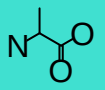
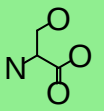
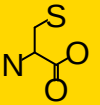
glycine
(Gly / G)



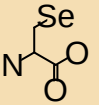
alanine
(Ala / A)



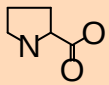
serine
(Ser / S)



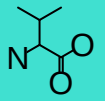
cysteine
(Cys / C)



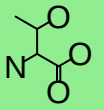
selenocysteine
(Sec / U)



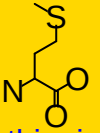
proline
(Pro / P)



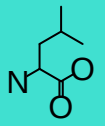
valine
(Val / V)



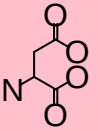
threonine
(Thr / T)



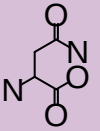
methionine
(Met / M)



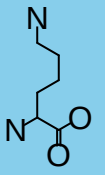
leucine
(Leu / L)



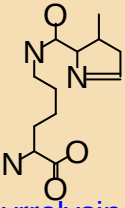
aspartic acid
(Asp / D)



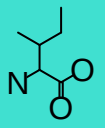
asparagine
(Asn / N)



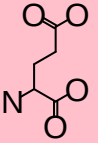
lysine
(Lys / K)



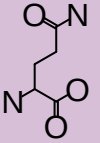
pyrrolysine
(Pyl / O)



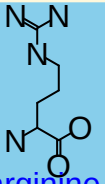
isoleucine
(Ile / I)



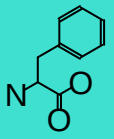
glutamic acid
(Glu / E)



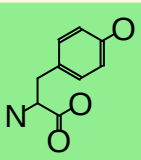
glutamine
(Gln / Q)



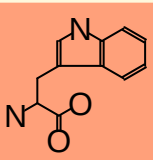
arginine
(Arg / R)



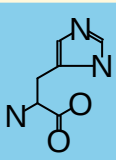
phenylalanine
(Phe / F)



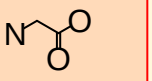
tyrosine
(Tyr / Y)



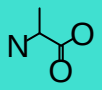
tryptophan
(Trp / W)



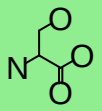
histidine
(His / H)



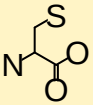
glycine
(Gly / G)



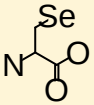
alanine
(Ala / A)



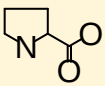
serine
(Ser / S)



cysteine
(Cys / C)

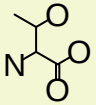


selenocysteine
(Sec / U)

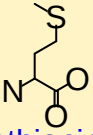


proline
(Pro / P)

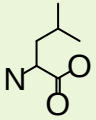
valine
(Val / V)



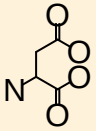
threonine
(Thr / T)



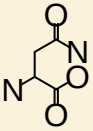
methionine
(Met / M)



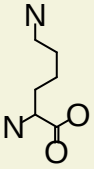
leucine
(Leu / L)



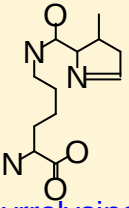
aspartic acid
(Asp / D)



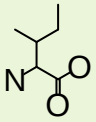
asparagine
(Asn / N)



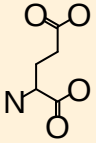
lysine
(Lys / K)



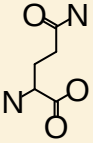
pyrrolysine
(Pyl / O)



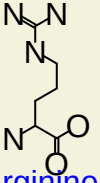
isoleucine
(Ile / I)



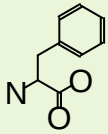
glutamic acid
(Glu / E)



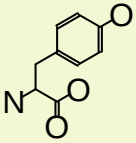
glutamine
(Gln / Q)



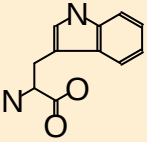
arginine
(Arg / R)



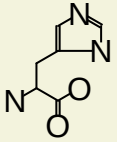
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

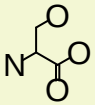


histidine
(His / H)

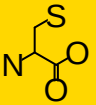
small

glycine
(Gly / G)

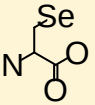
alanine
(Ala / A)



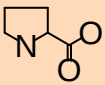
serine
(Ser / S)



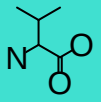
cysteine
(Cys / C)



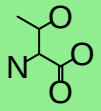
selenocysteine
(Sec / U)



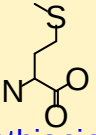
proline
(Pro / P)



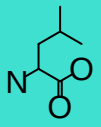
valine
(Val / V)



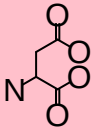
threonine
(Thr / T)



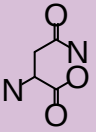
methionine
(Met / M)



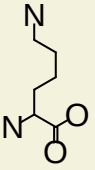
leucine
(Leu / L)



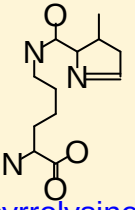
aspartic acid
(Asp / D)



