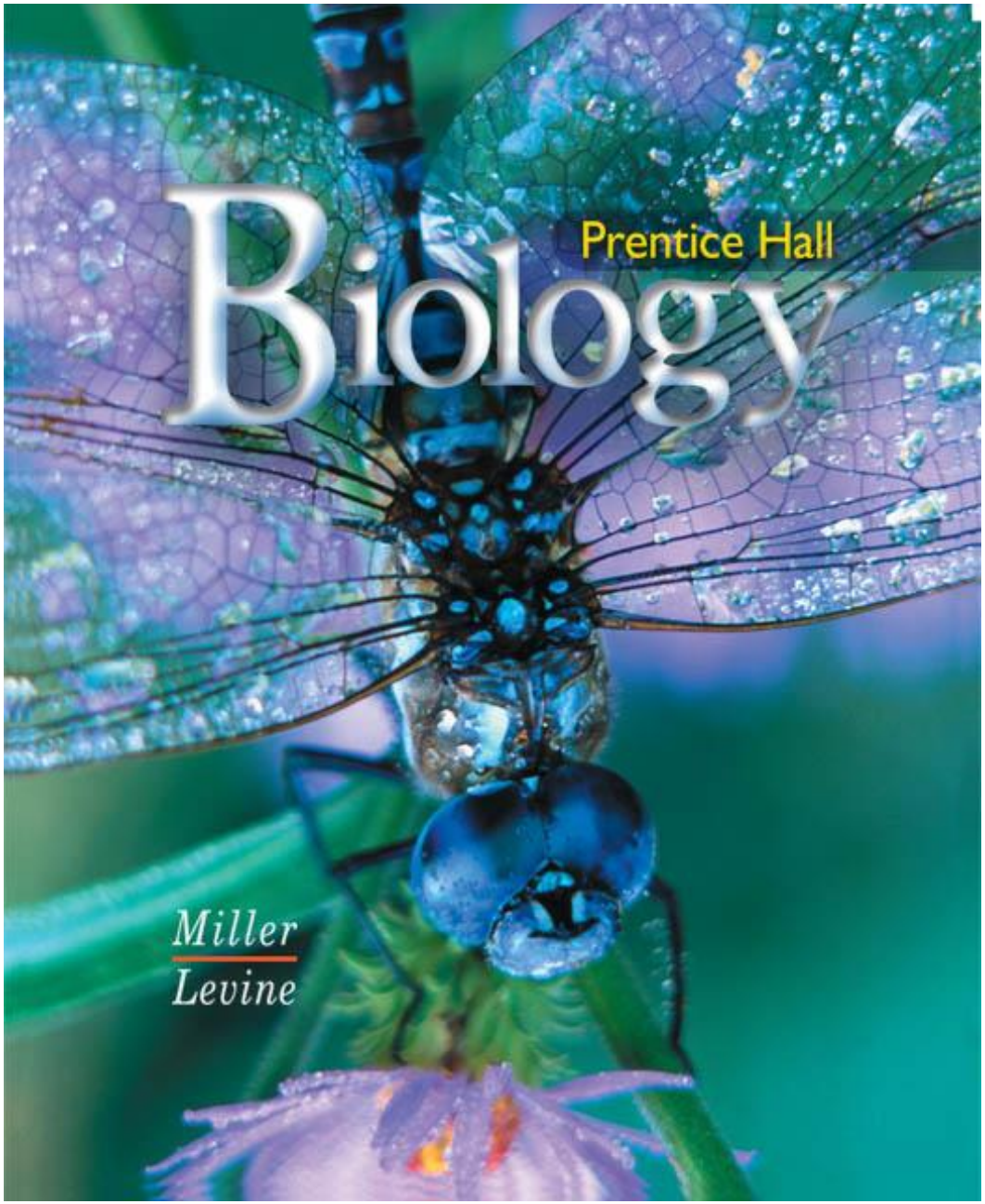
