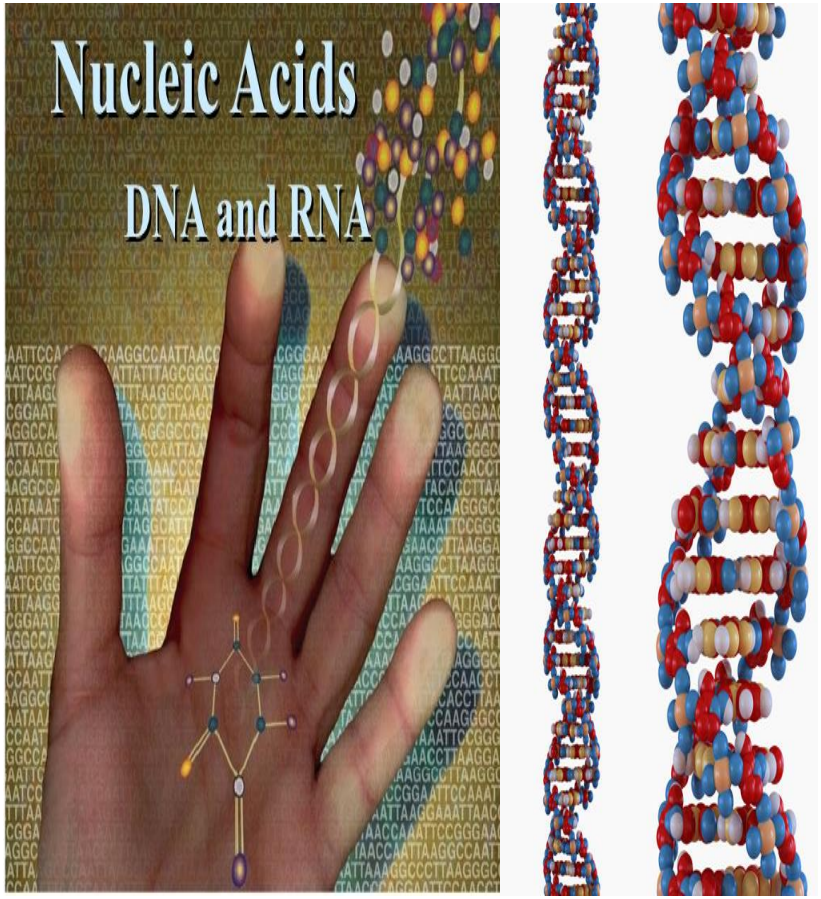
Biochemistry – Year 2



Lecture 1

By

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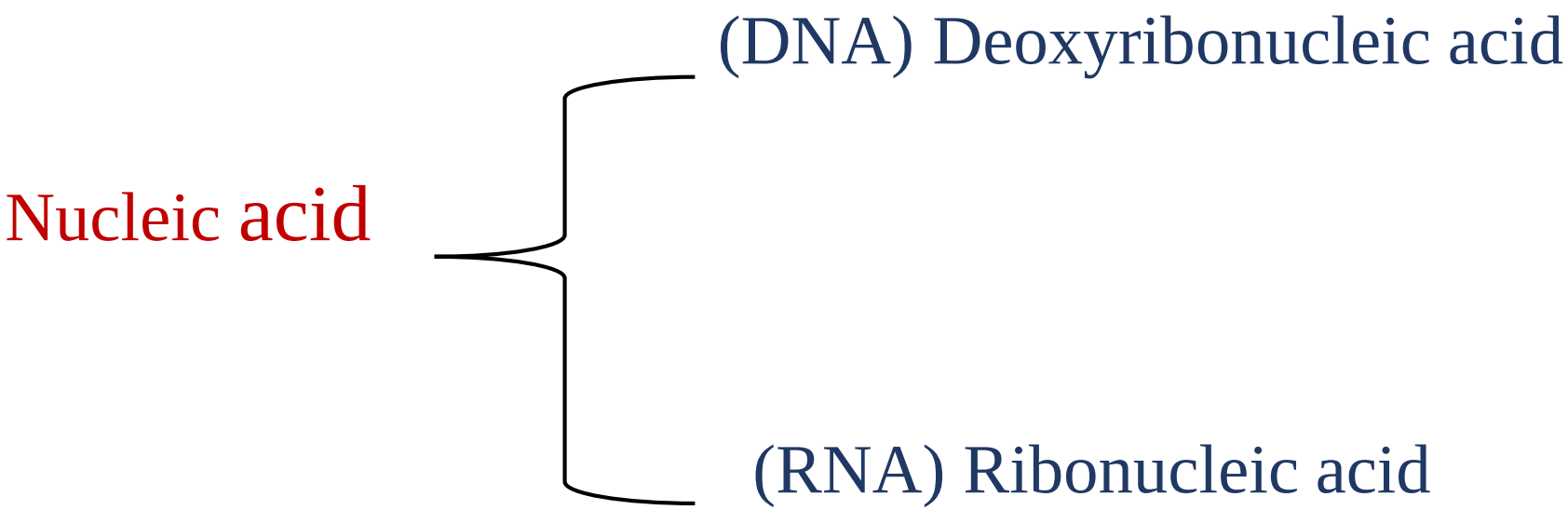
Objectives

