Appendix

THE INTERNATIONAL SYSTEM OF UNITS (SI)

Table 1 SI Base Units

Quantity	Name of unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of a substance	mole	mol

Table 2 SI Defined Units

Quantity	Name of unit	Defining equation
Capacitance	farad, f	$1\,F = 1A\,s/V$
Electrical resistance	ohm, Ω	$1\,\Omega = 1V/A$
Force	newton, N	$1\,N = 1\,kg\,m/s^2$
Potential difference	volt, V	$1\,V = 1\,W/A$
Power	watt, W	$1\,W = 1\,J/s$
Pressure	pascal, Pa	$1\,Pa = 1\,N/m^2$
Temperature	kelvin, K	$K = °C + 273.15$
Work, heat, energy	joule, J	$1\,J = 1\,Nm$

Table 3 SI Derived Units

Quantity	Name of unit	Symbol
Acceleration	meter per second square	m/s^2
Area	square meter	m^2
Density	kilogram per cubic meter	kg/m^3
Dynamic viscosity	newton-second per square meter	$N\,s/m^2$
Force	newton	N
Frequency	hertz	Hz
Kinematic viscosity	square meter per second	m^2/s
Plane angle	radian	rad
Power	watt	W
Radiant intensity	watt per steradian	W/sr
Solid angle	steradian	sr
Specific heat	joule per kilogram-kelvin	J/kg K
Thermal conductivity	watt per meter-kelvin	W/m K
Velocity	meter per second	m/s
Volume	cubic meter	m^3

Table 4 Physical Constants in SI Units

Quantity	Symbol	Value
—	e	2.718281828
—	Π	3.141592653
—	g_c	1.00000 kg m N^{-1} s^{-2}
Avogadro constant	N_A	6.022169×10^{26} $kmol^{-1}$
Boltzmann constant	k	1.380622×10^{-23} J K^{-1}
First radiation constant	$C_1 = 2\ \pi\ hc^2$	3.741844×10^{-16} W m^2
Gas constant	R_u	8.31434×10^{3} J $kmol^{-1}$ K^{-1}
Gravitational constant	G	6.6732×10^{-11} N m^2 kg^{-2}
Planck constant	h	6.626196×10^{-34} Js
Second radiation constant	$C_2 = hc/k$	1.438833×10^{-2} m K
Speed of light in a vacuum	c	2.997925×10^{8} ms^{-1}
Stefan-Boltzmann constant	σ	5.66961×10^{-8} Wm^{-2} K^{-4}

Table 5 SI Prefixes

Multiplier	Symbol	Prefix	Multiplier	Symbol	Prefix
10^{12}	T	tera	10^{-2}	c	centi
10^{9}	G	giga	10^{-3}	m	milli
10^{6}	M	mega	10^{-6}	μ	micro
10^{3}	k	kilo	10^{-9}	n	nano
10^{2}	h	hecto	10^{-12}	p	pico
10^{1}	da	deka	10^{-15}	f	femto
10^{-1}	d	deci	10^{-18}	a	atto

Table 6A Conversion Factors

Physical quantity	Symbol	Conversion factor
Area	A	$1\ ft^2 = 0.0929\ m^2$
		$1\ in.^2 = 6.452 \times 10^{-4}\ m^2$
Density	ρ	$1\ lb_m/ft^3 = 16.018\ kg/m^3$
		$1\ slug/ft^3 = 515.379\ kg/m^3$
Energy, heat	Q	1 Btu = 1055.1 J
		1 cal = 4.186 J
		1 (ft)(lb_f) = 1.3558 J
		$1\ (hp)(h) = 2.685 \times 10^6$ J
Force	F	$1\ lb_f = 4.448$ N
Heat flow rate	q	1 Btu/h = 0.2931 W
		1 Btu/s = 1055.1 W
Heat flux	q''	$1\ Btu/(h)(ft^2) = 3.1525\ W/m^2$
Heat generation per unit volume	q_G	$1\ Btu/(h)(ft^3) = 10.343\ W/m^3$
Heat transfer coefficient	h	$1\ Btu/(h)(ft^2)(°F) = 5.678\ W/m^2\ K$
Length	L	1 ft = 0.3048 m
		1 in. = 2.54 cm = 0.0254 m
		1 mile = 1.6093 km = 1609.3 m
Mass	m	$1\ lb_m = 0.4536$ kg
		1 slug = 14.594 kg
Mass flow rate	$\dot{m}$	$1\ lb_m/h = 0.000126$ kg/s
		$1\ lb_m/s = 0.4536$ kg/s
Power	*W*	1 hp = 745.7 W
		1 (ft)(lb_f)/s = 1.3558 W
		1 Btu/s = 1055.1 W
		1 Btu/h = 0.293 W
Pressure	p	$1\ lb_f/in.^2 = 6894.8\ N/m^2$ (Pa)
		$1\ lb_f/ft^2 = 47.88\ N/m^2$ (Pa)
		$1\ atm = 101{,}325\ N/m^2$ (Pa)
Specific energy	Q/m	$1\ Btu/lb_f = 2326.1$ J/kg
Specific heat capacity	c	1 Btu/(lb_f)(°F) = 4188 J/kg K
Temperature	T	T(°R) = (9/5) T (K)
		T(°F) = [T(°C)](9/5) + 32
		T(°F) = [T(K) − 273.15](9/5) + 32
Thermal conductivity	k	1 Btu/(h)(ft)(°F) = 1.731 W/m K
Thermal diffusivity	α	$1\ ft^2/s = 0.0929\ m^2/s$
		$1\ ft^2/h = 2.581 \times 10^{-5}\ m^2/s$
Thermal resistance	R_t	1 (h)(°F)/Btu = 1.8958 K/W

(*continued*)

Table 6A *Continued*

Physical quantity	Symbol	Conversion factor
Velocity	U	1 ft/s = 0.3048 m/s 1 mph = 0.44703 m/s
Viscosity, dynamic	μ	1 lb_m/(ft)(s) = 1.488 N s/m^2 1 centipoise = 0.00100 N s/m^2
Viscosity, kinematic	ν	1 ft^2/s = 0.0929 m^2/s 1 ft^2/h = 2,581 × 10^{-5} m^2/s
Volume	V	1 ft^3 = 0.02832 m^3 1 $in.^3$ = 1.6387 × 10^{-5} m^3 1 gal(U.S. liq.) = 0.003785 m^3

Table 6B Temperature Conversion Table

K	°C	°F	K	°C	°F	K	°C	°F
220	−53	−63	335	62	144	450	177	351
225	−48	−54	340	67	153	455	182	360
230	−43	−45	345	72	162	460	187	369
235	−38	−36	350	77	171	465	192	378
240	−33	−27	355	82	180	470	197	387
245	−28	−18	360	87	189	475	202	396
250	−23	−9	365	92	198	480	207	405
255	−18	0	370	97	207	485	212	414
260	−13	9	375	102	216	490	217	423
265	−8	18	380	107	225	495	222	432
270	−3	27	385	112	234	500	227	441
275	2	36	390	117	243	505	232	450
280	7	45	395	122	252	510	237	459
285	12	54	400	127	261	515	242	468
290	17	63	405	132	270	520	247	477
295	22	72	410	137	279	525	252	486
300	27	81	415	142	288	530	257	495
305	32	90	420	147	297	535	262	504
310	37	99	425	152	306	540	267	513
315	42	108	430	157	315	545	272	522
320	47	117	435	162	324	550	277	531
325	52	126	440	167	333	555	282	540
330	57	135	445	172	342	560	287	549

THERMODYNAMIC PROPERTIES OF WATER

Table 7 SI Saturated Water

		Specific volume (m^3/kg)			Internal energy (KJ/kg)			Enthalpy (KJ/kg)			Entropy (KJ/kg K)		
Temp C T	Pressure Kpa P	Saturated liquid (v_f)	Evap. (v_{fg})	Saturated vapor (v_g)	Saturated liquid (u_f)	Evap. (u_{fg})	Saturated vapor (u_g)	Saturated liquid (h_f)	Evap. (h_{fg})	Saturated vapor (h_g)	Saturated liquid (s_f)	Evap. (s_{fg})	Saturated vapor (s_g)
0.01	0.6113	0.001000	206.131	206.131	0	2375.33	2375.33	0.00	2501.35	2501.35	0	9.1562	9.1562
5	0.8721	0.001000	147.117	147.118	20.97	2361.27	2382.24	20.98	2489.57	2510.54	0.0761	8.9496	9.0257
10	1.2276	0.001000	106.376	106.377	41.99	2347.16	2389.15	41.99	2477.75	2519.74	0.1510	8.7498	8.9007
15	1.705	0.001001	77.924	77.925	62.98	2333.06	2396.04	62.98	2465.93	2528.91	0.2245	8.5569	8.7813
20	2.339	0.001002	57.7887	57.7897	83.94	2318.98	2402.91	83.94	2454.12	2538.06	0.2966	8.3706	8.6671
25	3.169	0.001003	43.3583	43.3593	104.86	2304.90	2409.76	104.87	2442.30	2547.17	0.3673	8.1905	8.5579
30	4.246	0.001004	32.8922	32.8932	125.77	2290.81	2416.58	125.77	2430.48	2556.25	0.4369	8.0164	8.4533
35	5.628	0.001006	25.2148	25.2158	146.65	2276.71	2423.36	146.66	2418.62	2565.28	0.5052	7.8478	8.3530
40	7.384	0.001008	19.5219	19.5229	167.53	2262.57	2430.11	167.54	2406.72	2574.26	0.5724	7.6845	8.2569
45	9.593	0.001010	15.2571	15.2581	188.41	2248.40	2436.81	188.42	2394.77	2583.19	0.6386	7.5261	8.1649
50	12.350	0.001012	12.0308	12.0318	209.30	2234.17	2443.47	209.31	2382.75	2592.06	0.7037	7.3725	8.0762
55	15.758	0.001015	9.56734	9.56835	230.19	2219.12	2450.08	230.20	2370.66	2600.86	0.7679	7.2234	7.9912
60	19.941	0.001017	7.66969	7.67071	251.09	2205.54	2456.63	251.11	2358.48	2609.59	0.8311	7.0784	7.9095
65	25.03	0.001020	6.19554	6.19656	272.00	2191.12	2463.12	272.03	2346.21	2618.24	0.8934	6.9375	7.8309
70	31.19	0.001023	5.04114	5.04217	292.93	2176.62	2469.55	292.96	2333.85	2626.80	0.9548	6.8004	7.7552
75	38.58	0.001026	4.13021	4.13123	331.87	2162.03	2475.91	313.91	2321.37	2635.28	1.0154	6.6670	7.6824
80	47.39	0.001029	3.40612	3.40715	334.84	2147.36	2482.19	334.88	2308.77	2643.66	1.0752	6.5369	7.6121
85	57.83	0.001032	2.82654	2.82757	355.82	2132.58	2488.40	355.88	2296.05	2651.93	1.1342	6.4102	7.5444
90	70.14	0.001036	2.35953	2.36056	376.82	2117.70	2494.52	376.90	2283.19	2660.09	1.1924	6.2866	7.4790
95	84.55	0.001040	1.98082	1.98186	397.86	2102.70	2500.56	397.94	2270.19	2668.13	1.2500	6.1659	7.4158
100	101.3	0.001044	1.67185	1.67290	418.91	2087.58	2506.50	419.02	2257.03	2676.05	1.3068	6.0480	7.3548
105	120.8	0.001047	1.41831	1.41936	440.00	2072.34	2512.34	440.13	2243.70	2683.83	1.3629	5.9328	7.2958

