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Nuclear Safety Council Instruction IS-05, of the 26th of February 2003, defining the values of exemption for nuclides as established in Tables A and B of Annex I of Royal Decree 1836/1999

Published in the Official State Gazette (BOE), number 86, of the 10th of April 2003

Royal Decree 1836/1999, of the 3rd of December, which approved the *Regulation on Nuclear and Radioactive Facilities* ("Official State Gazette", number 313, of the 31st of December 1999) establishes in Article 35 that to the effects of this aforementioned Regulation, those facilities in which radioactive substances intervene, whose activity, or activity per unit of mass, does not exceed the exemption levels indicated in Table A of Annex I of the aforementioned Regulation, shall not be given the consideration of radioactive facilities.

It also establishes that, when necessary, the Nuclear Safety Council may assign adequate values for the activities and the activities per unit of mass of the nuclides that are not included in Table A.

The exemption values that are included in the aforementioned Table A correspond to those indicated in Annex I of the Council of the European Union Directive 96/29 Euratom, which establishes the basic standards relative to the Health protection of workers and of the population againstionising radiations.

By applying the same methodology and considering the same dose criteria, the National Radiological Protection Board of the United Kingdom in its document, NRPB-R306, has determined the corresponding values for other nuclides. Having analysed this document, it has been considered as an adequate base for the allocation of values to those nuclides that are not included in the aforementioned Table A of the Regulation on Nuclear and Radioactive Facilities, as well as those included in Table B of this same Regulation, which are also developed in this Instruction.

By virtue of all that has been mentioned, and in conformity with the legal habilitation foreseen in Article 2) of Law 15/1980, of the 22nd of April, on the creation of the Nuclear Safety Council, according to the wording given by the First Additional Provision of Law 14/1999, of the 4th of May, and with the prior consultation of the affected sectors, following the related technical reports, the Nuclear Safety Council, in its meeting of the 26th of February 2003, has provided the following:

First. Object and scope of application

The object of this instruction is to allocate the activity and activity per unit of mass values to those nuclides of Tables A and B of Annex I of Royal Decree 1836/1999, of the 3rd of December, which approved the *Regulation on Nuclear and Radioactive Facilities*.

Second. Allocation of values

In the tables that are attached, are included those nuclides already considered in Tables A and B of Annex I of Royal Decree 1836/1999, of the 3rd of December, which approved the Regulation on Nuclear and Radioactive Facilities, to which are added others who through this Instruction are allocated values for their activity and activity per unit of mass.

Single Repeal Provision

The tables included in this present Instruction shall substitute, and annul Tables A and B of Annex I of Royal Decree 1836/1999, of the 3rd of December, which approved the *Regulation on Nuclear and Radioactive Facilities*

Single Final Provision

This present instruction shall enter in force on the day following its publication in the "Official State Gazette".

This I communicate to you all for your knowledge and relevant effects.

Madrid, on the 26th of February 2003.
The President,
María Teresa Estevan Bolea
His excellency, the Secretary-General of the Nuclear Safety Council

Table A

Element/Nuclide	Activity(Bq)	Activity per unit of mass (kBq/kg)
Hydrogen:		
Tritiated compounds (including OBT)	$1\ 10^{9}$	$1\ 10^{6}$
Elementary	$1\ 10^{9}$	$1\ 10^{6}$
Beryllium:		
Be-7	$1\ 10^{7}$	$1\ 10^{3}$
Be-10	$1\ 10^{6}$	$1\ 10^{4}$
Carbon:		
C-11	$1\ 10^{6}$	$1\ 10^{1}$
C-11 monoxide	$1\ 10^{9}$	$1\ 10^{1}$
C-11 dioxide	$1\ 10^{9}$	$1\ 10^{1}$
C-14	$1\ 10^{7}$	$1\ 10^{4}$
C-14 monoxide	$1\ 10^{11}$	$1\ 10^{8}$
C-14 dioxide	$1\ 10^{11}$	$1\ 10^{7}$
Nitrogen:		
N-13	$1\ 10^{9}$	$1\ 10^{2}$
Neon:		
Ne-19	$1\ 10^{9}$	$1\ 10^{2}$
Oxygen:		
O-15	$1\ 10^{9}$	$1\ 10^{2}$
Fluorine:		
F-18	$1\ 10^{6}$	$1\ 10^{1}$
Sodium:		
Na-22	$1\ 10^{6}$	$1\ 10^{1}$
Na-24	$1\ 10^{5}$	$1\ 10^{1}$
Magnesium:		
Mg-28+	$1\ 10^{5}$	$1\ 10^{1}$
Aluminium:		
A1-26	$1\ 10^{5}$	$1\ 10^{1}$
Silicon:		
Si-31	$1\ 10^{6}$	$1\ 10^{3}$
Si-32	$1\ 10^{6}$	$1\ 10^{3}$
Phosphorus:		
P-32	$1\ 10^{5}$	$1\ 10^{3}$
P-33	$1\ 10^{8}$	$1\ 10^{5}$
Sulphur:		
S-35	$1\ 10^{8}$	$1\ 10^{5}$
S-35 (organic)	$1\ 10^{8}$	$1\ 10^{5}$
S-35 (steam)	$1\ 10^{9}$	$1\ 10^{6}$
Chlorine:		
Cl-36	$1\ 10^{6}$	$1\ 10^{4}$
Cl-38	$1\ 10^{5}$	$1\ 10^{1}$
Cl-39	$1\ 10^{5}$	$1\ 10^{1}$
Argon:		
Ar-37	$1\ 10^{8}$	$1\ 10^{6}$

Ar-39	$1\ 10^{4}$	$1\ 10^{7}$
Ar-41	$1\ 10^{9}$	$1\ 10^{2}$
Potassium:		
K-40	$1\ 10^{6}$	$1\ 10^{2}$
K-42	$1\ 10^{6}$	$1\ 10^{2}$
K-43	$1\ 10^{6}$	$1\ 10^{1}$
K-44	$1\ 10^{5}$	$1\ 10^{1}$
K-45	$1\ 10^{5}$	$1\ 10^{1}$
Calcium:		
Ca-41	$1\ 10^{7}$	$1\ 10^{5}$
Ca-45	$1\ 10^{7}$	$1\ 10^{4}$
Ca-47	$1\ 10^{6}$	$1\ 10^{1}$
Scandium:		
Sc-43	$1\ 10^{6}$	$1\ 10^{1}$
Sc-44	$1\ 10^{5}$	$1\ 10^{1}$
Sc-44m	$1\ 10^{7}$	$1\ 10^{2}$
Sc-46	$1\ 10^{6}$	$1\ 10^{1}$
Sc-47	$1\ 10^{6}$	$1\ 10^{2}$
Sc-48	$1\ 10^{5}$	$1\ 10^{1}$
Sc-49	$1\ 10^{5}$	$1\ 10^{3}$
Titanium:		
Ti-44+	$1\ 10^{5}$	$1\ 10^{1}$
Ti-45	$1\ 10^{6}$	$1\ 10^{1}$
Vanadium:		
V-47	$1\ 10^{5}$	$1\ 10^{1}$
V-48	$1\ 10^{5}$	$1\ 10^{1}$
V-49	$1\ 10^{7}$	$1\ 10^{4}$
Chromium:		
Cr-48	$1\ 10^{6}$	$1\ 10^{2}$
Cr-49	$1\ 10^{6}$	$1\ 10^{1}$
Cr-51	$1\ 10^{7}$	$1\ 10^{3}$
Manganese:		
Mn-51	$1\ 10^{5}$	$1\ 10^{1}$
Mn-52	$1\ 10^{5}$	$1\ 10^{1}$
Mn-52m	$1\ 10^{5}$	$1\ 10^{1}$
Mn-53	$1\ 10^{9}$	$1\ 10^{4}$
Mn-54	$1\ 10^{6}$	$1\ 10^{1}$
Mn-56	$1\ 10^{5}$	$1\ 10^{1}$
Iron:		
Fe-52	$1\ 10^{6}$	$1\ 10^{1}$
Fe-55	$1\ 10^{6}$	$1\ 10^{4}$
Fe-59	$1\ 10^{6}$	$1\ 10^{1}$
Fe-60+	$1\ 10^{5}$	$1\ 10^{2}$
Cobalt:		
Co-55	$1\ 10^{6}$	$1\ 10^{1}$
Co-56	$1\ 10^{5}$	$1\ 10^{1}$
Co-57	$1\ 10^{6}$	$1\ 10^{2}$
Co-58	$1\ 10^{6}$	$1\ 10^{1}$
Co-58m	$1\ 10^{7}$	$1\ 10^{4}$
Co-60	$1\ 10^{5}$	$1\ 10^{1}$

