Determination of First Ionization Energy without Using Shell`S Mechanism of Electrons of All Elements

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Abstract- *Electronic configurations of the elements already established in the subject of material science. These were determined by the system of (1s) for Hydrogen (IA group, Period 1), Helium (8A or zero group, Period 1), these numbers added to next to next element with the series of (2s, 2p), (3s, 3p, 3d), (4s, 4p, 4d, 4f), (5s, 5p, 5d, 5f), etc. for other elements up to atomic number 118. There are huge numbers of electrons with respect to atomic numbers. This system is one of the wonder systems in the modern science. Though here in this script I tried to find the 1st ionization energy by using relative numbers which derived from couple system [1] and periodic numbers, both are new attempted in this field of material science. Relative numbers are very unique, these numbers are able to find the series of Pi [1], series of ½ [2], cells functions of mind [3]. There is no relation between number of electrons and relative numbers (r_1 and r_2), although I observed that, $[(r_2 – 2) + r_1]$ = Atomic Number of the elements = Z, $[r_2 > r_1$ and $r_2 = (r_1 + 2)]$. For example, relative number of Hydrogen $r_2 = 2$ and $r_1 = 1$, then $[(r_2 – 2) + r_1] = [(2 – 2) + 1] = 1 = Z$. For Helium, $r_2 = 2$, $r_1 = 2$, then $[(r_2 – 2) + r_1] = [(2 – 2) + 2] = 2 = Z$. Therefore, relative number is related to atomic number of element. Also, relative numbers of element almost ½ of atomic number.*

Index Terms- Couple System, Relative numbers, Periodic numbers, 1st Ionization Energy, Atomic masses.

Method to determine the relative numbers by Couple System:

I. INTRODUCTION WHAT IS COUPLE SYSTEM?

Normally couple means two bodies meet together. In mathematical term, **"**A special case of moments is a couple. A **couple** consists of two parallel forces that are equal in magnitude, opposite in sense and do not share a line of action. It does not produce any translation, only rotation. The resultant force of a couple is zero. But, the resultant of a couple is not zero; it is a pure moment" [4]. In mechanics, a **couple** is a system of forces with a resultant moment but no resultant force. A better term is **force couple** or **pure moment**. Its effect is to create rotation without translation, or more generally without any acceleration of the centre of mass. In rigid body mechanics, force couples are *free vectors*, meaning their effects on a body are independent of the point of application [5].

Many coupling may happened which will depend on that present environment. Here we will proceed to find the series of new numbers by this system. In this system we can find relative numbers, these numbers are applicable to atomic stage of elements

Couple means together with whichever are we can choose. In the case of male 1, (say 1 = r_1) and female (2 = r_2) when forms love between them, then love plays roll to make relation (R) and then R will related to r_1 & r_2 automatically. Afterwards when this series will increase, accordingly r_1 and r_2 will produce next to series & then to next etc. a Figure 1 is given here for couple system:

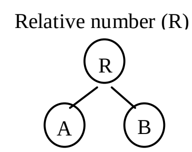
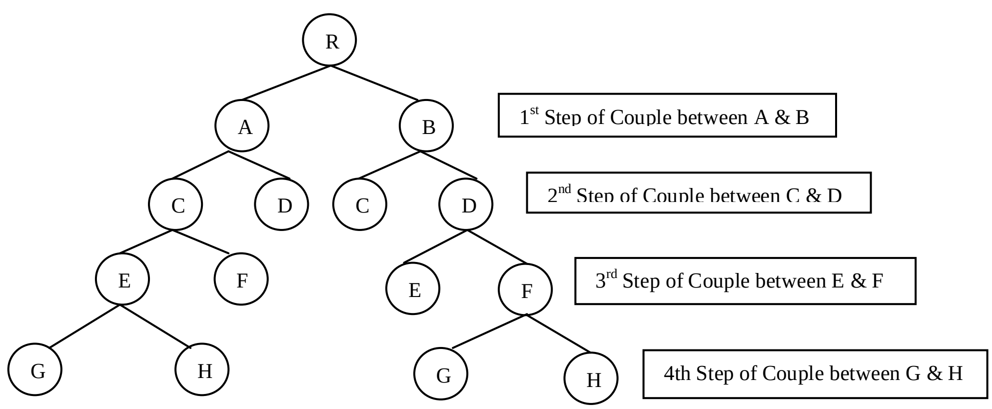


Figure 1. Formation of couple system

No. 1, Formation:

R is related to A, B, C, D, E, F, G, H and so on.



Object Portion (Figure – 2, Step of Coupling) **Image Portion**
Classification of Formation:

Relative number (R)

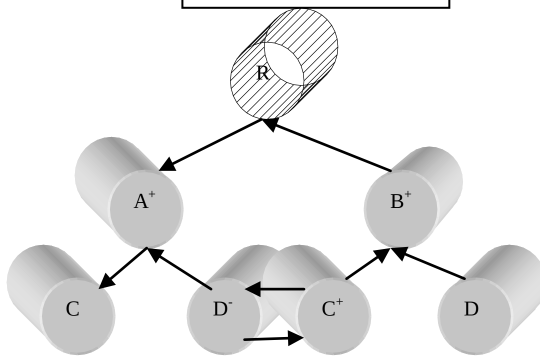


Fig. - 3

Reaction of couple:

If A & B takes place in the form of A^+ & B^+ in positive zone and C & D takes place in negative zone in the form of D^- & C^+ related to A^+ & B^+ in positive zone (Figure – 3), then if we dressed it in the form of: R → (D^- . A + C^+ . B^+), we can write, D^- = - D & C^+ = + C ------ (1) R → (C . A + C . A) ------ (2) R → 2 CA---- (3)

Description: (1) D is related to A (Fig-3, L.H.S.) and C is related to B (Fig-3, R.H.S.). But the value of A and C will same to the value of B and D.

D^- in L.H.S. means that it is the end of the reaction of problem to form relative number (R) acting with C^+ in R.H.S. (2) The original value of D is C; therefore, D reacts with A (arrow sign indicates in figure – 3) and forms CA. Similarly, C is the original value of D, but the original value of B is A. So, C reacts with B and forms CA.

(3) Total couple reaction with respect to R is 2CA. When the value of A, B, C, D…., individual, then the result of 2 CA will bring other number. This system described in reference [1]. A part of this system writing here to get relative numbers of elements that we can find its activity in the microscopic field of atom, for example, 1st Ionization energy of elements. Periodic Number (P) is another form of number when it acts with relative number in the form of [$\pi \sqrt{r_2} \times r_1$ / P], then we get 1st ionization energy.

Application of "No-1 Formation" for **odd number: Problem (1):**

If $(r + M)^3 \rightarrow r^3 + 3r\,(rM + M^2) + M^3$ and let M = 1, then
$(r + 1)^3 \rightarrow r^3 + 3r\,(r1 + 1^2) + 1^3 \rightarrow r^3 + 3r(r + 1) + 1$

The coefficient of 3r is (r + 1), since corresponding value of r & 1 are A & B respectively, thus r = A and 1 = B. Let (r + 1) has relative number R. So, the equation,

$(r + 1)^3 = r^3 + 3rR + 1^3$, then, $R \rightarrow (B^- .r + 1^+.A)$, $R \rightarrow (1.r + 1.r)$, $R \rightarrow 2r$.

