CRITICAL CONSTANTS

ADDITIONAL REFERENCES

Other data and estimation techniques for the elements are contained in Gates and Thodos, *Am. Inst. Chem. Eng. J.*, **6** (1960):50–54; and Ohse and von Tippelskirch, *High Temperatures—High Pressures*, **9** (1977):367–385. For inorganic substances see Mathews, *Chem. Rev.*, **72** (1972):71–100; for organics see Kudchaker, Alani, and Zwolinski, *Chem. Rev.*, **68** (1968):659–735; and for fluorocarbons see *Advances in Fluorine Chemistry*, App. B, Butterworth. Washington, 1963, pp. 173–175. Pages 6–49 and 6–50 of the 84th edition of the *Handbook of Chemistry and Physics* provide an excellent list of references for critical properties.

TABLE 2-141 Critical Constants and Acentric Factors of Inorganic and Organic Compounds

Cmpd. no.	Name	Formula	CAS no.	Mol. wt.	T_c, K	P_c, MPa	V_c, m^3/kmol	Z_c	Acentric factor
1	Acetaldehyde	C_2H_4O	75-07-0	44.053	466	5.55	0.154	0.221	0.2907
2	Acetamide	C_2H_5NO	60-35-5	59.067	761	6.6	0.215	0.224	0.4210
3	Acetic acid	$C_2H_4O_2$	64-19-7	60.052	591.95	5.786	0.177	0.208	0.4665
4	Acetic anhydride	$C_4H_6O_3$	108-24-7	102.089	606	4	0.29	0.23	0.4535
5	Acetone	C_3H_6O	67-64-1	58.079	508.2	4.701	0.209	0.233	0.3065
6	Acetonitrile	C_2H_3N	75-05-8	41.052	545.5	4.83	0.173	0.184	0.3379
7	Acetylene	C_2H_2	74-86-2	26.037	308.3	6.138	0.112	0.268	0.1912
8	Acrolein	C_3H_4O	107-02-8	56.063	506	5	0.197	0.234	0.3198
9	Acrylic acid	$C_3H_4O_2$	79-10-7	72.063	615	5.66	0.208	0.23	0.5383
10	Acrylonitrile	C_3H_3N	107-13-1	53.063	535	4.48	0.212	0.214	0.3498
11	Air	Mixture	132259-10-0	28.960	132.45	3.774	0.09147	0.313	
12	Ammonia	H_3N	7664-41-7	17.031	405.65	11.28	0.07247	0.242	0.2526
13	Anisole	C_7H_8O	100-66-3	108.138	645.6	4.25	0.337	0.267	0.3502
14	Argon	Ar	7440-37-1	39.948	150.86	4.898	0.07459	0.291	0.0000
15	Benzamide	C_7H_7NO	55-21-0	121.137	824	5.05	0.346	0.255	0.5585
16	Benzene	C_6H_6	71-43-2	78.112	562.05	4.895	0.256	0.268	0.2103
17	Benzenethiol	C_6H_6S	108-98-5	110.177	689	4.74	0.315	0.261	0.2628
18	Benzoic acid	$C_7H_6O_2$	65-85-0	122.121	751	4.47	0.344	0.246	0.6028
19	Benzonitrile	C_7H_5N	100-47-0	103.121	699.35	4.215	0.3132	0.227	0.3662
20	Benzophenone	$C_{13}H_{10}O$	119-61-9	182.218	830	3.352	0.5677	0.276	0.5019
21	Benzyl alcohol	C_7H_8O	100-51-6	108.138	720.15	4.374	0.382	0.279	0.3631
22	Benzyl ethyl ether	$C_9H_{12}O$	539-30-0	136.191	662	3.11	0.442	0.25	0.4332
23	Benzyl mercaptan	C_7H_8S	100-53-8	124.203	718	4.06	0.367	0.25	0.3126
24	Biphenyl	$C_{12}H_{10}$	92-52-4	154.208	773	3.38	0.497	0.261	0.4029
25	Bromine	Br_2	7726-95-6	159.808	584.15	10.3	0.135	0.286	0.1290
26	Bromobenzene	C_6H_5Br	108-86-1	157.008	670.15	4.519	0.324	0.263	0.2506
27	Bromoethane	C_2H_5Br	74-96-4	108.965	503.8	6.23	0.215	0.32	0.2548
28	Bromomethane	CH_3Br	74-83-9	94.939	467	8	0.156	0.321	0.1922
29	1,2-Butadiene	C_4H_6	590-19-2	54.090	452	4.36	0.22	0.255	0.1659
30	1,3-Butadiene	C_4H_6	106-99-0	54.090	425	4.32	0.221	0.27	0.1950
31	Butane	C_4H_{10}	106-97-8	58.122	425.12	3.796	0.255	0.274	0.2002
32	1,2-Butanediol	$C_4H_{10}O_2$	584-03-2	90.121	680	5.21	0.303	0.279	0.6305
33	1,3-Butanediol	$C_4H_{10}O_2$	107-88-0	90.121	676	4.02	0.305	0.218	0.7043
34	1-Butanol	$C_4H_{10}O$	71-36-3	74.122	563.1	4.414	0.273	0.258	0.5883
35	2-Butanol	$C_4H_{10}O$	78-92-2	74.122	535.9	4.188	0.27	0.254	0.5692
36	1-Butene	C_4H_8	106-98-9	56.106	419.5	4.02	0.241	0.278	0.1845
37	*cis*-2-Butene	C_4H_8	590-18-1	56.106	435.5	4.21	0.234	0.272	0.2019
