

THERMONUCLEAR REACTION RATES V*

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Analytic expressions are given for the reaction rates of astrophysically important thermonuclear reactions involving low-mass nuclei ($1 \leq Z \leq 14$). Numerical values of the rates are tabulated for the temperature range $10^6 \leq T \leq 10^{10}$ K. This provides a comprehensive update of our previous publications. © 1988 Academic Press, Inc.

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INTRODUCTION

In this paper we present in Table II analytic expressions for the reaction rates of astrophysically important reactions of low-mass nuclei and tabulate in Table III numerical values of those thermonuclear reaction rates for the temperature range 10^6 – 10^{10} K or $10^{-3} \leq T_9 (=T/10^9 \text{ K}) \leq 10$. The rates are expressed as $N_A \langle \sigma v \rangle$, where N_A is Avogadro's number and the average of the cross section, σ , times the relative velocity, v , of the reactants is taken over the Maxwell–Boltzmann distribution as a function of temperature. Table I serves as an index for Tables II and III.

In some cases there have been no changes in the analytic expressions reported in our previous publications (Refs. 1–4, referred to as FCZ67, FCZ75, HFCZ83, and CFHZ85 in the following text). We have, however, brought all Q values up to date using the latest atomic masses from Wapstra and Audi.⁵ Changes in the Q values have resulted in changes in several of the reverse-reaction ratios given as REV RATIO in Table II. We have also added some important reactions that were not included in our previous papers to ensure that the list is a complete comprehensive update of the astrophysically important thermonuclear reaction rates involving low-mass nuclei.

References to papers 1 through 4 must be made to ascertain the methods by which the analytic expressions have been derived from experimental laboratory cross-section measurements, specifically in regard to extrapolations to the low energies important at stellar temperatures. We have employed the latest values of the physical constants reported by Wohl et al.⁶ in our calculations.

Following our previous practice, some of the analytic rates given in Table II contain terms in which only an upper limit can be given. These terms are multiplied by the factor (0 to 1). However, in Table III, we give numerical rates for only intermediate values in which we take (0 to 1) = 0.1 for uncertain terms.

We discuss in detail in this paper only those reactions which are new or for which our analytic expressions have been revised since our previous publications. Unfortunately, details of our analyses of individual reactions in those publications have not been published and are not in publishable form. However, we will be happy to supply our notes on one or two individual reactions upon request to the first author of this paper.

Changes in Q values derived from Ref. 5 have resulted in some small changes in rates that had been derived from reverse reactions in our previous papers. These reactions are ${}^4\text{He}(t, n){}^6\text{Li}$, ${}^9\text{Be}(p, n){}^9\text{B}$, ${}^{14}\text{N}(\alpha, n){}^{17}\text{F}$, ${}^{26}\text{Mg}(\alpha, p){}^{29}\text{Al}$, and ${}^{27}\text{Al}(\alpha, n){}^{30}\text{P}$. Since we made no other revisions in those reactions, we do not discuss them in further detail.

We do not present an analytic expression for electron capture by protons (${}^1\text{H}(e^-, \nu){}^1n$) in Table II or a tabulation of reaction rates for such captures in Table III. The reader is referred to two papers by Fuller et al.⁷ for analysis and tabulations of electron-capture rates.

The Q values quoted for reactions in which positrons are emitted include the subsequent annihilation energy (1.022 MeV) of the positron with an electron. The positron-emitting reactions listed in Table II are $\text{H}1(\text{P}, \text{E+NU})\text{H}2$ and $\text{HE}3(\text{P}, \text{E+NU})\text{HE}4$. An im-

proved value from Bahcall and Ulrich⁸ for the cross-section factor in the capture of protons by hydrogen has caused a slight increase in the coefficient of the reaction-rate equation presented in Table II for $^1\text{H}(p, e^+\nu)^2\text{H}$ and corresponding increases in the values tabulated for H1PE+NU in Table III. This also leads to a similar increase in the rate for the $^1\text{H}(e^-p, \nu)^2\text{H}$ reaction. In order to include the electron-number-density factor, the rate given in Tables II and III for this $^1\text{H}(e^-p, \nu)^2\text{H}$ reaction must be multiplied by $n_-/N_A = \rho(1 + X_{\text{H}})/2$, where ρ is the total density in g cm⁻³ and X_{H} is the mass fraction of hydrogen.

Data of Barnes et al.⁹ were used to determine the nonresonant contribution to the $^2\text{H}(d, \gamma)^4\text{He}$ reaction presented in the analytic expression in Table II. In view of the fact that no low-lying resonances would be expected in this reaction, the nonresonant contribution is expected to be important to energies at least as high as 7.5 MeV; hence, no cutoff temperature appears in the analytic expression.

New data of Krauss et al.¹⁰ on the cross-section factors and their derivatives ($S(0)$, $S'(0)$, and $S''(0)$) for $^2\text{H}(d, n)^3\text{He}$, $^2\text{H}(d, p)^3\text{H}$, and $^3\text{He}(d, p)^4\text{He}$ were used to determine the revised analytic expressions presented for the nonresonance contributions to those reaction rates. In the case of charged-particle reactions, at low energies, the cross-section factor, $S(E)$, defined by the equation for the cross section, σ , $\sigma = [S(E)/E] \exp[-(E_G/E)^{1/2}]$, takes into account the importance of the Coulomb barrier ($E_G = (2\pi\alpha Z_0 Z_1)^2 (Mc^2/2)$). $S(0)$ is the experimentally determined value of the cross-section factor at $E = 0$, α is the fine-structure constant, Z_0 and Z_1 are the atomic numbers of the target and incident particles, and M is the reduced mass of the interacting particles. The first and second derivatives with respect to energy of the cross-section factor are employed in a Taylor expansion. $S(E) = S(0) + S'(0)E + \frac{1}{2}S''(0)E^2$ to include the experimentally determined energy dependence of the cross-section factor. The reader is referred to FCZ67 for further discussion of the cross-section factor. The contribution of the resonance at $E_R = 0.148$ MeV (CM) in $^3\text{He}(d, p)^4\text{He}$ is unchanged since FCZ75.

Morgan et al.¹¹ reported the ratio $^3\text{H}(d, \gamma)^5\text{He}/^3\text{H}(d, n)^4\text{He}$ as approximately equal to 7.6×10^{-5} . In Table II we present the analytic expression for $^3\text{H}(d, n)^4\text{He}$. New data for this reaction discussed in Brown et al.¹² do not necessitate a revision of the rate given in FCZ75. Since ^5He decays quickly by neutron emission to ^4He , we have not presented an expression for $^3\text{H}(d, \gamma)^5\text{He}$.

Improved data for the cross-section factor and its derivatives ($S(0)$, $S'(0)$, and $S''(0)$) for the $^3\text{He}(^3\text{He}, 2p)^4\text{He}$ reaction by Krauss et al.¹³ were used to obtain the analytic expression for that reaction in Table II.

An improved rate for $^4\text{He}(t, \gamma)^7\text{Li}$ has been derived by Langanke.¹⁴ The effect of energy dependence of the cross-section factor is included in his analytic expression which is presented in Table II. This rate shows an increase over that in FCZ75 and CFHZ85. Recent analysis by Kajino¹⁵ also recommends such an increase.

Filippone¹⁶ has reviewed several reports on the capture of alpha particles by ^3He and of the capture of protons by ^7Be . His choice of 5.4×10^{-4} MeV-b for the cross-section factor $S_{34}(0)$ for $^4\text{He}(^3\text{He}, \gamma)^7\text{Be}$ has changed the coefficient for that reaction in the expression reported in Table II. His choice of 2.40×10^{-5} MeV-b for $S_{17}(0)$ has changed the coefficient for the reaction $^7\text{Be}(p, \gamma)^8\text{B}$ in Table II.

Rates for the 3-alpha reactions for $T_9 \leq 0.08$ have been improved using the results of Nomoto et al.¹⁷ on the $^8\text{Be}(\alpha, \gamma)^{12}\text{C}$ reactions shown in the analytic expressions for that reaction and in the low-temperature expression for $^4\text{He}(2\alpha, \gamma)^{12}\text{C}$ in Table II. Note that for temperatures $T_9 > 0.08$ we advise the alternate expression from HFCZ83 given in Table II for $^4\text{He}(2\alpha, \gamma)^{12}\text{C}$. The values tabulated for the reaction rate for $^4\text{He}(2\alpha, \gamma)^{12}\text{C}$ in Table III were calculated from the low-temperature expression for $T_9 = 0.001$ to 0.08 and by the higher-temperature expression for $T_9 = 0.09$ to 10.0. As in all cases in Table III for reactions in which the factor (0 to 1) occurs, only the intermediate values with (0 to 1) = 0.1 have been tabulated for this reaction in HE42AGI in Table III.

A preprint of Koehler et al.¹⁸ on new experimental results obtained at Los Alamos plus resonance data in Ajzenberg-Selove¹⁹ has prompted us to change the rate of $^7\text{Li}(p, n)^7\text{Be}$ from that previously published in FCZ75 and used for numerical calculations in CFHZ85. The low-temperature rate is decreased by about 25%.

In FCZ75, contributions of the two resonances at $E_R = 0.386$ and 2.623 MeV (CM) were included in the rate for $^7\text{Li}(p, \alpha)^4\text{He}$. Actually, the 17.640-MeV state of excitation in ^8Be decays by gamma emission, but, because ^8Be will rapidly decay to two alpha particles, its contribution was included in the $^7\text{Li}(p, \alpha)^4\text{He}$ equation in FCZ75. Several astrophysicists interested in high-energy gamma rays have requested a separate expression for the rate of the $^7\text{Li}(p, \gamma)^8\text{Be}$ reaction. We comply with that request with the analytic expression given in Table II for that reaction. The first term in the expression is a nonresonance contribution due to the tail of the 0.386-MeV resonance. The second term is its resonant contribution.

New data on $^7\text{Li}(p, \alpha)^4\text{He}$ by Rolfs and Kavanagh²⁰ were used to derive the revised nonresonance contribution given in the first two terms of the analytic expression in Table II for $^7\text{Li}(p, \alpha)^4\text{He}$. We have found that a cross-section factor $S(E) = 0.093 - 0.041$

$\times \exp(-8.804E)$ MeV-b fits very well the experimental data of Ref. 20. Note the minus sign in the second term of $S(E)$: this means that the second term in the expression in Table II is *negative*. The third term is the contribution of the $E_R = 2.623$ -MeV resonance and is the same as that presented in FCZ75. In view of the rapid decay to two alpha particles of the ^8Be produced in $^7\text{Li}(p, \gamma)^8\text{Be}$, we include the expression $\text{LI7(P, AG)HE4} = \text{LI7(P, G)BE8} + \text{LI7(P, A)HE4}$ in Table II and a column LI7PAG in Table III.

Data on resonant alpha capture by ^7Li and ^7Be from Hardie et al.²¹ have led to the revisions of the analytic expressions for $^7\text{Li}(\alpha, \gamma)^{11}\text{B}$ and $^7\text{Be}(\alpha, \gamma)^{11}\text{C}$. The first term in each case is a nonresonance contribution due to the tails of resonances. The second term in $^7\text{Li}(\alpha, \gamma)^{11}\text{B}$ is due to a resonance at $E_R = 0.2565$ MeV (CM). The second term in $^7\text{Be}(\alpha, \gamma)^{11}\text{C}$ is due to a resonance at $E_R = 0.561$ MeV (CM). In each case, the third term is a continuum fitted to contributions of higher resonances.

Because of the importance of the alpha-particle captures by ^{11}B and ^{14}C in Big Bang nucleosynthesis in an inhomogeneous universe, we have added the reactions $^{11}\text{B}(\alpha, n)^{14}\text{N}$, $^{11}\text{B}(\alpha, p)^{14}\text{C}$, and $^{14}\text{C}(\alpha, \gamma)^{18}\text{O}$ to our list of thermonuclear reaction rates.

Data on energy states in ^{15}N , resonances in $^{11}\text{B} + \alpha$, resonances in $^{14}\text{N} + n$, and resonances in $^{14}\text{C} + p$, found in Ajzenberg-Selove¹⁹ were used to derive the strengths of the reaction rates for $^{11}\text{B}(\alpha, n)^{14}\text{N}$ and $^{11}\text{B}(\alpha, p)^{14}\text{C}$. In each case, the first term in the analytic expressions reported for these reactions in Table II is a contribution due to the tails of the resonances considered. The second and third terms in each case are contributions of two resonances at 0.2436 and 0.4462 MeV (CM).

The fourth term in the equation for $^{11}\text{B}(\alpha, n)^{14}\text{N}$ is a continuum contribution of seven higher resonances from 0.7866 to 1.9286 MeV (CM). The fourth term in the equation for $^{11}\text{B}(\alpha, p)^{14}\text{C}$ is a continuum contribution of eight resonances from 0.7866 to 1.9486 MeV (CM). The nonresonance term of $^{11}\text{B}(\alpha, n)^{14}\text{N}$ is cut off at the 0.2436-MeV resonance. That of $^{11}\text{B}(\alpha, p)^{14}\text{C}$ is cut off at the 0.4462-MeV resonance.

Data from Ajzenberg-Selove¹⁹ and Cunsolo et al.²² on the widths and methods of decay of energy states in ^{18}O were used to determine probable resonances in the $^{14}\text{C}(\alpha, \gamma)^{18}\text{O}$ reaction. The first term is the contribution of a subthreshold state at -0.02968 MeV (CM). We are grateful to J. Pickarewicz,²³ who calculated the direct-capture cross section used to obtain the second term in the equation. It is cut off at $T_9 = 2.662$ because our analytic expression becomes much higher than the rate given by the calculations of Pickarewicz²³ above this temperature. The third term gives an estimated rate for a

resonance arising from a 3^- state in ^{18}O at 6.404-MeV excitation. Cunsolo et al.²² were unable to observe this state in their experiments because of contamination by a state in ^{16}O at 6.92 MeV (see their Fig. 1). We assigned a spectroscopic factor of 0.019 for this state, the value that Cunsolo et al.²² observed for another 3^- state in ^{18}O at 8.287 MeV. The fourth term is the continuum contribution based on the Cunsolo et al.²² determinations of spectroscopic factors for six states in ^{18}O at excitations from 7.12 to 8.96 MeV.

The coefficients of the first and second terms of the expression for $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$ have been revised since CFHZ85 in the light of our analysis of new observations by Redder et al.²⁴ and Plaga et al.²⁵ Unpublished data and theoretical analysis on $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$ have been privately communicated to us by B. W. Filippone and J. Humbert. Their results have been taken into account in determining our final rates for $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$, but the differences between the various sets of data lead us to believe that our rates are uncertain within a factor of two up or down.

The first term of the analytic expression for $^{13}\text{C}(p, \gamma)^{14}\text{N}$ is the nonresonance contribution calculated by Azuma et al.²⁶ The second term is a continuum fitted to the contributions of three resonances. The data for the first resonance at 0.554 MeV (LAB) are from Ref. 26. Data for the other two resonances at 1.152 and 1.320 MeV are reported in Ajzenberg-Selove.¹⁹

Data for $^{13}\text{N}(p, \gamma)^{14}\text{O}$ by Langanke et al.²⁷ were used to derive our revision of the equation for that reaction. A later paper by Funck and Langanke²⁸ shows reasonable agreement with the reaction rates shown for N13PG in Table III.

Data of Schröder et al.²⁹ were used to derive our revision of the equation for the $^{14}\text{N}(p, \gamma)^{15}\text{O}$ reaction. The first term is a nonresonance contribution in which their value of $S(0) = 3.20 \times 10^{-3}$ MeV-b for the cross-section factor at $E = 0$ determined the coefficient. The expansion factor in powers of T913 is unchanged from that in FCZ75. The second term is due to a resonance at 0.2781 MeV (LAB). The final term is a continuum contribution calculated from data on eight higher resonances reported in Ajzenberg-Selove.¹⁹ The nonresonance contribution is cut off at $T_9 = 3.294$, the temperature at which the continuum becomes important.

The only change in the reaction rate for $^{15}\text{N}(\alpha, \gamma)^{19}\text{F}$ is the deletion of the second resonance contribution in the third term of the expression presented in FCZ75. Magnus et al.³⁰ have found that the 0.542-MeV (CM) resonance which that term represented has a very small upper limit for its strength.

Langanke et al.³¹ (referred to as LWFG86 in the following discussion) have investigated $^{15}\text{O}(\alpha, \gamma)^{19}\text{Ne}$ and $^{19}\text{Ne}(p, \gamma)^{20}\text{Na}$, the two most important reactions

for leakage from the CNO cycles. The first term in the analytic expression for $^{15}\text{O}(\alpha, \gamma)^{19}\text{Ne}$ in Table II is the direct-capture contribution which we calculated using $S_{DC} = 26.54(1-0.24E)$ MeV-b from LWFG86, but we have cut this contribution off at $T_9 = 3.000$ so its contribution is negligible when it becomes negative. The second term is a nonresonance contribution calculated from the tails of the resonances and added to the LWFG86 contributions. The third term is the contribution of the $E_R = 0.504$ -MeV (CM) resonance from LWFG86. The fourth term is a contribution due to 23 resonances from $E_R = 0.611$ to 3.000 MeV (CM). Data for the first four resonances from 0.611 to 1.076 MeV are from Magnus et al.³⁰ and for the remaining 19 resonances are from LWFG86. The continuum contribution is cut off at $T_9 = 8.000$.

The first term of $^{19}\text{Ne}(p, \gamma)^{20}\text{Na}$ is the direct-capture contribution from LWFG86. The second is a nonresonance contribution we have calculated from the tails of the resonances reported in LWFG86. This term differs somewhat from the term designated "Tails" in LWFG86, but we believe our calculations are correct. It is cut off at the 0.680-MeV (CM) resonance. The third term is the continuum contribution of LWFG86.

Wiescher et al.³² have studied the alpha burning of ^{14}O . Their data on nine resonances from 1.300 to 4.056 MeV (LAB) were used to obtain the analytic expressions presented for $^{14}\text{O}(\alpha, \gamma)^{18}\text{Ne}$ and $^{14}\text{O}(\alpha, p)^{17}\text{F}$ in Table II. In each case, the first term is a nonresonance contribution determined from the tails of the nine resonances. The second and third terms are resonance contributions of the strong p -wave resonances at $E_R = 1.300$ and 2.500 MeV (LAB), respectively. The fourth term in each expression corresponds to a continuum derived by Ref. 32 from the contributions of the other seven resonances augmented by Hauser-Feshbach theoretical reaction rates for $T_9 > 5.0$ in view of a probably higher density of states.

Recent research by Hahn et al.³³ on the capture of alpha particles by ^{16}O at low energies has revealed a cross-section factor for the nonresonance contribution slightly smaller than that used in deriving this rate in CFHZ85. However, their data show higher values for contributions of individual resonances from 1.054 to 2.422 MeV (CM). We have used their data to revise the analytic expression for $^{16}\text{O}(\alpha, \gamma)^{20}\text{Ne}$. The first term in the expression in Table II is the nonresonance contribution which is cut off at $T_9 = 1.586$, the temperature at which the continuum term dominates. The second and third terms are individual contributions of resonances at 0.8873 and 1.0536 MeV (CM), respectively. The fourth term is a continuum contribution from FCZ75 due to 24 higher resonances, but we have scaled the coefficient of this term up by a factor of 1.62 in the light of the

Hahn et al.³³ observations that resonance contributions are enhanced over previous measurements. The resulting numerical values for the rate reported in the O16AG column of Table III 15 are slightly smaller than those tabulated in CFHZ85 for $T_9 < 0.250$. For $T_9 \geq 0.250$, the rate is greater than that of CFHZ85.

Improved information for the first resonance in the capture of protons by ^{18}O from Champagne and Pitt³⁴ has changed the term for that resonance in the analytic expressions for $^{18}\text{O}(p, \gamma)^{19}\text{F}$ and $^{18}\text{O}(p, \alpha)^{15}\text{N}$ presented in Table II. We have also deleted the uncertain term in $^{18}\text{O}(p, \alpha)^{15}\text{N}$ given in HFCZ83 for that reaction.

The only changes in $^{21}\text{Ne}(p, \gamma)^{22}\text{Na}$ and $^{29}\text{Si}(p, \gamma)^{30}\text{P}$ from the equations given in HFCZ83 is an improved fit to the continuum in each case.

Two more new reactions in our tables are $^{21}\text{Na}(p, \gamma)^{22}\text{Mg}$ and $^{22}\text{Na}(p, \gamma)^{23}\text{Mg}$. Wiescher and Langanke³⁵ have studied these reactions. From their data on three resonances at 0.220, 0.340, and 0.470 MeV (CM), we have determined the analytic expression for $^{21}\text{Na}(p, \gamma)^{22}\text{Mg}$. The first term is a nonresonance contribution due to the tails of the resonances. The second term is a continuum fitted to the resonance contributions of the three resonances.

Wiescher and Langanke³⁵ derived the analytic expression presented in Table II for $^{22}\text{Na}(p, \gamma)^{23}\text{Mg}$. It represents well the average of the rates determined by them for the upper and lower limits of the reaction rates due to their choices of parameters for 12 probable resonances from $E_R = 0.011$ to 0.614 MeV (CM). We find good agreement for this equation in the range $0.01 \leq T_9 \leq 10$.

Because of the great current interest in the nucleosynthesis of ^{22}Na and ^{26}Al , we have included production and destruction rates for these nuclei based in part on experiment *but also in part on theory* (Woosley et al.³⁶). In the case of ^{26}Al , complications arise because the ground state $^{26}\text{Al}^g$ ($J^\pi = 5^+$, $\tau = 1.04 \times 10^6$ year) and the isomeric state $^{26}\text{Al}^m$ ($J^\pi = 0^+$, $\tau = 9.15$ s) do not come into statistical equilibrium for temperatures below $T_9 \sim 1$, the exact value depending on the applicable time scale. This is true even though $^{26}\text{Al}^g$ is in equilibrium with one set of the excited states of ^{26}Al and $^{26}\text{Al}^m$ is in equilibrium with another set even at very low temperatures. The problem is discussed in detail in Ward and Fowler.³⁷ The reaction rates given in this paper have been simplified by the omission of the time-dependent factors in the partition functions involving $^{26}\text{Al}^g$ and $^{26}\text{Al}^m$ since these factors are about equal to 1 for $T_9 < 1$. For $T_9 > 1$ these two states are in statistical equilibrium for all applicable time scales and rates are needed for only $^{26}\text{Al}^t$, where t (total) signifies the statistical ensemble of all the states of ^{26}Al . For the rates involving $^{26}\text{Al}^t$

we retain the time-dependent factors in the partition function. We also require that reactions producing $^{26}\text{Al}^{\text{i}}$ equal the sum of those producing $^{26}\text{Al}^{\text{m}}$ and $^{26}\text{Al}^{\text{g}}$ and the states in equilibrium with them. In general, we present stellar reaction rates which involve the statistical ensemble of all states at a specified temperature and do not include a superscript t (or a T as in AL26T in computer printout). The lone exception is ^{26}Al . In many cases we do not include the temperature-dependent factors in partition functions when these are close to unity for all temperatures of relevance in the production or destruction of a given nucleus. When required, these factors can be found in Tables IIA and IIB of Ref. 36 based on known states, excitation energies, and spins.

The rates for $^{22}\text{Na}(n, p)$, $^{22}\text{Na}(n, \alpha)$, $^{26}\text{Al}^{\text{i}}(n, p)$, and $^{26}\text{Al}^{\text{i}}(n, \alpha)$ are based on the theoretical calculations of Ref. 36 multiplied by 0.3. A study of nuclear-level densities in the mass range near $A = 25$ suggests that this factor probably leads to better values for these reaction rates.

The analytic expression presented for $^{26}\text{Al}^{\text{i}}(p, \gamma)^{27}\text{Si}$ is a fit derived theoretically by Woosley³⁸ for the first term. Data from Buchmann et al.³⁹ were used to obtain the resonance and continuum terms.

The reactions involving captures of neutrons by ^{26}Al appear in slightly different form in our list of analytic expressions from those in HFCZ83 and CFHZ85. We have used analyses of Skelton et al.^{40,41} on $^{26}\text{Mg}(p, n)^{26}\text{Al}$ and $^{23}\text{Na}(\alpha, n)^{26}\text{Al}$ and of Trautvetter et al.⁴² on $^{26}\text{Mg}(p, n)^{26}\text{Al}$ to derive the expressions in Table II for $^{26}\text{Al}^{\text{m}}(n, p)^{26}\text{Mg}$ and $^{26}\text{Al}^{\text{m}}(n, \alpha)^{23}\text{Na}$. Rather than giving explicit expressions for REV RATIO for reactions involving ^{26}Al , we present their reverse reactions, $^{26}\text{Mg}(p, n)^{26}\text{Al}^{\text{i}}$, etc., in symbolic form as the ^{26}Al reactions times REV RATIO. For example, NA23(A, N)AL26T = AL26T(N, A)NA23*GPT9/GT9*8.36E-01*EXP(-34.442/T9). The ground-state reactions for $^{26}\text{Al}^{\text{g}}$ in each case are presented as the difference between the total rate and the isomeric rate. In the case of the isomeric state of ^{26}Al , we used the data of Skelton et al.⁴¹ on $^{26}\text{Al}(n_1, \alpha_0)^{23}\text{Na}$ to derive the equation for decays to the ground state ($J^\pi = 3/2^+$) of ^{23}Na , then, to take into account the probability of decays to the 0.440-MeV ($J^\pi = 5/2^+$) excited state in ^{23}Na , we have multiplied our result by 2.5 to obtain the coefficient given in the expression for AL26M(N, A)NA23 as the total reaction rate for decays to ^{23}Na .

The revision of the rates for the $^{25}\text{Mg}(p, \gamma)^{26}\text{Al}$ total, isomeric-, and ground-state reactions are based on data of Endt and Rolfs.⁴³ The nonresonance contribution in the analytic expression for the total rate is a combination of contributions of the tails of the 56 resonances used in the HFCZ83 analysis, the direct-capture contribution derived by Endt and Rolfs,⁴³ and their

contribution of the -0.0257-MeV (CM) subthreshold resonance. The second and third terms are individual contributions of the 0.0375- and 0.0580-MeV (CM) resonances, respectively. The fourth and fifth terms are continuum contributions computed from the higher-energy data of Ref. 43. They are cut off at $T_9 = 13$. The nonresonance term is cut off at the limit of the subthreshold resonance ($T_9 = 0.06$). The branching-ratio factors used to determine the $^{25}\text{Mg}(p, \gamma)^{26}\text{Al}^{\text{m}}$ and $^{25}\text{Mg}(p, \gamma)^{26}\text{Al}^{\text{g}}$ rates (0.20 for the isomeric state and 0.80 for the ground state) were determined by calculating the averages of the f_0 values tabulated by Endt and Rolfs.⁴³

The revisions in the rate for $^{26}\text{Mg}(p, \gamma)^{27}\text{Al}$ since HFCZ83 are based on new data privately communicated to us by A. E. Champagne through H. C. Higdon. Because data on certain resonances in the reaction are incomplete, the new rates are uncertain within a factor of two up or down.

A recent investigation of $^{27}\text{Al}(p, \gamma)^{28}\text{Si}$ by Champagne et al.⁴⁴ has shown that the uncertain terms in the rate reported in FCZ75 for this reaction are high by a factor of about 10^3 . The revised uncertain terms presented in Table II for this reaction are from Ref. 44.

New measurements by Holmqvist and Ramström⁴⁵ have shown an increase in the rate of the $^{27}\text{Al}(\alpha, n)^{30}\text{P}$ reaction. This is reflected in the change of the coefficient of the expression for that reaction in Table II.

Data on direct capture and on five possible resonances from 0.08 to 0.57 MeV (CM) in the capture of protons by ^{27}Si from Wiescher et al.⁴⁶ were used to derive the expression for $^{27}\text{Si}(p, \gamma)^{28}\text{P}$ in Table II. The first term is the direct-capture contribution which is expected to be important even at high energies; hence, it is not cut off. The second and third terms are contributions due to resonances at $E_R = 0.080$ and 0.160 MeV (CM), respectively. The fourth term is a continuum due to the contributions of three higher resonances.

We have considerably revised the rate for the $^{12}\text{C} + ^{12}\text{C}$ fusion reaction, especially at low temperatures, based on new experimental results reported by Becker et al.⁴⁷ averaged with Patterson et al.⁴⁸ and Spinka and Winkler.⁴⁹ The experimental data from 2.5 to 6.5 MeV have been fitted to a cross-section factor given by $S(E) = 3 \times 10^{16} \exp(-0.46E)$ MeV-b. The EXP(-2.12E-03*T9**3) term in the equation in Table II is a rather unusual "cutoff term" adjusted to fit the high-temperature behavior of the reaction.

New data for $^{12}\text{C} + ^{16}\text{O}$ have not become available since Christensen et al.⁵⁰ By making an analysis similar to that of Reinhard et al.,⁵¹ we conclude that our rate for $^{12}\text{C} + ^{16}\text{O}$ is valid only for $T_9 > 0.5$. The temperature range for $^{12}\text{C} + ^{16}\text{O}$ is sufficient for all cases of hydrostatic or explosive burning involving this reaction.

New experimental data from Wu and Barnes⁵² and Thomas et al.⁵³ and new theoretical analysis by Reinhard et al.⁵¹ are available for $^{16}\text{O} + ^{16}\text{O}$. The rather unusual form of the equation for this reaction in Table II exhibits an expansion in powers of T923 in the exponent. This results from our empirical fitting of the data to a cross-section factor given by $S(E) = 4.533 \times 10^{26} \times \exp(-0.161E - 0.0292E^2 + 1.731 \times 10^{-4}E^3)$, which is different from the usual form of $S(E)$ in Eq. (30) of FCZ75. The expansion is in powers of E_0 , which is proportional to $(T_9)^{2/3}$.

The yields of n , p , and α in the fusion reactions have been studied in considerable detail by Wu and Barnes.⁵⁴ They emphasize that the sum of these yields can exceed unity because of such reactions as $^{16}\text{O}(^{16}\text{O}, np)^{30}\text{P}$ and $^{16}\text{O}(^{16}\text{O}, 2p)^{30}\text{Si}$. The Q values given apply to the emission of one particle as in $^{16}\text{O}(^{16}\text{O}, n)^{31}\text{S} + 1.500 \text{ MeV}$.

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EXPLANATION OF TABLES

TABLE I. Index to Analytic Expressions and Tabulated Reaction Rates

REACTION	The reaction in conventional notation
NOTATION IN TABLE II	Notation used in Table II for the reaction
NOTATION IN TABLE III	Notation used in Table III for the reaction

The following letters may appear at the end of the reaction notation:

I	indicates that the reaction-rate equation involves cross sections for which only upper limits can be stipulated. Accordingly, as discussed in the text, reaction rates in Table III have been calculated multiplying such terms by 0.1 to give the intermediate values.
G, M, T	indicate reactions leading, respectively, to the ground state, isomeric state, or both ground and isomeric states.
TABLE II	Location of analytic expression in Table II
TABLE III	Location of numerical reaction rates in Table III

TABLE II. Analytic Expressions for Reaction Rates

The rate equations given here include all reactions presented in Refs. 1–4. Many of those equations have been revised in the light of new data and new theoretical analysis. A number of important new reactions have been added to the list. The reaction is listed in column 1. The corresponding conventional notation is given in Table I. The analytic expressions are written using standard computer notation except as explained below. The reaction notation of column 1 is also used to indicate a functional dependence when appearing in the rate equation of another reaction.

Q	Q value of the reaction in MeV
REV RATIO	Multiplicative factor used in conjunction with the rates from Table III to calculate rates for the reverse reaction
T9	Temperature of the reactants in units of 10^9 K
T9nm	Abbreviated notation for $(T_9)^{n/m}$, e.g., T923 = $(T_9)^{2/3}$
RHO	Density in units of g cm ⁻³
X	Mass fraction of hydrogen

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

Reaction rates, in units of $(\text{cm}^3 \text{ mole}^{-1})^{(N-1)} \text{ s}^{-1}$, are listed as functions of T_9 below the corresponding reaction symbol. N refers to the number of particles involved in the reaction; i.e., $N = 2$ for two-body and $N = 3$ for three-body reactions. The key to the abbreviated notation for the reaction is given in Table I.

