DNA STRUCTURE AND FUNCTION

Learning objective: describe the structure of DNA

Nucleic acids

Biopolymer → Monomers

Natural
Not synthetic

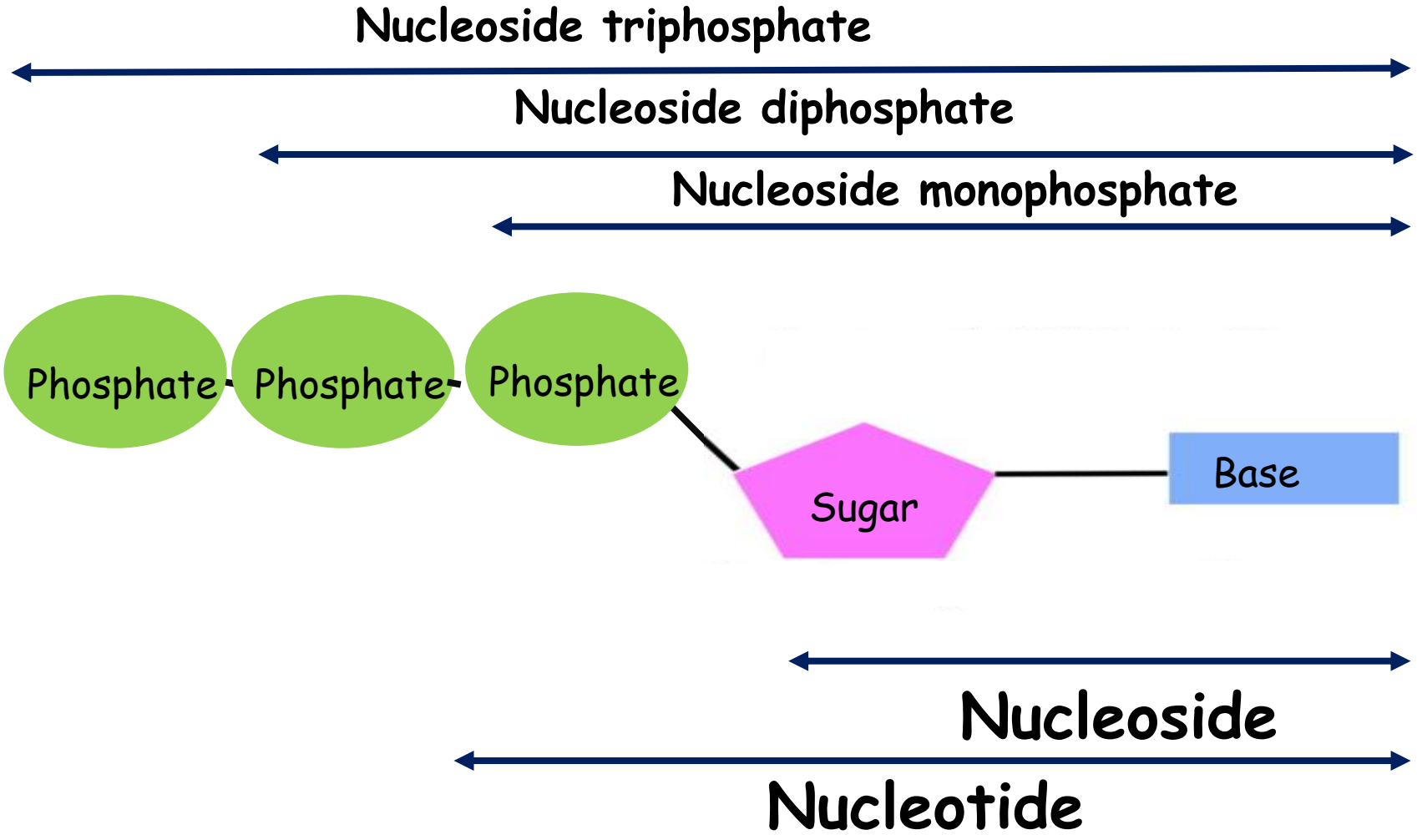
Nucleotides

Hold genetic information

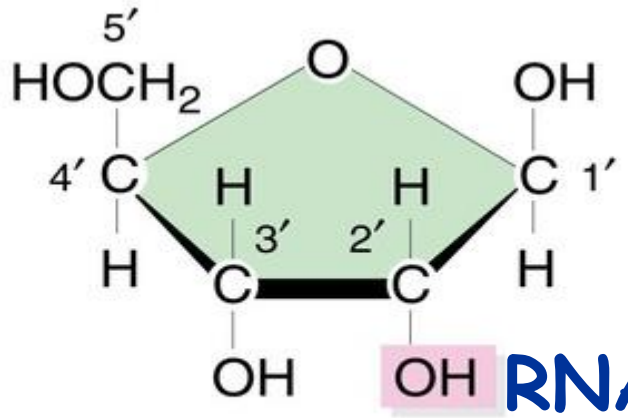
Various functions

DNA
RNA

Nucleotide

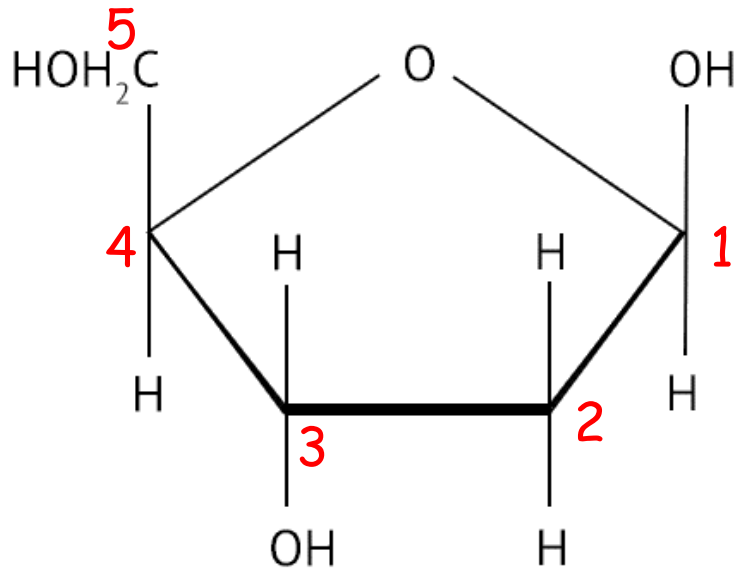

Nucleoside triphosphate
Nucleoside diphosphate
Nucleoside monophosphate
Phosphate
Phosphate
Phosphate
Sugar
Base
Nucleoside
Nucleotide