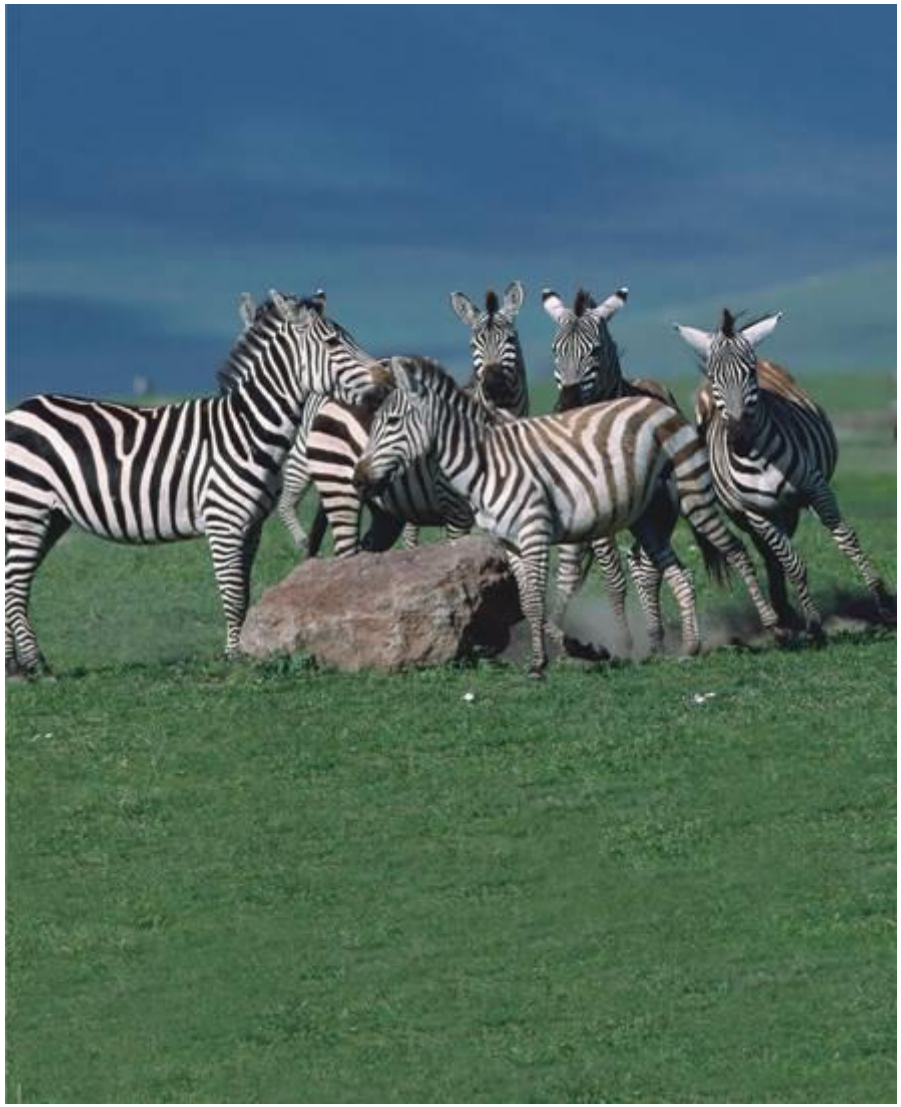


