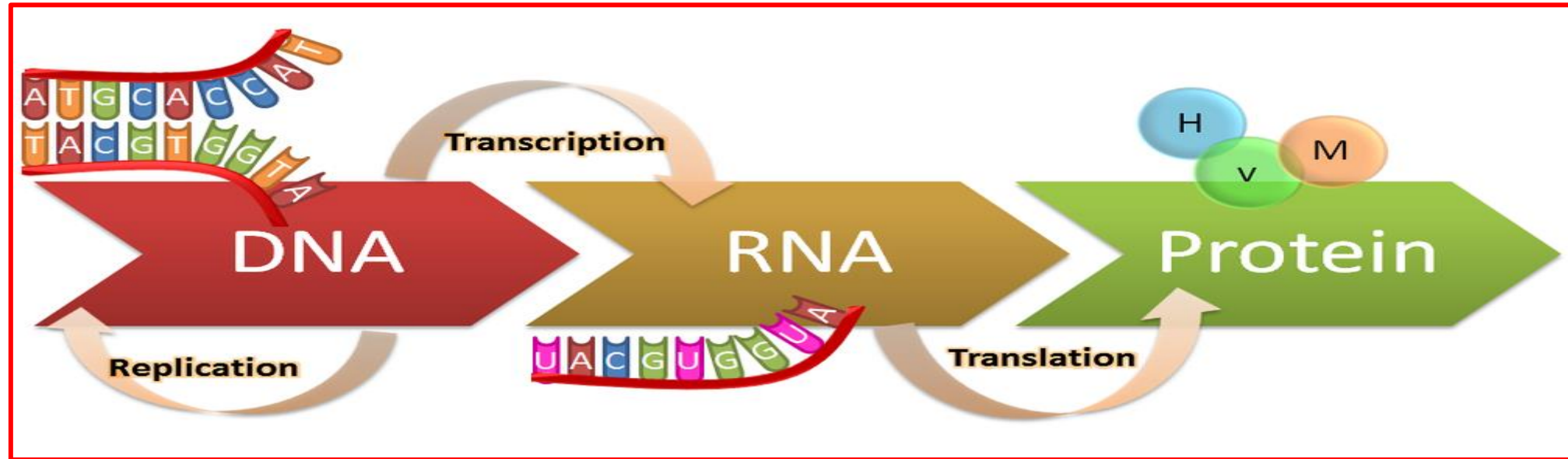


HELIX EXPERIMENT CELL ATOM
LABORATORY HEALTH BIO TECHNOLOGY DESIGN
SCIENCE DNA CHROMOSOME
DOCTOR
MEDICAL
SAMPLE ANALYSIS
MOLECULAR HUMAN
SCIENTIFIC
BIOCHEMISTRY
GENE EVOLUTION TUBE RESEARCH MEDICINE
TEST
CHEMICAL MOLECULE CHEMISTRY MODEL
LIFE BIOTECHNOLOGY
GENETICS
MICROBIOLOGY
STRUCTURE EQUIPMENT
PHARMACEUTICAL

The central dogma of Molecular Biology



A portion of DNA, called a **gene** , is transcribed into RNA.

RNA is translated into proteins.