T9	Temperature of reactants in units of 10^9 K
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TABLE I. Index to Analytic Expressions and Tabulated Reaction Rates
See page 291 for Explanation of Tables

REACTION	NOTATION IN TABLE II	NOTATION IN TABLE III	TABLE II	TABLE III	REACTION	NOTATION IN TABLE II	NOTATION IN TABLE III	TABLE II	TABLE III
$^1\text{H}(\text{e}^-, \nu)^1\text{n}$	H1(E-, NU)N1		1		$^7\text{Be}(\text{p}, \gamma)^8\text{B}$	BE7(P, G)B8	BE7PG	3	7
$^1\text{H}(\text{p}, \text{e}^+ \nu)^2\text{H}$	H1(P, E+NU)H2	H1PE+NU	1	1	$^7\text{Be}(\text{d}, \text{p})^2\text{He}$	BE7(D, P)2HE4	BE7DP	3	7
$^1\text{H}(\text{e}^-, \text{p}, \nu)^2\text{H}$	H1(E-P, NU)H2	H1E-PNU	1	1	$^7\text{Be}(\text{t}, \text{np})^2\text{He}$	BE7(T, NP)2HE4	BE7TNP	4	8
$^2\text{H}(\text{p}, \gamma)^3\text{He}$	H2(P, G)HE3	H2PG	1	1	$^7\text{Be}(\beta^3\text{He}, 2\text{p})^2\text{He}$	BE7(HE3, 2P)2HE4	BE7HE32P	4	8
$^2\text{H}(\text{p}, \text{n})^1\text{H}$	H2(P, N)2H1	H2PN	1	1	$^7\text{Be}(\alpha, \gamma)^{11}\text{C}$	BE7(A, G)C11	BE7AG	4	8
$^2\text{H}(\text{d}, \gamma)^4\text{He}$	H2(D, G)HE4	H2DG	1	1	$^8\text{Be}(\alpha, \gamma)^{12}\text{C}$	BE8(A, G)C12	BE8AG	2	5
$^2\text{H}(\text{d}, \text{n})^3\text{He}$	H2(D, N)HE3	H2DN	1	1	$^9\text{Be}(\text{p}, \gamma)^{10}\text{B}$	BE9(P, G)B10	BE9PG	4	8
$^2\text{H}(\text{d}, \text{p})^3\text{H}$	H2(D, P)H3	H2DP	1	2	$^9\text{Be}(\text{p}, \text{n})^9\text{B}$	BE9(P, N)B9	BE9PN	4	8
$^3\text{H}(\text{p}, \gamma)^4\text{He}$	H3(P, G)HE4	H3PG	1	2	$^9\text{Be}(\text{p}, \text{d})^2\text{He}$	BE9(P, D)2HE4	BE9PD	4	8
$^3\text{H}(\text{p}, \text{n})^3\text{He}$	H3(P, N)HE3	H3PN	1	2	$^9\text{Be}(\text{p}, \text{a})^6\text{Li}$	BE9(P, A)L16	BE9PA	4	9
$^3\text{H}(\text{d}, \text{n})^4\text{He}$	H3(D, N)HE4	H3DN	1	2	$^9\text{Be}(\alpha, \text{n})^{12}\text{C}$	BE9(A, N)C12	BE9AN	4	9
$^3\text{H}(\text{t}, 2\text{n})^4\text{He}$	H3(T, 2N)HE4	H3T2N	1	2	$^{10}\text{B}(\text{p}, \gamma)^{11}\text{C}$	B10(P, G)C11	B10PG	4	9
$^3\text{He}(\text{e}^-, \nu)^3\text{H}$	HE3(E-, NU)H3	HE3E-NU	1	2	$^{10}\text{B}(\text{p}, \alpha)^7\text{Be}$	B10(P, A)BE7	B10PA	4	9
$^3\text{He}(\text{p}, \text{e}^+ \nu)^4\text{He}$	HE3(P, E+NU)HE4	HE3PE+NU	1	3	$^{10}\text{B}(\alpha, \text{n})^{13}\text{N}$	B10(A, N)N13	B10AN	4	9
$^3\text{He}(\text{d}, \text{p})^4\text{He}$	HE3(D, P)HE4	HE3DP	1	3	$^{11}\text{B}(\text{p}, \gamma)^{12}\text{C}$	B11(P, G)C12	B11PG	4	9
$^3\text{He}(\text{t}, \text{d})^4\text{He}$	HE3(T, D)HE4	HE3TD	2	3	$^{11}\text{B}(\text{p}, \text{n})^{11}\text{C}$	B11(P, N)C11	B11PN	4	10
$^3\text{He}(\text{t}, \text{np})^4\text{He}$	HE3(T, NP)HE4	HE3TNP	2	3	$^{11}\text{B}(\text{p}, \alpha)^2\text{He}$	B11(P, A)2HE4	B11PA	5	10
$^3\text{He}(\beta^3\text{He}, 2\text{p})^4\text{He}$	HE3(HE3, 2P)HE4	HE3HE32P	2	3	$^{11}\text{B}(\alpha, \text{n})^{14}\text{N}$	B11(A, N)N14	B11AN	5	10
$^4\text{He}(\text{nn}, \gamma)^6\text{He}$	HE4(NN, G)HE6	HE4NNG1	2	3	$^{11}\text{B}(\alpha, \text{p})^{14}\text{C}$	B11(A, P)C14	B11AP	5	10
$^4\text{He}(\text{np}, \gamma)^6\text{Li}$	HE4(NP, G)L16	HE4NPG	2	4	$^{11}\text{C}(\text{p}, \gamma)^{12}\text{N}$	C11(P, G)N12	C11PG	5	10
$^4\text{He}(\text{d}, \gamma)^6\text{Li}$	HE4(D, G)L16	HE4DG	2	4	$^{12}\text{C}(\text{p}, \gamma)^{13}\text{N}$	C12(P, G)N13	C12PG	5	10
$^4\text{He}(\text{t}, \gamma)^7\text{Li}$	HE4(T, G)L17	HE4TG	2	4	$^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$	C12(A, G)O16	C12AG	5	11
$^4\text{He}(\text{t}, \text{n})^6\text{Li}$	HE4(T, N)L16	HE4TN	2	4	$^{12}\text{C}(\alpha, \text{n})^{15}\text{O}$	C12(A, N)O15	C12AN	5	11
$^4\text{He}(\beta^3\text{He}, \gamma)^7\text{Be}$	HE4(HE3, G)BE7	HE4HE3G	2	4	$^{13}\text{C}(\text{p}, \gamma)^{14}\text{N}$	C13(P, G)N14	C13PG	5	11
$^4\text{He}(\text{an}, \gamma)^9\text{Be}$	HE4(AN, G)BE9	HE4ANG	2	4	$^{13}\text{C}(\text{p}, \text{n})^{13}\text{N}$	C13(P, N)N13	C13PN	5	11
$^4\text{He}(\alpha)^8\text{Be}$	HE4(A)BE8	HE4ABE8	2	5	$^{13}\text{C}(\alpha, \text{n})^{16}\text{O}$	C13(A, N)O16	C13AN	5	11
$^4\text{He}(2\text{a}, \gamma)^{12}\text{C}$	HE4(2A, G)C12	HE42AG1	2	5	$^{14}\text{C}(\text{p}, \gamma)^{15}\text{N}$	C14(P, G)N15	C14PG	5	11
$^6\text{Li}(\text{p}, \gamma)^7\text{Be}$	LI6(P, G)BE7	LI6PG	3	5	$^{14}\text{C}(\text{p}, \text{n})^{14}\text{N}$	C14(P, N)N14	C14PN	6	12
$^6\text{Li}(\text{p}, \beta^3\text{He})^4\text{He}$	LI6(P, HE3)HE4	LI6PHE3	3	5	$^{14}\text{C}(\alpha, \gamma)^{18}\text{O}$	C14(A, G)O18	C14AG	6	12
$^6\text{Li}(\alpha, \gamma)^{10}\text{B}$	LI6(A, G)B10	LI6AG	3	5	$^{13}\text{N}(\text{p}, \gamma)^{14}\text{O}$	N13(P, G)O14	N13PG	6	12
$^7\text{Li}(\text{p}, \text{n})^7\text{Be}$	LI7(P, N)BE7	LI7PN	3	6	$^{14}\text{N}(\text{p}, \gamma)^{15}\text{O}$	N14(P, G)O15	N14PG	6	12
$^7\text{Li}(\text{p}, \gamma)^8\text{Be}$	LI7(P, G)BE8	LI7PG	3	6	$^{14}\text{N}(\text{p}, \text{n})^{14}\text{O}$	N14(P, N)O14	N14PN	6	12
$^7\text{Li}(\text{p}, \alpha)^4\text{He}$	LI7(P, A)HE4	LI7PA	3	6	$^{14}\text{N}(\text{p}, \alpha)^{11}\text{C}$	N14(P, A)C11	N14PA	6	12
$^7\text{Li}(\alpha, \gamma)^4\text{He}$	LI7(P, AG)HE4	LI7PAG	3	6	$^{14}\text{N}(\alpha, \gamma)^{18}\text{F}$	N14(A, G)F18	N14AG	6	13
$^7\text{Li}(\text{d}, \text{n})^2\text{He}$	LI7(D, N)2HE4	LI7DN	3	6	$^{14}\text{N}(\alpha, \text{n})^{17}\text{F}$	N14(A, N)F17	N14AN	6	13
$^7\text{Li}(\text{t}, 2\text{n})^2\text{He}$	LI7(T, 2N)2HE4	LI7T2N	3	6	$^{15}\text{N}(\text{p}, \gamma)^{16}\text{O}$	N15(P, G)O16	N15PG	6	13
$^7\text{Li}(\beta^3\text{He}, \text{np})^2\text{He}$	LI7(HE3, NP)2HE4	LI7HE3NP	3	7	$^{15}\text{N}(\text{p}, \text{n})^{15}\text{O}$	N15(P, N)O15	N15PN	6	13
$^7\text{Li}(\alpha, \gamma)^{11}\text{B}$	LI7(A, G)B11	LI7AG	3	7	$^{15}\text{N}(\text{p}, \alpha)^{12}\text{C}$	N15(P, A)C12	N15PAI	6	13
$^7\text{Li}(\alpha, \text{n})^{10}\text{B}$	LI7(A, N)B10	LI7AN	3	7	$^{15}\text{N}(\alpha, \gamma)^{19}\text{F}$	N15(A, G)F19	N15AG	7	13
$^7\text{Be}(\text{e}^-, \nu\gamma)^7\text{Li}$	BE7(E-, NU+G)L17	BE7E-NUG	3	7	$^{15}\text{N}(\alpha, \text{n})^{18}\text{F}$	N15(A, N)F18	N15AN	7	14

TABLE I. Index to Analytic Expressions and Tabulated Reaction Rates
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REACTION	NOTATION IN TABLE		TABLE		REACTION	NOTATION IN TABLE		TABLE	
	II	III	II	III		II	III	II	III
$^{14}_0(\alpha, \gamma)^{18}\text{Ne}$	014(A, G)NE18	014AG	7	14	$^{24}\text{Mg}(\alpha, \gamma)^{28}\text{Si}$	MG24(A, G)SI28	MG24AGI	11	24
$^{14}_0(\alpha, p)^{17}\text{F}$	014(A, P)F17	014AP	7	14	$^{25}\text{Mg}(p, \gamma)^{26}\text{Al}^t$	MG25(P, G)AL26T	MG25PGT	11	20
$^{15}_0(\alpha, \gamma)^{19}\text{Ne}$	015(A, G)NE19	015AG	7	14	$^{25}\text{Mg}(p, \gamma)^{26}\text{Al}^m$	MG25(P, G)AL26M	MG25PGM	11	20
$^{16}_0(p, \gamma)^{17}\text{F}$	016(P, G)F17	016PG	7	14	$^{25}\text{Mg}(p, \gamma)^{26}\text{Al}^s$	MG25(P, G)AL26G	MG25PGG	11	20
$^{16}_0(p, \alpha)^{13}\text{N}$	016(P, A)N13	016PA	7	14	$^{25}\text{Mg}(\alpha, \gamma)^{29}\text{Si}$	MG25(A, G)SI29	MG25AG	11	24
$^{16}_0(\alpha, \gamma)^{20}\text{Ne}$	016(A, G)NE20	016AG	7	15	$^{25}\text{Mg}(\alpha, n)^{28}\text{Si}$	MG25(A, N)SI28	MG25AN	11	24
$^{17}_0(p, \gamma)^{18}\text{F}$	017(P, G)F18	017PGI	7	15	$^{25}\text{Mg}(\alpha, p)^{28}\text{Al}$	MG25(A, P)AL28	MG25AP	11	24
$^{17}_0(p, \alpha)^{14}\text{N}$	017(P, A)N14	017PAI	7	15	$^{26}\text{Mg}(p, \gamma)^{27}\text{Al}$	MG26(P, G)AL27	MG26PG	11	25
$^{17}_0(\alpha, \gamma)^{21}\text{Ne}$	017(A, G)NE21	017AG	8	15	$^{26}\text{Mg}(p, n)^{26}\text{Al}^t$	MG26(P, N)AL26T	MG26PNT	12	21
$^{17}_0(\alpha, n)^{20}\text{Ne}$	017(A, N)NE20	017AN	8	15	$^{26}\text{Mg}(p, n)^{26}\text{Al}^m$	MG26(P, N)AL26M	MG26PNMI	12	21
$^{18}_0(p, \gamma)^{19}\text{F}$	018(P, G)F19	018PG	8	15	$^{26}\text{Mg}(p, n)^{26}\text{Al}^s$	MG26(P, N)AL26G	MG26PNGI	12	21
$^{18}_0(p, \alpha)^{15}\text{N}$	018(P, A)N15	018PA	8	16	$^{26}\text{Mg}(\alpha, \gamma)^{30}\text{Si}$	MG26(A, G)SI30	MG26AG	12	25
$^{18}_0(\alpha, \gamma)^{22}\text{Ne}$	018(A, G)NE22	018AGI	8	16	$^{26}\text{Mg}(\alpha, n)^{29}\text{Si}$	MG26(A, N)SI29	MG26AN	12	25
$^{18}_0(\alpha, n)^{21}\text{Ne}$	018(A, N)NE21	018AN	8	16	$^{26}\text{Mg}(\alpha, p)^{29}\text{Al}$	MG26(A, P)AL29	MG26AP	12	25
$^{19}_F(p, \gamma)^{20}\text{Ne}$	F19(P, G)NE20	F19PG	8	16	$^{26}\text{Al}^t(\gamma, p)^{25}\text{Mg}$	AL26T(G, P)MG25	AL26TPG	12	20
$^{19}_F(p, n)^{19}\text{Ne}$	F19(P, N)NE19	F19PN	8	16	$^{26}\text{Al}^m(\gamma, p)^{25}\text{Mg}$	AL26M(G, P)MG25	AL26MGP	12	20
$^{19}_F(p, \alpha)^{16}\text{O}$	F19(P, A)O16	F19PA	8	16	$^{26}\text{Al}^s(\gamma, p)^{25}\text{Mg}$	AL26G(G, P)MG25	AL26GGP	12	20
$^{19}_F(\alpha, p)^{22}\text{Ne}$	F19(A, P)NE22	F19AP	8	17	$^{26}\text{Al}^t(n, p)^{26}\text{Mg}$	AL26T(N, P)MG26	AL26TNP	12	21
$^{19}\text{Ne}(\alpha, \gamma)^{20}\text{Na}$	NE19(P, G)NA20	NE19PG	9	17	$^{26}\text{Al}^m(n, p)^{26}\text{Mg}$	AL26M(N, P)MG26	AL26MNPI	12	21
$^{20}\text{Ne}(\alpha, \gamma)^{21}\text{Na}$	NE20(P, G)NA21	NE20PG	9	17	$^{26}\text{Al}^s(n, p)^{26}\text{Mg}$	AL26G(N, P)MG26	AL26GNPI	12	21
$^{20}\text{Ne}(\alpha, p)^{17}\text{F}$	NE20(P, A)F17	NE20PA	9	17	$^{26}\text{Al}^t(n, \alpha)^{23}\text{Na}$	AL26T(N, A)NA23	AL26TNA	12	22
$^{20}\text{Ne}(\alpha, \gamma)^{24}\text{Mg}$	NE20(A, G)MG24	NE20AGI	9	17	$^{26}\text{Al}^m(n, \alpha)^{23}\text{Na}$	AL26M(N, A)NA23	AL26MNA	12	22
$^{21}\text{Ne}(\alpha, \gamma)^{22}\text{Na}$	NE21(P, G)NA22	NE21PGI	9	17	$^{26}\text{Al}^s(n, \alpha)^{23}\text{Na}$	AL26G(N, A)NA23	AL26GNA	12	22
$^{21}\text{Ne}(\alpha, \gamma)^{25}\text{Mg}$	NE21(A, G)MG25	NE21AG	9	18	$^{26}\text{Al}^t(p, \gamma)^{27}\text{Si}$	AL26T(P, G)SI27	AL26TPG	13	23
$^{21}\text{Ne}(\alpha, n)^{24}\text{Mg}$	NE21(A, N)MG24	NE21AN	9	18	$^{26}\text{Al}^m(p, \gamma)^{27}\text{Si}$	AL26M(P, G)SI27	AL26MPG	13	23
$^{22}\text{Ne}(\alpha, \gamma)^{23}\text{Na}$	NE22(P, G)NA23	NE22PGI	9	18	$^{26}\text{Al}^s(p, \gamma)^{27}\text{Si}$	AL26G(P, G)SI27	AL26GPG	13	23
$^{22}\text{Ne}(\alpha, \gamma)^{26}\text{Mg}$	NE22(A, G)MG26	NE22AG	10	18	$^{27}\text{Al}(\alpha, \gamma)^{28}\text{Si}$	AL27(P, G)SI28	AL27PGI	13	25
$^{22}\text{Ne}(\alpha, n)^{25}\text{Mg}$	NE22(A, N)MG25	NE22AN	10	18	$^{27}\text{Al}(p, \alpha)^{24}\text{Mg}$	AL27(P, A)MG24	AL27PAI	13	25
$^{21}\text{Na}(\alpha, \gamma)^{22}\text{Mg}$	NA21(P, G)MG22	NA21PG	10	18	$^{27}\text{Al}(\alpha, n)^{30}\text{p}$	AL27(A, N)P30	AL27AN	13	26
$^{22}\text{Na}(n, p)^{22}\text{Ne}$	NA22(N, P)NE22	NA22NP	10	19	$^{27}\text{Si}(\gamma, p)^{26}\text{Al}^t$	SI27(G, P)AL26T	SI27GPT	13	23
$^{22}\text{Na}(n, \alpha)^{19}\text{F}$	NA22(N, A)F19	NA22NA	10	19	$^{27}\text{Si}(\gamma, p)^{26}\text{Al}^m$	SI27(G, P)AL26M	SI27GPM	13	23
$^{22}\text{Na}(\alpha, \gamma)^{23}\text{Mg}$	NA22(P, G)MG23	NA22PG	10	19	$^{27}\text{Si}(\gamma, p)^{26}\text{Al}^s$	SI27(G, P)AL26G	SI27GPG	13	23
$^{23}\text{Na}(\alpha, \gamma)^{24}\text{Mg}$	NA23(P, G)MG24	NA23PG	10	19	$^{27}\text{Si}(p, \gamma)^{28}\text{p}$	SI27(P, G)P28	SI27PG	13	26
$^{23}\text{Na}(p, n)^{23}\text{Mg}$	NA23(P, N)MG23	NA23PN	10	19	$^{28}\text{Si}(p, \gamma)^{29}\text{p}$	SI28(P, G)P29	SI28PG	13	26
$^{23}\text{Na}(\alpha, p)^{20}\text{Ne}$	NA23(P, A)NE20	NA23PAI	10	19	$^{29}\text{Si}(p, \gamma)^{30}\text{p}$	SI29(P, G)P30	SI29PG	13	26
$^{23}\text{Na}(n, n)^{26}\text{Al}^t$	NA23(A, N)AL26T	NA23ANT	10	22	$^{30}\text{Si}(p, \gamma)^{31}\text{p}$	SI30(P, G)P31	SI30PG	14	26
$^{23}\text{Na}(n, n)^{26}\text{Al}^m$	NA23(A, N)AL26M	NA23ANN	10	22	$^{12}\text{C} + ^{12}\text{C}$	C12+C12	C12C12	14	27
$^{23}\text{Na}(n, n)^{26}\text{Al}^s$	NA23(A, N)AL26G	NA23ANG	10	22	$^{12}\text{C} + ^{16}\text{O}$	C12+O16	C12O16	14	27
$^{24}\text{Mg}(p, \gamma)^{25}\text{Al}$	MG24(P, G)AL25	MG24PG	11	24	$^{16}\text{O} + ^{16}\text{O}$	O16+O16	O16O16	14	27
$^{24}\text{Mg}(p, \alpha)^{21}\text{Na}$	MG24(P, A)NA21	MG24PA	11	24					

TABLE II. Analytic Expressions for Reaction Rates

See page 291 for Explanation of Tables

TABLE II 1

H1(E-,NU)N1	Q= -0.782	SEE AP.J. SUPPL. 48,279(1982) & AP.J. 293,1(1985)
H1(P,E+NU)H2	Q= 1.442	$4.01E-15/T923 * EXP(-3.380/T913)$ *(1.+0.123*T913+1.09*T923+0.938*T9) T9 LESS THAN OR EQUAL TO 3.
H1(E-P,NU)H2	Q= 1.442	$1.36E-20/T976 * EXP(-3.380/T913) * (1.-0.729*T913+9.82*T923)$ T9 LESS THAN OR EQUAL TO 3.
H2(P,G)HE3	Q= 5.494	$2.24E+03/T923 * EXP(-3.720/T913)$ *(1.+0.112*T913+3.38*T923+2.65*T9) REV RATIO $1.63E+10/T932 * EXP(-63.750/T9)$
H2(P,N)2H1	Q= -2.225	$3.35E+07 * EXP(-3.720/T913-25.815/T9)$ *(1.+0.784*T913+0.346*T923+0.690*T9) REV RATIO $4.24E-10/T932 * EXP(-25.815/T9)$
H2(D,G)HE4	Q= 23.847	$4.84E+01/T923 * EXP(-4.258/T913)$ *(1.+0.098*T913-0.203*T923-0.139*T9+0.106*T943+0.185*T953) REV RATIO $4.53E+10/T932 * EXP(-276.729/T9)$
H2(D,N)HE3	Q= 3.269	$3.88E+08/T923 * EXP(-4.258/T913)$ *(1.+0.098*T913+0.418*T923+0.287*T9+0.638*T943+1.112*T953) REV RATIO $1.73E+00 * EXP(-37.935/T9)$
H2(D,P)H3	Q= 4.033	$4.13E+08/T923 * EXP(-4.258/T913)$ *(1.+0.098*T913+4.39E-02*T923+3.01E-02*T9+0.543*T943+0.946*T953) REV RATIO $1.73E+00 * EXP(-46.798/T9)$
H3(P,G)HE4	Q= 19.814	$2.20E+04/T923 * EXP(-3.869/T913)$ *(1.+0.108*T913+1.68*T923+1.26*T9+0.551*T943+1.06*T953) REV RATIO $2.61E+10/T932 * EXP(-229.932/T9)$
H3(P,N)HE3	Q= -0.764	$7.07E+08 * (1.-0.150*T912+0.098*T9) * EXP(-8.863/T9)$ REV RATIO $9.98E-01 * EXP(-8.863/T9)$
H3(D,N)HE4	Q= 17.589	$8.09E+10/T923 * EXP(-4.524/T913-(T9/0.120)**2)$ *(1.+0.092*T913+1.80*T923+1.16*T9+10.52*T943+17.24*T953) REV RATIO $+8.73E+08/T923 * EXP(-0.523/T9)$ $5.54E+00 * EXP(-204.117/T9)$
H3(T,2N)HE4	Q= 11.332	$1.67E+09/T923 * EXP(-4.872/T913)$ *(1.+0.086*T913-0.455*T923-0.272*T9+0.148*T943+0.225*T953) REV RATIO $3.38E-10/T932 * EXP(-131.504/T9)$
HE3(E-,NU)H3	Q= -0.019	$7.71E-12 * T932 * (1.+6.48*T9+7.48*T9**2+2.91*T9**3)$ *EXP(-0.2158/T9) T9 LESS THAN OR EQUAL TO 3.
HE3(P,E+NU)HE4	Q= 19.795 10.155	EXCLUSIVE OF NU-ENERGY $8.78E-13/T923 * EXP(-6.141/T913)$ T9 LESS THAN OR EQUAL TO 3.
HE3(D,P)HE4	Q= 18.353	$5.86E+10/T923 * EXP(-7.181/T913-(T9/0.315)**2)$ *(1.+0.058*T913+0.142*T923+5.78E-02*T9+2.25*T943+2.32*T953) REV RATIO $+4.36E+08/T912 * EXP(-1.720/T9)$ $5.55E+00 * EXP(-212.980/T9)$

TABLE II. Analytic Expressions for Reaction Rates
 See page 291 for Explanation of Tables
 TABLE II 2

HE3(T,D)HE4	Q= 14.320	$5.46E+09*T9A56/T932*EXP(-7.733/T9A13)$ $T9A = T9/(1.+0.128*T9)$ $1.60E+00*EXP(-166.182/T9)$
HE3(T,NP)HE4	Q= 12.096	$7.71E+09*T9A56/T932*EXP(-7.733/T9A13)$ $T9A = T9/(1.+0.115*T9)$ $3.39E-10/T932*EXP(-140.367/T9)$
HE3(HE3,2P)HE4	Q= 12.860	$6.04E-10/T923*EXP(-12.276/T913)$ $*(1.+0.034*T913-0.522*T923-0.124*T9+0.353*T943+0.213*T953)$ $3.39E-10/T932*EXP(-149.230/T9)$
HE4(NN,G)HE6	Q= 0.975	$(0 \text{ TO } 1)*4.04E-11/T9**2*(1.+0.138*T9)*EXP(-9.585/T9)$ $1.08E+20*T9**3*EXP(-11.319/T9)$
HE4(NP,G)L16	Q= 3.700	$4.62E-06/T9**2*(1.+0.075*T9)*EXP(-19.353/T9)$ $7.22E+19*T9**3*EXP(-42.933/T9)$
HE4(D,G)L16	Q= 1.475	$3.01E+01/T923*EXP(-7.423/T913)$ $* (1.+0.056*T913-4.85*T923+8.85*T9-0.585*T943-0.584*T953)$ $+ 8.55E+01/T932*EXP(-8.228/T9)$ $1.53E+10*T932*EXP(-17.118/T9)$
HE4(T,G)L17	Q= 2.468	$8.67E+05/T923*EXP(-8.080/T913)$ $*(1.+0.052*T913-0.448*T923-0.165*T9+0.144*T943+0.134*T953)$ $1.11E+10*T932*EXP(-28.640/T9)$
HE4(T,N)L16	Q= -4.782	$1.80E+08*EXP(-55.494/T9)*(1.-0.261*T9A32/T932)$ $+2.72E+09/T932*EXP(-57.884/T9)$ $T9A = T9/(1.+49.18*T9)$ $9.35E-01*EXP(-55.494/T9)$
HE4(HE3,G)BE7	Q= 1.588	$5.61E+06*T9A56/T932*EXP(-12.826/T9A13)$ $T9A = T9/(1.+4.95E-02*T9)$ $1.11E+10*T932*EXP(-18.423/T9)$
HE4(AN,G)BE9	Q= 1.574	$2.59E-06/(T9**2*(1.+0.344*T9))*EXP(-1.062/T9)$ $5.84E+19*T9**3*EXP(-18.260/T9)$
HE4(A,BE8)	Q= -0.092	$7.40E+05/T932*EXP(-1.0663/T9)$ $+4.164E+09/T923*EXP(-13.490/T913-(T9/0.098)**2)$ $*(1.+0.031*T913+8.009*T923+1.732*T9+49.883*T943+27.426*T953)$ $1.40E+10*T932*EXP(-1.0663/T9)$
BE8(A,G)C12	Q= 7.367	$1.30E+02/T932*EXP(-3.3364/T9)$ $+2.510E+07/T923*EXP(-23.570/T913-(T9/0.235)**2)$ $*(1.+0.018*T913+5.249*T923+0.650*T9+19.176*T943+6.034*T953)$ $4.30E+10*T932*EXP(-85.486/T9)$
HE4(2A,G)C12	Q= 7.275	$2.90E-16*HE4(A)BE8*BE8(A,G)C12$ $*(0.01 + 0.2*(1. + 4.*EXP(-(0.025/T9)**3.263))/$ $(1. + 4.*EXP(-(T9/0.025)**9.227)))$ $+(0 \text{ TO } 1)*1.35E-07/T932*EXP(-24.811/T9)$ $\text{FOR } T9 > 0.08: HE4(2A,G)C12 =$ $2.79E-08/T9**3*EXP(-4.4027/T9)$ $+ (0 \text{ TO } 1)*1.35E-07/T932*EXP(-24.811/T9)$ $\text{IF } C12(A,G)016 \text{ ALWAYS FOLLOWS}$ $2.00E+20*T9**3*EXP(-84.420/T9)$
	Q= 14.437	
	REV RATIO	

TABLE II. Analytic Expressions for Reaction Rates

See page 291 for Explanation of Tables

TABLE II 3

LI6(P,G)BE7	Q= 5.606	$6.69E+05/T9A56/T932*EXP(-8.413/T9A13)$ $T9A = T9/(1.-9.69E-02*T9+2.84E-02*T953/$ $(1.-9.69E-02*T9)**(2./3.))$ REV RATIO $1.19E+10*T932*EXP(-65.054/T9)$
LI6(P,HE3)HE4	Q= 4.018	$3.73E+10/T923*EXP(-8.413/T913-(T9/5.50)**2)$ $* (1.+0.050*T913-0.061*T923-0.021*T9+0.006*T943+0.005*T953)$ $+ 1.33E+10/T932*EXP(-17.763/T9) + 1.29E+09/T9*EXP(-21.820/T9)$ REV RATIO $1.07E+00*EXP(-46.631/T9)$
LI6(A,G)B10	Q= 4.460	$4.06E+06/T923*EXP(-18.790/T913-(T9/1.326)**2)$ $* (1.+0.022*T913+1.54*T923+0.239*T9+2.20*T943+0.869*T953)$ $+ 1.91E+03/T932*EXP(-3.484/T9) + 1.01E+04/T9*EXP(-7.269/T9)$ REV RATIO $1.58E+10*T932*EXP(-51.753/T9)$
LI7(P,N)BE7	Q= -1.644	$5.15E+09*EXP(-1.167*T913-19.081/T9)$ $+ 7.84E+09/T932*EXP(-22.832/T9)$ REV RATIO $9.98E-01*EXP(-19.081/T9)$
LI7(P,G)BE8	Q= 17.254	$1.56E+05/T923*EXP(-8.472/T913-(T9/1.696)**2)$ $* (1.+0.049*T913+2.498*T923+0.860*T9+3.518*T943+3.080*T953)$ $+ 1.55E+06/T932*EXP(-4.478/T9)$ REV RATIO $6.55E+10*T932*EXP(-200.225/T9)$
LI7(P,A)HE4	Q= 17.346	$1.096E+09/T923*EXP(-8.472/T913)$ $- 4.830E+08*T9A56/T932*EXP(-8.472/T9A13)$ $+ 1.06E+10/T932*EXP(-30.442/T9)$ $T9A = T9/(1.+0.759*T9)$ REV RATIO $4.69E+00*EXP(-201.291/T9)$ REV RATIO APPLIES TO BOTH LI7(P,A)HE4 AND LI7(P,G)2HE4
LI7(P,AG)HE4	Q= 17.346	LI7(P,AG)HE4 = LI7(P,G)BE8 + LI7(P,A)HE4
LI7(D,N)2HE4	Q= 15.121	$2.92E+11/T923*EXP(-10.259/T913)$ REV RATIO $9.95E-10/T932*EXP(-175.476/T9)$
LI7(T,2N)2HE4	Q= 8.864	$8.81E+11/T923*EXP(-11.333/T913)$ REV RATIO $1.22E-19/T9**3*EXP(-102.864/T9)$
LI7(HE3, NP)2HE4	Q= 9.628	$1.11E+13/T923*EXP(-17.989/T913)$ REV RATIO $6.09E-20/T9**3*EXP(-111.727/T9)$
LI7(A,G)B11	Q= 8.664	$3.55E+07/T923*EXP(-19.161/T913-(T9/4.195)**2)$ $* (1.+0.022*T913+0.775*T923+0.118*T9+0.884*T943+0.342*T953)$ $+ 3.33E+02/T932*EXP(-2.977/T9)+4.10E+04/T9*EXP(-6.227/T9)$ REV RATIO $4.02E+10*T932*EXP(-100.538/T9)$
LI7(A,N)B10	Q= -2.790	$3.84E+08*EXP(-32.382/T9)$ REV RATIO $1.32E+00*EXP(-32.382/T9)$
BE7(E-, NU+G)LI7	Q= 0.862	$1.34E-10/T912*(1.-0.537*T913+3.86*T923$ $+ 0.0027/T9*EXP(2.515E-03/T9))$ T9 LESS THAN OR EQUAL TO 3. EXCLUSIVE OF NU ENERGY RATE MUST NOT EXCEED $1.51E-07/(RHO*(1.+X)/2.)$ FOR T9 LESS THAN 0.001.
BE7(P,G)B8	Q= 0.137	$3.11E+05/T923*EXP(-10.262/T913) + 2.53E+03/T932*EXP(-7.306/T9)$ REV RATIO $1.30E+10*T932*EXP(-1.595/T9)$
BE7(D,P)2HE4	Q= 16.766	$1.07E+12/T923*EXP(-12.428/T913)$ REV RATIO $9.97E-10/T932*EXP(-194.557/T9)$

TABLE II. Analytic Expressions for Reaction Rates

See page 291 for Explanation of Tables

TABLE II 4

BE7(T, NP)2HE4	$Q = 10.508$	$2.91E+12/T923 * EXP(-13.729/T913)$ $6.09E-20/T9 * 3 * EXP(-121.944/T9)$
BE7(HE3, 2P)2HE4	$Q = 11.272$	$6.11E+13/T923 * EXP(-21.793/T913)$ $1.22E-19/T9 * 3 * EXP(-130.807/T9)$
BE7(A, G)C11	$Q = 7.544$	$8.45E+07/T923 * EXP(-23.212/T913 - (T9/4.769)**2)$ * $(1.+0.018*T913+0.488*T923+0.061*T9+0.296*T943+0.095*T953)$ + $1.25E+04/T932 * EXP(-6.510/T9) + 1.29E+05/T954 * EXP(-10.039/T9)$ $4.02E+10/T932 * EXP(-87.539/T9)$
BE9(P, G)B10	$Q = 6.586$	$1.33E+07/T923 * EXP(-10.359/T913 - (T9/0.846)**2)$ * $(1.+0.040*T913+1.52*T923+0.428*T9+2.15*T943+1.54*T953)$ + $9.64E+04/T932 * EXP(-3.445/T9) + 2.72E+06/T932 * EXP(-10.620/T9)$ $9.73E+09/T932 * EXP(-76.427/T9)$
BE9(P, N)B9	$Q = -1.850$	$5.58E+07 * (1.+0.042*T912+0.985*T9) * EXP(-21.473/T9)$ + $1.02E+09/T932 * EXP(-26.725/T9)$ $9.98E-01 * EXP(-21.473/T9)$
BE9(P, D)2HE4	$Q = 0.651$	$2.11E+11/T923 * EXP(-10.359/T913 - (T9/0.520)**2)$ * $(1.+0.040*T913+1.09*T923+0.307*T9+3.21*T943+2.30*T953)$ + $5.79E+08/T9 * EXP(-3.046/T9) + 8.50E+08/T934 * EXP(-5.800/T9)$ $8.07E-11/T932 * EXP(-7.555/T9)$
BE9(P, A)LI6	$Q = 2.126$	$2.11E+11/T923 * EXP(-10.359/T913 - (T9/0.520)**2)$ * $(1.+0.040*T913+1.09*T923+0.307*T9+3.21*T943+2.30*T953)$ + $4.51E+08/T9 * EXP(-3.046/T9) + 6.70E+08/T934 * EXP(-5.160/T9)$ $6.18E-01 * EXP(-24.674/T9)$
BE9(A, N)C12	$Q = 5.701$	$4.62E+13/T923 * EXP(-23.870/T913 - (T9/0.049)**2)$ * $(1.+0.017*T913+8.57*T923+1.05*T9+74.51*T943+23.15*T953)$ + $7.34E-05/T932 * EXP(-1.184/T9) + 2.27E-01/T932 * EXP(-1.834/T9)$ + $1.26E+05/T932 * EXP(-4.179/T9) + 2.40E+08 * EXP(-12.732/T9)$ $1.03E+01 * EXP(-66.160/T9)$
B10(P, G)C11	$Q = 8.690$	$4.61E+05/T923 * EXP(-12.062/T913 - (T9/4.402)**2)$ * $(1.+0.035*T913+0.426*T923+0.103*T9+0.281*T943+0.173*T953)$ + $1.93E+05/T932 * EXP(-12.041/T9) + 1.14E+04/T932 * EXP(-16.164/T9)$ $3.03E+10/T932 * EXP(-100.840/T9)$
B10(P, A)BE7	$Q = 1.146$	$1.26E+11/T923 * EXP(-12.062/T913 - (T9/4.402)**2)$ * $(1.+0.035*T913-0.498*T923-0.121*T9+0.300*T943+0.184*T953)$ + $2.59E+09/T9 * EXP(-12.260/T9)$ $7.54E-01 * EXP(-13.301/T9)$
B10(A, N)N13	$Q = 1.059$	$1.20E+13/T923 * EXP(-27.989/T913 - (T9/9.589)**2)$ $9.34E+00 * EXP(-12.287/T9)$
B11(P, G)C12	$Q = 15.957$	$4.62E+07/T923 * EXP(-12.095/T913 - (T9/0.239)**2)$ * $(1.+0.035*T913+3.00*T923+0.723*T9+9.91*T943+6.07*T953)$ + $7.89E+03/T932 * EXP(-1.733/T9) + 9.68E+04/T915 * EXP(-5.617/T9)$ $7.01E+10/T932 * EXP(-185.173/T9)$
B11(P, N)C11	$Q = -2.764$	$1.69E+08 * (1.-0.048*T912+0.010*T9) * EXP(-32.080/T9)$ $9.98E-01 * EXP(-32.080/T9)$

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B11(P,A)2HE4	Q= 8.682	$2.20E+12/T923 * EXP(-12.095/T913 - (T9/1.644)^{**2})$ $* (1.+0.034*T913+0.140*T923+0.034*T9+0.190*T943+0.116*T953)$ $+ 4.03E+06/T932 * EXP(-1.734/T9) + 6.73E+09/T932 * EXP(-6.262/T9)$ $+ 3.88E+09/T9 * EXP(-14.154/T9)$ $REV\ RATIO\ 3.50E-10/T932 * EXP(-100.753/T9)$
B11(A,N)N14	Q= 0.158	$6.97E+12/T923 * EXP(-28.234/T913 - (T9/0.140)^{**2})$ $* (1.+0.015*T913+8.115*T923+0.838*T9+39.804*T943+10.456*T953)$ $+ 1.79E+00/T932 * EXP(-2.827/T9) + 1.71E+03/T932 * EXP(-5.178/T9)$ $+ 4.49E+06/T935 * EXP(-8.596/T9)$ $REV\ RATIO\ 3.67E+00 * EXP(-1.835/T9)$
B11(A,P)C14	Q= 0.784	$5.37E+11/T923 * EXP(-28.234/T913 - (T9/0.347)^{**2})$ $* (1.+0.015*T913+5.575*T923+0.576*T9+15.888*T943+4.174*T953)$ $+ 5.44E-03/T932 * EXP(-2.827/T9) + 3.36E+02/T932 * EXP(-5.178/T9)$ $+ 5.32E+06/T938 * EXP(-11.617/T9)$ $REV\ RATIO\ 1.10E+01 * EXP(-9.098/T9)$
C11(P,G)N12	Q= 0.601	$4.24E+04/T923 * EXP(-13.658/T913 - (T9/1.627)^{**2})$ $* (1.+0.031*T913+3.114*T923+0.665*T9+4.61*T943+2.50*T953)$ $+ 8.84E+03/T932 * EXP(-7.021/T9)$ $REV\ RATIO\ 2.33E+10 * T932 * EXP(-6.975/T9)$
C12(P,G)N13	Q= 1.944	$2.04E+07/T923 * EXP(-13.690/T913 - (T9/1.500)^{**2})$ $* (1.+0.030*T913+1.194*T923+0.254*T9+2.06*T943+1.12*T953)$ $+ 1.08E+05/T932 * EXP(-4.925/T9) + 2.15E+05/T932 * EXP(-18.179/T9)$ $REV\ RATIO\ 8.84E+09 * T932 * EXP(-22.553/T9)$
C12(A,G)O16	Q= 7.162	$1.04E+08/T9^{**2} / ((1.+0.0489/T923)^{**2} * EXP(-32.120/T913 - (T9/3.496)^{**2}))$ $+ 1.76E+08/T9^{**2} / ((1.+0.2654/T923)^{**2} * EXP(-32.120/T913))$ $+ 1.25E+03/T932 * EXP(-27.499/T9) + 1.43E-02 * T9^{**5} * EXP(-15.541/T9)$ $SEE\ COMMENT\ IN\ CFHZ85$ $REV\ RATIO\ 5.13E+10 * T932 * EXP(-83.111/T9)$
C12(A,N)O15	Q= -8.502	$2.48E+07 * (1.+0.188*T912+0.015*T9) * EXP(-98.661/T9)$ $REV\ RATIO\ 1.41E+00 * EXP(-98.661/T9)$
C13(P,G)N14	Q= 7.551	$8.01E+07/T923 * EXP(-13.717/T913 - (T9/2.000)^{**2})$ $* (1.+0.030*T913+0.958*T923+0.204*T9+1.39*T943+0.753*T953)$ $+ 1.21E+06/T965 * EXP(-5.701/T9)$ $REV\ RATIO\ 1.19E+10 * T932 * EXP(-87.621/T9)$
C13(P,N)N13	Q= -3.003	$1.88E+08 * (1.-0.167*T912+0.037*T9) * EXP(-34.846/T9)$ $REV\ RATIO\ 9.98E-01 * EXP(-34.846/T9)$
C13(A,N)O16	Q= 2.216	$6.77E+15/T923 * EXP(-32.329/T913 - (T9/1.284)^{**2})$ $* (1.+0.013*T913+2.04*T923+0.184*T9)$ $+ 3.82E+05/T932 * EXP(-9.373/T9) + 1.41E+06/T932 * EXP(-11.873/T9)$ $+ 2.00E+09/T932 * EXP(-20.409/T9) + 2.92E+09/T932 * EXP(-29.283/T9)$ $REV\ RATIO\ 5.79E+00 * EXP(-25.711/T9)$
C14(P,G)N15	Q= 10.207	$6.80E+06/T923 * EXP(-13.741/T913 - (T9/5.721)^{**2})$ $* (1.+0.030*T913+0.503*T923+0.107*T9+0.213*T943+0.115*T953)$ $+ 5.36E+03/T932 * EXP(-3.811/T9) + 9.82E+04/T913 * EXP(-4.739/T9)$ $REV\ RATIO\ 9.00E+09 * T932 * EXP(-118.452/T9)$

