

DENSITY OF ELEMENTS

The density is given in grams per cubic centimeter and pounds per cubic foot at the temperature stated. Where no temperature is given ordinary atmospheric temperature is understood.

Element	Temp. °C.	Density gm./c.c.	Lbs. per cu. ft.	Observer
Aluminum, hard drawn	20	2.699	168.5	Edwards, 1925
liquid	659	2.382	148.7	Moorman, 1921
Antimony, vacuo-distilled	20	6.618	413.1	Kahlbaum, 1902
compressed	20	6.691	417.7	Kahlbaum, 1902
amorphous		6.22	388.3	Herard
Argon, liquid	-183	1.3845	86.4	Baly-Doman
	-189	1.4233	88.9	Lashchenko, 1922
Arsenic, metallic	15	3.70	231.0	Guenther [1908]
amorphous, brown-black		3.78	236.0	Erdmann & Reppert,
yellow	18	2.0	124.9	Guntz
Barium	25	3.5	218.5	Biltz & Hütig, 1920
Beryllium	30	9.747	608.5	Fichter & Jablczynski,
Bismuth, electrolytic	20	9.80	611.8	Classen, 1890 [1912]
vacuo-distilled	20	9.781	610.6	Johnston & Adams,
liquid	271	10.00	624.3	Kahlbaum, 1902
	271	10.24	638.25	Vincentini-Omodei
solid	271	9.67	603.7	Pfuss, 1915
Boron, crystal		2.53	158.3	Vincentini-Omodei
amorphous		2.45	152.9	Moissan
Bromine, liquid	20	3.12	194.8	Richards-Stull
Cadmium, cast	20	8.648	539.9	Egerton & Lee, 1923
wrought		8.67	541.2	
vacuo-distilled	20	8.648	539.9	Kahlbaum, 1902
solid	318	8.37	522.5	Vincentini-Omodei
liquid	318	7.99	498.8	Vincentini-Omodei
Calcium	349	7.94	495.7	Arpi, 1914
Carbon, crystal		1.54	96.1	Brink
graphite		3.52	219.7	Wigand
Cerium, electrolytic		2.25	140.5	Wigand
rare		6.9	430.7	Muthmann-Weiss
Cesium	20	1.873	116.9	Muthmann-Weiss
Chlorine, liquid		1.507	94.1	Richards-Brink
Chromium	-35.6	6.32-73	407.0-420.1	Drugman-Ramsay
pure	20	6.62	432.0	Moissan
	28	7.20	449.5	Brenner, 1948
Cobalt	21	8.71	543.7	Tilden [1915]
Columbium		8.9	555.6	Kalmus & Harper.
Copper, cast	15	8.4	524.4	Muthmann-Weiss
annealed		8.30-95	518.1-558.7	Dellinger, 1911
wrought	20	8.89	555.0	Dellinger, 1911
hard-drawn		8.85-95	552.5-558.7	Kahlbaum, 1902
vacuo-distilled	20	8.89	555.0	Kahlbaum, 1902
compressed	20	8.9326	557.6	Kahlbaum, 1902
	20	8.9376	558.0	

* Temperature not stated, probably 20°C.