Co-60m	$1\ 10^{6}$	$1\ 10^{3}$
Co-61	$1\ 10^{6}$	$1\ 10^{2}$
Co-62m	$1\ 10^{5}$	$1\ 10^{1}$
Nickel:		
Ni-56	$1\ 10^{6}$	$1\ 10^{1}$
Ni-57	$1\ 10^{6}$	$1\ 10^{1}$
Ni-59	$1\ 10^{8}$	$1\ 10^{4}$
Ni-63	$1\ 10^{8}$	$1\ 10^{5}$
Ni-65	$1\ 10^{6}$	$1\ 10^{1}$
Ni-66	$1\ 10^{7}$	$1\ 10^{4}$
Copper:		
Cu-60	$1\ 10^{5}$	$1\ 10^{1}$
Cu-61	$1\ 10^{6}$	$1\ 10^{1}$
Cu-64	$1\ 10^{6}$	$1\ 10^{2}$
Cu-67	$1\ 10^{6}$	$1\ 10^{2}$
Zinc:		
Zn-62	$1\ 10^{6}$	$1\ 10^{2}$
Zn-63	$1\ 10^{5}$	$1\ 10^{1}$
Zn-65	$1\ 10^{6}$	$1\ 10^{1}$
Zn-69	$1\ 10^{6}$	$1\ 10^{4}$
Zn-69m	$1\ 10^{6}$	$1\ 10^{2}$
Zn-71m	$1\ 10^{6}$	$1\ 10^{1}$
Zn-72	$1\ 10^{6}$	$1\ 10^{2}$
Gallium:		
Ga-65	$1\ 10^{5}$	$1\ 10^{1}$
Ga-66	$1\ 10^{5}$	$1\ 10^{1}$
Ga-67	$1\ 10^{6}$	$1\ 10^{2}$
Ga-68	$1\ 10^{5}$	$1\ 10^{1}$
Ga-70	$1\ 10^{6}$	$1\ 10^{3}$
Ga-72	$1\ 10^{5}$	$1\ 10^{1}$
Ga-73	$1\ 10^{6}$	$1\ 10^{2}$
Germanium:		
Ge-66	$1\ 10^{6}$	$1\ 10^{1}$
Ge-67	$1\ 10^{5}$	$1\ 10^{1}$
Ge-68+	$1\ 10^{5}$	$1\ 10^{1}$
Ge-69	$1\ 10^{6}$	$1\ 10^{1}$
Ge-71	$1\ 10^{8}$	$1\ 10^{4}$
Ge-75	$1\ 10^{6}$	$1\ 10^{3}$
Ge-77	$1\ 10^{5}$	$1\ 10^{1}$
Ge-78	$1\ 10^{6}$	$1\ 10^{2}$
Arsenic:		
As-69	$1\ 10^{5}$	$1\ 10^{1}$
As-70	$1\ 10^{5}$	$1\ 10^{1}$
As-71	$1\ 10^{6}$	$1\ 10^{1}$
As-72	$1\ 10^{5}$	$1\ 10^{1}$
As-73	$1\ 10^{7}$	$1\ 10^{3}$
As-74	$1\ 10^{6}$	$1\ 10^{1}$
As-76	$1\ 10^{5}$	$1\ 10^{2}$
As-77	$1\ 10^{6}$	$1\ 10^{3}$
As-78	$1\ 10^{5}$	$1\ 10^{1}$

Selenium		
Se-70	$1\ 10^{6}$	$1\ 10^{1}$
Se-73	$1\ 10^{6}$	$1\ 10^{1}$
Se-73m	$1\ 10^{6}$	$1\ 10^{2}$
Se-75	$1\ 10^{6}$	$1\ 10^{2}$
Se-79	$1\ 10^{7}$	$1\ 10^{4}$
Se-81	$1\ 10^{6}$	$1\ 10^{3}$
Se-81m	$1\ 10^{7}$	$1\ 10^{3}$
Se-83	$1\ 10^{5}$	$1\ 10^{1}$
Bromine:		
Br-74	$1\ 10^{5}$	$1\ 10^{1}$
Br-74m	$1\ 10^{5}$	$1\ 10^{1}$
Br-75	$1\ 10^{6}$	$1\ 10^{1}$
Br-76	$1\ 10^{5}$	$1\ 10^{1}$
Br-77	$1\ 10^{6}$	$1\ 10^{2}$
Br-80	$1\ 10^{5}$	$1\ 10^{2}$
Br-80m	$1\ 10^{7}$	$1\ 10^{3}$
Br-82	$1\ 10^{6}$	$1\ 10^{1}$
Br-83	$1\ 10^{6}$	$1\ 10^{3}$
Br-84	$1\ 10^{5}$	$1\ 10^{1}$
Kryptonite:		
Kr-74	$1\ 10^{9}$	$1\ 10^{2}$
Kr-76	$1\ 10^{9}$	$1\ 10^{2}$
Kr-77	$1\ 10^{9}$	$1\ 10^{2}$
Kr-79	$1\ 10^{5}$	$1\ 10^{3}$
Kr-81	$1\ 10^{7}$	$1\ 10^{4}$
Kr-81m	$1\ 10^{10}$	$1\ 10^{3}$
Kr-83m	$1\ 10^{12}$	$1\ 10^{5}$
Kr-85	$1\ 10^{4}$	$1\ 10^{5}$
Kr-85m	$1\ 10^{10}$	$1\ 10^{3}$
Kr-87	$1\ 10^{9}$	$1\ 10^{2}$
Kr-88	$1\ 10^{9}$	$1\ 10^{2}$
Rubidium:		
Rb-79	$1\ 10^{5}$	$1\ 10^{1}$
Rb-81	$1\ 10^{6}$	$1\ 10^{1}$
Rb-81m	$1\ 10^{7}$	$1\ 10^{3}$
Rb-82m	$1\ 10^{6}$	$1\ 10^{1}$
Rb-83+	$1\ 10^{6}$	$1\ 10^{2}$
Rb-84	$1\ 10^{6}$	$1\ 10^{1}$
Rb-86	$1\ 10^{5}$	$1\ 10^{2}$
Rb-87	$1\ 10^{7}$	$1\ 10^{4}$
Rb-88	$1\ 10^{5}$	$1\ 10^{1}$
Rb-89	$1\ 10^{5}$	$1\ 10^{1}$
Strontium:		
Sr-80	$1\ 10^{7}$	$1\ 10^{3}$
Sr-81	$1\ 10^{5}$	$1\ 10^{1}$
Sr-82+	$1\ 10^{5}$	$1\ 10^{1}$
Sr-83	$1\ 10^{6}$	$1\ 10^{1}$
Sr-85	$1\ 10^{6}$	$1\ 10^{2}$