Now the equation turns to $(r + 1)^3 = r^3 + 3r.2r + 1^3$
Similarly, if M = 2,3,4,5… Then,
$(r + 2)^3 \rightarrow r^3 + 2^3.3r.2r + 2^3$
$(r + 3)^3 \rightarrow r^3 + 3^3.3r.2r + 3^3$
$(r + 4)^3 \rightarrow r^3 + 4^3.3r.2r + 4^3$
$(r + 5)^3 \rightarrow r^3 + 5^3.3r.2r + 5^3$
………→…………………….
$(r + M)^3 \rightarrow r^3 + M^3.3r.2r + M^3$ …………… (a)
This equation (a) will satisfy by only 0 & 1.

Problem (2):

When, $(r + M)^5 \rightarrow r^5 + 5r\,(r^3 + 2r^2 + 2r + 1) + 1^5$, then, $R = r^3 + 2r^2 + 2r + 1$, if A, B, C, D represents the corresponding values of r^3, $2r^2$, 2r, 1 (Since, these are the real values of $(r + 1)^5$) respectively. Then, R will related in Couple Systems as follows:

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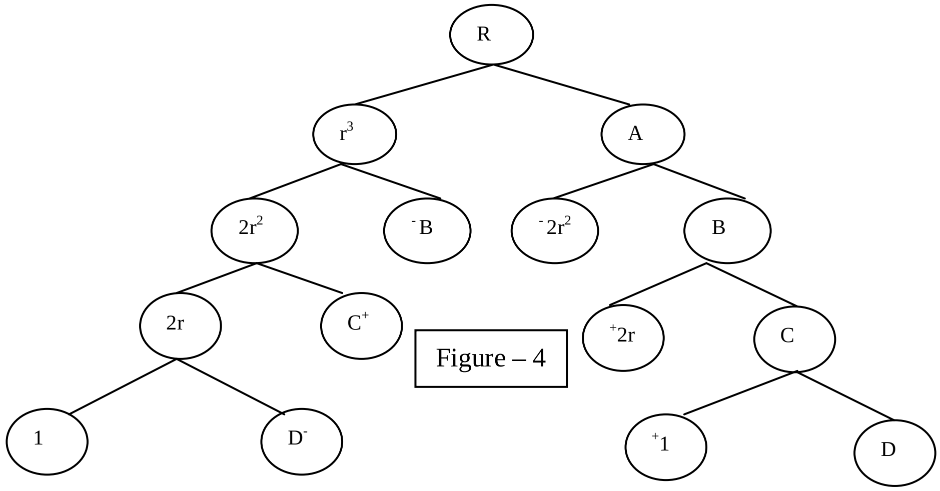

Figure – 4

$R \rightarrow (D^-. 2r + 1.C) + (C^+.2r^2 + 2r^+.B) + (B^-.2r^3 + 2r^{-2}.A)$
$R \rightarrow (1. 2r + 1.2r) + (2r.2r^2 + 2r.2r^{-2}) + (2r^2.2r^3 + 2r^{-2}.r^3)$
$R \rightarrow 1.(2r + 2r) + (2r.2r^2 - 2r.2r^{-2}) + (2r^2.2r^3 - 2r^{-2}.r^3)$
$R \rightarrow 4r + 0 + 0$
$R \rightarrow 4r$

Therefore, $(r + 1)^5 \rightarrow r^5 + 5r.4r + 1^5$ ……………….. (b)

If M = 2,3,4,5 …..[Vide Problem (1)], then,

$(r + 2)^5 \rightarrow r^5 + 2^7.5r.4r + 1^5$
$(r + 3)^5 \rightarrow r^5 + 3^7.5r.4r + 1^5$
$(r + 4)^5 \rightarrow r^5 + 4^7.5r.4r + 1^5$
$(r + 5)^5 \rightarrow r^5 + 5^7.5r.4r + 1^5$
……………………………
$(r + M)^5 \rightarrow r^5 + M^7.5r.4r + M^5$

Therefore, the real formation of $(r + 1)^5$ will $r^5 + 1^7.5r.4r + 1^5$; this is applicable to odd number of series.

Application of **"No – 2 formation** "for **even numbers**. Problem (1):

$(r + 1)^4 \rightarrow r^4 + 4r.(r^2 + [3/2] \text{ x } r + 1) + 1^4 = r^4 + 4r. (R) + 1^4$

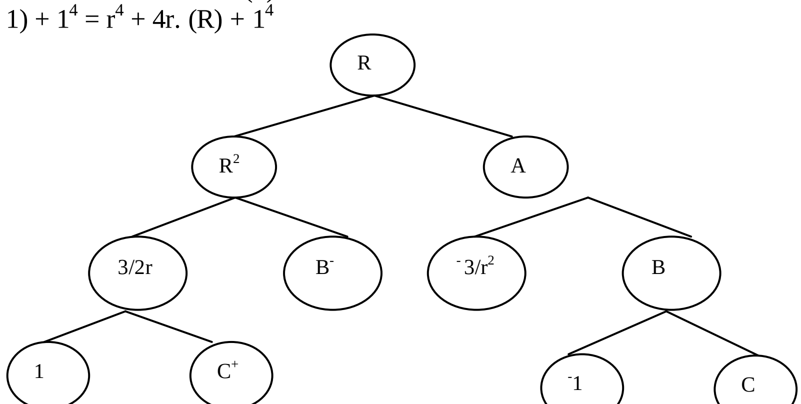

Figure – 5

$R \rightarrow (C.[3/2] \text{ x } r + 1^-.B) + (B^-.r^2 + [3/2] \text{ x } r^-.A)$
$R \rightarrow (1.[3/2] \text{ x } r + 1^-.[3/2] \text{ x } r^-) + ([3/2] \text{ x } r.r^2 + [3/2] \text{ x } r^-.r^2)$
$R \rightarrow 2.[3/2] \text{ x } r + 0 = 3r$

$(r + 1)^4 \rightarrow r^4 + 4r.(R) + 1^4 \rightarrow r^4 + 4r. ([3/2] \text{ x } r) + 1^4$ and $R \rightarrow [3/2] \text{ x } r = 3.r = 3r$. Now we can get a series in the forms of: $(r + 1)^4 \rightarrow r^4 + 1^5.4r.3r + 1^4$

Similarly, $(r + 2)^4 \rightarrow r^4 + 2^5.4r.3r + 2^4$
$(r + 3)^4 \rightarrow r^4 + 3^5.4r.3r + 3^4$
$(r + 4)^4 \rightarrow r^4 + 4^5.4r.3r + 4^4$

$(r + 5)^4 \rightarrow r^4 + 5^5.4r.3r + 5^4$
……………………………
$(r + M)^4 \rightarrow r^4 + M^5.4r.3r + M^4$

For power 6, we get,
$(r + 1)^6 \rightarrow r^6 +1^9.6r.5r + 1^6$
$(r + 2)^6 \rightarrow r^6 +2^9.6r.5r + 2^6$
$(r + 3)^6 \rightarrow r^6 +3^9.6r.5r + 3^6$
………………………….
$(r + M)^6 \rightarrow r^6 +M^9.6r.5r + M^6$, this is applicable to other even number series.

Therefore, including odd & even number produced a series as:

Hence the series:
$(r + M)^2 \rightarrow r^2 +M^1.2r.1r + M^2$
$(r + M)^3 \rightarrow r^3 +M^3.3r.2r + M^3$
$(r + M)^4 \rightarrow r^4 +M^5.4r.3r + M^4$
$(r + M)^5 \rightarrow r^5 +M^9.5r.4r + M^5$
$(r + M)^6 \rightarrow r^6 +M^9.6r.5r + M^6$
$(r + M)^7 \rightarrow r^7 +M^{11}.7r.6r + M^7$
……………………………………………

$(r + M)^N \rightarrow r^N +M^{[1 + 2(N-2)]}.Nr.(N-1)r + M^N$ … (A)
$(r + M)^N \rightarrow r^N +M^Z. Nr.(N-1)r + M^N$ ….(B) When, Z = [1 + 2(N – 2)] & N = 2,3.4.....

