

PRESSURE AND TENSILE CONVERSION								
psi	kgf/cm ²	MPa				psi	kgf/cm ²	MPa
100	7.03	.069	Change per Increment			5100	358.6	35.16
200	14.06	1.38				5200	365.6	35.85
300	21.09	2.07				5300	372.6	36.54
400	28.12	2.76				5400	379.7	37.23
500	35.15	3.45	psi	kgf/cm ²	MPa	5500	386.7	37.92
600	42.18	4.14	0.1	1.02	14.5	5600	393.7	38.61
700	49.22	4.83	0.2	2.04	29.0	5700	400.7	39.30
800	56.25	5.52	0.3	3.06	43.5	5800	407.8	39.99
900	63.28	6.21	0.4	4.08	58.0	5900	414.8	40.68
1000	70.13	6.90	0.5	5.10	72.5	6000	421.8	41.37
1100	77.34	7.58	0.6	6.12	87.0	6100	428.9	42.06
1200	84.37	8.27	0.7	7.14	101.5	6200	435.9	42.75
1300	91.40	8.96	0.8	8.16	116.0	6300	442.9	43.44
1400	98.43	9.65	0.9	9.18	131.5	6400	450.0	44.13
1500	105.5	10.34				6500	457.0	44.82
1600	112.5	11.03				6600	464.0	45.51
1700	119.5	11.72				6700	471.1	46.19
1800	126.5	12.41				6800	478.1	46.88
1900	133.6	13.10				6900	485.1	47.57
2000	140.6	13.79	psi	kgf/cm ²	MPa	7000	492.1	48.26
2100	147.7	14.48	10	0.70	0.07	7100	499.2	48.95
2200	154.7	15.17	20	1.41	0.14	7200	506.2	49.64
2300	161.7	15.86	30	2.11	0.21	7300	513.2	50.33
2400	168.7	16.55	40	2.81	0.28	7400	520.3	51.02
2500	175.8	17.24	50	3.52	0.35	7500	527.3	51.71
2600	182.8	17.93	60	4.22	0.41	7600	534.3	52.40
2700	189.8	18.62	70	4.92	0.48	7700	541.4	53.09
2800	196.9	19.31	80	5.63	0.55	7800	548.4	53.78
2900	203.9	20.00	90	6.33	0.62	7900	555.4	54.47
3000	210.9	20.68				8000	562.5	55.16
3100	218.0	21.37				8100	569.5	55.85
3200	225.0	22.06				8200	576.5	56.54
3300	232.0	22.75				8300	583.5	57.23
3400	239.0	23.44				8400	590.6	57.92
3500	246.1	24.13				8500	597.6	58.61
3600	253.1	24.82				8600	604.6	59.29
3700	260.1	25.51				8700	611.7	59.98
3800	267.2	26.20				8800	618.7	60.67
3900	274.2	26.89				8900	625.7	61.36
4000	281.2	27.58				9000	632.8	62.05
4100	288.3	28.27				9100	639.8	62.74
4200	295.3	28.96				9200	646.8	63.43
4300	302.3	29.65				9300	653.9	64.12
4400	309.4	30.34				9400	660.9	64.81
4500	316.4	31.03				9500	667.9	65.50
4600	323.4	31.72				9600	674.9	66.19
4700	330.4	32.41				9700	682.0	66.88
4800	337.5	33.10				9800	689.0	67.57
4900	344.5	33.78				9900	696.0	68.26
5000	351.5	34.48				10000	703.1	68.95

