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LOS ALAMOS SCIENTIFIC LABORATORY
OF THE UNIVERSITY OF CALIFORNIA o LOS ALAMOS NEW MEXICO

COMPRESSIBILITY FACTORS AND FUGACITY COEFFICIENTS CALCULATED FROM THE BEATTIE-BRIDGEMAN EQUATION OF STATE FOR HYDROGEN, NITROGEN, OXYGEN, CARBON DIOXIDE, AMMONIA, METHANE, AND HELIUM

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by

C. E. Holley, Jr.
W. J. Worlton
R. K. Zeigler

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ABSTRACT

Compressibility factors and fugacity coefficients for hydrogen, nitrogen, oxygen, carbon dioxide, ammonia, methane, and helium were calculated by use of the Beattie-Bridgeman equation of state. The results are tabulated for various pressures up to several hundred atmospheres, and temperatures up to several hundred degrees, at sufficiently close intervals to allow for easy interpolation.

A comparison is made of the calculated compressibility factors with the experimental values over those ranges of temperatures and pressure where the latter are available. From this comparison an attempt is made to indicate the probable reliability of the fugacity coefficients by the number of significant figures shown.

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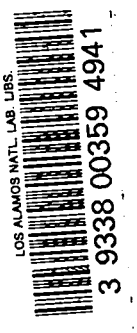

Introduction

In a recent study of the magnesium-hydrogen system, measurements were made of the hydrogen pressures at equilibrium and it was necessary to calculate the fugacities corresponding to these pressures before calculating the pertinent thermodynamic quantities. The method having been developed and the program prepared, the calculations were extended to other temperatures and pressures and to other gases. The results are presented here in the hope that they may be of value in future investigations. Any suggestions as to improvements will be welcome.

These calculations were made using the IBM-704. The problem was coded in the FORTRAN-I system, with the exception of the root-solving routine, LA S 871, which is due to J. K. Everton. With these aids, the calculation is quite simple, and can easily be extended at any computing installation.

Two general methods are available for the calculation of fugacities: 1) graphical and 2) analytical. The graphical method can always be used if P-V-T data are available. The analytical method requires that the P-V-T data be fitted to an analytical expression for the equation of state in a form which can be integrated. Fortunately, the Beattie-Bridgeman equation[1,2] is of such a form and with the proper constants closely represents the P-V-T data for many gases over a wide range of temperatures and pressures.

Integration of the Beattie-Bridgeman Equation

The Beattie-Bridgeman equation may be written in the form

$$PV^2 = RT\left(1 - \frac{c}{VT^3}\right)\left(V + B_o - \frac{bB_o}{V}\right) - A_o\left(1 - \frac{a}{V}\right) \qquad (1)$$

where A_o, B_o, a, b, and c are empirical constants to be determined experimentally for a particular gas and P, V, R, and T have their usual meanings.

This equation can be rearranged to give the following form

$$PV^4 - RTV^3 - \left(RTB_o - \frac{Rc}{T^2} - A_o\right)V^2 + \left(RTbB_o + \frac{RcB_o}{T^2} - aA_o\right)V - \frac{RcbB_o}{T^2} = 0 \qquad (2)$$

which, as can be seen, is a quartic equation in V. When the values of the empirical constants are inserted and this equation solved for V at a given T and P, there may be more than one real positive root. However, one of the roots will correspond more closely to experimental observations than the others and it can be chosen by inspection.

The fugacity, f, is found by means of the following expression[3]

$$\ln\left(\frac{f}{P}\right) = -\frac{1}{RT}\int_0^P \alpha \, dP \qquad (3)$$

where

$$\alpha = \frac{RT}{P} - V$$

Rearranging,

$$\ln\left(\frac{f}{P}\right) = -\frac{1}{RT}\int_0^P \left(\frac{RT}{P} - V\right) dP = -\int_0^P \frac{dP}{P} + \frac{1}{RT}\int_0^P V\, dP \qquad (4)$$

The Beattie-Bridgeman equation may be solved for P to give

$$P = \frac{RT}{V} + \left(RTB_o - \frac{Rc}{T^2} - A_o\right)\frac{1}{V^2} - \left(RTbB_o + \frac{RcB_o}{T^2} - aA_o\right)\frac{1}{V^3} + \frac{RcbB_o}{T^2}\,\frac{1}{V^4} \qquad (5)$$

Differentiating,

$$dP = \left[-\frac{RT}{V^2} - \left(RTB_o - \frac{Rc}{T^2} - A_o\right)\frac{2}{V^3} + \left(RTbB_o + \frac{RcB_o}{T^2} - aA_o\right)\frac{3}{V^4} - \frac{RcbB_o}{T^2}\,\frac{4}{V^5}\right] dV \qquad (6)$$

Hence,

$$V\, dP = \left[-\frac{RT}{V} - \left(RTB_o - \frac{Rc}{T^2} - A_o\right)\frac{2}{V^2} + \left(RTbB_o + \frac{RcB_o}{T^2} - aA_o\right)\frac{3}{V^3} - \frac{RcbB_o}{T^2}\,\frac{4}{V^4}\right] dV \qquad (7)$$

and

$$\int V\, dP = -RT \ln V + \left(RTB_o - \frac{Rc}{T^2} - A_o\right)\frac{2}{V} - \left(RTbB_o + \frac{RcB_o}{T^2} - aA_o\right)\frac{3}{2V^2} + \frac{RcbB_o}{T^2}\,\frac{4}{3V^3} \qquad (8)$$

Substituting in the expression for ln (f/P) in Eq. 4, we have

$$\ln\left(\frac{f}{P}\right) = -\ln P\Big|_{P=0}^{P=P} + \frac{1}{RT}\left[-RT\ln V + \left(RTB_o - \frac{Rc}{T^2} - A_o\right)\frac{2}{V} - \left(RTbB_o + \frac{RcB_o}{T^2} - aA_o\right)\frac{3}{2V^2} + \frac{RcbB_o}{T^2}\,\frac{4}{3V^3}\right]_{P=0\,(V=\infty)}^{P=P(V=V)} \qquad (9)$$

$$\ln f = \ln P - (\ln P)_{P=P} + (\ln P)_{P=0} + (\ln V)_{V=\infty} - (\ln V)_{V=V} + \left(B_o - \frac{c}{T^3} - \frac{A_o}{RT}\right)\frac{2}{V} - \left(bB_o + \frac{cB_o}{T^3} - \frac{aA_o}{RT}\right)\frac{3}{2V^2} + \frac{cbB_o}{T^3}\,\frac{4}{3V^3} \qquad (10)$$

At the limit $P=0(V=\infty)$, $PV = RT$, so

$$(\ln P)_{P=0} + (\ln V)_{V=\infty} = \ln RT$$

and

$$\ln f = \ln\left(\frac{RT}{V}\right) + \left(B_o - \frac{c}{T^3} - \frac{A_o}{RT}\right)\frac{2}{V} - \left(bB_o + \frac{cB_o}{T^3} - \frac{aA_o}{RT}\right)\frac{3}{2V^2} + \frac{cbB_o}{T^3}\,\frac{4}{3V^3} \qquad (11)$$

This is the equation used for calculating f for various values of P and T.

Compressibility Factors

For the calculation of the compressibility factors the Beattie-Bridgeman equation was solved for V at the various values of T and P, and then PV/RT was computed for each of the real positive roots. The values were then compared with experimental values to pick out those corresponding to the correct roots which were then tabulated. The results are shown in Tables II through VIII. Table I lists the constants of the Beattie-Bridgeman equation used in these and the subsequent calculations.

TABLE I

VALUES OF THE CONSTANTS OF THE BEATTIE-BRIDGEMAN EQUATION OF STATE FOR SEVERAL GASES[4]

Units: atmospheres; liters per mole; °K; R = 0.08206

Gas	A_o	a	B_o	b	$c \times 10^{-4}$
H_2	0.1975	-0.00506	0.02096	-0.04359	0.0504
N_2	1.3445	0.02617	0.05046	-0.00691	4.20
O_2	1.4911	0.02562	0.04624	0.004208	4.80
CO_2	5.0065	0.07132	0.10476	0.07235	66.00
NH_3	2.3930	0.17031	0.03415	0.19112	476.87
CH_4	2.2769	0.01855	0.05587	-0.01587	12.83
He	0.0216	0.05984	0.01400	0	0.0040

A comparison of the calculated compressibility factors with the experimentally observed values is made in Tables IX through XV. The experimental values were obtained from the following sources:

Hydrogen	Woolley, Scott, and Brickwidde[5] and Hilsenrath et al.[6]
Nitrogen	Hilsenrath et al.[6]
Oxygen	Hilsenrath et al.[6]
Carbon dioxide	Hilsenrath et al.[6]
Ammonia	Beattie and Lawrence[7]
Methane	Kvalnes and Gaddy[8]
Helium	Michels and Wouters[9] and Wiebe, Gaddy, and Heins[10]

Fugacity Coefficients

The fugacity coefficient, i.e., f/P where f = fugacity and P = pressure, is reported rather than the fugacities themselves, as this gives at a glance a value for the relation between the two quantities.

The calculated values of the fugacity coefficients are shown in Tables XVI through XXII.

Errors and Significant Figures

The calculated values of the compressibility factors and the fugacity coefficients are, of course, exact for a given set of values for the constants in the equation. In the tables of the compressibility factors the numbers are reported to the fifth decimal place. A comparison with the experimental values where these are known will allow one to estimate how many significant figures should be used in any particular case. For a discussion of the accuracy of the experimental values the reader is referred to the references cited.

In the tables of fugacity coefficients an attempt has been made to give some indication of how closely the numbers tabulated ought to agree with experimental values if they were available. To do this, it was noted from Equation 11 above that ln (f/P) = ln (RT)/(PV) + correction terms, where the correction terms are in general small. It was therefore assumed that, to a first approximation, calculated values of f/P will deviate from experimental values in about the same way as is the case for calculated values of PV/RT. Therefore, in those regions when PV/RT(calc) – PV/RT(expt) is less than 0.0005, f/P is given to five decimal places. Where this difference is between 0.0005 and 0.005, four decimal places are given. Where it is between 0.005 and 0.05, three decimal places are given. And where it is greater than 0.05, only two decimal places are given. In those regions where experimental values of PV/RT are not available for comparison with the calculated values, estimates of the difference were made and the number of significant figures adjusted accordingly. The authors hope that, if they have erred in this, it has been in the direction of too many significant figures rather than too few.

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TABLE II

VALUES OF PV/RT FOR HYDROGEN CALCULATED FROM THE BEATTIE-BRIDGEMAN EQUATION

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
30	0.99682	0.98392	0.96729	0.93216	0.80347							
40	0.99856	0.99279	0.98549	0.97062	0.92351	0.83348						
50	0.99924	0.99619	0.99237	0.98470	0.96138	0.92149	0.83747					
70	0.99974	0.99871	0.99742	0.99488	0.98742	0.97568	0.95507	0.92145	0.95581	1.15714	1.79350	2.67020
100	0.99996	0.99978	0.99957	0.99916	0.99809	0.99675	0.99583	1.00666	1.06090	1.23113	1.77658	2.55505
200	1.00005	1.00027	1.00054	1.00109	1.00277	1.00568	1.01191	1.03352	1.07735	1.18185	1.51950	2.03082
300	1.00005	1.00026	1.00053	1.00105	1.00265	1.00536	1.01095	1.02890	1.06217	1.13687	1.37937	1.76165
400	1.00005	1.00023	1.00046	1.00091	1.00229	1.00461	1.00934	1.02417	1.05073	1.10874	1.29715	1.60284
500	1.00004	1.00020	1.00039	1.00079	1.00198	1.00397	1.00801	1.02054	1.04259	1.08997	1.24357	1.49800
600	1.00003	1.00017	1.00034	1.00069	1.00173	1.00347	1.00698	1.01780	1.03663	1.07665	1.20603	1.42359
700	1.00003	1.00015	1.00031	1.00061	1.00153	1.00307	1.00617	1.01567	1.03210	1.06673	1.17833	1.36807
800	1.00003	1.00014	1.00027	1.00055	1.00137	1.00275	1.00552	1.01399	1.02855	1.05907	1.15708	1.32508
900	1.00002	1.00012	1.00025	1.00050	1.00124	1.00249	1.00499	1.01263	1.02571	1.05298	1.14029	1.29084
1000	1.00002	1.00011	1.00023	1.00045	1.00113	1.00227	1.00455	1.01150	1.02337	1.04802	1.12670	1.26294

TABLE III

VALUES OF PV/RT FOR NITROGEN CALCULATED FROM THE BEATTIE-BRIDGEMAN EQUATION

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
70	0.99464	0.97261										
100	0.99810	0.99045	0.98073	0.96073	0.89540							
200	0.99978	0.99888	0.99777	0.99554	0.98890	0.97798	0.95684	0.90124	0.85059	0.90504	1.31853	1.95877
300	0.99998	0.99988	0.99977	0.99955	0.99891	0.99795	0.99647	0.99541	1.00464	1.05634	1.31516	1.76358
400	1.00003	1.00013	1.00027	1.00054	1.00138	1.00281	1.00586	1.01636	1.03790	1.09244	1.29547	1.64101
500	1.00004	1.00021	1.00042	1.00085	1.00213	1.00428	1.00866	1.02237	1.04685	1.10022	1.27457	1.56068
600	1.00005	1.00023	1.00047	1.00093	1.00234	1.00468	1.00941	1.02381	1.04843	1.09923	1.25479	1.50266
700	1.00005	1.00023	1.00047	1.00094	1.00235	1.00470	1.00940	1.02359	1.04740	1.09527	1.23684	1.45779
800	1.00005	1.00023	1.00046	1.00091	1.00228	1.00455	1.00911	1.02275	1.04543	1.09041	1.22081	1.42150
900	1.00004	1.00022	1.00044	1.00087	1.00218	1.00436	1.00870	1.02170	1.04318	1.08545	1.20656	1.39126
1000	1.00004	1.00021	1.00041	1.00083	1.00207	1.00414	1.00827	1.02060	1.04091	1.08070	1.19390	1.36551

TABLE IV

VALUES OF PV/RT FOR OXYGEN CALCULATED FROM THE BEATTIE-BRIDGEMAN EQUATION

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
100	0.99776	0.98870	0.97715	0.95323								
200	0.99969	0.99846	0.99691	0.99382	0.98451	0.96889	0.93731	0.84100	0.70091	0.69090	1.07806	1.67361
300	0.99994	0.99967	0.99935	0.99870	0.99677	0.99362	0.98761	0.97189	0.95454	0.95540	1.12621	1.50296
400	1.00000	1.00000	1.00000	1.00001	1.00003	1.00010	1.00038	1.00225	1.00871	1.03290	1.16180	1.42812
500	1.00002	1.00012	1.00023	1.00047	1.00117	1.00236	1.00478	1.01249	1.02663	1.05902	1.17588	1.38877
600	1.00003	1.00016	1.00032	1.00064	1.00160	1.00321	1.00644	1.01629	1.03313	1.06809	1.17808	1.36183
700	1.00004	1.00018	1.00035	1.00070	1.00175	1.00351	1.00702	1.01757	1.03518	1.07042	1.17474	1.34006
800	1.00004	1.00018	1.00036	1.00071	1.00178	1.00357	1.00712	1.01775	1.03531	1.06984	1.16895	1.32115
900	1.00004	1.00018	1.00035	1.00070	1.00176	1.00351	1.00701	1.01743	1.03456	1.06795	1.16222	1.30425
1000	1.00003	1.00017	1.00034	1.00068	1.00171	1.00341	1.00680	1.01689	1.03342	1.06551	1.15527	1.28897

TABLE V

VALUES OF PV/RT FOR CARBON DIOXIDE CALCULATED FROM THE BEATTIE-BRIDGEMAN EQUATION

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
200	0.99827	0.99131	0.98248									
300	0.99950	0.99750	0.99498	0.98993	0.97454	0.94808	0.89161	0.67366				
400	0.99982	0.99912	0.99823	0.99646	0.99112	0.98219	0.96419	0.90926	0.81853	0.71446	0.95518	1.46161
500	0.99994	0.99972	0.99945	0.99890	0.99725	0.99451	0.98903	0.97271	0.94638	0.90102	0.89890	1.15474
600	1.00000	1.00000	1.00000	1.00000	0.99999	0.99998	0.99990	0.99936	0.99753	0.99076	0.95481	0.93276
700	1.00003	1.00014	1.00027	1.00054	1.00135	1.00267	1.00524	1.01233	1.02222	1.03555	1.02946	
800	1.00004	1.00021	1.00041	1.00083	1.00205	1.00407	1.00801	1.01906	1.03513	1.05963	1.08215	
900	1.00005	1.00024	1.00049	1.00097	1.00242	1.00481	1.00947	1.02263	1.04208	1.07303	1.11580	0.72066
1000	1.00005	1.00026	1.00052	1.00105	1.00261	1.00518	1.01020	1.02446	1.04574	1.08047	1.13697	1.07058

TABLE VI

VALUES OF PV/RT FOR AMMONIA CALCULATED FROM THE BEATTIE-BRIDGEMAN EQUATION

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500
300	0.99903	0.99511	0.99017	0.98016	0.94889						
400	0.99965	0.99827	0.99654	0.99306	0.98252	0.96458	0.92715	0.79976	0.56165		
500	0.99985	0.99924	0.99848	0.99696	0.99238	0.98471	0.96922	0.92187	0.84349	0.75222	1.00158
600	0.99993	0.99963	0.99926	0.99852	0.99629	0.99257	0.98512	0.96275	0.92621	0.86538	0.91456
700	0.99996	0.99981	0.99963	0.99925	0.99813	0.99626	0.99250	0.98114	0.96210	0.92561	0.88479
800	0.99998	0.99991	0.99982	0.99964	0.99911	0.99821	0.99639	0.99072	0.98065	0.95860	0.89226
900	0.99999	0.99997	0.99994	0.99987	0.99967	0.99933	0.99861	0.99619	0.99126	0.97820	0.91430
1000	1.00000	1.00000	1.00000	1.00000	1.00001	1.00000	0.99995	0.99950	0.99776	0.99057	0.93714

