The Structure of the Elements

Richard D. Pohl

June 21, 2024

1 Preface

The Hypothesis of Universal Matter ends with the creation of hydrogen. How then is the balance of elements created? This spreadsheet describes the building of elements by placing protons and neutrons in specified orders which includes all of the common isotopes. This document illustrates bits and parts of the sheet in order to allow an interested party to work through the build.

2 General Statements

2.1 Tabs

The sheet contains two tabs, Itemized for build detail and Graphic for a 'picture' of the build detail. Please note that both tabs open automatically win the sheet is opened (works in Excel but I am not sure about other programs). It is best to view the two tabs side-by-side.

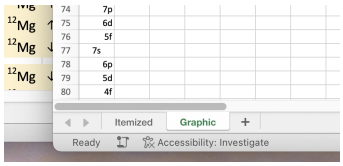


Figure 1: Tabs Detail

2.2 Side-By-Side

Here are the tabs side-by-side:

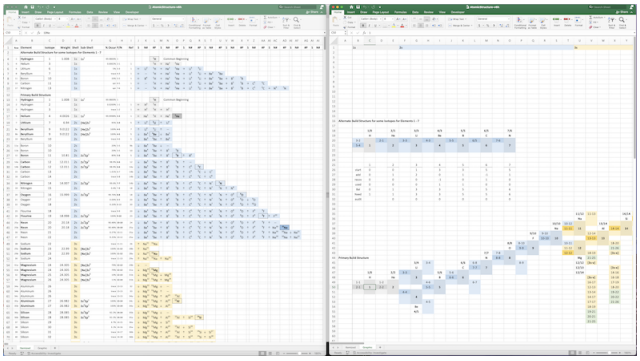
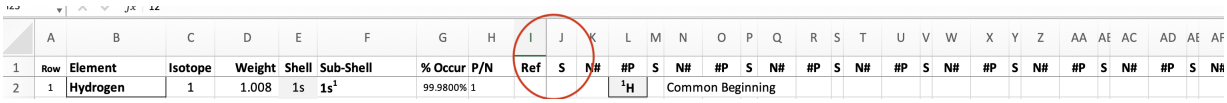


Figure 2: Side-by-Side

2.3 Frozen Panes

On the Itemized tab, columns A - I and row 1 are frozen panes:



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1	Row	Element	Isotope	Weight	Shell	Sub-Shell	% Occur	P/N	Ref	S	N#	#P	S	N#	#P	S	N#	#P	S	N#	#P	S	N#	#P	S	N#	#P	S	N#	#P	S	N#
2	1	Hydrogen	1	1.008	1s	$1s^1$	99.9800%	1				^1H		Common Beginning																		

Figure 3: Frozen Panes

2.4 Color Coding

2.4.1 Columns and Rows

Atoms are based on the number of shells and, in each tab, the shells are color-coded. For example the first shell is hydrogen and helium and in each tab the rows for this shell are color-coded grey. The second shell, containing lithium to neon, is color-coded medium blue in each tab. The color-coding is used consistently even when crossing between shells. Here are examples for two shells from each tab.

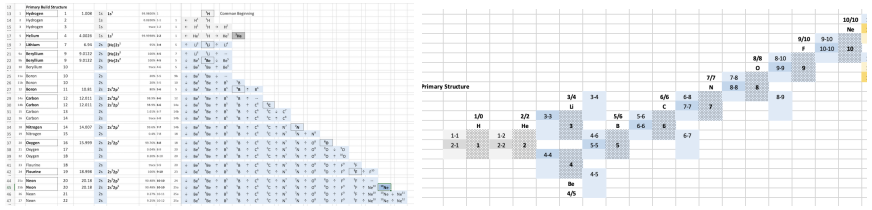


Figure 4: Color-Coded Shells

2.4.2 Final Elements in Shells

Each shell has a 'final' element, e.g., helium in shell one and neon in shell two. These final elements are denoted by an emphasized color, for example darker grey for helium and darker blue for neon. See the arrows in the following figure.