38	*trans*-2-Butene	C_4H_8	624-64-6	56.106	428.6	4.1	0.238	0.274	0.2176
39	Butyl acetate	$C_6H_{12}O_2$	123-86-4	116.158	575.4	3.09	0.389	0.251	0.4394
40	Butylbenzene	$C_{10}H_{14}$	104-51-8	134.218	660.5	2.89	0.497	0.262	0.3941
41	Butyl mercaptan	$C_4H_{10}S$	109-79-5	90.187	570.1	3.97	0.307	0.257	0.2714
42	*sec*-Butyl mercaptan	$C_4H_{10}S$	513-53-1	90.187	554	4.06	0.307	0.271	0.2506
43	1-Butyne	C_4H_6	107-00-6	54.090	440	4.6	0.208	0.262	0.2470
44	Butyraldehyde	C_4H_8O	123-72-8	72.106	537.2	4.32	0.258	0.25	0.2774
45	Butyric acid	$C_4H_8O_2$	107-92-6	88.105	615.7	4.06	0.293	0.232	0.6805
46	Butyronitrile	C_4H_7N	109-74-0	69.105	582.25	3.79	0.278	0.218	0.3714
47	Carbon dioxide	CO_2	124-38-9	44.010	304.21	7.383	0.094	0.274	0.2236
48	Carbon disulfide	CS_2	75-15-0	76.141	552	7.9	0.16	0.275	0.1107
49	Carbon monoxide	CO	630-08-0	28.010	132.92	3.499	0.0944	0.299	0.0482
50	Carbon tetrachloride	CCl_4	56-23-5	153.823	556.35	4.56	0.276	0.272	0.1926
51	Carbon tetrafluoride	CF_4	75-73-0	88.004	227.51	3.745	0.143	0.283	0.1790
52	Chlorine	Cl_2	7782-50-5	70.906	417.15	7.71	0.124	0.276	0.0688
53	Chlorobenzene	C_6H_5Cl	108-90-7	112.557	632.35	4.519	0.308	0.265	0.2499
54	Chloroethane	C_2H_5Cl	75-00-3	64.514	460.35	5.27	0.2	0.275	0.1902
55	Chloroform	$CHCl_3$	67-66-3	119.378	536.4	5.472	0.239	0.293	0.2219
56	Chloromethane	CH_3Cl	74-87-3	50.488	416.25	6.68	0.143	0.276	0.1531
57	1-Chloropropane	C_3H_7Cl	540-54-5	78.541	503.15	4.58	0.247	0.27	0.2277
58	2-Chloropropane	C_3H_7Cl	75-29-6	78.541	489	4.54	0.247	0.276	0.1986
59	*m*-Cresol	C_7H_8O	108-39-4	108.138	705.85	4.56	0.312	0.242	0.4480
60	*o*-Cresol	C_7H_8O	95-48-7	108.138	697.55	5.01	0.282	0.244	0.4339
61	*p*-Cresol	C_7H_8O	106-44-5	108.138	704.65	5.15	0.277	0.244	0.5072
62	Cumene	C_9H_{12}	98-82-8	120.192	631	3.209	0.434	0.265	0.3274
63	Cyanogen	C_2N_2	460-19-5	52.035	400.15	5.98	0.195	0.351	0.2790
64	Cyclobutane	C_4H_8	287-23-0	56.106	459.93	4.98	0.21	0.273	0.1847

TABLE 2-141 Critical Constants and Acentric Factors of Inorganic and Organic Compounds (*Continued*)

Cmpd. no.	Name	Formula	CAS no.	Mol. wt.	T_c, K	P_c, MPa	V_c, m^3/kmol	Z_c	Acentric factor
65	Cyclohexane	C_6H_{12}	110-82-7	84.159	553.8	4.08	0.308	0.273	0.2081
66	Cyclohexanol	$C_6H_{12}O$	108-93-0	100.159	650.1	4.26	0.322	0.254	0.3690
67	Cyclohexanone	$C_6H_{10}O$	108-94-1	98.143	653	4	0.311	0.229	0.2990
68	Cyclohexene	C_6H_{10}	110-83-8	82.144	560.4	4.35	0.291	0.272	0.2123
69	Cyclopentane	C_5H_{10}	287-92-3	70.133	511.7	4.51	0.26	0.276	0.1949
70	Cyclopentene	C_5H_8	142-29-0	68.117	507	4.8	0.245	0.279	0.1961
71	Cyclopropane	C_3H_6	75-19-4	42.080	398	5.54	0.162	0.271	0.1278
72	Cyclohexyl mercaptan	$C_6H_{12}S$	1569-69-3	116.224	664	3.97	0.355	0.255	0.2641
73	Decanal	$C_{10}H_{20}O$	112-31-2	156.265	674.2	2.6	0.58	0.269	0.5820
74	Decane	$C_{10}H_{22}$	124-18-5	142.282	617.7	2.11	0.617	0.254	0.4923
75	Decanoic acid	$C_{10}H_{20}O_2$	334-48-5	172.265	722.1	2.28	0.639	0.243	0.8126
76	1-Decanol	$C_{10}H_{22}O$	112-30-1	158.281	688	2.308	0.645	0.26	0.6070
77	1-Decene	$C_{10}H_{20}$	872-05-9	140.266	616.6	2.223	0.584	0.253	0.4805
78	Decyl mercaptan	$C_{10}H_{22}S$	143-10-2	174.347	696	2.13	0.624	0.23	0.5874
79	1-Decyne	$C_{10}H_{18}$	764-93-2	138.250	619.85	2.37	0.552	0.254	0.5178
80	Deuterium	D_2	7782-39-0	4.032	38.35	1.6617	0.060263	0.314	–0.1449
81	1,1-Dibromoethane	$C_2H_4Br_2$	557-91-5	187.861	628	6.03	0.276	0.319	0.1250
82	1,2-Dibromoethane	$C_2H_4Br_2$	106-93-4	187.861	650.15	5.477	0.2616	0.265	0.2067