TABLE VII

VALUES OF PV/RT FOR METHANE CALCULATED FROM THE BEATTIE-BRIDGEMAN EQUATION

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
100	0.99572	0.97820										
200	0.99940	0.99698	0.99395	0.98784	0.96916	0.94016	0.86584		0.16076	0.29390	0.62494	1.06673
300	0.99983	0.99916	0.99832	0.99664	0.99162	0.98331	0.96689	0.92001	0.85583	0.81560	1.04649	1.50411
400	0.99995	0.99976	0.99953	0.99906	0.99768	0.99545	0.99125	0.98089	0.97161	0.98271	1.15154	1.51094
500	1.00000	0.99999	0.99998	0.99997	0.99995	0.99995	1.00012	1.00196	1.00926	1.03785	1.18795	1.48559
600	1.00002	1.00009	1.00018	1.00037	1.00093	1.00190	1.00393	1.01080	1.02462	1.05973	1.19895	1.45701
700	1.00003	1.00014	1.00028	1.00055	1.00139	1.00280	1.00568	1.01478	1.03133	1.06865	1.19931	1.42982
800	1.00003	1.00016	1.00032	1.00064	1.00160	1.00321	1.00648	1.01654	1.03413	1.07176	1.19497	1.40493
900	1.00003	1.00017	1.00034	1.00067	1.00169	1.00338	1.00679	1.01719	1.03501	1.07205	1.18860	1.38238
1000	1.00003	1.00017	1.00034	1.00068	1.00171	1.00342	1.00686	1.01727	1.03490	1.07093	1.18145	1.36201

TABLE VIII

VALUES OF PV/RT FOR HELIUM CALCULATED FROM THE BEATTIE-BRIDGEMAN EQUATION

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
10	0.99360	0.96744	0.93341	0.85982	0.53690	0.37357	0.58424	1.13025	1.87863	3.11705	6.04445	9.91332
20	0.99975	0.99880	0.99772	0.99598	0.99398	1.00125	1.04857	1.29783	1.73713	2.50117	4.30321	6.64816
30	1.00015	1.00078	1.00160	1.00336	1.00957	1.02283	1.05846	1.20610	1.48176	1.99190	3.23005	4.85095
40	1.00021	1.00104	1.00210	1.00426	1.01111	1.02363	1.05226	1.15634	1.34964	1.72239	2.65629	3.89197
50	1.00021	1.00103	1.00207	1.00416	1.01060	1.02184	1.04597	1.12728	1.27453	1.56404	2.30925	3.30728
70	1.00018	1.00088	1.00177	1.00354	1.00890	1.01797	1.03653	1.09463	1.19493	1.39275	1.91899	2.63966
100	1.00014	1.00069	1.00138	1.00276	1.00691	1.01384	1.02775	1.06963	1.13916	1.27415	1.63844	2.14804
200	1.00008	1.00039	1.00077	1.00154	1.00386	1.00770	1.01533	1.03790	1.07444	1.14400	1.33138	1.59795
300	1.00005	1.00027	1.00053	1.00107	1.00266	1.00531	1.01058	1.02618	1.05148	1.09980	1.23084	1.41875
400	1.00004	1.00020	1.00041	1.00081	1.00203	1.00405	1.00808	1.02001	1.03945	1.07676	1.17897	1.32707
500	1.00003	1.00016	1.00033	1.00066	1.00164	1.00328	1.00653	1.01620	1.03200	1.06248	1.14675	1.27016
600	1.00003	1.00014	1.00028	1.00055	1.00138	1.00275	1.00548	1.01361	1.02693	1.05272	1.12461	1.23093
700	1.00002	1.00012	1.00024	1.00047	1.00118	1.00237	1.00472	1.01174	1.02325	1.04562	1.10839	1.20205
800	1.00002	1.00010	1.00021	1.00042	1.00104	1.00208	1.00415	1.01032	1.02045	1.04021	1.09597	1.17981
900	1.00002	1.00009	1.00019	1.00037	1.00093	1.00185	1.00370	1.00920	1.01826	1.03596	1.08613	1.16211
1000	1.00002	1.00008	1.00017	1.00033	1.00084	1.00167	1.00334	1.00831	1.01649	1.03252	1.07815	1.14766

TABLE IX

PV/RT(calc) - PV/RT(expt) FOR HYDROGEN

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
20	-0.001	+0.01										
30	+0.0001	-0.001	+0.001	+0.03								
40	+0.0001	-0.0001	+0.0010	+0.0022	+0.0043							
50	0.0000	-0.0007	+0.0005	+0.0007	+0.0020	+0.0029						
70	0.0000	-0.0001	-0.0001	-0.0001	-0.0003	-0.0003	-0.0068	-0.0132				
100	0.0000	-0.0001	-0.0002	-0.0004	-0.0009	-0.0015	-0.0040	-0.0026	-0.0049	+0.014		
200	0.0000	0.0000	-0.0002	-0.0003	-0.0007	-0.0011	-0.0021	-0.0058	+0.0013	+0.0017	+0.0061	
300	0.0000	-0.0001	-0.0001	-0.0002	-0.0004	-0.0005	-0.0009	-0.0010	+0.0015	+0.0129	+0.055	
400	0.0000	0.0000	0.0000	-0.0001	-0.0002	-0.0002	-0.0003	0.0000	+0.0021	+0.0106	+0.053	+0.115
500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	+0.0005	+0.0026	+0.0095	+0.038	+0.118
600	0.0000	+0.0001	0.0000	+0.0001	+0.0001	+0.0001	+0.0002	+0.0008	+0.0029	+0.0089	+0.039	+0.099

TABLE X

PV/RT(calc) - PV/RT(expt) FOR NITROGEN

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100
100	-0.0001	-0.001	0.000	-0.029	+0.028				
200	-0.00001	-0.0001	-0.0001	-0.0002	-0.0005	-0.0008	-0.0019	-0.0013	+0.006
300	0.00000	-0.00002	-0.0001	-0.0001	-0.0002	-0.0004	-0.0011	-0.0015	-0.0008
400	0.00000	-0.00001	-0.00001	-0.00002	-0.00004	-0.0001	-0.0004	-0.0005	-0.0004
500	0.00000	+0.00001	+0.00001	+0.00003	+0.0001	+0.0001	+0.0001	+0.0004	+0.0007
600	+0.00001	+0.00002	+0.00003	+0.0001	+0.0002	+0.0003	+0.0005	+0.0011	+0.0019
700	+0.00001	+0.00002	+0.00004	+0.0001	+0.0002	+0.0004	+0.0007	+0.0017	+0.0028
800	+0.00001	+0.00003	+0.0001	+0.0001	+0.0002	+0.0005	+0.0009	+0.0020	+0.0034
900	0.00000	+0.00003	+0.0001	+0.0001	+0.0003	+0.0005	+0.0010	+0.0023	+0.0041
1000	0.00000	+0.00003	+0.0001	+0.0001	+0.0003	+0.0005	+0.0011	+0.0024	+0.0044

TABLE XI

PV/RT(calc) - PV/RT(expt) FOR OXYGEN

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100
100	-0.00005	-0.0002	-0.0001						
200	+0.00001	+0.00005	+0.0001	+0.0002	+0.0004	+0.0007	+0.0002	+0.0001	-0.0138
300	0.00000	+0.00003	+0.00004	+0.0001	+0.0002	+0.0004	+0.0008	+0.008	-0.0004
400	0.00000	0.00000	+0.00001	+0.00002	+0.00005	+0.0001	+0.0003	+0.0003	-0.0008
500	0.00000	-0.00001	-0.00001	-0.00003	-0.00007	-0.0001	-0.0002	-0.0095	-0.0010
600	0.00000	-0.00001	-0.00003	-0.00006	-0.0002	-0.0003	-0.0005	-0.0011	-0.0017
700	-0.00001	-0.00003	-0.00004	-0.0001	-0.0002	-0.0003	-0.0007	-0.0015	-0.0024
800	-0.00001	-0.00003	-0.00005	-0.0001	-0.0002	-0.0005	-0.0008	-0.0016	-0.0030
900	-0.00001	-0.00003	-0.00005	-0.0001	-0.0003	-0.0005	-0.0009	-0.0021	-0.0034
1000	0.00000	-0.00002	-0.00005	-0.0001	-0.0003	-0.0005	-0.0010	-0.0022	-0.0038

TABLE XII

PV/RT(calc) - PV/RT(expt) FOR CARBON DIOXIDE

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100
300	0.00000	0.00000	-0.00003	0.0000	-0.0002	-0.0006	+0.0055		
400	+0.00001	+0.00002	+0.00005	+0.00011	+0.0003	+0.0007	+0.0014	+0.0025	+0.0030
500	+0.00002	+0.00008	+0.0002	+0.0004	+0.0009	+0.0017	+0.0031	+0.0069	+0.0099
600	+0.00003	+0.00013	+0.0002	+0.0005	+0.0012	+0.0023	+0.0043	+0.0092	+0.0125
700	+0.00004	+0.00015	+0.0003	+0.0006	+0.0014	+0.0027	+0.0047	+0.0107	+0.0154
800	+0.00003	+0.00016	+0.0003	+0.0006	+0.0015	+0.0029	+0.0055	+0.0119	+0.0179
900	+0.00004	+0.00015	+0.0005	+0.0007	+0.0015	+0.0030	+0.0057	+0.0124	+0.0197
1000	+0.00003	+0.00016	+0.0003	+0.0006	+0.0016	+0.0030	+0.0057	+0.0127	+0.0209

TABLE XIII

PV/RT(calc) - PV/RT(expt) FOR AMMONIA

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100
300				-0.0020	+0.0013				
400				+0.0004	+0.0006	+0.0035	-0.0056	+0.0008	
500					+0.0005	+0.0006	+0.0003	-0.0006	+0.0034

TABLE XIV

PV/RT(calc) - PV/RT(expt) FOR METHANE

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
200									-0.198			-1.384
300			0.0000				+0.0069		+0.0006	-0.0164	-0.146	-0.401
400			-0.0002					+0.0013		+0.0031	-0.0394	-0.176
500												-0.113

TABLE XV

PV/RT(calc) - PV/RT(expt) FOR HELIUM

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	50	100	200	500	1000
200									+0.0020	-0.0005	-0.0206	
300						+0.00048	+0.00104	+0.00249	+0.0036	+0.0043	+0.0068	-0.0178
400							+0.00116	+0.00295	+0.0050	+0.0083	+0.0120	-0.0056

TABLE XVI

FUGACITY COEFFICIENTS FOR HYDROGEN, f/P

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
30	0.99683	0.9842	0.9683	0.937	0.840					
40	0.99857	0.99283	0.9857	0.9714	0.9287	0.858				
50	0.99924	0.99620	0.99241	0.9849	0.9624	0.9256	0.855	0.72	0.61	0.52
60	0.99956	0.99782	0.99565	0.99133	0.9785	0.9578	0.918	0.849	0.794	0.754
70	0.99974	0.99871	0.99742	0.99486	0.98731	0.97517	0.953	0.915	0.886	0.867
80	0.99985	0.99923	0.99847	0.99695	0.99252	0.98547	0.973	0.953	0.940	0.933
90	0.99991	0.99956	0.99913	0.99828	0.99579	0.9919	0.9853	0.976	0.973	0.975
100	0.99996	0.99978	0.99957	0.99914	0.9979	0.9962	0.9935	0.9917	0.9943	1.0011
110	0.99999	0.99993	0.99986	0.99973	0.9994	0.9990	0.9991	1.0020	1.0086	1.0187
120	1.00001	1.00003	1.00007	1.00014	1.0004	1.0010	1.0029	1.0090	1.0183	1.0305
130	1.00002	1.00010	1.00021	1.00043	1.0011	1.0024	1.0056	1.0140	1.0250	1.0385
140	1.00003	1.00016	1.00032	1.00064	1.0016	1.0034	1.0075	1.0174	1.0296	1.0440
150	1.00004	1.00019	1.00039	1.00079	1.0020	1.0041	1.0088	1.0198	1.0327	1.0476
160	1.00004	1.00022	1.00044	1.00089	1.0023	1.0046	1.0098	1.0214	1.0349	1.0500
170	1.00005	1.00024	1.00048	1.00097	1.0025	1.0050	1.0105	1.0226	1.0363	1.0516
180	1.00005	1.00025	1.00051	1.00102	1.0026	1.0053	1.0109	1.0233	1.0372	1.0524
190	1.00005	1.00026	1.00053	1.00106	1.0027	1.0054	1.0112	1.0238	1.0377	1.0528
200	1.00005	1.00027	1.00054	1.00109	1.0027	1.0056	1.0114	1.0241	1.0379	1.0528
210	1.00005	1.00027	1.00055	1.00110	1.0028	1.0056	1.0115	1.0242	1.0379	1.0526
220	1.00006	1.00028	1.00055	1.00111	1.0028	1.0056	1.0116	1.0242	1.0377	1.0522
230	1.00006	1.00028	1.00056	1.00111	1.0028	1.0057	1.0116	1.0240	1.0374	1.0517
240	1.00006	1.00028	1.00055	1.00111	1.0028	1.0056	1.0115	1.0239	1.0371	1.0511
260	1.00005	1.00027	1.00055	1.00110	1.00276	1.0056	1.0113	1.0234	1.0362	1.0496
280	1.00005	1.00027	1.00054	1.00108	1.00271	1.0054	1.0111	1.0228	1.0351	1.0480
300	1.00005	1.00026	1.00053	1.00105	1.00264	1.00532	1.0108	1.0221	1.0340	1.0464
320	1.00005	1.00026	1.00051	1.00102	1.00257	1.00517	1.0105	1.0214	1.0329	1.0448
340	1.00005	1.00025	1.00050	1.00100	1.00250	1.00503	1.01016	1.0208	1.0318	1.0432
360	1.00005	1.00024	1.00048	1.00097	1.00243	1.00488	1.00986	1.0201	1.0307	1.0418
380	1.00005	1.00023	1.00047	1.00094	1.00236	1.00473	1.00955	1.01946	1.0297	1.0403
400	1.00005	1.00023	1.00046	1.00091	1.00229	1.00459	1.00926	1.01885	1.02874	1.0389

TABLE XVI (Continued)

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
420	1.00004	1.00022	1.00044	1.00088	1.00222	1.00445	1.00898	1.01825	1.02781	1.0376
440	1.00004	1.00021	1.00043	1.00086	1.00215	1.00432	1.00871	1.01769	1.02693	1.0364
460	1.00004	1.00021	1.00042	1.00083	1.00209	1.00420	1.00845	1.01715	1.02609	1.0353
480	1.00004	1.00020	1.00040	1.00081	1.00203	1.00408	1.00821	1.01664	1.0253	1.0342
500	1.00004	1.00020	1.00039	1.00079	1.00197	1.00396	1.00797	1.01615	1.0245	1.0331
520	1.00004	1.00019	1.00038	1.00077	1.00192	1.00385	1.00775	1.01569	1.0238	1.0321
540	1.00004	1.00019	1.00037	1.00075	1.00187	1.00375	1.00754	1.01525	1.0231	1.0312
560	1.00004	1.00018	1.00036	1.00073	1.00182	1.00365	1.00733	1.0148	1.0225	1.0303
580	1.00004	1.00018	1.00035	1.00071	1.00177	1.00355	1.00714	1.0144	1.0219	1.0295
600	1.00003	1.00017	1.00034	1.00069	1.00173	1.00346	1.00696	1.0141	1.0213	1.0287
620	1.00003	1.00017	1.00034	1.00067	1.00168	1.00337	1.00678	1.0137	1.0208	1.0279
640	1.00003	1.00016	1.00033	1.00066	1.00164	1.00329	1.00661	1.0134	1.0202	1.0272
660	1.00003	1.00016	1.00032	1.00064	1.00160	1.00321	1.00645	1.0130	1.0197	1.0265
680	1.00003	1.00016	1.00031	1.00062	1.00156	1.00314	1.00630	1.0127	1.0192	1.0259
700	1.00003	1.00015	1.00031	1.00061	1.00153	1.00306	1.00615	1.0124	1.0188	1.0252
720	1.00003	1.00015	1.00030	1.00060	1.00149	1.00299	1.00601	1.0121	1.0184	1.0247
740	1.00003	1.00015	1.00029	1.00058	1.00146	1.00293	1.00588	1.0119	1.0179	1.0241
760	1.00003	1.00014	1.00029	1.00057	1.00143	1.00286	1.00575	1.0116	1.0175	1.0236
780	1.00003	1.00014	1.00028	1.00056	1.00140	1.00280	1.00563	1.0113	1.0171	1.0230
800	1.00003	1.00014	1.00027	1.00055	1.00137	1.00274	1.00551	1.0111	1.0168	1.0225
820	1.00003	1.00013	1.00027	1.00054	1.00134	1.00269	1.00540	1.0109	1.0164	1.0220
840	1.00003	1.00013	1.00026	1.00053	1.00131	1.00263	1.00529	1.0106	1.0161	1.0216
860	1.00003	1.00013	1.00026	1.00051	1.00129	1.00258	1.00518	1.0104	1.0158	1.0212
880	1.00003	1.00013	1.00025	1.00051	1.00126	1.00253	1.00508	1.0102	1.0154	1.0207
900	1.00002	1.00012	1.00025	1.00050	1.00124	1.00248	1.00498	1.0100	1.0152	1.0203
920	1.00002	1.00012	1.00024	1.00049	1.00122	1.00244	1.00489	1.0098	1.0149	1.0199
940	1.00002	1.00012	1.00024	1.00048	1.00119	1.00239	1.00480	1.0097	1.0146	1.0196
960	1.00002	1.00012	1.00023	1.00047	1.00117	1.00235	1.00471	1.0095	1.0143	1.0192
980	1.00002	1.00012	1.00023	1.00046	1.00115	1.00231	1.00463	1.0093	1.0140	1.0188
1000	1.00002	1.00011	1.00023	1.00045	1.00113	1.00227	1.00455	1.0092	1.0138	1.0185

