

# DNA



# Lesson objectives

- To establish a connection between the structure of DNA and its function.

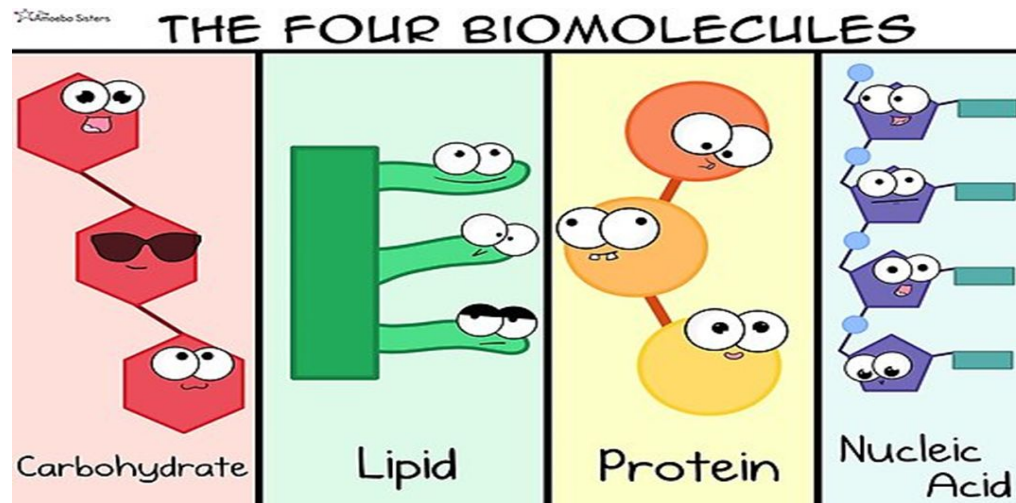


# How organisms differ if their DNA include same components?



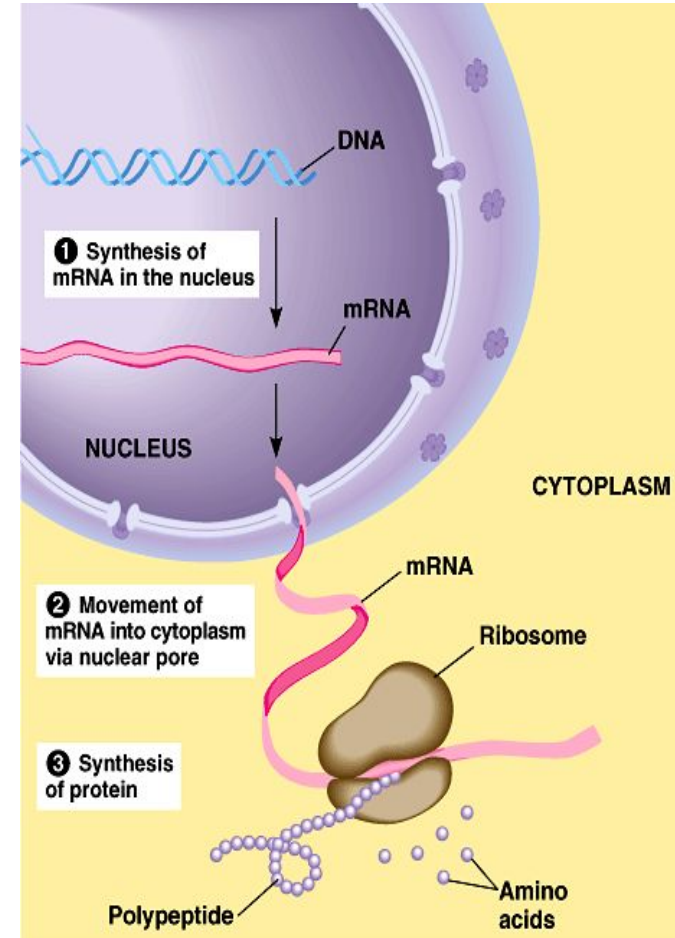
# Let's recall !!!