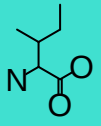
asparagine
(Asn / N)



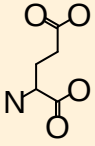
lysine
(Lys / K)



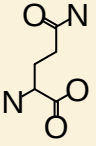
pyrrolysine
(Pyl / O)



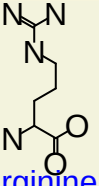
isoleucine
(Ile / I)



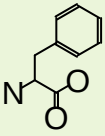
glutamic acid
(Glu / E)



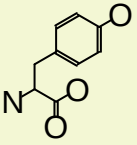
glutamine
(Gln / Q)



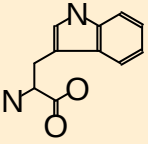
arginine
(Arg / R)



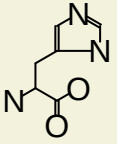
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

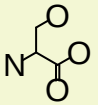


histidine
(His / H)

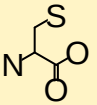
medium

glycine
(Gly / G)

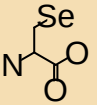
alanine
(Ala / A)



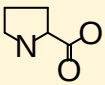
serine
(Ser / S)



cysteine
(Cys / C)

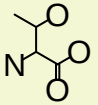


selenocysteine
(Sec / U)

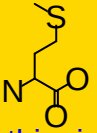


proline
(Pro / P)

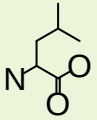
valine
(Val / V)



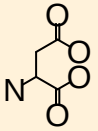
threonine
(Thr / T)



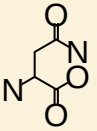
methionine
(Met / M)



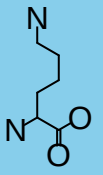
leucine
(Leu / L)



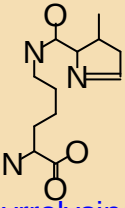
aspartic acid
(Asp / D)



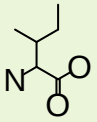
asparagine
(Asn / N)



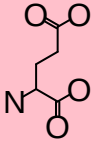
lysine
(Lys / K)



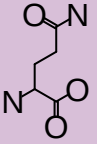
pyrrolysine
(Pyl / O)



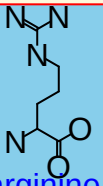
isoleucine
(Ile / I)



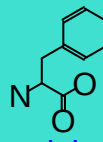
glutamic acid
(Glu / E)



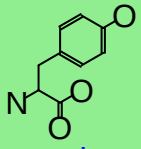
glutamine
(Gln / Q)



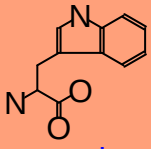
arginine
(Arg / R)



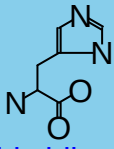
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



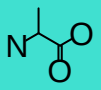
tryptophan
(Trp / W)



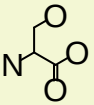
histidine
(His / H)

large

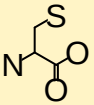
glycine
(Gly / G)



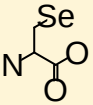
alanine
(Ala / A)



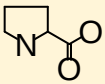
serine
(Ser / S)



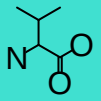
cysteine
(Cys / C)



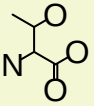
selenocysteine
(Sec / U)



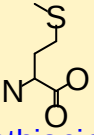
proline
(Pro / P)



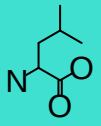
valine
(Val / V)



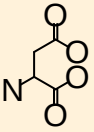
threonine
(Thr / T)



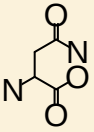
methionine
(Met / M)



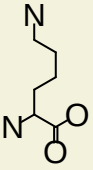
leucine
(Leu / L)



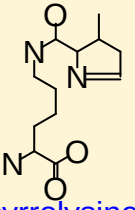
aspartic acid
(Asp / D)



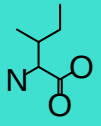
asparagine
(Asn / N)



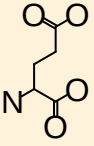
lysine
(Lys / K)



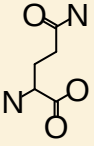
pyrrolysine
(Pyl / O)



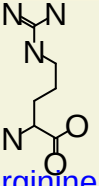
isoleucine
(Ile / I)



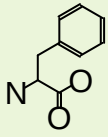
glutamic acid
(Glu / E)



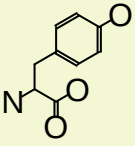
glutamine
(Gln / Q)



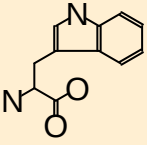
arginine
(Arg / R)



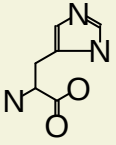
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

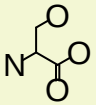


histidine
(His / H)

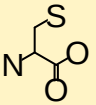
aliphatic

glycine
(Gly / G)

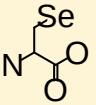
alanine
(Ala / A)



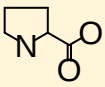
serine
(Ser / S)



cysteine
(Cys / C)

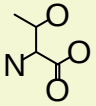


selenocysteine
(Sec / U)