- ✓ Nucleic acids
- ✓ The composition of nucleic acids
- ✓ nucleosides
- ✓ nucleotides
- ✓ Name of nucleosides

Nucleic acids

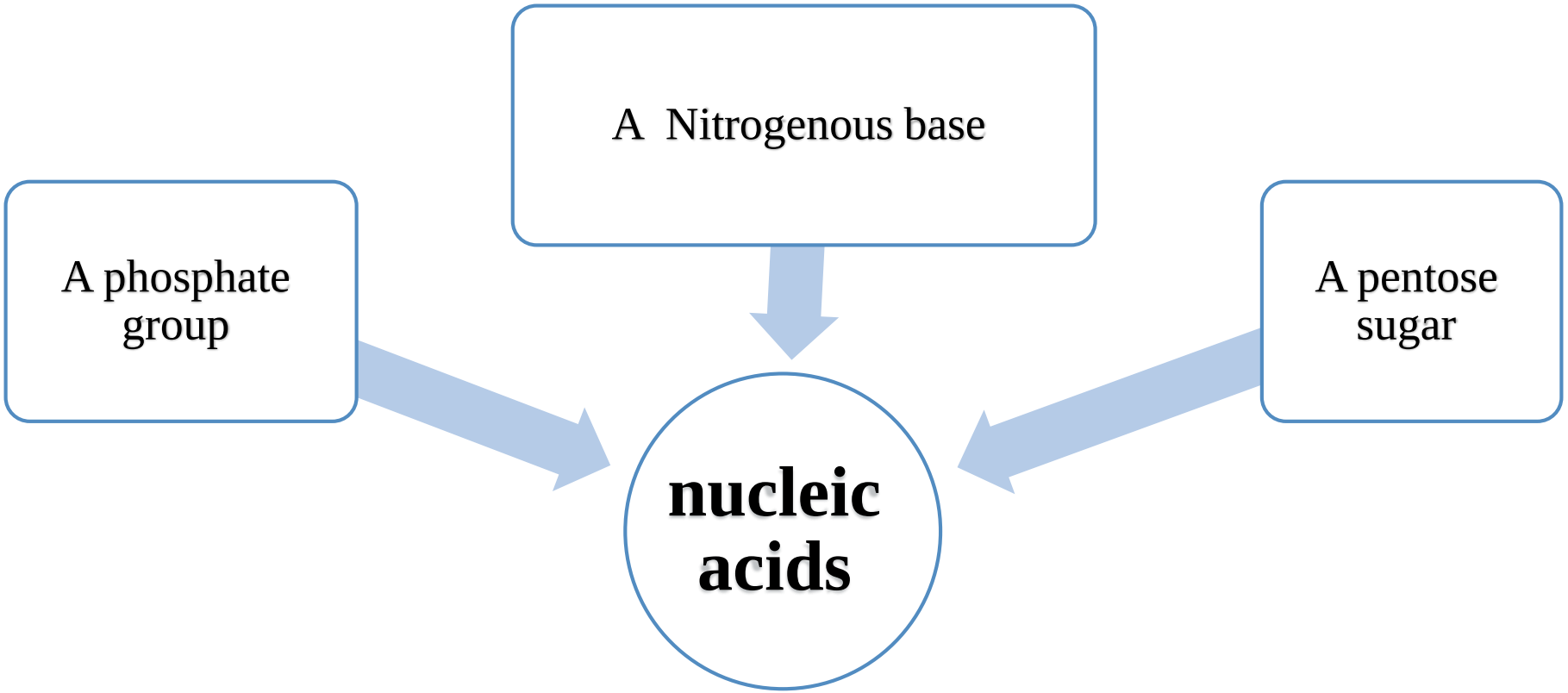
They unique feature of all living organisms is their ability to produce themselves. Are essential biological molecules for all form of life . They are responsible for transmitting the characteristics of a species from one generation to the next , and control its metabolism.

