



## OBJECTIVES

**Students will:**

predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses, and non-Mendelian inheritance.



## CORE VOCABULARY

allele  
 codominance  
 dihybrid cross  
 dominant  
 genotype  
 heterozygous  
 homozygous  
 incomplete dominance  
 Mendelian traits  
 monohybrid cross  
 multiple alleles  
 phenotype  
 polygenic inheritance  
 Punnett square  
 recessive  
 trait

## SUPPORT RESOURCES

- E-Poster
- Study Guide
- Vocabulary Boosters
- TEKS Video

## ENGAGE

Activate students' prior knowledge and establish relevance with the following: [How can this be?](#) Students will observe photos of a dog and a woman and discuss how one organism can have eyes with different colors.



**Probability Spinner Interactive - SEP 2H** - Students will navigate to Biology Interactives and collect data using the spinner. They will perform three trials and evaluate the results each time. After three trials, they will make a prediction for trial four and then run the test. Lead a class discussion about probabilities.

## TEACH AND DISCUSS

Present the E-Poster as an overview of what students will be able to do after this lesson. Provide instruction by making learning active, including relevant examples, asking higher-level questions, encouraging student discourse, and using the teacher resources listed. Core Vocabulary should be taught in context throughout the lesson.

Key Concepts:

Mendelian Inheritance Patterns

- **Gregor Mendel is considered the father of modern genetics. He studied inheritance patterns in pea plants and discovered many of the foundational principles that govern genetics.**
- **Mendelian traits follow the dominant and recessive pattern of inheritance discovered by Mendel. A trait is a characteristic of an organism. An allele is an inherited set of genetic instructions for producing a particular form of a trait.**
- **A genotype is a specific allele combination. A phenotype is an organism's expressed traits that result from its genotype.**
  - » Homozygous is the description of an organism that has two identical alleles for a particular trait.
  - » Heterozygous is the description of an organism that has two different alleles for a particular trait. The allele that is expressed is considered dominant. A recessive allele is not expressed in a heterozygous genotype.
- **A Punnett square is a tool that displays all of the genotype possibilities that can result from a cross between two individuals.**
- **A monohybrid cross is a cross between two individuals that are heterozygous for a single trait of interest.**



Students will [practice probabilities using one trait.](#)

- **A dihybrid cross is a cross between two individuals that are heterozygous for two traits of interest.**



Students will [practice probabilities using two traits.](#)

Non-Mendelian Inheritance

- **In Mendelian inheritance traits follow the dominant-recessive pattern of**

**inheritance discovered by Gregor Mendel.** Not all traits follow this pattern, however. When this happens, it is known as non-Mendelian inheritance.

- **Incomplete dominance is a non-Mendelian inheritance pattern in which neither allele is completely dominant over the other allele.** The heterozygous genotype results in an intermediate phenotype. For example, a cross between a snapdragon plant with red flowers and one with white flowers will produce a pink flower, an intermediate color between red and white.



[Incomplete Dominance Practice](#) Students will practice problems with non-Mendelian probabilities.

- **Codominance is a non-Mendelian inheritance pattern in which the heterozygous genotype expresses both alleles.**



[Codominance Practice](#) Students will practice problems based on roan cattle.

- **For some traits, there are more than two alleles. This non-Mendelian inheritance pattern is called multiple alleles.** The trait for blood type in humans follows this pattern. Remind students that the phenotypes for blood type are A, B, AB and O. AB is an example of codominance, and O is recessive.



Students will complete the [Multiple Alleles Practice Problems](#) using human blood types.

- **Some traits are controlled by more than one gene. They are known as polygenic traits.** In humans, eye color, skin color and height are examples of polygenic traits. These traits generally have a spectrum of phenotypes, rather than distinct categories.

## APPLY/EXTEND

- Students should complete study guide questions.
- Critical thinking skills questions:
  - » Is it possible for a person to have type ABO blood? Justify your answer. (It is not possible, because the person would have to receive three different alleles,  $I^A$ ,  $I^B$ , and  $i$ . Humans receive two alleles for each trait.)
  - » Many inherited genetic disorders of humans appear in children whose parents do not have the disorder. How can this be explained? (The parents have only one mutated, recessive allele, which is not expressed, so the parents are unaware of its presence. If the offspring receives one recessive allele from both of its parents, the disorder will be expressed in the child.)

## EVALUATE

Students log in to Summit K12 to master learning and assess understanding using the following components:

- Formative Assessment 1
- TEKS Video
- Vocabulary Review
- Formative Assessment 2