Molecular Genetics, Expression & Specialization HW Test Date: _____
Textbook Chapters: 16-18, 20
Open Stax Chapters: 14-17
https://openstax.org/books/biology-ap-courses/pages/14-introduction

Lesson 1: Nucleic Acids and Protein Synthesis

Read through 14.1 & 14.2 in the Open Stax textbook
https://openstax.org/books/biology-ap-courses/pages/14-1-historical-basis-of-modern-understanding for a historical perspective on DNA structure and function.

Work through the problem set at:
http://biology.arizona.edu/molecular_bio/problem_sets/nucleic_acids/nucleic_acids_1.html As
you do, use the tutorials on the site and your book/online to answer the following:

1. What evidence supports the idea that DNA is the genetic material of cells?

2. Describe how scientists know that each strand of the DNA molecule serves as a
   template for the other strand.

3. Draw or describe a replication fork with directions of replication indicated. What's the
   difference between the leading and lagging strands?

4. What is the complementary base-pairing rule for DNA? For RNA?

5. How does the length of the mRNA (in codons) relate to the number of amino acids in the
   resultant protein? Explain your answer.

6. Describe, step-by-step, how you use a codon chart to determine the sequence of an
   amino acid, if you're given a DNA sequence.

7. Compare and contrast replication and transcription.

8. What cellular machinery is needed for translation? Describe, step-by-step, how each
   piece of machinery is used in the process of translation.

9. Use the Open Stax Chapters 15.2 & 15.3
   https://openstax.org/books/biology-ap-courses/pages/15-2-prokaryotic-transcription

   Compare and Contrast Prokaryotic and Eukaryotic Transcription.

Lesson 2: Eukaryotic Gene Expression

Work through the problem set at:
http://biology.arizona.edu/molecular_bio/problem_sets/mol_genetics_of_eukaryotes/eukaryotes.html
As you do, use the provided tutorials and your book to answer the following:

1. What kinds of modifications are done to a mRNA transcript before it leaves the nucleus?

2. What are the differences between prokaryote and eukaryote gene expression?

3. Define "ribozyme" and describe its purpose.

4. Distinguish between introns and exons. Which code for a protein?

5. Describe how snRNPs accomplish splicing.

6. Define "promoter" and describe how eukaryotic and prokaryotic promoters are different.

7. The "Central Dogma" of Biology describes the flow of information in Biological molecules. Describe that flow of information.

Lesson 3: Biotechnology & RFLP Analysis

Visit Open Stax textbook and read online about different technologies in Ch. 17.1
https://openstax.org/books/biology-ap-courses/pages/17-1-biotechnology

Work through the Blackett Family DNA Activity at:
http://biology.arizona.edu/human_bio/activities/blackett/introduction.html As you do, answer the following:

1. What does RFLP stand for? What is it used for? How does gel electrophoresis help us to read an RFLP?

2. Where would you find long and short bands on an autorad? Why?

3. What do you see on an autorad for individuals related to one another? What do you see if they're not related to one another?

4. Why is a control used? What does it tell the analyst?

5. What's the purpose of a size ladder? Why load them between lanes of individuals you're analyzing?

Lesson 4: Recombinant DNA

Work through problems **1-6** in the problem set at
http://biology.arizona.edu/molecular_bio/problem_sets/Recombinant_DNA_Technology/recombinant_dna.html As you do, use your book and the tutorials provided to answer the following:
1. What are RNA primers used for?

2. What are the steps to creating recombinant DNA?

3. How do RFLP, Southern Blotting, and recombinant DNA relate to one another?

4. Describe step-by-step how transformation of bacteria works.

5. What is the purpose of a gene like the "X-gal" gene?

Lesson 5: AP Progress Check
Log in to your AP Classroom account and complete the Unit 6 Progress Check: MCQ (Note: This assignment will not open for you until 2 class days before the Unit test)