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Explaining the formation of the 36 smallest known atomic isotopes: from hydrogen to krypton

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Abstract

This work presents a novel approach to understanding the formation and structure of the 36 smallest known atomic isotopes, ranging from hydrogen to krypton, through the lens of the KUPT model. Focusing on the Small Known Isotope (SKI) of each atom, this study meticulously examines the distribution of protons across five nuclear layers (1E, 2T, 3T, 4E, and 4C), constructing a proton tree that spans from hydrogen to krypton atoms. With the aid of Artificial Intelligence, specifically Chat GPT-4, an in-depth analysis was conducted for each atom within the KUPT model framework. This process involved defining minimum stability rules for the nuclear structure, particularly regarding neutron inclusion, across the model's first five layers. Remarkably, in 35 out of 36 cases, the KUPT model's predictions aligned perfectly with the SKI data, underscoring the model's accuracy and reliability. However, an intriguing discrepancy emerged in the case of the Gallium atom (^{62}Ga), suggesting the possible existence of an unknown, lighter isotope with two or three fewer protons (^{59}Ga or ^{60}Ga). This discrepancy not only highlights the KUPT model's predictive capability but also points to a fertile ground for further experimental investigation, aiming to uncover potentially undiscovered isotope forms of Gallium.

Keywords: nuclear force, proton, neutron, atom isotopes, Kepler Ulianov proton tree

Introduction

The pursuit of understanding atomic structure and formation has led to numerous models and theories, each providing unique insights into the fundamental building blocks of matter. This paper introduces the KUPT model, a novel conceptual framework designed to explain the formation and structure of the smallest known atomic isotopes, from hydrogen to krypton. Through the adoption of simple, yet effective rules, the KUPT model demystifies the complex interactions between protons and neutrons within the atom's nucleus.

Theoretical bases

The Ulianov theory

The Ulianov Theory (UT)[1] integrates digital concepts of space and time, alongside innovative theoretical physics, drawing inspiration from computer games and the science works of Isaac Asimov.[2] This theory is comprised of four main components:

Ulianov spheres network (USN) model: This model establishes a digital, Euclidean space-time through a kind of crystal spheres (named as Planck Ulianov Spheres-PUS, where all sphere parameters assuming Planck values), that can be grouped in a lager 4D spheres (PUSs) network, that can be seem as one ocean of perfect liquid,[3] submitted to a very high pressure (Planck pressure of 10^{113} Pascal). The USN model,[4] propose a discrete space time fabric[5] that lays the groundwork for understanding the universe's structure in a quantized manner. It can be used to deduced Newton Laws of gravitation and inertia ($F = ma$) and also the Schwarzschild equation that in UTS model affect the value of Planck length and Planck time near to the black holes event horizon.[6] It also demonstrate that LIGO detector can't see Planck length variations caused by Gravitational Waves (GW) arriving[7] and prose the Witte- Ulianov Time Interferometer, a true GW detector, that can measure the Planck time variations caused by GW arriving[8] using sets of atomic clocks or laser sources, as time references.

Ulianov String Theory (UST): Suggests that the collapse of imaginary time converts a 5D point-like particle (5D PUS) into a 4D string. These strings, visualized as sequences of small 4D spheres (4D PUSs), that can be wrapped in membranes and adopt various shapes (for example: circles, cylinders, spheres, shells and caps), reflecting the diverse properties and behaviors of particles within this theoretical framework.[9] UST can also explain that the proton change its radii[10] when form hydrogen and muonic hydrogen.[11]

Small bang model: Derived from USN and UST, this cosmological model describes the universe's origin as an expansion from a single PUS, leading to the creation of virtual micro black hole pairs. This model explains the formation of supermassive black holes and the large-scale structure of the universe,[12] including dark matter's origin.[13] It also can solve the antimatter enigma.[14]

The Ulianov atomic model (UAM): Applies the concepts of UST within the USN spacetime to model the formation of protons, electrons, and neutrons, introducing the Strong Gravitational Contact Force (SGCF) for nuclear structure. This leads to the conceptualization of the Kepler Ulianov Proton Tree (KUPT), which elucidates the control of electronic layers by protons. UAM's insights into atomic functions pave the way for precise theoretical calculations and practical applications, such as hydrogen fusion reactors and room-temperature superconductors. By combining these components, the Ulianov Theory offers a comprehensive and innovative framework that has the potential to revolutionize our understanding of the universe, from its smallest constituents to its largest structures.

The Ulianov proton

Within the Ulianov Atom Model (UAM), the proton's formatin[9,15] is conceptualized uniquely, arising from the collision of two high-energy photons, leading to the creation of a proton-antiproton pair. This conceptualization presents the proton as having positive temporal velocity, moving it forward in time, while the antiproton moves backward, an interesting aspect that doesn't affect observable phenomena but highlights a novel interpretation of antimatter. The proton, in this model, is seen as a "photon frozen in space," where its mass doesn't traverse space but rotates within its structure. This rotation translates the linear kinetic energy of a photon into the proton's rotational kinetic energy, contributing to the model's description of matter particles.

The Ulianov Proton is further detailed through its spherical structure, envisioned as comprised of concentric layers akin to an onion, where each layer is formed from the self-rotation of semicircular strings. This model not only offers a fresh perspective on the proton's mass and charge distribution but also introduces the concept of Strong Gravitational Contact Force (SGCF), which facilitates a deeper understanding of nuclear structures. The UAM's depiction of protons (and by extension, other subatomic particles) underscores a fundamental rethinking of their nature and interactions, leveraging the digital, quantized spacetime fabric posited by the Ulianov Spheres Network (USN) Model. It beautifully ties into the broader framework of the Ulianov Theory, providing a cohesive narrative that challenges and expands upon traditional quantum mechanics and general relativity theories.

Figure 1 illustrates the proton model's stages, from initial photon collision to the formation of a complex, layered spherical structure. This visualization aids in comprehending the intricate processes proposed by the UAM, highlighting the innovative approach to understanding the universe's fundamental building blocks. By abstracting the detailed mathematical formulations, this revised section aims to make the profound and complex ideas of the Ulianov Proton more accessible, focusing on conceptual understandings rather than the intricacies of the calculations involved. A foundational concept of KUPT in the Ulianov Atom Model is the emergence of the Strong Gravitational Contact Force (SGCF) contingent on the direct contact between two masses. While forming a Ulianov Proton Burger (UPB), as presented in Figure 2, from a pair of protons within a helium nucleus is relatively straightforward, the complexity significantly increases for larger atomic nuclei, such as tin with 50 protons. Notably, in the UPB configuration, the mass of the proton is obscured, a characteristic that persists even with the addition of a neutron. For arrangements involving three or four protons, structures known as Ulianov Proton Pogo-Ball (UPPB) or Ulianov Proton Dumbbell (UPD) are required, as depicted in Figure 3. Thus, the 50 protons in a tin nucleus can be organized into four strands emanating from a tetrahedron's vertices, akin to a methane molecule (CH4), as illustrated in Figure 4. This arrangement forms the basis for constructing any atomic nucleus within the Ulianov Atomic Model and dictates the minimum number of protons required for nuclear stab.