Sugar



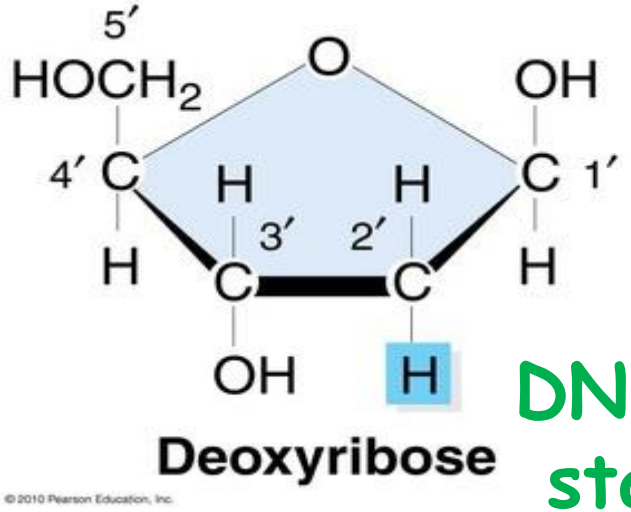
RNA

Ribose



Pentose Sugar

5 carbon



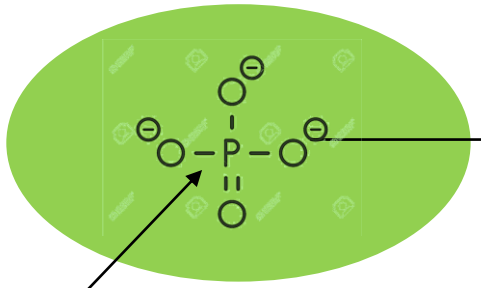
DNA

stable

Deoxyribose

Phosphate

ATP
Adenosine tri .phosphate



Polar
Highly organized
oxygen atoms

Phosphate

Phosphorus

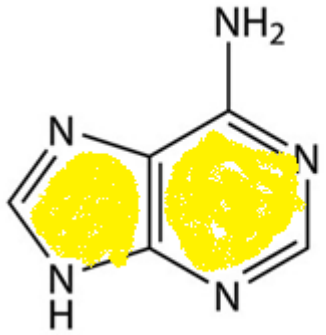
Nitrogenous bases

Molecules that contain nitrogen and act as a base

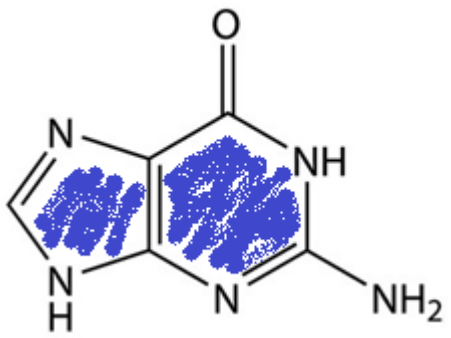
Carbon (C)
Hydrogen (H)
Oxygen (O)
Nitrogen (N)

