

# Unit 3 Review

## Molecular Genetics

### CHAPTER 5:

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#### **Section 5.1: DNA Structure and Organization in the Cell**

- What are the four nitrogenous bases?
- Which nitrogenous base base-pair with one another? How many hydrogen bonds form between each of them?
- Describe the 3-D structure of the DNA using the following key words: base-pair, hydrogen bonds, phosphodiester bond, 5' and 3' end, sugar, phosphate, nitrogenous base, double helix

#### **Section 5.2: DNA Replication**

- Explain the difference between the dispersive, conservative and semi-conservative model of replication.
- Explain the process of each phase of replication; *initiation, elongation, termination*
- What are the roles of the following proteins in the process of replication: helicase, SSB proteins, topoisomerase II, DNA polymerase III, Primase, DNA ligase
- Compare and contrast the replication of the leading and lagging strand.

### CHAPTER 6:

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#### **Section 6.1: The Transfer of Information from DNA**

- What is meant by the term “one gene/one protein” hypothesis?
- What is the difference between RNA and DNA?
- Define a codon and its three main characteristics.

#### **Section 6.2: Transcription: Synthesizing RNA from DNA**

- Explain the process of each phase of transcription: Initiation, elongation and termination
- Compare and contrast the sense and antisense strand.
- What is the role of RNA polymerase and what direction does it travel in?
- What are the three modifications of eukaryotic mRNA? Why are these modifications required?

#### **Section 6.3: Translation: Synthesizing Proteins from mRNA**

- What is the role of tRNA aminoacyl-tRNA synthetase in the process of translation?
- Describe the structure of tRNA and how its structure enables it to perform its function.
- Explain the process of each phase of translation: Initiation, elongation and termination
- Where does tRNA bind during initiation? During elongation?
- Define the following mutations: point mutation, frameshift mutation, silent mutation, missense mutation and nonsense mutation. What are each of their effects on the final polypeptide chain?

#### **Section 6.4: Regulation of Gene Expression**

- Compare and contrast the lac and trp Operon.
- What are the main components of an Operon?

## CHAPTER 7:

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### **Section 7.1: Techniques for Producing and Analyzing DNA**

- How do restriction enzymes enable a DNA fragment to bind to a bacterial plasmid?
- What genes are found in a plasmid and do these genes enable scientists to determine if transformation has occurred?
- What is PCR and what is it used for? What does this technology require in order for it to work efficiently?
- What is Gel Electrophoresis? Describe each step involved in the process? Describe how each component of the apparatus enables the DNA fragments to travel through the gel.
- Describe the process of sanger sequencing? What are ddNTPs and why are they important to use in this technology?

***\*\*For further practice answering Thinking/Inquiry and Application questions, consult the questions at the end of each chapter in the textbook.***