

A_r = 15.9994 Oxygen (O)O₁(g)

NIST-JANAF THERMOCHEMICAL TABLES

Enthalpy Reference Temperature = T _r = 298.15 K				Standard State Pressure = p° = 0.1 MPa			
T/K	J·K ⁻¹ ·mol ⁻¹			kJ·mol ⁻¹			log K _r
	C _p ^o	S ^o	-(G ^o -H ^o (T _r))/T	H ^o -H ^o (T _r)	Δ _f H ^o	Δ _f G ^o	
0	0.	0.	INFINITE	-6.725	246.790	246.790	INFINITE
100	23.703	135.947	181.131	-4.518	247.544	242.615	-126.729
200	22.734	152.153	163.085	-2.186	248.421	237.339	-61.986
250	22.246	157.170	161.421	-1.063	248.816	234.522	-49.001
298.15	21.911	161.058	161.058	0.	249.173	231.736	-40.599
300	21.901	161.194	161.059	0.041	249.187	231.628	-40.330
350	21.657	164.551	161.324	1.129	249.537	228.673	-34.128
400	21.482	167.430	161.912	2.207	249.868	225.670	-29.469
450	21.354	169.953	162.668	3.278	250.180	222.626	-25.842
500	21.257	172.197	163.511	4.343	250.474	219.549	-22.936
600	21.124	176.060	165.291	6.462	251.013	213.312	-18.570
700	21.040	179.310	167.067	8.570	251.494	206.990	-15.446
800	20.984	182.116	168.777	10.671	251.926	200.602	-13.098
900	20.944	184.585	170.399	12.767	252.320	194.163	-11.269
1000	20.915	186.790	171.930	14.860	252.682	187.681	-9.803
1100	20.893	188.782	173.373	16.950	253.018	181.165	-8.603
1200	20.877	190.599	174.734	19.039	253.332	174.619	-7.601
1300	20.864	192.270	176.019	21.126	253.627	168.047	-6.752
1400	20.853	193.816	177.236	23.212	253.906	161.453	-6.024
1500	20.845	195.254	178.390	25.296	254.171	154.840	-5.392
1600	20.838	196.599	179.486	27.381	254.421	148.210	-4.839
1700	20.833	197.862	180.530	29.464	254.659	141.564	-4.350
1800	20.830	199.053	181.527	31.547	254.884	134.905	-3.915
1900	20.827	200.179	182.479	33.630	255.097	128.234	-3.525
2000	20.826	201.247	183.391	35.713	255.299	121.552	-3.175
2100	20.827	202.263	184.266	37.796	255.488	114.860	-2.857
2200	20.830	203.232	185.106	39.878	255.667	108.159	-2.568
2300	20.835	204.158	185.914	41.962	255.835	101.450	-2.304
2400	20.841	205.045	186.693	44.045	255.992	94.734	-2.062
2500	20.851	205.896	187.444	46.130	256.139	88.012	-1.839
2600	20.862	206.714	188.170	48.216	256.277	81.284	-1.633
2700	20.877	207.502	188.871	50.303	256.405	74.551	-1.442
2800	20.894	208.261	189.550	52.391	256.525	67.814	-1.265
2900	20.914	208.995	190.208	54.481	256.637	61.072	-1.100
3000	20.937	209.704	190.846	56.574	256.741	54.327	-0.946
3100	20.963	210.391	191.466	58.669	256.838	47.578	-0.802
3200	20.991	211.057	192.068	60.767	256.929	40.826	-0.666
3300	21.022	211.704	192.653	62.867	257.014	34.071	-0.539
3400	21.056	212.332	193.223	64.971	257.094	27.315	-0.420
3500	21.092	212.943	193.777	67.079	257.169	20.555	-0.307
3600	21.130	213.537	194.318	69.190	257.241	13.794	-0.200
3700	21.170	214.117	194.845	71.305	257.309	7.030	-0.099
3800	21.213	214.682	195.360	73.424	257.373	0.265	-0.004
3900	21.257	215.234	195.862	75.547	257.436	-6.501	0.087
4000	21.302	215.772	196.353	77.675	257.496	-13.270	0.173
4100	21.349	216.299	196.834	79.808	257.554	-20.040	0.255
4200	21.397	216.814	197.303	81.945	257.611	-26.811	0.333
4300	21.445	217.318	197.763	84.087	257.666	-33.583	0.408
4400	21.495	217.812	198.213	86.234	257.720	-40.358	0.479
4500	21.545	218.295	198.654	88.386	257.773	-47.133	0.547
4600	21.596	218.769	199.086	90.543	257.825	-53.909	0.612
4700	21.647	219.234	199.510	92.705	257.876	-60.687	0.674
4800	21.697	219.690	199.925	94.872	257.926	-67.465	0.734
4900	21.748	220.138	200.333	97.045	257.974	-74.244	0.791
5000	21.799	220.578	200.734	99.222	258.021	-81.025	0.846
5100	21.849	221.010	201.127	101.405	258.066	-87.806	0.899
5200	21.899	221.435	201.514	103.592	258.110	-94.589	0.950
5300	21.949	221.853	201.893	105.784	258.150	-101.371	0.999
5400	21.997	222.264	202.267	107.982	258.189	-108.155	1.046
5500	22.045	222.668	202.634	110.184	258.224	-114.940	1.092
5600	22.093	223.065	202.995	112.391	258.255	-121.725	1.135
5700	22.139	223.457	203.351	114.602	258.282	-128.510	1.178
5800	22.184	223.842	203.701	116.818	258.304	-135.296	1.218
5900	22.229	224.222	204.046	119.039	258.321	-142.083	1.258
6000	22.273	224.596	204.385	121.264	258.332	-148.869	1.296

PREVIOUS: March 1977 (1 atm)

CURRENT: September 1982 (1 bar)

Oxygen (O)

O₁(g)

Enthalpy Reference Temperature = T _r = 298.15 K				Standard State Pressure = p° = 0.1 MPa			
T/K	J·K ⁻¹ mol ⁻¹			kJ·mol ⁻¹			log K _r
	C _p ^o	S ^o	-[G ^o -H ^o (T _r)]/T	H ^o -H ^o (T _r)	Δ _r H ^o	Δ _r G ^o	
0	0.000	0.000	INFINITE	-8.671	-113.805	-113.805	INFINITE
100	29.104	165.850	223.539	-5.769	-112.415	-120.239	62.807
200	29.108	186.025	200.317	-2.858	-111.286	-128.526	33.568
298.15	29.142	197.653	197.653	0.000	-110.527	-137.163	24.030
300	29.142	197.833	197.653	0.054	-110.516	-137.328	23.911
400	29.342	206.238	198.798	2.976	-110.102	-146.338	19.110
500	29.794	212.831	200.968	5.931	-110.003	-155.414	16.236
600	30.443	218.319	203.415	8.942	-110.150	-164.486	14.320
700	31.171	223.066	205.890	12.023	-110.469	-173.518	12.948
800	31.899	227.277	208.305	15.177	-110.905	-182.497	11.916
900	32.577	231.074	210.628	18.401	-111.418	-191.416	11.109
1000	33.183	234.538	212.848	21.690	-111.983	-200.275	10.461
1100	33.710	237.726	214.967	25.035	-112.586	-209.075	9.928
1200	34.175	240.679	216.988	28.430	-113.217	-217.819	9.481
1300	34.572	243.431	218.917	31.868	-113.870	-226.509	9.101
1400	34.920	246.006	220.761	35.343	-114.541	-235.149	8.774
1500	35.217	248.426	222.526	38.850	-115.229	-243.740	8.488
1600	35.480	250.707	224.216	42.385	-115.933	-252.284	8.236
1700	35.710	252.865	225.839	45.945	-116.651	-260.784	8.013
1800	35.911	254.912	227.398	49.526	-117.384	-269.242	7.813
1900	36.091	256.859	228.897	53.126	-118.133	-277.658	7.633
2000	36.250	258.714	230.342	56.744	-118.896	-286.034	7.470
2100	36.392	260.486	231.736	60.376	-119.675	-294.372	7.322
2200	36.518	262.182	233.081	64.021	-120.470	-302.672	7.186
2300	36.635	263.808	234.382	67.679	-121.282	-310.936	7.062
2400	36.740	265.369	235.641	71.348	-122.109	-319.165	6.946
2500	36.836	266.871	236.860	75.027	-122.953	-327.358	6.840
2600	36.924	268.318	238.043	78.715	-123.813	-335.517	6.741
2700	37.003	269.713	239.190	82.411	-124.689	-343.643	6.648
2800	37.083	271.060	240.304	86.116	-125.582	-351.736	6.562
2900	37.150	272.362	241.387	89.827	-126.490	-359.797	6.481
3000	37.217	273.623	242.441	93.546	-127.415	-367.826	6.404
3100	37.279	274.844	243.467	97.271	-128.356	-375.824	6.333
3200	37.338	276.029	244.466	101.001	-129.312	-383.792	6.265
3300	37.392	277.178	245.440	104.738	-130.283	-391.730	6.201
3400	37.443	278.295	246.390	108.480	-131.270	-399.638	6.140
3500	37.493	279.382	247.317	112.227	-132.271	-407.517	6.082
3600	37.543	280.438	248.222	115.978	-133.288	-415.366	6.027
3700	37.589	281.468	249.107	119.735	-134.318	-423.188	5.974
3800	37.631	282.471	249.972	123.496	-135.363	-430.981	5.924
3900	37.673	283.449	250.818	127.261	-136.422	-438.746	5.876
4000	37.715	284.403	251.645	131.031	-137.495	-446.485	5.830
4100	37.756	285.335	252.456	134.804	-138.581	-454.196	5.787
4200	37.794	286.245	253.250	138.582	-139.681	-461.881	5.744
4300	37.832	287.135	254.027	142.363	-140.794	-469.539	5.704
4400	37.869	288.005	254.790	146.148	-141.921	-477.171	5.665
4500	37.903	288.856	255.537	149.937	-143.062	-484.778	5.627
4600	37.941	289.690	256.271	153.729	-144.215	-492.359	5.591
4700	37.974	290.506	256.990	157.525	-145.383	-499.915	5.556
4800	38.007	291.306	257.697	161.324	-146.563	-507.446	5.522
4900	38.041	292.090	258.391	165.126	-147.758	-514.951	5.489
5000	38.074	292.859	259.073	168.932	-148.967	-522.433	5.458
5100	38.104	293.613	259.743	172.741	-150.190	-529.890	5.427
5200	38.137	294.354	260.401	176.553	-151.427	-537.323	5.397
5300	38.171	295.080	261.049	180.368	-152.679	-544.732	5.369
5400	38.200	295.794	261.685	184.187	-153.946	-552.118	5.341
5500	38.233	296.495	262.312	188.008	-155.228	-559.480	5.313
5600	38.263	297.184	262.929	191.833	-156.527	-566.818	5.287
5700	38.296	297.862	263.535	195.661	-157.841	-574.133	5.261
5800	38.325	298.528	264.133	199.492	-159.172	-581.424	5.236
5900	38.355	299.184	264.722	203.326	-160.521	-588.694	5.212
6000	38.388	299.829	265.301	207.163	-161.887	-595.939	5.188

