

Bioinformatics

Lecture 1: Basic Structure of DNA

Course name: Bioinformatics and Computer Application
Course Code: MSCCONBC401

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Composition

DNA (deoxyribonucleic acid):
macromolecule composed by
a repetition of:

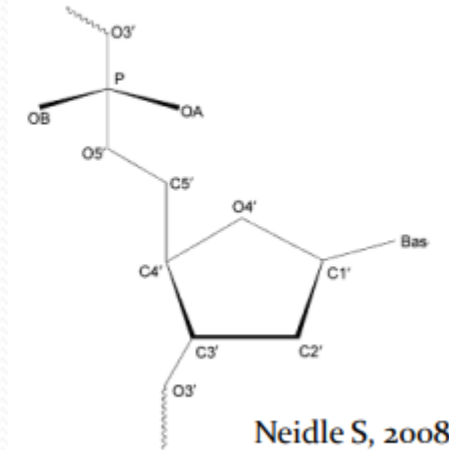
- Backbone

- Phosphate group
- Sugar: 2'-deoxyribose

} phosphodiester bond
glycosidic bond

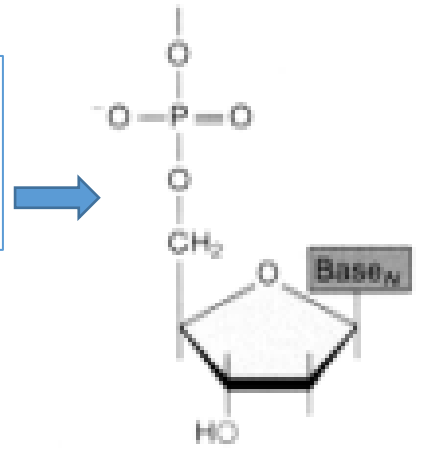
- Nitrogenous base

Structure of DNA



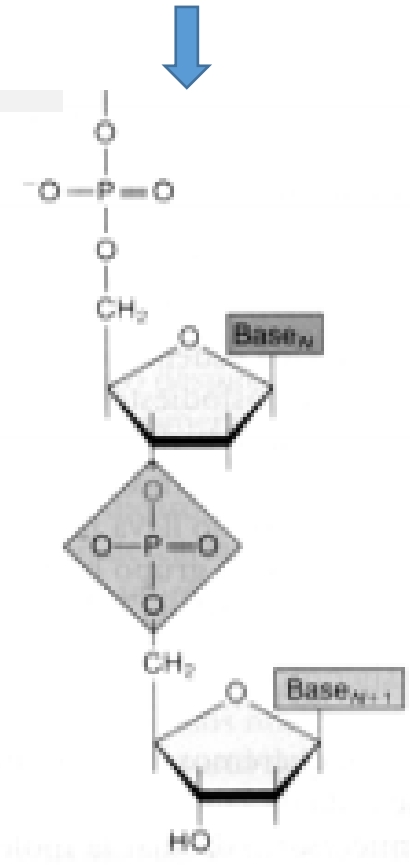
Deoxyribose with O missing at 2' carbon

Single phosphate attached to 5' carbon of deoxyribose



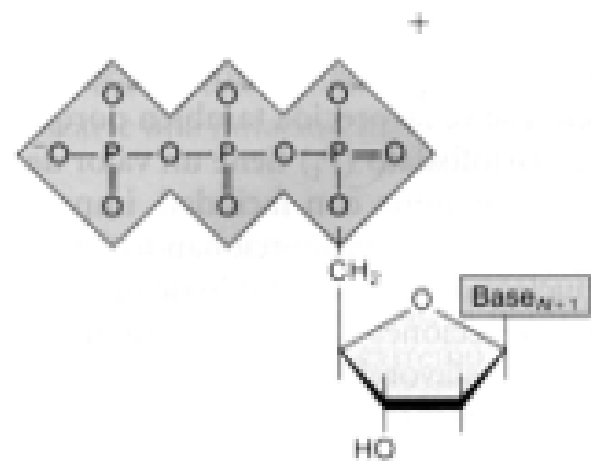
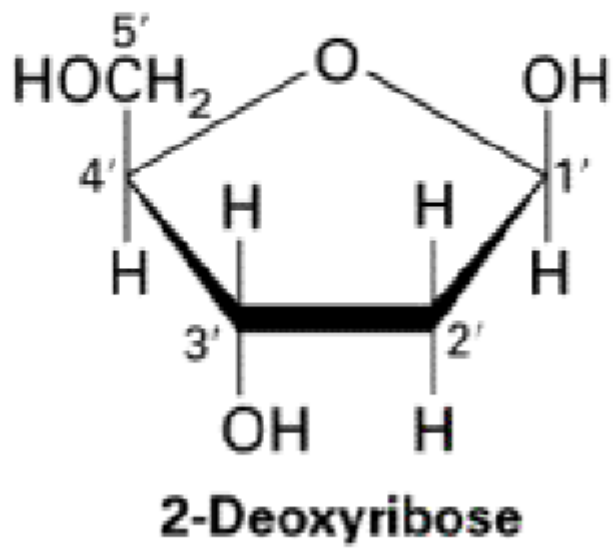
Polynucleotide with N residues