In the case of negative functions, this equation will turn to:

$(r - M)^N \rightarrow r^N - M^{[1 + 2(N-2)]}.Nr.(N-1)r - M^N$ ………. (C)
$(r - M)^N \rightarrow r^N - M^Z.Nr.(N-1)r - M^N$ ……….. (D)

Relative Numbers (R):

The middle part of the equation (A) or (B) and (C) or (D) is same. We have the Relative number as [Nr.(N – 1)r] which connected to $M^{[1 + 2(N-2)]}$ or M^Z, when Z = [1 + 2(N – 2)] of $(r + M)^N$ or $(r - M)^N$. so, we may write the general equation in the form of:

$(r \pm M)^N \rightarrow r^N \pm M^{[1 + 2(N-2)]}.Nr.(N-1)r \pm M^N$ ………..….(E)
And middle part of this equation is $M^{[1 + 2(N-2)]}.Nr.(N-1)r$ ………….(F)

When, N = 1, 2, 3, 4, 5 ….. We get relative numbers 1r, 2r, 3r, 4r, 5r etc both of even and odd numbers. The equation (A) obtained by the couple system and is applicable in forming relative numbers with respect to Z of which numbers become odd in series, when N = 2, 3, 4, 5 ….of the equation, $M^{[1 + 2(N-2)]}.Nr.(N-1)r$. On changing the number of Z as Z = [2 + 2(N – 2)], we get,

$M^{[2 + 2(N-2)]}.Nr.(N-1)r \rightarrow M^2. 2r.1r$, when N = 2
$M^{[2 + 2(N-2)]}.Nr.(N-1)r \rightarrow M^4. 3r.2r$, when N = 3, where, $(r + M)^3 \rightarrow M^3.3r.2r$, when, N = 3, due to change of Z, power changes as:

When, Z = [1 + 2(N – 2)], Z = - 3, when, N = 0 (not satisfying).
Z = [1 + 2(N – 2)], Z = – 1, when, N = 1 (not satisfying).
Z = [1 + 2(N – 2)], Z = 1, when, N = 2 (satisfying). It shows N > 1

If, Z = [2 + 2(N – 2)], we get,
Z = [2 + 2(N – 2)], Z = - 2, when, N = 0 (not satisfying)
Z = [2 + 2(N – 2)], Z = 0, when, N = 1 (satisfying), because, $M^Z = M^0 = 1$
Z = [2 + 2(N – 2)], Z = 2, when, N = 2 (satisfying), N > 1

At the time of changing of Z, let, Nr.(N – 1)r will change to Nr.(N – 2), then, we get a series as:
$M^{[2 + 2(N-2)]}.Nr.(N-2)r \rightarrow M^0. 0 \text{ x } r.(0-2)r = 0$, when N = 0
$M^{[2 + 2(N-2)]}.Nr.(N-2)r \rightarrow M^{-1}. 1r.(1-2)r = M^{-1} \text{ x } 1r \text{ x } -1 = - M^{-1}$, when N = 1
$M^{[2 + 2(N-2)]}.Nr.(N-2)r \rightarrow M^2. 2r.0xr = 0$, when N = 2
$M^{[2 + 2(N-2)]}.Nr.(N-2)r \rightarrow M^4. 3r.1r$, when N = 3 etc., N > 2

When this equation turns to $M^{[2 + 2(N-2)]}.Nr.Nr$ …… (G), when, (N – 1)r treated as Nr, then we will get even numbers (Z) of M of the series. So,

$M^{[2 + 2(N-2)]}.Nr.Nr \rightarrow M^{2}.2r.2r$, when, N = 2, N > 1
$M^{[2 + 2(N-2)]}.Nr.Nr \rightarrow M^{4}.3r.3r$, when, N = 3
$M^{[2 + 2(N-2)]}.Nr.Nr \rightarrow M^{6}.4r.4r$, when, N = 4 etc.

Therefore, the deduction (F) and (G) finds,

$M^{[1 + 2(N-2)]}.Nr.(N-1)r \rightarrow M^{1}.2r.1r$, when, N = 2, Z = 1 of power of M, odd number.
$M^{[2 + 2(N-2)]}.Nr.Nr \rightarrow M^{2}.2r.2r$, when, N = 2, Z = 2 of power of M, even number.
$M^{[1+ 2(N-2)]}.Nr.(N-1)r \rightarrow M^{3}.3r.2r$, when, N = 3, Z = 3 of power of M, odd number.
$M^{[2 + 2(N-2)]}.Nr.Nr \rightarrow M^{4}.3r.3r$, when, N = 3, Z = 4 of power of M, even number.
…………………………………

From the above deduction, we have the following results as:

i) When, N = 0, the equation (F) yields $M^{-3}.0r.(-1).r$
ii) ″ N = 0, ″ (G) ″ $M^{-2}.0r.0r$
iii) ″ N = 1, ″ (F) ″ $M^{-1}.1r.0r$
iv) ″ N = 1, ″ (G) ″ $M^{0}.1r.1r$

Therefore, when N has tendency to proceed in negative direction, i.e., N = -1, -2, -3, -4 …… then the deduction (F) & (G) will give results, the yielded values are listed here in a table (1) and corresponding graph – 1.

Table (1):

M^{Z} x r_2 x r_1 (Relative No.) Object part	M^{-Z} x $-r'_2$ x $-r'_1$ (Relative No.) Image Part
M^{0} x 1 x 1	
M^{1} x 2 x 1	M^{-1} x 1 x 0
M^{2} x 2 x 2	M^{-2} x 0 x 0
M^{3} x 3 x 2	M^{-3} x 0 x -1
M^{4} x 3 x 3	M^{-4} x -1 x -1
M^{5} x 4 x 3	M^{-5} x -1 x -2
M^{6} x 4 x 4	M^{-6} x -2 x -2
M^{7} x 5 x 4	M^{-7} x -2 x -3
M^{8} x 5 x 5	M^{-8} x -3 x -3
M^{9} x 6 x 5	M^{-9} x -3 x -4
M^{10} x 6 x 6	M^{-10} x -4 x -4
…………………………………………	………… up to n terms

The figure – 6 is representing the values of r_2 (Red line), r_1 (Black line), - r_2, - r_1 with respect to Z number of M^{Z} in positive and negative direction both.