PREVIOUS: September 1965 (1 atm)

CURRENT: September 1965 (1 bar)

$M_r = 2.01588$ Hydrogen (H_2)

$H_2(\text{ref})$

Enthalpy Reference Temperature = $T_r = 298.15$ K				Standard State Pressure = $p^\circ = 0.1$ MPa			
T/K	$J \cdot K^{-1} \cdot mol^{-1}$			$kJ \cdot mol^{-1}$			$\log K_r$
	C_p°	S°	$-(G^\circ - H^\circ(T_r))/T$	$H^\circ - H^\circ(T_r)$	$\Delta_r H^\circ$	$\Delta_r G^\circ$	
0	0.	0.	INFINITE	-8.467	0.	0.	0.
100	28.154	100.727	155.408	-5.468	0.	0.	0.
200	27.447	119.412	133.284	-2.774	0.	0.	0.
250	28.344	125.640	131.152	-1.378	0.	0.	0.
298.15	28.836	130.680	130.680	0.	0.	0.	0.
300	28.849	130.858	130.680	0.053	0.	0.	0.
350	29.081	135.325	131.032	1.502	0.	0.	0.
400	29.181	139.216	131.817	2.959	0.	0.	0.
450	29.229	142.656	132.834	4.420	0.	0.	0.
500	29.260	145.737	133.973	5.882	0.	0.	0.
600	29.327	151.077	136.392	8.811	0.	0.	0.
700	29.441	155.606	138.822	11.749	0.	0.	0.
800	29.624	159.548	141.171	14.702	0.	0.	0.
900	29.881	163.051	143.411	17.676	0.	0.	0.
1000	30.205	166.216	145.536	20.680	0.	0.	0.
1100	30.581	169.112	147.549	23.719	0.	0.	0.
1200	30.992	171.790	149.459	26.797	0.	0.	0.
1300	31.423	174.288	151.274	29.918	0.	0.	0.
1400	31.861	176.633	153.003	33.082	0.	0.	0.
1500	32.298	178.846	154.652	36.290	0.	0.	0.
1600	32.725	180.944	156.231	39.541	0.	0.	0.
1700	33.139	182.940	157.743	42.835	0.	0.	0.
1800	33.537	184.846	159.197	46.169	0.	0.	0.
1900	33.917	186.669	160.595	49.541	0.	0.	0.
2000	34.280	188.418	161.943	52.951	0.	0.	0.
2100	34.624	190.099	163.244	56.397	0.	0.	0.
2200	34.952	191.718	164.501	59.876	0.	0.	0.
2300	35.263	193.278	165.719	63.387	0.	0.	0.
2400	35.559	194.785	166.899	66.928	0.	0.	0.
2500	35.842	196.243	168.044	70.498	0.	0.	0.
2600	36.111	197.654	169.155	74.096	0.	0.	0.
2700	36.370	199.021	170.236	77.720	0.	0.	0.
2800	36.618	200.349	171.288	81.369	0.	0.	0.
2900	36.856	201.638	172.313	85.043	0.	0.	0.
3000	37.087	202.891	173.311	88.740	0.	0.	0.
3100	37.311	204.111	174.285	92.460	0.	0.	0.
3200	37.528	205.299	175.236	96.202	0.	0.	0.
3300	37.740	206.457	176.164	99.966	0.	0.	0.
3400	37.946	207.587	177.072	103.750	0.	0.	0.
3500	38.149	208.690	177.960	107.555	0.	0.	0.
3600	38.348	209.767	178.828	111.380	0.	0.	0.
3700	38.544	210.821	179.679	115.224	0.	0.	0.
3800	38.738	211.851	180.512	119.089	0.	0.	0.
3900	38.928	212.860	181.328	122.972	0.	0.	0.
4000	39.116	213.848	182.129	126.874	0.	0.	0.
4100	39.301	214.816	182.915	130.795	0.	0.	0.
4200	39.484	215.765	183.686	134.734	0.	0.	0.
4300	39.665	216.696	184.442	138.692	0.	0.	0.
4400	39.842	217.610	185.186	142.667	0.	0.	0.
4500	40.017	218.508	185.916	146.660	0.	0.	0.
4600	40.188	219.389	186.635	150.670	0.	0.	0.
4700	40.355	220.255	187.341	154.698	0.	0.	0.
4800	40.518	221.106	188.035	158.741	0.	0.	0.
4900	40.676	221.943	188.719	162.801	0.	0.	0.
5000	40.829	222.767	189.392	166.876	0.	0.	0.
5100	40.976	223.577	190.054	170.967	0.	0.	0.
5200	41.117	224.374	190.706	175.071	0.	0.	0.
5300	41.252	225.158	191.349	179.190	0.	0.	0.
5400	41.379	225.931	191.982	183.322	0.	0.	0.
5500	41.498	226.691	192.606	187.465	0.	0.	0.
5600	41.609	227.440	193.222	191.621	0.	0.	0.
5700	41.712	228.177	193.829	195.787	0.	0.	0.
5800	41.806	228.903	194.427	199.963	0.	0.	0.
5900	41.890	229.619	195.017	204.148	0.	0.	0.
6000	41.965	230.323	195.600	208.341	0.	0.	0.

PREVIOUS: March 1961 (1 atm) CURRENT: March 1977 (1 bar)

