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Appendix

APPENDIX.

HYDROMETER TABLES.

TABLE I.—COMPARISON OF THE DEGREES OF BAUMÉ'S HYDROMETER
WITH THE REAL SPECIFIC GRAVITIES.*For Liquids Heavier than Water.*

Degrees	Specific Gravity.	Degrees.	Specific Gravity.	Degrees.	Specific Gravity.
0	1·000	26	1·206	52	1·520
1	1·007	27	1·216	53	1·535
2	1·013	28	1·225	54	1·551
3	1·020	29	1·235	55	1·567
4	1·027	30	1·245	56	1·583
5	1·034	31	1·256	57	1·600
6	1·041	32	1·267	58	1·617
7	1·048	33	1·277	59	1·634
8	1·056	34	1·288	60	1·652
9	1·063	35	1·299	61	1·670
10	1·070	36	1·310	62	1·689
11	1·078	37	1·321	63	1·708
12	1·085	38	1·333	64	1·727
13	1·094	39	1·345	65	1·747
14	1·101	40	1·357	66	1·767
15	1·109	41	1·369	67	1·788
16	1·118	42	1·381	68	1·809
17	1·126	43	1·395	69	1·831
18	1·134	44	1·407	70	1·854
19	1·143	45	1·420	71	1·877
20	1·152	46	1·434	72	1·900
21	1·160	47	1·448	73	1·924
22	1·169	48	1·462	74	1·949
23	1·178	49	1·476	75	1·974
24	1·188	50	1·490	76	2·000
25	1·197	51	1·495		

TABLE II.

Baumé's Hydrometer for Liquids Lighter than Water.

Degrees.	Specific Gravity.	Degrees.	Specific Gravity.	Degrees.	Specific Gravity.
10	1·000	27	0·896	44	0·811
11	0·993	28	0·890	45	0·807
12	0·986	29	0·885	46	0·802
13	0·980	30	0·880	47	0·798
14	0·973	31	0·874	48	0·794
15	0·967	32	0·869	49	0·789
16	0·960	33	0·864	50	0·785
17	0·954	34	0·859	51	0·781
18	0·948	35	0·854	52	0·777
19	0·942	36	0·849	53	0·773
20	0·936	37	0·844	54	0·768
21	0·930	38	0·839	55	0·764
22	0·924	39	0·834	56	0·760
23	0·918	40	0·830	57	0·757
24	0·913	41	0·825	58	0·753
25	0·907	42	0·820	59	0·749
26	0·901	43	0·816	60	0·745

These two tables are on the authority of Francœur: they are taken from the *Handwörterbuch der Chemie* of Liebig, Poggendorff, and Wöhler. Baumé's hydrometer is very commonly used on the Continent, especially for liquids heavier than water. For lighter liquids the hydrometer of Cartier is often employed in France. Cartier's degrees differ but little from those of Baumé.

In the United Kingdom, Twaddell's hydrometer is a good deal used for dense liquids. This instrument is so graduated that the real specific gravity can be deduced by an extremely simple method from the degree of the hydrometer; namely, by multiplying the latter by 5, and adding 1000; the sum is the specific gravity, water being 1000. Thus 10° Twaddell indicates a specific gravity of 1050, or 1·05; 90° Twaddell, 1450, or 1·45.

In the Customs and Excise, Sykes's hydrometer is used.

TABLE III.
ABSTRACT

OF REGNAULT'S TABLE OF THE MAXIMUM TENSION OF WATER-
VAPOUR AT DIFFERENT TEMPERATURES, EXPRESSED IN MILLI-
METERS OF MERCURY.

