**Concord Consortium: How Do Cells Make Proteins?**

<https://authoring.concord.org/activities/22?show_index=true>

***Page 1: How do cells make proteins?***

Proteins carry out the work of the cell. Your body contains tens of thousands of different types of proteins, each with their own specific job to do. Each protein is coded for in the DNA. But you don't have enough different strands of DNA for each DNA strand to code for a single protein. You have 23 pairs of chromosomes, each one a single strand of DNA.

***Page 2: Transcription***

It takes three nucleotides (called a triplet) to code for each amino acid of a protein. There are 20 different amino acids that make up the proteins in your body.

Complete and describe the Simulation:

1. Which RNA nucleotide binds with adenine (A) on the DNA?

2. Why is an mRNA copy made of the DNA?

***Page 3: Translation***

After transcription, there is an mRNA copy of the DNA. The mRNA leaves the nucleus and goes out to the cytoplasm, where it joins up with a ribosome.

Complete and describe the simulation:

3. How does the tRNA-mRNA interaction ensure that the amino acids are added in the correct order?

4. One triplet (codon) of mRNA is GCC. What is the nucleotide sequence for the complementary tRNA?

***Page 4: Protein Folding***

Proteins can't do their jobs in the cell until they fold into the correct shapes. Different proteins have different shapes, depending on their function in the cell.

Some of them are hydrophilic (interact with water), and some are hydrophobic (don't interact with water). These properties are important in determining how a protein folds.

Complete and describe the simulation:

5. The cell is an aqueous environment. Describe the locations of hydrophobic and hydrophilic amino acids in a protein that folds within the cytoplasm of the cell.

***Page 5: When mistakes happen***

Complete and describe the simulation

6. Describe the types of effects a DNA mutation could have on the protein.

7. A particular mutation causes a protein to fold "inside out." Describe what type of mutation might cause a protein to fold "backwards."