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TABLE OF SPECIFIC ACTIVITIES OF SELECTED ISOTOPES

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PUB-3005

Table of Specific Activities of Selected Isotopes

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The front cover is a three-dimensional computer plot which graphically displays the distribution of fission fragment energies from the spontaneous fissioning of californium-252.

Section I

SPECIFIC ACTIVITIES OF SELECTED ISOTOPES

Introduction

This table contains the half-lives, decay modes and specific activities of isotopes selected for their particular interest to the Environmental Health and Safety Department, Lawrence Berkeley Laboratory (LBL).

The first Table of Specific Activities was compiled in 1965 by R. J. Barrett and Howard Browne. In 1971 a preliminary update was issued by Matti Nurmia and Bette Shipley.

The new Table of Isotopes, 7th edition 1978, by C. M. Lederer, Virginia Shirley, Edgardo Browne, Janis Dairiki and Raymond Doebler has necessitated this revision of Specific Activities of Selected Isotopes, PUB-3005. The half-lives and decay modes were taken from Table of Isotopes, 7th Edition.

The specific activities were calculated with a PDP 9/15 computer. In order to eliminate the possibility of typing errors, the computer printout sheets of the table were used for reproduction in this handbook.

The information is presented as follows:

Column 1: ATOMIC # This is the atomic number, or, just the number of the element. It equals the number of protons in the nucleus and also the number of electrons surrounding the nucleus if the atom is neutral (not ionized).

Column 2: NUCLIDE This is the chemical symbol of the element. In the case of two elements, Nos. 104 and 105, no symbol has been internationally approved, but we use the symbols proposed by the LBL group which has discovered these elements.

Column 3: MASS The total number of nucleons in the nucleus. It is the sum of the number of protons and neutrons.

Column 4: DECAY MODE The principal decay mode is shown, even though some isotopes decay by more than one process.

Column 5: HALF LIFE (T 1/2) The half lives are given in years (Y), days (D),hours (H), minutes (M), or seconds (S). Very large and very small numbers are expressed in exponential notation; thus 2.5E+6 means 2.5×10^{6}, or 2,500,000, and 1.64E-4 means 1.64×10^{-4}, or 0.000164.

Column 6: HALF LIFE IN SECONDS This column gives all half-lives in seconds. Note that the exponential format used by the computer always begins with a digit and a decimal point; thus, 3.862E+09 equals 3.862×10^{9}.

Column 7: CURIES PER GRAM This column gives the specific activity in curies per gram. The exponential notation is the same as in the preceding column.

Column 8: DPM PER MICROGRAM This column contains the specific activity in disintegrations per minute per microgram expressed in the same notation as in previous columns.

SPECIFIC ACTIVITIES OF SELECTED ISOTOPES

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
1	H 3	BETA	12.33 Y	3.8911E+08	9.6802E+03	2.1416E+10
4	BE 7	EC	53.3 D	4.6051E+06	3.5054E+05	7.7553E+11
4	BE 10	BETA	1.6E+6 Y	5.0493E+13	2.2379E-02	4.9512E+04
6	C 11	PSTRN	20.38 M	1.2228E+03	8.4010E+08	1.8586E+15
6	C 14	BETA	5730.0 Y	1.8083E+11	4.4636E+00	9.8752E+06
7	N 13	PSTRN	9.96 M	5.9760E+02	1.4545E+09	3.2180E+15
8	O 14	PSTRN	70.60 S	7.0600E+01	1.1433E+10	2.5293E+16
8	O 15	PSTRN	122.0 S	1.2200E+02	6.1749E+09	1.3661E+16
9	F 17	PSTRN	64.5 S	6.4500E+01	1.0306E+10	2.2800E+16
9	F 18	PSTRN	109.8 M	6.5880E+03	9.5291E+07	2.1082E+14
11	NA 22	PSTRN	2.602 Y	8.2114E+07	6.2552E+03	1.3839E+10
11	NA 24	BETA	15.02 H	5.4072E+04	8.7075E+06	1.9264E+13
11	NA 25	BETA	60.0 S	6.0000E+01	7.5333E+09	1.6667E+16
12	MG 27	BETA	9.46 M	5.6760E+02	7.3735E+08	1.6313E+15
12	MG 28	BETA	21.0 H	7.5600E+04	5.3382E+06	1.1810E+13
13	AL 26	PSTRN	7.2E+5 Y	2.2722E+13	1.9128E-02	4.2318E+04
13	AL 28	BETA	2.24 M	1.3440E+02	3.0028E+09	6.6433E+15
13	AL 29	BETA	6.6 M	3.9600E+02	9.8398E+08	2.1769E+15
13	AL 30	BETA	72.0 S	7.2000E+01	5.2315E+09	1.1574E+16
14	SI 31	BETA	2.62 H	9.4320E+03	3.8647E+07	8.5502E+13
14	SI 32	BETA	650.0 Y	2.0513E+10	1.7215E+01	3.8086E+07

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
15	P· 30	PSTRN	2.50 M	1.5000E+02	2.5111E+09	5.5556E+15
15	P· 32	BETA	14.28 D	1.2338E+06	2.8621E+05	6.3321E+11
15	P· 33	BETA	25.3 D	2.1859E+06	1.5665E+05	3.4657E+11
16	S 35	BETA	87.4 D	7.5514E+06	4.2755E+04	9.4590E+10
16	S 37	BETA	5.0 M	3.0000E+02	1.0180E+09	2.2523E+15
16	S 38	BETA	170.0 M	1.0200E+04	2.9154E+07	6.4499E+13
17	CL 34M	PSTRN	32.0 M	1.9200E+03	1.7310E+08	3.8297E+14
17	CL 36	BETA	3.0E+5 Y	9.4674E+12	3.3155E-02	7.3351E+04
17	CL 38	BETA	37.3 M	2.2380E+03	1.3287E+08	2.9397E+14
17	CL 39	BETA	56.0 M	3.3600E+03	8.6233E+07	1.9078E+14
18	AR 37	EC	35.0 D	3.0240E+06	1.0099E+05	2.2344E+11
18	AR 39	BETA	369.0 Y	1.1645E+10	2.4882E+01	5.5048E+07
18	AR 41	BETA	1.83 H	6.5880E+03	4.1835E+07	9.2556E+13
18	AR 42	BETA	33.0 Y	1.0414E+09	2.5835E+02	5.7157E+08
19	K 38	PSTRN	7.61 M	4.5660E+02	6.5127E+08	1.4409E+15
19	K 40	BETA	1.28E+9 Y	4.0394E+16	6.9936E-06	1.5473E+01
19	K 42	BETA	12.36 H	4.4496E+04	6.0466E+06	1.3377E+13
19	K 43	BETA	22.3 H	8.0280E+04	3.2734E+06	7.2421E+12
20	CA 41	EC	1.0E+5 Y	3.1558E+12	8.7334E-02	1.9322E+05
20	CA 45	BETA	165.0 D	1.4256E+07	1.7614E+04	3.8970E+10
20	CA 47	BETA	4.536 D	3.9191E+05	6.1347E+05	1.3572E+12
20	CA 49	BETA	8.72 M	5.2320E+02	4.4077E+08	9.7516E+14
21	SC· 43	PSTRN	3.89 H	1.4004E+04	1.8765E+07	4.1516E+13
21	SC· 44	PSTRN	3.93 H	1.4148E+04	1.8152E+07	4.0160E+13
21	SC 44M	IT	2.44 D	2.1082E+05	1.2182E+06	2.6952E+12
21	SC· 46	BETA	83.80 D	7.2403E+06	3.3928E+04	7.5063E+10
21	SC· 47	BETA	3.42 D	2.9549E+05	8.1366E+05	1.8001E+12
22	TI 44	EC	47.0 Y	1.4832E+09	1.7315E+02	3.8307E+08

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
22	TI 45	PSTRN	3.09 H	1.1124E+04	2.2574E+07	4.9942E+13
22	TI 51	BETA	5.80 M	3.4800E+02	6.3669E+08	1.4086E+15
23	V 47	PSTRN	32.6 M	1.9560E+03	1.2292E+08	2.7194E+14
23	V 48	EC	15.976 D	1.3803E+06	1.7055E+05	3.7733E+11
23	V 49	EC	330.0 D	2.8512E+07	8.0883E+03	1.7894E+10
23	V 52	BETA	3.76 M	2.2560E+02	9.6324E+08	2.1311E+15
24	CR 48	EC	21.56 H	7.7616E+04	3.0331E+06	6.7104E+12
24	CR 49	PSTRN	41.9 M	2.5140E+03	9.1731E+07	2.0295E+14
24	CR 51	EC	27.70 D	2.3933E+06	9.2579E+04	2.0482E+11
24	CR 55	BETA	3.55 M	2.1300E+02	9.6458E+08	2.1340E+15
25	MN 51	PSTRN	46.2 M	2.7720E+03	7.9931E+07	1.7684E+14
25	MN 52	EC	5.59 D	4.8298E+05	4.4993E+05	9.9543E+11
25	MN 52M	PSTRN	21.1 M	1.2660E+03	1.7165E+08	3.7975E+14
25	MN 53	EC	3.7E+6 Y	1.1676E+14	1.8260E-03	4.0397E+03
25	MN 54	EC	312.0 D	2.6957E+07	7.7628E+03	1.7174E+10
25	MN 56	BETA	2.579 H	9.2844E+03	2.1734E+07	4.8084E+13
26	FE 52	PSTRN	8.27 H	2.9772E+04	7.2991E+06	1.6148E+13
26	FE 53	PSTRN	8.51 M	5.1060E+02	4.1756E+08	9.2381E+14
26	FE 55	EC	2.7 Y	8.5207E+07	2.4113E+03	5.3346E+09
26	FE 59	BETA	44.6 D	3.8534E+06	4.9702E+04	1.0996E+11
26	FE 60	BETA	3.0E+5 Y	9.4674E+12	1.9893E-02	4.4011E+04
27	CO 55	PSTRN	17.5 H	6.3000E+04	3.2612E+06	7.2150E+12
27	CO 56	EC	78.8 D	6.8083E+06	2.9638E+04	6.5571E+10
27	CO 57	EC	271.0 D	2.3414E+07	8.4668E+03	1.8732E+10
27	CO 58	EC	70.8 D	6.1171E+06	3.1850E+04	7.0464E+10
27	CO 58M	IT	9.2 H	3.3120E+04	5.8825E+06	1.3014E+13
27	CO 60	BETA	5.271 Y	1.6634E+08	1.1322E+03	2.5049E+09
27	CO 60M	IT	10.5 M	6.3000E+02	2.9894E+08	6.6138E+14
27	CO 61	BETA	1.65 H	5.9400E+03	3.1186E+07	6.8996E+13
28	NI 56	EC	6.10 D	5.2704E+05	3.8287E+05	8.4705E+11

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
28	NI 57	EC	36.0 H	1.2960E+05	1.5297E+06	3.3842E+12
28	NI 59	EC	7.5E+4 Y	2.3669E+12	8.0920E-02	1.7903E+05
28	NI 63	BETA	100.0 Y	3.1558E+09	5.6837E+01	1.2574E+08
28	NI 65	BETA	2.520 H	9.0720E+03	1.9163E+07	4.2396E+13
28	NI 66	BETA	54.8 H	1.9728E+05	8.6786E+05	1.9201E+12
29	CU 60	PSTRN	23.4 M	1.4040E+03	1.3414E+08	2.9677E+14
29	CU 62	PSTRN	9.73 M	5.8380E+02	3.1219E+08	6.9069E+14
29	CU 64	EC	12.70 H	4.5720E+04	3.8618E+06	8.5439E+12
29	CU 66	BETA	5.10 M	3.0600E+02	5.5952E+08	1.2379E+15
29	CU 67	BETA	61.9 H	2.2284E+05	7.5685E+05	1.6744E+12
30	ZN 62	EC	9.2 H	3.3120E+04	5.5030E+06	1.2175E+13
30	ZN 63	PSTRN	38.1 M	2.2860E+03	7.8462E+07	1.7359E+14
30	ZN 65	EC	244.1 D	2.1090E+07	8.2430E+03	1.8237E+10
30	ZN 69	BETA	56.0 M	3.3600E+03	4.8741E+07	1.0783E+14
30	ZN 69M	IT	14.0 H	5.0400E+04	3.2494E+06	7.1889E+12
30	ZN 71	BETA	2.4 M	1.4400E+02	1.1052E+09	2.4452E+15
30	ZN 71M	BETA	3.9 H	1.4040E+04	1.1336E+07	2.5079E+13
30	ZN 72	BETA	46.5 H	1.6740E+05	9.3754E+05	2.0742E+12
31	GA 65	PSTRN	15.2 M	9.1200E+02	1.9062E+08	4.2173E+14
31	GA 66	PSTRN	9.4 H	3.3840E+04	5.0595E+06	1.1193E+13
31	GA 67	EC	78.3 H	2.8188E+05	5.9833E+05	1.3237E+12
31	GA 68	PSTRN	68.1 M	4.0860E+03	4.0670E+07	8.9977E+13
31	GA 70	BETA	21.1 M	1.2660E+03	1.2751E+08	2.8210E+14
31	GA 72	BETA	14.10 H	5.0760E+04	3.0919E+06	6.8405E+12
31	GA 73	BETA	4.87 H	1.7532E+04	8.8293E+06	1.9534E+13
32	GE 66	EC	2.3 H	8.2800E+03	2.0678E+07	4.5747E+13
32	GE 67	PSTRN	19.0 M	1.1400E+03	1.4794E+08	3.2731E+14
32	GE 68	EC	288.0 D	2.4883E+07	6.6783E+03	1.4775E+10
32	GE 69	EC	39.0 H	1.4040E+05	1.1664E+06	2.5806E+12
32	GE 71	EC	11.2 D	9.6768E+05	1.6447E+05	3.6387E+11