Name	Formula	Density g./l. 0°C 760 mm	Density lbs./ft. ³ 32°F. 1 atm.	Specific gravity Air = 1 O ₂ = 1	Specific gravity
Radon	Rn	9.73	607	7.526	6.800
Silicane, chloro-	SiH ₂ Cl	3.03	189	2.34	2.17
Silicane, chloromethyl-	SiH ₂ C(CH ₃)	3.64	227	2.82	2.68
Silicane, dichloromethyl-	SiHCl ₂ (CH ₃)	5.3	33	4.1	3.94
Silicane, dimethyl-	SiH ₂ (CH ₃) ₂	2.73	170	2.11	1.91
Silicane, methyl-	SiH ₃ CH ₃	2.08	130	1.61	1.46
Silicane, trifluoro-	SiHF ₃	3.86	241	2.90	2.74
Silicon fluoride	SiF ₄	4.684	2924	3.623	3.494
Silicon hexahydride	Si ₂ H ₆	2.85	178	2.204	2.074
Silicon tetrahydride	SiH ₄	1.44	89.9	1.114	1.074
Stibine (15°C, 754 mm)	SbH ₃	5.30	331	4.10	3.71
Sulfur dioxide	SO ₂	1.827	114.9	1.363	1.269
Sulfuric oxide	SF ₆	6.50*	406*	5.03*	4.65*
Sulfuric oxyfluoride	SO ₂ F ₂	3.72*	232*	2.88*	2.69*
Trimethylamine	(CH ₃) ₃ N	2.580	161.1	1.996	1.805
Trimethyl boron	(CH ₃) ₃ B	2.52	157	1.95	1.76
Tungsten fluoride	WF ₆	12.9	805	9.98	9.03
Xenon	Xe	5.851	365.3	4.525	4.094

DENSITY OF ELEMENTS (Continued)

Element	Temp. °C.	Density gm./c.c.	Lbs. per cu. ft.	Observer
liquid				
Erbium.....	8.217	513.0		Roberts-Wrightson
Fluorine, liquid.....	4.77(?)	298.0		St. Meyer
Gallium.....	1.14	71.2		Moss-Dewar
Germanium.....	25 5.903	360.1		Birn. of Stand., 1934
Gold, cast.....	20 19.3	340.9		Winkler
gold rolled.....	20 19.33	1204.8		
drawn annealed.....	20 19.296	1206.7		Rose, 1912
vacuo-distilled.....	20 19.33	1206.7		[1905
compressed.....	20 18.88	1202.3		Kahlbaum & Sturm,
Helium, liquid.....	20 18.88	1178.6		Kahlbaum, 1902
Hydrogen, liquid.....	20 19.27	1203.0		Kahlbaum, 1902
Iodine.....	-269 0.15	9.4		Dewar, 1904
Iron, pure.....	-252 0.07	4.4		Richardson
electrolytic, rolled.....	17 22.42	1390.6		Deville-Debray
gray cast.....	20 7.85-88	484.5		Richardson
white cast.....	20 7.02-13	308.1		Richardson-Stull [1924
liquid.....	20 7.00	489.1-491.9		Tritton & Hanson,
steel.....	7.02-13	488.2-445.1		
Krypton, liquid.....	7.80-90	486.9-493.2		
Lanthanum.....	7.00-80	429.5		Roberts-Austen
Lead, vacuo-distilled.....	-146 2.19	474.4-486.9		
solid, compressed.....	2.19	134.8		Ramsay-Travers
liquid.....	20 11.342	383.9		Muthmann-Weiss
Lithium.....	20 11.347	708.4		Kahlbaum, 1902
Magnesium.....	325 11.005	687.0		Kahlbaum, 1902
Manganese.....	325 10.045	664.5		Vincentini-Omodei
Mercury, liquid.....	400 10.597	661.5		Vincentini-Omodei
.....	800 10.078	629.1		Day, Sosman, 1914
.....	20 0.534	33.3		Day, Sosman, 1914
.....	7.42	108.7		Richardson-Brink, 1907
.....	7.42	463.2		Voigt
.....	0 13.896	848.8		Regnault, Volkmann
.....	20 13.846	845.6		
.....	-38.8 13.090	854.6		Vincentini-Omodei
.....	-38.8 14.193	886.0		Vincentini-Omodei
.....	-188 14.383	897.9		Dewar, 1902
.....	9.01	562.5		Moissan
.....	10.2	636.8		Fink, 1910
.....	6.96	434.5		Muthmann-Weiss
.....	8.00-90	536.9-555.6		Baly-Doman, 1902
.....	-195 0.81	50.6		Baly-Doman, 1902
.....	-205 0.854	53.3		Deville-Devray
.....	22.5	1404.6		
.....	-184 1.14	71.2		Richardson-Stull
.....	12.16	759.1		
.....	1.83	114.2		
.....	2.20	137.3		
.....	15 2.34	146.1		
.....	20 21.37	1334.1		Hittorf
.....	20 0.87	54.3		Richardson-Stull
.....	62.1 0.851	53.1		Richardson-Brink, 1907
.....	62.1 0.83	51.8		Vincentini-Omodei
.....	6.475	404.2		Muthmann-Weiss
.....	12.44	776.6		Holborn-Henning
.....	20 1.532	95.6		Richardson-Brink, 1907
.....	0 12.06	752.9		Toby
.....	7.7-8	480.7-486.9		Muthmann-Weiss