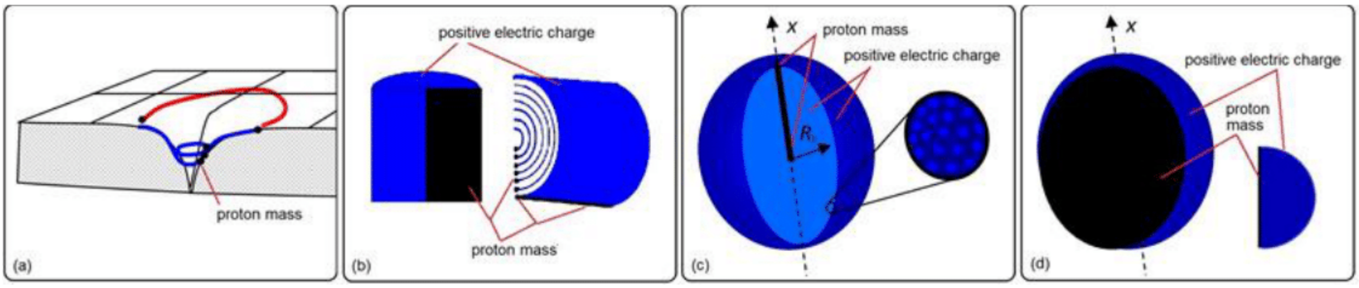

Figure 1 The Ulianov Proton Model visualized in stages. (a) Illustrates how the proton's mass influences spacetime curvature, leading to the coiling of its constituent strings. This coiling process contributes to a cyclical increase in mass, showcasing a dynamic interplay between mass and space time deformation. (b) Renders the proton as an assembly of concentric cylindrical layers, each segment representing a halved mass-containing string, symbolizing the proton's structured mass distribution. (c) Presents the proton as a densely packed sphere, with its electrical charge organized in discrete, onion-like shells, offering a visual analogy to its layered internal structure. (d) Depicts the proton's electrical charges distributed over the space as a spherical cap, emphasizing the mass's localization within a thin, circular region at the proton's periphery, constrained to a thickness of one Planck length, highlighting the proton's compact and efficient mass organization. This figure encapsulates the Ulianov Proton Model's key features, bridging complex theoretical concepts with intuitive visual representations.

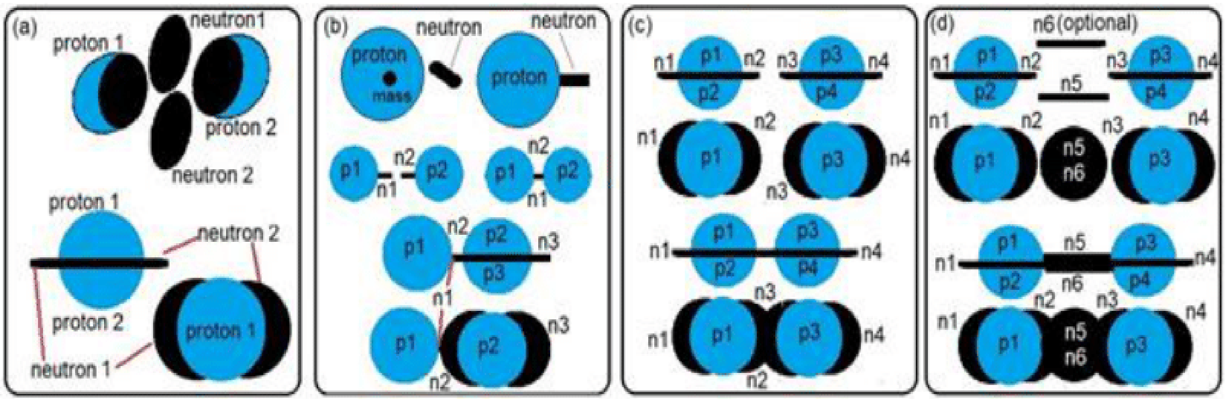

Figure 2 Nuclear proton connections: (a) Ulianov proton pogo-ball (UPPB) structure connecting two protons via two side-by-side neutrons forming a pogo-ball. (b) Ulianov Proton Dumbbell (UPD) structure integrates a neutron within the proton mass, connecting another proton-neutron pair to form a dumbbell. (c) Weak connection between two UPPBs. (d) Strong connection between two UPPBs using 5 to 6 neutrons for stabilizing four protons.

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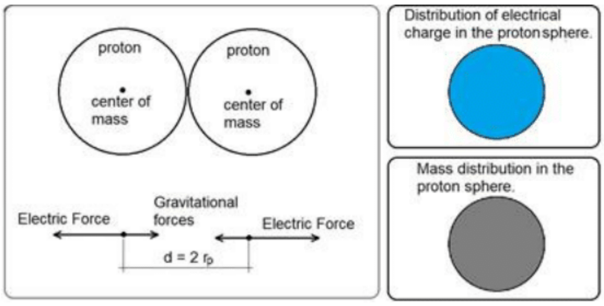

Figure 3 Simplified visualization of two protons in a helium nucleus, highlighting the predominance of electrical repulsion over gravitational attraction. Neutrons are omitted for clarity.

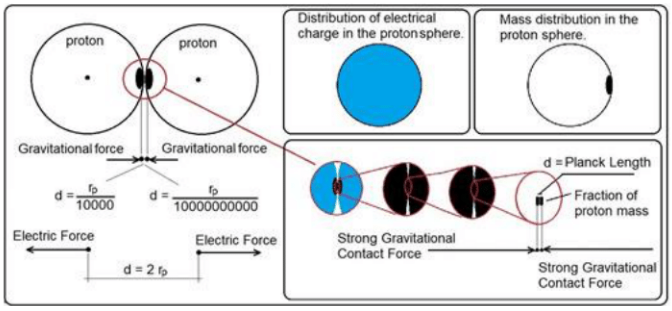

Figure 4 Model of two protons within a helium nucleus with non-uniform mass distribution, demonstrating increased gravitational attraction due to direct mass contact.