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
32	GE 75	BETA	82.8 M	4.9680E+03	3.0327E+07	6.7096E+13
32	GE 77	BETA	11.30 H	4.0680E+04	3.6075E+06	7.9812E+12
32	GE 78	BETA	1.45 H	5.2200E+03	2.7753E+07	6.1401E+13
33	AS 71	EC	61.0 H	2.1960E+05	7.2475E+05	1.6034E+12
33	AS 72	PSTRN	26.0 H	9.3600E+04	1.6768E+06	3.7096E+12
33	AS 73	EC	80.3 D	6.9379E+06	2.2311E+04	4.9361E+10
33	AS 74	EC	8.0 S	8.0000E+00	1.9088E+10	4.2230E+16
33	AS 76	BETA	26.3 H	9.4680E+04	1.5704E+06	3.4743E+12
33	AS 77	BETA	38.8 H	1.3968E+05	1.0506E+06	2.3244E+12
33	AS 78	BETA	91.0 M	5.4600E+03	2.6533E+07	5.8702E+13
34	SE 72	EC	8.4 D	7.2576E+05	2.1625E+05	4.7843E+11
34	SE 73	PSTRN	7.1 H	2.5560E+04	6.0561E+06	1.3399E+13
34	SE 73M	IT	41 M	2.4600E-01	6.2925E+11	1.3921E+18
34	SE 75	EC	118.5 D	1.0238E+07	1.4716E+04	3.2557E+10
34	SE 81	BETA	18.5 M	1.1100E+03	1.2568E+08	2.7806E+14
34	SE 81M	IT	57.3 M	3.4380E+03	4.0578E+07	8.9774E+13
34	SE 83	BETA	22.5 M	1.3500E+03	1.0085E+08	2.2311E+14
35	BR 76	PSTRN	16.1 H	5.7960E+04	2.5653E+06	5.6754E+12
35	BR 77	EC	57.0 H	2.0520E+05	7.1517E+05	1.5822E+12
35	BR 78	PSTRN	6.46 M	3.8760E+02	3.7377E+08	8.2692E+14
35	BR 80	BETA	17.6 M	1.0560E+03	1.3376E+08	2.9593E+14
35	BR 80M	IT	4.42 H	1.5912E+04	8.8769E+06	1.9639E+13
35	BR 83	BETA	2.39 H	8.6040E+03	1.5823E+07	3.5008E+13
36	KR 76	EC	14.8 H	5.3280E+04	2.7906E+06	6.1739E+12
36	KR 77	PSTRN	75.0 M	4.5000E+03	3.2612E+07	7.2150E+13
36	KR 79	EC	35.0 H	1.2600E+05	1.1352E+06	2.5116E+12
36	KR 81	EC	2.1E+5 Y	6.6272E+12	2.1051E-02	4.6572E+04
36	KR 83M	IT	1.83 H	6.5880E+03	2.0666E+07	4.5720E+13
36	KR 87	BETA	76.0 M	4.5600E+03	2.8484E+07	6.3017E+13
36	KR 88	BETA	2.84 H	1.0224E+04	1.2560E+07	2.7787E+13

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
37	RB 83	EC	86.2 D	7.4477E+06	1.8280E+04	4.0443E+10
37	RB 84	EC	32.9 D	2.8426E+06	4.7325E+04	1.0470E+11
37	RB 84M	IT	20.5 M	1.2300E+03	1.0937E+08	2.4197E+14
37	RB 86	BETA	18.8 D	1.6243E+06	8.0893E+04	1.7897E+11
37	RB 87	BETA	4.8E+10 Y	1.5148E+18	8.5745E-08	1.8970E-01
37	RB 88	BETA	17.8 M	1.0680E+03	1.2023E+08	2.6600E+14
37	RB 89	BETA	15.2 M	9.1200E+02	1.3922E+08	3.0800E+14
38	SR 82	EC	25.0 D	2.1600E+06	6.3799E+04	1.4115E+11
38	SR 83	EC	32.4 H	1.1664E+05	1.1672E+06	2.5823E+12
38	SR 85	EC	64.8 D	5.5987E+06	2.3745E+04	5.2533E+10
38	SR 85M	IT	68.0 M	4.0800E+03	3.2584E+07	7.2088E+13
38	SR 87M	IT	2.80 H	1.0080E+04	1.2885E+07	2.8508E+13
38	SR 89	BETA	50.5 D	4.3632E+06	2.9099E+04	6.4379E+10
38	SR 90	BETA	28.8 Y	9.0887E+08	1.3814E+02	3.0563E+08
38	SR 91	BETA	9.5 H	3.4200E+04	3.6309E+06	8.0329E+12
38	SR 92	BETA	2.71 H	9.7560E+03	1.2590E+07	2.7854E+13
39	Y 87	EC	80.3 H	2.8908E+05	4.4930E+05	9.9404E+11
39	Y 87M	IT	13.0 H	4.6800E+04	2.7753E+06	6.1401E+12
39	Y 88	EC	106.6 D	9.2102E+06	1.3942E+04	3.0845E+10
39	Y 90	BETA	64.1 H	2.3076E+05	5.4410E+05	1.2038E+12
39	Y 90M	IT	3.19 H	1.1484E+04	1.0933E+07	2.4188E+13
39	Y 91	BETA	58.5 D	5.0544E+06	2.4568E+04	5.4354E+10
39	Y 91M	IT	49.7 M	2.9820E+03	4.1642E+07	9.2128E+13
39	Y 92	BETA	3.54 H	1.2744E+04	9.6380E+06	2.1323E+13
39	Y 93	BETA	10.2 H	3.6720E+04	3.3090E+06	7.3207E+12
39	Y 94	BETA	18.7 M	1.1220E+03	1.0714E+08	2.3704E+14
39	Y 95	BETA	10.3 M	6.1800E+02	1.9247E+08	4.2582E+14
40	ZR 85	PSTRN	1.4 H	5.0400E+03	2.6377E+07	5.8357E+13
40	ZR 86	EC	16.5 H	5.9400E+04	2.2120E+06	4.8939E+12
40	ZR 87	PSTRN	1.6 H	5.7600E+03	2.2549E+07	4.9888E+13
40	ZR 88	EC	83.4 D	7.2058E+06	1.7820E+04	3.9426E+10
40	ZR 89	EC	78.4 H	2.8224E+05	4.4985E+05	9.9525E+11
40	ZR 89M	IT	4.18 M	2.5080E+02	5.0625E+08	1.1200E+15

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
40	ZR 93	BETA	1.5E+6 Y	4.7337E+13	2.5668E-03	5.6788E+03
40	ZR 95	BETA	64.0 D	5.5296E+06	2.1511E+04	4.7591E+10
40	ZR 97	BETA	16.9 H	6.0840E+04	1.9148E+06	4.2362E+12
41	NB 89	PSTRN	66.0 M	3.9600E+03	3.2062E+07	7.0934E+13
41	NB 90	PSTRN	14.6 H	5.2560E+04	2.3888E+06	5.2850E+12
41	NB 90M	IT	18.8 S	1.8800E+01	6.6785E+09	1.4775E+16
41	NB 92M	EC	10.15 D	8.7696E+05	1.4006E+05	3.0986E+11
41	NB 94	BETA	2.0E+4 Y	6.3116E+11	1.9046E-01	4.2138E+05
41	NB 95	BETA	35.0 D	3.0240E+06	3.9334E+04	8.7023E+10
41	NB 96	BETA	23.4 H	8.4240E+04	1.3973E+06	3.0914E+12
41	NB 97	BETA	72 M	4.3200E-01	2.6966E+11	5.9660E+17
42	MO 88	PSTRN	8.0 M	4.8000E+02	2.6752E+08	5.9186E+14
42	MO 90	EC	5.67 H	2.0412E+04	6.1511E+06	1.3609E+13
42	MO 91	PSTRN	15.49 M	9.2940E+02	1.3361E+08	2.9559E+14
42	MO 93M	IT	6.9 H	2.4840E+04	4.8915E+06	1.0822E+13
42	MO 99	BETA	66.02 H	2.3767E+05	4.8025E+05	1.0625E+12
42	MO 101	BETA	14.6 M	8.7600E+02	1.2772E+08	2.8256E+14
43	TC 95M	EC	61.0 D	5.2704E+06	2.2569E+04	4.9931E+10
43	TC 96	EC	4.3 D	3.7152E+05	3.1683E+05	7.0095E+11
43	TC 97	EC	2.6E+5 Y	8.2051E+12	1.4198E-02	3.1411E+04
43	TC 97M	IT	90.0 D	7.7760E+06	1.4981E+04	3.3145E+10
43	TC 98	BETA	4.2E+6 Y	1.3254E+14	8.6995E-04	1.9247E+03
43	TC 99	BETA	2.1E+5 Y	6.6272E+12	1.7223E-02	3.8104E+04
44	RU 97	EC	2.88 D	2.4883E+05	4.6817E+05	1.0358E+12
44	RU 103	BETA	39.4 D	3.4042E+06	3.2228E+04	7.1301E+10
44	RU 105	BETA	4.44 H	1.5984E+04	6.7329E+06	1.4896E+13
44	RU 106	BETA	367.0 D	3.1709E+07	3.3620E+03	7.4380E+09
45	RH 101	EC	3.3 Y	1.0414E+08	1.0743E+03	2.3768E+09
45	RH 102	EC	2.9 Y	9.1518E+07	1.2105E+03	2.6781E+09
45	RH 102M	EC	206.0 D	1.7798E+07	6.2244E+03	1.3771E+10

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
45	RH 105	BETA	35.4 H	1.2744E+05	8.4447E+05	1.8683E+12
46	PD 98	EC+P	18.0 M	1.0800E+03	1.0676E+08	2.3621E+14
46	PD 103	EC	17.0 D	1.4688E+06	7.4693E+04	1.6525E+11
46	PD 107	BETA	6.5E+6 Y	2.0513E+14	5.1484E-04	1.1390E+03
46	PD 109	BETA	13.43 H	4.8348E+04	2.1442E+06	4.7439E+12
46	PD 111M	IT	5.5 H	1.9800E+04	5.1415E+06	1.1375E+13
47	AG 105	EC	41.3 D	3.5683E+06	3.0160E+04	6.6725E+10
47	AG 108M	EC+P	127.0 Y	4.0079E+09	2.6106E+01	5.7757E+07
47	AG 110	BETA	24.4 S	2.4400E+01	4.2101E+09	9.3145E+15
47	AG 110M	BETA	252.0 D	2.1773E+07	4.7181E+03	1.0438E+10
48	CD 109	EC	453.0 D	3.9139E+07	2.6487E+03	5.8601E+09
48	CD 113M	BETA	14.0 Y	4.4181E+08	2.2634E+02	5.0075E+08
48	CD 115	BETA	53.4 H	1.9224E+05	5.1114E+05	1.1308E+12
48	CD 115M	BETA	44.8 D	3.8707E+06	2.5386E+04	5.6163E+10
48	CD 117	BETA	2.4 H	8.6400E+03	1.1178E+07	2.4731E+13
49	IN 111	EC	2.83 D	2.4451E+05	4.1635E+05	9.2112E+11
49	IN 113M	IT	99.5 M	5.9700E+03	1.6750E+07	3.7058E+13
49	IN 114M	IT	49.51 D	4.2777E+06	2.3172E+04	5.1266E+10
49	IN 116M	BETA	54.1 M	3.2460E+03	3.0010E+07	6.6395E+13
50	SN 113	EC	115.1 D	9.9446E+06	1.0056E+04	2.2247E+10
50	SN 117M	IT	14.0 D	1.2096E+06	7.9846E+04	1.7665E+11
50	SN 121	BETA	27.1 H	9.7560E+04	9.5724E+05	2.1178E+12
50	SN 123	BETA	129.0 D	1.1146E+07	8.2427E+03	1.8236E+10
50	SN 125	BETA	9.62 D	8.3117E+05	1.0876E+05	2.4063E+11
50	SN 126	BETA	1E+5 Y	3.1558E+08	2.8418E+02	6.2872E+08
51	SB 119	EC	38.0 H	1.3680E+05	6.9414E+05	1.5357E+12

