DS 4A

PHYSICAL CONSTANTS OF HYDROCARBONS C_1 to C_{10}

Prepared by

ASTM Committee D-2
on Petroleum Praducts and Lubricants
and
API Research Praject 44 on
Hydracarbons and Related Campaunds

ASTM DATA SERIES PUBLICATION DS 4A

AMERICAN SOCIETY FOR TESTING AND MATERIALS

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Foreword

The tabulation of the physical constants of C_1 to C_{10} hydrocarbons, shown as Tables 1C1.1 through 1C1.17, is based upon a revision of *Data Series 4* prepared for publication by Committee D-2 on Petroleum Products and Lubricants of the American Society for Testing and Materials. Constants in both the U.S. and metric systems are tabulated.

The major source of data for the tabulation is the findings of API Research Project 44, Data on Hydrocarbons and Related Compounds. These data are either selected critically, calculated precisely, or of good experimental quality. Data included from other sources are shown in italics. Estimated values of properties are shown in parentheses. The atomic weights used are based on oxygen = 15.9994, carbon = 12.011, and hydrogen = 1.0080.

Related
ASTM Publications

Manual on Hydrocarbon Analysis, STP 332A (1968), $16.00

Automated Analyzers and Quality Control for the Petroleum Industry, STP 428 (1968), $3.50

Contents

TABLE 1C1.1—Paraffins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants: Pressure, psi	Critical Constants: Temperature, deg Fahr	Critical Constants: Volume, cu ft per lb	Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F: lb per cu ft	Density of the Liquid*, [a, b] at 60 F: lb per gal	Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D: at 68 F	Refractive Index of the Liquid,[a] n_D: at 77 F
	Paraffins, C_1 to C_3:													
1	Methane, CH_4, M.W. 16.043	−258.69	...	−296.46[e]	667.8	−116.63	0.0991	*0.3*[i]	*340*[i]	*18.70*[i]	*2.5*[i]	...	...	...
2	Ethane, C_2H_6, M.W. 30.070	−127.48	...	−297.89[e]	707.8	+90.09	0.0788	*0.3564*[d]	*265.5*[d]	*22.16*[d]	*2.962*[d]	...	...	...
3	Propane, C_3H_8, M.W. 44.097	−43.67	*190*	−305.84[e]	616.3	206.01	0.0737	0.5077[d]	147.2[d]	31.59[d]	4.223[d]	0.00152[d]	...	...
	Paraffins, C_4H_{10}, M.W. 58.124:													
4	*n*-Butane	+31.10	*51.6*	−217.05	550.7	305.65	0.0702	0.5844[d]	110.6[d]	36.39[d]	4.865[d]	0.00117[d]	1.3326[d]	1.3292[d]
5	2-Methylpropane (isobutane)	10.90	*72.2*	−255.29	529.1	274.98	0.0724	0.5631[d]	119.8[d]	35.05[d]	4.686[d]	0.00119[d]	...	...
	Paraffins, C_5H_{12}, M.W. 72.151:													
6	*n*-Pentane	96.92	15.570	−201.51	488.6	385.7	0.0675	0.6310	92.8	39.28	5.251	0.00087	1.35748	1.35472
7	2-Methylbutane (isopentane)	82.12	20.44	−255.83	490.4	369.10	0.0679	0.6247	95.0	38.89	5.199	0.00090	1.35373	1.35088
8	2,2-Dimethylpropane (neopentane)	49.10	*35.9*	2.17	464.0	321.13	0.0674	0.5967	105.6	37.14[d]	4.965[d]	0.00104[d]	1.342[d]	1.339[d]
	Paraffins, C_6H_{14}, M.W. 86.178:													
9	*n*-Hexane	155.72	4.956	−139.58	436.9	453.7	0.0688	0.6640	81.6	41.34	5.526	0.00075	1.37486	1.37226
10	2-Methylpentane	140.47	6.767	−244.63	436.6	435.83	0.0681	0.6579	83.6	40.96	5.475	0.00078	1.37145	1.36873
11	3-Methylpentane	145.89	6.098	...	453.1	448.3	0.0681	0.6689	80.0	41.65	5.568	0.00075	1.37652	1.37386
12	2,2-Dimethylbutane	121.52	9.856	−147.72	446.8	420.13	0.0667	0.6540	84.9	40.72	5.443	0.00078	1.36876	1.36595
13	2,3-Dimethylbutane	136.36	7.404	−199.38	453.5	440.29	0.0665	0.6664	80.8	41.49	5.546	0.00075	1.37495	1.37231
	Paraffins, C_7H_{16}, M.W. 100.205:													
14	*n*-Heptane	209.17	1.620	−131.05	396.8	512.8	0.0691	0.6882	74.1	42.85	5.728	0.00069	1.38764	1.38511
15	2-Methylhexane	194.09	2.271	−180.89	396.5	495.00	0.0673	0.6830	75.7	42.53	5.685	0.00068	1.38485	1.38227
16	3-Methylhexane	197.32	2.130	...	408.1	503.78	0.0646	0.6917	73.1	43.07	5.757	0.00069	1.38864	1.38609
17	3-Ethylpentane	200.25	2.012	−181.48	419.3	513.48	0.0665	0.7028	69.9	43.76	5.850	0.00070	1.39339	1.39084
18	2,2-Dimethylpentane	174.54	3.492	−190.86	402.2	477.23	0.0665	0.6782	77.1	42.23	5.645	0.00072	1.38215	1.37955
19	2,3-Dimethylpentane	193.61	2.351	...	421.8	507.56	0.0628	0.6996	70.8	43.56	5.823	0.00070	1.39196	1.38945
20	2,4-Dimethylpentane	176.89	3.292	−182.63	396.9	475.95	0.0668	0.6773	77.4	42.17	5.637	0.00072	1.38145	1.37882
21	3,3-Dimethylpentane	186.91	2.773	−210.01	427.2	505.85	0.0662	0.6976	71.3	43.44	5.807	0.00065	1.39092	1.38842
22	2,2,3-Trimethylbutane	177.58	3.374	−12.82	428.4	496.44	0.0636	0.6946	72.2	43.25	5.782	0.00069	1.38944	1.38692
	Paraffins, C_8H_{18}, M.W. 114.232:													
23	*n*-Octane	258.22	0.537	−70.18	360.6	564.22	0.0690	0.7068	68.7	44.01	5.883	0.00062	1.39743	1.39505
24	2-Methylheptane	243.78	0.768	−164.19	360.3	547.68	0.0685	0.7021	70.0	43.72	5.844	0.00061	1.39494	1.39257
25	3-Methylheptane	246.08	0.731	−184.98	369.3	554.94	0.0651	0.7101	67.8	44.22	5.911	0.00062	1.39848	1.39610
26	4-Methylheptane	243.89	0.765	−185.72	368.7	551.46	0.0667	0.7090	68.1	44.15	5.902	0.00066	1.39792	1.39553
27	3-Ethylhexane	245.37	0.748	...	378.3	558.21	0.0638	0.7178	65.6	44.70	5.976	0.00063	1.40162	1.39919
28	2,2-Dimethylhexane	224.32	1.221	−186.12	366.8	530.10	0.0670	0.6997	70.7	43.57	5.824	0.00065	1.39349	1.39104
29	2,3-Dimethylhexane	240.10	0.861	...	381.2	554.61	0.0656	0.7165	66.0	44.62	5.965	0.00063	1.40113	1.39880
30	2,4-Dimethylhexane	228.98	1.097	...	370.8	536.67	0.0662	0.7047	69.3	43.88	5.866	0.00066	1.39534	1.39291
31	2,5-Dimethylhexane	228.39	1.101	−132.07	360.6	530.44	0.0676	0.6979	71.2	43.46	5.810	0.00065	1.39246	1.39004
32	3,3-Dimethylhexane	233.55	1.030	−194.98	384.9	551.97	0.0621	0.7143	66.6	44.48	5.946	0.00062	1.40009	1.39782
33	3,4-Dimethylhexane	243.92	0.797	...	390.5	564.26	0.0654	0.7236	64.1	45.06	6.023	0.00063	1.40406	1.40180
34	2-Methyl-3-ethylpentane	240.18	0.874	−174.91	391.6	561.09	0.0621	0.7236	64.0	45.06	6.024	0.00063	1.40401	1.40167
35	3-Methyl-3-ethylpentane	244.88	0.834	−131.52	407.2	578.17	0.0638	0.7315	61.9	45.55	6.089	0.00059	1.40775	1.40549
36	2,2,3-Trimethylpentane	229.72	1.142	−170.07	395.9	554.63	0.0611	0.7202	65.0	44.85	5.996	0.00063	1.40295	1.40066
37	2,2,4-Trimethylpentane	210.63	1.708	−161.27	372.4	519.46	0.0656	0.6962	71.7	43.35	5.795	0.00065	1.39145	1.38898
38	2,3,3-Trimethylpentane	238.58	0.967	−149.68	409.0	572.74	0.0638	0.7303	62.2	45.48	6.080	0.00059	1.40750	1.40522
39	2,3,4-Trimethylpentane	236.25	0.976	−164.56	395.9	559.87	0.0646	0.7233	64.1	45.04	6.021	0.00063	1.40422	1.40198
40	2,2,3,3-Tetramethylbutane	223.65	0.83[f]	+213.24	416	562.6	0.0646	...	...	...	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.1—Paraffins (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4\ (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
...	...	...	...	...	*0.5266*	...	219.22	...[o]	...	...	...	5.0	15	...	...	...	...	1
...	...	...	...	...	0.4097	0.9256	210.41	...[o]	...	...	...	2.9	13	+0.05[k]	...	+1.6[k,l]	...	2
...	...	...	...	...	0.3881	0.5920	183.05	21 498[o]	...	19 767	...	2.1	9.5	97.1	...	1.8[k,l]	...	3
...	...	...	...	181.6	*0.3867*	0.5636	165.65	21 136[o]	102 980	19 493	94 970	1.8	8.4	89.6[l]	+0.4[k]	93.8[l]	+0.4[k]	4
...	...	...	...	225.7	0.3872	0.5695	157.53	21 086[o]	98 990	19 443	91 280	1.8	8.4	97.6	...	+0.10[k,l]	...	5
98.1	98.0	0.330[d]	...	159.3	0.3883	*0.5441*	153.59	20 926[o]	110 120	19 339	101 770	1.4	8.3	62.6[l]	84.2[l]	61.7[l]	86.0[l]	6
98.7	98.6	...	...	170.6	0.3827	0.5353	147.13	20 887[o]	108 800	19 300	100 540	1.4	(8.3)	90.3	...	92.3	+1.0[k]	7
98[d]	98[d]	...	...	216[h]	(*0.3866*)	0.554	*135.58*	*20 819*[o]	*103 560*	*19 232*	*95 660*	1.4	(8.3)	80.2	99.9	85.5	0.1[k]	8
98.1	98.0	0.4137	...	155.5	0.3864	*0.5332*	143.95	20 784	115 060	19 232	106 470	1.2	7.7	26.0	65.2	24.8	65.3	9
98.7	98.6	...	...	164.8	*0.3872*	0.5264	138.67	20 756	113 850	19 205	105 340	1.2	(7.7)	73.5	91.1	73.4	93.1	10
97.2	97.1	...	...	156.7[h]	*0.3815*	0.507	140.09	20 768	115 840	19 217	107 180	(1.2)	(7.7)	74.3	91.3	74.5	93.4	11
99.9	99.8	...	...	178.2[h]	*0.3809*	0.5165	131.24	20 711	112 930	19 160	104 470	1.2	(7.7)	93.4	+2.1[k]	91.8	+0.6[k]	12
98.4	98.3	...	...	161.4[h]	0.378	0.5127	136.08	20 743	115 250	19 191	106 620	(1.2)	(7.7)	94.3	+1.8[k]	+0.3[k]	...	13
97.8	97.7	0.5214	0.3425[d]	157.5	*0.3875*	*0.5283*	136.01	20 681	118 660	19 156	109 910	1.0	7.0	0.0	46.9	0.0	43.5	14
98.4	98.5	...	...	165.2	(*0.390*)	*0.5223*	131.59	20 658	117 630	19 133	108 950	(1.0)	(7.0)	46.4	74.5	42.4	73.2	15
97.5	97.4	...	...	158.9	(*0.390*)	0.511	132.11	20 668	119 160	19 144	110 370	(1.0)	(7.0)	55.8	81.0	52.0	74.7	16
95.7	95.7	...	...	150.3	(*0.390*)	*0.5145*	132.83	20 679	121 130	19 154	112 200	(1.0)	(7.0)	69.3	88.0	65.0	85.0	17
99.4	99.3	...	...	171.7	(*0.395*)	*0.5171*	125.13	20 620	116 610	19 095	107 980	(1.0)	(7.0)	95.6	+2.4[k]	92.8	+0.4[k]	18
96.4	96.2	...	...	153.7	(*0.391*)	0.50	130.39	20 642	120 370	19 117	111 470	(1.0)	(7.0)	88.5	+0.3[k]	91.1	+0.3[k]	19
98.7	98.6	...	...	173.8	0.3906	*0.5247*	126.58	20 636	116 510	19 111	107 900	(1.0)	(7.0)	83.8	99.1	83.1	96.6	20
97.4	97.1	...	...	158.9	(*0.395*)	0.502	127.21	20 638	120 050	19 113	111 180	(1.0)	(7.0)	86.6	+0.6[k]	80.8	97.7	21
98.7	98.3	...	...	162.0	0.3812	*0.4995*	124.21	20 627	119 430	19 103	110 610	(1.0)	(7.0)	+0.1[k]	+3.1[k]	+1.8[k]	...	22
98.1	98.0	0.6476	0.4039	159.1	(*0.3876*)	*0.5239*	129.53	20 604	121 420	19 099	112 550	0.96	...	...	28.1	...	24.8	23
98.6	98.5	...	...	165[h]	(*0.3872*)	0.5173	127.2	20 585	120 500	19 079	111 680	0.98	...	23.0[l]	60.8[l]	20.6[l]	57.8[l]	24
97.6	97.5	...	...	162.0[h]	(*0.383*)	0.5134	127.6	20 595	121 930	19 090	113 020	(0.98)	...	35.0	68.0	26.8	59.6	25
97.6	97.5	...	...	160.9[h]	(*0.383*)	0.5152	127.53	20 597	121 750	19 092	112 850	(0.98)	...	39.0	70.1	26.7	61.1	26
96.5	96.4	...	...	155.7[h]	(*0.3838*)	0.50	126.50	20 601	123 300	19 097	114 300	(0.98)	...	52.4	80.0	33.5	61.1	22
99.8	99.7	...	...	172[h]	(*0.392*)	0.506	121.4	20 559	119 910	19 054	111 140	(0.98)	...	77.4	95.2	72.5	93.3	23
97.1	97.0	...	...	159.1[h]	(*0.3824*)	0.50	124.98	20 594	123 020	19 089	114 030	(0.98)	...	78.9	93.7	71.3	91.7	24
97.9	97.8	...	...	164.1[h]	(*0.368*)	0.51	122.7	20 577	120 890	19 072	112 050	(0.98)	...	69.9	89.0	65.2	87.3	37
99.1	99.0	...	...	172.4[h]	(*0.373*)	0.5114	122.8	20 564	119 670	19 059	110 910	(0.98)	...	55.7	82.9	55.2	81.6	38
97.4	97.3	...	...	162[h]	(*0.384*)	0.5053	122.2	20 575	122 530	19 070	113 570	(0.98)	...	83.4	100	75.5	94.6	39
96.7	96.6	...	...	154.4[h]	...	0.50	125.24	20 596	124 250	19 091	115 170	(0.98)	...	81.7	97.1	76.3	94.7	30
96.2	96.1	...	...	153.0[h]	*0.3793*	0.50	124.08	20 605	124 320	19 100	115 240	(0.98)	...	88.1	+0.1[k]	87.3	100	31
95.9	95.8	...	...	150.6[h]	(*0.3782*)	0.49	123.43	20 593	125 590	19 088	116 410	(0.98)	...	88.7	+0.2[k]	80.8	95.9	35
97.3	97.2	...	...	159.4[h]	(*0.388*)	0.50	120.5	20 577	123 570	19 072	114 530	(1.0)	...	99.9	+2.0[k]	+1.2[k]	...	36
100.6	100.5	...	...	175.1	*0.3758*	0.4892	116.71	20 569	119 390	19 064	110 660	1.0	...	100.0	+3.0[k]	100.0	+3.0[k]	37
96.2	96.1	...	...	152.6[h]	(*0.380*)	0.5046	121.7	20 590	125 320	19 085	116 220	(1.0)	...	99.4	+2.0[k]	+0.6[k]	...	38
97.0	96.9	...	...	154.9[h]	*0.3875*	0.5094	123.20	20 585	124 130	19 079	115 050	(1.0)	...	95.9	+0.7[k]	+0.2[k]	...	39
...	...	...	...	...	0.3908	...	118.3	...	...	...	...	(1.0)	...	...	...	...	...	40

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.1—Paraffins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants			Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F		Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid, [a] n_D	
					Pressure, psi	Temperature, deg Fahr	Volume, cu ft per lb			lb per cu ft	lb per gal		at 68 F	at 77 F
	Paraffins, C_9H_{20}, M.W. 128.259:													
41	*n*-Nonane	303.47	0.179	−64.28	332	610.68	0.0684	0.7217	64.6	44.94	6.008	0.00063	1.40542	1.40311
42	2-Methyloctane	289.90	0.25	−112.67	332	596.5	0.0676	0.7175	65.7	44.68	5.973	0.00058	1.4031	1.4008
43	3-Methyloctane	291.61	0.25	−161.7	339	602.6	0.0661	0.7245	63.8	45.11	6.030	0.00059	1.4063	1.4040
44	4-Methyloctane	288.39	0.27	−171.8	339	598.1	0.0653	0.7244	63.8	45.11	6.030	0.00063	1.4062	1.4039
45	3-Ethylheptane	289.4	0.27	...	348	603.3	0.0638	0.7308	62.1	45.51	6.084	0.00064	1.4093	1.4070
46	4-Ethylheptane	286.2	0.30	...	347	598.6	0.0631	0.7324	61.7	45.61	6.097	0.00064	1.4096	1.4073
47	2,2-Dimethylheptane	270.86	0.42	−171.38	337	580.3	0.0657	0.7146	66.5	44.50	5.949	0.00062	1.4016	1.3993
48	2,3-Dimethylheptane	284.9	0.31	...	348	601.7	0.0643	0.7302	62.3	45.47	6.078	0.00059	1.4085	1.4062
49	2,4-Dimethylheptane	271.22	0.40	...	339	578.7	0.0646	0.7194	65.2	44.80	5.989	0.00058	1.4034	1.4011
50	2,5-Dimethylheptane	276.8	0.36	...	341	586.4	0.0652	0.7210	64.7	44.90	6.002	0.00063	1.4038	1.4015
51	2,6-Dimethylheptane	275.40	0.36	−153.2	334	580.6	0.0668	0.7131	66.9	44.41	5.937	0.00062	1.4007	1.3983
52	3,3-Dimethylheptane	278.64	0.37	...	353	599.7	0.0632	0.7299	62.4	45.45	6.076	0.00064	1.4088	1.4063
53	3,4-Dimethylheptane	285.1	0.31	...	357	605.8	0.0628	0.7356	60.9	45.81	6.124	0.00055	1.4111	1.4089
54	3,5-Dimethylheptane	276.8	0.36	...	348	590.2	0.0637	0.7265	63.3	45.24	6.048	0.00054	1.4067	1.4044
55	4,4-Dimethylheptane	275.4	0.40	...	353	594.1	0.0626	0.7299	62.4	45.45	6.076	0.00064	1.4076	1.4053
56	2-Methyl-3-ethylhexane	280.4	0.35	...	356	599.2	0.0621	0.7378	60.3	45.94	6.141	0.00064	1.4120	1.4097
57	2-Methyl-4-ethylhexane	272.8	0.40	...	348	584.6	0.0629	0.7278	62.9	45.32	6.058	0.00064	1.4068	1.4046
58	3-Methyl-3-ethylhexane	296.1	0.33	...	370	615.9	0.0608	0.7454	58.3	46.42	6.205	0.00056	1.4140	1.4120
59	3-Methyl-4-ethylhexane	284.7	0.32	...	364	609.3	0.0612	0.7440	58.7	46.33	6.193	0.00056	1.4149	1.4128
60	2,2,3-Trimethylhexane	272.50	0.43	...	362	598.8	0.0622	0.7336	61.4	45.68	6.107	0.00055	1.4105	1.4082
61	2,2,4-Trimethylhexane	259.79	0.57	−184.0	345	572.9	0.0633	0.7196	65.1	44.81	5.990	0.00058	1.4033	1.4010
62	2,2,5-Trimethylhexane	255.37	0.62	−158.37	338	562.8	0.0648	0.7182	65.5	44.72	5.978	0.00058	1.39972	1.39728
63	2,3,3-Trimethylhexane	279.84	0.38	−178.23	370	613.4	0.0613	0.7418	59.3	46.19	6.175	0.00056	1.4141	1.4119
64	2,3,4-Trimethylhexane	282.31	0.35	...	366	610.5	0.0617	0.7433	58.9	46.29	6.188	0.00056	1.4144	1.4120
65	2,3,5-Trimethylhexane	268.43	0.45	−198.0	348	583.0	0.0636	0.7262	63.3	45.22	6.045	0.00063	1.4061	1.4037
66	2,4,4-Trimethylhexane	267.19	0.504	−172.07	353	587.3	0.0624	0.7278	62.9	45.32	6.058	0.00054	1.40745	1.4055
67	3,3,4-Trimethylhexane	284.86	0.34	−150.12	381	624.6	0.0605	0.7497	57.2	46.69	6.242	0.00065	1.4178	1.4154
68	3,3-Diethylpentane	295.14	0.282	−27.56	388	638.4	0.0591	0.7575	55.3	47.17	6.306	0.00052	1.42051	1.41837
69	2,2-Dimethyl-3-ethylpentane	272.91	0.43	−147.04	370	603.3	0.0607	0.7389	60.0	46.01	6.151	0.00055	1.4123	1.4102
70	2,3-Dimethyl-3-ethylpentane	292.5	0.30	...	389	632.7	0.0596	0.7591	54.9	47.27	6.319	0.00057	1.4221	1.4197
71	2,4-Dimethyl-3-ethylpentane	278.06	0.39	−188.25	366	604.6	0.0611	0.7421	59.2	46.21	6.177	0.00056	1.4137	1.4115
72	2,2,3,3-Tetramethylpentane	284.53	0.362	+14.20	397	639.9	0.0597	0.7606	54.5	47.37	6.332	0.00052	1.42360	1.42140
73	2,2,3,4-Tetramethylpentane	271.45	0.476	−185.96	372	606.2	0.0612	0.7430	58.9	46.27	6.185	0.00056	1.41472	1.41246
74	2,2,4,4-Tetramethylpentane	252.13	0.730	−87.16	342	568.8	0.0629	0.7236	64.1	45.06	6.023	0.00054	1.40694	1.40459
75	2,3,3,4-Tetramethylpentane	286.82	0.340	−151.78	391	636.6	0.0601	0.7587	55.0	47.25	6.317	0.00057	1.42222	1.42003
	Paraffins, $C_{10}H_{22}$, M.W. 142.286:													
76	*n*-Decane	345.48	0.0597	−21.36	304	652.1	0.0679	0.7342	61.2	45.72	6.112	0.00055	1.41189	1.40967
77	2-Methylnonane	332.65	0.085	−102.32	304	639.0	0.0671	0.7306	62.2	45.50	6.082	0.00064	1.4100	1.4075
78	3-Methylnonane	334.0	0.085	−120.59	310	644.7	0.0655	0.7375	60.4	45.93	6.140	0.00064	1.4125	1.4103
79	4-Methylnonane	330.3	0.095	−145.7	310	639.3	0.0647	0.7364	60.7	45.86	6.131	0.00060	1.4118	1.4095
80	5-Methylnonane	329.2	0.098	−125.81	310	637.9	0.0645	0.7367	60.6	45.88	6.133	0.00060	1.4122	1.4100
81	3-Ethyloctane	331.7	0.095	...	317	645.1	0.0632	0.7442	58.6	46.34	6.195	0.00056	1.4156	1.4136
82	4-Ethyloctane	326.61	0.11	...	316	637.9	0.0621	0.7422	59.1	46.22	6.179	0.00056	1.4151	1.4131
83	2,2-Dimethyloctane	314.4	0.14	...	309	624.0	0.0653	0.7285	62.7	45.36	6.064	0.00055	1.4082	1.4060
84	2,3-Dimethyloctane	327.81	0.11	...	317	644.2	0.0638	0.7420	59.2	46.21	6.177	0.00056	1.4149	1.4127
85	2,4-Dimethyloctane	312.6	0.15	...	310	619.3	0.0637	0.7305	62.2	45.49	6.081	0.00055	1.4091	1.4069
86	2,5-Dimethyloctane	317.3	0.13	...	312	626.0	0.0641	0.7343	61.2	45.73	6.113	0.00055	1.4112	1.4089
87	2,6-Dimethyloctane	320.74	0.12	...	312	626.0	0.0648	0.7319	61.8	45.58	6.093	0.00055	1.4106	1.4084
88	2,7-Dimethyloctane	319.80	0.12	−65	304	625.8	0.0664	0.7285	62.7	45.36	6.064	0.00059	1.4086	1.4062
89	3,3-Dimethyloctane	322.2	0.13	...	322	642.4	0.0627	0.7432	58.9	46.28	6.187	0.00056	1.4165	1.4142
90	3,4-Dimethyloctane	326.1	0.11	...	325	645.6	0.0620	0.7489	57.4	46.64	6.235	0.00056	1.4182	1.4159
91	3,5-Dimethyloctane	318.9	0.13	...	317	631.8	0.0625	0.7408	59.5	46.13	6.167	0.00055	1.4139	1.4115
92	3,6-Dimethyloctane	321.4	0.12	...	317	635.4	0.0633	0.7405	59.6	46.11	6.164	0.00060	1.4139	1.4115
93	4,4-Dimethyloctane	315.5	0.15	...	320	632.8	0.0617	0.7385	60.1	45.99	6.148	0.00055	1.4144	1.4122
94	4,5-Dimethyloctane	323.87	0.12	...	325	642.4	0.0615	0.7511	56.9	46.77	6.252	0.00056	1.4190	1.4167

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.1—Paraffins (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4\,(n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
97.4	97.2	0.8087	0.4766	164.7	0.3840	*0.5228*	123.76	*20 544*	*123 610*	*19 056*	*114 670*	0.87[m]	*2.9*	...	...	...	...	41
98.5	98.4	...	...	171.5[h]	(*0.396*)	0.516	122.9	20 525	122 780	19 036	113 870	(0.85)	...	...	...	...	...	42
97.6	97.5	...	...	167.0[h]	(*0.388*)	0.511	123.3	20 532	123 990	19 044	115 010	(0.85)	...	...	...	...	...	43
97.6	97.5	...	...	166.1[h]	(*0.388*)	0.51	122.7	20 533	124 000	19 045	115 010	(0.85)	...	...	...	...	...	44
96.7	96.6	...	...	163[h]	(*0.379*)	0.50	123.1	20 540	125 150	19 052	116 080	(0.85)	...	...	...	...	...	45
96.7	96.6	...	...	154[h]	...	0.50	122.9	20 542	125 430	19 053	116 340	(0.85)	...	...	...	...	...	46
99.6	99.5	...	...	174[h]	(*0.398*)	0.503	116.6	20 499	124 140	19 011	113 270	(0.85)	...	60.5	83.5	50.3	77.2	47
97.3	97.2	...	...	163.8[h]	...	0.51	121.0	20 526	124 940	19 038	115 890	(0.85)	...	...	...	...	...	48
97.9	97.8	...	...	172[h]	...	0.51	118.5	20 515	123 050	19 027	114 120	(0.85)	...	...	...	...	...	49
97.9	97.8	...	...	172[h]	...	0.51	119.3	20 514	123 310	19 026	114 370	(0.85)	...	...	...	...	...	50
99.0	98.9	...	...	176.0[h]	(*0.383*)	0.52	119.1	20 507	121 940	19 019	113 090	(0.85)	...	...	...	...	...	51
97.5	97.4	...	...	165[h]	...	0.503	118.4	20 514	124 830	19 026	115 770	(0.85)	...	...	...	...	...	52
96.9	96.8	...	...	158[h]	...	0.50	121.9	20 534	125 940	19 045	116 800	(0.85)	...	...	...	...	...	53
97.0	96.9	...	...	...	...	0.51	119.5	20 521	124 300	19 033	115 280	(0.85)	...	...	...	...	...	54
97.5	97.4	...	...	...	...	0.51	118.5	20 516	124 840	19 027	115 780	(0.85)	...	...	...	...	...	55
96.7	96.6	...	...	...	...	0.50	120.6	20 534	126 280	19 046	117 130	(0.85)	...	...	...	...	...	56
97.0	96.9	...	...	...	...	0.51	119.5	20 523	124 510	19 034	115 480	(0.85)	...	...	...	...	...	57
96.0	95.9	...	...	...	...	0.49	119.8	20 534	127 600	19 046	118 350	(0.85)	...	...	...	...	...	58
95.6	95.5	...	...	...	...	0.49	122.0	20 541	127 400	19 052	118 160	(0.85)	...	...	...	...	...	59
97.4	97.3	...	...	162[h]	...	0.50	116.6	20 518	125 490	19 030	116 390	(0.85)	...	...	...	...	...	60
98.9	98.8	...	...	172[h]	(*0.383*)	0.51	114.0	20 517	123 080	19 029	114 160	(0.85)	...	...	...	...	...	61
98.8	99.0	...	...	180.9	(*0.376*)	0.52	113.2	20 482	121 480	18 993	112 650	(0.85)	...	...	...	...	...	62
96.4	96.3	...	...	...	(*0.384*)	0.50	117.3	20 523	126 910	19 035	117 710	(0.85)	...	...	...	...	...	63
96.5	96.4	...	...	...	...	0.50	119.6	20 527	127 210	19 039	117 990	(0.85)	...	...	...	...	...	64
97.9	97.8	...	...	169	(*0.368*)	0.51	116.7	20 513	124 190	19 025	115 180	(0.85)	...	...	...	...	...	65
98.2	98.2	...	...	...	(*0.384*)	0.51	115.0	20 526	124 530	19 038	115 500	(0.85)	...	...	...	...	...	66
95.4	95.3	...	...	...	(*0.375*)	0.49	117.8	20 535	128 370	19 047	119 060	(0.85)	...	...	...	...	...	67
94.6	94.3	...	...	149[h]	(*0.3780*)	0.48	120.6	20 542	129 730	19 054	120 330	(0.85)	...	91.6	+0.1[k]	84.0	97.1	68
96.4	96.3	...	...	...	(*0.383*)	0.51	116.7	20 551	126 600	19 063	117 430	(0.85)	...	99.5	+0.8[k]	+1.8[k]	>+6[k]	69
94.7	94.6	...	...	151[h]	...	0.48	118.4	20 544	130 010	19 056	120 590	(0.85)	...	...	...	...	...	70
96.5	96.4	...	...	...	(*0.369*)	0.50	118.7	20 561	127 190	19 073	117 990	(0.85)	...	96.6	+0.4[k]	+0.5[k]	+3.6[k]	71
96.1	95.9	...	...	154[h]	(*0.387*)	0.48	118.2	20 533	130 200	19 044	120 760	0.84[m]	...	95.0	99.4	+3.6[k]	>+4.0[k]	72
96.8	96.8	...	...	...	(*0.380*)	0.50	114.9	20 534	127 190	19 046	117 970	(0.85)	...	...	...	...	...	73
100.8	101.0	...	...	167[h]	(*0.386*)	0.51	110.1	20 527	123 840	19 038	114 860	(0.85)	...	...	...	...	...	74
95.5	95.5	...	...	...	(*0.380*)	0.48	117.1	20 534	129 880	19 045	120 460	(0.85)	...	...	...	...	...	75
98.1	98.0	1.004	0.5591	170.6	0.3835	*0.5208*	118.68	20 493	125 440	19 017	116 410	0.78[m]	*2.6*	...	...	...	...	76
99	99	...	...	176.5[h]	(*0.398*)	0.517	118.5	20 477	124 730	19 001	115 740	(0.75)	...	...	...	...	...	77
98	98	...	...	172.9[h]	(*0.405*)	0.511	118.2	20 483	125 950	19 007	116 880	(0.75)	...	...	...	...	...	78
98	98	...	...	172.9[h]	(*0.405*)	0.514	117.2	20 485	125 780	19 009	116 720	(0.75)	...	...	...	...	...	79
98	98	...	...	172.2[h]	(*0.405*)	0.510	116.9	20 485	125 820	19 009	116 760	(0.75)	...	...	...	...	...	80
96	96	...	...	167[h]	...	0.50	116.9	20 481	127 060	19 005	117 910	(0.75)	...	...	...	...	...	81
96	96	...	...	...	...	0.51	115.7	20 494	126 820	19 018	117 680	(0.75)	...	...	...	...	...	82
100	100	...	...	178[h]	...	0.505	113.9	20 451	124 200	18 974	115 240	(0.75)	...	...	...	...	...	83
97	97	...	...	167[h]	...	0.51	115.4	20 479	126 680	19 004	117 560	(0.75)	...	...	...	...	...	84
98	98	...	...	176[h]	...	0.52	114.3	20 469	124 660	18 993	115 670	(0.75)	...	...	...	...	...	85
99	99	...	...	171[h]	...	0.51	114.3	20 468	125 310	18 994	116 280	(0.75)	...	...	...	...	...	86
99	99	...	...	172[h]	...	0.51	115.4	20 467	124 890	18 992	115 890	(0.75)	...	...	...	...	...	87
98.7	98.6	...	...	174.2	(*0.386*)	0.510	115.6	20 460	124 260	18 986	115 300	(0.75)	...	...	...	...	...	88
97	97	...	...	167[h]	...	0.502	113.7	20 469	126 830	18 993	117 680	(0.75)	...	...	...	...	...	89
97	97	...	...	163[h]	...	0.50	114.9	20 486	127 910	19 010	118 700	(0.75)	...	...	...	...	...	90
97	97	...	...	...	...	0.51	114.0	20 476	126 460	19 000	117 340	(0.75)	...	...	...	...	...	91
97	97	...	...	169[h]	...	0.51	115.0	20 475	126 390	18 998	117 280	(0.75)	...	...	...	...	...	92
97	97	...	...	...	...	0.51	112.5	20 469	126 030	18 994	116 950	(0.75)	...	...	...	...	...	93
95.9	95.8	...	...	165[h]	...	0.50	114.4	20 487	128 270	19 011	119 030	(0.75)	...	...	...	...	...	94

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.1—Paraffins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants			Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F		Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D	
					Pressure, psi	Temperature, deg Fahr	Volume, cu ft per lb			lb per cu ft	lb per gal		at 68 F	at 77 F
	Paraffins $C_{10}H_{22}$ (continued):													
95	4-*n*-Propylheptane	315.5	0.13	...	316	622.4	0.0614	0.7400	59.7	46.08	6.160	0.00055	1.4135	1.4113
96	4-Isopropylheptane	318.0	0.14	...	323	634.3	0.0605	0.7433	58.9	46.29	6.188	0.00056	1.4155	1.4132
97	2-Methyl-3-ethylheptane	322.2	0.13	...	323	640.0	0.0612	0.7477	57.7	46.56	6.224	0.00056	1.4174	1.4151
98	2-Methyl-4-ethylheptane	313.2	0.15	...	317	623.7	0.0614	0.7401	59.7	46.09	6.161	0.00055	1.4137	1.4114
99	2-Methyl-5-ethylheptane	319.5	0.13	...	317	632.7	0.0625	0.7397	59.8	46.06	6.157	0.00055	1.4134	1.4111
100	3-Methyl-3-ethylheptane	326.8	0.12	...	335	656.4	0.0599	0.7542	56.1	46.97	6.279	0.00056	1.4208	1.4185
101	3-Methyl-4-ethylheptane	324.0	0.13	...	331	646.3	0.0597	0.7545	56.0	46.99	6.282	0.00056	1.4206	1.4183
102	3-Methyl-5-ethylheptane	316.8	0.14	...	323	632.5	0.0609	0.7447	58.5	46.38	6.200	0.00056	1.4164	1.4141
103	4-Methyl-3-ethylheptane	325.4	0.12	...	331	648.3	0.0600	0.7547	56.0	47.00	6.283	0.00056	1.4207	1.4184
104	4-Methyl-4-ethylheptane	321.4	0.14	...	335	648.9	0.0591	0.7551	55.9	47.02	6.286	0.00057	1.4210	1.4187
105	2,2,3-Trimethylheptane	315.7	0.15	...	329	641.7	0.0615	0.7464	58.1	46.48	6.213	0.00056	1.4168	1.4145
106	2,2,4-Trimethylheptane	298.9	0.22	...	314	610.5	0.0621	0.7316	61.9	45.56	6.090	0.00055	1.4092	1.4069
107	2,2,5-Trimethylheptane	303.4	0.20	...	314	616.8	0.0629	0.7322	61.7	45.60	6.096	0.00055	1.4101	1.4078
108	2,2,6-Trimethylheptane	300.11	0.20	*−157*	309	608.5	0.0645	0.7279	62.9	45.33	6.060	0.00054	1.4078	1.4055
109	2,3,3-Trimethylheptane	320.4	0.14	...	337	652.1	0.0606	0.7529	56.4	46.89	6.268	0.00056	1.4202	1.4179
110	2,3,4-Trimethylheptane	319.8	0.14	...	332	645.3	0.0606	0.7526	56.5	46.87	6.266	0.00056	1.4195	1.4172
111	2,3,5-Trimethylheptane	321.3	0.14	...	325	643.5	0.0616	0.7492	57.4	46.66	6.238	0.00056	1.4169	1.4146
112	2,3,6-Trimethylheptane	312.8	0.16	...	317	628.0	0.0630	0.7388	60.0	46.01	6.151	0.00055	1.4131	1.4108
113	2,4,4-Trimethylheptane	303.8	0.21	...	322	621.0	0.0609	0.7387	60.1	46.00	6.149	0.00055	1.4143	1.4120
114	2,4,5-Trimethylheptane	313.7	0.16	...	325	632.8	0.0612	0.7452	58.2	46.41	6.204	0.00056	1.4160	1.4137
115	2,4,6-Trimethylheptane	297.7	0.21	...	312	603.0	0.0630	0.7269	63.1	45.26	6.050	0.00054	1.4071	1.4048
116	2,5,5-Trimethylheptane	307.08	0.18	...	322	625.6	0.0619	0.7441	58.7	46.34	6.195	0.00056	1.4149	1.4126
117	3,3,4-Trimethylheptane	323.4	0.14	...	344	660.2	0.0592	0.7606	54.5	47.37	6.332	0.00057	1.4236	1.4213
118	3,3,5-Trimethylheptane	312.26	0.17	...	328	636.8	0.0605	0.7469	57.9	46.51	6.217	0.00056	1.4170	1.4147
119	3,4,4-Trimethylheptane	322.0	0.14	...	344	658.2	0.0590	0.7614	54.3	47.42	6.339	0.00057	1.4235	1.4212
120	3,4,5-Trimethylheptane	324.5	0.13	...	339	655.7	0.0596	0.7598	54.7	47.32	6.326	0.00057	1.4229	1.4206
121	2-Methyl-3-isopropylhexane	332.1	0.13	...	332	662.5	0.0596	0.7515	56.8	46.80	6.256	0.00056	1.4195	1.4172
122	3,3-Diethylhexane	331.3	0.11	...	350	670.6	0.0574	0.7654	53.4	47.67	6.372	0.00057	1.4258	1.4235
123	3,4-Diethylhexane	327.0	0.12	...	338	654.4	0.0584	0.7551	55.9	47.02	6.286	0.00057	1.4190	1.4167
124	2,2-Dimethyl-3-ethylhexane	313.0	0.17	...	335	641.5	0.0592	0.7526	56.5	46.87	6.266	0.00056	1.4197	1.4174
125	2,2-Dimethyl-4-ethylhexane	297	0.24	...	322	610.9	0.0607	0.7381	60.2	45.96	6.144	0.00055	1.4131	1.4107
126	2,3-Dimethyl-3-ethylhexane	326.7	0.13	...	351	668.8	0.0581	0.7678	52.8	47.82	6.393	0.00057	1.4270	1.4247
127	2,3-Dimethyl-4-ethylhexane	321.6	0.14	...	339	651.6	0.0590	0.7595	54.8	47.30	6.323	0.00057	1.4226	1.4203
128	2,4-Dimethyl-3-ethylhexane	320.2	0.14	...	339	649.6	0.0588	0.7593	54.9	47.29	6.322	0.00057	1.4225	1.4202
129	2,4-Dimethyl-4-ethylhexane	322.0	0.14	...	344	658.2	0.0590	0.7604	54.6	47.36	6.331	0.00057	1.4235	1.4212
130	2,5-Dimethyl-3-ethylhexane	309.4	0.18	...	325	626.7	0.0605	0.7447	58.5	46.38	6.200	0.00056	1.4157	1.4134
131	3,3-Dimethyl-4-ethylhexane	325.2	0.14	...	351	666.7	0.0578	0.7677	52.8	47.81	6.391	0.00057	1.4269	1.4246
132	3,4-Dimethyl-3-ethylhexane	323.8	0.14	...	351	664.7	0.0575	0.7675	52.9	47.80	6.390	0.00057	1.4267	1.4244
133	2,2,3,3-Tetramethylhexane	320.61	0.16	−65.15	357	671.2	0.0583	0.7684	52.7	47.85	6.397	0.00053	1.42818	1.42600
134	2,2,3,4-Tetramethylhexane	317.8	0.17	...	344	657.1	0.0591	0.7592	54.9	47.28	6.320	0.00057	1.4216	1.4193
135	2,2,3,5-Tetramethylhexane	299.1	0.23	...	329	622.8	0.0608	0.7422	59.1	46.22	6.179	0.00060	1.4142	1.4119
136	2,2,4,4-Tetramethylhexane	308.8	0.23	...	326	639.0	0.0602	0.7503	57.1	46.72	6.246	0.00056	1.4208	1.4185
137	2,2,4,5-Tetramethylhexane	298.22	0.24	...	322	617.7	0.0612	0.7396	59.8	46.06	6.157	0.00055	1.41318	1.41095
138	2,2,5,5-Tetramethylhexane	279.45	0.35	+9.34	312	589.6	0.0627	0.7230	64.2	45.02	6.018	0.00063	1.40550	1.40316
139	2,3,3,4-Tetramethylhexane	328.32	0.14	...	360	680.0	0.0579	0.7735	51.4	48.17	6.439	0.00053	1.4298	1.4275
140	2,3,3,5-Tetramethylhexane	307.6	0.20	...	337	638.6	0.0598	0.7528	56.5	46.88	6.267	0.00056	1.4196	1.4173
141	2,3,4,4-Tetramethylhexane	322.9	0.15	...	351	668.3	0.0583	0.7665	53.1	47.74	6.382	0.00053	1.4267	1.4244
142	2,3,4,5-Tetramethylhexane	313.2	0.17	...	339	644.4	0.0597	0.7535	56.3	46.92	6.272	0.00056	1.4204	1.4181
143	3,3,4,4-Tetramethylhexane	338.0	0.20	...	373	704.7	0.0570	0.7863	48.5	48.97	6.546	0.00049	1.4368	1.4346
144	2,4-Dimethyl-3-isopropylpentane	314.71	0.17	−115.01	339	646.5	0.0587	0.7624	54.1	47.48	6.347	0.00052	1.42463	1.42248
145	2-Methyl-3,3-diethylpentane	337.5	0.11	...	367	692.2	0.0564	0.7835	49.1	48.79	6.522	0.00054	1.4343	1.4320
146	2,2,3-Trimethyl-3-ethylpentane	337.1	0.12	....	373	703.4	0.0566	0.7860	48.5	48.95	6.544	0.00054	1.4420	1.4397
147	2,2,4-Trimethyl-3-ethylpentane	311.5	0.19	...	344	648.1	0.0583	0.7614	54.3	47.42	6.339	0.00057	1.4223	1.4199
148	2,3,4-Trimethyl-3-ethylpentane	337.05	0.12	...	369	696.7	0.0570	0.7814	49.6	48.67	6.506	0.00058	1.4333	1.4310
149	2,2,3,3,4-Pentamethylpentane	330.94	0.14	−33.57	375	699.4	0.0572	0.7838	49.0	48.81	6.525	0.00049	1.43606	1.43412
150	2,2,3,4,4-Pentamethylpentane	318.76	0.19	−37.71	348	669.6	0.0587	0.7708	52.1	48.00	6.417	0.00048	1.43069	1.42868

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.1—Paraffins (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4\ (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
95.9	95.8	...	...	169[h]	...	0.51	115.2	20 494	126 430	19 019	117 330	(0.75)	...	...	...	...	...	95
97	97	...	...	...	...	0.51	113.2	20 489	126 970	19 013	117 820	(0.75)	...	...	...	...	...	96
96	96	...	...	...	...	0.50	114.0	20 487	127 700	19 012	118 500	(0.75)	...	...	...	...	...	97
96	96	...	...	...	...	0.51	112.9	20 477	126 350	19 002	117 240	(0.75)	...	...	...	...	...	98
96	96	...	...	...	...	0.51	114.0	20 475	126 250	19 000	117 150	(0.75)	...	...	...	...	...	99
97	97	...	...	163[h]	...	0.50	113.4	20 487	128 820	19 011	119 540	(0.75)	...	...	...	...	...	100
96	96	...	...	...	...	0.50	113.8	20 494	128 930	19 018	119 640	(0.75)	...	...	...	...	...	101
96	96	...	...	...	...	0.50	113.9	20 482	127 170	19 007	118 010	(0.75)	...	...	...	...	...	102
96	96	...	...	...	...	0.50	114.0	20 494	128 950	19 018	119 660	(0.75)	...	...	...	...	...	103
97	97	...	...	...	...	0.50	112.8	20 488	128 970	19 012	119 680	(0.75)	...	...	...	...	...	104
97	97	...	...	165[h]	...	0.50	112.1	20 468	127 350	18 992	118 170	(0.75)	...	...	...	...	...	105
100	100	...	...	...	...	0.51	110.0	20 469	124 850	18 995	115 850	(0.75)	...	...	...	...	...	106
100	100	...	...	...	...	0.51	110.8	20 440	124 790	18 965	115 780	(0.75)	...	...	...	...	...	107
98	98	...	...	178[h]	(0.370)	0.52	111.0	20 434	124 020	18 958	115 060	(0.75)	...	...	...	...	...	108
96	96	...	...	...	...	0.50	112.4	20 479	128 550	19 004	119 290	(0.75)	...	...	...	...	...	109
97	97	...	...	...	...	0.49	112.8	20 481	128 520	19 005	119 260	(0.75)	...	...	...	...	...	110
97	97	...	...	...	...	0.50	112.3	20 470	127 880	18 994	118 660	(0.75)	...	...	...	...	...	111
97	97	...	...	...	...	0.51	112.8	20 462	126 050	18 978	116 900	(0.75)	...	...	...	...	...	112
97	97	...	...	...	...	0.51	109.9	20 481	126 130	19 005	117 040	(0.75)	...	...	...	...	...	113
97	97	...	...	...	...	0.50	112.1	20 470	127 180	18 994	118 010	(0.75)	...	...	...	...	...	114
97	97	...	...	180[h]	...	0.52	111.5	20 453	123 930	18 977	114 990	(0.75)	...	...	...	...	...	115
97	97	...	...	...	...	0.50	111.1	20 452	126 880	18 977	117 730	(0.75)	...	...	...	...	...	116
97	97	...	...	...	...	0.49	112.4	20 486	129 900	19 010	120 540	(0.75)	...	...	...	...	...	117
97	97	...	...	158[h]	...	0.50	110.8	20 487	127 550	19 011	118 360	(0.75)	...	88.7	+0.2[k]	86.4	100	118
97	97	...	...	...	...	0.49	112.0	20 490	130 070	19 014	120 700	(0.75)	...	...	...	...	...	119
97	97	...	...	...	...	0.49	113.2	20 487	129 790	19 011	120 440	(0.75)	...	...	...	...	...	120
98	98	...	...	...	...	0.50	110.6	20 483	128 330	19 007	119 080	(0.75)	...	...	...	...	...	121
95	95	...	...	156[h]	...	0.49	113.7	20 503	130 830	19 028	121 418	(0.75)	...	...	...	...	...	122
94.7	94.6	...	...	163[h]	...	0.50	113.8	20 500	129 050	19 024	119 760	(0.75)	...	...	...	...	...	123
97	97	...	...	...	...	0.50	110.9	20 476	128 490	19 000	119 225	(0.75)	...	...	...	...	...	124
97	97	...	...	...	...	0.51	109.5	20 476	125 990	19 001	116 910	(0.75)	...	...	...	...	...	125
97	97	...	...	...	...	0.49	112.4	20 497	131 220	19 021	121 770	(0.75)	...	...	...	...	...	126
97	97	...	...	...	...	0.49	112.5	20 486	129 720	19 012	120 390	(0.75)	...	...	...	...	...	127
97	97	...	...	...	...	0.49	112.3	20 488	129 710	19 012	120 370	(0.75)	...	...	...	...	...	128
97	97	...	...	...	...	0.49	112.0	20 497	129 950	19 021	120 600	(0.75)	...	...	...	...	...	129
97	97	...	...	...	...	0.50	111.3	20 470	127 110	18 996	117 950	(0.75)	...	...	...	...	...	130
97	97	...	...	...	...	0.49	112.1	20 492	131 150	19 016	121 700	(0.75)	...	...	...	...	...	131
97	97	...	...	...	...	0.49	111.8	20 504	131 210	19 028	121 760	(0.75)	...	...	...	...	...	132
97	97	...	...	...	...	0.49	109.9	20 489	131 250	19 013	121 800	(0.75)	...	92.4	96.7	+2.0[k]	+2.5[k]	133
98	98	...	...	158[h]	...	0.49	110.0	20 496	129 720	19 020	120 380	(0.75)	...	...	...	...	...	134
98	98	...	...	...	...	0.51	109.5	20 452	126 560	18 976	117 430	(0.75)	...	...	...	...	...	135
99	99	...	...	...	...	0.50	105.9	20 492	128 180	19 016	118 940	(0.75)	...	...	...	...	...	136
99	99	...	...	...	...	0.51	108.2	20 464	126 180	18 987	117 080	(0.75)	...	...	...	...	...	137
102	102	...	...	181[h]	...	0.52	106.6	20 408	123 000	18 932	114 100	(0.75)	...	...	...	...	...	138
97	97	...	...	...	...	0.48	111.8	20 494	132 150	19 018	122 630	(0.75)	...	...	...	...	...	139
97	97	...	...	...	...	0.50	109.6	20 490	128 600	19 015	119 340	(0.75)	...	...	...	...	...	140
97	97	...	...	...	...	0.49	110.8	20 507	131 060	19 031	121 630	(0.75)	...	...	...	...	...	141
98	98	...	...	...	...	0.50	111.4	20 475	128 600	18 999	119 330	(0.75)	...	...	...	...	...	142
97	97	...	...	147[h]	...	0.47	105.8	20 505	134 410	19 029	124 740	(0.75)	...	...	...	...	...	143
97	97	...	...	...	...	0.49	109.9	20 476	130 150	19 000	120 770	(0.75)	...	...	...	...	...	144
97	97	...	...	...	...	0.48	113.4	20 514	133 980	19 038	124 340	(0.75)	...	...	...	...	...	145
97	97	...	...	...	...	0.47	110.2	20 505	134 370	19 030	124 710	(0.75)	...	...	...	...	...	146
98	98	...	...	...	...	0.49	109.2	20 498	130 120	19 022	120 750	(0.75)	...	...	...	...	...	147
97	97	...	...	...	...	0.48	111.9	20 506	133 600	19 031	123 990	(0.75)	...	...	...	...	...	148
97	97	...	...	...	...	0.47	109.9	20 526	134 120	19 050	124 480	(0.75)	...	...	...	...	...	149
98	98	...	...	...	...	0.48	106.7	20 517	131 840	19 041	122 360	(0.75)	...	...	...	...	...	150

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.2—Cycloparaffins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants			Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F		Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D	
					Pressure, psi	Temperature, deg Fahr	Volume, cu ft per lb			lb per cu ft	lb per gal		at 68 F	at 77 F
	Alkylcyclopropanes, C_3 and C_4:													
1	Cyclopropane, C_3H_6, M.W. 42.081	−27.0	...	−197.36	797.0	256.39	0.065	...	...	*35.08*	*4.690*	...	...	...
2	Methylcyclopropane, C_4H_8, M.W. 56.108	+33.31	...	−287.1	...	...	...	...	...	...	...	...	...	...
	Alkylcyclopropanes, C_5H_{10}, M.W. 70.135:													
3	Ethylcyclopropane	−96.66	...	−236.61	...	...	...	0.6891	73.8	42.90	5.735	0.00082	1.3786	1.3756
4	1,1-Dimethylcyclopropane	69.12	...	−164.0	...	...	...	0.6654	81.2	41.43	5.538	0.00083	1.3669	1.3639[d]
5	1,*cis*-2-Dimethylcyclopropane	98.64	...	−221.59	...	...	...	0.6990	70.9	43.52	5.818	0.00078	1.3829	1.3800
6	1,*trans*-2-Dimethylcyclopropane	82.76	...	−237.24	...	...	...	0.6748	78.2	42.02	5.617	0.00084	1.3713	1.3683
	Alkylcyclopropanes, C_6H_{12}, M.W. 84.162:													
7	*n*-Propylcyclopropane	156.45	...	...	...	...	...	0.7163	66.0	44.60	5.962	0.00076	1.3930	1.3905
8	Isopropylcyclopropane	136.96	...	−171.26	...	...	...	0.7037	69.6	43.82	5.858	0.00079	1.3865	1.3835
9	1-Methyl-1-ethylcyclopropane	134.17	...	−202.4	...	...	...	0.7069	68.7	44.02	5.885	0.00079	1.3887	1.3857
10	1-Methyl-*cis*-2-ethylcyclopropane	152.60	...	...	...	...	...	0.7197	65.1	44.81	5.990	0.00072	1.3953	1.3923
11	1-Methyl-*trans*-2-ethylcyclopropane	137.57	...	...	...	...	...	0.6986	71.0	43.50	5.815	0.00078	1.3846	1.3816
12	1,1,2-Trimethylcyclopropane	126.37	...	−216.75	...	...	...	0.6998	70.7	43.57	5.824	0.00079	1.3864	1.3834
13	1,*cis*-2,*cis*-3-Trimethylcyclopropane	151	...	...	...	...	...	0.7231	64.2	45.03	6.020	0.00081	1.3970	1.3940
14	1,*cis*-2,*trans*-3-Trimethylcyclopropane	139.5	...	...	...	...	...	0.7030	69.8	43.77	5.851	0.00079	1.3873	1.3843
	Alkylcyclobutanes, C_4 and C_5:													
15	Cyclobutane, C_4H_8, M.W. 56.108	54.52	...	−131.26[e]	723	368.2	0.060	0.6997[d]	70.7[d]	43.57[d]	5.824[d]	0.00087[d]	1.365[d]	1.362[d]
16	Methylcyclobutane, C_5H_{10}, M.W. 70.135	97.3	...	...	...	...	...	0.6978	71.3	43.45	5.808	0.00074	1.3836	1.3810
	Alkylcyclobutanes, C_6H_{12}, M.W. 84.162:													
17	Ethylcyclobutane	159.06	...	−224.97	...	...	...	0.7327	61.6	45.63	6.100	0.00073	1.4020	1.3994
18	1,1-Dimethylcyclobutane	133	...	...	...	...	...	0.718	65.6	44.7	5.98	0.00081	1.396	1.393
19	1,*cis*-2-Dimethylcyclobutane	154	...	...	...	...	...	0.741	59.5	46.1	6.16	0.00079	1.404	1.401
20	1,*trans*-2-Dimethylcyclobutane	140	...	...	...	...	...	0.718	65.6	44.7	5.98	0.00081	1.395	1.392
21	1,*cis*-3-Dimethylcyclobutane	140.9	...	...	...	...	...	0.7154	66.3	44.55	5.955	0.00071	1.3933	1.3908
22	1,*trans*-3-Dimethylcyclobutane	135.5	...	...	...	...	...	0.7064	68.8	43.98	5.879	0.00070	1.3896	1.3871
	Alkylcyclopentanes, C_5 and C_6:													
23	Cyclopentane, C_5H_{10}, M.W. 70.135	120.65	9.914	−136.91	653.8	461.5	0.059	0.7504	57.1	46.73	6.247	0.00070	1.40645	1.40363
24	Methylcyclopentane, C_6H_{12}, M.W. 84.162	161.25	4.503	−224.44	548.9	499.35	0.0607	0.7536	56.3	46.93	6.274	0.00071	1.40970	1.40700
	Alkylcyclopentanes, C_7H_{14}, M.W. 98.189:													
25	Ethylcyclopentane	218.24	1.409	−217.22	492.8	565.47	0.0611	0.7710	52.0	48.02	6.420	0.00067	1.41981	1.41730
26	1,1-Dimethylcyclopentane	189.47	2.561	−93.57	500	525	0.059	0.7592	54.9	47.28	6.320	0.00066	1.41356	1.41091
27	1,*cis*-2-Dimethylcyclopentane	211.16	1.648	−65.01	500	557	0.060	0.7773	50.5	48.41	6.472	0.00063	1.42217	1.41963
28	1,*trans*-2-Dimethylcyclopentane	197.36	2.192	−179.63	500	536	0.059	0.7562	55.6	47.09	6.295	0.00066	1.41200	1.40941
29	1,*cis*-3-Dimethylcyclopentane	195.39	2.291	−208.68	514	532	0.059	0.7496	57.3	46.68	6.240	0.00065	1.40894	1.40633
30	1,*trans*-3-Dimethylcyclopentane	197.10	2.209	−209.17	500	536	0.059	0.7534	56.3	46.92	6.272	0.00066	1.41074	1.40813
	Alkylcyclopentanes, C_8H_{16}, M.W. 112.216:													
31	*n*-Propylcyclopentane	267.73	0.471	−179.20	*435.0*	*626*	*0.0607*	0.7807	49.7	48.62	6.500	0.00058	1.42626	1.42389
32	Isopropylcyclopentane	259.57	0.601	−168.46	*435.0*	*622*	*0.0602*	0.7807	49.7	48.62	6.500	0.00054	1.42582	1.42350
33	1-Methyl-1-ethylcyclopentane	250.75	0.726	−226.86	*433.5*	*606*	*0.0602*	0.7855	48.6	48.92	6.540	0.00059	1.42718	1.42476
34	1-Methyl-*cis*-2-ethylcyclopentane	262.51	0.550	−158.67	*433.5*	*613*	*0.0601*	0.7897	47.7	49.18	6.574	0.00059	1.42933	1.42695
35	1-Methyl-*trans*-2-ethylcyclopentane	250.2	0.72	*−238.0*	*426.2*	*599*	*0.0601*	0.7733	51.5	48.16	6.438	0.00058	1.4219	1.4195
36	1-Methyl-*cis*-3-ethylcyclopentane	250.0	0.71	...	*426.2*	*597*	*0.0601*	0.771	52.0	48.0	6.42	0.00058	1.419	1.417
37	1-Methyl-*trans*-3-ethylcyclopentane	250.0	0.74	...	*420.3*	*598*	*0.0601*	0.771	52.0	48.0	6.42	0.00058	1.419	1.417
38	1,1,2-Trimethylcyclopentane	236.72	0.999	−6.93	*426.2*	*583.5*	*0.0595*	0.7772	50.6	48.40	6.470	0.00063	1.42298	1.42051
39	1,1,3-Trimethylcyclopentane	220.81	1.393	−224.41	*410.0*	*565.5*	*0.0595*	0.7528	56.5	46.88	6.267	0.00066	1.41119	1.40870
40	1,*cis*-2, *cis*-3-Trimethylcyclopentane	253.4	0.69	−177.56	*426.2*	*596*	*0.0594*	0.7836	49.1	48.80	6.524	0.00059	1.4262	1.4238
41	1,*cis*-2,*trans*-3-Trimethylcyclopentane	243.5	0.85	−170	*420.3*	*584*	*0.0594*	0.7749	51.1	48.26	6.451	0.00058	1.4218	1.4194
42	1,*trans*-2,*cis*-3-Trimethylcyclopentane	230.74	1.14	−170.85	*410.0*	*570*	*0.0594*	0.7580	55.2	47.21	6.311	0.00066	1.4138	1.4114
43	1,*cis*-2,*cis*-4-Trimethylcyclopentane	242.17	0.84	−206.19	*418.8*	*584*	*0.0594*	0.776	50.8	48.3	6.46	0.00063	*1.4186*	*1.4162*
44	1,*cis*-2,*trans*-4-Trimethylcyclopentane	242.13	0.881	−206.61	*417.4*	*583*	*0.0594*	0.7680	52.7	47.83	6.394	0.00057	1.41855	1.41612
45	1,*trans*-2,*cis*-4-Trimethylcyclopentane	228.73	1.162	−203.42	*407.8*	*568*	*0.0594*	0.7518	56.7	46.82	6.259	0.00066	1.41060	1.40812

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.2—Cycloparaffins (U.S. Units)

