01 The Pyramid Periodic Table

The Janet Periodic Table (first printed 1928) is also known as the Left Step Table. This table may be re-arranged as four square matrices. Each matrix is a different size.

If the cells of each matrix are represented as a cube (block), then the matrices may be stacked vertically to form a stepped pyramid with four “levels”. Each level represents a matrix. If each block represents a chemical element, then the stepped pyramid becomes a 3 dimensional Table of Elements. It may be called the “Pyramid Periodic Table”. It is also possible to view vertical sections cut through the pyramid to reveal “vertical relationships” of the elements.

Each element is associated with a single cube which has a “location” within the pyramid. Quantum numbers may be used to represent the location of an element within the pyramid. The atomic number of any element is related to the quantum numbers (and to the location of the element).

The Four Matrices;
The Janet table may be re-arranged as a set of four matrices. Each matrix is a different size. If the cells are represented as cubes or “blocks”, then the matrices may stack vertically with four core cells in alignment. The result appears as a stepped pyramid. Each cell represents a chemical element identified by atomic number (Z) shown as the upper number in each cell. Each matrix is identified by a “matrix number” (a) which is also a “level number” in the pyramid structure. An “orbital id” (e.g.; 1s, 2p, 3d, 4f) of the “most significant electron” is shown as the lower symbol in each cell. Some orbitals are shaded for easy recognition. The matrices are:

**Matrix; a = 1 (Top Level)**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1s</td>
<td>1s</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2s</td>
<td>2s</td>
</tr>
</tbody>
</table>

**Matrix; a = 2**

<table>
<thead>
<tr>
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<td>12</td>
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<tr>
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<td>3s</td>
<td>3s</td>
<td>2p</td>
</tr>
<tr>
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<td>19</td>
<td>20</td>
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<td>4s</td>
<td>4s</td>
<td>3p</td>
</tr>
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<tr>
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**Matrix; a = 3**

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</table>
**Bottom Level Matrix; \( a = 4 \)**

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<td>6p</td>
<td>7s</td>
<td>7s</td>
<td>6p</td>
<td>5d</td>
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</tr>
</tbody>
</table>

The central four “blocks” of any “level” are aligned vertically and form the “core” of the pyramid.

**Orbital Pairing;**

Orbitals are grouped to form “half square rings” arranged concentrically around the core in each matrix. Each orbital is contained within one half of a matrix (upper or lower half). Shaded and un-shaded elements highlight the orbitals. The orbitals are considered to be arranged in pairs, each pair are contained within the same matrix. The orbital pairs are:

- \((4f, 5f)\)
- \((5d, 6d)\)
- \((3d, 4d)\)
- \((6p, 7p)\)
- \((4p, 5p)\)
- \((2p, 3p)\)
- \((7s, 8s)\)
- \((5s, 6s)\)
- \((3s, 4s)\)
- \((1s, 2s)\)

A half matrix identifier \((m_a)\) identifies the upper half \((m_a = +\frac{1}{2})\) or the lower half \((m_a = -\frac{1}{2})\) of a matrix.
**The Quantum Numbers**;

The most significant electron is associated with four quantum numbers \((n, L, m_L, m_s)\) which are well defined in the literature;

- \(n\) is associated with radial distance from the nucleus; \(n = \text{range}; 1,8\)
- \(L\) is angular momentum; \(L = \text{range}; 0, (n-1)\) (This q.n. is not usually shown as a capital letter)
- \(m_L\) is magnetic moment associated with angular momentum; \(m_L = \text{range}; -L,0,+L\)
- \(m_s\) is magnetic moment associated with spin; \(m_s = \pm \frac{1}{2}\) (spin up, spin down)

A fifth quantum number \((s)\) represents the spin momentum of an electron; \(s = \frac{1}{2}\)

Spin momentum is usually omitted because it has the same value for all leptons (including all electrons).

**Location**;

Matrix numbers \((a,m_a)\) and quantum numbers \((L, m_s, m_L)\) also define the location of any “element” (cube) within the pyramid. The three quantum numbers are also location numbers. Location is identified by; level \((a)\), upper-lower half levels \((m_a)\), left-right half levels \((m_s)\), square ring \((L)\), and displacement from diagonal \((m_L)\).

The principal quantum number \((n)\) may be calculated as; \(n = 2a + m_a - L - s\)

\((n + L + s) = (a + a + m_a)\)

Giving; sum of quantum numbers = sum of matrix numbers

**Level Number**;

A matrix number \((a)\) identifies a level within the pyramid.

**Half Matrix (Upper, Lower)**;

A half matrix number \((m_a)\) identifies the upper half \((m_a = +\frac{1}{2})\) or the lower half \((m_a = -\frac{1}{2})\) of a matrix.

**Half Matrix (Left, Right)**;

A half matrix number \((m_s)\) identifies the left half \((m_s = \frac{1}{2})\) or the right half \((m_s = -\frac{1}{2})\) of a matrix.