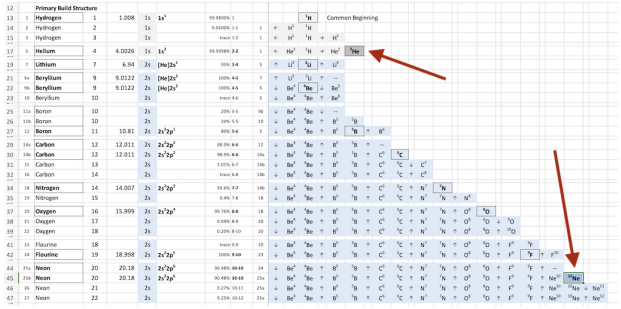


Figure 5: Final Shell Elements

3 Building Structures for Elements

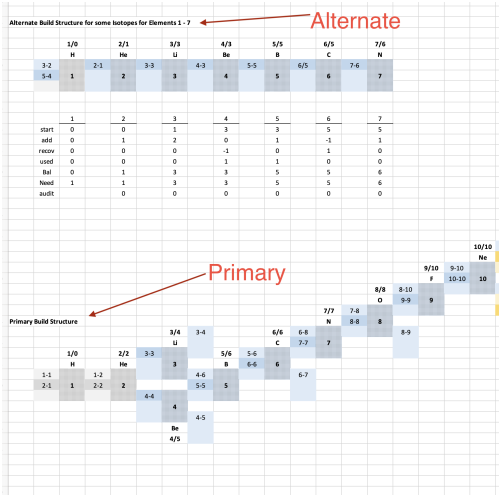
3.1 Note:

The build structure as noted on the Graphic Tab does not stay situated straight over, left-to-right. Keep in mind that the hydrogen proton rotates end-over-end and, as neutrons (first) and then protons are added to the 'chain', their additional rotations are added to the mix. The rotations of the triple-primes allow the 'chain' to loop back on itself, forming spiral layers as the atoms grow in complexity.

The rotational complexity, even when adding the first neutron to hydrogen, demonstrates the difficulty of 'growing the build'. Not only do neutrons and protons have to align to the neighboring triple-prime, but they must also match their rotational velocity. The needed pressure to do so must be strong and persistent and thusly very few atoms are made without the help of stars. These are hydrogen, helium, and traces of lithium and beryllium. It may be that these 'simple' atoms are built on the Alternate Build Structure as shown in several of the figures of the Graphic tab.

3.2 Primary (Common) and Alternate (Beginning) Structures

The sheets detail two structures for standard and alternate builds. The alternate structure is limited to just a few beginning elements (hydrogen through nitrogen) and some of their uncommon isotopes. The primary structure details the build for all the rest of the elements (and their isotopes). See arrows and text in the following figures:



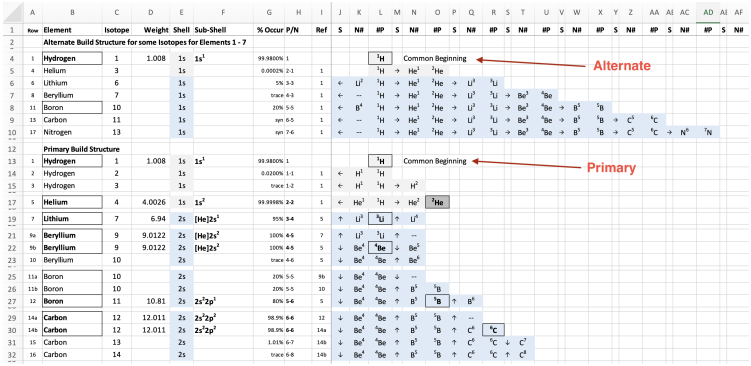


Figure 6: Element Structures

3.3 Understanding the Itemized Tab

3.3.1 Shell Folding

Each color-coded shell is folded underneath the previous shell. Consider row (column header) five, which illustrates helium, the last element in the shell. The first element of the next shell, lithium, should begin in sheet column P. But this row-cell is blank. Now, move to row seven (lithium). Note that it 'starts' in column J of the sheet just like the previous shell and not sheet column P. For readability purposes, after the final element of the shell, the first and subsequent elements the new shell are folded down (to sheet column J) and given a new color (see color-coding).