TABLE XVI (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280
50	0.46	0.41								
60	0.72	0.71	0.69	0.69	0.69	0.69	0.69	0.70	0.71	0.72
70	0.856	0.852	0.853	0.86	0.87	0.88	0.89	0.91	0.93	0.95
80	0.933	0.938	0.947	0.960	0.976	0.995	1.02	1.04	1.07	1.09
90	0.981	0.991	1.005	1.023	1.043	1.065	1.090	1.118	1.147	1.18
100	1.0117	1.026	1.043	1.062	1.085	1.109	1.136	1.165	1.195	1.228
110	1.0319	1.0480	1.0667	1.088	1.111	1.136	1.164	1.193	1.224	1.256
120	1.0454	1.0627	1.0823	1.104	1.128	1.153	1.181	1.209	1.240	1.272
130	1.0544	1.0724	1.0924	1.1143	1.1379	1.1632	1.190	1.218	1.248	1.280
140	1.0604	1.0787	1.0988	1.1206	1.1439	1.1687	1.195	1.223	1.252	1.282
150	1.0643	1.0827	1.1026	1.1241	1.1470	1.1712	1.1967	1.2235	1.2515	1.281
160	1.0668	1.0850	1.1047	1.1258	1.1481	1.1716	1.1964	1.2223	1.2492	1.277
170	1.0682	1.0863	1.1056	1.1261	1.1479	1.1707	1.1946	1.2196	1.2456	1.2726
180	1.0689	1.0867	1.1056	1.1256	1.1467	1.1688	1.1920	1.2160	1.2411	1.2670
190	1.0691	1.0865	1.1050	1.1245	1.1449	1.1664	1.1887	1.2119	1.2360	1.2609
200	1.0688	1.0859	1.1039	1.1229	1.1427	1.1635	1.1850	1.2074	1.2306	1.2546
210	1.0683	1.0850	1.1026	1.1210	1.1402	1.1603	1.1812	1.2028	1.2251	1.2482
220	1.0676	1.0839	1.1010	1.1189	1.1376	1.1570	1.1772	1.1980	1.2196	1.2418
230	1.0668	1.0827	1.0993	1.1167	1.1348	1.1536	1.1731	1.1933	1.2141	1.2355
240	1.0658	1.0813	1.0975	1.1145	1.1320	1.1503	1.1691	1.1886	1.2087	1.2293
260	1.0637	1.0785	1.0939	1.1099	1.1264	1.1436	1.1613	1.1795	1.1983	1.2175
280	1.0615	1.0756	1.0902	1.1054	1.1210	1.1372	1.1538	1.171	1.189	1.207
300	1.0593	1.0728	1.0866	1.101	1.116	1.131	1.147	1.163	1.179	1.196
320	1.0572	1.0700	1.0832	1.097	1.111	1.125	1.140	1.155	1.171	1.187
340	1.0551	1.0674	1.0800	1.093	1.106	1.120	1.134	1.149	1.163	1.178
360	1.0531	1.0648	1.0769	1.089	1.102	1.115	1.128	1.142	1.156	1.170
380	1.0512	1.0625	1.0740	1.086	1.098	1.110	1.123	1.136	1.150	1.163
400	1.0494	1.0602	1.0713	1.083	1.094	1.106	1.118	1.131	1.143	1.156
420	1.0478	1.0581	1.0688	1.080	1.091	1.102	1.114	1.126	1.138	1.150
440	1.0462	1.0562	1.0664	1.077	1.088	1.098	1.110	1.121	1.133	1.144
460	1.0447	1.0543	1.0641	1.074	1.084	1.095	1.106	1.117	1.128	1.139
480	1.0432	1.0525	1.0620	1.072	1.082	1.092	1.102	1.112	1.123	1.134
500	1.0419	1.0509	1.0600	1.069	1.079	1.089	1.098	1.109	1.119	1.129
520	1.0406	1.0493	1.0582	1.067	1.076	1.086	1.095	1.105	1.115	1.125
540	1.0394	1.0478	1.0564	1.065	1.074	1.083	1.092	1.102	1.111	1.121

TABLE XVI (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280
560	1.0383	1.0464	1.0547	1.063	1.072	1.080	1.089	1.098	1.108	1.117
580	1.0372	1.0451	1.0532	1.061	1.070	1.078	1.087	1.095	1.104	1.113
600	1.0362	1.0439	1.0517	1.060	1.068	1.076	1.084	1.093	1.101	1.110
620	1.0352	1.0427	1.0502	1.058	1.066	1.074	1.082	1.090	1.098	1.107
640	1.0343	1.0416	1.0489	1.056	1.064	1.072	1.079	1.087	1.095	1.104
660	1.0334	1.0405	1.0476	1.055	1.062	1.070	1.077	1.085	1.093	1.101
680	1.0326	1.0395	1.0464	1.053	1.061	1.068	1.075	1.083	1.090	1.098
700	1.0318	1.0385	1.0453	1.052	1.059	1.066	1.073	1.081	1.088	1.095
720	1.0311	1.0376	1.0442	1.051	1.058	1.065	1.072	1.079	1.086	1.093
740	1.0304	1.0367	1.0431	1.050	1.056	1.063	1.070	1.077	1.084	1.091
760	1.0297	1.0358	1.0421	1.048	1.055	1.061	1.068	1.075	1.082	1.088
780	1.0290	1.0350	1.0412	1.047	1.054	1.060	1.066	1.073	1.080	1.086
800	1.0284	1.0343	1.0403	1.046	1.052	1.059	1.065	1.071	1.078	1.084
820	1.0278	1.0335	1.0394	1.045	1.051	1.057	1.064	1.070	1.076	1.082
840	1.0272	1.0328	1.0386	1.044	1.050	1.056	1.062	1.068	1.074	1.081
860	1.0266	1.0322	1.0378	1.043	1.049	1.055	1.061	1.067	1.073	1.079
880	1.0261	1.0315	1.0370	1.042	1.048	1.054	1.060	1.065	1.071	1.077
900	1.0256	1.0309	1.0362	1.042	1.047	1.053	1.058	1.064	1.070	1.075
920	1.0251	1.0303	1.0355	1.041	1.046	1.052	1.057	1.063	1.068	1.074
940	1.0246	1.0297	1.0348	1.040	1.045	1.051	1.056	1.061	1.067	1.072
960	1.0241	1.0291	1.0342	1.039	1.044	1.050	1.055	1.060	1.066	1.071
980	1.0237	1.0286	1.0336	1.039	1.044	1.049	1.054	1.059	1.064	1.070
1000	1.0233	1.0281	1.0329	1.038	1.043	1.048	1.053	1.058	1.063	1.068

	300	320	340	360	380	400	420	440	460	480	500
60	0.73	0.74	0.76	0.77	0.79	0.81	0.83	0.85	0.87	0.89	0.92
70	0.98	1.00	1.03	1.06	1.09	1.12	1.16	1.19	1.23	1.27	1.31
80	1.12	1.16	1.19	1.23	1.26	1.30	1.35	1.39	1.43	1.48	1.53
90	1.21	1.25	1.28	1.32	1.36	1.41	1.45	1.50	1.54	1.59	1.65
100	1.262	1.298	1.336	1.38	1.42	1.46	1.50	1.55	1.60	1.65	1.70
110	1.291	1.327	1.364	1.403	1.444	1.486	1.530	1.576	1.623	1.672	1.723
120	1.306	1.341	1.377	1.416	1.455	1.496	1.539	1.583	1.628	1.675	1.724
130	1.312	1.346	1.382	1.418	1.457	1.496	1.537	1.579	1.623	1.668	1.714
140	1.313	1.346	1.380	1.415	1.452	1.490	1.529	1.569	1.610	1.653	1.697
150	1.311	1.343	1.375	1.409	1.444	1.480	1.517	1.555	1.595	1.635	1.677

TABLE XVI (Continued)

P, atmospheres

T, °K	300	320	340	360	380	400	420	440	460	480	500
160	1.306	1.337	1.368	1.400	1.434	1.468	1.503	1.540	1.577	1.616	1.655
170	1.3006	1.3295	1.359	1.390	1.422	1.455	1.488	1.523	1.559	1.595	1.633
180	1.2939	1.3216	1.350	1.380	1.410	1.441	1.473	1.506	1.540	1.575	1.611
190	1.2867	1.3133	1.3407	1.3689	1.3979	1.428	1.458	1.490	1.522	1.555	1.589
200	1.2794	1.3049	1.3311	1.3582	1.3859	1.414	1.444	1.474	1.504	1.536	1.568
210	1.2720	1.2965	1.3217	1.3476	1.3741	1.401	1.429	1.458	1.487	1.517	1.55
220	1.2647	1.2882	1.3124	1.3372	1.3627	1.389	1.416	1.443	1.471	1.500	1.53
230	1.2575	1.2802	1.3034	1.3273	1.3517	1.377	1.402	1.429	1.455	1.483	1.51
240	1.2506	1.2724	1.2948	1.3177	1.3412	1.365	1.390	1.415	1.441	1.467	1.49
260	1.2373	1.258	1.278	1.300	1.321	1.344	1.366	1.390	1.413	1.44	1.46
280	1.225	1.244	1.263	1.283	1.303	1.324	1.345	1.367	1.389	1.41	1.43
300	1.214	1.232	1.250	1.268	1.287	1.306	1.326	1.346	1.367	1.39	1.41
320	1.203	1.220	1.237	1.254	1.272	1.290	1.309	1.327	1.347	1.37	1.39
340	1.194	1.210	1.226	1.242	1.259	1.276	1.293	1.311	1.328	1.35	1.37
360	1.185	1.200	1.215	1.231	1.246	1.262	1.279	1.295	1.312	1.329	1.35
380	1.177	1.191	1.205	1.220	1.235	1.250	1.266	1.281	1.297	1.313	1.33
400	1.170	1.183	1.197	1.210	1.225	1.239	1.254	1.268	1.283	1.299	1.31
420	1.163	1.175	1.188	1.202	1.215	1.229	1.243	1.257	1.271	1.285	1.30
440	1.156	1.168	1.181	1.193	1.206	1.219	1.232	1.246	1.259	1.273	1.29
460	1.150	1.162	1.174	1.186	1.198	1.211	1.223	1.236	1.249	1.262	1.275
480	1.145	1.156	1.167	1.179	1.191	1.202	1.215	1.227	1.239	1.252	1.264
500	1.140	1.150	1.161	1.172	1.184	1.195	1.207	1.218	1.230	1.242	1.254
520	1.135	1.145	1.156	1.166	1.177	1.188	1.199	1.210	1.222	1.233	1.245
540	1.130	1.140	1.150	1.161	1.171	1.181	1.192	1.203	1.214	1.225	1.236
560	1.126	1.136	1.146	1.155	1.165	1.175	1.186	1.196	1.206	1.217	1.228
580	1.122	1.132	1.141	1.150	1.160	1.170	1.180	1.190	1.200	1.210	1.220
600	1.119	1.128	1.137	1.146	1.155	1.164	1.174	1.183	1.193	1.203	1.213
620	1.115	1.124	1.132	1.141	1.150	1.159	1.168	1.178	1.187	1.197	1.206
640	1.112	1.120	1.129	1.137	1.146	1.155	1.163	1.172	1.181	1.191	1.200
660	1.109	1.117	1.125	1.133	1.142	1.150	1.159	1.167	1.176	1.185	1.194
680	1.106	1.114	1.122	1.130	1.138	1.146	1.154	1.163	1.171	1.180	1.188
700	1.103	1.111	1.118	1.126	1.134	1.142	1.150	1.158	1.166	1.175	1.183
720	1.100	1.108	1.115	1.123	1.130	1.138	1.146	1.154	1.162	1.170	1.178
740	1.098	1.105	1.112	1.120	1.127	1.135	1.142	1.150	1.158	1.165	1.173
760	1.095	1.102	1.109	1.117	1.124	1.131	1.139	1.146	1.154	1.161	1.169

TABLE XVI (Continued)

P, atmospheres

T, °K	300	320	340	360	380	400	420	440	460	480	500
780	1.093	1.100	1.107	1.114	1.121	1.128	1.135	1.142	1.150	1.157	1.165
800	1.091	1.098	1.104	1.111	1.118	1.125	1.132	1.139	1.146	1.153	1.160
820	1.089	1.095	1.102	1.108	1.115	1.122	1.129	1.136	1.142	1.150	1.157
840	1.087	1.093	1.100	1.106	1.112	1.119	1.126	1.132	1.139	1.146	1.153
860	1.085	1.091	1.097	1.104	1.110	1.116	1.123	1.129	1.136	1.143	1.149
880	1.083	1.089	1.095	1.101	1.108	1.114	1.120	1.126	1.133	1.139	1.146
900	1.081	1.087	1.093	1.099	1.105	1.111	1.118	1.124	1.130	1.136	1.143
920	1.080	1.085	1.091	1.097	1.103	1.109	1.115	1.121	1.127	1.133	1.140
940	1.078	1.084	1.089	1.095	1.101	1.107	1.113	1.119	1.125	1.131	1.137
960	1.076	1.082	1.088	1.093	1.099	1.105	1.110	1.116	1.122	1.128	1.134
980	1.075	1.080	1.086	1.091	1.097	1.102	1.108	1.114	1.120	1.125	1.131
1000	1.074	1.079	1.084	1.090	1.095	1.100	1.106	1.112	1.117	1.123	1.129

TABLE XVII

FUGACITY COEFFICIENTS FOR NITROGEN, f/P

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
100	0.99811	0.9905	0.98108	0.962	0.905	0.81				
120	0.99888	0.9944	0.98880	0.978	0.944	0.889	0.78			
140	0.99929	0.9964	0.99288	0.986	0.965	0.930	0.861	0.73	0.59	0.49
160	0.99953	0.99763	0.99527	0.991	0.976	0.953	0.908	0.822	0.74	0.67
180	0.99968	0.99838	0.99677	0.9936	0.9840	0.968	0.938	0.880	0.828	0.782
200	0.99978	0.99888	0.99777	0.99554	0.98892	0.9780	0.9569	0.9175	0.882	0.851
220	0.99984	0.99923	0.99845	0.99691	0.99233	0.9848	0.9703	0.9434	0.9194	0.8985
240	0.99989	0.99947	0.99894	0.99789	0.99477	0.9897	0.9799	0.9619	0.9461	0.9326
260	0.99993	0.99965	0.99930	0.99861	0.99655	0.9932	0.9868	0.9753	0.9656	0.9576
280	0.99996	0.99978	0.99957	0.99914	0.99787	0.99583	0.9920	0.9854	0.9801	0.9763
300	0.99998	0.99988	0.99977	0.99954	0.99887	0.99782	0.9959	0.9930	0.9911	0.9904
320	0.99999	0.99996	0.99992	0.99985	0.99964	0.99934	0.9989	0.9988	0.9996	1.0013
340	1.00000	1.00002	1.00004	1.00009	1.00024	1.00053	1.0013	1.0033	1.0061	1.0098
360	1.00001	1.00007	1.00014	1.00028	1.00071	1.00145	1.0031	1.0068	1.0112	1.0163
380	1.00002	1.00011	1.00021	1.00042	1.00107	1.00218	1.00451	1.00960	1.0153	1.0215
400	1.00003	1.00013	1.00027	1.00054	1.00136	1.00276	1.00564	1.01179	1.01843	1.02556
420	1.00003	1.00016	1.00032	1.00063	1.00159	1.00321	1.00654	1.01352	1.02093	1.02877
440	1.00004	1.00018	1.00035	1.00071	1.00177	1.00357	1.00725	1.01489	1.02290	1.03130
460	1.00004	1.00019	1.00038	1.00077	1.00192	1.00386	1.00781	1.01596	1.02446	1.03328
480	1.00004	1.00020	1.00041	1.00081	1.00203	1.00409	1.00825	1.01681	1.02568	1.03483
500	1.00004	1.00021	1.00042	1.00085	1.00212	1.00426	1.00860	1.01748	1.02662	1.03603
510	1.00004	1.00022	1.00043	1.00086	1.00216	1.00434	1.00874	1.01775	1.02701	1.0365
520	1.00004	1.00022	1.00044	1.00088	1.00219	1.00440	1.00887	1.01799	1.02735	1.0370
530	1.00004	1.00022	1.00044	1.00089	1.00222	1.00446	1.00898	1.01819	1.0276	1.0373
540	1.00004	1.00022	1.00045	1.00090	1.00225	1.00451	1.00907	1.01837	1.0279	1.0376
550	1.00005	1.00023	1.00045	1.00091	1.00227	1.00455	1.00916	1.01853	1.0281	1.0379
560	1.00005	1.00023	1.00046	1.00091	1.00229	1.00459	1.00923	1.01866	1.0283	1.0381
570	1.00005	1.00023	1.00046	1.00092	1.00230	1.00462	1.00929	1.0188	1.0284	1.0383
580	1.00005	1.00023	1.00046	1.00093	1.00232	1.00464	1.00934	1.0189	1.0286	1.0384
590	1.00005	1.00023	1.00046	1.00093	1.00233	1.00467	1.00938	1.0189	1.0287	1.0386

TABLE XVII (Continued)

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
600	1.00005	1.00023	1.00047	1.00093	1.00234	1.00468	1.00941	1.0190	1.0288	1.0387
610	1.00005	1.00023	1.00047	1.00094	1.00234	1.00470	1.00944	1.0190	1.0288	1.0387
620	1.00005	1.00023	1.00047	1.00094	1.00235	1.00471	1.00946	1.0191	1.0288	1.0387
630	1.00005	1.00023	1.00047	1.00094	1.00235	1.00472	1.00947	1.0191	1.0289	1.0388
640	1.00005	1.00024	1.00047	1.00094	1.00236	1.00472	1.00948	1.0191	1.0289	1.0388
650	1.00005	1.00024	1.00047	1.00094	1.00236	1.00472	1.0095	1.0191	1.0289	1.0388
660	1.00005	1.00024	1.00047	1.00094	1.00236	1.00472	1.0095	1.0191	1.0288	1.0387
680	1.00005	1.00024	1.00047	1.00094	1.00235	1.00472	1.0095	1.0190	1.0288	1.0386
700	1.00005	1.00023	1.00047	1.00094	1.00235	1.00470	1.0094	1.0190	1.0286	1.0384
720	1.00005	1.00023	1.00047	1.00093	1.00234	1.00468	1.0094	1.0190	1.0285	1.0382
740	1.00005	1.00023	1.00046	1.00093	1.00233	1.00466	1.0093	1.0188	1.0283	1.0380
760	1.00005	1.00023	1.00046	1.00092	1.00231	1.00463	1.0093	1.0187	1.0281	1.0377
780	1.00005	1.00023	1.00046	1.00092	1.00230	1.00460	1.0092	1.0185	1.0279	1.0374
800	1.00005	1.00023	1.00046	1.00091	1.00228	1.00456	1.0092	1.0184	1.0277	1.0371
820	1.00005	1.00023	1.00045	1.00090	1.00226	1.00453	1.0091	1.0182	1.0274	1.0368
840	1.00004	1.00022	1.00045	1.00090	1.00224	1.00449	1.0090	1.0181	1.0272	1.0364
860	1.00004	1.00022	1.00044	1.00089	1.00222	1.00445	1.0089	1.0179	1.0270	1.0361
880	1.00004	1.00022	1.00044	1.00088	1.00220	1.00441	1.0088	1.0177	1.0267	1.0357
900	1.00004	1.00022	1.00044	1.00087	1.00218	1.00437	1.0088	1.0176	1.0264	1.0354
920	1.00004	1.00022	1.00043	1.00086	1.00216	1.00433	1.0087	1.0174	1.0262	1.0350
940	1.00004	1.00021	1.00043	1.00086	1.00214	1.00428	1.0086	1.0172	1.0259	1.0346
960	1.00004	1.00021	1.00042	1.00085	1.00212	1.00424	1.0085	1.0170	1.0256	1.0343
980	1.00004	1.00021	1.00042	1.00084	1.00210	1.00420	1.0084	1.0169	1.0254	1.0339
1000	1.00004	1.00021	1.00041	1.00083	1.00208	1.00415	1.0083	1.0167	1.0251	1.0336

