

DNA History



8.1

Why would someone want to make a mouse glow?

What is DNA? Video


DNA History

James **WATSON** and Francis **CRICK** were the first to discover the true structure of the DNA molecule in 1953


Double Helix

DNA History




Rosalind Franklin

- Used X-ray diffraction to study structure of DNA
- Photograph suggested two strands with bases near the center
- It indicated that DNA was a helix.
- Coworker (Maurice Wilkins) showed the photographs to Watson and Crick w/o her consent.

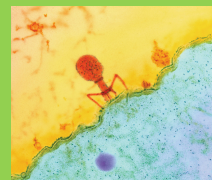



DNA History

Alfred Hershey and Martha Chase



- 1952
- Studied viruses (bacteriophages)
- Used radioactive markers
- Concluded genetic material of virus was DNA not protein.

duohamp. models

8.2 DNA - Structure

DNA Structure

- DNA stands for **DEOXYRIBONUCLEIC ACID**
- It's a type of nucleic acid
- What chromosomes (genes) are made of
- DNA consists of two strands that are arranged in a "twisted ladder" structure called a **DOUBLE HELIX**

DNA Structure

- DNA is made up of long chains of **NUCLEOTIDES**

Each nucleotide consists of a:

1. **PHOSPHATE GROUP**
2. **SUGAR** (called deoxyribose in DNA)
3. **NITROGEN BASE**

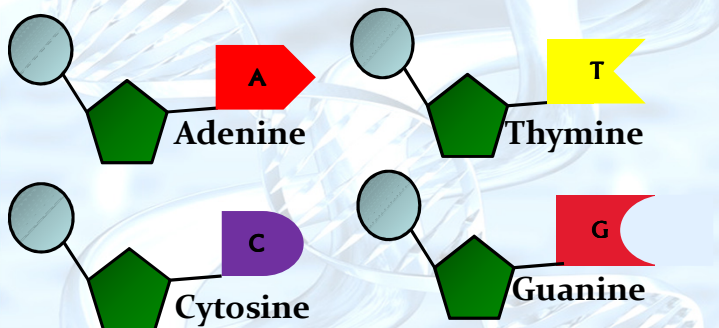
DNA Structure

Double Helix Structure

- The "backbone" (outer stand) of DNA is made up of **PHOSPHATE** and **SUGAR**
- The inner "rungs" of DNA is made up of **BASES**.

DNA Structure

There are 4 types of nitrogen bases:




Each base will only bond with one other specific base


Erwin Chargaff:
Discovered that the percentages of the nitrogenous bases were similar

Chargaff's Rules of Base-Pairing

Rule #1:
The number of A is always equal to the number of T...
therefore, **A bonds with T**



Rule #2:
The number of C is always equal to the number of G...
therefore, **C bonds with G**



DNA Structure

Chargaff's Rules of Base-Pairing Example

If a DNA molecule contains 20% adenine, how much (%) thymine should it contain?

20% thymine

How much (%) cytosine & guanine?

30 % cytosine 30 % guanine

DNA is Complementary

- Complementary: bases on one strand match up with the bases on the other strand (A-T and G-C)
- Example: Strand 1- ATG GGC CTA
Strand 2- TAC CCG GAT

Try this out..

- What sequence of bases would pair with the sequence TGACTA?