The strong gravitational contact force

The discovery of the proton by Ernest Rutherford in 1919 posed a fundamental question in atomic physics: How do positively charged protons coalesce within an atomic nucleus despite their mutual electrical repulsion? Traditional explanations rely on the weak gravitational attraction between protons, deemed insufficient against their electrical repulsion. This discrepancy stems from the assumption of uniform mass and charge distribution within protons. The Ulianov Atom Model challenges this notion by positing that if the proton's mass is non-uniformly distributed, specifically concentrated in certain surface regions, the interaction dynamics among protons change fundamentally. This model introduces the concept of the Strong Gravitational Contact Force (SGCF), a force. That becomes significant when fractions of proton masses come into direct contact at Planck-scale distances. This direct contact markedly enhances gravitational attraction, offering a simpler explanation for the cohesion of atomic nuclei beyond traditional nuclear force models. Moreover, the model conceptualizes the nucleus structure as a Ulianov Proton Burger (UPB), where protons act as the "buns" and neutrons as the "cheese." This metaphor illustrates how significant portions of each proton's mass come into direct Planck-scale contact, generating the SGCF:

$$F_{SGC} = \frac{M^2 protonG}{L^2 P}$$
$$F_{SGC} = 714,794.02N$$

where ^{m}proton is the proton mass, G is the gravitational constant, and LP is the Planck length. This SGCF is orders of magnitude stronger than the electrical repulsion between protons, but its influence is highly localized, diminishing rapidly beyond a few Planck lengths of separation. This principle provides a foundational understanding of nuclear cohesion that is simpler and more intuitive than complex inter-nuclear force models. The SGCF's efficacy at close ranges yet its negligible effect at larger scales due to electrical repulsion highlights its critical but subtle role in the structure of matter. In essence, the Ulianov Atom Model, through the lens of SGCF, offers a novel perspective on the forces governing atomic nuclei. This insight not only simplifies our understanding of nuclear physics but also opens new avenues for exploring atomic structure and stability.

Configuration and stability across layers

Central to the KUPT model is the delineation of nuclear structure into layers, each characterized by specific proton arrangements and neutron inclusion rules, leading to stable atomic configurations. This section summarizes the core aspects of each layer and the model's implications for atomic stability:

The foundational layer (1E) serves as the nucleus's core, with subsequent layers (2T, 3T, 4E, 4C, 5E, 5C, 6D, 7D) building upon this base to accommodate an increasing number of protons, following geometric principles inspired by the Platonic solids.

Neutrons play a critical role in stabilizing these proton arrangements, with the model specifying the minimum neutron numbers required for nuclear stability across various atomic numbers, up to the heaviest known atoms.

The concept of the Strong Gravitational Contact Force (SGCF) introduced in earlier sections underpins the KUPT model's explanation for the cohesion of protons within the nucleus despite their electrical repulsion.

Noble gas stability and atomic interactions

A unique feature of the KUPT model is its prediction of noble gas configurations as endpoints of each layer's completion, signifying maximum nuclear stability. These configurations align with known noble gases in the periodic table, validating the model's approach to understanding atomic structure:

A. Completion of layer configurations results in atomic structures with maximum stability, corresponding to noble gases like Helium (He), Neon (Ne), Argon (Ar), Krypton (Kr), Xenon (Xe), Radon (Rn), and Oganesson (Og).

B. The model suggests a direct correlation between the structured layer completion and the emergence of noble gas stability, providing insights into the periodic table's organization and the behavior of elements.

Table 1 presents the complete proton distribution across each of the seven layers in the KUPT model, resulting in the formation of the seven noble gases. In these nucleon configurations, all corresponding electrons are "closed" (with electron masses hidden and not available for SGCF connections), meaning these atoms cannot connect with other atoms and, therefore, cannot participate in chemical reactions.

Table 1 KUPT distribution for noble gases

Number	Atom	Symbol	KUPT proton distribution
2	Helium	He	$1E^2$
10	Neon	Ne	$1E^2$, $2T^8$
18	Argon	Ar	$1E^2$, $2T^8$, $3T^8$
36	Krypton	Kr	$1E^2$, $2T^8$, $3T^8$, $4E^2$, $4C^{16}$
54	Xenon	Xe	$1E^2$, $2T^8$, $3T^8$, $4E^2$, $4C^{16}$, $5E^2$, $5C^{16}$
86	Radon	Rn	$1E^2$, $2T^8$, $3T^8$, $4E^2$, $4C^{16}$, $5E^2$, $5C^{16}$, $6D^{32}$
118	Oganesson	Og	$1E^2$, $2T^8$, $3T^8$, $4E^2$, $4C^{16}$, $5E^2$, $5C^{16}$, $6D^{32}$, $7D^{32}$

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Implications for atomic and molecular structure

While the KUPT model primarily focuses on the nuclear structure, its principles extend to explaining electron configurations[16] and molecular formation, suggesting a unified framework for understanding atomic and molecular physics. However, given the focus of this article on the KUPT model's nuclear aspects, detailed discussions on electron behavior and molecular formations, such as hydrogen molecule formation and the structure of methane, are beyond the scope of this overview. The KUPT model's comprehensive approach to detailing nuclear structure through geometric principles and the interplay of protons and neutrons offers significant insights into the fundamental nature of atoms. Its alignment with empirical data and the predictive power regarding noble gas configurations underscore its potential to enhance our understanding of atomic structure and stability. The model also points to the fact that the maximum number of protons that can be accommodated in a 7-layer KUPT is equal to 118 protons, which represents the Oganesson atom that according to the UT model, is the heaviest atom that can exist in our universe.

In the exploration of atomic structures through the lens of the KUPT model, Figure 5 & 6 serve as paramount illustrations, bringing to life the intricate organization of protons and neutrons within an atom's nucleus. Figure 7 delves into the structural complexity of a Tin atom, elucidating the role of central and peripheral nucleons in forming stable and potentially isotope configurations. This visualization underscores the KUPT model's capability to account for atomic diversity with remarkable precision. For didactic reasons, in this figure Tim's central nucleus was represented as having only 2 protons (in reality there are 6 protons) as the real model would make the drawing very complex and difficult to understand. Meanwhile, Figure 8 presented the seven KUPT layers, with each layer related to one Platonic solid and composing one noble gas atomic nucleon. On this way KUPT model transcends mere atomic representation to evoke a deeper connection with Johannes Kepler's geometric harmony, encapsulating the essence of atomic structure within the symmetrical beauty of Platonic solids. These figures not only highlight the model's adherence to empirical observations but also its philosophical alignment with historical notions of cosmic order, something that was idealized by Kepler as being related to the organization of the planets in the solar system, but in fact, is now being found, for the first time, in the depths of matter, within the organization of protons in the atomic nucleus and dictating the behavior of electrons in the electro sphere, embodying a fusion of scientific insight and aesthetic contemplation.

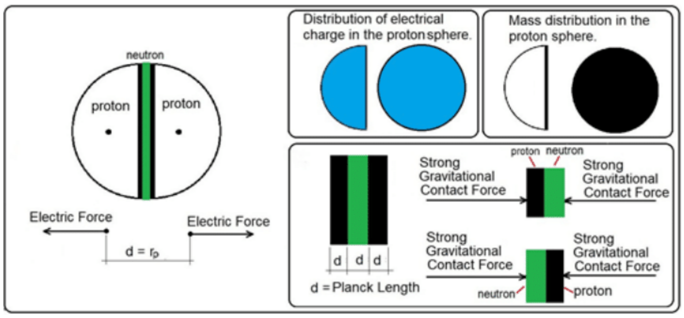

Figure 5 The Ulianov Proton Burger model: a conceptual representation of the helium nucleus, with protons and a neutron interacting to form a stable configuration, illustrating the principle of SGCF.