DENSITY OF ELEMENTS (Continued)

Element	Temp. °C.	Density gm./c.c.	Lbs. per cu. ft.	Observer
Selenium.....	4 2-8	288 4-299.6		Richardson-Stull-Brink
Silicon, crystal.....	2 49	151.1		Vigorous
amorphous.....	2 35	146.7		
Silver, cast.....	15 10.42-53	650 5-657.4		
wrought.....	10 6	661.7		
vacuo-distilled.....	20 10.602	655.0		Kahlbaum, 1902
compressed.....	20 9.51	593.7		Kahlbaum, 1902
liquid.....	0 0.9719	59.6		Wrightson
Sodium.....	0 0.9519	59.4		Richardson-Brink, 1907
solid.....	0 0.9287	58.0		Vincentini-Omodei
.....	97.6	62.8		Vincentini-Omodei
.....	-188 2.50-58	155 1-161.1		Dewar
Strontium.....	2 0.811	124 0-131.1		Mathiessen
Sulfur.....	16.6	1036.3		Vincentini-Omodei
Tantalum.....	6.25	309.9		
Tellurium, crystal.....	6.02	375.8		Beljankin
amorphous.....	11.86	744.4		Richardson-Stull [1922
Thallium.....	11.86-11.7	703 4-730.4		Richardson-Stull, 1922
Thorium.....	7.20	452.7		Reitcheiter, Mardac
Tin, white cast.....	6.97-7.18	438 1-448.2		Mathiessen
wrought.....	226	438.5		
crystallized.....	6.89	382.1		Vincentini-Omodei
liquid.....	226	382.1		Vincentini-Omodei
Titanium.....	4 5	382.0		Mixer
Tungsten.....	18 18.8-19.1	1461 1-1492.4		
Vanadium.....	13 18.7	1167.5		Zimmermann
.....	5.60	935.5		Ruff-Martin
.....	20 5.96	972.7		Fruhl, 1922
Xenon, liquid.....	20 5.52	917.7		Ramsay-Travers
.....	-109 5.5	237.2		St. Meyer
Zinc, cast.....	7.04-16	430.0-447.0		
wrought.....	7.19	438.9		Kahlbaum, 1902
vacuo-distilled.....	20 6.92	432.0		Kahlbaum, 1902
compressed.....	20 7.13	445.1		Robert-Wrightson
liquid.....	20 6.48	404.5		
Zirconium.....	6.44	402.0		

DENSITY OF ALLOYS

The density is given in grams per cubic centimeter at ordinary atmospheric temperatures.

Alloy.	Composition.	g./cm. ³	Pounds per cu. ft.
Aluminum and copper	10 Al, 90 Cu	7.69	480.06
	5 Al, 95 Cu	8.37	522.51
	3 Al, 97 Cu	8.69	542.49
Aluminum and zinc...	91 Al, 9 Zn	2.80	174.80
Bell metal.....	78 Cu, 22 Sn	8.70	543.11
Bismuth, lead and tin	53 Bi, 40 Pb, 7 Sn	10.56	659.23

DENSITY OF ALLOYS (Continued)