3.3.2 Itemized Sheet Column Header, Columns A - I

- Row: Numbers each isotope. If the isotope needs additional rows, then a letter is added. For example, see Beryllium which needs two rows and so is marked 9a and 9b.
- Element: Name of element. Note: A box is placed around primary isotopes for ease of reading. Also, if the isotope has additional rows, then all of the rows are boxed together. For example, see the fourth element beryllium.
- Isotope: Similar to Row but uses cardinal number only.
- Weight: Listed for primary isotopes only. For example, row one for hydrogen and row five for helium.
- Shell: Shell number (per common documentation such as Wikipedia).
- Sub-shell: A more detailed labeling for the element in the shell. See other documentation for details of this type of notation.
- % Occur: Percent of occurrence in nature. Note: Synthetic elements are marked as 'syn' for a percentage.
- P/N: The count of protons and neutrons for the element.
- Ref: A number referencing the previous row from which the build detail (starting in the next column J) continues.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Row	Element	Isotope	Weight	Shell	Sub-Shell	% Occur	P/N	Ref	S	N#	#P	S	N#	#P	S	N#	#P	S	N#	#P
13	1	**Hydrogen**	1	1.008	1s	$1s^1$	99.9800%	1				^1H		Common Beginning							
14	2	Hydrogen	2		1s		0.0200%	1-1	1	←	H^1	^1H									
15	3	Hydrogen	3		1s		trace	1-2	1	←	H^1	^1H	→	H^2							
17	5	**Helium**	4	4.0026	1s	$1s^2$	99.9998%	2-2	1	←	He^1	^1H	→	He^2	^2He						
19	7	**Lithium**	7	6.94	2s	$[He]2s^1$	95%	3-4	5	↑	Li^3	^3Li	↑	Li^4							
21	9a	**Beryllium**	9	9.0122	2s	$[He]2s^2$	100%	4-5	7	↑	Li^3	^3Li	↑	--							
22	9b	**Beryllium**	9	9.0122	2s	$[He]2s^2$	100%	4-5	5	↓	Be^4	^4Be	↓	Be^5							
23	10	Beryllium	10		2s		trace	4-6	5	↓	Be^4	^4Be	↑	Be^6							

Figure 7: Itemized Column Header

3.3.3 Itemized Build Columns

Each build item consists of a series of three columns repeated as necessary to complete the entry. The three column repeated group is S, N#, and #P (e.g., sheet columns J, K, and L).

- S: This is the build sub-item directional sign. From the last item or sub-item add the neutron or proton in this direction. Valid directions are up, down, right, and left.
- N#: Element abbreviation with neutron number in superscript.
- #P: Proton number in superscript with element abbreviation.

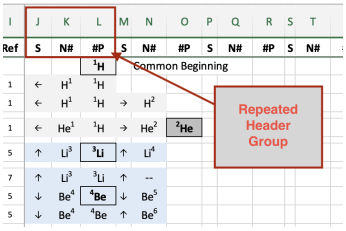


Figure 8: Itemized Build Column Header

3.4 Understanding the Graphic Tab

3.4.1 Graphic Chart Color-Coding

Color-coding is used to aid reading the Graphic build chart. Items of interest are as follows:

- A: Proton marking. It is the darker base color with small-dot fill.
- B: Neutron marking. Here indicating that it was used to designate the second neutron for element one, hydrogen. It is marked by a lighter variant of the element's shell base color.
- C: Neutron marking. The darker base color marking indicates that it was the final neutron used in conjunction with a proton. This neutron will be used throughout the rest of the chart. In the example, it denotes that it was the second neutron used in conjunction with the second element, helium.
- D: A minimum of two indicators are listed above each proton. In this example, it is the fifth element, boron, so marked with the abbreviation 'B' for the element in the cell above the proton marking. The cell above the abbreviation is the proton/neutron combination for a boxed, primary isotope for the element (see sub-section 3.3.2, the element column).

