Propriedades físicas de petróleo e produtos derivados
Classificação de líquidos inflamáveis ou combustíveis-Temperaturas de ignição-Faixa de explosividade de fluidos-Ponto de Fulgor-Pressão de Vapor

1- Classificação de líquidos inflamáveis ou combustíveis

1.1 Norma ABNT NBR 17501 – Parte 1

Tabela 1 — Classificação de líquidos inflamáveis e combustíveis

Líquidos	Ponto de fulgor (PF)	Ponto de ebulição (PE)
Inflamáveis	PF < 37,8°C	
Classe I	PF < 37,8ºC e PV < 2 068,6 mmHg	
Classe IA	PF < 22,8°C	PE < 37,8°C
Classe IB	PF < 22,8°C	PE ≥ 37,8°C
Classe IC	22,8°C ≤ PF < 37,8°C	-
Combustíveis	PF >= 37,8°C	
Classe II	37,8°C ≤ PF < 60°C	-
Classe IIIA	60°C ≤ PF < 93°C	-
Classe IIIB	PF ≥ 93°C	-
NOTA	PV é a pressão de vapor.	

1.2 Tabela de comparação das principais normas de caracterização de líquido

Tipo de líquido	NFPA 11	NFPA 30 29 CFR 1910.106	ABNT NBR 17505 -1	NR 20	29 CFR 1910-106
Líquido inflamável PF<37,8ºC PV ≤ 40 psia (276 kPa abs) (2068,6mm Hg) @ 37,8ºC	Class I PF < 37,8ºC		Class I PF < 37,8ºC pV < (2068,6mm Hg) @ 37,8ºC	Classe I PF < 37,7ºC pV < 2,8 kgf/cm² @ 37,7ºC	
	Class IA PF < 22,8ºC PE < 37,8ºC	Class IA PF < 22,8ºC PE < 37,8ºC	Class IA PF < 22,8ºC PE < 37,8ºC	Classe IA 37,7ºC<PF<70 ºC pV < 2,8 kgf/cm² @ 37,7ºC	Class IA PF < 22,8ºC PE < 37,8ºC
	Class IB PF < 22,8ºC PE > 37,8 ºC	Class IB PF < 22,8ºC PE ≥ 37,8 ºC	Class IB PF < 22,8ºC PE ≥ 37,8 ºC		Class IB PF < 22,8ºC PE ≥ 37,8 ºC
	Class IC 37,8ºC>PF≥22,8º C	Class IC 37,8ºC>PF≥22,8 ºC	Class IC 37,8ºC>PF≥ 22,8ºC		Class IC 37,8ºC>PF≥ 22,8ºC
Líquido combustível PF ≥ 37,8ºC	Class II 60ºC >PF ≥ 37,8ºC	Class II 60ºC >PF ≥ 37,8ºC	Class II 60ºC>PF≥37,8º C		Class II 60ºC>PF≥37,8º C
	Class IIIA 93,3ºC >PF≥ 60ºC	Class IIIA 93,3ºC >PF ≥ 60ºC	Class IIIA 93,3ºC>PF≥60º C		Class IIIA 93,3ºC>PF≥60º C
	Class IIIB PF ≥ 93,3ºC	Class IIIB PF ≥ 93,3ºC	Class IIIB PF ≥ 93,3ºC	Classe IIIB 70ºC≤PF<93,3 ºC	Class IIIB PF ≥ 93,3ºC

PF: Ponto de Fulgor ("Flash Point"); PE: Ponto de Ebulição ("Boiling Point"); PV: Pressão de vapor

2 Temperaturas de auto-ignição

The *Auto-Ignition Temperature* - or the minimum temperature required to ignite a gas or vapor in air without a spark or flame being present - are indicated for some common fuels below:

Fuel or Chemical	Temperature	
	(°C)	*(°F)*
Acetaldehyde	175	347
Acetone	465	869
Acetylene	305	581
Anthracite - glow point	600	1112
Benzene	560	1040
Bituminous coal - glow point	454	850
Butane	420	788
Carbon	700	1292
Carbon - bi sulfide	149	300
Carbon monoxide	609	1128
Charcoal	349	660
Coal-tar oil	580	1076
Coke	700	1292
Cyclohexane	245	473
Diethyl ether	160	320
Ethane	515	959
Ethylene	490	914
Ethyl Alcohol, Ethanol	365	689
Fuel Oil No.1	210	410
Fuel Oil No.2	256	494
Fuel Oil No.4	262	505
Heavy hydrocarbons	750	1382
Hydrogen	500	932
Gas oil	336	637
Gasoline	280	536
Gun Cotton	221	430
Kerosene	295	563
Isobutane	462	864
Isobutene	465	869
Isooctane	447	837
Isopentane	420	788
Isopropyl Alcohol	399	750
Light gas	600	1112
Light hydrocarbons	650	1202
Lignite - glow point	526	979
Methane (Natural Gas)	580	1076
Methyl Alcohol	385	725
Naphtha	550	1022
Neoheaxane	425	797

Fuel or Chemical	Temperature	
	(°C)	*(°F)*
Neopentane	450	842
Nitro-glycerine	254	490
n-Butane	405	761
n-Heptane	215	419
n-Hexane	225	437
n-Octane	220	428
n-Pentane	260	500
n-Pentene	298	569
Oak Wood - dry	482	900
Peat	227	440
Petroleum	400	752
Pine Wood - dry	427	800
Phosphorous, amorphous	260	500
Phosphorous, transparent	49	120
Production gas	750	1382
Propane	470	878
Propylene	458	856
p-Xylene	530	986
Rifle Powder	288	550
Toluene	535	995
Semi anthracite coal	400	752
Semi bituminous coal - glow point	527	980
Styrene	490	914
Sulphur	243	470
Wood	300	572
Xylene	463	867

3 Misturas explosivas

3.1 Flame and explosion limits for gases - propane, methane, butane, acetylene and more

The *Flammable Range* (Explosive Range) is the range of a concentration of a gas or vapor that will burn (or explode) if an ignition source is introduced.

Below the explosive or flammable range the mixture is too lean to burn and above the upper explosive or flammable limit the mixture is too rich to burn. The limits are commonly called the "Lower Explosive or Flammable Limit" (LEL/LFL) and the "Upper Explosive or Flammable Limit" (UEL/UFL).

The lower and upper explosion concentration limits for some common gases are indicated in the table below. Some of the gases are commonly used as fuel in combustion processes.

Fuel Gas	"Lower Explosive or Flammable Limit" (LEL/LFL) *(%)*	"Upper Explosive or Flammable Limit" (UEL/UFL) *(%)*
Acetaldehyde	4	60
Acetone	2.6	12.8
Acetylene	2.5	81

Fuel Gas	"Lower Explosive or Flammable Limit" (LEL/LFL) *(%)*	"Upper Explosive or Flammable Limit" (UEL/UFL) *(%)*
Ammonia	15	28
Arsine	5.1	78
Benzene	1.35	6.65
n-Butane	1.86	8.41
iso-Butane	1.80	8.44
iso-Butene	1.8	9.0
Butylene	1.98	9.65
Carbon Disulfide	1.3	50
Carbon Monoxide	12	75
Cyclohexane	1.3	8
Cyclopropane	2.4	10.4
Diethyl Ether	1.9	36
Ethane	3	12.4
Ethylene	2.75	28.6
Ethyl Alcohol	3.3	19
Ethyl Chloride	3.8	15.4
Fuel Oil No.1	0.7	5
Hydrogen	4	75
Isobutane	1.8	9.6
Isopropyl Alcohol	2	12
Gasoline	1.4	7.6
Kerosine	0.7	5
Methane	5	15
Methyl Alcohol	6.7	36
Methyl Chloride	10.7	17.4
Methyl Ethyl Ketone	1.8	10
Naphthalene	0.9	5.9
n-Heptane	1.0	6.0
n-Hexane	1.25	7.0
n-Pentene	1.65	7.7
Neopentane	1.38	7.22
Neohexane	1.19	7.58
n-Octane	0.95	3.20
iso-Octane	0.79	5.94
n-Pentane	1.4	7.8
iso-Pentane	1.32	9.16
Propane	2.1	10.1
Propylene	2.0	11.1
Silane	1.5	98
Styrene	1.1	6.1
Toluene	1.27	6.75

Fuel Gas	"Lower Explosive or Flammable Limit" (LEL/LFL) *(%)*	"Upper Explosive or Flammable Limit" (UEL/UFL) *(%)*
Triptane	1.08	6.69
p-Xylene	1.0	6.0

Note! The limits indicated are for gas and air at *20°C* and atmospheric pressure.
It is important that areas where flammable gases are stored are well ventilated. When designing the ventilation systems, be aware of the specific gravity of the actual gas. The gas mixture from a leakage will not be homogeneous. and a light gas concentrates along the ceiling. A heavy gas concentrates along the floor.
Ventilation, natural or mechanical, must be sufficient to limit the concentration of flammable gases or vapors to a maximum level of *25%* of their "Lower Explosive or Flammable Limit" (LEL/LFL).

