ISSN 1061-9208, Russian Journal of Mathematical Physics, Vol. 26, No. 3, 2019, pp. 352–367. © Pleiades Publishing, Ltd., 2019.

Table of Stable Chemical Elements Based on the “Intensity–Compressibility Factor” Diagram and on Mean Square Fluctuations of Energy and Time

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Received April 20, 2019; May 15, 2019; July 3, 2019

Dedicated to the memory of my dear pupil Mikhail Vladimirovich Karasev

Abstract. In this paper, a new physical notion, intensity, is introduced. The notion of intensity occurs in a special statistics, known as Gentile statistics, which is asymptotically close to ordinary thermodynamics. The introduction of the new notion of intensity in the theory of nuclear matter essentially changes the thermodynamical picture. Moreover, we can say that the thermodynamics of nuclear matter is the antipode of standard thermodynamics. On the basis of the “intensity–compressibility factor” diagram and mean square fluctuations of energy and time, a new table of properties of stable chemical elements is obtained and presented in this paper.

DOI 10.1134/S1061920819030105

THE UNCERTAINTY RELATION IN GENERAL FORM

The uncertainty relation for the coordinate p and the momentum x in the form $\delta x\delta p \sim \hbar$, where δp, δx are the mean square deviations of the momentum operator $\hat{p}$ and the coordinate operator $\hat{x}$, while $\hbar$ is the Planck constant, was obtained by Heisenberg in [1] in 1927.

At the present time, the Heisenberg uncertainty relation is generally written in the form of the following inequality for the operators p and q

$$\delta q\delta p \geqslant \hbar/2. \tag{1}$$

This inequality was obtained in 1927 by Kennard [2].

Three years later, Schrödinger [3] and Robertson [4] generalized inequality (1) to the case of an arbitrary pair of quantum observables X and Y:

$$\delta X\delta Y \geqslant \frac{1}{2}\sqrt{\left(\overline{XY-YX}\right)^2+\left(\overline{XY+YX}\right)^2}. \tag{2}$$

The right-hand side of the last inequality contains the commutator, as well as the anticommutator, of the operators X and Y. Here the operators are assumed self-adjoint. These formulas reflect the Heisenberg uncertainty principle for the quantities appearing in the left-hand side and determine their fluctuations.

As a rule, the Schrödinger equation is written in one of two forms: as an equation containing the time t and the self-adjoint operator $\hat{H}$

$$i\hbar\frac{\partial}{\partial t}\Psi = \hat{H}\Psi, \tag{3}$$

or in the form of a stationary equation (not involving time) which sets the spectrum problem for the operator $\hat{H}$

$$\Lambda\Psi = \hat{H}\Psi. \tag{4}$$

It is natural to relate the operator $\hat{H}$ with the eigenvalue Λ, or, as physicists say, indicate the time and the phase.

Since the Cauchy problem is considered for the Schrödinger equation, i.e., the initial-value problem with $t = 0$, if follows that time changes from 0 to plus infinity and the operator $i\hbar\frac{\partial}{\partial t}$ cannot be self-adjoint.

In quantum physics, since the time of von Neumann and Pauli, the notion of observable quantity has been considered and put in correspondence with a self-adjoint operator in Hilbert space. Von Neumann and Stone considered only self-adjoint operators and observable quantities.

One of the difficulties in the standard formulation of quantum mechanics is in the impossibility of assigning to such quantities as time (Pauli), phase (Dirac), angle, and so on, an appropriate operator in the Hilbert space of the system. However, such difficulties can be avoided by taking for observable quantities nonorthogonal partitions of unity subjected to covariance constraints that generalize the Weyl commutation relations in the Stone–von Neumann theorem.

A. S. Holevo in [5] and other papers was the first to propose a mathematical approach which allowed to assign observable quantities to non-self-adjoint operators. The general outline of his approach is to consider partitions of unity forming a convex set satisfying the covariance conditions and to distinguish the extreme points of this set that minimize the uncertainty functional in a certain state. In this way, one can obtain generalized observables, canonically corresponding to achievement time. In spectral theory, nonorthogonal partitions of unity arise, in particular, as generalized spectral measures for non-self-adjoint operators. In this context, for example, the operator corresponding to observable time turns out to be maximal Hermitian (but not self-adjoint). Using this approach, one can also show that relativistic massless particles turn out to be "approximately localized" if, in the definition of localization, arbitrary partitions of unity are allowed [6, 7].

From the contemporary point of view, the standard notion of observable corresponds to "sharp" observables, while the nonorthogonal partition of unity describes "unsharp" observables. In this situation, one can assign a probability distribution to sharp as well as unsharp observables in any state, which allows to calculate all the statistical characteristics – mean values, dispersion, correlation, and to establish the uncertainty relation for nonstandard canonically conjugate pairs [7, 8].

The time operator and the corresponding uncertainty relation has been studied by other authors, but the approach from the point of view of covariant observables appears to be most natural.

In the work of Olkhovsky (see [9] and other papers) based on Holevo's work, an approach convenient for physicists was developed. It allows to obtain the uncertainty relation for the time and energy operators in the form

$$\delta E \delta t \geqslant \hbar/2. \tag{5}$$

In particular, Olkhovsky considered the Yukawa potential and the BBGKY hierarchy (Bogolyubov–Born–Green–Kirkwood–Yvon hierarchy). In the paper [10], an explicit analytic formula for the S-matrix in the case of an arbitrary central interaction inside a sphere of finite radius with the "tail" of the Yukawa potential at large distances was obtained. This method uses the completeness of the space of wave functions outside a finite sphere, as well as the unitarity and symmetry of S-matrices.

In the present paper, we shall consider the uncertainty relation for time and energy. The problem of introducing the time operator in quantum mechanics goes back to its very origins. The time operator $\hat{t}$, defined as

$$\begin{aligned} \widehat{t} &= t, \quad \text{time-like } t\text{-representation}, \\ \widehat{t} &= -i\hbar\frac{\partial}{\partial E}, \quad \text{energy-like } E\text{-representation}, \end{aligned} \tag{6}$$

is not self-adjoint [11], but is Hermitian. It is precisely for this reason that V. Pauli, one of the founders of quantum mechanics, refused to use the time operator given by (6).

PASSAGE FROM BOSE TO FERMI

Consider the case in which at every energy level E_p, there can be no more than K particles (so called Gentile statistics, or parastatistics). For an ideal gas of dimension $D = 3$, the following relations for the number of particles N and the energy E hold:

$$N = \frac{V}{\lambda^3}(\mathrm{Li}_{3/2}(\mathbf{I}) - \frac{1}{(K+1)^{1/2}}\,\mathrm{Li}_{3/2}(\mathbf{I}^{K+1})), \tag{7}$$

$$E = \frac{3}{2}\frac{V}{\lambda^3}T(\mathrm{Li}_{5/2}(\mathbf{I}) - \frac{1}{(K+1)^{3/2}}\,\mathrm{Li}_{5/2}(\mathbf{I}^{K+1})), \tag{8}$$

where V is the volume, T is the temperature, $\mathrm{Li}_{(\cdot)}(\cdot)$ is the polylogarithmic function, $\mathbf{I}$ is a new quantity that we will call *intensity* and λ is the de Broglie wavelength:

$$\lambda = \sqrt{\frac{2\pi\hbar^2}{mT}}; \tag{9}$$

here m is the mass.

Gentile statistics, which coincides with the notion of polylogarithm and based on the formula

$$\mathrm{Li}_s(z) = \sum_{k=1}^{\infty}\frac{z^k}{k^s},$$

is related to the Bose–Einstein and Fermi–Dirac distributions in the following way. The integral of the Bose–Einstein distribution is expressed in terms of the polylogarithm as:

$$\mathrm{Li}_{s+1}(z) = \frac{1}{\Gamma(s+1)}\int_0^{\infty}\frac{t^s}{e^t/z-1}\,dt.$$

The integral of the Fermi-Dirac distribution is also expressed in terms of the polylogarithm:

$$\mathrm{Li}_{s+1}(-z) = \frac{1}{\Gamma(s+1)}\int_0^{\infty}\frac{t^s}{e^t/z+1}\,dt.$$

Therefore, the passage from the Bose–Einstein distribution to the Fermi-Dirac distribution corresponds to the passage, in the Hougen–Watson $P-F$ diagram (P is the pressure, $F = PV/(NT)$ is the compressibility factor), from the quadrant II ($P<0, F>0$) to the quadrant IV ($P>0, F<0$).

The values of s in relations for the polylogarithm can be arbitrary. However, in the case when only fixed values (e.g. $s=2$, $s=3$, etc) are given, one can consider all other values of s as holes. Holes are the values that we leave out.

The polylogarithm function sometimes appears in thermodynamics. However, the polylogarithm, as well as Gentile statistics, have no direct relationship to classical thermodynamics, which includes temperature, chemical potential, energy, lifetime, entropy, and other parameters used in classical and quantum thermodynamics. From the purely mathematical viewpoint, as well as asymptotically, the relations of Gentile statistics and of thermodynamics are very similar. But it should be stressed that Gentile statistics and the notion of polylogarithm have no relationship to thermodynamics.

Nevertheless, we introduce, as a new physical thermodynamical quantity, a certain constant related to Gentile statistics and to the polylogarithm. We have called this constant the intensity and denote it by $\mathbf{I}$. It is close to the notion of activity $a = e^{\mu/T}$ in standard thermodynamics, but certainly does not coincide with it. Basically, the new parameter $\mathbf{I}$ is related to the notion of "lacunary indeterminacy" [12], in situations when not all quantities are exactly defined. In [12], the meaning of lacunary indeterminacy was explained as follows: in a certain region we cannot distinguish and number particles, however, we can determine the total number of particles. This region is a lacuna of sorts in the general deterministic picture.

