glycine (Gly/G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se N O selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	glutamic acid (Glu/E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

N O glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se NO selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (lle / l)	glutamic acid (Glu/E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
small	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

glycine (Gly/G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se N O selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (lle / l)	QQ NQ glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
medium	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

glycine (Gly/G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se N O selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
large	ohenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His/H)	

glycine (Gly/G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se N O selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (lle / l)	glutamic acid (Glu/E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
aliphatic	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

NO glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se NO selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	glutamic acid (Glu/E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
aromatic	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp / W)	histidine (His / H)	

NO glycine (Gly / G)	N O alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se N O selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	QO NO glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
acyclic	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

glycine (Gly/G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se NO selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	N O pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
cyclic	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	NO tryptophan (Trp/W)	histidine (His / H)	

NYO	NO	N	N SO	Se N	
glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys / C)	selenocysteine (Sec/U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys / K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	Q O N O glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
acidic	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

glycine	alanine	serine		selenocysteine	
(Gly/G) proline (Pro/P)	(Ala / A) NO valine (Val / V)	(Ser/S) O N O threonine (Thr/T)	(Cys / C) N methionine (Met / M)	(Sec/U)	
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (lle / l)	glutamic acid (Glu/E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
basic	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

	N O glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys / C)	Se N O selenocysteine (Sec / U)	
	proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
		leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
		isoleucine (lle / l)	QQ NQ glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
r	neutral	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se NO selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
charged	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

NO glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se NO selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	N O pyrrolysine (Pyl/O)
	isoleucine (lle / l)	glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
positive	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

glycine (Gly/G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se NO selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	Q O N O glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
negative	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (lle / l)	glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
hydrophobic	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

N O glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se NO selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
polar	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His/H)	

glycine (Gly/G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys / C)	Se N O selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (lle / l)	QQ NQ glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
buried	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp / W)	histidine (His / H)	

glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se N O selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	Q O N O glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
surface	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His/H)	

glycine (Gly/G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys / C)	Se NO selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	NNO pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	glutamic acid (Glu/E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
essential	ohenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	

NO glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	pyrrolysine (Pyl/O)
	isoleucine (lle / l)	QQ NQ glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
essential2	ohenylalanine (Phe / F)	tyrosine (Tyr/Y)	NO tryptophan (Trp/W)	histidine (His / H)	

N O glycine (Gly / G)	alanine (Ala / A)	serine (Ser/S)	cysteine (Cys/C)	Se N O selenocysteine (Sec / U)	
proline (Pro / P)	valine (Val / V)	threonine (Thr/T)	methionine (Met / M)		
	leucine (Leu / L)	aspartic acid (Asp / D)	asparagine (Asn/N)	N NO lysine (Lys/K)	N O pyrrolysine (Pyl/O)
	isoleucine (Ile / I)	glutamic acid (Glu / E)	QN NO glutamine (Gln/Q)	N N N O arginine (Arg / R)	
newly	phenylalanine (Phe / F)	tyrosine (Tyr/Y)	tryptophan (Trp/W)	histidine (His / H)	