- Minimum ventilation required: *1 cfm/sq.ft*.
- Recommended ventilation: *2 cfm/sq.ft* or *12 air changes per hour* - half the air supplied and exhausted near the ceiling and half the air supplied and exhausted near the floor

3.2 Conforme API RP 520 Part I - Sizing, Selection, and Installation of Pressure-relieving Devices in Refineries Part I—Sizing and Selection

Table 7—Properties of Gases

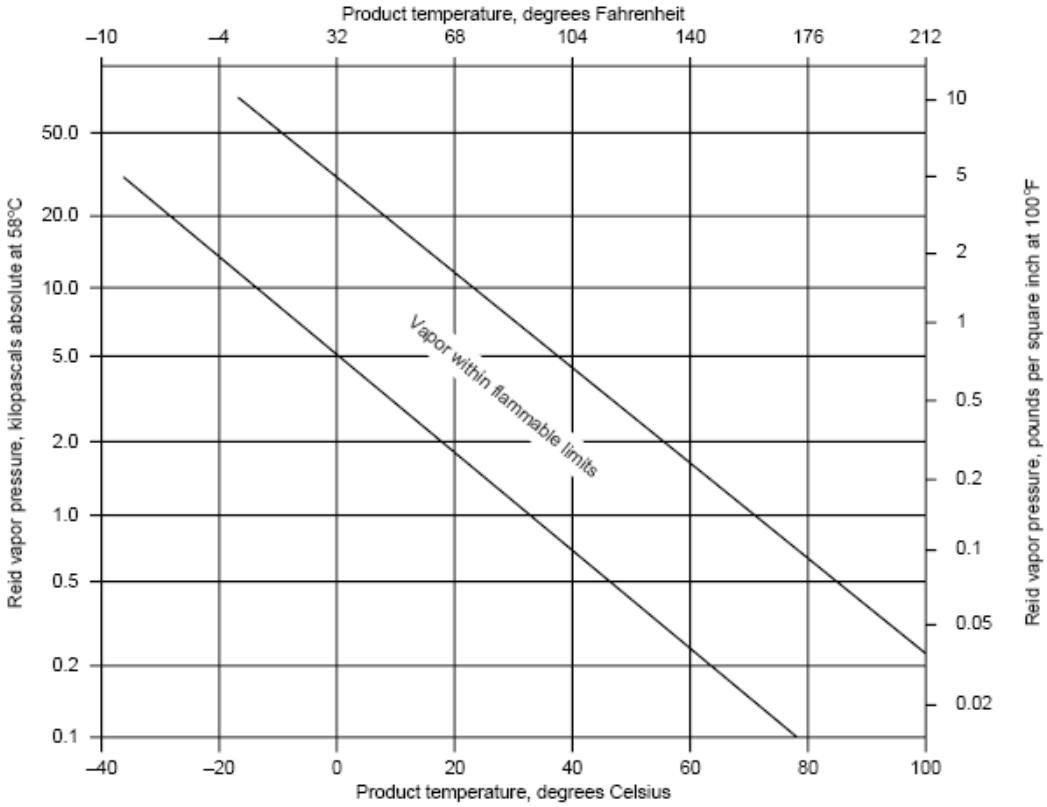
Gas	Molecular Weight	Ideal Gas Specific Heat Ratio ($k = C_p/C_v$) at 60 °F and One Atmosphere	Ideal Gas Critical Flow Pressure Ratio at 60 °F and One Atmosphere	Ideal Gas Specific Gravity at 60 °F and One Atmosphere	Critical Constants		Condensation Temperature One Atmosphere °F (°C)	Flammability Limits (volume % in air mixture)
					Pressure psia (kPa)	Temperature °F (°C)		
Methane [a]	16.04	1.31	0.54	0.554	673 (4640)	−116 (−82)	−259 (−162)	5.0 – 15.0
Ethane [a]	30.07	1.19	0.57	1.058	718 (4950)	90 (32)	−128 (−89)	2.9 – 13.8
Ethylene [a]	28.03	1.24	0.57	0.969	742 (5116)	50 (10)	−155 (−104)	2.7 – 34.8
Propane [a]	44.09	1.13	0.58	1.522	617 (4254)	206 (97)	−44 (−42)	2.1 – 9.5
Propylene	42.08	1.15	0.58	1.453	667 (4599)	197 (92)	−54 (−48)	2.8 – 10.8
Isobutane [a]	58.12	1.10	0.59	2.007	529 (3647)	273 (134)	11 (−12)	1.8 – 8.4
n-Butane [a]	58.12	1.09	0.59	2.007	551 (3799)	304 (151)	31 (−1)	1.9 – 8.4