110	143.3	0.001052	1.20909	1.21014	461.12	2056.96	2518.09	461.27	2230.20	2691.47	1.4184	5.8202	7.2386
115	169.1	0.001056	1.03552	1.03658	482.28	2041.44	2523.72	482.46	2216.50	2698.96	1.4733	5.7100	7.1832
120	198.5	0.001060	0.89080	0.89186	503.48	2055.76	2529.24	503.69	2202.61	2706.30	1.5275	5.6020	7.1295
125	232.1	0.001065	0.76953	0.77059	524.72	2009.91	2534.63	524.96	2188.50	2713.46	1.5812	5.4962	7.0774
130	270.1	0.001070	0.66744	0.66850	546.00	1993.90	2539.90	546.29	2174.16	2720.46	1.6343	5.3925	7.0269
135	313.0	0.001075	0.58110	0.58217	567.34	1977.69	2545.03	567.67	2159.59	2727.26	1.6869	5.2907	6.9777
140	361.3	0.001080	0.50777	0.50885	588.72	1961.30	2550.02	589.11	2144.75	2733.87	1.7390	5.1908	6.9298
145	415.4	0.001085	0.44524	0.44632	610.16	1944.69	2554.86	610.61	2129.65	2740.26	1.7906	5.0926	6.8832
150	475.9	0.001090	0.39169	0.39278	631.66	1927.87	2559.54	632.18	2114.26	2746.44	1.8419	4.9960	6.8378
155	543.1	0.001096	0.34566	0.34676	653.23	1910.82	2564.04	653.82	2098.56	2752.39	1.8924	4.9010	6.7934
160	617.8	0.001102	0.30596	0.30706	674.85	1893.52	2568.37	675.53	2082.55	2758.09	1.9426	4.8075	6.7501
165	700.5	0.001108	0.27158	0.27269	969.55	1875.97	2572.51	697.32	2066.20	2763.53	1.9924	4.7153	6.7078
170	791.7	0.001114	0.24171	0.24283	718.31	1858.14	2576.46	719.20	2049.50	2768.70	2.0418	4.6244	6.6663
175	892.0	0.001121	0.21568	0.21680	740.16	1840.03	2580.19	741.16	2032.42	2773.58	2.0909	4.5347	6.6256
180	1002.2	0.001127	0.19292	0.19405	762.08	1821.62	2583.70	763.21	2014.96	2778.16	2.1395	4.4461	6.5857
185	1122.7	0.001134	0.17295	0.17409	784.08	1802.90	2586.98	785.36	1997.07	2782.43	2.1878	4.3586	6.5464
190	1254.4	0.001141	0.15539	0.15654	806.17	1783.84	2590.01	807.61	1978.76	2786.37	2.2358	4.2720	6.5078
195	1397.8	0.001149	0.13990	0.14105	828.36	1764.43	2592.79	829.96	1959.99	2789.96	2.2835	4.1863	6.4697
200	1553.8	0.001156	0.12620	0.12736	850.64	1744.66	2595.29	852.43	1940.75	2793.18	2.3308	4.1014	6.4322
205	1723.0	0.001164	0.11405	0.11521	873.02	1724.49	2597.52	875.03	1921.00	2796.03	2.3779	4.0172	6.3951
210	1906.3	0.001173	0.10324	0.10441	895.51	1703.93	2599.44	897.75	1900.73	2798.48	2.4247	3.9337	6.3584
215	2104.2	0.001181	0.09361	0.09497	918.12	1682.94	2601.06	920.61	1879.91	2800.51	2,4713	3.8507	6.3221
220	2317.8	0.001190	0.08500	0.08619	940.85	1661.49	2602.35	943.61	1858.51	2802.12	2.5177	3.7683	6.2860
225	2547.7	0.001199	0.07729	0.07849	963.72	1639.58	2603.30	966.77	1836.50	2803.27	2,5639	3.6863	6.2502
230	2794.9	0.001209	0.07037	0.07158	986.72	1617.17	2603.89	990.10	1813.85	2803.95	2.6099	3.6047	6.2146
235	3060.1	0.001219	0.06415	0.06536	1009.88	1594.24	2604.11	1013.61	1790.53	2804.13	2.6557	3.5233	6.1791
240	3344.2	0.001229	0.05853	0.05976	1033.19	1570.75	2603.95	1037.31	1766.50	2803.81	2.7015	3.4422	6.1436
245	3648.2	0.001240	0.05346	0.05470	1056.69	1546.68	2603.37	1061.21	1741.73	2802.95	2.7471	3.3612	6.1083
250	3973.0	0.001251	0.04887	0.05013	1080.37	1522.00	2602.37	1085.34	1716.18	2801.52	2.7927	3.2802	6.0729
255	4319.5	0.001263	0.04471	0.04598	1104.26	1496.66	2600.93	1109.42	1689.80	2799.51	2.8382	3.1992	6.0374

(*continued*)

Table 7 *Continued*

		Specific volume (m^3/kg)			Internal energy (KJ/kg)			Enthalpy (KJ/kg)			Entropy (KJ/kg K)		
Temp C T	Pressure Kpa P	Saturated liquid (v_f)	Evap. (v_{fg})	Saturated vapor (v_g)	Saturated liquid (u_f)	Evap. (u_{fg})	Saturated vapor (u_g)	Saturated liquid (h_f)	Evap. (h_{fg})	Saturated vapor (h_g)	Saturated liquid (s_f)	Evap. (s_{fg})	Saturated vapor (s_g)
260	4688.6	0.001276	0.04093	0.04220	1128.37	1470.64	2599.01	1134.35	1662.54	2796.89	2.8837	3.1181	6.0018
265	5081.3	0.001289	0.03748	0.03877	1152.72	1443.87	2596.60	1159.27	1634.34	2793.61	2.9293	3.0368	5.9661
270	5498.7	0.001302	0.03434	0.03564	1177.33	1416.33	2593.66	1184.49	1605.16	2789.65	2.9750	2.9551	5,9301
275	5941.8	0.001317	0.03147	0.03279	1202.23	1387.94	2590.17	1210.05	1574.92	2784.97	3,0208	2.8730	5.8937
280	6411.7	0.001332	0.02884	0.03017	1227.41	1358.66	2586.09	1235.97	1543.55	2779.53	3.0667	2.7903	5.8570
285	6909.4	0.001348	0.02642	0.02777	1252.98	1328.41	2581.38	1262.29	1510.97	2773.27	3.1129	2.7069	5.8198
290	7436.0	0.001366	0.02420	0.02557	1278.89	1297.11	2575.99	1289.04	1477.08	2766.13	3.1593	2.6227	5.7821
295	7992.8	0.001384	0.02216	0.02354	1305.21	1264.67	2569.87	1316.27	1441.08	2758.05	3.2061	2.5375	5.7436
300	8581.0	0.001404	0.02027	0.02167	1331.97	1230.9	2562.96	1344.01	1404.93	2748.94	3.2533	2.4511	5.7044
305	9201.8	0.001425	0.01852	0.01995	1359.22	1195.94	2555.16	1372.33	1366.38	2738.72	3.3009	2.3633	5.6642
310	9856.6	0.001447	0.01690	0.01835	1387.03	1159.94	2546.40	1401.29	1325.97	2727.27	3.3492	2.2737	5.6229
315	10547	0.001472	0.01539	0.01687	1415.44	1159.37	2536.55	1430.97	1283.48	2714.44	3.3981	2.1812	5.5803
320	11274	0.001499	0.01399	0.01549	1444.55	1121.11	2525.48	1461.45	1238.64	2700.08	3.4479	2.0882	5.5361
325	12040	0.001528	0.01267	0.01420	1474.44	1080.93	2513.01	1492.84	1191.13	2683.97	3.4987	1.9913	5.4900
330	12845	0.001561	0.01144	0.01300	1505.24	1038.57	2498.91	1525.29	1140.56	2665.85	3.5506	1.8909	5.4416
335	13694	0.001597	0.01027	0.01186	1537.11	993.66	2482.88	1558.98	1086.37	2645.35	3.6040	1.7863	5.3903
340	14586	0.001638	0.00916	0.01080	1570.26	945.77	2464.53	1594.15	1027.86	2622.01	3.6593	1.6763	5.3356
345	15525	0.001685	0.00810	0.00978	1605.01	894.26	2443.30	1631.17	964.02	2595.19	3.7169	1.5594	5,2763
350	16514	0.001740	0.00707	0.00881	1641.81	838.29	2418.39	1670.54	893.38	2563.92	3.7776	1.4336	5.2111
355	17554	0.001807	0.00607	0.00787	1681.41	776.58	2388.52	1713.13	813.59	2526.72	3.8427	1.2951	5.1378
360	18561	0.001892	0.00505	0.00694	1725.19	707.11	2351.47	1760.54	720.52	2481.00	3.9146	1.1379	5.0525
365	19807	0.002011	0.00398	0.00599	1776.13	626.29	2302.67	1815.96	605.44	2421.40	3.9983	0.9487	4.9470
370	21028	0.002213	0.00271	0.00493	1843.84	526.54	2228.53	1890.37	441.75	2332.12	4.1104	0.6868	4.7972
374.1	22089	0.003155	0	0.00315	2029.58	384.69	2029.58	2099.26	0	2099.26	4.4297	0	4.4297

Table 8 SI Saturated Water Pressure Entry

		Specific volume (m^3/kg)			Internal energy (KJ/kg)			Enthalpy (KJ/kg)			Entropy (KJ/kg K)		
Pressure Kpa P	Temp T C	Saturated liquid (v_f)	Evap. (v_{fg})	Saturated vapor (v_g)	Saturated liquid (u_f)	Evap. (u_{fg})	Saturated vapor (u_g)	Saturated liquid (h_f)	Evap. (h_{fg})	Saturated vapor (h_g)	Saturated liquid (s_f)	Evap. (s_{fg})	Saturated vapor (s_g)
0.6613	0.01	0.0001000	206.131	206.132	0	2375.3	2375.3	0.00	2501.30	2501.30	0	9.1562	9.1562
1	6.98	0.0001000	129.20702	129.2080	29.29	2355.69	2384.98	29.29	2484.89	2514.18	0.1059	8.8697	8.9756
1.5	13.03	0.0001001	87.97913	87.98013	54.70	2338.63	2393.32	54.70	2470.59	2525.30	0.1956	8.6322	8.8278
2	17.50	0.0001001	67.00285	67.00385	73.47	2326.02	2399.48	73.47	2460.02	2533.49	0.2607	8.4629	8.7236
2.5	21.08	0.0001002	54.25285	54.25385	88.47	2315.93	2404.40	88.47	2451.56	2540.03	0.3120	8.3311	8.6431
3	24.08	0.0001003	45.66402	45.66502	101.43	2307.48	2408.51	101.03	2444.47	2545.50	0.3545	8.2231	8.5775
4	28.96	0.0001004	34.799915	34.80015	121.44	2293.73	2415.17	121.44	2432.93	2554.37	0.4226	8.0520	8.4746
5	32.88	0.0001005	28.19150	28.19251	137.79	2282.70	2420.49	137.79	2423.66	2561.45	0.4763	7.9187	8.3950
7.5	40.29	0.0001008	19.23674	19.23775	168.86	2261.74	2430.50	168.77	2406.02	2574.79	0.5763	7.6751	8.2514
10	45.81	0.0001010	14.67254	14.67355	191.76	2246.10	2437.89	191.81	2392.82	2584.63	0.6492	7.5010	8.1501
15	53.97	0.0001014	10.02117	10.02218	225.90	2222.83	2448.73	225.91	2373.14	2599.06	0.7548	7.2536	8.0084
20	60.06	0.0001017	7.64835	7.64937	251.35	2205.36	2456.71	251.38	2358.33	2609.70	0.8319	7.0766	7.9085
25	64.97	0.0001020	6.20322	6.20424	271.88	2191.21	2463.08	271.90	2346.29	2618.19	0.8930	6.9383	7.8313
30	69.10	0.0001022	5.22816	5.22918	289.18	2179.21	2468.40	289.21	2336.07	2625.28	0.9439	6.8247	7.7686
40	75.87	0.0001026	3.99243	3.99345	317.51	2159.49	2477.00	317.55	2319.19	2636.74	1.0258	6.6441	7.6700
50	81.33	0.0001030	3.23931	3.24034	340.52	2143.43	2483.85	340.47	2305.40	2645.87	1.0910	6.5029	7.5939
75	91.77	0.0001037	2.21607	2.21711	384.29	2112.39	2496.67	384.36	2278.59	2662.96	1.2129	6.2434	7.4563
100	99.62	0.0001043	1.69296	1.69400	417.33	2088.72	2506.06	417.44	2258.02	2675.46	1.3025	6.0568	7.3593
125	105.99	0.0001048	1.37385	1.37490	444.16	2069.32	2513.48	444.30	2241.05	2685.35	1.3739	5.9104	7.2843
150	111.37	0.0001053	1.15828	1.15933	466.92	2052.72	2519.64	467.08	2226.46	2693.54	1.4335	5.7897	7.2232
175	116.06	0.0001057	1.00257	1.00363	186.78	2038.12	2524.60	486.97	2213.57	2700.53	1.4848	5.6868	7.1717
200	120.23	0.0001061	0.88467	0.88573	504.47	2025.02	2529.49	504.68	2201.96	2706.63	1.5300	5.5960	7.1271
225	124.00	0.0001064	0.79219	0.79325	520.45	2013.10	2533.56	520.69	2191.35	2712.04	1.5705	5.5173	7.0878
250	127.43	0.0001067	0.71765	0.71871	535.08	2002.14	2537.21	535.34	2181.55	2716.89	1.6072	5.4455	7.0526
275	130.60	0.0001070	0.65624	0.65731	548.57	1991.95	2540.53	548.87	2172.42	2721.29	1.6407	5.3801	7.0208
300	133.55	0.0001073	0.60475	0.60582	561.13	1982.43	2543.55	561.45	2163.85	2725.30	1.6717	5.3201	6.9918