Sr-85m	$1\ 10^{7}$	$1\ 10^{2}$
Sr-87m	$1\ 10^{6}$	$1\ 10^{2}$
Sr-89	$1\ 10^{6}$	$1\ 10^{3}$
Sr-90+	$1\ 10^{4}$	$1\ 10^{2}$
Sr-91	$1\ 10^{5}$	$1\ 10^{1}$
Sr-92	$1\ 10^{6}$	$1\ 10^{1}$
Yttrium:		
Y-86	$1\ 10^{5}$	$1\ 10^{1}$
Y-86m	$1\ 10^{7}$	$1\ 10^{2}$
Y-87+	$1\ 10^{6}$	$1\ 10^{1}$
Y-88	$1\ 10^{6}$	$1\ 10^{1}$
Y-90	$1\ 10^{5}$	$1\ 10^{3}$
Y-90m	$1\ 10^{6}$	$1\ 10^{1}$
Y-91	$1\ 10^{6}$	$1\ 10^{3}$
Y-91m	$1\ 10^{6}$	$1\ 10^{2}$
Y-92	$1\ 10^{5}$	$1\ 10^{2}$
Y-93	$1\ 10^{5}$	$1\ 10^{2}$
Y-94	$1\ 10^{5}$	$1\ 10^{1}$
Y-95	$1\ 10^{5}$	$1\ 10^{1}$
Zirconium:		
Zr-86	$1\ 10^{7}$	$1\ 10^{2}$
Zr-88	$1\ 10^{6}$	$1\ 10^{2}$
Zr-89	$1\ 10^{6}$	$1\ 10^{1}$
Zr-93+	$1\ 10^{7}$	$1\ 10^{3}$
Zr-95	$1\ 10^{6}$	$1\ 10^{1}$
Zr-97+	$1\ 10^{5}$	$1\ 10^{1}$
Niobium:		
Nb-88	$1\ 10^{5}$	$1\ 10^{1}$
Nb-89 (2.03 hours)	$1\ 10^{5}$	$1\ 10^{1}$
Nb-89 (1.01 hours)	$1\ 10^{5}$	$1\ 10^{1}$
Nb-90	$1\ 10^{5}$	$1\ 10^{1}$
Nb-93m	$1\ 10^{7}$	$1\ 10^{4}$
Nb-94	$1\ 10^{6}$	$1\ 10^{1}$
Nb-95	$1\ 10^{6}$	$1\ 10^{1}$
Nb-95m	$1\ 10^{7}$	$1\ 10^{2}$
Nb-96	$1\ 10^{5}$	$1\ 10^{1}$
Nb-97	$1\ 10^{6}$	$1\ 10^{1}$
Nb-98	$1\ 10^{5}$	$1\ 10^{1}$
Molybdenum:		
Mo-90	$1\ 10^{6}$	$1\ 10^{1}$
Mo-93	$1\ 10^{8}$	$1\ 10^{3}$
Mo-93m	$1\ 10^{6}$	$1\ 10^{1}$
Mo-99	$1\ 10^{6}$	$1\ 10^{2}$
Mo-101	$1\ 10^{6}$	$1\ 10^{1}$
Technetium:		
Tc-93	$1\ 10^{6}$	$1\ 10^{1}$
Tc-93m	$1\ 10^{6}$	$1\ 10^{1}$
Tc-94	$1\ 10^{6}$	$1\ 10^{1}$
Tc-94m	$1\ 10^{5}$	$1\ 10^{1}$
Tc-95	$1\ 10^{6}$	$1\ 10^{1}$

Tc-95m+	$1\ 10^{6}$	$1\ 10^{1}$
Tc-96	$1\ 10^{6}$	$1\ 10^{1}$
Tc-96m	$1\ 10^{7}$	$1\ 10^{3}$
Tc-97	$1\ 10^{8}$	$1\ 10^{3}$
Tc-97m	$1\ 10^{7}$	$1\ 10^{3}$
Tc-98	$1\ 10^{6}$	$1\ 10^{1}$
Tc-99	$1\ 10^{7}$	$1\ 10^{4}$
Tc-99m	$1\ 10^{7}$	$1\ 10^{2}$
Tc-101	$1\ 10^{6}$	$1\ 10^{2}$
Tc-104	$1\ 10^{5}$	$1\ 10^{1}$
Ruthenium:		
Ru-94	$1\ 10^{6}$	$1\ 10^{2}$
Ru-97	$1\ 10^{7}$	$1\ 10^{2}$
Ru-103	$1\ 10^{6}$	$1\ 10^{2}$
Ru-105	$1\ 10^{6}$	$1\ 10^{1}$
Ru-106+	$1\ 10^{5}$	$1\ 10^{2}$
Rhodium:		
Rh-99	$1\ 10^{6}$	$1\ 10^{1}$
Rh-99m	$1\ 10^{6}$	$1\ 10^{1}$
Rh-100	$1\ 10^{6}$	$1\ 10^{1}$
Rh-101	$1\ 10^{7}$	$1\ 10^{2}$
Rh-101m	$1\ 10^{7}$	$1\ 10^{2}$
Rh-102	$1\ 10^{6}$	$1\ 10^{1}$
Rh-102m	$1\ 10^{6}$	$1\ 10^{2}$
Rh-103m	$1\ 10^{8}$	$1\ 10^{4}$
Rh-105	$1\ 10^{7}$	$1\ 10^{2}$
Rh-106m	$1\ 10^{5}$	$1\ 10^{1}$
Rh-107	$1\ 10^{6}$	$1\ 10^{2}$
Palladium:		
Pd-100	$1\ 10^{7}$	$1\ 10^{2}$
Pd-101	$1\ 10^{6}$	$1\ 10^{2}$
Pd-103	$1\ 10^{8}$	$1\ 10^{3}$
Pd-107	$1\ 10^{8}$	$1\ 10^{5}$
Pd-109	$1\ 10^{6}$	$1\ 10^{3}$
Silver:		
Ag-102	$1\ 10^{5}$	$1\ 10^{1}$
Ag-103	$1\ 10^{6}$	$1\ 10^{1}$
Ag-104	$1\ 10^{6}$	$1\ 10^{1}$
Ag-104m	$1\ 10^{6}$	$1\ 10^{1}$
Ag-105	$1\ 10^{6}$	$1\ 10^{2}$
Ag-106	$1\ 10^{6}$	$1\ 10^{1}$
Ag-106m	$1\ 10^{6}$	$1\ 10^{1}$
Ag-108m+	$1\ 10^{6}$	$1\ 10^{1}$
Ag-110m	$1\ 10^{6}$	$1\ 10^{1}$
Ag-111	$1\ 10^{6}$	$1\ 10^{3}$
Ag-112	$1\ 10^{5}$	$1\ 10^{1}$
Ag-115	$1\ 10^{5}$	$1\ 10^{1}$
Cadmium		
Cd-104	$1\ 10^{7}$	$1\ 10^{2}$
Cd-107	$1\ 10^{7}$	$1\ 10^{3}$

Cd-109	$1\ 10^{6}$	$1\ 10^{4}$
Cd-113	$1\ 10^{6}$	$1\ 10^{3}$
Cd-113m	$1\ 10^{6}$	$1\ 10^{3}$
Cd-115	$1\ 10^{6}$	$1\ 10^{2}$
Cd-115m	$1\ 10^{6}$	$1\ 10^{3}$
Cd-117	$1\ 10^{6}$	$1\ 10^{1}$
Cd-117m	$1\ 10^{6}$	$1\ 10^{1}$
Indium:		
In-109	$1\ 10^{6}$	$1\ 10^{1}$
In-110 (4.9 hours)	$1\ 10^{6}$	$1\ 10^{1}$
In-110 (69.1 minutes)	$1\ 10^{5}$	$1\ 10^{1}$
In-111	$1\ 10^{6}$	$1\ 10^{2}$
In-112	$1\ 10^{6}$	$1\ 10^{2}$
In-113m	$1\ 10^{6}$	$1\ 10^{2}$
In-114	$1\ 10^{5}$	$1\ 10^{3}$
In-114m	$1\ 10^{6}$	$1\ 10^{2}$
In-115	$1\ 10^{5}$	$1\ 10^{3}$
In-115m	$1\ 10^{6}$	$1\ 10^{2}$
In-116m	$1\ 10^{5}$	$1\ 10^{1}$
In-117	$1\ 10^{6}$	$1\ 10^{1}$
In-117m	$1\ 10^{6}$	$1\ 10^{2}$
In-119m	$1\ 10^{5}$	$1\ 10^{2}$
Tin:		
Sn-110	$1\ 10^{7}$	$1\ 10^{2}$
Sn-111	$1\ 10^{6}$	$1\ 10^{2}$
Sn-113	$1\ 10^{7}$	$1\ 10^{3}$
Sn-117m	$1\ 10^{6}$	$1\ 10^{2}$
Sn-119m	$1\ 10^{7}$	$1\ 10^{3}$
Sn-121	$1\ 10^{7}$	$1\ 10^{5}$
Sn-121m+	$1\ 10^{7}$	$1\ 10^{3}$
Sn-123	$1\ 10^{6}$	$1\ 10^{3}$
Sn-123m	$1\ 10^{6}$	$1\ 10^{2}$
Sn-125	$1\ 10^{5}$	$1\ 10^{2}$
Sn-126+	$1\ 10^{5}$	$1\ 10^{1}$
Sn-127	$1\ 10^{6}$	$1\ 10^{1}$
Sn-128	$1\ 10^{6}$	$1\ 10^{1}$
Antimony:		
Sb-115	$1\ 10^{6}$	$1\ 10^{1}$
Sb-116	$1\ 10^{6}$	$1\ 10^{1}$
Sb-116m	$1\ 10^{5}$	$1\ 10^{1}$
Sb-117	$1\ 10^{7}$	$1\ 10^{2}$
Sb-118m	$1\ 10^{6}$	$1\ 10^{1}$
Sb-119	$1\ 10^{7}$	$1\ 10^{3}$
Sb-120 (5.76 days)	$1\ 10^{6}$	$1\ 10^{1}$
Sb-120 (15.89 minutes)	$1\ 10^{6}$	$1\ 10^{2}$
Sb-122	$1\ 10^{4}$	$1\ 10^{2}$
Sb-124	$1\ 10^{6}$	$1\ 10^{1}$
Sb-124m	$1\ 10^{6}$	$1\ 10^{2}$
Sb-125	$1\ 10^{6}$	$1\ 10^{2}$
Sb-126	$1\ 10^{5}$	$1\ 10^{1}$