Bases : donate electrons to other molecules and form new molecules

Purines

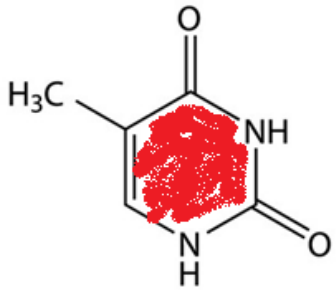


Adenine

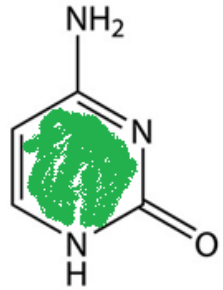


Guanine

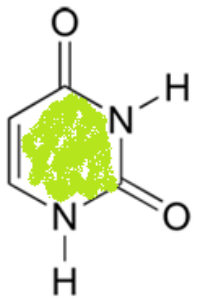
Pyrimidines



Thymine

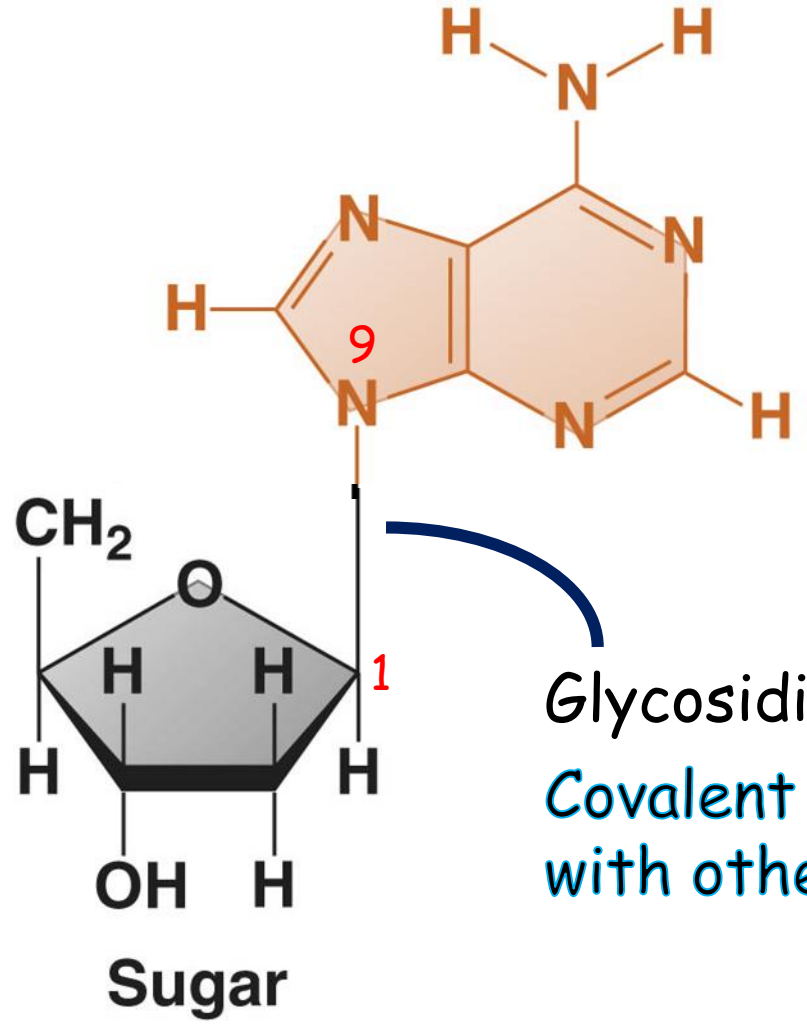


Cytosine



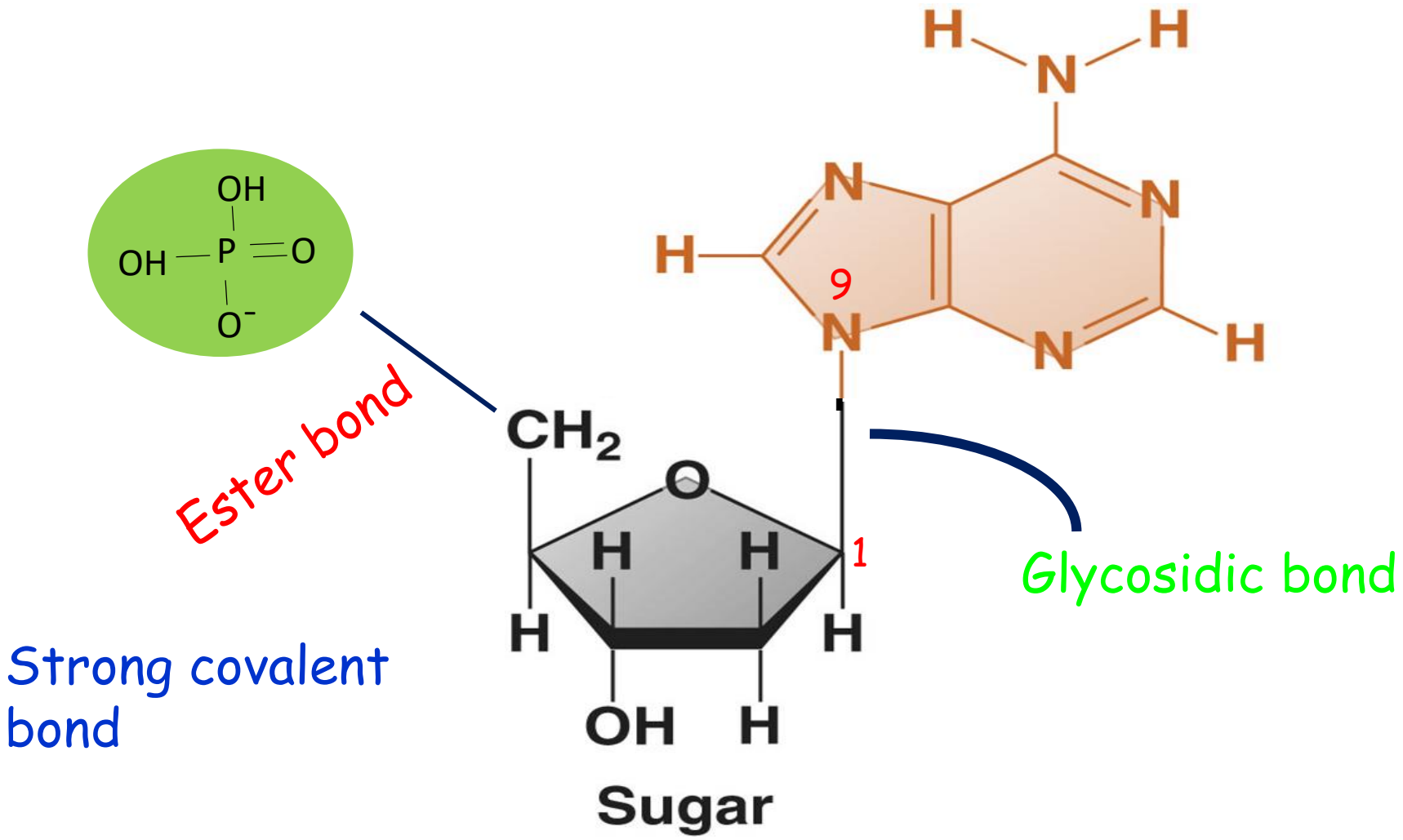
Uracil

How these components are linked?



Glycosidic bond

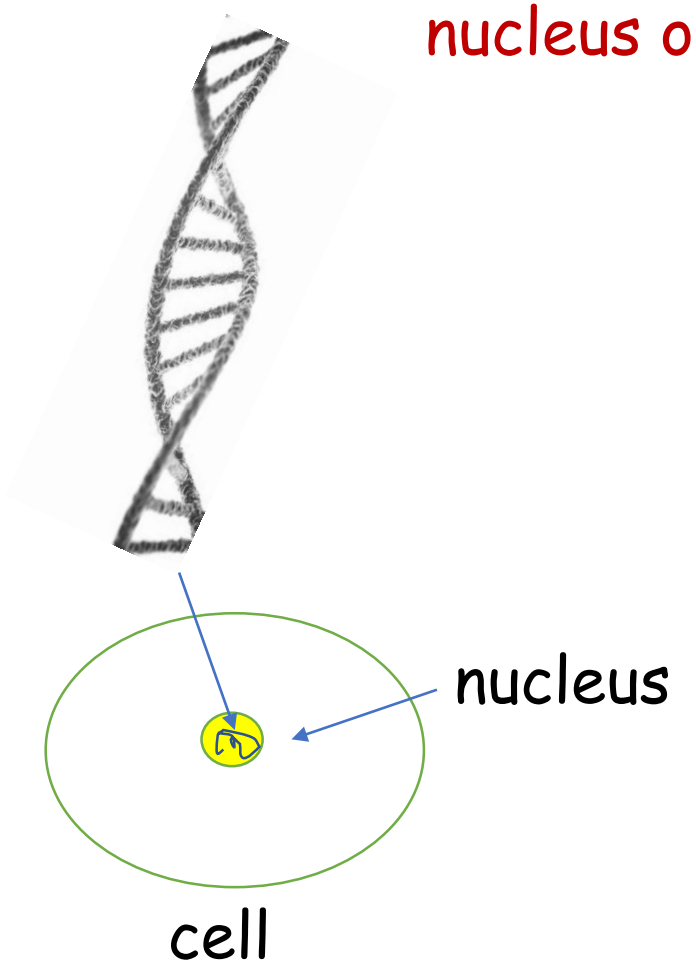
Covalent bond: link carbohydrates with other structures

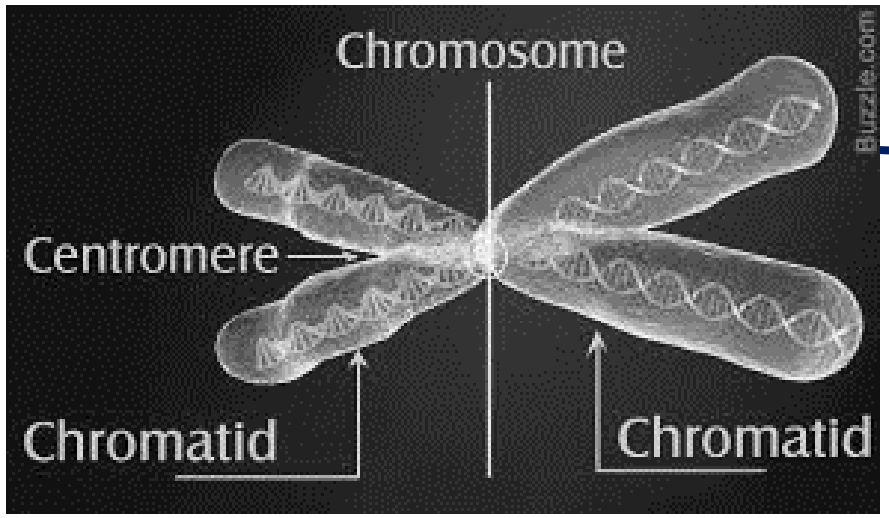

OH
OH
P
O
O⁻
Ester bond
CH2
O
H
H
H
H
OH
H
1
9
N
H
N
N
N
H
H
H
N
H
Glycosidic bond
Strong covalent bond
Sugar