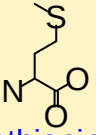


proline
(Pro / P)

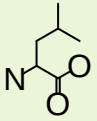
valine
(Val / V)



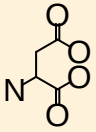
threonine
(Thr / T)



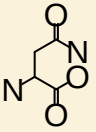
methionine
(Met / M)



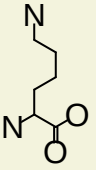
leucine
(Leu / L)



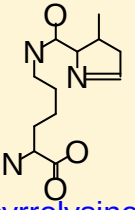
aspartic acid
(Asp / D)



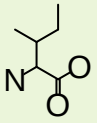
asparagine
(Asn / N)



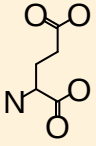
lysine
(Lys / K)



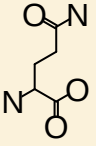
pyrrolysine
(Pyl / O)



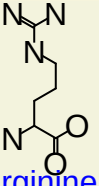
isoleucine
(Ile / I)



glutamic acid
(Glu / E)

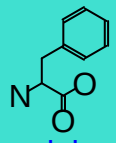


glutamine
(Gln / Q)

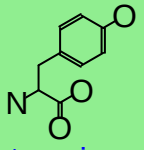


arginine
(Arg / R)

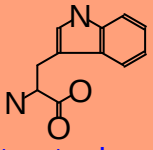
aromatic



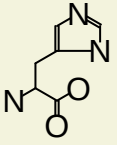
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)

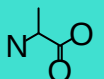


tryptophan
(Trp / W)

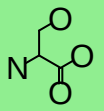


histidine
(His / H)

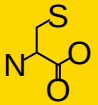
glycine
(Gly / G)



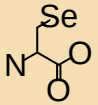
alanine
(Ala / A)



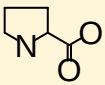
serine
(Ser / S)



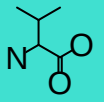
cysteine
(Cys / C)



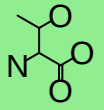
selenocysteine
(Sec / U)



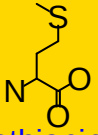
proline
(Pro / P)



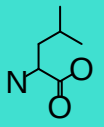
valine
(Val / V)



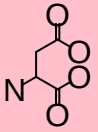
threonine
(Thr / T)



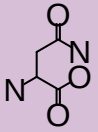
methionine
(Met / M)



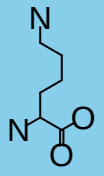
leucine
(Leu / L)



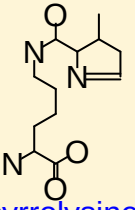
aspartic acid
(Asp / D)



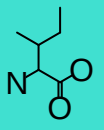
asparagine
(Asn / N)



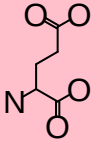
lysine
(Lys / K)



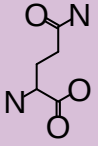
pyrrolysine
(Pyl / O)



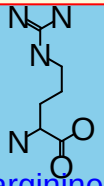
isoleucine
(Ile / I)



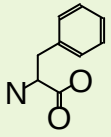
glutamic acid
(Glu / E)



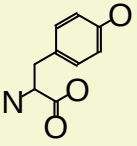
glutamine
(Gln / Q)



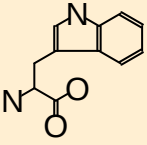
arginine
(Arg / R)



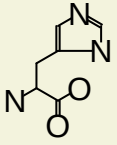
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

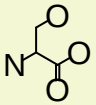


histidine
(His / H)

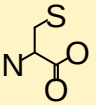
acyclic

glycine
(Gly / G)

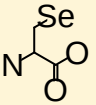
alanine
(Ala / A)



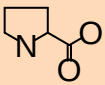
serine
(Ser / S)



cysteine
(Cys / C)

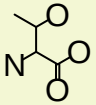


selenocysteine
(Sec / U)

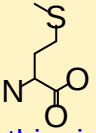


proline
(Pro / P)

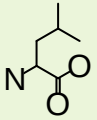
valine
(Val / V)



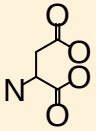
threonine
(Thr / T)



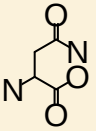
methionine
(Met / M)



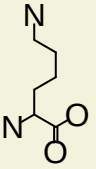
leucine
(Leu / L)



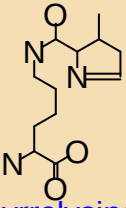
aspartic acid
(Asp / D)



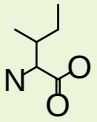
asparagine
(Asn / N)



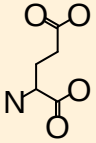
lysine
(Lys / K)



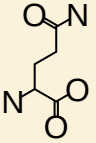
pyrrolysine
(Pyl / O)



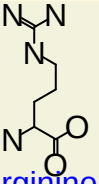
isoleucine
(Ile / I)



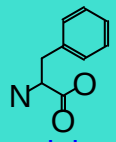
glutamic acid
(Glu / E)



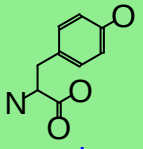
glutamine
(Gln / Q)



