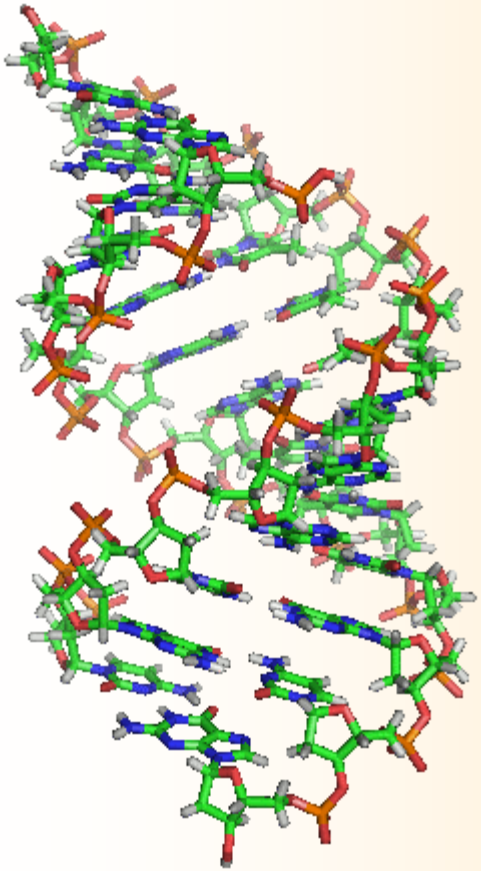
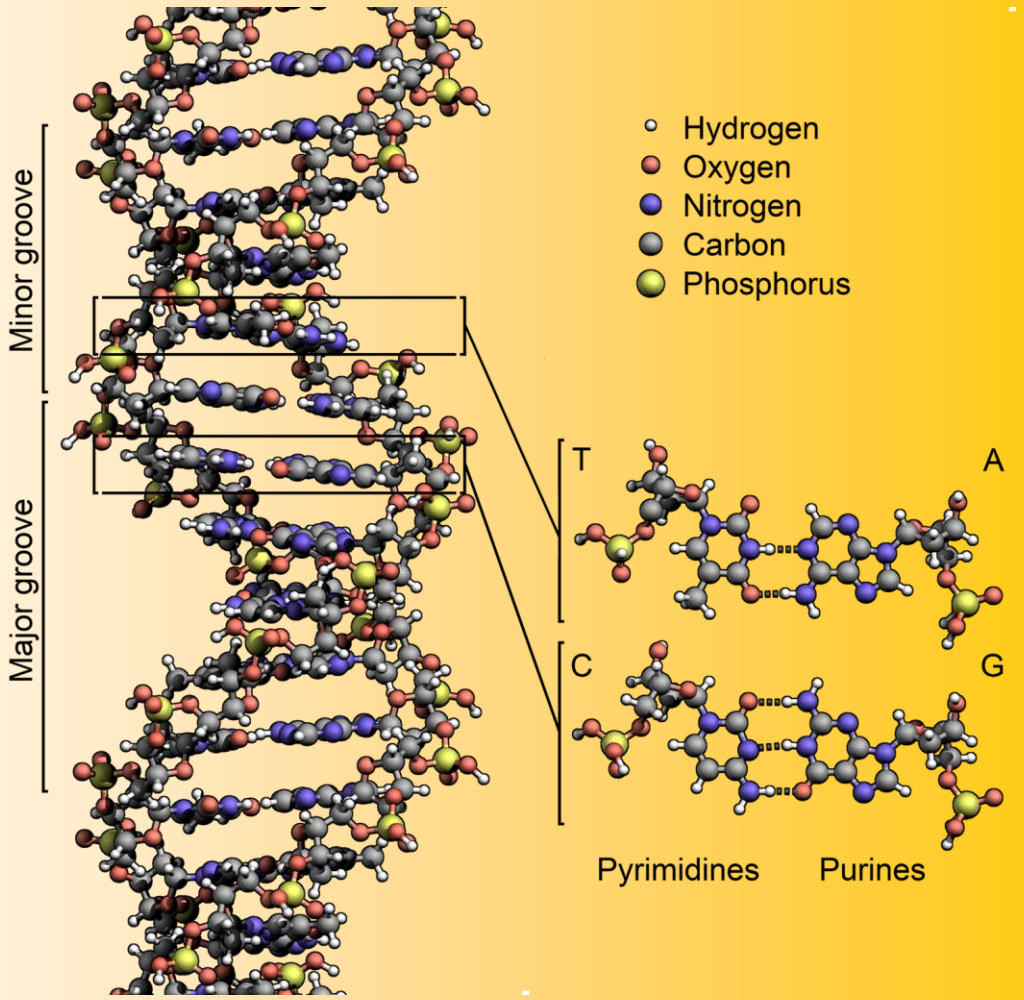
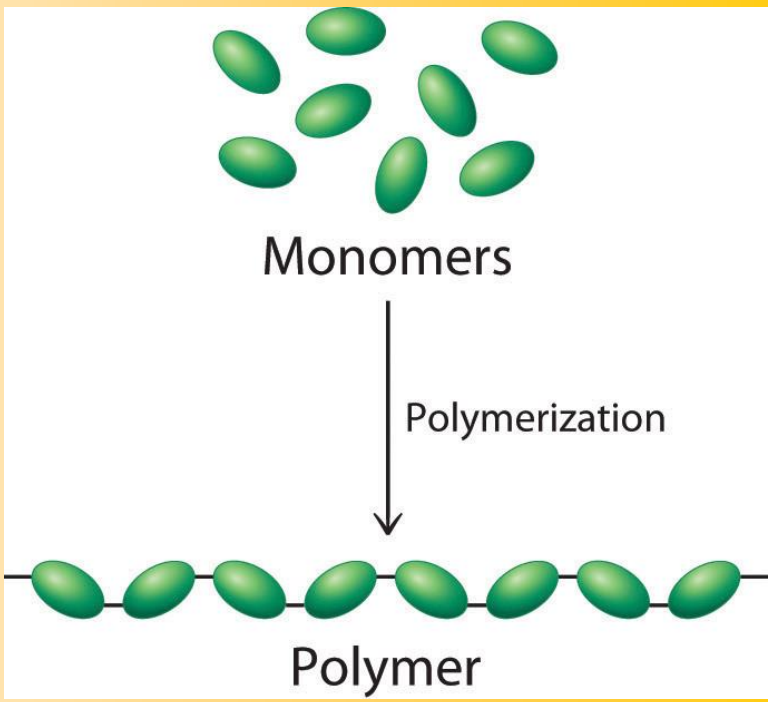
Nucleic Acids





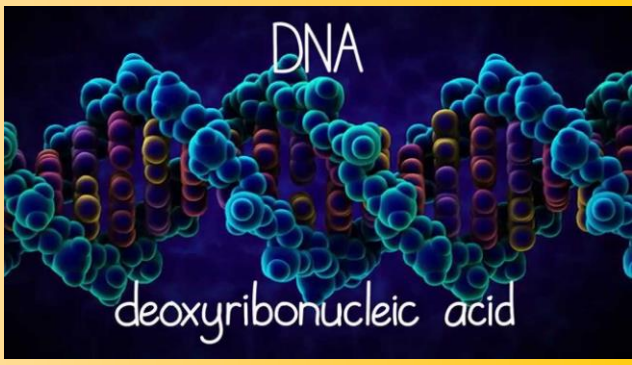
Review of ORGANIC CHEMISTRY

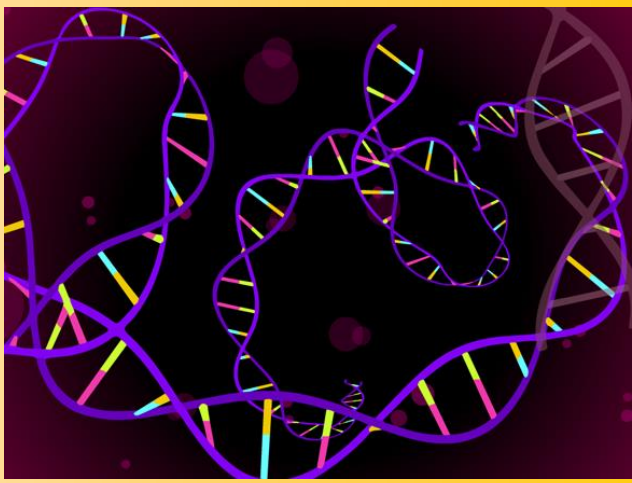
- **Definition:**
  - **Organic molecules Contain Carbon (C) and Hydrogen (H)**
  - **Large polymers can be made of smaller individual monomers.**