Deoxyribonucleic acid

Molecule located in the nucleus of the cell

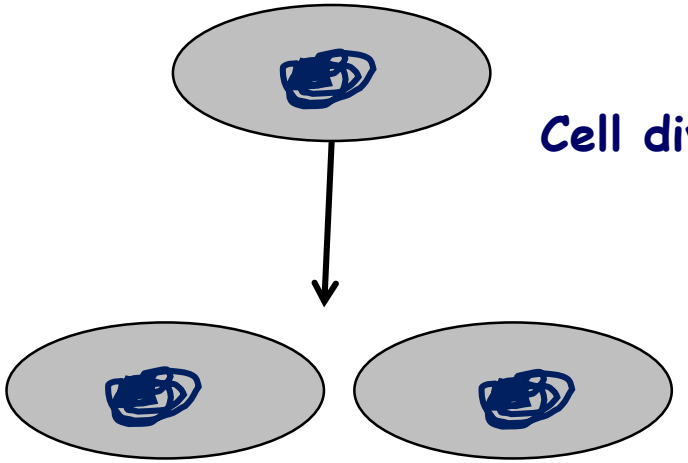
Code for genetic information





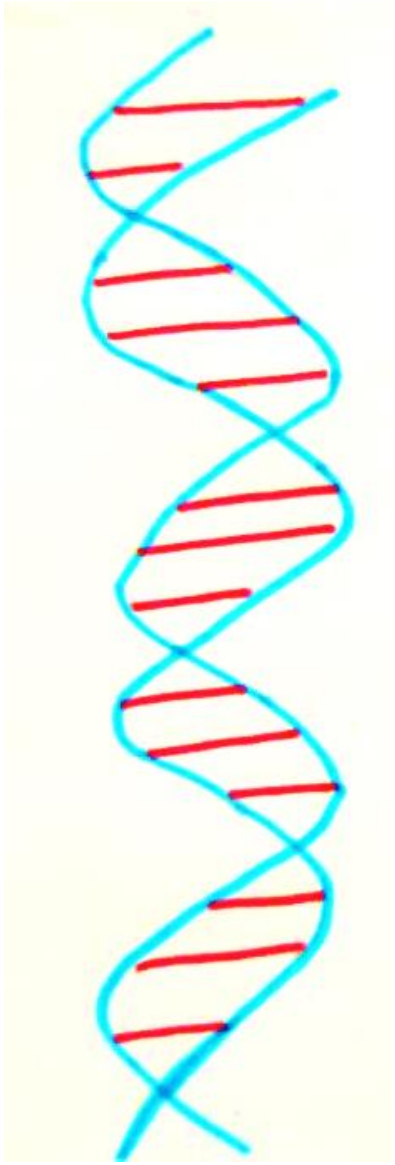
DNA is the working molecule

Protected and packaged



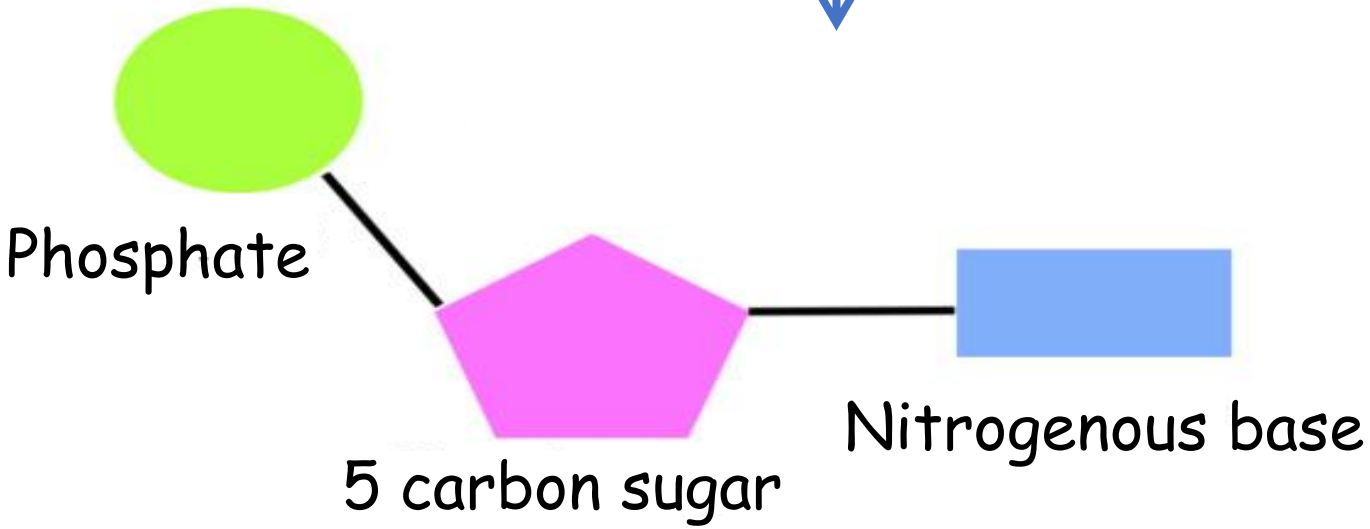
Cell division

Can be replicated when the cell is ready for division

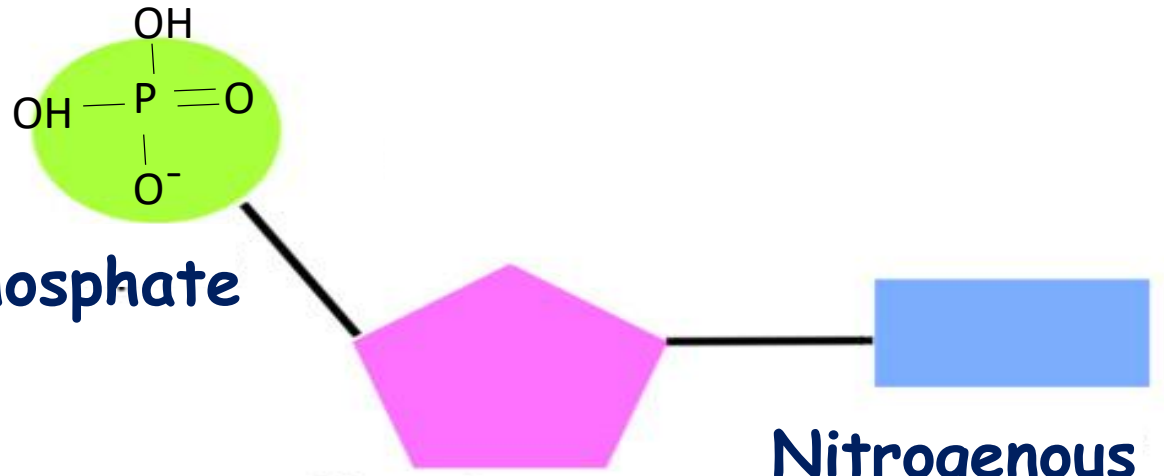


DNA is a polymer: Monomer.monomer.monomer……

Polynucleotide: Mononucleotide



Mononucleotide



