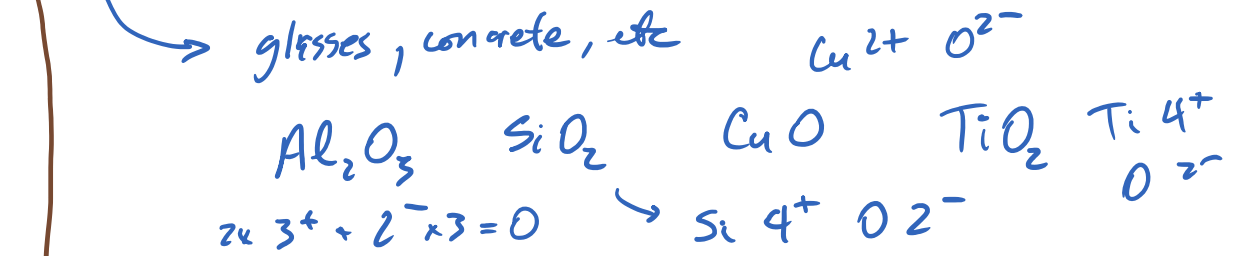
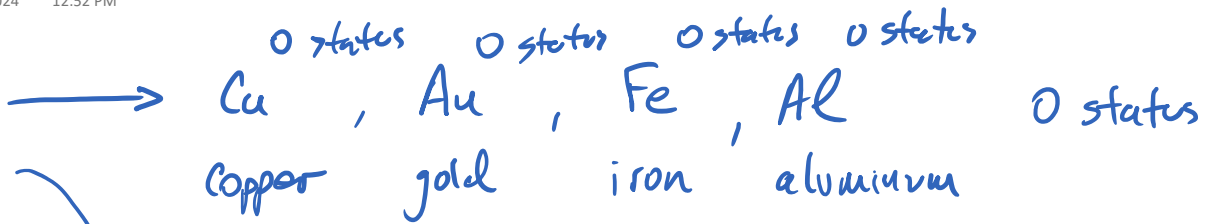


Metals

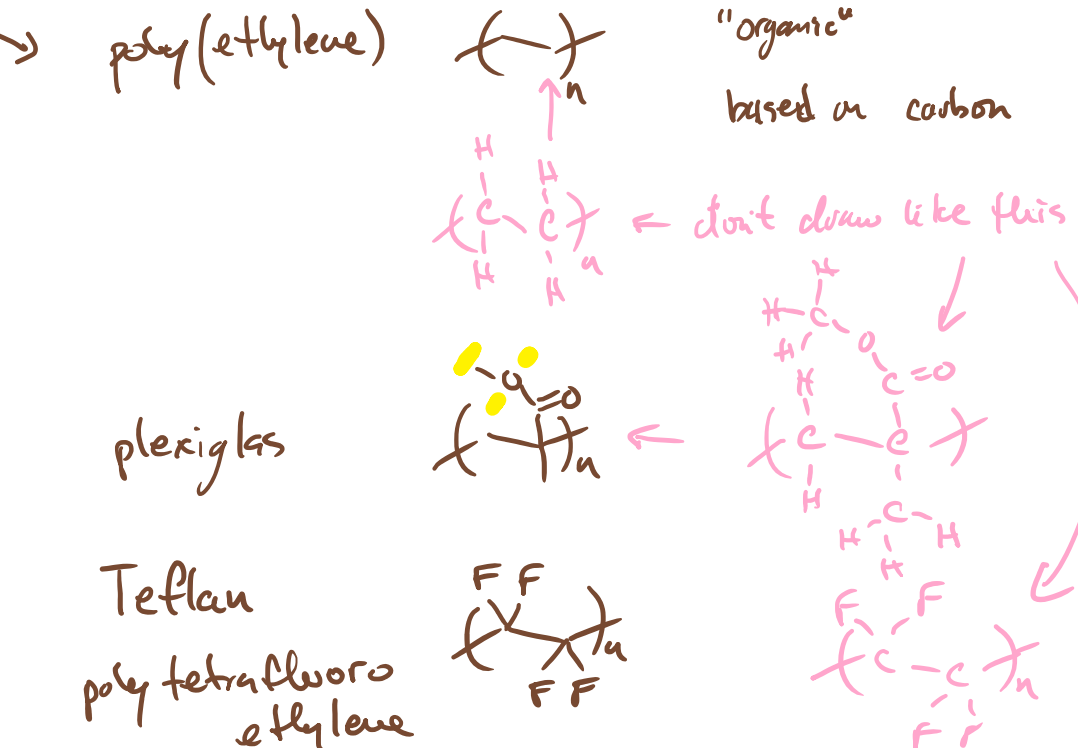
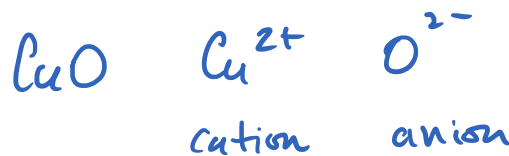
Ceramics

