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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_1 (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_1 generation to self-pollinate. The trait controlled by the recessive allele appeared in the next generation (F_2) in about one-fourth of the offspring—even when it did not appear in the F_1 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_2 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

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

_____

_____

7. How did Mendel cross-pollinate flowers?

_____

_____

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

_____

_____

9. State the principle of dominance.

_____

_____

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_1 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?

_____

_____

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

_____

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Segregation

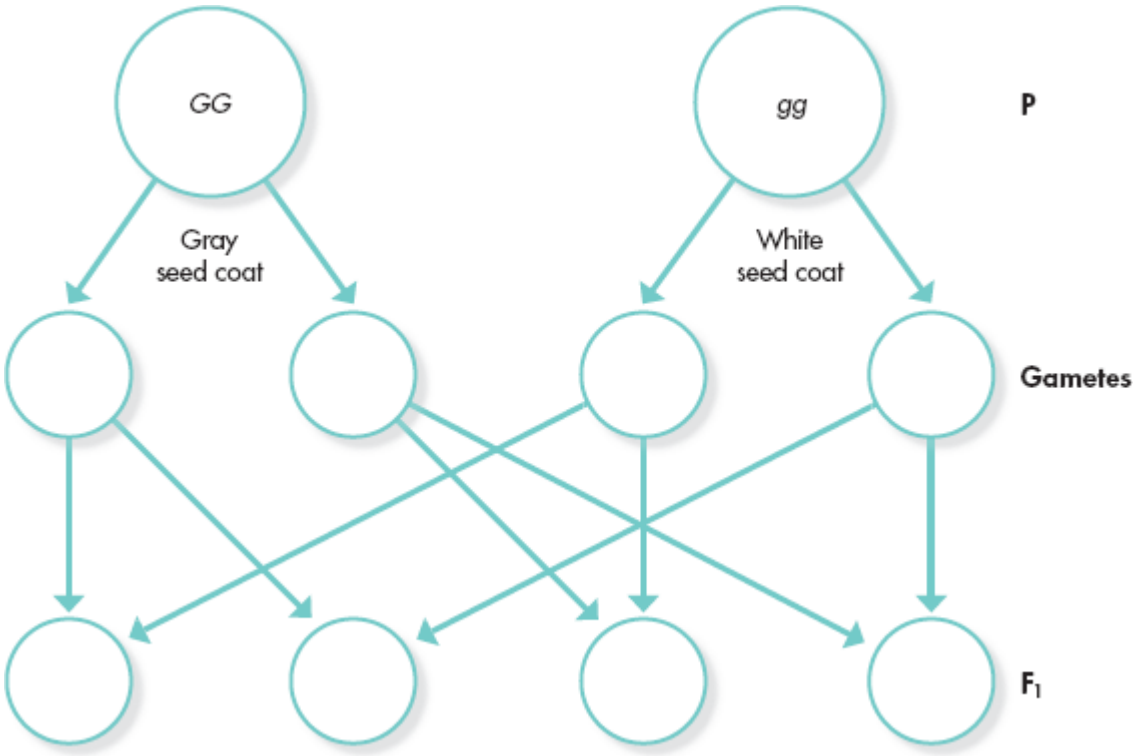
12. What is segregation? What is the result of segregation?

_____

_____

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.

_____

_____

_____