11-1 The Work of Gregor Mendel



Gregor Mendel's Peas

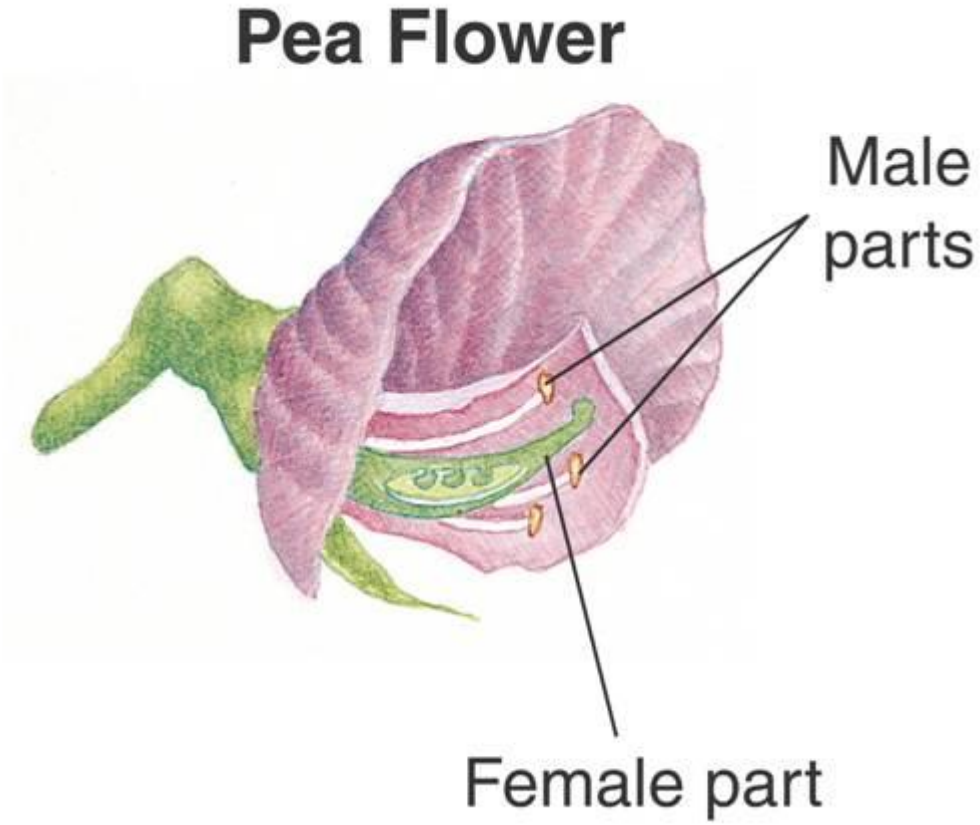
Genetics is the scientific study of heredity**.**

Gregor Mendel was an Austrian monk. His work was important to the understanding of heredity.

Mendel carried out his work with ordinary garden peas.

Mendel knew that

- the male part of each flower produces pollen, (containing sperm).
- the female part of the flower produces egg cells.



During sexual reproduction, sperm and egg cells join in a process called fertilization.

Fertilization produces a new cell.

Pea flowers are self-pollinating.

Sperm cells in pollen fertilize the egg cells in the same flower.

The seeds that are produced by self-pollination inherit all of their characteristics from the single plant that bore them.

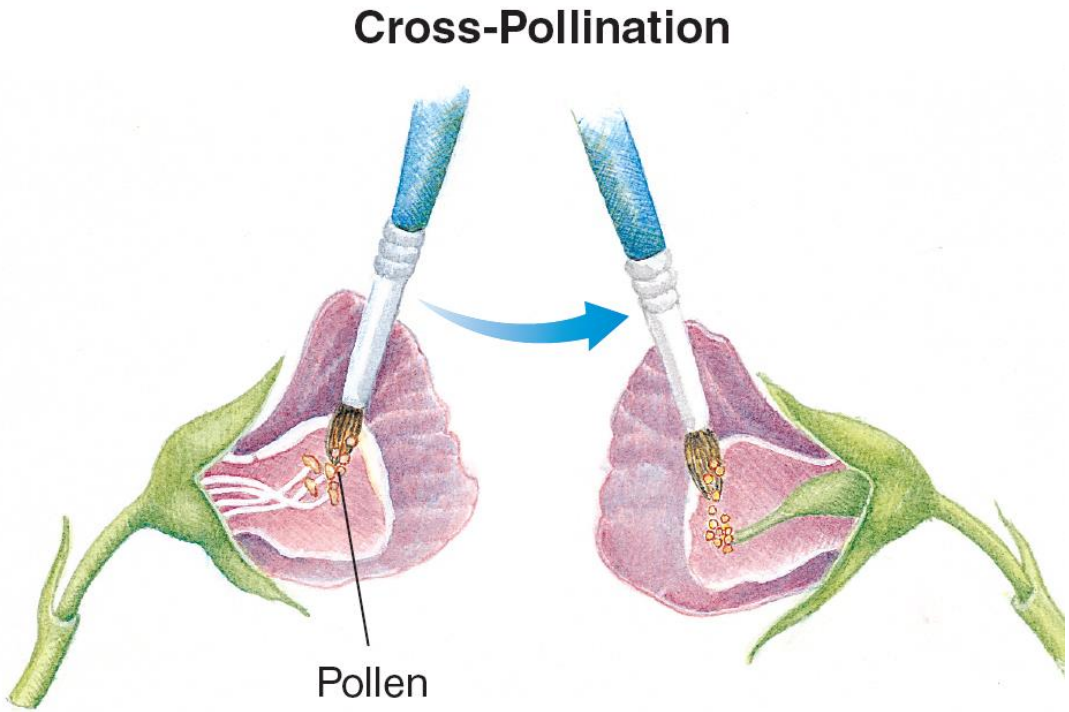
Mendel had **true-breeding** pea plants that, if allowed to self-pollinate, would produce offspring identical to themselves.

