Table 6.1 – Odor Threshold Values

The table contains the following information:

Chemical Name, CAS Number, Chemical Formula, Chemical Molecular weight"

- Range of Referenced Values
- Odor Character Description(s)
- ACGIH® Threshold Limit Value (TLV)®
- OSHA Permissible Exposure Limit (PEL)
- AIHA® WEEL® Value

Abbreviations/Definitions used in table:

- Alliaceous – Resembling garlic or onion in smell or taste
- BEI – Biological Exposure Indices
- DSEN – May cause dermal sensitization
- Empyreumatic – Being or having an odor of burnt organic material as a result of decomposition
- Etherous / Ethereal – Resembling or pertaining to ether
- Fusel – Hot acrid oily liquid
- H – Aerosol only
- IFV – Measured as Inhalable fraction and vapor
- L – Exposure to carcinogens should be kept to a minimum
- Q – Absorbed rapidly through the skin in molten/heated liquid form in amounts that have caused rapid death in humans
- SEN – Sensitization
- Skin – Potential exposure by the cutaneous route
- (W) – Worker exposure by all routes should be minimized to the fullest extent possible

Table 6.1 – Odor Threshold Values

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
1	**Acetaldehyde** *75-07-0* *C_2H_4O* *44.05*	0.0015 – 1,000	pungent, fruity, suffocating, fresh, green	C = 25	TWA = 200	–
2	**Acetic Acid** *64-19-7* *$C_2H_4O_2$* *60.05*	0.0004 – 204	pungent, vinegar	STEL = 15 TWA = 10	TWA = 10	–
3	**Acetic Anhydride** *108-24-7* *$C_4H_6O_3$* *102.09*	0.12 – 0.36	sour, acid	TWA = 1 C = 3	TWA = 5	–
4	**Acetone** *67-64-1* *C_3H_6O* *58.08*	0.40 – 11,745	sweet, fruity, etherous	TWA = 500 STEL = 750 BEI	TWA = 1,000	–
5	**Acetonitrile** *75-05-8* *C2H3N* *41.05*	13 – 1,161	etherish	TWA = 20 Skin	TWA = 40	–
6	**Acetophenone** *98-86-2* *C_8H_8O* *120.15*	0.00024 – 0.59	sweet, almond, pungent, oranges, river water	TWA = 10	–	TWA = 10
7	**Acetylene** *74-86-2* *C_2H_2* *26.02*	226 – 2584	gassy, garlic	Simple Asphyxiant	–	–
8	**Acrolein** *107-02-8* *C_3H_4O* *56.06*	0.0036 – 1.8	pungent	C = 0.1 Skin	TWA = 0.1	–
9	**Acrylic Acid** *79-10-7* *$C_3H_4O_2$* *72.06*	0.092 – 1.0	rancid, plastic, sweet	TWA = 2 Skin	–	–
10	**Acrylonitrile** *107-13-1* *C_3H_3N* *53.06*	1.6 – 22	onion, garlic	TWA = 2 Skin	TWA = 2 Skin	–
11	**Allyl Alcohol** *107-18-6* *C_3H_6O* *58.08*	0.51 – 35	mustard	TWA = 0.5 Skin	TWA = 2 Skin	–
12	**Allyl Chloride** *107-05-1* *C_3H_5Cl* *76.53*	0.48 – 5.9	pungent	TWA = 1 STEL = 2 Skin	TWA = 1	–
13	**Allyl Isothiocyanate** *57-06-7* *C_4H_5NS* *99.15*	0.0091 – 1.97	irritating	–	–	STEL = 1 Skin DSEN

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
14	**Ammonia** *7664-41-7* NH_3 *17.03*	0.043 – 60.3	pungent, irritating	TWA = 25 STEL = 35	TWA = 50	–
15	**n-Amyl Acetate** *628-63-7* $C_7H_{14}O_2$ *130.18*	0.007 – 43	banana, etherous	TWA = 50 STEL = 100	TWA = 100	–
16	**Aniline** *62-53-3* C_6H_7N *93.12*	0.012 – 10	pungent, oily, empyreumatic	TWA = 2 Skin BEI	TWA = 5 Skin	–
17	**Arsine** *7784-42-1* AsH_3 *77.93*	<1.0	garlic	TWA = 0.005	TWA = 0.05	–
18	**Benzaldehyde** *100-52-7* C_7H_6O *106.12*	0.0015 – 783	bitter almond, fruit, vanilla	–	–	TWA = 2 DSEN
19	**Benzene** *71-43-2* C_6H_6 *78.11*	0.47 – 313	aromatic, sweet, solvent, empyreumatic	TWA = 0.5 STEL = 2.5 Skin, BEI	TWA = 1	–
20	**Benzoyl Chloride** *98-88-4* C_7H_5ClO *140.56*	0.0021 – 0.0063	pungent	C = 0.5	–	C = 5 Skin, DSEN
21	**Benzyl Acetate** *140-11-4* $C_9H_{10}O_2$ *150.17*	0.00016 – 22	pears, plastic, etherous, anise	TWA = 10	–	–
22	**Benzyl Chloride** *100-44-7* C_7H_7Cl *126.58*	0.041 – 0.046	pungent	TWA = 1	TWA = 1	–
23	**Biphenyl** *92-52-4* $C_{12}H_{10}$ *154.2*	0.00052 – 0.0095	pleasant, butter-like	TWA = 0.2	TWA = 0.2	–
24	**Boron Trifluoride** *7637-07-2* BF_3 *67.82*	1.5	pungent	C = 1	C = 1	–
25	**Bromine** *7726-95-6* Br_2 *159.83*	<0.0099 – 0.99	alliaceous, sharp, irritating	TWA = 0.1 STEL = 0.2	TWA = 0.1	–
26	**Bromoform** *75-25-2* $CHBr_3$ *252.77*	0.19 – 15	chloroform, sweet, suffocating	TWA = 0.5	TWA = 0.5 Skin	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
27	**1,3-Butadiene** *106-99-0* C_4H_6 *54.09*	0.099 – 76	aromatic, rubber	TWA = 2	TWA = 1 STEL = 5	–
28	**Butane, all isomers** *106-97-8, 75-28-5* C_4H_{10} *58.12*	0.421 – 5,048	natural gas	STEL = 1,000	–	–
29	**Butenes, all isomers** *106-98-9, 107-01-7, 590-18-1* *624-64-6, 25167-67-3, 115-11-7* C_4H_8 *56.11*	0.362 – 2,126	petroleum	TWA = 250	–	–
30	**2-Butoxyethanol** *111-76-2* $C_6H_{14}O_2$ *118.17*	0.08 – 0.35	sweet, ester, musty	TWA = 20 BEI	TWA = 50 Skin	–
31	**2-Butoxyethyl Acetate** *112-07-2* $C_8H_{16}O_3$ *160.21*	0.107 – 0.99	fruity	TWA = 20	–	–
32	**n-Butyl Acetate** *123-86-4* $C_6H_{12}O_2$ *116.16*	0.00013 – 368	sweet, banana	TWA = 150 STEL = 200	TWA = 150	–
33	**sec-Butyl Acetate** *105-46-4* $C_6H_{12}O_2$ *116.16*	0.0025 – 4.76	fruity	TWA = 200	TWA = 200	–
34	**tert-Butyl Acetate** *540-88-5* $C_6H_{12}O_2$ *116.16*	0.008 – 1.31	mild	TWA = 200	TWA = 200	–
35	**n-Butyl Acrylate** *141-32-2* $C_7H_{12}O_2$ *128.17*	0.00029 – 0.101	sweet, rancid, plastic	TWA = 2 SEN	–	–
36	**n-Butyl Alcohol** *71-36-3* $C_4H_{10}O$ *74.12*	0.0033 – 990	sweet, malty, alcohol, medicinal	TWA = 20	TWA = 100	–
37	**sec-Butyl Alcohol** *78-92-2* $C_4H_{10}O$ *74.12*	0.043 – 94	sweet, malty alcohol	TWA = 100	TWA = 150	–
38	**tert-Butyl Alcohol** *75-65-0* $C_4H_{10}O$ *74.12*	3.3 – 957	sweet alcohol	TWA = 100	TWA = 100	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
39	**n-Butylamine** *109-73-9* $C_4H_{11}N$ *73.14*	0.08 – 13.9	sour ammonical	C = 5 Skin	C = 5 Skin	–
40	**n-Butyl Lactate** *138-22-7* $C_7H_{14}O_3$ *146.21*	0.0000000049	mild	TWA = 5	–	–
41	**Butyl Mercaptan** *109-79-5* $C_4H_{10}S$ *90.19*	0.0000027 – 4.9	skunk	TWA = 0.5	TWA = 10	–
42	**p-tert-Butyl Toluene** *98-51-1* $C_{11}H_{16}$ *148.24*	<5.031	gasoline	TWA = 1	TWA = 10	–
43	**Butyraldehyde** *123-72-8* C_4H_8O *72.11*	0.0003 – 5.09	pungent	–	–	TWA = 25
44	**Camphor, synthetic** *76-22-2* $C_{10}H_{16}O$ *152.23*	0.0026 - 7.2	camphorous	TWA = 2 STEL = 3	TWA = 0.321	–
45	**Caprolactam** *105-60-2* $C_6H_{11}NO$ *113.16*	0.065	mild	TWA 1.08 IFV	–	–
46	**Carbon Dioxide** *124-38-9* CO_2 *44.01*	39,000 – 600,136	–	TWA = 5000 STEL = 30000	TWA = 5000	–
47	**Carbon Disulfide** *75-15-0* CS_2 *76.14*	0.016 – 32	vegetable, sulfide, medicinal	TWA = 1 Skin BEI	TWA = 20 C = 30	–
48	**Carbon Tetrachloride** *56-23-5* CCl_4 *153.84*	1.68 – 720	sweet, ethereal, dry cleaner, aromatic	TWA = 5 STEL = 10 Skin	TWA = 10 C = 25	–
49	**Carbonyl Sulfide** *463-58-1* *COS* *60.08*	0.057 – 0.102	unpleasant	TWA = 5	–	–
50	**Chlorine** *7782-50-5* Cl_2 *70.91*	0.021 – 4.9	suffocating, sharp, bleach	TWA = 0.5 STEL = 1	C = 1	–
51	**Chlorine Dioxide** *10049-04-4* ClO_2 *67.46*	15	chlorine	TWA = 0.1 STEL = 0.3	TWA = 0.1	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
52	**2-Chloroacetophenone** *532-27-4* *C_8H_7ClO* *154.59*	0.016 - 0.111	fruity	TWA = 0.05	TWA = 0.05	–
53	**Chlorobenzene** *108-90-7* *C_6H_5Cl* *112.56*	0.087 - 13	almond-like, shoe polish	TWA = 10 BEI	TWA = 75	–
54	**Chlorodifluoromethane** *75-45-6* *$CHClF_2$* *86.47*	200,192	ethereal	TWA = 1,000	–	–
55	**Chloroform** *67-66-3* *$CHCl_3$* *119.38*	0.102 – 1,413	sweet, etherous, suffocating	TWA = 10	C = 50	–
56	**Chloropicrin** *76-06-2* *CCl_3NO_2* *164.38*	1.09	chlorine	TWA = 0.1	TWA = 0.1	–
57	**b-Chloroprene** *126-99-8* *C_4H_5Cl* *88.54*	0.11 – 276	rubber	TWA = 10 Skin	TWA = 25 Skin	–
58	**Chlorotoluene, o-isomer** *95-49-8* *C_7H_7Cl* *126.58*	0.18 – 0.270	aromatic	TWA = 50	–	–
59	**Citral** *5392-40-5* *$C_{10}H_{16}O$* *152.23*	0.000024 – 0.032	lemon, flowery, citrous	TWA = 5 IFV, Skin SEN	–	–
60	**Cresol, all isomers** *1319-77-3, 95-48-7* *108-39-4, 106-44-5* *C_7H_8O* *108.13*	0.00005 – 0.0090	creosote, phenol, irritating, smoky, empyreumatic, burnt plastic	TWA = 4.5 IFV, Skin	TWA = 5 Skin	–
61	**Crotonaldehyde** *4170-30-3, 123-73-9* *C_4H_6O* *70.09*	0.02 – 0.59	pungent	C = 0.3 Skin	TWA = 2	–
62	**Cumene** *98-82-8* *C_9H_{12}* *120.19*	0.008 – 1.3	sharp	TWA = 50	TWA = 50 Skin	–
63	**Cumene Hydroperoxide** *80-15-9* *$C_9H_{12}O_2$* *152.19*	0.0048	sharp, irritating	–	–	TWA = 1 Skin
64	**Cyanogen** *460-19-5* *CN* *26.02*	>500	almonds	TWA = 10	–	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
65	**Cyanogen Chloride** *506-77-4* *CCIN* *61.47*	0.994	acid	C = 0.3	–	–
66	**Cyclohexane** *110-82-7* C_6H_{12} *84.16*	0.52 – 784	pungent	TWA = 100	TWA = 300	–
67	**Cyclohexanol** *108-93-0* $C_6H_{12}O$ *100.16*	0.058 – 0.491	camphorous	TWA = 50 Skin	TWA = 50	–
68	**Cyclohexanone** *108-94-1* $C_6H_{10}O$ *98.14*	0.052 – 219	sweet, sharp	TWA = 20 Skin	TWA = 50	–
69	**Cyclohexene** *110-83-8* C_6H_{10} *82.14*	0.18	sweet	TWA = 300	TWA = 300	–
70	**Cyclohexylamine** *108-91-8* $C_6H_{13}N$ *99.17*	2.42	ammonia	TWA = 10	–	–
71	**Cyclopentadiene** *542-92-7* C_5H_6 *66.1*	1.8	terpene-like, pine, fruit	TWA = 75	TWA = 75	–
72	**Decaborane** *17702-41-9* $B_{10}H_{14}$ *122.31*	0.06	pungent	TWA = 0.05 STEL = 0.15 Skin	TWA = 0.05 Skin	–
73	**1-Decene** *872-05-9* $C_{10}H_{20}$ *140.27*	6.45	pleasant	–	–	TWA = 100
74	**Diacetone Alcohol** *123-42-2* $C_6H_{12}O_2$ *116.16*	0.27 – 13	sweet	TWA = 50	TWA = 50	–
75	**Diacetyl** *431-03-8* $C_4H_6O_2$ *86.09*	0.000002 – 2.9	pleasant, buttery	TWA = 0.01 STEL = 0.02	–	–
76	**Diallylamine** *124-02-7* $C_6H_{11}N$ *97.16*	2	disagreeable	–	–	TWA = 1 Skin
77	**Diborane** *19287-45-7* H_4B_2 *27.69*	1.8 – 3.5	repulsive	TWA = 0.1	TWA = 0.1	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
78	**2,3-Dibromo-1-Chloropropane** *96-12-8* C_3H_5BrCl *236.33*	0.01 – 0.031	irritating	–	TWA = 0.001	–
79	**Dibutylamine** *111-92-2* $C_8H_{19}N$ *129.24*	0.079 – 0.770	amine	–	–	C = 5 Skin
80	**Dibutyl Phthalate** *84-74-2* $C_{16}H_{22}O_4$ *278.34*	0.023	–	TWA = 0.44	TWA = 0.44	–
81	**Dichloroacetic Acid** *79-43-6* *C2H2Cl2O2* *128.94*	0.044	–	TWA = 0.5 Skin	–	–
82	**Dichlorobenzene, o- isomer** *95-50-1* $C_6H_4Cl_2$ *147.01*	0.02 – 50	camphor	TWA = 25 STEL = 50	C = 50	–
83	**Dichlorobenzene, p-isomer** *106-46-7* $C_6H_4Cl_2$ *147.01*	0.121 – 15	camphor, mothballs	TWA = 10	TWA = 75	–
84	**Dichlorodifluoromethane** *75-71-8* CCl_2F_2 *120.91*	199,790	ethereal	TWA = 1,000	TWA = 1,000	–
85	**1,1-Dichloroethane** *75-34-3* $C_2H_4Cl_2$ *98.97*	49 – 1,359	chloroform, aromatic	TWA = 100	TWA = 100	–
86	**1,2-Dichloroethylene, all isomers** *156-60-5, 156-59-2, 540-59-0* $C_2H_2Cl_2$ *96.94*	277	pleasant	TWA = 200	TWA = 200	–
87	**2,4-Dichlorophenol** *120-83-2* $C_6H_4Cl_2O$ *163*	0.000041	medicinal, phenolic, leather-like, fish sauce	–	–	TWA = 1 Skin, Q
88	**1,3-Dichloropropene** *542-75-6* $C_3H_2Cl_2$ *110.97*	<0.99	sweet, pungent	TWA = 1 Skin	–	–
89	**Dicyclopentadiene** *77-73-6* $C_{10}H_{12}$ *132.21*	0.00019 – 0.02	sweet, sharp	TWA = 5	–	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
90	**Diethanolamine** *111-42-2* $C_4H_{11}NO_2$ *105.14*	0.279	ammonia, amine, rotten fish	TWA = 0.2 IFV Skin	–	–
91	**Diethylamine** *109-89-7* $C_4H_{11}N$ *73.14*	0.0033 – 14.3	musty, fishy, amine	TWA = 5 STEL = 15	TWA = 25	–
92	**2-Diethylaminoethanol** *100-37-8* $C_6H_{15}ON$ *117.19*	0.01 – 0.25	amine, sharp, ammoniacal	TWA = 2 Skin	TWA = 10 Skin	–
93	**Diethylbenzenes, mixed isomers** *25340-17-4, 135-01-3* *105-05-5, 141-93-5* $C_{10}H_{14}$ *134.22*	0.00038 – 0.071	–	–	–	TWA = 5
94	**Diethyl Ketone** *96-22-0* $C_5H_{10}O$ *86.13*	0.85 – 14	acetone, fingernail polish remover	TWA = 200 STEL = 300	–	–
95	**Diethyl Phthalate** *84-66-2* $C_{12}H_{14}O_4$ *222.24*	0.036 – 0.363	–	TWA = 0.55	–	–
96	**Diisobutyl Ketone** *108-83-8* $C_9H_{18}O$ *142.24*	<0.103 – 1.6	peppermint	TWA = 25	TWA = 50	–
97	**Diisopropylamine** *108-18-9* $C_6H_{15}N$ *101.19*	0.014 – 4.2	amine, fishy	TWA = 5 Skin	TWA = 5 Skin	–
98	**N,N-Dimethylacetamide** *127-19-5* C_4H_9NO *87.12*	48	faint, ammonia	TWA = 10 Skin BEI	TWA = 10 Skin	–
99	**Dimethylamine** *124-40-3* C_2H_7N *45.08*	0.00076 – 4.2	ammoniacal, rotten fish	TWA = 5 STEL = 15	TWA = 10	TWA = 1
100	**Dimethylaniline** *121-69-7* $C_8H_{11}N$ *121.18*	0.001 – 0.2	oily	TWA = 5 STEL = 10 Skin BEI	TWA = 5 Skin	–
101	**Dimethyl Disulfide** *624-92-0* $C_2H_6S_2$ *94.2*	0.00029 – 1.45	garlic, putrid, asparagus	TWA = 0.5 Skin	–	–
102	**Dimethyl Ether** *115-10-6* C_2H_6O *46.07*	161 – 228	ethereal	–	–	TWA = 1,000

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
103	**Dimethyl Formamide** *68-12-2* *C_3H_7ON* *73.09*	0.047 – 100	fishy	TWA = 10 Skin BEI	TWA = 10 Skin	–
104	**1,1-Dimethylhydrazine** *57-14-7* *$C_2H_8N_2$* *60.1*	<0.31 – 14	fishy	TWA = 0.01 Skin	TWA = 0.5 Skin	–
105	**Dimethyl Sulfide** *75-18-3* *C_2H_6S* *62.13*	0.00012 – 8.11	disagreeable, asparagus, putrid	TWA = 10	–	–
106	**4,6-Dinitro-o-Cresol** *534-52-1* *$C_7H_6N_2O_5$* *198.13*	0.00049 - 0.00259	–	TWA = 0.025 Skin	TWA = 0.025 Skin	–
107	**1,4-Dioxane** *123-91-1* *$C_4H_8O_2$* *88.1*	0.8 – 2609	sweet, alcohol	TWA = 20 Skin	TWA = 100 Skin	–
108	**1,3-Dioxolane** *646-06-0* *$C_3H_6O_2$* *74.08*	16.8 – 63.4	–	TWA = 20	–	–
109	**Diphenylamine** *122-39-4* *$C_{12}H_{13}N$* *169.22*	0.022 – 0.188	floral	TWA = 1.44	–	–
110	**Dodecyl Mercaptan** *112-55-0* *$C_{12}H_{26}S$* *202.4*	0.00000011 – 0.000097	skunk	TWA = 0.1 SEN	–	–
111	**Epichlorohydrin** *106-89-8* *C_3H_5ClO* *92.53*	0.08 – 12	chloroform	TWA = 0.5 Skin	TWA = 5 Skin	–
112	**Ethane** *74-84-0* *C_2H_6* *30.07*	20,328 – 730,973	–	TWA = 1000	–	–
113	**Ethanolamine** *141-43-5* *C_2H_7NO* *61.08*	2.6 – 24	ammonia	TWA = 3 STEL = 6	TWA = 3	–
114	**2-Ethoxyethanol** *110-80-5* *$C_4H_{10}O_2$* *90.12*	0.3 – 49	sweet, musty	TWA = 5 Skin BEI	TWA = 200 Skin	–
115	**2-(2-Ethoxyethoxy) ethanol** *111-90-0* *$C_6H_{14}O_3$* *134.17*	<0.219 – 1.09	mild, pleasant	–	–	TWA = 25

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
116	**2-Ethoxyethyl Acetate** *111-15-9* $C_6H_{12}O_3$ *132.16*	0.048 – 0.13	sweet, ester	TWA = 5 Skin BEI	TWA = 100 Skin	–
117	**Ethyl Acetate** *141-78-6* $C_4H_8O_2$ *88.1*	0.09 – 190	fruity, sweet, fingernail polish, etherous	TWA = 400	TWA = 400	–
118	**Ethyl Acrylate** *140-88-5* $C_5H_8O_2$ *100.11*	0.0000066 – 0.0032	sweet, ester, plastic, alcohol, sharp, ammoniacal	TWA = 5 STEL = 15	TWA = 25 Skin	–
119	**Ethyl Alcohol** *64-17-5* C_2H_6O *46.07*	0.09 – 40334	vinous, alcohol	STEL = 1000	TWA = 1000	–
120	**Ethylamine** *75-04-7* C_2H_7N *45.08*	0.027 – 3.5	ammonia	TWA = 5 STEL = 15 Skin	TWA = 10	–
121	**Ethyl Amyl Ketone** *541-85-5* $C_8H_{16}O$ *128.21*	5.9	solvent, sharp	TWA = 10	TWA = 25	–
122	**Ethyl Benzene** *100-41-4* C_8H_{10} *106.16*	<0.002 – 18	oily, solvent	TWA = 20 STEL = 125 BEI	TWA = 100	–
123	**Ethyl Bromide** *74-96-4* C_2H_5Br *108.97*	2.7 – 3.6	ethereal	TWA = 5 Skin	TWA = 200	–
124	**Ethyl Chloride** *75-00-3* C_2H_5Cl *64.51*	3.8 – 379	pungent	TWA = 100 Skin	TWA = 1000	–
125	**Ethylene** *74-85-1* C_2H_4 *28.05*	17 – 1029	grassy	TWA = 200	–	–
126	**Ethylene Chlorohydrin** *107-07-3* C_2H_5ClO *80.51*	0.36	ethereal	C = 1 Skin	TWA = 5 Skin	–
127	**Ethylenediamine** *107-15-3* $C_2H_8N_2$ *60.1*	1.3 – 4.5	ammonia	TWA = 10 Skin	TWA = 10	–
128	**Ethylene Dibromide** *106-93-4* $C_2H_4Br_2$ *187.86*	<10	sweet	Skin	TWA = 20 C = 30	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
129	**Ethylene Dichloride** *107-06-2* *$C_2H_4Cl_2$* *98.96*	4.3 – 988	sweet	TWA = 10	TWA = 50 C = 100	–
130	**Ethylene Glycol** *107-21-1* *$C_2H_6O_2$* *62.07*	5.12	–	C = 39 H	–	–
131	**Ethyleneimine** *151-56-4* *C_2H_5N* *43.07*	0.71 – 2	ammonia	TWA = 0.05 STEL = 0.1 Skin	1910.1003 carcinogen	–
132	**Ethylene Oxide** *75-21-8* *C_2H_4O* *44.65*	0.82 – 690	sweet, olefinic	TWA = 1	TWA = 1 STEL = 5	–
133	**Ethyl Ether** *60-29-7* *$C_4H_{10}O$* *74.12*	0.165 – 1,924	anesthetic, etherous	TWA = 400 STEL = 500	TWA = 400	–
134	**Ethyl Formate** *109-94-4* *$C_3H_6O_2$* *74.08*	2.7 – 30	aromatic	STEL = 100	TWA = 100	–
135	**Ethylidene Norbornene** *16219-75-3* *C_9H_{12}* *120.19*	0.007 – 0.08	turpentine	C = 5	–	–
136	**Ethyl Mercaptan** *75-08-1* *C_2H_6S* *62.13*	0.0000087 – 18	rotten cabbage	TWA = 0.5	C = 10	–
137	**N-Ethylmorpholine** *100-74-3* *$C_6H_{13}NO$* *115.18*	0.085 – 0.25	ammonia	TWA = 5 Skin	TWA = 20 Skin	–
138	**Ethyl Silicate** *78-10-4* *$C_8H_{20}SiO_4$* *208.3*	3.6 – 85	sweet, alcohol	TWA = 10	TWA = 100	–
139	**Fluorine** *7782-41-4* *F_2* *37.997*	0.097 – 0.19	pungent	TWA = 1 STEL = 2	TWA = 0.1	–
140	**Formaldehyde** *50-00-0* *CH_2O* *30.03*	0.027 – 9,770	pungent	C = 0.3 SEN	TWA = 0.75 STEL = 2	–
141	**Formic Acid** *64-18-6* *CH_2O_2* *46.02*	0.52 – 340	sharp	TWA = 5 STEL = 10	TWA = 5	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
142	**Furan** *110-00-9* C_4H_4O *68.07*	10.06	strong	–	–	(W)
143	**Furfural** *98-01-1* $C_5H_4O_2$ *96.08*	0.002 – 0.713	bread, almond	TWA = 2 Skin BEI	TWA = 5 Skin	–
144	**Furfuryl Alcohol** *98-00-0* $C_5H_8O_2$ *98.1*	8	sweet, ether, alcohol	TWA = 10 STEL = 15 Skin	TWA = 50	–
145	**Glutaraldehyde** *111-30-8* $C_5H_8O_2$ *100.12*	0.00037 – 0.039	–	C = 0.05 SEN	–	–
146	**Halothane** *151-67-7* $C_2HBrClF_3$ *197.4*	33	chloroform	TWA = 50	–	–
147	**Heptane, all isomers** *142-82-5, 590-35-2, 565-59-3* *108-08-7, 591-76-4, 589-34-4* C_7H_{16} *100.2*	0.41 – 732	gasoline	TWA = 400 STEL = 500	TWA = 500	–
148	**Hexachlorocydopentadiene** *77-47-4* C_5Cl_6 *272.77*	0.15	pungent	TWA = 0.01	–	–
149	**1,6-Hexamethylene Diisocyanate** *822-06-0* $C_8H_{12}N_2O_2$ *168.19*	0.005 – 0.01	–	TWA = 0.005	–	–
150	**n-Hexane** *110-54-3* C_6H_{14} *86.17*	1.50 – 248	gasoline	TWA = 50 Skin BEI	TWA = 500	–
151	**Hexane, isomers except n-hexane** *107-83-5, 96-14-0, 75-83-2,* *79-29-8* C_6H_{14} *86.17*	0.426 – 20	gasoline	TWA = 500 STEL = 1,000	–	–
152	**1,6-Hexanediamine** *124-09-4* $C_6H_{16}N_2$ *116.2*	0.00067	–	TWA = 0.5	–	TWA = 1
153	**1-Hexene** *592-41-6* C_6H_{12} *84.16*	0.139	petroleum	TWA = 50	–	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
154	**sec-Hexyl Acetate** *108-84-9* $C_8H_{16}O_2$ *144.21*	<0.068 – 0.39	banana, pear, fruity	TWA = 50	TWA = 50	–
155	**n-Hexyl Alcohol** *111-27-3* $C_6H_{14}O$ *102.18*	0.0024 – 16	green grass, plastic	–	–	TWA = 40 Eye irritation
156	**Hexylene glycol** *107-41-5* $C_6H_{14}O_2$ *118.18*	3.93	mild, sweet	C = 25	–	–
157	**Hydrazine** *302-01-2* N_2H_4 *32.05*	3.0 – 4.0	ammonia	TWA = 0.01 Skin	TWA = 1 Skin	–
158	**Hydrogen Chloride** *7647-01-0* *HCl* *36.47*	0.06 – 10	sharp, irritating	C = 2	C = 5	–
159	**Hydrogen Cyanide** *74-90-8* *CHN* *27.03*	0.009 – 5.43	almonds	C = 4.7 Skin	TWA = 10 Skin	–
160	**Hydrogen Fluoride** *7664-39-3* *HF* *20.01*	0.04	highly corrosive, irritating	TWA = 0.5 C = 2 Skin, BEI	TWA = 3	–
161	**Hydrogen Selenide** *7783-07-5* H_2Se *80.98*	<0.3	garlic	TWA = 0.05	TWA = 0.05	–
162	**Hydrogen Sulfide** *7783-06-4* H_2S *34.08*	0.00004 – 1.4	rotten eggs	TWA = 1 STEL = 5	C = 20	–
163	**Indene** *95-13-6* C_9H_8 *116.15*	0.0027 – 0.0042	–	TWA = 5	–	–
164	**Iodine** *7553-56-2* I_2 *253.81*	0.973	sharp, alliaceous	TWA = 0.01 STEL = 0.1 IFV	C = 0.1	–
165	**Iodoform** *75-47-8* CHI_3 *393.78*	0.000019 – 1.12	chemical, etherish	TWA = 0.6	–	–
166	**Isoamyl Acetate** *123-92-2* $C_7H_{14}O_2$ *130.18*	0.00075 – 366	banana, fresh	TWA = 50 STEL = 100	TWA = 100	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
167	**Isoamyl Alcohol** *123-51-3* $C_5H_{12}O$ *88.15* *bitter*	0.00169 – 1.75	sweet, malty, rancid, rubber,	TWA = 100 STEL = 125	TWA = 100	–
168	**Isobutyl Acetate** *110-19-0* $C_6H_{12}O_2$ *116.16*	0.008 – 129	sweet, ester, medicinal	TWA = 150	TWA = 150	–
169	**Isobutyl Alcohol** *78-83-1* $C_4H_{10}O$ *74.12*	0.01 – 165	sweet, fusel, musty, alcohol, rubber, latex	TWA = 50	TWA = 100	–
170	**Isobutyraldehyde** *78-84-2* C_4H_8O *72.11*	0.00034 – 0.139	pungent	–	–	TWA = 25
171	**Isooctyl Alcohol** *26952-21-6, 60435-70-3* $C_8H_{18}O$ *130.23*	0.0092 – 0.049	faint, pleasant	TWA = 50 Skin	–	–
172	**Isophorone** *78-59-1* $C_9H_{14}O$ *138.2*	0.0003 – 0.19	sharp	C = 5	TWA = 25	–
173	**Isoprene** *78-79-5* C_5H_8 *68.12*	0.047 – 3.59	aromatic	–	–	TWA = 2
174	**Isopropyl Acetate** *108-21-4* $C_5H_{10}O_2$ *102.13*	0.160 – 41	fruity	TWA = 100 STEL = 200	TWA = 250	–
175	**Isopropyl Alcohol** *67-63-0* C_3H_8O *60.09*	1.0 – 2,197	sharp, rubbing alcohol	TWA = 100	TWA = 200	–
176	**Isopropylamine** *75-31-0* C_3H_9N *59.08*	0.025 – 0.70	ammoniacal, amine	TWA = 5 STEL = 10	TWA = 5	–
177	**Isopropyl Ether** *108-20-3* $C_6H_{14}O$ *102.17*	0.017 – 0.053	sweet	TWA = 250 STEL = 310	TWA = 500	–
178	**d-Limonene** *138-86-3* $C_{10}H_{16}$ *136.23*	0.0018 – 0.31	lemon, plastic, citrus, rubber, terpeny	–	–	TWA = 30
179	**Maleic Anhydride** *108-31-6* $C_4H_2O_3$ *98.06*	0.25 – 0.32	acrid	TWA = 0.0025 IFV, SEN	TWA = 0.25	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
180	**Mercaptoethanol** *60-24-2* *C_2H_6OS* *78.13*	0.075	–	–	–	TWA = 0.2 Skin
181	**Mesityl Oxide** *141-79-7* *$C_6H_{10}O$* *98.14*	0.017 – 12	sweet	TWA = 15 STEL = 25	TWA = 25	–
182	**Methacrylic acid** *79-41-4* *$C_4H_8O_2$* *86.09*	0.54 – 2.84	pungent	TWA = 20	–	–
183	**Methacrylonitrile** *126-98-7* *C_4H_5N* *67.09*	2.95 – 6.9	–	TWA = 1 Skin	–	–
184	**Methane** *74-82-8* *CH_4* *16.04*	2,896,197	–	TWA = 1,000	–	–
185	**2-Methoxyethanol** *109-86-4* *$C_3H_8O_2$* *76.09* *alcohol*	<0.096 – 90	sweet,	TWA = 0.1 Skin BEI	TWA = 25	–
186	**2-Methoxyethyl Acetate** *110-49-6* *$C_5H_{10}O_3$* *118.13*	0.33 – 0.64	sweet, ester	TWA = 0.1 Skin BEI	TWA = 25	–
187	**1-Methyoxy-2-Propanol** *107-98-2* *$C_4H_{10}O_2$* *90.12*	8.39 – 33	etherish, ammonia	TWA = 100 STEL = 150	–	–
188	**1-Methoxy-2-Propanol Acetate** *108-65-6* *$C_6H_{12}O_3$* *132.16*	0.0029 – 0.13	–	–	–	TWA = 50
189	**Methyl Acetate** *79-20-9* *$C_3H_6O_2$* *74.08*	0.17 – 2,848	fruity	TWA = 200 STEL = 250	TWA = 200	–
190	**Methyl Acrylate** *96-33-3* *$C_4H_6O_2$* *86.09*	0.003 – 0.025	plastic, sharp, airplane glue	TWA = 2 Skin SEN	TWA = 10 Skin	–
191	**Methyl Alcohol** *67-56-1* *CH_4O* *32.04*	3.05 – 198,686	sour, sweet, alcohol	TWA = 200 STEL = 250 Skin BEI	TWA = 200	–
192	**Methylamine** *74-89-5* *CH_5N* *31.06*	0.00075 - 4.8	fishy	TWA = 5 STEL = 15	TWA = 10	-

