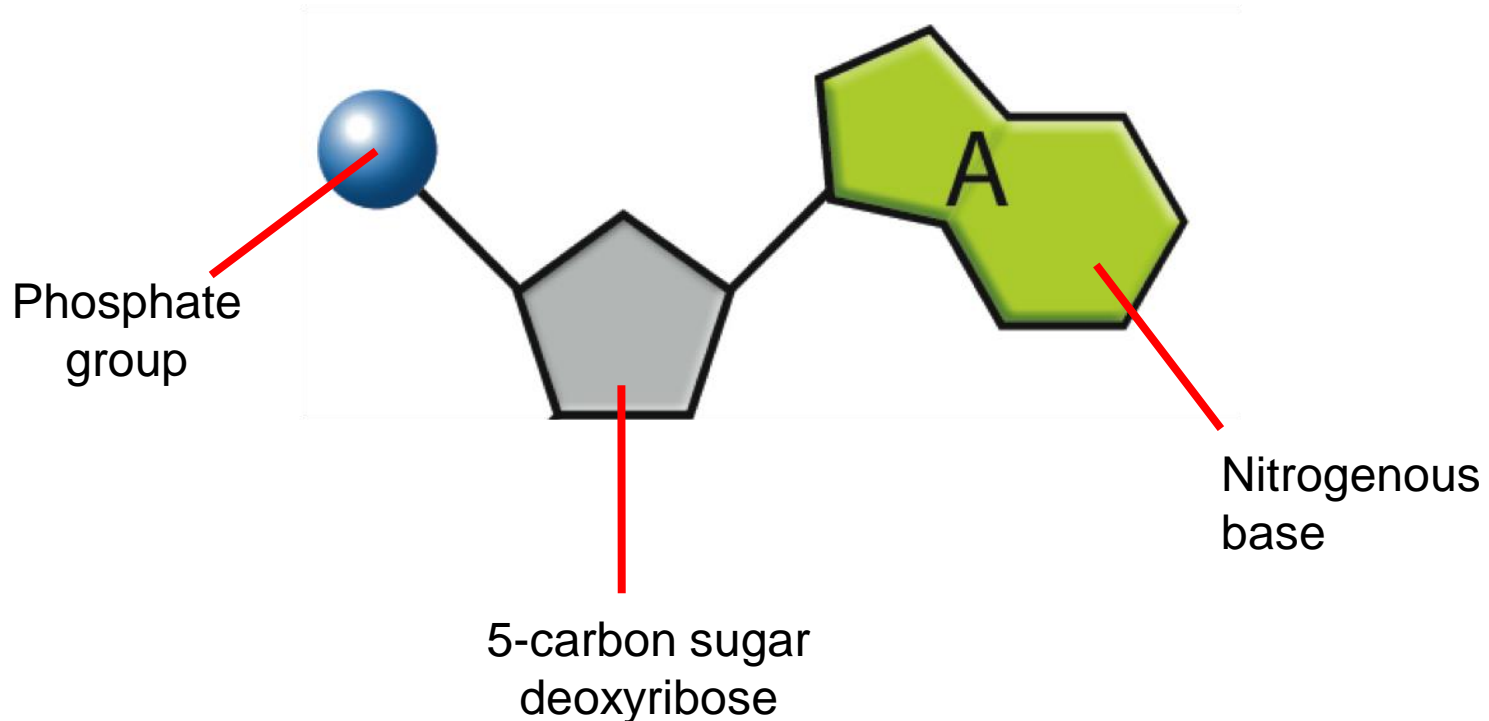


The Structure of DNA

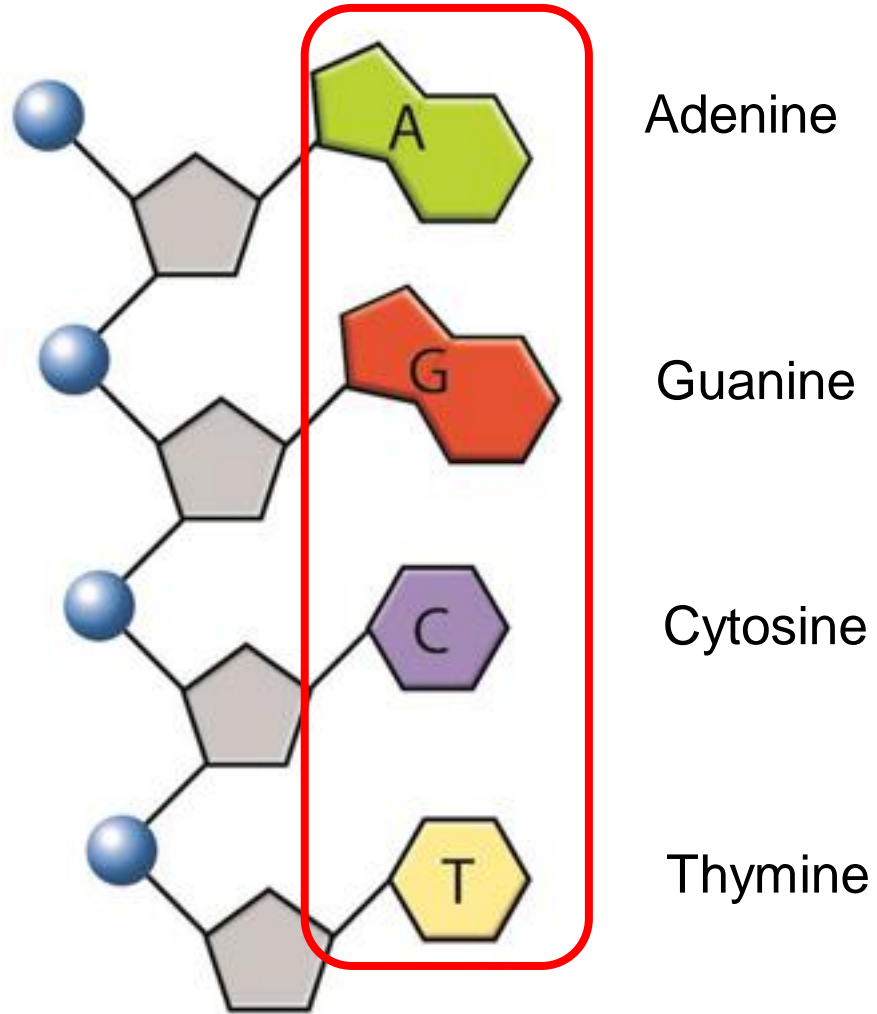


Nucleotide Structure

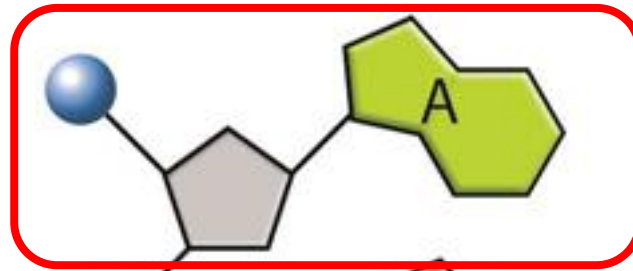
- 4 macromolecules – protein, carbs, lipids, nucleic acids
- DNA is made up of nucleotides joined into long strands or chains by covalent bonds.
- Nucleic acids are made up of building blocks called nucleotides.