**Square Rings**; Quantum number ‘\(L\)’ gives the ring number

A matrix is composed of a 2x2 “core” surrounded by concentric “square rings”. The core and each ring are identified by the ring number \((L)\);

\[ L = 0,1,2,3 = s,p,d,f \]
The core is; \( L = 0 = s \) (not to be confused with q.n. ‘s’)

**Displacement:** Quantum number \( m_L \) gives the displacement (clockwise or counterclockwise) within any ring from the diagonal (from the nearest corner cube). Each cell is identified by a “displacement number” \( (m_L) \);

- If the cube lies on a major diagonal then; \( m_L = 0 \)
- If \( m_L \) is positive the direction is clockwise (upper half)
- If \( m_L \) is negative the direction is counter-clockwise (upper half)
- Displacement rotations are reversed in the lower half.

The location of each element within the pyramid table may be represented by a “Location Matrix”;

\[
\begin{array}{ccc}
  a & L & s \\
  m_a & m_L & m_S \\
\end{array}
\]

**The Atomic Number;**

Each chemical element can be represented by an atomic number \( (Z) \) giving the number of protons in the nucleus.

Atomic number can be calculated from the quantum numbers and the matrix numbers. It may be represented as the sum of two parts; one part is associated with charge and mass \((Z_p)\) and the other part includes “magnetic moment” \((Z_m)\);

\[
Z = Z_p + Z_m
\]

Each part is the sum of three components \((a,L,s)\);

\[
Z_p = Z_{pa} + Z_{pl} + Z_{ps} \\
Z_m = Z_{ma} + Z_{ml} + Z_{ms}
\]

The components are defined as;

\[
Z_{pa} = (4/3)a(a+\frac{1}{2})(a+1) \\
Z_{ma} = -2a^2(m_a+\frac{1}{2}) \\
Z_{pl} = -2L(L+\frac{1}{2}) \\
Z_{ml} = m_L \\
Z_{ps} = s-\frac{1}{2} = 0 \\
Z_{ms} = -2(s+L)(m_s+\frac{1}{2})
\]

**Calculations of Location;**

The following examples are calculations of location for oxygen, copper, yttrium, and lead.

**Oxygen;** \( Z = 8 \)

Location Matrix;

\[
\begin{array}{ccc}
  2 & 1 & \frac{1}{2} \\
  +\frac{1}{2} & -1 & -\frac{1}{2} \\
\end{array}
\]
Location; Level Two; \( a = 2 \)

Upper half; \( m_a = +\frac{1}{2} \)

Outermost ring; \( L = 1 \)

Displacement one cell left of diagonal; \( m_L = -1 \)

Right half of matrix \( (m_s = -\frac{1}{2}) \)

Atomic Number Components;

\[
Z_{pa} = \frac{4}{3}a(a+\frac{1}{2})(a+1) = \frac{4}{3}(5)(2+1) = 20
\]

\[
Z_{pl} = -2L(L+\frac{1}{2}) = -2(1)(1+\frac{1}{2}) = -3
\]

\[
Z_{ps} = s-\frac{1}{2} = 0
\]

\[
Z_{ma} = -2a^2(m_s+\frac{1}{2}) = -2(4)(\frac{1}{2}+\frac{1}{2}) = -8
\]

\[
Z_{ml} = m_L = -1
\]

\[
Z_{ms} = -2(s+L)(m_s+\frac{1}{2}) = -2(\frac{1}{2}+1)(-\frac{1}{2}+\frac{1}{2}) = 0
\]

\[
Z_p = Z_{pa} + Z_{pl} + Z_{ps} = 20 - 3 + 0 = 17
\]

\[
Z_m = Z_{ma} + Z_{ml} + Z_{ms} = -8 - 1 + 0 = -9
\]

\[
Z = Z_p + Z_m = 17 - 9 = 8 \text{ (oxygen)}
\]

**Copper;** \( Z = 29 \)

Location Matrix;

\[
\begin{array}{ccc}
3 & 2 & \frac{1}{2} \\
+\frac{1}{2} & +1 & -\frac{1}{2}
\end{array}
\]

Location; Level Three; \( a = 3 \)

Ring; \( L = 2 \)

Upper half; \( m_a = +\frac{1}{2} \)

Off diagonal \( m_L = +1 \)

Right half; \( m_s = -\frac{1}{2} \)
Atomic Components;

\[
Z_{pa} = \frac{4}{3}a(a+\frac{1}{2})(a+1) = \frac{4}{3}(3)(3+\frac{1}{2})(3+1) = 56
\]

\[
Z_{pl} = -2L(L+\frac{1}{2}) = -2(2)(2+\frac{1}{2}) = -10
\]

\[
Z_{ps} = s-\frac{1}{2} = 0
\]

\[
Z_{ma} = -2a^2(m_a+\frac{1}{2}) = -2(9)(\frac{1}{2}+\frac{1}{2}) = -18
\]

\[
Z_{ml} = m_l = 1
\]

\[
Z_{mS} = -2(s+L)(m_s+\frac{1}{2}) = -2(\frac{1}{2}+1)(-\frac{1}{2}+\frac{1}{2}) = 0
\]

\[
Z_p = Z_{pa} + Z_{pl} + Z_{ps} = 56 - 10 + 0 = 46
\]

\[
Z_m = Z_{ma} + Z_{ml} + Z_{mS} = -18 + 1 + 0 = -17
\]

\[
Z = Z_p + Z_m = 46 - 17 = 29 \text{ (Copper)}
\]