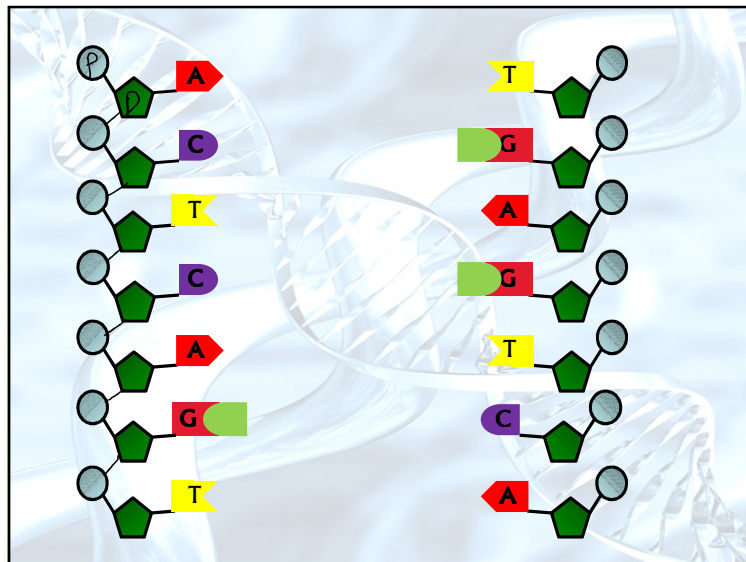
TGACTA
 ↓ ↓ ↓ ↓ ↓ ↓
ACTGAT

DNA Replication Example

1. A. Original DNA: CCTAT ATCTC TCTAT ATCTC TCATA CTGTG TGTCT CTATA
 Complementary DNA: GGATA TAGAG AGATA TAGAG AGTAT GACAC ACAGA GATAT

B. Make identical strands of DNA
 CCTAT ATCTC TCTAT ATCTC TCATA CTGTG TGTCT CTATA (original)
 GGATA TAGAG AGATA TAGAG AGTAT GACAC ACAGA GATAT (new)

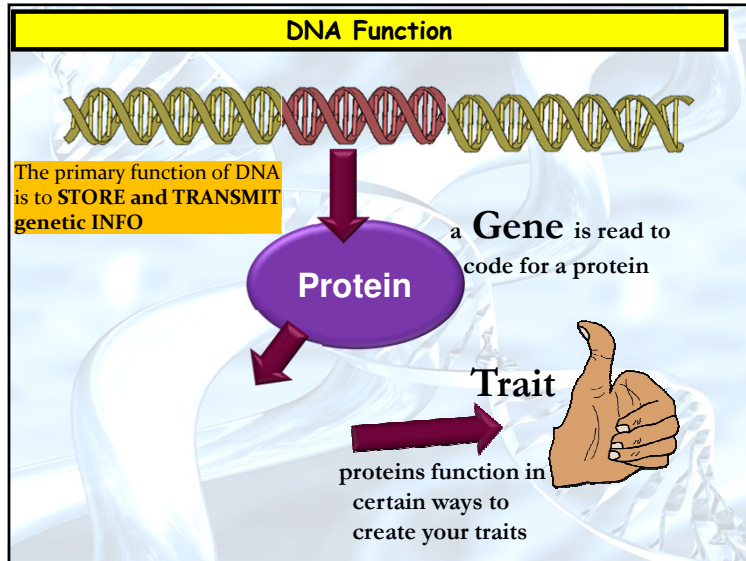
CCTAT ATCTC TCTAT ATCTC TCATA CTGTG TGTCT CTATA (new)
 GGATA TAGAG AGATA TAGAG AGTAT GACAC ACAGA GATAT (compl. From 1A)



DNA Structure

- The backbone is connected by covalent bonds.
- **HYDROGEN BONDS** between the bases hold the two strands of DNA together

hydrogen bond
Covalent bond



DNA Function

- DNA is the master copy of an organism's information code.
- DNA contains your genetic information (what you look like).

Eye color gene	Dimples gene	Hair color gene
----------------	--------------	-----------------

DNA Replication 8.3

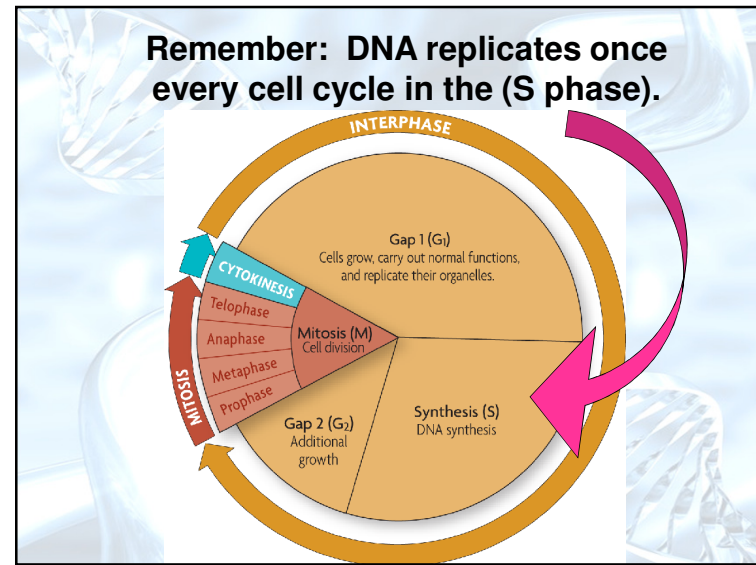
Replication is the process in which DNA copies itself.

