

Unit 10: Cell Biology, Molecular Biology, DNA

Big Idea:

- Knowledge of cellular structure and growth, coupled with manipulation of DNA allows for recombinant DNA technology and application

Essential Questions:

1. What is basic cell structure of pro and eukaryotic organisms?
2. How can bacteria be safely cultured in the laboratory?
3. What are basic microbiological techniques?
4. What is the structure of DNA and how does it code for traits?
5. How are restriction enzymes used in biotechnology?

Vocabulary: Prokaryote, Eukaryote, antibiotics, gram-positive, gram-negative, growth media, Petri dish, serial dilution, stem cells, molecular biology, genetics double helix, transcription, translation, recombinant DNA, restriction, enzymes, electrophoresis

NGSS Priority Standards:

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-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Common Core Math and ELA

Common Core State Standards Connections:

ELA/Literacy -

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Mathematics

MP.2 Reason abstractly and quantitatively

Unit 11: Genetic Transformation and Protein Purification

Big Idea:

- DNA can be manipulated to create transgenic organisms that make desired proteins. Desired proteins can be purified using chromatography.

Essential Questions:

1. How can the structure and function of plasmids be described?
2. How are restriction enzymes used to create designer plasmids?
3. How can a plasmid map be created and analyzed?
4. What are current uses of transgenic organisms?
5. What steps are required to transform E.coli using the pGLO plasmid?
6. How can protein structure be manipulated?
7. How can hydrophobic nature of polypeptide chains be used to purify proteins?
8. How is protein production regulated as modeled by operon functioning?

Vocabulary: E. coli, plasmid, restriction enzyme, heat shock, incubation, gene regulation, arabinose, antibiotic, ampicillin, growth media, control, buffer, protein, antibiotic resistance, insulin, protein synthesis, amino acids, chromatography

NGSS Priority Standards

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-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms

Common Core Math and ELA

Common Core State Standards Connections:

ELA/Literacy -

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Mathematics -

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