Specific Dispersion of the Liquid, $10^4 (n_F - n_C)/d$ [a]		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
...	...	...	...	...	...	...	204.8	...[o]	...	...	...	2.4	10.4	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	(1.8)	...	81.2	87.2	+0.2[k]	+0.4[k]	2
...	...	...	...	...	...	...	...	...	...	...	...	(1.4)	...	83.8[l]	87.8	+0.2[k]	+0.7[k]	3
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
98	98	...	...	...	...	...	...	...	...	...	...	...	...	84.3[l]	86.6	+0.4[k]	+0.7[k]	5
101	101	...	...	...	...	...	...	...	...	...	...	...	...	...	86.9	+0.4[k]	+0.7[k]	6
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	88.1	93.0	+0.02[k]	+0.2[k]	8
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	10
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	11
110	110	...	...	...	...	...	...	...	...	...	...	(1.2)	...	87.8	93.0	+1.5[k]	>+3.0[k]	12
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	13
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	14
...	...	...	...	...	...	0.413	185.3	20 858[d,o]	121 670[d]	19 497[d]	113 730[d]	(1.8)	...	...	...	...	...	15
...	...	...	...	...	...	0.465	...	...	...	...	...	(1.4)	...	...	...	...	...	16
99	99	...	...	101.7[h]	...	...	...	...	...	...	...	1.2	7.7	63.9	...	41.1	...	17
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	18
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	19
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	20
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	21
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	22
94.3	94.2	0.499	...	62.2	0.2712	0.4216	167.34	20 188	126 300	18 827	117 790	(1.4)	...	84.9[l]	95.2	+0.1[k]	+0.9[k]	23
96.2	96.1	0.565	...	91.4	0.3010	0.4407	147.83	*20 130*	*126 480*	*18 769*	*117 930*	(1.2)	*8.35*	80.0	93.0	91.3	+0.5[k]	24
95.5	95.4	0.619	0.39	98.1	0.3062	*0.4437*	141.35	20 120	129 330	18 759	120 580	1.1	6.7	61.2	80.7	67.2	79.5	25
97.3	97.2	...	...	*113.0*[h]	0.3140	*0.4455*	132.63	20 082	127 100	18 721	118 480	(1.1)	...	89.3	+0.1[k]	92.3	+0.9[k]	26
97.4	97.3	...	...	103.8[h]	0.3159	*0.4508*	138.80	20 113	130 330	18 752	121 510	(1.1)	...	...	...	...	...	27
96.5	96.4	...	...	116.1[h]	0.3170	0.451	135.12	20 086	126 620	18 724	118 040	(1.1)	...	...	...	...	...	28
97.4	97.3	...	...	...	0.3170	*0.4496*	134.33	20 091	125 550	18 730	117 040	(1.1)	...	73.1	86.8	79.2	91.2	29
96.2	96.1	...	...	121.8[h]	0.3170	*(0.45)*	134.86	20 100	126 250	18 739	117 700	(1.1)	...	72.6	87.1	80.6	93.2	30
95.7	95.6	0.724	0.46	112.1	0.3153	*0.4516*	130.7	20 108	130 880	18 747	122 030	(0.95)	...	28.1	60.5	31.2	59.8	31
95.6	95.5	...	...	...	*(0.307)*	*(0.41)*	130.7	*(20 089)*	*(130 760)*	*(18 728)*	*(121 900)*	(0.95)	...	76.2	89.4	81.1	94.3	32
95.9	95.8	...	...	...	*(0.338)*	*(0.46)*	128.9	*(20 074)*	*(131 470)*	*(18 710)*	*(122 530)*	(0.95)	...	...	...	...	...	33
94.7	94.6	...	...	117.5[h]	*(0.305)*	*(0.41)*	132.3	*(20 062)*	*(132 030)*	*(18 699)*	*(123 060)*	(0.95)	...	...	...	...	...	34
95	95	...	...	126.0[h]	*(0.305)*	*(0.41)*	129.4	*(20 072)*	*(129 400)*	*(18 709)*	*(120 620)*	(0.95)	...	...	...	...	...	35
95	95	...	...	...	*(0.305)*	*(0.41)*	129.5	*(20 072)*	*(129 040)*	*(18 709)*	*(120 280)*	(0.95)	...	59.8	79.6	57.6	79.2	36
95	95	...	...	...	*(0.305)*	*(0.41)*	129.0	*(20 073)*	*(129 050)*	*(18 711)*	*(120 290)*	(0.95)	...	59.8	79.6	57.6	79.2	37
97.0	96.9	...	...	...	*(0.324)*	*(0.44)*	124.9	*(20 030)*	*(129 780)*	*(18 668)*	*(120 950)*	(0.95)	...	...	...	...	...	38
98.7	98.6	...	...	...	*(0.324)*	*(0.44)*	121.4	*(20 038)*	*(125 760)*	*(18 676)*	*(117 210)*	(0.95)	...	83.5	95.6	87.7	+0.1[k]	39
96	96	...	...	105.8	*(0.312)*	*(0.42)*	128.9	*(20 016)*	*(130 770)*	*(18 657)*	*(121 890)*	(0.95)	...	...	...	...	...	40
96	96	...	...	105.8	*(0.312)*	*(0.42)*	127.0	*(20 020)*	*(129 330)*	*(18 661)*	*(120 550)*	(0.95)	...	...	...	...	...	41
96	96	...	...	105.8	*(0.312)*	*(0.42)*	123.8	*(20 026)*	*(126 570)*	*(18 667)*	*(117 980)*	(0.95)	...	...	...	...	...	42
96	96	...	...	...	*(0.312)*	*(0.42)*	126.6	*(20 020)*	*(129 510)*	*(18 661)*	*(120 720)*	(0.95)	...	...	...	...	...	43
95.8	95.7	...	...	...	*(0.312)*	*(0.42)*	126.6	*(20 021)*	*(128 190)*	*(18 617)*	*(119 210)*	(0.95)	...	79.5	...	89.2	98.3	44
96.9	96.8	...	...	...	*(0.312)*	*(0.42)*	124.1	*(20 023)*	*(125 500)*	*(18 664)*	*(116 990)*	(0.95)	...	...	...	...	...	45

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.2—Cycloparaffins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants: Pressure, psi	Critical Constants: Temperature, deg Fahr	Critical Constants: Volume, cu ft per lb	Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F: lb per cu ft	Density of the Liquid*, [a, b] at 60 F: lb per gal	Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D: at 68 F	Refractive Index of the Liquid,[a] n_D: at 77 F
	Alkylcyclopentanes, C_9H_{18}, M.W. 126.243:													
46	*n*-Butylcyclopentane	313.92	(0.17)	−162.35	395.3	677	0.0612	0.7888	47.9	49.12	6.566	0.00054	1.4316	1.4293
47	Isobutylcyclopentane	298.35	(0.26)	−175.39	396.8	666.5	0.0607	0.7853	48.7	48.90	6.537	0.00059	1.4298	1.4273
48	*sec*-Butylcyclopentane	309.87	(0.20)	...	396.8	681	0.0607	0.7989	45.6	49.75	6.651	0.00055	1.4357	1.4332
49	*tert*-Butylcyclopentane	292.77	(0.33)	−140.4	402.7	660	0.0602	0.7954	46.4	49.53	6.621	0.00055	1.4338	1.4313
50	1-Methyl-1-*n*-propylcyclopentane	295	...	...	...	...	...	0.803	44.7	50.0	6.68	0.00060	1.437	1.435
51	1-Methyl-*cis*-2-*n*-propylcyclopentane	306.68	(0.19)	−155	397.5	662.5	0.0606	0.7965	46.1	49.60	6.631	0.00055	1.4343	1.4318
52	1-Methyl-*trans*-2-*n*-propylcyclopentane	295.50	(0.26)	−189	390.9	650	0.0606	0.7818	49.5	48.69	6.509	0.00059	1.4274	1.4249
53	1-Methyl-*cis*-3-*n*-propylcyclopentane	298	(0.40)	...	...	...	...	0.784	49.0	48.8	6.52	0.00059	1.426	1.424
54	1-Methyl-*trans*-3-*n*-propylcyclopentane	298	(0.40)	...	...	...	...	0.784	49.0	48.8	6.52	0.00059	1.426	1.424
55	1-Methyl-1-isopropylcyclopentane	298	...	...	...	...	...	0.803	44.7	50.0	6.68	0.00060	1.436	1.434
56	1-Methyl-*cis*-2-isopropylcyclopentane	298	...	...	...	...	...	0.796	46.3	49.6	6.63	0.00060	1.434	1.432
57	1-Methyl-*trans*-2-isopropylcyclopentane	288	...	...	...	...	...	0.785	48.7	48.8	6.52	0.00059	1.429	1.427
58	1-Methyl-*cis*-3-isopropylcyclopentane	288	...	<−112	386.5	637	0.0601	0.784	49.0	48.8	6.52	0.00059	1.426	1.424
59	1-Methyl-*trans*-3-isopropylcyclopentane	288	...	<−112	386.5	637	0.0601	0.784	49.0	48.8	6.52	0.00059	1.426	1.424
60	1,1-Diethylcyclopentane	304	...	...	...	...	...	0.8072	43.8	50.27	6.720	0.00055	1.4388	1.4363
61	1,*cis*-2-Diethylcyclopentane	308.44	(0.18)	−180	402.7	664.5	0.0606	0.8004	45.3	49.85	6.664	0.00060	1.4355	1.4330
62	1,*trans*-2-Diethylcyclopentane	297.59	(0.25)	−139	392.4	652.5	0.0606	0.7876	48.4	49.05	6.557	0.00059	1.4295	1.4270
63	1,*cis*-3-Diethylcyclopentane	302	...	...	...	...	...	0.791	47.4	49.3	6.59	0.00059	1.430	1.428
64	1,*trans*-3-Diethylcyclopentane	302	...	...	...	...	...	0.791	47.4	49.3	6.59	0.00059	1.430	1.428
65	1,1-Dimethyl-2-ethylcyclopentane	280	...	...	...	...	...	0.792	47.2	49.4	6.60	0.00069	1.432	1.430
66	1,1-Dimethyl-3-ethylcyclopentane	273	...	...	...	...	...	0.774	51.3	48.2	6.44	0.00063	1.421	1.419
67	1,*cis*-2-Dimethyl-1-ethylcyclopentane	291	...	...	...	...	...	0.803	44.7	50.0	6.68	0.00060	1.437	1.435
68	1,*trans*-2-Dimethyl-1-ethylcyclopentane	291	...	...	...	...	...	0.800	45.4	49.8	6.66	0.00060	1.435	1.433
69	1,*cis*-2-Dimethyl-*cis*-3-ethylcyclopentane	306	...	...	...	...	...	0.800	45.4	49.8	6.66	0.00060	1.434	1.432
70	1,*cis*-2-Dimethyl-*trans*-3-ethylcyclopentane	293	...	...	...	...	...	0.792	47.2	49.3	6.59	0.00059	1.431	1.429
71	1,*trans*-2-Dimethyl-*cis*-3-ethylcyclopentane	280	...	...	...	...	...	0.772	51.8	48.1	6.43	0.00058	1.422	1.420
72	1,*trans*-2-Dimethyl-*trans*-3-ethylcyclopentane	293	...	...	...	...	...	0.788	48.1	49.1	6.56	0.00059	1.428	1.426
73	1,*cis*-2-Dimethyl-*cis*-4-ethylcyclopentane	297	...	...	...	...	...	0.800	45.4	49.8	6.66	0.00060	1.432	1.430
74	1,*cis*-2-Dimethyl-*trans*-4-ethylcyclopentane	297	...	...	...	...	...	0.785	48.7	48.9	6.54	0.00059	1.426	1.424
75	1,*trans*-2-Dimethyl-*cis*-4-ethylcyclopentane	284	...	...	...	...	...	0.773	51.5	48.1	6.43	0.00048	1.420	1.418
76	1,*cis*-3-Dimethyl-1-ethylcyclopentane	277	...	...	...	...	...	0.778	50.4	48.4	6.47	0.00049	1.423	1.421
77	1,*trans*-3-Dimethyl-1-ethylcyclopentane	277	...	...	...	...	...	0.782	49.4	48.7	6.51	0.00059	1.425	1.423
78	1,*cis*-3-Dimethyl-*cis*-2-ethylcyclopentane	306	...	...	...	...	...	0.793	46.9	49.4	6.60	0.00059	1.432	1.430
79	1,*cis*-3-Dimethyl-*trans*-2-ethylcyclopentane	279	...	...	...	...	...	0.770	52.3	47.9	6.40	0.00048	1.421	1.419
80	1,*trans*-3-Dimethyl-*cis*-2-ethylcyclopentane	291	...	...	...	...	...	0.788	48.1	49.1	6.56	0.00059	1.429	1.427
81	1,*cis*-3-Dimethyl-*cis*-4-ethylcyclopentane	293	...	...	...	...	...	0.793	46.9	49.4	6.60	0.00059	1.430	1.428
82	1,*cis*-3-Dimethyl-*trans*-4-ethylcyclopentane	279	...	...	...	...	...	0.770	52.3	47.9	6.40	0.00048	1.420	1.418
83	1,*trans*-3-Dimethyl-*cis*-4-ethylcyclopentane	279	...	...	...	...	...	0.773	51.5	48.1	6.43	0.00048	1.421	1.419
84	1,*trans*-3-Dimethyl-*trans*-4-ethylcyclopentane	293	...	...	...	...	...	0.782	49.4	48.7	6.51	0.00059	1.425	1.423
85	1,1,2,2-Tetramethylcyclopentane	271	...	...	...	...	...	0.798	45.8	49.7	6.64	0.00050	1.434	1.432
86	1,1,*cis*-2,*cis*-3-Tetramethylcyclopentane	280	...	...	...	...	...	0.783	49.2	48.8	6.52	0.00059	1.426	1.424
87	1,1,*cis*-2,*trans*-3-Tetramethylcyclopentane	266	...	...	...	...	...	0.771	52.0	48.0	6.42	0.00058	1.421	1.419
88	1,1,*cis*-2,*cis*-4-Tetramethylcyclopentane	266	...	...	...	...	...	0.778	50.3	48.4	6.47	0.00049	1.424	1.422
89	1,1,*cis*-2,*trans*-4-Tetramethylcyclopentane	266	...	...	...	...	...	0.767	53.0	47.8	6.39	0.00062	1.419	1.417
90	1,1,3,3-Tetramethylcyclopentane	244.49	...	−127.08	...	...	...	0.7551	55.9	47.02	6.286	0.00057	1.4125	*1.4101*
91	1,1,*cis*-3,*cis*-4-Tetramethylcyclopentane	*266.27*	...	*−157.89*	...	...	...	0.7712	52.0	48.03	6.421	0.00058	*1.4209*	*1.4189*
92	1,1,*cis*-3,*trans*-4-Tetramethylcyclopentane	*250.92*	...	*−135.65*	...	...	...	0.7531	56.4	46.90	6.270	0.00056	*1.4118*	*1.4095*
93	1,2,2,*cis*-3-Tetramethylcyclopentane	280	...	...	...	...	...	0.785	48.7	48.9	6.54	0.00059	1.427	1.425
94	1,2,2,*trans*-3-Tetramethylcyclopentane	280	...	...	...	...	...	0.793	46.9	49.4	6.60	0.00059	1.431	1.429
95	1,*cis*-2,*cis*-3,*cis*-4-Tetramethylcyclopentane	*297.18*	...	*−148.36*	...	...	...	*0.7968*	*46.1*	*49.62*	*6.634*	0.00049	*1.4332*	*1.4308*
96	1,*cis*-2,*cis*-3,*trans*-4-Tetramethylcyclopentane	*285.31*	...	...	...	...	...	*0.7807*	*49.8*	*48.62*	*6.499*	0.00058	*1.4248*	*1.4224*
97	1,*cis*-2,*trans*-3,*cis*-4-Tetramethylcyclopentane	*272.97*	...	*−166.92*	...	...	...	*0.7713*	*52.0*	*48.03*	*6.421*	0.00058	*1.4208*	*1.4184*
98	1,*cis*-2,*trans*-3,*trans*-4-Tetramethylcyclopentane	*289.33*	...	*−168.39*	...	...	...	*0.7777*	*50.5*	*48.43*	*6.474*	0.00058	*1.4297*	*1.4273*
99	1,*trans*-2,*cis*-3,*trans*-4-Tetramethylcyclopentane	*261.03*	...	...	...	...	...	*0.7605*	*54.6*	*47.36*	*6.332*	0.00061	*1.4155*	*1.4131*
100	1,*trans*-2,*trans*-3,*cis*-4-Tetramethylcyclopentane	*274.17*	...	*−171.60*	...	...	...	*0.7731*	*51.5*	*48.14*	*6.436*	0.00048	*1.4219*	*1.4195*
	Alkylcyclopentanes, $C_{10}H_{20}$, M.W. 140.270:													
101	*n*-Pentylcyclopentane	356.9	...	−117	...	...	...	0.7954	46.3	49.54	6.622	0.00055	1.4358	1.4336

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.2—Cycloparaffins (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
96	96	0.908	0.53	119.7	0.3224	0.4558	123.8	20 105	132 190	18 743	123 240	(0.85)	...	−2[z]	36.7	−3[z]	29.6	46
100	100	...	...	...	(0.311)	(0.40)	(118)	(20 028)	(131 000)	(18 667)	(122 000)	(0.85)	...	28.2	58.1	33.4	59.2	47
...	...	...	...	...	(0.311)	(0.40)	(120)	(20 073)	(133 000)	(18 662)	(124 000)	(0.85)	...	...	...	...	...	48
96	96	...	...	...	(0.320)	(0.41)	(116)	(19 995)	(132 600)	(18 634)	(124 000)	(0.85)	...	...	...	...	...	49
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	50
95	95	...	...	130.1[h]	(0.319)	(0.41)	(123)	(20 028)	(133 000)	(18 640)	(124 000)	(0.85)	...	...	...	...	...	51
97	97	...	...	130.1[h]	(0.319)	(0.41)	(119)	(20 008)	(130 400)	(18 645)	(122 000)	(0.85)	...	...	...	...	...	52
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	53
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	54
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	55
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	56
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	57
...	...	...	...	...	(0.315)	(0.40)	(115)	(20 015)	(130 700)	(18 652)	(122 000)	(0.85)	...	...	...	...	...	58
...	...	...	...	...	(0.315)	(0.40)	(115)	(20 015)	(130 700)	(18 652)	(122 000)	(0.85)	...	...	...	...	...	59
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	60
95	95	...	...	127.2[h]	(0.311)	(0.40)	(124)	(21 999)	(147 000)	(18 639)	(124 000)	(0.85)	...	...	...	...	...	61
96	96	...	...	127.2[h]	(0.311)	(0.40)	(119)	(20 007)	(131 000)	(18 644)	(122 000)	(0.85)	...	...	...	...	...	62
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	63
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	64
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	65
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	66
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	67
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	68
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	69
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	70
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	71
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	72
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	73
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	74
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	75
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	76
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	77
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	78
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	79
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	80
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	81
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	82
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	83
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	84
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	85
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	86
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	87
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	88.0	98.1	96.2	+0.3[k]	88
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	88.0	98.1	96.2	+0.3[k]	89
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	90
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	91
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	92
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	93
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	94
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	95
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	96
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	97
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	98
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	99
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	100
96	96	1.128	0.62	...	0.3281	(0.462)	119.4	20 099	133 270	18 738	124 250	(0.75)	...	...	...	...	...	101

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.2—Cycloparaffins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants			Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F		Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D	
					Pressure, psi	Temperature, deg Fahr	Volume, cu ft per lb			lb per cu ft	lb per gal		at 68 F	at 77 F
	Alkylcyclohexanes, C_6 and C_7:													
102	Cyclohexane, C_6H_{12}, M.W. 84.162	177.29	3.264	43.77	591	536.7	0.0586	0.7834	49.1	48.79	6.522	0.00068	1.42623	1.42354
103	Methylcyclohexane, C_7H_{14}, M.W. 98.189	213.68	1.609	−195.87	503.5	570.27	0.0600	0.7740	51.3	48.20	6.444	0.00063	1.42312	1.42058
	Alkylcyclohexanes, C_8H_{16}, M.W. 112.216:													
104	Ethylcyclohexane	269.23	0.483	−168.360	440	637	0.064	0.7922	47.1	49.34	6.596	0.00054	1.43304	1.43073
105	1,1-Dimethylcyclohexane	247.19	0.820	−28.28	430	604	0.064	0.7854	48.7	48.91	6.539	0.00059	1.42900	1.42662
106	1,*cis*-2-Dimethylcyclohexane	265.53	0.540	−57.99	430	631	0.066	0.8006	45.2	49.86	6.666	0.00055	1.43596	1.43358
107	1,*trans*-2-Dimethylcyclohexane	254.17	0.707	−126.70	430	613	0.066	0.7802	49.9	48.59	6.496	0.00058	1.42695	1.42470
108	1,*cis*-3-Dimethylcyclohexane	248.17	0.783	−103.97	430	604	0.064	0.7704	52.2	47.98	6.414	0.00058	1.42294	1.42063
109	1,*trans*-3-Dimethylcyclohexane	256.03	0.651	−130.14	430	617	0.066	0.7892	47.8	49.15	6.571	0.00059	1.43085	1.42843
110	1,*cis*-4-Dimethylcyclohexane	255.79	0.661	−125.33	430	617	0.066	0.7873	48.2	49.03	6.555	0.00059	1.42966	1.42731
111	1,*trans*-4-Dimethylcyclohexane	246.84	0.821	−34.49	430	602	0.064	0.7671	53.0	47.77	6.386	0.00062	1.42090	1.41853
	Alkylcyclohexanes, C_9H_{18}, M.W. 126.243:													
112	*n*-Propylcyclohexane	314.14	0.1689	−138.77	407.1	691	0.0605	0.7977	45.9	49.68	6.641	0.00050	1.43705	1.43478
113	Isopropylcyclohexane	310.61	0.1911	−128.85	411.5	692	0.0600	0.8063	44.0	50.22	6.713	0.00050	1.44087	1.43861
114	1-Methyl-1-ethylcyclohexane	305.92	...	...	...	...	...	0.8103	43.1	50.46	6.746	0.00050	1.4419	1.4397
115	1-Methyl-*cis*-2-ethylcyclohexane	313.80	...	...	...	...	...	0.8139	42.4	50.69	6.777	0.00061	1.4436	1.4413
116	1-Methyl-*trans*-2-ethylcyclohexane	305.10	...	...	...	...	...	0.798	45.8	49.7	6.64	0.00060	1.4381	1.4359
117	1-Methyl-*cis*-3-ethylcyclohexane	299.24	...	...	...	...	...	0.7879	48.1	49.07	6.559	0.00049	1.4326	1.4306
118	1-Methyl-*trans*-3-ethylcyclohexane	303.94	...	...	...	...	...	0.8054	44.2	50.16	6.706	0.00050	1.4374	1.4351
119	1-Methyl-*cis*-4-ethylcyclohexane	306.14	...	...	...	...	...	0.8007	45.2	49.87	6.666	0.00050	1.4370	1.4347
120	1-Methyl-*trans*-4-ethylcyclohexane	301.66	...	−114.13	...	...	...	0.7836	49.1	48.80	6.524	0.00059	1.4300	1.4287
121	1,1,2-Trimethylcyclohexane	293.4	0.2776	−20	402.7	661.5	0.0595	0.8041	44.4	50.08	6.695	0.00050	1.4382	1.4359
122	1,1,3-Trimethylcyclohexane	277.95	0.4202	−86.29	390.9	642	0.0595	0.7831	49.2	48.77	6.520	0.00054	1.42955	1.42725
123	1,1,4-Trimethylcyclohexane	275	...	...	...	...	...	0.7762	50.8	48.34	6.462	0.00053	1.4251	1.4228
124	1,*cis*-2,*cis*-3-Trimethylcyclohexane	305.02	...	−120.98	...	...	...	0.8069	43.9	50.26	6.718	0.00050	1.4403	1.4380
125	1,*cis*-2,*trans*-3-Trimethylcyclohexane	304.12	...	−122.26	...	...	...	0.8073	43.8	50.28	6.722	0.00061	1.4399	1.4376
126	1,*trans*-2,*cis*-3-Trimethylcyclohexane	291	...	...	...	...	...	0.785	48.7	48.9	6.54	0.00059	1.430	1.428
127	1,*cis*-2,*cis*-4-Trimethylcyclohexane	296.86	...	−107.36	...	...	...	0.7950	46.5	49.51	6.619	0.00059	1.4340	1.4317
128	1,*cis*-2,*trans*-4-Trimethylcyclohexane	296.01	...	−133.29	...	...	...	0.7950	46.5	49.51	6.619	0.00059	1.4345	1.4322
129	1,*trans*-2,*cis*-4-Trimethylcyclohexane	292.41	...	−188.30	...	...	...	0.792	47.2	49.3	6.59	0.00059	1.4341	1.4318
130	1,*trans*-2,*trans*-4-Trimethylcyclohexane	286.23	0.3495	−122	388	645	0.0594	0.7760	50.8	48.33	6.461	0.00053	1.4266	1.4243
131	1,*cis*-3,*cis*-5-Trimethylcyclohexane	281.17	...	−45.74	...	...	...	0.7737	51.4	48.18	6.441	0.00053	1.4266	1.4243
132	1,*cis*-3,*trans*-5-Trimethylcyclohexane	286.23	...	−119.92	...	...	...	0.7857	48.6	48.93	6.541	0.00054	1.4310	1.4287
	Alkylcyclohexanes, $C_{10}H_{20}$, M.W. 140.270:													
133	*n*-Butylcyclohexane	357.77	0.0561	−102.444	457.0	741	0.0610	0.8031	44.7	50.02	6.687	0.00050	1.44075	1.43855
134	Isobutylcyclohexane	340.322	0.0906	−138.604	452.6	726	0.0605	(0.799)	(45.6)	(49.8)	(6.65)	(0.00040)	1.4386	1.4364
135	*sec*-Butylcyclohexane	354.740	0.0635	Glass	388.0	744	0.0605	(0.817)	(41.7)	(50.9)	(6.80)	(0.00040)	1.4467	1.4445
136	*tert*-Butylcyclohexane	340.826	0.0967	−42.084	387.2	727	0.0601	(0.817)	(41.7)	(50.9)	(6.80)	(0.00041)	1.4469	1.4447
137	1-Methyl-4-isopropylcyclohexane	339.296	(0.10)	−125.662	371.1	718	0.0600	(0.803)	(44.7)	(50.0)	(6.69)	(0.00041)	1.4373	...
	Alkylcycloheptanes, C_7 and C_9:													
138	Cycloheptane, C_7H_{14}, M.W. 98.189	245.84	0.795	+18.0	540	601	0.064	0.8157	42.0	50.80	6.791	0.00061	1.4449	1.4424
139	Ethylcycloheptane, C_9H_{18}, M.W. 126.243	326.0	(0.13)	<−22	426.2	718	0.0599	(0.818)	(41.5)	(51.0)	(6.81)	0.00042	...	...
	Alkylcyclooctanes, C_8 and C_9:													
140	Cyclooctane, C_8H_{16}, M.W. 112.216	304.09	0.222	+58.6	500	653	0.064	0.8405	36.9	52.35	6.998	0.00052	1.4587	1.4563
141	Methylcyclooctane, C_9H_{18}, M.W. 126.243	323.6	(0.15)	60.8	439.4	725	0.0593	0.839	(37.2)	(52.3)	(6.99)	(0.00042)	...	...
	Cycloparaffins, C_9 and C_{10}:													
142	Cyclononane, C_9H_{18}, M.W. 126.243	353.1	(0.12)	52	460	700	0.065	0.8545	34.1	53.22	7.114	0.00053	1.4666	1.4644
143	Cyclodecane, $C_{10}H_{20}$, M.W. 140.270	396	...	50	430	741	0.065	0.8616	32.7	53.67	7.175	0.00048	1.4716	1.4695
	Decahydronaphthalenes, $C_{10}H_{18}$, M.W. 138.254:													
144	*cis*-Decahydronaphthalene	384.47	0.0355	−45.36	...	...	...	0.9011	25.5	56.13	7.503	0.00051	1.4810	1.4788
145	*trans*-Decahydronaphthalene	369.16	0.0539	−22.69	...	...	...	0.8744	30.3	54.46	7.281	0.00055	1.4695	1.4672

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.2—Cycloparaffins (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4\,(n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
96.2	96.1	0.953	...	87.8	0.2900	0.4332	153.0	20 034	130 850	18 676	121 970	1.3	7.8	77.2	87.3	83.0	97.4	102
97.9	97.8	0.767	0.43	105.8	0.3170	0.4397	136.3	20 000	129 040	18 639	120 260	1.2	...	71.1	86.2	74.8	88.2	103
97.5	97.4	0.861	0.51	110.8	0.3267	0.4411	131.5	20 022	132 250	18 661	123 260	0.95	6.6	40.8	65.4	45.6	65.1	104
98.6	98.4	...	...	113.7[h]	0.318	0.4356	124.9	19 997	130 920	18 636	122 010	(0.95)	...	85.9	95.7	87.3	98.0	105
96.0	95.9	...	...	107.1[h]	0.322	0.4383	128.9	20 024	133 640	18 663	124 560	(0.95)	...	78.6	90.7	80.9	94.3	106
98.0	97.9	...	...	118.9[h]	0.327	0.4358	126.0	19 999	130 100	18 638	121 240	(0.95)	...	78.7	90.8	80.9	94.5	107
99.2	99.1	...	...	125.1[h]	0.324	0.4364	125.7	19 981	128 340	18 619	119 590	(0.95)	...	71.0	...	71.7	...	108
97.2	97.1	...	...	115.3[h]	0.324	0.4436	129.7	20 009	131 640	18 648	122 690	(0.95)	...	64.2	83.8	66.9	83.5	109
97.2	97.1	...	...	116.4[h]	0.324	0.4423	129.4	20 009	131 320	18 648	122 390	(0.95)	...	68.2	85.0	67.2	84.7	110
97.2	97.1	...	...	126.9[h]	0.324	0.4383	124.9	19 982	127 790	18 623	119 100	(0.95)	...	62.2	83.4	68.3	82.8	111
97.5	97.4	1.000	0.58	121.6	0.3374	*0.4490*	122.9	20 024	133 160	18 663	124 110	(0.85)	...	14.0	47.7	17.8	42.8	112
96.6	96.5	...	...	120.0[h]	(*0.315*)	(*0.40*)	(*120*)	(*20 031*)	(*135 000*)	(*18 669*)	(*125 500*)	(0.85)	...	61.1	81.4	62.8	79.6	113
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	76.7	88.6	68.7	85.7	114
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	115
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	116
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	117
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	118
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	119
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	120
...	...	...	...	...	(*0.326*)	(*0.42*)	(*117*)	(*19 985*)	(*134 000*)	(*18 623*)	(*125 000*)	(0.85)	...	87.7	97.0	95.7	+0.4[k]	121
99.0	98.9	...	...	...	(*0.326*)	(*0.42*)	(*113*)	(*19 992*)	(*131 000*)	(*18 630*)	(*122 000*)	(0.85)	...	82.6	95.8	81.3	94.8	122
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	123
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	124
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	82.5	91.0	86.2	96.9	125
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	81.0	90.6	83.4	95.7	126
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	127
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	128
...	...	...	...	...	...	...	...	...	...	...	...	(0.85)	...	...	...	...	...	129
...	...	...	...	138.2[h]	(*0.319*)	(*0.41*)	(*116*)	(*20 002*)	(*129 000*)	(*18 639*)	(*121 000*)	(0.85)	...	74.3[l]	87.9	72.9[l]	88.0	130
101	101	...	...	...	...	...	...	...	...	...	...	(0.85)	...	56.4	79.4	59.1	78.0	131
99	99	...	...	...	...	...	...	...	...	...	...	(0.85)	...	70.1	...	68.5	83.9	132
97.1	97.0	1.251	0.69	129.9	0.3416	*0.4527*	118.0	20 029	134 110	18 668	125 000	(0.75)	...	...	25.3	...	22.5	133
...	...	...	...	*135.3*	(*0.317*)	(*0.39*)	(*117*)	(*20 032*)	(*133 000*)	(*18 664*)	(*124 000*)	...	...	...	...	...	...	134
...	...	...	...	...	(*0.317*)	(*0.39*)	(*114*)	(*20 029*)	(*136 000*)	(*18 666*)	(*127 000*)	...	...	...	...	...	...	135
...	...	...	...	*128.5*	(*0.326*)	(*0.40*)	(*112*)	(*19 999*)	(*136 000*)	(*18 637*)	(*127 000*)	...	...	...	...	...	...	136
...	...	...	...	*133.7*	(*0.321*)	(*0.42*)	(*111*)	(*20 010*)	(*134 000*)	(*18 647*)	(*125 000*)	...	...	...	...	...	...	137
101	101	...	...	...	(*0.282*)	*0.4314*	145.29	20 144	136 980	18 784	127 728	(1.1)	...	40.2[l]	65.3	38.8	59.8	138
...	...	...	...	...	(*0.299*)	(*0.38*)	(*124*)	(*19 970*)	(*136 000*)	(*18 609*)	(*127 000*)	...	...	...	...	...	...	139
104	104	...	...	...	(*0.280*)	*0.4510*	137.5	20 186	141 450	18 826	131 910	(0.95)	...	58.2[l]	...	71.0[l]	...	140
...	...	...	...	...	(*0.290*)	(*0.37*)	(*123*)	(*20 043*)	(*140 000*)	(*18 681*)	(*131 000*)	...	...	...	...	...	...	141
...	...	...	...	...	(*0.2777*)	0.444	130.0	20 212	143 970	18 852	134 280	(0.85)	...	...	...	...	...	142
...	...	...	...	...	...	0.450	123.1	20 200	145 120	18 839	135 340	(0.75)	...	...	...	...	...	143
...	...	...	...	95.5	...	*0.3918*	...	19 567	146 990	18 324	137 660	(0.76)	...	...	...	...	...	144
...	...	...	...	95.5	...	*0.3856*	...	19 532	142 390	18 289	133 330	(0.76)	...	...	...	...	...	145

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.3—Monoolefins and Diolefins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants			Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F		Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid, [a] n_D	
					Pressure, psi	Temperature, deg Fahr	Volume, cu ft per lb			lb per cu ft	lb per gal		at 68 F	at 77 F
	Monoolefins, C_2 and C_3:													
1	Ethene (ethylene), C_2H_4, M.W. 28.054	−154.62	...	−272.45[e]	729.8	48.58	0.0737	...	...	...	...	...	...	...
2	Propene (propylene), C_3H_6, M.W. 42.081	−53.90	*226.4*	−301.45[e]	669	196.9	0.0689	0.5220[d]	139.6[d]	32.49[d]	4.343[d]	0.00189[d]	...	...
	Monoolefins, C_4H_8, M.W. 56.108:													
3	1-Butene	+20.75	*63.05*	−301.63[e]	583	295.6	0.0685	0.6013[d]	103.8[d]	37.43[d]	5.004[d]	0.00116[d]	...	...
4	*cis*-2-Butene	38.69	*45.54*	−218.06	610	324.37	0.0668	0.6271[d]	94.1[d]	39.04[d]	5.219[d]	0.00098[d]	...	...
5	*trans*-2-Butene	33.58	*49.80*	−157.96	595	311.86	0.0680	0.6100[d]	100.5[d]	37.97[d]	5.076[d]	0.00107[d]	...	...
6	2-Methylpropene (isobutene)	19.59	*63.40*	−220.61	580	292.55	0.0682	0.6004[d]	104.2[d]	37.37[d]	4.996[d]	0.00120[d]	...	...
	Monoolefins, C_5H_{10}, M.W. 70.135:													
7	1-Pentene	85.93	19.115	−265.39	590	376.93	0.0697	0.6457	87.6	40.20	5.374	0.00089	1.37148	1.36835
8	*cis*-2-Pentene	98.48	15.122	−240.52	530	397	0.069	0.6608	82.6	41.14	5.500	0.00087	1.3830	1.3798
9	*trans*-2-Pentene	97.42	15.431	−220.46	530	396	0.069	0.6533	85.0	40.68	5.438	0.00090	1.3793	1.3761
10	2-Methyl-1-butene	88.08	18.399	−215.63	500	378	0.071	0.6557	84.3	40.83	5.458	0.00090	1.3778	1.3746
11	3-Methyl-1-butene	68.10	26.41	−271.28	510	351	0.069	0.6325	92.2	39.38	5.264	0.00095	1.3643	1.3611[c]
12	2-Methyl-2-butene	101.40	14.303	−208.77	500	387	0.073	0.6676	80.5	41.57	5.557	0.00087	1.3874	1.3842
	Monoolefins, C_6H_{12}, M.W. 84.162:													
13	1-Hexene	146.26	6.006	−219.70	460	447.58	0.070	0.6780	77.2	42.21	5.643	0.00076	1.38788	1.38502
14	*cis*-2-Hexene	155.99	4.909	−222.07	*(476.1)*	*(472)*	*(0.0668)*	0.6920	73.0	43.09	5.760	0.00073	1.39761	1.39473
15	*trans*-2-Hexene	154.18	5.089	−207.36	*(474.1)*	*(470)*	*(0.0668)*	0.6827	75.8	42.51	5.683	0.00072	1.39363	1.39073
16	*cis*-3-Hexene	151.59	5.378	−216.09	*(476.1)*	*(471)*	*(0.0668)*	0.6847	75.2	42.63	5.699	0.00073	1.39479	1.39189
17	*trans*-3-Hexene	152.74	5.219	−172.16	*(476.1)*	*(472)*	*(0.0668)*	0.6821	76.0	42.47	5.677	0.00077	1.39429	1.39137
18	2-Methyl-1-pentene	143.78	6.298	−212.31	...	...	...	0.6848	75.1	42.64	5.700	0.00077	1.39200	1.38912
19	3-Methyl-1-pentene	129.50	8.443	−243.4	...	...	...	0.6721	79.0	41.85	5.594	0.00075	1.38422	1.38133
20	4-Methyl-1-pentene	128.94	8.499	−244.55	...	...	...	0.6686	80.1	41.63	5.565	0.00079	1.38267	1.37974
21	2-Methyl-2-pentene	153.14	5.173	−211.14	*(476.1)*	*(472)*	*(0.0668)*	0.6912	73.2	43.04	5.754	0.00073	1.40030	1.39739
22	3-Methyl-*cis*-2-pentene	153.85	5.143	−210.73	*(476.1)*	*(472)*	*(0.0668)*	0.6980	71.2	43.46	5.810	0.00074	1.40157	1.39876
23	3-Methyl-*trans*-2-pentene	158.77	4.614	−217.22	*(477.6)*	*(479)*	*(0.0668)*	0.7023	70.0	43.73	5.846	0.00070	1.40452	1.40166
24	4-Methyl-*cis*-2-pentene	133.48	7.734	−209.96	...	...	...	0.6741	78.4	41.97	5.610	0.00076	1.38793	1.38498
25	4-Methyl-*trans*-2-pentene	137.48	7.123	−221.44	...	...	...	0.6736	78.6	41.94	5.607	0.00080	1.38878	1.38583
26	2-Ethyl-1-butene	148.41	5.697	−204.77	...	...	...	0.6944	72.3	43.24	5.780	0.00074	1.39671	1.39380
27	2,3-Dimethyl-1-butene	132.09	7.968	−251.07	*(470.3)*	*(442)*	*(0.0653)*	0.6830	75.7	42.53	5.685	0.00077	1.39022	1.38729
28	3,3-Dimethyl-1-butene	106.23	13.093	−175.34	*(457.0)*	*(423)*	*(0.0653)*	0.6584	83.4	40.99	5.480	0.00090	1.37620	1.37313
29	2,3-Dimethyl-2-butene	163.76	4.163	−101.62	*(487.9)*	*(484)*	*(0.0668)*	0.7129	67.0	44.39	5.934	0.00071	1.41235	1.40952
	Monoolefins, C_7H_{14}, M.W. 98.189:													
30	1-Heptene	200.55	1.964	−181.98	410	500.25	0.072	0.7015	70.2	43.68	5.839	0.00070	1.39980	1.39713
31	*cis*-2-Heptene	209.14	1.692	...	...	...	...	0.7116	67.3	44.1	5.90	0.00067	1.4069	1.4042
32	*trans*-2-Heptene	208.31	1.720	−165.04	...	...	...	0.7057	69.0	43.94	5.874	0.00066	1.4045	1.4020
33	*cis*-3-Heptene	204.35	1.864	...	...	...	...	0.7073	68.6	44.04	5.887	0.00071	1.4059	1.4033
34	*trans*-3-Heptene	204.21	1.864	−213.95	...	...	...	0.7026	69.8	43.75	5.848	0.00070	1.4044	1.4017
35	2-Methyl-1-hexene	197.60	2.117	−153.08	...	...	...	0.7075	68.5	44.05	5.889	0.00071	1.4035	1.4008
36	3-Methyl-1-hexene	183.02	2.807	...	...	...	...	0.6959	71.8	43.33	5.792	0.00069	1.3965	1.3938
37	4-Methyl-1-hexene	188.11	2.542	−222.63	...	...	...	0.7030	69.8	43.77	5.851	0.00066	1.4000	1.3973
38	5-Methyl-1-hexene	185.56	2.672	...	...	...	...	0.6965	71.7	43.37	5.798	0.00070	1.3967	1.3940
39	2-Methyl-2-hexene	203.74	1.878	−202.64	...	...	...	0.7126	67.1	44.37	5.931	0.00067	1.4106	1.4079
40	3-Methyl-*cis*-2-hexene	207.07	1.761	−181.30	...	...	...	0.7202	65.0	44.85	5.996	0.00072	1.4126	1.4100
41	3-Methyl-*trans*-2-hexene	203.32	1.893	−200.7	...	...	...	0.7188	65.4	44.76	5.984	0.00067	1.4118	1.4091
42	4-Methyl-*cis*-2-hexene	187.36	2.580	...	...	...	...	0.7040	69.5	43.84	5.860	0.00070	1.4026	1.3999
43	4-Methyl-*trans*-2-hexene	189.61	2.469	−194.25	...	...	...	0.7013	70.3	43.67	5.838	0.00070	1.4025	1.3998
44	5-Methyl-*cis*-2-hexene	193.1	2.307	...	...	...	...	0.706	68.9	43.93	5.873	0.00053	1.404	1.401
45	5-Methyl-*trans*-2-hexene	190.60	2.422	−191.81	...	...	...	0.6971	71.5	43.41	5.803	0.00070	1.4006	1.3979
46	2-Methyl-*cis*-3-hexene	187	2.615	...	...	...	...	0.698	71.2	43.4	5.80	0.00052	1.401	1.399
47	2-Methyl-*trans*-3-hexene	186.62	2.615	−222.83	...	...	...	0.6941	72.4	43.22	5.778	0.00074	1.4001	1.3974
48	3-Methyl-*cis*-3-hexene	203.72	1.800	...	...	...	...	0.7181	65.6	44.71	5.977	0.00081	1.41264	1.40995
49	3-Methyl-*trans*-3-hexene	200.38	1.957	...	...	...	...	0.7144	66.6	44.49	5.947	0.00076	1.41090	1.40820

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.3—Monoolefins and Diolefins (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
...	...	...	...	...	0.3622	...	207.57	...[o]	...	...	...	2.7	34	75.6	...	+0.03[k]	...	1
...	...	...	...	...	0.3541	0.585	188.18	...[o]	...	...	...	2.0	10	84.9	...	+0.2[k]	...	2
...	...	...	...	...	0.3548	0.535	167.94	20 672[d,o]	103 630[d]	19 313[d]	96 820[d]	1.6	9.3	80.8[l]	...	97.4	...	3
...	...	...	...	...	0.3269	0.5271	178.91	20 607[d,o]	107 740[d]	19 246[d]	100 620[d]	(1.6)	...	83.5	...	100	...	4
...	...	...	...	...	0.3654	0.5351	174.39	20 580[d,o]	104 650[d]	19 219[d]	97 730[d]	(1.6)	...	...	...	...	...	5
...	...	...	...	58.8	0.3701	0.549	169.48	20 540[d,o]	102 810[d]	19 179[d]	96 000[d]	(1.6)	...	...	...	...	...	6
126.2	126.1	...	...	66.2	0.3635	0.5196	154.46	20 546	110 600	19 185	103 280	1.4	8.7	77.1	82.9	90.9	98.6	7
130	130	...	...	64.4	0.3366	0.5079	160.1	20 499	112 940	19 138	105 440	(1.4)	...	...	...	...	...	8
132	132	...	...	64.4	0.3601	0.5255	159.8	20 472	111 520	19 113	104 110	(1.4)	...	...	...	...	...	9
133	133	...	...	...	0.3705	0.5266	156.31	20 451	111 810	19 090	104 370	(1.4)	...	81.9	84.2	+0.2[k]	+0.3[k]	10
128	128[c]	...	...	...	0.3936	0.5211	147.5	20 505	108 120	19 144	100 950	(1.4)	...	*n*	*n*	*n*	*n*	11
135	135	...	...	55.0	0.3483	0.5119	161.26	20 404	113 570	19 043	106 000	(1.4)	...	84.7	85.8	97.3	99.2	12
122.0	121.9	0.34	...	73.0	0.3659	*0.5116*	144.4	20 465	115 670	19 104	107 980	(1.2)	...	63.4	76.3	76.4	91.7	13
124.6	124.8	...	...	78.8	0.3471	0.50	148.8	20 406	117 730	19 045	109 880	(1.2)	...	...	...	...	...	14
126.7	126.8	...	...	78.8	0.3667	0.522	147.7	20 397	116 100	19 036	108 360	(1.2)	...	80.8	83.2	92.7	98.4	15
130.0	129.7	...	...	80.6[h]	0.3405	0.51	146.6	20 431	116 620	19 070	108 860	(1.2)	...	...	...	...	...	16
128.8	129.0	...	...	80.6[h]	0.3672	0.51	147.9	20 395	115 970	19 034	108 232	(1.2)	...	80.1	82.3	94.0	...	17
124.9	124.4	...	...	...	0.3749	0.517	144.1	20 375	116 330	19 014	108 560	(1.2)	...	81.5	85.2	94.2	99.8	18
121.7	121.6	...	...	...	0.3995	0.52	137.4	20 435	114 500	19 074	106 880	(1.2)	...	81.2	82.2	96.0	+0.05[k]	19
122.2	122.5	...	...	...	0.3495	0.52	138.3	20 426	113 860	19 065	106 273	(1.2)	...	80.9	84.5	95.7	+0.5[k]	20
132.1	132.4	...	...	...	0.3490	0.50	148.0	20 330	117 170	18 969	109 320	(1.2)	...	83.0	85.0	97.8	99.5	21
128.0	128.3	...	...	...	0.3490	0.50	147.3	20 352	118 430	18 991	110 510	(1.2)	...	...	...	...	...	22
128.4	128.3	...	...	...	0.3490	0.50	149.6	20 352	119 160	18 991	111 200	(1.2)	...	81.0	84.0	97.2	100	23
126.0	126.0	...	...	...	0.3686	0.52	140.8	20 390	114 580	19 029	106 930	(1.2)	...	84.5	86.3	99.7	+0.2[k]	24
126.4	126.4	...	...	...	0.3915	0.52	142.8	20 366	114 360	19 005	106 720	(1.2)	...	82.6	...	98.0	+0.02[k]	25
123.6	123.5	...	...	...	0.3686	0.50	147.1	20 390	118 040	19 029	110 160	(1.2)	...	79.4	82.0	98.3	+0.3[k]	26
125.6	125.7	...	...	...	0.3970	0.51	139.9	20 354	115 900	18 993	108 150	(1.2)	...	82.8	85.5	+0.1[k]	+0.3[k]	27
124.0	123.9	...	...	...	0.3491	0.523	131.0	20 388	111 910	19 027	104 440	(1.2)	...	93.3	...	+1.7[k]	...	28
132.9	133.2	...	...	...	0.3530	0.4881	151.40	20 316	120 740	18 955	112 650	(1.2)	...	80.5	84.0	97.4	98.5	29
118.3	118.2	0.44	...	81.0	0.3677	*0.5068*	136.2	20 408	119 350	19 047	111 390	(1.0)	...	50.7	68.9	54.5	80.2	30
122	122	...	...	...	...	0.50	135.6	20 375	120 880	19 014	112 810	(1.0)	...	...	...	...	...	31
124	124	...	...	...	...	0.519	135.6	20 356	119 770	18 995	111 760	(1.0)	...	68.8	78.9	73.4	89.5	32
122	122	...	...	94.8[h]	...	0.50	135.6	20 377	120 160	19 016	112 140	(1.0)	...	...	...	90.2	...	33
124	124	...	...	94.8	...	0.51	135.6	20 358	119 250	18 997	111 280	(1.0)	...	79.3	84.6	89.8	98.2	34
121	121	...	...	...	...	0.514	135.6	20 342	119 990	18 981	111 960	(1.0)	...	78.8	85.0	90.7	98.6	35
120	120	...	...	...	...	0.51	133.8	20 392	118 310	19 031	110 420	(1.0)	...	71.5	80.0	82.2	94.8	36
120	120	...	...	...	...	0.51	133.8	20 390	119 510	19 029	111 530	(1.0)	...	74.0	83.6	86.4	96.8	37
120	120	...	...	...	...	0.51	133.8	20 380	118 340	19 019	110 440	(1.0)	...	64.0	78.6	75.5	91.8	38
127	127	...	...	...	...	0.50	135.6	20 314	120 690	18 953	112 600	(1.0)	...	79.2[l]	83.7	91.6[l]	98.4	39
127	127	...	...	...	...	0.50	135.6	20 326	122 050	18 965	113 880	(1.0)	...	80.0	84.0	92.4[l]	97.4[l]	40
127	127	...	...	...	...	0.50	135.6	20 326	121 810	18 965	113 650	(1.0)	...	79.6[l]	83.8	91.5[l]	97.4[l]	41
122	122	...	...	...	...	0.51	133.8	20 361	119 510	19 000	111 520	(1.0)	...	...	...	98.6	...	42
124	124	...	...	...	...	0.51	133.8	20 342	118 940	18 981	110 980	(1.0)	...	83.0	85.8	96.8	+0.06[k]	43
122	122	...	....	...	...	0.51	133.8	20 349	119 780	18 988	111 770	(1.0)	...	...	...	...	...	44
124	124	...	...	...	...	0.51	133.8	20 331	118 160	18 970	110 250	(1.0)	...	81.0[l]	85.0	94.4[l]	+0.1[k]	45
122	122	...	...	...	...	0.51	133.8	20 351	118 430	18 990	110 510	(1.0)	...	...	...	...	...	46
124	124	...	...	...	...	0.51	133.8	20 333	117 670	18 972	109 790	(1.0)	...	82.0	85.7	97.9	+0.1[k]	47
127.4	127.1	...	...	...	...	0.50	137.8	20 325	121 670	18 964	113 520	(1.0)	...	...	...	96.0	...	48
126.8	127.4	...	...	...	...	0.50	136.5	20 340	121 140	18 979	113 040	(1.0)	...	81.4	85.1	96.4	98.8	49

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 ., for definitions of superscripts.

TABLE 1C1.3—Monoolefins and Diolefins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants: Pressure, psi	Critical Constants: Temperature, deg Fahr	Critical Constants: Volume, cu ft per lb	Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F: lb per cu ft	Density of the Liquid*, [a, b] at 60 F: lb per gal	Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D: at 68 F	Refractive Index of the Liquid,[a] n_D: at 77 F
	Monoolefins, C_7H_{14} (continued):													
50	2-Ethyl-1-pentene	201.2	1.972	...	...	...	...	0.712	67.2	44.3	5.92	0.00067	1.405	1.402
51	3-Ethyl-1-pentene	183.40	2.786	−197.47	...	...	...	0.7005	70.5	43.62	5.831	0.00070	1.3982	1.3955
52	2,3-Dimethyl-1-pentene	183.70	2.770	−209.76	...	...	...	0.7097	67.9	44.19	5.907	0.00071	1.4033	1.4006
53	2,4-Dimethyl-1-pentene	178.89	3.167	−191.31	...	...	...	0.6988	71.0	43.51	5.817	0.00074	1.39852	1.39577
54	3,3-Dimethyl-1-pentene	171.45	3.518	−209.90	...	...	...	0.7019	70.1	43.70	5.842	0.00066	1.3984	1.3958
55	3,4-Dimethyl-1-pentene	177.42	3.130	...	...	...	...	0.7022	70.0	43.72	5.845	0.00066	1.3992	1.3965
56	4,4-Dimethyl-1-pentene	162.52	4.483	−213.90	(414.4)	(488)	(0.0663)	0.6871	74.5	42.78	5.719	0.00073	1.39172	1.38895
57	3-Ethyl-2-pentene	204.82	1.839	...	...	...	...	0.7249	63.7	45.14	6.034	0.00068	1.4148	1.4122
58	2,3-Dimethyl-2-pentene	207.32	1.752	−180.89	(439.4)	(542)	(0.0665)	0.7322	61.7	45.60	6.096	0.00069	1.4211	1.4185
59	2,4-Dimethyl-2-pentene	181.93	2.868	−197.87	...	...	...	0.6996	70.8	43.56	5.823	0.00070	1.40371	1.40090
60	3,4-Dimethyl-*cis*-2-pentene	192.65	2.328	−172.09	...	...	...	0.7180	65.6	44.71	5.977	0.00072	1.4104	1.4078
61	3,4-Dimethyl-*trans*-2-pentene	196.70	2.152	−191.62	...	...	...	0.7212	64.7	44.91	6.004	0.00072	1.4128	1.4101
62	4,4-Dimethyl-*cis*-2-pentene	176.76	3.350	−211.85	...	...	...	0.7039	69.5	43.83	5.859	0.00070	1.40260	1.39989
63	4,4-Dimethyl-*trans*-2-pentene	170.12	3.701	−175.41	...	...	...	0.6936	72.5	43.19	5.774	0.00074	1.39807	1.39525
64	3-Methyl-2-ethyl-1-butene	187.45	2.599	...	...	...	...	0.7135	66.8	44.43	5.939	0.00071	1.40518	1.40244
65	2,3,3-Trimethyl-1-butene	172.19	3.681	−165.71	(420.3)	(499)	(0.0663)	0.7092	68.0	44.16	5.903	0.00071	1.40282	1.40007
	Monoolefins, C_8H_{16}, M.W. 112.216:													
66	1-Octene	250.32	0.656	−151.09	380	560.3	0.073	0.7193	65.2	44.79	5.987	0.00058	1.40870	1.40620
67	*cis*-2-Octene	258.17	0.596	−148.4	(402.7)	(587)	(0.0663)	0.7287	62.7	45.38	6.066	0.00064	1.4150	1.4125
68	*trans*-2-Octene	257.0	0.611	−125.9	(401.2)	(585)	(0.0663)	0.7243	63.8	45.10	6.029	0.00063	1.4132	1.4107
69	*cis*-3-Octene	253.2	0.657	...	...	...	...	0.725	63.6	45.1	6.03	0.00054	1.4135	1.4111
70	*trans*-3-Octene	253.9	0.648	−166.0	(398.3)	(581)	(0.0663)	0.7196	65.1	44.81	5.990	0.00067	1.4126	1.4102
71	*cis*-4-Octene	252.59	0.665	−181.7	(396.8)	(580)	(0.0663)	0.7256	63.5	45.18	6.040	0.00045	1.4148	1.4124
72	*trans*-4-Octene	252.07	0.672	−136.81	(396.8)	(580)	(0.0663)	0.7185	65.4	44.74	5.981	0.00063	1.4118	1.4093
73	2-Methyl-1-heptene	246.7	0.748	−130.0	(393.8)	(572)	(0.0663)	0.7248	63.7	45.13	6.033	0.00063	1.4123	1.4098
74	3-Methyl-1-heptene	232	1.001	...	...	...	...	0.715	66.4	44.5	5.95	0.00067	1.406	1.404
75	4-Methyl-1-heptene	235.0	0.938	...	...	...	...	0.721	64.7	44.9	6.00	0.00063	1.410	1.408
76	5-Methyl-1-heptene	235.9	0.922	...	...	...	...	0.7208	64.8	44.88	6.000	0.00067	1.4094	1.4069
77	6-Methyl-1-heptene	235.8	0.925	...	...	...	...	0.7163	66.0	44.60	5.962	0.00063	1.4070	1.4045
78	2-Methyl-2-heptene	252.7	0.663	...	...	...	...	0.7284	62.8	45.36	6.064	0.00064	1.4170	1.4145
79	3-Methyl-*cis*-2-heptene	252	0.679	...	...	...	...	0.733	61.5	45.6	6.10	0.00055	1.419	1.417
80	3-Methyl-*trans*-2-heptene	252	0.679	...	...	...	...	0.733	61.5	45.6	6.10	0.00055	1.419	1.417
81	4-Methyl-*cis*-2-heptene	237	0.900	...	...	...	...	0.720	65.0	44.8	5.99	0.00063	1.410	1.408
82	4-Methyl-*trans*-2-heptene	237	0.900	...	...	...	...	0.720	65.0	44.8	5.99	0.00063	1.410	1.408
83	5-Methyl-*cis*-2-heptene	244	0.781	...	...	...	...	0.727	63.1	45.3	6.06	0.00064	1.414	1.412
84	5-Methyl-*trans*-2-heptene	244	0.781	...	...	...	...	0.727	63.1	45.3	6.06	0.00064	1.414	1.412
85	6-Methyl-*cis*-2-heptene	243	0.809	...	...	...	...	0.722	64.4	44.9	6.00	0.00054	1.412	1.410
86	6-Methyl-*trans*-2-heptene	243	0.809	...	...	...	...	0.722	64.4	44.9	6.00	0.00054	1.412	1.410
87	2-Methyl-*cis*-3-heptene	234	0.966	...	...	...	...	0.710	67.7	44.2	5.91	0.00066	1.407	1.405
88	2-Methyl-*trans*-3-heptene	234	0.945	...	...	...	...	0.710	67.7	44.2	5.91	0.00066	1.407	1.405
89	3-Methyl-*cis*-3-heptene	250	0.703	...	...	...	...	0.732	61.8	45.6	6.10	0.00064	1.418	1.416
90	3-Methyl-*trans*-3-heptene	250	0.703	...	...	...	...	0.732	61.8	45.6	6.10	0.00064	1.418	1.416
91	4-Methyl-*cis*-3-heptene	252	0.679	...	...	...	...	0.729	62.6	45.4	6.07	0.00050	1.417	1.415
92	4-Methyl-*trans*-3-heptene	252	0.679	...	...	...	...	0.729	62.6	45.4	6.07	0.00050	1.417	1.415
93	5-Methyl-*cis*-3-heptene	234	0.966	...	...	...	...	0.717	65.9	44.6	5.96	0.00054	1.410	1.408
94	5-Methyl-*trans*-3-heptene	234	0.966	...	...	...	...	0.717	65.9	44.6	5.96	0.00054	1.410	1.408
95	6-Methyl-*cis*-3-heptene	239	0.8685	...	...	...	...	0.717	65.9	44.6	5.96	0.00054	1.410	1.408
96	6-Methyl-*trans*-3-heptene	239	0.899	...	...	...	...	0.717	65.9	44.6	5.96	0.00054	1.410	1.408
97	2-Ethyl-1-hexene	248	0.728	...	...	...	...	0.7314	62.0	45.55	6.089	0.00064	1.4157	1.4132
98	3-Ethyl-1-hexene	230.5	1.025	...	...	...	...	0.719	65.3	44.8	5.99	0.00067	1.407	1.405
99	4-Ethyl-1-hexene	235	0.932	...	...	...	...	0.730	62.3	45.4	6.07	0.00050	1.412	1.410

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.3—Monoolefins and Diolefins (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4\ (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
125	125	...	...	...	...	0.50	135.6	20 352	120 670	18 991	112 600	(1.0)	...	...	...	...	...	50
121	121	...	...	...	...	0.51	133.8	20 401	119 140	19 040	111 190	(1.0)	...	81.6	84.2	95.6	+0.05[k]	51
125	125	...	...	...	...	0.50	133.8	20 325	120 250	18 964	112 190	(1.0)	...	84.2	86.4	99.3	+0.17[k]	52
121.7	122.2	...	...	...	...	0.51	127.9	20 320	118 370	18 959	110 440	(1.0)	...	84.6	87.3	99.2	+0.36[k]	53
120	120	...	...	...	...	0.51	131.9	20 353	119 090	18 993	111 130	(1.0)	...	86.1	87.3	+0.3[k]	+0.6[k]	54
120	120	...	...	...	...	0.51	131.9	20 361	119 200	19 000	111 230	(1.0)	...	80.9	...	98.9	+0.1[k]	55
121.5	121.7	...	...	...	(0.365)	0.52	123.6	20 348	116 560	18 988	108 760	(1.0)	...	85.4	87.7	+0.4[k]	+0.8[k]	56
127	127	...	...	...	...	0.49	135.6	20 336	122 890	18 975	114 670	(1.0)	...	80.6	84.1	93.7	97.6	57
130	130	...	...	...	(0.375)	0.49	135.6	20 289	123 870	18 930	115 570	(1.0)	...	80.0	83.3	97.5	99.5	58
128.6	128.9	...	...	...	...	0.51	132.6	20 293	118 350	18 934	110 420	(1.0)	...	85.3[l]	86.4	100	+0.16[k]	59
127	127	...	...	...	...	0.50	133.8	20 298	121 510	18 937	113 360	(1.0)	...	82.2	85.1	96.0	99.5	60
127	127	...	...	...	...	0.50	135.6	20 296	122 040	18 935	113 860	(1.0)	...	...	...	...	...	61
123.5	124.2	...	...	...	...	0.51	127.7	20 372	119 540	19 011	111 560	(1.0)	...	90.2	...	+0.5[k]	...	62
123.2	123.6	...	...	...	...	0.51	129.2	20 300	117 400	18 939	109 530	(1.0)	...	90.9	94.5	+0.5[k]	+0.9[k]	63
119.2	119.4	...	...	...	...	0.50	132.6	20 332	120 940	18 973	112 850	(1.0)	...	82.0	85.6	97.0	+0.1[k]	64
119.6	120.1	...	...	95.4[h]	(0.394)	0.50	126.5	20 318	120 120	18 957	112 080	(1.0)	...	90.5	93.7	+0.5[k]	+1.2[k]	65
116.9	116.8	0.557	0.364	90.5	0.3693	*0.5057*	129.3	*20 366*	*122 340*	*19 005*	*114 170*	(0.9)	...	34.7	57.7	28.7	63.5	66
118	118	...	...	101.3[h]	(0.381)	0.50	132.1	(20 368)	(123 733)	(19 005)	(115 500)	(0.9)	...	56.5	73.0	56.3	78.7	67
120	120	...	...	101.3[h]	(0.387)	0.516	131.8	(20 357)	(122 920)	(18 998)	(115 000)	(0.9)	...	56.5	73.0	56.3	78.7	68
119	119	...	...	...	...	0.50	131.5	...	...	...	...	(0.9)	...	...	...	...	...	69
121	121	...	...	...	(0.377)	0.51	131.5	(20 358)	(122 129)	(18 998)	(114 900)	(0.9)	...	68.1	81.2	72.5	89.4	70
120	120	...	...	...	(0.370)	0.50	131.3	(20 357)	(123 142)	(18 996)	(114 900)	(0.9)	...	...	...	...	...	71
122	122	...	...	...	(0.377)	0.51	131.1	(20 347)	(121 880)	(18 987)	(113 730)	(0.9)	...	74.3	84.2	73.3	91.8	72
122	122	...	...	...	(0.388)	0.512	130.0	(20 312)	(122 722)	(18 929)	(114 370)	(0.9)	...	66.3	79.6	70.2	87.9	73
117	117	...	...	...	...	0.51	128.4	...	...	...	...	(0.9)	...	...	...	...	...	74
117	117	...	...	...	...	0.51	128.9	...	...	...	...	(0.9)	...	...	...	...	...	75
117	117	...	...	...	...	0.50	128.9	...	...	...	...	(0.9)	...	...	...	...	...	76
117	117	...	...	...	...	0.51	128.9	...	...	...	...	(0.9)	...	62.6	76.6	63.6	87.2	77
124	124	...	...	...	...	0.50	130.8	...	...	...	...	(0.9)	...	73.1[l]	81.6	79.8[l]	93.8	78
124	124	...	...	...	...	0.50	130.7	...	...	...	...	(0.9)	...	...	...	...	...	79
124	124	...	...	...	...	0.50	131.0	...	...	...	...	(0.9)	...	...	...	...	...	80
119	119	...	...	...	...	0.50	129.0	...	...	...	...	(0.9)	...	...	...	...	...	81
121	121	...	...	...	...	0.50	129.0	...	...	...	...	(0.9)	...	...	...	...	...	82
119	119	...	...	...	...	0.50	130.0	...	...	...	...	(0.9)	...	...	...	...	...	83
121	121	...	...	...	...	0.50	130.0	...	...	...	...	(0.9)	...	...	...	...	...	84
119	119	...	...	...	...	0.50	129.7	...	...	...	...	(0.9)	...	65.5	80.5	71.3	90.2	85
121	121	...	...	...	...	0.50	129.7	...	...	...	...	(0.9)	...	65.5	80.5	71.3	90.2	86
119	119	...	...	...	...	0.51	128.6	...	...	...	...	(0.9)	...	...	...	...	...	87
121	121	...	...	...	...	0.51	128.7	...	...	...	...	(0.9)	...	80.6[l]	85.0	94.6[l]	99.8	88
124	124	...	...	...	...	0.50	130.5	...	...	...	...	(0.9)	...	...	...	...	...	89
124	124	...	...	...	...	0.50	130.5	...	...	...	...	(0.9)	...	...	...	...	...	90
124	124	...	...	...	...	0.50	130.7	...	...	...	...	(0.9)	...	...	...	...	...	91
124	124	...	...	...	...	0.50	130.7	...	...	...	...	(0.9)	...	...	...	...	...	92
119	119	...	...	...	...	0.51	128.6	...	...	...	...	(0.9)	...	...	...	...	...	93
121	121	...	...	...	...	0.51	128.6	...	...	...	...	(0.9)	...	...	...	...	...	94
119	119	...	...	...	...	0.51	129.2	...	...	...	...	(0.9)	...	...	...	...	...	95
121	121	...	...	...	...	0.51	129.0	...	...	...	...	(0.9)	...	82.0	86.5	93.4	+0.03[k]	96
121	121	...	...	...	...	0.50	130.2	...	...	...	...	(0.9)	...	...	...	...	...	97
117	117	...	...	...	...	0.51	128.2	...	...	...	...	(0.9)	...	...	...	...	...	98
117	117	...	...	...	...	0.50	128.7	...	...	...	...	(0.9)	...	...	...	...	...	99

