Appendix B. Symbols and Units

Scientific notation

It is often more convenient to express the numbers encountered in radiological protection in scientific, rather than decimal notation because of their magnitude. This involves the use of significant figures within desired limits and multiplication by the appropriate power of ten. Examples are shown.

Converting decimal to scientific notation

Decimal	Scientific
1 230 000	1.23×10^{6}
100 000	10^{5}
3 531	3.53×10^{3} [a]
15.6	1.56×10^{1}
0.239	2.4×10^{-1} [b]
0.001	10^{-3}
0.000 087	8.7×10^{-5}

Notes:
[a] To three significant figures.

[b] To two significant figures.

Prefixes

Some powers of ten have special names and symbols. These may be prefixed to units of measurement: thus *kilo*gram, symbol kg, for 10^3 gram; *milli*metre, symbol mm, for 10^{-3} metre. A table of prefixes follows.

Prefixes

Multiplier	Prefix	Symbol	Multiplier	Prefix	Symbol
10^{1}	deca	da	10^{-1}	deci	d
10^{2}	hecto	h	10^{-2}	centi	c
10^{3}	kilo	k	10^{-3}	milli	m
10^{6}	mega	M	10^{-6}	micro	μ
10^{9}	giga	G	10^{-9}	nano	n
10^{12}	tera	T	10^{-12}	pico	p
10^{15}	peta	P	10^{-15}	femto	f
10^{18}	exa	E	10^{-18}	atto	a
10^{21}	zetta	Z	10^{-21}	zepto	z
10^{24}	yotta	Y	10^{-24}	yocto	y

Symbols

Mass and atomic numbers:

carbon-14 by $^{14}_{6}C$

barium-140 by $^{140}_{56}Ba$

lead-210 by $^{210}_{82}Pb$

Symbols are used extensively in radiological protection. The elements are usually represented by symbols, for example, C for carbon, Ba for barium, and Pb for lead. It is usual to indicate the mass number and atomic number of a particular nuclide by a superscript and subscript. The atomic number is frequently omitted.

A table of common symbols follows. When the symbol for a unit is shown with a superscript of -1 on its right, it signifies that the quantity is being used in a fractional context or to represent rate. Thus, for example, sievert *per* hour can be written either as Sv h^{-1} or as Sv/h.

Table of common symbols in radiological protection

Symbol	Term	Symbol	Term
α	*alpha particle*	*A*	*mass number*
β	*beta particle*	*eV*	*electron volt*
γ	*gamma ray*	*Bq*	*becquerel*
e	*electron*	*Gy*	*gray*
p	*proton*	*Sv*	*sievert*
n	*neutron*	*man Sv*	*man sievert*
Z	*atomic number*	*t½*	*half-life*

Units

Some time ago, the units for the main ionizing radiation quantities were changed to those used in this text. Readers may come across old units: this table shows how to convert them to the new units.

Relationship between old and new ionizing radiation units

Quantity	Old unit	Symbol	New unit	Symbol	Relationship
Activity	*curie*	*Ci*	*becquerel*	*Bq*	*1 Ci = 3.7 × 10^{10} Bq*
Absorbed dose	*rad*	*rad*	*gray*	*Gy*	*1 rad = 0.01 Gy*
Equivalent dose[a]	*rem*	*rem*	*sievert*	*Sv*	*1 rem = 0.01 Sv*

Note:
[a] Was dose equivalent