

TABLE 2. Summary Radioactive Properties for Selected Radionuclides^a

Isotope	Half-Life	Specific Activity (Ci/g)	Decay Mode	Radiation Energy (MeV)		
				Alpha (α)	Beta (β)	Gamma (γ)
Americium-241	430 yr	3.5	α	5.5	0.052	0.033
Americium-242m	150 yr	9.8	IT	0.025	0.044	0.0051
<i>Americium-242</i>	<i>16 hr</i>	<i>820,000</i>	β , EC	-	<i>0.18</i>	<i>0.018</i>
Americium-243	7,400 yr	0.20	α	5.3	0.022	0.056
<i>Neptunium-239</i>	<i>2.4 days</i>	<i>230,000</i>	β	-	<i>0.26</i>	<i>0.17</i>
Berkelium-247	1,400 yr	1.1	α	5.6	0.061	0.11
Cadmium-109	1.3 yr	2,600	EC	-	0.083	0.026
Cadmium-113 ^c	9.3×10^{15} yr	3.4×10^{-13}	β	-	0.093	-
Cadmium-113m	14 yr	240	β	-	0.19	-
Californium-248	330 days	1,600	α	6.3	0.0060	0.0013
Californium-249	350 yr	4.1	α	5.8	0.044	0.33
Californium-250	13 yr	110	α	6.0	0.0057	0.0012
Californium-251	900 yr	1.6	α	5.8	0.20	0.13
Californium-252	2.6 yr	540	α	5.9	0.0056	0.0012
Carbon-14 ^c	5,700 yr	4.5	β	-	0.049	-
Cesium-134	2.1 yr	1,300	β	-	0.16	1.6
Cesium-135	2.3 million yr	0.0012	β	-	0.067	-
Cesium-137	30 yr	88	β	-	0.19	-
<i>Barium-137m (95%)</i>	<i>2.6 min</i>	<i>540 million</i>	IT	-	<i>0.065</i>	<i>0.60</i>
Chlorine-36	300,000 yr	0.033	β , EC	-	0.027	<0.001
Cobalt-57	270 days	8,600	EC	-	0.019	0.13
Cobalt-60	5.3 yr	1,100	β	-	0.097	2.5
Curium-242	160 days	3,400	α	6.1	0.010	0.0018
Curium-243	29 yr	52	α	5.8	0.14	0.13
Curium-244	18 yr	82	α	5.8	0.086	0.0017
Curium-245	8,500 yr	0.17	α	5.4	0.065	0.096
Curium-246	4,700 yr	0.31	α	5.4	0.0080	0.0015
Curium-247	16 million yr	0.000094	α	4.9	0.021	0.32
<i>Plutonium-243</i>	<i>5.0 hr</i>	<i>2.6 million</i>	β	-	<i>0.17</i>	<i>0.026</i>
Curium-248	340,000 yr	0.0043	α	4.7	0.0060	0.0012
Curium-250	6,900 yr	0.21	α , β	1.3	0.0016	-
<i>Plutonium-246 (25%)</i>	<i>11 days</i>	<i>49,000</i>	β	-	<i>0.13</i>	<i>0.14</i>
<i>Berkelium-250 (14%)</i>	<i>3.2 hr</i>	<i>3.9 million</i>	β	-	<i>0.29</i>	<i>0.89</i>
<i>Americium-246 (25%)</i>	<i>39 min</i>	<i>20 million</i>	β	-	<i>0.66</i>	<i>0.70</i>
Europium-150	34 yr	70	EC	-	0.044	1.5
Europium-152	13 yr	180	β , EC	-	0.14	1.2
Europium-154	8.8 yr	270	β	-	0.29	1.2
Europium-155	5.0 yr	470	β	-	0.063	0.061
Iodine-129	16 million yr	0.00018	β	-	0.064	0.025
Iodine-131	8.0 days	130,000	β	-	0.19	0.38
Iridium-192	74 days	9,200	β , EC	-	0.22	0.82
Iridium-192m	240 yr	7.8	IT	-	-	0.16

