 13 14 5/2$^+$ 3.6 5/2$^+$	4.83	4	4.3^s	β_o^+	3.82	4		scin	55R1	
Mg $\xrightarrow{28}$ Al 12 16 13 15 0$^+$ 4.9 1$^+$ 2$^+$ 2$^+$ 3$^+$	1.837	5	21.4^h	γ_1 γ_2 and other γ's	.0319 1.346	1 1		s s	54S2 54S2	$(\gamma)(\gamma)$ and γ- well crystal summing indicate all γ's previously reported are coincident with 0.032 γ. (54S2)
Al $\xrightarrow{28}$ Si 13 15 14 14 3$^+$ 4.9 2$^+$ 0$^+$	4.65	1		β^- γ	2.75 ~3 1.83 1.76	10 5 2		a a scin scin	54N1 54S2 54N1 54S2	$(\beta)(\gamma)$ observed (54N1), (54S2)
P $\xrightarrow{28}$ Si 15 13 14 14 2, 3$^+$ >4.7 2$^+$ 0$^+$	13.4	4	0.28^s	β^+ γ	10.6 1.79	4 2	50 strong	scin scin	55G1 55G1	other γ's and lower energy β^+ present (55G1)
Al $\xrightarrow{29}$ Si 13 16 14 15 5/2$^+$ 4.9 3/2$^+$ 3/2$^+$ 1/2$^+$	3.95	10	6.6^m	β_1^- β_2^- γ_1 γ_2	1.55 2.65 2.43 2.43 2.42 1.28 1.28 1.31	10* 10* 5* 5* 5* 2* 2* 2*	~25 9	a a scin scin scin scin scin scin	54N2 54N2 56B1 55R2 54N2 56B1 55R2 54N2	(β 1.55)(γ 2.42) and (β 2.65)(γ 1.31) (54N2)
P $\xrightarrow{29}$ Si 15 14 14 15 1/2$^+$ 3.7 1/2$^+$	4.96	1	4.5^s	β_o^+	3.82 3.945	4 5		scin s	55R1 55R2	$(\beta^+)(\gamma)$ studies confirm this as ground state transition (55R1)
P $\xrightarrow{30}$ Si 15 15 14 16 1$^+$ 5.0 0$^+$	4.28	5	2.52^m	β_o^+ No γ	3.24	4		s	56G1 56G1	
S $\xrightarrow{31}$ P 16 15 15 16 1/2$^+$ 3.7 1/2$^+$	5.44	3	2.5^s	β_o^+	4.42	3		scin	55R1	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
P -32-> S 15 17 16 16 1^+ 7.9 0^+	1.706	3	14.3^d	β_0^-	1.704 1.712 1.712 1.700 1.711	10 5 8 5 6		s s s s s	56A1 56P1 56A2 56A2 54D1	
Cl -32-> S 17 15 16 16 1^+ >4.6 $\underline{0^+}$	≥12.8	4	0.35′	β^+	9.5	4	50	scin	56G1	assume β^+ decay to 2.25 level in S^{32}
P -33-> S 15 88 16 17 $1/2^+$ 5.0 $3/2^+$	0.249	2	25d	β^-	0.250 0.249	5 2		s s	54E1 54N3	
A -34-> Cl 18 16 17 17 0^+ 0^+	> 0		$0.2\text{-}2^s$	β^+					55K1	identified by Cl^{34} daughter
S -35-> Cl 16 19 17 18 $\underline{3/2^+}$ 5.0 $\underline{3/2^+}$	0.1670	5	87.1^d	β_0^-	0.165 0.167	5 2		s pc	54F2 54M1	F-K plot linear to 5 kev (54M1)
A -35-> Cl 18 17 17 18 $3/2^+$ 3.8 $\underline{3/2^+}$	5.98	4	1.83^s	β^+	4.96	4	93	s	56K1	weak γ rays (1.19 + 1.73) also reported (56K1)
Cl -36-> S 17 19 16 20 $\underline{2^+}$ 0^+	> 0		$3.1\text{x}10^5y$	ϵ_K			1.7	scin pc s	55D2	From relative intensity of (56J1) and K auger electrons/β-
Cl -36-> A 17 19 18 18 $\underline{2^+}$ 13.5 0^+	0.714	5	$3.1\text{x}10^5y$	β^-	0.714	4		scin	56J1	Shape is fitted by ΔJ = 2,no. (56J)
S -37-> Cl 16 21 17 20 $7/2^-$ 4.3 $5/2^-$ or $7/2^-$ 9.2^1 $\underline{3/2^+}$	4.7	1	5.0^m	β^-	1.6	1^*	90	scin	56M1	10 per cent ~4.7 β also reported (56M1)
				γ	3.1	1^*		scin	56M1	
					3.09	3		scin	56S3	
A -37-> Cl 18 19 17 20 $3/2^+$ 5.1 $\underline{3/2^+}$	0.815	2	34.1^d	continuous γ spectrum						Electron capture
				E_ϵ	0.812 0.814	8 2		s recoil s recoil	55K2 55S1	excess low energy photons supports Glauber-Martin Theory (56S4), (55L2).
				E_γ max	0.820 0.820 0.815	10 10 20		scin scin scin	56S4 55L2 54S3	K Binding energy = 0.003

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
${}_{19}\text{K}_{18} \xrightarrow{37} {}_{18}\text{A}_{19}$ $3/2^{+}$ 3.5 $3/2^{+}$	6.1	1	1.2^{s}	β_0^+	5.1	1*		s	56S5	
${}_{17}\text{Cl}_{22} \xrightarrow{39} {}_{18}\text{A}_{21}$ $3/2^{+}$ 5.6 $3/2^{+}$ $3/2,\ 5/2^{-}$ 8.3^{1} $7/2^{-}$	3.43	2	56^{m}	β_0^- β_1^- γ_1	3.43 1.90 1.520	2 5 	7 85 	s scin$\beta\gamma$ 	56P2 56P2 56P2	$(\beta_1)(\gamma_1)$, and $(\beta_1)(\gamma\ 0.246)(\gamma\ 1.270)$ give good energy match (56P2) $\Delta J = 2$,yes observed for β_0(56P2)
${}_{20}\text{Ca}_{19} \xrightarrow{39} {}_{19}\text{K}_{20}$ $3/2^{+}$ 3.8 $3/2^{+}$	6.6	1	0.95^{s}	β_0^+	5.58	4		scin	55R1	
${}_{17}\text{Cl}_{23} \xrightarrow{40} {}_{18}\text{A}_{22}$ 2^{-} $\geq 9.6^{1}$ 0^{+}	7.5	5	1.4^{m}	β^-	~7.5		weak	scin	56M2	Strong ~3.0 β component is assumed to decay to a (-) parity state at ~4.2 mev (56M2)
${}_{19}\text{K}_{21} \xrightarrow{40} {}_{20}\text{Ca}_{20}$ 4^{-} 18.1 0^{+}	1.33	1	$1.3\text{x}10^{9y}$	β_0^-	1.320	20		scin	55K3	$\Delta J = 4$,yes shape.
${}_{18}\text{A}_{23} \xrightarrow{41} {}_{19}\text{K}_{22}$ $7/2^{-}$ 4.8 $7/2^{-}$ 8.4^{1} $3/2^{+}$	2.49	1	1.78^{h}	β^- γ 	1.199 1.290 1.298	8 5 10	99.1 	s scin scin	56S6 56S6 55K4	~2.48 mev ground state decay spectrum can be fit to $\Delta J = 2$,yes shape (56S6)
${}_{19}\text{K}_{23} \xrightarrow{42} {}_{20}\text{Ca}_{22}$ 2^{-} 7.5 2^{+} 8.4^{1} 0^{+}	3.55	1	12.5^{h}	β_0^- β_1^- γ	3.545 3.560 1.985 1.970 1.530	10 30 10 20 10	82 82 18 18 	s s s$\beta\gamma$ s$\beta\gamma$ s	56P3 54K1 56P3 54K1 56P3	β_0 has $\Delta J = 2$,yes shape (56P3, 54K1)
${}_{21}\text{Sc}_{21} \xrightarrow{42?} {}_{20}\text{Ca}_{22}$ 0^{+} 0^{+}	>4		0.62^{s}	β^+	several mev			scin	55M1	K + α bombardment. Identified by yield.(55M1)
${}_{19}\text{K}_{24} \xrightarrow{43} {}_{20}\text{Ca}_{23}$ $3/2^{+}$ 5.5 $3/2^{+}$ $3/2^{-}$ $5/2^{-}$ 8.8^{1} $7/2^{-}$	1.815	15	22^{h}	β_0^- β_1^-	1.815 0.825	30 10	8 87	s s	57B1 57B1	$(0.371\gamma)(0.614\gamma)$ and $(0.591\gamma)(0.314\gamma)$ indicate state at 0.985 fed by 0.82β (βγ), (57B1) β_0 has $\Delta J = 2$,yes shape (57B1)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Sc -43-> Ca 21 22 20 23 $7/2^-$ 5.0 $\underline{7/2^-}$	2.22	1	3.9^h	β^+_0	1.20	1	79	s	54L1	$(0.82\beta^+)(0.38\gamma)$ gives energy match (54L1)
Sc -44-> Ca 21 23 20 24 2^+, 3^+ 5.3 2^+ 0^+	3.65	1	4.0^h	β^+ γ	1.471 1.159	5 3		s$\beta\gamma$ s	55B1 55B1	
Sc -46-> Ti 21 25 22 24 4^+ 6.2 4^+ 13.1 2^+ 0^+	2.364	5	85^d	β^- γ	1.475 0.892 1.118	6 3 3	.0036	s scin	56W1 56J2 56J2	β^- has $\Delta J = 2$,no shape. (56W1)
Ca -47-> Sc 20 27 21 26 $7/2^-$ 8.5 $7/2^-$	2.00	4	4.7^d	β^-_0	1.94 1.9	2 2	83	s a	56L2 55L3	F-K plot linear. Energy match provided by 0.66 β^- + 1.31γ (56L2, 55L3)
Sc -47-> Ti 21 26 22 25 $7/2^-$ 5.3 $7/2^-$ 6.1 $\underline{5/2^-}$	0.605	5	3.44^d	β^-_0	0.610 0.600 0.596 0.62	5 10 10 3	26 40 36	s s s a	56L2 56G2 55N1 55L4	Energy match by $(0.44\beta)(0.160\gamma)$ (56L2, 56G2, 55N1, 55L4)
V -48-> Ti 23 25 22 26 4^+ ~ 6.2 4^+ 2^+ 0^+	4.02	2	16.1^d	β^+	0.694	6		s	55K5	β^+ decays to 2.32 state in Ti^{48}
Cr -48-> V 24 24 23 25 0^+ ≥ 4.1 1^+ 2^+ 4^+	1.4	2	24^h	γ_1 γ_2 β^+	.116 .118 .305 .307 < 2 per cent		 $\gamma\pm$ γ^+_-	scin scin scin scin scin scin	55V1 55W1 55V1 55W1 55V1 55W1	$(0.12\gamma)(0.31\gamma)$ confirmed (55V1, 55W1) Q value selected on basis of < 2 per cent β^+ and on ft for an allowed transition.
Ca -49-> Sc 20 29 21 28 $3/2^-$ 5.8 $3/2^-$ $7/2^-$	5.08	6	8.8^m	β^- γ	2.12 1.95 2.0 3.07 3.10 3.00	10 5 2 5 3 15	 8.8	a$\beta\gamma$ scin scin scin scin scin	56M3 5601 55M2 56M3 5601 55M2	$(2.1\beta)(3.1\gamma)$ confirmed (56M3)
Sc -49-> Ti 21 28 22 27 $7/2^-$ 5.8 $\underline{7/2^-}$	2.0	1	57.2^m	β^-	1.8 2.05	1 5	 100	a scin	56M3 5601	no γ (5601)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
V —49→ Ti 23 26 22 27	0.62	1	330^d	continuous γ spectrum						K binding energy = 0.0055
7/2$^-$ 6.1 7/2$^-$				E_{max}	0.616	10		scin	56H1	γ spectrum fit by Glauber-Martin theory
					0.612	20		scin	54P2	
Sc —50→ Ti 21 29 22 28	6.3	5	1.7^m	β^- ~ 3.5			1†	scin	55M3	(1.17γ)(1.59γ) observed in crystal summing (55M3).
5$^-$, 4$^-$(?) ≥ 5.1 4$^+$				γ_1	1.17	5	1†	scin	55M3	approximately equal intensities indicate that all radiations may be in cascade.
2$^+$ 0$^+$				γ_2	1.59	10	1†	scin	55M3	
Ti —51→ V 22 29 23 28	2.46	4	5.8^m	β^-	2.3	2	95	aβγ	56J3	F-K plot linear (55B2, 55M4)
3/2$^-$ 3/2$^-$					2.17	4		scin	55S2	(2.2β)(0.3γ) observed (56J3, 55S2, 55B2, 55M4)
4.9 5/2$^-$					2.13	3		scin	55B2	
7/2$^-$					2.13	3		s	55M4	
					2.22	7		scin	53N1	
				γ	0.325	5*		scin	55S2	(1.5β)(0.93γ) gives energy match (55B2, 56J3)
					0.323	2*		scin	55B2	
					0.32	1		scin	55M4	
Cr —51→ V 24 27 23 28	0.750	5	27^d	ε						K binding energy = 0.006
7/2$^-$ 5.4 7/2$^-$				continuous γ spectrum						
				E_γ (max)	0.746	22		scin	56V1	
					0.750	5	93	scin	55B3	
					0.774	50		scin	55C1	
V —52→ Cr 23 29 24 28	4.13	10	3.77^m	β^-	2.73	6		scin	55B4	
2$^+$ 5.5 2$^+$ 0$^+$				γ	1.49	4		scin	55B4	
Mn —52→ Cr 25 27 24 28	4.735	25	5.7^d	β_m^+ see comment						
2$^+$ see comment 2$^+$ 6$^+$ 0$^+$					2.631	15		s	56A1	decay is from metastable 0.39 state in Mn^{52} to 1.47 state in Cr^{52}.
Fe —52→ Mn 26 26 25 27	≥2.22	2	7.8^h	β^+	0.804	10		s	56A1	unobserved low energy γ in Mn^{52} is probable.
0$^+$ 4.7 21^m 2$^+$ 0$^+$										
V —53→ Cr 23 30 24 29	≥2.53	5	1.7^m	β^-	2.53	5		scin	56S7	23^h activity previously assigned here not V^{53} (56S7, 55S3).
? ?				γ	1.00	1	st	scin	56S7	
3/2$^-$					1.29		wk	scin	56S7	β systematics suggest Q ~ 2.5 (54W2)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$Mn_{25\ 28} \xrightarrow{53} Cr_{24\ 29}$ 7/2$^-$ (?) $\underline{3/2^-}$	>0		14c^{y}	k xrays observed					55W2	
$V_{23\ 31} \xrightarrow{54} Cr_{24\ 30}$ (5$^+$) ≳5.3 2$^+$ 0$^+$	≳5.1	2	55^{s}	β^-	3.3	2		scin	56S7	(0.835γ)(0.990γ)(E_γ>1) observed.
				γ_1	0.835	9		scin	56S7	0.835γ more intense than 0.99γ.
				γ_2	0.990	10		scin	56S7	β decay systematics suggest Q ~ 6-7
				γ_3	2.21	4		weak scin	56S7	(54W2)
$Mn_{25\ 29} \xrightarrow{54} Cr_{24\ 30}$ 3$^+$ 6.1 2$^+$ 0$^+$	1.36	2	291^{d}	ϵ						K binding energy .006
				continuous γ-spectrum						
				E_γ max	0.522	20		(x-cont.γ) scin	56J4	
				γ	0.840	7		scin	54M3	
$Mn_{25\ 29} \xrightarrow{54} Fe_{2\ 28}$ 3$^+$ 0$^+$	see comment		291^{d}				~ 10^{-3}	(see comment)		~ 1 mev electrons assigned here previously are probably e^- from 0.84γ (see Mn^{54}---->Cr^{54}). Probable assignment of 3$^+$ to Mn^{54} from aligned nucleus studies (54G2) would suggest β^-/ϵ ~ 10^{-3} for a 1 mev β^- transition. (55T1).
$Cr_{24\ 31} \xrightarrow{55} Mn_{25\ 30}$ 3/2$^-$ 5.1 $\underline{5/2^-}$	2.82	14	3.6^{m}	β^-	~ 2.80	14*		a	54B1	
				noγ			<.01		56H2	
$Fe_{26\ 29} \xrightarrow{55} Mn_{25\ 30}$ 3/2$^-$ $\underline{5/2^-}$	0.220	4	2.9^{y}	ϵ						
				continuous γ spectrum						K binding energy = 0.0071
				$E_{\gamma max}$	0.213	10		scin	56S4	
					0.223	10		scin	54M4	
					0.225	10		scin	54S3	
$Co_{27\ 28} \xrightarrow{55} Fe_{26\ 29}$ 7/2$^-$ 6.4 5/2$^-$,7/2$^-$ 3/2$^-$	3.46	1	18.2^{h}	β^+	1.500	8		s	54C1	(1.03β^+)(1.41γ) gives good energy match (54C1).
				γ	0.935	9*		s	54C1	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$Co_{27\ 29} \xrightarrow{56} Fe_{26\ 30}$ 4^+ 8.5 4^+ 2^+ 0^+	4.610	15	77^d	β^+	1.47	3		s	56K2	Many other γ's present disagreement on presence and nature of lower energy β^+ groups. Decay scheme including spin assignments established by (γ)(γ) studies.
					1.496	15*		s	55H2	
				γ	0.845	8*		scin	56K2	
					0.85	1*		scin	56C1	
					0.845	5*		s	55H2	
				γ_2	1.24	1*		scin	56K2	
					1.20	1*		scin	56C1	
					1.238	5*		s	55H2	
$Ni_{28\ 28} \xrightarrow{56} Co_{27\ 29}$ 0^+ $\underline{4^+}$	> 1.75		6.4^d	γ	1.74	5	wk	scin	55W7	Many lower energy γ's observed. β systematics suggest Q ~ 2.7 (54W2)
$Mn_{25\ 32} \xrightarrow{57} Fe_{26\ 31}$ 5/2, $7/2^-$ ≥ 4.7 $5/2^-$ $1/2^-$, $3/2^-$	2.7	2	1.7^m	β^-	2.6	2		a scin	54C2	Weak γ's present (54C2). Same γ's appear in $Co \xrightarrow{57} Fe^{57}$
				γ_1	0.134	6	str	scin	54C2	
				γ_2	0.117 see comments	4	str	scin	54C2	
$Co_{27\ 30} \xrightarrow{57} Fe_{26\ 31}$ $\underline{7/2^-}$ 6.0 $5/2^-$ $3/2^-$, $1/2^-$	0.57	3	270^d	continuous γ spectrum E_γ max	0.426	30		(x)(cont.γ) scin	56J4	β^+ previously assigned here not Co^{57}. (55M5, 55C2, 55L5, 55M6, 55C3) K binding energy 0.008 decay scheme confirmed by (.123γ)(.014γ)(55M5, 55L5, 55M6).
				γ_1	0.137	2		s	55C2	
					0.1374	2		s	55C3	
					0.13631	3		s	55B5	
				noβ^+ (55M5, 55C2, 55L5)						
				very weak β^+ (impurity?)(55M6, 55C3)						
$Ni_{28\ 29} \xrightarrow{57} Co_{27\ 30}$ $3/2^-$ 5.3 $5/2^-$, $3/2^-$ $\underline{7/2^-}$	3.25	1	36^h	β^+	0.854	9	76	s	56K3	(0.72β^+ + 0.127γ + 1.37γ) confirm Q. (56K3)
				γ	1.363	8		scin	56K3	
					1.39	2*		scin	54M5	
$Co_{27\ 31} \xrightarrow{58} Fe_{26\ 32}$ 2^+ 2^+ 6.6 2^+ 0^+	2.319	6	72^d	β^+	0.485	10		s	55C3	no 0.5γ (56G3, 56F1)
				γ	0.805	8*		scin	56G3	
					0.815	4*		scin	55C3	
				also weak ε branch (56G3, 56F1)						
$Cu_{29\ 30} \xrightarrow{59} Ni_{28\ 31}$ $3/2^-$ $7/2^-$ $3/2^-$	3.7	3	82^s	β_o^+	3.75	10		s	56S8	β_o^+ is ~ what is expected from β-decay systematics (54W2). However (55Y1) reports 1.85 β^+ accompanied by only a weak γ. Weak γ's also reported by (56P4).
					3.4	5		a	55L6	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
Co $\xrightarrow{60}$ Ni 27 33 28 32 5^+ 7.4 4^+ 12.6 2^+ 0^+	3.818	3	5.2^y	β^-	0.309	3		s	54B2	1.48 β^- ($5^+ \rightarrow 2^+$) <u>can</u> be fit with ΔJ = 3; no shape (56W1)
Cu $\xrightarrow{60}$ Ni 29 31 28 32 2^+ 2^+ 2^+ 0^+	6.27	3	24^m	β^+	3.92	3		s	54N4	
Zn $\xrightarrow{60}$ Cu 30 30 29 31 0^+ 2^+	>0		2.1^m	weak γ with $0.5<E_\gamma<3$					56L3	Produced by 52 mev α on Ni 58 but not by 15 mev α. β systematics (54W2) suggest Q ~ 4
Fe $\xrightarrow{61}$ Co 26 35 27 34 5/2, 3/2⁻ 7/2⁻	> 0		5.5^m	β^-, γ					55R4a	β systematics (54W2) suggest Q ~ 3
Co $\xrightarrow{61}$ Ni 27 34 28 33 7/2⁻ 5.2 5/2⁻ 3/2⁻	1.29	4	1.66^h	β^-	1.22 1.3 1.1	4 1* 1*	95	scin a a	56N2 55F1 55N2	no 0.5γ (56N2)
				γ	.069 .066	2* 2*		scin scin	56F2 54N5	
Cu $\xrightarrow{61}$ Ni 29 22 28 23 <u>3/2⁻</u> 5.2 3/2⁻	2.24	1	3.3^h	β^+_o	1.220	15	50	s	56N2	energy match by (0.56 β^+)(0.66γ)(56N2)
Zn $\xrightarrow{61}$ Cu 30 31 29 22 3/2⁻ 5.4 <u>3/2⁻</u>	5.8	3	1.5^m	β^+_o	4.9 4.8	5 3		scin a	55C4 55L3	no strong γ (55C4)
Co $\xrightarrow{62}$ Ni 27 35 28 34 ? ≥5.8 2^+ 0^+	≥3.8	2	14^m	β^-	2.8	2		a	54N6	
				γ	1.17	3*	str	scin	54N6	
Cu $\xrightarrow{62}$ Ni 29 33 28 34 0^+, 1^+ ≥ 5.1 0^+	3.03	1	9.7^m	β^+_o	2.91	1		s	54N6	no γ (55R3)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$_{30}\mathrm{Zn}_{32} \xrightarrow{62} {}_{29}\mathrm{Cu}_{33}$ 0^+ ≥ 4.7 $1^+, 0^+$ $0^+, 1^+$	1.69	5	9.3^h	β^+ γ	0.675 0.0413	10 3		s s	54N6 54N6	β^+ may be 2 spectra of approx. = intensity diff. in end point by ~.04.
$_{30}\mathrm{Zn}_{35} \xrightarrow{65} {}_{29}\mathrm{Cu}_{36}$ $5/2^-$ 8.4 $\underline{3/2^-}$	1.347	1	245^d	β^+	0.325 0.324	2 4		s s	56A2 56A3	
$_{28}\mathrm{Ni}_{38} \xrightarrow{66} {}_{29}\mathrm{Cu}_{37}$ 0^+ 5.7 1^+	0.20	3	55^h	β^-	0.20 ~0.15 ~0.3	3		scin a a	56J5 56K4 55N2	F-K plot linear (56J5); no γ (56J5)
$_{29}\mathrm{Cu}_{37} \xrightarrow{66} {}_{30}\mathrm{Zn}_{36}$ 1^+ 2^+ 5.4 0^+	2.63	1	5.1^m	β_o^-	2.63	3		scin	56J5	Energy match provided by 1.64β + 1.03γ.
$_{31}\mathrm{Ga}_{36} \xrightarrow{67} {}_{30}\mathrm{Zn}_{37}$ $3/2^-$ $5/2-$	≥ 0.88 $\lesssim 1.1$	1	78^h	γ 0.870		10		scin	55R4	Complex γ's consistent decay scheme with highest level in Zn^{67} at 0.87. Upper limit on Q from no β^+ and ft value for ~ 1 per cent ϵ branch to 0.87 state.
$_{32}\mathrm{Ge}_{35} \xrightarrow{67} {}_{31}\mathrm{Ga}_{36}$ $3/2^-, 5/2^-$ ≥ 5.3 $3/2^-$	≥ 3.9	3	19^m	β^+	2.9	3		a	56A4	Recalibration of absorbers with known radiations leads to reinterpretation of previously reported $3.4\beta^+$ as 2.9 β^+. (56A4)
$_{31}\mathrm{Ga}_{37} \xrightarrow{68} {}_{30}\mathrm{Zn}_{38}$ 1^+ 2^+ 0^+	2.91	2	68^m	β_o^+	1.94	5		s	56C2	
$_{32}\mathrm{Ge}_{36} \xrightarrow{68} {}_{31}\mathrm{Ga}_{37}$ 0^+ 1^+	≥ 0 ≤ 1.3		275^d	no β^+ with E > 0.3				s	56C2	β-decay energy systematics (54W2) suggest Q ~ 0.7.
$_{30}\mathrm{Zn}_{39} \xrightarrow{69} {}_{31}\mathrm{Ga}_{38}$ $1/2^-$ 4.4 $\underline{3/2^-}$	0.905	6	52^m	β_o^-	0.85 0.914	4* 5*	100	s	55L7 53S1	simple β^- decay (53S1); no $52^m\gamma$ (55L7)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
As -69-> Ge 33 36 32 37 3/2, 5/2⁻ ≥ 5.5 5/2, 3/2⁻	3.9	3	15^m	β^+	2.9	2*		a	55B6	from J, π assignments to g.s. of As^{69}, Ge^{69}, J seems probable that β^+ is a composite spectrum.
				γ	0.23	1*		scin	55B6	
Ga -70-> Ge 31 39 32 38 1^+ 5.1 0^+	1.65	1	21.1^m	β_o^-	1.65	1	99.2	scin	57B2	
As -70-> Ge 33 37 32 38 $4,5^+$ 6.2 0^+	6.54	10	52^m	β_1^+	2.2 2.45	3 4	33	a s	56A4 55S4	a consideration of states from complex decay of Ga^{70} and additional γ's found by (55B6) support decay scheme and adopted Q.
				β_2^+	1.35	3	67	s	55S4	
Ge -71-> Ga 32 39 31 40 $1/2^-$ 4.3 $\underline{3/2^-}$	0.233	3	12^d	continuous γ-spectrum Eγ max						K binding energy is 0.0111
					0.226	5		scin	56L4	
					0.220	3		scin	55B7	
As -71-> Ge 33 38 32 39 $5/2^-$ 5.7 $3/2^-$, $5/2^-$ $1/2^-$	2.011	8	62^h	β^+	0.815 0.813	10 10	97	s s	55G2 54T1	$(0.8\beta^+)(0.175\gamma)$ observed by 54T1
				γ	0.1750 0.1745	4 4		s s	55G2 54T1	
Ga -72-> Ge 31 41 32 40 3, 4^- 9.0 2^+ 0^+	4.00	2	14.1^h	β^-	3.166	30*	8	s	55J1	Very complex β and γ spectra, but consistent decay scheme and Q are established by βγ and γγ (56K5). [eg. (2.53β)(0.63γ)(0.83γ)]
				γ	0.834	5*		scin	55J1	
				γγ, βγ					56K5	
Se -72-> As 34 38 33 39 0^+ 2^-	≥ .045		8.4^d	γ	0.0451			xγscin	57J2	β-decay energy systematics (54W2) suggest Q ~ 0.2
Se -73-> As 34 39 33 40 $9/2^+$ 5.4 $9/2^+$ $5/2^-$ $3/2^-$	2.75	1	7.1^h	β^+	1.29	1	100	s	56H3	[≯ 1 per cent 1.65 β (56H3, 56A4)] and (γ±)(0.066γ (0.36γ), (56H3) establish decay scheme and Q.
				γ	0.0658	1		s	56H3	
				γ	0.359	1		s	56H3	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$\mathrm{Ga}_{31\ 43} \xrightarrow{74} \mathrm{Ge}_{32\ 42}$ 0^+	≥ 2.6	1	~ 8^m	γ	0.58, 2.3, 2.6			scin	56M2	β-decay energy systematics (54W2) suggest Q ~ 6.
$\mathrm{Ge}_{32\ 43} \xrightarrow{75} \mathrm{As}_{33\ 42}$ $1/2^-$ 5.1 $\underline{3/2^-}$	1.150	15	82^m	β_o^-	1.188	20	87	scin	55S5	(11 per cent 0.919β)(0.265γ) confirm Q. (55S5)
$\mathrm{Se}_{34\ 31} \xrightarrow{75} \mathrm{As}_{33\ 42}$ $\underline{5/2^+}$ $\underline{3/2^-}$	> 0.4		127^d	no ϵ to g. s.					55S5	decay scheme may be established by $\gamma\gamma$ (55S5) and by Σ scin (55L8) with highest state at 0.4.
$\mathrm{As}_{33\ 43} \xrightarrow{76} \mathrm{Se}_{34\ 42}$ 2^- 8.2 2^+ 8.8^1 0^+	2.97	1	26.5^h	β_o^-	2.97 2.965	1 10	 50	s s	56P1 55K2	complex decay. Q confirmed by (2.42β)(0.55γ). (56P1, 55K2). ΔJ = 2; yes shape for β_o (56P1, 55K2)
$\mathrm{Kr}_{36\ 40} \xrightarrow{76} \mathrm{Br}_{35\ 41}$ 0^+ 2^-	≥ 0.4		10^h	no $\gamma\pm$				scin	55T2	other γ's observed (55T2). β decay energy systematics (54W2) suggest Q ~ 1
				γ 0.4				scin	55T2	
$\mathrm{Ge}_{32\ 45} \xrightarrow{77} \mathrm{As}_{33\ 44}$ $1/2^-(52^s)$ $7/2^+$ $3/2^-$	2.74	6	12^h	data from 52^s isomer decay						(2.7β)(0.215γ); no(0.159γ)(0.215γ); no β(0.159γ). (54B3). 0.159 is excitation energy of 52^s state above g. s. of Ge^{77}
				β_o^-	2.90	5	90	scin	55B4	
				β_1^-	~2.7		10	a$\beta\gamma$	54B3	
				γ_1	0.159	3		scin	54B3	
				γ_2	0.215	3		scin	54B3	
$\mathrm{Kr}_{36\ 41} \xrightarrow{77} \mathrm{Br}_{35\ 42}$ $1/2^-$ 5.4 $3/2^-$	2.88	2	1.2^h	β_o^+	1.86	2*	61	s	55T2	complex decay. lower energy β^+ groups and γ's present.
$\mathrm{Kr}_{36\ 43} \xrightarrow{79} \mathrm{Br}_{35\ 44}$ $1/2^-$ 5.5 $3/2^-$	1.619	5	34.5^h	β_o^+	0.598	5		s	54T2	F-K plot is linear for β_o.
				no (0.598β^+)γ					54T2	
$\mathrm{Br}_{35\ 45} \xrightarrow{80} \mathrm{Kr}_{36\ 44}$ 1^+ 5.5 0^+	2.00	1	4.5^h	β_o^-	1.99	1	85	s	56L5	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$_{35}Br_{47} \xrightarrow{82} {}_{36}Kr_{46}$ 5^- 5.1 $4,5^-$ 0^+	3.07	1	35.5^h	β^-	0.460	10		scin	56D2	complex γ cascades. Several investigators give similar decay schemes.
					0.444	1		s	56W2	
					0.435	5		s	56B2	
					0.440	10		s	53L1	
				β^- feeds state which decays by γ cascades.						
				state energy						
					2.620	10*		$\gamma\gamma$scin	56D2	
					2.615*	5*		$\gamma\gamma$scin	56W2	
					2.645*	7*		$\gamma\gamma$scin	56B2	
					2.620	10		Σ scin	54L2	
$_{37}Rb_{46} \xrightarrow{83} {}_{36}Kr_{47}$ $5/2^-$ $3/2^-$ $9/2^+$	> 0.57		~ 90^d	γ	0.525	7		scin	55P2	no 0.8γ or 0.15γ. γ decay is to 1.9^h Kr^{83}
				(K Xray) (0.525γ)					55P2	
$_{35}Br_{49} \xrightarrow{84} {}_{36}Kr_{48}$ $2^-, 1^-$ 7.6 0^+	4.70	5	33^m	β_o^-	4.76	10*	25	scin	57J3	complex decay (3.83β) (0.879γ) confirm Q.
$_{37}Rb_{47} \xrightarrow{84} {}_{36}Kr_{48}$ 2^- 8.5^1 0^+	2.66	2	33.0^d	β_o^+	1.70	10*		scin	55W3	($\gamma\pm$)(γ)/γ indicate β_o is g. s. transition (55W3)
					1.66	2		s	56W4	
$_{37}Rb_{47} \xrightarrow{84} {}_{38}Sr_{46}$ 2^- 9.2^1 0^+	0.91	1	33.0^d	β_o^-	0.91	1	~3	s	56W4	
$_{36}Kr_{49} \xrightarrow{85} {}_{37}Rb_{48}$ $9/2^+$ 8.2^1 $5/2^-$	0.675	7	10.6^y	β_o^-	0.672	7	>99	s	55T2	0.672β^- shows ΔJ = 2, yes shape(55T2). 0.824β + 0.1495γ - 0.305γ from 4.4^h isomeric state gives energy match.
$_{37}Rb_{49} \xrightarrow{86} {}_{38}Sr_{48}$ 2^- 8.4^1 0^+	1.772	5	18.65^d	β_o^-	1.795	15	86	s	56A2	ΔJ = 2, yes shape observed for β_o^- (56A2, 56L5, 56L9, 55K5, 54C1, 54P3, 54M6). s $\beta\gamma$ gives linear F-K Plot and energy match. (1.08γ) (0.71β). (56L5, 55L9, 54C1, 54P3)
					1.760	10	85	s	56L5	
					1.770	10*	85	s	55L9	
					1.767	15*	80	s	55K5	
					1.798	15*		s	54C1	
					1.770	15*	88	s	54P3	
					1.760	15*		s	54M6	
$_{39}Y_{47} \xrightarrow{86} {}_{38}Sr_{48}$? 6.7 0^+	6.01	5	15^h	γ_1	1.93			scin	54H1	Each γ coinc. with all others and with $\gamma\pm$ by Σ scin (54H1). Thus 1.8β^+ + 1.2β^+(51 H 24) feed parent states in cascade.
				γ_2	1.08					
				γ_3	0.635					
				γ_4	0.180					

