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Section 12–1 DNA (pages 287–294)

This section tells about the experiments that helped scientists discover the relationship between genes and DNA. It also describes the chemical structure of the DNA molecule.

Griffith and Transformation (pages 287–289)

1. What did Frederick Griffith want to learn about bacteria? He wanted to learn how certain types of bacteria produce pneumonia.

2. The strain of bacteria that caused pneumonia grew into smooth colonies on culture plates; harmless bacteria produced colonies with rough edges.

3. Circle the letter of each sentence that is true about Griffith's experiment.
   - **a.** Mice injected with bacteria from smooth colonies died.
   - **b.** Mice injected with bacteria from rough colonies died.
   - **c.** Mice injected with heat-killed bacteria from smooth colonies died.
   - **d.** Mice injected with a mixture of bacteria from heat-killed smooth colonies and live rough colonies died.

4. What result from Griffith's experiment suggested that the cause of pneumonia was not a chemical poison released by the disease-causing bacteria? The mice survived after being injected with heat-killed disease-causing bacteria.

5. What is transformation? It is the process by which one strain of bacteria changes into another.

6. What hypothesis did Griffith form from the results of his experiments? Some factor, which might be a gene, was transferred from the heat-killed bacteria cells into the live cells.

Avery and DNA (page 289)

7. Is the following sentence true or false? Avery and his colleagues thought that the molecule required in transformation might also be the molecule of the gene.
   true

8. Briefly describe how Avery and his group determined which molecule was most important for transformation? They treated the extract of heat-killed bacteria with enzymes that destroyed proteins, lipids, carbohydrates, and other molecules, including RNA and DNA.

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9. Transformation did not occur when DNA was destroyed.

10. What was the conclusion from Avery's experiments? DNA was the transforming factor.

The Hershey-Chase Experiment (pages 289–290)

11. What is a bacteriophage? It is a virus that infects bacteria.

12. Circle the letter of each part that makes up a bacteriophage.

a. lipid coat **c.** carbohydrate core

b. protein coat **d.** DNA core

13. What happens when a bacteriophage infects a bacterial cell? The bacteriophage injects its DNA into the cell. The viral genes act to produce many new bacteriophages, which burst out when the cell splits open.

14. How would Hershey and Chase learn whether genes were made of protein or DNA? If they could determine which part of the virus entered the infected cell, they would learn whether genes were made of protein or DNA.

15. Circle the letter of the molecule for which phosphorus-32 (^{32}P) is used as a radioactive marker.

a. protein **b.** lipid **c.** DNA **d.** carbohydrate

16. Is the following sentence true or false? If ^{35}S was found in the bacteria, it would mean that the viruses' DNA had been injected into the bacteria. false

17. What results did Hershey and Chase observe? Nearly all of the radioactivity in the bacteria was from phosphorus, the marker found in DNA.

18. Hershey and Chase concluded that the genetic material of the bacteriophage was DNA.

The Components and Structure of DNA (pages 291–294)

19. List the three critical things that genes were known to do.

a. Genes had to carry information from one generation to the next.

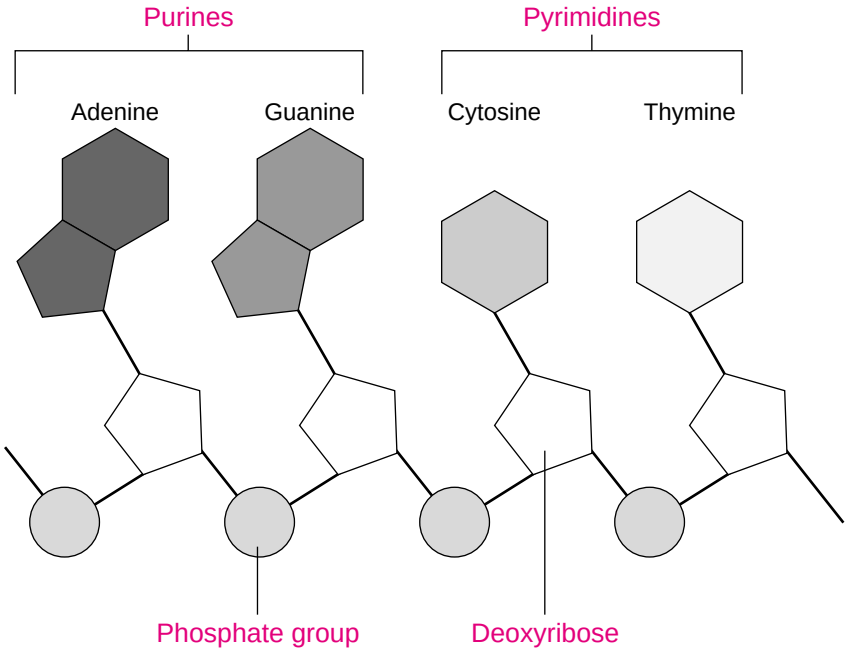
b. Genes had to determine the heritable characteristics of organisms.

c. Genes had to be easily copied.

20. Adenine, guanine, cytosine, and thymine are four kinds of nitrogenous bases in DNA.

Chapter 12, DNA and RNA *(continued)*

21. Identify the components of a nucleotide in the diagram below. Label the bases as purines or pyrimidines.



22. Is the following sentence true or false? Adenine and guanine are larger molecules than cytosine and thymine because they have two rings in their structure. true

23. What forms the backbone of a DNA chain? It is formed by the sugar and phosphate groups of each nucleotide.

24. Is the following sentence true or false? The nucleotides must be joined together in a specific order. false

25. According to Chargaff's rules, the percentages of adenine are equal to thymine and the percentages of cytosine are equal to guanine in the DNA molecule.

26. Rosalind Franklin's work with X-ray diffraction showed that the DNA molecule is shaped like a(an) helix and contains two strands.

27. How did Francis Crick and James Watson try to understand the structure of DNA? They built three-dimensional models of the DNA molecule from cardboard and wire.

28. How did Watson and Crick describe the structure of DNA? DNA was a double helix, in which two strands were wound around each other.

29. Is the following sentence true or false? According to the principle of base pairing, hydrogen bonds could form only between adenine and cytosine. false