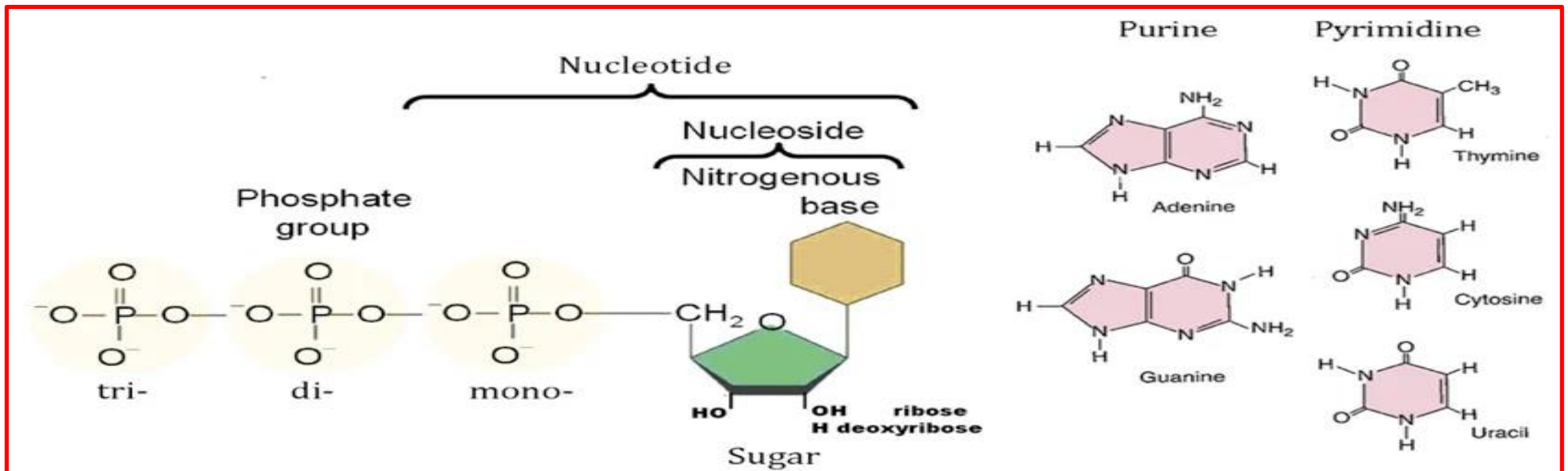
Human genome contains about 35,000 genes

Nucleic acids

- Required for the storage and expression of genetic information.
- Two types:
- **DNA** (Deoxyribonucleic acid).
- **RNA** (Ribonucleic acid).
- Building blocks of nucleic acids are **nuclueoside** triphosphates
- (nucleotides).

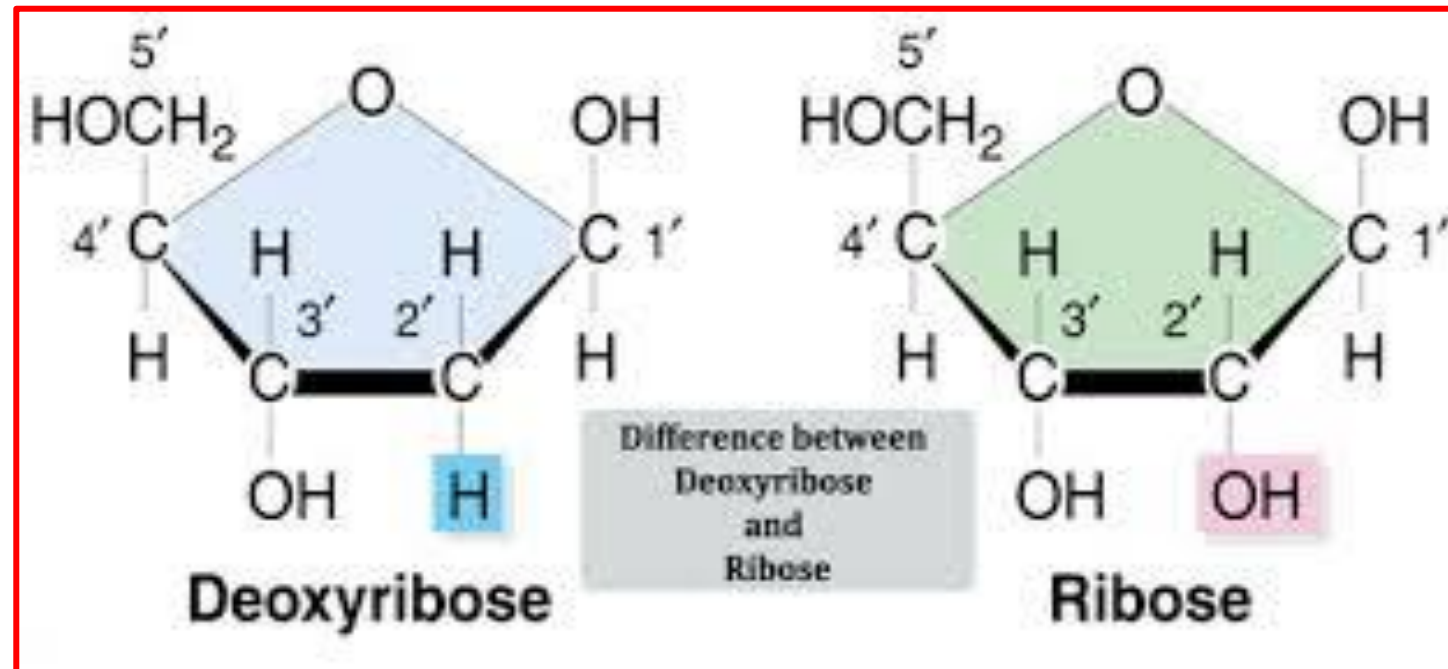
Nucleotides

- Nucleotides are composed of:
 - 1. Nitrogenous base:
 - **Purines:** Adenine (A) and Guanine (G)
 - **Pyrimidines:** Cytosine (C), Thymine (T) and Uracil (U)

