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Towards a New Paradigm in Scientific Notation

Patterns of Periodicity among Proteinogenic Amino Acids

[Abridged Version]

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Dedicated to Jorge Luna Martínez

Presentation

In this brief essay, the traditional order of some of the proteinogenic amino acids is critically examined. As shown in the following tables, the amino acids are presented by their names, their chemical formulas and their molecular weight.

For years, I have been questioning the presentation of the elements and their compounds as of the historically accidental names, especially when these are presented in alphabetical order*: Alanine, Arginine, Asparagine, Aspartate, Cysteine, Glutamate, Glutamine, Glycine, Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Proline, Serine, Threonine, Tryptophan, Tyrosine,* and *Valine.* When these accidental names and/or their alphabetical order are employed in listing the amino acids, they do not necessarily represent any particular progression of physical characteristics of the elements or their compounds. Similarly, an alphabetical list of the 92 natural elements mixes up the chemical and physical characteristics of the elements and their compounds as of their historical names. The alphabetical order of the elements that make up the amino acids or of the amino acids themselves does not obey any scientific notation.

A general practice in presenting chemical formulas of the elements and their compounds is to list them according to their supposed chemical structure and/or chemical formula. However, as is shown in this essay, the traditional notation for chemical formulas does not always reflect the chemical and physical characteristics of the elements and their compounds. For the past twelve years I have been proposing listing the elements according to their progressive atomic numbers in the chemical formulas.

In this essay, the comparison between the traditional notation of chemical formulas *and* my specific proposal effectively reveals how certain patterns and periodicity of the amino acids appear in the latter and not in the former. The following examples based on the amino acids illustrate instead of listing the amino acids as **6-C 1-H 7-N 8-O**, my proposal to list them as of **1-H 6-C 7-N 8-O;** as of the progressive atomic numbers of the elements. Structurally, chemists may argue in favor of the scientific notation with 6-C as the lead element in the chemical formulas of the amino acids. However, with my suggestion of placing the elements of the compound in their progressive numerical order, certain patterns become available that are unavailable on the traditional notation.

The following list is alphabetically presented as is common as of the names of the amino acids.

Alphabetic Order:

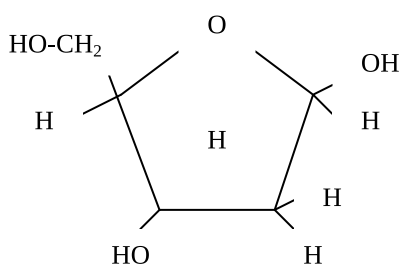
Amino acid	**Abbreviations**		**Molecular formula**	**Linear formula**
Alanine	Ala	A	$C_3H_7NO_2$	CH3-CH(NH2)-COOH
Arginine	Arg	R	$C_6H_{14}N_4O_2$	HN=C(NH2)-NH-(CH2)3-CH(NH2)-COOH
Asparagine	Asn	N	$C_4H_8N_2O_3$	H2N-CO-CH2-CH(NH2)-COOH
Aspartic acid	Asp	D	$C_4H_7NO_4$	HOOC-CH2-CH(NH2)-COOH
Cysteine	Cys	C	$C_3H_7NO_2S$	HS-CH2-CH(NH2)-COOH
Glutamine	Gln	Q	$C_5H_{10}N_2O_3$	H2N-CO-(CH2)2-CH(NH2)-COOH
Glutamic acid	Glu	E	$C_5H_9NO_4$	HOOC-(CH2)2-CH(NH2)-COOH
Glycine	Gly	G	$C_2H_5NO_2$	NH2-CH2-COOH
Histidine	His	H	$C_6H_9N_3O_2$	NH-CH=N-CH=C-CH2-CH(NH2)-COOH
Isoleucine	Ile	I	$C_6H_{13}NO_2$	CH3-CH2-CH(CH3)-CH(NH2)-COOH
Leucine	Leu	L	$C_6H_{13}NO_2$	(CH3)2-CH-CH2-CH(NH2)-COOH
Lysine	Lys	K	$C_6H_{14}N_2O_2$	H2N-(CH2)4-CH(NH2)-COOH
Methionine	Met	M	$C_5H_{11}NO_2S$	CH3-S-(CH2)2-CH(NH2)-COOH
Phenylalanine	Phe	F	$C_9H_{11}NO_2$	Ph-CH2-CH(NH2)-COOH
Proline	Pro	P	$C_5H_9NO_2$	NH-(CH2)3-CH-COOH
Serine	Ser	S	$C_3H_7NO_3$	HO-CH2-CH(NH2)-COOH
Threonine	Thr	T	$C_4H_9NO_3$	CH3-CH(OH)-CH(NH2)-COOH
Tryptophan	Trp	W	$C_{11}H_{12}N_2O_2$	Ph-NH-CH=C-CH2-CH(NH2)-COOH
Tyrosine	Tyr	Y	$C_9H_{11}NO_3$	HO-Ph-CH2-CH(NH2)-COOH
Valine	Val	V	$C_5H_{11}NO_2$	(CH3)2-CH-CH(NH2)-COOH

Source: IM MUNO GENE TICS Information System, http://www.imgt.org
http://www.imgt.org/IMGTeducation/Aide-memoire/_UK/aminoacids/formuleAA/

Note that the previous alphabetical list mixes up the presentation of the corresponding data in the other columns. Note that the data in the column of Molecular Formula do not follow a progression of the number of Carbon atoms as the lead element in the notation. Note that the lead elements of the Linear Formulas are also mixed up not only as of a numerical progression but as to which particular element is the lead element in the formulas themselves. Because of these mixed-up presentations of the amino acids and their corresponding data, it is no wonder that patterns and periodicities are hidden in such presentations. In other words, there is no way to identify patterns as of these kinds of disorganized presentations.

