



# 11.1 The Work of Gregor Mendel

## Lesson Objectives

-  Describe Mendel's studies and conclusions about inheritance.
-  Describe what happens during segregation.

## Lesson Summary

**The Experiments of Gregor Mendel** The delivery of characteristics from parents to offspring is heredity. The scientific study of heredity is **genetics**. Gregor Mendel founded modern genetics with his experiments on a convenient model system, pea plants:

- ▶ **Fertilization** is the process in which reproductive cells (egg from the female and sperm from the male) join to produce a new cell.
- ▶ A **trait** is a specific characteristic, such as (in peas) seed color or plant height.
- ▶ Mendel prevented self-pollination in the peas. He controlled fertilization so he could study how traits passed from one generation to the next.
- ▶ He created **hybrids**, which are crosses between true-breeding parents (the P generation) with different traits.
  - These hybrids were the F<sub>1</sub> (first filial) generation.
  - They each showed the characteristic of only one parent.
- ▶ Mendel found that traits are controlled by factors that pass from parent to offspring. Those factors are **genes**. The different forms of a gene are **alleles**.
- ▶ Mendel's **principle of dominance** states that some alleles are dominant and others are recessive. The recessive allele is exhibited only when the dominant allele is not present.

**Segregation** Mendel allowed members of the F<sub>1</sub> generation to self-pollinate. The trait controlled by the recessive allele appeared in the next generation (F<sub>2</sub>) in about one-fourth of the offspring—even when it did not appear in the F<sub>1</sub> generation.

- ▶ Separation of alleles is **segregation**.
- ▶ When **gametes** (sex cells) form, alleles segregate so that each gamete carries only one allele for each gene.
- ▶ The F<sub>2</sub> generation gets a new combination of alleles: one from each parent.

## The Experiments of Gregor Mendel

Match the term with its definition.

Term	Definition
_____ 1. genes	A. Specific characteristics that vary among individuals
_____ 2. hybrids	B. The offspring of true-breeding parents with different traits
_____ 3. traits	C. Factors that determine traits
_____ 4. alleles	D. Sex cells, egg or sperm
_____ 5. gametes	E. The different forms of a gene

6. Why are peas a good model system for studying heredity?

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7. How did Mendel cross-pollinate flowers?

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8. What is the difference between a gene and an allele?

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9. State the principle of dominance.

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The table shows some crosses between true-breeding parents that carry pairs of dominant alleles (such as  $SS$ ) or pairs of recessive alleles (such as  $ss$ ). Complete the table to show the combination of alleles in the offspring. Then use it to answer Questions 10–11.

Dominant and Recessive Forms of Pea Plant Traits				
Trait	Parent Plants (P Generation)		Offspring (F <sub>1</sub> Generation)	
Seed Color	Yellow $YY$ 	X	Green $yy$ 	Yellow $Yy$ 
Seed Coat Color	White $gg$ 	X	Gray $GG$ 	Gray 
Pod Shape	Constricted $ss$ 	X	Smooth $SS$ 	Smooth 
Pod Color	Green $CC$ 	X	Yellow $cc$ 	Green 

10. What is the dominant shape of a pea pod? How do you know?

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11. What symbol represents the recessive allele for pod color?

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## Segregation

12. What is segregation? What is the result of segregation?

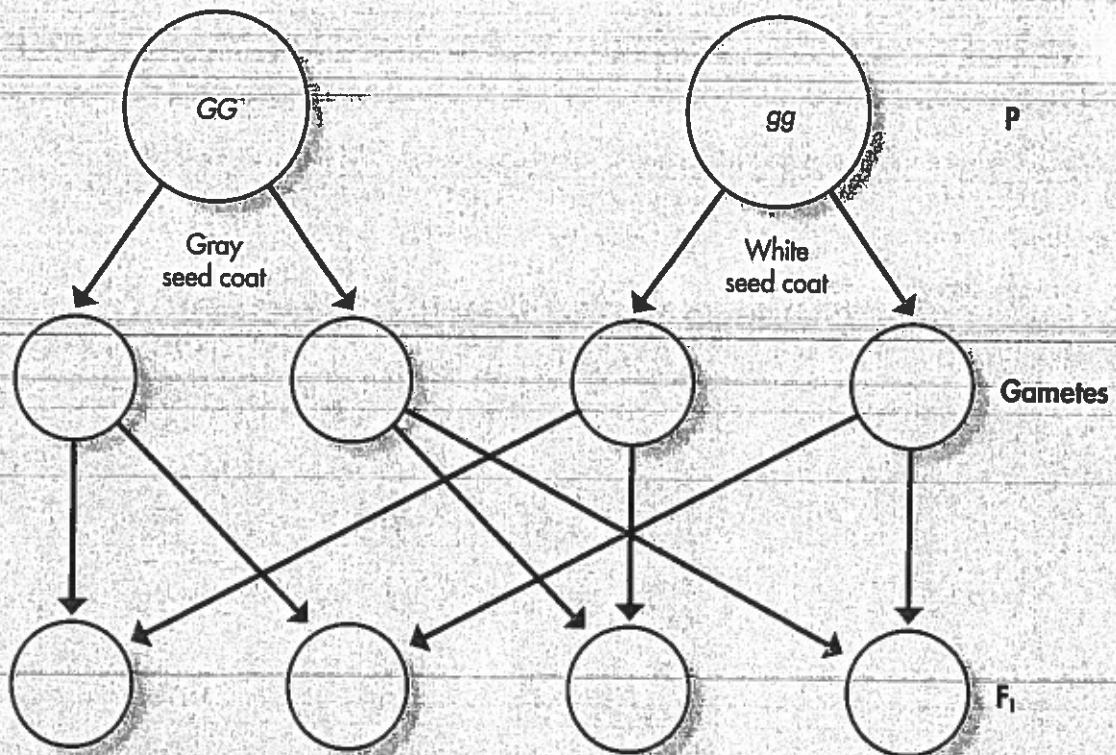
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13. **THINK VISUALLY** The capital letter  $G$  represents the allele in peas that causes the dominant trait, gray seed coat. The lower-case letter  $g$  represents the recessive allele that causes the recessive trait, white seed coat.

In the circles, show the alleles in the gametes of the parent generation. Show how the alleles recombine in the  $F_1$  plants.



### Apply the Big idea

14. A black cat and a white cat have four black kittens in the  $F_1$  generation. In the  $F_2$  generation, there are three black kittens and one white kitten. Explain how the  $F_2$  generation proves that genetic information passes unchanged from one generation to the next, even when a specific trait is not exhibited.

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