There are two types of nucleic acid :



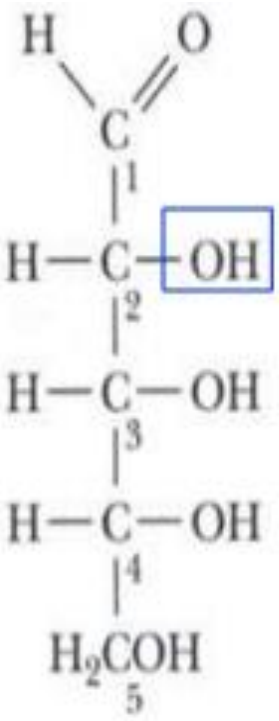
The composition of nucleic acids

Nucleic acids are polymers made up of repeating monomers of nucleotide units .
Each nucleotide unit is composed of :

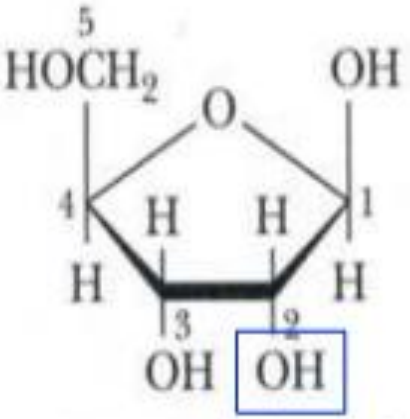


Pentose Sugars

Ribose (in RNA) and deoxyribose (in DNA)

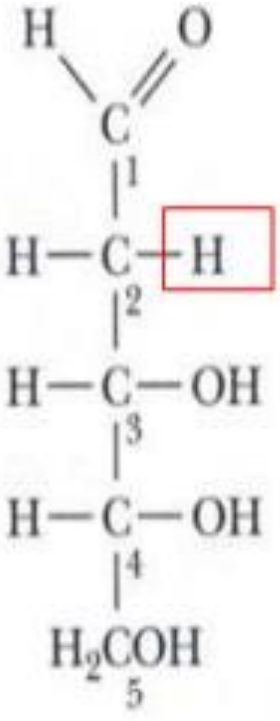


D-Ribose

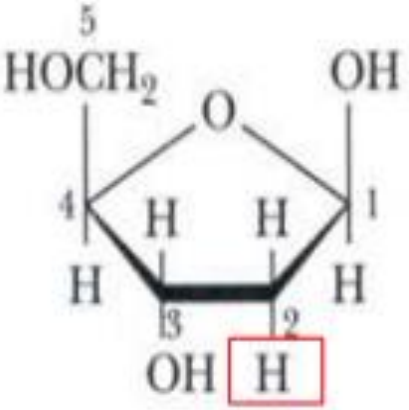


Furanose form of D-Ribose

β-D-Ribofuranose



D-2-Deoxyribose



Furanose form of D-2-Deoxyribose

β-D-2-Deoxyribofurano

- Ribose and deoxyribose predominantly exist in the cyclic form.