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
193	**Methyl n-amyl Ketone** *110-43-0* $C_7H_{14}O$ *114.18*	0.00075 – 0.71	sweet, mushroom	TWA = 50	TWA = 100	–
194	**N-Methyl Aniline** *100-61-8* C_7H_9N *107.15*	1.6 – 2.0	–	TWA = 0.5 Skin BEI	TWA = 2 Skin	–
195	**2-Methyl Butyl Acetate** *624-41-9* $C_7H_{14}O_2$ *130.18*	0.026 – 0.039	–	TWA = 50 STEL = 100	–	–
196	**Methyl tert-Butyl Ether** *1634-04-4* $C_5H_{12}O$ *88.15*	0.03 – 0.17	anesthetic	TWA = 50	–	–
197	**Methyl n-Butyl Ketone** *591-78-6* $C_6H_{12}O$ *100.16*	0.024 – 1.15	sweet, paint	TWA = 5 STEL = 10 Skin BEI	TWA = 100	–
198	**Methyl Chloride** *74-87-3* CH_3Cl *50.49*	>10	sweet, etherish	TWA = 50 STEL = 100	TWA = 100 Skin	–
199	**Methyl Chloroform** *71-55-6* $C_2H_3Cl_3$ *133.42*	0.97 – 715	sweet, etherish	TWA = 350 STEL = 450 BEI	TWA = 350	–
200	**Methyl 2-Cyanoacrylate** *137-05-3* $C_4H_5NO_2$ *111.1*	0.99 – 2.97	–	TWA = 0.2	–	–
201	**Methylcyclohexane** *108-87-2* C_7H_{14} *98.19*	0.149	petroleum	TWA = 400	TWA = 500	–
202	**2-Methylcyclohexanone** *583-60-8* $C_7H_{12}O$ *112.17*	0.181	acetone	TWA = 50 STEL = 75 Skin	TWA = 100 Skin	–
203	**Methylene Bisphenyl Isocyanate** *101-68-8* $C_{15}H_{10}O_2N_2$ *250*	0.39	–	TWA = 0.005	C = 0.02	–
204	**Methylene Chloride** *75-09-2* CH_2Cl_2 *84.94*	1.2 – 440	sweet	TWA = 50 BEI	TWA = 25	–
205	**Methyl Ethyl Ketone** *78-93-3* C_4H_8O *72.1*	0.07 – 339	sweet, sharp	TWA = 200 STEL = 300 BEI	TWA = 200	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
206	**Methyl Formate** *107-31-3* $C_2H_4O_2$ *60.06*	67 – 2,809	ethereal	TWA = 100 STEL = 150	TWA = 100	–
207	**Methyl Hydrazine** *60-34-4* CH_6N_2 *46.07*	1 – 3	ammonia	TWA = 0.01 Skin	C = 0.2 Skin	–
208	**Methyl Isoamyl Ketone** *110-12-3* $C_7H_{11}O$ *114.2*	0.0021 – 0.135	sweet, sharp	TWA = 50	TWA = 100	–
209	**Methyl Isobutyl Ketone** *108-101* $C_6H_{12}O$ *100.16*	0.03 – 16	sweet, sharp	TWA = 20 STEL = 75 BEI	TWA = 100	–
210	**Methyl Isocyanate** *624-83-9* C_2H_3NO *57.05*	2.14	–	TWA = 0.02 Skin	TWA = 0.02 Skin	–
211	**Methyl Isopropyl Ketone** *563-80-4* $C_5H_{10}O$ *86.14*	0.51 – 4.8	sweet, sharp	TWA = 20	–	–
212	**Methyl Mercaptan** *74-93-1* CH_4S *48.11*	0.00000000000051 – 0.56	rotten cabbage, garlic	TWA = 0.5	C = 10	–
213	**Methyl Methacrylate** *80-62-6* $C_5H_8O_2$ *100.13*	0.014 – 0.66	plastic, sharp	TWA = 50 STEL = 100 SEN	TWA = 100	–
214	**2-Methylnaphthalene** *91-57-6* $C_{11}H_{10}$ *142.2*	0.00069	–	TWA = 0.5 Skin	–	–
215	**Methyl Parathion** *298-00-0* $C_8H_{10}NO_5PS$ *263.23*	0.0012	pungent	TWA = 0.002 IFV Skin	–	–
216	**4-Methyl-2-Propanol** *108-11-2* $C_6H_{14}O$ *102.17*	0.335 – 0.526	–	TWA = 25 STEL = 40 Skin	TWA = 25 Skin	–
217	**Methyl Propyl Ketone** *107-87-9* $C_5H_{10}O$ *86.17*	0.028 – 65	fingernail polish	STEL = 150	TWA = 200	–
218	**n-Methyl-2-Pyrrolidone** *872-50-4* C_5H_9NO *99.13*	4.2 – 10	amine	–	–	TWA = 10 Skin

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
219	**Methyl Styrene** *98-83-9* C_9H_{10} *118.18*	0.02 – 49.7	–	TWA = 10	C= 100	–
220	**Methyl Vinyl Ketone** *78-94-4* C_4H_6O *70.09*	0.174	pungent	C = 0.2 Skin SEN	–	–
221	**Monochloroacetic Acid** *79-11-8* $C_2H_3ClO_2$ *94.5*	0.013 – 0.155	–	TWA = 0.5 IFV Skin	–	TWA = 0.5 Skin
222	**Morpholine** *110-91-8* C_4H_9NO *87.12*	0.011 – 0.070	fishy, amine	TWA = 20 Skin	TWA = 20 Skin	–
223	**Naphthalene** *91-20-3* $C_{10}H_8$ *128.16*	0.0019 – 1.02	tar, creosote, mothballs, empyreumatic	TWA = 10 STEL = 15 Skin	TWA = 10	–
224	**1-Naphthylamine** *134-32-7* $C_{10}H_9N$ *143.19*	0.024 – 0.050	–	–	1910.1003 carcinogen	–
225	**2-Naphthylamine** *91-59-8* $C_{10}H_9N$ *143.19*	0.24 – 0.32	–	–	1910.1003 carcinogen	–
226	**Nickel Carbonyl** *13463-39-3* $Ni(CO)_4$ *170.73*	0.5 – 3	sooty	TWA = 0.05	TWA = 0.001	–
227	**Nicotine** *54-11-5* $C_{10}H_{14}N_2$ *162.23*	0.0099	–	TWA = 0.075 Skin	TWA = 0.075 Skin	–
228	**Nitric Acid** *7697-37-2* HNO_3 *63.02*	0.27	suffocating	TWA = 2 STEL = 4	TWA = 2	–
229	**Nitrobenzene** *98-95-3* $C_6H_5NO_2$ *123.11*	0.0004 – 29	almonds, shoe polish, pungent	TWA = 1 Skin BEI	TWA = 1 Skin	–
230	**Nitrogen Dioxide** *10102-44-0* NO_2 *46.01*	0.058 – 0.5	bleach	TWA = 0.2	C = 5	–
231	**Nitromethane** *75-52-5* CH_3NO_2 *61.04*	50	–	TWA = 20	TWA = 100	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
232	**1-Nitropropane** *108-03-2* *$C_3H_7NO_2$* *89.09*	7.7 – 140	–	TWA = 25	TWA = 25	–
233	**2-Nitropropane** *79-46-9* *$C_3H_7NO_2$* *89.09*	4.94 – 288	fruity	TWA = 10	TWA = 25	–
234	**N-Nitrosodimethylamine** *62-75-9* *$C_2H_6N_2O$* *74.08*	0.0079 – 0.013	faint	Skin, L	1910.1003 carcinogen	–
235	**Nonane** *111-84-2* *C_9H_{20}* *128.26*	2.3 – 21	gasoline	TWA = 200	–	–
236	**Octane, all isomers** *111-65-9, 540-84-1, 86290-81-5* *C_8H_{18}* *114.22*	0.66 – 235	gasoline, oil	TWA = 300	TWA = 500 n-Octane only	–
237	**1-Octanol** *111-87-5* *$C_8H_{18}O$* *130.23*	0.0009 – 1.69	penetrating	–	–	TWA = 50
238	**1-Octene** *111-66-0* *C_8H_{16}* *112.21*	0.001 – 206	–	–	–	TWA = 75
239	**Oxygen Difluoride** *7783-41-7* *OF_2* *54*	0.0996	strong, peculiar	C = 0.05	TWA = 0.05	–
240	**Ozone** *10028-15-6* *O_3* *48*	0.0031 – 0.25	pungent, thunder storm	TWA = 0.05	TWA = 0.1	–
241	**Pentaborane** *19624-22-7* *B_5H_9* *63.17*	0.97	pungent	TWA = 0.005 STEL = 0.015	TWA = 0.005	–
242	**Pentane, all isomers** *78-78-4, 109-66-0, 463-82-1* *C_5H_{12}* *72.15*	1.29 – 1147	sweet	TWA = 600	TWA = 1,000	–
243	**2,4-Pentanedione** *123-54-6* *$C_5H_8O_2$* *100.12*	0.0098 – 0.0195	–	TWA = 25 Skin	–	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
244	**Pentanol, all isomers** *71-41-0,75-85-4, 75-84-3, 123-51-3, 137-32-6, 584-02-1, 598-75-4, 6032-29-7, 30899-19-5, 94624-12-1* $C_5H_{12}O$ *88.15*	0.0055 – 305	–	–	–	TWA = 100 71-41-0 only
245	**Perchloroethylene** *127-18-4* C_2Cl_4 *165.84*	0.767 – 71	etherish	TWA = 25 STEL = 100 BEI	TWA = 100 C = 200	–
246	**Perchloryl Fluoride** *7616-94-6* *ClFO* *70.45*	14.58	sweet	TWA = 3 STEL = 6	TWA = 3	–
247	**Phenol** *108-95-2* C_6H_5OH *94.11*	0.0045 – 1.95	medicinal, acid, ink, creosote, empyreumatic	TWA = 5 Skin BEI	TWA = 5 Skin	–
248	**Phenyl Mercaptan** *108-98-5* C_6H_6S *110.17*	0.00003 – 0.00027	putrid	TWA = 0.1 Skin	–	–
249	**Phosgene** *75-44-5* $COCl_2$ *98.92*	0.12 – 5.7	hay like	TWA = 0.1	TWA = 0.1	–
250	**Phosphine** *7803-51-2* PH_3 *34*	0.01 – 5	garlic	TWA = 0.3 STEL = 1	TWA = 0.3	–
251	**Phthalic Anhydride** *85-44-9* $C_8H_4O_3$ *148.1*	0.053	choking	TWA = 1 SEN	TWA = 2	–
252	**Picolines** *109-06-8, 108-99-6, 108-89-4* C_6H_7N *93.13*	0.0026 – 0.0236	strong, unpleasant	–	–	TWA = 2 STEL = 5 Skin
253	**Piperdine** *110-89-4* $C_5H_{11}N$ *85.15*	0.14 – <2	pepper	–	–	TWA = 1 Skin
254	**Propane** *74-98-6* C_3H_8 *44.09*	1497 – 19964	natural gas	TWA = 1000	TWA = 1000	–
255	**Propionaldehyde** *123-38-6* C_3H_6O *58.08*	0.001 – 101	fruity	TWA = 20	–	TWA = 20

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
256	**Propionic Acid** *79-09-4* $C_3H_6O_2$ *74.08*	0.00099 – 4.65	sour	TWA = 10	–	–
257	**n-Propyl Acetate** *109-60-4* $C_5H_{10}O_2$ *102.13*	0.048 – 87	sweet, ester	TWA = 200 STEL = 250	TWA = 200	–
258	**Propyl Alcohol** *71-23-8* C_3H_8O *60.09*	<0.031 – 10172	sweet, alcohol	TWA = 100	TWA = 200	–
259	**Propylene** *115-07-1* C_3H_6 *42.08*	10.1 – 99	gassy, aromatic	TWA = 500	–	–
260	**Propylene Dichloride** *78-87-5* $C_3H_6Cl_2$ *112.99*	0.26 – 8.66	sweet	TWA = 10 SEN	TWA = 75	–
261	**Propylene Glycol** *57-55-6* $C_3H_8O_2$ *76.09*	5.14	–	–	–	TWA = 3.2
262	**Propylene Glycol Dinitrate** *6423-43-4* $C_3H_6N_2O_6$ *166.09*	0.236	disagreeable	TWA = 0.05 Skin BEI	–	–
263	**Propylene Oxide** *75-56-9* C_3H_6O *58.08*	10 – 199	sweet	TWA = 2 SEN	TWA = 100	–
264	**Pyridine** *110-86-1* C_5H_5N *79.1*	0.01 – 12	burnt, pungent, nauseating	TWA = 1	TWA = 5	–
265	**Quinoline** *91-22-5* C_9H_7N *129.16*	0.0057 – 5.3	peculiar	–	–	TWA = 0.001 Skin
266	**Quinone** *106-51-4* $C_6H_4O_2$ *108.09*	0.011 – 0.10	pungent	TWA = 0.1	TWA = 0.1	–
267	**Styrene, monomer** *100-42-5* C_8H_8 *104.14*	0.0028 – 61	sharp, sweet	TWA = 20 STEL = 40 BEI	TWA = 100 C = 200	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
268	**Sulfur Dioxide** *7446-09-5* SO_2 *64.07*	0.33 - 8	metallic	STEL = 0.25	TWA = 5	-
269	**Sulfur Hexafluoride** *2551-62-4* F_6S *146.06*	4,017,527	–	TWA = 1,000	TWA = 1,000	–
270	**Sulfuric Acid** *7664-93-9, 8014-95-7* H_2SO_4 *98.08*	0.15	–	TWA = 0.05	TWA = 0.25	
271	**1,1,2,2-Tetrabromoethane** *79-27-6* $C_2H_2Br_4$ *345.65*	<0.99	camphor, pungent	TWA = 0.1 IFV	TWA = 1	–
272	**1,1,2,2-Tetrachloroethane** *79-34-5* $C_2H_2Cl_4$ *167.9*	0.233 – 7.3	solvent	TWA = 1 Skin	TWA = 5 Skin	–
273	**Tetrahydrofuran** *109-99-9* C_4H_8O *72.1*	0.092 – 61	ether	TWA = 50 STEL = 100 Skin	TWA = 200	–
274	**Thiogylcolic Acid** *68-11-1* $C_2H_4O_2S$ *92.12*	0.00021	unpleasant	TWA = 1 Skin	–	–
275	**Toluene** *108-88-3* C_7H_8 *92.13*	0.021 – 157	sour, burnt	TWA = 20 BEI	TWA = 200 C = 300	–
276	**Toluene 2,4- or 2,6-Diisocyanate** *584-84-9, 91-08-7* $C_9H_6N_2O_2$ *174.06*	0.02 – 2	–	TWA = 0.005 STEL = 0.02 SEN	C = 0.02 584-84-9 only	–
277	**o-Toluidine** *95-53-4* C_7H_9N *107.15*	0.025 – 6.6	aromatic, amine, empyreumatic	TWA = 2 Skin BEI	TWA = 5 Skin	–
278	**m-Toluidine** *108-44-1* C_7H_9N *107.15*	0.46 – 5.9	empyreumatic	TWA = 2 Skin BEI	–	–
279	**p-Toluidine** *106-49-0* C_7H_9N *107.15*	0.027 – 3.2	amine, empyreumatic	TWA = 2 Skin BEI	–	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
280	**Trichloroacetic acid** *76-03-9* $C_2HCl_3O_2$ *163.39*	0.24 – 0.37	–	TWA = 1	–	–
281	**1,2,4-Trichlorobenzene** *120-82-1* $C_6H_3Cl_3$ *181.46*	2.96	aromatic	C = 5	–	–
282	**Trichloroethylene** *79-01-6* C_2HCl_3 *131.4*	0.5 – 167	ether, solvent	TWA = 10 STEL = 25 BEI	TWA = 100 C = 200	–
283	**Trichlorofluoromethane** *75-69-4* CCl_3F *137.37*	5 – 200,057	–	C = 1000	TWA = 1000	–
284	**Triethanolamine** *102-71-6* $C_6H_{15}NO_3$ *149.19*	>10	mild, ammonia	TWA = 0.82	–	–
285	**Triethylamine** *121-44-8* C_3H_9N *101.19*	0.005 – 2.9	fishy, amine	TWA = 1 STEL = 3 Skin	TWA = 25	–
286	**Trimethylamine** *75-50-3* $C_6H_{15}N$ *59.11*	0.00002 – 1.82	fishy, pungent	TWA = 5 STEL = 15	–	TWA = 1
287	**Trimethyl Benzene, all isomers** *95-63-6, 108-67-8, 526-73-8, 25551-13-7* C_9H_{12} *120.19*	0.006 – 2.4	aromatic	TWA = 25	–	–
288	**Trimethyl Phosphite** *121-45-9* $C_3H_9O_3P$ *124.08*	0.000099	pungent	TWA = 2	–	–
289	**Turpentine & monoterpenes** *80-56-8, 127-91-3, 13466-78-9, 8006-64-2* $C_{10}H_{16}$ *136.23*	0.00006 – 19	turpentine, rosiny, pine tree, camphorous, fir needles	TWA = 20 SEN	TWA = 100 80006-64-2 only	–
290	**n-Valeraldehyde** *110-62-3* $C_5H_{10}O$ *86.13*	0.0004 – 4.97	sickening, rancid, decayed	TWA = 50	–	–

Table 6.1 – Odor Threshold Values, cont.

#	Compound Name *CAS Number* *Formula* *Molecular Weight*	Range of Odor Values (ppm)	Odor Character	ACGIH TLV® (ppm)	OSHA PEL (ppm)	AIHA WEEL® (ppm)
291	**Vanillin** *121-33-5* $C_8H_8O_3$ *152.15*	0.00000016 – 0.0929	vanilla, caramel, sweet	–	–	TWA = 1.6
292	**Vinyl Acetate** *108-05-4* $C_4H_6O_2$ *86.09*	0.12 – 0.4	sour, sharp	TWA = 10 STEL = 15	–	–
293	**Vinyl Chloride** *75-01-4* C_2H_3Cl *62.5*	203 – 356	sweet	TWA = 1	TWA = 1 STEL = 5	–
294	**Vinylidene chloride** *75-35-4* $C_2H_2Cl_2$ *96.94*	50 – 1387	chloroform	TWA = 5	–	–
295	**Xylene (o-, m-, p-, isomers)** *1330-20-7, 95-47-6* *108-38-3, 106-42-3* C_8H_{10} *106.16*	0.012 – 316	sweet, empyreumatic	TWA = 100 STEL = 150 BEI	TWA = 100	

Table 6.2 – Methods Summary of Reviewed Articles

Threshold methodologies were reviewed according to the criteria discussed in Section 4.4.

The table contains the following information:

- Source (Last name of first author) and publication date
- Panel size
- Panel selection criteria (i.e., trained, screened, etc.)
- Panel calibration
- Vapor modality (usually air; however, in a few cases water vapor or water)
- Diluent (unless specified otherwise in the paper, it was assumed to be air)
- Presentation mode (type of instrument at interface)
- Analytic measure
- Flow rate
- Threshold type
- Concentration series
- Trials (greater than one trial)
- Forced choice
- Concentration interval (less than or equal to a three-fold step size)

Abbreviations Used in Table

- R = recognition
- D = detection
- MP = minimum perceptible
- I = intensity
- A = ascending
- D = descending
- R = random
- V = variable
- U-D = up-down series
- ng – information not given in article
- nd – data not determined, usually in a foreign language article
- VDD8 = Vapor Delivery Device

Table 6.2 – Methods Summary of Reviewed Articles

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Adams (1968)	114 - 789	no	no	air	pure air	odor hood	yes	2-5 lpm	D	A + D + R	yes	no	yes	
Ahlstrom (1986a)	40	yes	yes	air	air	odor hood	yes	100 lpm	D	A + D + R	yes	yes	yes	
Ahlstrom (1968b)	64	yes	no	air	air	mobile olfactometer	yes	100 lpm	D	A	yes	yes	yes	
Akhemedov (1968)	4	yes	no	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Alibaev (1970)	25	yes	no	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Allison (1919)	ng	ng	ng	air	pure air	glass	no	≥8 lpm	D	ng	ng	no	ng	1
Amdur (1953)	14	ng	ng	air	air	face mask	yes	ng	R	ng	ng	no	yes	1
Amoore (1978)	>10	ng	ng	water	water or buffered water	flask	no	static	D	D	ng	yes	yes	56
Amoore (1977)	>10	ng	ng	water	water or buffered water	flask	no	static	D	D	ng	yes	yes	20, 56
Andreescheva (1964)	29	yes	yes	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Andreescheva (1968)	26	yes	no	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Appell (1969)	ng	ng	ng	water	water	bottle	ng	static	MP	ng	ng	ng	yes	17
Babin (1965)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Baikov (1963)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Baikov (1973)	28	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Basmadzhieva (1968)	13	ng	ng	air	ng	ng	ng	0.2-0.6 lpm	MP	ng	yes	yes	yes	36
Baydar (1993)	79	yes	no	air	air	olfactometer	yes	ng	D + R	A	yes	yes	yes	12
Belkov (1969)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2
Berglund (1992)	44	yes	no	air	natrium hydroxide	dynamic olfactometer	yes	100 lpm	D	A	yes	yes	yes	52
Berzins (1967)	18	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2
Bezpalkova (1967a)	23	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	yes	45
Blank (1993)	7	yes	ng	air	nitrogen	GC-olfactometry	yes	0.01 lpm	D	ng	yes	ng	ng	50
Blank (1989)	ng	ng	ng	ng	ng	GC-olfactometry	ng	ng	D	ng	ng	ng	ng	
Blinova (1965)	9 - 10	ng	ng	air	ng	gas mask	ng	ng	MP	ng	yes	ng	ng	46
Bocca (1964)	3	ng	ng	air	ng	blast	ng	167 lpm	D	D	yes	ng	ng	20, 62
Bokowa (2012)	3	yes	ng	ng	ng	dynamic olfactometer	ng	ng	D	ng	ng	ng	ng	

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Boriskova (1957)	12	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Brunekreef (1980)	4	ng	ng	air	air	ng	ng	ng	ng	ng	ng	yes	ng	59
Buettner (2001a)	10	yes	yes	air	water	bottle	ng	static	D	ng	yes	ng	ng	
Buettner (2001b)	ng	ng	ng	ng	ng	ng	ng	ng	D	ng	ng	ng	ng	
Bushtueva (1962)	ng	yes	ng	air	Clean air	cylinder	ng	ng	ng	ng	ng	no	ng	1
Buttery (1969)	>10	ng	ng	water	water	bottles	no	static	D + R	D	ng	yes	yes	20, 56
Cain (1987)	57, 72	yes	yes	air	propane, argon	olfactometer, bottles	yes	static, 180 lpm, 85 lpm	D + R	A	yes	yes	yes	51
Cain (2005)	33	yes	ng	air	silicon oil, water	glass vessel	yes	static, 3 lpm	D, S, I (eye)	A	yes	yes	yes	49
Cain (2007a)	10	yes	ng	air	air	VDD8	yes	40 lpm	D	yes	yes	yes	yes	
Cain (2008)	48	yes	ng	air	mineral oil, water	squeeze bottles	yes	static	D	A	yes	yes	yes	
Cain (2009)	29, 26	yes	no	air	nitrogen, air	VDD8	yes	78 lpm, 10 lpm	D + I (eye)	A	yes	yes	yes	49
Cain (1969)	12	ng	ng	vapor	Diethylphthalate	test tubes	no	static	R	A + D	yes	no	yes	19
Cain (1977)	2	ng	no	air	water	glass vessel	yes	static	D	A + D	yes	yes	ng	25

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	**Size**	**Selection Criteria**	**Calibration**	**Vapor Modality**	**Diluent**	**Presentation Mode**	**Analytic Measure**	**Flow Rate**	**Threshold Type**	**Conc. Series**	**Trials**	**Forced - Choice**	**Conc. Interval**	**Note #**
Cain (2007b)	50	yes	ng	air	air	VDD8	yes	40 lpm	D	yes	yes	yes	yes	
Cain (2010)	70, 17	yes	yes	air	nitrogen	VDD8	yes	1 lpm	D + eye irritation	ng	ng	ng	ng	49
Cancho (2001)	5 - 6	yes	ng	air	methanol or MTBE	Flavor Profile or GC-O	yes	ng	D	ng	ng	ng	ng	55
Catana (2012)	248	no	no	ng	ng	sniffin sticks	ng	ng	R	ng	ng	ng	ng	
Cederlof (1966)	30	ng	ng	air	air	hood	ng	100 lpm	D	A	ng	yes	yes	
Cerny (1994)	3	yes	ng	ng	ng	GC-olfactometery	ng	ng	D	ng	ng	ng	ng	
Chao-Chen-Tzi (1959)	13	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Cheesman (1959)	10-20	ng	ng	air	air	tube	no	yes	D	V	5	no	yes	29, 57
Clausen (1955)	ng	ng	ng	air	pure air	tube	ng	stream	D	D	ng	yes	ng	1, 20
Cometto-Muniz (1990)	7	yes	ng	air	mineral oil	squeeze bottles	yes	static	D	A	yes	yes	yes	
Cometto-Muniz (1991)	4	yes	no	air	mineral oil	squeeze bottles	yes	static	D, I	A	yes	yes	yes	
Cometto-Muniz (1993)	8	yes	ng	air	water, mineral oil	squeeze bottles	yes	static	D	A	yes	yes	yes	49
Cometto-Muniz (2002)	8	yes	ng	air	mineral oil	squeeze bottles	yes	static	D	A	yes	yes	yes	

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Cometto-Muniz (2008)	34	yes	yes	air	air	VDD8	yes	40 lpm	D	A	yes	yes	yes	44
Cometto-Muniz (2008)	36	yes	yes	air	air	VDD8	yes	40 lpm	D	A	yes	yes	yes	44
Cometto-Muniz (2009a)	39	yes	yes	air	air	VDD8	yes	40 lpm	D	A	yes	yes	yes	44
Cometto-Muniz (2009b)	36	yes	yes	air	air	VDD8	yes	40 lpm	D	A	yes	yes	yes	44
Cometto-Muniz (2010a)	16	yes	yes	air	air	VDD8	yes	40 lpm	D	A	yes	yes	yes	41
Cometto-Muniz (2010b)	14	yes	yes	air	air	VDD8	yes	40 lpm	D	A	yes	yes	yes	41
Cometto-Muniz (1998a)	11	yes	ng	air	mineral oil	squeeze bottles	yes	static	D	A	yes	yes	yes	
Cometto-Muniz (1998b)	4	yes	yes	air	mineral oil	squeeze bottles	yes	static	D	A	yes	yes	yes	49
Cometto-Muniz (2003)	varied	yes	ng	air	ng	glass bottles	yes	static	D	A	yes	yes	yes	
Cometto-Muniz (2004)	10	yes	ng	?	mineral oil	bottle	yes	static	D, S, I (eye)	yes	yes	yes	yes	
Cometto-Muniz (2005)	varied	yes	ng	air	mineral oil	glass bottles	yes	static	D	A	yes	yes	yes	
Cometto-Muniz (1999)	4, 14	yes	yes	air	mineral oil	squeeze bottles	yes	static	D	A	yes	yes	yes	49
Corbit (1971)	3	yes	no	air	air	nose port	no	2 lpm	D	A	5	yes	yes	37

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	**Size**	**Selection Criteria**	**Calibration**	**Vapor Modality**	**Diluent**	**Presentation Mode**	**Analytic Measure**	**Flow Rate**	**Threshold Type**	**Conc. Series**	**Trials**	**Forced - Choice**	**Conc. Interval**	**Note #**
Cormack (1974)	4-6	yes	ng	air	air	Room	yes	static	D	ng	ng	no	yes	
Crawford (1984)	4	ng	ng	ng	ng	Triangle Olfactometer	ng	ng	D	A	yes	yes	ng	
Czerny (2008)	ng	ng	ng	ng	water	ng	ng	ng	D	ng	ng	ng	ng	
Czerny (2011)	13	yes	no	air	water	GC-olfactometry	yes	ng	D	D	yes	no	no	
Dalton (1997b)	90	yes	no	air	propylene glycol, mineral oil	squeeze bottles	yes	static	D + I	A	yes	yes	yes	
Dalton (2000)	40	yes	yes	air	air	bottle	yes	static	D, I	U-D	yes	yes	yes	
Dalton (2007)	15	yes	yes	air	air	VDD8	yes	40 lpm	D	A & D	no	yes	yes	47
Davis (1973)	3	ng	ng	air	Clean air	funnel	ng	20 lpm	D	D	ng	no	yes	37
Dixon (1977)	II	yes	ng	air	Oxygen	tube	yes	7-8 lpm	D	U-D	ng	yes	yes	38
Dobrinskii (1964)	ng	ng	ng	air	ng	ng	yes	ng	MP	ng	ng	ng	ng	46
Doty (1984)	1955	ng	ng	ng	ng	ng	ng	ng	D	ng	ng	ng	ng	51
Doty (1988)	36	yes	ng	air	Clean air	bottles	yes	static	D	A + D	ng	yes	yes	
Dravnieks (1971)	5-7	ng	ng	air	ng	ng	yes	ng	D	ng	ng	ng	ng	

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Dravnieks (1972)	nd	nd	nd	water	nd	nd	nd	static	D	nd	nd	nd	nd	
Dravnieks (1968)	ng	ng	ng	air	ng	ng	yes	ng	ng	ng	ng	ng	ng	
Dravnieks (1973)	9	Yes	ng	Air	Pure air	glass port	No	0.6 Lpm	D	A	ng	Yes	Yes	
Dravnieks (1974)	9	ng	ng	Air	Pure air	glass port	No	0.15 Lpm	D	A	ng	Yes	Yes	
Duan-Fen-Djuy (1959)	12	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Dubrovskaya (1961)	12	ng	ng	air	ng	ng	ng	ng	MP	ng	yes	ng	yes	46
Dubrovskaya (1973)	18	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Dubrovskaya (1957)	12	ng	ng	air	ng	ng	ng	ng	MP	ng	yes	ng	yes	36
Dubrovskaya (1969)	22	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Dumas (1974)	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	
Eglite (1968)	20	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Elfimova (1967	18	ng	ng	air	ng	ng	ng	ng	ng	ng	yes	ng	ng	2
Feddes (2001)	24	yes	yes	air	air	olfactometer	Indirectly	Up to 20 lpm	D	A	yes	yes	ng	8