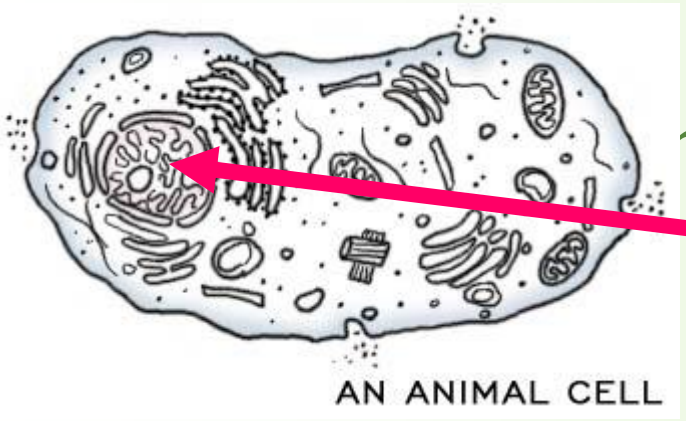
Organic Chemistry

- 4 kinds of Organic Macromolecules
  1. ~~Carbohydrates~~
  2. ~~Lipids~~
  3. Nucleic Acids
  4. Proteins





NUCLEIC ACIDS



Named for where they

re first found:

The

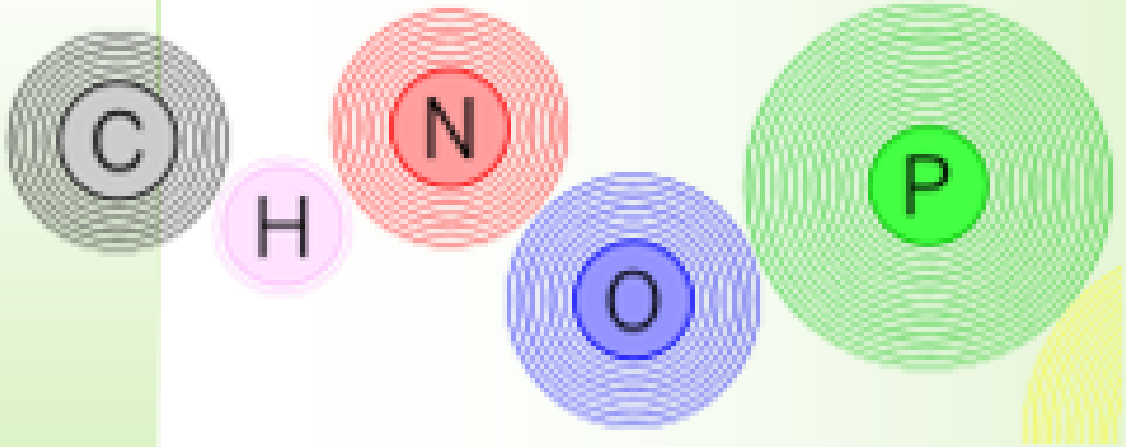
REMEMBER ATP?!?

Three types that we will be studying

1. DNA (Deoxyribonucleic Acid)
2. RNA (Ribonucleic Acid)
3. ATP (Adenosine Triphosphate)

NUCLEIC ACIDS

- Contain the elements:



- Carbon
- Hydrogen
- Oxygen
- *Nitrogen*
- *Phosphorous*

NUCLEIC ACIDS

- How can you tell the difference between nucleic acids and lipids/carbohydrates?

Lipids and carbohydrates don’t have phosphorus (except phospholipids) or nitrogen.

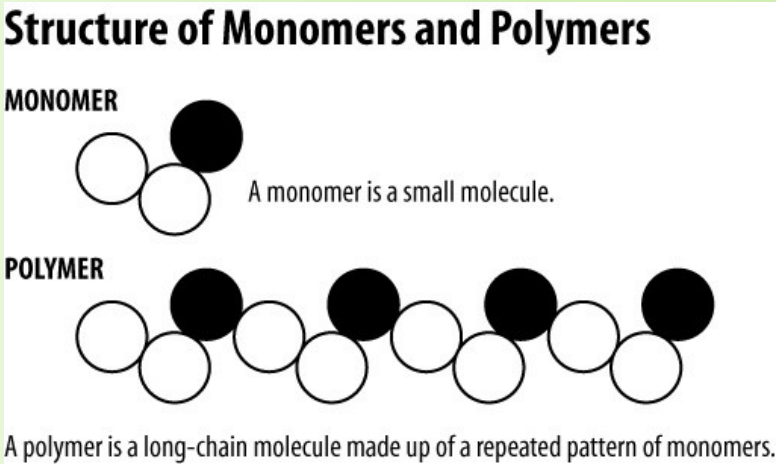
Structure of Nucleic Acids:

- **Definition:**
  - Repeating chain of **nucleotides.**

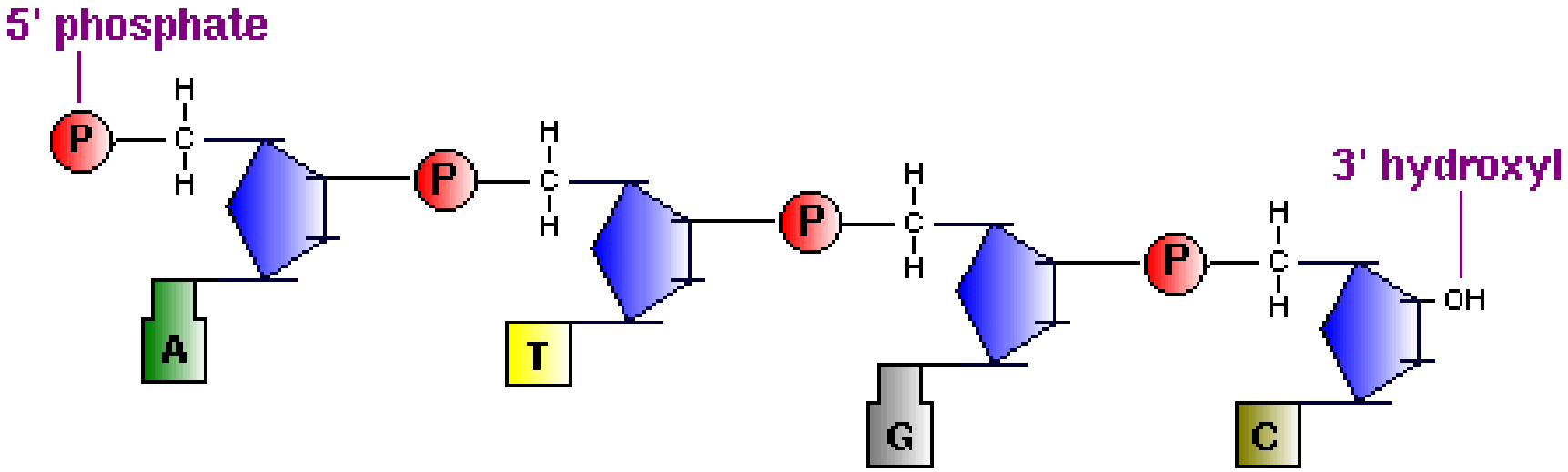
Polymer = Nucleic Acid

made of repeating monomers

Monomer = Nucleotide



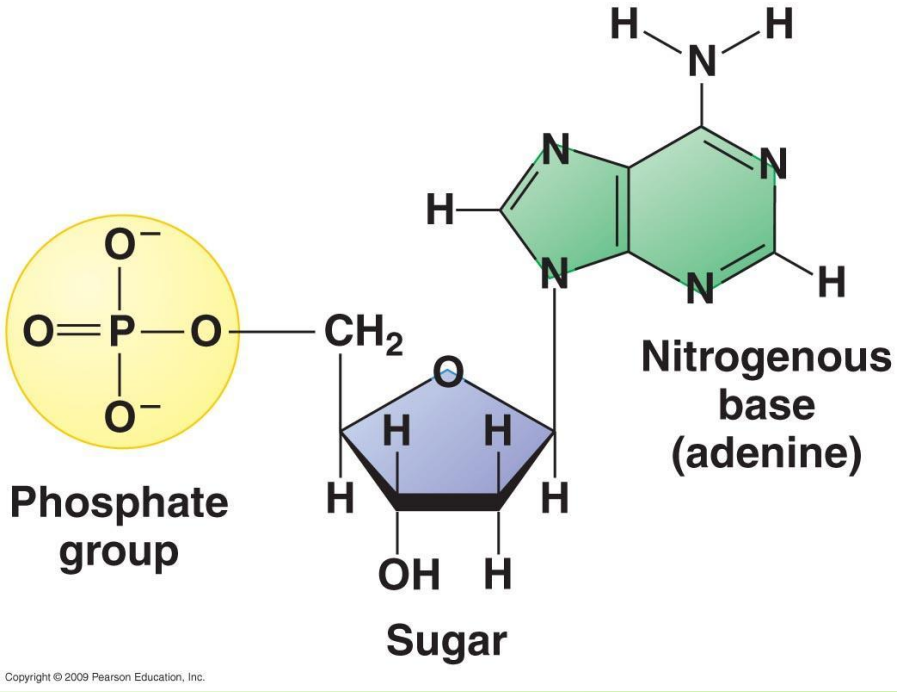
Structure of Nucleic Acids:



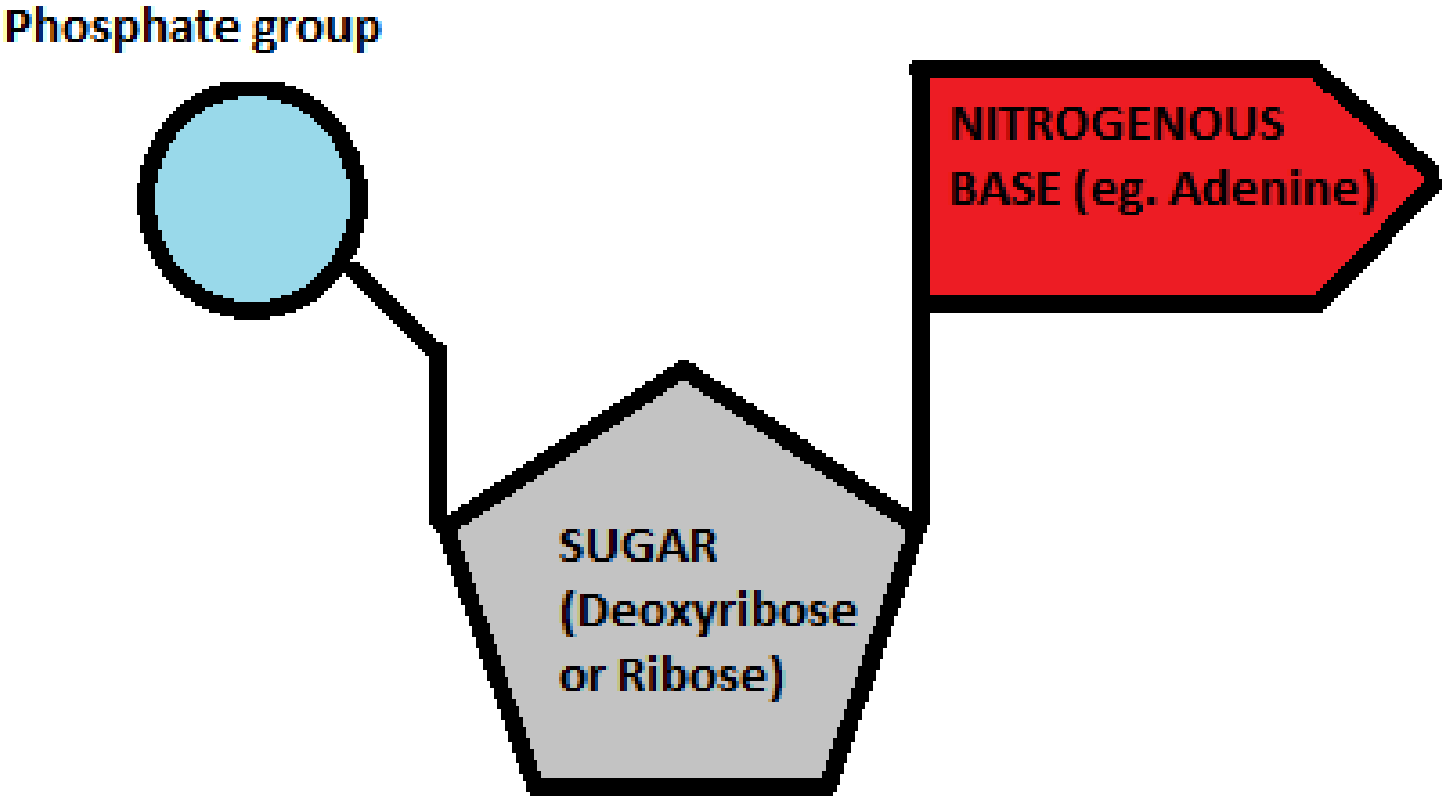
Can you recognize the monomers (repeating subunits) in the polymer above?

Structure of Nucleic Acids:

- **Nucleotides have 3 parts:**
  - * 5 carbon sugar
  - * phosphate
  - * nitrogenous base



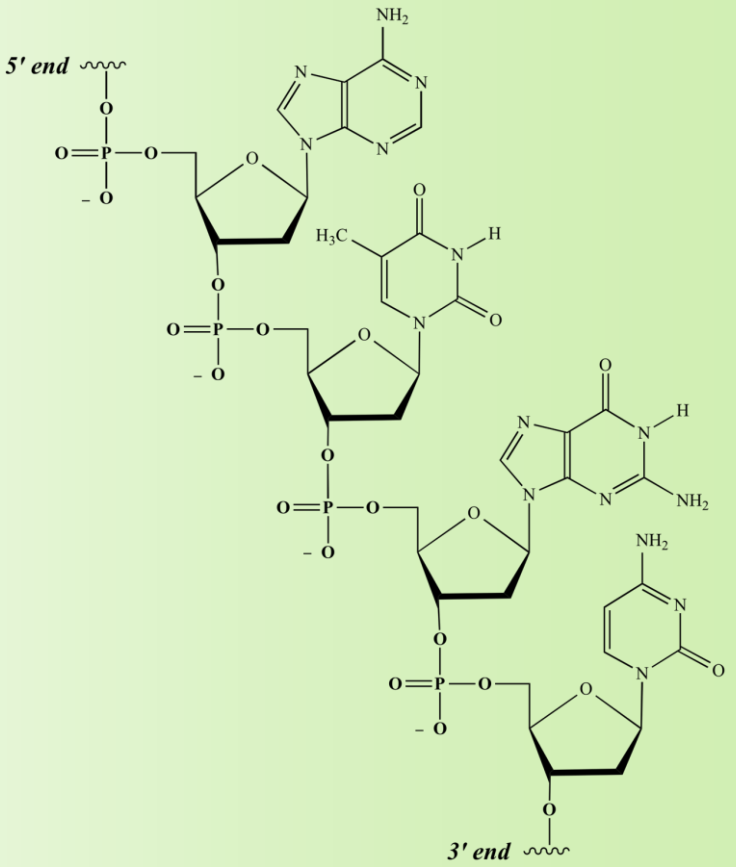
Generalized Nucleotide:



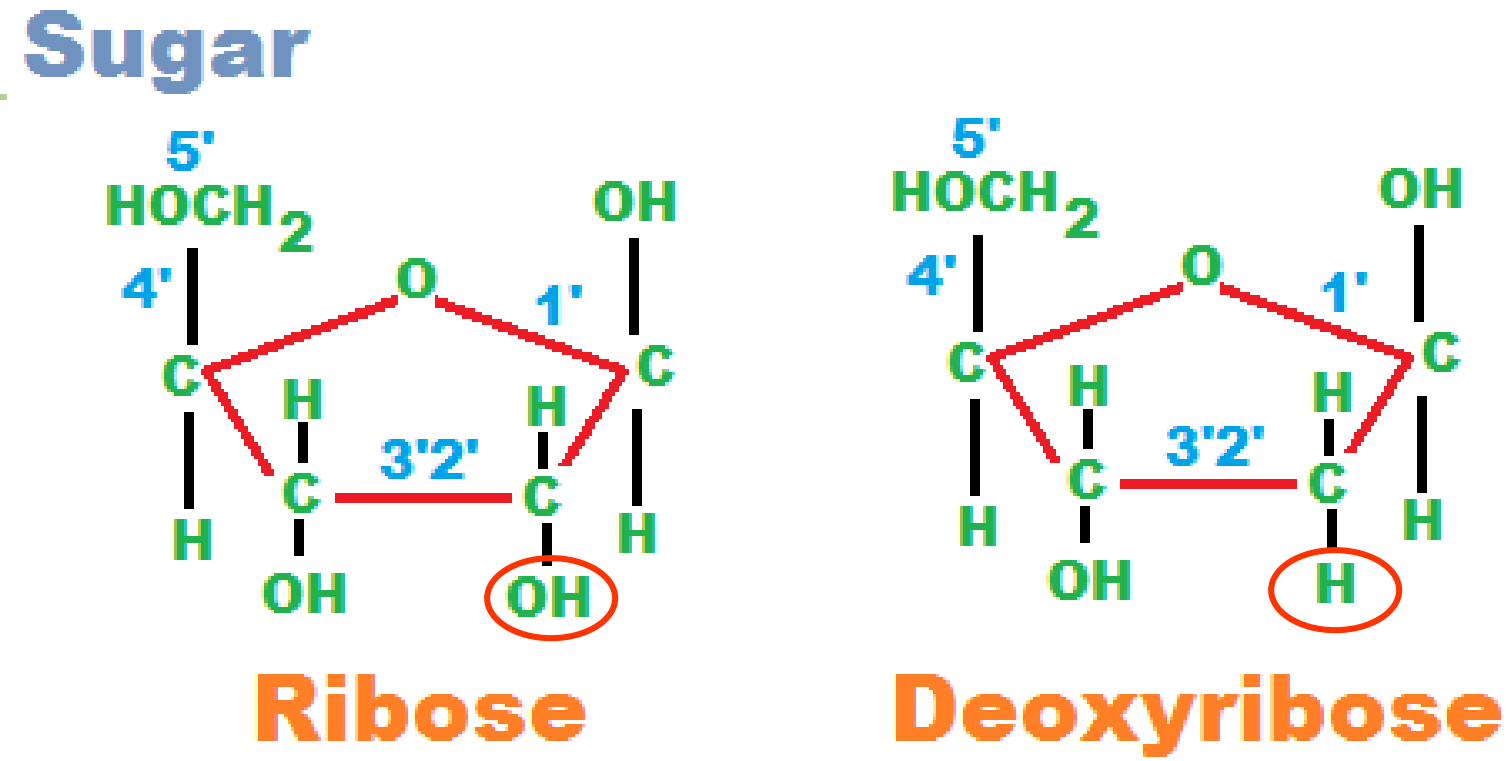
Types of Nucleotides:

Nucleotides can differ from one another depending on the **sugar** and the **base** they are using. The phosphate never changes.

There are two different types of sugar and five different types of base to choose from.

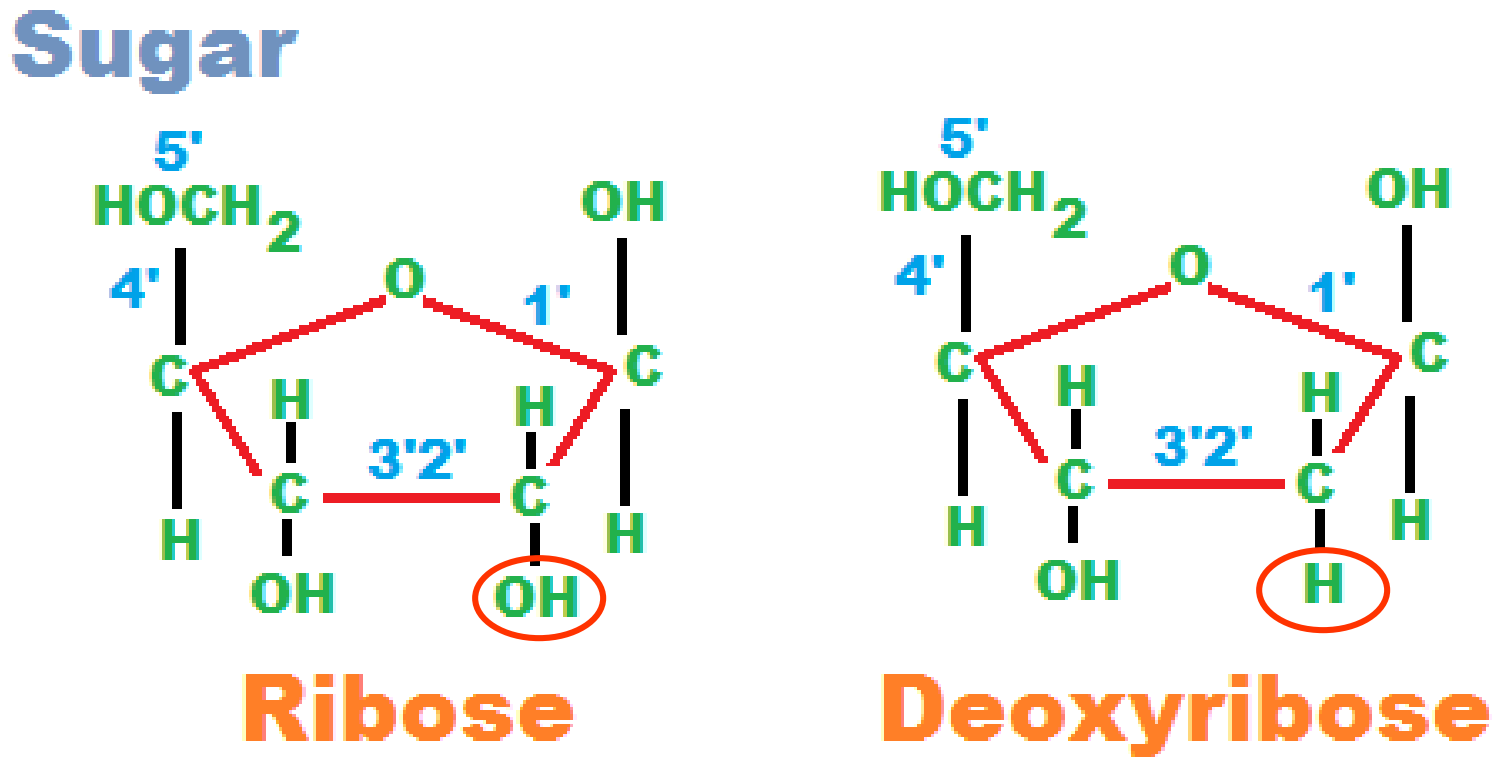


Two types of sugars used:



Can you spot the difference?
Look closely!

Two types of sugars used:

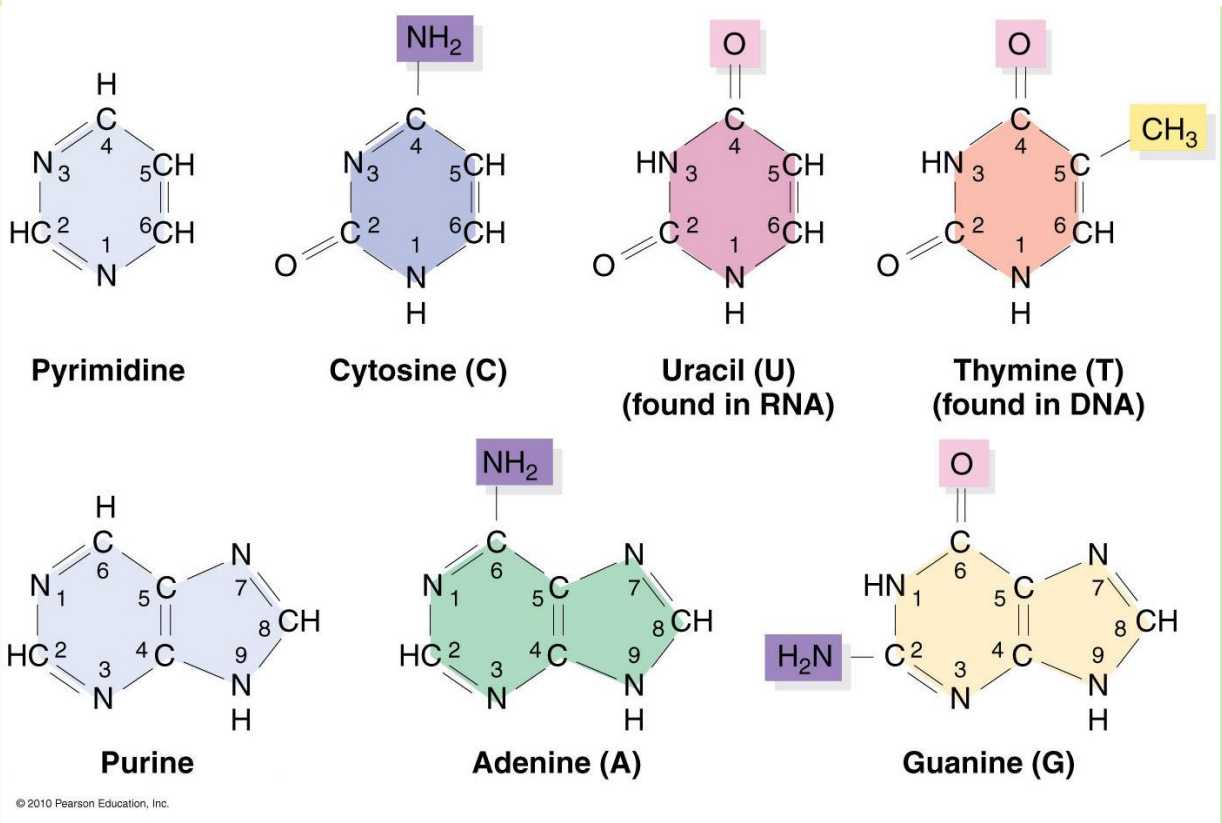


Ribose is the sugar used in RNA.
Deoxyribose is the sugar used in DNA

Five types of nitrogenous bases:

Pyrimidine= 1 ring structure (think: a pyramid has one base)

Purine= 2 ring structure



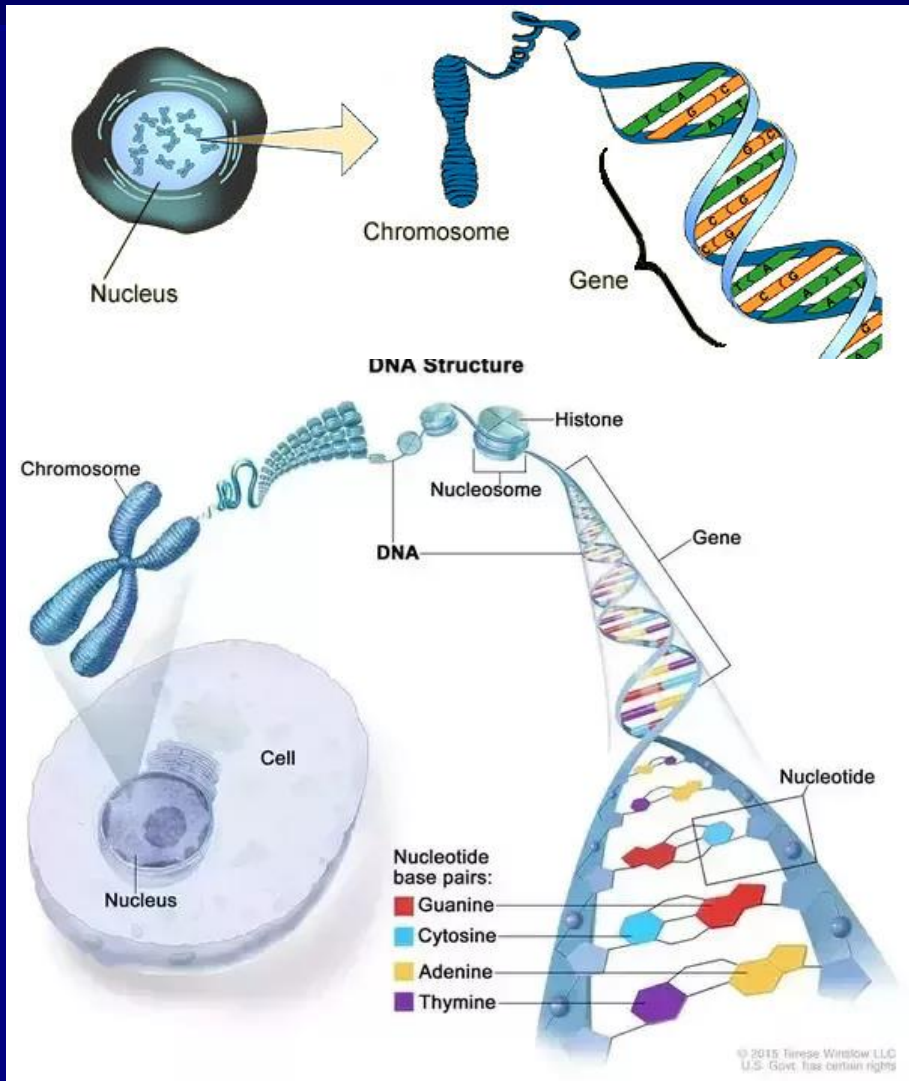
DNA:
Nucleic acid made using deoxyribose

Stands for:
Deoxyribonucleic Acid

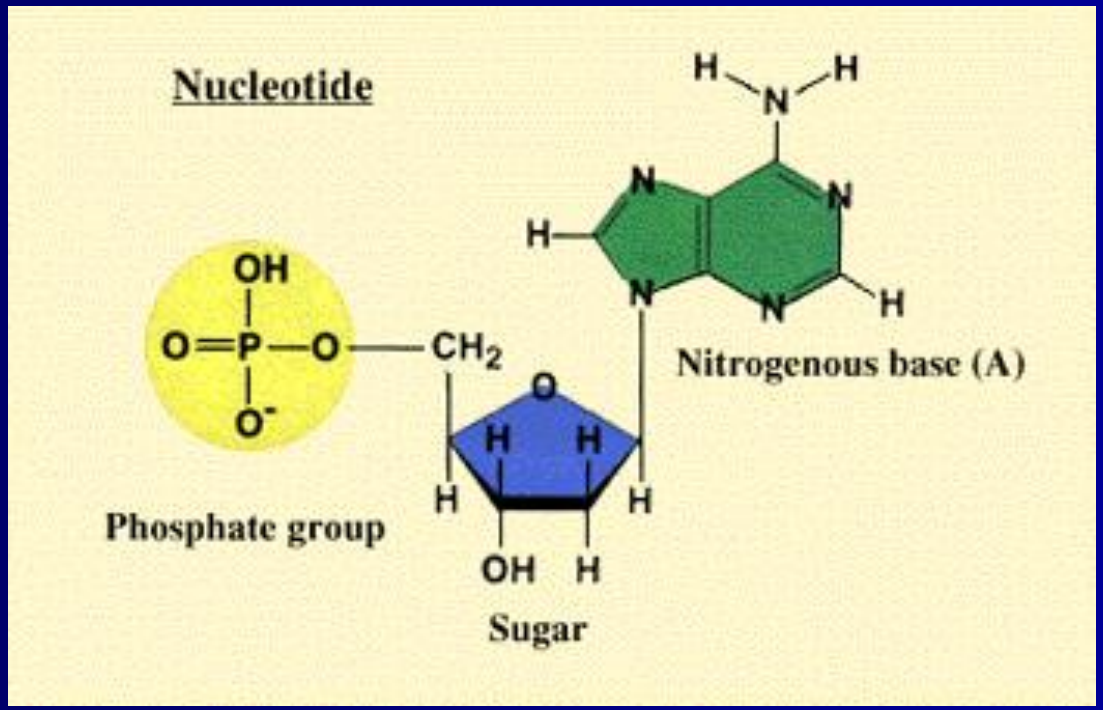
- Stores **hereditary** information in the cell that directs the cell's activities