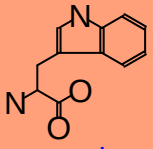
arginine
(Arg / R)



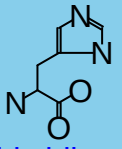
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

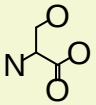


histidine
(His / H)

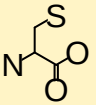
cyclic

glycine
(Gly / G)

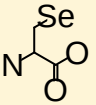
alanine
(Ala / A)



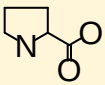
serine
(Ser / S)



cysteine
(Cys / C)

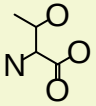


selenocysteine
(Sec / U)

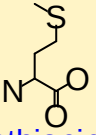


proline
(Pro / P)

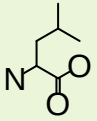
valine
(Val / V)



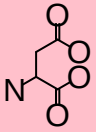
threonine
(Thr / T)



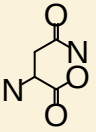
methionine
(Met / M)



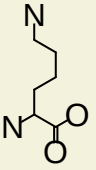
leucine
(Leu / L)



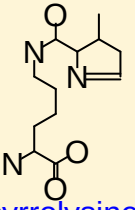
aspartic acid
(Asp / D)



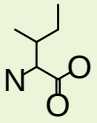
asparagine
(Asn / N)



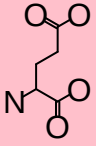
lysine
(Lys / K)



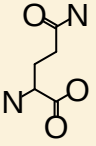
pyrrolysine
(Pyl / O)



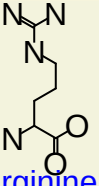
isoleucine
(Ile / I)



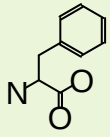
glutamic acid
(Glu / E)



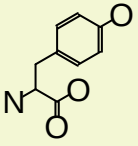
glutamine
(Gln / Q)



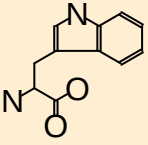
arginine
(Arg / R)



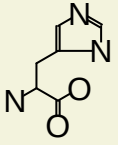
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

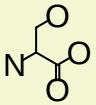


histidine
(His / H)

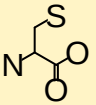
acidic

glycine
(Gly / G)

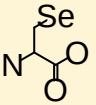
alanine
(Ala / A)



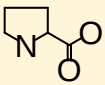
serine
(Ser / S)



cysteine
(Cys / C)

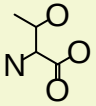


selenocysteine
(Sec / U)

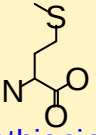


proline
(Pro / P)

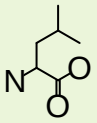
valine
(Val / V)



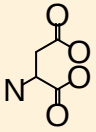
threonine
(Thr / T)



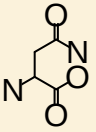
methionine
(Met / M)



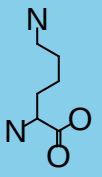
leucine
(Leu / L)



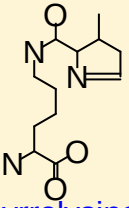
aspartic acid
(Asp / D)



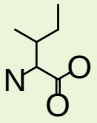
asparagine
(Asn / N)



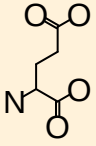
lysine
(Lys / K)



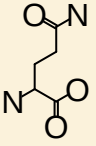
pyrrolysine
(Pyl / O)



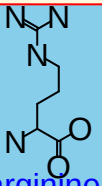
isoleucine
(Ile / I)



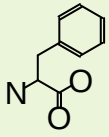
glutamic acid
(Glu / E)



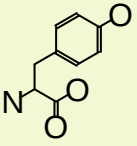
glutamine
(Gln / Q)



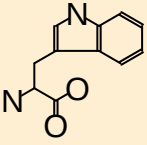
arginine
(Arg / R)



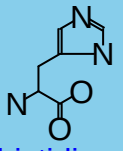
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



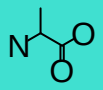
tryptophan
(Trp / W)



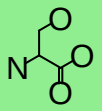
histidine
(His / H)

basic

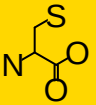
glycine
(Gly / G)



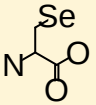
alanine
(Ala / A)



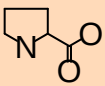
serine
(Ser / S)



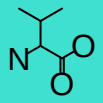
cysteine
(Cys / C)



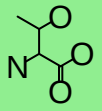
selenocysteine
(Sec / U)



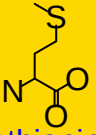
proline
(Pro / P)



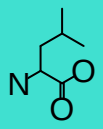
valine
(Val / V)



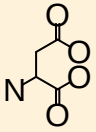
threonine
(Thr / T)



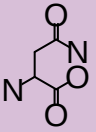
methionine
(Met / M)



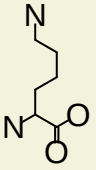
leucine
(Leu / L)



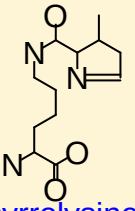
aspartic acid
(Asp / D)