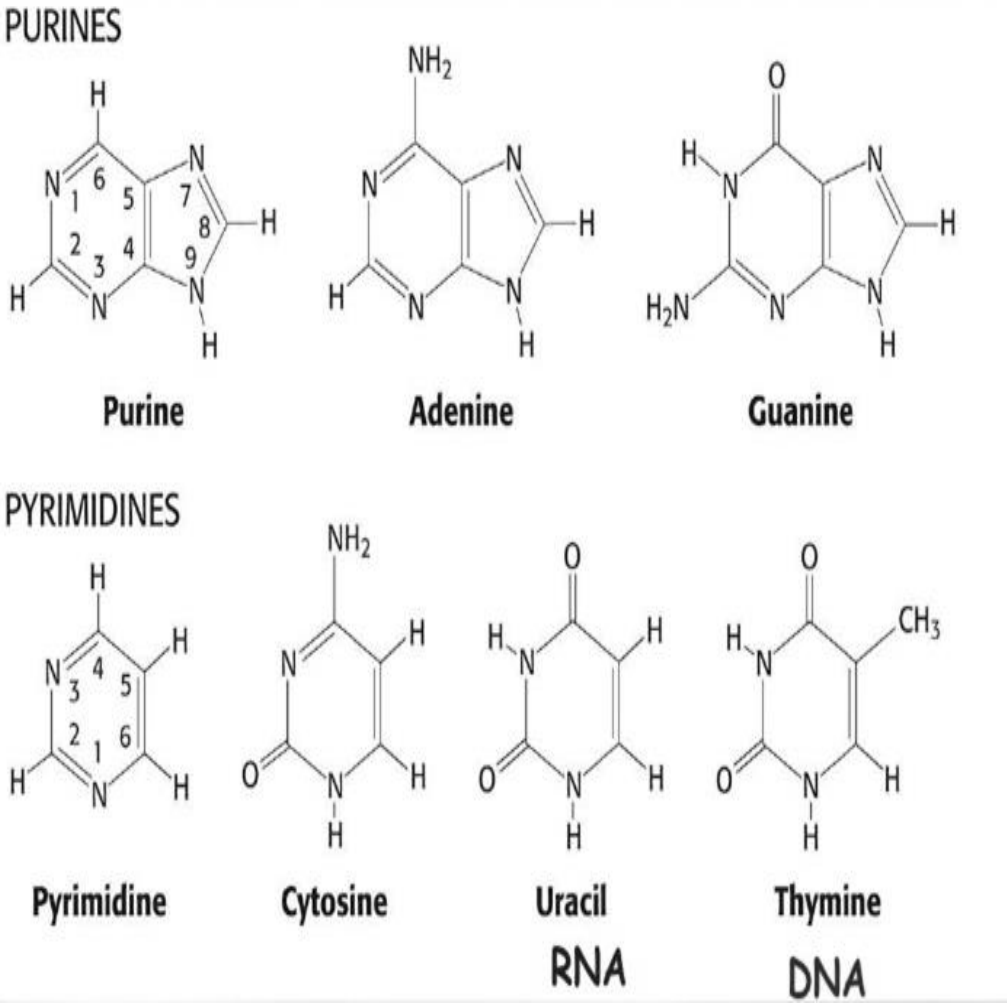
Nitrogenous Bases

- Purines:
  - Adenine (A)
  - Guanine (G)

- Pyrimidines:
  - Cytosine (C)
  - Uracil (U)
  - Thymine (T)

