

TABLE 6. PROPERTIES OF SATURATED WATER VAPOR AT LOW TEMPERATURES^a
Barometer, 29.92 Inches of Mercury

TEMPERATURE F	VAPOR PRESSURE IN. Hg × 10 ⁻⁴	WEIGHT OF SATURATED VAPOR PER LB DRY AIR × 10 ⁻⁴	BTU PER LB OF VAPOR (32 F DATUM)	TEMPERATURE F	VAPOR PRESSURE IN. Hg × 10 ⁻⁴	WEIGHT OF SATURATED VAPOR PER LB DRY AIR × 10 ⁻⁴	BTU PER LB OF VAPOR (32 F DATUM)
-130	0.276	0.005738	1000.7	-85	15.87	0.3299	1021.0
-129	.306	.006362	1001.2	-84	17.20	.3576	1021.4
-128	.338	.007027	1001.6	-83	18.58	.3863	1021.9
-127	.373	.007755	1002.1	-82	20.10	.4179	1022.3
-126	.411	.008545	1002.5	-81	21.72	.4516	1022.8
-125	.455	.009459	1003.0	-80	23.47	.4879	1023.2
-124	.499	.01037	1003.4	-79	25.34	.5268	1023.7
-123	.542	.01127	1003.9	-78	27.29	.5674	1024.1
-122	.604	.01256	1004.3	-77	29.52	.6137	1024.6
-121	.669	.01391	1004.8	-76	31.81	.6613	1025.0
-120	.735	.01528	1005.2	-75	34.37	.7146	1025.5
-119	.805	.01674	1005.7	-74	37.01	.7694	1025.9
-118	.892	.01854	1006.1	-73	39.96	.8308	1026.4
-117	.989	.02056	1006.6	-72	43.04	.8948	1026.8
-116	1.098	.02283	1007.0	-71	46.33	.9632	1027.3
-115	1.208	.02511	1007.5	-70	49.87	1.037	1027.7
-114	1.317	.02738	1007.9	-69	53.59	1.114	1028.2
-113	1.444	.03002	1008.4	-68	57.65	1.199	1028.6
-112	1.575	.03274	1008.8	-67	61.81	1.285	1029.1
-111	1.728	.03593	1009.3	-66	66.41	1.381	1029.5
-110	1.889	.03927	1009.7	-65	71.17	1.480	1030.0
-109	2.087	.04339	1010.2	-64	76.64	1.593	1030.4
-108	2.292	.04765	1010.6	-63	82.28	1.711	1030.9
-107	2.511	.05220	1011.1	-62	88.19	1.833	1031.3
-106	2.742	.05701	1011.5	-61	94.62	1.967	1031.8
-105	2.983	.06202	1012.0	-60	101.4	2.108	1032.2
-104	3.258	.06773	1012.4	-59	108.8	2.262	1032.7
-103	3.543	.07366	1012.9	-58	116.3	2.418	1033.1
-102	3.872	.08050	1013.3	-57	124.8	2.595	1033.6
-101	4.213	.08759	1013.8	-56	133.4	2.773	1034.0
-100	4.607	.09578	1014.2	-55	143.0	2.973	1034.5
-99	5.018	.1043	1014.7	-54	153.0	3.181	1034.9
-98	5.455	.1134	1015.1	-53	163.5	3.399	1035.4
-97	5.946	.1236	1015.6	-52	174.9	3.636	1035.8
-96	6.470	.1345	1016.0	-51	187.0	3.888	1036.3
-95	7.047	.1465	1016.5	-50	199.9	4.156	1036.7
-94	7.638	.1588	1016.9	-49	213.0	4.428	1037.2
-93	8.316	.1729	1017.4	-48	227.9	4.738	1037.6
-92	9.017	.1875	1017.8	-47	243.1	5.054	1038.1
-91	9.806	.2039	1018.3	-46	259.5	5.395	1038.5
-90	10.64	.2212	1018.7	-45	276.7	5.753	1039.0
-89	11.53	.2397	1019.2	-44	295.0	6.133	1039.4
-88	12.51	.2601	1019.6	-43	314.7	6.543	1039.9
-87	13.53	.2813	1020.1	-42	335.3	6.971	1040.3
-86	14.69	.3054	1020.5	-41	357.6	7.435	1040.8

