MYP/3D Science Unit Planner
Marietta City Schools

Grade & Course: 10th Grade Biology	**Topic: Mendelian and Non Mendelian Genetics:** Patterns of Heredity	**Duration:** 3.5 weeks
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Georgia Standards of Excellence:

SB3. Obtain, evaluate, and communicate information to analyze how biological traits are passed on to successive generations.

a. Use Mendel's laws (segregation and independent assortment) to ask questions that explain the role of meiosis in reproductive variability.

b. Use mathematical models to predict and explain patterns of inheritance. (Clarification statement: Students should be able to use Punnett squares (monohybrid and dihybrid crosses) and/or rules of probability, to analyze the following inheritance patterns: dominance, codominance, incomplete dominance.)

Narrative / Background Information

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

S7L3. Obtain, evaluate, and communicate information to explain how organisms reproduce either sexually or asexually and transfer genetic information to determine the traits of their offspring.

a. Construct an explanation supported with scientific evidence of the role of genes and chromosomes in the process of inheriting a specific trait.

b. Develop and use a model to describe how asexual reproduction can result in offspring with identical genetic information while sexual reproduction results in genetic variation. (Clarification statement: Models could include, but are not limited to, the use of monohybrid Punnett squares to demonstrate the heritability of genes and the resulting genetic variation, identification of heterozygous and homozygous, and comparison of genotype vs. phenotype.)

c. Ask questions to gather and synthesize information about the ways humans influence the inheritance of desired traits in organisms through selective breeding. (Clarification statement: The element specifically addresses artificial selection and the ways in which it is fundamentally different from natural selection.)

Year-Long Anchoring Phenomena: (LEARNING PROCESS)
Sickle cell is a heritable genetic mutation that evolved in response to interactions in ecosystems**.** Roan Cows

Unit Phenomena (LEARNING PROCESS)
Non-identical twin siblings do not look like each other or their parents.

MYP Inquiry Statement:
Models help people visualize and predict the **relationship** within **patterns** that shape **human identity.**

MYP Global Context:
Identities & Relationships

Approaches to Learning Skills: ***	Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)	Crosscutting Concepts: *** (KNOWLEDGE & SKILLS)
Thinking Skills Communication Skills	• Mendel's law of dominance • Mendel's law of segregation • Mendel's law of independent assortment • Calculating expected genotype and phenotype ratios from completed Punnett squares • Determining patterns of inheritance using pedigree analysis • Codominance • Incomplete dominance • Sex-linked inheritance • Calculating expected genotype and phenotype ratios from completed non-Mendelian Punnett squares	System & System Models Cause & Effect Patterns **MYP Key and Related Concepts: **** **Select one Key Concept:** Relationships (key concept) Identities & Relationships (global context)

GADOE Achievement Level Descriptors for Biology
GADOE Inspire Notes for Biology

Disciplinary Core Content: Mendelian and non-Mendelian patterns of inheritance and structure of DNA, Structure of RNA, function of DNA, function of RNA
Focus Science & Engineering Practices: developing and using models; engaging in argument from evidence, asking questions, constructing explanations, using mathematics and computational thinking
Focus Crosscutting Concepts: stability and change, systems and system modes, patterns, cause and effect, scale, proportion, and quantity

Refer to the Georgia Standards of Excellence outlined on page 1 of the unit planner.

Beginning *Students performing in the beginning range are able to consistently…*	**Developing** *Students performing in the developing range are able to consistently…*	**Proficient** *Students performing in the proficient range are able to consistently…*	**Distinguished** *Students performing at the distinguished range are able to consistently…*
As a ***beginning learner***, I can… • recognize examples of Mendel's laws; • identify general patterns of inheritance;	As a ***developing learner***, I can… • describe Mendel's laws and recognize how they can be used to explain the role of meiosis in reproductive variability; • determine how models can be used to explain patterns of inheritance;	As a ***proficient learner***, I can… • use Mendel's laws (segregation and independent assortment) to ask questions that explain the role of meiosis in reproductive variability; • use mathematical models to predict and explain patterns of inheritance;	As a ***distinguished learner***, I can… • use Mendel's laws to answer questions and solve problems related to the role of meiosis in reproductive variability; • analyze mathematical models used to predict and explain patterns of inheritance;

Student-Friendly Learning Targets:

1. I can appropriately use key terms such as monohybrid, dihybrid, hybrid, heterozygous, homozygous, carrier, phenotype, genotype, ratio, zygote, recombination (fertilization), homologous, allele, gene, Punnett square, genetic cross, segregation, assortment, F1, F2, parental generation, pedigree analysis, karyotype, dominant (example HH), recessive (example Hh), codominant (example HC), incomplete dominance (example HH' or HB).
2. I can state Mendel's law of segregation.
3. I can identify models and diagrams that demonstrate my understanding of Mendel's law of segregation.