MALCOLM W. CHASE

Enthalpy Reference Temperature = T _r = 298.15 K				Standard State Pressure = p° = 0.1 MPa			
T/K	J·K ⁻¹ mol ⁻¹			kJ·mol ⁻¹			log K _r
	C _p ^o	S ^o	−[G ^o −H ^o (T _r)]/T	H ^o −H ^o (T _r)	Δ _f H ^o	Δ _f G ^o	
0	0.	0.	INFINITE	−9.904	−238.921	−238.921	INFINITE
100	33.299	152.388	218.534	−6.615	−240.083	−236.584	123.579
200	33.349	175.485	191.896	−3.282	−240.900	−232.766	60.792
298.15	33.590	188.834	188.834	0.	−241.826	−228.582	40.047
300	33.596	189.042	188.835	0.062	−241.844	−228.500	39.785
400	34.262	198.788	190.159	3.452	−242.846	−223.901	29.238
500	35.226	206.534	192.685	6.925	−243.826	−219.051	22.884
600	36.325	213.052	195.550	10.501	−244.758	−214.007	18.631
700	37.495	218.739	198.465	14.192	−245.632	−208.812	15.582
800	38.721	223.825	201.322	18.002	−246.443	−203.496	13.287
900	39.987	228.459	204.084	21.938	−247.185	−198.083	11.496
1000	41.268	232.738	206.738	26.000	−247.857	−192.590	10.060
1100	42.536	236.731	209.285	30.191	−248.460	−187.033	8.881
1200	43.768	240.485	211.730	34.506	−248.997	−181.425	7.897
1300	44.945	244.035	214.080	38.942	−249.473	−175.774	7.063
1400	46.054	247.407	216.341	43.493	−249.894	−170.089	6.346
1500	47.090	250.620	218.520	48.151	−250.265	−164.376	5.724
1600	48.050	253.690	220.623	52.908	−250.592	−158.639	5.179
1700	48.935	256.630	222.655	57.758	−250.881	−152.883	4.698
1800	49.749	259.451	224.621	62.693	−251.138	−147.111	4.269
1900	50.496	262.161	226.526	67.706	−251.368	−141.325	3.885
2000	51.180	264.769	228.374	72.790	−251.575	−135.528	3.540
2100	51.823	267.282	230.167	77.941	−251.762	−129.721	3.227
2200	52.408	269.706	231.909	83.153	−251.934	−123.905	2.942
2300	52.947	272.048	233.604	88.421	−252.092	−118.082	2.682
2400	53.444	274.312	235.253	93.741	−252.239	−112.252	2.443
2500	53.904	276.503	236.860	99.108	−252.379	−106.416	2.223
2600	54.329	278.625	238.425	104.520	−252.513	−100.575	2.021
2700	54.723	280.683	239.952	109.973	−252.643	−94.729	1.833
2800	55.089	282.680	241.443	115.464	−252.771	−88.878	1.658
2900	55.430	284.619	242.899	120.990	−252.897	−83.023	1.495
3000	55.748	286.504	244.321	126.549	−253.024	−77.163	1.344
3100	56.044	288.337	245.711	132.139	−253.152	−71.298	1.201
3200	56.323	290.120	247.071	137.757	−253.282	−65.430	1.068
3300	56.583	291.858	248.402	143.403	−253.416	−59.558	0.943
3400	56.828	293.550	249.705	149.073	−253.553	−53.681	0.825
3500	57.058	295.201	250.982	154.768	−253.696	−47.801	0.713
3600	57.276	296.812	252.233	160.485	−253.844	−41.916	0.608
3700	57.480	298.384	253.459	166.222	−253.997	−36.027	0.509
3800	57.675	299.919	254.661	171.980	−254.158	−30.133	0.414
3900	57.859	301.420	255.841	177.757	−254.326	−24.236	0.325
4000	58.033	302.887	256.999	183.552	−254.501	−18.334	0.239
4100	58.199	304.322	258.136	189.363	−254.684	−12.427	0.158
4200	58.357	305.726	259.252	195.191	−254.876	−6.516	0.081
4300	58.507	307.101	260.349	201.034	−255.078	−0.600	0.007
4400	58.650	308.448	261.427	206.892	−255.288	5.320	−0.063
4500	58.787	309.767	262.486	212.764	−255.508	11.245	−0.131
4600	58.918	311.061	263.528	218.650	−255.738	17.175	−0.195
4700	59.044	312.329	264.553	224.548	−255.978	23.111	−0.257
4800	59.164	313.574	265.562	230.458	−256.229	29.052	−0.316
4900	59.275	314.795	266.554	236.380	−256.491	34.998	−0.373
5000	59.390	315.993	267.531	242.313	−256.763	40.949	−0.428
5100	59.509	317.171	268.493	248.258	−257.046	46.906	−0.480
5200	59.628	318.327	269.440	254.215	−257.338	52.869	−0.531
5300	59.746	319.464	270.373	260.184	−257.639	58.838	−0.580
5400	59.864	320.582	271.293	266.164	−257.950	64.811	−0.627
5500	59.982	321.682	272.199	272.157	−258.268	70.791	−0.672
5600	60.100	322.764	273.092	278.161	−258.595	76.777	−0.716
5700	60.218	323.828	273.973	284.177	−258.930	82.769	−0.758
5800	60.335	324.877	274.841	290.204	−259.272	88.767	−0.799
5900	60.453	325.909	275.698	296.244	−259.621	94.770	−0.839
6000	60.571	326.926	276.544	302.295	−259.977	100.780	−0.877

PREVIOUS: March 1961 (1 atm)

CURRENT: March 1979 (1 bar)

MALCOLM W. CHASE

Enthalpy Reference Temperature = $T_r = 298.15$ K				Standard State Pressure = $p^\circ = 0.1$ MPa			
T/K	$J \cdot K^{-1} \cdot mol^{-1}$			$kJ \cdot mol^{-1}$			$\log K_r$
	C_p°	S°	$-[G^\circ - H^\circ(T_r)]/T$	$H^\circ - H^\circ(T_r)$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	
0							
100							
200							
280	75.563	65.215	70.102	-1.368	-286.410	-240.123	44.796
298.15	75.351	69.950	69.950	0.	-285.830	-237.141	41.546
300	75.349	70.416	69.952	0.139	-285.771	-236.839	41.237
320	75.344	75.279	70.134	1.646	-285.137	-233.598	38.131
340	75.388	79.847	70.573	3.153	-284.506	-230.396	35.396
360	75.679	84.164	71.209	4.664	-283.874	-227.231	32.970
372.780	75.962	86.808	71.699	5.633	--- LIQUID <---> REAL GAS ---		
380	76.154	88.267	72.000	6.182	-283.237	-224.102	30.805
400	76.770	92.189	72.912	7.711	-282.591	-221.006	28.860
420	77.547	95.952	73.920	9.254	-281.934	-217.943	27.105
440	78.543	99.582	75.004	10.814	-281.262	-214.912	25.513
460	79.793	103.100	76.150	12.397	-280.569	-211.911	24.063
480	81.463	106.530	77.344	14.009	-279.850	-208.941	22.737
500	83.694	109.898	78.579	15.659	-279.095	-206.002	21.521

PREVIOUS: March 1979 (1 atm)

CURRENT: March 1979 (1 bar)

Enthalpy Reference Temperature = T _r = 298.15 K				Standard State Pressure = p° = 0.1 MPa			
T/K	J·K ⁻¹ mol ⁻¹			kJ·mol ⁻¹			log K _r
	C _p ^o	S ^o	-[G ^o -H ^o (T _r)]/T	H ^o -H ^o (T _r)	Δ _f H ^o	Δ _f G ^o	
0	0.	0.	INFINITE	-6.197	216.035	216.035	INFINITE
100	20.786	92.009	133.197	-4.119	216.614	212.450	-110.972
200	20.786	106.417	116.618	-2.040	217.346	208.004	-54.325
250	20.786	111.055	115.059	-1.001	217.687	205.629	-42.964
298.15	20.786	114.716	114.716	0.	217.999	203.278	-35.613
300	20.786	114.845	114.717	0.038	218.011	203.186	-35.378
350	20.786	118.049	114.970	1.078	218.326	200.690	-29.951
400	20.786	120.825	115.532	2.117	218.637	198.150	-25.876
450	20.786	123.273	116.259	3.156	218.946	195.570	-22.701
500	20.786	125.463	117.072	4.196	219.254	192.957	-20.158
600	20.786	129.253	118.796	6.274	219.868	187.640	-16.335
700	20.786	132.457	120.524	8.353	220.478	182.220	-13.597
800	20.786	135.232	122.193	10.431	221.080	176.713	-11.538
900	20.786	137.681	123.781	12.510	221.671	171.132	-9.932
1000	20.786	139.871	125.282	14.589	222.248	165.485	-8.644
1100	20.786	141.852	126.700	16.667	222.807	159.782	-7.587
1200	20.786	143.660	128.039	18.746	223.346	154.028	-6.705
1300	20.786	145.324	129.305	20.824	223.865	148.230	-5.956
1400	20.786	146.865	130.505	22.903	224.361	142.394	-5.313
1500	20.786	148.299	131.644	24.982	224.836	136.522	-4.754
1600	20.786	149.640	132.728	27.060	225.289	130.620	-4.264
1700	20.786	150.900	133.760	29.139	225.721	124.689	-3.831
1800	20.786	152.088	134.745	31.217	226.132	118.734	-3.446
1900	20.786	153.212	135.688	33.296	226.525	112.757	-3.100
2000	20.786	154.278	136.591	35.375	226.898	106.760	-2.788
2100	20.786	155.293	137.458	37.453	227.254	100.744	-2.506
2200	20.786	156.260	138.291	39.532	227.593	94.712	-2.249
2300	20.786	157.184	139.092	41.610	227.916	88.664	-2.014
2400	20.786	158.068	139.864	43.689	228.224	82.603	-1.798
2500	20.786	158.917	140.610	45.768	228.518	76.530	-1.599
2600	20.786	159.732	141.330	47.846	228.798	70.444	-1.415
2700	20.786	160.516	142.026	49.925	229.064	64.349	-1.245
2800	20.786	161.272	142.700	52.004	229.318	58.243	-1.087
2900	20.786	162.002	143.353	54.082	229.560	52.129	-0.939
3000	20.786	162.706	143.986	56.161	229.790	46.007	-0.801
3100	20.786	163.388	144.601	58.239	230.008	39.877	-0.672
3200	20.786	164.048	145.199	60.318	230.216	33.741	-0.551
3300	20.786	164.688	145.780	62.397	230.413	27.598	-0.437
3400	20.786	165.308	146.345	64.475	230.599	21.449	-0.330
3500	20.786	165.911	146.895	66.554	230.776	15.295	-0.228
3600	20.786	166.496	147.432	68.632	230.942	9.136	-0.133
3700	20.786	167.066	147.955	70.711	231.098	2.973	-0.042
3800	20.786	167.620	148.465	72.790	231.244	-3.195	0.044
3900	20.786	168.160	148.963	74.868	231.381	-9.366	0.125
4000	20.786	168.686	149.450	76.947	231.509	-15.541	0.203
4100	20.786	169.200	149.925	79.025	231.627	-21.718	0.277
4200	20.786	169.700	150.390	81.104	231.736	-27.899	0.347
4300	20.786	170.190	150.845	83.183	231.836	-34.082	0.414
4400	20.786	170.667	151.290	85.261	231.927	-40.267	0.478
4500	20.786	171.135	151.726	87.340	232.009	-46.454	0.539
4600	20.786	171.591	152.153	89.418	232.082	-52.643	0.598
4700	20.786	172.038	152.571	91.497	232.147	-58.834	0.654
4800	20.786	172.476	152.981	93.576	232.204	-65.025	0.708
4900	20.786	172.905	153.383	95.654	232.253	-71.218	0.759
5000	20.786	173.325	153.778	97.733	232.294	-77.412	0.809
5100	20.786	173.736	154.165	99.811	232.327	-83.606	0.856
5200	20.786	174.140	154.546	101.890	232.353	-89.801	0.902
5300	20.786	174.536	154.919	103.969	232.373	-95.997	0.946
5400	20.786	174.924	155.286	106.047	232.386	-102.192	0.989
5500	20.786	175.306	155.646	108.126	232.392	-108.389	1.029
5600	20.786	175.680	156.001	110.204	232.393	-114.584	1.069
5700	20.786	176.048	156.349	112.283	232.389	-120.780	1.107
5800	20.786	176.410	156.692	114.362	232.379	-126.976	1.144
5900	20.786	176.765	157.029	116.440	232.365	-133.172	1.179
6000	20.786	177.114	157.361	118.519	232.348	-139.368	1.213