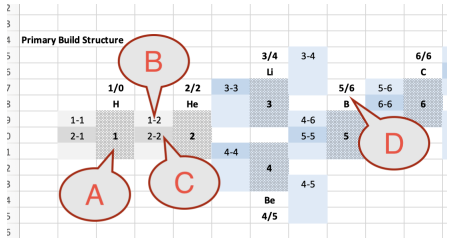


Figure 9: Graphic Color-Coding

Please note the comments for item D in the previous list. In some cases there may be several listed in reverse ascending order. The following figure illustrates this:

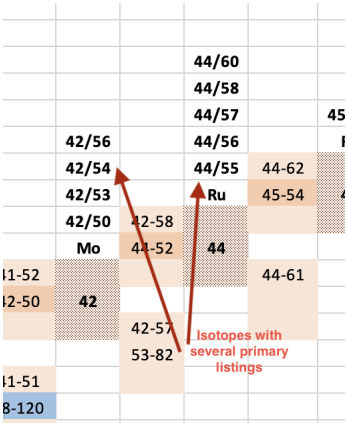


Figure 10: Graphic Showing Primary isotopes

Please see the figure for sub-section 3.4.1 and note the comments for items 'B' and 'C' for neutron marking. In some cases the neutron list contained more than three neutrons. In these cases a cross referenced list was created above or below the list in question. Consider the following figure detailing the neutron to the lower-right of element 12, magnesium.

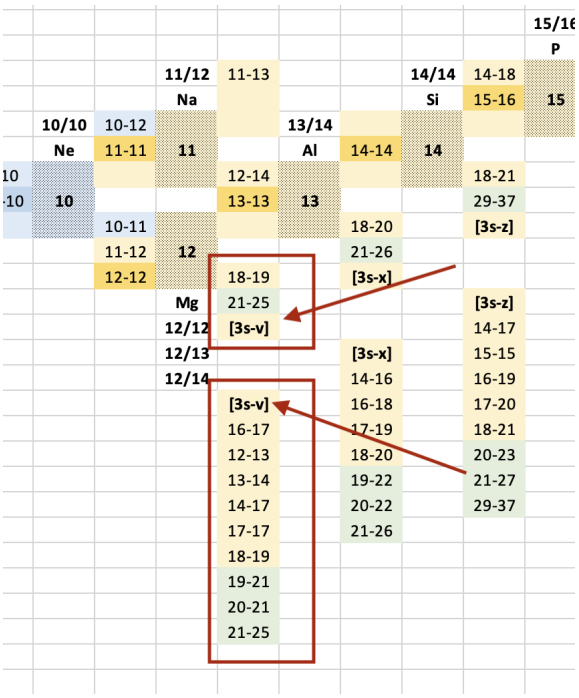


Figure 11: Graphic Extended Neutron Lists

Note the smaller rectangle above the longer one rectangle below. The highest cell contains '18-19' which is the last neutron used to complete the third (yellow) shell. In the middle cell '21-25' refers to the last neutron used in this place in the fourth (green) shell. Finally, in the bottom cell, '[3s-v]' refers to the extended list shown in the longer rectangle area directly below this reference.

Note that the reference just noted in the '[ ]' brackets begins the list. The reference link is bracketed followed by the shell number and sub-shell letter, in this case '3s'. Next, after the dash, the Excel column letter(s) indicate where to find the list. It is usually below if the neutron is low on the chart or above if otherwise.

3.5 Audits

The area below the Graphic build chart, beginning after row 71, contains an audit of the protons and neutrons used to illustrate the chart. Rows 72 - 93 tallies up the sub-shells for all of the shells used to document the element. Rows 94 - 102