Alloy.	Composition.	g/cm. ³	Pounds per cu. ft.
Brass, yellow	70 Cu, 30 Zn cast	8.44	526.88
red	rolled	8.56	534.38
white	drawn	8.70	543.11
Bronze	90 Cu, 10 Zn	8.60	536.87
	50 Cu, 50 Zn	8.20	511.01
	90 Cu, 10 Sn (gun metal)	8.78	548.11
	85 Cu, 15 Sn	8.89	554.98
	80 Cu, 20 Sn	8.74	545.61
	75 Cu, 25 Sn	8.83	551.23
	32 Cd, 68 Sn	7.70	480.68
Cadmium and tin	60 Cu, 40 Ni	8.88	554.38
Constantan	26.3 Cu, 36.6 Zn, 36.8 Ni	8.30	518.14
German silver	52 Cu, 26 Zn, 22 Ni	8.45	527.51
	59 Cu, 30 Zn, 11 Ni	8.34	520.64
	63 Cu, 30 Zn, 6 Ni	8.30	518.14
Gold and copper	98 Au, 2 Cu	18.84	1176.12
	96 Au, 4 Cu	18.36	1146.16
	94 Au, 6 Cu	17.95	1120.56
	92 Au, 8 Cu	17.52	1093.72
	90 Au, 10 Cu	17.16	1071.25
	88 Au, 12 Cu	16.81	1049.40
	86 Au, 14 Cu	16.47	1028.17
Invar	63.8 Fe, 36 Ni, 0.2 C	8.00	499.42
Lead and tin	87.5 Pb, 12.5 Sn	10.60	661.73
	84 Pb, 16 Sn	10.33	644.87
	77.8 Pb, 22.2 Sn	10.05	627.39
	63.7 Pb, 36.3 Sn	9.43	588.69
	46.7 Pb, 53.3 Sn	8.73	544.99
	30.5 Pb, 69.5 Sn	8.24	514.40
Magnalium	90 Al, 10 Mg	2.50	156.07
	70 Al, 30 Mg	2.00	124.85
Manganese bronze	95 Cu, 5 Mn	8.80	549.36
Manganin	84 Cu, 12 Mn, 4 Ni	8.50	530.63
Monel metal	71 Ni, 27 Cu, 2 Fe	8.90	555.60
Nickel	79.7 Cu, 10 Sn, 9.5 Sb, 0.8 P	8.77	547.48
Phosphor bronze	90 Pt, 10 Ir	21.62	1349.67
Platinum and iridium	85 Pt, 15 Ir	21.62	1349.67
	66.67 Pt, 33.33 Ir	21.87	1365.28
Speculum metal	5 Pt, 95 Ir	22.38	1397.12
Steel	99 Fe, 33 Sn	8.60	536.87
manganese	86 Fe, 1 C	7.83	488.80
Wood's metal	50 Bi, 25 Pb, 12.5 Cd, 12.5 Sn	7.81	487.55
		9.70	659.23

DENSITY OF VARIOUS SOLIDS

The approximate density of various solids at ordinary atmospheric temperature. In the case of substances with voids such as paper or leather the bulk density is indicated rather than the density of the solid portion. (Selected principally from the Smithsonian Tables.)