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.3—Monoolefins and Diolefins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants: Pressure, psi	Critical Constants: Temperature, deg Fahr	Critical Constants: Volume, cu ft per lb	Specific Gravity[a, c] 60 F/60 F	API Gravity*, c at 60 F, deg API	Density of the Liquid*, a, b at 60 F: lb per cu ft	Density of the Liquid*, a, b at 60 F: lb per gal	Coefficient of Expansion*, a $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D: at 68 F	Refractive Index of the Liquid,[a] n_D: at 77 F
	Monoolefins, C_8H_{16} (continued):													
100	2,3-Dimethyl-1-hexene	230.9	1.018	...	...	...	...	0.7321	61.8	45.20	6.042	0.00068	1.4113	1.4089
101	2,4-Dimethyl-1-hexene	232.2	0.992	...	...	...	...	0.724	63.9	45.1	6.03	0.00068	1.411	1.409
102	2,5-Dimethyl-1-hexene	232.9	0.978	...	...	...	...	0.7217	64.5	44.94	6.008	0.00068	1.4105	1.4080
103	3,3-Dimethyl-1-hexene	219	1.284	...	...	...	...	0.7183	65.5	44.73	5.980	0.00063	1.4070	1.4046
104	3,4-Dimethyl-1-hexene	234	0.966	...	...	...	...	0.728	62.9	45.3	6.06	0.00064	1.413	1.411
105	3,5-Dimethyl-1-hexene	219	1.284	...	...	...	...	0.712	67.2	44.3	5.92	0.00067	1.404	1.402
106	4,4-Dimethyl-1-hexene	225.0	1.144	...	...	...	...	0.7241	63.9	45.09	6.028	0.00063	1.4102	1.4078
107	4,5-Dimethyl-1-hexene	228	1.074	...	...	...	...	0.732	61.8	45.6	6.10	0.00064	1.414	1.412
108	5,5-Dimethyl-1-hexene	216.5	1.353	...	...	...	...	0.713	66.9	44.4	5.94	0.00067	1.4049	1.4024
109	3-Ethyl-*cis*-2-hexene	250	0.703	...	...	...	...	0.741	59.4	46.1	6.16	0.00051	1.424	1.422
110	3-Ethyl-*trans*-2-hexene	250	0.703	...	...	...	...	0.741	59.4	46.1	6.16	0.00051	1.424	1.422
111	4-Ethyl-*cis*-2-hexene	235	0.932	...	...	...	...	0.729	62.6	45.4	6.07	0.00064	1.412	1.410
112	4-Ethyl-*trans*-2-hexene	235	0.932	...	...	...	...	0.729	62.6	45.4	6.07	0.00064	1.412	1.410
113	2,3-Dimethyl-2-hexene	251.20	0.683	−175.2	(*396.8*)	(*580*)	(*0.0668*)	0.7452	58.3	46.41	6.204	0.00065	1.4268	1.4244
114	2,4-Dimethyl-2-hexene	231.1	1.014	...	...	...	...	0.7257	63.4	45.19	6.041	0.00068	1.4118	1.4094
115	2,5-Dimethyl-2-hexene	234.0	0.918	...	...	...	...	0.724	63.9	45.1	6.03	0.00068	1.4140	1.4115
116	3,4-Dimethyl-*cis*-2-hexene	241	0.838	...	...	...	...	0.741	59.5	46.1	6.16	0.00051	1.418	1.416
117	3,4-Dimethyl-*trans*-2-hexene	241	0.838	...	...	...	...	0.741	59.5	46.1	6.16	0.00051	1.418	1.416
118	3,5-Dimethyl-*cis*-2-hexene	234	0.966	...	...	...	...	0.729	62.6	45.4	6.07	0.00064	1.416	1.414
119	3,5-Dimethyl-*trans*-2-hexene	234	0.966	...	...	...	...	0.729	62.6	45.4	6.07	0.00064	1.416	1.414
120	4,4-Dimethyl-*cis*-2-hexene	223	1.195	...	...	...	...	0.726	63.4	45.2	6.04	0.00063	1.413	1.411
121	4,4-Dimethyl-*trans*-2-hexene	223	1.195	...	...	...	...	0.726	63.4	45.2	6.04	0.00063	1.413	1.411
122	4,5-Dimethyl-*cis*-2-hexene	230	1.037	...	...	...	...	0.729	62.6	45.4	6.07	0.00064	1.413	1.411
123	4,5-Dimethyl-*trans*-2-hexene	230	1.037	...	...	...	...	0.729	62.6	45.4	6.07	0.00064	1.413	1.411
124	5,5-Dimethyl-*cis*-2-hexene	224.4	1.157	...	...	...	...	0.7215	64.6	44.93	6.006	0.00068	1.4113	1.4088
125	5,5-Dimethyl-*trans*-2-hexene	219.4	1.278	...	...	...	...	0.7111	67.5	44.28	5.919	0.00067	1.4055	1.4030
126	3-Ethyl-3-hexene	241	0.838	...	...	...	...	0.733	61.5	45.6	6.10	0.00055	1.418	1.416
127	2,2-Dimethyl-*cis*-3-hexene	221.77	1.308	−215.25	...	...	...	0.7172	65.8	44.66	5.970	0.00063	1.4099	1.4074
128	2,2-Dimethyl-*trans*-3-hexene	213.53	1.477	...	...	...	...	0.7085	68.2	44.12	5.898	0.00071	1.4063	1.4037
129	2,3-Dimethyl-*cis*-3-hexene	237	0.900	...	...	...	...	0.732	61.8	45.6	6.10	0.00064	1.416	1.414
130	2,3-Dimethyl-*trans*-3-hexene	237	0.900	...	...	...	...	0.732	61.8	45.6	6.10	0.00064	1.416	1.414
131	2,4-Dimethyl-*cis*-3-hexene	228.2	1.073	...	...	...	...	0.7223	64.4	44.98	6.013	0.00068	1.4140	1.4114
132	2,4-Dimethyl-*trans*-3-hexene	225.7	1.130	...	...	...	...	0.7191	65.2	44.78	5.986	0.00076	1.4126	1.4101
133	2,5-Dimethyl-*cis*-3-hexene	216	1.556	...	...	...	...	0.714	66.7	44.4	5.94	0.00053	1.406	1.404
134	2,5-Dimethyl-*trans*-3-hexene	216	1.373	...	...	...	...	0.714	66.7	44.4	5.94	0.00053	1.406	1.404
135	3,4-Dimethyl-*cis*-3-hexene	252	0.679	...	...	...	...	0.751	56.9	46.8	6.26	0.00066	1.430	1.428
136	3,4-Dimethyl-*trans*-3-hexene	252	0.679	...	...	...	...	0.751	56.9	46.8	6.26	0.00066	1.430	1.428
137	2-*n*-propyl-1-pentene	243.9	0.789	...	...	...	...	0.7284	62.7	45.36	6.064	0.00064	1.4136	1.4111
138	2-Isopropyl-1-pentene	235	0.975	...	...	...	...	0.729	62.6	45.4	6.07	0.00064	1.414	1.412
139	3-Methyl-2-ethyl-1-pentene	234.5	0.948	...	...	...	...	0.733	61.5	45.6	6.10	0.00064	1.4142	1.4118
140	4-Methyl-2-ethyl-1-pentene	230.5	1.025	...	...	...	...	0.7240	63.9	45.08	6.026	0.00059	1.4105	1.4080
141	2-Methyl-3-ethyl-1-pentene	230	1.102	...	...	...	...	0.734	61.3	45.7	6.11	0.00064	1.415	1.413
142	3-Methyl-3-ethyl-1-pentene	234	0.966	...	...	...	...	0.7348	61.0	45.76	6.117	0.00060	1.418	1.416
143	4-Methyl-3-ethyl-1-pentene	225.5	1.132	...	...	...	...	0.7244	63.8	45.11	6.030	0.00068	1.4097	1.4072
144	2,3,3-Trimethyl-1-pentene	226.96	1.100	−92	(*389.6*)	(*565*)	(*0.0652*)	0.7398	59.8	46.07	6.159	0.00069	1.4174	1.4151
145	2,3,4-Trimethyl-1-pentene	226	1.113	...	...	...	...	0.733	61.5	45.6	6.10	0.00055	1.415	1.413
146	2,4,4-Trimethyl-1-pentene	214.59	1.559	−136.22	(*383.6*)	(*548*)	(*0.0652*)	0.7194	65.2	44.80	5.989	0.00063	1.4086	1.4060
147	3,3,4-Trimethyl-1-pentene	221	1.238	...	...	...	...	0.733	61.5	45.6	6.10	0.00055	1.4144	1.4120
148	3,4,4-Trimethyl-1-pentene	219	1.284	...	...	...	...	0.723	64.2	45.0	6.02	0.00063	1.412	1.410
149	2-Methyl-3-ethyl-2-pentene	242.6	0.744	...	...	...	...	0.743	58.9	46.3	6.19	0.00065	1.4247	1.4222
150	4-Methyl-3-ethyl-*cis*-2-pentene	241	0.838	...	...	...	...	0.743	58.9	46.3	6.19	0.00065	1.424	1.422
151	4-Methyl-3-ethyl-*trans*-2-pentene	237.7	0.889	...	...	...	...	0.7394	59.9	46.04	6.155	0.00060	1.4210	1.4183
152	2,3,4-Trimethyl-2-pentene	241.29	0.830	−171.9	...	...	...	0.7479	57.6	46.58	6.227	0.00061	1.4275	1.4249
153	2,4,4-Trimethyl-2-pentene	220.84	1.290	−159.36	(*385.0*)	(*554*)	(*0.0652*)	0.7262	63.3	45.22	6.045	0.00063	1.4160	1.4135
154	3,4,4-Trimethyl-*cis*-2-pentene	234	0.963	...	...	...	...	0.743	58.9	46.3	6.19	0.00065	1.423	1.421
155	3,4,4-Trimethyl-*trans*-2-pentene	234	0.966	...	...	...	...	0.743	58.9	46.3	6.19	0.00065	1.423	1.421
156	3-Methyl-2-isopropyl-1-butene	219	1.284	...	...	...	...	0.726	63.4	45.2	6.04	0.00063	1.4085	1.4061
157	3,3-Dimethyl-2-ethyl-1-butene	230	1.037	...	...	...	...	0.732	61.8	45.6	6.10	0.00064	1.4159	1.4135

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.3—Monoolefins and Diolefins (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
122	122	...	...	...	...	0.50	128.1	...	...	...	...	(0.9)	...	83.6	88.1	96.3	...	100
122	122	...	...	...	...	0.50	128.4	...	...	...	...	(0.9)	...	...	...	...	...	101
122	122	...	...	...	...	0.50	128.4	...	...	...	...	(0.9)	...	...	...	...	...	102
117	117	...	...	...	...	0.51	126.6	...	...	...	...	(0.9)	...	...	...	...	...	103
117	117	...	...	...	...	0.50	128.4	...	...	...	...	(0.9)	...	...	...	...	...	104
117	117	...	...	...	...	0.51	126.5	...	...	...	...	(0.9)	...	...	...	...	...	105
117	117	...	...	...	...	0.50	127.4	...	...	...	...	(0.9)	...	...	...	...	...	106
117	117	...	...	...	...	0.50	127.8	...	...	...	...	(0.9)	...	...	...	...	...	107
117	117	...	...	...	...	0.51	126.3	...	...	...	...	(0.9)	...	...	...	...	...	108
124	124	...	...	...	...	0.49	130.5	...	...	...	...	(0.9)	...	...	...	...	...	109
124	124	...	...	...	...	0.49	130.5	...	...	...	...	(0.9)	...	...	...	...	...	110
119	119	...	...	...	...	0.50	128.7	...	...	...	...	(0.9)	...	...	...	...	...	111
121	121	...	...	...	...	0.50	128.7	...	...	...	...	(0.9)	...	...	...	...	...	112
127	127	...	...	...	(0.399)	0.49	130.2	(20 269)	(125 933)	(18 886)	(117 341)	(0.9)	...	79.3	...	93.1	97.1	113
124	124	...	...	...	...	0.50	128.2	...	...	...	...	(0.9)	...	...	...	...	...	114
124	124	...	...	...	...	0.50	128.9	...	...	...	...	(0.9)	...	82.2	85.3	95.2	+0.10[k]	115
124	124	...	...	...	...	0.49	129.4	...	...	...	...	(0.9)	...	...	...	...	...	116
124	124	...	...	...	...	0.49	129.4	...	...	...	...	(0.9)	...	...	...	...	...	117
124	124	...	...	...	...	0.50	128.1	...	...	...	...	(0.9)	...	...	...	...	...	118
124	124	...	...	...	...	0.50	128.1	...	...	...	...	(0.9)	...	...	...	...	...	119
119	119	...	...	...	...	0.50	127.0	...	...	...	...	(0.9)	...	...	...	...	...	120
121	121	...	...	...	...	0.50	127.0	...	...	...	...	(0.9)	...	...	...	...	...	121
119	119	...	...	...	...	0.50	128.1	...	...	...	...	(0.9)	...	...	...	...	...	122
121	121	...	...	...	...	0.50	128.1	...	...	...	...	(0.9)	...	...	...	...	...	123
119	119	...	...	...	...	0.50	127.3	...	...	...	...	(0.9)	...	...	...	...	...	124
121	121	...	...	...	...	0.51	126.5	...	...	...	...	(0.9)	...	...	...	...	...	125
124	124	...	...	...	...	0.50	129.4	...	...	...	...	(0.9)	...	...	...	...	...	126
119	119	...	...	...	...	0.51	123.1	20 348	121 670	18 987	113 530	(0.9)	...	88.0	...	+0.7[k]	...	127
121	121	...	...	...	...	0.51	124.1	20 276	119 780	18 915	111 740	(0.9)	...	89.0	91.9	+0.5[k]	+1.6[k]	128
124	124	...	...	...	...	0.50	128.9	...	...	...	...	(0.9)	...	...	...	...	...	129
124	124	...	...	...	...	0.50	128.9	...	...	...	...	(0.9)	...	...	...	...	...	130
124	124	...	...	...	...	0.50	127.9	...	...	...	...	(0.9)	...	...	...	...	...	131
124	124	...	...	...	...	0.51	127.4	...	...	...	...	(0.9)	...	...	...	...	...	132
119	119	...	...	...	...	0.51	125.5	...	...	...	...	(0.9)	...	87.4[l]	90.6	+0.4[k]	+1.1[k,l]	133
121	121	...	...	...	...	0.51	126.3	...	...	...	...	(0.9)	...	83.3	87.3	99.8	+0.25[k]	134
127	127	...	...	...	...	0.49	130.3	...	...	...	...	(0.9)	...	...	...	...	...	135
127	127	...	...	...	...	0.49	130.3	...	...	...	...	(0.9)	...	...	...	...	...	136
123	123	...	...	...	...	0.50	129.9	...	...	...	...	(0.9)	...	...	...	...	...	137
122	122	...	...	...	...	0.50	128.4	...	...	...	...	(0.9)	...	...	...	...	...	138
122	122	...	...	...	...	0.50	128.6	...	...	...	...	(0.9)	...	...	...	...	...	139
122	122	...	...	...	...	0.50	128.1	...	...	...	...	(0.9)	...	...	...	...	...	140
122	122	...	...	...	...	0.50	125.4	20 305	124 250	18 939	115 890	(0.9)	...	85.3	87.6	99.5	+0.24[k]	141
117	117	...	...	...	...	0.50	128.4	...	...	...	...	(0.9)	...	...	...	...	...	142
117	117	...	...	...	...	0.50	127.4	...	...	...	...	(0.9)	...	...	...	...	...	143
122	122	...	...	...	(0.373)	0.49	127.6	(20 287)	(125 131)	(18 928)	(116 750)	(0.9)	...	85.7	87.2	+0.6[k]	+0.9[k]	144
122	122	...	...	...	...	0.50	127.6	...	...	...	...	(0.9)	...	...	...	...	...	145
122	122	...	...	...	(0.374)	0.497	120.2	20 275	121 610	18 914	113 450	(0.9)	...	86.5	88.8	+0.6[k]	+1.0[k]	146
117	117	...	...	...	...	0.50	126.8	...	...	...	...	(0.9)	...	...	...	...	...	147
117	117	...	...	...	...	0.50	126.6	...	...	...	...	(0.9)	...	...	...	...	...	148
127	127	...	...	...	...	0.49	129.7	...	...	...	...	(0.9)	...	82.0	85.6	95.6	99.4	149
124	124	...	...	...	...	0.49	129.4	...	...	...	...	(0.9)	...	...	...	...	...	150
124	124	...	...	...	...	0.49	129.0	...	...	...	...	(0.9)	...	...	...	...	...	151
127	127	...	...	...	...	0.49	129.5	...	...	...	...	(0.9)	...	80.9	84.4	96.8[l]	+0.02[k]	152
125	125	...	...	90.0	(0.374)	0.501	124.9	20 287	122 820	18 926	114 580	(0.9)	...	86.2	88.0	+0.3[k]	+0.6[k]	153
124	124	...	...	...	...	0.49	128.6	...	...	...	...	(0.9)	...	86.1[l]	88.0[l]	+0.2[k]	+0.5[k,l]	154
124	124	...	...	...	...	0.49	128.4	...	...	...	...	(0.9)	...	86.1[l]	88.0[l]	+0.2[k]	+0.5[k]	155
122	122	...	...	...	...	0.50	126.6	...	...	...	...	(0.9)	...	...	...	...	...	156
122	122	...	...	...	...	0.50	128.1	...	...	...	...	(0.9)	...	...	...	...	...	157

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.3—Monoolefins and Diolefins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants: Pressure, psi	Critical Constants: Temperature, deg Fahr	Critical Constants: Volume, cu ft per lb	Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F: lb per cu ft	Density of the Liquid*, [a, b] at 60 F: lb per gal	Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D: at 68 F	Refractive Index of the Liquid,[a] n_D: at 77 F
	Monoolefins, C_9H_{18}, M.W. 126.243:													
158	1-Nonene	296.40	0.219	−114.41	340	606	0.074	0.7334	61.4	45.67	6.105	0.00059	1.41572	1.41333
159	2-Methyl-1-octene	292.41	...	−107.77	...	...	...	0.7383	60.1	45.98	6.147	0.00060	1.4186	1.4162
160	2,3-Dimethyl-2-heptene	*293.2*	*(0.35)*	*−163.3*	*(361.5)*	*(622)*	*(0.0661)*	*0.739*	*60.0*	*46.02*	*6.152*	*0.00058*	*1.4319*	...
	Monoolefins, $C_{10}H_{20}$, M.W. 140.247:													
161	1-Decene	339.08	...	−87.30	320	647	0.074	0.7450	58.4	46.39	6.202	0.00060	1.42146	1.41913
162	2-Methyl-1-nonene	335.1	...	−83.56	...	...	...	0.7493	57.3	46.66	6.238	0.00061	1.4241	1.4217
	Diolefins, C_3H_4, M.W. 40.065:													
163	Propadiene (allene)	−30.1	*(168)*	−213.3	*(793)*	248	*(0.0649)*	*0.657*[d]	*88.9*[d]	*40.90*[d]	*5.468*[d]	...	...	...
	Diolefins, C_4H_6, M.W. 54.092:													
164	1,2-Butadiene	+51.53	*(20)*	−213.16	*(653)*	*(339)*	*(0.0649)*	0.658[d]	83.5[d]	40.9[d]	5.47[d]	0.00098[d]	...	...
165	1,3-Butadiene	24.06	*(60)*	−164.02	628	306	0.0654	0.6272[d]	94.1[d]	39.05[d]	5.220[d]	0.00113[d]	...	...
	Diolefins, C_5H_8, M.W. 68.119:													
166	1,2-Pentadiene	112.72	11.479	−215.09	*(590.8)*	*(446)*	*(0.0649)*	0.6977	71.3	43.44	5.807	0.00083	1.42091	1.41773
167	1,*cis*-3-Pentadiene	111.30	11.811	−221.50	*(582)*	*(438)*	*(0.0650)*	0.6962	71.7	43.35	5.795	0.00082	1.43634	1.43291
168	1,*trans*-3-Pentadiene	107.64	12.692	−125.39	*(579)*	*(434)*	*(0.0650)*	0.6812	76.2	42.41	5.670	0.00085	1.43008	1.42669
169	1,4-Pentadiene	78.73	21.91	−234.92	*(549.6)*	*(400)*	*(0.0650)*	0.6659	81.0	41.46	5.542	0.00083	1.38876	1.38542
170	2,3-Pentadiene	118.86	10.143	−194.17	...	...	...	0.7002	70.6	43.60	5.829	0.00083	1.42842	1.42509
171	3-Methyl-1,2-butadiene	105.49	13.5	−172.51	*(579)*	*(434)*	*(0.0649)*	0.6915	73.1	43.06	5.756	0.00086	1.42026	1.41692
172	2-Methyl-1,3-butadiene (isoprene)	93.30	16.672	−230.74	*(558.4)*	*(412)*	*(0.0650)*	0.6861	74.7	42.72	5.711	0.00086	1.42194	1.41852
	Diolefins, C_6H_{10}, M.W. 82.146:													
173	1,2-Hexadiene	169	...	...	...	...	...	0.7198	65.0	44.82	5.992	0.00072	1.4282	1.4252
174	1,*cis*-3-Hexadiene	*168.53*	...	...	...	...	...	*0.7127*	*67.0*	*44.38*	*5.933*	0.00080	*1.4410*	*1.4379*
175	1,*trans*-3-Hexadiene	*168.74*	...	*−152.3*	...	...	...	*0.7087*	*68.2*	*44.13*	*5.900*	0.00080	*1.4406*	*1.4375*
176	1,*cis*-4-Hexadiene	*151.3*	...	...	...	...	...	0.705	69.2	43.8	5.86	0.00066	*1.4049*	*1.4018*
177	1,*trans*-4-Hexadiene	*149.0*	...	*−217.7*	...	...	...	0.705	69.2	43.8	5.86	0.00066	*1.4104*	*1.4073*
178	1,5-Hexadiene	139.01	*(7.1)*	−221.25	*(499.7)*	*(478)*	*(0.0650)*	0.6970	71.5	43.40	5.802	0.00078	1.4042	1.4010
179	2,3-Hexadiene	154.4	...	...	...	...	...	0.685	75.1	42.6	5.69	0.00085	1.395	1.392
180	*cis*-2,*cis*-4-Hexadiene	*184.87*	...	*−92.81*	...	...	...	*0.7393*	*59.9*	*46.04*	*6.154*	0.00081	*1.4606*	*1.4575*
181	*cis*-2,*trans*-4-Hexadiene	*182.25*	...	*−141.0*	...	...	...	*0.7278*	*62.9*	*45.32*	*6.058*	0.00081	*1.4560*	*1.4529*
182	*trans*-2,*trans*-4-Hexadiene	*179.91*	...	*−48.8*	...	...	...	*0.7196*	*65.2*	*44.81*	*5.990*	0.00081	*1.4510*	*1.4479*
183	3-Methyl-1,2-pentadiene	158	...	...	...	...	...	0.720	65.0	44.8	5.99	0.00081	1.425	1.422
184	4-Methyl-1,2-pentadiene	158	...	...	...	...	...	0.713	66.9	44.4	5.94	0.00080	1.424	1.421
185	2-Methyl-1,*cis*-3-pentadiene	169	...	...	...	...	...	0.724	63.9	45.1	6.03	0.00081	1.446	1.443
186	2-Methyl-1,*trans*-3-pentadiene	*168.19*	...	*−179.59*	...	...	...	0.724	63.9	45.1	6.03	0.00081	*1.4448*	*1.4422*
187	3-Methyl-1,*cis*-3-pentadiene	171	...	...	...	...	...	0.740	59.7	46.1	6.16	0.00079	1.452	1.449
188	3-Methyl-1,*trans*-3-pentadiene	171	...	...	...	...	...	0.740	59.7	46.1	6.16	0.00079	1.452	1.449
189	4-Methyl-1,3-pentadiene	*170.6*	*(4.1)*	*−194.64*	*(514.4)*	*509*	*(0.0650)*	0.724	63.9	45.1	6.03	0.00081	*1.4534*	*1.4503*
190	2-Methyl-1,4-pentadiene	133	...	...	...	...	...	0.699	70.9	43.5	5.82	0.00078	1.405	1.402
191	3-Methyl-1,4-pentadiene	131	...	...	...	...	...	0.700	70.6	43.6	5.83	0.00070	1.405	1.402
192	2-Methyl-2,3-pentadiene	162	...	...	...	...	...	0.716	66.1	44.6	5.96	0.00067	1.425	1.422
193	2-Ethyl-1,3-butadiene	167	...	...	...	...	...	0.722	64.5	44.9	6.00	0.00068	1.445	1.442
194	2,3-Dimethyl-1,3-butadiene	155.79	*(5.2)*	−104.87	*(512.9)*	*489*	*(0.0650)*	0.7314	62.0	45.55	6.089	0.00059	1.4394	1.4362
	Diolefins, C_7H_{12}, M.W. 96.173:													
195	2-Methyl-1,5-hexadiene	*190.6*	*(2.8)*	*−199.8*	*(471.7)*	*(536)*	*(0.0650)*	*0.7246*	*63.8*	*45.11*	*6.031*	*0.00071*	...	...
196	2-Methyl-2,4-hexadiene	*232.7*	*(1.1)*	*−102.3*	*(495.2)*	*(588)*	*(0.0650)*	*0.7491*	*57.4*	*46.65*	*6.236*	*0.00058*	...	...
197	2,4-Dimethyl-1,3-pentadiene	*199.7*	*(1.3)*	*−173.2*	*(426.2)*	*(421)*	*(0.0650)*	*0.7410*	*59.5*	*46.15*	*6.169*	*0.00059*	...	...
	Diolefins, C_8H_{14}, M.W. 110.200:													
198	2,6-Octadiene	*256.1*	*(1.1)*	*−104.8*	*(415.9)*	*(607)*	*(0.0690)*	*0.7483*	*57.6*	*46.60*	*6.230*	*0.00058*	...	...
199	3-Methyl-1,5-heptadiene	*231.8*	*(1.4)*	*−70.6*	*(405.6)*	*(590)*	*(0.0644)*	*0.7335*	*61.4*	*45.68*	*6.106*	*0.00063*	...	...
200	2,5-Dimethyl-1,5-hexadiene	*237.8*	*(1.2)*	*−104.1*	*(405.6)*	*(591)*	*(0.0670)*	*0.7465*	*58.3*	*46.49*	*6.215*	*0.00059*	...	...
201	2,5-Dimethyl-2,4-hexadiene	*274.1*	*(0.52)*	*+57.1*	*(423.2)*	*(624)*	*(0.0662)*	*0.7656*	*53.3*	*47.69*	*6.375*	*0.00056*	...	...
	Diolefins, C_9H_{16}, M.W. 124.227:													
202	2,6-Dimethyl-1,5-heptadiene	*289*	*(0.45)*	*−94.0*	*(390)*	*(652)*	*(0.0650)*	*0.7724*	*51.7*	*48.10*	*6.430*	*0.00053*	...	...
203	2-Methyl-3-ethyl-1,5-hexadiene	*293*	*(0.42)*	*−94.0*	*(383.6)*	*(660)*	*(0.0645)*	*0.7668*	*53.0*	*47.76*	*6.384*	*0.00052*	...	...
	Diolefins, $C_{10}H_{18}$, M.W. 138.254:													
204	3,7-Dimethyl-1,6-octadiene	*322*	*(0.23)*	*−94.0*	*368.9*	*(693)*	*(0.0645)*	*0.7621*	*54.2*	*47.46*	*6.345*	*0.00056*	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.3—Monoolefins and Diolefins (U.S. Units)

Specific Dispersion of the Liquid, $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
114.5	114.4	*0.704*	0.429	*100.4*	*0.3703*	*0.505*	123.8	*20 327*	124 280	18 966	115 960	*(0.8)*	...	...	...	...	...	158
116	116	...	...	...	...	*0.510*	...	...	...	...	...	*(0.8)*	...	...	...	...	...	159
...	...	...	...	...	*(0.385)*	*0.50*	*(111)*	*(20 278)*	*(124 900)*	*(18 917)*	*(116 550)*	...	...	...	...	...	...	160
113.0	112.9	*0.877*	*0.505*	111.4	*0.3713*	*0.5041*	118.5	*20 300*	*126 080*	*18 939*	*117 630*	*(0.7)*	...	...	...	...	...	161
115	115	...	...	...	...	*0.509*	...	...	...	...	...	(0.7)	...	...	...	...	...	162
...	...	...	...	...	0.3439	...	*(218)*	*(20 710)[o]*	*(113 240)*	*(19 755)*	*108 022*	...	...	...	...	...	...	163
...	...	...	...	...	*0.3458*	*0.5408*	*(181)*	*20 429[d,o]*	*111 930[d]*	*19 371[d]*	*106 140[d]*	*(2.0)*	(12)	...	...	...	...	164
...	...	...	...	...	0.3412	*0.5079*	*(174)*	*20 036[d,o]*	*104 780[d]*	18 979[d]	99 250[d]	*2.0*	11.5	...	...	...	...	165
164.7	164.6	...	...	...	0.360	*0.5213*	*(160)*	*20 347[o]*	*118 340*	*19 227*	*111 830*	(1.5)	...	...	...	...	...	166
243.9	243.8	...	...	...	*0.321*	*0.5054*	*(160)*	*19 984[o]*	*115 990*	*18 864*	*109 490*	(1.5)	...	...	...	...	...	167
245.8	245.7	...	...	...	*0.354*	*0.5145*	*(158)*	*19 944[o]*	*113 270*	*18 823*	*106 900*	(1.5)	...	...	...	...	...	168
153.2	153.1	...	...	...	0.359	*0.5066*	*(146)*	*20 151[o]*	*111 860*	*19 031*	*105 650*	(1.5)	...	...	...	...	...	169
174.6	174.5	...	...	...	0.347	*0.5273*	...	*20 295[o]*	*118 480*	*19 173*	*111 940*	(1.5)	...	...	...	...	...	170
171.7	171.8	...	...	...	0.361	*0.5266*	*(156)*	*20 280[o]*	*116 920*	*19 158*	*110 450*	(1.5)	...	42.4	49.6	61.*0*	71.5	171
224.9	224.8	...	...	...	*0.357*	*0.5192*	*(153)*	*19 951[o]*	*114 120*	*18 830*	*107 710*	(1.5)	...	81.*0*	79.4	99.1	98.8	172
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	173
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	174
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	175
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	176
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	177
...	...	...	...	...	*(0.332)*	*(0.51)*	*(184)*	*(20 138)*	*(117 005)*	*(18 960)*	*(110 160)*	(1.2)	...	37.6	43.3	71.1	80.7	178
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	179
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	80.7	80.*0*	97.1	97.2	180
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	80.7	80.0	97.1	97.2	181
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	80.7	80.*0*	97.1	97.2	182
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	183
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	184
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	185
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	186
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	187
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	188
225	225	...	...	...	*(0.346)*	*(0.54)*	*(145)*	*(19 950)*	*(120 502)*	*(18 782)*	*(113 427)*	(1.2)	...	...	...	...	...	189
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	190
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	191
...	...	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	192
225	225	...	...	...	...	...	...	...	...	...	...	(1.2)	...	...	...	...	...	193
225	225	...	...	...	*(0.372)*	*(0.58)*	*(141)*	*(19 890)*	*(121 286)*	*(18 706)*	*(114 071)*	(1.2)	...	83.4	82.3	99.2	98.9	194
...	...	...	...	...	*(0.390)*	*(0.58)*	(125)	*(20 077)*	*(121 267)*	*(18 925)*	*(114 309)*	...	...	...	...	...	...	195
...	...	...	...	...	*(0.359)*	*(0.53)*	(137)	*(19 953)*	*(124 606)*	*(18 758)*	*(117 142)*	...	...	...	...	...	...	196
...	...	...	...	...	*(0.370)*	*(0.55)*	(150)	*(19 868)*	*(122 741)*	*(18 675)*	*(115 375)*	...	...	...	...	...	...	197
...	...	...	...	...	*(0.336)*	*(0.47)*	*(107)*	*(20 107)*	*(125 446)*	*(18 895)*	*(117 883)*	...	...	...	...	...	...	198
...	...	...	...	...	*(0.339)*	*(0.48)*	*(113)*	*(20 111)*	*(122 980)*	*(18 899)*	*(115 567)*	...	...	...	...	...	...	199
...	...	...	...	...	*(0.368)*	*(0.52)*	*(114)*	*(19 941)*	*(124 113)*	*(18 729)*	*(116 569)*	...	...	...	...	...	...	200
...	...	...	...	...	*(0.368)*	*(0.52)*	*(125)*	*(19 916)*	*(127 143)*	*(18 580)*	*(118 612)*	...	...	...	...	...	...	201
...	...	...	...	...	*(0.375)*	*(0.50)*	*(109)*	*(20 024)*	*(128 934)*	*(18 796)*	*(121 026)*	...	...	...	...	...	...	202
...	...	...	...	...	*(0.348)*	*(0.47)*	*(109)*	*(20 105)*	*(128 529)*	*(18 878)*	*(120 656)*	...	...	...	...	...	...	203
...	...	...	...	...	*(0.366)*	*(0.47)*	*(108)*	*(20 076)*	*(127 565)*	*(18 832)*	*(119 660)*	...	...	...	...	...	...	204

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.4—Cycloolefins (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants: Pressure, psi	Critical Constants: Temperature, deg Fahr	Critical Constants: Volume, cu ft per lb	Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F: lb per cu ft	Density of the Liquid*, [a, b] at 60 F: lb per gal	Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid, [a] n_D: at 68 F	Refractive Index of the Liquid, [a] n_D: at 77 F
	Alkylcyclopentenes, C_5H_8, M.W. 68.119:													
1	Cyclopentene	111.62	...	−211.15	...	*451.2*	...	0.7776	50.5	48.43	6.474	0.00078	1.42246	1.41940
	Alkylcyclopentenes, C_6H_{10}, M.W. 82.146:													
2	1-Methylcyclopentene	167.86	...	−195.75	...	...	...	0.7844	48.9	48.85	6.530	0.00068	1.4322	1.4294
3	3-Methylcyclopentene	148.82	...	...	...	...	...	0.7674	52.9	47.79	6.389	0.00077	1.4210	1.4184
4	4-Methylcyclopentene	150.19	...	−257.53	...	...	...	0.7736	51.4	48.18	6.441	0.00072	1.4209	1.4184
	Alkylcyclopentenes, C_7H_{12}, M.W. 96.173:													
5	1-Ethylcyclopentene	223.39	...	−181.25	...	...	...	0.8031	44.7	50.01	6.685	0.00065	1.4412	1.4387
6	3-Ethylcyclopentene	207.99	...	...	...	...	...	0.7878	48.1	49.07	6.560	0.00064	1.4315	1.4291
7	4-Ethylcyclopentene	208.8	...	...	...	...	...	0.788	48.1	49.1	6.56	0.00074	1.431	1.429
8	1,2-Dimethylcyclopentene	222.4	...	−130.7	...	...	...	0.8027	44.8	49.99	6.683	0.00065	1.4448	1.4420
9	1,3-Dimethylcyclopentene	198	...	...	...	...	...	0.771	52.0	48.0	6.42	0.00072	1.428	1.425
10	1,4-Dimethylcyclopentene	199.8	...	...	...	...	...	0.766	53.2	48.33	6.461	0.00073	1.4283	1.4255
11	1,5-Dimethylcyclopentene	216	...	−180	...	...	...	0.785	48.7	48.8	6.52	0.00059	1.4331	1.4304
12	3,3-Dimethylcyclopentene	190	...	...	...	...	...	0.776	50.8	48.3	6.46	0.00073	1.423	1.420
13	3,*cis*-4-Dimethylcyclopentene	...	...	...	...	...	...	0.782	49.4	48.7	6.51	0.00073	1.4300	1.4272
14	3,*trans*-4-Dimethylcyclopentene	...	...	...	...	...	...	...	...	...	...	...	...	...
15	3,*cis*-5-Dimethylcyclopentene	...	...	...	...	...	...	...	...	...	...	...	...	...
16	3,*trans*-5-Dimethylcyclopentene	...	...	...	...	...	...	...	...	...	...	...	...	...
17	4,4-Dimethylcyclopentene	190	...	...	...	...	...	0.776	50.8	48.3	6.46	0.00073	1.423	1.420
	Alkylcyclopentenes, C_8 to C_{10}:													
18	1-*n*-Propylcyclopentene, C_8H_{14}, M.W. 110.200	268.2	...	...	...	...	...	0.8062	44.0	50.21	6.712	0.00055	1.4452	1.4428
19	1-*n*-Butylcyclopentene, C_9H_{16}, M.W. 124.227	313	...	...	...	...	...	0.8115	42.9	50.54	6.756	0.00056	1.4486	1.4463
20	1-*n*-Pentylcyclopentene, $C_{10}H_{18}$, M.W. 138.254	354	...	...	...	...	...	0.8165	41.8	50.85	6.798	0.00051	1.4516	1.4494
	Alkylcyclohexenes, C_6H_{10}, M.W. 82.146:													
21	Cyclohexene	181.35	...	−154.29	...	*549.1*	...	0.8160	41.9	50.82	6.794	0.00066	1.44654	1.44377
	Alkylcyclohexenes, C_7H_{12}, M.W. 96.173:													
22	1-Methylcyclohexene	230.54	...	−184.72	...	...	...	0.8166	41.8	50.86	6.799	0.00066	1.45046	1.44784
23	3-Methylcyclohexene	216.45	...	−190.3	...	...	...	0.8057	44.1	50.18	6.708	0.00060	1.4435	1.4410
24	4-Methylcyclohexene	216.93	...	−175.7	...	...	...	0.8038	44.5	50.06	6.692	0.00060	1.4414	1.4389
	Alkylcyclohexenes, C_8H_{14}, M.W. 110.200:													
25	1-Ethylcyclohexene	278.61	...	−165.90	...	...	...	0.8269	39.6	51.50	6.885	0.00057	1.45668	*1.45437*
26	3-Ethylcyclohexene	268.9	...	...	...	...	...	0.8152	42.1	50.77	6.805	0.00056	1.4500	1.4476
27	4-Ethylcyclohexene	271	...	...	...	...	...	0.815	42.1	50.7	6.78	0.00056	1.449	1.447
28	1,2-Dimethylcyclohexene	280.38	...	−119.40	...	...	...	0.8307	38.8	51.74	6.917	0.00057	1.4620	1.4594
29	1,3-Dimethylcyclohexene	261	...	...	...	...	...	0.807	43.8	50.3	6.72	0.00060	1.449	1.447
30	1,4-Dimethylcyclohexene	262	...	−74	...	...	...	0.806	44.1	50.22	6.713	0.00060	1.446	1.444
31	1,5-Dimethylcyclohexene	262	...	...	...	...	...	0.8096	43.3	50.42	6.740	0.00056	1.450	1.448
32	1,6-Dimethylcyclohexene	268	...	...	...	...	...	0.820	41.1	51.0	6.82	0.00056	1.456	1.453
33	3,3-Dimethylcyclohexene	246	...	...	...	...	...	0.809	43.4	50.3	6.72	0.00060	1.445	1.443
34	4,4-Dimethylcyclohexene	243.05	...	−101.99	...	...	...	0.8051	44.2	50.14	6.704	0.00055	1.4418	1.4394
	Alkylcyclohexene, C_9 and C_{10}:													
35	1-*n*-Propylcyclohexene, C_9H_{16}, M.W. 124.227	...	...	...	...	...	...	...	...	...	...	...	...	...
36	1-*n*-Butylcyclohexene, $C_{10}H_{18}$, M.W. 138.254	...	...	...	...	...	...	...	...	...	...	...	...	...
37	4-Vinylcyclohexene, C_8H_{12}, M.W. 108.184	*262.4*	*0.50*	*−164.07*	...	...	...	*(0.834)*	*37.7*	*52.14*	*6.96*	0.00045	*1.4641*	...
38	1,5-Cyclooctadiene, C_8H_{12}, M.W. 108.184	*(302)*	*0.50*	*−69.53*	...	...	...	*0.8865*	*28.1*	*55.29*	*7.38*	0.00034	*1.4933*	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.4—Cycloolefins (U.S. Units)

Specific Dispersion of the Liquid, [a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
118.7	118.7	...	...	<−14	0.2544	0.4196	...	19 672[o]	127 530	18 551	120 270	(1.5)	...	69.7	73.4	93.3	94.8	1
124	124	...	...	19.4	0.285	(*0.441*)	...	*19 656*	*128 530*	*18 494*	*120 930*	(1.2)	...	72.9	77.1	93.6	97.0	2
119	119	...	...	...	0.281	(*0.452*)	...	19 724	126 190	18 561	118 760	(1.2)	...	...	...	...	...	3
...	...	...	...	...	0.281	(*0.437*)	...	19 756	127 430	18 594	119 930	(1.2)	...	...	...	...	...	4
119	119	...	...	34.2	...	(*0.451*)	...	19 731	132 080	18 541	124 110	(1.0)	...	72.0	78.2	90.3	95.7	5
...	...	...	...	...	...	(*0.460*)	...	19 772	129 880	18 580	122 060	(1.0)	...	71.4	76.6	90.8	96.5	6
...	...	...	...	...	...	(*0.439*)	...	19 799	130 060	18 608	122 240	(1.0)	...	...	...	...	...	7
125.8	125.8	...	...	...	0.306	(*0.454*)	...	...	...	...	...	(1.0)	...	...	...	...	...	8
...	...	...	...	...	0.303	(*0.463*)	...	...	...	...	...	(1.0)	...	...	...	...	...	9
...	...	...	...	...	0.303	(*0.443*)	...	...	...	...	...	(1.0)	...	...	...	...	...	10
120.8	120.8	...	...	...	0.303	(*0.463*)	...	...	...	...	...	(1.0)	...	...	...	...	...	11
...	...	...	...	...	0.295	(*0.442*)	...	...	...	...	...	(1.0)	...	...	...	...	...	12
...	...	...	...	...	0.299	(*0.439*)	...	...	...	...	...	(1.0)	...	...	...	...	...	13
...	...	...	...	...	0.301	(*0.458*)	...	...	...	...	...	(1.0)	...	...	...	...	...	14
...	...	...	...	...	0.301	(*0.458*)	...	...	...	...	...	(1.0)	...	...	...	...	...	15
...	...	...	...	...	0.301	(*0.472*)	...	...	...	...	...	(1.0)	...	...	...	...	...	16
...	...	...	...	...	...	(*0.423*)	...	...	...	...	...	(1.0)	...	...	...	...	...	17
...	...	...	...	57.6	...	(*0.458*)	...	...	...	...	...	(0.9)	...	...	...	...	...	18
...	...	...	...	77.0	...	(*0.464*)	...	...	...	...	...	(0.8)	...	...	...	...	...	19
...	...	...	...	...	...	(*0.470*)	...	...	...	...	...	(0.7)	...	...	...	...	...	20
117.2	117.1	...	...	−4.0	...	0.4244	...	*19 647*	*133 680*	*18 485*	*125 770*	(1.2)	...	63.0	68.1	83.9	88.4	21
119.3	120.0	...	...	...	...	(*0.440*)	...	19 629	133 640	18 438	125 520	(1.0)	...	72.0[l]	75.6[l]	89.2[l]	92.7[l]	22
...	...	...	...	...	...	(*0.450*)	...	...	...	...	...	...	...	...	...	...	...	23
...	...	...	...	...	...	(*0.430*)	...	...	...	...	...	...	...	67.0	72.7	84.1	89.5	24
117.3	117.0	...	...	...	...	(*0.449*)	...	...	...	...	...	(0.9)	...	70.5	75.4	85.0	91.2	25
...	...	...	...	...	...	(*0.457*)	...	19 683	135 700	18 471	127 340	(0.9)	...	...	...	...	...	26
...	...	...	...	...	...	(*0.440*)	...	...	...	...	...	(0.9)	...	...	...	...	...	27
123	123	...	...	...	...	(*0.451*)	...	...	...	...	...	(0.9)	...	72.2	77.3	89.7	93.5	28
120	120	...	...	...	...	(*0.460*)	...	...	...	...	...	(0.9)	...	...	...	...	...	29
119	119	...	...	...	...	(*0.443*)	...	...	...	...	...	(0.9)	...	...	...	...	...	30
119	119	...	...	...	...	(*0.443*)	...	...	...	...	...	(0.9)	...	...	...	...	...	31
...	...	...	...	...	...	(*0.460*)	...	...	...	...	...	(0.9)	...	...	...	...	...	32
...	...	...	...	...	...	(*0.442*)	...	...	...	...	...	(0.9)	...	...	...	...	...	33
115	115	...	...	...	...	(*0.421*)	...	...	...	...	...	(0.9)	...	80.0[l]	81.2	96.2	97.7	34
...	...	...	...	...	...	(*0.457*)	...	...	...	...	...	...	...	...	...	...	...	35
...	...	...	...	...	...	(*0.462*)	...	...	...	...	...	...	...	...	...	...	...	36
...	...	...	...	...	...	(*0.433*)	...	...	...	...	...	...	...	...	...	...	...	37
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	38

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.5—Acetylenes (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants			Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F		Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D	
					Pressure, psi	Temperature, deg Fahr	Volume, cu ft per lb			lb per cu ft	lb per gal		at 68 F	at 77 F
	Acetylenes, C_2 and C_3:													
1	Ethyne (acetylene), C_2H_2, M.W. 26.038	−119[p]	...	−114[e]	890.4	95.31	0.0695	0.615[q]	98.6[q]	...	...	...	...	...
2	Propyne (methylacetylene), C_3H_4, M.W. 40.065	−9.78	...	−152.9	816.2	264.63	(0.0656)	(0.63)	(93.1)	(39.22)	(5.248)	...	...	...
	Acetylenes, C_4H_6, M.W. 54.092:													
3	1-Butyne (ethylacetylene)	46.53	(39)	−194.30	(683.4)	375.0	(0.0654)	0.65[d]	86.1[d]	40.9[d]	5.47[d]	...	...	...
4	2-Butyne (dimethylacetylene)	80.56	21.5	−26.03	(737.4)	419	(0.0654)	0.6965	71.6	43.37	5.798	0.00087	1.3921	1.3893
	Acetylenes, C_5H_8, M.W. 68.119:													
5	1-Pentyne	104.31	13.5	−158.3	(587.8)	428	(0.0653)	0.6954	71.9	43.30	5.788	0.00087	1.3852	1.3826
6	2-Pentyne	132.91	7.6	−164.7	(609.9)	(482)	(0.0653)	0.7160	66.1	44.58	5.959	0.00080	1.4039	1.4009
7	3-Methyl-1-butyne	79.41	21.9	−130.5	...	...	...	0.672	79.1	41.8	5.59	0.00096	1.3723	1.3695
	Acetylenes, C_6H_{10}, M.W. 82.146:													
8	1-Hexyne	160.38	(4.9)	−205.4	(512.9)	(506)	(0.0652)	0.7206	64.9	44.87	5.998	0.00076	1.3989	1.3960
9	2-Hexyne	184.14	...	−129.05	...	...	...	0.7360	60.7	45.83	6.127	0.00069	1.4138	1.4109
10	3-Hexyne	178.56	(3.6)	−153.58	(515.8)	(538)	(0.0652)	0.7274	63.0	45.30	6.056	0.00068	1.4113	1.4088
11	3-Methyl-1-pentyne	135.9	...	...	...	...	...	0.7084	68.2	44.11	5.897	0.00071	1.3916	1.3891
12	4-Methyl-1-pentyne	142.09	...	−156.3	...	...	...	0.7092	68.0	44.16	5.903	0.00071	1.3930	1.3905
13	4-Methyl-2-pentyne	163.62	...	−166.54	...	...	...	0.7204	64.9	44.86	5.997	0.00067	1.4057	1.4032
14	3,3-Dimethyl-1-butyne	99.88	...	−108.8	...	...	...	0.6733	78.6	41.92	5.604	0.00088	1.3736	1.3706
	Acetylenes, C_7H_{12}, M.W. 96.173:													
15	1-Heptyne	211.53	(1.8)	−113.6	(470.3)	(552)	(0.0652)	0.7375	60.4	45.93	6.140	0.00069	1.4087	1.4061
16	2-Heptyne	234	...	...	...	...	...	0.753	56.4	46.8	6.26	0.00061	1.4230	1.4204
17	3-Heptyne	224.89	...	−202.9	...	...	...	0.7428	59.0	46.26	6.184	0.00069	1.4189	1.4163
18	3-Methyl-1-hexyne	185	...	...	...	...	...	0.7232	64.1	45.03	6.020	0.00068	1.4001	1.3975
19	4-Methyl-1-hexyne	196	...	...	...	...	...	0.7374	60.3	45.92	6.139	0.00069	1.4076	1.4050
20	5-Methyl-1-hexyne	197.33	(2.6)	−191	(492.3)	(558)	(0.0646)	0.7321	61.8	45.59	6.094	0.00068	1.4059	1.4033
21	4-Methyl-2-hexyne	211.17	...	−161.7	...	...	...	0.7433	58.9	46.29	6.188	0.00070	1.4170	1.4144
22	5-Methyl-2-hexyne	216.43	...	−135.2[e]	...	...	...	0.7425	59.1	46.24	6.181	0.00070	1.4176	1.4150
23	2-Methyl-3-hexyne	203.4	...	−177.9	...	...	...	0.7296	62.4	45.43	6.073	0.00068	1.4120	1.4094
24	3-Ethyl-1-pentyne	183	...	...	...	...	...	0.7318	61.9	45.57	6.092	0.00068	1.4035	1.4009
25	3,3-Dimethyl-1-pentyne	158	...	...	...	...	...	0.7124	67.1	44.36	5.930	0.00071	1.3934	1.3908
26	3,4-Dimethyl-1-pentyne	176	...	...	...	...	...	0.7283	62.8	45.35	6.062	0.00068	1.4018	1.3992
27	4,4-Dimethyl-1-pentyne	168.93	...	−103.0	...	...	...	0.7189	65.3	44.76	5.984	0.00067	1.3983	1.3957
28	4,4-Dimethyl-2-pentyne	181	...	...	...	...	...	0.7223	64.4	44.98	6.013	0.00068	1.4071	1.4045
	Acetylenes, C_8H_{14}, M.W. 110.200:													
29	1-Octyne	259.18	(0.73)	−110.7	(418.8)	(609)	(0.0651)	0.7511	56.9	46.77	6.252	0.00061	1.4163	1.4138
30	2-Octyne	279.93	(0.54)	−78.9	(430.6)	(658)	(0.0651)	0.7638	53.7	47.57	6.359	0.00062	1.4276	1.4251
31	3-Octyne	271.67	(0.63)	−155	(426.2)	(646)	(0.0651)	0.7567	55.5	47.12	6.299	0.00061	1.4250	1.4223
32	4-Octyne	268.7	(0.68)	−152.5	(424.7)	(644)	(0.0651)	0.7555	55.8	47.05	6.290	0.00061	1.4248	1.4225
	Acetylenes, C_9H_{16}, M.W. 124.227:													
33	1-Nonyne	303.3	(0.31)	−58	(389.4)	(655)	(0.0651)	0.7622	54.1	47.49	6.348	0.00062	1.4219	1.4195
34	2-Nonyne	323.4	...	...	...	...	...	0.7729	51.6	48.14	6.435	0.00058	1.4327	1.4303
35	3-Nonyne	314.8	...	...	...	...	...	0.7640	53.7	47.58	6.361	0.00057	1.4288	1.4264
	Acetylenes, $C_{10}H_{18}$, M.W. 138.254:													
36	1-Decyne	345	...	−47	...	...	...	0.7712	52.0	48.03	6.421	0.00058	1.4272	1.4249
37	2-Decyne	364.3	...	...	...	...	...	0.7805	49.8	48.61	6.498	0.00058	1.4364	1.4341
38	3-Decyne	354.7	...	...	...	...	...	0.7700	52.3	47.95	6.410	0.00058	1.4315	1.4292

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 ., for definitions of superscripts.

TABLE 1C1.5—Acetylenes (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
...	...	...	...	...	0.3966	...	...	...[o]	...	...	...	2.5	80	...	...	...	...	1
...	...	...	...	...	0.3545	...	(175)	(20 633)[o]	(108 366)	(19 680)	(103 359)	...	...	...	...	...	...	2
...	...	...	...	...	0.3513	0.5946	(179)	20 453[d,o]	112 070[d]	19 393[d]	106 260[d]	...	...	...	...	...	...	3
...	...	...	...	...	0.3372	0.5474	(197)	20 281[d,o]	117 780[d]	19 223[d]	111 630[d]	...	...	70.2	71.5	85.9	86.4	4
119	119	...	...	...	0.3609	(0.577)	(157)	20 374[o]	118 110	19 251	111 600	...	...	...	...	...	...	5
...	...	...	...	...	0.3383	(0.536)	(167)	20 263[o]	120 930	19 140	114 230	...	...	...	...	...	...	6
...	...	...	...	...	0.3579	(0.567)	...	20 340[o]	113 890	19 217	107 600	...	...	...	...	...	...	7
115	115	...	...	...	0.3640	(0.567)	(140)	(20 351)	(122 250)	(19 178)	(115 202)	...	...	...	...	...	...	8
115	115	...	...	...	...	(0.532)	...	...	...	...	...	...	...	...	...	...	...	9
119	119	...	...	...	(0.332)	(0.532)	(144)	(20 259)	(122 869)	(19 099)	(115 914)	...	...	...	...	...	...	10
...	...	...	...	...	...	(0.559)	...	...	...	...	...	...	...	...	...	...	...	11
114	114	...	...	...	...	(0.559)	...	...	...	...	...	...	...	73.1[l]	77.3[l]	91.6[l]	96.6[l]	12
...	...	...	...	...	...	(0.523)	...	...	...	...	...	...	...	...	...	...	...	13
114	114	...	...	...	...	(0.537)	...	...	...	...	...	...	...	...	...	...	...	14
113	113	...	...	...	0.3664	(0.559)	(131)	(20 303)	(124 844)	(19 112)	(117 519)	...	...	...	...	...	...	15
...	...	...	...	...	...	(0.530)	...	...	...	...	...	...	...	...	...	...	...	16
...	...	...	...	...	...	(0.530)	...	...	...	...	...	...	...	...	...	...	...	17
...	...	...	...	...	...	(0.552)	...	...	...	...	...	...	...	...	...	...	...	18
...	...	...	...	...	...	(0.552)	...	...	...	...	...	...	...	...	...	...	...	19
...	...	...	...	...	(0.351)	(0.552)	(127)	(20 170)	(123 098)	(18 974)	(115 798)	...	...	...	...	...	...	20
...	...	...	...	...	...	(0.522)	...	...	...	...	...	...	...	...	...	...	...	21
...	...	...	...	...	...	(0.522)	...	...	...	...	...	...	...	...	...	...	...	22
...	...	...	...	...	...	(0.522)	...	...	...	...	...	...	...	...	...	...	...	23
...	...	...	...	...	...	(0.552)	...	...	...	...	...	...	...	...	...	...	...	24
...	...	...	...	...	...	(0.535)	...	...	...	...	...	...	...	...	...	...	...	25
...	...	...	...	...	...	(0.545)	...	...	...	...	...	...	...	...	...	...	...	26
...	...	...	...	...	...	(0.535)	...	...	...	...	...	...	...	...	...	...	...	27
117	117	...	...	...	...	(0.505)	...	...	...	...	...	...	...	...	...	...	...	28
111	111	...	...	...	0.3680	(0.554)	(121)	(20 279)	(126 964)	(19 066)	(119 375)	...	...	51.5	66.1	50.5	75.9	29
...	...	...	...	...	(0.368)	(0.527)	(122)	(20 224)	(128 788)	(19 012)	(121 068)	...	...	...	...	...	...	30
...	...	...	...	...	(0.357)	(0.527)	(121)	(20 225)	(127 579)	(19 013)	(119 933)	...	...	...	...	...	...	31
...	...	...	...	...	(0.348)	(0.527)	(120)	(20 226)	(127 402)	(19 014)	(119 767)	...	...	...	...	...	...	32
110	110	...	...	...	0.3694	(0.549)	(113)	(20 261)	(128 800)	(19 033)	(120 993)	...	...	...	...	...	...	33
...	...	...	...	...	...	(0.526)	...	...	...	...	...	...	...	...	...	...	...	34
...	...	...	...	...	...	(0.526)	...	...	...	...	...	...	...	...	...	...	...	35
108	108	...	...	...	0.3703	(0.546)	...	...	...	...	...	...	...	...	...	...	...	36
...	...	...	...	...	...	(0.525)	...	...	...	...	...	...	...	...	...	...	...	37
...	...	...	...	...	...	(0.525)	...	...	...	...	...	...	...	...	...	...	...	38

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.6—Alkylbenzenes, Naphthalene, Indans, and Tetrahydronaphthalene (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants: Pressure, psi	Critical Constants: Temperature, deg Fahr	Critical Constants: Volume, cu ft per lb	Specific Gravity[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F: lb per cu ft	Density of the Liquid*, [a, b] at 60 F: lb per gal	Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D: at 68 F	Refractive Index of the Liquid,[a] n_D: at 77 F
	Alkylbenzenes, C_6 and C_7:													
1	Benzene, C_6H_6, M.W. 78.114	176.17	3.224	41.96	710.4	552.22	0.0531	0.8844	28.5	55.096	7.3653	0.00066	1.50112	1.49792
2	Methylbenzene (toluene), C_7H_8, M.W. 92.143	231.13	1.032	−138.94	595.9	605.55	0.0549	0.8718	30.8	54.309	7.2601	0.00060	1.49693	1.49413
	Alkylbenzenes, C_8H_{10}, M.W. 106.168:													
3	Ethylbenzene	277.16	0.371	−138.91	523.5	651.24	0.0564	0.8718	30.8	54.299	7.2589	0.00054	1.49588	1.49320
4	1,2-Dimethylbenzene (*o*-xylene)	291.97	0.264	−13.30	541.4	675.0	0.0557	0.8848	28.4	55.111	7.3673	0.00055	1.50545	1.50295
5	1,3-Dimethylbenzene (*m*-xylene)	282.41	0.326	−54.12	513.6	651.02	0.0567	0.8687	31.4	54.114	7.2339	0.00054	1.49722	1.49464
6	1,4-Dimethylbenzene (*p*-xylene)	281.05	0.342	+55.86	509.2	649.6	0.0572	0.8657	31.9	53.924	7.2086	0.00054	1.49582	1.49325
	Alkylbenzenes, C_9H_{12}, M.W. 120.195:													
7	*n*-Propylbenzene	318.63	*0.1409*	−147.06	464.1	689.41	0.0586	0.8665	31.8	53.97	7.215	0.00054	1.49202	1.48951
8	Isopropylbenzene (cumene)	306.34	0.188	−140.82	465.4	676.4	0.0570	0.8663	31.8	53.96	7.214	0.00054	1.49145	1.48890
9	1-Methyl-2-ethylbenzene	329.32	*0.1059*	−113.44	440.9	712	0.061	0.8851	28.4	55.13	7.370	0.00050	1.50456	1.50208
10	1-Methyl-3-ethylbenzene	322.39	*0.1240*	−139.98	411.5	687	0.065	0.8690	31.3	54.13	7.236	0.00054	1.49660	1.49406
11	1-Methyl-4-ethylbenzene	323.62	*0.1243*	−80.17	426.2	693	0.063	0.8657	32.0	53.92	7.208	0.00054	1.49500	1.49244
12	1,2,3-Trimethylbenzene	349.01	*0.0656*	−13.65	501.0	736.48	0.0552	0.8987	26.0	55.98	7.483	0.00045	1.51303	1.51150
13	1,2,4-Trimethylbenzene	336.88	*0.0878*	−46.79	468.8	708.76	0.0573	0.8803	29.2	54.83	7.330	0.00049	1.50484	1.50237
14	1,3,5-Trimethylbenzene	328.54	*0.1036*	−48.45	453.5	687.58	0.0577	0.8696	31.2	54.16	7.241	0.00054	1.49937	1.49684
	Alkylbenzenes, $C_{10}H_{14}$, M.W. 134.222:													
15	*n*-Butylbenzene (1-phenylbutane)	361.95	*0.0469*	−126.29	418.7	729.3	0.0593	0.8646	32.1	53.85	7.199	0.00054	1.48979	1.48742
16	Isobutylbenzene (1-phenyl-2-methylpropane)	343.02	*0.0809*	−60.61	440	711	*0.0571*	0.8576	33.5	53.42	7.141	0.00053	1.48646	1.48400
17	*sec*-Butylbenzene (2-phenylbutane)	344.00	0.0777	−103.78	*428.0*	*736.5*	*0.0571*	0.8664	31.5	53.97	7.215	0.00054	1.49020	1.48779
18	*tert*-Butylbenzene (2-phenyl-2-methylpropane)	336.47	*0.0926*	−72.19	*430.0*	728	*0.0560*	0.8710	31.0	54.25	7.252	0.00054	1.49266	1.49024
19	1-Methyl-2-*n*-propylbenzene	364.95	...	−76.49	...	...	...	0.8779	29.5	54.68	7.310	0.00049	1.4996	1.4975
20	1-Methyl-3-*n*-propylbenzene	359.62	...	−116.59	...	...	...	0.8653	32.0	53.90	7.205	0.00054	1.4935	1.4911
21	1-Methyl-4-*n*-propylbenzene	362.16	...	−82.59	...	...	...	0.8628	32.5	53.74	7.184	0.00054	1.4922	1.4898
22	1-Methyl-2-isopropylbenzene (*o*-cymene)	352.72	(*0.070*)	−96.71	*420.0*	*746*	*0.0571*	0.8810	29.1	54.88	7.336	0.00055	1.5005	1.4983
23	1-Methyl-3-isopropylbenzene (*m*-cymene)	347.14	(*0.078*)	−82.68	*426.2*	*739.5*	*0.0571*	0.8654	32.0	53.90	7.205	0.00054	1.4929	1.4905
24	1-Methyl-4-isopropylbenzene (*p*-cymene)	350.83	(*0.072*)	−90.22	410	716	*0.0571*	0.8617	32.7	53.67	7.175	0.00054	1.4909	1.4885
25	1,2-Diethylbenzene	362.22	...	−24.20	...	...	...	0.8843	28.5	55.08	7.363	0.00050	1.50346	1.50106
26	1,3-Diethylbenzene	358.04	...	−119.00	...	...	...	0.8684	31.4	54.09	7.231	0.00054	1.49552	1.49310
27	1,4-Diethylbenzene	362.82	...	−45.08	406.5	724.66	...	0.8664	31.8	53.96	7.214	0.00054	1.49483	1.49245
28	1,2-Dimethyl-3-ethylbenzene	381.11	...	−57.12	...	...	...	0.8965	26.3	55.84	7.465	0.00056	1.5117	1.5095
29	1,2-Dimethyl-4-ethylbenzene	373.14	...	−88.41	...	...	...	0.8788	29.5	54.74	7.318	0.00055	1.5031	1.5009
30	1,3-Dimethyl-2-ethylbenzene	374.09	...	+2.75	...	...	...	0.8948	26.6	55.74	7.451	0.00056	1.5107	1.5085
31	1,3-Dimethyl-4-ethylbenzene	370.83	...	−81.12	...	...	...	0.8807	29.2	54.86	7.334	0.00055	1.5037	1.5015
32	1,3-Dimethyl-5-ethylbenzene	362.52	...	−119.73	...	...	...	0.8692	31.3	54.14	7.237	0.00054	1.4981	1.4958
33	1,4-Dimethyl-2-ethylbenzene	368.37	...	−64.7	...	...	...	0.8816	29.0	54.91	7.340	0.00049	1.5043	1.5020
34	1,2,3,4-Tetramethylbenzene (prehnitene)	401.16	...	+20.75	...	...	...	0.9094	24.1	56.64	7.572	0.00045	1.5203	1.5181
35	1,2,3,5-Tetramethylbenzene (isodurene)	388.47	...	−10.61	...	...	...	0.8946	26.7	55.72	7.449	0.00050	1.5130	1.5107
36	1,2,4,5-Tetramethylbenzene (durene)	386.31	...	+174.62	430	756	...	0.8918[r]	27.2[r]	55.53[r]	7.423[r]	0.00044[r]	1.5116[r]	1.5093[r]
	Naphthalenes, $C_{10}H_8$, M.W. 128.174:													
37	Naphthalene	424.38	...	+176.51	587.5	887.50	0.051	1.178[mm]	11.4[mm]	73.5[mm]	9.82[mm]	0.00019[mm]	...	1.5898[s]
	Alkylindans, C_9H_{10}, M.W. 118.179:													
38	2,3-Dihydroindene (indan)	352.13	...	−60.47	...	...	...	0.9685	14.6	60.33	8.065	0.00042	1.5385	1.5358
	Alkylindans, $C_{10}H_{12}$, M.W. 132.206:													
39	1-Methyl-2,3-dihydroindene (1-methylindan)	375.1	...	...	...	...	...	0.947	17.9	59.0	7.89	0.00024	1.5266	1.5240
40	2-Methyl-2,3-dihydroindene (2-methylindan)	376.5	...	...	...	...	...	0.949	17.6	59.1	7.90	0.00053	1.5220	1.5194
41	4-Methyl-2,3-dihydroindene (4-methylindan)	401.9	...	...	...	...	...	0.975	13.6	60.7	8.11	0.00049	1.5348	1.5322
42	5-Methyl-2,3-dihydroindene (5-methylindan)	395.6	...	...	...	...	...	0.953	17.0	59.3	7.93	0.00053	1.5336	1.5310
	Tetrahydronaphthalenes, $C_{10}H_{12}$, M.W. 132.206:													
43	1,2,3,4-Tetrahydronaphthalene	405.72	...	−32.38	...	...	...	0.9747	13.7	60.72	8.118	0.00043	1.54135	1.53919

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 ', for definitions of superscripts.