	100	120	140	160	180	200	220	240	260	280
140	0.42									
160	0.62	0.58	0.54	0.52	0.50	0.49	0.48	0.47	0.46	0.46
180	0.74	0.71	0.68	0.66	0.65	0.64	0.63	0.62	0.62	0.61
200	0.824	0.801	0.78	0.77	0.76	0.75	0.74	0.74	0.74	0.74
220	0.881	0.866	0.854	0.844	0.838	0.833	0.830	0.829	0.830	0.832
240	0.9213	0.9123	0.905	0.900	0.897	0.896	0.896	0.897	0.900	0.904
260	0.9513	0.9467	0.9437	0.9422	0.9422	0.9435	0.9460	0.9497	0.9545	0.960
280	0.9738	0.9726	0.9726	0.9739	0.9763	0.9798	0.9843	0.9898	0.9961	1.0033
300	0.9908	0.9923	0.9947	0.9982	1.0025	1.0078	1.0139	1.0208	1.0284	1.0367
320	1.0039	1.0074	1.0117	1.0169	1.0227	1.0294	1.0368	1.0448	1.0534	1.0627

TABLE XVII (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280
340	1.0141	1.0192	1.0250	1.0314	1.0385	1.0463	1.0546	1.0635	1.0730	1.0830
360	1.0220	1.0284	1.0353	1.0428	1.0508	1.0594	1.0685	1.0781	1.0882	1.0988
380	1.02826	1.0356	1.0434	1.0517	1.0605	1.0697	1.0794	1.0896	1.1001	1.1111
400	1.03316	1.04122	1.04972	1.0587	1.0680	1.0778	1.0879	1.0985	1.1094	1.1207
420	1.03702	1.04567	1.05471	1.0641	1.0739	1.0841	1.0946	1.1054	1.1166	1.1281
440	1.04005	1.04916	1.0586	1.0684	1.0785	1.0890	1.0997	1.1108	1.1221	1.1338
460	1.04243	1.05189	1.0617	1.0717	1.0821	1.0927	1.1037	1.1149	1.1264	1.1381
480	1.04428	1.0540	1.0640	1.0743	1.0848	1.0956	1.1067	1.1180	1.1295	1.1413
500	1.0457	1.0556	1.0658	1.0762	1.0869	1.0978	1.1089	1.1202	1.1318	1.1436
510	1.0463	1.0563	1.0665	1.0770	1.0877	1.0986	1.1097	1.1211	1.1326	1.1444
520	1.0468	1.0568	1.0671	1.0776	1.0884	1.0993	1.1104	1.1218	1.1334	1.1451
530	1.0472	1.0573	1.0677	1.0782	1.0889	1.0999	1.1110	1.1224	1.1339	1.1457
540	1.0476	1.0577	1.0681	1.0787	1.0894	1.1004	1.1115	1.1228	1.1344	1.1461
550	1.0479	1.0581	1.0685	1.0790	1.0898	1.1008	1.1119	1.1232	1.1347	1.1464
560	1.0481	1.0584	1.0688	1.0793	1.0901	1.1010	1.1122	1.1234	1.1349	1.1465
570	1.0484	1.0586	1.0690	1.0796	1.0903	1.1012	1.1124	1.1236	1.1350	1.1466
580	1.0485	1.0588	1.0692	1.0797	1.0905	1.1014	1.1125	1.1237	1.1351	1.1466
590	1.0486	1.0589	1.0693	1.0799	1.0906	1.1015	1.1125	1.1237	1.1350	1.1465
600	1.0487	1.0590	1.0694	1.0799	1.0906	1.1015	1.1125	1.1236	1.1349	1.1464
610	1.0488	1.0590	1.0694	1.0799	1.0906	1.1014	1.1124	1.1235	1.1348	1.146
620	1.0488	1.0590	1.0694	1.0799	1.0906	1.1014	1.1123	1.1233	1.1345	1.146
630	1.0488	1.0590	1.0694	1.0798	1.0905	1.1012	1.1121	1.1231	1.134	1.146
640	1.0488	1.0590	1.0693	1.0798	1.0903	1.1010	1.1119	1.1228	1.134	1.145
650	1.0488	1.0589	1.0692	1.0796	1.0902	1.1008	1.1116	1.123	1.134	1.145
660	1.0487	1.0588	1.0691	1.0795	1.0900	1.1006	1.1113	1.122	1.133	1.144
680	1.0485	1.0586	1.0688	1.0791	1.0895	1.1000	1.111	1.121	1.132	1.143
700	1.0483	1.0583	1.0684	1.0786	1.0889	1.099	1.110	1.120	1.131	1.142
720	1.0480	1.0579	1.0680	1.0781	1.0883	1.099	1.109	1.120	1.130	1.141
740	1.0477	1.0575	1.0674	1.0775	1.0876	1.098	1.108	1.118	1.129	1.140
760	1.0473	1.0571	1.0669	1.0768	1.087	1.097	1.107	1.117	1.128	1.138
780	1.0470	1.0566	1.0663	1.0761	1.086	1.096	1.106	1.116	1.126	1.137
800	1.0466	1.0561	1.0657	1.075	1.085	1.095	1.105	1.115	1.125	1.135
820	1.0461	1.0556	1.0651	1.075	1.084	1.094	1.104	1.114	1.124	1.134
840	1.0457	1.0550	1.0645	1.074	1.084	1.093	1.103	1.113	1.122	1.132
860	1.0452	1.0545	1.064	1.073	1.083	1.092	1.102	1.111	1.121	1.131

TABLE XVII (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280	
880	1.0448	1.0540	1.063	1.072	1.082	1.091	1.101	1.110	1.120	1.129	
900	1.0444	1.0534	1.062	1.072	1.081	1.090	1.100	1.109	1.118	1.128	
920	1.0439	1.0528	1.062	1.071	1.080	1.089	1.098	1.108	1.117	1.126	
940	1.0434	1.052	1.061	1.070	1.079	1.088	1.097	1.106	1.116	1.125	
960	1.0430	1.052	1.060	1.069	1.078	1.087	1.096	1.105	1.114	1.124	
980	1.0425	1.051	1.060	1.069	1.077	1.086	1.095	1.104	1.113	1.122	
1000	1.0420	1.051	1.059	1.068	1.076	1.085	1.094	1.103	1.112	1.121	
	300	320	340	360	380	400	420	440	460	480	500
160	0.46	0.45	0.45	0.45	0.46	0.46	0.46	0.46	0.47	0.47	0.48
180	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.64	0.64	0.65	0.66
200	0.74	0.74	0.74	0.75	0.75	0.76	0.77	0.78	0.78	0.79	0.80
220	0.835	0.839	0.844	0.851	0.858	0.866	0.875	0.884	0.895	0.905	0.917
240	0.909	0.915	0.922	0.930	0.939	0.948	0.958	0.969	0.981	0.993	1.005
260	0.967	0.974	0.983	0.992	1.002	1.012	1.023	1.035	1.047	1.060	1.074
280	1.0113	1.0200	1.029	1.040	1.050	1.062	1.074	1.086	1.099	1.113	1.127
300	1.0458	1.0554	1.0657	1.0766	1.0880	1.100	1.113	1.126	1.139	1.153	1.168
320	1.0726	1.0830	1.0940	1.1054	1.1174	1.1299	1.1428	1.1563	1.170	1.184	1.199
340	1.0935	1.1045	1.1159	1.1279	1.1403	1.1531	1.1664	1.1800	1.1941	1.2086	1.2234
360	1.1098	1.1212	1.1331	1.1453	1.1580	1.1711	1.1845	1.1983	1.2125	1.2271	1.2420
380	1.1225	1.1342	1.1464	1.1588	1.1717	1.1849	1.1985	1.2124	1.2266	1.2412	1.256
400	1.1323	1.1443	1.1566	1.1693	1.1822	1.1955	1.2091	1.2231	1.2373	1.252	1.267
420	1.1399	1.1520	1.1645	1.1772	1.1902	1.2036	1.2172	1.2310	1.245	1.260	1.274
440	1.1457	1.1579	1.1704	1.1832	1.1962	1.2095	1.2231	1.237	1.251	1.265	1.280
460	1.1501	1.1623	1.1748	1.1876	1.2006	1.2138	1.227	1.241	1.255	1.269	1.284
480	1.1533	1.1655	1.1780	1.1907	1.2036	1.217	1.230	1.244	1.258	1.272	1.286
500	1.1556	1.1678	1.1802	1.1928	1.206	1.219	1.232	1.245	1.259	1.273	1.287
510	1.1564	1.1686	1.1810	1.194	1.206	1.219	1.232	1.246	1.259	1.273	1.287
520	1.1571	1.1692	1.1816	1.194	1.207	1.220	1.233	1.246	1.260	1.273	1.287
530	1.1576	1.1697	1.182	1.194	1.207	1.220	1.233	1.246	1.260	1.273	1.287
540	1.1580	1.1700	1.182	1.195	1.207	1.220	1.233	1.246	1.259	1.273	1.286
550	1.1582	1.170	1.182	1.195	1.207	1.220	1.233	1.246	1.259	1.272	1.286
560	1.1583	1.170	1.182	1.195	1.207	1.220	1.233	1.246	1.259	1.272	1.285
570	1.1584	1.170	1.182	1.195	1.207	1.220	1.232	1.245	1.258	1.271	1.285

TABLE XVII (Continued)

P, atmospheres

T, °K	300	320	340	360	380	400	420	440	460	480	500
580	1.1583	1.170	1.182	1.194	1.207	1.219	1.232	1.244	1.257	1.270	1.284
590	1.158	1.170	1.182	1.194	1.206	1.219	1.231	1.244	1.257	1.270	1.283
600	1.158	1.170	1.182	1.194	1.206	1.218	1.230	1.243	1.256	1.269	1.282
610	1.158	1.169	1.181	1.193	1.205	1.217	1.230	1.242	1.255	1.268	1.280
620	1.157	1.169	1.181	1.193	1.205	1.217	1.229	1.241	1.254	1.266	1.279
630	1.157	1.168	1.180	1.192	1.204	1.216	1.228	1.240	1.253	1.265	1.278
640	1.156	1.168	1.180	1.191	1.203	1.215	1.227	1.239	1.252	1.264	1.277
650	1.156	1.167	1.179	1.191	1.202	1.214	1.226	1.238	1.251	1.263	1.275
660	1.155	1.167	1.178	1.190	1.201	1.213	1.225	1.237	1.249	1.262	1.274
680	1.154	1.165	1.177	1.188	1.200	1.211	1.223	1.235	1.247	1.259	1.271
700	1.153	1.164	1.175	1.186	1.198	1.209	1.221	1.232	1.244	1.256	1.268
720	1.152	1.163	1.174	1.185	1.196	1.207	1.218	1.230	1.242	1.253	1.265
740	1.150	1.161	1.172	1.183	1.194	1.205	1.216	1.227	1.239	1.250	1.262
760	1.149	1.159	1.170	1.181	1.192	1.203	1.214	1.225	1.236	1.247	1.259
780	1.147	1.158	1.168	1.179	1.189	1.200	1.211	1.222	1.233	1.244	1.255
800	1.146	1.156	1.166	1.177	1.187	1.198	1.209	1.219	1.230	1.241	1.252
820	1.144	1.154	1.164	1.175	1.185	1.196	1.206	1.217	1.227	1.238	1.249
840	1.142	1.152	1.163	1.173	1.183	1.193	1.204	1.214	1.225	1.235	1.246
860	1.141	1.151	1.161	1.171	1.181	1.191	1.201	1.211	1.222	1.232	1.243
880	1.139	1.149	1.159	1.169	1.179	1.189	1.199	1.209	1.219	1.229	1.240
900	1.138	1.147	1.157	1.167	1.176	1.186	1.196	1.206	1.216	1.226	1.237
920	1.136	1.145	1.155	1.165	1.174	1.184	1.194	1.204	1.214	1.224	1.234
940	1.134	1.144	1.153	1.163	1.172	1.182	1.191	1.201	1.211	1.221	1.231
960	1.133	1.142	1.151	1.161	1.170	1.180	1.189	1.199	1.208	1.218	1.228
980	1.131	1.140	1.150	1.159	1.168	1.177	1.187	1.196	1.206	1.215	1.225
1000	1.130	1.139	1.148	1.157	1.166	1.175	1.184	1.194	1.203	1.213	1.222

TABLE XVIII

FUGACITY COEFFICIENTS FOR OXYGEN, f/P

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
100	0.99776	0.98882	0.97765	0.9553	0.888	0.771				
120	0.99865	0.99325	0.98651	0.9730	0.933	0.865	0.721			
140	0.99912	0.99459	0.99121	0.98244	0.9562	0.913	0.826	0.503		
160	0.99940	0.99699	0.99398	0.98798	0.9700	0.9404	0.882	0.766	0.640	0.523
180	0.99957	0.99787	0.99574	0.99149	0.97880	0.9578	0.9165	0.836	0.760	0.687
200	0.99969	0.99846	0.99692	0.99384	0.98466	0.9695	0.9397	0.8822	0.828	0.777
220	0.99977	0.99887	0.99774	0.99548	0.98874	0.9776	0.9558	0.9138	0.874	0.837
240	0.99983	0.99916	0.99833	0.99666	0.99168	0.9835	0.9674	0.9365	0.907	0.880
260	0.99988	0.99938	0.99876	0.99753	0.99386	0.98780	0.9759	0.9532	0.932	0.912
280	0.99991	0.99955	0.99909	0.99819	0.99550	0.99106	0.9824	0.9658	0.950	0.936
300	0.99994	0.99967	0.99935	0.99870	0.99675	0.99356	0.9873	0.9755	0.965	0.955
320	0.99995	0.99977	0.99954	0.99909	0.99773	0.99551	0.99120	0.9831	0.9757	0.969
340	0.99997	0.99985	0.99970	0.99940	0.99851	0.99705	0.99424	0.9891	0.9845	0.9805
360	0.99998	0.99991	0.99982	0.99965	0.99912	0.99828	0.99667	0.99383	0.9915	0.9896
380	0.99999	0.99996	0.99992	0.99984	0.99962	0.99926	0.99863	0.99766	0.9971	0.9970
400	1.00000	1.00000	1.00000	1.00001	1.00002	1.00006	1.00021	1.00076	1.00166	1.0029
420	1.00001	1.00003	1.00007	1.00014	1.00035	1.00071	1.00150	1.00329	1.00538	1.0078
440	1.00001	1.00006	1.00012	1.00024	1.00061	1.00124	1.00255	1.00536	1.00842	1.0117
460	1.00002	1.00008	1.00017	1.00033	1.00083	1.00168	1.00342	1.00706	1.0109	1.0150
480	1.00002	1.00010	1.00020	1.00040	1.00101	1.00204	1.00413	1.00846	1.0130	1.0177
500	1.00002	1.00012	1.00023	1.00046	1.00116	1.00234	1.00472	1.00961	1.0147	1.0199
520	1.00003	1.00013	1.00026	1.00051	1.00129	1.00259	1.00521	1.01056	1.0161	1.0217
540	1.00003	1.00014	1.00028	1.00055	1.00139	1.00279	1.00561	1.01135	1.0172	1.0232
560	1.00003	1.00015	1.00029	1.00059	1.00147	1.00296	1.00594	1.0120	1.0182	1.0245
580	1.00003	1.00015	1.00031	1.00062	1.00154	1.00309	1.00621	1.0125	1.0190	1.0255
600	1.00003	1.00016	1.00032	1.00064	1.00160	1.00321	1.0064	1.0130	1.0196	1.0263
620	1.00003	1.00016	1.00033	1.00066	1.00165	1.00330	1.0066	1.0133	1.0201	1.0270
640	1.00003	1.00017	1.00034	1.00067	1.00168	1.00337	1.0068	1.0136	1.0205	1.0275
660	1.00003	1.00017	1.00034	1.00068	1.00171	1.00343	1.0069	1.0138	1.0208	1.0279
680	1.00003	1.00017	1.00035	1.00069	1.00174	1.00348	1.0070	1.0140	1.0211	1.0282

TABLE XVIII (Continued)

