

Equation Sheet

Chem 184, Biological Chemistry. Spring 2007

Instructors: Altman, Elrad, Kool, Zare

These equations are provided to you for the final exam. Not all equations are necessarily required to complete the exam.

Autocorrelation function (ACF) for fluorescence emission from a confocal volume.

$$G(\tau) = \frac{1}{N} \left[1 + \frac{\tau}{\tau_D} \right]^{-1} \left[1 + \frac{\tau}{\tau_D} \left(\frac{r_o}{z_o} \right)^2 \right]^{-1/2}$$

r_o, z_o – radial and axial dimensions of the confocal volume, respectively (m).
 τ_D – correlation time of the fluorophore (s)
 N – mean number of fluorophores in the confocal volume

Correlation time for a fluorophore.

$$\tau_D = \frac{r_o^2}{4D}$$

D – diffusion constant of the fluorophore (m²/s)

Diffusion constant for a spherical particle.

$$D = \frac{k_B T}{6\pi\eta r}$$

r – radius of sphere (m)
 η – viscosity of the medium (Pa*s or kg/(m*s))
 T – temperature (K)
 k_B – Boltzmann constant (1.38*10⁻²³ J/K)

Absorbance.

$$A = -\log T$$

T – transmittance, fraction of incident light of a given wavelength that passes through a sample

Quantum yield of fluorescence.

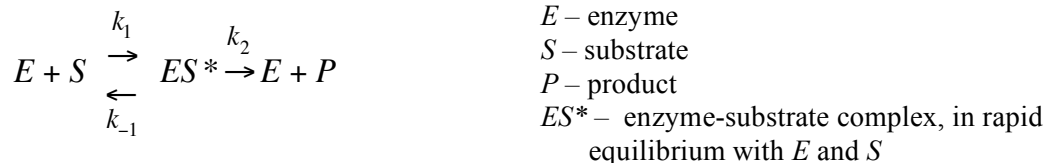
$$\Phi = \frac{\text{photons emitted}}{\text{photons absorbed}}$$

Beer-Lambert Law: absorbance of a pigment solution as light of a particular wavelength passes through it.

$$A = \epsilon bc$$

ϵ – molar absorption coefficient (M⁻¹cm⁻¹)
 b – length of the path traversed by the light (cm)
 c – concentration of the solution (M)

Michaelis-Menten kinetic model.



Rate of product formation for an enzyme that obeys *Michaelis-Menten kinetics*.

$$v = \frac{d[P]}{dt} = \frac{V_{\max} [S]}{K_M + [S]}$$

$$K_M = \frac{(k_{-1} + k_2)}{k_1}$$

$$V_{\max} = k_2 [E_o]$$

[P] – product concentration

[S] – substrate concentration

[E_o] – total enzyme concentration