Phosphodiester bond between two nucleotide



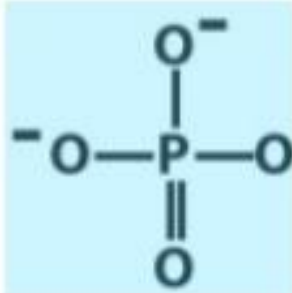
3' O of previous nucleotide joined to 5' C of the next through phosphate

• β-D-2-deoxyribose

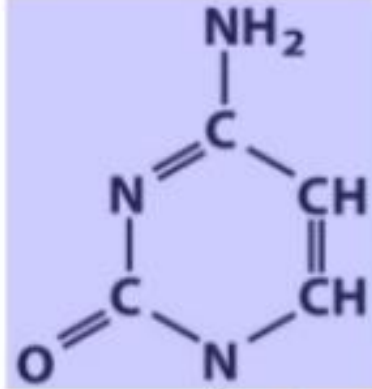


Triphosphate deoxynucleoside

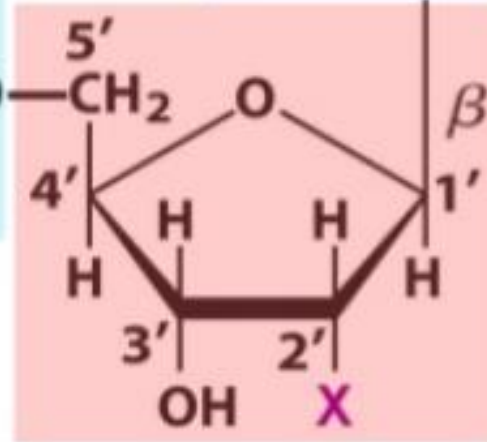
Phosphate



Base



Sugar



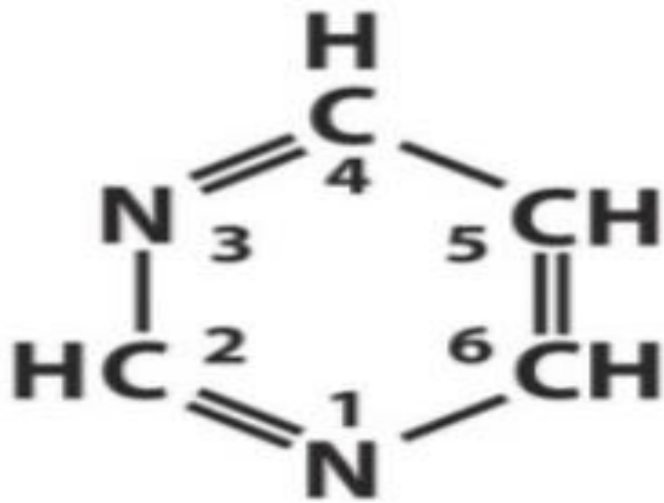
X=H: DNA
X=OH: RNA

Nucleoside

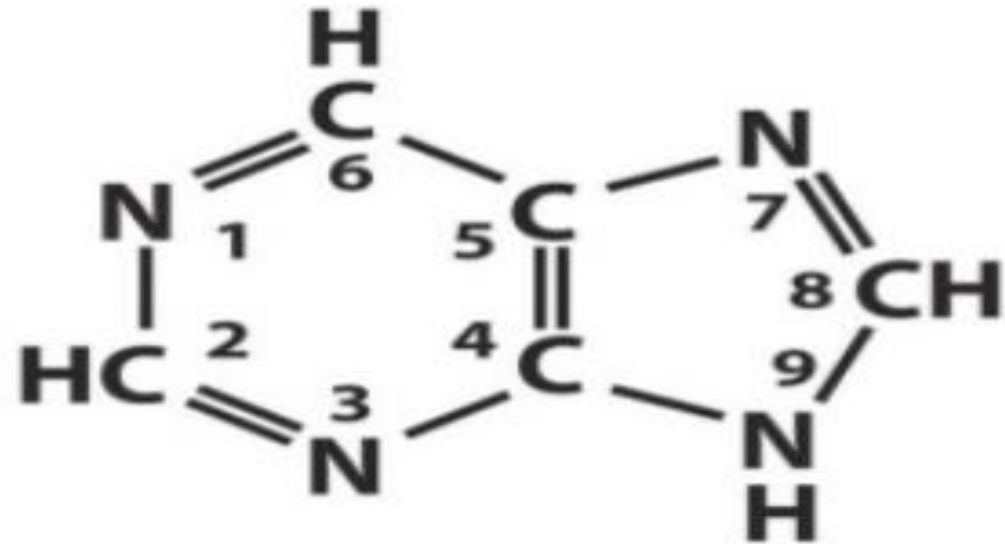
Nucleotide

Structure of one Nucleotide

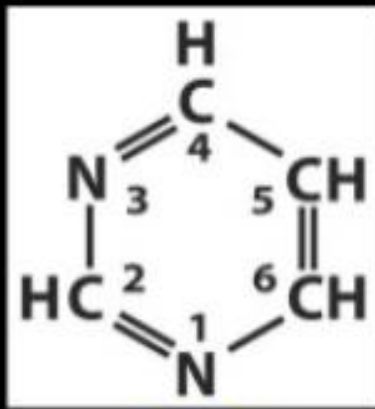
Basic structure of pyrimidine and purine