- Organic compounds in living things:
- 1) Carbohydrates
- 2) Lipids
- 3) Proteins
- 4) Nucleic acids



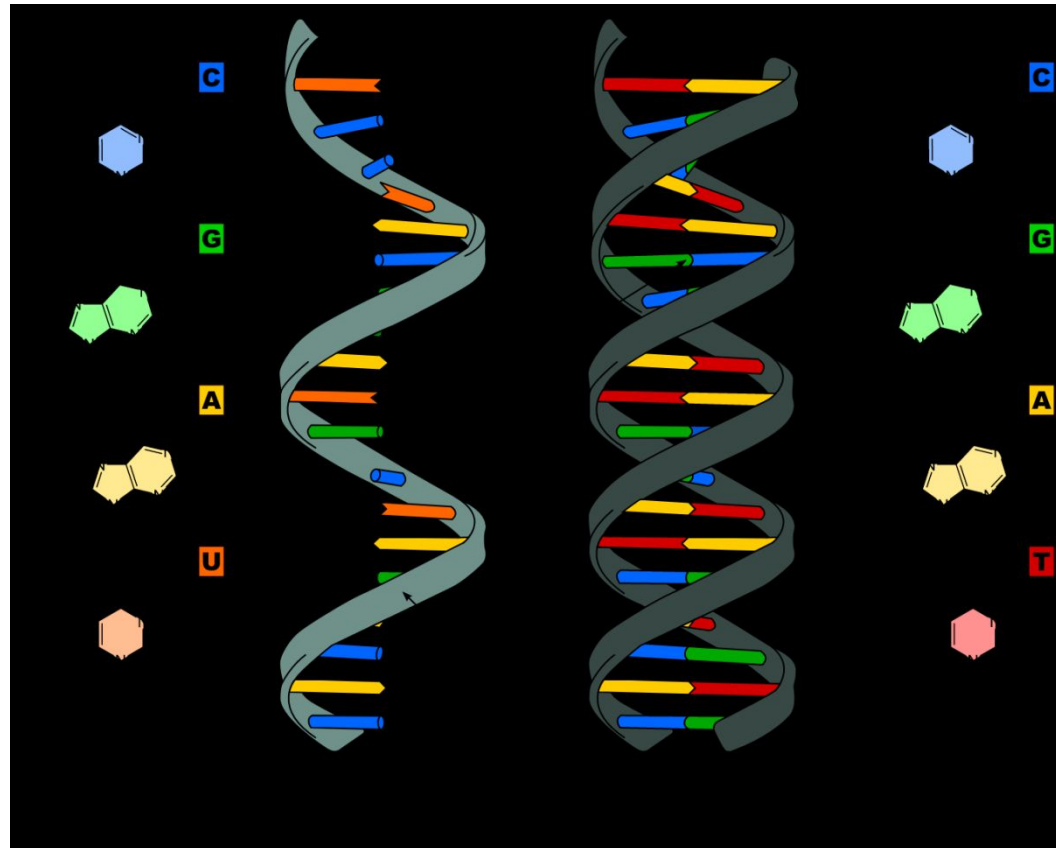
# Nucleic acids

- Nucleic acids are master molecules mainly found in nucleus.
- They are polymers