PREVIOUS: March 1977 (1 atm)

CURRENT: March 1982 (1 bar)

Enthalpy Reference Temperature = T _r = 298.15 K				Standard State Pressure = p° = 0.1 MPa			
T/K	J·K ⁻¹ mol ⁻¹			kJ·mol ⁻¹			log K _r
	C _p ^o	S ^o	−[G ^o −H ^o (T _r)]/T	H ^o −H ^o (T _r)	Δ _r H ^o	Δ _r G ^o	
0	0.	0.	INFINITE	−8.670	0.	0.	0.
100	29.104	159.811	217.490	−5.768	0.	0.	0.
200	29.107	179.985	194.272	−2.857	0.	0.	0.
250	29.111	186.481	192.088	−1.402	0.	0.	0.
298.15	29.124	191.609	191.609	0.	0.	0.	0.
300	29.125	191.789	191.610	0.054	0.	0.	0.
350	29.165	196.281	191.964	1.511	0.	0.	0.
400	29.249	200.181	192.753	2.971	0.	0.	0.
450	29.387	203.633	193.774	4.437	0.	0.	0.
500	29.580	206.739	194.917	5.911	0.	0.	0.
600	30.110	212.176	197.353	8.894	0.	0.	0.
700	30.754	216.866	199.813	11.937	0.	0.	0.
800	31.433	221.017	202.209	15.046	0.	0.	0.
900	32.090	224.757	204.510	18.223	0.	0.	0.
1000	32.697	228.170	206.708	21.463	0.	0.	0.
1100	33.241	231.313	208.804	24.760	0.	0.	0.
1200	33.723	234.226	210.802	28.109	0.	0.	0.
1300	34.147	236.943	212.710	31.503	0.	0.	0.
1400	34.518	239.487	214.533	34.936	0.	0.	0.
1500	34.843	241.880	216.277	38.405	0.	0.	0.
1600	35.128	244.138	217.948	41.904	0.	0.	0.
1700	35.378	246.275	219.552	45.429	0.	0.	0.
1800	35.600	248.304	221.094	48.978	0.	0.	0.
1900	35.796	250.234	222.577	52.548	0.	0.	0.
2000	35.971	252.074	224.006	56.137	0.	0.	0.
2100	36.126	253.833	225.385	59.742	0.	0.	0.
2200	36.268	255.517	226.717	63.361	0.	0.	0.
2300	36.395	257.132	228.004	66.995	0.	0.	0.
2400	36.511	258.684	229.250	70.640	0.	0.	0.
2500	36.616	260.176	230.458	74.296	0.	0.	0.
2600	36.713	261.614	231.629	77.963	0.	0.	0.
2700	36.801	263.001	232.765	81.639	0.	0.	0.
2800	36.883	264.341	233.869	85.323	0.	0.	0.
2900	36.959	265.637	234.942	89.015	0.	0.	0.
3000	37.030	266.891	235.986	92.715	0.	0.	0.
3100	37.096	268.106	237.003	96.421	0.	0.	0.
3200	37.158	269.285	237.993	100.134	0.	0.	0.
3300	37.216	270.429	238.959	103.852	0.	0.	0.
3400	37.271	271.541	239.901	107.577	0.	0.	0.
3500	37.323	272.622	240.821	111.306	0.	0.	0.
3600	37.373	273.675	241.719	115.041	0.	0.	0.
3700	37.420	274.699	242.596	118.781	0.	0.	0.
3800	37.465	275.698	243.454	122.525	0.	0.	0.
3900	37.508	276.671	244.294	126.274	0.	0.	0.
4000	37.550	277.622	245.115	130.027	0.	0.	0.
4100	37.590	278.549	245.919	133.784	0.	0.	0.
4200	37.629	279.456	246.707	137.545	0.	0.	0.
4300	37.666	280.341	247.479	141.309	0.	0.	0.
4400	37.702	281.208	248.236	145.078	0.	0.	0.
4500	37.738	282.056	248.978	148.850	0.	0.	0.
4600	37.773	282.885	249.706	152.625	0.	0.	0.
4700	37.808	283.698	250.420	156.405	0.	0.	0.
4800	37.843	284.494	251.122	160.187	0.	0.	0.
4900	37.878	285.275	251.811	163.973	0.	0.	0.
5000	37.912	286.041	252.488	167.763	0.	0.	0.
5100	37.947	286.792	253.153	171.556	0.	0.	0.
5200	37.981	287.529	253.807	175.352	0.	0.	0.
5300	38.013	288.253	254.451	179.152	0.	0.	0.
5400	38.046	288.964	255.083	182.955	0.	0.	0.
5500	38.080	289.662	255.705	186.761	0.	0.	0.
5600	38.116	290.348	256.318	190.571	0.	0.	0.
5700	38.154	291.023	256.921	194.384	0.	0.	0.
5800	38.193	291.687	257.515	198.201	0.	0.	0.
5900	38.234	292.341	258.099	202.023	0.	0.	0.
6000	38.276	292.984	258.675	205.848	0.	0.	0.

PREVIOUS: March 1977 (1 atm)

CURRENT: March 1977 (1 bar)