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
51	SB 120	EC	15.8 M	9.4800E+02	9.9332E+07	2.1976E+14
51	SB 122	BETA	2.68 D	2.3155E+05	4.0001E+05	8.8498E+11
51	SB 124	BETA	60.20 D	5.2013E+06	1.7521E+04	3.8762E+10
51	SB 125	BETA	2.7 Y	8.5207E+07	1.0610E+03	2.3472E+09
51	SB 126	BETA	12.4 D	1.0714E+06	8.3709E+04	1.8520E+11
51	SB 127	BETA	3.9 D	3.3696E+05	2.6406E+05	5.8420E+11
51	SB 128	BETA	9.1 H	3.2760E+04	2.6948E+06	5.9619E+12
51	SB 128M	BETA	10.0 M	6.0000E+02	1.4714E+08	3.2552E+14
52	TE 121	EC	16.8 D	1.4515E+06	6.4338E+04	1.4234E+11
52	TE 121M	IT	154.0 D	1.3306E+07	7.0187E+03	1.5528E+10
52	TE 123M	IT	119.7 D	1.0342E+07	8.8831E+03	1.9653E+10
52	TE 125M	IT	58.0 D	5.0112E+06	1.8040E+04	3.9911E+10
52	TE 127	BETA	9.4 H	3.3840E+04	2.6293E+06	5.8171E+12
52	TE 127M	IT	109.0 D	9.4176E+06	9.4479E+03	2.0902E+10
52	TE 129M	IT	33.5 D	2.8944E+06	3.0264E+04	6.6956E+10
52	TE 131M	BETA	30.0 H	1.0800E+05	7.9870E+05	1.7670E+12
52	TE 132	BETA	78.0 H	2.8080E+05	3.0486E+05	6.7448E+11
53	I 124	EC	4.2 D	3.6288E+05	2.5113E+05	5.5559E+11
53	I 125	EC	60.21 D	5.2021E+06	1.7377E+04	3.8446E+10
53	I 126	EC	13.0 D	1.1232E+06	7.9846E+04	1.7665E+11
53	I 128	BETA	24.99 M	1.4994E+03	5.8878E+07	1.3026E+14
53	I 129	BETA	1.6E+7 Y	5.0493E+14	1.7348E-04	3.8381E+02
53	I 130	BETA	12.36 H	4.4496E+04	1.9535E+06	4.3219E+12
53	I 131	BETA	8.040 D	6.9466E+05	1.2418E+05	2.7473E+11
53	I 132	BETA	2.28 H	8.2080E+03	1.0430E+07	2.3074E+13
53	I 133	BETA	20.9 H	7.5240E+04	1.1292E+06	2.4983E+12
53	I 135	BETA	6.61 H	2.3796E+04	3.5176E+06	7.7822E+12
54	XE 129M	IT	8.89 D	7.6810E+05	1.1404E+05	2.5231E+11
54	XE 131M	IT	11.77 D	1.0169E+06	8.4824E+04	1.8766E+11
54	XE 133M	IT	2.19 D	1.8922E+05	4.4902E+05	9.9341E+11
54	XE 135	BETA	9.10 H	3.2760E+04	2.5551E+06	5.6528E+12

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
55	CS 131	EC	9.688 D	8.3704E+05	1.0305E+05	2.2799E+11
55	CS 132	EC	6.47 D	5.5901E+05	1.5314E+05	3.3880E+11
55	CS 134	BETA	2.062 Y	6.5073E+07	1.2959E+03	2.8671E+09
55	CS 134M	IT	2.90 H	1.0440E+04	8.0774E+06	1.7870E+13
55	CS 135	BETA	3.0E+6 Y	9.4674E+13	8.8413E-04	1.9560E+03
55	CS 136	BETA	13.1 D	1.1318E+06	7.3410E+04	1.6241E+11
55	CS 137	BETA	30.17 Y	9.5210E+08	8.6631E+01	1.9166E+08
56	BA 131	EC	12.0 D	1.0368E+06	8.3198E+04	1.8407E+11
56	BA 133	EC	10.7 Y	3.3767E+08	2.5161E+02	5.5667E+08
56	BA 133M	IT	38.9 H	1.4004E+05	6.0670E+05	1.3423E+12
56	BA 139	BETA	82.9 M	4.9740E+03	1.6344E+07	3.6159E+13
56	BA 140	BETA	12.79 D	1.1051E+06	7.3041E+04	1.6159E+11
57	LA 135	EC	19.4 H	6.9840E+04	1.1985E+06	2.6516E+12
57	LA 137	EC	6.0E+4 Y	1.8935E+12	4.3561E-02	9.6374E+04
57	LA 140	BETA	40.3 H	1.4508E+05	5.5634E+05	1.2308E+12
57	LA 141	BETA	3.90 H	1.4040E+04	5.7081E+06	1.2629E+13
57	LA 142	BETA	93.0 M	5.5800E+03	1.4261E+07	3.1551E+13
58	CE 135	EC	17.8 H	6.4080E+04	1.3062E+06	2.8899E+12
58	CE 137	EC	9.0 H	3.2400E+04	2.5457E+06	5.6322E+12
58	CE 137M	IT	34.4 H	1.2384E+05	6.6603E+05	1.4735E+12
58	CE 139	EC	137.2 D	1.1854E+07	6.8580E+03	1.5173E+10
58	CE 141	BETA	32.5 D	2.8080E+06	2.8541E+04	6.3143E+10
58	CE 143	BETA	33.0 H	1.1880E+05	6.6516E+05	1.4716E+12
58	CE 144	BETA	284.0 D	2.4538E+07	3.1980E+03	7.0753E+09
59	PR 142	BETA	1.6 M	9.6000E+01	8.2893E+08	1.8339E+15
59	PR 143	BETA	13.58 D	1.1733E+06	6.7349E+04	1.4900E+11
59	PR 145	BETA	5.98 H	2.1528E+04	3.6200E+06	8.0088E+12
60	ND 140	EC	3.37 D	2.9117E+05	2.7721E+05	6.1329E+11
60	ND 147	BETA	11.0 D	9.5040E+05	8.0883E+04	1.7894E+11
60	ND 149	BETA	1.73 H	6.2280E+03	1.2177E+07	2.6940E+13

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
61	PM 143	EC	265.0 D	2.2896E+07	3.4513E+03	7.6356E+09
61	PM 144	EC	349.0 D	3.0154E+07	2.6024E+03	5.7576E+09
61	PM 145	EC	17.7 Y	5.5858E+08	1.3952E+02	3.0867E+08
61	PM 146	EC	5.5 Y	1.7357E+08	4.4592E+02	9.8654E+08
61	PM 147	BETA	2.6234 Y	8.2789E+07	9.2851E+02	2.0542E+09
61	PM 149	BETA	53.1 H	1.9116E+05	3.9673E+05	8.7772E+11
61	PM 151	BETA	28.4 H	1.0224E+05	7.3195E+05	1.6194E+12
62	SM 151	BETA	90.0 Y	2.8402E+09	2.6348E+01	5.8292E+07
62	SM 153	BETA	46.8 H	1.6848E+05	4.3837E+05	9.6984E+11
62	SM 156	BETA	9.4 H	3.3840E+04	2.1405E+06	4.7357E+12
63	EU 145	EC	5.93 D	5.1235E+05	1.5210E+05	3.3651E+11
63	EU 146	EC	4.62 D	3.9917E+05	1.9390E+05	4.2897E+11
63	EU 147	EC	22.0 D	1.9008E+06	4.0441E+04	8.9472E+10
63	EU 148	EC	54.0 D	4.6656E+06	1.6365E+04	3.6205E+10
63	EU 149	EC	93.1 D	8.0438E+06	9.4282E+03	2.0859E+10
63	EU 150	EC	36.0 Y	1.1361E+09	6.6309E+01	1.4670E+08
63	EU 150	BETA	12.6 H	4.5360E+04	1.6608E+06	3.6743E+12
63	EU 152	EC	13.0 Y	4.1025E+08	1.8121E+02	4.0091E+08
63	EU 152M	BETA	9.3 H	3.3480E+04	2.2205E+06	4.9126E+12
63	EU 154	BETA	8.5 Y	2.6824E+08	2.7355E+02	6.0519E+08
63	EU 155	BETA	4.9 Y	1.5463E+08	4.7146E+02	1.0430E+09
63	EU 156	BETA	15.0 D	1.2960E+06	5.5892E+04	1.2365E+11
64	GD 148	ALPHA	98.0 Y	3.0927E+09	2.4688E+01	5.4619E+07
64	GD 150	ALPHA	1.8E+6 Y	5.6804E+13	1.3262E-03	2.9340E+03
64	GD 151	EC	120.0 D	1.0368E+07	7.2178E+03	1.5969E+10
64	GD 153	EC	241.6 D	2.0874E+07	3.5382E+03	7.8278E+09
64	GD 159	BETA	18.6 H	6.6960E+04	1.0614E+06	2.3482E+12
65	TB 156	EC	5.3 D	4.5792E+05	1.5818E+05	3.4997E+11
65	TB 157	EC	150.0 Y	4.7337E+09	1.5205E+01	3.3639E+07
65	TB 158	EC	150.0 Y	4.7337E+09	1.5108E+01	3.3426E+07

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
65	TB 160	BETA	72.1 D	6.2294E+06	1.1337E+04	2.5083E+10
65	TB 161	BETA	6.90 D	5.9616E+05	1.1773E+05	2.6047E+11
66	DY 159	EC	144.4 D	1.2476E+07	5.6964E+03	1.2603E+10
66	DY 165	BETA	2.33 H	8.3880E+03	8.1646E+06	1.8063E+13
66	DY 166	BETA	81.5 H	2.9340E+05	2.3201E+05	5.1330E+11
67	HO 166	BETA	26.80 H	9.6480E+04	7.0556E+05	1.5610E+12
67	HO 166M	BETA	1.2E+3 Y	3.7870E+10	1.7975E+00	3.9769E+06
68	ER 165	EC	10.4 H	3.7440E+04	1.8292E+06	4.0469E+12
68	ER 169	BETA	9.40 D	8.1216E+05	8.2328E+04	1.8214E+11
68	ER 171	BETA	7.52 H	2.7072E+04	2.4410E+06	5.4004E+12
68	ER 172	BETA	49.5 H	1.7820E+05	3.6867E+05	8.1565E+11
69	TM 167	EC	9.25 D	7.9920E+05	8.4666E+04	1.8731E+11
69	TM 168	EC	93.1 D	8.0438E+06	8.3619E+03	1.8500E+10
69	TM 170	BETA	128.6 D	1.1111E+07	5.9824E+03	1.3235E+10
69	TM 171	BETA	1.92 Y	6.0591E+07	1.0906E+03	2.4129E+09
69	TM 172	BETA	63.6 H	2.2896E+05	2.8694E+05	6.3482E+11
69	TM 173	BETA	8.2 H	2.9520E+04	2.2127E+06	4.8953E+12
70	YB 166	EC	56.7 H	2.0412E+05	3.3349E+05	7.3781E+11
70	YB 169	EC	32.0 D	2.7648E+06	2.4184E+04	5.3504E+10
70	YB 175	BETA	4.19 D	3.6202E+05	1.7837E+05	3.9462E+11
70	YB 177	BETA	1.9 H	6.8400E+03	9.3336E+06	2.0650E+13
71	LU 171	EC	8.25 D	7.1280E+05	9.2707E+04	2.0510E+11
71	LU 172	EC	6.70 D	5.7888E+05	1.1349E+05	2.5109E+11
71	LU 173	EC	1.37 Y	4.3234E+07	1.5108E+03	3.3424E+09
71	LU 174	EC	3.3 Y	1.0414E+08	6.2360E+02	1.3796E+09
71	LU 174M	IT	142.0 D	1.2269E+07	5.2933E+03	1.1711E+10
71	LU 176M	BETA	3.68 H	1.3248E+04	4.8464E+06	1.0722E+13
71	LU 177	BETA	6.71 D	5.7974E+05	1.1012E+05	2.4363E+11
71	LU 177M	BETA	160.5 D	1.3867E+07	4.6038E+03	1.0185E+10