TABLE II. Analytic Expressions for Reaction Rates

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C14(P,N)N14	Q= -0.626	$7.19E+05 * (1. + 0.361 * T912 + 0.502 * T9) * \exp(-7.263/T9)$ +3.34E+08/T912 * EXP(-12.246/T9) 3.33E-01 * EXP(-7.263/T9)
C14(A,G)018	Q= 6.227	$3.375E+08/T9^{**2} * \exp(-32.513/T913)$ +1.528E+09/T923 * EXP(-32.513/T913 - (T9/2.662)**2) *(1.+0.0128*T913-0.869*T923-0.0779*T9+0.321*T943+0.0732*T953) +9.29E-08/T932 * EXP(-2.048/T9) +2.77E+03/T945 * EXP(-9.876/T9) 5.42E+10*T932 * EXP(-72.262/T9)
N13(P,G)014	Q= 4.628	$4.04E+07/T923 * \exp(-15.202/T913 - (T9/1.191)**2)$ *(1.+0.027*T913-0.803*T923-0.154*T9+5.00*T943+2.44*T953) +2.43E+05/T932 * EXP(-6.348/T9) 3.57E+10*T932 * EXP(-53.706/T9)
N14(P,G)015	Q= 7.297	$4.90E+07/T923 * \exp(-15.228/T913 - (T9/3.294)**2)$ *(1.+0.027*T913-0.778*T923-0.149*T9+0.261*T943+0.127*T953) +2.37E+03/T932 * EXP(-3.011/T9)+2.19E+04 * EXP(-12.530/T9) 2.70E+10*T932 * EXP(-84.678/T9)
N14(P,N)014	Q= -5.925	$6.74E+07 * (1. + 0.658 * T912 + 0.379 * T9) * \exp(-68.762/T9)$ REV RATIO 2.99E+00 * EXP(-68.762/T9)
N14(P,A)C11	Q= -2.923	$2.63E+16 * T9A56/T932 * \exp(-31.883/T9A13 - 33.915/T9)$ $T9A = T9 / (1. + 4.78E-02 * T9 + 7.56E-03 * T953)$ /(1.+4.78E-02*T9)**(2./3.) REV RATIO 2.72E-01 * EXP(-33.915/T9)
N14(A,G)F18	Q= 4.415	$7.78E+09/T923 * \exp(-36.031/T913 - (T9/0.881)**2)$ *(1.+0.012*T913+1.45*T923+0.117*T9+1.97*T943+0.406*T953) +2.36E-10/T932 * EXP(-2.798/T9)+2.03E+00/T932 * EXP(-5.054/T9) +1.15E+04/T923 * EXP(-12.310/T9) 5.42E+10*T932 * EXP(-51.236/T9)
N14(A,N)F17	Q= -4.735	$5.24E+09 * (1. - 1.15 * T912 + 0.365 * T9) * \exp(-54.942/T9 - (T9/2.798)**2)$ +3.28E+10/T932 * EXP(-70.708/T9) 1.48E+00 * EXP(54.942/T9)
N15(P,G)016	Q= 12.128	$9.78E+08/T923 * \exp(-15.251/T913 - (T9/0.450)**2)$ *(1.+0.027*T913+0.219*T923+0.042*T9+6.83*T943+3.32*T953) +1.11E+04/T932 * EXP(-3.328/T9)+1.49E+04/T932 * EXP(-4.665/T9) +3.80E+06/T932 * EXP(-11.048/T9) 3.62E+10*T932 * EXP(-140.734/T9)
N15(P,N)015	Q= -3.536	$3.51E+08 * (1. + 0.452 * T912 - 0.191 * T9) * \exp(-41.037/T9)$ REV RATIO 9.98E-01 * EXP(-41.037/T9)
N15(P,A)C12	Q= 4.966	$1.08E+12/T923 * \exp(-15.251/T913 - (T9/0.522)**2)$ *(1.+0.027*T913+2.62*T923+0.501*T9+5.36*T943+2.60*T953) +1.19E+08/T932 * EXP(-3.676/T9)+5.41E+08/T912 * EXP(-8.926/T9) +4.72E+08/T932 * EXP(-7.721/T9)+2.20E+09/T932 * EXP(-11.418/T9) 7.06E-01 * EXP(-57.623/T9)

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N15(A,G)F19	Q= 4.014	$2.54E+10/T923*EXP(-36.211/T913-(T9/0.616)**2)$ $*(1.+0.012*T913+1.69*T923+0.136*T9+1.91*T943+0.391*T953)$ $+9.83E-03/T932*EXP(-4.232/T9)+1.52E+03*T9*EXP(-9.747/T9)$ $5.54E+10*T932*EXP(-46.578/T9)$
N15(A,N)F18	Q= -6.418	$3.14E+08*(1.-0.641*T912+0.108*T9)*EXP(-74.479/T9)$ REV RATIO $2.00E+00*EXP(74.479/T9)$
014(A,G)NE18	Q= 5.112	$9.47E+08/T923*EXP(-39.388/T913-(T9/0.717)**2)$ $*(1.+0.011*T913+1.974*T923+0.146*T9+3.036*T943+0.572*T953)$ $+1.16E-01/T932*EXP(-11.733/T9)+3.39E+01/T932*EXP(-22.609/T9)$ $+9.10E-03*T9**5*EXP(-12.159/T9)$ $5.42E+10*T932*EXP(-59.328/T9)$
014(A,P)F17	Q= 1.191	$1.68E+13/T923*EXP(-39.388/T913-(T9/0.717)**2)$ $*(1.+0.011*T913+13.117*T923+0.971*T9+85.295*T943+16.061*T953)$ $+3.31E+04/T932*EXP(-11.733/T9)+1.79E+07/T932*EXP(-22.609/T9)$ $+9.00E+03*T9**5*EXP(-12.517/T9)$ $4.93E-01*EXP(-13.820/T9)$
015(A,G)NE19	Q= 3.529	$3.57E+11/T923*EXP(-39.584/T913-(T9/3.000)**2)$ $*(1.+0.011*T913-0.273*T923-0.020*T9)$ $+5.10E+10/T923*EXP(-39.584/T913-(T9/1.937)**2)$ $*(1.+0.011*T913+1.59*T923+0.117*T9+1.81*T943+0.338*T953)$ $+3.95E-01/T932*EXP(-5.849/T9)$ $+1.90E+01*T9**2.85*EXP(-7.356/T9-(T9/8.000)**2)$ $5.54E+10*T932*EXP(-40.957/T9)$
016(P,G)F17	Q= 0.600	$1.50E+08/(T923*(1.+2.13*(1.-EXP(-0.728*T923))))$ $*EXP(-16.692/T913)$ REV RATIO $3.03E+09*T932*EXP(-6.968/T9)$
016(P,A)N13	Q= -5.218	$1.88E+18*T9A56/T932*EXP(-35.829/T9A13-60.557/T9)$ $T9A=T9/(1.+7.76E-02*T9+2.64E-02*T953/(1.+7.76E-02*T9)**(2./3.))$ $1.72E-01*EXP(60.557/T9)$
016(A,G)NE20	Q= 4.734	$9.37E+09/T923*EXP(-39.757/T913-(T9/1.586)**2)$ $+6.21E+01/T932*EXP(-10.297/T9)+5.38E+02/T932*EXP(-12.226/T9)$ $+1.30E+01*T9**2*EXP(-20.093/T9)$ $5.65E+10*T932*EXP(-54.937/T9)$
017(P,G)F18	Q= 5.607	$7.97E+07*T9A56/T932*EXP(-16.712/T9A13)$ $+1.51E+08/T923*EXP(-16.712/T913)$ $*(1.+0.025*T913-0.051*T923-8.82E-03*T9)$ $+1.56E+05/T9*EXP(-6.272/T9)$ $+(0 TO 1, SAME AS 017(P,A)N14)*1.31E+01/T932*EXP(-1.961/T9)$ $T9A=T9/(1.+2.69*T9)$ $3.66E+10*T932*EXP(-65.061/T9)$
017(P,A)N14	Q= 1.191	$1.53E+07/T923*EXP(-16.712/T913-(T9/0.565)**2)$ $*(1.+0.025*T913+5.39*T923+0.940*T9+13.5*T943+5.98*T953)$ $+2.92E+06*T9*EXP(-4.247/T9)$ $+(0 TO 1)*$ $(4.81E+10*T9*EXP(-16.712/T913-(T9/0.040)**2)$ $+5.05E-05/T932*EXP(-0.723/T9))$ $+(0 TO 1, SAME AS 017(P,G)F18)*1.31E+01/T932*EXP(-1.961/T9)$ $6.76E-01*EXP(-13.825/T9)$

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017(A,G)NE21	Q= 7.351	$1.73E+17 * FPT9A / GT9 * T9A56 / T932 * EXP\{-39.914 / T9A13\}$ $+ 3.50E+15 * FT9A / GT9 * T9A56 / T932 * EXP\{-39.914 / T9A13\}$ $T9A = T9 / (1 + 0.1646 * T9)$ $GT9 = 1 + EXP\{-10.106 / T9\} / 3.$ $FT9A = EXP\{-(0.786 / T9A)^{**3.51}\}$ $FPT9A = EXP\{-(T9A / 1.084)^{**1.69}\}$
017(A,N)NE20	Q= 0.590	$1.03E+18 / GT9 * T9A56 / T932 * EXP\{-39.914 / T9A13\}$ $T9A = T9 / (1 + 0.0268 * T9 + 0.0232 * T953 / (1 + 0.0268 * T9)^{**2})$ $GT9 = 1 + EXP\{-10.106 / T9\} / 3.$ $REV RATIO$ $1.86E+01 * EXP\{-6.852 / T9\}$
018(P,G)F19	Q= 7.994	$3.45E+08 / T923 * EXP\{-16.729 / T913 - (T9 / 0.139)^{**2}\}$ $* (1 + 0.025 * T913 + 2.26 * T923 + 0.394 * T9 + 30.56 * T943 + 13.55 * T953)$ $+ 1.25E-15 / T932 * EXP\{-0.231 / T9\} + 1.64E+02 / T932 * EXP\{-1.670 / T9\}$ $+ 1.28E+04 * T912 * EXP\{-5.098 / T9\}$ $REV RATIO$ $9.20E+09 * T932 * EXP\{-92.769 / T9\}$
018(P,A)N15	Q= 3.980	$3.63E+11 / T923 * EXP\{-16.729 / T913 - (T9 / 1.361)^{**2}\}$ $* (1 + 0.025 * T913 + 1.88 * T923 + 0.327 * T9 + 4.66 * T943 + 2.06 * T953)$ $+ 9.90E-14 / T932 * EXP\{-0.231 / T9\} + 2.66E+04 / T932 * EXP\{-1.670 / T9\}$ $+ 2.41E+09 / T932 * EXP\{-7.638 / T9\} + 1.46E+09 / T9 * EXP\{-8.310 / T9\}$ $REV RATIO$ $1.66E-01 * EXP\{-46.191 / T9\}$
018(A,G)NE22	Q= 9.669	$1.82E+12 / T923 * EXP\{-40.057 / T913 - (T9 / 0.343)^{**2}\}$ $* (1 + 0.010 * T913 + 0.988 * T923 + 0.072 * T9 + 3.17 * T943 + 0.586 * T953)$ $+ 7.54E+00 / T932 * EXP\{-6.228 / T9\} + 3.48E+01 / T932 * EXP\{-7.301 / T9\}$ $+ 6.23E+03 * T9 * EXP\{-16.987 / T9\}$ $+ (0 TO 1) * 1.00E-11 / T932 * EXP\{-1.994 / T9\}$ $REV RATIO$ $5.85E+10 * T932 * EXP\{-112.208 / T9\}$
018(A,N)NE21	Q= -0.693	$7.22E+17 * FT9A / GT9 * T9A56 / T932 * EXP\{-40.056 / T9A13\}$ $+ 150.31 / GT9 * EXP\{-8.045 / T9\}$ $T9A = T9 / (1 + 0.0483 * T9 + 0.00569 * T953 / (1 + 0.0483 * T9)^{**2})$ $GT9 = 1 + EXP\{-23.002 / T9\}$ $FT9A = EXP\{-(0.431 / T9A)^{**3.89}\}$ $REV RATIO$ $7.84E-01 * EXP\{-8.045 / T9\}$
F19(P,G)NE20	Q= 12.848	$6.04E+07 / T923 * EXP\{-18.113 / T913 - (T9 / 0.416)^{**2}\}$ $* (1 + 0.023 * T913 + 2.06 * T923 + 0.332 * T9 + 3.16 * T943 + 1.30 * T953)$ $+ 6.32E+02 / T932 * EXP\{-3.752 / T9\} + 7.56E+04 / T927 * EXP\{-5.722 / T9\}$ $DIVIDE ALL TERMS BY GT9 = 1 + 4. * EXP\{-2.090 / T9\} + 7. * EXP\{-16.440 / T9\}$ $REV RATIO$ $3.70E+10 * T932 * EXP\{-149.093 / T9\}$
F19(P,N)NE19	Q= -4.021	$1.27E+08 * (1 - 0.147 * T912 + 0.069 * T9) * EXP\{-46.659 / T9\}$ $REV RATIO$ $9.98E-01 * EXP\{-46.659 / T9\}$
F19(P,A)O16	Q= 8.114	$3.55E+11 / T923 * EXP\{-18.113 / T913 - (T9 / 0.845)^{**2}\}$ $* (1 + 0.023 * T913 + 1.96 * T923 + 0.316 * T9 + 2.86 * T943 + 1.17 * T953)$ $+ 3.67E+06 / T932 * EXP\{-3.752 / T9\} + 3.07E+08 * EXP\{-6.019 / T9\}$ $DIVIDE ALL TERMS BY GT9 = 1 + 4. * EXP\{-2.090 / T9\} + 7. * EXP\{-16.440 / T9\}$ $REV RATIO$ $6.54E-01 * EXP\{-94.156 / T9\}$
F19(A,P)NE22	Q= 1.675	$4.50E+18 / T923 * EXP\{-43.467 / T913 - (T9 / 0.637)^{**2}\}$ $+ 7.98E+04 * T932 * EXP\{-12.760 / T9\}$ $REV RATIO$ $6.36E+00 * EXP\{-19.439 / T9\}$

TABLE II. Analytic Expressions for Reaction Rates

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NE19(P,G)NA20	Q= 2.199	$1.71E+06/T923 * \exp(-19.431/T913) * (1.+0.021*T913 + 0.130*T923 + 0.95E-02*T9 + 3.86E-02*T943 + 1.47E-02*T953 + 1.89E+05/T923 * \exp(-19.431/T913 - (T9/1.142)^{**2}) * (1.+0.021*T913 + 2.13*T923 + 0.320*T9 + 2.80*T943 + 1.07*T953) + 8.45E+03/T954 * \exp(-7.64/T9))$ REV RATIO $7.39E+09*T932 * \exp(-25.519/T9)$
NE20(P,G)NA21	Q= 2.431	$9.55E+06 * \exp(-19.447/T913) / (T9^{**2} * (1.+0.0127/T923)^{**2}) + 2.05E+08/T923 * \exp(-19.447/T913) * (1.+2.67 * \exp(-\text{SQRT}(T9/0.210))) + 1.80E+01/T932 * \exp(-4.242/T9) + 1.02E+01/T932 * \exp(-4.607/T9) + 3.60E+04/T914 * \exp(-11.249/T9)$ REV RATIO $4.63E+09*T932 * \exp(-28.216/T9)$
NE20(P,A)F17	Q= -4.134	$3.25E+19 * (5.31 + 0.544*T9 - 0.0523*T9^{**2}) * T9A56/T932$ $T9A = T9 / (1.+6.12E-02*T9 + 1.30E-02*T953 / (1.+6.12E-02*T9)^{**2} (2./3.))$ REV RATIO $5.37E-02 * \exp(47.969/T9)$ SEE COMMENT IN HFCZ83
NE20(A,G)MG24	Q= 9.312	$4.11E+11/T923 * \exp(-46.766/T913 - (T9/2.219)^{**2}) * (1.+0.009*T913 + 0.882*T923 + 0.055*T9 + 0.749*T943 + 0.119*T953) + 5.27E+03/T932 * \exp(-15.869/T9) + 6.51E+03/T912 * \exp(-16.223/T9) + (0 TO 1)^*$ $4.21E+01/T932 * \exp(-9.115/T9) + 3.20E+01/T923 * \exp(-9.383/T9)$ DIVIDE ALL TERMS BY GT9=1.+5.*EXP(-18.960/T9) REV RATIO $6.01E+10*T932 * \exp(-108.059/T9)$
NE21(P,G)NA22	Q= 6.738	$4.37E+08/T923 * \exp(-19.462/T913) + 5.85E+00/T932 * \exp(-1.399/T9) + 1.29E+04/T932 * \exp(-3.009/T9) + 3.15E+05/T935 * \exp(-5.763/T9) + (0 TO 1)^*$ $2.95E+08/T923 * \exp(-19.462/T913 - (T9/0.058)^{**2}) * (1.+0.021*T913 + 13.29*T923 + 1.99*T9 + 124.1*T943 + 47.29*T953) + 7.80E-01/T932 * \exp(-1.085/T9)$ REV RATIO $1.06E+10*T932 * \exp(-78.194/T9)$
NE21(A,G)MG25	Q= 9.882	$4.94E+19*T9A56/T932 * \exp(-46.890/T9A13) + 2.66E+07/T932 * \exp(-22.049/T9)$ $T9A = T9 / (1.+0.0537*T9)$ MULTIPLY ALL TERMS BY $1.52E-04 * \exp(-46.90/T913 * (8.72E-03*T9 - 6.87E-04*T9^{**2}) + 2.15E-05*T9^{**3}) / (1.+1.5 * \exp(-4.068/T9) + 2.0 * \exp(-20.258/T9))$ REV RATIO $4.06E+10*T932 * \exp(-114.676/T9)$
NE21(A,N)MG24	Q= 2.551	$4.94E+19*T9A56/T932 * \exp(-46.890/T9A13) + 2.66E+07/T932 * \exp(-22.049/T9)$ $T9A = T9 / (1.+0.0537*T9)$ DIVIDE ALL TERMS BY GT9=1.+1.5*EXP(-4.068/T9) REV RATIO $1.29E+01 * \exp(-29.606/T9)$
NE22(P,G)NA23	Q= 8.794	$1.15E+09/T923 * \exp(-19.475/T913) + 9.77E-12/T932 * \exp(-0.348/T9) + 8.96E+03/T932 * \exp(-4.840/T9) + 6.52E+04/T932 * \exp(-5.319/T9) + 7.97E+05/T912 * \exp(-7.418/T9) + (0 TO 1)^* 1.63E-01/T932 * \exp(-1.775/T9)$ REV RATIO $4.67E+09*T932 * \exp(-102.048/T9)$

TABLE II. Analytic Expressions for Reaction Rates

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NE22(A,G)MG26	Q= 10.612	$4.16E+19 * FPT9A / GT9 * T9A56 / T932 * EXP(-47.004 / T9A13)$ $+2.08E+16 * FT9A / GT9 * T9A56 / T932 * EXP(-47.004 / T9A13)$ $T9A = T9 / (1. + 0.0548 * T9)$ $FT9A = EXP(-(0.197 / T9A)^{**4.82})$ $FPT9A = EXP(-(T9A / 0.249)^{**2.31})$ $6.15E+10 * T932 * EXP(-123.151 / T9)$
NE22(A,N)MG25	Q= -0.481	$4.16E+19 * FT9A / GT9 * T9A56 / T932 * EXP(-47.004 / T9A13)$ $+1.44E-04 / GT9 * EXP(-5.577 / T9)$ $T9A = T9 / (1. + 0.0548 * T9)$ $FT9A = EXP(-(0.197 / T9A)^{**4.82})$ $GT9 = 1. + 5.0 * EXP(-14.791 / T9)$ $5.44E-01 * EXP(-5.577 / T9)$
NA21(P,G)MG22	Q= 5.497	$1.41E+05 / T923 * EXP(-20.739 / T913 - (T9 / 0.366)^{**2})$ $* (1. + 0.020 * T913 + 4.741 * T923 + 0.667 * T9 + 16.380 * T943 + 5.858 * T953)$ $+6.72E+02 / T934 * EXP(-2.436 / T9)$ $7.44E+10 * T932 * EXP(-63.790 / T9)$
NA22(N,P)NE22	Q= 3.624	$1.24E+08 * EXP(1. - 3.037E-02 * T9 + 8.380E-03 * T9^{**2} - 7.101E-04 * T9^{**3})$ $7.01 * EXP(-42.059 / T9)$
NA22(N,A)F19	Q= 1.949	$1.21E+06 * EXP(1. + 8.955E-01 * T9 - 5.645E-02 * T9^{**2} + 7.302E-04 * T9^{**3})$ $1.10 * EXP(-22.620 / T9)$
NA22(P,G)MG23	Q= 7.578	$9.63E-05 * T932 * EXP(-0.517 / T9) + 2.51E+04 * T9 * EXP(-2.013 / T9)$ $3.27E+10 * T932 * EXP(-87.933 / T9)$
NA23(P,G)MG24	Q= 11.691	$2.93E+08 / T923 * EXP(-20.766 / T913 - (T9 / 0.297)^{**2})$ $* (1. + 0.020 * T913 + 1.61 * T923 + 0.226 * T9 + 4.94 * T943 + 1.76 * T953)$ $+9.34E+01 / T932 * EXP(-2.789 / T9) + 1.89E+04 / T932 * EXP(-3.434 / T9)$ $+5.10E+04 * T915 * EXP(-5.510 / T9)$ $DIVIDE ALL TERMS BY GT9 = 1. + 1.5 * EXP(-5.105 / T9)$ $7.49E+10 * T932 * EXP(-135.665 / T9)$
NA23(P,N)MG23	Q= -4.841	$9.29E+08 * (1. - 0.881 * T9A32 / T932) * EXP(-56.173 / T9)$ $T9A = T9 / (1. + 0.141 * T9)$ $9.98E-01 * EXP(-56.173 / T9)$
NA23(P,A)NE20	Q= 2.379	$8.56E+09 / T923 * EXP(-20.766 / T913 - (T9 / 0.131)^{**2})$ $* (1. + 0.020 * T913 + 8.21 * T923 + 1.15 * T9 + 44.36 * T943 + 15.84 * T953)$ $+4.02E+00 / T932 * EXP(-1.990 / T9) + 1.18E+04 / T954 * EXP(-3.148 / T9)$ $+8.59E+05 * T943 * EXP(-4.375 / T9)$ $+(0 TO 1)^{*}3.06E-12 / T932 * EXP(-0.447 / T9)$ $1.25E+00 * EXP(-27.606 / T9)$
NA23(A,N)AL26T	Q= -2.968	$AL26T(N, A) NA23 * GPT9 / GT9 * 8.36E-01 * EXP(-34.442 / T9)$ $GT9 = 1. + EXP(-4.612 / T9 - 5.623E-04 + 7.460E-02 * T9)$ $GPT9 = 1. + EXP(-3.573 / T9 - 1.008 + 0.1357 * T9)$ SEE COMMENT IN TEXT
NA23(A,N)AL26M	Q= -3.196	$AL26M(N, A) NA23 * 7.60E-02 * EXP(-37.093 / T9)$ SEE COMMENT IN TEXT
NA23(A,N)AL26G	Q= -2.968	$AL26G(N, A) NA23 * 8.36E-01 * EXP(-34.442 / T9)$ SEE COMMENT IN TEXT

TABLE II. Analytic Expressions for Reaction Rates

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TABLE II 11

MG24(P,G)AL25	Q= 2.271	$\begin{aligned} & 5.60E+08/T923*EXP(-22.019/T913) \\ & * (1.+0.019*T913-0.173*T923-0.023*T9) \\ & + 1.48E+03/T932*EXP(-2.484/T9) + 4.00E+03*EXP(-4.180/T9) \\ & \text{DIVIDE ALL TERMS BY GT9 = } 1. + 5.*EXP(-15.882/T9) \\ & 3.13E+09*T932*EXP(-26.358/T9) \end{aligned}$
MG24(P,A)NA21	Q= -6.880	$\begin{aligned} & 1.81E+21*(4.43+3.31*T9-0.229*T9**2)*T9A56/T932 \\ & *EXP(-49.967/T9A13-79.843/T9) \\ & T9A = T9/(1.+0.127*T9) \\ & \text{REV RATIO } 7.71E-02*EXP(79.843/T9) \end{aligned}$
MG24(A,G)SI28	Q= 9.984	$\begin{aligned} & 4.78E+01/T932*EXP(-13.506/T9) + 2.38E+03/T932*EXP(-15.218/T9) \\ & + 2.47E+02*T932*EXP(-15.147/T9) \\ & \quad \quad \quad \{ 0 \text{ TO } 1 \} * \\ & 1.72E-09/T932*EXP(-5.028/T9) + 1.25E-03/T932*EXP(-7.929/T9) \\ & + 2.43E+01/T9*EXP(-11.523/T9) \\ & \text{DIVIDE ALL TERMS BY GT9 = } 1. + 5.*EXP(-15.882/T9) \\ & 6.27E+10*T932*EXP(-115.862/T9) \end{aligned}$
MG25(P,G)AL26T	Q= 6.306	$\begin{aligned} & 3.57E+09/T923*EXP(-22.031/T913-(T9/0.06)**2) \\ & * (1.+0.019*T913+7.669*T923+1.015*T9+167.4*T943+56.35*T953) \\ & + 3.07E-13/T932*EXP(-0.435/T9)+1.94E-07/T932*EXP(-0.673/T9) \\ & + 3.15E-05/T9**3*(3.40)*EXP(-1.342/T9-(T9/13.)**2) \\ & + 1.77E+04*T958*EXP(-3.049/T9-(T9/13.)**2) \\ & \text{REV RATIO } 1.03E+10*T932*EXP(-73.183/T9) \end{aligned}$
MG25(P,G)AL26M	Q= 6.078	0.20*MG25(P,G)AL26T
	REV RATIO	1.13E+11*T932*EXP(-70.532/T9)
MG25(P,G)AL26 G	Q= 6.306	0.80*MG25(P,G)AL26T
	REV RATIO	1.03E+10*T932*EXP(-73.183/T9)
MG25(A,G)SI29	Q= 11.127	$\begin{aligned} & 3.59E+20/GT9*T9A56/T932*EXP(-53.410/T9A13) \\ & * 5.87E-04*EXP(-53.42/T913) \\ & * (0.0156*T9-1.79E-03*T9**2+9.08E-05*T9**3)) \\ & T9A = T9/(1.+0.0630*T9) \quad GT9 = 1.+10.*EXP(-13.180/T9)/3. \\ & 1.90E+11*T932*EXP(-129.128/T9) \end{aligned}$
MG25(A,N)SI28	Q= 2.653	$\begin{aligned} & 3.59E+20/GT9*T9A56/T932*EXP(-53.410/T9A13) \\ & T9A = T9/(1.+0.063*T9) \quad GT9 = 1.+10.*EXP(-13.180/T9)/3. \\ & 2.00E+01*EXP(-30.792/T9) \end{aligned}$
MG25(A,P)AL28	Q= -1.206	$\begin{aligned} & 3.23E+08/T923*EXP(-23.271/T913-13.995/T9+6.46*T9-2.39*T9**2) \\ & + 0.506*T9**3-6.04E-02*T9**4+3.75E-03*T9**5-9.38E-05*T9**6) \\ & \text{REV RATIO } 2.86E+00*EXP(-13.995/T9) \end{aligned}$
MG26(P,G)AL27	Q= 8.272	$\begin{aligned} & 7.39E+08/T923*EXP(-22.042/T913-(T9/0.299)**2) \\ & * (1.+0.019*T913+3.61*T923+0.478*T9+9.78*T943+3.29*T953) \\ & + 1.32E-10/T932*EXP(-0.603/T9) + 2.90E-05/T932*EXP(-1.056/T9) \\ & + 6.45E-05/T932*EXP(-1.230/T9) + 5.64E-02/T932*EXP(-1.694/T9) \\ & + 2.86E+03/T932*EXP(-3.265/T9) + 7.99E+04/T932*EXP(-3.781/T9) \\ & + 4.23E+04*T912*EXP(-3.661/T9) \\ & \text{DIVIDE ALL TERMS BY GT9 = } 1. + 5.*EXP(-20.990/T9) \\ & 3.14E+09*T932*EXP(-95.990/T9) \end{aligned}$

TABLE II. Analytic Expressions for Reaction Rates

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MG26(P,N)AL26T	Q= -4.786	$AL26T(N,P)MG26^*GPT9/GT9^{*11.}^*\exp(-55.544/T9)$ $GT9 = 1.+\exp(-19.30/T9+0.6642+0.1386*T9)$ $GPT9 = 1.+\exp(-3.573/T9-1.008+0.1357*T9)$ SEE COMMENT IN TEXT
MG26(P,N)AL26M	Q= -5.015	$AL26M(N,P)MG26^*\exp(-58.195/T9)$ SEE COMMENT IN TEXT
MG26(P,N)AL26G	Q= -4.786	$AL26G(N,P)MG26^{*11.}^*\exp(-55.544/T9)$ SEE COMMENT IN TEXT
MG26(A,G)SI30	Q= 10.644	$2.93E+20/GT9^*T9A56/T932^*\exp(-53.505/T9A13)$ $* 4.55E-02^*\exp(-53.51/T913)$ $* (0.0751^*T9-0.0105^*T9^{*2}+5.57E-04^*T9^{*3})$ $T9A = T9/(1.+0.0628*T9)$ $GT9 = 1.+5.^*\exp(-20.990/T9)$ REV RATIO $6.38E+10^*T932^*\exp(-123.520/T9)$
MG26(A,N)SI29	Q= 0.035	$2.93E+20/GT9^*T9A56/T932^*\exp(-53.505/T9A13)$ $T9A = T9/(1.+0.0628*T9)$ $GT9 = 1.+5.^*\exp(-20.990/T9)$ REV RATIO $1.68E+00^*\exp(-0.401/T9)$
MG26(A,P)AL29	Q= -2.863	$9.72E+10/T923^*\exp(-23.280/T913-33.225/T9)$ $+2.20E+07/T9^{*4}^*\exp(-41.340/T9)+2.50E+05^*T974^*\exp(-38.825/T9)$ REV RATIO $5.60E-01^*\exp(33.225/T9)$
AL26T(G,P)MG25	Q= -6.306	$MG25(P,G)AL26T^*1.03E+10^*T932^*\exp(-73.183/T9)$
AL26M(G,P)MG25	Q= -6.078	$MG25(P,G)AL26M^*1.13E+11^*T932^*\exp(-70.532/T9)$
AL26G(G,P)MG25	Q= -6.306	$MG25(P,G)AL26G^*1.03E+10^*T932^*\exp(-73.183/T9)$
AL26T(N,P)MG26	Q= 4.786	$3.09E+07^*\exp(0.0731^*T9+0.0381^*T9^{*2}-3.22E-03^*T9^{*3})$ SEE COMMENT IN TEXT
AL26M(N,P)MG26	Q= 5.015	$1.84E+05/T932^*\exp(-0.043/T9)+2.28E+07/T932^*\exp(-0.348/T9)$ $+6.54E+08/T938^*\exp(-0.826/T9)+(0 TO 1)^*1.60E+04/T932$ SEE COMMENT IN TEXT
AL26G(N,P)MG26	Q= 4.786	$AL26T(N,P)MG26^*GPT9/GT9-AL26M(N,P)MG26^*9.09E-02^*\exp(-2.651/T9)$ $GT9 = 1.+\exp(-19.30/T9+0.6642+0.1386*T9)$ $GPT9 = 1.+\exp(-3.573/T9-1.008+0.1357*T9)$
AL26T(N,A)NA23	Q= 2.968	$3.38E+06^*\exp(0.388^*T9+9.08E-03^*T9^{*2}-2.07E-03^*T9^{*3})$ SEE COMMENT IN TEXT
AL26M(N,A)NA23	Q= 3.196	$4.18E+06 + 5.43E+07/T932^*\exp(-0.9653/T9)$ $+6.97E+07^*T927^*\exp(-1.494/T9)$ SEE COMMENT IN TEXT
AL26G(N,A)NA23	Q= 2.968	$AL26T(N,A)NA23^*GPT9/GT9-AL26M(N,A)NA23^*9.09E-02^*\exp(-2.651/T9)$ $GT9=1.+\exp(-4.612/T9-5.623E-04+7.460E-02*T9)$ $GPT9=1.+\exp(-3.573/T9-1.008+0.1357*T9)$ SEE COMMENT IN TEXT