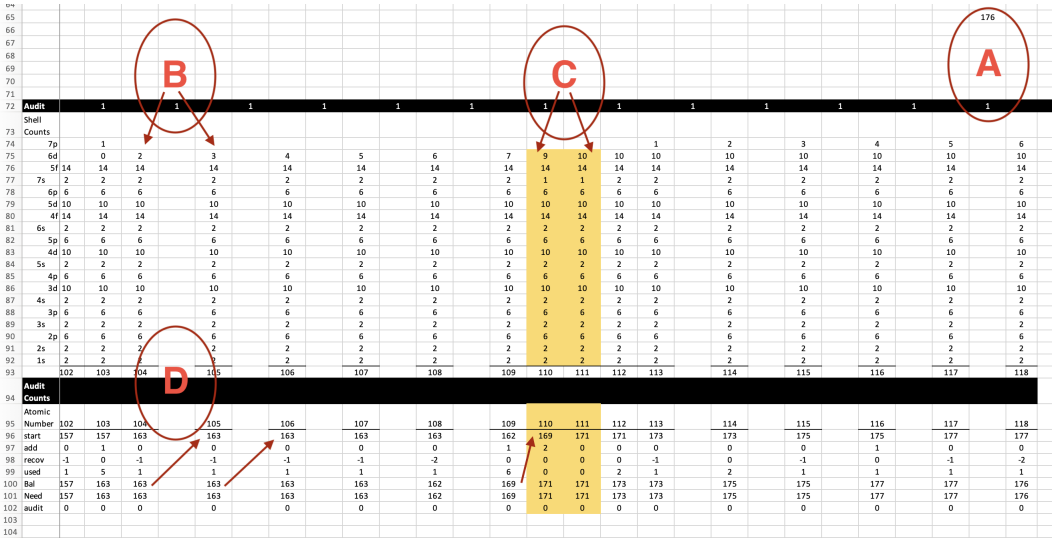


Figure 12: Graphic Audits

Audits are characterized baby the following items:

- A: The count of neutrons for the column. The number in the top of the oval labeled 'A', 176, is the tally of row 72, the total number of neutrons detailed in the chart.
- B: Oval 'B' illustrates the tally of protons in the column rows above. The tally is located in row 93. Where columns are side-by-side with no blank column in between indicate that there are two protons listed in the column rows above.
- C: Proton columns in rows 74 - 92 are usually consecutively numbered but an exception must be made when the elements are in a separate sub-shell, such as darmstadtium (proton number 110) and roentgenium (proton number 111). In these cases as a visual aide, such as in oval 'C', the 'out-of-order' elements are highlighted in the shell color-coding with no column spacing.
- D: Neutron audits. Start with atomic number 104 and notice that it has an ending balance (row 100) of 163 neutrons. That carries forward as the beginning balance for number 105. Here one neutron is removed and one is added for a zero balance change. The same situation carries forward for number 106.

  Now refer to number 109. Here one neutron was added (row 97), zero were recovered, and six were used, adding seven neutrons to the ending balance. That balance carries forward to number 110. Note that row 102 contains a formula that should always be zero, anything else indicates an error when processing the build.

4 Examples

Building examples will help solidify the above documentation. In these exercises we will build hydrogen and helium, then lithium through boron, and finally (for fun) we will build a water molecule.

4.1 Hydrogen and Helium

Building helium from hydrogen will help you to understand the build nomenclature of the Itemized tab and apply it to the Graphic tab. Let's set the Itemized and Graphic tabs together for reference:

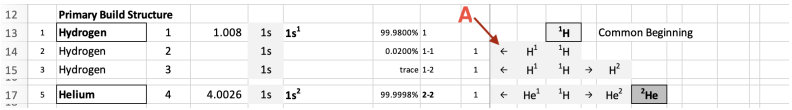


Figure 13: Itemized Tab

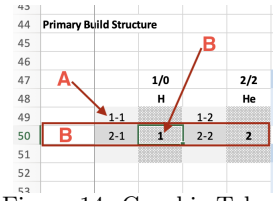


Figure 14: Graphic Tab

Figure 15: Build Example Hydrogen to Helium

In the Itemized tab, note common beginning for hydrogen in (sheet) row 13 with the boxed $\boxed{^1H}$ for hydrogen.

At row 14, in the cell directly below the boxed hydrogen cell, move left one cell and note the label H^1. This indicates that we need to place a neutron, numbered '1', on the Graphic build chart. Where is the neutron to be placed in the Graphic tab? This is ascertained in the cell to the left of the noted neutron cell, the black left-arrow noted by 'A' on the Itemized tab and it means to move one column to the left of the hydrogen proton column.