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Iridium-194m	170 days	4,000	β	-	0.16	2.3
Krypton-81	210,000 yr	0.021	EC	-	0.0051	0.012
Krypton-85	11 yr	400	β	-	0.25	0.0022
Neptunium-235	1.1 yr	1,400	EC	<0.001	0.010	0.0071
Neptunium-236	120,000 yr	0.013	β , EC	-	0.21	0.14
Plutonium-236 (9%)	2.9 yr	540	α	5.8	0.013	0.0021
Neptunium-237	2.1 million yr	0.00071	α	4.8	0.070	0.035
Protactinium-233	27 days	21,000	β	-	0.20	0.20
Nickel-59	75,000 yr	0.082	EC	-	0.0046	0.0024
Nickel-63	96 yr	60	β	-	0.17	-
Plutonium-236	2.9 yr	540	α	5.8	0.013	0.0021
Plutonium-238	88 yr	17	α	5.5	0.011	0.0018
Plutonium-239	24,000 yr	0.063	α	5.1	0.0067	<0.001
Plutonium-240	6,500 yr	0.23	α	5.2	0.011	0.0017
Plutonium-241	14 yr	100	β	<0.001	0.0052	<0.001
Plutonium-242	380,000 yr	0.0040	α	4.9	0.0087	0.0014
Plutonium-244	83 million yr	0.000018	α	4.6	0.0071	0.0012
Uranium-240	14 hr	940,000	β	-	0.14	0.0076
Neptunium-240m	7.4 min	110 million	β	-	0.68	0.34
Polonium-208	2.9 yr	590	α	5.1	<0.001	<0.001
Polonium-208	100 yr	17	α	4.9	<0.001	<0.001
Potassium-40 ^c	1.3 billion yr	0.0000071	β , EC	-	0.52	0.16
Protactinium-231 ^c	33,000 yr	0.048	α	5.0	0.065	0.048
Actinium-227 ^e	22 yr	73	α , β	0.068	0.016	<0.001
Thorium-227 ^e (99%)	19 days	31,000	α	5.9	0.053	0.11
Francium-223 ^e (1%)	22 min	39 million	β	-	0.40	0.059
Radium-223 ^e	11 days	52,000	α	5.7	0.076	0.13
Radon-219 ^e	4.0 sec	13 billion	α	6.8	0.0063	0.056
Polonium-215 ^e	0.0018 sec	30 trillion	α	7.4	<0.001	<0.001
Lead-211 ^e	36 min	25 million	β	-	0.46	0.051
Bismuth-211 ^e	2.1 min	420 million	α	6.6	0.010	0.047
Thallium-207 ^e	4.8 min	190 million	β	-	0.49	0.0022
Radium-226 ^c	1600 yr	1.0	α	4.8	0.0036	0.0067
Radon-222 ^e	3.8 days	160,000	α	5.5	<0.001	<0.001
Polonium-218 ^e	3.1 min	290 million	α	6.0	<0.001	<0.001
Lead-214 ^e	27 min	33 million	β	-	0.29	0.25
Bismuth-214 ^e	20 min	45 million	β	-	0.66	1.5
Polonium-214 ^e	0.00016 sec	330 trillion	α	7.7	<0.001	<0.001
Lead-210 ^e	22 yr	77	β	-	0.038	0.0048
Bismuth-210 ^e	5.0 days	130,000	β	-	0.39	-
Polonium-210 ^e	140 days	4,500	α	5.3	<0.001	<0.001
Radium-228 ^c	5.8 yr	280	β	-	0.017	<0.001
Actinium-228 ^e	6.1 hr	2.3 million	β	-	0.48	0.97

