Lesson Self-Check

CAN YOU EXPLAIN IT?

FIGURE 19: With advanced technology, we can directly observe DNA.

The photos shown here represent images of DNA at different scales. Current models of DNA include specific details about the shape and chemical makeup of this molecule. How do we know what DNA looks like if even our best technology to date gives us limited images?

What we know about DNA today is the result of multiple scientists building on each other's work. At each step in the process, scientists made observations, asked questions, tested ideas, and shared data. Advances in technology let scientists expand on discoveries, adding new information to our body of knowledge. For example, Frederick Griffith's discoveries led to questions Oswald Avery wanted to answer. Avery's work, in turn, provided valuable information that helped Alfred Hershey and Martha Chase prove definitively that DNA is the molecule of inheritance. James Watson and Francis Crick built on Erwin Chargaff's base-pairing rules and evidence from Linus Pauling to propose DNA's helical structure. The work of Rosalind Franklin was critical to the confirmation that DNA did indeed have a twisted, helical shape.

Explain Refer to the notes in your Evidence Notebook to explain how you would describe the structure of DNA. Use evidence and models to support your explanation, and address the following questions in your explanation:

1. How did the research of scientists such as Chargaff, Franklin, Watson, and Crick help advance our understanding of the structure of DNA?
2. What other methods can you think of that could be used to further study the structure of an object, such as DNA?

CHECKPOINTS

Check Your Understanding

1. What is the complementary DNA strand for a strand with the nucleotide sequence AACCCGGTTT?

a. GGAAATTCCCT
b. TTAAACCGGG
c. TTGGGCCAAA
d. CCGGGTTAAT

2. What did Avery's work on the identification of transforming factors prove?

a. DNA is made of four different nucleotides.
b. The DNA molecule is a double-stranded helix.
c. Genetic information is contained in DNA.
d. Bacterial DNA is interchangeable between species.

3. Replication is a critical process during the cell cycle. In which phase of the cell cycle does replication take place?

a. G_1
b. G_2
c. S
d. M

4. What knowledge did scientists gain based on the x-ray crystallograph taken by Rosalind Franklin?

a. The sequence of nucleotides
b. How nucleotide bases form a template
c. The role of DNA in genetic mutations
d. The double-helix structure of DNA

5. How does the central dogma connect DNA, RNA, and proteins?

6. What do you predict would happen to the length of a human pregnancy if there was a single origin of replication on each chromosome?

7. What is the function of the proofreading step of replication? What might happen if this step were skipped?

8. What process did Watson and Crick use to develop their model of DNA, and how did it differ from the controlled experiments used by Griffith, Avery, and Hershey and Chase?

9. How do the base-pairing rules explain how a strand of DNA acts as a template during DNA replication?

MAKE YOUR OWN STUDY GUIDE

In your Evidence Notebook, design a study guide that supports the main idea from this lesson:

DNA codes for proteins and is responsible for an organism's traits.

Remember to include the following information in your study guide:

- Use examples that model main ideas.
- Record explanations for the phenomena you investigated.
- Use evidence to support your explanations. Your support can include drawings, data, graphs, laboratory conclusions, and other evidence recorded throughout the lesson.

Consider how the unique structure of DNA allows it to be copied and to transmit traits from parent to offspring.