On the Graphic tab move one column to the left of the proton column labeled '1' in the darker grey area (see the box labeled 'B') and place a '1-1' in the top cell of the three available cells in the neutron column pointed out by text-arrow 'A'. Label the neutron by the element number '1', followed by a dash, and then the neutron number '1'. This completes the hydrogen isotope '1-1'. Now move to row 15 on the Itemized tab.

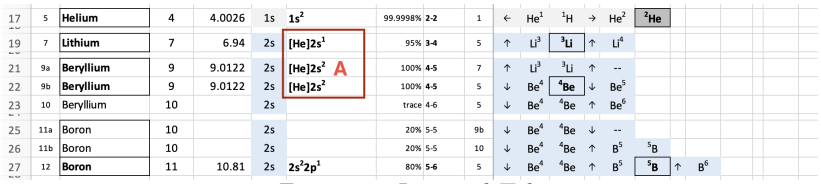
Note that the build instructions in row 14 are repeated in row 15. Do not repeat these instructions. Start with the cell directly to the right of the cell labeled ^1H. To the right of this cell note the cell with a black, right arrow and, to the right of it, H^2. This means we are to place a second neutron to the right of the proton column on the Graphic tab and label it '1-2', meaning it is the second neutron for element number '1', hydrogen. This completes the build for second hydrogen isotope, '1-2'. Now we can easily create the helium atom.

On the Itemized tab note row 17, the row that has the instructions to builds helium. This build requires only a single instruction row but you will note that the neutrons for the first and second hydrogen isotopes have been relabeled as neutrons for helium. This is due to the fact that these neutron designations will remain as such for the balance of the build chart.

Now we will add the (second) proton needed for helium. On the Itemized tab, in row 17 note that the next proton is to be placed next to the second neutron labeled and is labeled $\boxed{^2He}$. On the Graphic tab, this is noted as a '2' in the middle of the darker three-cell area under the bold '2-2' and 'He' labeled cells. This completes the build chart for helium, and completes the first atomic shell.

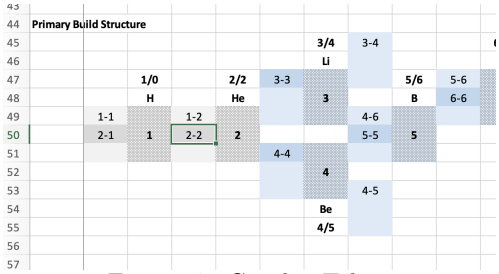
4.2 Lithium, Beryllium, and Boron

Now that we have completed the first shell containing hydrogen and helium, let's build the first three elements of the second shell. As you will see, the beginning of a shell is always a busy place! We will need refreshed illustrations for both tabs.



17	5	Helium	4	4.0026	1s	$1s^2$	99.9998%	2-2	1	←	He^1	^1H	→	He^2	^2He					
19	7	Lithium	7	6.94	2s	[He]$2s^1$	95%	3-4	5	↑	Li^3	^3Li	↑	Li^4						
21	9a	Beryllium	9	9.0122	2s	[He]$2s^2$ A	100%	4-5	7	↑	Li^3	^3Li	↑	--						
22	9b	Beryllium	9	9.0122	2s	[He]$2s^2$	100%	4-5	5	↓	Be^4	^4Be	↓	Be^5						
23	10	Beryllium	10		2s		trace	4-6	5	↓	Be^4	^4Be	↑	Be^6						
25	11a	Boron	10		2s		20%	5-5	9b	↓	Be^4	^4Be	↓	--						
26	11b	Boron	10		2s		20%	5-5	10	↓	Be^4	^4Be	↑	B^5	^5B					
27	12	Boron	11	10.81	2s	$2s^2 2p^1$	80%	5-6	5	↓	Be^4	^4Be	↑	B^5	^5B	↑	B^6			

Figure 16: Itemized Tab



44	Primary Build Structure																			
45									3/4	3-4										
46									Li											
47			1/0		2/2	3-3					5/6	5-6								
48			H		He		3				B	6-6								
49		1-1		1-2						4-6										
50		2-1	1	2-2	2					5-5	5									
51						4-4														
52							4													
53									4-5											
54									Be											
55									4/5											
56																				
57																				

