

ACTIVITY 3

CENTRAL DOGMA OF MOLECULAR BIOLOGY

Directions: Read and analyze the instructions below to answer the essential questions.

1. Given the DNA **non-template** strand below, write out the sequence of the **template** strand. Then fill in the mRNA and the resultant protein that would come from this gene. Remember to label the ends of your sequences.

DNA **non-template** strand:

5'-T A T G C T G A T G C G T A C C T G T T G A C G C-3'

DNA **template** strand:

mRNA:

Polypeptide:

2. Rewrite below the sequence of the DNA **template** strand that you worked out in problem 1, **changing the sequence near the middle from TACGCA to TACGTA**. Remember to label the ends of all sequences in the answers below.

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- a. What type of DNA change occurred in this example? _____
- b. Transcribe this new gene sequence in the same way you did in problem 1.

mRNA:

- c. Translate the mRNA into a polypeptide and write the polypeptide sequence here:

- d. How is the amino acid sequence different from the original sequence in problem 1? Be very specific about what is different.

3. The original DNA **non-template** strand from problem 1 is reproduced below:
5'-T A T G C T G A T G C G T A C C T G T T G A C G C-3'

Write the sequence of the **template** strand, **this time adding the base G between TAC and GCA so it now reads TACGGCA**. Remember to label the ends of all sequences.

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- a. What type of DNA change occurred in this example? _____
- b. Transcribe this new gene sequence in the same way you did in problem 1.

mRNA:

- c. Translate the mRNA into a polypeptide and write the polypeptide sequence here:

- d. How is the amino acid sequence different from the original sequence in problem 1?
Be very specific about what is different.

- e. Which do you think would be worse for the cell, the mutation in problem 2 or the mutation in problem 3? Why?

4. Which would probably be worse: a single nucleotide change in the **promoter** of a gene or a single nucleotide change in the **first AUG codon** in the gene? Why?

5. The error rate for DNA polymerases is about one error per 10 million bases. The error rate for RNA polymerase is much higher—about one error per 10 thousand bases. Why do you think cells can get away with having a higher error rate in RNA polymerases compared to DNA polymerases?
6. Erythromycin (made by a strain of *Streptomyces*) is an antibiotic that binds to the large ribosomal subunit of some prokaryotic ribosomes. Studies indicate that erythromycin prevents translation through 2 different mechanisms: (1) causes premature dissociation of polypeptide-tRNA complex from ribosome and (2) prevents movement of ribosome along mRNA. Indicate whether each mechanism affects initiation, elongation, or termination of translation. Speculate about which might be worse for the cell; explain your reasoning.

<i>mechanism</i>	<i>Initiation?</i>	<i>Elongation?</i>	<i>Termination?</i>
1			
2			

Source: <https://studylib.net/doc/25243058/central-dogma-worksheet>