"Amino acids are biologically important organic compounds made from amine (-NH_2) and carboxylic acid (-COOH) functional groups, along with a side-chain specific to each amino acid. The key elements of an amino acid are carbon, hydrogen, oxygen and nitrogen, though other elements are found in the side-chains of certain amino acids."…"20 of the 23 proteinogenic amino acids are encoded directly by the triplet codons in the genetic code and are known as 'standard' amino acids." [Source: www.wikipedia.com]

"DNA is a polymer—a very large molecule made up of smaller units of four components. Each monomer contains a phosphate and a sugar component. In DNA, the sugar is deoxyribose, and in RNA the sugar is ribose." [Source: www.wikipedia.com]



The structural significance of the 1-Hydrogen atom in the previous illustration is apparent.

"Deoxyribose, or more precisely 2-deoxyribose, is a monosaccharide with **idealized formula** *H-(C=O)-(CH2)-(CHOH)3-H. Its name indicates that it is a deoxy sugar, meaning that it is derived from the sugar ribose by loss of an oxygen atom. Since the pentose sugars*

arabinose and ribose only differ by the stereochemistry at C2', 2-deoxyribose and 2-deoxyarabinose are equivalent, although the latter term is rarely used because ribose, not arabinose, is the precursor to deoxyribose."
[Emphasis mine. Source: www.wikipedia.com]

In my view, given the fact that periodicities exist within the 92 natural elements, similar periodicities must exist within compounds of the elements. By employing a scientific notation for chemical formulas and molecular formulas that mixes up the elements in their *aufbau*, progressive presentation, then the underlying periodicities and patterns derived as of the elements are made unavailable.

Years ago, I made the proposal to present the chemical formulas and molecular formulas based on the 92 natural elements in a progressive sequence. From the previous data shown, the current presentation of molecular formulas does not reflect any particular logic for presenting the first element within the formula. The chemical formulas above are presented as of the lead element 6-Carbon. But, as shown in this study neither presentation of the chemical or molecular formulas according to traditional scientific notation provide any insight into the possible patterns and periodicities of the amino acids in this case.

In ***The Schemata of the Elements,*** *[Earth/matriX Editions, 2001]*,various sets of chemical and molecular formulas have been presented in order to derive the underlying patterns and periodicities inherent in elemental compounds. In this analysis, I have chosen the amino acids to illustrate how elemental patterns and periodicities make their appearance in the corresponding chemical formulas.

Again, the theoretical posit behind this procedure is basic: given the fact that the 92 natural elements reveal patterns and periodicities in their composition and behavior, compounds of these elements should also derive further patterns and periodicities. The following tables and charts confirm this idea.

From this study, it should be now evident that a *paradigmatic shift* is required in conceptualizing the scientific notation of chemical and molecular formulas of the elements.

The Traditional Order of Presentation by Molecular Formula: 6-Carbon Lead Element

Aminoacid	*Chemical formula*	*Molecular weight, g/mol*
Isoleucine	$C_6H_{13}NO_2$	131.1736
Leucine	$C_6H_{13}NO_2$	131.1736
Lysine	$C_6H_{14}N_2O_2$	146.1882
Methionine	$C_5H_{11}NO_2S$	149.2124
Phenylalanine	$C_9H_{11}NO_2$	165.1900
Threonine	$C_4H_9NO_3$	119.1197
Tryptophan	$C_{11}H_{12}N_2O_2$	204.2262
Valine	$C_5H_{11}NO_2$	117.1469
Arginine	$C_6H_{14}N_4O_2$	174.2017
Histidine	$C_6H_9N_3O_2$	155.1552
Alanine	C_3H7NO_2	89.0935
Asparagine	$C_4H_8N_2O_3$	132.1184
Aspartate	$C_4H_7NO_4$	133.1032
Cysteine	$C_3H_7NO_2S$	121.1590
Glutamate	$C_5H_9NO_4$	147.1299
Glutamine	$C_5H_{10}N_2O_3$	146.1451
Glycine	$C_2H_5NO_2$	75.0669
Proline	$C_5H_9NO_2$	115.1310
Serine	$C_3H_7NO_3$	105.0930
Tyrosine	$C_9H_{11}NO_3$	181.1894

Source: *By using this website, you signify your acceptance of Terms and Conditions and Privacy Policy.*

Note that the three columns do not present any recognizable pattern of incremental | decremental order or an alphabetical order of the amino acids. The columns of chemical formula and molecular weight are both presented in a disorganized manner, with no discernible pattern of progression in numbers, or any discernible pattern whatsoever.

The Traditional Order of Presentation by Molecular Formula: 6-Carbon Lead Element

Aminoacid	Chemical formula	# Atoms	**Molecular weight, g/mol Incremental Progression**
Glycine	$C_2H_5NO_2$	10	75.0669
Alanine	$C_3H_7NO_2$	13	89.0935
Serine	$C_3H_7NO_3$	14	105.0930
Cysteine	$C_3H_7NO_2S$	14	121.1590
Aspartate	$C_4H_7NO_4$	16	133.1032
Asparagine	$C_4H_8N_2O_3$	17	132.1184
Threonine	$C_4H_9NO_3$	17	119.1197
Proline	$C_5H_9NO_2$	17	115.1310
Glutamate	$C_5H_9NO_4$	19	147.1299
Glutamine	$C_5H_{10}N_2O_3$	20	146.1451
Valine	$C_5H_{11}NO_2$	18	117.1469
Methionine	$C_5H_{11}NO_2S$	20	149.2124
Histidine	$C_6H_9N_3O_2$	20	155.1552
Isoleucine	$C_6H_{13}NO_2$	22	131.1736
Leucine	$C_6H_{13}NO_2$	22	131.1736
Lysine	$C_6H_{14}N_2O_2$	24	146.1882
Arginine	$C_6H_{14}N_4O_2$	26	174.2017
Phenylalanine	$C_9H_{11}NO_2$	23	165.1900
Tyrosine	$C_9H_{11}NO_3$	24	181.1894
Tryptophan	$C_{11}H_{12}N_2O_2$	27	204.2262

No discernible pattern for molecular weight. Note progression of carbon

Note when the list of amino acids is presented as of the 6-Carbon element as the lead atom in the chemical formula no discernible pattern appears regarding their molecular weight.