# Types of nucleic acids

1. Deoxyribonucleic acid (DNA)
2. Ribonucleic acid (RNA)



# DNA

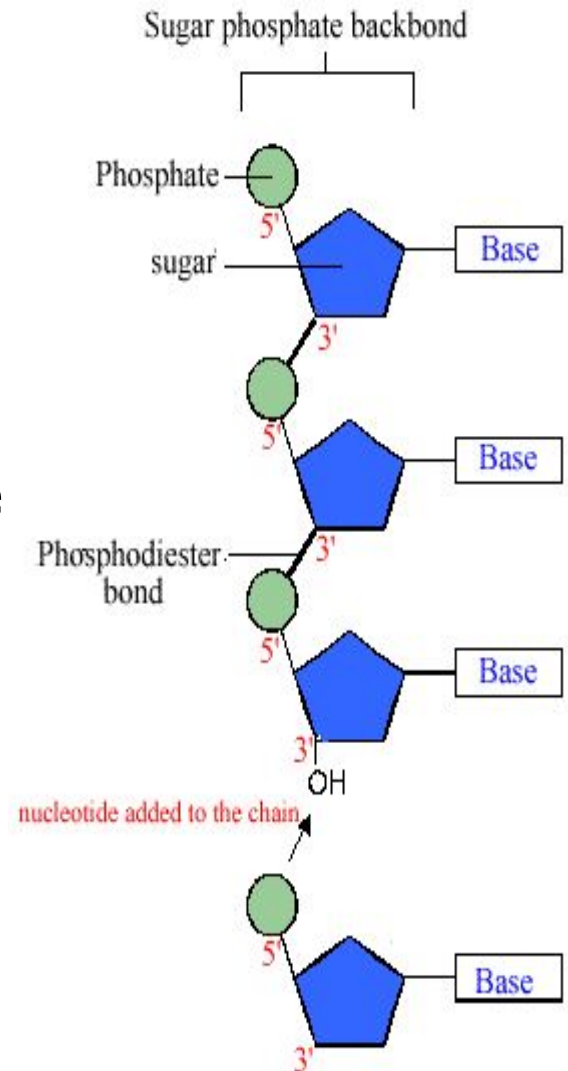
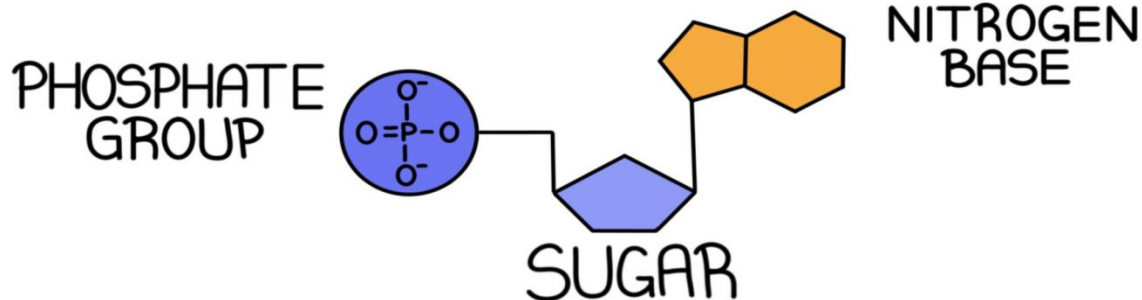
- DNA is a type of nucleic acid that stores genetic information and transmits it to the next generation.



# DNA structure

- Polymer.
- Monomers are nucleotides.
- Nucleotide structure:
  1. 5 C-sugar called deoxyribose
  2. phosphate group ( $H_3PO_4$ )
  3. nitrogenous base

## NUCLEOTIDE





# Nitrogenous base

- There are four types of nitrogenous base:

1. Adenine (A)

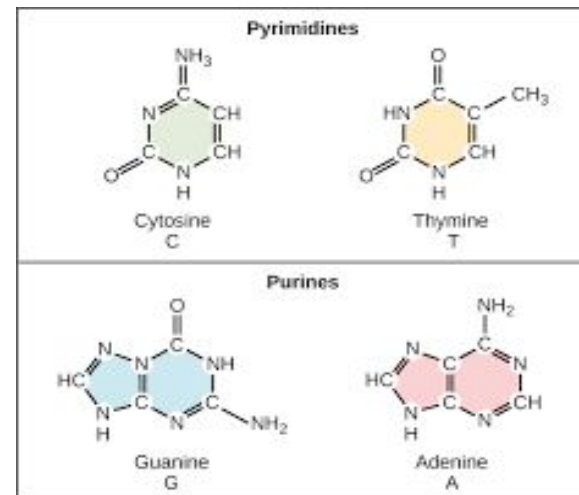
2. Guanine (G)