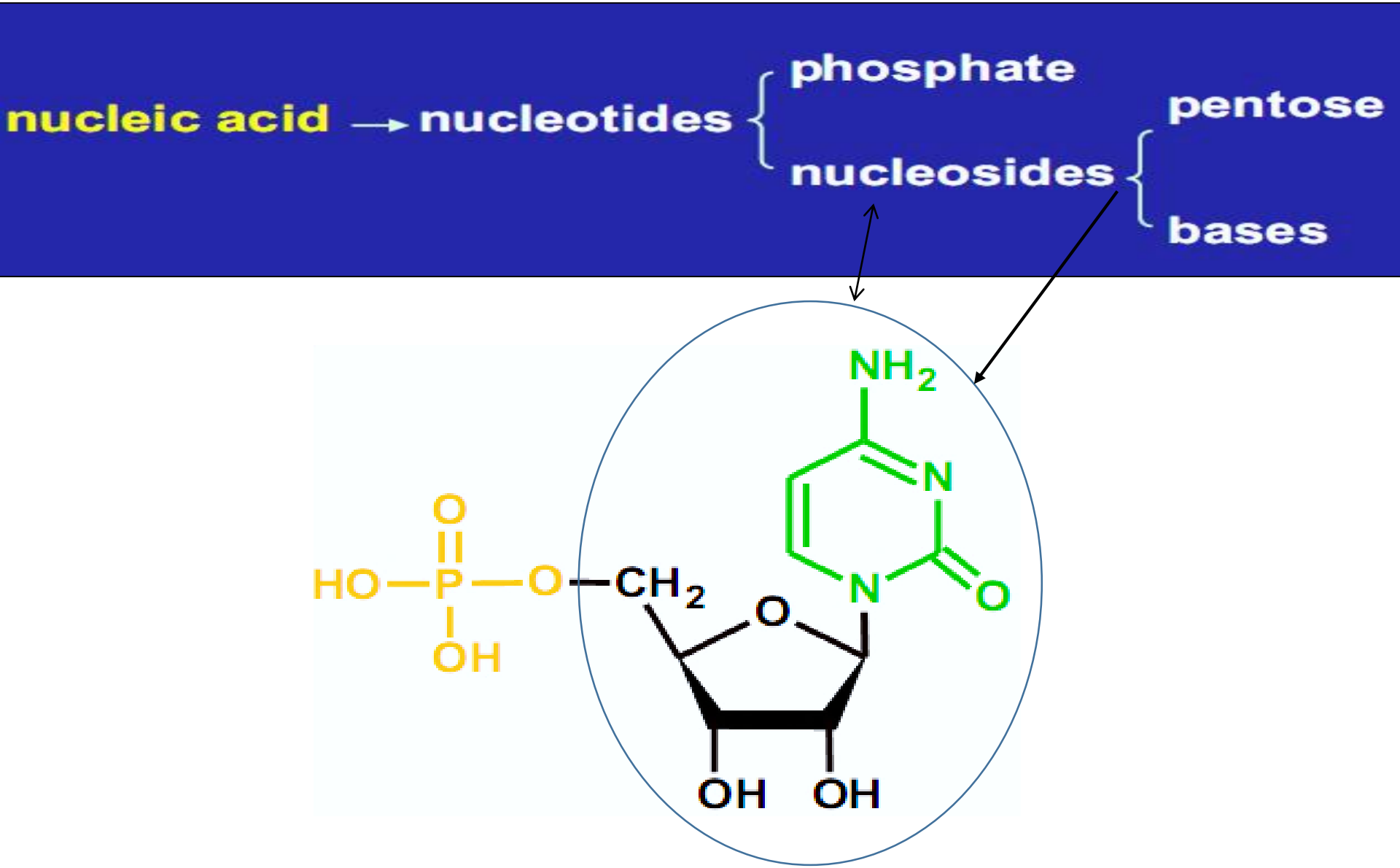
Chargraffs rule

DNA : A ,G ,C , **T**
RNA: A ,G ,C , **U**



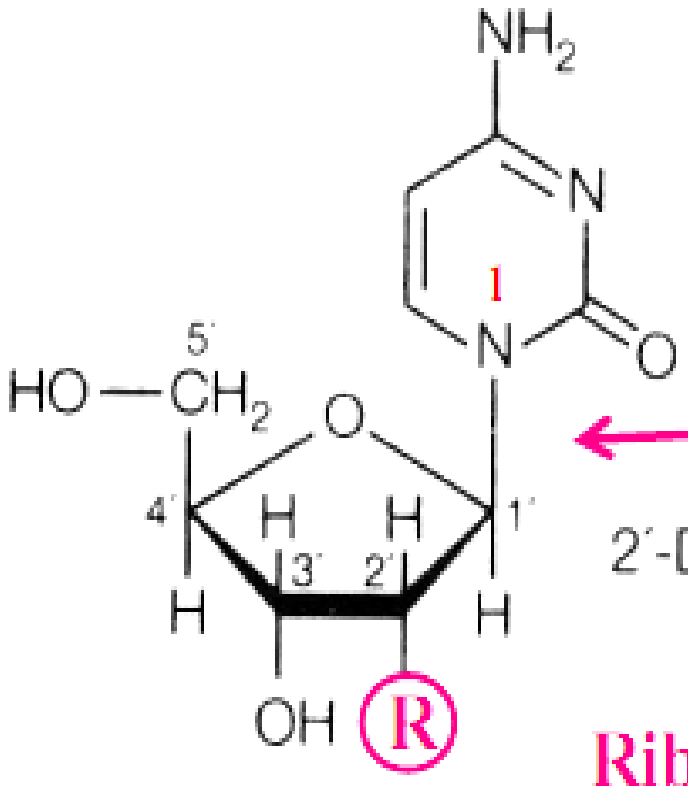
Thymine (T) is a 5-methyluracil(U)

For more details



Nucleosides = ribose or deoxyribose + base

The bases are covalently attached to the 1′ position of a pentose sugar ring , to form a nucleoside .