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Feldman (1960)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	45
Feldman (1971)	15	yes	ng	air	ng	ng	yes	ng	MP	ng	ng	ng	yes	46
Feldman (1967)	20	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Ferreira (1998)	4	yes	ng	air	helium	GC-olfactometry	yes	4 ml/min	D	ng	ng	ng	ng	33
Filatova (1962)	14	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Fischer (2008)	2	no	yes	air	Dichloromethane	nasal cone	yes	ng	D	D	no	no	ng	13
Flemming (1977)	18 - 20	yes	ng	air	Compressed air	tube	yes	10 lpm	R	A	no	no	yes	
Fluck (1976)	10	ng	ng	air	Room air	test room	yes	static	R	R	ng	no	yes	4
Fomin (1966)	18	ng	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	ng	
Gijs (2000)	3	yes	ng	air	air	GC-olfactometery	yes	20 ml/min	D	yes	no	no	no	
Glindemann (2006)	4	yes	ng	air	ng	dilution olfactometer	yes	ng	D	D	ng	ng	ng	
Gofmekler (1967)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	
Gofmekler (1960)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Gorlova (1970)	24	ng	ng	air	ng	ng	yes	ng	MP	ng	yes	ng	ng	
Greenman (2004)	7	yes	yes	air	several	bottles	no	0.2 lpm	D	ng	yes	ng	yes	14
Grigorieva (1964)	12	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Gundlach (1939)	16-60	ng	ng	air	pure air	nose piece	no	0.041-0.35 lpm	D	ng	ng	yes	yes	24
Gusev (1965)	18-30	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Guth (2001)	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	13
Hartung (1971)	ng	ng	ng	air	ng	ng	yes	ng	ng	ng	ng	ng	ng	5
Hellman (1974)	5	yes	no	air	air	air stream	yes	20-80 lpm	D+R	A	yes	yes	yes	
Hellman (1973a,b)	5	yes	no	air	air	air stream	yes	20-80 lpm	D+R	A	yes	yes	yes	
Hesse (1926)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	1
Hesse (1928)	ng	ng	ng	air	ng	ng	yes	ng	ng	ng	ng	ng	ng	1
Higuchi (2004)	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	
Hildenskiold (1959)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	45

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Hollingsworth (1963)	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	
Holmes (1915)	60	no	ng	air	air	booth	ng	High Velocity	D+R	A	yes	no	yes	
Homans (1978)	16	nd	nd	air	nd	nd	yes	yes	D	A	nd	nd	yes	29
Hori (1972)	5 - 10	no	ng	air	air	syringe	yes	static	ng	A	ng	no	ng	1
Hoshika (1997)	7	ng	ng	air	air	ng	yes	static	R	two	ng	ng	ng	53
Ifeadi (1972)	1	no	ng	air	Charcoal filtered	hood	yes	0.4 lpm	D	A	yes	no	yes	37
Imasheva (1963)	18	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Itskovich (1962)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2
Ivanov (1964)	11	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Jacobson (1955)	15 - 22	ng	ng	air	Room air	nostril piece	yes	static	D	A	ng	no	yes	
Jacobson (1956)	14 - 16	ng	ng	air	Room air	nostril piece	yes	static	D	A	ng	no	yes	
Jacobson (1958)	13	ng	ng	air	Room air	nostril piece	yes	static	D	A	ng	no	yes	
Jones (1954)	4	no	no	air	pure air	nostril piece	no	3 lpm	R	A	yes	no	ng	1, 46

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Jones (1955a)	24	no	no	water	Mineral Spirits	flask	no	static	ng	A	yes	no	ng	1
Jones (1955b)	45	no	no	air	pure air	nostril piece	no	3 lpm	R	A	no	no	ng	1
Jones (1955c)	84	no	no	air	pure air	nostril piece	no	3 lpm	D	A	no	no	ng	1
Kaloyanova (1967)	10	yes	no	air	ng	ng	ng	ng	MP	ng	ng	ng	yes	
Kaloyanova (1968)	12	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Katz (1930)	7 - 14	no	no	air	pure air	funnel	no	≥8 lpm	D	A	no	no	yes	
Kerka (1956)	6	yes	ng	air	nitrogen	test room	ng	static	D + R	ng	yes	no	ng	21
Khachaturyan (1968)	3	ng	ng	air	ng	ng	ng	ng	ng	D	yes	ng	yes	38
Khachaturyan (1969)	3	ng	ng	air	ng	ng	ng	ng	ng	ng	yes	ng	ng	36
Khiari (1992)	ng	yes	ng	ng	ng	GC-olfactometery	yes	ng	D	ng	ng	ng	ng	
Khikmatullaeva (1967)	21	yes	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	ng	
Kinkead (1971a)	6	no	no	air	Test room	no	no	static	D	R	yes	no	yes	3
Kinkead (1971b)	3	no	no	air	Test room	no	no	static	D	ng	yes	no	2-5	37

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Kleinbeck (2011)	44	yes	no	air	nitrogen	flow olfactometer	yes	ng	D + I	A	yes	yes	yes	
Kniebes (1969)	13 - 33	no	ng	air	nitrogen	test room		static	D	R	yes	no	yes	20
Komthong (2006)	3	yes	ng	air	air	GC-olfactometery	yes	ng	D	D	only two trials	no	ng	34
Korneev (1965)	22	yes	ng	air	carbon	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Kosiborod (1968)	22	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Krackow (1953)	ng	ng	ng	air	ng	ng	ng	ng	D	ng	ng	ng	ng	
Krasovitskaya (1968)	11	yes	ng	air	Clean air	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Krichevskaya (1968)	21	yes	ng	air	Clean air	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Kristesashvili (1965)	12	ng	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	ng	
Kulakov (1964)	19	yes	ng	air	Clean air	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Laffort (1987)	9	yes	ng	ng	ng	tedlar bags	ng	ng	D	ng	ng	ng	ng	32
Laffort (1973)	4	no	no	air	air	Mono rhinal valve	yes	0.4 lpm	D	R	yes	ng	ng	1, 20, 37
Laing (1975)	6	no	no	air	nitrogen	sniff port	yes	0.04 lpm	D	R + D	yes	no	yes	38

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
aing (1978)	16	yes	no	air	nitrogen	nose & mouth port	yes	10 lpm	R	R	yes	no	yes	42
aing (1982)	23	yes	yes	air	air	chamber & olfactometer	ng	10 lpm	D	A - D	yes	yes	yes	
aska (2010)	20	yes	no	air	several	squeeze bottles	no	static	D	A	yes	yes	yes	10
aska (1991)	44	yes	ng	air	n-butanol	sniff bottles	estimated	static	D	A	yes	yes	ng	31
eonardos (1969)	4	yes	no	air	Purified air	test room	no	static	100%	R	no	no	no	
L-Shen (1961)	15	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
oginova (1957)	11	ng	ng	air	air	bifarate tube		ng	MP	ng	yes	no	yes	36
otsch (1997)	5	yes	yes	air	air	dynamic olfactometer	yes	ng	D, I	A - D	yes	yes	yes	
Makhinya (1966)	19	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Malyarova (1967)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2
Marin (1988)	8	yes	yes	air	air	G-olfactometry	yes	ng	D	D	yes	no	ng	54
Martirosyan (1970)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2
Mateson (1955)	ng	yes	yes	air	ng	glass funnel	ng	yes	ng	ng	ng	ng	ng	8, 29

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
May (1966)	16	yes	ng	air	air	flask	yes	static	D+R	U-D	yes	no	yes	60
McGinley (2003)	5	yes	no	air	air	Scentometer, Nasal Ranger	yes	16 - 20 lpm	D	A	yes	yes	yes	8
Melekhina (1958)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Melekhina (1968)	16	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Melzner (2011)	25	yes	yes	air	air	olfactometer	yes	8 lpm	D	A	yes	yes	yes	9
Minaev (1966)	19	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Miryakubova (1970)	ng	ng	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	ng	2
Miyazawa (2009a)	12	yes	ng	air	water	GC-olfactometry	yes	30 lpm	D	A	yes	yes	yes	31
Mnatsakanyan (1962)	11	yes	ng	air	ng	ng	yes	ng	R	ng	yes	ng	yes	1
Molhave (2000)	12	yes	yes	Aor	air	olfactometer	ng	ng	D	A	no	yes	yes	18
Moskowitz (1974)	33	no	ng	air	air	nose port	yes	0.12 lpm	D	ng	ng	no	yes	40
Muhlen (1968)	4	ng	ng	air	air	hood	yes	static	R	U-D	ng	no	yes	37
Mukhamedova (1968)	22	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Mukhitov (1971)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2
Mukhitov (1962)	14	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Mullins (1955)	9 - 23	no	no	air	air	nose port	no	4 lpm	R	ng	yes	no	ng	37
Murphy (1985)	9 - 20	yes	ng	air	air	dilution olfactometer	no	no	D	A + D	ng	yes	yes	63
Nader (1958)	10	no	no	air	pure air	mask	no	15-20 lpm	D	A	yes	no	yes	
Nagata (2003)	6	yes	yes	air	nitrogen	tedlar bag	yes	static	D	ng	ng	yes	ng	
Neuhaus (1957)	nd	nd	nd	air	nd	nd	nd	nd	D + R	nd	nd	nd	no	28
Nevers (1965)	6+	ng	ng	air	pure air	funnel	ng	1.25 lpm	I	R	ng	yes	yes	58
Nikiforov (1970)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2
Nimmermark (2011)	4 - 16	yes	yes	ng	ng	olfactometer	ng	ng	D + R	ng	yes	yes	yes	
Nishida (1975)	20	ng	ng	air	Fresh air	mask	ng	I lpm	D	ng	ng	no	yes	
Nishida (1979)	8 - 11	ng	ng	air	carbon	mask	yes	2 lpm	D	A + D	yes	no	yes	19
Nordin (1997)	16	yes	yes	air	air	dynamic olfactometer	yes	100 lpm	D	yes	yes	yes	yes	39

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Novikov (1957)	12	yes	ng	air	ng	ng	ng	ng	MP	ng	yes	ng	yes	36
Odoshashvili (1962)	12	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	nd	yes	yes	yes	36
Olsson (2010)	500	yes	no	air	Diethyl Phthalate	squeeze bottles	no	static	D	A	yes	yes	yes	12
Ozturk (1976)	12-26	yes	ng	water vapor	Distilled water	aerosol bottle	yes	static	D	A	ng	no	yes	
Pangborn (1964)	5	yes	ng	air	pure air	hood	no	ng	D	R	yes	yes	yes	
Parker (1913)	2	ng	ng	air	air	jar	no	static	R	ng	yes	yes	yes	37
Patterson (1993)	40	yes	ng	air	mineral oil	squeeze bottles	yes	static	D	A + D	yes	yes	no	
Piggott (1975)	10	yes	ng	water	water	bottle	no	static	ng	R	yes	no	yes	20
Pliska (1965)	nd	nd	nd	air	nd	nose port	nd	nd	nd	ng	A	nd	nd	
Plotnikova (1957)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Pogosyan (1965)	18	ng	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	ng	
Polednik (2008)	22	yes	ng	air	air	Room	yes	ng	D	ng	yes	yes	yes	
Polgar (1975)	6	yes	ng	air	pure air	cup	ng	3 lpm	R	A	ng	yes	yes	

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	**Size**	**Selection Criteria**	**Calibration**	**Vapor Modality**	**Diluent**	**Presentation Mode**	**Analytic Measure**	**Flow Rate**	**Threshold Type**	**Conc. Series**	**Trials**	**Forced - Choice**	**Conc. Interval**	**Note #**
Poostchi (1986)	7 to 10	ng	ng	ng	ng	olfactometer	yes	01 lpm	D-R	ng	yes	yes	yes	
Popov (1970)	ng	ng	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	ng	
Pozzani (1968)	8 - 9	no	ng	air	air	test room	yes	static	D	R	yes	no	yes	3
Prusakov (1976)	7	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Punter (1983)	26 - 44	nd	nd	air	nitrogen	port	yes	5 lpm	D	A	yes	yes	yes	
Randebrock (1971)	5	ng	ng	air	ng	sniff port	yes	ng	ng	ng	1-5	ng	ng	1
Ripp (1968)	16	yes	ng	air	pure air	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Rylova (1953)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	1
Sadilova (1968)	17	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Saifutdinov (1966)	22	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Sanders (1970)	4	yes	yes	air	Clean air	mask	no	12 lpm	D	A	yes	no	yes	37
Savenhed (1985)	ng	ng	ng	air	ng	G-olfactometery	yes	ng	D	ng	ng	ng	ng	
Scherberger (1958)	3	no	no	air	air	glass	yes	07 or 31 lpm	R	ng	yes	no	ng	1, 37

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Scherberger (1960)	ng	ng	ng	ng	ng	ng	ng	ng	D	ng	ng	ng	ng	
Schmidt (2010)	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	16
Schneider (1955)	53	yes	ng	air	Odor free air	test room	no	static	D	R + D + A	yes	no	ng	20
Schneider (1966)	8	yes	ng	air	nitrogen	nares piece	yes	0.6-4.8 lpm	R	A	yes	no	ng	1
Schulman (2011)	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	61
Selyuzhitskii (1976)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	2
Sgibnev (1968)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Shalamberidze (1967)	14-15	ng	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	ng	
Shusterman (1997a)	30	yes	no	air	air	nasal canula	no	5 lpm	I (Irritation)	A	no	no	no	49
Sinkuvene (1970)	ng	ng	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	ng	
Slavgorodskiy (1968)	27	ng	ng	air	ng	ng	ng	ng	MP	ng	yes	ng	yes	
Slotnick (1984)	10	ng	ng	ng	air	olfactometer	ng	ng	ng	ng	ng	ng	ng	
Smeets (2002)	26	yes	yes	air	propylene glycol, mineral oil	bottle	Y	static	D and I	A + D	yes	yes	yes	47

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Smeets (2007)	24	yes	yes	air	water	bottle	yes	static & Dynamic	D and I	A	yes	yes	yes	49
Smith (1969)	7	ng	ng	air	nitrogen	nose piece	yes	static	R	D	ng	yes	yes	20
Solomin (1961)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Solomin (1964)	14	yes	ng	air	carbon	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Stalker (1963)	23	yes	no	air	pure air	mask	yes	15-20 lpm	D	A	yes	no	yes	
Steinmetz (1969)	5	yes	ng	air	Odor free air	hood	no	yes	D	R	yes	yes	ng	20, 29
Stephens (1971)	ng	ng	ng	air	pure air	sniff port	yes	yes	ng	ng	ng	yes	ng	1, 29
Stevens (1993)	24	yes	no	air	water	squeeze bottles	yes	static	D	A	yes	yes	yes	63
Stevens (1988)	3	no	yes	ng	water, mineral oil	squeeze bottles	yes	ng	D	A	ng	yes	yes	
Stewart (1974)	9	yes	ng	air	Room air	test room	yes	static	D	R	yes	no	yes	38
Stone (1965)	9	yes	ng	air	Charcoal filtered	hood	yes	yes	D	R	yes	yes	yes	20, 29
Stone (1967b)	6	yes	ng	air	Odor free air	hood	no	yes	D	R	yes	yes	yes	20, 29
Stone (1962)	48	yes	ng	air	Charcoal filtered	hood	yes	yes	D	R	yes	yes	yes	20, 29

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Stone (19623b)	54	no	ng	air	pure air	hood	yes	yes	D	R	yes	yes	yes	20, 29
Stone (1963a)	6	no	ng	air	Charcoal filtered	hood	no	yes	D	R	yes	yes	yes	20, 29
Stone (1967a)	9	yes	ng	air	Charcoal filtered	hood	no	yes	D + R	R	yes	yes	yes	20, 29
Stone (1972)	3 - 5	yes	no	air	air	nose port	yes	yes	D	R	ng	yes	yes	20, 29
Strube (2012)	10	yes	yes	air	air and water	GC-olfactometry	yes	ng	D	ng	ng	ng	ng	
Styazhkin (1973)	17	yes	ng	air	pure air	ng	ng	ng	MP	ng	ng	yes	yes	
Tabakova (1969)	23	yes	ng	air	ng	ng	ng	ng	MP	ng	ng	ng	yes	
Takhiroff (1957)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	45
Takhirov (1969)	ng	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Tamman (1928)	3-7	ng	ng	air	air	nd	no	yes	D	A	ng	no	yes	29, 37
Tarkhova (1965)	20	yes	ng	air	air	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Tepikina (1968)	24	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Teranishi (1974)	ng	ng	ng	water	water	ng	ng	static	ng	ng	ng	ng	ng	1

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Thiele (1979)	3, 15, 150	nd	nd	air	Activated carbon	port	nd	nd	D	nd	nd	yes	yes	
Thriel (2006a)	144	yes	yes	air	water or Mineral Oil	bottle	yes	static	D	A	yes	yes	yes	51
Tkach (1965)	16	yes	ng	air	carbon filtered	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Tkachev (1963)	17	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Tkachev (1969)	ng	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	1
Tkachev (1970)	21	ng	ng	air	ng	ng	ng	ng	ng	ng	ng	ng	ng	
Torkelson (1977)	10	no	no	ng	ng	ng	ng	ng	R	A	ng	ng	yes	
Tsukatani (2003)	31	ng	ng	ng	several	ng	ng	ng	D	A	ng	ng	ng	
Turk (1973)	ng	no	no	air	ambient air	vent	yes	Varied	R	D	yes	no	yes	20
Ubaidullaev (1978)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Ubaidullaev (1961)	nd	nd	nd	air	nd	nd	nd	nd	MP	nd	nd	nd	nd	46
Ubaidullaev (1966)	25	ng	ng	air	air	ng	yes	ng	MP	ng	ng	ng	ng	
Ueno (2009)	6, 12, 51	yes	yes	ng	air	olfactometer	yes	ng	D	D + A	ng	Triangle Bag Method	yes	

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	Size	Selection Criteria	Calibration	Vapor Modality	Diluent	Presentation Mode	Analytic Measure	Flow Rate	Threshold Type	Conc. Series	Trials	Forced - Choice	Conc. Interval	Note #
Ventura (1997)	5	ng	ng	air	water, air	GC / Sniffer	yes	71 cm/s	R	A	ng	ng	yes	
Vermeulen (2006)	2	ng	ng	air	air	GC-olfactometry	yes	20ml/min	D	A	ng	ng	yes	
Viswanathan (1983)	17	no	no	ng	ng	bag and olfactometry	ng	static and dynamic	D	A	ng	yes	yes	
Walker (1996)	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	
Walker (2003)	7 & 5	yes	yes	air	air	olfactometer	yes	43 lpm	D	A	Y	no	yes	
Weeks (1960)	12	ng	ng	ng	air	Fair Wells Osmoscope	ng	ng	R	ng	ng	no	ng	
Whisman (1978)	6	yes	ng	air	air	test room	yes	yes	D	A	yes	no	yes	29
Wilby (1964)	3-4	yes	ng	air	air	10-inch square port	no	2830 lpm	D	A	yes	no	yes	37
Wilby (1969)	35	no	ng	air	air	10-inch square port	yes	2830 lpm	R	R	yes	no	yes	42
Williams (1977)	10	yes	nd	air	Clean air	nose port	no	0.5 lpm	D	A	ng	yes	yes	
Winneke (1979)	31	nd	nd	air	nd	hood	yes	yes	D	A	nd	no	yes	29
Wise (2007)	20	yes	yes	nitrogen	air	olfactometer	yes	30 lpm	R	A	yes	yes	yes	
Witheridge (1939)	2	yes	ng	air	Clean air	test room	yes	static	D	ng	ng	no	yes	37

Table 6.2 – Methods Summary of Reviewed Articles, cont.

	Panel			Presentation Apparatus					Presentation Method					
Source (Year)	**Size**	**Selection Criteria**	**Calibration**	**Vapor Modality**	**Diluent**	**Presentation Mode**	**Analytic Measure**	**Flow Rate**	**Threshold Type**	**Conc. Series**	**Trials**	**Forced - Choice**	**Conc. Interval**	**Note #**
Yang (2008)	3	ng	ng	ng	hexane	GC-olfactometry	yes	2 ml/min	D	ng	ng	no	yes	
Young (1966)	81	yes	ng	air	Filtered air	mask	yes	57 lpm	D	A	yes	no	yes	
Yuldashev (1965)	20	ng	ng	air	ng	ng	yes	ng	MP	ng	ng	ng	ng	
Zarzo (2012)	ng	ng	ng	ng	ng	ng	ng	ng	D	ng	ng	ng	ng	
Zibireva (1967)	ng	ng	ng	air	pure air	cylinder	yes	15 lpm	MP	ng	yes	yes	yes	36
Ziemer (2000)	10	ng	ng	air	air	Devlin olfactometer	yes	ng	D	A	yes	no	ng	

Notes to Table 6.2

1 A project note about an experimental paper presenting threshold values.
2 Abstract with insufficient information.
3 Adaptation effects were avoided with a 45-min interval between concentrations.
4 Although a random presentation was used in this study, adaptation effects were avoided by presenting stimuli with 30 minute intervals between concentrations.
5 Approximate thresholds determined and no threshold methodology is given.
6 Article only provided the range of all measurements and the values detected 90% of the time.
7 Article investigated an additive effect of odorants.
8 Article focused upon validating olfactometer(s).
9 Article investigated whether subjects detected CO_2 in the nose or the mouth first.
10 Article investigates the odor detection, descrimination and chemesthetic properties.
11 Article investigating nasal irritation sensitivity variation in humans.
12 Article investigating odor threshold differences between males, females, osmics and anosmics.
13 Article contains good descriptions for the compounds found in orange peel vapor.
14 Article investigating the compounds and their organoleptic intensity scales.
15 Article mentions new olfactometer. Flow rate difficult to determine.
16 Article on good odor measurement methods/studies and the vapor delivery device 8 (VDD8).
17 Article refers to a minimal perceptible concentration based on an intensity scale.
18 Article refers to a previously published articles for the details of the odor testing. Results are for brief, 2 minute duration, exposures only.
19 Ascending/descending patterns with consideration of other factors of the experimental design.
20 Concentration series are presented with insufficient time for de-adaptation of the olfactory receptors.
21 Concentration series not given, however the 1-hr waiting period used would eliminate adaptation effects.
22 Concentrations are presented in ascending, descending, and random order.
23 Detection threshold was a 50% response.
24 Different subjects were tested at different concentrations to eliminate adaptation effects.
25 Evaluation of the repeatability of odor threshold data; determining the precision of odor threshold identification methods. air-dilution olfactometer had good precision (4.2%).
26 Experimental purpose was to avoid inhibition.
27 Eye irritation and pugency was measured.
28 German article. A tenfold concentration step size was used.
29 Flow rate difficult to determine.
30 Panel was 50% anosmic.
31 Investigation of how the detection threshold might change when compounds are presented in mixtures.
32 Investigation of olfactory properties of chemicals under hyperbaric atmospheres.
33 Investigation of the properties affecting odor thresholds in hydroalcoholic solutions (like wine).
34 Investigation to identify and quantify the odorants from apple.
35 Investigation to identify the odorants and thresholds from linden tree honey from Romania.
36 The MP is the minimum perceptible concentration of the most sensitive subject.
37 Number of subjects was insufficient to represent the range of olfactory sensitivity.

38 Only one concentration per day was tested to avoid adaptation effects.
39 Only the detection threshold for the Controls (without Alzheimers disease) were quoted.
40 Panelists completed four scaling tasks in 30 min with 10-sec waiting period between sniffs.
41 Participant count is the lowest number of subjects per compound.
42 Random presentation order to determine recognition threshold.
43 Reported values are for 100 percent recognition.
44 Results displayed on small graph in log ppb units; conversion errors may have resulted during conversion.
45 Russian article minimal perceptible value was determined from English summary.
46 Russian article was categorized based on translation of key words and review of tables presenting minimum perceptible values.
47 Study focus was testing olfactory fatigue between exposed and non-exposed workers.
48 Study investigated the odor threshold differences between smokers and non-smokers.
49 Study of the odor and chemesthesis (pungency and eye irritation).
50 Study of the odorant extracts of Lovage using GC-O.
51 Study on possible odorants for inert gas and investigated differences in age, sex, and smoking.
52 Study to compare the odor detection thresholds for smokers and non-smokers.
53 Study to determine the odor recognition thresholds of several organics.
54 Study to identify the odor detection thresholds of common food odorants.
55 Study to identify the odor thresholds of chemicals in drinking water.
56 The study presents air values based on transformed data from water values and a descending series without adequate de-adaptation time.
57 Variable presentation was used with intervals between sniffs to reduce adaptation effects.
58 Threshold was calculated from the intensity slope at the intercept.
59 Thresholds were conducted as training for a field program. Threshold measurement recorded to document panel calibration.
60 Up-down technique used is less likely to cause olfactory fatigue than a descending or random pattern.
61 U.S. EPA Report on odor detection of methyl tert-butyl ether in water based upon on previously published data.
62 Purpose of the experiment was to prove hypothesis on the effects of humidity and temperature on odor thresholds.
63 Investigation of the relationship between odor detection thresholds and age.
64 Study of glutaraldehyde odor detection threshold, eye and throat sensation threshold, and response over time.
65 Only dilution to threshold values presented.
66 Study evaluated subjects ability to recognize the odorant, not to determine a threshold.
67 Study to evaluate the effect of the molecule length (carbon atoms) on the odor detection threshold.
68 Study comparing age-related loss of detection threshold, intensity, pleasantness and repeated exposure effects.
69 Using the triangle odor bag method, 12 years of data on 223 compounds was summaried and trends were examined.
70 Study of individual's odor detection and hedonic tone from animal production facility odorants.
71 An evaluation of the methodology and data analysis to identify the appropriate study size and trials.

Table 6.3 – Reported Odor Thresholds from All Sources

All published odor threshold values for the 295 chemicals with occupational exposure values.

The table provides the following information:

- Chemical Name
- Source (Last name of first author) and publication date
- Type of odor threshold values reported as either detection (d) or recognition (r)
- All threshold values from the Gemert compendium in both mg/m^3 and ppm.

Note: *Conversion of units from mg/m3 to ppm was based on the molecular weight of the compound and the known volume of a perfect gas or vapor at standard temperature and pressure (STP).*

Table 6.3 – Odor Threshold Values *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
1	**Acetaldehyde**	Zwaardemaker 1914	d	0.7	0.39
		Backman 1917	r	0.062 - 0.075	0.034 - 0.042
		Katz & Talbert 1930	d	0.12	0.067
		Balavoine 1943		10	6
		Pliska & Janicek 1965		1,800	1,000
		Gofmekler 1967, 1968	d	0.012	0.0067
		Leonardos et al 1969	r	0.38	0.21
		Hartung et al 1971		0.005	0.0028
		Takhirov 1974		0.49	0.27
		Teranishi et al 1974		0.041	0.023
		Anon. 1980	d	0.0027	**0.0015**
		Anon. 1980	r	0.027	0.015
		Naus 1982	d	1	0.555
		Naus 1982	r	10	6
		Nagy 1991	d	0.09	0.05
		Nagata 2003	d	0.0027	0.0015
2	**Acetic Acid**	Passy 1893b, 1893c	d	5 - 10	2.0 - 4.1
		Grijns 1906		49 - 76	20 - 31
		Backman 1917	r	4.8 - 5.0	2.0 - 20
		Grijns 1919		2	0.81
		Mitsumoto 1926	r	0.074 - 0.57	0.030 - 0.23
		Hesse 1926	r	0.6	0.24
		Henning 1927	d	3.6	1.5
		Morimura 1934	r	1.82 - 1.91	0.74 - 0.78
		Jung 1936	d	0.025	0.01
		Jung 1936	r	0.05	0.02
		Balavoine 1943, 1948		300 - 500	122 - 204
		Stone 1963c	d	3.9	1.6
		Stone & Bosley 1965	d	4.2	1.7
		Endo et al 1967		6.5	2.65
		Takhirov 1969, 1974		0.6	0.24
		Leonardos et al 1969	r	2.5	1
		Homans et al 1978	d	0.37	0.15
		Naus 1982	d	0.5	0.20
		Naus 1982	r	25	10
		Punter 1983	d	0.09	0.037
		Homans 1984		0.93	0.38
		Walker et al 1990		5	2.04
		Nagy 1991	d	0.37	0.15
		Blank & Schieberle 1993		0.03 - 0.09	0.012 - 0.037
		Walker et al 1996		0.25 - 2.5	0.1 - 1.0
		Cometto - Muniz et al 1998a	d	0.025	0.01
		Cometto - Muniz 1999	d	0.025	0.01

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
2	**Acetic Acid cont.**	Nagata 2003	d	0.015	0.006
		Van Thriel et al 2006	d	1.45	0.59
		Wise et al 2007	d	0.017 - 0.020	0.0069 - 0.0081
		Miyazawa et al 2009a	d	0.017 - 0.020	0.0069 - 0.0081
		Miyazawa et al 2009b	d	0.001	**0.0004**
		Cain et al 2010	d	0.15	0.06
		Cometto - Muniz & Abraham 2010b	d	0.013	0.0053
3	**Acetic Anhydride**	Takhirov 1969		0.49	**0.12**
		Hellman & Small 1973a,b, 1974	d	<0.6	<0.14
		Hellman & Small 1973a,b, 1974	r	1.5	0.36
4	**Acetone**	Zwaardemaker 1914, 1927	d	4 - 7	1.7 - 2.9
		Backman 1917	r	4.1 - 4.3	1.7 - 1.8
		Van Anrooij 1931	d	1.1	0.46
		Jung 1936	d	78	33
		Jung 1936	r	78	33
		Scherberger et al 1958	r	1,900	800
		Stuiver 1958	d	5.8	2.4
		Feldman 1960		1.1	0.46
		Naus 1962	d	4	1.7
		Pogosyan 1965		1.1	0.46
		Tkach 1965		1.1	0.46
		May 1966	d	770	324
		May 1966	r	1,660	699
		Kittel 1968		11 - 240	4.6 - 101
		Leonardos et al 1969	r	240	101
		Kittel & Wendelstein 1971	d	75	32
		Kittel & Wendelstein 1971	r	121	51
		Hartung et al 1971		2.3	0.97
		Dravnieks & Laffort 1972		240	10
		Artho & Koch 1973		1,000 - 10,000	421 - 4,208
		Hellman & Small 1973a,b, 1974	d	48	20
		Hellman & Small 1973a,b, 1974	r	78	33
		Dravnieks 1974	d	1,550	653
		Takhirov 1974		1.15	0.48
		Makeicheva 1978		0.94	**0.4**
		Anon. 1980	d	72	30
		Anon. 1980	r	264	111
		Naus 1982	d	1	0.42
		Naus 1982	r	20	8

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
4	**Acetone cont.**	Punter 1983	d	8.6	3.6
		Nagy 1991	d	40	17
		Cometto - Muniz & Cain 1993	d	27,900	11,745
		Cometto - Muniz 1993	d	27,900	11,745
		Dalton et al 1997a	d	199 - 204	84 - 86
		Dalton et al 1997b	d	626 - 936	263 - 394
		Wysocki et al 1997	d	97 - 2,026	41 - 853
		Dalton et al 2000	d	59	25
		Nagata 2003	d	101	43
		Cometto - Muniz & Abraham 2009a	d	2	0.84
5	**Acetonitrile**	Pozzani et al 1959		<67	<40
		Dravnieks & Laffort 1972		285	170
		Dravnieks 1974	d	1,950	1,161
		Nagata 2003	d	22	**13**
6	**Acetophenone**	Imasheva 1963		0.01	0.002
		Tkach 1965		0.01	0.002
		Korneev 1965		0.01	0.002
		Gavaudan & Poussel 1966		0.23	0.047
		Hellman & Small 1973a,b, 1974		1.5	0.305
		Hellman & Small 1973a,b, 1974	r	2.9	0.59
		Savenhed et al 1985	d	0.01 - 0.04	0.002 - 0.008
		Randebrock 1986		0.0012	**0.00024**
7	**Acetylene**	Deadman & Prigg 1959	d	240	**226**
		Babin et al 1965		1,300 - 2,750	1,222 - 2,584
		Nagy 1991	d	510	479
8	**Acrolein**	Katz & Talbert 1930	d	4.1	1.8
		Plotnikova 1957		0.8	0.35
		Buchberg et al 1961		0.2 - 0.7	0.087 - 0.31
		Leonardos et al 1969	r	0.48	0.21
		Sinkuvene 1970		0.07	0.031
		Knuth 1973		0.14	0.061
		Cormack et al 1974		0.23	0.1
		Teranishi et al 1974		0.05	0.022
		Anon. 1980	d	0.069	0.03
		Anon. 1980	r	0.32	0.14
		Nagata 2003	d	0.0083	**0.0036**
9	**Acrylic Acid**	Hellman & Small 1974	d	0.27	**0.092**
		Hellman & Small 1974	r	3	1
		Piringer & Granzer 1984		2	0.679
		Van Thriel et al 2006	d	1.5	0.51