In order to relate the Bose–Einstein and Fermi–Dirac distributions with the principle of lacunary indeterminacy, it is necessary to construct an analog of Mendeleev's periodic table of elements for stable gases on the basis of experimental data. In the present paper, we present such a table

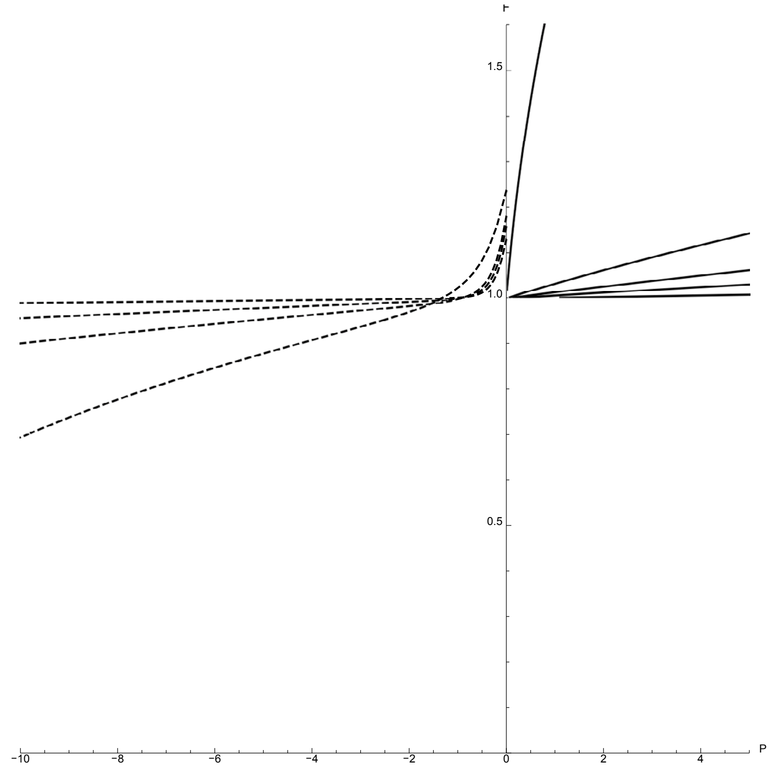

Fig. 1. Dependence of the compressibility factor $F = PV/(NT)$ on the pressure P expressed in MeV/fm^3 for helium-4, litium-6, litium-7, berillium-9 (from top to bottom along the F (vertical) axis). The continuous lines represent the Fermi branch. The hashed lines are isotherms of the Bose branch, constructed according to formulas (7) - (8).

for stable chemical elements; this table is related to lacunary indeterminacy and, except for the parameter $\mathbf{I}$, has nothing to do with Gentile statistics.

The table presented by the author is indeed related to lacunary indeterminacy, but does not pretend to explain any law of nature, just as Mendeleev's table, which initially was purely empirical and gave no explanation of all the physical phenomena that lead to it (see, for example, [13]).

The passage of particles from the domain where the Bose–Einstein statistics is obeyed to that where the Fermi–Dirac statistics rules, goes through a domain known as a fur coat or a region of lacunary indeterminacy [12]. The minimal value of the intensity $\mathbf{I}$ for which the number of Bose particles N tends to 0 will be denoted by $\mathbf{I}_0$. The quantity $\mathbf{I}_0$ shows for what minimal intensity the decomposition of a boson into fermions begins.

In our previous papers [12,14–15], we have obtained an expression for $\mathbf{I}_0$, i.e., for those values of $\mathbf{I}$ for which $K = N = 0$:

$$\frac{1}{2}\,\mathrm{Li}_{3/2}(\mathbf{I}_0) - \log(\mathbf{I}_0)\,\mathrm{Li}_{1/2}(\mathbf{I}_0) - B^{-1} = 0, \tag{10}$$

where $B = \frac{V}{\lambda^3} > 0$.

In thermodynamics, it is customary to use the Hougen–Watson P-F diagram (P is the pressure, $F = PV/(NT)$ is the compressibility factor), which illustrates the Van der Waals law of corresponding states. On the P-F diagram, the Fermi–Dirac distribution corresponds to the domain of positive values. Figure 1 represents the P-F diagram for helium-4, litium-6, litium-7, and berillium-9.

At this point, the author's approach consists in using an analogous diagram, the $\mathbf{I}$-F diagram ($\mathbf{I}$ is the intensity, F, the compressibility factor), for very high temperature isotherms. This diagram is in a certain sense the antipode of the P-F diagram. Figure 2 shows the Bose branch on the $\mathbf{I}$-F diagram for the same chemical elements.

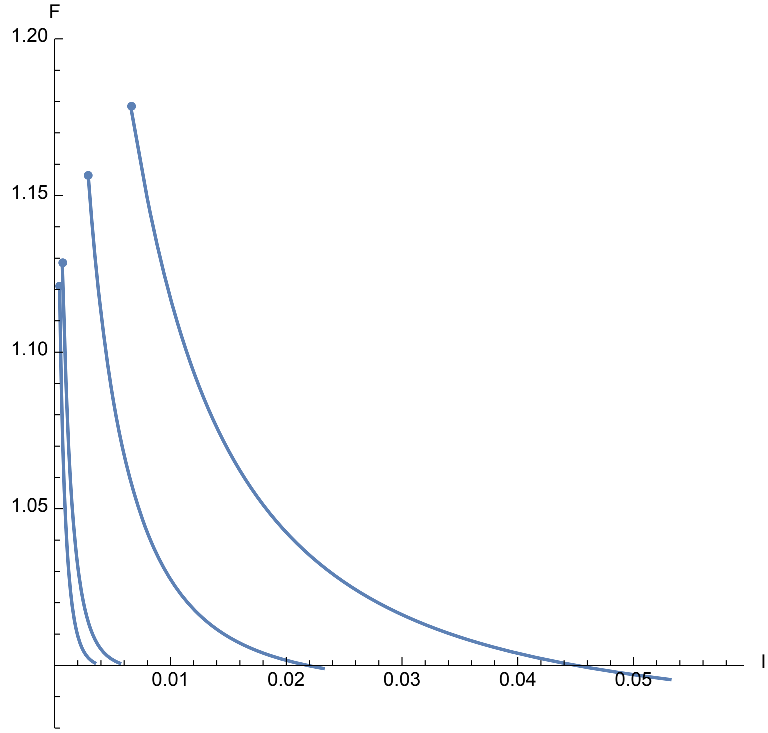

Fig. 2. Dependence of the compressibility factor F on the intensity $\mathbf{I}$, for berillium-9, litium-7, litium-6, helium-4 (from left to right). The curves are the isotherms of the Bose branch and are plotted according to formulas (0.7)–(0.8). The temperature is equal to the binding energy E_b of the nucleus (see Table 1).

In the paper [15], it was established that in the passage from the Bose branch to the Fermi branch a jump in the specific energy E_{sp} occurs, and the value of this jump is given by the formula

$$\Delta E_{sp} = T(\gamma + 1)(F|_{\mathbf{I}=\mathbf{I}_0} - 1), \tag{11}$$

where $\gamma = D/2 - 1$.

According to the formula

$$\delta t_{min} = \hbar/(2\Delta E_{sp}) \geqslant \delta t, \tag{12}$$

we can compute the minimal interval of time δt_{min} required to discover the energy jump ΔE_{sp}. If we introduce the time operator, we can consider its mean square fluctuation δt. Then δt_{min} is the minimal time fluctuation corresponding to the energy jump ΔE_{sp}.

Let us use the approach due to Kvasnikov [16] and show how one can find the mean square fluctuation for the number of particles N in the case when N is infinitely small.

PASSING TO INFINITELY SMALL QUANTITIES

From now on, we shall denote the mean square value of the number of particles by N, omitting the bar. Let us find the value of $\left(\frac{\partial \overline{N}}{\partial \mu}\right)_{TV}$, which is needed to compute N. We shall assume that $K = N$. Let us introduce the notation

$$\phi(\mu, N) = \left(\frac{2\pi m T}{(2\pi\hbar)^2}\right)^{\gamma+1} V(\mathrm{Li}_{1+\gamma}(\mathbf{I}) - \frac{1}{(N+1)^\gamma}\mathrm{Li}_{1+\gamma}(\mathbf{I}^{N+1})) - N. \tag{13}$$

As was shown in [12], there is a one-to-one correspondence between the chemical potential μ and the number of particles N. Let us expand the function $\phi(\mu(N), N)$ into a Maclaurin series in the variable N

$$\phi(\mu_0,0)+N[\phi_\mu(\mu_0,0)\mu_N+\phi_N(\mu_0,0)] \\ +N^2[\phi_{\mu\mu}(\mu_0,0)\mu_N^2+\phi_\mu(\mu_0,0)\mu_{NN}+2\phi_{\mu N}(\mu_0,0)\mu_N+\phi_{NN}(\mu_0,0)]+O(N^3), \quad (14)$$

where the derivative of μ_N is computed at the point $\mu=\mu_0$.

Since $\phi(\mu,0)\equiv 0$, the quantities $\phi(\mu_0,0)$, $\phi_\mu(\mu_0,0)$ and $\phi_{\mu\mu}(\mu_0,0)$ are all equal to zero. Dividing by N, we obtain the equality

$$\phi_N(\mu_0,0)+N[2\phi_{\mu N}(\mu_0,0)\mu_N+\phi_{NN}(\mu_0,0)]+O(N^2)=0. \quad (15)$$

Let us compute $\phi_N(\mu_0,0)$:

$$\phi_N(\mu_0,0)=\left(\frac{2\pi mT}{(2\pi\hbar)^2}\right)^{\gamma+1}V[\gamma\mathrm{Li}_{\gamma+1}(\exp[\mu_0/T])-\log(\exp[\mu_0/T])\mathrm{Li}_\gamma(\exp[\mu_0/T])]-1 \quad (16)$$

The value of μ_0 is chosen so as to have $\phi_N(\mu_0,0)=0$ (see formula (10) for the calculation of $\mathbf{I}_0$). If we now pass to the limit as $N\to 0$ in the expression (15), then the derivative

$$\mu_N=-\frac{\phi_N(\mu_0,0)}{\phi_\mu(\mu_0,0)}. \quad (17)$$

will have an uncertainty of type

$$\langle\langle 0/0\rangle\rangle$$

and, therefore, cannot be calculated according to this formula.

