

Protein Modification Visualizer Activity

NGSS High School Teacher Guide (Grades 9-12)

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Interactive Biology Education

Teacher Guide

Learning Objectives: - Students will apply glycosylation to proteins - Students will apply phosphorylation to proteins
- Students will perform protein cleavage - Students will direct proteins to membrane and lysosome destinations

Standards Alignment: - **HS-LS1-2:** Develop and use a model to illustrate the hierarchical organization of interacting systems - **HS-LS1-6:** Construct explanations based on evidence for how organelles carry out essential functions

Prerequisites: - Basic cell structure - Basic understanding of proteins

Time Estimate: 35 minutes

Materials Needed: - Computer/tablet with internet access - Student Activity Sheet

Differentiation Tips: - Focus on the five specific app functions - Use simple analogies for modifications

Teaching Notes:

Phase 1: ENGAGE (5 minutes) - Students should quickly identify the five app functions
- Expected answers: - Glycosylation, Phosphorylation, Protein cleavage, Membrane delivery, Lysosome delivery

Phase 2: EXPLORE (20 minutes) - Guide students through hands-on practice with each modification - Encourage experimentation and observation - Help students connect modifications to protein function

Answer Key:

Initial Exploration: 1. Glycosylation (adding sugar groups) 2. Phosphorylation (adding phosphate groups) 3. Protein cleavage (cutting proteins) 4. Delivering proteins to cell membrane 5. Delivering proteins to lysosomes

Mission Results: - Glycosylation: Students should observe changes in protein structure/function - Phosphorylation: Should note this can be reversed unlike other modifications - Cleavage: Should see proteins being cut into smaller pieces - Delivery: Should successfully target proteins to different cellular locations

Key Vocabulary: - **Glycosylation:** Adding sugar groups to proteins - **Phosphorylation:** Adding phosphate groups to proteins
- **Protein cleavage:** Cutting proteins - **Cell membrane:** Outer boundary of cell - **Lysosome:** Cell's recycling center