INCH TO MILLIMETER CONVERSION

INCH		MILLIMETER			
FRACTION	DECIMAL	0	1 INCH	2 INCH	3 INCH
	—	—	25.40	50.80	76.20
1/64	0.015625	0.397	25.80	51.20	76.60
1/32	0.03125	0.794	26.19	51.59	76.99
3/64	0.046875	1.191	26.59	51.99	77.39
1/16	0.0625	1.588	26.99	52.39	77.79
5/64	0.078125	1.984	27.38	52.78	78.18
3/32	0.09375	2.381	27.78	53.18	78.58
7/64	0.109375	2.778	28.18	53.58	78.98
1/8	0.125	3.175	28.58	53.98	79.38
9/64	0.140625	3.572	28.97	54.37	79.77
5/32	0.15625	3.969	29.37	54.77	80.17
11/64	0.171875	4.366	29.77	55.17	80.57
3/16	0.1875	4.763	30.16	55.56	80.96
13/64	0.203125	5.159	30.56	55.96	81.36
7/32	0.21875	5.556	30.96	56.36	81.76
15/64	0.234375	5.953	31.35	56.75	82.15
1/4	0.25	6.350	31.75	57.15	82.55
17/64	0.265625	6.747	32.15	57.55	82.95
9/32	0.28125	7.144	32.54	57.94	83.34
19/64	0.296875	7.541	32.94	58.34	83.74
5/16	0.3125	7.938	33.34	58.74	84.14
21/64	0.328125	8.334	33.73	59.13	84.53
11/32	0.34375	8.731	34.13	59.53	84.93
23/64	0.359375	9.128	34.53	59.93	85.33
3/8	0.375	9.525	34.93	60.33	85.73
25/64	0.390625	9.922	35.32	60.72	86.12
13/32	0.40625	10.319	35.72	61.12	86.52
27/64	0.421875	10.716	36.12	61.52	86.92
7/16	0.4375	11.113	36.51	61.91	87.31
29/64	0.453125	11.509	36.91	62.31	87.71
15/32	0.46875	11.906	37.31	62.71	88.11
31/64	0.484375	12.303	37.70	63.10	88.50

Values of 1 inch and more are rounded off to one hundredth of a millimeter, based on 1 inch = 25.4mm

INCH TO MILLIMETER CONVERSION					
INCH		MILLIMETER			
FRACTION	DECIMAL	0	1 INCH	2 INCH	3 INCH
1/2	0.5	12.700	38.10	63.50	88.90
33/64	0.515625	13.097	38.50	63.90	89.30
17/32	0.53125	13.494	38.89	64.29	89.69
35/64	0.546875	13.891	39.29	64.69	90.09
9/16	0.5625	14.288	39.69	65.09	90.49
37/64	0.578125	14.684	40.08	65.48	90.88
19/32	0.59375	15.081	40.48	65.88	91.28
39/64	0.609375	15.478	40.88	66.28	91.68
5/8	0.625	15.875	41.28	66.68	92.08
41/64	0.640625	16.272	41.67	67.07	92.47
21/32	0.65625	16.669	42.07	67.47	92.87
43/64	0.671875	17.066	42.47	67.87	93.27
11/16	0.6875	17.463	42.86	68.26	93.66
45/64	0.703125	17.859	43.26	68.66	94.06
23/32	0.71875	18.256	43.66	69.06	94.46
47/64	0.734375	18.653	44.05	69.45	94.85
3/4	0.75	19.050	44.45	69.85	95.25
49/64	0.765625	19.447	44.85	70.25	95.65
25/32	0.78125	19.844	45.24	70.64	96.04
51/64	0.796875	20.241	45.64	71.04	96.44
13/16	0.8125	20.638	46.04	71.44	96.84
53/64	0.828125	21.034	46.43	71.83	97.23
27/32	0.84375	21.431	46.83	72.23	97.63
55/64	0.859375	21.828	47.23	72.63	98.03
7/8	0.875	22.225	47.63	73.03	98.43
57/64	0.890625	22.622	48.02	73.42	98.82
29/32	0.90625	23.019	48.42	73.82	99.22
59/64	0.921875	23.416	48.82	74.22	99.62
15/16	0.9375	23.813	49.21	74.61	100.01
61/64	0.953125	24.209	49.61	75.01	100.41
31/32	0.96875	24.606	50.01	75.41	100.81
63/64	0.984375	25.003	50.40	75.80	101.20

Values of 1 inch and more are rounded off to one hundredth of a millimeter, based on 1 inch = 25.4mm