Mendel wanted to produce seeds by joining male and female reproductive cells from two different plants.

He cut away the pollen-bearing male parts of the plant and dusted the plant's flower with pollen from another plant.

This process is called cross-pollination.

Mendel was able to produce seeds that had two different parents.



Genes and Dominance

A **trait** is a specific characteristic that varies from one individual to another.

Genes and Dominance

Mendel studied seven pea plant traits, each with two contrasting characters.

He crossed plants with each of the seven contrasting characters and studied their offspring.

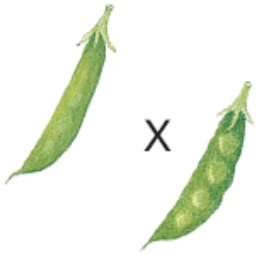
Each original pair of plants is the P (parental) generation.

The offspring are called the F_1, or “first filial,” generation.

The offspring of crosses between parents with different traits are called **hybrids**.

The F_1 hybrid plants all had the character of only one of the parents.

Mendel's F_1 Crosses on Pea Plants

	Seed Shape	Seed Color	Seed Coat Color	Pod Shape
P	Round  Wrinkled	Yellow  Green	Gray  White	Smooth  Constricted
F_1	 Round	 Yellow	 Gray	 Smooth

Mendel's F_1 Crosses on Pea Plants

	Pod Shape	Pod Color	Flower Position	Plant Height
P	Smooth  Constricted	Green  Yellow	Axial  Terminal	Tall  Short
F_1	 Smooth	 Green	 Axial	 Tall

Mendel's first conclusion was that biological inheritance is determined by factors that are passed from one generation to the next.

Today, scientists call the factors that determine traits **genes**. (like plant height)

The different forms of a gene are called **alleles.** (like tall vs. short plants)

Each of the traits Mendel studied was controlled by one gene that occurred in two contrasting forms that produced different characters for each trait.

Mendel's second conclusion is called the principle of dominance.

What is the principle of dominance?

The principle of dominance states that some alleles are dominant and others are recessive.

An organism with a dominant allele for a trait will always exhibit that form of the trait.

An organism with the recessive allele for a trait will exhibit that form only when the dominant allele for that trait is not present.

