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Keywords

Organic Chemistry

structure of organic compounds
structural determination of organic compounds
delocalization and conjugation
acidity and basicity
stability and reactivity of carbocation and carbanion
kinetic control and thermodynamic control
electrophilic addition
elimination
nucleophilic addition
conjugate addition
nucleophilic substitution
aromatic electrophilic substitution
aromatic nucleophilic substitution
formation and reaction of enol, enolate, and their equivalents
pericyclic reaction
sigmatropic rearrangement and electrocyclic reaction
rearrangement reaction
cleavage reaction
radical reaction
synthesis and reaction of carbenes
functional group selectivity: selective reaction and protection
retrosynthetic analysis
saturated heterocyclic compounds
aromatic heterocyclic compounds
asymmetric synthesis
typical element chemistry
organometallic chemistry
biomolecules

Polymer Chemistry

molecular weight and its distribution
determination of molecular weight
tacticity
geometrical isomer
condensation polymerization
addition polymerization
ring-opening polymerization
coordination polymerization
living polymerization
relation between molecular weight and polymerization mechanism
copolymerization
monomer reactivity ratio
block copolymer, graft copolymer
shape and expanse of polymer chains
random coil state
viscoelasticity
thermoplasticity and heat curing
glass transition temperature and melting point
elastomer, rubber elasticity
crystal and amorphous
microphase separated structure
conductive polymer
high-strength polymer, high-elasticity polymer
photofunctional polymer
polymer liquid crystal
biopolymer
gel
bio-based polymer

Biochemistry

structure and physical property of nucleic acids
protein structure and function
enzymatic reaction kinetics
chemical equilibrium and free energy
central dogma
epigenetics
transcription and RNA processing
translation and protein synthesis
gene-expression regulation (transcriptional regulation)
gene-expression regulation (post-transcriptional regulation)
bioenergy
protein folding and transportation
post-translational modification of proteins
quality control of proteins
cytoskeleton and cell migration
cell cycle and cell growth
signal transduction and cancer
life and death of cells
cell differentiation and development
degenerative disease, regeneration, and stem cells
genetic manipulation at the whole-body level
antibody and immunity

Biotechnology

gene-cloning techniques
labeling and detection methods for nucleic acids
acquiring cDNA
subtraction method
DNA sequencing methods
polymerase chain reaction (PCR)
gene-transfection/transduction techniques
host-vector system (*E.coli*, animal cells, and plant cells)
cell culture
equation for mass balance in cell-culture systems
specific rate and yield factor
equation for specific growth rate (Monod equation)
steady-state model of chemostat culture systems
oxygen transfer coefficients
immobilized biocatalysts
refolding techniques for proteins
protein stability
methods for protein extraction
methods for protein concentration
chromatography and carriers (ion exchange, gel filtration, hydrophobic and affinity chromatographies)
cell fusion and selection techniques
techniques to generate monoclonal antibodies
transgenic animals
cloned animals
DNA chips
SNPs analysis techniques
flow cytometry