TABLE 1C1.6—Alkylbenzenes, Naphthalene, Indans, and Tetrahydronaphthalene (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4(n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
189.9	189.6	0.5870	...	<−22	*0.2429*	0.4098	169.31	17 991	132 670	17 258	127 270	1.3[t]	7.9[t]	+2.8[k]	...	...	...	1
185.0	184.7	*0.5584*	*0.341*	<−22	*0.2598*	*0.4012*	154.84	18 251	132 670	17 422	126 640	1.2[t]	7.1[t]	+0.3[k]	+1.7[k]	+5.8[k]	...	2
175.0	174.7	0.6428	0.390	<−22	0.2795	0.4114	144.0	18 493	134 410	17 595	127 880	0.99[t]	6.7[t]	97.9	+0.2[k]	+0.8[k]	+0.8[k]	3
180.4	180.1	0.740	*0.428*	<−4	*0.2914*	*0.4418*	149.1	18 445	136 070	17 546	129 430	1.1[t]	6.4[t]	100.0	100.0	...	...	4
180.9	180.6	0.591	0.366	−22	0.2782	0.4045	147.2	18 441	133 560	17 543	127 060	1.1[t]	6.4[t]	+2.8[k]	+6.0[k]	+4.0[k]	+6.0[k]	5
182.4	182.1	0.613	0.372	−22	0.2769	0.4083	*144.52*	18 445	133 130	17 547	126 650	1.1[t]	6.6[t]	+1.2[k]	+5.1[k]	+3.4[k]	>+6[k]	6
166.7	166.4	0.7944	0.455	<−22	0.2934	*0.4199*	136.8	18 674	134 900	17 721	128 030	(0.88)	...	98.7	+2.0[k]	+1.5[k]	+4.3[k]	7
165.7	165.4	0.740	...	<+5	0.2917	(*0.414*)	134.3	18 665	134 800	17 711	127 908	0.88[t]	6.5[t]	99.3	+0.5[k]	+2.1[k]	+4.3[k]	8
172.4	172.1	...	...	...	0.3050	(*0.416*)	139.0	18 645	137 580	17 692	130 549	(0.88)	...	92.1	92.9	+0.2[k]	+0.35[k]	9
173.4	173.1	...	...	...	0.2934	(*0.416*)	137.8	18 637	135 030	17 684	128 119	(0.88)	...	100	...	+1.8[k]	...	10
173.9	173.6	0.671	...	...	0.2923	(*0.416*)	137.4	18 634	134 480	17 680	127 596	(0.88)	...	97.0	...	...	...	11
176.0	175.7	...	...	...	0.2986	0.4236	143.2	18 601	139 370	17 649	132 230	(0.88)	...	+0.06[k]	+0.05[k]	+0.5[k]	+0.5[k]	12
178.2	177.9	...	...	...	0.3007	0.4203	140.4	18 590	136 420	17 637	129 430	(0.88)	...	+0.6[k,l]	+0.6[k]	+1.4[k]	+1.5[k]	13
177.8	177.5	...	...	<−22	0.2903	0.3876	139.6	18 584	134 740	17 631	127 810	(0.88)	...	+0.6[k]	...	>+6[k]	...	14
159.6	159.3	0.947	0.518	<−22	0.3022	0.4261	125.7	18 818	135 650	17 822	128 470	0.8	5.8	94.5[l]	+0.1[k]	+0.4[k]	+1.5[k]	15
160.8	160.5	...	...	...	(*0.297*)	(*0.421*)	121.2	(*18 822*)	*134 580*	(*17 826*)	*127 450*	(0.8)	...	98.0	+0.3[k]	+1.6[k]	+3.0[k]	16
159.0	158.7	...	...	...	(*0.305*)	(*0.421*)	121.6	(*18 823*)	*135 980*	(*17 828*)	*128 790*	(0.8)	...	95.7	+0.1[k]	+0.7[k]	+1.5[k]	17
159.3	159.0	...	...	...	(*0.309*)	0.4170	120.5	(*18 791*)	*136 440*	(*17 795*)	*129 210*	(0.8)	...	+0.8[k]	...	>+3[k]	...	18
166	166	...	...	...	...	(*0.421*)	126.4	...	...	...	...	(0.8)	...	92.2	95.7	+0.3[k]	+0.6[k]	19
166	166	...	...	...	...	(*0.421*)	126.0	...	...	...	...	(0.8)	...	+0.04[k]	+0.6[k]	+1.8[k]	+3.8[k]	20
166	166	...	...	...	...	(*0.421*)	125.4	...	...	...	...	(0.8)	...	...	...	...	...	21
166	166	...	...	...	(*0.307*)	(*0.415*)	122.9	(*18 793*)	*138 035*	(*17 796*)	*130 710*	(0.8)	...	96.0	97.7	+0.6[k]	+1.5[k]	22
166	166	...	...	...	(*0.299*)	(*0.415*)	122.1	(*18 785*)	*135 510*	(*17 784*)	*128 300*	(0.8)	...	...	...	...	...	23
166	166	...	...	...	(*0.239*)	0.4149	122.2	(*18 785*)	*134 950*	(*17 787*)	*127 780*	0.85	5.5	97.7	...	+1.4[k]	...	24
166.2	165.9	...	...	...	...	(*0.419*)	126.3	...	...	...	...	(0.8)	...	...	...	...	...	25
166.9	166.6	...	...	...	...	(*0.419*)	126.1	...	...	...	...	(0.8)	...	97.0	+0.2[k]	>+3[k]	>+3[k]	26
168.2	167.9	...	...	...	...	(*0.419*)	126.1	...	...	...	...	(0.8)	...	95.2[l]	99.3	+0.6[k]	+1.6[k]	27
170	170	...	...	...	...	(*0.420*)	130.0	...	...	...	...	(0.8)	...	91.9	93.3	+0.4[k]	+0.4[k]	28
171	171	...	...	...	...	(*0.420*)	127.1	...	...	...	...	(0.8)	...	...	...	...	...	29
170	170	...	...	...	...	(*0.420*)	128.7	...	...	...	...	(0.8)	...	...	...	...	...	30
171	171	...	...	...	...	(*0.420*)	128.1	...	...	...	...	(0.8)	...	95.9	98.8[l]	+0.6[k]	+1.2[k]	31
172	172	...	...	...	...	(*0.420*)	126.9	...	...	...	...	(0.8)	...	+0.2[k]	+0.8[k]	+2.7[k]	>+6.0[k]	32
171	171	...	...	...	...	(*0.420*)	127.1	...	...	...	...	(0.8)	...	96.0	98.9[l]	+0.6[k]	+0.9[k]	33
174	174	...	...	...	...	0.4184	144.2	...	...	...	...	(0.8)	...	+0.02[k]	99.7	+0.5[k]	+0.5[k]	34
174	174	...	...	...	...	0.4217	140.3	...	...	...	...	(*0.8*)	...	+0.2[k]	...	...	...	35
174[r]	174[r]	...	...	...	...	...	145.8	...	...	...	...	(0.8)	...	...	...	...	...	36
...	(297)[s]	...	...	...	...	*0.2975*[mm]	...	17 302[mm]	169 920[mm]	16 721[mm]	164 210[mm]	*0.9*	5.9	...	...	...	...	37
...	...	...	...	...	...	...	...	...	...	...	...	(0.9)	...	89.8	90.8	+0.3[k]	+0.5[k]	38
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	39
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	40
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	41
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	42
166	166	...	...	<−4	...	...	...	...	...	...	...	0.84[t]	5.0[u]	81.9	84.0	96.4	100.0	43

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.7—Styrenes and Indenes (U.S. Units)

No.	Compound	Boiling Point at 1 atmos, deg Fahr	Vapor Pressure at 100 F, psi	Freezing Point in Air at 1 atmos, deg Fahr	Critical Constants			Specific Gravity,[a, c] 60 F/60 F	API Gravity*, [c] at 60 F, deg API	Density of the Liquid*, [a, b] at 60 F		Coefficient of Expansion*, [a] $\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$ at 60 F, per deg Fahr	Refractive Index of the Liquid,[a] n_D	
					Pressure, psi	Temperature, deg Fahr	Volume, cu ft per lb			lb per cu ft	lb per gal		at 68 F	at 77 F
	Styrenes, C_8H_8, M.W. 104.152:													
1	Ethenylbenzene (styrene; vinylbenzene; phenylethylene)	293.29	(*0.24*)	−23.10	*580*	*706.0*	*0.0541*	0.9110	23.8	56.75	7.586	0.00057	1.54682	1.54395
	Styrenes, C_9H_{10}, M.W. 118.179:													
2	Isopropenylhenzene (α-methylstyrene; 2-Phenyl-1-propene)	329.9	(*0.10*)	−9.8	*580*	*751*	*0.0553*	0.9138	23.3	56.92	7.609	0.00057	1.5386	1.5358
3	*cis*-1-Propenylbenzene (*cis*-β-methylstyrene; *cis*-1-Phenyl-1-propene)	333.43	(*0.089*)	−78.97	*526*	*760*	*0.0553*	0.9138	23.3	56.92	7.609	0.00057	1.5430	1.5402
4	*trans*-1-Propenylbenzene (*trans*-β-methylstyrene; *trans*-1-Phenyl-1-propene)	352.92	...	−20.76	*526*	*760*	*0.0553*	0.9115	23.7	56.78	7.590	0.00057	1.5506	1.5478
5	1-Methyl-2-ethenylbenzene (*o*-methylstyrene)	337.71	(*0.085*)	−91.37	*529*	*763*	*0.0509*	0.9165	22.9	57.09	7.632	0.00052	1.5437	1.5413
6	1-Methyl-3-ethenylhenzene (*m*-methylstyrene)	340.9	(*0.10*)	−123.36	*516*	*755*	*0.0516*	0.9164	22.9	57.08	7.630	0.00046	1.5411	1.5385
7	1-Methyl-4-ethenylbenzene (*p*-methylstyrene)	343.0	(*0.095*)	−29.43	*514*	*757*	*0.0516*	0.9261	21.3	57.69	7.712	0.00052	1.5420	1.5395
	Styrenes, $C_{10}H_{12}$, M.W. 132.206:													
8	*cis*-1-Phenyl-1-hutene (*cis*-β-ethylstyrene)	372	...	...	...	...	...	0.9153	23.0	57.01	7.621	0.00051	1.5390	1.5364
9	*trans*-1-Phenyl-1-hutene (*trans*-β-ethylstyrene)	389.70	...	−45.4	...	...	...	0.9065	24.5	56.46	7.548	0.00051	1.5420	1.5394
10	2-Phenyl-1-butene (α-ethylstyrene)	360	...	...	...	...	...	0.896	26.4	55.8	7.46	0.00056	1.5288	1.5262
11	*cis*-2-Phenyl-2-hutene (*cis*-α,β-dimethylstyrene)	382.5	...	−10.3	...	...	...	0.9223	21.9	57.45	7.680	0.00052	1.5425	1.5401
12	*trans*-2-Phenyl-2-hutene (*trans*-α,β-dimethylstyrene)	345	...	...	...	...	...	0.9003	25.6	56.08	7.497	0.00051	1.5217	1.5193
13	2-Methyl-1-phenyl-1-propene (β,β-dimethylstyrene)	370.31	...	−59.8	...	...	...	0.9056	24.7	56.41	7.541	0.00056	1.5400	1.5376
14	1-Methyl-2-(*cis*-1′-*n*-propenyl)henzene (*cis*-*o*,β-dimethylstyrene)	...	...	...	...	...	...	0.907	24.5	56.5	7.55	0.00051	1.539	1.537
15	1-Methyl-2-(*trans*-1′-*n*-propenyl)benzene (*trans*-*o*,β-dimethylstyrene)	...	...	...	...	...	...	0.907	24.5	56.5	7.55	0.00051	1.539	1.539
16	1-Methyl-3-(*cis*-1′-*n*-propenyl)benzene (*cis*-*m*,β-dimethylstyrene)	...	...	...	...	...	...	0.900	25.7	56.0	7.49	0.00056	1.540	1.538
17	1-Methyl-3-(*trans*-1′-*n*-propenyl)benzene (*trans*-*m*,β-dimethylstyrene)	...	...	...	...	...	...	0.900	25.7	56.0	7.49	0.00056	1.540	1.538
18	1-Methyl-4-(*cis*-1′-*n*-propenyl)benzene (*cis*-*p*,β-dimethylstyrene)	385	...	...	...	...	...	0.8941	26.7	55.69	7.445	0.00056	1.5392	1.5368
19	1-Methyl-4-(*trans*-1′-*n*-propenyl)benzene (*trans*-*p*,β-dimethylstyrene)	394	...	−150	...	...	...	0.9104	23.9	56.71	7.581	0.00051	1.543	1.541
20	1-Methyl-2-isopropenylbenzene (*o*,α-dimethylstyrene)	342.0	...	...	...	...	...	0.8938	26.8	55.67	7.442	0.00050	1.5155	1.5130
21	1-Methyl-3-isopropenylhenzene (*m*,α-dimethylstyrene)	365	...	...	...	...	...	0.9095	24.1	56.65	7.573	0.00051	1.5335	1.5310
22	1-Methyl-4-isopropenylbenzene (*p*,α-dimethylstyrene)	367	...	...	...	...	...	0.9044	24.9	56.33	7.530	0.00051	1.5340	1.5315
23	1-Ethyl-2-ethenylbenzene (*o*-ethylstyrene)	369.1	...	−103.9	...	...	...	0.9103	23.9	56.70	7.580	0.00051	1.5380	1.5356
24	1-Ethyl-3-ethenylbenzene (*m*-ethylstyrene)	374.0	...	−150	...	...	...	0.8990	25.8	56.00	7.486	0.00056	1.5351	1.5325
25	1-Ethyl-4-ethenylhenzene (*p*-ethylstyrene)	378.1	...	−57.5	...	...	...	0.8970	26.2	55.87	7.469	0.00056	1.5376	1.5348
26	1,2-Dimethyl-3-ethenylbenzene (2,3-dimethylstyrene)	...	...	...	...	...	...	...	...	...	...	...	...	...
27	1,2-Dimethyl-4-ethenylhenzene (3,4-dimethylstyrene)	...	...	...	...	...	...	0.915	23.1	57.0	7.62	0.00051	1.5464	1.5438
28	1,3-Dimethyl-2-ethenylbenzene (2,6-dimethylstyrene)	...	...	...	...	...	...	0.910	24.0	56.6	7.57	0.00051	1.535	1.533
29	1,3-Dimethyl-4-ethenylhenzene (2,4-dimethylstyrene)	...	...	...	...	...	...	0.910	24.0	56.6	7.57	0.00051	1.5423	1.5397
30	1,3-Dimethyl-5-ethenylhenzene (3,5-dimethylstyrene)	...	...	...	...	...	...	0.903	25.1	56.2	7.51	0.00051	1.5382	1.5356
31	1,4-Dimethyl-2-ethenylhenzene (2,5-dimethylstyrene)	...	...	...	...	...	...	0.911	23.8	56.7	7.58	0.00057	1.540	1.538
32	**Phenylacetylene, M.W. 102.136**	*287.06*	(*0.34*)	*−40*	*611.4*	*720*	*0.0526*	(*0.933*)	(*20.2*)	(*58.1*)	(*7.77*)	*0.00048*	*1.5485*	...
	Alkylindenes, C_9H_8, M.W. 116.163:													
33	Indene	360.45	...	+29.3	...	...	...	1.0006	9.9	62.33	8.332	0.00050	1.5764	1.5737
	Alkylindenes, $C_{10}H_{10}$, M.W. 130.190:													
34	1-Methylindene	390	...	...	...	...	...	0.977	13.3	60.8	8.13	0.00024	1.5616	1.5591
35	2-Methylindene	406	...	176	...	...	...	0.981[r]	12.7[r]	61.1[r]	8.17[r]	0.00037[r]	1.5652[r]	1.5627[r]
36	3-Methylindene	401	...	...	...	...	...	0.979	13.0	61.0	8.15	0.00037	1.5621	1.5596
37	4-Methylindene	408	...	...	...	...	...	0.996	10.6	62.0	8.29	0.00043	1.568	1.566
38	5-Methylindene	405	...	...	...	...	...	0.984	12.3	61.3	8.19	0.00037	1.566	1.564
39	6-Methylindene	405	...	...	...	...	...	0.984	12.3	61.3	8.19	0.00037	1.566	1.564
40	7-Methylindene	408	...	...	...	...	...	0.996	10.6	62.0	8.29	0.00043	1.568	1.566

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64. .
2. M.W = molecular weight.
3. See Appendix I, p. 61 ., for definitions of superscripts.

TABLE 1C1.7—Styrenes and Indenes (U.S. Units)

Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Aniline Point, deg Fahr	Heat Capacity at 60 F and Constant Pressure, Btu per lb, deg Fahr		Heat of Vaporization at the Normal Boiling Point, 1 atmos, Btu per lb	Heat of Combustion of the Liquid at 60 F and Constant Pressure*				Flammability Limits, Volume Percent in Air Mixture		ASTM Octane Numbers				No.
								Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)				Motor Method D 357		Research Method D 908		
at 68 F	at 77 F	at 100 F	at 210 F		Gas, Ideal State	Liquid at 1 atmos		Btu per lb	Btu per gal	Btu per lb	Btu per gal	Lower	Higher	Clear	With 3 ml TEL per gal	Clear	With 3 ml TEL per gal	
265	265	...	...	...	0.2711	0.4122	(151)	18 150	137 870	17 416	132 290	1.1	6.1	+0.2[k]	+0.1[k]	>+3[k]	+2.5[k]	1
265	265	...	...	...	0.285	(0.436)	(140)	(18 323)	(139 600)	(17 515)	(133 400)	(0.9)	...	+0.1[k]	100.0	+2.1[k]	+1.8[k]	2
265	265	...	...	...	0.285	(0.435)	(139)	(18 384)	(139 700)	(17 576)	(133 600)	(0.9)	...	91.7	...	+0.5[k]	+0.5[k]	3
265	265	...	...	...	0.287	(0.435)	(139)	(18 384)	(139 700)	(17 576)	(133 600)	(0.9)	...	92.1	91.4	+0.4[k]	+0.4[k]	4
265	265	...	...	...	0.285	(0.416)	(141)	(18 348)	(140 200)	(17 541)	(134 000)	(0.9)	...	...	...	...	...	5
265	265	...	...	...	0.285	(0.416)	(137)	(18 345)	(140 100)	(17 535)	(134 000)	(0.9)	...	...	...	...	...	6
265	265	...	...	...	0.285	(0.416)	(138)	(18 339)	(141 600)	(17 531)	(135 400)	(0.9)	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	10
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	11
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	12
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	91.7	...	+0.5[k]	...	13
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	14
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	15
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	16
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	17
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	18
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	19
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	20
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	21
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	22
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	23
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	24
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	25
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	26
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	27
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	28
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	29
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	30
...	...	...	...	...	...	...	...	...	...	...	...	(0.8)	...	...	...	...	...	31
...	...	...	...	...	(0.35)	(0.58)	(151)	...	...	...	...	...	...	...	...	...	...	32
...	...	...	...	...	...	...	...	...	...	...	...	...	...	+0.7[k]	+0.4[k]	+2.3[k]	+1.4[k]	33
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	34
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	35
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	36
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	37
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	38
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	39
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	40

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.8—Gaseous Hydrocarbons, C_1 to C_5 (U.S. Units)

No.	Compound	Compressibility Factor of the Gas, $Z=PV/RT$		Specific Gravity* of Real Gas, at 60 F and 1 atmos, Referred to Air as Unity	Specific Volume* of the Gas at 60 F and 1 atmos		Heat Capacity of the Gas* at Constant Pressure at 60 F and 1 atmos, Btu per lb, deg Fahr	Heat of Combustion of the Real Gas* at 60 F and Constant Pressure, Btu per cu ft		Air Required for Combustion of the Real Gas* at 60 F and 1 atmos	
		Under critical conditions, Z_p	At 60 F and 1 atmos, Z		cu ft gas per lb gas	cu ft gas per gal liquid		Gross, to form H_2O (liquid) + CO_2 (gas)	Net, to form H_2O (gas) + CO_2 (gas)	cu ft air per cu ft gas	lb air per lb gas
	Paraffins, C_1 to C_3:										
1C1.1 1	Methane, CH_4, M.W. 16.043	0.288	0.9981	0.55469	23.6107	...	0.5266	1011.5	910.73	9.561	17.235
2	Ethane, C_2H_6, M.W. 30.070	0.284	0.9916	1.0465	12.5148	39.47[d]	0.4097	1783.5	1631.4	16.841	16.092
3	Propane, C_3H_8, M.W. 44.097	0.281	0.9820	1.5496	8.4513	35.744[d]	0.3881	2563.1	2358.0	24.294	15.676
	Paraffins, C_4H_{10}, M.W. 58.124:										
4	*n*-Butane	0.274	0.9667	2.0749	6.3119	30.766[d]	0.3867	3373.7	3113.8	32.082	15.461
5	2-Methylpropane (isobutane)	0.283	0.9696	2.0687	6.3308	29.725[d]	0.3872	3354.1	3094.6	31.986	15.461
	Paraffins, C_5H_{12}, M.W. 72.151:										
6	*n*-Pentane	0.262	0.9549[g]	2.6073[g]	5.3795[g]	28.298[g]	0.4057[g]	3913.8[g]	3624.3[g]	39.971[g]	15.329
7	2-Methylbutane (isopentane)	0.273	0.9544[g]	2.6091[g]	5.2338[g]	27.259[g]	0.3948[g]	4015.8[g]	3715.9[g]	39.998[g]	15.329
8	2,2-Dimethylpropane (neopentane)	0.269	0.9510	2.6181	5.0022	24.882[d]	(0.3866)	4188.9	3871.8	40.137	15.329
	Cycloalkanes, C_3 to C_5:										
1C1.2 1	Cyclopropane, M.W. 42.081	0.28	0.9828	1.4783	8.8589	41.631[d]	(0.306)	2413.2	2259.5	21.858	14.784
15	Cyclobutane, M.W. 56.108	0.28	(0.97)	1.20	6.56	38.3[d]	(0.297)	3207	2999	29.5	14.784
23	Cyclopentane, M.W. 70.135	0.276	0.9657[g]	2.5070[g]	5.8355[g]	36.507[g]	0.3116[g]	3450.7[g]	3224.8	37.067[g]	14.784
	Monoolefins, C_2 and C_3:										
1C1.3 1	Ethene, C_2H_4, M.W. 28.054	0.276	0.9938	0.9742	13.4440	...	0.3624	1609.4	1508.2	14.403	14.784
2	Propene, C_3H_6, M.W. 42.081	0.275	0.9844	1.4752	8.8779	38.640[d]	0.3541	2370.3	2216.9	21.811	14.784
	Monoolefins, C_4H_8, M.W. 56.108:										
3	1-Butene	0.277	0.9704	1.9953	6.5637	32.906[d]	0.3551	3174.1	2966.7	29.501	14.784
4	*cis*-2-Butene	0.271	0.9661	2.0042	6.5347	34.165[d]	0.3269	3180.2	2971.9	29.632	14.784
5	*trans*-2-Butene	0.274	0.9662	2.0040	6.5353	33.233[d]	0.3654	3174.8	2966.5	29.629	14.784
6	2-Methylpropene	0.275	0.9689	1.9984	6.5536	32.802[d]	0.3701	3159.4	2951.7	29.546	14.784
	Monoolefins, C_5H_{10}, M.W. 70.135:										
7	1-Pentene	0.32	0.9550[g]	2.5345[g]	5.4256[g]	29.207[g]	0.3782[g]	3812.4[g]	3566.8[g]	37.479[g]	14.784
8	*cis*-2-Pentene	0.28	(0.969)[g]	2.524[g]	5.574[g]	30.71[g]	0.3590[g]	3703[g]	3463[g]	37.32[g]	14.784
9	*trans*-2-Pentene	0.28	(0.969)[g]	2.524[g]	5.563[g]	30.30[g]	0.3803[g]	3705[g]	3465[g]	37.31[g]	14.784
10	2-Methyl-1-butene	0.28	0.9551[g]	2.5344[g]	5.4474[g]	29.782[g]	0.3866[g]	3780.0[g]	3533.8[g]	37.472[g]	14.784
11	3-Methyl-1-butene	0.28	(0.958)[g]	2.526[g]	5.264[g]	27.76[g]	0.3986[g]	3923[g]	3665[g]	37.35[g]	14.784
12	2-Methyl-2-butene	0.28	0.9554[g]	2.5338[g]	5.5818[g]	31.070[g]	0.3710[g]	3680.1[g]	3441.5[g]	37.463[g]	14.784
	Diolefins, C_3H_4, M.W. 40.065:										
163	Propadiene (allene)	...	0.9828	1.4068	9.3095	50.990[d]	0.3439	2242	2140	19.419	13.803
	Diolefins, C_4H_6, M.W. 54.092:										
164	1,2-Butadiene	...	(0.969)	1.926	6.799	37.3[d]	0.3458	3033	2878	27.08	14.057
165	1,3-Butadiene	0.270	(0.965)	1.934	6.770	35.40[d]	0.3412	2985	2829	27.19	14.057
	Diolefins, C_5H_8, M.W. 68.119:										
166	1,2-Pentadiene	...	(0.963)[g]	2.442[g]	5.910[g]	34.37[g]	0.389[g]	3468[g]	3284[g]	34.68[g]	14.207
167	1,*cis*-3-Pentadiene	...	(0.963)[g]	2.442[g]	5.895[g]	34.22[g]	0.351[g]	3415[g]	3230[g]	34.68[g]	14.207
168	1,*trans*-3-Pentadiene	...	(0.962)[g]	2.444[g]	5.851[g]	33.23[g]	0.380[g]	3434[g]	3247[g]	34.72[g]	14.207
169	1,4-Pentadiene	...	(0.956)[g]	2.459[g]	5.518[g]	30.63[g]	0.370[g]	3677[g]	3478[g]	34.93[g]	14.207
170	2,3-Pentadiene	...	(0.963)[g]	2.442[g]	5.973[g]	34.87[g]	0.375[g]	3423[g]	3241[g]	34.68[g]	14.207
171	3-Methyl-1,2-butadiene	...	(0.963)[g]	2.442[g]	5.835[g]	33.64[g]	0.384[g]	3502[g]	3314[g]	34.68[g]	14.207
172	2-Methyl-1,3-butadiene (isoprene)	...	(0.962)[g]	2.444[g]	5.703[g]	32.62[g]	0.377[g]	3525[g]	3331[g]	34.72[g]	14.207
	Cycloolefins: M.W. 68.119										
1C1.4 1	Cyclopentene C_5H_8,	...	(0.964)[g]	2.439[g]	5.904[g]	38.28[g]	0.2833[g]	3356[g]	3171[g]	34.65	14.207
	Acetylenes, C_2 and C_3:										
1C1.5 1	Ethyne (acetylene), C_2H_2, M.W. 26.038	0.271	0.9925	0.9053	14.466	...	0.3966	1483.7	1433.0	12.019	13.274
2	Propyne (methylacetylene), C_3H_4, M.W. 40.065	0.276	0.9835	1.4058	9.3161	48.930[d]	0.3545	2232.8	2130.5	19.405	13.803
	Acetylenes, C_4H_6, M.W. 54.092:										
3	1-Butyne	...	0.9650	1.9344	6.7705	37.1[d]	0.3513	3049	2893	27.194	14.057
4	2-Butyne	...	(0.965)[g]	1.9346[g]	7.039[g]	40.87[g]	0.3455[g]	2910[g]	2761[g]	27.19[g]	14.057
	Acetylenes, C_5H_8, M.W. 68.119:										
5	1-Pentyne	...	(0.959)[g]	2.452[g]	5.798[g]	33.61[g]	0.387[g]	3541[g]	3352[g]	34.83[g]	14.207
6	2-Pentyne	...	(0.964)[g]	2.440[g]	6.124[g]	36.55[g]	0.371[g]	3333[g]	3157[g]	34.66[g]	14.207
7	3-Methyl-1-butyne	...	(0.951)[g]	2.472[g]	5.496[g]	30.8[g]	0.368[g]	3729[g]	3527[g]	35.12[g]	14.207

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 ., for definitions of superscripts.

TABLE 1C1.9—Paraffins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Paraffins, C_1 to C_3:														
1	Methane, CH_4, M.W. 16.043	−161.495	0.0160	−182.48[e]	*0.26*[j]	...	...	...	...	...	...	...	...	...	...
2	Ethane, C_2H_6, M.W. 30.070	−88.60	0.0244	−183.27[e]	*0.3580*	*0.3399*	*0.3165*	...	...	...	...	...	...	...	...
3	Propane, C_3H_8, M.W. 44.097	−42.045	0.0298	−187.69[e]	0.5076[d]	0.5005[d]	0.4928[d]	...	...	...	...	...	...	...	...
	Paraffins, C_4H_{10}, M.W. 58.124:														
4	*n*-Butane	−0.50	0.0347	−138.362	0.5847[d]	0.5788[d]	0.5730[d]	1.3326[d]	1.3292[d]	...	...	...	...	...	83.1
5	2-Methylpropane (isobutane)	−11.72	0.0337	−159.605	0.5633[d]	0.5572[d]	0.5510[d]	...	...	...	...	...	...	...	107.6
	Paraffins, C_5H_{12}, M.W. 72.151:														
6	*n*-Pentane	+36.064	0.03856	−129.730	0.63087	0.62622	0.62137	1.35748	1.35472	98.1	98.0	0.330[d]	...	15.48	70.7
7	2-Methylbutane (isopentane)	27.843	0.03815	−159.905	0.62463	0.61965	0.61460	1.35373	1.35088	98.7	98.6	...	...	14.46	77.0
8	2,2-Dimethylpropane (neopentane)	9.499	0.0361	−16.57	0.5967[d]	0.5910[d]	0.5851[d]	1.342[d]	1.339[d]	98[d]	98[d]	...	...	...	102[h]
	Paraffins, C_6H_{14}, M.W. 86 178:														
9	*n*-Hexane	68.732	0.04191	−95.322	0.66382	0.65935	0.65479	1.37486	1.37226	98.1	98.0	0.4137	...	17.90	68.6
10	2-Methylpentane	60.261	0.04141	−153.681	0.65774	0.65313	0.65840	1.37145	1.36873	98.7	98.6	...	...	16.87	73.8
11	3-Methylpentane	63.272	0.04182	...	0.66878	0.66429	0.65974	1.37652	1.37386	97.2	97.1	...	...	17.60	69.3[h]
12	2,2-Dimethylbutane	49.731	0.04117	−99.843	0.65390	0.64914	0.64444	1.36876	1.36595	99.9	99.8	...	...	15.81	81.2[h]
13	2,3-Dimethylbutane	57.978	0.04173	−128.543	0.66622	0.66162	0.65700	1.37495	1.37231	98.4	98.3	...	...	16.87	71.9[h]
	Paraffins, C_7H_{16}, M.W. 100.205:														
14	*n*-Heptane	...	0.04479	−90.581	0.68799	0.68374	0.67949	1.38764	1.38511	97.8	97.7	0.5214	0.3425[d]	19.80	69.7
15	2-Methylhexane	90.049	0.04431	−118.271	0.68285	0.67857	0.67437	1.38485	1.38227	98.4	98.5	...	...	18.80	74.0
16	3-Methylhexane	91.847	0.04459	...	0.69150	0.68711	0.68293	1.38864	1.38609	97.5	97.4	...	...	19.30	70.5
17	3-Ethylpentane	93.473	0.04482	−118.599	0.70258	0.69814	0.69393	1.39339	1.39084	95.7	95.7	...	...	19.94	65.7
18	2,2-Dimethylpentane	79.191	0.04394	−123.811	0.67805	0.67383	0.66951	1.38215	1.37955	99.4	99.3	...	...	17.55	77.6
19	2,3-Dimethylpentane	89.781	0.04482	...	0.69938	0.69506	0.69089	1.39196	1.38945	96.4	96.2	...	...	19.47	67.6
20	2,4-Dimethylpentane	80.494	0.04376	−119.238	0.67710	0.67268	0.66830	1.38145	1.37882	98.7	98.6	...	...	17.66	78.8
21	3,3-Dimethylpentane	86.060	0.04509	−134.45	0.69741	0.69325	0.68906	1.39092	1.38842	97.4	97.1	...	...	19.10	70.5
22	2,2,3-Trimethylhutane	80.876	0.04484	−24.897	0.69440	0.69009	0.68586	1.38944	1.38692	98.7	98.3	...	...	18.26	72.2
	Paraffins, C_8H_{18}, M.W. 114.232:														
23	*n*-Octane	125.675	0.04738	−56.764	0.70652	0.70250	0.69847	1.39743	1.39505	98.1	98.0	0.6476	0.4039	21.26	70.6
24	2-Methylheptane	117.653	0.04691	−108.993	0.70188	0.69790	0.69390	1.39494	1.39257	98.6	98.5	...	...	20.14	74[h]
25	3-Methylheptane	118.932	0.04712	−120.547	0.70989	0.70580	0.70173	1.39848	1.39610	97.6	97.5	...	...	20.70	72.2[h]
26	4-Methylheptane	117.715	0.04695	−120.953	0.70880	0.70461	0.70053	1.39792	1.39553	97.6	97.5	...	...	20.54	71.6[h]
27	3-Ethylhexane	118.541	0.04719	...	0.71759	0.71356	0.70946	1.40162	1.39919	96.5	96.4	...	...	21.04	68.7[h]
28	2,2-Dimethylhexane	106.842	0.04650	−121.18	0.69949	0.69526	0.69110	1.39349	1.39104	99.8	99.7	...	...	19.14	78[h]
29	2,3-Dimethylhexane	115.612	0.04724	...	0.71631	0.71212	0.70807	1.40113	1.39880	97.1	97.0	...	...	20.53	70.6[h]
30	2,4-Dimethylhexane	109.432	0.04664	...	0.70447	0.70034	0.69618	1.39534	1.39291	97.9	97.8	...	...	19.59	73.4[h]
31	2,5-Dimethylhexane	109.106	0.04646	−91.148	0.69773	0.69352	0.68932	1.39246	1.39004	99.1	99.0	...	...	19.28	78.0[h]
32	3,3-Dimethylhexane	111.973	0.04741	−126.10	0.71407	0.70998	0.70594	1.40009	1.39782	97.4	97.3	...	...	20.18	72[h]
33	3,4-Dimethylhexane	117.731	0.04752	...	0.72336	0.71921	0.71514	1.40406	1.40180	96.7	96.6	...	...	21.18	68.0[h]
34	2-Methyl-3-ethylpentane	115.655	0.04748	−114.952	0.72336	0.71930	0.71520	1.40401	1.40167	96.2	96.1	...	...	21.05	67.2[h]
35	3-Methyl-3-ethylpentane	118.266	0.04844	−90.842	0.73119	0.72740	0.72352	1.40775	1.40549	95.9	95.8	...	...	21.53	65.9[h]
36	2,2,3-Trimethylpentane	109.845	0.04755	−112.26	0.71999	0.71600	0.71205	1.40295	1.40066	97.3	97.2	...	...	20.22	70.8[h]
37	2,2,4-Trimethylpentane	99.238	0.04651	−107.373	0.69597	0.69191	0.68779	1.39145	1.38898	100.6	100.5	...	...	18.32	79.5[h]
38	2,3,3-Trimethylpentane	114.765	0.04833	−100.934	0.73005	0.72617	0.72230	1.40750	1.40522	96.2	96.1	...	...	21.10	67.0[h]
39	2,3,4-Trimethylpentane	113.472	0.04761	−109.197	0.72304	0.71904	0.71501	1.40422	1.40198	97.0	96.9	...	...	20.68	68.3[h]
40	2,2,3,3-Tetramethylbutane	106.47	0.0476	+100.69	...	...	...	...	...	...	...	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.9—Paraffins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[e]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
45.44	−82.57	0.099	*8.534*	*0.5320*	...	...	...	...	1.955	121.87	−17.889	...	−12.144	...	...[o]	...	...	...	1
48.16	+32.27	0.148	12.58	0.4184	36.10	1.2006	1.200	39.91	3.517	116.97	−20.236	−22.500[d]	−7.860	...	370.56[d,o]	12 324[d]	339.00[d]	11 274[d]	2
41.94	96.67	0.203	17.57	0.3985	26.56	0.6023	3.605	81.76	4.487	101.76	−24.820	−28.789[d]	−5.614	...	526.63[d,o]	11 943[d]	484.56[d]	10 989[d]	3
37.47	152.03	0.255	*23.03*	*0.3963*	33.41	0.5748	5.035	86.63	5.352	92.09	−30.15	−35.34[d]	−4.08	...	682.45[d,o]	11 742[d]	629.86[c]	10 837[d]	4
36.00	134.99	0.263	23.14	*0.3981*	33.85	*0.5824*	4.570	78.63	5.090	87.58	−32.15	−36.95[d]	−5.00	...	680.84[d,o]	11 714[d]	628.25[c]	10 810[d]	5
33.25	196.5	0.304	28.73	0.3982	*39.99*	*0.5543*	6.316	87.54	6.160	85.38	−35.00	−41.40	−2.00	−2.30	838.77[o]	11 626	775.66	10 751	6
33.37	187.28	0.306	28.39	0.3935	39.406	0.54620	5.937	82.29	5.901	81.79	−36.92	−42.95	−3.50	−3.60	837.21[o]	11 604	774.10	10 730	7
31.57	160.63	0.303	28.71	0.3976	40.8	0.566	*5.223*	*72.39*	*5.498*	*76.37*	*−40.26*	*−45.61*[d]	−4.06	...	*834.54*[d,o]	*11 566*[d]	*771.48*[d]	*10 692*[d]	8
29.73	234.3	0.370	34.20	0.3969	*46.72*	*0.5422*	7.541	87.51	6.896	80.03	−39.94	−47.52	−0.05	−1.03	995.01	11 547	921.37	10 692	9
29.71	224.35	0.367	*34.26*	*0.3975*	46.212	0.53628	7.138	82.83	6.643	77.09	−41.66	−48.82	−1.19	−1.97	993.71	11 532	920.07	10 677	10
30.83	231.3	0.367	*33.77*	*0.3919*	45.3	0.526	7.236	83.97	6.711	77.88	−41.01	−48.28	−0.66	−1.34	994.25	11 538	920.61	10 683	11
30.40	215.63	0.359	*33.78*	*0.3920*	45.42	0.5271	6.618	76.80	6.287	72.96	−44.32	−51.00	−2.26	−2.90	991.52	11 506	917.88	10 652	12
30.86	226.83	0.358	33.59	0.3898	45.11	0.5235	6.961	80.78	6.519	75.65	−42.47	−49.48	−0.96	−1.69	993.05	11 524	919.41	10 670	13
27.00	267.1	0.432	*39.76*	*0.3968*	*53.76*	*0.5365*	8.736	87.19	7.576	75.61	−44.88	−53.63	1.93	0.26	1151.27	11 490	1067.11	10 650	14
26.98	257.22	0.421	(*39.6*)	(*0.395*)	*53.28*	*0.5317*	8.319	83.03	7.330	73.16	−46.59	−54.93	0.81	−0.67	1149.97	11 477	1065.81	10 637	15
27.77	262.10	0.404	(*39.6*)	(*0.395*)	52.3	0.522	8.386	83.69	7.359	73.44	−45.94	−54.35	1.12	−0.39	1150.55	11 483	1066.39	10 643	16
28.53	267.49	0.416	(*39.6*)	(*0.395*)	*52.48*	*0.5237*	8.420	84.04	7.399	73.84	−45.33	−53.77	2.61	1.12	1151.13	11 489	1066.97	10 649	17
27.37	247.35	0.416	(*40.1*)	(*0.400*)	*52.85*	*0.5274*	7.752	77.37	6.970	69.56	−49.27	−57.05	−3.03	−1.15	1147.85	11 456	1063.69	10 616	18
28.70	264.20	0.393	39.67	0.3959	52	0.52	8.185	81.69	7.263	72.49	−47.60	−55.81	0.18	−1.27	1149.09	11 468	1064.93	10 628	19
27.01	246.64	0.418	(*39.3*)	(*0.393*)	*53.59*	*0.5348*	7.861	78.45	7.051	70.37	−48.28	−56.17	0.79	−0.47	1148.73	11 465	1064.57	10 625	20
29.07	263.25	0.414	(*40.1*)	(0.400)	51.4	0.513	7.893	78.77	7.086	70.72	−48.15	−56.07	0.65	−0.69	1148.83	11 466	1064.67	10 626	21
29.15	258.02	0.398	*39.04*	*0.3896*	*51.03*	*0.5093*	7.658	76.43	6.919	69.05	−48.94	−56.63	1.03	−0.16	1148.27	11 460	1064.11	10 620	22
24.54	295.68	0.492	*45.32*	(*0.3968*)	*60.73*	*0.5317*	9.916	86.81	8.225	72.01	−49.82	−59.74	3.91	1.54	1307.53	11 447	1212.85	10 618	23
24.52	286.49	0.488	(*45.1*)	(*0.395*)	60.13	0.5264	9.484	83.03	8.08	70.7	−51.49	−60.98	2.83	0.92	1306.28	11 436	1211.60	10 607	24
25.13	290.52	0.464	(*44.5*)	(*0.39*)	59.67	0.5223	9.521	83.35	8.10	70.9	−50.82	−60.34	3.29	1.12	1306.92	11 442	1212.24	10 613	25
25.09	288.59	0.476	(*44.5*)	(*0.39*)	60.01	0.5254	9.483	83.02	8.101	70.92	−50.88	−60.17	4.01	1.86	1307.09	11 443	1212.41	10 614	26
25.74	292.34	0.455	*44.98*	*0.3938*	58.0	0.51	9.476	82.96	8.033	70.33	−50.40	−59.88	4.03	1.80	1307.39	11 446	1212.71	10 617	27
24.96	276.72	0.478	(*46*)	(*0.40*)	59.2	0.518	8.913	78.03	7.71	67.5	−53.71	−62.63	2.56	0.72	1304.64	11 422	1209.96	10 593	28
25.94	290.34	0.468	*44.84*	*0.3925*	59.0	0.52	9.272	81.17	7.936	69.48	−51.12	−60.40	3.59	2.17	1306.86	11 441	1212.18	10 612	29
25.23	280.37	0.472	(*43*)	(*0.38*)	60.0	0.53	9.027	79.03	7.79	68.2	−52.44	−61.47	2.80	0.89	1305.80	11 432	1211.12	10 603	30
24.54	276.91	0.482	(*43*)	(*0.38*)	59.56	0.5214	9.049	79.22	7.80	68.3	−53.21	−62.26	2.50	0.59	1305.00	11 425	1210.32	10 596	31
26.19	288.87	0.443	(*44.5*)	(*0.39*)	58.94	0.5160	8.972	78.55	7.76	68.0	−52.61	−61.58	3.17	1.23	1305.68	11 431	1211.00	10 602	32
26.57	295.70	0.466	*44.49*	*0.3895*	58.0	0.51	9.316	81.56	7.953	69.63	−50.91	−60.23	3.68	2.03	1307.04	11 443	1212.36	10 614	33
26.65	293.94	0.443	*44.53*	0.3898	58.0	0.51	9.208	80.61	7.879	68.98	−50.48	−59.69	4.49	3.03	1307.58	11 448	1212.90	10 619	34
27.71	303.43	0.455	(*44.39*)	(0.3886)	57.0	0.50	9.081	79.50	7.838	68.62	−51.38	−60.46	4.18	2.69	1306.80	11 441	1212.12	10 612	35
26.94	290.35	0.436	(*46*)	(*0.40*)	58.0	0.51	8.824	77.25	7.65	67.0	−52.61	−61.44	4.09	2.22	1305.83	11 432	1211.15	10 603	36
25.34	270.81	0.468	*44.24*	0.3873	57.02	0.4992	8.397	73.51	7.411	64.88	−53.57	−61.97	3.42	1.65	1305.29	11 428	1210.61	10 599	37
27.83	300.41	0.455	(*44.5*)	(*0.39*)	58.69	0.5138	8.896	77.88	7.73	67.7	−51.73	−60.63	4.52	2.54	1306.64	11 439	1211.96	10 610	38
26.94	293.26	0.461	*45.52*	0.3985	59.39	0.5199	9.013	78.91	7.684	67.27	−51.96	−60.98	4.49	2.54	1306.28	11 436	1211.60	10 607	39
28.3	294.8	0.461	46.03	0.4030	...	...	10.24[f]	89.6[f]	7.51	65.7	−53.99	−64.23	5.35	3.13	...	...	...	...	40

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.9—Paraffins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Paraffins, C_9H_{20}, M.W. 128.259:														
41	*n*-Nonane	150.818	0.04967	−53.489	0.72144	0.71761	0.71379	1.40542	1.40311	97.4	97.2	0.8087	0.4766	22.44	73.7
42	2-Methyloctane	143.28	0.0480	−80.37	0.7173	0.7134	0.7095	1.4031	1.4008	98.5	98.4	...	...	21.41	77.5[h]
43	3-Methyloctane	144.23	0.049	−107.6	0.7242	0.7205	0.7168	1.4063	1.4040	97.6	97.5	...	...	21.87	75.0[h]
44	4-Methyloctane	142.44	0.0492	−113.2	0.7242	0.7202	0.7163	1.4062	1.4039	97.6	97.5	...	...	21.87	74.5[h]
45	3-Ethylheptane	143.0	0.050	...	0.7306	0.7265	0.7225	1.4093	1.4070	96.7	96.6	...	...	22.34	73[h]
46	4-Ethylheptane	141.2	0.050	...	0.7322	0.7281	0.7241	1.4096	1.4073	96.7	96.6	...	...	22.34	68[h]
47	2,2-Dimethylheptane	132.70	0.049	−112.99	0.7144	0.7105	0.7066	1.4016	1.3993	99.6	99.5	...	...	20.34	79[h]
48	2,3-Dimethylheptane	140.5	0.050	...	0.7299	0.7260	0.7221	1.4085	1.4062	97.3	97.2	...	...	21.87	73.2[h]
49	2,4-Dimethylheptane	132.90	0.049	...	0.7192	0.7153	0.7115	1.4034	1.4011	97.9	97.8	...	...	20.84	78[h]
50	2,5-Dimethylheptane	136.0	0.049	...	0.7208	0.7167	0.7127	1.4038	1.4015	97.9	97.8	...	...	20.84	78[h]
51	2,6-Dimethylheptane	135.22	0.049	−102.9	0.7130	0.7089	0.7049	1.4007	1.3983	99.0	98.9	...	...	20.38	80.0[h]
52	3,3-Dimethylheptane	137.02	0.0489	...	0.7296	0.7256	0.7216	1.4088	1.4063	97.5	97.4	...	...	21.55	74[h]
53	3,4-Dimethylheptane	140.6	0.050	...	0.7353	0.7314	0.7275	1.4111	1.4089	96.9	96.8	...	...	22.34	70[h]
54	3,5-Dimethylheptane	136.0	0.049	...	0.7262	0.7225	0.7186	1.4067	1.4044	97.0	96.9	...	...	21.31	...
55	4,4-Dimethylheptane	135.2	0.049	...	0.7296	0.7256	0.7216	1.4076	1.4053	97.5	97.4	...	...	21.55	...
56	2-Methyl-3-ethylhexane	138.0	0.050	...	0.7375	0.7335	0.7295	1.4120	1.4097	96.7	96.6	...	...	22.34	...
57	2-Methyl-4-ethylhexane	133.8	0.049	...	0.7276	0.7235	0.7195	1.4068	1.4046	97.0	96.9	...	...	21.31	...
58	3-Methyl-3-ethylhexane	140.6	0.050	...	0.7451	0.7411	0.7371	1.4140	1.4120	96.0	95.9	...	...	22.76	...
59	3-Methyl-4-ethylhexane	140.4	0.051	...	0.7437	0.7400	0.7363	1.4149	1.4128	95.6	95.5	...	...	22.80	...
60	2,2,3-Trimethylhexane	133.61	0.049	...	0.7333	0.7295	0.7257	1.4105	1.4082	97.4	97.3	...	...	21.41	72[h]
61	2,2,4-Trimethylhexane	126.55	0.0491	−120.0	0.7193	0.7156	0.7118	1.4033	1.4010	98.9	98.8	...	...	20.09	78[h]
62	2,2,5-Trimethylhexane	124.093	0.04838	−105.763	0.71923	0.70719	0.70320	1.39972	1.39728	98.8	99.0	...	...	19.60	82.7
63	2,3,3-Trimethylhexane	137.69	0.049	−116.794	0.7414	0.7375	0.7345	1.4141	1.4119	96.4	96.3	...	...	21.95	...
64	2,3,4-Trimethylhexane	139.06	0.050	...	0.7430	0.7392	0.7354	1.4144	1.4120	96.5	96.4	...	...	22.34	...
65	2,3,5-Trimethylhexane	131.35	0.0492	−127.8	0.7260	0.7219	0.7179	1.4061	1.4037	97.9	97.8	...	...	20.82	76
66	2,4,4-Trimethylhexane	130.660	0.04960	−113.370	0.72747	0.72379	0.72005	1.40745	1.40515	98.2	98.2	...	...	20.75	...
67	3,3,4-Trimethylhexane	140.48	0.049	−101.18	0.7495	0.7454	0.7414	1.4178	1.4154	95.4	95.3	...	...	22.79	...
68	3,3-Diethylpentane	146.186	0.05153	−33.090	0.75711	0.75357	0.74998	1.42051	1.41837	94.6	94.3	...	...	23.29	65[h]
69	2,2-Dimethyl-3-ethylpentane	133.84	0.051	−99.468	0.7385	0.7348	0.7310	1.4123	1.4102	96.4	96.3	...	...	21.92	...
70	2,3-Dimethyl-3-ethylpentane	144.7	0.050	...	0.7588	0.7548	0.7508	1.4221	1.4197	94.7	94.6	...	...	23.40	66[h]
71	2,4-Dimethyl-3-ethylpentane	136.70	0.0504	−122.36	0.7418	0.7379	0.7341	1.4137	1.4115	96.5	96.4	...	...	22.34	...
72	2,2,3,3-Tetramethylpentane	140.292	0.05124	−9.89	0.76031	0.75664	0.75297	1.42360	1.42140	96.1	95.9	...	...	22.93	68[h]
73	2,2,3,4-Tetramethylpentane	133.029	0.05030	−121.09	0.74271	0.73893	0.73522	1.41472	1.41246	96.8	96.8	...	...	21.54	...
74	2,2,4,4-Tetramethylpentane	122.292	0.04932	−66.20	0.72331	0.71945	0.71561	1.40694	1.40459	100.8	101.0	...	...	19.92	75[h]
75	2,3,3,4-Tetramethylpentane	141.567	0.04223	−102.103	0.75842	0.75471	0.75111	1.42222	1.42003	95.5	95.5	...	...	22.88	...
	Paraffins, $C_{10}H_{22}$, M.W. 142.286:														
76	*n*-Decane	174.154	0.05172	−29.643	0.73388	0.73003	0.72623	1.41189	1.40967	98.1	98.0	1.004	0.5591	23.37	77.0
77	2-Methylnonane	167.03	0.051	−74.62	0.7304	0.7264	0.7225	1.4100	1.4075	99.0	99.0	...	...	...	80.3[h]
78	3-Methylnonane	167.8	0.051	−84.77	0.7373	0.7334	0.7296	1.4125	1.4103	98.0	98.0	...	...	...	78.25[h]
79	4-Methylnonane	165.7	0.051	−98.7	0.7362	0.7322	0.7283	1.4118	1.4095	98.0	98.0	...	...	...	78.3[h]
80	5-Methylnonane	165.1	0.051	−87.67	0.7365	0.7326	0.7288	1.4122	1.4100	98.0	98.0	...	...	...	77.9[h]
81	3-Ethyloctane	166.5	0.052	...	0.7438	0.7399	0.7359	1.4156	1.4136	96.0	96.0	...	...	...	75[h]
82	4-Ethyloctane	163.67	0.052	...	0.7419	0.7381	0.7343	1.4151	1.4131	96.0	96.0	...	...	...	...
83	2,2-Dimethyloctane	156.9	0.051	...	0.7281	0.7245	0.7208	1.4082	1.4060	100.0	100.0	...	...	...	81
84	2,3-Dimethyloctane	164.34	0.051	...	0.7418	0.7379	0.7341	1.4149	1.4127	97.0	97.0	...	...	...	75[h]
85	2,4-Dimethyloctane	155.9	0.051	...	0.7302	0.7264	0.7226	1.4091	1.4069	98.0	98.0	...	...	...	80[h]
86	2,5-Dimethyloctane	158.5	0.051	...	0.7341	0.7302	0.7264	1.4112	1.4089	99.0	99.0	...	...	...	77[h]
87	2,6-Dimethyloctane	160.41	0.0521	...	0.7317	0.7276	0.7236	1.4106	1.4084	99.0	99.0	...	...	...	78[h]
88	2,7-Dimethyloctane	159.89	0.051	−54.0	0.7282	0.7242	0.7202	1.4086	1.4062	98.7	98.6	...	...	...	79.0
89	3,3-Dimethyloctane	161.2	0.052	...	0.7429	0.7390	0.7351	1.4165	1.4142	97.0	97.0	...	...	...	75[h]
90	3,4-Dimethyloctane	163.4	0.052	...	0.7487	0.7448	0.7410	1.4182	1.4159	97.0	97.0	...	...	...	73[h]
91	3,5-Dimethyloctane	159.4	0.051	...	0.7405	0.7367	0.7329	1.4139	1.4115	97.0	97.0	...	...	...	...
92	3,6-Dimethyloctane	160.8	0.051	...	0.7402	0.7363	0.7324	1.4139	1.4115	97.0	97.0	...	...	...	76[h]
93	4,4-Dimethyloctane	157.5	0.052	...	0.7382	0.7347	0.7312	1.4144	1.4122	97.0	97.0	...	...	...	...
94	4,5-Dimethyloctane	162.15	0.052	...	0.7507	0.7470	0.7432	1.4190	1.4167	95.9	95.8	...	...	...	74[h]

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 ', for definitions of superscripts.

