**Protein Synthesis Review and Mutation Activity**

Using your phone, log in to: <http://concord.org/stem-resources/mutations>  
Then, click the button that says "Launch"

*Part 1: Transcription*  
Review the process of transcription by clicking on the button that says "Transcribe." The simulation will stop when it gets to a stop sequence. After you have watched the transcription of the gene...

1. Describe what happens in transcription in your own words?  
2. Even though it's not shown, what is responsible for transcription?  
3. The purpose of transcription is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  
4. How many sides of the DNA are transcribed?

*Part 2: Translation*  
Review the process of translation by clicking on the button that says "Translate."

1. To what part of the cell does the mRNA move for translation? From where?  
2. What molecules bring the amino acids? How are these specific to the amino acid?  
3. When amino acids are brought in, what happens to them?  
4. What is the end product of Translation?  
*5.* Write the amino acid sequence of the final product. *Notice how they attract/repel and behave due to the folding nature of a protein?!*

*Part 3: Mutation*  
Hit the reset button on the animation.

Mutation 1: *Point (Substitution) mutation*  
In the 3rd codon, change the final C to a T by clicking on it and selecting substitution C-->T. In the 4th codon, change the first letter to an A. Then hit "Translate."

1. Write the sequence of the amino acids in the final product. How is it different from the original product?  
2. Based on what you have seen, define, in your own words, Substitution mutation.  
3. Are the effects of a substitution mutation confined or do they spread to the whole protein? Explain your answer.

Mutation 2: *Deletion mutation*  
Hit reset on the animation and click on the final C in the 3rd codon again. This time, delete it. Hit translate.

1. Write the sequence of the amino acids in the final product. How is it different from the original product?  
2. Based on what you've seen, define, in your own words, deletion mutation.  
3. Are the effects of a deletion mutation confined or do they spread to the whole protein? Explain your answer.

Mutation 3: *Insertion mutation*  
1. Write the sequence of the amino acids in the final product. How is it different from the original product?  
2. Based on what you've seen, define, in your own words, insertion mutation.  
3. Are the effects of an insertion mutation confined or do they spread to the whole protein? Explain your answer.

Analysis:

Feel free to keep playing with the animations by resetting and introducing mutations into the DNA molecule so that you get a better understanding of the effects of mutations. When you're ready, answer the following:

1. What's worse, a substitution, deletion, or insertion mutation? Explain why you think so.  
2. Deletions and insertions are grouped together into a category called "Frameshift Mutations." Why would they be grouped together?  
3. Look at the codon chart that you used to find amino acid sequences last week. is it possible to have a substitution mutation that has no impact on the resulting protein? Explain your answer. \*hint\* Codon Redundancy