

Periodic Table of Elements vAsbestos

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
°C = $\frac{5}{9}(\text{°F} - 32)$
°F = $\frac{9}{5}\text{°C} + 32$
1 cal = 4.184 J
1 lb = 453.59 g
1 atm = 760 mmHg
= 760 torr = 101.325 kPa
1 bar = 10⁵ Pa = 10⁵ N/m²

Periodic Trends

\mathbb{Z}_{eff} increase →↓
EN, IE, & EA 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.

Gasses/Solutions

$PV = nRT$
 $P_A = P_{\text{total}}X_A$, where $X_A = \frac{\text{moles } A}{\text{total moles}}$
 $P_{\text{total}} = P_A + P_B + P_C + \dots$
 $M = \frac{\text{moles solute}}{\text{Liters solution}}$, $m = \frac{\text{moles solute}}{\text{kg solvent}}$
 $M_1V_1 = M_2V_2$ for dilution
STP = 273.15 K and 1.0 atm
At STP, ideal gas 22.4L mol^{−1}.
Standard conditions 25° C, 1 atm.
 $v_{rms} = \sqrt{\frac{3RT}{\mathcal{M}}}$

Quantum

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

Thermo/Electrochem

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

Kinetics

$[A]_t - [A]_0 = -kt$ (0th order)
 $\ln[A]_t - \ln[A]_0 = -kt$ (1st order)
 $\frac{1}{[A]_t} - \frac{1}{[A]_0} = kt$ (2nd order)
 $t_{1/2} = \frac{0.693}{k}$ (1st order)

Solutions (cont.)

$\Delta T_b = K_bmi$ $\Delta T_f = -K_fm i$
 $P_A = X_AP_A^\circ$ $S_g = kP_g$
 $\Pi = \left(\frac{n}{V} \right) RT = MRT$
 $(K_{b_{\text{water}}}, K_{f_{\text{water}}}) = (0.512, 1.86)^\circ\text{C/m}$
 $\Delta H_{\text{fus water}} = 6.008 \text{ kJ/mol}$
 $\Delta H_{\text{vap water, 100}^\circ\text{C}} = 40.67 \text{ kJ/mol}$
 $c_{\text{ice}} = 2.093 \text{ J/(}^\circ\text{C)}$
 $c_{\text{water}} = 4.184 \text{ J/(}^\circ\text{C)}$
 $c_{\text{steam}} = 1.841 \text{ J/(}^\circ\text{C)}$

Valent (Wa)

1 Valent = 0.082 L(mol K)^{−1}

 $R = 1$ Valentmosphere (Wam)
= 1 *Valent*orr

1 m³ = 8.2 × 10^{−5} Wamokel (Wal)
Ideal Gas at STP:
1.837 Wake (Wk)

18 VIIIA

2 **He**
Helium
4.00

13 IIIB

5 **B**
Boron
10.81

14 IVA

6 **C**
Carbon
12.01

15 VA

7 **N₂**
Nitrogen
14.01

16 VIA

8 **O₂**
Oxygen
16.00

17 VIIA

9 **F₂**
Fluorine
19.00

18

10 **Ne**
Neon
20.18

3

11 **Na**
Sodium
22.99

4

12 **Mg**
Magnesium
24.31

2

3 **Li**
Lithium
6.94

2 IIA

4 **Be**
Beryllium
9.01

4

19 **K**
Potassium
39.10

4

20 **Ca**
Calcium
40.08

21

21 **Sc**
Scandium
44.96

22

22 **Ti**
Titanium
47.87

23

23 **V**
Vanadium
50.94

24

24 **Cr★**
Chromium
52.00

25

25 **Mn**
Manganese
54.94

26

26 **Fe**
Iron
55.85

27

27 **Co**
Cobalt
58.93

28

28 **Ni**
Nickel
58.69

29

29 **Cu★**
Copper
63.55

30

30 **Zn**
Zinc⁽²⁺⁾
65.38

31

31 **Ga**
Gallium
69.72

32

32 **Ge**
Germanium
72.63

33

33 **As**
Arsenic
74.92

34

34 **Se**
Selenium
78.97

35

35 **Br₂**
Bromine
79.90

36

36 **Kr**
Krypton
83.80

5

37 **Rb**
Rubidium
85.47

5

38 **Sr**
Strontium
87.62

39

39 **Y**
Yttrium
88.91

40

40 **Zr**
Zirconium
91.22

41

41 **Nb★**
Niobium
92.91

42

42 **Mo★**
Molybdenum
95.95

43

43 **Tc**
Technetium
(98)

44

44 **Ru★**
Ruthenium
101.07

45

45 **Rh★**
Rhodium
102.91

46

46 **Pd★★**
Palladium
106.42

47

47 **Ag★**
Silver⁽¹⁺⁾
107.87

48

48 **Cd**
Cadmium
112.41

49

49 **In**
Indium
114.82

50

50 **Sn**
Tin
118.71

51

51 **Sb**
Antimony
121.76

52

52 **Te**
Tellurium
127.60

53

53 **I₂**
Iodine
126.90

54

54 **Xe**
Xenon
131.29

6

55 **Cs**
Caesium
132.91

6

56 **Ba**
Barium
137.33

57-71

57-71 **La-Lu**
Lanthanide

72

72 **Hf**
Hafnium
178.49

73

73 **Ta**
Tantalum
180.95

74

74 **W**
Tungsten
183.84

75

75 **Re**
Rhenium
186.21

76

76 **Os**
Osmium
190.23

77

77 **Ir**
Iridium
192.22