FORCE, ENERGY AND VISCOSITY CONVERSION

	MULTIPLY BY:	TO FIND:	MULTIPLY BY:	TO FIND:
VELOCITY ft / s mph mph	x 0.3048 x 0.447 x 1.6093	= m / s = m / s = km / h	x 3.2808 x 2.2369 x 0.6214	= ft / s = mph = mph
FORCE ounces _f pounds _f kilograms _f	x 0.278 x 4.448 x 9.807	= newtons (N) = newtons (N) = newtons (N)	x 3.597 x 0.2248 x 0.10197	= ounces _f = pounds _f = kilograms _f
PRESSURE lb _f / in ² (psi) lb _f / in ² (psi) lb _f / in ² (psi) lb _f / in ² (psi) lb _f / in ² (psi)	x 0.068 x 51.715 x 6895 x 0.0069 x 0.069	= atm = mm Hg = kg / m ² •s ² (PA) = MPa = bar	x 14.6959 x 0.01934 x 0.000145 x 14.5 x 14.5	= lb _f / in ² (psi) = lb _f / in ² (psi) = lb _f / in ² (psi) = lb _f / in ² (psi) = lb _f / in ² (psi)
ENERGY Btu (I.T.) Btu (I.T.) ft•lb _f	x 1055 x 252 x 1.356	= kg•m ² / s ² (J) = cal (I.T.) = kg•m ² / s ² (J)	x 9.478x10 ⁻⁴ x 0.00397 x 0.7375	= Btu (I.T.) = Btu (I.T.) = ft•lb _f
POWER hp hp	x 746 x 2544	= J / s (W) = Btu / h	x .00134 x 0.00039	= hp = hp
SPECIFIC HEAT Btu / lb _m •°F Btu / lb _m •°F cal / g•F	x 4.1867 x 0.5555 x 1.8	= kJ / kg•K = cal / g•°F = cal / g•°C	x 0.23885 x 1.8 x 0.5555	= Btu / lb _m •°F = Btu / lb _m •°F = cal / g•F
VISCOSITY (dynamic) lb _m / ft•s lb _m / ft•s	x 1.488 x 1488	= kg / m•s = centipoise	x 0.672 x .00067	= lb _m / ft•s = lb _m / ft•s
VISCOSITY (kinematic) in ² / s ft ² / s	x 6.45 x 0.0929	= cm ² / s = m ² / s	x 0.155 x 10.764	= in ² / s = ft ² / s
TEMPERATURE °F = (9/5) °C + 32	°C = 5/9 (°F - 32)	K = °C + 273		

LINEAR, VOLUME AND FORCE CONVERSION				
	MULTIPLY BY:	TO FIND:	MULTIPLY BY:	TO FIND:
LINEAR				
inches	x 25.40	= millimeters (mm)	x 0.03937	= inches
feet	x 0.3048	= meters (m)	x 3.281	= feet
yards	x 0.9144	= meters (m)	x 1.0936	= yards
miles	x 1.6093	= kilometers (km)	x 0.6214	= miles
inches	x 2.540	= centimeters (cm)	x 0.3937	= inches
microinches	x 0.0254	= micrometers (μm)	x 39.37	= microinches
AREA				
inches ²	x 645.16	= millimeters ² (mm ²)	x 0.00155	= inches ²
inches ²	x 6.452	= centimeters ² (cm ²)	x 0.155	= inches ²
feet ²	x 0.0929	= meters ² (m ²)	x 10.764	= feet ²
yards ²	x 0.8361	= meters ² (m ²)	x 1.196	= yards ²
acres	x 0.4047	= hectares (10 ⁴ m ²) (ha)	x 2.471	= acres
miles ²	x 2.590	= kilometers ² (km ²)	x 0.3861	= miles ²
VOLUME				
inches ³	x 16387	= millimeters ³ (mm ³)	x 0.000061	= inches ³
inches ³	x 16.387	= centimeters ³ (cm ³)	x 0.06102	= inches ³
inches ³	x 0.01639	= liters (L)	x 61.024	= inches ³
quarts	x 0.94635	= liters (L)	x 1.0567	= quarts
gallons	x 3.7854	= liters (L)	x 0.2642	= gallons
feet ³	x 28.317	= liters (L)	x 0.03531	= feet ³
feet ³	x 0.02832	= meters ³ (m ³)	x 35.315	= feet ³
fluid oz	x 29.57	= milliliters (mL)	x 0.03381	= fluid oz
yards ³	x 0.7646	= meters ³ (m ³)	x 1.3080	= yards ³
teaspoons	x 4.929	= milliliters (mL)	x 0.2029	= teaspoons
cups	x 0.2366	= liters (L)	x 4.227	= cups
MASS				
ounces (av)	x 28.35	= grams (g)	x 0.03527	= ounces (av)
pounds (av)	x 0.4536	= kilograms (kg)	x 2.2046	= pounds (av)
tons (2000 lb)	x 907.18	= kilograms (kg)	x 0.001102	= tons (2000 lb)
tons (2000 lb)	x 0.90718	= metric tons (t)	x 1.1023	= tons (2000 lb)
carats	x 0.2	= grams (g)	x 5	= carats
DENSITY				
lb _m / in ³	x 0.0277	= g / mm ³	x 36.10	= lb _m / in ³
lb _m / in ³	x 0.016	= g / cm ³	x 62.428	= lb _m / in ³
lb _m / gal (U.S.)	x 0.1198	= g / cm ³	x 8.3454	= lb _m / gal (U.S.)
slug / ft ³	x 515.4	= kg / m ³	x 0.0019	= slug / ft ³

