**Unit Five – Molecular Genetics**

**Honors Biology Student Learning Targets**

**(Textbook sections: 5.5, 8.4-8.7, 9.1-9.5)**

**Always know vocabulary!!!**

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**5.1 Explain the flow of information from DNA to RNA to protein (i.e. the central dogma of molecular biology). (p.225)**

**5.2 Explain the role of transcription in the flow of genetic information (p. 225-228)**

* 5.2.A. Identify where in the cell transcription happens (p. 225)
* 5.2.B. Identify what is made at the end of transcription (p. 225)
* 5.2.C. Describe the structure of RNA and how it differs from DNA (p. 225-226)
* 5.2.D. Given a strand of DNA, transcribe it into RNA (p. 226-226 and CLASS NOTES)
* 5.2.E. Identify the enzyme responsible for adding new nucleotides during transcription (p. 227)
* 5.2.F. Explain how and why RNA must be edited after transcription before being shipped from the nucleus for translation (p. 236-237)

**5.3 Explain the role of translation in the flow of genetic information (p. 225, 229-233)**

* + 5.2.A. Identify where in the cell translation happens (p. 225)
  + 5.2.B. Identify what is made at the end of translation (p. 225)
  + 5.2.C. Explain the importance of the ribosome, codons and the genetic code in the process of translation (p. 229-233)
  + 5.2.D. Given a strand of RNA, translate it into protein (Note: You will be given a copy of the genetic code to use on your test) (p. 230)
  + 5.2.E. Explain how the ribosome knows where to begin and end translation (p. 230)
  + 5.2.F Explain the role of mRNA, rRNA, and tRNA in translation (p. 231-233 and CLASS NOTES)
  + 5.2.G. Explain the role of anticodons in interpreting the genetic code (p. 231)
  + 5.2.H. Describe the steps of translation (p. 232-233)

**5.4 Explain mutations and the possible effect they may or may not have on a protein (p. 238-241)**

* 5.4.A. Define mutation and mutagen (p. 238, 241)
* 5.4.B. Differentiate between point mutations, insertions and deletions. (p. 238-239)
* 5.4.C. Explain why each type of mutation may or may not alter the structure and function of a protein (p. 238-240)
* 5.4.D. Explain how mutations can be beneficial, negative, or have no impact on the organism they occur in (p. 238-240 and CLASS NOTES)
* 5.4.E. Describe errors or mutations that affect more than one gene, including nondisjunction, large scale insertions and deletions, and translocations (p. 239 and CLASS NOTES)

**5.5** **Explain how differences in gene expression can lead to difference in cellular differentiation. (p144-147)**

* 5.5.A. Explain how two cells with the same DNA can have entirely different structures and functions (p. 144-145)
* 5.5.B Define stem cells and explain the differences between adult and embryonic stem cells (p. 145-147)

**5.6 Explain how restriction maps are generated and how they can be used as a tool in molecular biology (p. 248-251, 256-258)**

* 5.6.A. Explain how restrictions enzymes work and what they do to the DNA they are exposed to (p. 249-250)
* 5.6.B. Explain the principles of gel electrophoresis including why different bands travel different lengths of a gel and how it can be used with restriction enzymes to identify unique segments of DNA (p. 250-251)
* 5.6.C. Define DNA fingerprinting and explain how it can be used with restriction enzymes an gel electrophoresis to identify individuals (p. 251, 256-258)

**5.7 Explain the principles and importance of the polymerase chain reaction (PCR) (p. 253-255)**

* 5.7.A. Explain the importance of PCR to molecular biology (p. 253)
* 5.7.B. Describe the three steps of PCR and how they can lead to the generation of many new DNA strands in very little time (p. 254-255)

**5.8 Explain how an entire animal can be cloned (p. 259 and CLASS NOTES)**

**5.9 Explain how bacteria have been engineered to carry certain genes. (p. 260-263)**

* 5.9.A. Define genetic engineering and recombinant DNA technology (p. 260)
* 5.9.B. Explain plasmids, restriction enzymes and ligase can be used to introduce a piece of DNA into a bacterial cell. (p260-261 and CLASS NOTES)
* 5.9.C. Provide examples of how genetic engineering has been used to benefit humans. (p. 261-263)
* 5.9.D Explain common concerns about the use of genetic engineering and the organisms it produces. (p. 263)

**5.10 Explain the importance of the human genome project (p. 264-265)**

* + 5.10.A. Define genomics (p. 264)
  + 5.10.B. Describe the two main goals of the human genome project and which of these goals we are working on today (P. 264-265)

**Scientific Skills Learning Targets**

*These are skills that are used repeatedly through all units and do not correspond to any one particular unit.*

**\_\_\_\_ SS.1 Identify the following parts of a scientific article, and explain the purpose of each section (title, abstract, introduction, materials, methods, results/calculations, discussion/conclusion, acknowledgements, citations/references).**

**\_\_\_\_ SS.2 Examine data from a scientific article to learn more about biological concepts.**

\_\_\_\_ **SS.3 Use a database to find scientific articles about various topics.**

\_\_\_\_ **SS.4 Write a scientific article about lab work with the appropriate sections and information.**

\_\_\_\_ **SS.5 Use a microscope safely and appropriately in the classroom.**

**\_\_\_\_ SS.6 Use a spreadsheet program (such as Excel or Google Sheets) to perform basic calculations and generate an accurate representation of data in both tables and graphs.**

\_\_\_\_**SS.7 Use APA citations to reference the work of other authors**

**\_\_\_\_SS.8 Identify primary and summary research articles, explain the different purposes for these types of articles, and read these articles for understanding**