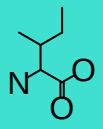
asparagine
(Asn / N)



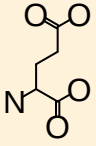
lysine
(Lys / K)



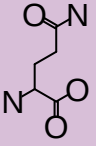
pyrrolysine
(Pyl / O)



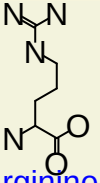
isoleucine
(Ile / I)



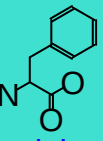
glutamic acid
(Glu / E)



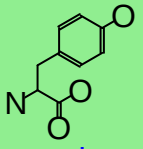
glutamine
(Gln / Q)



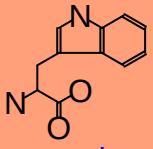
arginine
(Arg / R)



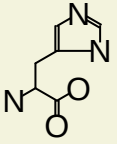
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

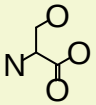


histidine
(His / H)

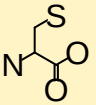
neutral

glycine
(Gly / G)

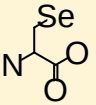
alanine
(Ala / A)



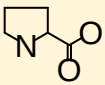
serine
(Ser / S)



cysteine
(Cys / C)

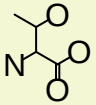


selenocysteine
(Sec / U)

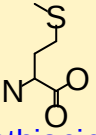


proline
(Pro / P)

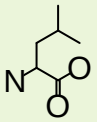
valine
(Val / V)



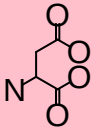
threonine
(Thr / T)



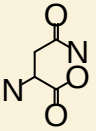
methionine
(Met / M)



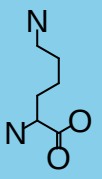
leucine
(Leu / L)



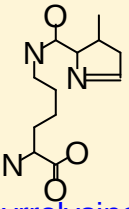
aspartic acid
(Asp / D)



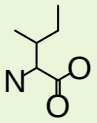
asparagine
(Asn / N)



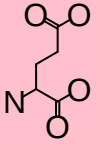
lysine
(Lys / K)



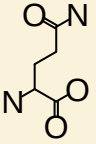
pyrrolysine
(Pyl / O)



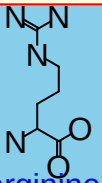
isoleucine
(Ile / I)



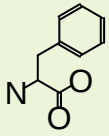
glutamic acid
(Glu / E)



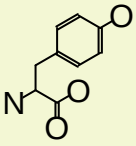
glutamine
(Gln / Q)



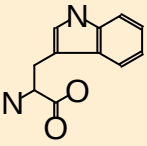
arginine
(Arg / R)



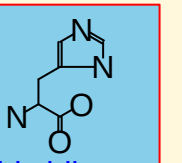
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

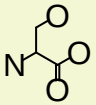


histidine
(His / H)

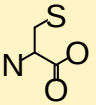
charged

glycine
(Gly / G)

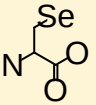
alanine
(Ala / A)



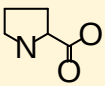
serine
(Ser / S)



cysteine
(Cys / C)

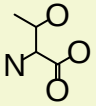


selenocysteine
(Sec / U)

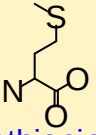


proline
(Pro / P)

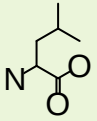
valine
(Val / V)



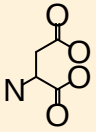
threonine
(Thr / T)



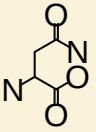
methionine
(Met / M)



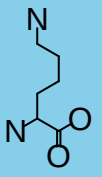
leucine
(Leu / L)



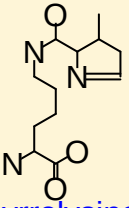
aspartic acid
(Asp / D)



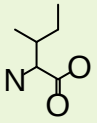
asparagine
(Asn / N)



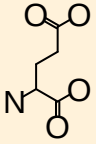
lysine
(Lys / K)



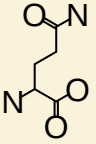
pyrrolysine
(Pyl / O)



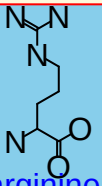
isoleucine
(Ile / I)



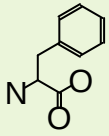
glutamic acid
(Glu / E)



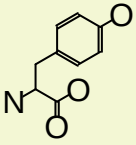
glutamine
(Gln / Q)



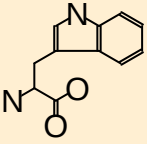
arginine
(Arg / R)



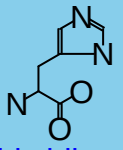
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

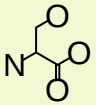


histidine
(His / H)

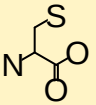
positive

glycine
(Gly / G)

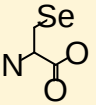
alanine
(Ala / A)



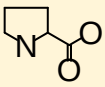
serine
(Ser / S)



cysteine
(Cys / C)

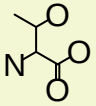


selenocysteine
(Sec / U)