TABLE 1C1.9—Paraffins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[a]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g. deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
22.6	321.49	0.548	50.60	0.3945	67.97	0.5300	11.100	86.55	8.823	68.80	−54.56	−65.67	6.11	3.02	*1463.95*	*11 414*	*1358.76*	*10 594*	41
22.6	313.6	0.541	(51)	(0.40)	67.6	0.527	10.73	83.66	8.76	68.3	−56.34	−67.07	...	...	1462.54	11 403	1357.35	10 583	42
23.1	317.0	0.529	(51)	(0.40)	66.7	0.520	10.72	83.59	8.79	68.5	−55.84	−60.56	...	...	1463.05	11 407	1357.86	10 587	43
23.1	314.5	0.523	(51)	(0.40)	67	0.52	10.63	82.88	8.75	68.2	−55.84	−66.47	...	...	1463.14	11 408	1357.95	10 588	44
23.7	317.4	0.511	(50)	(0.39)	66	0.51	10.63	82.88	8.78	68.5	−55.36	−65.95	...	...	1463.66	11 418	1358.47	10 592	45
23.6	314.8	0.505	...	...	66	0.51	10.71	83.5	8.76	68.3	−55.36	−65.86	...	...	1463.75	11 412	1358.56	10 592	46
22.9	304.6	0.526	(52.6)	(0.41)	66.2	0.516	10.11	78.83	8.31	64.8	−58.76	−68.87	...	...	*1460.74*	*11 389*	*1355.55*	*10 569*	47
23.7	316.5	0.515	...	...	66	0.51	10.42	81.25	8.63	67.3	−55.64	−66.95	...	...	1462.66	11 404	1357.47	10 584	48
23.1	303.7	0.517	...	...	67	0.52	10.26	80.00	8.45	65.9	−57.46	−67.73	...	...	1461.88	11 398	1356.69	10 578	49
23.2	308.0	0.522	...	...	67	0.52	10.34	80.62	8.51	66.4	−57.46	−67.82	...	...	1461.79	11 397	1356.60	10 577	50
22.7	304.8	0.535	(50)	(0.39)	68	0.53	10.35	80.70	8.49	66.2	−57.94	−68.33	...	...	1461.28	11 393	1356.09	10 573	51
24.0	315.4	0.506	...	...	65.8	0.513	10.18	79.38	8.44	65.8	−57.62	−67.80	...	...	1461.81	11 397	1356.62	10 577	52
24.3	318.8	0.503	...	...	65	0.51	10.42	81.25	8.69	67.8	−56.06	−66.43	...	...	1463.18	11 408	1357.99	10 588	53
23.7	310.1	0.510	...	...	66	0.52	10.34	80.62	8.52	66.4	−56.98	−67.30	...	...	1462.31	11 401	1357.12	10 581	54
24.0	312.3	0.501	...	...	66	0.51	10.09	78.67	8.45	65.9	−57.62	−67.71	...	...	1461.90	11 398	1356.71	10 578	55
24.2	315.1	0.497	...	...	65	0.51	10.33	80.55	8.60	67.1	−56.06	−66.35	...	...	1463.26	11 409	1358.07	10 588	56
23.7	307.0	0.504	...	...	66	0.52	10.25	79.92	8.52	66.4	−56.98	−67.21	...	...	1462.40	11 402	1357.21	10 582	57
25.2	324.4	0.487	...	...	64	0.50	10.25	79.92	8.54	66.6	−56.22	−66.41	...	...	1463.20	11 408	1358.01	10 588	58
24.8	320.7	0.490	...	...	64	0.50	10.41	81.17	8.70	67.8	−55.58	−65.92	...	...	1463.69	11 412	1358.50	10 592	59
24.6	314.9	0.498	...	...	66	0.51	9.97	77.74	8.31	64.8	−57.59	−67.56	...	...	*1462.05*	*11 399*	*1356.86*	*10 579*	60
23.5	300.5	0.507	(50)	(0.39)	67	0.52	9.73	75.87	8.13	63.4	−57.87	−67.60	...	...	*1462.01*	*11 399*	*1356.82*	*10 579*	61
23.0	294.9	0.519	(50)	(0.39)	68	0.53	9.602	74.87	8.07	62.9	−60.51	−70.11	...	...	*1459.50*	*11 379*	*1354.31*	*10 559*	62
25.2	323.0	0.491	(50)	(0.39)	65	0.51	10.05	78.36	8.36	65.2	−57.13	−67.18	...	...	*1462.43*	*11 402*	*1357.24*	*10 582*	63
24.9	321.4	0.494	...	...	65	0.51	10.21	79.61	8.53	66.5	−56.76	−66.91	...	...	1462.70	11 404	1357.51	10 584	64
23.7	306.1	0.509	(49)	(0.38)	66	0.52	9.901	77.20	8.32	64.9	−57.98	−67.88	...	...	*1461.73*	*11 397*	*1356.54*	*10 576*	65
24.0	308.5	0.500	(50)	(0.39)	66	0.52	9.81	76.49	8.20	63.9	−57.15	−66.96	...	...	*1462.65*	*11 404*	*1357.46*	*10 584*	66
25.9	329.2	0.484	(50)	(0.39)	64	0.50	10.13	78.99	8.40	65.5	−56.20	−66.33	...	...	*1463.28*	*11 409*	*1358.09*	*10 589*	67
26.4	336.9	0.473	(49)	(0.38)	63	0.49	10.41	81.17	8.60	67.1	−55.41	−65.82	...	...	1463.79	11 413	1358.60	10 593	68
25.2	317.4	0.486	(50)	(0.39)	65	0.51	9.96	77.66	8.32	64.9	−55.21	−65.17	...	...	*1464.44*	*11 418*	*1359.25*	*10 598*	69
26.5	333.7	0.477	...	...	63	0.49	10.20	79.53	8.44	65.8	−55.56	−65.67	...	...	1463.94	11 414	1358.75	10 594	70
24.9	318.1	0.489	(49)	(0.38)	65	0.51	10.12	78.91	8.46	66.0	−54.34	−64.46	...	...	*1465.15*	*11 423*	*1359.96*	*10 603*	71
27.0	337.7	0.478	(51)	(0.40)	63	0.49	9.84	76.73	8.43	65.7	−56.61	−66.51	...	...	1463.10	11 407	1357.91	10 587	72
25.3	319.0	0.490	(50)	(0.39)	65	0.51	9.76	76.10	8.19	63.9	−56.73	−66.37	...	...	1463.24	11 408	1358.05	10 588	73
23.3	298.2	0.504	(51)	(0.40)	67	0.52	9.12	71.11	7.85	61.2	−57.69	−66.92	...	...	1462.69	11 404	1357.50	10 584	74
26.6	335.9	0.481	(50)	(0.39)	63	0.49	10.00	77.97	8.35	65.1	−56.51	−66.43	...	...	1463.18	11 408	1357.99	10 588	75
20.7	344.5	0.603	56.07	0.3941	*75.16*	*0.5283*	12.276	86.28	9.387	65.98	−59.63	−71.92	7.98	4.18	1620.06	11 386	1504.35	10 573	76
20.7	337.2	0.596	(58)	(0.41)	74.6	0.524	12.2	85.7	9.37	65.9	−61.25	−73.20	...	...	1618.78	11 377	1503.07	10 564	77
21.1	340.4	0.582	(58)	(0.41)	74.0	0.520	12.0	85.0	9.35	65.7	−60.77	−72.68	...	...	1619.30	11 381	1503.59	10 567	78
21.1	337.4	0.575	(58)	(0.41)	74.8	0.526	11.9	84.3	9.27	65.2	−60.77	−72.58	...	...	1619.40	11 381	1503.69	10 568	79
21.1	336.6	0.573	(58)	(0.41)	74.4	0.522	11.9	83.6	9.25	65.0	−60.77	−72.54	...	...	1619.44	11 382	1503.73	10 568	80
21.6	340.6	0.561	...	...	73	0.51	11.7	83.6	9.25	65.0	−60.29	−72.96	...	...	1619.02	11 379	1503.31	10 565	81
21.5	336.6	0.552	...	...	73	0.51	11.5	82.2	9.15	64.3	−60.29	−71.92	...	...	1620.06	11 386	1504.35	10 573	82
21.0	328.9	0.580	...	...	73.1	0.514	11.7	80.8	9.01	63.3	−63.95	−75.32	...	...	1616.66	11 362	1500.95	10 549	83
21.6	340.1	0.567	...	...	73	0.51	11.5	82.2	9.13	64.2	−61.47	−73.07	...	...	1618.90	11 378	1503.20	10 565	84
21.2	326.3	0.566	...	...	74	0.52	11.6	80.8	9.04	63.5	−62.39	−73.82	...	...	1618.16	11 373	1502.45	10 559	85
21.2	330.0	0.569	...	...	74	0.52	11.7	81.5	9.04	63.5	−62.39	−73.86	...	...	1618.12	11 372	1502.41	10 559	86
21.2	330.0	0.576	...	...	74	0.52	11.8	82.2	9.13	64.2	−62.39	−73.96	...	...	1618.02	11 372	1502.31	10 558	87
20.7	329.9	0.590	(57)	(0.40)	73.6	0.517	11.4	82.9	9.14	64.2	−62.87	−74.48	...	...	1617.50	11 368	1501.79	10 555	88
21.9	339.1	0.557	...	...	72.8	0.512	11.6	80.1	8.99	63.2	−62.55	−73.92	...	...	1618.06	11 372	1502.35	10 559	89
22.1	340.9	0.551	...	...	72	0.51	11.5	81.5	9.09	63.9	−60.99	−72.52	...	...	1619.46	11 382	1503.75	10 568	90
21.6	333.2	0.555	...	...	73	0.51	11.6	80.8	9.02	63.4	−61.91	−73.34	...	...	1618.64	11 376	1502.93	10 563	91
21.6	335.2	0.562	...	...	73	0.51	11.3	81.5	9.10	64.0	−61.91	−73.44	...	...	1618.54	11 375	1502.83	10 562	92
21.8	333.8	0.548	...	...	73	0.52	11.5	79.4	8.90	62.6	−62.55	−73.78	...	...	1618.20	11 373	1502.49	10 560	93
22.1	339.1	0.546	...	...	72	0.51	11.6	80.8	9.05	63.6	−60.99	−72.45	...	...	1619.52	11 382	1503.82	10 569	94

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.9—Paraffins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4\,(n_F-n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Paraffins, $C_{10}H_{22}$ (continued):														
95	4-*n*-Propylheptane	157.5	0.051	...	0.7397	0.7359	0.7321	1.4135	1.4113	95.9	95.8	...	...	...	76[h]
96	4-Isopropylheptane	158.9	0.051	...	0.7430	0.7392	0.7354	1.4155	1.4132	97	97	...	...	...	...
97	2-Methyl-3-ethylheptane	161.2	0.052	...	0.7474	0.7436	0.7398	1.4174	1.4151	96	96	...	...	...	...
98	2-Methyl-4-ethylheptane	156.2	0.051	...	0.7398	0.7360	0.7322	1.4137	1.4114	96	96	...	...	...	...
99	2-Methyl-5-ethylheptane	159.7	0.051	...	0.7393	0.7356	0.7318	1.4134	1.4111	96	96	...	...	...	...
100	3-Methyl-3-ethylheptane	163.8	0.053	...	0.7539	0.7501	0.7463	1.4208	1.4185	97	97	...	...	...	73[h]
101	3-Methyl-4-ethylheptane	162.2	0.052	...	0.7543	0.7504	0.7466	1.4206	1.4183	96	96	...	...	...	...
102	3-Methyl-5-ethylheptane	158.2	0.051	...	0.7445	0.7406	0.7368	1.4164	1.4141	96	96	...	...	...	...
103	4-Methyl-3-ethylheptane	163.0	0.052	...	0.7544	0.7506	0.7468	1.4207	1.4184	96	96	...	...	...	...
104	4-Methyl-4-ethylheptane	160.8	0.053	...	0.7548	0.7510	0.7472	1.4210	1.4187	97	97	...	...	...	...
105	2,2,3-Trimethylheptane	157.6	0.052	...	0.7461	0.7423	0.7385	1.4168	1.4145	97	97	...	...	...	74[h]
106	2,2,4-Trimethylheptane	148.3	0.051	...	0.7313	0.7275	0.7237	1.4092	1.4069	100	100	...	...	...	...
107	2,2,5-Trimethylheptane	150.8	0.051	...	0.7320	0.7281	0.7243	1.4101	1.4078	100	100	...	...	...	...
108	2,2,6-Trimethylheptane	148.95	0.051	*−105.0*	0.7277	0.7238	0.7200	1.4078	1.4055	98	98	...	...	...	81[h]
109	2,3,3-Trimethylheptane	160.2	0.053	...	0.7527	0.7488	0.7450	1.4202	1.4179	96	96	...	...	...	...
110	2,3,4-Trimethylheptane	159.9	0.052	...	0.7523	0.7485	0.7447	1.4195	1.4172	97	97	...	...	...	...
111	2,3,5-Trimethylheptane	160.7	0.051	...	0.7490	0.7451	0.7413	1.4169	1.4146	97	97	...	...	...	...
112	2,3,6-Trimethylheptane	156.0	0.051	...	0.7385	0.7347	0.7309	1.4131	1.4108	97	97	...	...	...	...
113	2,4,4-Trimethylheptane	151.0	0.052	...	0.7384	0.7346	0.7308	1.4143	1.4120	97	97	...	...	...	...
114	2,4,5-Trimethylheptane	156.5	0.051	...	0.7450	0.7411	0.7373	1.4160	1.4137	97	97	...	...	...	...
115	2,4,6-Trimethylheptane	147.6	0.050	...	0.7265	0.7228	0.7190	1.4071	1.4048	97	97	...	...	...	82[h]
116	2,5,5-Trimethylheptane	152.82	0.052	...	0.7438	0.7400	0.7362	1.4149	1.4126	97	97	...	...	...	...
117	3,3,4-Trimethylheptane	161.9	0.053	...	0.7604	0.7565	0.7527	1.4236	1.4213	97	97	...	...	...	...
118	3,3,5-Trimethylheptane	155.70	0.052	...	0.7466	0.7428	0.7390	1.4170	1.4147	97	97	...	...	...	70[h]
119	3,4,4-Trimethylheptane	161.1	0.053	...	0.7612	0.7573	0.7535	1.4235	1.4212	97	97	...	...	...	...
120	3,4,5-Trimethylheptane	162.5	0.052	...	0.7596	0.7557	0.7519	1.4229	1.4206	97	97	...	...	...	...
121	2-Methyl-3-isopropylhexane	166.7	0.052	...	0.7512	0.7474	0.7436	1.4195	1.4172	98	98	...	...	...	...
122	3,3-Diethylhexane	166.3	0.053	...	0.7652	0.7613	0.7575	1.4258	1.4235	95	95	...	...	...	69[h]
123	3,4-Diethylhexane	163.9	0.052	...	0.7548	0.7510	0.7472	1.4190	1.4167	94.7	94.6	...	...	...	73[h]
124	2,2-Dimethyl-3-ethylhexane	156.1	0.052	...	0.7523	0.7485	0.7447	1.4197	1.4174	97	97	...	...	...	...
125	2,2-Dimethyl-4-ethylhexane	147	0.051	...	0.7377	0.7340	0.7302	1.4131	1.4107	97	97	...	...	...	...
126	2,3-Dimethyl-3-ethylhexane	163.7	0.054	...	0.7676	0.7637	0.7599	1.4270	1.4247	97	97	...	...	...	...
127	2,3-Dimethyl-4-ethylhexane	160.9	0.052	...	0.7592	0.7554	0.7516	1.4226	1.4203	97	97	...	...	...	...
128	2,4-Dimethyl-3-ethylhexane	160.1	0.052	...	0.7591	0.7552	0.7514	1.4225	1.4202	97	97	...	...	...	...
129	2,4, Dimethyl-4-ethylhexane	161.1	0.052	...	0.7600	0.7563	0.7525	1.4235	1.4212	97	97	...	...	...	...
130	2,5-Dimethyl-3-ethylhexane	154.1	0.051	...	0.7445	0.7406	0.7368	1.4157	1.4134	97	97	...	...	...	...
131	3,3-Dimethyl-4-ethylhexane	162.9	0.053	...	0.7674	0.7636	0.7598	1.4269	1.4246	97	97	...	...	...	...
132	3,4-Dimethyl-3-ethylhexane	162.1	0.054	...	0.7673	0.7634	0.7596	1.4267	1.4244	97	97	...	...	...	...
133	2,2,3,3-Tetramethylhexane	160.34	0.0538	−53.97	0.76800	0.76444	0.76087	1.42818	1.42600	97	97	...	...	...	...
134	2,2,3,4-Tetramethylhexane	158.8	0.052	...	0.7589	0.7551	0.7513	1.4216	1.4193	98	98	...	...	...	70[h]
135	2,2,3,5-Tetramethylhexane	148.4	0.051	...	0.7420	0.7378	0.7336	1.4142	1.4119	98	98	...	...	...	...
136	2,2,4,4-Tetramethylhexane	153.8	0.051	...	0.7499	0.7462	0.7424	1.4208	1.4185	99	99	...	...	...	...
137	2,2,4,5-Tetramethylhexane	147.90	0.0512	...	0.73933	0.73544	0.73159	1.41318	1.41095	99	99	...	...	...	...
138	2,2,5,5-Tetramethylhexane	137.47	0.0500	−12.59	0.72272	0.71873	0.71478	1.40550	1.40316	102	102	...	...	...	83[h]
139	2,3,3,4-Tetramethylhexane	164.62	0.0054	...	0.7731	0.7694	0.7656	1.4298	1.4275	97	97	...	...	...	...
140	2,3,3,5-Tetramethylhexane	153.1	0.052	...	0.7525	0.7487	0.7449	1.4196	1.4173	97	97	...	...	...	...
141	2,3,4,4-Tetramethylhexane	161.6	0.054	...	0.7663	0.7624	0.7586	1.4267	1.4244	97	97	...	...	...	...
142	2,3,4,5-Tetramethylhexane	156.2	0.053	...	0.7531	0.7494	0.7456	1.4204	1.4181	98	98	...	...	...	...
143	3,3,4,4-Tetramethylhexane	170.0	0.054	...	0.7859	0.7824	0.7789	1.4368	1.4346	97	97	...	...	...	64[h]
144	2,4-Dimethyl-3-isopropylpentane	157.06	0.0544	−81.67	0.76208	0.75828	0.75455	1.42463	1.42248	97	97	...	...	...	...
145	2-Methyl-3,3-diethylpentane	169.7	0.055	...	0.7831	0.7793	0.7755	1.4343	1.4320	97	97	...	...	...	...
146	2,2,3-Trimethyl-3-ethylpentane	169.5	0.054	...	0.7857	0.7818	0.7780	1.4420	1.4397	97	97	...	...	...	...
147	2,2,4-Trimethyl-3-ethylpentane	155.3	0.053	...	0.7612	0.7571	0.7531	1.4223	1.4199	98	98	...	...	...	...
148	2,3,4-Trimethyl-3-ethylpentane	169.47	0.052	...	0.7812	0.7773	0.7735	1.4333	1.4310	97	97	...	...	...	...
149	2,2,3,3,4-Pentamethylpentane	166.08	0.0552	−36.43	0.78336	0.78007	0.77673	1.43606	1.43412	97	97	...	...	...	...
150	2,2,3,4,4-Pentamethylpentane	159.31	0.0537	−38.73	0.77037	0.76701	0.76359	1.43069	1.42868	98	98	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.9—Paraffins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[a]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
21.5	328.0	0.545	...	...	73	0.52	11.6	81.5	9.11	64.0	−60.29	−71.81	...	...	1620.16	11 387	1504.46	10 573	95
22.0	334.6	0.537	...	...	73	0.51	11.3	79.4	8.95	62.9	−60.99	−72.31	...	...	1619.66	11 383	1503.36	10 570	96
22.0	337.8	0.544	...	...	72	0.51	11.5	80.8	9.02	63.4	−60.99	−72.42	...	...	1619.56	11 382	1503.85	10 569	97
21.6	328.7	0.545	...	...	73	0.52	11.3	79.4	8.93	62.8	−61.91	−73.20	...	...	1618.78	11 377	1503.07	10 564	98
21.6	333.7	0.555	...	...	73	0.52	11.5	80.8	9.02	63.4	−61.91	−73.34	...	...	1618.64	11 376	1502.93	10 563	99
22.8	346.9	0.532	...	...	72	0.51	11.4	80.1	8.97	63.0	−61.15	−72.48	...	...	1619.50	11 382	1503.74	10 569	100
22.5	341.3	0.530	...	...	72	0.51	11.4	80.1	9.00	63.3	−60.51	−71.90	...	...	1620.08	11 386	1504.37	10 573	101
22.0	333.6	0.541	...	...	73	0.51	11.4	80.1	9.01	63.3	−61.43	−72.82	...	...	1619.16	11 380	1503.45	10 566	102
22.5	342.2	0.533	...	...	72	0.51	11.5	80.8	9.02	63.4	−60.51	−71.94	...	...	1620.04	11 386	1504.33	10 573	103
22.8	342.7	0.525	...	...	72	0.51	11.2	78.7	8.92	62.7	−61.15	−72.38	...	...	1619.60	11 383	1503.89	10 569	104
22.4	338.7	0.546	...	...	73	0.51	11.2	78.7	8.87	62.3	−62.81	−73.95	...	...	1618.02	11 372	1502.32	10 558	105
21.4	321.4	0.552	...	...	74	0.52	10.9	76.6	8.70	61.1	−62.89	−73.78	...	...	1618.20	11 373	1502.49	10 560	106
21.4	324.9	0.559	...	...	74	0.52	11.0	77.3	8.76	61.6	−65.09	−76.09	...	...	1615.88	11 357	1500.18	10 543	107
21.0	320.3	0.573	(54)	(0.38)	75	0.53	11.1	78.0	8.78	61.7	−65.57	−76.60	...	...	1615.38	11 353	1499.67	10 540	108
22.9	344.5	0.538	...	...	72	0.51	11.2	78.7	8.89	62.5	−61.89	−73.06	...	...	1618.92	11 378	1503.21	10 565	109
22.6	340.7	0.538	...	...	72	0.50	11.3	79.4	8.92	62.7	−61.69	−72.95	...	...	1619.02	11 379	1503.32	10 565	110
22.1	339.7	0.547	...	...	72	0.51	11.3	79.4	8.88	62.4	−62.61	−73.84	...	...	1618.14	11 372	1502.43	10 559	111
21.6	331.1	0.560	...	...	73	0.52	11.3	79.4	8.92	62.7	−63.09	−74.35	...	...	1617.62	11 369	1501.92	10 556	112
21.9	327.2	0.541	...	...	73	0.52	10.8	75.9	8.69	61.1	−61.97	−72.86	...	...	1619.12	11 379	1503.41	10 566	113
22.1	333.8	0.544	...	...	73	0.51	11.2	78.7	8.87	62.3	−62.61	−73.80	...	...	1618.18	11 373	1502.47	10 559	114
21.2	317.2	0.560	...	...	75	0.53	11.1	78.0	8.82	62.0	−64.01	−75.10	...	...	1616.88	11 364	1501.17	10 550	115
21.9	329.8	0.550	...	...	73	0.51	11.0	77.3	8.79	61.8	−64.17	−75.20	...	...	1616.78	11 363	1501.07	10 550	116
23.4	349.0	0.526	...	...	71	0.50	11.2	78.7	8.89	62.5	−61.41	−72.58	...	...	1619.40	11 381	1503.69	10 568	117
22.3	336.0	0.537	...	...	73	0.51	11.0	77.3	8.76	61.6	−61.49	−72.49	...	...	1619.48	11 382	1503.78	10 569	118
23.4	347.9	0.524	...	...	71	0.50	11.1	78.0	8.86	62.3	−61.13	−72.26	...	...	1619.72	11 383	1504.01	10 570	119
23.1	346.5	0.529	...	...	71	0.50	11.3	79.4	8.95	62.9	−61.21	−72.50	...	...	1619.48	11 382	1503.77	10 569	120
22.6	350.3	0.529	...	...	72	0.51	11.1	78.0	8.75	61.5	−61.69	−72.81	...	...	1619.16	11 380	1503.46	10 566	121
23.8	354.8	0.510	...	...	71	0.50	11.3	79.4	8.99	63.2	−59.83	−71.16	...	...	1620.82	11 391	1505.11	10 578	122
23.0	345.8	0.519	...	...	72	0.51	11.4	80.1	9.00	63.3	−60.03	−71.42	...	...	1620.56	11 389	1504.85	10 576	123
22.8	338.6	0.526	...	...	72	0.51	11.0	77.3	8.77	61.6	−62.33	−73.32	...	...	1618.66	11 376	1502.95	10 563	124
21.9	321.6	0.539	...	...	74	0.52	10.8	75.9	8.66	60.9	−62.41	−73.27	...	...	1618.70	11 376	1502.10	10 563	125
23.9	353.8	0.516	...	...	70	0.49	11.2	78.7	8.89	62.5	−60.49	−71.66	...	...	1620.32	11 388	1504.61	10 574	126
23.1	344.2	0.524	...	...	71	0.50	11.2	78.7	8.90	62.6	−61.21	−72.43	...	...	1619.54	11 382	1503.84	10 569	127
23.1	343.1	0.522	...	...	71	0.50	11.2	78.7	8.88	62.4	−61.21	−72.40	...	...	1619.58	11 382	1503.87	10 569	128
23.4	347.9	0.524	...	...	71	0.50	11.1	78.0	8.86	62.3	−60.57	−71.70	...	...	1620.28	11 387	1504.57	10 574	129
22.1	330.4	0.537	...	...	73	0.51	11.1	78.0	8.80	61.9	−62.61	−73.70	...	...	1618.28	11 373	1502.57	10 560	130
23.9	352.6	0.513	...	...	70	0.49	11.1	78.0	8.87	62.3	−60.93	−72.06	...	...	1619.92	11 385	1504.21	10 572	131
23.9	351.5	0.511	...	...	70	0.49	11.1	78.0	8.84	62.1	−60.01	−71.11	...	...	1620.86	11 392	1506.16	10 578	132
24.3	355.1	0.518	...	...	70	0.49	10.8	75.9	8.69	61.1	−61.43	−72.31	...	...	1619.66	11 383	1503.96	10 570	133
23.4	347.3	0.525	...	...	71	0.50	10.9	76.6	8.70	61.1	−60.83	−71.73	...	...	1620.24	11 387	1504.54	10 574	134
22.4	328.2	0.540	...	...	73	0.52	10.8	75.9	8.66	60.9	−64.43	−75.23	...	...	1616.74	11 363	1501.04	10 549	135
22.2	337.2	0.535	...	...	72	0.51	10.4	73.1	8.38	58.9	−61.59	−72.05	...	...	1619.92	11 385	1504.22	10 572	136
21.9	325.4	0.544	...	...	73	0.52	10.6	74.5	8.56	60.2	−63.59	−74.28	...	...	1617.70	11 369	1501.99	10 556	137
21.2	309.8	0.557	...	...	75	0.53	10.4	73.1	8.43	59.3	−68.27	−78.73	...	...	1613.24	11 338	1497.54	10 525	138
24.5	360.0	0.514	...	...	70	0.49	11.1	78.0	8.84	62.1	−60.75	−71.82	...	...	1620.16	11 387	1504.45	10 573	139
22.9	337.0	0.531	...	...	72	0.51	10.8	75.9	8.67	60.9	−61.31	−72.14	...	...	1619.84	11 384	1504.13	10 571	140
23.9	353.5	0.518	...	...	70	0.50	11.0	77.3	8.76	61.6	−59.91	−70.88	...	...	1621.10	11 393	1505.39	10 580	141
23.1	340.2	0.530	...	...	72	0.51	11.0	77.3	8.81	61.9	−62.39	−73.45	...	...	1618.52	11 375	1502.82	10 562	142
25.4	373.7	0.506	...	...	68	0.48	10.1	71.0	8.37	58.8	−60.03	−71.04	...	...	1620.94	11 392	1505.23	10 579	143
23.1	341.4	0.521	...	...	71	0.50	10.9	76.6	8.69	61.1	−62.39	−73.31	...	...	1618.66	11 376	1502.96	10 563	144
25.0	366.8	0.501	...	...	69	0.49	11.3	79.4	8.97	63.0	−59.09	−70.36	...	...	1621.62	11 397	1505.91	10 584	145
25.4	373.0	0.503	...	...	68	0.48	11.0	77.3	8.72	61.3	−60.03	−71.01	...	...	1620.96	11 392	1505.26	10 579	146
23.4	342.3	0.518	...	...	71	0.50	10.7	75.2	8.64	60.7	−60.83	−71.26	...	...	1620.36	11 388	1504.65	10 575	147
25.1	369.3	0.506	...	...	69	0.49	11.1	78.0	8.85	62.2	−59.83	−70.93	...	...	1621.04	11 393	1505.34	10 580	148
25.5	370.8	0.508	...	...	69	0.48	10.8	75.9	8.69	61.1	−58.57	−69.38	...	...	1622.60	11 404	1506.89	10 591	149
23.7	354.2	0.521	...	...	70	0.49	10.4	73.1	8.44	59.3	−59.57	−70.07	...	...	1621.90	11 399	1506.20	10 586	150

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.10—Cycloparaffins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4\,(n_F-n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Alkylcyclopropanes, C_3 and C_4:														
1	Cyclopropane, C_3H_6, M.W. 42.081	−32.80	0.0306	−127.42	*0.563*[g]	...	...	...	...	...	...	...	...	...	...
2	Methylcyclopropane, C_4H_8, M.W. 56.108	+0.73	0.040	−177.3	...	...	...	...	...	...	...	...	...	...	...
	Alkylcyclopropanes, C_5H_{10}, M.W. 70.135:														
3	Ethylcyclopropane	35.92	0.040	−149.230	0.6889	0.6840	0.6790	1.3786	1.3756	...	...	...	...	...	...
4	1,1-Dimethylcyclopropane	20.62	0.040	−108.9	0.6649	0.6604	0.6554[d]	1.3669	1.3639[d]	...	...	...	...	...	...
5	1,*cis*-2-Dimethylcyclopropane	37.02	0.040	−140.883	0.6988	0.6939	0.6889	1.3829	1.3800	98	98	...	...	...	...
6	1,*trans*-2-Dimethylcyclopropane	28.20	0.040	−149.58	0.6748	0.6698	0.6648	1.3713	1.3683	101	101	...	...	...	...
	Alkylcyclopropanes, C_6H_{12}, M.W. 84.162:														
7	*n*-Propylcyclopropane	69.14	0.040	...	0.7161	0.7112	0.7062	1.3930	1.3905	...	...	...	...	...	...
8	Isopropylcyclopropane	58.31	0.040	−112.92	0.7036	0.6986	0.6936	1.3865	1.3835	...	...	...	...	...	...
9	1-Methyl-1-ethylcyclopropane	56.76	0.040	−130.2	0.7068	0.7018	0.6968	1.3887	1.3857	...	...	...	...	...	...
10	1-Methyl-*cis*-2-ethylcyclopropane	67.00	0.040	...	0.7194	0.7146	0.7096	1.3953	1.3923	...	...	...	...	...	...
11	1-Methyl-*trans*-2-ethylcyclopropane	58.65	0.040	...	0.6985	0.6935	0.6885	1.3846	1.3816	...	...	...	...	...	...
12	1,1,2-Trimethylcyclopropane	52.43	0.039	−138.192	0.6996	0.6947	0.6897	1.3864	1.3834	110	110	...	...	...	...
13	1,*cis*-2,*cis*-3-Trimethylcyclopropane	66	0.040	...	0.7230	0.7180	0.7130	1.3970	1.3940	...	...	...	...	...	...
14	1,*cis*-2,*trans*-3-Trimethylcyclopropane	59.7	0.040	...	0.7028	0.6979	0.6929	1.3873	1.3843	...	...	...	...	...	...
	Alkylcyclobutanes, C_4 and C_5:														
15	Cyclobutane, C_4H_8, M.W. 56.108	12.51	0.0360	−90.70[e]	0.6997[d]	0.6943[d]	0.6890[d]	1.365[d]	1.362[d]	...	...	...	...	...	...
16	Methylcyclobutane, C_5H_{10}, M.W. 70.135	36.3	0.04	...	0.6977	0.6930	0.6884	1.3836	1.3810	...	...	...	...	...	...
	Alkylcyclobutanes, C_6H_{12}, M.W. 84.162:														
17	Ethylcyclobutane	70.59	0.04	−142.762	0.7326	0.7279	0.7232	1.4020	1.3994	99	99	...	...	...	38.7[h]
18	1,1-Dimethylcyclobutane	56	0.04	...	0.718	0.713	0.708	1.396	1.393	...	...	...	...	...	...
19	1,*cis*-2-Dimethylcyclobutane	68	0.04	...	0.741	0.736	0.731	1.404	1.401	...	...	...	...	...	...
20	1,*trans*-2-Dimethylcyclobutane	60	0.04	...	0.718	0.713	0.708	1.395	1.392	...	...	...	...	...	...
21	1,*cis*-3-Dimethylcyclobutane	60.5	0.04	...	0.7153	0.7106	0.7060	1.3933	1.3908	...	...	...	...	...	...
22	1,*trans*-3-Dimethylcyclobutane	57.5	0.04	...	0.7061	0.7016	0.6970	1.3896	1.3871	...	...	...	...	...	...
	Alkylcyclopentanes, C_5 and C_6:														
23	Cyclopentane, C_5H_{10}, M.W. 70.135	49.252	0.04003	−93.839	0.75016	0.74536	0.74043	1.40645	1.40363	94.3	94.2	0.499	...	21.82	16.8
24	Methylcyclopentane, C_6H_{12}, M.W. 84.162	71.804	0.04274	−142.469	0.75338	0.74862	0.74392	1.40970	1.40700	96.2	96.1	0.565	...	21.61	33.0
	Alkylcyclopentanes, C_7H_{14}, M.W. 98.189:														
25	Ethylcyclopentane	103.467	0.04623	−138.458	0.77084	0.76645	0.76215	1.41981	1.41730	95.5	95.4	0.619	0.39	23.37	36.7
26	1,1-Dimethylcyclopentane	87.482	0.04497	−69.761	0.75897	0.75446	0.74989	1.41356	1.41091	97.3	97.2	...	...	21.23	45[h]
27	1,*cis*-2-Dimethylcyclopentane	99.532	0.04603	−53.893	0.77707	0.77260	0.76805	1.42217	1.41963	97.4	97.3	...	...	...	39.9[h]
28	1,*trans*-2-Dimethylcyclopentane	91.866	0.04521	−117.57	0.75592	0.75142	0.74684	1.41200	1.40941	96.5	96.4	...	...	...	46.7[h]
29	1,*cis*-3-Dimethylcyclopentane	90.770	0.04518	−133.711	0.74934	0.74477	0.74023	1.40894	1.40633	97.4	97.3	...	...	...	...
30	1,*trans*-3-Dimethylcyclopentane	91.722	0.04525	−133.984	0.75320	0.74878	0.74433	1.41074	1.40813	96.2	96.1	...	...	...	49.9[h]
	Alkylcyclopentanes, C_8H_{16}, M.W. 112.216:														
31	*n*-Propylcyclopentane	130.961	0.04888	−117.334	0.78038	0.77631	0.77227	1.42626	1.42389	95.7	95.6	0.724	0.46	...	44.5
32	Isopropylcyclopentane	126.429	0.04913	−111.364	0.78035	0.77651	0.77257	1.42582	1.42350	95.6	95.5	...	...	...	...
33	1-Methyl-1-ethylcyclopentane	*121.529*	0.04863	−143.814	0.78521	0.78091	0.77668	1.42718	1.42476	95.9	95.8	...	...	...	...
34	1-Methyl-*cis*-2-ethylcyclopentane	128.061	0.04897	−105.93	0.78937	0.78520	0.78111	1.42933	1.42695	94.7	94.6	...	...	...	47.5[h]
35	1-Methyl-*trans*-2-ethylcyclopentane	121.2	0.049	*−150.0*	0.7730	0.7690	0.7649	1.4219	1.4195	95	95	...	...	...	52.2[h]
36	1-Methyl-*cis*-3-ethylcyclopentane	121.1	0.049	...	0.771	0.767	0.763	1.419	1.417	95	95	...	...	...	...
37	1-Methyl-*trans*-3-ethylcyclopentane	121.1	0.049	...	0.771	0.767	0.763	1.419	1.417	95	95	...	...	...	...
38	1,1,2-Trimethylcyclopentane	113.734	0.04818	−21.63	0.77691	0.77250	0.76815	1.42298	1.42051	97.0	96.9	...	...	...	...
39	1,1,3-Trimethylcyclopentane	104.895	0.04724	−142.45	0.75256	0.74823	0.74390	1.41119	1.40870	98.7	98.6	...	...	...	...
40	1,*cis*-2,*cis*-3-Trimethylcyclopentane	123.0	0.049	−116.423	0.7833	0.7792	0.7751	1.4262	1.4238	96	96	...	...	...	41.0
41	1,*cis*-2,*trans*-3-Trimethylcyclopentane	117.5	0.048	−112	0.7746	0.7704	0.7661	1.4218	1.4194	96	96	...	...	...	41.0
42	1,*trans*-2,*cis*-3-Trimethylcyclopentane	*110.41*	0.048	−112.694	0.7579	0.7535	0.7492	1.4138	1.4114	96	96	...	...	...	41.0
43	1,*cis*-2,*cis*-4-Trimethylcyclopentane	*116.76*	0.048	*−132.33*	0.7758	*0.762*	*0.758*	*1.4186*	*1.4162*	96	96	...	...	...	...
44	1,*cis*-2,*trans*-4-Trimethylcyclopentane	116.737	0.04827	−132.56	0.76771	0.76343	0.75918	1.41855	1.41612	95.8	95.7	...	...	...	...
45	1,*trans*-2,*cis*-4-Trimethylcyclopentane	109.293	0.04738	−130.79	0.75160	0.74725	0.74300	1.41060	1.40812	96.9	96.8	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.10—Cycloparaffins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[a]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
54.23	124.66	0.17	...	...	...	...	...	...	4.79	114	...	...	...	...	...[c]	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14
49.2	186.8	0.21	...	...	23.8	0.425	5.65	101	5.78	103	6.42	0.77	...	...	650.23[c]	11 589	608.16	10 839	15
...	...	...	...	...	33.2	0.474	...	...	...	...	...	...	...	...	...	...	...	...	16
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	22
44.49	238.60	0.260	19.82	0.2826	30.32	0.4323	6.818	97.22	6.524	93.03	−18.41	−25.28	9.28	8.72	786.55[c]	11 215	733.96	10 465	23
37.35	259.64	0.319	26.24	0.3118	37.93	0.4507	7.56	89.83	6.916	82.18	−25.34	−32.92	8.71	7.68	941.28	11 184	878.17	10 434	24
33.53	296.37	0.375	31.49	0.3207	44.48	0.4530	8.72	88.81	7.715	78.58	−30.33	−39.06	10.70	8.99	1097.50	11 177	1023.87	10 427	25
35	274	0.36	31.86	0.3245	44.64	0.4546	8.079	82.29	7.239	73.73	−33.02	−41.12	9.36	7.99	1095.44	11 156	1021.81	10 406	26
34	292	0.37	32.06	0.3265	45.12	0.4595	8.549	87.07	7.576	77.16	−30.94	−39.50	10.95	9.31	1097.06	11 173	1023.43	10 423	27
34	280	0.36	32.14	0.3274	44.2	0.450	8.259	84.12	7.375	75.12	−32.64	−40.92	9.20	7.72	1095.64	11 158	1022.01	10 408	28
34	278	0.36	32.14	0.3274	45.04	0.4587	8.200	83.52	7.332	74.68	−32.44	−40.66	9.40	7.98	1095.90	11 161	1022.27	10 411	29
34	280	0.36	32.14	0.3274	(45)	(0.46)	8.248	84.01	7.361	74.97	−31.90	−40.17	9.94	8.47	1096.39	11 166	1022.76	10 416	30
29.60	330	0.425	36.96	0.3294	51.69	0.4606	9.91	88.3	8.151	72.64	−35.37	−45.19	12.58	10.37	1253.74	11 172	1169.59	10 422	31
29.60	328	0.422	(36)	(0.32)	(47)	(0.42)	9.5	84.7	8.15	72.6	...	...	...	...	(1253.9)	(11 176)	(1169.8)	(10 425)	32
29.50	319	0.422	(39)	(0.35)	(53)	(0.47)	9.3	82.9	8.04	71.7	...	...	...	...	(1253.0)	(11 167)	(1168.8)	(10 417)	33
29.50	323	0.421	(36)	(0.32)	(47)	(0.42)	9.6	85.6	8.25	73.5	...	...	...	...	(1252.3)	(11 160)	(1168.1)	(10 410)	34
29.00	316	0.421	(36)	(0.32)	(47)	(0.42)	9.4	83.8	8.07	71.9	...	...	...	...	(1252.9)	(11 166)	(1168.7)	(10 416)	35
29.00	314	0.421	(36)	(0.32)	(47)	(0.42)	9.4	83.8	8.08	72.0	...	...	...	...	(1252.1)	(11 158)	(1167.9)	(10 408)	36
28.60	314	0.421	(36)	(0.32)	(47)	(0.42)	9.3	82.9	8.05	71.7	...	...	...	...	(1252.9)	(11 166)	(1168.7)	(10 416)	37
29.00	306.4	0.417	(37)	(0.33)	(50)	(0.45)	8.9	79.3	7.79	69.4	...	...	...	...	(1250.2)	(11 142)	(1166.1)	(10 392)	38
27.90	296.4	0.417	(37)	(0.33)	(50)	(0.45)	8.6	76.6	7.57	67.5	...	...	...	...	(1250.7)	(11 146)	(1166.6)	(10 396)	39
29.00	313	0.416	(36)	(0.32)	(48)	(0.43)	9.3	82.9	8.04	71.7	...	...	...	...	(1251.6)	(11 153)	(1167.4)	(10 403)	40
28.60	307	0.416	(36)	(0.32)	(48)	(0.43)	9.1	81.1	7.92	70.6	...	...	...	...	(1249.6)	(11 137)	(1165.5)	(10 387)	41
27.90	299	0.416	(36)	(0.32)	(48)	(0.43)	8.8	78.4	7.72	68.8	...	...	...	...	(1250.0)	(11 140)	(1165.8)	(10 390)	42
28.50	307	0.416	(36)	(0.32)	(48)	(0.43)	9.1	81.1	7.90	70.4	...	...	...	...	(1249.6)	(11 137)	(1165.5)	(10 387)	43
28.40	306	0.416	(36)	(0.32)	(48)	(0.43)	9.1	81.1	7.90	70.4	...	...	...	...	(1249.7)	(11 137)	(1165.5)	(10 387)	44
27.75	298	0.416	(36)	(0.32)	(48)	(0.43)	8.8	78.4	7.74	69.0	...	...	...	...	(1249.8)	(11 138)	(1165.6)	(10 388)	45

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.10—Cycloparaffins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4\,(n_F-n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Alkylcyclopentanes, C_9H_{18}, M.W. 126.243:														
46	*n*-Butylcyclopentane	156.62	0.0512	−107.970	0.7884	0.7846	0.7808	1.4316	1.4293	96	96	0.908	0.53	...	48.7
47	Isobutylcyclopentane	147.97	0.05	−115.217	0.7849	0.7809	0.7769	1.4298	1.4273	100	100	...	...	...	...
48	*sec*-Butylcyclopentane	154.37	0.05	...	0.7985	0.7945	0.7905	1.4357	1.4332	...	...	...	...	...	...
49	*tert*-Butylcyclopentane	144.87	0.05	−95.8	0.7950	0.7910	0.7870	1.4338	1.4313	96	96	...	...	...	...
50	1-Methyl-1-*n*-propylcyclopentane	146	0.05	...	0.8030	0.799	0.795	1.437	1.435	...	...	...	...	...	...
51	1-Methyl-*cis*-2-*n*-propylcyclopentane	152.60	0.05	−104	0.7961	0.7921	0.7881	1.4343	1.4318	95	95	...	...	...	54.5[h]
52	1-Methyl-*trans*-2-*n*-propylcyclopentane	146.39	0.05	−123	0.7815	0.7775	0.7735	1.4274	1.4249	97	97	...	...	...	54.5[h]
53	1-Methyl-*cis*-3-*n*-propylcyclopentane	148	0.05	...	0.784	0.780	0.776	1.426	1.424	...	...	...	...	...	...
54	1-Methyl-*trans*-3-*n*-propylcyclopentane	148	0.05	...	0.784	0.780	0.776	1.426	1.424	...	...	...	...	...	...
55	1-Methyl-1-isopropylcyclopentane	148	0.05	...	0.803	0.799	0.795	1.436	1.434	...	...	...	...	...	...
56	1-Methyl-*cis*-2-isopropylcyclopentane	148	0.05	...	0.797	0.792	0.788	1.434	1.432	...	...	...	...	...	...
57	1-Methyl-*trans*-2-isopropylcyclopentane	141	0.05	...	0.784	0.780	0.776	1.429	1.427	...	...	...	...	...	...
58	1-Methyl-*cis*-3-isopropylcyclopentane	142	0.05	*<−80*	0.784	0.780	0.777	1.426	1.424	...	...	...	...	...	...
59	1-Methyl-*trans*-3-isopropylcyclopentane	142	0.05	*<−80*	0.784	0.780	0.777	1.426	1.424	...	...	...	...	...	...
60	1,1-Diethylcyclopentane	150.5	0.05	...	0.8068	0.8028	0.7988	1.4388	1.4363	...	...	...	...	...	...
61	1,*cis*-2-Diethylcyclopentane	153.58	0.05	−118	0.8001	0.7960	0.7920	1.4355	1.4330	95	95	...	...	...	52.9[h]
62	1,*trans*-2-Diethylcyclopentane	147.55	0.05	−95	0.7873	0.7832	0.7792	1.4295	1.4270	96	96	...	...	...	52.9[h]
63	1,*cis*-3-Diethylcyclopentane	150	0.05	...	0.792	0.787	0.783	1.430	1.428	...	...	...	...	...	...
64	1,*trans*-3-Diethylcyclopentane	150	0.05	...	0.792	0.787	0.783	1.430	1.428	...	...	...	...	...	...
65	1,1-Dimethyl-2-ethylcyclopentane	138	0.05	...	0.794	0.788	0.784	1.432	1.430	...	...	...	...	...	...
66	1,1-Dimethyl-3-ethylcyclopentane	134	0.05	...	0.774	0.770	0.766	1.421	1.419	...	...	...	...	...	...
67	1,*cis*-2-Dimethyl-1-ethylcyclopentane	144	0.05	...	0.803	0.799	0.795	1.437	1.435	...	...	...	...	...	...
68	1,*trans*-2-Dimethyl-1-ethylcyclopentane	144	0.05	...	0.800	0.796	0.792	1.435	1.433	...	...	...	...	...	...
69	1,*cis*-2-Dimethyl-*cis*-3-ethylcyclopentane	152	0.05	...	0.800	0.796	0.792	1.434	1.432	...	...	...	...	...	...
70	1,*cis*-2-Dimethyl-*trans*-3-ethylcyclopentane	145	0.05	...	0.792	0.788	0.784	1.431	1.429	...	...	...	...	...	...
71	1,*trans*-2-Dimethyl-*cis*-3-ethylcyclopentane	138	0.05	...	0.773	0.768	0.764	1.422	1.420	...	...	...	...	...	...
72	1,*trans*-2-Dimethyl-*trans*-3-ethylcyclopentane	145	0.05	...	0.789	0.784	0.780	1.428	1.426	...	...	...	...	...	...
73	1,*cis*-2-Dimethyl-*cis*-4-ethylcyclopentane	147	0.05	...	0.800	0.796	0.792	1.432	1.430	...	...	...	...	...	...
74	1,*cis*-2-Dimethyl-*trans*-4-ethylcyclopentane	147	0.05	...	0.785	0.781	0.777	1.426	1.424	...	...	...	...	...	...
75	1,*trans*-2-Dimethyl-*cis*-4-ethylcyclopentane	140	0.05	...	0.772	0.769	0.765	1.420	1.418	...	...	...	...	...	...
76	1,*cis*-3-Dimethyl-1-ethylcyclopentane	136	0.05	...	0.777	0.774	0.770	1.423	1.421	...	...	...	...	...	...
77	1,*trans*-3-Dimethyl-1-ethylcyclopentane	136	0.05	...	0.782	0.778	0.774	1.425	1.423	...	...	...	...	...	...
78	1,*cis*-3-Dimethyl-*cis*-2-ethylcyclopentane	152	0.05	...	0.793	0.789	0.785	1.432	1.430	...	...	...	...	...	...
79	1,*cis*-3-Dimethyl-*trans*-2-ethylcyclopentane	137	0.05	...	0.769	0.766	0.762	1.421	1.419	...	...	...	...	...	...
80	1,*trans*-3-Dimethyl-*cis*-2-ethylcyclopentane	144	0.05	...	0.789	0.784	0.780	1.429	1.427	...	...	...	...	...	...
81	1,*cis*-3-Dimethyl-*cis*-4-ethylcyclopentane	145	0.05	...	0.793	0.789	0.785	1.430	1.428	...	...	...	...	...	...
82	1,*cis*-3-Dimethyl-*trans*-4-ethylcyclopentane	137	0.05	...	0.769	0.766	0.762	1.420	1.418	...	...	...	...	...	...
83	1,*trans*-3-Dimethyl-*cis*-4-ethylcyclopentane	137	0.05	...	0.772	0.769	0.765	1.421	1.419	...	...	...	...	...	...
84	1,*trans*-3-Dimethyl-*trans*-4-ethylcyclopentane	145	0.05	...	0.782	0.778	0.774	1.425	1.423	...	...	...	...	...	...
85	1,1,2,2-Tetramethylcyclopentane	133	0.05	...	0.798	0.794	0.790	1.434	1.432	...	...	...	...	...	...
86	1,1,*cis*-2,*cis*-3-Tetramethylcyclopentane	138	0.05	...	0.784	0.779	0.775	1.426	1.424	...	...	...	...	...	...
87	1,1,*cis*-2,*trans*-3-Tetramethylcyclopentane	130	0.05	...	0.771	0.767	0.763	1.421	1.419	...	...	...	...	...	...
88	1,1,*cis*-2,*cis*-4-Tetramethylcyclopentane	130	0.05	...	0.777	0.774	0.770	1.424	1.422	...	...	...	...	...	...
89	1,1,*cis*-2,*trans*-4-Tetramethylcyclopentane	130	0.05	...	0.768	0.763	0.759	1.419	1.417	...	...	...	...	...	...
90	1,1,3,3-Tetramethylcyclopentane	*118.05*	0.05	*−88.377*	0.7549	0.7509	0.7469	1.4125	*1.4101*	...	...	...	...	...	...
91	1,1,*cis*-3,*cis*-4-Tetramethylcyclopentane	*130.15*	0.05	*−105.496*	0.7710	0.7670	0.7630	*1.4209*	*1.4189*	...	...	...	...	...	...
92	1,1,*cis*-3,*trans*-4-Tetramethylcyclopentane	*121.62*	0.05	*−93.14*	*0.7526*	*0.7486*	*0.7446*	*1.4118*	*1.4095*	...	...	...	...	...	...
93	1,2,2,*cis*-3-Tetramethylcyclopentane	138	0.05	...	0.785	0.781	0.777	1.427	1.425	...	...	...	...	...	...
94	1,2,2,*trans*-3-Tetramethylcyclopentane	138	0.05	...	0.793	0.789	0.785	1.431	1.429	...	...	...	...	...	...
95	1,*cis*-2,*cis*-3,*cis*-4-Tetramethylcyclopentane	*147.82*	0.05	*−100.20*	*0.7964*	*0.7924*	*0.7884*	*1.4382*	*1.4308*	...	...	...	...	...	...
96	1,*cis*-2,*cis*-3,*trans*-4-Tetramethylcyclopentane	*140.73*	0.05	...	*0.7803*	*0.7763*	*0.7723*	*1.4248*	*1.4224*	...	...	...	...	...	...
97	1,*cis*-2,*trans*-3,*cis*-4-Tetramethylcyclopentane	*138.87*	0.05	*−110.51*	*0.7709*	*0.7669*	*0.7629*	*1.4208*	*1.4184*	...	...	...	...	...	...
98	1,*cis*-2,*trans*-3, *trans*-4-Tetramethylcyclopentane	*142.96*	0.05	*−111.33*	*0.7773*	*0.7733*	*0.7693*	*1.4297*	*1.4273*	...	...	...	...	...	...
99	1,*trans*-2,*cis*-3, *trans*-4-Tetramethylcyclopentane	*127.24*	0.05	...	*0.7602*	*0.7562*	*0.7522*	*1.4155*	*1.4131*	...	...	...	...	...	...
100	1,*trans*-2,*trans*-3, *cis*-4-Tetramethylcyclopentane	*134.54*	0.05	*−118.11*	*0.7727*	*0.7687*	*0.7647*	*1.4219*	*1.4195*	...	...	...	...	...	...
	Alkylcyclopentanes, $C_{10}H_{20}$, M.W. 140.270:														
101	*n*-Pentylcyclopentane	180.5	0.053	−83	0.7951	0.7912	0.7874	1.4358	1.4336	96	96	1.128	0.62	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.10—Cycloparaffins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
26.90	*358*	*0.482*	42.42	0.3360	*58.64*	*0.4645*	11.00	87.1	8.69	68.8	−40.19	−51.19	14.89	11.73	1410.10	11 170	1315.43	10 420	46
27.00	*352.5*	*0.478*	*(40)*	*(0.32)*	*(52)*	*(0.41)*	...	...	*(8.28)*	*(65.6)*	...	...	...	...	*(1406.4)*	*(11 141)*	*(1311.8)*	*(10 391)*	47
27.00	*360.6*	*0.478*	*(40)*	*(0.32)*	*(52)*	*(0.41)*	...	...	*(8.35)*	*(66.1)*	...	...	...	...	*(1406.0)*	*(11 138)*	*(1311.3)*	*(10 388)*	48
27.40	*349*	*0.474*	*(42)*	*(0.33)*	*(53)*	*(0.42)*	...	...	*(8.14)*	*(65.5)*	...	...	...	...	*(1404.1)*	*(11 123)*	*(1309.4)*	*(10 373)*	49
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	50
27.05	*350.3*	*0.478*	*(42)*	*(0.33)*	*(53)*	*(0.42)*	...	...	*(8.63)*	*(68.4)*	...	...	...	...	*(1406.1)*	*(11 139)*	*(1311.4)*	*(10 389)*	51
26.60	*343*	*0.478*	*(42)*	*(0.33)*	*(53)*	*(0.42)*	...	...	*(8.35)*	*(66.2)*	...	...	...	...	*(1405.0)*	*(11 130)*	*(1310.3)*	*(10 380)*	52
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	53
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	54
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26.30	*336*	*0.474*	*(42)*	*(0.33)*	*(52)*	*(0.41)*	...	...	*(8.07)*	*(63.9)*	...	...	...	...	*(1405.5)*	*(11 134)*	*(1310.8)*	*(10 384)*	58
26.30	*336*	*0.474*	*(42)*	*(0.33)*	*(52)*	*(0.41)*	...	...	*(8.07)*	*(63.9)*	...	...	...	...	*(1405.5)*	*(11 134)*	*(1310.8)*	*(10 384)*	59
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	60
27.40	*351.4*	*0.478*	*(40)*	*(0.32)*	*(52)*	*(0.41)*	...	...	*(8.63)*	*(68.4)*	...	...	...	...	*(1404.6)*	*(11 127)*	*(1309.9)*	*(10 377)*	61
26.70	*344.7*	*0.478*	*(40)*	*(0.32)*	*(52)*	*(0.41)*	...	...	*(8.35)*	*(66.2)*	...	...	...	...	*(1404.9)*	*(11 130)*	*(1310.2)*	*(10 380)*	62
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	63
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...	...	...	47.89	0.3414	*66.0*	*0.470*	12.18	86.8	9.31	66.4	−45.15	...	16.68	...	1566.36	11 167	1461.17	10 417	101

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.10—Cycloparaffins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4\,(n_F-n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Alkylcyclohexanes, C_6 and C_7:														
102	Cyclohexane, C_6H_{12}, M.W. 84.162	80.719	0.04376	6.541	0.78312	0.77853	0.77387	1.42623	1.42354	96.2	96.1	0.953	...	24.38	31.0
103	Methylcyclohexane, C_7H_{14}, M.W. 98.189	100.934	0.04671	−126.596	0.77369	0.76937	0.76504	1.42312	1.42058	97.9	97.8	0.767	0.43	23.17	41.0
	Alkylcyclohexanes, C_8H_{16}, M.W. 112.216:														
104	Ethylcyclohexane	131.795	0.04969	−111.311	0.79189	0.78790	0.78388	1.43304	1.43073	97.5	97.4	0.861	0.51	25.12	43.8
105	1,1-Dimethylcyclohexane	119.550	0.04920	−33.490	0.78505	0.78092	0.77675	1.42900	1.42662	98.6	98.4	...	...	23.61	45.4[h]
106	1,*cis*-2-Dimethylcyclohexane	129.739	0.04988	−49.994	0.80027	0.79625	0.79220	1.43596	1.43358	96.0	95.9	...	...	25.19	41.7[h]
107	1,*trans*-2-Dimethylcyclohexane	123.428	0.04951	−88.164	0.77990	0.77599	0.77202	1.42695	1.42470	98.0	97.9	...	...	23.57	48.3[h]
108	1,*cis*-3-Dimethylcyclohexane	120.095	0.04880	−75.539	0.77013	0.76601	0.76194	1.42294	1.42063	99.2	99.1	...	...	22.64	51.7[h]
109	1,*trans*-3-Dimethylcyclohexane	124.459	0.04910	−90.079	0.78889	0.78470	0.78053	1.43085	1.42843	97.2	97.1	...	...	24.16	46.3[h]
110	1,*cis*-4-Dimethylcyclohexane	124.330	0.04921	−87.406	0.78697	0.78283	0.77868	1.42966	1.42731	97.2	97.1	...	...	23.96	46.9[h]
111	1,*trans*-4-Dimethylcyclohexane	119.358	0.04903	−36.940	0.76680	0.76253	0.75883	1.42090	1.41853	97.2	97.1	...	...	22.52	52.7[h]
	Alkylcyclohexanes, C_9H_{18}, M.W. 126.243:														
112	*n*-Propylcyclohexane	156.747	0.05200	−94.874	0.79732	0.79358	0.78975	1.43705	1.43478	97.5	97.4	1.000	0.58	...	49.8
113	Isopropylcyclohexane	154.785	0.05210	−89.360	0.80597	0.80219	0.79831	1.44087	1.43861	96.6	96.5	...	...	...	48.9[h]
114	1-Methyl-1-ethylcyclohexane	152.18	0.05	...	0.8098	0.8062	0.8025	1.4419	1.4397	...	...	...	...	...	...
115	1-Methyl-*cis*-2-ethylcyclohexane	*156.00*	0.05	...	*0.8135*	*0.8097*	*0.8059*	*1.4436*	*1.4413*	...	...	...	...	...	...
116	1-Methyl-*trans*-2-ethylcyclohexane	151.72	0.05	...	0.798	0.794	0.790	1.4381	1.4359	...	...	...	...	...	...
117	1-Methyl-*cis*-3-ethylcyclohexane	*148.467*	0.05	...	*0.7875*	*0.7837*	*0.7799*	*1.4326*	*1.4306*	...	...	...	...	...	...
118	1-Methyl-*trans*-3-ethylcyclohexane	*151.08*	0.05	...	*0.8050*	*0.8012*	*0.7974*	*1.4374*	*1.4351*	...	...	...	...	...	...
119	1-Methyl-*cis*-4-ethylcyclohexane	*152.30*	0.05	...	*0.8003*	*0.7965*	*0.7927*	*1.4370*	*1.4347*	...	...	...	...	...	...
120	1-Methyl-*trans*-4-ethylcyclohexane	*149.81*	0.05	*−81.181*	*0.7832*	*0.7794*	*0.7756*	*1.4300*	*1.4287*	...	...	...	...	...	...
121	1,1,2-Trimethylcyclohexane	145.2	0.05	−29	0.8037	0.8000	0.7963	1.4382	1.4359	...	...	...	...	...	...
122	1,1,3-Trimethylcyclohexane	136.640	0.05089	−65.716	0.78275	0.77881	0.77495	1.42955	1.42725	99.0	98.9	...	...	...	...
123	1,1,4-Trimethylcyclohexane	135	0.05	...	0.7759	0.7722	0.7685	1.4251	1.4228	...	...	...	...	...	...
124	1,*cis*-2,*cis*-3-Trimethylcyclohexane	*151.68*	0.05	*−84.99*	*0.8065*	*0.8027*	*0.7989*	*1.4408*	*1.4380*	...	...	...	...	...	...
125	1,*cis*-2,*trans*-3-Trimethylcyclohexane	*151.18*	0.05	*−85.70*	*0.8069*	*0.8031*	*0.7993*	*1.4399*	*1.4376*	...	...	...	...	...	...
126	1,*trans*-2,*cis*-3-Trimethylcyclohexane	144	0.05	...	0.785	0.781	0.777	1.430	1.428	...	...	...	...	...	...
127	1,*cis*-2,*cis*-4-Trimethylcyclohexane	*146.59*	0.05	*−77.42*	0.792	0.787	0.783	*1.4340*	*1.4317*	...	...	...	...	...	...
128	1,*cis*-2,*trans*-4-Trimethylcyclohexane	*146.67*	0.05	*−91.83*	*0.7946*	*0.7908*	*0.7870*	*1.4345*	*1.4322*	...	...	...	...	...	...
129	1,*trans*-2,*cis*-4-Trimethylcyclohexane	*144.67*	0.05	*−88.50*	*0.7946*	*0.7908*	*0.7870*	*1.4341*	*1.4318*	...	...	...	...	...	...
130	1,*trans*-2,*trans*-4-Trimethylcyclohexane	141.24	0.05	−86	0.7757	0.7720	0.7683	1.4266	1.4243	...	...	...	...	...	59.0[h]
131	1,*cis*-3,*cis*-5-Trimethylcyclohexane	138.43	0.05	−43.19	0.7733	0.7697	0.7660	1.4266	1.4243	101	101	...	...	...	...
132	1,*cis*-3,*trans*-5-Trimethylcyclohexane	141.24	0.05	−84.40	0.7853	0.7817	0.7780	1.4310	1.4287	99	99	...	...	...	...
	Alkylcyclohexanes, $C_{10}H_{20}$, M.W. 140.270:														
133	*n*-Butylcyclohexane	180.981	0.05412	−74.691	0.80276	0.79916	0.79549	1.44075	1.43855	97.1	97.0	1.251	0.69	...	54.4
134	Isobutylcyclohexane	*171.290*	...	*−94.780*	*0.799*	*0.796*	*0.793*	*1.4386*	*1.4364*	...	...	...	...	...	57.4
135	*sec*-Butylcyclohexane	*179.300*	...	*Glass*	*0.817*	*0.814*	*0.811*	*1.4467*	*1.4445*	...	...	...	...	...	...
136	*tert*-Butylcyclohexane	*171.570*	...	*−41.158*	*0.817*	*0.814*	*0.811*	*1.4469*	*1.4447*	...	...	...	...	...	53.8
137	1-Methyl-4-isopropylcyclohexane	*170.720*	...	*−87.590*	*0.803*	*0.800*	*0.797*	*1.4373*	...	...	...	...	...	...	56.5
	Alkylcycloheptanes, C_7 and C_9:														
138	Cycloheptane, C_7H_{14}, M.W. 98.189	*118.80*	0.0482	*−8.04*	0.8154	0.8110	0.8066	1.4449	1.4424	101	101	...	...	...	...
139	Ethylcycloheptane, C_9H_{18}, M.W. 126.243	*163.3*	...	*<−30*	*0.818*	*0.815*	*0.811*	...	...	...	...	...	...	...	...
	Alkylcyclooctanes, C_8 and C_9:														
140	Cyclooctane, C_8H_{16}, M.W. 112.216	151.16	0.0518	+14.82	0.8401	0.8361	0.8320	1.4587	1.4563	104	104	...	...	...	...
141	Methylcyclooctane, C_9H_{18}, M.W. 126.243	*162.0*	...	*16.8*	*0.839*	*0.835*	*0.832*	...	...	...	...	...	...	...	...
	Cycloparaffins, C_9 and C_{10}:														
142	Cyclononane, C_9H_{18}, M.W. 126.243	178.4	0.05	11	0.8541	0.8502	0.8463	1.4666	1.4644	...	...	...	...	...	...
143	Cyclodecane, $C_{10}H_{20}$, M.W. 140.270	202	0.05	10	0.8613	0.8575	0.8538	1.4716	1.4695	...	...	...	...	...	...
	Decahydronaphthalenes, $C_{10}H_{18}$, M.W. 138.254:														
144	*cis*-Decahydronaphthalene	195.815	0.0550	−42.98	0.9006	0.8967	0.8929	1.48098	1.47878	...	...	...	...	...	35.3
145	*trans*-Decahydronaphthalene	187.310	0.0564	−30.382	0.8740	0.86969	0.86590	1.46932	1.46715	...	...	...	...	...	35.3

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.10—Cycloparaffins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[a]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)		Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g					kcal per mole	cal per g	kcal per mole	cal per g	
40.2	280.4	0.308	25.40	0.3018	37.36	0.4439	7.896	93.83	7.16	85.08	−29.44	−37.34	7.58	6.37	936.86	11 131	873.75	10 382	102
34.26	299.04	0.368	32.27	0.3287	44.10	0.4492	8.451	86.07	7.44	75.78	−36.99	−45.45	6.52	4.86	1091.13	11 112	1017.48	10 362	103
30	336	0.45	37.96	0.3383	50.62	0.4511	9.674	86.21	8.20	73.08	−41.05	−50.72	9.38	6.96	1248.23	11 123	1164.08	10 373	104
29	318	0.45	36.9	0.329	50.01	0.4457	9.043	80.59	7.79	69.42	−43.26	−52.31	8.42	6.34	1246.65	11 109	1162.50	10 359	105
29	333	0.46	37.4	0.333	50.24	0.4477	9.492	84.59	8.04	71.65	−41.15	−50.64	9.85	7.50	1248.31	11 124	1164.16	10 374	106
29	323	0.46	38.0	0.339	50.05	0.4460	9.168	81.71	7.86	70.05	−43.02	−52.19	8.24	6.06	1246.76	11 110	1162.61	10 360	107
29	318	0.45	37.6	0.335	50.04	0.4460	9.137	81.43	7.84	69.87	−44.16	−53.30	7.13	5.02	1245.65	11 100	1161.50	10 350	108
29	325	0.46	37.6	0.335	50.87	0.4533	9.369	83.50	8.09	72.1	−42.20	−51.57	8.68	6.44	1247.38	11 116	1163.23	10 360	109
29	325	0.46	37.6	0.335	50.69	0.4518	9.329	83.14	8.07	71.9	−42.22	−51.55	9.07	6.85	1247.40	11 116	1163.25	10 366	110
29	317	0.45	37.7	0.336	50.25	0.4478	9.053	80.68	7.79	69.42	−44.12	−53.18	7.58	5.50	1245.78	11 101	1161.63	10 352	111
27.70	366	0.477	44.03	0.3488	57.85	0.4583	10.790	85.48	8.62	68.3	−46.20	−56.98	11.31	8.22	1404.34	11 124	1309.67	10 374	112
28.00	367	0.478	(42)	(0.33)	(52)	(0.41)	...	...	(8.35)	(66)	...	...	...	...	(1406.6)	(11 143)	1311.9	10 393	113
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	. .	114
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	115
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	116
...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	117
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	118
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	119
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	120
27.40	350	0.469	(43)	(0.34)	(54)	(0.43)	...	...	(8.2)	(65)	...	...	...	...	(1403.8)	(11 117)	1308.6	10 367	121
26.60	339	0.469	(42)	(0.33)	(54)	(0.43)	...	...	(8.8)	(68)	...	...	...	...	(1403.8)	(11 121)	1309.2	10 371	122
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	123
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	124
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	125
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	126
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	127
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	128
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	129
26.40	341	0.468	(42)	(0.33)	(53)	(0.42)	...	...	(8.1)	(64.5)	...	...	...	...	(1404.6)	(11 127)	1309.9	10 376.5	130
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	131
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	132
31.10	394	0.534	49.50	0.3529	64.78	0.4619	11.957	85.25	9.20	65.6	−50.95	−62.91	13.49	9.69	1560.78	11 127	1455.59	10 377	133
30.80	386	0.530	(46)	(0.33)	(56)	(0.40)	...	...	(9.1)	(65)	...	...	...	...	(1563.0)	(11 143)	1457.8	10 393	134
26.40	396	0.530	(46)	(0.33)	(56)	(0.40)	...	...	(8.9)	(63)	...	...	...	...	(1562.7)	(11 142)	1457.5	10 392	135
26.35	386	0.526	(48)	(0.34)	(57.5)	(0.41)	...	...	(8.7)	(62)	...	...	...	...	(1560.8)	(11 125)	1455.1	10 375	136
25.66	381	0.525	(46)	(0.33)	(60)	(0.43)	...	...	(8.7)	(62)	...	...	...	...	(1561.1)	(11 131)	1456.0	10 381	137
37	316	0.39	(28.5)	(0.29)	43.20	0.4400	9.210	93.81	7.930	80.77	−28.5	−37.7	...	5.9	1098.9	11 192	1025.3	10 442	138
29.00	381	0.472	(39)	(0.31)	(49)	(0.39)	...	...	(8.6)	(69)	...	...	...	...	(1402.4)	(11 109)	1307.7	10 359	139
34	345	0.45	(32.5)	(0.29)	51.50	0.4589	10.36	92.33	8.58	76.47	−30.1	−40.4	...	11.1	1258.5	11 215	1174.4	10 465	140
29.90	385	0.467	(38)	(0.30)	(48)	(0.38)	...	...	(8.6)	(68)	...	...	...	...	(1407.5)	(11 150)	1312.8	10 400	141
31	371	0.51	(37)	(0.29)	57.0	0.452	11.6	91.89	9.12	72.25	−32.5	−44.1	...	...	1417.2	11 230	1323.0	10 480	142
29	394	0.57	...	...	64.2	0.458	12.8	91.26	9.60	68.44	−32.5	−49.5	...	...	1574.2	11 223	1469.0	10 473	143
...	...	...	...	...	55.45	0.4011	...	...	...	...	−41.13	−52.45	...	16.52	1502.92	10 872	1408.24	10 187	144
...	...	...	...	...	54.61	0.3950	...	...	...	...	−44.15	−55.14	...	13.34	1500.23	10 852	1405.55	10 167	145