Substance	Grams per cu. cm	Pounds per cu. ft.	Substance	Grams per cu. cm	Pounds per cu. ft.
Agate	2.5-2.7	156-168	Garnet	3.15-4.3	197-268
Alabaster, carbonate	2.69-2.78	168-173	Gas carbon	1.88	117
Alumina	2.20-2.32	141-145	Gelatin	1.97	123
Albite	2.62-2.65	163-165	Glass, common	2.4-2.8	150-175
Amber	1.06-1.11	66-69	flint	2.9-3.9	180-370
Amphiboles	2.9-3.2	180-200	Globe	1.37-5.9	85-370
Anorthite	2.74-2.76	171-172	Granite	2.64-2.76	165-172
Asbestos	2.0-2.8	125-175	Graphite	2.30-2.72	143-170
Asbestos slate	1.8	112	Gum arabic	1.3-1.4	81-87
Asphalt	1.1-1.5	69-94	Gypsum	2.31-2.33	144-145
Basalt	2.4-3.1	150-190	Hematite	4.9-5.3	306-330
Beeswax	0.96-0.97	60-61	Hornblende	3.0	187
Beryl	2.69-2.7	168-169	Ice	0.917	57.2
Biotite	2.7-3.1	170-190	Ivory	1.83-1.92	114-120
Bone	1.7-2.0	106-125	Leather, dry	0.86	54
Brick	1.4-2.2	87-137	Lime, slaked	1.3-1.4	81-87
Butter	0.86-0.87	53-54	Limestone	2.68-2.76	167-171
Calcamine	4.1-4.5	255-280	Linoleum	1.18	74
Calcpar	2.6-2.8	162-175	Magnetite	4.9-5.2	306-324
Camphor	0.99	62	Malachite	3.7-4.1	231-256
Caoutchouc	0.92-0.99	57-62	Marble	2.6-2.84	160-177
Cardboard	0.69	43	Meerschaum	0.99-1.28	62-80
Cement, set	1.4	87	Mica	2.76-3.00	172-187
Celluloid	1.9-2.8	118-175	Muscovite	2.2	137
Chalk	0.57	35	Opal	2.2	137
Charcoal, oak	0.28-0.44	18-28	Paper	0.7-1.15	44-72
Chinabar	8.12	507	Paraffin	0.87-0.91	54-57
Clay	1.8-2.6	112-162	Peat blocks	0.84	52
Coal, anthracite	1.4-1.8	87-112	Pitch	1.07	67
bituminous	1.2-1.5	75-94	Porcelain	2.3-2.5	143-156
Cocoa butter	0.89-0.91	56-57	Porphyry	2.6-2.9	162-181
Coke	1.0-1.1	62-65	Pressed wood pulp		
Cork	0.22-0.26	14-16	board	0.19	12
Cork	0.94-1.14	58-71	Pyrite	4.95-5.1	309-318
Cork	0.92-0.99	57-62	Quartz	2.65	165
Cork	0.92-0.99	57-62	Rock salt	1.07	67
Cork	0.92-0.99	57-62	Rubber, hard	1.19	74
Cork	0.92-0.99	57-62	Rubber, soft		
Cork	0.92-0.99	57-62	commercial	1.1	69
Cork	0.92-0.99	57-62	pure gum	0.91-0.93	57-58
Cork	0.92-0.99	57-62	Sandstone	2.14-2.36	134-147
Cork	0.92-0.99	57-62	Serpentine	2.50-2.65	156-165
Cork	0.92-0.99	57-62	Silica, fused trans-		
Cork	0.92-0.99	57-62	parent	2.21	138
Cork	0.92-0.99	57-62	translucent	2.07	129
Cork	0.92-0.99	57-62	Slag	2.0-3.9	125-240

DENSITY OF VARIOUS SOLIDS (Continued)

Substance	Grams per cu. cm.	Pounds per cu. ft.	Substance	Grams per cu. cm.	Pounds per cu. ft.
Slate	2.6-3.3	162-205	elm	0.54-0.60	34-37
Sonpstone	2.6-2.8	162-175	hickory	0.60-0.93	37-58
Spermaceti	0.95	59	holly	0.76	47
Starch	1.53	95	juniper	0.56	35
Sugar	1.59	99	larch	0.56-0.56	31-35
Tallow	2.7-2.8	168-174	lignum vitae	1.17-1.33	73-83
Tallow, beef	0.94	59	locust	0.67-0.71	42-44
Tallow, mutton	0.94	59	logwood	0.91	57
Tar	1.02	66	mahogany	0.66	41
Tepez	3.5-3.6	219-223	Honduras	0.85	53
Terminale	3.0-3.2	190-200	Spanish	0.62-0.75	39-47
Wax, sealing	1.8	112	maple	0.60-0.90	37-56
Wood (seasoned)			oak	0.61-0.73	38-45
alder	0.42-0.68	26-42	pear	0.83-0.85	52-53
apple	0.66-0.84	41-52	pine, pitch	0.37-0.60	23-37
ash	0.65-0.85	40-53	white	0.66-0.78	41-49
balsa	0.31-0.40	19-25	yellow	0.35-0.50	22-31
bamboo	0.32-0.59	20-37	plum	0.35-0.50	22-31
basswood	0.70-0.90	43-56	poplar	0.95	59
beech	0.70-0.90	43-56	satinwood	0.48-0.70	30-44
birch	0.51-0.77	32-48	spruce	0.40-0.60	24-37
blue gum	1.00	62	sycamore	0.66-0.88	41-55
box	0.95-1.16	59-72	tea	0.98	61
butternut	0.38	24	African	0.64-0.70	40-43
cedar	0.49-0.57	30-35	water	1.00	62
cherry	0.70-0.90	43-56	willow gum	1.00	62
dogwood	0.76	47	willow	0.40-0.60	24-37
ebony	1.11-1.33	69-83			

