

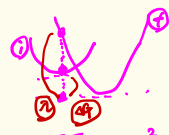
complex

simple

What is biophysics?



Grotthuss mechanism



λ : reorganization energy
 ΔG : energy gap

photosynthetic reaction center

$$k = \frac{2\pi}{\hbar} |H_{if}|^2 \frac{1}{\sqrt{4\pi\lambda kT}} \exp\left(-\frac{(\lambda + \Delta G)^2}{4\lambda kT}\right)$$

Marcus theory and energy gap law

(Electrostatic field of electrolyte solutions)

Debye Hückel theory

Poisson-Boltzmann equation

hydrophobic and hydrophilic interactions

Potential of mean force

Statistical mechanics

proton transfer

Electron transfer theory

Liquid theory

Chemical reaction

Transition state theory
Absolute rate theory

Chemical physics

activation energy
rate constant

photobiology & photochemistry

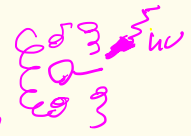
Interaction between Light & Matter

Transition dipole moment

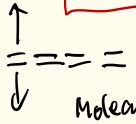
Maxwell equation
Time-dependent perturbation theory

Electromagnetism

Quantum Mechanics



Fermi's Golden rule



Molecular dynamics simulation

Verlet algorithm

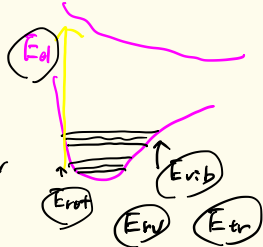
$$R(t+\Delta t) = 2R(t) - R(t-\Delta t) + a(t)\Delta t^2 + O(\Delta t^4)$$

$$W_{if} = \frac{2\pi}{\hbar} |V_{if}|^2 \rho$$

ρ : transition rate $i \rightarrow f$
 ρ : density of matrix element of final state

Dynamics

Adiabatic Approximation
(Born-Oppenheimer potential energy surface)



Structure

MOLECULE

Molecular orbital theory

Bonding orbital & Anti-Bonding orbital

INFORMATION THEORY

What is bit?
Binary digit?
Shannon Entropy

ATOM

Hydrogen atom

QUANTUM MECHANICS

3D Schrödinger eq.

Genetic information