




# 12.1 Identifying the Substance of Genes

## Lesson Objectives

-  Summarize the process of bacterial transformation.
-  Describe the role of bacteriophages in identifying genetic material.
-  Identify the role of DNA in heredity.

## Bacterial Transformation

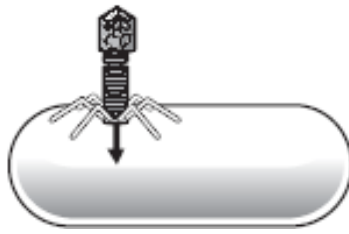
1. What happened when Griffith injected mice with the pneumonia-causing strain of bacteria that had been heat-killed?  
\_\_\_\_\_
2. What happened when Griffith injected mice with a mixture of heat-killed, pneumonia-causing bacteria and live bacteria of the harmless type?  
\_\_\_\_\_
3. What was the purpose of Oswald Avery's experiments?  
\_\_\_\_\_
4. What experiments did Avery do?  
\_\_\_\_\_
5. What did Avery conclude?  
\_\_\_\_\_

## Bacterial Viruses

6. Fill in the blanks to summarize the experiments of Hershey and Chase. (Note: The circles represent radioactive labels.)



\_\_\_\_\_ with  
radioactive label



\_\_\_\_\_ with  
radioactive label



7. What did Hershey and Chase conclude? Why?

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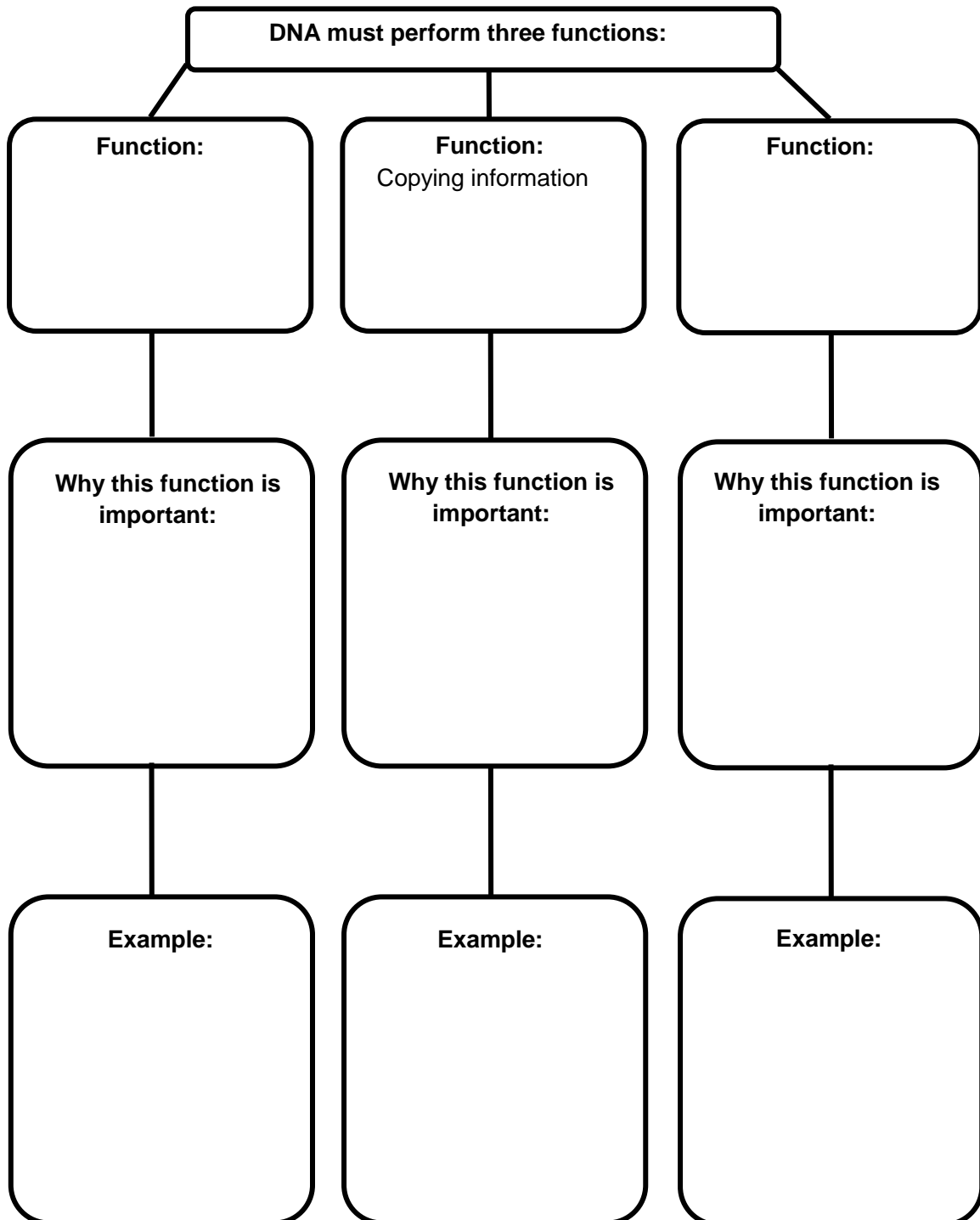
8. How did Hershey and Chase confirm Avery's results?

