Table III. Analytical approximations of the reaction rates

^{1}**H(p,νe^{+})^{2}H**, $Q = 1.442$ MeV, (3%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 4.08\times10^{-15}\,T_9^{-2/3}\exp(-3.381\,T_9^{-1/3})\times(1+3.82\,T_9+1.51\,T_9^2+0.144\,T_9^3-1.14\times10^{-2}\,T_9^4)$$
$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

^{2}**H(p,γ)^{3}He**, $Q = 5.493$ MeV, (3%)

For $T_9 \le 0.11$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 1.81\times10^{3}\,T_9^{-2/3}\exp(-3.721\,T_9^{-1/3})\times(1+14.3\,T_9-90.5\,T_9^2+395\,T_9^3)$

For $T_9 > 0.11$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 2.58\times10^{3}\,T_9^{-2/3}\exp(-3.721\,T_9^{-1/3})\times(1+3.96\,T_9+0.116\,T_9^2)$

$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 1.630\times10^{10}\,T_9^{3/2}\exp(-63.749/T_9)$

^{2}**H(d,γ)^{4}He**, $Q = 23.847$ MeV, (3%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 42.1\,T_9^{-2/3}\exp(-4.259\,T_9^{-1/3})\times(1+0.514\,T_9+0.339\,T_9^2-1.18\times10^{-2}\,T_9^3)$$
$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 4.488\times10^{10}\,T_9^{3/2}\exp(-276.73/T_9)$

^{2}**H(d,n)^{3}He**, $Q = 3.269$ MeV, (4%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 4.67\times10^{8}\,T_9^{-2/3}\exp(-4.259\,T_9^{-1/3})\times(1+1.079\,T_9-0.1124\,T_9^2+5.68\times10^{-3}\,T_9^3)$$
$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 1.730\exp(-37.935/T_9)$

^{2}**H(d,p)^{3}H**, $Q = 4.033$ MeV, (5%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 4.66\times10^{8}\,T_9^{-2/3}\exp(-4.259\,T_9^{-1/3})\times(1+0.759\,T_9-0.0612\,T_9^2+2.78\times10^{-3}\,T_9^3)$$
$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 1.732\exp(-46.797/T_9)$

^{2}**H(α,γ)^{6}Li**, $Q = 1.474$ MeV, (4%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 14.82\,T_9^{-2/3}\exp(-7.435\,T_9^{-1/3})\times(1+6.572\,T_9+0.076\,T_9^2+0.0248\,T_9^3) + 82.8\,T_9^{-3/2}\exp(-7.904/T_9)$$
$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 1.531\times10^{10}\,T_9^{3/2}\exp(-17.108/T_9)$

^{3}**H(d,n)^{4}He**, $Q = 17.589$ MeV, (8%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 8.29\times10^{10}\,T_9^{-2/3}\exp(-4.524\,T_9^{-1/3}-(T_9/0.08)^2)\times(1+17.2\,T_9+175\,T_9^2) + 8.12\times10^{8}\,T_9^{-0.712}\exp(-0.506/T_9)$$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs}$

Rev. ratio $= 5.506\,\exp(-204.12/T_9)$

^{3}**H(α,γ)^{7}Li**, $Q = 2.467$ MeV, (5%)

$$N_A\langle\sigma v\rangle_{gs} = 8.20\times10^5\,T_9^{-2/3}\exp(-8.081\,T_9^{-1/3})\times(1-0.389\,T_9+0.134\,T_9^2-1.81\times10^{-2}\,T_9^3+9.23\times10^{-4}\,T_9^4)$$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs}$

Rev. ratio $= 1.113\times10^{10}\,T_9^{3/2}\exp(-28.629/T_9)$

^{3}**He(^{3}He,2p)^{4}He**, $Q = 12.859$ MeV, (2%)

$$N_A\langle\sigma v\rangle_{gs} = 5.59\times10^{10}\,T_9^{-2/3}\exp(-12.277\,T_9^{-1/3})\times(1-0.135\,T_9+2.54\times10^{-2}\,T_9^2-1.29\times10^{-3}\,T_9^3)$$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs}$

Rev. ratio $= 3.392\times10^{-10}\,T_9^{-3/2}\exp(-149.23/T_9)$

^{3}**He(α,γ)^{7}Be**, $Q = 1.587$ MeV, (6%)

$$N_A\langle\sigma v\rangle_{gs} = 5.46\times10^6\,T_9^{-2/3}\exp(-12.827\,T_9^{-1/3})\times(1-0.307\,T_9+8.81\times10^{-2}\,T_9^2-1.06\times10^{-2}\,T_9^3+4.46\times10^{-4}\,T_9^4)$$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs}$

Rev. ratio $= 1.113\times10^{10}\,T_9^{3/2}\exp(-18.412/T_9)$

^{4}**He(αn,γ)^{9}Be**[1], $Q = 1.573$ MeV, (19%)

$$\begin{aligned}N_A\langle\sigma v\rangle_{gs}^{\alpha\alpha} &= 2.43\times10^9\,T_9^{-2/3}\exp(-13.490\,T_9^{-1/3}-(T_9/0.15)^2)\times(1+74.5\,T_9)\\ &\quad+6.09\times10^5\,T_9^{-3/2}\exp(-1.054/T_9)\end{aligned}$$

$$\text{For } T_9\le0.03:\quad N_A^2\langle\sigma v\rangle_{gs}^{\alpha\alpha n} = N_A\langle\sigma v\rangle_{gs}^{\alpha\alpha}\times6.69\times10^{-12}\times(1-192\,T_9+2.48\times10^4\,T_9^2-1.50\times10^6\,T_9^3+4.13\times10^7\,T_9^4-3.90\times10^8\,T_9^5)$$

$$\text{For } T_9>0.03:\quad N_A^2\langle\sigma v\rangle_{gs}^{\alpha\alpha n} = N_A\langle\sigma v\rangle_{gs}^{\alpha\alpha}\times2.42\times10^{-12}\times(1-1.52\,\log_{10}T_9+0.448\,(\log_{10}T_9)^2+0.435\,(\log_{10}T_9)^3)$$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs}$

Rev. ratio $= 5.844\times10^{19}\,T_9^3\exp(-18.258/T_9)$

^{4}**He($\alpha\alpha,\gamma$)^{12}C**, $Q = 7.274$ MeV, (23%)

$$\begin{aligned}N_A\langle\sigma v\rangle_{gs}^{\alpha^8\mathrm{Be}} &= 2.76\times10^7\,T_9^{-2/3}\exp(-23.570\,T_9^{-1/3}-(T_9/0.4)^2)\times(1+5.47\,T_9+326\,T_9^2)\\ &\quad+130.7\,T_9^{-3/2}\exp(-3.338/T_9)+2.51\times10^4\,T_9^{-3/2}\exp(-20.307/T_9)\end{aligned}$$

$$\text{For } T_9\le0.03:\quad N_A^2\langle\sigma v\rangle_{gs}^{\alpha\alpha\alpha} = N_A\langle\sigma v\rangle_{gs}^{\alpha\alpha}\times N_A\langle\sigma v\rangle_{gs}^{\alpha^8\mathrm{Be}}\times3.07\times10^{-16}\times(1-29.1\,T_9+1308\,T_9^2)$$

$$\text{For } T_9>0.03:\quad N_A^2\langle\sigma v\rangle_{gs}^{\alpha\alpha\alpha} = N_A\langle\sigma v\rangle_{gs}^{\alpha\alpha}\times N_A\langle\sigma v\rangle_{gs}^{\alpha^8\mathrm{Be}}\times3.44\times10^{-16}\times(1+0.0158\,T_9^{-0.65})$$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs}$

Rev. ratio $= 2.003\times10^{20}\,T_9^3\exp(-84.415/T_9)$

[1] The rate $N_A\langle\sigma v\rangle_{gs}^{\alpha\alpha}$ has no physical meaning but is convenient for the definitions of $N_A\langle\sigma v\rangle^{\alpha\alpha n}$ and $N_A\langle\sigma v\rangle^{\alpha\alpha\alpha}$.

