Honors Chemistry Conversion Factors, Equations, and Constants

Metric Conversions

mega	M	10^6
kilo	k	10^3
hecto	h	10^2
deka	da	10^1
UNIT	1	10^0
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

Atomic Theory

Energy of photon $E = h\nu = \frac{hc}{\lambda}$ $E = h\nu$ $c = \lambda\nu$

E = energy (J) ν = frequency (s^{-1}) λ = wavelength (m)

Planck's constant, $h = 6.626 \times 10^{-34}$ J s
Speed of light, $c = 2.998 \times 10^8$ ms^{-1}
Avogadro's number = 6.022×10^{23} mol^{-1}
Electron charge, $e = -1.602 \times 10^{-19}$ coulomb (C)
Coulomb's Law, $F_e = k \frac{Q1Q2}{r\text{^}2}$ $k = 9.0 \times 10^9$ $N \cdot m^3/kg \cdot s^2$

Length/Distance

1 inch = 2.54 centimeter
1 mile = 5280 feet = 1.609 kilometers
1 yard = 3 feet = 36 inches = 0.9144 meters
1 meter = 39.37 inches = 3.281 feet = 1.094 yards
1 kilometer = 1094 yards = 0.6215 miles
1 light-year = 5.88×10^{12} miles = 9.46×10^{12} km

Liquids and Solutions:

Density = Mass/Volume 1 mL = 1 cm^3 1 ppm = $\frac{1\ mg}{1\ L}$
Density of water = 1.00 g/mL
Molarity = mol/L
Molar volume = L/mol
Molar mass = g/mol
Dilution = $C_1V_1 = C_2V_2$

pH Equations

$pH = -\log [H^+]$ $pOH = -\log [OH^-]$

$[OH^-] = 10^{-pOH}$ $[H^+][OH^-] = 1.0 \times 10^{-14}$

$pH = pOH = 14$ $[H^+] = 10^{-pH}$

$K_w = [H^+][OH^-] = 1.0 \times 10^{-14}$ at 25°C = $= K_a \times K_b$

Pressure and Gas Laws

STP = 0.00 °C and 1.000 atm 22.4 L gas at STP Kelvin = $T_c + 273$

1 atm = 760 mmHg = 760 torr = 14.7 psi = 101.3 kPa = 1.01 bar

PV = nRT n = mol $R = 0.0821 \frac{L*atm}{mol*K}$

$\frac{V1}{T1} = \frac{V2}{T2}$ $\frac{P1}{T1} = \frac{P2}{T2}$ $\frac{V1}{n1} = \frac{V2}{n2}$ $P_1V_1 = P_2V_2$

Thermochemistry

Q = mcΔT
Q = heat energy (J) m = mass object (g) $\Delta T = T_f - T_i$ (°C)
c = specific heat capacity at 25°C (J/g°C)
c (water) at 25°C = 4.184 J/g°C
ΔH = kJ/mol