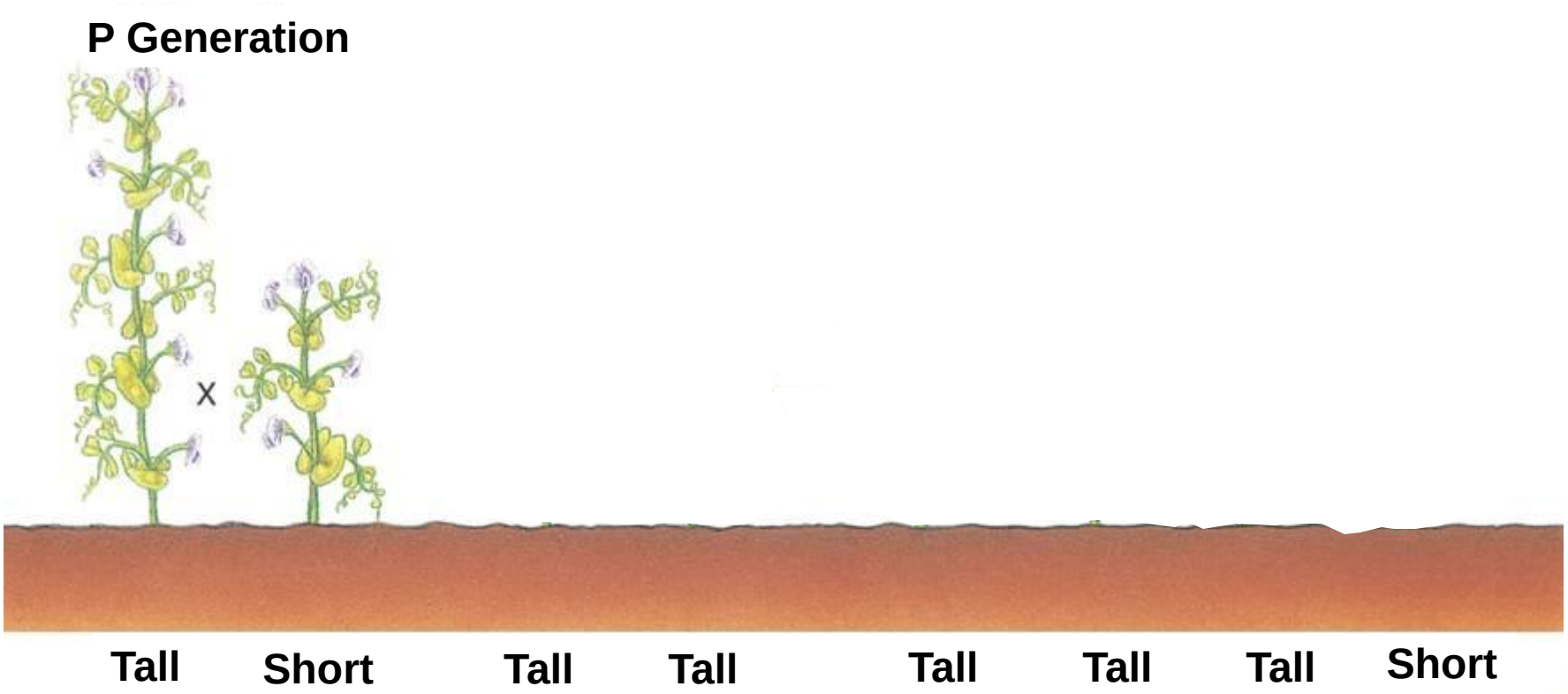
What happens during segregation?

Segregation

Mendel crossed the F_1 generation with itself to produce the F_2 (second filial) generation.

The traits controlled by recessive alleles reappeared in one fourth of the F_2 plants.

Mendel's F_2 Generation



Mendel assumed that a dominant allele had masked the corresponding recessive allele in the F_1 generation.

The trait controlled by the recessive allele showed up in some of the F_2 plants.