TABLE II. Analytic Expressions for Reaction Rates

See page 291 for Explanation of Tables

TABLE II 13

AL26T(P,G)SI27	Q= 7.464	$6.78E+13/T923*EXP((-23.261/T913))$ $* (1.+2.004E-01*T9-1.538E-02*T9**2+5.723E-04*T9**3)$ $+6.13E+02/T932*EXP(-3.202/T9)+9.45E+03/T9*EXP(-4.008/T9)$ REV RATIO $3.46E+10*T932*EXP(-86.621/T9)$
AL26M(P,G)SI27	Q= 7.693	$1.36E+14/T923*EXP((-23.261/T913))$ $* (1.+2.004E-01*T9-1.538E-02*T9**2+5.723E-04*T9**3)$ REV RATIO $3.46E+10/11.*T932*EXP(-89.272/T9)$
AL26 G(P,G)SI27	Q= 7.464	AL26T(P,G)SI27-1/11.*EXP(-2.651/T9)*AL26M(P,G)SI27 REV RATIO $3.46E+10*T932*EXP(-86.621/T9)$
AL27(P,G)SI28	Q= 11.585	$1.67E+08/T923*EXP(-23.261/T913-(T9/0.155)**2)$ $* (1.+0.018*T913+5.81*T923+0.728*T9+27.31*T943+8.71*T953)$ $+2.20E+00/T932*EXP(-2.269/T9)+1.22E+01/T932*EXP(-2.491/T9)$ $+1.50E+04*T9*EXP(-4.112/T9)$ $(0 TO 1)^*$ $6.50E-10/T932*EXP(-0.853/T9)+1.63E-10/T932*EXP(-1.001/T9)$ DIVIDE ALL TERMS BY GT9=1.+EXP(-9.792/T9)/3. REV RATIO $+2.*EXP(-11.773/T9)/3.$ $1.13E+11*T932*EXP(-134.434/T9)$
AL27(P,A)MG24	Q= 1.600	$1.10E+08/T923*EXP(-23.261/T913-(T9/0.157)**2)$ $* (1.+0.018*T913+12.85*T923+1.61*T9+89.87*T943+28.66*T953)$ $+1.29E+02/T932*EXP(-2.517/T9)+5.66E+03*T972*EXP(-3.421/T9)$ $(0 TO 1)^*$ $3.89E-08/T932*EXP(-0.853/T9)+8.18E-09/T932*EXP(-1.001/T9)$ DIVIDE ALL TERMS BY GT9=1.+EXP(-9.792/T9)/3. $+2.*EXP(-11.773/T9)/3.$ REV RATIO $1.81E+00*EXP(-18.572/T9)$
AL27(A,N)P30	Q= -2.636	$8.20E+04*EXP(-30.588/T9)+5.21E+05*T974*EXP(-33.554/T9)$ REV RATIO $6.75E+00*EXP(30.588/T9)$
SI27(G,P)AL26T	Q= -7.464	AL26T(P,G)SI27*3.46E+10*T932*EXP(-86.621/T9)
SI27(G,P)AL26M	Q= -7.693	AL26M(P,G)SI27*3.46E+10/11.*T932*EXP(-89.272/T9)
SI27(G,P)AL26 G	Q= -7.464	AL26 G(P,G)SI27*3.46E+10*T932*EXP(-86.621/T9)
SI27(P,G)P28	Q= 2.065	$1.64E+09/T923*EXP(-24.439/T913)$ $+2.00E-08/T932*EXP(-0.928/T9)+1.95E-02/T932*EXP(-1.857/T9)$ $+3.70E+02/T947*EXP(-3.817/T9)$ REV RATIO $1.62E+10*T932*EXP(-23.960/T9)$
SI28(P,G)P29	Q= 2.747	$1.64E+08/T923*EXP(-24.449/T913-(T9/2.91)**2)$ $* (1.+0.017*T913-4.11*T923-0.491*T9+5.22*T943+1.58*T953)$ $+3.52E+02/T932*EXP(-4.152/T9)+6.30E+05/T932*EXP(-18.505/T9)$ $+1.69E+03*EXP(-14.518/T9)$ REV RATIO $9.46E+09*T932*EXP(-31.879/T9)$
SI29(P,G)P30	Q= 5.601	$3.26E+09/T923*EXP(-24.459/T913-(T9/0.256)**2)$ $* (1.+0.017*T913+4.27*T923+0.509*T9+15.40*T943+4.67*T953)$ $+2.98E+03/T932*EXP(-3.667/T9)+3.94E+04/T932*EXP(-4.665/T9)$ $+2.08E+04*T912*EXP(-8.657/T9)$ REV RATIO $1.26E+10*T932*EXP(-65.002/T9)$

TABLE II. Analytic Expressions for Reaction Rates

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TABLE II 14

SI30(P,G)P31	$Q = 7.297$	$4.25E+08/T923 * EXP(-24.468/T913 - (T9/0.670)^{**2})$ $* (1.+0.017*T913 + 0.150*T923 + 0.018*T9 + 5.53*T943 + 1.68*T953)$ $+ 1.86E+04/T932 * EXP(-5.601/T9) + 3.15E+05/T932 * EXP(-6.961/T9)$ $+ 2.75E+05/T912 * EXP(-10.062/T9)$ $REV\ RATIO\ 9.50E+09*T932 * EXP(-84.673/T9)$			
C12+C12 (MG24)	$Q = 13.933$	$4.27E+26*T9A56/T932 * EXP(-84.165/T9A13 - 2.12E-03*T9^{**3})$ $T9A = T9/(1.+0.0396*T9)$			
C12+016 (SI28)	$Q = 16.755$	$1.72E+31*T9A56/T932 * EXP(-106.594/T9A13) / (EXP(-0.180*T9A^{**2})$ $+ 1.06E-03 * EXP(2.562*T9A23))$ $T9A = T9/(1.+0.055*T9)$ $T9\ GREAFTER THAN OR EQUAL TO 0.5$			
016+016 (S32)	$Q = 16.542$	$7.10E+36/T923 * EXP(-135.93/T913 - 0.629*T923)$ $- 0.445*T943 + 0.0103*T9^{**2})$			
YIELD PER REACTION AND (Q-VALUE)					
C12+C12					
	T9 <1.75 1.75 TO 3.3 3.3 TO 6.0	N-YIELD 0.00(-2.598) 0.05 0.07	P-YIELD 0.44(2.242) 0.45 0.40	A-YIELD 0.56(4.621) 0.50 0.53	TOTAL YIELD 1.00 1.00 1.00
C12+016					
	0.5 TO 3.7 3.7 TO 7.3 >7.3	0.09(-0.423) 0.14 0.24	0.54(5.171) 0.68 0.73	0.37(6.771) 0.38 0.42	1.00 1.20 1.39
016+016					
	0.8 TO 2.6 2.6 TO 4.0 >4.0	0.25(1.500) 0.16 0.17	0.85(7.678) 1.09 1.06	0.30(9.593) 0.32 0.49	1.40 1.57 1.72

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 1

T9	H1PE+NU	H1E-PNU	H2PG	H2PN	H2DG	H2DN	T9
0.001	8.60E-28	9.23E-32	1.64E-11	0.00E+00	1.57E-15	1.27E-08	0.001
0.002	5.84E-25	4.55E-29	2.28E-08	0.00E+00	6.47E-12	5.24E-05	0.002
0.003	1.34E-23	8.71E-28	7.41E-07	0.00E+00	3.54E-10	2.88E-03	0.003
0.004	9.46E-23	5.46E-27	6.58E-06	0.00E+00	4.35E-09	3.55E-02	0.004
0.005	3.78E-22	1.99E-26	3.09E-05	0.00E+00	2.56E-08	2.10E-01	0.005
0.006	1.08E-21	5.29E-26	1.00E-04	0.00E+00	9.86E-08	8.09E-01	0.006
0.007	2.49E-21	1.15E-25	2.55E-04	0.00E+00	2.88E-07	2.37E+00	0.007
0.008	4.93E-21	2.17E-25	5.52E-04	0.00E+00	6.94E-07	5.72E+00	0.008
0.009	8.79E-21	3.70E-25	1.06E-03	0.00E+00	1.46E-06	1.20E+01	0.009
0.010	1.44E-20	5.85E-25	1.85E-03	0.00E+00	2.75E-06	2.28E+01	0.010
0.011	2.22E-20	8.71E-25	3.01E-03	0.00E+00	4.79E-06	3.98E+01	0.011
0.012	3.25E-20	1.24E-24	4.63E-03	0.00E+00	7.81E-06	6.51E+01	0.012
0.013	4.57E-20	1.69E-24	6.80E-03	0.00E+00	1.21E-05	1.01E+02	0.013
0.014	6.20E-20	2.24E-24	9.63E-03	0.00E+00	1.79E-05	1.50E+02	0.014
0.015	8.18E-20	2.89E-24	1.32E-02	0.00E+00	2.55E-05	2.14E+02	0.015
0.016	1.05E-19	3.64E-24	1.76E-02	0.00E+00	3.53E-05	2.97E+02	0.016
0.018	1.64E-19	5.48E-24	2.92E-02	0.00E+00	6.25E-05	5.28E+02	0.018
0.020	2.41E-19	7.79E-24	4.53E-02	0.00E+00	1.02E-04	8.66E+02	0.020
0.025	5.16E-19	1.56E-23	1.09E-01	0.00E+00	2.71E-04	2.32E+03	0.025
0.030	9.18E-19	2.64E-23	2.11E-01	0.00E+00	5.65E-04	4.89E+03	0.030
0.040	2.11E-18	5.63E-23	5.57E-01	0.00E+00	1.63E-03	1.44E+04	0.040
0.050	3.80E-18	9.59E-23	1.11E+00	0.00E+00	3.43E-03	3.08E+04	0.050
0.060	5.92E-18	1.43E-22	1.88E+00	0.00E+00	5.99E-03	5.48E+04	0.060
0.070	8.43E-18	1.97E-22	2.86E+00	0.00E+00	9.30E-03	8.66E+04	0.070
0.080	1.13E-17	2.55E-22	4.06E+00	0.00E+00	1.33E-02	1.26E+05	0.080
0.090	1.44E-17	3.17E-22	5.45E+00	0.00E+00	1.80E-02	1.73E+05	0.090
0.100	1.77E-17	3.81E-22	7.03E+00	0.00E+00	2.32E-02	2.28E+05	0.100
0.110	2.13E-17	4.48E-22	8.79E+00	0.00E+00	2.90E-02	2.89E+05	0.110
0.120	2.51E-17	5.17E-22	1.07E+01	0.00E+00	3.52E-02	3.57E+05	0.120
0.130	2.90E-17	5.86E-22	1.28E+01	0.00E+00	4.19E-02	4.31E+05	0.130
0.140	3.30E-17	6.56E-22	1.50E+01	0.00E+00	4.89E-02	5.11E+05	0.140
0.150	3.71E-17	7.27E-22	1.74E+01	0.00E+00	5.62E-02	5.96E+05	0.150
0.160	4.14E-17	7.98E-22	1.99E+01	0.00E+00	6.37E-02	6.87E+05	0.160
0.180	5.01E-17	9.40E-22	2.53E+01	0.00E+00	7.95E-02	8.84E+05	0.180
0.200	5.91E-17	1.08E-21	3.11E+01	0.00E+00	9.60E-02	1.10E+06	0.200
0.250	8.24E-17	1.42E-21	4.73E+01	2.35E-40	1.39E-01	1.71E+06	0.250
0.300	1.06E-16	1.75E-21	6.53E+01	1.04E-32	1.83E-01	2.42E+06	0.300
0.350	1.30E-16	2.05E-21	8.48E+01	3.12E-27	2.27E-01	3.21E+06	0.350
0.400	1.55E-16	2.34E-21	1.05E+02	4.11E-23	2.70E-01	4.07E+06	0.400
0.450	1.79E-16	2.60E-21	1.27E+02	6.73E-20	3.12E-01	5.01E+06	0.450
0.500	2.03E-16	2.85E-21	1.49E+02	2.55E-17	3.53E-01	6.02E+06	0.500
0.600	2.50E-16	3.31E-21	1.95E+02	1.95E-13	4.31E-01	8.23E+06	0.600
0.700	2.97E-16	3.71E-21	2.42E+02	1.20E-10	5.06E-01	1.07E+07	0.700
0.800	3.42E-16	4.07E-21	2.90E+02	1.52E-08	5.78E-01	1.34E+07	0.800
0.900	3.87E-16	4.39E-21	3.39E+02	6.70E-07	6.48E-01	1.63E+07	0.900
1.000	4.30E-16	4.67E-21	3.88E+02	1.41E-05	7.17E-01	1.95E+07	1.000
1.250	5.35E-16	5.28E-21	5.10E+02	3.54E-03	8.87E-01	2.84E+07	1.250
1.500	6.35E-16	5.77E-21	6.32E+02	1.48E-01	1.06E+00	3.86E+07	1.500
1.750	7.31E-16	6.16E-21	7.52E+02	2.19E+00	1.24E+00	4.99E+07	1.750
2.000	8.22E-16	6.49E-21	8.70E+02	1.70E+01	1.43E+00	6.24E+07	2.000
2.500	9.96E-16	7.00E-21	1.10E+03	3.13E+02	1.85E+00	9.06E+07	2.500
3.000	1.16E-15	7.38E-21	1.32E+03	2.29E+03	2.33E+00	1.22E+08	3.000
3.500			1.53E+03	9.78E+03	2.86E+00	1.58E+08	3.500
4.000			1.73E+03	2.98E+04	3.45E+00	1.96E+08	4.000
5.000			2.12E+03	1.48E+05	4.79E+00	2.81E+08	5.000
6.000			2.48E+03	4.51E+05	6.33E+00	3.75E+08	6.000
7.000			2.81E+03	1.03E+06	8.04E+00	4.78E+08	7.000
8.000			3.13E+03	1.96E+06	9.91E+00	5.88E+08	8.000
9.000			3.44E+03	3.29E+06	1.19E+01	7.04E+08	9.000
10.000			3.73E+03	5.05E+06	1.41E+01	8.27E+08	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 2

T9	H2DP	H3PG	H3PN	H3DN	H3T2N	HE3E-NU	T9
0.001	1.34E-08	3.56E-11	0.00E+00	1.88E-07	1.16E-10	0.00E+00	0.001
0.002	5.54E-05	6.66E-08	0.00E+00	1.36E-03	1.70E-06	0.00E+00	0.002
0.003	3.04E-03	2.49E-06	0.00E+00	9.82E-02	1.72E-04	7.43E-47	0.003
0.004	3.74E-02	2.42E-05	0.00E+00	1.44E+00	3.11E-03	7.43E-39	0.004
0.005	2.21E-01	1.21E-04	0.00E+00	9.71E+00	2.42E-02	5.07E-34	0.005
0.006	8.50E-01	4.09E-04	0.00E+00	4.13E+01	1.15E-01	8.93E-31	0.006
0.007	2.48E+00	1.08E-03	0.00E+00	1.31E+02	3.96E-01	1.93E-28	0.007
0.008	5.99E+00	2.40E-03	0.00E+00	3.39E+02	1.10E+00	1.12E-26	0.008
0.009	1.26E+01	4.71E-03	0.00E+00	7.56E+02	2.59E+00	2.69E-25	0.009
0.010	2.38E+01	8.40E-03	0.00E+00	1.51E+03	5.41E+00	3.49E-24	0.010
0.011	4.15E+01	1.39E-02	0.00E+00	2.75E+03	1.03E+01	2.88E-23	0.011
0.012	6.77E+01	2.17E-02	0.00E+00	4.68E+03	1.81E+01	1.69E-22	0.012
0.013	1.05E+02	3.23E-02	0.00E+00	7.52E+03	3.01E+01	7.66E-22	0.013
0.014	1.55E+02	4.62E-02	0.00E+00	1.15E+04	4.74E+01	2.82E-21	0.014
0.015	2.22E+02	6.40E-02	0.00E+00	1.70E+04	7.16E+01	8.79E-21	0.015
0.016	3.08E+02	8.61E-02	0.00E+00	2.43E+04	1.04E+02	2.39E-20	0.016
0.018	5.46E+02	1.45E-01	0.00E+00	4.55E+04	2.03E+02	1.29E-19	0.018
0.020	8.93E+02	2.28E-01	0.00E+00	7.80E+04	3.58E+02	5.09E-19	0.020
0.025	2.38E+03	5.60E-01	0.00E+00	2.29E+05	1.11E+03	6.34E-18	0.025
0.030	4.99E+03	1.11E+00	0.00E+00	5.18E+05	2.62E+03	3.62E-17	0.030
0.040	1.45E+04	2.98E+00	0.00E+00	1.70E+06	8.99E+03	3.56E-16	0.040
0.050	3.08E+04	6.01E+00	0.00E+00	4.02E+06	2.13E+04	1.55E-15	0.050
0.060	5.44E+04	1.02E+01	0.00E+00	7.97E+06	4.09E+04	4.40E-15	0.060
0.070	8.53E+04	1.57E+01	7.03E-47	1.41E+07	6.83E+04	9.76E-15	0.070
0.080	1.23E+05	2.23E+01	5.24E-40	2.29E+07	1.04E+05	1.84E-14	0.080
0.090	1.68E+05	3.00E+01	1.16E-34	3.43E+07	1.47E+05	3.12E-14	0.090
0.100	2.19E+05	3.89E+01	2.19E-30	4.81E+07	1.98E+05	4.86E-14	0.100
0.110	2.77E+05	4.87E+01	6.92E-27	6.38E+07	2.57E+05	7.15E-14	0.110
0.120	3.40E+05	5.95E+01	5.69E-24	8.09E+07	3.22E+05	1.00E-13	0.120
0.130	4.08E+05	7.11E+01	1.67E-21	9.86E+07	3.94E+05	1.36E-13	0.130
0.140	4.80E+05	8.37E+01	2.17E-19	1.17E+08	4.71E+05	1.78E-13	0.140
0.150	5.58E+05	9.70E+01	1.48E-17	1.34E+08	5.53E+05	2.28E-13	0.150
0.160	6.39E+05	1.11E+02	5.92E-16	1.52E+08	6.40E+05	2.87E-13	0.160
0.180	8.14E+05	1.42E+02	2.78E-13	1.84E+08	8.27E+05	4.31E-13	0.180
0.200	1.00E+06	1.75E+02	3.82E-11	2.14E+08	1.03E+06	6.14E-13	0.200
0.250	1.53E+06	2.67E+02	2.69E-07	2.83E+08	1.57E+06	1.27E-12	0.250
0.300	2.12E+06	3.73E+02	9.89E-05	3.43E+08	2.14E+06	2.28E-12	0.300
0.350	2.77E+06	4.88E+02	6.72E-03	3.95E+08	2.73E+06	3.71E-12	0.350
0.400	3.47E+06	6.14E+02	1.59E-01	4.35E+08	3.31E+06	5.66E-12	0.400
0.450	4.21E+06	7.47E+02	1.86E+00	4.65E+08	3.88E+06	8.21E-12	0.450
0.500	5.01E+06	8.87E+02	1.34E+01	4.87E+08	4.44E+06	1.15E-11	0.500
0.600	6.75E+06	1.19E+03	2.56E+02	5.13E+08	5.51E+06	2.05E-11	0.600
0.700	8.67E+06	1.51E+03	2.11E+03	5.25E+08	6.52E+06	3.38E-11	0.700
0.800	1.08E+07	1.86E+03	1.03E+04	5.27E+08	7.49E+06	5.25E-11	0.800
0.900	1.31E+07	2.22E+03	3.54E+04	5.24E+08	8.43E+06	7.78E-11	0.900
1.000	1.56E+07	2.60E+03	9.49E+04	5.17E+08	9.36E+06	1.11E-10	1.000
1.250	2.25E+07	3.61E+03	5.62E+05	4.95E+08	1.17E+07	2.40E-10	1.250
1.500	3.06E+07	4.71E+03	1.85E+06	4.70E+08	1.43E+07	4.58E-10	1.500
1.750	3.97E+07	5.88E+03	4.35E+06	4.46E+08	1.72E+07	8.02E-10	1.750
2.000	4.98E+07	7.12E+03	8.28E+06	4.23E+08	2.05E+07	1.31E-09	2.000
2.500	7.29E+07	9.76E+03	2.06E+07	3.84E+08	2.85E+07	3.06E-09	2.500
3.000	9.93E+07	1.26E+04	3.81E+07	3.53E+08	3.85E+07	6.20E-09	3.000
3.500	1.29E+08	1.56E+04	5.97E+07	3.26E+08	5.07E+07	1.11E-08	3.500
4.000	1.61E+08	1.88E+04	8.42E+07	3.04E+08	6.50E+07	1.40E-08	4.000
5.000	2.33E+08	2.55E+04	1.39E+08	2.69E+08	9.96E+07	2.00E-08	5.000
6.000	3.14E+08	3.27E+04	1.97E+08	2.42E+08	1.42E+08	2.60E-08	6.000
7.000	4.03E+08	4.03E+04	2.57E+08	2.21E+08	1.91E+08	3.20E-08	7.000
8.000	4.98E+08	4.83E+04	3.17E+08	2.04E+08	2.46E+08	3.80E-08	8.000
9.000	6.00E+08	5.65E+04	3.78E+08	1.90E+08	3.08E+08	4.40E-08	9.000
10.000	7.07E+08	6.51E+04	4.39E+08	1.78E+08	3.74E+08	5.00E-08	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 3

T9	HE3PE+NU	HE3DP	HE3TD	HE3TNP	HE3 HE32P	HE4 NNGI	T9
0.001	1.88E-37	3.84E-19	1.42E-22	2.00E-22	2.93E-41	0.00E+00	0.001
0.002	3.76E-32	6.59E-13	7.56E-16	1.07E-15	1.83E-30	0.00E+00	0.002
0.003	1.36E-29	6.79E-10	1.35E-12	1.91E-12	3.12E-25	0.00E+00	0.003
0.004	5.51E-28	5.33E-08	1.50E-10	2.12E-10	6.17E-22	0.00E+00	0.004
0.005	7.60E-27	1.18E-06	4.23E-09	5.98E-09	1.36E-19	0.00E+00	0.005
0.006	5.59E-26	1.24E-05	5.39E-08	7.62E-08	8.27E-18	0.00E+00	0.006
0.007	2.74E-25	8.13E-05	4.09E-07	5.79E-07	2.20E-16	0.00E+00	0.007
0.008	1.01E-24	3.82E-04	2.17E-06	3.07E-06	3.28E-15	0.00E+00	0.008
0.009	3.06E-24	1.41E-03	8.89E-06	1.26E-05	3.22E-14	0.00E+00	0.009
0.010	7.90E-24	4.33E-03	2.99E-05	4.22E-05	2.29E-13	0.00E+00	0.010
0.011	1.81E-23	1.15E-02	8.60E-05	1.22E-04	1.28E-12	0.00E+00	0.011
0.012	3.76E-23	2.74E-02	2.19E-04	3.10E-04	5.83E-12	0.00E+00	0.012
0.013	7.22E-23	5.95E-02	5.05E-04	7.14E-04	2.27E-11	0.00E+00	0.013
0.014	1.30E-22	1.19E-01	1.07E-03	1.52E-03	7.70E-11	0.00E+00	0.014
0.015	2.21E-22	2.25E-01	2.12E-03	3.00E-03	2.34E-10	0.00E+00	0.015
0.016	3.60E-22	4.01E-01	3.95E-03	5.59E-03	6.45E-10	0.00E+00	0.016
0.018	8.51E-22	1.11E+00	1.19E-02	1.68E-02	3.88E-09	0.00E+00	0.018
0.020	1.78E-21	2.68E+00	3.06E-02	4.33E-02	1.82E-08	0.00E+00	0.020
0.025	7.77E-21	1.55E+01	2.02E-01	2.87E-01	3.99E-07	0.00E+00	0.025
0.030	2.37E-20	5.86E+01	8.49E-01	1.20E+00	4.18E-06	0.00E+00	0.030
0.040	1.19E-19	4.05E+02	6.77E+00	9.60E+00	1.27E-04	0.00E+00	0.040
0.050	3.73E-19	1.59E+03	2.93E+01	4.16E+01	1.42E-03	0.00E+00	0.050
0.060	8.82E-19	4.47E+03	8.88E+01	1.26E+02	8.88E-03	0.00E+00	0.060
0.070	1.75E-18	1.02E+04	2.14E+02	3.04E+02	3.83E-02	0.00E+00	0.070
0.080	3.06E-18	2.00E+04	4.41E+02	6.27E+02	1.27E-01	0.00E+00	0.080
0.090	4.89E-18	3.52E+04	8.08E+02	1.15E+03	3.50E-01	0.00E+00	0.090
0.100	7.32E-18	5.72E+04	1.36E+03	1.93E+03	8.35E-01	0.00E+00	0.100
0.110	1.04E-17	8.73E+04	2.13E+03	3.04E+03	1.78E+00	4.87E-48	0.110
0.120	1.41E-17	1.27E+05	3.18E+03	4.53E+03	3.48E+00	5.83E-45	0.120
0.130	1.86E-17	1.77E+05	4.53E+03	6.46E+03	6.32E+00	2.32E-42	0.130
0.140	2.38E-17	2.39E+05	6.22E+03	8.88E+03	1.08E+01	3.88E-40	0.140
0.150	2.97E-17	3.15E+05	8.29E+03	1.18E+04	1.76E+01	3.25E-38	0.150
0.160	3.64E-17	4.07E+05	1.08E+04	1.54E+04	2.74E+01	1.55E-36	0.160
0.180	5.21E-17	6.49E+05	1.71E+04	2.44E+04	6.01E+01	9.56E-34	0.180
0.200	7.06E-17	9.86E+05	2.53E+04	3.62E+04	1.18E+02	1.59E-31	0.200
0.250	1.29E-16	2.39E+06	5.49E+04	7.88E+04	4.51E+02	1.49E-27	0.250
0.300	2.03E-16	4.76E+06	9.82E+04	1.41E+05	1.25E+03	6.22E-25	0.300
0.350	2.90E-16	8.10E+06	1.55E+05	2.23E+05	2.80E+03	4.42E-23	0.350
0.400	3.88E-16	1.23E+07	2.24E+05	3.23E+05	5.45E+03	1.04E-21	0.400
0.450	4.95E-16	1.70E+07	3.04E+05	4.40E+05	9.55E+03	1.19E-20	0.450
0.500	6.08E-16	2.22E+07	3.94E+05	5.71E+05	1.55E+04	8.17E-20	0.500
0.600	8.50E-16	3.35E+07	5.98E+05	8.70E+05	3.46E+04	1.40E-18	0.600
0.700	1.10E-15	4.53E+07	8.27E+05	1.21E+06	6.59E+04	1.02E-17	0.700
0.800	1.37E-15	5.70E+07	1.07E+06	1.56E+06	1.13E+05	4.39E-17	0.800
0.900	1.63E-15	6.80E+07	1.32E+06	1.94E+06	1.79E+05	1.33E-16	0.900
1.000	1.89E-15	7.81E+07	1.58E+06	2.32E+06	2.69E+05	3.16E-16	1.000
1.250	2.53E-15	9.85E+07	2.20E+06	3.26E+06	6.20E+05	1.42E-15	1.250
1.500	3.14E-15	1.13E+08	2.79E+06	4.15E+06	1.21E+06	3.64E-15	1.500
1.750	3.70E-15	1.23E+08	3.32E+06	4.97E+06	2.12E+06	6.85E-15	1.750
2.000	4.23E-15	1.30E+08	3.78E+06	5.69E+06	3.42E+06	1.07E-14	2.000
2.500	5.17E-15	1.39E+08	4.54E+06	6.89E+06	7.56E+06	1.88E-14	2.500
3.000	5.97E-15	1.42E+08	5.09E+06	7.79E+06	1.43E+07	2.60E-14	3.000
3.500	1.43E+08	5.47E+06	8.43E+06	2.43E+07	3.16E-14	3.500	
4.000	1.42E+08	5.73E+06	8.88E+06	3.81E+07	3.57E-14	4.000	
5.000	1.38E+08	5.97E+06	9.37E+06	7.94E+07	4.02E-14	5.000	
6.000	1.34E+08	5.99E+06	9.48E+06	1.42E+08	4.15E-14	6.000	
7.000	1.29E+08	5.88E+06	9.38E+06	2.28E+08	4.12E-14	7.000	
8.000	1.24E+08	5.70E+06	9.16E+06	3.41E+08	4.01E-14	8.000	
9.000	1.20E+08	5.49E+06	8.87E+06	4.81E+08	3.85E-14	9.000	
10.000	1.16E+08	5.25E+06	8.54E+06	6.50E+08	3.69E-14	10.000	

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 4

T9	HE4 NPG	HE4 DG	HE4 TG	HE4 TN	HE4 HE3 G	HE4 ANG	T9
0.001	0.00E+00	1.68E-29	7.04E-28	0.00E+00	1.11E-47	0.00E+00	0.001
0.002	0.00E+00	4.65E-23	7.68E-21	0.00E+00	2.17E-36	0.00E+00	0.002
0.003	0.00E+00	6.00E-20	1.94E-17	0.00E+00	6.41E-31	0.00E+00	0.003
0.004	0.00E+00	5.41E-18	2.69E-15	0.00E+00	1.80E-27	0.00E+00	0.004
0.005	0.00E+00	1.32E-16	8.88E-14	0.00E+00	5.07E-25	0.00E+00	0.005
0.006	0.00E+00	1.49E-15	1.27E-12	0.00E+00	3.74E-23	0.00E+00	0.006
0.007	0.00E+00	1.03E-14	1.06E-11	0.00E+00	1.16E-21	0.00E+00	0.007
0.008	0.00E+00	5.08E-14	6.12E-11	0.00E+00	1.96E-20	0.00E+00	0.008
0.009	0.00E+00	1.94E-13	2.68E-10	0.00E+00	2.14E-19	0.00E+00	0.009
0.010	0.00E+00	6.17E-13	9.52E-10	0.00E+00	1.67E-18	1.95E-48	0.010
0.011	0.00E+00	1.69E-12	2.88E-09	0.00E+00	1.01E-17	2.51E-44	0.011
0.012	0.00E+00	4.11E-12	7.68E-09	0.00E+00	4.94E-17	6.58E-41	0.012
0.013	0.00E+00	9.10E-12	1.84E-08	0.00E+00	2.05E-16	5.07E-38	0.013
0.014	0.00E+00	1.86E-11	4.05E-08	0.00E+00	7.37E-16	1.49E-35	0.014
0.015	0.00E+00	3.56E-11	8.28E-08	0.00E+00	2.36E-15	2.05E-33	0.015
0.016	0.00E+00	6.44E-11	1.59E-07	0.00E+00	6.83E-15	1.50E-31	0.016
0.018	0.00E+00	1.84E-10	5.05E-07	0.00E+00	4.48E-14	1.89E-28	0.018
0.020	0.00E+00	4.51E-10	1.36E-06	0.00E+00	2.26E-13	5.59E-26	0.020
0.025	0.00E+00	2.72E-09	9.86E-06	0.00E+00	5.74E-12	1.46E-21	0.025
0.030	0.00E+00	1.06E-08	4.43E-05	0.00E+00	6.73E-11	1.20E-18	0.030
0.040	0.00E+00	7.67E-08	3.91E-04	0.00E+00	2.41E-09	4.71E-15	0.040
0.050	0.00E+00	3.11E-07	1.82E-03	0.00E+00	3.04E-08	6.07E-13	0.050
0.060	0.00E+00	9.04E-07	5.82E-03	0.00E+00	2.09E-07	1.45E-11	0.060
0.070	0.00E+00	2.12E-06	1.47E-02	0.00E+00	9.69E-07	1.33E-10	0.070
0.080	0.00E+00	4.29E-06	3.13E-02	0.00E+00	3.42E-06	6.76E-10	0.080
0.090	0.00E+00	7.81E-06	5.91E-02	0.00E+00	9.92E-06	2.33E-09	0.090
0.100	0.00E+00	1.31E-05	1.02E-01	0.00E+00	2.47E-05	6.12E-09	0.100
0.110	0.00E+00	2.06E-05	1.64E-01	0.00E+00	5.49E-05	1.32E-08	0.110
0.120	0.00E+00	3.09E-05	2.49E-01	0.00E+00	1.11E-04	2.48E-08	0.120
0.130	0.00E+00	4.45E-05	3.61E-01	0.00E+00	2.08E-04	4.15E-08	0.130
0.140	0.00E+00	6.19E-05	5.04E-01	0.00E+00	3.66E-04	6.40E-08	0.140
0.150	0.00E+00	8.37E-05	6.82E-01	0.00E+00	6.11E-04	9.21E-08	0.150
0.160	0.00E+00	1.11E-04	8.98E-01	0.00E+00	9.75E-04	1.26E-07	0.160
0.180	0.00E+00	1.82E-04	1.46E+00	0.00E+00	2.23E-03	2.06E-07	0.180
0.200	1.11E-46	2.80E-04	2.20E+00	0.00E+00	4.52E-03	2.99E-07	0.200
0.250	1.81E-38	6.79E-04	4.99E+00	0.00E+00	1.85E-02	5.45E-07	0.250
0.300	5.06E-33	1.36E-03	9.22E+00	0.00E+00	5.37E-02	7.57E-07	0.300
0.350	3.75E-29	2.39E-03	1.49E+01	0.00E+00	1.25E-01	9.08E-07	0.350
0.400	2.89E-26	3.85E-03	2.21E+01	0.00E+00	2.50E-01	1.00E-06	0.400
0.450	4.96E-24	5.80E-03	3.06E+01	6.21E-46	4.46E-01	1.05E-06	0.450
0.500	2.97E-22	8.30E-03	4.05E+01	1.54E-40	7.33E-01	1.06E-06	0.500
0.600	1.32E-19	1.53E-02	6.37E+01	1.96E-32	1.65E+00	1.02E-06	0.600
0.700	9.76E-18	2.56E-02	9.10E+01	1.24E-26	3.12E+00	9.34E-07	0.700
0.800	2.39E-16	4.07E-02	1.22E+02	2.78E-22	5.26E+00	8.41E-07	0.800
0.900	2.79E-15	6.25E-02	1.56E+02	6.72E-19	8.13E+00	7.50E-07	0.900
1.000	1.96E-14	9.27E-02	1.93E+02	3.40E-16	1.18E+01	6.66E-07	1.000
1.250	6.11E-13	2.13E-01	2.97E+02	2.45E-11	2.44E+01	4.96E-07	1.250
1.500	5.69E-12	3.98E-01	4.19E+02	4.12E-08	4.19E+01	3.74E-07	1.500
1.750	2.69E-11	6.33E-01	5.61E+02	8.11E-06	6.38E+01	2.88E-07	1.750
2.000	8.33E-11	9.00E-01	7.28E+02	4.19E-04	8.95E+01	2.26E-07	2.000
2.500	3.81E-10	1.47E+00	1.15E+03	1.02E-01	1.49E+02	1.46E-07	2.500
3.000	9.93E-10	2.02E+00	1.70E+03	3.85E+00	2.17E+02	9.94E-08	3.000
3.500	1.89E-09	2.53E+00	2.42E+03	5.07E+01	2.88E+02	7.08E-08	3.500
4.000	2.97E-09	3.00E+00	3.30E+03	3.46E+02	3.59E+02	5.22E-08	4.000
5.000	5.30E-09	3.84E+00	5.64E+03	5.01E+03	4.97E+02	3.08E-08	5.000
6.000	7.39E-09	4.58E+00	8.77E+03	2.93E+04	6.21E+02	1.97E-08	6.000
7.000	9.06E-09	5.25E+00	1.27E+04	1.03E+05	7.28E+02	1.33E-08	7.000
8.000	1.03E-08	5.85E+00	1.75E+04	2.61E+05	8.19E+02	9.45E-09	8.000
9.000	1.11E-08	6.39E+00	2.31E+04	5.40E+05	8.95E+02	6.94E-09	9.000
10.000	1.17E-08	6.85E+00	2.94E+04	9.64E+05	9.56E+02	5.25E-09	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 5