Temperature.	Tension, millimeters.	Temperature.	Tension, millimeters.
-32° C.	0·320	100° C.	760·000
30	0·386	105	906·410
25	0·605	110	1075·370
20	0·927	115	1269·410
15	1·400	120	1491·280
10	2·093	125	1743·880
5	3·113	130	2030·280
0	4·600	135	2353·730
+ 5	6·534	140	2717·630
10	9·165	145	3125·55
15	12·699	150	3581·23
20	17·391	155	4088·56
25	23·550	160	4651·62
30	31·548	165	5274·54
35	41·827	170	5961·66
40	54·906	175	6717·43
45	71·391	180	7546·39
50	91·982	185	8453·23
55	117·478	190	9442·70
60	148·791	195	10519·63
65	186·945	200	11688·96
70	233·093	205	12955·66
75	288·517	210	14324·80
80	354·643	215	15801·33
85	433·041	220	17390·36
90	525·450	225	19097·04
95	633·778	230	20926·40

TABLE IV.
WEIGHTS AND MEASURES.

480	grains Troy	= 1 oz. Troy.
437·5	„	= 1 oz. Avoirdupois.
7000	„	= 1 lb. Avoirdupois.
5760	„	= 1 lb. Troy.

The imperial gallon contains of water at 62° F. ($16\frac{2}{3}$ ° C.) 70,000 grains
 The pint ($\frac{1}{8}$ of gallon) 8,750 „
 The fluid ounce ($\frac{1}{16}$ of pint) 437·5 „
 The pint equals 34·56 cubic inches.

TABLE V.
COMPARISON OF FRENCH AND ENGLISH MEASURES. BY DR. WARREN DE LA RUE.

MEASURES OF LENGTH.

	In English Inches.	In English Feet = 12 Inches.	In English Yards = 3 Feet.	In English Fathoms = 6 Feet.	In English Miles = 1,760 Yards.
Millimeter	0·03937	0·0032809	0·0010936	0·0005468	0·000006
Centimeter	0·39371	0·0328090	0·0109363	0·0054682	0·000062
Decimeter	3·93708	0·3280899	0·1093633	0·0546816	0·000621
Meter	39·37079	3·2808992	1·0936331	0·5468165	0·0006214
Decameter	393·70790	32·8089920	10·9363310	5·4681655	0·0062188
Hectometer	3937·07900	328·0899200	109·3633100	54·6816550	0·0621382
Kilometer	39370·79000	3280·8992000	1093·6331000	546·8165500	0·6213824
Myriameter	393707·90000	32808·9920000	10936·3310000	5468·1655000	6·2138244

1 Inch = 2·539954 Centimeters.
1 Foot = 3·0479449 Decimeters.
1 Yard = 0·91438348 Meter.
1 Mile = 1·6093449 Kilometer.

MEASURES OF SURFACE.

	In English Square Feet.	In English Sq. Yards = 9 Square Feet.	In English Poles = 272·25 Sq. Feet.	In English Roods = 10,890 Sq. Feet.	In English Acres = 43,560 Sq. Feet.
Centiare or Square Meter	10·7642993	1·1960333	0·0395383	0·000988457	0·0002471143
Are or 100 Square Meters	1076·4299342	119·6033260	3·9538290	0·098845724	0·0247114310
Hectare or 10,000 Square Meters	107642·9934183	11960·3326020	395·3828959	9·884572398	2·4711430996

1 Square Inch = 6·4513669 Square Centimeters.
1 Square Foot = 9·2899683 Square Decimeters.
1 Square Yard = 0·83609715 Square Meter or Centiare.
1 Acre = 0·404671021 Hectare.

TABLE V. (Continued.)
MEASURES OF CAPACITY.

	In Cubic Inches.	In Cubic Feet = 1,728 Cubic Inches.	In Pints = 34.65923 Cubic Inches.	In Gallons = 8 Pints = 277.27384 Cubic Inches.	In Bushels = 8 Gal- lons = 2218.19075 Cubic Inches.
Millilitre, or Cubic Centimeter	0.061027	0.0000353	0.001761	0.00022010	0.000027512
Centilitre, or 10 Cubic Centimeters	0.610271	0.0003532	0.017608	0.00220097	0.000275121
Decilitre, or 100 Cubic Centimeters	6.102705	0.0035317	0.176077	0.02200967	0.002751208
Litre, or Cubic Decimeter	61.027052	0.0353166	1.760773	0.22009668	0.027512085
Decalitre, or Centistere	610.270515	0.3531658	17.607734	2.20096677	0.275120846
Hectolitre, or Decistere	6102.705152	3.5316581	176.077341	22.00966767	2.751208459
Kilolitre, or Stere or Cubic Meter	61027.051519	35.3165807	1760.773414	220.09667675	27.512084594
Myrialitre, or Decastere	610270.515194	353.1658074	17607.734140	2200.96676750	275.120845937

