
Atomic Structure

$c = \lambda\nu$ $E = h\nu$ $\lambda = \frac{h}{mv}$ $p = mV$ $hc = \lambda E$

$E_n = \frac{-2.178 \times 10^{-18}}{n^2}$ joule $\Delta E = E_{higher-energy\ orbit} - E_{lower-energy\ orbit}$

E = energy v = frequency λ = wavelength V = velocity h = Plank's constant
P = momentum m = mass n = principal quantum number
C= 3.0 X 10^8 m/s h = 6.63 X 10^{-34} J s

Stoichiometry

$n = \frac{m}{M}$

n = moles m = mass M = molar mass Avogadro's number = 6.02 X 10^{23}

States of Matter / Gases

$KE = \frac{1}{2}mv^2$ $P_t = P_1 + P_s + P_3 + \ldots P_n$ $\frac{Rate_A}{Rate_B} = \sqrt{\frac{M_B}{M_A}}$

$P_1V_1 = P_2V_2$ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $\frac{n_1}{V_1} = \frac{n_2}{V_2}$

$PV = nRT$

P = pressure V = volume T = temperature n = moles m = mass v = velocity
KE = kinetic energy M = molar mass

R = gas constant = $0.0821 \frac{L\ atm}{mol\ K} = 8.314 \frac{L\ kPa}{mol\ K} = 62.4 \frac{L\ mmHg}{mol\ K}$

1 atm = 760 mmHg = 760 torr = 101.3 kPa = 14.7 lb/in^2 STP = 0.00°C and 1.00 atm

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Solutions

$\frac{S_1}{P_1} = \frac{S_2}{P_2}$ $\%_{by\ mass} = \frac{mass\ solute}{mass\ solution} \times 100\%$ $\%_{by\ volume} = \frac{volume\ solute}{volume\ solution} \times 100\%$

$M = \frac{moles\ solute}{L\ solution}$ $m = \frac{moles\ solute}{kg\ solvent}$ $M_cV_c = M_dV_d$

$X_A = \frac{n_A}{n_A + n_B + \ldots}$ $\Delta T_f = i\,K_f\,m$ $\Delta T_b = i\,K_b\,m$

S = solubility P = pressure M = Molarity m = molality V = volume
X = mole fraction T_f = freezing point T_b = boiling point I = van't Hoff factor
K_f = molal freezing point constant K_{fb} = molal boiling point constant

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Thermochemistry

$q = c\,m\,\Delta T \qquad \Delta G = \Delta H - T\Delta S$

$\Delta H_{rxn} = \Sigma\Delta H_f\,(\text{products}) - \Sigma\Delta H_f\,(\text{reactants})$

$\Delta S_{rxn} = \Sigma\Delta S\ (\text{products}) - \Sigma\Delta S\ (\text{reactants})$

$\Delta G_{rxn} = \Sigma\Delta G_f\,(\text{products}) - \Sigma\Delta G_f\,(\text{reactants})$

q = heat　c = specific heat capacity　T = temperature　G = standard free energy
H = standard enthalpy　S = standard entropy　H_f = enthalpy of formation　G_f = free energy of formation

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Kinetics

Average rate $= \frac{\Delta\text{quantity}}{\Delta t}$　Rate = k[A]　Rate $= k[A]^m k[B]^n$

K = reaction constant　t = time　[A], [B] = reactants　*m, n* = order

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Equilibrium

$K_{eq} = \frac{C^c D^d}{A^a B^b}$, where $aA + bB \leftrightarrow cC + dD$　$Q = \frac{C^c D^d}{A^a B^b}$

Keq = equilibrium constant　Q = reaction quotient

Acids and Bases

pH = - log [H^+]　pOH = - log [OH^-]　pH + pOH = 14.00

K_w = [H^+] [OH^-]　$K_w = K_a \times K_b$　$K_a = \frac{[H^+]\,[A^-]}{[HA]}$　$K_b = \frac{[OH^-]\,[HB^+]}{[B]}$

[ ] = concentration (M)　K_w = water ionization constant　K_a = acid ionization constant　Kb = base ionization constant

$K_w = 1.0 \times 10^{-14}$

Electrochemistry

$E^\circ_{cell} = E^\circ_{reduction} - E^\circ_{oxidation}$

Nuclear

$E = mc^2$　Decay: Amount remaining = (Initial)$(1/2)^n$
Decay : Amount remaining = (Initial)$(1/2)^{t/T}$
N = number of ½ lives; t = elapsed time; T= half life duration
α = alpha particle (${}^4_2He$) ;β = beta particle (${}^{\ 0}_{-1}e$); positron (${}^0_1e$)

General

$D = \frac{m}{V}$　$K = {}^\circ C + 273$
D= density　m = mass　V = volume　K = Kelvin　°C = Celcius