

12-1 DNA EQ: What are the components of DNA?



The Components and Structure of DNA

DNA is made up of **nucleotides**.

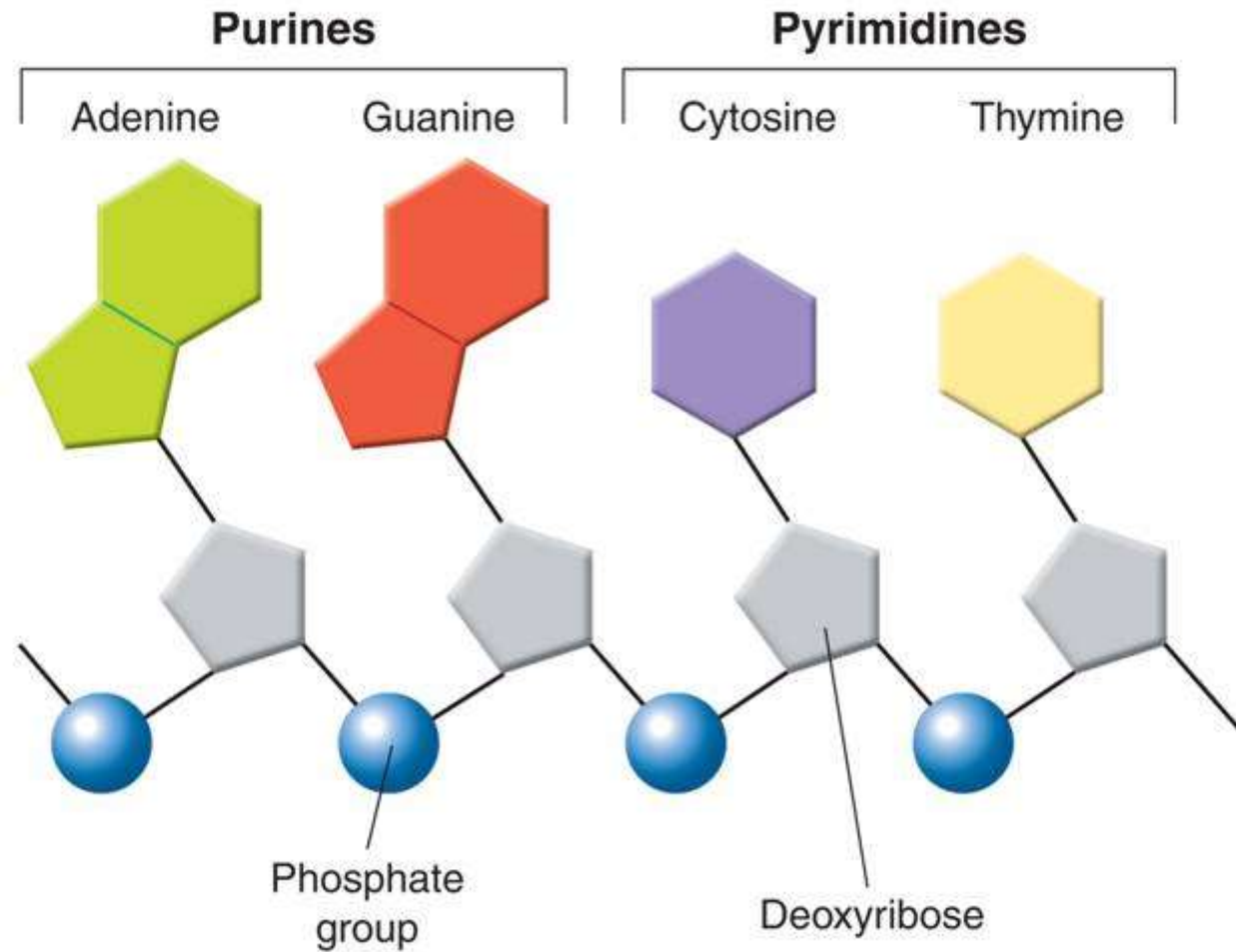
A nucleotide is a monomer of nucleic acids made up of:

- Deoxyribose – 5-carbon Sugar
- Phosphate Group
- Nitrogenous Base

12-1 DNA → The Components and Structure of DNA

There are four kinds of bases in DNA:

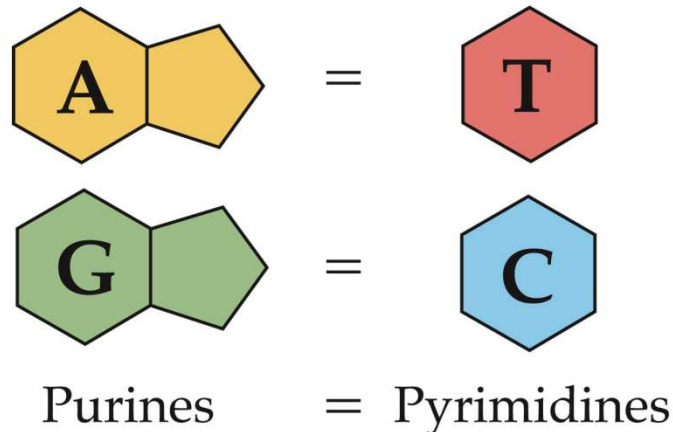
- adenine
- guanine
- cytosine
- thymine



Chargaff's Rules

Erwin Chargaff discovered that:

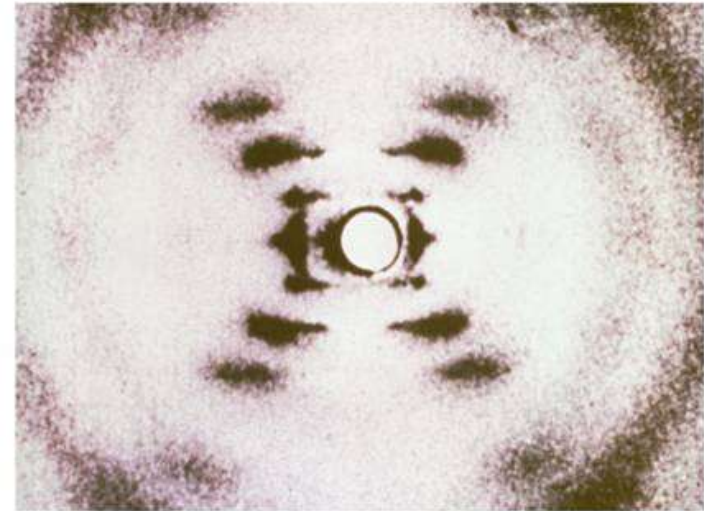
- The percentages of guanine [G] and cytosine [C] bases are almost equal in any sample of DNA.
- The percentages of adenine [A] and thymine [T] bases are almost equal in any sample of DNA.



X-Ray Evidence

Rosalind Franklin used X-ray diffraction to get information about the structure of DNA.

She aimed an X-ray beam at concentrated DNA samples and recorded the scattering pattern of the X-rays on film.



The Double Helix

Using clues from Franklin's pattern, James Watson and Francis Crick built a model that explained how DNA carried information and could be copied.

Watson and Crick's model of DNA was a double helix, in which two strands were wound around each other.

