CONCEPT: STRUCTURE AND FUNCTION OF DNA

● **Nucleotides** are the _____ of DNA

□ There are four nucleotides of DNA: **adenine (A), cytosine (C), guanine (G)**, and **thymine (T)**

- The **pyrimidines** (C/T) have one carbon ring

- The **purines** (A/G) have two carbon rings

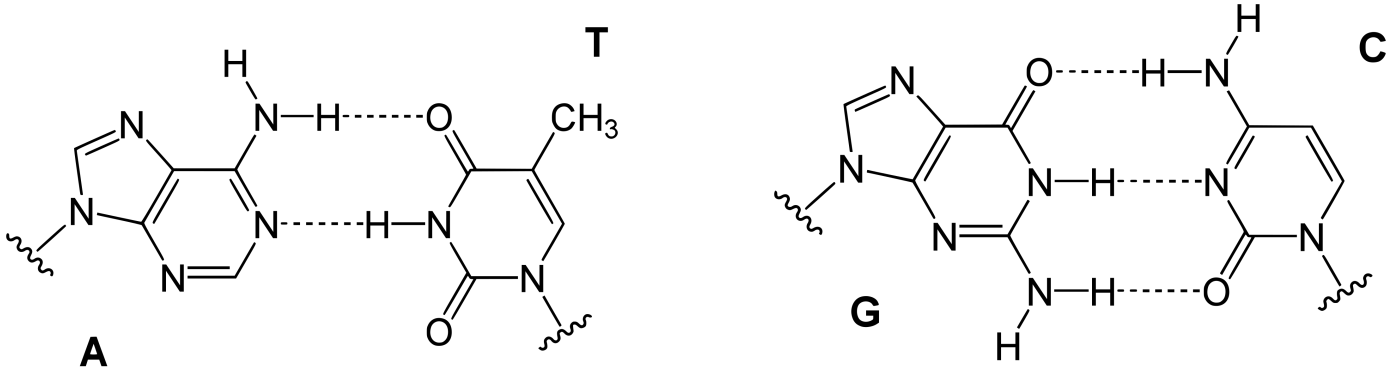
□ **Chargoff's** rules state that A pairs with T and C pairs with G

- A **base pair** is the pairing of two nucleotides (A-T or C-G)

- They pair through two (A-T) or three (G-C) hydrogen bonds

- Due to size, a purine can only pair with a pyrimidine

EXAMPLE:



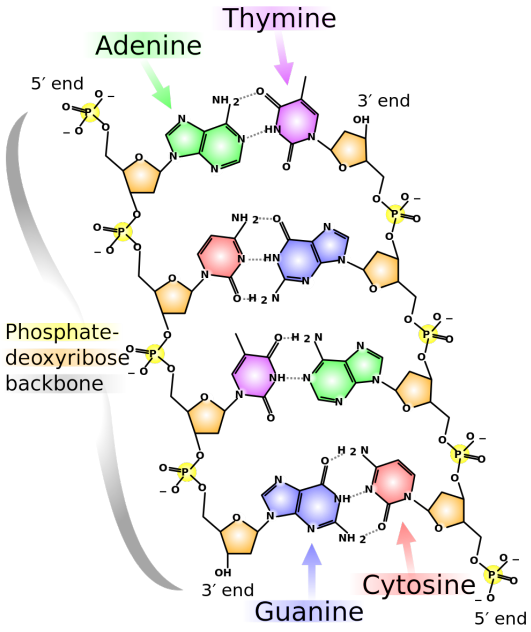
□ The **backbone** of DNA is created via _____ between sugar and phosphate groups on adjacent nucleotides

- The 5' phosphate group binds to the 3' hydroxyl group on the neighboring nucleotide

- This bond gives **directionality** to the linear DNA strand

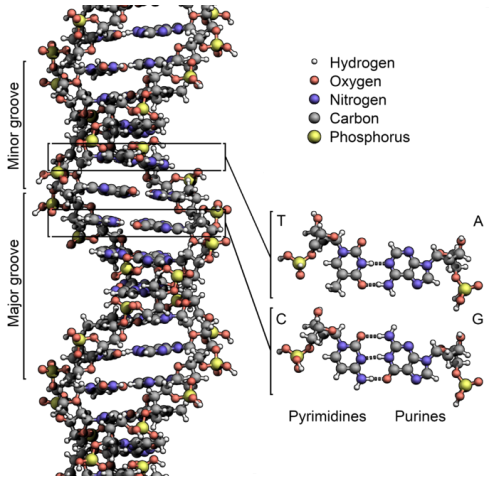
□ The string of nucleotides is **polar**, due to the charged phosphate groups and the hydroxyl groups on the sugar

EXAMPLE: Linear structure of DNA



- DNA is formed into a *double helix*
  - □ A **DNA double helix** is created via bonds between two linear DNA strands
    - Sugar-phosphate backbone forms the outside edges, with the bases facing the _____
    - There are 10 base pairs per helical turn
    - One helical turn adds 3.4nm to length of DNA (0.34nm per nucleotide pair)
  - □ Two **complementary** strands run **antiparallel** to make up the DNA helix
  - □ The helix forms a **major groove** and **minor groove**

EXAMPLE: Structure of the DNA double helix



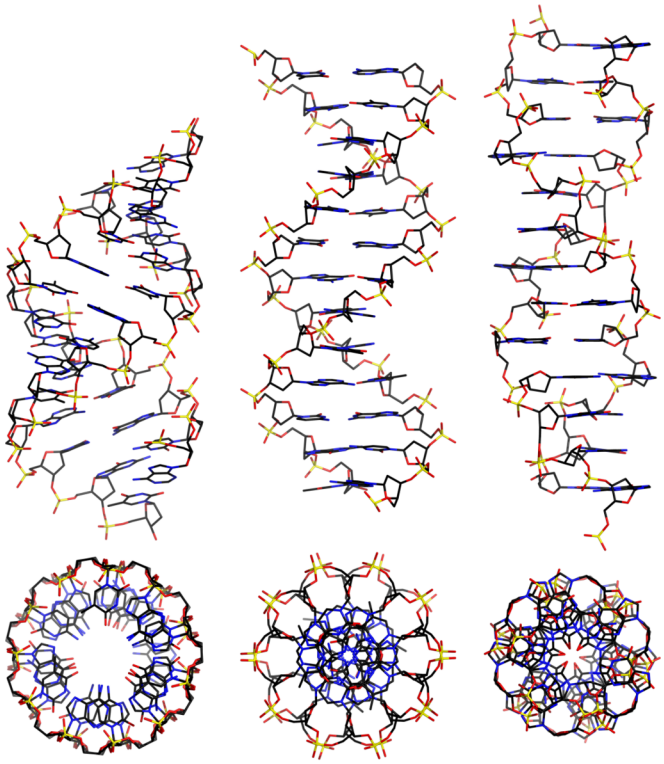
□ There are three types of DNA double helices

- **B-DNA:** is the most common, right handed helix

- **A-DNA:** is a rare, shorter right handed helix

- **Z-DNA**: is a left handed helix, with unknown significance

EXAMPLE: Structure of A, B, and Z DNA



PRACTICE:

1. Chargoff's rules state that…
    a. A purine always pairs with a purine
    b. A pairs with C and T pairs with G
    c. A pairs with T and C pairs with G

2. True or False: The two complementary DNA strands that make up the double helix run parallel to each other.
    a. True
    b. False

3. Which of the following is not a purine nucleotide?
    a. Adenine
    b. Thymine
    c. Guanine