Molecular formula	Linear formula	Amino acid	Abbreviations	
$\mathbf{C_2}H_5NO_2$	NH2-CH2-COOH	Glycine	Gly	G
$\mathbf{C_3}H_7NO_2$	CH3-CH(NH2)-COOH	Alanine	Ala	A
$\mathbf{C_3}H_7NO_3$	HO-CH2-CH(NH2)-COOH	Serine	Ser	S
$\mathbf{C_3}H_7NO_2S$	HS-CH2-CH(NH2)-COOH	Cysteine	Cys	C
$\mathbf{C_4}H_7NO_4$	HOOC-CH2-CH(NH2)-COOH	Aspartic acid	Asp	D
$\mathbf{C_4}H_8N_2O_3$	H2N-CO-CH2-CH(NH2)-COOH	Asparagine	Asn	N
$\mathbf{C_4}H_9NO_3$	CH3-CH(OH)-CH(NH2)-COOH	Threonine	Thr	T
$\mathbf{C_5}H_9NO_2$	NH-(CH2)3-CH-COOH	Proline	Pro	P
$\mathbf{C_5}H_9NO_4$	HOOC-(CH2)2-CH(NH2)-COOH	Glutamic acid	Glu	E
$\mathbf{C_5}H_{10}N_2O_3$	H2N-CO-(CH2)2-CH(NH2)-COOH	Glutamine	Gln	Q
$\mathbf{C_5}H_{11}NO_2$	(CH3)2-CH-CH(NH2)-COOH	Valine	Val	V
$\mathbf{C_5}H_{11}NO_2S$	CH3-S-(CH2)2-CH(NH2)-COOH	Methionine	Met	M
$\mathbf{C_6}H_9N_3O_2$	NH-CH=N-CH=C-CH2-CH(NH2)-COOH	Histidine	His	H
$\mathbf{C_6}H_{13}NO_2$	CH3-CH2-CH(CH3)-CH(NH2)-COOH	Isoleucine	Ile	I
$\mathbf{C_6}H_{13}NO_2$	(CH3)2-CH-CH2-CH(NH2)-COOH	Leucine	Leu	L
$\mathbf{C_6}H_{14}N_2O_2$	H2N-(CH2)4-CH(NH2)-COOH	Lysine	Lys	K
$\mathbf{C_6}H_{14}N_4O_2$	HN=C(NH2)-NH-(CH2)3-CH(NH2)-COOH	Arginine	Arg	R
$\mathbf{C_9}H_{11}NO_2$	Ph-CH2-CH(NH2)-COOH	Phenylalanine	Phe	F
$\mathbf{C_9}H_{11}NO_3$	HO-Ph-CH2-CH(NH2)-COOH	Tyrosine	Tyr	Y
$\mathbf{C_{11}}H_{12}N_2O_2$	Ph-NH-CH=C-CH2-CH(NH2)-COOH	Tryptophan	Trp	W

1-Hydrogen Lead Element

Molecular formula	Linear formula	Amino acid	Abbreviations	
$\mathbf{H_5}C_2NO_2$	NH2-CH2-COOH	Glycine	Gly	G
$\mathbf{H_7}C_3NO_2$	CH3-CH(NH2)-COOH	Alanine	Ala	A
$\mathbf{H_7}C_3NO_3$	HO-CH2-CH(NH2)-COOH	Serine	Ser	S
$\mathbf{H_7}C_3NO_2S$	HS-CH2-CH(NH2)-COOH	Cysteine	Cys	C
$\mathbf{H_7}C_4NO_4$	HOOC-CH2-CH(NH2)-COOH	Aspartic acid	Asp	D
$\mathbf{H_8}C_4N_2O_3$	H2N-CO-CH2-CH(NH2)-COOH	Asparagine	Asn	N
$\mathbf{H_9}C_4NO_3$	CH3-CH(OH)-CH(NH2)-COOH	Threonine	Thr	T
$\mathbf{H_9}C_5NO_2$	NH-(CH2)3-CH-COOH	Proline	Pro	P
$\mathbf{H_9}C_5NO_4$	HOOC-(CH2)2-CH(NH2)-COOH	Glutamic acid	Glu	E
$\mathbf{H_9}C_6N_3O_2$	NH-CH=N-CH=C-CH2-CH(NH2)-COOH	Histidine	His	H
$\mathbf{H_{10}}C_5N_2O_3$	H2N-CO-(CH2)2-CH(NH2)-COOH	Glutamine	Gln	Q
$\mathbf{H_{11}}C_5NO_2$	(CH3)2-CH-CH(NH2)-COOH	Valine	Val	V
$\mathbf{H_{11}}C_5NO_2S$	CH3-S-(CH2)2-CH(NH2)-COOH	Methionine	Met	M
$\mathbf{H_{11}}C_9NO_2$	Ph-CH2-CH(NH2)-COOH	Phenylalanine	Phe	F
$\mathbf{H_{11}}C_9NO_3$	HO-Ph-CH2-CH(NH2)-COOH	Tyrosine	Tyr	Y
$\mathbf{H_{12}}C_{11}N_2O_2$	Ph-NH-CH=C-CH2-CH(NH2)-COOH	Tryptophan	Trp	W
$\mathbf{H_{13}}C_6NO_2$	(CH3)2-CH-CH2-CH(NH2)-COOH	Leucine	Leu	L
$\mathbf{H_{13}}C_6NO_2$	CH3-CH2-CH(CH3)-CH(NH2)-COOH	Isoleucine	Ile	I
$\mathbf{H_{14}}C_6N_2O_2$	H2N-(CH2)4-CH(NH2)-COOH	Lysine	Lys	K
$\mathbf{H_{14}}C_6N_4O_2$	HN=C(NH2)-NH-(CH2)3-CH(NH2)-COOH	Arginine	Arg	R

