Name _____ Date _____ Class _____

SECTION 3-1 SECTION SUMMARY

Mendel's Work

Guide for Reading

- **What factors control the inheritance of traits in organisms?**

Gregor Mendel was curious about the physical characteristics, or **traits,** of pea plants. The passing of traits from parents to offspring is called **heredity.** Mendel's work was the foundation of **genetics,** the scientific study of heredity.

Pea plants are useful for studying heredity because they have many traits that exist in only two forms. They also produce large numbers of offspring, making it easy to collect large amounts of data. Their flower structure makes it easy to set up crosses between specific plants.

Mendel crossed two pea plants that differed in only one trait—height. He crossed purebred tall plants with purebred short plants. These parent plants, the P generation, were **purebred** because they always produced offspring with the same form of the trait. The offspring of this cross, which Mendel called the first filial, or F_1, generation, were all tall. It seemed as if the shortness trait had disappeared. When the F_1 plants were allowed to cross, about three fourths of the F_2 generation were tall and about one fourth were short. From his results, Mendel reasoned that individual factors, one from each parent, control the inheritance of traits. Today, scientists call the factors that control traits **genes.** The different forms of a gene are called **alleles.**

Individual alleles control the inheritance of traits. Some alleles are dominant, while other alleles are recessive. A **dominant allele** is one whose trait always shows up in the organism when the allele is present. A **recessive allele** is masked, or covered up, whenever the dominant allele is present. A trait controlled by a recessive allele will only show up if the organism inherits two recessive alleles for the trait.

In Mendel's cross, the purebred tall plant has two alleles for tall stems. The purebred short plant has two alleles for short stems. The F_1 plants are all **hybrids,** they have two different alleles for the trait—one allele for tall stems and one for short stems. Geneticists use a capital letter to represent a dominant allele and a lowercase version of the same letter for the recessive allele. Mendel presented his results in 1866. However his work went unnoticed for over 30 years. In 1900, three different scientists rediscovered Mendel's work. Many of the principles that Mendel discovered still stand to this day. Because of his work, Mendel is often called the Father of Genetics.

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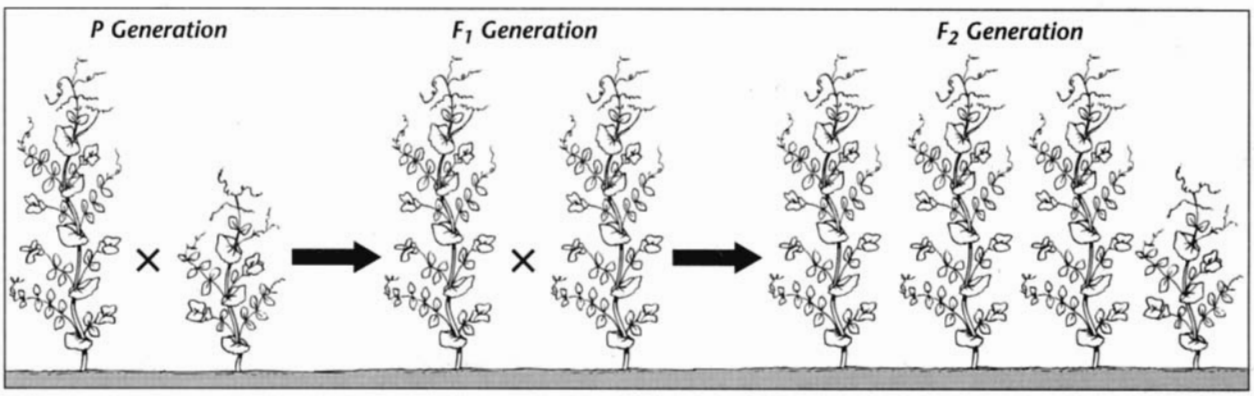
SECTION 3-1 REVIEW AND REINFORCE

Mendel's Work

◆ Understanding Main Ideas

Study the figure. Then answer the following questions on a separate sheet of paper.



