

SECTION 4-1

SECTION SUMMARY

Human Inheritance

Guide for Reading

- ◆ Why do some human traits show a large variety of phenotypes?
- ◆ Why are some sex-linked traits more common in males than in females?
- ◆ How do geneticists use pedigrees?

Many human traits are controlled by a single gene with one dominant allele and one recessive allele. As with tall and short pea plants, these human traits have two distinctly different phenotypes, or physical appearances. For example, the allele for a widow's peak, which is a hairline that comes to a point in the middle of the forehead, is dominant over the allele for a straight hairline.

Some human traits are controlled by a single gene that has more than two alleles. Such a gene is said to have **multiple alleles**—three or more forms of a gene that code for a single trait. An example of a human trait that is controlled by a gene with multiple alleles is blood type. There are four main blood types—A, B, AB, and O—controlled by three alleles.

Some human traits show a large number of phenotypes because the traits are controlled by many genes. The genes act together as a group to produce a single trait. Height and skin color are both examples of human traits controlled by many genes. When more than one gene controls a trait, there are many possible combinations of genes and alleles. There is an enormous variety of phenotypes for height, for example, and human skin color ranges from almost white to nearly black, with many shades in between.

The effects of genes are often altered by the environment—the organism's surroundings. For example, people's diets can affect their height.

As with other traits, your sex is controlled by your chromosomes. If you are female, you have two X chromosomes. If you are male, you have an X and a Y chromosome. Whether you inherited an X or Y chromosome from your father determines your sex.

Genes on the X and Y chromosomes are often called **sex-linked genes**. Traits controlled by sex-linked genes are called sex-linked traits. **Because males have only one X chromosome, males are more likely than females to have a sex-linked trait that is controlled by a recessive allele.** One example of a sex-linked trait that is controlled by a recessive allele is red-green colorblindness. A **carrier** is a person who has one recessive allele for a trait and one dominant allele. Although a carrier does not have the trait, the carrier can pass the recessive allele on to his or her offspring.

Geneticists interested in studying inheritance patterns in humans need to trace the inheritance of traits through many generations in a number of families. **One important tool that geneticists use to trace the inheritance of traits in humans is a pedigree.** A **pedigree** is a chart or "family tree" that tracks which members of a family have a particular trait.

© Prentice-Hall, Inc.

SECTION 4-1

REVIEW AND REINFORCE

Human Inheritance

◆ Understanding Main Ideas

Fill in the Punnett squares for dimples, a trait controlled by a dominant allele (A), and colorblindness, a trait controlled by a recessive sex-linked allele (B). Then answer the questions that follow.

5. Does either the mother or the father in A have dimples?

6. What percentage of children are likely to have dimples?

A: Dimples

	D	d
d	1.	2.
d	3.	4.

B: Colorblindness

	X ^c	Y
X ^C	7.	8.
X ^c	9.	10.

11. Is either the mother or father in B colorblind?

12. What percentage of female children are likely to be colorblind?

13. What percentage of male children are likely to be colorblind?

◆ Building Vocabulary

Fill in the blank to complete each statement.

14. Three or more forms of a gene that code for a single trait are called _____.

15. _____ are alleles passed from parent to child on a sex chromosome.

16. A(n) _____ is a person who has one recessive allele for a trait and one dominant allele for the same trait.

17. A(n) _____ is a chart that tracks which members of a family have a particular trait.