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
72	HF 172	EC	1.87 Y	5.9013E+07	1.1133E+03	2.4630E+09
72	HF 173	EC	24.0 H	8.6400E+04	7.5599E+05	1.6726E+12
72	HF 175	EC	70.0 D	6.0480E+06	1.0676E+04	2.3621E+10
72	HF 180M	IT	5.5 H	1.9800E+04	3.1706E+06	7.0146E+12
72	HF 181	BETA	42.4 D	3.6634E+06	1.7042E+04	3.7704E+10
72	HF 182	BETA	9.0E+6 Y	2.8402E+14	2.1860E-04	4.8363E+02
73	TA 177	EC	56.6 H	2.0376E+05	3.1332E+05	6.9318E+11
73	TA 178	EC	9.3 M	5.5800E+02	1.1377E+08	2.5170E+14
73	TA 178	EC	2.4 H	8.6400E+03	7.3476E+06	1.6256E+13
73	TA 180M	EC	8.1 H	2.9160E+04	2.1529E+06	4.7630E+12
73	TA 182	BETA	115.0 D	9.9360E+06	6.2488E+03	1.3825E+10
73	TA 182M	IT	0.28 S	2.8000E-01	2.2174E+11	4.9058E+17
73	TA 183	BETA	5.1 D	4.4064E+05	1.4013E+05	3.1003E+11
74	W 178	EC	21.5 D	1.8576E+06	3.4175E+04	7.5608E+10
74	W 181	EC	121.0 D	1.0454E+07	5.9717E+03	1.3212E+10
74	W 185	BETA	75.1 D	6.4886E+06	9.4135E+03	2.0826E+10
74	W 187	BETA	23.9 H	8.6040E+04	7.0232E+05	1.5538E+12
74	W 188	BETA	69.4 D	5.9962E+06	1.0024E+04	2.2177E+10
75	RE 183	EC	71.0 D	6.1344E+06	1.0066E+04	2.2270E+10
75	RE 184	EC	38.0 D	3.2832E+06	1.8705E+04	4.1383E+10
75	RE 184M	IT	169.0 D	1.4602E+07	4.2059E+03	9.3051E+09
75	RE 186	BETA	90.6 H	3.2616E+05	1.8627E+05	4.1209E+11
75	RE 188	BETA	16.9 H	6.0840E+04	9.8794E+05	2.1857E+12
75	RE 189	BETA	24.3 H	8.7480E+04	6.8345E+05	1.5121E+12
76	OS 185	EC	93.6 D	8.0870E+06	7.5530E+03	1.6710E+10
76	OS 186	ALPHA	2.0E+15 Y	6.3116E+22	9.6256E-13	2.1295E-06
76	OS 189M	IT	5.7 H	2.0520E+04	2.9137E+06	6.4462E+12
76	OS 191	BETA	15.4 D	1.3306E+06	4.4464E+04	9.8372E+10
76	OS 191M	IT	13.1 H	4.7160E+04	1.2545E+06	2.7754E+12
76	OS 193	BETA	30.6 H	1.1016E+05	5.3149E+05	1.1759E+12
76	OS 194	BETA	6.0 Y	1.8935E+08	3.0762E+02	6.8058E+08

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
77	IR 188	EC	41.5 H	1.4940E+05	4.0232E+05	8.9009E+11
77	IR 189	EC	13.1 D	1.1318E+06	5.2824E+04	1.1687E+11
77	IR 190	EC	11.8 D	1.0195E+06	5.8335E+04	1.2906E+11
77	IR 190M	IT	1.2 H	4.3200E+03	1.3767E+07	3.0458E+13
77	IR 192	BETA	74.2 D	6.4109E+06	9.1804E+03	2.0311E+10
77	IR 193M	IT	10.6 D	9.1584E+05	6.3930E+04	1.4144E+11
77	IR 194	BETA	19.2 H	6.9120E+04	8.4270E+05	1.8644E+12
78	PT 186	EC	2.0 H	7.2000E+03	8.4379E+06	1.8668E+13
78	PT 188	EC	10.2 D	8.8128E+05	6.8204E+04	1.5089E+11
78	PT 189	EC	10.9 H	3.9240E+04	1.5237E+06	3.3709E+12
78	PT 190	ALPHA	6.0E+11 Y	1.8935E+19	3.1410E-09	6.9491E-03
78	PT 193M	IT	4.3 D	3.7152E+05	1.5759E+05	3.4866E+11
78	PT 195M	IT	4.02 D	3.4733E+05	1.6684E+05	3.6912E+11
78	PT 197	BETA	18.3 H	6.5880E+04	8.7068E+05	1.9263E+12
78	PT 197M	IT	94.0 M	5.6400E+03	1.0170E+07	2.2501E+13
78	PT 200	BETA	12.6 H	4.5360E+04	1.2456E+06	2.7557E+12
79	AU 194	EC	39.5 H	1.4220E+05	4.0962E+05	9.0623E+11
79	AU 195	EC	183.0 D	1.5811E+07	3.6650E+03	8.1085E+09
79	AU 196	EC	6.18 D	5.3395E+05	1.0797E+05	2.3888E+11
79	AU 196M	IT	8.2 S	8.2000E+00	7.0309E+09	1.5555E+16
79	AU 198	BETA	2.696 D	2.3293E+05	2.4501E+05	5.4205E+11
79	AU 199	BETA	3.14 D	2.7130E+05	2.0931E+05	4.6307E+11
80	HG 193	EC	4.0 H	1.4400E+04	4.0659E+06	8.9954E+12
80	HG 194	EC	260.0 Y	8.2051E+09	7.0989E+00	1.5706E+07
80	HG 195	EC	10.0 H	3.6000E+04	1.6097E+06	3.5613E+12
80	HG 195M	EC	41.0 H	1.4760E+05	3.9261E+05	8.6860E+11
80	HG 197	EC	64.1 H	2.3076E+05	2.4857E+05	5.4994E+11
80	HG 197M	IT	23.8 H	8.5680E+04	6.6947E+05	1.4811E+12
80	HG 199M	IT	42.6 M	2.5560E+03	2.2216E+07	4.9150E+13
80	HG 203	BETA	46.8 D	4.0435E+06	1.3766E+04	3.0457E+10
81	TL 198	EC	5.3 H	1.9080E+04	2.9911E+06	6.6175E+12
81	TL 198M	EC+P	1.87 H	6.7320E+03	8.4775E+06	1.8756E+13

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
81	TL 199	EC	7.4 H	2.6640E+04	2.1315E+06	4.7158E+12
81	TL 200	EC	26.1 H	9.3960E+04	6.0132E+05	1.3304E+12
81	TL 201	EC	73.0 H	2.6280E+05	2.1392E+05	4.7328E+11
81	TL 202	EC	12.2 D	1.0541E+06	5.3071E+04	1.1741E+11
81	TL 204	BETA	3.77 Y	1.1897E+08	4.6558E+02	1.0301E+09
82	PB 200	EC	21.5 H	7.7400E+04	7.2997E+05	1.6150E+12
82	PB 201	EC	9.4 H	3.3840E+04	1.6613E+06	3.6755E+12
82	PB 202	EC	3.0E+5 Y	9.4674E+12	5.9088E-03	1.3072E+04
82	PB 202M	IT	3.62 H	1.3032E+04	4.2926E+06	9.4968E+12
82	PB 203	EC	52.0 H	1.8720E+05	2.9736E+05	6.5787E+11
82	PB 204M	IT	66.9 M	4.0140E+03	1.3800E+07	3.0530E+13
82	PB 205	EC	1.4E+7 Y	4.4181E+14	1.2476E-04	2.7603E+02
82	PB 209	BETA	3.25 H	1.1700E+04	4.6211E+06	1.0224E+13
82	PB 210	BETA	22.3 Y	7.0374E+08	7.6462E+01	1.6916E+08
82	PB 211	BETA	36.1 M	2.1660E+03	2.4725E+07	5.4701E+13
82	PB 212	BETA	10.64 H	3.8304E+04	1.3915E+06	3.0786E+12
82	PB 214	BETA	26.8 M	1.6080E+03	3.2838E+07	7.2651E+13
83	BI 200	EC	36.0 M	2.1600E+03	2.6157E+07	5.7870E+13
83	BI 202	EC	1.7 H	6.1200E+03	9.1406E+06	2.0223E+13
83	BI 203	EC	11.8 H	4.2480E+04	1.3104E+06	2.8991E+12
83	BI 204	EC	11.2 H	4.0320E+04	1.3738E+06	3.0394E+12
83	BI 205	EC	15.3 D	1.3219E+06	4.1698E+04	9.2253E+10
83	BI 206	EC	6.243 D	5.3940E+05	1.0170E+05	2.2499E+11
83	BI 207	EC	38.0 Y	1.1992E+09	4.5521E+01	1.0071E+08
83	BI 208	EC	3.68E+5	4.4131E+14	1.2310E-04	2.7236E+02
83	BI 210	BETA	5.01 D	4.3286E+05	1.2431E+05	2.7502E+11
83	BI 210M	ALPHA	3.0E+6 Y	9.4674E+13	5.6837E-04	1.2574E+03
83	BI 211	ALPHA	2.15 M	1.2900E+02	4.1515E+08	9.1848E+14
83	BI 212	BETA	60.60 M	3.6360E+03	1.4659E+07	3.2432E+13
83	BI 214	BETA	19.7 M	1.1820E+03	4.4673E+07	9.8835E+13

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
84	PO 202	EC+P	44.0 M	2.6400E+03	2.1190E+07	4.6880E+13
84	PO 203	EC+P	33.0 M	1.9800E+03	2.8114E+07	6.2198E+13
84	PO 204	EC	3.57 H	1.2852E+04	4.3100E+06	9.5354E+12
84	PO 205	EC+P	1.80 H	6.4800E+03	8.5065E+06	1.8820E+13
84	PO 206	EC	8.8 D	7.6032E+05	7.2146E+04	1.5962E+11
84	PO 207	EC	5.7 H	2.0520E+04	2.6603E+06	5.8856E+12
84	PO 208	ALPHA	2.90 Y	9.1518E+07	5.9362E+02	1.3133E+09
84	PO 209	ALPHA	102.0 Y	3.2189E+09	1.6797E+01	3.7161E+07
84	PO 210	ALPHA	138.38 D	1.1956E+07	4.5006E+03	9.9571E+09
84	PO 211	ALPHA	0.516 S	5.1600E-01	1.0379E+11	2.2962E+17
84	PO 211M	ALPHA	25.0 S	2.5000E+01	2.1422E+09	4.7393E+15
84	PO 214	ALPHA	164.0 U	1.6400E-04	3.2197E+14	7.1233E+20
84	PO 215	ALPHA	1.78E-3 S	1.7800E-03	2.9527E+13	6.5325E+19
84	PO 216	ALPHA	0.15 S	1.5000E-01	3.4877E+11	7.7160E+17
84	PO 218	ALPHA	3.05 M	1.8300E+02	2.8325E+08	6.2666E+14
85	AT 205	EC	26.0 M	1.5600E+03	3.5335E+07	7.8174E+13
85	AT 206	EC	31.0 M	1.8600E+03	2.9492E+07	6.5247E+13
85	AT 207	EC+P	1.8 H	6.4800E+03	8.4243E+06	1.8638E+13
85	AT 208	EC+P	1.63 H	5.8680E+03	9.2582E+06	2.0483E+13
85	AT 209	EC	5.4 H	1.9440E+04	2.7812E+06	6.1531E+12
85	AT 210	EC+P	8.3 H	2.9880E+04	1.8009E+06	3.9842E+12
85	AT 211	EC	7.21 H	2.5956E+04	2.0633E+06	4.5648E+12
86	RN 208	ALPHA	24.0 M	1.4400E+03	3.7727E+07	8.3467E+13
86	RN 209	EC	29.0 M	1.7400E+03	3.1073E+07	6.8746E+13
86	RN 210	ALPHA	2.4 H	8.6400E+03	6.2280E+06	1.3779E+13
86	RN 211	EC+P	14.6 H	5.2560E+04	1.0189E+06	2.2543E+12
86	RN 212	ALPHA	23.0 M	1.3800E+03	3.8625E+07	8.5453E+13
86	RN 219	ALPHA	3.96 S	3.9600E+00	1.3030E+10	2.8827E+16
86	RN 220	ALPHA	55.6 S	5.5600E+01	9.2381E+08	2.0438E+15
86	RN 222	ALPHA	3.8235 D	3.3035E+05	1.5408E+05	3.4089E+11
86	RN 223	BETA	43.0 M	2.5800E+03	1.9641E+07	4.3453E+13

