Life Sciences 11

LG 4/5

DNA, Replication, Transcription & Translation

DNA is the molecule that stores all of the instructions needed for life. These instructions are written in a code made of four bases, and they guide the growth, development, and functioning of every organism. To ensure cells can divide and pass on the same information, DNA must first be **replicated**, or copied. Once copied, specific sections of DNA can be used in a process called **transcription**, where the information in DNA is rewritten into messenger RNA (mRNA). The mRNA then leaves the nucleus and is read by ribosomes in a process called **translation**, which builds proteins. These proteins carry out most of the work in cells and determine an organism's traits. Together, replication, transcription, and translation show how genetic information flows from DNA to proteins. What did one strand of DNA say to the other? *"Stop copying me!"*

https://www.thssscience.com/resources/Biology%20Miller%20Lavine%20Chapter%207.pdf

LG 4/5: DNA & Replication Instructions - Use your Miller/Levine Textbook **and read pages 137-145** on DNA and then complete the following questions:

1. **1. Section Review Questions**
   Complete questions **#1–6** from the Section Review on **page 145**.

2. **2. DNA Structure (Figure 7-10, page 143)**
   Draw and label **Figure 7-10** (the diagram showing how DNA is held together by base pairs). On your drawing, make sure to:
   a. Label the **four nucleotides** (A, T, G, C).
   b. Identify which **two bases are purines** and which **two are pyrimidines**.
   c. Compare the number of **hydrogen bonds** between **A–T** vs **G–C**.
   d. Name the **sugar** in DNA.
   e. Explain the difference between the **sugars** in the left strand of DNA and the right strand.
   f. Explain why A, T, G, and C are called **nitrogenous bases**.
   g. Describe why DNA is shaped like a **double helix**.

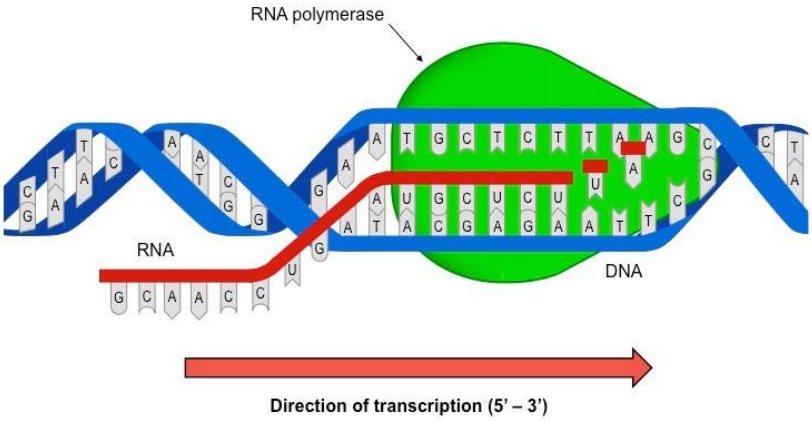
3. **3. DNA Replication (Figure 7-11, page 144)**
   Draw and label **Figure 7-11**. Below your drawing, write a detailed explanation of **DNA replication** (researched using online resources), including:
   a) The role of **DNA polymerase**
   b) The role of **helicase**
   c) The role of **ligase**
   d) The role of **Okazaki fragments**
   e) Be sure to explain **why replication happens only in the 5' → 3' direction**.

https://www.thssscience.com/resources/Biology%20Miller%20Lavine%20Chapter%207.pdf

LG 4/5: Transcription & Translation Instructions - In your textbook to **Read pages #146 – 148**