83	Dibromomethane	CH_2Br_2	74-95-3	173.835	611	7.17	0.223	0.315	0.2095
84	Dibutyl ether	$C_8H_{18}O$	142-96-1	130.228	584.1	2.46	0.487	0.247	0.4476
85	*m*-Dichlorobenzene	$C_6H_4Cl_2$	541-73-1	147.002	683.95	4.07	0.351	0.251	0.2790
86	*o*-Dichlorobenzene	$C_6H_4Cl_2$	95-50-1	147.002	705	4.07	0.351	0.244	0.2192
87	*p*-Dichlorobenzene	$C_6H_4Cl_2$	106-46-7	147.002	684.75	4.07	0.351	0.251	0.2846
88	1,1-Dichloroethane	$C_2H_4Cl_2$	75-34-3	98.959	523	5.07	0.24	0.28	0.2339
89	1,2-Dichloroethane	$C_2H_4Cl_2$	107-06-2	98.959	561.6	5.37	0.22	0.253	0.2866
90	Dichloromethane	CH_2Cl_2	75-09-2	84.933	510	6.08	0.185	0.265	0.1986
91	1,1-Dichloropropane	$C_3H_6Cl_2$	78-99-9	112.986	560	4.24	0.291	0.265	0.2529
92	1,2-Dichloropropane	$C_3H_6Cl_2$	78-87-5	112.986	572	4.24	0.291	0.259	0.2564
93	Diethanol amine	$C_4H_{11}NO_2$	111-42-2	105.136	736.6	4.27	0.349	0.243	0.9529
94	Diethyl amine	$C_4H_{11}N$	109-89-7	73.137	496.6	3.71	0.301	0.27	0.3039
95	Diethyl ether	$C_4H_{10}O$	60-29-7	74.122	466.7	3.64	0.28	0.263	0.2811
96	Diethyl sulfide	$C_4H_{10}S$	352-93-2	90.187	557.15	3.96	0.318	0.272	0.2900
97	1,1-Difluoroethane	$C_2H_4F_2$	75-37-6	66.050	386.44	4.52	0.179	0.252	0.2751
98	1,2-Difluoroethane	$C_2H_4F_2$	624-72-6	66.050	445	4.34	0.195	0.229	0.2224
99	Difluoromethane	CH_2F_2	75-10-5	52.023	351.255	5.784	0.123	0.244	0.2771
100	Di-isopropyl amine	$C_6H_{15}N$	108-18-9	101.190	523.1	3.2	0.418	0.308	0.3883
101	Di-isopropyl ether	$C_6H_{14}O$	108-20-3	102.175	500.05	2.88	0.386	0.267	0.3387
102	Di-isopropyl ketone	$C_7H_{14}O$	565-80-0	114.185	576	3.02	0.416	0.262	0.4044
103	1,1-Dimethoxyethane	$C_4H_{10}O_2$	534-15-6	90.121	507.8	3.773	0.297	0.265	0.3277
104	1,2-Dimethoxypropane	$C_5H_{12}O_2$	7778-85-0	104.148	543	3.446	0.35	0.267	0.3522
105	Dimethyl acetylene	C_4H_6	503-17-3	54.090	473.2	4.87	0.221	0.274	0.2385
106	Dimethyl amine	C_2H_7N	124-40-3	45.084	437.2	5.34	0.18	0.264	0.2999
107	2,3-Dimethylbutane	C_6H_{14}	79-29-8	86.175	500	3.15	0.361	0.274	0.2493
108	1,1-Dimethylcyclohexane	C_8H_{16}	590-66-9	112.213	591.15	2.938	0.45	0.269	0.2326
109	*cis*-1,2-Dimethylcyclohexane	C_8H_{16}	2207-01-4	112.213	606.15	2.938	0.46	0.268	0.2324
110	*trans*-1,2-Dimethylcyclohexane	C_8H_{16}	6876-23-9	112.213	596.15	2.938	0.46	0.273	0.2379
111	Dimethyl disulfide	$C_2H_6S_2$	624-92-0	94.199	615	5.36	0.252	0.264	0.2059
112	Dimethyl ether	C_2H_6O	115-10-6	46.068	400.1	5.37	0.17	0.2744	0.2002
113	*N*,*N*-Dimethyl formamide	C_3H_7NO	68-12-2	73.094	649.6	4.42	0.26199	0.214	0.3177
114	2,3-Dimethylpentane	C_7H_{16}	565-59-3	100.202	537.3	2.91	0.393	0.256	0.2964
115	Dimethyl phthalate	$C_{10}H_{10}O_4$	131-11-3	194.184	766	2.78	0.53	0.231	0.6568
116	Dimethylsilane	C_2H_8Si	1111-74-6	60.170	402	3.56	0.258	0.275	0.1300
117	Dimethyl sulfide	C_2H_6S	75-18-3	62.134	503.04	5.53	0.201	0.266	0.1943
118	Dimethyl sulfoxide	C_2H_6OS	67-68-5	78.133	729	5.65	0.227	0.212	0.2806
119	Dimethyl terephthalate	$C_{10}H_{10}O_4$	120-61-6	194.184	772	2.78	0.529	0.229	0.6371
120	1,4-Dioxane	$C_4H_8O_2$	123-91-1	88.105	587	5.208	0.238	0.254	0.2793
121	Diphenyl ether	$C_{12}H_{10}O$	101-84-8	170.207	766.8	3.08	0.503	0.243	0.4389
122	Dipropyl amine	$C_6H_{15}N$	142-84-7	101.190	550	3.14	0.402	0.276	0.4497
123	Dodecane	$C_{12}H_{26}$	112-40-3	170.335	658	1.82	0.755	0.251	0.5764
124	Eicosane	$C_{20}H_{42}$	112-95-8	282.547	768	1.16	1.34	0.243	0.9069
125	Ethane	C_2H_6	74-84-0	30.069	305.32	4.872	0.1455	0.279	0.0995
126	Ethanol	C_2H_6O	64-17-5	46.068	514	6.137	0.168	0.241	0.6436