NIST-JANAF THERMOCHEMICAL TABLES

Enthalpy Reference Temperature = T _r = 298.15 K				Standard State Pressure = p° = 0.1 MPa			
T/K	J·K ⁻¹ ·mol ⁻¹			kJ·mol ⁻¹			log K _r
	C _p ^o	S ^o	-(G°-H°(T _r))/T	H°-H°(T _r)	Δ _f H°	Δ _f G°	
0	0.	0.	INFINITE	-6.197	470.820	470.820	INFINITE
100	20.786	130.593	171.780	-4.119	471.448	466.379	-243.611
200	20.786	145.001	155.201	-2.040	472.071	461.070	-120.419
250	20.786	149.639	153.642	-1.001	472.383	458.283	-95.753
298.15	20.786	153.300	153.300	0.	472.683	455.540	-79.809
300	20.786	153.429	153.300	0.038	472.694	455.434	-79.298
350	20.786	156.633	153.554	1.078	473.005	452.533	-67.537
400	20.786	159.408	154.116	2.117	473.314	449.587	-58.710
450	20.786	161.857	154.843	3.156	473.621	446.603	-51.840
500	20.786	164.047	155.655	4.196	473.923	443.584	-46.341
600	20.786	167.836	157.379	6.274	474.510	437.461	-38.084
700	20.786	171.041	159.108	8.353	475.067	431.242	-32.180
800	20.786	173.816	160.777	10.431	475.591	424.945	-27.746
900	20.786	176.264	162.364	12.510	476.081	418.584	-24.294
1000	20.786	178.454	163.866	14.589	476.540	412.171	-21.530
1100	20.786	180.436	165.284	16.667	476.970	405.713	-19.266
1200	20.786	182.244	166.623	18.746	477.374	399.217	-17.377
1300	20.786	183.908	167.889	20.824	477.756	392.688	-15.778
1400	20.786	185.448	169.089	22.903	478.118	386.131	-14.407
1500	20.786	186.882	170.228	24.982	478.462	379.548	-13.217
1600	20.786	188.224	171.311	27.060	478.791	372.943	-12.175
1700	20.786	189.484	172.344	29.139	479.107	366.318	-11.256
1800	20.787	190.672	173.329	31.218	479.411	359.674	-10.437
1900	20.788	191.796	174.272	33.296	479.705	353.014	-9.705
2000	20.790	192.863	175.175	35.375	479.990	346.339	-9.045
2100	20.793	193.877	176.042	37.454	480.266	339.650	-8.448
2200	20.797	194.844	176.874	39.534	480.536	332.947	-7.905
2300	20.804	195.769	177.676	41.614	480.799	326.233	-7.409
2400	20.813	196.655	178.448	43.695	481.057	319.507	-6.954
2500	20.826	197.504	179.194	45.777	481.311	312.770	-6.535
2600	20.843	198.322	179.914	47.860	481.561	306.024	-6.148
2700	20.864	199.109	180.610	49.945	481.809	299.268	-5.790
2800	20.891	199.868	181.285	52.033	482.054	292.502	-5.457
2900	20.924	200.601	181.938	54.124	482.299	285.728	-5.147
3000	20.963	201.311	182.572	56.218	482.543	278.946	-4.857
3100	21.010	202.000	183.188	58.317	482.789	272.155	-4.586
3200	21.064	202.667	183.786	60.420	483.036	265.357	-4.332
3300	21.126	203.317	184.368	62.530	483.286	258.550	-4.093
3400	21.197	203.948	184.935	64.646	483.540	251.736	-3.867
3500	21.277	204.564	185.487	66.769	483.799	244.915	-3.655
3600	21.365	205.164	186.025	68.902	484.064	238.086	-3.455
3700	21.463	205.751	186.550	71.043	484.335	231.249	-3.265
3800	21.569	206.325	187.063	73.194	484.614	224.405	-3.085
3900	21.685	206.887	187.564	75.357	484.903	217.554	-2.914
4000	21.809	207.437	188.054	77.532	485.201	210.695	-2.751
4100	21.941	207.977	188.534	79.719	485.510	203.829	-2.597
4200	22.082	208.508	189.003	81.920	485.830	196.955	-2.449
4300	22.231	209.029	189.463	84.136	486.164	190.073	-2.309
4400	22.388	209.542	189.913	86.367	486.510	183.183	-2.175
4500	22.551	210.047	190.355	88.614	486.871	176.285	-2.046
4600	22.722	210.544	190.788	90.877	487.247	169.379	-1.923
4700	22.899	211.035	191.214	93.158	487.638	162.465	-1.806
4800	23.081	211.519	191.632	95.457	488.046	155.542	-1.693
4900	23.269	211.997	192.043	97.775	488.471	148.610	-1.584
5000	23.461	212.469	192.447	100.111	488.912	141.670	-1.480
5100	23.658	212.935	192.844	102.467	489.372	134.721	-1.380
5200	23.858	213.397	193.235	104.843	489.849	127.762	-1.283
5300	24.061	213.853	193.619	107.238	490.345	120.794	-1.190
5400	24.266	214.305	193.998	109.655	490.860	113.817	-1.101
5500	24.474	214.752	194.371	112.092	491.394	106.829	-1.015
5600	24.682	215.195	194.739	114.550	491.947	99.832	-0.931
5700	24.892	215.633	195.102	117.028	492.519	92.825	-0.851
5800	25.102	216.068	195.460	119.528	493.110	85.808	-0.773
5900	25.312	216.499	195.813	122.049	493.720	78.780	-0.697
6000	25.521	216.926	196.161	124.590	494.349	71.742	-0.625

PREVIOUS: March 1977 (1 atm)

CURRENT: December 1982 (1 bar)

MALCOLM W. CHASE

Enthalpy Reference Temperature = $T_r = 298.15 \text{ K}$				Standard State Pressure = $p^\circ = 0.1 \text{ MPa}$			
T/K	$\text{J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$			$\text{kJ}\cdot\text{mol}^{-1}$			$\log K_r$
	C_p°	S°	$-[G^\circ - H^\circ(T_r)]/T$	$H^\circ - H^\circ(T_r)$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	
0	0.	0.	INFINITE	-10.186	35.927	35.927	INFINITE
100	33.276	202.563	271.168	-6.861	34.898	39.963	-20.874
200	34.385	225.852	243.325	-3.495	33.897	45.422	-11.863
250	35.593	233.649	240.634	-1.746	33.460	48.355	-10.103
298.15	36.974	240.034	240.034	0.	33.095	51.258	-8.980
300	37.029	240.262	240.034	0.068	33.083	51.371	-8.944
350	38.583	246.086	240.491	1.958	32.768	54.445	-8.125
400	40.171	251.342	241.524	3.927	32.512	57.560	-7.517
450	41.728	256.164	242.886	5.975	32.310	60.703	-7.046
500	43.206	260.638	244.440	8.099	32.154	63.867	-6.672
600	45.834	268.755	247.830	12.555	31.959	70.230	-6.114
700	47.986	275.988	251.345	17.250	31.878	76.616	-5.717
800	49.708	282.512	254.840	22.138	31.874	83.008	-5.420
900	51.076	288.449	258.250	27.179	31.923	89.397	-5.188
1000	52.166	293.889	261.545	32.344	32.005	95.779	-5.003
1100	53.041	298.903	264.717	37.605	32.109	102.152	-4.851
1200	53.748	303.550	267.761	42.946	32.226	108.514	-4.724
1300	54.326	307.876	270.683	48.351	32.351	114.867	-4.615
1400	54.803	311.920	273.485	53.808	32.478	121.209	-4.522
1500	55.200	315.715	276.175	59.309	32.603	127.543	-4.441
1600	55.533	319.288	278.759	64.846	32.724	133.868	-4.370
1700	55.815	322.663	281.244	70.414	32.837	140.186	-4.307
1800	56.055	325.861	283.634	76.007	32.940	146.497	-4.251
1900	56.262	328.897	285.937	81.624	33.032	152.804	-4.201
2000	56.441	331.788	288.158	87.259	33.111	159.106	-4.155
2100	56.596	334.545	290.302	92.911	33.175	165.404	-4.114
2200	56.732	337.181	292.373	98.577	33.223	171.700	-4.077
2300	56.852	339.706	294.377	104.257	33.255	177.993	-4.042
2400	56.958	342.128	296.316	109.947	33.270	184.285	-4.011
2500	57.052	344.455	298.196	115.648	33.268	190.577	-3.982
2600	57.136	346.694	300.018	121.357	33.248	196.870	-3.955
2700	57.211	348.852	301.787	127.075	33.210	203.164	-3.930
2800	57.278	350.934	303.505	132.799	33.155	209.460	-3.908
2900	57.339	352.945	305.176	138.530	33.082	215.757	-3.886
3000	57.394	354.889	306.800	144.267	32.992	222.058	-3.866
3100	57.444	356.772	308.382	150.009	32.885	228.363	-3.848
3200	57.490	358.597	309.923	155.756	32.761	234.670	-3.831
3300	57.531	360.366	311.425	161.507	32.622	240.981	-3.814
3400	57.569	362.084	312.890	167.262	32.467	247.298	-3.799
3500	57.604	363.754	314.319	173.020	32.297	253.618	-3.785
3600	57.636	365.377	315.715	178.783	32.113	259.945	-3.772
3700	57.666	366.957	317.079	184.548	31.914	266.276	-3.759
3800	57.693	368.495	318.412	190.316	31.701	272.613	-3.747
3900	57.719	369.994	319.715	196.086	31.475	278.956	-3.736
4000	57.742	371.455	320.991	201.859	31.236	285.305	-3.726
4100	57.764	372.881	322.239	207.635	30.985	291.659	-3.716
4200	57.784	374.274	323.461	213.412	30.720	298.020	-3.706
4300	57.803	375.634	324.659	219.191	30.444	304.388	-3.698
4400	57.821	376.963	325.833	224.973	30.155	310.762	-3.689
4500	57.837	378.262	326.983	230.756	29.854	317.142	-3.681
4600	57.853	379.534	328.112	236.540	29.540	323.530	-3.674
4700	57.867	380.778	329.219	242.326	29.214	329.925	-3.667
4800	57.881	381.996	330.306	248.114	28.875	336.326	-3.660
4900	57.894	383.190	331.373	253.902	28.523	342.736	-3.654
5000	57.906	384.360	332.421	259.692	28.158	349.152	-3.648
5100	57.917	385.507	333.451	265.483	27.778	355.576	-3.642
5200	57.928	386.631	334.463	271.276	27.384	362.006	-3.636
5300	57.938	387.735	335.458	277.069	26.974	368.446	-3.631
5400	57.948	388.818	336.436	282.863	26.548	374.892	-3.626
5500	57.957	389.881	337.398	288.658	26.106	381.347	-3.622
5600	57.965	390.926	338.344	294.455	25.646	387.811	-3.617
5700	57.973	391.952	339.276	300.251	25.167	394.281	-3.613
5800	57.981	392.960	340.193	306.049	24.669	400.762	-3.609
5900	57.988	393.951	341.096	311.848	24.150	407.249	-3.606
6000	57.995	394.926	341.985	317.647	23.608	413.748	-3.602