Sb-126m	$1\ 10^{5}$	$1\ 10^{1}$
Sb-127	$1\ 10^{6}$	$1\ 10^{1}$
Sb-128 (9.01 hours)	$1\ 10^{5}$	$1\ 10^{1}$
Sb-128 (10.4 minutes)	$1\ 10^{5}$	$1\ 10^{1}$
Sb-129	$1\ 10^{6}$	$1\ 10^{1}$
Sb-130	$1\ 10^{5}$	$1\ 10^{1}$
Sb-131	$1\ 10^{6}$	$1\ 10^{1}$
Tellurium:		
Te-116	$1\ 10^{7}$	$1\ 10^{2}$
Te-121	$1\ 10^{6}$	$1\ 10^{1}$
Te-121m	$1\ 10^{6}$	$1\ 10^{2}$
Te-123	$1\ 10^{6}$	$1\ 10^{3}$
Te-123m	$1\ 10^{7}$	$1\ 10^{2}$
Te-125m	$1\ 10^{7}$	$1\ 10^{3}$
Te-127	$1\ 10^{6}$	$1\ 10^{3}$
Te-127m	$1\ 10^{7}$	$1\ 10^{3}$
Te-129	$1\ 10^{6}$	$1\ 10^{2}$
Te-129m	$1\ 10^{6}$	$1\ 10^{3}$
Te-131	$1\ 10^{5}$	$1\ 10^{2}$
Te-131m	$1\ 10^{6}$	$1\ 10^{1}$
Te-132	$1\ 10^{7}$	$1\ 10^{2}$
Te-133	$1\ 10^{5}$	$1\ 10^{1}$
Te-133m	$1\ 10^{5}$	$1\ 10^{1}$
Te-134	$1\ 10^{6}$	$1\ 10^{1}$
Iodine:		
I-120	$1\ 10^{5}$	$1\ 10^{1}$
I-120m	$1\ 10^{5}$	$1\ 10^{1}$
I-121	$1\ 10^{6}$	$1\ 10^{2}$
I-123	$1\ 10^{7}$	$1\ 10^{2}$
I-124	$1\ 10^{6}$	$1\ 10^{1}$
I-125	$1\ 10^{6}$	$1\ 10^{3}$
I-126	$1\ 10^{6}$	$1\ 10^{2}$
I-128	$1\ 10^{5}$	$1\ 10^{2}$
I-129	$1\ 10^{5}$	$1\ 10^{2}$
I-130	$1\ 10^{6}$	$1\ 10^{1}$
I-131	$1\ 10^{6}$	$1\ 10^{2}$
I-132	$1\ 10^{5}$	$1\ 10^{1}$
I-132m	$1\ 10^{6}$	$1\ 10^{2}$
I-133	$1\ 10^{6}$	$1\ 10^{1}$
I-134	$1\ 10^{5}$	$1\ 10^{1}$
I-135	$1\ 10^{6}$	$1\ 10^{1}$
Xenon:		
Xe-120	$1\ 10^{9}$	$1\ 10^{2}$
Xe-121	$1\ 10^{9}$	$1\ 10^{2}$
Xe-122+	$1\ 10^{9}$	$1\ 10^{2}$
Xe-123	$1\ 10^{9}$	$1\ 10^{2}$
Xe-125	$1\ 10^{9}$	$1\ 10^{3}$
Xe-127	$1\ 10^{5}$	$1\ 10^{3}$
Xe-129m	$1\ 10^{4}$	$1\ 10^{3}$
Xe-131m	$1\ 10^{4}$	$1\ 10^{4}$

Xe-133m	$1\ 10^{4}$	$1\ 10^{3}$
Xe-133	$1\ 10^{4}$	$1\ 10^{3}$
Xe-135m	$1\ 10^{9}$	$1\ 10^{2}$
Xe-135	$1\ 10^{10}$	$1\ 10^{3}$
Xe-138	$1\ 10^{9}$	$1\ 10^{2}$
Caesium:		
Cs-125	$1\ 10^{4}$	$1\ 10^{1}$
Cs-127	$1\ 10^{5}$	$1\ 10^{2}$
Cs-129	$1\ 10^{5}$	$1\ 10^{2}$
Cs-130	$1\ 10^{6}$	$1\ 10^{2}$
Cs-131	$1\ 10^{6}$	$1\ 10^{3}$
Cs-132	$1\ 10^{5}$	$1\ 10^{1}$
Cs-134	$1\ 10^{4}$	$1\ 10^{1}$
Cs-134m	$1\ 10^{5}$	$1\ 10^{3}$
Cs-135	$1\ 10^{7}$	$1\ 10^{4}$
Cs-135m	$1\ 10^{6}$	$1\ 10^{1}$
Cs-136	$1\ 10^{5}$	$1\ 10^{1}$
Cs-137+	$1\ 10^{4}$	$1\ 10^{1}$
Cs-138	$1\ 10^{4}$	$1\ 10^{1}$
Barium:		
Ba-126	$1\ 10^{7}$	$1\ 10^{2}$
Ba-128	$1\ 10^{7}$	$1\ 10^{2}$
Ba-131	$1\ 10^{6}$	$1\ 10^{2}$
Ba-131m	$1\ 10^{7}$	$1\ 10^{2}$
Ba-133	$1\ 10^{6}$	$1\ 10^{2}$
Ba-133m	$1\ 10^{6}$	$1\ 10^{2}$
Ba-135m	$1\ 10^{6}$	$1\ 10^{2}$
Ba-137m	$1\ 10^{6}$	$1\ 10^{1}$
Ba-139	$1\ 10^{5}$	$1\ 10^{2}$
Ba-140+	$1\ 10^{5}$	$1\ 10^{1}$
Ba-141	$1\ 10^{5}$	$1\ 10^{1}$
Ba-142	$1\ 10^{6}$	$1\ 10^{1}$
Lanthanum:		
La-131	$1\ 10^{6}$	$1\ 10^{1}$
La-132	$1\ 10^{6}$	$1\ 10^{1}$
La-135	$1\ 10^{7}$	$1\ 10^{3}$
La-137	$1\ 10^{7}$	$1\ 10^{3}$
La-138	$1\ 10^{6}$	$1\ 10^{1}$
La-140	$1\ 10^{5}$	$1\ 10^{1}$
La-141	$1\ 10^{5}$	$1\ 10^{2}$
La-142	$1\ 10^{5}$	$1\ 10^{1}$
La-143	$1\ 10^{5}$	$1\ 10^{2}$
Cerium:		
Ce-134	$1\ 10^{7}$	$1\ 10^{3}$
Ce-135	$1\ 10^{6}$	$1\ 10^{1}$
Ce-137	$1\ 10^{7}$	$1\ 10^{3}$
Ce-137m	$1\ 10^{6}$	$1\ 10^{3}$
Ce-139	$1\ 10^{6}$	$1\ 10^{2}$
Ce-141	$1\ 10^{7}$	$1\ 10^{2}$
Ce-143	$1\ 10^{6}$	$1\ 10^{2}$

