

12.3 DNA Replication

Copying the Code Each strand of the double helix has all the information needed to reconstruct the other half by the mechanism of base pairing. Because each strand can be used to make the other strand, the strands are said to be complementary. DNA copies itself through the process of **replication**:

- ▶ 1 The two strands of the double helix unzip, forming replication forks.
- ▶ 2 New bases are added, following the rules of base pairing (A with T and G with C).
- ▶ 3 Each new DNA molecule has one original strand and one new strand.
- ▶ 4 **DNA polymerase** is an enzyme that joins individual nucleotides to produce a new strand of DNA.
- ▶ During replication, DNA may be lost from the tips of chromosomes, which are called **telomeres**.

Replication in Living Cells The cells of most prokaryotes have a single, circular DNA molecule in the cytoplasm. Eukaryotic cells have much more DNA. Nearly all of it is contained in chromosomes, which are in the nucleus.

- ▶ Replication in most prokaryotic cells starts from a single point and proceeds in two directions until the entire chromosome is copied.
- ▶ In eukaryotic cells, replication may begin at dozens or even hundreds of places on the DNA molecule, proceeding in both directions until each chromosome is completely copied.

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. 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.



The Role of Enzymes Enzymes have several important jobs in DNA replication. The jobs of some enzymes are listed below.

Write the jobs in the order in which they occur.

join free nucleotides to existing DNA strand	unwind DNA
unzip DNA	

1. _____
2. _____
3. _____

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		

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

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

13. In your own words, define the word *replicate*. _____

14. Enzymes usually end in -ase. What is the name of the enzyme that joins individual nucleotides?

15. Circle the correct answer to complete the sentence. A(n) _____ is the place where a DNA strand opens to make new strands.

original strand

old strand

replication fork