127	Ethyl acetate	$C_4H_8O_2$	141-78-6	88.105	523.3	3.88	0.286	0.255	0.3664
128	Ethyl amine	C_2H_7N	75-04-7	45.084	456.15	5.62	0.207	0.307	0.2848
129	Ethylbenzene	C_8H_{10}	100-41-4	106.165	617.15	3.609	0.374	0.263	0.3035
130	Ethyl benzoate	$C_9H_{10}O_2$	93-89-0	150.175	698	3.18	0.489	0.268	0.4771
131	2-Ethyl butanoic acid	$C_6H_{12}O_2$	88-09-5	116.158	655	3.41	0.389	0.244	0.6326
132	Ethyl butyrate	$C_6H_{12}O_2$	105-54-4	116.158	571	2.95	0.403	0.25	0.4011
133	Ethylcyclohexane	C_8H_{16}	1678-91-7	112.213	609.15	3.04	0.43	0.258	0.2455
134	Ethylcyclopentane	C_7H_{14}	1640-89-7	98.186	569.5	3.4	0.375	0.269	0.2701
135	Ethylene	C_2H_4	74-85-1	28.053	282.34	5.041	0.131	0.281	0.0862
136	Ethylenediamine	$C_2H_8N_2$	107-15-3	60.098	593	6.29	0.264	0.337	0.4724
137	Ethylene glycol	$C_2H_6O_2$	107-21-1	62.068	720	8.2	0.191	0.262	0.5068
138	Ethyleneimine	C_2H_5N	151-56-4	43.068	537	6.85	0.173	0.265	0.2007
139	Ethylene oxide	C_2H_4O	75-21-8	44.053	469.15	7.19	0.140296	0.25876	0.1974
140	Ethyl formate	$C_3H_6O_2$	109-94-4	74.079	508.4	4.74	0.229	0.257	0.2847

TABLE 2-141 Critical Constants and Acentric Factors of Inorganic and Organic Compounds (*Continued*)

Cmpd. no.	Name	Formula	CAS no.	Mol. wt.	T_c, K	P_c, MPa	V_c, m^3/kmol	Z_c	Acentric factor
141	2-Ethyl hexanoic acid	$C_8H_{16}O_2$	149-57-5	144.211	674.6	2.778	0.528	0.262	0.8067
142	Ethylhexyl ether	$C_8H_{18}O$	5756-43-4	130.228	583	2.46	0.487	0.247	0.4944
143	Ethylisopropyl ether	$C_5H_{12}O$	625-54-7	88.148	489	3.41	0.329	0.276	0.3056
144	Ethylisopropyl ketone	$C_6H_{12}O$	565-69-5	100.159	567	3.32	0.369	0.26	0.3891
145	Ethyl mercaptan	C_2H_6S	75-08-1	62.134	499.15	5.49	0.207	0.274	0.1878
146	Ethyl propionate	$C_5H_{10}O_2$	105-37-3	102.132	546	3.362	0.345	0.256	0.3944
147	Ethylpropyl ether	$C_5H_{12}O$	628-32-0	88.148	500.23	3.37	0.339	0.275	0.3473
148	Ethyltrichlorosilane	$C_2H_5Cl_3Si$	115-21-9	163.506	559.95	3.33	0.414	0.296	0.2691
149	Fluorine	F_2	7782-41-4	37.997	144.12	5.172	0.066547	0.287	0.0530
150	Fluorobenzene	C_6H_5F	462-06-6	96.102	560.09	4.551	0.269	0.263	0.2472
151	Fluoroethane	C_2H_5F	353-36-6	48.060	375.31	5.028	0.164	0.264	0.2200
152	Fluoromethane	CH_3F	593-53-3	34.033	317.42	5.875	0.113	0.252	0.1980
153	Formaldehyde	CH_2O	50-00-0	30.026	408	6.59	0.115	0.223	0.2818
154	Formamide	CH_3NO	75-12-7	45.041	771	7.8	0.163	0.198	0.4124
155	Formic acid	CH_2O_2	64-18-6	46.026	588	5.81	0.125	0.149	0.3173
156	Furan	C4H4O	110-00-9	68.074	490.15	5.5	0.218	0.294	0.2015
157	Helium-4	He	7440-59-7	4.003	5.2	0.2275	0.0573	0.302	–0.3900
158	Heptadecane	$C_{17}H_{36}$	629-78-7	240.468	736	1.34	1.11	0.244	0.7697
159	Heptanal	$C_7H_{14}O$	111-71-7	114.185	616.8	3.16	0.434	0.267	0.4279
160	Heptane	C_7H_{16}	142-82-5	100.202	540.2	2.74	0.428	0.261	0.3495
161	Heptanoic acid	$C_7H_{14}O_2$	111-14-8	130.185	677.3	3.043	0.466	0.252	0.7564
162	1-Heptanol	$C_7H_{16}O$	111-70-6	116.201	632.3	3.085	0.444	0.261	0.5621
163	2-Heptanol	$C_7H_{16}O$	543-49-7	116.201	608.3	3.001	0.447	0.265	0.5628
164	3-Heptanone	$C_7H_{14}O$	106-35-4	114.185	606.6	2.92	0.433	0.251	0.4076
165	2-Heptanone	$C_7H_{14}O$	110-43-0	114.185	611.4	2.94	0.434	0.251	0.4190
166	1-Heptene	C_7H_{14}	592-76-7	98.186	537.4	2.92	0.402	0.263	0.3432
167	Heptyl mercaptan	$C_7H_{16}S$	1639-09-4	132.267	645	2.77	0.465	0.24	0.4226
168	1-Heptyne	C_7H_{12}	628-71-7	96.170	547	3.21	0.387	0.273	0.3778
169	Hexadecane	$C_{16}H_{34}$	544-76-3	226.441	723	1.4	1.04	0.243	0.7174