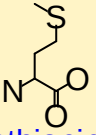


proline
(Pro / P)

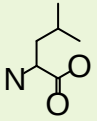
valine
(Val / V)



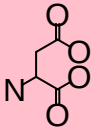
threonine
(Thr / T)



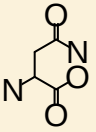
methionine
(Met / M)



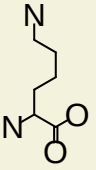
leucine
(Leu / L)



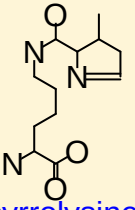
aspartic acid
(Asp / D)



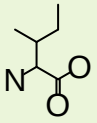
asparagine
(Asn / N)



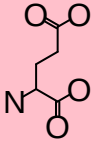
lysine
(Lys / K)



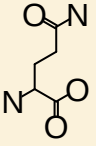
pyrrolysine
(Pyl / O)



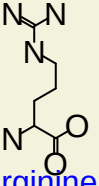
isoleucine
(Ile / I)



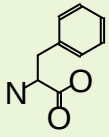
glutamic acid
(Glu / E)



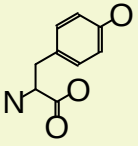
glutamine
(Gln / Q)



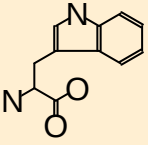
arginine
(Arg / R)



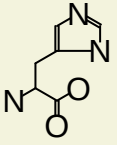
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)

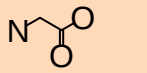


tryptophan
(Trp / W)

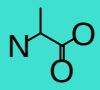


histidine
(His / H)

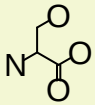
negative



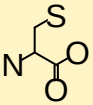
glycine
(Gly / G)



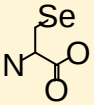
alanine
(Ala / A)



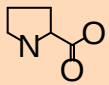
serine
(Ser / S)



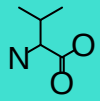
cysteine
(Cys / C)



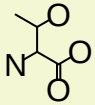
selenocysteine
(Sec / U)



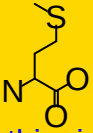
proline
(Pro / P)



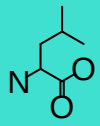
valine
(Val / V)



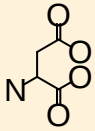
threonine
(Thr / T)



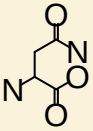
methionine
(Met / M)



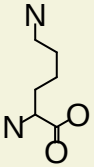
leucine
(Leu / L)



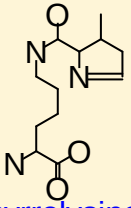
aspartic acid
(Asp / D)



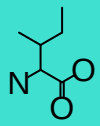
asparagine
(Asn / N)



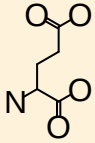
lysine
(Lys / K)



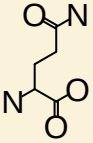
pyrrolysine
(Pyl / O)



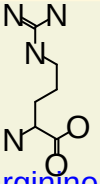
isoleucine
(Ile / I)



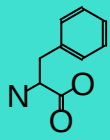
glutamic acid
(Glu / E)



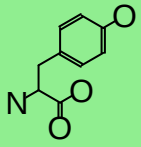
glutamine
(Gln / Q)



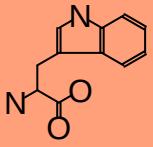
arginine
(Arg / R)



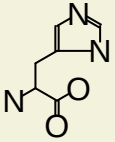
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

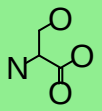


histidine
(His / H)

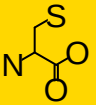
hydrophobic

glycine
(Gly / G)

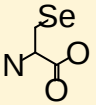
alanine
(Ala / A)



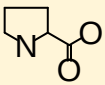
serine
(Ser / S)



cysteine
(Cys / C)

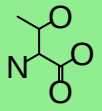


selenocysteine
(Sec / U)

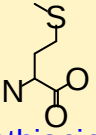


proline
(Pro / P)

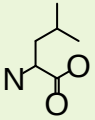
valine
(Val / V)



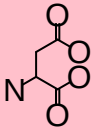
threonine
(Thr / T)



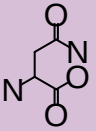
methionine
(Met / M)



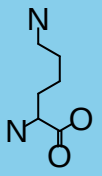
leucine
(Leu / L)



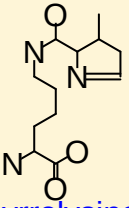
aspartic acid
(Asp / D)



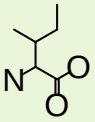
asparagine
(Asn / N)



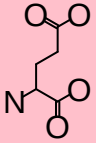
lysine
(Lys / K)



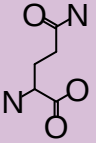
pyrrolysine
(Pyl / O)



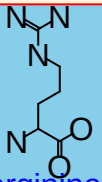
isoleucine
(Ile / I)



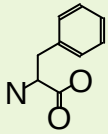
glutamic acid
(Glu / E)



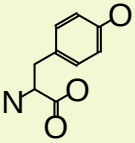
glutamine
(Gln / Q)



