

## Introduction to Genetics Reading

Over 150 years ago, in the 1850s, in a small country called the Czech Republic, there lived a monk named Gregor Mendel. In the monastery where Mendel lived, there was a garden that grew pea plants. Mendel was in charge of tending to this garden and as he did, he noticed that pea plants have many different traits. A **trait** is any characteristic belonging to an organism or object. Mendel noticed that some pea plants were tall, some were short, some have round yellow seeds, and others wrinkled green seeds. Some pods (where the pea grew) were round and others were flat. He soon became curious about the connection between the color of a pea flower and the type of seed the plant would produce. This curiosity inspired him to experiment with garden peas in 1856.

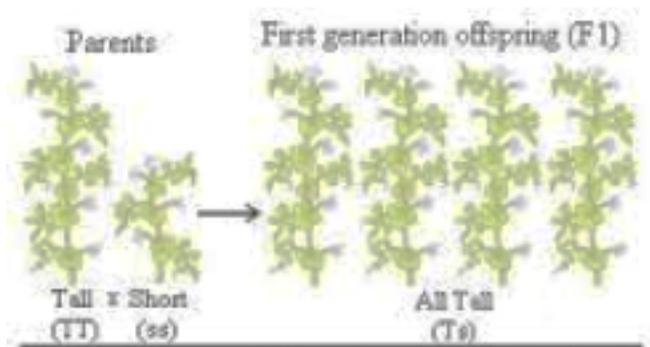


	Height	Seed Shape	Seed Color	Seed Coat Color	Pod Shape	Pod Color	Flower Position
Dominant	 Tall	 Round	 Yellow	 Green	 Inflated (full)	 Green	 Axial
Recessive Trait	 Short	 Wrinkled	 Green	 White	 Constricted (flat)	 Yellow	 Terminal

Each time Mendel studied a trait, he would cross two plants with different expressions of a trait. Crossing is another way to say that he bred the two plants so they would produce offspring. In one experiment he conducted, he crossed a tall pea plant with a short pea plant. He found that the offspring of these two parents were all tall! Since Mendel knew that during reproduction, each parent plant would give one gene for height to its children, he determined that there must be dominant and recessive traits. **Dominant traits** are those that, when inherited, will cover over or

be more powerful than another trait—like the gene for a tall pea plant. **Recessive traits** are those that, when inherited will be hidden by the dominant trait—like the gene for a short pea plant.

Mendel made careful use of scientific methods, which resulted in the first recorded study of how traits passed from one generation to the next. The study of how traits are inherited is now called **genetics**. Mendel's work with pea plants is important because he was the first to trace one trait through several generations. He was also the first to use the mathematics of probability to explain heredity. Because of this, Mendel is often called the "Father of Genetics."



## Dominant and Recessive Genes

Coded within an organism's DNA are thousands of genes. **Genes** contain the code for certain characteristics and are passed down from the parents to the offspring. Gregor Mendel is famous for a series of experiments he did on pea plants in which he proved that genes can be recessive or dominant. A **dominant gene** is one that cannot be covered up. A **recessive gene**, on the other hand, is a gene that can be hidden by the dominant version.

## Two Alleles for Each Gene

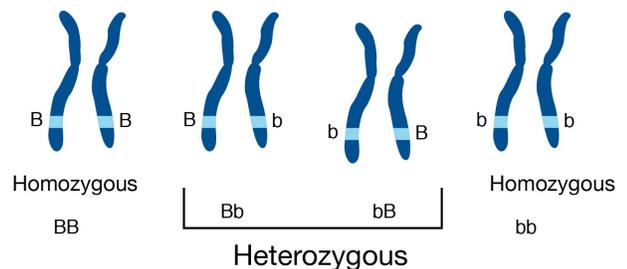
For each gene that codes for a certain trait (pea color), you have two **alleles**, or versions of that trait. This is because you get one version from your mom and one version from your dad. Let's look at the ability to roll your tongue. You can have a dominant gene for this ability, which would mean that you **can** roll your tongue. Or, you can have a recessive gene, which would mean that you **cannot**. Scientists use letters to represent whether or not a gene is dominant or recessive. If a gene is dominant it gets a capital letter, for instance "R" for ability to roll your tongue. If a gene is recessive it gets a lower case letter, for instance "r" for not being able to roll your tongue. These letters make up the **genotype** of an organism.