GEOMETRIC AND TOLERANCING SYMBOLS

CHARACTERISTIC	ANSI-Y14.5	ISO 1101
Straightness		
Flatness		
Angularity		
Perpendicularity (squareness)		
Parallelism		
Concentricity		
Position		
Circularity (roundness)		
Symmetry		
Profile of any line		
Profile of any surface		
Runout (circular)		
Runout (total)		
Cylindricity		
Datum feature		
Maximum material condition (MMC)		
Regardless of feature size (RFS)		None (assumed unless specified MMC)
Least material condition (LMC)		None (proposed)

NATURAL TRIGONOMETRIC FUNCTIONS

If A , B , and C are the angles of any right triangle (C is the right angle), and a , b , and c the sides opposite respectively, as shown in the diagram, then:

$$\sin A = \frac{\text{side opposite } A}{\text{hypotenuse}} = \frac{a}{c}$$

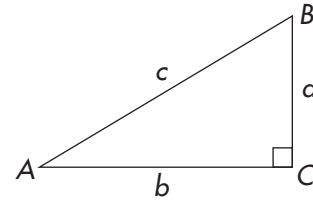
$$\sin B = \frac{\text{side opposite } B}{\text{hypotenuse}} = \frac{b}{c}$$

$$\cos A = \frac{\text{side adjacent } A}{\text{hypotenuse}} = \frac{b}{c}$$

$$\cos B = \frac{\text{side adjacent } B}{\text{hypotenuse}} = \frac{a}{c}$$

$$\tan A = \frac{\text{side opposite } A}{\text{side adjacent } A} = \frac{a}{b}$$

$$\tan B = \frac{\text{side opposite } B}{\text{side adjacent } B} = \frac{b}{a}$$