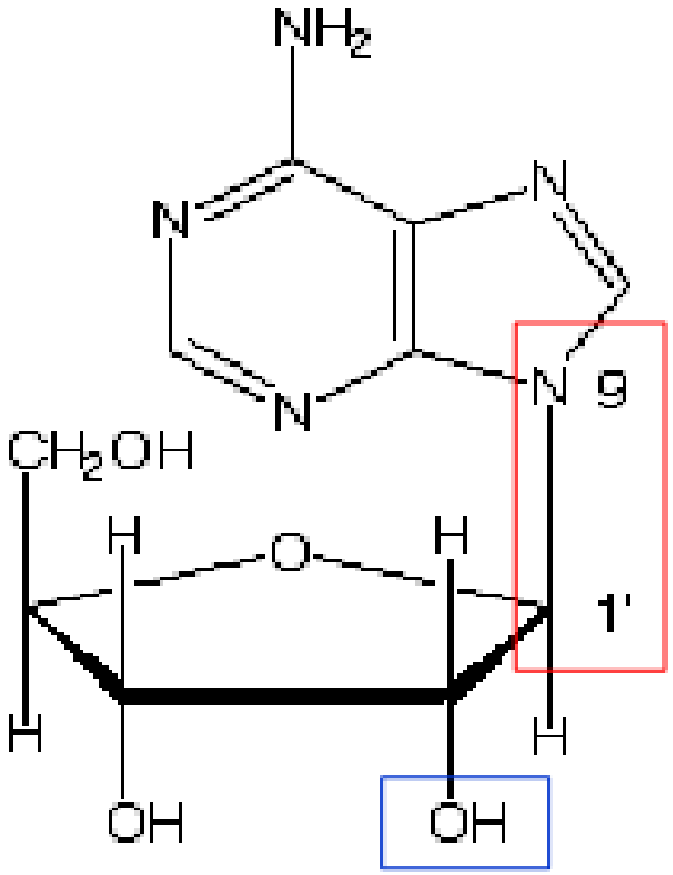


Glycosidic bond

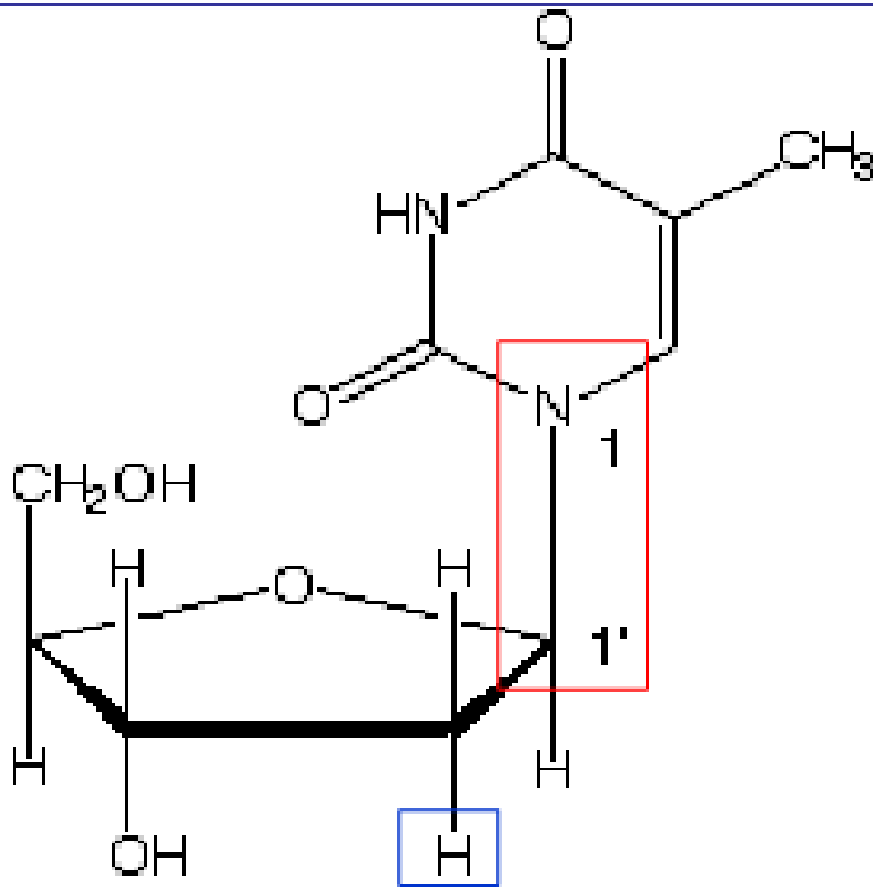
Ribonucleoside (R = OH; cytidine)

2′-Deoxyribonucleoside (R = H; deoxycytidine)

Ribose or 2'-deoxyribose



Adenosine



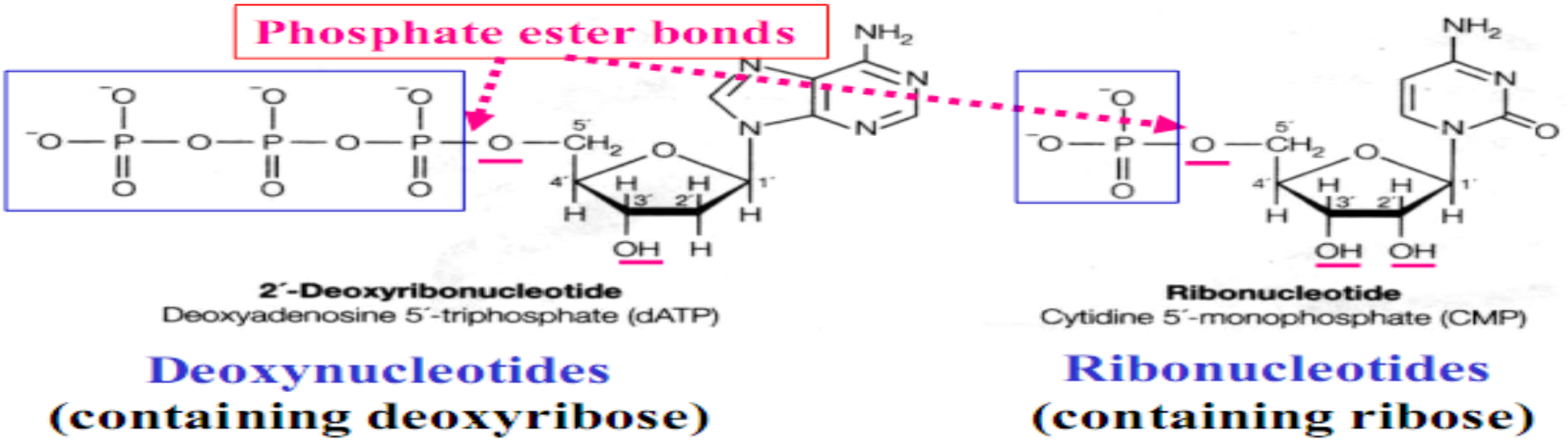
Deoxythymidine

Adenosine, guanosine, cytidine, thymidine, uridine

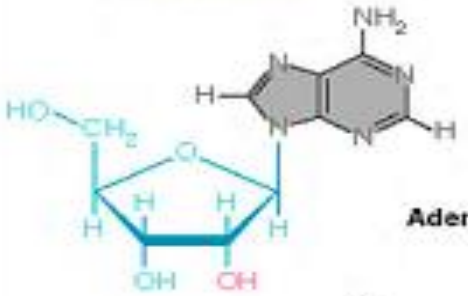
Phosphate groups

Nucleotides = nucleoside + phosphate

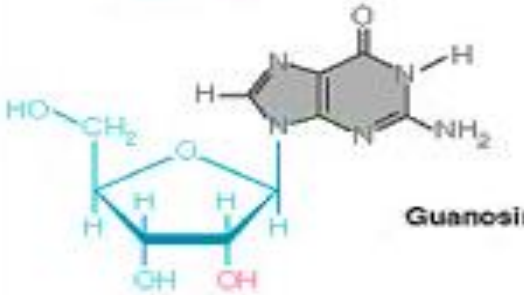
A nucleotide is a nucleoside with one or more phosphate groups bond covalently to the 3′- , 5′- or (in ribonucleosides only) the 2′- position . In the case of 5-position , up to three phosphates may be attached.



