Honors Chemistry Equations and Constants 2018-2019

L, mL = liter(s), milliliter(s)
g = gram(s)
atm = atmosphere(s)
mm Hg = millimeters of mercury
J, kJ = joule(s), kilojoule(s)
mol = mole(s)
$1\ cm^3 = 1\ mL$

ATOMIC STRUCTURE

$E = h\nu$

$E = hc / \lambda$

$c = \lambda\nu$

E = energy
ν = frequency
λ = wavelength
Plank's constant, $h = 6.626 \times 10^{-34}$ Js
Speed of light, $c = 3 \times 10^{8}\ ms^{-1}$
Avogadro's number $= 6.02 \times 10^{23}\ mol^{-1}$
Electron Charge, $e = -1.602 \times 10^{-19}$ coulomb

EQUILIBRIUM

$Kc = \frac{[C]^c[D]^d}{[A]^a[B]^b}$, where $aA + bB \leftrightarrows cC + dD$

$Ka = \frac{[H+][A-]}{[HA]}$

$Kb = \frac{[OH-][HB+]}{[B]}$

Kw = [H+][OH-] = 1.0 x 10-14 at 25°C
= Ka x Kb

pH = -log[H+], pOH = -log[OH-]

14 = pH + pOH

Equilibrium Constants

Kc (molar concentration)

Ka (weak acid)

Kb (weak base)

Kw (water)

GASES, LIQUIDS, AND SOLUTIONS

$PV = nRT$

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

$K = {}^{o}C + 273$

$D = \frac{m}{V}$

$D = \frac{PM}{RT}$

$$\frac{v_1}{n_2} = \frac{v_2}{n_2}$$

$$\frac{P_1V_1}{T_1}$$

$$\%\ by\ mass = \frac{mass\ of\ solute}{mass\ of\ soln} x\ 100$$

$$\%\ by\ vol = \frac{vol\ of\ solute}{vol\ of\ soln}\ x\ 100$$

$$parts\ per\ million = \frac{solute}{soln}\ x\ 10^6$$

$$molarity = \frac{moles\ of\ solute}{liters\ of\ soln}$$

P = pressure, V = volume, T = temperature, n = number of moles

m = mass, M = molar mass, K = degrees Kelvin, D = density

Gas constant, R = 8.314 J mol-1 K-1
= 8.314 L kPa mol-1 K-1
= 0.0821 L atm mol-1 K-1
= 62.4 L torr mol-1 K-1

1 atm = 760 torr = 760 mmHg = 101.3 kPa

STP = 273 K and 1 atm

1 mol gas @ STP = 22.4 L

THERMODYNAMICS

$q = ms\Delta T$

$\Delta H^o = \Sigma\Delta H^o f$ products $-\Delta H^o f$ reactants

q = heat, m = mass, s = specific heat capacity, T = temperature

H^0 = standard enthalpy

1 Calorie (C) = 1000 calorie (cal) = 1 kcal

1 cal = 4.184 J

KINETICS

$$\text{rate} = \frac{\Delta concentration}{\Delta time} = \frac{[A]\ final - [A]\ initial}{t_{final} - t_{initial}}$$

$$\frac{r_1}{r_2} = \sqrt{\frac{m_2}{m_1}}$$

NUCLEAR CHEMISTRY

average atomic mass = (% abundance of isotope #1 x mass of isotope #1) +
(% abundance of isotope #2 x mass of isotope #2) +
(% abundance of isotope #3 x mass of isotope #3) +…

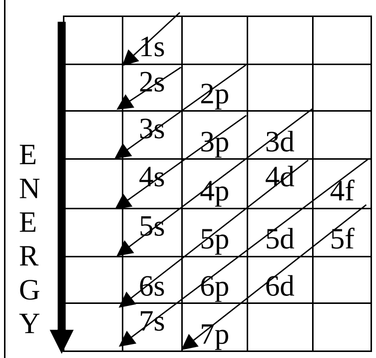
Half-life $N_T = N_0\,(1/2)^n$ and $n = \dfrac{\text{time T}}{\text{time of 1 half-life}}$

amu = atomic mass unit

N_T = amount remaining at time T
N_0 = initial amount
n = # of half-lives

$$\text{\% error} = \frac{\left|\text{Experimental value} - \text{Actual value}\right|}{\text{Actual value}} \times 100$$

n = energy levels



1s	2s	2p	3s	3p	4s	3d	4p	5s	4d	5p	6s	4f	5d