Polymers



not salts = NaCl

i.e. here is a salt - above are not 'salts'...



Kelvin - K

Celsius - °C

$0\text{K} = -273.15^\circ\text{C}$

$100^\circ\text{C} = 373.15\text{K}$

water
boiling point

September 5, 2024 2:21 PM

PERIODIC TABLE OF ELEMENTS

09-06-2024 Page 3

PERIODIC TABLE OF ELEMENTS

1 H Hydrogen 1	PubChem																2 He Helium 2																		
3 Li Lithium 3	4 Be Beryllium 4	1 H Hydrogen 120 Atomic Number Symbol Name Atomic Radius (van der Waals), pm																5 B Boron 5	6 C Carbon 6	7 N Nitrogen 7	8 O Oxygen 8	9 F Fluorine 9	10 Ne Neon 10												
11 Na Sodium 11	12 Mg Magnesium 12	metals																13 Al Aluminum 13	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulfur 16	17 Cl Chlorine 17	18 Ar Argon 18												
19 K Potassium 19	20 Ca Calcium 20	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54
55 Cs Cesium 55	56 Ba Barium 56	72 Hf Hafnium 72	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86	87 Fr Francium 87	88 Ra Radium 88	104 Rf Rutherfordium 104	105 Db Dubnium 105	106 Sg Seaborgium 106	107 Bh Bohrium 107	108 Hs Hassium 108	109 Mt Meitnerium 109	110 Ds Darmstadtium 110	111 Rg Roentgenium 111	112 Cn Copernicium 112	113 Nh Nihonium 113	114 Fl Flerovium 114	115 Mc Moscovium 115	116 Lv Livermorium 116	117 Ts Tennessine 117	118 Og Oganesson 118		
57 La Lanthanum 57	58 Ce Cerium 58	59 Pr Praseodymium 59	60 Nd Neodymium 60	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67	68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71	89 Ac Actinium 89	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103						

'metalloids'