Phosphate

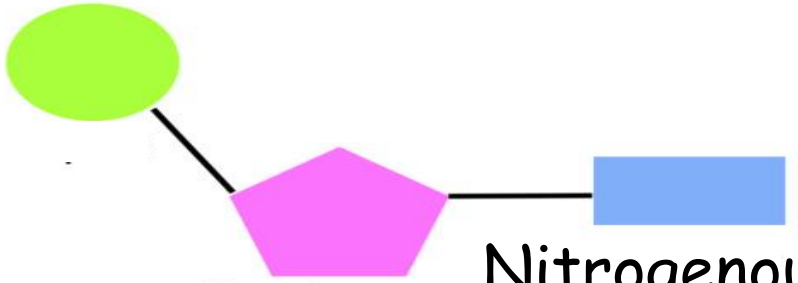
5 carbon sugar

DNA: Deoxyribose sugar

Nitrogenous base

Adenine
Guanine
Thymine
Cytosine

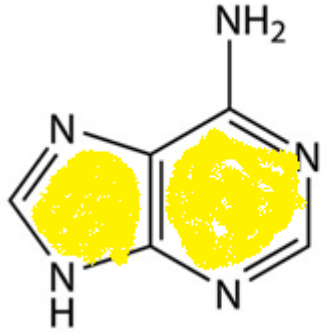
Components of DNA



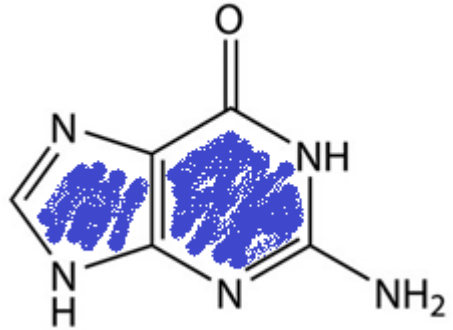
Nitrogenous base

Nitrogenous bases in DNA

Purines

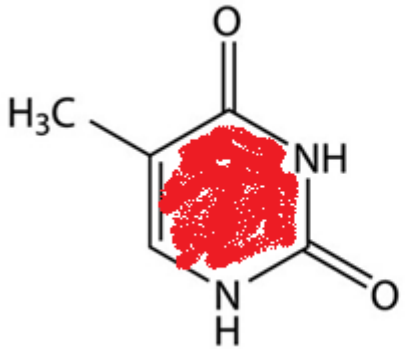


Adenine

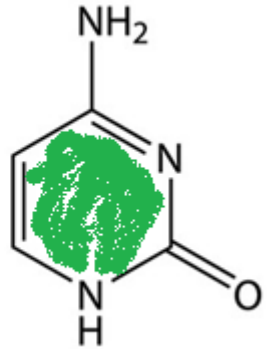


Guanine

and pyrimidines

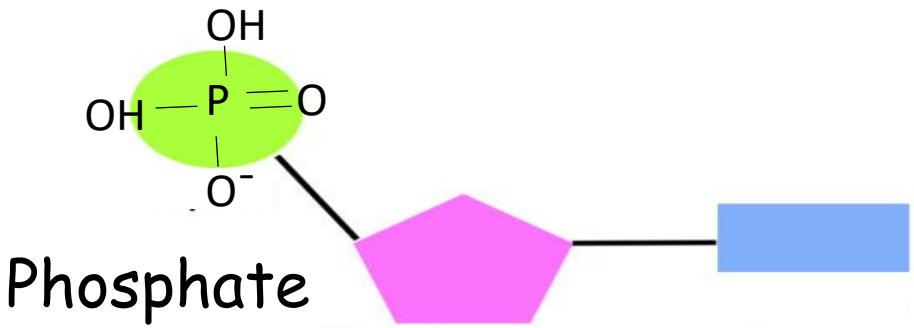


Thymine