T9	HE4ABE8	BE8AG	HE42AGI	LI6PG	LI6PHE3	LI6AG	T9
0.001	1.18E-47	1.15E-93	0.00E+00	1.95E-29	1.09E-24	1.03E-73	0.001
0.002	9.52E-36	9.80E-73	0.00E+00	4.24E-22	2.36E-17	4.48E-57	0.002
0.003	5.74E-30	1.44E-62	0.00E+00	1.50E-18	8.37E-14	5.31E-49	0.003
0.004	2.55E-26	3.75E-56	1.39E-98	2.57E-16	1.43E-11	6.59E-44	0.004
0.005	1.01E-23	1.39E-51	2.02E-91	9.91E-15	5.51E-10	2.77E-40	0.005
0.006	9.66E-22	4.25E-48	5.95E-86	1.60E-13	8.89E-09	1.61E-37	0.006
0.007	3.71E-20	2.59E-45	1.39E-81	1.47E-12	8.15E-08	2.59E-35	0.007
0.008	7.52E-19	5.16E-43	5.63E-78	9.11E-12	5.06E-07	1.72E-33	0.008
0.009	9.60E-18	4.54E-41	6.33E-75	4.26E-11	2.36E-06	5.94E-32	0.009
0.010	8.62E-17	2.15E-39	2.69E-72	1.60E-10	8.90E-06	1.26E-30	0.010
0.011	5.88E-16	6.29E-38	5.36E-70	5.11E-10	2.83E-05	1.81E-29	0.011
0.012	3.22E-15	1.25E-36	5.84E-68	1.42E-09	7.88E-05	1.93E-28	0.012
0.013	1.48E-14	1.81E-35	3.88E-66	3.55E-09	1.97E-04	1.59E-27	0.013
0.014	5.83E-14	2.02E-34	1.72E-64	8.11E-09	4.48E-04	1.07E-26	0.014
0.015	2.03E-13	1.81E-33	5.44E-63	1.71E-08	9.47E-04	6.05E-26	0.015
0.016	6.37E-13	1.34E-32	1.31E-61	3.39E-08	1.87E-03	2.95E-25	0.016
0.018	4.81E-12	4.68E-31	3.95E-59	1.14E-07	6.27E-03	4.85E-24	0.018
0.020	2.75E-11	9.99E-30	6.10E-57	3.21E-07	1.77E-02	5.42E-23	0.020
0.025	9.63E-10	4.63E-27	2.71E-52	2.56E-06	1.41E-01	6.82E-21	0.025
0.030	6.52E-08	5.03E-25	6.27E-48	1.24E-05	6.79E-01	2.72E-19	0.030
0.040	2.46E-04	4.73E-22	2.88E-41	1.23E-04	6.67E+00	5.88E-17	0.040
0.050	3.62E-02	6.21E-20	6.08E-37	6.20E-04	3.35E+01	2.69E-15	0.050
0.060	9.64E-01	2.58E-18	6.96E-34	2.12E-03	1.14E+02	4.99E-14	0.060
0.070	9.68E+00	6.45E-17	1.78E-31	5.64E-03	3.02E+02	5.14E-13	0.070
0.080	5.32E+01	5.02E-15	7.69E-29	1.26E-02	6.72E+02	3.53E-12	0.080
0.090	1.96E+02	3.87E-13	2.18E-26	2.48E-02	1.32E+03	1.90E-11	0.090
0.100	5.47E+02	1.33E-11	2.11E-24	4.44E-02	2.35E+03	1.18E-10	0.100
0.110	1.25E+03	2.40E-10	8.69E-23	7.38E-02	3.88E+03	1.17E-09	0.110
0.120	2.46E+03	2.63E-09	1.88E-21	1.15E-01	6.04E+03	1.20E-08	0.120
0.130	4.33E+03	1.98E-08	2.49E-20	1.72E-01	8.97E+03	9.55E-08	0.130
0.140	6.95E+03	1.11E-07	2.24E-19	2.47E-01	1.28E+04	5.72E-07	0.140
0.150	1.04E+04	4.90E-07	1.48E-18	3.42E-01	1.77E+04	2.70E-06	0.150
0.160	1.47E+04	1.79E-06	7.64E-18	4.60E-01	2.37E+04	1.04E-05	0.160
0.180	2.59E+04	1.52E-05	1.14E-16	7.78E-01	3.97E+04	9.83E-05	0.180
0.200	4.00E+04	8.27E-05	9.60E-16	1.22E+00	6.19E+04	5.81E-04	0.200
0.250	8.32E+04	1.66E-03	4.01E-14	2.99E+00	1.49E+05	1.35E-02	0.250
0.300	1.29E+05	1.17E-02	4.37E-13	5.91E+00	2.90E+05	1.05E-01	0.300
0.350	1.70E+05	4.55E-02	2.24E-12	1.01E+01	4.89E+05	4.38E-01	0.350
0.400	2.03E+05	1.23E-01	7.23E-12	1.58E+01	7.50E+05	1.25E+00	0.400
0.450	2.29E+05	2.60E-01	1.73E-11	2.29E+01	1.07E+06	2.75E+00	0.450
0.500	2.48E+05	4.65E-01	3.35E-11	3.15E+01	1.46E+06	5.10E+00	0.500
0.600	2.69E+05	1.08E+00	8.40E-11	5.31E+01	2.39E+06	1.25E+01	0.600
0.700	2.75E+05	1.89E+00	1.51E-10	8.03E+01	3.53E+06	2.29E+01	0.700
0.800	2.73E+05	2.81E+00	2.22E-10	1.13E+02	4.84E+06	3.57E+01	0.800
0.900	2.65E+05	3.74E+00	2.87E-10	1.49E+02	6.29E+06	5.01E+01	0.900
1.000	2.55E+05	4.62E+00	3.42E-10	1.90E+02	7.84E+06	6.57E+01	1.000
1.250	2.26E+05	6.45E+00	4.22E-10	3.06E+02	1.20E+07	1.09E+02	1.250
1.500	1.98E+05	7.65E+00	4.39E-10	4.36E+02	1.65E+07	1.55E+02	1.500
1.750	1.74E+05	8.34E+00	4.21E-10	5.71E+02	2.09E+07	2.04E+02	1.750
2.000	1.54E+05	8.67E+00	3.86E-10	7.05E+02	2.54E+07	2.53E+02	2.000
2.500	1.22E+05	8.66E+00	3.07E-10	9.52E+02	3.45E+07	3.42E+02	2.500
3.000	9.98E+04	8.23E+00	2.39E-10	1.14E+03	4.38E+07	4.14E+02	3.000
3.500	8.33E+04	7.65E+00	1.87E-10	1.26E+03	5.30E+07	4.70E+02	3.500
4.000	7.09E+04	7.06E+00	1.48E-10	1.29E+03	6.15E+07	5.10E+02	4.000
5.000	5.35E+04	5.97E+00	1.01E-10	1.15E+03	7.51E+07	5.57E+02	5.000
6.000	4.22E+04	5.07E+00	7.67E-11	8.25E+02	8.36E+07	5.74E+02	6.000
7.000	3.43E+04	4.36E+00	6.44E-11	4.80E+02	8.81E+07	5.73E+02	7.000
8.000	2.86E+04	3.79E+00	5.83E-11	2.13E+02	9.02E+07	5.63E+02	8.000
9.000	2.43E+04	3.32E+00	5.52E-11	5.62E+01	9.11E+07	5.48E+02	9.000
10.000	2.10E+04	2.94E+00	5.37E-11	1.56E+00	9.15E+07	5.31E+02	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 6

T9	LI7PN	LI7PG	LI7PA	LI7PAG	LI7DN	LI7T2N	T9
0.001	0.00E+00	2.59E-30	1.00E-26	1.00E-26	8.15E-32	5.33E-36	0.001
0.002	0.00E+00	6.46E-23	2.49E-19	2.49E-19	7.98E-23	4.78E-26	0.002
0.003	0.00E+00	2.46E-19	9.41E-16	9.41E-16	1.80E-18	3.17E-21	0.003
0.004	0.00E+00	4.42E-17	1.68E-13	1.68E-13	9.92E-16	3.45E-18	0.004
0.005	0.00E+00	1.77E-15	6.70E-12	6.70E-12	8.79E-14	4.96E-16	0.005
0.006	0.00E+00	2.94E-14	1.11E-10	1.11E-10	2.68E-12	2.19E-14	0.006
0.007	0.00E+00	2.77E-13	1.04E-09	1.04E-09	4.08E-11	4.49E-13	0.007
0.008	0.00E+00	1.76E-12	6.57E-09	6.57E-09	3.86E-10	5.42E-12	0.008
0.009	0.00E+00	8.38E-12	3.12E-08	3.12E-08	2.57E-09	4.44E-11	0.009
0.010	0.00E+00	3.21E-11	1.19E-07	1.19E-07	1.31E-08	2.71E-10	0.010
0.011	0.00E+00	1.04E-10	3.84E-07	3.84E-07	5.46E-08	1.32E-09	0.011
0.012	0.00E+00	2.94E-10	1.08E-06	1.08E-06	1.93E-07	5.34E-09	0.012
0.013	0.00E+00	7.45E-10	2.73E-06	2.73E-06	5.95E-07	1.86E-08	0.013
0.014	0.00E+00	1.72E-09	6.28E-06	6.28E-06	1.64E-06	5.75E-08	0.014
0.015	0.00E+00	3.69E-09	1.34E-05	1.34E-05	4.13E-06	1.60E-07	0.015
0.016	0.00E+00	7.39E-09	2.67E-05	2.68E-05	9.58E-06	4.07E-07	0.016
0.018	0.00E+00	2.53E-08	9.09E-05	9.09E-05	4.25E-05	2.13E-06	0.018
0.020	0.00E+00	7.31E-08	2.60E-04	2.60E-04	1.53E-04	8.82E-06	0.020
0.025	0.00E+00	6.10E-07	2.14E-03	2.14E-03	1.98E-03	1.52E-04	0.025
0.030	0.00E+00	3.08E-06	1.06E-02	1.06E-02	1.39E-02	1.32E-03	0.030
0.040	0.00E+00	3.27E-05	1.09E-01	1.09E-01	2.34E-01	3.06E-02	0.040
0.050	0.00E+00	1.76E-04	5.65E-01	5.65E-01	1.73E+00	2.83E-01	0.050
0.060	0.00E+00	6.36E-04	1.98E+00	1.98E+00	7.93E+00	1.54E+00	0.060
0.070	0.00E+00	1.78E-03	5.37E+00	5.37E+00	2.66E+01	5.92E+00	0.070
0.080	0.00E+00	4.17E-03	1.22E+01	1.22E+01	7.19E+01	1.79E+01	0.080
0.090	0.00E+00	8.59E-03	2.44E+01	2.44E+01	1.66E+02	4.56E+01	0.090
0.100	0.00E+00	1.60E-02	4.43E+01	4.43E+01	3.41E+02	1.02E+02	0.100
0.110	0.00E+00	2.77E-02	7.44E+01	7.45E+01	6.39E+02	2.05E+02	0.110
0.120	0.00E+00	4.50E-02	1.18E+02	1.18E+02	1.11E+03	3.80E+02	0.120
0.130	0.00E+00	6.96E-02	1.77E+02	1.77E+02	1.82E+03	6.60E+02	0.130
0.140	1.81E-50	1.03E-01	2.56E+02	2.56E+02	2.85E+03	1.08E+03	0.140
0.150	1.58E-46	1.48E-01	3.58E+02	3.58E+02	4.26E+03	1.70E+03	0.150
0.160	4.41E-43	2.06E-01	4.85E+02	4.86E+02	6.15E+03	2.57E+03	0.160
0.180	2.44E-37	3.71E-01	8.31E+02	8.32E+02	1.18E+04	5.30E+03	0.180
0.200	9.58E-33	6.19E-01	1.32E+03	1.32E+03	2.05E+04	9.88E+03	0.200
0.250	1.76E-24	1.93E+00	3.30E+03	3.31E+03	6.23E+04	3.41E+04	0.250
0.300	5.62E-19	6.91E+00	6.62E+03	6.63E+03	1.44E+05	8.74E+04	0.300
0.350	4.77E-15	2.80E+01	1.15E+04	1.15E+04	2.80E+05	1.84E+05	0.350
0.400	4.19E-12	9.65E+01	1.80E+04	1.81E+04	4.83E+05	3.39E+05	0.400
0.450	8.12E-10	2.64E+02	2.62E+04	2.65E+04	7.63E+05	5.67E+05	0.450
0.500	5.48E-08	5.94E+02	3.62E+04	3.68E+04	1.13E+06	8.80E+05	0.500
0.600	3.02E-05	1.97E+03	6.12E+04	6.32E+04	2.14E+06	1.81E+06	0.600
0.700	2.74E-03	4.50E+03	9.26E+04	9.71E+04	3.55E+06	3.20E+06	0.700
0.800	8.08E-02	8.17E+03	1.30E+05	1.38E+05	5.38E+06	5.10E+06	0.800
0.900	1.12E+00	1.27E+04	1.72E+05	1.85E+05	7.61E+06	7.55E+06	0.900
1.000	9.24E+00	1.79E+04	2.18E+05	2.36E+05	1.02E+07	1.05E+07	1.000
1.250	4.09E+02	3.13E+04	3.50E+05	3.81E+05	1.84E+07	2.05E+07	1.250
1.500	5.09E+03	4.32E+04	4.97E+05	5.40E+05	2.86E+07	3.37E+07	1.500
1.750	3.05E+04	5.25E+04	6.53E+05	7.06E+05	4.04E+07	5.00E+07	1.750
2.000	1.16E+05	5.91E+04	8.15E+05	8.75E+05	5.35E+07	6.88E+07	2.000
2.500	7.26E+05	6.60E+04	1.16E+06	1.22E+06	8.27E+07	1.13E+08	2.500
3.000	2.40E+06	6.74E+04	1.55E+06	1.61E+06	1.14E+08	1.64E+08	3.000
3.500	5.51E+06	6.60E+04	2.05E+06	2.12E+06	1.47E+08	2.19E+08	3.500
4.000	1.01E+07	6.33E+04	2.74E+06	2.80E+06	1.81E+08	2.77E+08	4.000
5.000	2.27E+07	5.66E+04	4.78E+06	4.84E+06	2.48E+08	3.99E+08	5.000
6.000	3.76E+07	5.00E+04	7.64E+06	7.69E+06	3.12E+08	5.22E+08	6.000
7.000	5.24E+07	4.41E+04	1.10E+07	1.10E+07	3.74E+08	6.44E+08	7.000
8.000	6.59E+07	3.91E+04	1.44E+07	1.44E+07	4.32E+08	7.62E+08	8.000
9.000	7.75E+07	3.49E+04	1.76E+07	1.77E+07	4.87E+08	8.76E+08	9.000
10.000	8.71E+07	3.13E+04	2.06E+07	2.06E+07	5.38E+08	9.86E+08	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 7

T9	LI7HE3NP	LI7AG	LI7AN	BE7E-NUG	BE7PG	BE7DP	T9
0.001	0.00E+00	0.00E+00	0.00E+00	1.46E-07	8.42E-38	1.14E-40	0.001
0.002	6.86E-48	0.00E+00	0.00E+00	1.72E-08	8.30E-29	9.76E-30	0.002
0.003	3.62E-40	3.49E-49	0.00E+00	7.55E-09	1.88E-24	1.94E-24	0.003
0.004	2.68E-35	5.46E-44	0.00E+00	4.83E-09	1.04E-21	4.23E-21	0.004
0.005	7.79E-32	2.70E-40	0.00E+00	3.63E-09	9.20E-20	9.98E-19	0.005
0.006	3.41E-29	1.78E-37	0.00E+00	2.97E-09	2.80E-18	6.42E-17	0.006
0.007	4.38E-27	3.16E-35	0.00E+00	2.55E-09	4.28E-17	1.78E-15	0.007
0.008	2.40E-25	2.27E-33	0.00E+00	2.26E-09	4.05E-16	2.76E-14	0.008
0.009	7.09E-24	8.43E-32	0.00E+00	2.05E-09	2.70E-15	2.79E-13	0.009
0.010	1.31E-22	1.89E-30	0.00E+00	1.89E-09	1.38E-14	2.04E-12	0.010
0.011	1.67E-21	2.87E-29	0.00E+00	1.76E-09	5.74E-14	1.16E-11	0.011
0.012	1.59E-20	3.19E-28	0.00E+00	1.66E-09	2.03E-13	5.43E-11	0.012
0.013	1.19E-19	2.75E-27	0.00E+00	1.57E-09	6.25E-13	2.15E-10	0.013
0.014	7.35E-19	1.92E-26	0.00E+00	1.50E-09	1.73E-12	7.43E-10	0.014
0.015	3.83E-18	1.12E-25	0.00E+00	1.44E-09	4.34E-12	2.29E-09	0.015
0.016	1.73E-17	5.61E-25	0.00E+00	1.38E-09	1.01E-11	6.41E-09	0.016
0.018	2.50E-16	9.74E-24	0.00E+00	1.30E-09	4.47E-11	3.96E-08	0.018
0.020	2.49E-15	1.14E-22	0.00E+00	1.22E-09	1.61E-10	1.90E-07	0.020
0.025	2.48E-13	1.56E-20	0.00E+00	1.10E-09	2.08E-09	4.35E-06	0.025
0.030	8.27E-12	6.66E-19	0.00E+00	1.01E-09	1.46E-08	4.72E-05	0.030
0.040	1.36E-09	1.58E-16	0.00E+00	8.98E-10	2.47E-07	1.51E-03	0.040
0.050	5.08E-08	7.68E-15	0.00E+00	8.29E-10	1.83E-06	1.76E-02	0.050
0.060	8.01E-07	1.49E-13	0.00E+00	7.81E-10	8.38E-06	1.14E-01	0.060
0.070	7.22E-06	1.59E-12	0.00E+00	7.47E-10	2.81E-05	5.05E-01	0.070
0.080	4.42E-05	1.22E-11	0.00E+00	7.20E-10	7.60E-05	1.72E+00	0.080
0.090	2.04E-04	1.11E-10	0.00E+00	6.99E-10	1.76E-04	4.81E+00	0.090
0.100	7.59E-04	1.48E-09	0.00E+00	6.82E-10	3.61E-04	1.17E+01	0.100
0.110	2.39E-03	1.69E-08	0.00E+00	6.68E-10	6.77E-04	2.53E+01	0.110
0.120	6.61E-03	1.37E-07	0.00E+00	6.57E-10	1.18E-03	5.02E+01	0.120
0.130	1.64E-02	8.12E-07	0.00E+00	6.47E-10	1.93E-03	9.24E+01	0.130
0.140	3.70E-02	3.72E-06	0.00E+00	6.38E-10	3.01E-03	1.60E+02	0.140
0.150	7.78E-02	1.38E-05	0.00E+00	6.31E-10	4.51E-03	2.63E+02	0.150
0.160	1.53E-01	4.33E-05	0.00E+00	6.24E-10	6.52E-03	4.15E+02	0.160
0.180	5.07E-01	2.87E-04	0.00E+00	6.14E-10	1.25E-02	9.26E+02	0.180
0.200	1.42E+00	1.28E-03	0.00E+00	6.05E-10	2.18E-02	1.84E+03	0.200
0.250	1.11E+01	1.80E-02	2.14E-48	5.91E-10	6.60E-02	7.29E+03	0.250
0.300	5.29E+01	9.95E-02	5.09E-39	5.82E-10	1.53E-01	2.07E+04	0.300
0.350	1.83E+02	3.28E-01	2.53E-32	5.77E-10	2.97E-01	4.73E+04	0.350
0.400	5.10E+02	7.89E-01	2.67E-27	5.73E-10	5.12E-01	9.32E+04	0.400
0.450	1.21E+03	1.57E+00	2.15E-23	5.72E-10	8.10E-01	1.65E+05	0.450
0.500	2.53E+03	2.77E+00	2.87E-20	5.71E-10	1.20E+00	2.69E+05	0.500
0.600	8.52E+03	7.16E+00	1.40E-15	5.70E-10	2.30E+00	6.00E+05	0.600
0.700	2.24E+04	1.62E+01	3.12E-12	5.72E-10	3.90E+00	1.13E+06	0.700
0.800	4.94E+04	3.27E+01	1.01E-09	5.74E-10	6.09E+00	1.90E+06	0.800
0.900	9.64E+04	5.96E+01	9.09E-08	5.77E-10	8.96E+00	2.95E+06	0.900
1.000	1.71E+05	9.85E+01	3.32E-06	5.80E-10	1.26E+01	4.29E+06	1.000
1.250	5.35E+05	2.49E+02	2.16E-03	5.88E-10	2.48E+01	9.00E+06	1.250
1.500	1.27E+06	4.61E+02	1.62E-01	5.96E-10	4.09E+01	1.57E+07	1.500
1.750	2.51E+06	7.07E+02	3.53E+00	6.04E-10	5.97E+01	2.45E+07	1.750
2.000	4.40E+06	9.63E+02	3.57E+01	6.11E-10	8.00E+01	3.51E+07	2.000
2.500	1.06E+07	1.46E+03	9.10E+02	6.26E-10	1.22E+02	6.13E+07	2.500
3.000	2.04E+07	1.89E+03	7.88E+03	6.39E-10	1.64E+02	9.31E+07	3.000
3.500	3.44E+07	2.27E+03	3.68E+04		2.04E+02	1.29E+08	3.500
4.000	5.28E+07	2.59E+03	1.17E+05		2.43E+02	1.69E+08	4.000
5.000	1.02E+08	3.03E+03	5.91E+05		3.16E+02	2.55E+08	5.000
6.000	1.69E+08	3.19E+03	1.74E+06		3.83E+02	3.47E+08	6.000
7.000	2.50E+08	3.10E+03	3.76E+06		4.46E+02	4.41E+08	7.000
8.000	3.44E+08	2.85E+03	6.71E+06		5.04E+02	5.35E+08	8.000
9.000	4.50E+08	2.58E+03	1.05E+07		5.59E+02	6.29E+08	9.000
10.000	5.65E+08	2.35E+03	1.51E+07		6.11E+02	7.20E+08	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 8

T9	BE7TNP	BE7HE32P	BE7AG	BE9PG	BE9PN	BE9PD	T9
0.001	6.91E-46	0.00E+00	0.00E+00	1.39E-36	0.00E+00	2.20E-32	0.001
0.002	8.70E-34	0.00E+00	0.00E+00	1.69E-27	0.00E+00	2.67E-23	0.002
0.003	6.38E-28	0.00E+00	0.00E+00	4.26E-23	0.00E+00	6.70E-19	0.003
0.004	3.17E-24	5.77E-45	0.00E+00	2.52E-20	0.00E+00	3.96E-16	0.004
0.005	1.35E-21	9.35E-41	3.28E-50	2.35E-18	0.00E+00	3.69E-14	0.005
0.006	1.36E-19	1.52E-37	8.70E-47	7.47E-17	0.00E+00	1.17E-12	0.006
0.007	5.39E-18	5.57E-35	4.73E-44	1.18E-15	0.00E+00	1.84E-11	0.007
0.008	1.12E-16	7.26E-33	8.53E-42	1.15E-14	0.00E+00	1.79E-10	0.008
0.009	1.46E-15	4.46E-31	6.89E-40	7.83E-14	0.00E+00	1.22E-09	0.009
0.010	1.32E-14	1.54E-29	3.03E-38	4.09E-13	0.00E+00	6.38E-09	0.010
0.011	9.12E-14	3.43E-28	8.27E-37	1.74E-12	0.00E+00	2.71E-08	0.011
0.012	5.02E-13	5.32E-27	1.54E-35	6.24E-12	0.00E+00	9.72E-08	0.012
0.013	2.31E-12	6.19E-26	2.12E-34	1.96E-11	0.00E+00	3.05E-07	0.013
0.014	9.14E-12	5.65E-25	2.24E-33	5.49E-11	0.00E+00	8.53E-07	0.014
0.015	3.19E-11	4.22E-24	1.92E-32	1.40E-10	0.00E+00	2.17E-06	0.015
0.016	9.98E-11	2.65E-23	1.36E-31	3.30E-10	0.00E+00	5.11E-06	0.016
0.018	7.52E-10	6.84E-22	4.38E-30	1.50E-09	0.00E+00	2.32E-05	0.018
0.020	4.27E-09	1.12E-20	8.71E-29	5.51E-09	0.00E+00	8.53E-05	0.020
0.025	1.38E-07	3.06E-18	3.47E-26	7.49E-08	0.00E+00	1.16E-03	0.025
0.030	1.95E-06	2.20E-16	3.34E-24	5.47E-07	0.00E+00	8.42E-03	0.030
0.040	9.15E-05	1.11E-13	2.58E-21	9.89E-06	0.00E+00	1.52E-01	0.040
0.050	1.40E-03	9.17E-12	2.92E-19	7.75E-05	0.00E+00	1.18E+00	0.050
0.060	1.12E-02	2.66E-10	1.07E-17	3.73E-04	0.00E+00	5.68E+00	0.060
0.070	5.84E-02	3.90E-09	1.90E-16	1.31E-03	0.00E+00	1.99E+01	0.070
0.080	2.28E-01	3.56E-08	2.04E-15	3.68E-03	0.00E+00	5.59E+01	0.080
0.090	7.18E-01	2.31E-07	1.51E-14	8.84E-03	0.00E+00	1.34E+02	0.090
0.100	1.93E+00	1.15E-06	8.51E-14	1.88E-02	0.00E+00	2.84E+02	0.100
0.110	4.56E+00	4.70E-06	3.85E-13	3.64E-02	0.00E+00	5.49E+02	0.110
0.120	9.76E+00	1.63E-05	1.46E-12	6.54E-02	0.00E+00	9.83E+02	0.120
0.130	1.93E+01	4.94E-05	4.83E-12	1.10E-01	0.00E+00	1.65E+03	0.130
0.140	3.55E+01	1.34E-04	1.42E-11	1.77E-01	0.00E+00	2.65E+03	0.140
0.150	6.19E+01	3.33E-04	3.77E-11	2.73E-01	0.00E+00	4.06E+03	0.150
0.160	1.03E+02	7.63E-04	9.26E-11	4.05E-01	0.00E+00	6.00E+03	0.160
0.180	2.51E+02	3.31E-03	4.81E-10	8.18E-01	1.04E-44	1.21E+04	0.180
0.200	5.42E+02	1.17E-02	2.78E-09	1.52E+00	1.60E-39	2.22E+04	0.200
0.250	2.51E+03	1.46E-01	5.18E-07	5.74E+00	3.52E-30	8.09E+04	0.250
0.300	8.05E+03	9.92E-01	2.89E-05	1.84E+01	6.04E-24	2.40E+05	0.300
0.350	2.03E+04	4.57E+00	5.06E-04	5.02E+01	1.73E-19	5.95E+05	0.350
0.400	4.33E+04	1.61E+01	4.23E-03	1.15E+02	3.85E-16	1.25E+06	0.400
0.450	8.21E+04	4.64E+01	2.17E-02	2.26E+02	1.55E-13	2.29E+06	0.450
0.500	1.42E+05	1.15E+02	7.90E-02	3.91E+02	1.90E-11	3.74E+06	0.500
0.600	3.49E+05	5.16E+02	5.35E-01	8.82E+02	2.61E-08	7.77E+06	0.600
0.700	7.11E+05	1.70E+03	2.07E+00	1.55E+03	4.63E-06	1.30E+07	0.700
0.800	1.28E+06	4.52E+03	5.71E+00	2.30E+03	2.29E-04	1.88E+07	0.800
0.900	2.08E+06	1.03E+04	1.27E+01	3.08E+03	4.82E-03	2.50E+07	0.900
1.000	3.17E+06	2.10E+04	2.43E+01	3.84E+03	5.60E-02	3.14E+07	1.000
1.250	7.32E+06	8.62E+04	8.07E+01	5.51E+03	4.78E+00	4.78E+07	1.250
1.500	1.37E+07	2.52E+05	1.85E+02	7.06E+03	9.58E+01	6.38E+07	1.500
1.750	2.26E+07	5.89E+05	3.38E+02	8.83E+03	8.30E+02	7.84E+07	1.750
2.000	3.39E+07	1.18E+06	5.30E+02	1.10E+04	4.24E+03	9.09E+07	2.000
2.500	6.39E+07	3.53E+06	9.78E+02	1.60E+04	4.25E+04	1.10E+08	2.500
3.000	1.03E+08	8.05E+06	1.44E+03	2.11E+04	2.02E+05	1.24E+08	3.000
3.500	1.49E+08	1.55E+07	1.85E+03	2.55E+04	6.22E+05	1.33E+08	3.500
4.000	2.02E+08	2.64E+07	2.20E+03	2.90E+04	1.47E+06	1.38E+08	4.000
5.000	3.24E+08	6.10E+07	2.70E+03	3.34E+04	5.02E+06	1.43E+08	5.000
6.000	4.61E+08	1.14E+08	2.99E+03	3.52E+04	1.17E+07	1.42E+08	6.000
7.000	6.08E+08	1.88E+08	3.11E+03	3.54E+04	2.20E+07	1.40E+08	7.000
8.000	7.60E+08	2.83E+08	3.11E+03	3.46E+04	3.59E+07	1.36E+08	8.000
9.000	9.15E+08	3.98E+08	3.04E+03	3.34E+04	5.32E+07	1.32E+08	9.000
10.000	1.07E+09	5.32E+08	2.93E+03	3.19E+04	7.38E+07	1.27E+08	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 9

T9	BE9PA	BE9AN	B10PG	B10PA	B10AN	B11PG	T9
0.001	2.20E-32	0.00E+00	1.92E-45	5.19E-40	0.00E+00	1.42E-43	0.001
0.002	2.67E-23	0.00E+00	7.77E-35	2.09E-29	0.00E+00	6.25E-33	0.002
0.003	6.70E-19	0.00E+00	1.07E-29	2.87E-24	0.00E+00	9.05E-28	0.003
0.004	3.96E-16	1.15E-50	1.86E-26	4.96E-21	0.00E+00	1.62E-24	0.004
0.005	3.69E-14	4.92E-46	3.73E-24	9.90E-19	0.00E+00	3.34E-22	0.005
0.006	1.17E-12	1.69E-42	2.12E-22	5.61E-17	0.00E+00	1.94E-20	0.006
0.007	1.84E-11	1.14E-39	5.32E-21	1.40E-15	9.38E-50	4.98E-19	0.007
0.008	1.79E-10	2.45E-37	7.59E-20	2.00E-14	5.01E-47	7.23E-18	0.008
0.009	1.22E-09	2.30E-35	7.17E-19	1.88E-13	1.01E-44	6.94E-17	0.009
0.010	6.38E-09	1.15E-33	4.95E-18	1.29E-12	9.81E-43	4.87E-16	0.010
0.011	2.71E-08	3.54E-32	2.68E-17	6.98E-12	5.35E-41	2.67E-15	0.011
0.012	9.72E-08	7.33E-31	1.19E-16	3.10E-11	1.84E-39	1.21E-14	0.012
0.013	3.05E-07	1.10E-29	4.54E-16	1.18E-10	4.37E-38	4.64E-14	0.013
0.014	8.53E-07	1.27E-28	1.51E-15	3.91E-10	7.59E-37	1.57E-13	0.014
0.015	2.17E-06	1.17E-27	4.51E-15	1.16E-09	1.02E-35	4.73E-13	0.015
0.016	5.11E-06	8.95E-27	1.23E-14	3.15E-09	1.09E-34	1.30E-12	0.016
0.018	2.32E-05	3.25E-25	7.18E-14	1.84E-08	7.25E-33	7.77E-12	0.018
0.020	8.53E-05	7.17E-24	3.29E-13	8.36E-08	2.70E-31	3.63E-11	0.020
0.025	1.16E-03	3.51E-21	6.89E-12	1.73E-06	3.77E-28	7.95E-10	0.025
0.030	8.42E-03	4.77E-19	6.99E-11	1.74E-05	9.43E-26	8.39E-09	0.030
0.040	1.52E-01	1.60E-15	2.03E-09	4.95E-04	2.94E-22	2.61E-07	0.040
0.050	1.18E+00	3.76E-13	2.22E-08	5.30E-03	8.94E-20	3.02E-06	0.050
0.060	5.68E+00	1.52E-11	1.37E-07	3.21E-02	6.99E-18	1.97E-05	0.060
0.070	1.99E+01	2.42E-10	5.83E-07	1.35E-01	2.26E-16	9.42E-05	0.070
0.080	5.59E+01	2.41E-09	1.93E-06	4.37E-01	3.98E-15	4.32E-04	0.080
0.090	1.34E+02	1.75E-08	5.28E-06	1.18E+00	4.49E-14	2.10E-03	0.090
0.100	2.84E+02	9.56E-08	1.26E-05	2.77E+00	3.61E-13	9.44E-03	0.100
0.110	5.49E+02	4.02E-07	2.68E-05	5.82E+00	2.23E-12	3.55E-02	0.110
0.120	9.83E+02	1.36E-06	5.24E-05	1.12E+01	1.12E-11	1.10E-01	0.120
0.130	1.65E+03	3.82E-06	9.54E-05	2.01E+01	4.73E-11	2.89E-01	0.130
0.140	2.65E+03	9.43E-06	1.64E-04	3.41E+01	1.73E-10	6.61E-01	0.140
0.150	4.06E+03	2.13E-05	2.67E-04	5.50E+01	5.63E-10	1.35E+00	0.150
0.160	6.00E+03	4.69E-05	4.18E-04	8.50E+01	1.66E-09	2.50E+00	0.160
0.180	1.20E+04	2.49E-04	9.23E-04	1.83E+02	1.11E-08	6.95E+00	0.180
0.200	2.20E+04	1.45E-03	1.83E-03	3.54E+02	5.75E-08	1.55E+01	0.200
0.250	7.83E+04	5.66E-02	7.16E-03	1.32E+03	1.53E-06	6.24E+01	0.250
0.300	2.23E+05	6.87E-01	2.03E-02	3.55E+03	1.86E-05	1.50E+02	0.300
0.350	5.35E+05	3.98E+00	4.67E-02	7.82E+03	1.36E-04	2.72E+02	0.350
0.400	1.10E+06	1.45E+01	9.28E-02	1.49E+04	7.02E-04	4.12E+02	0.400
0.450	1.97E+06	3.87E+01	1.66E-01	2.58E+04	2.80E-03	5.59E+02	0.450
0.500	3.18E+06	8.36E+01	2.75E-01	4.12E+04	9.20E-03	7.01E+02	0.500
0.600	6.54E+06	2.56E+02	6.31E-01	8.91E+04	6.51E-02	9.55E+02	0.600
0.700	1.09E+07	5.53E+02	1.24E+00	1.65E+05	3.09E-01	1.17E+03	0.700
0.800	1.58E+07	9.78E+02	2.21E+00	2.76E+05	1.11E+00	1.35E+03	0.800
0.900	2.11E+07	1.59E+03	3.75E+00	4.29E+05	3.28E+00	1.54E+03	0.900
1.000	2.66E+07	2.64E+03	6.24E+00	6.34E+05	8.30E+00	1.75E+03	1.000
1.250	4.11E+07	1.22E+04	2.06E+01	1.46E+06	5.29E+01	2.45E+03	1.250
1.500	5.54E+07	5.37E+04	5.58E+01	2.95E+06	2.15E+02	3.46E+03	1.500
1.750	6.83E+07	1.71E+05	1.21E+02	5.37E+06	6.54E+02	4.76E+03	1.750
2.000	7.94E+07	4.18E+05	2.19E+02	8.89E+06	1.63E+03	6.25E+03	2.000
2.500	9.61E+07	1.48E+06	4.96E+02	1.93E+07	6.73E+03	9.52E+03	2.500
3.000	1.07E+08	3.45E+06	8.29E+02	3.31E+07	1.95E+04	1.28E+04	3.000
3.500	1.14E+08	6.32E+06	1.16E+03	4.87E+07	4.49E+04	1.59E+04	3.500
4.000	1.18E+08	9.96E+06	1.46E+03	6.40E+07	8.81E+04	1.87E+04	4.000
5.000	1.20E+08	1.88E+07	1.88E+03	8.82E+07	2.44E+05	2.33E+04	5.000
6.000	1.19E+08	2.88E+07	2.09E+03	9.97E+07	5.02E+05	2.69E+04	6.000
7.000	1.16E+08	3.89E+07	2.14E+03	1.00E+08	8.51E+05	2.97E+04	7.000
8.000	1.12E+08	4.89E+07	2.10E+03	9.44E+07	1.25E+06	3.19E+04	8.000
9.000	1.08E+08	5.83E+07	2.02E+03	8.80E+07	1.65E+06	3.37E+04	9.000
10.000	1.04E+08	6.72E+07	1.94E+03	8.33E+07	1.99E+06	3.50E+04	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 10