$^{6}\mathbf{Li(p,\gamma)^{7}Be}$, $Q = 5.606$ MeV, (7%)

$$N_A\langle\sigma v\rangle_{gs} = 1.25\times10^{6}\,T_9^{-2/3}\exp(-8.415\,T_9^{-1/3})\times(1-0.252\,T_9+5.19\times10^{-2}\,T_9^2-2.92\times10^{-3}\,T_9^3)$$
$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 1.187\times10^{10}\,T_9^{3/2}\exp(-65.052/T_9)$

$^{6}\mathbf{Li(p,\alpha)^{3}He}$, $Q = 4.019$ MeV, (2%)

$$N_A\langle\sigma v\rangle_{gs} = 3.54\times10^{10}\,T_9^{-2/3}\exp(-8.415\,T_9^{-1/3})\times(1-0.137\,T_9+2.41\times10^{-2}\,T_9^2-1.28\times10^{-3}\,T_9^3)$$
$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 1.067\exp(-46.641/T_9)$

$^{7}\mathbf{Li(p,\gamma)^{8}Be}$, $Q = 17.255$ MeV, (11%)

$$\begin{aligned} N_A\langle\sigma v\rangle_{gs} &= 1.75\times10^{7}\,T_9^{-2/3}\exp(-8.473\,T_9^{-1/3}-(T_9/0.8)^2)\times(1-1.47\,T_9+4.43\,T_9^2) \\ &\quad +1.60\times10^{6}\,T_9^{-3/2}\exp(-4.441/T_9)+4.32\times10^{4}\,T_9^{0.309}\exp(-2.811/T_9) \\ N_A\langle\sigma v\rangle_{tt} &= N_A\langle\sigma v\rangle_{gs} \end{aligned}$$

Rev. ratio $= 6.531\times10^{10}\,T_9^{3/2}\exp(-200.23/T_9)$

$^{7}\mathbf{Li(p,\alpha)^{4}He}$, $Q = 17.347$ MeV, (6%)

$$\begin{aligned} N_A\langle\sigma v\rangle_{gs} &= 7.20\times10^{8}\,T_9^{-2/3}\exp(-8.473\,T_9^{-1/3}-(T_9/6.5)^2)\times(1+1.05\,T_9-0.653\,T_9^2+0.185\,T_9^3 \\ &\quad -2.12\times10^{-2}\,T_9^4+9.30\times10^{-4}\,T_9^5)+9.85\times10^{6}\,T_9^{0.576}\exp(-10.415/T_9) \\ N_A\langle\sigma v\rangle_{tt} &= N_A\langle\sigma v\rangle_{gs} \end{aligned}$$

Rev. ratio $= 4.676\exp(-201.30/T_9)$

$^{7}\mathbf{Li(\alpha,\gamma)^{11}B}$, $Q = 8.664$ MeV, (17%)

$$\begin{aligned} N_A\langle\sigma v\rangle_{gs} &= 9.72\times10^{7}\,T_9^{-2/3}\exp(-19.163\,T_9^{-1/3}-(T_9/0.4)^2)\times(1+2.84\,T_9-7.89\,T_9^2) \\ &\quad +3.35\times10^{2}\,T_9^{-3/2}\exp(-2.959/T_9)+1.04\times10^{4}\,T_9^{-0.023}\exp(-4.922/T_9) \\ N_A\langle\sigma v\rangle_{tt} &= N_A\langle\sigma v\rangle_{gs} \end{aligned}$$

Rev. ratio $= 4.015\times10^{10}\,T_9^{3/2}\exp(-100.55/T_9)$

$^{7}\mathbf{Li(\alpha,n)^{10}B}$, $Q = -2.790$ MeV, (5%)

$$N_A\langle\sigma v\rangle_{gs} = 1.66\times10^{7}\,\exp(-32.371/T_9)\times(1+1.064\,T_9)$$
$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 1.325\exp(32.371/T_9)$

$^{7}\mathbf{Be(p,\gamma)^{8}B}$, $Q = 0.137$ MeV, (3%)

$$\begin{aligned} N_A\langle\sigma v\rangle_{gs} &= 2.61\times10^{5}\,T_9^{-2/3}\exp(-10.264\,T_9^{-1/3})\times(1-5.11\times10^{-2}\,T_9+4.68\times10^{-2}\,T_9^2-6.60\times10^{-3}\,T_9^3 \\ &\quad +3.12\times10^{-4}\,T_9^4)+2.05\times10^{3}\,T_9^{-3/2}\exp(-7.345/T_9) \end{aligned}$$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 1.306\times10^{10}\,T_9^{3/2}\exp(-1.594/T_9)$

^{7}**Be(**α,γ**)**^{11}**C**, $Q = 7.544$ MeV, (17%)

For $T_9 \le 2$: $N_A\langle\sigma v\rangle_{gs} = 1.29\times10^{10}\,T_9^{-2/3}\exp(-23.214\,T_9^{-1/3}-(T_9/0.8)^2)\times(1-6.47\,T_9+19.5\,T_9^2-19.3\,T_9^3)$
$+1.25\times10^{4}\,T_9^{-3/2}\exp(-6.498/T_9)+1.44\times10^{5}\,T_9^{-3/2}\exp(-10.177/T_9)$
$+1.63\times10^{4}\,T_9^{0.178}\exp(-15.281/T_9)$

For $T_9 > 2$: $N_A\langle\sigma v\rangle_{gs} = 1.41\times10^{3}\,T_9^{0.636}\exp(-3.015/T_9)$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 4.016\times10^{10}\,T_9^{3/2}\exp(-87.541/T_9)$

^{9}**Be(p,**γ**)**^{10}**B**, $Q = 6.586$ MeV, (7%)

$$N_A\langle\sigma v\rangle_{gs} = 1.36\times10^{7}\,T_9^{-2/3}\exp(-10.361\,T_9^{-1/3}-(T_9/1.5)^2)\times(1+2.71\,T_9-1.95\,T_9^2+0.594\,T_9^3)$$
$$+4.80\times10^{3}\,T_9^{-3/2}\exp(-3.102/T_9)+2.75\times10^{6}\,T_9^{-3/2}\exp(-10.615/T_9)$$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 9.734\times10^{9}\,T_9^{3/2}\exp(-76.424/T_9)$

^{9}**Be(p,n)**^{9}**B**, $Q = -1.851$ MeV, (4%)

$$N_A\langle\sigma v\rangle_{gs} = 5.06\times10^{7}\exp(-21.474/T_9)\times(1+1.26\,T_9-0.0302\,T_9^2)$$
$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 9.989\times10^{-1}\exp(21.474/T_9)$

^{9}**Be(p,d)**2α, $Q = 0.651$ MeV, (8%)

$$N_A\langle\sigma v\rangle_{gs} = 2.18\times10^{11}\,T_9^{-2/3}\exp(-10.361\,T_9^{-1/3}-(T_9/0.42)^2)\times(1-0.427\,T_9+34.055\,T_9^2)$$
$$+6.24\times10^{8}\,T_9^{-3/2}\exp(-3.446/T_9)+3.53\times10^{8}\,T_9^{-0.205}\exp(-3.889/T_9)$$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 8.071\times10^{-11}\,T_9^{-3/2}\exp(-7.556/T_9)$

^{9}**Be(p,**α**)**^{6}**Li**, $Q = 2.125$ MeV, (9%)

$$N_A\langle\sigma v\rangle_{gs} = 2.11\times10^{11}\,T_9^{-2/3}\exp(-10.361\,T_9^{-1/3}-(T_9/0.4)^2)\times(1-0.189\,T_9+35.2\,T_9^2)$$
$$+5.24\times10^{8}\,T_9^{-3/2}\exp(-3.446/T_9)+4.65\times10^{8}\,T_9^{-0.293}\exp(-4.396/T_9)$$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 6.177\times10^{-1}\exp(-24.663/T_9)$

^{9}**Be(**α**,n)**^{12}**C**, $Q = 5.701$ MeV, (10%)

$$N_A\langle\sigma v\rangle_{gs} = 5.00\times10^{13}\,T_9^{-2/3}\exp(-23.872\,T_9^{-1/3}-(T_9/0.154)^2)\times(1+27.3\,T_9+1632\,T_9^2)$$
$$+0.70\,T_9^{-3/2}\exp(-1.832/T_9)+1.77\times10^{5}\,T_9^{-3/2}\exp(-4.385/T_9)$$
$$+4.12\times10^{7}\,T_9^{0.65}\exp(-10.060/T_9)$$

$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 10.28 \exp(-66.158/T_9)$

^{10}**B(p,**γ**)**^{11}**C**, $Q = 8.689$ MeV, (13%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 1.68\times10^{6}\,T_9^{-2/3}\exp(-12.064\,T_9^{-1/3})\times((T_9^{2/3}-0.0273)^2+4.69\times10^{-4})^{-1}$$
$$\times(1+0.977\,T_9+1.87\,T_9^2-0.272\,T_9^3+1.30\times10^{-2}\,T_9^4)$$
$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 3.026\times10^{10}\,T_9^{3/2}\exp(-100.83/T_9)$

^{10}**B(p,**α**)**^{7}**Be**, $Q = 1.145$ MeV, (8%)

For $T_9 \le 0.8$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 2.56\times10^{10}\,T_9^{-2/3}\exp(-12.064\,T_9^{-1/3})\times((T_9^{2/3}-0.026)^2+4.70\times10^{-4})^{-1}$
$\times(1+5.95\,T_9+29.2\,T_9^2-316\,T_9^3+914\,T_9^4-1085\,T_9^5+465\,T_9^6)$

For $T_9 > 0.8$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 1.01\times10^{10}\,T_9^{-2/3}\exp(-12.064\,T_9^{-1/3})\times(-1+15.8\,T_9-2.60\,T_9^2+0.125\,T_9^3)$

$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 7.537\times10^{-1}\exp(-13.291/T_9)$

^{11}**B(p,**γ**)**^{12}**C**, $Q = 15.957$ MeV, (5%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 4.58\times10^{7}\,T_9^{-2/3}\exp(-12.097\,T_9^{-1/3}-(T_9/0.6)^2)\times(1+0.353\,T_9+0.842\,T_9^2)$$
$$+6.82\times10^{3}\,T_9^{-3/2}\exp(-1.738/T_9)+2.80\times10^{4}T_9^{0.104}\exp(-3.892/T_9)$$
$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 7.004\times10^{10}\,T_9^{3/2}\exp(-185.17/T_9)$