NUCLEOSIDES

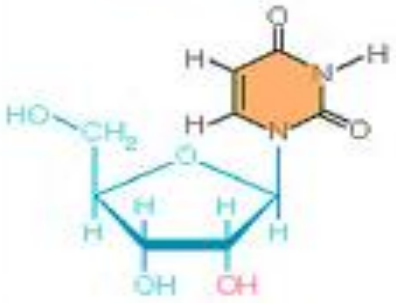


Adenosine



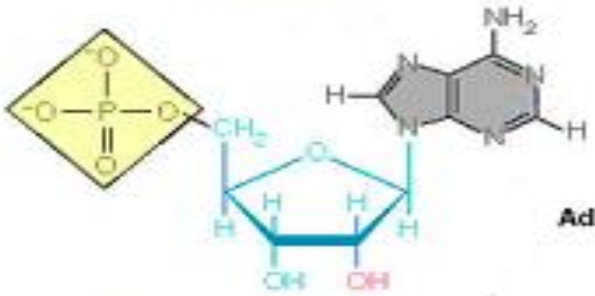
Guanosine

Cytidine

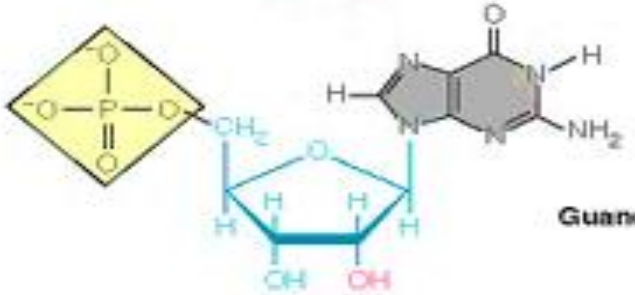


Uridine

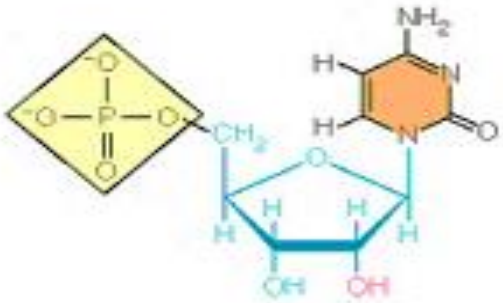
NUCLEOTIDES



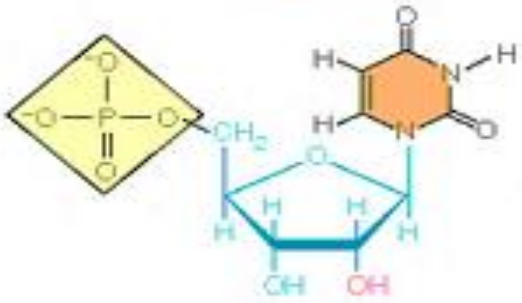
Adenosine 5′-monophosphate (AMP)



Guanosine 5′-monophosphate (GMP)



Cytidine 5′-monophosphate (CMP)

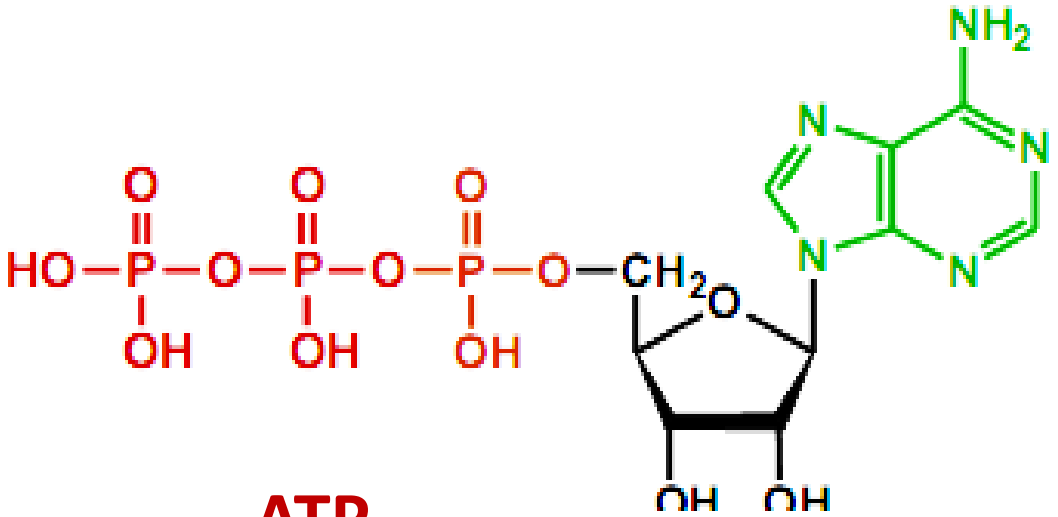


Uridine 5′-monophosphate (UMP)

