

SECTION 4-3

SECTION SUMMARY

Advances in Genetics

Guide for Reading

- ◆ What are three ways in which an organism's traits can be altered?
- ◆ What is the goal of the Human Genome Project?

For thousands of years, people have tried to produce plants and animals with desirable traits. **Three methods that people have used to develop organisms with desirable traits are selective breeding, cloning, and genetic engineering.**

The process of selecting a few organisms with desired traits to serve as parents of the next generation is called **selective breeding**. Breeding programs usually focus on increasing the value of the plant or animal to people. Examples include cows that produce more milk and vegetables that resist disease. One selective breeding technique is called **inbreeding**. **Inbreeding** involves crossing two individuals that have identical or similar sets of genes. One goal of inbreeding is to produce breeds of organisms with specific traits. For example, by only crossing horses with exceptional speed, breeders can produce purebred horses that can run very fast. Unfortunately, inbreeding also increases the probability that organisms may inherit alleles that lead to genetic disorders. Another selective breeding technique is called **hybridization**. In **hybridization**, breeders cross two genetically different individuals. The hybrid organism that results is bred to have the best traits from both parents. For example, a farmer might cross corn that produces many kernels with corn that is resistant to disease.

For some organisms, another technique, called cloning, can be used to produce offspring with desired traits. A **clone** is an organism that is genetically identical to the organism from which it was produced. One way to produce a clone of a plant is to cut and grow a small part of a plant, such as a leaf or stem. Producing a clone of an animal is much more difficult.

Another technique for producing organisms with desired traits is called genetic engineering. In **genetic engineering**, genes from one organism are transferred into the DNA of another organism. Researchers use genetic engineering to produce medicines, improve food crops, and try to cure human genetic disorders. In a type of genetic engineering, called **gene therapy**, working copies of a gene are inserted directly into the cells of a person with a genetic disorder. Gene therapy is still an experimental method for treating genetic disorders.

A genetic technique called DNA fingerprinting is used to help solve crimes. DNA from samples of hair, skin, and blood are used to identify people. No two people, except for identical twins, have the same DNA.

A **genome** is all the DNA in one cell of an organism. **The main goal of the Human Genome Project is to identify the DNA sequence of every gene in the human genome.** From the Human Genome Project, scientists hope to learn what makes the body work and what causes things to go wrong.

SECTION 4 - 3 **REVIEW AND REINFORCE**

Advances in Genetics

◆ Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. What are two types of selective breeding, and how do they compare?
2. What is cloning?
3. How is bacteria used in genetic engineering?
4. How is gene therapy used to treat genetic disorders?
5. What is the Human Genome Project?

◆ Building Vocabulary

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

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| _____ 6. The process of selecting a few organisms with desired traits to serve as parents of the next generation | a. inbreeding |
| _____ 7. Crossing two individuals that have identical or similar sets of alleles | b. clone |
| _____ 8. Crossing two genetically different individuals | c. gene therapy |
| _____ 9. Organism that is genetically identical to the organism from which it was produced | d. selective breeding |
| _____ 10. Process in which genes from one organism are inserted into the DNA of another organism | e. hybridization |
| _____ 11. Inserting working copies of a gene directly into the cells of a person with a genetic disorder | f. genetic engineering |
| _____ 12. All the DNA in one cell of an organism | g. genome |