Proteins (enzymes) carry out the process of replication

The original DNA strand is used as a template to build 2 identical copies of DNA.

New strand

[Watch DNA Replication](#)



Process of DNA Replication

- Enzymes unzip the double helix.
 - Free-floating nucleotides form hydrogen bonds with the template strand.

The diagram shows a DNA double helix being unzipped. Two black arrows point outwards from the center, indicating the direction of unzipping. Small red and blue structures representing nucleotides are shown binding to the separated strands. A label 'nucleotide' points to one of these structures.

Process of DNA Replication

- DNA polymerase enzymes bond the free-floating nucleotides to the original DNA strand.

The diagram shows DNA polymerase enzymes (blue spheres) moving along the DNA strands. They are incorporating free-floating nucleotides (red and blue) into the growing new strands. Labels include 'new strand', 'nucleotide', and 'DNA polymerase'.

Process of DNA Replication

- Two new molecules of DNA are formed, each with one new strand and one old strand. Therefore, DNA replication is semiconservative.

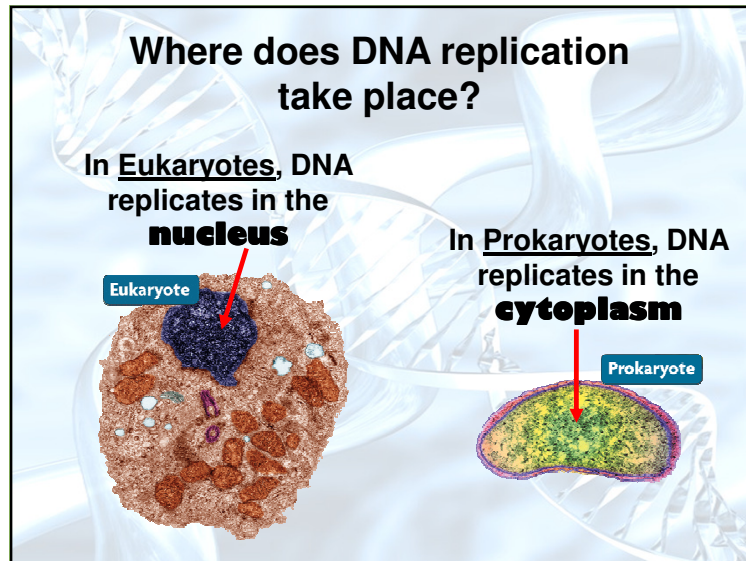
The diagram shows two separate DNA double helices. Each molecule consists of one original strand (colored blue) and one newly synthesized strand (colored orange). Labels include 'original strand', 'new strand', and 'Two molecules of DNA'.

Process of DNA Replication

Replication is fast and accurate.

- Occurs at hundreds of origins of replication along a chromosome
- DNA polymerase "proofreads" the new strand and removes any incorrect nucleotides and replaces them with correct ones

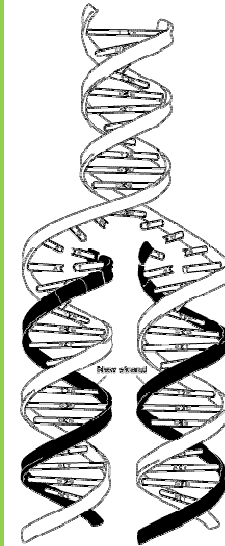
[DNA Replication Video](#)



DNA Replication Animations

Replication

Classzone



Try this Out!

- 1. What does "semiconservative replication" mean?
- 2. What is the goal of DNA replication?
- 3. What is the function of DNA polymerase?
- 4. What feature of replication ensures that DNA is copied quickly?
- 5. How does a cell ensure that no errors are introduced during replication?