

Periodic Table of Elements v4

Super Seven

HI
HBr
HCl
HNO₃
H₂SO₄
HClO₃
HClO₄

Gas

NO
NO₂
CO
CO₂
CH₄
C₂H₆
C₃H₈
C₄H₁₀
N₂O
NH₃
SO₃
SO₂
H₂S
HCl

Conversions

1 L · atm = 101.3 J
K = °C + 273.15
1 cal = 4.184 J

Periodic Trends

EN, IE, EA, & \mathbb{Z}_{eff} increase →↑
Radius & Metallic decrease →↑

Equilibrium

When $aA + bB \rightleftharpoons cC + dD$,
 $K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$
 $K_p = \frac{(P_C)^c(P_D)^d}{(P_A)^a(P_B)^b}$
 $K_a = \frac{[H^+][A^-]}{[HA]}$
 $K_b = \frac{[OH^-][HB^+]}{[B]}$
 $K_w = K_aK_b = [H^+][OH^-]$
 $K_w = 1.0 \times 10^{-14}$ (25° C)
pH = $pK_a + \log \frac{[A^-]}{[HA]}$ = -log[H⁺]
pH + pOH = 14.
 $pK_a = -\log K_a, pK_b = -\log K_b$.

Quantum

$E_{\text{photon}} = hf = \frac{hc}{\lambda}$
 $\lambda = \frac{h}{mv}$
 $R_{H\text{Rydberg}} = 1.097 \times 10^7 \text{ m}^{-1}$
 $\frac{1}{\lambda} = R_H \left(\frac{1}{n_i^2} - \frac{1}{n_f^2} \right)$
 $\Delta E = (-2.18 \times 10^{-18} \text{ J}) \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$

Thermo/Electrochem

$q = mc\Delta T$
 $\Delta S^\circ = \sum_{\text{products}} S^\circ - \sum_{\text{reactants}} S^\circ$
Same for ΔH° and ΔG°
 $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$
 $= -RT \ln K = -nFE^\circ$
 $I = \frac{q}{t}$
 $E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{RT}{nF} \ln Q$.

Gasses/Solutions

$PV = nRT$
 $P_A = P_{\text{total}}X_A$, where $X_A = \frac{\text{moles } A}{\text{total moles}}$
 $P_{\text{total}} = P_A + P_B + P_C + \dots$
 $M = \frac{\text{moles solute}}{\text{Liters solution}}, m = \frac{\text{moles solute}}{\text{kg solvent}}$
1 atm = 760 mmHg = 760 torr
STP = 273.15 K and 1.0 atm
At STP, ideal gas 22.4L mol⁻¹.
Standard conditions 25° C, 1 atm.

Kinetics

$[A]_t - [A]_0 = -kt$ (1st order)
 $\ln[A]_t - \ln[A]_0 = -k$ (2nd order)
 $\frac{1}{[A]_t} - \frac{1}{[A]_0} = kt$ (3rd order)
 $t_{1/2} = \frac{0.963}{k}$ (1st order)

Constants

Avogadro's Number $N_A = 6.02214 \times 10^{23} \text{ mol}^{-1}$
Faraday Constant $F = 96485.33 \text{ C mol}^{-1}$
Atomic Mass Constant 1 amu = 1.660538 × 10⁻²⁷ kg
Molar Gas Constant $R = 8.3145 \text{ J (mol K)}^{-1}$
 $R = 0.082057 \text{ L atm (mol K)}^{-1}$
 $R = 62.36 \text{ L torr (mol K)}^{-1}$
 $k_e = 8.987551 \times 10^9 \text{ N m}^2 \text{ C}^{-2}$
 $k_b = 1.3807 \times 10^{-23} \text{ J K}^{-1}$
 $e = 1.602 \times 10^{-19} \text{ C}$
 $h = 6.626 \times 10^{-34} \text{ Js}$
 $c = 4.18 \text{ kJ kg}^{-1} \text{ }^\circ\text{C}^{-1}$

Coulomb's Constant
Speed of Light (Vacuum)
Boltzmann Constant
Charge on a Proton/Electron
Planck's Constant
Specific heat cap. of H₂O(l)