Ce-144+	$1\ 10^{5}$	$1\ 10^{2}$
Praseodymium:		
Pr-136	$1\ 10^{5}$	$1\ 10^{1}$
Pr-137	$1\ 10^{6}$	$1\ 10^{2}$
Pr-138m	$1\ 10^{6}$	$1\ 10^{1}$
Pr-139	$1\ 10^{7}$	$1\ 10^{2}$
Pr-142	$1\ 10^{5}$	$1\ 10^{2}$
Pr-142m	$1\ 10^{9}$	$1\ 10^{7}$
Pr-143	$1\ 10^{6}$	$1\ 10^{4}$
Pr-144	$1\ 10^{5}$	$1\ 10^{2}$
Pr-145	$1\ 10^{5}$	$1\ 10^{3}$
Pr-147	$1\ 10^{5}$	$1\ 10^{1}$
Neodymium:		
Nd-136	$1\ 10^{6}$	$1\ 10^{2}$
Nd-138	$1\ 10^{7}$	$1\ 10^{3}$
Nd-139	$1\ 10^{6}$	$1\ 10^{2}$
Nd-139m	$1\ 10^{6}$	$1\ 10^{1}$
Nd-141	$1\ 10^{7}$	$1\ 10^{2}$
Nd-147	$1\ 10^{6}$	$1\ 10^{2}$
Nd-149	$1\ 10^{6}$	$1\ 10^{2}$
Nd-151	$1\ 10^{5}$	$1\ 10^{1}$
Promethium:		
Pm-141	$1\ 10^{5}$	$1\ 10^{1}$
Pm-143	$1\ 10^{6}$	$1\ 10^{2}$
Pm-144	$1\ 10^{6}$	$1\ 10^{1}$
Pm-145	$1\ 10^{7}$	$1\ 10^{3}$
Pm-146	$1\ 10^{6}$	$1\ 10^{1}$
Pm-147	$1\ 10^{7}$	$1\ 10^{4}$
Pm-148	$1\ 10^{5}$	$1\ 10^{1}$
Pm-148m+	$1\ 10^{6}$	$1\ 10^{1}$
Pm-149	$1\ 10^{6}$	$1\ 10^{3}$
Pm-150	$1\ 10^{5}$	$1\ 10^{1}$
Pm-151	$1\ 10^{6}$	$1\ 10^{2}$
Samarium:		
Sm-141	$1\ 10^{5}$	$1\ 10^{1}$
Sm-141m	$1\ 10^{6}$	$1\ 10^{1}$
Sm-142	$1\ 10^{7}$	$1\ 10^{2}$
Sm-145	$1\ 10^{7}$	$1\ 10^{2}$
Sm-146	$1\ 10^{5}$	$1\ 10^{1}$
Sm-147	$1\ 10^{4}$	$1\ 10^{1}$
Sm-151	$1\ 10^{8}$	$1\ 10^{4}$
Sm-153	$1\ 10^{6}$	$1\ 10^{2}$
Sm-155	$1\ 10^{6}$	$1\ 10^{2}$
Sm-156	$1\ 10^{6}$	$1\ 10^{2}$
Europium:		
Eu-145	$1\ 10^{6}$	$1\ 10^{1}$
Eu-146	$1\ 10^{6}$	$1\ 10^{1}$
Eu-147	$1\ 10^{6}$	$1\ 10^{2}$
Eu-148	$1\ 10^{6}$	$1\ 10^{1}$
Eu-149	$1\ 10^{7}$	$1\ 10^{2}$

Eu-150 (34.2 years) ..... $1\ 10^{6}$	$1\ 10^{1}$
Eu-150 (12.6 hours) ..... $1\ 10^{6}$	$1\ 10^{3}$
Eu-152..... $1\ 10^{6}$	$1\ 10^{1}$
Eu-152m ..... $1\ 10^{6}$	$1\ 10^{2}$
Eu-154..... $1\ 10^{6}$	$1\ 10^{1}$
Eu-155..... $1\ 10^{7}$	$1\ 10^{2}$
Eu-156..... $1\ 10^{6}$	$1\ 10^{1}$
Eu-157..... $1\ 10^{6}$	$1\ 10^{2}$
Eu-158..... $1\ 10^{5}$	$1\ 10^{1}$
Gadolinium:	
Gd-145 ..... $1\ 10^{5}$	$1\ 10^{1}$
Gd-146+ ..... $1\ 10^{6}$	$1\ 10^{1}$
Gd-147 ..... $1\ 10^{6}$	$1\ 10^{1}$
Gd-148 ..... $1\ 10^{4}$	$1\ 10^{1}$
Gd-149 ..... $1\ 10^{6}$	$1\ 10^{2}$
Gd-151 ..... $1\ 10^{7}$	$1\ 10^{2}$
Gd-152 ..... $1\ 10^{4}$	$1\ 10^{1}$
Gd-153 ..... $1\ 10^{7}$	$1\ 10^{2}$
Gd-159 ..... $1\ 10^{6}$	$1\ 10^{3}$
Terbium:	
Tb-147..... $1\ 10^{6}$	$1\ 10^{1}$
Tb-149..... $1\ 10^{6}$	$1\ 10^{1}$
Tb-150..... $1\ 10^{6}$	$1\ 10^{1}$
Tb-151..... $1\ 10^{6}$	$1\ 10^{1}$
Tb-153..... $1\ 10^{7}$	$1\ 10^{2}$
Tb-154..... $1\ 10^{6}$	$1\ 10^{1}$
Tb-155..... $1\ 10^{7}$	$1\ 10^{2}$
Tb-156..... $1\ 10^{6}$	$1\ 10^{1}$
Tb-156m (24.4 hours) .. $1\ 10^{7}$	$1\ 10^{3}$
Tb-156m (5 hours)..... $1\ 10^{7}$	$1\ 10^{4}$
Tb-157..... $1\ 10^{7}$	$1\ 10^{4}$
Tb-158..... $1\ 10^{6}$	$1\ 10^{1}$
Tb-160..... $1\ 10^{6}$	$1\ 10^{1}$
Tb-161..... $1\ 10^{6}$	$1\ 10^{3}$
Dysprosium:	
Dy-155 ..... $1\ 10^{6}$	$1\ 10^{1}$
Dy-157 ..... $1\ 10^{6}$	$1\ 10^{2}$
Dy-159 ..... $1\ 10^{7}$	$1\ 10^{3}$
Dy-165 ..... $1\ 10^{6}$	$1\ 10^{3}$
Dy-166 ..... $1\ 10^{6}$	$1\ 10^{3}$
Holmium:	
Ho-155 ..... $1\ 10^{6}$	$1\ 10^{2}$
Ho-157 ..... $1\ 10^{6}$	$1\ 10^{2}$
Ho-159 ..... $1\ 10^{6}$	$1\ 10^{2}$
Ho-161 ..... $1\ 10^{7}$	$1\ 10^{2}$
Ho-162 ..... $1\ 10^{7}$	$1\ 10^{2}$
Ho-162m..... $1\ 10^{6}$	$1\ 10^{1}$
Ho-164 ..... $1\ 10^{6}$	$1\ 10^{3}$
Ho-164m..... $1\ 10^{7}$	$1\ 10^{3}$
Ho-166 ..... $1\ 10^{5}$	$1\ 10^{3}$