^{11}**B(p,n)**^{11}**C**, $Q = -2.765$ MeV, (4%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 1.36\times10^{8}\exp(-32.085/T_9)\times(1+0.963\,T_9-0.285\,T_9^2+3.36\times10^{-2}\,T_9^3-1.37\times10^{-3}\,T_9^4)$$
$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 9.988\times10^{-1}\exp(32.085/T_9)$

^{11}**B(p,**α**)**2α, $Q = 8.682$ MeV, (3%)

For $T_9 \le 2$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 2.68\times10^{12}\,T_9^{-2/3}\exp(-12.097\,T_9^{-1/3})\times(1+1.62\,T_9-1.31\,T_9^2+0.260\,T_9^3)$
$+2.12\times10^{6}\,T_9^{-3/2}\exp(-1.724/T_9)$

For $T_9 > 2$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 5.84\times10^{11}\,T_9^{-2/3}\exp(-12.097\,T_9^{-1/3})\times((T_9^{2/3}-1.47)^2+0.187)^{-1}$
$\times(-1+0.883\,T_9+0.012\,T_9^2)$

$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 3.501\times10^{-10}\,T_9^{-3/2}\exp(-100.76/T_9)$

^{12}**C(p,**γ**)**^{13}**N**, $Q = 1.943$ MeV, (6%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 2.00\times10^{7}\,T_9^{-2/3}\exp(-13.692\,T_9^{-1/3}-(T_9/0.46)^2)\times(1+9.89\,T_9-59.8\,T_9^2+266\,T_9^3)$$
$$+1.00\times10^{5}\,T_9^{-3/2}\exp(-4.913/T_9)+4.24\times10^{5}\,T_9^{-3/2}\exp(-21.62/T_9)$$

$$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$$

Rev. ratio $= 8.847 \times 10^{9}\, T_9^{3/2} \exp(-22.553/T_9)$

^{12}**C(α,γ)**^{16}**O**, $Q = 7.162$ MeV, (17%)

$$\begin{aligned}
N_{\rm A}\langle\sigma v\rangle_{\rm gs} &= N_{\rm A}\langle\sigma v\rangle_{\rm E1} + N_{\rm A}\langle\sigma v\rangle_{\rm E2} + N_{\rm A}\langle\sigma v\rangle_{\rm res}\\
N_{\rm A}\langle\sigma v\rangle_{\rm E1} &= 6.66 \times 10^{7}\, T_9^{-2} \exp(-32.123\, T_9^{-1/3} - (T_9/4.6)^2) \times (1 + 2.54\, T_9 + 1.04\, T_9^2 - 0.226\, T_9^3)\\
&\quad +1.39 \times 10^{3}\, T_9^{-3/2} \exp(-28.930/T_9)\\
N_{\rm A}\langle\sigma v\rangle_{\rm E2} &= 6.56 \times 10^{7}\, T_9^{-2} \exp(-32.123\, T_9^{-1/3} - (T_9/1.3)^2) \times (1 + 9.23\, T_9 - 13.7\, T_9^2 + 7.4\, T_9^3)\\
N_{\rm A}\langle\sigma v\rangle_{\rm res} &= 19.2\, T_9^2 \exp(-26.9/T_9)\\
N_{\rm A}\langle\sigma v\rangle_{\rm tt} &= N_{\rm A}\langle\sigma v\rangle_{\rm gs}
\end{aligned}$$

Rev. ratio $= 5.132 \times 10^{10}\, T_9^{3/2} \exp(-83.109/T_9)$

^{13}**C(p,γ)**^{14}**N**, $Q = 7.551$ MeV, (20%)

$$\begin{aligned}
N_{\rm A}\langle\sigma v\rangle_{\rm gs} &= 9.57 \times 10^{7}\, T_9^{-2/3} (1 + 3.56\, T_9) \exp(-13.720\, T_9^{-1/3} - T_9^2)\\
&\quad +1.50 \times 10^{6}\, T_9^{-3/2} \exp(-5.930/T_9) + 6.83 \times 10^{5}\, T_9^{-0.864} \exp(-12.057/T_9)\\
N_{\rm A}\langle\sigma v\rangle_{\rm tt} &= N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 - 2.070 \exp(-37.938/T_9))
\end{aligned}$$

Rev. ratio $= 1.190 \times 10^{10}\, T_9^{3/2} \exp(-87.619/T_9)$

^{13}**C(p,n)**^{13}**N**, $Q = -3.003$ MeV, (14%)

$$\begin{aligned}
N_{\rm A}\langle\sigma v\rangle_{\rm gs} &= 1.18 \times 10^{8} \exp(-34.846/T_9) \times (1 + 0.336\, T_9 - 3.79 \times 10^{-2}\, T_9^2 + 2.02 \times 10^{-3}\, T_9^3)\\
N_{\rm A}\langle\sigma v\rangle_{\rm tt} &= N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 + 1.131 \exp(-12.892/T_9 + 0.019\, T_9))
\end{aligned}$$

Rev. ratio $= 9.988 \times 10^{-1} \exp(34.846/T_9)$

^{13}**C(α,n)**^{16}**O**, $Q = 2.216$ MeV, (9%)

$$\begin{aligned}
\text{For } T_9 \leq 4.0: \quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} &= 3.78 \times 10^{14}\, T_9^{-2} \exp(-32.333\, T_9^{-1/3} - (T_9/0.71)^2) \times (1 + 46.8\, T_9 - 292\, T_9^2 + 738\, T_9^3)\\
&\quad +2.30 \times 10^{7}\, T_9^{0.45} \exp(-13.03/T_9)\\
\text{For } T_9 > 4.0: \quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} &= 7.59 \times 10^{6}\, T_9^{1.078} \exp(-12.056/T_9)\\
N_{\rm A}\langle\sigma v\rangle_{\rm tt} &= N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 + 73.318 \exp(-58.176/T_9 - 0.198\, T_9))
\end{aligned}$$

Rev. ratio $= 5.793 \exp(-25.710/T_9)$

^{13}**N(p,γ)**^{14}**O**, $Q = 4.628$ MeV, (7%)

$$\begin{aligned}
N_{\rm A}\langle\sigma v\rangle_{\rm gs} &= 4.02 \times 10^{7}\, T_9^{-2/3} \exp(-15.205\, T_9^{-1/3} - (T_9/0.54)^2) \times (1 + 3.81\, T_9 + 18.6\, T_9^2 + 32.3\, T_9^3)\\
&\quad +3.25 \times 10^{5}\, T_9^{-1.35} \exp(-5.926/T_9)\\
N_{\rm A}\langle\sigma v\rangle_{\rm tt} &= N_{\rm A}\langle\sigma v\rangle_{\rm gs}
\end{aligned}$$

Rev. ratio $= 3.571 \times 10^{10}\, T_9^{3/2} \exp(-53.705/T_9)$

^{14}**N(p,γ)**^{15}**O**, $Q = 7.297$ MeV, (10%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 4.83 \times 10^{7}\, T_9^{-2/3} \exp(-15.231\, T_9^{-1/3} - (T_9/0.8)^2)$$

$$\times(1-2.00\,T_9+3.41\,T_9^2-2.43\,T_9^3)+2.36\times10^3\,T_9^{-3/2}\exp(-3.010/T_9)$$
$$+6.72\times10^3\,T_9^{0.380}\exp(-9.530/T_9)$$
$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} \;=\; N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs}$$

Rev. ratio $= 2.699\times10^{10}\,T_9^{3/2}\exp(-84.677/T_9)$

^{14}N(p,n)^{14}O, $Q=-5.925$ MeV, (2%)

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \;=\; 6.40\times10^5\exp(-68.761/T_9)\times(-1+8.74\,T_9-0.431\,T_9^2)$$
$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} \;=\; N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs}\times(1+1.206\exp(0.007/T_9+0.046\,T_9))$$

Rev. ratio $= 2.996\exp(68.761/T_9)$

^{14}N(p,α)^{11}C, $Q=-2.923$ MeV, (19%)

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \;=\; 3.01\times10^{16}\exp(-31.884\,T_9^{-1/3}-33.920/T_9)$$
$$\times\exp(-1.379\,T_9+0.215\,T_9^2-2.13\times10^{-2}\,T_9^3+8.00\times10^{-4}\,T_9^4)$$
$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} \;=\; N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs}\times(1+0.140\exp(-0.275/T_9-0.210\,T_9))$$

Rev. ratio $= 2.719\times10^{-1}\exp(33.920/T_9)$

^{14}N(α,γ)^{18}F, $Q=4.415$ MeV, (5%)

For $T_9\le 2$: $N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 7.93\times10^{11}\,T_9^{-2/3}\exp(-36.035\,T_9^{-1/3}-(T_9/0.07)^2)$
$$+1.85\times10^{-10}\,T_9^{-3/2}\exp(-2.750/T_9)+2.62\,T_9^{-3/2}\exp(-5.045/T_9)$$
$$+2.93\times10^3\,T_9^{0.344}\exp(-10.561/T_9)$$

