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Study Guide 6.3: Mendel and Meiosis

KEY CONCEPT

Mendel's research showed that traits are inherited as discrete units.

VOCABULARY

trait	purebred	law of segregation
genetics	cross	

MAIN IDEA: Mendel laid the groundwork for genetics.

1. What is genetics?

_____

2. Whose early work is the basis for much of our current understanding of genetics?

_____

3. How did Mendel's views on inheritance differ from the views of many scientists of his time?

_____

MAIN IDEA: Mendel's data revealed patterns of inheritance.

In designing his experiments, Mendel made three important choices that helped him see patterns of inheritance. In the table below, list Mendel's three choices and write an example of how he put each of these choices into action.

Mendel's Choices	Example
4.	
5.	
6.	

7. Why did Mendel use pea plants?

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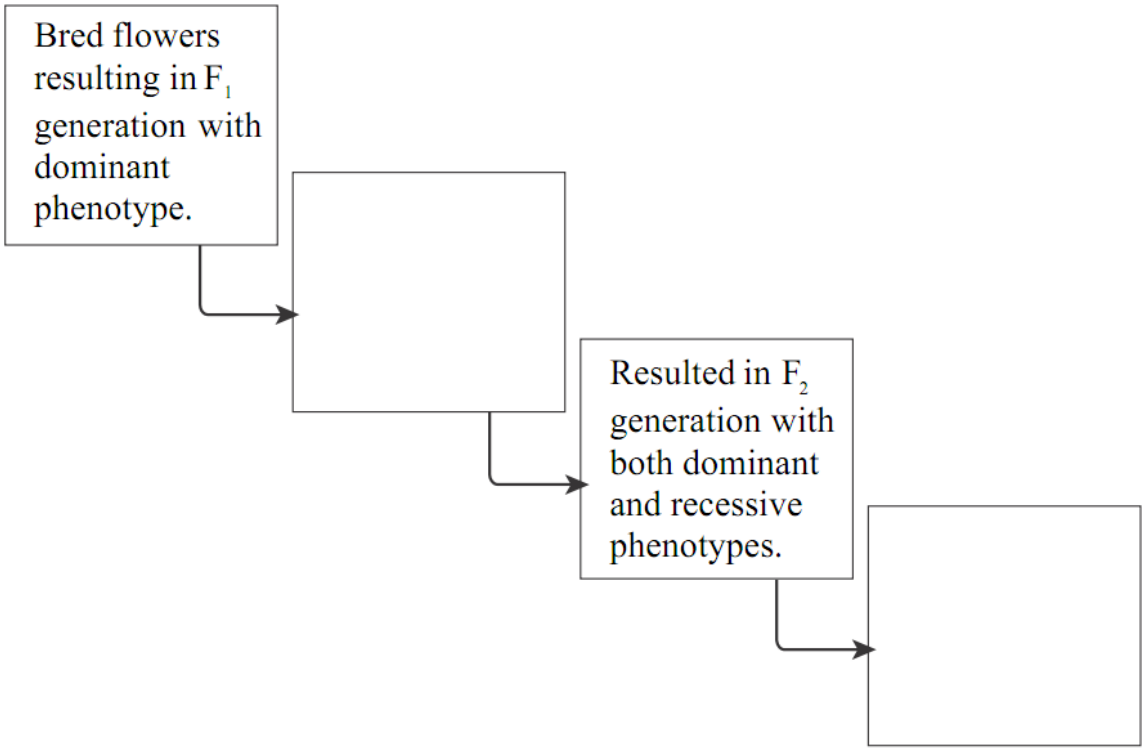
8. Fill in the sequence diagram below to summarize Mendel's experimental process.



9. Mendel concluded that traits are inherited as "discrete units." What do we call these discrete units today?

_____

10. What two conclusions make up Mendel's law of segregation?

_____

_____

Vocabulary Check

11. *Segregation* means "separation." What is "segregated" in Mendel's law of segregation?

_____

12. What does "purebred" mean?

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SECTION QUIZ 6.3: Mendel and Meiosis

Choose the letter of the best answer.

____ 1. Which of the following is an example of a biological trait?
   a. personality
   b. hair style
   c. eye color
   d. regional accent

____ 2. Mendel began his experiments with purebred pea plants. This approach enabled him to determine that variations among offspring were the result of
   a. random mutations.
   b. self-pollination.
   c. genetic uniformity.
   d. his crossings.

____ 3. When Mendel crossed plants that were purebred purple-flowered with plants that were purebred white-flowered, the resulting offspring all had purple flowers. When allowed to self-pollinate, this F1 generation gave rise to white-flowered plants as well as purple. As a result, Mendel determined that individual traits are
   a. inherited as discrete units.
   b. diluted in offspring.
   c. merged with successive generations.
   d. lost in the pollination process.

____ 4. Mendel was able to identify predictable patterns of heredity. He succeeded mainly because he chose to study traits that
   a. were always dominant.
   b. tended to be recessive.
   c. could be diluted.
   d. had only two forms.

____ 5. Which of the following conclusions was a result of Mendel's observations?
   a. Organisms that give rise to purebreds are genetically superior.
   b. Organisms that have intermediate features are self-pollinating.
   c. Organisms inherit two copies of each gene, one from each parent.
   d. Organisms that self-pollinate do not have "either-or" features. l

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Reinforcement 6.3: Mendel and Meiosis

KEY CONCEPT **Mendel's research showed that traits are inherited as discrete units.**

Traits are inherited characteristics, and **genetics** is the study of the biological inheritance of traits and variation. Gregor Mendel, an Austrian monk, first recognized that traits are inherited as discrete units. We call these units genes. Mendel conducted his experiments with pea plants, which were an excellent choice because they are easily manipulated, produce large numbers of offspring, and have a short life cycle. Mendel made three important decisions that helped him to see patterns in the resulting offspring.

- Use of purebred plants: Mendel used pea plants that had self-pollinated for so long that they had become genetically uniform, or **purebred.** This meant that the offspring looked like the parent plant. Because of this characteristic, Mendel knew that any differences he observed in the offspring were the result of his experiments.
- Control over breeding: At the start of his experiments, Mendel removed the male flower parts from the pea plants. He then pollinated the female flower part with pollen from a plant of his choosing, which produced offspring referred to as the F_1 generation.
- Observation of "either-or" traits: Mendel studied seven traits that appeared in only two forms. For example, flowers were white or purple; peas were wrinkled or round.

Mendel observed that when he mated, or **crossed,** a purple-flowered plant with a white-flowered plant, for example, all of the F_1 offspring had purple flowers. Mendel next allowed the F_1 offspring to self-pollinate; that is, the plant mated with itself. In the resulting offspring, the F_2 generation, approximately three-fourths of the flowers were purple and one-fourth were white. Mendel continued to find this 3:1 ratio for each of his crosses, regardless of the specific trait he was examining.

Based on his results, Mendel concluded that traits are inherited as discrete units. He also developed what is known as Mendel's first law, or the **law of segregation.** This law states the following:

- Organisms inherit two copies of each unit (gene), one from each parent.
- The two copies separate, or segregate, during gamete formation. As a result, organisms donate only one copy of each unit (gene) in their gametes.

1. In which generation of offspring did Mendel observe a 3:1 ratio in the appearance of the offspring?

   _____

2. What is segregating in the law of segregation? When does this segregation occur?

   _____

   _____