^aVapor pressures converted from *International Critical Tables*.TABLE 6. PROPERTIES OF SATURATED WATER VAPOR AT LOW TEMPERATURES^a (Con'd.)
Barometer, 29.92 Inches of Mercury

TEMPERATURE F	VAPOR PRESSURE IN. Hg × 10 ⁻⁴	WEIGHT OF SATURATED VAPOR PER LB DRY AIR × 10 ⁻⁴	BTU PER LB OF VAPOR (32 F DATUM)	TEMPERATURE F	VAPOR PRESSURE IN. Hg × 10 ⁻⁴	WEIGHT OF SATURATED VAPOR PER LB DRY AIR × 10 ⁻⁴	BTU PER LB OF VAPOR (32 F DATUM)
-40	380.3	7.907	1041.2	-20	1262.0	26.25	1050.2
-39	405.5	8.431	1041.7	-19	1337.	27.81	1050.7
-38	431.2	8.965	1042.1	-18	1416.	29.45	1051.1
-37	459.2	9.548	1042.6	-17	1496.	31.12	1051.6
-36	488.4	10.16	1043.0	-16	1584.	32.95	1052.0
-35	519.5	10.80	1043.5	-15	1675.	34.84	1052.5
-34	552.4	11.49	1043.9	-14	1772.	36.86	1052.9
-33	586.5	12.20	1044.4	-13	1874.	38.98	1053.4
-32	623.7	12.97	1044.8	-12	1980.	41.19	1053.8
-31	661.8	13.76	1045.3	-11	2093.	43.54	1054.3
-30	701.0	14.58	1045.7	-10	2210.	45.98	1054.7
-29	742.2	15.43	1046.2	-9	2335.	48.58	1055.2
-28	791.2	16.45	1046.6	-8	2463.	51.25	1055.6
-27	841.0	17.49	1047.1	-7	2502.	52.06	1056.1
-26	892.1	18.55	1047.5	-6	2745.	57.12	1056.5
-25	946.4	19.68	1048.0	-5	2898.	60.30	1057.0
-24	1003.	20.86	1048.4	-4	3055.	63.57	1057.4
-23	1064.	22.13	1048.9	-3	3222.	67.05	1057.9
-22	1126.	23.42	1049.3	-2	3397.	70.69	1058.3
-21	1192.	24.79	1049.8	-1	3580.	74.50	1058.8
				0	3773.	78.52	1059.2

^aVapor pressures converted from *International Critical Tables*. W = weight of water vapor mixed with each pound of dry air, pounds. h'_{fg} = latent heat of vaporization at t' , Btu per pound.

Since this definition holds for any mixture of dry air and water vapor, the total heat of a mixture with a relative humidity of 100 per cent and at a temperature equal to the wet-bulb temperature (t') is

$$\Sigma' = c_{pa}(t' - 0) + W_t h'_{fg} \quad (11)$$

By equating Equation 10 to Equation 11, the equation for the adiabatic saturation process, Equation 9a, follows. This demonstrates that the adiabatic saturation process at constant wet-bulb temperature is also a process of constant total heat. In short, the total heat of a mixture of dry air and water vapor is the same for any two states of the mixture at the same wet-bulb temperature. This fact furnishes a convenient means of finding the total heat of an air-vapor mixture in any state.

Example 5. Find the total heat of an air-vapor mixture having a dry-bulb temperature of 85 F and a wet-bulb temperature of 70 F.

Solution. From Table 5, for saturation at the wet-bulb temperature $W_t = 0.01578$, and from Equation 11,

$$\Sigma' = c_{pa}(70 - 0) + 0.01578 h'_{fg} = 16.9 + 16.61 = 33.51$$