Equation Sheet
Chem 184, Biological Chemistry. Spring 2007
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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 (m^2/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.

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

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

$$A = \varepsilon b c$$

ε – molar absorption coefficient ($M^{-1}cm^{-1}$)
b – length of the path traversed by the light (cm)
c – concentration of the solution (M)

Michaelis-Menten kinetic model.

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftarrows}} ES^* \xrightarrow{k_2} E + P$$

E – enzyme
S – substrate
P – product
ES^* – enzyme-substrate complex, in rapid equilibrium with E and S

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