Study Guide: Highlights and Themes from
Midterm #2 Lecture Series

Lecture Series 8 – DNA and Its Role in Heredity

DNA: The Genetic Material
 Griffiths' rough and smooth *Streptococcus pneumoniae*
 Hershey-Chase Blender Experiment
The Structure of DNA
 Models and X-ray crystallography
DNA Replication
 Meselson and Stahl's experiment proved semiconservative model
The Mechanism of DNA Replication
 Enzymes involved
 Lagging strand problem and resolution
DNA Proofreading and Repair
 DNA repair mechanisms
 Lost telomeric DNA replaced by telomerase
Practical Applications of DNA Replication
 DNA sequencing
 Polymerase Chain Reaction

Lecture Series 9 – From DNA to Protein: Genotype to Phenotype (aka The Central Dogma)

Transcription: DNA-Directed RNA Synthesis
 Steps: Initiation, Elongation, Termination
RNA Processing: Capping, Tailing, Splicing, UTRs
 snRNP's
 Spliceosomes
 Introns vs Exons
The Genetic Code
 Degenerate but not ambiguous

The three types of RNA: tRNA, mRNA, and rRNA
    Why are aminoacyl-tRNA synthetases so important not to mutate
    or otherwise mess with???
Translation: RNA-Directed Polypeptide Synthesis
    Steps: Initiation, Elongation, Termination
    Rem: Elongation includes codon recognition, peptide bond
    formation & translocation
Regulation of Translation
    Polysome aka polyribosome
Posttranslational Events
    Signal sequences and modifications
Mutations: Heritable Changes in Genes
    Small scale or point mutations: silent, missense, nonsense, &
    frameshift
    Large scale at chromosome level: deletion, duplication, inversion,
    & reciprocal translocation

Lecture Series 10 – The Genetics of Viruses and Prokaryotes

Classification of viruses
Viral life cycles
Bacterial Genetic Diversity
    Transformation
    Conjugation: F+, F-, F', Hfr
    Transduction: Generalized and Specialized
Transposition (Transposons or Jumping Genes)
    Function of Transposase
Operon Control
    Inducible/Repressible Enymes
    lac vs trp operons
    + vs - control
    cAMP/CRP complex
    Where is the Operator?

Control of Transcription in Viruses
Prokaryote genomics
 Minimal genome experiment

Lecture Series 11 – Eukaryotic Genome & Expression

Compare and contrast Prokaryotes with Eukaryotes
 Genome size vs complexity issue
 Levels of chromatin packing
Frequency of Repeat Sequences (rem: teleomeres)
The Structures of Protein-Coding Genes
 Introns vs Exons revisited
 Gene families and pseudogenes
Transcriptional Control
 DNA binding protein motifs
 Proximal vs distal control
 Histones control access via acetylation level
Posttranscriptional and Posttranslational Control
 Alternative RNA splicing
 Proteasomes degrade "old & tired" proteins