



Classroom Teacher Preparation

Anatomy/Physiology 5: From Genes to Proteins

Please use the following to prepare for the next SfS lesson.

Description:

This module is a hands-on simulation of how DNA ultimately creates the proteins in our bodies. Students are provided with DNA gene sequences, which they must first transcribe into mRNA and then translate into a protein (amino acid sequence) to build a new species, called the Scimon. Time permitting, students may have the opportunity to investigate the effects of three types of mutations (insertion, deletion and substitution) on their Scimon model.

Lesson Objectives – SWBAT (“Students Will Be Able To...”):

6th-8th

- Model the steps taken to get from DNA to a protein-instructed trait
- Observe the effects that a gene mutation can cause on the ending protein-instructed traits [Elaborate]

Disciplinary Core Idea (DCI)

LS3. Heredity: Inheritance and Variation of Traits

- (6th-8th): LS3.A *Inheritance of traits* - Genes chiefly regulate a specific protein, which affect an individual's traits.
- (6th-8th): LS3.B *Variation of traits* - In sexual reproduction, each parent randomly contributes half of its offspring's genetic information, resulting in variation between parent and offspring. Genetic information can be altered because of mutations, which may results in beneficial, negative, or no change to traits of an organism. (This DCI is optional for classes with enough time to cover it.)

Science & Engineering Practice (SEP)

Developing and Using Models

- (6th-8th) Develop a model to describe unobservable mechanisms

Crosscutting Concept (CCC)

Structure and Function

- (6th-8th) Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

Preparation:

This lesson is only for students who already are familiar with DNA, its role in inheritance, its location in the cell, and its ability to produce varying alleles in a gene. This can be used as an introduction to the processes of transcription (DNA->RNA) and translation (RNA->proteins).

Room Set Up for Activities:

Students will work in pairs for this activity.



Safety:

There are no safety precautions for this lesson.

Related Modules:

This lesson may be taught as part of a sequence or group of related modules on *Heredity*. Modules include:

Anatomy/Physiology 1: DNA is Everywhere – An overview of DNA's importance as the blueprint of life is followed by an exciting DNA extraction from foods such as strawberries or peas.

Anatomy/Physiology 4: Phenotypes, Genotypes, & the Environment - This module covers dominant and recessive genes, along with complete and incomplete dominance. Through the activity, students delve more into genetic variation within a population by focusing on the genotype and phenotype of fish color.

Life Science 42: Mechanisms of Biodiversity – this module explores the mechanisms by which biodiversity (genetic variation) is created within populations. It explains the concepts of mutation, gene flow, genetic drift, and natural selection, and how these mechanisms work in different ways to create genetic variation in a population.

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state:

www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

Extend this lesson by learning about sickle cell anemia through an interactive online activity.

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

- A wonderful resource for all things DNA: <http://learn.genetics.utah.edu/content/molecules/>
- Online Virtual Lab: DNA and Genes (requires Flash):
http://mhhe.com/biosci/genbio/virtual_labs/BL_26/BL_26.html
- A website dedicated to the human genome: <https://www.yourgenome.org/facts/what-is-a-gene> (Copy & paste)
- Short, information-packed video From DNA to Protein in 3D (2:39)
<https://www.youtube.com/watch?v=gG7uCskUOrA>