4. I can use Mendel's law of segregation to ask questions that explain the role of meiosis in reproductive variability.
5. I can state Mendel's law of independent assortment.
6. I can identify models and diagrams that demonstrate my understanding of Mendel's law independent assortment.
7. I can use Mendel's law of independent assortment to ask questions that explain the role of meiosis in reproductive variability.
8. I can use Mendel's laws of segregation and independent assortment to ask questions regarding the relationship between meiosis and genetic variation.
9. I can create and use mono and dihybrid Punnett square as a mathematical model to predict and explain patterns of Mendelian inheritance.
10. I can define and give examples of Non-Mendelian inheritance patterns (codominance and incomplete dominance).
11. I can create and use a monohybrid Punnett square mathematical model to predict and explain patterns of Non-Mendelian inheritance (codominance and incomplete dominance).
12. I can interpret a Punnett square demonstrating basic sex linkage (i.e., color blindness in humans or hemophilia in humans).
13. I can interpret the outcome of Punnett squares in terms of ratios, percentages, and probabilities.
14. I can interpret and use a karyotype as a possible model to predict patterns of inheritance (monosomy, trisomy, etc.).
15. I can interpret and use a pedigree as a model to predict patterns of inheritance.

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Students may think that Mendel's Law of dominance is the only pattern of inheritance, and they may not understand that 50% of an offspring's DNA comes from mom and the other 50% from dad, even if you look more like one parent over the other.
Mutations can be genetic or environmental- students often don't know that there are environmental causes of DNA mutations, which in turn can cause diseases such as cancer.
There is more than one form of asexual reproduction- binary fission is not the only way to asexually reproduce. Sexual reproduction can be internal or external, and many organisms can perform both sexual and asexual reproduction. There are many unique and interesting methods of reproduction other than what is commonly thought of in terms of sexual and asexual reproduction. Students may think that the genotype of one generation of offspring will affect the genotypes of future offspring. Students may think that dominant traits are more prevalent and/or they are more advantageous to have in a population.

Key Vocabulary: (KNOWLEDGE & SKILLS)

centrioles, centromere, chromosome, chromatid, daughter cells, fertilization, genes, gametes, genetic continuity, homologous chromosome, meiosis I, meiosis II, parent cell, replicated chromosome, unreplicated chromosome, sister chromatids, spindle fibers, chromosomal mutation, crossing over, genetic variation, karyotype, nondisjunction, recombinant DNA, trisomy, pedigree analysis, allele, autosomal chromosome, sex chromosome, carrier, codominance, incomplete dominance, crossing over, monohybrid cross, dihybrid cross, diploid, haploid, dominant trait, recessive trait, genotype, phenotype, heterozygous, homozygous, hybrid, probability, Punnett square, purebred (true breeding), ratio, sexual reproduction, trait, X-linked trait

Inquiry Questions:

Factual:

What type of inheritance patterns are observed by different genes?

What type of inheritance does blood type follow?

Conceptual:

How is it possible that an offspring can have a 3rd and different phenotype than either of the parent phenotypes?

If two heterozygous parents are crossed, and the F1 generation is 25% homozygous recessive, what are the chances that the same parents will produce another homozygous recessive offspring in a different cross?

Debatable:

Were Mendel's results of inheritance too perfect?

MYP Objectives	Summative assessment	
Sciences **Design**	Common Formative Assessments Common Summative Assessments MYP Approach to all topics	Relationship between summative assessment task(s) and statement of inquiry: The CFAs help to monitor and determine student progress as we move through the unit. This data informs the teacher of which students to accelerate, and which to remediate prior to the unit summative. The summative assessments serve to test students' mastery of the learning targets at the proficient and distinguished level of the Achievement Level Descriptors for Biology.

Unit Objectives:			
Learning Activities and Experiences	**Inquiry & Obtain:**	**Evaluate:**	**Communicate:**
Week 1: **Topic 1: Mendel's Laws of Heredity** - **Mendel's law of dominance** - **Mendel's law of segregation** - **Mendel's law of independent assortment**	Patterns of Heredity PPT **(Honors)**	Mendel's Laws of Heredity Exploration Intro to Basic Punnett Squares	**Writing Task on Heredity Patterns and Mathematical Models** **Common Formative Assessment (Topics 1, 2, and 3)**
Week 2: **Topic 2: Interpreting Punnett Squares and Pedigree Analysis** - **finding expected genotype and phenotype ratios from completed Punnett squares** - **understanding how to use pedigrees to determine**	Patterns of Heredity PPT **(Honors)**	Genetics Crosses Practice Dihybrid Crosses Labrador Retrievers Practice Activity **Pedigree Analysis**	**Mathematical Modeling of all types of Mendelian Inheritance Patterns**

patterns of inheritance			
Week 3.5: Topic 3: Non-Mendelian Patterns of Inheritance - codominance , incomplete dominance - sex linked (intro level only	Patterns of Heredity PPT (Honors)	Patterns of Inheritance Practice Problems Non-Mendelian Patterns of Inheritance Practice Problems Pet Dragons Genetics- MYP	Mathematical Modeling of all types of Mendelian and Non-Mendelian Inheritance Patterns MYP Global Approach to all topics (Topics 1, 2, 3)
Assess & Remediate - Common Summative Assessment & Unit Remediation			Common Summative Assessment Unit Remediation per policy

Resources (hyperlink to model lessons and/or resources):
All resources are available on schoology.

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit
Students tend to struggle with vocabulary. The content is engaging, however, meiosis is difficult. To address the struggles, students will model and practice the vocabulary and meiosis.		