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
10	**Acrylonitrile**	Stalker 1963	d	3.4	**1.6**
		Leonardos et al 1969	r	47	22
		Nagata 2003	d	19	8.8
11	**Allyl Alcohol**	Katz & Talbert 1930	d	3.3	1.4
		Jones 1955c	d	83	35
		Dunlap et al 1958		1.9	0.8
		Pliska & Janicek 1965		48	20
		Dravnieks 1974	d	5	2.1
		Dravnieks & Laffort 1972		1.2	**0.51**
12	**Allyl Chloride**	Toxicity Data Sheet 1958a		9.3 - 18.6	3.0 - 5.9
		Torkelson et al 1959		3 - 9	0.958 - 2.875
		Leonardos et al 1969	r	1.5	**0.48**
13	**Allyl Isothiocyanate**	Allison & Katz 1919		8	1.97
		Katz & Talbert 1930		0.61	0.15
		Stone et al 1967a	d	0.19	0.05
		Stone & Pryor 1967b	d	0.037 - 0.24	**0.0091** - 0.0592
14	**Ammonia**	Valentin 1848, 1850		21	30
		Grijns 1906		21.6 - 42	31.0 - 60.3
		Fieldner et al 1921		37	53
		Smolczyk & Cobler 1930		0.71 - 7.1	1.02 - 10.2
		Geier 1936	d	1.25	1.79
		Geier 1936	r	2.5	3.6
		Carpenter et al 1948		0.7	1
		Smyth 1956	r	≤0.7	≤1.00
		Patty 1962a		<3.5	<5.0
		Saifutdinov 1966		0.50 - 0.55	0.72 - 0.79
		Endo et al 1967		37	53
		Leonardos et al 1969	r	33	47
		Hamanabe et al 1969		0.03	**0.043**
		Stephens 1971		2.7	3.9
		Nishida et al 1975	d	1.8 - 37.8	2.6 - 54.3
		Hill & Barth 1976		21	30
		Schoedder 1977		5.0 - 7.6	7.2 - 10.9
		Logtenberg 1978	d	5.2	7.5
		Nishida et al 1979	d	11.6	16.7
		Anon. 1980	d	0.1	0.14
		Anon. 1980	r	0.4	0.57
		Naus 1982	d	1.5	2.15
		Naus 1982	r	35	50
		Nagy 1991	d	3.7	5.31
		Nagata 2003	d	1.1	1.58
		Van Thriel et al 2006	d	0.04	0.057
		Smeets et al 2007	d	1.8	2.58
		Smeets et al 2007	d	1.8	2.58

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
15	**n - Amyl Acetate**	Grijns 1919		0.9	0.17
		Allison & Katz 1919		39	7.3
		Jones 1955c	d	1.6	0.3
		Gofmekler 1960		0.6	0.11
		Pliska & Janicek 1960		31	5.8
		Guadagni 1966		0.05	0.0094
		Davis 1973	d	0.04	0.0075
		Hendriks 1979	d	0.27	0.051
		Slotnick 1981		1.3	0.24
		Laing 1982	d	0.95	0.178
		Punter 1983	d	0.27 - 0.28	0.051 - 0.053
		Cristoph 1983	r	0.045 - 0.06	0.00845 - 0.0113
		Walker et al 1990		6.9	1.3
		Cometto - Muniz & Cain 1991		6.3	1.18
		Cometto - Muniz 1993	d	6.3	1.18
		Walker et al 1996		0.53 - 5.3	0.09954 - 0.9954
		Hoshika et al 1997	r	41	7.7
		Ziemer et al 2000	d	0.049	0.0092
		Walker et al 2003		0.038 - 0.89	**0.007** - 0.167
		Komthong et al 2006		10.7 - 230	2.0 - 43
		Olsson & Laska 2010	d	2.2 - 2.7	0.414 - 0.508
16	**Aniline**	Tempelaar 1913	d	0.97	0.25
		Huijer 1924	d	0.046	**0.012**
		Zwaardemaker 1927	d	0.046	0.012
		Backman 1917	r	5.0 - 5.8	1.3 - 1.5
		Geier 1936	d	1.2 - 1.5	0.32 - 0.39
		Geier 1936		2.0 - 2.5	0.53 - 0.66
		Jacobson et al 1958	d	38	10
		Tkachev 1963		0.37	0.097
		Leonardos et al 1969	r	3.8	1
		Ozturk 1976	d	2.21	0.58
		Naus 1982	d	2	0.53
		Naus 1982	r	20	5.3
17	**Arsine**	Patty 1962b		<3.2	<1.0
18	**Benzaldehyde**	Backman 1917	r	0.33 - 0.50	0.05 - 0.076
		Rocen 1920	r	1.7	0.260
		Ohma 1922	d	0.44	0.067
		Katz & Talbert 1930		0.18	0.027
		Jones 1955c	r	4.1	0.626
		Pliska & Janicek 1965		13	2.0
		Knuth 1973		0.27	0.041
		Laing 1975	d	4.3	0.657
		Nishida et al 1979	d	3,400	783

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
18	**Benzaldehyde cont.**	Randebrock 1986		0.014	0.0021
		Stevens & Cain 1987a	d	0.43 - 43	0.0657 - 6.57
		Khiari et al 1992	d	<0.01	**<0.0015**
		Von Ranson & Belitz 1992b	d	0.61	0.093
		Von Ranson & Belitz 1992b	r	2.1	0.32
		McGee et al 1995	d	0.1 - 1	0.015 - 0.15
		Yang et al 2008		0.085	0.013
19	**Benzene**	Backman 1917	r	6.6 - 6.9	2.1 - 2.2
		Backman 1918		5 - 5.3	1.7
		Zwaardemaker 1927		5 - 5.3	1.7
		Grijns 1919		420	131
		Zwaardemaker 1927		420	131
		Schley 1934	d	8.8	2.8
		Schley 1934	r	12	3.8
		Jones 1954	r	480 - 510	150 - 160
		Jones 1955c	d	180	56
		Novikov 1957		4.9	1.5
		Deadman & Prigg 1959	d	9	2.8
		Gusev 1965		2.8 - 4	0.88 - 1.3
		Naus 1962	d	6	1.9
		May 1966	d	180	56
		May 1966	r	310	97
		Elfimova 1966		2.5	0.78
		Schutte & Zubek 1967	r	310	97
		Leonardos et al 1969	r	15	4.7
		Alibaev 1970		2.9	0.91
		Dravnieks & O'Donnell 1971		38	12
		Koster 1971	d	37	12
		Dravnieks & Laffort 1972		32.5	10.2
		Laffort & Dravineks 1973		14.5	4.5
		Artho & Koch 1973		100 - 1,000	31.3 - 313
		Dravnieks 1974	d	380	119
		Naus 1982	d	1.5	**0.47**
		Naus 1982	r	16	5
		Punter 1983	d	108	34
		Nagata 2003	d	8.6	2.69
20	**Benzoyl Chloride**	Schley 1934	d	0.012 - 0.024	**0.0021** - 0.0042
		Schley 1934	r	0.012 - 0.036	0.0021 - 0.0063
21	**Benzyl Acetate**	Appell 1969		0.001	**0.00016**
		Koster 1971		85 - 135	14 - 22
22	**Benzyl Chloride**	Katz & Talbert 1930	d	0.21	**0.041**
		Leonardos et al 1969	r	0.24	0.046

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
23	**Biphenyl**	Solomin 1961		0.06	0.0095
		Nagy 1991	d	0.0033	**0.00052**
24	**Boron Trifluoride**	Torkelson et al 1961		4.2	1.5
25	**Bromine**	Valentin 1848, 1850		3	0.46
		Henning 1924	d	0.2	0.031
		Rupp & Henschler 1967	d	<0.065	**<0.0099**
		Rupp & Henschler 1967	r	>6.5	>0.99
		Leonardos et al 1969	r	0.3	0.046
		Randebrock 1986		0.9	0.14
26	**Bromoform**	Passy 1893a	d	2 - 5	**0.19** - 0.48
		Backman 1917	r	2.2 - 2.5	0.21 - 0.24
		Grijns 1919		150	15
		Rocen 1920	r	30	2.9
27	**1,3 - Butadiene**	Mullins 1955	r	169	76
		Deadman & Prigg 1959	d	2.1	0.95
		Ripp 1968		4	1.8
		Laffort & Dravnieks 1973		5.8	2.6
		Hellman & Small 1974	d	1	0.45
		Hellman & Small 1974	r	2.4	1.1
		Jeltes 1975		0.22	**0.099**
		Nagata 2003	d	0.51	0.23
28	**Butane, all isomers**	Patty & Yant 1929		12,000	5,048
		Mullins 1955	r	6,160	2,591
		Mullins 1955	r	1,370	576
		Schneider et al 1966		8,700	3,660
		Laffort & Dravnieks 1973		3,000	1,262
		Artho & Koch 1973		1 - 10	**0.421** - 4.21
		Nagata 2003	d	2,880	1,212
29	**Butenes, all isomers**	Katz & Talbert 1930		2.1	0.915
		Katz & Talbert 1930		4.8	2.09
		Katz & Talbert 1930		3	1.31
		Mullins 1955	r	39.2	17
		Mullins 1955	r	2,700	1,177
		Mullins 1955	r	28.5	12
		Mullins 1955	r	4,880	2126
		Krasovitskaya & Malyarova 1968		15.4	6.71
		Knuth 1973		1.2	0.523
		Anon 1980	d	15	6.5
		Anon 1980	r	46	20
		Nagata 2003	d	0.83	**0.362**
		Nagata 2003	d	23	10

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
30	2 - Butoxyethanol	Hellman & Small 1973a,b; 1974	d	0.5	0.1
		Hellman & Small 1973a,b; 1974	r	1.7	0.35
		Nagy 1991		0.4	**0.08**
		Nagata 2003		1.3	0.27
31	2 - Butoxyethyl Acetate	Hellman & Small 1973a,b; 1974	d	0.7	**0.107**
		Hellman & Small 1973a,b; 1974	r	1.3	0.198
		Nagy 1991	d	6.5	0.99
32	n - Butyl Acetate	Backman 1917	r	1.3 - 1.7	0.27 - 0.36
		Jung 1936	d	0.044	0.0093
		Jung 1936	r	0.044 - 0.13	0.0093 - 0.027
		Scherberger et al 1958	r	96	20
		Gofmekler 1960		0.6	0.13
		Pliska & Janicek 1960		190	40
		Naus 1962	d	0.7	0.147
		May 1966	d	35	7.4
		May 1966	r	55	12
		Koster 1971	d	480 - 1,750	101 - 368
		Dravnieks & Laffort 1972		0.04	0.008
		Dravnieks 1974	d	3	0.63
		Hellman & Small 1974	d	0.03	0.0063
		Hellman & Small 1974	r	0.18	0.038
		Anon. 1980	d	0.32	0.067
		Anon. 1980	r	2.4	0.505
		Cristoph 1983	r	0.46 - 0.55	0.097 - 0.116
		Scharfenberger 1990		4	0.84
		Cometto - Muniz & Cain 1991, 1993	d	11.5	2.4
		Cometto - Muniz 1993	d	11.5	2.4
		Nagy 1991	d	1	0.21
		Nagy 1991	d	0.521	0.11
		Patterson et al 1993	d	7.7	1.6
		Ziemer et al 2000	d	0.061	0.013
		Cometto - Muniz et al 2002		0.00062	**0.00013**
		Cometto - Muniz et al 2003		0.009	0.0019
		Nagata 2003	d	0.077	0.016
		Cometto - Muniz et al 2004	d	0.015	0.003
		Komthong et al 2006		165 - 1,570	35 - 330
		Cometto - Muniz et al 2008	d	0.02	0.004
		Cain & Schmidt 2009	d	0.01	0.002

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
33	**sec - Butyl Acetate**	Cometto - Muniz & Cain 1993	d	22.6	4.76
		Cometto - Muniz 1993	d	22.6	4.76
		Nagata 2003	d	0.012	**0.0025**
34	**tert - Butyl Acetate**	Cometto - Muniz & Cain 1993	d	6.2	1.31
		Cometto - Muniz 1993	d	6.2	1.31
		Nagata 2003	d	0.34	0.072
		Cain & Schmidt 2009	d	0.038	**0.008**
35	**Butyl Acrylate**	Anon. 1969		0.53	0.1
		Gemert 1973	d	0.005 - 0.01	0.00096 - 0.0019
		Anon. 1980	d	0.0015	**0.00029**
		Anon. 1980		0.014	0.0027
		Piringer & Granzer		0.01	0.0019
		Nagata 2003	d	0.0029	0.00055
36	**n - Butyl Alcohol**	Passy 1892c	d	1	0.33
		Backman 1917	r	0.35 - 0.6	0.12 - 0.20
		Zwaardemaker 1927		1	0.33
		Jung 1936	d	0.158 - 0.316	0.052 - 0.10
		Jung 1936	r	0.474 - 0.632	0.16 - 0.21
		Gavaudan et al 1948		0.15	0.049
		Mullins 1955	r	37.2	12
		Jones 1955a	r	3.1	1
		Jones 1955b	r	110 - 285	36 - 94
		Jones 1955c	d	42	14
		Scherberger et al 1958	r	45	15
		Janicek et al 1960		20	6.6
		Naus 1962	d	4	1.3
		Pliska & Janicek 1965		3,000	990
		Gavaudan & Poussel 1966		1.1	0.36
		May 1966	d	33	11
		May 1966	r	48	16
		Dravnieks & Krotoszynski 1968		1.35	0.45
		Khachaturyan & Baikov 1969		1.2 - 2	0.7 - 4
		Cain 1969	r	60	20
		Corbit & Engen 1971		13 - 20	4.3 - 6.6
		Dravnieks & Laffort 1972		10	3.3
		Baikov & Khachaturyan 1973		1.2	0.396
		Laffort & Dravnieks 1973		0.9	0.3
		Hellman & Small 1974	d	0.9	0.3
		Hellman & Small 1974	r	3	1
		Moskowitz et al 1974		186	61
		Jones et al 1975		<132	<44
		Piggott & Harper 1975		4 - 1,000	1.3 - 330

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
36	**n - Butyl Alcohol cont.**	Dravnieks 1976	d	0.36 - 10.2	0.12 - 3.4
		Williams et al 1977	d	0.63 - 1.14	0.21 - 0.38
		Amoore & Buttery 1978	d	2.3	0.76
		Homans et al 1978	d	13.94	4.6
		Jones et al 1978	d	42 - 105	14 - 35
		Laing et al 1978	r	10.5	3.5
		Laing 1982	d	3	1
		Cain et al 1983	d	<4.2	<1.4
		Cain et al 1983	d	<4.2	<1.4
		Cristoph 1983	r	0.7 - 0.9	0.23 - 0.30
		Laing 1983		6	1.98
		Jensen & Flyger 1983		0.10 - 2.4	0.033 - 0.79
		Punter 1983	d	2.6 - 5.3	0.86 - 1.7
		Viswanathan et al 1983		1.26 - 2.4	0.42 - 0.79
		Homans 1984		21.5	7.09
		Murphy & Cain 1985	d	0.39 - 4.26	0.13 - 1.41
		Roos et al 1985	d	0.101 - 0.136	0.033 - 0.45
		Roos et al 1985	d	0.77	0.25
		Don 1986	d	0.77	0.25
		Ahlstrom et al 1986	d	0.136 - 0.224	0.045 - 0.074
		Dravnieks et al 1986	d	0.51 - 4.05	0.168 - 1.34
		Hartigh 1986	d	0.01 - 0.292	**0.0033** - 0.096
		MacLeod et al 1986		0.69	0.23
		Poostchi et al 1986	d	0.99 - 1.85	0.33 - 0.61
		Poostchi et al 1986	r	3.72 - 4.02	1.23 - 1.33
		Cain et al 1988		1.4	0.46
		Dollnick et al 1988		0.384	0.13
		Stevens et al 1988	d	0.36 - 3.3	0.12 - 1.09
		De Wijk 1989		4.43	1.46
		Hermans 1989		0.15 - 0.214	0.049 - 0.071
		Cometto - Muniz & Cain 1990	d	5.4	1.78
		Cometto - Muniz 1993	d	5.4	1.78
		Scharfenberger 1990		0.5	0.16
		Cain & Gent 1991	d	3 - 9	1 - 3
		Laska & Hudson 1991	d	0.79	0.26
		Lea & Ford 1991		2	0.66
		Nagy 1991	d	3.1	1.02
		Nagy 1991	d	0.591	0.19
		Cometto - Muniz & Cain 1993	d	162	53
		Patterson et al 1993	d	5.4	1.78
		Stevens & Dadarwala 1993	d	0.48 - 38.4	0.16 - 13
		Dalton et al 1997a	d	0.61 - 5.5	0.20 - 1.8

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
36	**n - Butyl Alcohol cont.**	Dalton et al 1997b	d	8.2 - 15.8	2.7 - 5.2
		Harreveld & Heeres 1997		0.058 - 0.53	0.019 - 0.17
		Wysocki et al 1997	d	0.48 - 9.6	0.16 - 3.2
		Cometto - Muniz et al 1999	d	1.7 - 3.8	0.56 - 1.25
		Molhave et al 2000	d	11	3.63
		Ziemer et al 2000	d	0.15	0.049
		Feddes et al 2001	d	0.17	0.056
		Mannebeck & Mannebeck 2002	d	0.105 - 0.1739	0.035 - 0.057
		Smeets & Dalton 2002	d	42 - 54	14 - 18
		Nagata 2003	d	0.11	0.036
		Cometto - Muniz et al 2004	d	0.97	0.32
		Maxeiner & Mannebeck 2004	d	0.1323 - 0.1957	0.044 - 0.065
		Cometto - Muniz & Abraham 2008	d	0.024	0.008
		Polednik et al 2008	d	0.2 - 0.4	0.0660.13
		Maxeiner 2006	d	0.1071 - 0.1251	0.035 - 0.041
		Maxeiner 2007	d	0.111 - 0.130	0.037 - 0.043
		Ueno et al 2009		0.051	0.017
		Ueno et al 2009		0.26	0.086
		Ueno et al 2009		0.16	0.053
		Ueno et al 2009		0.42	0.14
		Cain et al 2010		0.48	0.16
		Nimmermark 2011		0.078 - 1.4	0.026 - 0.46
37	**sec - Butyl Alcohol**	Jung 1936	d	7.4	2.4
		Jung 1936	r	14.4	4.8
		Jones 1955c	r	80	26
		Laffort & Dravnieks 1973		9	3
		Hellman & Small 1974	d	0.4	0.12
		Hellman & Small 1974	r	1.2	0.41
		Bedborough & Trott 1979	d	3.3	1.1
		Punter 1983	d	59.1	19.5
		Punter 1983	d	41.8	13.8
		Cometto - Muniz & Cain 1993	d	285	94
		Cometto - Muniz 1993	d	285	94
		Ziemer et al 2000	d	0.13	**0.043**
		Nagata 2003	d	0.66	0.218
38	**tert - Butyl Alcohol**	Passy 1892c	d	10 - 20	3.3 - 6.6
		Backman 1917	r	36 - 40	11.875 - 13.195
		Jones 1955c	r	750	247
		Dravnieks & Laffort 1972		71	23
		Dravnieks 1974	d	2,900	957
		Nagy 1991	d	42	14

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
38	**tert - Butyl Alcohol cont.**	Cometto - Muniz & Cain 1993	d	1,827	603
		Cometto - Muniz 1993	d	1,827	603
		Ziemer et al 2000	d	24.2	7.98
		Nagata 2003	d	14	4.62
39	**n - Butylamine**	Scherberger et al 1960		<0.36	<0.12
		Sutton 1962a		<3	<1
		Hellman & Small 1973a,b, 1974	d	0.24	**0.08**
		Hellman & Small 1973a,b, 1974	r	0.72	0.24
		Laing et al 1978	r	41.7	13.9
		Nagata 2003	d	0.51	0.17
40	**n - Butyl Lactate**	Ziemer et al 2000	d	0.000000029	0.00000000485
41	**Butyl Mercaptan**	Allison & Katz 1919	d	18	4.9
		Katz & Talbert 1930	d	0.0037	0.001
		Deadman & Prigg 1959	d	0.0015	0.00041
		Blinova 1965		0.007 - 0.04	0.0019 - 0.0011
		Kniebes et al 1969		0.003	0.00081
		Wilby 1969	r	0.0027	0.00073
		Patte 1978	d	0.003	0.00081
		Patte & Punter 1979	d	0.003	0.00081
		Nagata 2003	d	0.00001	**0.0000027**
42	**p - tert Butyl Toluene**	Hine et al 1954	r	<30.5	<5.03
43	**Butyraldehyde**	Backman 1917	r	0.013 - 0.014	0.0044 - 0.0047
		Pliska & Janicek 1965		15	5.09
		Hellman & Small 1973a,b, 1974	d	<0.013	<0.0044
		Hellman & Small 1973a,b, 1974	r	0.027	0.0092
		Teranshi et al 1974		0.042	0.014
		Anon 1980	d	0.00084	**0.0003**
		Anon 1980	r	0.011	0.0037
		Hall & Andersson 1983	d	0.2	0.068
		Cristoph 1983	r	0.18 - 0.21	0.061 - 0.071
		Cometto - Muniz et al 1998a	d	8.8	2.98
		Cometto - Muniz 1999	d	8.8	2.98
		Nagata 2003	d	0.0019	0.0006
		Cometto - Muniz & Abraham 2010a	d	0.0013	0.0004
		Laska & Ringh 2010	d	0.1	0.034
44	**Camphor, synthetic**	Passy 1892a, 1892b	d	5	0.8
		Zwaardemaker 1914, 1927	d	0.016 - 2	**0.0026** - 0.32
		Backman 1917	r	0.76 - 0.88	0.12 - 0.14
		Ohma 1922	d	0.06	0.0096

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
44	**Camphor, synthetic cont.**	Hofmann & Kohlrausch 1925	r	2 - 33	0.32 - 5.3
		Mitsumoto 1926	r	4.4 - 45.0	0.71 - 7.2
		Tamman & Oelsen 1928	d	6 - 13	0.97 - 2.1
		Morimura 1934	r	1.16 - 32.5	0.19 - 5.2
		Gundlach & Kenway 1939	d	0.49	0.079
		Kleinschmidt 1983	r	3.35	0.54
		De Wijk 1989		2.84	0.46
45	**Caprolactam**	Krichevskaya 1968		0.3	0.065
46	**Carbon Dioxide**	Lotsch et al 1997		540,000 - 1,080,000	300,068 - 600,136
		Shusterman & Balmes 1997a, 1997b		486,000	270,000
		Melzner et al 2011	d	95,400	53,000
		Melzner et al 2011	d	81,000	45,000
		Melzner et al 2011	d	75,600	42,000
		Melzner et al 2011	d	70,200	**39,000**
47	**Carbon Disulfide**	Deadman & Prigg 1959	d	0.07	0.022
		Hildenskiold 1959		0.05	**0.016**
		Frantikova 1962		1.3	0.42
		Baikov 1963		0.08 - 0.5	0.026 - 0.16
		Leonardos et al 1969	r	0.65	0.21
		Naus 1982	d	0.1	0.032
		Naus 1982	r	1	0.32
		Kleinschmidt 1983	r	98.9	32
		Moriguchi et al 1983	d	0.11	0.04
		Don 1986	d	0.18	0.06
		Nagy 1991	d	3.9	1.25
		Nagy 1991	d	1.269	0.41
		Nagata 2003	d	0.65	0.21
48	**Carbon Tetrachloride**	Allison & Katz 1919		4,533	720
		Davis 1934		500	79
		Lehmann & Schmidt - Kehl 1936		900	143
		May 1966	d	1,260	200
		May 1966	r	1,600	254
		Leonardos et al 1969	r	135 - 630	21 - 100
		Belkov 1969		11.5 - 58	1.8 - 9
		Nikiforov 1970		10.58	**1.68**
		Dravnieks & Laffort 1972		280	45
		Dravnieks 1974	d	3700	588
		Punter 1983	d	884	140
		Nagata 2003	d	29	4.6
49	**Carbonyl Sulfide**	Polgar et al 1975		0.25	0.102
		Nagata 2003	d	0.14	**0.057**

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
50	**Chlorine**	Fieldner et al 1921		10	3.4
		Prentiss 1937		10	3.4
		Smolczyk & Cobler 1930		1.43 - 14.3	0.49 - 4.9
		Takhiroff 1957		0.8	0.28
		Beck 1959		0.15 - 0.3	0.05 - 0.10
		Styazhkin 1963		0.7	0.24
		Rupp & Henschler 1967	d	0.06 - 0.15	0.021 - 0.052
		Rupp & Henschler 1967	r	0.3	0.1
		Leonardos et al 1969	r	0.6	0.21
		Kramer 1976		3.2 - 7.8	1.10 - 2.69
		Dixon & Ikels 1977	d	0.23	0.08
		Naus 1982		3	1.03
		Naus 1982		10	3.45
		Randebrock 1986		0.18	0.062
		Nagata 2003		0.14	0.048
51	**Chlorine Dioxide**	Vincent et al 1946		42	15
52	**Chloroacetophenone**	Katz & Talbert 1930		0.10 - 0.70	**0.016** - 0.111
		Prentis 1937		0.2	0.032
53	**Chlorobenzene**	Backman 1917	r	7.5 - 8.1	1.6 - 1.8
		Mateson 1955		21.6	4.7
		Tarkhova 1965		0.4	**0.087**
		Leonardos et al 1969	r	0.97	0.21
		Smith & Hochstettler 1969	r	3	0.65
		Punter 1983	d	5.9	1.3
		Don 1986	d	1	0.217
		Nagy 1991	d	4.5	0.98
		Cometto - Muniz 1993	d	59.3	13
		Cometto - Muniz & Cain 1994	d	59.3	13
54	**Chlorodifluoromethane**	Braker & Mossman 1980		708,000	200,192
55	**Chloroform**	Passy 1893a	d	30	6.1
		Tempelaar 1913	d	3,000	614
		Backman 1917	r	14.1 - 15.1	2.9 - 3.1
		Allison & Katz 1919		3,300	676
		Grijns 1919		2,350	481
		Rocen 1920	d	730	150
		Rocen 1920	r	2,500	512
		Mitsumoto 1926	r	353.8 - 589.0	72.7 - 121
		Schley 1934	d	42	8.6
		Schley 1934	r	56	11
		Morimura 1934	r	480 - 622	99 - 128
		Lehmann & Schmidt - Kehl 1936		1,000 - 1,500	205 - 307
		Scherberger et al 1958	r	6,900	1,413

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
55	**Chloroform cont.**	Janicek et al 1960		3,700	758
		Naus 1962	d	3	0.6
		Dravnieks & Laffort 1972		150	31
		Dravnieks 1974	d	1,350	276
		Naus 1982	d	0.5	**0.1**
		Naus 1982	r	20	4.1
		Punter 1983	d	650	133
		Nagata 2003	d	19	3.9
56	**Chloropicrin**	Prentiss 1937		7.3	1.09
57	**β - Chloroprene**	Mnatsakanyan 1962		0.4 - 2.0	**0.11** - 0.55
58	**Chlorotoluene**	Blackman 1917	r	0.95 - 1.4	**0.18** - 0.27
59	**Citral**	Passy 1892a, 1892b	d	0.1 - 0.5	0.016 - 0.08
		Tempelaar 1913	d	0.062 - 0.1	0.010 - 0.016
		Zwaardemaker 1927	d	0.062 - 0.1	0.010 - 0.016
		Backman 1917	r	0.06 - 0.09	0.0097 - 0.014
		Ohma 1922	d	0.13	0.0209
		Schneider & Wolf 1955		0.027	0.0043
		Schneider et al 1958		0.12	0.0193
		Apell 1969		0.0005	0.00008
		Koster 1971	d	0.17 - 0.19	0.027 - 0.031
		Etzweiler et al 1980		0.02	0.032
		Randebrock 1986		0.00015	**0.000024**
60	**Cresol, all isomers**	**o - cresol**			
		Backman 1917	r	0.004	0.0009
		Stuiver 1958	d	0.0004	**0.00009**
		Kendall et al 1968	r	0.0028	0.00063
		Anon. 1980	d	0.0017	0.00038
		Anon. 1980	r	0.027	0.0061
		Moriguchi et al 1983	d	0.02	0.00452
		Schieberle et al 1988		0.0007 - 0.0027	0.00016 - 0.00061
		Nagata 2003	d	0.0012	0.00027
		Strube et al 2012		0.0078	0.0018
		m - cresol			
		Backman 1917	r	0.0007 - 0.0009	0.00016 - 0.00020
		Stuiver 1958	d	0.0004	0.00009
		Nader 1958	d	0.00022 - 0.035	**0.000050** - 0.0079
		Anon. 1980	d	0.00057	0.00013
		Anon. 1980	r	0.011	0.0025
		Nagata 2003	d	0.00044	0.0001
		p - cresol			
		Backman 1917	r	0.03 - 0.04	0.0068 - 0.0090
		Baldus 1936	d	0.0125	0.0028
		Baldus 1936	r	0.015	0.0034

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
60	**Cresol, all isomers cont.**	Stuiver 1958	d	0.00005	0.000011
		Leonardos et al1969	r	0.0044	0.00099
		Punter 1975, 1979	d	0.024	0.0054
		Anon. 1980	d	0.00018	0.000041
		Anon. 1980	r	0.0084	0.0019
		Schieberle et al 1988		0.0003 - 0.001	**0.00007** - 0.00023
		Schieberle & Grosch 1988		0.0003 - 0.001	0.00007 - 0.00023
		Blank et al 1989		0.0003 - 0.001	0.00007 - 0.00023
		Blank 1990		0.0003 - 0.001	0.00007 - 0.00023
		Nagata 2003	d	0.00024	0.000054
61	**Crotonaldehyde**	Katz & Talbert 1930	d	0.18 - 0.57	0.063 - 0.20
		Teranishi et al 1974		0.42	0.147
		Hall & Andersson 1983	d	1.7	0.59
		Nagata 2003	d	0.067	**0.02**
62	**Cumene**	Solomin 1964		0.06	0.012
		Elfimova 1966		0.025	0.0051
		Koster 1971	d	0.25	0.051
		Turk 1973	r	4.8 - 6.4	0.98 - 1.3
		Hellman & Small 1974	d	0.04	0.008
		Hellman & Small 1974	r	0.23	0.047
		Anon. 1980	d	0.074	0.025
		Anon. 1980	r	0.54	0.11
		Punter 1983	d	0.65	0.132
		Bahmuller 1983		0.017 - 1.19	0.035 - 0.242
		Nagy 1991	d	0.6	0.12
		Cometto - Muniz et al 1998b		5.3	1.08
		Cometto - Muniz 1999	d	5.3	1.08
		Nagata 2003	d	0.041	**0.008**
63	**Cumene Hydroperoxide**	Solomin 1964		0.03	0.0048
64	**Cyanogen**	Braker & Mossman 1980		>533	>500
65	**Cyanogen Chloride**	Prentiss 1937		2.5	0.994
66	**Cyclohexane**	Schley 1934	d	39	11
		Schley 1934	r	120	35
		Jones 1955c	d	900	261
		Alibaev 1970		1.8	**0.52**
		Stone et al 1972	d	35.6	10.3
		Dravnieks & Laffort 1972		315	91.5
		Laffort & Dravnieks 1973		165	48
		Dravnieks & Laffort 1972	d	2,700	784
		Nagata 2003	d	8.5	2.47
67	**Cyclohexanol**	Dobrinskiy 1964		0.24	**0.058**
		Punter 1983	d	0.64	0.156
		Van Thriel et al 2006	d	2.01	0.491

