Unit 6: Molecular Biology and Biotechnology

Content Area: **Science**
Course(s): **AP Biology**
Time Period: **Semester 2**
Length: **3 weeks**
Status: **Published**

Standards

SCI.9-12.5.1.12	All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
SCI.9-12.5.3.12	All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.
SCI.9-12.5.3.12.A	Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.
SCI.9-12.5.3.12.A.5	Describe modern applications of the regulation of cell differentiation and analyze the benefits and risks (e.g., stem cells, sex determination).
SCI.9-12.5.3.12.D	Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.
SCI.9-12.5.3.12.D.1	Explain the value and potential applications of genome projects.
SCI.9-12.5.3.12.D.2	Predict the potential impact on an organism (no impact, significant impact) given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations.
SCI.9-12.5.3.12.D.a	Genes are segments of DNA molecules located in the chromosome of each cell. DNA molecules contain information that determines a sequence of amino acids, which result in specific proteins.
SCI.9-12.5.3.12.D.b	Inserting, deleting, or substituting DNA segments can alter the genetic code. An altered gene may be passed on to every cell that develops from it. The resulting features may help, harm, or have little or no effect on the offspring's success in its environment.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.2.12.D.1	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.

College Board AP Biology Big Ideas

Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.

Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.

Enduring Understanding - College Board AP Biology

Enduring understanding 2.A: Growth, reproduction, and maintenance of the organization of living systems require free energy and matter.

Enduring understanding 2.C: Organisms use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis.

Enduring understanding 3.A: Heritable information provides for continuity of life.

Enduring Understanding 3.B. Expression of genetic information involves cellular and molecular mechanisms.

Enduring Understanding 3.C. Transfer of genetic information may produce variation.

Essential Questions

How is the information in DNA transformed into a protein?

How can the expression of a gene be regulated?

How can changes in the sequence of nucleotides change the gene product?

How can humans manipulate heritable information to produce desired characteristics?

Knowledge and Skills

Essential knowledge 3.A.1 DNA, and in some cases RNA, is the primary source of heritable information.

Essential knowledge 3.B.1 Cells can be activated, produce new products, and retain their activated state through gene regulation

Essential knowledge 3.B.2 A variety of intercellular and intracellular signal transmissions mediate gene expression.

Essential knowledge 3.C.3 Viruses reproduce and can introduce genetic variation into their hosts.

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit

Resources

AP Investigations: Bacterial Transformation; DNA fingerprinting through restriction digests and gel electrophoresis