



SECTION

6.4

TRAITS, GENES, AND ALLELES

Reinforcement

**KEY CONCEPT** Genes encode proteins that produce a diverse range of traits.

A **gene** is a segment of DNA that tells the cell how to make a particular polypeptide. The location of a gene on a chromosome is called a locus. A gene has the same locus on both chromosomes in a pair of homologous chromosomes. In genetics, scientists often focus on a single gene or set of genes. **Genotype** typically refers to the genetic makeup of a particular set of genes. **Phenotype** refers to the physical characteristics resulting from those genes.

An alternative form of a gene is an **allele**. The pea plants that Mendel worked with had two alleles for each gene. For example, there was an allele for round peas and an allele for wrinkled peas. Genes are not limited to two alleles, however. Some genes are found in many different forms throughout a population.

Your cells have two alleles for each gene regardless of how many alleles are present in a population. Suppose there were 64 alleles of a hair color gene present in the human population. Your cells would only have two of those alleles, one from your mother and one from your father. If the two alleles are the same, they are **homozygous**. If the two alleles are different, they are **heterozygous**.

Some alleles are dominant over others.

- A **dominant** allele is expressed when two different alleles or two dominant alleles are present. Therefore, both homozygous dominant and heterozygous genotypes can produce the dominant phenotype.
- A **recessive** allele is expressed only when both alleles are recessive. Therefore, only the homozygous recessive genotype can produce the recessive phenotype.

Alleles may be represented using letters. Uppercase letters represent dominant alleles. Lowercase letters represent recessive alleles.

1. If you were to make an analogy and say that genotype is like blueprints, how would you complete the analogy to describe phenotype?

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2. Use the letters B and b to represent the following genotypes: heterozygous, homozygous recessive, homozygous dominant.

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