Dividing by N once again, we obtain

$$2\phi_{\mu N}(\mu_0,0)\mu_N+\phi_{NN}(\mu_0,0)+O(N)=0. \quad (18)$$

The passage to the limit as $N\to 0$ in (18) gives the value of the derivative μ_N at the point $\mu=\mu_0$

$$\mu_N=-\frac{\phi_{NN}(\mu_0,0)}{2\phi_{\mu N}(\mu_0,0)}. \quad (19)$$

The expressions for the partial derivatives $\phi_{NN}(\mu_0,0),\phi_{\mu N}(\mu_0,0)$ are of the form

$$\phi_{NN}(\mu_0,0)=-\left(\frac{2\pi mT}{(2\pi\hbar)^2}\right)^{\gamma+1}V[\log^2(\mathbf{I}_0)\mathrm{Li}_{\gamma-1}(\mathbf{I}_0)+\gamma((\gamma+1)\mathrm{Li}_{\gamma+1}(\mathbf{I}_0)-2\log(\mathbf{I}_0)\mathrm{Li}_\gamma(\mathbf{I}_0))], \quad (20)$$

$$\phi_{\mu N}(\mu_0,0)=-\frac{1}{T}\left(\frac{2\pi mT}{(2\pi\hbar)^2}\right)^{\gamma+1}V[(1-\gamma)\mathrm{Li}_\gamma(\mathbf{I}_0)+\log(\mathbf{I}_0)\mathrm{Li}_{\gamma-1}(\mathbf{I}_0)]. \quad (21)$$

Substituting the last two expressions into formula (19), leads to a formula for the derivative at the point $\mathbf{I}=\mathbf{I}_0$

$$\left(\frac{\partial\mu}{\partial N}\right)_{TV}=-\frac{T}{2}\frac{\log^2(\mathbf{I}_0)\mathrm{Li}_{\gamma-1}(\mathbf{I}_0)+\gamma((\gamma+1)\mathrm{Li}_{\gamma+1}(\mathbf{I}_0)-2\log(\mathbf{I}_0)\mathrm{Li}_\gamma(\mathbf{I}_0))}{(1-\gamma)\mathrm{Li}_\gamma(\mathbf{I}_0)+\log(\mathbf{I}_0)\mathrm{Li}_{\gamma-1}(\mathbf{I}_0)} \quad (22)$$

and to an expression for the dispersion of the number of particles of the system

$$\overline{(\Delta N)^2}=-2\frac{(1-\gamma)\mathrm{Li}_\gamma(\mathbf{I}_0)+\log(\mathbf{I}_0)\mathrm{Li}_{\gamma-1}(\mathbf{I}_0)}{\log^2(\mathbf{I}_0)\mathrm{Li}_{\gamma-1}(\mathbf{I}_0)+\gamma((\gamma+1)\mathrm{Li}_{\gamma+1}(\mathbf{I}_0)-2\log(\mathbf{I}_0)\mathrm{Li}_\gamma(\mathbf{I}_0))}. \quad (23)$$

Recall that for an arbitrary quantity x, its mean square fluctuation is defined as $\delta x=\sqrt{\overline{(\Delta x)^2}}$. Using the well known uncertainty relation $\delta N\delta\mu\geqslant T$ for grand canonical ensembles (see [17]), we can find the value of the minimal admissible mean square fluctuation

$$\delta\mu_{min}=T/\delta N\leqslant\delta\mu. \quad (24)$$

The values of $\delta\mu_{min}$ (in MeV units) and δN are given in Table 1 below.

The quantity $\delta\mu_{min}$ determines the width of the region of lacunary indeterminacy and also changes monotonically with all the columns of the table, except the columns Z, $\Delta E_{sp},\delta t_{min}$.

TABLE OF STABLE NUCLEI

We obtained Table 1 of stable nuclei of chemical elements using the data base IsotopeData, included in the software Wolfram Mathematica and containing 255 stable elements.

In Table 1, the values for the fluctuation of energy and time were obtained by means of formulas (11) and (12), respectively. The time t and the intensity $\mathbf{I}$ are related by the uncertainty equation.

Thus, the intensity $\mathbf{I}$ plays the main role in this table. If the value of $\mathbf{I}_0$ is sufficiently small, the corresponding temperature (and the energy) will be huge. If the quantity $\mathbf{I}_0$ is of the order of 1, then the temperature (and the excitation energy) will be small.

Remark 1. In the table, we have not taken in consideration the tunnel effect, which can substantially affect the stability of nuclei.

In Table 1, the following parameters of stable isotopes of different nuclei are presented:

(1) No – the number of the nucleus in our list
(2) isotope – the name of the corresponding chemical element, with its mass number A (i.e., the number of nucleons in the nucleus) after the hyphen
(3) Z – the charge number (i.e., the number of protons in the nucleus)
(4) $\mathbf{I}_0$ – the minimal value of the intensity $\mathbf{I}$ for Bose particles, calculated according to formula (10)
(5) E_b – the binding energy, which is equal to the temperature T of the nucleus
(6) ΔE_{sp} – the jump in the specific energy in the passage from the Bose branch to the Fermi branch (formula (11))
(7) $\delta t_{min} = \hbar/(2\Delta E_{sp})$ – time fluctuation (in seconds)
(8) δN – mean square fluctuation of the number of particles equal to $\sqrt{\overline{(\Delta N)^2}}$ and computed at the point $\mathbf{I}_0$ according to formula (23)
(9) $\delta\mu_{min}$ – minimal mean square fluctuation of the chemical potential at the point $\mathbf{I}_0$, equal to $T/\delta N$
(10) μ_0 – chemical potential $\mu_0 = T \log \mathbf{I}_0$
(11) $F(\mathbf{I}_0)$ – value of the compressibility factor at the point $\mathbf{I} = \mathbf{I}_0$

The value of $\mathbf{I}_0$ in the case of the disintegration of the nucleus is found from formula (10) taking into account the expression for the de Broglie wavelength λ, calculated from the known volume V of the nucleus, the temperature$T$ of the nucleus and the mass m. The volume of the nucleus is taken to be equal to the volume of a ball of radius $r_0 = A^{1/3} 1.2 \times 10^{-15}$m. The temperature T of the nucleus expressed in energy units, is taken to be equal to the binding energy E_b of the nucleus (taken from the database IsotopeData). In the table, all the quantities having the dimension of energy are given in MeV units. The mass m is taken to be the mass of the whole nucleus. In all the calculations, the three-dimensional case was considered, i.e.,$\gamma = D/2 - 1 = 1/2$.

In conclusion, let us note that the notion of intensity $\mathbf{I}_0$ introduced by the author is a new quantity related to Gentile statistics, to the notion of infinitely small quantity, and to the polylogarithm function. This quantity bears no relationship to thermodynamics and statistical physics, just as the $\mathbf{I}_0 - F$ diagram has no relationship to ordinary thermodynamics. We have obtained this new thermodynamics by transforming ordinary thermodynamics into its “antipode”. An example of the antipode of a physical quantity can be the same quantity taken with a minus sign. Thus, the antipode of a particle is an antiparticle.

The notion of antiparticle was introduced speculatively. There was nothing in reality corresponding to it until physicists gave it the meaning of a hole, i.e., the absence of a particle. Similarly, before the author’s recent papers, the notion of “infinitely small number of particles” did not exist. This important notion is part of the antipode of standard thermodynamics. It allows to develop nuclear physics in connection with nuclear matter.

ACKNOWLEDGEMENT

I express my deep gratitude to E. I. Nikulin for help in the computations and in the plotting of figures.

The paper was written in the framework of State Assignment No. AAAA-A17-117021310377-1.