3. Cytosine (C)

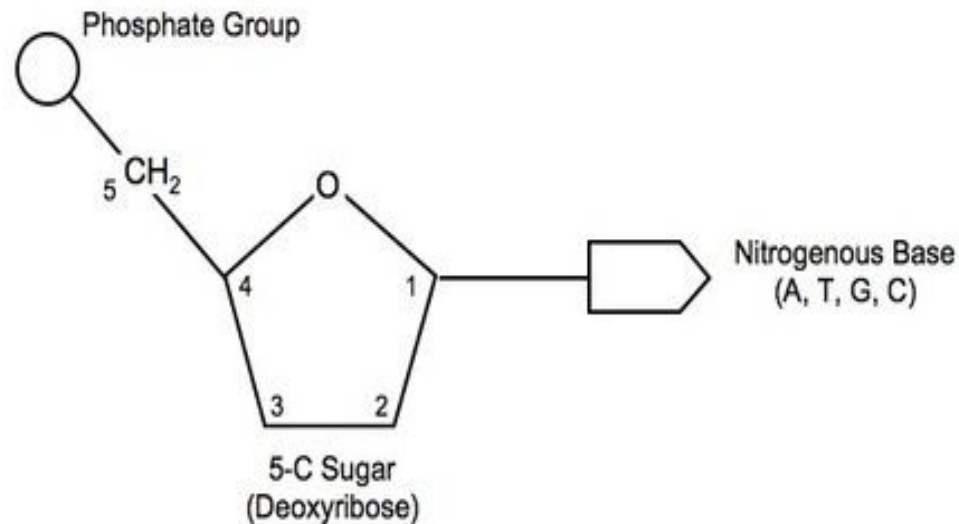
4. Thymine (T)

Purines (double ring)

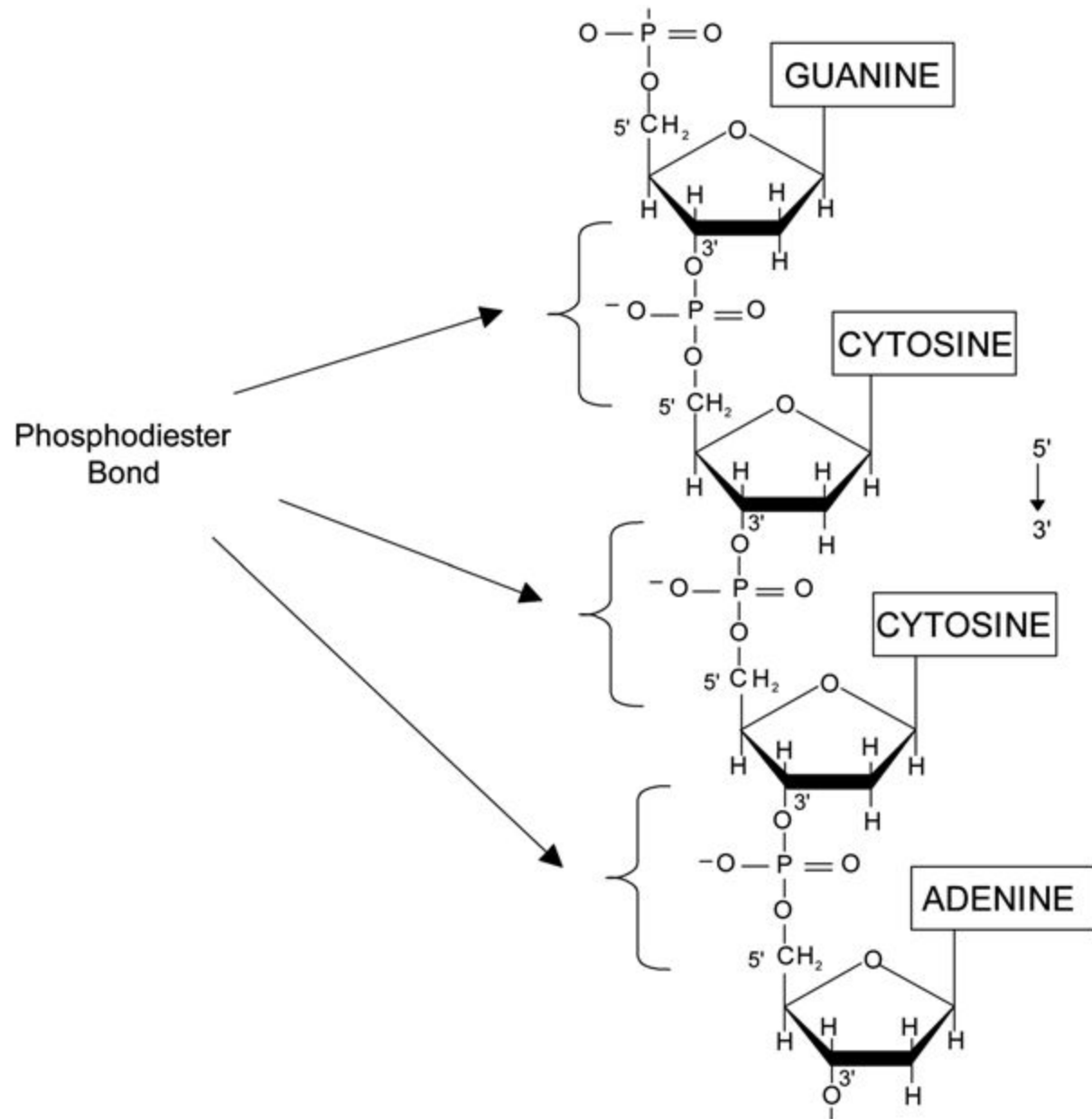
Pyrimidines (single ring)



