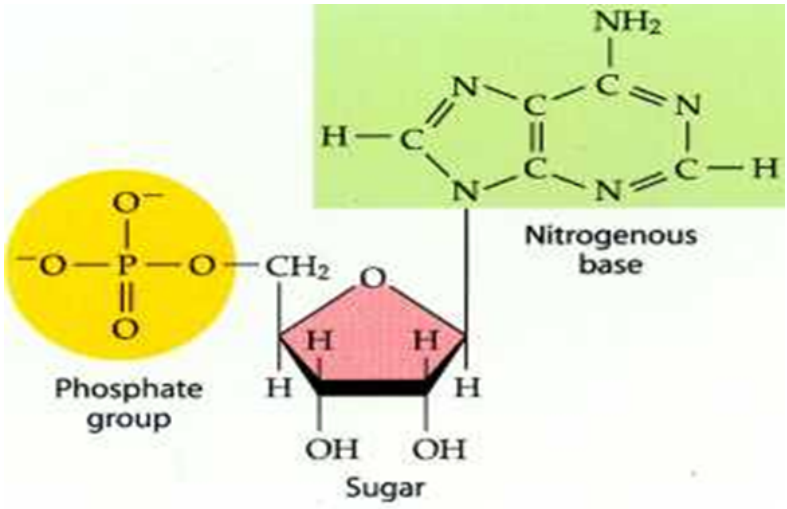
Topic 2 – DNA structure

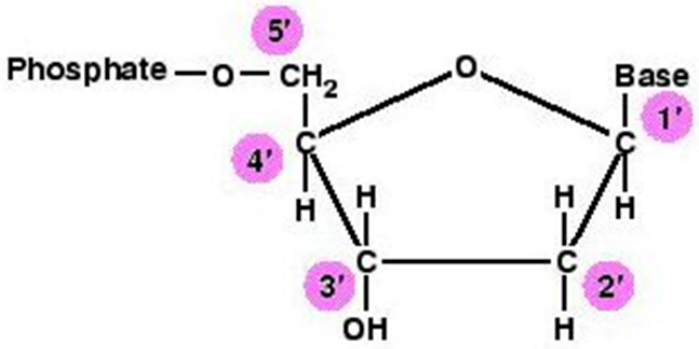
http://highered.mcgraw-hill.com/sites/0073383198/student_view0/chapter2/animation_quiz_-_dna_structure.html

- According to Watson and Crick, DNA consists of **two** strands of **nucleotides**

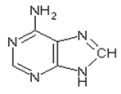
- A nucleotide consists of:
  - A Deoxyribose sugar (5 carbons)
  - A phosphate group
  - A nitrogenous base
    - The only thing different between nucleotides

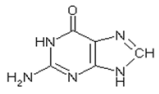


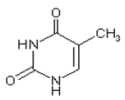
- Deoxyribose sugar consists of 5 carbons
  - Nitrogenous base is attached to the 1' carbon
  - Phosphate group is attached to the 5' or 3'carbon

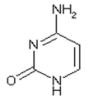


- There are two different types of nitrogenous bases
  - Purines – double ringed structures
    - adenine (A) and guanine (G)
  - Pyrimideines – single ringed structures
    - Thymine (T) and cytosine (C)
  - A purine always pairs with a pyrimidine
  - Called complementary base pairing


Adenine (A)


Guanine (G)


Thymine (T)