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№	isotope	Z	$\mathbf{I_0}$	E_b	ΔE_{sp}	δt_{min}	δN	$\delta\mu_{min}$	μ_0	$F(\mathbf{I_0})$
1	lead-208	82	1.636*10^(3)	1.1341*10^(2)	2.9018*10^(-24)	2.9672*10^(-1)	5.515*10^(3)	6.57*10^(-10)	-3.46*10^(4)	1.046203
2	lead-207	82	1.629*10^(3)	1.13*10^(2)	2.9123*10^(-24)	2.9685*10^(-1)	5.488*10^(3)	6.7*10^(-10)	-3.44*10^(4)	1.046245
3	lead-206	82	1.622*10^(3)	1.1264*10^(2)	2.9218*10^(-24)	2.9697*10^(-1)	5.463*10^(3)	6.83*10^(-10)	-3.42*10^(4)	1.046286
4	thallium-205	81	1.615*10^(3)	1.1224*10^(2)	2.9322*10^(-24)	2.971*10^(-1)	5.436*10^(3)	6.96*10^(-10)	-3.41*10^(4)	1.046328
5	mercury-204	80	1.609*10^(3)	1.1189*10^(2)	2.9413*10^(-24)	2.9723*10^(-1)	5.412*10^(3)	7.1*10^(-10)	-3.39*10^(4)	1.046369
6	lead-204	82	1.608*10^(3)	1.1181*10^(2)	2.9433*10^(-24)	2.9723*10^(-1)	5.408*10^(3)	7.11*10^(-10)	-3.39*10^(4)	1.046372
7	thallium-203	81	1.601*10^(3)	1.1145*10^(2)	2.9528*10^(-24)	2.9736*10^(-1)	5.384*10^(3)	7.25*10^(-10)	-3.37*10^(4)	1.046414
8	mercury-202	80	1.595*10^(3)	1.1115*10^(2)	2.9608*10^(-24)	2.9748*10^(-1)	5.362*10^(3)	7.38*10^(-10)	-3.35*10^(4)	1.046454
9	mercury-201	80	1.587*10^(3)	1.1072*10^(2)	2.9724*10^(-24)	2.9762*10^(-1)	5.334*10^(3)	7.54*10^(-10)	-3.33*10^(4)	1.046498
10	mercury-200	80	1.581*10^(3)	1.1038*10^(2)	2.9815*10^(-24)	2.9774*10^(-1)	5.311*10^(3)	7.68*10^(-10)	-3.32*10^(4)	1.04654
11	mercury-199	80	1.573*10^(3)	1.0993*10^(2)	2.9937*10^(-24)	2.9788*10^(-1)	5.281*10^(3)	7.85*10^(-10)	-3.3*10^(4)	1.046586
12	platinum-198	78	1.567*10^(3)	1.096*10^(2)	3.0028*10^(-24)	2.9801*10^(-1)	5.258*10^(3)	8.*10^(-10)	-3.28*10^(4)	1.046628
13	mercury-198	80	1.566*10^(3)	1.0957*10^(2)	3.0037*10^(-24)	2.9802*10^(-1)	5.256*10^(3)	8.*10^(-10)	-3.28*10^(4)	1.046629
14	gold-197	79	1.559*10^(3)	1.0917*10^(2)	3.0145*10^(-24)	2.9815*10^(-1)	5.23*10^(3)	8.17*10^(-10)	-3.26*10^(4)	1.046673
15	platinum-196	78	1.554*10^(3)	1.0887*10^(2)	3.023*10^(-24)	2.9828*10^(-1)	5.209*10^(3)	8.33*10^(-10)	-3.25*10^(4)	1.046715
16	mercury-196	80	1.551*10^(3)	1.0871*10^(2)	3.0273*10^(-24)	2.9829*10^(-1)	5.2*10^(3)	8.35*10^(-10)	-3.24*10^(4)	1.046721
17	platinum-195	78	1.546*10^(3)	1.0842*10^(2)	3.0354*10^(-24)	2.9842*10^(-1)	5.18*10^(3)	8.51*10^(-10)	-3.23*10^(4)	1.046762
18	platinum-194	78	1.540*10^(3)	1.0809*10^(2)	3.0447*10^(-24)	2.9855*10^(-1)	5.157*10^(3)	8.68*10^(-10)	-3.21*10^(4)	1.046805
19	iridium-193	77	1.532*10^(3)	1.0767*10^(2)	3.0566*10^(-24)	2.9869*10^(-1)	5.129*10^(3)	8.86*10^(-10)	-3.19*10^(4)	1.046852
20	osmium-192	76	1.526*10^(3)	1.0735*10^(2)	3.0656*10^(-24)	2.9882*10^(-1)	5.107*10^(3)	9.04*10^(-10)	-3.18*10^(4)	1.046895
21	platinum-192	78	1.525*10^(3)	1.0728*10^(2)	3.0678*10^(-24)	2.9883*10^(-1)	5.103*10^(3)	9.05*10^(-10)	-3.18*10^(4)	1.046898
22	iridium-191	77	1.518*10^(3)	1.069*10^(2)	3.0787*10^(-24)	2.9897*10^(-1)	5.078*10^(3)	9.24*10^(-10)	-3.16*10^(4)	1.046944
23	osmium-190	76	1.513*10^(3)	1.0662*10^(2)	3.0866*10^(-24)	2.991*10^(-1)	5.058*10^(3)	9.42*10^(-10)	-3.14*10^(4)	1.046986
24	osmium-189	76	1.505*10^(3)	1.0618*10^(2)	3.0994*10^(-24)	2.9924*10^(-1)	5.029*10^(3)	9.63*10^(-10)	-3.12*10^(4)	1.047035
25	osmium-188	76	1.499*10^(3)	1.0586*10^(2)	3.1087*10^(-24)	2.9938*10^(-1)	5.007*10^(3)	9.83*10^(-10)	-3.11*10^(4)	1.047079
26	osmium-187	76	1.491*10^(3)	1.0541*10^(2)	3.1221*10^(-24)	2.9953*10^(-1)	4.978*10^(3)	1.*10^(-9)	-3.09*10^(4)	1.047129
27	tungsten-186	74	1.486*10^(3)	1.0514*10^(2)	3.1301*10^(-24)	2.9966*10^(-1)	4.959*10^(3)	1.02*10^(-9)	-3.08*10^(4)	1.047173
28	rhenium-185	75	1.478*10^(3)	1.0472*10^(2)	3.1428*10^(-24)	2.9981*10^(-1)	4.931*10^(3)	1.05*10^(-9)	-3.06*10^(4)	1.047222
29	tungsten-184	74	1.473*10^(3)	1.0443*10^(2)	3.1514*10^(-24)	2.9994*10^(-1)	4.911*10^(3)	1.07*10^(-9)	-3.04*10^(4)	1.047267
30	osmium-184	76	1.470*10^(3)	1.0423*10^(2)	3.1573*10^(-24)	2.9996*10^(-1)	4.9*10^(3)	1.07*10^(-9)	-3.04*10^(4)	1.047274
31	tungsten-183	74	1.466*10^(3)	1.0401*10^(2)	3.164*10^(-24)	3.0009*10^(-1)	4.884*10^(3)	1.09*10^(-9)	-3.02*10^(4)	1.047316
32	tungsten-182	74	1.459*10^(3)	1.0368*10^(2)	3.1742*10^(-24)	3.0023*10^(-1)	4.861*10^(3)	1.12*10^(-9)	-3.01*10^(4)	1.047363

Table 1. Parameters of stable isotopes of different nuclei.

33	tantalum-181	73	1.452*10^(3)	1.0328*10^(2)	3.1864*10^(-24)	3.0038*10^(-1)	4.835*10^(3)	1.14*10^(-9)	-2.99*10^(4)	1.047413
34	hafnium-180	72	1.446*10^(3)	1.0296*10^(2)	3.1963*10^(-24)	3.0052*10^(-1)	4.813*10^(3)	1.17*10^(-9)	-2.98*10^(4)	1.04746
35	tungsten-180	74	1.445*10^(3)	1.0285*10^(2)	3.1998*10^(-24)	3.0054*10^(-1)	4.807*10^(3)	1.17*10^(-9)	-2.97*10^(4)	1.047465
36	hafnium-179	72	1.439*10^(3)	1.0255*10^(2)	3.2093*10^(-24)	3.0068*10^(-1)	4.786*10^(3)	1.19*10^(-9)	-2.96*10^(4)	1.047512
37	hafnium-178	72	1.433*10^(3)	1.0222*10^(2)	3.2196*10^(-24)	3.0082*10^(-1)	4.763*10^(3)	1.22*10^(-9)	-2.94*10^(4)	1.04756
38	hafnium-177	72	1.425*10^(3)	1.0178*10^(2)	3.2333*10^(-24)	3.0098*10^(-1)	4.735*10^(3)	1.25*10^(-9)	-2.92*10^(4)	1.047612
39	ytterbium-176	70	1.419*10^(3)	1.0147*10^(2)	3.2434*10^(-24)	3.0112*10^(-1)	4.713*10^(3)	1.27*10^(-9)	-2.91*10^(4)	1.047661
40	hafnium-176	72	1.419*10^(3)	1.0143*10^(2)	3.2444*10^(-24)	3.0113*10^(-1)	4.712*10^(3)	1.27*10^(-9)	-2.91*10^(4)	1.047662
41	lutetium-175	71	1.412*10^(3)	1.0106*10^(2)	3.2564*10^(-24)	3.0128*10^(-1)	4.687*10^(3)	1.3*10^(-9)	-2.89*10^(4)	1.047713
42	ytterbium-174	70	1.407*10^(3)	1.0077*10^(2)	3.2658*10^(-24)	3.0143*10^(-1)	4.666*10^(3)	1.33*10^(-9)	-2.87*10^(4)	1.047762
43	ytterbium-173	70	1.399*10^(3)	1.0035*10^(2)	3.2795*10^(-24)	3.0159*10^(-1)	4.639*10^(3)	1.36*10^(-9)	-2.86*10^(4)	1.047815
44	ytterbium-172	70	1.393*10^(3)	1.*10^(2)	3.291*10^(-24)	3.0174*10^(-1)	4.616*10^(3)	1.39*10^(-9)	-2.84*10^(4)	1.047867
45	ytterbium-171	70	1.385*10^(3)	9.9541*10^(1)	3.3062*10^(-24)	3.0191*10^(-1)	4.587*10^(3)	1.43*10^(-9)	-2.82*10^(4)	1.047923
46	erbium-170	68	1.379*10^(3)	9.9235*10^(1)	3.3164*10^(-24)	3.0206*10^(-1)	4.566*10^(3)	1.46*10^(-9)	-2.81*10^(4)	1.047973
47	ytterbium-170	70	1.378*10^(3)	9.9174*10^(1)	3.3184*10^(-24)	3.0206*10^(-1)	4.562*10^(3)	1.46*10^(-9)	-2.8*10^(4)	1.047975
48	thulium-169	69	1.371*10^(3)	9.8797*10^(1)	3.3311*10^(-24)	3.0222*10^(-1)	4.538*10^(3)	1.5*10^(-9)	-2.79*10^(4)	1.048029
49	erbium-168	68	1.366*10^(3)	9.8499*10^(1)	3.3411*10^(-24)	3.0237*10^(-1)	4.517*10^(3)	1.53*10^(-9)	-2.77*10^(4)	1.04808
50	ytterbium-168	70	1.363*10^(3)	9.83*10^(1)	3.3479*10^(-24)	3.024*10^(-1)	4.507*10^(3)	1.53*10^(-9)	-2.77*10^(4)	1.048088
51	erbium-167	68	1.358*10^(3)	9.8055*10^(1)	3.3563*10^(-24)	3.0254*10^(-1)	4.489*10^(3)	1.57*10^(-9)	-2.75*10^(4)	1.048137
52	erbium-166	68	1.352*10^(3)	9.77*10^(1)	3.3685*10^(-24)	3.0271*10^(-1)	4.465*10^(3)	1.6*10^(-9)	-2.74*10^(4)	1.048191
53	holmium-165	67	1.344*10^(3)	9.7285*10^(1)	3.3828*10^(-24)	3.0287*10^(-1)	4.438*10^(3)	1.64*10^(-9)	-2.72*10^(4)	1.048248
54	dysprosium-164	66	1.338*10^(3)	9.6944*10^(1)	3.3947*10^(-24)	3.0304*10^(-1)	4.415*10^(3)	1.68*10^(-9)	-2.7*10^(4)	1.048302
55	erbium-164	68	1.336*10^(3)	9.6838*10^(1)	3.3985*10^(-24)	3.0305*10^(-1)	4.41*10^(3)	1.69*10^(-9)	-2.7*10^(4)	1.048306
56	dysprosium-163	66	1.330*10^(3)	9.6506*10^(1)	3.4101*10^(-24)	3.0321*10^(-1)	4.388*10^(3)	1.72*10^(-9)	-2.68*10^(4)	1.04836
57	dysprosium-162	66	1.324*10^(3)	9.6161*10^(1)	3.4224*10^(-24)	3.0337*10^(-1)	4.365*10^(3)	1.77*10^(-9)	-2.67*10^(4)	1.048416
58	erbium-162	68	1.321*10^(3)	9.5933*10^(1)	3.4305*10^(-24)	3.034*10^(-1)	4.353*10^(3)	1.77*10^(-9)	-2.66*10^(4)	1.048425
59	dysprosium-161	66	1.316*10^(3)	9.5687*10^(1)	3.4393*10^(-24)	3.0355*10^(-1)	4.335*10^(3)	1.81*10^(-9)	-2.65*10^(4)	1.048477
60	dysprosium-160	66	1.309*10^(3)	9.5329*10^(1)	3.4523*10^(-24)	3.0372*10^(-1)	4.311*10^(3)	1.86*10^(-9)	-2.63*10^(4)	1.048534
61	gadolinium-160	64	1.309*10^(3)	9.5318*10^(1)	3.4527*10^(-24)	3.0372*10^(-1)	4.311*10^(3)	1.86*10^(-9)	-2.63*10^(4)	1.048534
62	terbium-159	65	1.302*10^(3)	9.4905*10^(1)	3.4677*10^(-24)	3.039*10^(-1)	4.284*10^(3)	1.9*10^(-9)	-2.61*10^(4)	1.048594
63	gadolinium-158	64	1.296*10^(3)	9.4569*10^(1)	3.48*10^(-24)	3.0407*10^(-1)	4.262*10^(3)	1.95*10^(-9)	-2.6*10^(4)	1.04865
64	dysprosium-158	66	1.294*10^(3)	9.4444*10^(1)	3.4846*10^(-24)	3.0408*10^(-1)	4.256*10^(3)	1.96*10^(-9)	-2.59*10^(4)	1.048656
65	gadolinium-157	64	1.288*10^(3)	9.411*10^(1)	3.497*10^(-24)	3.0425*10^(-1)	4.233*10^(3)	2.*10^(-9)	-2.58*10^(4)	1.048713