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Zr -86-> Y 40 46 39 47 0^+ ?	≥ 0.24	]	17^h	ε						
				K x ray				scin	59H1	
				γ	0.241	7*		scin	54H1	
				no β^+				scin	54H1	
Kr -87-> Rb 36 51 37 50 7/2+ 7.5 5/2− 3/2−	4.2	2	78^m	β_1^-	~3.8		≥65	sβγ	55T2	(3.8β)(0.403γ), (3.3β, 0.85γ), and (1.3β)(2.57γ)(.403γ) provide energy match. (55T2)
				γ_1	0.403	4		scin	55T2	
				βγ					55T2	
Rb -87-> Sr 37 50 38 49 3/2− 17.6 9/2+	0.273	4	~5×10^{5y}	β^-	0.250	25		a	54F3	3rd forbidden transition
Y -88-> Sr 39 49 38 50 4− 3− ≥9.0 2+ 0^+	3.45	4	105^d	β^+	0.58	1*	<0.3	s	56S9	$0.83\beta^+$ previously assigned, due to internal pairs from 1.85γ, (56S9)
				γ	1.85	4*		scin	56L6	
					1.85	4*		scin	56S10	
					1.83	4*		scin	55A1	
Rb -89-> Sr 37 52 38 51 3/2− 7.8 5/2+	3.90	10	15^m	β_0^-	3.92	5	7	scin	56O2	complex decay 2.81β(5 per cent) + 1.05γ give energy match
Sr -89-> Y 38 51 39 50 5/2+ 8.3[1] 1/2−	1.463	10	51^d	β_0^-	1.462	5	100	s	55B8	β_0 shows ΔJ = 2;yes shape (55B8)
Nb -89-> Zr 41 48 40 49 9/2+ 6.1 9/2+	3.88	10	1.9^h	β_0^+	2.85	10		scin	55M7	
					2.9	4		a	54D2	
				noγ				scin	55M7	
Y -90-> Zr 39 51 40 50 2− 0^+	2.26	1	65^h	β_0^-	2.275	10		s	56P3	β_0 shows ΔJ = 2;yes shape (56P3, 55J2)
					2.26	2		s	55J2	
Nb -90-> Zr 41 49 40 50 ? 0^+	~6.2		15^h	β^+	1.51	3		scin	56L7	A decay scheme can be set up similar to that of (55T3) incorporating the data of (56L7) but leading to a Q value ~6.2 rather than 6.0 as proposed by (55T3)
					1.7	1		scin	55M8	
					1.500	5	87	s	54O1	
				complex γ spectrum. Various data and decay schemes presented. (56L7, 55M8, 54O1):						

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$_{42}\mathrm{Mo}_{48} \xrightarrow{90} {}_{41}\mathrm{Nb}_{49}$	2.54	10	5.7^h	β^+	1.15	10		scin	55M8	5.7^h Mo^{90} ----> 0.015^s Nb^{90} ----> 24^s Nb^{90} ----> 15^h Nb^{90} (g. s.)
0^+ 5.2 $0^+, 1^+$				γ_1	0.250	2^*		s	55M8	
?				γ_2	0.120	1^*		s	55M8	
$_{38}\mathrm{Sr}_{53} \xrightarrow{91} {}_{39}\mathrm{Y}_{52}$	2.67	1	9.7^h	β_o^-	2.7	3^*	25	a	55H3	
$5/2^+$ 8.2^1 $1/2^-$										
$_{39}\mathrm{Y}_{52} \xrightarrow{91} {}_{40}\mathrm{Zr}_{51}$	1.549	4	57.5^d	β^-	0.36	2^*		$\beta\gamma$a	55K6	confirms and assigns previously reported weak γ. Good energy match to g. s. transition.
$1/2^-$ 8.8 $1/2, 3/2^+$					0.33	1^*		$\beta\gamma$scin	54B4	
8.5^1 $\underline{5/2^+}$				γ	1.190	5^*	0.22	scin	55K6	
					1.22	1^*	0.3	scin	54B4	
$_{41}\mathrm{Nb}_{50} \xrightarrow{91} {}_{40}\mathrm{Zr}_{51}$	$1.1 \leq Q \leq 1.7$		?	ϵ see comment						ϵ observed is from 60^d metastable state. $Q > 1.21 - 0.104$. Absence of β^+ and consideration of the $\Delta J = 2$;no nature of transition sets upper limit on Q (55T4)
$1/2^-$ 60^d				Zr x ray				crit abs	55H4	
$9/2^+$ $1/2, 3/2^+$				No β^+				scin	55H4	
$\underline{5/2^+}$				γ_1	0.104	1^*		s	55H4	
				γ_2	1.21	1^*		scin	55H4	
$_{42}\mathrm{Mo}_{49} \xrightarrow{91} {}_{41}\mathrm{Zr}_{50}$	4.42	4	15.7^m see comment	β_o^+	3.44	3	94	s	56S11	Consideration of (γ, n) thresholds for 66^s and 16^m Mo^{91}, the centrifugal barrier operative in the case of the $9/2^+$ state and the existence of a 0.65γ in the 66^s state assigns 16^m Mo^{91} as the $9/2^+$ ground state. (55A2).
$9/2^+$ 5.6 $9/2^+$					3.32	5^*		a	53K1	
					3.2	3^*		a	49D1	
				no γ			56S11, 55A2, 49D1			
$_{38}\mathrm{Sr}_{54} \xrightarrow{92} {}_{39}\mathrm{Y}_{53}$	1.92	4	2.7^h	β^-	0.545	5	90	scin $\beta\gamma$	57H1	weak 0.44γ, 0.23γ (57H1)
0^+ 4.4 1^+				γ	1.37	5		scin	57H1	
2^-										
$_{39}\mathrm{Y}_{53} \xrightarrow{92} {}_{40}\mathrm{Zr}_{52}$	3.60	5	3.5^h	β_o^-	3.6	2		s	55C5	$\Delta J = 2$;yes shape observed (54A1). γ present (55C5, 54A1). Energy match provided by $(1.3\beta)(1.4\gamma)$ + 0.93γ (55C5)
2^- 8.2^1 0^+					3.60	5^*	77	s	54A1	
$_{41}\mathrm{Nb}_{51} \xrightarrow{92} {}_{40}\mathrm{Zr}_{52}$	$1.84 \leq Q$		10^d	ϵ						
2,3 2^+				γ_1	0.900	10^*		scin	55H4	(γ_1) (γ_2), (γ_2, γ_3) (K x ray) (55H4)
0^+				γ_2	0.934	10^*		scin	55H4	
				γ_3	1.83	2^*		scin	55H4	$\beta^+ < 10^{-4}$ (55H4)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Tc $\xrightarrow{93}$ Mo 43 50 42 51 $9/2^+$ ~4.9 $7/2^+$ $5/2^+$	3.16	3	2.7^h	β_1^+	0.82	1*		s	54L3	(β_1^+) (γ_1) and (β_2^+) (γ_2), (54L3). Relative intensities of groups indicate β^+ transitions are allowed, hence $9/2^+$ for Tc^{93}.
				β_2^+	0.64	2*		s	54L3	
				γ_1	1.35	2*		scin	54L3	
				γ_2	1.50	5*		scin	54L3	
Nb $\xrightarrow{94}$ Mo 41 53 42 52 6^+ 12.1 4^+ 2^+ 0^+	2.13	5	2×10^{4y}	β^-	0.5-0.6			a	55R5	1.65 γ cross over (55R5)
				γ_1	0.726	10*		scin	55R5	
				γ_2	0.903	10*		scin	55R5	
Zr $\xrightarrow{95}$ Nb 40 55 41 54 $5/2^+$ 6.9 $5/2,7/2^+$ >10.2 $9/2^+$	1.122	5	65^d	β_0^-	1.13	4		s	56A2	$0.364\beta + 0.756\gamma$ and 0.9β to 0.235 Nb^{95} state provide energy matches (56A2)
				β_1^-	0.404	8		s	56A2	
				γ_1	0.723 0.722	2 3 *		s s	56A2 55R6	
Nb $\xrightarrow{95}$ Mo 41 54 42 53 $9/2^+$ 5.1 $7/2$, $9/2^+$ $5/2^+$ see comment	0.929	4	35^d	β^-	0.162	5		s	56A2	g. s. J of Mo^{95} has also been reported as 7/2 by (55M9). 5/2 seems more consistent with the absence of a g. s. transition.
				γ	0.764 0.767	2 2		s scin	56A2 56J3	
Ru $\xrightarrow{95}$ Tc 44 51 43 52 $5/2^+$, $7/2^+$ >4.8 $3/2^+$ $7/2^+$ $9/2^+$	2.2 or 2.6	1 1	1.6^h	β^+	1.2	1		a	56S12	observed ϵ/β^+ and γ intensities suggest β^+ is either to g. s. or to level at 0.38. (0.34γ + 0.039 isomeric decay.)
Zr $\xrightarrow{97}$ Nb 40 57 41 56 ? 60^s, $1/2^-$ see comment 7.1 $9/2^+$	2.65 see comment	2	17^h	β^-	1.900	25		s	56S13	Shell model favors $5/2^+$ or $7/2^+$ for Zr^{97}. Data do not rule out possibility of $\Delta J = 2$, yes β transition (i. e. $5/2^+$ assignment). In this case, log $f^1t = 8.5$ and Q ~ 2.6.
				γ	0.746 0.75 0.75	5 1 1		s scin scin	56S13 56N3 55S6	
Nb $\xrightarrow{97}$ Mo 41 56 42 55 $9/2^+$ 5.4 $9/2^+$ $5/2^+$ see comment	1.90	4	74^m	β^-	1.180	25		s	56S13	g. s. J of Mo^{97} has also been reported as 7/2 by (55M9). For this spin, a 1.8β would exist, but might be masked by 1.9β of Zr^{97}
				γ	0.664 0.66 0.67	6 1 1*		s scin scin	56S13 56N3 55S6	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Ru -97-> Tc 44 53 43 54 $5/2^+$ 91^d $1/2^-$ $9/2^+$	≥ 0.41		2.44^d	γ	0.219 0.220 0.2161	4 5* 10*		s scin s	56S13 55A3 55C6	(0.109γ)(.216γ) and x(0.109γ, 0.325γ) indicate level 0.325 above 91^d Tc^{97}. (55C6). Very weak 0.57γ also seen (55C6).
Tc -98-> Ru 43 55 44 54 6^+ ~12 4^+ 2^+ 0^+	1.70	5	$\sim 10^{5y}$	β^- γ_1 γ_2	0.30 0.660 0.65 0.750 0.74	5* 10* 1* 10* 10*		scin scin scin scin scin	55K7 56B3 55K7 56B3 55K7	(0.3β)(0.65γ, 0.74γ). (55K7). (0.66γ)(0.75γ). (56B3). no x (0.65γ , 0.74γ) (55K7).
Rh -98-> Ru 45 53 44 54 2, 3^+ ≥ 4.7 2^+ 0^+	4.35	15	8.7^m	β_1^+ β_2^+ γ $(2.5\beta^+)(0.65\gamma)$	2.5 3.3 0.650 0.650	2 4 10 20		scin a scin scin scin	56K6 55A3 56K6 55A3 56K6	no other γ (56K6). Other γ's with Eγ > 0.7 (55A3)
Pd -98-> Rh 46 52 45 53 0^+ 2, 3^+	> 0		17^m					scin	56K6 55A3	
Mo -99-> Tc 42 57 43 56 $1/2^+$ 7.1 $1/2^-$ $9/2^+$	1.37	1	68^h	β_1^- β_2^- γ_2	1.18 0.80 0.87 0.390 0.372	2* 2* 4* 20 10		s sβγ scin βγ sγβ scin	54L4 54L4 54V1 54L4 54V1	$(\beta_2)(\gamma_2)$ by (54L4, 54V1) provides energy match.
Rh -99-> Ru 45 54 44 55 $7/2^+$, $9/2^+$ 4.9 $\underline{5/2^+}$	2.08 see comment	3	4.7^h	β^+ γ $(0.74\beta^+)(0.355\gamma)$	0.74 0.355	2* 10*	10	scin scin scinβγ	56K6 56K6 56K6	15^d Rh^{99}(?) with (0.35γ)(0.09γ) reported by (56H4, 55F2). Possibly isomeric with 4.7^h Rh^{99}.
Pd -99-> Rh 46 53 45 54 ? >4.8 7/2, $9/2^+$	3.8	1	22^m	β^+ γ_1 γ_2 $(2.0\beta^+)(0.140\gamma, 0.67\gamma)\gamma\gamma$ $(0.14\gamma)(0.67\gamma)$	2.0 0.670 0.140 0.132	1 10* 5* 5*		scin, a scin scin scin scin βγscin	56K6 56K6 56K6 55A3 56K6 56K6	other β^+, other γ present. p.4.7^h Rh^{97}, β decay energy systematics (54W2) suggests Q ~ 3.
Mo -101-> Tc 42 59 43 58 $5/2^+$ 6.0 10^{-3s} 3/2, $5/2^-$ $9/2^+$	2.81	5	14.6^m	β_1^- γ_1 (β_1, γ_1)	2.23 2.20 0.590 0.585	4 6* 10* 10*		scin βγscin scin? scin scin	5701 56M4 56M4 5701 56M4	Complex β and γ spectra. (5701, 56M4). (56M4) suggests a level scheme. $t_{1/2}$ (0.19 state in Tc^{101}) ~ 10^{-3}s. (56M4) 0.19γ is M2 or E3.