PREVIOUS: September 1964 (1 atm)

CURRENT: September 1964 (1 bar)

NIST-JANAF THERMOCHEMICAL TABLES

Enthalpy Reference Temperature = $T_r = 298.15$ K				Standard State Pressure = $p^\circ = 0.1$ MPa			
T/K	$J \cdot K^{-1} \cdot mol^{-1}$			$kJ \cdot mol^{-1}$			$\log K_r$
	C_p°	S°	$-[G^\circ - H^\circ(T_r)]/T$	$H^\circ - H^\circ(T_r)$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	
0	0.	0.	INFINITE	-9.192	89.775	89.775	INFINITE
100	32.302	177.031	237.757	-6.073	89.991	88.944	-46.460
200	30.420	198.747	213.501	-2.951	90.202	87.800	-22.931
250	30.025	205.488	211.251	-1.441	90.256	87.193	-18.218
298.15	29.845	210.758	210.758	0.	90.291	86.600	-15.172
300	29.841	210.943	210.759	0.055	90.292	86.577	-15.074
350	29.823	215.540	211.122	1.546	90.316	85.955	-12.828
400	29.944	219.529	211.929	3.040	90.332	85.331	-11.143
450	30.175	223.068	212.974	4.542	90.343	84.705	-9.832
500	30.486	226.263	214.145	6.059	90.352	84.079	-8.784
600	31.238	231.886	216.646	9.144	90.366	82.822	-7.210
700	32.028	236.761	219.179	12.307	90.381	81.564	-6.086
800	32.767	241.087	221.652	15.548	90.398	80.303	-5.243
900	33.422	244.985	224.031	18.858	90.417	79.041	-4.587
1000	33.987	248.536	226.307	22.229	90.437	77.775	-4.063
1100	34.468	251.799	228.478	25.653	90.457	76.508	-3.633
1200	34.877	254.816	230.549	29.120	90.476	75.239	-3.275
1300	35.226	257.621	232.525	32.626	90.493	73.969	-2.972
1400	35.524	260.243	234.412	36.164	90.508	72.697	-2.712
1500	35.780	262.703	236.217	39.729	90.518	71.425	-2.487
1600	36.002	265.019	237.945	43.319	90.525	70.151	-2.290
1700	36.195	267.208	239.603	46.929	90.526	68.878	-2.116
1800	36.364	269.282	241.195	50.557	90.522	67.605	-1.962
1900	36.514	271.252	242.725	54.201	90.511	66.332	-1.824
2000	36.647	273.128	244.199	57.859	90.494	65.060	-1.699
2100	36.767	274.919	245.619	61.530	90.469	63.788	-1.587
2200	36.874	276.632	246.990	65.212	90.438	62.519	-1.484
2300	36.971	278.273	248.315	68.904	90.398	61.251	-1.391
2400	37.060	279.849	249.596	72.606	90.350	59.984	-1.306
2500	37.141	281.363	250.837	76.316	90.295	58.720	-1.227
2600	37.216	282.822	252.039	80.034	90.231	57.458	-1.154
2700	37.285	284.227	253.205	83.759	90.160	56.199	-1.087
2800	37.350	285.585	254.338	87.491	90.081	54.943	-1.025
2900	37.410	286.896	255.438	91.229	89.994	53.689	-0.967
3000	37.466	288.165	256.508	94.973	89.899	52.439	-0.913
3100	37.519	289.395	257.549	98.722	89.798	51.192	-0.863
3200	37.570	290.587	258.563	102.477	89.689	49.948	-0.815
3300	37.617	291.744	259.551	106.236	89.574	48.708	-0.771
3400	37.663	292.867	260.514	110.000	89.451	47.472	-0.729
3500	37.706	293.960	261.454	113.768	89.323	46.239	-0.690
3600	37.747	295.022	262.372	117.541	89.189	45.010	-0.653
3700	37.787	296.057	263.269	121.318	89.049	43.784	-0.618
3800	37.825	297.065	264.145	125.098	88.903	42.563	-0.585
3900	37.862	298.048	265.002	128.883	88.752	41.346	-0.554
4000	37.898	299.008	265.840	132.671	88.596	40.132	-0.524
4100	37.933	299.944	266.660	136.462	88.434	38.922	-0.496
4200	37.966	300.858	267.464	140.257	88.268	37.717	-0.469
4300	37.999	301.752	268.251	144.056	88.097	36.515	-0.444
4400	38.031	302.626	269.022	147.857	87.922	35.318	-0.419
4500	38.062	303.481	269.778	151.662	87.741	34.124	-0.396
4600	38.092	304.318	270.520	155.469	87.556	32.934	-0.374
4700	38.122	305.137	271.248	159.280	87.366	31.749	-0.353
4800	38.151	305.940	271.962	163.094	87.171	30.568	-0.333
4900	38.180	306.727	272.664	166.910	86.970	29.391	-0.313
5000	38.208	307.499	273.353	170.730	86.765	28.218	-0.295
5100	38.235	308.256	274.030	174.552	86.553	27.049	-0.277
5200	38.262	308.998	274.695	178.377	86.336	25.884	-0.260
5300	38.289	309.728	275.349	182.204	86.112	24.724	-0.244
5400	38.316	310.443	275.993	186.034	85.881	23.568	-0.228
5500	38.342	311.147	276.625	189.867	85.644	22.416	-0.213
5600	38.367	311.838	277.248	193.703	85.399	21.269	-0.198
5700	38.393	312.517	277.861	197.541	85.146	20.125	-0.184
5800	38.418	313.185	278.464	201.381	84.884	18.987	-0.171
5900	38.443	313.842	279.058	205.224	84.613	17.853	-0.158
6000	38.468	314.488	279.643	209.070	84.331	16.724	-0.146

PREVIOUS: June 1963 (1 atm)

CURRENT: June 1963 (1 bar)

Enthalpy Reference Temperature = $T_r = 298.15$ K				Standard State Pressure = $p^\circ = 0.1$ MPa			
T/K	$J \cdot K^{-1} \cdot mol^{-1}$			$kJ \cdot mol^{-1}$			$\log K_r$
	C_p°	S°	$-[G^\circ - H^\circ(T_r)]/T$	$H^\circ - H^\circ(T_r)$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	
0	0.	0.	INFINITE	-8.683	0.	0.	0.
100	29.106	173.307	231.094	-5.779	0.	0.	0.
200	29.126	193.485	207.823	-2.868	0.	0.	0.
250	29.201	199.990	205.630	-1.410	0.	0.	0.
298.15	29.376	205.147	205.147	0.	0.	0.	0.
300	29.385	205.329	205.148	0.054	0.	0.	0.
350	29.694	209.880	205.506	1.531	0.	0.	0.
400	30.106	213.871	206.308	3.025	0.	0.	0.
450	30.584	217.445	207.350	4.543	0.	0.	0.
500	31.091	220.693	208.524	6.084	0.	0.	0.
600	32.090	226.451	211.044	9.244	0.	0.	0.
700	32.981	231.466	213.611	12.499	0.	0.	0.
800	33.733	235.921	216.126	15.835	0.	0.	0.
900	34.355	239.931	218.552	19.241	0.	0.	0.
1000	34.870	243.578	220.875	22.703	0.	0.	0.
1100	35.300	246.922	223.093	26.212	0.	0.	0.
1200	35.667	250.010	225.209	29.761	0.	0.	0.
1300	35.988	252.878	227.229	33.344	0.	0.	0.
1400	36.277	255.556	229.158	36.957	0.	0.	0.
1500	36.544	258.068	231.002	40.599	0.	0.	0.
1600	36.796	260.434	232.768	44.266	0.	0.	0.
1700	37.040	262.672	234.462	47.958	0.	0.	0.
1800	37.277	264.796	236.089	51.673	0.	0.	0.
1900	37.510	266.818	237.653	55.413	0.	0.	0.
2000	37.741	268.748	239.160	59.175	0.	0.	0.
2100	37.969	270.595	240.613	62.961	0.	0.	0.
2200	38.195	272.366	242.017	66.769	0.	0.	0.
2300	38.419	274.069	243.374	70.600	0.	0.	0.
2400	38.639	275.709	244.687	74.453	0.	0.	0.
2500	38.856	277.290	245.959	78.328	0.	0.	0.
2600	39.068	278.819	247.194	82.224	0.	0.	0.
2700	39.276	280.297	248.393	86.141	0.	0.	0.
2800	39.478	281.729	249.558	90.079	0.	0.	0.
2900	39.674	283.118	250.691	94.036	0.	0.	0.
3000	39.864	284.466	251.795	98.013	0.	0.	0.
3100	40.048	285.776	252.870	102.009	0.	0.	0.
3200	40.225	287.050	253.918	106.023	0.	0.	0.
3300	40.395	288.291	254.941	110.054	0.	0.	0.
3400	40.559	289.499	255.940	114.102	0.	0.	0.
3500	40.716	290.677	256.916	118.165	0.	0.	0.
3600	40.868	291.826	257.870	122.245	0.	0.	0.
3700	41.013	292.948	258.802	126.339	0.	0.	0.
3800	41.154	294.044	259.716	130.447	0.	0.	0.
3900	41.289	295.115	260.610	134.569	0.	0.	0.
4000	41.421	296.162	261.485	138.705	0.	0.	0.
4100	41.549	297.186	262.344	142.854	0.	0.	0.
4200	41.674	298.189	263.185	147.015	0.	0.	0.
4300	41.798	299.171	264.011	151.188	0.	0.	0.
4400	41.920	300.133	264.821	155.374	0.	0.	0.
4500	42.042	301.076	265.616	159.572	0.	0.	0.
4600	42.164	302.002	266.397	163.783	0.	0.	0.
4700	42.287	302.910	267.164	168.005	0.	0.	0.
4800	42.413	303.801	267.918	172.240	0.	0.	0.
4900	42.542	304.677	268.660	176.488	0.	0.	0.
5000	42.675	305.538	269.389	180.749	0.	0.	0.
5100	42.813	306.385	270.106	185.023	0.	0.	0.
5200	42.956	307.217	270.811	189.311	0.	0.	0.
5300	43.105	308.037	271.506	193.614	0.	0.	0.
5400	43.262	308.844	272.190	197.933	0.	0.	0.
5500	43.426	309.639	272.864	202.267	0.	0.	0.
5600	43.599	310.424	273.527	206.618	0.	0.	0.
5700	43.781	311.197	274.181	210.987	0.	0.	0.
5800	43.973	311.960	274.826	215.375	0.	0.	0.
5900	44.175	312.713	275.462	219.782	0.	0.	0.
6000	44.387	313.457	276.089	224.210	0.	0.	0.

