

SECTION

1

What Does DNA Look Like?

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What units make up DNA?
- What does DNA look like?
- How does DNA copy itself?

National Science Education Standards
LS 1a, 2d, 5a

What Is DNA?

Remember that *inherited traits* are traits that are passed from generation to generation. To understand how inherited traits are passed on, you must understand the structure of DNA. **DNA** (*deoxyribonucleic acid*) is the molecule that carries the instructions for inherited traits. In cells, DNA is wrapped around proteins to form *chromosomes*. Stretches of DNA that carry the information for inherited traits are called *genes*.

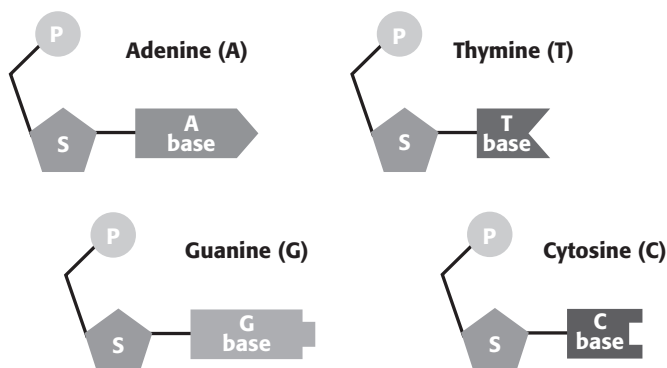


Clarify Concepts As you read the text, make a list of ideas that are confusing. Discuss these with a small group. Ask your teacher to explain things that your group is unsure about.

What Is DNA Made Of?

DNA is made up of smaller units called nucleotides. A *nucleotide* is made of three parts: a sugar, a phosphate, and a base. The sugar and the phosphate are the same for each nucleotide. However, different nucleotides may have different bases.

There are four different bases found in DNA nucleotides. They are *adenine*, *thymine*, *guanine*, and *cytosine*. Scientists often refer to a base by its first letter: *A* for adenine, *T* for thymine, *G* for guanine, and *C* for cytosine. Each base has a different shape.

The Four Nucleotides of DNA**TAKE A LOOK**

1. Identify What are two things that are the same in all nucleotides?

SECTION 1 What Does DNA Look Like? *continued*

What Does DNA Look Like?

As you can see in the figure below, a strand of DNA looks like a twisted ladder. This spiral shape is called a *double helix*. The two sides of the ladder are made of the sugar and phosphate parts of nucleotides. The sugars and phosphates alternate along each side of the ladder. The rungs of the DNA ladder are made of pairs of bases. ✓

The bases in DNA can only fit together in certain ways, like puzzle pieces. Adenine on one side of a DNA strand always pairs with thymine on the other side. Guanine always pairs with cytosine. This means that adenine is *complementary* to thymine, and guanine is complementary to cytosine. Because the pairs of bases in DNA are complementary, the two sides of a strand of DNA are also complementary.

READING CHECK

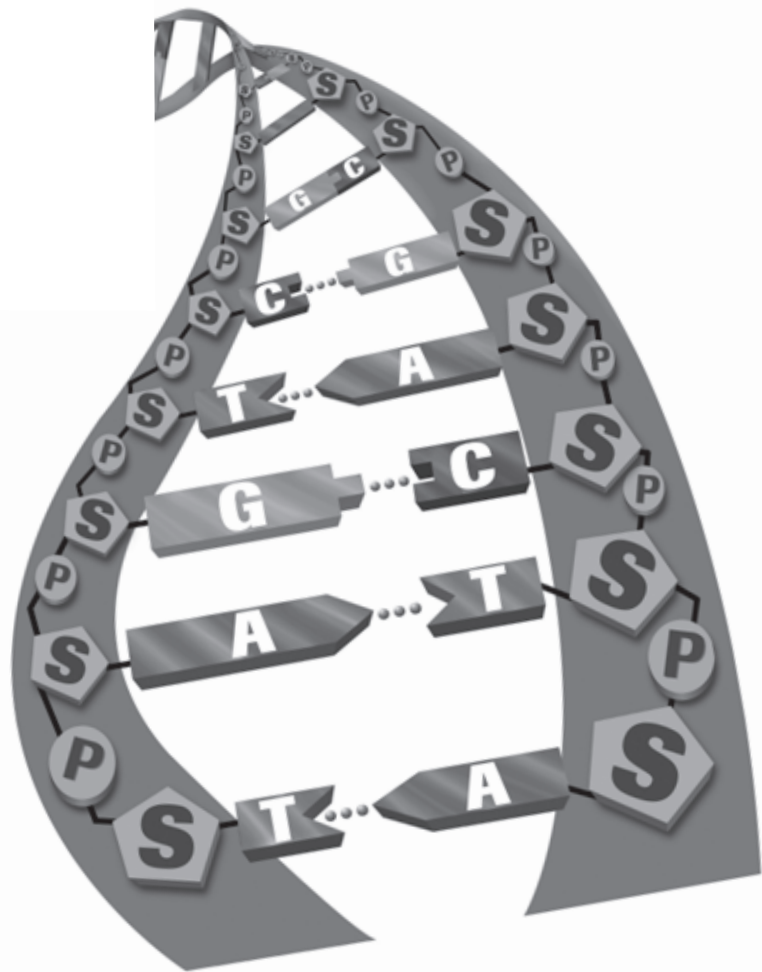
2. Identify What are the sides of the DNA “ladder” made of?