Ho-166m	$1\ 10^{6}$	$1\ 10^{1}$
Ho-167	$1\ 10^{6}$	$1\ 10^{2}$
Erbium:		
Er-161	$1\ 10^{6}$	$1\ 10^{1}$
Er-165	$1\ 10^{7}$	$1\ 10^{3}$
Er-169	$1\ 10^{7}$	$1\ 10^{4}$
Er-171	$1\ 10^{6}$	$1\ 10^{2}$
Er-172	$1\ 10^{6}$	$1\ 10^{2}$
Thulium:		
Tm-162	$1\ 10^{6}$	$1\ 10^{1}$
Tm-166	$1\ 10^{6}$	$1\ 10^{1}$
Tm-167	$1\ 10^{6}$	$1\ 10^{2}$
Tm-170	$1\ 10^{6}$	$1\ 10^{3}$
Tm-171	$1\ 10^{8}$	$1\ 10^{4}$
Tm-172	$1\ 10^{6}$	$1\ 10^{2}$
Tm-173	$1\ 10^{6}$	$1\ 10^{2}$
Tm-175	$1\ 10^{6}$	$1\ 10^{1}$
Ytterbium:		
Yb-162	$1\ 10^{7}$	$1\ 10^{2}$
Yb-166	$1\ 10^{7}$	$1\ 10^{2}$
Yb-167	$1\ 10^{6}$	$1\ 10^{2}$
Yb-169	$1\ 10^{7}$	$1\ 10^{2}$
Yb-175	$1\ 10^{7}$	$1\ 10^{3}$
Yb-177	$1\ 10^{6}$	$1\ 10^{2}$
Yb-178	$1\ 10^{6}$	$1\ 10^{3}$
Lutetium:		
Lu-169	$1\ 10^{6}$	$1\ 10^{1}$
Lu-170	$1\ 10^{6}$	$1\ 10^{1}$
Lu-171	$1\ 10^{6}$	$1\ 10^{1}$
Lu-172	$1\ 10^{6}$	$1\ 10^{1}$
Lu-173	$1\ 10^{7}$	$1\ 10^{2}$
Lu-174	$1\ 10^{7}$	$1\ 10^{2}$
Lu-174m	$1\ 10^{7}$	$1\ 10^{2}$
Lu-176	$1\ 10^{6}$	$1\ 10^{2}$
Lu-176m	$1\ 10^{6}$	$1\ 10^{3}$
Lu-177	$1\ 10^{7}$	$1\ 10^{3}$
Lu-177m	$1\ 10^{6}$	$1\ 10^{1}$
Lu-178	$1\ 10^{5}$	$1\ 10^{2}$
Lu-178m	$1\ 10^{5}$	$1\ 10^{1}$
Lu-179	$1\ 10^{6}$	$1\ 10^{3}$
Hafnium:		
Hf-170	$1\ 10^{6}$	$1\ 10^{2}$
Hf-172+	$1\ 10^{6}$	$1\ 10^{1}$
Hf-173	$1\ 10^{6}$	$1\ 10^{2}$
Hf-175	$1\ 10^{6}$	$1\ 10^{2}$
Hf-177m	$1\ 10^{5}$	$1\ 10^{1}$
Hf-178m	$1\ 10^{6}$	$1\ 10^{1}$
Hf-179m	$1\ 10^{6}$	$1\ 10^{1}$
Hf-180m	$1\ 10^{6}$	$1\ 10^{1}$
Hf-181	$1\ 10^{6}$	$1\ 10^{1}$

Hf-182	$1\ 10^{6}$	$1\ 10^{2}$
Hf-182m	$1\ 10^{6}$	$1\ 10^{1}$
Hf-183	$1\ 10^{6}$	$1\ 10^{1}$
Hf-184	$1\ 10^{6}$	$1\ 10^{2}$
Tantalum:		
Ta-172	$1\ 10^{6}$	$1\ 10^{1}$
Ta-173	$1\ 10^{6}$	$1\ 10^{1}$
Ta-174	$1\ 10^{6}$	$1\ 10^{1}$
Ta-175	$1\ 10^{6}$	$1\ 10^{1}$
Ta-176	$1\ 10^{6}$	$1\ 10^{1}$
Ta-177	$1\ 10^{7}$	$1\ 10^{2}$
Ta-178	$1\ 10^{6}$	$1\ 10^{1}$
Ta-179	$1\ 10^{7}$	$1\ 10^{3}$
Ta-180	$1\ 10^{6}$	$1\ 10^{1}$
Ta-180m	$1\ 10^{7}$	$1\ 10^{3}$
Ta-182	$1\ 10^{4}$	$1\ 10^{1}$
Ta 182m	$1\ 10^{6}$	$1\ 10^{2}$
Ta-183	$1\ 10^{6}$	$1\ 10^{2}$
Ta-184	$1\ 10^{6}$	$1\ 10^{1}$
Ta-185	$1\ 10^{5}$	$1\ 10^{2}$
Ta-186	$1\ 10^{5}$	$1\ 10^{1}$
Tungsten:		
W-176	$1\ 10^{6}$	$1\ 10^{2}$
W-177	$1\ 10^{6}$	$1\ 10^{1}$
W-178+	$1\ 10^{6}$	$1\ 10^{1}$
W-179	$1\ 10^{7}$	$1\ 10^{2}$
W-181	$1\ 10^{7}$	$1\ 10^{3}$
W-185	$1\ 10^{7}$	$1\ 10^{4}$
W-187	$1\ 10^{6}$	$1\ 10^{2}$
W-188+	$1\ 10^{5}$	$1\ 10^{2}$
Rhenium:		
Re-177	$1\ 10^{6}$	$1\ 10^{1}$
Re-178	$1\ 10^{6}$	$1\ 10^{1}$
Re-181	$1\ 10^{6}$	$1\ 10^{1}$
Re-182 (64 hours)	$1\ 10^{6}$	$1\ 10^{1}$
Re-182 (12.7 hours)	$1\ 10^{6}$	$1\ 10^{1}$
Re-184	$1\ 10^{6}$	$1\ 10^{1}$
Re-184m	$1\ 10^{6}$	$1\ 10^{2}$
Re-186	$1\ 10^{6}$	$1\ 10^{3}$
Re-186m	$1\ 10^{7}$	$1\ 10^{3}$
Re-187	$1\ 10^{9}$	$1\ 10^{6}$
Re-188	$1\ 10^{5}$	$1\ 10^{2}$
Re-188m	$1\ 10^{7}$	$1\ 10^{2}$
Re-189+	$1\ 10^{6}$	$1\ 10^{2}$
Osmium:		
Os-180	$1\ 10^{7}$	$1\ 10^{2}$
Os-181	$1\ 10^{6}$	$1\ 10^{1}$
Os-182	$1\ 10^{6}$	$1\ 10^{2}$
Os-185	$1\ 10^{6}$	$1\ 10^{1}$

Os-189m	$1\ 10^{7}$	$1\ 10^{4}$
Os-191	$1\ 10^{7}$	$1\ 10^{2}$
Os-191m	$1\ 10^{7}$	$1\ 10^{3}$
Os-193	$1\ 10^{6}$	$1\ 10^{2}$
Os-194+	$1\ 10^{5}$	$1\ 10^{2}$
Iridium:		
Ir-182	$1\ 10^{5}$	$1\ 10^{1}$
Ir-184	$1\ 10^{6}$	$1\ 10^{1}$
Ir-185	$1\ 10^{6}$	$1\ 10^{1}$
Ir-186 (15.8 hours)	$1\ 10^{6}$	$1\ 10^{1}$
Ir-186 (1.75 hours)	$1\ 10^{6}$	$1\ 10^{1}$
Ir-187	$1\ 10^{6}$	$1\ 10^{2}$
Ir-188	$1\ 10^{6}$	$1\ 10^{1}$
Ir-189+	$1\ 10^{7}$	$1\ 10^{2}$
Ir-190	$1\ 10^{6}$	$1\ 10^{1}$
Ir-190m (3.1 hours)	$1\ 10^{6}$	$1\ 10^{1}$
Ir-190m (1.2 hours)	$1\ 10^{7}$	$1\ 10^{4}$
Ir-192	$1\ 10^{4}$	$1\ 10^{1}$
Ir-192m	$1\ 10^{7}$	$1\ 10^{2}$
Ir-193m	$1\ 10^{7}$	$1\ 10^{4}$
Ir-194	$1\ 10^{5}$	$1\ 10^{2}$
Ir-194m	$1\ 10^{6}$	$1\ 10^{1}$
Ir-195	$1\ 10^{6}$	$1\ 10^{2}$
Ir-195m	$1\ 10^{6}$	$1\ 10^{2}$
Platinum:		
Pt-186	$1\ 10^{6}$	$1\ 10^{1}$
Pt-188+	$1\ 10^{6}$	$1\ 10^{1}$
Pt-189	$1\ 10^{6}$	$1\ 10^{2}$
Pt-191	$1\ 10^{6}$	$1\ 10^{2}$
Pt-193	$1\ 10^{7}$	$1\ 10^{4}$
Pt-193m	$1\ 10^{7}$	$1\ 10^{3}$
Pt-195m	$1\ 10^{6}$	$1\ 10^{2}$
Pt-197	$1\ 10^{6}$	$1\ 10^{3}$
Pt-197m	$1\ 10^{6}$	$1\ 10^{2}$
Pt-199	$1\ 10^{6}$	$1\ 10^{2}$
Pt-200	$1\ 10^{6}$	$1\ 10^{2}$
Gold:		
Au-193	$1\ 10^{7}$	$1\ 10^{2}$
Au-194	$1\ 10^{6}$	$1\ 10^{1}$
Au-195	$1\ 10^{7}$	$1\ 10^{2}$
Au-198	$1\ 10^{6}$	$1\ 10^{2}$
Au-198m	$1\ 10^{6}$	$1\ 10^{1}$
Au-199	$1\ 10^{6}$	$1\ 10^{2}$
Au-200	$1\ 10^{5}$	$1\ 10^{2}$
Au-200m	$1\ 10^{6}$	$1\ 10^{1}$
Au-201	$1\ 10^{6}$	$1\ 10^{2}$
Mercury:		
Hg-193	$1\ 10^{6}$	$1\ 10^{2}$
Hg-193m	$1\ 10^{6}$	$1\ 10^{1}$
Hg-194+	$1\ 10^{6}$	$1\ 10^{1}$