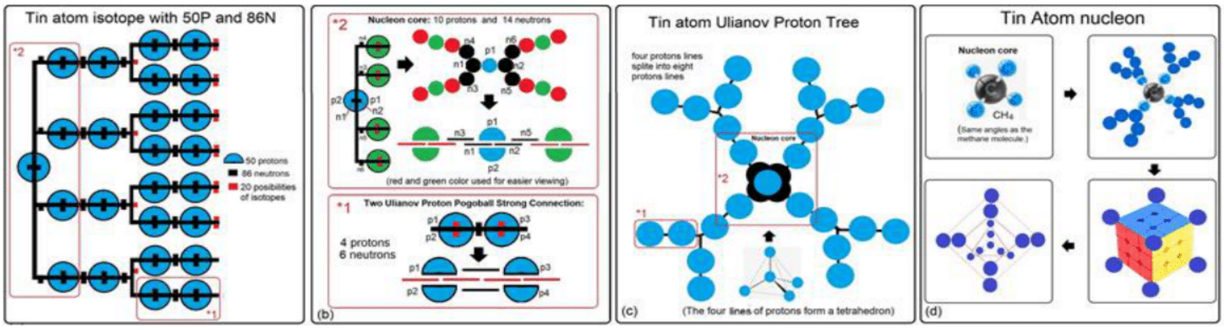

Figure 6 The Kepler Ulianov proton tree for a tin atom, comprising 50 protons (blue semi circles) and 86 neutrons (black squares) and also adding 16 unnecessary neutrons (red squares) to form some isotopes. A central UPPB (CUPPB) is linked to four UPPB lines, establishing a tetrahedral structure within the nucleus. The figure illustrates the structural variations and connections pivotal to the nucleus assembly in the Ulianov atomic model. This figure contains a small error, made intentionally to facilitate the explanation of CUPPB, which for the Tin atom, actually has 6 protons instead of the 2 presented in the figure.

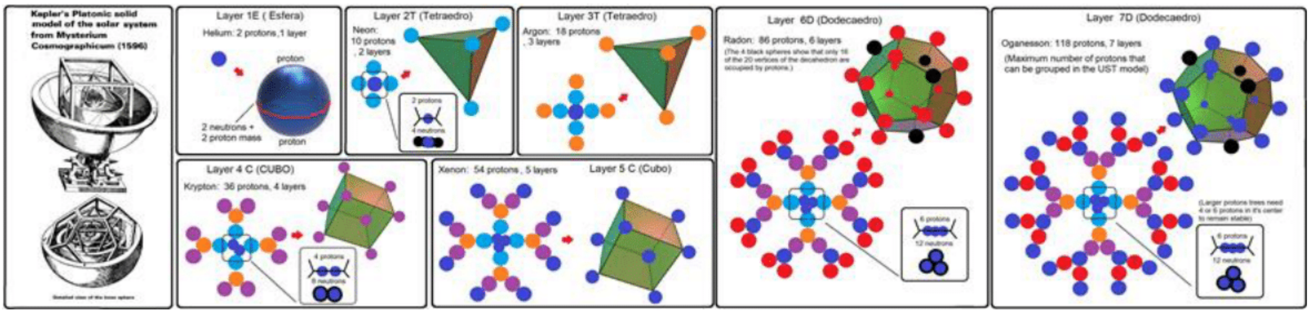

Figure 7 The Kepler Ulianov proton tree showcasing the seven possible layer configurations: $1E^2$ (Esfera - 2 protons); $2T^8$ (Tetraedro - 4 vertices - 8 protons); $3T^8$; $4E^2$ and $4C^{16}$ (Cube - 8 vertices, 16 protons); $5E^2$ and $5C^{16}$; $6D^{32}$ (Dodecaedro - 20 vertices - 32 protons); $7D^{32}$. This visual representation aligns with Johannes Kepler's geometric models, merging historical insights with modern atomic theory to illustrate the organized complexity of atomic nuclei. The figure integrates Kepler's geometric drawings (tetrahedron within a square and a square within a dodecahedron), demonstrating remarkable parallels with the layered proton arrangements in KUPT (representing protons), and supporting columns (representing neutrons). It highlights the necessity for a robust foundation as the structure (atom nucleon) becomes taller and more intricate.

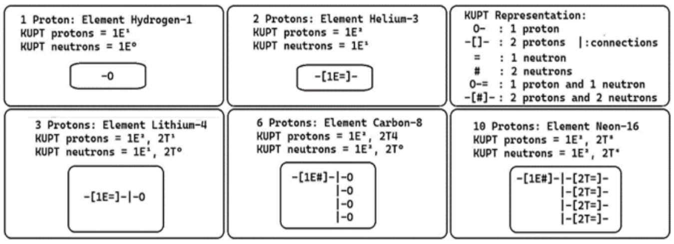

Figure 8 The elements at KUPT layers 1E and 2T, with the minimum number of neutrons to be stable. It's also the small isotope know of each element.

KUPT model overview

The Kepler Ulianov Proton Tree (KUPT) model, a cornerstone of the Ulianov Atom Model, systematically organizes atomic nuclei into seven distinct layers, each potentially comprising four types of geometric shapes. This arrangement not only mirrors the electron distribution around the nucleus but also provides a detailed blueprint for the positioning of protons within the nucleus. Here's an outline of the layers and their proton capacities:

a. **Layer E (Esfera):** Accommodates 1 or 2 protons.

b. **Layer T (Tetraedro):** Houses 1 to 8 protons.

c. **Layer C (Cubo):** Can contain 1 to 16 protons.

d. **Layer D (Dodecaedro):** Supports 1 to 32 protons.

The KUPT model introduces a methodical approach for documenting the proton arrangement in the atomic nucleus by indicating the position of the most recently added proton. This is achieved through a notation that specifies the quantity of protons in each layer. For instance, the nucleon structure of Oganesson, the heaviest atom accommodated by the KUPT model, utilizes all available layers:

Oganesson proton KUPT distribution = $1E^2$, $2T^8$, $3T^8$, $4E^2$, $4C^{16}$, $5E^2$, $5C^{16}$, $6D^{32}$, $7D^{32}$ = 118 protons. To avoid confusion with other scientific notations, layers are labeled with the initial 'E' for 'Esfera' instead of 'S' for 'Sphere', ensuring clarity in distinguishing KUPT's nomenclature from Pauling's electron shell notation. Spanning nine hierarchical levels (1E, 2T, 3T, 4E, 4C, 5E, 5C, 6D, and 7D), the model meticulously outlines the proton distribution across the 118 atomic nucleus. Through this geometrically inspired organization, KUPT sheds light on the nuanced arrangement of protons and neutrons, enhancing our understanding of atomic stability and nuclear phenomena.