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$_{43}$Tc$_{58}$ —101→ $_{44}$Ru$_{57}$	1.63	3	14^m	β_1^-	1.32	3	strong	scin	5701	
$9/2^+$ 4.5 $7/2^+$				β_2^-	1.07	5		scin	5701	
$5/2^+$				γ_1	0.307	10*		scin	5701	
				γ_2	0.545	10*		scin	5701	
					0.540	8		scin	56T2	
				$\beta_1\gamma_1$, $\beta_2\gamma_2$ observed					5701	
$_{45}$Rh$_{56}$ —101→ $_{44}$Ru$_{57}$	> 0.31		see comment	ϵ (> 3y Rh^{101})						identification of Rh^{101} is (?)(56H4) but γ's fit levels seen in Ru^{101}(α,α') (55T5). It may be that these two activities are closely spaced isomers.
$9/2^+$ (?)				γ_1	0.190	5*		scin	56H4	
$5/2^+$				γ_2	0.125	5*		scin	56H4	
				$\gamma_1\gamma_2$ observed					56H4, 56P5	
				ϵ 4.7^d Rh^{101}						
				γ_3	0.312	10			56K6	
				no other γ					56K6	
$_{46}$Pd$_{55}$ —101→ $_{45}$Rh$_{56}$	1.57	4	8.5^h	β_o^+	0.58	4	~ 4	scin,	56K6	complex γ spectrum (56K6)
$7/2^+$(?) ≥ 5.2				no β^+ γ				scin	56K6	
$9/2^+$(?)										
$_{45}$Rh$_{57}$ —102→ $_{44}$Ru$_{58}$	2.28	2	215^d	β_o^+	1.27	2*		s	54K3	β^+ spectrum complex (54K3) (54M7) Mixed β^+, β^- present. Reasonable energy match by 0.76β^+ + 0.474γ, (54M7). All γ are (x)(γ), (55D3).
2^- ? 8.1^1					1.240	20*	75+	s	54M7	
0^+				complex γ's					56A3, 56H4, 55D3, 55B9, 55F2, 54K3, 54M7	
$_{45}$Rh$_{57}$ —102→ $_{46}$Pd$_{56}$	1.13	2	215^d	β_o^-	1.12	2*		s	54K3	Mixed β^+, β^-, present. β^-spectrum complex (54K3), F-K plot linear (54M7) Presence of e^- makes decision on complexity of β^- weak. However, (55D3) reports x(all γ), hence probably all γ in β^+ or ε branch.
2^-? 8.8^1					1.150	20		s	54M7	
0^+										
$_{44}$Ru$_{59}$ —103→ $_{45}$Rh$_{58}$	0.748	5	39.5^d	β^-	0.216	8		s	56S13	(.12β) (0.61γ), (55S7, 55D3) provides good energy match.
? 5.7 $3/2^+$					0.202	2		s	55F3	
56^m $7/2^+$				γ	0.496	4*		s	56S13	
$1/2^-$					0.498	5*		scin	55F3	
					0.495	5*		scin	55S7	
					0.498	4		s	54D3	
				From 56^m Rh^{103} isomer						
				γ	0.038	2		s	56S13	
					0.0402	5		s	55A4	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Pd -103-> Rh 46 57 45 58 5/2, 7/2+ ≥ 5.7,56m 7/2+ 1/2−	0.56	2	17d	ε γ	 0.495 0.498	 5 4		 scin scin	 55S7 55A4	K binding energy = 0.023 ~ 0.5 state fed by L capture only. (55A4)
Ag -103-> Pd 47 56 46 57 9/2+ ≥ 4.3,7/2+, 5/2+	2.3 or 2.9	2 2	59m	β+ γ	1.3 0.554 0.764	2 5* 8*		a s	54H2 53B1	First excited state of Pd is at ~ 0.5 excitation by Rh^{103}(p,n). (54P4).
Tc -104-> Ru 43 61 44 60 ? ≥ 5.2 0+	~4		3.8m	β− γ	~2 >1			a scin	56F3 56F3	Eγ/β ~ indicates Q ~ 4 (56F3) 18m Tc^{104} has Q ~ 5.5, so 3.8m is pro- bably g. s. (56F3).
Rh -104-> Pd 45 59 46 58 1+ 2+ 4.5 0+	2.44	3	44s	β_0^-	2.44	3*		s	55B10	energy match by (1.88β−) (0.556γ) and (0.64β−) (1.24γ), (55B10).
Ag -104-> Pd 47 57 46 58 3+ (?) 5.3 2+ 0+	4.28	1	27m	β+ γ	2.70 0.5562	1 4		s s	55J3 55J3	β+ and γ probably in cascade. F-K plot of β+ straight above endpoint of Cd^{105} β+ contamination (1.7 mev), (55J3).
Cd -104-> Ag 48 68 47 57 ≥ 0.13 3+(?)	≥0.13		59m	ε no β+ γ 0.1342		 1		 s s	 55J3 55J3	p. 27m Ag^{104}. Other lower energy γ assigned to decay present as well as higher energy unassigned γ's, (55J3).
Ru -105-> Rh 44 61 45 60 ? 5.8 ? 1/2− 7/2+	2.008	7	4.5h	β− γ from 45s Rh^{105} isomer γ	1.15 0.728 0.133	2 4 10		s s s	56S13 56S13 56S13	
$_{45}Rh_{60}$ -105-> $_{46}Pd_{59}$ 7/2+ 5.6 5/2+	0.565	3	36.5h	β_0^-	0.560 0.560	15 5	 70	s s	56S13 56L5	0.25β + 0.31γ gives good energy match, (56S13). (0.25β)(0.31γ), (56L5).

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$_{47}Ag_{58} \xrightarrow{105} {}_{46}Pd_{59}$ 1/2 ? 5/2+	≥ 1.1		45^d	ϵ						
				γ_1	0.443 0.446 0.433 0.430	1 4 * 7 9 *	30+	s s scin scin	56H5 55A5 55T6 55M10	γ intensities relative to 0.345γ = 100.
				γ_2	0.654	5	8+	scin	55H5	
				$\gamma_1\gamma_2$				scin	55H5	
$_{45}Rh_{61} \xrightarrow{106} {}_{46}Pd_{60}$ 1+ 5.2 0+	3.54	2	30^s	β_o^-	3.58	4		s	56S14	
$_{44}Ru_{63} \xrightarrow{107} {}_{45}Rh_{62}$ ~ 6.2	≳ 4		4^m	β^-	~4			a	55B11	high energy γ present (55B11)
$_{45}Rh_{62} \xrightarrow{107} {}_{46}Pd_{61}$? ≥ 4.9 5/2+	> 2 or > 1 see comment		see comment	24^m	Rh^{107}					possible Rh^{107} activity $t_{1/2}$ = 2.3^h, β^- ~ 1 and complex γ reported. (55N2). It is more likely that this is from an isomer of Rh^{107} than from Rh^{106}.
				β_1^-	1.15	10*	~100	a	55B11	
				β_2^-	~2		weak	a	55B11	
				complex γ spectrum				scin	55B11 55N2	
$_{49}In_{58} \xrightarrow{107} {}_{48}Cd_{59}$ 9/2+ 5/2, 7/2+ ≥ 5.0 7/2, 5/2+	~ 3 or ~ 3.2 see comment		33^m	β^+ ~2				scin	55C7	0.22γ shown to be in coincidence with β^+(energy range 0.8-1 mev.) (55C7).
				γ	0.22	1		scin $\beta\gamma$, scin	55C7	
$_{45}Rh_{63} \xrightarrow{108?} {}_{46}Pd_{62}$ ≥ 5.3 0+	≥ 4		18^s	β^-	4 - 5			a	55B11	not p. 13h Pd^{109} (55B11).Q too high to be any other Pd isotope (54W2)
				complex γ spectrum				a, scin	55B11	
$_{47}Ag_{61} \xrightarrow{108} {}_{48}Cd_{60}$ 1+ 4.6 0+	1.75	5	2.3^m	β_o^-	1.7	1		a	56J6	0.639γ present (56J6)
$_{48}Cd_{61} \xrightarrow{109} {}_{47}Ag_{62}$ 5/2, 7/2+ ~ 4.8 39^s 7/2+ 1/2−	0.16		350^d	ϵ						
				E_ϵ	~ .067 from ϵ_L/ϵ_K		≅0.32	4		
							pc, scin		54B5	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$_{50}Sn_{59} \xrightarrow{109} {}_{49}In_{60}$	≥ 1.1		18^m	β^+				s	55P3	Complex γ (56P6). g. s. spins
$5/2^+$ $9/2^+$				γ_1	0.658	7*		s	56P6	assigned by (56P6). 0.66γ is M4
					0.678	7*		s	55P3	(56P6). Beta decay energy syste-
				γ_2	1.12	10*		s	56P6	matics (54W2) suggest Q ~ 4.
$_{47}Ag_{63} \xrightarrow{110} {}_{48}Cd_{62}$	2.875	15	24^s	β_o^-	2.869	20	100	s	56T3	
1^+ 4.7 0^+					2.7	1		a	56J6	
					2.84	10*		scin	54B6	
				no other γ present				scin	56T3	
				other γ present				scin	56J6, 54B6	
				no $\beta_o\gamma$					56T3	
$_{50}Sn_{60} \xrightarrow{110} {}_{49}In_{61}$	> 0.28	1	4.1^h	γ	0.285	3*		s	55M11	p. 66^m In^{110}. β-decay energy systematics (54W2) suggests Q ~ 0.
0^+										
$_{46}Pd_{66} \xrightarrow{112} {}_{47}Ag_{65}$	0.30	2	21^h	β^-	0.28	2		aβγ	55N3	0.0185γ is not Ag x ray (55N3).
0^+ > 4.3 1^+				γ	0.0185	5		scin	55N3	
2, 1, 0^-				(0.28β)(0.0185γ)			GM,	scin	55N3	
$_{48}Cd_{65} \xrightarrow{113} {}_{49}In_{64}$	0.28	3	≥ 3 x 10^{15y}	from 5.1^y Cd^{113}						
5^y $11/2^-$				γ	0.265	10*	0.1		56D3	~ 0.55 β^- from this state to In^{113}
$1/2^+$ $9/2^+$				γ is E5					56D3	is known, thus establishing Q.
$_{50}Sn_{63} \xrightarrow{113} {}_{49}In_{64}$	0.49	1	118^d	ε						
1/2, $3/2^-$				continuous γ spectrum						K binding energy = 0.028
4.7 1.7^h $1/2^-$				E_γ max	0.07	1*		scin	56J4	ϵ_L/ϵ_K = 0.17±0.12 (56A3)
$9/2^+$				x(continuum γ)				scin	56J4	
				From 1.7^h In^{113} isomer						
				γ	0.393	5		scin	56G4	
$_{49}In_{65} \xrightarrow{114} {}_{48}Cd_{66}$	1.42	3	72^s	β_o^+	0.400	25	.004	scin	56G5	previously reported 0.56γ and 0.72γ
1^+ 5.1 0^+				1.3γ assigned to Sn^{114}					56J7, 56G5	are associated with ε from 50^d In^{114}.
$_{49}In_{65} \xrightarrow{114} {}_{50}Sn_{64}$	1.985	4	72^s	β^-	0.674	40	0.09	scin βγ	56G5	
1^+ ~6 2^+					0.71	5	0.2	scin βγ	56J7	
4.5 0^+				γ	1.30	4	0.09	scin	56G5	
					1.299	2	0.2	s	56J7	
				(0.7β)(1.3γ)				scin βγ	56J7, 56G5	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$_{48}Cd_{67} \xrightarrow{115} {}_{49}In_{66}$ $1/2^+$ 7.1 $4.5^h\ 1/2^-$ $9/2^+$	1.45	1	2.33^d	from $4.5^h\ In^{115}$						
				γ	0.335	1*			55V2	
$_{51}Sb_{65} \xrightarrow{116} {}_{50}Sn_{66}$ 3^+ 4^+ >4.8 2^+ 0^+	4.73	9	15.5^m	β_1^+	2.3	3		a	56A4	
					2.4	3*		scin $\beta\gamma$	55S8	
				β_2^+	1.5	2*		scin $\beta\gamma$	55S8	
				γ_1	1.305	15		scin	55S8	
				γ_2	2.2	1		scin	54A2	
					2.215	20		scin	55S8	
				$(\beta_1)(\gamma_1)$, $(\beta_2)(\gamma_2)$					55S8	
$_{49}In_{68} \xrightarrow{117} {}_{50}Sn_{67}$ $9/2^+$ 4.6 $7/2^+$ $3/2^+$ $1/2^+$	1.462	10	1.1^h	β^-	0.74	1		s	55M12	
				γ_1	0.565	7		s	55M12	
				γ_2	0.161	1		s	55M12	
				also, from $1.9^h\ In^{117}$ isomer						
				β_0^-	1.772	5	55	s	55M12	
				γ_{IT}	0.311	2	22	s	55M12	
$_{51}Sb_{66} \xrightarrow{117} {}_{50}Sn_{67}$ $5/2^+$ $3/2^+$ $1/2^+$	1.70	15	2.8^h	γ	0.161	1		s	55M12	Q is calculated from β^+/ϵ for an allowed β^+ transition (55M12)
				β^+/ϵ	=0.026			scin $(\gamma\ \pm)\gamma$	55M12	
$_{51}Sb_{67} \xrightarrow{118} {}_{50}Sn_{68}$? >6 0^+	>1.7		5.1^h	β^+	0.7				53F1	3.3^m formerly considered g. s. of Sb^{118} is assumed to decay by 0.108γ I. T. To $5.1^h\ Sb^{118}$ (53F1). β-decay energy systematics (54W2) suggest Q ~ 3-4.
				$\beta^+\gamma$					53F1	
$_{51}Sb_{68} \xrightarrow{119} {}_{50}Sn_{69}$ $5/2^+$ 5.1 $3/2^+$ $1/2^+$	0.59	3	39^h	ϵ						K binding energy =0.029; γ is M1(56O4)
				continuous γ spectrum						
				E_{max}	0.534	30		scin	56O3	
				γ	0.02383		3	s	56O4	
$_{53}I_{67} \xrightarrow{120} {}_{52}Te_{68}$ $1,2^-$ >7 0^+	≥ 5		$>1.3^h$	β^+	4.0	2		s	53F1	β-decay energy systematics (54W2) suggest Q ~ 5.
					4.0	2		s	53D1	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
Sb -122-> Sn	1.55	5	2.75^d	β^+			~.01	$\gamma\gamma$(e)	55G3	Q obtained using ϵ/β^+ = 300 ± 120,
51 71 50 72	see comment						<0.1	s	55F4	and ΔJ = 2,yes for β^+ transition.
2^- 2^+				ϵ			3	crit a	55G3	(55G3)
							3.1	pc	55F4	
0^+							2.6	pc	54J2	
				γ	1.152	15	0.75	s	55G3	
					1.137	6	0.73	s	55F4	
					1.10	1*		scin	54C3	
Sb -122-> Te	1.973	5	2.75^d	β_o^-	1.970	5	30	s	55F4	excellent energy match by
51 71 52 70					1.987	20	26	s	55G3	β γ
2^- 2^+					1.97	1	21	s	54M8	1.400 10 + 0.566 4 55F4
2^+					2.00	2*	36	s	54C3	1.423 10 + .563 5 55G3
8.6^1 0^+										1.41 1 + .588 5* 54M8
										1.40 2* + .566 5* 54C3
I -122-> Te	4.14	4	3.5^m	β_o^+	3.12	4		s	54M9	
53 69 52 70				no γ				scin	54M9	
1^+ 4.8 0^+										
Xe -122-> I	> 0.23		19^h	ϵ , K x rays				scin	54M9	β decay energy systematics (54W2)
54 68 53 69				γ	0.182			scin	54M9	suggests Q ~ 0.3.
0^+ 1^+					0.235					
I -123-> Te	> 0.16		13^h	ϵ						β decay energy systematics (54W2)
53 70 52 71				γ	0.160	2*		s	54M9	suggests Q ~ 1.2.
$5/2^+$ $3/2^+$										
$1/2^+$										
Xe -123-> I	2.7	1	1.8^h	β^+	1.7	1*		scin, a	54M9	
54 69 53 70	or									
	2.9	1		γ	0.148	2*		s	54M9	
3/2, $1/2^+$										
≥ 5.1 $5/2^+$										
Sb -124-> Te	2.925	15	54^d	β^-	2.300	10		s	56A2	non unique shape for 2.3 β^-, complex
51 73 52 72					2.39	3*	22	s	55A6	β and γ spectrum. Decay scheme pro-
4^+ 10.3 2^+					2.31	3*	22	s	54M10	viding good energy matches establish-
0^+				γ	0.605	6*		s	56A2	ed.
					0.605	6*		s	55A6	
					0.603	10*		scin	54L5	
Sn -125-> Sb	2.35	2	9.7^d	β_o^-	~ 2.4			scin	56D2	data of 56D2 and 55B12 fit a very
50 75 51 74			see comment		~ 2.4			a	55B12	consistent decay scheme (56D2).
$3/2^+$ 9.5^m				γ	1.41	2*		scin	56D2	Lowest state to which $3/2^+$ 9.5^m
$11/2^-$ $3/2^+$					1.41	2		scin	55B12	Sn^{125} can decay is at 1.41 mev
$7/2^+$				$\beta\gamma$, $\gamma\gamma$				56D2,	55B12	leading to Q ~ 3.4. Hence 9.7^d
9.0^1 $7/2^+$										Sn^{125} is the ground state.

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
Sb -125-> Te	0.757	7	2^y	β^-	0.612	12*	14	s	54M11	0.6β has ΔJ = 2,yes shape (54M11)
51 74 52 73				$\beta\gamma$					54M11	Decay scheme with good energy
$7/2^+$ 8.6^1 58^d $11/2^-$										matches from other β, γ present.
$3/2^+$										Earlier data adjusted for shape to
$1/2^+$										establish Q.
Cs -125-> Xe	3.07	2	45^m	β^+	2.05	2*		s	54M12	
55 70 54 71	or									
	3.18	2		γ	0.112	1*		s	54M12	
$5/2^+$? ≥ 5.1 $3/2^+$				$(\gamma\pm)(0.112\gamma)$				s	54M12	
I -126-> Te	2.14	2	13.3^d	β^+_o	1.110	20	0.96	s	55K8	β^+_o has ΔJ = 2;yes shape (55K8).
53 73 52 74					1.19	4*		$\gamma\pm\gamma$ scin	54P5	Good energy match by $0.46\beta^+$ +
2^- 2^+										0.65γ. Earlier data adjusted for
8.1^1 0^+										shape to establish Q.
I -126-> Xe	1.235	15	13.3^d	β^-_o	1.250	10	5.8	s	55K8	β^-_o has ΔJ = 2;yes shape (55K8).
53 73 54 72				β^-_1	0.865	5	29	βγs	55K8	Earlier data adjusted for shape to
2^- 7.9 2^+				γ_1	0.386	2		s	55K8	establish Q.
8.8^1 0^+					0.382	10*		scin	54P5	
				(0.86β) (0.38γ)					55K8, 54P5	
Cs -126-> Xe	4.8	4	1.6^m	β^+	3.8	4		a,scin	54K4	absence of γ's from known transitions
55 71 54 72				γ	0.385	5		scin	54K4	in Xe^{126}, and presence of 0.385γ is
1^+ ≥ 4.8 0^+				no other γ (< 10 per cent)				scin	54K4	puzzling.
				no β^+ (0.385)				scin	54K4	
Ba -126-> Cs	> 0.7		96^m	no β^+ (?)				scin	54K4	0.9 ?γ and (0.7γ)(0.2γ) ?(54K4).
56 70 55 71				γ	0.700	30	33+	scin	54K4	β-decay energy systematics (54W2)
0^+ 1^+?					0.225	10	100^+			suggest Q ~ 1.
Sb -127-> Te	1.64	2	93^h	β^-_o	1.57	3	30	scin	56D4	The allowed character of Te^{127}
51 76 52 74	see comment			β^-_1	1.11	3	20	βγscin	56D4	β^- decay considered together with
$7/2^+$ 9.8^1 113^d $11/2^-$				β^-_2	0.86	2	50	βγscin	56D4	the high ft value for β^-_o of Sb^{127}
$3/2^+$				γ_1	0.456	4		scin	56D4	suggests that g. s. of Te^{127} is
				γ_2	0.674	5		scin	56D4	$3/2^+$ and β^-_o goes to $11/2^-$ 113^d
				$\beta_1\gamma_1$, $\beta_2\gamma_2$				scin	56D4	Te^{127} isomer.

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$_{52}\mathrm{Te}_{75} \xrightarrow{127} {}_{53}\mathrm{I}_{74}$ $3/2^+$ 5.5 $5/2^+$	0.690	7	9.4^h	β^-_o	0.695 0.72 0.683	10 5 10	99	s s scin	56K7 56K8 55D4	(56K7) reports weak (~ 1 per cent) γ spectrum
$_{54}\mathrm{Xe}_{73} \xrightarrow{127} {}_{53}\mathrm{I}_{74}$ $3/2^+$ $5/2^+$	> 0.37 Q < 1.3		36.4^d	ϵ , no $\gamma\pm$ γ	 0.368	 7*		scin scin	55M26 55M26	several other γ's present. $\gamma\gamma$ studies place highest level in I^{127} at 0.368. β decay energy systematics (54M26) suggest Q ~ 0.8. Upper limit set by absence of β^+.
$_{55}\mathrm{Cs}_{72} \xrightarrow{127} {}_{54}\mathrm{Xe}_{73}$ $5/2^+$ $5/2^+$ > 5.3 $3/2^+$	2.09	2	6.25^h	β^+_o	1.063	11*		s	54M12	approximate energy match from 0.68β^+ + 0.4γ (54M12).
$_{53}\mathrm{I}_{75} \xrightarrow{128} {}_{52}\mathrm{Te}_{76}$ 1^+ 0^+	> 0.75		25^m	γ $\epsilon/\beta+\epsilon$	0.750 =0.069	10*		xγscin pc,scin	56B4 56B4	$\epsilon_{exc\ st}/\epsilon_{g.s.}$ = 1/19 (56B4). β decay energy systematics suggest Q ~ 1.3.
$_{53}\mathrm{I}_{75} \xrightarrow{128} {}_{54}\mathrm{Xe}_{74}$ 1^+ 6.6 0^+	2.12	1	25^m	β^-_o	2.120	10	76	s	56B4	1.665β+ 0.455β give good energy match. (56B4)
$_{55}\mathrm{Cs}_{73} \xrightarrow{128} {}_{54}\mathrm{I}_{74}$ 1^+ > 4.7 0^+	4.0	1	3.8^m	β^+_o	3.0 ~2.9	1*	70	s a	55H5 55M13	lower β^+ groups and γ's present (55H5).
$_{56}\mathrm{Ba}_{72} \xrightarrow{128} {}_{55}\mathrm{Cs}_{73}$ 0^+ (?) 1^+	> 0.27		2.4^d	ϵ γ	 0.270	 3*		 s	 55H5	β decay energy systematics (54W2) suggest Q > 0.
$_{51}\mathrm{Sb}_{78} \xrightarrow{129} {}_{52}\mathrm{Te}_{77}$ $7/2^+$ 7.4 ? $11/2^-$ $3/2^+$	$\geq$ 1.98	5	4.6^h	β^-	1.87	5	20	scin	56D4	several γ present, also lower energy β^-. (56D4). β decay energy systematics (54W2) suggest Q ~ 3.
$_{52}\mathrm{Te}_{77} \xrightarrow{129} {}_{53}\mathrm{I}_{76}$ $3/2^+$ 5.9 $5/2^+$ $7/2^+$	1.481	5	74^m	β^- γ $\beta\gamma$, $\gamma\gamma$	1.453 1.46 0.0268 ~0.035	5 1 5*	71 80	s scin s scin	56G6 55D4 56G6 55D4 55D4	decay scheme established with good energy matches.