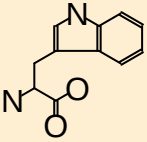
arginine
(Arg / R)



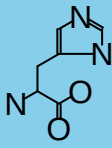
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



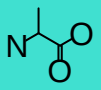
tryptophan
(Trp / W)



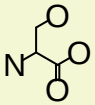
histidine
(His / H)

polar

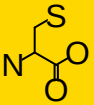
glycine
(Gly / G)



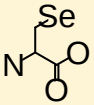
alanine
(Ala / A)



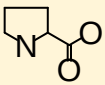
serine
(Ser / S)



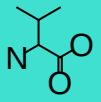
cysteine
(Cys / C)



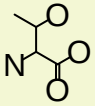
selenocysteine
(Sec / U)



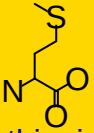
proline
(Pro / P)



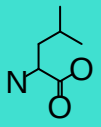
valine
(Val / V)



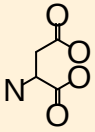
threonine
(Thr / T)



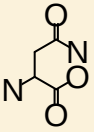
methionine
(Met / M)



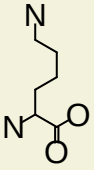
leucine
(Leu / L)



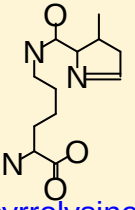
aspartic acid
(Asp / D)



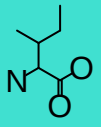
asparagine
(Asn / N)



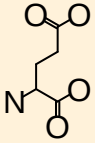
lysine
(Lys / K)



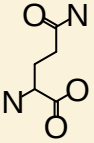
pyrrolysine
(Pyl / O)



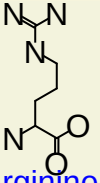
isoleucine
(Ile / I)



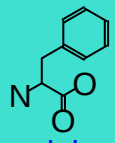
glutamic acid
(Glu / E)



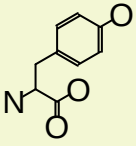
glutamine
(Gln / Q)



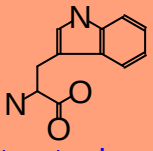
arginine
(Arg / R)



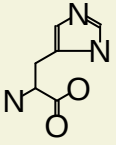
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)

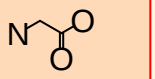


tryptophan
(Trp / W)

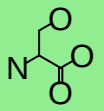


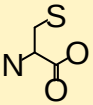
histidine
(His / H)

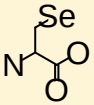
buried

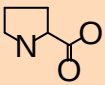

glycine
(Gly / G)


alanine
(Ala / A)

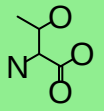

serine
(Ser / S)

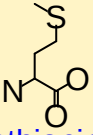

cysteine
(Cys / C)

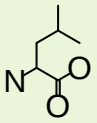

selenocysteine
(Sec / U)

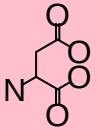

proline
(Pro / P)

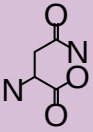

valine
(Val / V)

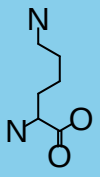

threonine
(Thr / T)

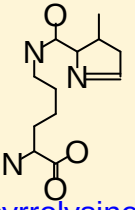

methionine
(Met / M)

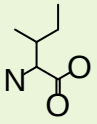

leucine
(Leu / L)

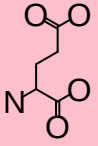

aspartic acid
(Asp / D)

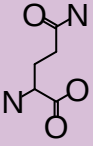

asparagine
(Asn / N)

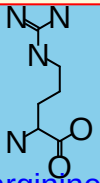

lysine
(Lys / K)

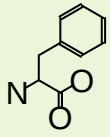

pyrrolysine
(Pyl / O)

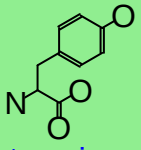

isoleucine
(Ile / I)

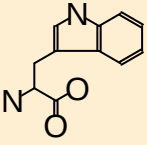

glutamic acid
(Glu / E)

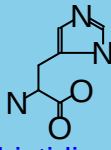

glutamine
(Gln / Q)


arginine
(Arg / R)


phenylalanine
(Phe / F)


tyrosine
(Tyr / Y)

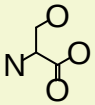

tryptophan
(Trp / W)


histidine
(His / H)

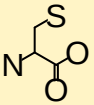
surface

glycine
(Gly / G)

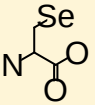
alanine
(Ala / A)



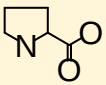
serine
(Ser / S)



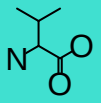
cysteine
(Cys / C)



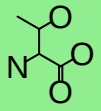
selenocysteine
(Sec / U)



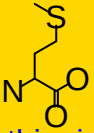
proline
(Pro / P)



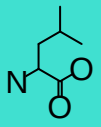
valine
(Val / V)



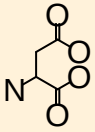
threonine
(Thr / T)



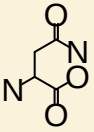
methionine
(Met / M)