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
68	**Cyclohexanone**	Dobrinsky 1964		0.21	**0.052**
		Stone et al 1967	d	1.15	0.29
		Koster 1971	d	790 - 880	197 - 219
		Stone et al 1972	d	1.6	0.4
		Hellman & Small 1973a,b, 1974	d	0.48	0.12
		Hellman & Small 1973a,b, 1974	r	0.48	0.12
		Davis 1973	d	2	0.5
		Laing 1975	d	40	10
		Laing 1983		1.0 - 2.4	0.249 - 0.598
		Laska & Hudson 1991	d	0.88 - 1.2	0.219 - 0.299
		Ziemer et al 2000	d	1.1	0.27
		Van Thriel et al 2006	d	5.27	1.31
69	**Cyclohexene**	Deadman & Prigg 1959	d	0.6	0.18
70	**Cyclohexylamine**	Van Thriel et al 2006	d	9.83	2.42
71	**Cyclopentadiene**	Deadman & Prigg 1959	d	5	1.8
72	**Decaborane**	Krackow 1953		0.3	0.06
73	**1 - Decene**	Koszinowski & Piringer 1983		37	6.45
74	**Diacetone Alcohol**	Hellman & Small 1974	d	1.3	**0.27**
		Hellman & Small 1974	r	5.2	1.1
		Nagy 1991	d	60	13
		Nagy 1991	d	37.418	7.88
75	**Diacetyl**	Backman 1917	r	0.003 - 0.006	0.00085 - 0.00170
		Van Anrooij 1931	d	0.0025	0.0007
		Apell 1969		0.0026	0.00074
		Artho & Koch 1973		0.00001	0.0000028
		Punter 1975	d	0.000007	**0.0000019**
		Punter 1979	d	0.000007	0.0000019
		Hall & Andersson 1983	d	0.005	0.0014
		Bahnmuller 1983		0.0007 - 0.087	0.00020 - 0.247
		Randebrock 1986		10.2	2.9
		Blank 1990		0.015 - 0.030	0.0043 - 0.0085
		Blank et al 1992		0.01 - 0.02	0.0028 - 0.0057
		Nagata 2003	d	0.00018	0.000051
76	**Diallylamine**	Hine et al 1960		8	2
77	**Diborane**	Krackow 1953		2 - 4	1.8 - 3.5
78	**2,3 Dibromo-1-Chloro-propane**	Torkelson & Rowe 1981		0.1 - 0.3	0.010 - 0.031
79	**Dibutylamine**	Hellman & Small 1973a,b, 1974	d	0.42	**0.079**
		Hellman & Small 1973a,b, 1974	r	1.4	0.265
		Laing et al 1978	r	2.76	0.522

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
79	**Dibutylamine cont.**	Bahnmuller 1984		0.44 - 4.069	0.083 - 0.77
80	**Dibutyl Phthalate**	Menshikova 1972		0.26	0.023
81	**Dichloroacetic Acid**	Backman 1917	r	0.232	0.044
82	**Dichlorobenzene, o - isomer**	Backman 1917	r	0.12	**0.02**
		Hollingsworth et al 1958		<300	<50
		Punter 1983	d	4.2	0.699
83	**Dichlorobenzene, p - isomer**	Hollingsworth et al 1956		<90	<15
		Punter 1983	d	0.73	**0.121**
84	**Dichlorodifluoromethane**	Braker & Mossman 1980		988,000	199,790
85	**1,1 - Dichloroethane**	Rylova 1953		200	**49**
		Janicek et al 1960		5,500	1359
		Irish 1963		2,000 - 4,000	494 - 988
86	**1,2 Dichloroethylene, all isomers**	Lehmann & Schmidt - Kehl 1936		1,100	277
87	**2,4 - Dichlorophenol**	Punter 1983	d	0.00027	0.000041
		Strube et al 2012		0.0068	0.00102
88	**1,3 - Dichloropropene**	Torkelson & Oyen 1977		<4.5	<0.99
89	**Dicyclopentadiene**	Kinkead et al 1971b		0.016	0.003
		Hellman & Small 1974	d	0.06	0.011
		Hellman & Small 1974	r	0.11	0.02
		Ventura et al 1997		0.001	**0.00019**
90	**Diethanolamine**	England et al 1978	r	1.2	0.279
91	**Diethylamine**	Geier 1936	d	0.01 - 0.1	**0.0033** - 0.033
		Geier 1936	r	2.25 - 5	0.75 - 1.67
		Kosiborod 1968		0.084	0.028
		Hellman & Small 1973a	d	0.42	0.14
		Hellman & Small 1973a	r	1.5	0.5
		Hellman & Small 1974	d	0.06	0.02
		Hellman & Small 1974	r	0.18	0.06
		Cormack et al 1974		0.09	0.03
		Laing et al 1978	r	42.9	14.3
		Tkachev 1978		0.044 - 0.558	0.015 - 0.187
		Anon. 1980	d	0.09	0.03
		Anon. 1980	r	0.9	0.3
		Laing 1982	d	4	1.3
		Nagata 2003	d	0.14	0.0468
92	**2 - Diethylaminoethanol**	Hellman & Small 1973a,b, 1974	d	0.05	**0.01**
		Hellman & Small 1973a,b, 1974	r	0.19	0.04
		England et al 1978	r	1.2	0.25

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
93	**Diethylbenzenes, mixed isomers**	Nagata 2003	d	0.052	0.0095
		Nagata 2003	d	0.39	0.071
		Nagata 2003	d	0.0021	**0.00038**
94	**Diethyl Ketone**	Backman 1917	r	3.8	1.1
		May 1966	d	33	9.4
		May 1966	r	49	14
		Dravnieks 1974	d	3	**0.85**
95	**Diethyl Phthalate**	Wunsche et al 1995	d	0.33 - 3.3	0.036 - 0.363
96	**Diisobutyl Ketone**	Hellman & Small 1973a,b, 1974	d	<0.6	**<0.103**
		Hellman & Small 1973a,b, 1974	r	1.8	0.309
		Nagy 1991	d	9.3	1.6
97	**Diisopropylamine**	Hellman & Small 1974	d	0.56	**0.14**
		Hellman & Small 1974	r	1.6	0.39
		England et al 1978	r	17.4	4.2
98	**N,N - Dimethylacetamide**	Leonardos et al 1969	r	170	48
99	**Dimethylamine**	Geier 1936	d	0.65 - 1.0	0.35 - 0.54
		Geier 1936	r	2.2 - 3.0	1.2 - 1.6
		Taylor & Bodurtha 1960		1.1	0.6
		Leonardos et al 1969	r	0.085	0.046
		Stephens 1971		0.16	0.087
		Prusakov et al 1976		0.01 - 0.03	0.005 - 0.016
		Tkachev 1978		0.03	0.016
		Anon. 1980	d	0.0014	**0.00076**
		Anon. 1980	r	0.023	0.012
		Nagata 2003	d	0.059	0.032
		Van Thriel et al 2006	d	7.75	4.2
100	**Dimethylaniline**	Backman 1917	r	0.8 - 1.0	0.16 - 0.20
		Geier 1936	d	0.005 - 0.1	**0.001** - 0.02
		Geier 1936	r	0.05 - 0.25	0.010 - 0.050
		Deadman & Prigg 1959	d	0.012	0.0024
101	**Dimethyl Disulfide**	Wilby 1969	r	0.029	0.0075
		Lindvall 1970	d	0.003 - 0.014	0.00078 - 0.00363
		Selyuzhitskii 1972		3.5	0.908
		Bedborough & Trott 1979	d	0.046	0.012
		Anon 1980	d	0.0011 - 0.0020	**0.00029** - 0.00052
		Anon 1980	r	0.011 - 0.017	0.00286 - 0.0044
		Moriguchi et al 1983	d	0.007	0.0018
		Ahlstrom et al 1986	d	0.050 - 0.078	0.0130 - 0.0202
		Nagy 1991	d	0.066	0.017
		Gijs et al 2000		0.82	0.213

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
101	**Dimethyl Disulfide cont.**	Greenman et al 2004		5.6	1.45
		Nagata 2003	d	0.0084	0.0022
102	**Dimethyl Ether**	Nagy 1991	d	430	228
		Nagy 1991	d	303.967	**161**
103	**Dimethyl Formamide**	Odoshashvili 1962		0.14	**0.047**
		Leonardos et al 1969	r	300	100
104	**1,1 - Dimethylhydrazine**	Jacobson et al 1955	d	15 - 35	6.1 - 14
		Rumsey &Cesta 1970		<0.75	**<0.31**
105	**Dimethyl Sulfide**	Katz & Talbert 1930		0.0094	0.0037
		Nevers & Oister 1965		0.0035	0.0014
		Guadagni 1966		0.003	0.0012
		Leonardos et al 1969	r	0.0025	0.001
		Wilby 1969	r	0.0063	0.0025
		Lindvall 1970	d	0.002 - 0.03	0.00079 - 0.012
		Laffort 1968b		0.014	0.0055
		Laffort & Dravnieks 1973		0.014	0.0055
		Hamanabe et al 1969		0.025	0.0098
		Selyuzhitskii 1972		0.75	0.295
		Ifeadi 1972		0.65	0.256
		Cormack et al 1974		0.0075	0.003
		Nishida et al 1975	d	0.0025 - 0.065	0.00098 - 0.026
		Nishida et al 1979	d	0.16	0.063
		Anon 1980	d	0.0003	**0.00012**
		Anon 1980	r	0.0058	0.0023
		Moschandreas & Jones 1983	d	0.027	0.011
		Moschandreas & Jones 1983	r	0.049	0.019
		Randebrock 1986		20.6	8.11
		Nagy 1991	d	0.051	0.020
		Nagata 2003	d	0.0075	0.003
		Glindemann et al 2006	d	0.001	0.00039
106	**4,6 - Dinitro - o - cresol**	Kurtschatowa & Dawidkowa 1970		0.004 - 0.021	**0.00049** - 0.00259
107	**1,4 - Dioxane**	Wirth & Klimmer 1937	d	10	2.8
		May 1966	d	620	172
		May 1966	r	1000	278
		Koster 1968a, 1971	d	45 - 9,400	12 - 2609
		Dravnieks & Laffort 1972		30.6	8.5
		Hellman & Small 1973a,b, 1974	d	2.9	**0.8**
		Hellman & Small 1973a,b, 1974	r	6.5	1.8
		Dravnieks 1974	d	270	75
		Nagy 1991	d	46	12.8

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
108	**1,3 - Dioxolane**	Hellman & Small 1974	d	51	**16.8**
		Hellman & Small 1974	r	192	63.4
109	**Diphenylamine**	Backman 1917	r	0.15 - 0.17	**0.022** - 0.025
		Nagy 1991	d	1.3	0.188
110	**Dodecyl Mercaptan**	Kendall et al 1968	r	0.0008	0.000097
		Patte 1978	d	0.0000009	**0.00000011**
		Patte & Punter 1979	d	0.0000009	0.00000011
111	**Epichlorohydrin**	Toxicity Data Sheet 1959		38 - 46	10.04 - 12.15
		Fomin 1966		0.3	**0.08**
112	**Ethane**	Mullins 1955	r	899,000	730973
		Laffort & Dravnieks 1973		25,000	**20328**
113	**Ethanolamine**	Weeks et al 1960	d	6.5	**2.6**
		Weeks et al 1960	r	60	24
114	**2 - Ethoxyethanol**	May 1966	d	90	24
		May 1966	r	180	49
		Hellman & Small 1973a,b, 1974	d	1.1	**0.3**
		Hellman & Small 1973a,b, 1974	r	2	0.54
		Nagy 1991	d	11.6	3.15
		Nagata 2003	d	2.1	0.57
115	**2-(2-Ethoxyethoxy) - ethanol**	Hellman & Small 1973a,b, 1974	d	<1.2	**<0.219**
		Hellman & Small 1973a,b, 1974	r	6	1.09
116	**2 - Ethoxyethyl Acetate**	Hellman & Small 1973a,b, 1974	d	0.3	0.06
		Hellman & Small 1973a,b, 1974	r	0.7	0.13
		Nagy 1991	d	0.48	0.089
		Nagata 2003	d	0.26	**0.048**
117	**Ethyl Acetate**	Backman 1917	r	15 - 17.5	4.2 - 4.9
		Allison & Katz 1919		686	190
		Jung 1936	d	3.6	1
		Jung 1936	r	3.6 - 5.4	1.0 - 1.5
		Jones 1955c	d	155	43
		Clausen et al 1955	d	4.8	1.33
		Gofmekler 1960		0.6	0.17
		Janicek et al 1960		1120	311
		May 1966	d	180	50
		May 1966	r	270	75
		Laffort & Dravnieks 1973		27	7.5
		Hellman & Small 1973a, 1974	d	23	6.4
		Hellman & Small 1973a, 1974	r	48	13.3

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
117	**Ethyl Acetate cont.**	Anon. 1980	d	0.9	0.25
		Anon. 1980	r	5	1.39
		Bahnmuller 1983		3.7 - 25	1.027 - 6.9
		Cristoph 1983	r	4.6 - 5.0	1.3 - 1.4
		Randebrock 1986		0.34	0.09
		Scharfenberger 1990		141	39
		Cometto - Muniz & Cain 1991	d	623	173
		Cometto - Muniz 1993	d	623	173
		Nagy 1991	d	28	8
		Ziemer et al 2000	d	4.6	1.28
		Nagata 2003	d	3.1	0.86
		Higuchi & Masuda 2004	d	2.0 - 3.0	0.555 - 0.833
		Komthong et al 2006		1,030	286
		Van Thriel et al 2006	d	5.36	1.49
		Cometto - Muniz et al 2008	d	0.88	0.24
		Ueno et al 2009		1.3	0.36
		Ueno et al 2009		6.1	1.69
		Ueno et al 2009		4.7	1.30
		Ueno et al 2009		4.3	1.19
118	**Ethyl Acrylate**	Leonardos et al 1969	r	0.0019	0.00046
		Hellman & Small 1973a, 1974	d	0.001	0.00024
		Hellman & Small 1973a, 1974	r	0.0015	0.00037
		Anon. 1980	d	0.00082	0.0002
		Anon. 1980	r	0.0053	0.0013
		Piringer & Granzer 1984		0.001	0.00024
		Nagy 1991	d	0.013	0.0032
		Nagata 2003	d	0.0011	0.00026
		Van Thriel et al 2006	d	0.000027	0.0000066
119	**Ethyl Alcohol**	Passy 1892c	d	250	133
		Parker & Stabler 1913	r	17	9
		Backman 1917	r	175 - 200	93 - 106
		Grijns 1919		2,600	1380
		Zwaardemaker 1927		2,600	1380
		Henning 1924	d	183	97
		Jung 1936	d	7.8	4.1
		Jung 1936	r	11.7 - 14	6.2 - 7.4
		Balavoine 1943		10,000	5,307
		Mullins 1955	r	9,230	4,898
		Scherberger et al 1958	r	665	353
		Janicek et al 1960		884	469
		Naus 1962	d	2	1.1
		Pliska & Janicek 1965		76,000	40,334
		Ubaidullaev 1966b		7.1	3.77

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
119	**Ethyl Alcohol cont.**	Guadagni 1966		100	53
		May 1966	d	93	49
		May 1966	r	190	101
		Leonardos et al 1969	r	19	10
		Dravnieks & Laffort 1972		640	340
		Dravnieks 1974	d	1,350	716
		Nishida et al 1979	d	302	159
		Anon. 1980	d	0.64	0.34
		Anon. 1980	r	11.6	6.2
		Naus 1982	d	2	1.06
		Naus 1982	r	20	10.61
		Cristoph 1983	r	8.7 - 9.2	4.6 - 4.9
		Cometto - Muniz & Cain 1990		154	82
		Cometto - Muniz 1993	d	154	82
		Scharfenberger 1990		988	524
		Nagy 1991	d	36	19
		Nagata 2003	d	0.99	0.525
		Cain et al 2005	d	0.17	**0.09**
		Cometto - Muniz & Abraham 2008	d	0.62	0.329
120	**Ethylamine**	Tkachev 1969		0.05	**0.027**
		Hellman & Small 1974	d	0.5	0.27
		Hellman & Small 1974	r	1.5	0.81
		Laing et al 1978	r	6.5	3.5
		Nagata 2003	d	0.083	0.045
121	**Ethyl Amyl Ketone**	Toxicity Data Sheet 1958b		31	5.9
122	**Ethyl Benzene**	Ivanov 1964		2 - 2.6	0.46 - 0.60
		Koster 1971	d	0.4	0.092
		Nagy 1991	d	1.9	0.44
		Khiari et al 0992		<0.01	**<0.002**
		Cometto - Muniz 1993	d	78.3	18
		Cometto - Muniz & Cain 1994	d	78.3	18
		Nagata 2003	d	0.73	0.17
		Cometto - Muniz & Abraham 2009b	d	0.026	0.006
123	**Ethyl Bromide**	Backman 1917		12.1 - 16	**2.7** - 3.6
124	**Ethyl Chloride**	Backman 1917	r	10 - 12	**3.8** - 4.5
		Nagy 1991	d	>1000	>379
125	**Ethylene**	Mullins 1955	r	1,180	1,029
		Deadman & Prigg 1959	d	125	109
		Krasovitskaya & Malyarova 1968		20	**17**
		Laffort & Dravnieks 1973		1,100	959

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
125	**Ethylene cont.**	Hellman & Small 1974	d	310	270
		Hellman & Small 1974	r	480	418
126	**Ethylene Chlorohydrin**	Semenova et al 1980		1.2	0.36
127	**Ethylenediamine**	Hellman & Small 1974	d	3.2	1.3
128	**Ethylene Dibromide**	Olmstead 1972	r	<77	<10
129	**Ethylene Dichloride**	McCawley 1942		1,200 - 4,000	297 - 988
		Jones 1955c	d	1,500	371
		Borisova 1957		17.5 - 23.2	**4.3** - 5.7
		Scherberger et al 1958	r	820	203
		Irish 1963		200	49
		May 1966	d	450	111
		May 1966	r	750	185
		Dravnieks & O'Donnell 1971		190	47
		Hellman & Small 1974	d	25	6
		Hellman & Small 1974	r	165	41
		Kleinschmidt 1983	r	350	86
130	**Ethylene Glycol**	Nagy 1991	d	13	5.12
131	**Ethyleneimine**	Carpenter et al 1948		3.6	2
		Berzins 1967		1.25 - 3.5	**0.71** - 1.99
132	**Ethylene Oxide**	Jacobson et al 1956	d	1,260	690
		Yuldashev 1965		1.5	**0.82**
		Hellman & Small 1974	d	470	257
		Hellman & Small 1974	r	900	493
133	**Ethyl Ether**	Passy 1892a,b,d	d	0.5 - 4	**0.165** - 1.32
		Allison & Katz 1919		5,833	1,924
		Grijns 1919		<50	<16.49
		Henning 1924	d	0.75	0.25
		Zwaardemaker 1927		1	0.33
		Jung 1936	d	35	12
		Jung 1936	r	35	12
		Scherberger et al 1958	r	210	69
		Flemming & Johnstone 1977	r	4.8	1.58
		Nagy 1991	d	0.95	0.31
134	**Ethyl Formate**	Backman 1917	r	54 - 61	18 - 20
		Nagata 2003	d	8.1	**2.67**
		Van Thriel et al 2006	d	90.9	30
135	**Ethylidene Norbomene**	Kinkead et al 1971a		0.035 - 0.07	**0.007** - 0.014
		Hellman & Small 1974	d	0.1	0.02
		Hellman & Small 1974	r	0.4	0.08
136	**Ethyl Mercaptan**	Allison & Katz 1919		46	18
		Katz & Talbert 1930	d	0.00066 - 0.0076	0.00026 - 0.0030
		Thomas et al 1943		0.005	0.002
		Stuiver 1958	d	0.0001	0.0004

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
136	**Ethyl Mercaptan cont.**	Sales 1958		0.0025 - 0.0045	0.00098 - 0.0018
		Blinova 1965		0.006 - 0.03	0.002 - 0.01
		Endo et al 1967		0.00065	0.00026
		Leonardos et al 1969	r	0.0025	0.0098
		Wilby 1969	r	0.001	0.0004
		Blanchard 1976		0.016	0.0063
		Selyuzhitskii et al 1978		0.000095	0.000037
		Whisman et al 1978	d	0.00025 - 0.0005	0.000098 - 0.00020
		Bedborough & Trott 1979	d	0.00033	0.00013
		Anon 1980	d	0.000043	0.000017
		Anon 1980	r	0.00073	0.00029
		Cristoph 1983	r	0.0008 - 0.0009	0.00031 - 0.00035
		Stevens et al 1987		0.0019 - 0.021	0.00075 - 0.00826
		Stevens & Cain 1987b	d	0.0019 - 0.021	0.00075 - 0.00826
		Nagata 2003	d	0.000022	**0.0000087**
137	**N - Ethylmorpholine**	Hellman & Small 1974	d	0.4	**0.085**
		Hellman & Small 1974	r	1.2	0.25
138	**Ethyl Silicate**	Smyth & Seaton 1940	d	<720	<85
		Hellman & Small 1974	d	31	**3.6**
		Hellman & Small 1974	r	43	5
139	**Fluorine**	Belles et al 1965		0.15 - 0.30	**0.097** - 0.19
140	**Formaldehyde**	Backman 1917	r	0.033 - 0.036	**0.027** - 0.029
		Melekhina 1958		0.07	0.057
		Buchberg et al 1961		1.1 - 2.2	0.90 - 1.8
		Pliska & Janicek 1965		12,000	9,770
		Sgibnev 1968		0.3 - 0.4	0.24 - 0.33
		Leonardos et al 1969	r	1.2	0.98
		Feldman & Bonashevskya 1971		0.073	0.059
		Takhirov 1974		0.065	0.053
		Makeicheva 1978		0.077	0.063
		Anon. 1980	d	0.49	0.4
		Anon. 1980	r	2.3	1.9
		Berglund et al 1984	d	0.06	0.049
		Ahstrom et al 1986b	d	0.06	0.049
		Berglund et al 1987	d	0.14 - 0.21	0.114 - 0.171
		Winneke et al 1988		0.15 - 0.29	0.122 - 0.236
		Nagy 1991	d	2.2	1.8
		Berglund & Nordin 1992	d	0.066 - 0.11	0.054 - 0.09
		Berglund & Esfandabad 1992		0.18	0.15
		Berglund & Esfandabad 1992		0.69	0.56
		Nagata 2003	d	0.6	0.49

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
141	**Formic Acid**	Passy 1893b, 1893c	d	25 - 50	13 - 27
		Zwaardemaker 1914	d	640	340
		Backman 1917	r	21 - 24	11 - 13
		Schley 1934		3.0 - 6.0	1.6 - 3.2
		Guadagni 1966		450	239
		Naus 1982	d	2	1.06
		Naus 1982	r	20	10.63
		Kleinschmidt 1983	r	453	241
		Cometto - Muniz et al 1998a		14.5	7.7
		Cometto - Muniz 1999	d	14.5	7.7
		Van Thriel et al 2006	d	12.4	6.59
		Cometto - Muniz & Abraham 2010b	d	0.98	**0.52**
142	**Furan**	Nagata 2003	d	28	10.06
143	**Furfural**	Ubaidullaev 1961		1	0.254
		Apell 1969		0.008	**0.002**
		Makeicheva 1978		0.98	0.249
		Bedborough & Trott 1979	d	0.25	0.0636
		Nagy 1991	d	2.8	0.713
144	**Furfuryl Alcohol**	Jacobson et al 1958	d	32	8
145	**Glutaraldehyde**	Colwell 1976	r	0.16	0.039
		Cain et al 2007b	d	0.0015	**0.00037**
146	**Halothane**	Flemming & Johnstone 1977	r	267	33
147	**Heptane, all isomers**	Patty & Yant 1929		410	100
		Mullins 1955	r	2,240	547
		Jones 1955c	d	750	183
		May 1966	d	930	227
		May 1966	r	1,350	329
		Dravnieks & Laffort 1972		870	212
		Laffort & Dravnieks 1973		165	40
		Dravnieks 1974	d	3,000	732
		Nagy 1991	d	110	27
		Nagata 2003	d	2.7	0.66
		Nagata 2003	d	1.7	**0.41**
		Nagata 2003	d	3.4	0.83
		Nagata 2003	d	156	38
		Nagata 2003	d	18	4.39
		Nagata 2003	d	3.9	0.95
148	**Hexachlorocyclopenta-diene**	Treon et al 1955		1.7	0.15
149	**1,6 Hexamethylene Diisocyanate**	Kimmerle 1971		0.035 - 0.07	**0.005** - 0.010

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
150	**n - Hexane**	Patty & Yant 1929		875	248
		Laffort & Dravnieks 1973		230	65
		De Wijk 1989		107	30
		Nagata 2003	d	5.3	1.5
151	**Hexane, all isomers, except n - Hexane**	Nagata 2003	d	5.8	1.68
		Nagata 2003	d	25	7
		Nagata 2003	d	31	9
		Nagata 2003	d	70	20
		Nagata 2003	d	1.5	**0.426**
152	**1,6 - Hexanediamine**	Kulakov 1964		0.0032	0.00067
153	**1 - Hexene**	Nagata 2003	d	0.48	0.139
154	**sec - Hexyl Acetate**	Stone et al 1972	d	2.3	0.39
		Hellman & Small 1974	d	<0.4	**<0.068**
		Hellman & Small 1974	r	1.4	0.237
155	**n - Hexyl Alcohol**	Backman 1917	r	1.0 - 1.3	0.24 - 0.31
		Mullins 1955	r	9.94	2.38
		Pliska 1962		65	16
		Cain 1969	r	3.5	0.837
		Stone et al 1972	d	1.5	0.359
		Dravnieks & Laffort 1972		0.01	**0.0024**
		Dravnieks 1974	d	0.3	0.072
		Hellman & Small 1974	d	0.04	0.01
		Hellman & Small 1974	r	0.38	0.091
		Punter 1983	d	1.93	0.46
		Cristoph 1983	r	0.10 - 0.15	0.024 - 0.036
		Cometto - Muniz & Cain 1990	d	4	0.96
		Cometto - Muniz 1993	d	4	0.96
		Ferreira et al 1998		0.74	0.18
		Nagata 2003	d	0.025	0.006
		Komthong et al 2006		12.3	2.9
		Cometto - Muniz & Abraham 2008	d	0.034	0.0081
156	**Hexylene Glycol**	Nagy 1991	d	19	3.93
157	**Hydrazine**	Jacobson et al 1955	d	3.9 - 5.2	**3.0** - 4.0
		Jacobson et al 1958	d	5.2	4
158	**Hydrogen Chloride**	Schley 1934		4.5	3.02
		Elfimova 1959		0.1 - 0.2	0.067 - 0.134
		Heyroth 1963	d	1.5 - 7.5	1.01 - 5.03
		Styazhkin 1963		0.2	0.134
		Melekhina 1968	d	0.39	0.262
		Leonardos et al 1969	r	15	10
		Takhirov 1974		0.38	0.255

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
158	**Hydrogen Chloride cont.**	Naus 1982	d	7	4.69
		Naus 1982	r	15	10
		Van Thriel et al 2006	d	0.09	**0.06**
159	**Hydrogen Cyanide**	Sherrard 1928		6	5.43
		Smolczyk & Cobler 1930		<1.1	<1
		Prentiss 1937		1	0.905
		Artho & Koch 1973		0.01 - 0.1	**0.009** - 0.09
		Braker & Mossman 1980	r	2.2 - 5.6	1.99 - 5.07
160	**Hydrogen Fluoride**	Sadilova 1968		0.03	0.04
161	**Hydrogen Selenide**	Dudley & Miller 1941		<1	<0.3
162	**Hydrogen Sulfide**	Valentin 1848, 1850		2	1.4
		Lehmann 1897		<2	<1.4
		Kulka & Homma 1910		0.2 - 0.3	0.14 - 0.22
		Henderson & Haggard 1922		<0.001	<0.00072
		Henning 1924	d	0.0001	0.00007
		Katz & Talbert 1930	d	0.18	0.13
		Thomas et al 1943		0.035	0.025
		Loginova 1957		0.04	0.029
		Duan - Fen - Djuy 1959		0.012 - 0.03	0.0086 - 0.022
		Sanders & Dechant 1961		0.04 - 0.10	0.029 - 0.072
		Baikov 1963		0.014 - 0.03	0.010 - 0.022
		Young & Adams 1966	d	0.008 - 0.011	0.0057 - 0.0079
		Cederlof et al 1966	d	0.01	0.0072
		Sakuma et al 1967		0.007	0.005
		Endo et al 1967		1.4	1
		Basmadzhieva & Argirova 1968		0.012	0.0086
		Adams et al 1968	d	0.0047 - 0.0090	0.0034 - 0.0065
		Leonardos et al 1969	r	0.00066 - 0.0066	0.00047 - 0.0047
		Pomeroy & Cruse 1969		0.0042 - 0.042	0.003 - 0.030
		Wilby 1969	r	0.0063	0.0045
		Lindvall 1970	d	0.00021 - 0.0016	0.00015 - 0.0017
		Stephens 1971		0.067	0.048
		Randebrock 1971		0.012	0.0086
		Nishida et al 1975	d	0.0014 - 0.055	0.0010 - 0.039
		Winkler 1975	d	0.003	0.0022
		Winkler 1975	r	0.03	0.022
		Hill & Barth 1976		0.0007	0.0005
		Williams et al 1977	d	0.27	0.019
		Logtenberg 1978	d	0.002	0.0014
		Nishida et al 1979	d	0.074	0.053
		Winneke et al 1979	d	0.00265	0.0019
		Thiele 1979	d	0.0016	0.0011

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
162	**Hydrogen Sulfide cont.**	Bedborough & Trott 1979	d	0.0036	0.0026
		Brunekreef & Harssema 1980		0.0011 - 0.0024	0.00079 - 0.0017
		Anon. 1980	d	0.0007	0.0005
		Anon. 1980	r	0.0078	0.0056
		Thiele et al 1981		0.0013 - 0.0053	0.00093 - 0.0038
		Thiele 1982		0.0028	0.062
		Naus 1982	d	0.1	0.072
		Naus 1982	r	5	3.6
		Jensen & Flyger 1983		0.0038 - 0.0067	0.0027 - 0.0048
		Kobal & Thiele 1983		0.0022	0.0016
		Bahmuller 1983		0.0014 - 0.023	0.001 - 0.017
		Moriguchi et al 1983	d	0.0007	0.0005
		Bahmuller 1984		0.0012 - 0.0073	0.00086 - 0.0052
		Thiele 1984		0.0018	0.0013
		Roos et al 1985	d	0.00085 - 0.00105	0.00061 - 0.00075
		Roos et al 1985	d	0.0004 - 0.00043	0.00029 - 0.00031
		Don 1986	d	0.0004 - 0.00043	0.00029 - 0.00031
		Hoshika et al 1993	d	0.0004 - 0.00043	0.00029 - 0.00031
		Randebrock 1986		0.0096	0.0069
		Heeres et al 1986		0.0004 - 0.0052	0.00029 - 0.0037
		Dollnick et al 1988		0.00166	0.0012
		Winneke et al 1988		0.0015 - 0.0026	0.0011 - 0.0019
		Hermans 1989		0.000056 - 0.001545	**0.00004** - 0.0011
		Nagy 1991	d	0.0055	0.0039
		Hoshika et al 1993	d	0.0007	0.0005
		Lotsch et al 1997		0.14 - 2.8	0.10 - 2
		Mannebeck & Mannebeck 2002	d	0.000491 - 0.000946	0.00035 - 0.00068
		Nagata 2003	d	0.00057	0.00041
		Greenman et al 2004		0.022	0.0157
		McGinely & McGinley 2004		0.00070 - 0.003	0.0005 - 0.0022
		McGinely & McGinley 2004	r	0.00064 - 0.0013	0.00046 - 0.00093
		McGinely & McGinley 2004	d	0.00057 - 0.00142	0.00041 - 0.0010
		McGinely & McGinley 2004	r	0.00071 - 0.0032	0.00051 - 0.0023
		Glindemann et al 2006	d	0.001	0.00072
		Ueno et al 2009		0.00045	0.00032
		Ueno et al 2009		0.0018	0.013
163	**Indene**	Deadman & Prigg 1959	d	0.02	0.0042
		Moriguchi et al 1983	d	0.013	**0.0027**
164	**Iodine**	Randebrock 1986		10.1	0.973
165	**Iodoform**	Passy 1893a	d	0.06 - 0.7	0.0037 - 0.043
		Berthelot 1901		0.0003 - 0.03	**0.000019** - 0.0019