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	%	METHOD	REF.	COMMENTS
$Cs_{55\ 74} \xrightarrow{129} Xe_{54\ 75}$ 7/2+ 1/2+	> 0.59		31^h	γ	0.55 0.585	3 20		scin scin	55R7 55N2	other γ's present (55R7, 55N2). β-decay energy systematics suggest Q ~ 1.4 (54W2).
$Sb_{51\ 79} \xrightarrow{130} Te_{52\ 78}$ 6.2 0+	≥ 2.9	3	10^m	β^-	2.9	2*		a	55F5	
$Te_{52\ 79} \xrightarrow{131} I_{53\ 78}$ 3/2+ 6.2 5/2+ 7/2+	2.29	5	25^m	β^- γ 0.145γ/β ~ 1	2.14 0.145	5* 10	60	s scin GM	55H6 55M14 55M14	very complex decay makes energy determinations difficult. Decay scheme with fair energy matches (55H6).
$Cs_{55\ 76} \xrightarrow{131} Xe_{54\ 77}$ 5/2+ 5.5 3/2+	0.354	5	10^d	ε continuous γ spectrum $E_\gamma$max	 0.320 0.320	 10 10*		 scin scin	 56H6 56M5	K binding energy = 0.0345
$Ba_{56\ 75} \xrightarrow{131} Cs_{55\ 76}$ 1/2+ 5/2+	≥ 1.05	2	11.5^d	ε γ	 1.032 1.050 1.030 1.09	 15 15* 15* 15*	 3+ 4+ (?)	 scin scin scin scin	 56B4 56G7 56V2 55L8	other γ's present, but γγ studies lead to decay scheme with highest level at ~ 1.0 (56B4, 56V2). 1.0γ intensities relative to 0.496γ =100 β decay energy systematics (54W2) suggest Q ~ 1.7.
$I_{53\ 79} \xrightarrow{132} Xe_{54\ 78}$ 4, 5⁻ 6.3 4+ 2+ 0+	3.56	3	2.4^h	β^- γ βγ, γγ	2.12 0.777 0.673	3* 8* 4*	18	s scin s	54F4 54F4 54F4 54F4	complex β and γ. Decay scheme consistent with coincidence and intensity data provides energy matches (54F4).
$Cs_{55\ 77} \xrightarrow{132} Xe_{54\ 76}$ 2 2+ 0+	> 0.67		6.2^d	ε γ < 20 per cent ε to g. s. xγ/γ	 0.669			 scin	 55R8 55R8	weak 1.10γ, 1.26γ (55F8). However these γ's not seen in I^{132} decay. β decay energy systematics (54W2) suggest Q ~ 2.
$Ba_{56\ 77} \xrightarrow{133} Cs_{55\ 78}$ 1/2+ 1/2+ 7/2+	0.48	4	10^y	ε ϵ_L/ϵ_K to 0.44 level ≥ 9					 56L4	Intensity of K x ray due to K internal conversion only. (56L4) ϵ_L/ϵ_K implies E_ϵ ~0.04 (56L4)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
Cs -134-> Ba 55 79 56 78 4^+ 8.9 4^+ 0^+	2.055	3	2.3^y	β^-	0.650 0.655 0.645	5 2 10	56 50	s s s	55F6 55K9 55B13	extremely complicated decay. (4-5 β groups, ~ 10-12 γ rays) Disagreement on details of decay scheme. In general there is agreement that 0.65β goes to state at ~ 1.4 mev.
				γ_1	0.604	1	weighted average of seven spectrometer measurements			
				γ_2	0.796	1				
				56J2, 55F6, 55B13, 55K9, 54V2, 54J3, 54B7.						
Pr -135-> Ce 59 76 58 77 $5/2^+$ > 5.1 $3/2^+$	≥ 3.5	1	22^m	β^+	2.5	1		a, scin	54H3	several γ (0.08 - 0.3) present, (54H3)
Cs -136-> Ba 55 81 56 80 ? 8.0 0^+	2.85	1	12.9^d	β_1^-	0.657	3	7.4	s	54O2	complex γ spectrum. $\gamma\gamma$ and γ intensities allow construction of consistent decay scheme. Energy match by $0.341\beta + 0.153\gamma + 0.162\gamma$ to 2.2 level. (54O2)
				γ_1	1.041	5		scin, s	54O2	
				γ_2	0.822	2		scin, s	54O2	
				γ_3	0.335	2		scin, s	54O2	
				$\gamma\gamma$				scin	54O2	
Pr -136-> Ce 59 77 58 78 1^+ ≥ 5.2 0^+	≥ 3.0	1	70^m	β^+	2.0	1		a, scin	54H3	(0.17-1.1?) γ present (54H3)
Xe -137-> Cs 54 83 55 82 $7/2^-$, $9/2^-$ ≥6.2 $7/2^+$	≥ 3.5	3	3.9^m	β^-	3.5	3*		a	55N4	
				γ					55N4	
La -137-> Ba 57 80 56 81 $7/2^+$ >10 $3/2^+$	> 0.04		6×10^{4y}	ϵ, Ba K x ray				pc, crit a	56B5	
Ce -137-> La 58 79 57 80 $11/2^-$ 35^h $3/2^+$ $1/2^+$ $5/2^+$ $7/2^+$	> 0.45 Q < 0.75		8.7^h	ϵ, La K x ray				pc, crit a	56B5 56D5	35^h Ce^{137} is $11/2^-$ isomer of 8.7^h $3/2^+$ Ce^{137} g. s. (56D5, 55B14). Upper limit on Q from ft value for ϵ_K branches.
				γ	0.445 0.440	5* 5*	3 2.3	scin scin	56B5 56D5	
Pr -137-> Ce 59 78 58 79 $5/2^+$ 5.8 $3/2^+$	2.8	2	1.5^h see comment	β_o^+	1.8	2*			56D5	(54H3) report no 1.4^h Pr^{137} activity. Theoretical β^+/ϵ ~ 0.5.
				no γ, β^+/ϵ	~ 0.2				56D5	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF	COMMENTS
Xe $\xrightarrow{138}$ Cs 54 84 55 83 0^+ > 6.2 3^-	2.4 or 3.7	3 3	17^m	β^- $E\gamma/\beta$ = 1.3	2.4				55N4 55N4	
Cs $\xrightarrow{138}$ Ba 55 83 56 82 3^- 7.7 2^+ 0^+	4.83	5	32^m	γ	1.426 1.44	5 2		scin scin	56B6 55T2	complex γ spectrum. Establish consistent decay scheme by $\gamma\gamma$ (56B6) with 3.4β ~ 20 per cent.
La $\xrightarrow{138}$ Ba 57 81 56 82 $\underline{5^-}$ 16.9 2^+ 0^+	1.59 see comment	3	~ 10^{11}y	γ (x) (1.4γ) K x ray / gm / sec.	1.44 1.43 see Cs $\xrightarrow{138}$ Ba 0.145 0.23	2* 1 10		scin scin scin	57G1 56T4 57G1 56T4 56T4 54S4	Calculate ϵ_L/ϵ_K =1.4(from K x ray/γ and assuming flourescent yield = 0.85) implies E_ϵ = 0.16 3 (56T4). Assumed ΔJ = 3,<u>no</u>.
La $\xrightarrow{138}$ Ce 57 81 58 80 5^- 19.0 2^+ 0^+	1.02	2	10^{11}y	β^- γ	0.205 0.81 0.81	20* 1* 1*	100	scin scin scin	57G1 57G1 56T4	
Pr $\xrightarrow{138}$ Ce 59 79 58 80 3, 5^+ ≥ 5.4 4^+ 2^+ 0^+	3.2 or 4.3	1 1	2.0^h	β^+ γ	1.4 0.30 0.80 1.05 1.4 1.7	1 1* 1* 2* 1 weak* 1 weak*		a, scin scin scin scin scin scin	54H3 54H3 54H3 54H3 54H3 54H3	0.8γ corresponds to 2^+ state in Ce^{138} (see above). Intensities of γ's suggest 1.05γ and 0.8γ may be in cascade.
Cs $\xrightarrow{132}$ Ba 55 82 56 83 7/2, $5/2^+$ ≥ 6.3 $7/2^-$	3.17	15	10^m	β_0^-	3.17	15*		a	54F5	
Ba $\xrightarrow{132}$ La 56 83 57 82 $7/2^-$ 6.8 $5/2^+$ 7.4 $\underline{7/2^+}$	2.39	2	85^m	β_0^- β_1^- γ (2.23β)(0.163γ)	2.38 2.23 0.163 0.165	3* 2* 2* 5*	15 66	s s s scin	54M13 54M13 54M13 54N7 54M13	other β, γ present (54M13).
Ce $\xrightarrow{132}$ La 58 81 57 82 $3/2^+$ 5.8 $5/2^+$ $\underline{7/2^+}$	0.27	1	140^d	γ ϵ_L/ϵ_K = 1.37 E_ϵ < 0.147 (ϵ_L/ϵ_K) E_ϵ ~0.104	0.1665	10* 2 6		s $\gamma\gamma$, xγ, xx ϵ_L/ϵ_K	54P6 56K9 54P6 56K9	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Pr -132-> Ce 59 80 58 81 5/2+ 5.5 3/2+	2.0	1	4.5^h	β^+_o	1.0	1		a, scin	54H3	weak γ present (54H3)
La -140-> Ce 57 83 58 82 3, 4− 9.1 2+ 0+	3.78	3	40.2^h	β^-	2.20	2	8	s	56A2	very complex decay, but γγ studies permit consistent decay scheme. (56K10, 55C8, 55B15, 55B16).
				γ	1.601	10		s	56A2	
					1.60	20*		scin	55B15	
					1.597	10*		s	55C8	
Ce -141-> Pr 58 83 59 82 7/2− 7.1 7/2+ 7.8 5/2+	0.577	2	33^d	β^-_o	0.574	3	25	s	55J4	β_o, β_1, F-K plot linear (55J4).
				β^-_1	0.432	2	75	βγs	55J4	
				γ_1	0.1416	3		s	56M6	
					0.1449	7		s	55J4	
				$(\beta)(\gamma_1)$					55J4	
Pr -142-> Nd 59 83 60 82 2− 7.1 2+ 9.2^1 0+	2.160	15	19.2^h	β^-_o	2.12	10	97.2	a	55S9	β_o has ΔJ = 2,yes shape (54P3). Energy match by (0.6β)(1.6γ), (55S9, 54P3).
					2.166	6	93	s	54P3	
				γ	1.61	2		scin	55S9	
					1.572	5*		s	54P3	
				βγ				55S9, 54P3		
Ce -143-> Pr 58 85 59 84 9/2− 7.8 7/2+ 5/2+	1.544	5	33.4^h	β^-	1.40	2	37	s	56M6	complex decay, βγ + γγ studies establish decay scheme with good energy matches. (56M6).
				γ	0.0574	2		s	56M6	
				(1.4β)(0.06γ), βγ, γγ				scin	56M6	
Pr -143-> Nd 59 84 60 83 5/2+ 7.6 7/2−	0.929	5	14^d	β^-_o	0.93	1		s	56M6	
				no γ		< 0.1 per cent		scin	55S6	
Sm -143-> Pm 62 81 61 82 3/2+ 5.2 5/2+	3.5	2	9^m	β^+_o	2.6	3*		a	56S15	
					2.3	3		a	56M7	
				noγ	(E_γ > 0.15)			scin	56M7	
Ce -144-> Pr 58 86 59 85 0+ 6.5 0−	0.308	4	290^d	β^-_o	0.320	3*	60	s	57H2	Good energy match by ~ 0.17β +~0.14γ (57H2, 56P7, 54C4).
					0.309	5	76	s	56P7	
					0.327	7	75	s	54C4	
Pr -144-> Nd 59 85 60 84 0− 6.5 0+	3.03	4	17.5^m	β^-_o	3.15	6*	99	s	57H2	some indication of non linear F-K plot (due to 0^- ---> 0^+ nature of transition with possible T-P interference?)(56L8).
					2.99	6*	99	s	56L8	
					3.12	6*	99	s	54C4	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$Sm \xrightarrow{145} Pm$; 62 83 → 61 84	> 0.1		~ 1^y	Pm K x ray					57C1	
$7/2^-$, $9/2^-$ $5/2^+$, $7/2^+$				γ	0.0613			(K x ray)γ	57C1	
$5/2^+$, $7/2^+$				no $\gamma^\pm$, α					57C1	
$Nd \xrightarrow{147} Pm$; 60 87 → 61 86	0.911	7	11.6^d	β^-	0.818	7		s	56E1	
$\underline{9/2^-}$ 7.6 $7/2^+$				γ	0.09071 0.092	1 5		crys scin	56K11 55H7	
$5/2^+$				$(0.818\beta)(0.091\gamma)$				$\beta\gamma$s	56E1	
$Pm \xrightarrow{149} Sm$; 61 88 → 62 87	1.34?	1	50^h	β^-	0.97	5^*		s	54F6	With shell model assignment of $5/2^+$ to Pm^{149} it is difficult to explain the absence of a g. s. β^- transition.
$5/2^+$ 7.0 ?				γ	0.285	5^*		scin	54F6	
$\underline{7/2^-}$										
$Pm \xrightarrow{150} Sm$; 61 89 → 62 88	5.3	1	2.7^h	β^-	3.00	5	20	s	54F6	Complex γ. Level scheme constructed in accordance with $\gamma\gamma$(54F6). Level scheme for Sm^{150} from $Sm^{149}(n, \gamma)$ in excellent agreement and has state at 2.30(55A7).
5, 6^- 8.2 ?				$\gamma\gamma$				scin	54F6	
0^+				$3.0\beta^-$ decay is to level at 2.3		1		$\gamma\gamma$	54F6	
$Pm \xrightarrow{151} Sm$; 61 90 → 62 89	1.44	10	28^h	γ	0.335	10^*		scin	55H7	Complex γ. Constructs decay scheme by $\gamma\gamma$ with $(1.1\beta)(0.3\gamma)$ for decay energy. (55H7)
$5/2^+$?> 6.9 $7/2^-$?				$\gamma\gamma$					55H7	
$9/2^-$?										
$Eu \xrightarrow{152} Sm$; 63 89 → 62 90	> 1.58	2	12.7^y	ϵ						
4, 5^+ ?				γ_1	0.122 0.12231	1^* 4	59 9	s crys	56G8 56A5	Complex γ spectrum. Construct decay scheme by $\gamma\gamma$ and intensity arguments. Highest established level decays by $\gamma_1 + \gamma_2 + \gamma_3$ (56G8).
2^+				γ_2	0.244 0.24464	2^* 8		s crys	56G8 56A5	
0^+				γ_3 $\gamma\gamma$	1.210	20^*		scin	56G8 56G8, 54S5	
$Eu \xrightarrow{152} Gd$; 63 89 → 64 88	1.80	2	12.7^y	β^-	1.460	14^*	13	s	56G8	Complex decay. Construct consistent decay scheme by $\beta\gamma$ and $\gamma\gamma$ arguments. Energy match provided by 1.0β + 0.41γ (56G8); 0.7β(54S5) + 0.78γ. No report of non linear F-K plot for 1.46β.
4, 5^+				γ	0.344 0.34434	3^* 23		s crys	56G8 56A5	
11.9 2^+				$(1.46\beta)(0.34\gamma)$ $\gamma\gamma$, $\beta\gamma$				scin	56G8 56G8, 54S5	
0^+										

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$Sm \xrightarrow{153} Eu$	0.803	5	47^h	β_0^-	0.825	25*	27	scin	56D6	Levels seen in coulomb excitation not in agreement with those seen in β decay. Complex decay. Consistent decay scheme with good energy matches possible.
62 91 → 63 90					0.820	10	40	s	55M15	
$7/2^-$ 6.8 $7/2^+$				β_1^-	0.720	15	40	sβγ	55M15	
6.9 $5/2^+$				γ_1	0.10327	2		crys	56A5	
					0.100	10*		scin	56D6	
					0.103	2*		s	55M15	
				(0.72β)(0.10γ)					55M15	
$Gd \xrightarrow{153} Eu$	0.21	2	236^d	ε						
64 89 → 63 90				γ	0.103	1*		s	56M8	
$7/2^-$ 7.2 $7/2^+$					0.100	4*		scin	56B7	
$5/2^+$					0.104	5*		scin	56B8	
					0.1031	5		s	54C5	
				from ϵ_L/ϵ_K estimate Q						
				Q	~0.22 (<0.23)				56M8	
					0.20				56B7	
					0.187				56B8	
					0.225				56B9	
$Eu \xrightarrow{154} Sm$	see comment		16^y							1.17γ assigned here because it is associated with Eu^{154} and does not fit the decay scheme of the Eu^{154} β^- branch (54S5).
63 91 → 62 92										
$8^\pm$? 2^+										
0^+										
$Eu \xrightarrow{154} Gd$	2.99	5	16^y	β^-	1.45	5		s	54S5	Spin 6 for 1.54 state of Gd^{154} on basis of (1.42γ)(0.123γ)(Θ) (56H7) and lifetime of state (54S5).
63 91 → 64 90					1.575	150		s	48S1	
$8^\mp$? ≥10 6^+				γ_1	1.415	30*		scin	54S5	
2^+				γ_2	0.12354	9		crys	56A5	
0^+					0.1234	5		s	54C5	
				(1.4γ)(0.12γ)					56H7, 54S5	
$Eu \xrightarrow{155} Gd$	0.247	3	1.7^y	β_0^-	0.240	10	21	scin	56D6	0.15β + 0.102γ provide fair energy match. No(0.24β)γ (56D6). g. s. spin has been reported as $3/2^+$(56S16) and ≥ $5/2^+$ (54M14). The decay data makes no choice between $3/2^+$, $5/2^+$, $7/2^+$.
63 92 → 64 91										
$5/2^+$ 8.2 see comment										
$Eu \xrightarrow{156} Gd$	2.54	5	15.4^d	β^-	2.45	5		s	56B10	decay scheme shows 2.45β to 0.09 state in Gd^{156}. (56B10)
63 93 → 64 92				γ	0.08897	1		crys	56B10	
9.1 2^+										
0^+										

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$Tb \xrightarrow{156} Gd$ 65 91 64 92 0^+	see comment		5^h	no $\gamma^\pm$ no Gd X ray 5.2^d Tb Gd X ray, no $\gamma^\pm$				scin pc pc	55H8 55H8 55H8	5^h Tb^{156} is assigned as g. s. see comments in β^- decay. Severe disagreement with previous data.
$Tb \xrightarrow{156} Dy$ 65 91 66 90 > 5.4 0^+	see comment		5^h	β^- e^- and Dy L x ray no hard γ	0.14	1*		a pc a	55H8 55H8 55H8	5.2^d Tb decays by ϵ, $0.6\beta^-$ and hardγ. Hence 5^h is g. s. β^-/ϵ very small (55H8).
$Gd \xrightarrow{152} Tb$ 64 95 65 94 $3/2^-$ >6.4 $3/2^+$	0.948	10	18^h	β_o^- $\beta\gamma$, $\gamma\gamma$	0.948	10	76	s	55M16 55B17, 55M16	$(0.6\beta)(0.36\gamma)$ provides good energy match to β_o (55M16). No $(0.36\gamma)(0.05\gamma)$ thus indicates β_o is the g. s. transition.
$Tb \xrightarrow{160} Dy$ 65 95 66 94 ? 8.7 ? 11.9 2^+ 0^+	1.82	1	73^d	β_1^- β_2^- γ_1 $\beta\gamma$, $\gamma\gamma$	~1.700 1.711 0.861 0.851 0.0880	 7 2 10 5	 0.3 35 30	 s s s s	57C1 56B11 56B11 54K5 56B11 56B11	Very complex decay. (56B11, 54K5) have constructed decay schemes incorporating most of the well known data.
$Tb \xrightarrow{161} Dy$ 65 96 66 95 ? 7.1 ? $5/2^-$	0.562 or 0.596 see comment	10 4	7.15^d	β^- $\gamma\gamma$ $\beta\gamma$	0.571 0.531 0.550 56S17, 56C3, 56B12, 56B13, 55B17.	4 10 10	14 6	s s s	56S17 56C3 55B17 56B12, 55B17	Complex β spectrum makes analysis open to wide error. Several decay schemes proposed. A level scheme with excellent energy matches between γ rays (56C3) is fit very closely by the β groups from the most careful β spectrum analysis (56S17), if it is assumed that $0.57\beta^-$ goes to 0.026 level in Dy^{161}. Under these conditions g. s. spin of Dy^{161} is 7/2(53M2).
$Er \xrightarrow{161} Ho$ 68 93 67 94 7/2, $9/2^-$ ≥ 5.8 ? $7/2^+$	≥ 2.1 see comment	1	3.1^h	β^+ see comment	1.2	1		a	55N2	However, (54H4) reports no $\gamma^\pm$.
$Ho \xrightarrow{164} Dy$ 67 97 66 98 2^+ 0^+	$0.11 \leq Q$ ≤ 1.4		36.7^m	γ_1 γ_2 $\epsilon_K/\beta^+ > 2 \times 10^3$	0.0728 0.0373	5 5		s s s	54B8 54B8 54B8	However, 0.046γ may be possible isomeric transition to long lived Ho^{164} g. s. (54B8, 52B1).

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$\mathrm{Ho}_{67\ 97} \xrightarrow{164} \mathrm{Er}_{68\ 96}$ 1^- 2^+ 5.9 0^+	0.98	3	36.7^m	β_o^- $\beta\gamma$	0.99 0.9	3 1*	25	s a	54B8 54H5 54B8	$\beta\gamma$ and β spectrum suggest strong β group in coincidence with 0.09γ (54B8). See comment for $\mathrm{Ho} \xrightarrow{164} \mathrm{Dy}$.
$\mathrm{Ho}_{67\ 99} \xrightarrow{166} \mathrm{Er}_{68\ 98}$ 0^- 9.4^1 2^+ 8.4 0^+	1.853	4	27.3^h	β_o^- β_1^- γ_1 $\beta_1\gamma_1$	1.854 1.771 0.0803	5 7 2	52 48	s s$\beta\gamma$ s	55G4 55G4 55G4 55G4	Scin and $\beta\gamma$ studies show that Q for 30y Ho^{166} decay > 2.1 (55M17). F-K plot for β_o is linear, for β_1 has ΔJ = 2; yes shape (55G4).
$\mathrm{Ho}_{67\ 100} \xrightarrow{167} \mathrm{Er}_{68\ 99}$ $7/2^+$ 6.4 $7/2^-$	1.0	1	3^h	β_o^- $\gamma/\beta \sim 0.25$	1.0	1	50	scin	55H9 55H9	
$\mathrm{Tm}_{69\ 98} \xrightarrow{167} \mathrm{Er}_{68\ 99}$ $1/2^+$? $7/2^-$	> 0.72	1	9.6^d	γ	0.720	10*		scin	55N2	lower energy γ's present (55N2).
$\mathrm{Yb}_{70\ 97} \xrightarrow{167} \mathrm{Tm}_{69\ 98}$? ? or $1/2^-$ > 5.6 $1/2^+$	3.4 or >0.118	2 2	74^m or 18.5^m	β_o^+	2.4	2		s	55N2	
$\mathrm{Er}_{68\ 101} \xrightarrow{169} \mathrm{Tm}_{69\ 100}$ $1/2^-$ 6.9 $3/2^+$ 6.1 $1/2^+$	0.339	2	9^d	β^- γ	0.330 0.340 0.00842	10 2 5	85	s s s	56H8 56B14 56H8	85 per cent β^- to g. s., 15 per cent to 0.008 state. (56H8).
$\mathrm{Yb}_{70\ 99} \xrightarrow{169} \mathrm{Tm}_{69\ 100}$? $3/2^+$ $1/2^+$	> 0.473	1	30.6^d	ϵ many γ Highest state reached 0.47291 0.474 0.4732* 0.473 0.474		10* 1* 7* 5* 5*	 $\gamma\gamma$ $\gamma\gamma$ xγ,	 crys s s scin $\gamma\gamma$,scin	 56H9 56M9 56C4 56K12 55J5	
$\mathrm{Tm}_{69\ 101} \xrightarrow{170} \mathrm{Er}_{68\ 102}$ 1^- 0^+	> 0.05		127^d	Er K x ray					56D7	$\epsilon/\beta^- \sim 1/100$ (56D7)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$\underset{69\ 101}{\mathrm{Tm}} \xrightarrow{170} \underset{70\ 100}{\mathrm{Yb}}$	0.966	3	127^{d}	β_0^-	0.950	5	76	scin	56B15	F-K plot for both β_0 and β_1 is linear (54P3). $\beta_1\ \gamma_1$ observed (56B15, 54P3).
1^- 2^+					0.970	2	78	s	54P3	
9.0 0^+				β_1^-	0.867	5	24	scin$\beta\gamma$	56B15	
					0.886	9	22	s$\beta\gamma$	54P3	
				γ_1	0.084229	41		crys	56D7	
					0.08426	2		crys	55H10	
$\underset{68\ 103}{\mathrm{Er}} \xrightarrow{171} \underset{69\ 102}{\mathrm{Tm}}$	1.48	1	7.8^{h}	β_1^-	1.52	5^*	6	scin$\beta\gamma$	57J4	$\gamma\gamma$ and $\beta\gamma$ studies fit γ's reported by (51K1) into decay scheme. Level spacings in agreement with a K = 1/2 rotational band (57J4, 56C5, 56K11).
5/2$^-$ 6.4 7/2$^-$					1.45	2^*	3	s	56C5	
8.1 3/2$^+$				β_2^-	1.10	3^*	94	scin$\beta\gamma$	57J4	
1/2$^+$					1.05	1^*	97	s	56C5	
				$\beta\gamma$, $\gamma\gamma$					57J4, 56C5, 56K11	
$\underset{69\ 102}{\mathrm{Tm}} \xrightarrow{171} \underset{70\ 101}{\mathrm{Yb}}$	0.103	2	680^{d}	β_0^-	0.103	2		s	55B18	
1/2$^+$ 6.4 $\underline{1/2^-}$				no γ					55B18	
$\underset{69\ 103}{\mathrm{Tm}} \xrightarrow{172} \underset{70\ 102}{\mathrm{Yb}}$	> 1.79	5	63.6^{h}	β^-	1.5	1^*		a	56N4	other, lower energy γ's noted (56N4)
?$^-$ >8 0^+				γ	1.79	5^*		scin	56N4	
$\underset{70\ 105}{\mathrm{Yb}} \xrightarrow{175} \underset{71\ 104}{\mathrm{Lu}}$	0.467	3	4.2^{d}	β_0^-	0.471	3	80	s	56C4	Complex decay. Good energy matches by $(0.07\beta)(0.4\gamma)$ and $(0.35\beta)(0.11\gamma)$. Consistent decay scheme by (56H9, 56C4, 55M18, 55D5). Level spacings in Lu^{175} in agreement with a K = 7/2 rotational band.
7/2$^-$ 6.4 $\underline{7/2^+}$					0.468	5	80	s	55M18	
					0.463	3	87	s	55D5	
$\underset{72\ 103}{\mathrm{Hf}} \xrightarrow{175} \underset{71\ 104}{\mathrm{Lu}}$	> 0.541		70^{d}	ϵ						Complex decay. Level spacings in Lu^{175} in agreement with K = 7/2, 5/2 bands. β decay energy systematics (54W2) suggest Q ~ 0.9.
5/2$^-$ $\underline{7/2^+}$				many γ. Highest state reached.						
					0.5407	5^*		s, crys	56H9	
				$\gamma\gamma$					56H9, 55M18	
$\underset{71\ 105}{\mathrm{Lu}} \xrightarrow{176} \underset{70\ 106}{\mathrm{Yb}}$	> 0		3×10^{10y}	ϵ				pc	54D4	$\epsilon/\beta^- = 0.03$ (54D4)
9, 10$^-$ 0^+										
$\underset{71\ 105}{\mathrm{Lu}} \xrightarrow{176} \underset{72\ 104}{\mathrm{Hf}}$	1.00	2	3×10^{10y}	β^-	0.43	2^*		pc	54D4	
9, 10$^-$ 18.4 6^+				γ_1	0.19	1^*		scin	54D4	
4^+					0.203	4^*		scin	54A3	
2^+				γ_2	0.31	1^*		scin	54D4	
0^+					0.306	6^*		scin	54A3	
				γ_3	0.089	2^*		scin	54A3	
				$\gamma\gamma$					54D4	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Yb -177-> Lu 70 107 71 106 $5/2^-$ 6.2 $5/2^+$	1.38	3	1.8^h	β_0^- β_1^- γ $\beta\gamma$, $\gamma\gamma$	1.30 0.16 1.24 1.228	5 2 2 5	88	s scin$\beta\gamma$ scin scin	55D5 56M10 56M10 56C4 56M10,56C4,55D5	Decay scheme established with good energy matches (e. g. (0.16β^-) (>0.7γ), (56M10)).
Lu -177-> Hf 71 106 72 105 $5/2^+$ 6.8 $\underline{7/2^-}$	0.494	5	6.8^d	β_0^-	0.497	2	90	s	55M19	Decay scheme establishes β_0 as g. s. transition (55M19).
Ta -177-> Hf 73 104 72 105 $5/2^+$ > 6.5 $\underline{7/2^-}$	1.15	5	2.2^d	ϵ					57M1	Several γ present (57M1). ϵ_L/ϵ_K suggest Q = 1.15 5 (57M1)
Re -177-> W 75 102 74 103	> 1.4		17^m	β^+	> 0.4			s	57H3	
Ta -178-> Hf 73 105 72 106 0^+	see comment			no $\gamma^{\pm}$ no 1.5γ				scin scin	56B16 56B16	15^d β^+, 1.5γ previously reported here.
W -178-> Ta 74 104 73 105 0^+	> 0.07		22^d	ϵ, K x ray				scin	56B16	
Re -178-> W 75 103 74 104 ≥ 5.2 0^+	≥ 4.1	1	15^m	β^+	3.1	1*		s, a	57H3	
W -179-> Ta 74 105 73 106 $7/2^-$? $5/2^+$?	> 0.03	1	40^m	γ	0.030		9*		56R1	
Ta -180-> Hf 73 107 72 108 1^- 8.1^h 6.8 ? 0^+	see comment > 0.093		>10^{12}y or 8.1^h							Ta^{180}/Ta^{181} = 12.3/99,988 in natural Ta (55W5). t estimated from abundance of W^{180} in Ta ores (55E1) 8.1^h previously reported here may not be g. s.
Ta -180-> W 73 107 74 106 1^- 8.1^h ? 0^+	see comment ≤ 0.70	2	> 10^{12}y or 8.1^h	see comment in Ta -180-> Hf						