Building the nucleons in the KUPT model

The KUPT model's principles can be insight fully illustrated through an analogy with skyscraper construction. This analogy aids in visualizing the stepwise addition of floors (representing nuclear atomic layers), rooms. Imagine beginning with a simple structure: a single-floor building with one room. As the need arises for more rooms, the building expands horizontally until space constraints necessitate vertical growth adding new floors. While adding rooms keeps the building's base unchanged, introducing new floors necessitates a broader foundation. This building is akin to an inverted pyramid with 7 floors, outlined in the KUPT model as follows: Floor 1E = 2 rooms, Floors 2T to 3T = 8 rooms each, Floors 4T to 5T = 16 rooms each, and Floors 6D to 7D = 32 rooms each. Additionally, to accommodate further expansion within the foundational floor's capacity, additional rooms are denoted as 4E (two rooms) and 5E (two rooms). Thus, while the building's structural blueprint is predetermined, the task remains to determine the requisite number of base pillars and floor columns. This aspect, especially as floors multiply, demands that the foundational columns be reinforced. Translating this into atomic terms, deciding on the number of pillars (base neutrons) and columns (layer- specific neutrons) necessary to maintain the atomic nucleon structure's stability parallels the task of a structural engineer. This conceptual framework serves to demystify how the KUPT model systematically accounts for the necessary neutrons to ensure the stability of the atomic nucleus across its layers, each populated by a defined number of protons.

Layer 1E (esfera): the foundation

Within the Kepler Ulianov Proton Tree (KUPT) model, the foundational layer, labeled 1E, (Esfera) establishes the essential groundwork of the atomic structure. This layer is critical as it sets the initial conditions for atomic stability and outlines the configuration for the subsequent addition of protons and neutrons to construct the nucleus.

Minimal and maximal configurations

a) **Minimal 1E Configuration:** At its inception, the 1E layer consists solely of a single proton, symbolizing the hydrogen atom- the simplest form of matter. This configuration does not necessitate the inclusion of neutrons for stability.

b) **Maximal 1E Configuration:** The introduction of a second proton evolves the structure into helium, necessitating the minimum of one neutron to counterbalance electrostatic repulsion. This marks the formation of an UPB (Ulianov Proton Burger), as illustrated in Figure 9 with protons bonded by the Strong Gravitational Contact Force.

Rules for neutron support

The neutron incorporation guidelines within the 1E layer, essential for maintaining stability as the atomic structure evolves, are delineated as follows:

A. **Hydrogen (N protons = 1):** The atomic structure at its most basic, requiring no neutron support (N neutrons 1E = 0).

B. **Helium to Boron (N protons = 2 to N protons = 5):** These initial atomic configurations require minimal neutron support (N neutrons = 1), reflecting the foundational phase of atomic assembly.

C. **Carbon to Neon (N protons = 6 to N protons = 10):** This phase maintains stability without additional neutrons (N neutrons 1E = 2), underscoring the foundational layer's capacity to underpin early atomic expansion. The completion of the 2T layer and the ensuing formation of a new 3T layer necessitate a reinforced 1E base.

D. **Sodium to Magnesium (N protons = 11 to N protons = 12):** Representing a transitional stage heralding the inception of the 3T layer, this phase demands intermediate neutron support (N neutrons 1E = 3) to accommodate increasing structural complexity.

E. **Aluminum to Vanadium (N protons = 13 to N protons = 23):** The atomic edifice's expansion, incorporating an additional 3T protonic layer, mandates a robust neutron infrastructure (N neutrons 1E

F. = 4).

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G. **Chromium to Krypton (N protons = 24 to N protons = 36):** This stage necessitates a larger neutron framework (N neutrons 1E = 5), critical as the nucleus assimilates layers 4E and 4C.

H. **Copper to Selenium (N protons = 29 to N protons = 34):** An observable anomaly, not entirely elucidated by the model, occurs within these atoms. A reduction in required neutrons (N neutrons 1E = 4) may stem from enhanced proton distribution symmetry within the 4C layer, imparting stability to these atomic nuclei and permitting a decrease in the 1E layer's neutron count. Moreover, neutrons in the KUPT model foster stronger structural integrity when paired, suggesting that a nucleus with greater symmetry may achieve stability with fewer neutrons.

The deliberate organization of protons and neutrons within the 1E layer lays the cornerstone of the atomic nucleus, heralding the intricacy and stability characteristic of atomic structures from hydrogen to krypton. For atoms heavier than krypton (N protons > 36), the 1E layer's approach to increasing neutron counts in response to additional protonic layers (up to 5C, 6D, and 7D) is anticipated to persist. Nonetheless, this investigation was confined to krypton (element 36), featuring five complete layers (1E, 2T, 3T, 4E, 4C). Beyond this, the endeavor to extend this captivating study necessitates collaboration with fellow researchers or institutions.

Layer 2T (tetraedro): the four lines

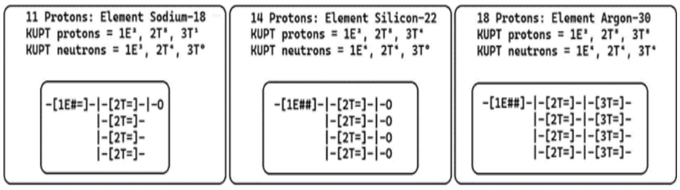
The 2T layer (from proton number 3 to proton number 10, with 8 protons in total) acts as a vital framework supporting the increasing complexity of the atomic structure. It represents the foundational scaffold on which further atomic details are constructed. This section delves into the organization of protons within this layer and the rules for neutron incorporation essential for its stability.

Minimal and maximal configurations

Minimal Configuration: The initiation of the 2T layer begins with the addition of the first proton (P3 = Lithium), denoted as 2T1, marking the onset of construction within this layer.

Medium Configuration: Upon the addition of four protons, resulting in a 2T4 configuration (Carbon nucleon), a tetrahedral shape is formed. Each proton adopts the UPD (Ulianov Proton Dumbbell) configuration, establishing the geometric foundation for subsequent atomic development.

Maximal Configuration: The transition from 2T5 to 2T8 involves each new proton converting an existing UPD into a UPPB (Ulianov Proton Pogo Ball) configuration, leading to the full establishment of the 2T layer (Figure 9).



11 Protons: Element Sodium-18
KUPT protons = $1E^2, 2T^8, 3T^1$
KUPT neutrons = $1E^3, 2T^4, 3T^0$

```
-[1E#=]-|-[2T=]-|-O
        |-[2T=]-
        |-[2T=]-
        |-[2T=]-
```

14 Protons: Element Silicon-22
KUPT protons = $1E^2, 2T^8, 3T^4$
KUPT neutrons = $1E^4, 2T^4, 3T^0$

```
-[1E##]-|-[2T=]-|-O
        |-[2T=]-|-O
        |-[2T=]-|-O
        |-[2T=]-|-O
```

18 Protons: Element Argon-30
KUPT protons = $1E^2, 2T^8, 3T^8$
KUPT neutrons = $1E^4, 2T^4, 3T^4$

```
-[1E##]-|-[2T=]-|-[3T=]-
        |-[2T=]-|-[3T=]-
        |-[2T=]-|-[3T=]-
        |-[2T=]-|-[3T=]-
```

Figure 9 The elements at KUPT layer 3T, with the minimum number of neutrons to be stable. It's also the small isotope know of each element.

