

Reference Tables for Physical Science: CHEMISTRY

2025 Edition

Periodic Table of the Elements

1

1
H
Hydrogen
1.01

2

4
Be
Beryllium
9.01

3

3
Li
Lithium
6.94

4

11
Na
Sodium
22.99

5

19
K
Potassium
39.10

6

55
Cs
Cesium
132.91

7

87
Fr
Francium

8

20
Ca
Calcium
40.08

9

38
Sr
Strontium
87.62

10

56
Ba
Barium
137.33

11

88
Ra
Radium

12

12
Mg
Magnesium
24.31

13

21
Sc
Scandium
44.96

14

39
Y
Yttrium
88.91

15

89
Ac
Actinium

16

22
Ti
Titanium
47.87

17

40
Zr
Zirconium
91.22

18

104
Rf
Rutherfordium

19

23
V
Vanadium
50.94

20

41
Nb
Niobium
92.91

21

105
Db
Dubnium

22

24
Cr
Chromium
52.00

23

42
Mo
Molybdenum
95.95

24

106
Sg
Seaborgium

25

25
Mn
Manganese
54.94

26

43
Tc
Technetium

27

107
Bh
Bohrium

28

26
Fe
Iron
55.85

29

44
Ru
Ruthenium
101.07

30

108
Hs
Hassium

31

27
Co
Cobalt
58.93

32

45
Rh
Rhodium
102.91

33

109
Mt
Meitnerium

34

28
Ni
Nickel
58.69

35

46
Pd
Palladium
106.42

36

110
Ds
Darmstadtium

37

29
Cu
Copper
63.55

38

47
Ag
Silver
107.87

39

111
Rg
Roentgenium

39

30
Zn
Zinc
65.38

40

48
Cd
Cadmium
112.41

41

112
Cn
Copernicium

42

31
Ga
Gallium
69.72

43

49
In
Indium
114.82

44

113
Nh
Nihonium

45

32
Ge
Germanium
72.63

46

50
Sn
Tin
118.71

47

114
Fl
Flerovium

48

33
As
Arsenic
74.92

49

115
Mc
Moscovium

50

34
Se
Selenium
78.97

51

116
Lv
Livermorium

52

35
Br
Bromine
79.90

53

117
Ts
Tennessine

54

36
Kr
Krypton
83.80

55

118
Og
Oganesson

56

51
Sb
Antimony
121.76

57

83
Bi
Bismuth
208.98

58

115
Mc
Moscovium

59

52
Te
Tellurium
127.60

60

84
Po
Polonium

61

116
Lv
Livermorium

62

53
I
Iodine
126.90

63

117
Ts
Tennessine

64

54
Xe
Xenon
131.29

65

118
Og
Oganesson

66

55
Cs
Cesium
132.91

67

86
Rn
Radon

68

118
Og
Oganesson

69

85
At
Astatine

70

117
Ts
Tennessine

71

84
Po
Polonium

72

116
Lv
Livermorium

73

83
Bi
Bismuth
208.98

74

115
Mc
Moscovium

75

82
Pb
Lead
207.2

76

114
Fl
Flerovium

77

81
Tl
Thallium
204.38

78

80
Hg
Mercury
200.59

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79
Au
Gold
196.97

80

78
Pt
Platinum
195.08

81

77
Ir
Iridium
192.22

82

76
Os
Osmium
190.23

83

75
Re
Rhenium
186.21

84

74
W
Tungsten
183.84

85

73
Ta
Tantalum
180.95

86

72
Hf
Hafnium
178.49

87

71
La
Lanthanum
138.91

88

57