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Re $\xrightarrow{180}$ W 75 105 74 106 ? > 3.5 or > 6.4 0^+	≥ 2.1 or ≥ 2.9	1 2	2.4^m or 20^h	β^+ γ β^+	1.1 0.880 1.9	1 40 2	20	a scin s	55F7 55F7 57H3	0.106γ also present (55F7)
W $\xrightarrow{181}$ Ta 74 107 73 108 $7/2^-$ $\underline{7/2^+}$	0.16 Q < 0.22	1 < 2		γ_1 γ_2 (L x ray) γ; no (K x ray) γ	0.152 0.136	10^* 10^*		scin scin	56D8 56D8 56D8	γ intensity ~ 10^{-3}/K x ray (56D8). (56B1) reports no γ and estimates Q from K x ray/L x ray. 0.136γ appears, 0.152γ does not appear in Hf $\xrightarrow{181}$ Ta. (56B17).
Ta $\xrightarrow{182}$ W 73 109 74 108 > 8 2^+ 0^+	1.732	10	111^d	β^- γ	0.51 1.2220 1.222 1.222	1 2 1^* 1		s s s s	55M20 56B18 55M20 54F7	Extremely complex γ spectrum (~ 30 γ's). Decay schemes consistent with 0.51β to 1.22 level (56B18, 55M20, 54F7).
Hf $\xrightarrow{183}$ Ta 72 111 73 110 $1/2^-$ ≥6.0 $1/2^+$ 5/2, $7/2^+$	2.2	2	64^m	β^- Eγ/β~	~1.4 0.8	2^*		a GM	56G11 56G11	
Ta $\xrightarrow{183}$ W 73 110 74 109 5/2, $7/2^+$ 6.9 $7/2^-$ $\underline{1/2^-}$	1.068	10	5^d	β^- $0.615\beta^-$ to state at 0.45308	0.615 0.6	10 1^* 10^*	>95	s scin crys	55M20 55P4 55M20	Extremely complex γ spectrum (55M20, 55P4). Decay scheme established by combination principle. Weak, higher energy β^- present with E_β < ~1 (55M20).
Ta $\xrightarrow{184}$ W 73 111 74 110 $?^-$ 6.9 0^+	≥ 1.26	7	8.7^h	β^-	1.26	7	70	scin	55B19	9 γ's reported (Eγ 0.11 to 1.18). (55B19)
Ta $\xrightarrow{185}$ W 73 112 74 111 $7/2^+$ ≥6.3 $7/2^-$	≥ 1.72	7	49^m	β^-	1.72	7		scin	55P4	4 γ's reported (Eγ 0.06 to 0.235) (55P4).
W $\xrightarrow{185}$ Re 74 111 75 110 $7/2^-$ 7.5 $\underline{5/2^+}$	0.428	3	73^d	β_0^-	0.435 0.426	5 3	90	s s	57D1 55B20	Weak γ reported (56B19, 55B20, 55K10). Possible $0.37\beta^-$ (55B20) + 0.06γ provides energy match.

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
Os $\xrightarrow{185}$ Re 76 109 → 75 110 $1/2^-$ $\underline{5/2^+}$	> 0.879	1	97^d	γ	0.8789	9*		s	56N5	Other γ's reported (56N5, 55P5). Highest state reached in Re^{185} at ~ 0.88 (55P5).
					0.875	10*		scin	55P5	
				$\gamma\gamma$					55P5	
Ta $\xrightarrow{186}$ W 73 113 → 74 112 $2, 3^-$ ≥ 6.2 2^+ 0^+	>2.3	2	10^m	β^-	2.2	2		scin	55P6	8 other γ's observed. 0.125γ is from 0.12 state in W^{186} (see Re $\xrightarrow{186}$ W).
				γ	0.125			scin	55P6	
				$(2.2\beta)\gamma$				GM	55P6	
Re $\xrightarrow{186}$ W 75 111 → 74 112 1^- 2^+ 0^+	>0.123	1	3.7^d	ϵ						ϵ/β^- ~ 3/100 (56J8)
				γ	0.12267	21		s	56P8	
					0.1229	4		s	56J8	
				no β^+					56P8	
Re $\xrightarrow{186}$ Os 75 111 → 76 110 1^- 8.0 2^+ 7.7 0^+	1.067	2	3.7^d	β^-_0	1.0715	13	76	s	56P8	$(0.93\beta)(0.137\gamma)$ provides energy match (56P8, 56J8, 54K6). (56P8) reports F-K plots for β_0 and for β_1 are non linear. (54K6) reports both linear.
					1.064	2	76	s	56J8	
					1.060	5*	73	s	56A2	
					1.063	5	76	s	54K6	
				β^-_1	0.9335	30	24	$s\beta\gamma$	56P8	
					0.926	5	24	$s\beta\gamma$	54K6	
				γ	0.13719	7		s	56P8	
					0.1372	2		s	56J8	
					0.13722	3		crys	55R9	
W $\xrightarrow{187}$ Re 74 113 → 75 112 $1/2^-$ 9.1^1 $\underline{5/2^+}$	1.312	6	24^h	β^-_0	1.320	20		s	57D1	$0.62\beta + 0.69\gamma$ provide good energy match. F-K plot for β_0 has ΔJ = 2,yes shape (57D1)
Re $\xrightarrow{187}$ Os 75 112 → 76 111 $\underline{5/2^+}$ $\underline{1/2^-}$	~ 0 see comment		$<10^{11}y$ or $>10^{16}y$	β^-	<0.008			a	54S6	(54D5) reports no β with E_β > 0.001. Measurement of Os^{187} spin (54M15) and shell model assignment of parity change leads to ΔJ = 2;yes transition and suggests Q ~ 0.
Ir $\xrightarrow{187}$ Os 77 110 → 76 111 $3/2^+$ $\underline{1/2^-}$	≥ 0.435	10	14^h	$\gamma\pm$(?)				scin	55S10	other γ's present $\gamma^\pm$ may be due to Ir^{188} contaminant (55S10).
				γ	0.435	15		scin	55S10	
Re $\xrightarrow{188}$ Os 75 113 → 76 112 1^- 8.6 2^+ 8.1 0^+	2.114	6	17^h	β^-_0	2.15	4	79	s	56P9	$(2.0\beta)(0.155\gamma)$ provides energy match (56P9).
					2.116	2	79	s	56J8	
					2.01	2*		s	56A2	
				$\beta\gamma$					56P9	
				$\gamma\gamma$					56P9, 56J8	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
Ir $\xrightarrow{188}$ Os	> 0.625	10	41^h	no $\gamma^{\pm}$				scin	55S10	0.15γ (55S10, 55N5) and 0.475γ
77 111 76 112				γ	0.625	15		scin	55S10	(55S10) also present.
0^+										
Pt $\xrightarrow{188}$ Ir	> 0.4	1	10^d	no $\gamma^{\pm}$ (?)				scin	55S10	other γ's (55S10), e^- (55N5) present.
78 110 77 111				γ	~ 0.4	1^*		scin	55S10	
0^+ ?										
Ir $\xrightarrow{189}$ Os	≥ 0.245	10	11^d	no $\gamma^{\pm}$				scin	55S10	
77 112 76 113				γ	0.245	10		scin	55S10	
$3/2^+$ $\underline{3/2^-}$										
Pt $\xrightarrow{189}$ Ir	> 0.14	1	10.5^h	no $\gamma^{\pm}$ (?)				scin	55S10	possible γ(0.55 to 0.70)(55S10).
78 111 77 112				γ	0.14	1		scin	55S10	
$1/2^-$ $3/2^+$										
Au $\xrightarrow{189}$ Pt	> 0.29	1	42^m	no $\gamma^{\pm}$ (?)				scin	55S10	0.135γ, possible > 0.8γ present
79 110 78 111				γ	0.29	1		scin	55S10	(55S10).
$3/2^+$ $1/2^-$										
Re $\xrightarrow{190}$ Os	1.7	3≤	2.8^m	β^-	1.7	3		a	55A8	Several γ (0.19 to 0.83) present
75 115 76 114	Q ≤ 3.2	3		$E\gamma/\beta$ ~ 1.5					55A8	(55A8).
5^-(?) ≥5.5 4^+										
2^+										
0^+										
Ir $\xrightarrow{190}$ Os	1.33	3<	11^d	From 3^h Ir^{190}						3^h Ir decay leads to level scheme
77 113 76 114	Q < ~2			β^+	2.04	7		scin	55A9	and spin assignments in Os^{190}.
9, 10, 11^+ 3^h				From 11^d Ir^{190}						Absence of β^+ from 11^d Ir leads to
3, 4, 5^- 11^d				no β^+				scin	55A9	estimate of upper bound to Q(55A9).
10^m 10^-				γ	1.33	3^*		scin	55A9	
2^+										
0^+										
Pt $\xrightarrow{191}$ Ir	≥ 0.625	2	3^d	ϵ						Complex γ (55T7, 55S10, 54C6). $\gamma\gamma$
78 113 77 114				γ	0.626	3^*		s	55T7	establishes highest level reached
$1/2^-$ $\underline{3/2^+}$					0.623	3^*		s	54C6	in Ir^{191} at ~ 0.62 (56P10).
				$\gamma\gamma$					56P10	
Au $\xrightarrow{191}$ Pt	> 0.60	2	3^h	ϵ						
79 112 78 113				γ	0.60	2		scin	55S10	other γ's (0.14 to 0.48) also present.
$3/2^+$ $1/2^-$										(55S10).

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$_{77}Ir_{115} \xrightarrow{192} {}_{76}Os_{116}$	1.065	1<	74^d	ϵ			4.3		56B20	Many γ's. Level scheme with good energy matches indicate that highest level reached in Os^{192} decays by $\gamma_1 + \gamma_2 + \gamma_3$ as well as by direct g. s. γ (56A2, 55B21). Upper bound to Q is estimated from lack of β^+ to 4^+ 0.69 level (55B21).
	$Q < \sim 2$						3.5		55B21	
5^- 4^+				no β^+				crys	55B21	
2^+				γ_1	0.3747	5		s,crys	55B21	
					0.374	2		s	54J4	
0^+				γ_2	0.48475	23		crys	55B21	
					0.4840	5*		s	55G5	
					0.4844	2		s	54J4	
				γ_3	0.20575	4		crys	55B21	
					0.2054	2		s	54J4	
$_{77}Ir_{115} \xrightarrow{192} {}_{78}Pt_{114}$	1.452	6	74^d	β^-	0.673	10	48	s	55B21	** γ_1 and γ_2 energies are each weighted average of 4 spectrometer and crystal measurements (55B21, 55R9, 55G5, 54J4). $\gamma\gamma$ and Σ scin establish decay scheme. Q from $0.67\beta + 0.31\gamma + 0.47\gamma$.
					0.672	10		s	54J4	
5^- 8.3 4^+				γ_1	0.3165**	1				
2^+				γ_2	0.4679**	1				
0^+				$\gamma\gamma$					56K10, 55B2, 55T8	
				Σ scin					54L6, 54P7	
$_{76}Os_{117} \xrightarrow{193} {}_{77}Ir_{116}$	1.134	9	31.5^h	β_0^-	1.136	5	<100	s	56N5	Complex γ and β. Good energy matches in decay scheme involving 5 excited states of Ir^{193} (56N5).
$1/2^-$ ≥ 7.3 $\underline{3/2^+}$										
$_{78}Pt_{115} \xrightarrow{193} {}_{77}Ir_{116}$	0.013 <		$\leq 500^y$	ϵ_L/ϵ_K					56N6	$\epsilon_L/\epsilon_K > 1000$ (56N6).
$1/2^-$ $\underline{3/2^+}$	$Q < 0.080$			no β^+, β^-, γ, K x ray				scin	56N6	
$_{80}Hg_{113} \xrightarrow{193} {}_{79}Au_{114}$	> 1.646	4	11^h	β^+				s	56B24	Very complex γ. Other γ with $E_\gamma < 1.6$ present (56B24).
$1/2^-$ $3/2^+$				γ	1.646	4		s	56B24	
$_{77}Ir_{117} \xrightarrow{194} {}_{78}Pt_{116}$	2.233	13	19^h	β_0^-	2.236	10	66	s	54J4	Complex γ and β. Decay scheme with good energy matches (55M21, 54J4).
1^-				$\beta\gamma$, $\gamma\gamma$					55M21	
8.2 0^+										
$_{79}Au_{115} \xrightarrow{194} {}_{78}Pt_{116}$	2.566	14	39^h	β_0^+	1.55	2		s	56T5	$(1.21\beta)(0.33\gamma)$, complex γ. (56T5).
1^- ≥ 7.7 0^+				β_1^+	1.21	2		s$\beta\gamma$	56T5	
				γ	0.3267	5		s	56T5	
				$\beta\gamma$, $\gamma\gamma$					56T5	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
$_{79}Au_{116} \xrightarrow{195} {}_{78}Pt_{117}$ 3/2+ ≥6.8 1/2−	0.27	2	185^d	ϵ					54B9	Several γ's present. (56P11, 55B23, 54B9). ϵ_L/ϵ_K implies E_ϵ = 0.14 2 (54B9).
				ϵ_L/ϵ_K to 0.13 level	0.58	14			54B9	
$_{80}Hg_{115} \xrightarrow{195} {}_{79}Au_{116}$ 3/2− 3/2+	≥1.21	1	9.5^h	γ_1	1.150	10*			55J6	Other γ's present. Coincidence studies support level scheme with highest level at 1.21 . (55J6)
				γ_2	0.0614	5*			55J6	
				(0.06e− -(1.15γ)					55J6	
$_{81}Tl_{114} \xrightarrow{195} {}_{80}Hg_{115}$ 1/2+ 3/2−	≥ 0.037	1	1.2^h	ϵ						higher energy γ may be present. (57A1).
				γ	0.0370	2*		s	57A1	
$_{82}Pb_{113} \xrightarrow{195} {}_{81}Tl_{114}$ 17^m 13/2+ ? 11/2− 1/2+	see comment		see comment	From 17^m Pb^195						Suggest 17^m state is <u>not</u> Pb^195 g. s. (57A1). If γ_1, γ_2, γ_3 in cascade, Q > 0.94 − I.T. γ(unobserved) (57A1).
				γ_1	0.3931	4*		s	57A1	
				γ_2	0.4475	5*		s	57A1	
				γ_3	0.0990	2*		s	57A1	
$_{79}Au_{117} \xrightarrow{196} {}_{78}Pt_{118}$ 2, 3− 0+	> 0.685	1	5.6^d	γ_1	0.3310	4*		s	56T6	β decay energy systematics (54W2) suggest Q ~ 1.3.
					0.330	5*		scin	55B23	
				γ_2	0.3540	4*		s	56T6	
					0.360	5*		scin	55B23	
				$\gamma_1\gamma_2$					56T6,55B23	
$_{79}Au_{117} \xrightarrow{196} {}_{80}Hg_{116}$ 2, 3− 6.8 2+ 0+	0.70	2	5.6^d	γ	0.430	5*		scin	55B23	β^- branching 12 per cent (56T6).
				β^-(0.43γ)					55B23	
$_{81}Tl_{115} \xrightarrow{196} {}_{80}Hg_{116}$ 2,3 2+ 0+	> 0.425	1	2.4^h	γ_1	0.4246	5*		s	57A1	
					0.426	2*		s	55A1	
$_{82}Pb_{114} \xrightarrow{196} {}_{81}Tl_{115}$ 0+ 2, 3	> 0.420	1	37^m	γ_1	0.1668	2*		s	57A1	(e_1^-) (e_2^-) observed (57A1), γ's may be in Pb^196 metastable state (57A1).
				γ_2	0.2529	3*		s	57A1	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Pt $\xrightarrow{197}$ Au	0.75	1	18^h	β_1^-	0.670	14^*		scin$\beta\gamma$	56P10	no $\gamma\gamma_3$(56P10).
78 119 — 79 118				β_2^-	0.479	10^*		scin$\beta\gamma$	56P10	
1/2⁻ 6.2 1/2⁻				β_3^-	0.468	10^*		scin$\beta\gamma$	56P10	
3/2⁺				γ_1	0.077	2^*		scin	56P10	
				γ_2	0.191	4^*		scin	56P10	
				γ_3	0.279	6^*		scin	56P10	
				$\beta_1\gamma_1$, $\beta_2\gamma_2$, $\beta_3\gamma_3$					56P10	
Hg $\xrightarrow{197}$ Au	>0.268	1	65^h	ϵ						
80 117 — 79 118				γ_1	0.0776	5^*		s	55J6	
1/2⁻ — 1/2⁺				γ_2	0.1918	5^*		s	55J6	
3/2⁺										
Tl $\xrightarrow{197}$ Hg	> 0.611	2	2.8^h	ϵ						Strong 0.15γ (55K11, 55A10). Other
81 116 — 80 117				γ	0.611	2^*	weak	s	55A10	γ's present (55A10).
1/2⁺ — 1/2⁻										
Pb $\xrightarrow{197}$ Tl	> 0.759	1	$<<42^m$	ϵ						e^- e^- establishes γ_1 γ_2 γ_3 in
82 115 — 81 116				γ_1	0.3867 / 0.388	4^* / 1^*		s / s	57A1 / 55A10	cascade and follow ϵ from 42^m
13/2⁺ 42^m										Pb^{197} (57A1). γ_4 is I. T. γ to
5/2⁻ — 11/2⁻				γ_2	0.3848	4^*		s	57A1	short lived Pb^{197} g. s. (57A1)
1/2⁺				γ_3	0.2219	3^*		s	57A1	
				γ_4	0.2340	3^*		s	57A1	
Au $\xrightarrow{198}$ Pt			2.694^d	ϵ_K			$< 10^{-2}$		56B20	
79 119 — 78 120										
2⁺ — 0⁺										
Au $\xrightarrow{198}$ Hg	1.373	2	2.694^d	β^-	0.960 / 0.967	2 / 5		s / s	56P8 / 54P3	
79 119 — 80 118				γ	0.41176	19		elec s	56C6	
2⁺ 7.4 2⁺										
11.5 0⁺										
Tl $\xrightarrow{198}$ Hg	>1.44	5	5.3^h	ϵ						other γ's present (55K11).
81 117 — 80 118				γ	1.44	5^*		scin	55K11	
2⁺										
0⁺										

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$_{82}Pb_{116} \xrightarrow{198} {}_{81}Tl_{117}$ 0^+	> 0.763	1	2.3^h	ϵ						Other γ's present (57A1, 55A10). $(e_1^-)(e_2^-)$(57A1). Previously reported 25^m isomer (54P8) not found (55A10).
				γ_1	0.3978	4*		s	57A1	
				γ_2	0.3655	4*		s	57A1	
$_{78}Pt_{121} \xrightarrow{199} {}_{79}Au_{120}$ $5/2^-$ >6.4 $3/2^+$	1.78	6	30^m	β_0^-	1.7	2		a	56L9	aβγ and γγ suggest decay scheme with 1.1β to 0.63 level, 0.8β to 0.96 level (56L9).
				β_1^-	1.3	1		aβγ	56L9	
				γ_1	0.197	1*		s	56L9	
				γ_2	0.318	1*		s	56L9	
				βγ, γγ					56L9	
$_{79}Au_{120} \xrightarrow{199} {}_{80}Hg_{119}$ $3/2^+$ 7.8 $1/2^-$	0.455	3	3.15^d	β_0^-	0.460	10*	6	s	55H11	0.3β + 0.16γ provides good energy match.
				β_1^-	0.302	5*	69	s	55H11	
$_{82}Pb_{117} \xrightarrow{199} {}_{81}Tl_{118}$ $5/2^-$ $1/2^+$	> 0.721	2	90^m	ϵ						Weak 0.72γ suggests γ_1 and γ_2 are in cascade (55A10).
				γ_1	0.354	1*		s	55A10	
				γ_2	0.367	1*		s	55A10	
$_{78}Pt_{122} \xrightarrow{200} {}_{79}Au_{121}$ 0^+ 0, 1^-	> 0		11.5^h	p	Au^{200}			chem	57R1	Previously reported ~ 82^d activity is 76^d Ir^{192} (56W3).
$_{79}Au_{121} \xrightarrow{200} {}_{80}Hg_{120}$ 0, 1^- ≥ 6.9 0^+	2.3	1	48^m	β_0^-	2.2	1*		a	57R1	1.23 γ present (57R1).
$_{81}Tl_{119} \xrightarrow{200} {}_{80}Hg_{120}$ 0^+	> 2.137	2	26^h	ϵ						Complex γ(56G9, 55B24).
				complex γ. Highest level reached						
					2.1367	20*		e^-e^-,s	56G9	
$_{82}Pb_{118} \xrightarrow{200} {}_{81}Tl_{119}$ 0^+	> 0.416	1	18^h	ϵ						Complex γ(56G9, 55B24).
				Complex γ. Highest level reached						
					0.416	1*		e^-e^-, s	56G9	
$_{81}Tl_{120} \xrightarrow{201} {}_{80}Hg_{121}$ $1/2^+$ $3/2^-$	> 0.167	1	3^d	ϵ						Complex γ. (55B24). e^-e^- studies suggest highest level reached is 0.167(55B24).
				γ	0.1672	10*		s	55B24	
				e^-e^-					55B24	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF	COMMENTS
$Pb \xrightarrow{201} Tl$ 82 119 81 120 $1/2^+$	> 1.53	1	9.4^h	ϵ γ e^-e^-	 1.099	 5^*		 s	 55B24 55B24	Complex γ. (55B24). e^-e^- studies suggest highest level reached is 1.53(55B24).
$Tl \xrightarrow{202} Hg$ 81 121 80 122 0^+	0.54 Q < 0.75	3<	12^d	ϵ γ ϵ_L/ϵ_K	 0.4406 = 0.90 = 0.43	 4 27		 s	 56K13 56K13 54H7	Limits on Q are from ϵ_L/ϵ_K and possible ft values (56K13).
$Pb \xrightarrow{202} Tl$ 82 120 81 121 0^+	0.015 Q < 0.085	<	3×10^{5y}	no ϵ_K ϵ_L/ϵ_M	 ~ 1.5				54H7 54H7	Limits on Q from ϵ_K ~ 0 and existence of L capture.
$Hg \xrightarrow{203} Tl$ 80 123 81 122 $5/2^-$ 6.4 $3/2^+$ > 10.6 $1/2^+$	0.486	3	47^d	β^- γ	0.195 0.214 0.219 0.210 0.2783 0.279 0.279 0.279	2 2 10 2 5 * 2 * 2 * 2		s s s s s s s s	56W1 55M22 54W3 54T3 56W1 55M22 54W3 54T3	no 0.49β(56W1, 54W3). $s\beta\gamma$ confirms decay scheme (55M22).
$Tl \xrightarrow{204} Hg$ 81 123 80 124 2^- 0^+	0.34	1	4.26^y	ϵ continuous γ spectrum E_{max} ϵ_L/ϵ_K	 0.293 = 0.33	 20		 scin $x\gamma$	 56J4 54J2	K binding energy = 0.0833.
$Tl \xrightarrow{204} Pb$ 81 123 82 122 2^- 8.9^1 0^+	0.765	2	4.26^y	β_o^-	0.765 0.762 0.766	10 5 2		s s s	55Y2 54F2 54K7	β_o has ΔJ = 2;yes shape(55Y2, 54F2, 54K7).
$Bi \xrightarrow{204} Pb$ 83 121 82 122 0^+	>3.45	5	11.6^h	ϵ γ_1 γ_2 $\gamma\gamma$	 0.981 1.20	 5^* 4^*		 s scin	 56W4 56W4 56W4	Complex γ. (0.98γ)(1.2γ) precedes 1.266 0.26$^{\mu s}$ level in Pb^{204}(56W4).
$Pb \xrightarrow{205} Tl$ 82 123 81 124 $5/2^-$ $1/2^+$	0.015 < Q < 0.085		5×10^{7y}	ϵ L, L x ray no K x ray				scin scin	56H10 56H11,54C7	ϵ_L/ϵ_K > 200 from reported limits on τ_{ϵ_L} and τ_{ϵ_K} (56H10, 56H11).
$Bi \xrightarrow{205} Pb$ 83 122 82 123 $9/2^-$ ≥6.1 $7/2^-$ $5/2^-$	2.65	3	14.5^d	β^+ γ $\gamma\gamma$	0.925 0.7033	30 8^*		s s	56S19 56S19 56S19, 56G9	Extremely complex γ spectrum (56S19, 56G9). Consistent decay scheme constructed (56S19, 56G9). ($\gamma^{\pm}$)(0.70γ) demonstrated (56S19).