Earth/matriX Order by 1-Hydrogen Lead Element Atomic Progression

Aminoacid	**Chemical formula By 1-H Lead Atom**	Molecular weight, g/mol	
Glycine	$H_5C_2NO_2$	75.0669	
Alanine	$H_7C_3NO_2$	89.0935	
Serine	$H_7C_3NO_3$	105.0930	
Cysteine	$H_7C_3NO_2S$	121.1590	
Aspartate	$H_7C_4NO_4$	133.1032	
Asparagine	$H_8C_4N_2O_3$	132.1184	
Threonine	$H_9C_4NO_3$	119.1197	
Proline	$H_9C_5NO_2$	115.1310	
Glutamate	$H_9C_5NO_4$	147.1299	
Histidine	$H_9C_6N_3O_2$	**155.1552**	**Midpoint**
Glutamine	$H_{10}C_5N_2O_3$	146.1451	
Valine	$H_{11}C_5NO_2$	117.1469	
Methionine	$H_{11}C_5NO_2S$	149.2124	
Phenylalanine	$H_{11}C_9NO_2$	165.1900	
Tyrosine	$H_{11}C_9NO_3$	181.1894	
Tryptophan	$H_{12}C_{11}N_2O_2$	204.2262	
Leucine	$H_{13}C_6NO_2$	131.1736	
Isoleucine	$H_{13}C_6NO_2$	131.1736	
Lysine	$H_{14}C_6N_2O_2$	146.1882	
Arginine	$H_{14}C_6N_4O_2$	174.2017	

Note incremental progression of 1-Hydrogen atoms.

Note no apparent pattern in molecular weight values.

Place aside for the moment considerations regarding the chemical structure generally cited for the amino acids in relation to their Carbon atoms. In this manner, the amino acids are listed here as of their elemental structure of the atomic numbers of the elements in a sequential order: **1-Hydrogen**, **6-**Carbon, **7-**Nitrogen, and **8-**Oxygen. I proposed following this procedure about twelve years ago when I presented ***The Schemata of the Elements*** [www.earthmatrix.com]. The traditional order of chemical formulas based on **6-C, 1-H, 7-N, 8-O** males little sense regarding the search for progressive elemental patterns.

Earth/matriX Order by 1-Hydrogen Lead Element Atomic Progression

Aminoacid	**Chemical formula By 1-H Lead Atom**	Molecular weight, g/mol
Glycine	$H_5C_2NO_2$	**75.0669**
Alanine	$H_7C_3NO_2$	**89.**0935
Serine	$H_7C_3NO_3$	**105**.0930
Cysteine	$H_7C_3NO_2S$	**121**.1590
Aspartate	$H_7C_4NO_4$	**133.**1032
Asparagine	$H_8C_4N_2O_3$	**132.1184**
Threonine	$H_9C_4NO_3$	119.1197
Proline	$H_9C_5NO_2$	**115**.1310
Glutamate	$H_9C_5NO_4$	**147.**1299
Histidine	$H_9C_6N_3O_2$	**155.**1552
Glutamine	$H_{10}C_5N_2O_3$	**146.1451**
Valine	$H_{11}C_5NO_2$	**117**.1469
Methionine	$H_{11}C_5NO_2S$	**149**.2124
Phenylalanine	$H_{11}C_9NO_2$	**165.**1900
Tyrosine	$H_{11}C_9NO_3$	**181.**1894
Tryptophan	$H_{12}C_{11}N_2O_2$	**204.2262**
Leucine	$H_{13}C_6NO_2$	**131.**1736
Isoleucine	$H_{13}C_6NO_2$	**131**.1736
Lysine	$H_{14}C_6N_2O_2$	146.1882
Arginine	$H_{14}C_6N_4O_2$	174.2017

Midpoint

Note internal numerical progressions.

A discernible pattern.

The alphabetical names of the cited amino acids present no discernible structure. However, now the columns relating to the elemental structure and molecular weight reveal a direct relationship in progressive sequential patterns and tendencies.

Earth/matriX Order by 1-Hydrogen Lead Element Atomic Progression
Capable of Hydrogen Bond Formation

Aminoacid	**Chemical formula By 1-H Lead Atom**	Molecular weight, g/mol
Glycine	$H_5C_2NO_2$	75.0669
Alanine	$H_7C_3NO_2$	89.0935
Serine	$H_7C_3NO_3$	**105.0930**
Cysteine	$H_7C_3NO_2S$	121.1590
Aspartate	$H_7C_4NO_4$	133.1032
Asparagine	$H_8C_4N_2O_3$	**132.1184** ↑
Threonine	$H_9C_4NO_3$	**119.1197**
Proline	$H_9C_5NO_2$	115.1310
Glutamate	$H_9C_5NO_4$	147.1299
Histidine	$H_9C_6N_3O_2$	**155.1552** ↑
Glutamine	$H_{10}C_5N_2O_3$	**146.1451**
Valine	$H_{11}C_5NO_2$	117.1469
Methionine	$H_{11}C_5NO_2S$	149.2124
Phenylalanine	$H_{11}C_9NO_2$	165.1900
Tyrosine	$H_{11}C_9NO_3$	**181.1894**
Tryptophan	$H_{12}C_{11}N_2O_2$	**204.2262** ↓
Leucine	$H_{13}C_6NO_2$	131.1736
Isoleucine	$H_{13}C_6NO_2$	131.1736
Lysine	$H_{14}C_6N_2O_2$	**146.1882**
Arginine	$H_{14}C_6N_4O_2$	**174.2017** ↓

Of the 20 common amino acids, those with side groups capable of hydrogen bond formation are:
arginine, histidine, lysine, serine, threonine, asparagine, glutamine, tryptophan and tyrosine.

Source:
http://wiki.answers.com/Q/Which_amino_acid_side_chains_are_capable_of_forming_hydrogen_bonds

The alphabetical names of the cited amino acids present no discernible structure. However, now the columns relating to the elemental structure and molecular weight reveal a direct relationship in progressive sequential patterns and tendencies.