For $T_9>2$: $N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 1.52\times10^2\,T_9^{1.567}\exp(-6.315/T_9)$

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} \;=\; N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs}\times(1-0.340\exp(-26.885/T_9-0.012\,T_9))$$

Rev. ratio $= 5.420\times10^{10}\,T_9^{3/2}\exp(-51.231/T_9)$

^{14}N(α,n)^{17}F, $Q=-4.735$ MeV, (8%)

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \;=\; 1.38\times10^8\,T_9^{0.053}\exp(-55.0/T_9)$$
$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} \;=\; N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs}\times(1+0.039\exp(-0.012/T_9+0.217\,T_9))$$

Rev. ratio $= 1.478\exp(54.943/T_9)$

^{15}N(p,γ)^{16}O, $Q=12.127$ MeV, (15%)

For $T_9\le 3.5$: $N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 1.08\times10^9\,T_9^{-2/3}\exp(-15.254\,T_9^{-1/3}-(T_9/0.34)^2)\times(1+6.15\,T_9+16.4\,T_9^2)$
$$+9.23\times10^3\,T_9^{-3/2}\exp(-3.597/T_9)+3.27\times10^6\,T_9^{-3/2}\exp(-11.024/T_9)$$

For $T_9>3.5$: $N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 3.54\times10^4\,T_9^{0.095}\exp(-2.306/T_9)$

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} \;=\; N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs}$$

Rev. ratio $= 3.622\times10^{10}\,T_9^{3/2}\exp(-140.73/T_9)$

^{15}N(p,n)^{15}O, $Q=-3.536$ MeV, (4%)

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \;=\; 1.16\times10^8\exp(-41.037/T_9)\times(1+0.219\,T_9-0.029\,T_9^2+1.73\times10^{-3}\,T_9^3)$$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} \quad = \quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 + 0.387\,\exp(-26.171/T_9 + 0.118\,T_9))$

Rev. ratio $= 9.988 \times 10^{-1}\ \exp(41.037/T_9)$

^{15}**N(p,α)**^{12}**C**, $Q = 4.966$ MeV, (13%)

For $T_9 \leq 2.5:\quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} = \quad 1.12 \times 10^{12}\,T_9^{-2/3}\exp(-15.253\,T_9^{-1/3} - (T_9/0.28)^2) \times (1 + 4.95\,T_9 + 143\,T_9^2)$
$\qquad +1.01 \times 10^8\,T_9^{-3/2}\ \exp(-3.643/T_9) + 1.19 \times 10^9\,T_9^{-3/2}\ \exp(-7.406/T_9)$

For $T_9 > 2.5:\quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} = \quad 4.17 \times 10^7\,T_9^{0.917}\exp(-3.292/T_9)$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} \quad = \quad N_{\rm A}\langle\sigma v\rangle_{\rm gs}$

Rev. ratio $= 7.060 \times 10^{-1}\ \exp(-57.622/T_9)$

^{15}**N(α,γ)**^{19}**F**, $Q = 4.014$ MeV, (13%)

$N_{\rm A}\langle\sigma v\rangle_{\rm gs} \quad = \quad 1.10 \times 10^{11}\,T_9^{-2/3}\exp(-36.214\,T_9^{-1/3} - (T_9/0.6)^2) + 1.65 \times 10^{-4}\,T_9^{-3/2}\exp(-4.224/T_9)$
$\qquad +2.66\,T_9^{-3/2}\exp(-6.220/T_9) + 1.56 \times 10^2\,T_9^{-3/2}\exp(-7.764/T_9)$
$\qquad +3.92 \times 10^4\,T_9^{-0.333}\exp(-14.522/T_9)$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} \quad = \quad N_{\rm A}\langle\sigma v\rangle_{\rm gs}$

Rev. ratio $= 5.542 \times 10^{10}\,T_9^{3/2}\exp(-46.577/T_9)$

^{16}**O(p,γ)**^{17}**F**, $Q = 0.600$ MeV, (10%)

$N_{\rm A}\langle\sigma v\rangle_{\rm gs} \quad = \quad 7.37 \times 10^7\exp(-16.696\,T_9^{-1/3}) \times T_9^{-0.82}$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} \quad = \quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 + 202\ \exp(-70.348/T_9 - 0.161\,T_9))$

Rev. ratio $= 3.037 \times 10^9\,T_9^{3/2}\exp(-6.966/T_9)$

^{16}**O(α,γ)**^{20}**Ne**, $Q = 4.730$ MeV, (3%)

$N_{\rm A}\langle\sigma v\rangle_{\rm gs} \quad = \quad 2.68 \times 10^{10}\,T_9^{-2/3}\ \exp(-39.760\,T_9^{-1/3} - (T_9/1.6)^2)$
$\qquad +51.1\,T_9^{-3/2}\ \exp(-10.32/T_9) + 616.1\,T_9^{-3/2}\ \exp(-12.200/T_9) + 0.41\,T_9^{2.966}\ \exp(-11.900/T_9)$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} \quad = \quad N_{\rm A}\langle\sigma v\rangle_{\rm gs}$

Rev. ratio $= 5.653 \times 10^{10}\,T_9^{3/2}\exp(-54.886/T_9)$

^{17}**O(p,γ)**^{18}**F**, $Q = 5.606$ MeV, (10%)

For $T_9 \leq 3:\quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} = \quad 1.50 \times 10^8\,T_9^{-2/3}\exp(-16.710\,T_9^{-1/3} - (T_9/0.2)^2) + 9.79 \times 10^{-6}\,T_9^{-3/2}\exp(-0.7659/T_9)$
$\qquad +4.15\,T_9^{-3/2}\exp(-2.083/T_9) + 7.74 \times 10^4\,T_9^{1.16}\exp(-6.342/T_9)$

For $T_9 > 3:\quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} = \quad 1.74 \times 10^3\,T_9^{0.700}\exp(-1.072/T_9)$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} \quad = \quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 - 0.287\ \exp(-10.011/T_9 - 0.062\,T_9))$

Rev. ratio $= 3.663 \times 10^{10}\,T_9^{3/2}\exp(-65.060/T_9)$

^{17}**O(p,α)**^{14}**N**, $Q = 1.192$ MeV, (11%)

For $T_9 \leq 6:\quad N_{\rm A}\langle\sigma v\rangle_{\rm gs} = \quad 9.20 \times 10^8\,T_9^{-2/3}\exp(-16.715\,T_9^{-1/3} - (T_9/0.06)^2) \times (1 - 80.31\,T_9 + 2211\,T_9^2)$

$$+9.13 \times 10^{-4}\, T_9^{-3/2} \exp(-0.7667\,/T_9) + 9.68\, T_9^{-3/2} \exp(-2.083\,/T_9)$$
$$+8.13 \times 10^{6}\, T_9^{-3/2} \exp(-5.685\,/T_9) + 1.85 \times 10^{6}\, T_9^{1.591} \exp(-4.848\,/T_9)$$

For $T_9 > 6$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 8.73 \times 10^{6}\, T_9^{0.950} \exp(-7.508/T_9)$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 + 1.033 \exp(-10.034/T_9 - 0.165\, T_9))$

Rev. ratio $= 6.759 \times 10^{-1} \exp(-13.829/T_9)$

^{17}O(α,n)^{20}Ne, $Q = 0.586$ MeV, (6%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 4.38 \times 10^{17}\, T_9^{-2/3} \exp(-39.918\, T_9^{-1/3} - (T_9/1.1)^2)$$
$$+1.73 \times 10^{3}\, T_9^{-3/2} \exp(-8.55/T_9) + 7.50 \times 10^{5}\, T_9^{1.83} \exp(-13.8/T_9)$$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs}$

Rev. ratio $= 18.59 \exp(-6.806/T_9)$

^{18}O(p,γ)^{19}F, $Q = 7.994$ MeV, (15%)

For $T_9 \leq 2$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 4.59 \times 10^{8}\, T_9^{-2/3} \exp(-16.732\, T_9^{-1/3} - (T_9/0.15)^2) \times (1 - 9.02\, T_9 + 506\, T_9^2 - 2400\, T_9^3)$
$$+9.91 \times 10^{-17}\, T_9^{-3/2} \exp(-0.232\,/T_9) + 3.30 \times 10^{-3}\, T_9^{-3/2} \exp(-1.033\,/T_9)$$
$$+1.61 \times 10^{2}\, T_9^{-3/2} \exp(-1.665\,/T_9) + 1.25 \times 10^{4}\, T_9^{0.458} \exp(-5.297\,/T_9)$$

For $T_9 > 2$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 1.38 \times 10^{4}\, T_9^{0.829} \exp(-5.919/T_9)$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 - 0.475 \exp(-15.513/T_9 - 0.102\, T_9))$