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Bi $\xrightarrow{206}$ Pb 83 123 82 124 6^+ $145^{\mu s}$ 7^- 0^+	3.404 Q < 3.7	3<	6.4^d	ϵ $\gamma\gamma$, $e^-\gamma$, e^-e^- β^+ < 1/2600				scin, s s	54A4 54A4	Extremely complex γ spectrum. Coincidence studies and precise γ energy measurements fit decay scheme deduced from shell model (54A4). Highest level at 3.4035 (54A4)
Bi $\xrightarrow{207}$ Pb 83 124 82 125 $9/2^-$ $7/2^-$ $\underline{1/2^-}$	2.357 Q $\leq$ 2.431	5< 5	8^y	ϵ γ_1 γ_2 Only L capture to 2.34 level	 0.5696** 1.771**	 2 5			55A1, 55L10	** γ_1 is weighted average of 5 spectrometer and 2 scin measurements (56B21, 55M23, 55Y3, 55A1, 55L10, 54P9, 54W4). ** γ_2 is weighted average of 1 spectrometer and 2 scin measurements (55A1, 55L10, 54P9).
Tl $\xrightarrow{208}$ Pb 81 127 82 126 5^+ 5.6 5^- 3^- 0^+	4.97	2	3.1^m	β^- γ_1 γ_2 $\gamma\gamma$	1.79 0.58832 2.614	9* 13 2	22	$a\beta\gamma$ s s	56D9 56B21 54M16 55W6	Other β^- groups. (56D9). Consistent decay scheme with energy matches.
Po $\xrightarrow{208}$ Bi 84 124 83 125 0^+ ?	> 0.85	1	2.9^y	ϵ γ_1 γ_2 $\gamma_1\gamma_2$	 0.285 0.270 ~0.60 0.570	 5* 5* 5* 5*		 scin scin scin scin	 55P7 55D6 55P7 55D6 55P7, 55D6	$0.3\gamma/\alpha$ ~ $3/10^5$(55P7). ~ $7/10^3$(55D6).
Rn $\xrightarrow{208}$ At 86 122 85 123 0^+	> 0		23^m	ϵ			80		55M24	
Tl $\xrightarrow{209}$ Pb 81 128 82 127 $1/2^+$ 5.3 $1/2^-$ $9/2^+$	3.12	3	2.2^m	γ_1 γ_2 γ_3	1.560 1.56 0.450 0.45 0.120 0.12	30* 3* 9* 1* 3* 1*		scin scin scin scin scin scin	56S20 55P8 56S20 55P8 56S20 55P8	Coincidence studies indicate all β to 2.23 level in Pb (56S20, 55P8)
Pb $\xrightarrow{209}$ Bi 82 127 83 126 $9/2^+$ 5.5 $\underline{9/2^-}$	0.63	1	3.3^h	β_o^- no γ	0.63	1			55M25 55M25	F-K plot of β_o is linear (55M25).

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
$_{84}Po_{125} \xrightarrow{209} {}_{83}Bi_{126}$	1.4	2	103^y	ϵ						All ϵ to 0.9 level (55P7).
$1/2^-$ → $5/2^-$?				γ	0.910	18^*		scin	55P7	
$\underline{9/2^-}$					0.865	17^*		scin	55D6	
				$\epsilon_{LM}/\epsilon_K \sim 0.2$				scin	55P7	
$_{86}Rn_{123} \xrightarrow{209} {}_{85}At_{124}$	> 0		30^m	ϵ			83		55M24	
$_{81}Tl_{129} \xrightarrow{210} {}_{82}Pb_{128}$	5.40	10	1.3^m	β^-	1.96	10		scin$\beta\gamma$	56M11	$\beta\gamma$, $\gamma\gamma$ studies suggest that all γ's are in cascade (56M11).
3, 4, 5^+ 5.0 → ?				γ_1	0.297	8		scin	56M11	
2^+				γ_2	0.783	10		scin	56M11	
0^+				γ_3	2.36	5		scin	56M11	
$_{82}Pb_{128} \xrightarrow{210} {}_{83}Bi_{127}$	0.063	1	19.4^y	β^-	0.017	2		scin	55L11	no γ with $0.025 < E_\gamma < 0.032$. (56F4).
0^+ 5.4 0^-										
$\underline{1^-}$										
$_{83}Bi_{127} \xrightarrow{210} {}_{84}Po_{126}$	1.17	1	5.0^d	β_o^-	1.17	1		s	55L12	non-unique shape does not permit good determination of β_o^- end point energy. 2.6×10^{6y} Bi^{210} is possibly 25 kev below 5^d Bi^{210}.
$\underline{1^-}$ 8.0 0^+	see comment		see comment		1.155	5		s	54P10	
$_{85}At_{125} \xrightarrow{210} {}_{84}Po_{126}$	4.1	1<	8.3^h	ϵ						Complex γ. Coincidence studies suggest decay scheme with highest level at 4.1 (54M17). Intensity of γ's suggest decay energy to 4.1 level ~ 0.1 (54M17).
4, 5, 6 → 4, 5^-	Q < 4.3	1		γ_1	0.2460	4^*		s	54M17	
0^+				γ_2	1.185	3^*		s	54M17	
				$\gamma\gamma$, $\gamma\gamma(\theta)$					54M17	
$_{86}Rn_{124} \xrightarrow{210} {}_{85}At_{125}$	> 0		2.7^h	ϵ			4		55M24	
0^+ → 4,5,6										
$_{85}At_{126} \xrightarrow{211} {}_{84}Po_{127}$	> 0.67	1	7.2^h	ϵ						
7/2, $9/2^-$ → $9/2^+$				γ	0.671	10^*		scin	54M17	
$_{86}Rn_{125} \xrightarrow{211} {}_{85}At_{126}$	> 1.34		16^h	ϵ			74		55M24	other γ's present (55M24).
$9/2^+$ → 7/2,$9/2^-$				γ	1.34	2^*		scin	55M24	

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
Pb $\xrightarrow{214}$ Bi 82 132 83 131 0^+ 6.6 1^-	1.03	6	27^m	β_o^-	1.03	6	6	s	56D10	
Bi $\xrightarrow{214}$ Po 83 131 84 130 1^- 7.8 0^+	3.21	3	20^m	β_o^- $\beta\gamma$, $\gamma\gamma$	3.26 3.179	3 90	19 13	s a	56D11 55R10 56D12, 55R10, 55R11	Complex β's and γ's (56A2, 56D11, 56D12, 55J7, 55R10, 55R11, 55B25). Decay scheme, consistent with coincidence data, provides good energy matches (55J7).
Rn $\xrightarrow{221}$ Fr 86 135 87 134	> 0		25^m	β^-			80		56M12	
Fr $\xrightarrow{223}$ Ra 87 136 88 135 ≥ 6	≥ 1.3	2	21^m	β^- γ $\gamma\gamma$	1.3 1.15 0.310	2* 3* 30*	weak	s scin scin scin	54P11 54H8 54H8 54H8	Complex γ. Coincidence search suggests no γ coincidences (54H8).
Ra $\xrightarrow{225}$ Ac 88 137 89 136 $9/2^+$(?) ≥6.7 $7/2^-$?	0.35	1	14.8^d	β^- γ $\beta\gamma$	0.32 0.32 0.0395 0.040	3 1 20 1		 scin scin scin	55P8 55M25 55P8 55M25 55P8, 55M25	Complex β, γ (55M25). $(0.32\beta)(0.04\gamma)$ demonstrated.
Ac $\xrightarrow{226}$ Th 89 137 90 136 1^-(?) ≥ 7.6 0^+	≥ 1.2	1	29^h	γ γ	0.159 0.232	5* 7*		scin scin	55S11 55S11	
Ac $\xrightarrow{227}$ Th 89 138 90 137 $\underline{3/2^-}$ 6.7 $1/2^+$?	0.043	2	22^y	β_o^- no γ, e^-, x	0.0455	10		pc 4πpc	55B26 55B26	
Pa $\xrightarrow{228}$ Th 91 137 90 138 2^+ 0^+	> 1.72	2	22^h	ε, complex γ Highest level reached 1.72 2*				s	56O5 56O5	Information from both Pa $\xrightarrow{228}$ Th and Ac $\xrightarrow{228}$ Th is used in constructing level scheme (56O5).
Pa $\xrightarrow{230}$ Th 91 139 90 140 0, 1^- ~7.7 0^+	≥ 1.4	1	17.7^d	β^+	~0.4	1*		s	55O1	Complex γ, K/β^+ only ~2500 rather than > 2 x 10^4 estimated for Z = 90 (55O1). See β^- branch below.

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF	COMMENTS
$Pa_{91\ 139} \xrightarrow{230} U_{92\ 138}$	0.41	2	17.7^d	β_0^-	0.405	20		s	5501	β^- branching ≤ 20 per cent (5501).
$0, 1^-$ 6.4 0^+				no γ				s	5501	
$Th_{90\ 141} \xrightarrow{231} Pa_{91\ 140}$	0.386	3	26^h	β^-	0.305	10	40	s	56M13	Complex γ. (56M13). Decay scheme
$7/2^+$ 5.9 $5/2^+$				γ_1	0.0585	3^*		s	56M13	with good γ energy sum matches.
$\underline{3/2^-}$				γ_2	0.0255	1^*		s	56M13	(56M13). Suggest 0.3β to 0.084 level
				$\beta\gamma$				56M13,	55S12	in Pa^{231} (56M13).
$Pa_{91\ 141} \xrightarrow{232} U_{92\ 140}$	1.25	2	1.31^d	β_0^-	1.27	3^*	2	s	54B10	Lower energy β^- and γ present (54B10).
9.2 0^+										
$Pa_{91\ 142} \xrightarrow{233} U_{92\ 141}$	0.568	4	27.4^d	β_0^-	0.568 0.566	5_* 6^*	5 5	s s	5502 54B11	Complex lower energy β^- and γ. (5502, 54B11). Decay scheme has good energy matches (5502, 54B11).
8.9 $\underline{5/2^+}$										
$Th_{90\ 144} \xrightarrow{234} Pa_{91\ 143}$	≥ 0.192	1	24^d	β^-	0.100 0.10	2_* 1	35	sβγ scinβγ	55D7 54J5	Data indicates that I. T. energy is very small (5606, 54J5).
0^+ 6.6 1.2^m 6.7^h				γ	0.0914 0.093	5^*_* 2^*		s scin	5606 54J5	
				$\beta\gamma$, $\gamma\gamma$		56V3,	5606,	55D7,	54J5	
$Pa_{91\ 143} \xrightarrow{234} U_{92\ 142}$	2.28	6	6.66^h	β^-	1.13	5	13	s	5606	Complex γ(5606, 55D7, 54J5). Decay scheme by (5606) has 1.13β to level at 1.145.
1.2^m 6.7^h 7.3 ? 0^+										
$Np_{93\ 141} \xrightarrow{234} U_{92\ 142}$	1.8	1	4.4^d	β_0^+	~0.8	1^*		a,s	55P9	Complex γ (56H12). β^+/ϵ ratio in-
8.3 0^+				β^+/ϵ	= 5 x 10^{-4}			s	55P9	dicates that β_0^+ is probably g. s.
				γ	1.565	30^*		scin	56H12	transition. (56H12).
$Np_{93\ 142} \xrightarrow{235} U_{92\ 143}$	0.13	2	410^d	ϵ						ϵ_L/ϵ_K = 30 implies Σ_ϵ = 0.13(56H13)
$5/2^-$ 6.5 $\underline{5/2^+}$				ϵ_L/ϵ_K = 30		2		pc, scin	56H13	
				no $U^{235}\gamma$				scin	56H13	
$Np_{93\ 143} \xrightarrow{236} Pu_{94\ 142}$	0.515	7	22^h	β_0^-	0.518	10	80	s	56G9	β_0^- reported to have non-linear FK plot (56G9). 22^h Np^{236} may not be
2^+			see comment		0.53	3		S	54P11	g. s. since long lived (> 5000^y) Np^{236} has been found in U^{238}(d, 4n) bombardment (55S13).
6.6 0^+										

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
Pa $\xrightarrow{237}$ U 91 146 92 145	> 0		10^m							p. 6.7^d U^{237} (54C8).
U $\xrightarrow{237}$ Np 92 135 93 144 1/2 6.1 5/2⁻	0.514	3	6.75^d	β^-	0.249	5	74	s	56B22	Decay scheme established with the aid of information from Am^{241} decay. Complex γ. 0.25β and 0.27γ considered to be in cascade (56B22).
				γ	0.268	2*		s	56B22	
Np $\xrightarrow{238}$ Pu 93 145 94 144 2⁺ 8.5 2⁺ 0⁺	1.305	8	2.1^d	β^-	1.25	2*		s	55R12	$(1.25\beta)(0.04\gamma)$ demonstrated. (55R12).
				γ	0.0440	2*		s	55R12	
				$\beta\gamma$, $\gamma\gamma$					55R13	
Np $\xrightarrow{239}$ Pu 93 146 94 145 1/2 >7.2 1/2⁺	0.719 or 0.729 see comment	6 6	2.35^d	β^-	0.343	15		scin$\beta\gamma$	55E2	Complex β's and γ's (56H14, 55L13, 55E2). Decay scheme, consistent with predictions of collective model, displaces earlier level schemes upward by 7.8 kev and predicts a first excited state at 0.00785. (56H14, 56H15). However, level scheme suggests spin of Np^{239} is 5/2 or 3/2 and that $0.7\beta^-$ may not go to Pu^{239} g. s.
Np $\xrightarrow{240}$ Pu 93 147 94 146 0, 1 ≥5.8 0⁺	2.05	6	1^h	β^-	0.90	5*		s	54L7	Other γ's present (56L10, 54L7). 7.3^m Np^{240} is probably isomer of 1^h Np^{240} (54L7).
				γ	1.14 1.16	3* 3*		scin scin	56L10 54L7	
				$\gamma\gamma$, $\beta\gamma$					54L7	
Am $\xrightarrow{240}$ Pu 95 145 94 146 0⁺	> 1.40	3	47^h	ϵ						
				γ	1.40	3		scin	54G3	Lower energy γ's present (54G3).
Pu $\xrightarrow{241}$ Am 94 147 95 146 5/2 5.6 5/2⁻	0.0208	2	12.9^y	β_o^-	0.0208 0.0205	2 10*		s s	56S21 54P11	F-K plot of β_o has allowed shape (56S21). α branching ~ 4×10^{-5} (55J8).
				no γ				s	56S21	
Cm $\xrightarrow{241}$ Am 96 145 95 146 5/2⁻	> 0.592	10	35^d	γ	0.592	10		scin	54G3	0.47γ present (54G3).

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF	COMMENTS
$Am \xrightarrow{242} Pu$ 95 147 94 148 16^h 0^- 100^y $4^+, 5^{\pm}$ 2^+ 0^+	> 0.0445	3	100^y	ϵ						ϵ branching ~ 10 percent. (55H12).
				γ	0.0445	4*		s	55B27	
					0.0446	3		s	55H13	
$Am \xrightarrow{242} Cm$ 95 147 96 146 16^h 0^- 100^y $4^+, 5^{\pm}$ 11.3 2^+ 0^+	0.633	5	100^y	β^-	0.585	10		s	55H12	$\Delta J = 2$; yes shape observed for β^- decay to 2^+ state in Cm^{242} implies spin 0^- for 16^h Am^{242}. Hence 100^y Am^{242} probably has spin 4, 5 and 0.59β is probably to 2^+ state in Cm^{242}(55B27). However, (55H12) suggests β branching to 2^+ <u>and</u> 0^+ g. s.
				γ	0.0422	4*		s	55B27	
					0.0422	3		s	55H13	
$Am \xrightarrow{244} Pu$ 95 149 94 150 0^- 0^+	> 0		26^m	ϵ				chem	55F8	$\epsilon/\beta^- = 3.9 \times 10^{-4}$ (55F8).
$Am \xrightarrow{244} Cm$ 95 149 96 148 0^- 6.1 0^+	1.5	1	26^m	β^-_0	1.5	1		scin	54G4	
				no γ				scin	54G4	
$Pu \xrightarrow{245} Am$ 94 151 95 150	> 0		10.5^h	p	2^h Am^{245}			chem	56B23	
				p	25^m Am^{245}			chem	55F9	
								chem	55B28	
$Am \xrightarrow{245} Cm$ 95 150 96 149 ≥ 6.2	≥ 0.905	5	2.03^h	β^-	~0.86	5*		a	55F9	Complex γ (55B28, 55F9).
					0.905	5		s	55B28	
				$\gamma\gamma$				scin	55B28	
$Bk \xrightarrow{245} Cm$ 97 148 96 149 6.7	0.66	3	5^d							ϵ_L/ϵ_K to 0.25 level = 0.33, to ~ 0.39 level = 5 to 10 (56M14). Estimate Q from $\gamma\gamma$ and ϵ_L/ϵ_K.
				γ_1	0.250	2*		s,scin	56M14	
				γ_2	0.380(double?)			s, scin	56M14	
				γ_1 γ_2					56M14	
$Cf \xrightarrow{245} Bk$ 98 147 97 148	> 0		45^m	ϵ			70	chem	56C7	p 5^d Bk (56C7).

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	MEV	ERROR	%	METHOD	REF.	COMMENTS
Pu --246--> Am 94 152 95 151 0^+ 7.4 1^- ?	0.375	30	11^d	β_1^-	0.33	3	27	scin$\beta\gamma$	56H16	$(0.33\beta^-)(0.05\gamma)$ (56H16).
					0.15	1	73	scin$\beta\gamma$	56H16	$(0.15\beta^-)(0.175\gamma)$ gives good energy match. (56H16).
				β_2^-	0.15	1		a	55E3	
				γ	0.047	2*		scin	56H16	
					0.043	2		scin	55E3	
				$\beta\gamma$, $\gamma\gamma$				scin	56H16	
Am --246--> Cm 95 151 96 150 ? 0^+	2.29	5	25^m	β^-	1.222	40*	strong	scin$\beta\gamma$	55E3	$(1.2\beta^-)(1.07\gamma)$ reported by (55E3).
				β^-	>1.2		weak	scin	55E3	
				γ	1.069	20*		scin	55E3	
				$\beta\gamma$, $\gamma\gamma$					55E3	
Bk --246--> Cm 97 149 96 150 0^+	> 0.82	2	1.8^d	ϵ (K, L x rays)				pc,scin	54H9	
				γ	0.82	2*	40	scin	54H9	
E --246--> Cf 99 147 98 148 0^+	> 0		$?^m$	ϵ, p. 1.5^d Cf				chem	54G4	
Cf --247--> Bk 98 149 97 150	> 0.13		2.5^h	ϵ (K, L x rays observed)				pc,scin	54H9	
E --248--> Cf 99 149 98 150 0^+	> 0		25^m	ϵ				chem	56C7	
Cm --249--> Bk 96 153 97 152 6.0	≥ 0.9	1	65^m	β^-	0.9	1*		a(?)	56F5	
Bk --249--> Cm 97 152 98 151 ≥ 6	≥ 0.08	2	290^d	β^-	0.08	2		a	54M18	α branching ~ 10^{-3} per cent (54M18)
E --249--> Cf 99 150 98 151	> 0		2^h	ϵ				chem	56H17	ϵ/α ~ 760 (56H17)
Bk --250--> Cm 97 153 98 154 1^- 2^+ ≥7.5 0^+	1.9	1	3.1^h	β_0^-	1.9	1*		scin	54G4	$(0.9\beta)(\sim 0.9\gamma)$ provides energy match (54G4).
E --250--> Cf 99 151 98 152	> 0		8^h	ϵ					56H17	
E --251--> Cf 99 152 98 153	> 0		1.5^d	ϵ					56H17	ϵ/α ~ 190 (56H17)

TABLE I (*continued*).

DISINTEGRATION	ADOPTED Q MEV	ADOPTED Q ERROR	HALF-LIFE	DECAY DATA TYPE	DECAY DATA MEV	DECAY DATA ERROR	DECAY DATA %	DECAY DATA METHOD	DECAY DATA REF.	COMMENTS
${}_{98}Cf_{155} \xrightarrow{253} {}_{99}E_{154}$	> 0		18^d	β^-					54M18 54C9	
${}_{100}Fm_{153} \xrightarrow{253} {}_{99}E_{154}$	> 0		4.5	ϵ			89	chem	57A2	
${}_{99}E_{155} \longrightarrow {}_{100}Fm_{154}$ 38^h > 2y 2^+ 0^+	< 1.70	5	> 2y	From 38^h state β^- γ	 1.04 1.1 0.660	 4 1 15	 70^+	 a scin scin	 56J9 54C9 56J9	+ photons / $100\beta_1^-$ (56J9).
${}_{99}E_{156} \xrightarrow{255} {}_{100}Fm^{255}_{155}$	> 0		27^d	p	22^h Fm^{255}				56J9 54C9	

(References to Table I appear on pages 826–830.)

REFERENCES

1948

48S1 F.B.Shull, Phys. Rev. 74, 917.

1949

49D1 R.B.Duffield, J.D.Knight, Phys. Rev. 76, 573.

1951

51H1 E.K.Hyde, G.D.O'Kelley, Phys. Rev. 82, 944.
51K1 H.B.Keller, J.M.Cork, Phys. Rev. 84, 1079.

1952

52B1 F.D.S.Butement, Proc. Phys. Soc. 65A, 254.

1953

53B1 Bendel, Shore, Brown, Becker, Phys. Rev. 90, 888.
53C1 Cork, Nester, LeBlanc, Brice, Phys. Rev. 92, 119.
53F1 R.W.Fink, Thesis, Univ. of Rochester (1953); NSA 9, 24B (1955).
53K1 L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250.
53L1 L.J.Lidofsky, unpublished data.
53M1 J.P.Mize, D.J.Zaffarano, ISC 347.
53M2 K.Murakawa, T.Kamei, Phys. Rev. 92, 235.
53N1 R.H.Nussbaum, R.van Lieshout, A.H.Wapstra, Phys. Rev. 92, 207.
53S1 A.B.Smith, Dissertation Abstr. 13, 849; NSA 9, 24B (1955).
53W1 C.S.Wu, A.Schwarzschild, Phys. Rev. 91, 483A; private communication (March 1957).

1954

54A1 D.P.Ames, M.E.Bunker, J.W.Starner, private communication to TID 5300 (54A44).
54A2 A.H.W.Aten,Jr., J.Manassen, G.D.de Feyfer, Physica 20, 665.
54A3 J.A.Arnold, Phys. Rev. 93, 743.
54A4 D.E.Alburger, M.H.L.Pryce, Phys. Rev. 95, 1482.

54B1 G.A.Bazorgan, J.W.Irvine, C.D.Coryell, Phys. Rev. 95, 781.
54B2 G.Bolla, S.Terrani, S.Zappa, Nuovo Cim. 12, 875.
54B3 S.B.Burson, W.C.Jordan, J.M.LeBlanc, Phys. Rev. 96, 1555.
54B4 M.E.Bunker, J.P.Mize, J.W.Starner, Phys. Rev. 94, 1694.
54B5 Bertolini, Bisi, Lazzarini, Zappa, Nuovo Cim. 11, 539.
54B6 F.I.Boley, Phys. Rev. 94, 1078.
54B7 Bashilov, Anton'eva, Blinov, Dzhelepov, Izvest. Akad. Nauk Ser. FIZ SSSR 18, 43; NSA 9, 24B (1955).
54B8 H.N.Brown, R.A.Becker, Phys. Rev. 96, 1372.
54B9 A.Bisi, L.Zappa, Nuovo Cim. 12, 539.
54B10 Browne, Hoffman, Smith, Bunker, Mize, Starner, Moore, Balagna, Phys. Rev. 96, 827A.
54B11 W.D.Brodie, Proc. Phys. Soc. 67A, 397.