ANGLE		VALUES OF FUNCTION			ANGLE		VALUES OF FUNCTION		
DEGREES	RADIANS	SIN	COS	TAN	DEGREES	RADIANS	SIN	COS	TAN
0	0.0000	0.0000	1.000	0.0000	45	0.7854	0.7071	0.7071	1.000
1	0.01745	0.01745	0.9998	0.01746	46	0.8029	0.7193	0.6947	1.036
2	0.03491	0.03490	0.9994	0.03492	47	0.8203	0.7314	0.6820	1.072
3	0.05236	0.05234	0.9986	0.05241	48	0.8378	0.7431	0.6691	1.111
4	0.06981	0.06976	0.9976	0.06993	49	0.8552	0.7547	0.6561	1.150
5	0.08727	0.08716	0.9962	0.08749	50	0.8727	0.7660	0.6428	1.192
6	0.1047	0.1045	0.9945	0.1051	51	0.8901	0.7771	0.6293	1.235
7	0.1222	0.1219	0.9925	0.1228	52	0.9076	0.7880	0.6157	1.280
8	0.1396	0.1392	0.9903	0.1405	53	0.9250	0.7986	0.6018	1.327
9	0.1571	0.1564	0.9877	0.1584	54	0.9425	0.8090	0.5878	1.376
10	0.1745	0.1736	0.9848	0.1763	55	0.9599	0.8192	0.5736	1.428
11	0.1920	0.1908	0.9816	0.1944	56	0.9774	0.8290	0.5592	1.483
12	0.2094	0.2079	0.9781	0.2126	57	0.9948	0.8387	0.5446	1.540
13	0.2269	0.2250	0.9744	0.2309	58	1.012	0.8480	0.5299	1.600
14	0.2443	0.2419	0.9703	0.2493	59	1.030	0.8572	0.5150	1.664
15	0.2618	0.2588	0.9659	0.2679	60	1.047	0.8660	0.5000	1.732
16	0.2793	0.2756	0.9613	0.2867	61	1.065	0.8746	0.4848	1.804
17	0.2967	0.2924	0.9563	0.3057	62	1.082	0.8829	0.4695	1.881
18	0.3142	0.3090	0.9511	0.3249	63	1.100	0.8910	0.4540	1.963
19	0.3316	0.3256	0.9455	0.3443	64	1.117	0.8988	0.4384	2.050
20	0.3491	0.3420	0.9397	0.3640	65	1.134	0.9063	0.4226	2.144
21	0.3665	0.3584	0.9336	0.3839	66	1.152	0.9135	0.4067	2.246
22	0.3840	0.3746	0.9272	0.4040	67	1.169	0.9205	0.3907	2.356
23	0.4014	0.3907	0.9205	0.4245	68	1.187	0.9272	0.3746	2.475
24	0.4189	0.4067	0.9135	0.4452	69	1.204	0.9336	0.3584	2.605
25	0.4363	0.4226	0.9063	0.4663	70	1.222	0.9397	0.3420	2.748
26	0.4538	0.4384	0.8988	0.4877	71	1.239	0.9455	0.3256	2.904
27	0.4712	0.4540	0.8910	0.5095	72	1.257	0.9511	0.3090	3.078
28	0.4887	0.4695	0.8829	0.5317	73	1.274	0.9563	0.2924	3.271
29	0.5061	0.4848	0.8746	0.5543	74	1.292	0.9613	0.2756	3.487
30	0.5236	0.5000	0.8660	0.5774	75	1.309	0.9659	0.2588	3.732
31	0.5411	0.5150	0.8572	0.6009	76	1.326	0.9703	0.2419	4.011
32	0.5585	0.5299	0.8480	0.6249	77	1.344	0.9744	0.2250	4.332
33	0.5760	0.5446	0.8387	0.6494	78	1.361	0.9781	0.2079	4.705
34	0.5934	0.5592	0.8290	0.6745	79	1.379	0.9816	0.1908	5.145
35	0.6109	0.5736	0.8192	0.7002	80	1.396	0.9848	0.1736	5.671
36	0.6283	0.5878	0.8090	0.7265	81	1.414	0.9877	0.1564	6.314
37	0.6458	0.6018	0.7986	0.7536	82	1.431	0.9903	0.1392	7.115
38	0.6632	0.6157	0.7880	0.7813	83	1.449	0.9925	0.1219	8.144
39	0.6807	0.6293	0.7771	0.8098	84	1.466	0.9945	0.1045	9.514
40	0.6981	0.6428	0.7660	0.8391	85	1.484	0.9962	0.08716	11.43
41	0.7156	0.6561	0.7547	0.8693	86	1.501	0.9976	0.06976	14.30
42	0.7330	0.6691	0.7431	0.9004	87	1.518	0.9986	0.05234	19.08
43	0.7505	0.6820	0.7314	0.9325	88	1.536	0.9994	0.03490	28.64
44	0.7679	0.6947	0.7193	0.9657	89	1.553	0.9998	0.01745	57.29
					90	1.571	1.000	0.0000	∞

TYPICAL UNIT PREFIXES			
PREFIX	PREFIX SYMBOL	POWER OF TEN	NAME
atto	a	10^{-18}	trillionth (UK)
femto	f	10^{-15}	thousand billionth (UK)
pico	p	10^{-12}	trillionth (USA) billionth (UK)
nano	n	10^{-9}	billionth (USA)
micro	μ	10^{-6}	millionth
milli	m	10^{-3}	thousandth
centi	c	10^{-2}	hundredth
deci	d	10^{-1}	tenth
deca	da	10^1	ten
hecto	h	10^2	hundred
kilo	k	10^3	thousand
mega	M	10^6	million
giga	G	10^9	billion (USA)
tera	T	10^{12}	trillion (USA) billion (UK)
peta	P	10^{15}	thousand billion (UK)
exa	E	10^{18}	trillion (UK)

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ROMAN NUMERAL CONVERSION			
I	1	XXX	30
II	2	XL	40
III	3	L	50
IV	4	LX	60
V	5	LXX	70
VI	6	LXXX	80
VII	7	XC	90
VIII	8	C	100
IX	9	CC	200
X	10	CD	400
XI	11	D	500
XX	20	DC	600
XXI	21	M	1000
XXIX	29	MCMXCV	1995