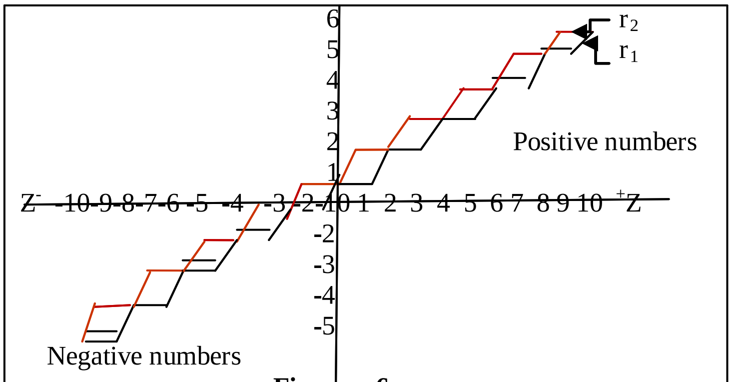

Figure – 6

If the reaction occurs by acting with M and M^{-}, then M will turn to Z, thus:

1) $M^{1}.M^{-1} \rightarrow (r_2 - r'_2), (r_1 - r'_1)$
$\rightarrow (2-1), (1-0)$ When, $r_2, r_1 = 2, 1$ and $r'_2, r'_1 = 1, 0$

Or, $M^0 \rightarrow 1, 1$

2) $M^6.M^{-6} \rightarrow (r_2 - r'_2), (r_1 - r'_1)$
$\rightarrow [4-(-2)], [4-(-2)]$ When, $r_2, r_1 = 4, 4$ and $r'_2, r'_1 = -2, -2$
Or, $M^0 \rightarrow 6, 6$

3) $M^9.M^{-9} \rightarrow (r_2 - r'_2), (r_1 - r'_1)$
$\rightarrow [6-(-3)], [5-(-4)]$ When, $r_2, r_1 = 6, 5$ and $r'_2, r'_1 = -3, -4$
Or, $M^0 \rightarrow 9, 9$

The above deductions proves that when the power of positive number of M and power of negative number of M react together, the power of M becomes zero and finally two Z number of positive number of M are obtained, i.e.,

$M^Z.M^{-Z} \rightarrow Z, Z$ or $M^0 \rightarrow M^0.Z.Z$ ………. (H)

Now it is possible to react $M^0.Z.Z$ with $M^Z.r_2.\ r_1$, and then r_2, r_1 will change at the rate of $(r_2 - 2)$ and $(r_1 - 2)$. But the rate of change of $(r_2 - 2)$ and $(r_1 - 2)$ will not be relative numbers of M^Z. The power (Z) of M should differ by 4 steps and M^Z will turn to M^{Z-4}, then for example, 87 of (Z) number will produce relative numbers to follow the equation (F) as:

$M^{[1+2(N-2)]}.Nr.(N-1)r \rightarrow M^{87}.45.44$, when N = 45 and correspondingly for M^0 (equation – H), $M^0.Z.Z \rightarrow M^0.87.87$, now,

$M^{87}.45.44 \times M^0.87.87 \rightarrow M^{(87-0)}.(87-44).(87-45) \rightarrow M^{87}.43.42$, these are not the relative number of M87 according to equation (C), because, when, N = 43, then, the power of M will 83. The difference between 87 & 83 is 4, this 4 difference will come in every numbers and applicable to all cases. So, general form of this equation will:

$M^Z.r_2.\ r_1 \times M^0.Z.Z \rightarrow M^{[Z-4]}.(Z - r_1).\ (Z - r_2) \rightarrow M^{[Z-4]}.(r_1 - 2).\ (r_2 - 2).$

We observed in table – (1) that when $M^0.1.1$ will react with $M^{-4}. -1. -1$, M will get exponent – 4 (Z = – 4) but without relative numbers, thus,

$M^0{}_{1,1}.\ M^{-4}{}_{-1,-1} \rightarrow M^{-4}{}_{0,0}$. So, $M^{-4}{}_{0,0}.\ M^0{}_{.Z,Z} \rightarrow M^{-4}.Z.Z$. Now $M^Z.r_2.\ r_1$ will react with the new form,

$M^Z.r_2.\ r_1 \times M^{-4}.Z.Z \rightarrow M^{[Z-4]}.(Z - r_1).\ (Z - r_2)$ ……… (I)

If we consider, that M is an element of atomic number Z, then this rule is applicable for transmutation of element from one to another.

This is another application relation between electron, proton, and neutron with corresponding to atomic mass. Here we will discuss on the subject 1st ionization energy which related to relative numbers and periodic number. Accordingly calculated 1st ionization energy of all elements is listed here comparing to present experimental results.

List of Calculated Ionization Energy comparing to Experimental Results. (Table – 2).

Atomic Numbers	Elements & Symbol	Relative No.		Value of $\pi\sqrt{r_2 \times r_1}$	Periodic No. P	Value of $\pi\sqrt{r_2 \times r_1} / P$ (Calculated value $_eI^E$) eV	1st Ionization Potential (Experimental) [6], eV
		r_2	r_1				
1	Hydrogen (H)	2	1	4.442	0.333	13.328	13.595
2	Helium (He)	2	2	6.283	0.25	25.132	24.58741
3	Lithium (Li)	3	2	7.695	1.5	5.130	5.39172
4	Beryllium (Be)	3	3	9.242	1	9.242	9.3227
5	Boron (B)	4	3	10.882	1.25	8.706	8.29803
6	Carbon (C)	4	4	12.566	1.125	11.170	11.26030
7	Nitrogen (N)	5	4	14.049	1.031	13.627	14.53414
8	Oxygen (O)	5	5	15.707	1.062	14.790	13.61806
9	Fluorine (F)	6	5	17.207	1.015	16.953	17.42282
10	Neon (Ne)	6	6	18.849	1*	18.849	21.5646
11	Sodium (Na)	7	6	20.3509	4	5.089	6.13908
12	Magnesium (Mg)	7	7	21.991	3	7.330	7.64624
13	Aluminum (Al)	8	7	23.509	4	5.877	5.98577
14	Silicon (Si)	8	8	25.132	3	8.377	8.15169
15	Phosphorus (P)	9	8	26.657	3	8.885	10.48669
16	Sulfur (S)	9	9	28.274	3	9.424	10.36001
17	Chlorine (Cl)	10	9	29.803	2	14.901	12.96764
18	Argon (Ar)	10	10	31.415	2	15.707	15.75962
19	Potassium (K)	11	10	32.949	8	4.113	4.34066