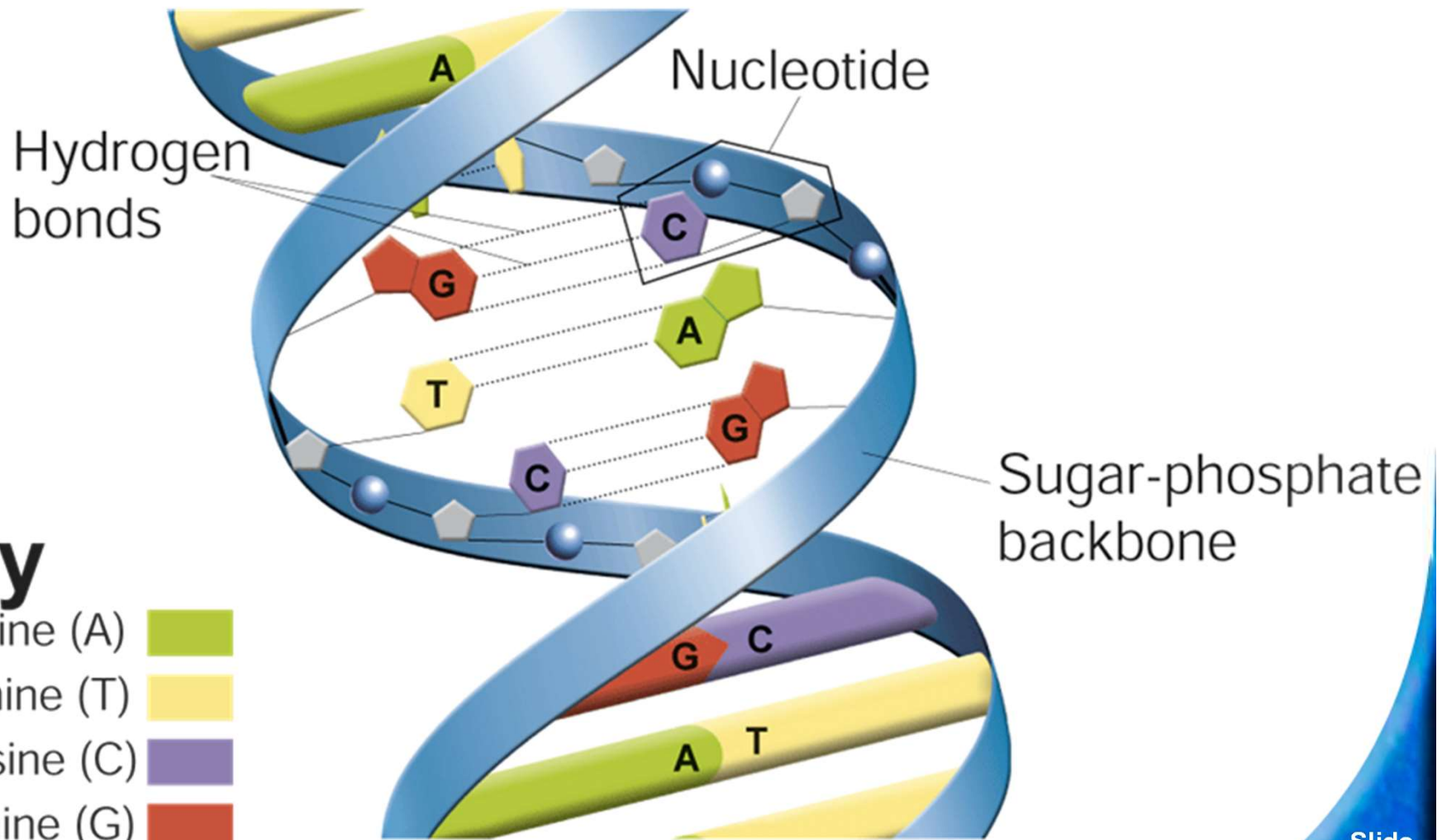


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12-1 DNA → The Components and Structure of DNA

DNA Double Helix



Key

- Adenine (A)
- Thymine (T)
- Cytosine (C)
- Guanine (G)

12-1 DNA → The Components and Structure of DNA

Watson and Crick discovered that hydrogen bonds can form only between certain base pairs—adenine and thymine, and guanine and cytosine.

This principle is called **base pairing**.

Adenine pairs with Thymine. A with T.

Cytosine pairs with Guanine. C with G.

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.

DNA Replication

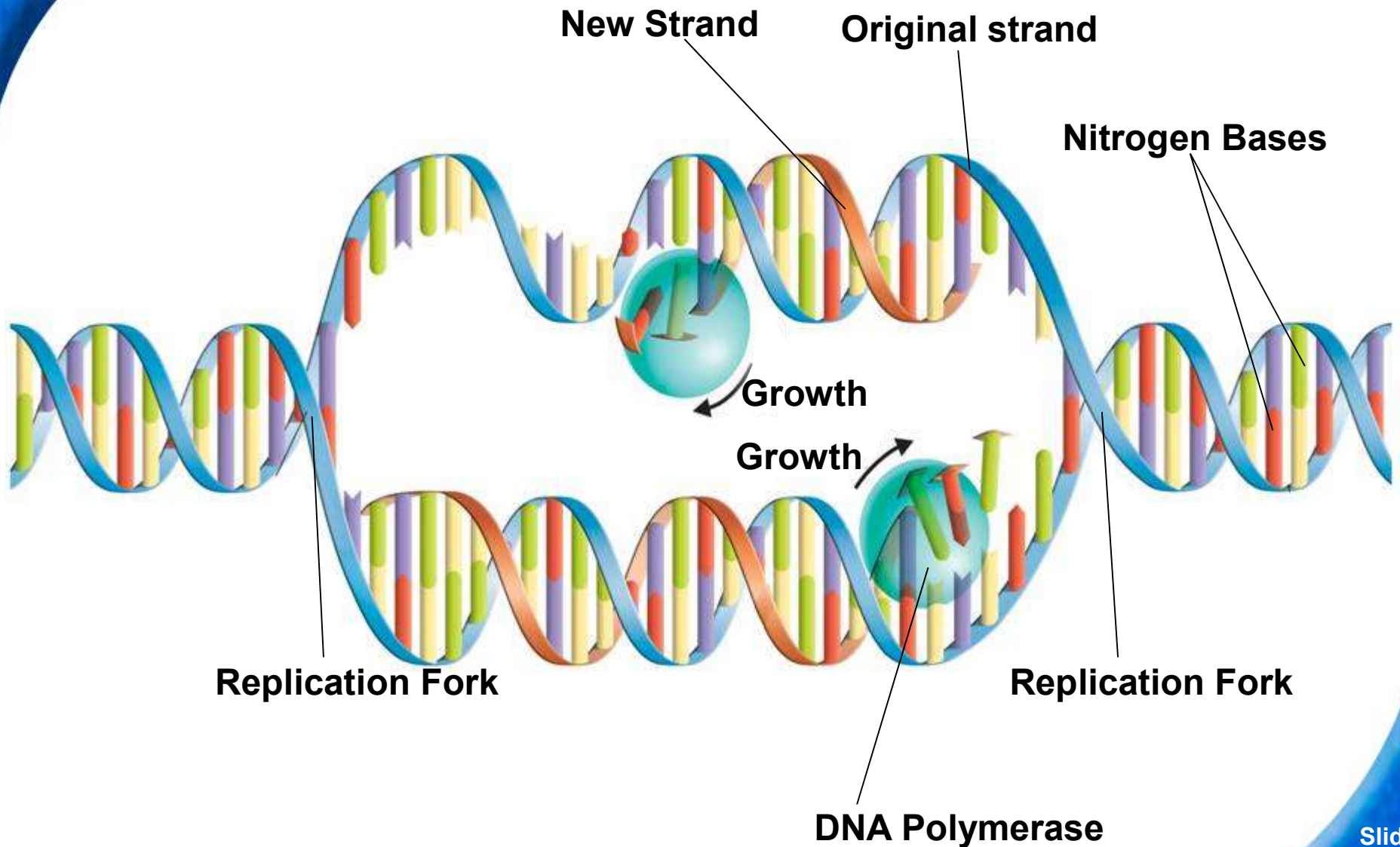
Each strand of the DNA double helix has all the information needed to reconstruct the other half by the mechanism of base pairing.