PERIODIC TABLE OF ELEMENTS

1

H

Hydrogen

0.00008988

3

Li

Lithium

0.534

4

Be

Beryllium

1.85

11

Na

Sodium

0.97

12

Mg

Magnesium

1.74

1

H

Hydrogen

0.00008988

Atomic Number

Symbol

Name

Density, g/cm³

5

B

Boron

2.37

6

C

Carbon

2.2670

7

N

Nitrogen

0.0012506

8

O

Oxygen

0.001429

9

F

Fluorine

0.001696

10

Ne

Neon

0.0008999

13

Al

Aluminum

2.70

14

Si

Silicon

2.3296

15

P

Phosphorus

1.82

16

S

Sulfur

2.067

17

Cl

Chlorine

0.003214

18

Ar

Argon

0.0017837

19

K

Potassium

0.89

20

Ca

Calcium

1.54

21

Sc

Scandium

2.89

22

Ti

Titanium

4.5

23

V

Vanadium

6.0

24

Cr

Chromium

7.15

25

Mn

Manganese

7.3

26

Fe

Iron

7.874

27

Co

Cobalt

8.86

28

Ni

Nickel

8.912

29

Cu

Copper

8.933

30

Zn

Zinc

7.134

31

Ga

Gallium

5.91

32

Ge

Germanium

5.323

33

As

Arsenic

5.778

34

Se

Selenium

4.809

35

Br

Bromine

3.11

36

Kr

Krypton

0.003733

37

Rb

Rubidium

1.53

38

Sr

Strontium

2.64

39

Y

Yttrium

4.47

40

Zr

Zirconium

6.52

41

Nb

Niobium

8.57

42

Mo

Molybdenum

10.2

43

Tc

Technetium

11

44

Ru

Ruthenium

12.1

45

Rh

Rhodium

12.4

46

Pd

Palladium

12.0

47

Ag

Silver

10.501

48

Cd

Cadmium

8.69

49

In

Indium

7.31

50

Sn

Tin

7.287

51

Sb

Antimony

6.685

52

Te

Tellurium

6.232

53

I

Iodine

4.93

54

Xe

Xenon

0.005887

55

Cs

Cesium

1.93

56

Ba

Barium

3.62

•

72

Hf

Hafnium

13.3

73

Ta

Tantalum

16.4

74

W

Tungsten

19.3

75

Re

Rhenium

20.9

76

Os

Osmium

22.57

77

Ir

Iridium

22.43

78

Pt

Platinum

21.46

79

Au

Gold

19.382

80

Hg

Mercury

13.5336

81

Tl

Thallium

11.8

82

Pb

Lead

11.342

83

Bi

Bismuth

9.807

84

Po

Polonium

9.32

85

At

Astatine

7

86

Rn

Radon

0.00973

87

Fr

Francium

88

Ra

Radium

5

••

104

Rf

Rutherfordium

105

Db

Dubnium

106

Sg

Seaborgium

107

Bh

Bohrium

108

Hs

Hassium

109

Mt

Meitnerium

110

Ds

Darmstadtium

111

Rg

Roentgenium

112

Cn

Copernicium

113

Nh

Nihonium

114

Fl

Flerovium

115

Mc

Moscovium

116

Lv

Livermorium

117

Ts

Tennessine

118

Og

Oganesson

•

57

La

Lanthanum

6.15

58

Ce

Cerium

6.770

59

Pr

Praseodymium

6.77

60

Nd

Neodymium

7.01

61

Pm

Promethium

7.26

62

Sm

Samarium

7.52

63

Eu

Europium

5.24

64

Gd

Gadolinium

7.90

65

Tb

Terbium

8.23

66

Dy

Dysprosium

8.55

67

Ho

Holmium

8.80

68

Er

Erbium

9.07

69

Tm

Thulium

9.32

70

Yb

Ytterbium

6.90

71

Lu

Lutetium

9.84

••

89

Ac

Actinium

10.07

90

Th

Thorium

11.72

91

Pa

Protactinium

15.37

92

U

Uranium

18.95

93

Np

Neptunium

20.25

94

Pu

Plutonium

19.84

95

Am

Americium

13.89

96

Cm

Curium

13.51

97

Bk

Berkelium

14

98

Cf

Californium

99

Es

Einsteinium

100

Fm

Fermium

101

Md

Mendelevium

102

No

Nobelium

103