Earth/matriX Order by 1-Hydrogen Lead Element Atomic Progression

Aminoacid	**Chemical formula By 1-H Lead Atom**	Molecular weight, g/mol
Glycine	$H_5C_2NO_2$	75.0669
Alanine	$H_7C_3NO_2$	89.0935
Serine	$H_7C_3NO_3$	105.0930
Cysteine	$H_7C_3NO_2S$	121.1590
Aspartate	$H_7C_4NO_4$	133.1032
Asparagine	$H_8C_4N_2O_3$	**132.1184**
Threonine	$H_9C_4NO_3$	119.1197
Proline	$H_9C_5NO_2$	115.1310
Glutamate	$H_9C_5NO_4$	147.1299
Histidine	$H_9C_6N_3O_2$	155.1552
Glutamine	$H_{10}C_5N_2O_3$	**146.1451**
Valine	$H_{11}C_5NO_2$	117.1469
Methionine	$H_{11}C_5NO_2S$	149.2124
Phenylalanine	$H_{11}C_9NO_2$	165.1900
Tyrosine	$H_{11}C_9NO_3$	**181.1894**
Tryptophan	$H_{12}C_{11}N_2O_2$	**204.2262**
Leucine	$H_{13}C_6NO_2$	131.1736
Isoleucine	$H_{13}C_6NO_2$	131.1736
Lysine	$H_{14}C_6N_2O_2$	**146.1882**
Arginine	$H_{14}C_6N_4O_2$	**174.2017**

Notice tendency to incremental progression

Note discernible pattern.

Midpoint

Of the 20 common amino acids, those with side groups capable of hydrogen bond formation are: **arginine, histidine, lysine, serine, threonine, asparagine, glutamine, tryptophan** and **tyrosine.**

Source:
http://wiki.answers.com/Q/Which_amino_acid_side_chains_are_capable_of_forming_hydrogen_bonds

Note tendency of alternate pattern in relation to even|odd numbers of 1-H series as lead element [$\mathbf{H_5, H_7, H_9, H_{11}, H_{13}}$; and, $\mathbf{H_8, H_{10}, H_{12}, H_{14}}$]. There are two sub-sets of progressive patterns as noted on the previous tables.

Earth/matriX Order by 1-Hydrogen Lead Element Atomic Progression
With Atomic Numbers Instead of Accidental Historical Names of the Elements

Aminoacid	**Chemical formula By 1-H Lead Atom**	Molecular weight, g/mol
Glycine	$1_5 6_2 7\ 8_2$	**75.0669**
Alanine	$1_7 6_3 7\ 8_2$	**89.**0935
Serine	$1_7 6_3 7\ 8_3$	**105**.0930
Cysteine	$1_7 6_3 7\ 8_2 S$	**121**.1590
Aspartate	$1_7 6_4 7\ 8_4$	**133.**1032
Asparagine	$1_8 6_4 7_2 8_3$	**132.1184**
Threonine	$1_9 6_4 7\ 8_3$	*119.1197*
Proline	$1_9 6_5 7\ 8_2$	**115**.1310
Glutamate	$1_9 6_5 7\ 8_4$	**147.**1299
Histidine	$1_9 6_6 7_3 8_2$	**155.**1552
Glutamine	$1_{10} 6_5 7_2 8_3$	**146.1451**
Valine	$1_{11} 6_5 7\ 8_2$	**117**.1469
Methionine	$1_{11} 6_5 7\ 8_2 16$	**149**.2124
Phenylalanine	$1_{11} 6_9 7\ 8_2$	**165.**1900
Tyrosine	$1_{11} 6_9 7\ 8_3$	**181.**1894
Tryptophan	$1_{12} 6_{11} 7_2 8_2$	**204.2262**
Leucine	$1_{13} 6_6 7\ 8_2$	**131.**1736
Isoleucine	$1_{13} 6_6 7\ 8_2$	**131**.1736
Lysine	$1_{14} 6_6 7_2 8_2$	146.1882
Arginine	$1_{14} 6_6 7_4 8_2$	174.2017

Midpoint

Notice internal incremental progressions.

Numerous additional observations are in order regarding the proposed structuring of the chemical formulas and the relationships to the molecular weights of the amino acids. For now, comments are limited to the patterns cited here. Much more is to follow.

Earth/matriX Order by 1-Hydrogen Lead Element Atomic Progression

Aminoacid	**Chemical formula By 1-H Lead Atom**	Molecular weight, g/mol
Glycine	$H_5C_2NO_2$	**75.0669**
Alanine	$H_7C_3NO_2$	**89.**0935
Serine	$H_7C_3NO_3$	**105**.0930
Cysteine	$H_7C_3NO_2S$	**121**.1590
Aspartate	$H_7C_4NO_4$	**133.**1032
Asparagine	$H_8C_4N_2O_3$	**132.1184**
Threonine	$H_9C_4NO_3$	119.1197
Proline	$H_9C_5NO_2$	**115**.1310
Glutamate	$H_9C_5NO_4$	**147.**1299
Histidine	$H_9C_6N_3O_2$	**155.**1552
Glutamine	$H_{10}C_5N_2O_3$	**146.1451**
Valine	$H_{11}C_5NO_2$	**117**.1469
Methionine	$H_{11}C_5NO_2S$	**149**.2124
Phenylalanine	$H_{11}C_9NO_2$	**165.**1900
Tyrosine	$H_{11}C_9NO_3$	**181.**1894
Tryptophan	$H_{12}C_{11}N_2O_2$	**204.2262**
Leucine	$H_{13}C_6NO_2$	**131.**1736
Isoleucine	$H_{13}C_6NO_2$	**131**.1736
Lysine	$H_{14}C_6N_2O_2$	146.1882
Arginine	$H_{14}C_6N_4O_2$	174.2017

A discernible pattern.

The alphabetical names of the cited amino acids present no discernible structure. However, now the columns relating to the elemental structure and molecular weight reveal a direct relationship in progressive sequential patterns and tendencies. The existence of elemental patterns and periodicities is hereby confirmed.

