Section 13.2
The Structure of DNA
I Can...

• **LS 3.1** I can use historical evidence to identify patterns and model the structure of the DNA molecule.
Key Questions

1. What are the chemical components of DNA?
2. What clues helped scientists determine the structure of DNA?
3. What does the double-helix model show about DNA?
Vocabulary

• Base pairing
The Components of DNA

• Nucleic acids and nucleotides
• Nitrogenous bases
Nucleic Acids and Nucleotides

• DNA is a nucleic acid.
• Nucleic acids are long, slightly acidic molecules made up of monomers called nucleotides.

• Each nucleotide has 3 parts:
  • A 5-carbon sugar (deoxyribose)
  • A phosphate group
  • A nitrogenous base (A, T, C, or G)
Nitrogenous Bases

• Nucleotides are joined by covalent bonds between the sugar of one nucleotide and the phosphate group of the next.
• Nucleotides can be joined in any order.
Nitrogenous bases

- **Pyrimidines** = cytosine (C) and thymine (T)
- **Purines** = adenine (A) and guanine (G)
Chargaff’s Rule

• 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.

\[ [G] = [C] \]

\[ [A] = [T] \]
Rosalind Franklin

• In the early 1950s, Franklin used X-ray diffraction to study the structure of DNA.

1. Purified a large amount of the DNA molecule
2. Stretched the DNA fibers in a thin glass tube so that most of the strands were parallel
3. Aimed a powerful X-ray beam at the concentrated DNA samples
4. Recorded the scattering pattern of the X-rays on film
Rosalind Franklin

Conclusions:

- The strands in DNA are twisted around each other like the coils of a spring. This shape is known as a *helix*.
- The angle of the X suggests that there are two strands.
- Other clues suggest the nitrogenous bases are near the center of the DNA molecule.
James Watson and Francis Crick

• Built 3-dimensional models of DNA made of cardboard and wire.

• In 1953, Watson showed Crick a copy of Franklin’s work...

• Completed their model of DNA as a double helix, in which two strands were wound around each other.
James Watson and Francis Crick

• **Base pairing**
  • A always bonds with T.
  • C always bonds with G.
  • Nitrogenous bases are held together with *hydrogen bonds*. 
Section 13.2 Exit Ticket

1. What does the research of Chargaff, Franklin, and Watson and Crick provide us about the structure of DNA?
2. What are the three parts of a DNA nucleotide?
3. What are the four DNA base pairs and how do they bind to one another?
The End 😊