This means that if you have two dominant genes for tongue rolling ("RR") then you will be able to roll your tongue! But if you have two recessive genes for tongue rolling ("rr") you will not have that ability! What happens, though if you get a dominant gene ("R") from your dad and a recessive gene ("r") from your mom? Will you be able to roll your tongue?

## Homozygous and Heterozygous

If you have either two dominant ("RR") or two recessive ("rr"), it is easy to know whether or not you will have that ability. An organism like this, with two alleles that are the same, is called **homozygous**. But an organism that has two different alleles, such as "Rr", is called **heterozygous**. When an organism is heterozygous, the trait that is more dominant will be the one that will show. So if you have both a dominant and recessive trait, "Rr", then you will be able to roll your tongue!

The way an organism looks or behaves as a result of its genotype is called **phenotype**. So a person with the genes "rr" for tongue rolling will have a phenotype of not being able to roll their tongue. But a person with either the genes "RR" or "Rr" will have a phenotype where they can.



Using the reading, complete the review questions on the next 2 pages.

## Notes from the Reading

Directions: Use the reading to fill in the blank for the questions below.

1. Gregor Mendel performed experiments on \_\_\_\_\_.
2. Mendel noticed that pea plants have many different traits. Traits are \_\_\_\_\_  
\_\_\_\_\_.
3. An example of a trait can be \_\_\_\_\_ or \_\_\_\_\_.
4. Mendel discovered that crossing two plants with different traits resulted in offspring that looked like one of the parents. Crossing means \_\_\_\_\_.
5. Based on Mendel's experiments, he determined that there can be dominant and recessive traits.
  - a. Dominant traits are \_\_\_\_\_.
  - b. Recessive traits are \_\_\_\_\_.
6. Gregor Mendel is so important to the study of genetics, that he is called the \_\_\_\_\_.
7. You have \_\_\_\_\_ alleles, or versions of a trait, for each gene.
8. The genes you have for any trait can be represented by letters. This is called the \_\_\_\_\_.
  - a. Scientists use a \_\_\_\_\_ letter to show that a gene is dominant.
  - b. Scientists use a \_\_\_\_\_ letter to show that a gene is recessive.
9. If you get both the dominant OR both the recessive gene from your parents, it is called \_\_\_\_\_, for example, "RR" or "rr".
10. If you get one dominant and one recessive gene from your parents, it is called \_\_\_\_\_, for example, "Rr".
  - a. In this case, the \_\_\_\_\_ allele will take over and that is the trait you will have.
11. The way an organism looks or behaves, regardless of its genotype, is called \_\_\_\_\_.

## Vocabulary Review

- |                       |  |
|-----------------------|--|
| 1. _____ Trait        | A. two different alleles for a trait                             |
| 2. _____ Inherit      | B. sperm and egg join in order to produce offspring              |
| 3. _____ Dominant     | C. the study of how traits are inherited                         |
| 4. _____ Genetics     | D. an allele that will overpower any other                       |
| 5. _____ DNA          | E. genetic information that is stored in the nucleus             |
| 6. _____ Recessive    | F. the letters used to explain an allele                         |
| 7. _____ Homozygous   | G. two of the same alleles for a trait                           |
| 8. _____ Heterozygous | H. a characteristic or quality that an organism has              |
| 9. _____ Genotype     | I. an allele that can be hidden by more powerful one             |
| 10. _____ Phenotype   | J. how an organism looks or behaves based on the inherited trait |

## Heterozygous and Homozygous Practice

11. For each genotype below, indicate whether it is Homozygous (Ho) or Heterozygous (He).

AA _____	Ee _____	ii _____	Mm _____
Bb _____	ff _____	Jj _____	nn _____
Cc _____	Gg _____	kk _____	OO _____
DD _____	HH _____	Ll _____	Pp _____

12. For each of the **genotypes** below determine what **phenotypes** would be seen.

a. Purple flowers are dominant to white flowers

PP \_\_\_\_\_

Pp \_\_\_\_\_

pp \_\_\_\_\_

b. Bobtails in cats are recessive to long tails.

TT \_\_\_\_\_

Tt \_\_\_\_\_

tt \_\_\_\_\_

c. Brown eyes are dominant to blue eyes

BB \_\_\_\_\_

Bb \_\_\_\_\_

bb \_\_\_\_\_

d. Round seeds are dominant to wrinkled seeds

RR \_\_\_\_\_

Rr \_\_\_\_\_

rr \_\_\_\_\_