Study Guide and Vocabulary List Unit: Gene Expression

Lesson: RNA Structure and Function	Vocabulary:
1. How, in regards to sugar and bases, is RNA different from DNA? 2. What are the three basic categories of RNA, their abbreviations, their structures and their basic function?	Ribonucleic Acid Uracil mRNA tRNA rRNA
Lesson: Transcription	Vocabulary:
1. Where does transcription occur? 2. What enzyme is responsible for the process of transcription? 3. When a gene is being transcribed, how does the mRNA strand differ from DNA? 4. Skill: be able to transcribe a sequence of DNA into mRNA.	Transcription RNA Polymerase
Lesson: Translation and Protein Structure	Vocabulary:
1. Where does translation take place? 2. What monomers are linked together during translation, how many different types are there, and what type of molecule is formed? 3. What is a “codon,” where are they found, and how many combinations are there? 4. What is an “anti-codon” and where are they found? 5. What sequence of bases results in a “start codon” and what amino acid does it translate into? 6. What happens when a “stop codon” is read. 7. Skill: be able to translate a sequence of mRNA into a polypeptide. 8. Why is the order of amino acids so critical to a protein’s function (primary→ quaternary structure)? 9. Describe the R-group interactions that shape proteins. 10. Briefly describe the jobs of a protein in a cell/organism.	Amino Acid Polypeptide Codon Anticodon Start codon Stop codon Primary structure Secondary structure Tertiary structure Quaternary structure R-group Charge interactions Hydrophilic/Hydrophobic Cysteine-cysteine bonds
Lesson: Gene Regulation	Vocabulary:
1. What is the role of DNA promoters? 2. mRNA is often edited post-transcription. Identify both the names of the segments that are retained and the segments that are discarded.	Promoter RNA editing Intron Exon

3. How do operons work? (Use the example of the *lac operon*; include operator, repressor, binding site) 4. How do enhancers, TATA boxes, and homeobox/hox genes affect gene expression and regulation in eukaryotes? 5. What effect do DNA coiling and methylation have on gene expression? 6. Why should we be concerned with the actions of teratogens, epigenetic factors, and steroid hormones?	Operon Operator Represor Binding site Enhancer TATA box Homeobox/Hox Coiling Methylation Teratogen Epigenetic factor Steroid Hormone
Lesson: Mutation	Vocabulary:
1. What is the potential effect of point mutations/base pair substitutions (and why do they have a greater impact in the first two bases of a codon? 2. How do frame-shift/addition & deletion mutations affect the polypeptide sequence? 3. Given simplified gene maps, identify the major types of chromosomal mutations. 4. What are the two major impacts of non-disjuction? 5. How do the processes of mutation contribute to genetic variation and drive evolutionary processes?	Point Mutation/Base-Pair substitution Frame-Shift Mutation Deletion Addition Inversion Translocation Nondisjunction Monosomy Trisomy

Second Base

First Base	U	C	A	G	Third Base
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	stop	stop	A
	Leu	Ser	stop	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gin	Arg	A
	Leu	Pro	Gin	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

Genetic Code for Amino Acids