(*continued*)

Table 8 *Continued*

		Specific volume (m^3/kg)			Internal energy (KJ/kg)			Enthalpy (KJ/kg)			Entropy (KJ/kg K)		
Pressure Kpa P	Temp T C	Saturated liquid (v_f)	Evap. (v_{fg})	Saturated vapor (v_g)	Saturated liquid (u_f)	Evap. (u_{fg})	Saturated vapor (u_g)	Saturated liquid (h_f)	Evap. (h_{fg})	Saturated vapor (h_g)	Saturated liquid (s_f)	Evap. (s_{fg})	Saturated vapor (s_g)
325	136.30	0.0001076	0.56093	0.56201	572.88	1973.46	2546.34	573.23	2155.76	2728.99	1.7005	5.2646	6.9651
350	138.88	0.0001079	0.52317	0.52425	583.93	1964.98	2548.92	584.31	2148.10	2732.40	1.7274	5.2130	6.9404
375	141.32	0.0001081	0.49029	0.49137	594.38	1956.93	2551.31	594.79	2140.79	2735.58	1.7527	5.1647	6.9174
400	143.63	0.0001084	0.46138	0.42646	604.29	1949.26	2553.55	604.73	2133.81	2738.53	1.7766	5.1193	6.8958
450	147.93	0.0001088	0.41289	0.41398	622.75	1934.87	2557.62	623.24	2120.67	2743.91	1.8206	5.0359	6.8565
500	151.86	0.0001093	0.37380	0.37489	639.66	1921.57	2561.23	640.21	2108.47	2748.67	1.8606	4.9606	6.8212
550	155.48	0.0001097	0.34159	0.34268	655.30	1909.17	2564.47	655.91	2097.04	2752.94	1.8972	4.8920	6.7892
600	158.48	0.0001101	0.31457	0.31567	669.88	1897.52	2567.70	670.54	2086.26	2756.80	1.9311	4.8289	6.7600
650	162.01	0.0001104	0.29158	0.29268	683.55	1886.51	2570.06	684.26	2076.04	2760.30	1.9627	4.7704	6.7330
700	164.97	0.0001108	0.27126	0.27286	696.43	1876.07	2572.49	697.20	2066.30	2763.50	1.9922	4.7158	6.7080
750	167.77	0.0001111	0.25449	0.25560	708.62	1866.11	2574.73	709.45	2056.98	2766.43	2.0199	4.6647	6.6846
800	170.43	0.0001115	0.23931	0.24043	720.20	1856.58	2576.79	721.10	2048.04	2769.13	2.0461	4.6166	6.6627
850	172.96	0.001118	0.22586	0.22698	731.25	1847.45	2578.69	732.20	2039.43	2771.63	2.0709	4.5711	6.6421
900	175.38	0.001121	0.21385	0.21497	741.81	1838.65	2580.46	742.82	2031.12	2773.94	2.0946	4.5280	6.6225
950	177.69	0.001124	0.20306	0.20419	751.94	1830.17	2582.11	753.00	2023.08	2776.08	2.1171	4.4869	6.6040
1000	179.91	0.001127	0.19332	0.19444	761.67	1821.97	2583.64	762.79	2015.29	2778.08	2.1386	4.4478	6.5864
1100	184.09	0.001133	0.17639	0.17753	780.08	1806.32	2586.40	781.32	2000.36	2781.68	2.1791	4.3744	6.5535
1200	187.99	0.001139	0.16220	0.16333	797.27	1791.55	2588.82	798.64	1986.19	2784.82	2.2165	4.3067	6.5233
1300	191.64	0.001144	0.15011	0.15125	813.42	1777.53	2590.95	814.91	1972.67	2787.58	2.2514	4.2438	6.4953
1400	195.07	0.001149	0.13969	0.14084	828.68	1764.15	2592.83	830.29	1959.72	2790.00	2.2842	4.1850	6.4692
1500	198.32	0.001154	0.13062	0.13177	843.14	1751.30	2594.50	844.87	1947.28	2792.15	2.3150	4.1298	6.4448
1750	205.76	0.001166	0.11232	0.11349	876.44	1721.39	2597.83	878.48	1917.95	2796.43	2.3851	4.0044	6.3895
2000	212.42	0.001177	0.09845	0.09963	906.42	1693.84	2600.26	908.77	1890.74	2799.51	2.4473	3.8935	6.3408
2250	218.45	0.001187	0.08756	0.08875	933.81	1668.18	2601.98	936.48	1865.19	2801.67	2.5034	3.7938	6.2971
2500	223.99	0.001197	0.07878	0.07998	959.09	1644.04	2603.13	962.09	1840.98	2803.07	2.5546	3.7028	6.2574
2750	229.12	0.001207	0.07154	0.07275	982.65	1621.16	2603.81	985.97	1817.89	2803.86	2.6018	3.6190	6.2208
3000	233.90	0.001216	0.06546	0.06668	1004.76	1599.34	2604.10	1008.41	1795.73	2804.14	2.6456	3.5412	6.1869

3250	238.38	0.001226	0.06029	0.06152	1025.62	1578.43	2604.04	1029.60	1774.37	2803.97	2.6866	3.4685	6.1551
3500	242.60	0.001235	0.04483	0.05707	1045.41	1558.29	2603.70	1049.73	1753.70	2803.43	2.7252	3.4000	6.1252
4000	250.40	0.001252	0.04853	0.04978	1082.28	1519.99	2602.27	1087.29	1714.09	2801.38	2.7963	3.2737	6.0700
5000	263.99	0.001286	0.03815	0.03944	1147.78	1449.34	2597.12	1154.21	1640.12	2794.33	2.9201	3.0532	5.9733
6000	275.44	0.001319	0.03112	0.03244	1205.41	1384.27	2589.69	1213.32	1571.00	2784.33	3.0266	2.8625	5.8891
7000	285.88	0.001351	0.02602	0.02737	1257.51	1322.97	2580.48	1266.97	1505.10	2772.07	3.1210	2.6922	5.8132
8000	295.06	0.001384	0.02213	0.02352	1305.54	1264.25	2569.79	1316.61	1441.33	2757.94	3.2067	2.5365	5.7431
9000	303.44	0.001418	0.01907	0.02048	1350.47	1207.28	2557.75	1363.23	1378.88	2742.11	3.2857	2.3915	5.6771
10000	311.06	0.001452	0.01657	0.01803	1393.00	1151.40	2544.41	1407.53	1317.14	2724.67	3.3595	2.2545	5.6140
11000	318.15	0.001489	0.01450	0.01599	1433.68	1096.06	2529.74	1450.05	1255.55	2705.60	3.4294	2.1233	5.5527
12000	324.75	0.001527	0.01274	0.01426	1472.92	1040.76	2513.67	1491.24	1193.59	2684.83	3.4961	1.9962	5.4923
13000	330.95	0.001567	0.01121	0.01278	1511.09	984.99	2496.08	1531.46	1130.76	2662.22	3.5604	1.8718	5.4323
14000	336.75	0.001611	0.00987	0.01149	1548.53	928.23	2476.76	1571.08	1066.47	2637.55	3.6231	1.7485	5.3716
15000	342.24	0.001658	0.00868	0.01034	1585.58	869.85	2455.43	1610.45	1000.04	2610.49	3.6847	1.6250	5.3097
16000	347.43	0.001711	0.00760	0.00931	1622.63	809.07	2431.70	1650.00	930.59	2580.49	3.7460	1.4995	5.2454
17000	352.37	0.001770	0.00659	0.00836	1660.16	744.80	2404.96	1690.25	856.90	2547.15	3.8078	1.3698	5.1776
18000	357.06	0.001840	0.00565	0.00749	1698.86	675.42	2374.28	1731.97	777.13	2509.09	3.8713	1.2330	5.1044
19000	361.54	0.001924	0.00473	0.00666	1739.87	598.18	2338.05	1776.43	688.11	2464.54	3.9387	1.0841	5.0227
20000	365.81	0.002035	0.00380	0.00583	1758.47	507.58	2293.05	1826.18	583.56	2409.74	4.0137	0.9132	4.9269
21000	369.89	0.002206	0.00275	0.00495	1841.97	388.74	2230.71	1888.30	446.42	2334.72	4.1073	0.6942	4.8015
22000	373.80	0.002808	0.00072	0.00353	1973.16	108.24	2081.39	2034.92	124.04	2158.97	4.3307	0.1917	4.5224
22089	374.14	0.003155	0	0.00315	2029.58	0	2029.58	2099.26	0	2099.26	4.4297	0	4.4297

Table 9 SI Superheated Vapor Water

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	V (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
		P = 10 KPa	(45.81)			P = 50KPa	(81.33)	
Saturated	14.67355	2437.89	2584.63	8.1501	3.24034	2483.85	2645.87	7.5939
50	14.86920	2443.87	2592.56	8.1749	—	—	—	—
100	17.19561	2515.50	2687.56	8.4479	3.41833	2511.61	2682.52	7.6947
150	19.51251	2587.86	2782.99	8.6881	3.88937	2585.61	2780.08	7.9400
200	21.82507	2661.27	2879.52	8.9037	4.35595	2659.85	2877.64	8.1579
250	24.13559	2735.95	2977.31	9.1002	4.82045	2734.97	2975.99	8.3555
300	26.44508	2812.06	3076.51	9.2812	5.28391	2811.33	3075.52	8.5372
400	31.06252	2968.89	3279.51	9.6076	6.20929	2968.43	3278.89	8.8641
500	35.67896	3132.26	3489.05	9.8977	7.13364	3131.94	3488.62	9.1545
600	40.29498	3302.45	3705.40	10.1608	8.05748	3302.22	3705.10	9.4177
700	44.91052	3479.63	3928.73	10.4028	8.98104	3479.45	3928.51	9.6599
800	49.52599	3663.84	4159.10	10.6281	9.90444	3663.70	4158.92	9.8852
900	54.14137	3855.03	4396.44	10.8395	10.82773	3854.91	4396.30	10.0967
1000	58.75669	4053.01	4640.58	11.0392	11.75097	4052.91	4640.46	10.2964
1100	63.37198	4257.47	4891.19	11.2287	12.67418	4257.37	4891.08	10.4858
1200	67.98724	4467.91	5147.78	11.4090	13.59737	4467.82	5147.69	10.6662
1300	72.60250	4683.68	5409.70	11.5810	14.52054	4683.58	5409.61	10.8382
		P = 100 KPa	(99.62)			P = 200 KPa	(120.23)	
Saturated	1.69400	2506.06	2675.46	7.3593	0.88573	2529.49	2706.63	7.1271
150	1.93636	2582.75	2776.38	7.6133	0.95964	2576.87	2768.80	7.2795
200	2.17226	2658.05	2875.27	7.8342	1.08034	2654.39	2870.46	7.5066

250	2.40604	2733.73	2974.33	8.0332	1.19880	2731.22	2970.98	7.7085
300	2.63876	2810.41	3074.28	8.2157	1.31616	2808.55	3071.79	7.8926
400	3.01263	2967.85	3278.11	8.5434	1.54930	2966.69	3276.55	8.2217
500	3.56547	3131.54	3488.09	8.8314	1.78139	3130.75	3487.03	8.5132
600	4.02781	3301.94	3704.72	9.0975	2.01297	3301.36	3703.96	8.7769
700	4.48986	3479.24	3928.23	9.3398	2.24426	3478.81	3927.66	9.0194
800	4.95174	3663.53	4158.71	9.5652	2.47539	3663.19	4158.27	9.2450
900	5.41353	3854.77	4396.12	9.7767	2.70643	3854.49	4395.77	9.4565
1000	5.87526	4052.78	4640.31	9.9764	2.93740	4052.53	4640.01	9.6563
1100	6.33696	4257.25	4890.95	10.1658	3.16834	4257.53	4890.68	9.8458
1200	6.79863	4467.70	5147.56	10.3462	3.39927	4467.46	5147.32	10.0262
1300	7.26030	4683.47	5409.49	10.5182	3.63018	4683.23	5409.26	10.1982
		P = 300 KPa	(133.5)			P = 400 KPa	(143.63)	
Saturated	0.60582	2543.55	2775.30	6.9918	0.46246	2553.55	2738.53	6.8958
150	0.63388	2570.79	2760.95	7.0778	0.47084	2564.48	2752.82	6.9299
200	0.71629	2650.65	2865.54	7.3115	0.53422	2646.83	2860.51	7.1706
250	0.79636	2728.69	2967.59	7.5165	0.59512	2726.11	2964.16	7.3788
300	0.87529	2806.69	3069.28	7.7022	0.65484	2804.81	3066.75	7.5661
400	1.03151	2965.53	3274.98	8.0329	0.77232	2964.36	3273.41	7.8984
500	1.18669	3129.95	3485.96	8.3250	0.88934	3129.15	3484.89	8.1912
600	1.34136	3300.79	3703.20	8.5892	1.00555	3300.22	3702.44	8.4557
700	1.49573	3478.38	3927.10	8.8319	1.12147	3477.95	3926.53	8.6987
800	1.64994	3662.85	4157.83	9.0575	1.23422	3662.51	4157.40	8.9244