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
86	RN 224	BETA	1.8 H	6.4800E+03	7.7849E+06	1.7223E+13
87	FR 212	EC+P	19.3 M	1.1580E+03	4.6029E+07	1.0183E+14
87	FR 223	BETA	21.8 M	1.3080E+03	3.8741E+07	8.5709E+13
88	RA 213	ALPHA	2.7 M	1.6200E+02	3.2748E+08	7.2451E+14
88	RA 223	ALPHA	11.435 D	9.8798E+05	5.1289E+04	1.1347E+11
88	RA 224	ALPHA	3.66 D	3.1622E+05	1.5953E+05	3.5294E+11
88	RA 225	BETA	14.8 D	1.2787E+06	3.9275E+04	8.6892E+10
88	RA 226	ALPHA	1.60E+3 Y	5.0493E+10	9.9024E-01	2.1908E+06
88	RA 227	BETA	42.2 M	2.5320E+03	1.9660E+07	4.3496E+13
88	RA 228	BETA	5.76 Y	1.8177E+08	2.7265E+02	6.0322E+08
89	AC 223	ALPHA	2.2 M	1.3200E+02	3.8388E+08	8.4930E+14
89	AC 224	EC	2.9 H	1.0440E+04	4.8320E+06	1.0690E+13
89	AC 225	ALPHA	10.0 D	8.6400E+05	5.8128E+04	1.2860E+11
89	AC 226	BETA	29.0 H	1.0440E+05	4.7893E+05	1.0596E+12
89	AC 227	BETA	21.773 Y	6.8711E+08	7.2448E+01	1.6028E+08
89	AC 228	BETA	6.13 H	2.2068E+04	2.2458E+06	4.9687E+12
90	TH 227	ALPHA	18.718 D	1.6172E+06	3.0781E+04	6.8099E+10
90	TH 228	ALPHA	1.9131 Y	6.0374E+07	8.2091E+02	1.8162E+09
90	TH 229	ALPHA	7.3E+3 Y	2.3037E+11	2.1420E-01	4.7388E+05
90	TH 230	ALPHA	8.0E+4 Y	2.5246E+12	1.9460E-02	4.3054E+04
90	TH 231	BETA	25.52 H	9.1872E+04	5.3246E+05	1.1780E+12
90	TH 232	ALPHA	1.41E+10 Y	4.4497E+17	1.0946E-07	2.4217E-01
90	TH 233	BETA	22.3 M	1.3380E+03	3.6247E+07	8.0191E+13
90	TH 234	BETA	24.10 D	2.0822E+06	2.3192E+04	5.1309E+10
91	PA 228	EC	22.0 H	7.9200E+04	6.2578E+05	1.3845E+12
91	PA 229	EC	1.4 D	1.2096E+05	4.0794E+05	9.0253E+11
91	PA 230	EC	17.7 D	1.5293E+06	3.2127E+04	7.1076E+10
91	PA 231	ALPHA	3.28E+4 Y	1.0351E+12	4.7259E-02	1.0455E+05

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
91	PA 232	BETA	1.31 D	1.1318E+05	4.3033E+05	9.5207E+11
91	PA 233	BETA	27.0 D	2.3328E+06	2.0790E+04	4.5995E+10
91	PA 234	BETA	6.75 H	2.4300E+04	1.9873E+06	4.3966E+12
92	U 229	EC	58.0 M	3.4800E+03	1.4180E+07	3.1371E+13
92	U 230	ALPHA	20.8 D	1.7971E+06	2.7338E+04	6.0483E+10
92	U 231	EC	4.2 D	3.6288E+05	1.3480E+05	2.9824E+11
92	U 232	ALPHA	72.0 Y	2.2722E+09	2.1436E+01	4.7425E+07
92	U 233	ALPHA	1.592E+5 Y	5.0240E+12	9.6532E-03	2.1357E+04
92	U 234	ALPHA	2.45E+5 Y	7.7317E+12	6.2458E-03	1.3818E+04
92	U 235	ALPHA	7.038E+8 Y	2.2211E+16	2.1650E-06	4.7898E+00
92	U 235M	IT	26.0 M	1.5600E+03	3.0824E+07	6.8194E+13
92	U 236	ALPHA	2.342E+7 Y	7.3909E+14	6.4784E-05	1.4333E+02
92	U 237	BETA	6.75 D	5.8320E+05	8.1755E+04	1.8087E+11
92	U 238	ALPHA	4.468E+9 Y	1.4100E+17	3.3673E-07	7.4497E-01
92	U 239	BETA	23.5 M	1.4100E+03	3.3532E+07	7.4186E+13
92	U 240	BETA	14.1 H	5.0760E+04	9.2757E+05	2.0521E+12
93	NP 234	EC	4.4 D	3.8016E+05	1.2703E+05	2.8103E+11
93	NP 235	EC	396.0 D	3.4214E+07	1.4054E+03	3.1093E+09
93	NP 236	EC	1.1E+5 Y	3.4714E+12	1.3793E-02	3.0516E+04
93	NP 236	EC	22.5 H	8.1000E+04	5.9113E+05	1.3078E+12
93	NP 237	ALPHA	2.14E+6 Y	6.7534E+13	7.0600E-04	1.5620E+03
93	NP 238	BETA	2.117 D	1.8291E+05	2.5958E+05	5.7429E+11
93	NP 239	BETA	2.35 D	2.0304E+05	2.3286E+05	5.1518E+11
94	PU 234	EC	8.8 H	3.1680E+04	1.5243E+06	3.3724E+12
94	PU 236	ALPHA	2.85 Y	8.9940E+07	5.3237E+02	1.1778E+09
94	PU 237	EC	45.4 D	3.9226E+06	1.2155E+04	2.6892E+10
94	PU 238	ALPHA	87.74 Y	2.7689E+09	1.7147E+01	3.7936E+07
94	PU 239	ALPHA	2.41E+4 Y	7.6055E+11	6.2166E-02	1.3754E+05
94	PU 240	ALPHA	6.57E+3 Y	2.0734E+11	2.2709E-01	5.0240E+05
94	PU 241	BETA	14.4 Y	4.5444E+08	1.0318E+02	2.2827E+08
94	PU 242	ALPHA	3.76E+5 Y	1.1866E+13	3.9352E-03	8.7062E+03

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
94	PU 243	BETA	4.956 H	1.7842E+04	2.6064E+06	5.7663E+12
94	PU 244	ALPHA	8.1E+7 Y	2.5562E+15	1.8117E-05	4.0083E+01
94	PU 245	BETA	10.5 H	3.7800E+04	1.2202E+06	2.6995E+12
94	PU 246	BETA	10.85 D	9.3744E+05	4.9000E+04	1.0841E+11
95	AM 239	EC	11.9 H	4.2840E+04	1.1036E+06	2.4417E+12
95	AM 240	EC	50.8 H	1.8288E+05	2.5745E+05	5.6959E+11
95	AM 241	ALPHA	433.0 Y	1.3665E+10	3.4313E+00	7.5915E+06
95	AM 242	BETA	16.01 H	5.7636E+04	8.1016E+05	1.7924E+12
95	AM 243	ALPHA	7.37E+3 Y	2.3258E+11	1.9994E-01	4.4234E+05
95	AM 244	BETA	10.1 H	3.6360E+04	1.2737E+06	2.8179E+12
95	AM 245	BETA	2.05 H	7.3800E+03	6.2497E+06	1.3827E+13
96	CM 238	EC	2.3 H	8.2800E+03	5.7342E+06	1.2686E+13
96	CM 239	EC	2.9 H	1.0440E+04	4.5288E+06	1.0019E+13
96	CM 240	ALPHA	27.0 D	2.3328E+06	2.0183E+04	4.4653E+10
96	CM 241	EC	32.8 D	2.8339E+06	1.6545E+04	3.6605E+10
96	CM 242	ALPHA	162.8 D	1.4066E+07	3.3197E+03	7.3444E+09
96	CM 243	ALPHA	28.5 Y	8.9940E+08	5.1703E+01	1.1439E+08
96	CM 244	ALPHA	18.11 Y	5.7152E+08	8.1033E+01	1.7928E+08
96	CM 245	ALPHA	8.5E+3 Y	2.6824E+11	1.7194E-01	3.8040E+05
96	CM 246	ALPHA	4.7E+3 Y	1.4832E+11	3.0970E-01	6.8517E+05
96	CM 247	ALPHA	1.6E+7 Y	5.0493E+14	9.0605E-05	2.0045E+02
96	CM 248	ALPHA	3.5E+5 Y	1.1045E+13	4.1252E-03	9.1266E+03
96	CM 249	BETA	65.0 M	3.9000E+03	1.1636E+07	2.5744E+13
96	CM 250	SF	1.1E+4 Y	3.4714E+11	1.3021E-01	2.8807E+05
97	BK 243	EC	4.5 H	1.6200E+04	2.8705E+06	6.3507E+12
97	BK 244	EC	4.4 H	1.5840E+04	2.9237E+06	6.4684E+12
97	BK 245	EC	4.90 D	4.2336E+05	1.0894E+05	2.4103E+11
97	BK 246	EC	1.80 D	1.5552E+05	2.9536E+05	6.5346E+11
97	BK 247	ALPHA	1.4E+3 Y	4.4181E+10	1.0355E+00	2.2909E+06
97	BK 248	ALPHA	23.5 H	8.4600E+04	5.3859E+05	1.1916E+12

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
97	BK 249	BETA	0.88 Y	2.7771E+07	1.6341E+03	3.6153E+09
98	CF 246	ALPHA	35.7 H	1.2852E+05	3.5741E+05	7.9074E+11
98	CF 247	EC	3.15 H	1.1340E+04	4.0343E+06	8.9254E+12
98	CF 248	ALPHA	333.0 D	2.8771E+07	1.5837E+03	3.5037E+09
98	CF 249	ALPHA	351.0 Y	1.1077E+10	4.0970E+00	9.0641E+06
98	CF 250	ALPHA	13.1 Y	4.1341E+08	1.0933E+02	2.4189E+08
98	CF 251	ALPHA	9.0E+2 Y	2.8402E+10	1.5851E+00	3.5068E+06
98	CF 252	ALPHA	2.64 Y	8.3313E+07	5.3823E+02	1.1908E+09
98	CF 253	BETA	17.8 D	1.5379E+06	2.9042E+04	6.4252E+10
98	CF 254	SF	60.5 D	5.2272E+06	8.5109E+03	1.8829E+10
99	ES 249	EC	1.70 H	6.1200E+03	7.4153E+06	1.6405E+13
99	ES 250	EC	8.6 H	3.0960E+04	1.4599E+06	3.2300E+12
99	ES 251	EC	33.0 H	1.1880E+05	3.7896E+05	8.3840E+11
99	ES 252	ALPHA	472.0 D	4.0781E+07	1.0996E+03	2.4327E+09
99	ES 253	ALPHA	20.47 D	1.7686E+06	2.5254E+04	5.5871E+10
99	ES 254	ALPHA	276.0 D	2.3846E+07	1.8656E+03	4.1275E+09
99	ES 254M	BETA	39.3 H	1.4148E+05	3.1445E+05	6.9568E+11
99	ES 255	BETA	38.3 D	3.3091E+06	1.3391E+04	2.9627E+10
100	FM 252	ALPHA	25.4 H	9.1440E+04	4.9039E+05	1.0849E+12
100	FM 253	EC	3 D	2.5920E+01	1.7231E+09	3.8123E+15
100	FM 254	ALPHA	3.240 H	1.1664E+04	3.8141E+06	8.4384E+12
100	FM 255	ALPHA	20.1 H	7.2360E+04	6.1241E+05	1.3549E+12
100	FM 256	SF	2.63 H	9.4680E+03	4.6621E+06	1.0314E+13
100	FM 257	ALPHA	100.5 D	8.6832E+06	5.0637E+03	1.1203E+10
101	MD 256	EC	75.0 M	4.5000E+03	9.8090E+06	2.1701E+13
101	MD 257	EC	5.0 H	1.8000E+04	2.4427E+06	5.4042E+12
101	MD 258	EC	56.0 D	4.8384E+06	9.0523E+03	2.0027E+10
101	MD 259	SF	1.6 H	5.7600E+03	7.5745E+06	1.6758E+13
102	NO 253	ALPHA	1.7 M	1.0200E+02	4.3788E+08	9.6877E+14