- Pentose sugar is attached with its 5' end to phosphate group.
- Pentose sugar is attached with its 1' end to nitrogenous base.



- With its 3' C sugar links to phosphate group of next nucleotide via phosphodiester bond.
- So phosphodiester bond forms polynucleotide chain.



- The sequence of nucleotides in polynucleotide chain determines genetic information of the organism.
- It is the primary structure of DNA

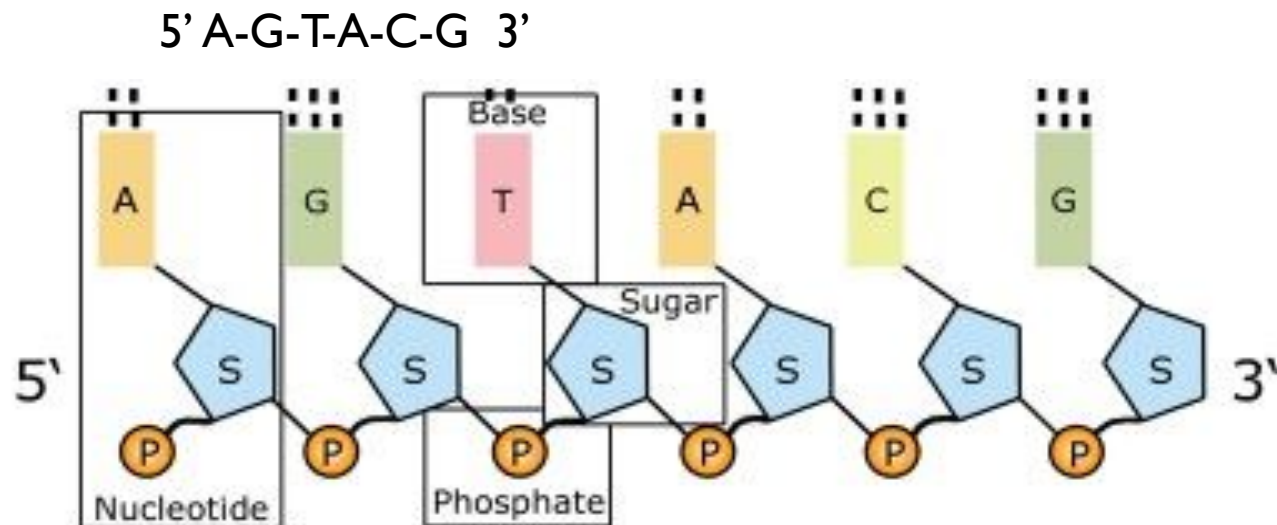


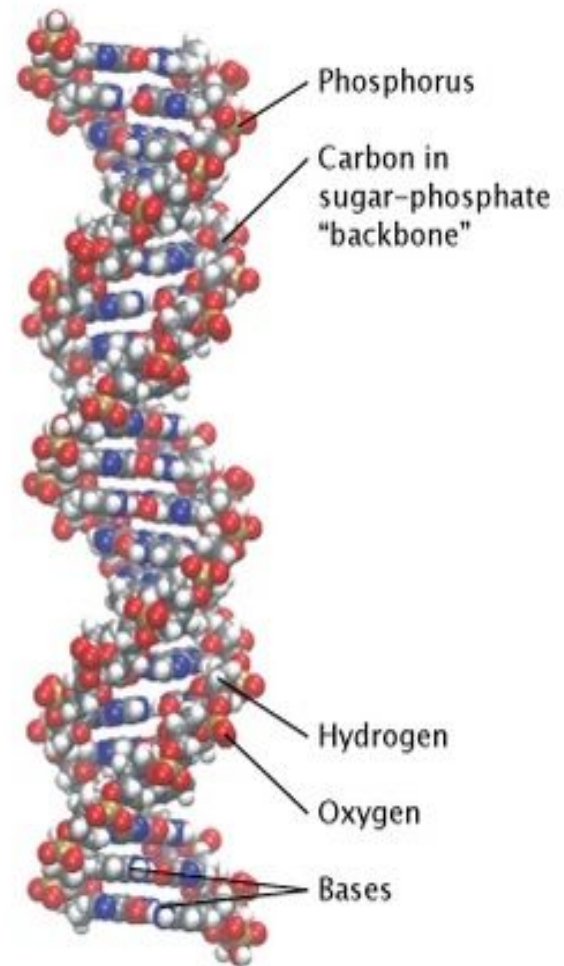
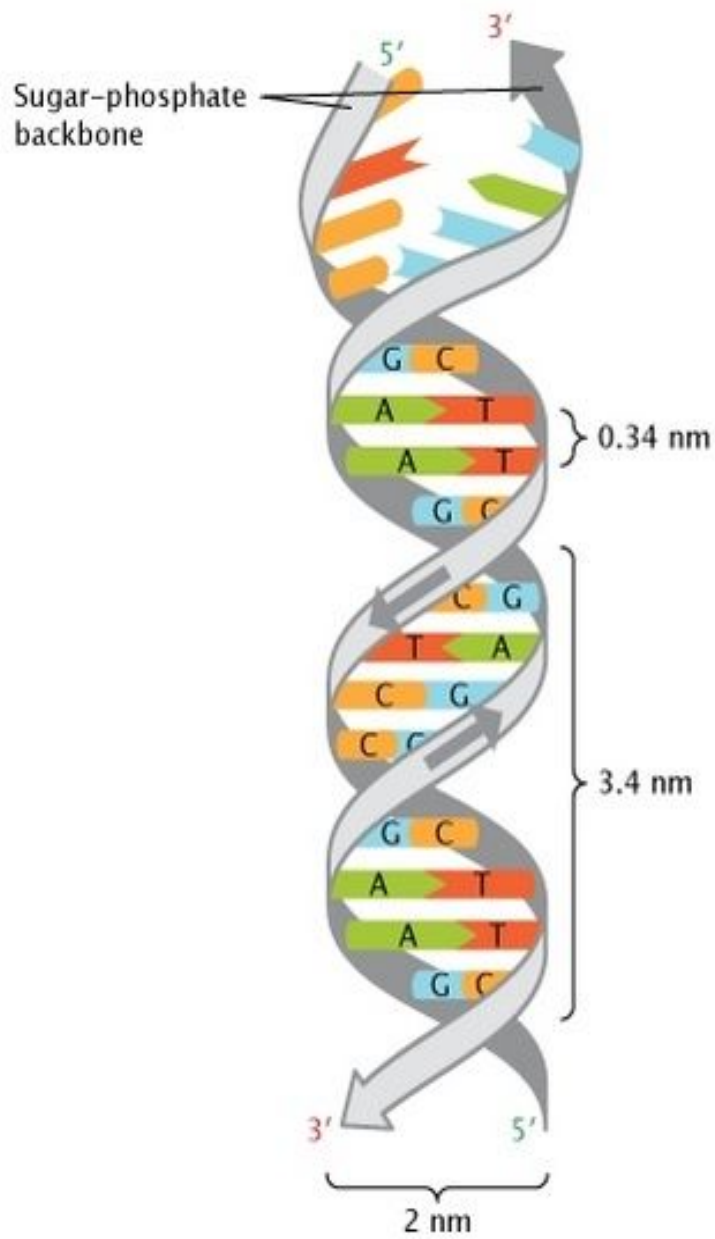
Image adapted from: National Human Genome Research Institute.