Earth/matriX: SCIENCE TODAY

Towards a New Paradigm in Scientific Notation

Patterns of Periodicity among Proteinogenic Amino Acids

[Abridged Version]

By

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Essential | Non-essential Amino Acids

Molecular Weight: Incremental Progression ⇨

Pattern of Reflexive Symmetry By Molecular Weight As of *Proline*

Non-essential

Tyrosine	181.2
Arginine	174.2
Glutamic Acid	147.1
Glutamine	146.1
Aspartic Acid	*133.1*
Asparagine	*132.1*
Cysteine	121.2
Proline	115.1

Serine		105.1
Alanine		89.1
Glycine	±0-100 baseline	75.1

Valine	117.1
Threonine	119.1
Isoleucine	*131.2*
Leucine	*131.2*
Lysine	146.2
Methionine	149.2
Histidine	155.2
Phenylalanine	165.2
Tryptophan	204.2

Essential

Data source: Lehninger, "Principle of Biochemistry".

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Essential | Non-essential Amino Acids

19-Lysine to 6-Asparagine L417N

Molecular Weight: Incremental Progression

Essential to Non-essential

Pattern of Reflexive Symmetry By Molecular Weight As of *Proline*

Non-essential

Amino acid	Molecular weight
Tyrosine	181.2
Arginine	174.2
Glutamic Acid	147.1
Glutamine	146.1
Aspartic Acid	*133.1*
Asparagine	***132.1***
Cysteine	121.2
Proline	115.1

Amino acid	Molecular weight
Serine	105.1
Alanine	89.1
Glycine	75.1

±0-100 baseline

Essential

Amino acid	Molecular weight
Valine	117.1
Threonine	119.1
Isoleucine	*131.2*
Leucine	*131.2*
Lysine	**146.2**
Methionine	149.2
Histidine	155.2
Phenylalanine	165.2
Tryptophan	204.2

19-Lysine to 6-Asparagine	**L417N**
7-Threonine to 19-Lysine	T478K
18-Leucine to 20-Arginine	L452R
5-Aspartic Acid to 1-Glycine	*D614G*
8-Proline to 20-Arginine	P681R
5-Aspartic Acid to 6-Asparagine	D950N

Data source: Lehninger, "Principle of Biochemistry".

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Essential | Non-essential **Amino Acids**

7-Threonine to 19-Lysine T478K

Molecular Weight: Incremental Progression

Essential to Essential

Pattern of Reflexive Symmetry By Molecular Weight As of *Proline*

Non-essential

Tyrosine	181.2
Arginine	174.2
Glutamic Acid	147.1
Glutamine	146.1
Aspartic Acid	*133.1*
Asparagine	*132.1*
Cysteine	121.2
Proline	115.1
Serine	105.1
Alanine	89.1
Glycine	75.1

±0-100 baseline

Valine	117.1
Threonine	119.1
Isoleucine	*131.2*
Leucine	*131.2*
Lysine	146.2
Methionine	149.2
Histidine	155.2
Phenylalanine	165.2
Tryptophan	204.2

Essential

19-Lysine to 6-Asparagine	K417N
7-Threonine to 19-Lysine	**T478K**
19-Leucine to 20-Arginine	L452R
5-Aspartic Acid to 1-Glycine	*D614G*
8-Proline to 20-Arginine	P681R
5-Aspartic Acid to 6-Asparagine	D950N

Data source: Lehninger, "Principle of Biochemistry".

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Essential | Non-essential Amino Acids

19-Leucine to 20-Arginine L452R

Molecular Weight: Incremental Progression ⇨

Essential to Non-essential

Pattern of Reflexive Symmetry By Molecular Weight As of *Proline*

Non-essential

Amino acid	Molecular weight
Tyrosine	181.2
Arginine	**174.2**
Glutamic Acid	147.1
Glutamine	146.1
Aspartic Acid	*133.1*
Asparagine	*132.1*
Cysteine	121.2
Proline	115.1
Serine	105.1
Alanine	89.1
Glycine	75.1

±0-100 baseline

Amino acid	Molecular weight
Valine	117.1
Threonine	119.1
Isoleucine	*131.2*
Leucine	***131.2***
Lysine	146.2
Methionine	149.2
Histidine	155.2
Phenylalanine	165.2
Tryptophan	204.2

Essential

19-Lysine to 6-Asparagine	L417N
7-Threonine to 19-Lysine	T478K
19-Leucine to 20-Arginine	**L452R**
5-Aspartic Acid to 1-Glycine	*D614G*
8-Proline to 20-Arginine	P681R
5-Aspartic Acid to 6-Asparagine	D950N

Data source: Lehninger, "Principle of Biochemistry".

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Essential | **Non-essential** **Amino Acids**

5-Aspartic Acid to 1-Glycine D614G

Molecular Weight: Incremental Progression

Non-Essential to **Non-essential**

Pattern of Reflexive Symmetry By Molecular Weight As of *Proline*

Non-essential

Tyrosine	181.2
Arginine	174.2
Glutamic Acid	147.1
Glutamine	146.1
Aspartic Acid	***133.1***
Asparagine	*132.1*
Cysteine	121.2
Proline	115.1
Serine	105.1
Alanine	89.1
Glycine	**75.1**
Valine	117.1
Threonine	119.1
Isoleucine	*131.2*
Leucine	*131.2*
Lysine	146.2
Methionine	149.2
Histidine	155.2
Phenylalanine	165.2
Tryptophan	204.2

± 0-100 baseline

Essential

19-Lysine to 6-Asparagine	K417N
7-Threonine to 19-Lysine	T478K
19-Leucine to 20-Arginine	L452R
5-Aspartic Acid to 1-Glycine	***D614G***
8-Proline to 20-Arginine	P681R
5-Aspartic Acid to 6-Asparagine	D950N

Data source: Lehninger, "Principle of Biochemistry".