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## The Role of DNA

9. Complete this graphic organizer to summarize the assumptions that guided research on DNA in the middle of the twentieth century. Use an oak tree to give an example of each function.



## VISUAL ANALOGY

10. DNA is like a book titled *How to Be a Cell*. Explain why that title is appropriate for each of DNA's three functions.

a. \_\_\_\_\_

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b. \_\_\_\_\_

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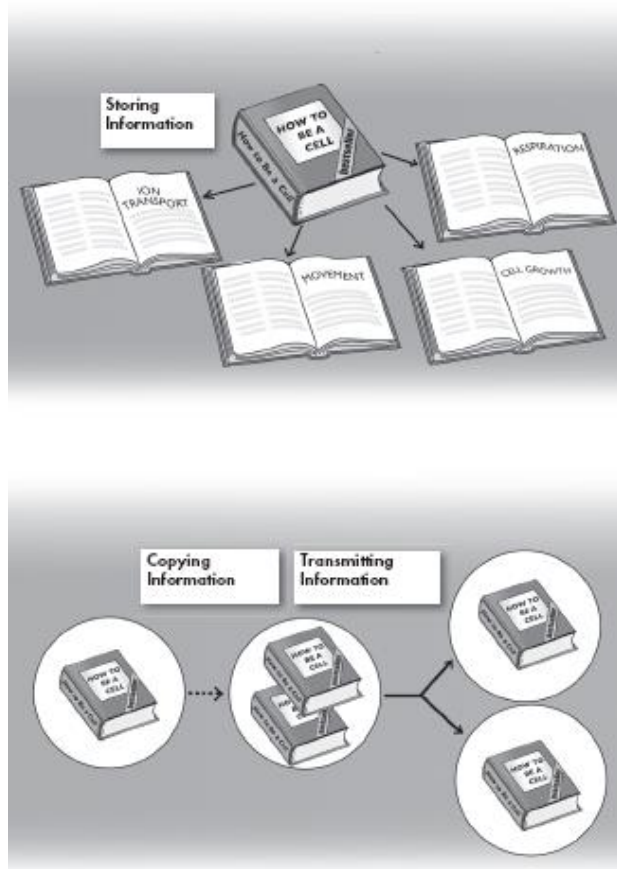
c. \_\_\_\_\_

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## Apply the Big idea

11. By 1952, many scientists were convinced that genes are made of DNA, but they did not yet know how DNA worked. Why was it important to determine the structure of DNA to understand how DNA stored, copied, and transmitted information?

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12. Why was the fact of transformation so important to the study of DNA's role? What did transformation demonstrate?




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# 12.2 The Structure of DNA

## Lesson Objectives

-  Identify the chemical components of DNA.
-  Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code.
-  Describe the steps leading to the development of the double-helix model of DNA.

## The Components of DNA

For Questions 1–5, complete each statement by writing in the correct word or words.