1 Cubic Inch = 16.3861769 Cubic Centimeters. 1 Cubic Foot = 28.3153119 Cubic Decimeters. 1 Gallon = 4.543467969 Litres.

MEASURES OF WEIGHT.

	In English Grams.	In Troy Ounces = 480 Grains.	In Avoirdupois lbs. = 7,000 Grains.	In Cwt. = 112 lbs. = 784,000 Grains.	Tons = 20 Cwt. = 15,680,000 Grains.
Milligram	0.015432	0.000032	0.0000022	0.00000002	0.000000001
Centigram	0.154323	0.000322	0.0000220	0.00000020	0.000000010
Decigram	1.543235	0.003215	0.0002205	0.00000197	0.000000098
Gram	15.432349	0.032151	0.0022046	0.00001968	0.000000984
Decagram	154.323488	0.321507	0.0220462	0.00019684	0.000009842
Hectogram	1543.234880	3.215073	0.2204621	0.00196841	0.000098421
Kilogram	15432.348800	32.150727	2.2046213	0.01968412	0.000984206
Myriagram	154323.488000	321.507267	22.0462126	0.19684118	0.009842059

1 Grain = 0.064798950 Gram. 1 Troy oz. = 31.103496 Gram. 1 lb. Avo. = 0.45359265 Kilogr. 1 Cwt. = 50.80237689 Kilogr.

TABLE VI.

FOR CONVERTING DEGREES OF THE CENTIGRADE THERMOMETER
INTO DEGREES OF FAHRENHEIT'S SCALE.

Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.
-90°	-130°	-60°	-76°	-30°	-22°
85	121	55	67	25	13
80	112	50	58	20	4
75	103	45	49	15	+ 5
70	94	40	40	10	14
65	85	35	31	5	23
0°	+32	+100°	+212°	+200°	+392°
+ 5	41	105	221	205	401
10	50	110	230	210	410
15	59	115	239	215	419
20	68	120	248	220	428
25	77	125	257	225	437
30	86	130	266	230	446
35	95	135	275	235	455
40	104	140	284	240	464
45	113	145	293	245	473
50	122	150	302	250	482
55	131	155	311	255	491
60	140	160	320	260	500
65	149	165	329	265	509
70	158	170	338	270	518
75	167	175	347	275	527
80	176	180	356	280	536
85	185	185	365	285	545
90	194	190	374	290	554
95	203	195	383	295	563

1° C.	=	1·8° F.
2	=	3·6
3	=	5·4
4	=	7·2

TABLE VII.

WEIGHT OF ONE CUBIC CENTIMETER OF ATMOSPHERIC AIR, IN GRAMS,
AT DIFFERENT TEMPERATURES, FOR EVERY 5 DEGREES FROM 0° TO
300° C. AT 760 MM.

		Difference.			Difference.
0°	0·001293		155°	0·000824	
5	0·001270	23	160	0·000815	9
10	0·001248	22	165	0·000806	9
15	0·001226	22	170	0·000797	9
20	0·001205	21	175	0·000788	9
25	0·001185	20	180	0·000779	9
30	0·001165	20	185	0·000770	9
35	0·001146	19	190	0·000762	8
40	0·001128	18	195	0·000754	8
45	0·001111	17	200	0·000746	8
50	0·001094	17	205	0·000738	8
55	0·001077	17	210	0·000730	8
60	0·001060	17	215	0·000722	8
65	0·001044	16	220	0·000715	7
70	0·001029	15	225	0·000708	7
75	0·001014	15	230	0·000701	7
80	0·001000	14	235	0·000694	7
85	0·000986	14	240	0·000687	7
90	0·000972	14	245	0·000680	6
95	0·000959	13	250	0·000674	6
100	0·000946	13	255	0·000668	6
105	0·000933	13	260	0·000662	6
110	0·000921	12	265	0·000656	6
115	0·000909	12	270	0·000650	6
120	0·000898	11	275	0·000644	6
125	0·000887	11	280	0·000638	6
130	0·000876	11	285	0·000632	6
135	0·000865	11	290	0·000626	6
140	0·000854	11	295	0·000621	5
145	0·000844	10	300	0·000616	5
150	0·000834	10			