- Two chains of nucleotides make double helix structure.
- These two chains are antiparallel to each other. One strand is 5'-3' , second strand is 3'-5'



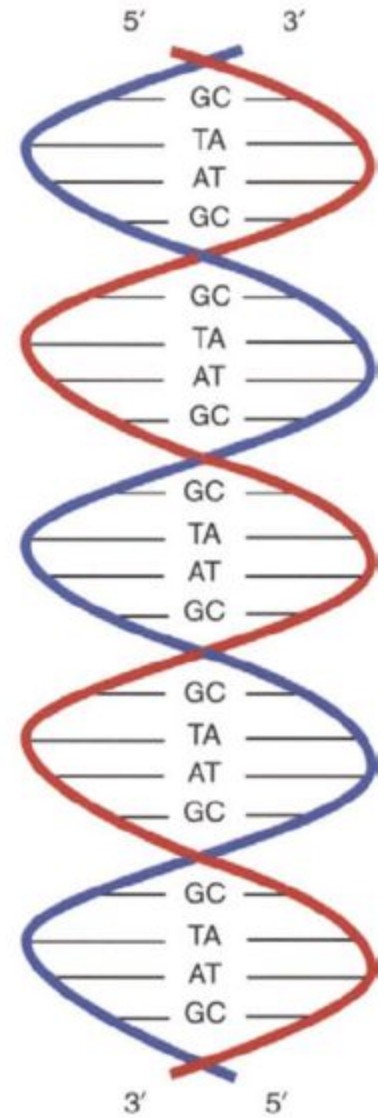
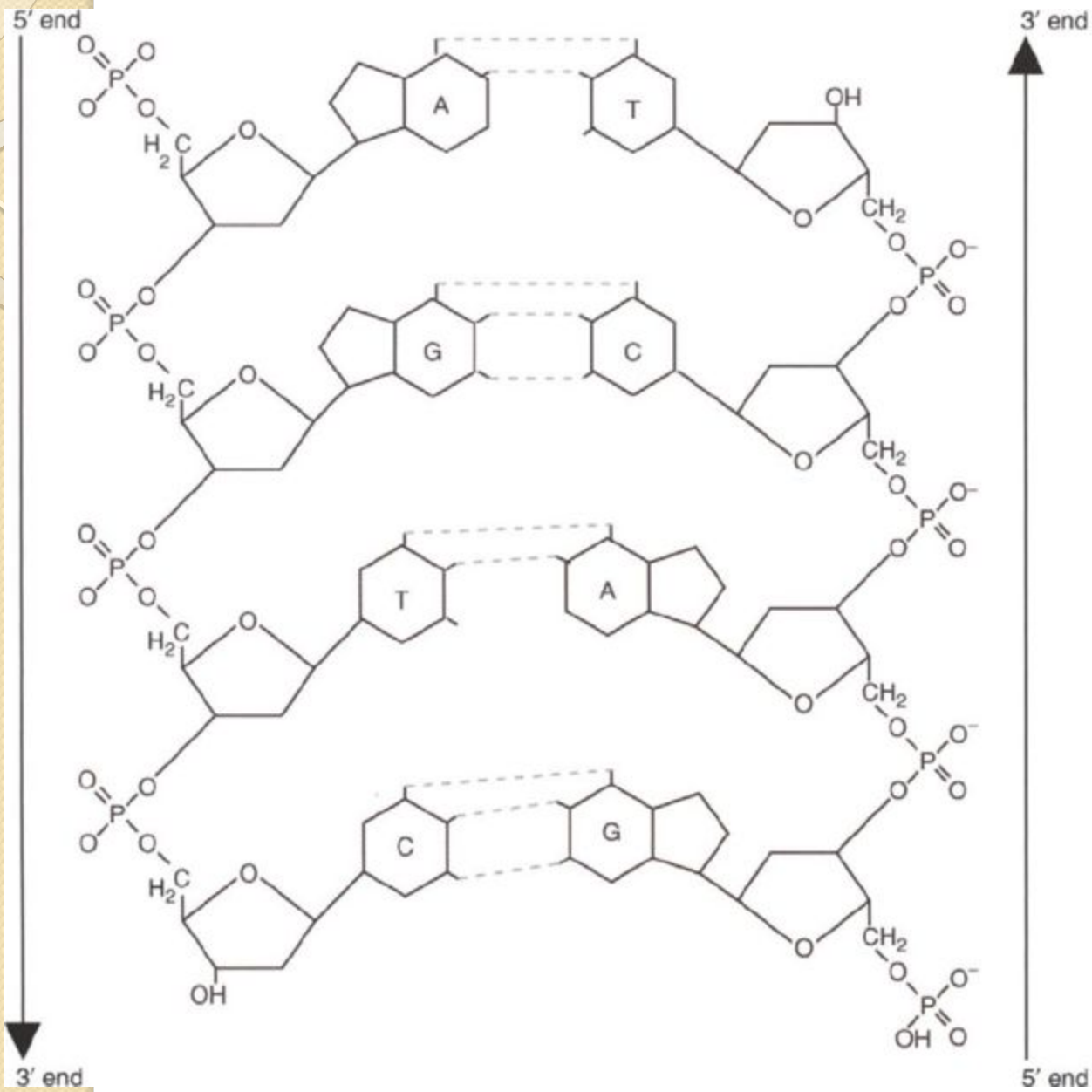
# Double helix structure is revealed in 1953 by James Watson and Francis Crick.





