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