Unit 2: Cell Division and Genetics

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 2: Cell Division and Genetics

Essential Skills

- Define genome, haploid, diploid, gamete, homologous chromosome, gene, locus
- Describe the process of binary fission in prokaryotes
- Describe the process of cytokinesis
- Describe the process of meiosis
- Describe the process of mitosis
- Describe the three stages of interphase
- Discuss the importance of G1, G2, and metaphase checkpoints
- Discuss the involvement of proto-oncogenes and tumor suppressor genes in caner formation
- Discuss various types of chromosome structure abnormality
- Explain how cancer is caused by uncontrolled cell division
- Explain how genetic variations are generated during sexual reproduction
- Explain how nondisjunction leads to disorders in chromosome number
- Explain the effect of linkage and recombination on gamete genotypes
- Explain the purpose and methods of a test cross
- Identify non-Mendelian inheritance patterns such as incomplete dominance, co-dominance, multiple alleles, and sex linkage from the results of crosses
- State Mendel's Laws, and illustrate Mendel's Laws with appropriate monohybrid and dihybrid crosses
- Use a Punnett square to calculate the expected proportions of genotypes and phenotypes in monohybrid cross

Learning Objectives

- Explain how sexually produced offspring are never identical to either of their parents
- Explain how the chemical and structural properties of DNA allow for genetic information to be both encoded in genes and replicated
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- 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 genes as a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism
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- Identify that hereditary information is contained in genes, located in the chromosomes of each cell, and each gene carries a single unit of information
- Present evidence that supports the concept that complex multicellular organisms are formed as a highly organized arrangement of differentiated cells
- Provide examples of how different parts of the genetic instructions are influenced by the cell's environment
- Provide specific examples of how an inherited trait of an individual can be determined by one or many genes and a single gene can influence more than one trait
- Recognize that certain chemicals, pathogens, and high-energy radiation can seriously impair normal cell functions and the health of the organism
- Recognize that changes in DNA (mutations) occur spontaneously at low rates, and some of these changes make no difference to the organism, whereas others can change cells and organisms
- Recognize that the instructions for specifying the characteristics of the organism are carried in DNA, a large polymer formed from subunits of four kinds (adenine, thymine, guanine, and cytosine)
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- 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-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
9-12.HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

9-12.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.
9-12.HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
9-12.HS-LS1-4.LS1.B.1	In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.

Instructional Tasks/Activities

- Abnormalities
- Alterations of Chromosome Number and Structure: Describe various mutations and their effects on the body
- Analyze a pedigree
- Calculations (surface area, volume, ratios)
- Cancer Research Project
- Cell Division Model
- Classroom survey of traits
- Clay/Bead Models
- Coloring Diagrams
- Comparing Mitosis and Meiosis
- Design a species (DNA to protein to trait) Lab
- DNA Comic Strip: Students must use their knowledge of DNA Replication to create a comic strip describing the process in an artistic fashion.
- Dragon Genetics Lab: Using popsicle sticks to represent chromosomes, students will model how genes are inherited
- Essays and Application Question practice in groups
- Genetic Disorder Research
- Identifying problems and effects of Chromosomal Abnormalities
- Internet research (cancer & stem cells)
- Internet Simulations
- Interpret abnormal karyotypes
- Meiosis and Fertilization presentation
- Model building
- Modeling Meiosis Lab: Students use clay and paper plates to model the stages of Meiosis
- Nondisjunction clay simulation lab
- Problem practice (SpongeBob)
- Review Game

- Snork
- Vocabulary

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 meiosis
- Quiz on Mendel and his laws
- Quiz on mitosis
- Quiz on Non-Mendelian traits
- Quiz on Punnett Squares
- 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