(*continued*)

Table 9 *Continued*

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	V (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
		P = 300 KPa	(133.5)			P = 400 KPa	(143.63)	
900	1.80406	3854.20	4395.42	9.2691	1.35288	3853.91	4395.06	9.1361
1000	1.95812	4052.27	4639.71	9.4689	1.46847	4052.02	4639.41	9.3360
1100	2.11214	4256.77	4890.41	9.6585	1.58404	4256.53	4890.15	9.5255
1200	2.26614	4467.23	5147.07	9.8389	1.69958	4466.99	5146.83	9.7059
1300	2.42013	4682.99	5409.03	10.0109	1.81511	4682.75	5408.80	9.8780
		P = 500 KPa	(151.86)			P = 600 KPa	(158.85)	
Saturated	0.37489	2561.23	2748.67	6.8212	0.31567	2567.40	2756.80	6.7600
200	0.42492	2642.91	2855.37	7.0592	0.35202	2638.91	2850.12	6.9665
250	0.47436	2723.50	2960.68	7.2708	0.39383	2720.86	2957.16	7.1816
300	0.52256	2802.91	3064.20	7.4598	0.43437	2801.00	3061.63	7.3723
350	0.57012	2882.59	3167.65	7.6528	0.47424	2881.12	3156.66	7.5463
400	0.61728	2963.19	3271.83	7.7937	0.51372	2962.02	3270.25	7.7058
500	0.71093	3128.35	3483.82	8.0872	0.59199	3127.55	3482.75	8.0020
600	0.80406	3299.64	3701.67	8.3521	0.66974	3299.07	3700.91	8.2673
700	0.89691	3477.52	3925.97	8.5952	0.74720	3477.08	3925.41	8.5107
800	0.98959	3662.17	4156.96	8.8211	0.82450	3661.83	4156.52	8.7367
900	1.08217	3853.63	4394.71	9.0329	0.90169	3853.34	4394.36	8.9485
1000	1.17469	4051.76	4639.11	9.2328	0.97883	4051.51	4638.81	9.1484
1100	1.26718	4256.29	4889.88	9.4224	1.05594	4256.05	4889.61	9.3381

1200	1.35964	4464.76	5164.58	9.6028	1.13302	446.52	5146.34	9.5185
1300	1.45210	4682.52	5408.57	9.7749	1.21009	4682.28	5408.34	9.6906
		P = 800 KPa	(170.43)			P = 1000 KPa	(179.91)	
Saturated	0.24043	2576.79	2769.13	6.6627	0.19444	2583.64	2778.08	6.5864
200	0.26080	2630.61	2839.25	6.8158	0.20596	2621.90	2827.86	6.6939
250	0.29314	2715.46	2949.97	7.0384	0.23268	2709.91	2942.59	6.9246
300	0.32411	2797.14	3056.43	7.2327	0.25794	2793.21	3051.15	7.1228
350	0.35439	2878.16	3161.68	7.4088	0.28247	2875.18	3157.65	7.3010
400	0.38426	2959.66	3267.07	7.5715	0.30659	2957.29	3263.88	7.4650
500	0.44331	3125.95	3480.60	7.8672	0.35411	3124.34	3478.44	7.7621
600	0.50184	3297.91	3699.38	8.1332	0.40109	3296.76	3697.85	8.0289
700	0.56007	3476.22	3924.27	8.3770	0.44779	3475.35	3923.14	8.2731
800	0.61813	3661.14	4155.65	8.6033	0.49432	3660.46	4154.78	8.4669
900	0.67610	3852.77	4393.65	8.8153	0.54075	3852.19	4392.94	8.7118
1000	0.73401	4051.00	4638.20	9.0153	0.58712	4050.49	4637.60	8.9119
1100	0.79188	4255.57	4889.08	9.2049	0.63345	4255.09	4888.55	9.1016
1200	0.84974	4466.05	5145.85	9.3854	0.67977	4465.58	5145.36	9.2821
1300	0.90758	4681.81	5407.87	9.5575	0.72608	4681.33	5407.41	9.4542
		P = 1200 KPa	(187.99)			P = 1400 KPa	(195.07)	
Saturated	0.16333	2588.82	2784.82	6.5233	0.14084	2592.83	2790.00	6.4692
200	0.16930	2612.74	2815.90	6.5898	0.14302	2603.09	2803.32	6.4975
250	0.19235	2704.20	2935.01	6.8293	0.16350	2698.32	2927.22	6.7467
300	0.21382	2789.22	3045.80	7.0316	0.18228	2785.16	3040.35	6.9533
350	0.23452	2872.16	3153.59	7.2120	0.20026	2869.12	3149.49	7.1359

(*continued*)

Table 9 *Continued*

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	V (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
		P = 1200 KPa	(187.99)			P = 1400 KPa	(195.07)	
400	0.25480	2954.90	3260.66	7.3773	0.21780	2952.50	3257.42	7.3025
500	0.29463	3122.72	3476.28	7.6758	0.25215	3121.10	3474.11	7.6026
600	0.33393	3295.60	3696.32	7.9434	0.28596	3294.44	3694.78	7.8710
700	0.37294	3474.48	3922.01	8.1881	0.31947	3473.61	3920.87	8.1660
800	0.41177	3659.77	4153.90	8.4149	0.35281	3659.09	4153.03	8.3431
900	0.45051	3851.62	4392.23	8.6272	0.38606	3851.05	4391.53	8.5555
1000	0.48919	4049.98	4637.00	8.8274	0.41926	4049.47	4636.41	8.7558
1100	0.52783	4254.61	4888.02	9.0171	0.45239	4254.14	4887.49	8.9456
1200	0.56646	4465.12	5144.87	9.1977	0.48552	4464.65	5144.38	9.1262
1300	0.60507	4680.86	5406.95	9.3698	0.51864	4680.39	5406.49	9.2983
		P = 1600 KPa	(201.40)			P = 1800 KPa	(207.15)	
Saturated	0.12380	2595.95	2794.02	6.4217	0.11042	2598.38	2797.13	6.3793
250	0.14148	2692.26	2919.20	6.6732	0.12497	2686.02	2910.96	6.6066
300	0.15862	2781.03	3034.83	6.8844	0.14021	2776.83	3029.21	6.8226
350	0.17456	2866.05	3145.35	7.0693	0.15457	2862.95	3141.18	7.0099
400	0.19005	2950.09	3254.17	7.2373	0.16847	2947.66	3250.90	7.1793
500	0.22029	3119.47	3471.93	7.5389	0.19550	3117.84	3469.75	7.4824
600	0.24998	3293.27	3693.23	7.8080	0.22199	3292.10	3691.69	7.7523
700	0.27937	3472.74	3919.73	8.0535	0.24818	3471.87	3918.59	7.9983
800	0.30859	3658.40	4152.15	8.2808	0.27420	3657.71	4151.27	8.2258
900	0.33772	3850.47	4390.82	8.4934	0.30012	3849.90	4390.11	8.4386

1000	0.36678	4048.96	4635.81	8.6938	0.32598	4048.45	4635.21	8.6390
1100	0.39581	4253.66	4886.95	8.8837	0.35180	4253.18	4886.42	8.8290
1200	0.42482	4464.18	5143.89	9.0642	0.37761	4463.71	5143.40	9.0096
1300	0.45382	4679.92	5406.02	9.2364	0.40340	4679.44	5405.56	9.1817
		P = 2000 KPa	(212.42)			P = 2500 KPa	(223.99)	
Saturated	0.09963	2600.26	2799.51	6.3408	0.07998	2603.13	2803.07	6.2574
250	0.11144	2679.58	2902.46	6.5452	0.08700	2662.55	2880.06	6.4084
300	0.12547	2772.56	3023.50	6.7663	0.09890	2761.56	3008.81	6.6437
350	0.13857	2859.81	3136.96	6.9562	0.10976	2851.84	3126.24	6.8402
400	0.15120	2945.21	3247.60	7.1270	0.12010	2939.03	3239.28	7.0147
450	0.16353	3030.41	3357.48	7.2844	0.13014	3025.43	3350.77	7.1745
500	0.17568	3116.20	3467.58	7.4316	0.13998	3112.08	3462.04	7.3233
600	0.19960	3290.93	3690.14	7.7023	0.15930	3287.99	3686.25	7.5960
700	0.22323	3470.99	3917.45	7.9487	0.17832	3468.80	3914.59	7.8435
800	0.24668	3657.03	4150.40	8.1766	0.19716	3655.30	4148.20	8.0720
900	0.27004	3849.33	4389.40	8.3895	0.21590	3847.89	4387.64	8.2853
1000	0.29333	4047.94	4634.61	8.5900	0.23458	4046.67	4633.12	8.4860
1100	0.31659	4252.71	4885.89	8.7800	0.25322	4251.52	4884.57	8.6761
1200	0.33984	4463.25	5142.92	8.9606	0.27185	4462.08	5141.70	8.8569
1300	0.36306	4678.97	5405.10	9.1328	0.29046	4677.80	5403.95	9.0921
		P = 3000 KPa	(233.90)			P = 3500 KPa	(242.60)	
Saturated	0.06668	2604.10	2804.14	6.1869	0.05707	2603.70	2803.43	6.1252
250	0.07058	2644.00	2855.75	6.2871	0.05873	2623.65	2829.19	6.1748
300	0.08114	2750.05	2993.43	6.5389	0.06842	2737.99	2977.46	6.4460

(*continued*)

Table 9 *Continued*

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	V (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
		P = 3000 KPa	(233.90)			P = 3500 KPa	(242.60)	
350	0.09053	2843.66	3115.25	6.7427	0.07678	2835.27	3103.99	6.6578
400	0.09936	2932.75	3230.82	6.9211	0.08453	2926.37	3222.24	6.8404
450	0.10787	3020.38	3344.00	7.0833	0.09196	3015.28	3337.15	7.0051
500	0.11619	3107.92	3456.48	7.2337	0.09918	3103.73	3450.87	7.1571
600	0.13243	3285.03	3682.34	7.5084	0.11324	3282.06	3678.40	7.4338
700	0.14838	3466.59	3911.72	7.7571	0.12699	3464.37	3908.84	7.6837
800	0.16414	3653.58	4146.00	7.9862	0.14056	3651.84	4143.80	7.9135
900	0.17980	3846.46	4385.87	8.1999	0.15402	3845.02	4384.11	8.1275
1000	0.19541	4045.40	4631.63	8.4009	0.16743	4044.14	4630.14	8.3288
1100	0.21098	4250.33	4883.26	8.5911	0.18080	4249.14	4881.94	8.5191
1200	0.22652	4460.92	5140.49	8.7719	0.19415	4459.76	5139.28	8.7000
1300	0.24206	4676.63	5402.81	8.9942	0.20749	4675.45	5401.66	8.8723
		P = 4000 KPa	(250.40)			P = 4500 KPa	(257.48)	
Saturated	0.04978	2602.27	2801.38	6.0700	0.04406	2600.03	2798.29	6.0198
300	0.05884	2725.33	2960.68	6.3614	0.05135	2712.00	2943.07	6.2827
350	0.06645	2826.65	3092.43	6.5820	0.05840	2817.78	3080.57	6.5130
400	0.07341	2919.88	3213.51	6.7689	0.06475	2913.29	3204.65	6.7046
450	0.08003	3010.13	3330.23	6.9362	0.07074	3004.91	3323.23	6.8745
500	0.08643	3099.49	3445.21	7.0900	0.07661	3095.23	3439.51	7.0300
600	0.09885	3279.06	3674.44	7.3688	0.08765	3276.04	3670.47	7.3109
700	0.11095	3462.15	3905.94	7.6198	0.09847	3459.91	3903.04	7.5631