CHEMICAL ELEMENTS							
ELEMENT	SYMBOL	TYPE ¹	ATOMIC NUMBER	ATOMIC WEIGHT	VALENCE	YEAR OF DISCOVERY	DISCOVERER'S
Actinium	Ac	m	89	227	3	1899	Debiere
Aluminum	Al	m	13	26.98	3	1827	Wohler
Americium ²	Am	m	95	243	3,4,5,6	1945	Seaborg, Morgan
Antimony	Sb	m	51	121.75	3,5	ancient	
Argon	Ar	g	18	39.95	0	1894	Ramsay, Rayleigh
Arsenic	As	n	33	74.92	3,5	1649	Schroder
Astatine	At	n	85	210	1,3,5,7	1940	Carson et al.
Barium	Ba	m	56	137.34	2	1808	Davy
Berkelium ²	Bk	m	97	245	3,4	1950	Seaborg
Beryllium	Be	m	4	9.01	2	1827	Wohler
Bismuth	Bi	m	83	208.9	3,5	1546	Agricola
Boron	B	n	5	10.81	3	1808	Gay-Lussac, Thénard
Bromine	Br	n	35	79.91	1,5	1826	Balard
Cadmium	Cd	m	48	112.4	2	1818	Strohmeyer
Calcium	Ca	m	20	40.08	2	1808	Davy
Californium ²	Cf	m	98	246	2,3,4	1950	Seaborg
Carbon	C	n	6	12.01	2,4	ancient	
Cerium	Ce	m	58	140.12	3,4	1814	Berzelius
Cesium	Cs	m	55	132.9	1	1860	Bunsen, Kirchoff
Chlorine	Cl	g	17	35.46	1,3,5,7	1774	Scheele
Chromium	Cr	m	24	52.00	2,3,6	1797	Vauquelin
Cobalt	Co	m	27	58.93	2,3	1735	Brandt
Copper	Cu	m	29	63.54	1,2	ancient	
Curium ²	Cm	m	96	243	3,4,5,6	1945	Seaborg and James
Dysprosium	Dy	m	66	162.5	3	1886	Lecoq de Boisbaudran
Einsteinium ²	Es		99	246	3	1955	Seaborg et al.
Erbium	Er	m	68	167.25	3	1843	Mosander
Europium	Eu	m	63	151.96	3	1892	Lecoq de Boisbaudran
Fermium ²	Fm		100	250	1,2,3	1955	Seaborg et al.
Fluorine	F	g	9	19.00	1	1887	Moissan
Francium	Fr	m	87	223	1	1939	Perey
Gadolinium	Gd	m	64	157.25	3	1880	Marignac
Gallium	Ga	m	31	69.72	2,3	1875	Lecoq de Boisbaudran
Germanium	Ge	m	32	72.59	2,4	1886	Winkler
Gold	Au	m	79	196.97	1,3	ancient	
Hafnium	Hf	m	72	178.49	4	1923	Hevesy and Coster
Hahnium ²	Ha	m	105			1970	USA
Helium	He	g	2	4.003	0	1894	Ramsay, Rayleigh
Holmium	Ho	m	67	164.93	3	1911	Holmberg
Hydrogen	H	g	1	1.008	1	1766	Cavendish
Indium	In	m	49	114.82	3	1863	Reich and Richter
Iron	Fe	m	26	55.85	2,3,6	ancient	
Iridium	Ir	m	77	192.2	3,4	1803	Tennant
Iodine	J	n	53	126.9	1,3,5,7	1811	Courtois

Note: Isotopes of the elements with Atomic Numbers 104 through 109 have been produced artificially, and to date have not been allocated standard unified designations.

- ¹⁾ m – metal, n – nonmetal, g – gas
- ²⁾ Artificially produced; does not occur in nature
- ³⁾ Called Joliotium (Jo) in the former USSR