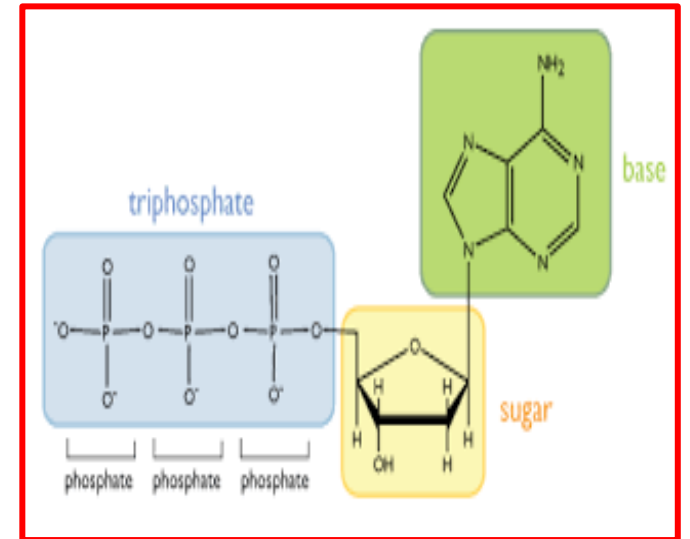
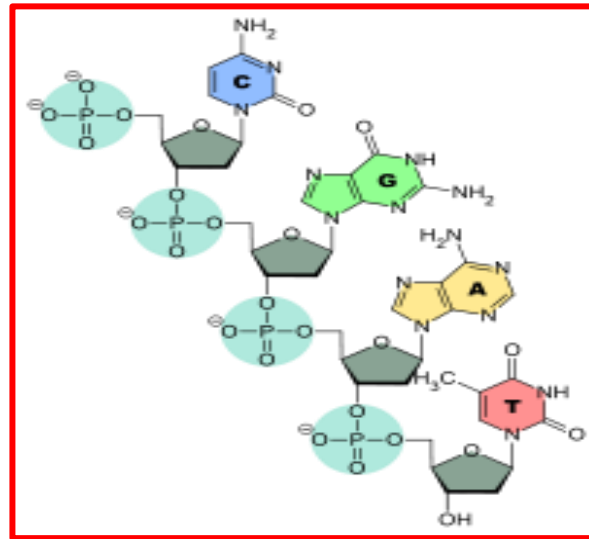
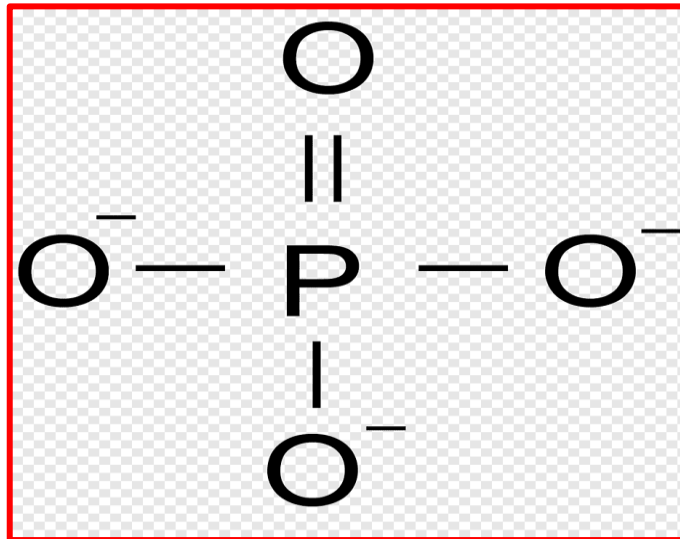