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
700	1.00004	1.00018	1.00035	1.00070	1.00175	1.00351	1.0070	1.0141	1.0213	1.0285
710	1.00004	1.00018	1.00035	1.00070	1.00176	1.00353	1.0071	1.0142	1.0214	1.0286
720	1.00004	1.00018	1.00035	1.00071	1.00177	1.00354	1.0071	1.0142	1.0214	1.0287
730	1.00004	1.00018	1.00035	1.00071	1.00177	1.00355	1.0071	1.0143	1.0215	1.0287
740	1.00004	1.00018	1.00036	1.00071	1.00178	1.00356	1.0071	1.0143	1.0215	1.0288
750	1.00004	1.00018	1.00036	1.00071	1.00178	1.00356	1.0071	1.0143	1.0216	1.0288
760	1.00004	1.00018	1.00036	1.00071	1.00178	1.0036	1.0072	1.0143	1.0216	1.0288
770	1.00004	1.00018	1.00036	1.00071	1.00178	1.0036	1.0072	1.0144	1.0216	1.0289
780	1.00004	1.00018	1.00036	1.00071	1.00179	1.0036	1.0072	1.0144	1.0216	1.0289
790	1.00004	1.00018	1.00036	1.00071	1.00179	1.0036	1.0072	1.0144	1.0216	1.0288
800	1.00004	1.00018	1.00036	1.00071	1.00179	1.0036	1.0072	1.0144	1.0216	1.0288
820	1.00004	1.00018	1.00036	1.00071	1.00178	1.0036	1.0072	1.0143	1.0215	1.0288
840	1.00004	1.00018	1.00036	1.00071	1.00178	1.0036	1.0071	1.0143	1.0215	1.0287
860	1.00004	1.00018	1.00035	1.00071	1.00177	1.0035	1.0071	1.0142	1.0214	1.0286
880	1.00004	1.00018	1.00035	1.00071	1.00177	1.0035	1.0071	1.0142	1.0213	1.0285
900	1.00004	1.00018	1.00035	1.00070	1.00176	1.0035	1.0070	1.0141	1.0212	1.0283
920	1.00004	1.00018	1.00035	1.00070	1.00175	1.0035	1.0070	1.0140	1.0211	1.0282
940	1.00003	1.00017	1.00035	1.00070	1.00174	1.0035	1.0070	1.0140	1.0210	1.0280
960	1.00003	1.00017	1.00035	1.00069	1.00173	1.0035	1.0069	1.0139	1.0208	1.0278
980	1.00003	1.00017	1.00034	1.00069	1.00172	1.0034	1.0069	1.0138	1.0207	1.0276
1000	1.00003	1.00017	1.00034	1.00068	1.00171	1.0034	1.0068	1.0137	1.0206	1.0274

	100	120	140	160	180	200	220	240	260	280
160	0.45	0.40	0.37	0.34						
180	0.622	0.570	0.529	0.500	0.47	0.45	0.44	0.42	0.41	0.41
200	0.731	0.690	0.655	0.626	0.602	0.58	0.57	0.55	0.54	0.53
220	0.804	0.773	0.746	0.722	0.702	0.685	0.670	0.658	0.648	0.640
240	0.855	0.833	0.812	0.794	0.779	0.765	0.753	0.743	0.735	0.728
260	0.894	0.877	0.862	0.849	0.837	0.827	0.819	0.811	0.805	0.800
280	0.923	0.911	0.901	0.891	0.883	0.876	0.870	0.865	0.861	0.858
300	0.946	0.937	0.930	0.924	0.919	0.914	0.910	0.908	0.905	0.904
320	0.963	0.958	0.954	0.950	0.947	0.944	0.943	0.942	0.941	0.942
340	0.9771	0.9743	0.9721	0.9704	0.9693	0.969	0.969	0.969	0.970	0.972

TABLE XVIII (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280
360	0.9882	0.9873	0.9869	0.9870	0.9875	0.9884	0.9898	0.9916	0.9938	0.9965
380	0.9972	0.9979	0.9989	1.0003	1.0022	1.0043	1.0069	1.0098	1.0130	1.0166
400	1.0045	1.0064	1.0086	1.0112	1.0141	1.0173	1.0208	1.0246	1.0287	1.0330
420	1.0104	1.0134	1.0166	1.0201	1.0239	1.0279	1.0322	1.0367	1.0415	1.0465
440	1.0153	1.0191	1.0231	1.0274	1.0319	1.0366	1.0415	1.0467	1.0521	1.0576
460	1.0193	1.0238	1.0285	1.0334	1.0385	1.0438	1.0492	1.0549	1.0608	1.0668
480	1.0226	1.0276	1.0329	1.0383	1.0439	1.0496	1.0556	1.0617	1.0679	1.0743
500	1.0253	1.0308	1.0365	1.0424	1.0484	1.0545	1.0608	1.0672	1.0738	1.0805
520	1.0275	1.0334	1.0395	1.0457	1.0520	1.0585	1.0651	1.0718	1.0787	1.0856
540	1.0293	1.0356	1.0420	1.0484	1.0551	1.0618	1.0686	1.0756	1.0826	1.0898
560	1.0309	1.0374	1.0440	1.0507	1.0575	1.0645	1.0715	1.0786	1.0859	1.0932
580	1.0321	1.0388	1.0456	1.0525	1.0596	1.0666	1.0738	1.0811	1.0885	1.0960
600	1.0331	1.0400	1.0470	1.0540	1.0612	1.0684	1.0757	1.0831	1.0906	1.0982
620	1.0339	1.0409	1.0480	1.0552	1.0625	1.0698	1.0772	1.0847	1.0923	1.0999
640	1.0346	1.0417	1.0489	1.0562	1.0635	1.0709	1.0784	1.0860	1.0936	1.101
660	1.0351	1.0423	1.0496	1.0569	1.0643	1.0718	1.0793	1.0869	1.095	1.102
680	1.0355	1.0427	1.0501	1.0575	1.0649	1.0724	1.0800	1.088	1.095	1.103
700	1.0358	1.0431	1.0504	1.0579	1.0653	1.0729	1.080	1.088	1.096	1.104
710	1.0359	1.0432	1.0506	1.0580	1.0655	1.0730	1.081	1.088	1.096	1.104
720	1.0360	1.0433	1.0507	1.0581	1.0656	1.0732	1.081	1.088	1.096	1.104
730	1.0360	1.0434	1.0508	1.0582	1.0657	1.0733	1.081	1.088	1.096	1.104
740	1.0361	1.0434	1.0508	1.0583	1.0658	1.0733	1.081	1.089	1.096	1.104
750	1.0361	1.0435	1.0509	1.0583	1.0658	1.0734	1.081	1.089	1.096	1.104
760	1.0362	1.0435	1.0509	1.0584	1.0658	1.0734	1.081	1.089	1.096	1.104
770	1.0362	1.0435	1.0509	1.0584	1.0658	1.073	1.081	1.088	1.096	1.104
780	1.0362	1.0435	1.0509	1.0583	1.0658	1.073	1.081	1.088	1.096	1.104
790	1.0362	1.0435	1.0509	1.0583	1.0658	1.073	1.081	1.088	1.096	1.104
800	1.0361	1.0435	1.0508	1.0582	1.0657	1.073	1.081	1.088	1.096	1.103
820	1.0361	1.0434	1.0507	1.0581	1.0655	1.073	1.080	1.088	1.095	1.103
840	1.0360	1.0432	1.0506	1.0579	1.0653	1.073	1.080	1.088	1.095	1.103
860	1.0358	1.0431	1.0504	1.0577	1.065	1.072	1.080	1.087	1.095	1.102
880	1.0357	1.0429	1.0501	1.0574	1.065	1.072	1.079	1.087	1.094	1.102
900	1.0355	1.0426	1.0498	1.0571	1.064	1.072	1.079	1.086	1.094	1.101
920	1.0353	1.0424	1.0496	1.0567	1.064	1.071	1.078	1.086	1.093	1.100
940	1.0351	1.0421	1.0492	1.056	1.064	1.071	1.078	1.085	1.092	1.100

TABLE XVIII (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280	
960	1.0348	1.0419	1.0489	1.056	1.063	1.070	1.077	1.084	1.092	1.099	
980	1.0346	1.0416	1.0486	1.056	1.063	1.070	1.077	1.084	1.091	1.098	
1000	1.0344	1.0413	1.0482	1.055	1.062	1.069	1.076	1.083	1.090	1.097	
	300	320	340	360	380	400	420	440	460	480	500
180	0.40										
200	0.52	0.52	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
220	0.633	0.63	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
240	0.723	0.719	0.716	0.713	0.712	0.711	0.712	0.712	0.714	0.716	0.718
260	0.796	0.793	0.791	0.790	0.790	0.790	0.791	0.793	0.795	0.798	0.801
280	0.856	0.854	0.853	0.854	0.854	0.856	0.857	0.860	0.863	0.866	0.870
300	0.903	0.903	0.904	0.905	0.907	0.909	0.912	0.915	0.919	0.923	0.928
320	0.942	0.944	0.945	0.948	0.950	0.954	0.957	0.961	0.966	0.970	0.975
340	0.974	0.976	0.979	0.982	0.986	0.990	0.994	0.999	1.004	1.009	1.015
360	0.999	1.003	1.007	1.011	1.015	1.020	1.025	1.030	1.036	1.042	1.048
380	1.0205	1.0247	1.0292	1.0340	1.0390	1.044	1.050	1.056	1.062	1.068	1.075
400	1.0377	1.0426	1.0477	1.0531	1.0588	1.0647	1.0708	1.0772	1.0837	1.0905	1.0975
420	1.0518	1.0573	1.0630	1.0689	1.0751	1.0814	1.0880	1.0947	1.1017	1.1088	1.1161
440	1.0634	1.0694	1.0756	1.0819	1.0885	1.0952	1.1021	1.1092	1.1164	1.1239	1.1315
460	1.0730	1.0794	1.0860	1.0927	1.0996	1.1066	1.1138	1.1211	1.1287	1.1363	1.1441
480	1.0809	1.0876	1.0945	1.1015	1.1087	1.1160	1.1234	1.1310	1.1387	1.1466	1.1545
500	1.0874	1.0944	1.1015	1.1088	1.1162	1.1237	1.1313	1.1391	1.1470	1.1550	1.1631
520	1.0927	1.1000	1.1073	1.1147	1.1223	1.1300	1.1378	1.146	1.154	1.162	1.170
540	1.0971	1.1045	1.1120	1.1196	1.127	1.135	1.143	1.151	1.159	1.167	1.176
560	1.1006	1.108	1.116	1.124	1.131	1.139	1.147	1.155	1.164	1.172	1.180
580	1.1035	1.111	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.184
600	1.106	1.114	1.121	1.129	1.137	1.145	1.153	1.162	1.170	1.178	1.187
620	1.108	1.115	1.123	1.131	1.139	1.147	1.155	1.164	1.172	1.180	1.189
640	1.109	1.117	1.125	1.133	1.141	1.149	1.157	1.165	1.173	1.182	1.190
660	1.110	1.118	1.126	1.134	1.142	1.150	1.158	1.166	1.174	1.183	1.191
680	1.111	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.183	1.192
700	1.111	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.184	1.192
710	1.111	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.176	1.184	1.192
720	1.112	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.176	1.184	1.192
730	1.112	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.184	1.192

TABLE XVIII (Continued)

P, atmopsheres

T, °K	300	320	340	360	380	400	420	440	460	480	500
740	1.112	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.184	1.192
750	1.112	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.183	1.191
760	1.112	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.183	1.191
770	1.112	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.183	1.191
780	1.111	1.119	1.127	1.135	1.143	1.150	1.158	1.166	1.174	1.182	1.190
790	1.111	1.119	1.127	1.135	1.142	1.150	1.158	1.166	1.174	1.182	1.190
800	1.111	1.119	1.127	1.134	1.142	1.150	1.158	1.166	1.174	1.182	1.190
820	1.111	1.118	1.126	1.134	1.141	1.149	1.157	1.165	1.173	1.181	1.189
840	1.110	1.118	1.125	1.133	1.141	1.148	1.156	1.164	1.172	1.180	1.188
860	1.110	1.117	1.125	1.132	1.140	1.148	1.155	1.163	1.171	1.179	1.186
880	1.109	1.116	1.124	1.132	1.139	1.147	1.154	1.162	1.170	1.177	1.185
900	1.108	1.116	1.123	1.131	1.138	1.146	1.153	1.161	1.168	1.176	1.184
920	1.108	1.115	1.122	1.130	1.137	1.145	1.152	1.160	1.167	1.175	1.182
940	1.107	1.114	1.121	1.129	1.136	1.144	1.151	1.158	1.166	1.173	1.181
960	1.106	1.113	1.121	1.128	1.135	1.142	1.150	1.157	1.165	1.172	1.179
980	1.105	1.112	1.120	1.127	1.134	1.141	1.149	1.156	1.163	1.171	1.178
1000	1.104	1.112	1.119	1.126	1.133	1.140	1.147	1.155	1.162	1.169	1.176

TABLE XIX

FUGACITY COEFFICIENTS FOR CARBON DIOXIDE, f/P

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
180	0.998	0.99								
200	0.9983	0.991	0.98	0.97						
220	0.99870	0.9935	0.987	0.974	0.94					
240	0.99900	0.99500	0.9900	0.980	0.950	0.90				
260	0.99922	0.99608	0.99216	0.9843	0.961	0.922	0.84			
280	0.99938	0.99688	0.99377	0.98755	0.9689	0.938	0.877	0.75		
300	0.99950	0.99750	0.99500	0.99001	0.97509	0.9503	0.901	0.804	0.71	
320	0.99960	0.99798	0.99596	0.99193	0.97987	0.9599	0.9203	0.8424	0.766	0.69
340	0.99967	0.99836	0.99672	0.99345	0.98366	0.9674	0.9353	0.8722	0.8108	0.751
360	0.99973	0.99866	0.99733	0.99467	0.98669	0.9735	0.9473	0.8960	0.8461	0.7979
380	0.99978	0.99891	0.99783	0.99565	0.98915	0.9784	0.9570	0.9152	0.8745	0.8352
400	0.99982	0.99912	0.99823	0.99646	0.99118	0.9824	0.9650	0.9309	0.8977	0.8656
420	0.99986	0.99928	0.99857	0.99713	0.99285	0.9857	0.9716	0.9439	0.9169	0.8907
440	0.99988	0.99942	0.99885	0.99769	0.99424	0.9885	0.9772	0.9548	0.9330	0.9117
460	0.99991	0.99954	0.99908	0.99816	0.9954	0.9909	0.9818	0.9639	0.9465	0.9294
480	0.99993	0.99964	0.99928	0.99856	0.9964	0.9928	0.9857	0.9717	0.9579	0.9444
500	0.99994	0.99972	0.99945	0.99890	0.9973	0.9945	0.9891	0.9783	0.968	0.957
520	0.99996	0.99980	0.99960	0.99919	0.9980	0.9960	0.9919	0.9839	0.976	0.968
540	0.99997	0.99986	0.99972	0.99944	0.9986	0.9972	0.9944	0.9888	0.983	0.978
560	0.99998	0.99991	0.99983	0.99965	0.9991	0.9983	0.9965	0.9930	0.989	0.986
580	0.99999	0.99996	0.99992	0.99984	0.9996	0.9992	0.9984	0.997	0.995	0.993
600	1.00000	1.00000	1.00000	1.00000	1.0000	1.0000	1.0000	1.000	1.000	0.999
620	1.00001	1.00004	1.00007	1.00014	1.0004	1.0007	1.0013	1.002	1.004	1.005
640	1.00001	1.00007	1.00013	1.00026	1.0006	1.0013	1.0026	1.005	1.007	1.009
660	1.00002	1.00009	1.00018	1.0004	1.0009	1.0018	1.0036	1.007	1.010	1.013
680	1.00002	1.00012	1.00023	1.0005	1.0012	1.0023	1.0046	1.009	1.013	1.017
700	1.00003	1.00014	1.00027	1.0005	1.0014	1.0027	1.0054	1.010	1.016	1.020
720	1.00003	1.00015	1.00031	1.0006	1.0015	1.0031	1.0061	1.012	1.018	1.023
740	1.00003	1.00017	1.00034	1.0007	1.0017	1.0034	1.0067	1.013	1.020	1.026
760	1.00004	1.00018	1.00037	1.0007	1.0018	1.0037	1.007	1.014	1.021	1.028

TABLE XIX (Continued)

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
780	1.00004	1.00020	1.00039	1.0008	1.0020	1.0039	1.008	1.015	1.023	1.030
800	1.00004	1.00021	1.00041	1.0008	1.0021	1.0041	1.008	1.016	1.024	1.032
820	1.00004	1.00022	1.00043	1.0009	1.0022	1.0043	1.009	1.017	1.025	1.033
840	1.00005	1.00022	1.00045	1.0009	1.0022	1.0045	1.009	1.018	1.026	1.034
860	1.00005	1.00023	1.00046	1.0009	1.0023	1.0046	1.009	1.018	1.027	1.036
880	1.00005	1.00024	1.00048	1.0010	1.0024	1.0048	1.009	1.019	1.028	1.037
900	1.00005	1.00024	1.00049	1.0010	1.0024	1.0049	1.010	1.019	1.028	1.037
920	1.00005	1.00025	1.00050	1.0010	1.0025	1.0050	1.010	1.020	1.029	1.038
940	1.00005	1.00025	1.00051	1.0010	1.0025	1.0050	1.010	1.020	1.030	1.039
960	1.00005	1.00026	1.00051	1.0010	1.0026	1.0051	1.010	1.020	1.030	1.040
980	1.00005	1.00026	1.00052	1.0010	1.0026	1.0052	1.010	1.020	1.030	1.040
1000	1.00005	1.00026	1.00052	1.0010	1.0026	1.0052	1.010	1.021	1.031	1.041

T, °K	100	120	140	160	180	200	220	240	260	280
320	0.62	0.56	0.52	0.49	0.46	0.44	0.43	0.41	0.40	0.39
340	0.694	0.643	0.600	0.565	0.538	0.515	0.497	0.48	0.47	0.46
360	0.7517	0.7087	0.670	0.636	0.608	0.585	0.565	0.549	0.535	0.524
380	0.7974	0.7617	0.7285	0.6985	0.672	0.649	0.629	0.612	0.598	0.585
400	0.8346	0.8051	0.7772	0.7512	0.728	0.706	0.687	0.670	0.656	0.643
420	0.8654	0.8410	0.8178	0.7959	0.775	0.756	0.739	0.724	0.710	0.697
440	0.8911	0.8712	0.852	0.834	0.816	0.800	0.785	0.771	0.758	0.746
460	0.9128	0.8967	0.881	0.866	0.852	0.838	0.825	0.813	0.801	0.791
480	0.931	0.918	0.906	0.894	0.882	0.871	0.860	0.850	0.840	0.831
500	0.947	0.937	0.927	0.918	0.908	0.899	0.890	0.882	0.874	0.866
520	0.961	0.953	0.945	0.938	0.931	0.924	0.917	0.910	0.904	0.898
540	0.972	0.967	0.961	0.956	0.951	0.945	0.940	0.935	0.930	0.925
560	0.982	0.979	0.975	0.971	0.968	0.964	0.961	0.957	0.953	0.950
580	0.991	0.989	0.987	0.985	0.983	0.981	0.978	0.976	0.974	0.972
600	0.999	0.998	0.998	0.997	0.996	0.995	0.994	0.993	0.992	0.991
620	1.005	1.006	1.007	1.007	1.008	1.008	1.008	1.008	1.008	1.008
640	1.011	1.013	1.015	1.016	1.018	1.019	1.020	1.021	1.022	1.023
660	1.016	1.019	1.022	1.024	1.027	1.029	1.031	1.033	1.035	1.037
680	1.021	1.025	1.028	1.032	1.034	1.038	1.041	1.044	1.046	1.049
700	1.025	1.029	1.034	1.038	1.042	1.046	1.049	1.053	1.056	1.059