170	Hexanal	$C_6H_{12}O$	66-25-1	100.159	591	3.46	0.369	0.26	0.3872
171	Hexane	C_6H_{14}	110-54-3	86.175	507.6	3.025	0.371	0.266	0.3013
172	Hexanoic acid	$C_6H_{12}O_2$	142-62-1	116.158	660.2	3.308	0.408	0.246	0.7299
173	1-Hexanol	$C_6H_{14}O$	111-27-3	102.175	611.3	3.446	0.382	0.259	0.5586
174	2-Hexanol	$C_6H_{14}O$	626-93-7	102.175	585.3	3.311	0.385	0.262	0.5574
175	2-Hexanone	$C_6H_{12}O$	591-78-6	100.159	587.61	3.287	0.378	0.254	0.3846
176	3-Hexanone	$C_6H_{12}O$	589-38-8	100.159	582.82	3.32	0.378	0.259	0.3801
177	1-Hexene	C_6H_{12}	592-41-6	84.159	504	3.21	0.348	0.267	0.2888
178	3-Hexyne	C_6H_{10}	928-49-4	82.144	544	3.53	0.331	0.258	0.2183
179	Hexyl mercaptan	$C_6H_{14}S$	111-31-9	118.240	623	3.08	0.412	0.245	0.3681
180	1-Hexyne	C_6H_{10}	693-02-7	82.144	516.2	3.62	0.322	0.272	0.3327
181	2-Hexyne	C_6H_{10}	764-35-2	82.144	549	3.53	0.331	0.256	0.2214
182	Hydrazine	H_4N_2	302-01-2	32.045	653.15	14.7	0.158	0.428	0.3143
183	Hydrogen	H_2	1333-74-0	2.016	33.19	1.313	0.064147	0.305	–0.2160
184	Hydrogen bromide	HBr	10035-10-6	80.912	363.15	8.552	0.1	0.283	0.0734
185	Hydrogen chloride	HCl	7647-01-0	36.461	324.65	8.31	0.081	0.249	0.1315
186	Hydrogen cyanide	CHN	74-90-8	27.025	456.65	5.39	0.139	0.197	0.4099
187	Hydrogen fluoride	HF	7664-39-3	20.006	461.15	6.48	0.069	0.117	0.3823
188	Hydrogen sulfide	H_2S	7783-06-4	34.081	373.53	8.963	0.0985	0.284	0.0942
189	Isobutyric acid	$C_4H_8O_2$	79-31-2	88.105	605	3.7	0.292	0.215	0.6141
190	Isopropyl amine	C_3H_9N	75-31-0	59.110	471.85	4.54	0.221	0.256	0.2759
191	Malonic acid	$C_3H_4O_4$	141-82-2	104.061	805	5.64	0.258	0.217	0.9418
192	Methacrylic acid	$C_4H_6O_2$	79-41-4	86.089	662	4.79	0.28	0.244	0.3318
193	Methane	CH_4	74-82-8	16.042	190.564	4.599	0.0986	0.286	0.0115
194	Methanol	CH_4O	67-56-1	32.042	512.5	8.084	0.117	0.222	0.5658
195	*N*-Methyl acetamide	C_3H_7NO	79-16-3	73.094	718	4.98	0.267	0.223	0.4351
196	Methyl acetate	$C_3H_6O_2$	79-20-9	74.079	506.55	4.75	0.228	0.257	0.3313
197	Methyl acetylene	C_3H_4	74-99-7	40.064	402.4	5.63	0.164	0.276	0.2115
198	Methyl acrylate	$C_4H_6O_2$	96-33-3	86.089	536	4.25	0.27	0.258	0.3423
199	Methyl amine	CH_5N	74-89-5	31.057	430.05	7.46	0.154	0.321	0.2814
200	Methyl benzoate	$C_8H_8O_2$	93-58-3	136.148	693	3.59	0.436	0.272	0.4205
201	3-Methyl-1,2-butadiene	C_5H_8	598-25-4	68.117	490	3.83	0.291	0.274	0.1874
202	2-Methylbutane	C_5H_{12}	78-78-4	72.149	460.4	3.38	0.306	0.27	0.2279
203	2-Methylbutanoic acid	$C_5H_{10}O_2$	116-53-0	102.132	643	3.89	0.347	0.252	0.5894
204	3-Methyl-1-butanol	$C_5H_{12}O$	123-51-3	88.148	577.2	3.93	0.329	0.269	0.5939
205	2-Methyl-1-butene	C_5H_{10}	563-46-2	70.133	465	3.447	0.292	0.26	0.2341
206	2-Methyl-2-butene	C_5H_{10}	513-35-9	70.133	470	3.42	0.292	0.256	0.2870
207	2-Methyl-1-butene-3-yne	C_5H_6	78-80-8	66.101	492	4.38	0.248	0.266	0.1370
208	Methylbutyl ether	$C_5H_{12}O$	628-28-4	88.148	512.74	3.371	0.329	0.26	0.3130
209	Methylbutyl sulfide	$C_5H_{12}S$	628-29-5	104.214	593	3.47	0.36	0.253	0.3229
210	3-Methyl-1-butyne	C_5H_8	598-23-2	68.117	463.2	4.2	0.275	0.3	0.3081
211	Methyl butyrate	$C_5H_{10}O_2$	623-42-7	102.132	554.5	3.473	0.34	0.256	0.3775
212	Methylchlorosilane	CH_5ClSi	993-00-0	80.589	442	4.17	0.246	0.279	0.2252
213	Methylcyclohexane	C_7H_{14}	108-87-2	98.186	572.1	3.48	0.369	0.27	0.2361
214	1-Methylcyclohexanol	$C_7H_{14}O$	590-67-0	114.185	686	4	0.374	0.262	0.2213
215	*cis*-2-Methylcyclohexanol	$C_7H_{14}O$	7443-70-1	114.185	614	3.79	0.374	0.278	0.6805