PREVIOUS: March 1977 (1 atm)

CURRENT: March 1977 (1 bar)

Enthalpy Reference Temperature = $T_r = 298.15$ K				Standard State Pressure = $p^\circ = 0.1$ MPa			
T/K	$J \cdot K^{-1} \cdot mol^{-1}$			$kJ \cdot mol^{-1}$			$\log K_r$
	C_p°	S°	$-[G^\circ - H^\circ(T_r)]/T$	$H^\circ - H^\circ(T_r)$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	
0	0.	0.	INFINITE	-9.172	38.390	38.390	INFINITE
100	32.627	149.590	210.980	-6.139	38.471	37.214	-19.438
200	30.777	171.592	186.471	-2.976	38.832	35.803	-9.351
250	30.283	178.402	184.204	-1.450	38.930	35.033	-7.320
298.15	29.986	183.708	183.708	0.	38.987	34.277	-6.005
300	29.977	183.894	183.709	0.055	38.988	34.248	-5.963
350	29.780	188.499	184.073	1.549	39.019	33.455	-4.993
400	29.650	192.466	184.880	3.035	39.029	32.660	-4.265
450	29.567	195.954	185.921	4.515	39.020	31.864	-3.699
500	29.521	199.066	187.082	5.992	38.995	31.070	-3.246
600	29.527	204.447	189.542	8.943	38.902	29.493	-2.568
700	29.663	209.007	192.005	11.902	38.764	27.935	-2.085
800	29.917	212.983	194.384	14.880	38.598	26.399	-1.724
900	30.264	216.526	196.651	17.888	38.416	24.884	-1.444
1000	30.676	219.736	198.801	20.935	38.230	23.391	-1.222
1100	31.124	222.680	200.840	24.024	38.046	21.916	-1.041
1200	31.586	225.408	202.775	27.160	37.867	20.458	-0.891
1300	32.046	227.955	204.615	30.342	37.697	19.014	-0.764
1400	32.492	230.346	206.368	33.569	37.535	17.583	-0.656
1500	32.917	232.602	208.043	36.839	37.381	16.163	-0.563
1600	33.319	234.740	209.645	40.151	37.234	14.753	-0.482
1700	33.694	236.771	211.182	43.502	37.093	13.352	-0.410
1800	34.044	238.707	212.657	46.889	36.955	11.960	-0.347
1900	34.369	240.557	214.078	50.310	36.819	10.575	-0.291
2000	34.670	242.327	215.446	53.762	36.685	9.197	-0.240
2100	34.950	244.026	216.767	57.243	36.551	7.826	-0.195
2200	35.209	245.658	218.043	60.752	36.416	6.462	-0.153
2300	35.449	247.228	219.278	64.285	36.278	5.103	-0.116
2400	35.673	248.741	220.474	67.841	36.137	3.750	-0.082
2500	35.881	250.202	221.635	71.419	35.992	2.404	-0.050
2600	36.075	251.613	222.761	75.017	35.843	1.063	-0.021
2700	36.256	252.978	223.855	78.633	35.689	-0.271	0.005
2800	36.426	254.300	224.918	82.267	35.530	-1.600	0.030
2900	36.586	255.581	225.954	85.918	35.365	-2.924	0.053
3000	36.736	256.824	226.962	89.584	35.194	-4.241	0.074
3100	36.878	258.031	227.945	93.265	35.017	-5.552	0.094
3200	37.013	259.203	228.904	96.960	34.834	-6.858	0.112
3300	37.140	260.344	229.839	100.667	34.644	-8.158	0.129
3400	37.261	261.455	230.753	104.387	34.448	-9.452	0.145
3500	37.376	262.537	231.645	108.119	34.246	-10.741	0.160
3600	37.486	263.591	232.518	111.863	34.037	-12.023	0.174
3700	37.592	264.620	233.372	115.617	33.821	-13.300	0.188
3800	37.693	265.624	234.208	119.381	33.599	-14.570	0.200
3900	37.791	266.604	235.026	123.155	33.371	-15.834	0.212
4000	37.885	267.562	235.827	126.939	33.136	-17.093	0.223
4100	37.976	268.499	236.613	130.732	32.894	-18.346	0.234
4200	38.064	269.415	237.383	134.534	32.646	-19.593	0.244
4300	38.150	270.311	238.138	138.345	32.391	-20.833	0.253
4400	38.233	271.189	238.879	142.164	32.130	-22.068	0.262
4500	38.315	272.050	239.607	145.991	31.862	-23.297	0.270
4600	38.394	272.893	240.322	149.827	31.587	-24.520	0.278
4700	38.472	273.719	241.023	153.670	31.305	-25.737	0.286
4800	38.549	274.530	241.713	157.521	31.017	-26.947	0.293
4900	38.625	275.326	242.391	161.380	30.722	-28.152	0.300
5000	38.699	276.107	243.057	165.246	30.420	-29.350	0.307
5100	38.773	276.874	243.713	169.120	30.111	-30.542	0.313
5200	38.846	277.627	244.358	173.001	29.796	-31.729	0.319
5300	38.919	278.368	244.993	176.889	29.473	-32.909	0.324
5400	38.991	279.096	245.617	180.784	29.144	-34.083	0.330
5500	39.062	279.812	246.233	184.687	28.807	-35.251	0.335
5600	39.134	280.517	246.839	188.597	28.464	-36.412	0.340
5700	39.206	281.210	247.436	192.514	28.113	-37.568	0.344
5800	39.278	281.892	248.024	196.438	27.756	-38.716	0.349
5900	39.350	282.564	248.604	200.369	27.391	-39.860	0.353
6000	39.423	283.226	249.175	204.308	27.019	-40.997	0.357

PREVIOUS: June 1977 (1 atm)

CURRENT: June 1977 (1 bar)