800	0.12287	3650.11	4141.59	7.8502	0.10911	3648.37	4139.38	7.7942
900	0.13469	3843.59	4382.34	8.0647	0.11965	3842.15	4380.58	8.0091
1000	0.14645	4042.87	4328.65	8.2661	0.13013	4041.61	4627.17	8.2108
1100	0.15817	4247.96	4880.63	8.4566	0.14056	4246.78	4879.32	8.4014
1200	0.16987	4458.60	5138.07	8.6376	0.15098	4457.45	5136.87	8.5824
1300	0.18156	4674.29	5400.52	8.8099	0.16139	4673.12	5399.38	8.7548
		P = 5000 KPa	(263.99)			P = 6000 KPa	(275.64)	
Saturated	0.03944	2597.12	2794.33	5.9733	0.03244	2589.69	2784.33	5.8891
300	0.04532	2697.94	2924.53	6.2083	0.03616	2667.22	2884.19	6.0673
350	0.05194	2808.67	3068.39	6.4492	0.04223	2789.61	3042.97	6.3334
400	0.05781	2906.58	3195.64	6.6458	0.04739	2892.81	3177.17	6.5407
450	0.06330	2999.64	3316.15	6.8185	0.05214	2988.90	3301.76	6.7192
500	0.06857	3090.92	3433.76	6.9758	0.05665	3082.20	3422.12	6.8802
550	0.07368	3181.82	3550.23	7.1217	0.06101	3174.57	3540.62	7.0287
600	0.07879	3273.01	3666.47	7.2588	0.06525	3266.89	3658.40	7.1676
700	0.08849	3457.67	3900.13	7.5122	0.07352	3453.15	3894.28	7.4234
800	0.09811	3646.62	4137.17	7.7440	0.08160	3643.12	4132.74	7.6566
900	0.10762	3840.71	4378.82	7.9593	0.08958	3837.84	4375.29	7.8727
1000	0.11707	4040.35	4625.69	8.1612	0.09749	4037.83	4622.74	8.0751
1100	0.12648	4245.61	4878.02	8.3519	0.10536	4243.26	4875.42	8.2661
1200	0.13587	4456.30	5135.67	8.5330	0.11321	4454.00	5133.28	8.4473
1300	0.14526	4671.96	5398.24	8.7055	0.12106	4669.64	5397.97	8.6199

(*continued*)

Table 9 *Continued*

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	V (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
		P = 7000 KPa	(285.88)			P = 8000 KPa	(295.06)	
Saturated	0.02737	2580.48	2772.07	5.8132	0.02352	2569.79	2757.94	5.7431
300	0.02947	2632.13	2838.40	5.9304	0.02426	2590.93	2784.98	5.7905
350	0.03524	2769.34	3016.02	6.2282	0.02995	2747.67	2987.30	6.1300
400	0.03993	2878.55	3158.07	6.4477	0.03432	2863.75	3138.28	6.3633
450	0.04416	2977.91	3287.04	6.6326	0.03817	2966.66	3271.99	6.5550
500	0.04814	3073.33	3410.29	6.7974	0.04175	3064.30	3398.27	6.7239
550	0.05195	3167.21	3530.87	6.9486	0.04516	3159.76	3521.01	6.8778
600	0.05565	3260.69	3650.26	7.0894	0.04845	3254.43	3642.03	7.0205
700	0.06283	3448.60	3888.39	7.3476	0.05481	3444.00	3882.47	7.2812
800	0.06981	3639.61	4128.30	7.5822	0.06097	3636.08	4123.84	7.5173
900	0.07669	3834.96	4371.77	7.7991	0.06702	3832.08	4368.26	7.7350
1000	0.08350	4035.31	4619.80	8.0020	0.07301	4032.81	4616.87	7.9384
1100	0.09027	4240.92	4872.83	8.1933	0.07896	4238.60	4870.25	8.1299
1200	0.09703	4451.72	5130.90	8.3747	0.08489	4449.45	5128.54	8.3115
1300	0.10377	4667.33	5393.71	8.5472	0.09080	4665.02	5391.46	8.4842
		P = 9000 KPa	(303.40)			P = 10000 KPa	(311.06)	
Saturated	0.02048	2557.75	2742.11	5.6771	0.01803	2544.41	2724.67	5.6140
300	0.02580	2724.38	2956.55	6.0361	0.02242	2699.16	2923.39	5.9442
350	0.02993	2848.38	3117.76	6.2853	0.02641	2832.38	3096.46	6.2119
400	0.03350	2955.13	3256.59	6.4846	0.02975	2943.32	3240.83	6.4189
450	0.03677	3055.12	3386.05	6.6575	0.03279	3045.77	3373.63	6.5965

500	0.03987	3152.20	3511.02	6.8141	0.03564	3144.54	3500.92	6.7561
550	0.04285	3248.09	3633.73	6.9588	0.03837	3241.68	3625.34	6.9028
600	0.04574	3343.65	3755.32	7.0943	0.04101	3338.22	3748.27	7.0397
700	0.04857	3439.38	3876.51	7.2221	0.04358	3434.72	3870.52	7.1687
800	0.05409	3632.53	4119.38	7.4597	0.04859	3628.97	4114.91	7.4077
900	0.05950	3829.20	4364.74	7.6782	0.05349	3826.32	4361.24	7.6272
1000	0.06482	4030.30	4613.95	7.8821	0.05832	4027.81	4611.04	7.8315
1100	0.07016	4236.28	4867.69	8.0739	0.06312	4233.97	4865.14	8.0236
1200	0.07544	4447.18	5126.18	8.2556	0.06789	4444.93	5123.84	8.2054
1300	0.08072	4662.73	5389.22	8.4283	0.07265	4660.44	5386.99	8.3783
		P = 12500 KPa	(327.89)			P = 15000 KPa	(342.24)	
Saturated	0.01350	2505.08	2673.77	5.4623	0.01034	2455.43	2610.49	5.3097
350	0.01613	2624.57	2826.15	5.7117	0.01147	2520.36	2692.41	5.4420
400	0.02000	2789.25	3039.30	6.0416	0.01565	2740.70	2975.44	5.8810
450	0.02299	2912.44	3199.78	6.2718	0.01845	2879.47	3156.15	6.1403
500	0.02560	3021.68	3341.72	6.4617	0.02080	2996.52	3308.53	6.3442
550	0.02801	3124.94	3475.13	6.6289	0.02293	3104.71	3448.61	6.5198
600	0.03029	3225.37	3604.75	6.7810	0.02491	3208.64	3582.30	6.6775
650	0.03248	3324.43	3730.44	6.9218	0.02680	3310.37	3712.32	6.8223
700	0.03460	3422.93	3855.41	7.0536	0.02861	3410.94	3840.12	6.9572
800	0.03869	3620.02	4103.69	7.2965	0.03210	3610.99	4092.43	7.2040
900	0.04267	3819.11	4352.48	7.5181	0.03546	3811.89	4343.75	7.4279
1000	0.04658	4021.59	4603.81	7.7237	0.03875	4015.41	4596.63	7.6347
1100	0.05045	4228.23	4858.82	7.9165	0.04200	4222.55	4852.56	7.8282
1200	0.05430	4439.33	5118.02	8.0987	0.04523	4433.78	5112.27	8.0108

(*continued*)

Table 9 *Continued*

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	V (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
		P = 12500 KPa	(327.89)			P = 15000 KPa	(342.24)	
1300	0.05813	4654.76	5381.44	8.2717	0.04845	4649.12	5375.94	8.1839
		P = 17500 KPa	(354.75)			P = 20000 KPa	(365.81)	
Saturated	0.00792	2390.19	2528.79	5.1418	0.00583	2293.05	2409.74	4.9269
400	0.01245	2684.98	2902.82	5.7212	0.00994	2619.22	2818.07	5.5539
450	0.01517	2844.15	3109.69	6.0182	0.01270	2806.16	3060.06	5.9016
500	0.01736	2970.25	3274.02	6.2382	0.01477	2942.82	3238.18	6.1400
550	0.01929	3083.84	3421.37	6.4229	0.01656	3062.34	3393.45	6.3347
600	0.02106	3191.51	3560.13	6.5866	0.01818	3174.00	3537.57	6.5048
650	0.02274	3296.04	3693.94	6.7356	0.01969	3281.46	3675.32	6.6582
700	0.02434	3398.78	3824.67	6.8736	0.02113	3386.46	3809.09	6.7993
750	0.02588	3500.56	3953.48	7.0026	0.02251	3490.01	3940.27	6.9308
800	0.02738	3601.89	4081.13	7.1245	0.02385	3592.73	4069.80	7.0544
900	0.03031	3804.67	4335.05	7.3507	0.02645	3797.44	4326.37	7.2830
1000	0.03316	4009.25	4589.37	7.5588	0.02897	4003.12	4582.45	7.4925
1100	0.03597	4216.90	4846.37	7.7530	0.03145	4211.30	4840.24	7.6874
1200	0.03876	4428.28	5106.59	7.9359	0.03391	4421.81	5100.96	7.8706
1300	0.04154	4643.52	5370.50	8.1093	0.03636	4637.95	5365.10	8.0441
		P = 25000 KPa				P = 30000 KPa		
375	0.001973	1798.60	1847.93	4.0319	0.001789	1737.75	1791.43	3.9303

400	0.006004	2430.05	2580.16	5.1418	0.002790	2067.34	2151.04	4.4728
425	0.007882	2609.21	2806.16	5.4722	0.005304	2455.06	2614.17	5.1503
450	0.009162	2720.65	2949.70	5.6743	0.006735	2619.30	2821.35	5.4423
500	0.011124	2884.29	3162.39	5.9592	0.008679	2820.67	3081.03	5.7904
550	0.012724	3017.51	3335.62	6.1764	0.010168	2970.31	3275.36	6.0342
600	0.014138	3137.51	3491.36	6.3602	0.011446	3100.53	3443.91	6.2330
650	0.015433	3251.64	3637.46	6.5229	0.012596	3221.04	3598.93	6.4057
700	0.016647	3361.39	3777.56	6.6707	0.013661	3335.84	3745.67	6.5606
800	0.018913	3574.26	4047.08	6.9345	0.015623	3555.60	4024.31	6.8332
900	0.021045	3782.97	4309.09	7.1679	0.017448	3768.48	4291.93	7.0717
1000	0.023102	3990.92	4568.47	7.3801	0.019196	3978.79	4554.68	7.2867
1100	0.025119	4200.18	4828.15	7.5765	0.020903	4189.18	4816.28	7.4845
1200	0.027115	4412.00	5089.86	7.7604	0.022589	4401.29	5078.97	7.6691
1300	0.029101	4626.91	5354.44	7.9342	0.024266	4615.96	5343.95	7.8432
	P = 35000 KPa				P = 40000 KPa			
375	0.001700	1702.86	1762.37	3.8721	0.001641	1677.09	1742.71	3.8283
400	0.002100	1914.02	1987.52	4.2124	0.001908	1854.52	1930.83	4.1134
425	0.003428	2253.42	2373.41	4.7747	0.002532	2096.83	2198.11	4.5028
450	0.004962	2498.71	2672.36	5.1962	0.003693	2365.07	2512.79	4.9459
500	0.006927	2751.88	2994.34	5.6281	0.005623	2678.36	2903.26	5.4699
550	0.008345	2920.94	3213.01	5.9025	0.006984	2869.69	3149.05	5.7784
600	0.009527	3062.03	3395.49	6.1178	0.008094	3022.61	3346.38	6.0113
650	0.010575	3189.79	3559.49	6.3010	0.009064	3158.04	3520.58	6.2054
700	0.011533	3309.89	3713.54	6.4631	0.009942	3283.63	3681.29	6.3750
800	0.013278	3536.81	4001.54	6.7450	0.011523	3517.89	3978.80	6.6662
900	0.014883	3753.96	4274.87	6.9886	0.012963	3739.42	4257.93	6.9150

(*continued*)