CHEMICAL ELEMENTS							
ELEMENT	SYMBOL	TYPE ¹	ATOMIC NUMBER	ATOMIC WEIGHT	VALENCE	YEAR OF DISCOVERY	DISCOVERER'S
Krypton	Kr	g	36	83.80	0	1898	Ramsay
Lanthanum	La	m	57	138.91	3	1839	Mosander
Lawrencium ²	Lr	m	103	257	3	1961	Ghiorso et al.
Lead	Pb	m	82	207.19	2,4	ancient	
Lithium	Li	m	3	6.94	1	1817	Arfvedson
Lutetium	Lu	m	71	174.97	3	1905	Auer v. Welshach
Magnesium	Mg	m	12	24.31	2	1808	Davy
Manganese	Mn	m	25	54.94	2,3,4,6,7	1780	Gahn, Scheele
Mendelevium ²	Md	m	101	256	1,2,3	1955	Seaborg
Mercury	Hg	m	80	200.59	1,2	ancient	
Molybdenum	Mo	m	42	95.94	3,4,6	1782	Hjelm
Neodymium	Nd	m	60	144.24	3	1885	Auer v. Welsbach
Neon	Ne	g	10	20.18	0	1898	Ramsay, Travers
Neptunium ²	Np	m	93	237	3,4,5,6	1938	Fermi, Hahn, Millan
Nickel	Ni	m	28	58.71	2,3	1751	Cronstedt, Bergmann
Niobium	Nb	m	41	92.91	2,3,5	1801	Hatchett
Nitrogen	N	g	7	14.01	3,5	1772	Rutherford, Scheele
Nobelium ^{2,3}	No	m	102	254		1957	Sweishu/English group
Osmium	Os	m	76	190.2	2,3,4,8	1803	Tennant
Oxygen	O	g	8	16.00	2	1774	Priestley, Scheele
Palladium	Pd	m	46	106.4	2,4	1803	Wollaston
Phosphorus	P	n	15	30.97	3,5	1669	Brandt
Platinum	Pt	m	78	195.1	2,4	1748	Ulloa
Plutonium ²	Pu	m	94	242	3,4,5,6	1940	Seaborg
Polonium	Po	m	84	210	6	1898	P. and M. Curie
Potassium	K	m	19	39.10	1	1807	Davy
Praseodymium	Pm	m	61	145	3	1926	Hopkins, Yntema
Protactinium	Pa	m	91	231	5	1917	Hahn and Meitner
Radium	Ra	m	88	226.0	2	1898	Curie
Radon	Rn	g	86	222	0	1900	Dorn
Rhenium	Re	m	72	186.2	3,4,5,6,7	1925	Noddack
Rhodium	Rh	m	45	102.9	3	1803	Wollaston
Rubidium	Rb	m	37	85.47	1	1860	Bunsen, Kirchhoff
Ruthenium	Ru	m	44	101.07	4,8	1848	Klaus
Samarium	Sm	m	62	150.35	3	1879	Lecoq de Boisbaudran
Scandium	Sc	m	21	44.96	3	1879	Nilson
Selenium	Se	n	34	78.96	2,4,6	1817	Berzelius
Silicon	Si	n	14	28.09	4	1823	Berzelius
Silver	Ag	m	47	107.87	1,2	ancient	
Sodium	Na	m	11	22.99	1	1807	Davy
Strontium	Sr	n	38	87.62	2	1808	Davy
Sulphur	S	m	16	32.08	2,4,6	ancient	

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CHEMICAL ELEMENTS							
ELEMENT	SYMBOL	TYPE ¹	ATOMIC NUMBER	ATOMIC WEIGHT	VALENCE	YEAR OF DISCOVERY	DISCOVERER'S
Tantalum	Ta	m	73	180.95	5	1802	Eckeberg
Technetium	Tc	m	43	99	7	1937	Perrier, Segré, Wu
Tellurium	Te	m	52	127.6	2,4,6	1789	Klaproth
Terbium	Tb	m	65	158.92	3	1842	Mosander
Thalium	Tl	m	81	204.37	1,3	1861	Crookes
Thorium	Th	m	90	232.04	4	1828	Berzelius
Thulium	Tm	m	69	168.93	3	1879	Cleve
Tin	Sn	m	50	118.69	2,4	ancient	
Titanium	Ti	m	22	47.90	2,3,4	1791	Gregor
Tungsten	W	m	74	183.85	2,3,4,5,6	1785	Elhuyar
Uranium	U	m	92	238.03	3,4,5,6	1786	Klaproth
Vanadium	V	m	23	50.94	2,3,4,5	1830	Sefstrom
Xenon	Xe	g	54	131.3	0	1898	Ramsay
Ytterbium	Yb	m	70	173.04	3	1907	Auer v. Welsbach
Yttrium	Y	m	39	88.90	3	1843	Mosander
Zinc	Zn	m	30	65.37	2	ancient	
Zirconium	Zr	m	40	91.22	4	1824	Berzelius

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