Nitrogenous Bases

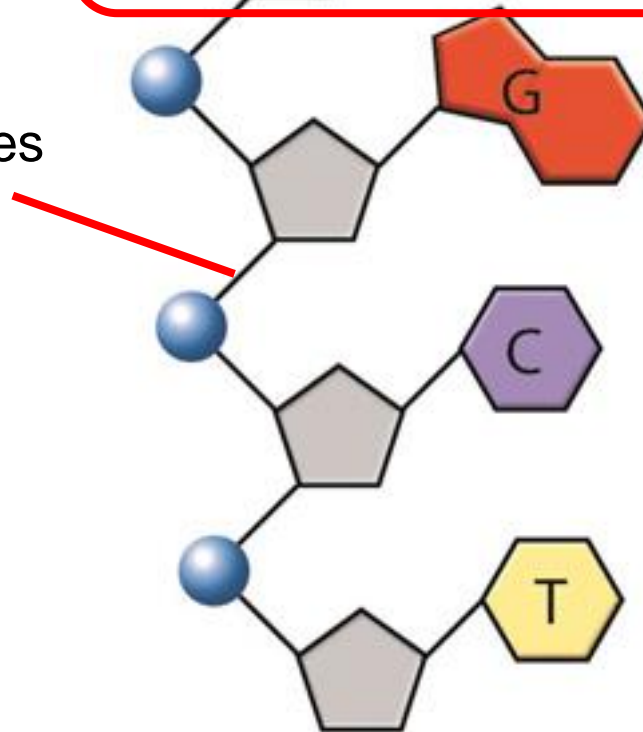


Nucleic Acid Structure



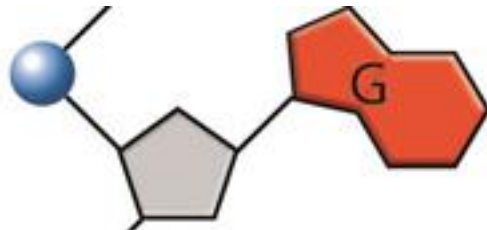
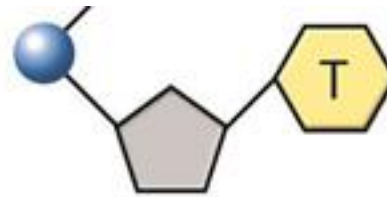
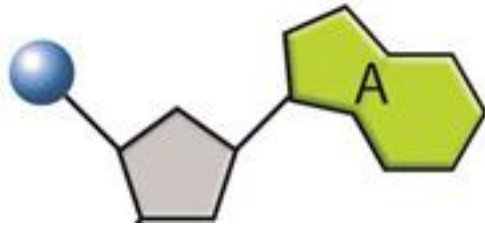
One nucleotide

Covalent bond
between nucleotides



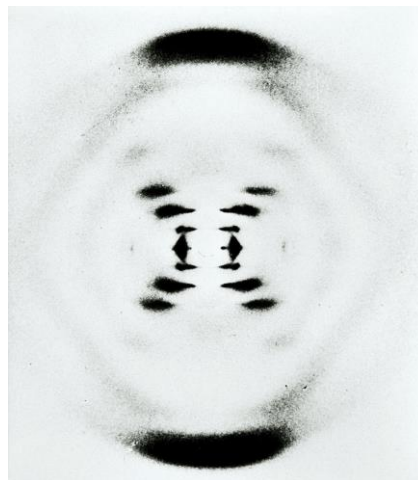
Chargaff's Rule

- Erwin Chargaff, biochemist, discovered the percentages of adenine and thymine were almost equal in a sample of DNA
- The same was true for guanine and cytosine
- $[A] = [T]$ and $[C] = [G]$
- Scientists showed that DNA samples from other organisms obeyed this rule.