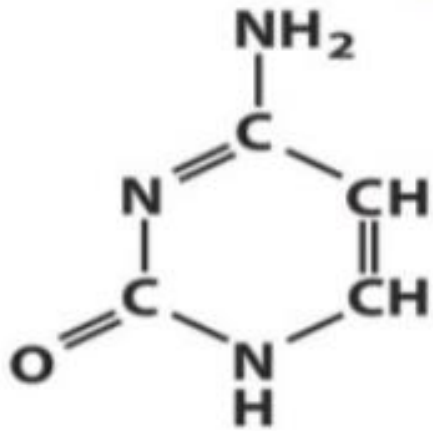
Pyrimidine



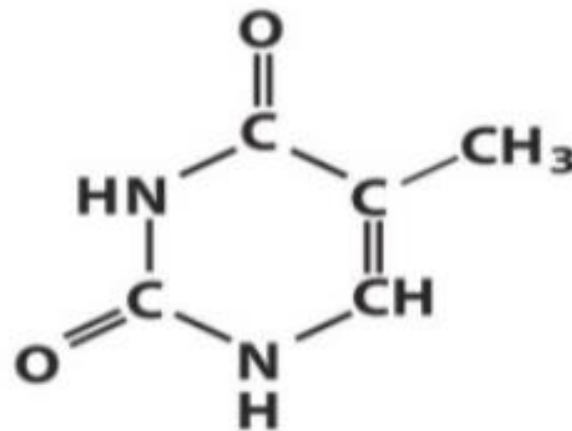
Purine



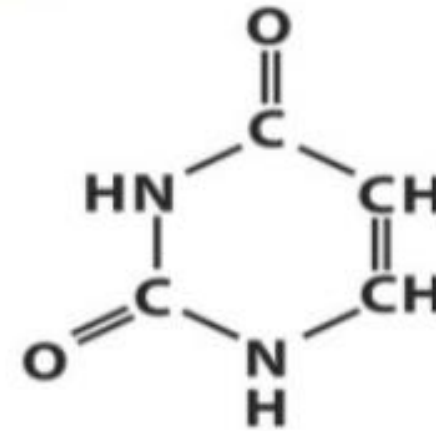
Pyrimidines



Cytosine

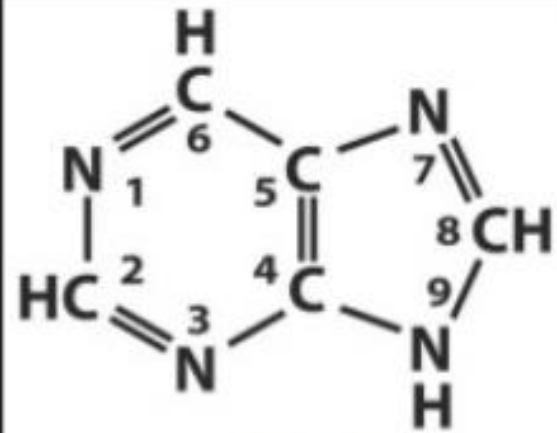