TABLE XIX (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280
720	1.029	1.034	1.039	1.043	1.048	1.053	1.057	1.061	1.065	1.069
740	1.032	1.037	1.043	1.048	1.054	1.059	1.064	1.068	1.073	1.077
760	1.034	1.041	1.047	1.053	1.058	1.064	1.069	1.075	1.080	1.085
780	1.037	1.044	1.050	1.057	1.063	1.069	1.075	1.081	1.086	1.091
800	1.039	1.046	1.053	1.060	1.067	1.073	1.079	1.086	1.092	1.097
820	1.041	1.048	1.056	1.063	1.070	1.077	1.084	1.090	1.096	1.103
840	1.042	1.050	1.058	1.066	1.073	1.080	1.087	1.094	1.101	1.11
860	1.044	1.052	1.060	1.068	1.076	1.083	1.091	1.098	1.105	1.11
880	1.045	1.054	1.062	1.070	1.078	1.086	1.094	1.101	1.11	1.12
900	1.046	1.055	1.064	1.072	1.080	1.088	1.096	1.104	1.11	1.12
920	1.047	1.056	1.065	1.074	1.082	1.090	1.098	1.106	1.11	1.12
940	1.048	1.057	1.066	1.075	1.084	1.092	1.100	1.108	1.12	1.12
960	1.049	1.058	1.067	1.076	1.085	1.094	1.102	1.110	1.12	1.13
980	1.050	1.059	1.068	1.077	1.086	1.095	1.104	1.112	1.12	1.13
1000	1.050	1.060	1.069	1.078	1.087	1.096	1.105	1.114	1.12	1.13

	300	320	340	360	380	400	420	440	460	480	500
320	0.39	0.38	0.38	0.38	0.37	0.37	0.37	0.37	0.37	0.37	0.37
340	0.45	0.45	0.44	0.44	0.43	0.43	0.43	0.43	0.43	0.43	0.43
360	0.515	0.507	0.500	0.50	0.49	0.49	0.49	0.48	0.48	0.48	0.48
380	0.575	0.566	0.559	0.553	0.548	0.544	0.540	0.538	0.536	0.535	0.534
400	0.632	0.623	0.615	0.608	0.602	0.597	0.593	0.590	0.587	0.586	0.584
420	0.686	0.676	0.668	0.661	0.654	0.649	0.644	0.640	0.637	0.634	0.632
440	0.736	0.726	0.718	0.710	0.704	0.698	0.693	0.688	0.685	0.682	0.679
460	0.781	0.772	0.764	0.757	0.750	0.744	0.739	0.734	0.730	0.727	0.724
480	0.822	0.814	0.807	0.800	0.793	0.788	0.782	0.778	0.773	0.770	0.766
500	0.859	0.852	0.845	0.839	0.833	0.828	0.823	0.818	0.814	0.810	0.807
520	0.891	0.886	0.880	0.875	0.870	0.865	0.860	0.856	0.852	0.849	0.85
540	0.921	0.916	0.911	0.907	0.903	0.899	0.895	0.891	0.888	0.88	0.88
560	0.946	0.943	0.940	0.936	0.933	0.930	0.926	0.923	0.92	0.92	0.91
580	0.969	0.967	0.965	0.962	0.960	0.957	0.955	0.95	0.95	0.95	0.95
600	0.990	0.988	0.987	0.986	0.984	0.983	0.98	0.98	0.98	0.98	0.97

TABLE XIX (Continued)

P, atmospheres

T, °K	300	320	340	360	380	400	420	440	460	480	500
620	1.008	1.007	1.007	1.006	1.006	1.01	1.00	1.00	1.00	1.00	1.00
640	1.024	1.024	1.025	1.025	1.03	1.03	1.03	1.03	1.02	1.02	1.02
660	1.038	1.040	1.041	1.042	1.04	1.04	1.04	1.04	1.05	1.05	1.05
680	1.051	1.053	1.055	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.07
700	1.062	1.065	1.068	1.07	1.07	1.07	1.07	1.08	1.08	1.08	1.08
720	1.072	1.076	1.08	1.08	1.09	1.09	1.09	1.09	1.10	1.10	1.10
740	1.081	1.085	1.09	1.09	1.10	1.10	1.10	1.11	1.11	1.11	1.11
760	1.089	1.09	1.10	1.10	1.11	1.11	1.11	1.12	1.12	1.12	1.13
780	1.097	1.10	1.11	1.11	1.12	1.12	1.12	1.13	1.13	1.14	1.14
800	1.10	1.11	1.11	1.12	1.12	1.13	1.13	1.14	1.14	1.15	1.15
820	1.11	1.11	1.12	1.13	1.13	1.14	1.14	1.15	1.15	1.16	1.16
840	1.11	1.12	1.13	1.13	1.14	1.14	1.15	1.15	1.16	1.16	1.17
860	1.12	1.12	1.13	1.14	1.14	1.15	1.15	1.16	1.17	1.17	1.18
880	1.12	1.13	1.14	1.14	1.15	1.15	1.16	1.17	1.17	1.18	1.18
900	1.13	1.13	1.14	1.15	1.15	1.16	1.17	1.17	1.18	1.18	1.19
920	1.13	1.14	1.14	1.15	1.16	1.16	1.17	1.18	1.18	1.19	1.19
940	1.13	1.14	1.15	1.15	1.16	1.17	1.17	1.18	1.19	1.19	1.20
960	1.13	1.14	1.15	1.16	1.16	1.17	1.18	1.19	1.19	1.20	1.20
980	1.14	1.14	1.15	1.16	1.17	1.17	1.18	1.19	1.20	1.20	1.21
1000	1.14	1.15	1.15	1.16	1.17	1.18	1.18	1.19	1.20	1.21	1.21

TABLE XX

FUGACITY COEFFICIENTS FOR AMMONIA, f/P

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
220	0.997									
240	0.998	0.989	0.978							
260	0.9984	0.9918	0.984	0.967						
280	0.9988	0.9938	0.9875	0.975						
300	0.99903	0.99513	0.9903	0.9805	0.951					
320	0.99923	0.99614	0.9923	0.9846	0.961	0.923				
340	0.99938	0.99690	0.99380	0.9876	0.9691	0.938	0.877			
360	0.99950	0.99748	0.99496	0.9899	0.9748	0.9497	0.900	0.799		
380	0.99958	0.99792	0.99585	0.99170	0.9793	0.9586	0.9176	0.836	0.754	0.671
400	0.99966	0.99828	0.99655	0.99310	0.9828	0.9656	0.9316	0.8642	0.798	0.732
420	0.99971	0.99856	0.99711	0.99422	0.9856	0.9712	0.9427	0.8864	0.8312	0.7773
440	0.99976	0.99878	0.99756	0.99512	0.9878	0.9757	0.9516	0.9042	0.8578	0.8126
460	0.99979	0.99896	0.99793	0.99586	0.98966	0.9794	0.9590	0.9186	0.8792	0.8409
480	0.99982	0.99912	0.99823	0.99646	0.99117	0.9824	0.9649	0.9305	0.8968	0.8641
500	0.99985	0.99924	0.99848	0.99696	0.99242	0.9849	0.9699	0.9403	0.9114	0.8832
520	0.99987	0.99935	0.99869	0.99738	0.99347	0.9870	0.9740	0.9485	0.9236	0.8992
540	0.99989	0.99943	0.99887	0.99774	0.99435	0.9887	0.9775	0.9555	0.9338	0.9126
560	0.99990	0.99951	0.99902	0.99804	0.99510	0.9902	0.9805	0.9613	0.9425	0.9241
580	0.99992	0.99957	0.99915	0.99830	0.99574	0.9915	0.9831	0.9664	0.9499	0.9338
600	0.99993	0.99963	0.99926	0.99852	0.99630	0.9926	0.9852	0.9707	0.9563	0.9422
620	0.99994	0.99968	0.99935	0.99871	0.99677	0.9936	0.9871	0.9744	0.9618	0.9495
640	0.99994	0.99972	0.99944	0.99887	0.99718	0.9944	0.9888	0.9776	0.9666	0.9558
660	0.99995	0.99975	0.99951	0.99902	0.99754	0.9951	0.9902	0.9805	0.9708	0.9613
680	0.99996	0.99979	0.99957	0.99914	0.99786	0.9957	0.9915	0.9829	0.9745	0.9661
700	0.99996	0.99981	0.99963	0.99926	0.99814	0.9963	0.9926	0.9851	0.9777	0.9704
720	0.99997	0.99984	0.99968	0.99935	0.99838	0.9968	0.9935	0.9870	0.9806	0.9741
740	0.99997	0.99986	0.99972	0.99944	0.99860	0.9972	0.9944	0.9887	0.9831	0.9774
760	0.99998	0.99988	0.99976	0.99952	0.99879	0.9976	0.9951	0.9903	0.9853	0.9804
780	0.99998	0.99990	0.99979	0.99958	0.99896	0.9979	0.9958	0.9916	0.9873	0.9830
800	0.99998	0.99991	0.99982	0.99965	0.99911	0.9982	0.9964	0.9928	0.9891	0.9854

TABLE XX (Continued)

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
820	0.99998	0.99992	0.99985	0.99970	0.99925	0.9985	0.9970	0.9939	0.9907	0.9875
840	0.99999	0.99994	0.99988	0.99975	0.99937	0.9987	0.9975	0.9949	0.9922	0.9894
860	0.99999	0.99995	0.99990	0.99979	0.99943	0.9990	0.9979	0.9957	0.9935	0.9911
880	0.99999	0.99996	0.99992	0.99983	0.99958	0.9992	0.9983	0.9965	0.9946	0.9927
900	0.99999	0.99997	0.99994	0.99987	0.99967	0.9993	0.9987	0.9972	0.9957	0.9941
920	1.00000	0.99998	0.99995	0.99990	0.99975	0.9995	0.9990	0.9979	0.9967	0.9954
940	1.00000	0.99998	0.99997	0.99993	0.99983	0.9996	0.9993	0.9985	0.9975	0.9965
960	1.00000	0.99999	0.99998	0.99996	0.99989	0.9998	0.9995	0.9990	0.9983	0.9976
980	1.00000	1.00000	0.99999	0.99998	0.99996	0.9999	0.9998	0.9995	0.9990	0.9985
1000	1.00000	1.00000	1.00000	1.00000	1.00001	1.0000	1.0000	0.9999	0.9997	0.9994
	100	120	140	160	180	200	220	240	260	280
400	0.670									
420	0.725	0.678	0.638	0.605	0.578	0.557	0.539	0.529	0.514	0.505
440	0.7692	0.729	0.692	0.660	0.634	0.612	0.593	0.578	0.566	0.556
460	0.8040	0.7691	0.737	0.708	0.682	0.660	0.642	0.626	0.613	0.603
480	0.8324	0.8022	0.774	0.748	0.724	0.703	0.685	0.670	0.656	0.645
500	0.8559	0.8297	0.805	0.782	0.760	0.741	0.723	0.708	0.695	0.683
520	0.8755	0.8527	0.831	0.810	0.791	0.773	0.757	0.742	0.729	0.718
540	0.8920	0.8721	0.853	0.835	0.817	0.801	0.786	0.772	0.760	0.749
560	0.9060	0.8885	0.872	0.855	0.840	0.825	0.812	0.799	0.787	0.776
580	0.9180	0.9027	0.888	0.873	0.859	0.846	0.834	0.822	0.811	0.801
600	0.9284	0.9148	0.902	0.889	0.876	0.865	0.853	0.842	0.832	0.823
620	0.9373	0.9253	0.914	0.902	0.891	0.881	0.870	0.860	0.851	0.842
640	0.9450	0.9345	0.924	0.914	0.904	0.895	0.885	0.876	0.868	0.859
660	0.9518	0.9425	0.933	0.924	0.915	0.907	0.898	0.890	0.882	0.875
680	0.9578	0.9496	0.941	0.933	0.926	0.918	0.910	0.903	0.896	0.889
700	0.9630	0.9558	0.949	0.941	0.934	0.927	0.921	0.914	0.907	0.901
720	0.9677	0.9612	0.955	0.949	0.942	0.936	0.930	0.924	0.918	0.912
740	0.9718	0.9661	0.960	0.955	0.949	0.944	0.938	0.933	0.927	0.922
760	0.9754	0.9705	0.965	0.960	0.955	0.950	0.946	0.941	0.936	0.931
780	0.9787	0.9743	0.970	0.966	0.961	0.957	0.952	0.948	0.943	0.939
800	0.9816	0.9778	0.974	0.970	0.966	0.962	0.958	0.954	0.950	0.946
820	0.9842	0.9809	0.978	0.974	0.971	0.967	0.964	0.960	0.956	0.953
840	0.9866	0.9837	0.981	0.978	0.975	0.972	0.968	0.965	0.962	0.959
860	0.9887	0.9863	0.984	0.981	0.978	0.976	0.973	0.970	0.967	0.964
880	0.9907	0.9886	0.986	0.984	0.982	0.979	0.977	0.974	0.972	0.969

TABLE XX (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280	
900	0.9924	0.9906	0.989	0.987	0.985	0.983	0.981	0.978	0.976	0.974	
920	0.9940	0.9925	0.991	0.989	0.988	0.986	0.984	0.982	0.980	0.978	
940	0.9954	0.9942	0.993	0.992	0.990	0.989	0.987	0.985	0.983	0.981	
960	0.9967	0.9958	0.995	0.994	0.992	0.991	0.990	0.988	0.987	0.985	
980	0.9979	0.9972	0.996	0.995	0.994	0.993	0.992	0.991	0.990	0.988	
1000	0.9990	0.9985	0.998	0.997	0.996	0.996	0.995	0.993	0.992	0.991	
	300	320	340	360	380	400	420	440	460	480	500
420	0.498	0.492	0.488	0.485	0.483	0.482	0.482	0.482	0.483	0.485	0.487
440	0.548	0.541	0.536	0.532	0.530	0.528	0.527	0.526	0.527	0.528	0.529
460	0.594	0.586	0.580	0.576	0.572	0.570	0.568	0.567	0.567	0.567	0.568
480	0.636	0.628	0.621	0.616	0.611	0.608	0.606	0.604	0.603	0.603	0.604
500	0.674	0.665	0.658	0.652	0.647	0.643	0.640	0.638	0.637	0.636	0.636
520	0.708	0.699	0.692	0.685	0.680	0.676	0.672	0.669	0.667	0.666	0.665
540	0.739	0.730	0.722	0.716	0.710	0.705	0.701	0.698	0.695	0.693	0.692
560	0.767	0.758	0.750	0.743	0.737	0.732	0.728	0.724	0.721	0.718	0.716
580	0.791	0.783	0.775	0.768	0.762	0.757	0.752	0.748	0.744	0.741	0.739
600	0.814	0.806	0.798	0.791	0.785	0.779	0.774	0.770	0.766	0.763	0.760
620	0.834	0.826	0.819	0.812	0.806	0.800	0.795	0.790	0.786	0.782	0.779
640	0.852	0.844	0.837	0.831	0.824	0.819	0.814	0.809	0.805	0.801	0.797
660	0.867	0.860	0.854	0.848	0.842	0.836	0.831	0.826	0.822	0.817	0.814
680	0.882	0.875	0.869	0.863	0.857	0.852	0.847	0.842	0.837	0.833	0.829
700	0.895	0.888	0.883	0.877	0.871	0.866	0.861	0.856	0.852	0.848	0.844
720	0.906	0.900	0.895	0.890	0.884	0.879	0.874	0.870	0.865	0.861	0.857
740	0.916	0.911	0.906	0.901	0.896	0.891	0.887	0.882	0.878	0.873	0.869
760	0.926	0.921	0.916	0.912	0.907	0.902	0.898	0.893	0.889	0.885	0.881
780	0.934	0.930	0.925	0.921	0.917	0.912	0.908	0.904	0.900	0.896	0.892
800	0.942	0.938	0.934	0.930	0.926	0.922	0.918	0.914	0.910	0.906	0.902
820	0.949	0.945	0.941	0.938	0.934	0.930	0.926	0.922	0.919	0.915	0.911
840	0.955	0.952	0.948	0.945	0.941	0.938	0.934	0.931	0.927	0.923	0.920
860	0.961	0.958	0.955	0.951	0.948	0.945	0.942	0.938	0.935	0.931	0.928
880	0.966	0.963	0.961	0.958	0.955	0.951	0.948	0.945	0.942	0.939	0.935
900	0.971	0.968	0.966	0.963	0.960	0.957	0.955	0.952	0.948	0.945	0.942
920	0.975	0.973	0.971	0.968	0.966	0.963	0.960	0.957	0.955	0.952	0.949
940	0.979	0.977	0.975	0.973	0.971	0.968	0.966	0.963	0.960	0.958	0.955
960	0.983	0.981	0.979	0.977	0.975	0.973	0.971	0.968	0.966	0.963	0.960
980	0.987	0.985	0.983	0.981	0.979	0.977	0.975	0.973	0.970	0.968	0.965
1000	0.990	0.988	0.987	0.985	0.983	0.981	0.979	0.977	0.975	0.973	0.970