Table 9 *Continued*

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	V (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
	P = 35000 KPa				P = 40000 KPa			
1000	0.016410	3966.70	4541.05	7.2063	0.014324	3954.64	4527.59	7.1356
1100	0.017895	4178.25	4804.59	7.4056	0.015643	4167.38	4793.08	7.3364
1200	0.019360	4390.67	5068.26	7.5910	0.016940	4380.11	5057.72	7.5224
1300	0.020815	4605.09	5333.62	7.7652	0.018229	4594.28	5323.45	7.6969
	P = 50000 KPa				P = 60000 KPa			
375	0.001559	1638.55	1716.52	3.7638	0.001503	1609.34	1699.51	3.7140
400	0.001731	1788.04	1874.58	4.0030	0.001633	1745.34	1843.35	3.9317
425	0.002007	1959.63	2059.98	4.2733	0.001817	1892.66	2001.65	4.1625
450	0.002486	2159.60	2283.91	4.5883	0.002085	2053.86	2178.96	4.4119
500	0.003892	2525.45	2720.07	5.1725	0.002956	2390.53	2567.88	4.9320
550	0.005118	2763.61	3019.51	5.5485	0.003957	2658.76	2896.16	5.3440
600	0.006112	2941.98	3247.59	5.8177	0.004835	2861.14	3151.21	5.6451
650	0.006966	3093.56	3441.84	6.0342	0.005595	3028.83	3364.55	5.8829
700	0.007727	3230.54	3616.91	6.2189	0.006272	3177.25	3553.56	6.0824
800	0.009076	3479.82	3933.62	6.5290	0.007459	3441.60	3889.12	6.4110
900	0.010283	3710.26	4224.41	6.7882	0.008508	3680.97	4191.47	6.6805
1000	0.011411	3930.53	4501.09	7.0146	0.009480	3906.36	4475.16	6.9126
1100	0.012497	4145.72	4770.55	7.2183	0.010409	4124.07	4748.61	7.1194
1200	0.013561	4359.12	5037.15	7.4058	0.011317	4338.18	5017.19	7.3082
1300	0.014616	4572.77	5303.56	7.5807	0.012215	4551.35	5284.28	7.4837

Table 10 SI Compressed Liquid Water

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
		P = 5000 KPa	(263.99)			P = 10000 KPa	(311.06)	
Saturated	0.00129	1147.78	1154.21	2.9201	0.001452	1393.00	1407.53	3.3595
0	0.00099	0.03	5.02	0.0001	0.000995	0.10	10.05	0.0003
20	0.00100	83.64	88.64	0.2955	0.00997	83.35	93.62	0.2945
40	0.00101	166.93	171.95	0.5705	0.00100	166.33	176.36	0.5685
60	0.00101	250.21	255.28	0.5284	0.00101	249.34	259.47	0.8258
80	0.00103	333.69	338.83	1.0719	0.00102	332.56	324.81	1.0687
100	0.00104	417.50	422.71	1.3030	0.00104	416.09	426.48	1.2992
120	0.00106	501.79	507.07	1.5232	0.00105	500.07	510.61	1.5188
140	0.00108	586.74	592.13	1.7342	0.00107	584.67	595.40	1.7291
160	0.00110	672.61	678.10	1.9374	0.00110	670.11	681.07	1.9316
180	0.00112	759.62	765.24	2.1341	0.00112	756.63	767.83	2.1274
200	0.00115	848.08	853.85	2.3254	0.00115	844.49	855.97	2.3178
220	0.00119	938.43	944.36	2.5128	0.00118	934.07	945.88	2.5038
240	0.00123	1031.34	1037.47	2.6978	0.00122	1025.94	1038.13	2.6872
260	0.00127	1127.92	1134.30	2.8829	0.00126	1121.03	1133.68	2.8698
280					0.00132	1220.90	1234.11	3.0547
300					0.00140	1328.34	1342.31	3.2468
		P = 15000 KPa	(342.24)			P = 20000 KPa	(365.81)	
Saturated	0.001658	1585.58	1610.45	3.6847	0.002035	1785.47	1826.18	4.0137
0	0.000993	0.15	15.04	0.0004	0.00099	0.20	20.00	0.0004

(*continued*)

Table 10 *Continued*

Temp (C)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)	v (m^3/kg)	u (KJ/kg)	h (KJ/kg)	s (KJ/kg K)
		P = 15000 KPa	(342.24)			P = 20000 KPa	(365.81)	
20	0.000995	83.05	97.97	0.2934	0.000993	82.75	102.61	0.2922
40	0.00100	165.73	180.75	0.5665	0.00100	165.15	185.14	0.5646
60	0.00101	248.49	263.65	0.8231	0.00101	247.66	267.82	0.8205
80	0.00102	331.46	346.79	1.0655	0.00102	330.38	350.78	1.0623
100	0.00104	414.72	430.26	1.2954	0.00103	413.37	434.04	1.2917
120	0.00105	498.39	514.17	1.5144	0.00105	496.75	517.74	1.5101
140	0.00107	582.64	598.70	1.7241	0.00107	580.67	602.03	1.7192
160	0.00109	667.69	684.07	1.9259	0.00109	665.34	687.11	1.9203
180	0.00112	753.74	770.48	2.1209	0.00111	750.94	773.18	2.1146
200	0.00114	841.04	858.18	2.3103	0.00114	837.90	860.47	2.3031
220	0.00117	929.89	947.52	2.4952	0.00117	925.89	949.27	2.4869
240	0.00121	1020.82	1038.99	2.6770	0.00120	1015.94	1040.04	2.6673
260	0.00126	1114.59	1133.41	2.8575	0.00125	1108.53	1133.45	2.8459
280	0.00131	1212.47	1232.09	3.0392	0.00130	1204.69	1230.62	3.0248
300	0.00138	1316.58	1337.23	3.2259	0.00136	1306.10	1333.29	3.2071
320	0.00147	1431.05	1453.13	3.4246	0.00144	1415.66	1444.53	3.3978
340	0.00163	1567.42	1591.88	3.6545	0.00157	1539.64	1571.01	3.6074
360					0.00182	1702.78	1739.23	3.8770

	P = 30000 KPa				P = 50000 KPa			
0	0.000986	0.25	29.82	0.0001	0.000977	0.20	49.03	−0.0014
20	0.000989	82.16	111.82	0.2898	0.000980	80.98	130.00	0.2847
40	0.000995	164.01	193.87	0.5606	0.000987	161.84	211.20	0.5526
60	0.001004	246.03	276.16	0.8153	0.000996	242.96	292.77	0.8051
80	0.001016	328.28	358.75	1.0561	0.001007	324.32	374.68	1.0439
100	0.001029	410.76	441.63	1.2844	0.001020	405.86	456.87	1.2703
120	0.001044	493.58	524.91	1.5017	0.001035	487.63	539.37	1.4857
140	0.001062	576.86	608.73	1.7097	0.001052	569.76	622.33	1.6915
160	0.001082	660.81	693.27	1.9095	0.001070	652.39	705.91	1.8890
180	0.001105	745.57	778.71	2.1024	0.001091	735.68	790.24	2.0793
200	0.001130	831.34	865.24	2.2892	0.001115	819.73	875.46	2.2634
220	0.001159	918.32	953.09	2.4710	0.001141	904.67	961.71	2.4419
240	0.001192	1006.84	1042.60	2.6489	0.001170	990.69	1049.20	2.6158
260	0.001230	1097.38	1134.29	2.8242	0.001203	1078.06	1138.23	2.7860
280	0.001275	1190.69	1228.96	2.9985	0.001242	1167.19	1229.26	2.9536
300	0.001330	1287.89	1327.80	3.1470	0.001286	1258.66	1322.95	3.1200
320	0.001400	1390.64	1462.63	3.3538	0.001339	1353.23	1420.17	3.2867
340	0.001492	1501.71	1546.47	3.5425	0.001403	1451.91	1522.07	3.4556
360	0.001627	1626.57	1675.36	3.7492	0.001484	1555.97	1630.16	3.6290
380	0.001869	1781.35	1837.43	4.0010	0.001588	1667.13	1746.54	3.8100

Table 11 SI Saturated Solid—Saturated Vapor Water

		Specific volume (m^3/kg)			Internal energy (KJ/kg)			Enthalpy (KJ/kg)			Entropy (KJ/kg K)		
Temp C T	Pressure KPa P	Saturated solid (v_i)	Evap. (v_{fg})	Saturated vapor (v_g)	Saturated solid (u_i)	Evap. (u_{ig})	Saturated vapor (u_g)	Saturated solid (h_i)	Evap. (v_{fg})	Saturated vapor (v_g)	Saturated solid (s_i)	Evap. (s_{ig})	Saturated vapor (s_g)
0.01	0.6113	0.0010908	206.152	2036.153	−333.40	2708.7	2375.3	−333.40	2834.7	2501.3	−1.2210	10.3772	9.1562
0	0.6108	0.0010908	206.314	206.315	−333.42	2708.7	2375.3	−333.42	2834.8	2501.3	−1.2211	10.3776	9.1565
−2	0.5177	0.0010905	241.662	241.663	−337.61	2710.2	2372.5	−337.61	2835.3	2497.6	−1.2369	10.4562	9.2193
−4	0.4376	0.0010901	283.798	283.799	−341.78	2711.5	2369.8	−341.78	2835.7	2494.0	−1.2526	10.5368	9.2832
−6	0.3689	0.0010898	334.138	334.139	−345.91	2712.9	2367.0	−345.91	2836.2	2490.3	−1.2683	10.6165	9.3482
−8	0.3102	0.0010894	394.413	394.414	−350.02	2714.2	2364.2	−350.02	2836.6	2486.6	−1.2939	10.6982	9.4143
−10	0.2601	0.0010891	466.756	466.757	−354.09	2715.5	2361.4	−354.09	2837.0	2482.9	−1.2995	10.7809	9.4815
−12	0.2176	0.0010888	553.802	553.803	−358.14	2716.8	2358.7	−358.14	2837.3	2479.2	−1.3150	10.8648	9.5498
−14	0.1815	0.0010884	658.824	658.824	−362.16	2718.0	2355.9	−362.16	2837.6	2475.5	−1.3306	10.9498	9.6192
−16	0.1510	0.0010881	785.906	785.907	−366.14	2719.2	2353.1	−366.14	2837.9	2471.8	−1.3461	11.0359	9.6898
−18	0.1252	0.0010878	940.182	940.183	−370.10	2720.4	2350.3	−370.10	2838.2	2468.1	−1.3617	11.1233	9.7616
−20	0.10355	0.0010874	1128.112	1128.113	−374.03	2721.6	2347.5	−374.03	2838.4	2464.3	−1.3772	11.2120	9.8348
−22	0.08535	0.0010871	1357.863	1357.864	−377.93	2722.7	2344.7	−377.93	2838.6	2460.6	−1.3928	11.3020	9.9093
−24	0.07012	0.0010868	1639.752	1639.753	−381.80	2723.7	2342.0	−381.80	2838.7	2456.9	−1.4083	11.3935	9.9852
−26	0.05741	0.0010864	1986.775	1986.776	−385.64	2724.8	2339.2	−385.64	2838.9	2453.2	−1.4239	11.4864	10.0625
−28	0.04684	0.0010861	2145.200	2145.201	−389.45	2725.8	2336.4	−389.45	2839.0	2449.5	−1.4394	11.5808	10.1413
−30	0.03810	0.0010858	2945.227	2945.228	−393.23	2726.8	2333.6	−393.23	2839.0	2445.8	−1.4550	11.6765	10.2215
−32	0.03090	0.0010854	3601.822	3601.823	−396.98	2727.8	2330.8	−396.98	2839.1	2442.1	−1.4705	11.7733	10.3028
−34	0.02499	0.0010851	4416.252	4416.253	−400.71	2728.7	2328.0	−400.71	2839.1	2438.4	−1.4860	11.8713	10.3853
−36	0.02016	0.0010848	5430.115	5430.116	−404.40	2729.6	2325.2	−404.40	2839.1	2434.7	−1.5014	11.9704	10.4690
−38	0.01618	0.0010844	6707.021	6707.022	−408.06	2730.5	2322.4	−408.06	2839.0	2431.0	−1.5168	12.0714	10.5546
−40	0.01286	0.0010841	8366.395	8366.396	−411.70	2731.3	2319.6	−411.70	2839.9	2427.2	−1.5321	12.1768	10.6447