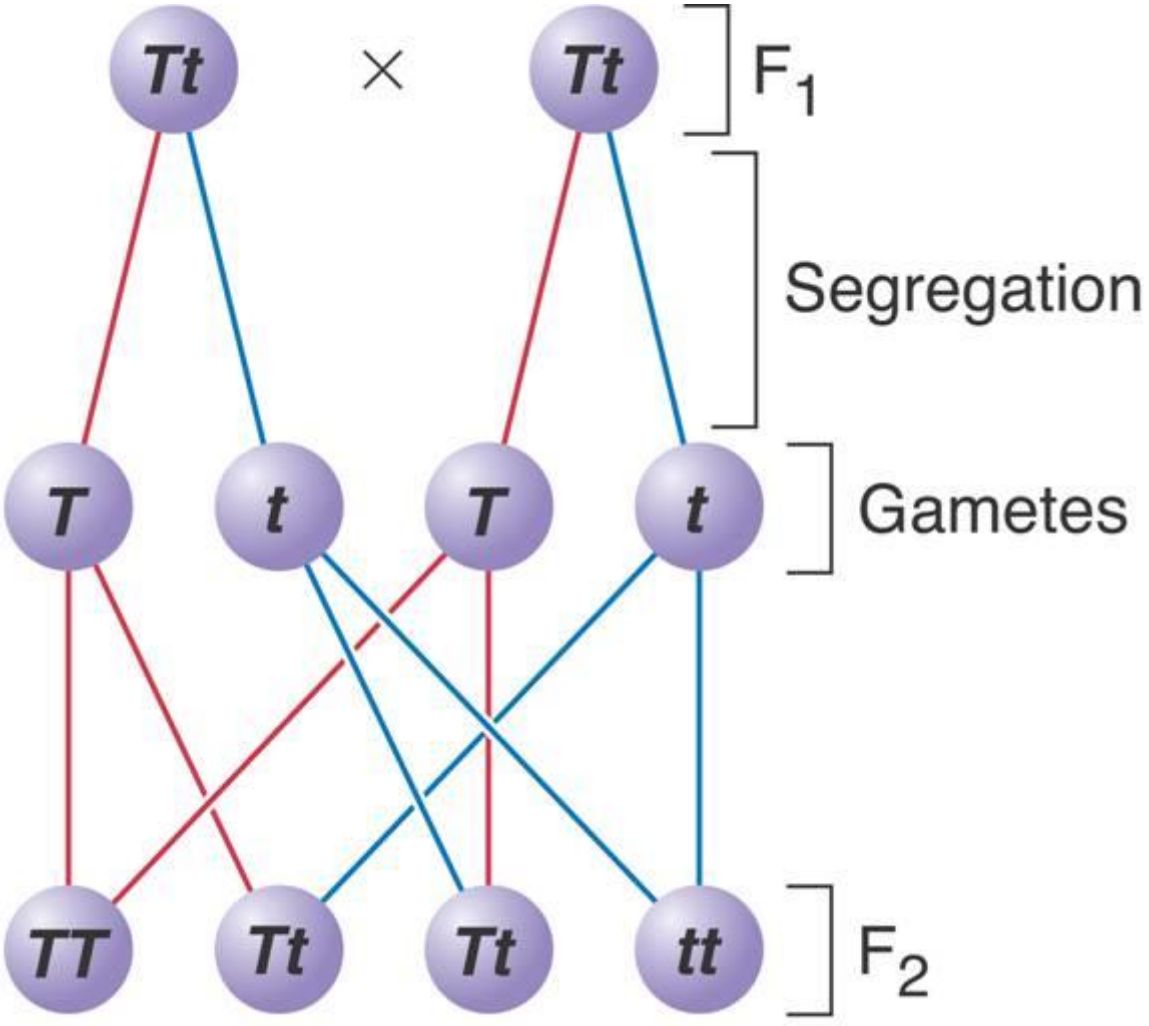
The reappearance of the trait controlled by the recessive allele indicated that at some point the allele for shortness had been separated, or **segregated**, from the allele for tallness.

Mendel suggested that the alleles for tallness and shortness in the F_1 plants segregated from each other during the formation of the sex cells, or **gametes.**

When each F_1 plant flowers and produces gametes, the two alleles segregate from each other so that each gamete carries only a single copy of each gene.

Therefore, each F_1 plant produces two types of gametes—those with the allele for tallness, and those with the allele for shortness.

Alleles separate during gamete formation.



11-1 Section QUIZ

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Section QUIZ

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11-1 Section QUIZ

1 Gametes are also known as

a. genes.

A b. sex cells.

c. alleles.

d. hybrids.

2 The offspring of crosses between parents with different traits are called

a. alleles.

A b. hybrids.

c. gametes.

d. dominant.

3 In Mendel's pea experiments, the male gametes are the

a. eggs.

b. seeds.

A c. pollen.

d. sperm.

4 In a cross of a true-breeding tall pea plant with a true-breeding short pea plant, the F_1 generation consists of

a. all short plants.

A b. all tall plants.

c. half tall plants and half short plants.

d. all plants of intermediate height.

5 If a particular form of a trait is always present when the allele controlling it is present, then the allele must be

a. mixed.

b. recessive.

c. hybrid.

A d. dominant.

END OF SECTION