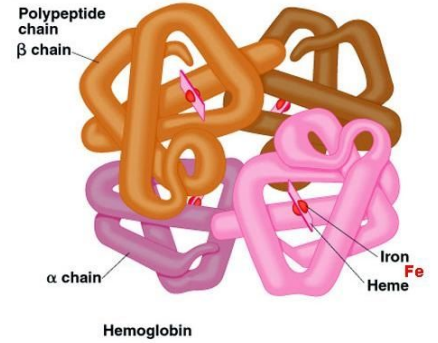


Name: _____

Investigation: DNA, Proteins, and Sickle Cell

Sickle cell is a disease where a person has abnormally shaped blood cells. The reason for the abnormal shape of blood lies in the underlying genetic code.

The sequence below shows a part of the genetic code for the **HBB Gene**. This gene provides the instructions for making a protein called beta-globin. The gene sequence is shown below. Use the sequence to create RNA and the sequence of amino acids.

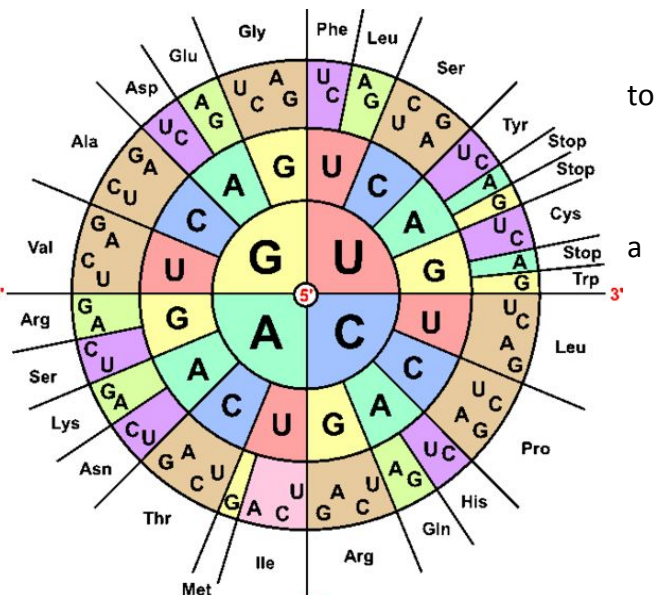


DNA of HbA - hemoglobin in normal adults							
DNA 3'to 5'	CAC	GTG	GAC	TGA	GGA	CTT	CTC
RNA							
Amino Acid							

Each amino acid in the chain joins together and then folds into a three dimensional shape - a PROTEIN. In most people, that protein is fully functional and results in blood cells that have a round shape and can bind with oxygen efficiently. What would happen if one small change occurs?

DNA of HbS - hemoglobin found in individuals with sickle cell anemia							
DNA	CAC	GTG	GAC	TGA	GGA	CAT	CTC
RNA							
Amino Acid							

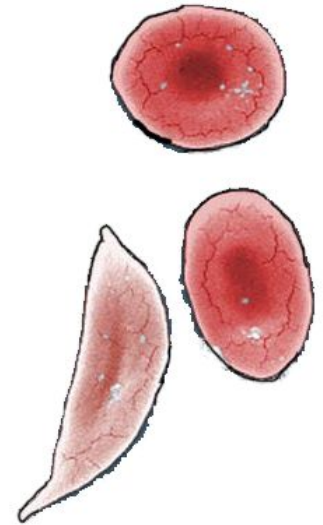
The change in the sequence of HbS causes the blood cells be shaped like sausages, rather than round. These cells cannot bind oxygen as efficiently and become clogged in tiny capillaries. The result is a person who is **ANEMIC**, or has low amounts of oxygen in their blood, which will make person feel tired. The abnormal cells can become clumped together causing blood clots, which may damage tissue or even lead to a stroke. People with sickle cell anemia may also experience pain in their joints.



SYNTHESIS: Answer each of the following using complete sentences.

1. What is the relationship between DNA, codons, and proteins?

2. How does the shape of a protein relate to its function? Refer to specific details about this case and sickle cell anemia.



3. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. ([HS-LS1-1](#))

Fill in the blanks:

DNA is composed of sugar, phosphate and four _____ (A, T, G, C). During transcription, DNA is made into a molecule of _____ which will travel to the _____ in the cytoplasm, Here, three bases, called a _____ will determine what _____ acid is added to the chain. This chain will fold into a _____.

This shape of this molecule determines how it functions.

Changes in the DNA code are called _____ and they can cause a protein to not function properly. A single change in the DNA of the hemoglobin gene will cause _____ cell anemia.