TABLE XXI

FUGACITY COEFFICIENTS FOR METHANE, f/P

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
100	0.99574	0.9787								
120	0.99746	0.9873	0.9746	0.9493						
140	0.99835	0.9918	0.9836	0.9671	0.918	0.834				
160	0.99887	0.9943	0.9887	0.9774	0.943	0.887	0.770			
180	0.99919	0.9959	0.9919	0.9837	0.959	0.919	0.838			
200	0.99940	0.9970	0.9940	0.9880	0.970	0.940	0.881	0.76	0.48	0.37
220	0.99954	0.99772	0.9954	0.9909	0.9773	0.9548	0.910	0.823	0.736	0.64
240	0.99965	0.99825	0.99650	0.9930	0.9826	0.9653	0.9312	0.8648	0.801	0.739
260	0.99973	0.99864	0.99728	0.99456	0.9864	0.9730	0.9466	0.8954	0.8465	0.8002
280	0.99979	0.99893	0.99787	0.99574	0.98938	0.9789	0.9582	0.9183	0.8805	0.8449
300	0.99983	0.99916	0.99832	0.99665	0.99165	0.98339	0.9672	0.9360	0.9065	0.8789
320	0.99987	0.99934	0.99868	0.99736	0.99342	0.98693	0.9742	0.9498	0.9268	0.9054
340	0.99990	0.99948	0.99896	0.99793	0.99484	0.98975	0.9798	0.9608	0.9430	0.9265
360	0.99992	0.99960	0.99919	0.99838	0.99598	0.99202	0.9843	0.9696	0.9560	0.9434
380	0.99994	0.99969	0.99938	0.99876	0.99690	0.99386	0.9879	0.9768	0.9665	0.9572
400	0.99995	0.99976	0.99953	0.99906	0.99766	0.99537	0.9909	0.9827	0.9752	0.9685
420	0.99996	0.99983	0.99966	0.99931	0.99829	0.99662	0.9934	0.9875	0.9823	0.9778
440	0.99998	0.99988	0.99976	0.99952	0.99882	0.99767	0.9955	0.9916	0.9883	0.9856
460	0.99998	0.99992	0.99985	0.99970	0.99925	0.99854	0.9972	0.9950	0.9933	0.9921
480	0.99999	0.99996	0.99992	0.99984	0.99962	0.99928	0.9987	0.9978	0.9975	0.9976
500	1.00000	0.99999	0.99998	0.99997	0.99994	0.99990	0.9999	1.0002	1.0010	1.0022
520	1.00000	1.00002	1.00004	1.00008	1.00020	1.00042	1.0010	1.0023	1.0040	1.0062
540	1.00001	1.00004	1.00008	1.00017	1.00043	1.00087	1.0018	1.0040	1.0066	1.0095
560	1.00001	1.00006	1.00012	1.00024	1.00062	1.00126	1.0026	1.0055	1.0088	1.0124
580	1.00002	1.00008	1.00016	1.00031	1.00078	1.00159	1.0032	1.0068	1.0107	1.0148
600	1.00002	1.00009	1.00018	1.00037	1.00093	1.00187	1.0038	1.0079	1.0123	1.0169
620	1.00002	1.00010	1.00021	1.00042	1.00105	1.00211	1.0043	1.0088	1.0136	1.0187
640	1.00002	1.00011	1.00023	1.00046	1.00115	1.00232	1.0047	1.0096	1.0148	1.0202
660	1.00002	1.00012	1.00025	1.00050	1.00124	1.00250	1.0050	1.0103	1.0158	1.0215
680	1.00003	1.00013	1.00026	1.00053	1.00132	1.00265	1.0054	1.0109	1.0167	1.0226

TABLE XXI (Continued)

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	50	60
700	1.00003	1.00014	1.00028	1.00055	1.00139	1.00278	1.0056	1.0114	1.0174	1.0236
720	1.00003	1.00014	1.00029	1.00058	1.00144	1.00290	1.0058	1.0119	1.0181	1.0244
740	1.00003	1.00015	1.00030	1.00060	1.00149	1.00299	1.0060	1.0122	1.0186	1.0251
760	1.00003	1.00015	1.00031	1.00061	1.00153	1.00308	1.0062	1.0126	1.0190	1.0257
780	1.00003	1.00016	1.00031	1.00063	1.00157	1.00315	1.0063	1.0128	1.0194	1.0262
800	1.00003	1.00016	1.00032	1.00064	1.00160	1.00321	1.0064	1.0130	1.0198	1.0266
820	1.00003	1.00016	1.00032	1.00065	1.00162	1.00326	1.0066	1.0132	1.0200	1.0270
830	1.00003	1.00016	1.00033	1.00065	1.00163	1.00328	1.0066	1.0133	1.0201	1.0271
840	1.00003	1.00016	1.00033	1.00066	1.00164	1.00330	1.0066	1.0134	1.0202	1.0272
850	1.00003	1.00017	1.00033	1.00066	1.00165	1.00332	1.0067	1.0134	1.0203	1.0274
860	1.00003	1.00017	1.00033	1.00066	1.00166	1.00333	1.0067	1.0135	1.0204	1.0275
870	1.00003	1.00017	1.00033	1.00067	1.00167	1.00335	1.0067	1.0136	1.0205	1.0276
880	1.00003	1.00017	1.00033	1.00067	1.00168	1.00336	1.0067	1.0136	1.0206	1.0276
890	1.00003	1.00017	1.00034	1.00067	1.00168	1.00337	1.0068	1.0136	1.0206	1.0277
900	1.00003	1.00017	1.00034	1.00067	1.00169	1.00338	1.0068	1.0137	1.0207	1.0278
910	1.00003	1.00017	1.00034	1.00068	1.00169	1.00339	1.0068	1.0137	1.0207	1.0278
920	1.00003	1.00017	1.00034	1.00068	1.00169	1.00340	1.0068	1.0137	1.0208	1.0279
930	1.00003	1.00017	1.00034	1.00068	1.00170	1.00340	1.0068	1.0138	1.0208	1.0279
940	1.00003	1.00017	1.00034	1.00068	1.00170	1.00341	1.0068	1.0138	1.0208	1.0279
950	1.00003	1.00017	1.00034	1.00068	1.00170	1.00341	1.0068	1.0138	1.0208	1.0279
960	1.00003	1.00017	1.00034	1.00068	1.00171	1.00342	1.0068	1.0138	1.0208	1.0280
970	1.00003	1.00017	1.00034	1.00068	1.00171	1.00342	1.0069	1.0138	1.0208	1.0280
980	1.00003	1.00017	1.00034	1.00068	1.00171	1.00342	1.0069	1.0138	1.0208	1.0280
990	1.00003	1.00017	1.00034	1.00068	1.00171	1.00342	1.0069	1.0138	1.0208	1.0280
1000	1.00003	1.00017	1.00034	1.00068	1.00171	1.00342	1.0069	1.0138	1.0208	1.0279

	100	120	140	160	180	200	220	240	260	280
200	0.31	0.27	0.23	0.21	0.19	0.18	0.17	0.16	0.15	0.14
220	0.55	0.48	0.43	0.40	0.37	0.35	0.33	0.31	0.30	0.29
240	0.680	0.627	0.582	0.54	0.51	0.49	0.47	0.45	0.44	0.42
260	0.757	0.717	0.682	0.651	0.624	0.601	0.58	0.57	0.55	0.54
280	0.8117	0.781	0.754	0.729	0.707	0.689	0.672	0.658	0.65	0.64
300	0.8533	0.8297	0.808	0.789	0.772	0.757	0.744	0.733	0.723	0.715
320	0.8857	0.8675	0.8511	0.8363	0.823	0.812	0.802	0.793	0.786	0.780
340	0.9113	0.8975	0.8851	0.8740	0.8642	0.8557	0.848	0.842	0.837	0.833
360	0.9320	0.9217	0.9125	0.9045	0.8975	0.8915	0.8865	0.883	0.879	0.877
380	0.9488	0.9414	0.9349	0.9293	0.9246	0.9208	0.9179	0.9157	0.914	0.914

TABLE XXI (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280
400	0.9626	0.9576	0.9533	0.9498	0.9471	0.9451	0.9438	0.9432	0.9432	0.944
420	0.9741	0.9710	0.9685	0.9668	0.9657	0.9652	0.9654	0.9661	0.9675	0.969
440	0.9836	0.9821	0.9812	0.9810	0.9813	0.9821	0.9835	0.9854	0.9878	0.991
460	0.9915	0.9915	0.9919	0.9929	0.9943	0.9963	0.9987	1.0015	1.0048	1.009
480	0.9982	0.9993	1.0009	1.0029	1.0053	1.0082	1.0115	1.0152	1.0196	1.024
500	1.0039	1.0060	1.0084	1.0113	1.0146	1.0183	1.0223	1.0267	1.0315	1.037
520	1.0087	1.0116	1.0149	1.0185	1.0225	1.0268	1.0315	1.0365	1.0418	1.047
540	1.0128	1.0164	1.0203	1.0246	1.0292	1.0341	1.0393	1.0448	1.0506	1.057
560	1.0163	1.0205	1.0250	1.0298	1.0349	1.0403	1.0460	1.0519	1.0582	1.065
580	1.0192	1.0240	1.0290	1.0342	1.0398	1.0456	1.0517	1.0580	1.0645	1.071
600	1.0218	1.0270	1.0324	1.0380	1.0440	1.0501	1.0565	1.0631	1.0700	1.077
620	1.0240	1.0295	1.0353	1.0413	1.0475	1.0540	1.0606	1.0675	1.0746	1.082
640	1.0258	1.0317	1.0378	1.0440	1.0505	1.0572	1.0641	1.0712	1.0785	1.086
660	1.0274	1.0336	1.0399	1.0464	1.0531	1.0600	1.0671	1.0744	1.0818	1.089
680	1.0288	1.0352	1.0417	1.0484	1.0553	1.0624	1.0696	1.0771	1.0847	1.092
700	1.0300	1.0365	1.0432	1.0501	1.0572	1.0644	1.0718	1.0793	1.0870	1.095
720	1.0310	1.0377	1.0445	1.0516	1.0588	1.0661	1.0736	1.0812	1.0890	1.097
740	1.0318	1.0386	1.0456	1.0528	1.0601	1.0675	1.0751	1.0828	1.0907	1.099
760	1.0325	1.0395	1.0466	1.0538	1.0612	1.0687	1.0764	1.0841	1.0920	1.100
780	1.0331	1.0402	1.0473	1.0546	1.0621	1.0697	1.0774	1.0852	1.0932	1.101
800	1.0336	1.0407	1.0480	1.0554	1.0628	1.0705	1.0782	1.0861	1.0940	1.102
820	1.0340	1.0412	1.0485	1.0559	1.0634	1.0711	1.0789	1.0868	1.0947	1.103
830	1.0342	1.0414	1.0487	1.0562	1.0637	1.0714	1.0791	1.0870	1.0950	1.103
840	1.0343	1.0416	1.0489	1.0564	1.0639	1.0716	1.0794	1.0873	1.0953	1.103
850	1.0345	1.0417	1.0491	1.0565	1.0641	1.0718	1.0796	1.0875	1.0955	1.104
860	1.0346	1.0419	1.0492	1.0567	1.0643	1.0720	1.0798	1.0876	1.0956	1.104
870	1.0347	1.0420	1.0494	1.0568	1.0644	1.0721	1.0799	1.0878	1.0958	1.104
880	1.0348	1.0421	1.0495	1.0570	1.0646	1.0722	1.0800	1.0879	1.0959	1.104
890	1.0349	1.0422	1.0496	1.0571	1.0646	1.0723	1.0801	1.0880	1.0960	1.104
900	1.0350	1.0423	1.0496	1.0571	1.0647	1.0724	1.0802	1.0880	1.0960	1.104
910	1.0350	1.0423	1.0497	1.0572	1.0648	1.0725	1.0802	1.0881	1.0960	1.104
920	1.0351	1.0424	1.0498	1.0572	1.0648	1.0725	1.0802	1.0881	1.0960	1.104
930	1.0351	1.0424	1.0498	1.0573	1.0649	1.0725	1.0803	1.0881	1.0960	1.104
940	1.0351	1.0424	1.0498	1.0573	1.0649	1.0725	1.0802	1.0881	1.0960	1.104
950	1.0352	1.0424	1.0498	1.0573	1.0649	1.0725	1.0802	1.0880	1.0959	1.104

TABLE XXI (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280	
960	1.0352	1.0425	1.0498	1.0573	1.0648	1.0725	1.0802	1.0880	1.0958	1.104	
970	1.0352	1.0424	1.0498	1.0573	1.0648	1.0724	1.0801	1.0879	1.0957	1.104	
980	1.0352	1.0424	1.0498	1.0572	1.0648	1.0724	1.0800	1.0878	1.0956	1.104	
990	1.0352	1.0424	1.0498	1.0572	1.0647	1.0723	1.0800	1.0877	1.0955	1.103	
1000	1.0351	1.0424	1.0497	1.0572	1.0646	1.0722	1.0798	1.0876	1.0954	1.103	
	300	320	340	360	380	400	420	440	460	480	500
200	0.14	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11
220	0.28	0.27	0.27	0.26	0.25	0.25	0.25	0.24	0.24	0.24	0.24
240	0.41	0.41	0.40	0.39	0.39	0.38	0.38	0.37	0.37	0.37	0.37
260	0.53	0.52	0.51	0.51	0.50	0.50	0.50	0.49	0.49	0.49	0.49
280	0.63	0.62	0.61	0.61	0.61	0.60	0.60	0.60	0.60	0.60	0.60
300	0.71	0.70	0.70	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
320	0.775	0.771	0.77	0.77	0.76	0.76	0.76	0.76	0.77	0.77	0.77
340	0.830	0.828	0.826	0.826	0.83	0.83	0.83	0.83	0.83	0.83	0.84
360	0.876	0.875	0.875	0.875	0.877	0.878	0.88	0.88	0.89	0.89	0.89
380	0.914	0.914	0.915	0.917	0.920	0.922	0.926	0.930	0.93	0.94	0.94
400	0.945	0.947	0.949	0.952	0.956	0.959	0.964	0.968	0.973	0.979	0.984
420	0.972	0.975	0.978	0.982	0.986	0.990	0.996	1.001	1.007	1.013	1.019
440	0.994	0.998	1.002	1.006	1.011	1.017	1.022	1.029	1.035	1.042	1.049
460	1.013	1.017	1.022	1.027	1.033	1.039	1.045	1.052	1.059	1.066	1.073
480	1.029	1.034	1.039	1.045	1.051	1.058	1.065	1.072	1.079	1.087	1.095
500	1.042	1.048	1.054	1.060	1.067	1.074	1.081	1.088	1.096	1.104	1.112
520	1.053	1.060	1.066	1.073	1.080	1.087	1.095	1.103	1.111	1.119	1.128
540	1.063	1.070	1.077	1.084	1.091	1.099	1.107	1.115	1.123	1.132	1.140
560	1.071	1.078	1.085	1.093	1.101	1.108	1.117	1.125	1.133	1.142	1.151
580	1.078	1.086	1.093	1.101	1.109	1.117	1.125	1.134	1.142	1.151	1.160
600	1.084	1.092	1.099	1.107	1.115	1.124	1.132	1.141	1.150	1.159	1.168
620	1.089	1.097	1.105	1.113	1.121	1.130	1.138	1.147	1.156	1.165	1.174
640	1.094	1.102	1.110	1.118	1.126	1.135	1.143	1.152	1.161	1.170	1.180
660	1.097	1.105	1.113	1.122	1.130	1.139	1.148	1.157	1.166	1.175	1.184
680	1.100	1.108	1.117	1.125	1.134	1.142	1.151	1.160	1.169	1.179	1.188

TABLE XXI (Continued)

P, atmospheres

T, °K	300	320	340	360	380	400	420	440	460	480	500
700	1.103	1.111	1.119	1.128	1.136	1.145	1.154	1.163	1.172	1.182	1.191
720	1.105	1.113	1.122	1.130	1.139	1.148	1.156	1.166	1.175	1.184	1.193
740	1.107	1.115	1.123	1.132	1.141	1.149	1.158	1.167	1.177	1.186	1.195
760	1.108	1.117	1.125	1.134	1.142	1.151	1.160	1.169	1.178	1.187	1.197
780	1.109	1.118	1.126	1.135	1.143	1.152	1.161	1.170	1.179	1.188	1.198
800	1.110	1.119	1.127	1.136	1.144	1.153	1.162	1.171	1.180	1.189	1.198
820	1.111	1.119	1.128	1.136	1.145	1.154	1.163	1.171	1.181	1.190	1.199
830	1.111	1.120	1.128	1.137	1.145	1.154	1.163	1.172	1.181	1.190	1.199
840	1.112	1.120	1.128	1.137	1.145	1.154	1.163	1.172	1.181	1.190	1.199
850	1.112	1.120	1.128	1.137	1.146	1.154	1.163	1.172	1.181	1.190	1.199
860	1.112	1.120	1.129	1.137	1.146	1.154	1.163	1.172	1.181	1.190	1.199
870	1.112	1.120	1.129	1.137	1.146	1.154	1.163	1.172	1.181	1.190	1.199
880	1.112	1.120	1.129	1.137	1.146	1.154	1.163	1.172	1.181	1.190	1.199
890	1.112	1.120	1.129	1.137	1.146	1.154	1.163	1.172	1.181	1.190	1.199
900	1.112	1.120	1.129	1.137	1.146	1.154	1.163	1.172	1.180	1.189	1.198
910	1.112	1.120	1.129	1.137	1.146	1.154	1.163	1.171	1.180	1.189	1.198
920	1.112	1.120	1.129	1.137	1.145	1.154	1.163	1.171	1.180	1.189	1.198
930	1.112	1.120	1.129	1.137	1.145	1.154	1.162	1.171	1.180	1.189	1.197
940	1.112	1.120	1.128	1.137	1.145	1.154	1.162	1.171	1.179	1.188	1.197
950	1.112	1.120	1.128	1.137	1.145	1.153	1.162	1.170	1.179	1.188	1.197
960	1.112	1.120	1.128	1.136	1.145	1.153	1.162	1.170	1.179	1.187	1.196
970	1.112	1.120	1.128	1.136	1.144	1.153	1.161	1.170	1.178	1.187	1.196
980	1.112	1.120	1.128	1.136	1.144	1.153	1.161	1.169	1.178	1.187	1.195
990	1.111	1.119	1.127	1.136	1.144	1.152	1.161	1.169	1.178	1.186	1.195
1000	1.111	1.119	1.127	1.135	1.144	1.152	1.160	1.169	1.177	1.186	1.194