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20	Calcium (Ca)	11	11	34.557	6	5.759	6.11316
21	Scandium (Sc)	12	11	36.094	6	6.015	6.5615
22	Titanium (Ti)	12	12	37.699	6	6.283	6.8281
23	Vanadium (V)	13	12	39.238	6	6.539	6.7462
24	Chromium (Cr)	13	13	40.840	6	6.806	6.7665
25	Manganese (Mn)	14	13	42.382	6	7.063	7.43402
26	Iron (Fe)	14	14	43.982	6	7.330	7.9024
27	Cobalt (Co)	15	14	45.526	6	7.587	7.8810
28	Nickel (Ni)	15	15	47.123	6	7.853	7.6398
29	Cupper (Cu)	16	15	48.669	6	8.111	7.7263
30	Zinc (Zn)	16	16	50.265	5	10.053	9.3942
31	Gallium (Ga)	17	16	51.812	9	5.756	5.99930
32	Germanium (Ge)	17	17	53.487	6	8.901	7.8994
33	Arsenic (As)	18	17	54.955	6	9.159	9.7886
34	Selenium (Se)	18	18	56.548	6	9.424	9.75234
35	Bromine (Br)	19	18	58.098	5	11.619	11.81381
36	Krypton (Kr)	19	19	59.690	4	14.922	13.9990
37	Rubidium (Rb)	20	19	61.240	16	3.827	4.17713
38	Strontium (Sr)	20	20	62.831	10	6.283	5.6949
39	Yttrium (Y)	21	20	64.383	10	6.438	6.2171
40	Zirconium (Zr)	21	21	65.973	10	6.597	6.63390
41	Niobium (Nb)	22	21	67.529	10	6.752	6.75885
42	Molybdenum (Mo)	22	22	69.115	10	6.911	7.09243
43	Technetium (Tc)	23	22	70.668	10	7.066	7.28
44	Ruthenium (Ru)	23	23	72.256	10	7.225	7.36050
45	Rhodium (Rh)	24	23	73.810	10	7.381	7.45890
46	Palladium (Pd)	24	24	75.398	10	7.539	8.3369
47	Silver (Ag)	25	24	76.952	10	7.695	7.5762
48	Cadmium (Cd)	25	25	78.539	9	8.726	8.9938
49	Indium (In)	26	25	80.095	14	5.721	5.78636
50	Tin (Sn)	26	26	81.681	10	8.168	7.3439
51	Antimony (Sb)	27	26	83.237	10	8.323	8.6084
52	Tellurium (Te)	27	27	84.823	10	8.482	9.0096
53	Iodine (I)	28	27	86.379	9	9.597	10.45126
54	Xenon (Xe)	28	28	87.964	8	10.995	12.1298
55	Cesium (Cs)	29	28	89.521	24	3.730	3.89390
56	Barium (Ba)	29	29	91.106	18	5.061	5.21170
57	Lanthanum (La)	30	29	92.663	16	5.791	5.5769
58	Cerium (Ce)	30	30	94.247	18	5.235	5.5387
59	Praseodymium (Pr)	31	30	95.805	18	5.322	5.473
60	Neodymium (Nd)	31	31	97.389	18	5.410	5.5250
61	Promethium (Pm)	32	31	98.947	18	5.497	5.582
62	Samarium (Sm)	32	32	100.530	18	5.585	5.6436
63	Europium (Eu)	33	32	102.089	18	5.671	5.6704
64	Gadolinium (Gd)	33	33	103.672	18	5.759	6.1501
65	Terbium (Tb)	34	33	105.231	18	5.846	5.638
66	Dysprosium (Dy)	34	34	106.814	18	5.934	5.9389
67	Holmium (Ho)	35	34	108.373	18	6.020	6.0215
68	Erbium (Er)	35	35	109.955	18	6.108	6.1077
69	Thulium (Tm)	36	35	111.515	18	6.195	6.18431
70	Ytterbium (Yb)	36	36	113.097	18	6.283	6.25416
71	Lutetium (Lu)	37	36	114.657	18	6.369	5.4259
72	Hafnium (Hf)	37	37	116.238	22	5.283	6.82507
73	Tantalum (Ta)	38	37	117.799	16	7.632	7.5496
74	Tungsten (W)	38	38	119.380	16	7.461	7.8640
75	Rhenium (Re)	39	38	120.941	16	7.558	7.8335
76	Osmium (Os)	39	39	122.522	14	8.751	8.4382
77	Iridium (Ir)	40	39	124.082	14	8.863	8.9670
78	Platinum (Pt)	40	40	125.663	14	8.975	8.9587

79	Gold (Au)	41	40	127.224	14	9.087	9.2255
80	Mercury (Hg)	41	41	128.805	13	9.908	10.43750
81	Thallium (Tl)	42	41	130.366	22	5.925	6.1082
82	Lead (Pb)	42	42	131.946	18	7.307	7.41666
83	Bismuth (Bi)	43	42	133.508	18	7.417	7.2856
84	Polonium (Po)	43	43	135.088	16	8.443	8.417
85	Astatine (At)	44	43	136.650	15	9.110	9.31751
86	Radon (Rn)	44	44	138.230	12	11.519	10.74850
87	Francium (Fr)	45	44	139.792	36	3.883	4.0727
88	Radium (Ra)	45	45	141.137	27	5.235	5.2784
89	Actinium (Ac)	46	45	142.933	21	6.806	5.17
90	Thorium (Th)	46	46	144.513	22	6.568	6.3067
91	Protactinium (Pa)	47	46	146.075	23	6.351	5.89
92	Uranium (U)	47	47	147.654	24	6.152	6.9405
93	Neptunium (Np)	48	47	149.173	25	5.968	6.2657
94	Plutonium (Pu)	48	48	150.796	26	5.799	6.0262
95	Americium (Am)	49	48	152.359	25	6.094	5.9738
96	Curium (Cm)	49	49	153.938	26	5.920	5.9915
97	Berkelium (Bk)	50	49	155.500	26	5.980	6.1979
98	Californium (Cf)	50	50	157.079	27	5.817	6.2817
99	Einsteinium (Es)	51	50	158.642	28	5.665	6.42
100	Fermium (Fm)	51	51	160.221	29	5.524	6.50
101	Mendelevium (Md)	52	51	161.178	30	5.329	6.58
102	Nobelium (No)	52	52	163.362	31	5.269	6.65
103	Lawrencium (Lr)	53	52	164.926	32	5.153	4.9
104	Rutherfordium (Rf)	53	53	166.504	27	6.166	6.0
105	Dubnium (Db)	54	53	168.067	27	6.224	-
106	Seaborgium (Sg)	54	54	169.640	27	6.283	-
107	Bohrium (Bh)	55	54	171.209	27	6.341	-
108	Hassium (Hs)	55	55	172.787	27	6.399	-

Note: 1) * In the case of Neon (Z = 10), if the periodic number consider as 0.9 the less of P = 1, then we get ionization value, 20.9433 which is near to 21.5646. More accurately, 0.88 gives best result, 21.665. Similarly minor correction is need for Periodic number (P). It requires more investigation in this field.

Note: 2) 1st Ionization Energy unknown from 105 to 118 elements.

3) For Hydrogen, $3 \overline{\text{x } [\pi\sqrt{r_2} \text{ x } r_1]}/P$ = (4.442882938 x 3) / 1 = 13.32864881 = Ionization Energy of H, when P = 1

Or $[\pi \sqrt{r_2} \text{ x } r_1]$ / P = 4.442882938 / (1/3), when P = 1/3 = 0.333333.

4) We observed that, $[(r_2 - 2) + r_1]$ = Atomic No. of the elements = Z, $[r_2 > r_1$ and $r_2 = (r_1 + 2)]$. For example, relative number of Hydrogen $r_2 = 2$ and $r_1 = 1$, then $[(r_2 - 2) + r_1] = [(2 - 2) + 1] = 1$ = Z. For Helium, $r_2 = 2$, $r_1 = 2$, then $[(r_2 - 2) + r_1] = [(2 - 2) + 2] = 2$ = Z. the element and the atomic structure formed on it. Though it has been tried to find the 1st ionization potential or energy by using relative numbers through couple system. Because we can determine the series Therefore, relative number is related to atomic number of element. Therefore, relative numbers of element almost ½ of atomic number. Normally, ionization energy determined by the electron shell configuration of Pi [1], series of ½ [2], quark coupling relation, properties of mind, activity of number of cells in brain by couple system [3]. From the view of that Couple System is very important and we can apply to microscopic field of atom. This is a parallel system to find the ionization energy comparing to modern theories.

Helium Element:

Helium is the 2nd element in the periodic table having one neutron particle. About 23% elements in the periodic table are mass related to Helium. So it's ionization energy need to function to all other elements. On considering this element, we can deduce an empirical formula as stated bellow:

The ionization potential of Helium = 24.58741, its relative number (even number characteristic) is $r_2 = 2$ & $r_1 = 1$. It has no unit until we consider as length, time, energy in electron volt etc. like 1, 2, 3, numbers. Thus means that 1 for 1 second, 2 for 2 meter, 3 for 3 volt etc. Again the value of π is 3.141592654 and it has no unit. It is a transcendental number, normally Pi defined as, circumference / diameter of circle. The value of Pi used in many fields. When root of relative numbers multiplied by Pi value, we get irrational number. If we treated r_1, r_2 value as electron volt divided by periodic number $[\pi \sqrt{r_2} \text{ x } r_1]$ / P in eV to calculate the ionization energy, then this value wills almost the near value of experimental result.

