Unit 3: Molecular Biology and Biotechnology

Content Area: **Template**
Course(s):
Time Period:
Length:
Status: **Published**

State Mandated Topics Addressed in this Unit

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N/A	N/A

Unit 3: Molecular Biology and Biotechnology

Learning Objectives

- Define codon and anticodon and describe the function of mRNA, tRNA, in translation
- Define genomics and proteomics
- Define whole genome sequencing
- Describe how eukaryotic mRNA is processed
- Describe the mechanisms of DNA repair
- Describe the structure of DNA
- Describe uses of biotechnology in medicine and agriculture
- Discuss ethical issues involving the application of biotechnology
- Explain different applications of genomics and proteomics
- Explain molecular and reproductive cloning
- Explain the basic techniques used to manipulate genetic material
- Explain the central dogma
- Explain the importance of telomerase to DNA replication
- Explain the main steps of transcription
- Explain the process of DNA Replication

Essential Skills

- Apply genetics understandings to analyze, support and/or critique current and emerging biotechnologies
- Explain how sexually produced offspring are never identical to either of their parents
- Explain how the many cells in an individual can be very different from one another, even though they

are all descended from a single cell and thus have essentially identical genetic instructions

- Explain the process where an egg and sperm unite to begin the development of a new individual, and how that new individual receives genetic information from its parents
- Identify emerging biotechnology that shows promise in preventing and treating disease
- Present evidence that supports the concept that complex multicellular organisms are formed as a highly organized arrangement of differentiated cells
- Recognize that certain chemicals, pathogens, and high-energy radiation can seriously impair normal cell functions and the health of the organism
- Relate the specialization of cells in multicellular organisms to the different patterns of gene expression rather than to differences of the genes themselves
- Trace the general process where the progeny from a single cell form an embryo in which the cells multiply and differentiate to form the many specialized cells, tissues and organs that comprise the final organism
- Understand how new heritable characteristics can result from new combinations of existing genes in reproductive cells

Standards

9-12.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.
9-12.HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
9-12.HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Instructional Tasks/Activities

- “The Quest Resumes”: Article on Stem Cell Research from Time Magazine. Read, summarize, reflect and predict about Stem Cell Research and technology.
- Essays and Application Question practice in groups
- Gel Electrophoresis Lab: Students separate and sort DNA fragments
- Group presentations of different epigenetic gene controls
- Model an Operon
- Nova’s “Ghost in your Genes” video
- Reading DNA Fingerprints Activity: Students analyze
- Review Game
- Vocabulary
- Watch and review Videos

Assessment Procedure

- Chapter Tests
- Classroom Total Participation Technique
- Classwork
- DBQ
- Essay
- Exit Ticket/Entrance Ticket/Do Now
- Homework questions
- Journal / Student Reflection
- Kahoot
- Laboratory Quizzes
- Other named in lesson
- Peer Review
- Performance
- Problem Correction
- Project
- Quiz
- Quiz on biotechnology
- Quiz on molecular biology
- Quiz on vocabulary
- Rubric
- Teacher Collected Data
- Test
- Worksheet

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Chromebook
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Forms
- Google Slides
- Kahoot

- MagicSchool AI
- Other- Specified in Lesson
- Quiziz
- Screencastify

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Gifted and Talented

- Compare & Contrast
- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- extended time
- large print
- modified quiz
- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson
- provide assistance and cues for transitions

- provide daily assignment list
- read class materials orally
- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group
- modify student schedule (Describe)
- other- please specify in plans
- provide desktop list/formula

Honors Modifications

Resources

- Resource 1
- Resource 2
- Resource 3
- Resource 4
- Resource 5