

## Appendix C Useful Quantities in Nuclear Science

atomic mass unit (u)	$\frac{1}{12}$ mass $^{12}\text{C}$	$1.6605402 \times 10^{-27}$ kg
electric charge (coulomb)	$e$	$1.60217733 \times 10^{-19}$ C
speed of light (vacuum)	$c$	299792458 m/s (exact)

Particle	Mass (in $u$ )	Charge (in electron charge, $e$ )	Half-life (in seconds)
proton, p	1.007276	+1	stable
neutron, n	1.008665	0	624
electron, $e$ or $e^-$	0.000549	-1	stable
neutrino, $\nu$	consistent with 0	0	stable
antiproton, $\bar{p}$	1.007276	-1	stable <sup>†</sup>
antineutron, $\bar{n}$	1.008665	0	624 <sup>†</sup>
positron, $e^+$	0.000549	+1	stable
antineutrino, $\bar{\nu}$	consistent with 0	0	stable <sup>†</sup>
muon, $\mu^\pm$	0.10565	+1, -1	$3.17 \times 10^{-6}$
pion, $\pi^\pm$	0.14	+1, -1	$3.76 \times 10^{-8}$
pion, $\pi^0$	0.14	0	$6.63 \times 10^{-17}$
photon, $\gamma$	0	0	stable
gluon, g	0	0	
up quark, u	approximately 0.005	+2/3	
down quark, d	approximately 0.01	-1/3	
strange quark, s	0.1 to 0.3	-1/3	
charm quark, c	1.0 to 1.6	+2/3	
bottom quark, b	4.1 to 4.5	-1/3	
top quark, t	$180 \pm 12$	+2/3	
$^1\text{H}$ atom	1.007825	0	stable
$^2\text{H}$ nucleus	2.013553	+1	stable
$^2\text{H}$ atom	2.014102	0	stable
$^3\text{H}$ nucleus	3.015500	+1	$3.88 \times 10^8$
$^3\text{H}$ atom	3.016049	0	$3.88 \times 10^8$
$^3\text{He}$ nucleus	3.014952	+2	stable
$^3\text{He}$ atom	3.016029	0	stable
$^4\text{He}$ nucleus	4.001506	+2	stable
$^4\text{He}$ atom	4.002603	0	stable
$^{12}\text{C}$ atom	12.000000	0	stable
$^{238}\text{U}$ atom	238.050785	0	$1.41 \times 10^{17}$

<sup>†</sup> Antiparticles are assumed to have same half-life as particles.

From the Review of Particle Properties, R. M. Barnett *et al.*, Physical Review **D54**, 1 (1996).

**International System of Units (SI)—SI prefixes**

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

**Example of a Branching Ratio**