**Thymine
(DNA)**

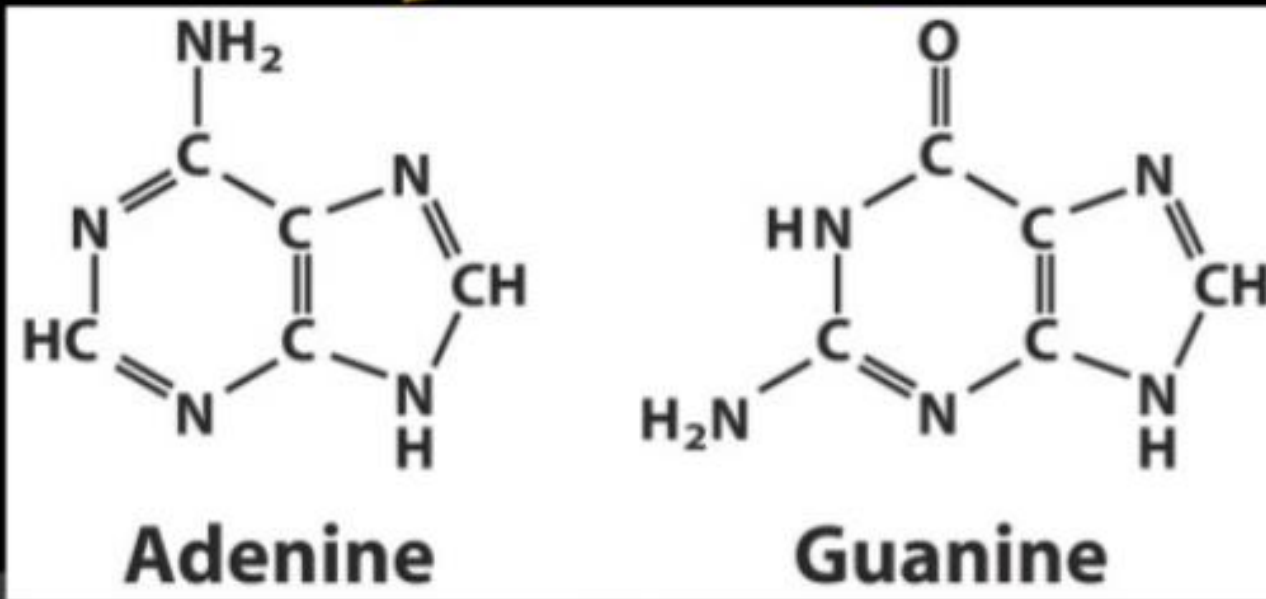


**Uracil
(RNA)**

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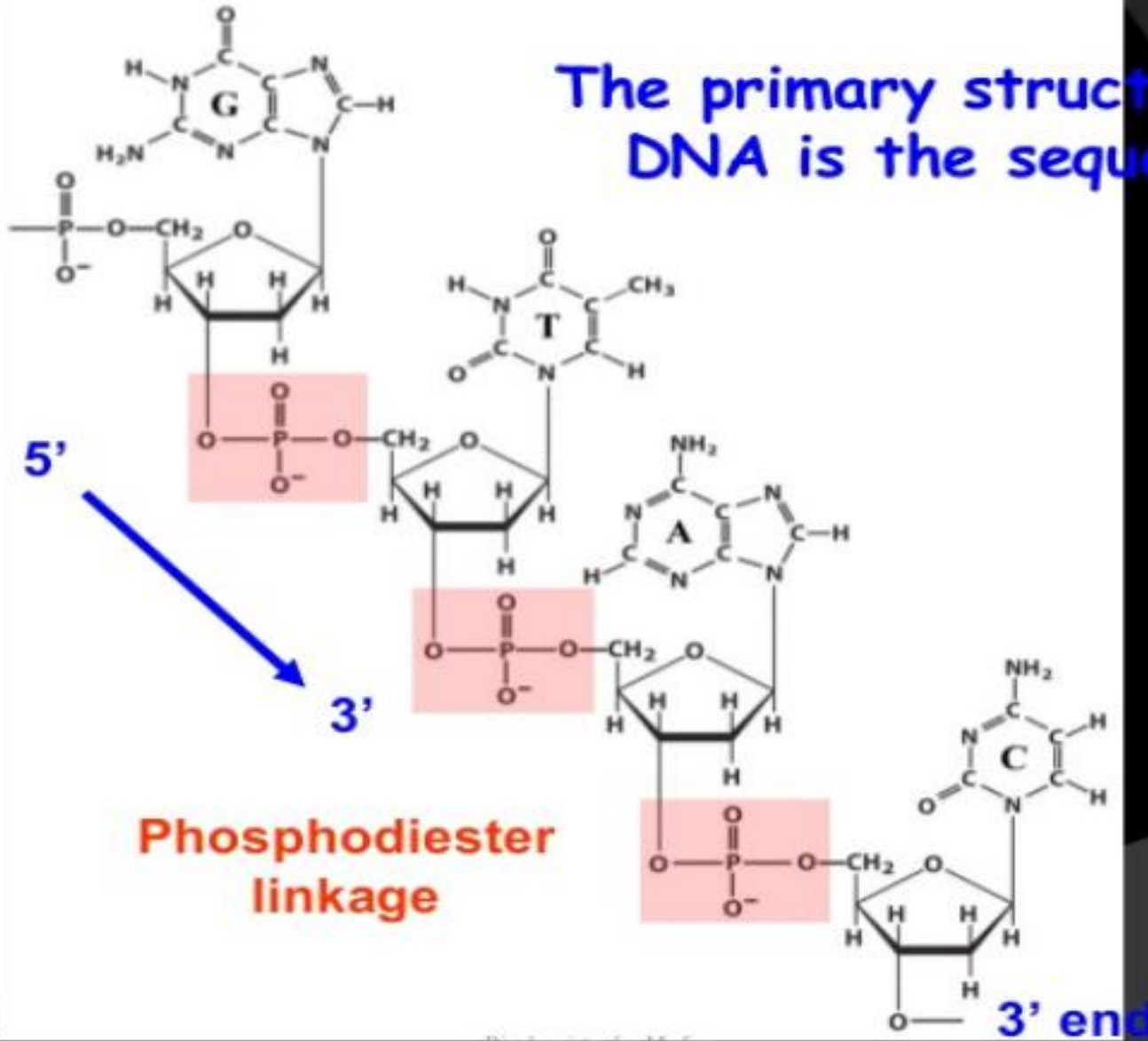
Purines



