

# 8.3 DNA Replication

**KEY CONCEPT** DNA replication copies the genetic information of a cell.

## Replication copies the genetic information.

According to the rules of base pairing, A pairs with T and C pairs with G. If the base sequence of one strand of DNA is known, the sequence of the other strand is also known. One strand can act as a template\*, or pattern, for another strand. During the process of DNA **replication**, a cell uses both strands of DNA as templates to make a copy of the DNA.

Recall that your body cells each contain 46 chromosomes made up of DNA. The DNA is copied once during the cell cycle, in the S phase. After a cell divides, the resulting cells each have a complete set of DNA.



What do the base pairing rules have to do with replication?

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## Proteins carry out the process of replication.

DNA does not copy itself. Enzymes and other proteins do the actual work of replication. Here we will look at the process of replication in eukaryotes. The process is similar in prokaryotes.

First, some enzymes pull apart, or unzip, the double helix to separate the two strands of DNA. Other proteins keep the strands apart while the strands serve as templates. There are nucleotides floating around in the nucleus. These nucleotides can pair up, according to the base pairing rules, with the nucleotides on the open strands. A group of enzymes called **DNA polymerases** (PAHL-uh-muh-rays) bond the new nucleotides together. When the process is finished, there are two complete molecules of DNA, each exactly like the original double strand as shown in the figure on the next page.

### VISUAL VOCAB

**DNA polymerases** are enzymes that form bonds between nucleotides during replication.

The ending *-ase* signals that this is an enzyme.

DNA polymer **ase**

This part of the name tells what the enzyme does—makes DNA polymers.



What is the job of the DNA polymerases? \_\_\_\_\_

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\* ACADEMIC VOCABULARY

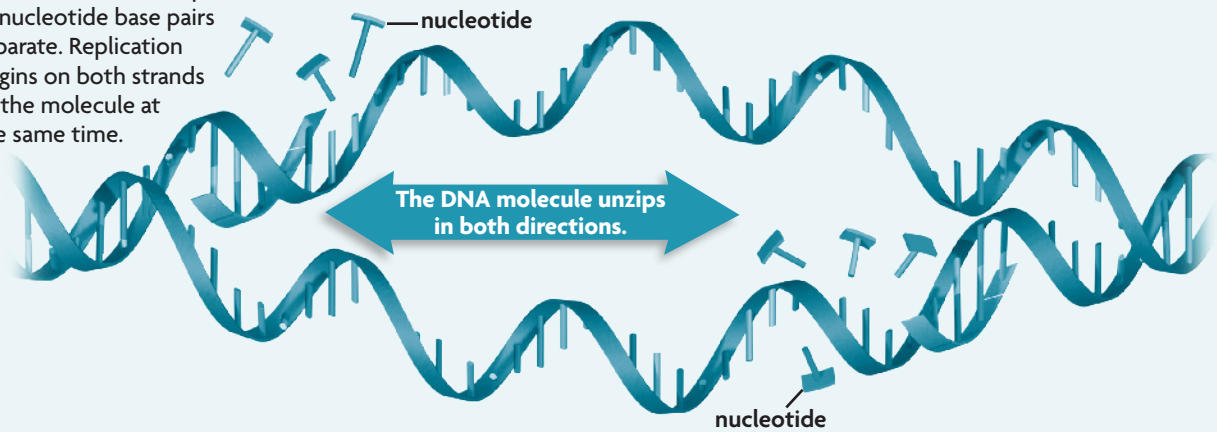
**template** a pattern that can be used to make a copy of something

## REPLICATION

When a cell's DNA is copied, or replicated, two complete and identical sets of genetic information are produced. Then cell division can occur.