La
Lanthanum
138.91

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Ba
Barium
137.33

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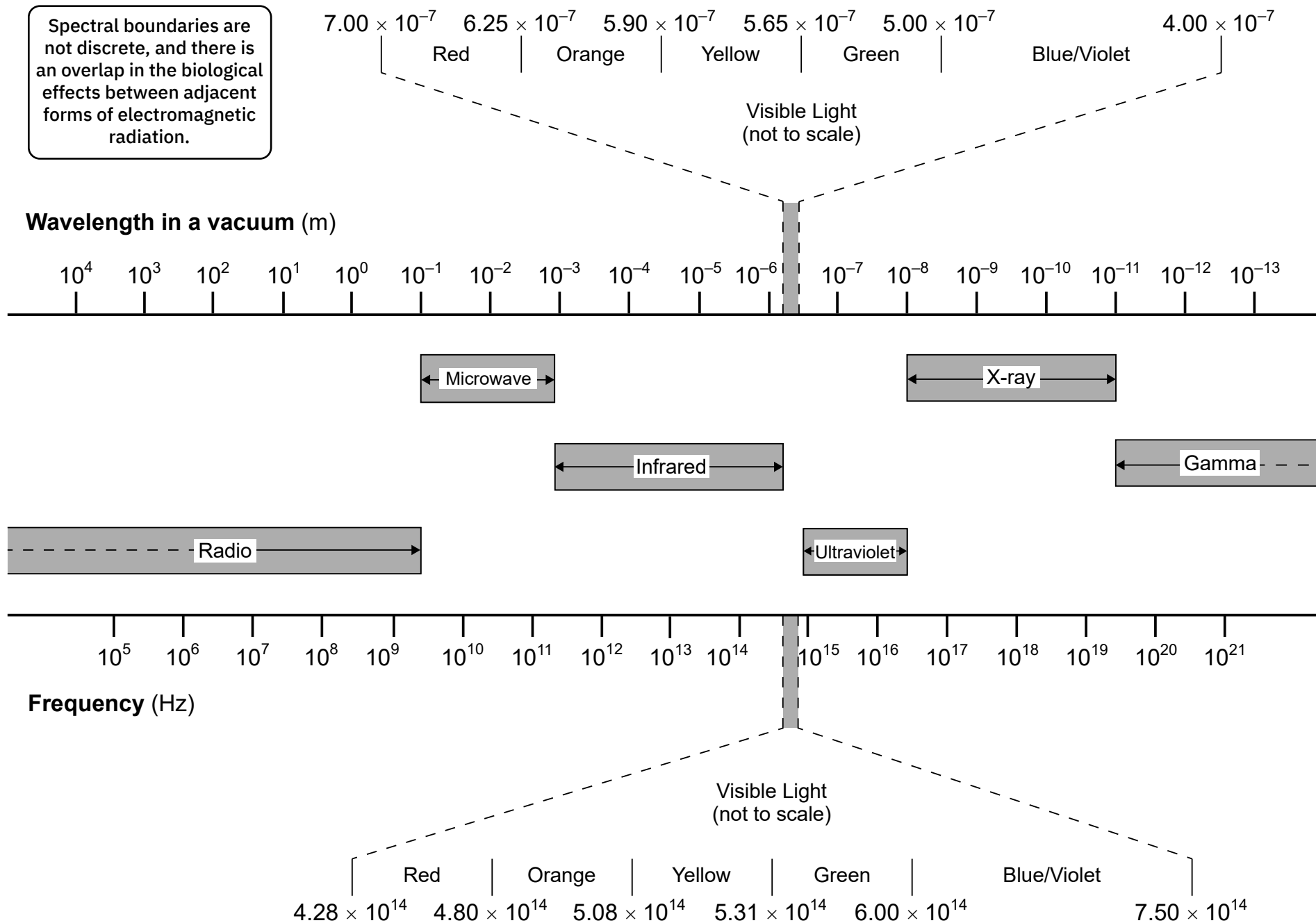
Key	
50	Atomic number
Sn	Element symbol
Tin	Element name
118.71	Average atomic mass

Source: CRC Handbook of
Chemistry and Physics, 104th ed.,
2023–2024, CRC Press

58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.97
90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium

The Electromagnetic Spectrum

Spectral boundaries are not discrete, and there is an overlap in the biological effects between adjacent forms of electromagnetic radiation.



Symbols Used in Nuclear Chemistry	
Name	Notation
alpha	${}^4_2\text{He}$ or ${}^4_2\alpha$
beta	${}^0_{-1}\text{e}$ or ${}^0_{-1}\beta$
gamma	${}^0_0\gamma$
neutron	${}^1_0\text{n}$
positron	${}^0_{+1}\text{e}$ or ${}^0_{+1}\beta$
proton	${}^1_1\text{H}$ or ${}^1_1\text{p}$

Selected Ions Forming Aqueous Solutions	
Name	Formula
Group 1 metals	$\text{Li}^+, \text{Na}^+, \text{etc.}$
ammonium	NH_4^+
acetate	$\text{C}_2\text{H}_3\text{O}_2^-$
chlorate	ClO_3^-
hydrogen carbonate	HCO_3^-
nitrate	NO_3^-

Mathematical and Computational Models	
Equations	Variables
$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$	P = pressure V = volume T = temperature
$q = mc\Delta T$ $q = mH_f$ $q = mH_v$	q = heat m = mass c = specific heat capacity ΔT = change in temperature H_f = heat of fusion H_v = heat of vaporization
$\text{ppm} = \frac{\text{mass of solute}}{\text{mass of solution}} \times 1\,000\,000$	ppm = parts per million
$n = MV$	n = moles M = molarity V = volume
$F \propto \frac{q_1 q_2}{d^2}$ *qualitative analysis	F = coulombic force q = charge d = distance of separation

Mathematical Relationships	
Temperature	$K = ^\circ\text{C} + 273.15$
Pressure	$1 \text{ atm} = 101.3 \text{ kPa}$
1 mole	= molar mass (g)
	= 6.02×10^{23} particles
	= 22.4 L (ideal gas at STP)

Note: Standard Temperature and Pressure (STP) conditions are 273.15 K and 1 atm.

Selected Units	
Symbol	Name
atm	atmosphere
$^\circ\text{C}$	degrees Celsius
g	gram
Hz	hertz
J	joule
K	kelvin
L	liter
m	meter
mol	mole
Pa	pascal
s	second

Selected Metric Prefixes		
Name	Symbol	Factor
kilo–	k	10^3
milli–	m	10^{-3}
micro–	μ	10^{-6}
nano–	n	10^{-9}