Figure 17: Graphic Tab

Figure 18: Build Example Lithium to Boron

On the Itemized tab new shells are folded underneath the last shell. On the Graphic tab this is not so, each new shell continues from the last. To aide this fact on the Itemized tab, as noted in the Itemized tab box labeled 'A', the first two main element entries of the new shell contain a bracketed entry for the final element of the previous shell, in this case helium. The label [He2s^1] (on row 19) for lithium means it continues directly from helium and constitutes the first proton on sub-shell 's' in shell '2'. [1]On the Graphic tab, you will note that lithium goes 'up' from helium and constitutes the only element in sub-shell '1' of shell '2'. Also in box 'A' is the label [He2s^2] (on rows 21 and 22). This means that beryllium is the second proton in shell '2', sub-shell '2' and, on the Graphic tab, goes 'down' from helium.

Let's observe some neutron nomenclature for lithium and beryllium. From the itemized tab, on row 19, note that lithium contains three protons and four neutrons. In addition, on rows 21 and 22, beryllium contains four protons and five neutrons. This can be correlated on the Graphic tab by neutrons '3-3' and '3-4' for lithium and neutrons '4-4' and '4-5' for beryllium. Note that neutron '3-4' is offset from proton '3' up and over two cells and neutron '4-5' is offset from proton '4' down and over two cells. This offset is not structural and in nature the neutrons are not offset, rather they go directly next to their protons and in hydrogen and helium. But for visual purposes in building the chart, I have employed the offset for visual convenience.

Also note the difference in font for neutrons '3-3' and '3-4', and neutrons '4-4' and '4-5'. Neutrons '3-3' and 4-4' are in bold but '3-4' and 4-5' are not. The bold font indicates that these neutron are set and continue as such throughout the build. Neutrons '3-4' and '4-5' are not so and 'disappear' with the neutron positions remaining unused for additional elements. The fact that these neutron positions are left empty is noted on the Itemized tab in row '9a' for beryllium and '11a' for boron. In the build instructions for these two elements you'll note the '–' double-dash entries. These entries 'delete' the underlying neutrons and further build instructions for element do not replace them.

Beryllium isotope '4-6' places neutron '4-6' straddling protons '3' for lithium and '4' for beryllium with its two outer ineffective primes attaching to the two outer effective primes of the two protons. Boron then renames this neutron as '5-5' as noted in row '11b'.

4.3 A H^2O (Water) Molecule

A H^2O molecule (water) is made by adding two hydrogen atoms to oxygen. This is accomplished by adding each hydrogen atom at the top of the two neutrons used to preface lithium and beryllium. These are noted by the text-

[1]Please note that I did not invent this nomenclature.

arrows in the below figure. Note the join point noted by the circles showing that the effective prime of each proton is joined to the ineffective primes of the two neutrons. The two protons labeled '3' (lithium) and '4' (beryllium) push the two hydrogen atoms to the left, as noted by the green text-arrows.

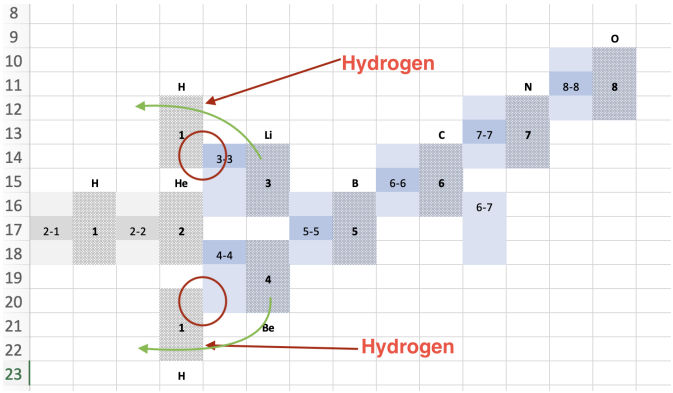


Figure 19: Water Molecule