66	gadolinium-156	64	1.282*10^(3)	9.3758*10^(1)	3.5101*10^(-24)	3.0443*10^(-1)	4.21*10^(3)	2.05*10^(-9)	-2.56*10^(4)	1.048771
67	dysprosium-156	66	1.278*10^(3)	9.3516*10^(1)	3.5192*10^(-24)	3.0446*10^(-1)	4.198*10^(3)	2.06*10^(-9)	-2.56*10^(4)	1.048782
68	gadolinium-155	64	1.273*10^(3)	9.3258*10^(1)	3.5289*10^(-24)	3.0462*10^(-1)	4.179*10^(3)	2.11*10^(-9)	-2.54*10^(4)	1.048837
69	samarium-154	62	1.267*10^(3)	9.2921*10^(1)	3.5417*10^(-24)	3.0479*10^(-1)	4.157*10^(3)	2.16*10^(-9)	-2.53*10^(4)	1.048896
70	gadolinium-154	64	1.267*10^(3)	9.29*10^(1)	3.5425*10^(-24)	3.048*10^(-1)	4.156*10^(3)	2.16*10^(-9)	-2.53*10^(4)	1.048896
71	europium-153	63	1.259*10^(3)	9.2461*10^(1)	3.5593*10^(-24)	3.0498*10^(-1)	4.128*10^(3)	2.22*10^(-9)	-2.51*10^(4)	1.04896
72	samarium-152	62	1.253*10^(3)	9.214*10^(1)	3.5718*10^(-24)	3.0516*10^(-1)	4.106*10^(3)	2.28*10^(-9)	-2.49*10^(4)	1.049019
73	europium-151	63	1.244*10^(3)	9.1609*10^(1)	3.5924*10^(-24)	3.0536*10^(-1)	4.074*10^(3)	2.34*10^(-9)	-2.47*10^(4)	1.049088
74	samarium-150	62	1.239*10^(3)	9.1355*10^(1)	3.6024*10^(-24)	3.0553*10^(-1)	4.056*10^(3)	2.4*10^(-9)	-2.46*10^(4)	1.049146
75	samarium-149	62	1.231*10^(3)	9.0891*10^(1)	3.6208*10^(-24)	3.0573*10^(-1)	4.027*10^(3)	2.47*10^(-9)	-2.44*10^(4)	1.049213
76	neodymium-148	60	1.225*10^(3)	9.0545*10^(1)	3.6347*10^(-24)	3.0591*10^(-1)	4.005*10^(3)	2.53*10^(-9)	-2.42*10^(4)	1.049275
77	neodymium-146	60	1.212*10^(3)	8.9843*10^(1)	3.6631*10^(-24)	3.0628*10^(-1)	3.958*10^(3)	2.67*10^(-9)	-2.39*10^(4)	1.049402
78	neodymium-145	60	1.205*10^(3)	8.9405*10^(1)	3.681*10^(-24)	3.0648*10^(-1)	3.931*10^(3)	2.74*10^(-9)	-2.38*10^(4)	1.04947
79	samarium-144	62	1.196*10^(3)	8.8863*10^(1)	3.7035*10^(-24)	3.067*10^(-1)	3.899*10^(3)	2.83*10^(-9)	-2.35*10^(4)	1.049544
80	neodymium-143	60	1.191*10^(3)	8.8637*10^(1)	3.7129*10^(-24)	3.0687*10^(-1)	3.882*10^(3)	2.9*10^(-9)	-2.34*10^(4)	1.049604
81	cerium-142	58	1.185*10^(3)	8.8308*10^(1)	3.7267*10^(-24)	3.0706*10^(-1)	3.86*10^(3)	2.97*10^(-9)	-2.33*10^(4)	1.049669
82	neodymium-142	60	1.185*10^(3)	8.8298*10^(1)	3.7272*10^(-24)	3.0706*10^(-1)	3.86*10^(3)	2.97*10^(-9)	-2.33*10^(4)	1.049669
83	praseodymium-141	59	1.178*10^(3)	8.7883*10^(1)	3.7448*10^(-24)	3.0727*10^(-1)	3.834*10^(3)	3.06*10^(-9)	-2.31*10^(4)	1.049739
84	cerium-140	58	1.173*10^(3)	8.7605*10^(1)	3.7566*10^(-24)	3.0745*10^(-1)	3.814*10^(3)	3.14*10^(-9)	-2.3*10^(4)	1.049803
85	lanthanum-139	57	1.165*10^(3)	8.7127*10^(1)	3.7773*10^(-24)	3.0767*10^(-1)	3.785*10^(3)	3.23*10^(-9)	-2.28*10^(4)	1.049877
86	barium-138	56	1.158*10^(3)	8.6777*10^(1)	3.7925*10^(-24)	3.0787*10^(-1)	3.762*10^(3)	3.33*10^(-9)	-2.26*10^(4)	1.049946
87	cerium-138	58	1.156*10^(3)	8.6622*10^(1)	3.7993*10^(-24)	3.0789*10^(-1)	3.755*10^(3)	3.34*10^(-9)	-2.26*10^(4)	1.049953
88	barium-137	56	1.150*10^(3)	8.6265*10^(1)	3.815*10^(-24)	3.0809*10^(-1)	3.732*10^(3)	3.43*10^(-9)	-2.24*10^(4)	1.050023
89	barium-136	56	1.143*10^(3)	8.5871*10^(1)	3.8325*10^(-24)	3.083*10^(-1)	3.707*10^(3)	3.53*10^(-9)	-2.22*10^(4)	1.050095
90	xenon-136	54	1.142*10^(3)	8.5809*10^(1)	3.8353*10^(-24)	3.0831*10^(-1)	3.704*10^(3)	3.53*10^(-9)	-2.22*10^(4)	1.050098
91	cerium-136	58	1.139*10^(3)	8.5595*10^(1)	3.8448*10^(-24)	3.0834*10^(-1)	3.693*10^(3)	3.55*10^(-9)	-2.22*10^(4)	1.050109
92	barium-135	56	1.134*10^(3)	8.5324*10^(1)	3.8571*10^(-24)	3.0854*10^(-1)	3.674*10^(3)	3.64*10^(-9)	-2.2*10^(4)	1.050176
93	xenon-134	54	1.127*10^(3)	8.4975*10^(1)	3.8729*10^(-24)	3.0875*10^(-1)	3.652*10^(3)	3.75*10^(-9)	-2.19*10^(4)	1.050247
94	barium-134	56	1.127*10^(3)	8.4924*10^(1)	3.8752*10^(-24)	3.0875*10^(-1)	3.649*10^(3)	3.75*10^(-9)	-2.19*10^(4)	1.050249
95	cesium-133	55	1.119*10^(3)	8.4441*10^(1)	3.8974*10^(-24)	3.0898*10^(-1)	3.62*10^(3)	3.87*10^(-9)	-2.17*10^(4)	1.050328
96	xenon-132	54	1.112*10^(3)	8.4102*10^(1)	3.9131*10^(-24)	3.0919*10^(-1)	3.598*10^(3)	3.98*10^(-9)	-2.15*10^(4)	1.050401
97	barium-132	56	1.110*10^(3)	8.3934*10^(1)	3.9209*10^(-24)	3.0922*10^(-1)	3.59*10^(3)	4.*10^(-9)	-2.15*10^(4)	1.050409