1. The building blocks of DNA are \_\_\_\_\_.
2. Nucleotides in DNA are made of three basic components: a sugar called \_\_\_\_\_, a \_\_\_\_\_, and a nitrogenous \_\_\_\_\_.
3. DNA contains four kinds of nitrogenous bases: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
4. In DNA, \_\_\_\_\_ can be joined in any order.
5. The nucleotides in DNA are joined by \_\_\_\_\_ bonds.

## Solving the Structure of DNA

6. Complete the table to describe each scientist’s contribution to solving the structure of DNA.

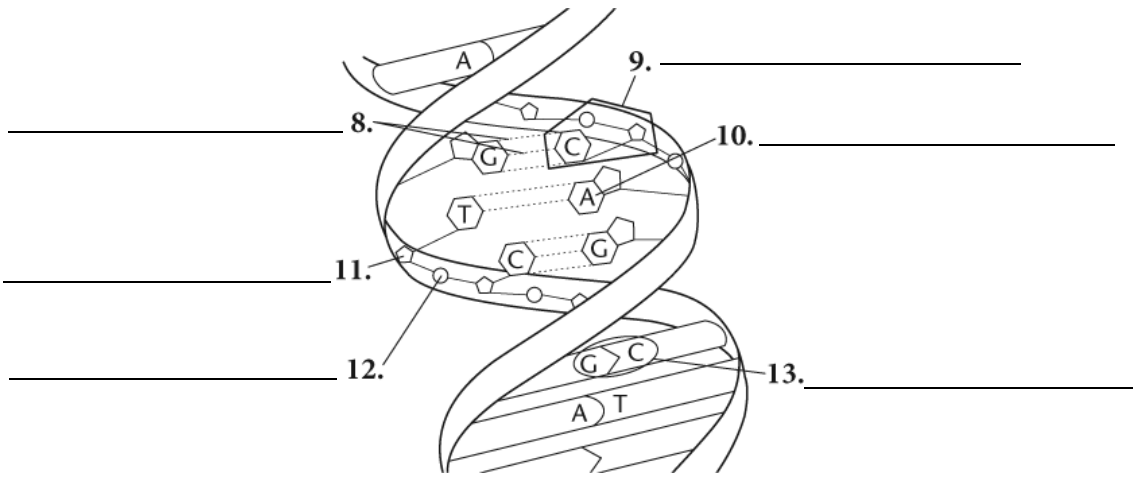
Scientist	Contribution
Erwin Chargaff	
Rosalind Franklin	
James Watson and Francis Crick	

7. Complete the table by estimating the percentages of each based on Chargaff’s rules.

DNA sample	Percent of adenine	Percent of thymine	Percent of guanine	Percent of cytosine
1	31.5			
2		30	20	
3				17

## The Double-Helix Model

For Questions 8–13, on the lines provided, label the parts of the DNA molecule that correspond to the numbers in the diagram. Picture is on the next page.



14. **THINK VISUALLY** The drawing below shows half of a DNA molecule. Fill in the appropriate letters for the other half. Explain why you drew your sketch the way you did.

Key	
A = Adenine	
C = Cytosine	
G = Guanine	
T = Thymine	

C <	G
A )	T
G >	
G >	
C <	
C <	
T (	
A )	
C <	

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**Apply the Big idea**

15. Complete this table to show how the structure of the DNA molecule allows it to perform each essential function.

Function	Structure of the Molecule
Store information	
Copy information	
Transmit information	

# 12.3 DNA Replication

## Lesson Objectives



Summarize the events of DNA replication.



Compare DNA replication in prokaryotes with that of eukaryotes.