Franklin's X-rays

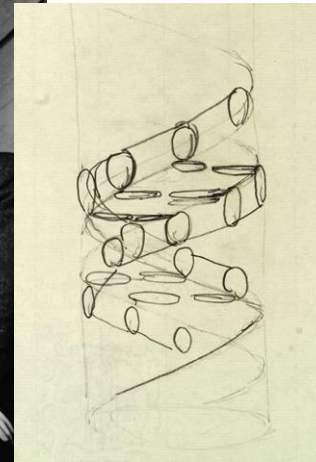
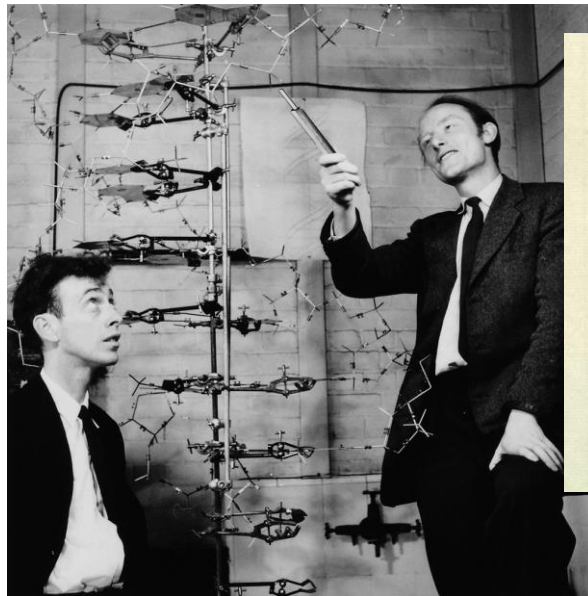
- Rosalind Franklin, British scientist, studied DNA
 - Used a technique called X-ray diffraction to study the structure.
 - The X-shaped pattern didn't reveal every detail but shows that the strands in DNA are twisted around each other like the coils of a spring. DNA is a helix.
 - Likely two strands to the molecule
 - Nitrogenous bases near the center of the molecule



- X-Ray photo known as photo 51
- Dark spots are nitrogenous bases stacked at regular intervals

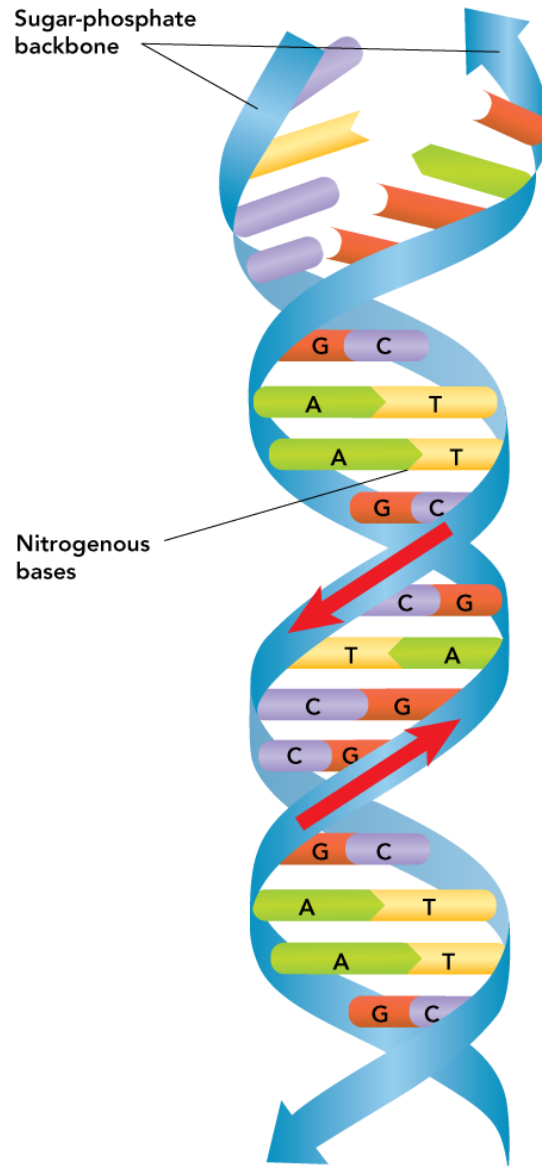
The Work of Watson and Crick

- James Watson, American biologist and Francis Crick, British physicist were trying to understand the structure of DNA
- The data in Franklin's X-ray pattern enabled Watson and Crick to build a model that explained the specific structure and properties of DNA
- DNA is a double helix, in which two strands of nucleotide sequences are wound around each other.