In most prokaryotes, DNA replication begins at a single point and continues in two directions.

12-1 DNA → DNA Replication

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.

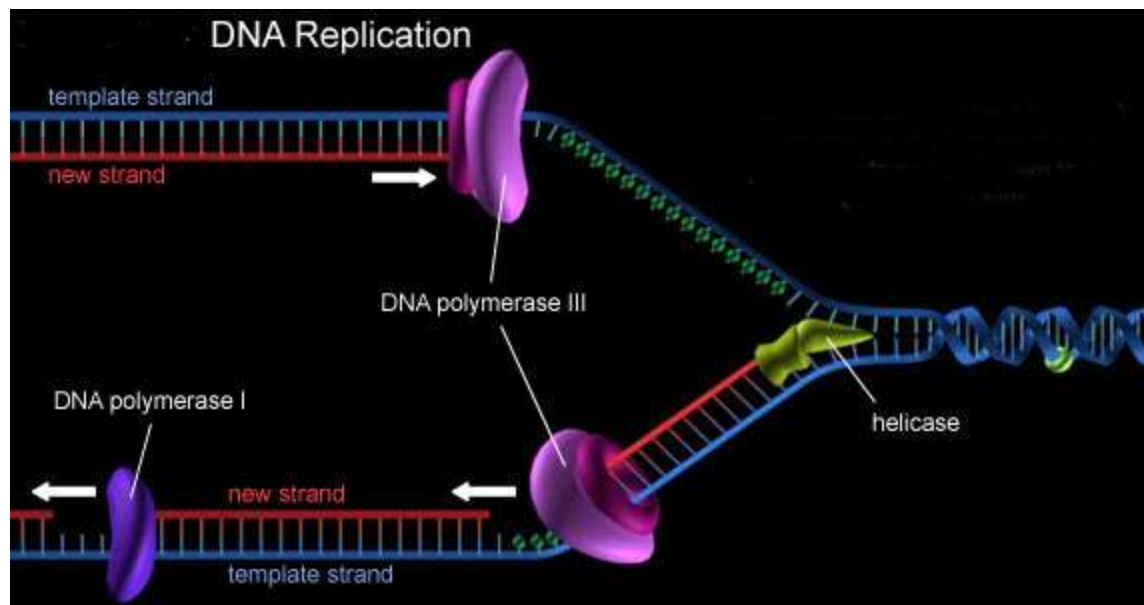
12-1 DNA → **DNA Replication**



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.

Left Side Activity

- Answer the following questions
 1. What does DNA stand for?
 2. What are the three components found in DNA?
 3. What are the four bases found in DNA?
 4. Explain base pairing.
 5. Which bases pair with each other?
 6. What is the structure of DNA?
 7. Who discover that DNA had this structure?
 8. What type of bonds connect the bases?
 9. How many bonds are there between each of the two pairs of bases?
 10. How does DNA replication occur?