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.11—Monoolefins and Diolefins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Monoolefins, C_2 and C_3:														
1	Ethene (ethylene), C_2H_4, M.W. 28.054	−103.68	0.0224	−169.14[e]	...	...	...	...	...	...	...	...	...	...	...
2	Propene (propylene), C_3H_6, M.W. 42.081	−47.72	0.0289	−185.25[e]	0.5226[d]	0.5139[d]	0.5053[d]	...	...	...	...	...	...	...	...
	Monoolefins, C_4H_8, M.W. 56.108:														
3	1-Butene	−6.25	0.0337	−185.35[e]	0.6014[d]	0.5951[d]	0.5888[d]	...	...	...	...	...	...	...	...
4	*cis*-2-Butene	+3.718	0.0345	−138.922	0.6271[d]	0.6213[d]	0.6154[d]	...	...	...	...	...	...	...	...
5	*trans*-2-Butene	0.88	0.0345	−105.533	0.6100[d]	0.6042[d]	0.5984[d]	...	...	...	...	...	...	...	...
6	2-Methylpropene (isobutene)	−6.896	0.0336	−140.337	0.6005[d]	0.5942[d]	0.5879[d]	...	...	...	...	...	...	...	14.9
	Monoolefins, C_5H_{10}, M.W. 70.135:														
7	1-Pentene	+29.959	0.03801	−165.219	0.64563	0.64048	0.63531	1.37148	1.36835	126.2	126.1	...	...	15.45	19.0
8	*cis*-2-Pentene	36.932	0.03830	−151.402	0.6607	0.6556	0.6504	1.3830	1.3798	130	130	...	...	16.8	18.3
9	*trans*-2-Pentene	36.343	0.03824	−140.257	0.6534	0.6482	0.6431	1.3793	1.3761	132	132	...	...	16.42	18.3
10	2-Methyl-1-butene	31.154	0.03778	−137.572	0.6558	0.6504	0.6451	1.3778	1.3746	133	133	...	...	15.9	...
11	3-Methyl-1-butene	20.054	0.03721	−168.490	0.6326	0.6272	0.6219[d]	1.3643	1.3611[d]	128	128[d]	...	...	13.8[c]	...
12	2-Methyl-2-butene	38.558	0.03844	−133.759	0.6676	0.6623	0.6570	1.3874	1.3842	135	135	...	...	17.14	12.8
	Monoolefins, C_6H_{12}, M.W. 84.162:														
13	1-Hexene	63.475	0.04149	−139.832	0.67777	0.67315	0.66846	1.38788	1.38502	122.0	121.9	0.34	...	17.90	22.8
14	*cis*-2-Hexene	68.883	0.04161	−141.152	0.69186	0.68718	0.68250	1.39761	1.39473	124.6	124.8	...	...	...	26.0
15	*trans*-2-Hexene	67.875	0.04164	−132.979	0.68256	0.67793	0.67325	1.39363	1.39073	126.7	126.8	...	...	...	26.0
16	*cis*-3-Hexene	66.441	0.04162	−137.829	0.68450	0.67988	0.67520	1.39479	1.39189	130.0	129.7	...	...	...	27.0[h]
17	*trans*-3-Hexene	67.079	0.04140	−113.420	0.68197	0.67709	0.67231	1.39429	1.39137	128.8	129.0	...	...	...	27.0[h]
18	2-Methyl-1-pentene	62.103	0.04129	−135.730	0.68467	0.67985	0.67503	1.39200	1.38912	124.9	124.4	...	...	...	...
19	3-Methyl-1-pentene	54.168	0.04135	−153.0	0.67199	0.66743	0.66285	1.38422	1.38133	121.7	121.6	...	...	...	...
20	4-Methyl-1-pentene	53.856	0.04098	−153.64	0.66849	0.66368	0.65892	1.38267	1.37974	122.2	122.5	...	...	...	...
21	2-Methyl-2-pentene	67.299	0.04139	−135.080	0.69106	0.68648	0.68185	1.40030	1.39739	132.1	132.4	...	...	...	...
22	3-Methyl-*cis*-2-pentene[w]	67.694	0.04175	−134.850	0.69779	0.69319	0.68856	1.40157	1.39876	128.0	128.2	...	...	...	...
23	3-Methyl-*trans*-2-pentene[x]	70.430	0.04171	−138.457	0.70210	0.69759	0.69300	1.40452	1.40166	128.4	128.3	...	...	...	...
24	4-Methyl-*cis*-2-pentene	56.377	0.04083	−134.421	0.67392	0.66916	0.66439	1.38793	1.38498	126.0	126.0	...	...	...	...
25	4-Methyl-*trans*-2-pentene	58.602	0.04083	−140.803	0.67348	0.66860	0.66378	1.38878	1.38583	126.4	126.4	...	...	...	...
26	2-Ethyl-1-butene	64.672	0.04109	−131.537	0.69427	0.68956	0.68479	1.39671	1.39380	123.6	123.5	...	...	...	...
27	2,3-Dimethyl-1-butene	55.607	0.04090	−157.261	0.68291	0.67808	0.67323	1.39022	1.38729	125.6	125.7	...	...	...	...
28	3,3-Dimethyl-1-butene	41.238	0.04006	−115.22	0.65830	0.65308	0.64793	1.37620	1.37313	124.0	123.9	...	...	...	...
29	2,3-Dimethyl-2-butene	73.197	0.04193	−74.235	0.71269	0.70808	0.70345	1.41235	1.40952	132.9	133.2	...	...	...	...
	Monoolefins, C_7H_{14}, M.W. 98.189:														
30	1-Heptene	93.641	0.04447	−118.88[e]	0.70130	0.69696	0.69265	1.39980	1.39713	118.3	118.2	0.44	...	19.80	27.2
31	*cis*-2-Heptene	98.41	0.0456	...	0.7117	0.7071	0.7028	1.4069	1.4042	122	122	...	...	...	...
32	*trans*-2-Heptene	97.95	0.0455	−109.466	0.7055	0.7012	0.6969	1.4045	1.4020	124	124	...	...	...	...
33	*cis*-3-Heptene	95.75	0.0452	...	0.7071	0.7028	0.6985	1.4059	1.4033	122	122	...	...	...	...
34	*trans*-3-Heptene	95.67	0.0451	−136.64	0.7024	0.6981	0.6938	1.4044	1.4017	124	124	...	...	...	...
35	2-Methyl-1-hexene	92.00	0.0445	−102.820	0.7073	0.7029	0.6985	1.4035	1.4008	121	121	...	...	...	...
36	3-Methyl-1-hexene	83.90	0.0432	...	0.6957	0.6914	0.6871	1.3965	1.3938	120	120	...	...	...	...
37	4-Methyl-1-hexene	86.73	0.0437	−141.46	0.7027	0.6985	0.6942	1.4000	1.3973	120	120	...	...	...	...
38	5-Methyl-1-hexene	85.31	0.0434	...	0.6964	0.6920	0.6877	1.3967	1.3940	120	120	...	...	...	...
39	2-Methyl-2-hexene	95.41	0.0451	−130.356	0.7125	0.7081	0.7038	1.4106	1.4079	127	127	...	...	...	...
40	3-Methyl-*cis*-2-hexene	97.26	0.0454	−118.500	0.7200	0.7157	0.7114	1.4126	1.4100	127	127	...	...	...	...
41	3-Methyl-*trans*-2-hexene	95.18	0.0451	−129.3	0.7186	0.7143	0.7100	1.4118	1.4091	127	127	...	...	...	...
42	4-Methyl-*cis*-2-hexene	86.31	0.0436	...	0.7039	0.6995	0.6952	1.4026	1.3999	122	122	...	...	...	...
43	4-Methyl-*trans*-2-hexene	87.56	0.0438	−125.692	0.7011	0.6968	0.6925	1.4025	1.3998	124	124	...	...	...	...
44	5-Methyl-*cis*-2-hexene	89.5	0.0441	...	0.705	0.702	0.697	1.404	1.401	122	122	...	...	...	...
45	5-Methyl-*trans*-2-hexene	88.11	0.0439	−124.341	0.6970	0.6926	0.6883	1.4006	1.3979	124	124	...	...	...	...
46	2-Methyl-*cis*-3-hexene	86.0	0.0436	...	0.697	0.694	0.690	1.401	1.399	122	122	...	...	...	...
47	2-Methyl-*trans*-3-hexene	85.90	0.0435	−141.574	0.6939	0.6896	0.6853	1.4001	1.3974	124	124	...	...	...	...
48	3-Methyl-*cis*-3-hexene	95.400	0.04435	...	0.71794	0.71285	0.70793	1.41264	1.40995	127.4	127.1	...	...	...	...
49	3-Methyl-*trans*-3-hexene	93.540	0.04433	...	0.71426	0.70963	0.70504	1.41090	1.40820	126.8	127.4	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.11—Monoolefins and Diolefins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[o]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
49.66	9.21	0.129	10.41	0.3711	...	...	...	...	3.237	115.39	12.496	...	16.282	...[o]	...	...	...	...	1
45.5	91.6	0.181	15.27	0.3629	25.7	0.611	...	...	4.402	104.62	4.879	...	14.990	...[o]	...	...	...	...	2
39.7	146.4	0.240	20.47	0.3649	30.8	0.549	4.81	85.73	5.238	93.36	−0.01	−4.98	17.05	...[o]	644.49	11 486	602.41	10 737	3
41.5	162.43	0.234	18.86	0.3362	30.15	0.5374	5.29	94.29	5.580	99.46	−1.65	−7.06	15.76	...[o]	642.41	11 450	600.33	10 700	4
40.5	155.48	0.238	20.99	0.3741	30.49	0.5435	5.10	90.90	5.439	96.94	−2.65	−7.88	15.07	...[o]	641.58	11 435	599.50	10 685	5
39.48	144.75	0.239	21.30	0.3796	31.3	0.558	4.92	87.7	5.286	94.22	−4.04	−9.11	13.88	...[o]	640.36	11 413	598.28	10 663	6
40	191.63	0.305	26.19	0.3734	37.12	0.5293	6.088	86.81	6.022	85.87	−5.00	−11.14	18.82	18.72[o]	800.68	11 416	748.09	10 666	7
36	203	0.30	24.32	0.3468	36.26	0.5170	6.41	91.4	6.24	89.0	−6.49	−12.96	17.43	17.18[o]	798.87	11 390	746.27	10 640	8
36	202	0.30	25.92	0.3696	37.52	0.5350	6.38	91.0	6.23	88.8	−7.59	−14.02	16.51	16.27[o]	797.81	11 375	745.22	10 626	9
34	192	0.31	26.69	0.3806	37.57	0.5357	6.181	88.14	6.094	86.90	−8.68	−14.92	15.68	15.55[o]	796.92	11 363	744.32	10 613	10
35	177	0.30	28.35	0.4042	37.30	0.5319	5.70	81.3	5.75	82.0	−6.92	−12.76	17.66	17.76[o]	799.07	11 393	746.47	10 643	11
34	197	0.32	25.10	0.3579	*36.52*	*0.5106*	6.468	92.23	6.287	89.65	−10.17	−16.68	14.29	14.00[o]	795.15	11 337	742.55	10 587	12
31	230.88	0.37	31.63	0.3758	*43.81*	*0.5206*	7.32	86.98	6.76	80.3	−9.92	−17.28	20.80	19.97	956.92	11 371	893.80	10 621	13
(*32.40*)	(*244*)	(*0.351*)	30.04	0.3570	43	0.51	7.52	89.4	6.96	82.7	−12.49	−20.04	19.59	18.62	954.16	11 338	891.04	10 588	14
(*32.26*)	(*243*)	(*0.351*)	31.64	0.3760	44.5	0.529	7.54	89.6	6.91	82.1	−12.86	−20.43	19.10	18.16	953.77	11 333	890.65	10 583	15
(*32.40*)	(*244*)	(*0.351*)	29.55	0.3511	44	0.52	7.47	88.8	6.86	81.5	−11.35	−18.85	19.97	19.06	955.35	11 352	892.23	10 602	16
(*32.40*)	(*244*)	(*0.351*)	31.75	0.3773	44	0.52	7.54	89.6	6.92	82.2	−12.98	−20.55	19.51	18.58	953.65	11 332	890.53	10 582	17
...	...	...	32.41	0.3851	44.5	0.529	7.29	86.6	6.74	80.1	−14.16	−21.48	17.44	16.64	952.72	11 321	889.60	10 571	18
...	...	...	34.64	0.4116	44	0.52	6.83	81.2	6.43	76.4	−11.80	−18.66	19.46	18.84	955.54	11 354	892.42	10 604	19
...	...	...	30.23	0.3592	44	0.53	6.86	81.5	6.47	76.9	−12.22	−19.11	19.57	18.96	955.09	11 349	891.97	10 599	20
(*32.40*)	(*244*)	(*0.351*)	30.26	0.3596	43	0.51	7.55	89.7	6.93	82.3	−15.96	−23.54	16.37	14.58	950.66	11 296	887.54	10 546	21
(*32.40*)	(*244*)	(*0.351*)	30.26	0.3596	43	0.51	7.49	89.00	6.89	81.87	−15.03	−22.55	17.16	16.24	951.65	11 308	888.53	10 558	22
(*32.50*)	(*248*)	(*0.351*)	30.26	0.3596	43	0.51	7.67	91.14	7.00	83.18	−14.89	−22.59	17.68	16.68	951.61	11 308	888.49	10 558	23
...	...	...	31.92	0.3793	44	0.52	7.04	83.7	6.59	78.3	−13.70	−20.78	17.22	16.55	953.42	11 329	890.30	10 579	24
...	...	...	33.80	0.4016	44	0.52	7.16	85.1	6.68	79.4	−14.66	−21.86	17.50	16.77	952.34	11 316	889.22	10 566	25
...	...	...	31.92	0.3793	43	0.51	7.41	88.1	6.88	81.8	−13.36	−20.80	18.73	17.86	953.40	11 329	890.28	10 579	26
(*32.00*)	(*228*)	(*0.343*)	34.29	0.4075	44	0.52	6.97	82.8	6.55	77.8	−15.48	−22.49	17.13	16.48	951.71	11 309	888.59	10 559	27
(*31.10*)	(*217*)	(*0.343*)	30.23	0.3592	45.1	0.536	6.36	75.6	6.13	72.8	−14.48	−20.89	17.53	17.19	953.31	11 328	890.19	10 578	28
(*33.20*)	(*251*)	(*0.351*)	30.48	0.3622	41.75	0.4961	7.776	92.40	7.083	84.17	−16.41	−20.22	16.65	15.58	949.98	11 288	886.86	10 538	29
28	260.14	0.44	37.10	0.3779	*50.62*	*0.5156*	8.52	86.8	7.43	75.7	−14.66	−23.19	22.95	21.46	*1113.37*	*11 339*	*1039.74*	*10 589*	30
...	...	...	...	...	50	0.51	8.6	87.6	7.4	75.4	...	−25.09	...	...	1111.49	11 321	1037.85	10 571	31
...	...	...	...	...	51.4	0.524	8.6	87.6	7.4	75.4	...	−26.09	...	...	1110.49	11 311	1036.85	10 560	32
...	...	...	...	...	50	0.51	8.5	86.6	7.4	75.4	...	−24.99	...	...	1111.59	11 322	1037.95	10 572	33
...	...	...	...	...	51	0.52	8.5	86.6	7.4	75.4	...	−25.99	...	...	1110.59	11 312	1036.95	10 562	34
...	...	...	...	...	51.2	0.522	8.4	85.6	7.4	75.4	...	−26.90	...	...	1109.68	11 302	1036.04	10 552	35
...	...	...	...	...	51	0.52	8.2	83.5	7.3	74.4	...	−24.16	...	...	1112.42	11 330	1038.78	10 580	36
...	...	...	...	...	51	0.52	8.3	84.5	7.3	74.4	...	−24.26	...	...	1112.32	11 329	1038.68	10 579	37
...	...	...	...	...	51	0.52	8.2	83.5	7.3	74.4	...	−24.80	...	...	1111.78	11 324	1038.14	10 574	38
...	...	...	...	...	50	0.51	8.5	86.6	7.4	75.4	...	−28.40	...	...	1108.18	11 287	1034.54	10 537	39
...	...	...	...	...	50	0.51	8.5	86.6	7.4	75.4	...	−27.76	...	...	1108.82	11 294	1035.18	10 543	40
...	...	...	...	...	50	0.51	8.5	86.6	7.4	75.4	...	−27.76	...	...	1108.82	11 294	1035.18	10 543	41
...	...	...	...	...	51	0.52	8.3	84.5	7.3	74.4	...	−25.86	...	...	1110.72	11 313	1037.08	10 563	42
...	...	...	...	...	51	0.52	8.3	84.5	7.3	74.4	...	−26.96	...	...	1109.72	11 303	1036.08	10 553	43
...	...	...	...	...	51	0.52	8.3	84.5	7.3	74.4	...	−26.50	...	...	1110.08	11 306	1036.44	10 556	44
...	...	...	...	...	51	0.52	8.3	84.5	7.3	74.4	...	−27.50	...	...	1109.08	11 296	1035.44	10 546	45
...	...	...	...	...	51	0.52	8.2	83.5	7.3	74.4	...	−26.40	...	...	1110.18	11 307	1036.54	10 557	46
...	...	...	...	...	51	0.52	8.2	83.5	7.3	74.4	...	−27.40	...	...	1109.18	11 297	1035.54	10 547	47
...	...	...	...	...	50	0.51	8.71	88.7	7.52	76.6	−18.99	−27.72	...	...	*1108.84*	*11 293*	*1035.21*	*10 543*	48
...	...	...	...	...	50	0.51	8.56	87.2	7.45	75.9	−18.37	−26.95	...	...	*1109.61*	*11 301*	*1035.98*	*10 551*	49

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.11—Monoolefins and Diolefins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Monoolefins, C_7H_{14} (continued):														
50	2-Ethyl-1-pentene	94.0	0.0449	...	0.712	0.708	0.704	1.405	1.402	125	125	...	...	...	...
51	3-Ethyl-1-pentene	84.11	0.0433	−127.484	0.7003	0.6960	0.6917	1.3982	1.3955	121	121	...	...	...	...
52	2,3-Dimethyl-1-pentene	84.28	0.0433	−134.31	0.7095	0.7052	0.7009	1.4033	1.4006	125	125	...	...	...	...
53	2,4-Dimethyl-1-pentene	81.604	0.04391	−124.061	0.69859	0.69408	0.68964	1.39852	1.39577	121.7	122.2	...	...	...	...
54	3,3-Dimethyl-1-pentene	77.47	0.0422	−134.389	0.7016	0.6974	0.6931	1.3984	1.3958	120	120	...	...	...	...
55	3,4-Dimethyl-1-pentene	80.79	0.0427	...	0.7019	0.6977	0.6934	1.3992	1.3965	120	120	...	...	...	...
56	4,4-Dimethyl-1-pentene	72.510	0.04361	−136.611	0.68687	0.68247	0.67802	1.39172	1.38895	121.5	121.7	...	...	...	...
57	3-Ethyl-2-pentene	96.01	0.0452	...	0.7247	0.7204	0.7161	1.4148	1.4122	127	127	...	...	...	...
58	2,3-Dimethyl-2-pentene	97.40	0.0454	−118.27	0.7321	0.7277	0.7234	1.4211	1.4185	130	130	...	...	...	...
59	2,4-Dimethyl-2-pentene	83.295	0.04320	−127.704	0.69938	0.69490	0.69050	1.40371	1.40090	128.6	128.9	...	...	...	...
60	3,4-Dimethyl-*cis*-2-pentene	89.25	0.0441	−113.385	0.7178	0.7135	0.7092	1.4104	1.4078	127	127	...	...	...	...
61	3,4-Dimethyl-*trans*-2-pentane	91.50	0.0445	−124.236	0.7210	0.7167	0.7124	1.4128	1.4101	127	127	...	...	...	...
62	4,4-Dimethyl-*cis*-2-pentene	80.424	0.04416	−135.47	0.70370	0.69941	0.69508	1.40260	1.39989	123.5	124.2	...	...	...	...
63	4,4-Dimethyl-*trans*-2-pentene	76.734	0.04277	−115.227	0.69347	0.68883	0.68428	1.39807	1.39525	123.2	123.6	...	...	...	...
64	3-Methyl-2-ethyl-1-butene	86.361	0.04392	...	0.71333	0.70876	0.70427	1.40518	1.40244	119.2	119.4	...	...	...	...
65	2,3,3-Trimethyl-1-butene	77.885	0.04398	−109.84	0.70899	0.70464	0.70022	1.40282	1.40007	119.6	120.1	...	...	...	35.2[h]
	Monoolefins, C_8H_{16}, M.W. 112.216:														
66	1-Octene	121.288	0.04711	−101.715	0.71900	0.71490	0.71083	1.40870	1.40620	116.9	116.8	0.557	0.364	21.28	32.5
67	*cis*-2-Octene	125.65	0.046	−100.2	0.7285	0.7243	0.7201	1.4150	1.4125	118	118	...	...	...	...
68	*trans*-2-Octene	125.0	0.046	−87.7	0.7240	0.7199	0.7157	1.4132	1.4107	120	120	...	...	...	...
69	*cis*-3-Octene	122.9	0.046	...	0.7244	0.721	0.717	1.4135	1.4111	119	119	...	...	...	...
70	*trans*-3-Octene	123.3	0.046	−110	0.7194	0.7152	0.7110	1.4126	1.4102	121	121	...	...	...	...
71	*cis*-4-Octene	122.55	0.046	−118.7	0.7252	0.7212	0.7170	1.4148	1.4124	120	120	...	...	...	...
72	*trans*-4-Octene	122.26	0.046	−93.783	0.7183	0.7141	0.7099	1.4118	1.4093	122	122	...	...	...	...
73	2-Methyl-1-heptene	119.3	0.046	−90.0	0.7245	0.7205	0.7164	1.4123	1.4098	122	122	...	...	...	...
74	3-Methyl-1-heptene	111	0.045	...	0.7149	0.711	0.707	1.406	1.404	117	117	...	...	...	...
75	4-Methyl-1-heptene	112.8	0.045	...	0.7213	0.717	0.713	1.410	1.408	117	117	...	...	...	...
76	5-Methyl-1-heptene	113.3	0.045	...	0.7205	0.7164	0.7122	1.4094	1.4069	117	117	...	...	...	...
77	6-Methyl-1-heptene	113.2	0.045	...	0.7160	0.7120	0.7079	1.4070	1.4045	117	117	...	...	...	...
78	2-Methyl-2-heptene	122.6	0.046	...	0.7282	0.7241	0.7200	1.4170	1.4145	124	124	...	...	...	...
79	3-Methyl-*cis*-2-heptene	122	0.046	...	0.7325	0.729	0.725	1.419	1.417	124	124	...	...	...	...
80	3-Methyl-*trans*-2-heptene	122	0.046	...	0.7325	0.729	0.725	1.419	1.417	124	124	...	...	...	...
81	4-Methyl-*cis*-2-heptene	114	0.045	...	0.7197	0.716	0.712	1.410	1.408	119	119	...	...	...	...
82	4-Methyl-*trans*-2-heptene	114	0.045	...	0.7197	0.716	0.712	1.410	1.408	121	121	...	...	...	...
83	5-Methyl-*cis*-2-heptene	118	0.046	...	0.7277	0.723	0.719	1.414	1.412	119	119	...	...	...	...
84	5-Methyl-*trans*-2-heptene	118	0.046	...	0.7277	0.723	0.719	1.414	1.412	121	121	...	...	...	...
85	6-Methyl-*cis*-2-heptene	117	0.046	...	0.7212	0.718	0.714	1.412	1.410	119	119	...	...	...	...
86	6-Methyl-*trans*-2-heptene	117	0.046	...	0.7212	0.718	0.714	1.412	1.410	121	121	...	...	...	...
87	2-Methyl-*cis*-3-heptene	112	0.045	...	0.7101	0.706	0.702	1.407	1.405	119	119	...	...	...	...
88	2-Methyl-*trans*-3-heptene	112	0.045	...	0.7101	0.706	0.702	1.407	1.405	121	121	...	...	...	...
89	3-Methyl-*cis*-3-heptene	121	0.046	...	0.7325	0.728	0.724	1.418	1.416	124	124	...	...	...	...
90	3-Methyl-*trans*-3-heptene	121	0.046	...	0.7325	0.728	0.724	1.418	1.416	124	124	...	...	...	...
91	4-Methyl-*cis*-3-heptene	122	0.046	...	0.7292	0.725	0.721	1.417	1.415	124	124	...	...	...	...
92	4-Methyl-*trans*-3-heptene	122	0.046	...	0.7292	0.725	0.721	1.417	1.415	124	124	...	...	...	...
93	5-Methyl-*cis*-3-heptene	112	0.045	...	0.7164	0.713	0.709	1.410	1.408	119	119	...	...	...	...
94	5-Methyl-*trans*-3-heptene	112	0.045	...	0.7164	0.713	0.709	1.410	1.408	121	121	...	...	...	...
95	6-Methyl-*cis*-3-heptene	115	0.045	...	0.7164	0.713	0.709	1.410	1.408	119	119	...	...	...	...
96	6-Methyl-*trans*-3-heptene	115	0.045	...	0.7164	0.713	0.709	1.410	1.408	121	121	...	...	...	...
97	2-Ethyl-1-hexene	120	0.046	...	0.7312	0.7270	0.7228	1.4157	1.4132	121	121	...	...	...	...
98	3-Ethyl-1-hexene	110.3	0.046	...	0.7197	0.715	0.711	1.407	1.405	117	117	...	...	...	...
99	4-Ethyl-1-hexene	113	0.046	...	0.7292	0.726	0.722	1.412	1.410	117	117	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.11—Monoolefins and Diolefins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[c]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
...	...	...	...	...	50	0.51	8.4	85.6	7.4	75.4	...	−26.26	...	...	1110.30	11 308	1036.67	10 558	50
...	...	...	...	...	51	0.52	8.2	83.5	7.3	74.4	...	−23.54	...	...	1113.02	11 335	1039.39	10 585	51
...	...	...	...	...	50	0.51	8.2	83.5	7.3	74.4	...	−27.72	...	...	1108.84	11 293	1035.21	10 543	52
...	...	...	...	...	51	0.52	7.91	80.6	6.98	71.1	−20.04	−27.97	...	...	*1108.59*	*11 290*	*1034.96*	*10 540*	53
...	...	...	...	...	51	0.52	8.0	81.5	7.2	73.3	...	−26.17	...	...	1110.39	11 309	1036.76	10 559	54
...	...	...	...	...	51	0.52	8.1	82.5	7.2	73.3	...	−25.72	...	...	1110.84	11 313	1037.21	10 563	55
(*28.20*)	(*253*)	(0.400)	(*37*)	(0.38)	52	0.53	7.45	75.9	6.75	68.7	−18.96	−26.43	...	...	*1110.13*	*11 306*	*1036.50*	*10 556*	56
...	...	...	...	...	50	0.50	8.5	86.6	7.4	75.4	...	−27.14	...	...	1109.42	11 299	1035.79	10 549	57
(*29.90*)	*283*	(0.408)	(*38*)	(0.39)	49	0.50	8.5	86.6	7.4	75.4	...	−29.62	...	...	1106.94	11 273	1033.31	10 524	58
...	...	...	...	...	51	0.52	8.20	83.5	7.24	73.7	−21.20	−29.42	...	...	*1107.14*	*11 275*	*1033.51*	*10 526*	59
...	...	...	...	...	50	0.51	8.3	84.5	7.3	74.4	...	−29.22	...	...	1107.34	11 278	1033.71	10 528	60
...	...	...	...	...	50	0.51	8.4	85.6	7.4	75.4	...	−29.32	...	...	1107.24	11 277	1033.61	10 527	61
...	...	...	...	...	51	0.52	7.79	79.3	6.97	71.0	−17.36	−25.17	...	...	*1111.39*	*11 319*	*1037.76*	*10 569*	62
...	...	...	...	...	51	0.52	7.85	80.0	7.05	71.8	−21.24	−29.11	...	...	*1107.45*	*11 279*	*1033.82*	*10 529*	63
...	...	...	...	...	50	0.51	8.20	83.5	7.24	73.7	−19.04	−27.26	...	...	*1109.30*	*11 297*	*1035.67*	*10 548*	64
(*28.60*)	*259*	(0.400)	(*39*)	(0.40)	50	0.51	7.68	78.2	6.90	70.3	−20.43	−28.13	...	...	*1108.43*	*11 289*	*1034.80*	*10 539*	65
26	293.5	0.51	42.56	0.3793	*57.65*	*0.5138*	9.70	86.4	8.07	71.9	−19.41	−29.11	25.37	22.92	*1269.82*	*11 316*	*1185.67*	*10 566*	66
(*27.40*)	(*308*)	(*0.464*)	(*43*)	(*0.39*)	57	0.51	9.6	85.6	8.24	73.4	...	...	...	...	(*1271.2*)	(*11 329*)	(1187.0)	(*10 579*)	67
(*27.30*)	(*307*)	(*0.464*)	(*45*)	(*0.40*)	58.3	0.520	9.6	85.6	8.22	73.3	...	...	...	...	(*1270.5*)	(*11 323*)	(*1186.4*)	(*10 573*)	68
...	...	...	...	...	57	0.51	9.5	84.7	8.20	73.1	...	...	...	...	...	...	...	...	69
(*27.10*)	(*305*)	(*0.464*)	(*43*)	(*0.39*)	58	0.52	9.6	85.6	8.20	73.1	...	...	...	...	(*1270.6*)	(*11 324*)	(*1186.4*)	(*10 573*)	70
(*27.00*)	(*304*)	(*0.464*)	(*43*)	(*0.38*)	57	0.51	9.5	84.7	8.19	73.0	...	...	...	...	(*1271.2*)	(*11 329*)	(1187.0)	(*10 579*)	71
(*27.00*)	(*304*)	(*0.464*)	(*43*)	(*0.39*)	58	0.52	9.5	84.7	8.18	73.0	...	...	...	...	(1270.0)	(*11 318*)	(*1185.8*)	(*10 568*)	72
(*26.80*)	(*300*)	(*0.464*)	(*45*)	(*0.40*)	57.9	0.516	9.4	83.8	8.11	72.3	...	...	...	...	(*1267.7*)	(*11 297*)	(*1183.5*)	(*10 547*)	73
...	...	...	...	...	58	0.52	9.2	82.0	8.01	71.4	...	...	...	...	...	...	...	...	74
...	...	...	...	...	58	0.52	9.3	82.9	8.04	71.7	...	...	...	...	...	...	...	...	75
...	...	...	...	...	57	0.51	9.3	82.9	8.04	71.7	...	...	...	...	...	...	...	...	76
...	...	...	...	...	58	0.52	9.3	82.9	8.04	71.7	...	...	...	...	...	...	...	...	77
...	...	...	...	...	57	0.51	9.5	84.7	8.16	72.7	...	...	...	...	...	...	...	...	78
...	...	...	...	...	57	0.51	9.5	84.7	8.15	72.6	...	...	...	...	...	...	...	...	79
...	...	...	...	...	57	0.51	9.5	84.7	8.17	72.8	...	...	...	...	...	...	...	...	80
...	...	...	...	...	58	0.51	9.3	82.9	8.05	71.7	...	...	...	...	...	...	...	...	81
...	...	...	...	...	58	0.51	9.3	82.9	8.05	71.7	...	...	...	...	...	...	...	...	82
...	...	...	...	...	57	0.51	9.4	83.8	8.11	72.3	...	...	...	...	...	...	...	...	83
...	...	...	...	...	57	0.51	9.4	83.8	8.11	72.3	...	...	...	...	...	...	...	...	84
...	...	...	...	...	58	0.51	9.4	83.8	8.09	72.1	...	...	...	...	...	...	...	...	85
...	...	...	...	...	58	0.51	9.4	83.8	8.09	72.1	...	...	...	...	...	...	...	...	86
...	...	...	...	...	58	0.52	9.3	82.9	8.02	71.5	...	...	...	...	...	...	...	...	87
...	...	...	...	...	58	0.52	9.3	82.9	8.03	71.6	...	...	...	...	...	...	...	...	88
...	...	...	...	...	57	0.51	9.5	84.7	8.14	72.6	...	...	...	...	...	...	...	...	89
...	...	...	...	...	57	0.51	9.5	84.7	8.14	72.5	...	...	...	...	...	...	...	...	90
...	...	...	...	...	57	0.51	9.5	84.7	8.15	72.6	...	...	...	...	...	...	...	...	91
...	...	...	...	...	57	0.51	9.5	84.7	8.15	72.6	...	...	...	...	...	...	...	...	92
...	...	...	...	...	58	0.52	9.3	82.9	8.02	71.5	...	...	...	...	...	...	...	...	93
...	...	...	...	...	58	0.52	9.3	82.9	8.02	71.5	...	...	...	...	...	...	...	...	94
...	...	...	...	...	58	0.52	9.3	82.9	8.06	71.8	...	...	...	...	...	...	...	...	95
...	...	...	...	...	58	0.52	9.3	82.9	8.05	71.7	...	...	...	...	...	...	...	...	96
...	...	...	...	...	57	0.51	9.5	84.7	8.12	72.4	...	...	...	...	...	...	...	...	97
...	...	...	...	...	58	0.52	9.2	82.0	8.00	71.3	...	...	...	...	...	...	...	...	98
...	...	...	...	...	57	0.51	9.3	82.9	8.03	71.6	...	...	...	...	...	...	...	...	99

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.11—Monoolefins and Diolefins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4\,(n_F-n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Monoolefins, C_8H_{16} (continued):														
100	2,3-Dimethyl-1-hexene	110.5	0.046	...	0.7257	0.7214	0.7172	1.4113	1.4089	122	122	...	...	...	...
101	2,4-Dimethyl-1-hexene	111.2	0.046	...	0.726	0.720	0.716	1.411	1.409	122	122	...	...	...	...
102	2,5-Dimethyl-1-hexene	111.6	0.046	...	0.7215	0.7172	0.7129	1.4105	1.4080	122	122	...	...	...	...
103	3,3-Dimethyl-1-hexene	104	0.046	...	0.7181	0.7140	0.7099	1.4070	1.4046	117	117	...	...	...	...
104	3,4-Dimethyl-1-hexene	112	0.046	...	0.728	0.724	0.720	1.413	1.411	117	117	...	...	...	...
105	3,5-Dimethyl-1-hexene	104	0.045	...	0.712	0.708	0.704	1.404	1.402	117	117	...	...	...	...
106	4,4-Dimethyl-1-hexene	107.2	0.046	...	0.7239	0.7198	0.7157	1.4102	1.4078	117	117	...	...	...	...
107	4,5-Dimethyl-1-hexene	109	0.046	...	0.732	0.728	0.724	1.414	1.412	117	117	...	...	...	...
108	5,5-Dimethyl-1-hexene	102.5	0.047	...	0.713	0.709	0.705	1.4049	1.4024	117	117	...	...	...	...
109	3-Ethyl-*cis*-2-hexene	121	0.046	...	0.740	0.737	0.733	1.424	1.422	124	124	...	...	...	...
110	3-Ethyl-*trans*-2-hexene	121	0.046	...	0.740	0.737	0.733	1.424	1.422	124	124	...	...	...	...
111	4-Ethyl-*cis*-2-hexene	113	0.046	...	0.732	0.725	0.721	1.412	1.410	119	119	...	...	...	...
112	4-Ethyl-*trans*-2-hexene	113	0.046	...	0.732	0.725	0.721	1.412	1.410	121	121	...	...	...	...
113	2,3-Dimethyl-2-hexene	121.78	0.046	−115.1	0.7450	0.7408	0.7366	1.4268	1.4244	127	127	...	...	...	...
114	2,4-Dimethyl-2-hexene	110.6	0.047	...	0.7255	0.7213	0.7171	1.4118	1.4094	124	124	...	...	...	...
115	2,5-Dimethyl-2-hexene	112.2	0.045	...	0.724	0.720	0.716	1.4140	1.4115	124	124	...	...	...	...
116	3,4-Dimethyl-*cis*-2-hexene	116	0.046	...	0.740	0.737	0.733	1.418	1.416	124	124	...	...	...	...
117	3,4-Dimethyl-*trans*-2-hexene	116	0.046	...	0.740	0.737	0.733	1.418	1.416	124	124	...	...	...	...
118	3,5-Dimethyl-*cis*-2-hexene	112	0.045	...	0.729	0.725	0.721	1.416	1.414	124	124	...	...	...	...
119	3,5-Dimethyl-*trans*-2-hexene	112	0.045	...	0.729	0.725	0.721	1.416	1.414	124	124	...	...	...	...
120	4,4-Dimethyl-*cis*-2-hexene	106	0.046	...	0.726	0.722	0.718	1.413	1.411	119	119	...	...	...	...
121	4,4-Dimethyl-*trans*-2-hexene	106	0.046	...	0.726	0.725	0.718	1.413	1.411	121	121	...	...	...	...
122	4,5-Dimethyl-*cis*-2-hexene	110	0.046	...	0.729	0.725	0.721	1.413	1.411	119	119	...	...	...	...
123	4,5-Dimethyl-*trans*-2-hexene	110	0.046	...	0.729	0.725	0.721	1.413	1.411	121	121	...	...	...	...
124	5,5-Dimethyl-*cis*-2-hexene	106.9	0.047	...	0.7213	0.7169	0.7125	1.4113	1.4088	119	119	...	...	...	...
125	5,5-Dimethyl-*trans*-2-hexene	104.1	0.046	...	0.7109	0.7066	0.7023	1.4055	1.4030	121	121	...	...	...	...
126	3-Ethyl-3-hexene	116	0.046	...	0.732	0.729	0.725	1.418	1.416	124	124	...	...	...	...
127	2,2-Dimethyl-*cis*-3-hexene	105.43	0.045	−137.361	0.7170	0.7128	0.7086	1.4099	1.4074	119	119	...	...	...	...
128	2,2-Dimethyl-*trans*-3-hexene	100.85	0.045	...	0.7084	0.7039	0.6995	1.4063	1.4037	121	121	...	...	...	...
129	2,3-Dimethyl-*cis*-3-hexene	114	0.046	...	0.732	0.728	0.724	1.416	1.414	124	124	...	...	...	...
130	2,3-Dimethyl-*trans*-3-hexene	114	0.046	...	0.732	0.728	0.724	1.416	1.414	124	124	...	...	...	...
131	2,4-Dimethyl-*cis*-3-hexene	109.0	0.045	...	0.7221	0.7178	0.7135	1.4140	1.4114	124	124	...	...	...	...
132	2,4-Dimethyl-*trans*-3-hexene	107.6	0.046	...	0.7190	0.7145	0.7101	1.4126	1.4101	...	...	...	...	...	...
133	2,5-Dimethyl-*cis*-3-hexene	102	0.045	...	0.713	0.710	0.706	1.406	1.404	119	119	...	...	...	...
134	2,5-Dimethyl-*trans*-3-hexene	102	0.045	...	0.713	0.710	0.706	1.406	1.404	121	121	...	...	...	...
135	3,4-Dimethyl-*cis*-3-hexene	122	0.046	...	0.752	0.747	0.743	1.430	1.428	127	127	...	...	...	...
136	3,4-Dimethyl-*trans*-3-hexene	122	0.046	...	0.752	0.747	0.743	1.430	1.428	127	127	...	...	...	...
137	2-*n*-Propyl-1-pentene	117.7	0.046	...	0.7282	0.7240	0.7198	1.4136	1.4111	123	123	...	...	...	...
138	2-Isopropyl-1-pentene	113	0.046	...	0.729	0.725	0.721	1.414	1.412	122	122	...	...	...	...
139	3-Methyl-2-ethyl-1-pentene	112.5	0.046	...	0.732	0.729	0.725	1.4142	1.4118	122	122	...	...	...	...
140	4-Methyl-2-ethyl-1-pentene	110.3	0.046	...	0.7237	0.7195	0.7152	1.4105	1.4080	122	122	...	...	...	...
141	2-Methyl-3-ethyl-1-pentene	110	0.046	...	0.734	0.730	0.726	1.415	1.413	122	122	...	...	...	...
142	3-Methyl-3-ethyl-1-pentene	112	0.047	...	0.7346	0.7305	0.7264	1.418	1.416	117	117	...	...	...	...
143	4-Methyl-3-ethyl-1-pentene	107.5	0.047	...	0.7242	0.7200	0.7158	1.4097	1.4072	117	117	...	...	...	...
144	2,3,3-Trimethyl-1-pentene	108.31	0.047	−69	0.7396	0.7352	0.7308	1.4174	1.4151	122	122	...	...	...	...
145	2,3,4-Trimethyl-1-pentene	108	0.046	...	0.732	0.729	0.725	1.415	1.413	122	122	...	...	...	...
146	2,4,4-Trimethyl-1-pentene	101.44	0.046	−93.453	0.7192	0.7150	0.7108	1.4086	1.4060	122	122	...	...	...	...
147	3,3,4-Trimethyl-1-pentene	105	0.047	...	0.732	0.729	0.725	1.4144	1.4120	117	117	...	...	...	...
148	3,4,4-Trimethyl-1-pentene	104	0.046	...	0.723	0.719	0.715	1.412	1.410	117	117	...	...	...	...
149	2-Methyl-3-ethyl-2-pentene	117.0	0.046	...	0.744	0.739	0.735	1.4247	1.4222	127	127	...	...	...	...
150	4-Methyl-3-ethyl-*cis*-2-pentene	116	0.047	...	0.744	0.739	0.735	1.424	1.422	124	124	...	...	...	...
151	4-Methyl-3-ethyl-*trans*-2-pentene	114.3	0.047	...	0.7391	0.7350	0.7308	1.4210	1.4183	124	124	...	...	...	...
152	2,3,4-Trimethyl-2-pentene	116.27	0.046	−113.3	0.7477	0.7434	0.7391	1.4275	1.4249	127	127	...	...	...	...
153	2,4,4-Trimethyl-2-pentene	104.91	0.047	−106.314	0.7259	0.7218	0.7176	1.4160	1.4135	125	125	...	...	...	32.2
154	3,4,4-Trimethyl-*cis*-2-pentene	112	0.046	...	0.744	0.739	0.735	1.423	1.421	124	124	...	...	...	...
155	3,4,4-Trimethyl-*trans*-2-pentene	112	0.046	...	0.744	0.739	0.735	1.423	1.421	124	124	...	...	...	...
156	3-Methyl-2-isopropyl-1-butene	104	0.046	...	0.726	0.722	0.718	1.4085	1.4061	122	122	...	...	...	...
157	3,3-Dimethyl-2-ethyl-1-butene	110	0.046	...	0.732	0.728	0.724	1.4159	1.4135	122	122	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.11—Monoolefins and Diolefins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[e]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid)+ CO_2 (gas)		Net, to form H_2O (gas)+ CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
...	...	...	...	...	57	0.51	9.2	82.0	7.99	71.2	...	...	...	...	...	...	...	...	100
...	...	...	...	...	57	0.51	9.2	82.0	8.01	71.4	...	...	...	...	...	...	...	...	101
...	...	...	...	...	58	0.51	9.3	82.9	8.01	71.4	...	...	...	...	...	...	...	...	102
...	...	...	...	...	58	0.51	9.1	81.1	7.90	70.4	...	...	...	...	...	...	...	...	103
...	...	...	...	...	57	0.51	9.3	82.9	8.01	71.4	...	...	...	...	...	...	...	...	104
...	...	...	...	...	58	0.52	9.1	81.1	7.89	70.3	...	...	...	...	...	...	...	...	105
...	...	...	...	...	57	0.51	9.1	81.1	7.95	70.9	...	...	...	...	...	...	...	...	106
...	...	...	...	...	57	0.51	9.2	82.0	7.97	71.0	...	...	...	...	...	...	...	...	107
...	...	...	...	...	58	0.52	9.0	80.2	7.88	70.2	...	...	...	...	...	...	...	...	108
...	...	...	...	...	56	0.50	9.5	84.7	8.14	72.5	...	...	...	...	...	...	...	...	109
...	...	...	...	...	56	0.50	9.5	84.7	8.14	72.5	...	...	...	...	...	...	...	...	110
...	...	...	...	...	57	0.51	9.3	82.9	8.03	71.6	...	...	...	...	...	...	...	...	111
...	...	...	...	...	57	0.51	9.3	82.9	8.03	71.6	...	...	...	...	...	...	...	...	112
(27.00)	(304)	(0.464)	(46)	(0.41)	56	0.50	9.5	84.7	8.12	72.4	...	...	...	...	(1265.1)	(11 274)	(1180.9)	(10 524)	113
...	...	...	...	...	57	0.51	9.2	82.0	8.00	71.3	...	...	...	...	...	...	...	...	114
...	...	...	...	...	57	0.51	9.3	82.9	8.04	71.7	...	...	...	...	...	...	...	...	115
...	...	...	...	...	56	0.50	9.4	83.8	8.07	71.9	...	...	...	...	...	...	...	...	116
...	...	...	...	...	56	0.50	9.4	83.8	8.07	71.9	...	...	...	...	...	...	...	...	117
...	...	...	...	...	57	0.51	9.3	82.9	7.99	71.2	...	...	...	...	...	...	...	...	118
...	...	...	...	...	57	0.51	9.3	82.9	7.99	71.2	...	...	...	...	...	...	...	...	119
...	...	...	...	...	57	0.51	9.1	81.1	7.92	70.6	...	...	...	...	...	...	...	...	120
...	...	...	...	...	57	0.51	9.1	81.1	7.92	70.6	...	...	...	...	...	...	...	...	121
...	...	...	...	...	57	0.51	9.2	82.0	7.99	71.2	...	...	...	...	...	...	...	...	122
...	...	...	...	...	57	0.51	9.2	82.0	7.99	71.2	...	...	...	...	...	...	...	...	123
...	...	...	...	...	58	0.51	9.1	81.1	7.94	70.8	...	...	...	...	...	...	...	...	124
...	...	...	...	...	58	0.52	9.1	81.1	7.89	70.3	...	...	...	...	...	...	...	...	125
...	...	...	...	...	57	0.51	9.4	83.8	8.07	71.9	...	...	...	...	...	...	...	...	126
...	...	...	...	...	58	0.52	8.9	79.3	7.68	68.4	...	−30.21	...	...	1268.72	11 306	1184.56	10 556	127
...	...	...	...	...	58	0.52	8.9	79.3	7.74	69.0	...	−34.65	...	...	1264.28	11 266	1180.13	10 516	128
...	...	...	...	...	57	0.51	9.3	82.9	8.04	71.7	...	...	...	...	...	...	...	...	129
...	...	...	...	...	57	0.51	9.3	82.9	8.04	71.7	...	...	...	...	...	...	...	...	130
...	...	...	...	...	58	0.51	9.2	82.0	7.98	71.1	...	...	...	...	...	...	...	...	131
...	...	...	...	...	58	0.51	9.2	82.0	7.95	70.9	...	...	...	...	...	...	...	...	132
...	...	...	...	...	58	0.52	8.9	79.3	7.83	69.8	...	...	...	...	...	...	...	...	133
...	...	...	...	...	58	0.52	9.0	80.2	7.88	70.2	...	...	...	...	...	...	...	...	134
...	...	...	...	...	56	0.50	9.5	84.7	8.13	72.5	...	...	...	...	...	...	...	...	135
...	...	...	...	...	56	0.50	9.5	84.7	8.13	72.5	...	...	...	...	...	...	...	...	136
...	...	...	...	...	57	0.51	9.4	83.8	8.10	72.2	...	...	...	...	...	...	...	...	137
...	...	...	...	...	57	0.51	9.3	82.9	8.01	71.4	...	...	...	...	...	...	...	...	138
...	...	...	...	...	57	0.51	9.3	82.9	8.02	71.5	...	...	...	...	...	...	...	...	139
...	...	...	...	...	57	0.51	9.2	82.0	7.99	71.2	...	...	...	...	...	...	...	...	140
...	...	...	...	...	57	0.51	9.0	80.2	7.82	69.7	...	−32.92	...	...	1266.01	11 282	1181.86	10 529	141
...	...	...	...	...	57	0.51	9.3	82.9	8.01	71.4	...	...	...	...	...	...	...	...	142
...	...	...	...	...	57	0.51	9.2	82.0	7.95	70.9	...	...	...	...	...	...	...	...	143
(26.51)	(296)	(0.457)	(43)	(0.38)	57	0.51	9.2	82.0	7.96	70.9	...	...	...	...	(1266.2)	(11 284)	(1182.0)	(10 534)	144
...	...	...	...	...	57	0.51	9.2	82.0	7.96	70.9	...	...	...	...	...	...	...	...	145
(26.10)	(287)	(0.457)	(43)	(0.38)	57.0	0.508	8.5	75.8	7.50	66.8	...	−34.81	...	...	1264.12	11 265	1179.97	10 515	146
...	...	...	...	...	57	0.51	9.1	81.1	7.91	70.5	...	...	...	...	...	...	...	...	147
...	...	...	...	...	57	0.51	9.1	81.1	7.90	70.4	...	...	...	...	...	...	...	...	148
...	...	...	...	...	56	0.50	9.4	83.8	8.09	72.1	...	...	...	...	...	...	...	...	149
...	...	...	...	...	56	0.50	9.4	83.8	8.07	71.9	...	...	...	...	...	...	...	...	150
...	...	...	...	...	57	0.50	9.3	82.9	8.05	71.7	...	...	...	...	...	...	...	...	151
...	...	...	...	...	56	0.50	9.4	83.8	8.08	72.0	...	...	...	...	...	...	...	...	152
(26.20)	(290)	(0.457)	(43)	(0.38)	57.3	0.511	8.9	79.3	7.79	69.4	...	−34.04	...	...	1264.89	11 272	1180.74	10 522	153
...	...	...	...	...	56	0.50	9.3	82.9	8.02	71.5	...	...	...	...	...	...	...	...	154
...	...	...	...	...	56	0.50	9.3	82.9	8.01	71.4	...	...	...	...	...	...	...	...	155
...	...	...	...	...	57	0.51	9.1	81.1	7.90	70.4	...	...	...	...	...	...	...	...	156
...	...	...	...	...	57	0.51	9.2	82.0	7.99	71.2	...	...	...	...	...	...	...	...	157

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.11—Monoolefins and Diolefins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4\,(n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Monoolefins, C_9H_{18}, M.W. 126.243:														
158	1-Nonene	146.887	0.04944	−81.34	0.73311	0.72920	0.72529	1.41572	1.41333	114.5	114.4	0.704	0.429	22.56	38.0
159	2-Methyl-1-octene	144.67	0.049	−77.65	0.7381	0.7340	0.7299	1.4186	1.4162	116	116	...	...	...	...
160	2,3-Dimethyl-2-heptene	*145.2*	...	*−108.5*	*0.739*	*0.735*	*0.731*	*1.4319*	...	...	...	...	...	...	...
	Monoolefins, $C_{10}H_{20}$, M.W. 140.270:														
161	1-Decene	170.599	0.05157	−66.276	0.74465	0.74079	0.73691	1.42146	1.41913	113.0	112.9	0.877	0.505	23.54	...
162	2-Methyl-1-nonene	168.4	0.051	−64.20	0.7490	0.7451	0.7412	1.4241	1.4217	115	115	...	...	...	...
	Diolefins, C_3H_4, M.W. 40.065:														
163	Propadiene (allene)	−34.5	0.033	−136.3	...	0.6575[g]	...	...	...	...	...	...	...	...	...
	Diolefins, C_4H_6, M.W. 54.092:														
164	1,2-Butadiene	+10.85	0.0351	−136.201	0.657[d]	0.652[d]	0.646[d]	...	...	...	...	...	...	...	...
165	1,3-Butadiene	−4.411	0.03377	−108.902	0.6274[d]	0.6211[d]	0.6149[d]	...	...	...	...	...	...	...	...
	Diolefins, C_5H_8, M.W. 68.119:														
166	1,2-Pentadiene	+44.846	0.03867	−137.27	0.69753	0.69255	0.68758	1.42091	1.41773	164.7	164.6	...	...	...	...
167	1,*cis*-3-Pentadiene	44.058	0.03875	−140.833	0.69609	0.69100	0.68590	1.43634	1.43291	243.9	243.8	...	...	...	...
168	1,*trans*-3-Pentadiene	42.022	0.03879	−87.440	0.68104	0.67601	0.67100	1.43008	1.42669	245.8	245.7	...	...	...	...
169	1,4-Pentadiene	25.959	0.03720	−148.289	0.66582	0.66074	0.65569	1.38876	1.38542	153.2	153.1	...	...	...	...
170	2,3-Pentadiene	48.255	0.03871	−125.652	0.70010	0.69500	0.68998	1.42842	1.42509	174.6	174.5	...	...	...	...
171	3-Methyl-1,2-butadiene	40.827	0.03826	−113.615	0.69146	0.68605	0.68062	1.42026	1.41692	171.7	171.8	...	...	...	...
172	2-Methyl-1,3-butadiene (isoprene)	34.057	0.03818	−145.964	0.68602	0.68093	0.67585	1.42194	1.41852	224.9	224.8	...	...	...	...
	Diolefins, C_6H_{10}, M.W. 82.146:														
173	1,2-Hexadiene	76	0.044	...	0.7196	0.7149	0.7102	1.4282	1.4252	...	...	...	...	...	...
174	1,*cis*-3-Hexadiene	*73.07*	0.043	...	*0.7125*	*0.7079*	*0.7033*	*1.4410*	*1.4379*	225	225	...	...	...	...
175	1,*trans*-3-Hexadiene	*73.19*	0.043	*−102.4*	*0.7085*	*0.7039*	*0.6993*	*1.4406*	*1.4375*	225	225	...	...	...	...
176	1,*cis*-4-Hexadiene	*66.3*	0.042	...	0.704	0.700	0.695	*1.4049*	*1.4018*	...	...	...	...	...	...
177	1,*trans*-4-Hexadiene	*65.0*	0.042	*−138.7*	0.704	0.700	0.695	*1.4104*	*1.4073*	...	...	...	...	...	...
178	1,5-Hexadiene	59.45	0.042	−140.693	0.6969	0.6923	0.6878	1.4042	1.4010	...	...	...	...	...	...
179	2,3-Hexadiene	68.0	0.043	...	0.685	0.680	0.675	1.395	1.392	...	...	...	...	...	...
180	*cis*-2,*cis*-4-Hexadiene	*84.93*	0.044	*−69.34*	*0.7390*	*0.7344*	*0.7298*	*1.4606*	*1.4575*	225	225	...	...	...	...
181	*cis*-2,*trans*-4-Hexadiene	*83.47*	0.044	*−96.1*	*0.7275*	*0.7229*	*0.7183*	*1.4560*	*1.4529*	225	225	...	...	...	...
182	*trans*-2,*trans*-4-Hexadiene	*82.17*	0.044	*−44.9*	*0.7193*	*0.7147*	*0.7101*	*1.4510*	*1.4479*	225	225	...	...	...	...
183	3-Methyl-1,2-pentadiene	70	0.043	...	0.720	0.715	0.710	1.425	1.422	...	...	...	...	...	...
184	4-Methyl-1,2-pentadiene	70	0.043	...	0.713	0.708	0.703	1.424	1.421	...	...	...	...	...	...
185	2-Methyl-1,*cis*-3-pentadiene	76	0.044	...	0.725	0.719	0.714	1.446	1.443	225	225	...	...	...	...
186	2-Methyl-1,*trans*-3-pentadiene	*75.66*	0.044	*−117.551*	0.725	0.719	0.714	*1.4448*	*1.4422*	...	...	...	...	...	...
187	3-Methyl-1,*cis*-3-pentadiene	77	0.044	...	0.741	0.735	0.730	1.452	1.449	225	225	...	...	...	...
188	3-Methyl-1,*trans*-3-pentadiene	77	0.044	...	0.741	0.735	0.730	1.452	1.449	225	225	...	...	...	...
189	4-Methyl-1,3-pentadiene	*76.98*	0.044	*−125.91*	0.725	0.719	0.714	*1.4534*	*1.4503*	225	225	...	...	...	...
190	2-Methyl-1,4-pentadiene	56	0.041	...	0.699	0.694	0.689	1.405	1.402	...	...	...	...	...	...
191	3-Methyl-1,4-pentadiene	55	0.041	...	0.700	0.695	0.690	1.405	1.402	...	...	...	...	...	...
192	2-Methyl-2,3-pentadiene	72	0.043	...	0.716	0.711	0.706	1.425	1.422	...	...	...	...	...	...
193	2-Ethyl-1,3-butadiene	75	0.044	...	0.721	0.717	0.712	1.445	1.442	225	225	...	...	...	...
194	2,3-Dimethyl-1,3-butadiene	68.77	0.043	−76.039	0.7312	0.7267	0.7222	1.4394	1.4362	225	225	...	...	...	...
	Diolefins, C_7H_{12}, M.W. 96.173:														
195	2-Methyl-1,5-hexadiene	*88.1*	...	*−128.8*	*0.7244*	*0.7198*	*0.7153*	...	...	...	...	...	...	...	...
196	2-Methyl-2,4-hexadiene	*111.5*	...	*−74.6*	*0.7488*	*0.7449*	*0.7411*	...	...	...	...	...	...	...	...
197	2,4-Dimethyl-1,3-pentadiene	*93.2*	...	*−114.0*	*0.7407*	*0.7368*	*0.7329*	...	...	...	...	...	...	...	...
	Diolefins, C_8H_{14}, M.W. 110.200:														
198	2,6-Octadiene (dicrotyl)	*124.5*	...	*−76.0*	*0.7484*	*0.7445*	*0.7406*	...	...	...	...	...	...	...	...
199	3-Methyl-1,5-heptadiene	*111.0*	...	*−67.0*	*0.7333*	*0.7291*	*0.7250*	...	...	...	...	...	...	...	...
200	2,5-Dimethyl-1,5-hexadiene	*114.3*	...	*−75.6*	*0.7462*	*0.7423*	*0.7384*	...	...	...	...	...	...	...	...
201	2,5-Dimethyl-2,4-hexadiene	*134.5*	...	*+13.94*	*0.7653*	*0.7615*	*0.7577*	...	...	...	...	...	...	...	...
	Diolefins, C_9H_{16}, M.W. 124.227:														
202	2,6-Dimethyl-1,5-heptadiene	*143*	...	*−70.0*	*0.7721*	*0.7684*	*0.7648*	...	...	...	...	...	...	...	...
203	2-Methyl-3-ethyl-1,5-hexadiene	*145*	...	*−70.0*	*0.7665*	*0.7629*	*0.7594*	...	...	...	...	...	...	...	...
	Diolefins, $C_{10}H_{18}$, M.W. 138.254:														
204	3,7-Dimethyl-1,6-octadiene	*161*	...	*−70.0*	*0.7618*	*0.7580*	*0.7542*	...	...	...	...	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.11—Monoolefins and Diolefins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[c]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)		Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	Gross, to form H_2O (liquid)+ CO_2 (gas)		Net, to form H_2O (gas)+ CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g					kcal per mole	cal per g	kcal per mole	cal per g	
23	319	0.58	48.03	0.3805	64.7	0.512	10.88	86.18	8.68	68.8	−24.70	−35.58	27.01	23.84	1425.70	11 294	1331.02	10 544	158
...	...	...	...	...	64.8	0.513	...	...	...	...	...	...	...	...	...	...	...	...	159
(24.60)	(328)	(0.521)	(50)	(0.40)	(64)	(0.51)	...	...	(7.79)	(61.7)	...	...	...	...	(1423.8)	(11 279)	(1329.2)	(10 529)	160
22	342	0.65	53.49	0.3814	71.78	0.5118	12.06	85.98	9.24	65.9	−29.48	−41.54	29.17	25.31	1582.12	11 279	1476.98	10 529	161
...	...	...	...	...	71.6	0.510	...	...	...	...	...	...	...	...	...	...	...	...	162
(54.0)	120	(0.162)	14.10	0.3520	...	...	...	...	(4.85)	(121)	45.92	...	48.37	...	(461)[y,c]	(11 510)[y]	(440)[y,c]	(10 980)[y]	163
(44.4)	(171)	(0.219)	19.15	0.3540	29.78	0.5506	5.71	105.6	(5.44)	(101)	38.78	32.78	47.43	...	614.13[c]	11 353	582.58	10 770	164
42.7	152	0.221	19.01	0.3515	28.10	0.5195	5.03	93.0	(5.23)	(97)	26.34	21.17	36.01	...	602.32[c]	11 135	570.76	10 552	165
(40.2)	(230)	(0.276)	25.2	0.370	36.05	0.5293	6.85	100.5	(6.06)	(88.9)	33.62	26.74	49.11	48.55	770.26[c]	11 307	728.18	10 690	166
(39.6)	(226)	(0.276)	22.6	0.332	35.034	0.51434	6.77	99.3	(6.06)	(88.9)	19.78	12.97	35.96	35.61	756.48[c]	11 105	714.41	10 488	167
(39.4)	(223)	(0.276)	24.7	0.363	35.68	0.5238	6.64	97.4	(5.98)	(87.8)	18.12	11.44	34.57	34.52	754.96[c]	11 083	712.88	10 465	168
(37.4)	(204)	(0.276)	25.1	0.369	35.09	0.5152	6.01	88.1	(5.53)	(81.1)	25.42	19.33	40.91	40.86	762.84[c]	11 198	720.76	10 581	169
...	...	...	24.2	0.355	36.414	0.53460	7.05	103.4	...	...	31.80	24.72	47.92	47.07	768.23[c]	11 278	726.16	10 660	170
(39.4)	(223)	(0.276)	25.2	0.370	36.43	0.5348	6.68	98.0	(5.91)	(86.7)	30.92	24.19	47.39	46.93	767.70[c]	11 270	725.62	10 652	171
(38.00)	(211)	(0.276)	25.0	0.367	36.101	0.53001	6.32	92.7	(5.79)	(85.1)	18.10	11.72	34.87	34.72	755.24[c]	11 087	713.16	10 469	172
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	173
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	174
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	175
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	176
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	177
(34.00)	(248)	(0.333)	(28)	(0.34)	(43)	(0.52)	...	...	(6.12)	(74.5)	...	...	...	...	(920.0)	(11 200)	(867.4)	(10 560)	178
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	179
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	180
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	183
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	184
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	186
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	187
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	188
(35.00)	(265)	(0.333)	(29.5)	(0.36)	(45)	(0.55)	...	...	(6.62)	(80.6)	...	...	...	...	(912.0)	(11 103)	(859.4)	(10 463)	189
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	190
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	191
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	192
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	193
(34.90)	(254)	(0.333)	(31)	(0.38)	(48)	(0.59)	...	...	(6.44)	(78.4)	...	...	...	...	(908.5)	(11 061)	(855.9)	(10 420)	194
(32.10)	(280)	(0.390)	(38.5)	(0.40)	(58)	(0.59)	...	...	(6.68)	(69.5)	...	...	...	...	(1073.8)	(11 166)	(1010.6)	(10 509)	195
(33.70)	(309)	(0.390)	(36.5)	(0.37)	(52)	(0.54)	...	...	(7.32)	(76.2)	...	...	...	...	(1067.1)	(11 097)	(1004.0)	(10 440)	196
(29.00)	(216)	(0.390)	(36.5)	(0.38)	(54)	(0.56)	...	...	(8.02)	(83.4)	...	...	...	...	(1062.1)	(11 045)	(999.0)	(10 388)	197
(28.30)	(319)	(0.476)	(38.5)	(0.35)	(53)	(0.48)	...	...	(6.55)	(59.5)	...	...	...	...	(1232.3)	(11 183)	(1158.7)	(10 515)	198
(27.60)	(310)	(0.443)	(38.5)	(0.35)	(54)	(0.49)	...	...	(6.92)	(62.8)	...	...	...	...	(1232.6)	(11 186)	(1158.9)	(10 517)	199
(27.60)	(310.6)	(0.461)	(42)	(0.38)	(58)	(0.53)	...	...	(6.98)	(63.4)	...	...	...	...	(1222.1)	(11 090)	(1148.4)	(10 422)	200
(28.80)	(329)	(0.455)	(42)	(0.38)	(58)	(0.53)	...	...	(7.66)	(69.5)	...	...	...	...	(1220.0)	(11 071)	(1146.3)	(10 403)	201
(26.54)	(344)	(0.504)	(48)	(0.39)	(63)	(0.51)	...	...	(7.53)	(60.6)	...	...	...	...	(1383.4)	(11 136)	(1299.2)	(10 459)	202
(26.10)	(349)	(0.500)	(45)	(0.36)	(60)	(0.48)	...	...	(7.53)	(60.6)	...	...	...	...	(1388.9)	(11 181)	(1304.7)	(10 504)	203
(25.10)	(367)	(0.557)	(52.5)	(0.38)	(66)	(0.48)	...	...	(7.92)	(57.3)	...	...	...	...	(1543.7)	(11 166)	(1449.0)	(10 481)	204

