DNA Replication

DNA Replication

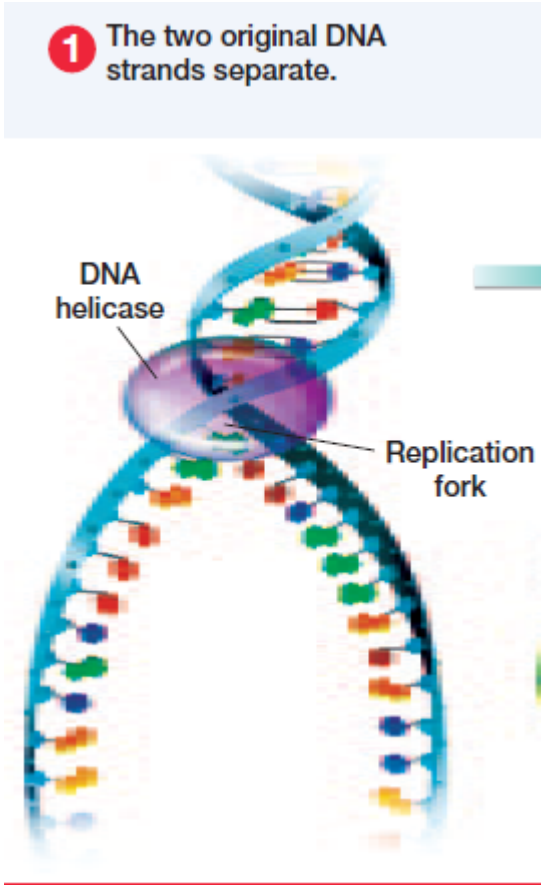
- Complementary base pairs of the nucelotides in DNA are important because it serves as a basis for making an **exact copy** of the DNA when a cell is divided.

- Watson and Crick proposed that one strand serves as a pattern on which another strand is built and this was later proved to be true.

- This process of making a copy of DNA is known as **DNA Replication**.

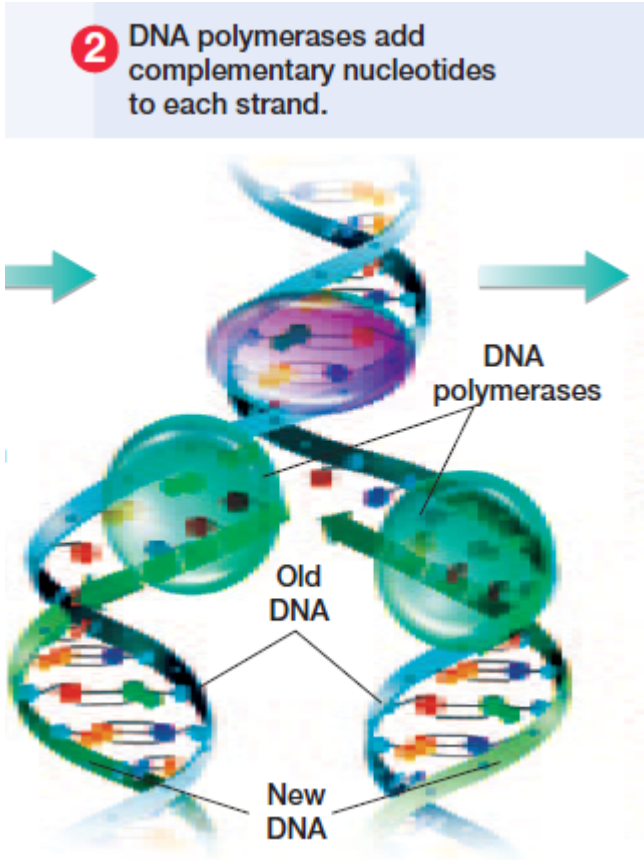
Stages of Replication

- DNA Replication occurs in 3 stages:
  - **1. DNA Helicase** (enzymes) unwind or unzip the double helix structure of DNA by breaking hydrogen bonds linking the complementary bases.
  - The area where the double helix separates is called a **replication fork**.
  - Additional proteins hold the two strands apart and prevent them from reassuming their double helix shape.



