Pre-Lab, Skills, and Standards Alignments

PROTEIN PURIFICATION

Students will isolate green fluorescent protein (GFP) from genetically engineered bacterial cells. Using a technique called hydrophobic interaction chromatography (HIC), GFP is then separated from cellular proteins through binding with a hydrophobic resin. Upon completion of the lab, tubes of purified GFP fluoresce bright green when exposed to UV light.

Lab Length: 2 hours

Suggested Pre-Lab Teaching

- Bacterial cell components, including plasmids
- Genetic Engineering
- Asexual reproduction
- Central Dogma (genes to proteins)

Lab Skills

- Lyse bacterial cells and isolate proteins from the cell lysate.
- Measure small volumes of liquid using micropipettes.
- Centrifuge samples to separate materials of different densities.
- Use hydrophobic interaction chromatography to separate proteins.

Conceptual Knowledge/Skills

- Explain how bacterial cells can be used to manufacture human proteins.
- Describe how GFP is used as a molecular reporter in research.

New York State Science Learning Standards/NGSS

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
Engaging in Argument from Evidence Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.	LS1.B: Growth and Development of Organisms Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (MS-LS3-2) LS3.A: Inheritance of Traits Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. (MS-LS3-1) LS3.B: Variation of Traits (NYSED)Advances in biotechnology have allowed organisms to be modified genetically. (HS-LS3-2)	Structure and Function 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. Patterns Patterns can be used to identify cause and effect relationships. Cause and Effect Cause and effect relationships may be used to predict phenomena in natural or designed systems.