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.12—Cycloolefins (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4\,(n_F-n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Alkylcyclopentenes, C_5H_8, M.W. 68.119:														
1	Cyclopentene	44.232	0.03928	−135.082	0.77750	0.77197	0.76651	1.42246	1.41940	118.7	118.7	...	...	...	<−10
	Alkylcyclopentenes, C_6H_{10}, M.W. 82.146:														
2	1-Methylcyclopentene	75.48	0.0431	−126.527	0.7842	0.7795	0.7748	1.4322	1.4294	124	124	...	...	...	−7.0
3	3-Methylcyclopentene	64.90	0.0418	...	0.7673	0.7622	0.7572	1.4210	1.4184	119	119	...	...	...	...
4	4-Methylcyclopentene	65.66	0.042	−160.85	0.7735	0.7684	0.7634	1.4209	1.4184	...	...	...	...	...	...
	Alkylcyclopentenes, C_7H_{12}, M.W. 96.173:														
5	1-Ethylcyclopentene	106.33	0.0467	−118.47	0.8028	0.7982	0.7936	1.4412	1.4387	119	119	...	...	...	+1.2
6	3-Ethylcyclopentene	97.77	0.0458	...	0.7877	0.7830	0.7784	1.4315	1.4291	...	...	...	...	...	...
7	4-Ethylcyclopentene	98.2	0.046	...	0.789	0.783	0.778	1.431	1.429	...	...	...	...	...	...
8	1,2-Dimethylcyclopentene	105.8	0.0467	−90.4	0.8024	0.7976	0.7928	1.4448	1.4420	125.8	125.8	...	...	...	...
9	1,3-Dimethylcyclopentene	92	0.045	...	0.771	0.766	0.761	1.428	1.425	...	...	...	...	...	...
10	1,4-Dimethylcyclopentene	93.2	0.046	...	0.7764	0.7714	0.7664	1.4283	1.4255	...	...	...	...	...	...
11	1,5-Dimethylcyclopentene	102	0.046	−118	0.784	0.780	0.775	1.4331	1.4304	120.8	120.8	...	...	...	...
12	3,3-Dimethylcyclopentene	88	0.045	...	0.776	0.771	0.766	1.423	1.420	...	...	...	...	...	...
13	3,*cis*-4-Dimethylcyclopentene	...	...	...	0.782	0.777	0.772	1.4300	1.4272	...	...	...	...	...	...
14	3,*trans*-4-Dimethylcyclopentene	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	3,*cis*-5-Dimethylcyclopentene	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	3,*trans*-5-Dimethylcyclopentene	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	4,4-Dimethylcyclopentene	88	0.045	...	0.776	0.771	0.766	1.423	1.420	...	...	...	...	...	...
	Alkylcyclopentenes, C_8 to C_{10}:														
18	1-*n*-Propylcyclopentene, C_8H_{14}, M.W. 110.200	131.2	0.048	...	0.8059	0.8018	0.7978	1.4452	1.4428	...	...	...	...	...	14.2
19	1-*n*-Butylcyclopentene, C_9H_{16}, M.W. 124.227	156	0.051	...	0.8112	0.8073	0.8035	1.4486	1.4463	...	...	...	...	...	25.0
20	1-*n*-Pentylcyclopentene, $C_{10}H_{18}$, M.W. 138.254	179	0.053	...	0.8161	0.8123	0.8085	1.4516	1.4494	...	...	...	...	...	...
	Alkylcyclohexenes, C_6H_{10}, M.W. 82.146:														
21	Cyclohexene	82.974	0.04381	−103.493	0.81572	0.81094	0.80607	1.44654	1.44377	117.2	117.1	...	...	...	−20.0
	Alkylcyclohexenes, C_7H_{12}, M.W. 96.173:														
22	1-Methylcyclohexene	110.300	0.04665	−120.397	0.8163	0.81146	0.80658	1.45046	1.44784	119.3	120.0	...	...	...	...
23	3-Methylcyclohexene	102.47	0.0463	−123.5	0.8054	0.8010	0.7966	1.4435	1.4410	...	...	...	...	...	...
24	4-Methylcyclohexene	102.74	0.0461	−115.4	0.8035	0.7991	0.7947	1.4414	1.4389	...	...	...	...	...	...
	Alkylcyclohexenes, C_8H_{14}, M.W. 110.200:														
25	1-Ethylcyclohexene	137.006	0.04915	−109.947	0.8276	0.82212	0.81765	1.45668	1.45437	117.3	117.0	...	...	...	...
26	3-Ethylcyclohexene	131.6	0.0500	...	0.8059	0.8104	0.8059	1.4500	1.4476	...	...	...	...	...	...
27	4-Ethylcyclohexene	133	0.049	...	0.814	0.810	0.806	1.449	1.447	...	...	...	...	...	...
28	1,2-Dimethylcyclohexene	137.99	0.0500	−84.113	0.8302	0.8262	0.8220	1.4620	1.4594	123	123	...	...	...	...
29	1,3-Dimethylcyclohexene	127	0.050	...	0.807	0.803	0.799	1.449	1.447	120	120	...	...	...	...
30	1,4-Dimethylcyclohexene	128	0.049	−59	0.806	0.802	0.798	1.446	1.444	119	119	...	...	...	...
31	1,5-Dimethylcyclohexene	128	0.049	...	0.8092	0.8051	0.8009	1.450	1.448	119	119	...	...	...	...
32	1,6-Dimethylcyclohexene	131	0.049	...	0.819	0.815	0.811	1.456	1.453	...	...	...	...	...	...
33	3,3-Dimethylcyclohexene	119	0.048	...	0.808	0.804	0.800	1.445	1.443	...	...	...	...	...	...
34	4,4-Dimethylcyclohexene	117.25	0.0477	−74.44	0.805	0.8008	0.7968	1.4418	1.4394	115	115	...	...	...	...
	Alkylcyclohexenes, C_9 and C_{10}:														
35	1-*n*-Propylcyclohexene, C_9H_{16}, M.W. 124.227	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	1-*n*-Butylcyclohexene, $C_{10}H_{18}$, M.W. 138.254	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	4-Vinylcyclohexene, C_8H_{12}, M.W. 108.184	*128.0*	...	*−108.98*	*0.834*	*0.8908*	*0.826*	*1.4641*	...	...	...	...	...	...	...
38	1,5-Cyclooctadiene, C_8H_{12}, M.W. 108.184	*150.0*	...	*−56.406*	*0.886*	*0.8883*	*0.880*	*1.4933*	...	...	...	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.12—Cycloolefins (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[a]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid)+ CO_2 (gas)		Net, to form H_2O (gas)+ CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
...	...	...	17.95	0.2635	29.24	0.4293	...	...	...	...	7.73	1.02	26.48	...	744.55[c]	10 931	702.47	10 313	1
...	...	...	24.1	0.293	*(36.9)*	*(0.449)*	...	...	...	...	−0.96	−8.71	...	...	*897.17*	*10 922*	*844.58*	*10 281*	2
...	...	...	23.9	0.291	*(37.8)*	*(0.460)*	...	...	...	...	...	−5.68	...	...	900.22	10 960	847.62	10 319	3
...	...	...	23.9	0.291	*(35.7)*	*(0.435)*	...	...	...	...	...	−4.22	...	...	901.68	10 977	849.08	10 337	4
...	...	...	...	...	*(44.1)*	*(0.459)*	...	...	...	...	−4.91	−13.95	...	...	1054.32	10 964	991.20	10 307	5
...	...	...	...	...	*(45.0)*	*(0.468)*	...	...	...	...	...	−11.79	...	...	1056.48	10 986	993.36	10 330	6
...	...	...	...	...	*(43.0)*	*(0.447)*	...	...	...	...	...	−10.33	...	...	1057.94	11 001	994.82	10 345	7
...	...	...	30.3	0.315	*(44.4)*	*(0.462)*	...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	30.1	0.313	*(45.3)*	*(0.471)*	...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	30.0	0.312	*(43.4)*	*(0.451)*	...	...	...	...	...	...	...	...	...	...	...	...	10
...	...	...	30.1	0.313	*(45.3)*	*(0.471)*	...	...	...	...	...	...	...	...	...	...	...	...	11
...	...	...	29.4	0.306	*(43.3)*	*(0.450)*	...	...	...	...	...	...	...	...	...	...	...	...	12
...	...	...	29.8	0.310	*(43.0)*	*(0.447)*	...	...	...	...	...	...	...	...	...	...	...	...	13
...	...	...	30.0	0.312	*(44.3)*	*(0.461)*	...	...	...	...	...	...	...	...	...	...	...	...	14
...	...	...	30.0	0.312	*(44.9)*	*(0.466)*	...	...	...	...	...	...	...	...	...	...	...	...	15
...	...	...	30.0	0.312	*(46.2)*	*(0.480)*	...	...	...	...	...	...	...	...	...	...	...	...	16
...	...	...	...	...	*(41.5)*	*(0.431)*	...	...	...	...	...	...	...	...	...	...	...	...	17
...	...	...	...	...	*(51.4)*	*(0.466)*	...	...	...	...	−9.84	−20.06	...	...	1210.58	10 986	1136.94	10 318	18
...	...	...	...	...	*(58.6)*	*(0.472)*	...	...	...	...	−14.76	−26.16	...	...	1366.85	11 004	1282.69	10 326	19
...	...	...	...	...	*(65.9)*	*(0.477)*	...	...	...	...	−19.69	−32.27	...	...	1523.11	11 018	1428.43	10 333	20
...	...	...	25.10	0.306	35.64	0.4339	...	...	...	...	−1.08	−9.13	...	...	*896.75*	*10 916*	*844.16*	*10 276*	21
...	...	...	...	...	*(43.1)*	*(0.448)*	*9.04*	*94.0*	...	...	−10.38	−19.42	...	...	1048.85	10 907	985.73	10 250	22
...	...	...	...	...	*(44.0)*	*(0.458)*	...	...	...	...	...	...	...	...	...	...	...	...	23
...	...	...	...	...	*(42.2)*	*(0.438)*	...	...	...	...	...	...	...	...	...	...	...	...	24
...	...	...	...	...	*(50.4)*	*(0.457)*	*10.33*	*93.7*	...	...	−15.17	−25.50	...	...	1205.11	10 937	1131.47	10 268	25
...	...	...	...	...	*(51.3)*	*(0.465)*	...	...	...	...	...	...	...	...	...	...	...	...	26
...	...	...	...	...	*(49.4)*	*(0.448)*	...	...	...	...	...	...	...	...	...	...	...	...	27
...	...	...	...	...	*(50.6)*	*(0.459)*	...	...	...	...	...	...	...	...	...	...	...	...	28
...	...	...	...	...	*(51.5)*	*(0.468)*	...	...	...	...	...	...	...	...	...	...	...	...	29
...	...	...	...	...	*(49.7)*	*(0.451)*	...	...	...	...	...	...	...	...	...	...	...	...	30
...	...	...	...	...	*(49.7)*	*(0.451)*	...	...	...	...	...	...	...	...	...	...	...	...	31
...	...	...	...	...	*(51.5)*	*(0.468)*	...	...	...	...	...	...	...	...	...	...	...	...	32
...	...	...	...	...	*(49.6)*	*(0.450)*	...	...	...	...	...	...	...	...	...	...	...	...	33
...	...	...	...	...	*(47.3)*	*(0.429)*	...	...	...	...	...	...	...	...	...	...	...	...	34
...	...	...	...	...	*(57.6)*	*(0.464)*	...	...	...	...	−20.10	−31.61	...	...	1361.37	10 960	1277.21	10 282	35
...	...	...	...	...	*(64.9)*	*(0.469)*	...	...	...	...	−25.02	−37.71	...	...	1517.64	10 978	1422.96	10 293	36
...	...	...	...	...	*(47.7)*	*(0.441)*	...	...	...	...	...	...	...	...	...	...	...	...	37
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	38

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.13—Acetylenes (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Acetylenes, C_2 and C_3:														
1	Ethyne (acetylene), C_2H_2, M.W. 26.038	−84[p]	0.018	−81[e]	...	*0.6154*[p]	...	...	...	...	...	...	...	...	...
2	Propyne (methylacetylene), C_3H_4, M.W. 40.065	−23.21	0.030	−102.7	...	*0.6711*[q]	...	...	...	...	...	...	...	...	...
	Acetylenes, C_4H_6, M.W. 54.092:														
3	1-Butyne (ethylacetylene)	8.07	0.036	−125.721	0.65[d]	0.65[d]	0.65[d]	...	...	...	...	...	...	...	...
4	2-Butyne (dimethylacetylene)	26.98	0.037	−32.240	0.6965	0.6910	0.6856	1.3921	1.3893	...	...	...	...	...	...
	Acetylenes, C_5H_8, M.W. 68.119:														
5	1-Pentyne	40.17	0.039	−105.7	0.6953	0.6901	0.6849	1.3852	1.3826	119	119	...	...	...	...
6	2-Pentyne	56.06	0.041	−109.3	0.7158	0.7107	0.7055	1.4039	1.4009	...	...	...	...	...	...
7	3-Methyl-1-butyne	26.34	0.038	−89.7	0.672	0.666	0.660	1.3723	1.3695	...	...	...	...	...	...
	Acetylene, C_6H_{10}, M.W. 82.146:														
8	1-Hexyne	71.32	0.042	−131.9	0.7204	0.7155	0.7106	1.3989	1.3960	115	115	...	...	...	...
9	2-Hexyne	84.52	0.04	−89.47	0.7358	0.7313	0.7268	1.4138	1.4109	115	115	...	...	...	...
10	3-Hexyne	81.42	0.04	−103.10	0.7273	0.7227	0.7182	1.4113	1.4088	119	119	...	...	...	...
11	3-Methyl-1-pentyne	57.7	0.04	...	0.7082	0.7037	0.6992	1.3916	1.3891	...	...	...	...	...	...
12	4-Methyl-1-pentyne	61.16	0.04	−104.6	0.7090	0.7045	0.7000	1.3930	1.3905	114	114	...	...	...	...
13	4-Methyl-2-pentyne	73.12	0.04	−110.30	0.7202	0.7157	0.7112	1.4057	1.4032	...	...	...	...	...	...
14	3,3-Dimethyl-1-butyne	37.71	0.04	−78.2	0.6732	0.6678	0.6623	1.3736	1.3706	114	114	...	...	...	...
	Acetylenes, C_7H_{12}, M.W. 96.173:														
15	1-Heptyne	99.74	0.045	−80.9	0.7374	0.7328	0.7283	1.4087	1.4061	113	113	...	...	...	...
16	2-Heptyne	112	0.05	...	0.752	0.748	0.744	1.4230	1.4204	...	...	...	...	...	...
17	3-Heptyne	107.16	0.05	−130.5	0.7427	0.7381	0.7336	1.4189	1.4163	...	...	...	...	...	...
18	3-Methyl-1-hexyne	85	0.04	...	0.7230	0.7185	0.7140	1.4001	1.3975	...	...	...	...	...	...
19	4-Methyl-1-hexyne	91	0.04	...	0.7372	0.7327	0.7282	1.4076	1.4050	...	...	...	...	...	...
20	5-Methyl-1-hexyne	91.85	0.04	−124	0.7320	0.7274	0.7229	1.4059	1.4033	...	...	...	...	...	...
21	4-Methyl-2-hexyne	99.54	0.05	−107.6	0.7431	0.7386	0.7341	1.4170	1.4144	...	...	...	...	...	...
22	5-Methyl-2-hexyne	102.46	0.05	−92.9[e]	0.7423	0.7378	0.7333	1.4176	1.4150	...	...	...	...	...	...
23	2-Methyl-3-hexyne	95.2	0.04	−116.6	0.7294	0.7249	0.7204	1.4120	1.4094	...	...	...	...	...	...
24	3-Ethyl-1-pentyne	84	0.04	...	0.7316	0.7271	0.7226	1.4035	1.4009	...	...	...	...	...	...
25	3,3-Dimethyl-1-pentyne	70	0.04	...	0.7122	0.7077	0.7032	1.3934	1.3908	...	...	...	...	...	...
26	3,4-Dimethyl-1-pentyne	80	0.04	...	0.7281	0.7236	0.7191	1.4018	1.3992	...	...	...	...	...	...
27	4,4-Dimethyl-1-pentyne	76.07	0.04	−75.0	0.7186	0.7142	0.7097	1.3983	1.3957	...	...	...	...	...	...
28	4,4-Dimethyl-2-pentyne	83	0.04	...	0.7222	0.7176	0.7131	1.4071	1.4045	117	117	...	...	...	...
	Acetylenes, C_8H_{14}, M.W. 110.200:														
29	1-Octyne	126.21	0.0469	−79.3	0.7508	0.7468	0.7426	1.4163	1.4138	111	111	...	...	...	...
30	2-Octyne	137.74	0.048	*−61.6*	0.7636	0.7594	0.7552	1.4276	1.4251	...	...	...	...	...	...
31	3-Octyne	133.15	0.048	−104	0.7564	0.7522	0.7479	1.4250	1.4223	...	...	...	...	...	...
32	4-Octyne	*131.5*	...	*−102.5*	*0.755*	*0.751*	*0.747*	*1.4248*	*1.4225*	...	...	...	...	...	...
	Acetylenes, C_9H_{16}, M.W. 124.227:														
33	1-Nonyne	150.7	0.049	−50	0.7623	0.7579	0.7538	1.4219	1.4195	110	110	...	...	...	...
34	2-Nonyne	161.9	0.050	...	0.7727	0.7686	0.7645	1.4327	1.4303	...	...	...	...	...	...
35	3-Nonyne	157.1	0.050	...	0.7637	0.7597	0.7556	1.4288	1.4264	...	...	...	...	...	...
	Acetylenes, $C_{10}H_{18}$, M.W. 138.254:														
36	1-Decyne	174	0.052	−44	0.7710	0.7670	0.7631	1.4272	1.4249	108	108	...	...	...	...
37	2-Decyne	184.6	0.052	...	0.7802	0.7763	0.7724	1.4364	1.4341	...	...	...	...	...	...
38	3-Decyne	179.3	0.052	...	0.7697	0.7658	0.7619	1.4315	1.4292	...	...	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.13—Acetylenes (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[a]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
60.59	35.17	0.113	10.499	0.4032	...	...	...	...	...	...	54.194	...	50.000	...	...[c]	...	...	...	1
55.54	129.24	*0.164*	14.50	0.3618	...	...	...	...	*(3.90)*	*(97.3)*	44.319	...	46.313	...	*(460)*[b,c]	(11 470)[b]	(438)[b]	(10 940)[b]	2
(46.50)	190.5	*(0.221)*	19.46	0.3597	32.79	0.6062	5.67	104.8	*(5.37)*	*(99.5)*	39.48	33.70	48.30	...	614.85[c]	11 367	583.30	10 783	3
(50.18)	215	*(0.221)*	18.63	0.3444	29.92	0.5532	6.38	117.9	*(5.91)*	*(109.5)*	34.97	28.54	44.32	...	609.69[c]	11 271	578.13	10 688	4
(40.00)	220	*(0.278)*	25.18	0.3697	*(40.1)*	*(0.587)*	6.79	99.7	*(5.94)*	*(87.3)*	34.50	27.67	50.16	...	771.18[c]	11 321	729.10	10 703	5
(41.50)	*(250)*	*0.278*	23.59	0.3463	*(37.2)*	*(0.546)*	7.35	107.9	*(6.32)*	*(92.8)*	30.80	23.43	46.41	...	766.95[c]	11 259	724.87	10 641	6
...	...	...	25.02	0.3673	*(39.3)*	*(0.577)*	6.16	90.4	...	...	32.60	26.35	49.12	...	769.86[c]	11 302	727.79	10 684	7
(34.90)	*(263)*	*(0.334)*	30.65	0.3731	*(47.3)*	*(0.576)*	...	...	*(6.39)*	*(77.8)*	29.55	...	52.17	...	*(929.7)*	*(11 318)*	*(877.2)*	*(10 679)*	8
...	...	...	...	...	*(44.4)*	*(0.541)*	...	...	...	...	...	...	...	...	...	...	...	...	9
(35.10)	*(281)*	*(0.334)*	*(28)*	*(0.34)*	*(44.4)*	*(0.541)*	...	...	*(6.58)*	*(80.0)*	...	...	...	...	*(925.5)*	*(11 267)*	*(873.0)*	*(10 628)*	10
...	...	...	...	...	*(46.6)*	*(0.568)*	...	...	...	...	...	...	...	...	...	...	...	...	11
...	...	...	...	...	*(46.6)*	*(0.568)*	...	...	...	...	...	...	...	...	...	...	...	...	12
...	...	...	...	...	*(43.7)*	*(0.532)*	...	...	...	...	...	...	...	...	...	...	...	...	13
...	...	...	...	...	*(44.9)*	*(0.546)*	...	...	...	...	...	...	...	...	...	...	...	...	14
(32.00)	*(289)*	*(0.391)*	36.11	0.3755	*(54.6)*	*(0.567)*	...	...	*(7.00)*	*(72.8)*	24.62	...	54.18	...	*(1085.8)*	*(11 291)*	*(1022.8)*	*(10 636)*	15
...	...	...	...	...	*(51.7)*	*(0.538)*	...	...	...	...	...	...	...	...	...	...	...	...	16
...	...	...	...	...	*(51.7)*	*(0.538)*	...	...	...	...	...	...	...	...	...	...	...	...	17
...	...	...	...	...	*(53.9)*	*(0.560)*	...	...	...	...	...	...	...	...	...	...	...	...	18
...	...	...	...	...	*(53.9)*	*(0.560)*	...	...	...	...	...	...	...	...	...	...	...	...	19
(33.50)	*(292)*	*(0.389)*	*(35)*	*(0.36)*	*(53.9)*	*(0.560)*	...	...	*(6.79)*	*(70.6)*	...	...	...	...	*(1078.7)*	*(11 217)*	*(1015.7)*	*(10 562)*	20
...	...	...	...	...	*(51.0)*	*(0.530)*	...	...	...	...	...	...	...	...	...	...	...	...	21
...	...	...	...	...	*(51.0)*	*(0.530)*	...	...	...	...	...	...	...	...	...	...	...	...	22
...	...	...	...	...	*(50.9)*	*(0.530)*	...	...	...	...	...	...	...	...	...	...	...	...	23
...	...	...	...	...	*(53.9)*	*(0.560)*	...	...	...	...	...	...	...	...	...	...	...	...	24
...	...	...	...	...	*(52.2)*	*(0.543)*	...	...	...	...	...	...	...	...	...	...	...	...	25
...	...	...	...	...	*(53.2)*	*(0.553)*	...	...	...	...	...	...	...	...	...	...	...	...	26
...	...	...	...	...	*(52.2)*	*(0.543)*	...	...	...	...	...	...	...	...	...	...	...	...	27
...	...	...	...	...	*(49.3)*	*(0.513)*	...	...	...	...	...	...	...	...	...	...	...	...	28
(28.50)	*(321)*	*(0.448)*	41.58	0.3773	*(61.8)*	*(0.561)*	...	...	*(7.41)*	*(67.3)*	19.70	...	56.19	...	*(1242.8)*	*(11 278.5)*	*(1169.3)*	*(10 611)*	29
(29.30)	*(348)*	*(0.448)*	*(42)*	*(0.38)*	*(59.0)*	*(0.535)*	...	...	*(7.47)*	*(67.8)*	...	...	...	...	*(1239.4)*	*(11 248)*	*(1165.9)*	*(10 581)*	30
(29.00)	*(341)*	*(0.448)*	*(41)*	*(0.37)*	*(59.0)*	*(0.535)*	...	...	*(7.41)*	*(67.3)*	...	...	...	...	*(1239.5)*	*(11 248.5)*	*(1166.0)*	*(10 582)*	31
(28.90)	*(340)*	*(0.448)*	*(40)*	*(0.36)*	*(59.0)*	*(0.535)*	...	...	*(7.36)*	*(66.7)*	...	...	...	...	*(1239.5)*	*(11 249)*	*(1166.0)*	*(10 582)*	32
(26.50)	*(346)*	*(0.505)*	47.04	0.3787	*(69.1)*	*(0.556)*	...	...	*(7.80)*	*(62.8)*	14.77	...	58.20	...	*(1399.8)*	*(11 277)*	*(1315.8)*	*(10 600)*	33
...	...	...	...	...	*(66.2)*	*(0.533)*	...	...	...	...	...	...	...	...	...	...	...	...	34
...	...	...	...	...	*(66.2)*	*(0.533)*	...	...	...	...	...	...	...	...	...	...	...	...	35
...	...	...	52.51	0.3798	*(76.4)*	*(0.552)*	...	...	...	...	9.85	...	60.20	...	...	...	...	...	36
...	...	...	...	...	*(73.5)*	*(0.531)*	...	...	...	...	...	...	...	...	...	...	...	...	37
...	...	...	...	...	*(73.5)*	*(0.531)*	...	...	...	...	...	...	...	...	...	...	...	...	38

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.14—Alkylbenzenes, Naphthalene, Indans, and Tetrahydronaphthalene (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4 (n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Alkylbenzenes, C_6 and C_7:														
1	Benzene, C_6H_6, M.W. 78.114	80.094	0.04271	+5.531	0.88415	0.87889	0.87368	1.50112	1.49792	189.9	189.6	0.5870	...	28.18	<−30
2	Methylbenzene (toluene), C_7H_8, M.W. 92.143	110.629	0.04630	−94.965	0.87144	0.86696	0.86231	1.49693	1.49413	185.0	184.7	0.5584	0.341	27.92	<−30
	Alkylbenzenes, C_8H_{10}, M.W. 106.168:														
3	Ethylbenzene	136.200	0.04898	−94.949	0.87139	0.86700	0.86262	1.49588	1.49320	175.0	174.7	0.6428	0.390	28.48	<−30
4	1,2-Dimethylbenzene (*o*-xylene)	144.429	0.04969	−25.167	0.88438	0.88018	0.87594	1.50545	1.50295	180.4	180.1	0.740	0.428	29.48	<−30
5	1,3-Dimethylbenzene (*m*-xylene)	139.118	0.04903	−47.844	0.86834	0.86415	0.85988	1.49722	1.49464	180.9	180.6	0.591	0.366	28.08	<−30
6	1,4-Dimethylbenzene (*p*-xylene)	*138.360*	0.04917	+13.258	0.86530	0.86103	0.85667	1.49582	1.49325	182.4	182.1	0.613	0.372	27.76	<−30
	Alkylbenzenes, C_9H_{12}, M.W. 120.195:														
7	*n*-Propylbenzene	159.241	0.05143	−99.479	0.86610	0.86202	0.85778	1.49202	1.48951	166.7	166.4	0.7944	0.455	28.45	<−30
8	Isopropylbenzene (cumene)	152.413	0.05074	−96.010	0.86594	0.86177	0.85749	1.49145	1.48890	165.7	165.4	0.740	...	27.68	<−15
9	1-Methyl-2-ethylbenzene	165.180	0.05163	−80.800	0.88467	0.88067	0.87655	1.50456	1.50208	172.4	172.1	...	...	29.66	...
10	1-Methyl-3-ethylbenzene	161.330	0.05111	−95.544	0.86866	0.86450	0.86038	1.49660	1.49406	173.4	173.1	...	...	28.52	...
11	1-Methyl-4-ethylbenzene	162.014	0.05148	−62.317	0.86530	0.86116	0.85700	1.49500	1.49244	173.9	173.6	0.671	...	28.28	...
12	1,2,3-Trimethylbenzene	176.116	0.05263	−25.360	0.89824	0.89436	0.89042	1.51393	1.51150	176.0	175.7	...	...	30.76	...
13	1,2,4-Trimethylbenzene	169.380	0.05187	−43.77	0.87985	0.87580	0.87178	1.50484	1.50237	178.2	177.9	...	...	29.19	...
14	1,3,5-Trimethylbenzene (mesitylene)	164.743	0.05100	−44.694	0.86915	0.86516	0.86109	1.49937	1.49684	177.8	177.5	...	...	28.31	<−30
	Alkylbenzenes, $C_{10}H_{14}$, M.W. 134.222:														
15	*n*-Butylbenzene (1-phenylbutane)	183.305	0.05358	−87.940	0.8642	0.86011	0.85605	1.48979	1.48742	159.6	159.3	0.947	0.518	...	<−30
16	Isobutylbenzene (1-phenyl-2-methylpropane)	172.789	0.05319	−51.45	0.8573	0.85319	0.84905	1.48646	1.48400	160.8	160.5	...	...	...	...
17	*sec*-Butylbenzene (2-phenylbutane)	173.336	0.05313	−75.436	0.8661	0.86205	0.85795	1.49020	1.48779	159.0	158.7	...	...	...	...
18	*tert*-Butylbenzene (2-phenyl-2-methylpropane)	169.148	0.05269	−57.881	0.87059	0.86648	0.86238	1.49266	1.49024	159.3	159.0	...	...	...	...
19	1-Methyl-2-propylbenzene	184.97	0.0535	−60.273	0.8783	0.8736	0.8697	1.4996	1.4975	166	166	...	...	...	...
20	1-Methyl-3-propylbenzene	182.01	0.0530	−82.548	0.8650	0.8609	0.8569	1.4935	1.4911	166	166	...	...	...	...
21	1-Methyl-4-propylbenzene	183.42	0.0535	−63.662	0.8624	0.8584	0.8544	1.4922	1.4898	166	166	...	...	...	...
22	1-Methyl-2-isopropylbenzene (*o*-cymene)	178.18	0.0529	−71.506	0.8807	0.8766	0.8726	1.5005	1.4983	166	166	...	...	...	...
23	1-Methyl-3-isopropylbenzene (*m*-cymene)	175.08	0.0524	−63.712	0.8650	0.8610	0.8570	1.4929	1.4905	166	166	...	...	...	...
24	1-Methyl-4-isopropylbenzene (*p*-cymene)	177.13	0.0528	−67.901	0.8613	0.8573	0.8533	1.4909	1.4885	166	166	...	...	...	...
25	1,2-Diethylbenzene	183.458	0.05340	−31.221	0.88386	0.87994	0.87590	1.50346	1.50106	166.2	165.9	...	...	...	...
26	1,3-Diethylbenzene	181.136	0.05293	−83.891	0.86802	0.86392	0.85991	1.49552	1.49310	166.9	166.6	...	...	...	...
27	1,4-Diethylbenzene	183.787	0.05351	−42.825	0.86594	0.86194	0.85792	1.49483	1.49245	168.2	167.9	...	...	...	...
28	1,2-Dimethyl-3-ethylbenzene	193.95	0.0554	−49.51	0.8961	0.8921	0.8881	1.5117	1.5095	170	170	...	...	...	...
29	1,2-Dimethyl-4-ethylbenzene	189.52	0.0563	−66.896	0.8785	0.8745	0.8706	1.5031	1.5009	171	171	...	...	...	...
30	1,3-Dimethyl-2-ethylbenzene	190.05	0.0561	−16.25	0.8945	0.8904	0.8864	1.5107	1.5085	170	170	...	...	...	...
31	1,3-Dimethyl-4-ethylbenzene	188.24	0.0555	−62.847	0.8804	0.8763	0.8723	1.5037	1.5015	171	172	...	...	...	...
32	1,3-Dimethyl-5-ethylbenzene	183.62	0.0542	−84.293	0.8688	0.8648	0.8608	1.4981	1.4958	172	172	...	...	...	...
33	1,4-Dimethyl-2-ethylbenzene	186.87	0.0533	−53.7	0.8811	0.8772	0.8732	1.5043	1.5020	171	171	...	...	...	...
34	1,2,3,4-Tetramethylbenzene (prehnitene)	205.09	0.055	−6.25	0.9088	0.9052	0.9015	1.5203	1.5181	174	174	...	...	...	...
35	1,2,3,5-Tetramethylbenzene (isodurene)	198.04	0.055	−23.671	0.8941	0.8903	0.8865	1.5130	1.5107	174	174	...	...	...	...
36	1,2,4,5-Tetramethylbenzene (durene)	196.84	0.054	+79.234	0.8910	0.8875[r]	0.8837[r]	1.5116[r]	1.5093[r]	174[r]	174[r]	...	...	...	...
	Naphthalenes, $C_{10}H_8$, M.W. 128.174:														
37	Naphthalene	217.991	0.05809	+80.284	...	...	...	1.175[mm]	(1.5898)[s]	...	(297)[s]	...	...	...	...
	Alkylindans, C_9H_{10}, M.W. 118.179:														
38	2,3-Dihydroindene (indan)	177.85	0.055	−51.371	0.9679	0.9640	0.9600	1.5385	1.5358	...	...	...	...	...	...
	Alkylindans, $C_{10}H_{12}$, M.W. 132.206:														
39	1-Methyl-2,3-dihydroindene (1-methylindan)	190.6	0.055	...	0.947	0.942	0.938	1.5266	1.5240	...	...	...	...	...	...
40	2-Methyl-2,3-dihydroindene (2-methylindan)	191.4	0.055	...	0.949	0.944	0.940	1.5220	1.5194	...	...	...	...	...	...
41	4-Methyl-2,3-dihydroindene (4-methylindan)	205.5	0.055	...	0.974	0.970	0.966	1.5348	1.5322	...	...	...	...	...	...
42	5-Methyl-2,3-dihydroindene (5-methylindan)	202.0	0.055	...	0.952	0.948	0.944	1.5336	1.5310	...	...	...	...	...	...
	Tetrahydronaphthalenes, $C_{10}H_{12}$, M.W. 132.206:														
43	1,2,3,4-Tetrahydronaphthalene	207.62	0.0575	−35.769	0.9742	0.9695	0.9660	1.54135	1.53919	166	166	...	...	...	<−20

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 ., for definitions of superscripts.

TABLE 1C1.14—Alkylbenzenes, Naphthalene, Indans, and Tetrahydronaphthalene (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[a]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid)+ CO_2 (gas)		Net, to form H_2O (gas)+ CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
48.34	289.01	0.259	*19.68*	*0.2520*	32.52	0.4163	8.090	103.57	7.352	94.13	19.820	11.718	30.989	29.756	780.98	9 999	749.42	9595	1
40.55	318.64	0.316	*24.77*	*0.2688*	*37.58*	*0.4079*	9.080	98.55	7.931	86.08	11.950	2.883	29.228	27.220	934.50	10 143	892.42	9686	2
35.62	344.02	0.374	30.69	0.2891	44.46	0.4188	10.098	95.12	8.50	80.07	7.145	−2.953	31.233	28.638	1091.03	10 277	1038.43	9782	3
36.84	357.2	0.369	31.85	0.3000	44.89	0.4228	10.381	97.79	8.80	82.9	4.540	−5.841	29.177	26.370	1088.16	10 250	1035.56	9755	4
34.95	343.90	0.376	30.49	0.2872	43.77	0.4123	10.195	96.03	8.59	81.86	4.120	−6.075	28.405	25.730	1087.92	10 248	1035.32	9752	5
34.65	343.1	0.379	30.32	0.2856	43.94	0.4139	10.128	95.40	8.529	80.34	4.290	−5.838	28.952	26.310	1088.16	10 250	1035.56	9755	6
31.58	365.23	0.440	36.41	0.3030	*51.32*	*0.4270*	11.050	91.94	9.14	76.0	1.891	−9.159	32.831	29.844	1247.19	10 377	1184.07	9852	7
31.67	358.0	0.428	36.26	0.3017	(*50.6*)	(*0.421*)	10.789	89.77	8.97	74.6	0.940	−9.848	32.738	29.708	1246.52	10 372	1183.40	9846	8
30	378	0.46	37.74	0.3140	(*50.9*)	(*0.423*)	11.40	94.9	9.29	77.3	0.290	−11.110	31.323	27.973	1245.26	10 361	1182.14	9836	9
28	364	0.49	36.38	0.3027	(*50.9*)	(*0.423*)	11.21	93.3	9.21	76.6	−0.460	−11.670	30.217	26.977	1244.71	10 357	1181.59	9831	10
29	367	0.47	36.22	0.3014	(*50.9*)	(*0.423*)	11.41	94.90	9.18	76.4	−0.780	−11.920	30.281	27.041	1244.45	10 354	1181.33	9829	11
34.09	391.38	0.414	36.85	0.3066	51.73	0.4304	11.726	97.57	9.57	79.6	−2.287	−14.013	29.322	25.679	1242.36	10 337	1179.24	9812	12
31.90	375.98	0.430	37.10	0.3087	51.37	0.4274	11.458	95.34	9.38	78.0	−3.327	−14.785	27.915	24.462	1241.58	10 331	1178.46	9805	13
30.86	364.21	0.433	35.91	0.2988	47.92	0.3987	11.348	94.42	9.33	77.6	−3.836	−15.184	28.176	24.832	1241.19	10 327	1178.07	9802	14
28.49	387.4	0.497	41.85	0.3118	*58.16*	*0.4333*	11.98	89.26	9.38	69.89	−3.30	−15.26	31.08	...	1403.46	10 457	1329.82	9908	15
30	377	*0.478*	(*42*)	(*0.31*)	(*57.5*)	(*0.428*)	11.82	88.06	9.04	67.36	...	...	...	...	(*1404.7*)	(*10 466*)	(*1331.2*)	(*9919*)	16
29.12	*391.4*	*0.478*	(*42*)	(*0.31*)	(*57.5*)	(*0.428*)	11.83	88.14	9.07	67.58	...	...	...	...	(*1404.8*)	(*10 467*)	(*1331.3*)	(*9919*)	17
29.26	*387*	*0.461*	(*43*)	(*0.32*)	57.13	0.4257	11.73	87.40	8.99	66.98	...	...	...	...	(*1402.3*)	(*10 449*)	(*1328.8*)	(*9901*)	18
...	...	...	...	...	(*57.4*)	(*0.428*)	12.59	93.81	9.43	70.26	...	...	...	...	...	...	...	...	19
...	...	...	...	...	(*57.4*)	(*0.428*)	12.45	92.76	9.40	70.04	...	...	...	...	...	...	...	...	20
...	...	...	...	...	(*57.4*)	(*0.428*)	12.41	92.47	9.36	69.74	...	...	...	...	...	...	...	...	21
28.58	*397*	*0.478*	(*43*)	(*0.32*)	(*56.7*)	(*0.422*)	12.10	90.16	9.17	68.32	...	...	...	...	(*1402.5*)	(*10 450*)	(*1329.0*)	(*9902*)	22
29.00	*393.1*	*0.478*	(*42*)	(*0.31*)	(*56.7*)	(*0.422*)	11.94	88.96	9.11	67.88	...	...	...	...	(*1401.9*)	(*10 445*)	(*1328.4*)	(*9898*)	23
28	380	*0.478*	(*34*)	(*0.25*)	56.68	0.4223	12.02	89.56	9.12	67.95	...	...	...	...	(*1401.9*)	(*10 445*)	(*1328.4*)	(*9898*)	24
...	...	...	...	...	(*57.2*)	(*0.426*)	12.61	93.96	9.42	70.19	...	...	...	...	...	...	...	...	25
...	...	...	...	...	(*57.2*)	(*0.426*)	12.55	93.51	9.41	70.11	...	...	...	...	...	...	...	...	26
27.66	384.81	...	...	...	(*57.2*)	(*0.426*)	12.54	93.44	9.41	70.11	...	...	...	...	...	...	...	...	27
...	...	...	...	...	(*57.3*)	(*0.427*)	13.11	97.68	9.70	72.27	...	...	...	...	...	...	...	...	28
...	...	...	...	...	(*57.3*)	(*0.427*)	12.89	96.04	9.62	71.68	...	...	...	...	...	...	...	...	29
...	...	...	...	...	(*57.3*)	(*0.427*)	12.88	95.97	9.60	71.53	...	...	...	...	...	...	...	...	30
...	...	...	...	...	(*57.3*)	(*0.427*)	12.74	94.92	9.56	71.23	...	...	...	...	...	...	...	...	31
...	...	...	...	...	(*57.3*)	(*0.427*)	12.52	93.29	9.47	70.56	...	...	...	...	...	...	...	...	32
...	...	...	...	...	(*57.3*)	(*0.427*)	12.58	93.73	9.48	70.63	...	...	...	...	...	...	...	...	33
...	...	...	...	...	56.96	0.4244	13.66	101.78	10.76	80.17	...	...	...	...	...	...	...	...	34
...	...	...	...	...	57.54	0.4287	13.34	99.39	10.47	78.01	...	...	...	...	...	...	...	...	35
29	402	...	...	...	...	...	13.27	98.87	10.88	81.07	...	...	...	...	...	...	...	...	36
39.98	475.28	0.41	...	...	*39.60*^{mm}	*0.3090*^{mm}	...	...	...	...	36.14	18.77^{mm}	...	44.40^{mm}	1232.54^{mm}	9616^{mm}	1190.46^{mm}	9296^{mm}	37
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	38
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	39
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	40
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	41
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	42
...	...	...	...	...	*51.97*	*0.3931*	...	...	...	...	...	...	...	...	...	...	...	...	43

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 ., for definitions of superscripts.

TABLE 1C1.15—Styrenes and Indenes (Metric Units)

No.	Compound	Boiling Point at 1 atmos, deg Cent	$\frac{dt}{dp}$ at 1 atmos, deg Cent per mm Hg	Freezing Point in Air at 1 atmos, deg Cent	Density of the Liquid,[a] g per cu cm			Refractive Index of the Liquid,[a] n_D		Specific Dispersion of the Liquid,[a] $10^4\,(n_F - n_C)/d$		Kinematic Viscosity of the Liquid, centistokes		Surface Tension of the Liquid[a] at 25 C, dynes per cm	Aniline Point, deg Cent
					at 15 C	at 20 C	at 25 C	at 20 C	at 25 C	at 20 C	at 25 C	at 37.78 C	at 98.89 C		
	Styrenes, C_8H_8, M.W. 104.152:														
1	Ethenylbenzene (styrene; vinylbenzene; phenylethylene)	145.16	0.049	−30.610	0.91067	0.90597	0.90119	1.54682	1.54395	265	265	...	...	...	...
	Styrenes, C_9H_{10}, M.W. 118.179:														
2	Isopropenylbenzene (α-methylstyrene; 2-Phenyl-1-propene)	165.5	0.055	−23.2	0.9134	0.9090	0.9046	1.5386	1.5358	265	265	...	...	...	...
3	*cis*-1-Propenylbenzene (*cis*-β-metbylstyrene; *cis*-1-Phenyl-1-propene)	167.46	0.055	−61.65	0.9134	0.9090	0.9046	1.5430	1.5402	265	265	...	...	...	...
4	*trans*-1-Propenylbenzene (*trans*-β-methylstyrene; *trans*-1-Phenyl-1-propene)	178.29	0.056	−29.31	0.9112	0.9067	0.9023	1.5506	1.5478	265	265	...	...	...	...
5	1-Methyl-2-ethenylhenzene (*o*-methylstyrene)	169.84	0.051	−68.54	0.9161	0.9119	0.9077	1.5437	1.5413	265	265	...	...	...	...
6	1-Methyl-3-ethenylhenzene (*m*-metbylstyrene)	171.6	0.052	−86.31	0.9159	0.9118	0.9076	1.5411	1.5385	265	265	...	...	...	...
7	1-Methyl-4-ethenylbenzene (*p*-methylstyrene)	172.8	0.052	−34.13	0.9257	0.9215	0.9173	1.5420	1.5395	265	265	...	...	...	...
	Styrenes, $C_{10}H_{12}$, M.W. 132.206:														
8	*cis*-1-Phenyl-1-butene (*cis*-β-etbylstyrene)	189	0.05	...	0.9148	0.9107	0.9065	1.5390	1.5364	...	...	...	...	...	...
9	*trans*-1-Phenyl-1-butene (*trans*-β-ethylstyrene)	198.72	0.05	−43.0	0.9060	0.9019	0.8977	1.5420	1.5394	...	...	...	...	...	...
10	2-Phenyl-1-hutene (α-ethylstyrene)	182	0.05	...	0.896	0.891	0.887	1.5288	1.5262	...	...	...	...	...	...
11	*cis*-2-Phenyl-2-butene (*cis*-α,β-dimethylstyrene)	194.7	0.05	−23.5	0.9219	0.9178	0.9138	1.5425	1.5401	...	...	...	...	...	...
12	*trans*-2-Phenyl-2-butene (*trans*-α,β-dimethylstyrene)	174	0.05	...	0.8999	0.8958	0.8918	1.5217	1.5193	...	...	...	...	...	...
13	2-Methyl-1-phenyl-1-propene (β,β-dimethylstyrene)	187.95	0.05	−51.0	0.9052	0.9011	0.8971	1.5400	1.5376	...	...	...	...	...	...
14	1-Methyl-2-(*cis*-1′-*n*-propenyl)benzene (*cis*-*o*,β-dimethylstyrene)	...	...	...	0.907	0.902	0.898	1.539	1.537	...	...	...	...	...	...
15	1-Methyl-2-(*trans*-1′-*n*-propenyl)benzene (*trans*-*o*,β-dimetbylstyrene)	...	...	...	0.907	0.902	0.898	1.539	1.537	...	...	...	...	...	...
16	1-Methyl-3-(*cis*-1′-*n*-propenyl)henzene (*cis*-*m*,β-dimethylstyrene)	...	...	...	0.899	0.895	0.891	1.540	1.538	...	...	...	...	...	...
17	1-Methyl-3-(*trans*-1′-*n*-propenyl)benzene (*trans*-*m*,β-dimethylstyrene)	...	...	...	0.899	0.895	0.891	1.540	1.538	...	...	...	...	...	...
18	1-Methyl-4-(*cis*-1′-*n*-propenyl)benzene (*cis*-*p*,β-dimethylstyrene)	196	0.05	...	0.8937	0.8896	0.8856	1.5392	1.5368	...	...	...	...	...	...
19	1-Methyl-4-(*trans*-1′-*n*-propenyl)benzene (*trans*-*p*,β-dimethylstyrene)	201	0.05	−18	0.9100	0.9059	0.9019	1.543	1.541	...	...	...	...	...	...
20	1-Metbyl-2-isopropenylbenzene (*o*,α-dimethylstyrene)	172.2	0.05	...	0.8933	0.8893	0.8853	1.5155	1.5130	...	...	...	...	...	...
21	1-Metbyl-3-isopropenylbenzene (*m*,α-dimethylstyrene)	185	0.05	...	0.9091	0.9050	0.9010	1.5335	1.5310	...	...	...	...	...	...
22	1-Methyl-4-isopropenylhenzene (*p*,α-dimethylstyrene)	186	0.05	...	0.9039	0.8999	0.8959	1.5340	1.5315	...	...	...	...	...	...
23	1-Etbyl-2-ethenylhenzene (*o*-ethylstyrene)	187.3	0.052	−75.5	0.9099	0.9058	0.9017	1.5380	1.5356	...	...	...	...	...	...
24	1-Ethyl-3-ethenylbenzene (*m*-ethylstyrene)	190.0	0.053	−101	0.8987	0.8945	0.8904	1.5351	1.5325	...	...	...	...	...	...
25	1-Ethyl-4-ethenylhenzene (*p*-ethylstyrene)	192.3	0.053	−49.7	0.8966	0.8925	0.8884	1.5376	1.5348	...	...	...	...	...	...
26	1,2-Dimetbyl-3-ethenylbenzene (2,3-dimethylstyrene)	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	1,2-Dimethyl-4-etbenylbenzene (3,4-dimethylstyrene)	...	...	...	0.915	0.910	0.906	1.5464	1.5438	...	...	...	...	...	...
28	1,3-Dimetbyl-2-ethenylbenzene (2,6-dimetbylstyrene)	...	...	...	0.909	0.905	0.901	1.535	1.533	...	...	...	...	...	...
29	1,3-Dimetbyl-4-etbenylbenzene (2,4-dimethylstyrene)	...	...	...	0.909	0.905	0.901	1.5423	1.5397	...	...	...	...	...	...
30	1,3-Dimethyl-5-ethenylbenzene (3,5-dimethylstyrene)	...	...	...	0.902	0.898	0.894	1.5382	1.5356	...	...	...	...	...	...
31	1,4-Dimethyl-2-ethenylbenzene (2,5-dimethylstyrene)	...	...	...	0.910	0.906	0.902	1.540	1.538	...	...	...	...	...	...
32	Pbenylacetylene, M.W. 102.136	*129.48*	...	*−40*	*(0.933)*	*(0.929)*	*(0.925)*	*1.5485*	...	...	...	...	...	...	...
	Alkylindenes, C_9H_8, M.W. 116.163:														
33	Indene	182.47	0.0516	−1.5	1.0000	0.9957	0.9918	1.5764	1.5737	...	...	...	...	...	...
	Alkylindenes, $C_{10}H_{10}$, M.W. 130.190:														
34	1-Metbylindene	199	0.054	...	0.976	0.973	0.970	1.5616	1.5591	...	...	...	...	...	...
35	2-Methylindene	208	0.055	+80	0.981[r]	0.977	0.974	1.5652[r]	1.5627[r]	...	...	...	...	...	...
36	3-Methylindene	205	0.054	...	0.979	0.975	0.972	1.5621	1.5596	...	...	...	...	...	...
37	4-Methylindene	209	0.055	...	0.995	0.992	0.989	1.568	1.566	...	...	...	...	...	...
38	5-Methylindene	207	0.055	...	0.984	0.980	0.977	1.566	1.564	...	...	...	...	...	...
39	6-Methylindene	207	0.055	...	0.984	0.980	0.977	1.566	1.564	...	...	...	...	...	...
40	7-Methylindene	209	0.055	...	0.995	0.992	0.989	1.568	1.566	...	...	...	...	...	...

NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, page 61, for definitions of superscripts.

TABLE 1C1.15—Styrenes and Indenes (Metric Units)

Critical Constants			Heat Capacity at 25 C and Constant Pressure				Heat of Vaporization at Saturation Pressure				Heat of Formation at 25 C, kcal per mole		Free Energy of Formation at 25 C, kcal per mole		Heat of Combustion of the Liquid at 25 C and Constant Pressure[c]				No.
			Gas, Ideal State		Liquid at 1 atmos		at 25 C		at the Normal Boiling Point (1 atmos)						Gross, to form H_2O (liquid)+ CO_2 (gas)		Net, to form H_2O (gas)+ CO_2 (gas)		
Pressure, atmos	Temperature, deg Cent	Volume, liter per mole	cal per deg-mole	cal per g, deg Cent	cal per deg-mole	cal per g, deg Cent	kcal per mole	cal per g	kcal per mole	cal per g	Gas, Ideal State	Liquid	Gas, Ideal State	Liquid	kcal per mole	cal per g	kcal per mole	cal per g	
39.47	*374.4*	*0.369*	29.18	0.2802	43.70	0.4196	...	...	*(8.74)*	*83.9*	35.22	24.83	51.10	...	1050.51	10 087	1008.44	9683	1
39.47	*399*	*0.408*	34.7	0.294	*(51.2)*	*(0.444)*	...	...	*(9.20)*	*77.8*	27.00	...	49.84	...	*(1204.0)*	*(10 189)*	*(1151.5)*	*(9744)*	2
35.79	*404*	*0.408*	34.7	0.294	*(52.4)*	*(0.443)*	...	...	*(9.13)*	*77.3*	29.00	...	51.84	...	*(1208.1)*	*(10 223)*	*(1155.6)*	*(9779)*	3
35.79	*404*	*0.408*	34.9	0.295	*(52.4)*	*(0.443)*	...	...	*(9.13)*	77.3	28.00	...	51.08	...	*(1208.1)*	*(10 223)*	*(1155.6)*	*(9779)*	4
36.00	*406*	*0.375*	34.7	0.294	*(50.1)*	*(0.424)*	...	...	*(9.26)*	*78.4*	28.30	...	51.14	...	*(1205.7)*	*(10 203)*	*(1153.2)*	*(9759)*	5
35.11	*402*	*0.381*	34.7	0.294	*(50.1)*	*(0.424)*	...	...	*(9.00)*	*76.2*	27.60	...	50.02	...	*(1205.8)*	*(10 200)*	*(1152.8)*	*(9755)*	6
34.98	*403*	*0.381*	34.7	0.294	*(50.1)*	*(0.424)*	...	...	*(9.07)*	*76.7*	27.40	...	50.24	...	*(1205.2)*	*(10 198)*	*(1152.7)*	*(9755)*	7
...	...	...	...	...	...	...	....	...	...	...	...	...	...	...	...	...	...	...	8
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46.82	*382*	*0.441*	*(87)*	*(0.36)*	*(60)*	*(0.59)*	...	...	*(8.57)*	*(83.9)*	...	...	...	...	*(871.3)*	*(8532)*	*(839.8)*	*(8223)*	32
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	33
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NOTES:

1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61, for definitions of superscripts.

TABLE 1C1.16—Gaseous Hydrocarbons, C_1 to C_5 (Metric Units)

	No.[m]	Compound[l]	Heat of Combustion of the Ideal Gas at 25 C and Constant Pressure			
			Gross, to form H_2O (liquid) + CO_2 (gas)		Net, to form H_2O (gas) + CO_2 (gas)	
			kcal per mole	cal per g	kcal per mole	cal per g
		Paraffins, C_1 to C_3:				
1C1.1	1	Methane, CH_4, M.W. 16.043	212.80	13 265	191.76	11 954
	2	Ethane, C_2H_6, M.W. 30.070	372.82	12 399	341.26	11 350
	3	Propane, C_3H_8, M.W. 44.097	530.60	12 034	488.53	11 079
		Paraffins, C_4H_{10}, M.W. 58.124:				
	4	*n*-Butane	687.64	11 831	635.05	10 927
	5	2-Methylpropane (isobutane)	685.64	11 797	633.05	10 892
		Paraffins, C_5H_{12}, M.W. 72.151:				
	6	*n*-Pentane	845.16	11 715	782.05	10 840
	7	2-Methylbutane (isopentane)	843.24	11 688	780.13	10 813
	8	2,2-Dimethylpropane (neopentane)	*839.89*	*11 642*	*776.77*	*10 768*
		Cycloalkanes, C_3 to C_5:				
1C1.2	1	Cyclopropane, C_3H_6, M.W. 42.081	499.85	11 878	468.29	11 128
	15	Cyclobutane, C_4H_8, M.W. 56.108	655.79	11 688	613.72	10 938
	23	Cyclopentane, C_5H_{10}, M.W. 70.135	793.42	11 313	740.83	10 563
		Monoolefins, C_2 and C_3:				
1C1.3	1	Ethene (ethylene), C_2H_4, M.W. 28.054	337.23	12 022	316.19	11 272
	2	Propene (propylene), C_3H_6, M.W. 42.081	491.99	11 692	460.43	10 942
		Monoolefins, C_4H_8, M.W. 56.108:				
	3	1-Butene	649.45	11 576	607.37	10 826
	4	*cis*-2-Butene	647.81	11 547	605.73	10 797
	5	*trans*-2-Butene	646.81	11 529	604.73	10 779
	6	2-Methylpropene (isobutene)	645.43	11 505	603.36	10 755
		Monoolefins, C_5H_{10}, M.W. 70.135:				
	7	1-Pentene	806.82	11 504	754.23	10 754
	8	*cis*-2-Pentene	805.34	11 484	752.74	10 734
	9	*trans*-2-Pentene	804.26	11 468	751.66	10 718
	10	2-Methyl-1-butene	803.17	11 453	750.57	10 703
	11	3-Methyl-1-butene	804.93	11 478	752.33	10 728
	12	2-Methyl-2-butene	801.68	11 431	749.08	10 681
		Diolefins, C_3H_4, M.W. 40.065:				
	163	Propadiene (allene)	464.71	11 600	443.67	11 075
		Diolefins, C_4H_6, M.W. 54.092:				
	164	1,2-Butadiene	619.93	11 461	588.37	10 878
	165	1,3-Butadiene	607.49	11 231	575.93	10 648
		Diolefins, C_5H_8, M.W. 68.119:				
	166	1,2-Pentadiene	*777.14*	*11 408*	*735.06*	*10 791*
	167	1,*cis*-3-Pentadiene	*763.29*	*11 205*	*721.22*	*10 588*
	168	1,*trans*-3-Pentadiene	*761.63*	*11 181*	*719.56*	*10 563*
	169	1,4-Pentadiene	*768.93*	*11 282*	*726.85*	*10 670*
	170	2,3-Pentadiene	*775.32*	*11 382*	*733.25*	*10 764*
	171	3-Methyl-1,2-butadiene	*774.43*	*11 369*	*732.35*	*10 751*
	172	2-Methyl-1,3-butadiene (isoprene)	*761.62*	*11 181*	*719.54*	*10 562*
1C1.4	1	Cyclopentene, C_5H_8, M.W. 68.119	751.26	11 030	709.18	10 412
		Acetylenes, C_2 and C_3:				
1C1.5	1	Ethyne (acetylene), C_2H_2, M.W. 26.038	310.62	11 930	300.10	11 526
	2	Propyne (methylacetylene), C_3H_4, M.W. 40.065	463.11	11 560	442.07	11 035
		Acetylenes, C_4H_6, M.W. 54.092:				
	3	1-Butyne (ethylacetylene)	620.64	11 474	589.08	10 891
	4	2-Butyne (dimethylacetylene)	616.13	11 391	584.57	10 807
		Acetylenes, C_5H_8, M.W. 68.119:				
	5	1-Pentyne	778.03	11 422	735.95	10 805
	6	2-Pentyne	774.33	11 368	732.25	10 750
	7	3-Methyl-1-butyne	776.13	11 395	734.05	10 777

NOTES:
1. Values in parentheses are estimated. For methods of estimation, see p. 64.
2. M.W. = molecular weight.
3. See Appendix I, p. 61 , for definitions of superscripts.

TABLE 1C1.17—Appendixes

I. KEY TO FOOTNOTES

* Calculated values, see Appendix III.
[a] For the air-saturated hydrocarbon at 1 atmos.
[b] Apparent values from weights in air.
[c] Absolute values from weights in vacuum.
[d] At saturation pressure.
[e] At saturation pressure (triple point).
[f] For solid-vapor equilibrium.
[g] At boiling point.
[h] Critical solution temperature instead of aniline point.
[i] Apparent values for methane at 60 F (15.56 C).
[k] The + sign and the number following signify that the octane number of the compound corresponds to that of 2,2,4-trimethylpentane with the indicated number of milliliters of tetraethyl lead added.
[l] Average value from octane numbers of more than one sample.
[m] Extrapolated to room temperature from higher temperatures.
[n] Too volatile to run as a liquid in the CFR engine.
[o] For heats of combustion of gaseous hydrocarbons, C_1 to C_5, see Table 1C1.8.
[p] At sublimation point.
[q] Specific gravity — 119 F/60 F (sublimation point).
[r] For the undercooled liquid below the normal freezing point.
[s] At 185 F (85 C).
[t] Determined at 212 F.
[u] Determined at 302 F.
[v] Value for the ideal gas.
[w] Formerly labeled "*trans*".
[x] Formerly labeled "*cis*".
[y] At 15.56 C.
[z] Approximate value.
[mm] For the solid phase.

II. UNITS AND CONVERSION FACTORS

Molecular weights (M.W.): Based on the 1969 atomic weight table, see reference (**95**)[1], in which atomic weight of oxygen = 15.9994, hydrogen = 1.0080, and carbon = 12.011.

Temperature: Temperatures in degrees centigrade (Celsius) are given on the International Practical Temperature Scale of 1968 (IPTS-68), see reference (**66**).

Other constants: Fundamental constants and conversion factors are given in Sect. 1A.

III. DEFINITIONS OF PROPERTIES[2]

Density of Liquids

(1) *Metric Unit Tables:* Values of the absolute density, d, of the air saturated hydrocarbon in vacuum are reported at 15 C, 20 C, and 25 C in g per cu cm:

$$d(\text{g per cu cm}) = 0.999972\, d(\text{g per ml})$$

(2) *U.S. Unit Tables:* Specific gravity,

$$60\text{ F}/60\text{ F} = \frac{d(15.56\text{ C, g per cu cm})}{d(\text{water, }15.56\text{ C, g per cu cm})} = \frac{d(15.56\text{ C, g per cu cm})}{0.999024}$$

Densities at 60 F, d_{app} (lb per cu ft) and d_{app} (lb per gal), are the apparent densities in air of the air saturated hydrocarbon:

$$d(60\text{ F, lb per cu ft}) = 62.42795\, d(15.56\text{ C, g per cu cm})$$

$$d_{app}(\text{lb per cu ft}) = [d(\text{lb per cu ft}) - d(\text{air, lb per cu ft})] \times \frac{d(\text{brass, lb per cu ft})}{d(\text{brass, lb per cu ft}) - d(\text{air, lb per cu ft})}$$

Since density of air at 60 F is 0.0762 lb per cu ft and density of brass is 524 lb per cu ft, this formula reduces to:

$$d_{app}(\text{lb per cu ft}) = 62.43700\, d(\text{g per cu cm}) - 0.0762$$

$$d_{app}(\text{lb per gal}) = 0.133681\, d_{app}(\text{lb per cu ft})$$

Density at other temperatures can be calculated from density at 60 F by:

$$d(t\text{ deg Fahr}) = \frac{d(60\text{ F})}{\left[1 + \frac{1}{V}\left(\frac{dV}{dt}\right)\right](t - 60)}$$

API gravity is calculated by:

$$deg\ API = \frac{141.5}{\text{sp gr } 60\text{ F}/60\text{ F}} - 131.5$$

Refractive Index of Liquids

(1) *Metric Unit Tables:* Values of the refractive index, n_D, of the air saturated hydrocarbon relative to air at the sodium D-line (5892.6 Å) are reported at 20 C and 25 C. The specific dispersion given at 20 C and 25 C is defined as $10^4(n_F - n_C)/d$, where n_F = refractive index for the hydrogen F-line (4861.3 Å), n_C = refractive index of the hydrogen C-line (6562.8 Å), and d = density, in g per cu cm.

(2) *U.S. Unit Tables:* Values of refractive index and dispersion at 68 F and 77 F are the same as those in the metric tables at 20 C and 25 C, respectively.

Viscosity of Liquids

(1) *Metric Unit Tables:* The kinematic viscosity in centistokes is reported for

[1] The boldface numbers in parentheses refer to references listed in Appendix V.
[2] Calculated values are indicated in U.S. Unit Tables by asterisks (*), see column headings.

temperatures of 37.78 C and 98.89 C. The kinematic viscosity, μ, is related to the absolute viscosity, η, by:

$$\mu\,(\text{stokes}) = \frac{\eta\,(\text{poise})}{d\,(\text{g per cu cm})}$$

The absolute viscosity is referred to a value of 1.002 centipoises for water at 20 C.