MALCOLM W. CHASE

Enthalpy Reference Temperature = $T_r = 298.15$ K				Standard State Pressure = $p^\circ = 0.1$ MPa			
T/K	$\text{J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$			$\text{kJ}\cdot\text{mol}^{-1}$			$\log K_r$
	C_p°	S°	$-[G^\circ - H^\circ(T_r)]/T$	$H^\circ - H^\circ(T_r)$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	
0	0.	0.	INFINITE	-9.364	-393.151	-393.151	INFINITE
100	29.208	179.009	243.568	-6.456	-393.208	-393.683	205.639
200	32.359	199.975	217.046	-3.414	-393.404	-394.085	102.924
298.15	37.129	213.795	213.795	0.	-393.522	-394.389	69.095
300	37.221	214.025	213.795	0.069	-393.523	-394.394	68.670
400	41.325	225.314	215.307	4.003	-393.583	-394.675	51.539
500	44.627	234.901	218.290	8.305	-393.666	-394.939	41.259
600	47.321	243.283	221.772	12.907	-393.803	-395.182	34.404
700	49.564	250.750	225.388	17.754	-393.983	-395.398	29.505
800	51.434	257.494	228.986	22.806	-394.188	-395.586	25.829
900	52.999	263.645	232.500	28.030	-394.405	-395.748	22.969
1000	54.308	269.299	235.901	33.397	-394.623	-395.886	20.679
1100	55.409	274.528	239.178	38.884	-394.838	-396.001	18.805
1200	56.342	279.390	242.329	44.473	-395.050	-396.098	17.242
1300	57.137	283.932	245.356	50.148	-395.257	-396.177	15.919
1400	57.802	288.191	248.265	55.896	-395.462	-396.240	14.784
1500	58.379	292.199	251.062	61.705	-395.668	-396.288	13.800
1600	58.886	295.983	253.753	67.569	-395.876	-396.323	12.939
1700	59.317	299.566	256.343	73.480	-396.090	-396.344	12.178
1800	59.701	302.968	258.840	79.431	-396.311	-396.353	11.502
1900	60.049	306.205	261.248	85.419	-396.542	-396.349	10.896
2000	60.350	309.293	263.574	91.439	-396.784	-396.333	10.351
2100	60.622	312.244	265.822	97.488	-397.039	-396.304	9.858
2200	60.865	315.070	267.996	103.562	-397.309	-396.262	9.408
2300	61.086	317.781	270.102	109.660	-397.596	-396.209	8.998
2400	61.287	320.385	272.144	115.779	-397.900	-396.142	8.622
2500	61.471	322.890	274.124	121.917	-398.222	-396.062	8.275
2600	61.647	325.305	276.046	128.073	-398.562	-395.969	7.955
2700	61.802	327.634	277.914	134.246	-398.921	-395.862	7.658
2800	61.952	329.885	279.730	140.433	-399.299	-395.742	7.383
2900	62.095	332.061	281.497	146.636	-399.695	-395.609	7.126
3000	62.229	334.169	283.218	152.852	-400.111	-395.461	6.886
3100	62.347	336.211	284.895	159.081	-400.545	-395.298	6.661
3200	62.462	338.192	286.529	165.321	-400.998	-395.122	6.450
3300	62.573	340.116	288.124	171.573	-401.470	-394.932	6.251
3400	62.681	341.986	289.681	177.836	-401.960	-394.726	6.064
3500	62.785	343.804	291.202	184.109	-402.467	-394.506	5.888
3600	62.884	345.574	292.687	190.393	-402.991	-394.271	5.721
3700	62.980	347.299	294.140	196.686	-403.532	-394.022	5.563
3800	63.074	348.979	295.561	202.989	-404.089	-393.756	5.413
3900	63.166	350.619	296.952	209.301	-404.662	-393.477	5.270
4000	63.254	352.219	298.314	215.622	-405.251	-393.183	5.134
4100	63.341	353.782	299.648	221.951	-405.856	-392.874	5.005
4200	63.426	355.310	300.955	228.290	-406.475	-392.550	4.882
4300	63.509	356.803	302.236	234.637	-407.110	-392.210	4.764
4400	63.588	358.264	303.493	240.991	-407.760	-391.857	4.652
4500	63.667	359.694	304.726	247.354	-408.426	-391.488	4.544
4600	63.745	361.094	305.937	253.725	-409.106	-391.105	4.441
4700	63.823	362.466	307.125	260.103	-409.802	-390.706	4.342
4800	63.893	363.810	308.292	266.489	-410.514	-390.292	4.247
4900	63.968	365.128	309.438	272.882	-411.242	-389.862	4.156
5000	64.046	366.422	310.565	279.283	-411.986	-389.419	4.068
5100	64.128	367.691	311.673	285.691	-412.746	-388.959	3.984
5200	64.220	368.937	312.762	292.109	-413.522	-388.486	3.902
5300	64.312	370.161	313.833	298.535	-414.314	-387.996	3.824
5400	64.404	371.364	314.888	304.971	-415.123	-387.493	3.748
5500	64.496	372.547	315.925	311.416	-415.949	-386.974	3.675
5600	64.588	373.709	316.947	317.870	-416.794	-386.439	3.605
5700	64.680	374.853	317.953	324.334	-417.658	-385.890	3.536
5800	64.772	375.979	318.944	330.806	-418.541	-385.324	3.470
5900	64.865	377.087	319.920	337.288	-419.445	-384.745	3.406
6000	64.957	378.178	320.882	343.779	-420.372	-384.148	3.344

PREVIOUS: September 1965 (1 atm)

CURRENT: September 1965 (1 bar)

Enthalpy Reference Temperature = T _r = 298.15 K				Standard State Pressure = p° = 0.1 MPa			
T/K	J·K ⁻¹ ·mol ⁻¹			kJ·mol ⁻¹			log K _r
	C _p ^o	S ^o	-(G ^o -H ^o (T _r))/T	H ^o -H ^o (T _r)	Δ _f H ^o	Δ _f G ^o	
0	0.000	0.000	INFINITE	-10.351	145.348	145.348	INFINITE
100	33.292	200.791	271.040	-7.025	144.318	150.235	-78.474
200	35.058	224.221	242.401	-3.636	143.340	156.541	-40.884
298.15	39.238	238.932	238.932	0.000	142.674	163.184	-28.589
300	39.330	239.175	238.933	0.073	142.665	163.311	-28.435
400	43.744	251.116	240.531	4.234	142.370	170.247	-22.232
500	47.262	261.272	243.688	8.792	142.340	177.224	-18.514
600	49.857	270.129	247.373	13.654	142.462	184.191	-16.035
700	51.752	277.963	251.194	18.738	142.665	191.130	-14.262
800	53.154	284.969	254.986	23.986	142.907	198.037	-12.931
900	54.208	291.292	258.674	29.356	143.169	204.913	-11.893
1000	55.024	297.048	262.228	34.819	143.439	211.759	-11.061
1100	55.660	302.323	265.637	40.355	143.711	218.578	-10.379
1200	56.174	307.189	268.899	45.947	143.980	225.372	-9.810
1300	56.593	311.702	272.020	51.586	144.245	232.144	-9.328
1400	56.948	315.909	275.007	57.264	144.502	238.896	-8.913
1500	57.245	319.849	277.866	62.974	144.750	245.629	-8.554
1600	57.501	323.551	280.607	68.711	144.987	252.347	-8.238
1700	57.722	327.044	283.237	74.473	145.211	259.050	-7.960
1800	57.919	330.349	285.763	80.255	145.419	265.740	-7.712
1900	58.095	333.485	288.193	86.056	145.611	272.419	-7.489
2000	58.250	336.469	290.533	91.873	145.784	279.089	-7.289
2100	58.396	339.315	292.789	97.705	145.938	285.750	-7.108
2200	58.526	342.035	294.966	103.552	146.072	292.406	-6.943
2300	58.647	344.639	297.069	109.410	146.185	299.054	-6.792
2400	58.764	347.137	299.104	115.281	146.276	305.698	-6.653
2500	58.869	349.538	301.073	121.163	146.346	312.339	-6.526
2600	58.969	351.849	302.982	127.055	146.393	318.978	-6.408
2700	59.066	354.077	304.833	132.956	146.419	325.616	-6.299
2800	59.158	356.226	306.631	138.868	146.424	332.253	-6.198
2900	59.245	358.304	308.377	144.788	146.408	338.889	-6.104
3000	59.329	360.314	310.075	150.716	146.371	345.527	-6.016
3100	59.409	362.260	311.727	156.653	146.314	352.167	-5.934
3200	59.488	364.148	313.336	162.598	146.238	358.808	-5.857
3300	59.563	365.980	314.904	168.551	146.144	365.451	-5.785
3400	59.639	367.759	316.432	174.511	146.033	372.100	-5.717
3500	59.714	369.489	317.923	180.479	145.905	378.750	-5.653
3600	59.781	371.172	319.379	186.453	145.761	385.405	-5.592
3700	59.852	372.811	320.801	192.435	145.601	392.063	-5.535
3800	59.919	374.408	322.191	198.424	145.427	398.728	-5.481
3900	59.986	375.965	323.550	204.419	145.239	405.396	-5.430
4000	60.053	377.485	324.879	210.421	145.038	412.069	-5.381
4100	60.120	378.968	326.181	216.429	144.823	418.747	-5.335
4200	60.183	380.418	327.455	222.445	144.597	425.431	-5.291
4300	60.245	381.835	328.703	228.466	144.358	432.121	-5.249
4400	60.308	383.220	329.926	234.494	144.106	438.815	-5.209
4500	60.371	384.576	331.126	240.528	143.844	445.516	-5.171
4600	60.434	385.904	332.302	246.568	143.568	452.222	-5.135
4700	60.492	387.204	333.457	252.614	143.281	458.935	-5.100
4800	60.555	388.479	334.590	258.667	142.981	465.655	-5.067
4900	60.614	389.728	335.702	264.725	142.667	472.381	-5.036
5000	60.672	390.953	336.795	270.789	142.340	479.113	-5.005
5100	60.731	392.155	337.869	276.859	141.999	485.853	-4.976
5200	60.789	393.335	338.924	282.935	141.643	492.597	-4.948
5300	60.848	394.493	339.962	289.017	141.270	499.351	-4.921
5400	60.906	395.631	340.982	295.105	140.880	506.110	-4.896
5500	60.965	396.749	341.986	301.199	140.472	512.876	-4.871
5600	61.024	397.848	342.974	307.298	140.045	519.653	-4.847
5700	61.078	398.929	343.946	313.403	139.596	526.434	-4.824
5800	61.137	399.992	344.903	319.514	139.126	533.226	-4.802
5900	61.191	401.037	345.846	325.630	138.631	540.023	-4.781
6000	61.250	402.066	346.774	331.752	138.111	546.832	-4.761

PREVIOUS: June 1961 (1 atm)

CURRENT: June 1961 (1 bar)