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Thorium-228 ^e	1.9 yr	830	α	5.4	0.021	0.0033
Radium-224 ^e	3.7 days	160,000	α	5.7	0.0022	0.010
Radon-220 ^e	56 sec	930 million	α	6.3	<0.001	<0.001
Polonium-216 ^e	0.15 sec	350 billion	α	6.8	<0.001	<0.001
Lead-212 ^e	11 hr	1.4 million	β	-	0.18	0.15
Bismuth-212 ^e	61 min	15 million	α, β	2.2	0.47	0.19
Polonium-212 ^e (64%)	0.00000031 sec	180,000 trillion	α	8.8	-	-
Thallium-208 ^e (36%)	3.1 min	300 million	β	-	0.60	3.4
Samarium-146	100,000,000 yr	0.000024	α	2.5	-	-
Samarium-151	90 yr	27	β	-	0.020	<0.001
Selenium-79	650,000 yr	0.070	β	-	0.056	-
Strontium-90	29 yr	140	β	-	0.20	-
Yttrium-90	64 hr	550,000	β	-	0.94	<0.001
Technetium-97	2.6 million	0.0014	EC	-	0.0056	0.011
Technetium-98	4.2 million	0.00088	β	-	0.16	1.4
Technetium-99	210,000	0.017	β	-	0.10	-
Thorium-229	7,300 yr	0.22	α	4.9	0.12	0.096
Radium-225	15 days	40,000	β	-	0.11	0.014
Actinium-225	10 days	59,000	α	5.8	0.022	0.018
Francium-221	4.8 min	180 million	α	6.3	0.010	0.031
Astatine-217	0.032 sec	1.6 trillion	α	7.1	<0.001	<0.001
Bismuth-213	46 min	20 million	α, β	0.13	0.44	0.13
Polonium-213 (98%)	0.0000042 sec	13,000 trillion	α	8.4	-	-
Thallium-209 (2%)	2.2 min	410 million	β	-	0.69	2.0
Lead-209	3.3 hr	4.7 million	β	-	0.20	-
Thorium-230 ^e	77,000 yr	0.020	α	4.7	0.015	0.0016
Thorium-232 ^e	14 billion yr	0.00000011	α	4.0	0.012	0.0013
Tin-121m	55 yr	54	β, IT	-	0.035	0.0049
Tin-121 (78%)	27 hr	970,000	β	-	0.11	-
Tin-126	250,000 yr	0.029	β	-	0.17	0.057
Antimony-126	12 days	85,000	β	-	0.28	2.8
Tritium (H-3) ^e	12 yr	9,800	β	-	0.0057	-
Uranium-232	72 hr	22	α	5.3	0.017	0.0022
Uranium-233	160,000 yr	0.0098	α	4.8	0.0061	0.0013
Uranium-234 ^e	240,000 yr	0.0063	α	4.8	0.013	0.0017
Uranium-235 ^e	700 million yr	0.0000022	α	4.4	0.049	0.16
Thorium-231 ^e	26 hr	540,000	β	-	0.17	0.026
Uranium-236	23 million yr	0.000065	α	4.5	0.011	0.0016
Uranium-238 ⁿ	4.5 billion yr	0.00000034	α	4.2	0.010	0.0014
Thorium-234 ^e	24 days	23,000	β	-	0.060	0.0093
Protactinium-234m ^e	1.2 min	690 million	β	-	0.82	0.012
Zirconium-93	1.5 million yr	0.0025	β	-	0.020	-

Isotope	Half-Life	Specific Activity (Ci/g)	Decay Mode	Radiation Energy (MeV)		
				Alpha (α)	Beta (β)	Gamma (γ)
<i>Niobium-93m</i>	<i>14 yr</i>	<i>290</i>	<i>IT</i>	-	<i>0.028</i>	<i>0.0019</i>

^a This table summarizes key radioactive properties of selected radionuclides and their associated decay products, which are indicated in italics. An “e” indicates the isotope exists naturally in the environment. A dash means the entry is not applicable, EC = electron capture, IT = isomeric transition, Ci = curie, g = gram, and MeV = million electron volts. Values are given to two significant figures. See the radionuclide-specific fact sheets for further information, and the companion fact sheet on *Radioactive Properties, Internal Distribution, and Risk Coefficients* for an explanation of terms and interpretation of radiation energies.