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
165	**Iodoform cont.**	Backman 1917	r	0.095	0.0059
		Allison & Katz 1919		18	1.12
		Zwaardemaker 1927		0.03	0.0019
		Cancho et al 2001		<0.14	<0.0087
166	**Isoamyl Acetate**	Hermanides 1909	r	0.09	0.017
		Zwaardemaker 1914	d	0.09	0.017
		Backman 1917	r	0.18 - 0.29	0.034 - 0.054
		Katz & Talbert 1930	d	0.018	0.0034
		Jung 1936	d	0.20	0.038
		Jung 1936	r	0.2	0.038
		Kerka & Humphreys 1956		0.2	0.038
		Pliska & Janicek 1965		5	0.94
		Appell 1969		0.004	**0.00075**
		Nishida et al 1979	d	1,100	209
		Punter 1983	d	0.070 - 0.084	0.013 - 0.016
		Cristoph 1983	r	0.015 - 0.02	0.0028 - 0.0038
		Don 1986	d	0.075	0.014
		Lea & Ford 1991		0.5	0.094
		Laska & Hudson 1991	d	0.13 - 0.14	0.024 - 0.026
		Hoshika et al 1997	r	8	1.5
		Langridge 2004		0.2289	0.043
		Langridge 2004		0.0107	0.002
		Atanasova et al 2005	d	0.018 - 0.919	0.0034 - 0.173
		Atanasova et al 2005	r	0.067 - 0.918	0.013 - 0.172
		Komthong et al 2006		1,950	366
167	**Isoamyl Alcohol**	Passy 1892c	d	0.1	0.028
		Backman 1917	r	0.26	0.072
		Jung 1936	d	0.08	0.022
		Jung 1936	r	0.16	0.044
		Bahmuller 1983		0.019 - 0.547	0.0053 - 0.1517
		Bahmuller 1984		0.030 - 0.16	0.0083 - 0.0444
		Dollnick et al 1988		0.116	0.032
		Guth 1997		0.125	0.035
		Guth 1997		6.3	1.75
		Ferreira et al 1998		2.8	0.777
		Nagata 2003	d	0.0061	**0.00169**
168	**Isobutyl Acetate**	Backman 1917	r	1.9 - 2.1	0.40 - 0.44
		May 1966	d	17	3.6
		May 1966	r	34	7.2
		Hellman & Small 1974	d	1.7	0.36
		Hellman & Small 1974	r	2.4	0.51
		Cristoph 1983	r	0.42 - 0.52	0.088 - 0.109
		Nagata 2003	d	0.038	**0.008**
		Komthong et al 2006		21.1 - 612	4.4 - 129

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
169	**Isobutyl Alcohol**	Passy 1892c	d	1	0.33
		Zwaardemaker 1914	d	500	165
		Backman 1917	r	0.2 - 0.4	0.066 - 0.13
		Jones 1955c	r	31	10
		May 1966	d	120	40
		May 1966	r	160	53
		Laffort & Dravnieks 1973		3	1
		Hellman & Small 1973a,b, 1974	d	2	0.66
		Hellman & Small 1973a,b, 1974	r	5.4	1.8
		Anon. 1980	d	0.036	0.012
		Anon. 1980	r	0.66	0.218
		Punter 1983	d	3.8 - 8.1	1.25 - 2.67
		Cristoph 1983	r	0.7 - 1.0	0.23 - 0.33
		Nagy 1991	d	2.64	0.87
		Nagy 1991	d	1.73	0.57
		Guth 1997		0.64	0.21
		Guth 1997		200	66
		Nagata 2003	d	0.033	**0.011**
170	**Isobutyraldehyde**	Hellman & Small 1973a,b, 1974	d	0.14	0.0475
		Hellman & Small 1973a,b, 1974	r	0.41	0.139
		Amoore 1977	d	0.015	0.0051
		Hendriks 304	d	0.022	0.0075
		Nagata 2003	d	0.001	**0.00034**
171	**Isooctyl Alcohol**	Tsulaya et al 1972		0.26	0.049
		Nagata 2003	d	0.049	**0.0092**
172	**Isophorone**	Hellman & Small 1974	d	1.1	0.19
		Hellman & Small 1974	r	3	0.53
		Ziemer et al 2000	d	0.0017	**0.0003**
173	**Isoprene**	Artho & Koch 1973		1 - 10	0.359 - 3.59
		Nagata 2003	d	0.13	**0.047**
174	**Isopropyl Acetate**	Backman 1917	r	27 - 33	6.5 - 7.9
		Jung 1936	d	1.9	0.45
		Jung 1936	r	1.9 - 2.9	0.45 - 0.69
		May 1966	d	140	34
		May 1966	r	170	41
		Hellman & Small 1974	d	2.1	0.5
		Hellman & Small 1974	r	3.8	0.91
		Scharfenberger 1990		68	16
		Nagy 1991	d	9.4	2.25
		Nagata 2003	d	0.67	**0.16**

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
175	**Isopropyl Alcohol**	Passy 1892c	d	40	16
		Backman 1917	r	18 - 24	7.3 - 9.8
		Jung 1936	d	3.9 - 32.4	1.6 - 13.2
		Jung 1936	r	7.8 - 31.2	3.2 - 12.7
		Scherberger et al 1958	r	500	203
		Cheesman & Kirkby 1959	d	43 - 290	17 - 118
		May 1966	d	90	37
		May 1966	r	120	49
		Gorlova 1970		2.5	**1**
		Koster 1968a, 1971	d	64 - 5,400	26 - 2,197
		Dravnieks & Laffort 1972		57.4	23.4
		Dravnieks 1974	d	1,500	610
		Hellman & Small 1974	d	8	3.3
		Hellman & Small 1974	r	18.8	7.6
		Scharfenberger 1990		491	200
		Nagy 1991	d	180	73
		Cometto - Muniz & Cain 1993		1,245	507
		Cometto - Muniz 1993, 1999	d	1,245	507
		Smith & Duffy 1995	d	103	42
		Smith & Duffy 1965	r	228	93
		Smeets & Dalton 2002	d	28 - 98	11 - 40
		Nagata 2003	d	65	26
176	**Isopropyl amine**	Hellman & Small 1974	d	0.5	0.21
		Hellman & Small 1974	r	1.7	0.7
		Nagata 2003	d	0.06	**0.025**
177	**Isopropyl Ether**	Hellman & Small 1974	d	0.07	**0.017**
		Hellman & Small 1974	r	0.22	0.053
178	**d-Limonene**	Fuller et al 1964	r	0.058	0.01
		Apell 1969		0.01	**0.0018**
		Dravnieks et al 1986	d	1.7	0.31
		Nagata 2003	d	0.21	0.04
		Langridge 2004		1.6878	0.3
		Langridge 2004		0.0539	0.01
179	**Maleic Anhydride**	Grigorieva 1964		1.0 - 1.3	**0.25** - 0.32
180	**Mercaptoethanol**	Vermeulen & Collin 2006		0.24	0.075
181	**Mesityl Oxide**	Toxicity Data Sheet 1957		48	12
		Hellman & Small 1974	d	0.07	**0.017**
		Hellman & Small 1974	r	0.2	0.05
182	**Methacrylic Acid**	Piringer & Granzer 1984		10	2.84
		Nagy 1991	d	1.9	**0.54**
183	**Methacrylonitrile**	Pozzani et al 1968	d	19	6.9
		Nagata 2003	d	8.1	**2.95**
184	**Methane**	Laffort & Gortan 1987		1,900,000	2,896,197

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
185	2 - Methoxyethanol	May 1966	d	190	61
		May 1966	r	280	90
		Hellman & Small 1973a,b, 1974	d	<0.3	**<0.096**
		Hellman & Small 1973a,b, 1974	r	0.7	0.22
186	2 - Methoxyethyl Acetate	Hellman & Small 1973a,b, 1974	d	1.6	**0.33**
		Hellman & Small 1973a,b, 1974	r	3.1	0.64
187	1 - Methoxy - 2 - Propanol	Stewart et al 1970	d	37	10
		Nagy 1991	d	121	33
		Nagy 1991	d	30.908	**8.39**
188	1-Methoxy-2-Propyl Acetate	Nagy 1991	d	0.7	0.13
		Ziemer et al 2000	d	0.016	**0.0029**
189	Methyl Acetate	Zwaardemaker 1914, 1927	d	2	0.66
		Backman 1917	r	67	22
		Gofmekler 1960		0.5	**0.17**
		Janicek et al 1960		5250	1733
		Naus 1962	d	0.7	0.231
		May 1966	d	550	182
		May 1966	r	900	297
		Anon. 1980	d	22	7.3
		Anon. 1980	r	63	20.8
		Scharfenberger 1990		579	191
		Cometto - Muniz & Cain 1991		8,628	2,848
		Cometto - Muniz 1993	d	8,628	2,848
		Nagata 2003	d	5.1	1.68
190	Methyl Acrylate	Bezpalkova 1967a, b		0.017	0.0048
		Anon. 1980	d	0.01	**0.003**
		Anon. 1980	r	0.06	0.020
		Bahnmuller 1984		0.015 - 0.088	0.004 - 0.025
		Priinger & Granzer 1984		0.05	0.0142
		Nagy 1991	d	0.061	0.0173
		Nagata 2003	d	0.012	0.0034
191	Methyl Alcohol	Passy 1892c	d	1,000	764
		Zwaardemaker 1914	d	600	458
		Backman 1917	r	900 - 1,000	687 - 763
		Grijns 1919		2,150	1,643
		Zwaardemaker 1927		2,150	1,643
		Jung 1936	d	23.4 - 54.6	17.9 - 41.7
		Jung 1936	r	54.6 - 62.4	41.7 - 47.7
		Gavaudan et al 1948		150	115
		Mullins 1955	r	19,300	14,746

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
191	**Methyl Alcohol cont.**	Scherberger et al 1958	r	1,950	1,490
		Chao - Chen - Tzi 1959		4.3	3.3
		Janicek et al 1960		4,000	3,056
		Pliska & Janicek 1965		260,000	198,656
		May 1966	d	7,800	5,960
		May 1966	r	11700	8,940
		Ubaidullaev 1966a		4.5	3.4
		Leonardos et al 1969	r	130	99
		Hellman & Small 1974	d	5.5	4.2
		Hellman & Small 1974	r	69	53
		Anon. 1980	d	74	57
		Anon. 1980	r	260	199
		Naus 1982	d	4	**3.05**
		Naus 1982	r	10	7.63
		Cometto - Muniz & Cain 1990	d	2,096	1,599
		Cometto - Muniz 1993	d	2,096	1,599
		Scharfenberger 1990		1,975	1,507
		Nagata 2003	d	43	33
192	**Methylamine**	Leonardos et al 1969	r	0.027	0.021
		Nishida et al 1975	d	0.065	0.0512
		Nishida et al 1979	d	6.1	4.8
		Anon. 1980	d	0.0012	**0.0009**
		Anon. 1980	r	0.012	0.009
		Hill & Barth 1976		0.027	0.021
		Nagy 1991	d	0.23	0.18
		Nagata 2003	d	0.046	0.036
193	**Methyl n - Amyl Ketone**	Stone et al 1962	d	0.9	0.19
		Pangborn et al 1964	d	0.82	0.18
		Teranishi et al 1974		0.84	0.18
		Hall & Andersson 1983	d	1.3	0.28
		Nagy 1991	d	1.2	0.26
		Nagy 1991	d	0.398	0.085
		Cometto - Muniz & Cain 1993	d	3.3	0.71
		Cometto - Muniz 1993	d	3.3	0.71
		Cometto - Muniz et al 1999	d	0.29 - 0.65	0.062 - 0.139
		Ziemer et al 2000	d	0.045	0.01
		Nagata 2003	d	0.032	0.007
		Cometto - Muniz et al 2004	d	0.47	0.1
		Cain et al 2008	d	0.062	0.013
		Cometto - Muniz et al 2008	d	0.023	0.0049
		Cometto - Muniz & Abraham 2009a	d	0.023	0.0049
		Yang et al 2008		0.0035	**0.00075**

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
194	**N - Methyl Aniline**	Backman 1917	r	6.9 - 8.6	**1.6** - 2.0
195	**2 - Methylbutyl Acetate**	Cristoph 1983	r	0.14 - 0.21	**0.026** - 0.039
196	**Methyl tert Butyl Ether**	Smith & Duffy 1995	d	0.11	**0.03**
		Smith & Duffy 1995	r	0.22	0.06
		Prah et al 1994	d	0.63	0.17
		Schulman 2001	d	0.63	0.17
197	**Methyl n - Butyl Ketone**	Backman 1917	r	0.28 - 0.35	0.068 - 0.085
		Hall & Andersson 1983	d	4.7	1.15
		Nagata 2003	d	0.098	**0.024**
198	**Methyl Chloride**	Leonardos et al 1969	r	>21	>10
199	**Methyl Chloroform**	Scherberger et al 1958	r	1,650	302
		May 1966	d	2,100	385
		May 1966	r	3,900	715
		Kendall et al 1968	r	88	16
		Don 1986	d	5.3	**0.97**
200	**Methyl - 2 - Cyanoacrylate**	McGee et al 1968		4.5 - 13.5	**0.99** - 2.97
201	**Methyl Cyclohexane**	Nagata 2003	d	0.6	0.149
202	**2 - Methyl Cyclohexanone**	Van Thriel et al 2006	d	0.83	0.181
203	**Methylene Bisphenyl Isocyanate**	Woolrich 1982		4	0.39
204	**Methylene Chloride**	Lehmann & Schmidt - Kehl 1936		1,100	317
		Scherberger et al 1958	r	1,530	440
		May 1966	d	550	158
		May 1966	r	790	227
		Leonardos et al 1969	r	730	210
		Basmadshijewa et al 1970	d	4.1 - 33.2	**1.2** - 9.6
		Don 1986	d	640	184
		Nagata 2003	d	560	161
205	**Methyl Ethyl Ketone**	Backman 1917	r	63 - 70	21 - 24
		May 1966	d	80	27
		May 1966	r	163	55
		Leonardos et al 1969	r	29	9.8
		Hartung et al1971		7	2.4
		Mukhitov & Azimbekov 1971		0.75	0.25
		Dravnieks & Laffort 1972		22	7.5
		Artho & Koch 1973		100 - 1,000	34 - 339
		Dravnieks 1974	d	250	85
		Hellman & Small 1974	d	5.8	2
		Hellman & Small 1974	r	16	5.4
		Anon. 1980	d	8.4	2.8
		Anon. 1980	r	29	9.8
		Hall & Andersson 1983	d	61	21
		Doty et al 1988	d	16.5 - 23.9	5.6 - 8.1

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
205	**Methyl Ethyl Ketone cont.**	Scharfenberger 1990		126	43
		Doty 1991	d	2.9 - 51.6	0.983 - 17.5
		Nagy 1991	d	4.8	1.63
		Ziemer et al 2000	d	0.21	**0.07**
		Nagata 2003	d	1.3	0.44
206	**Methyl Formate**	Backman 1917	r	165 - 180	**67** - 73
		May 1966	d	5,000	2,035
		May 1966	r	6,900	2,809
		Nagata 2003	d	325	132
207	**Methyl Hydrazine**	Jacobson et al 1955		1.9 - 5.7	**1** - 3
208	**Methyl Isoamyl Ketone**	Hellman & Small 1974	d	0.06	0.013
		Hellman & Small 1974	r	0.23	0.049
		Nagy 1911	d	0.63	0.135
		Nagata 2003	d	0.0099	**0.0021**
209	**Methyl Isobutyl Ketone**	Backman 1917	r	0.6 - 0.8	0.15 - 0.2
		Middleton 1956	r	1.9	0.46
		May 1966	d	32	7.8
		May 1966	r	64	16
		Stone et al 1967b, 1972	d	0.97 - 9.7	0.24 - 2.4
		Steinmetz et al 1969	d	1.21	0.3
		Leonardos et al 1969	r	1.9	0.46
		Hellman & Small 1974	d	0.4	0.1
		Hellman & Small 1974	r	1.1	0.27
		Anon. 1980	d	0.7	0.17
		Anon. 1980	r	2.8	0.68
		Dravnieks et al 1986	d	0.14	**0.03**
		Nagy 1911	d	6.3	1.54
		Dalton et al 2000	d	41	10.00
		Ziemer et al 2000	d	1.1	0.27
		Nagata 2003	d	0.7	0.17
210	**Methyl Isocyanate**	Kimmerle & Eben 1964		5	2.14
211	**Methyl Isopropyl Ketone**	Backman 1917	r	15 - 17	4.3 - 4.8
		Nagata 2003	d	1.8	**0.51**
212	**Methyl Mercaptan**	Katz & Talbert 1930	d	0.081	0.041
		Bozza & Colombo 1949		1	0.51
		Freudenberg & Reichert 1955		0.0005	0.00025
		Guadagni 1966		0.0002	0.0001
		Endo et al 1967		1.1	0.56
		Leonardos et al 1969	r	0.0042	0.0021
		Wilby 1969	r	0.002	0.001
		Hamanabe et al 1969		0.0002	0.0001
		Sanders et al1970		0.0019	0.00097
		Selyuzhitskii 1972		0.0005	0.00025

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
212	**Methyl Mercaptan cont.**	Artho & Koch 1973		0.000000000001	**0.00000000000051**
		Blanchard 1976		0.003	0.0015
		Williams et al 1977	d	0.0000003	0.0000002
		Nishida et al 1979	d	0.038	0.019
		Bedborough & Trott 1979	d	0.00016	0.000081
		Anon. 1980	d	0.00024	0.00012
		Anon. 1980	r	0.0013	0.00066
		Nagy 1991	d	0.0024	0.0012
		Nagata 2003	d	0.00014	0.000071
		Greenman et al 2004		0.00048	0.00024
		Clindemann et al 2006	d	0.001	0.00051
213	**Methyl Methacrylate**	Filatova 1962		0.2	0.049
		Leonardos et al 1969	r	0.85	0.21
		Hellman & Small 1973a,b, 1974	d	0.2	0.049
		Hellman & Small 1973a,b, 1974	r	1.4	0.34
		Holland 1974		0.057	**0.014**
		Anon. 1980	d	0.62	0.15
		Anon. 1980	r	1.9	0.46
		Piringer & Granzer 1984		0.7	0.17
		Nagy 1991	d	2.7	0.66
		Nagata 2003	d	0.86	0.21
214	**2 - Methylnaphthalene**	Moriguchi et al 1983	d	0.004	0.00069
215	**Methyl Parathion**	Akhmedov 1968		0.0125	0.0012
216	**4 - Methyl - 2 - Pentanol**	Hellman & Small 1974	d	1.4	**0.335**
		Hellman & Small 1974	r	2.2	0.526
217	**Methyl Propyl Ketone**	Backman 1917	r	11 - 15	3.1 - 4.3
		May 1966	d	27	7.7
		May 1966	r	48	13.6
		Hall & Andersson 1983	d	22	6.24
		Laska & Hudson 1991	d	6.7 - 8.3	1.9 - 2.4
		Cometto - Muniz & Cain 1993	d	30.1	8.54
		Cometto - Muniz 1993	d	30.1	8.54
		Patterson et al 1993	d	9.1	2.58
		Nagata 2003	d	0.098	**0.028**
		Komthong et al 2006		230	65
		Cometto - Muniz et al 2008	d	0.35	0.099
		Cometto - Muniz & Abraham 2009a	d	0.35	0.099
218	**1 - Methyl - 2 - Pyrrolidone**	Nagy 1991	d	41	10
		Nagy 1991	d	17.113	**4.22**

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
219	**Methyl Styrene**	Wolf et al 1956		48 - 240	9.9 - 49.7
		Minaev 1966		0.1	**0.02**
		Hellman & Small 1974	d	0.25	0.05
		Hellman & Small 1974	r	0.75	0.16
		Nagy 1991	d	2.2	0.46
220	**Methyl Vinyl Ketone**	Martirosyan 1970		0.5	0.174
221	**Monochloroacetic Acid**	Backman 1917	r	0.6	0.155
		Smith & Hochstettler 1969	r	0.05	**0.013**
222	**Morpholine**	Hellman & Small 1973a,b, 1974	d	0.04	**0.01**
		Hellman & Small 1973a,b, 1974	r	0.25	0.07
223	**Naphthalene**	Backman 1917	r	0.05 - 0.055	0.0095 - 0.0105
		Mitsumoto 1926	r	4.0 - 4.4	0.76 - 0.84
		Hesse 1928	r	0.3	0.057
		Morimura 1934	r	3.37 - 5.34	0.64 - 1.02
		Robbins 1951		<1.6	<0.31
		Punter 1983	d	0.2	0.038
		Moriguchi et al 1983	d	0.007	**0.0013**
		Savenhed et al 1985	d	0.01 - 0.04	0.0019 - 0.0076
		Nagy 1991	d	0.45	0.086
224	**1 - Naphthylamine**	Backman 1917		0.14 - 0.29	**0.024** - 0.050
225	**2 - Naphthylamine**	Backman 1917	r	1.4 - 1.9	**0.24** - 0.32
226	**Nickel Carbonyl**	Armit 1907		3.5	**0.5**
		Kincaid 1956		7 - 21	1.0 - 3.0
227	**Nicotine**	Walker et al 1996		0.066	0.0099
228	**Nitric Acid**	Melekhina 1968	d	0.7	0.27
229	**Nitrobenzene**	Hermanides 1909	r	0.0412	0.0082
		Zwaardemaker 1914, 1927	d	0.04 - 0.041	0.0079 - 0.0081
		Backman 1917	r	0.34 - 0.70	0.068 - 0.14
		Allison & Katz 1919		146	29
		Henning 1924	d	0.0065	0.0013
		Katz & Talbert 1930	d	9.6	1.9
		Van Anrooij 1931	d	0.019	0.0038
		Janicek et al 1960		19	3.78
		Andrcescheva 1964		0.0182	0.0036
		Gavaudan & Poussel 1966		0.15	0.03
		Leonardos et al 1969	r	0.024	0.0048
		Randebrock 1971		0.002	**0.0004**
		Ozturk 1976	d	0.363	0.072
		Naus 1982	d	0.2	0.04
		Naus 1982	r	20	3.97
		Randebrock 1986		0.0053	0.0011

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
230	**Nitrogen Dioxide**	Beck 1959		0.2 - 1.0	0.1 - 0.5
		Henschler et al 1960	d	0.2 - 1.0	0.1 - 0.5
		Shalamberidze 1967		0.23	0.12
		Rumsey & Cesta 1970		<1	<0.5
		Knuth 1973		0.11	**0.058**
		Prusakov et al 1976		0.2 - 0.26	0.11 - 0.14
		Braker & Mossman 1980		<9.4	<5
		Nagata 2003		0.23	0.12
231	**Nitromethane**	Nagy 1991	d	124	50
232	**1 - Nitropropane**	Dravnieks 1974	d	510	140
		Dravnieks & Laffort 1972		28.2	**7.7**
233	**2 - Nitropropane**	Treon & Dutra 1952		297 - 1,050	82 - 288
		Hine et al 1978	r	580	159
		Crawford et al 1984	d	18	**4.94**
234	**N - Nitrosodimethyl Amine**	Prusakov et al 1976		0.024 - 0.04	**0.0079** - 0.013
235	**Nonane**	Mullins 1955	r	108	21
		Laffort & Dravnieks 1973		60	11
		Nagata 2003	d	12	**2.3**
236	**Octane, all isomers**	Jones 1955c	d	550	118
		May 1966	d	710	152
		May 1966	r	1,100	235
		Laffort & Dravnieks 1973		71	15
		Nagy 1991	d	61.8	13
		Nagy 1991	d	90.102	19
		Nagata 2003	d	8	1.71
		Nagata 2003	d	3.1	**0.66**
237	**1 - Octanol**	Backman 1917	r	0.005 - 0.008	0.0009 - 0.0015
		Rcoen 1920	r	0.005	**0.0009**
		Gavaudan et al 1948		0.02	0.0038
		Mullins 1955	r	5.44	1.02
		Pliska & Janicek 1960		0.14	0.026
		Pliska 1962		9	1.69
		Stone et al 1967	d	0.05	0.009
		Cain 1969	r	0.5	0.09
		Punter 1983	d	0.73	0.137
		Cristoph 1983	r	0.03 - 0.05	0.0056 - 0.009
		Cometto - Muniz & Cain 1990	d	0.037	0.0069
		Cometto - Muniz 1993	d	0.037	0.0069
		Nagata 2003	d	0.014	0.0026
		Commetto - Muniz & Abraham 2008	d	0.023	0.0043
		Yang et al 2008		0.022	0.0041

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
238	**1 - Octene**	Dravnieks & Laffort 1972		0.33	0.07
		Dravnieks 1974	d	5	1.09
		Kosinowski & Piringer 1983		37	8.06
		Cometto - Muniz 1993	d	945	206
		Cometto - Muniz & Cain 1994	d	945	206
		Nagata 2003	d	0.0046	**0.001**
239	**Oxygen Difluoride**	Lester & Adams 1965		0.22	0.0996
240	**Ozone**	Witheridge & Yaglou 1939		0.02 - 0.03	0.010 - 0.015
		Wilska 1951		<0.2	<0.10
		Beck 1959		<0.04	<0.02
		Henschler et al 1960		<0.04	<0.020
		Buchberg et al 1961		0.07 - 0.5	0.036 - 0.25
		Eglite 1968		0.015	0.0076
		Nagata 2003	d	0.0064	**0.0033**
		Cain et al 2007a	d	0.014	0.0071
241	**Pentaborane**	Krackow 1963		2.5	0.97
242	**Pentane, all isomers**	Patty & Yant 1929		1450	491
		Mullins 1955	r	3,090	1,147
		Laffort & Dravnieks 1973		350	119
		Nagata 2003	d	4.1	1.39
		Nagata 2003	d	3.8	**1.29**
243	**2,4 - Pentanedione**	Hellman & Small 1974	d	0.04	**0.0098**
		Hellman & Small 1974	r	0.08	0.0195
244	**Pentanol, all isomers**	Backman 1917	r	1.0 - 1.2	0.28 - 0.33
		Allison & Katz 1919		225	62
		Jung 1936	d	0.4 - 0.81	0.11 - 0.22
		Jung 1936	r	1.62	0.45
		Janicek et al 1960		11	3.05
		Naus 1962	d	4	1.11
		Pliska & Janicek 1965		1,100	305
		Gavaudan & Poussel 1966		0.4	0.11
		May 1966	d	35	9.71
		May 1966	r	80	22.00
		Stone et al 1972	d	1.2	0.33
		Baikov et al 1973		0.1	0.028
		Hellman & Small 1974	d	0.8	0.22
		Hellman & Small 1974	r	1.1	0.31
		Naus 1982	d	4	1.11
		Naus 1982	r	30	8.32
		Punter 1983	d	2	0.55
		Cristoph 1983	r	1.0 - 1.1	0.28 - 0.30
		Cometto - Muniz & Cain 1990	d	5	1.39
		Cometto - Muniz 1993	d	5	1.39

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
244	**Pentanol, all isomers cont.**	Lindell 1991	d	1.3	0.36
		Ziemer et al 2000	d	0.02	**0.0055**
		Nagata 2003	d	0.36	0.10
		Yang et al 2008		0.153	0.04
		Nagata 2003	d	1	0.28
		Passy 1892c	d	20 - 40	5.5 - 11
		Backman 1917	r	2.0 - 3.0	0.55 - 0.83
		Nagata 2003	d	0.32	0.089
		Backman 1917	r	1.4 - 1.7	0.39 - 0.47
		Hellman & Small 1973a,b, 1974	d	0.14	0.039
		Hellman & Small 1973a,b, 1974	r	0.83	0.23
		Cristoph 1983	r	0.9 - 1.0	0.25 - 0.28
		Komthong et al 2006		329	91
		Nagata 2003	d	1	0.28
245	**Perchloroethylene**	Carpenter 1937		<340	<50
		May 1966	d	320	47
		May 1966	r	480	71
		Leonardos et al 1969	r	32	5
		Anon. 1980	d	12	2
		Anon. 1980	r	55	8
		Torkelson & Rowe 1981		340	50
		Don 1986	d	8.1 - 8.3	1.19 - 1.22
		Hoshika et al 1993	d	8.1 - 8.3	1.19 - 1.22
		Hoshika et al 1993	d	12	2
		Nagata 2003	d	5.2	**0.767**
246	**Perchloryl Fluoride**	Braker & Mossman 1980		42	14.58
247	**Phenol**	Grijns 1906		2.2 - 6.8	0.57 - 1.8
		Zwaardemaker 1914, 1927	d	4	1
		Backman 1917	r	0.13 - 0.26	0.034 - 0.068
		Henning 1924	d	1.2	0.31
		Mukhitov 1962, 1963		0.022	0.0057
		Itskovich & Vinogradova 1962		3	0.78
		Pogosyan 1965		0.022	0.0057
		Komeev 1965		0.0172	**0.0045**
		Makhinya 1966		0.022	0.0057
		Basmadzhieva & Argirova 1968		0.021	0.0055
		Leonardos et al 1969	r	0.18	0.047
		Takhirov 1974		0.022	0.0057
		Punter 1975, 1979	d	0.8	0.21
		Makeicheva 1978		0.027	0.007

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
247	**Phenol cont.**	Anon. 1980	d	0.046	0.012
		Anon. 1980	r	0.22	0.057
		Naus 1982	d	0.2	0.2
		Naus 1982	r	20	20
		Punter 1983	d	0.23	0.06
		Moriguchi et al 1983	d	0.046	0.012
		Kohler & Homans 1980		5.8 - 7.5	1.51 - 1.95
		Homans 1984		5.8 - 7.5	1.51 - 1.95
		Hoshika et al 1993	d	0.039	0.010
		Don 1986	d	0.039	0.010
		Nagy 1991	d	0.5	0.130
		Hoshika et al 1993	d	0.046	0.012
		Nagata 2003	d	0.021	0.0055
248	**Phenyl Mercaptan**	Katz & Talbert 1930	d	0.0012	0.00027
		Stuiver 1958	d	0.00014	**0.00003**
249	**Phosgene**	Fieldner et al 1921		23	5.7
		Suchier 1929		4	1
		Schley 1934	d	0.5	**0.12**
		Schley 1934	r	0.5 - 1	0.12 - 0.25
		Prentiss 1937		4.4	1.09
		Patty 1962c		2	0.49
		Leonardos et al 1 969	r	4	1
250	**Phosphine**	Valentin 1848		1.4	1
		Valentin 1850		0.13	0.094
		Singh et al 1967	d	7	5
		Berck 1968	r	<2	<1.4
		Leonardos et al 1969	r	0.03	0.022
		Dumas & Bond 1974	d	>280	>201
		Fluck 1976	r	0.014 - 2.8	**0.010** - 2.014
251	**Phthalic Anhydride**	Slavgorodskiy 1968		0.32	0.053
252	**Picolines, all isomers**	Hellman & Small 1974	d	0.05	0.0131
		Hellman & Small 1974	r	0.09	0.0236
		Moriguchi et al 1983	d	0.01	**0.0026**
253	**Piperdine**	Geier 1936	d	0.5	**0.14**
		Geier 1936	r	2	0.57
		Nawakowski 1980		<7	<2
254	**Propane**	Patty & Yant 1929		36,000	19,964
		Laffort & Dravnieks 1973		22,000	12,200
		Nagata 2003		2,700	**1,497**
255	**Propionaldehyde**	Backman 1917	r	0.02	0.0084
		Pliska & Janicek 1965		240	101
		Hartung et al 1971		1.7	0.716
		Knuth 1973		0.026	0.011

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
255	**Propionaldehyde cont.**	Hellman & Small 1974	d	0.02	0.008
		Hellman & Small 1974	r	0.1	0.042
		Teranishi et al 1974		0.02	0.008
		Bedborough & Trott 1979	d	0.014	0.006
		Anon 1980	d	0.0036	0.0015
		Anon 1980	r	0.036	0.015
		Hall & Andersson 1983	d	0.69	0.29
		Cristoph 1983	d	0.33 - 0.40	0.139 - 0.168
		Nagy 1991	d	0.21	0.088
		Nagata 2003	d	0.0024	**0.001**
		Cometto - Muniz & Abraham 2010a	d	0.0048	0.002
256	**Propionic Acid**	Passy 1893b, 1893c	d	0.05	0.017
		Backman 1917	r	0.5	0.17
		Grijns 1919		0.6	0.2
		Mitsumoto 1926	r	1.7 - 2.55	0.56 - 0.84
		Hesse 1926	r	4.6	1.5
		Morimura 1934	r	1.77 - 2.38	0.58 - 0.79
		Stone 1963a, 1963c	d	0.39 - 0.68	0.13 - 0.22
		Stone & Bosley 1965	d	0.89	0.29
		Goldenberg 1967	d	0.003	**0.00099**
		Hellman & Small 1974	d	0.08	0.026
		Hellman & Small 1974	r	0.1	0.033
		Anon. 1980	d	0.0051	0.0017
		Anon. 1980	r	0.025	0.0083
		Punter 1983	d	0.44 - 0.58	0.15 - 0.19
		Dollnick et al 1988		0.147	0.049
		Walker et al 1990		14.1	4.65
		Nagy 1991	d	1.2	0.4
		Walker et al 1996		0.3 - 3	0.099 - 0.99
		Nagata 2003	d	0.017	0.0056
		Van Thriel et al 2006	d	1	0.33
257	**n - Propyl Acetate**	Backman 1917	r	12	2.9
		Jung 1936	d	0.35	0.084
		Jung 1936	r	0.35 - 0.62	0.084 - 0.15
		May 1966	d	70	17
		May 1966	r	110	26
		Hellman & Small 1974	d	0.2	**0.048**
		Hellman & Small 1974	r	0.6	0.14
		Cometto - Muniz & Cain 1991	d	104	25
		Cometto - Muniz & Cain 1991	d	104	25
		Nagata 2003	d	1	0.239
		Komthong et al 2006		363	87