The Double Helix: Antiparallel Strands

The double-helix model explains Chargaff's rule of base pairing and how the two strands of DNA are held together.



The two strands in a DNA molecule run in opposite directions.

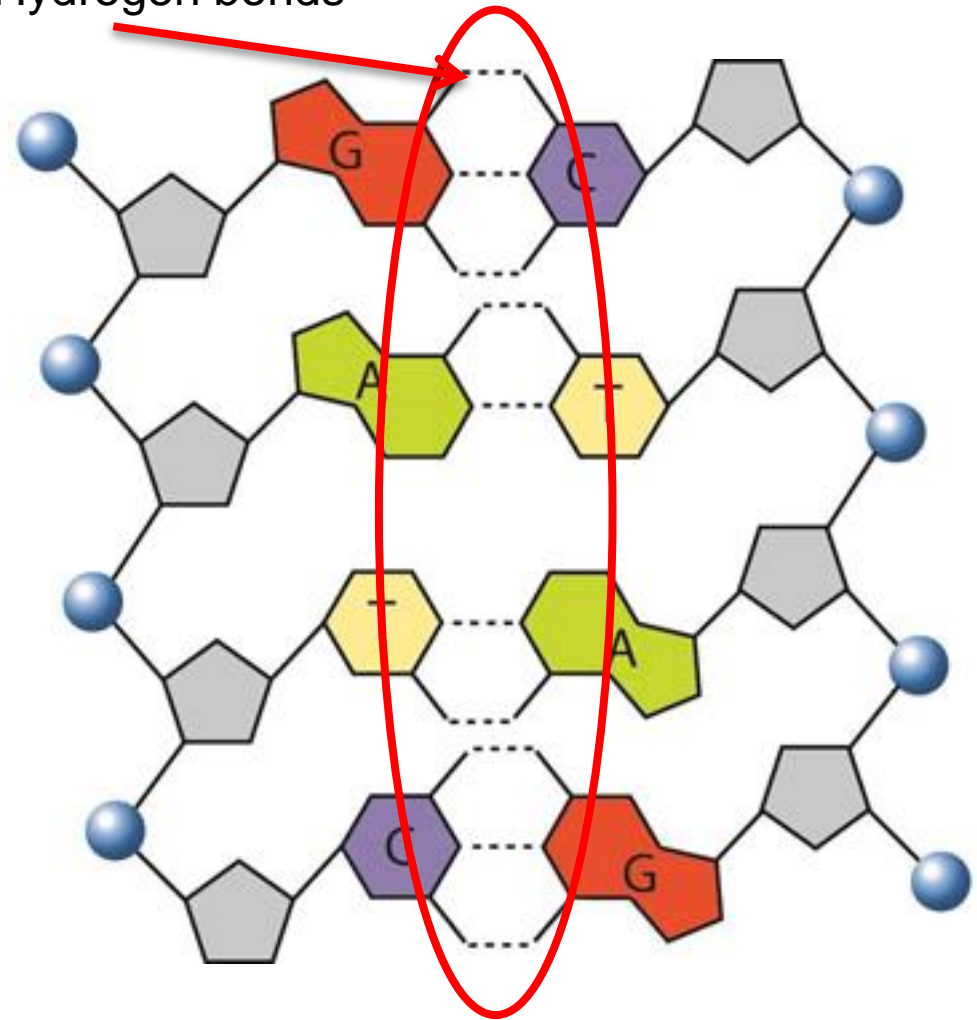
The two strands are said to be antiparallel.

Enables the nitrogenous bases on both strands to come into contact near the center.

The Double Helix: Hydrogen Bonding

Hydrogen bonds

- Hydrogen bonds hold the two strands of DNA together
- Relatively weak bonds
- If the two strands were held together by stronger bonds, it would be impossible to separate, which is critical to DNA's functions.



The Double Helix: Base Pairing

The two strands of DNA are held together by hydrogen bonds between the nitrogenous bases adenine and thymine and between guanine and cytosine.

