**Meiosis and Genetics:**

As a result of this unit, the learner will KNOW:

* How meiosis and gametogenesis are different
* The difference between haploid and diploid
* When during meiosis each cell is haploid or diploid
* The difference between phenotype and genotype
* The difference between sexual and asexual reproductive processes for cells and whole organisms
* How and why a test cross is used

As a result of this unit, the learner will UNDERSTAND:

* That cells must contain the correct numbers of chromosomes in order to function normally
* That mutations in the sex cells’ chromosomes result in mutations in offspring
* That meiosis plays a role in the combination of genes donated from parents to offspring
* That genetic outcomes are the result of chance
* That there is a difference between a chromosomal mutation and a mutation resulting from inheriting an allele with a DNA mutation.
* That what we inherit from our parents and the environment influence what we look and act like
* That we can make predictions about inheritance patterns

As a result of this unit, the learner will be able to:

* Put pictures of the steps of meiosis in order
* Compare and contrast mitosis and meiosis
* Read and analyze karyotypes
* Make and use Punnett Squares and probability to predict inheritance
* Rule out paternity using blood types
* Predict inheritance patterns for incomplete and codominance
* Predict the outcome of a cross with sex-linked traits
* Identify polygenic traits
* Read and analyze pedigrees and karyotypes

**From the NC Curriculum:**

**Bio.3.2.1**

• Recall the process of meiosis and identify process occurring in diagrams of stages. (middle school review) Note: Students are not expected to memorize the names of the steps or the order of the step names.

• Infer the importance of the genes being on separate chromosomes as it relates to meiosis.

 • Explain how the process of meiosis leads to independent assortment and ultimately to greater genetic diversity.

• Exemplify sources of genetic variation in sexually reproducing organisms including crossing over, random assortment of chromosomes, gene mutation, nondisjunction, and fertilization.

• Compare meiosis and mitosis including type of reproduction (asexual or sexual), replication and separation of DNA and cellular material, changes in chromosome number, number of cell divisions, and number of cells produced in a complete cycle.

**Bio.3.2.2**

• Interpret Punnett squares (monohybrid only) to determine genotypic and phenotypic ratios. Understand that dominant alleles mask recessive alleles.

 • Determine parental genotypes based on offspring ratios.

• Interpret karyotypes (gender, and chromosomal abnormalities).

• Recognize a variety of intermediate patterns of inheritance (codominance and incomplete dominance).

• Recognize that some traits are controlled by more than one pair of genes and that this pattern of inheritance is identified by the presence of a wide range of phenotypes (skin, hair, and eye color).

• Interpret autosomal inheritance patterns: sickle cell anemia including the relationship to malaria, cystic fibrosis (recessive heredity), and Huntington’s disease (dominant heredity).

• Solve and interpret codominant crosses involving multiple alleles including blood typing problems. (Blood Types: A, B, AB and O and Alleles: IA , IB , and i). Students should be able to determine if parentage is possible based on blood types.

• Understand human sex chromosomes and interpret crosses involving sex-linked traits (color-blindness and hemophilia). Students should understand why males are more likely to express a sex-linked trait.

• Interpret phenotype pedigrees to identify the genotypes of individuals and the type of inheritance.

**Bio.3.2.3**

Develop a cause-and-effect relationship between environmental factors and expression of a particular genetic trait. All traits depend both on genetic and environmental factors. Heredity and environment interact to produce their effects. This means that the way genes are expressed depends on the environment in which they act.