## Copying the Code

1. Why are the strands of a DNA molecule said to be complementary?

\_\_\_\_\_

2. What is the first step in eukaryotic DNA replication?

\_\_\_\_\_

\_\_\_\_\_

3. If the base sequence on a separated DNA strand is CGTAGG, what will the base sequence on its complementary strand be?

\_\_\_\_\_

4. What enzyme joins individual nucleotides to produce the new strand of DNA?

\_\_\_\_\_

5. What enzyme makes it less likely that DNA will be lost from telomeres during replication?

\_\_\_\_\_

6. How does this enzyme work?

\_\_\_\_\_

\_\_\_\_\_

7. What is a replication fork?

\_\_\_\_\_

8. Does DNA replication take place in the same direction along both strands of the DNA molecule that is being replicated? Explain your answer. (Hint: Look at the illustration of DNA replication in your textbook.)

\_\_\_\_\_

\_\_\_\_\_

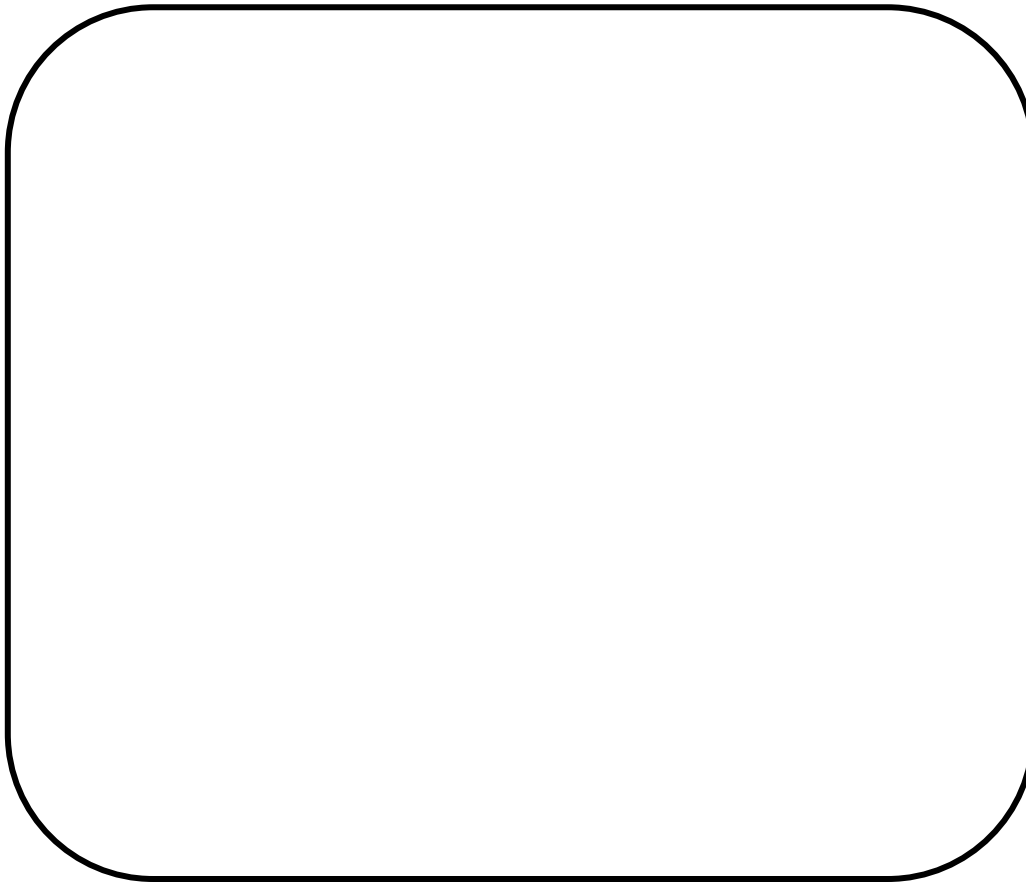
9. Is DNA replication always a foolproof process? Explain your answer.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Make a sketch of the double helix of DNA. Show how it unzips for replication and how complementary strands are built. Label the nitrogenous bases, replication fork, DNA polymerase, the original strand, and the new strand.



## Replication in Living Cells

10. Complete the table to compare and contrast DNA replication in prokaryotes and eukaryotes.

	Prokaryotes	Eukaryotes
Location of DNA		
Amount of DNA		
Starting Point(s) for Replication		

Why is the pairing of bases during replication essential for the transmission of inherited traits from parent to offspring?

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