

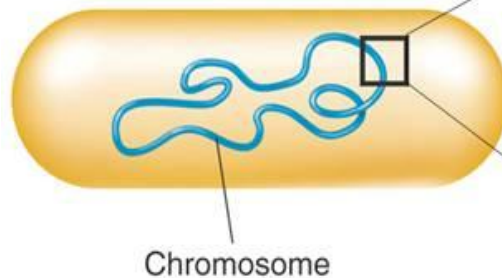
12-2 Chromosomes and DNA Replication



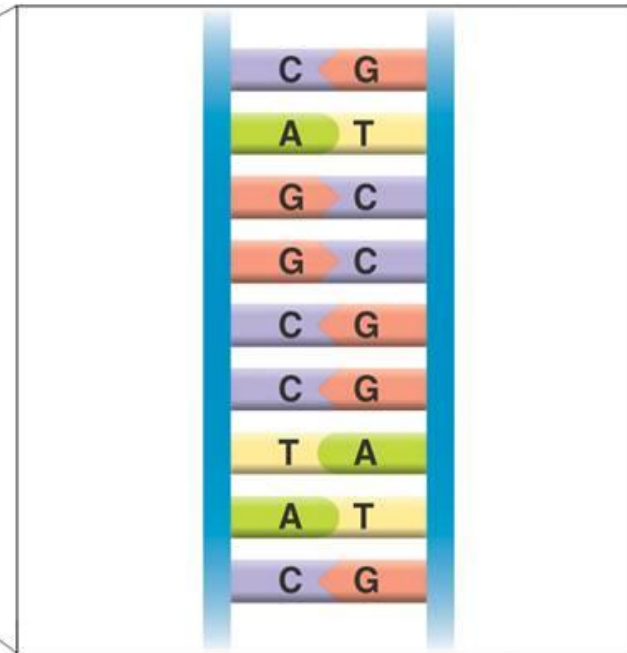
DNA and Chromosomes

In prokaryotic cells, DNA is located in the cytoplasm.

Most prokaryotes have a single DNA molecule containing nearly all of the cell's genetic information.



E. coli Bacterium



Bases on the
Chromosome

Many eukaryotes have 1000 times the amount of DNA as prokaryotes.

Eukaryotic DNA is located in the cell nucleus inside chromosomes.

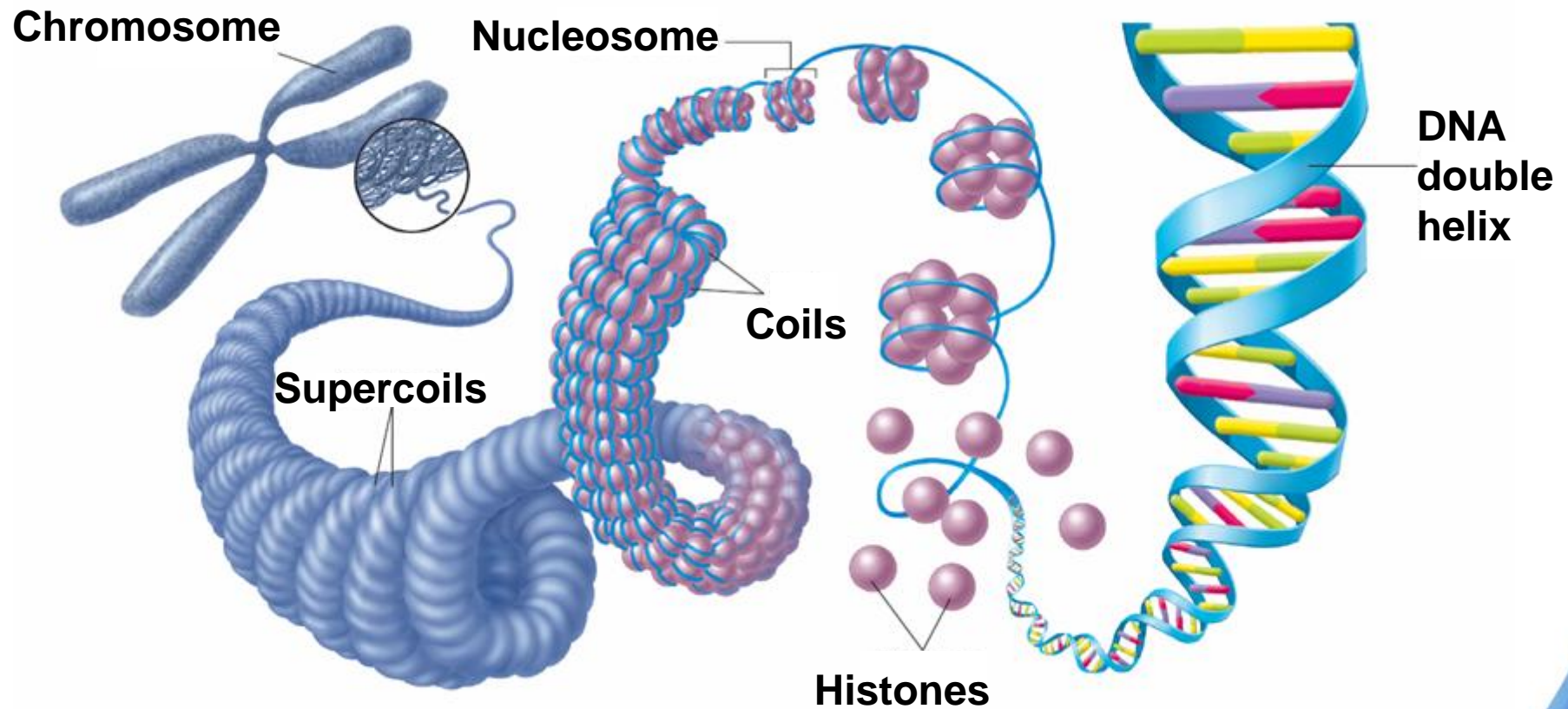
The number of chromosomes varies widely from one species to the next.