Lr

Lawrencium

PubChem

2

He

Helium

0.0001785

Periodic table - melting point

September 6, 2024 8:18 AM

<https://pubchem.ncbi.nlm.nih.gov/>

PERIODIC TABLE OF ELEMENTS

1 H Hydrogen 13.81		PubChem																2 He Helium 0.95																							
3 Li Lithium 453.65		4 Be Beryllium 1560		1 H Hydrogen 13.81																5 B Boron 2348		6 C Carbon 3823		7 N Nitrogen 63.15		8 O Oxygen 54.36		9 F Fluorine 53.53		10 Ne Neon 24.56											
11 Na Sodium 370.95		12 Mg Magnesium 923																		13 Al Aluminum 933.437		14 Si Silicon 1687		15 P Phosphorus 317.3		16 S Sulfur 388.36		17 Cl Chlorine 171.65		18 Ar Argon 83.8											
19 K Potassium 336.53		20 Ca Calcium 1115		21 Sc Scandium 1814		22 Ti Titanium 1941		23 V Vanadium 2183		24 Cr Chromium 2180		25 Mn Manganese 1519		26 Fe Iron 1811		27 Co Cobalt 1768		28 Ni Nickel 1728		29 Cu Copper 1357.77		30 Zn Zinc 692.68		31 Ga Gallium 302.91		32 Ge Germanium 1211.4		33 As Arsenic 1090		34 Se Selenium 493.65		35 Br Bromine 265.95		36 Kr Krypton 115.79							
37 Rb Rubidium 372.46		38 Sr Strontium 1050		39 Y Yttrium 1795		40 Zr Zirconium 2128		41 Nb Niobium 2750		42 Mo Molybdenum 2896		43 Tc Technetium 2430		44 Ru Ruthenium 2607		45 Rh Rhodium 2237		46 Pd Palladium 1828.05		47 Ag Silver 1234.93		48 Cd Cadmium 594.22		49 In Indium 429.75		50 Sn Tin 505.08		51 Sb Antimony 903.78		52 Te Tellurium 722.66		53 I Iodine 386.85		54 Xe Xenon 161.36							
55 Cs Cesium 301.59		56 Ba Barium 1000		•		72 Hf Hafnium 2506		73 Ta Tantalum 3290		74 W Tungsten 3695		75 Re Rhenium 3459		76 Os Osmium 3306		77 Ir Iridium 2719		78 Pt Platinum 2041.55		79 Au Gold 1337.33		80 Hg Mercury 234.32		81 Tl Thallium 577		82 Pb Lead 600.61		83 Bi Bismuth 544.55		84 Po Polonium 527		85 At Astatine 575		86 Rn Radon 202							
87 Fr Francium 300		88 Ra Radium 973		**		104 Rf Rutherfordium		105 Db Dubnium		106 Sg Seaborgium		107 Bh Bohrium		108 Hs Hassium		109 Mt Meitnerium		110 Ds Darmstadtium		111 Rg Roentgenium		112 Cn Copernicium		113 Nh Nihonium		114 Fl Flerovium		115 Mc Moscovium		116 Lv Livermorium		117 Ts Tennessine		118 Og Oganesson							
•		57 La Lanthanum 1191		58 Ce Cerium 1071		59 Pr Praseodymium 1204		60 Nd Neodymium 1284		61 Pm Promethium 1315		62 Sm Samarium 1347		63 Eu Europium 1095		64 Gd Gadolinium 1586		65 Tb Terbium 1629		66 Dy Dysprosium 1685		67 Ho Holmium 1747		68 Er Erbium 1802		69 Tm Thulium 1818		70 Yb Ytterbium 1092		71 Lu Lutetium 1936											
**		89 Ac Actinium 1324		90 Th Thorium 2023		91 Pa Protactinium 1845		92 U Uranium 1408		93 Np Neptunium 917		94 Pu Plutonium 913		95 Am Americium 1449		96 Cm Curium 1618		97 Bk Berkelium 1323		98 Cf Californium 1173		99 Es Einsteinium 1133		100 Fm Fermium 1800		101 Md Mendelevium 1100		102 No Nobelium 1100		103 Lr Lawrencium 1900											

Periodic table - 'standard state'

