

## Key Concept 5: Inheritance Patterns

### Learning Objectives

Students will be able to ...

### Essential Knowledge

Students need to know that ...

#### Inheritance Patterns

**GEN 5.1(a)** Explain the relationship between genotype and phenotype.

**GEN 5.1(b)** Describe the type of inheritance pattern based on data and/or use of models.

**GEN 5.1.1 Investigation of Mendelian, or single-gene, traits reveals the basis for understanding patterns of inheritance.**

- Many of an organism's traits (phenotype) are determined by the organism's genes (genotype), which are passed from one generation to the next.
- Somatic cells of sexually reproducing organisms have two copies of each gene (one inherited from each parent).
- Each gene copy may have variants called alleles.
- If present, dominant alleles are expressed, whereas recessive alleles are expressed only in the absence of a dominant allele.

**GEN 5.1.2 Most traits do not follow Mendelian inheritance patterns.**

- Some traits are determined by genes on sex chromosomes.
- Most of our traits involve the interactions of multiple genes.
  - Codominance occurs when both alleles of homologous chromosomes are fully expressed.
  - Incomplete dominance occurs when neither of the alleles from a homologous chromosome pair are completely dominant.

#### Predicting Inheritance

**GEN 5.2(a)** Create and/or use models to analyze the probability of the inheritance of traits.

**GEN 5.2(b)** Predict the inheritance of traits that do not follow Mendelian patterns.

**GEN 5.2(c)** Use a pedigree to predict the inheritance of a trait within a family.

**GEN 5.2.1 The inheritance of certain traits from parents to offspring can be predicted using models.**

- Rules of probability can be applied to make predictions about the passage of alleles from parent to offspring using mathematical models (Punnett squares).
- Pedigrees are useful tools for modeling inheritance patterns to examine and/or make predictions about inheritance of a specific trait from one generation to the next.

**Content Boundary:** Students will be expected to know non-Mendelian inheritance patterns such as codominance and incomplete dominance. However, epistatic genes are *beyond the scope* of this course.