From DNA to Protein
Teaching Module Student Worksheet

Jessica has been working tirelessly in the lab to determine what proteins are the most important for Francis Richmond middle school 7th graders. She has found DNA which corresponds to pieces of 3 VERY important proteins. Use your DNA to Protein Kits to help her determine what protein pieces they are!

1. First let’s identify our pieces!

Please draw one of each of the following:

DNA nucleotide: RNA nucleotide:

tRNA: Amino Acid:

2. Now let’s get started!

   a) Use your nucleotides to first **transcribe** the sequence you are given from DNA to RNA. Transcribe means matching the DNA message with an RNA message, to do this match RNA nucleotides to the DNA sequence you are given.

   DNA sequence: ACACGATTCCCTC

   Write your RNA sequence: __________________________________________________________

   b) Next use the appropriate tRNA’s to **translate** your message to an amino acid sequence. Translating means changing from the RNA language (nucleotides) to the language of a protein (amino acids). With your materials match every 3 RNA nucleotides to a tRNA.

   Record your amino acid sequence: __________________________________________________
3. Here is another one for you. Do exactly the same thing as you did in number 2!

   DNA sequence: TGGCAA
   Write your RNA sequence: ____________________________________________________
   Record your amino acid sequence: ____________________________________________

4. You know the drill!
   DNA sequence: ACCGATGGCTGCA
   Write your RNA sequence: ____________________________________________________
   Record your amino acid sequence: ____________________________________________

Extension: If you finish transcribing and translating here is another challenge for you. Use the amino acids you have to make up new protein (they should be real words!) Once you have come up with your own, work backwards and tell me what the DNA sequence of that protein would be. See how many you can come up with!

5. Oh No! There has been a mistake. One of your very important proteins has been mutated! The piece of DNA that originally coded for the sequence of CAKE now codes for RAKE. You need to help fix it so you can get your CAKE back an you don’t have to RAKE the leaves! Work backwards to identify the DNA sequence of the mutant protein, and then determine how to fix it.
a) Write the RAKE RNA sequence ________________________________

b) Write the RAKE DNA sequence ________________________________

c) What needs to be changed to fix this mutation?

6. The pathway in which the message found in DNA is eventually passed to the message found in a protein is called The Central Dogma. Please draw a sketch of this pathway and then describe it in your own words. (You may want to draw things as they appear in the DNA the Protein kits I made for you).

Extensions:

A different kind of mutation that can affect a protein is called an Indel. Indel is short for insertion or deletion. This type of mutation occurs when either an extra nucleotide is inserted into the DNA sequence or a nucleotide that is in the sequence is deleted. What sort of effect would an INDEL mutation have on a protein?
CAKE changing to RAKE is just one small example of how mutations in a single nucleotide can have a big impact on proteins (and therefore 7th graders who want cake!) Many human diseases are caused by similar changes in our DNA. Use the internet to find the names of a few diseases that are caused by these types of single nucleotide changes. (Hint: single nucleotide changes are often also called *point mutations*)