54C1 R.S.Caird, A.C.G.Mitchell, Phys. Rev. 94, 412.
54C2 Cohen, Charpie, Handley, Olson, Phys. Rev. 94, 953.
54C3 Cork, Brice, Hickman, Schmid, Phys. Rev. 93, 1059.
54C4 J.M.Cork, M.K.Brice, L.C.Schmid, Phys. Rev. 96, 1259.
54C5 E.L.Church, M.Goldhaber, Phys. Rev. 95, 626A.
54C6 Cork, Brice, Schmid, Hickman, Nine, Phys. Rev. 94, 1218.
54C7 Coryell, Herber, Sugihara, Bennett, Phys. Rev. 95, 298A.
54C8 W.W.T.Crane, G.M.Iddings, Phys. Rev. 95, 1702.
54C9 Choppin, Thompson, Ghiorso, Harvey, Phys. Rev. 94, 1080.

54D1 H.Daniel, W.Bothe, Z. Naturf. 9a, 402.
54D2 R.M.Diamond, Phys. Rev. 95, 410.
54D3 DeRaad, Middelkoop, B.Van Nooyen, P.M.Endt, Physica 20, 1278.
54D4 D.Dixon, A. McNair, S.C.Curran, Phil. Mag. 45, 683.
54D5 D.Dixon, A.McNair, Phil. Mag. 45, 1099.

54E1 B.Elbek, K.O.Nielsen, O.B.Nielsen, Phys. Rev. 95, 96.

54F1 H.H.Forster, A.Oswald, Phys. Rev. 96, 1030.
54F2 L. Feuvrais, T.Yuasa, Compt.rend. 239, 1627.
54F3 J.Flinta, S.Eklund, Arkiv. Fysik 7, 401.
54F4 H.L.Finston, W.Bernstein, Phys. Rev. 96, 71.
54F5 R.C.Fix, C.D.Coryell, MIT LSNE Prog. Rep., p. 37, May (1954); NSA 9, 24B (1955).
54F6 V.K.Fischer, Phys. Rev. 96, 1549.
54F7 Fowler, Kruse, Keshishian, Klotz, Mellor, Phys. Rev. 94, 1082.

54G1 J.B.Gerhart, Phys. Rev. 95, 288.
54G2 Grace, Johnson, Kurti, Lemmer, Robinson, Phil. Mag. 45, 1192.
54G3 R.A.Glass, UCRL-2560.
54G4 Ghiorso, Thompson, Choppin, Harvey, Phys. Rev. 94, 1081.
54G5 Ghiorso, Rossi, Harvey, Thompson, Phys. Rev. 93, 257.

54H1 E.K.Hyde, M.G.Florence, F.S.Stephens, UCRL-2813.
54H2 B.C.Haldar, E.O.Wiig, Phys. Rev. 94, 1713.
54H3 T.H.Handley, E.L.Olson, Phys. Rev. 96, 1003.
54H4 T.H.Handley, E.L.Olson, Phys. Rev. 93, 524.
54H5 T.H.Handley, Phys. Rev. 94, 945.
54H6 T.H.Handley, E.L.Olson, Phys. Rev. 94, 968.
54H7 J.R.Huizenga, C.M.Stevens, Phys. Rev. 96, 548.
54H8 E.K.Hyde, Phys. Rev. 94, 1221.
54H9 E.K.Hulet, S.G.Thompson, A.Ghiorso, Phys. Rev. 95, 1702.

54J1 Jones, Phillips, Johnson, Wilkinson, Phys. Rev. 96, 547.
54J2 H.Jaffe, UCRL-2537.
54J3 M.C.Joshi, B.V.Thosar, Phys. Rev. 96, 1022.
54J4 M.W.Johns, S.V.Nablo, Phys. Rev. 96, 1599.
54J5 S.A.E.Johansson, Phys. Rev. 96, 1075.

54K1 Koerts, Schwarzschild, Gold, Wu, Phys. Rev. 95, 612A.
54K2 J.D.Kurbatov, B.B.Murray, M.Sakai, Phys. Rev. 98, 674.
54K3 D.B.Kochendorfer, D.J.Farmer, Phys. Rev. 96, 855A.
54K4 M.I.Kalkstein, J.M.Hollander, Phys. Rev. 96, 730.
54K5 Keshnian, Kruse, Klotz, Fowler, Phys. Rev. 96, 1050.
54K6 L.Koertś, Phys. Rev. 95, 1358.
54K7 J.C.Knight, T.H.Braid, H.O.W.Richardson, Proc. Phys. Soc. 67A, 881.

54L1 T.Lindqvist, A.C.G.Mitchell, Phys. Rev. 95, 1535.
54L2 D.C.Lu, W.H.Kelley, M.L.Wiedenbeck, Phys. Rev. 95, 1533.
54L3 C.Levi, L.Papineau, Compt.rend. 238, 2313.
54L4 C.Levi, L.Papineau, Compt.rend. 239, 1782.
54L5 N.H.Lazar, Phys. Rev. 95, 292.
54L6 D.C.Lu, M.L.Wiedenbeck, Phys. Rev. 94, 501.
54L7 R.M.Lessler, UCRL-2531, p. 50 (1954).

54M1 A.Moljk, S.C.Curran, Phys. Rev. 96, 395.
54M2 Th.Mayer-Kuckuk, Z. Naturf. 9a, 338.
54M3 Maeder, Wapstra, Nijgh, Ornstein, Physica 20, 521.
54M4 L.Madansky, F.Rasetti, Phys. Rev. 94, 412.
54M5 W.C.Middelkoop, B.Van Nooyen, P.M.Endt, private communication to TID-5300 (54M76).
54M6 P.Macq, Ann. Soc. Sci. Bruxelles 67, 309; NSA 8 24B (1954).
54M7 L.Marquez, Phys. Rev. 95, 67.
54M8 J.Moreau, Compt. rend. 239, 1130.
54M9 H.B.Mathur, E.K.Hyde, Phys. Rev. 96, 126.
54M10 J.Moreau, Compt. rend. 239, 820.
54M11 J.Moreau, Arkiv Fysik 7, 391.
54M12 H.B.Mathur, E.K.Hyde, Phys. Rev. 95, 708.
54M13 A.C.G.Mitchell, E.Hebb, Phys. Rev. 95, 727.
54M14 K.Murakawa, Phys. Rev. 96, 1543.
54M15 K.Murakawa, Phys. Rev. 98, 1285.
54M16 D.I.Meyer, F.M.Schmidt, Phys. Rev. 94, 927.
54M17 J.W.Mihelich, A.W.Schardt, E.Segre, Phys. Rev. 95, 1508.

54M18 Magnusson, Studier, Fields, Stevens, Mech, Friedman, Diamond, Huizenga, Phys. Rev. 96, 1576; 94, 1083.

54N1 M.E.Nahmias, J. Phys. radium 15, 568.
54N2 M.E.Nahmias, A.H.Wapstra, J. Phys. radium 15, 570.
54N3 R.T.Nichols, E.N.Jensen, Phys. Rev. 94, 369.
54N4 Nussbaum, Van Lieshout, Wapstra, Verster, Ten Haaf, Nijgh, Ornstein, Physica 20, 555.
54N5 R.H.Nussbaum, A.H.Wapstra, M.J.Sterk, private communication to TID-5300 (54N23).
54N6 Nussbaum, Wapstra, Van Lieshout, Nijgh, Ornstein, Physica 20, 571.
54N7 R.H.Nussbaum, R. Van Lieshout, Physica 20, 440.

54O1 Ong Ping Hok, P.Kramer, G.Meijer, Physica 20, 1200.
54O2 J.L.Olsen, G.D.O'Kelley, Phys. Rev. 95, 1539.

54P1 J.R.Penning, F.H.Schmidt, Phys. Rev. 94, 779A.
54P2 F.T.Porter, private communication to TID-5300 (54P05).
54P3 Pohm, Lewis, Talboy, Jensen, Phys. Rev. 95, 1523.
54P4 R.Patterson, Phys. Rev. 95, 303A.
54P5 M.L.Perlman, J.Welker, Phys. Rev. 95, 133, 613A.
54P6 C.H.Pruett, R.G.Wilkinson, Phys. Rev. 96, 1340.
54P7 R.W.Pringle, W.Turchinetz, H.W.Taylor, Phys. Rev. 95, 115.
54P8 T.O.Passell,M.C.Michel, I.Bergstrom, Phys. Rev. 95, 999.
54P9 J.R.Prescott, Proc. Phys. Soc. 67A, 540.
54P10 E.A.Plassmann, L.M.Langer, Phys. Rev. 96, 1593.
54P11 T.O.Passell,UCRL-2528.

54S1 Simanton, Rightmire, Long, Kohman, Phys. Rev. 96, 1171.
54S2 Sheline, Johnson, Bell, Davis, McGowan, Phys. Rev. 94, 1642.
54S3 S.E.Singer, W.S.Emmerich, J.D.Kurbatov, Phys. Rev. 94, 113.
54S4 H.Selig, NYO-6626; NSA 10, 24.
54S5 R.E.Slattery, D.C.Lu, M.L.Wiedenbeck, Phys. Rev. 96, 465.
54S6 A.D.Suttle, Jr., W.F.Libby, Phys. Rev. 95, 866.

54T1 S.Thulin, J.Moreau, H.Atterling, Arkiv Fysik 8, 219.
54T2 S.Thulin, J.Moreau, H.Atterling, Arkiv Fysik 8, 229.
54T3 S.Thulin, K.Nybo, Arkiv Fysik 7, 289.

54V1 J.Varma, C.E.Mandeville, Phys. Rev. 94, 91.
54V2 J.Verhaega, J.Demuynck, Compt. rend. 239, 1374.

54W1 Calvin Wong, Phys. Rev. 95, 765.
54W2 K.Way, M.Wood, Phys. Rev. 94, 119.
54W3 Wapstra, Maeder, Nijgh, Ornstein, Physica 20, 169.
54W4 A.H.Wapstra, Arkiv Fysik 7, 279.

1955

55A1 D.E.Alburger, A.W.Sunyar, Phys. Rev. 99, 695.
55A2 P.Axel, J.D.Fox, R.H.Parker, Phys. Rev. 97, 975.
55A3 A.H.W.Aten,Jr., de Vries-Hamerling, Physica 21, 597.
55A4 P.Avignon, A.Michalowicz, R.Bouchez, J. Phys. radium 16, 404.
55A5 D.E.Alburger, B.J.Toppel, Phys. Rev. 100, 1357.
55A6 T.Azuma, J. Phys. Soc. Japan 10, 167; NSA 9 24B.
55A7 B.P.Adyasevich, B.D.Groshev, A.M.Demidov, Conf. Acad. Sci. USSR on Peaceful Use of Atomic Energy, Phys. Math. Sci. p. 270, July (1955). Consultants Bureau Trans. p. 150; NSA 10 24B (1956).
55A8 A.H.W.Aten,Jr., G.D.de Feyfer, Physica 21, 543.
55A9 Aten,Jr., De Feyfer, Sterk, Wapstra, Physica 21, 740.
55A10 Andersson, Arbman, Bergstrom, Wapstra, Phil. Mag. 46, 70.

55B1 J.W.Blue, E.Bleuler, Phys. Rev. 100, 1324.
55B2 M.E.Bunker, J.W.Starner, Phys. Rev. 97, 1272.
55B3 A.Bisi, E.Germagnoli, L.Zappa, Nuovo Cim. 2, 1052.
55B4 F.I.Boley, private communication to TID-5300 (55B36).
55B5 J.Bellicard, A.Moussa, Compt. rend. 241, 1202.
55B6 F.D.S.Butement, E.G.Prout, Phil. Mag. 46, 357.
55B7 A.Bisi, E.Germagnoli, L.Zappa, Nuovo Cim. 2, 290.
55B8 A.Bisi, S.Terrani, L.Zappa, Nuovo Cim. 2, 1297.
55B9 D.Bes, H.Bosch, Compt. rend. 240, 294.
55B10 M.E.Bunker, J.P.Mize, J.W.Starner, Phys. Rev. 99, 659A.
55B11 G.B.Baro, P.Rey, W.Seelmann-Eggebert, Z. Naturf. 10a, 81.
55B12 S.B.Burson, J.M.LeBlanc, D.W.Martin, Phys. Rev. 99, 660A.
55B13 G.Bertolini, M.Bettoni, E.Lazzarini, Nuovo Cim. 2, 273; 1, 746.
55B14 A.R.Brosi, B.H.Ketelle, Phys. Rev. 100, 169.
55B15 Bolotin, Pruett, Roggencamp, Wilkinson, Phys. Rev. 99, 62.
55B16 G.R.Bishop, J.P.Perez y Jorba, Phys. Rev. 98, 89.
55B17 R.Barloutaud, R.Ballini, Compt. rend. 241, 389.
55B18 A.Bisi, S.Terrani, L.Zappa, Nuovo Cim. 2, 172.
55B19 F.D.S.Butement, A.J.Poe, Phil. Mag. 46, 482.
55B20 A.Bisi, S.Terrani, L.Zappa, Nuovo Cim. 1, 291.
55B21 Baggerly, Marmier, Boehm, DuMond, Phys. Rev. 100, 1364.
55B22 H.Brysk, M.E.Rose, ORNL 1830.
55B23 Brunner, Guhl, Halter, Leisi, Helv. Phys. Acta 28, 475A.
55B24 Bergkvist, Bergstrom, Herrlander, Hultberg, Slatis, Sokolowski, Wapstra, Wiedling, Phil. Mag. 46, 65.
55B25 G.Backenstoss, K.Wohlleben, Z.Naturf. 10a, 384.
55B26 W.Beckmann, Z. Phys. 142, 585.
55B27 S.A.Baranov, K.N.Shliagin, Conf. Acad. Sci. USSR on Peaceful Use of Atomic Energy, Phys. Math. Sci. p. 251, July (1955); Consultants Bureau Trans. p. 183.
55B28 Browne, Hoffman, Crane, Balagna, Higgins, Barnes, Hoff, Smith, Mize, Bunker, J. Inorg. Nucl. Chem. 1, 254; NSA 10, 24B, p. 126 (1956).

55C1 S.G.Cohen, S.Ofer, Phys. Rev. 100, 856.
55C2 B.Craseman, D.L.Manley, Phys. Rev. 98, 66.
55C3 J.M.Cork, M.K.Brice, L.C.Schmid, Phys. Rev. 99, 703.
55C4 J.B.Cumming, Phys. Rev. 99, 1645A.
55C5 W.A.Cassatt,Jr., W.W.Meinke, Phys. Rev. 99, 760.
55C6 Cork, Brice, Schmid, Helmer, Phys. Rev. 100, 188.
55C7 W.A.Cassatt,Jr., W.W.Meinke, Phys. Rev. 100, 1372.
55C8 O.F.Coleman, Phil. Mag. 46, 1132.

55D1 E.F.de Haan, G.J.Sizoo, Physica 21, 818.
55D2 R.W.P.Drever, A.Moljk, Phil. Mag. 46, 1337.
55D3 Dick, Foucher, Perrin, Vartapetian, Compt. rend. 240, 1335.
55D4 M.C.Day,Jr., G.W.Eakins, A.F.Voigt, Phys. Rev. 100, 796.
55D5 H.de Waard, Phil. Mag. 46, 445.
55D6 E.H.Daggett, G.R.Grove, Phys. Rev. 99, 1.
55D7 E.F.de Haan, G.J.Sizoo, P.Kramer, Physica, 21, 803.

55E1 Eberhardt, Geiss, Lang, Herr, Merz, Z. Naturf. 10a, 796.
55E2 D.Engelkemeir, L.B.Magnusson, Phys. Rev. 99, 135.
55E3 Engelkemeir, Fields, Fried, Pyle, Stevens, Asprey, Browne, Smith, Spence, J. Inorg. Nucl. Chem. 1, 345; NSA 10, 24B, p. 126 (1956).

55F1 R.L.Folger, P.C.Stevenson, G.T.Seaborg, Phys. Rev. 98, 107.
55F2 D.J.Farmer, Phys. Rev. 99, 659A.
55F3 H.H.Forster, A.Rosen, Nuovo Cim. 1, 972.
55F4 Farrelly, Koerts, Benczer, van Lieshout, Wu, Phys. Rev. 99, 1440.
55F5 I.Franz, J.Rodriguez, H.Carminatti, Z. Naturf. 10a, 82.
55F6 H.H.Forster, J.S.Wiggins, Nuovo Cim. 2, 854.
55F7 V.K.Fischer, Phys. Rev. 99, 764.
55F8 Fields, Gindler, Harkness, Studier, Huizenga, Friedman, Phys. Rev. 100, 172.
55F9 Fields, Studier, Friedman, Diamond, Sjoblom, Sellers, J. Inorg. Nucl. Chem. 1, 254; NSA 10, 24B, p. 126 (1956).

55G1 N.W.Glass, J.R.Richardson, Phys. Rev. 98, 1251.
55G2 W.E.Graves, A.C.G.Mitchell, Phys. Rev. 97, 1033.
55G3 M.J.Glaubmann, Phys. Rev. 98, 645.
55G4 R.L.Graham, J.L.Wolfson, M.A.Clark, Phys. Rev. 98, 1173A.
55G5 S.F. Grard, L.Danguy, J.Franeau, J. phys. radium 16, 839.

55H1 T.H.Handley, W.S.Lyon, Phys. Rev. 99, 755.
55H2 K.P.Howard, T.A.Pond, P.S.Jastram, private communication to TID-5300 (55H24).
55H3 G.Herrmann, F.Strassmann, Z. Naturf, 10a, 146.
55H4 R.W.Hayward, D.D.Hoppes, H.Ernst, Phys. Rev. 98, 231A.
55H5 J.M.Hollander, M.I.Kalkstein, Phys. Rev. 98, 260A.
55H6 E.Hebb, Phys. Rev. 97, 987.
55H7 H.S.Hans, B.Saraf, C.E.Mandeville, Phys. Rev. 97, 1267.

55H8 T.H.Handley, W.S.Lyon, Phys. Rev. 99, 1415.
55H9 T.H.Handley, W.S.Lyon, E.L.Olson, Phys. Rev. 98, 688.
55H10 E.N.Hatch, F.Boehm, J.W.M.DuMond, private communication to NSA 10, 24B, p. 92 (1956).
55H11 S.K.Haynes, W.T.Achor, J. phys. radium 16, 48.
55H12 Hoff, Jaffe, Passell, Stephens, Hulet, Thompson, Phys. Rev. 100, 1403.
55H13 Ref. 55H12; E.L.Church, <u>ibid</u>.

55J1 M.W.Johns, B.C.Chidley, I.R.Williams, Phys. Rev. 99, 1645A.
55J2 O.E.Johnson, R.G.Johnson, L.M.Langer, Phys. Rev. 98, 1517.
55J3 F.A.Johnson, Can. J. Phys. 33, 841.
55J4 J.T.Jones,Jr., E.N.Jensen, Phys. Rev. 97, 1031.
55J5 S.E.Johansson, Phys. Rev. 100, 835.
55J6 Joly, Brunner, Halter, Huber, Helv. Phys. Acta 28, 403.
55J7 S.E.Johansson, Arkiv Fysik 9, 561.
55J8 Jones, Schuman, Butler, Cowper, Eastwood, Jackson, KAPL-1378.

55K1 O.C.Kistner, B.M.Rustad, O.Kofoed-Hansen, private communication (March 1957).
55K2 O.Kofoed-Hansen, A.Nielsen, Kgl. Danske Videnskab. Selskab Mat.-Fys. Medd. 29, No. 15; Phys. Rev. 96, 1045 (1954).
55K3 S.Kono, J. Phys. Soc. Japan, 10, 495; NSA 9 24B (1955).
55K4 J.C.Kluyver, C.Van der Leun, Physica 21, 604.
55K5 L.E.Killion, Dissertation Abstr. 15, 858; NSA 9 24B (1955).
55K6 B.Kahn, W.S.Lyon, Phys. Rev. 98, 58.
55K7 S.Katcoff, Phys. Rev. 99, 1618.
55K8 Koerts, Macklin, Farrelly, van Lieshout, Wu, Phys. Rev. 98, 1230.
55K9 G.L.Keister, E.B.Lee, F.H.Schmidt, Phys. Rev. 97, 451.
55K10 Kreger, McIsaac, Mackin, Lai, Phys. Rev. 100, 953.
55K11 J.D.Knight, E.W.Baker, Phys. Rev. 100, 1334.

55L1 M.J.Laubitz, Proc. Phys. Soc. 68A, 1033.
55L2 T.Lindqvist, C.S.Wu, Phys. Rev. 100, 145.
55L3 W.S.Lyon, T.H.Handley, Phys. Rev. 100, 1280.
55L4 W.S.Lyon, B.Kahn, Phys. Rev. 99, 728.
55L5 H.R.Lemmer, O.J.A.Segaert, M.A.Grace, Proc. Phys. Soc. 68A, 701.
55L6 L.Linder, G.A.Brinkman, A.C.Pieterse, Physica 21, 745.
55L7 J.M.LeBlanc, J.M.Cork, S.B.Burson, Phys. Rev. 97, 750.
55L8 D.C.Lu, W.H.Kelly, M.L.Wiedenbeck, Phys. Rev. 97, 139.
55L9 J.Laberrigue-Frolow, M.Lederer, J. Phys. radium 16, 346.
55L10 N.H.Lazar, E.D.Klema, Phys. Rev. 98, 710.
55L11 G.M.Lewis, Proc. Phys. Soc. 68A, 7351.
55L12 Lidofsky, Benczer, Macklin, Wu, Phys. Rev. 98, 1186A.
55L13 H.W.Lefevre, E.M.Kinderman, H.H.Van Tuyl, Phys. Rev. 100, 1374.

55M1 H.Morinaga, Phys. Rev. 100, 431.
55M2 M.McKeown, G.Scharff-Goldhaber, private communication to TID-5300 (55M47).
55M3 H.Morinaga, E.Bleuler, Phys. Rev. 1236A.
55M4 Th.Mayer-Kuckuk, H.Daniel, Z. Naturf. 10a, 168.
55M5 Middelkoop, Heyligers, Rietjens, Van den Bold, Endt, Physica 21, 897.
55M6 L.Madansky, F.Rasetti, Phys. Rev. 97, 837.
55M7 Mathur, Hyde, Levine, Kofstad, Phys. Rev. 97, 117.
55M8 H.B.Mathur, E.K.Hyde, Phys. Rev. 98, 79.
55M9 K.Murakawa, Phys. Rev. 100, 1369.
55M10 H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245.
55M11 S.W.Mead, M.D.Petroff, W.O.Doggett, Phys. Rev. 100, 1794A.
55M12 C.L.McGinnis, Phys. Rev. 97, 93.
55M13 Murin, Preobrazhensky, Yutlandov, Yakimov, Conf. Acad. Sci. on Peaceful Use of Atomic Energy, Chem. Sci. p. 160, July 1955; NSA 10, 24B (1956).
55M14 Mallmann, Aten,Jr., Bess, deMcMillan, Phys. Rev. 99, 7.
55M15 N.Marty, J. Phys. radium 16, 458.
55M16 N.Marty, Compt. rend. 241, 385.
55M17 J.C.D.Milton, J.S.Fraser, G.M.Milton, Phys. Rev. 98, 1173A.
55M18 J.P.Mize, M.E.Bunker, J.W.Starner, Phys. Rev. 100, 1390.
55M19 P.Marmier, F.Boehm, Phys. Rev. 97, 103.
55M20 Murray, Boehm, Marmier, DuMond, Phys. Rev. 97, 1007.
55M21 C.E.Mandeville, J.Varma, B.Saraf, Phys. Rev. 98, 94.
55M22 N.Marty, Compt. rend. 240, 291.
55M23 P.Marmier, F.Boehm, private communication quoted in (55A1).
55M24 F.F.Momyer, E.K.Hyde, J. Inorg. Nucl. Chem. 1, 274; NSA 10, 24B, p. 116 (1956).
55M25 Magnusson, Wagner, Engelkemeir, Freedman, ANL-5386.

55N1 R.T.Nichols, E.N.Jensen, Phys. Rev. 100, 1407.
55N2 W.E.Nervik, G.T.Seaborg, Phys. Rev. 97, 1092.
55N3 Nussbaum, Wapstra, Sterk, Kropveld, Physica 21, 77.
55N4 S.J.Nassiff, W.Seelman-Eggebert, Z. Naturf. 10a, 83.
55N5 R.A.Naumann, Phys. Rev. 96, 90.

55O1 Ong, Kramer, Meyer, Fennema, Zijp, Physica 21, 719.
55O2 Ong Ping Hok, P.Kramer, Physica 21, 676.