Rev. ratio $= 9.201 \times 10^{9}\, T_9^{3/2} \exp(-92.769/T_9)$

^{18}O(p,α)^{15}N, $Q = 3.981$ MeV, (10%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 5.58 \times 10^{11}\, T_9^{-2/3} \exp(-16.732\, T_9^{-1/3} - (T_9/0.51)^2) \times (1 + 3.2\, T_9 + 21.8\, T_9^2)$$
$$+9.91 \times 10^{-14}\, T_9^{-3/2} \exp(-0.232\,/T_9) + 2.58 \times 10^{4}\, T_9^{-3/2} \exp(-1.665\,/T_9)$$
$$+3.24 \times 10^{8}\, T_9^{-0.378} \exp(-6.395/T_9)$$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 - 1.968 \exp(-25.673/T_9 - 0.083\, T_9))$

Rev. ratio $= 1.660 \times 10^{-1} \exp(-46.192/T_9)$

^{18}O(α,γ)^{22}Ne, $Q = 9.667$ MeV, (19%)

For $T_9 \leq 6$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = \; = 1.95 \times 10^{-13}\, T_9^{-3/2} \exp(-2.069/T_9) + 1.56 \times 10^{-2}\, T_9^{-3/2} \exp(-4.462/T_9)$
$$+10.1\, T_9^{-3/2} \exp(-6.391/T_9) + 44.1\, T_9^{-3/2} \exp(-7.389/T_9)$$
$$+3.44 \times 10^{5}\, T_9^{-0.5} \exp(-22.103/T_9)$$

For $T_9 > 6$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 3.31 \times 10^{5}\, T_9^{-0.221} \exp(-24.990/T_9)$

$N_{\rm A}\langle\sigma v\rangle_{\rm tt} = N_{\rm A}\langle\sigma v\rangle_{\rm gs} \times (1 - 1.411 \exp(-20.533/T_9 - 0.038\, T_9))$

Rev. ratio $= 5.847 \times 10^{10}\, T_9^{3/2} \exp(-112.18/T_9)$

^{18}O(α,n)^{21}Ne, $Q = -0.697$ MeV, (12%)

$$N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 49.1 \exp(-8.085/T_9) \times (-1 + 18.7\, T_9 - 85.6\, T_9^2 + 146.8\, T_9^3)$$
$$+6.94 \times 10^{5}\, T_9^{2.24} \exp(-15.444/T_9)$$

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} = N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \times (1 + 0.427\exp(-22.836/T_9 - 0.009\,T_9))$$

Rev. ratio $= 7.845 \times 10^{-1}\ \exp(8.085/T_9)$

^{19}**F(p,γ)^{20}Ne**, $Q = 12.843$ MeV, (11%)

For $T_9 \leq 1.5$: $N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 6.37 \times 10^7\, T_9^{-2/3}\ \exp(-18.116\, T_9^{-1/3}) \times (1 + 0.775\, T_9 + 36.1\, T_9^2) + 8.27 \times 10^2\, T_9^{-3/2}\ \exp(-3.752/T_9) + 1.28 \times 10^6\, T_9^{-3.667}\ \exp(-9.120/T_9)$

For $T_9 > 1.5$ $N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 3.66 \times 10^3\, T_9^{0.947} \exp(-2.245/T_9)$

$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} = N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \times (1 - 0.990\ \exp(-1.207/T_9 - 0.0886\, T_9))$

Rev. ratio $= 3.696 \times 10^{10}\, T_9^{3/2} \exp(-149.04/T_9)$

^{19}**F(p,n)^{19}Ne**, $Q = -4.021$ MeV, (7%)

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 4.42 \times 10^7\ \exp(-46.659/T_9) \times (1 + 1.19\, T_9 - 0.150\, T_9^2 + 6.68 \times 10^{-3}\, T_9^3)$$

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} = N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs}\ \times (1.536 + 2.848 \times \exp(-0.0331/T_9 - 0.943\, T_9))$$

Rev. ratio $= 9.988 \times 10^{-1}\ \exp(46.659/T_9)$

^{19}**F(p,α)^{16}O**, $Q = 8.114$ MeV, (18%)

$$\begin{aligned} N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} &= 2.62 \times 10^{11}\, T_9^{-2/3}\ \exp(-18.116\, T_9^{1/3} - (T_9/0.185)^2) \\ &\quad \times(1 + 6.26 \times 10^{-2}\, T_9 + 0.285\, T_9^2 + 4.94 \times 10^{-3}\, T_9^3 + 11.5\, T_9^4 + 7.40 \times 10^4\, T_9^5) \\ &\quad + 3.80 \times 10^6\, T_9^{-3/2}\ \exp(-3.752/T_9) + 3.27 \times 10^7\, T_9^{-0.193} \exp(-6.587/T_9) \\ &\quad + 7.30 \times 10^8\, T_9^{-0.201}\ \exp(-16.249/T_9) \\ N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} &= N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \times (1 + 0.755\ \exp(-1.755/T_9 - 0.174\, T_9)) \end{aligned}$$

Rev. ratio $= 6.538 \times 10^{-1}\ \exp(-94.154/T_9)$

^{20}**Ne(p,γ)^{21}Na**, $Q = 2.431$ MeV, (12%)

$$\begin{aligned} N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} &= 2.35 \times 10^7\, T_9^{-1.84} \exp(-19.451\, T_9^{-1/3}) \times (1 + 10.80\, T_9) + 18.0\, T_9^{-3/2} \exp(-4.247/T_9) \\ &\quad + 9.83\, T_9^{-3/2} \exp(-4.619/T_9) + 6.76 \times 10^4\, T_9^{-0.641} \exp(-11.922/T_9) \\ N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} &= N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \times (1 - 7.929\ \exp(-20.108/T_9 - 0.327\, T_9)) \end{aligned}$$

Rev. ratio $= 4.637 \times 10^9\, T_9^{3/2} \exp(-28.214/T_9)$

^{20}**Ne(p,α)^{17}F**, $Q = -4.130$ MeV, (6%)

$$\begin{aligned} N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} &= 3.75 \times 10^{18}\, T_9^{-2/3} \exp(-43.180\, T_9^{-1/3} - 47.920/T_9) \times \\ &\quad \exp(-1.40 \times 10^{-3}\, T_9^4 + 3.44 \times 10^{-2}\, T_9^3 - 0.278\, T_9^2 + 0.354\, T_9) \\ N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} &= N_A\langle\sigma v\rangle_\mathrm{gs} \times (5.341 - 0.549\, T_9 + 0.363\, T_9^2 - 0.0603\, T_9^3 + 2.90 \times 10^{-3}\, T_9^4) \end{aligned}$$

Rev. ratio $= 5.372 \times 10^{-2}\ \exp(47.920/T_9)$

^{20}**Ne(α,γ)^{24}Mg**, $Q = 9.316$ MeV, (12%)

For $T_9 \leq 1$: $N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 8.72\, T_9^{-0.532} \exp(-8.995/T_9)$

For $T_9 > 1$: $N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = 3.74 \times 10^2\, T_9^{2.229} \exp(-12.681/T_9)$

$$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 - 7.787\exp(-19.821/T_9 - 0.114\,T_9))$$

Rev. ratio $= 6.010 \times 10^{10}\,T_9^{3/2}\exp(-108.11/T_9)$

^{21}**Ne(p,γ)**^{22}**Na**, $Q = 6.739$ MeV, (5%)

For $T_9 \le 2:\quad N_A\langle\sigma v\rangle_{gs} = \; 4.68 \times 10^{8}\,T_9^{-2/3}\exp(-19.465\,T_9^{-1/3} - (T_9/0.2)^2)$
$+8.18 \times 10^{-4}\,T_9^{-3/2}\exp(-1.085/T_9) + 6.11\,T_9^{-3/2}\exp(-1.399/T_9)$
$+1.34 \times 10^{4}\,T_9^{-3/2}\exp(-3.009/T_9) + 1.26 \times 10^{5}\,T_9^{-0.128}\exp(-4.962/T_9)$

For $T_9 > 2:\quad N_A\langle\sigma v\rangle_{gs} = \; 3.04 \times 10^{4}\,T_9^{0.420}\exp(-2.650/T_9)$

$$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 - 0.708\exp(-3.851/T_9 - 0.156\,T_9))$$

Rev. ratio $= 1.064 \times 10^{10}\,T_9^{3/2}\exp(-78.205/T_9)$

^{21}**Ne(α,n)**^{24}**Mg**, $Q = 2.555$ MeV, (7%)

For $T_9 \le 2.5:\quad N_A\langle\sigma v\rangle_{gs} = \; 1.00 \times 10^{19}\,T_9^{-2/3}\exp(-46.880\,T_9^{-1/3} - (T_9/1.5)^2) \times (1 - 0.15\,T_9)$
$+7.00 \times 10^{5}\,T_9^{-3/2}\exp(-16.9/T_9) + 3.7 \times 10^{6}\,T_9^{1.61}\exp(-20.20/T_9)$

For $T_9 > 2.5:\quad N_A\langle\sigma v\rangle_{gs} = \; 7.50 \times 10^{6}\,T_9^{1.511}\exp(-21.764/T_9)$

$$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 12.94\exp(-29.651/T_9)$

^{22}**Ne(p,γ)**^{23}**Na**, $Q = 8.794$ MeV, (12%)

