

## Key Concept 1: Structure of DNA

### Learning Objectives

Students will be able to ...

### Essential Knowledge

Students need to know that ...

#### Race to Discover DNA

**GEN 1.1(a)** Explain how models of DNA changed over time as new scientific evidence emerged, resulting in the final consensus model.

**GEN 1.1.1 Several scientists' models of DNA contributed to the final consensus model of DNA's structure produced by Watson and Crick.**

- a. Chargaff observed 1:1 ratios between certain nitrogenous bases in DNA's nucleotides (A-T, G-C).
- b. Franklin's work showed that DNA was in the shape of a helix and suggested that the nitrogenous bases were near the center.
- c. Watson and Crick built the consensus model of DNA known today.

#### The Structure of DNA

**GEN 1.2(a)** Describe how DNA is organized differently in prokaryotes and eukaryotes.

**GEN 1.2.1 Living systems obtain the monomers necessary to build DNA strands using products from metabolic reactions.**

**GEN 1.2(b)** Describe the monomers necessary for cells to build DNA.

**GEN 1.2.2 DNA is the genetic material found in all living organisms.**

**GEN 1.2(c)** Explain how the structure of DNA enables storage of heritable information.

- a. In prokaryotes, genomic DNA is organized into a single, circular chromosome.
- b. In eukaryotes, genomic DNA is organized into multiple, linear chromosomes found in the nucleus.
  1. DNA is a double helix with the two strands running in opposite directions (antiparallel).
  2. Nitrogenous base pairing occurs in between the two strands, each of which contains a sugar-phosphate backbone.

**Content Boundary:** Quizzes will not require students to recall a list of scientists and their contributions to the discovery of the structure of DNA. The *focus* here is on how scientific knowledge (e.g., work from Pauling, Chargaff, Franklin and Watson, and Crick) developed over time, finally leading to the understanding of the consensus model of DNA.

**Cross Connections:** *Connect key concepts* from the cycling of matter in the biosphere (Unit 1: Ecological Systems) and the chemistry of life (Unit 3: Cellular Systems) to help students understand where the building blocks to make these nucleic acids (both DNA and RNA) come from.