BI-112 FInal Study Guide

THIS EXAM IS OVER CHAPTERS 7-12.

**BIG IDEA FOCUS POINTS**

**Chapter 7 : Cell Reproduction**

* Be able to compare prokaryotic and eukaryotic cell division
* Recognize differences in Mitosis and Meiosis
  + Product of Mitosis – number of cells and content (haploid vs diploid)
  + Product of Meiosis – number of cells and content (haploid vs diploid)
  + Somatic vs gametic cells
* Cell Cycle – phases, check points and significance
  + Mitosis – 5 phases and how to identify them
  + Understand the significance of proto-oncogenes and tumor suppressor genes
  + Recognize common mutations that transform cells into cancerous ones
  + Unique events in Meiosis (not in mitosis)
* Chromosome/chromatid structure
* Gametogenesis
  + Timing of gametogenesis for males vs females
  + Products – number of cells (sperm, ovum, polar bodies)
* Fertilization
  + Cleavage vs compaction

**Chapter 8 : Heredity**

* True breeding vs hybrid
  + The relationship between homozygous vs heterozygous alleles and dominance/recessive traits
  + Genotype vs phenotype
  + The typical ratios seen in a monohybrid cross (via punnet square)
* Multiplication rule vs addition rules in probability
* Patterns of inheritance
  + Pedigree analysis – what is is, how you read them, be able to identify genotype and phenotype of an individual
  + Key characteristics of autosomal dominant, autosomal recessive and X-linked recessive
  + Punnet square – what it is, how you draw them, how you read them, ratios of monohybrid and dihybrid crosses
* Degrees of dominance
* Exceptions to Mendelian genetics
* Law of segregation
* Law of independent assortment

**Chapter 9 : Inheritance**

* Genome Structure (introns and exons)
  + Nucleotides (A, T, C, G)
  + Gene vs Chromosome
  + “Chromosomal theory of inheritance”
* Recombination
  + Understanding cross over
  + When it occurs and its significance
  + Value of variation?
* Gene Linkage
  + Reading a linkage map
  + Understanding the likelihood of 2 being combined together
  + X chromosome linkage (hemizygous)
* Chromosomal disorders
  + Aneuploidy vs euploidy
  + Types of aneuploidy
* Karyotype – what it is, how you read them (what you look for)
  + Alterations to chromosome structure – types and how to identify them
  + Significance of nondisjunction at various points of meiosis

**Chapter 10 : Molecular Biology**

* DNA Structure
  + Antiparallel, complimentary, semiconservative
  + Purine vs pyrimidine
  + Chargaff’s rules
  + Repair Mechanisms – Mismatch vs Nucleotide excision repair
* Telomeres
  + Why they shorten
  + Significance
  + Telomerease – enzyme location and function
* Central Dogma of Molecular Biology – flow of information and nucleotide or amino acid language, structure of starting and end product
  + Replication
    - Know the details of what’s going on inside the replication bubble
    - Leading vs lagging
    - Know the enzymes and their function
  + Transcription
    - 3 post transcription modification (pre-mRNA to mature RNA processing)
  + Translation
    - Know the details of what’s going on inside the ribosome
    - Understand why the genetic code is said to be “redundant” and how wobble contributes to that

**Chapter 11 : Expression**

* Know the differences between prokaryotic and eukaryotic regulation
* Operons
  + Know the overall structure
  + Recognize the Lac and Trp operon examples. (Inducible vs repressible)
* Be able to explain types of DNA level, transcriptional or translational control
  + Epigenetics – Acetylation vs methylation
  + Importance/significance of the TATA box
  + Importance and significance of Enhancers
* Be able to explain microRNAs
* Be able to explain alternative splicing and its significance

**Chapter 12: Technology**

* PCR – explain the process/procedure and significance
  + Why Taq polymerase?
* DNA Sequencing
  + Dideoxynucleotides vs restriction enzymes – where do they cut?
  + How to read Gel Electrophoresis
  + Significance of the Barcode
* Cloning – explain the process/procedure and significance
  + Be able to identify / read diagrams of variable selection/confirmation processes
* Gene Therapy – explain concept and the 2 potential techniques
* Vaccination – explain concept and significance
* GMOS – explain concept and be able to discuss pros and cons