1-Butene	56.10	1.11	0.59	1.937	586 (4040)	296 (147)	21 (−6)	1.4 – 9.3
Isopentane [a]	72.15	1.08	0.59	2.491	483 (3330)	369 (187)	82 (28)	1.4 – 8.3
n-Pentane [a]	72.15	1.08	0.59	2.491	490 (3378)	386 (197)	97 (36)	1.4 – 7.8
1-Pentene [a]	70.13	1.08	0.59	2.421	510 (3930)	377 (192)	86 (30)	1.4 – 8.7
n-Hexane [a]	86.18	1.06	0.59	2.973	437 (3013)	454 (234)	156 (69)	1.2 – 7.7
Benzene	78.11	1.12	0.58	2.697	714 (4923)	552 (289)	176 (80)	1.3 – 7.9
n-Heptane [a]	100.20	1.05	0.60	3.459	397 (2737)	513 (267)	209 (98)	1.0 – 7.0
Toluene	92.13	1.09	0.59	3.181	590 (4068)	604 (318)	231 (111)	1.2 – 7.1
n-Octane [a]	114.22	1.05	0.60	3.944	362 (2496)	564 (296)	258 (126)	0.96 – 6.7
n-Nonane	128.23	1.04	0.60	4.428	332 (2289)	610 (321)	303 (151)	0.87 – 2.9
n-Decane	142.28	1.03	0.60	4.912	304 (2096)	632 (333)	345 (174)	0.78 – 2.6
Air	28.96	1.40	0.53	1.000	547 (3771)	−221 (−141)	−313 (−192)	—
Ammonia	17.03	1.30	0.53	0.588	1636 (11280)	270 (132)	−28 (−33)	15.5 – 27.0
Carbon Dioxide	44.01	1.29	0.55	1.519	1071 (7384)	88 (31)	−109 (−78)	—
Hydrogen	2.02	1.41	0.52	0.0696	188 (1296)	−400 (−240)	−423 (−253)	4.0 – 74.2
Hydrogen Sulfide	34.08	1.32	0.53	1.176	1306 (9005)	213 (101)	−77 (−61)	4.3 – 45.5
Sulfur Dioxide	64.04	1.27	0.55	2.212	1143 (7881)	316 (158)	14 (−10)	—
Steam	18.01	1.33	0.54	0.622	3206 (22104)	706 (374)	212 (100)	—