1 IA

1 2.20
H₂
Hydrogen
1.01

2 IIA

3 0.98
Li
Lithium
6.94

4 1.57
Be
Beryllium
9.01

11 0.93
Na
Sodium
22.99

12 1.31
Mg
Magnesium
24.31

13 IIIA

14 IVA

15 VA

16 VIA

17 VIIA

18 VIIIA

2 2
He
Helium
4.00

5 2.04
B
Boron
10.81

6 2.55
C
Carbon
12.01

7 3.14
N₂
Nitrogen
14.01

8 3.44
O₂
Oxygen
16.00

9 3.98
F₂
Fluorine
19.00

10
Ne
Neon
20.18

19 0.82
K
Potassium
39.10

20 1.00
Ca
Calcium
40.08

21 1.36
Sc
Scandium
44.96

22 1.54
Ti
Titanium
47.87

23 1.63
V
Vanadium
50.94

24 1.66
Cr★
Chromium
52.00

25 1.55
Mn
Manganese
54.94

26 1.83
Fe
Iron
55.85

27 1.88
Co
Cobalt
58.93

28 1.91
Ni
Nickel
58.69

29 1.90
Cu★
Copper
63.55

30 1.65
Zn
Zinc(2+)
65.38

31 1.81
Ga
Gallium
69.72

32 2.01
Ge
Germanium
72.63

33 2.18
As
Arsenic
74.92

34 2.55
Se
Selenium
78.97

35 2.96
Br₂
Bromine
79.90

36 3.00
Kr
Krypton
83.80

37 0.82
Rb
Rubidium
85.47

38 0.95
Sr
Strontium
87.62

39 1.22
Y
Yttrium
88.91

40 1.33
Zr
Zirconium
91.22

41 1.6
Nb★
Niobium
92.91

42 2.16
Mo★
Molybdenum
95.95

43 1.9
Tc
Technetium
(98)

44 2.2
Ru★
Ruthenium
101.07

45 2.28
Rh★
Rhodium
102.91

46 2.20
Pd★★
Palladium
106.42

47 1.93
Ag★
Silver(1+)
107.87

48 1.69
Cd
Cadmium
112.41

49 1.78
In
Indium
114.82

50 1.96
Sn
Tin
118.71

51 2.05
Sb
Antimony
121.76

52 2.1
Te
Tellurium
127.60

53 2.86
I₂
Iodine
126.90

54 2.60
Xe
Xenon
131.29

55 0.79
Cs
Caesium
132.91

56 0.89
Ba
Barium
137.33

57-71
La-Lu
Lanthanide

72 1.3
Hf
Hafnium
178.49

73 1.5
Ta
Tantalum
180.95

74 2.36
W
Tungsten
183.84

75 1.9
Re
Rhenium
186.21

76 2.2
Os
Osmium
190.23

77 2.20
Ir
Iridium
192.22

78 2.28
Pt★
Platinum
195.08

79 2.54
Au★
Gold
196.97

80 2.00
Hg
Mercury
200.59

81 1.62
Tl
Thallium
204.38

82 1.87
Pb
Lead
207.2

83 2.02
Bi
Bismuth
208.98

84 2.0
Po
Polonium
(209)

85 2.2
At
Astatine
(210)

86 2.2
Rn
Radon
(222)

87 0.7
Fr
Francium
(223)

88 0.9
Ra
Radium
(226)

89-103
Ac-Lr
Actinide

104
Rf
Rutherfordium
(267)

105
Db
Dubnium
(268)

106
Sg
Seaborgium
(269)

107
Bh
Bohrium
(270)

108
Hs
Hassium
(277)

109
Mt
Meitnerium
(278)

110
Ds
Darmstadtium
(281)

111
Rg
Roentgenium
(282)

112
Cn
Copernicium
(285)

113
Nh
Nihonium
(286)

114
Fl
Flerovium
(289)

115
Mc
Moscovium
(290)

116
Lv
Livermorium
(293)

117
Ts
Tennessine
(294)

118
Og
Ogannesson
(294)

57 1.1
La
Lanthanum
138.91

58 1.12
Ce
Cerium
140