98	xenon-131	54	1.104*10^(3)	8.3564*10^(1)	3.9383*10^(-24)	3.0943*10^(-1)	3.566*10^(3)	4.12*10^(-9)	-2.13*10^(4)	1.050484
99	xenon-130	54	1.097*10^(3)	8.3189*10^(1)	3.9561*10^(-24)	3.0965*10^(-1)	3.542*10^(3)	4.24*10^(-9)	-2.11*10^(4)	1.05056
100	barium-130	56	1.093*10^(3)	8.2897*10^(1)	3.97*10^(-24)	3.097*10^(-1)	3.528*10^(3)	4.27*10^(-9)	-2.11*10^(4)	1.050575
101	xenon-129	54	1.088*10^(3)	8.2628*10^(1)	3.9829*10^(-24)	3.099*10^(-1)	3.51*10^(3)	4.39*10^(-9)	-2.09*10^(4)	1.050646
102	xenon-128	54	1.081*10^(3)	8.223*10^(1)	4.0022*10^(-24)	3.1013*10^(-1)	3.485*10^(3)	4.52*10^(-9)	-2.08*10^(4)	1.050725
103	iodine-127	53	1.073*10^(3)	8.1744*10^(1)	4.026*10^(-24)	3.1037*10^(-1)	3.456*10^(3)	4.67*10^(-9)	-2.06*10^(4)	1.050809
104	tellurium-126	52	1.066*10^(3)	8.1395*10^(1)	4.0432*10^(-24)	3.1059*10^(-1)	3.433*10^(3)	4.81*10^(-9)	-2.04*10^(4)	1.050886
105	xenon-126	54	1.064*10^(3)	8.1222*10^(1)	4.0518*10^(-24)	3.1062*10^(-1)	3.425*10^(3)	4.83*10^(-9)	-2.04*10^(4)	1.050896
106	tellurium-125	52	1.057*10^(3)	8.0842*10^(1)	4.0709*10^(-24)	3.1085*10^(-1)	3.401*10^(3)	4.98*10^(-9)	-2.02*10^(4)	1.050976
107	tellurium-124	52	1.051*10^(3)	8.0467*10^(1)	4.0899*10^(-24)	3.1108*10^(-1)	3.377*10^(3)	5.14*10^(-9)	-2.01*10^(4)	1.051057
108	tin-124	50	1.050*10^(3)	8.0416*10^(1)	4.0925*10^(-24)	3.1109*10^(-1)	3.375*10^(3)	5.15*10^(-9)	-2.*10^(4)	1.051059
109	xenon-124	54	1.046*10^(3)	8.0155*10^(1)	4.1058*10^(-24)	3.1113*10^(-1)	3.363*10^(3)	5.17*10^(-9)	-2.*10^(4)	1.051074
110	antimony-123	51	1.042*10^(3)	7.9949*10^(1)	4.1164*10^(-24)	3.1134*10^(-1)	3.347*10^(3)	5.32*10^(-9)	-1.99*10^(4)	1.051146
111	tin-122	50	1.036*10^(3)	7.9573*10^(1)	4.1358*10^(-24)	3.1158*10^(-1)	3.323*10^(3)	5.49*10^(-9)	-1.97*10^(4)	1.051229
112	tellurium-122	52	1.034*10^(3)	7.9489*10^(1)	4.1402*10^(-24)	3.1159*10^(-1)	3.32*10^(3)	5.5*10^(-9)	-1.97*10^(4)	1.051234
113	antimony-121	51	1.026*10^(3)	7.9011*10^(1)	4.1652*10^(-24)	3.1185*10^(-1)	3.291*10^(3)	5.69*10^(-9)	-1.95*10^(4)	1.051323
114	tin-120	50	1.021*10^(3)	7.869*10^(1)	4.1822*10^(-24)	3.1208*10^(-1)	3.27*10^(3)	5.87*10^(-9)	-1.93*10^(4)	1.051404
115	tellurium-120	52	1.017*10^(3)	7.8459*10^(1)	4.1945*10^(-24)	3.1212*10^(-1)	3.259*10^(3)	5.9*10^(-9)	-1.93*10^(4)	1.051418
116	tin-119	50	1.011*10^(3)	7.8134*10^(1)	4.212*10^(-24)	3.1236*10^(-1)	3.238*10^(3)	6.08*10^(-9)	-1.91*10^(4)	1.0515
117	tin-118	50	1.005*10^(3)	7.7763*10^(1)	4.2321*10^(-24)	3.126*10^(-1)	3.215*10^(3)	6.29*10^(-9)	-1.9*10^(4)	1.051586
118	tin-117	50	995.6	7.7189*10^(1)	4.2636*10^(-24)	3.1289*10^(-1)	3.182*10^(3)	6.52*10^(-9)	-1.88*10^(4)	1.051685
119	tin-116	50	988.7	7.6784*10^(1)	4.286*10^(-24)	3.1314*10^(-1)	3.157*10^(3)	6.75*10^(-9)	-1.86*10^(4)	1.051775
120	tin-115	50	979.1	7.6192*10^(1)	4.3193*10^(-24)	3.1343*10^(-1)	3.124*10^(3)	7.01*10^(-9)	-1.84*10^(4)	1.051878
121	cadmium-114	48	972.6	7.5817*10^(1)	4.3407*10^(-24)	3.1369*10^(-1)	3.1*10^(3)	7.25*10^(-9)	-1.82*10^(4)	1.051969
122	tin-114	50	971.6	7.5744*10^(1)	4.3449*10^(-24)	3.1371*10^(-1)	3.097*10^(3)	7.26*10^(-9)	-1.82*10^(4)	1.051973
123	indium-113	49	963.1	7.5228*10^(1)	4.3747*10^(-24)	3.1399*10^(-1)	3.067*10^(3)	7.54*10^(-9)	-1.8*10^(4)	1.052074
124	cadmium-112	48	957.0	7.4883*10^(1)	4.3948*10^(-24)	3.1425*10^(-1)	3.045*10^(3)	7.79*10^(-9)	-1.79*10^(4)	1.052165
125	tin-112	50	953.5	7.4633*10^(1)	4.4096*10^(-24)	3.1429*10^(-1)	3.034*10^(3)	7.84*10^(-9)	-1.78*10^(4)	1.05218
126	cadmium-111	48	947.6	7.4301*10^(1)	4.4293*10^(-24)	3.1455*10^(-1)	3.013*10^(3)	8.1*10^(-9)	-1.77*10^(4)	1.052272
127	cadmium-110	48	940.6	7.3891*10^(1)	4.4539*10^(-24)	3.1483*10^(-1)	2.988*10^(3)	8.4*10^(-9)	-1.75*10^(4)	1.052369
128	palladium-110	46	940.2	7.3859*10^(1)	4.4558*10^(-24)	3.1483*10^(-1)	2.986*10^(3)	8.4*10^(-9)	-1.75*10^(4)	1.052371
129	silver-109	47	931.7	7.3341*10^(1)	4.4873*10^(-24)	3.1513*10^(-1)	2.957*10^(3)	8.73*10^(-9)	-1.73*10^(4)	1.052477
130	palladium-108	46	925.2	7.2966*10^(1)	4.5103*10^(-24)	3.1541*10^(-1)	2.933*10^(3)	9.05*10^(-9)	-1.71*10^(4)	1.052574

131	cadmium-108	48	923.4	7.2833*10^(1)	4.5186*10^(-24)	3.1543*10^(-1)	2.927*10^(3)	9.08*10^(-9)	-1.71*10^(4)	1.052583
132	silver-107	47	915.3	7.2337*10^(1)	4.5495*10^(-24)	3.1574*10^(-1)	2.899*10^(3)	9.43*10^(-9)	-1.69*10^(4)	1.05269
133	palladium-106	46	909.5	7.2012*10^(1)	4.5701*10^(-24)	3.1601*10^(-1)	2.878*10^(3)	9.77*10^(-9)	-1.68*10^(4)	1.052787
134	cadmium-106	48	905.1	7.1698*10^(1)	4.5901*10^(-24)	3.1607*10^(-1)	2.864*10^(3)	9.84*10^(-9)	-1.67*10^(4)	1.052808
135	palladium-105	46	899.9	7.1413*10^(1)	4.6084*10^(-24)	3.1634*10^(-1)	2.845*10^(3)	1.02*10^(-8)	-1.66*10^(4)	1.052903
136	ruthenium-104	44	893.1	7.1011*10^(1)	4.6345*10^(-24)	3.1663*10^(-1)	2.821*10^(3)	1.06*10^(-8)	-1.64*10^(4)	1.053008
137	palladium-104	46	892.8	7.0992*10^(1)	4.6358*10^(-24)	3.1663*10^(-1)	2.82*10^(3)	1.06*10^(-8)	-1.64*10^(4)	1.053009
138	rhodium-103	45	884.2	7.0456*10^(1)	4.671*10^(-24)	3.1696*10^(-1)	2.79*10^(3)	1.1*10^(-8)	-1.62*10^(4)	1.053125
139	ruthenium-102	44	877.9	7.0099*10^(1)	4.6948*10^(-24)	3.1725*10^(-1)	2.767*10^(3)	1.14*10^(-8)	-1.61*10^(4)	1.053229
140	palladium-102	46	875.2	6.9898*10^(1)	4.7083*10^(-24)	3.1729*10^(-1)	2.758*10^(3)	1.15*10^(-8)	-1.6*10^(4)	1.053243
141	ruthenium-101	44	868.7	6.9521*10^(1)	4.7339*10^(-24)	3.1759*10^(-1)	2.735*10^(3)	1.19*10^(-8)	-1.58*10^(4)	1.05335
142	ruthenium-100	44	861.9	6.9119*10^(1)	4.7613*10^(-24)	3.179*10^(-1)	2.711*10^(3)	1.24*10^(-8)	-1.57*10^(4)	1.053461
143	ruthenium-99	44	852.3	6.8506*10^(1)	4.804*10^(-24)	3.1826*10^(-1)	2.678*10^(3)	1.3*10^(-8)	-1.55*10^(4)	1.053588
144	molybdenum-98	42	846.2	6.8162*10^(1)	4.8282*10^(-24)	3.1856*10^(-1)	2.656*10^(3)	1.35*10^(-8)	-1.53*10^(4)	1.053698
145	ruthenium-98	44	844.8	6.8055*10^(1)	4.8358*10^(-24)	3.1858*10^(-1)	2.652*10^(3)	1.35*10^(-8)	-1.53*10^(4)	1.053705
146	molybdenum-97	42	837.6	6.7623*10^(1)	4.8667*10^(-24)	3.1891*10^(-1)	2.626*10^(3)	1.41*10^(-8)	-1.51*10^(4)	1.053823
147	molybdenum-96	42	830.8	6.7218*10^(1)	4.896*10^(-24)	3.1924*10^(-1)	2.602*10^(3)	1.46*10^(-8)	-1.5*10^(4)	1.05394
148	ruthenium-96	44	826.5	6.6901*10^(1)	4.9192*10^(-24)	3.193*10^(-1)	2.588*10^(3)	1.48*10^(-8)	-1.49*10^(4)	1.053964
149	molybdenum-95	42	821.6	6.664*10^(1)	4.9385*10^(-24)	3.196*10^(-1)	2.571*10^(3)	1.53*10^(-8)	-1.48*10^(4)	1.054072
150	zirconium-94	40	814.7	6.6225*10^(1)	4.9694*10^(-24)	3.1994*10^(-1)	2.546*10^(3)	1.6*10^(-8)	-1.46*10^(4)	1.054193
151	molybdenum-94	42	814.3	6.6194*10^(1)	4.9718*10^(-24)	3.1995*10^(-1)	2.545*10^(3)	1.6*10^(-8)	-1.46*10^(4)	1.054196
152	niobium-93	41	805.8	6.5663*10^(1)	5.0119*10^(-24)	3.2031*10^(-1)	2.516*10^(3)	1.67*10^(-8)	-1.44*10^(4)	1.054328
153	zirconium-92	40	799.7	6.5315*10^(1)	5.0387*10^(-24)	3.2065*10^(-1)	2.494*10^(3)	1.74*10^(-8)	-1.43*10^(4)	1.054448
154	molybdenum-92	42	796.5	6.5075*10^(1)	5.0572*10^(-24)	3.207*10^(-1)	2.484*10^(3)	1.75*10^(-8)	-1.42*10^(4)	1.054467
155	zirconium-91	40	791.1	6.4772*10^(1)	5.0809*10^(-24)	3.2103*10^(-1)	2.464*10^(3)	1.82*10^(-8)	-1.41*10^(4)	1.054585
156	zirconium-90	40	783.9	6.4337*10^(1)	5.1153*10^(-24)	3.2139*10^(-1)	2.439*10^(3)	1.9*10^(-8)	-1.39*10^(4)	1.054716
157	yttrium-89	39	775.5	6.3814*10^(1)	5.1572*10^(-24)	3.2177*10^(-1)	2.41*10^(3)	2.*10^(-8)	-1.38*10^(4)	1.054855
158	strontium-88	38	768.5	6.3386*10^(1)	5.192*10^(-24)	3.2214*10^(-1)	2.386*10^(3)	2.09*10^(-8)	-1.36*10^(4)	1.054989
159	strontium-87	38	757.4	6.2654*10^(1)	5.2527*10^(-24)	3.2258*10^(-1)	2.348*10^(3)	2.2*10^(-8)	-1.34*10^(4)	1.055151
160	krypton-86	36	749.2	6.2145*10^(1)	5.2957*10^(-24)	3.2298*10^(-1)	2.32*10^(3)	2.31*10^(-8)	-1.32*10^(4)	1.055297
161	strontium-86	38	748.9	6.2122*10^(1)	5.2976*10^(-24)	3.2299*10^(-1)	2.319*10^(3)	2.31*10^(-8)	-1.32*10^(4)	1.055299
162	rubidium-85	37	739.3	6.1497*10^(1)	5.3515*10^(-24)	3.2342*10^(-1)	2.286*10^(3)	2.43*10^(-8)	-1.3*10^(4)	1.055457
163	krypton-84	36	732.3	6.107*10^(1)	5.3889*10^(-24)	3.2381*10^(-1)	2.261*10^(3)	2.55*10^(-8)	-1.28*10^(4)	1.0556