THERMODYNAMIC PROPERTIES OF LIQUIDS

Table 12 Water at Saturation Pressure

Temp T			Density ρ (kg/m^3)	Coefficient of thermal expansion, $\beta \times 10^4$ (l/K)	Specific heat, c_p (J/kg K)	Thermal conductivity, k (W/m k)	Thermal Diffusivity, $\alpha \times 10^6$ (m^2/s)	Absolute viscosity, $\mu \times 10^6$ (N s/m^2)	Kinematic viscosity, $\nu \times 10^6$ (m^2/s)	Prandtl number, Pr	$g\beta/v^2 \times 10^{-9}$ (l/K m^3)
°F	K	°C	$\times 6.243 \times 10^{-2}$ = (lb_m/ft^3)	$\times 0.5556$ = (l/R)	$\times 2.388 \times 10^{-4}$ = (Btu/lb_m °F)	$\times$ 0.5777 = (Btu/h ft °F)	$\times 3.874 \times 10^4$ = (ft^2/h)	$\times 0.6720$ = (lb_m/ft s)	$\times 3.874 \times 10^4$ = (ft^2/h)		$\times 1.573 \times 10^{-2}$ = (l/R ft^3)
32	273	0	999.9	−0.7	4266	0.558	0.131	1794	1.789	13.7	—
41	278	5	1000.0	—	4206	0.568	0.135	1535	1.535	11.4	—
50	283	10	999.7	0.95	4195	0.577	0.137	1296	1.300	9.5	0.551
59	288	15	999.1	—	4187	0.585	0.141	1136	1.146	8.1	—
68	293	20	998.2	2.1	4182	0.597	0.143	993	1.006	7.0	2.035
77	298	25	997.1	—	4178	0.606	0.146	880.6	0.884	6.1	—
86	303	30	995.7	3.0	4176	0.615	0.149	792.4	0.805	5.4	4.540
95	308	35	994.1	—	4175	0.624	0.150	719.8	0.725	4.8	—

(*continued*)

Table 12 *Continued*

Temp T			Density ρ (kg/m^3)	Coefficient of thermal expansion, $\beta \times 10^4$ (l/K)	Specific heat, c_p (J/kg K)	Thermal conductivity, k (W/m k)	Thermal Diffusivity, $\alpha \times 10^6$ (m^2/s)	Absolute viscosity, $\mu \times 10^6$ (N s/m^2)	Kinematic viscosity, $\nu \times 10^6$ (m^2/s)	Prandtl number, Pr	$g\beta/v^2 \times 10^{-9}$ (l/K m^3)
			$\times 6.243 \times 10^{-2}$	$\times 0.5556$	$\times 2.388 \times 10^{-4}$	$\times$ 0.5777	$\times 3.874 \times 10^4$	$\times 0.6720$	$\times 3.874 \times 10^4$		$\times 1.573 \times 10^{-2}$
°F	K	°C	$= (lb_m/ft^3)$	= (l/R)	= (Btu/lb_m °F)	= (Btu/h ft °F)	= (ft^2/h)	= (lb_m/ft s)	= (ft^2/h)		= (l/R ft^3)
104	313	40	992.2	3.9	4175	0.633	0.151	658.0	0.658	4.3	8.333
113	318	45	990.2	—	4176	0.640	0.155	605.1	0.611	3.9	—
122	323	50	988.1	4.6	4178	0.647	0.157	555.1	0.556	3.55	14.59
167	348	75	974.9	—	4190	0.671	0.164	376.6	0.366	2.23	—
212	373	100	958.4	7.5	4211	0.682	0.169	277.5	0.294	1.75	85.09
248	393	120	943.5	8.5	4232	0.685	0.171	235.4	0.244	1.43	140.0
284	412	140	926.3	9.7	4257	0.684	0.172	201.0	0.212	1.23	211.7
320	433	160	907.6	10.8	4285	0.680	0.173	171.6	0.191	1.10	290.3
356	453	180	886.6	12.1	4396	0.673	0.172	152.0	0.173	1.01	396.5
396	473	200	862.8	13.5	4501	0.665	0.170	139.3	0.160	0.95	517.2
428	493	220	837.0	15.2	4605	0.652	0.167	124.5	0.149	0.90	671.4
464	513	240	809.0	17.2	4731	0.634	0.162	113.8	0.141	0.86	848.5
500	533	260	779.0	20.0	4982	0.613	0.156	104.9	0.135	0.86	1076.0
536	553	280	750.0	23.8	5234	0.588	0.147	98.07	0.131	0.89	1360.0
572	573	300	712.5	29.5	5694	0.564	0.132	92.18	0.128	0.98	1766.0

Table 13 Water at Saturation Temperature

Saturation Temperature T			Saturation Pressure $P \times 10^{-5}$ (N/m^2)	Specific volume of Vapor v_g(m^3/kg)	Enthalpy		
					h_f (KJ/kg)	h_g (KJ/kg) $\times 0.430 =$ (Btu/lb_m)	h_{fg} (KJ/kg)
°F	K	°C	$\times 1.450 \times 10^{-4}$ = (psi)	$\times 16.02$ = (ft^3/lb_m)	$\times 0.430$ = (Btu/lb_m)	$\times 0.430$ = (Btu/lb_m)	$\times 0.430$ = (Btu/lb_m)
32	273	0	0.0061	206.3	−0.04	2501	2501
60	283	10	0.0122	106.4	41.99	2519	2477
68	293	20	0.0233	57.833	83.86	2537	2453
86	303	30	0.0424	32.929	125.66	2555	2430
104	313	40	0.0737	19.548	167.45	2574	2406
122	323	50	0.1233	12.048	209.26	2591	2382
140	333	60	0.1991	7.680	251.09	2609	2358
158	343	70	0.3116	5.047	292.97	2626	2333
176	353	80	0.4735	3.410	334.92	2643	2308
194	363	90	0.7010	2.362	376.94	2660	2283
212	373	100	1.0132	1.673	419.06	2676	2257
248	393	120	1.9854	0.892	503.7	2706	2202
284	413	140	3.6136	0.508	589.1	2734	2144
320	433	160	6.1804	0.306	675.5	2757	2082
356	453	180	10.027	0.193	763.1	2777	2014
392	473	200	15.551	0.127	852.4	2791	1939
428	493	220	23.201	0.0860	943.7	2799	1856
464	513	240	33.480	0.0596	1037.6	2801	1764
500	533	260	46.940	0.0421	1135.0	2795	1660
536	553	280	64.191	0.0301	1237.0	2778	1541
572	573	300	85.917	0.0216	1345.4	2748	1403

Table 14 Unused Engine Oil (Saturated Liquid)

Temp T			Density ρ (kg/m^3)	Coefficient of thermal expansion, β × 10^4 (l/K)	Specific heat, c_p (J/kg K)	Thermal conductivity k (W/m k)	Thermal diffusivity, α × 10^{10} (m^2/s)	Absolute viscosity, μ × 10^3 (N s/m^2)	Kinematic viscosity, v × 10^6 (m^2/s)	Prandtl number, Pr	gβ/v^2 (l/K m^3)
			× 6.243 × 10^{-2}	× 0.5556	× 2.388 × 10^{-4}	× 0.5777	× 3.874 × 10^4	× 0.6720	× 3.874 × 10^4		× 1.573 × 10^{-2}
°F	K	°C	= (lb$_m$/ft^3)	= (l/R)	= (Btu/lb$_m$ °F)	= (Btu/h ft °F)	= (ft^2/h)	= (lb$_m$/ft s)	= (ft^2/h)		= (l/R ft^3)
32	273	0	899.1		1796	0.147	911	3848.0	4280.0	471.0	
68	293	20	888.2	0.70	1880	0.145	872	799.0	900.0	104.0	8475
104	313	40	876.1		1964	0.144	834	210.0	240.0	28.7	
140	333	60	864.0		2047	0.140	800	72.5	83.9	10.5	
176	353	80	852.0		2121	0.138	769	32.0	37.5	4.90	
212	373	100	840.0		2219	0.137	738	17.1	20.3	2.76	
248	393	120	829.0		2307	0.135	710	10.3	12.4	1.75	
284	413	140	816.9		2395	0.133	686	6.54	8.0	1.16	
320	433	160	805.9		2483	0.132	663	4.51	5.6	0.84	

Table 15 Mercury (Saturated Liquid)

°F	Temp T K	°C	Density ρ (kg/m^3) × 6.243 × 10^{-2} = (lb$_m$/ft^3)	Coefficient of thermal expansion, β × 10^4 (l/K) × 0.556 = (l/R)	Specific heat, c_p (J/kg K) × 2.388 × 10^{-4} = (Btu/lb$_m$ °F)	Thermal conductivity k (W/m k) × 0.5777 = (Btu/h ft °F)	Thermal diffusivity, α × 10^{10} (m^2/s) × 3.874 × 10^4 = (ft^2/h)	Absolute viscosity, μ × 10^4 (N s/m^2) × 0.6720 = (lb$_m$/ft s)	Kinematic viscosity, v × 10^6 (m^2/s) × 3.874 × 10^4 = (ft^2/h)	Prandtl number, Pr	gβ/v^2 × 10^{-10} (l/K m^3) × 1.573 × 10^{-2}
32	273	0	13,628		140.3	8.20	42.99	16.90	0.124	0.0288	
68	293	20	13,579	1082	139.4	8.69	46.06	15.48	0.114	0.0249	13.73
122	323	50	13,506		138.6	9.40	50.22	14.05	0.104	0.0207	
212	373	100	13,385		137.3	10.51	57.16	12.42	0.0928	0,0162	
302	423	150	13,264		136.5	11.49	63.54	11.31	0.0853	0.0134	
392	473	200	13,145		157.0	12.34	69.08	10.54	0.0802	0.0116	
482	523	250	13,026		135.7	13.07	74.06	9.96	0.0765	0.0103	
600	588.7	315.5	12,847		134.0	14.02	81.50	8.65	0.0673	0.0083	

Table 16 Sodium

Temp T			Density ρ (kg/m^3)	Coefficient of thermal expansion, $\beta \times 10^4$ (l/K)	Specific heat, c_p (J/kg K)	Thermal conductivity k (W/m k)	Thermal diffusivity, $\alpha \times 10^5$ (m^2/s)	Absolute viscosity, $\mu \times 10^4$ (N s/m^2)	Kinematic viscosity, $v \times 10^7$ (m^2/s)	Prandtl number, Pr	$g\beta/v^2 \times 10^{-8}$ (l/K m^3)
			$\times 6.243 \times 10^{-2}$		$\times 2.388 \times 10^{-4}$				$\times 3.874 \times 10^4$		$\times 1.573 \times 10^{-2}$
°F	K	°C	$= (lb_m/ft^3)$	$\times 0.5556 = (l/R)$	$= (Btu/lb_m\ °F)$	$\times 0.5777 =$ (Btu/h ft °F)	$\times 3.874 \times 10^4 = (ft^2/h)$	$\times 0.6720 = (lb_m/ft\ s)$	$= (ft^2/h)$		$= (l/R\ ft^3)$
220	367	94	929	0.27	1382	86.2	6.71	6.99	7.31	0.0110	4.96
400	487	205	902	0.36	1340	80.3	6.71	4.32	4.60	0.0072	16.7
700	644	371	860		1298	72.4	6.45	2.83	3.16	0.0051	
1000	811	538	820		1256	65.4	6.19	2.08	2.44	0.0040	
1200	978	705	778		1256	59.7	6.19	1.79	2.26	0.0038	

Table 17 Dry Air at Atmospheric Pressure

Temp T			Density ρ (kg/m^3)	Coefficient of thermal expansion, $\beta \times 10^4$ (l/K)	Specific heat, c_p (J/kg K)	Thermal conductivity k (W/m k)	Thermal diffusivity, $\alpha \times 10^6$ (m^2/s)	Absolute viscosity, $\mu \times 10^6$ (N s/m^2)	Kinematic viscosity, $v \times 10^6$ (m^2/s)	Prandtl number, Pr	$g\beta/v^2 \times 10^{-8}$ (l/K m^3)
			$\times 6.243 \times 10^{-2}$		$\times 2.388 \times 10^{-4}$		$\times 3.874 \times 10^4$		$\times 3.874 \times 10^4$		$\times 1.573 \times 10^{-2}$
°F	K	°C	$= (lb_m/ft^3)$	$\times 0.5556$ = (l/R)	= (Btu/lb_m °F)	$\times 0.5777$ = (Btu/h ft °F)	= (ft^2/h)	$\times 0.6720$ = (lb_m/ft s)	= (ft^2/h)		= (l/R ft^3)
32	273	0	1,252	3.66	1011	0.0237	19.2	17,456	13.9	0.71	1.85
68	293	20	1,164	3.41	1012	0.0251	22.0	18,240	15.7	0.71	1.36
104	313	40	1,092	3.19	1014	0.0265	24.8	19,123	17.6	0.71	1.01
140	333	60	1,025	3.00	1017	0.0279	27.6	19,907	19.4	0.71	0.782
176	353	80	0,968	2.83	1019	0.0293	30.6	20,790	21.5	0.71	0.600
212	373	100	0,916	2.68	1022	0.0307	33.6	21,673	23.6	0.71	0.472
392	473	200	0,723	2.11	1035	0.0370	49.7	35,693	35.5	0.71	0.164
572	573	300	0,596	1.75	1047	0.0429	68.9	29,322	49.2	0.71	0.0709
752	673	400	0,508	1.49	1059	0.0485	89.4	32,754	64.6	0.72	0.0350
932	773	500	0,442	1.29	1076	0.0540	113.2	35,794	81.0	0.72	0.0193
1832	1273	1000	0,268	0.79	1139	0.0762	240	48,445	181	0.74	0.00236