For the specific gravity of other substances the reader is referred to the following tables:

- Physical Constants of Inorganic and Metal-Organic Compounds
- Physical Constants of Organic Compounds
- Constants of Vegetable and Animal Oils, Fats and Waxes
- Physical and Chemical Constants of Resins, Oleo-Resins and Gum-Resins
- Physical Constants of Minerals
- Composition and Physical Properties of Alloys
- Properties of Commercial Plastics
- Physical Properties of Common Woods

DENSITY OF WATER

The temperature of maximum density for pure water, free from air = **3.98°C.**
 The density at this temperature = **0.999973 g/cm³.**
 The density of water at 3.98°C is 1.000000 g/ml.

(International Bureau of Weights and Measures, 1910.)

WEIGHT OF 1 GALLON OF WATER

The weights in air are for dry air at the same temperature as the water up to 40°C. and at a (corrected) barometric pressure of 760 mm and against brass weights of 8.4 density at 0°C. Above 40°C. the temperature of the air is assumed to be 20°C. i. e., the water is allowed to cool to 20°C. before the weighings are made. The volumetric computations are based on the relation that 1 liter = 1.000027 cubic decimeters and 1 cubic decimeter = 61.028378 cubic inches.

Temperature °C.	Weight in vacuo		Weight in air	
	Grams	Pounds	Grams	Pounds
0	3784.833	8.34412	3780.520	8.33461
1	5.055	3.4461	0.758	3.3513
2	5.211	3.4495	0.930	3.3551
3	5.303	3.4515	1.037	3.3575
4	5.332	3.4522	1.082	3.3585
5	5.302	3.4515	1.067	3.3582
6	5.212	3.4495	0.992	3.3565
7	5.066	3.4463	0.861	3.3536
8	4.864	3.4419	0.675	3.3495
9	4.610	3.4363	0.435	3.3442
10	4.303	3.4295	0.144	3.3378
11	3.943	3.4216	3779.748	3.3302
12	3.534	3.4125	8.403	3.3219
13	3.076	3.4025	8.960	3.3117
14	2.574	3.3914	8.472	3.3009
15	2.026	3.3793	7.939	3.2892
(15½) 60° F.	(3781.703)	(8.32822)	(3777.623)	(8.32823)
16	1.435	3.3663	7.362	3.2765
(16½) 62° F.	(3781.017)	(8.33571)	(3776.953)	(8.32675)
17	0.801	3.3523	6.741	3.2628
18	0.125	3.3374	6.080	3.2482
19	3779.407	3.3216	5.375	3.2327
20	8.640	3.3049	4.630	3.2162
21	7.850	3.2872	3.845	3.1989
22	7.019	3.2688	3.021	3.1808
23	6.135	3.2494	2.157	3.1617
24	5.220	3.2293	1.256	3.1419
25	4.268	3.2083	0.317	3.1212
26	3.279	3.1865	3769.341	3.0996
27	2.254	3.1639	3.0773	3.0773
28	1.195	3.1405	7.283	3.0543
29	0.100	3.1164	6.201	3.0304
30	3768.972	3.0915	5.086	3.0058
31	7.812	3.0659	3.938	2.9805
32	6.618	3.0396	2.757	2.9545
33	5.393	3.0126	1.545	2.9278
34	4.137	2.9849	0.301	2.9003
35	2.851	2.9566	3759.027	2.8723
40	3745.995	2.8054	2.232	2.7225
45	3748.39	2.638	3744.0	2.580
50	3740.17	8.2457	3730.90	8.2399
55	3731.32	2.261	3727.35	2.174
60	3721.89	2.054	3717.83	1.966
65	3711.86	1.832	3707.91	1.745
70	3701.33	1.600	3697.40	1.514
75	3690.28	1.357	3686.36	1.270
80	3678.70	1.101	3674.79	1.015
85	3666.66	0.836	3662.76	0.750
90	3654.13	0.560	3650.25	0.474
95	3641.19	0.274	3637.32	0.189
100	3627.79	7.9979	3623.93	7.9584