216	*trans*-2-Methylcyclohexanol	$C_7H_{14}O$	7443-52-9	114.185	617	3.79	0.374	0.276	0.6790

TABLE 2-141 Critical Constants and Acentric Factors of Inorganic and Organic Compounds (*Continued*)

Cmpd. no.	Name	Formula	CAS no.	Mol. wt.	T_c, K	P_c, MPa	V_c, m³/kmol	Z_c	Acentric factor
217	Methylcyclopentane	C_6H_{12}	96-37-7	84.159	532.7	3.79	0.319	0.273	0.2288
218	1-Methylcyclopentene	C_6H_{10}	693-89-0	82.144	542	4.13	0.303	0.278	0.2318
219	3-Methylcyclopentene	C_6H_{10}	1120-62-3	82.144	526	4.13	0.303	0.286	0.2296
220	Methyldichlorosilane	CH_4Cl_2Si	75-54-7	115.034	483	3.95	0.289	0.284	0.2758
221	Methylethyl ether	C_3H_8O	540-67-0	60.095	437.8	4.4	0.221	0.267	0.2314
222	Methylethyl ketone	C_4H_8O	78-93-3	72.106	535.5	4.15	0.267	0.249	0.3234
223	Methylethyl sulfide	C_3H_8S	624-89-5	76.161	533	4.26	0.254	0.244	0.2091
224	Methyl formate	$C_2H_4O_2$	107-31-3	60.052	487.2	6	0.172	0.255	0.2556
225	Methylisobutyl ether	$C_5H_{12}O$	625-44-5	88.148	497	3.41	0.329	0.272	0.3078
226	Methylisobutyl ketone	$C_6H_{12}O$	108-10-1	100.159	574.6	3.27	0.369	0.253	0.3557
227	Methyl Isocyanate	C_2H_3NO	624-83-9	57.051	488	5.48	0.202	0.273	0.3007
228	Methylisopropyl ether	$C_4H_{10}O$	598-53-8	74.122	464.48	3.762	0.276	0.269	0.2656
229	Methylisopropyl ketone	$C_5H_{10}O$	563-80-4	86.132	553.4	3.8	0.31	0.256	0.3208
230	Methylisopropyl sulfide	$C_4H_{10}S$	1551-21-9	90.187	553.1	4.021	0.328	0.28718	0.2461
231	Methyl mercaptan	CH_4S	74-93-1	48.107	469.95	7.23	0.145	0.268	0.1582
232	Methyl methacrylate	$C_5H_8O_2$	80-62-6	100.116	566	3.68	0.323	0.253	0.2802
233	2-Methyloctanoic acid	$C_9H_{18}O_2$	3004-93-1	158.238	694	2.54	0.572	0.252	0.7913
234	2-Methylpentane	C_6H_{14}	107-83-5	86.175	497.7	3.04	0.368	0.27	0.2791
235	Methyl pentyl ether	$C_6H_{14}O$	628-80-8	102.175	546.49	3.042	0.38	0.254	0.3442
236	2-Methylpropane	C_4H_{10}	75-28-5	58.122	407.8	3.64	0.259	0.278	0.1835
237	2-Methyl-2-propanol	$C_4H_{10}O$	75-65-0	74.122	506.2	3.972	0.275	0.26	0.6152
238	2-Methyl propene	C_4H_8	115-11-7	56.106	417.9	4	0.239	0.275	0.1948
239	Methyl propionate	$C_4H_8O_2$	554-12-1	88.105	530.6	4.004	0.282	0.256	0.3466
240	Methylpropyl ether	$C_4H_{10}O$	557-17-5	74.122	476.25	3.801	0.276	0.265	0.2770
241	Methylpropyl sulfide	$C_4H_{10}S$	3877-15-4	90.187	565	3.97	0.307	0.259	0.2737
242	Methylsilane	CH_6Si	992-94-9	46.144	352.5	4.7	0.205	0.329	0.1314
243	alpha-Methyl styrene	C_9H_{10}	98-83-9	118.176	654	3.36	0.399	0.247	0.3230
244	Methyl *tert*-butyl ether	$C_5H_{12}O$	1634-04-4	88.148	497.1	3.287	0.314	0.25	0.2466
245	Methyl vinyl ether	C_3H_6O	107-25-5	58.079	437	4.67	0.21	0.27	0.2416
246	Naphthalene	$C_{10}H_8$	91-20-3	128.171	748.4	4.05	0.407	0.265	0.3020
247	Neon	Ne	7440-01-9	20.180	44.4	2.653	0.0417	0.3	−0.0396
248	Nitroethane	$C_2H_5NO_2$	79-24-3	75.067	593	5.16	0.236	0.247	0.3803
249	Nitrogen	N_2	7727-37-9	28.013	126.2	3.4	0.08921	0.289	0.0377
250	Nitrogen trifluoride	F_3N	7783-54-2	71.002	234	4.461	0.11875	0.272	0.1200
251	Nitromethane	CH_3NO_2	75-52-5	61.040	588.15	6.31	0.173	0.223	0.3480
252	Nitrous oxide	N_2O	10024-97-2	44.013	309.57	7.245	0.0974	0.274	0.1409
253	Nitric oxide	NO	10102-43-9	30.006	180.15	6.48	0.058	0.251	0.5829
254	Nonadecane	$C_{19}H_{40}$	629-92-5	268.521	758	1.21	1.26	0.242	0.8522
255	Nonanal	$C_9H_{18}O$	124-19-6	142.239	658	2.73	0.527	0.263	0.5117
256	Nonane	C_9H_{20}	111-84-2	128.255	594.6	2.29	0.551	0.255	0.4435
257	Nonanoic acid	$C_9H_{18}O_2$	112-05-0	158.238	710.7	2.514	0.584	0.248	0.7724