2. Sugar

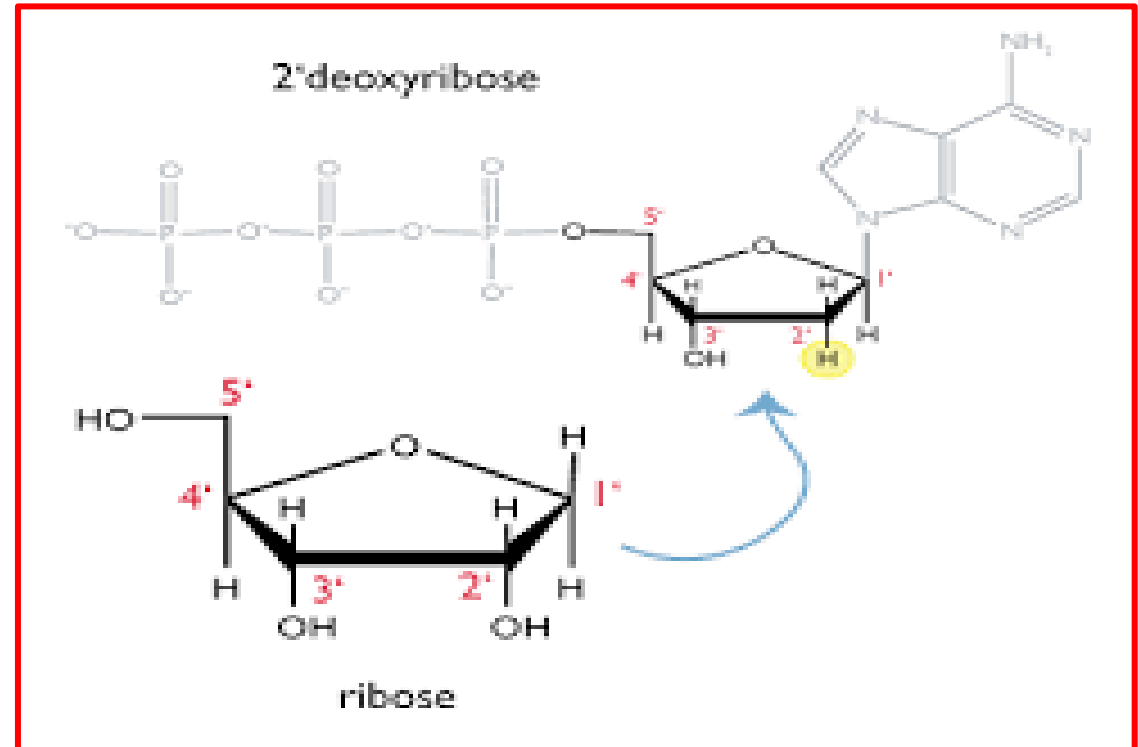
- pentose with 5 carbon ring:
- a) Ribose (with -OH at C2).
- b) Deoxyribose.