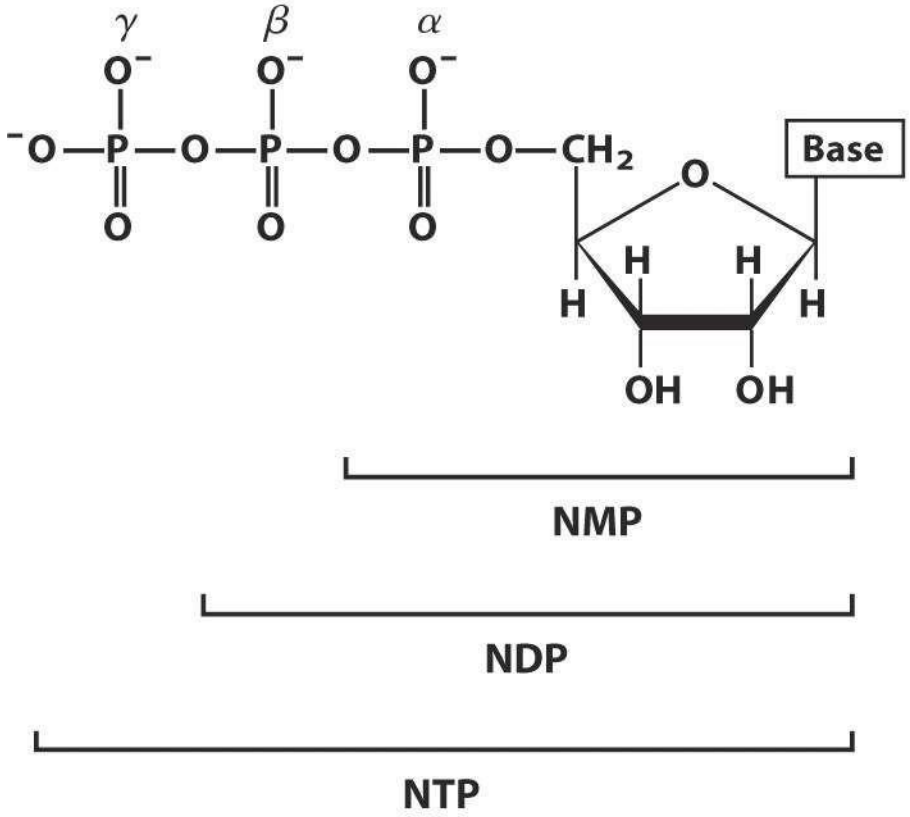
Nucleic acid derivatives

Multiple phosphate nucleotides

Adenosine monophosphate (AMP)
Adenosine diphosphate (ADP)
Adenosine triphosphate (ATP)



ATP



Abbreviations of ribonucleoside 5′-phosphates			
Base	**Mono-**	**Di-**	**Tri-**
Adenine	AMP	ADP	ATP
Guanine	GMP	GDP	GTP
Cytosine	CMP	CDP	CTP
Uracil	UMP	UDP	UTP

Abbreviations of deoxyribonucleoside 5′-phosphates			
Base	**Mono-**	**Di-**	**Tri-**
Adenine	dAMP	dADP	dATP
Guanine	dGMP	dGDP	dGTP
Cytosine	dCMP	dCDP	dCTP
Thymine	dTMP	dTDP	dTTP

Name of nucleosides

The common names of nucleosides indicate their structure : ⟶

- ✓ **nucleosides (ribose or deoxyribose + purine base) changing the – ine of the base to – osine.**
  Ex. Adenine = adenosine
  ⟶
- ✓ **nucleosides (ribose or deoxyribose + pyrimidine base) changing the – ine of the base to – idine.**
  Ex. thamine = thamidine

Names of Nucleosides

Base	Name when combined with Ribose	Name when combined with Deoxyribose
Adenine	Adenosine	Deoxyadenosine
Guanine	Guanosine	Deoxyguanosine
Cytosine	Cytidine	Deoxycytidine
Thymine	Thymidine	Deoxythymidine
Uracil	Uridine	Deoxyuridine

Exercise 1: Give the name of the nucleoside formed by combining the sugar and base in each of the following:

(a) Ribose and guanine **(b)** thymine and deoxyribose

thanks