The column of Differences is intended to facilitate the calculation of the intermediate values. Thus to find the weight of 1 cub. cent. of air for 52°, we must deduct from the weight for 50°, two-fifths of the difference (17) between this and the number for 55 degrees: thus

$$\begin{array}{rcl} \text{Weight of 1 cub. cent. of air at } 50^\circ & = & 0\cdot001094 \\ \text{Deduct } \frac{2}{5} \text{ of } 17 & = & \underline{\quad 7 \quad} \end{array}$$

$$\text{Weight of 1 cub. cent. of air at } 55^\circ = 0\cdot001087$$

TABLE VIII.

FOR THE CALCULATION OF $\frac{1}{1 + 0.00367t}$ (See page 70.)

<i>t</i>		<i>t</i>		<i>t</i>		<i>t</i>		<i>t</i>	
1	0.99634	31	0.89785	61	0.81708	91	0.74964	121	0.69249
2	0.99271	32	0.89490	62	0.81464	92	0.74758	122	0.69073
3	0.98911	33	0.89197	63	0.81221	93	0.74554	123	0.68899
4	0.98553	34	0.88906	64	0.80979	94	0.74351	124	0.68725
5	0.98198	35	0.88617	65	0.80740	95	0.74148	125	0.68552
6	0.97845	36	0.88330	66	0.80501	96	0.73947	126	0.68380
7	0.97495	37	0.88044	67	0.80264	97	0.73747	127	0.68209
8	0.97148	38	0.87761	68	0.80068	98	0.73548	128	0.68038
9	0.96803	39	0.87479	69	0.79794	99	0.73350	129	0.67869
10	0.96460	40	0.87199	70	0.79561	100	0.73153	130	0.67700
11	0.96120	41	0.86921	71	0.79329	101	0.72957	131	0.67532
12	0.95782	42	0.86645	72	0.79099	102	0.72762	132	0.67365
13	0.95446	43	0.86370	73	0.78870	103	0.72568	133	0.67199
14	0.95113	44	0.86097	74	0.78642	104	0.72376	134	0.67034
15	0.94782	45	0.85826	75	0.78416	105	0.72184	135	0.66870
16	0.94454	46	0.85556	76	0.78191	106	0.71993	136	0.66706
17	0.94127	47	0.85289	77	0.77967	107	0.71803	137	0.66543
18	0.93803	48	0.85022	78	0.77745	108	0.71615	138	0.66380
19	0.93482	49	0.84758	79	0.77523	109	0.71427	139	0.66219
20	0.93162	50	0.84495	80	0.77304	110	0.71240	140	0.66059
21	0.92844	51	0.84234	81	0.77085	111	0.71055	141	0.65899
22	0.92529	52	0.83974	82	0.76867	112	0.70870	142	0.65740
23	0.92216	53	0.83716	83	0.76651	113	0.70686	143	0.65582
24	0.91905	54	0.83460	84	0.76436	114	0.70503	144	0.65424
25	0.91596	55	0.83205	85	0.76222	115	0.70321	145	0.65268
26	0.91289	56	0.82952	86	0.76010	116	0.70140	146	0.65112
27	0.90984	57	0.82700	87	0.75798	117	0.69960	147	0.64957
28	0.90682	58	0.82450	88	0.75588	118	0.69781	148	0.64802
29	0.90381	59	0.82201	89	0.75379	119	0.69603	149	0.64648
30	0.90082	60	0.81954	90	0.75171	120	0.69425	150	0.64495