Critical Thinking

3. Apply Concepts Imagine that you are a scientist studying DNA. You measure the number of cytosines and thymines in a small strand of DNA. There are 45 cytosines and 55 thymines. How many guanines are there in the strand? How many adenines are there?

TAKE A LOOK

4. Identify Give the ways that DNA bases can pair up.



Each side of a DNA molecule is complementary to the other side.

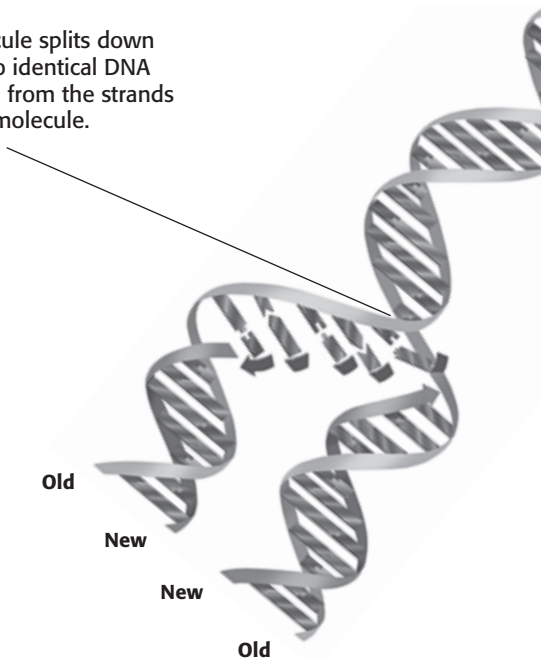
SECTION 1 What Does DNA Look Like? *continued***How Does DNA Copy Itself?**

Before a cell divides, it makes a copy of its genetic information for the new cell. The pairing of bases allows the cell to *replicate*, or make copies of, DNA. Remember that bases are complementary and can only fit together in certain ways. Therefore, the order of bases on one side of the DNA strand controls the order of bases on the other side of the strand. For example, the base order CGAC can only fit with the order GCTG. ✓

When DNA replicates, the pairs of bases separate and the DNA splits into two strands. The bases on each side of the original strand are used as a pattern to build a new strand. As the bases on the original strands are exposed, the cell adds nucleotides to form a new strand.

Finally, two DNA strands are formed. Half of each of the two DNA strands comes from the original strand. The other half is built from new nucleotides.

The DNA molecule splits down the middle. Two identical DNA molecules form from the strands of the original molecule.



DNA is copied every time a cell divides. Each new cell gets a complete copy of the entire DNA strand. Proteins in the cell unwind, copy, and rewind the DNA.

 **READING CHECK**

5. Explain What happens to DNA before a cell divides?

TAKE A LOOK

6. Compare What is the difference between an "old" and a "new" strand of DNA?

Section 1 Review

NSES LS 1a, 2d, 5a

SECTION VOCABULARY

DNA deoxyribonucleic acid, a molecule that is present in all living cells and that contains the information that determines the traits that a living thing inherits and needs to live

nucleotide in a nucleic-acid chain, a subunit that consists of a sugar, a phosphate, and a nitrogenous base

1. **Identify** Where are genes located? What do they do?

2. **Compare** How are the four kinds of DNA nucleotides different from each other?

3. **Apply Concepts** The diagram shows part of a strand of DNA. Using the order of bases given in the top of the strand, write the letters of the bases that belong on the bottom strand.



4. **Describe** How is DNA related to chromosomes?

5. **Identify Relationships** How are proteins involved in DNA replication?

6. **List** What are three parts of a nucleotide?