Determination of Ionization energy of Helium:

1) Ionization potential = 24.58741
2) $\pi\sqrt{r_1 \text{ x } r_2}$ = 6.283185307, when, $r_2 = 2$ & $r_1 = 2$.
3) Now, 6.283185307 / 24.58741 = 0.2555448 = Periodic number of Helium.

There is no periodic number in periodic table. Atomic number used serially from hydrogen to all elements. It is the new attempted to search different characteristics of elements from the view of couple system. Here we want to find the 1st ionization potential of all elements. How we can determine this energy, let us try to solve it by calculating relative numbers of elements.

Determination of Periodic Number of other elements.
We can use this 0.25 value in all cases to find the Periodic number in the form of **2^n x 0.25** for elements **(Table – 3)**

Period	2^n x 0.25	Periodic Number	Element	Group in Periodic Table
I	2^0 x 0.25 = 0.25	0.25	He	0
-	2^1 x 0.25 = 0.5	-	-	-
II	2^2 x 0.25 = 1	1	Be, Ne	(IIA) & 0
III	2^3 x 0.25 = 2	2	Ar	0
IV	2^4 x 0.25 = 4	4	Kr	0
V	2^5 x 0.25 = 8	8	K, Xe	IA & 0
VI	2^6 x 0.25 = 16	16	Rb (Shifted 0 to 1A),	La(IIIA),Ta(VA),W(VIA), Re (VII) & Po

(IVB), these are exceptional case. **If we arrange number 8, 4, 2, 1 as,**

1) 8 (number for Xe) + 4 (number for Kr) = 12, this periodic number for element Rn in 0 group.
2) 4 (number for Kr) + 2 (number for Ar) = 6, this number for element Ca to Cu group from IIA to IB & for Ge, As, Se for IVA, VA, VIA.
3) 16 (number for above mentioned group) + 2 (number for Ar) = 18, this number used for the elements Ba & Ce to Lu & Pb, Bi.
4) 2 (number for Ar) + 1 (number for Ne) = 3 for the element Mg (IIA), Si (IVA), P (VA) & S (VIA).
5) 8 (number for Xe) + 2 (number for Ar) = 10 for elements Sr to Ag (group IIA to IB) and Sn, Sb, Te group for IVA, VA & VIIA.
6) 8 (number for Xe) + 1 (number for Ne) = 9 for Cd & I of group IIB & VIIA.
7) 16 (number for above mentioned group) + 8 (number for Xe) = 24 for Cs, U in group IA & VIIB.
8) 8 (number for Xe) + 4 (number for Kr) + 2 (number for Ar) = 14 for In, Os, Ir, Pt (group VIII), Au (in gr. IB).
9) 8 (number for Xe) + 4 (number for Kr) + 1 (number for Ne) = 13 only for Hg (group IIB).
10) 4 (number for Kr) + 1 (number for Ne) = 5 for Zn & Br of the group IIB & VIIA.

But, 3 x [8 (number for Xe) + 1 (number for Ne)] = 27 for element Ra (group IIA), Cf (group IIIA) & Rf (group IVB), Db (group VB).

11) 4 x [8 (number for Xe) + 1 (number for Ne)] = 36 only for Fr in group IA.

This is one type of system to find the periodic number of the elements, because, when we divide [$\pi \sqrt{r_2 \times r_1}$] by Periodic Number (P), we get Ionization Potential or Energy, r_2 & r_1 relative number for each element is different.

More simple way we can find periodic number of following elements: **(Table – 4)**

Period	nx0.25with Periodic No.	Element & Group	When n =	For Example (Calculated Value),
I	1x0.25 = 0.25	He 0	n = 1	a) Ionization Energy of Helium:
?	2x0.25 = 0.5	?	n = 2	= [$\pi \sqrt{(r_2 x r_1)}$] / P = 25.132
II	2x0.5 = 1	Be (IIA) & Ne (0)	n = 2	When, [$\pi \sqrt{(r_2 x r_1)}$] = 6.283, & P = 0.25
III	2x1 = 2	Li IA	n = 2	
IV	2x2 = 4	Na IA	n = 2	**Experimental Value of He = 24.58741**
V	2x4 = 8	K IA	n = 2	b) For Lawrencium (Lr), (Calculated):
VI	2x8 = 16	Rb IA	n = 2	[$\pi\sqrt{(r_2 x r_1)}$] = 164.926 & P = 32, then,
Actinides	2x16 = 32	Lr VII	n = 2	[$\pi\sqrt{(r_2 x r_1)}$] / P =5.153
				Experimental Value of Lr = 4.9
VII	3x9 = 36 (Maximum)	Fr IA	n = 3	c) Calculated Value of Fr = 3.883
				Experimental Value = 4.0727

When the values of n are considered as 0, - 1, - 2, - 3…., then, another set of values for period II will form as listed here:

(Table – 5)
A System of Forming Periodic Numbers: [Equation* – (2^{-n} +1), n = 0, 1, 2, 3, 4 ...] (Table – 5)

Equation* (2^{-n} + 1)	Periodic Number	Element	Group in Periodic Table
$2^0 + 0 = 2 \times 0 + 1 = 1$	1	Be	IIA
$2^{-1} + 1 = ½ + 1 = 1.5$	1.5	Li	IA
$2^{-2} + 1 = ¼ + 1 = 1.25$	1.25	B	IIIB
$2^{-3} + 1 = 1/8 + 1 = 1.125$	1.125	C	IVB
$2^{-4} + 1 = 1/16 + 1 = 1.0625$	1.0625	O	VIB
$2^{-5} + 1 = 1/32 + 1 = 1.03125$	1.03125	N	VB
$2^{-6} + 1 = 1/64 + 1 = 1.015625$	1.015625	F	VIIB
$2^{-7} + 1 = 1/128 + 1 = 1.0078125 \approx 1$	1.0078125	Ne	0

When the form **(2^n + 2)** is applied to determine the periodic number, then we get,

[Equation* – (2^n +2), n = 0, 2, 3, 4, 5 …] **(Table – 6)**

Period	Equation* (2^n + 2)	Periodic Number	Element	Group
III	$1^0 + 2 =$	3 (as special case)	Mg, Si, P, S	IIA, IVB, VB.
III	$2^1 + 2 =$	4	Na, Al, Kr	IA, IIIB, 0
IV	$2^2 + 2 =$	6	Ca to Cu, Ge, As, Se	IB, IV, V, VIB
V	$2^3 + 2 =$	10	Sr to Ag, Sn, Sb, Te	IB, IV, V, VIB
VI	$2^4 + 2 =$	18	Ba, Pb, Bi, Lanthanide	IIA, IVA, VA,
Series	Ce, Pr, Nd, Pm,	IVB, VB, VIB, VIIB,		
Sm, Eu	, Gd, Tb, Dy,	VIIIB, VIIIB, VIIIB,		
Ho, Er,	Tm, Yb & Lu	IB, IIB, IIA, IVA,		
		VA, VIA, VIIA.		