Section I (Continued)
Specific Activities of Selected Isotopes

ATOM NO.	NUCLIDE	DECAY MODE	HALF-LIFE	HALF-LIFE IN SECONDS	CURIES PER GRAM	DPM PER MICROGRAM
102	NO 255	ALPHA	3.1 M	1.8600E+02	2.3825E+08	5.2709E+14
102	NO 259	ALPHA	58.0 M	3.4800E+03	1.2537E+07	2.7737E+13
103	LR 256	ALPHA	27.0 S	2.7000E+01	1.6348E+09	3.6169E+15
103	LR 260	ALPHA	3.0 M	1.8000E+02	2.4145E+08	5.3419E+14
104	RF 257	ALPHA	5.0 S	5.0000E+00	8.7938E+09	1.9455E+16
104	RF 259	ALPHA	3.0 S	3.0000E+00	1.4543E+10	3.2175E+16
104	RF 261	ALPHA	1.1 M	6.6000E+01	6.5599E+08	1.4513E+15
105	HA 260	ALPHA	1.5 S	1.5000E+00	2.8974E+10	6.4103E+16
105	HA 261	ALPHA	2.0 S	2.0000E+00	2.1648E+10	4.7893E+16
105	HA 262	ALPHA	0.7 M	4.2000E+01	1.0269E+09	2.2719E+15

Section II

TABLE OF STABLE ISOTOPES

TABLE OF STABLE ISOTOPES MARCH 1979

ATOMIC #	ELEMENT	ISOTOPE	ABUNDANCE %
1	H	1	99.985
2	HE	4	99.99986
3	LI	6	7.5
3	LI	7	92.5
4	BE	9	100.00
5	B	10	19.8
5	B	11	80.2
6	C	12	98.89
6	C	13	1.11
7	N	14	99.63
7	N	15	0.366
8	O	16	99.76
8	O	17	0.038
8	O	18	0.204
9	F	19	100.00
10	NE	20	90.51
10	NE	21	0.27
10	NE	22	9.22
11	NA	23	100.00
12	MG	24	78.99
12	MG	25	10.00
12	MG	26	11.01
13	AL	27	100.00
14	SI	28	92.23
14	SI	29	4.67
14	SI	30	3.10
15	P	31	100.00
16	S	32	95.02
16	S	33	0.75
16	S	34	4.21
16	S	36	0.017
17	CL	35	75.77
17	CL	37	24.23
18	AR	36	0.337
18	AR	38	0.063
18	AR	40	99.60
19	K	39	93.26
19	K	40	0.0117
19	K	41	6.73
20	CA	40	96.94
20	CA	42	0.647
20	CA	43	0.135
20	CA	44	2.09
20	CA	46	0.0035
20	CA	48	0.187
21	SC	45	100.00
22	TI	46	8.2
22	TI	47	7.4
22	TI	48	73.7
22	TI	49	5.4
22	TI	50	5.2
23	V	50	0.250
23	V	51	99.750
24	CR	50	4.35
24	CR	52	83.79
24	CR	53	9.50

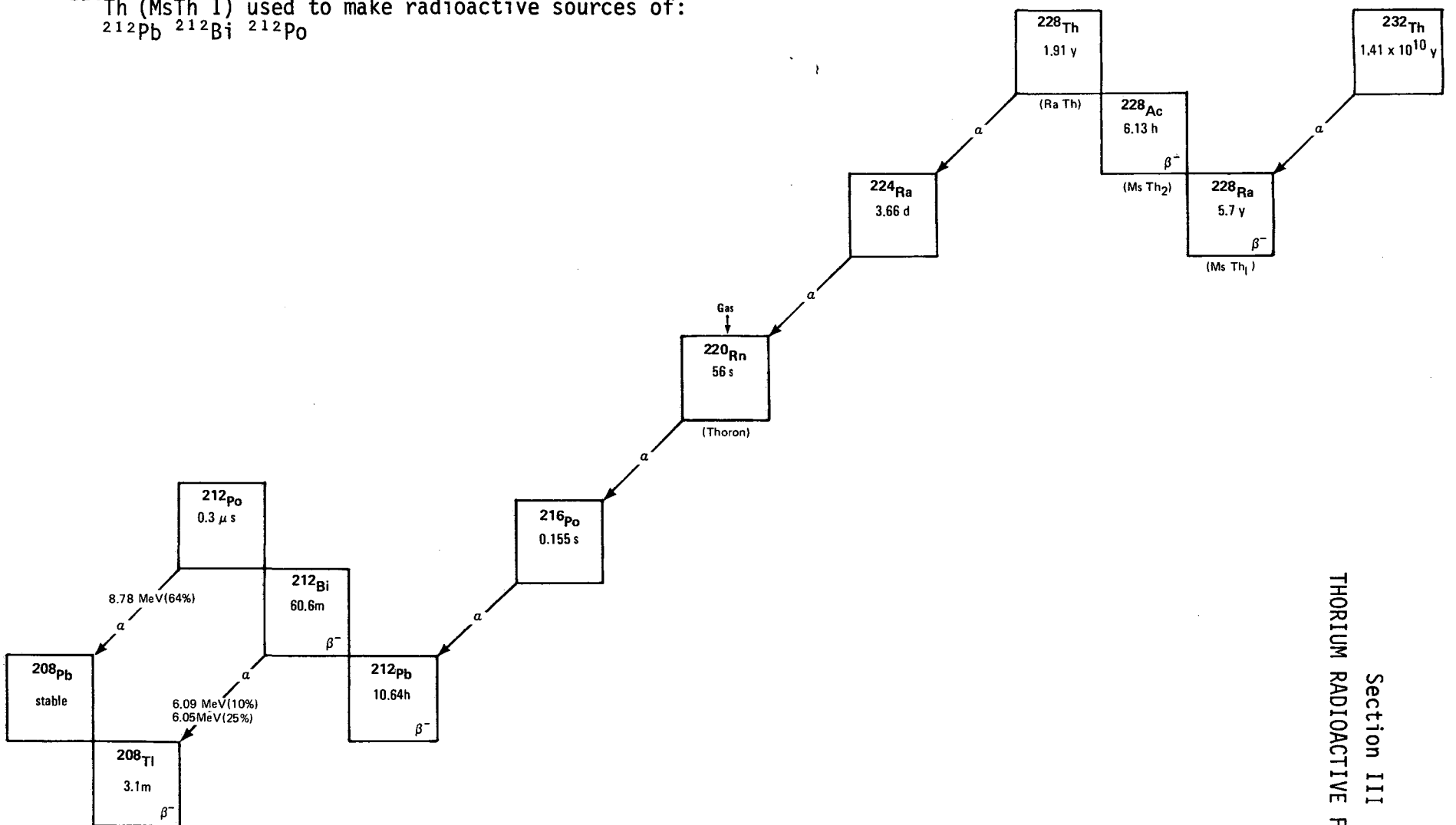
ATOMIC #	ELEMENT	ISOTOPE	ABUNDANCE %
24	CR	54	2.36
25	MN	55	100.00
26	FE	54	5.8
26	FE	56	91.8
26	FE	57	2.15
26	FE	58	0.29
27	CO	59	100.00
28	NI	58	68.3
28	NI	60	26.1
28	NI	61	1.13
28	NI	62	3.59
28	NI	64	0.91
29	CU	63	69.2
29	CU	65	30.8
30	ZN	64	48.6
30	ZN	66	27.9
30	ZN	67	4.10
30	ZN	68	18.8
30	ZN	70	0.62
31	GA	69	60.1
31	GA	71	39.9
32	GE	70	20.5
32	GE	72	27.4
32	GE	73	7.8
32	GE	74	36.5
32	GE	76	7.8
33	AS	75	100.00
34	SE	74	0.87
34	SE	76	9.0
34	SE	77	7.6
34	SE	78	23.5
34	SE	80	49.8
34	SE	82	9.2
35	BR	79	50.69
35	BR	81	49.31
36	KR	78	0.356
36	KR	80	2.27
36	KR	82	11.6
36	KR	83	11.5
36	KR	84	57.0
36	KR	86	17.3
37	RB	85	72.17
37	RB	87	27.83
38	SR	84	0.56
38	SR	86	9.8
38	SR	87	7.0
38	SR	88	82.6
39	Y	89	100.00
40	ZR	90	51.5
40	ZR	91	11.2
40	ZR	92	17.1
40	ZR	94	17.4
40	ZR	96	2.80
41	NB	92	2XE-11
41	NB	93	100.00
42	MO	92	14.8
42	MO	94	9.3
42	MO	95	15.9
42	MO	96	16.7
42	MO	97	9.6
42	MO	98	24.1

ATOMIC #	ELEMENT	ISOTOPE	ABUNDANCE %
42	MO	100	9.6
44	RU	96	5.5
44	RU	98	1.86
44	RU	99	12.7
44	RU	100	12.6
44	RU	101	17.0
44	RU	102	31.6
44	RU	104	18.7
45	RH	103	100.00
46	PD	102	1.0
46	PD	104	11.0
46	PD	105	22.2
46	PD	106	27.3
46	PD	108	26.7
46	PD	110	11.8
47	AG	107	51.83
47	AG	109	48.17
48	CD	106	1.25
48	CD	108	0.89
48	CD	110	12.5
48	CD	111	12.8
48	CD	112	24.1
49	IN	113	4.3
49	IN	115	95.7
50	SN	112	1.01
50	SN	114	0.67
50	SN	115	0.38
50	SN	116	14.8
50	SN	117	7.75
50	SN	118	24.3
50	SN	119	8.6
50	SN	120	32.4
50	SN	122	4.56
50	SN	124	5.64
51	SB	121	57.3
51	SB	123	42.7
52	TE	120	0.091
52	TE	123	0.89
52	TE	124	4.6
52	TE	126	18.7
52	TE	128	31.7
52	TE	130	34.5
53	I	127	100.00
54	XE	124	0.096
54	XE	126	0.090
54	XE	128	1.92
54	XE	129	26.4
54	XE	130	4.1
54	XE	131	21.2
54	XE	132	26.9
54	XE	134	10.4
54	XE	136	8.9
55	CS	133	100.00
56	BA	130	0.106
56	BA	132	0.101
56	BA	134	2.42
56	BA	135	6.59
56	BA	136	7.85
56	BA	137	11.2
56	BA	138	71.7
57	LA	138	0.089
57	LA	139	99.911

ATOMIC #	ELEMENT	ISOTOPE	ABUNDANCE %
58	CE	136	0.190
58	CE	138	0.254
58	CE	140	88.5
58	CE	142	11.1
59	PR	141	100.00
60	ND	142	27.2
60	ND	143	12.2
60	ND	144	23.8
60	ND	145	8.3
60	ND	146	17.2
60	ND	148	5.7
60	ND	150	5.6
62	SM	144	3.1
62	SM	146	2XE-7
62	SM	147	15.1
62	SM	148	11.3
62	SM	149	13.9
62	SM	150	7.4
62	SM	152	26.6
62	SM	154	22.6
63	EU	151	47.9
63	EU	153	52.1
64	GD	152	0.20
64	GD	154	2.1
64	GD	155	14.8
64	GD	156	20.6
64	GD	157	15.7
64	GD	158	24.8
64	GD	160	21.8
65	TB	159	100.00
66	DY	156	0.057
66	DY	158	0.100
66	DY	160	2.3
66	DY	161	19.0
66	DY	162	25.5
66	DY	163	24.9
66	DY	164	28.1
67	HO	165	100.00
68	ER	162	0.14
68	ER	164	1.56
68	ER	166	33.4
68	ER	167	22.9
68	ER	168	27.1
68	ER	170	14.9
69	TM	169	100.00
70	YB	168	0.135
70	YB	170	3.1
70	YB	171	14.4
70	YB	172	21.9
70	YB	173	16.2
70	YB	174	31.6
70	YB	176	12.6
71	LU	175	97.39
71	LU	176	2.61
72	HF	174	0.16
72	HF	176	5.2
72	HF	177	18.6
72	HF	178	27.1
72	HF	179	13.7
72	HF	180	35.2
73	TA	181	99.9877