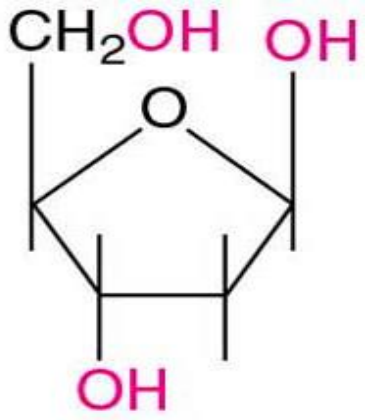
Cytosine

Components of DNA



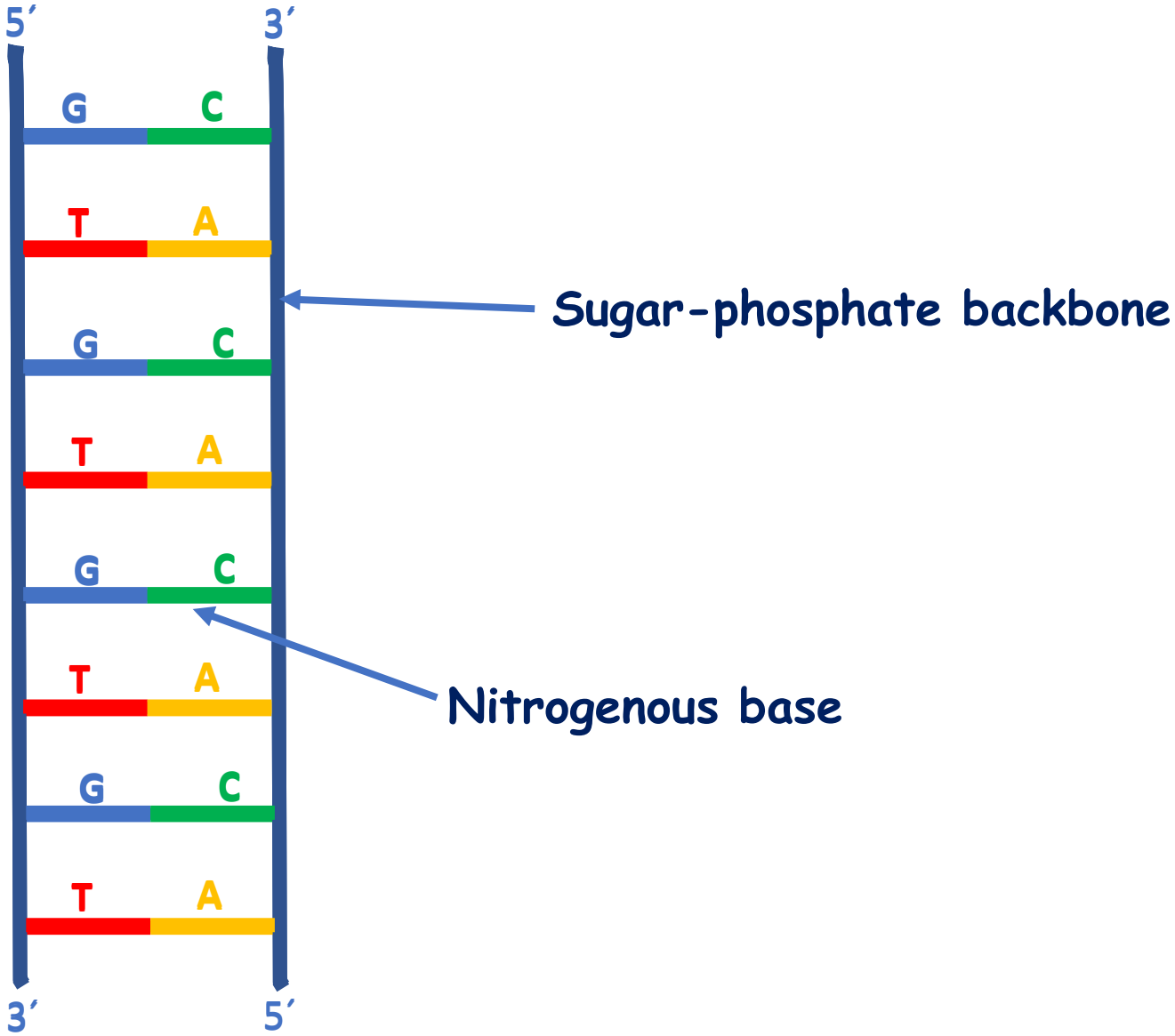
Phosphate

5 carbon sugar

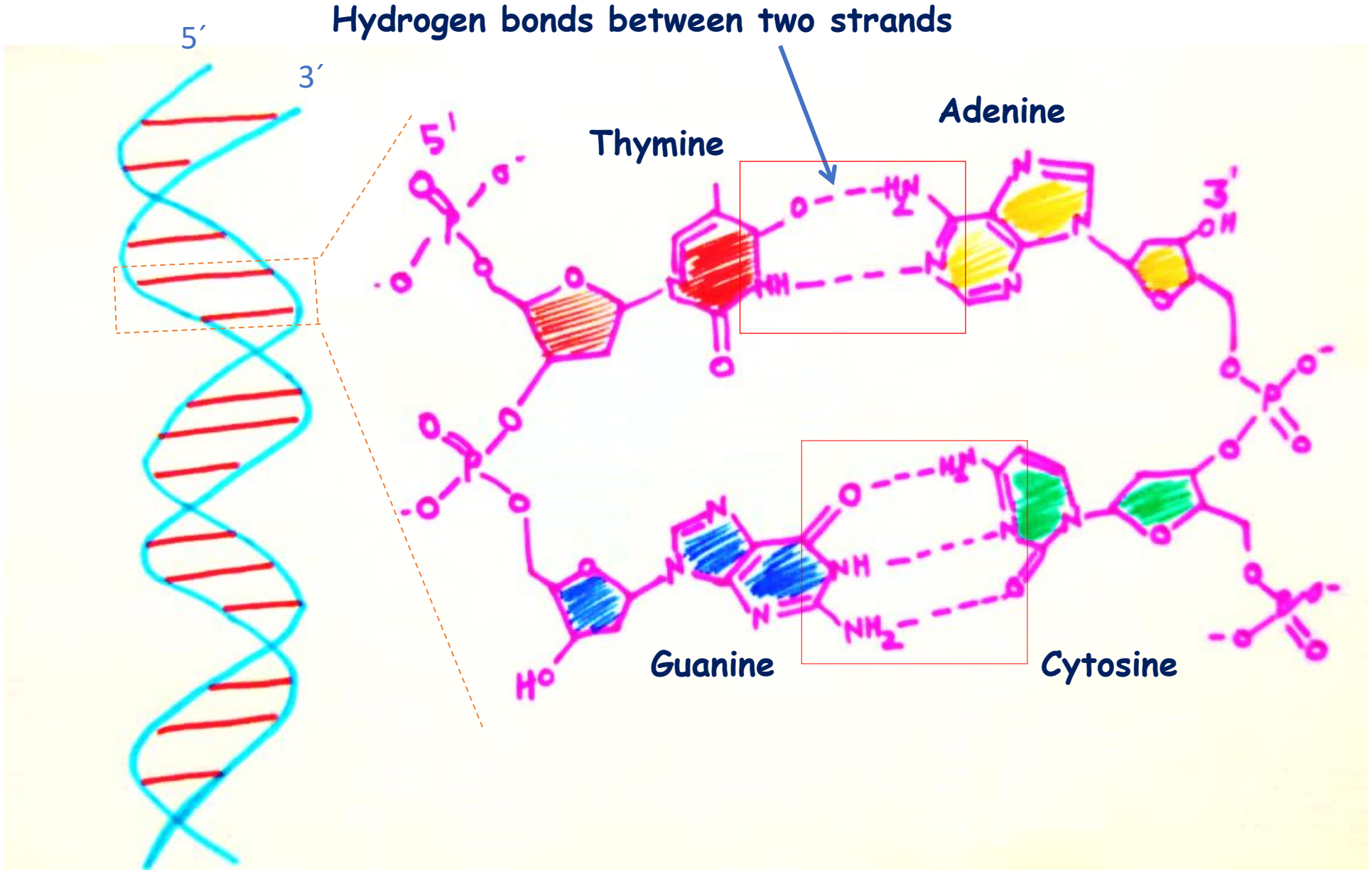


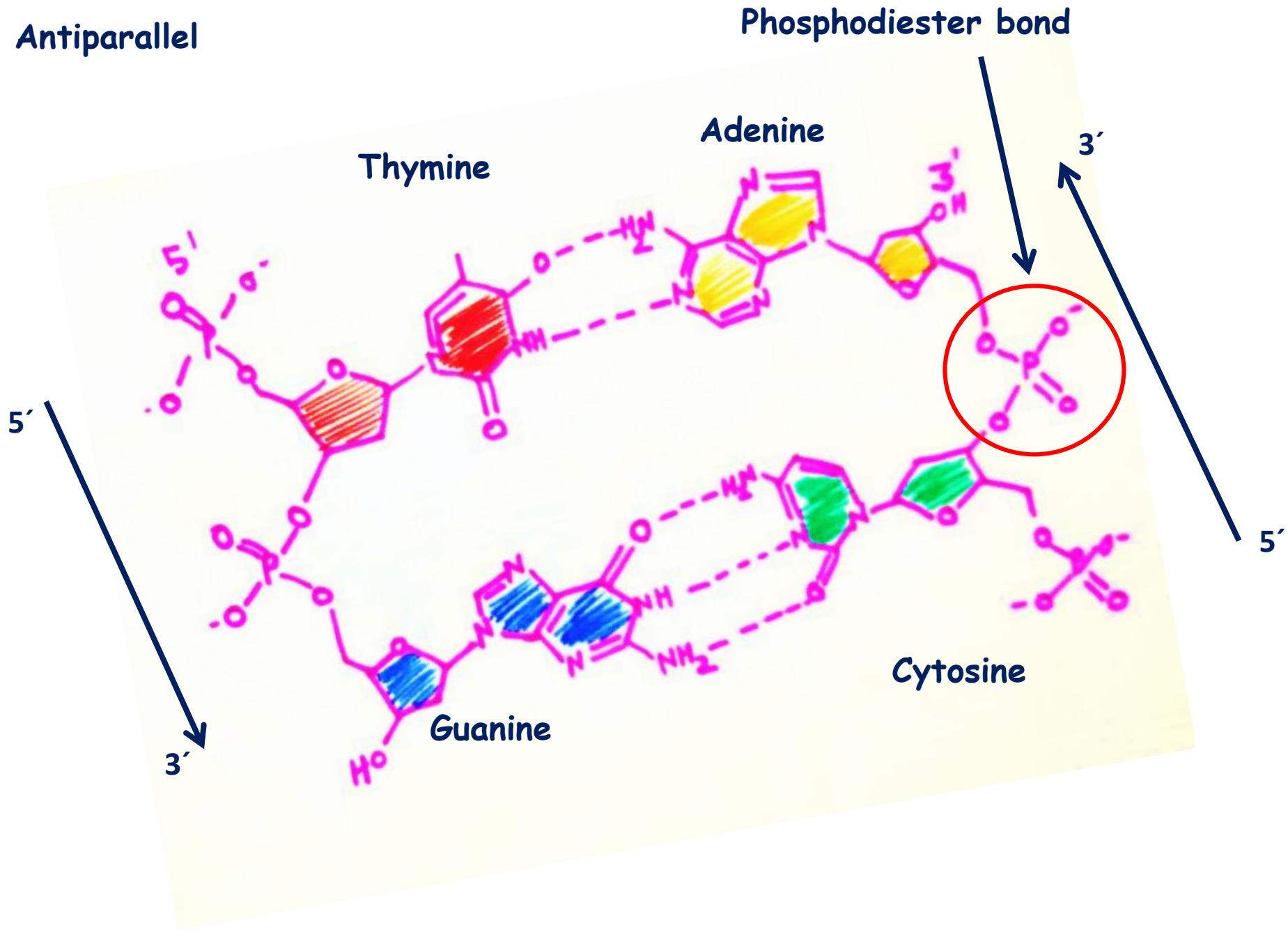
2-deoxyribose

DNA step- ladder model

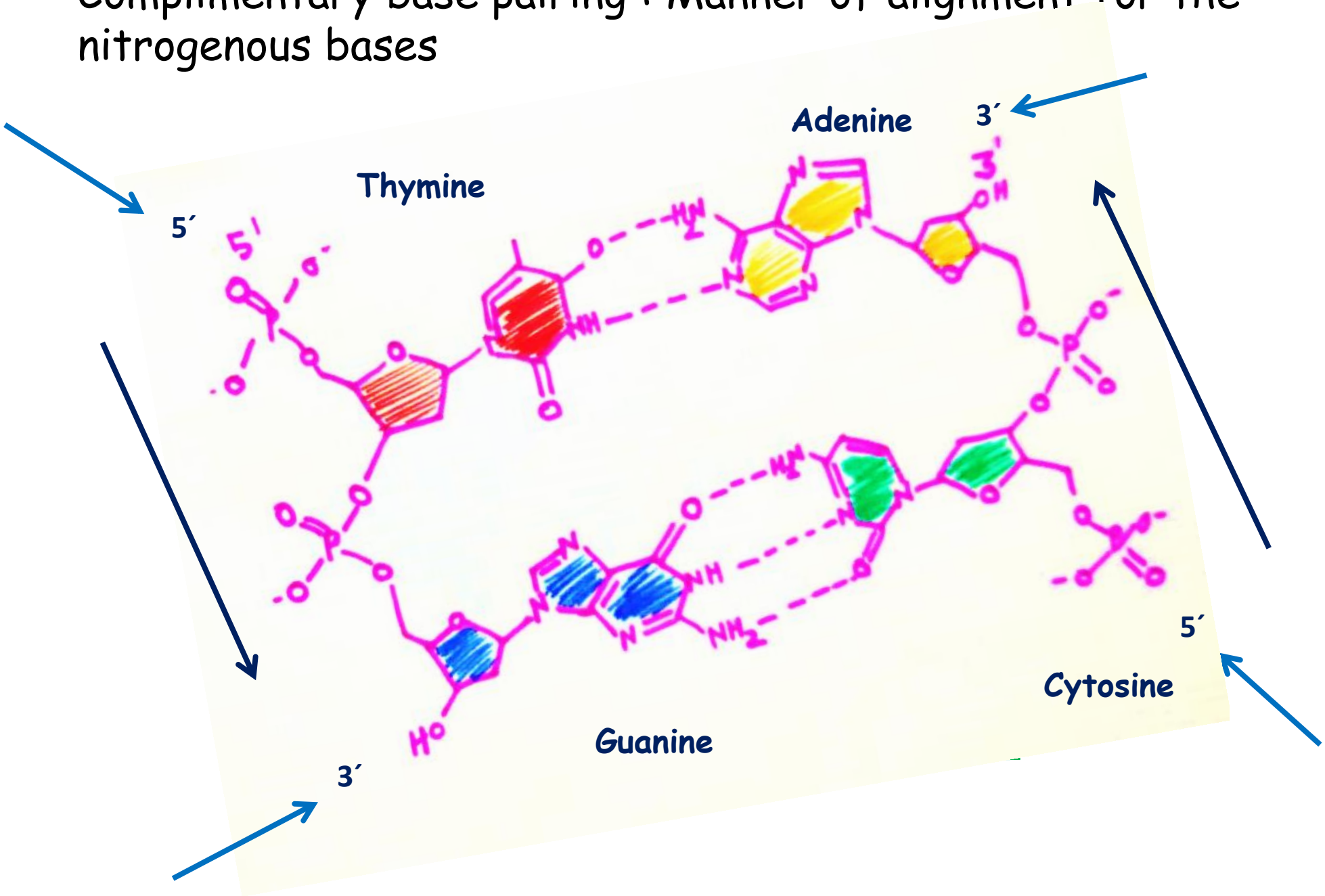


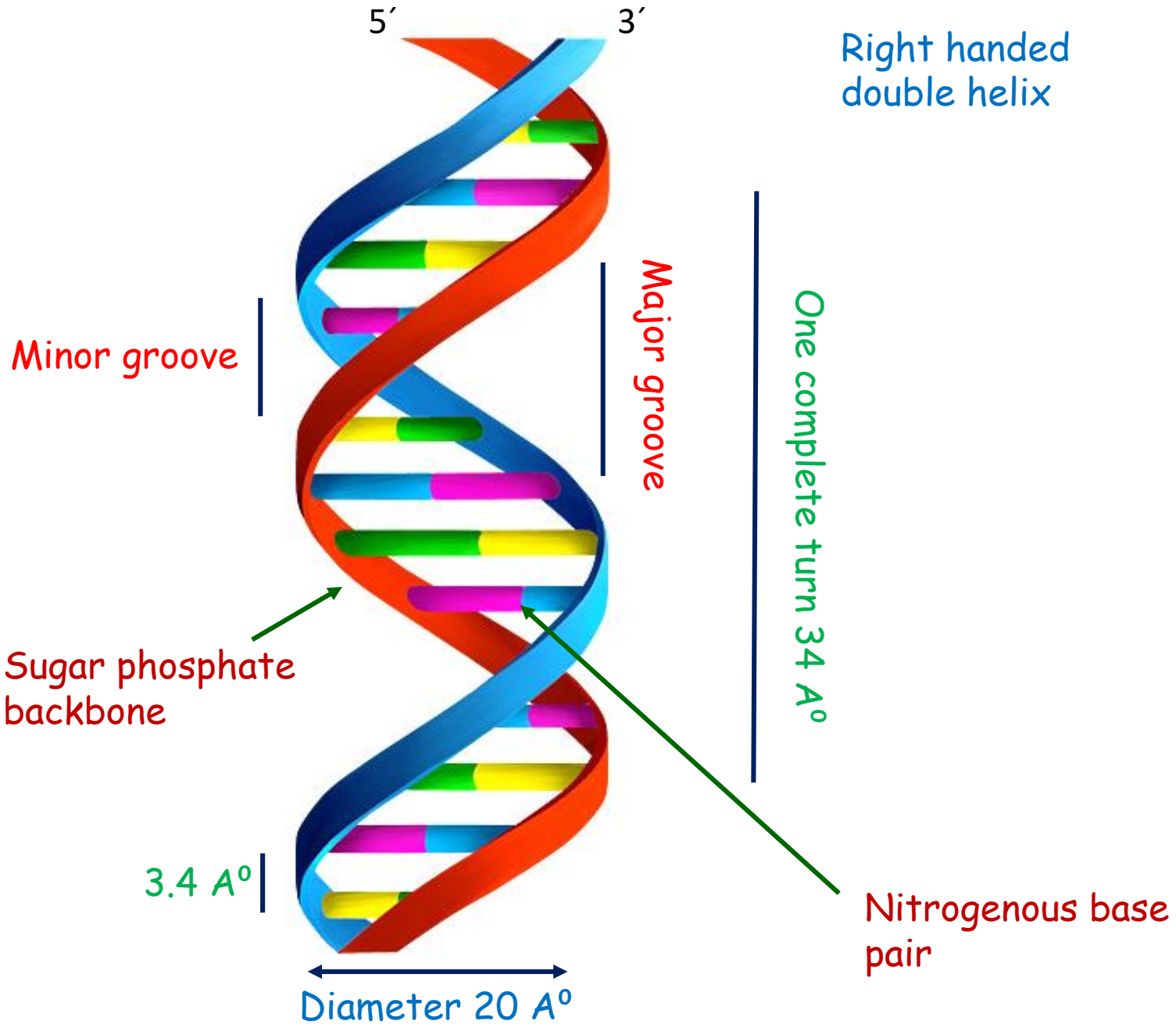
DNA step- ladder model


Hydrogen bonds between two strands
5′
3′
Thymine
Adenine
Guanine
Cytosine

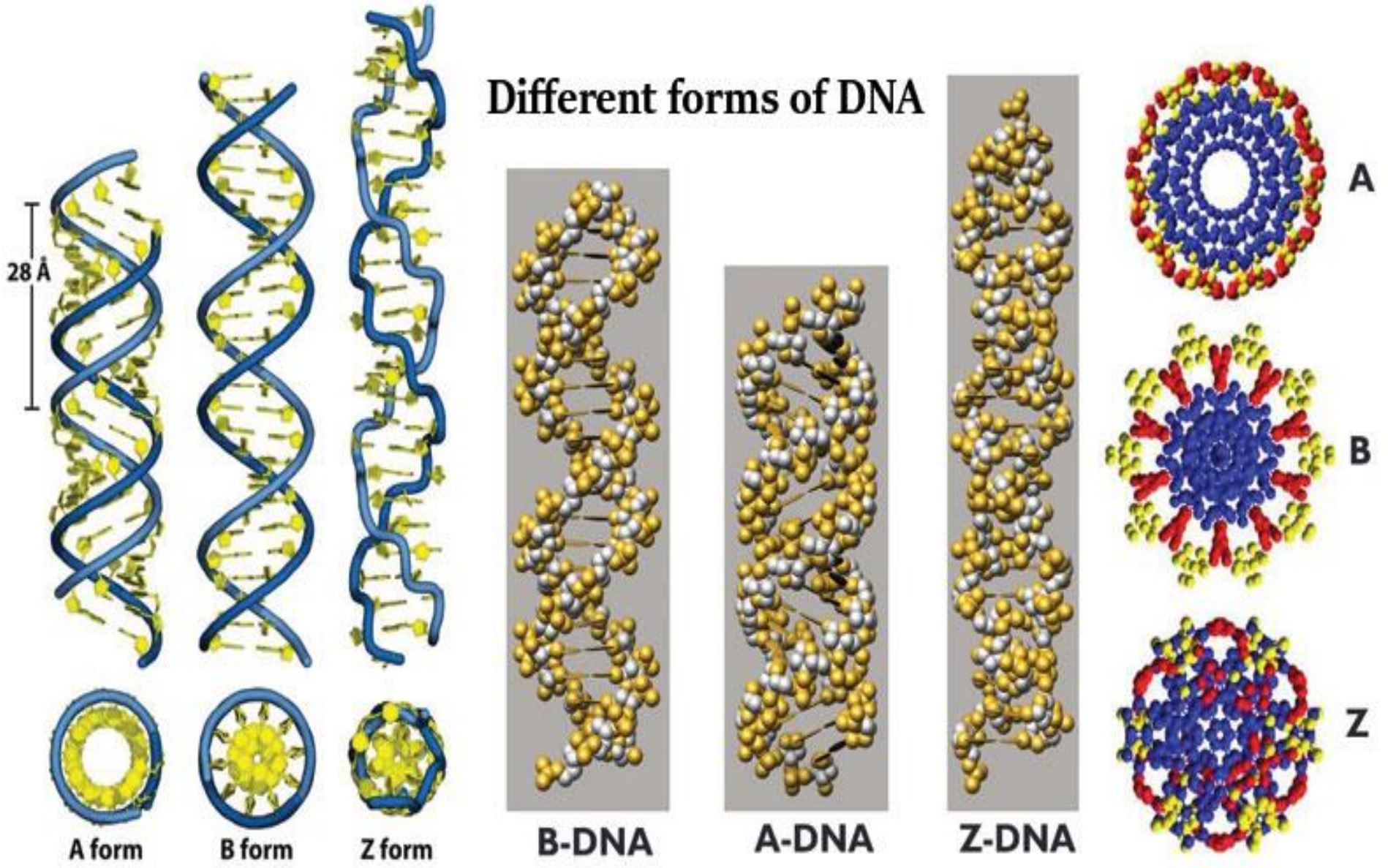