(2) *U.S. Unit Tables:* The kinematic viscosity reported at temperatures of 100 F and 210 F are the same as those in the metric unit tables at 37.78 C and 98.89 C, respectively. The absolute viscosity in lb(force) sec per sq in. may be calculated from the kinematic viscosity by:

$$\eta[\text{lb(force) sec per sq in.}] = 2.32328 \times 10^{-7}\,\mu\,(\text{stokes})\,d\,(\text{lb per cu ft})$$

Heat of Vaporization

(1) *Metric Unit Tables:* The heat of vaporization, λ, is defined as the enthalpy of the real gas at the equilibrium vapor pressure minus the enthalpy of the liquid at the same pressure and temperature. The two units reported are related by:

$$\lambda\,(\text{cal per g}) = \frac{\lambda\,(\text{cal per mole})}{\text{M.W.}}$$

Where direct calorimetric data are not available, the heat of vaporization was calculated from the equilibrium vapor pressure, p^*, by:

$$\lambda\,(\text{cal per mole}) = T\frac{dp^*}{dT} \times [V\,(\text{gas}) - V\,(\text{liquid})]$$

(2) *U.S. Unit Tables:* The heat of vaporization at the normal boiling point was calculated from the corresponding value in the metric unit tables by:

$$\lambda\,(\text{Btu per lb}) = 1.798796\,\lambda\,(\text{cal per g})$$

Heat of Combustion of the Liquid

(1) *Metric Unit Tables:* The gross heat of combustion, $\tilde{Q}$, of the hydrocarbon C_aH_b is the change in enthalpy for the reaction:

C_aH_b (liquid, 25 C, 1 atmos)

$+\left(a+\frac{b}{4}\right)O_2$ (ideal gas, 25 C, 1 atmos)

$\rightarrow a\,CO_2$ (ideal gas, 25 C, 1 atmos)

$+\frac{b}{2}H_2O$ (liquid, 25 C, 1 atmos)

The net heat of combustion, $\Delta\tilde{H}$, is the change in enthalpy for the reaction:

C_aH_b (liquid, 25 C, 1 atmos)

$+\left(a+\frac{b}{4}\right)O_2$ (ideal gas, 25 C, 1 atmos)

$\rightarrow a\,CO_2$ (ideal gas, 25 C, 1 atmos)

$+\frac{b}{2}H_2O$ (ideal gas, 25 C, 1 atmos)

These two types of heat of combustion are related at 25 C by:

$$\Delta\tilde{H}\,(\text{net, kcal per mole}) = \Delta\tilde{H}\,(\text{gross, kcal per mole}) + 5.2595b$$

where the enthalpy of vaporization of one-half mole of water from the liquid to the ideal gas is 5.2595 kcal per mole. The heat of combustion in cal per g is obtained by:

$$\Delta H_{\text{comb}}\,(\text{cal per g}) = \frac{1000\Delta\tilde{H}_{\text{comb}}\,(\text{kcal per mole})}{\text{M.W.}}$$

where ΔH_{comb} represents either the net or gross heat of combustion. The molecular weights used in this conversion were based on the 1962 atomic weights where carbon is 12.01115 and hydrogen is 1.00797.

(2) *U.S. Unit Tables:* The gross and net heats of combustion at 60 F in Btu per lb were calculated from the corresponding values reported in the metric unit tables at 25 C by:

$$\Delta H\,(\text{Btu per lb 60 F}) = 1.798796\Delta H\,(\text{cal per g, 25 C}) + \Delta C_p(60-77)$$

ΔC_p is the total heat capacity of the products of the combustion of one pound of hydrocarbon minus the total heat capacity of the reactants. For the gross heat of combustion, this is:

$$\Delta C_p = \frac{\left[a\tilde{C}_p(CO_2,\text{gas}) + \frac{b}{2}\tilde{C}_p(H_2O,\text{liquid})\right]}{\text{M.W.}} - \frac{\left[\left(a+\frac{b}{4}\right)\tilde{C}_p(O_2,\text{gas})\right]}{\text{M.W.}} - C_p(C_aH_b) = \frac{[1.854a+7.245b]}{\text{M.W.}} - C_p(C_aH_b)$$

and for the net heat of combustion is:

$$\Delta C_p = \frac{\left[a\tilde{C}_p(CO_2,\text{gas}) + \frac{b}{2}\tilde{C}_p(H_2O,\text{gas})\right]}{\text{M.W.}} - \frac{\left[\left(a+\frac{b}{4}\right)\tilde{C}_p(O_2,\text{gas})\right]}{\text{M.W.}} - C_p(C_aH_b) = \frac{[1.854a+2.347b]}{\text{M.W.}} - C_p(C_aH_b)$$

$C_p(C_aH_b)$ is the specific heat of the liquid hydrocarbon in Btu per (lb)(deg Fahr). The heat capacities of other substances are $\tilde{C}_p(CO_2,\text{gas}) = 8.874$ Btu per (lb-mole)(deg Fahr), $\tilde{C}_p(O_2,\text{gas}) = 7.020$ Btu per (lb-mole)(deg Fahr), $\tilde{C}_p(H_2O,\text{liquid}) = 18.000$ Btu per (lb-mole)(deg Fahr), and $\tilde{C}_p(H_2O,\text{gas}) = 8.025$ Btu per (lb-mole)(deg Fahr). The gross and net heats of combustion at 60 F are related by:

$$\Delta H\,(\text{net, Btu per lb}) = Q\,(\text{gross, Btu per lb}) + \frac{9550.7b}{\text{M.W.}}$$

The heat of combustion in Btu per gal is calculated from the value in Btu per lb by:

$$\Delta H\,(\text{Btu per gal}) = \Delta H\,(\text{Btu per lb})\,d\,(\text{lb per gal})$$

Heat of Formation of Gas and Liquid (*Metric Unit Tables*)

The enthalpy of formation of the liquid hydrocarbon, C_aH_b, from the elements C (graphite) and H_2 (gas) at 25 C is obtained from the heat of combustion by:

$$\Delta\tilde{H}_f^{\circ}\,(\text{kcal per mole}) = \tilde{Q}\,(\text{gross, kcal per mole}) + a\Delta\tilde{H}_f^{\circ}\,(CO_2,\text{gas}) + \frac{b}{2}\Delta\tilde{H}_f^{\circ}\,(H_2O,\text{liquid}) = \tilde{Q}\,(\text{gross, kcal per mole}) - 24.051a - 34.1575b$$

The enthalpy of formation in the ideal gas state is related to the enthalpy of formation of the liquid by:

$$\Delta\tilde{H}_f^{\circ}\,(\text{ideal gas, kcal per mole}) = \Delta\tilde{H}_f^{\circ}\,(\text{liquid, kcal per mole}) + \lambda\,(\text{kcal per mole}) + [\tilde{H}^{\circ}\,(\text{ideal gas, kcal per mole}) - \tilde{H}\,(\text{real gas, kcal per mole})]$$

The difference between the enthalpy of the real and ideal gas, as shown by the last term, is calculated at the equilibrium vapor pressure at 25 C.

Free Energy of Formation of Gas and Liquid (*Metric Unit Tables*)

The free (Gibbs) energy of formation of the liquid and gaseous hydrocarbon from the elements at 25 C and 1 atmos is calculated from the corresponding enthalpy of formation and entropy of formation.

$$\Delta\tilde{G}_f^\circ\,(\text{liquid, kcal per mole}) = \Delta\tilde{H}_f^\circ\,(\text{liquid, kcal per mole}) - T\Delta\tilde{S}[\text{liquid, kcal per (mole) (deg K)}]$$

$$\Delta\tilde{G}_f^\circ\,(\text{ideal gas, kcal per mole}) = \Delta\tilde{H}_f^\circ\,(\text{ideal gas, kcal per mole}) - T\Delta\tilde{S}[\text{ideal gas, kcal per (mole) (deg K)}]$$

The free energy of formation in the ideal gas at 1 atmos is related to the free energy of formation of the liquid by:

$$\Delta\tilde{G}_f^\circ\,(\text{ideal gas}) = \Delta\tilde{G}_f^\circ\,(\text{liquid}) - RT\ln p^* + [\tilde{G}^\circ\,(\text{ideal gas})] - [\tilde{G}\,(\text{real gas})]$$

where the difference between the free energy of the real and ideal gas is calculated at the equilibrium vapor pressure, p^*, in atmospheres.

Heat Capacity of the Liquid and Gas

(1) *Metric Unit Tables:* The heat capacity at constant pressure is reported for the liquid and ideal gas at 25 C and 1-atmos pressure. This is related to the enthalpy by:

$$C_p = \left(\frac{\partial H}{\partial T}\right)_p$$

The heat capacity observed for a liquid in equilibrium with the vapor is C_s. This may be converted to the heat capacity at constant pressure by:

$$C_p = T\left(\frac{\partial V}{\partial T}\right)_p \frac{dp^*}{dT} + C_s$$

dp^*/dT is the temperature derivative of the vapor pressure. The heat capacity of an ideal gas is equal to the observed values extrapolated to zero pressure. It should be noted that:

$$C_p[\text{cal per (g) (deg K)}] = \frac{\tilde{C}_p[\text{cal per (mole) (deg K)}]}{\text{M.W.}}$$

(2) *U.S. Unit Tables:* The specific heat is reported for the liquid and ideal gas at 60 F and 1 atmos in Btu per (lb)(deg Fahr). This is related to the corresponding metric unit value at the same temperature by:

$$C_p[\text{Btu per (lb) (deg Fahr)}] = 0.99933\,C_p[\text{cal per (g) (deg K)}]$$

Heat of Combustion of the Gas

(1) *Metric Unit Tables:* Enthalpies of combustion are reported in Table 1C1.16 for the ideal gas at 25 C and 1-atmos pressure. The gross and net heats of combustion are defined the same way for the hydrocarbon in the gaseous state as for the liquid. The heat of combustion for the gas is related to that for the liquid by:

$$\Delta H_{\text{comb}}\,(\text{ideal gas}) = \Delta H_{\text{comb}}\,(\text{liquid}) - \lambda + [H\,(\text{real gas}) - H^\circ\,(\text{ideal gas})]$$

(2) *U.S. Unit Tables:* Enthalpies of combustion are reported in Table 1C1.8 for the real gas at 60 F and 1-atmos pressure for those compounds that boil at or below 60 F, and at the normal boiling point and 1 atmos pressure for those compounds that boil above 60 F. The heat (enthalpy) of combustion for the real gas is calculated from that of the liquid at the same temperature by:

$$\Delta H_{\text{comb}}\,(\text{real gas}) = \Delta H_{\text{comb}}\,(\text{liquid}) - \lambda$$

and the conversion to units of Btu per cu ft is made by:

$$\Delta H_{\text{comb}}\,(\text{real gas, Btu per cu ft}) = \frac{\Delta H_{\text{comb}}\,(\text{real gas, Btu per lb})}{V\,(\text{real gas, cu ft per lb})}$$

Volume of the Real Gas and Related Properties (*U.S. Unit Tables*)

The compressibility factor, z, the volume of the real gas, and the specific gravity of the real gas are reported in Table 1C1.8 at 60 F and 1 atmos for those compounds that boil at or below 60 F, and at the normal boiling point and 1-atmos pressure for those compounds that boil above 60 F. The compressibility factor is defined as:

$$z = \frac{pV}{RT}$$

where V is the volume of the real gas at temperature T and 1-atmos pressure. Under these conditions, the compressibility coefficient can be calculated accurately from the second virial coefficient, B, by:

$$z = 1 + \frac{Bp}{RT}$$

The specific volume of the hydrocarbon gas at 1 atmos is calculated from z by:

$$V\,(\text{cu ft per lb}) = \frac{0.73203zT\,(\text{deg R})}{\text{M.W.}}$$

The volume of real gas per gallon of liquid at the same temperature is calculated by:

$$V\,(\text{cu ft per gal}) = V\,(\text{real gas, cu ft per lb}) \times d\,(\text{liquid, lb per gal})$$

The specific gravity of the hydrocarbon gas relative to air at 1 atmos and the same temperature is given by:

$$\text{Sp gr.} = \frac{V\,(\text{hydrocarbon gas, cu ft per lb})}{V\,(\text{air, cu ft per lb})}$$

The average molecular weight of dry air, including 0.003 mole fraction CO_2, is 28.964. The specific volume of dry air at 60 F and 1 atmos is 13.0965 cu ft per lb. Values at other temperatures were calculated from the tables in reference (**27**)[1].

The quantity of air required for the combustion of the gaseous hydrocarbon was based on the chemical reaction:

$$C_aH_b\,(\text{gas}) + \left(a + \frac{b}{4}\right)O_2\,(\text{gas}) \rightarrow aCO_2\,(\text{gas}) + H_2O\,(\text{gas or liquid})$$

Since the mole fraction of oxygen in dry air is 0.2095, the mass of air required for the combustion of 1 lb of hydrocarbon is:

lb air per lb hydrocarbon

$$= \frac{28.964\left(a + \frac{b}{4}\right)}{0.2095\ \text{M.W.}}$$

$$= \frac{138.254\left(a + \frac{b}{4}\right)}{\text{M.W.}}$$

This is independent of pressure or temperature. Since the weight fraction of oxygen in air is 0.23145, the volume of air (including CO_2) per pound-mole of oxygen at 1 atmos is:

$$V' = \frac{31.9988V\,(\text{air, cu ft per lb})}{0.23145} = 138.253V\,(\text{air, cu ft per lb})$$

At 60 F, $V' = 1810.63$ cu ft per lb-mole of O_2. The volume of air required for the combustion of 1 cu ft of real hydrocarbon gas at the same temperature is:

$$\frac{\left(a + \frac{b}{4}\right)V'}{V\,(\text{real gas})} = \frac{\left(a + \frac{b}{4}\right)V'P}{RTz}$$

[1] The boldface numbers in parentheses refer to references listed in Appendix V.

ESTIMATED VALUES

Estimated values of properties are written in parentheses in the tables. In general, references to methods of estimation may be found in Appendix IV, Key to References.

Estimated heats of combustion were first calculated for the gas phase by the method described in reference (**80**) and then converted to the liquid phase by adding the heat of vaporization. Conversion to the various units listed in the U.S. and metric tables was made by the methods in the section on "Definitions of Properties."

Compressibility factors for the real gas in Table 1C1.8 were either taken from reference (**2**) or (**27**) or calculated from the second virial coefficient as described in the section on "Definitions of Properties." The second virial coefficients were either taken from reference (**29**) or estimated by the methods described in reference (**56**) or (**73**). These various sources are identified for specific compounds in Appendix IV, Key to References.

In those cases where a reference is not given in Appendix IV, the estimated heat capacity of the liquid was calculated by the formula:

$$C_p[\text{liquid, cal per (g) (deg K)}] = \frac{C_v[\text{ideal gas, cal per (g) (deg K)}]}{0.400 + 0.0125n}$$

where n is the number of carbon atoms in the molecule. The heat capacity of the ideal gas was estimated by the method described in reference (**79**).

Where a reference is not given, the estimated flammability limits were supplied by M.G. Zabetakis, Chief, Branch of Gas Explosives, Explosives Research Laboratory, U.S. Bureau of Mines [reference (**91**)]. These estimates were obtained by comparison with values for other hydrocarbons and checked with a master plot.

IV. KEY TO REFERENCES

NOTE: For sources of data on compounds and properties not listed here, see Appendix III (p. 61) on calculated and estimated values or references as follows:
(1) Octane numbers: reference (4)
(2) All others: reference (2).

No.	Compound	Boiling Point	Vapor Pressure	Freezing Point	Critical Constants			Heat Capacity, Liquid	Density, Liquid	Refractive Index, Liquid	Heat Capacity, Ideal Gas	Heat of Vaporization at Normal Boiling Point	Heat of Combustion, Liquid	Flammability Limits (Measured)	Aniline Point or Critical Solution Temperature	Compressibility Factor
					Pressure	Temperature	Volume									
1C1.1	**Paraffins:**															
1	Methane	...	...	...	...	...	...	...	68	...	62	...	...	26	...	...
2	Ethane	...	...	...	...	...	...	...	13	...	...	...	...	26, 94	...	...
3	Propane	...	51	...	...	...	...	...	...	...	...	...	...	26, 94	...	...
4	*n*-Butane	...	50	...	...	...	...	...	...	...	7	...	...	26, 94	57	...
5	2-Methylpropane (isobutane)	...	50	...	...	...	...	...	...	...	...	...	...	26	57	...
6	*n*-Pentane	...	...	...	...	...	...	65	...	...	...	...	...	26, 92	12, 32, 41, 78, 90	29
7	2-Methylbutane (isopentane)	...	...	...	...	...	...	...	...	...	...	...	...	26	12, 32, 41, 82, 90	29
8	2,2-Dimethylpropane (neopentane)	...	71	...	...	...	...	...	...	...	...	7	72	26	38	...
9	*n*-Hexane	...	...	...	...	...	...	65	...	...	...	...	...	26, 92	12, 30, 32, 78, 90	...
10	2-Methylpentane	...	...	...	...	...	...	...	...	...	86	...	...	26	...	...
11	3-Methylpentane	...	...	...	...	...	...	...	...	...	86	...	...	...	...	...
12	2,2-Dimethylbutane	...	...	...	...	...	...	...	...	...	85	...	...	26	...	...
13	2,3-Dimethylbutane	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	*n*-Heptane	...	...	...	...	...	...	65	...	...	84	...	...	92, 94	12, 30, 32, 41, 53, 57, 78, 90	...
15	2-Methylhexane	...	...	...	...	...	...	54	...	...	10	...	...	...	30, 32, 41, 90	...
16	3-Methylhexane	...	...	...	...	...	...	...	...	...	10	...	...	...	30, 32, 41, 43	...
17	3-Ethylpentane	...	...	...	...	...	...	54	...	...	10	...	...	...	30, 32	...
18	2,2-Dimethylpentane	...	...	...	...	...	...	54	...	...	10	...	...	...	30, 32, 90	...
19	2,3-Dimethylpentane	...	...	...	...	...	...	...	...	...	...	...	...	...	30, 32, 41, 90	...
20	2,4-Dimethylpentane	...	...	...	...	...	...	54	...	...	10	...	...	...	30, 32, 90	...
21	3,3-Dimethylpentane	...	...	...	...	...	...	...	...	...	10	...	...	...	30, 32, 90	...
22	2,2,3-Trimethylbutane	...	...	...	...	...	...	54	...	...	84	...	...	...	30, 32, 90	...
23	*n*-Octane	...	...	...	...	...	...	65	...	...	9	...	...	94	11, 12, 30, 32, 37, 58, 78, 90	...
24	2-Methylheptane	...	...	...	...	...	...	...	...	...	65	...	...	94	30, 58	...
25	3-Methylheptane	...	...	...	...	...	...	...	...	...	79	...	...	...	58, 90	...
26	4-Methylheptane	...	...	...	...	...	...	...	...	...	79	...	...	...	58	...
27	3-Ethylhexane	...	...	...	...	...	...	...	...	...	9	...	...	...	58	...
28	2,2-Dimethylhexane	...	...	...	...	...	...	...	...	...	79	...	...	...	38	...
29	2,3-Dimethylhexane	...	...	...	...	...	...	...	...	...	9	...	...	...	58, 90	...
30	2,4-Dimethylhexane	...	...	...	...	...	...	...	...	...	79	...	...	...	58	...
31	2,5-Dimethylhexane	...	...	...	...	...	...	...	...	...	79	...	...	...	58, 90	...
32	3,3-Dimethylhexane	...	...	...	...	...	...	...	...	...	79	...	...	...	38	...
33	3,4-Dimethylhexane	...	...	...	...	...	...	...	...	...	9	...	...	...	58, 90	...
34	2-Methyl-3-ethylpentane	...	...	...	...	...	...	...	...	...	9	...	...	...	58	...
35	3-Methyl-3-ethylpentane	...	...	...	...	...	...	...	...	...	7	...	...	...	90	...
36	2,2,3-Trimethylpentane	...	...	...	...	...	...	...	...	...	79	...	...	...	90	...
37	2,2,4-Trimethylpentane	...	...	...	...	...	...	...	...	...	7	...	...	...	32, 53, 90	...
38	2,3,3-Trimethylpentane	...	...	...	...	...	...	...	...	...	79	...	...	...	38	...
39	2,3,4-Trimethylpentane	...	...	...	...	...	...	...	...	...	9	...	...	...	38	...
40	2,2,3,3-Tetramethylbutane	...	...	...	...	...	...	...	...	...	79	...	...	...	38	...
41	*n*-Nonane	...	...	...	...	...	...	65	...	...	...	...	45	67, 94	32, 41, 78, 90	...
42	2-Methyloctane	...	...	...	...	...	...	...	...	...	79	...	...	...	87	...
43	3-Methyloctane	...	...	...	...	...	...	...	...	...	79	...	...	...	87	...
44	4-Methyloctane	...	...	...	...	...	...	...	...	...	79	...	...	...	87	...
45	3-Ethylheptane	...	...	...	...	...	...	...	...	...	79	...	...	...	38	...
46	4-Ethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
47	2,2-Dimethylheptane	...	...	...	...	...	...	...	...	...	79	...	45	...	38	...
48	2,3-Dimethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
49	2,4-Dimethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
50	2,5-Dimethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...

KEY TO REFERENCES—Continued

No.	Compound	Boiling Point	Vapor Pressure	Freezing Point	Critical Constants			Heat Capacity, Liquid	Density, Liquid	Refractive Index, Liquid	Heat Capacity, Ideal Gas	Heat of Vaporization at Normal Boiling Point	Heat of Combustion, Liquid	Flammability Limits (Measured)	Aniline Point or Critical Solution Temperature	Compressibility Factor
					Pressure	Temperature	Volume									
1C1.1	**Paraffins**—Continued:															
51	2,6-Dimethylheptane	...	...	...	...	...	...	...	...	...	79	...	...	...	89	...
52	3,3-Dimethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
53	3,4-Dimethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
60	2,2,3-Trimethylhexane	...	...	...	...	...	...	...	...	...	...	...	45	...	38	...
61	2,2,4-Trimethylhexane	...	...	...	...	...	...	...	...	...	79	...	45	...	38	...
62	2,2,5-Trimethylhexane	...	...	...	...	...	...	...	...	...	79	...	45	...	38	...
63	2,3,3-Trimethylhexane	...	...	...	...	...	...	...	...	...	79	...	45	...	38	...
65	2,3,5-Trimethylhexane	...	...	...	...	...	...	...	...	...	79	...	45	...	38	...
66	2,4,4-Trimethylhexane	...	...	...	...	...	...	...	...	...	79	...	45	...	38	...
67	3,3,4-Trimethylhexane	...	...	...	...	...	...	...	...	...	79	...	45	...	...	...
68	3,3-Diethylpentane	...	...	...	...	...	...	...	...	...	79	...	...	...	38	...
69	2,2-Dimethyl-3-ethylpentane	...	...	...	...	...	...	...	...	...	79	...	45	...	...	...
70	2,3-Dimethyl-3-ethylpentane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
71	2,4-Dimethyl-3-ethylpentane	...	...	...	...	...	...	...	...	...	79	...	45	...	...	...
72	2,2,3,3-Tetramethylpentane	...	...	...	...	...	...	...	...	...	79	...	...	...	38	...
73	2,2,3,4-Tetramethylpentane	...	...	...	...	...	...	...	...	...	79	...	...	...	...	...
74	2,2,4,4-Tetramethylpentane	...	...	...	...	...	...	...	...	...	79	...	...	...	38	...
75	2,3,3,4-Tetramethylpentane	...	...	...	...	...	...	...	...	...	79	...	...	...	...	...
76	*n*-Decane	...	...	...	...	...	...	65	...	...	...	...	...	94	15, 32, 37, 41, 78	...
77	2-Methylnonane	...	...	...	...	...	...	...	...	...	79	...	...	67	15	...
78	3-Methylnonane	...	...	...	...	...	...	...	...	...	79	...	...	...	15	...
79	4-Methylnonane	...	...	...	...	...	...	...	...	...	79	...	...	...	15	...
80	5-Methylnonane	...	...	...	...	...	...	...	...	...	79	...	...	...	15	...
81	3-Ethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
83	2,2-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
84	2,3-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
85	2,4-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
86	2,5-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
87	2,6-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
88	2,7-Dimethyloctane	...	...	...	...	...	...	...	...	...	79	...	...	...	38, 41	...
89	3,3-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
90	3,4-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
92	3,6-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
94	4,5-Dimethyloctane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
95	4-*n*-Propylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
100	3-Methyl-3-ethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
105	2,2,3-Trimethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
108	2,2,6-Trimethylheptane	...	...	28	...	...	...	...	...	...	79	...	...	...	38	...
115	2,4,6-Trimethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
118	3,3,5-Trimethylheptane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
122	3,3-Diethylhexane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
124	2,2-Dimethyl-3-ethylhexane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
134	2,2,3,4-Tetramethylhexane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
138	2,2,5,5-Tetramethylhexane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
143	3,3,4,4-Tetramethylhexane	...	...	...	...	...	...	...	...	...	...	...	...	...	38	...
1C1.2	**Cycloparaffins:**															
1	Cyclopropane	...	...	...	...	...	...	...	15	...	...	...	...	26	...	29
17	Ethylcyclobutane	...	...	...	...	...	...	...	...	...	...	...	...	26	90	...
23	Cyclopentane	...	...	...	...	...	...	...	...	...	...	...	...	...	11, 18, 32, 33, 41, 42, 78	29
24	Methylcyclopentane	...	...	...	...	...	...	...	...	...	...	...	44	55	11, 18, 21, 32, 33, 41, 42, 78	...
25	Ethylcyclopentane	...	...	...	...	...	...	49	...	...	...	...	...	26	18, 32, 33, 41, 42	...
26	1,1-Dimethylcyclopentane	...	...	...	...	...	...	49	...	...	...	...	...	...	28	...
27	1,*cis*-2-Dimethylcyclopentane	...	...	...	...	...	...	49	...	...	...	...	...	...	17	...

KEY TO REFERENCES—Continued

No.	Compound	Boiling Point	Vapor Pressure	Freezing Point	Critical Constants			Heat Capacity, Liquid	Density, Liquid	Refractive Index, Liquid	Heat Capacity, Ideal Gas	Heat of Vaporization at Normal Boiling Point	Heat of Combustion, Liquid	Flammability Limits (Measured)	Aniline Point or Critical Solution Temperature	Compressibility Factor
					Pressure	Temperature	Volume									
1C1.2	**Cycloparaffins**—Continued:															
28	1,*trans*-2-Dimethylcyclopentane	...	...	...	...	...	...	...	...	...	...	...	...	...	17, 43	...
29	1,*cis*-3-Dimethylcyclopentane	...	...	...	...	...	...	49	...	...	...	...	...	...	...	...
30	1,*trans*-3-Dimethylcyclopentane	...	...	...	...	...	...	...	...	...	...	...	...	...	18, 20, 32, 33, 41, 42, 43	...
31	*n*-Propylcyclopentane	...	...	...	77	77	77	63	...	...	...	...	...	...	18, 32, 33, 41, 42	...
32	Isopropylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	...	47, 80	...	...
33	1-Methyl-1-ethylcyclopentane	7	...	...	77	77	77	...	...	...	79	...	47, 80	...	...	...
34	1-Methyl-*cis*-2-ethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	25	...
35	1-Methyl-*trans*-2-ethylcyclopentane	...	...	25	77	77	77	...	...	...	79	...	47, 80	...	25	...
36	1-Methyl-*cis*-3-ethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	...	...
37	1-Methyl-*trans*-3-ethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	...	...
38	1,1,2-Trimethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	...	...
39	1,1,3-Trimethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	...	...
40	1,*cis*-2,*cis*-3-Trimethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	...	...
41	1,*cis*-2,*trans*-3-Trimethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	41	...
42	1,*trans*-2,*cis*-3-Trimethylcyclopentane	5	...	...	77	77	77	...	...	...	79	...	47, 80	...	41	...
43	1,*cis*-2,*cis*-4-Trimethylcyclopentane	5	...	5	77	77	77	...	5	5	79	...	47, 80	...	...	...
44	1,*cis*-2,*trans*-4-Trimethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	...	...
45	1,*trans*-2,*cis*-4-Trimethylcyclopentane	...	...	...	77	77	77	...	...	...	79	...	47, 80	...	...	...
46	*n*-Butylcyclopentane	...	47	...	77	77	77	63	...	...	...	...	...	...	18, 32, 33, 41, 42	...
47	Isobutylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	47, 80	...	...	...
48	*sec*-Butylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	47, 80	...	...	...
49	*tert*-Butylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	47, 80	...	...	...
51	1-Methyl-*cis*-2-*n*-propylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	47, 80	...	24	...
52	1-Methyl-*trans*-2-*n*-propylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	47, 80	...	24	...
58	1-Methyl-*cis*-3-isopropylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	47, 80	...	...	...
59	1-Methyl-*trans*-3-isopropylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	...	...	...	...
61	1,*cis*-2-Diethylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	...	...	23	...
62	1,*trans*-2-Diethylcyclopentane	...	47	...	77	77	77	...	...	...	79	47	...	...	23	...
90	1,1,3,3-Tetramethylcyclopentane	6	...	6	...	...	...	...	...	...	...	...	...	...	...	...
91	1,1-*cis*-3,*cis*-4-Tetramethylcyclopentane	6	...	6	...	...	...	...	...	6	...	...	...	...	...	...
92	1,1-*cis*-3,*trans*-4-Tetramethylcyclopentane	6	...	5	...	...	...	...	5	5, 6	...	...	...	...	...	...
95	1,*cis*-2,*cis*-4-Tetramethylcyclopentane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
96	1,*cis*-2,*cis*-3,*trans*-4-Tetramethylcyclopentane	5	...	...	...	...	...	...	5	5	...	...	...	...	...	...
97	1,*cis*-2,*trans*-3,*cis*-4-Tetramethylcyclopentane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
98	1,*cis*-2,*trans*-3,*trans*-4-Tetramethylcyclopentane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
99	1,*trans*-2,*cis*-3,*trans*-4-Tetramethylcyclopentane	5	...	...	...	...	...	...	5	5	...	...	...	...	...	...
100	1,*trans*-2,*trans*-3,*cis*-4-Tetramethylcyclopentane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
101	*n*-Pentylcyclopentane	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
102	Cyclohexane	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
103	Methylcyclohexane	...	...	...	...	...	...	...	...	...	...	...	...	26	11, 18, 21, 22, 23, 32, 53, 82, 90	...
104	Ethylcyclohexane	...	...	...	...	...	...	...	...	...	...	...	...	...	32, 42	...
105	1,1-Dimethylcyclohexane	...	...	...	...	...	...	...	...	...	...	...	...	...	59	...
106	1,*cis*-2-Dimethylcyclohexane	...	...	...	...	...	...	...	...	...	...	...	...	...	41, 59, 97	...
107	1,*trans*-2-Dimethylcyclohexane	...	...	...	...	...	...	...	...	...	...	...	...	...	59	...
108	1,*cis*-3-Dimethylcyclohexane	...	...	...	...	...	...	...	...	...	...	...	...	...	59	...
109	1,*trans*-3-Dimethylcyclohexane	...	...	...	77	...	...	...	...	...	...	...	...	...	59	...
110	1,*cis*-4-Dimethylcyclohexane	...	...	...	77	...	...	...	...	...	...	...	...	...	41, 59	...
111	1,*trans*-4-Dimethylcyclohexane	...	...	...	...	...	...	...	...	...	...	...	...	...	59	...
112	*n*-Propylcyclohexane	...	...	...	77	77	77	...	...	...	...	35	...	...	32, 42	...
113	Isopropylcyclohexane	...	...	...	77	77	77	...	...	...	79	47	47, 80	...	...	...
115	1-Methyl,*cis*-2-ethylcyclohexane	5	...	...	...	...	...	...	5	5	...	...	...	...	...	...
117	1-Methyl,*cis*-3-ethylcyclohexane	7	...	...	...	...	...	...	5	5, 6	...	...	...	...	...	...
118	1-Methyl,*trans*-3-ethylcyclohexane	5	...	...	...	...	...	...	5	5	...	...	...	...	...	...
119	1-Methyl,*cis*-4-ethylcyclohexane	6	...	...	...	...	...	...	5	5	...	...	...	...	...	...
120	1-Methyl,*trans*-4-ethylcyclohexane	6	...	6	...	...	...	...	5	5	...	...	...	...	...	...
121	1,1,2-Trimethylcyclohexane	...	47	...	77	77	77	...	...	...	79	47	47, 80	...	...	...

KEY TO REFERENCES—Continued

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					Pressure	Temperature	Volume									
1C1.2	**Cycloparaffins**—Continued:															
122	1,1,3-Trimethylcyclohexane	...	...	...	77	77	77	...	...	...	79	47	47,80	...	...	...
124	1,*cis*-2,*cis*-3-Trimethylcyclohexane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
125	1,*cis*-2,*trans*-3-Trimethylcyclohexane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
127	1,*cis*-2,*cis*-4-Trimethylcyclohexane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
128	1,*cis*-2,*trans*-4-Trimethylcyclohexane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
129	1,*trans*-2,*cis*-4-Trimethylcyclohexane	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
130	1,*trans*-2,*trans*-4-Trimethylcyclohexane	...	47	...	77	77	77	...	...	...	...	...	...	...	88	...
133	*n*-Butylcyclohexane	...	...	...	77	77	77	35	...	...	79	35	...	...	32, 42	...
134	Isobutylcyclohexane	3	...	81	77	77	77	...	3	3	79	47	47, 80	...	28	...
135	*sec*-Butylcyclohexane	3	...	3	77	77	77	...	3	3	79	47	47, 80	...	...	...
136	*tert*-Butylcyclohexane	3	...	3	77	77	77	...	3	3	79	47	47, 80	...	28	...
137	1-Methyl-4-isopropylcyclohexane	3	47	3	77	77	77	...	...	...	79	47	47, 80	...	28	...
138	Cycloheptane	...	36	...	...	...	...	36	...	...	79	...	...	...	...	...
139	Ethylcycloheptane	28	47	...	77	77	77	...	28	...	79	...	47, 80	...	...	...
140	Cyclooctane	...	39	...	...	...	...	36	...	...	79	47	47, 80	...	...	...
141	Methylcyclooctane	28	47	...	77	77	77	...	28	...	79	47	47, 80	...	...	...
142	Cyclononane	...	47	...	...	...	...	...	...	...	79	...	...	...	...	...
143	Cyclodecane	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
144	*cis*-Decahydronaphthalene	...	...	...	...	...	...	61	...	...	...	...	...	...	32	...
145	*trans*-Decahydronaphthalene	...	...	...	...	...	...	61	...	...	...	...	...	...	32	...
1C1.3	**Monoolefins and Diolefins:**															
1	Ethene (ethylene)	...	...	...	...	...	...	...	...	...	...	...	26	...	29	...
2	Propene (propylene)	...	48	...	...	...	...	...	...	...	...	...	26	...	29	...
3	1-Butene	...	...	69	...	...	...	...	...	...	...	...	...	26	...	29
4	*cis*-2-Butene	...	...	48	...	...	...	...	...	...	...	...	...	...	...	29
5	*trans*-2-Butene	...	...	48	...	...	...	...	...	...	...	...	...	...	...	29
6	2-Methylpropene (isobutene)	...	...	48	...	...	...	...	...	...	...	...	...	...	57	29
7	1-Pentene	...	...	...	...	...	...	...	...	...	...	...	...	26	32	29
8	*cis*-2-Pentene	...	...	...	...	...	...	...	...	...	...	...	...	...	28, 32, 96	73
9	*trans*-2-Pentene	...	...	...	...	...	...	...	...	...	...	...	...	...	28, 32, 96	73
10	2-Methyl-1-butene	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29
11	3-Methyl-1-butene	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29
12	2-Methyl-2-butene	...	...	...	...	...	...	...	...	...	...	...	...	...	12, 32, 41, 53	29
13	1-Hexene	...	...	...	...	...	...	60	...	...	...	...	...	...	32	...
14	*cis*-2-Hexene	...	...	...	8	8	8	...	...	...	...	...	...	...	32	...
15	*trans*-2-Hexene	...	...	...	8	8	8	...	...	...	...	...	...	...	32	...
16	*cis*-3-Hexene	...	...	...	8	8	8	...	...	...	...	...	...	...	28	...
17	*trans*-3-Hexene	...	...	...	8	8	8	...	...	...	...	...	...	...	28	...
21	2-Methyl-2-pentene	...	...	...	8	8	8	...	...	...	...	...	...	...	...	...
22	3-Methyl-*cis*-2-pentene	...	...	...	8	8	8	...	...	...	...	...	...	...	...	...
23	3-Methyl-*trans*-2-pentene	...	...	...	8	8	8	...	...	...	...	...	...	...	...	...
27	2,3-Dimethyl-1-butene	...	...	...	8	8	8	...	...	...	...	...	...	...	...	...
28	3,3-Dimethyl-1-butene	...	...	...	8	8	8	...	...	...	...	...	...	...	...	...
29	2,3-Dimethyl-2-butene	...	...	...	8	8	8	...	...	...	...	...	...	...	...	...
30	1-Heptene	...	...	...	...	...	...	60	...	...	...	...	74	...	32	...
33	*cis*-3-Heptene	...	...	...	...	...	...	...	...	...	...	...	...	...	28	...
34	*trans*-3-Heptene	...	...	...	...	...	...	...	...	...	...	...	...	...	28	...
48	3-Methyl-*cis*-3-hexene	...	...	...	...	...	...	...	...	...	...	...	74	...	...	...
49	3-Methyl-*trans*-3-hexene	...	...	...	...	...	...	...	...	...	...	...	74	...	...	...
53	2,4-Dimethyl-1-pentene	...	...	...	...	...	...	...	...	...	...	...	74	...	...	...
56	4,4-Dimethyl-1-pentene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
58	2,3-Dimethyl-2-pentene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
65	2,3,3-Trimethyl-1-butene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	19	...
66	1-Octene	...	...	...	...	...	...	60	...	...	...	...	74	...	...	...
67	*cis*-2-Octene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
68	*trans*-2-Octene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
70	*trans*-3-Octene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
71	*cis*-4-Octene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
72	*trans*-4-Octene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
73	2-Methyl-1-heptene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
113	2,3-Dimethyl-2-hexene	...	...	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
127	2,2-Dimethyl-*cis*-3-hexene	...	...	...	...	...	...	...	...	...	...	...	74	...	...	...

KEY TO REFERENCES—Continued

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					Pressure	Temperature	Volume									
1C1.3	**Monoolefins and Diolefins**—Continued:															
128	2,2-Dimethyl-*trans*-3-hexene	...	...	...	...	...	...	...	...	...	...	...	74	...	...	...
141	2-Methyl-3-ethyl-1-pentene	...	...	...	...	...	...	...	...	...	...	...	74	...	...	...
144	2,3,3-Trimethyl-1-pentene	...	...	...	8	8	8	...	...	...	...	...	...	...	...	...
146	2,4,4-Trimethyl-1-pentene	...	...	...	8	8	8	...	...	...	...	...	...	...	...	...
153	2,4,4-Trimethyl-2-pentene	...	...	...	8	8	8	...	...	...	...	...	...	...	53	...
158	1-Nonene	...	...	...	...	...	...	...	...	...	...	...	...	...	32	...
160	2,3-Dimethyl-2-heptene	...	47	...	8	8	8	...	...	...	79	...	47, 80	...	...	...
161	1-Decene	...	...	...	...	...	...	...	...	...	...	...	...	...	28	...
163	Propadiene (allene)	...	47	...	...	...	...	...	...	...	...	47	2, 47	...	29	...
164	1,2-Butadiene	...	47	...	...	...	...	...	...	...	...	47	...	...	56	...
165	1,3-Butadiene	...	47	...	...	...	...	...	...	...	...	47	...	...	73	...
166	1,2-Pentadiene	...	...	...	...	...	...	...	...	...	...	47	39	...	56	...
167	1,*cis*-3-Pentadiene	...	...	...	...	...	...	...	...	...	...	47	39	...	56	...
168	1,*trans*-3-Pentadiene	...	...	...	...	...	...	...	...	...	...	47	39	...	56	...
169	1,4-Pentadiene	...	...	...	...	...	...	...	...	...	...	47	39	...	56	...
170	2,3-Pentadiene	...	...	...	...	...	...	...	...	...	...	47	39	...	56	...
171	3-Methyl-1,2-butadiene	70	...	...	...	...	...	...	...	...	...	47	39	...	56	...
172	2-Methyl-1,3-butadiene (isoprene)	...	...	...	...	...	...	...	...	...	...	47	39	...	56	...
174	1,*cis*-3-Hexadiene	5	...	...	...	...	...	...	5	5	...	...	...	...	...	...
175	1,*trans*-3-Hexadiene	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
176	1,*cis*-4-Hexadiene	5	...	...	...	...	...	...	...	5	...	...	...	...	...	...
177	1,*trans*-4-Hexadiene	5	...	5	...	...	...	...	...	5	...	...	...	...	...	...
178	1,5-Hexadiene	...	47	...	8	8	8	...	...	...	79	47	47, 80	...	...	...
180	*cis*-2,*cis*-4-Hexadiene	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
181	*cis*-2,*trans*-4-Hexadiene	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
182	*trans*-2,*trans*-4-Hexadiene	5	...	5	...	...	...	...	5	5	...	...	...	...	...	...
186	2-Methyl-1,*trans*-2-pentadiene	6	...	6	...	...	...	...	...	5, 6	...	...	...	...	...	...
189	4-Methyl-1,3-pentadiene	5	47	5	8	8	8	...	...	5	79	47	47, 80	...	...	...
194	2,3-Dimethyl-1,3-butadiene	...	47	...	8	8	8	...	...	...	79	47	47, 80	...	...	...
195	2-Methyl-1,5-hexadiene	28	47	28	8	8	8	...	...	...	79	47	47, 80	...	...	...
196	2-Methyl-2,4-hexadiene	28	47	28	8	8	8	...	...	...	79	47	47, 80	...	...	...
197	2,4-Dimethyl-1,3-pentadiene	28	47	28	8	8	8	...	...	...	79	47	47, 80	...	...	...
198	2,6-Octadiene	28	47	28	8	8	8	...	...	...	79	47	47, 80	...	...	...
199	3-Methyl-1,5-heptadiene	28	47	28	8	8	8	...	...	...	79	47	47, 80	...	...	...
200	2,5-Dimethyl-1,5-hexadiene	28	47	28	8	8	8	...	...	...	79	47	47, 80	...	...	...
201	2,5-Dimethyl-2,4-hexadiene	28	47	28	8	8	8	...	...	...	79	47	47, 80	...	...	...
202	2,6-Dimethyl-1,5-heptadiene	28	47	28	8	8	8	...	28, 40	...	79	47	47, 80	...	...	...
203	2-Methyl-3-ethyl-1,5-hexadiene	28	47	28	8	8	8	...	28, 40	...	79	47	47, 80	...	...	...
204	3,7-Dimethyl-1,6-octadiene	28	47	28	8	8	8	...	28, 40	...	79	47	47, 80	...	...	...
1C1.4	**Cycloolefins:**															
1	Cyclopentene	...	...	...	...	...	...	...	...	...	...	...	...	...	32, 42	56
2	1-Methylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	44	...	32, 42	...
3	3-Methylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
4	4-Methylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
5	1-Ethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	32, 42	...
6	3-Ethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
7	4-Ethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
8	1,2-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
9	1,3-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
10	1,4-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
11	1,5-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
12	3,3-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
13	3,*cis*-4-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
14	3,*trans*-4-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
15	3,*cis*-5-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
16	3,-*trans*-5-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
17	4,4-Dimethylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
18	1-*n*-Propylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	32, 42	...
19	1-*n*-Butylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	32, 42	...
20	1-*n*-Pentylcyclopentene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
21	Cyclohexene	...	...	...	...	...	...	76	...	...	...	...	44	...	32, 41, 53	...
22	1-Methylcyclohexene	...	...	...	...	...	...	76	...	...	...	16	...	...	...	...
23	3-Methylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...

KEY TO REFERENCES—Continued

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					Pressure	Temperature	Volume									
1C1.4	**Cycloolefins**—Continued:															
24	4-Methylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
25	1-Ethylcyclohexene	...	...	...	...	...	...	76	...	...	...	16	...	...	...	...
26	3-Ethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
27	4-Ethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
28	1,2-Dimethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
29	1,3-Dimethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
30	1,4-Dimethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
31	1,5-Dimethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
32	1,6-Dimethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
33	3,3-Dimethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
34	4,4-Dimethylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
35	1-*n*-Propylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
36	1-*n*-Butylcyclohexene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
37	4-Vinylcyclohexene	71	71	71	...	...	...	76	71	71	...	...	...	...	...	...
38	1,5-Cyclooctadiene	71	71	71	...	...	...	...	71	71	...	...	...	...	...	...
1C1.5	**Acetylenes:**															
1	Ethyne (acetylene)	...	...	...	...	...	...	...	28, 40	...	...	...	...	26	...	27
2	Propyne (methylacetylene)	...	...	...	...	...	8	...	28, 40	...	...	47	...	...	...	29
3	1-Butyne (ethylacetylene)	...	47	...	8	...	8	...	...	...	...	47	...	...	...	29
4	2-Butyne (dimethylacetylene)	...	...	...	8	...	8	...	...	...	...	47	...	...	...	56
5	1-Pentyne	...	...	...	8	...	8	76	...	...	...	47	...	...	...	56
6	2-Pentyne	...	...	...	8	8	8	76	...	...	...	47	...	...	...	56
7	3-Methyl-1-butyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	56
8	1-Hexyne	...	47	...	8	8	8	76	...	...	...	47	2, 47	...	...	...
9	2-Hexyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
10	3-Hexyne	...	47	...	8	8	8	76	...	...	79	47	47, 80	...	...	...
11	3-Methyl-1-pentyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
12	4-Methyl-1-pentyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
13	4-Methyl-2-pentyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
14	3,3-Dimethyl-1-butyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
15	1-Heptyne	...	47	...	8	8	8	76	...	...	...	47	47, 80	...	...	...
16	2-Heptyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
17	3-Heptyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
18	3-Methyl-1-hexyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
19	4-Methyl-1-hexyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
20	5-Methyl-1-hexyne	...	47	...	8	8	8	76	...	...	79	47	47, 80	...	...	...
21	4-Methyl-2-hexyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
22	5-Methyl-2-hexyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
23	2-Methyl-3-hexyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
24	3-Ethyl-1-pentyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
25	3,3-Dimethyl-1-pentyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
26	3,4-Dimethyl-1-pentyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
27	4,4-Dimethyl-1-pentyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
28	4,4-Dimethyl-2-pentyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
29	1-Octyne	...	47	...	8	8	8	76	...	...	79	...	47, 80	...	...	...
30	2-Octyne	...	47	52	8	8	8	76	...	...	79	47	47, 80	...	...	...
31	3-Octyne	...	47	...	8	8	8	76	...	...	79	47	47, 80	...	...	...
32	4-Octyne	28	47	52	8	8	8	76	28	31, 52	...	47	2, 47	...	...	...
33	1-Nonyne	...	47	...	8	8	8	76	...	...	...	47	2, 47	...	...	...
34	2-Nonyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
35	3-Nonyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
36	1-Decyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
37	2-Decyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
38	3-Decyne	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
1C1.6	**Alkylbenzenes, Naphthalene, Indans, and Tetrahydronaphthalene:**															
1	Benzene	...	...	...	...	...	...	...	...	...	7	...	...	93	12, 42	...
2	Methylbenzene (toluene)	...	...	...	...	...	...	75	...	...	75	...	...	93	42	...
3	Ethylbenzene	...	...	...	...	...	...	...	...	...	...	...	...	93	42	...
4	1,2-Dimethylbenzene (*o*-xylene)	...	...	...	...	...	...	...	...	...	...	...	...	93	12	...
5	1,3-Dimethylbenzene (*m*-xylene)	...	...	...	...	...	...	...	...	...	...	...	...	93	28	...
6	1,4-Dimethylbenzene (*p*-xylene)	7	...	...	...	...	...	...	...	...	...	...	...	93	28	...
7	*n*-Propylbenzene	...	...	...	...	...	...	64	...	...	...	...	...	...	34, 42	...
8	Isopropylbenzene (cumene)	...	...	...	...	...	...	76	...	...	...	...	...	93	12	...
9	1-Methyl-2-ethylbenzene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
10	1-Methyl-3-ethylbenzene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...

KEY TO REFERENCES—Continued

No.	Compound	Boiling Point	Vapor Pressure	Freezing Point	Critical Constants			Heat Capacity, Liquid	Density, Liquid	Refractive Index, Liquid	Heat Capacity, Ideal Gas	Heat of Vaporization at Normal Boiling Point	Heat of Combustion, Liquid	Flammability Limits (Measured)	Aniline Point or Critical Solution Temperature	Compressibility Factor
					Pressure	Temperature	Volume									
1C1.6	**Alkylbenzenes, Naphthalene, Indans, and Tetrahydronaphthalene**—Continued:															
11	1-Methyl-4-ethylbenzene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
12	1,2,3-Trimethylbenzene	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	1,2,4-Trimethylbenzene	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	1,3,5-Trimethylbenzene	...	...	...	...	...	...	...	...	...	...	...	...	...	42	...
15	*n*-Butylbenzene (1-phenylbutane)	...	...	...	...	...	...	64	...	...	...	...	...	26	34, 42	...
16	Isobutylbenzene (1-phenyl-2-methylpropane)	...	...	...	...	...	77	76	...	...	76	...	47, 80	...	...	...
17	*sec*-Butylbenzene (2-phenylbutane)	...	...	...	77	77	77	76	...	...	76	...	47, 80	...	...	...
18	*tert*-Butylbenzene (2-phenyl-2-methylpropane)	...	...	...	77	77	77	76	...	...	76	...	47, 80	...	...	...
19	1-Methyl-2-propylbenzene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
20	1-Methyl-3-propylbenzene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
21	1-Metbyl-4-propylbenzene	...	...	...	...	...	...	76	...	...	...	...	...	...	...	...
22	1-Methyl-2-isopropylbenzene (*o*-cymene)	...	...	...	28	77	77	76	...	...	76	...	47, 80	...	...	...
23	1-Methyl-3-isopropylbenzene (*m*-cymene)	...	...	...	77	77	77	76	...	...	76	...	47, 80	...	...	...
24	1-Methyl-4-isopropylbenzene (*p*-cymene)	...	...	...	...	77	...	...	...	...	76	...	47, 80	...	...	...
36	1,2,4,5-Tetramethylbenzene (durene)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	Naphthalene	...	...	...	...	...	...	61	...	...	...	...	...	...	...	...
43	1,2,3,4-Tetrahydronaphthalene	...	...	...	...	...	...	61	...	...	...	...	...	...	...	...
1C1.7	**Styrenes and Indenes:**															
1	Ethenylbenzene (styrene; vinylbenzene; phenylethylene)	...	47	...	77	77	77	...	...	...	...	28	...	26	...	...
2	Isopropenylbenzene (α-methylstyrene; 2-Phenyl-1-propene)	...	47	...	77	77	77	76	...	...	...	28	2, 47	...	...	...
3	*cis*-1-Propenylbenzene (*cis*-β-methylstyrene; *cis*-1-Phenyl-1-propene)	...	47	...	77	77	77	76	...	...	...	28	2, 47	...	...	...
4	*trans*-1-Propenylbenzene (*trans*-β-methylstyrene; *trans*-1-Phenyl-1-propene)	...	47	...	77	...	...	76	...	...	...	28	2, 47	...	...	...
5	1-Methyl-2-ethenylbenzene (*o*-methylstyrene)	...	47	...	77	77	77	76	...	...	...	28	2, 47	...	...	...
6	1-Methyl-3-ethenylbenzene (*m*-methylstyrene)	...	47	...	77	77	77	76	...	...	...	28	2, 47	...	...	...
7	1-Methenyl-4-ethenylbenzene (*p*-methylstyrene)	...	47	...	77	77	77	76	...	...	...	28	2, 47	...	...	...
32	Phenylacetylene	28	47	28	77	77	77	...	28	28	79	28	47, 80	...	...	...

V. REFERENCES

(1) Ambrose, D., Cox, J. D., Townsend, R., *Trans. Faraday Soc.* **56** 1452 (1960).

(2) API Research Project 44, *Selected Values of Properties of Hydrocarbons and Related Compounds*, Thermodynamics Research Ctr. Texas A&M Univ. (loose-leaf data sheets, extant, 1969).

(3) API Research Project 45, *Cumulative Tabulation of Freezing Points, Boiling Points, Refractive Indices and Densities*, Ohio State Research Found., June 30 (1948).

(4) API Research Project 45, *Knocking Characteristics of Pure Hydrocarbons*, ASTM STP No. 225, Am. Soc. Testing Mater. (1958).

(5) API Research Project 58A, Annual Reports.

(6) API Research Project 58B, Annual Reports.

(7) API Research Project 62, Annual Reports.

(8) Barkelew, C. H., Hurd, C. O., "Estimation of Critical Properties of Pure Compounds," Shell Development Co., private communication (1949).

(9) Barrow, G. M., *J. Am. Chem. Soc.* **73** 1824 (1951).

(10) Benson, S. W., Cruickshank, F. R., Golden, D. M., Haugen, G. R., O'Neal, H. E., Rodgers, A. S., Shaw, R., Walsh, R., *Chem. Rev.* **69** 279 (1969).

(11) Bonauguri, E., *Riv. Combust.* **7** 699 (1953).

(12) Brame, J. S. S., Hunter, T. G., *J. Inst. Petrol. (London)* **13** 794 (1927).

(13) Sliwinski, P., *Z. Physik. Chem. (Frankfurt)* **63** 263 (1969).

(14) Buchner, E. H., Kleyn, D., *Rec. Trav. Chim.* **43** 154 (1924).

(15) Calingaert, G., Soroos, H., *J. Am. Chem. Soc.* **58** 636 (1936).
(16) Camin, D. L., Rossini, F. D., *J. Chem. Eng. Data* **5** 368 (1960).
(17) Chavanne, G., *Bull. Soc. Chim. Belges.* **39** 402 (1930).
(18) Chavanne, G., Becker, P., *Bull. Soc. Chim. Belges.* **36** 591 (1927).
(19) Chavanne, G., Lejeune, B., *Bull. Soc. Chim. Belges.* **31** 98 (1922).
(20) Chavanne, G., Miller, O., *Bull. Soc. Chim. Belges.* **39** 287 (1930).
(21) Chavanne, G., Simon, L. J., *Compt. Rend.* **168** 1111, 1324 (1919).
(22) Chiurdoglu, G., *Bull. Soc. Chim. Belges.* **41** 152 (1932).
(23) Chiurdoglu, G., *Bull. Soc. Chim. Belges.* **42** 347 (1933).
(24) Chiurdoglu, G., *Bull. Soc. Chim. Belges.* **43** 35 (1934).
(25) Chiurdoglu, G., *Bull. Soc. Chim. Belges.* **53** 45 (1944).
(26) Coward, H. F., Jones, G. W., *U.S. Bur. Mines Bull. No. 503*, 155 (1952).
(27) Din, F., *Thermodynamic Functions of Gases*, **2** Butterworth Scientific Publishers, London (1956).
(28) Doss, M. P., *Physical Constants of the Principal Hydrocarbons*, fourth edn., The Texas Co. (1943).
(29) Dymond, J. H., Smith, E. B., *The Virial Coefficients of Gases*, Clarendon Press, Oxford (1969).
(30) Edgar, G., Calingaert, G., *J. Am. Chem. Soc.* **51** 1544 (1929).
(31) Egloff, G., *Physical Constants of Hydrocarbon*, **1** Reinhold Publishing Corp., New York, N. Y. (1939).
(32) Evans, E. B., *J. Inst. Petrol. (London)* **23** 220 (1937).
(33) Evans, E. B., *J. Inst. Petrol. (London)* **24** 321 (1938).
(34) Evans, E. B., *J. Inst. Petrol. (London)* **24** 537 (1938).
(35) Finke, H. L., Messerly, J. F., Todd, S. S., *J. Phys. Chem.* **69** 2094 (1965).
(36) Finke, H. L., Scott, D. W., Gross, M. E., Messerly, J. F., Waddington, G., *J. Am. Chem. Soc.* **78** 5469 (1956).
(37) Fischer, R., Neupaur, E., *Mikrochem. Ver. Mikrochim. Acta* **34** 319 (1949).
(38) Francis, A. W., *Ind. Eng. Chem.* **33** 554 (1941).
(39) Fraser, F. M., Prosen, E. J., *J. Res. Natl. Bur. Std.* **54** 143 (1955).
(40) Gamson, B. W., Watson, K. M., *Petrol. Process*, May (1944).
(41) Garner, F. H., *J. Inst. Petrol. (London)* **14** 713 (1928).
(42) Garner, F. H., Evans, J. B., *J. Inst. Petrol (London)* **18** 751 (1932).
(43) Glasgow, Jr., A. R., *J. Res. Natl. Bur. Std.* **24** 509 (1940).
(44) Good, W. D., Smith, N. K., *J. Chem. Eng. Data* **14** 102 (1969).
(45) Good, W. D., *J. Chem. Eng. Data* **14** 231 (1969).
(46) Good, W. D., *J. Chem. Eng. Data* **14** 480 (1969).
(47) Gordon, D. H., *Ind. Eng. Chem.* **35** 851 (1943).
(48) Griswold, J., Brooks, W. B., *Hydrocarbon Process. Petrol: Refiner* **26**, 818 (1947).
(49) Gross, M. E., Oliver, G. D., Huffman, H. M., *J. Am. Chem. Soc.* **75** 2801 (1953).
(50) Hachmuth, K., Hanson, G. H., *Trans. AIChE* **42** 975 (1946).
(51) Hanson, G. H., *Trans. AIChE* **42** 959 (1946).
(52) Henne, A. L., Greenlee, K. W., *J. Am. Chem. Soc.* **67** 484 (1945).
(53) Howes, D. A., *J. Inst. Petrol. (London)* **19** 301 (1933).
(54) Huffman, H. M., Gross, M. E., Scott, D. W., McCullough, J. P., *J. Phys. Chem.* **65** 495 (1961).
(55) Jones, G. W., *Chem. Rev.* **22** 1 (1938).
(56) Kreglewski, A., *J. Phys. Chem.* **73** 608 (1969).
(57) Ludeman, C. G., *Ind. Eng. Chem.*, Anal. Edn. **12** 446 (1940).
(58) Maman, A., *Compt. Rend.* **205** 320 (1937).
(59) Miller, O., *Bull. Soc. Chim. Belges.* **44** 513 (1935).
(60) McCullough, J. P., Finke, H. L., Gross, M. E., Messerly, J. F., Waddington, G., *J. Phys. Chem.* **61** 289 (1957).
(61) McCullough, J. P., Finke, H. L., Messerly, J. F., Todd, S. S., Kincheloe, T. C., Waddington, G., *J. Phys. Chem.* **61** 1105 (1957).
(62) McDowell, R. S., Kruse, F. H., *J. Chem. Eng. Data* **8** 547 (1963).
(63) Messerly, J. F., Todd, S. S., Finke, H. L., *J. Phys. Chem.* **69** 353 (1965).
(64) Messerly, J. F., Todd, S. S., Finke, H. L., *J. Phys. Chem.* **69** 4304 (1965).
(65) Messerly, J. F., Guthrie, G. B., Todd, S. S., Finke, H. L., *J. Chem. Eng. Data* **12** 338 (1967).
(66) *Metrol. Apl. (Bucharest)* **5** 35 (1969).
(67) Natl. Fire Protection Assoc., *Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids*, May (1960).
(68) Natural Gasoline Supply Men's Assoc., *Enginecring Data Book* (1957).
(69) Olds, R. H., Sage, B. H., Lacey, W. N., *Ind. Eng. Chem.* **38** 301 (1946).
(70) Osborn, A. G., Douslin, D. R., *J. Chem. Eng. Data* **14** 208 (1969).
(71) Phillips Petroleum Co., *Bull. No. 518: Phillips 66 Hydrocarbons and Petro-Sulfur Compounds*, fifth edn. (1958).
(72) Pilcher, G., Chadwick, J. D. M., *Trans. Faraday Soc.* **63** 2357 (1967).
(73) Pitzer, K. S., Curl, Jr., R. F., *J. Am. Chem. Soc.* **79** 2369 (1959).
(74) Rockenfeller, J. D., Rossini, F. D., *J. Phys. Chem.* **65** 267 (1961).
(75) Scott, D. W., Guthrie, G. B., Messerly, J. F., Todd, S. S., Berg, W. T., Hossenlopp, I. A., McCullough, J. P., *J. Phys. Chem.* **66** 911 (1962).
(76) Shaw, R., *J. Chem. Eng. Data* **14** 461 (1969).
(77) Shell Development Co., "Correlation of Critical Properties," unpublished data.
(78) Shepard, A. F., Henne, A. L., Midgley, Jr., T., *J. Am. Chem. Soc.* **53** 1948 (1931).
(79) Souders, M., Matthews, C. S., Hurd, C. O., *Ind. Eng. Chem.* **41** 1037 (1949).
(80) Souders, M., Matthews, C. S., Hurd, C. O., *Ind. Eng. Chem.* **41** 1048 (1949).
(81) Streiff, A. J., Rossini, F. D., *et al.*, *J. Res. Natl. Bur. Std.* **39** 321 (1947).
(82) Timmermans, J., Martin, F., *J. Chim. Phys.* **23** 747 (1926).
(83) Todd, S. S., Oliver, G. D., Huffman, H. M., *J. Am. Chem. Soc.* **69** 1519 (1947).
(84) Waddington, G., Todd, S. S., Huffman, H. M., *J. Am. Chem. Soc.* **69** 22 (1947).
(85) Waddington, G., Douslin, D. R., *J. Am. Chem. Soc.* **69** 2275 (1947).
(86) Waddington, G., Smith, J. C., Scott, D. W., Huffman, H. M., *J. Am. Chem. Soc.* **71** 3902 (1949).
(87) White, J. D., Glasgow, Jr., A. R., *J. Res. Natl. Bur. Std.* **19** 423 (1937).
(88) White, J. D., Glasgow, Jr., A. R., *J. Res. Natl. Bur. Std.* **22** 137 (1939).
(89) White, J. D., Rose, Jr., F. W., Calingaert, G., Soroos, H., *J. Res. Natl. Bur. Std.* **22** 315 (1939).
(90) Wibaut, J. P., *Rec. Trav. Chim.* **58** 329 (1939).
(91) Zabetakis, M. G., U.S. Bur. Mines, Pittsburgh, Pa., unpublished data (1960).
(92) Zabetakis, M. G., Jones, G. W., Scott, G. S., Furno, A. L., *Tech. Rept. No. 52/35 Suppl. 4*, Wright Air Develop. Ctr. (1956).
(93) Zabetakis, M. G., Scott, G. S., Jones, G. W., *U. S. Bur. Mines Rept. Invest. No. 4824* (1951).
(94) Zabetakis, M. G., Scott, G. S., Jones, G. W., *Ind. Eng. Chem.* **43** 2120 (1951).
(95) Pure Appl. Chem. **20** [4] (1969).
(96) Phillips Petroleum Co., *Bull. No. 96: Phillips Hydrocarbons* (1942).
(97) Miller, O., *Bull. Soc. Chim. Belges.* **41** 217 (1932).