164	strontium-84	38	728.9	6.0815*10^(1)	5.4115*10^(-24)	3.2388*10^(-1)	2.251*10^(3)	2.57*10^(-8)	-1.27*10^(4)	1.055623
165	krypton-83	36	721.7	6.0376*10^(1)	5.4508*10^(-24)	3.2428*10^(-1)	2.226*10^(3)	2.69*10^(-8)	-1.26*10^(4)	1.05577
166	krypton-82	36	714.3	5.9915*10^(1)	5.4928*10^(-24)	3.2469*10^(-1)	2.2*10^(3)	2.82*10^(-8)	-1.24*10^(4)	1.055921
167	bromine-81	35	704.4	5.9265*10^(1)	5.553*10^(-24)	3.2516*10^(-1)	2.166*10^(3)	2.98*10^(-8)	-1.22*10^(4)	1.056093
168	selenium-80	34	696.9	5.8798*10^(1)	5.5971*10^(-24)	3.2558*10^(-1)	2.14*10^(3)	3.14*10^(-8)	-1.2*10^(4)	1.05625
169	krypton-80	36	695.4	5.8688*10^(1)	5.6076*10^(-24)	3.2561*10^(-1)	2.136*10^(3)	3.15*10^(-8)	-1.2*10^(4)	1.056261
170	bromine-79	35	686.3	5.8097*10^(1)	5.6647*10^(-24)	3.2608*10^(-1)	2.105*10^(3)	3.32*10^(-8)	-1.18*10^(4)	1.056433
171	selenium-78	34	680.0	5.7719*10^(1)	5.7018*10^(-24)	3.265*10^(-1)	2.083*10^(3)	3.49*10^(-8)	-1.17*10^(4)	1.056588
172	krypton-78	36	675.6	5.7378*10^(1)	5.7357*10^(-24)	3.2659*10^(-1)	2.069*10^(3)	3.52*10^(-8)	-1.16*10^(4)	1.056621
173	selenium-77	34	669.5	5.7018*10^(1)	5.7719*10^(-24)	3.2701*10^(-1)	2.047*10^(3)	3.7*10^(-8)	-1.15*10^(4)	1.056777
174	selenium-76	34	662.1	5.6554*10^(1)	5.8192*10^(-24)	3.2747*10^(-1)	2.022*10^(3)	3.9*10^(-8)	-1.13*10^(4)	1.056947
175	arsenic-75	33	652.6	5.5927*10^(1)	5.8845*10^(-24)	3.2797*10^(-1)	1.99*10^(3)	4.13*10^(-8)	-1.11*10^(4)	1.057136
176	germanium-74	32	645.7	5.5502*10^(1)	5.9295*10^(-24)	3.2844*10^(-1)	1.966*10^(3)	4.35*10^(-8)	-1.09*10^(4)	1.057308
177	selenium-74	34	642.9	5.5285*10^(1)	5.9527*10^(-24)	3.285*10^(-1)	1.957*10^(3)	4.38*10^(-8)	-1.09*10^(4)	1.05733
178	germanium-73	32	635.5	5.4819*10^(1)	6.0034*10^(-24)	3.2898*10^(-1)	1.932*10^(3)	4.63*10^(-8)	-1.07*10^(4)	1.05751
179	germanium-72	32	628.7	5.4401*10^(1)	6.0495*10^(-24)	3.2945*10^(-1)	1.908*10^(3)	4.88*10^(-8)	-1.06*10^(4)	1.057688
180	gallium-71	31	619.0	5.3751*10^(1)	6.1227*10^(-24)	3.3001*10^(-1)	1.876*10^(3)	5.2*10^(-8)	-1.04*10^(4)	1.057895
181	zinc-70	30	611.1	5.3247*10^(1)	6.1806*10^(-24)	3.3053*10^(-1)	1.849*10^(3)	5.51*10^(-8)	-1.02*10^(4)	1.05809
182	germanium-70	32	610.5	5.3202*10^(1)	6.1858*10^(-24)	3.3054*10^(-1)	1.847*10^(3)	5.52*10^(-8)	-1.02*10^(4)	1.058095
183	gallium-69	31	602.0	5.2645*10^(1)	6.2513*10^(-24)	3.3108*10^(-1)	1.818*10^(3)	5.86*10^(-8)	-1.*10^(4)	1.0583
184	zinc-68	30	595.4	5.2238*10^(1)	6.3*10^(-24)	3.3159*10^(-1)	1.796*10^(3)	6.2*10^(-8)	-9.88*10^(3)	1.058492
185	zinc-67	30	585.2	5.1545*10^(1)	6.3847*10^(-24)	3.322*10^(-1)	1.762*10^(3)	6.63*10^(-8)	-9.67*10^(3)	1.058722
186	zinc-66	30	578.1	5.1102*10^(1)	6.4401*10^(-24)	3.3274*10^(-1)	1.737*10^(3)	7.03*10^(-8)	-9.52*10^(3)	1.058927
187	copper-65	29	569.2	5.0508*10^(1)	6.5159*10^(-24)	3.3334*10^(-1)	1.708*10^(3)	7.51*10^(-8)	-9.34*10^(3)	1.059155
188	nickel-64	28	561.8	5.003*10^(1)	6.578*10^(-24)	3.3392*10^(-1)	1.682*10^(3)	7.99*10^(-8)	-9.18*10^(3)	1.059374
189	zinc-64	30	559.1	4.9816*10^(1)	6.6063*10^(-24)	3.3399*10^(-1)	1.674*10^(3)	8.05*10^(-8)	-9.13*10^(3)	1.0594
190	copper-63	29	551.4	4.9316*10^(1)	6.6733*10^(-24)	3.3458*10^(-1)	1.648*10^(3)	8.58*10^(-8)	-8.97*10^(3)	1.059627
191	nickel-62	28	545.3	4.8945*10^(1)	6.7239*10^(-24)	3.3514*10^(-1)	1.627*10^(3)	9.12*10^(-8)	-8.84*10^(3)	1.059842
192	nickel-61	28	534.7	4.8209*10^(1)	6.8266*10^(-24)	3.3584*10^(-1)	1.592*10^(3)	9.82*10^(-8)	-8.63*10^(3)	1.060111
193	nickel-60	28	526.8	4.7697*10^(1)	6.8998*10^(-24)	3.3648*10^(-1)	1.566*10^(3)	1.05*10^(-7)	-8.47*10^(3)	1.060355
194	cobalt-59	27	517.3	4.7044*10^(1)	6.9956*10^(-24)	3.3718*10^(-1)	1.534*10^(3)	1.13*10^(-7)	-8.27*10^(3)	1.060626
195	iron-58	26	509.9	4.6567*10^(1)	7.0672*10^(-24)	3.3784*10^(-1)	1.509*10^(3)	1.21*10^(-7)	-8.12*10^(3)	1.060878
196	nickel-58	28	506.5	4.6279*10^(1)	7.1112*10^(-24)	3.3794*10^(-1)	1.499*10^(3)	1.22*10^(-7)	-8.06*10^(3)	1.060919

