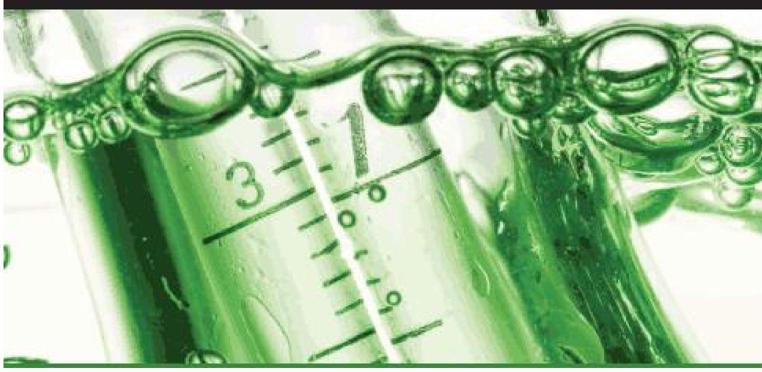
AP® CHEMISTRY



This document was made using the reference documents in College Board's AP Chemistry *Course Description* and other miscellaneous sources, cited at the end of this document.

Version 1 Description (8/29/13):

- A basic skeleton to be filled in later.
- Added a few equations to the skeleton

Version 1.5 Description (3/10/14):

- Added more equations to the skeleton

Atomic Structure

E = energy v = frequency λ = wavelength

Planck's constant, h = 6.626 × 10^{-3}4 Js Speed of light, c = 2.998 × 10^{8} m s^{-1}

Avogadro's number = 6.022 × 10^{23} mol^{-1} Electron charge, e = −1.602 × 10^{-19} coulomb

$E = hv$	
$c = \lambda v$	

Equilibrium

<u>Equilibrium constants</u>

K_c molar concentration K_p gas pressures

K_a weak acid K_b weak base K_w water

$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$	where *a* A + *b* B ⇄ *c* C + *d* D
$K_p = \frac{(P_C)^c(P_D)^d}{(P_A)^a(P_B)^b}$	
$K_a = \frac{[H^+][A^-]}{[HA]}$	
$K_b = \frac{[OH^-][HB^+]}{[B]}$	
$K_w = [H^+][OH^-]$ $= K_a \times K_b$	=1.0 x 10^{-14} at 25ºC
pH = -log[H^+] pOH = -log[OH^-]	
14 = pH + pOH	
$pH = pK_a + log\frac{[A^-]}{[HA]}$	
$pK_a = -logK_a$, $pK_b = -logK_b$	

Kinetics

k = rate constant *t* = time $t_{1/2}$ = half-life

$ln[A]_t = -ln[A]_0 = -kt$	
$\frac{1}{[A]_t} - \frac{1}{[A]_0} = kt$	
$t_{1/2} = \frac{0.693}{k}$	

Gases, Liquids, and Solutions

P = pressure
V = volume
T = temperature
n = number of moles
m = mass
M= molar mass
D = density
KE = kinetic energy
v = velocity
A = absorbance
a = molar absorptivity
b = path length
c = concentration

$PV = nRT$	Ideal gas law: the product of pressure (P) and volume (V) is directly proportional to the product of temperature (K) and number of moles of gas molecules (mol). The constant of proportionality is R (0.0821 $\frac{L \cdot atm}{mol \cdot K}$).
$P_A = P_{total} \times X_A$ where $X_A = \frac{moles\ A}{total\ moles}$	
$P_{total} = P_A + P_B + P_C$	
$n = \frac{m}{M}$	
$K = C^\circ + 273$	
$D = \frac{m}{v}$	density is mass over volume
$KE\ per\ molecule = \frac{1}{2}mv^2$	
$Molarity,\ M = moles\ of\ solute\ per\ liter\ of\ solution$	
$A = abc$	

Thermochemistry/ Electrochemistry

q = heat m = mass c = specific heat capacity T = temperature
S^o = standard entropy H^o = standard enthalpy G^o = standard free energy
n = number of moles E^o = standard reduction potential I = current (amperes)
q = charge (coulombs) t = time (seconds)
Faraday's constant, F = 96, 485 coulombs per mole of electrons.
1 volt = 1 joule/ 1 coulomb

n = number of moles m = mass M= molar mass
D = density KE = kinetic energy v = velocity
A = absorbance
a = molar absorptivity b = path length c = concentration

$q=mc\Delta T$	
$\Delta S^o = \Sigma S^o$ products $-\Sigma S^o$ reactants	
$\Delta H^o = \Sigma H^o_f$ products $-\Sigma H^o_f$ reactants	
$\Delta G^o = \Sigma G^o_f$ products $-\Sigma S^o_f$ reactants	
$\Delta G^o = \Delta H^o - T\Delta S^o$ $= -RT \ln K$ $= -nFE^o$	
$I = \frac{q}{t}$	