# Lab 6: Gene Expression and Inheritance Lab Response Form

## Name and Course Section:

## Part 1: Research About Sickle Cell Anemia

1. What is sickle cell anemia?
2. What are the common symptoms of the disorder?
3. What protein in the **red blood cell** is affected by the disorder?
4. What is the function of the protein?

## Part 2: Phenotype of the Red Blood Cells

1. **Table 6.1. Compare and contrast the phenotypes of the blood smears.**

|  |  |  |
| --- | --- | --- |
|  | Blood smear of person without sickle cell anemia | Blood smear of your patient |
| Drawing of image underneath the compound microscope at high power (40x) | A black background with a black square  AI-generated content may be incorrect. | A black background with a black square  AI-generated content may be incorrect. |
| What are the shapes of the cells? |  |  |
| Are the red blood cells evenly distributed or clumped together in the blood smears? |  |  |

1. After examining the blood smears, hypothesize how the phenotype of the sickled blood cells contributes to the symptoms of the disorder (as listed in question 2).

## Part 3: Gene Expression of the Sickled Red Blood Cell Phenotype

1. Which molecular process does the partial hemoglobin gene (**Table 6.2**) go through first? What are the steps of the process?
2. Add your labeled photo or drawing of transcription of the typical hemoglobin DNA sequence below.
3. **Table 6.3. Partial typical hemoglobin DNA sequence and complementary mRNA sequence.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DNA Sequence | CAC | CTG | ACT | CCT | GAG | GAG |
| mRNA Sequence |  |  |  |  |  |  |

1. Which molecular process does the partial hemoglobin mRNA sequence (**Table 6.3**) go through next? What are the steps of the process?
2. Add your labeled photo or drawing of translation of the typical hemoglobin DNA sequence below.
3. **Table 6.4. Partial typical hemoglobin DNA sequence, complementary mRNA sequence, and amino acid sequence.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DNA Sequence | CAC | CTG | ACT | CCT | GAG | GAG |
| mRNA Sequence |  |  |  |  |  |  |
| Amino Acid |  |  |  |  |  |  |

1. **Table 6.5. Partial DNA sequence of sickle cell.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DNA Sequence | CAC | CTG | ACT | CCT | GTG | GAG |
| mRNA Sequence |  |  |  |  |  |  |
| Amino Acid |  |  |  |  |  |  |

1. Compare and contrast the molecular sequences of the normal hemoglobin versus the sickled hemoglobin.
   1. What are the similarities?
   2. What are the differences? Write out the specific differences between the normal hemoglobin versus the sickled hemoglobin.
2. How many amino acids were affected by the mutation, resulting in the misfolding of the hemoglobin and leading to sickle cell anemia?

## Part 4: Inheritance of Sickle Cell Anemia

1. What is the genotype of the patient? HbA is the normal allele and HbS is the mutated allele.
2. If neither of the biological parents show symptoms, but your patient does, what are the possible genotypes of both parents?
3. Based on the parental genotypes above, what is the probability they would have a child with sickle cell anemia? What is the genotypic ratio? What is the phenotypic ratio? Create a **Punnett Square** to calculate the ratios.
4. If the patient decides to have child with someone that is**heterozygous** for the mutation, what are the odds that their children will live with sickle cell anemia?
5. Construct a pedigree based on your answers to questions 16 through 19. Include the following three generations: the patient, the patient’s parents, and the patient’s grandparents.

## Part 5: Treatment plan for sickle cell anemia

1. Research two different potential treatment plans, examining each at the molecular, anatomical, and physiological levels. Describe how each treatment would alleviate the patient’s symptoms and determine which of the two has a higher success rate. Be sure to cite [using Council for Science Editors (CSE) citation format] at least three reputable sources for each treatment plan to support your analysis.