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
258	**Propyl Alcohol**	Passy 1892c	d	5 - 10	2.0 - 4.1
		Backman 1917	r	3 - 5	1.2 - 2.0
		Jung 1936	d	0.8 - 8	0.33 - 3.3
		Jung 1936	r	8 - 24	3.3 - 9.8
		Jones 1955c	d	140	57
		Janicek et al 1960		540	220
		Pliska & Janicek 1965		25,000	10,172
		Guadagni 1966		9	3.7
		May 1966	d	80	33
		May 1966	r	150	61
		Khachaturyan et al 1968		1.25	0.51
		Cain 1969	r	660	269
		Corbit & Engen 1971		46 - 51	19 - 21
		Stone et al 1972	d	2.8	1.1
		Dravnieks & Laffort 1972		32.3	13
		Dravnieks 1974	d	100	41
		Hellman & Small 1974	d	<0.075	**<0.031**
		Hellman & Small 1974	r	0.2	0.081
		Laing 1975	d	100	41
		Naus 1982	d	2	0.81
		Naus 1982	r	20	8
		Punter 1983	d	5.9	2.4
		Cristoph 1983	r	2.9 - 3.2	1.18 - 1.3
		Cometto - Muniz & Cain 1990, 1993	d	27.5 - 35	11 - 14
		Cometto - Muniz 1993	d	27.5 - 35	11 - 14
		Scharfenberger 1990		16	6.5
		Nagata 2003	d	0.24	0.098
259	**Propylene**	Krasovitskaya & Malyarova 1968		17.3	**10.1**
		Laffort & Dravnieks 1973		170	99
		Hellman & Small 1974	d	38	22.1
		Hellman & Small 1974	r	115	67
		Nagata 2003	d	22	13
260	**Propylene Dichloride**	Hellman & Small 1974	d	1.2	**0.26**
		Hellman & Small 1974	r	2.4	0.52
		Nagy 1991	d	40	8.66
261	**Propylene Glycol**	Nagy 1991	d	16	5.14
262	**Propylene Glycol Dinitrate**	Stewart et al 1974	d	1.6	0.236
263	**Propylene Oxide**	Jacobson et al 1956	d	473	199
		Hellman & Small 1974	d	24	**10**
		Hellman & Small 1974	r	84	35

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
264	**Pyridine**	Hermanides 1909	r	0.16	0.05
		Zwaardemaker 1914, 1927	d	0.04	0.012
		Backman 1917	r	0.2	0.062
		Allison & Katz 1919		32	9.9
		Katz & Talbert 1930	d	0.74	0.23
		Van Anrooij 1931	d	0.078	0.024
		Geier 1936	d	0.09	0.029
		Geier 1936	r	0.095	0.029
		Jones 1955c	d	40	12
		Sales 1958		0.42	0.13
		Janicek et al 1960		4.6	1.4
		Sutton 1962b		<3.2	<0.99
		Kristesashvili 1965		0.21	0.065
		Leonardos et al 1969	r	0.067	0.021
		Dravnieks & Laffort 1972		0.33	0.1
		Laffort & Dravnieks 1973		0.74	0.23
		Dravnieks 1974	d	6	1.9
		Amoore & Buttery 1978	d	2.4	0.74
		Laing et al 1978	r	2.4	0.74
		Hangartner 1981		0.08 - 2.9	0.025 - 0.90
		Naus 1982	d	1	0.31
		Naus 1982	r	10	3.1
		Moriguchi et al 1983	d	0.023	**0.007**
		Bahnmuller 1983		0.132 - 1.21	0.041 - 0.374
		Ahlstrom et al 1986a	d	0.124 - 0.146	0.038 - 0.045
		Amoore 1986a,b	d	2.1	0.65
		Don 1986	d	0.12	0.04
		Hartigh 1986	d	0.15 - 0.29	0.046 - 0.090
		MacLeod et al 1986		0.054	0.017
		Cain et al 1987	d	0.34	0.11
		Steven et al 1988	d	0.13 - 1.2	0.040 - 0.371
		Cometto - Muniz & Cain 1990		4.1	1.27
		Cometto - Muniz 1993	d	4.1	1.27
		Cain & Gent 1991	d	0.32	0.1
		Laska & Hudson 1991	d	0.039	0.012
		Nagy 1991	d	1.5	0.46
		Berglund & Esfandabad 1992		0.31	0.1
		Berglund & Esfandabad 1992		2.5	0.77
		Nordin et al 1997		0.34	0.11
		Nagata 2003	d	0.2	0.062
		Cain et al 2010	d	0.32	0.1

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
265	**Quinoline**	Geier 1936	d	0.03	**0.0057**
		Geier 1936	r	0.05 - 0.1	0.0095 - 0.019
		Gundlach & Kenway 1939	d	28	5.3
266	**Quinone**	Backman 1917	r	0.047 - 0.050	**0.0106** - 0.0113
		Oglesby et al 1947		0.44	0.1
267	**Styrene, Monomer**	Wolf et al 1956		43 - 258	10 - 61
		Deadman & Prigg 1959	d	0.11	0.026
		Li - Shen 1961		0.02	0.0047
		Stalker 1963	d	0.073	0.017
		Muhlen 1968	r	4.3	1
		Leonardos et al 1969	r	0.2 - 0.4	0.047 - 0.094
		Smith & Hochstettler 1969	r	0.2	0.047
		Dravnieks & Laffort 1972		1.7	0.4
		Hellman & Small 1973a,b, 1974	d	0.22 - 0.64	0.052 - 0.15
		Hellman & Small 1973a,b, 1974	r	0.64	0.15
		Dravnieks 1974	d	8	1.9
		Anon. 1980	d	0.14	0.033
		Anon. 1980	r	0.73	0.17
		Don 1986	d	0.068	0.016
		Hoshika et al 1993	d	0.068	0.016
		Randebrock 1986		0.012	**0.0028**
		Nagy 1991	d	1.3	0.305
		Hoshika et al 1993	d	0.14	0.033
		Nagata 2003	d	0.15	0.035
		Dalton et al 2007	d	26.4	6.2
268	**Sulfur Dioxide**	Holmes et al 1915	d	5 - 10	1.9 - 3.8
		Holmes et al 1915	r	10 - 13	3.8 - 5.0
		Smolczyk & Cobler 1930		<4	<1.5
		Thomas et al 1943		1.3 - 1.6	0.50 - 0.61
		Popov et al 1952		4 - 6.5	1.5 - 2.5
		Amdur et al 1953		2.6 - 21	0.99 - 8.0
		Dubrovskaya 1957		2.6 - 3.0	0.99 - 1.1
		Beck 1959		1.3 - 2.6	0.50 - 0.99
		Henschler et al 1960	d	1.3 - 2.6	0.50 - 0.99
		Bushtueva 1960		1.5	0.57
		Bushtueva 1962		1.6 - 2.6	0.61 - 0.99
		Makhinya 1966		0.87 - 0.88	**0.33 - 0.34**
		Shalamberidze 1967		1.6	0.61
		Leonardos et al 1969	r	1.2	0.46
		Nagata 2003	d	2.3	0.88
		Kleinbeck et al 2011		1.434 - 8.307	0.547 - 3.17
269	**Sulfur Hexafluoride**	Laffort 1968a		24,000,000	4,017,527

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
270	**Sulfuric Acid**	Melekhina 1968	d	0.6	0.15
271	**1,1,2,2 - Tetrabromo-ethane**	Hollingsworth et al 1963	r	<14	<0.99
272	**1,1,2,2 - Tetrachloro-ethane**	Lehmann & Schmidt - Kehl 1936		20	2.9
		Dravnieks & Laffort 1972		1.6	**0.233**
		Dravnieks 1974	d	50	7.3
273	**Tetrahydrofuran**	May 1966	d	90	30.5
		May 1966	r	180	61
		Popov 1970		0.27	**0.092**
		Kendall et al 1968	r	7.3 - 10.2	2.5 - 3.5
		Nagy 1991	d	18	6.1
274	**Thioglycolic Acid**	Dravnieks et al 1986	d	0.0008	0.00021
275	**Toluene**	Backman 1917	r	3.5 - 3.6	0.93 - 0.96
		Backman 1918		2	0.53
		Grijns 1919		170	45
		Zwaardemaker 1927		170	45
		Zwaardemaker 1927		2	0.53
		Schley 1934	d	6	1.6
		Schley 1934	r	16	4.2
		Nader 1958	d	0.08 - 1.9	0.021 - 0.50
		Deadman & Prigg 1959	d	5.5	1.5
		Naus 1962	d	2	0.53
		Stalker 1963	d	1	0.27
		Gusev 1965		1.5 - 3.2	0.40 - 0.85
		May 1966	d	140	37
		May 1966	r	260	69
		Leonardos et al 1969	r	8.1 - 17.8	2.1 - 4.7
		Dravnieks & O'Donnell 1971		45	12
		Koster 1971	d	13.7	3.6
		Dravnieks & Laffort 1972		0.53	0.14
		Artho & Koch 1973		100 - 1,000	26.5 - 265
		Hellman & Small 1973a,b, 1974	d	0.6	0.16
		Hellman & Small 1973a,b, 1974	r	7	1.9
		Dravnieks 1974	d	60	16
		Winneke & Kastka 1975		46 - 84	12 - 22
		Anon. 1980	d	3.5	0.93
		Anon. 1980	r	18	4.8
		Naus 1982	d	2	0.53
		Naus 1982	r	20	5.3
		Punter 1983	d	25.4	6.7
		Bahmuller 1983		5.85 - 29.8	1.55 - 7.9

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
275	**Toluene cont.**	Don 1986	d	3.7 - 3.8	0.98 - 1.01
		Hoshika et al 1993	d	3.7 - 3.8	0.98 - 1.01
		Scharfenberger 1990		17	4.51
		Nagy 1991	d	12	3.18
		Cometto - Muniz 1993	d	590	157
		Cometto - Muniz & Cain 1994	d	590	157
		Hoshika et al 1993	d	305	81
		Cometto - Muniz et al 2002		0.4	0.11
		Cometto - Muniz et al 2003		0.098	**0.026**
		Nagata 2003	d	1.3	0.35
		Cometto - Muniz et al 2004	d	0.12 - 0.38	0.032 - 0.10
		Cometto - Muniz & Abraham 2009b	d	0.3	0.08
276	**Toluene 2,4 - & 2,6 - Diisocyanate**	Zapp 1957		2.8	0.39
		Henschler et al 1962		0.14 - 0.35	**0.020** - 0.049
		Chizhikov 1963		0.2	0.028
		Leonardos et al 1969	r	15	2
277	**o - Toluidine**	Huijer 1924	d	29	6.6
		Backman 1917	r	4.0 - 5.4	0.91 - 1.23
		Stuiver 1958	d	0.11	**0.025**
278	**m - Toluidine**	Huijer 1924	d	26	5.9
		Backman 1917	r	3.0 - 3.9	0.68 - 0.089
		Stuiver 1958	d	2	**0.46**
279	**p - Toluidine**	Huijer 1924	d	14	3.2
		Backman 1917	r	1.0 - 1.3	0.23 - 0.30
		Stuiver 1958	d	0.12	**0.027**
280	**Trichloroacetic Acid**	Backman 1917	r	1.6 - 2.5	**0.24** - 0.37
281	**1,2,4 - Trichlorobenzene**	Rowe 1975		22	2.96
282	**Trichloroethylene**	Lehmann & Schmidt - Kehl 1936		900	167
		Weitbrecht 1957		110	20
		Scherberger et al 1958	r	410	76
		Frantikova 1962		69	13
		Naus 1962	d	3	0.56
		May 1966	d	440	82
		May 1966	r	580	108
		Malyarova 1967		2.5 - 21	**0.5** - 4
		Leonardos et al 1969	r	115	21
		Torkelson & Rowe 1981		538	100
		Naus 1982	d	3	0.56
		Naus 1982	r	20	3.72
		Don 1986	d	3.9	0.73
		Nagata 2003	d	21	3.91

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
283	**Trichlorofluoromethane**	Hellman & Small 1974	d	28	**5**
		Hellman & Small 1974	r	760	135
		Braker & Mossman 1980		1,124,000	200,057
284	**Triethanolamine**	Nagata 2003	d	>61	>10
285	**Triethylamine**	Tkachev 1970		0.33	0.08
		Hellman & Small 1974	d	<0.4	<0.10
		Hellman & Small 1974	r	1.1	0.27
		Laing et al 1978	r	11.9	2.9
		Homans et al 1978	d	2.7	0.65
		Dravnieks et al 1986	d	1	0.24
		Nagata 2003	d	0.022	**0.0053**
286	**Trimethylamine**	Tempelaar 1913	d	2.1	0.87
		Rotenberg & Mashbits 1967		2	0.83
		Sakuma et al 1967		0.0007	0.00029
		Leonardos et al 1969	r	0.0005	0.00021
		Stephens 1971		0.0014	0.00058
		Amoore 1977		0.0025	0.001
		Bedborough & Trott 1979	d	0.0012	0.0005
		Anon. 1980	d	0.00026	0.00011
		Anon. 1980	r	0.0034	0.0014
		Jensen & Flyger 1983		0.0031 - 0.027	0.00128 - 0.1117
		Langenhove & Schamp 1984		0.002	0.00083
		Homans 1984		4.4	1.82
		Nagy 1991		0.0059	0.0024
		Greenman et al 2004		0.000041 - 0.0011	**0.00002** - 0.00045
		Nagata 2003		0.000077	0.000032
		Van Thriel et al 2006		0.63	0.26
287	**Trimethyl Benzene, all isomers**	Backman 1917	r	0.35 - 0.4	0.071 - 0.081
		Backman 1917	r	0.3 - 0.35	0.061 - 0.071
		Backman 1918		0.2	0.041
		Deadman & Prigg 1959	d	0.7	0.14
		Deadman & Prigg 1959	d	0.2	0.041
		Dravnieks & Laffort 1972		0.03	**0.006**
		Knuth 1973		1.2	0.24
		Dravnieks 1974	d	12	2.4
		Anon. 1980	d	0.14	0.028
		Anon. 1980	r	1.1	0.22
		Anon. 1980	d	0.18	0.037
		Anon. 1980	r	1.4	0.28
		Punter 1983	d	10.7	2.2
		Nagata 2003	d	0.59	0.12
288	**Trimethyl Phosphite**	Levin & Gabriel 1973		0.0005	0.000099

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
289	**Turpentine and selected monoterpenes**	Apell 1969		0.016	0.0029
		Cristoph 1983	r	25 - 29	4.49 - 5.20
		Cristoph 1983	r	35 - 38	6.3 - 6.8
		Randerbrock 1986		0.00036	**0.00006**
		Laska & Hudson 1991	d	0.23 - 0.36	0.041 - 0.065
		Lindell 1991	d	2.1	0.38
		Lindell 1991	d	3.3	0.59
		Lindell 1991	d	8.9	1.60
		Cometto - Muniz et al 1998b	d	105	19
		Cometto - Muniz et al 1998b	d	65	12
		Jagella & Grosch 1998		0.035	0.0063
		Jagella & Grosch 1998		0.018	0.0032
		Cometto - Muniz 1999	d	105	19
		Cometto - Muniz 1999	d	65	12
		Molhave et al 2000	d	23	4.13
		Buettmer & Schieberle 2001a, 2001b		0.0053	0.0010
		Nagata 2003	d	0.18	0.032
		Nagata 2003	d	0.1	0.0179
290	**n - Valeraldehyde**	Backman 1917	r	0.009 - 0.01	0.0026 - 0.0028
		Teranishi et al 1974		0.072	0.02
		Anon. 1980	d	0.0025	0.0007
		Anon. 1980	r	0.013	0.0037
		Hall & Andersson 1983	d	0.034	0.0097
		Cristoph 1983	r	0.14 - 0.15	0.04 - 0.043
		Lindell 1991	d	0.092	0.026
		Von Ronson & Belitz 1992a	d	0.12	0.034
		Von Ronson & Belitz 1992a	r	0.22	0.062
		Cometto - Muniz et al 1998a		17.5	4.97
		Cometto - Muniz 1999	d	17.5	4.97
		Nagata 2003	d	0.0014	**0.0004**
		Laska & Ringh 2010	d	0.85	0.24
291	**Vanillin**	Passy 1892a,b,d	d	0.00007 - 0.005	0.000011 - 0.000803
		Tempelaar 1913	d	0.00018 - 0.0002	0.000029 - 0.000032
		Zwaardemaker 1927	d	0.00018 - 0.0002	0.000029 - 0.000032
		Backman 1917	r	0.0015 - 0.002	0.000241 - 0.000321
		Baldus 1936	d	0.000001	0.00000016
		Baldus 1936	r	0.000004	0.000000643
		Appell 1969		0.000001	**0.00000016**
		Randebrock 1971		0.000006	0.000000964

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
291	**Vanillin cont.**	Herrmann & Abel El Salam 1980a,b		0.08 - 0.12	0.0129 - 0.0193
		Kleinschmidt 1983	r	0.578	0.0929
		Randebrock 1986		0.000033	0.00000530
		Blank et al 1989, 1992		0.0006 - 0.0012	0.000096 - 0.000193
292	**Vinyl Acetate**	Gofmekler 1960		1	0.28
		Deese & Joyner 1969	r	≤1.4	≤0.40
		Hellman & Small 1973a,b, 1974	d	0.4	**0.12**
		Hellman & Small 1973a,b, 1974	r	1.4	0.4
293	**Vinyl Chloride**	Hori et al 1972		520 - 910	203 - 356
294	**Vinylidene Chloride**	Rylova 1953		200	**50**
		Janicek et al 1960		5500	1387
		Irish 1962		2,000 - 4,000	504 - 1,009
295	**Xylene (o - , m - , p - , isomers)**	Backman 1917	r	1.0 - 1.2	0.23 - 0.28
		Backman 1917	r	1.1 - 1.3	0.25 - 0.30
		Backman 1917	r	1.4 - 1.5	0.32 - 0.35
		Backman 1918		0.8	0.18
		Stuiver 1958	d	2.1	0.48
		Stuiver 1958	d	0.35	0.081
		Stuiver 1958	d	0.6	0.14
		Naus 1962	d	1	0.23
		Gusev 1965		0.6 - 1.9	0.14 - 0.44
		May 1966	d	100	23
		May 1966	r	1,370	316
		Koster 1965, 1968a,b, 1971	d	0.6 - 86	0.16 - 20
		Koster 1968a, 1971	d	11	2.5
		Koster 1968a, 1971	d	8	1.8
		Leonardos et al 1969	r	2	0.46
		Dravnieks & O'Donnell 1971		1.3	0.3
		Knuth 1973		0.8	0.18
		Anon. 1980	d	0.77	0.18
		Anon. 1980	r	3.1	0.71
		Anon. 1980	d	0.52	0.12
		Anon. 1980	r	2.4	0.55
		Anon. 1980	d	0.52	0.12
		Anon. 1980	r	2.2	0.51
		Punter 1983	d	23.6	5.4
		Punter 1983	d	1.5 - 4.9	0.35 - 1.1
		Punter 1983	d	9.1	2.1
		Don 1986	d	0.52 - 0.54	0.120 - 0.124

Table 6.3 – Odor Threshold Values, cont. *Bold = Lowest Value Reported*

#	Chemical Name	Source	Type of Threshold	Odor Thresholds	
				mg/m³	ppm
295	**Xylene (o - , m - , p - , isomers) cont.**	Hoshika et al 1993	d	0.52 - 0.54	0.120 - 0.124
		Hoshika et al 1993	d	0.052	**0.012**
		Nagata 2003	d	1.6	0.37
		Nagata 2003	d	0.18	0.041
		Nagata 2003	d	0.25	0.058

Table 6.4 – Odor Character List

The Table contains the following information:

- Odor Character
- Chemical Name

Note: Odor character is affected by odor concentration.

Table 6.4 – Odor Character List

Odor Character	Chemical(s)
Acetone	Diethyl Ketone; 2-Methylcyclohexanone
Acid	Acetic Anhydride; Cyanogen Chloride; Phenol
Acrid	Maleic Anhydride
Airplane glue	Methyl Acrylate
Alcohol	n-Butyl Alcohol; sec-Butyl Alcohol; tert-Butyl Alcohol; 1,4-Dioxane; Ethyl Acrylate, Ethyl Alcohol; Ethyl Silicate; Furfuryl Alcohol; Isobutyl Alcohol; 2-Methoxyethanol; Methyl Alcohol; Propyl Alcohol
Alliaceous	Bromine; Iodine
Almond	Acetophenone; Benzaldehyde; Chlorobenzene; Cyanogen; Furfural; Hydrogen Cyanide; Nitrobenzene
Amine	Dibutylamine; Diethanolamine; Diethylamine; 2-Diethylaminoethanol; Diisopropylamine; Isopropylamine; n-Methyl-2-Pyrrolidone; Morpholine; o-Toluidine; p-Toluidine; Triethyleamine
Ammonia; Ammonical	n-Butylamine; Cyclohexylamine; Diethanolamine; Diethylaminoethanol; n,n-Dimethylacetamide; Dimethylamine; Ethanolamine; Ethyl Acrylate; Ethylamine; Ethylenediamine; Ethyleneimine; n-Ethylmorpholine; Hydrazine; Isopropylamine; 1-Methoxy-2-Propanol; Methyl Hydrazine; Triethanolamine
Anesthetic	Ethyl Ether; Methyl tert-Butyl Ether
Anise	Benzyl Acetate
Aromatic	Benzene; 1,3-Butadiene; Carbon Tetrachloride; Chlorotoluene; 1,1-Dichloroethane; Ethyl Formate; Isoprene; Propylene; o-Toluidine; 1,2,4-Trichlorobenzene; Trimethyl Benzene
Asparagus	Dimethyl Disulfide; Dimethyl Sulfide
Banana	n-Amyl Acetate; n-Butyl Acetate; sec-Hexyl Acetate; Isoamyl Acetate
Bitter	Isoamyl Alcohol
Bitter almond	Benzaldehyde
Bleach	Chlorine; Nitrogen Dioxide
Bread	Furfural
Burnt	Pyridine, Toluene
Burnt plastic	Cresol
Butter-like; buttery	Biphenyl; Diacetyl
Camphor; camphorous	Camphor; Cyclohexanol; o-Dichlorobenzene; p-Dichlorobenzene; 1,1,2,2-Tetrabromoethane; Turpentine
Caramel	Vanillin
Chemical	Iodoform

Table 6.4 – Odor Character List, cont.

Odor Character	Chemical(s)
Chlorine	Chlorine Dioxide; Chloropicrin
Chloroform	Bromoform; 1,1-Dichlrorethane; Epichlorohydrin; Halothane; Vinylidene Chloride
Choking	Phthalic Anhydride
Citrus	Citral; d-Limonene
Creosote	Cresol; Naphthalene; Phenol
Decayed	n-Valeraldehyde
Disagreeable	Diallylamine; Dimethyl Sulfide; Propylene Glycol Dinitrate
Dry cleaner	Carbon Tetrachloride
Empyreumatic	Aniline; Benzene; Cresol; Naphthalene; Phenol; o-Toluidine; m-Toluidine; p-Toluidine; Xylene
Ester	2-Butoxyethanol, 2-Ethoxyethyl Acetate; Ethyl Acrylate; Isobutyl Acetate; 2-Methoxyethyl Acetate; n-Propyl Acetate
Ether; Etherish; Etherous; Ethereal	Acetone; Acetonitrile; n-Amyl Acetate; Benzyl Acetate; Carbon Tetrachloride; Chlorodifluoromethane; Chloroform; Dichlorodifluoromethane; Dimethyl Ether; Ethyl Acetate; Ethyl Bromide; Ethylene Chlorohydrin; Ethyl Ether; Furfuryl Alcohol; Iodoform; 1-Methoxy-2-propanol; Methyl Chloride; Methyl Chloroform; Methyl Formate; Perchloroethylene; Tetrahydrofuran; Trichloroethylene
Faint	n-Nitrosodimethylamine
Fingernail polish	Ethyl Acetate; Methyl Propyl Ketone
Fingernail polish remover	Diethyl Ketone
Fir needles	Turpentine
Fish sauce	2,4-Dichlorophenol
Fishy	Diethylamine; Diisopropylamine; Dimethyl Formamide; 1,1-Dimethylhydrazine; Methylamine; Morpholine; Triethylamine; Trimethylamine
Floral; Flowery	Citral; Diphenylamine
Fresh	Acetaldehyde; Isoamyl Acetate
Fruity	Acetaldehyde; Acetone; Benzaldehyde; 2-Butoxyethyl Acetate; sec-Butyl Acetate; 2-Chloroacetophenone; Cyclopentadiene; Ethyl Acetate; sec-Hexyl Acetate; Isopropyl Acetate; Methyl Acetate; 2-Nitropropane; Propionaldehyde
Fusel	Isobutyl Alcohol
Garlic	Acetylene; Acrylonitrile; Arsine; Dimethyl Disulfide; Hydrogen Selenide; Methyl Mercaptan; Phosphine
Gasoline	p-tert-Butyl Toluene; Heptane; Hexane, Nonane; Octane
Gassy	Acetylene; Propylene
Grassy	Ethylene; n-Hexyl Alcohol
Green	Acetaldehyde
Hay like	Phosgene
Highly corrosive	Hydrogen Fluoride
Ink	Phenol
Irritating	Allyl Isothiocyanate; Ammonia; Bromine; Cresol; Cumene Hydroiperoxide; 2,3-Dibromo-1-chloropropane; Hydrogen Chloride; Hydrogen Fluoride

Table 6.4 – Odor Character List, cont.

Odor Character	Chemical(s)
Latex	Isobutyl Alcohol
Leather-like	2;4-Dichlorophenol
Lemon	Citral; d-Limonene
Malty	n-Butyl Alcohol; sec-Butyl Alcohol; Isoamyl Alcohol
Medicinal	n-Butyl Alcohol; Carbon Disulfide; 2,4-Dichlorophenol; Isobutyl Acetate; Phenol
Metallic	Sulfur Dioxide
Mild	tert-Butyl Acetate; n- Butyl Lactate; Caprolactam; 2-(2-Ethoxyethoxy)ethanol; Hexylene Glycol; Triethanolamine
Mothballs	p-Dichlorobenzene; Naphthalene
Mushroom	Methyl n-amyl Ketone
Mustard	allyl alcohol
Musty	2-Butoxyethanol; Diethylamine; 2-Ethoxyethanol; Isobutyl Alcohol
Natural gas	Butane; Propane
Nauseating	Pyridine
Oil	Octane
Oily	Aniline; Dimethylaniline; Ethyl Benzene
Olefinic	Ethylene Oxide
Onion	acrylonitrile
Oranges	acetophenone
Paint	Methyl n-Butyl Ketone
Pears	Benzyl Acetate; sec-Hexyl Acetate
Peculiar	Oxygen Difluoride; Quinoline
Penetrating	1-Octanol
Pepper	Piperdine
Peppermint	Diisobutyl Ketone
Petroleum	Butenes; 1-Hexene; Methylcyclohexane
Phenol; phenolic	Cresol; 2;4-Dichlorophenol
Pine	Cyclopentadiene; Turpentine
Plastic	Acrylic Acid; Benzyl Acetate; n-Butyl Acrylate; Ethyl Acrylate; n-Hexyl Alcohol; d-Limonene; Methyl Acrylate; Methyl Metacrylate
Pleasant	Biphenyl; 1-Decene; Diacetyl; 1;2-Dichloroethylene; 2-(2-Ethoxyethoxy)ethanol; Isooctyl Alcohol
Pungent	Acetaldehyde; Acetic Acid; Acetophenone; Acrolein; Ally Chloride; Ammonia; Aniline; Benzyl Chloride; Boron Trifluoride; Butyraldehyde; Crotonaldehyde; Cyclohexane; Decaborane; Ethyl Chloride; Fluorine; Formaldehyde; Hexachlorocyclopentadiene; Isobutyraldehyde; Methacrylic Acid; Methyl Parathion; Methyl Vinyl Ketone; Nitrobenzene; Ozone; Pentaborane; Pyridine; Quinone; 1,1,2,2-Tetrabromoethane; Trimethylamine; Trimethyl Phosphite
Putrid	Dimethyl Disulfide; Dimethyl Sulfide; Phenyl Mercaptan
Rancid	Acrylic Acid; n-Butyl Acrylate; Isoamyl Alcohol; n-Valeraldehyde
Repulsive	Diborane

Table 6.4 – Odor Character List, cont.

Odor Character	Chemical(s)
River water	Acetophenone
Rosiny	Turpentine
Rotten cabbage	Ethyl Mercaptan; Methyl Mercaptan
Rotten eggs	Hydrogen Sulfide
Rotten fish	Diethanolamine; Dimethylamine
Rubber	1;3-Butadiene; Chloroprene; Isoamyl Alcohol; Isobutyl Alcohol; d-Limonene
Rubbing alcohol	Isopropyl Alcohol
Sharp	Bromine; Chlorine; Cumene; Cumene Hydroperoxide; Cyclohexanone; Dicyclopentadiene; 2-Diethylaminoethanol; Ethyl Acrylate; Ethyl Amyl Ketone; Formic Acid; Hydrogen Chloride; Iodine; Isophorone; Isopropyl Alcohol; Methyl Acrylate; Methyl Ethyl Ketone; Methyl Isoamyl Ketone, Methyl Isobutyl Ketone; Methyl Methacrylate; Styrene; Vinyl Acetate
Shoe polish	Chlorobenzene; Nitrobenzene
Sickening	n-Valeraldehyde
Skunk	Butyl Mercaptan; Dodecyl Mercaptan
Smoky	Cresol
Solvent	Benzene; Ethyl Amyl Ketone; Ethyl Benzene; 1,1,2,2-Tetrachloroethane; Trichloroethylene
Sooty	Nickel Carbonyl
Sour	Acetic Anhydride; n-Butylamine; Methyl Alcohol; Propionic Acid; Toluene; Vinyl Acetate
Strong	Furan; Oxygen Difluoride; Picolines
Suffocating	Acetaldehyde; Bromoform; Chlorine; Chloroform; Nitric Acid
Sulfide	Carbon Disulfide
Sweet	Acetone; Acetophenone; Acrylic Acid; Benzene; Bromoform; 2-Butoxyethanol; n-Butyl Acetate; n-Butyl Acrylate; n-Butyl Alcohol; sec-Butyl Alcohol; tert-Butyl Alcohol; Carbon Tetrachloride; Chloroform; Cyclohexanone; Cyclohexene; Diacetone Alcohol; Dicyclopentadiene; 1,4-Dioxane; 2-Ethoxyethanol; 2-Ethoxyethyl Acetate; Ethyl Acetate; Ethyl Acrylate; Ethylene Dibromide; Ethylene Dichloride; Ethylene Oxide; Ethyl Silicate; Furfuryl Alcohol; Hexylene Glycol; Isoamyl Alcohol; Isobutyl Acetate; Isobutyl Alcohol; Isopropyl Ether; Mesityl Oxide; 2-Methoxyethanol; 2-Methoxyethyl Acetate; Methyl Alcohol; Methyl n-amyl Ketone; Methyl n-Butyl Ketone; Methyl Chloride; Methyl Chloroform; Methylene Chloride; Methyl Ethyl Ketone; Methyl Isoamyl Ketone; Methyl Isobutyl Ketone; Pentane; Perchloryl Fluoride; n-Propyl Acetate; Propyl Alcohol; Propylene Dichloride; Propylene Oxide; Styrene; Vanillin; Vinyl Chloride; Xylene
Tar	Naphthalene
Terpene-like; terpeny	Cyclopentadiene; d-Limonene
Thunder storm	Ozone
Turpentine	Ethylidene Norbornene; Turpentine
Unpleasant	Carbonyl Sulfide; Picolines; Thioglycolic Acid
Vanilla	Vanillin
Vegetable	Carbon Disulfide
Vinegar	acetic acid
Vinous	Ethyl Alcohol

Table 6.5 – Synonyms of Chemical Names

The table contains the following information:

- Synonyms in alphabetical order
- Chemical Name

Table 6.5 – Synonyms

Synonym Name	Chemical Name
Acetanhydride	Acetic Anhydride
Acetic Acid Benzyl Ester	Benzyl Acetate
Acetic Acid Dimethylamine	Dimethylamine
Acetic Aldehyde	Acetaldehyde
Acetic Oxide	Acetic Anhydride
Acetoacetone	2,4-Pentanedione
Acetylene Tetrachloride	1,1,2,2-Tetrachloroethane
Acetyl Oxide	Acetic Anhydride
Acroleaic Acid	Acrylic Acid
Acrylic Acid n-butyl Ester	n-Butyl Acrylate
Acrylic Acid Ethyl Ester	Ethyl Acetate
Adronal	Cyclohexanol
Aethyl Chloride	Ethyl Chloride
Aldehyde Crotonique	Crotonaldehyde
Allyl Mustard Oil	Allyl Isothiocyanate
1-Aminobutane	n-Butylamine
Aminocyclohexane	Cyclohexylamine
2-Aminoethanol	Ethanolamine
1-Amino-2-Methylbenzene	o-Toluidine
1-Amino-3-Methylbenzene	m-Toluidine
1-Amino-4-Methylbenzene	p-Toluidine
1-Aminonaphthalene	1-Naphthylamine
2-Aminonaphthalene	2-Naphthylamine
2-Aminopropane	Isopropylamine
2-Aminotoluene	o-Toluidine
4-Aminotoluene	p-Toluidine
3-Aminotoluene	m-Toluidine
n-Amyl Alcohol	Pentanol, all isomers
Amyl Ethyl Ketone	Ethyl Amyl Ketone
1-Benzazine	Quinoline
Benzene Chloride	Chlorobenzene

Synonym Name	Chemical Name
Benzenethiol	Phenyl Mercaptan
Benzinofonn	Carbon Tetrachloride
1,4-Benzoquinone	Quinone
Biethylene	1,3-Butadine
2-Bromo-2-Chloro-1,1,1-Trifluoroethane	Halothane
Butadien	1,3-Butadiene
Butanal	Butyraldehyde
2,3-Butanedione	Diacetyl
1-Butanethiol	Butyl Mercaptan
n-Butanol	n-Butyl Alcohol
2-Butanol	sec-Butyl Alcohol
tert-Butanol	tert-Butyl Alcohol
Butanone	Methyl Ethyl Ketone
2-Butenal	Crotonaldehyde
1-Buten-3-one	Methyl Vinyl Ketone
n-Butyl-1-Butanamine	Dibutylamine
Butyl Cellosolve	2-Butoxyethanol
Butyl Cellosolve Acetate	2-Butoxyethanol Acetate
1-Butylene	Butenes
Butyl 2-Hydroxypropanoate	Butyl Lactate
1-tert-Butyl-2-Methylbenzene	p-tert-Butyl Toluene
Butyl-2-Propenoate	n-Butyl Acrylate
Butyric Alcohol	n-Butyl Alcohol
Carbolic Acid	Phenol
Carbon Bisulfide	Carbon Disulfide
Carbonic Chloride	Phosgene
Carbon Nitride	Cyanogen
Carbonyl Chloride	Phosgene
Cellosolve	2-Ethoxyethanol
Cellosolve Acetate	2-Ethoxyethyl Acetate

Table 6.5 – Synonyms, cont.