HANDBOOK

OF

CHEMISTRY AND PHYSICS

A READY-REFERENCE BOOK OF
CHEMICAL AND PHYSICAL DATA
FORTY-THIRD EDITION

EDITOR IN CHIEF

CHARLES D. HODGMAN, M.S.
Professor Emeritus, Case Institute of Technology

ASSOCIATE EDITOR IN CHARGE OF CHEMISTRY

ROBERT C. WEAST, Ph.D.
Professor of Chemistry at Case Institute of Technology

ASSOCIATE EDITOR IN CHARGE OF MATHEMATICS

SAMUEL M. SELBY, Ph.D.
Chairman, Mathematics Department at University of Akron

IN COLLABORATION WITH A LARGE NUMBER OF PROFESSIONAL CHEMISTS AND PHYSICISTS WHOSE ASSISTANCE IS ACKNOWLEDGED IN THE LIST OF GENERAL COLLABORATORS AND IN CONNECTION WITH THE PARTICULAR TABLES OR SECTIONS INVOLVED.

Depto. de Física e Ciência dos Materiais
BIBLIOTECA

PUBLISHED BY

THE CHEMICAL RUBBER PUBLISHING CO.
2310 Superior Ave. N. E. Cleveland, Ohio

UNITED STATES OF AMERICA

- LATITUDE S. CAROLAS $\phi = 22^{\circ} 00' 127'' S$

- LONGITUDE S. CAROLAS: $\lambda = 47^{\circ} 50' 00''$

- INCLINAÇÃO DO EIXO (SUSTIÇÃO)
23,26',40"

- HORÁRIO EXATO DA PASSA

SEM DO SOL DO MEIO-DIA
19/06

fonda du
HALL

12. 12m 50s

Campeço Miquelhu Silveira (0.2500.418 founn)
RONE SAGE - 01205

1070 = 23 25 20

DENSITY OF VARIOUS LIQUIDS

(Selected from Smithsonian Tables.)

Liquid	Grams per cu. cm.	Pounds per cu. ft.	Temp. °C.
Acetone.....	0.782	49.4	20°
Alcohol, ethyl.....	0.791	49.5	20
Alcohol, methyl.....	0.810	50.7	0
Benzene.....	0.869	56.2-60.2	0
Carbolic acid.....	0.960-0.965	59.7-60.2	15
Carbon disulfide.....	1.263	80.7	0
Carbon tetrachloride.....	1.595	99.6	20
Chloroform.....	1.489	93.0	20
Ether.....	0.736	45.9	0
Gasoline.....	0.66-0.69	41.0-43.0	0
Glycerin.....	1.260	78.9	0
Kerosene.....	0.82	51.2	..
Milk.....	1.028-1.035	64.2-64.6	..
Naphtha, petroleum ether.....	0.665	41.5	15
Oil:	0.848-0.810	52.9-50.5	0
castor.....	0.969	60.5	15
cocoanut.....	0.925	57.7	15
cotton seed.....	0.926	57.8	15
creosote.....	1.040-1.100	64.0-68.6	15
linseed, boiled.....	0.942	58.8	15
olive.....	0.915	57.3	15
Sea water.....	1.025	63.9	15
Turpentine (spirits).....	0.87	54.3	..
Water.....	1.00	62.43	4

DENSITY OF ALCOHOL

DENSITY OF ETHYL ALCOHOL IN GRAMS PER CUBIC CENTIMETER, COMPUTED FROM MENDELÉEFF'S FORMULA

(Selected from Smithsonian Tables.)