[a] Estimated

55

API STANDARD 520, PART 1 – SIZING AND SELECTION

3.3 Conforme API RP 2003 - Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents



Note: Caution should be exercised when dealing with conditions near the boundaries of this estimate since it is not necessarily conservative in all cases.

Figure 2—Approximate Relationship Between Temperature, Reid Vapor Pressure, and the Flammability Limits of Petroleum Products at Sea Level

3.4 Conforme Petrobras

Produto	Ponto de fulgor ("flashing point") ºC	Pressão de vapor "Reid" @ 37,8 ºC KPa	Pressão de vapor "Reid" @ 37,8 ºC Psig
GLP (para comparação)	< 0	1470	215
Petróleo	< 0	50 a 74	7,25 a 10,72
Gasolina A	< 0	54,3	7,87
Gasolina C	< 0	58	8,40
Nafta leve ou craqueada	< 0	46,3 a 81	6,71 a 11,74
GAV 100/130	< 0	31,6 a 106,5	4,58 a 15,43
GAV 115/145	< 0	31,6 a 106,5	4,58 a 15,43
Álcool/Etanol	< 0	15,7	2,27
Metanol	< 0	30,9	4,48
MTBE	< 0	55,5	8,04
Gasóleo leve			
Gasóleo pesado			

Nafta pesada	40	1	0,15
QAV	40	0,4 a 0,6	0,06 a 0,09
Querosene	40	O,4 a 0,6	0,06 a 0,09
Óleo diesel rodoviário (S1800, S500, S50)	38	Desprezível	Desprezível
Óleo diesel marítimo	60	Desprezível	Desprezível
Óleo combustível	65	Desprezível	Desprezível
Óleo combustível tipo "Bunker"	60	Desprezível	Desprezível
Asfalto	>60	Desprezível	Desprezível
"Slop"	>60	Desprezível	Desprezível

Produto	**Pressão de vapor PV verdadeira (kgf/cm²)**	**Densidade (20/4°C)**
Petróleo Marlim	0.51	0.662
Nafta Leve ou Petroquímica	0,75 a 35°C	0,728
Nafta craqueada	0,75 a 35°C	0,73
Nafta Leve	0,75 a 35°C	0,715
Gasolina A	0,67 a 37,8°C	0,746
Gasolina B	0,55 a 37,8°C	0,752
Gasolina A	0,49 a 37,8°C	0,743
Gasolina B	0,47 a 37,8°C	0,749
Petrosolve	0,75 a 35°C	0,72

3.5 Pressões de vapor conforme documento EPA - AP 42 Chapter 7 Liquid storage tank

Table 7.1-2. PROPERTIES (M_V, P_{VA}, W_L) OF SELECTED PETROLEUM LIQUIDS

Petroleum Liquid	Vapor Molecular Weight at 60°F, M_V (lb/lb-mole)	Liquid Density At 60°F, W_L (lb/gal)	True Vapor Pressure, P_{VA} (psi)						
			40°F	50°F	60°F	70°F	80°F	90°F	100°F
Crude oil RVP 5	50	7.1	1.8	2.3	2.8	3.4	4.0	4.8	5.7
Distillate fuel oil No. 2	130	7.1	0.0031	0.0045	0.0065	0.0090	0.012	0.016	0.022
Gasoline RVP 7	68	5.6	2.3	2.9	3.5	4.3	5.2	6.2	7.4
Gasoline RVP 7.8	68	5.6	2.5929	3.2079	3.9363	4.793	5.7937	6.9552	8.2952
Gasoline RVP 8.3	68	5.6	2.7888	3.444	4.2188	5.1284	6.1891	7.4184	8.8344
Gasoline RVP 10	66	5.6	3.4	4.2	5.2	6.2	7.4	8.8	10.5
Gasoline RVP 11.5	65	5.6	4.087	4.9997	6.069	7.3132	8.7519	10.4053	12.2949
Gasoline RVP 13	62	5.6	4.7	5.7	6.9	8.3	9.9	11.7	13.8
Gasoline RVP 13.5	62	5.6	4.932	6.0054	7.2573	8.7076	10.3774	12.2888	14.4646
Gasoline RVP 15.0	60	5.6	5.5802	6.774	8.1621	9.7656	11.6067	13.7085	16.0948
Jet kerosene	130	7.0	0.0041	0.0060	0.0085	0.011	0.015	0.021	0.029
Jet naphtha (JP-4)	80	6.4	0.8	1.0	1.3	1.6	1.9	2.4	2.7
Residual oil No. 6	190	7.9	0.00002	0.00003	0.00004	0.00006	0.00009	0.00013	0.00019

Table 7.1-3. PHYSICAL PROPERTIES OF SELECTED PETROCHEMICALS[a]