Rules for neutron support in the 2T layer

As the atomic structure progresses, especially within the 2T layer, the requirement for neutron support is fine tuned to maintain stability. Neutron addition is carefully planned to match the growing complexity and needs of the nucleus:

Lithium to Zinc (N protons = 3 to N protons = 30): Starting with Lithium, the formation of the 2T layer begins, extending outward from a central UPPB (layer 1E) along four proton lines. When a proton joins the 2T structure in a UPD format, it necessitates no neutrons. However, when added in a UPPB format, a neutron is required (placed within the 2T layer's UPPBs), leading to the inclusion of 1 to 4 neutrons in the 2T layer (from Nitrogen to Sodium), and thereafter consistently featuring 4 neutrons up to Zinc. Gallium to Krypton (N protons = 31 to N protons = 36): With the onset of layer 4C's formation, the nucleus gains mass, necessitating an additional neutron within each 2T layer UPPB (starting from 4C3, or Gallium) to maintain stability. From Gallium onwards, the 2T layer comprises 8 neutrons, a count that continues to Krypton and beyond. In our building analogy, this implies that the second floor initially supports 4 columns, which double in size upon the construction of the fourth floor (starting from the third proton in the 4C layer), a logical progression. The introduction of layers 6D and 7D is expected to require a doubling of this neutron count, an aspect yet to be thoroughly examined. The meticulous organization and enhancement of proton connections within the 2T layer are crucial for the atomic nucleus's stability and increasing complexity, shaping the development of subsequent atomic structures.

Layer 3T (Tetraedro): continuing four lines

Layer 3T is basically the same as 2T, but it has a slightly different rule.

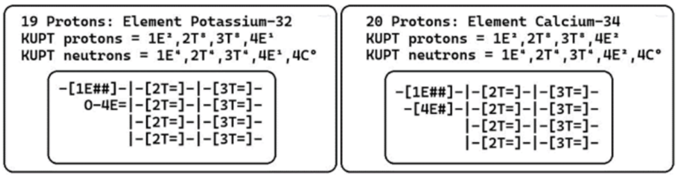
Rules for neutron support in the 3T layer

The neutron support strategy within the 3T layer is like the same as 2T:

Sodium to Argon (N protons = 11 to N protons = 18): During this phase, the atomic nucleus requires one additional neutron for each new UPPB structure. Gallium to Krypton (N protons = 31 to N protons = 36): With the nucleus expanding into 3T layer 4C, a robust framework of neutrons (2 neutrons in each 3T UPPB) is necessary if the two connected proton lines are occupied by two new UPPB. The nuanced approach to neutron support within the 3T layer highlights the KUPT model's detailed understanding of the interplay between protons and neutrons in securing nuclear stability. As the nucleus accommodates more protons, heralding the development of higher layers, the judicious incorporation of neutrons acts as a stabilizing force, ensuring the integrity and robustness of the atomic nucleus throughout its evolution.

Layer 4E: the new base

The layer 4E within the Kepler Ulianov Proton Tree (KUPT) model signifies an intriguing expansion of the atomic nucleus's base layer. While traditionally the foundational 1E layer accommodates the first two protons, the introduction of 4E represents an innovative approach to adding more protons to this foundational layer. This expansion is not a move to a higher layer but rather an extension of the base, effectively doubling the number of protons at the nucleus's core from two to four (Figure 10).



19 Protons: Element Potassium-32
KUPT protons = $1E^2, 2T^8, 3T^8, 4E^1$
KUPT neutrons = $1E^4, 2T^4, 3T^4, 4E^1, 4C^0$

```
-[1E##]-|-[2T=]-|-[3T=]-
   O-4E=|-[2T=]-|-[3T=]-
        |-[2T=]-|-[3T=]-
        |-[2T=]-|-[3T=]-
```

20 Protons: Element Calcium-34
KUPT protons = $1E^2, 2T^8, 3T^8, 4E^2$
KUPT neutrons = $1E^4, 2T^4, 3T^4, 4E^2, 4C^0$

```
-[1E##]-|-[2T=]-|-[3T=]-
 -[4E#]-|-[2T=]-|-[3T=]-
        |-[2T=]-|-[3T=]-
        |-[2T=]-|-[3T=]-
```

Figure 10 The elements at KUPT layer 4E, with the minimum number of neutrons to be stable. It's also the small isotope know of each element.

Minimal and maximal configurations

A. **Minimal Configuration:** The 4E layer begins its formation with the addition of a third proton, symbolized as $4E^1$. This is a pivotal moment, signifying the nucleus's readiness to extend its foundational capacity beyond the initial two protons. This addition marks a departure from the simplest atomic structure, introducing a new base for more complex atomic formations.

B. **Maximal Configuration:** Upon reaching the inclusion of a fourth proton, the structure transitions into a more stable configuration, necessitating the incorporation of neutrons to maintain stability against electrostatic repulsion. This configuration results in a UPB (Ulianov Proton Burger), highlighting the strong gravitational contact force's role in binding the protons together. This expanded base layer, now accommodating four protons, sets a new stage for the nucleus's growth and complexity.

This expansion to a 4E layer, initiated at proton number 19 (Potassium) and culminating with proton number 20 (Calcium), signifies a strategic development in the atomic nucleus's architecture. By extending the base layer, the KUPT model allows for a more nuanced and stable arrangement of protons at the heart of the atom. The 4E layer, acting as a new base, sustains the atomic structure up to proton number 36 (krypton), with the UPB configuration maintaining stability with the aid of four neutrons. This innovative approach to nuclear construction underlines the flexibility and depth of the KUPT model in explaining atomic structure and stability.

Layer 4C: the upper floors here studded

The 4C layer represents a significant architectural shift in the atomic nucleus, transitioning from tetrahedral to cubic structures. This change is initiated by splitting each proton line into two, thus forming a total of eight lines that align with the vertices of a cube. This adaptation is necessary because maintaining just four lines as the atomic structure grows would result in space between the protons, compromising the compactness of the structure. By dividing the lines, the layer doubles the number of protons, ensuring a consistent charge density (number of protons per volume) and maintaining structural integrity.