* Not necessarily an indicator of evolutionary complexity.

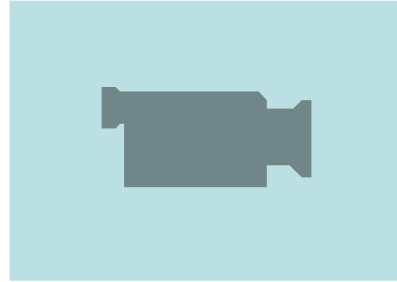
Chromosome Structure

- Eukaryotic chromosomes contain DNA and protein, tightly packed together to form **chromatin**.
- Chromatin consists of DNA tightly coiled around proteins called **histones**.
- DNA and histone molecules form nucleosomes.
- Nucleosomes pack together, forming a thick fiber that we call chromosomes.

Eukaryotic Chromosome Structure



DNA Replication



- Each strand of the DNA double helix has all the information needed to reconstruct the other half by the mechanism of base pairing.
- In most prokaryotes, DNA replication begins at a single point and continues in two directions.
- In eukaryotic chromosomes, DNA replication occurs at hundreds of places. Replication proceeds in both directions until each chromosome is completely copied.

The sites where separation and replication occur are called replication forks.

Duplicating DNA

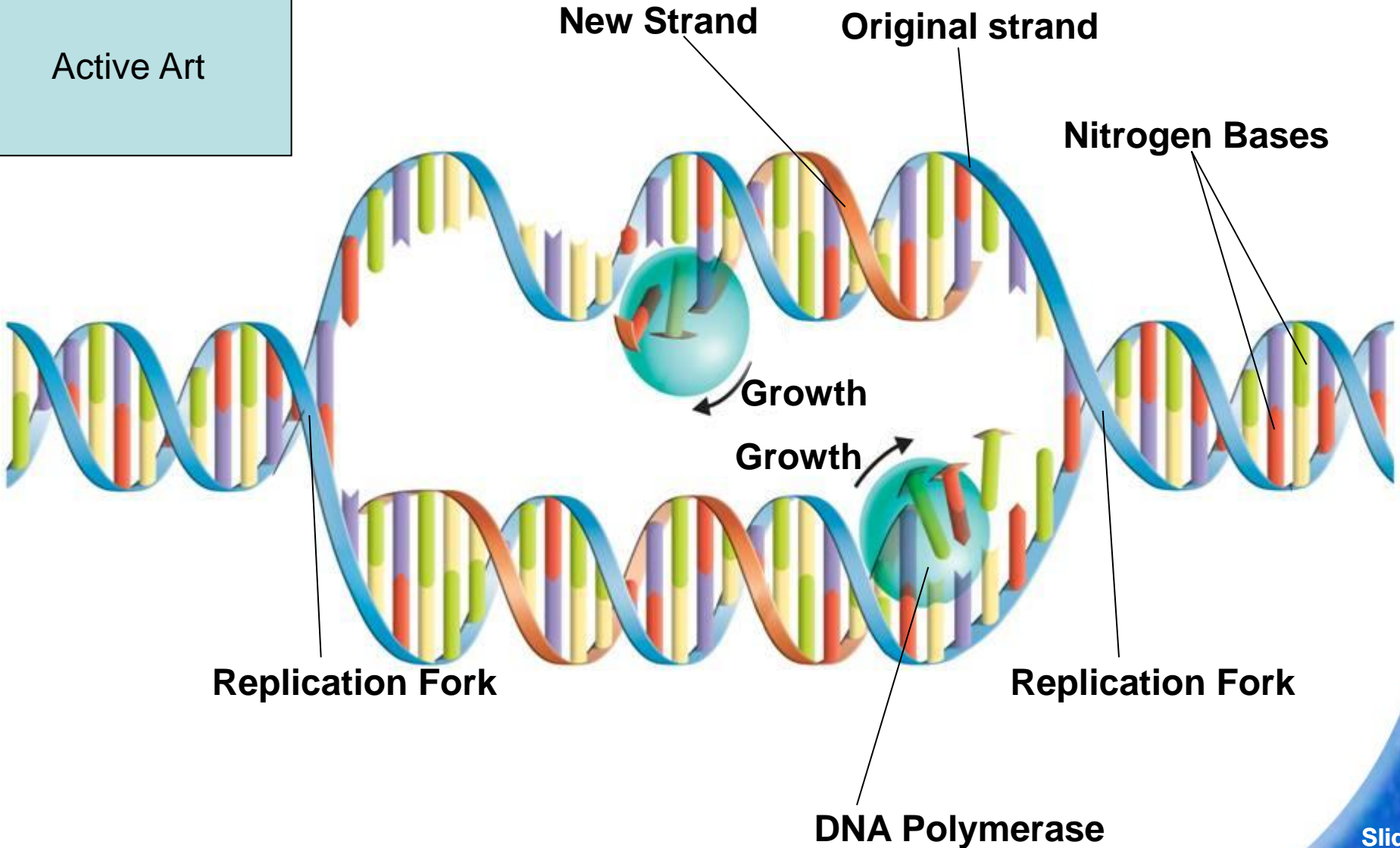
- Before a cell divides, it duplicates its DNA in a process called **replication**.
- Replication ensures that each resulting cell will have a complete set of DNA.
- During DNA replication, the DNA molecule separates into two strands, then produces two new complementary strands following the rules of base pairing. Each strand of the double helix of DNA serves as a template for the new strand.