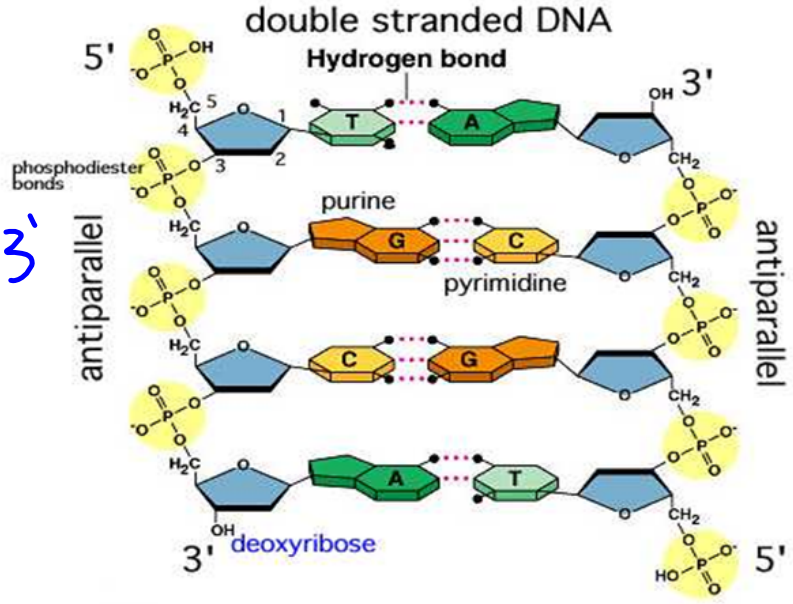

Cytosine (C)

- The two strands of nucleotides form a structure that resembles a twisted ladder

- The nitrogen bases of the 2 chains are joined together by weak hydrogen bonds. (easily broken)

- A specific purine base is paired with a specific pyrimidine base.
  - Adenine pairs with Thymine (A-T)
  - Guanine pairs with Cytosine (G-C)

- The sequence of base pairs along the DNA molecule determine the genetic code.



5' → 3'

3' → 5'

- The two strands of nucleotides are antiparallel
  - They run parallel but in opposite directions

  - Direction of strand is important when enzymes interact with DNA to:
    - Copy the DNA prior to cell division
    - Read genes to make proteins

  - Enzymes can read/copy DNA in one direction only

Examples:

1. Write the complementary strand of DNA that matches the one below

5' – AGCTTGCACCGGATCATT – 3'

3' - TCGAACGTGGCCTAGTAA - 5'

Topic 2 – DNA Structure
Review Sheet

1. Define the following terms: nucleotide, complementary base pairing, and antiparallel.

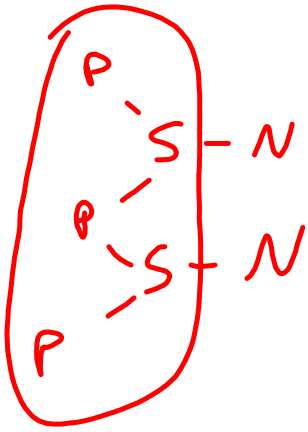
2. In a DNA molecule, a purine pairs with a pyrimidine. If this is the case, then why can't A-C and G-T pairs form? (Hint: Look closely at the bond between the base pairs in Figure 2 on page 662.)

3. The following is a segment taken from a strand of DNA: 5'-ATGCCTTA-3'. Write out the complementary strand for this segment. Be sure to show directionality

5' - A T G C C T T A - 3'
3' - T A C G G A A T - 5'

Which of the following rows correctly describes a DNA molecule?

Row	Components	Backbone	Molecules that form the links between two strands
A.	amino acids, sugars, and bases	sugars and bases	amino acids
B.	amino acids, sugars, and bases	sugars and amino acids	bases
C.	phosphates, sugars, and bases	sugars and bases	phosphates
D.	phosphates, sugars, and bases	sugars and phosphates	bases



Analysis of a DNA sample showed that 15% of the nitrogen-base molecules present were adenine molecules. This sample would likely contain

A. 15% thymine
B. 15% uracil
C. 85% thymine
D. 85% uracil

15% 15%
A - T
35% 35%
C - G
30%
70%

Use the following information to answer the next question.

Erwin Chargaff found that the relative amount of each of the base pairs that make up DNA varies from species to species. He analyzed a sample of DNA from *Escherichia coli* (a bacterium) and found that 23.6% of the nitrogen base molecules present in this sample were thymine.

—from *Curtis, 1983*

In this sample of *Escherichia coli* DNA, the percentage of the nitrogen base molecules that would be adenine is

A. 76.4%
B. 38.2%
C. 23.6%
D. 11.8%