For actinide series and for other few group, periodic number obtained by using system in form of **(2^5 – n)** when **n = 0, 1, 2, 3, 4 …**

[Equation*: (2^5 – n), n = 0, 2, 3, 4, 5 …] **(Table – 7)**

Equation*	Periodic number	Element	Group
$2^5 – 0 = 36$	36	Fr	IA
$2^5 – 1 = 35$	35	-	- (Element not yet found the Periodic
$2^5 – 2 = 34$	34	-	- ,, Number [P])
$2^5 – 3 = 33$	33	-	- ,,
$2^5 – 4 = 32$	32	Lr	VIIA
$2^5 – 5 = 31$	31	No	VIA
$2^5 – 6 = 30$	30	Md	VA
$2^5 – 7 = 29$	29	Fm	IVA
$2^5 – 8 = 28$	28	Es	IIIA
$2^5 – 9 = 27$	27	Ra, Cf, Rf, Db	IIA, IIB, IVB, VB
$2^5 – 10 = 26$	26	Pu, Cm, Bk	VIIIB, VIIIB, IB
$2^5 – 11 = 25$	25	Np, Am	VIIB, VIIIB
$2^5 – 12 = 24$	24	Cs, U	IA, VIB
$2^5 – 13 = 23$	23	Pa	VB
$2^5 – 14 = 22$	22	Hf, Tl, Th,	IVB, IIIA, IVB
$2^5 – 15 = 21$	21	Ac	IIIB

With these periodic numbers and in the form of $\pi \sqrt{r_2 \times r_1}$ / P in eV, 1st ionization energy is plotted in a graph against atomic numbers of corresponding elements comparing with reference 1st ionization energy.

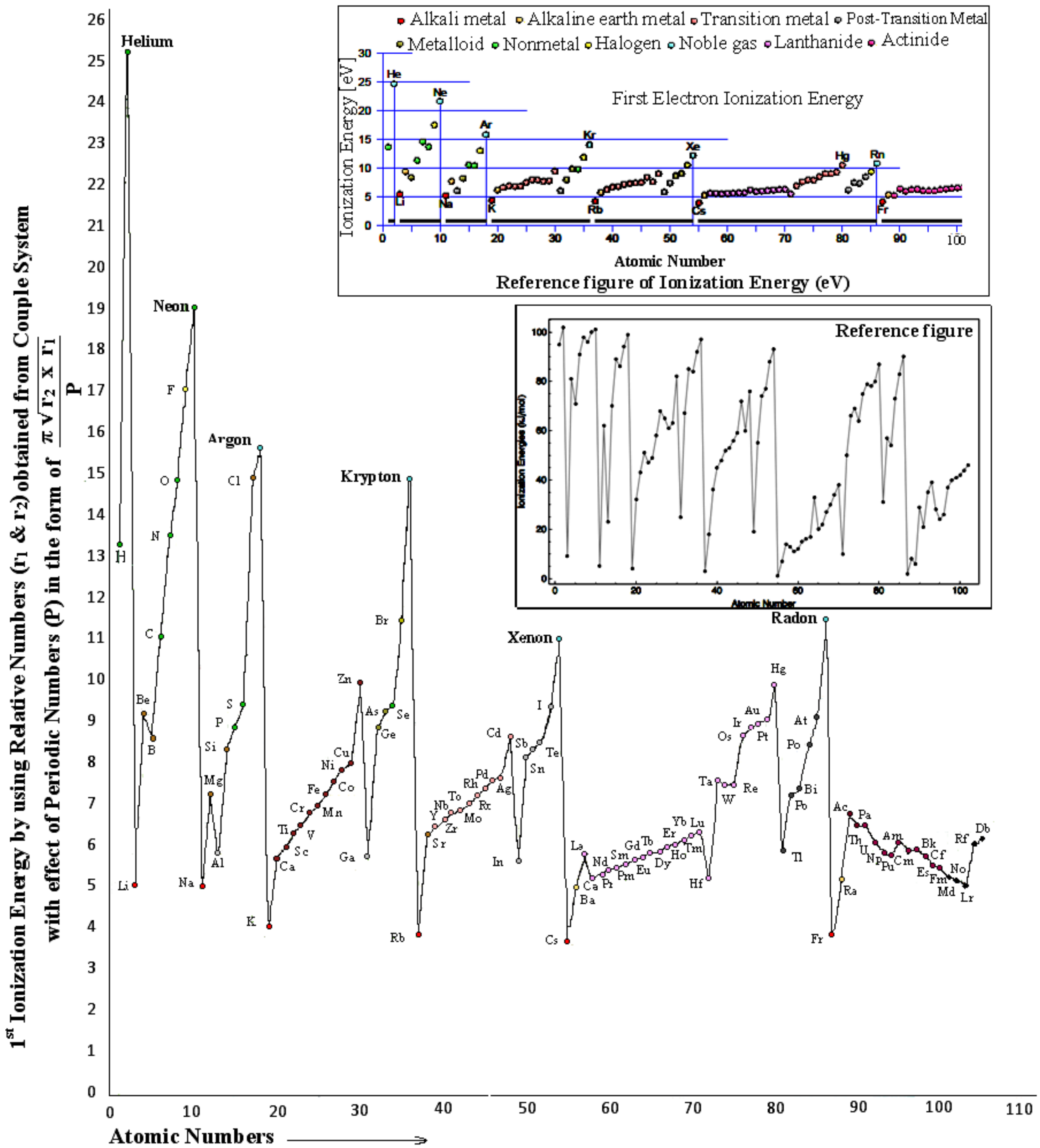

Figure – 7: Calculated values of 1st Ionization Energy plotted against atomic number of the elements.

Ionization energy classified by using shell configuration of electron in the form of (2s, 2p), (3s, 3p, 3d), (4s, 4p, 4d, 4f), (5s, 5p, 5d, 5f), etc. This system depends on the characteristics of electron based on atomic number of elements. The relative numbers are also plotted against atomic numbers of elements in the form of $\pi \sqrt{r_2} \times r_1 / P$, here P is indicating the periodic number of element. The calculated result of 1st ionization energy is almost near to experimental value. The produced figure – 7 is showing these facts which tallied to reference figures plotted in side of this figure. Relative number is one type of number which obtained from couple system. This method is new one in mathematics. If we treated relative number in other fields, we must get some good result which may open the new door of research to progress in front.