Name	Formula	Molecular Weight	Boiling Point At 1 Atmosphere (°F)	Liquid Density At 60°F (lb/gal)	Vapor Pressure (psia) At						
					40°F	50°F	60°F	70°F	80°F	90°F	100°F
Acetone	CH_3COCH_3	58.08	133.0	6.628	1.682	2.185	2.862	3.713	4.699	5.917	7.251
Acetonitrile	CH_3CN	41.05	178.9	6.558	0.638	0.831	1.083	1.412	1.876	2.456	3.133
Acrylonitrile	$CH_2{:}CHCN$	53.06	173.5	6.758	0.812	0.967	1.373	1.779	2.378	3.133	4.022
Allyl alcohol	$CH_2{:}CHCH_2OH$	58.08	206.6	7.125	0.135	0.193	0.261	0.387	0.522	0.716	1.006
Allyl chloride	$CH_2{:}CHCH_2Cl$	76.53	113.2	7.864	2.998	3.772	4.797	6.015	7.447	9.110	11.025
Ammonium hydroxide (28.8% solution)	$NH_4OH{-}{-}H_2O$	35.05	83.0	7.481	5.130	6.630	8.480	10.760	13.520	16.760	20.680
Benzene	C_6H_6	78.11	176.2	7.365	0.638	0.870	1.160	1.508	1.972	2.610	3.287
iso-Butyl alcohol	$(CH_3)_2CHCH_2OH$	74.12	227.1	6.712	0.058	0.097	0.135	0.193	0.271	0.387	0.541
tert-Butyl alcoholv	$(CH_3)_3COH$	74.12	180.5	6.595	0.174	0.290	0.425	0.638	0.909	1.238	1.702
n-Butyl chloride	$CH_3CH_2CH_2CH_2Cl$	92.57	172.0	7.430	0.715	1.006	1.320	1.740	2.185	2.684	3.481
Carbon disulfide	CS_2	76.13	115.3	10.588	3.036	3.867	4.834	6.014	7.387	9.185	11.215
Carbon tetrachloride	CCl_4	153.84	170.2	13.366	0.793	1.064	1.412	1.798	2.301	2.997	3.771
Chloroform	$CHCl_3$	119.39	142.7	12.488	1.528	1.934	2.475	3.191	4.061	5.163	6.342
Chloroprene	$CH_2{:}CCl{\cdot}CH{:}CH_2$	88.54	138.9	8.046	1.760	2.320	2.901	3.655	4.563	5.685	6.981
Cyclohexane	C_6H_{12}	84.16	177.3	6.522	0.677	0.928	1.218	1.605	2.069	2.610	3.249
Cyclopentane	C_5H_{10}	70.13	120.7	6.248	2.514	3.287	4.177	5.240	6.517	8.063	9.668
1,1-Dichloroethane	CH_3CHCl_2	98.97	135.1	9.861	1.682	2.243	2.901	3.771	4.738	5.840	7.193
1,2-Dichloroethane	CH_2ClCH_2Cl	98.97	182.5	10.500	0.561	0.773	1.025	1.431	1.740	2.243	2.804
cis-1,2- Dichloro-ethylene	$CHCl{:}CHCl$	96.95	140.2	10.763	1.450	2.011	2.668	3.461	4.409	5.646	6.807
trans-1,2-Dichloro-ethylene	$CHCl{:}CHCl$	96.95	119.1	10.524	2.552	3.384	4.351	5.530	6.807	8.315	10.016
Diethylamine	$(C_2H_5)_2NH$	73.14	131.9	5.906	1.644	1.992	2.862	3.867	4.892	6.130	7.541
Diethyl ether	$C_2H_5OC_2H_5$	74.12	94.3	5.988	4.215	5.666	7.019	8.702	10.442	13.342	Boils
Di-*iso*-propyl ether	$(CH_3)_2CHOCH(CH_3)_2$	102.17	153.5	6.075	1.199	1.586	2.127	2.746	3.481	4.254	5.298
1,4-Dioxane	$O{\cdot}CH_2CH_2OCH_2CH_2$	88.10	214.7	8.659	0.232	0.329	0.425	0.619	0.831	1.141	1.508
Dipropyl ether	$CH_3CH_2CH_2OCH_2CH_2CH_3$	102.17	195.8	6.260	0.425	0.619	0.831	1.102	1.431	1.876	2.320
Ethyl acetate	$C_2H_5OOCCH_3$	88.10	170.9	7.551	0.580	0.831	1.102	1.489	1.934	2.514	3.191
Ethyl acrylate	$C_2H_5OOCCH{:}CH_2$	100.11	211.8	7.750	0.213	0.290	0.425	0.599	0.831	1.122	1.470
Ethyl alcohol	C_2H_5OH	46.07	173.1	6.610	0.193	0.406	0.619	0.870	1.218	1.682	2.320

Table 7.1-3 (cont.).