ATOMIC #	ELEMENT	ISOTOPE	ABUNDANCE %
74	W	180	0.13
74	W	182	26.3
74	W	183	14.3
74	W	184	30.7
74	W	186	28.6
75	RE	185	37.40
75	RE	187	62.60
76	OS	184	0.018
76	OS	186	1.6
76	OS	187	1.6
76	OS	188	13.3
76	OS	189	16.1
76	OS	190	26.4
76	OS	192	41.0
77	IR	191	37.3
77	IR	193	62.7
78	PT	190	0.013
78	PT	192	0.78
78	PT	194	32.9
78	PT	195	33.8
78	PT	196	25.3
78	PT	198	7.2
79	AU	197	100.00
80	HG	196	0.15
80	HG	198	10.0
80	HG	199	16.8
80	HG	200	23.1
80	HG	201	13.2
80	HG	202	29.8
80	HG	204	6.9
81	TL	203	29.5
81	TL	205	70.5
82	PB	204	1.42
82	PB	206	24.1
82	PB	207	22.1
82	PB	208	52.3
83	BI	209	100.00
90	TH	232	100.00
92	U	234	0.0054
92	U	235	0.720
92	U	238	99.275

^{228}Th (MsTh I) used to make radioactive sources of:
^{212}Pb ^{212}Bi ^{212}Po



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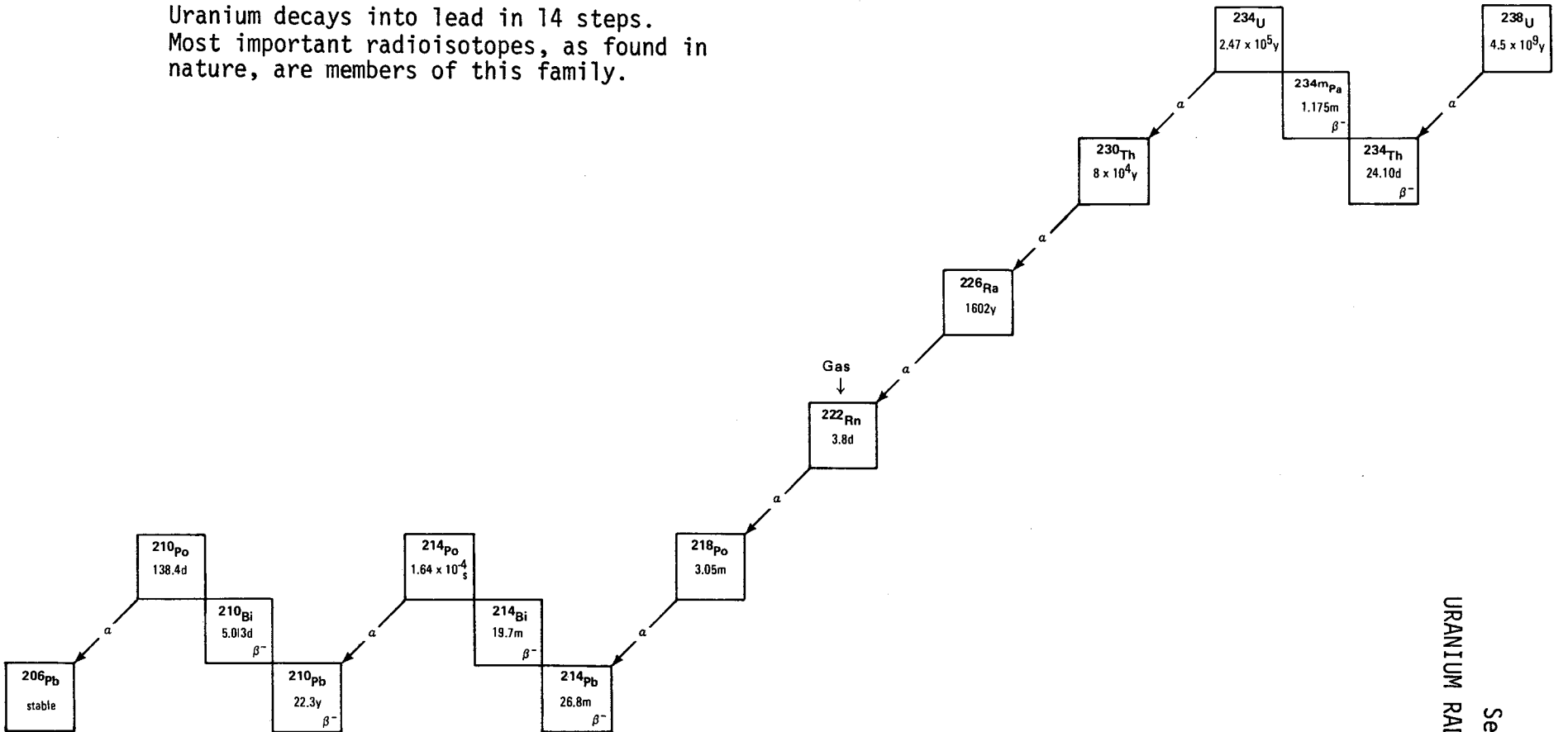
Uranium decays into lead in 14 steps.
Most important radioisotopes, as found in nature, are members of this family.



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Section IV
URANIUM RADIOACTIVE FAMILY

CHART OF THE NUCLIDES FOR
ELEMENTS 101 – 106

											106	106 263 0.9s 9.25 9.06 α
									105 Ha	Ha 260 1.5s 9.12 19% 9.07 28% 9.04 53% α 90.4% SF 9.6%	Ha 261 2s 8.29 α	Ha 262 0.7m 8.66 20% 8.45 80% α 40% SF 60%
							104 Rf	Rf 257 5s 9.00 35% 8.95 30% 8.78 20% 8.70 15% α	Rf 258 11ms ? SF	Rf 259 3s 8.86 8.77 α	Rf 260 ? α	Rf 261 1.1m 8.29 α
						103 Lr	Lr 255 22s 8.37 50% 8.35 50% α	Lr 256 27s 8.65 32% 8.53 19% 8.49 13% 8.44 34% 8.40 23% 8.33 8% α	Lr 257 0.65s 8.86 85% 8.80 15% α	Lr 258 4.3s 8.65 10% 8.61 35% 8.59 45% 8.54 10% α	Lr 259 5s 8.46 100% α	Lr 260 3.0m 8.04 α
	102 No	No 250 0.25ms ? SF	No 251 0.8s 8.68 20% 8.60 80% α	No 252 2.3s 8.41 75% 8.37 25% α SF 27%	No 253 1.7m 8.01 α	No 254 55s 8.10 8.11 SF α 0.28s IT	No 255 3.1m 8.30 3% 8.25 6% 8.11 57% 7.92 19% 7.76 15% α 62% EC 38%	No 256 3.2s 8.43 α 99.7% SF 0.3%	No 257 26s 8.32 19% 8.27 26% 8.22 55% α	No 258 1.2ms ? SF	No 259 58m 7.67 11% 7.59 14% 7.52 23% 7.48 39% 7.44 13% α 78% EC 22%	
101 Md	Md 248 7s 8.32 75% α EC 80%	Md 249 24s 8.03 α EC 80%	Md 250 0.9m 7.82 30% 7.75 70% α EC 94%	Md 251 4.0m 7.55 α EC 90%	Md 252 2m EC		Md 254 10m EC 28m EC	Md 255 27m 7.33 7.31 α 7% EC 93%	Md 256 75m 7.71 4% 7.66 2% 7.48 6% 7.45 5% 7.32 4% 7.22 6.3% 7.15 16% α 10% EC 90%	Md 257 5h 7.06 α 10% EC 90%	Md 258 56d 6.79 28% 6.71 72% α 43m	Md 259 1.6h SF

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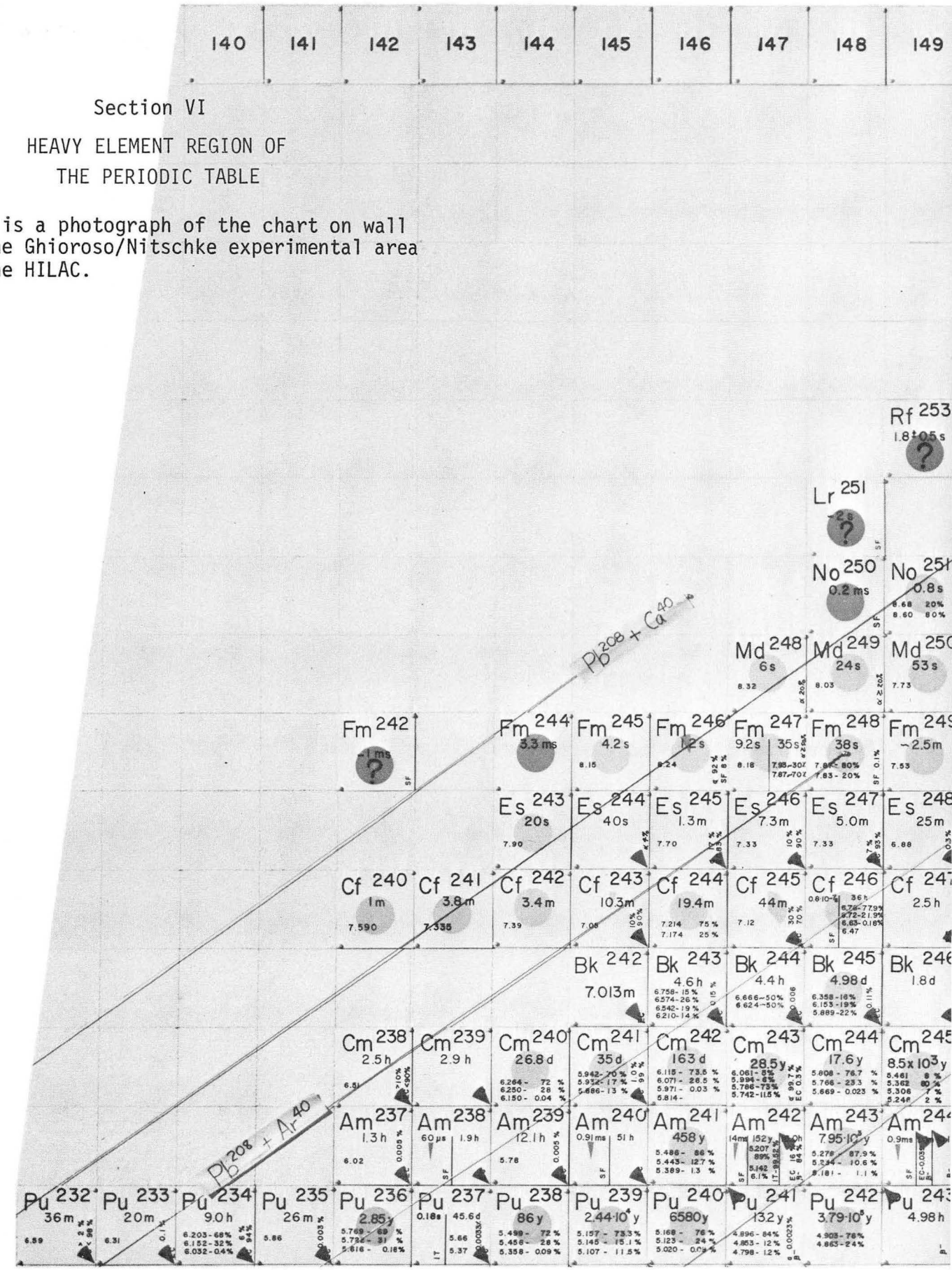
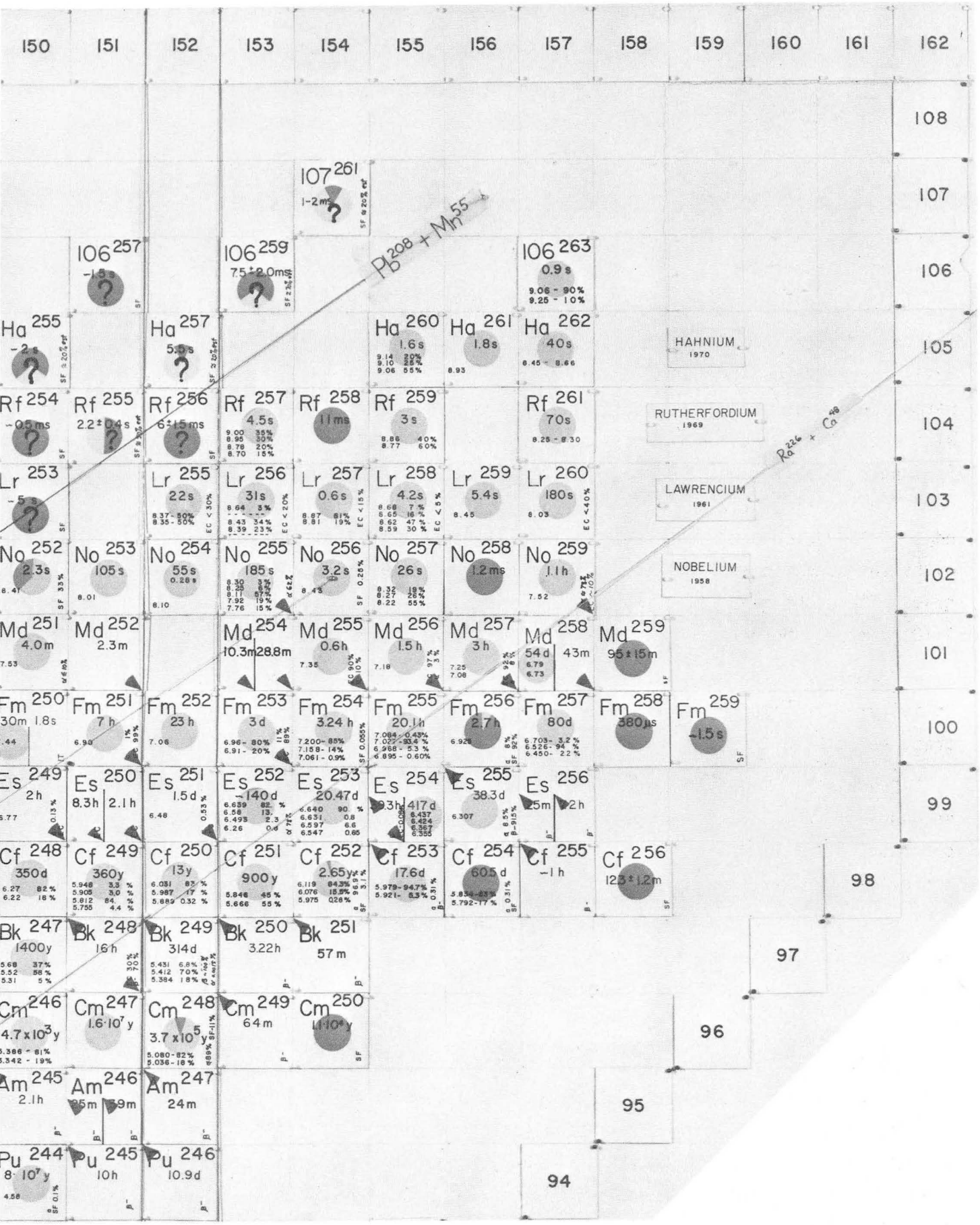
Section VI