258	1-Nonanol	$C_9H_{20}O$	143-08-8	144.255	670.9	2.527	0.576	0.261	0.5841
259	2-Nonanol	$C_9H_{20}O$	628-99-9	144.255	649.5	2.541	0.577	0.271	0.5911
260	1-Nonene	C_9H_{18}	124-11-8	126.239	593.1	2.428	0.524	0.258	0.4367
261	Nonyl mercaptan	$C_9H_{20}S$	1455-21-6	160.320	681	2.31	0.571	0.233	0.5260
262	1-Nonyne	C_9H_{16}	3452-09-3	124.223	598.05	2.61	0.497	0.261	0.4710
263	Octadecane	$C_{18}H_{38}$	593-45-3	254.494	747	1.27	1.19	0.243	0.8114
264	Octanal	$C_8H_{16}O$	124-13-0	128.212	638.9	2.96	0.488	0.272	0.4636
265	Octane	C_8H_{18}	111-65-9	114.229	568.7	2.49	0.486	0.256	0.3996
266	Octanoic acid	$C_8H_{16}O_2$	124-07-2	144.211	694.26	2.779	0.523	0.252	0.7706
267	1-Octanol	$C_8H_{18}O$	111-87-5	130.228	652.3	2.783	0.509	0.261	0.5697
268	2-Octanol	$C_8H_{18}O$	123-96-6	130.228	629.8	2.749	0.512	0.269	0.5807
269	2-Octanone	$C_8H_{16}O$	111-13-7	128.212	632.7	2.64	0.497	0.249	0.4549
270	3-Octanone	$C_8H_{16}O$	106-68-3	128.212	627.7	2.704	0.497	0.257	0.4406
271	1-Octene	C_8H_{16}	111-66-0	112.213	566.9	2.663	0.464	0.262	0.3921
272	Octyl mercaptan	$C_8H_{18}S$	111-88-6	146.294	667.3	2.52	0.518	0.235	0.4497
273	1-Octyne	C_8H_{14}	629-05-0	110.197	574	2.88	0.442	0.267	0.4233
274	Oxalic acid	$C_2H_2O_4$	144-62-7	90.035	804	7.02	0.205	0.215	0.9176
275	Oxygen	O_2	7782-44-7	31.999	154.58	5.043	0.0734	0.288	0.0222
276	Ozone	O_3	10028-15-6	47.998	261	5.57	0.089	0.228	0.2119
277	Pentadecane	$C_{15}H_{32}$	629-62-9	212.415	708	1.48	0.969	0.244	0.6863
278	Pentanal	$C_5H_{10}O$	110-62-3	86.132	566.1	3.97	0.313	0.264	0.3472
279	Pentane	C_5H_{12}	109-66-0	72.149	469.7	3.37	0.313	0.27	0.2515
280	Pentanoic acid	$C_5H_{10}O_2$	109-52-4	102.132	639.16	3.63	0.35	0.239	0.7052
281	1-Pentanol	$C_5H_{12}O$	71-41-0	88.148	588.1	3.897	0.326	0.258	0.5748
282	2-Pentanol	$C_5H_{12}O$	6032-29-7	88.148	561	3.7	0.326	0.259	0.5549
283	2-Pentanone	$C_5H_{10}O$	107-87-9	86.132	561.08	3.694	0.301	0.238	0.3433
284	3-Pentanone	$C_5H_{10}O$	96-22-0	86.132	560.95	3.74	0.336	0.269	0.3448
285	1-Pentene	C_5H_{10}	109-67-1	70.133	464.8	3.56	0.293	0.27	0.2372
286	2-Pentyl mercaptan	$C_5H_{12}S$	2084-19-7	104.214	584.3	3.536	0.385	0.28	0.2685
287	Pentyl mercaptan	$C_5H_{12}S$	110-66-7	104.214	598	3.47	0.359	0.251	0.3207
288	1-Pentyne	C_5H_8	627-19-0	68.117	481.2	4.17	0.277	0.289	0.2899
289	2-Pentyne	C_5H_8	627-21-4	68.117	519	4.03	0.276	0.258	0.1752
290	Phenanthrene	$C_{14}H_{10}$	85-01-8	178.229	869	2.9	0.554	0.222	0.4707
291	Phenol	C_6H_6O	108-95-2	94.111	694.25	6.13	0.229	0.243	0.4435
292	Phenyl isocyanate	C_7H_5NO	103-71-9	119.121	653	4.06	0.37	0.277	0.4123

TABLE 2-141 Critical Constants and Acentric Factors of Inorganic and Organic Compounds (*Concluded*)

Cmpd. no.	Name	Formula	CAS no.	Mol. wt.	T_c, K	P_c, MPa	V_c, m³/kmol	Z_c	Acentric factor
293	Phthalic anhydride	$C_8H_4O_3$	85-44-9	148.116	791	4.72	0.421	0.302	0.7025
294	Propadiene	C_3H_4	463-49-0	40.064	394	5.25	0.165	0.264	0.1041
295	Propane	C_3H_8	74-98-6	44.096	369.83	4.248	0.2	0.276	0.1523
296	1-Propanol	C_3H_8O	71-23-8	60.095	536.8	5.169	0.219	0.254	0.6209
297	2-Propanol	C_3H_8O	67-63-0	60.095	508.3	4.765	0.222	0.25	0.6544
298	Propenylcyclohexene	C_3H_{14}	13511-13-2	122.207	636	3.12	0.437	0.258	0.3420
299	Propionaldehyde	C_3H_6O	123-38-6	58.079	504.4	4.92	0.204	0.239	0.2559
300	Propionic acid	$C_3H_6O_2$	79-09-4	74.079	600.81	4.668	0.235	0.22	0.5796
301	Propionitrile	C_3H_5N	107-12-0	55.079	564.4	4.18	0.229	0.204	0.3243
302	Propyl acetate	$C_5H_{10}O_2$	109-60-4	102.132	549.73	3.36	0.345	0.254	0.3889