  and determines a cell's characteristics.
- Supercoiled into

  chromosomes
  - DNA makes up **GENES**



DNA Nucleotide



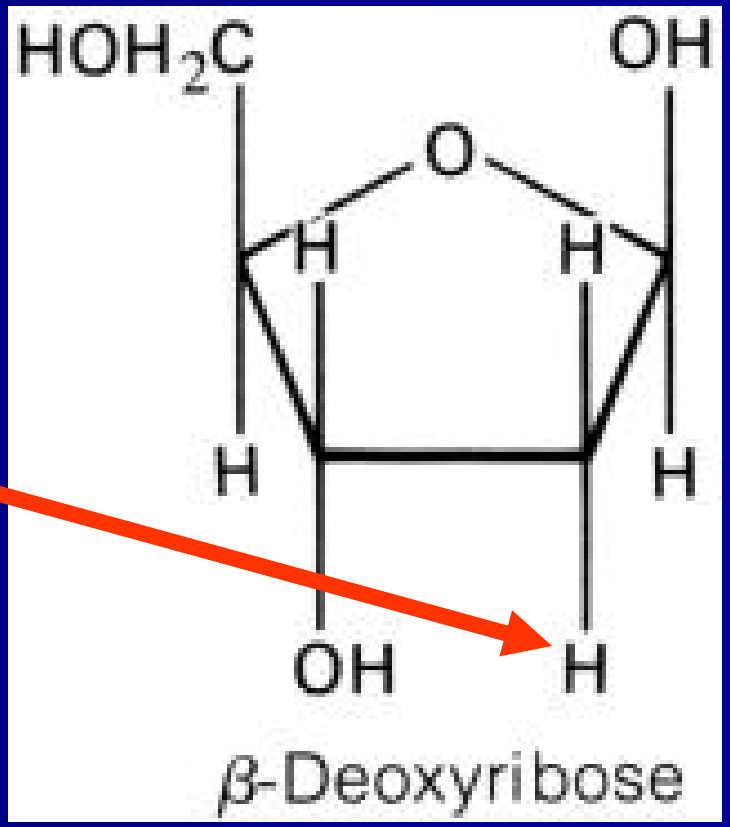
3 separate components

DNA Nucleotide Structure: component #1

5 carbon sugar

Deoxyribose

- "de" means without…
  - With one less oxygen than ribose sugar

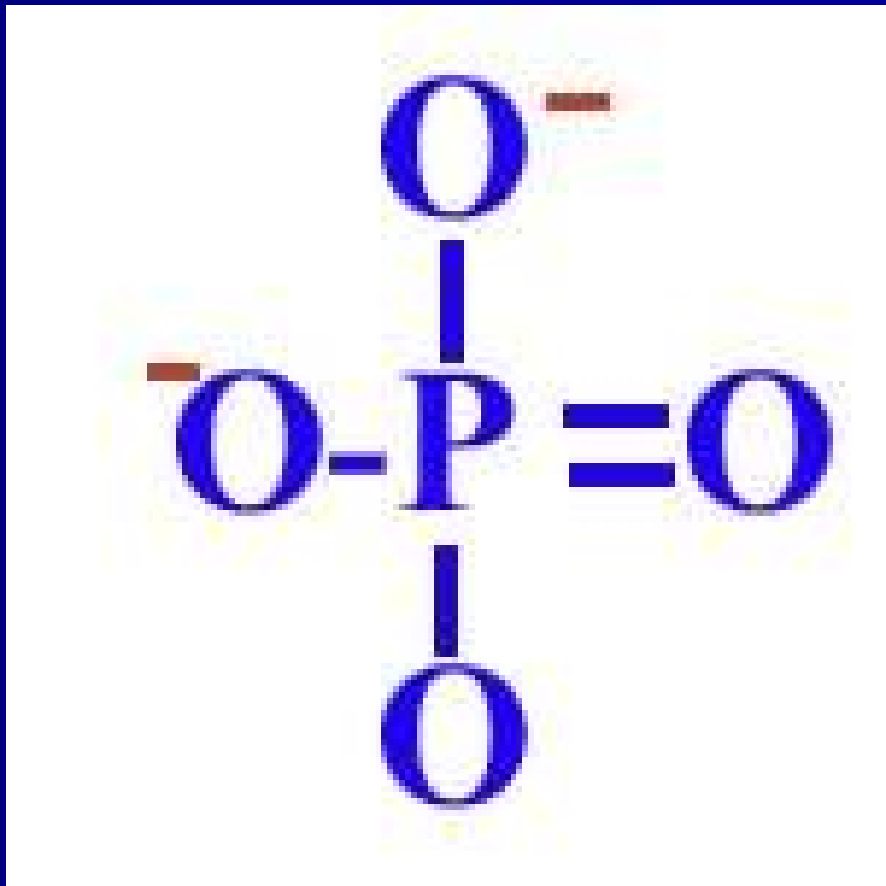


DNA Nucleotide Structure: component #2

Phosphate

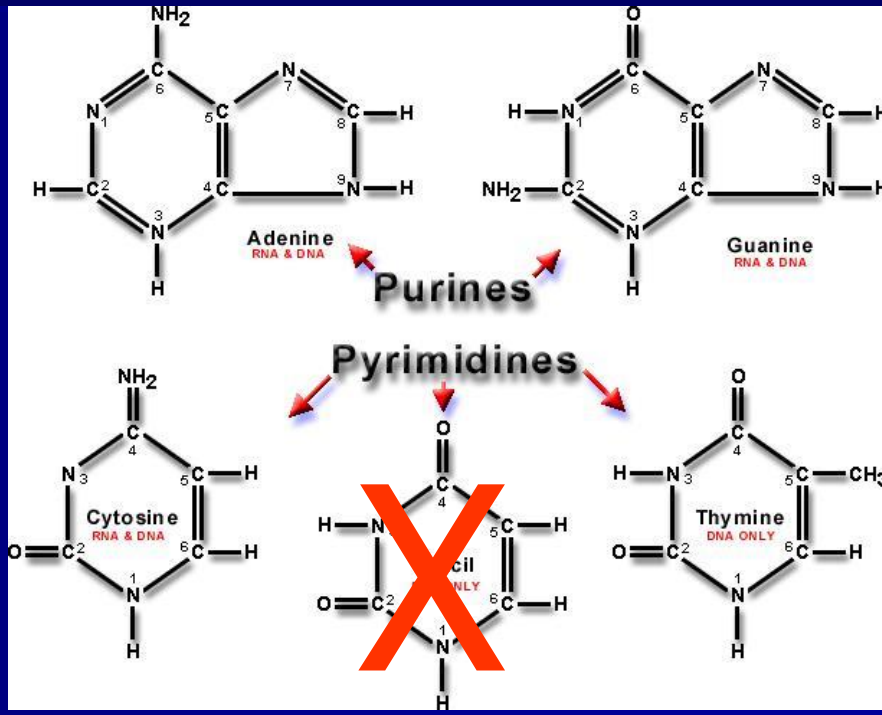
PO_4^{-3}

Carries a **negative** charge.



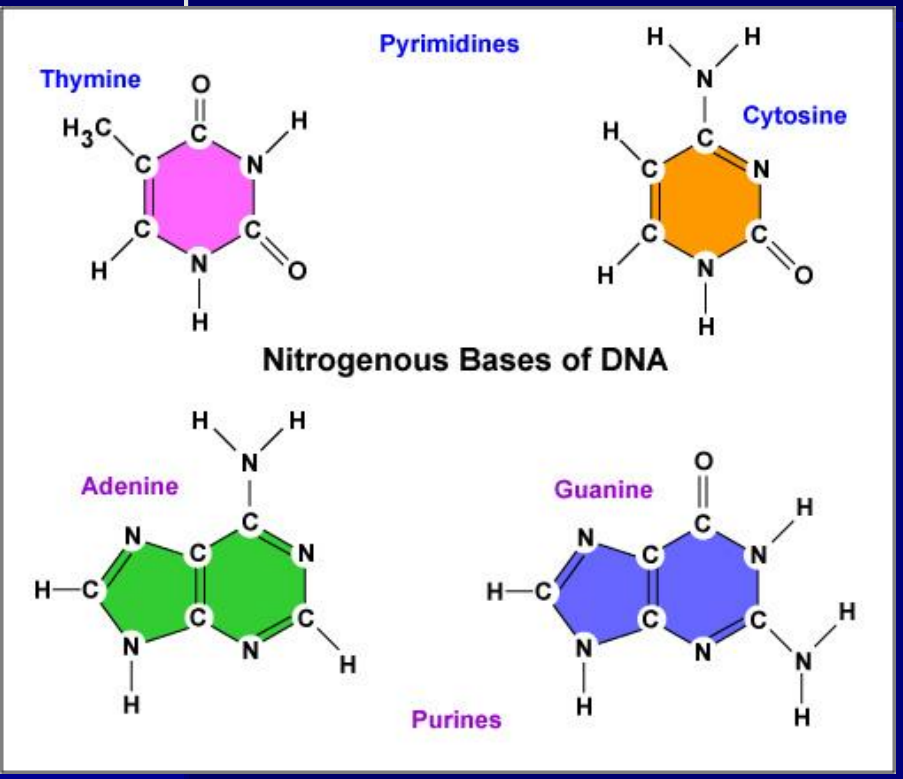
DNA Nucleotide Structure: component #3

- Nitrogenous Base
- DNA uses 4 of the 5 possible bases:
- Adenine (A)
- Guanine (G)
- Cytosine (C)
- Thymine (T)