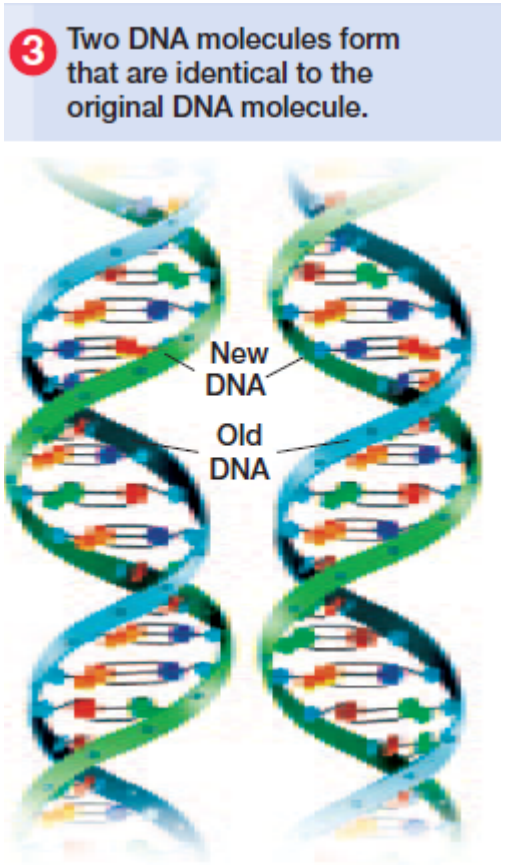
Stages of Replicaton

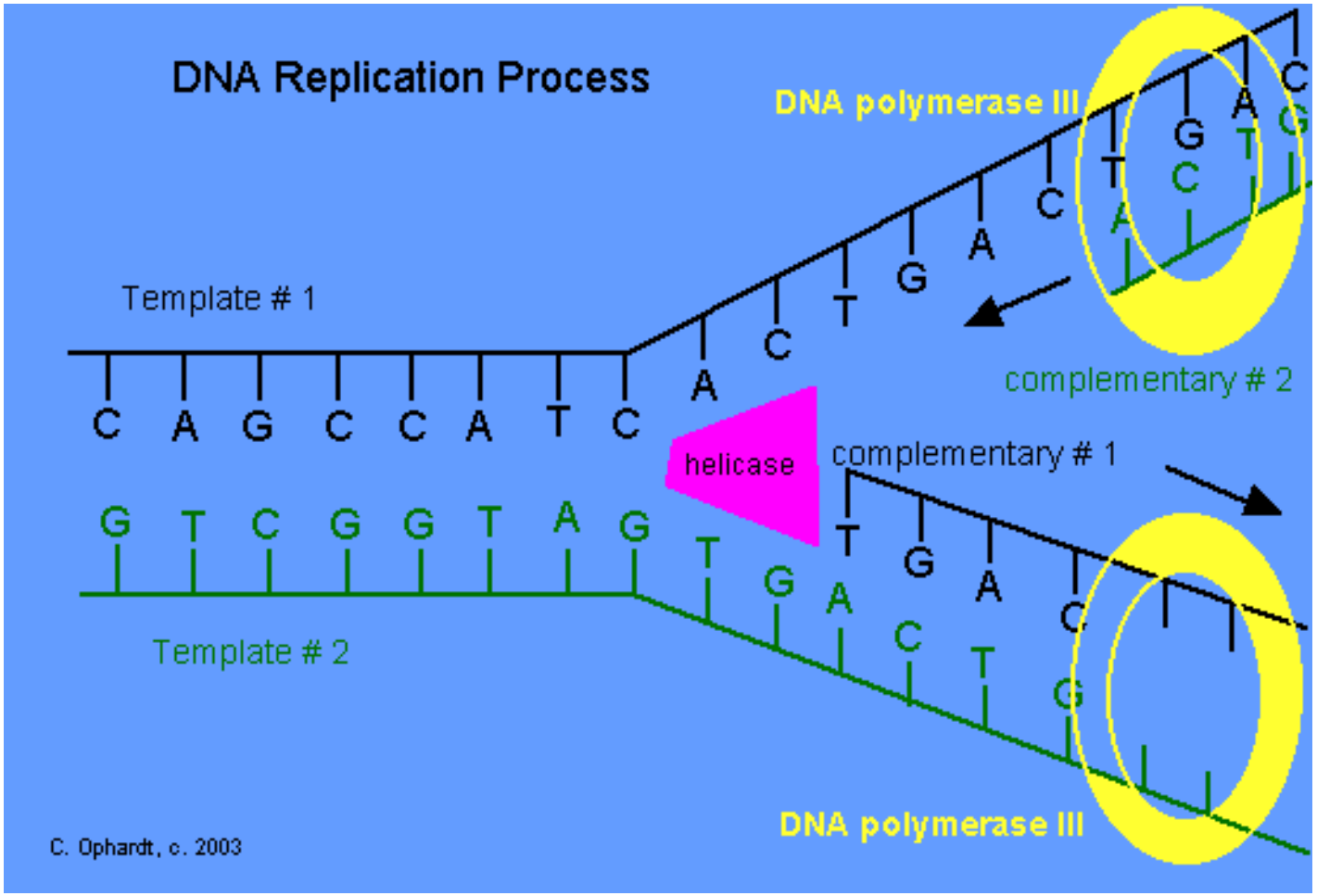
- Stages (continued):
  - **2.** At the replication fork, **DNA polymerase** move along the DNA strands and add nucleotides to the exposed nitrogen bases according to base-pairing rules.



Stages of Replication

- Stages (continued)
  - **3.** Process of adding new nucleotides continues until the entire DNA strand has been copied and two new double helices are formed.
  - This process produces two DNA molecules that are identical (a new and original strand) to each other and the original DNA.




DNA Replication Process
DNA polymerase III
Template # 1
C A G C C A T C
A C T G A C T A G C A T G
complementary # 2
helicase
complementary # 1
G T C G G T A G T G A C T G A C T G
Template # 2
DNA polymerase III
C. Ophardt, c. 2003

Errors

- Errors do occur during the course of replication at times as the wrong nucleotide is added to the new strand. However, DNA polymerase has a **“proofreading”** role.
- DNA polymerase can add nucleotides to the strand only if the previous nucleotide is correctly paired.
- If an error occurs, the DNA polymerase must backtrack and correct the mistake.

- In addition, each DNA strand is replicated not from one end to the other, but from several sections that all meet up with each other.
- This allows DNA replication to take place in a matter of **hours** rather than in a matter of **days**.

Practice

- Adenine (A) binds to _____.
- Cytosine (C) binds to _____.

- Using the DNA below as a template, write the nucleotides below that would be replicated on the other DNA strand:

A G G C T T A G A G T T A T G G A T T C