T9	B11PN	B11PA	B11AN	B11AP	C11PG	C12PG	T9
0.001	0.00E+00	6.56E-39	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.001
0.002	0.00E+00	2.84E-28	0.00E+00	0.00E+00	2.35E-41	8.51E-39	0.002
0.003	0.00E+00	4.05E-23	0.00E+00	0.00E+00	1.63E-35	6.04E-33	0.003
0.004	0.00E+00	7.15E-20	0.00E+00	0.00E+00	7.88E-32	2.95E-29	0.004
0.005	0.00E+00	1.45E-17	0.00E+00	0.00E+00	3.28E-29	1.24E-26	0.005
0.006	0.00E+00	8.34E-16	0.00E+00	0.00E+00	3.27E-27	1.24E-24	0.006
0.007	0.00E+00	2.11E-14	2.06E-50	0.00E+00	1.29E-25	4.88E-23	0.007
0.008	0.00E+00	3.03E-13	1.19E-47	8.28E-49	2.67E-24	1.01E-21	0.008
0.009	0.00E+00	2.88E-12	2.60E-45	1.79E-46	3.45E-23	1.31E-20	0.009
0.010	0.00E+00	2.00E-11	2.69E-43	1.84E-44	3.14E-22	1.19E-19	0.010
0.011	0.00E+00	1.09E-10	1.56E-41	1.05E-42	2.16E-21	8.18E-19	0.011
0.012	0.00E+00	4.86E-10	5.67E-40	3.81E-41	1.19E-20	4.51E-18	0.012
0.013	0.00E+00	1.85E-09	1.41E-38	9.44E-40	5.48E-20	2.07E-17	0.013
0.014	0.00E+00	6.18E-09	2.57E-37	1.71E-38	2.17E-19	8.19E-17	0.014
0.015	0.00E+00	1.85E-08	3.60E-36	2.38E-37	7.59E-19	2.86E-16	0.015
0.016	0.00E+00	5.04E-08	4.03E-35	2.64E-36	2.38E-18	8.96E-16	0.016
0.018	0.00E+00	2.96E-07	2.89E-33	1.88E-34	1.81E-17	6.76E-15	0.018
0.020	0.00E+00	1.36E-06	1.15E-31	7.41E-33	1.03E-16	3.85E-14	0.020
0.025	0.00E+00	2.86E-05	1.86E-28	1.18E-29	3.42E-15	1.26E-12	0.025
0.030	0.00E+00	2.91E-04	5.27E-26	3.28E-27	4.93E-14	1.79E-11	0.030
0.040	0.00E+00	8.49E-03	1.98E-22	1.22E-23	2.42E-12	8.57E-10	0.040
0.050	0.00E+00	9.27E-02	6.95E-20	4.26E-21	3.88E-11	1.34E-08	0.050
0.060	0.00E+00	5.71E-01	6.44E-18	3.76E-19	3.24E-10	1.10E-07	0.060
0.070	0.00E+00	2.44E+00	4.89E-16	1.43E-17	1.77E-09	5.86E-07	0.070
0.080	0.00E+00	8.08E+00	3.95E-14	3.66E-16	7.18E-09	2.34E-06	0.080
0.090	0.00E+00	2.26E+01	1.56E-12	7.74E-15	2.36E-08	7.54E-06	0.090
0.100	0.00E+00	5.58E+01	3.02E-11	1.18E-13	6.58E-08	2.07E-05	0.100
0.110	0.00E+00	1.26E+02	3.41E-10	1.21E-12	1.62E-07	5.01E-05	0.110
0.120	0.00E+00	2.67E+02	2.54E-09	8.63E-12	3.59E-07	1.10E-04	0.120
0.130	0.00E+00	5.30E+02	1.38E-08	4.60E-11	7.34E-07	2.21E-04	0.130
0.140	0.00E+00	9.90E+02	5.82E-08	1.93E-10	1.40E-06	4.16E-04	0.140
0.150	0.00E+00	1.75E+03	2.02E-07	6.72E-10	2.52E-06	7.40E-04	0.150
0.160	0.00E+00	2.93E+03	5.95E-07	2.01E-09	4.32E-06	1.25E-03	0.160
0.180	0.00E+00	7.17E+03	3.55E-06	1.33E-08	1.12E-05	3.20E-03	0.180
0.200	0.00E+00	1.50E+04	1.47E-05	7.19E-08	2.57E-05	7.18E-03	0.200
0.250	3.09E-48	5.94E+04	1.90E-04	3.43E-06	1.36E-04	3.87E-02	0.250
0.300	5.99E-39	1.53E+05	1.21E-03	7.00E-05	4.92E-04	1.75E-01	0.300
0.350	2.57E-32	3.12E+05	5.84E-03	6.31E-04	1.45E-03	7.46E-01	0.350
0.400	2.43E-27	5.52E+05	2.34E-02	3.25E-03	4.03E-03	2.70E+00	0.400
0.450	1.80E-23	8.96E+05	8.22E-02	1.15E-02	1.15E-02	7.89E+00	0.450
0.500	2.24E-20	1.38E+06	2.73E-01	3.13E-02	3.22E-02	1.90E+01	0.500
0.600	9.86E-16	2.98E+06	2.67E+00	1.56E-01	1.91E-01	7.10E+01	0.600
0.700	2.04E-12	5.88E+06	1.87E+01	7.32E-01	7.41E-01	1.79E+02	0.700
0.800	6.27E-10	1.06E+07	8.84E+01	3.59E+00	2.05E+00	3.52E+02	0.800
0.900	5.39E-08	1.74E+07	3.06E+02	1.50E+01	4.49E+00	5.86E+02	0.900
1.000	1.90E-06	2.64E+07	8.40E+02	4.98E+01	8.30E+00	8.68E+02	1.000
1.250	1.16E-03	5.64E+07	5.31E+03	4.54E+02	2.40E+01	1.69E+03	1.250
1.500	8.32E-02	9.16E+07	1.86E+04	1.98E+03	4.63E+01	2.52E+03	1.500
1.750	1.76E+00	1.25E+08	4.63E+04	5.65E+03	7.16E+01	3.24E+03	1.750
2.000	1.74E+01	1.53E+08	9.26E+04	1.23E+04	9.65E+01	3.77E+03	2.000
2.500	4.29E+02	1.86E+08	2.50E+05	3.62E+04	1.38E+02	4.31E+03	2.500
3.000	3.63E+03	1.98E+08	4.95E+05	7.33E+04	1.66E+02	4.40E+03	3.000
3.500	1.67E+04	2.04E+08	8.17E+05	1.20E+05	1.83E+02	4.34E+03	3.500
4.000	5.25E+04	2.09E+08	1.20E+06	1.73E+05	1.91E+02	4.26E+03	4.000
5.000	2.61E+05	2.18E+08	2.11E+06	2.85E+05	1.94E+02	4.12E+03	5.000
6.000	7.59E+05	2.23E+08	3.14E+06	3.92E+05	1.87E+02	3.94E+03	6.000
7.000	1.63E+06	2.22E+08	4.23E+06	4.88E+05	1.75E+02	3.75E+03	7.000
8.000	2.89E+06	2.19E+08	5.34E+06	5.71E+05	1.62E+02	3.56E+03	8.000
9.000	4.53E+06	2.14E+08	6.46E+06	6.42E+05	1.50E+02	3.37E+03	9.000
10.000	6.48E+06	2.08E+08	7.57E+06	7.02E+05	1.39E+02	3.19E+03	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 11

T9	C12AG	C12AN	C13PG	C13PN	C13AN	C14PG	T9
0.001	0.00E+00	0.00E+00	2.17E-50	0.00E+00	0.00E+00	0.00E+00	0.001
0.002	0.00E+00	0.00E+00	2.69E-38	0.00E+00	0.00E+00	1.87E-39	0.002
0.003	0.00E+00	0.00E+00	1.96E-32	0.00E+00	0.00E+00	1.39E-33	0.003
0.004	0.00E+00	0.00E+00	9.71E-29	0.00E+00	0.00E+00	7.00E-30	0.004
0.005	0.00E+00	0.00E+00	4.12E-26	0.00E+00	0.00E+00	3.00E-27	0.005
0.006	0.00E+00	0.00E+00	4.15E-24	0.00E+00	0.00E+00	3.04E-25	0.006
0.007	0.00E+00	0.00E+00	1.65E-22	0.00E+00	0.00E+00	1.21E-23	0.007
0.008	0.00E+00	0.00E+00	3.44E-21	0.00E+00	0.00E+00	2.53E-22	0.008
0.009	0.00E+00	0.00E+00	4.47E-20	0.00E+00	0.00E+00	3.31E-21	0.009
0.010	0.00E+00	0.00E+00	4.07E-19	0.00E+00	1.09E-48	3.02E-20	0.010
0.011	0.00E+00	0.00E+00	2.81E-18	0.00E+00	1.12E-46	2.09E-19	0.011
0.012	2.66E-50	0.00E+00	1.55E-17	0.00E+00	6.77E-45	1.15E-18	0.012
0.013	9.64E-49	0.00E+00	7.14E-17	0.00E+00	2.66E-43	5.32E-18	0.013
0.014	2.45E-47	0.00E+00	2.83E-16	0.00E+00	7.28E-42	2.11E-17	0.014
0.015	4.63E-46	0.00E+00	9.90E-16	0.00E+00	1.48E-40	7.38E-17	0.015
0.016	6.80E-45	0.00E+00	3.11E-15	0.00E+00	2.31E-39	2.32E-16	0.016
0.018	7.85E-43	0.00E+00	2.35E-14	0.00E+00	3.02E-37	1.75E-15	0.018
0.020	4.67E-41	0.00E+00	1.34E-13	0.00E+00	2.00E-35	1.00E-14	0.020
0.025	1.65E-37	0.00E+00	4.39E-12	0.00E+00	9.00E-32	3.28E-13	0.025
0.030	8.28E-35	0.00E+00	6.27E-11	0.00E+00	5.51E-29	4.66E-12	0.030
0.040	6.93E-31	0.00E+00	3.01E-09	0.00E+00	6.38E-25	2.22E-10	0.040
0.050	4.17E-28	0.00E+00	4.71E-08	0.00E+00	4.98E-22	3.45E-09	0.050
0.060	5.40E-26	0.00E+00	3.84E-07	0.00E+00	8.01E-20	2.79E-08	0.060
0.070	2.59E-24	0.00E+00	2.05E-06	0.00E+00	4.64E-18	1.47E-07	0.070
0.080	6.27E-23	0.00E+00	8.15E-06	0.00E+00	1.32E-16	5.82E-07	0.080
0.090	9.19E-22	0.00E+00	2.62E-05	0.00E+00	2.25E-15	1.85E-06	0.090
0.100	9.23E-21	0.00E+00	7.18E-05	0.00E+00	2.58E-14	5.02E-06	0.100
0.110	6.90E-20	0.00E+00	1.73E-04	0.00E+00	2.18E-13	1.20E-05	0.110
0.120	4.08E-19	0.00E+00	3.78E-04	0.00E+00	1.44E-12	2.59E-05	0.120
0.130	1.99E-18	0.00E+00	7.59E-04	0.00E+00	7.81E-12	5.17E-05	0.130
0.140	8.30E-18	0.00E+00	1.43E-03	0.00E+00	3.58E-11	9.63E-05	0.140
0.150	3.03E-17	0.00E+00	2.53E-03	0.00E+00	1.43E-10	1.70E-04	0.150
0.160	9.85E-17	0.00E+00	4.27E-03	0.00E+00	5.08E-10	2.87E-04	0.160
0.180	7.92E-16	0.00E+00	1.08E-02	0.00E+00	4.78E-09	7.49E-04	0.180
0.200	4.74E-15	0.00E+00	2.41E-02	0.00E+00	3.30E-08	1.87E-03	0.200
0.250	1.67E-13	0.00E+00	1.22E-01	0.00E+00	1.58E-06	1.86E-02	0.250
0.300	2.48E-12	0.00E+00	4.46E-01	6.21E-43	3.01E-05	1.44E-01	0.300
0.350	2.10E-11	0.00E+00	1.48E+00	9.93E-36	3.20E-04	7.31E-01	0.350
0.400	1.21E-10	0.00E+00	4.91E+00	2.51E-30	2.28E-03	2.64E+00	0.400
0.450	5.27E-10	0.00E+00	1.51E+01	3.99E-26	1.23E-02	7.42E+00	0.450
0.500	1.86E-09	0.00E+00	4.04E+01	9.16E-23	5.30E-02	1.74E+01	0.500
0.600	1.46E-08	0.00E+00	1.92E+02	1.01E-17	5.87E-01	6.46E+01	0.600
0.700	7.43E-08	0.00E+00	5.95E+02	4.00E-14	3.80E+00	1.69E+02	0.700
0.800	2.81E-07	8.06E-47	1.38E+03	2.00E-11	1.68E+01	3.52E+02	0.800
0.900	8.56E-07	7.28E-41	2.62E+03	2.52E-09	5.61E+01	6.25E+02	0.900
1.000	2.22E-06	4.23E-36	4.34E+03	1.20E-07	1.54E+02	9.92E+02	1.000
1.250	1.49E-05	1.61E-27	1.04E+04	1.26E-04	1.10E+03	2.27E+03	1.250
1.500	6.94E-05	8.45E-22	1.80E+04	1.30E-02	4.87E+03	3.94E+03	1.500
1.750	2.88E-04	1.04E-17	2.60E+04	3.57E-01	1.60E+04	5.82E+03	1.750
2.000	1.09E-03	1.21E-14	3.35E+04	4.27E+00	4.17E+04	7.78E+03	2.000
2.500	9.70E-03	2.40E-10	4.55E+04	1.38E+02	1.75E+05	1.16E+04	2.500
3.000	4.91E-02	1.77E-07	5.27E+04	1.39E+03	4.83E+05	1.51E+04	3.000
3.500	1.72E-01	1.99E-05	5.62E+04	7.29E+03	1.02E+06	1.81E+04	3.500
4.000	4.80E-01	6.91E-04	5.73E+04	2.52E+04	1.78E+06	2.07E+04	4.000
5.000	2.50E+00	9.99E-02	5.66E+04	1.43E+05	3.78E+06	2.48E+04	5.000
6.000	9.30E+00	2.78E+00	5.46E+04	4.59E+05	6.06E+06	2.76E+04	6.000
7.000	2.76E+01	3.01E+01	5.19E+04	1.06E+06	8.27E+06	2.92E+04	7.000
8.000	6.92E+01	1.80E+02	4.89E+04	1.99E+06	1.02E+07	3.01E+04	8.000
9.000	1.53E+02	7.31E+02	4.60E+04	3.26E+06	1.19E+07	3.03E+04	9.000
10.000	3.05E+02	2.25E+03	4.32E+04	4.85E+06	1.32E+07	3.02E+04	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 12

T9	C14PN	C14AG	N13PG	N14PG	N14PN	N14PA	T9
0.002	0.00E+00	0.00E+00	1.00E-43	9.88E-44	0.00E+00	0.00E+00	0.002
0.003	0.00E+00	0.00E+00	3.21E-37	3.25E-37	0.00E+00	0.00E+00	0.003
0.004	0.00E+00	0.00E+00	4.06E-33	4.17E-33	0.00E+00	0.00E+00	0.004
0.005	0.00E+00	0.00E+00	3.34E-30	3.47E-30	0.00E+00	0.00E+00	0.005
0.006	0.00E+00	0.00E+00	5.59E-28	5.85E-28	0.00E+00	0.00E+00	0.006
0.007	0.00E+00	0.00E+00	3.33E-26	3.50E-26	0.00E+00	0.00E+00	0.007
0.008	0.00E+00	0.00E+00	9.66E-25	1.02E-24	0.00E+00	0.00E+00	0.008
0.009	0.00E+00	0.00E+00	1.67E-23	1.77E-23	0.00E+00	0.00E+00	0.009
0.010	0.00E+00	0.00E+00	1.93E-22	2.06E-22	0.00E+00	0.00E+00	0.010
0.011	0.00E+00	0.00E+00	1.65E-21	1.75E-21	0.00E+00	0.00E+00	0.011
0.012	0.00E+00	5.00E-50	1.10E-20	1.17E-20	0.00E+00	0.00E+00	0.012
0.013	0.00E+00	1.80E-48	5.96E-20	6.38E-20	0.00E+00	0.00E+00	0.013
0.014	0.00E+00	4.53E-47	2.75E-19	2.94E-19	0.00E+00	0.00E+00	0.014
0.015	0.00E+00	8.48E-46	1.10E-18	1.18E-18	0.00E+00	0.00E+00	0.015
0.016	0.00E+00	1.23E-44	3.91E-18	4.19E-18	0.00E+00	0.00E+00	0.016
0.018	0.00E+00	1.41E-42	3.69E-17	3.95E-17	0.00E+00	0.00E+00	0.018
0.020	0.00E+00	8.26E-41	2.55E-16	2.73E-16	0.00E+00	0.00E+00	0.020
0.025	0.00E+00	2.85E-37	1.22E-14	1.30E-14	0.00E+00	0.00E+00	0.025
0.030	0.00E+00	1.81E-34	2.32E-13	2.46E-13	0.00E+00	0.00E+00	0.030
0.040	0.00E+00	6.76E-28	1.69E-11	1.76E-11	0.00E+00	0.00E+00	0.040
0.050	0.00E+00	1.35E-23	3.57E-10	3.64E-10	0.00E+00	0.00E+00	0.050
0.060	2.16E-47	9.48E-21	3.66E-09	3.64E-09	0.00E+00	0.00E+00	0.060
0.070	7.06E-40	9.87E-19	2.35E-08	2.27E-08	0.00E+00	0.00E+00	0.070
0.080	3.06E-34	3.13E-17	1.09E-07	1.02E-07	0.00E+00	0.00E+00	0.080
0.090	7.43E-30	4.51E-16	4.01E-07	3.65E-07	0.00E+00	0.00E+00	0.090
0.100	2.40E-26	3.75E-15	1.23E-06	1.09E-06	0.00E+00	0.00E+00	0.100
0.110	1.78E-23	2.09E-14	3.30E-06	2.89E-06	0.00E+00	0.00E+00	0.110
0.120	4.41E-21	8.66E-14	7.90E-06	7.21E-06	0.00E+00	0.00E+00	0.120
0.130	4.68E-19	2.85E-13	1.73E-05	1.81E-05	0.00E+00	0.00E+00	0.130
0.140	2.55E-17	7.87E-13	3.51E-05	4.75E-05	0.00E+00	0.00E+00	0.140
0.150	8.18E-16	1.88E-12	6.69E-05	1.28E-04	0.00E+00	0.00E+00	0.150
0.160	1.70E-14	4.01E-12	1.21E-04	3.35E-04	0.00E+00	0.00E+00	0.160
0.180	2.68E-12	1.39E-11	3.46E-04	1.92E-03	0.00E+00	0.00E+00	0.180
0.200	1.54E-10	3.71E-11	8.62E-04	8.20E-03	0.00E+00	0.00E+00	0.200
0.250	2.27E-07	2.06E-10	5.46E-03	1.14E-01	0.00E+00	0.00E+00	0.250
0.300	2.97E-05	6.55E-10	2.35E-02	6.41E-01	0.00E+00	0.00E+00	0.300
0.350	9.72E-04	4.90E-09	8.66E-02	2.13E+00	0.00E+00	7.39E-46	0.350
0.400	1.34E-02	1.12E-07	3.07E-01	5.10E+00	0.00E+00	8.58E-40	0.400
0.450	1.04E-01	1.55E-06	1.01E+00	9.87E+00	0.00E+00	5.03E-35	0.450
0.500	5.43E-01	1.27E-05	2.93E+00	1.65E+01	0.00E+00	3.60E-31	0.500
0.600	6.88E+00	2.96E-04	1.59E+01	3.43E+01	1.98E-42	2.62E-25	0.600
0.700	4.71E+01	2.75E-03	5.41E+01	5.60E+01	2.67E-35	4.80E-21	0.700
0.800	2.25E+02	1.44E-02	1.35E+02	7.89E+01	5.98E-30	8.50E-18	0.800
0.900	8.37E+02	5.17E-02	2.69E+02	1.01E+02	8.73E-26	3.12E-15	0.900
1.000	2.54E+03	1.42E-01	4.63E+02	1.22E+02	1.88E-22	3.76E-13	1.000
1.250	2.10E+04	8.58E-01	1.17E+03	1.66E+02	1.92E-16	2.51E-09	1.250
1.500	9.01E+04	2.77E+00	2.06E+03	2.03E+02	1.98E-12	1.05E-06	1.500
1.750	2.57E+05	6.27E+00	2.96E+03	2.43E+02	1.47E-09	8.68E-05	1.750
2.000	5.66E+05	1.14E+01	3.77E+03	2.95E+02	2.12E-07	2.55E-03	2.000
2.500	1.69E+06	2.56E+01	4.95E+03	4.66E+02	2.28E-04	3.29E-01	2.500
3.000	3.45E+06	4.28E+01	5.67E+03	7.42E+02	2.45E-02	9.25E+00	3.000
3.500	5.71E+06	6.06E+01	6.06E+03	1.11E+03	7.04E-01	1.06E+02	3.500
4.000	8.25E+06	7.75E+01	6.21E+03	1.53E+03	8.84E+00	6.82E+02	4.000
5.000	1.36E+07	1.06E+02	6.11E+03	2.38E+03	3.13E+02	9.72E+03	5.000
6.000	1.88E+07	1.28E+02	5.74E+03	3.17E+03	3.47E+03	5.88E+04	6.000
7.000	2.33E+07	1.43E+02	5.30E+03	3.94E+03	1.97E+04	2.15E+05	7.000
8.000	2.73E+07	1.53E+02	4.86E+03	4.73E+03	7.35E+04	5.66E+05	8.000
9.000	3.07E+07	1.60E+02	4.45E+03	5.53E+03	2.07E+05	1.20E+06	9.000
10.000	3.35E+07	1.64E+02	4.07E+03	6.32E+03	4.78E+05	2.16E+06	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 13

T9	N14AG	N14AN	N15PG	N15PN	N15PAI	N15AG	T9
0.002	0.00E+00	0.00E+00	1.67E-42	0.00E+00	1.92E-39	0.00E+00	0.002
0.003	0.00E+00	0.00E+00	5.66E-36	0.00E+00	6.57E-33	0.00E+00	0.003
0.004	0.00E+00	0.00E+00	7.42E-32	0.00E+00	8.69E-29	0.00E+00	0.004
0.005	0.00E+00	0.00E+00	6.28E-29	0.00E+00	7.42E-26	0.00E+00	0.005
0.006	0.00E+00	0.00E+00	1.07E-26	0.00E+00	1.28E-23	0.00E+00	0.006
0.007	0.00E+00	0.00E+00	6.49E-25	0.00E+00	7.79E-22	0.00E+00	0.007
0.008	0.00E+00	0.00E+00	1.92E-23	0.00E+00	2.32E-20	0.00E+00	0.008
0.009	0.00E+00	0.00E+00	3.35E-22	0.00E+00	4.07E-19	0.00E+00	0.009
0.010	0.00E+00	0.00E+00	3.93E-21	0.00E+00	4.81E-18	0.00E+00	0.010
0.011	0.00E+00	0.00E+00	3.38E-20	0.00E+00	4.17E-17	0.00E+00	0.011
0.012	0.00E+00	0.00E+00	2.27E-19	0.00E+00	2.82E-16	0.00E+00	0.012
0.013	0.00E+00	0.00E+00	1.25E-18	0.00E+00	1.56E-15	0.00E+00	0.013
0.014	0.00E+00	0.00E+00	5.80E-18	0.00E+00	7.27E-15	0.00E+00	0.014
0.015	0.00E+00	0.00E+00	2.34E-17	0.00E+00	2.95E-14	0.00E+00	0.015
0.016	0.00E+00	0.00E+00	8.40E-17	0.00E+00	1.06E-13	0.00E+00	0.016
0.018	2.47E-49	0.00E+00	8.03E-16	0.00E+00	1.03E-12	4.11E-49	0.018
0.020	2.67E-47	0.00E+00	5.61E-15	0.00E+00	7.23E-12	4.56E-47	0.020
0.025	3.18E-43	0.00E+00	2.76E-13	0.00E+00	3.62E-10	5.70E-43	0.025
0.030	4.10E-40	0.00E+00	5.38E-12	0.00E+00	7.18E-09	7.64E-40	0.030
0.040	1.41E-35	0.00E+00	4.08E-10	0.00E+00	5.60E-07	2.77E-35	0.040
0.050	3.43E-32	0.00E+00	8.90E-09	0.00E+00	1.25E-05	4.88E-32	0.050
0.060	9.67E-29	0.00E+00	9.36E-08	0.00E+00	1.34E-04	1.48E-29	0.060
0.070	5.64E-26	0.00E+00	6.14E-07	0.00E+00	8.89E-04	4.34E-27	0.070
0.080	6.80E-24	0.00E+00	2.91E-06	0.00E+00	4.25E-03	4.67E-24	0.080
0.090	3.07E-22	0.00E+00	1.08E-05	0.00E+00	1.60E-02	1.38E-21	0.090
0.100	1.25E-20	0.00E+00	3.37E-05	0.00E+00	5.02E-02	1.30E-19	0.100
0.110	6.77E-19	0.00E+00	9.11E-05	0.00E+00	1.36E-01	5.27E-18	0.110
0.120	2.54E-17	0.00E+00	2.20E-04	0.00E+00	3.31E-01	1.14E-16	0.120
0.130	5.68E-16	0.00E+00	4.85E-04	0.00E+00	7.31E-01	1.53E-15	0.130
0.140	8.14E-15	0.00E+00	9.93E-04	0.00E+00	1.50E+00	1.40E-14	0.140
0.150	8.14E-14	0.00E+00	1.92E-03	0.00E+00	2.90E+00	9.45E-14	0.150
0.160	6.07E-13	0.00E+00	3.54E-03	0.00E+00	5.36E+00	5.00E-13	0.160
0.180	1.70E-11	0.00E+00	1.10E-02	0.00E+00	1.68E+01	7.92E-12	0.180
0.200	2.41E-10	0.00E+00	3.09E-02	0.00E+00	5.01E+01	7.10E-11	0.200
0.250	2.70E-08	0.00E+00	2.87E-01	0.00E+00	6.09E+02	3.50E-09	0.250
0.300	5.96E-07	0.00E+00	1.57E+00	0.00E+00	4.29E+03	4.47E-08	0.300
0.350	5.25E-06	0.00E+00	5.56E+00	5.06E-43	1.81E+04	2.67E-07	0.350
0.400	2.61E-05	0.00E+00	1.45E+01	1.18E-36	5.34E+04	1.00E-06	0.400
0.450	8.92E-05	1.90E-44	3.03E+01	1.06E-31	1.22E+05	2.95E-06	0.450
0.500	2.34E-04	3.56E-39	5.42E+01	9.75E-28	2.34E+05	8.46E-06	0.500
0.600	9.79E-04	2.80E-31	1.27E+02	8.58E-22	6.00E+05	9.86E-05	0.600
0.700	2.87E-03	1.18E-25	2.25E+02	1.51E-17	1.13E+06	9.94E-04	0.700
0.800	7.89E-03	1.90E-21	3.39E+02	2.32E-14	1.78E+06	6.29E-03	0.800
0.900	2.28E-02	3.45E-18	4.67E+02	6.95E-12	2.47E+06	2.72E-02	0.900
1.000	6.48E-02	1.37E-15	6.18E+02	6.67E-10	3.19E+06	8.90E-02	1.000
1.250	5.49E-01	5.97E-11	1.21E+03	2.46E-06	5.00E+06	7.81E-01	1.250
1.500	2.43E+00	6.77E-08	2.33E+03	5.84E-04	6.95E+06	3.44E+00	1.500
1.750	7.03E+00	9.69E-06	4.14E+03	2.90E-02	9.17E+06	1.01E+01	1.750
2.000	1.54E+01	3.88E-04	6.61E+03	5.42E-01	1.17E+07	2.32E+01	2.000
2.500	4.55E+01	6.77E-02	1.29E+04	3.23E+01	1.77E+07	7.70E+01	2.500
3.000	9.14E+01	2.27E+00	1.97E+04	4.87E+02	2.43E+07	1.77E+02	3.000
3.500	1.48E+02	2.95E+01	2.60E+04	3.34E+03	3.10E+07	3.28E+02	3.500
4.000	2.10E+02	2.04E+02	3.12E+04	1.40E+04	3.74E+07	5.32E+02	4.000
5.000	3.35E+02	3.04E+03	3.83E+04	1.01E+05	4.86E+07	1.08E+03	5.000
6.000	4.48E+02	1.91E+04	4.19E+04	3.61E+05	5.74E+07	1.80E+03	6.000
7.000	5.42E+02	7.47E+04	4.31E+04	8.57E+05	6.41E+07	2.64E+03	7.000
8.000	6.17E+02	2.11E+05	4.29E+04	1.56E+06	6.91E+07	3.60E+03	8.000
9.000	6.77E+02	4.71E+05	4.19E+04	2.34E+06	7.29E+07	4.63E+03	9.000
10.000	7.23E+02	8.81E+05	4.04E+04	3.01E+06	7.56E+07	5.74E+03	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 14

T9	N15AN	014AG	014AP	015AG	016PG	016PA	T9
0.002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-48	0.00E+00	0.002
0.003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.81E-41	0.00E+00	0.003
0.004	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-36	0.00E+00	0.004
0.005	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.98E-33	0.00E+00	0.005
0.006	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.52E-31	0.00E+00	0.006
0.007	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.93E-29	0.00E+00	0.007
0.008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-27	0.00E+00	0.008
0.009	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.59E-26	0.00E+00	0.009
0.010	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.79E-25	0.00E+00	0.010
0.011	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.15E-24	0.00E+00	0.011
0.012	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.75E-23	0.00E+00	0.012
0.013	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E-22	0.00E+00	0.013
0.014	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.98E-21	0.00E+00	0.014
0.015	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.11E-21	0.00E+00	0.015
0.016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.67E-20	0.00E+00	0.016
0.018	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.32E-19	0.00E+00	0.018
0.020	0.00E+00	0.00E+00	5.40E-49	0.00E+00	3.60E-18	0.00E+00	0.020
0.025	0.00E+00	4.18E-49	1.74E-44	7.70E-47	2.51E-16	0.00E+00	0.025
0.030	0.00E+00	1.07E-45	4.84E-41	2.00E-43	6.35E-15	0.00E+00	0.030
0.040	0.00E+00	9.94E-41	5.24E-36	1.89E-38	6.94E-13	0.00E+00	0.040
0.050	0.00E+00	3.43E-37	2.05E-32	6.54E-35	1.93E-11	0.00E+00	0.050
0.060	0.00E+00	1.72E-34	1.15E-29	3.27E-32	2.43E-10	0.00E+00	0.060
0.070	0.00E+00	2.49E-32	1.82E-27	4.67E-30	1.82E-09	0.00E+00	0.070
0.080	0.00E+00	1.51E-30	1.20E-25	2.80E-28	9.55E-09	0.00E+00	0.080
0.090	0.00E+00	4.84E-29	4.14E-24	9.77E-27	3.86E-08	0.00E+00	0.090
0.100	0.00E+00	9.65E-28	8.82E-23	6.70E-25	1.28E-07	0.00E+00	0.100
0.110	0.00E+00	1.32E-26	1.28E-21	8.98E-23	3.65E-07	0.00E+00	0.110
0.120	0.00E+00	1.34E-25	1.38E-20	6.47E-21	9.20E-07	0.00E+00	0.120
0.130	0.00E+00	1.07E-24	1.15E-19	2.43E-19	2.10E-06	0.00E+00	0.130
0.140	0.00E+00	6.93E-24	7.84E-19	5.41E-18	4.41E-06	0.00E+00	0.140
0.150	0.00E+00	3.80E-23	4.49E-18	7.91E-17	8.65E-06	0.00E+00	0.150
0.160	0.00E+00	1.80E-22	2.21E-17	8.21E-16	1.60E-05	0.00E+00	0.160
0.180	0.00E+00	2.82E-21	3.74E-16	4.00E-14	4.73E-05	0.00E+00	0.180
0.200	0.00E+00	3.03E-20	4.28E-15	8.79E-13	1.20E-04	0.00E+00	0.200
0.250	0.00E+00	3.50E-18	5.66E-13	2.18E-10	7.66E-04	0.00E+00	0.250
0.300	0.00E+00	1.38E-16	2.54E-11	8.21E-09	3.12E-03	0.00E+00	0.300
0.350	0.00E+00	3.86E-15	8.92E-10	1.06E-07	9.48E-03	0.00E+00	0.350
0.400	0.00E+00	1.08E-13	2.90E-08	7.11E-07	2.36E-02	0.00E+00	0.400
0.450	0.00E+00	2.00E-12	5.60E-07	3.12E-06	5.09E-02	0.00E+00	0.450
0.500	0.00E+00	2.21E-11	6.26E-06	1.04E-05	9.82E-02	0.00E+00	0.500
0.600	2.20E-46	8.19E-10	2.34E-04	7.05E-05	2.88E-01	5.93E-45	0.600
0.700	1.05E-38	1.06E-08	3.05E-03	3.45E-04	6.75E-01	7.37E-38	0.700
0.800	5.95E-33	7.07E-08	2.06E-02	1.38E-03	1.36E+00	1.74E-32	0.800
0.900	1.76E-28	3.06E-07	9.10E-02	4.62E-03	2.44E+00	2.88E-28	0.900
1.000	6.61E-25	9.91E-07	3.03E-01	1.31E-02	4.02E+00	7.30E-25	1.000
1.250	1.75E-18	9.00E-06	3.09E+00	1.00E-01	1.09E+01	1.16E-18	1.250
1.500	3.23E-14	5.15E-05	1.95E+01	4.37E-01	2.30E+01	1.85E-14	1.500
1.750	3.52E-11	2.41E-04	9.13E+01	1.34E+00	4.17E+01	2.03E-11	1.750
2.000	6.53E-09	9.31E-04	3.30E+02	3.26E+00	6.77E+01	4.08E-09	2.000
2.500	9.28E-06	8.14E-03	2.35E+03	1.24E+01	1.44E+02	7.49E-06	2.500
3.000	1.11E-03	4.23E-02	9.76E+03	3.26E+01	2.55E+02	1.18E-03	3.000
3.500	3.22E-02	1.57E-01	2.93E+04	6.83E+01	4.00E+02	4.51E-02	3.500
4.000	3.86E-01	4.61E-01	7.16E+04	1.22E+02	5.79E+02	6.95E-01	4.000
5.000	1.14E+01	2.53E+00	2.87E+05	2.90E+02	1.03E+03	3.16E+01	5.000
6.000	9.94E+01	9.38E+00	8.25E+05	5.25E+02	1.58E+03	3.92E+02	6.000
7.000	4.52E+02	2.70E+01	1.93E+06	7.91E+02	2.23E+03	2.30E+03	7.000
8.000	1.45E+03	6.53E+01	3.90E+06	1.04E+03	2.95E+03	8.41E+03	8.000
9.000	3.92E+03	1.39E+02	7.12E+06	1.24E+03	3.73E+03	2.25E+04	9.000
10.000	9.69E+03	2.70E+02	1.20E+07	1.35E+03	4.56E+03	4.83E+04	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 15

T9	016AG	017PGI	017PAI	017AG	017AN	018PG	T9
0.002	0.00E+00	3.34E-48	2.64E-49	0.00E+00	0.00E+00	4.93E-48	0.002
0.003	0.00E+00	4.78E-41	3.99E-42	0.00E+00	0.00E+00	7.45E-41	0.003
0.004	0.00E+00	1.55E-36	1.36E-37	0.00E+00	0.00E+00	2.94E-36	0.004
0.005	0.00E+00	2.49E-33	2.30E-34	0.00E+00	0.00E+00	3.47E-32	0.005
0.006	0.00E+00	6.91E-31	6.70E-32	0.00E+00	0.00E+00	5.24E-29	0.006
0.007	0.00E+00	6.16E-29	6.25E-30	0.00E+00	0.00E+00	1.01E-26	0.007
0.008	0.00E+00	2.50E-27	2.65E-28	0.00E+00	0.00E+00	5.08E-25	0.008
0.009	0.00E+00	5.70E-26	6.30E-27	0.00E+00	0.00E+00	1.05E-23	0.009
0.010	0.00E+00	8.42E-25	9.68E-26	0.00E+00	0.00E+00	1.18E-22	0.010
0.011	0.00E+00	8.85E-24	1.06E-24	0.00E+00	0.00E+00	8.39E-22	0.011
0.012	0.00E+00	7.09E-23	8.82E-24	0.00E+00	0.00E+00	4.30E-21	0.012
0.013	0.00E+00	4.56E-22	5.88E-23	0.00E+00	0.00E+00	1.71E-20	0.013
0.014	0.00E+00	2.44E-21	3.26E-22	0.00E+00	0.00E+00	5.68E-20	0.014
0.015	0.00E+00	1.12E-20	1.55E-21	0.00E+00	0.00E+00	1.64E-19	0.015
0.016	0.00E+00	4.50E-20	6.49E-21	0.00E+00	0.00E+00	4.34E-19	0.016
0.018	0.00E+00	5.28E-19	8.77E-20	1.55E-48	1.05E-47	2.63E-18	0.018
0.020	0.00E+00	4.39E-18	1.06E-18	2.74E-46	1.87E-45	1.50E-17	0.020
0.025	9.77E-49	3.05E-16	4.07E-16	8.70E-42	6.07E-41	8.43E-16	0.025
0.030	2.62E-45	7.70E-15	3.47E-14	2.35E-38	1.68E-37	2.22E-14	0.030
0.040	2.61E-40	8.44E-13	9.11E-12	2.34E-33	1.73E-32	2.76E-12	0.040
0.050	9.35E-37	2.37E-11	2.43E-10	8.29E-30	6.36E-29	1.30E-10	0.050
0.060	4.80E-34	3.00E-10	2.08E-09	4.19E-27	3.32E-26	1.03E-08	0.060
0.070	7.01E-32	2.32E-09	9.53E-09	6.00E-25	4.91E-24	3.95E-07	0.070
0.080	4.27E-30	1.33E-08	3.10E-08	3.58E-23	3.02E-22	6.28E-06	0.080
0.090	1.38E-28	6.59E-08	9.10E-08	1.13E-21	9.81E-21	5.33E-05	0.090
0.100	2.74E-27	2.91E-07	2.90E-07	2.20E-20	1.96E-19	2.91E-04	0.100
0.110	3.74E-26	1.13E-06	9.90E-07	2.93E-19	2.69E-18	1.15E-03	0.110
0.120	3.78E-25	3.73E-06	3.21E-06	2.89E-18	2.73E-17	3.57E-03	0.120
0.130	2.99E-24	1.07E-05	9.23E-06	2.23E-17	2.16E-16	9.23E-03	0.130
0.140	1.93E-23	2.66E-05	2.34E-05	1.41E-16	1.40E-15	2.07E-02	0.140
0.150	1.05E-22	5.91E-05	5.27E-05	7.46E-16	7.61E-15	4.13E-02	0.150
0.160	4.94E-22	1.19E-04	1.08E-04	3.43E-15	3.58E-14	7.52E-02	0.160
0.180	7.74E-21	3.85E-04	3.77E-04	5.04E-14	5.54E-13	2.01E-01	0.180
0.200	1.11E-19	9.80E-04	1.24E-03	5.08E-13	5.84E-12	4.34E-01	0.200
0.250	6.55E-16	5.26E-03	3.53E-02	5.03E-11	6.49E-10	1.65E+00	0.250
0.300	4.76E-13	1.68E-02	6.37E-01	1.62E-09	2.33E-08	3.82E+00	0.300
0.350	5.19E-11	4.58E-02	5.52E+00	2.53E-08	4.03E-07	6.71E+00	0.350
0.400	1.74E-09	1.38E-01	2.87E+01	2.38E-07	4.20E-06	9.99E+00	0.400
0.450	2.66E-08	4.48E-01	1.05E+02	1.55E-06	3.03E-05	1.34E+01	0.450
0.500	2.36E-07	1.36E+00	2.99E+02	7.65E-06	1.65E-04	1.68E+01	0.500
0.600	6.34E-06	8.12E+00	1.48E+03	1.02E-04	2.65E-03	2.38E+01	0.600
0.700	6.72E-05	3.00E+01	4.74E+03	7.68E-04	2.40E-02	3.31E+01	0.700
0.800	3.97E-04	7.95E+01	1.16E+04	3.90E-03	1.45E-01	4.80E+01	0.800
0.900	1.58E-03	1.68E+02	2.35E+04	1.49E-02	6.59E-01	7.21E+01	0.900
1.000	4.73E-03	3.03E+02	4.18E+04	4.58E-02	2.39E+00	1.09E+02	1.000
1.250	3.35E-02	8.49E+02	1.22E+05	3.89E-01	3.05E+01	2.73E+02	1.250
1.500	1.20E-01	1.64E+03	2.58E+05	1.76E+00	2.03E+02	5.53E+02	1.500
1.750	2.90E-01	2.57E+03	4.51E+05	5.35E+00	8.86E+02	9.47E+02	1.750
2.000	5.51E-01	3.54E+03	6.99E+05	1.24E+01	2.89E+03	1.44E+03	2.000
2.500	1.31E+00	5.42E+03	1.34E+06	3.96E+01	1.71E+04	2.65E+03	2.500
3.000	2.29E+00	7.04E+03	2.13E+06	8.39E+01	6.07E+04	4.07E+03	3.000
3.500	3.51E+00	8.39E+03	3.04E+06	1.42E+02	1.55E+05	5.60E+03	3.500
4.000	5.13E+00	9.54E+03	4.04E+06	2.13E+02	3.18E+05	7.17E+03	4.000
5.000	1.07E+01	1.14E+04	6.24E+06	4.01E+02	8.54E+05	1.03E+04	5.000
6.000	2.20E+01	1.30E+04	8.63E+06	6.65E+02	1.58E+06	1.34E+04	6.000
7.000	4.19E+01	1.44E+04	1.11E+07	1.01E+03	2.34E+06	1.64E+04	7.000
8.000	7.34E+01	1.58E+04	1.37E+07	1.40E+03	2.98E+06	1.91E+04	8.000
9.000	1.19E+02	1.71E+04	1.64E+07	1.82E+03	3.44E+06	2.18E+04	9.000
10.000	1.80E+02	1.85E+04	1.91E+07	2.24E+03	3.71E+06	2.43E+04	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 16