12-2 Chromosomes and DNA Replication



DNA Replication

Active Art



How Replication Occurs

- DNA replication is carried out by enzymes that “unzip” a molecule of DNA.
- Hydrogen bonds between base pairs are broken and the two strands of DNA unwind.

The principal enzyme involved in DNA replication is DNA polymerase.

DNA polymerase joins individual nucleotides to produce a DNA molecule and then “proofreads” each new DNA strand.

1 In prokaryotic cells, DNA is found in the

- cytoplasm.
- nucleus.
- ribosome.
- cell membrane.

2 The first step in DNA replication is

- producing two new strands.
- separating the strands.
- producing DNA polymerase.
- correctly pairing bases.

3 A DNA molecule separates, and the sequence GCGAATTCG occurs in one strand. What is the base sequence on the other strand?

- GCGAATTCG

- CGCTTAAGC

- TATCCGGAT

- GATGGCCAG

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In addition to carrying out the replication of DNA, the enzyme DNA polymerase also functions to

- unzip the DNA molecule.
- regulate the time copying occurs in the cell cycle.
- “proofread” the new copies to minimize the number of mistakes.
- wrap the new strands onto histone proteins.

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The structure that may play a role in regulating how genes are “read” to make a protein is the

- coil.
- histone.
- nucleosome.
- chromatin.