Yttrium;  \(Z = 39\)

Location Matrix;

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>½</th>
</tr>
</thead>
<tbody>
<tr>
<td>-½</td>
<td>-2</td>
<td>+½</td>
</tr>
</tbody>
</table>

Location;  Level Three;  \(a = 3\)

Ring;  \(L = 2\)

Lower half;  \(m_a = -\frac{1}{2}\)

Off diagonal  \(m_l = -2\)

Left half;  \(m_s = ½\)

Atomic Components;

\[
Z_{pa} = \frac{4}{3}a(a+\frac{1}{2})(a+1) = \frac{4}{3}(3)(3+\frac{1}{2})(3+1) = 56
\]

\[
Z_{pl} = -2L(L+\frac{1}{2}) = -2(2)(2+\frac{1}{2}) = -10
\]

\[
Z_{ps} = s-\frac{1}{2} = 0
\]

\[
Z_{ma} = -2a^2(m_a+\frac{1}{2}) = -2(9)(\frac{1}{2}+\frac{1}{2}) = 0
\]

\[
Z_{ml} = m_l = -2
\]

\[
Z_{mS} = -2(s+L)(m_s+\frac{1}{2}) = -2(\frac{1}{2}+2)(\frac{1}{2}+\frac{1}{2}) = -5
\]
The Pyramid Periodic Table

\[ Z_p = Z_{pa} + Z_{pl} + Z_{pS} = 56 - 10 + 0 = 46 \]
\[ Z_m = Z_{ma} + Z_{ml} + Z_{mS} = 0 - 2 - 5 = -7 \]
\[ Z = Z_p + Z_m = 46 - 7 = 39 \text{ (Yttrium)} \]

**Lead; \( Z = 82 \)**

Location Matrix:
\[
\begin{array}{ccc}
4 & 1 & \frac{1}{2} \\
+\frac{1}{2} & 0 & +\frac{1}{2} \\
\end{array}
\]

Location; Level Four; \( a = 4 \)

Ring; \( L = 1 \)

Upper half; \( m_a = +\frac{1}{2} \)

On diagonal \( m_L = 0 \)

Left half; \( m_s = \frac{1}{2} \)

Atomic Components;
\[ Z_{pa} = \frac{4}{3}a(a+\frac{1}{2})(a+1) = \frac{4}{3}(18)(4+1) = 120 \]
\[ Z_{pl} = -2L(L+\frac{1}{2}) = -2(1)(1+\frac{1}{2}) = -3 \]
\[ Z_{pS} = s-\frac{1}{2} = 0 \]
\[ Z_{ma} = -2a^2(m_a+\frac{1}{2}) = -2(16)(\frac{1}{2}+\frac{1}{2}) = -32 \]
\[ Z_{ml} = m_L = 0 \]
\[ Z_{mS} = -2(s+L)(m_s+\frac{1}{2}) = -2(\frac{1}{2}+1)(\frac{1}{2}+\frac{1}{2}) = -3 \]
\[ Z_p = Z_{pa} + Z_{pl} + Z_{pS} = 120 - 3 + 0 = 117 \]
\[ Z_m = Z_{ma} + Z_{ml} + Z_{mS} = -32 + 0 - 3 = -35 \]
\[ Z = Z_p + Z_m = 117 - 35 = 82 \text{ (Lead)} \]

**Slicing;**

The 3D table resembles a stepped pyramid.

Vertical slices through the structure reveal vertical relationships between the elements. Major slicing reveals all four “levels” of the structure. Minor slicing does not account for all levels and also reveals vertical relationships. Two major slices are shown below;
Major East-West Slice (View Northward):

<table>
<thead>
<tr>
<th></th>
<th>1s</th>
<th>2s</th>
<th>3d</th>
<th>4f</th>
<th>5d</th>
<th>6p</th>
<th>7s</th>
<th>8s</th>
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Major Diagonal Slice (“North-West” View):

<table>
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<tr>
<th></th>
<th>1s</th>
<th>2s</th>
<th>3d</th>
<th>4f</th>
<th>5d</th>
<th>6p</th>
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Janet (Left Step) Periodic Table;

The Janet PT is displayed below in two parts (A,B). Each cell represents a chemical element represented by the atomic number (Z), shown as the lower number. A cell also contains the “orbital” (nL) of the most significant electron, shown as the upper number.

The Janet Periodic Table (Part A):
The Pyramid Periodic Table

Each row has a common sum (n+L) of quantum numbers.

Where; $L = 0,1,2,3 = s,p,d,f$

$n = 1......8$

**The Janet Periodic Table (Part B):**

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Conclusion;

The Periodic Table may be represented in 3D as a stepped pyramid having four levels. This is a series of four square matrices. The matrices have different sizes. Each element is precisely located by quantum numbers of the most significant electron. Relationships of the elements may also be revealed by vertical slicing.