September 6, 2024 8:24 AM

PERIODIC TABLE OF ELEMENTS

1

H

Hydrogen

Gas

3

Li

Lithium

Solid

4

Be

Beryllium

Solid

11

Na

Sodium

Solid

12

Mg

Magnesium

Solid

19

K

Potassium

Solid

20

Ca

Calcium

Solid

21

Sc

Scandium

Solid

22

Ti

Titanium

Solid

23

V

Vanadium

Solid

24

Cr

Chromium

Solid

25

Mn

Manganese

Solid

26

Fe

Iron

Solid

27

Co

Cobalt

Solid

28

Ni

Nickel

Solid

29

Cu

Copper

Solid

30

Zn

Zinc

Solid

31

Ga

Gallium

Solid

32

Ge

Germanium

Solid

33

As

Arsenic

Solid

34

Se

Selenium

Solid

35

Br

Bromine

Liquid

36

Kr

Krypton

Gas

37

Rb

Rubidium

Solid

38

Sr

Strontium

Solid

39

Y

Yttrium

Solid

40

Zr

Zirconium

Solid

41

Nb

Niobium

Solid

42

Mo

Molybdenum

Solid

43

Tc

Technetium

Solid

44

Ru

Ruthenium

Solid

45

Rh

Rhodium

Solid

46

Pd

Palladium

Solid

47

Ag

Silver

Solid

48

Cd

Cadmium

Solid

49

In

Indium

Solid

50

Sn

Tin

Solid

51

Sb

Antimony

Solid

52

Te

Tellurium

Solid

53

I

Iodine

Solid

54

Xe

Xenon

Gas

55

Cs

Cesium

Solid

56

Ba

Barium

Solid

72

Hf

Hafnium

Solid

73

Ta

Tantalum

Solid

74

W

Tungsten

Solid

75

Re

Rhenium

Solid

76

Os

Osmium

Solid

77

Ir

Iridium

Solid

78

Pt

Platinum

Solid

79

Au

Gold

Solid

80

Hg

Mercury

Liquid

81

Tl

Thallium

Solid

82

Pb

Lead

Solid

83

Bi

Bismuth

Solid

84

Po

Polonium

Solid

85

At

Astatine

Solid

86

Rn

Radon

Gas

87

Fr

Francium

Solid

88

Ra

Radium

Solid

104

Rf

Rutherfordium

Solid

105

Dh

Dubnium

Solid

106

Sg

Seaborgium

Solid

107

Bh

Bohrium

Solid

108

Hs

Hassium

Solid

109

Mt

Meitnerium

Solid

110

Ds

Darmstadtium

Solid (Expected)

111

Rg

Roentgenium

Solid (Expected)

112

Cn

Copernicium

Solid (Expected)

113

Nh

Nihonium

Solid (Expected)

114

Fl

Flerovium

Solid (Expected)

115

Mc

Moscovium

Solid (Expected)

116

Lv

Livermorium

Solid (Expected)

117

Ts

Tennessine

Solid (Expected)

118

Og

Oganesson

Gas (Expected)

57

La

Lanthanum

Solid

58

Ce

Cerium

Solid

59

Pr

Praseodymium

Solid

60

Nd

Neodymium

Solid

61

Pm

Promethium

Solid

62

Sm

Samarium

Solid

63

Eu

Europium

Solid

64

Gd

Gadolinium

Solid

65

Tb

Terbium

Solid

66

Dy

Dysprosium

Solid

67

Ho

Holmium

Solid

68

Er

Erbium

Solid

69

Tm

Thulium

Solid

70

Yb

Ytterbium

Solid

71

Lu

Lutetium

Solid

89

Ac

Actinium

Solid

90

Th

Thorium

Solid

91

Pa

Protactinium

Solid

92

U

Uranium

Solid

93

Np

Neptunium

Solid

94

Pu

Plutonium

Solid

95

Am

Americium

Solid

96

Cm

Curium

Solid

97

Bk

Berkelium

Solid

98

Cf

Californium

Solid

99

Es

Einsteinium

Solid

100

Fm

Fermium

Solid

101

Md

Mendelevium

Solid

102

No

Nobelium

Solid

103

Lr

Lawrencium

Solid

Atomic Number

Symbol

Name

Standard State

1

H

Hydrogen

Gas

5

B

Boron

Solid

6

C

Carbon

Solid

7

N

Nitrogen

Gas

8

O

Oxygen

Gas

9

F

Fluorine

Gas

10

Ne

Neon

Gas

13

Al

Aluminum

Solid

14

Si

Silicon

Solid

15

P

Phosphorus

Solid

16

S

Sulfur

Solid

17

Cl

Chlorine

Gas

18

Ar

Argon

Gas

PubChem

2

He

Helium

Gas

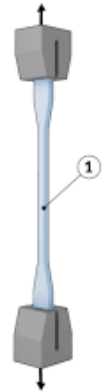
Hooke's Law

September 5, 2024

2:34 PM

Tensile Test

September 5, 2024 2:59 PM



MANUFACTURING GUIDE