Phosphate groups

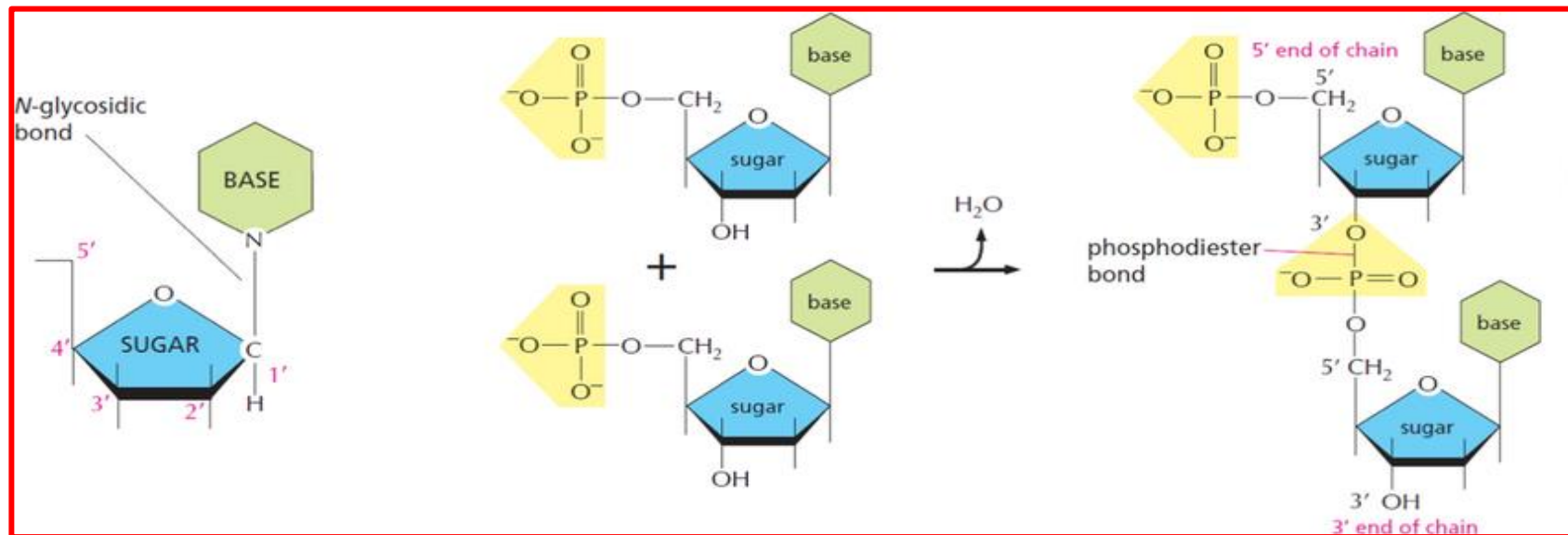


- The sugar carbon numbers are primed (1' 2' 3' etc.), while the
- nitrogenous base atoms are unprimed.
- The nitrogenous base is bonded
- to C1' of sugar.
- The PO₄ group is bonded to
- C3' or C5' of sugar.



Chemical structure of DNA & RNA

- The PO₄ bridges the 3' and 5' positions of ribose sugar.
- • The PO₄ and sugar bonding is the backbone of DNA structure.
- • The linkage between the nucleotides
- is called **phosphodiester bond**.

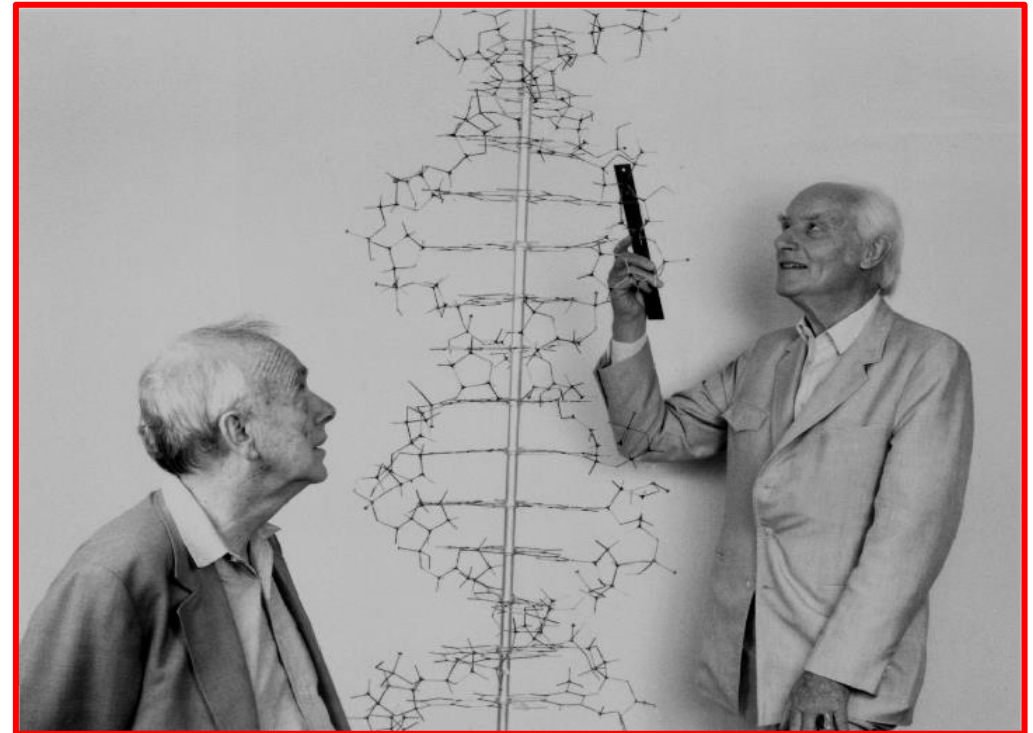


Function of nucleotides

- Polymers of nucleotides (as DNA or RNA) store and transfer genetic information.
- Free nucleotides and their derivatives perform various metabolic functions not related to genetic information.
- Other nucleotides: FAD, NAD, CoA.

