Study Guide: Highlights and Themes from Midterm #1 Lecture Series

Lecture Series 1 – Evolutionary Framework

Overview of Biology
Evolutionary Milestones
Biological Diversity
Fundamental Concepts
    Emergent Properties
    Hierarchical Organization
Habitable Zones in our Solar System

Lecture Series 2 – Water as THE Biological Solvent

Construction of Atoms
Isotopes
Chemical Bonds
    Redox Reactions
Special Properties of Water
    Reynolds Numbers
pH & Buffers
Types of Isomers

Lecture Series 3 – Biologically Important Macromolecules

Condensation/Dehydration or Hydrolysis Reactions
Macromolecules vs. Polymers
    Lipids
    Carbos
    Proteins
    Nucleic Acids
Bonds/Linkages for each!
Structures and Functions

Lecture Series 4 – The Organization of the Cell

Cell Theory
Surface Area to Volume Ratios
Compare and Contrast Prokaryotes with Eukaryotes
Compare and Contrast Plant Cells with Animal Cells
Organelles
    Structures and Functions
Endomembrane System
    e.g., From Signal Sequence to Oligosaccharide in a Glycoprotein
Cytoskeleton
    Whose Who and What Do They do?
    Motor Proteins and How They Work
Extracellular Structures of Plants and Animals

Lecture Series 5 – Cellular Membranes

Membrane Composition and Structure
Animal Cell Adhesion
Passive Processes of Membrane Transport
    Osmosis, Which Way Does It Flow?
Active Transport of Membrane Transport
    Primary vs Secondary
Endocytosis and Exocytosis
    Receptor-Mediated Endocytosis

Lecture Series 6 – Energy, Enzymes, and Metabolism

Energy and Energy Conversions
    Gibbs Free Energy Isn't Free
ATP: Transferring Energy in Cells
Enzymes: Biological Catalysts
    Exergonic vs Endergonic Reactions
Molecular Structure Determines Enzyme Function

Metabolism and the Regulation of Enzymes
- Competitive vs Non-Competitive Inhibition
- Allosteric Enzymes and Cooperativity
- Environmental Factors

Lecture Series 7 – Cell Cycle & Cell Division

Bacterial Cell Division
The Eukaryotic Cell Cycle
Cell Cycle Control
- Internal and External

Organization of Chromosomes
- Levels of Packing
- Histones

Mitosis = Cloning
- All the steps
- Cytokinesis in Animal vs Plant Cells
- Evolutionary Development Issues

Meiosis = Diversity
- All the steps – twice!
- Alternation of Generations

Meiotic Errors
- Nondisjunction
- Aneuploidy

Cell Death
- Apoptosis

Genetic Variation Provided by Sex
- Independent Assortment of Chromosomes
- Crossing Over Events of Non-Sister Chromatids
- Random Fertilization