1. What trait in pea plants is being studied in the cross above?

2. What are the two alleles of this trait?

3. Which allele is the dominant allele? Explain how you know.

4. Which allele is the recessive allele? Explain.

5. What alleles do the F_1 offspring have? Explain which allele was inherited from which parent.

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

_____ **6.** genetics

_____ **7.** alleles

_____ **8.** traits

_____ **9.** recessive allele

_____ **10.** genes

_____ **11.** hybrid

_____ **12.** heredity

_____ **13.** dominant allele

a. the passing of traits from parents to offspring

b. an organism with two different alleles for a trait

c. factors that control traits

d. physical characteristics of organisms

e. an allele whose trait always shows up in the organism

f. the different forms of a gene

g. the scientific study of heredity

h. an allele whose trait is masked in the presence of a dominant allele

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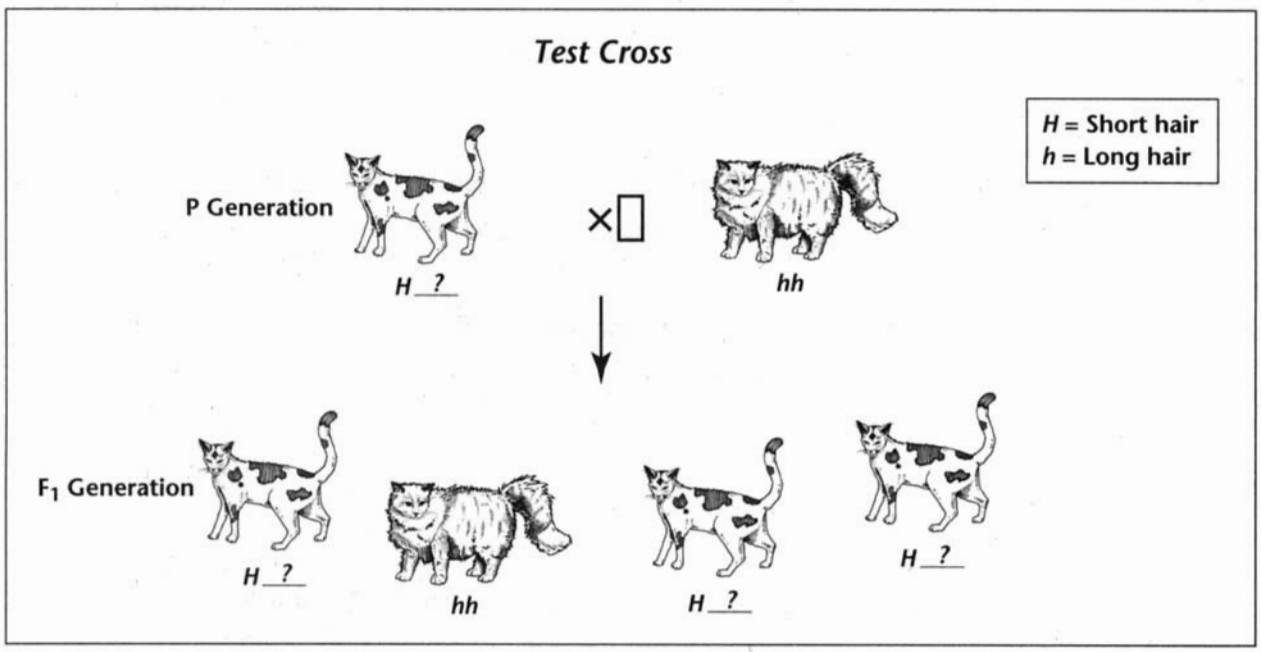
SECTION 3-1 **ENRICH**

The Test Cross

When an organism has a trait controlled by a dominant allele, it can either be a hybrid or a purebred. To find out which, geneticists can use a test cross. In a test cross, the organism with the trait controlled by a dominant allele is crossed with an organism with a trait controlled by a recessive allele. If all offspring have the trait controlled by the dominant allele, then the parent is a purebred. If any offspring has the recessive trait, then the dominant parent is a hybrid. Study the test cross below, then answer the questions.



Answer the following questions on a separate sheet of paper.

1. Is the long-haired cat in the P generation a hybrid or a purebred? Explain your answer.
2. Is the short-haired cat in the P generation a hybrid or a purebred? Explain your answer.
3. If the short-haired cat in the P generation were purebred, what would you expect the offspring to look like?
4. In horses, the allele for a black coat (*B*) is dominant over the allele for a brown coat (*b*). A cross between a black horse and a brown horse produces a brown foal. Is the black horse a hybrid or a purebred? Explain.
5. In guinea pigs, the allele for a smooth coat (*S*) is dominant over the allele for a rough coat (*s*). Explain how you could find out whether a guinea pig with a smooth coat is a hybrid or a purebred.