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Selected Cited Amino Acid Replacements in Covid-19 Delta Variant:

Gly	Ala	Cys	Ser	AspA	Aspg	Thre	Prol	GltmA	Valn	Hstd	Gltm	Mthn	Islc	Lcn	Phnl	Tyrs	Lys	Argn	Trpt
7	10	11	11	13	14	14	14	16	16	17	17	17	19	19	20	21	21	23	24

Proton Numbers

7	Gly
10	Ala
11	Cys
11	Ser
13	AspA
14	Aspg
14	Thre
14	Prol
16	GltmA
16	Valn
17	Hstd
17	Gltm
17	Mthn
19	Islc
19	Lcn
20	Phnl
21	Tyrs
21	Lys
23	Argn
24	Trpt

Other cited amino acid mutations in* Covid-19 Delta *are:

19-Lysine to	6-Asparagine	L417N
7-Threonine to	19-Lysine	T478K
19-Leucine to	20-Arginine	L452R
5-Aspartic Acid to	*1-Glycine*	*D614G*
8-Proline to	20-Arginine	P681R
5-Aspardic Acid to	6-Asparagine	D950N

3 essential amino acids and 3 non-essential amino acids substitute to 5 non-essential amino acids and 1 essential amino acid.

It is also pointed out that Covid-19 Delta does NOT have mutations

9-Glutamic Acid to 19-Lysine	E484K
6-Asparagine to 15-Tyrosine	N501Y

Essential | Non-Essential

Amino Acids

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Selected Amino Acid Replacements in Covid-19 Delta Variant:

Lysine to	Asparagine	L417N
Threonine to	Lysine	T478K
Leucine to	Arginine	L452R
Aspartic Acid to	Glycine	D614G
Proline to	Arginine	P681R
Aspardic Acid to	Asparagine	D950N

It is also pointed out that Covid-19 Delta does NOT have mutations

Glutamic Acid to	Lysine	E484K
Asparagine to	Tyrosine	N501Y

One could propose color-coding the particular mutations according to essential | non-essential amino acids as shown.

Essential | Non-Essential
Amino Acids

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Amino Acid	Chemical Formula	Molecular Weight	Numerical Value of Monomer	Genetic Code Letters
Glycine	$H_5C_2NO_2$	75.0669	441-444	GGU-GGG
Alanine	$H_7C_3NO_2$	89.0935	421-424	
Serine	$H_7C_3NO_3$	105.0930	121-124, 341-342	
Cysteine	$H_7C_3NO_2S$	121.1590	141-142	
Aspartate	$H_7C_4NO_4$	133.1032	431-432	
Asparagine	$H_8C_4N_2O_3$	132.1184	331-332	AAU-AAC
Threonine	$H_9C_4NO_3$	119.1197	321-324	
Proline	$H_9C_5NO_2$	115.1310	221-224	
Glutamate	$H_9C_5NO_4$	147.1299	433-434	
Histidine	$H_9C_6N_3O_2$	155.1552	231-232	
Glutamine	$H_{10}C_5N_2O_3$	146.1451	233-234	CAA-CAG
Valine	$H_{11}C_5NO_2$	117.1469	411-414	
Methionine	$H_{11}C_5NO_2S$	149.2124	314	
Phenylalanine	$H_{11}C_9NO_2$	165.1900	111-112	
Tyrosine	$H_{11}C_9NO_3$	181.1894	131-132	
Tryptophan	$H_{12}C_{11}N_2O_2$	204.2262	144	UGG
Leucine	$H_{13}C_6NO_2$	131.1736	113-214	
Isoleucine	$H_{13}C_6NO_2$	131.1736	311-313	
Lysine	$H_{14}C_6N_2O_2$	146.1882	333-334	
Arginine	$H_{14}C_6N_4O_2$	174.2017	241-244	

On this list, numbers were assigned to the genetic code letters.

The arrows emphasize the incremental progression of Molecular weight.

1

Earth/matriX Classification Of

Amino Acids

Tables from 2013 Essay

1-Hydrogen is the lead element in the molecular formulae of the amino acids. Two main incremental progressions of molecular weight appear indicated by the red and blue highlights/arrows.

A proposal.

Opposing Pattern of 1-H Lead Elements in Chemical Formulas of Amino Acids

Amino Acid	Chemical Formula	Molecular Weight	Numerical Value of Monomer	Genetic Code Letters
Glycine	$H_5C_2NO_2$	75.0669	441-444	GGU-GGG
Asparagine	$H_8C_4N_2O_3$	132.1184	331-332	AAU-AAC
Glutamine	$H_{10}C_5N_2O_3$	146.1451	233-234	CAA-CAG
Tryptophan	$H_{12}C_{11}N_2O_2$	204.2262	144	UGG
Lysine	$H_{14}C_6N_2O_2$	*146.1882*		

Edited 23 August 2019

The Earth/matriX Classification of the Non-essential Amino Acids

1_5 6_2 7_1 8_2 *Glycine [$C_2H_5NO_2$]*

1-H 3 5	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 2	7-N 21 1	8-O 24 2	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_7 6_3 7_1 8_2 *Alanine [$C_3H_7NO_2$]*

1-H 3 7	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 3	7-N 21 1	8-O 24 2	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_7 6_3 7_1 8_2 16_1 *Cysteine [$C_3H_7NO_2S$]*

1-H 3 7	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 3	7-N 21 1	8-O 24 2	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48 1	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_7 6_3 7_1 8_3 *Serine [$C_3H_7NO_3$]*

1-H 3 7	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 3	7-N 21 1	8-O 24 3	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_7 6_4 7_1 8_4 *Aspartic acid [$C_4H_7NO_4$]*

1-H 3 7	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 4	7-N 21 1	8-O 24 4	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_8 6_4 7_2 8_3 *Asparagine [$C_4H_8N_2O_3$]*

1-H 3 8	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 4	7-N 21 2	8-O 24 3	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_9 6_5 7_1 8_2 *Proline [$C_5H_9NO_2$]*

1-H 3 9	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 5	7-N 21 1	8-O 24 2	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_9 6_5 7_1 8_4 *Glutamic acid [$C_5H_9NO_4$]*

1-H 3 9	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 5	7-N 21 1	8-O 24 4	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_{11} 6_9 7_1 8_3 *Tyrosine [$C_9H_{11}NO_3$]*

1-H 3 11	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 9	7-N 21 1	8-O 24 3	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