Temp. °C.	0	1	2	3	4
0	.80625	.80541	.80457	.80374	.80290
10	.79788	.79704	.79620	.79535	.79451
20	.78945	.78860	.78775	.78691	.78606
30	.78097	.78012	.77927	.77841	.77756

Temp. °C.	5	6	7	8	9
0	.80207	.80123	.80039	.79956	.79872
10	.79367	.79283	.79198	.79114	.79029
20	.78522	.78437	.78352	.78267	.78182
30	.77671	.77585	.77500	.77414	.77329

HYDROMETERS AND DENSITY UNITS

Alcoholometer.—For testing alcoholic solutions; the scale shows the per cent of alcohol by volume; 0°-100° is the per cent.

Arcometer.—For testing ammonia solutions; scale 0°-40°; to convert to sp. gr. multiply by 3 and deduct from 1000.

Barkometer or **Barkometer.**—For testing tanning liquor; scale 0°-80° Bk; the number to the right of the decimal point of the sp. gr. is the degree Bk; thus, 1.025 sp. gr. is 25° Bk.

Baumé.—There are two kinds in use: heavy B₄ for liquids heavier than water and light B₄ for liquids lighter than water. In the former 0° corresponds to a sp. gr. 1.000 (water at 4°C.) and 66° corresponds to a sp. gr. 1.842; the lighter than water scale, 0° B₄ is equivalent to the gravity of a 10% solution of sodium chloride and 60° B₄ corresponds to a sp. gr. of 0.745. For Baumé degrees on the scale of densities greater than unity, the following equation gives the means of conversion:

$$\text{Sp. Gr.} = \frac{m}{m-d} \text{ where } m = 145 \text{ (in the United States)}$$

$$m = 144 \text{ (old scale used in Holland)}$$

$$m = 146.78 \text{ (New scale or Gerlach scale)}$$

$$d = \text{Baumé reading}$$

Beck's Hydrometer has 0° corresponding to sp. gr. 1.000 and 30° to sp. gr. 0.850; equal divisions on the scale are continued as far as required in both directions.

Brix Saccharometer or **Balling Saccharometer** shows directly the per cent of sugar (sucrose) by weight at the temperature indicated on the instrument, usually 17.5°C.; i.e., degrees Brix is the per cent sugar.

Cartier's Hydrometer floats in water at the 10° scale division and at 30° corresponds to 32° B₄.

Oleometer.—For vegetable and sperm oils; scale 50°-0° corresponds to sp. gr. 0.870-0.970.

Soxhlet's Lactometer, for determining the density of milk, has a scale from 25° (sp. gr. 1.025) to 35° (sp. gr. 1.035) divided into suitable scale divisions.

Twaddell Hydrometers have the scale so arranged that the reading multiplied by 5 and added to 1000 gives the sp. gr. with reference to water as 1000; it is always used for densities greater than water.

HYDROMETER CONVERSION TABLES

SHOWING THE RELATION BETWEEN DENSITY (C. G. S.) AND DEGREES BAUMÉ FOR DENSITIES LESS THAN UNITY.

Density.	Degrees Baumé.				
	.00	.01	.02	.03	.04
0.60	103.33	99.51	95.81	92.22	88.75
.70	70.00	67.18	64.44	61.78	59.19
.80	45.00	42.84	40.73	38.68	36.67
.90	25.56	23.85	22.17	20.54	18.94
1.00	10.00

Density.	Degrees Baumé.				
	.05	.06	.07	.08	.09
0.60	85.38	82.12	78.95	75.88	72.90
.70	56.67	54.21	51.82	49.49	47.22
.80	34.71	32.79	30.92	29.09	27.30
.90	17.37	15.83	14.33	12.86	11.41
1.00