T9	018PA	018AGI	018AN	F19PG	F19PN	F19PA	T9
0.002	5.12E-45	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.50E-50	0.002
0.003	7.70E-38	0.00E+00	0.00E+00	8.73E-46	0.00E+00	5.12E-42	0.003
0.004	2.62E-33	0.00E+00	0.00E+00	7.07E-41	0.00E+00	4.15E-37	0.004
0.005	6.71E-30	0.00E+00	0.00E+00	2.19E-37	0.00E+00	1.29E-33	0.005
0.006	5.28E-27	0.00E+00	0.00E+00	1.01E-34	0.00E+00	5.92E-31	0.006
0.007	9.00E-25	0.00E+00	0.00E+00	1.35E-32	0.00E+00	7.93E-29	0.007
0.008	4.45E-23	0.00E+00	0.00E+00	7.70E-31	0.00E+00	4.51E-27	0.008
0.009	9.36E-22	0.00E+00	0.00E+00	2.34E-29	0.00E+00	1.37E-25	0.009
0.010	1.08E-20	0.00E+00	0.00E+00	4.44E-28	0.00E+00	2.60E-24	0.010
0.011	8.26E-20	0.00E+00	0.00E+00	5.82E-27	0.00E+00	3.40E-23	0.011
0.012	4.72E-19	0.00E+00	0.00E+00	5.67E-26	0.00E+00	3.32E-22	0.012
0.013	2.22E-18	0.00E+00	0.00E+00	4.34E-25	0.00E+00	2.54E-21	0.013
0.014	9.17E-18	0.00E+00	0.00E+00	2.72E-24	0.00E+00	1.59E-20	0.014
0.015	3.48E-17	0.00E+00	0.00E+00	1.45E-23	0.00E+00	8.45E-20	0.015
0.016	1.23E-16	0.00E+00	0.00E+00	6.65E-23	0.00E+00	3.89E-19	0.016
0.018	1.28E-15	0.00E+00	0.00E+00	9.90E-22	0.00E+00	5.78E-18	0.018
0.020	1.03E-14	0.00E+00	0.00E+00	1.01E-20	0.00E+00	5.92E-17	0.020
0.025	7.36E-13	5.88E-45	0.00E+00	1.07E-18	0.00E+00	6.26E-15	0.025
0.030	1.95E-11	2.62E-39	0.00E+00	3.75E-17	0.00E+00	2.19E-13	0.030
0.040	2.33E-09	2.80E-32	0.00E+00	6.69E-15	0.00E+00	3.91E-11	0.040
0.050	7.75E-08	4.28E-28	0.00E+00	2.67E-13	0.00E+00	1.56E-09	0.050
0.060	2.42E-06	2.51E-25	0.00E+00	4.45E-12	0.00E+00	2.61E-08	0.060
0.070	7.01E-05	2.30E-23	1.84E-48	4.21E-11	0.00E+00	2.48E-07	0.070
0.080	1.05E-03	6.62E-22	3.19E-42	2.69E-10	0.00E+00	1.59E-06	0.080
0.090	8.79E-03	8.84E-21	2.27E-37	1.29E-09	0.00E+00	7.67E-06	0.090
0.100	4.76E-02	6.92E-20	1.73E-33	4.96E-09	0.00E+00	2.98E-05	0.100
0.110	1.88E-01	3.68E-19	2.60E-30	1.62E-08	0.00E+00	9.76E-05	0.110
0.120	5.83E-01	1.47E-18	1.15E-27	4.61E-08	0.00E+00	2.81E-04	0.120
0.130	1.51E+00	4.90E-18	2.00E-25	1.20E-07	0.00E+00	7.36E-04	0.130
0.140	3.38E+00	1.94E-17	1.66E-23	2.96E-07	0.00E+00	1.83E-03	0.140
0.150	6.75E+00	1.50E-16	7.66E-22	7.23E-07	0.00E+00	4.47E-03	0.150
0.160	1.23E+01	1.54E-15	2.19E-20	1.80E-06	0.00E+00	1.11E-02	0.160
0.180	3.29E+01	9.42E-14	5.84E-18	1.12E-05	0.00E+00	6.81E-02	0.180
0.200	7.12E+01	2.58E-12	5.10E-16	6.15E-05	0.00E+00	3.67E-01	0.200
0.250	2.74E+02	9.73E-10	1.64E-12	1.63E-03	0.00E+00	9.56E+00	0.250
0.300	6.53E+02	4.99E-08	4.97E-10	1.51E-02	0.00E+00	8.63E+01	0.300
0.350	1.21E+03	8.28E-07	3.47E-08	7.61E-02	1.51E-50	4.10E+02	0.350
0.400	2.01E+03	6.78E-06	7.98E-07	2.69E-01	2.60E-43	1.32E+03	0.400
0.450	3.33E+03	3.47E-05	8.96E-06	7.64E-01	1.10E-37	3.35E+03	0.450
0.500	6.14E+03	1.28E-04	6.28E-05	1.87E+00	3.51E-33	7.28E+03	0.500
0.600	2.72E+04	8.92E-04	1.28E-03	7.97E+00	1.99E-26	2.61E+04	0.600
0.700	1.10E+05	3.52E-03	1.26E-02	2.39E+01	1.32E-21	7.30E+04	0.700
0.800	3.36E+05	9.68E-03	7.91E-02	5.51E+01	5.49E-18	1.67E+05	0.800
0.900	8.12E+05	2.10E-02	3.66E-01	1.05E+02	3.58E-15	3.27E+05	0.900
1.000	1.64E+06	3.86E-02	1.36E+00	1.75E+02	6.38E-13	5.63E+05	1.000
1.250	5.66E+06	1.19E-01	1.81E+01	4.29E+02	7.20E-09	1.50E+06	1.250
1.500	1.25E+07	3.23E-01	1.27E+02	7.59E+02	3.63E-06	2.88E+06	1.500
1.750	2.13E+07	9.88E-01	5.85E+02	1.12E+03	3.10E-04	4.54E+06	1.750
2.000	3.12E+07	2.99E+00	2.02E+03	1.49E+03	8.72E-03	6.37E+06	2.000
2.500	5.07E+07	1.81E+01	1.36E+04	2.16E+03	9.36E-01	1.02E+07	2.500
3.000	6.73E+07	6.57E+01	5.54E+04	2.73E+03	2.13E+01	1.37E+07	3.000
3.500	8.05E+07	1.71E+02	1.63E+05	3.17E+03	1.99E+02	1.69E+07	3.500
4.000	9.04E+07	3.58E+02	3.84E+05	3.50E+03	1.07E+03	1.96E+07	4.000
5.000	1.02E+08	1.04E+03	1.35E+06	3.91E+03	1.14E+04	2.37E+07	5.000
6.000	1.07E+08	2.20E+03	3.21E+06	4.09E+03	5.61E+04	2.64E+07	6.000
7.000	1.07E+08	3.85E+03	5.92E+06	4.13E+03	1.77E+05	2.81E+07	7.000
8.000	1.06E+08	5.96E+03	9.23E+06	4.10E+03	4.23E+05	2.91E+07	8.000
9.000	1.03E+08	8.49E+03	1.28E+07	4.04E+03	8.40E+05	2.97E+07	9.000
10.000	9.91E+07	1.14E+04	1.64E+07	3.95E+03	1.46E+06	3.01E+07	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 17

T9	F19AP	NE19PG	NE20PG	NE20PA	NE20AGI	NE21PGI	T9
0.003	0.00E+00	0.00E+00	1.22E-47	0.00E+00	0.00E+00	5.69E-49	0.003
0.004	0.00E+00	5.26E-46	1.82E-42	0.00E+00	0.00E+00	1.08E-43	0.004
0.005	0.00E+00	2.94E-42	8.49E-39	0.00E+00	0.00E+00	6.13E-40	0.005
0.006	0.00E+00	2.12E-39	5.27E-36	0.00E+00	0.00E+00	4.48E-37	0.006
0.007	0.00E+00	4.06E-37	8.87E-34	0.00E+00	0.00E+00	8.68E-35	0.007
0.008	0.00E+00	3.09E-35	6.05E-32	0.00E+00	0.00E+00	6.69E-33	0.008
0.009	0.00E+00	1.21E-33	2.13E-30	0.00E+00	0.00E+00	2.63E-31	0.009
0.010	0.00E+00	2.83E-32	4.57E-29	0.00E+00	0.00E+00	6.22E-30	0.010
0.011	0.00E+00	4.46E-31	6.65E-28	0.00E+00	0.00E+00	9.88E-29	0.011
0.012	0.00E+00	5.12E-30	7.10E-27	0.00E+00	0.00E+00	1.14E-27	0.012
0.013	0.00E+00	4.54E-29	5.88E-26	0.00E+00	0.00E+00	1.02E-26	0.013
0.014	0.00E+00	3.25E-28	3.96E-25	0.00E+00	0.00E+00	7.33E-26	0.014
0.015	0.00E+00	1.94E-27	2.23E-24	0.00E+00	0.00E+00	4.41E-25	0.015
0.016	0.00E+00	9.97E-27	1.09E-23	0.00E+00	0.00E+00	2.27E-24	0.016
0.018	0.00E+00	1.80E-25	1.78E-22	0.00E+00	0.00E+00	4.16E-23	0.018
0.020	1.74E-50	2.17E-24	1.97E-21	0.00E+00	0.00E+00	5.79E-22	0.020
0.025	1.45E-45	3.18E-22	2.42E-19	0.00E+00	0.00E+00	2.87E-18	0.025
0.030	8.21E-42	1.42E-20	9.43E-18	0.00E+00	0.00E+00	2.96E-15	0.030
0.040	2.43E-36	3.61E-18	1.94E-15	0.00E+00	1.61E-47	1.66E-11	0.040
0.050	1.89E-32	1.84E-16	8.53E-14	0.00E+00	2.56E-43	3.00E-09	0.050
0.060	1.75E-29	3.69E-15	1.52E-12	0.00E+00	4.10E-40	1.04E-07	0.060
0.070	4.10E-27	4.03E-14	1.51E-11	0.00E+00	1.49E-37	1.44E-06	0.070
0.080	3.69E-25	2.89E-13	1.00E-10	0.00E+00	1.94E-35	1.10E-05	0.080
0.090	1.65E-23	1.53E-12	4.96E-10	0.00E+00	1.19E-33	5.52E-05	0.090
0.100	4.35E-22	6.40E-12	1.96E-09	0.00E+00	4.12E-32	2.03E-04	0.100
0.110	7.60E-21	2.24E-11	6.51E-09	0.00E+00	9.16E-31	5.92E-04	0.110
0.120	9.54E-20	6.78E-11	1.88E-08	0.00E+00	1.44E-29	1.44E-03	0.120
0.130	9.15E-19	1.83E-10	4.86E-08	0.00E+00	1.99E-28	3.07E-03	0.130
0.140	7.02E-18	4.46E-10	1.14E-07	0.00E+00	5.88E-27	5.86E-03	0.140
0.150	4.46E-17	1.00E-09	2.48E-07	0.00E+00	3.14E-25	1.04E-02	0.150
0.160	2.42E-16	2.11E-09	5.04E-07	0.00E+00	1.24E-23	1.73E-02	0.160
0.180	4.80E-15	7.82E-09	1.77E-06	0.00E+00	5.85E-21	4.40E-02	0.180
0.200	6.26E-14	2.42E-08	5.28E-06	0.00E+00	7.98E-19	1.06E-01	0.200
0.250	1.05E-11	2.35E-07	5.10E-05	0.00E+00	5.34E-15	7.94E-01	0.250
0.300	5.08E-10	1.63E-06	3.17E-04	0.00E+00	1.82E-12	3.81E+00	0.300
0.350	1.09E-08	1.55E-05	1.39E-03	0.00E+00	1.14E-10	1.21E+01	0.350
0.400	1.34E-07	1.51E-04	4.54E-03	0.00E+00	2.50E-09	2.86E+01	0.400
0.450	1.09E-06	1.01E-03	1.18E-02	0.00E+00	2.71E-08	5.56E+01	0.450
0.500	6.57E-06	4.74E-03	2.59E-02	7.70E-46	1.80E-07	9.46E+01	0.500
0.600	1.30E-04	4.76E-02	8.76E-02	1.36E-37	3.06E-06	2.14E+02	0.600
0.700	1.50E-03	2.41E-01	2.20E-01	1.34E-31	2.38E-05	4.05E+02	0.700
0.800	1.17E-02	7.98E-01	4.73E-01	4.92E-27	1.23E-04	6.89E+02	0.800
0.900	6.58E-02	1.99E+00	9.45E-01	1.97E-23	5.26E-04	1.09E+03	0.900
1.000	2.80E-01	4.07E+00	1.82E+00	1.65E-20	1.99E-03	1.63E+03	1.000
1.250	4.36E+00	1.42E+01	8.05E+00	3.81E-15	3.19E-02	3.58E+03	1.250
1.500	3.01E+01	3.13E+01	2.68E+01	1.80E-11	2.43E-01	6.26E+03	1.500
1.750	1.26E+02	5.35E+01	6.78E+01	8.69E-09	1.09E+00	9.39E+03	1.750
2.000	3.83E+02	7.82E+01	1.40E+02	9.82E-07	3.46E+00	1.27E+04	2.000
2.500	1.92E+03	1.27E+02	3.93E+02	8.62E-04	1.80E+01	1.93E+04	2.500
3.000	5.90E+03	1.70E+02	7.92E+02	8.91E-02	5.53E+01	2.51E+04	3.000
3.500	1.36E+04	2.02E+02	1.32E+03	2.61E+00	1.24E+02	3.00E+04	3.500
4.000	2.63E+04	2.27E+02	1.94E+03	3.41E+01	2.28E+02	3.40E+04	4.000
5.000	6.95E+04	2.59E+02	3.37E+03	1.30E+03	5.28E+02	4.02E+04	5.000
6.000	1.40E+05	2.79E+02	4.95E+03	1.49E+04	9.02E+02	4.46E+04	6.000
7.000	2.39E+05	2.95E+02	6.62E+03	8.33E+04	1.30E+03	4.80E+04	7.000
8.000	3.66E+05	3.14E+02	8.34E+03	2.94E+05	1.67E+03	5.09E+04	8.000
9.000	5.22E+05	3.39E+02	1.01E+04	7.56E+05	2.02E+03	5.35E+04	9.000
10.000	7.04E+05	3.71E+02	1.19E+04	1.53E+06	2.34E+03	5.60E+04	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 18

T9	NE21AG	NE21AN	NE22PGI	NE22AG	NE22AN	NA21PG	T9
0.003	0.00E+00	0.00E+00	1.26E-48	0.00E+00	0.00E+00	0.00E+00	0.003
0.004	0.00E+00	0.00E+00	2.39E-43	0.00E+00	0.00E+00	1.16E-50	0.004
0.005	0.00E+00	0.00E+00	1.77E-38	0.00E+00	0.00E+00	1.19E-46	0.005
0.006	0.00E+00	0.00E+00	1.36E-33	0.00E+00	0.00E+00	1.37E-43	0.006
0.007	0.00E+00	0.00E+00	4.28E-30	0.00E+00	0.00E+00	3.83E-41	0.007
0.008	0.00E+00	0.00E+00	1.75E-27	0.00E+00	0.00E+00	4.00E-39	0.008
0.009	0.00E+00	0.00E+00	1.84E-25	0.00E+00	0.00E+00	2.04E-37	0.009
0.010	0.00E+00	0.00E+00	7.52E-24	0.00E+00	0.00E+00	6.02E-36	0.010
0.011	0.00E+00	0.00E+00	1.54E-22	0.00E+00	0.00E+00	1.16E-34	0.011
0.012	0.00E+00	0.00E+00	1.89E-21	0.00E+00	0.00E+00	1.61E-33	0.012
0.013	0.00E+00	0.00E+00	1.56E-20	0.00E+00	0.00E+00	1.68E-32	0.013
0.014	0.00E+00	0.00E+00	9.45E-20	0.00E+00	0.00E+00	1.39E-31	0.014
0.015	0.00E+00	0.00E+00	4.47E-19	0.00E+00	0.00E+00	9.55E-31	0.015
0.016	0.00E+00	0.00E+00	1.73E-18	0.00E+00	0.00E+00	5.55E-30	0.016
0.018	0.00E+00	0.00E+00	1.62E-17	0.00E+00	0.00E+00	1.25E-28	0.018
0.020	0.00E+00	0.00E+00	9.59E-17	0.00E+00	0.00E+00	1.84E-27	0.020
0.025	0.00E+00	1.22E-49	2.23E-15	6.91E-50	0.00E+00	4.03E-25	0.025
0.030	2.00E-49	1.37E-45	1.72E-14	7.90E-46	0.00E+00	2.47E-23	0.030
0.040	1.58E-43	1.09E-39	2.05E-13	6.47E-40	0.00E+00	1.01E-20	0.040
0.050	2.47E-39	1.71E-35	9.23E-13	1.03E-35	0.00E+00	5.14E-18	0.050
0.060	3.88E-36	2.72E-32	4.04E-12	1.64E-32	6.18E-45	1.29E-14	0.060
0.070	1.38E-33	9.74E-30	3.25E-11	5.88E-30	3.61E-39	3.80E-12	0.070
0.080	1.75E-31	1.24E-27	3.18E-10	7.46E-28	7.63E-35	2.67E-10	0.080
0.090	1.05E-29	7.50E-26	2.42E-09	4.44E-26	1.76E-31	7.19E-09	0.090
0.100	3.56E-28	2.55E-24	1.33E-08	1.49E-24	8.66E-29	9.95E-08	0.100
0.110	7.72E-27	5.57E-23	5.50E-08	3.17E-23	1.38E-26	8.49E-07	0.110
0.120	1.17E-25	8.52E-22	1.81E-07	4.72E-22	9.50E-25	5.03E-06	0.120
0.130	1.34E-24	9.76E-21	4.99E-07	5.24E-21	3.67E-23	2.26E-05	0.130
0.140	1.20E-23	8.79E-20	1.19E-06	4.56E-20	9.93E-22	8.15E-05	0.140
0.150	8.77E-23	6.47E-19	2.53E-06	3.22E-19	1.94E-20	2.47E-04	0.150
0.160	5.41E-22	4.01E-18	4.91E-06	1.91E-18	2.63E-19	6.49E-04	0.160
0.180	1.35E-20	1.01E-16	1.53E-05	4.35E-17	1.87E-17	3.22E-03	0.180
0.200	2.15E-19	1.62E-15	4.22E-05	6.20E-16	5.30E-16	1.15E-02	0.200
0.250	5.41E-17	4.17E-13	7.97E-04	1.09E-13	2.37E-13	1.11E-01	0.250
0.300	3.62E-15	2.85E-11	1.42E-02	4.56E-12	1.86E-11	4.93E-01	0.300
0.350	1.03E-13	8.22E-10	1.25E-01	7.16E-11	5.62E-10	1.40E+00	0.350
0.400	1.60E-12	1.31E-08	6.48E-01	5.48E-10	9.13E-09	3.03E+00	0.400
0.450	1.62E-11	1.35E-07	2.32E+00	2.42E-09	9.53E-08	5.45E+00	0.450
0.500	1.19E-10	1.00E-06	6.46E+00	6.90E-09	7.14E-07	8.65E+00	0.500
0.600	3.09E-09	2.68E-05	3.04E+01	2.62E-08	1.94E-05	1.70E+01	0.600
0.700	4.11E-08	3.66E-04	9.52E+01	1.46E-07	2.67E-04	2.71E+01	0.700
0.800	3.44E-07	3.15E-03	2.32E+02	1.15E-06	2.30E-03	3.78E+01	0.800
0.900	2.08E-06	1.95E-02	4.79E+02	7.01E-06	1.40E-02	4.86E+01	0.900
1.000	9.82E-06	9.43E-02	8.73E+02	3.30E-05	6.60E-02	5.88E+01	1.000
1.250	2.20E-04	2.23E+00	2.70E+03	7.18E-04	1.44E+00	8.10E+01	1.250
1.500	2.20E-03	2.33E+01	5.88E+03	7.30E-03	1.46E+01	9.77E+01	1.500
1.750	1.27E-02	1.40E+02	1.04E+04	4.55E-02	9.09E+01	1.10E+02	1.750
2.000	5.08E-02	5.81E+02	1.58E+04	2.02E-01	4.03E+02	1.18E+02	2.000
2.500	4.07E-01	4.96E+03	2.86E+04	2.00E+00	4.01E+03	1.28E+02	2.500
3.000	1.88E+00	2.42E+04	4.20E+04	1.09E+01	2.19E+04	1.31E+02	3.000
3.500	6.24E+00	8.35E+04	5.50E+04	4.04E+01	8.08E+04	1.31E+02	3.500
4.000	1.65E+01	2.28E+05	6.70E+04	1.14E+02	2.28E+05	1.29E+02	4.000
5.000	7.28E+01	1.06E+06	8.76E+04	5.28E+02	1.06E+06	1.23E+02	5.000
6.000	2.16E+02	3.27E+06	1.04E+05	1.56E+03	3.11E+06	1.17E+02	6.000
7.000	4.99E+02	7.70E+06	1.18E+05	3.47E+03	6.95E+06	1.10E+02	7.000
8.000	9.68E+02	1.51E+07	1.30E+05	6.47E+03	1.29E+07	1.04E+02	8.000
9.000	1.66E+03	2.60E+07	1.41E+05	1.06E+04	2.12E+07	9.87E+01	9.000
10.000	2.59E+03	4.07E+07	1.51E+05	1.59E+04	3.19E+07	9.37E+01	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 19

T9	NA22NP	NA22NA	NA22PG	NA23PG	NA23PN	NA23PAI	T9
0.001	3.37E+08	3.29E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.001
0.002	3.37E+08	3.30E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.002
0.003	3.37E+08	3.30E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.003
0.004	3.37E+08	3.30E+06	0.00E+00	1.87E-47	0.00E+00	6.49E-46	0.004
0.005	3.37E+08	3.30E+06	0.00E+00	1.92E-43	0.00E+00	6.85E-42	0.005
0.006	3.37E+08	3.31E+06	1.69E-45	2.21E-40	0.00E+00	8.07E-39	0.006
0.007	3.37E+08	3.31E+06	4.74E-40	6.14E-38	0.00E+00	2.39E-36	0.007
0.008	3.37E+08	3.31E+06	5.92E-36	6.38E-36	0.00E+00	4.76E-34	0.008
0.009	3.37E+08	3.32E+06	9.27E-33	3.23E-34	0.00E+00	1.09E-31	0.009
0.010	3.37E+08	3.32E+06	3.39E-30	9.50E-33	0.00E+00	1.22E-29	0.010
0.011	3.37E+08	3.32E+06	4.30E-28	1.83E-31	0.00E+00	6.04E-28	0.011
0.012	3.37E+08	3.32E+06	2.46E-26	2.50E-30	0.00E+00	1.56E-26	0.012
0.013	3.37E+08	3.33E+06	7.64E-25	2.60E-29	0.00E+00	2.42E-25	0.013
0.014	3.37E+08	3.33E+06	1.46E-23	2.15E-28	0.00E+00	2.52E-24	0.014
0.015	3.37E+08	3.33E+06	1.90E-22	1.46E-27	0.00E+00	1.91E-23	0.015
0.016	3.37E+08	3.34E+06	1.81E-21	8.45E-27	0.00E+00	1.12E-22	0.016
0.018	3.37E+08	3.34E+06	7.81E-20	1.88E-25	0.00E+00	2.09E-21	0.018
0.020	3.37E+08	3.35E+06	1.62E-18	2.73E-24	0.00E+00	2.14E-20	0.020
0.025	3.37E+08	3.36E+06	3.97E-16	5.81E-22	0.00E+00	1.36E-18	0.025
0.030	3.37E+08	3.38E+06	1.64E-14	3.46E-20	0.00E+00	2.17E-17	0.030
0.040	3.37E+08	3.41E+06	1.88E-12	1.34E-17	0.00E+00	1.30E-15	0.040
0.050	3.37E+08	3.44E+06	3.48E-11	9.31E-16	0.00E+00	6.15E-14	0.050
0.060	3.36E+08	3.47E+06	2.60E-10	2.37E-14	0.00E+00	2.56E-12	0.060
0.070	3.36E+08	3.50E+06	1.68E-09	3.38E-13	0.00E+00	1.17E-10	0.070
0.080	3.36E+08	3.53E+06	2.71E-08	5.80E-12	0.00E+00	2.96E-09	0.080
0.090	3.36E+08	3.56E+06	4.45E-07	1.55E-10	0.00E+00	3.83E-08	0.090
0.100	3.36E+08	3.60E+06	4.56E-06	3.08E-09	0.00E+00	2.98E-07	0.100
0.110	3.36E+08	3.63E+06	3.12E-05	3.96E-08	0.00E+00	1.62E-06	0.110
0.120	3.36E+08	3.66E+06	1.56E-04	3.52E-07	0.00E+00	6.80E-06	0.120
0.130	3.36E+08	3.69E+06	6.15E-04	2.32E-06	0.00E+00	2.40E-05	0.130
0.140	3.36E+08	3.72E+06	2.00E-03	1.20E-05	0.00E+00	7.55E-05	0.140
0.150	3.36E+08	3.76E+06	5.59E-03	5.07E-05	0.00E+00	2.18E-04	0.150
0.160	3.36E+08	3.79E+06	1.38E-02	1.80E-04	0.00E+00	5.83E-04	0.160
0.180	3.35E+08	3.86E+06	6.28E-02	1.51E-03	0.00E+00	3.39E-03	0.180
0.200	3.35E+08	3.93E+06	2.14E-01	8.30E-03	0.00E+00	1.51E-02	0.200
0.250	3.35E+08	4.10E+06	2.00E+00	1.74E-01	0.00E+00	2.42E-01	0.250
0.300	3.34E+08	4.28E+06	9.18E+00	1.28E+00	0.00E+00	1.59E+00	0.300
0.350	3.34E+08	4.47E+06	2.79E+01	5.17E+00	0.00E+00	6.30E+00	0.350
0.400	3.33E+08	4.66E+06	6.55E+01	1.44E+01	0.00E+00	1.88E+01	0.400
0.450	3.33E+08	4.87E+06	1.29E+02	3.12E+01	1.12E-46	4.72E+01	0.450
0.500	3.33E+08	5.08E+06	2.24E+02	5.73E+01	3.07E-41	1.06E+02	0.500
0.600	3.32E+08	5.52E+06	5.26E+02	1.40E+02	4.48E-33	4.14E+02	0.600
0.700	3.31E+08	5.99E+06	9.91E+02	2.60E+02	3.08E-27	1.24E+03	0.700
0.800	3.31E+08	6.50E+06	1.62E+03	4.14E+02	7.42E-23	3.00E+03	0.800
0.900	3.30E+08	7.04E+06	2.41E+03	5.99E+02	1.92E-19	6.19E+03	0.900
1.000	3.30E+08	7.62E+06	3.35E+03	8.14E+02	1.04E-16	1.13E+04	1.000
1.250	3.28E+08	9.24E+06	6.27E+03	1.49E+03	8.75E-12	3.56E+04	1.250
1.500	3.27E+08	1.11E+07	9.84E+03	2.34E+03	1.72E-08	8.07E+04	1.500
1.750	3.27E+08	1.33E+07	1.39E+04	3.33E+03	3.91E-06	1.50E+05	1.750
2.000	3.26E+08	1.58E+07	1.83E+04	4.42E+03	2.32E-04	2.44E+05	2.000
2.500	3.26E+08	2.19E+07	2.80E+04	6.68E+03	7.13E-02	5.08E+05	2.500
3.000	3.26E+08	2.96E+07	3.85E+04	8.86E+03	3.30E+00	8.66E+05	3.000
3.500	3.26E+08	3.90E+07	4.94E+04	1.09E+04	5.15E+01	1.31E+06	3.500
4.000	3.26E+08	5.02E+07	6.07E+04	1.27E+04	4.07E+02	1.83E+06	4.000
5.000	3.27E+08	7.73E+07	8.39E+04	1.57E+04	7.42E+03	3.06E+06	5.000
6.000	3.26E+08	1.09E+08	1.08E+05	1.82E+04	5.18E+04	4.52E+06	6.000
7.000	3.22E+08	1.40E+08	1.32E+05	2.02E+04	2.08E+05	6.16E+06	7.000
8.000	3.14E+08	1.67E+08	1.56E+05	2.20E+04	5.94E+05	7.96E+06	8.000
9.000	3.01E+08	1.83E+08	1.81E+05	2.34E+04	1.34E+06	9.89E+06	9.000
10.000	2.83E+08	1.87E+08	2.05E+05	2.47E+04	2.58E+06	1.19E+07	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 20

T9	MG25PGT	MG25PGM	MG25PGG	AL26TGP	AL26MGP	AL26GGP	T9
0.004	9.84E-50	1.97E-50	7.87E-50	0.00E+00	0.00E+00	0.00E+00	0.004
0.005	1.88E-45	3.76E-46	1.50E-45	0.00E+00	0.00E+00	0.00E+00	0.005
0.006	2.50E-41	5.00E-42	2.00E-41	0.00E+00	0.00E+00	0.00E+00	0.006
0.007	5.40E-37	1.08E-37	4.32E-37	0.00E+00	0.00E+00	0.00E+00	0.007
0.008	1.04E-33	2.08E-34	8.34E-34	0.00E+00	0.00E+00	0.00E+00	0.008
0.009	3.67E-31	7.34E-32	2.94E-31	0.00E+00	0.00E+00	0.00E+00	0.009
0.010	3.94E-29	7.88E-30	3.15E-29	0.00E+00	0.00E+00	0.00E+00	0.010
0.011	1.78E-27	3.56E-28	1.43E-27	0.00E+00	0.00E+00	0.00E+00	0.011
0.012	4.23E-26	8.45E-27	3.38E-26	0.00E+00	0.00E+00	0.00E+00	0.012
0.013	6.13E-25	1.23E-25	4.90E-25	0.00E+00	0.00E+00	0.00E+00	0.013
0.014	6.10E-24	1.22E-24	4.88E-24	0.00E+00	0.00E+00	0.00E+00	0.014
0.015	4.60E-23	9.19E-24	3.68E-23	0.00E+00	0.00E+00	0.00E+00	0.015
0.016	2.88E-22	5.76E-23	2.31E-22	0.00E+00	0.00E+00	0.00E+00	0.016
0.018	8.71E-21	1.74E-21	6.97E-21	0.00E+00	0.00E+00	0.00E+00	0.018
0.020	2.06E-19	4.11E-20	1.65E-19	0.00E+00	0.00E+00	0.00E+00	0.020
0.025	1.02E-16	2.04E-17	8.17E-17	0.00E+00	0.00E+00	0.00E+00	0.025
0.030	6.78E-15	1.36E-15	5.43E-15	0.00E+00	0.00E+00	0.00E+00	0.030
0.040	1.20E-12	2.40E-13	9.61E-13	0.00E+00	0.00E+00	0.00E+00	0.040
0.050	2.66E-11	5.32E-12	2.13E-11	0.00E+00	0.00E+00	0.00E+00	0.050
0.060	2.64E-10	5.29E-11	2.12E-10	0.00E+00	0.00E+00	0.00E+00	0.060
0.070	1.96E-09	3.91E-10	1.56E-09	0.00E+00	0.00E+00	0.00E+00	0.070
0.080	1.07E-08	2.13E-09	8.53E-09	0.00E+00	0.00E+00	0.00E+00	0.080
0.090	4.19E-08	8.39E-09	3.35E-08	0.00E+00	0.00E+00	0.00E+00	0.090
0.100	1.25E-07	2.50E-08	1.00E-07	0.00E+00	0.00E+00	0.00E+00	0.100
0.110	3.04E-07	6.07E-08	2.43E-07	0.00E+00	0.00E+00	0.00E+00	0.110
0.120	6.53E-07	1.31E-07	5.22E-07	0.00E+00	0.00E+00	0.00E+00	0.120
0.130	1.41E-06	2.82E-07	1.13E-06	0.00E+00	0.00E+00	0.00E+00	0.130
0.140	3.56E-06	7.13E-07	2.85E-06	0.00E+00	0.00E+00	0.00E+00	0.140
0.150	1.07E-05	2.13E-06	8.54E-06	0.00E+00	0.00E+00	0.00E+00	0.150
0.160	3.35E-05	6.70E-06	2.68E-05	0.00E+00	0.00E+00	0.00E+00	0.160
0.180	2.73E-04	5.46E-05	2.18E-04	0.00E+00	0.00E+00	0.00E+00	0.180
0.200	1.56E-03	3.12E-04	1.25E-03	0.00E+00	0.00E+00	0.00E+00	0.200
0.250	3.76E-02	7.52E-03	3.01E-02	0.00E+00	0.00E+00	0.00E+00	0.250
0.300	3.21E-01	6.43E-02	2.57E-01	0.00E+00	0.00E+00	0.00E+00	0.300
0.350	1.51E+00	3.02E-01	1.21E+00	0.00E+00	0.00E+00	0.00E+00	0.350
0.400	4.88E+00	9.76E-01	3.90E+00	0.00E+00	0.00E+00	0.00E+00	0.400
0.450	1.22E+01	2.45E+00	9.80E+00	0.00E+00	0.00E+00	0.00E+00	0.450
0.500	2.58E+01	5.15E+00	2.06E+01	0.00E+00	1.12E-50	0.00E+00	0.500
0.600	7.97E+01	1.59E+01	6.38E+01	4.07E-42	7.41E-40	3.26E-42	0.600
0.700	1.81E+02	3.62E+01	1.45E+02	4.31E-34	4.17E-32	3.45E-34	0.700
0.800	3.39E+02	6.79E+01	2.71E+02	4.67E-28	2.82E-26	3.74E-28	0.800
0.900	5.57E+02	1.11E+02	4.46E+02	2.38E-23	9.92E-22	1.90E-23	0.900
1.000	8.34E+02	1.67E+02	6.67E+02	1.42E-19	4.40E-18	1.13E-19	1.000
1.250	1.76E+03	3.52E+02	1.41E+03	9.48E-13	1.74E-11	7.59E-13	1.250
1.500	2.95E+03	5.90E+02	2.36E+03	3.61E-08	4.64E-07	2.89E-08	1.500
1.750	4.32E+03	8.64E+02	3.45E+03	7.10E-05	7.08E-04	5.68E-05	1.750
2.000	5.80E+03	1.16E+03	4.64E+03	2.17E-02	1.79E-01	1.74E-02	2.000
2.500	8.93E+03	1.79E+03	7.15E+03	7.04E+01	4.46E+02	5.63E+01	2.500
3.000	1.21E+04	2.41E+03	9.65E+03	1.64E+04	8.73E+04	1.32E+04	3.000
3.500	1.51E+04	3.01E+03	1.21E+04	8.44E+05	3.95E+06	6.75E+05	3.500
4.000	1.79E+04	3.57E+03	1.43E+04	1.67E+07	7.10E+07	1.33E+07	4.000
5.000	2.27E+04	4.54E+03	1.81E+04	1.15E+09	4.29E+09	9.19E+08	5.000
6.000	2.64E+04	5.27E+03	2.11E+04	2.01E+10	6.87E+10	1.61E+10	6.000
7.000	2.89E+04	5.78E+03	2.31E+04	1.59E+11	5.09E+11	1.27E+11	7.000
8.000	3.04E+04	6.07E+03	2.43E+04	7.53E+11	2.30E+12	6.03E+11	8.000
9.000	3.08E+04	6.17E+03	2.47E+04	2.52E+12	7.43E+12	2.02E+12	9.000
10.000	3.04E+04	6.09E+03	2.44E+04	6.58E+12	1.88E+13	5.26E+12	10.000