For $T_9 \le 2:\quad N_A\langle\sigma v\rangle_{gs} = \; 1.11 \times 10^{-9}\,T_9^{-3/2}\exp(-0.422/T_9) + 6.83 \times 10^{-5}\,T_9^{-3/2}\exp(-0.810/T_9)$
$+9.76 \times 10^{-3}\,T_9^{-3/2}\exp(-1.187/T_9) + 1.06 \times 10^{-1}T_9^{-3/2}\exp(-1.775/T_9)$
$+8.51 \times 10^{4}\,T_9^{0.725}\exp(-4.315/T_9)$

For $T_9 > 2:\quad N_A\langle\sigma v\rangle_{gs} = \; 6.30 \times 10^{4}\,T_9^{0.816}\exp(-3.910/T_9)$

$$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 - 1.410\exp(-14.651/T_9 - 0.020\,T_9))$$

Rev. ratio $= 4.668 \times 10^{9}\,T_9^{3/2}\exp(-102.05/T_9)$

^{22}**Ne(α,γ)**^{26}**Mg**, $Q = 10.615$ MeV, (22%)

For $T_9 \le 1.25:\quad N_A\langle\sigma v\rangle_{gs} = \; 3.55 \times 10^{-9}\,T_9^{-3/2}\exp(-3.927/T_9) + 7.07 \times 10^{-1}\,T_9^{-1.064}\exp(-7.759/T_9)$
$+1.27 \times 10^{-3}\,T_9^{-2.556}\exp(-6.555/T_9)$

For $T_9 > 1.25:\quad N_A\langle\sigma v\rangle_{gs} = \; 1.76\,T_9^{3.322}\exp(-12.412/T_9)$

$$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 - 0.005\exp(-5.109/T_9 + 0.373\,T_9))$$

Rev. ratio $= 6.150 \times 10^{10}\,T_9^{3/2}\exp(-123.18/T_9)$

^{22}**Ne(α,n)**^{25}**Mg**, $Q = -0.478$ MeV, (4%)

For $T_9 \le 2:\quad N_A\langle\sigma v\rangle_{gs} = \; 7.40\exp(-7.79/T_9) + 1.30 \times 10^{-4}\,T_9^{0.83}\exp(-5.52/T_9)$
$+9.41 \times 10^{3}\,T_9^{2.78}\exp(-11.7/T_9) + 8.59 \times 10^{6}\,T_9^{0.892}\exp(-24.4/T_9)$

For $T_9 > 2:\quad N_A\langle\sigma v\rangle_{gs} = \; 1.51 \times 10^{5}\,T_9^{2.879}\exp(-16.717/T_9)$

$$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 + 2.674\exp(-15.025/T_9 - 0.321\,T_9))$$

Rev. ratio $= 5.440 \times 10^{-1} \exp(5.547/T_9)$

^{22}**Na(p,γ)**^{23}**Mg**, $Q = 7.579$ MeV, (11%)

$$\begin{aligned}
\text{For } T_9 \le 1: \quad N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = \;& 1.12 \times 10^{-10}\, T_9^{-3/2} \exp(-0.483/T_9) + 4.51 \times 10^{-7}\, T_9^{-3/2} \exp(-0.715/T_9) \\
& + 2.80 \times 10^{2}\, T_9^{-3/2} \exp(-2.369/T_9) + 4.15 \times 10^{3}\, T_9^{0.152} \exp(-2.775/T_9) \\
\text{For } T_9 > 1: \quad N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = \;& 7.55 \times 10^{3}\, T_9^{0.744} \exp(-3.299/T_9)
\end{aligned}$$

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} = N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \times (1 - 0.769 \exp(-7.854/T_9 + 0.016\, T_9))$$

Rev. ratio $= 3.268 \times 10^{10}\, T_9^{3/2} \exp(-87.955/T_9)$

^{23}**Na(p,γ)**^{24}**Mg**, $Q = 11.693$ MeV, (7%)

$$\begin{aligned}
\text{For } T_9 \le 5: \quad N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = \;& 9.55 \times 10^{7}\, T_9^{-2/3} \exp(-20.770\, T_9^{-1/3} - (T_9/0.3)^2) \times (1 - 10.80\, T_9 + 61.08\, T_9^2) \\
& + 8.20 \times 10^{-2}\, T_9^{-3/2} \exp(-1.601/T_9) + 85.2\, T_9^{-3/2} \exp(-2.808/T_9) \\
& + 1.70 \times 10^{4}\, T_9^{-3/2} \exp(-3.458/T_9) + 5.94 \times 10^{4} \exp(-5.734/T_9) \\
\text{For } T_9 > 5: \quad N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = \;& 5.60 \times 10^{3}\, T_9^{1.112} \exp(-2.337/T_9)
\end{aligned}$$

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} = N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \times (1 - 0.560 \exp(-5.119/T_9 - 0.050\, T_9))$$

Rev. ratio $= 7.490 \times 10^{10}\, T_9^{3/2} \exp(-135.69/T_9)$

^{23}**Na(p,n)**^{23}**Mg**, $Q = -4.839$ MeV, (3%)

$$\begin{aligned}
N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} &= 2.26 \times 10^{8} \exp(-56.156/T_9) \times (1 + 0.071\, T_9 - 2.26 \times 10^{-3}\, T_9^2) \\
N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} &= N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} \times (1 + 1.651 \exp(-0.014/T_9 - 0.054\, T_9))
\end{aligned}$$

Rev. ratio $= 9.988 \times 10^{-1} \exp(56.156/T_9)$

^{23}**Na(p,α)**^{20}**Ne**, $Q = 2.377$ MeV, (12%)

$$\begin{aligned}
\text{For } T_9 \le 5: \quad N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = \;& 8.39 \times 10^{9}\, T_9^{-2/3} \exp(-20.770\, T_9^{-1/3} - (T_9/0.1)^2) \times (1 + 45.2\, T_9) \\
& + 3.09 \times 10^{-13}\, T_9^{-3/2} \exp(-0.420/T_9) + 8.12 \times 10^{-3}\, T_9^{-3/2} \exp(-1.601/T_9) \\
& + 4.37\, T_9^{-3/2} \exp(-1.934/T_9) + 7.50 \times 10^{3}\, T_9^{-1.48} \exp(-3.150/T_9) \\
& + 1.05 \times 10^{6}\, T_9^{1.456} \exp(-4.482/T_9) \\
\text{For } T_9 > 5: \quad N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs} = \;& 3.96 \times 10^{6}\, T_9^{1.291} \exp(-9.277/T_9)
\end{aligned}$$

$$N_\mathrm{A}\langle\sigma v\rangle_\mathrm{tt} = N_\mathrm{A}\langle\sigma v\rangle_\mathrm{gs}$$

Rev. ratio $= 1.246 \exp(-27.578/T_9)$

^{23}**Na(α,n)**^{26}**Al**$^\mathrm{g}$, $Q = -2.966$ MeV (6%)

$$\begin{aligned}
N_\mathrm{A}\langle\sigma v\rangle^\mathrm{g}_\mathrm{gs} &= 2.74 \times 10^{6}\, T_9^{-2/3} \exp(-34.440/T_9)\,(1 + 2.86\, T_9 + 0.38\, T_9^2 - 3.00 \times 10^{-2}\, T_9^3) \\
&\quad + 1.45 \times 10^{10}\, T_9^{-1.36} \exp(-74.00/T_9) \\
N_\mathrm{A}\langle\sigma v\rangle^\mathrm{g}_\mathrm{tt} &= N_\mathrm{A}\langle\sigma v\rangle^\mathrm{g}_\mathrm{gs} \times (1 + 1.14 \exp(-0.0097/T_9 - 0.246\, T_9))
\end{aligned}$$

Rev. ratio $= 1.196 \exp(34.414/T_9)$

^{23}**Na(α,n)**^{26}**Al**$^{\rm m}$, $Q = -3.194$ MeV (5%)

$$N_{\rm A}\langle\sigma v\rangle^{\rm m}_{\rm gs} = 5.55\times10^{2}\,T_9^{-2/3}\,\exp(-37.090/T_9)\,(1+1.80\times10^{3}\,T_9+5.40\times10^{2}\,T_9^{2}-1.50\times10^{2}\,T_9^{3}) +1.38\times10^{6}\,T_9^{1.5}\,\exp(-48.00/T_9)$$

$$N_{\rm A}\langle\sigma v\rangle^{\rm m}_{\rm tt} = N_{\rm A}\langle\sigma v\rangle^{\rm m}_{\rm gs}\times(1+1.14\exp(-0.0097/T_9-0.246\,T_9))$$

Rev. ratio $= 13.16\,\exp(37.062/T_9)$

^{23}**Na(α,n)**^{26}**Al**$^{\rm t}$, (6%)

$$N_{\rm A}\langle\sigma v\rangle^{\rm t}_{\rm gs} = 1.30\times10^{4}\,T_9^{-2/3}\,\exp(-34.440/T_9)\,(1-20.0\,T_9^{2}+7.80\,T_9^{3}) +1.17\times10^{7}\,T_9^{0.35}\,\exp(-34.350/T_9)$$

$$N_{\rm A}\langle\sigma v\rangle^{\rm t}_{\rm tt} = N_{\rm A}\langle\sigma v\rangle^{\rm t}_{\rm gs}\times(1+1.14\exp(-0.0097/T_9-0.246\,T_9))$$