4. **Answer #1-4** of the section review **on page 148.**

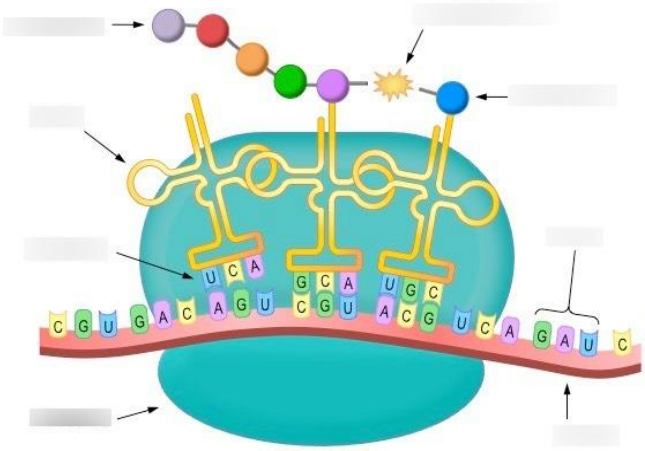
5. **Explain the diagram below.** In your explanation, make sure to:
   a) Describe the role of **RNA polymerase** in the process.
   b) Explain what the letter **U** represents.
   c) State whether **U (uracil)** is a **purine** or a **pyrimidine**.
   d) Identify which base uracil pairs with and explain **why**.



6. **Reading and Review Questions:** Read pages **148–153** from the textbook. Complete questions **#1–7** from the Section Review **on page 153**.

7. **Research Task:** Use reliable online resources to research which **enzymes are responsible for attaching amino acids to tRNA**.

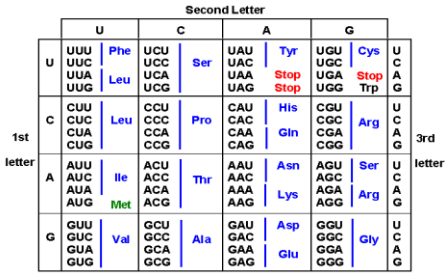
8. **Diagram Practice:** Label the diagram below. Use pages **152–153** in your textbook to guide you.



9. **Answer** all multiple-choice and true/false questions on page 156 of your textbook.

10. **Complete** questions #**1 & #3** in the *Critical and Creative Thinking* section **on page 157**.

USE THE GENTEIC CODE TABLE BELOW TO ANSWER THE NEXT SET OF QUESTIONS:



1st letter	Second Letter: U	Second Letter: C	Second Letter: A	Second Letter: G	3rd letter
U	UUU Phe, UUC Phe, UUA Leu, UUG Leu	UCU Ser, UCC Ser, UCA Ser, UCG Ser	UAU Tyr, UAC Tyr, UAA Stop, UAG Stop	UGU Cys, UGC Cys, UGA Stop, UGG Trp	U C A G
C	CUU Leu, CUC Leu, CUA Leu, CUG Leu	CCU Pro, CCC Pro, CCA Pro, CCG Pro	CAU His, CAC His, CAA Gln, CAG Gln	CGU Arg, CGC Arg, CGA Arg, CGG Arg	U C A G
A	AUU Ile, AUC Ile, AUA Ile, AUG Met	ACU Thr, ACC Thr, ACA Thr, ACG Thr	AAU Asn, AAC Asn, AAA Lys, AAG Lys	AGU Ser, AGC Ser, AGA Arg, AGG Arg	U C A G
G	GUU Val, GUC Val, GUA Val, GUG Val	GCU Ala, GCC Ala, GCA Ala, GCG Ala	GAU Asp, GAC Asp, GAA Glu, GAG Glu	GGU Gly, GGC Gly, GGA Gly, GGG Gly	U C A G

11. Using the genetic code table above, determine the amino acid sequence for the following mRNA transcript. Be sure to include the corresponding tRNA anticodons.
mRNA transcript: A U G G U A G C A A A A C A G U G A

12. Explain how to determine the protein (amino acid sequence) from the following DNA gene. Show both **transcription** and **translation** steps.
DNA gene: T A C T A T T C A T T A C C C G G A A T T

13. Consider the DNA gene below and answer the questions that follow:
DNA gene: T A C C C C G G G G C T A T A G G C A T T A G C T A T

a) How many codons are in this gene? _____
b) Identify the stop codon. _____
c) Once the stop codon is located, how many amino acids will this gene code for?
_____
d) Write the mRNA codons produced from transcription underneath the DNA sequence.
e) Write the corresponding amino acids produced from translation beneath your mRNA codons.
f) Suppose a deletion occurs at the 3rd base. Explain how this would affect the protein after translation, and show the new amino acid sequence compared to the original.