CHAPTER

9 Review

CHAPTER VOCABULARY

9.1
- restriction enzyme
- gel electrophoresis
- restriction map

9.2
- polymerase chain reaction (PCR)
- primer

9.3
- DNA fingerprint

9.4
- clone
- genetic engineering
- recombinant DNA
- plasmid
- transgenic
- gene knockout

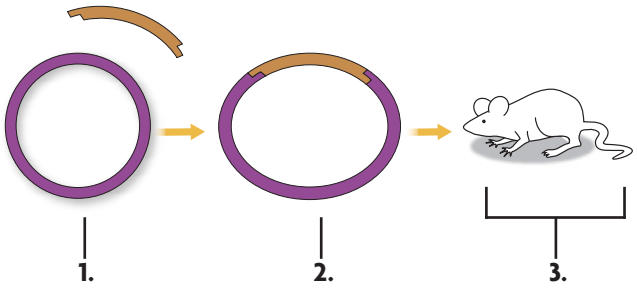
9.5
- genomics
- gene sequencing
- Human Genome Project
- bioinformatics
- DNA microarray
- proteomics

9.6
- genetic screening
- gene therapy

Reviewing Vocabulary

Label Diagrams

In your notebook, write the vocabulary term that matches each item that is pointed out below.



Keep It Short

For each vocabulary term below, write a short, precise phrase that describes its meaning. For example, a short phrase to describe *PCR* could be "DNA copying tool."

4. genetic screening

5. genomics

6. DNA fingerprint

7. clone

READING TOOLBOX WORD ORIGINS

8. The prefix *electro-* means "electricity." The suffix *-phoresis* means "transmission" or "carrying." How do these meanings relate to the meaning of the term *electrophoresis*?

9. The suffix *-ics* means "science or study of." What is studied in *genomics*? in *proteomics*? in *bioinformatics*?

Reviewing MAIN IDEAS

10. Why can restriction enzymes be thought of as molecular "scissors"?

11. Explain what gel electrophoresis shows about DNA, and how it is used to separate DNA.

12. PCR requires DNA polymerase from bacteria that live in hot springs. Why can't DNA polymerase from organisms that live in cooler temperatures be used in PCR?

13. Briefly describe the three main steps of PCR.

14. What parts of DNA molecules are the basis of the differences detected by DNA fingerprinting?

15. Why is probability important in DNA fingerprinting?

16. What is the role of nuclear transfer in the process of cloning an animal?

17. Describe the general process used to make bacteria that have recombinant DNA. Include the terms *restriction enzyme* and *plasmid* in your answer.

18. How are gene knockout mice useful in determining the function of genes?

19. How does genomics rely on DNA sequencing?

20. Explain why computer databases are important in genomics and proteomics.

21. How are pedigree analysis and DNA testing used together in genetic screening?

22. What is gene therapy, and how might it be used as a treatment for cancer or for genetic disorders?

Critical Thinking

23. Analyze How are DNA microarrays related to genomics?

24. Compare and Contrast How are restriction maps and DNA fingerprints similar? How are they different? Explain your answers.

25. Compare and Contrast A plant can send out a runner that will sprout a new plant that is a clone of the "parent." Single-celled organisms divide in two, forming two clones. How is the cloning of an animal similar to and different from the cloning that happens in nature?

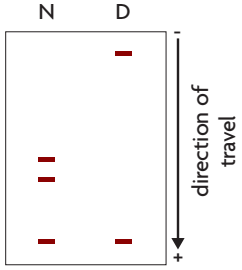
26. Synthesize Some fruits and vegetables are the result of crossing different species. A tangelo, for example, results from crossing a tangerine with a grapefruit. How are the genetic engineering processes of making transgenic organisms similar to and different from crossbreeding?

27. Apply Identical twins are technically clones of each other but can differ in both appearance and behavior. How is it possible that two people with the same genome could be different?

28. Synthesize Transgenic bacteria can be used to make human insulin. Explain how bacteria can produce a human protein.

Interpreting Visuals

The gel below shows two different restriction maps for the same segment of DNA. One of the maps is for a normal gene (N) and the other is for a disease gene (D). Use the information in the gel to answer the next two questions.



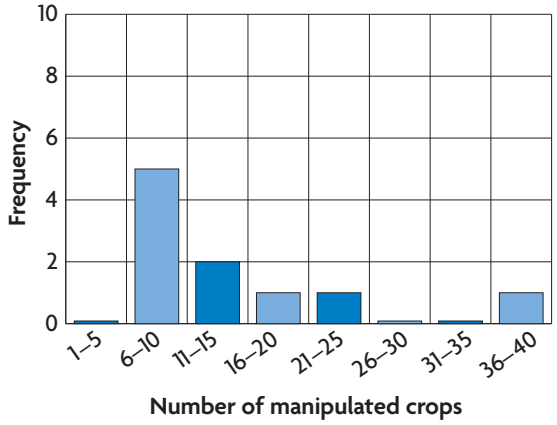
29. Analyze Which restriction map (N or D) has the smallest fragment of DNA? Which has the largest fragment? Explain your answers.

30. Interpret What do the restriction maps tell you about differences between a normal allele (N) and a disease (D) allele? Explain.

Analyzing Data Construct a Histogram

Ten of the most commonly modified crops include rice, potatoes, maize, papayas, tomatoes, corn, soybeans, wheat, alfalfa, and sugar cane. The histogram below shows how many times these crops have been modified. Among the 15 countries studied from 2001 through 2003, for example, different researchers modified rice a total of 37 times. Use the data to answer the next two questions.

FREQUENCY OF CROP MODIFICATION



Source: Cohen, Nature Biotechnology, 23:1.

31. Analyze What is the most common range of genetic modifications for crop plants? The least common?

32. Calculate What percentage of crop types fall in the range of 11–15 genetic modifications?

Making Connections

33. Write an Informational Pamphlet Suppose that you work for a biotechnology company that specializes in DNA fingerprinting to help reunite families that have been separated. Write a pamphlet that describes how DNA fingerprinting works. Explain why the results of DNA fingerprinting can be trusted.

34. Synthesize Look again at the picture of Baby 81 on the chapter opener. After reading this chapter, you know that DNA fingerprinting is just one part of biotechnology. Choose a topic from the chapter, such as genetic engineering or PCR. Discuss how that topic is related to Mendel's work on heredity, and how it is related to the structure and function of DNA.