The double helix DNA

- The structure of DNA was first determined by James Watson
- and Francis Crick in 1953.
- Commonly known as Watson-Crick structure



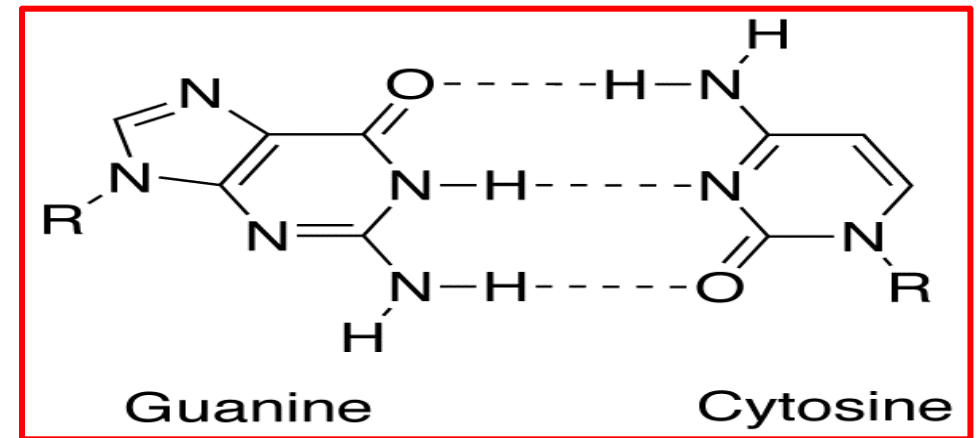
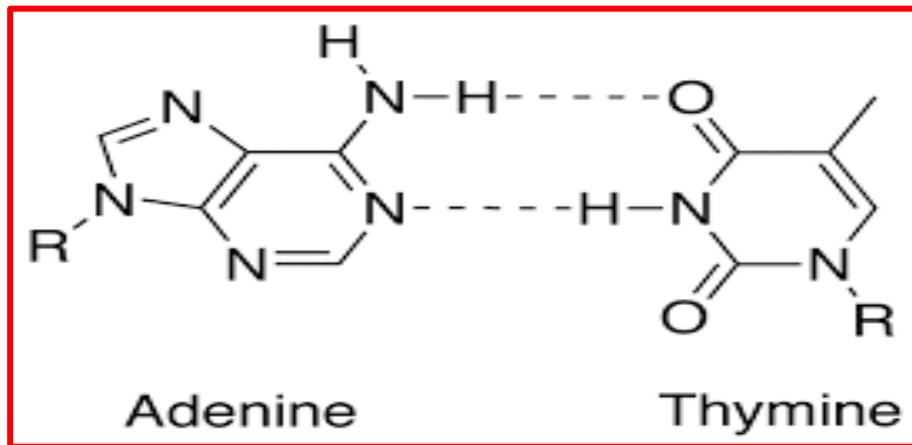
Features of Watson-Crick DNA

- **Structure**
- Two polynucleotide chains wind around a common axis to
- form a double helix.
- The two strands are anti-parallel (run in opposite direction).
- Each strand is a right-handed helix.
- The nitrogenous bases are in the center of the double helix
- and the sugar-phosphate chains are on the sides.

- The surface of the double helix contains 2 grooves: the major
- and minor grooves.
- Each base is hydrogen bonded to a base in the opposite strand
- to form a base pair (A-T and G-C), known as complementary
- base pairing.
- The helix has 10 base pairs (bp) per turn

Watson-Crick base pairs

- Adenine (A) = Thymine (T)
- Guanine (G) = Cytosine (C)
- In RNA, Thymine is replaced by Uracil (U)



Types of DNA structure

	B form DNA	A form DNA	Z form DNA
Helical sense	Right handed	Right handed	Left handed
Major groove	Present	Present	Absent
bp/helical tern	10.5	11	12
Glycosyl bond conformation	Anti	Anti	Anti (for pyrimidines) and syn (for Purines)
Helix rise/bp	3.4Å	2.6Å	3.7Å
Base tilt	6°	20°	7°
Structure	