^{24}**Mg(p,γ)**^{25}**Al**, $Q = 2.271$ MeV, (12%)

For $T_9 \le 7$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 5.97\times10^{8}\,T_9^{-2/3}\exp(-22.023\,T_9^{-1/3}-(T_9/0.1)^2)+1.59\times10^{3}\,T_9^{-3/2}\exp(-2.483/T_9) +3.33\times10^{3}\,T_9^{0.122}\exp(-3.981/T_9)$

For $T_9 > 7$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 3.81\times10^{1}\,T_9^{2.113}\exp(0.860/T_9)$

$$N_{\rm A}\langle\sigma v\rangle^{\rm t}_{\rm tt} = N_{\rm A}\langle\sigma v\rangle^{\rm t}_{\rm gs}$$

Rev. ratio $= 3.129\times10^{9}\,T_9^{3/2}\exp(-26.357/T_9)$

^{24}**Mg(p,α)**^{21}**Na**, $Q = -6.885$ MeV (5%)

$$N_A\langle\sigma v\rangle_{\rm gs} = 3.72\times10^{16}\,T_9^{-2/3}\exp(-44.480\,T_9^{-1/3}-79.897/T_9)\times \exp(1.88\,T_9-0.516\,T_9^{2}+5.17\times10^{-2}\,T_9^{3}-1.86\times10^{-3}\,T_9^{4})$$

$$N_A\langle\sigma v\rangle_{\rm tt} = N_A\langle\sigma v\rangle_{\rm gs}\times(4.555+2.790\,T_9-0.127\,T_9^{2})$$

Rev. ratio $= 7.716\times10^{-2}\,\exp(79.897/T_9)$

^{25}**Mg(p,γ)**^{26}**Al**$^{\rm g}$, $Q = 6.306$ MeV, (16%)

For $T_9 \le 2$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 3.07\times10^{-16}\,T_9^{-3/2}\exp(-0.435/T_9)+3.70\times10^{-8}\,T_9^{-3/2}\exp(-0.673/T_9) +1.60\times10^{-5}\,T_9^{-3/2}\exp(-1.074/T_9)+1.27\times10^{4}\,T_9^{0.647}\exp(-3.055/T_9)$

For $T_9 > 2$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 8.75\times10^{3}\,T_9\exp(-2.997/T_9)$

$$N_{\rm A}\langle\sigma v\rangle^{\rm g}_{\rm tt} = N_{\rm A}\langle\sigma v\rangle^{\rm g}_{\rm gs}\times(1-0.352\exp(-7.221/T_9+0.068\,T_9))$$

Rev. ratio $= 1.026\times10^{11}\,T_9^{3/2}\exp(-73.183/T_9)$

^{25}**Mg(p,γ)**^{26}**Al**$^{\rm m}$, $Q = 6.078$ MeV, (28%)

For $T_9 \le 2$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 8.15\times10^{-17}\,T_9^{-3/2}\exp(-0.435/T_9)+8.68\times10^{-9}\,T_9^{-3/2}\exp(-0.673/T_9) +2.82\times10^{-6}\,T_9^{-3/2}\exp(-1.074/T_9)+3.48\times10^{3}\,T_9^{1.362}\exp(-2.906/T_9)$

For $T_9 > 2$: $N_{\rm A}\langle\sigma v\rangle_{\rm gs} = 3.91\times10^{3}\,T_9^{1.262}\exp(-3.229/T_9)$

$$N_{\rm A}\langle\sigma v\rangle^{\rm m}_{\rm tt} = N_{\rm A}\langle\sigma v\rangle^{\rm m}_{\rm gs}\times(1-0.352\exp(-7.221/T_9+0.068\,T_9))$$

Rev. ratio $= 1.129\times10^{11}\,T_9^{3/2}\exp(-70.535/T_9)$

^{25}**Mg(p,γ)^{26}Al^{t}**, (16%)

$$N_A\langle\sigma v\rangle^{t}_{gs} = N_A\langle\sigma v\rangle^{g}_{gs} + N_A\langle\sigma v\rangle^{m}_{gs}$$

$$N_A\langle\sigma v\rangle^{t}_{tt} = N_A\langle\sigma v\rangle^{t}_{gs} \times (1 - 0.352\exp(-7.221/T_9 + 0.068\,T_9))$$

^{25}**Mg(α,n)^{28}Si**, $Q = 2.654$ MeV, (9%)

For $T_9 \leq 2:$ $N_A\langle\sigma v\rangle_{gs} = 3.84\times10^{19}\,T_9^{-2/3}\exp(-53.415\,T_9^{-1/3})$
$\times(1 + 6.993\times10^{-1}\,T_9 - 4.538\times10^{-1}\,T_9^2 + 8.853\times10^{-2}\,T_9^3 - 7.387\times10^{-3}\,T_9^4$
$+2.276\times10^{-4}\,T_9^5)$

For $T_9 > 2:$ $N_A\langle\sigma v\rangle_{gs} = 5.37\times10^{4}\,T_9^{2.852}\exp(-21.052/T_9)$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs} \times (1 - 0.397\exp(-12.153/T_9 - 0.093\,T_9))$$

Rev. ratio $= 20.01\exp(-30.794/T_9)$

^{26}**Mg(p,γ)^{27}Al**, $Q = 8.271$ MeV, (21%)

For $T_9 \leq 3.5:$ $N_A\langle\sigma v\rangle_{gs} = 8.54\times10^{-12}\,T_9^{-3/2}\exp(-0.605/T_9) + 1.93\times10^{-6}\,T_9^{-3/2}\exp(-1.044/T_9)$
$+9.67\times10^{-3}\,T_9^{-3/2}\exp(-1.726/T_9) + 9.50\times10^{4}\,T_9^{-3/2}\exp(-3.781/T_9)$
$+10.2\,T_9^{-1.565}\exp(-2.521/T_9) + 7.07\times10^{4}\,T_9^{0.215}\exp(-3.947/T_9)$

For $T_9 > 3.5:$ $N_A\langle\sigma v\rangle_{gs} = 3.95\times10^{4}\,T_9^{1.068}\exp(-4.990/T_9)$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs} \times (1 - 1.259\exp(-20.076/T_9 + 0.069\,T_9))$$

Rev. ratio $= 3.144\times10^{9}\,T_9^{3/2}\exp(-95.983/T_9)$

^{26}**Mg(α,n)^{29}Si**, $Q = 0.034$ MeV, (7%)

For $T_9 \leq 2:$ $N_A\langle\sigma v\rangle_{gs} = 8.09\times10^{19}\,T_9^{-2/3}\exp(-53.505\,T_9^{-1/3} - (T_9/7.3)^2)$
$\times(1 - 0.17\,T_9 + 8.9\times10^{-3}\,T_9^2) + 2.80\times10^{4}\,T_9^{-0.43}\exp(-18.73/T_9)$

For $T_9 > 2:$ $N_A\langle\sigma v\rangle_{gs} = 4.92\times10^{4}\,T_9^{3.117}\exp(-20.864/T_9)$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs}$$

Rev. ratio $= 1.678\exp(-0.396/T_9)$

^{26}**Al^{g}(p,γ)^{27}Si**, $Q = 7.463$ MeV, (10%)

For $T_9 \leq 0.9:$ $N_A\langle\sigma v\rangle_{gs} = 3.54\times10^{-9}\,T_9^{-3/2}\exp(-0.789/T_9) + 8.54\times10^{-7}\,T_9^{-3/2}\exp(-1.079/T_9)$
$+10.3\,T_9^{-3/2}\exp(-2.182/T_9) + 6.12\times10^{2}\,T_9^{-3/2}\exp(-3.203/T_9)$
$+1.05\times10^{4}\,T_9^{-3/2}\exp(-4.213/T_9)$

For $T_9 > 0.9:$ $N_A\langle\sigma v\rangle_{gs} = 1.63\times10^{4}\,T_9^{0.348}\exp(-4.285/T_9)$

$$N_A\langle\sigma v\rangle_{tt} = N_A\langle\sigma v\rangle_{gs} \times (1 + 2.17\exp(-4.616/T_9 - 0.076\,T_9))$$

Rev. ratio $= 3.459\times10^{10}\,T_9^{3/2}\exp(-86.608/T_9)$

^{26}**Al^{ms}(p,γ)^{27}Si**, $Q = 7.691$ MeV, (10%)

For $T_9 \leq 0.4:$ $N_A\langle\sigma v\rangle_{ms} = N_A\langle\sigma v\rangle_{gs} \times (1 + 7.80\exp(-0.854/T_9 - 0.019\,T_9))$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 + 2.17\exp(-4.616/T_9 - 0.076\,T_9))$

Rev. ratio $= 3.459 \times 10^{10}\,T_9^{3/2}\exp(-89.254/T_9)$

^{27}**Al(p,γ)^{28}Si**, $Q = 11.585$ MeV, (10%)