303	Propyl amine	C_3H_9N	107-10-8	59.110	496.95	4.74	0.26	0.298	0.2798
304	Propylbenzene	C_9H_{12}	103-65-1	120.192	638.35	3.2	0.44	0.265	0.3444
305	Propylene	C_3H_6	115-07-1	42.080	364.85	4.6	0.185	0.281	0.1376
306	Propyl formate	$C_4H_8O_2$	110-74-7	88.105	538	4.02	0.285	0.256	0.3088
307	2-Propyl mercaptan	C_3H_8S	75-33-2	76.161	517	4.75	0.254	0.281	0.2138
308	Propyl mercaptan	C_3H_8S	107-03-9	76.161	536.6	4.63	0.254	0.264	0.2318
309	1,2-Propylene glycol	$C_3H_8O_2$	57-55-6	76.094	626	6.1	0.239	0.28	1.1065
310	Quinone	$C_6H_4O_2$	106-51-4	108.095	683	5.96	0.291	0.305	0.4945
311	Silicon tetrafluoride	F_4Si	7783-61-1	104.079	259	3.72	0.202	0.349	0.3858
312	Styrene	C_8H_8	100-42-5	104.149	636	3.84	0.352	0.256	0.2971
313	Succinic acid	$C_4H_6O_4$	110-15-6	118.088	806	4.71	0.317	0.223	0.9922
314	Sulfur dioxide	O_2S	7446-09-5	64.064	430.75	7.884	0.122	0.269	0.2454
315	Sulfur hexafluoride	F_6S	2551-62-4	146.055	318.69	3.76	0.19852	0.282	0.2151
316	Sulfur trioxide	O_3S	7446-11-9	80.063	490.85	8.21	0.127	0.255	0.4240
317	Terephthalic acid	$C_8H_6O_4$	100-21-0	166.131	1113	3.95	0.424	0.181	1.0591
318	*o*-Terphenyl	$C_{18}H_{14}$	84-15-1	230.304	857	2.99	0.731	0.307	0.5513
319	Tetradecane	$C_{14}H_{30}$	629-59-4	198.388	693	1.57	0.897	0.244	0.6430
320	Tetrahydrofuran	C_4H_8O	109-99-9	72.106	540.15	5.19	0.224	0.259	0.2254
321	1,2,3,4-Tetrahydronaphthalene	$C_{10}H_{12}$	119-64-2	132.202	720	3.65	0.408	0.249	0.3353
322	Tetrahydrothiophene	C_4H_8S	110-01-0	88.171	631.95	5.16	0.249	0.245	0.1996
323	2,2,3,3-Tetramethylbutane	C_8H_{18}	594-82-1	114.229	568	2.87	0.461	0.28	0.2450
324	Thiophene	C_4H_4S	110-02-1	84.140	579.35	5.69	0.219	0.259	0.1970
325	Toluene	C_7H_8	108-88-3	92.138	591.75	4.108	0.316	0.264	0.2640
326	1,1,2-Trichloroethane	$C_2H_3Cl_3$	79-00-5	133.404	602	4.48	0.281	0.252	0.2591
327	Tridecane	$C_{13}H_{28}$	629-50-5	184.361	675	1.68	0.826	0.247	0.6174
328	Triethyl amine	$C_6H_{15}N$	121-44-8	101.190	535.15	3.04	0.39	0.266	0.3162
329	Trimethyl amine	C_3H_9N	75-50-3	59.110	433.25	4.07	0.254	0.287	0.2062
330	1,2,3-Trimethylbenzene	C_9H_{12}	526-73-8	120.192	664.5	3.454	0.414	0.259	0.3666
331	1,2,4-Trimethylbenzene	C_9H_{12}	95-63-6	120.192	649.1	3.232	0.43	0.258	0.3787
332	2,2,4-Trimethylpentane	C_8H_{18}	540-84-1	114.229	543.8	2.57	0.468	0.266	0.3035
333	2,3,3-Trimethylpentane	C_8H_{18}	560-21-4	114.229	573.5	2.82	0.455	0.269	0.2903
334	1,3,5-Trinitrobenzene	$C_6H_3N_3O_6$	99-35-4	213.105	846	3.39	0.479	0.231	0.8623
335	2,4,6-Trinitrotoluene	$C_7H_5N_3O_6$	118-96-7	227.131	828	3.04	0.572	0.253	0.8972
336	Undecane	$C_{11}H_{24}$	1120-21-4	156.308	639	1.95	0.685	0.252	0.5303
337	1-Undecanol	$C_{11}H_{24}O$	112-42-5	172.308	703.9	2.119	0.715	0.259	0.6236
338	Vinyl acetate	$C_4H_6O_2$	108-05-4	86.089	519.13	3.958	0.27	0.248	0.3513
339	Vinyl acetylene	C_4H_4	689-97-4	52.075	454	4.86	0.205	0.264	0.1069
340	Vinyl chloride	C_2H_3Cl	75-01-4	62.498	432	5.67	0.179	0.283	0.1001
341	Vinyl trichlorosilane	$C_2H_3Cl_3Si$	75-94-5	161.490	543.15	3.06	0.408	0.276	0.2815
342	Water	H_2O	7732-18-5	18.015	647.096	22.064	0.0559472	0.229	0.3449
343	*m*-Xylene	C_8H_{10}	108-38-3	106.165	617	3.541	0.375	0.259	0.3265
344	*o*-Xylene	C_8H_{10}	95-47-6	106.165	630.3	3.732	0.37	0.264	0.3101
345	*p*-Xylene	C_8H_{10}	106-42-3	106.165	616.2	3.511	0.378	0.259	0.3218

All substances are listed by chemical family in Table 2-6 and by formula in Table 2-7.

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