DNA does not contain Uracil (U)

DNA Nucleotide Structure: component #3



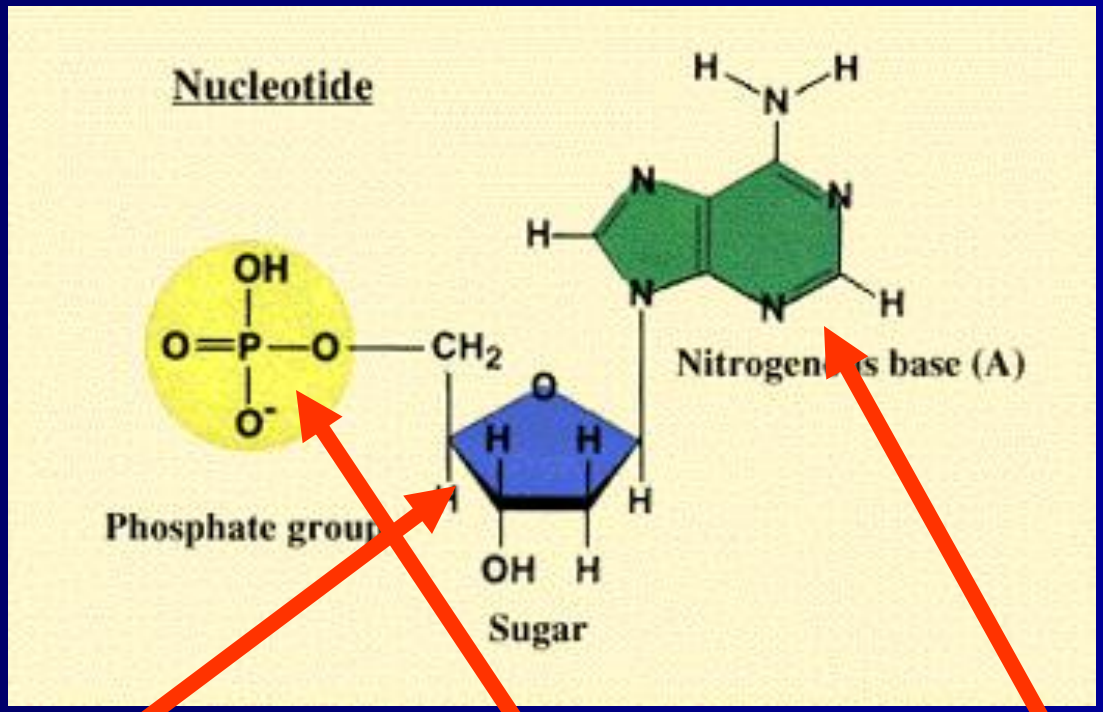
Nitrogenous Base:

For DNA, the pyrimidines are: Cytosine and Thymine

For DNA, the purines are: Guanine and Adenine

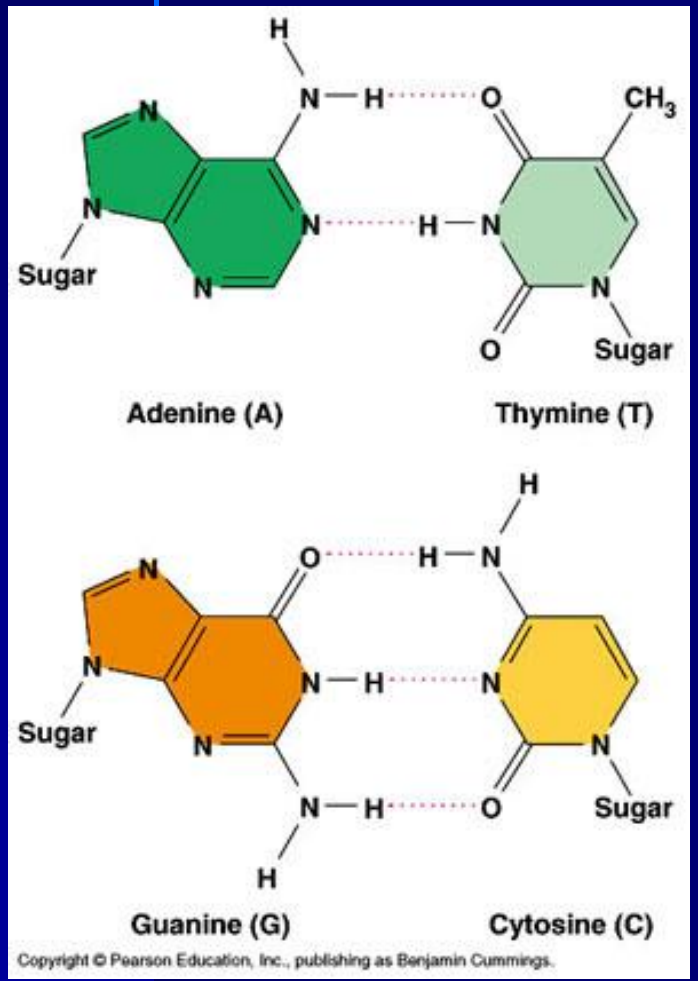
I keep these straight by remembering that the pyrimidines both have a y in them, like the word pyrimidine.

DNA Nucleotide



Sugar Phosphate Base

Complementary bonding Happens between the nitrogenous bases.

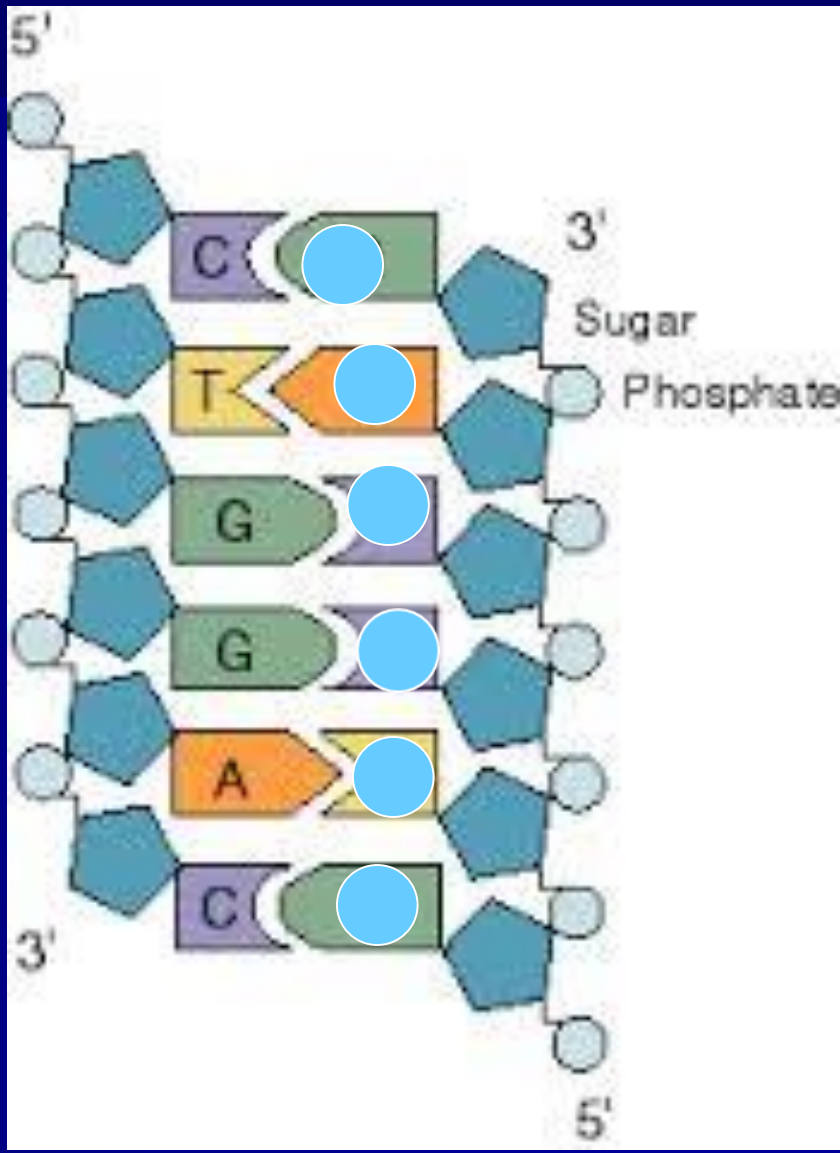


- Purines are always attracted to Pyrimidines.
- They will form weak hydrogen bonds.