197	iron-57	26	499.9	4.5868*10^(1)	7.175*10^(-24)	3.3859*10^(-1)	1.476*10^(3)	1.31*10^(-7)	-7.92*10^(3)	1.061169
198	iron-56	26	492.3	4.5366*10^(1)	7.2544*10^(-24)	3.3928*10^(-1)	1.451*10^(3)	1.41*10^(-7)	-7.77*10^(3)	1.061439
199	manganese-55	25	482.1	4.465*10^(1)	7.3706*10^(-24)	3.4007*10^(-1)	1.418*10^(3)	1.53*10^(-7)	-7.57*10^(3)	1.061748
200	chromium-54	24	474.0	4.411*10^(1)	7.4609*10^(-24)	3.4082*10^(-1)	1.391*10^(3)	1.65*10^(-7)	-7.4*10^(3)	1.062038
201	iron-54	26	471.8	4.3922*10^(1)	7.4929*10^(-24)	3.4089*10^(-1)	1.384*10^(3)	1.66*10^(-7)	-7.36*10^(3)	1.062067
202	chromium-53	24	464.3	4.3429*10^(1)	7.5779*10^(-24)	3.4163*10^(-1)	1.359*10^(3)	1.79*10^(-7)	-7.21*10^(3)	1.062359
203	chromium-52	24	456.3	4.2896*10^(1)	7.672*10^(-24)	3.4241*10^(-1)	1.333*10^(3)	1.94*10^(-7)	-7.05*10^(3)	1.062665
204	vanadium-51	23	445.8	4.2144*10^(1)	7.809*10^(-24)	3.433*10^(-1)	1.299*10^(3)	2.12*10^(-7)	-6.85*10^(3)	1.063017
205	titanium-50	22	437.8	4.1597*10^(1)	7.9117*10^(-24)	3.4413*10^(-1)	1.272*10^(3)	2.3*10^(-7)	-6.69*10^(3)	1.063345
206	chromium-50	24	435.0	4.1363*10^(1)	7.9563*10^(-24)	3.4423*10^(-1)	1.264*10^(3)	2.32*10^(-7)	-6.65*10^(3)	1.063385
207	titanium-49	22	426.8	4.0801*10^(1)	8.0659*10^(-24)	3.4509*10^(-1)	1.237*10^(3)	2.52*10^(-7)	-6.48*10^(3)	1.063726
208	titanium-48	22	418.7	4.0244*10^(1)	8.1777*10^(-24)	3.4597*10^(-1)	1.21*10^(3)	2.75*10^(-7)	-6.32*10^(3)	1.064077
209	titanium-47	22	407.1	3.9382*10^(1)	8.3566*10^(-24)	3.4702*10^(-1)	1.173*10^(3)	3.04*10^(-7)	-6.11*10^(3)	1.064496
210	calcium-46	20	398.8	3.8805*10^(1)	8.4808*10^(-24)	3.4796*10^(-1)	1.146*10^(3)	3.33*10^(-7)	-5.95*10^(3)	1.064875
211	titanium-46	22	398.2	3.8755*10^(1)	8.4918*10^(-24)	3.4799*10^(-1)	1.144*10^(3)	3.34*10^(-7)	-5.94*10^(3)	1.064885
212	scandium-45	21	387.8	3.7997*10^(1)	8.6612*10^(-24)	3.4905*10^(-1)	1.111*10^(3)	3.7*10^(-7)	-5.74*10^(3)	1.065313
213	calcium-44	20	381.0	3.754*10^(1)	8.7666*10^(-24)	3.4999*10^(-1)	1.088*10^(3)	4.04*10^(-7)	-5.61*10^(3)	1.065694
214	calcium-43	20	369.8	3.6706*10^(1)	8.9657*10^(-24)	3.5116*10^(-1)	1.053*10^(3)	4.51*10^(-7)	-5.4*10^(3)	1.066168
215	calcium-42	20	361.9	3.6153*10^(1)	9.1029*10^(-24)	3.5221*10^(-1)	1.027*10^(3)	4.97*10^(-7)	-5.25*10^(3)	1.0666
216	potassium-41	19	351.6	3.5388*10^(1)	9.2998*10^(-24)	3.5342*10^(-1)	9.949*10^(2)	5.55*10^(-7)	-5.06*10^(3)	1.067095
217	argon-40	18	343.8	3.4841*10^(1)	9.4457*10^(-24)	3.5455*10^(-1)	9.697*10^(2)	6.15*10^(-7)	-4.92*10^(3)	1.067559
218	calcium-40	20	342.1	3.4682*10^(1)	9.489*10^(-24)	3.5464*10^(-1)	9.645*10^(2)	6.2*10^(-7)	-4.89*10^(3)	1.067596
219	potassium-39	19	333.7	3.4086*10^(1)	9.6551*10^(-24)	3.5583*10^(-1)	9.379*10^(2)	6.9*10^(-7)	-4.73*10^(3)	1.068092
220	argon-38	18	327.3	3.3665*10^(1)	9.7758*10^(-24)	3.5696*10^(-1)	9.17*10^(2)	7.64*10^(-7)	-4.61*10^(3)	1.068562
221	chlorine-37	17	317.1	3.2888*10^(1)	1.0007*10^(-23)	3.5836*10^(-1)	8.849*10^(2)	8.63*10^(-7)	-4.43*10^(3)	1.069144
222	sulfur-36	16	308.7	3.2279*10^(1)	1.0195*10^(-23)	3.597*10^(-1)	8.583*10^(2)	9.7*10^(-7)	-4.27*10^(3)	1.069707
223	argon-36	18	306.7	3.2094*10^(1)	1.0254*10^(-23)	3.5982*10^(-1)	8.524*10^(2)	9.81*10^(-7)	-4.24*10^(3)	1.069758
224	chlorine-35	17	298.2	3.147*10^(1)	1.0458*10^(-23)	3.6123*10^(-1)	8.256*10^(2)	1.11*10^(-6)	-4.09*10^(3)	1.070352
225	sulfur-34	16	291.8	3.1044*10^(1)	1.0601*10^(-23)	3.6255*10^(-1)	8.05*10^(2)	1.24*10^(-6)	-3.97*10^(3)	1.070915
226	sulfur-33	16	280.4	3.0139*10^(1)	1.0919*10^(-23)	3.6427*10^(-1)	7.698*10^(2)	1.43*10^(-6)	-3.77*10^(3)	1.071651
227	sulfur-32	16	271.8	2.9492*10^(1)	1.1159*10^(-23)	3.6588*10^(-1)	7.428*10^(2)	1.64*10^(-6)	-3.62*10^(3)	1.072343
228	phosphorus-31	15	262.9	2.882*10^(1)	1.1419*10^(-23)	3.6758*10^(-1)	7.153*10^(2)	1.88*10^(-6)	-3.47*10^(3)	1.073079
229	silicon-30	14	255.6	2.8298*10^(1)	1.163*10^(-23)	3.6924*10^(-1)	6.923*10^(2)	2.15*10^(-6)	-3.34*10^(3)	1.073802

230	silicon-29	14	245.0	2.7448*10^(1)	1.199*10^(-23)	3.7126*10^(-1)	6.599*10^(2)	2.52*10^(-6)	-3.16*10^(3)	1.074685
231	silicon-28	14	236.5	2.6803*10^(1)	1.2279*10^(-23)	3.732*10^(-1)	6.338*10^(2)	2.94*10^(-6)	-3.01*10^(3)	1.075542
232	aluminum-27	13	225.0	2.5841*10^(1)	1.2736*10^(-23)	3.7553*10^(-1)	5.99*10^(2)	3.52*10^(-6)	-2.82*10^(3)	1.076583
233	magnesium-26	12	216.7	2.5206*10^(1)	1.3057*10^(-23)	3.7769*10^(-1)	5.737*10^(2)	4.14*10^(-6)	-2.69*10^(3)	1.077551
234	magnesium-25	12	205.6	2.4276*10^(1)	1.3556*10^(-23)	3.8027*10^(-1)	5.406*10^(2)	5.02*10^(-6)	-2.51*10^(3)	1.078722
235	magnesium-24	12	198.3	2.3728*10^(1)	1.387*10^(-23)	3.826*10^(-1)	5.182*10^(2)	5.95*10^(-6)	-2.39*10^(3)	1.07979
236	sodium-23	11	186.6	2.2718*10^(1)	1.4486*10^(-23)	3.8561*10^(-1)	4.838*10^(2)	7.37*10^(-6)	-2.2*10^(3)	1.081181
237	neon-22	10	177.8	2.2004*10^(1)	1.4956*10^(-23)	3.8847*10^(-1)	4.576*10^(2)	9.*10^(-6)	-2.07*10^(3)	1.08252
238	neon-21	10	167.4	2.1114*10^(1)	1.5587*10^(-23)	3.9178*10^(-1)	4.273*10^(2)	1.13*10^(-5)	-1.91*10^(3)	1.084081
239	neon-20	10	160.6	2.0609*10^(1)	1.5969*10^(-23)	3.9479*10^(-1)	4.069*10^(2)	1.38*10^(-5)	-1.8*10^(3)	1.085525
240	fluorine-19	9	147.8	1.9421*10^(1)	1.6945*10^(-23)	3.9907*10^(-1)	3.704*10^(2)	1.82*10^(-5)	-1.61*10^(3)	1.0876
241	oxygen-18	8	139.8	1.8764*10^(1)	1.7538*10^(-23)	4.0288*10^(-1)	3.47*10^(2)	2.31*10^(-5)	-1.49*10^(3)	1.089478
242	oxygen-17	8	131.8	1.8097*10^(1)	1.8185*10^(-23)	4.0704*10^(-1)	3.237*10^(2)	2.98*10^(-5)	-1.37*10^(3)	1.091564
243	oxygen-16	8	127.6	1.7888*10^(1)	1.8398*10^(-23)	4.1074*10^(-1)	3.107*10^(2)	3.72*10^(-5)	-1.3*10^(3)	1.093442
244	nitrogen-15	7	115.5	1.6724*10^(1)	1.9678*10^(-23)	4.1673*10^(-1)	2.771*10^(2)	5.24*10^(-5)	-1.14*10^(3)	1.096538
245	nitrogen-14	7	104.7	1.5692*10^(1)	2.0972*10^(-23)	4.2319*10^(-1)	2.473*10^(2)	7.48*10^(-5)	-9.94*10^(2)	1.099958
246	carbon-13	6	97.11	1.5057*10^(1)	2.1857*10^(-23)	4.2948*10^(-1)	2.261*10^(2)	1.04*10^(-4)	-8.9*10^(2)	1.103371
247	carbon-12	6	92.16	1.4764*10^(1)	2.2291*10^(-23)	4.3565*10^(-1)	2.116*10^(2)	1.42*10^(-4)	-8.16*10^(2)	1.106795
248	boron-11	5	76.20	1.2987*10^(1)	2.5341*10^(-23)	4.4753*10^(-1)	1.703*10^(2)	2.5*10^(-4)	-6.32*10^(2)	1.113615
249	boron-10	5	64.75	1.176*10^(1)	2.7985*10^(-23)	4.5996*10^(-1)	1.408*10^(2)	4.32*10^(-4)	-5.02*10^(2)	1.121078
250	beryllium-9	4	58.16	1.1215*10^(1)	2.9346*10^(-23)	4.7184*10^(-1)	1.233*10^(2)	7.01*10^(-4)	-4.22*10^(2)	1.128538
251	lithium-7	3	39.24	9.2079	3.5741*10^(-23)	5.1231*10^(-1)	7.66*10^(1)	2.9*10^(-3)	-2.29*10^(2)	1.156422
252	lithium-6	3	31.99	8.5662	3.8418*10^(-23)	5.4087*10^(-1)	5.915*10^(1)	6.64*10^(-3)	-1.6*10^(2)	1.178496
253	helium-4	2	28.30	9.9942	3.2929*10^(-23)	6.0521*10^(-1)	4.675*10^(1)	2.98*10^(-2)	-9.94*10^(1)	1.235472
254	helium-3	2	7.718	7.2058	4.5672*10^(-23)	9.2368*10^(-1)	8.356	1.73	4.24	1.622418
255	deuterium	1	2.225	1.358*10^(1)	2.4235*10^(-23)	2.6432	8.416*10^(-1)	1.42*10^(5)	2.64*10^(1)	5.069582