Name	Formula	Molecular Weight	Boiling Point At 1 Atmosphere (°F)	Liquid Density At 60°F (Pounds Per Gallon)	Vapor Pressure (Pounds Per Square Inch Absolute) At						
					40°F	50°F	60°F	70°F	80°F	90°F	100°F
Freon 11	CCl_3F	137.38	75.4	12.480	7.032	8.804	10.900	13.40	16.31	19.69	23.60
n-Heptane	$CH_3(CH_2)_5CH_3$	100.20	209.2	5.727	0.290	0.406	0.541	0.735	0.967	1.238	1.586
n-Hexane	$CH_3(CH_2)_4CH_3$	86.17	155.7	5.527	1.102	1.450	1.876	2.436	3.055	3.906	4.892
Hydrogen cyanide	HCN	27.03	78.3	5.772	6.284	7.831	9.514	11.853	15.392	18.563	22.237
Isopentane	$(CH_3)_2CHCH_2CH_3$	72.15	82.1	5.199	5.878	7.889	10.005	12.530	15.334	18.370	21.657
Isoprene	$(CH_2):C(CH_3)CH:CH_2$	68.11	93.5	5.707	4.757	6.130	7.677	9.668	11.699	14.503	17.113
Isopropyl alcohol	$(CH_3)_2{\cdot}CHOH$	60.09	180.1	6.573	0.213	0.329	0.483	0.677	0.928	1.296	1.779
Methacrylonitrile	$CH_2:CH(CH_3)CN$	67.09	194.5	6.738	0.483	0.657	0.870	1.160	1.470	1.934	2.456
Methyl acetate	CH_3OOCCH_3	74.08	134.8	7.831	1.489	2.011	2.746	3.693	4.699	5.762	6.961
Methyl acrylate	$CH_3OOCCH{\cdot}CH_2$	86.09	176.9	7.996	0.599	0.773	1.025	1.354	1.798	2.398	3.055
Methyl alcohol	CH_3OH	32.04	148.4	6.630	0.735	1.006	1.412	1.953	2.610	3.461	4.525
Methylcyclohexane	$CH_3{\cdot}C_6H_{11}$	98.18	213.7	6.441	0.309	0.425	0.541	0.735	0.986	1.315	1.721
Methylcyclopentane	$CH_3C_5H_9$	84.16	161.3	6.274	0.909	1.160	1.644	2.224	2.862	3.616	4.544
Methylene chloride	CH_2Cl_2	84.94	104.2	11.122	3.094	4.254	5.434	6.787	8.702	10.329	13.342
Methyl ethyl ketone	$CH_3COC_2H_5$	72.10	175.3	6.747	0.715	0.928	1.199	1.489	2.069	2.668	3.345
Methyl methacrylate	$CH_3OOC(CH_3):CH_2$	100.11	212.0	7.909	0.116	0.213	0.348	0.541	0.773	1.064	1.373
Methyl propyl ether	$CH_3OC_3H_7$	74.12	102.1	6.166	3.674	4.738	6.091	7.058	9.417	11.602	13.729
Nitromethane	CH_3NO_2	61.04	214.2	9.538	0.213	0.251	0.348	0.503	0.715	1.006	1.334
n-Pentane	$CH_3(CH_2)_3CH_3$	72.15	96.9	5.253	4.293	5.454	6.828	8.433	10.445	12.959	15.474
n-Propylamine	$C_3H_7NH_2$	59.11	119.7	6.030	2.456	3.191	4.157	5.250	6.536	8.044	9.572
1,1,1-Trichloroethane	CH_3CCl_3	133.42	165.2	11.216	0.909	1.218	1.586	2.030	2.610	3.307	4.199
Trichloroethylene	$CHCl:CCl_2$	131.40	188.6	12.272	0.503	0.677	0.889	1.180	1.508	2.030	2.610
2,2,4-trimethyl pentane (isooctane)	$(CH_2)_3CCH_2CH(CH_3)_2$	114.23	210.6	5.76			0.596				
Toluene	$CH_3{\cdot}C_6H_5$	92.13	231.1	7.261	0.174	0.213	0.309	0.425	0.580	0.773	1.006
Vinyl acetate	$CH_2:CHOOCCH_3$	86.09	162.5	7.817	0.735	0.986	1.296	1.721	2.262	3.113	4.022
Vinylidene chloride	$CH_2:CCl_2$	96.5	89.1	10.383	4.990	6.344	7.930	9.806	11.799	15.280	23.210