For $T_9 \le 6$: $N_A\langle\sigma v\rangle_{gs} = 2.51 \times 10^{-11}\,T_9^{-3/2}\exp(-0.839/T_9) + 48.2\,T_9^{-0.2}\exp(-2.223/T_9)$
$+1.76 \times 10^3\,T_9^{1.12}\exp(-3.196/T_9) + 3.25 \times 10^4\,T_9^{0.251}\exp(-5.805/T_9)$

For $T_9 > 6$: $N_A\langle\sigma v\rangle_{gs} = 1.62 \times 10^5\,T_9^{0.549}\exp(-17.222/T_9)$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 - 0.669\exp(-10.426/T_9 + 0.008\,T_9))$

Rev. ratio $= 1.134 \times 10^{11}\,T_9^{3/2}\exp(-134.440/T_9)$

^{27}**Al(p,α)^{24}Mg**, $Q = 1.601$ MeV, (11%)

For $T_9 \le 6$: $N_A\langle\sigma v\rangle_{gs} = 4.76 \times 10^{10}\,T_9^{-2/3}\exp(-23.265\,T_9^{-1/3} - (T_9/0.15)^2) \times (1 - 22.3\,T_9 + 126.7\,T_9^2)$
$+9.65 \times 10^{-11}\,T_9^{-3/2}\exp(-0.834/T_9) + 2.09 \times 10^{-3}\,T_9^{-3/2}\exp(-2.269/T_9)$
$+1.17 \times 10^{-2}\,T_9^{-3/2}\exp(-3.273/T_9) + 2.84 \times 10^4\,\exp(-5.623/T_9)/T_9$
$+1.38 \times 10^6\,T_9\,\exp(-10.01/T_9)$

For $T_9 > 6$: $N_A\langle\sigma v\rangle_{gs} = 6.02 \times 10^5\,T_9^{1.862}\exp(-14.352/T_9)$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 + 3.471\,\exp(-11.091/T_9 - 0.129\,T_9))$

Rev. ratio $= 1.809\,\exp(-18.574/T_9)$

^{27}**Al(α,n)^{30}P**, $Q = -2.643$ MeV, (3%)

$N_A\langle\sigma v\rangle_{gs} \;=\; 8.15 \times 10^4\,\exp(-30.667/T_9)\,(1 - 1.351\,T_9 + 1.086\,T_9^2 + 0.354\,T_9^3 + 0.014\,T_9^4 - 2.13 \times 10^{-3}\,T_9^5)$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 + 0.227\,\exp(-3.588/T_9 + 0.0172\,T_9))$

Rev. ratio $= 6.751\,\exp(30.677/T_9)$

^{28}**Si(p,γ)^{29}P**, $Q = 2.748$ MeV, (1%)

For $T_9 \le 3$: $N_A\langle\sigma v\rangle_{gs} = 8.71 \times 10^8\,T_9^{-2/3}\exp(-24.453\,T_9^{-1/3} - (T_9/1.1)^2)$
$\times(1 + 0.301\,T_9 + 0.069\,T_9^2) + 3.37 \times 10^2\,T_9^{-3/2}\exp(-4.155/T_9)$
$+1.14 \times 10^3\,T_9^{1.654}\exp(-11.055/T_9)$

For $T_9 > 3$: $N_A\langle\sigma v\rangle_{gs} = 32.4\,T_9^{2.052}\exp(-1.525/T_9)$

$N_A\langle\sigma v\rangle_{tt} \;=\; N_A\langle\sigma v\rangle_{gs} \times (1 - 23.813\exp(-22.872/T_9 - 0.353\,T_9))$

Rev. ratio $= 9.468 \times 10^9\,T_9^{3/2}\exp(-31.889/T_9)$

Table IV. Analytical approximations of the partition functions

$$G(T_9) = 1 + a_1\, T_9^{a_2} \exp(a_3/T_9 + a_4\, T_9 + a_5\, T_9^{2/3})$$

$G(T_9) = 1$ for H and He isotopes, as well as for ^{8}B and ^{9}B

isotope	a_1	a_2	a_3	a_4	a_5
^{6}Li	3.47×10^0	-3.43×10^{-1}	-2.59×10^1	5.58×10^{-2}	–
^{7}Li	5.20×10^{-1}	-5.75×10^{-2}	-5.59×10^0	1.27×10^{-2}	–
^{7}Be	5.16×10^{-1}	-5.18×10^{-2}	-5.02×10^0	1.20×10^{-2}	–
^{8}Be	4.52×10^0	5.29×10^{-2}	-3.51×10^1	-3.79×10^{-3}	–
^{9}Be	1.73×10^{-2}	2.25×10^0	-1.54×10^1	-1.08×10^{-1}	–
^{10}B	5.04×10^{-1}	-3.19×10^{-1}	-8.59×10^0	9.40×10^{-2}	–
^{11}B	2.16×10^0	-1.19×10^0	-2.67×10^1	1.74×10^{-1}	–
^{11}C	2.89×10^0	-1.38×10^0	-2.57×10^1	1.95×10^{-1}	–
^{12}C	4.55×10^0	1.64×10^{-2}	-5.13×10^1	3.91×10^{-3}	–
^{13}C	4.44×10^{-1}	1.06×10^0	-3.57×10^1	-4.57×10^{-2}	–
^{13}N	4.68×10^{-2}	1.69×10^0	-2.33×10^1	-3.84×10^{-2}	–
^{14}N	1.23×10^0	-1.48×10^0	-2.85×10^1	2.97×10^{-1}	–
^{15}N	1.61×10^0	1.60×10^{-1}	-5.94×10^1	7.03×10^{-2}	–
^{14}O	3.16×10^{-1}	1.38×10^0	-5.75×10^1	-4.25×10^{-2}	–
^{15}O	2.95×10^0	-3.40×10^{-2}	-6.04×10^1	7.82×10^{-2}	–
^{16}O	2.38×10^0	5.15×10^{-1}	-6.87×10^1	1.53×10^{-2}	–
^{17}O	6.47×10^{-1}	-7.03×10^{-1}	-1.10×10^1	1.29×10^{-1}	–
^{18}O	8.11×10^0	-6.71×10^{-1}	-2.37×10^1	1.59×10^{-1}	–
^{17}F	4.16×10^{-1}	-3.07×10^{-1}	-6.03×10^0	6.64×10^{-2}	–
^{18}F	4.36×10^0	6.46×10^{-2}	-1.14×10^1	4.81×10^{-2}	–
^{19}F	9.05×10^0	1.66×10^0	-1.05×10^0	6.81×10^{-1}	-2.39×10^0
^{19}Ne	3.73×10^0	-1.33×10^{-1}	-2.87×10^0	7.61×10^{-2}	–
^{20}Ne	1.02×10^1	-6.02×10^{-1}	-1.99×10^1	8.95×10^{-2}	–
^{21}Ne	2.98×10^0	4.86×10^{-1}	-3.97×10^0	4.16×10^{-1}	-1.20×10^0
^{22}Ne	1.00×10^1	-6.92×10^{-1}	-1.57×10^1	1.22×10^{-1}	–
^{21}Na	1.58×10^0	-2.51×10^{-1}	-3.99×10^0	8.92×10^{-2}	–
^{22}Na	3.24×10^{-1}	7.64×10^{-1}	-6.32×10^0	3.87×10^{-2}	–
^{23}Na	1.80×10^0	-4.17×10^{-1}	-5.40×10^0	1.20×10^{-1}	–
^{23}Mg	4.30×10^0	8.89×10^{-1}	-5.00×10^0	6.16×10^{-1}	-1.90×10^0
^{24}Mg	8.23×10^0	-4.74×10^{-1}	-1.65×10^1	7.87×10^{-2}	–
^{25}Mg	1.51×10^{-1}	6.37×10^{-1}	-6.07×10^0	9.59×10^{-2}	–
^{26}Mg	1.15×10^1	-9.90×10^{-1}	-2.22×10^1	2.17×10^{-1}	–
^{25}Al	5.26×10^{-2}	-1.91×10^0	-5.78×10^0	-5.96×10^{-1}	2.99×10^0
^{26}Al	2.26×10^0	3.98×10^0	-1.58×10^0	1.39×10^0	-5.09×10^0
^{27}Al	9.52×10^{-1}	-4.51×10^{-1}	-1.08×10^1	1.69×10^{-1}	–
^{27}Si	9.24×10^{-1}	-4.28×10^{-1}	-1.01×10^1	1.63×10^{-1}	–
^{28}Si	9.87×10^0	-5.50×10^{-1}	-2.16×10^1	7.73×10^{-2}	–
^{29}Si	1.31×10^0	1.27×10^{-3}	-1.44×10^1	1.32×10^{-1}	–
^{30}Si	1.87×10^1	-1.28×10^0	-2.78×10^1	2.38×10^{-1}	–
^{29}P	1.46×10^0	2.90×10^{-2}	-1.59×10^1	1.33×10^{-1}	–
^{30}P	1.41×10^0	-5.33×10^{-1}	-8.41×10^0	2.36×10^{-1}	–
^{31}P	4.05×10^0	-1.03×10^0	-1.57×10^1	2.69×10^{-1}	–

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