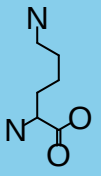
leucine
(Leu / L)



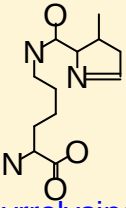
aspartic acid
(Asp / D)



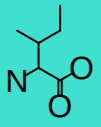
asparagine
(Asn / N)



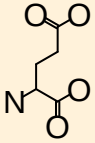
lysine
(Lys / K)



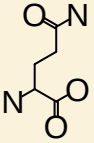
pyrrolysine
(Pyl / O)



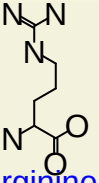
isoleucine
(Ile / I)



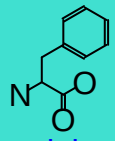
glutamic acid
(Glu / E)



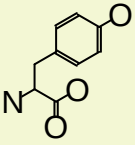
glutamine
(Gln / Q)



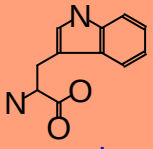
arginine
(Arg / R)



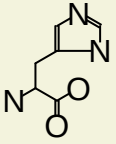
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

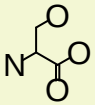


histidine
(His / H)

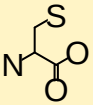
essential

glycine
(Gly / G)

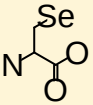
alanine
(Ala / A)



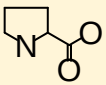
serine
(Ser / S)



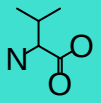
cysteine
(Cys / C)



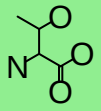
selenocysteine
(Sec / U)



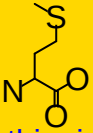
proline
(Pro / P)



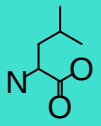
valine
(Val / V)



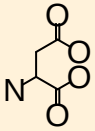
threonine
(Thr / T)



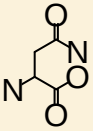
methionine
(Met / M)



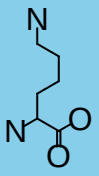
leucine
(Leu / L)



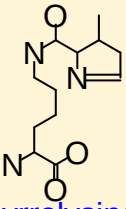
aspartic acid
(Asp / D)



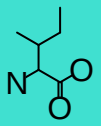
asparagine
(Asn / N)



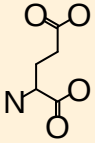
lysine
(Lys / K)



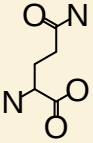
pyrrolysine
(Pyl / O)



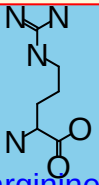
isoleucine
(Ile / I)



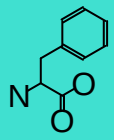
glutamic acid
(Glu / E)



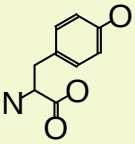
glutamine
(Gln / Q)



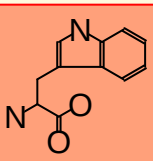
arginine
(Arg / R)



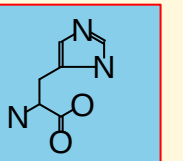
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)

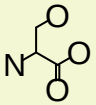


histidine
(His / H)

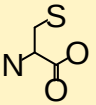
essential2

glycine
(Gly / G)

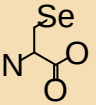
alanine
(Ala / A)



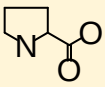
serine
(Ser / S)



cysteine
(Cys / C)

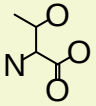


selenocysteine
(Sec / U)

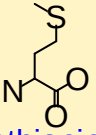


proline
(Pro / P)

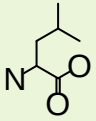
valine
(Val / V)



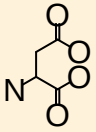
threonine
(Thr / T)



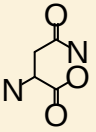
methionine
(Met / M)



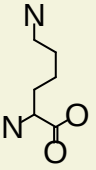
leucine
(Leu / L)



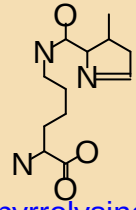
aspartic acid
(Asp / D)



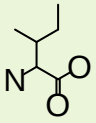
asparagine
(Asn / N)



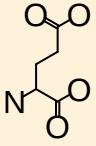
lysine
(Lys / K)



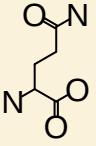
pyrrolysine
(Pyl / O)



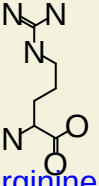
isoleucine
(Ile / I)



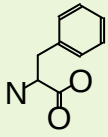
glutamic acid
(Glu / E)



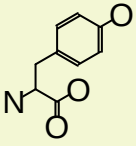
glutamine
(Gln / Q)



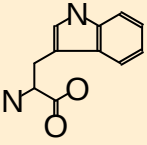
arginine
(Arg / R)



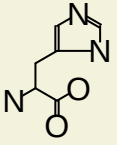
phenylalanine
(Phe / F)



tyrosine
(Tyr / Y)



tryptophan
(Trp / W)



histidine
(His / H)

newly