HEAVY ELEMENT REGION OF
THE PERIODIC TABLE

This is a photograph of the chart on wall of the Ghioroso/Nitschke experimental area at the HILAC.




150
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97
96
95
94
107 261 1-2ms
106 257 ~1.5s
106 259 7.5±2.0ms
106 263 0.9s 9.06 - 90% 9.25 - 10%
Ha 255 ~2s
Ha 257 5.5s
Ha 260 1.6s 9.14 20% 9.10 25% 9.06 55%
Ha 261 1.8s 8.93
Ha 262 40s 8.45 - 8.66
HAHNIUM 1970
Rf 254 ~0.5ms
Rf 255 2.2±0.4s
Rf 256 6±1.5ms
Rf 257 4.5s 9.00 35% 8.95 50% 8.78 20% 8.70 15%
Rf 258 11ms
Rf 259 3s 8.86 40% 8.77 60%
Rf 261 70s 8.25 - 8.30
RUTHERFORDIUM 1969
Lr 253 ~5s
Lr 255 22s 8.37 - 50% 8.35 - 50%
Lr 256 31s 8.64 3% 8.43 34% 8.39 23%
Lr 257 0.6s 8.87 81% 8.81 19%
Lr 258 4.2s 8.68 7% 8.65 16% 8.62 47% 8.59 30%
Lr 259 5.4s 8.45
Lr 260 180s 8.03
LAWRENCIUM 1961
No 252 2.3s 8.41
No 253 105s 8.01
No 254 55s 0.28s 8.10
No 255 185s 8.30 3% 8.25 6% 8.11 67% 7.92 19% 7.76 15%
No 256 3.2s 8.43
No 257 26s 8.32 19% 8.27 26% 8.22 55%
No 258 1.2ms
No 259 1.1h 7.52
NOBELIUM 1958
Md 251 4.0m 7.53
Md 252 2.3m
Md 254 10.3m 28.8m
Md 255 0.6h 7.35
Md 256 1.5h 7.18
Md 257 3h 7.25 7.08
Md 258 54d 43m 6.79 6.73
Md 259 95±15m
Fm 250 30m 1.8s 7.44
Fm 251 7h 6.90
Fm 252 23h 7.06
Fm 253 3d 6.96 - 80% 6.91 - 20%
Fm 254 3.24h 7.200 - 85% 7.158 - 14% 7.061 - 0.9%
Fm 255 20.1h 7.084 - 0.43% 7.022 - 93.4% 6.968 - 5.3% 6.895 - 0.60%
Fm 256 2.7h 6.926
Fm 257 80d 6.703 - 3.2% 6.526 - 94% 6.450 - 2.2%
Fm 258 380μs
Fm 259 ~1.5s
Es 249 2h 5.77
Es 250 8.3h 2.1h
Es 251 1.5d 6.48
Es 252 ~140d 6.639 82% 6.58 13% 6.493 2.3 6.26 0.6
Es 253 20.47d 6.640 90% 6.631 0.8 6.597 6.6 6.547 0.65
Es 254 93h 417d 6.437 6.424 6.327 6.355
Es 255 38.3d 6.307
Es 256 25m 2h
Cf 248 350d 6.27 82% 6.22 18%
Cf 249 360y 5.948 3.3% 5.905 3.0% 5.812 84% 5.755 4.4%
Cf 250 13y 6.031 83% 5.987 17% 5.889 0.32%
Cf 251 900y 5.846 45% 5.666 55%
Cf 252 2.65y 6.119 84.3% 6.076 15.5% 5.975 0.26%
Cf 253 17.6d 5.979 - 94.7% 5.921 - 5.3%
Cf 254 60.5d 5.834 - 83% 5.792 - 17%
Cf 255 ~1h
Cf 256 12.3±1.2m
Bk 247 1400y 5.68 37% 5.52 58% 5.31 5%
Bk 248 16h
Bk 249 314d 5.431 6.8% 5.412 70% 5.384 18%
Bk 250 3.22h
Bk 251 57m
Cm 246 4.7x10³y 5.386 - 81% 5.342 - 19%
Cm 247 1.6·10⁷y
Cm 248 3.7x10⁵y 5.080 - 82% 5.036 - 18%
Cm 249 64m
Cm 250 1.1·10⁴y
Am 245 2.1h
Am 246 25m 39m
Am 247 24m
Pu 244 8·10⁷y 4.58
Pu 245 10h
Pu 246 10.9d
Pb208 + Mn55
Ra226 + Ca48

Section VII
SPECIFIC ACTIVITY NOMOGRAPH

This nomograph can be used to determine the approximate specific activity of any isotope with a half-life between 5 days and 4 million years. It is also useful in problems involving conversion of units, as will be shown in the examples below.

Example 1. The half-life of ^{41}Ca is $8x10^4$ years. What is its specific activity? Place the top edge of a ruler over $8x10^4$ years on the left-hand scale (over the 8 between 10^4 and 10^5 - note that the numbers increase downwards). Without moving this point rotate the ruler so that the top edge also meets the point for the mass number, 41, on the extreme right-hand scale (slightly below the point marked "40" - numbers again increase downwards).

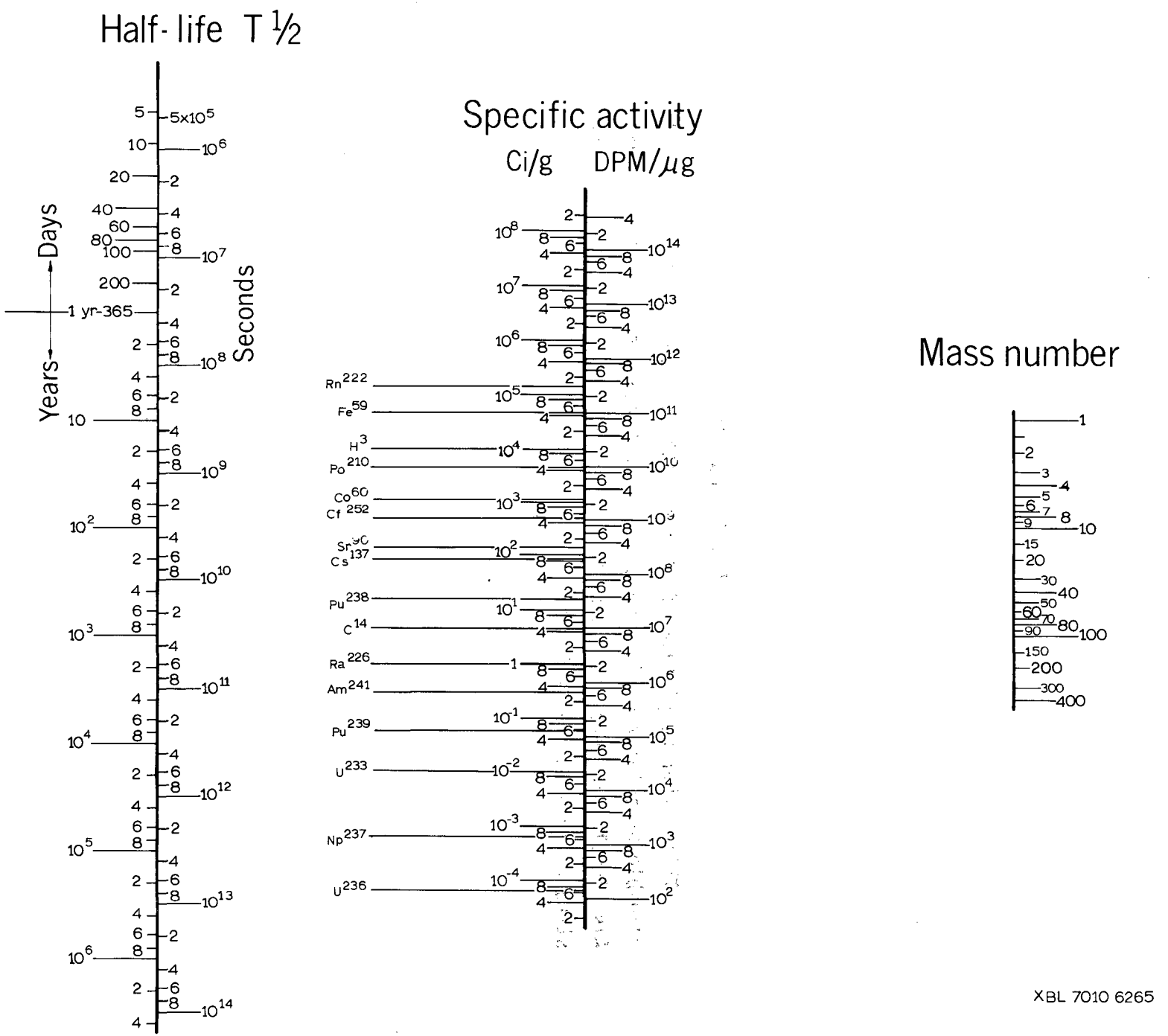
The spcific activity can now be read off at the point where the top edge of the ruler meets the center scales. The left of the center scales gives the specific activity in curies/gram; the answer is 10^{-1} or 0.1 curie/gram. The right side gives the specific activity in dpm/μg; the answer is $3x10^5$ dpm/μg. Note that the numbers in the center scales increase upwards.

Example 2. The half-life of ^7Be is 53 days. What is its specific activity? The same procedure gives the answers: about $4x10^5$ curies per gram, about $8x10^{11}$ dpm/μg.

Example 3. The half-life of ^{231}Pa is $3.25x10^4$ years. To find the number of seconds — only the left-hand pair of scales is needed for this. Locate the point for $3.25x10^4$ years; on the right side of the vertical line you read the approximate answer; 10^{12} seconds.

Example 4. How many dpm/μg is 10^2 Ci/gm? Only the center pair of scales is needed; locate 10^2 Ci/gm on the left side of the vertical line and read the answer, about $2.2x10^8$ dpm/μg, off the right side of the vertical line.

Example 5. The specific activity of ^{60}Fe is $2x10^{-2}$ Ci/gm. What is its half-life? Place the top edge of the ruler so that it meets the points for the mass number (60) on the right-hand scale and for the specific activity on the middle scale. The half-life, $\sim 3x10^5$ years or 10^{13} seconds, can now be read off at the point where the top edge of the ruler meets the left-hand pair of scales.



XBL 7010 6265

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