

Name:

Date:

Class:

New Genes, New Proteins: Pre-Lab Worksheet

Teacher Guide / Answer Key

Teacher Guide

The following can be used as a pre-lab exercise to ensure that students understand the objectives for the activity.

	NGSS Standards
MS-LS3-1.	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
HS-LS1-1.	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-ETS1-3 .	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

	College Board AP Standards
Big Idea #3	Information Storage and Transmission (IST): Living systems store, retrieve, transmit, and respond to information essential to life processes.
Science Practice 2	The student can analyze visual representations of biological concepts and processes.
Science Practice 3	The student can determine scientific questions and methods.
Science Practice 4	The student can represent and describe data.
Science Practice 5	The student can perform statistical tests and mathematical calculations to analyze and interpret data (if you choose to run a t-test on comparing adhesive properties of the proteins).

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Instructions: After reading the procedures for our investigation, please complete the following pre-lab questions.

1. In your own words, please state the main objective of Phase 1 of the investigation.
During Phase 1, we will use a codon wheel to work backwards from a strand chain of amino acids (AA) and determine the possible mRNA and DNA strands that would code for the polypeptide.
2. In your own words, please state the objectives of Phases 2 and 3.
During Phase 2, we are going to use the AA models and a blue rope with marks on it. Our objective is to build the polypeptide designed by the synthetic biologists at Washington University. There are magnets in the AA blocks that we will use to bond the AAs together. The AAs are placed on the marks on the blue rope. In Phase 3, we are going to use the force probe to pull our models apart and see how many newtons it takes to separate all the AAs. We will repeat this at least three times so that we can get an average cohesion strength.
3. Do you expect all the lab groups' proteins built in Phase 1 to look similar?
Yes, all the models should have a similar shape because they are made from the same order of AAs.
4. What are the objectives of Phase 4?
During Phase 4, we will make our own proteins that are more cohesive than the protein developed by the synthetic biologist. We will have to determine the strand of DNA and mRNA that will code for our new protein. We will follow the same procedures as we did in Phase 3, but we will use a different rope and arrange the AA in a different structure.
5. Do you expect all the lab groups will have proteins from Phase 4 with the same confirmation?
No, they might have some similarities, but they will be different because the different groups will have a different primary level of protein structure and as a result have a different overall structure.
6. After reading the procedures, what three aspects of the lab are you most concerned with?
Answers will vary. Some examples: I am a little concerned with operating the Vernier probe correctly. I also want to make the strongest protein, but I am not sure what order of AA would be best. I also struggle with statistics, so I am not sure if I will get the t-test done correctly. I am also worried that my lab partners will lose an AA or get it in the wrong order and we will have to start over again.