Synonym Name	Chemical Name
Chlorene	Ethyl Chloride
Chlorine Cyanide	Cyanogen Chloride
Chloformyl Chloride	Phosgene
3-Chloroally Chloride	1,3-Dichloropropene
Chloroben	Dichlorobenzene, o-isomer
Chlorobenzol	Chlorobenzene
2-Chloro-1 ,3-butadiene	_-Chloroprene
4-Chlorocarbonyl Polystyrene	Benzoyl Chloride
Chlorocyanogen	Cyanogen Chloride
Chloroethane	Ethyl Chloride
2-Chloroethanol	Ethylene Chlorohydrin
Chloroethene	Vinyl Chloride
Chloroethylene	Vinyl Chloride
1-Chloro-2,3-Epoxypropane	Epichlorohydrin
Chloromethane	Methyl Chloride
1-Chloro-2-Methylbenzene	Chlorotoluene, o-isomer
3-Chloro-1-Propene	Allyl Chloride
3-Chloropropylene	Allyl Chloride
_-Chlorotoluene	Benzyl Chloride
Cinnamene	Styrene, monomer
Cresylic Acid	Cresol, all isomers
Cyano Acrylic Acid Methyl Ester	Methyl 2-Cyanoacrylate
Cyanomethane	Acetonitrile
2,5-Cyclohexadiene Dioxide	Quinone
Cyclohexyl Alcohol	Cyclohexanol
DCPD	Dicyclopentadiene
DEAE	2-Diethylaminoethanol
1,2-Diaminoethane	Ethylenediamine
1,2-Dibromoethane	Ethylene Dibromide
1,2-Dichloroethane	Ethylene Dichloride
Dichloromethane	Methylene Chloride
1,2-Dichloropropane	Propylene Dichloride
1,3-Dichloropropylene	1,3-Dichloropropene
Dicyan	Cyanogen
N-Diethylethanolamine	2-Diethylaminoethanol
Diethyl- 2-hydroxyethyl amine	2-Diethylaminoethanol
Diethylene Oxide	Tetrahydrofuran

Synonym Name	Chemical Name
1,4-Diethylene Dioxide	Dioxane
Diethyl Ether	Ethyl Ether
Diethylolamine	Diethanolamine
Difluorochloromethane	Chlorodifluoromethane
2,2-Dihydroxy Diethylamine	Diethanolamine
2,4-Diisocyanato-1-Methylbenzene	Toluene-2,4-Diisocyanate
Dimethyl Acetate	N,N-Dimethylaniline
Dimethyl Benzene	Xylene
1,3-Dimethylbutyl Acetate	sec-Hexyl Acetate
Dimethyl Diketone	Diacetyl
Dimethyl Glyoxal	Diacetyl
Dimethyformaldehyde	Acetone
Dimethylnitromethane	2-Nitropropane
Dimethyl Nitrosamine	N-Nitrosodimethylamine
o,o-Dimethyl, o,p-Nitrophenyl Phosphorothioate	Methyl Parathion
3,7-Dimethyl-2,6-Octadienal	Citral
Dimethyl Oxide	Dimethyl Ether
Diphenyl	Biphenyl
Diphenylmethane 4,4-Diisocyanate	Methylene Bisphenyl Isocyanate
Di-2-Propenylamine	Diallylamine
Divinyl	1,3-Butadiene
DMA	Dimethylamine
DMN	N-Nitrosodimethylamine
DMNA	N-Nitrosodimethylamine
DMF	Dimethyl Formamide
1-Dodecanethiol	Dodecyl Mercaptan
EAK	Ethyl Amyl Ketone
EGBE	2-Butoxyethanol
EGBEA	2-Butoxyethyl Acetate
EgMEA	2-Methoxyethyl Acetate
1,4-Epoxybutane	Tetrahydrofuran
1,2-Epoxy-3-Chloropropane	Epichlorohydrin
2,3-Epoxypropyl Chloride	Epichlorohydrin
1,2-Epoxyethane	Ethylene Oxide
Erythrene	1,3-Butadiene

Table 6.5 – Synonyms, cont.

Synonym Name	Chemical Name
Ethanal	Acetaldehyde
1,2-Ethanediamine	Ethylenediamine
1,2-Ethanediol	Ethylene Glycol
Ethanenitrile	Acetonitrile
Ethanethiol	Ethyl Mercaptan
Ethanoic Acid	Acetic Acid
Ethanol	Ethyl Alcohol
Ethene	Ethylene
Ethenyl Acetate	Vinyl Acetate
Ethenyl Benzene	Styrene
Ethenyl Cyanide	Acrylonitrile
Ethoxyethane	Ethyl Ether
Ethyl Acetone	Methyl Propyl Ketone
Ethylene Bromide	Ethylene Dibromide
Ethylene Carboxylic Acid	Acrylic Acid
Ethylene Chloride	Ethylene Dichloride
Ethylene Glycol Methylene Ether	1,3-Dioxolane
Ethylene Glycol Monobutyl Ether	2-Butoxyethanol
Ethylene Glycol Monoethyl Ether	2-Ethyoxyethanol
Ethylene Glycol Monoethyl Ether Acetate	2-Ethyoxyethyl Acetate
Ethylene Glycol Methyl Ether	2-Methoxyethanol
Ethylene Glycol Monomethyl Acetate	2-Methyoxyethyl Acetate
Ethylethylene	Butenes, all isomers
Ethyl Fonnic Acid	Propionic Acid
Ethyl Glycol	2-Ethoxyethanol
Ethyl Glycol Acetate	2-Ethoxyethyl Acetate
5-Ethlidenebycyclo[2.2.1]-2-Heptene	Ethylidenenorbomene
Ethylidene Chloride	1,1-Dichloroethane
Ethylmethyl Carbinol	sec-Butyl Alcohol
Ethyl Nitrile	Acetonitrile
Ethylolamine Glycol	Ethanolamine
Ethyl 2-Propenoate	Ethyl Acrylate
Ethyne	Acetylene

Synonym Name	Chemical Name
Formic Acid Ethyl Ester	Ethyl Formate
Formic Nitrate	Hydrogen Cyanide
Freon 12	Dichlorodifluoromethane
Freon 22	Chlorodilfluoromethane
Freon 30	Methylene Chloride
Freon 40	Methyl Chloride
2,5-Furandione	Maleic Anhydride
2-Furanmethanol	Furfuryl Alcohol
Glacial Acrylic Acid	Acrylic Acid
Glycinol	Ethanolamine
2-Heptanone	Methyl n-Amyl Ketone
Hexahydroaniline	Cyclohexylamine
Hexahydroazine	Piperidine
Hexahydrobenzene	Cyclohexane
Hexahydrophenol	Cyclohexanol
Hexahydrotoluene	2-Methycyclohexane
Hexalin	Cyclohexanol
Hexamethylene	Cyclohexane
Hexanaphthalene	Cyclohexane
Hexanaphthylene	Cyclohexene
1-Hexanol	Hexyl Alcohol
2-Hexanone	Methyl n-Butyl Ketone
Hexone	Methyl Isobutyl Ketone
Hydroxy Benzene	Phenol
Hydrocyclohexane	Cyclohexanol
1-Hydroxy-2,4-Dichlorobenzene	2,4-Dichlorophenol
2-Hydroxyethyl Chloride	Ethylene Dichloride
4-Hydroxy-4-Methyl-2-Pentanone	Diacetone Alcohol
2,2-Iminodiethanol	Diethanolamine
1,3-Isobenzofurandione	Phthalic Anhydride
Isobutanol	Isobutyl Alcohol
Isobutyl Carbinol	Isoamyl Alcohol
Isocyanic Acid-Methyl Ester	Methyl Isocycanate
Isonitropropane	2-Nitropropane
Isopentyl Acetate	Isoamyl Acetate
Isopentyl Alcohol	Isoamyl Alcohol

Table 6.5 – Synonyms, cont.

Synonym Name	Chemical Name
Isopropanol	Isopropyl Alcohol
Isopropenylbenzene	Methyl Styrene
Isopropenyl Cyanide	Methacrylonitrile
4-Isopropenyl-1-Methyl-1-Cyclohexene	d-Limonene
2-Isopropoxypropane	Isopropyl Ether
Isopropyl Benzene	Cumene
Isopropyl Benzene Hydroperoxide	Cumene Hydroperoxide
Isopropylidene Acetone	Mesityl Oxide
Ketohexamethylene	Cyclohexanone
MBK	Methyl n-Butyl Ketone
MEK	Methyl Ethyl Ketone
Mercaptoacetic Acid	Thioglycolic Acid
Mesitylene	Trimethyl Benzene
Methanal	Formaldehyde
Methanamine	Methylamine
Methanethiol	Methyl Mercaptan
Methanol	Methyl Alcohol
Methanone	Acetaldehyde
Methoxymethane	Dimethyl Ether
Methylacetic Acid	Propionic Acid
Methyl Acetone	Methyl Ether Ketone
_-Methylacrolein	Crotonaldehyde
2-Methylaniline	o-Toluidine
3-Methylaniline	m-Toluidine
4-Methylaniline	p-Toluidine
Methyl-2-Butanone	Methyl Isopropyl Ketone
2-Methylbenzeneamine	o-Toluidine
3-Methylbenzenamine	m-Toluidine
4-Methylbenzenamine	p-Toluidine
Methylbenzene	Toluene
3-Methyl-1-butanol	Isoamyl Alcohol
3-Methyl-1-butanol Acetate	Isoamyl Acetate
3-Methyl-2-butanone	Methyl Isopropyl Ketone
Methyl Cellosolve	2-Methoxyethanol
Methyl Cyanide	Acetonitrite
Methyl Dithiomethane	Dimethyl Disulfide

Synonym Name	Chemical Name
Methyl Glycol	2-Methoxyethanol
2-Methyl-1-Heptanol	Isooctyl Alcohol
5-Methyl-3-Heptanone	Ethyl Amyl Ketone
5-Methyl-3-Hexanone	Methyl Isoamyl Ketone
Methyl Isoamyl Acetate	sec-Hexyl Acetate
N-Methylmethanamine	Dimethylamine
Methyl 2-Methyl-2-Propenoate	Methyl Methacrylate
N-Methyl-N-Nitrosomethanamine	N-Nitrosodimethylamine
Methyloxidrane	Propylene Oxide
2-Methyl-2,4-Pentanediol	Hexylene Glycol
4-Methyl-2-Pentanone	Methyl Isobutyl Ketone
4-methyl-3-Pentene-2-One	Mesityl Oxide
4-Methylpentyl-2-Acetate	sec-Hexyl Acetate
Methylphenol	Cresol, all isomers
4-Methyl-1,3-Phenylenediisocyanate	Toluene-2,4- or 2,6-Diisocyanate
Methyl 2-Propenoate	Methyl Acrylate
2-Methylpropenoic Acid	Methacrylic Acid
1-Methyl Propanol	sec-Butyl Alcohol
2-Methyl-1-Propanol	Isobutyl Alcohol
2-Methyl-2-Propanol	tert-Butyl Alcohol
2-Methyl-2-Propenitrile	Methacrylonitrile
2-Methylpropyl Acetate	Isobutyl Acetate
2-Methylpyridine	Picolines
MIBK	Methyl Isobutyl Ketone
MIC	Methyl Isocyanate
MIPK	Methyl Isopropyl Ketone
Monochlorobenzene	Chlorobenzene
Monoethyl Ether of Ethylene Glycol	2-Ethoxyethanol
Necatorina	Carbon Tetrachloride
Nitro	Methyl Parathion
Nitrox	Methyl Parathion
1-NP	1-Nitropropane
2-NP	2-Nitropropane
3-Octanone	Ethyl Amyl Ketone
Orthodichloro Benzene	Dichlorobenzene, o-isomer

Table 6.5 – Synonyms, cont.

Synonym Name	Chemical Name
Oxacyclopentadiene	Furan
Oxirane	Ethylene Oxide
2-Oxobutane	Methyl Ethyl Ketone
Oxocyclohexane	Cyclohexanone
Oxybenzene	Phenol
Oxybismethane	Dimethyl Ether
PAN	Phthalic Anhydride
Parazene	Dichlorobenzene, p-isomer
Paracide	Dichlorobenzene, p-isomer
Parton M	Methyl Parathion
Pentanal	n-Valeraldehyde
1,5-Pentanedial	Glutaraldehyde
1-Pentanol	Amyl Alcohol
2-Pentanone	Methyl Propyl Ketone
3-Pentanone	Diethyl Ketone
Pentyl Acetate	n-Amyl Acetate
Perchlorocyclopentadiene	Hexachloro-1.3-Cyclopentadiene
Perchloromethane	Carbon Tetrachloride
PGDN	Propylene Glycol Dinitrate
Phenacyl Chloride	2-Chloracetophenone
Phenyl Benzene	Biphenyl
N-Phenylbenzene Amine	Diphenylamine
Phenyl Chloride	Chlorobenzene
Phenyl Ethane	Ethyl Benzene
Phenyl Ethylene	Styrene, Monomer
Phenyl Hydroxide	Phenol
Phenylic Acid	Phenol
Phenylmethane	Toluene
Phenylmethyl Acetate	Benzyl Acetate
2-Phenyl-1-Propane	Methyl Styrene
Phosphorothiol	Methyl Parathion
Propanal	Propionaldehyde
2-Propanamine	Isopropylamine
1,2-Propanediol	Propylene Glycol
1,2-Propanediol Dinitrate	Propylene Glycol Dinitrate
Propane Nitrile	Acrylonitrile
Propane Oxide	Propylene Oxide

Synonym Name	Chemical Name
Propanoic Acid	Propionic Acid
1-Propanol	Propyl Alcohol
2-Propanol	Isopropyl Alcohol
2-Propanone	Acetone
2-Propenal	Acrolein
Propene	Propylene
Propene Acid	Acrylic Acid
Propenenitrile	Acrylonitrile
Propene Oxide	Propylene Oxide
Propenoic Acid	Acrylic Acid
2-Propenoic Acid	Acrylic Acid
2-Propenoic Acid Butyl Ester	n-Butyl Acrylate
2-Propen-1-ol	Allyl Alcohol
1-Propenol-3	Allyl Alcohol
2-Propenyl Isothiocyanate	Allyl Isothiocyanate
Propional	Propionaldehyde
2-Propylamine	Isopropylamine
Propylene Chloride	N,N-Dimehtylacetamide
Santochlor	Dichlorobenzene, p-isomer
Silicic Acid Tetraethyl Ester	Ethyl Silicate
TCE	Trichloroethylene
Termitkiln	Dichlorobenzene, o-isomer
sym-Tetrachlorethane	1,1,2,2-Tetrachlorethane
Tetrachloroethene	Perchloroethylene
Tetrachloroethylene	Perchloroethylene
Tetrachloromethane	Carbon Tetrachloride
3a,4,7,7a-Tetrahydro-4,7-Methanoindene	Dicyclopentadiene
Tetramethylene Oxide	Tetrahydrofuran
THF	Tetrahydrofuran
Thiophenol	Phenyl Mercaptan
TMA	Trimethylamine
Toluol	Toluene
Tribromoethane	Bromoform
1,1,1-Trichloroethane	Methyl Chloroform
Triiodomethane	Iodoform
1,7-Trimethylbicyclo[2.2.1]-2-Heptanone	Camphor

Table 6.5 – Synonyms, cont.

Synonym Name	Chemical Name
3,5,5-Trimethyl-2-Cyclohexenone	Isophorone
Trioxychlorofluoride	Perchloryl Fluoride
Vinyl Benzene	Styrene, monomer
Vinyl Carbinol	Allyl Alcohol
Vinyl Cyanide	Acrylonitrile
Vinyl Formic Acid	Acrylic Acid
Wofatos	Methyl Parathion

Table 6.6 – Chemical Abstract Numbers & Chemical Names

The table contains the following information:

- Chemical Abstract Number (CAS) in numerical order
- Chemical Name

Table 6.6 – Chemical Abstract Numbers

CAS #	Chemical Name
50-00-0	Formaldehyde
54-11-5	Nicotine
56-23-5	Carbon Tetrachloride
57-06-7	Allyl Isothiocyanate
57-14-7	1,1-Dimethylhydrazine
57-55-6	Propylene Glycol
60-24-2	Mercaptoethanol
60-29-7	Ethyl Ether
60-34-4	Methyl Hydrazine
62-53-3	Aniline
62-75-9	N-Nitrosodimethylamine
64-17-5	Ethyl Alcohol
64-18-6	Formic Acid
64-19-7	Acetic Acid
67-56-1	Methyl Alcohol
67-63-0	Isopropyl Alcohol
67-64-1	Acetone
67-66-3	Chloroform
68-11-1	Thiogylcolic Acid
68-12-2	Dimethyl Formamide
71-23-8	Propyl Alcohol
71-36-3	n-Butyl Alcohol
71-41-0	Pentanol, all isomers
71-43-2	Benzene
71-55-6	Methyl Chloroform
74-82-8	Methane
74-84-0	Ethane
74-85-1	Ethylene
74-86-2	Acetylene
74-87-3	Methyl Chloride
74-89-5	Methylamine
74-90-8	Hydrogen Cyanide
74-93-1	Methyl Mercaptan
74-96-4	Ethyl Bromide
74-98-6	Propane
75-00-3	Ethyl Chloride
75-01-4	Vinyl Chloride
75-04-7	Ethylamine
75-05-8	Acetonitrile
75-07-0	Acetaldehyde
75-08-1	Ethyl Mercaptan
75-09-2	Methylene Chloride
75-15-0	Carbon Disulfide
75-18-3	Dimethyl Sulfide
75-21-8	Ethylene Oxide
75-25-2	Bromoform
75-28-5	Butane, all isomers
75-31-0	Isopropylamine
75-34-3	1,1-Dichloroethane
75-35-4	Vinylidene chloride
75-44-5	Phosgene
75-45-6	Chlorodifluoromethane
75-47-8	Iodoform
75-50-3	Trimethylamine
75-52-5	Nitromethane
75-56-9	Propylene Oxide
75-65-0	tert-Butyl Alcohol
75-69-4	Trichlorofluoromethane
75-71-8	Dichlorodifluoromethane
75-83-2	Hexane, all isomers except n-hexane
75-85-4	Pentanol, all isomers
76-03-9	Trichloroacetic acid

Table 6.6 – Chemical Abstract Numbers, cont.

CAS #	Chemical Name
76-06-2	Chloropicrin
76-22-2	Camphor, synthetic
77-47-4	Hexachlorocyclopentadiene
77-73-6	Dicyclopentadiene
78-10-4	Ethyl Silicate
78-59-1	Isophorone
78-78-4	Pentane, all isomers
78-79-5	Isoprene
78-83-1	Isobutyl Alcohol
78-84-2	Isobutyraldehyde
78-87-5	Propylene Dichloride
78-92-2	sec-Butyl Alcohol
78-93-3	Methyl Ethyl Ketone
78-94-4	Methyl Vinyl Ketone
79-01-6	Trichloroethylene
79-09-4	Propionic Acid
79-10-7	Acrylic Acid
79-11-8	Monochloroacetic Acid
79-20-9	Methyl Acetate
79-27-6	1,1,2,2-Tetrabromoethane
79-29-8	Hexane, all isomers except n-hexane
79-34-5	1,1,2,2-Tetrachloroethane
79-41-4	Methacrylic acid
79-43-6	Dichloroacetic Acid
79-46-9	2-Nitropropane
80-15-9	Cumene Hydroperoxide
80-56-8	Turpentine & selected monoterpenes
80-62-6	Methyl Methacrylate
84-66-2	Diethyl Phthalate
84-74-2	Dibutyl Phthalate
85-44-9	Phthalic Anhydride
91-08-7	Toluene Diisocyanate
91-20-3	Naphthalene
91-22-5	Quinoline
91-57-6	2-Methylnaphthalene
91-59-8	2-Naphthylamine
92-52-4	Biphenyl

CAS #	Chemical Name
93-82-8	Cumene
95-13-6	Indene
95-47-6	Xylene (o-, m-, p- isomers)
95-48-7	Cresol, all isomers
95-49-8	Chlorotoluene, o-isomer
95-50-1	Dichlorobenzene, o- isomer
95-53-4	o-Toluidine
95-63-6	Trimethyl Benzene, all isomers
96-12-8	2,3-Dibromo-1-Chloropropane
96-14-0	Hexane, all isomers except n-hexane
96-22-0	Diethyl Ketone
96-33-3	Methyl Acrylate
96-37-7	Hexane, all isomers except n-hexane
98-00-0	Furfuryl Alcohol
98-01-1	Furfural
98-51-1	p-tert-Butyl toluene
98-82-8	Cumene
98-83-9	Methyl Styrene
98-86-2	Acetophenone
98-88-4	Benzoyl Chloride
98-95-3	Nitrobenzene
100-37-8	2-Diethylaminoethanol
100-41-4	Ethyl Benzene
100-42-5	Styrene, monomer
100-44-7	Benzyl Chloride
100-52-7	Benzaldehyde
100-61-8	N-Methyl Aniline
100-74-3	N-Ethylmorpholine
101-68-8	Methylene Bisphenyl Isocyanate
102-71-6	Triethanolamine
105-05-5	Diethylbenzenes, mixed isomers
105-46-4	sec-Butyl Acetate
105-60-2	Caprolactam
106-42-3	Xylene (o-, m-, p- isomers)
106-44-5	Cresol, all isomers
106-46-7	Dichlorobenzene, p-isomer
106-49-0	p-Toluidine

Table 6.6 – Chemical Abstract Numbers, cont.

CAS #	Chemical Name
106-51-4	Quinone
106-89-8	Epichlorohydrin
106-93-4	Ethylene Dibromide
106-97-8	Butane, all isomers
106-98-9	Butenes, all isomers
106-99-0	1,3-Butadiene
107-01-7	Butenes, all isomers
107-02-8	Acrolein
107-05-1	Allyl Chloride
107-06-2	Ethylene Dichloride
107-07-3	Ethylene Chlorohydrin
107-13-1	Acrylonitrile
107-15-3	Ethylenediamine
107-18-6	Allyl Alcohol
107-21-1	Ethylene Glycol
107-31-3	Methyl Formate
107-41-5	Hexylene glycol
107-83-5	Hexane, all isomers except n-hexane
107-87-9	Methyl Propyl Ketone
107-98-2	1-Methyoxy-2-Propanol
108-03-2	1-Nitropropane
108-05-4	Vinyl Acetate
108-08-7	Heptane, all isomers
108-10-1	Methyl Isobutyl Ketone
108-11-2	4-Methyl-2-Pentanol
108-18-9	Diisopropylamine
108-20-3	Isopropyl Ether
108-21-4	Isopropyl Acetate
108-24-7	Acetic Anhydride
108-31-6	Maleic Anhydride
108-38-3	Xylene (o-, m-, p- isomers)
108-39-4	Cresol, all isomers
108-44-1	m-Toluidine
108-65-6	1-Methoxy-2-Propyl Acetate
108-67-8	Trimethyl Benzene, all isomers
108-83-8	Diisobutyl Ketone
108-84-9	sec-Hexyl Acetate

CAS #	Chemical Name
108-87-2	Methylcyclohexane
108-88-3	Toluene
108-89-4	Picolines
108-90-7	Chlorobenzene
108-91-8	Cyclohexylamine
108-93-0	Cyclohexanol
108-94-1	Cyclohexanone
108-95-2	Phenol
108-98-5	Phenyl Mercaptan
108-99-6	Picolines
109-06-8	Picolines
109-60-4	n-Propyl Acetate
109-66-0	Pentane, all isomers
109-73-9	n-Butylamine
109-79-5	Butyl Mercaptan
109-86-4	2·Methoxyethanol
109-89-7	Diethylamine
109-94-4	Ethyl Formate
109-99-9	Tetrahydrofuran
110-00-9	Furan
110-12-3	Methyl Isoamyl Ketone
110-19-0	Isobutyl Acetate
110-43-0	Methyl n-amyl Ketone
110-49-6	2·Methoxyethyl Acetate
110-54-3	n-Hexane
110-62-3	n-Valeraldehyde
110-80-5	2-Ethoxyethanol
110-82-7	Cyclohexane
110-83-8	Cyclohexene
110-86-1	Pyridine
110-89-4	Piperdine
110-91-8	Morpholine
111-15-9	2-Ethoxyethyl Acetate
111-27-3	n-Hexyl Alcohol
111-30-8	Glutaraldehyde
111-42-2	Diethanolamine
111-65-9	Octane, all isomers

Table 6.6 – Chemical Abstract Numbers, cont.

CAS #	Chemical Name
111-66-0	1-Octene
111-76-2	2-Butoxyethanol
111-84-2	Nonane
111-87-5	1-Octanol
111-90-0	2-(2-Ethoxyethoxy)ethanol
111-92-2	Dibutylamine
112-07-2	2-Butoxyethyl Acetate
112-55-0	Dodecyl Mercaptan
115-07-1	Propylene
115-10-6	Dimethyl Ether
115-11-7	Butenes, all isomers
120-82-1	1,2,4-Trichlorobenzene
120-83-2	2,4-Dichlorophenol
121-33-5	Vanillin
121-44-8	Triethylamine
121-45-9	Trimethyl Phosphite
121-69-7	Dimethylaniline
122-39-4	Diphenylamine
123-38-6	Propionaldehyde
123-42-2	Diacetone Alcohol
123-51-3	Isoamyl Alcohol
123-54-6	2,4-Pentanedione
123-72-8	Butyraldehyde
123-73-9	Crotonaldehyde
123-86-4	n-Butyl Acetate
123-91-1	1,4-Dioxane
123-92-2	Isoamyl Acetate
124-02-7	Diallylamine
124-09-4	1,6-Hexanediamine
124-38-9	Carbon Dioxide
124-40-3	Dimethylamine
126-98-7	Methacrylonitrile
126-99-8	b-Chloroprene
127-18-4	Perchloroethylene
127-19-5	N,N-Dimethylacetamide
127-91-3	Turpentine & selected monoterpenes
134-32-7	1-Naphthylamine & selected monoterpenes

CAS #	Chemical Name
135-01-3	Diethylbenzenes, mixed isomers
137-05-3	Methyl 2-Cyanoacrylate
137-32-6	Pentanol, all isomers
138-22-7	n-Butyl lactate
138-86-3	d-Limonene
140-11-4	Benzyl Acetate
140-88-5	Ethyl Acrylate
141-32-2	n-Butyl Acrylate
141-43-5	Ethanolamine
141-78-6	Ethyl Acetate
141-79-7	Mesityl Oxide
141-93-5	Diethylbenzenes, mixed isomers
142-82-5	Heptane, all isomers
151-56-4	Ethyleneimine
151-67-7	Halothane
156-59-2	1,2-Dichloroethylene, all isomers
156-60-5	1,2-Dichloroethylene, all isomers
298-00-0	Methyl Parathion
302-01-2	Hydrazine
431-03-8	Diacetyl
460-19-5	Cyanogen
463-58-1	Carbonyl Sulfide
463-82-1	Pentane, all isomers
506-77-4	Cyanogen Chloride
526-73-8	Trimethyl Benzene, all isomers
532-27-4	2-Chloroacetophenone
534-52-1	4,6-Dinitro-o-Cresol
540-59-0	1,2-Dichloroethylene, all isomers
540-84-1	Octane, all isomers
540-88-5	tert-Butyl Acetate
541-85-5	Ethyl Amyl Ketone
542-75-6	1,3-Dichloropropene
542-92-7	Cyclopentadiene
563-80-4	Methyl Isopropyl Ketone
565-59-3	Heptane, all isomers
583-60-8	2-Methylcyclohexanone
584-84-9	Toluene 2,4- or 2,6-Diisocyanate

Table 6.6 – Chemical Abstract Numbers, cont.

CAS #	Chemical Name
589-34-4	Heptane, all isomers
590-18-1	Butenes, all isomers
590-35-2	Heptane, all isomers
591-76-4	Heptane, all isomers
591-78-6	Methyl n-Butyl Ketone
592-41-6	1-Hexene
624-41-9	2-Methyl Butyl Acetate
624-64-6	Butenes, all isomers
624-83-9	Methyl Isocyanate
624-92-0	Dimethyl Disulfide
628-63-7	n-Amyl Acetate
646-06-0	1,3-Dioxolane
822-06-0	1,6-Diisocyanatohexane
872-05-9	1-Decene
872-50-4	n-Methyl-2-Pyrrolidone
1319-77-3	Cresol, all isomers
1330-20-7	Xylene (o-,m-, p- isomers)
1634-04-4	Methyl tert-Butyl Ether
2551-62-4	Sulfur Hexafluoride
4170-30-3	Crotonaldehyde
5392-40-5	Citral
6032-29-7	Pentanol, all isomers
6423-43-4	Propylene Glycol Dinitrate
7446-09-5	Sulfur Dioxide
7553-56-2	Iodine
7616-94-6	Perchloryl Fluoride
7637-07-2	Boron Trifluoride
7647-01-0	Hydrogen Chloride
7664-39-3	Hydrogen Fluoride
7664-41-7	Ammonia
7664-93-9	Sulfuric Acid
7697-37-2	Nitric Acid
7726-95-6	Bromine
7782-41-4	Fluorine
7782-50-5	Chlorine
7783-06-4	Hydrogen Sulfide
7783-07-5	Hydrogen Selenide

CAS #	Chemical Name
7783-41-7	Oxygen Difluoride
7784-42-1	Arsine
7785-26-4	Turpentine & selected monoterpenes
7785-70-8	Turpentine & selected monoterpenes
7803-51-2	Phosphine
8006-64-2	Turpentine & selected monoterpenes
8014-95-7	Sulfuric Acid
10028-15-6	Ozone
10049-04-4	Chlorine Dioxide
10102-44-0	Nitrogen Dioxide
13463-39-3	Nickel Carbonyl
13466-78-9	Turpentine & selected monoterpenes
16219-75-3	Ethylidene Norbornene
17702-41-9	Decaborane
19287-45-7	Diborane
19624-22-7	Pentaborane
25167-67-3	Butenes, all isomers
25340-17-4	Diethylbenzenes, mixed isomers
25551-13-7	Trimethyl Benzene, all isomers
26952-21-6	Isooctyl Alcohol
60435-70-3	Isooctyl Alcohol
86290-81-5	Octane, all isomers

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