TABLE XXII

FUGACITY COEFFICIENTS FOR HELIUM, f/P

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
30	1.00015	1.00077	1.0016	1.0032	1.0086	1.0193	1.046	1.120	1.216	1.331
40	1.00021	1.00104	1.00209	1.0042	1.0108	1.0224	1.0482	1.109	1.180	1.262
50	1.00021	1.00103	1.00206	1.00414	1.0105	1.0214	1.0446	1.0958	1.153	1.216
60	1.00019	1.00096	1.00192	1.00385	1.0097	1.0197	1.0404	1.0847	1.1327	1.184
80	1.00016	1.00081	1.00162	1.00325	1.00815	1.0164	1.0333	1.0683	1.1049	1.1432
100	1.00014	1.00069	1.00138	1.00277	1.00693	1.01392	1.0281	1.0570	1.0869	1.1176
120	1.00012	1.00060	1.00120	1.00240	1.00600	1.01203	1.0242	1.0489	1.0742	1.1000
140	1.00011	1.00053	1.00105	1.00211	1.00528	1.01058	1.0212	1.0428	1.0648	1.0870
160	1.00009	1.00047	1.00094	1.00188	1.00471	1.00943	1.0189	1.0381	1.0574	1.0771
180	1.00008	1.00042	1.00085	1.00170	1.00425	1.00850	1.0170	1.0343	1.0516	1.0692
200	1.00008	1.00039	1.00077	1.00155	1.00387	1.00774	1.0155	1.0311	1.0469	1.0628
220	1.00007	1.00035	1.00071	1.00142	1.00355	1.00710	1.0142	1.0285	1.0430	1.0574
240	1.00007	1.00033	1.00066	1.00131	1.00328	1.00656	1.0131	1.0263	1.0396	1.0530
260	1.00006	1.00030	1.00061	1.00122	1.00305	1.00609	1.0122	1.0245	1.0368	1.0491
280	1.00006	1.00028	1.00057	1.00114	1.00284	1.00569	1.0114	1.0228	1.0343	1.0458
300	1.00005	1.00027	1.00053	1.00107	1.00267	1.00533	1.0107	1.0214	1.0321	1.0429
320	1.00005	1.00025	1.00050	1.00100	1.00251	1.00502	1.0100	1.0201	1.0302	1.0404
340	1.00005	1.00024	1.00047	1.00095	1.00237	1.00474	1.0095	1.0190	1.0286	1.0381
360	1.00004	1.00022	1.00045	1.00090	1.00225	1.00449	1.0090	1.0180	1.0270	1.0361
380	1.00004	1.00021	1.00043	1.00085	1.00213	1.00427	1.0085	1.0171	1.0257	1.0343
400	1.00004	1.00020	1.00041	1.00081	1.00203	1.00407	1.0081	1.0163	1.0245	1.0326
420	1.00004	1.00019	1.00039	1.00078	1.00194	1.00388	1.0078	1.0156	1.0233	1.0312
440	1.00004	1.00019	1.00037	1.00074	1.00186	1.00371	1.0074	1.0149	1.0223	1.0298
460	1.00004	1.00018	1.00036	1.00071	1.00178	1.00356	1.0071	1.0142	1.0214	1.0285
480	1.00003	1.00017	1.00034	1.00068	1.00171	1.00342	1.0068	1.0137	1.0205	1.0274
500	1.00003	1.00016	1.00033	1.00066	1.00164	1.00329	1.0066	1.0132	1.0197	1.0263
520	1.00003	1.00016	1.00032	1.00063	1.00158	1.00316	1.0063	1.0127	1.0190	1.0254
540	1.00003	1.00015	1.00030	1.00061	1.00152	1.00305	1.0061	1.0122	1.0183	1.0244
560	1.00003	1.00015	1.00029	1.00059	1.00147	1.00295	1.0059	1.0118	1.0177	1.0236
580	1.00003	1.00014	1.00028	1.00057	1.00142	1.00285	1.0057	1.0114	1.0171	1.0228

TABLE XXII (Continued)

P, atmospheres

T, °K	0.1	0.5	1	2	5	10	20	40	60	80
600	1.00003	1.00014	1.00028	1.00055	1.00138	1.00276	1.0055	1.0110	1.0165	1.0221
620	1.00003	1.00013	1.00027	1.00053	1.00133	1.00267	1.0053	1.0107	1.0160	1.0214
640	1.00003	1.00013	1.00026	1.00052	1.00129	1.00259	1.0052	1.0104	1.0155	1.0207
660	1.00003	1.00013	1.00025	1.00050	1.00126	1.00251	1.0050	1.0100	1.0151	1.0201
680	1.00002	1.00012	1.00024	1.00049	1.00122	1.00244	1.0049	1.0098	1.0146	1.0195
700	1.00002	1.00012	1.00024	1.00047	1.00119	1.00237	1.0048	1.0095	1.0142	1.0190
720	1.00002	1.00012	1.00023	1.00046	1.00115	1.00231	1.0046	1.0092	1.0139	1.0185
740	1.00002	1.00011	1.00022	1.00045	1.00112	1.00225	1.0045	1.0090	1.0135	1.0180
760	1.00002	1.00011	1.00022	1.00044	1.00109	1.00219	1.0044	1.0088	1.0132	1.0175
780	1.00002	1.00011	1.00021	1.00043	1.00107	1.00213	1.0043	1.0085	1.0128	1.0171
800	1.00002	1.00010	1.00021	1.00042	1.00104	1.00208	1.0042	1.0083	1.0125	1.0167
820	1.00002	1.00010	1.00020	1.00041	1.00102	1.00203	1.0041	1.0081	1.0122	1.0163
840	1.00002	1.00010	1.00020	1.00040	1.00099	1.00199	1.0040	1.0080	1.0119	1.0159
860	1.00002	1.00010	1.00019	1.00039	1.00097	1.00194	1.0039	1.0078	1.0116	1.0155
880	1.00002	1.00009	1.00019	1.00038	1.00095	1.00190	1.0038	1.0076	1.0114	1.0152
900	1.00002	1.00009	1.00019	1.00037	1.00093	1.00186	1.0037	1.0074	1.0111	1.0149
920	1.00002	1.00009	1.00018	1.00036	1.00091	1.00182	1.0036	1.0073	1.0109	1.0145
940	1.00002	1.00009	1.00018	1.00036	1.00089	1.00178	1.0036	1.0071	1.0107	1.0142
960	1.00002	1.00009	1.00017	1.00035	1.00087	1.00174	1.0035	1.0070	1.0105	1.0140
980	1.00002	1.00009	1.00017	1.00034	1.00085	1.00171	1.0034	1.0068	1.0102	1.0137
1000	1.00002	1.00008	1.00017	1.00033	1.00084	1.00167	1.0034	1.0067	1.0100	1.0134
	100	120	140	160	180	200	220	240	260	280
30	1.463	1.613	1.780	1.966	2.172	2.399	2.649	2.923	3.223	3.552
40	1.352	1.450	1.558	1.674	1.800	1.935	2.080	2.235	2.401	2.578
50	1.284	1.357	1.435	1.518	1.606	1.699	1.797	1.901	2.011	2.126
60	1.239	1.297	1.358	1.422	1.489	1.560	1.634	1.711	1.791	1.875
80	1.1830	1.2243	1.2671	1.311	1.357	1.404	1.453	1.504	1.556	1.609
100	1.1492	1.1816	1.2148	1.2489	1.2838	1.3196	1.356	1.394	1.432	1.471
120	1.1263	1.1531	1.1804	1.2082	1.2366	1.2655	1.2949	1.325	1.355	1.386
140	1.1096	1.1325	1.1558	1.1794	1.2034	1.2277	1.2523	1.2774	1.303	1.328
160	1.0969	1.1170	1.1373	1.1578	1.1786	1.1997	1.2210	1.2425	1.2643	1.286
180	1.0869	1.1048	1.1228	1.1410	1.1594	1.1780	1.1968	1.2157	1.2348	1.2541

TABLE XXII (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280
200	1.0788	1.0949	1.1111	1.1275	1.1440	1.1607	1.1775	1.1944	1.2114	1.2286
220	1.0720	1.0867	1.1015	1.1164	1.1314	1.1465	1.1617	1.1770	1.1924	1.2080
240	1.0664	1.0799	1.0935	1.1071	1.1209	1.1347	1.1486	1.1626	1.1766	1.191
260	1.0616	1.0741	1.0866	1.0992	1.1119	1.1246	1.1375	1.1503	1.1633	1.176
280	1.0574	1.0690	1.0807	1.0924	1.1042	1.1160	1.1279	1.1398	1.152	1.164
300	1.0538	1.0646	1.0755	1.0865	1.0975	1.1085	1.1196	1.1308	1.142	1.153
320	1.0506	1.0608	1.0710	1.0813	1.0916	1.1020	1.1124	1.1228	1.133	1.144
340	1.0477	1.0574	1.0670	1.0767	1.0864	1.0962	1.1059	1.116	1.126	1.135
360	1.0452	1.0543	1.0634	1.0726	1.0818	1.091	1.100	1.109	1.119	1.128
380	1.0429	1.0516	1.0602	1.069	1.078	1.086	1.095	1.104	1.113	1.121
400	1.0408	1.049	1.057	1.066	1.074	1.082	1.090	1.099	1.107	1.116
420	1.0390	1.047	1.055	1.063	1.070	1.078	1.086	1.094	1.102	1.110
440	1.0373	1.045	1.052	1.060	1.067	1.075	1.082	1.090	1.098	1.105
460	1.0357	1.043	1.050	1.057	1.064	1.072	1.079	1.086	1.093	1.101
480	1.0343	1.041	1.048	1.055	1.062	1.069	1.076	1.083	1.090	1.097
500	1.0329	1.040	1.046	1.053	1.059	1.066	1.073	1.079	1.086	1.093
520	1.0317	1.038	1.044	1.051	1.057	1.064	1.070	1.076	1.083	1.089
540	1.0306	1.037	1.043	1.049	1.055	1.061	1.068	1.074	1.080	1.086
560	1.0295	1.035	1.041	1.047	1.053	1.059	1.065	1.071	1.077	1.083
580	1.0285	1.034	1.040	1.046	1.051	1.057	1.063	1.069	1.075	1.080
600	1.0276	1.033	1.039	1.044	1.050	1.055	1.061	1.066	1.072	1.078
620	1.0267	1.032	1.037	1.043	1.048	1.054	1.059	1.064	1.070	1.075
640	1.0259	1.031	1.036	1.042	1.047	1.052	1.057	1.062	1.068	1.073
660	1.0252	1.030	1.035	1.040	1.045	1.050	1.055	1.061	1.066	1.071
680	1.0244	1.029	1.034	1.039	1.044	1.049	1.054	1.059	1.064	1.069
700	1.0238	1.029	1.033	1.038	1.043	1.048	1.052	1.057	1.062	1.067
720	1.0231	1.028	1.032	1.037	1.042	1.046	1.051	1.056	1.060	1.065
740	1.0225	1.027	1.032	1.036	1.041	1.045	1.050	1.054	1.059	1.063
760	1.0219	1.026	1.031	1.035	1.040	1.044	1.048	1.053	1.057	1.062
780	1.0214	1.026	1.030	1.034	1.039	1.043	1.047	1.051	1.056	1.060
800	1.0208	1.025	1.029	1.033	1.038	1.042	1.046	1.050	1.054	1.059
820	1.0204	1.024	1.029	1.033	1.037	1.041	1.045	1.049	1.053	1.057
840	1.0199	1.024	1.028	1.032	1.036	1.040	1.044	1.048	1.052	1.056
860	1.0194	1.023	1.027	1.031	1.035	1.039	1.043	1.047	1.051	1.055
880	1.0190	1.023	1.027	1.030	1.034	1.038	1.042	1.046	1.050	1.053

TABLE XXII (Continued)

P, atmospheres

T, °K	100	120	140	160	180	200	220	240	260	280	
900	1.0186	1.022	1.026	1.030	1.033	1.037	1.041	1.045	1.048	1.052	
920	1.0182	1.022	1.025	1.029	1.033	1.036	1.040	1.044	1.047	1.051	
940	1.0178	1.021	1.025	1.029	1.032	1.036	1.039	1.043	1.046	1.050	
960	1.0174	1.021	1.024	1.028	1.031	1.035	1.038	1.042	1.045	1.049	
980	1.0171	1.021	1.024	1.027	1.031	1.034	1.038	1.041	1.045	1.048	
1000	1.0168	1.020	1.023	1.027	1.030	1.034	1.037	1.040	1.044	1.047	
	300	320	340	360	380	400	420	440	460	480	500
30	3.912	4.306	4.735	5.204	5.715	6.271	6.877	7.536	8.253	9.032	9.878
40	2.676	2.969	3.184	3.414	3.658	3.918	4.195	4.489	4.802	5.134	5.487
50	2.248	2.375	2.510	2.651	2.799	2.954	3.118	3.289	3.468	3.656	3.854
60	1.962	2.054	2.148	2.247	2.350	2.457	2.568	2.684	2.804	2.929	3.058
80	1.664	1.721	1.779	1.839	1.901	1.965	2.030	2.097	2.166	2.238	2.310
100	1.511	1.552	1.594	1.637	1.681	1.725	1.771	1.817	1.865	1.914	1.963
120	1.418	1.450	1.483	1.516	1.550	1.584	1.619	1.654	1.691	1.727	1.765
140	1.355	1.381	1.408	1.435	1.463	1.491	1.519	1.548	1.577	1.606	1.636
160	1.309	1.331	1.354	1.377	1.400	1.424	1.448	1.472	1.496	1.521	1.546
180	1.274	1.293	1.313	1.333	1.353	1.374	1.395	1.415	1.436	1.458	1.479
200	1.246	1.263	1.281	1.299	1.317	1.335	1.353	1.371	1.390	1.409	1.428
220	1.224	1.239	1.255	1.271	1.287	1.303	1.320	1.336	1.353	1.369	1.386
240	1.205	1.219	1.234	1.248	1.263	1.278	1.292	1.307	1.322	1.337	1.352
260	1.189	1.203	1.216	1.229	1.242	1.256	1.269	1.283	1.297	1.310	1.324
280	1.176	1.188	1.200	1.213	1.225	1.237	1.250	1.262	1.275	1.288	1.300
300	1.164	1.176	1.187	1.199	1.210	1.222	1.233	1.245	1.256	1.268	1.280
320	1.154	1.165	1.176	1.186	1.197	1.208	1.218	1.229	1.240	1.251	1.262
340	1.145	1.155	1.165	1.175	1.185	1.195	1.206	1.216	1.226	1.236	1.247
360	1.137	1.147	1.156	1.166	1.175	1.185	1.194	1.204	1.213	1.223	1.233
380	1.130	1.139	1.148	1.157	1.166	1.175	1.184	1.193	1.202	1.211	1.220
400	1.124	1.132	1.141	1.149	1.158	1.166	1.175	1.183	1.192	1.201	1.209
420	1.118	1.126	1.134	1.142	1.150	1.158	1.167	1.175	1.183	1.191	1.199
440	1.113	1.121	1.128	1.136	1.144	1.151	1.159	1.167	1.175	1.182	1.190
460	1.108	1.115	1.123	1.130	1.137	1.145	1.152	1.160	1.167	1.174	1.182
480	1.104	1.111	1.118	1.125	1.132	1.139	1.146	1.153	1.160	1.167	1.174

TABLE XXII (Continued)

P, atmospheres

T, °K	300	320	340	360	380	400	420	440	460	480	500
500	1.100	1.106	1.113	1.120	1.127	1.133	1.140	1.147	1.154	1.161	1.167
520	1.096	1.102	1.109	1.115	1.122	1.128	1.135	1.141	1.148	1.154	1.161
540	1.092	1.099	1.105	1.111	1.117	1.124	1.130	1.136	1.142	1.149	1.155
560	1.089	1.095	1.101	1.107	1.113	1.119	1.125	1.131	1.137	1.143	1.150
580	1.086	1.092	1.098	1.103	1.109	1.115	1.121	1.127	1.133	1.139	1.144
600	1.083	1.089	1.094	1.100	1.106	1.111	1.117	1.123	1.128	1.134	1.140
620	1.081	1.086	1.091	1.097	1.102	1.108	1.113	1.119	1.124	1.130	1.135
640	1.078	1.083	1.089	1.094	1.099	1.104	1.110	1.115	1.120	1.126	1.131
660	1.076	1.081	1.086	1.091	1.096	1.101	1.106	1.112	1.117	1.122	1.127
680	1.074	1.079	1.084	1.088	1.093	1.098	1.103	1.108	1.113	1.118	1.123
700	1.072	1.076	1.081	1.086	1.091	1.096	1.100	1.105	1.110	1.115	1.120
720	1.070	1.074	1.079	1.084	1.088	1.093	1.098	1.102	1.107	1.112	1.117
740	1.068	1.072	1.077	1.081	1.086	1.091	1.095	1.100	1.104	1.109	1.113
760	1.066	1.070	1.075	1.079	1.084	1.088	1.093	1.097	1.102	1.106	1.110
780	1.064	1.069	1.073	1.077	1.082	1.086	1.090	1.095	1.099	1.103	1.108
800	1.063	1.067	1.071	1.075	1.080	1.084	1.088	1.092	1.096	1.101	1.105
820	1.061	1.065	1.069	1.074	1.078	1.082	1.086	1.090	1.094	1.098	1.102
840	1.060	1.064	1.068	1.072	1.076	1.080	1.084	1.088	1.092	1.096	1.100
860	1.058	1.062	1.066	1.070	1.074	1.078	1.082	1.086	1.090	1.094	1.098
880	1.057	1.061	1.065	1.069	1.072	1.076	1.080	1.084	1.088	1.092	1.096
900	1.056	1.060	1.063	1.067	1.071	1.075	1.078	1.082	1.086	1.090	1.093
920	1.055	1.058	1.062	1.066	1.069	1.073	1.077	1.080	1.084	1.088	1.091
940	1.054	1.057	1.061	1.064	1.068	1.071	1.075	1.079	1.082	1.086	1.089
960	1.052	1.056	1.059	1.063	1.066	1.070	1.074	1.077	1.081	1.084	1.088
980	1.051	1.055	1.058	1.062	1.065	1.069	1.072	1.075	1.079	1.082	1.086
1000	1.050	1.054	1.057	1.060	1.064	1.067	1.071	1.074	1.077	1.081	1.084