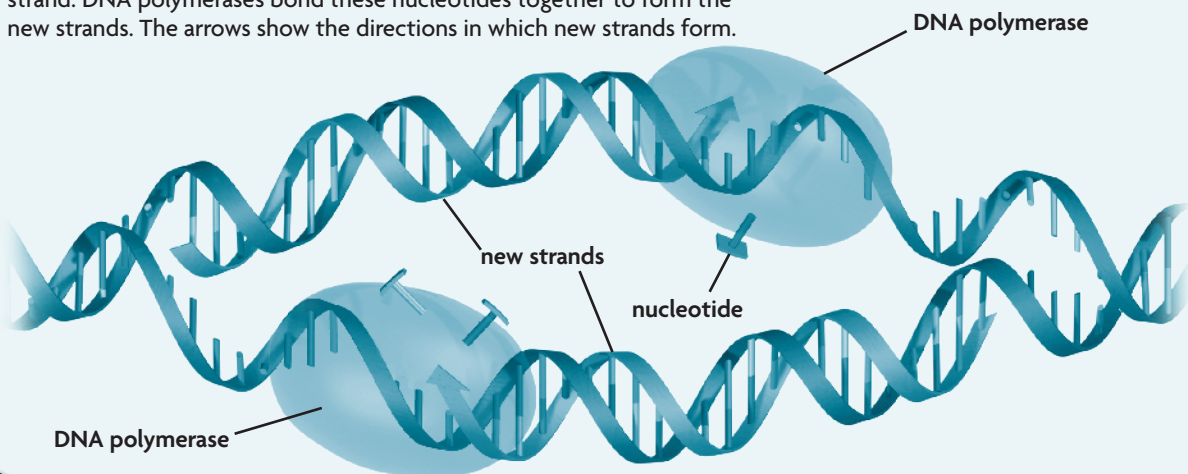
1

A DNA molecule unzips as nucleotide base pairs separate. Replication begins on both strands of the molecule at the same time.



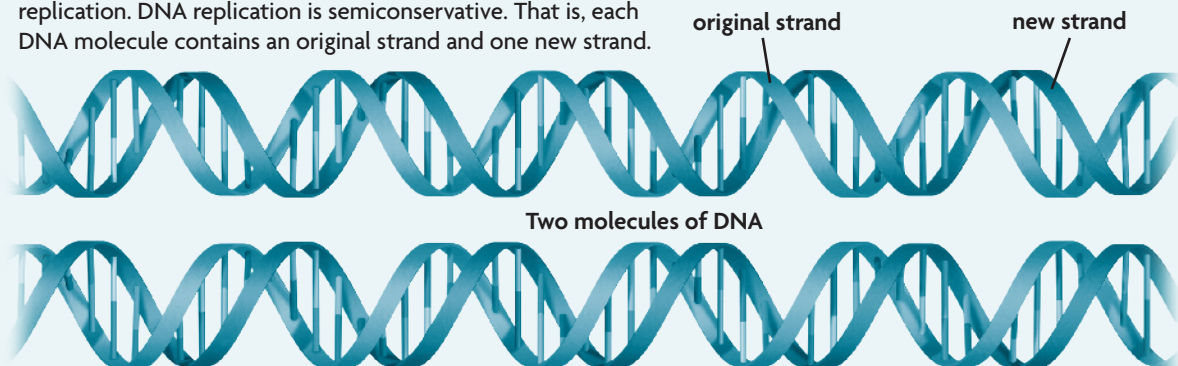
2

Each existing strand of the DNA molecule is a template for a new strand. Free-floating nucleotides pair up with the exposed bases on each template strand. DNA polymerases bond these nucleotides together to form the new strands. The arrows show the directions in which new strands form.



3

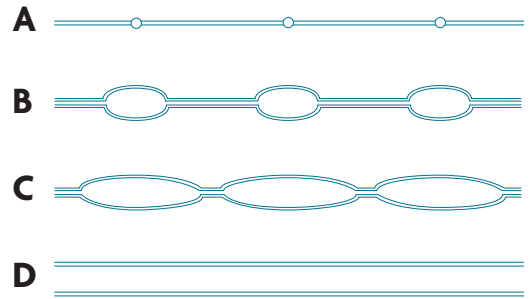
Two identical double-stranded DNA molecules result from replication. DNA replication is semiconservative. That is, each DNA molecule contains an original strand and one new strand.



## Replication is fast and accurate.

Your DNA has replicated trillions of times since you grew from a single cell. And DNA replication is happening in your cells right now. Replication happens very fast. As you can see in the figure, the process starts at many different places along a eukaryotic chromosome.

DNA replication is also very accurate. There are very few errors—only about one error per 1 billion nucleotides. Replication has a built-in “proofreading” process. If the wrong nucleotide gets added, DNA polymerase can find the error, remove the incorrect nucleotide, and replace it with the correct one.



Replication starts at many different places along a eukaryotic chromosome. The DNA helix is unzipped at many points. The replication “bubbles” grow larger as replication progresses in both directions, resulting in two complete copies.



What does it mean that replication has a “proofreading” function? \_\_\_\_\_

### 8.3 Vocabulary Check

replication

DNA polymerase

### Mark It Up

Go back and highlight each sentence that has a vocabulary word in **bold**.



1. What is the end product of replication? \_\_\_\_\_
2. What is the role of DNA polymerase in replication? \_\_\_\_\_

### 8.3 The Big Picture

3. What does it mean that a DNA strand is *used as a template* in replication? \_\_\_\_\_
4. Give at least two examples of how enzymes and other proteins help in the process of replication. \_\_\_\_\_
5. What is one reason that there are very few errors in DNA replication? \_\_\_\_\_