- G bonds to C
- A bonds to T

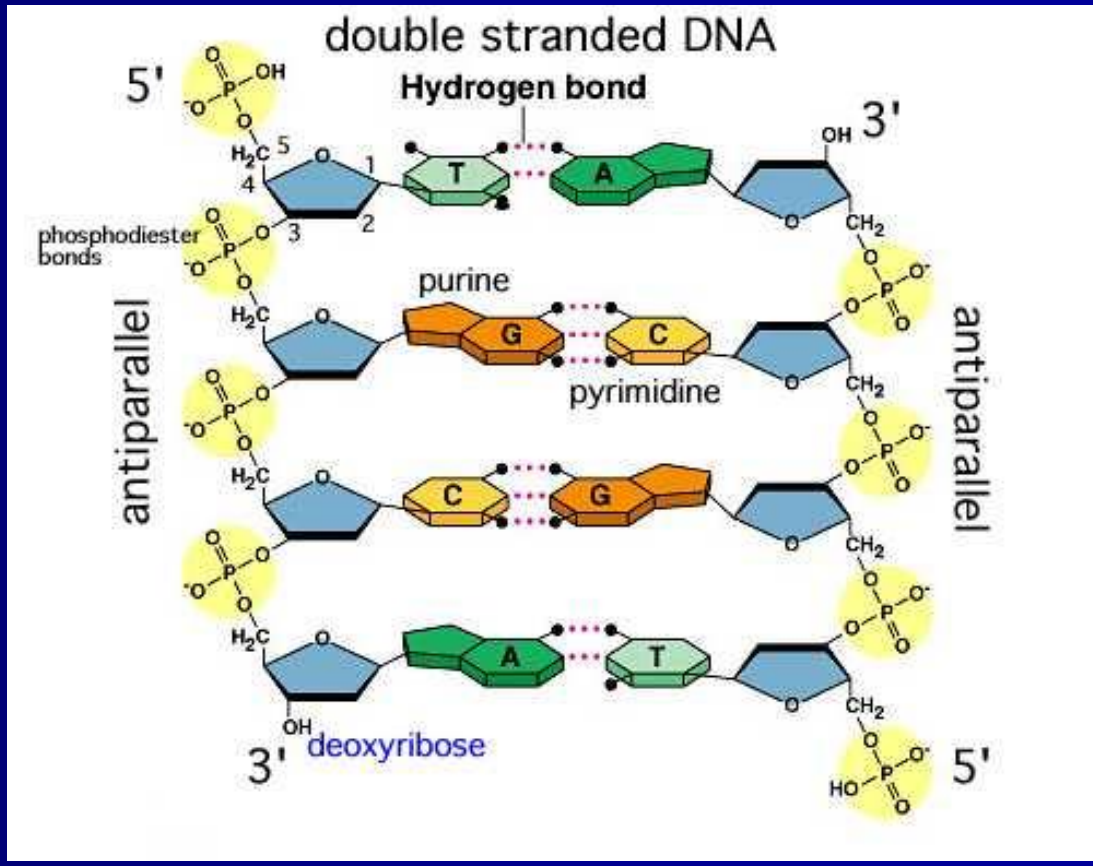
Complementary Bonding

If the sequence of bases on one strand is known, you can determine the sequence of bases on the other strand.

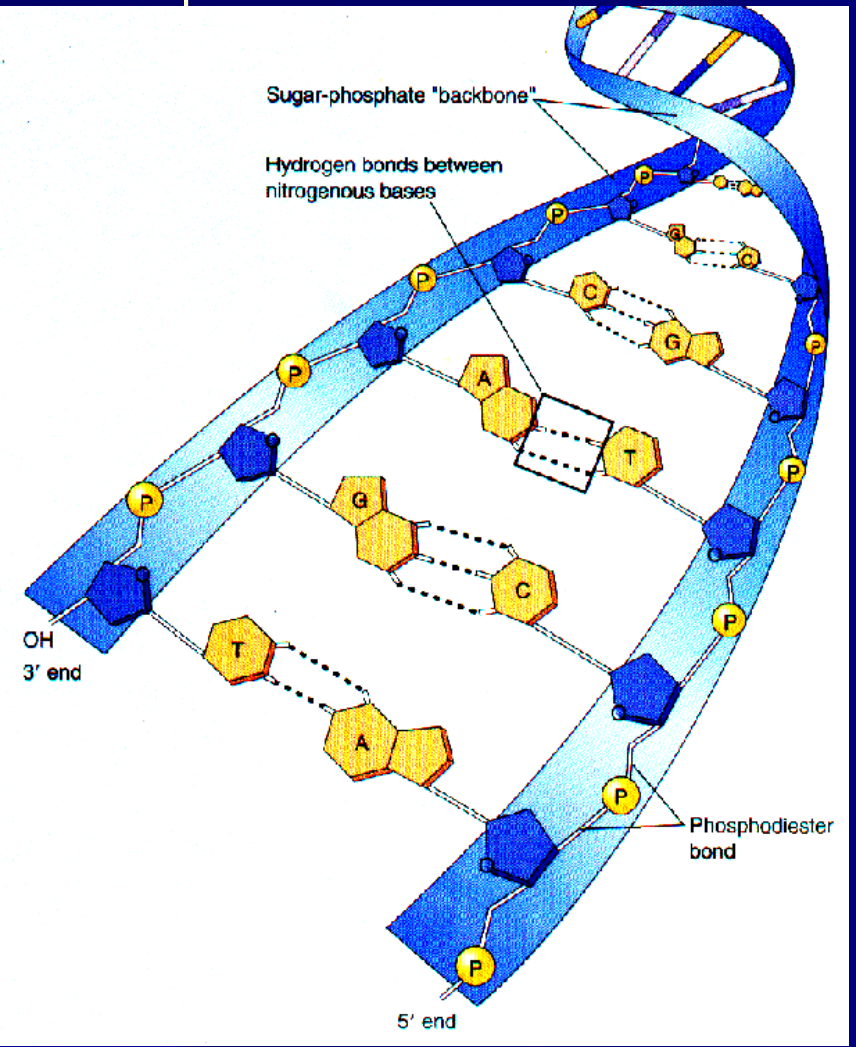


3-D Structure of DNA

- The nucleotides are connected together into two long chains hooked together in the middle to create a ladder.



3-D Structure of DNA

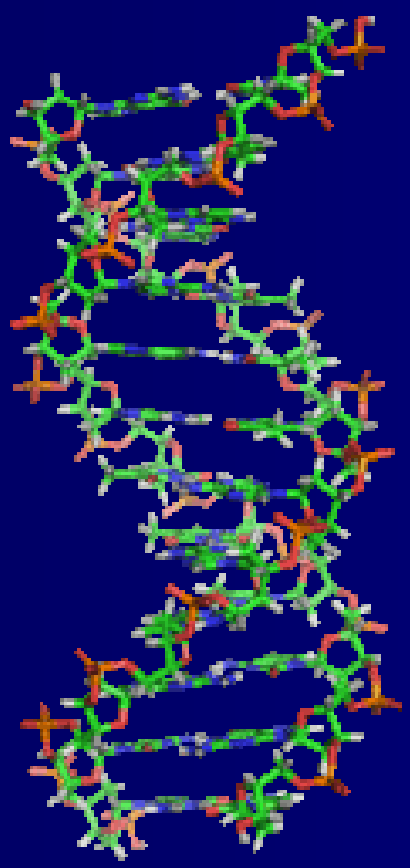


- Double Stranded

(DNA when untwisted looks like a ladder).

  - Sides of the ladder: alternating sugar and phosphate units. Sometimes referred to as the sugar-phosphate backbone.
  - Rungs of the ladder: Purine and pyrimidine held together by weak hydrogen bonds.

3-D Structure of DNA



- When twisted, DNA looks like a:

DOUBLE HELIX

Could be described as:

- "Spiral Staircase"
- "Twisted Ladder"