## Table of Contents

**Section 1** Mendel's Legacy

**Section 2** Genetic Crosses





## Gregor Mendel, *continued*

- **Mendel's Garden Peas**
  - Mendel observed characteristics of pea plants.
  - Traits are genetically determined variants of a characteristic.
  - Each characteristic occurred in two contrasting traits.





## Objectives

- **Describe** how Mendel was able to control how his pea plants were pollinated.
- **Describe** the steps in Mendel's experiments on true-breeding garden peas.
- **Distinguish** between dominant and recessive traits.
- **State** two laws of heredity that were developed from Mendel's work.
- **Describe** how Mendel's results can be explained by scientific knowledge of genes and chromosomes.





## Gregor Mendel, *continued*

- **Mendel's Methods**
  - Mendel used **cross-pollination** techniques in which pollen is transferred between flowers of two different plants.





## Gregor Mendel

- The study of how characteristics are transmitted from parents to offspring is called **genetics**.



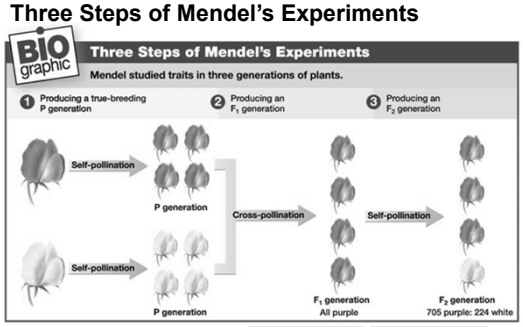


## Mendel's Experiments

- Mendel bred plants for several generations that were true-breeding for specific traits and called these the **P generation.**
- Offspring of the P generation were called the **$F_1$ generation.**
- Offspring of the $F_1$ generation were called the **$F_2$ generation.**

## Chapter 9

### Three Steps of Mendel's Experiments









## Chapter 9

### Mendel's Results and Conclusions, *continued*

- **The Law of Independent Assortment**
  - The **law of independent assortment** states that factors for individual characteristics are distributed to gametes independent of one another.
  - The law of independent assortment is observed only for genes that are located on separate chromosomes or are far apart on the same chromosome.

End of Slide






## Chapter 9

### Mendel's Results and Conclusions

- **Recessive and Dominant Traits**
  - Mendel concluded that inherited characteristics are controlled by factors that occur in pairs.
  - In his experiments on pea plants, one factor in a pair masked the other. The trait that masked the other was called the **dominant** trait. The trait that was masked was called the **recessive** trait.

End of Slide






## Chapter 9

### Support for Mendel's Conclusions

- We now know that the factors that Mendel studied are **alleles**, or alternative forms of a gene.
- One allele for each trait is passed from each parent to the offspring.

End of Slide






## Chapter 9

### Mendel's Results and Conclusions, *continued*

- **The Law of Segregation**
  - The **law of segregation** states that a pair of factors is segregated, or separated, during the formation of gametes.

End of Slide






## Chapter 9

### Objectives

- **Differentiate** between the genotype and the phenotype of an organism.
- **Explain** how probability is used to predict the results of genetic crosses.
- **Use** a Punnett square to predict the results of monohybrid and dihybrid genetic crosses.
- **Explain** how a testcross is used to show the genotype of an individual whose phenotype expresses the dominant trait.
- **Differentiate** a monohybrid cross from a dihybrid cross.

End of Slide

## Chapter 9

### Genotype and Phenotype

- The **genotype** is the genetic makeup of an organism.
- The **phenotype** is the appearance of an organism.

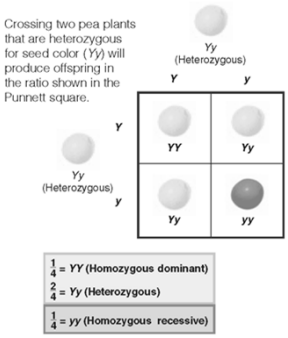





## Chapter 9

### Monohybrid Cross of Heterozygous Plants

Crossing two pea plants that are heterozygous for seed color (*Yy*) will produce offspring in the ratio shown in the Punnett square.




$\frac{1}{4}$ = *YY* (Homozygous dominant)
$\frac{2}{4}$ = *Yy* (Heterozygous)
$\frac{1}{4}$ = *yy* (Homozygous recessive)






## Chapter 9

### Probability

- **Probability** is the likelihood that a specific event will occur.
- A probability may be expressed as a decimal, a percentage, or a fraction.






## Chapter 9

### Predicting Results of Monohybrid Crosses, *continued*

- A **testcross**, in which an individual of unknown genotype is crossed with a homozygous recessive individual, can be used to determine the genotype of an individual whose phenotype expresses the dominant trait.






## Chapter 9

### Predicting Results of Monohybrid Crosses

- A **Punnett square** can be used to predict the outcome of genetic crosses.
- A cross in which one characteristic is tracked is a **monohybrid cross.**






## Chapter 9

### Predicting Results of Monohybrid Crosses, *continued*

- **Complete dominance** occurs when heterozygous individuals and dominant homozygous individuals are indistinguishable in phenotype.

## Chapter 9

**Predicting Results of Monohybrid Crosses,** *continued*

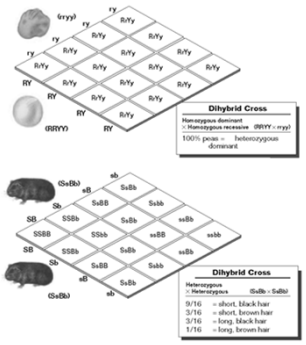
- **Incomplete dominance** occurs when two or more alleles influence the phenotype and results in a phenotype intermediate between the dominant trait and the recessive trait.






## Chapter 9

**Dihybrid Crosses**









## Chapter 9

**Predicting Results of Monohybrid Crosses,** *continued*

- **Codominance** occurs when both alleles for a gene are expressed in a heterozygous offspring.






## Chapter 9

### Predicting Results of Dihybrid Crosses

- A cross in which two characteristics are tracked is a **dihybrid cross.**