TABLE III
Thermal Nuclear Reaction Rates I $\leq Z \leq 14$
See page 291 for Explanation of Tables

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 22

T9	AL26TNA	AL26MNA	AL26GNA	NA23ANT	NA23ANM	NA23ANG	T9
0.001	3.38E+06	4.18E+06	3.38E+06	0.00E+00	0.00E+00	0.00E+00	0.001
0.002	3.38E+06	4.18E+06	3.38E+06	0.00E+00	0.00E+00	0.00E+00	0.002
0.003	3.38E+06	4.18E+06	3.38E+06	0.00E+00	0.00E+00	0.00E+00	0.003
0.004	3.39E+06	4.18E+06	3.39E+06	0.00E+00	0.00E+00	0.00E+00	0.004
0.005	3.39E+06	4.18E+06	3.39E+06	0.00E+00	0.00E+00	0.00E+00	0.005
0.006	3.39E+06	4.18E+06	3.39E+06	0.00E+00	0.00E+00	0.00E+00	0.006
0.007	3.39E+06	4.18E+06	3.39E+06	0.00E+00	0.00E+00	0.00E+00	0.007
0.008	3.39E+06	4.18E+06	3.39E+06	0.00E+00	0.00E+00	0.00E+00	0.008
0.009	3.39E+06	4.18E+06	3.39E+06	0.00E+00	0.00E+00	0.00E+00	0.009
0.010	3.39E+06	4.18E+06	3.39E+06	0.00E+00	0.00E+00	0.00E+00	0.010
0.011	3.39E+06	4.18E+06	3.39E+06	0.00E+00	0.00E+00	0.00E+00	0.011
0.012	3.40E+06	4.18E+06	3.40E+06	0.00E+00	0.00E+00	0.00E+00	0.012
0.013	3.40E+06	4.18E+06	3.40E+06	0.00E+00	0.00E+00	0.00E+00	0.013
0.014	3.40E+06	4.18E+06	3.40E+06	0.00E+00	0.00E+00	0.00E+00	0.014
0.015	3.40E+06	4.18E+06	3.40E+06	0.00E+00	0.00E+00	0.00E+00	0.015
0.016	3.40E+06	4.18E+06	3.40E+06	0.00E+00	0.00E+00	0.00E+00	0.016
0.018	3.40E+06	4.18E+06	3.40E+06	0.00E+00	0.00E+00	0.00E+00	0.018
0.020	3.41E+06	4.18E+06	3.41E+06	0.00E+00	0.00E+00	0.00E+00	0.020
0.025	3.41E+06	4.18E+06	3.41E+06	0.00E+00	0.00E+00	0.00E+00	0.025
0.030	3.42E+06	4.18E+06	3.42E+06	0.00E+00	0.00E+00	0.00E+00	0.030
0.040	3.43E+06	4.18E+06	3.43E+06	0.00E+00	0.00E+00	0.00E+00	0.040
0.050	3.45E+06	4.18E+06	3.45E+06	0.00E+00	0.00E+00	0.00E+00	0.050
0.060	3.46E+06	4.18E+06	3.46E+06	0.00E+00	0.00E+00	0.00E+00	0.060
0.070	3.47E+06	4.18E+06	3.47E+06	0.00E+00	0.00E+00	0.00E+00	0.070
0.080	3.49E+06	4.19E+06	3.49E+06	0.00E+00	0.00E+00	0.00E+00	0.080
0.090	3.50E+06	4.22E+06	3.50E+06	0.00E+00	0.00E+00	0.00E+00	0.090
0.100	3.51E+06	4.29E+06	3.51E+06	0.00E+00	0.00E+00	0.00E+00	0.100
0.110	3.53E+06	4.41E+06	3.53E+06	0.00E+00	0.00E+00	0.00E+00	0.110
0.120	3.54E+06	4.60E+06	3.54E+06	0.00E+00	0.00E+00	0.00E+00	0.120
0.130	3.56E+06	4.87E+06	3.56E+06	0.00E+00	0.00E+00	0.00E+00	0.130
0.140	3.57E+06	5.23E+06	3.57E+06	0.00E+00	0.00E+00	0.00E+00	0.140
0.150	3.58E+06	5.68E+06	3.58E+06	0.00E+00	0.00E+00	0.00E+00	0.150
0.160	3.60E+06	6.22E+06	3.60E+06	0.00E+00	0.00E+00	0.00E+00	0.160
0.180	3.63E+06	7.52E+06	3.63E+06	0.00E+00	0.00E+00	0.00E+00	0.180
0.200	3.65E+06	9.07E+06	3.65E+06	0.00E+00	0.00E+00	0.00E+00	0.200
0.250	3.73E+06	1.34E+07	3.73E+06	0.00E+00	0.00E+00	0.00E+00	0.250
0.300	3.80E+06	1.78E+07	3.80E+06	4.39E-44	2.71E-48	4.39E-44	0.300
0.350	3.88E+06	2.15E+07	3.87E+06	5.94E-37	1.54E-40	5.93E-37	0.350
0.400	3.95E+06	2.47E+07	3.95E+06	1.33E-31	1.00E-34	1.33E-31	0.400
0.450	4.03E+06	2.72E+07	4.03E+06	1.94E-27	3.29E-30	1.94E-27	0.450
0.500	4.11E+06	2.93E+07	4.10E+06	4.17E-24	1.35E-26	4.16E-24	0.500
0.600	4.28E+06	3.26E+07	4.24E+06	4.20E-19	3.50E-21	4.17E-19	0.600
0.700	4.45E+06	3.50E+07	4.38E+06	1.59E-15	2.58E-17	1.57E-15	0.700
0.800	4.63E+06	3.70E+07	4.52E+06	7.78E-13	2.05E-14	7.58E-13	0.800
0.900	4.82E+06	3.88E+07	4.64E+06	9.68E-11	3.72E-12	9.31E-11	0.900
1.000	5.02E+06	4.05E+07	4.76E+06	4.63E-09	2.39E-10	4.39E-09	1.000
1.250	5.55E+06	4.46E+07	5.05E+06	5.00E-06	4.39E-07	4.56E-06	1.250
1.500	6.13E+06	4.86E+07	5.32E+06	5.41E-04	6.73E-05	4.74E-04	1.500
1.750	6.78E+06	5.25E+07	5.59E+06	1.57E-02	2.49E-03	1.33E-02	1.750
2.000	7.49E+06	5.63E+07	5.89E+06	2.01E-01	3.77E-02	1.64E-01	2.000
2.500	9.14E+06	6.33E+07	6.62E+06	7.49E+00	1.73E+00	5.76E+00	2.500
3.000	1.11E+07	6.97E+07	7.60E+06	8.82E+01	2.26E+01	6.56E+01	3.000
3.500	1.34E+07	7.55E+07	8.87E+06	5.38E+02	1.43E+02	3.95E+02	3.500
4.000	1.62E+07	8.08E+07	1.05E+07	2.17E+03	5.77E+02	1.59E+03	4.000
5.000	2.28E+07	9.01E+07	1.47E+07	1.67E+04	4.11E+03	1.25E+04	5.000
6.000	3.07E+07	9.80E+07	2.02E+07	6.96E+04	1.54E+04	5.42E+04	6.000
7.000	3.92E+07	1.05E+08	2.63E+07	2.00E+05	3.98E+04	1.60E+05	7.000
8.000	4.67E+07	1.11E+08	3.18E+07	4.41E+05	8.18E+04	3.59E+05	8.000
9.000	5.12E+07	1.17E+08	3.53E+07	7.87E+05	1.44E+05	6.43E+05	9.000
10.000	5.12E+07	1.22E+08	3.53E+07	1.17E+06	2.26E+05	9.43E+05	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 23

T9	AL26TPG	AL26MPG	AL26GPG	SI27GPT	SI27GPM	SI27GPG	T9
0.004	5.49E-49	1.10E-48	5.49E-49	0.00E+00	0.00E+00	0.00E+00	0.004
0.005	1.69E-44	3.39E-44	1.69E-44	0.00E+00	0.00E+00	0.00E+00	0.005
0.006	4.48E-41	8.99E-41	4.48E-41	0.00E+00	0.00E+00	0.00E+00	0.006
0.007	2.42E-38	4.86E-38	2.42E-38	0.00E+00	0.00E+00	0.00E+00	0.007
0.008	4.34E-36	8.71E-36	4.34E-36	0.00E+00	0.00E+00	0.00E+00	0.008
0.009	3.48E-34	6.98E-34	3.48E-34	0.00E+00	0.00E+00	0.00E+00	0.009
0.010	1.52E-32	3.04E-32	1.52E-32	0.00E+00	0.00E+00	0.00E+00	0.010
0.011	4.10E-31	8.23E-31	4.10E-31	0.00E+00	0.00E+00	0.00E+00	0.011
0.012	7.60E-30	1.52E-29	7.60E-30	0.00E+00	0.00E+00	0.00E+00	0.012
0.013	1.03E-28	2.07E-28	1.03E-28	0.00E+00	0.00E+00	0.00E+00	0.013
0.014	1.08E-27	2.17E-27	1.08E-27	0.00E+00	0.00E+00	0.00E+00	0.014
0.015	9.16E-27	1.84E-26	9.16E-27	0.00E+00	0.00E+00	0.00E+00	0.015
0.016	6.45E-26	1.29E-25	6.45E-26	0.00E+00	0.00E+00	0.00E+00	0.016
0.018	2.04E-24	4.08E-24	2.04E-24	0.00E+00	0.00E+00	0.00E+00	0.018
0.020	3.97E-23	7.96E-23	3.97E-23	0.00E+00	0.00E+00	0.00E+00	0.020
0.025	1.51E-20	3.02E-20	1.51E-20	0.00E+00	0.00E+00	0.00E+00	0.025
0.030	1.38E-18	2.77E-18	1.38E-18	0.00E+00	0.00E+00	0.00E+00	0.030
0.040	9.74E-16	1.95E-15	9.74E-16	0.00E+00	0.00E+00	0.00E+00	0.040
0.050	1.01E-13	2.02E-13	1.01E-13	0.00E+00	0.00E+00	0.00E+00	0.050
0.060	3.41E-12	6.84E-12	3.41E-12	0.00E+00	0.00E+00	0.00E+00	0.060
0.070	5.59E-11	1.12E-10	5.59E-11	0.00E+00	0.00E+00	0.00E+00	0.070
0.080	5.55E-10	1.11E-09	5.55E-10	0.00E+00	0.00E+00	0.00E+00	0.080
0.090	3.83E-09	7.67E-09	3.83E-09	0.00E+00	0.00E+00	0.00E+00	0.090
0.100	2.02E-08	4.01E-08	2.02E-08	0.00E+00	0.00E+00	0.00E+00	0.100
0.110	8.81E-08	1.69E-07	8.81E-08	0.00E+00	0.00E+00	0.00E+00	0.110
0.120	3.38E-07	6.00E-07	3.38E-07	0.00E+00	0.00E+00	0.00E+00	0.120
0.130	1.19E-06	1.85E-06	1.19E-06	0.00E+00	0.00E+00	0.00E+00	0.130
0.140	3.93E-06	5.10E-06	3.93E-06	0.00E+00	0.00E+00	0.00E+00	0.140
0.150	1.22E-05	1.27E-05	1.22E-05	0.00E+00	0.00E+00	0.00E+00	0.150
0.160	3.49E-05	2.93E-05	3.49E-05	0.00E+00	0.00E+00	0.00E+00	0.160
0.180	2.25E-04	1.26E-04	2.25E-04	0.00E+00	0.00E+00	0.00E+00	0.180
0.200	1.08E-03	4.40E-04	1.08E-03	0.00E+00	0.00E+00	0.00E+00	0.200
0.250	2.01E-02	5.14E-03	2.01E-02	0.00E+00	0.00E+00	0.00E+00	0.250
0.300	1.52E-01	3.20E-02	1.52E-01	0.00E+00	0.00E+00	0.00E+00	0.300
0.350	6.68E-01	1.33E-01	6.68E-01	0.00E+00	0.00E+00	0.00E+00	0.350
0.400	2.07E+00	4.19E-01	2.07E+00	0.00E+00	0.00E+00	0.00E+00	0.400
0.450	5.03E+00	1.08E+00	5.03E+00	0.00E+00	0.00E+00	0.00E+00	0.450
0.500	1.03E+01	2.39E+00	1.03E+01	0.00E+00	0.00E+00	0.00E+00	0.500
0.600	3.04E+01	8.49E+00	3.03E+01	0.00E+00	0.00E+00	0.00E+00	0.600
0.700	6.59E+01	2.22E+01	6.59E+01	2.42E-42	1.68E-45	2.42E-42	0.700
0.800	1.18E+02	4.73E+01	1.18E+02	2.77E-35	3.67E-38	2.76E-35	0.800
0.900	1.86E+02	8.70E+01	1.86E+02	8.73E-30	1.95E-32	8.71E-30	0.900
1.000	2.68E+02	1.43E+02	2.67E+02	2.23E-25	7.65E-28	2.22E-25	1.000
1.250	5.20E+02	3.60E+02	5.16E+02	2.02E-17	1.53E-19	2.00E-17	1.250
1.500	8.09E+02	6.71E+02	7.99E+02	4.29E-12	5.52E-14	4.23E-12	1.500
1.750	1.11E+03	1.04E+03	1.09E+03	2.83E-08	5.31E-10	2.78E-08	1.750
2.000	1.40E+03	1.44E+03	1.36E+03	2.12E-05	5.27E-07	2.07E-05	2.000
2.500	1.91E+03	2.21E+03	1.84E+03	2.34E-01	8.54E-03	2.25E-01	2.500
3.000	2.31E+03	2.89E+03	2.20E+03	1.20E+02	5.64E+00	1.14E+02	3.000
3.500	2.63E+03	3.47E+03	2.48E+03	1.06E+04	5.99E+02	1.00E+04	3.500
4.000	2.89E+03	3.98E+03	2.70E+03	3.15E+05	2.03E+04	2.94E+05	4.000
5.000	3.31E+03	4.89E+03	3.05E+03	3.84E+07	3.03E+06	3.53E+07	5.000
6.000	3.71E+03	5.78E+03	3.37E+03	1.01E+09	9.22E+07	9.22E+08	6.000
7.000	4.11E+03	6.67E+03	3.69E+03	1.11E+10	1.12E+09	1.00E+10	7.000
8.000	4.47E+03	7.49E+03	3.98E+03	6.94E+10	7.59E+09	6.18E+10	8.000
9.000	4.70E+03	8.04E+03	4.15E+03	2.90E+11	3.36E+10	2.56E+11	9.000
10.000	4.69E+03	8.12E+03	4.13E+03	8.88E+11	1.07E+11	7.81E+11	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 24

T9	MG24PG	MG24PA	MG24AGI	MG25AG	MG25AN	MG25AP	T9
0.004	1.27E-50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.004
0.005	2.28E-46	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.005
0.006	4.01E-43	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.006
0.007	1.56E-40	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.007
0.008	2.14E-38	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.008
0.009	1.37E-36	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.009
0.010	4.94E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.010
0.011	1.13E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.011
0.012	1.81E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.012
0.013	2.16E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.013
0.014	2.02E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.014
0.015	1.54E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.015
0.016	9.84E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.016
0.018	2.63E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.018
0.020	4.45E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.020
0.025	1.28E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.025
0.030	9.61E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.030
0.040	5.16E-19	0.00E+00	0.00E+00	2.14E-50	4.02E-47	0.00E+00	0.040
0.050	7.99E-17	0.00E+00	0.00E+00	1.30E-45	2.47E-42	0.00E+00	0.050
0.060	1.07E-13	0.00E+00	4.73E-45	5.72E-42	1.11E-38	0.00E+00	0.060
0.070	3.10E-11	0.00E+00	5.93E-40	4.63E-39	9.08E-36	0.00E+00	0.070
0.080	2.14E-09	0.00E+00	3.85E-36	1.16E-36	2.30E-33	0.00E+00	0.080
0.090	5.65E-08	0.00E+00	3.48E-33	1.23E-34	2.47E-31	0.00E+00	0.090
0.100	7.63E-07	0.00E+00	7.93E-31	6.80E-33	1.38E-29	0.00E+00	0.100
0.110	6.32E-06	0.00E+00	6.64E-29	2.27E-31	4.67E-28	0.00E+00	0.110
0.120	3.64E-05	0.00E+00	2.63E-27	5.05E-30	1.05E-26	0.00E+00	0.120
0.130	1.59E-04	0.00E+00	5.85E-26	8.06E-29	1.70E-25	0.00E+00	0.130
0.140	5.56E-04	0.00E+00	8.30E-25	9.80E-28	2.08E-24	0.00E+00	0.140
0.150	1.64E-03	0.00E+00	8.22E-24	9.47E-27	2.03E-23	0.00E+00	0.150
0.160	4.18E-03	0.00E+00	6.11E-23	7.52E-26	1.63E-22	7.24E-48	0.160
0.180	1.97E-02	0.00E+00	1.79E-21	2.93E-24	6.47E-21	6.49E-43	0.180
0.200	6.68E-02	0.00E+00	3.17E-20	6.83E-23	1.54E-19	6.68E-39	0.200
0.250	5.73E-01	0.00E+00	1.95E-17	3.69E-20	8.66E-17	1.57E-31	0.250
0.300	2.29E+00	0.00E+00	2.76E-15	4.39E-18	1.07E-14	1.80E-26	0.300
0.350	5.94E+00	0.00E+00	1.28E-13	1.96E-16	4.97E-13	9.34E-23	0.350
0.400	1.19E+01	0.00E+00	3.79E-12	4.45E-15	1.17E-11	6.80E-20	0.400
0.450	2.00E+01	0.00E+00	8.11E-11	6.17E-14	1.67E-10	1.31E-17	0.450
0.500	3.01E+01	0.00E+00	1.19E-09	5.88E-13	1.64E-09	9.77E-16	0.500
0.600	5.45E+01	0.00E+00	8.69E-08	2.37E-11	7.01E-08	7.92E-13	0.600
0.700	8.29E+01	0.00E+00	2.12E-06	4.42E-10	1.38E-06	1.18E-10	0.700
0.800	1.14E+02	4.38E-46	2.41E-05	4.86E-09	1.59E-05	5.91E-09	0.800
0.900	1.48E+02	1.90E-40	1.61E-04	3.63E-08	1.24E-04	1.40E-07	0.900
1.000	1.85E+02	6.79E-36	7.40E-04	2.02E-07	7.25E-04	1.94E-06	1.000
1.250	2.87E+02	1.43E-27	1.16E-02	6.08E-06	2.39E-02	2.85E-04	1.250
1.500	4.02E+02	6.56E-22	7.35E-02	7.80E-05	3.33E-01	1.01E-02	1.500
1.750	5.25E+02	8.59E-18	2.82E-01	5.79E-04	2.65E+00	1.50E-01	1.750
2.000	6.51E+02	1.17E-14	7.98E-01	2.94E-03	1.43E+01	1.24E+00	2.000
2.500	9.00E+02	3.52E-10	3.68E+00	3.58E-02	1.93E+02	2.82E+01	2.500
3.000	1.13E+03	3.97E-07	1.09E+01	2.26E-01	1.31E+03	2.55E+02	3.000
3.500	1.32E+03	6.59E-05	2.49E+01	9.36E-01	5.77E+03	1.33E+03	3.500
4.000	1.47E+03	3.23E-03	4.72E+01	2.90E+00	1.87E+04	4.86E+03	4.000
5.000	1.67E+03	8.16E-01	1.19E+02	1.58E+01	1.09E+05	3.34E+04	5.000
6.000	1.74E+03	3.44E+01	2.24E+02	5.30E+01	3.79E+05	1.31E+05	6.000
7.000	1.73E+03	5.03E+02	3.56E+02	1.30E+02	9.67E+05	3.51E+05	7.000
8.000	1.66E+03	3.73E+03	5.08E+02	2.59E+02	2.00E+06	7.34E+05	8.000
9.000	1.52E+03	1.73E+04	6.77E+02	4.34E+02	3.60E+06	1.34E+06	9.000
10.000	1.34E+03	5.68E+04	8.58E+02	6.34E+02	5.81E+06	2.32E+06	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 25

T9	MG26 PG	MG26 AG	MG26 AN	MG26 AP	AL27PGI	AL27PAI	T9
0.004	1.60E-50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.004
0.005	2.95E-46	0.00E+00	0.00E+00	0.00E+00	5.73E-50	4.61E-50	0.005
0.006	5.31E-43	0.00E+00	0.00E+00	0.00E+00	1.58E-46	1.31E-46	0.006
0.007	2.11E-40	0.00E+00	0.00E+00	0.00E+00	8.89E-44	7.50E-44	0.007
0.008	2.99E-38	0.00E+00	0.00E+00	0.00E+00	1.66E-41	1.42E-41	0.008
0.009	3.16E-36	0.00E+00	0.00E+00	0.00E+00	1.38E-39	1.21E-39	0.009
0.010	9.27E-34	0.00E+00	0.00E+00	0.00E+00	6.20E-38	5.55E-38	0.010
0.011	1.80E-31	0.00E+00	0.00E+00	0.00E+00	1.74E-36	1.58E-36	0.011
0.012	1.51E-29	0.00E+00	0.00E+00	0.00E+00	3.32E-35	3.11E-35	0.012
0.013	6.39E-28	0.00E+00	0.00E+00	0.00E+00	4.66E-34	5.20E-34	0.013
0.014	1.57E-26	0.00E+00	0.00E+00	0.00E+00	5.17E-33	1.29E-32	0.014
0.015	2.50E-25	0.00E+00	0.00E+00	0.00E+00	5.10E-32	4.68E-31	0.015
0.016	2.80E-24	0.00E+00	0.00E+00	0.00E+00	5.44E-31	1.38E-29	0.016
0.018	1.54E-22	0.00E+00	0.00E+00	0.00E+00	8.13E-29	4.24E-27	0.018
0.020	3.76E-21	0.00E+00	0.00E+00	0.00E+00	7.12E-27	4.13E-25	0.020
0.025	1.12E-18	0.00E+00	0.00E+00	0.00E+00	2.51E-23	1.50E-21	0.025
0.030	5.03E-17	0.00E+00	0.00E+00	0.00E+00	5.63E-21	3.36E-19	0.030
0.040	1.75E-14	7.09E-49	2.49E-47	0.00E+00	4.49E-18	2.68E-16	0.040
0.050	1.94E-12	4.12E-44	1.56E-42	0.00E+00	2.35E-16	1.37E-14	0.050
0.060	5.28E-11	1.75E-40	7.08E-39	0.00E+00	9.48E-15	1.86E-13	0.060
0.070	6.17E-10	1.36E-37	5.89E-36	0.00E+00	1.24E-12	2.79E-12	0.070
0.080	4.56E-09	3.28E-35	1.51E-33	0.00E+00	6.30E-11	1.28E-10	0.080
0.090	2.54E-08	3.35E-33	1.63E-31	0.00E+00	1.35E-09	3.43E-09	0.090
0.100	1.12E-07	1.78E-31	9.21E-30	0.00E+00	1.56E-08	4.78E-08	0.100
0.110	4.08E-07	5.74E-30	3.13E-28	0.00E+00	1.15E-07	4.08E-07	0.110
0.120	1.31E-06	1.23E-28	7.07E-27	0.00E+00	6.08E-07	2.41E-06	0.120
0.130	4.09E-06	1.90E-27	1.15E-25	0.00E+00	2.48E-06	1.07E-05	0.130
0.140	1.34E-05	2.23E-26	1.42E-24	0.00E+00	8.21E-06	3.83E-05	0.140
0.150	4.61E-05	2.08E-25	1.39E-23	0.00E+00	2.31E-05	1.15E-04	0.150
0.160	1.55E-04	1.60E-24	1.12E-22	0.00E+00	5.69E-05	2.97E-04	0.160
0.180	1.37E-03	5.83E-23	4.47E-21	0.00E+00	2.53E-04	1.43E-03	0.180
0.200	8.45E-03	1.28E-21	1.07E-19	0.00E+00	8.26E-04	4.94E-03	0.200
0.250	2.31E-01	5.94E-19	6.08E-17	0.00E+00	6.88E-03	4.38E-02	0.250
0.300	2.08E+00	6.15E-17	7.60E-15	0.00E+00	3.04E-02	1.79E-01	0.300
0.350	9.80E+00	2.42E-15	3.55E-13	7.73E-43	1.06E-01	4.77E-01	0.350
0.400	3.09E+01	4.86E-14	8.39E-12	1.16E-36	3.31E-01	9.88E-01	0.400
0.450	7.44E+01	6.00E-13	1.21E-10	7.02E-32	9.32E-01	1.76E+00	0.450
0.500	1.49E+02	5.13E-12	1.19E-09	4.50E-28	2.31E+00	2.91E+00	0.500
0.600	4.15E+02	1.68E-10	5.12E-08	2.11E-22	1.00E+01	7.35E+00	0.600
0.700	8.51E+02	2.62E-09	1.01E-06	2.17E-18	3.03E+01	1.83E+01	0.700
0.800	1.45E+03	2.43E-08	1.18E-05	2.08E-15	7.12E+01	4.38E+01	0.800
0.900	2.18E+03	1.55E-07	9.22E-05	4.16E-13	1.41E+02	9.67E+01	0.900
1.000	3.02E+03	7.50E-07	5.39E-04	2.79E-11	2.47E+02	1.95E+02	1.000
1.250	5.46E+03	1.65E-05	1.79E-02	5.11E-08	7.00E+02	8.13E+02	1.250
1.500	8.19E+03	1.63E-04	2.51E-01	7.61E-06	1.45E+03	2.40E+03	1.500
1.750	1.11E+04	9.74E-04	2.01E+00	2.85E-04	2.50E+03	5.68E+03	1.750
2.000	1.41E+04	4.15E-03	1.09E+01	4.60E-03	3.82E+03	1.15E+04	2.000
2.500	2.01E+04	3.91E-02	1.49E+02	2.64E-01	7.15E+03	3.52E+04	2.500
3.000	2.60E+04	2.12E-01	1.04E+03	4.45E+00	1.11E+04	8.25E+04	3.000
3.500	3.17E+04	8.17E-01	4.72E+03	3.59E+01	1.55E+04	1.64E+05	3.500
4.000	3.69E+04	2.50E+00	1.58E+04	1.79E+02	2.02E+04	2.90E+05	4.000
5.000	4.55E+04	1.45E+01	9.70E+04	1.84E+03	2.97E+04	7.19E+05	5.000
6.000	5.15E+04	5.44E+01	3.51E+05	9.23E+03	3.91E+04	1.46E+06	6.000
7.000	5.52E+04	1.45E+02	9.10E+05	3.06E+04	4.84E+04	2.61E+06	7.000
8.000	5.72E+04	2.80E+02	1.89E+06	7.76E+04	5.74E+04	4.27E+06	8.000
9.000	5.82E+04	3.97E+02	3.36E+06	1.64E+05	6.61E+04	6.55E+06	9.000
10.000	5.86E+04	4.01E+02	5.35E+06	3.05E+05	7.47E+04	9.55E+06	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 26

T9	AL27AN	SI27PG	SI28PG	SI29PG	SI30PG	T9
0.006	0.00E+00	1.93E-48	1.59E-49	4.01E-48	4.33E-49	0.006
0.007	0.00E+00	1.47E-45	1.20E-46	3.12E-45	3.33E-46	0.007
0.008	0.00E+00	3.50E-43	2.81E-44	7.58E-43	8.00E-44	0.008
0.009	0.00E+00	3.57E-41	2.83E-42	7.89E-41	8.23E-42	0.009
0.010	0.00E+00	1.92E-39	1.50E-40	4.32E-39	4.45E-40	0.010
0.011	0.00E+00	6.26E-38	4.84E-39	1.43E-37	1.46E-38	0.011
0.012	0.00E+00	1.37E-36	1.04E-37	3.18E-36	3.21E-37	0.012
0.013	0.00E+00	2.29E-35	1.62E-36	5.09E-35	5.08E-36	0.013
0.014	0.00E+00	4.56E-34	1.93E-35	6.21E-34	6.14E-35	0.014
0.015	0.00E+00	1.72E-32	1.83E-34	6.03E-33	5.91E-34	0.015
0.016	0.00E+00	6.59E-31	1.43E-33	4.83E-32	4.69E-33	0.016
0.018	0.00E+00	3.38E-28	5.39E-32	1.92E-30	1.83E-31	0.018
0.020	0.00E+00	4.99E-26	1.23E-30	4.59E-29	4.30E-30	0.020
0.025	0.00E+00	3.83E-22	6.37E-28	2.67E-26	2.40E-27	0.025
0.030	0.00E+00	1.42E-19	7.39E-26	3.45E-24	2.99E-25	0.030
0.040	0.00E+00	2.10E-16	7.34E-23	4.16E-21	3.40E-22	0.040
0.050	0.00E+00	1.57E-14	9.66E-21	6.53E-19	5.08E-20	0.050
0.060	0.00E+00	3.09E-13	3.91E-19	3.10E-17	2.32E-18	0.060
0.070	0.00E+00	5.06E-12	7.38E-18	6.82E-16	4.94E-17	0.070
0.080	0.00E+00	7.96E-11	8.26E-17	1.03E-14	6.16E-16	0.080
0.090	0.00E+00	8.15E-10	7.43E-16	2.97E-13	5.21E-15	0.090
0.100	0.00E+00	5.37E-09	1.39E-14	1.17E-11	3.29E-14	0.100
0.110	0.00E+00	2.50E-08	4.07E-13	2.75E-10	1.65E-13	0.110
0.120	0.00E+00	8.95E-08	8.03E-12	3.86E-09	6.91E-13	0.120
0.130	0.00E+00	2.61E-07	1.01E-10	3.60E-08	2.55E-12	0.130
0.140	0.00E+00	6.48E-07	8.87E-10	2.42E-07	9.35E-12	0.140
0.150	0.00E+00	1.42E-06	5.77E-09	1.26E-06	4.19E-11	0.150
0.160	0.00E+00	2.82E-06	2.95E-08	5.32E-06	2.41E-10	0.160
0.180	0.00E+00	9.06E-06	4.43E-07	5.83E-05	7.85E-09	0.180
0.200	0.00E+00	2.50E-05	3.79E-06	3.96E-04	1.47E-07	0.200
0.250	5.98E-49	2.84E-04	1.73E-04	1.26E-02	2.98E-05	0.250
0.300	4.30E-40	2.44E-03	2.09E-03	1.31E-01	1.04E-03	0.300
0.350	9.10E-34	1.28E-02	1.20E-02	7.15E-01	1.36E-02	0.350
0.400	5.05E-29	4.56E-02	4.32E-02	2.57E+00	9.55E-02	0.400
0.450	2.48E-25	1.22E-01	1.15E-01	6.96E+00	4.42E-01	0.450
0.500	2.23E-22	2.67E-01	2.46E-01	1.54E+01	1.52E+00	0.500
0.600	6.05E-18	8.58E-01	7.48E-01	4.98E+01	9.75E+00	0.600
0.700	9.06E-15	1.95E+00	1.60E+00	1.13E+02	3.66E+01	0.700
0.800	2.25E-12	3.57E+00	2.74E+00	2.04E+02	9.80E+01	0.800
0.900	1.70E-10	5.68E+00	4.09E+00	3.19E+02	2.09E+02	0.900
1.000	5.66E-09	8.18E+00	5.56E+00	4.51E+02	3.79E+02	1.000
1.250	3.63E-06	1.56E+01	9.36E+00	8.11E+02	1.09E+03	1.250
1.500	3.18E-04	2.37E+01	1.40E+01	1.18E+03	2.17E+03	1.500
1.750	8.64E-03	3.21E+01	2.27E+01	1.54E+03	3.54E+03	1.750
2.000	1.09E-01	4.08E+01	4.10E+01	1.91E+03	5.10E+03	2.000
2.500	4.24E+00	6.11E+01	1.30E+02	2.75E+03	8.53E+03	2.500
3.000	5.25E+01	8.98E+01	3.12E+02	3.78E+03	1.21E+04	3.000
3.500	3.33E+02	1.33E+02	5.81E+02	5.03E+03	1.55E+04	3.500
4.000	1.38E+03	1.99E+02	9.08E+02	6.46E+03	1.86E+04	4.000
5.000	1.08E+04	4.17E+02	1.60E+03	9.75E+03	2.40E+04	5.000
6.000	4.52E+04	7.87E+02	2.20E+03	1.34E+04	2.82E+04	6.000
7.000	1.31E+05	1.34E+03	2.68E+03	1.72E+04	3.14E+04	7.000
8.000	3.01E+05	2.09E+03	3.05E+03	2.10E+04	3.39E+04	8.000
9.000	5.88E+05	3.06E+03	3.33E+03	2.48E+04	3.57E+04	9.000
10.000	1.03E+06	4.25E+03	3.53E+03	2.85E+04	3.71E+04	10.000

TABLE III. Thermonuclear Reaction Rates $1 \leq Z \leq 14$

See page 291 for Explanation of Tables

TABLE III 27

T9	C12C12	C12016	016016	T9
0.110	7.42E-50		0.00E+00	0.110
0.120	1.04E-47		0.00E+00	0.120
0.130	8.72E-46		0.00E+00	0.130
0.140	4.71E-44		0.00E+00	0.140
0.150	1.77E-42		0.00E+00	0.150
0.160	4.86E-41		0.00E+00	0.160
0.180	1.71E-38		0.00E+00	0.180
0.200	2.66E-36		0.00E+00	0.200
0.250	6.52E-32		0.00E+00	0.250
0.300	1.44E-28		0.00E+00	0.300
0.350	6.66E-26		1.60E-47	0.350
0.400	1.05E-23		6.18E-44	0.400
0.450	7.49E-22		6.61E-41	0.450
0.500	2.94E-20	3.86E-28	2.67E-38	0.500
0.600	1.23E-17	8.15E-25	5.21E-34	0.600
0.700	1.51E-15	3.62E-22	1.36E-30	0.700
0.800	7.89E-14	5.46E-20	8.87E-28	0.800
0.900	2.21E-12	3.75E-18	2.08E-25	0.900
1.000	3.86E-11	1.42E-16	2.27E-23	1.000
1.250	1.16E-08	2.02E-13	2.60E-19	1.250
1.500	8.66E-07	5.02E-11	3.04E-16	1.500
1.750	2.64E-05	4.03E-09	8.15E-14	1.750
2.000	4.33E-04	1.49E-07	7.81E-12	2.000
2.500	3.34E-02	4.16E-05	9.09E-09	2.500
3.000	8.64E-01	2.82E-03	1.73E-06	3.000
3.500	1.10E+01	7.22E-02	1.01E-04	3.500
4.000	8.58E+01	8.92E-01	2.61E-03	4.000
5.000	1.91E+03	3.10E+01	3.33E-01	5.000
6.000	1.73E+04	3.34E+02	9.93E+00	6.000
7.000	8.53E+04	1.88E+03	1.15E+02	7.000
8.000	2.66E+05	7.04E+03	6.82E+02	8.000
9.000	5.76E+05	1.99E+04	2.50E+03	9.000
10.000	9.13E+05	4.59E+04	6.30E+03	10.000