Antiparallel
Phosphodiester bond
Adenine
Thymine
3´
5´
5´
3´
Cytosine
Guanine

Complimentary base pairing : Manner of alignment for the nitrogenous bases




5´
3´
Right handed double helix
Minor groove
Major groove
One complete turn 34 A°
Sugar phosphate backbone
3.4 A°
Nitrogenous base pair
Diameter 20 A°

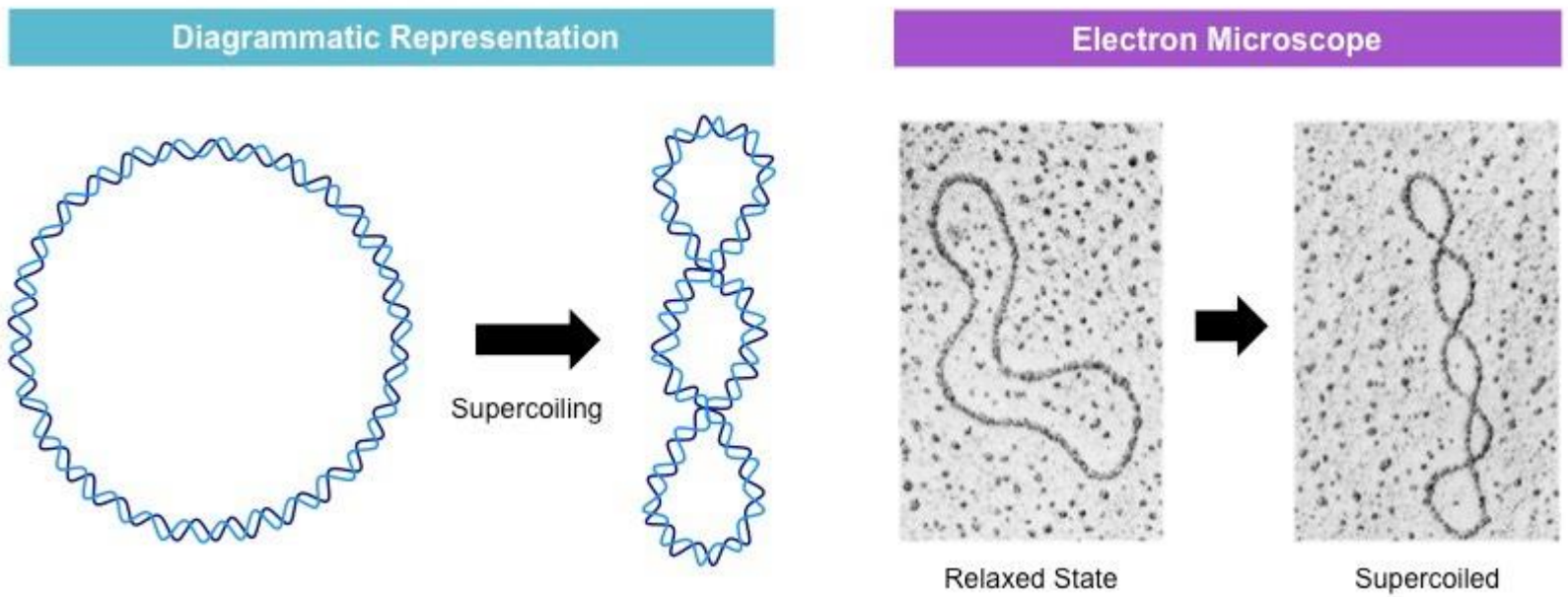
	B- form	A- form	Z- form	C- form
Helix sense	Right handed	Right handed	left handed	Right handed
% humidity	92%	75%	(Pu-Py)n	66%
