

Student Name:

Gene Expression Essentials Online Lab

Instructions: Please answer the following questions in complete sentences.

Part One:

1. What purpose does the regulatory portion of the gene have?
2. In this simulation, the DNA molecule's different strands are represented as different colors (one blue and one red). What is the significance of the two different strands? Are they both used in transcription?
3. There are two required components to initiate transcription on the gene. What are they, and where do they bind on the DNA strand?
4. How would you know if transcription has been successful?
5. How do negative transcription factors impact transcription?

Part Two:

1. Explain the difference in transcription between Gene 1 and Gene 2. Hypothesize the reason for the difference.

2. The ribosome is crucial in the process of translation, as it is the site of protein synthesis. What RNA molecule is NOT being shown here that is vital to the process of translation? What does it bring to the ribosome?
3. If we infer Genes 1 and 2 came from the same chromosome (DNA strand), why are the proteins they created different?
4. Animals are multicellular organisms, meaning they are made up of more than one kind of cell. For example, humans have skin, muscle, bone, and nerve cells (just to name a few). While these cells all have the same DNA, their functions are different. How is this related to gene expression?
5. Does the order of the DNA bases matter for translation? Why or why not?

Part Three:

1. Which factor(s) and amounts MAXIMIZE the rate of transcription? Why would this be important for scientists researching certain protein-related diseases?
2. In what situations would overproduction of proteins be advantageous? In what ways would it be problematic?

3. How does RNA polymerase “know” when to stop and release the mRNA molecule?

4. Let’s say Gene 1 produces a mutated version of the CFTR gene (the one that causes cystic fibrosis), and you are a geneticist studying ways to prevent this protein from forming. Based on the simulation, what molecule do you think would be MOST useful to investigate and why?

5. Mutations, spontaneous changes in the genetic sequence, can occur anywhere along the process of transcription and translation. If a mutation occurred that altered positive transcription factors, how could that impact the organism?