Hg-195	$1\ 10^{6}$	$1\ 10^{2}$
Hg-195m+ (organic)	$1\ 10^{6}$	$1\ 10^{2}$
Hg-195m+ (inorganic)	$1\ 10^{6}$	$1\ 10^{2}$
Hg-197	$1\ 10^{7}$	$1\ 10^{2}$
Hg-197m (organic)	$1\ 10^{6}$	$1\ 10^{2}$
Hg-197m (inorganic)	$1\ 10^{6}$	$1\ 10^{2}$
Hg-199m	$1\ 10^{6}$	$1\ 10^{2}$
Hg-203	$1\ 10^{5}$	$1\ 10^{2}$
Thallium:		
Tl-194	$1\ 10^{6}$	$1\ 10^{1}$
Tl-194m	$1\ 10^{6}$	$1\ 10^{1}$
Tl-195	$1\ 10^{6}$	$1\ 10^{1}$
Tl-197	$1\ 10^{6}$	$1\ 10^{2}$
Tl-198	$1\ 10^{6}$	$1\ 10^{1}$
Tl-198m	$1\ 10^{6}$	$1\ 10^{1}$
Tl-199	$1\ 10^{6}$	$1\ 10^{2}$
Tl-200	$1\ 10^{6}$	$1\ 10^{1}$
Tl-201	$1\ 10^{6}$	$1\ 10^{2}$
Tl-202	$1\ 10^{6}$	$1\ 10^{2}$
Tl-204	$1\ 10^{4}$	$1\ 10^{4}$
Lead:		
Pb-195m	$1\ 10^{6}$	$1\ 10^{1}$
Pb-198	$1\ 10^{6}$	$1\ 10^{2}$
Pb-199	$1\ 10^{6}$	$1\ 10^{1}$
Pb-200	$1\ 10^{6}$	$1\ 10^{2}$
Pb-201	$1\ 10^{6}$	$1\ 10^{1}$
Pb-202	$1\ 10^{6}$	$1\ 10^{3}$
Pb-202m	$1\ 10^{6}$	$1\ 10^{1}$
Pb-203	$1\ 10^{6}$	$1\ 10^{2}$
Pb-205	$1\ 10^{7}$	$1\ 10^{4}$
Pb-209	$1\ 10^{6}$	$1\ 10^{5}$
Pb-210+	$1\ 10^{4}$	$1\ 10^{1}$
Pb-211	$1\ 10^{6}$	$1\ 10^{2}$
Pb-212+	$1\ 10^{5}$	$1\ 10^{1}$
Pb-214	$1\ 10^{6}$	$1\ 10^{2}$
Bismuth:		
Bi-200	$1\ 10^{6}$	$1\ 10^{1}$
Bi-201	$1\ 10^{6}$	$1\ 10^{1}$
Bi-202	$1\ 10^{6}$	$1\ 10^{1}$
Bi-203	$1\ 10^{6}$	$1\ 10^{1}$
Bi-205	$1\ 10^{6}$	$1\ 10^{1}$
Bi-206	$1\ 10^{5}$	$1\ 10^{1}$
Bi-207	$1\ 10^{6}$	$1\ 10^{1}$
Bi-210	$1\ 10^{6}$	$1\ 10^{3}$
Bi-210m+	$1\ 10^{5}$	$1\ 10^{1}$
Bi-212+	$1\ 10^{5}$	$1\ 10^{1}$
Bi-213	$1\ 10^{6}$	$1\ 10^{2}$
Bi-214	$1\ 10^{5}$	$1\ 10^{1}$
Polonium:		
Po-203	$1\ 10^{6}$	$1\ 10^{1}$

Po-205	$1\ 10^{6}$	$1\ 10^{1}$
Po-206	$1\ 10^{6}$	$1\ 10^{1}$
Po-207	$1\ 10^{6}$	$1\ 10^{1}$
Po-208	$1\ 10^{4}$	$1\ 10^{1}$
Po-209	$1\ 10^{4}$	$1\ 10^{1}$
Po-210	$1\ 10^{4}$	$1\ 10^{1}$
Astatine:		
At-207	$1\ 10^{6}$	$1\ 10^{1}$
At-211	$1\ 10^{7}$	$1\ 10^{3}$
Francium:		
Fr-222	$1\ 10^{5}$	$1\ 10^{3}$
Fr-223	$1\ 10^{6}$	$1\ 10^{2}$
Radon:		
Rn-220+	$1\ 10^{7}$	$1\ 10^{4}$
Rn-222+	$1\ 10^{8}$	$1\ 10^{1}$
Radium:		
Ra-223+	$1\ 10^{5}$	$1\ 10^{2}$
Ra-224+	$1\ 10^{5}$	$1\ 10^{1}$
Ra-225	$1\ 10^{5}$	$1\ 10^{2}$
Ra-226+	$1\ 10^{4}$	$1\ 10^{1}$
Ra-227	$1\ 10^{6}$	$1\ 10^{2}$
Ra-228+	$1\ 10^{5}$	$1\ 10^{1}$
Actinium:		
Ac-224	$1\ 10^{6}$	$1\ 10^{2}$
Ac-225+	$1\ 10^{4}$	$1\ 10^{1}$
Ac-226	$1\ 10^{5}$	$1\ 10^{2}$
Ac-227+	$1\ 10^{3}$	$1\ 10^{-1}$
Ac-228	$1\ 10^{6}$	$1\ 10^{1}$
Thorium:		
Th-226+	$1\ 10^{7}$	$1\ 10^{3}$
Th-227	$1\ 10^{4}$	$1\ 10^{1}$
Th-228+	$1\ 10^{4}$	$1\ 10^{0}$
Th-229+	$1\ 10^{3}$	$1\ 10^{0}$
Th-230	$1\ 10^{4}$	$1\ 10^{0}$
Th-231	$1\ 10^{7}$	$1\ 10^{3}$
Th-232	$1\ 10^{4}$	$1\ 10^{1}$
Th-232sec	$1\ 10^{3}$	$1\ 10^{0}$
Th-234+	$1\ 10^{5}$	$1\ 10^{3}$
Protactinium:		
Pa-227	$1\ 10^{6}$	$1\ 10^{3}$
Pa-228	$1\ 10^{6}$	$1\ 10^{1}$
Pa-230	$1\ 10^{6}$	$1\ 10^{1}$
Pa-231	$1\ 10^{3}$	$1\ 10^{0}$
Pa-232	$1\ 10^{6}$	$1\ 10^{1}$
Pa-233	$1\ 10^{7}$	$1\ 10^{2}$
Pa-234	$1\ 10^{6}$	$1\ 10^{1}$
Uranium:		
U-230+	$1\ 10^{5}$	$1\ 10^{1}$
U-231	$1\ 10^{7}$	$1\ 10^{2}$
U-232+	$1\ 10^{3}$	$1\ 10^{0}$

