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| --- | --- | --- | --- | --- | --- |
| Name: | **[insert name]** | Period: | **[insert Period]** | Date: | **[insert date]** |

A Closer Look at Hemoglobin

# Background

Your research has determined that sickle cell hemoglobin differs from normal hemoglobin in the net negative charge on the proteins. This discovery is an important one; it identifies a characteristic that can be used to diagnose sickle cell anemia. However, it does not tell us what causes sickle cell anemia or why the proteins are different.

Advances in molecular biology and our understanding of DNA in the past two decades have provided us with more insights into the cause of sickle cell anemia. See if you can use the following data obtained from research in molecular biology to uncover more information about sickle cell anemia.

##

## Analyzing Normal Hemoglobin

### *Transcription*

Use Document 1 of the Reference Sheet to complete the first question.

|  |  |
| --- | --- |
| **Question/Prompt** | **Your Response** |
| 1. Transcribe the DNA sequence for the first 7 amino acids of a NORMAL hemoglobin gene. Write the mRNA sequence to the right.
 | **[Answers are intentionally BLUE]** |

### Translation

1. Translate the mRNA sequence into its corresponding amino acids. Use the chart of mRNA codons from Document 2 of the Reference Sheet. Write each amino acid in a box below.
2. Record the charge of each amino acid in the second row. Use Document 3 of the Reference Sheet to find the charge information.

|  |  |
| --- | --- |
|  | **Amino Acid Sequence for NORMAL Hemoglobin** |
| 2. Amino acid abbreviation | **[Ex. Glu]** |  |  |  |  |  |  |
| 3. Charge |  |  |  |  |  |  |  |

##

## Analyzing Sickle Hemoglobin

### Transcription

Use Document 1 of the Reference Sheet to complete the fourth question.

|  |  |
| --- | --- |
| **Question/Prompt** | **Your Response** |
| 1. Transcribe the DNA sequence for the first 7 amino acids of a SICKLE hemoglobin gene. Write the mRNA sequence to the right.
 | **[Answers are intentionally BLUE]** |

### Translation

1. Translate the mRNA sequence into its corresponding amino acids. Use the chart of mRNA codons from Document 2 of the Reference Sheet. Write each amino acid in a box below.
2. Record the charge of each amino acid in the second row. Use Document 3 of the Reference Sheet to find the charge information

|  |  |
| --- | --- |
|  | **Amino Acid Sequence for SICKLE Hemoglobin** |
| 5. Amino acid abbreviation | **[Ex. Glu]** |  |  |  |  |  |  |
| 6. Charge |  |  |  |  |  |  |  |

## Drawing conclusions

Answer the following questions.

|  |  |
| --- | --- |
| **Question/Prompt** | **Your Response** |
| 1. Do the sequences for normal and sickle hemoglobin differ? If so, how?
 | **[Answers are intentionally BLUE]** |
| 1. How do you think the differences affect protein function?
 |  |