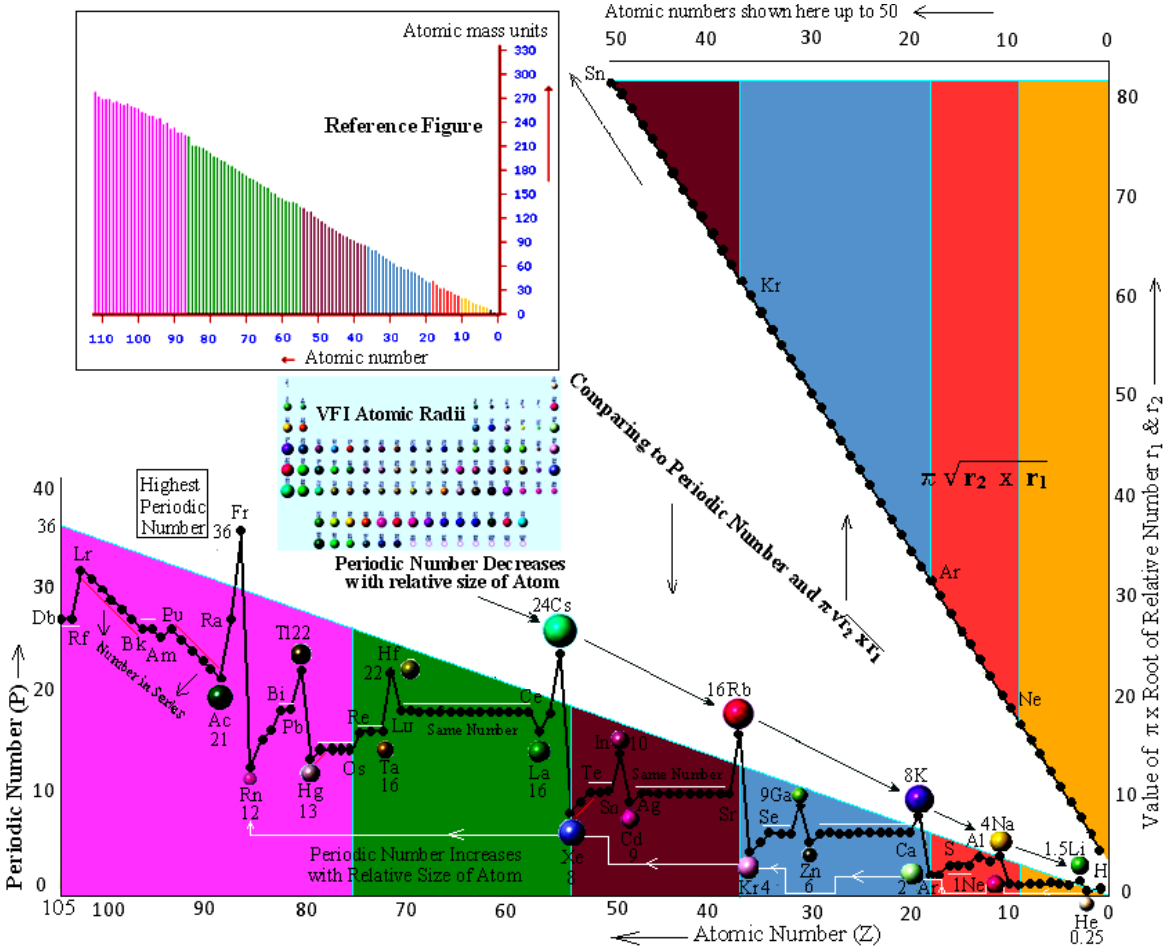

Figure – 8, Graph of Periodic Numbers against Atomic Number of the Elements (Bellow) and values of Relative Numbers r_2 & r_1 plotted against Atomic Number up to 50 in the form of $\pi\ \sqrt{r_2 \times r_1}$ / P (In R.H.S. Upper Side).

In this figure of periodic number & relative number with respect to atomic numbers, we observed that these number increases with increase of atomic mass. In the case of periodic number, the elements of 1A group, Li, Na, K, Rb, Cs, Fr takes place out of colored position (Green arrow line) with respect to periodic number 1.5, 4, 8, 16, 24 & 36. Except Periodic number of Li, there is symmetry between these even number as 4x2 = 8, 4x4 = 16, 4x6 = 24 & 4x9 = 36 (indicated by WHITE Arrow Straight Line). Few relative sizes of atoms given here comparing to periodic numbers. Number increases from He to Rn (12) in zero group in the form of 0.25 (He) x 4 = 1 (Ne), 0.25 x4 = 2 (Ar), 2 x 2 = 4 (Kr), 2 x 4 = 8 (Xe), 2 x 6 = 12 (Rn). Few elements placed in figure which are not in series (listed in table), few elements Ca to Cu obeying number 6, similarly, Sr to Ag follows number 10, Ce to Lu follows number 18 in series shown in graph by WHITE straight arrow line from R.H.S. to L.H.S. more examples are there of Periodic Numbers. All numbers brings the value of 1st ionization energy of the elements acting with relative numbers in the form of ($\pi\ \sqrt{r_2 \times r_1}$) / P, the results are almost near to reference values listed in **Table – 2.**

Periodic number is important from the view of new angle of microscopic particles. Because we can determine the atomic mass of element almost near the atomic mass of elements. There are many isotopic mass of each elements, it is possible to find few isotopic mass of the elements by using periodic number. How we can find this mass, let us try to solve it.

Determination of atomic mass of elements:

We have the equation [$\pi\ \sqrt{r_2 \times r_1}$] eV. If we divided atomic weight by [$\pi\ \sqrt{r_2 \times r_1}$], then we will get a fractional value as say ${}^{Z}F_{wr}$ = At. Wt. / [$\pi\ \sqrt{r_2 \times r_1}$] with atomic mass unit / eV, where, ${}^{Z}F_{wr}$ is representing the fractional atomic weight of Z number of element.

For example for element He:

Calculated values of Hydrogen are: [$\pi\ \sqrt{r_2 \times r_1}$] = 4.44288938 eV, Periodic number (P) = 0.333333333, Ionization energy of H is, ${}_{H}I^{E}$ = 13.328 eV (calculated, experimental value = 13.595 eV) . Atomic weight = 1.00794 amu.

Now, ${}^{1}F_{H}$ = 1.00794 amu / 4.442 eV = 0.226865878 amu / eV. Then, ${}^{1}F_{H}$ x P x ${}_{H}I^{E}$ = 0.226865878 amu / eV x 0.3333333333 x 13.32864895 eV = 1.007938539 amu.

Isotopic mass of hydrogen = 2 x 1.007938539 = 2.015877078 (experimental = 2.0141017778), having number of neutron = 1 and Z = 1 [7]. Similarly for other isotopic masses are:

3 x 1.007938539 = 3.023815617 (experimental = 3.0160492777) having 2 neutron, Z = 1

4 x 1.007938539 = 4.031754156 (experimental = 4.02781(11) having 3 neutron, Z = 1

5 x 1.007938539 = 5.039692695 (experimental = 5.03531(11) having 4 neutron, Z = 1

6 x 1.007938539 = 6.047631234 (experimental = 6.04494(28) having 5 neutron, Z = 1

The calculated value is nearest of experimental results.

Example for element Ne:

For Neon (Ne), $\overline{[\pi \sqrt{r_2} \text{ x } r_1]}$ = 18.849, P = 1, $_{Ne}I^E$ = 18.849 eV, At. Wt. = 20.1797 amu

$^{10}F_{Ne}$ = 20.1797/18.849 = 1.0705971. Then, $^{10}F_{Ne}$ x P x $_{Ne}I^E$ = 1.0705971 x 1 x 18.849 = 20.1797

Isotopic mass of Neon: [8].

When periodic number varied as like as 0.9, 0.8, 0.7, 0.6. 0.5 & 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, then we get the result as:

20.1797 x 0.9 = 18.16173 (Experimental = 18.0057082(3) having 8 neutron, Z = 10

20.1797 x 0.8 = 16.14376 (Experimental = 16.025761(22) having 6 neutron, Z = 10

But, 20.1797 x 0.85 = 17.152745 (Experimental = 17.017672(29)) having 7 neutron, Z = 10

The exact value of periodic number will give exact result of particle.

20.1797 x 1.1 = 22.19767 (Experimental = 20.99384668(4) having 11 neutron, Z = 10

20.1797 x 1.2 = 24.21564 (Experimental = 23.9936108(4) having 14 neutron, Z = 10

20.1797 x 1.3 = 26.23361 (Experimental = 26.000461(29) having 16 neutron, Z = 10 and so on.

This process is applicable to other elements.

II. Conclusion

This system proves that the function of relative numbers and periodic numbers in microscopic field are there which is unknown to us. We can use this system in other fields to find remarkable properties of matter. Many scope are there to do research on couple system.

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