55P1 Pohm, Waddell, Powers, Jensen, Phys. Rev. 97, 432.
55P2 M.L.Perlman, J.P.Welker, Phys. Rev. 100, 81.
55P3 M.D.Petroff, S.W.Mead, W.O.Doggett, Phys. Rev. 98, 279A.
55P4 A.J.Poe, Phil. Mag. 46, 611.
55P5 C.H.Pruett, R.G.Wilkinson, Phys. Rev. 100, 1237A.
55P6 A.J.Poe, Phil. Mag. 46, 1165.
55P7 Perlman, Asaro, Stephens, Hummel, Pilger, UCRL-2932, p. 59; private communication to NSA 10, 24B, p. 115 (1956).
55P8 I.Perlman, F.Stephens, F.Asaro, Phys. Rev. 98, 262A.
55P9 Prestwood, Smith, Brown, Hoffman, Phys. Rev. 98, 1324.

55R1 Laurence S.Ring, Jr., D.J.Zaffarano, ISC 648.
55R2 H.Roderick, O.Lonsjo, W.E.Meyerhoff, Phys. Rev. 97, 97.
55R3 J.M.Reid, I.F.Wright, Nature 175, 298.
55R4a E.Ricci, J.Pahissa Campa, Nussis, Z. Naturf. 10a, 654.
55R4 L.H.T.Rietjens, H.J.Van den Bold, Physica 21, 701.
55R5 Rollier, Saeland, Morpurgo, Caglieris, Acta Chem. Scandinavica 9, 57; NSA 9, 24B.
55R6 R.C.Rohr, R.D.Birkhoff, Phys. Rev. 98, 1266.
55R7 B.L.Robinson, R.W.Fink, Phys. Rev. 98, 221.
55R8 B.L.Robinson, R.W.Fink, Phys. Rev. 98, 231A.
55R9 N.Ryde, B.Andersson, Proc. Phys. Soc. 68B, 1117.
55R10 R.A.Ricci, G.Trivero, Nuovo Cim. 2, 745.
55R11 R.E.Rowland, Phys. Rev. 99, 757.
55R12 J.O.Rasmussen, H.Slatis, T.O.Passell, Phys. Rev. 99, 42.
55R13 Rasmussen, Stephens, Strominger, Astrom, Phys. Rev. 99, 47.

55S1 A.H.Snell, F.Pleasonton, Phys. Rev. 100, 1396.
55S2 M.J.Sterk, R.H.Nussbaum, A.H.Wapstra, Physica 21, 441.
55S3 Sheline, Wilkinson, Dropesky, Shull, Phys. Rev. 99, 1055.
55S4 A.E.Souch, Proc. Phys. Soc. 68A, 760.
55S5 A.W.Schardt, J.P.Welker, Phys. Rev. 99, 810.
55S6 B.Saraf, J.Varma, C.E.Mandeville, Phys. Rev. 98, 1206A.
55S7 B.Saraf, Phys. Rev. 97, 715.
55S8 P.Staehelin, D.Maeder, M.Pochon, Z. Phys. 140, 498.
55S9 M.J.Sterk, R.H.Nussbaum, H.Cerfontain, Physica 21, 541.
55S10 W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258.
55S11 F.S.Stephens,Jr., F.Asaro, I.Perlman, Phys. Rev. 100, 1543; J.R.Grover, G.T.Seaborg, <u>ibid</u>.
55S12 D.Strominger, J.O.Rasmussen, Phys. Rev. 100, 844.
55S13 M.H.Studier, J.E.Gindler, C.M.Stevens, Phys. Rev. 97, 88.

55T1 This has been pointed out in TID-5300, p. 47.
55T2 S.Thulin, Arkiv Fysik 9, 137.
55T3 TID-5300, p. 174.
55T4 TID-5300, p. 181.
55T5 G.M.Temmer, N.P.Heydenberg, Phys. Rev. 100, 961A.
55T6 G.M.Temmer, N.P.Heydenberg, Phys. Rev. 98, 1308.
55T7 E.P.Tomlinson, R.A.Naumann, Phys. Rev. 100, 955A.
55T8 H.W.Taylor, R.W.Pringle, Phys. Rev. 99, 1345.

55V1 R.van Lieshout, D.G.Greenberg, C.S.Wu, Phys. Rev. 99, 165.
55V2 J.Varma, C.E.Mandeville, Phys. Rev. 97, 977.

55W1 J.R.Wilkinson, R.K.Sheline, Phys. Rev. 99, 165.
55W2 J.R.Wilkinson, R.K.Sheline, Phys. Rev. 99, 752.
55W3 J.P.Welker, M.L.Perlman, Phys. Rev. 100, 74.
55W4 C.S.Wu, N.Benczer-Koller, private communication (March 1956).
55W5 F.A.White, T.L.Collins, F.M.Rourke, Phys. Rev. 97, 566.
55W6 G.T.Wood, P.S.Jastram, Phys. Rev. 100, 1237A.

55Y1 T. Yuasa, M.E.Nahmiass, M.Vivargent, J. Phys. radium 16, 654.

55Y2 T.Yuasa, J.Laberrigue-Frolow, L.Feuvrais, J. Phys. radium 16, 39, 165.

55Y3 A.I.Yavin, F.H.Schmidt, Phys. Rev. 100, 171.

1956

56A1 E. Arbman, N.Svartholm, Arkiv Fysik 10, 1.

56A2 F.Ajzenberg-Selove, "Classical" Nuclear Physics in the U.S.S.R., Nuvo Cim. Suppl. 4, 2.

56A3 Paul Avignon, Ann. Phys. 1, 10.

56A4 A.H.W.Aten, Jr., Physica 22, 288.

56A5 B.Andersson, Proc. Phys. Soc. 69A, 415.

56B1 Bromley, Gove, Litherland, Paul, Almqvist, BAPS II, 1, 30.

56B2 N.Benczer, C.S.Wu, BAPS II, 1, 41.

56B3 G.E.Boyd, Q.V.Larson, J. Phys. Chem. 60, 707 (O'Kelley, Larson, Boyd, ibid.); NSA 10, 24B.

56B4 W.C.Beggs, B.L.Robinson, R.W.Fink, Phys. Rev. 101, 149.

56B5 A.R.Brosi, B.H.Ketelle, Phys. Rev. 103, 917.

56B6 Bunker, Duffield, Mize, Starner, Phys. Rev. 103, 1417.

56B7 S.K.Bhattacherjee, S.Raman, Nucl. Phys. 1, 486.

56B8 A.Bisi, E.Germagnoli, L.Zappa, Nucl. Phys. 1, 593.

56B9 Ref. 56B7; R.K.Gupta, S.Jha, ibid.

56B10 F.Boehm, E.N.Hatch, BAPS II, 1, 390.

56B11 G.Bertolini, M.Bettoni, E.Lazzarini, Nuovo Cim. 3, 754.

56B12 A.Bisi, S.Terrani, L.Zappa, Nucl. Phys. 1, 425.

56B13 R.Ballini, R.Barloutaud, J. Phys. radium 17, 498.

56B14 A.Bisi, S.Terrani, L.Zappa, Nuovo Cim. 4, 758.

56B15 A.Bisi, E.Germagnoli, L.Zappa, Nuovo Cim. 3, 1007.

56B16 A.Bisi, S.Terrani, L.Zappa, Nuovo Cim. 3, 661.

56B17 F.Boehm, P.Marmier, Phys. Rev. 103, 342.

56B18 G.Backstrom, Arkiv Fysik 10, 387.

56B19 S.K.Bhattacherjee, S.Raman, Nuovo Cim. 3, 1131.

56B20 A.A.Bashilov, Nucl. Phys. 1, 629.

56B21 G.Backstrom, Arkiv Fysik 10, 393.

56B22 S.A.Baranov, K.N.Shliagin, Sov. Phys. JEPT 3, 200.

56B23 Butler, Eastwood, Collins, Jones, Rourke, Schuman, Phys. Rev. 103, 634.

56B24 J.Brunner, J.Halter, H.J.Leisi, Helv. Phys. Acta 29, 235.

56C1 C.S.Cook, F.M.Tomnoves, BAPS II, 1, 31.

56C2 B.Crasemann, D.E.Rehfuss, H.T.Easterday, Phys. Rev. 102, 1344.

56C3 Cork, Brice, Schmid, Helmer, Phys. Rev. 104, 481.

56C4 Cork, Brice, Martin, Schmid, Helmer, Phys. Rev. 101, 1042.

56C5 Cranston, Bunker, Mize, Starner, BAPS II, 1, 389.

56C6 D.R.Connors, W.C.Miller, B.Waldman, Phys. Rev. 102, 1584.

56C7 A.Chetham-Strode, Jr., G.R.Choppin, B.G.Harvey, Phys. Rev. 102, 747.

56D1 Douglas, Gasten, Downey, Mukerji, BAPS II, 1, 21.

56D2 V.S.Dubey, C.E.Mandeville, M.A.Rothman, Phys. Rev. 103, 1430.

56D3 E.der Mateosian, M.Goldhaber, BAPS II, 1, 207.

56D4 M.C.Day, Jr., A.F.Voigt, Phys. Rev. 101, 1784.

56D5 G.T.Danby, A.L.Thompson, J.S.Foster, Proc. Roy. Soc. Canada 50, 27A; NSA 10, 24B (1956).

56D6 V.S.Dubey, C.E.Mandeville, M.A.Rothman, BAPS II, 1, 164.

56D7 P.P.Day, Phys. Rev. 102, 1572.

56D8 Debrunner, Heer, Kundig, Ruetschi, Helv. Phys. Acta 29, 235; Debrunner, Heer, Kundig, Ruetschi, Lindqvist, Helv. Phys. Acta 29, 432.

56D9 F.Demichelis, R.A.Ricci, G.Trivero, Nuovo Cim. 3, 377.

56D10 H.Daniel, Z. Naturf. 11a, 759.

56D11 H.Daniel, R.Nierhaus, Z. Naturf. 11a, 212.

56D12 F.Demichelis, L.A.Radicati, Nuovo Cim. 3, 152.

56E1 G.T.Ewan, M.A.Clark, J.W.Knowles, AECL 343, p. 12 (1956).

56F1 Frauenfelder, Levine, Rossi, Singer, Phys. Rev. 103, 352.

56F2 L.W.Fagg, E.H.Geer, E.A.Wolicki, BAPS II, 1, 165.

56F3 J.Flegenheimer, W.Seelmann-Eggebert, Z. Naturf. 11a, 678.

56F4 Fink, Warren, Edwards, Damon, Phys. Rev. 103, 651.

56F5 Fields, Studier, Diamond, Mech, Inghram, Pyle, Stevens, Fried, Manning, Ghiorso, Thompson, Higgins, Seaborg, Phys. Rev. 102, 180.

56G1 H.J.Gerber, M.G.Munoz, D.Maeder, Phys. Rev. 101, 774; Helv. Phys. Acta 28, 478A (1955).

56G2 W.E.Graves, S.K.Suri, Phys. Rev. 101, 1368.

56G3 M.A.Grace, G.A.Jones, J.O.Newton, Phil. Mag. 1, 363.

56G4 G.Gardener, J.I.Hopkins, Phys. Rev. 101, 999.

56G5 L. Grodzins, H.Motz, Phys. Rev. 102, 761.

56G6 W.E.Graves, A.C.G.Mitchell, Phys. Rev. 101, 701.

56G7 R.K.Gupta, S.Jha, Proc. Phys. Soc. 69A, 70.

56G8 L.Grodzins, H.Kendall, BAPS II, 1, 163, 164.

56G9 T.Gerholm, Arkiv Fysik 11, 55.

56G10 P.R.Gray, Phys. Rev. 101, 1306; G.D.O'Kelley, ibid.

56H1 R.W.Hayward, D.D.Hoppes, Phys. Rev. 104, 183.

56H2 T.H.Handley, S.A.Reynolds, CF-56-65; NSA 10, No. 3243; NSA 10, 24B.

56H3 R.W.Hayward, D.D.Hoppes, Phys. Rev. 101, 93.

56H4 K.Histake, J.T.Jones, J.D.Kurhatov, BAPS II, 1, 271.

56H5 R.W.Hayward, D.D.Hoppes, BAPS II, 1, 42.

56H6 R.W.Hayward, D.D.Hoppes, Phys. Rev. 104, 368.

56H7 B.Hartmann, T.Wiedling, Arkiv Fysik 10, 355.

56H8 E.N.Hatch, F.Boehm, BAPS II, 1, 390.

56H9 Hatch, Marmier, Boehm, DuMond, Phys. Rev. 104, 745.

56H10 J.R.Huizenga, J.Wing, Phys. Rev. 102, 926.

56H11 Herber, Sugihara, Coryell, Bennet, Huizenga, Phys. Rev. 103, 955.

56H12 Huizenga, Engelkemeir, Freedman, Porter, Gindler, BAPS 1, 171.

56H13 R.W.Hoff, J.L.Olsen, L.G.Mann, Phys. Rev. 102, 805.

56H14 J.M.Hollander, W.G.Smith, J.W.Mihelich, Phys. Rev. 102, 740.

56H15 Ref. 56H14; J.O.Newton, private communication to J.O.Rasmussen; ibid.

56H16 D.C.Hoffman, C.I.Browne, J. Inorg. Nucl. Chem. 2, 209; NSA 10, 24B, p. 126 (1956).

56H17 Harvey, Chetham-Strode, Ghiorso, Choppin, Thompson, Phys. Rev. 104, 1315.

56J1 R.G.Johnson, O.E.Johnson, L.M.Langer, Phys. Rev. 102, 1142.

56J2 K.E.Johansson, Arkiv Fysik 10, 247.

56J3 W.C.Jordan, S.B.Burson, J.M.Leblanc, Phys. Rev. 96, 1582.

56J4 R.G.Jung, M.L.Pool, BAPS II, 1, 172.

56J5 N.R.Johnson, R.K.Sheline, R.Wolfgang, Phys. Rev. 102, 831.

56J6 M.C.Joshi, B.V.Thosan, Proc. Indian Acad. Sci. 43A, 255; NSA 10, 24B.

56J7 M.W.Johns, I.R.Williams, D.E.Brodie, Can. J. Phys. 34, 147.

56J8 Johns, McMullen, Williams, Nablo, Can. J. Phys. 34, 69.

56J9 Jones, Schuman, Butler, Cowper, Eastwood, Jackson, Phys. Rev. 102, 203.

56K1 O.C.Kistner, A.Schwarzschild, B.M.Rustad, Phys. Rev. 104, 154.

56K2 Kurbatov, Sathoff, Sakai, Histake, BAPS II, 1, 162.

56K3 Konijn, Van Nooijen, Moster, Endt, Physica 22, 887.

56K4 A.Kjelberg, A.C.Pappas, Nucl. Phys. 1, 322.

56K5 J.J.Kraushaar, E.Brun, W.E.Meyerhof, Phys. Rev. 101, 139.

56K6 S.Katcoff, H.Abrash, Phys. Rev. 103, 966.

56K7 Knight, Mize, Starner, Barnes, Phys. Rev. 102, 1592.

56K8 P. Kleinhaus, Z. Naturf. 11a, 252.

56K9 B.H.Ketelle, H.Thomas, A.R.Brosi, Phys. Rev. 103, 190.

56K10 W.H.Kelly, M.L.Wiedenbeck, Phys. Rev. 102, 1130.

56K11 J.W.Knowles, M.A.Clark, G.T.Ewan, AECL 343, p. 47 (1956).

56K12 S.D.Koicki, A.M.Koicki, Bull. Inst. Nucl. Sci. Boris Kidrich 6, 1.

56K13 P.Kramer, H.C.Hamers, G.Meyer, Physica 22, 208; private communication to NSA 10, 24B, p. 109 (1956).

56L1 W.S.Lyon, N.H.Lazar, Phys. Rev. 101, 1524.

56L2 L.J.Lidofsky, V.K.Fischer, Phys. Rev. 104, 759.

56L3 L.Linder, G.A.Brinkman, Physica 21, 747.

56L4 M.Langevin, Ann. Phys. 1, 57.

56L5 J.Laberrigue-Frolow, Ann. Phys. 1, 152.

56L6 N.H.Lazar, E.Eichler, G.O.O'Kelley, Phys. Rev. 101, 727.

56L7 N.H.Lazar, G.D.O'Kelley, BAPS II, 1, 163.

56L8 M.J.Laubitz, Proc. Phys. Soc. A, 69, 1789.

56L9 J.M.LeBlanc, J.M.Cork, S.B.Burson, Phys. Rev. 104, 1670.
56L10 H.W.Lefevre, E.M.Kinderman, H.H.Van Tuyl, BAPS II, 1, 62; verbal report.

56M1 H.Morinaga, E.Bleuler, BAPS II, 1, 30.
56M2 H.Morinaga, Phys. Rev. 103, 504.
56M3 D.W.Martin, J.M.Cork, S.B.Burson, Phys. Rev. 102, 457.
56M4 D.W.Martin, S.B.Burson, J.M.Cork, BAPS II, 1, 329.
56M5 A.Michalowicz, Compt. rend. 242, 108.
56M6 Martin, Brice, Cork, Burson, Phys. Rev. 101, 182.
56M7 M.Mirnik, A.H.W.Aten, Jr., Physica 22, 14.
56M8 N.Marty, M.Vergnes, Compt. rend. 242, 1438.
56M9 J.W.Mihelich, T.J.Ward, K.P.Jacob, Phys. Rev. 103, 1285.
56M10 J.P.Mize, M.E.Bunker, J.W.Starner, Phys. Rev. 103, 182.
56M11 Th.Mayer-Kuckuk, Z. Naturf. 11a, 627.
56M12 F.F.Momyer, Jr., E.K.Hyde, Phys. Rev. 101, 136.
56M13 J.P.Mize, J.W.Starner, BAPS II, 1, 171; NSA 10, 24B, p. 118 (1956).
56M14 Magnusson, Friedman, Engelkemeir, Fields, Wagner, Phys. Rev. 102, 1097.

56N1 E.Norbeck, Jr., BAPS II, 1, 329.
56N2 Nussbaum, Wapstra, Bruil, Sterk, Nijgh, Grabben, Phys. Rev. 101, 905.
56N3 R.Nordhagen, J.Thomassen, Nucl. Phys. 1, 499.
56N4 D.R.Nethaway, C.M.Michel, W.E.Nervik, Phys. Rev. 103, 147.
56N5 S.V.Nablo, M.W.Johns, BAPS II, 1, 42.
56N6 R.Naumann, BAPS II, 1, 42.

56O1 G.D.O'Kelley, N.H.Lazar, E.Eichler, Phys. Rev. 101, 1059.
56O2 G.D.O'Kelley, N.H.Lazar, E.Eichler, Phys. Rev. 102, 223.
56O3 J.L.Olsen, L.G.Mann, M.Lindner, BAPS II, 1, 41.
56O4 Ref. 56O3; J.M.Hollander, ibid.
56O5 Ong Ping Hok, E.Arbman, Arkiv Fysik 11, 193.
56O6 Ong Ping Hok, J.T.Verschoor, P. Born, Physica 22, 465.

56P1 A.V.Pohm, R.C.Waddell, E.N.Jensen, Phys. Rev. 101, 1315.
56P2 Penning, Maltrud, Hopkins, Schmidt, Phys. Rev. 104, 740.
56P3 A.V.Pohm, R.C.Waddell, E.N.Jensen, Phys. Rev. 101, 1067.
56P4 F.W.Prosser, Jr., M.S.Moore, J.P.Schiffer, BAPS II, 1, 163.
56P5 Perrin, Dick, Foucher, Vartapetian, J. Phys. radium 17, 539 (1956); NSA 10, 24B.
56P6 Michael D.Petroff, BAPS II, 1, 389.
56P7 I.Pullman, P. Axel, Phys. Rev. 102, 1366.
56P8 Porter, Freedman, Novey, Wagner, Jr., Phys. Rev. 103, 921.
56P9 V.R.Potnis, Phys. Rev. 104, 722.
56P10 V.R.Potnis, C.E.Mandeville, J.S.Burlew, Phys. Rev. 101, 753.
56P11 V.R.Potnis, BAPS II, 1, 170.

56R1 T.J.Rock, Proc. Roy. Soc. Canada 50, 28A; NSA 10, 24B (1956).

56S1 A.Schwarzschild, B.M.Rustad, C.S.Wu, BAPS II, 1, 336.
56S2 Sherr, Gerhart, Horie, Hornyak, Phys. Rev. 100, 945.
56S3 T.Stribel, Z. Naturf. 11a, 254.
56S4 B.Saraf, Phys. Rev. 102, 466.
56S5 C.R.Sun, Byron T.Wright, BAPS II, 1, 253.
56S6 A.Schwarzschild, B.M.Rustad, C.S.Wu, Phys. Rev. 103, 1796.
56S7 A.W.Schardt, B.J.Dropesky, BAPS II, 1, 162.
56S8 J.P.Schiffer, M.S.Moore, C.M.Class, Phys. Rev. 104, 1661.
56S9 W.L.Stirling, N.Goldberg, BAPS II, 1, 291.
56S10 R.M.Sinclair, Westinghouse Research Report 60-94511-6-R12; NSA 10, 24B (1956).
56S11 Smith, Gove, Henry, Becker, Phys. Rev. 104, 706.
56S12 E.Schalscha, Nucl. Phys. 1, 481.
56S13 V.S.Shpinel, G.A.Kuznetsova, Sov. Phys. JEPT 3, 216.
56S14 A.Schwarzschild, unpublished data, private communication (March 1957).
56S15 E.Silva, J.Goldemberg, Nuovo Cim. 3, 12.
56S16 D.R.Speck, Phys. Rev. 101, 1725.
56S17 Smith, Hamilton, Robinson, Langer, Phys. Rev. 104, 1020.
56S18 V.W.Shiel, L.D.Wyly, C.H.Braden, BAPS II, 1, 264.
56S19 Schmorak, Stockendal, McDonell, Bergstrom, Gerholm, Nucl. Phys. 2, 193.
56S20 D.Strominger, F.S.Stephens, Jr., J.O.Rasmussen, Phys. Rev. 103, 748.
56S21 K.N.Shliagin, Sov. Phys. JEPT 3, 663.

56T1 N.W.Tanner, Phil. Mag. 1, 47.
56T2 G.M.Temmer, N.P.Heydenberg, Phys. Rev. 100, 961A.
56T3 R.F.Thomas, Jr., W.A.Whitaker, C.L.Peacock, BAPS II, 1, 86.
56T4 W.Turchinetz, R.W.Pringle, Phys. Rev. 103, 1000.
56T5 M.T.Thieme, E.Bleuler, Phys. Rev. 102, 195.
56T6 M.T.Thieme, E.Bleuler, Phys. Rev. 101, 1031.

56V1 J.B.Van der Kooi, H.J.Van den Bold, Physica 22, 681.
56V2 Hamlet Vartapetian, Compt. rend. 243, 1512.
56V3 Vartapetian, Dick, Foucher, Perrin, J.Phys. radium 17, 537.

56W1 J.L.Wolfson, Can. J. Phys. 34, 256.
56W2 R.C.Waddell, E.N.Jensen, Phys. Rev. 102, 816.
56W3 G.W.Warren, R.W.Fink, BAPS II, 1, 171.
56W4 G.K.Wertheim, R.V.Pound, Phys. Rev. 102, 185.

1957

57A1 G.Andersson, E.Arbman, B.Jung, Arkiv Fysik 11, 297.
57A2 S.Amiel, Phys. Rev. 105, 1412.
57B1 N.Benczer-Koller, A.Schwarzschild, C.S.Wu, BAPS II, 2, 23; private communication (March 1957).
57B2 M.E.Bunker, J.P.Mize, J.W.Starner, Phys. Rev. 105, 227.
57C1 M.A.Clark, J.W.Knowles, BAPS II, 2 (Washington, 1957).
57D1 Dubey, Mandeville, Mukerji, Potnis, BAPS II, 2, 24.
57G1 R.N.Glover, D.E.Watt, Phil. Mag. 2, 49.
57H1 R.L.Heath, Phys. Rev. 105, 1011.
57H2 R.L.Hickok, W.A.McKinley, S.C.Fultz, BAPS II, 2, 24.
57H3 B.C.Haldar, E.O.Wiig, Phys. Rev. 105, 1285.
57J1 R.C.Johnson, R.D.Moffat, BAPS II, 2 (Washington, 1957).
57J2 N.R.Johnson, J.B.Cumming, M.Izawa, BAPS II, 2 (Washington, 1957).
57J3 N.R.Johnson, G.D.O'Kelley, BAPS II, 2, 23.
57J4 S.A.E.Johansson, Phys. Rev. 105, 189.
57K1 Kistner, Schwarzschild, Rustad, Alburger, Phys. Rev. 105, 1339.
57M1 L.G.Mann, R.J.Nagle, H.I.West, BAPS II, 2 (Washington, 1957).
57O1 G.D.O'Kelley, Q.V.Larson, G.E.Boyd, BAPS II, 2, 24.
57P1 J.R.Penning, F.H.Schmidt, Phys. Rev. 105, 647.
57R1 L.P.Roy, J.Roy, J.S.Merritt, Phys. Rev. 105, 1337.

Addenda

55M26 H.B.Mathur, Phys. Rev. 97, 707 (1955).

55W7 J.R.Wilkinson, R.K.Sheline, private communication to TID 5300, p. 55 (1955).

56G11 O.O.Gatti, J.Flegenheimer, Z. Naturf. 11a, 679.