U-233 ..... $1\ 10^{4}$ $1\ 10^{1}$
U-234 ..... $1\ 10^{4}$ $1\ 10^{1}$
U-235+ ..... $1\ 10^{4}$ $1\ 10^{1}$
U-236 ..... $1\ 10^{4}$ $1\ 10^{1}$
U-237 ..... $1\ 10^{6}$ $1\ 10^{2}$
U-238+ ..... $1\ 10^{4}$ $1\ 10^{1}$
U-238 sec ..... $1\ 10^{3}$ $1\ 10^{0}$
U-239 ..... $1\ 10^{6}$ $1\ 10^{2}$
U-240 ..... $1\ 10^{7}$ $1\ 10^{3}$
U-240+ ..... $1\ 10^{6}$ $1\ 10^{1}$
Neptunium:
Np-232 ..... $1\ 10^{6}$ $1\ 10^{1}$
Np-233 ..... $1\ 10^{7}$ $1\ 10^{2}$
Np-234 ..... $1\ 10^{6}$ $1\ 10^{1}$
Np-235 ..... $1\ 10^{7}$ $1\ 10^{3}$
Np-236($1.15\ 10^{5}$ years) . $1\ 10^{5}$ $1\ 10^{2}$
Np-236(22.5 hours) ..... $1\ 10^{7}$ $1\ 10^{3}$
Np-237+ ..... $1\ 10^{3}$ $1\ 10^{0}$
Np-238 ..... $1\ 10^{6}$ $1\ 10^{2}$
Np-239 ..... $1\ 10^{7}$ $1\ 10^{2}$
Np-240 ..... $1\ 10^{6}$ $1\ 10^{1}$
Plutonium:
Pu-234..... $1\ 10^{7}$ $1\ 10^{2}$
Pu-235..... $1\ 10^{7}$ $1\ 10^{2}$
Pu-236..... $1\ 10^{4}$ $1\ 10^{1}$
Pu-237..... $1\ 10^{7}$ $1\ 10^{3}$
Pu-238..... $1\ 10^{4}$ $1\ 10^{0}$
Pu-239..... $1\ 10^{4}$ $1\ 10^{0}$
Pu-240..... $1\ 10^{3}$ $1\ 10^{0}$
Pu-241..... $1\ 10^{5}$ $1\ 10^{2}$
Pu-242..... $1\ 10^{4}$ $1\ 10^{0}$
Pu-243..... $1\ 10^{7}$ $1\ 10^{3}$
Pu-244..... $1\ 10^{4}$ $1\ 10^{0}$
Pu-245..... $1\ 10^{6}$ $1\ 10^{2}$
Pu-246..... $1\ 10^{6}$ $1\ 10^{2}$
Americium:
Am-237 ..... $1\ 10^{6}$ $1\ 10^{2}$
Am-238 ..... $1\ 10^{6}$ $1\ 10^{1}$
Am-239 ..... $1\ 10^{6}$ $1\ 10^{2}$
Am-240 ..... $1\ 10^{6}$ $1\ 10^{1}$
Am-241 ..... $1\ 10^{4}$ $1\ 10^{0}$
Am-242 ..... $1\ 10^{6}$ $1\ 10^{3}$
Am-242m+ ..... $1\ 10^{4}$ $1\ 10^{0}$
Am-243+ ..... $1\ 10^{3}$ $1\ 10^{0}$
Am-244 ..... $1\ 10^{6}$ $1\ 10^{1}$
Am-244m ..... $1\ 10^{7}$ $1\ 10^{4}$
Am-245 ..... $1\ 10^{6}$ $1\ 10^{3}$
Am-246 ..... $1\ 10^{5}$ $1\ 10^{1}$
Am-246m ..... $1\ 10^{6}$ $1\ 10^{1}$
Curium:

Cm-238	$1\ 10^{7}$	$1\ 10^{2}$
Cm-240	$1\ 10^{5}$	$1\ 10^{2}$
Cm-241	$1\ 10^{6}$	$1\ 10^{2}$
Cm-242	$1\ 10^{5}$	$1\ 10^{2}$
Cm-243	$1\ 10^{4}$	$1\ 10^{0}$
Cm-244	$1\ 10^{4}$	$1\ 10^{1}$
Cm-245	$1\ 10^{3}$	$1\ 10^{0}$
Cm-246	$1\ 10^{3}$	$1\ 10^{0}$
Cm-247	$1\ 10^{4}$	$1\ 10^{0}$
Cm-248	$1\ 10^{3}$	$1\ 10^{0}$
Cm-249	$1\ 10^{6}$	$1\ 10^{3}$
Cm-250	$1\ 10^{3}$	$1\ 10^{-1}$
Berkelium:		
Bk-245	$1\ 10^{6}$	$1\ 10^{2}$
Bk-246	$1\ 10^{6}$	$1\ 10^{1}$
Bk-247	$1\ 10^{4}$	$1\ 10^{0}$
Bk-249	$1\ 10^{6}$	$1\ 10^{3}$
Bk-250	$1\ 10^{6}$	$1\ 10^{1}$
Californium:		
Cf-244	$1\ 10^{7}$	$1\ 10^{4}$
Cf-246	$1\ 10^{6}$	$1\ 10^{3}$
Cf-248	$1\ 10^{4}$	$1\ 10^{1}$
Cf-249	$1\ 10^{3}$	$1\ 10^{0}$
Cf-250	$1\ 10^{4}$	$1\ 10^{1}$
Cf-251	$1\ 10^{3}$	$1\ 10^{0}$
Cf-252	$1\ 10^{4}$	$1\ 10^{1}$
Cf-253	$1\ 10^{5}$	$1\ 10^{2}$
Cf-254	$1\ 10^{3}$	$1\ 10^{0}$
Einsteinium:		
Es-250	$1\ 10^{6}$	$1\ 10^{2}$
Es-251	$1\ 10^{7}$	$1\ 10^{2}$
Es-253	$1\ 10^{5}$	$1\ 10^{2}$
Es-254	$1\ 10^{4}$	$1\ 10^{1}$
Es-254m	$1\ 10^{6}$	$1\ 10^{2}$
Fermium:		
Fm-252	$1\ 10^{6}$	$1\ 10^{3}$
Fm-253	$1\ 10^{6}$	$1\ 10^{2}$
Fm-254	$1\ 10^{7}$	$1\ 10^{4}$
Fm-255	$1\ 10^{6}$	$1\ 10^{3}$
Fm-257	$1\ 10^{5}$	$1\ 10^{1}$
Mendelevium:		
Md-257	$1\ 10^{7}$	$1\ 10^{2}$
Md-258	$1\ 10^{5}$	$1\ 10^{2}$

Table B. List of radionuclides in secular equilibrium that are referred to in section 2.b) of this Annex.

Nuclear Parent	Daughter product
Ac-225+	Fr-221, At-217, Bi-213, Po-213(0.978), Tl-209(0.0216), Pb-209 (0.978)
Ac-227+	Fr-223(0.0138)
Ag-108m+	Ag-108(0.089)
Am-242m+	Am-242
Am-243+	Np-239
Ba-140+	La-140
Bi-210m+	Tl-206
Bi-212+	Tl-208(0.36), Po-212(0.64)
Ce-144+	Pr-144
Cs-137+	Ba-137m
Fe-60+	Co-60m
Gd-146+	Eu-146
Ge-68+	Ga-68
Hf-172+	Lu-172
Hg-194+	Au-194
Hg-195m+	Hg-195(0.542)
Ir-189+	Os-189m
Mg-28+	Al-28
Np-237+	Pa-233
Os-194+	Ir-194
Pb-210+	Bi-210, Po-210
Pb-212+	Bi-212, Tl-208(0.36), Po-212(0.64)
Pm-148m+	Pm-148(0.046)
Pt-188+	Ir-188
Ra-223+	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224+	Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36), Po-212(0.64)
Ra-226+	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228+	Ac-228
Rb-83+	Kr-83m
Rn-220+	Po-216
Rn-222+	Po-218, Pb-214, Bi-214, Po-214
Ru-106+	Rh-106
Re-189+	Os-189m(0.241)
Sn-121m+	Sn-121(0.776)
Sn-126+	Sb-126m
Sr-82+	Rb-82
Sr-90+	Y-90
Tc-95m+	Tc-95(0.04)

Ti-44+	Sc-44
Th-226+	Ra-222, Rn-218, Po-214
Th-228+	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36), Po-212(0.64)
Th-229+	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213(0.978), Pb-209(0.978)
Th-sec	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36), Po-212(0.64)
Th-234+	Pa-234m
U-230+	Th-226, Ra-222, Rn-218, Po-214
U-232+	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36). Po-212(0.64)
U-235+	Th-231
U-238+	Th-234, Pa-234m
U-sec	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
U-240+	Np-240m
W-178+	Ta-178
W-188+	Re-188
Xe-122+	I-122
Y-87+	Sr-87m
Zr-93+	Nb-93m
Zr-97+	Nb-97

Note:
a) The number in parenthesis is the x for one produced by that isotope.