1_{12} 6_{11} 7_2 8_2 *Tryptophan [$C_{11}H_{12}N_2O_2$]*

1-H 3 12	2-He 6	3-Li 10	4-Be 13	5-B 16	6-C 18 11	7-N 21 2	8-O 24 2	9-F 28	10-Ne 30	11-Na 34	12-Mg 36	13-Al 40	14-Si 42	15-P 46	16-S 48	17-Cl 52	18-Ar 58	19-K 58	20-Ca 60

Original Chart Sequential Vertical Presentation

Earth/matriX Genetic Code by Numbers

U = 1
C = 2
A = 3
G = 4

16-6 1_2 6 1(7 1_2)-6 8 8 1Serine	UCU 121
16-6 1_2 6 1(7 1_2)-6 8 8 1Serine	UCC 122
16-6 1_2 6 1(7 1_2)-6 8 8 1 Serine	UCA 123
16-6 1_2 6 1(7 1_2)-6 8 8 1 Serine	UCG 124
16-6 1_2 6 1(7 1_2)-6 8 8 1 Serine	AGU 341
16-6 1_2 6 1(7 1_2)-6 8 8 1 Serine	AGC 342
1 7-6(7 1_2)-7 1-(6 1_2)3-6 1(7 1_2)-6 8 8 1 Arginine	CGU 241
1 7-6(7 1_2)-7 1-(6 1_2)3-6 1(7 1_2)-6 8 8 1 Arginine	CGC 242
1 7-6(7 1_2)-7 1-(6 1_2)3-6 1(7 1_2)-6 8 8 1 Arginine	CGA 243
1 7-6(7 1_2)-7 1-(6 1_2)3-6 1(7 1_2)-6 8 8 1 Arginine	CGG 244
1 7-6(7 1_2)-7 1-(6 1_2)3-6 1(7 1_2)-6 8 8 1 Arginine	AGA 343
1 7-6(7 1_2)-7 1-(6 1_2)3-6 1(7 1_2)-6 8 8 1 Arginine	AGG 344
1 8- 6_6 1_5 -6 1_2 -6 1(7 1_2)-6 8 8 1Tyrosine	UAU 131
1 8- 6_6 1_5 -6 1_2 -6 1(7 1_2)-6 8 8 1Tyrosine	UAU 132
Stop	UAA 133
Stop	UAG 134
1 8 8 6-6 1_2 -6 1(7 1_2)-6 8 8 1 Aspartic Acid	GAU 431
1 8 8 6-6 1_2 -6 1(7 1_2)-6 8 8 1 Aspartic Acid	GAC 432
1 8 8 6-(6 1_2)-6 1 (7 1_2)- 6 8 8 1Glutamic Acid	GAA 433
1 8 8 6-(6 1_2)-6 1 (7 1_2)- 6 8 8 1 Glutamic Acid	GAG 434
1 16-6 1_2 -6 1(7 1_2)-6 8 8 1Cysteine	UGU 141
1 16-6 1_2 -6 1(7 1_2)-6 8 8 1Cysteine	UGC 142
Stop	UAG 143
1_2 7-(6 1_2 $)_4$-6 1 (7 1_2)-6 8 8 1Lysine	AAA 333
1_2 7-(6 1_2 $)_4$-6 1 (7 1_2)-6 8 8 1Lysine	AAG 334
$1_2$7-6 8-6 1_2-6 1(7 1_2)-6 8 8 1Asparagine	AAU 331
$1_2$7-6 8-6 1_2-6 1(7 1_2)-6 8 8 1 Asparagine	AAC 332
1_2 7-6 8-(6 1_2 $)_2$-6 1(7 1_2)- 6 8 8 1Glutamine	CAA 233
1_2 7-6 8-(6 1_2 $)_2$-6 1(7 1_2)- 6 8 8 1Glutamine	CAG 234
6 1_3-6 1(7 1$)_2$-6 8 8 1 Alanine	GCU 421
6 1_3-6 1(7 1$)_2$-6 8 8 1 Alanine	GCC 422
6 1_3-6 1(7 1$)_2$-6 8 8 1 Alanine	GCA 423
6 1_3-6 1(7 1$)_2$-6 8 8 1 Alanine	GCG 424
6 1_3 6 1(8 1)-6 1(7 1_2)-6 8 8 1Threonine	ACU 321
6 1_3 6 1(8 1)-6 1(7 1_2)-6 8 8 1Threonine	ACC 322
6 1_3 6 1(8 1)-6 1(7 1_2)-6 8 8 1Threonine	ACA 323
7 1_2 -6 1_2 - 6 8 8 1 Glysine	GGG 444

Amino Acids Listed on the Genetic Code

	U = 1	C = 2	A = 3	G = 4	
U	111 Phenylalanine	121 Serine	131 Tyrosine	141 Cysteine	U
	112 Phenylalanine	122 Serine	132 Tyrosine	142 Cysteine	C
	113 Leucine	123 Serine	133 Stop	143 Stop	A
	114 Leucine	124 Serine	134 Stop	144 Tryptophan	G
C	211 Leucine	221 Proline	231 Histidine	241 Arginine	U
	212 Leucine	222 Proline	232 Histidine	242 Arginine	C
	213 Leucine	223 Proline	233 Glutamine	243 Arginine	A
	214 Leucine	224 Proline	234 Glutamine	244 Arginine	G
A	311 Isoleucine	321 Threonine	331 Asparagine	341 Serine	U
	312 Isoleucine	322 Threonine	332 Asparagine	342 Serine	C
	313 Isoleucine	323 Threonine	333 Lysine	343 Arginine	A
	314 Methionine (Start)	324 Threonine	334 Lysine	344 Arginine	G
G	411 Valine	421 Alanine	431 Aspartic Acid	441 Glycine	U
	412 Valine	422 Alanine	432 Aspartic Acid	442 Glycine	C
	413 Valine	423 Alanine	433 Aspartic Acid	443 Glycine	A
	414 Valine	424 Alanine	434 Aspartic Acid	444 Glycine	G