Base pairs/turn	10	11	12	9.3
Helical diameter	19A°	23A°	18A°	19A°

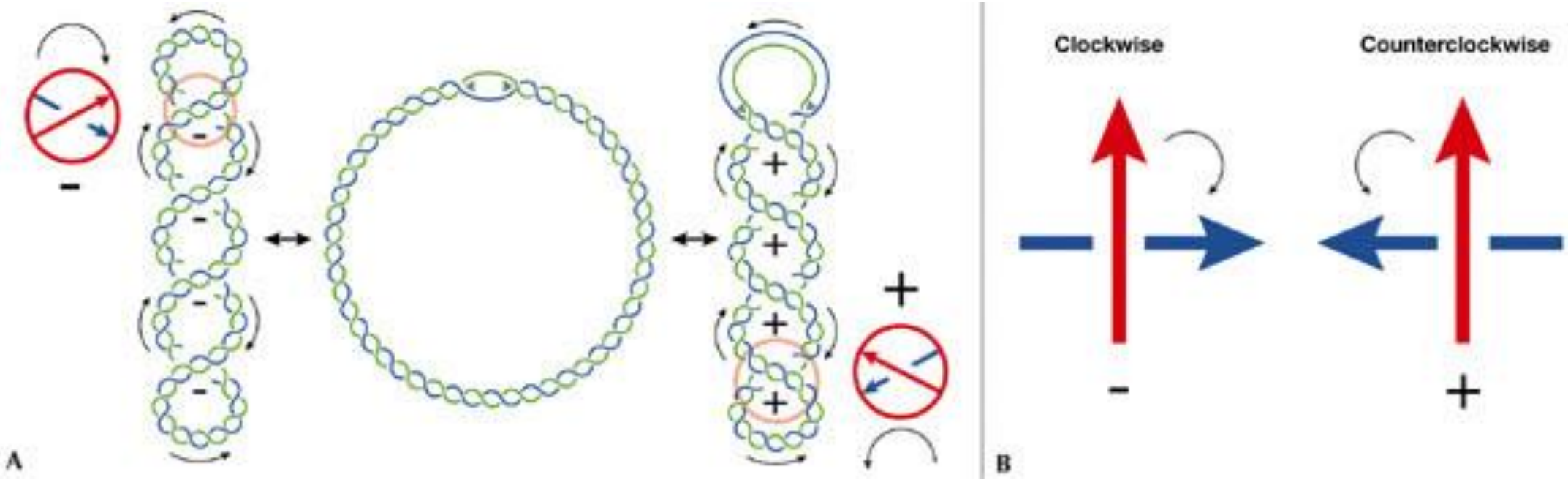

Different forms of DNA
28 Å
A form
B form
Z form
B-DNA
A-DNA
Z-DNA
A
B
Z

Supercoiled form of DNA

DNA supercoiling describes a higher-order DNA structure and a special property of circular double stranded DNA

The double-helical structure of DNA entails the interwinding of two complementary strands around one another and around a common helical axis.




A
B
Clockwise
Counterclockwise
-
+