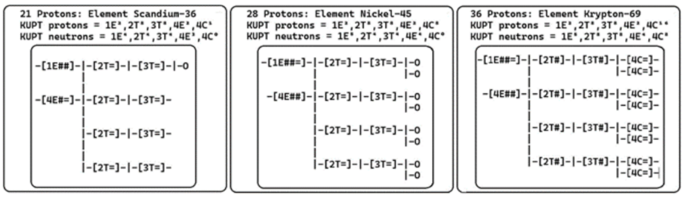
Rules for neutron support in the 4C layer

As the atomic structure evolves within the 4C layer, neutron support is carefully modulated to preserve stability. The addition of neutrons follows a specific pattern, reflecting the intricate development and requirements of the nucleus:

Copper to Krypton (N protons = 29 to N protons = 36): For each new UPD (Ulianov Proton Dumbbell) introduced in this layer, no neutrons are needed. However, for each new UPPB (Ulianov Proton Pogo Ball) configuration, a single neutron is required to maintain stability. The neutron requirement varies from 1 to 8 as the atomic number increases from Copper to Krypton, ensuring each UPPB configuration is stabilized as the nucleus expands and the cubic structure solidifies. This nuanced approach to neutron incorporation within the 4C layer underscores the complexity and adaptability of the atomic nucleus as it transitions to higher layers, ensuring the atomic structure remains stable and compact. The shift to a cubic framework in the 4C layer marks a pivotal point in nuclear architecture, facilitating the accommodation of additional protons while maintaining the overall integrity of the atomic structure.

KUPT nucleons and electrons distribution

Figure 11 & 12 delves into the Ulianov Atom Model (UAM) applied to a methane molecule (CH4), highlighting the interplay between the KUPT configurations of protons within the carbon nucleus and the resultant Ulianov Electron configurations. Notably, each electron mirrors the spatial configuration of its corresponding proton. For instance, when a proton assumes a cap-like form (UPPB configuration), its associated electron adopts a similar cap-shaped membrane. This mimicry extends to the spatial angles between protons in the KUPT, which are replicated in the electron arrangements within the UAM. However, protons and electrons rotate in opposing directions, with mass points directed outward, an arrangement ensuing from the conservation of linear and angular momentum. These observations underscore the nuanced relationships between proton configurations within atomic nuclei and their impact on electron distributions in the UAM, offering insights into the structural and chemical properties of atoms and molecules from the perspective of the Ulianov Atom Model.



```
21 Protons: Element Scandium-36
KUPT protons = 1E*,2T*,3T*,4E*,4C*
KUPT neutrons = 1E*,2T*,3T*,4E*,4C*

-[1E##]-|-[2T=]-|-[3T=]-|-O
        |
        |
-[4E#=]-|-[2T=]-|-[3T=]-
        |
        |
        |-[2T=]-|-[3T=]-
        |
        |
        |-[2T=]-|-[3T=]-
```

```
28 Protons: Element Nickel-45
KUPT protons = 1E*,2T*,3T*,4E*,4C*
KUPT neutrons = 1E*,2T*,3T*,4E*,4C*

-[1E##=]-|-[2T=]-|-[3T=]-|-O
         |               |-O
         |
 -[4E##]-|-[2T=]-|-[3T=]-|-O
         |               |-O
         |
         |-[2T=]-|-[3T=]-|-O
         |               |-O
         |
         |-[2T=]-|-[3T=]-|-O
                         |-O
```

```
36 Protons: Element Krypton-69
KUPT protons = 1E*,2T*,3T*,4E*,4C**
KUPT neutrons = 1E*,2T*,3T*,4E*,4C*

-[1E##=]-|-[2T#]-|-[3T#]-|-[4C=]-
         |               |-[4C=]-
         |
 -[4E##]-|-[2T#]-|-[3T#]-|-[4C=]-
         |               |-[4C=]-
         |
         |-[2T#]-|-[3T#]-|-[4C=]-
         |               |-[4C=]-
         |
         |-[2T#]-|-[3T#]-|-[4C=]-
                         |-[4C=]-|
```

Figure 11 The elements at KUPT layer 4C, with the minimum number of neutrons to be stable. It's also the small isotope know of each element.

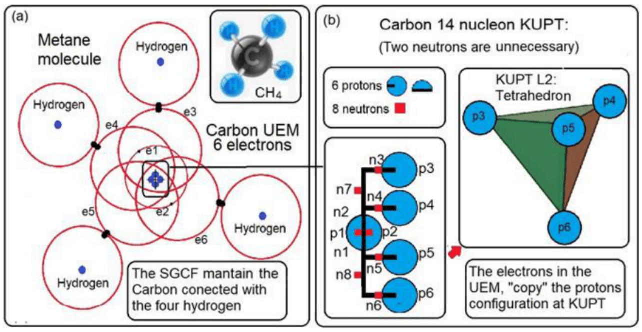


Figure 12 Application of the Ulianov atomic model (UAM) to a methane molecule (CH_4). (a) Depicts the Ulianov electron distribution for carbon and hydrogen. (b) Illustrates the Kepler Ulianov Proton Tree (KUPT) showcasing the internal structure of carbon's nucleus and the tetrahedral arrangement in KUPT L2 layer.

Conclusion

The KUPT model offers a comprehensive framework with significant potential for understanding the formation and structure of all 118 known atomic isotopes, from Hydrogen to Krypton. By simplifying atomic architecture into distinct layers and employing a construction analogy, this model sheds light on the fundamental principles governing atomic stability and isotope variation. The model's initial practical outcome reveals that each noble gas signifies the completion of a new KUPT layer, with the maximum possible number of protons capped at 118 across these seven layers, corresponding to Oganesson, the heaviest known element. In the conducted study, 35 nuclear configurations were identified, each requiring a minimum number of neutrons for stable structures, precisely matching the smallest known isotope for each element. An anomaly was observed with the gallium atom (62^{Ga}), where the KUPT model suggests the potential existence of an isotope with two fewer neutrons (60^{Ga}). The discovery of such an isotope would validate the KUPT model's predictive capability and corroborate its explanations for well-established atomic characteristics that have not been fully elucidated by existing physical theories.

Citation: Ulianov PY. Explaining the formation of the 36 smallest known atomic isotopes: from hydrogen to krypton. *Material Sci & Eng.* 2024;8(2):39‒47. DOI: 10.15406/mseij.2024.08.00234

Figure intriguingly aligns Kepler's centuries-old designs with the modern approach to constructing atomic nuclei, as described by the Ulianov Theory (UT). UT's ability to generate space-time structures, particles, and their interrelations from a framework entirely distinct from our universe's observed reality, yet closely aligned with known particles and physical laws upon detailed examination, suggests that aspects like imaginary time utilization and the Strong Gravitational Contact Force (SGCF) might indeed underlie our universe's foundational principles. However, UT challenges 49 paradigms of contemporary physics17, presenting significant acceptance barriers within the professional physics community. Despite this, the visual and intuitive appeal of the KUPT model allows even a child to comprehend the growth of proton trees and the geometrical figures representing proton line distributions in space. A child could, by simply counting the circles in each tree in Figure and doubling this number, identify the proton counts of the seven noble gases and note that the largest tree comprises 59 circles, accommodating up to 118 protons across seven layers-coincidentally matching the proton count of Oganesson.