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- Phosphate group with sugar make up the DNA's backbone
  - Nitrogenous bases of antiparallel chains join via hydrogen bonds.
  - **A** pairs with **T** by **two** hydrogen bonds.
  - **C** pairs with **G** by **three** hydrogen bonds.
  - So hydrogen bonds join antiparallel chains.
  - Nucleotides in parallel chains are complementary paired to each other A is complementary to T, G is complementary to C.
  - So if we know one strand sequence we know sequence of the second one





# For example:

- 5' AAGCCCTTAT 3'
- 3' TTCGGGAATA 5'
  
- C in DNA is equal to 140. Total number of nucleotides is equal to 1000 Find:
  - a) G=?
  - b) A=?
  - c) T=?

Solution: number of C=G so  $G=140$

$$A+T+C+G=1000$$

$$(C+G)=140+140=280$$

$$A+T=1000-280=720 \text{ since } A=T$$

$$A=720:2=360$$

$$T=360$$

# Problems

1) Find the sequence of the second strand:

- 5' CGGTCATTT 3'

2) Amount of A is equal to 220 in DNA. C = 125 . Find:

- T = ?
- G = ?
- Total nucleotides in DNA = ?
- How many hydrogen bonds are in DNA?

# Homework

- Read p.28-29
- Literacy questions on p 29
- Research time (fill in the table)
- New words