Table 18 Ideal Gas Properties of Air, Standard Entropy at 0.1 MPa (1 bar) Pressure

T K	u KJ/kg	h KJ/kg	s° KJ/kg	P_r	v_r
200	142.768	200.174	6.46260	0.27027	493.466
220	157.071	220.218	6.55812	0.37700	389.150
240	171.379	240.267	6.64535	0.51088	313.274
260	185.695	260.323	6.72562	0.67573	256.584
280	200.022	280.390	6.79998	0.87556	213.257
290	207.191	290.430	6.83521	0.98990	195.361
298.15	213.036	298.615	6.86305	1.09071	182.288
300	214.364	300.473	6.86926	1.11458	179.491
320	228.726	320.576	6.93412	1.39722	152.728
340	243.113	340.704	6.99515	1.72814	131.200
360	257.532	360.863	7.05276	2.11226	113.654
380	271.988	381.060	7.10735	2.55479	99.1882
400	286.487	401.299	7.15926	3.06119	87.1367
420	301.035	421.589	7.20875	3.63727	77.0025
440	315.640	441.934	7.25607	4.28916	68.4088
460	330.306	462.340	7.30142	5.02333	61.0658
480	345.039	482.814	7.34499	5.84663	54.7479
500	359.844	503.360	7.38692	6.76629	49.2777
520	374.726	523.982	7.42736	7.78997	44.5143
540	389.689	544.686	7.46642	8.92569	40.3444
560	404.736	565.474	7.50422	10.18197	36.6765
580	419.871	586.350	7.54084	11.56771	33.4358
600	435.097	607.316	7.57638	13.09232	30.5609
620	450.415	628.375	7.61090	14.76564	28.0008
640	465.828	649.528	7.64448	16.59801	25.7132
660	481.335	670.776	7.67717	18.60025	23.6623
680	496.939	692.120	7.70903	20.78637	21.8182
700	512.639	713.561	7.74010	23.16010	20.1553
720	528.435	735.098	7.77044	25.74188	18.6519
740	544.328	756.731	7.80008	28.54188	17.2894
760	560.316	778.460	7.82905	31.57347	16.0518
780	574.600	800.284	7.85740	34.85061	14.9250

(*continued*)

Table 18 *Continued*

T K	u KJ/kg	h KJ/kg	s° KJ/kg	P_r	v_r
800	592.577	822.202	7.88514	38.38777	13.8972
850	633.422	877.397	7.95207	48.46828	11.6948
900	674.824	933.152	8.01581	60.51977	9.91692
950	716.756	989.436	8.07667	74.81519	8.46770
1000	759.189	1046.221	8.13493	91.65077	7.27604
1050	802.095	1103.478	8.19081	111.3467	6.28845
1100	845.445	1161.180	8.24449	134.2478	5.46408
1150	889.211	1219.298	8.29616	160.7245	4.77141
1200	933.367	1277.805	8.34596	191.1736	4.18568
1250	977.888	1336.677	8.39402	226.0192	3.68804
1300	1022.751	1395.892	8.44046	265.7145	3.26257
1350	1067.936	1455.429	8.48539	310.7426	2.89711
1400	1113.426	1515.270	8.52891	361.6192	2.58171
1450	1159.202	1575.398	8.57111	418.8942	2.30831
1500	1205.253	1635.800	8.61208	483.1554	2.07031
1550	1251.547	1696.446	8.65185	554.9577	1.86253
1600	1298.079	1757.329	8.69051	634.9670	1.68035
1650	1344.834	1818.436	8.72811	723.8560	1.52007
1700	1391.801	1879.755	8.76472	822.3320	1.37858
1750	1438.970	1941.275	8.80039	931.1376	1.25330
1800	1486.331	2002.987	8.83516	1051.051	1.14204
1850	1533.873	2064.882	8.86908	1182.888	1.04294
1900	1581.591	2126.951	8.90219	1327.498	0.95445
1950	1629.474	2189.186	8.93452	1485.772	0.87521
2000	1677.518	2251.581	8.96611	1658.635	0.80410
2050	1725.714	2314.128	8.99699	1847.077	0.74012
2100	1774.057	2376.823	9.02721	2052.109	0.68242
2150	1822.541	2439.659	9.05678	2274.789	0.63027
2200	1871.161	2502.630	9.08573	2516.217	0.58305
2250	1919.912	2565.733	9.11409	2777.537	0.54020
2300	1968.790	2628.962	9.14189	3059.939	0.50124
2350	2017.789	2692.313	9.16913	3364.658	0.46576
2400	2066.907	2755.782	9.19586	3692.974	0.43338
2450	2116.138	2819.366	9.22208	4046.215	0.40378
2500	2165.480	2883.059	9.24781	4425.759	0.37669
2550	2214.133	2946.859	9.27308	4833.031	0.35185

(*continued*)

Table 18 *Continued*

T K	u KJ/kg	h KJ/kg	s° KJ/kg	P_r	v_r
2600	2264.481	3010.763	9.29790	5269.505	0.32903
2650	2314.133	3074.767	9.32228	5736.707	0.30805
2700	2363.883	3138.868	9.34625	6236.215	0.28872
2750	2413.727	3203.064	9.36980	6769.657	0.27089
2800	2463.663	3267.351	9.39297	7338.715	0.25443
2850	2513.687	3331.726	9.41576	7945.124	0.23291
2900	2563.797	3396.188	9.43818	8590.676	0.22511
2950	2613.990	3460.733	9.46025	9277.216	0.21205
3000	2664.265	3525.359	9.48198	10006.645	0.19992

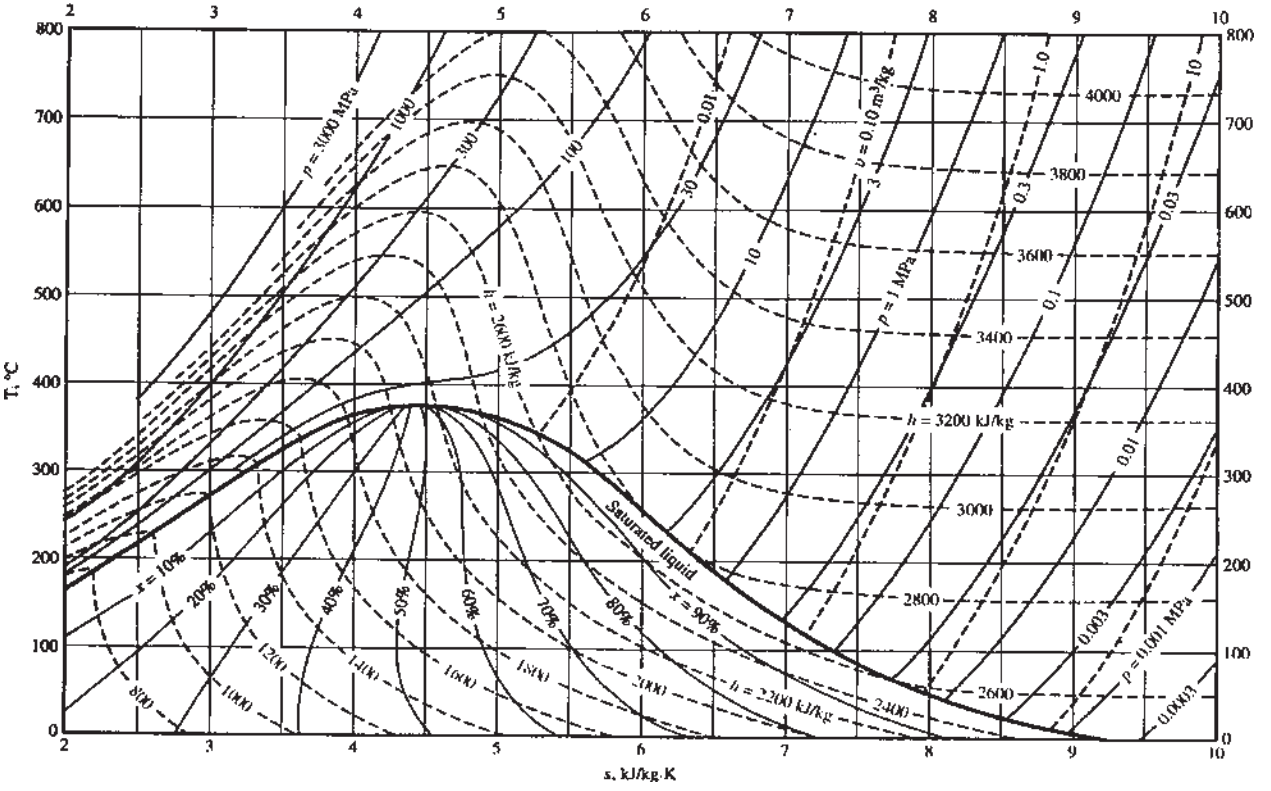

Figure A.1 Temperature-Entropy Diagram for Water

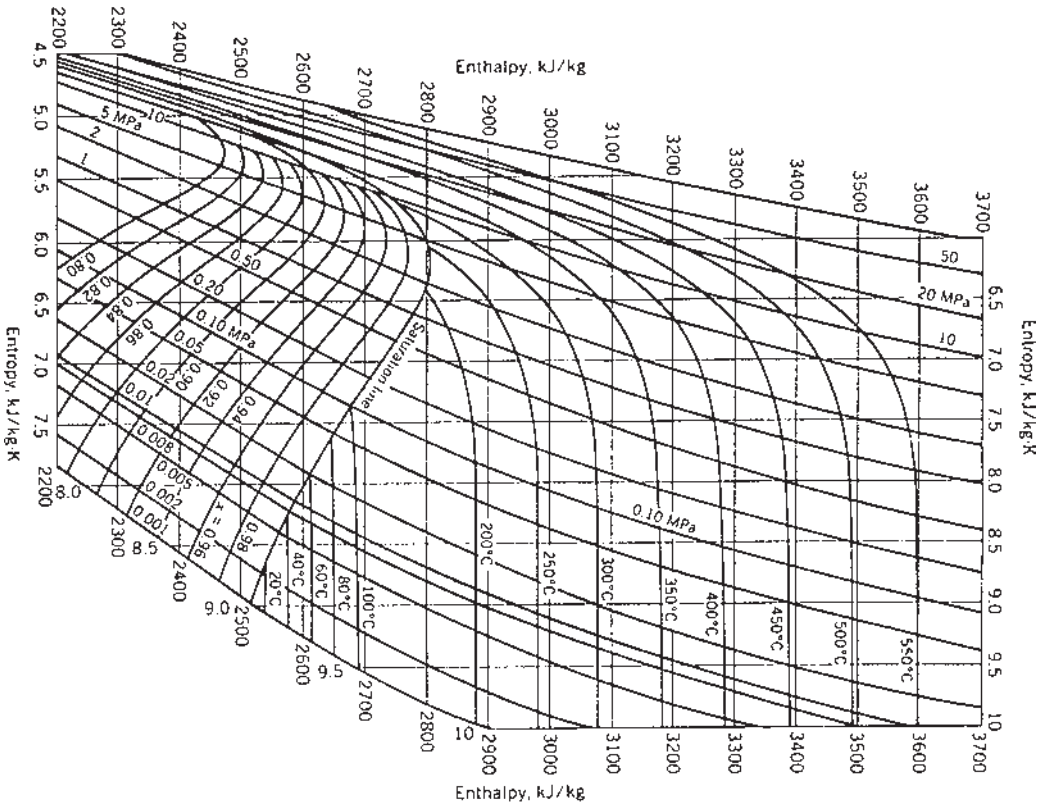

Figure A.2 Enthalpy-Entropy Diagram for Water