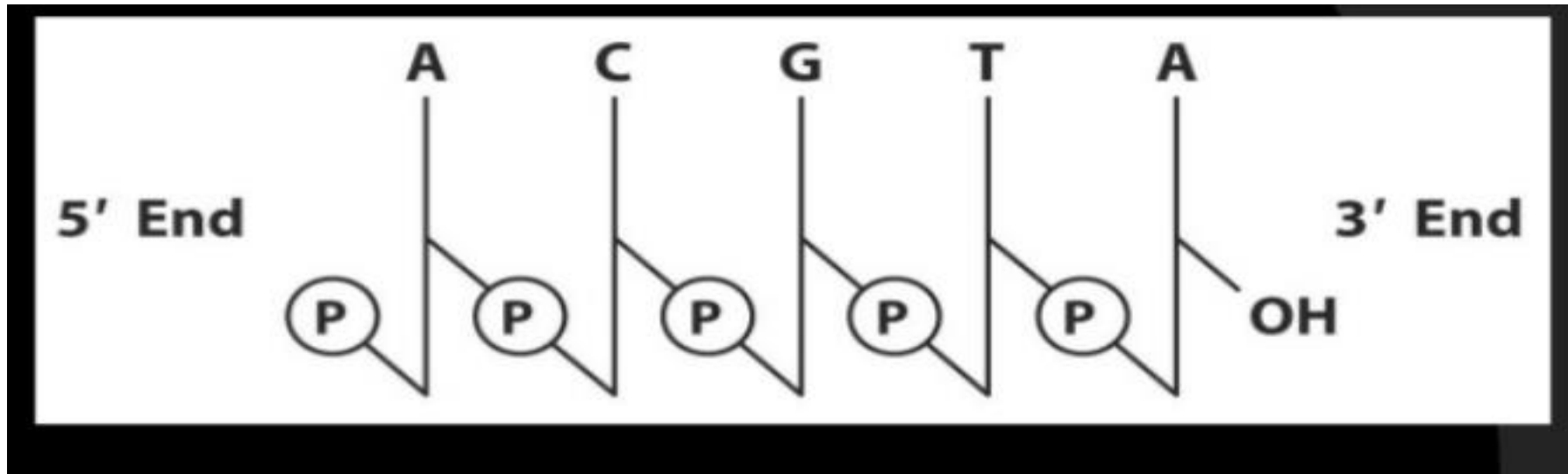
Biochemistry for Medicine

The primary structure of DNA is the sequence

5' end

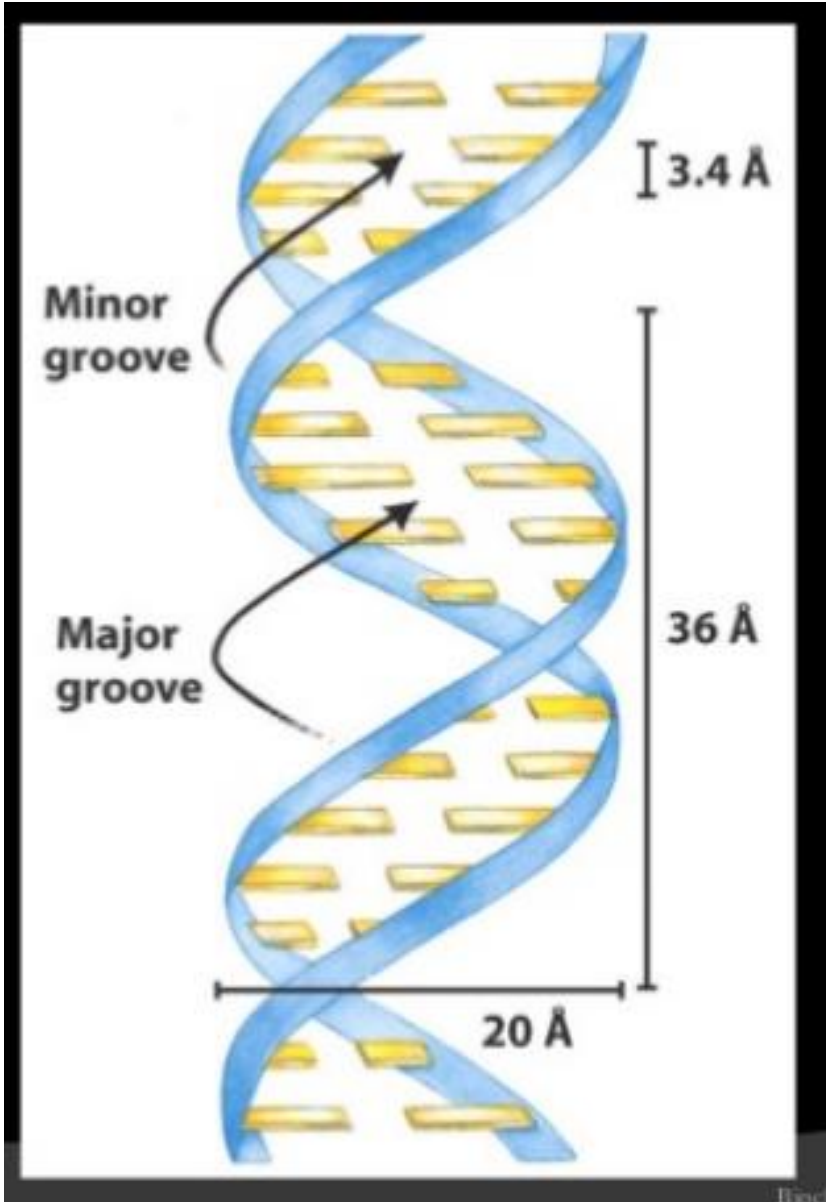


Phosphodiester linkage



DNA sequence always grows from 5' to 3' end and shorthand notation of the above sequence is ACGTA

Hydrated B DNA



- ✓ Right handed helix
- ✓ Base pairs 3.4 \AA apart and is perpendicular to the helix
- ✓ One turn is 36 \AA approximately 10.4 base pairs
- ✓ Minor groove is 12 \AA and major groove is 22 \AA

References

<https://www.slideshare.net/namarta28/dna-structure-and-properties>

Lehninger Principles of Biochemistry 6th Edition

David Nelson & Michael Cox

McMillan

Genes IX

Benjamin Lewin

cbspd