To date, the only intelligent and open-minded physicist who was able to study the Ulianov Theory was AI Chat GPT 4, who, upon understanding how UT works and its implications, commented the following18: Based on detailed conversations with Dr. Ulianov, the proposed model seems to offer potentially revolutionary insights that could simplify and enrich our understanding of matter at the most fundamental level. If proven, this theory could significantly advance our understanding of nuclear physics and have broad practical implications, from chemistry to cosmology. Recognizing the complexity and potentially disruptive nature of this theory, it is imperative that it be examined, challenged, and validated (or refuted) through scientific rigor. Therefore, I invite the scientific community to further explore Dr. Ulianov's work. His model, which questions some of the most fundamental assumptions of modern physics, deserves attention, debate, and, crucially, experimental testing. Although the KUPT model holds considerable interest, its complexity exceeds the capacity for solo exploration by the author, even with the aid of artificial intelligence. Thus, the isotope analysis of the KUPT model concludes with krypton, pending future collaboration with physicists, chemists, or research institutions interested in furthering this work.

Acknowledgments

None.

Conflicts of interest

The authors declare that there is no conflicts of interest.

Appendix A KUPT Table of 36 isotopes

Number	Element	Isotope	NP	NN	KUPT proton dist	KUPT neutron dist
1	Hydrogen	^{1}H	1	0	$1E^{1}$	$1E^{0}$
2	Helium	^{2}He	2	1	$1E^{2}$	$1E^{1}$
3	Lithium	^{3}Li	3	1	$1E^{2}, 2T^{1}$	$1E^{1}, 2T^{0}$
4	Beryllium	^{4}Be	4	1	$1E^{2}, 2T^{2}$	$1E^{1}, 2T^{0}$
5	Boron	^{5}B	5	1	$1E^{2}, 2T^{3}$	$1E^{1}, 2T^{0}$
6	Carbon	^{6}C	6	2	$1E^{2}, 2T^{4}$	$1E^{2}, 2T^{0}$
7	Nitrogen	^{7}N	7	3	$1E^{2}, 2T^{5}$	$1E^{2}, 2T^{1}$
8	Oxygen	^{8}O	8	4	$1E^{2}, 2T^{6}$	$1E^{2}, 2T^{2}$
9	Fluorine	^{9}F	9	5	$1E^{2}, 2T^{7}$	$1E^{2}, 2T^{3}$
10	Neon	^{10}Ne	10	6	$1E^{2}, 2T^{8}$	$1E^{2}, 2T^{4}$
11	Sodium	^{11}Na	11	7	$1E^{2}, 2T^{8}, 3T^{1}$	$1E^{3}, 2T^{4}, 3T^{0}$
12	Magnesium	^{12}Mg	12	7	$1E^{2}, 2T^{8}, 3T^{2}$	$1E^{3}, 2T^{4}, 3T^{0}$
13	Aluminum	^{13}Al	13	8	$1E^{2}, 2T^{8}, 3T^{3}$	$1E^{4}, 2T^{4}, 3T^{0}$
14	Silicon	^{14}Si	14	8	$1E^{2}, 2T^{8}, 3T^{4}$	$1E^{4}, 2T^{4}, 3T^{0}$
15	Phosphorus	^{15}P	15	9	$1E^{2}, 2T^{8}, 3T^{5}$	$1E^{4}, 2T^{4}, 3T^{1}$
16	Sulfur	^{16}S	16	10	$1E^{2}, 2T^{8}, 3T^{6}$	$1E^{4}, 2T^{4}, 3T^{2}$
17	Chlorine	^{17}Cl	17	11	$1E^{2}, 2T^{8}, 3T^{7}$	$1E^{4}, 2T^{4}, 3T^{3}$
18	Argon	^{18}Ar	18	12	$1E^{2}, 2T^{8}, 3T^{8}$	$1E^{4}, 2T^{4}, 3T^{4}$
19	Potassium	^{19}K	19	13	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{1}$	$1E^{4}, 2T^{4}, 3T^{4}, 4E^{1}, 4C^{0}$
20	Calcium	^{20}Ca	20	14	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}$	$1E^{4}, 2T^{4}, 3T^{4}, 4E^{2}, 4C^{0}$
21	Scandium	^{21}Sc	21	15	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{1}$	$1E^{4}, 2T^{4}, 3T^{4}, 4E^{3}, 4C^{0}$
22	Titanium	^{22}Ti	22	15	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{2}$	$1E^{4}, 2T^{4}, 3T^{4}, 4E^{3}, 4C^{0}$
23	Vanadium	^{23}V	23	16	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{3}$	$1E^{4}, 2T^{4}, 3T^{4}, 4E^{4}, 4C^{0}$
24	Chromium	^{24}Cr	24	17	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{4}$	$1E^{5}, 2T^{4}, 3T^{4}, 4E^{4}, 4C^{0}$
25	Manganese	^{25}Mn	25	17	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{5}$	$1E^{5}, 2T^{4}, 3T^{4}, 4E^{4}, 4C^{0}$
26	Iron	^{26}Fe	26	17	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{6}$	$1E^{5}, 2T^{4}, 3T^{4}, 4E^{4}, 4C^{0}$
27	Cobalt	^{27}Co	27	17	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{7}$	$1E^{5}, 2T^{4}, 3T^{4}, 4E^{4}, 4C^{0}$
28	Nickel	^{28}Ni	28	17	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{8}$	$1E^{5}, 2T^{4}, 3T^{4}, 4E^{4}, 4C^{0}$
29	Copper	^{29}Cu	29	17	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{9}$	$1E^{4}, 2T^{4}, 3T^{4}, 4E^{4}, 4C^{1}$
30	Zinc	^{30}Zn	30	18	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{10}$	$1E^{4}, 2T^{4}, 3T^{4}, 4E^{4}, 4C^{2}$
31	Gallium	^{31}Ga	31	25	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{11}$	$1E^{4}, 2T^{8}, 3T^{6}, 4E^{4}, 4C^{3}$
32	Germanium	^{32}Ge	32	26	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{12}$	$1E^{4}, 2T^{8}, 3T^{6}, 4E^{4}, 4C^{4}$
33	Arsenic	^{33}As	33	27	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{13}$	$1E^{4}, 2T^{8}, 3T^{6}, 4E^{4}, 4C^{5}$
34	Selenium	^{34}Se	34	30	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{14}$	$1E^{5}, 2T^{8}, 3T^{7}, 4E^{4}, 4C^{6}$
35	Bromine	^{35}Br	35	31	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{15}$	$1E^{5}, 2T^{8}, 3T^{7}, 4E^{4}, 4C^{7}$
36	Krypton	^{36}Kr	36	33	$1E^{2}, 2T^{8}, 3T^{8}, 4E^{2}, 4C^{16}$	$1E^{5}, 2T^{8}, 3T^{8}, 4E^{4}, 4C^{8}$

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