

A stylized illustration of a DNA double helix. The sugar-phosphate backbones are represented by thick, curved purple ribbons. The nitrogenous base pairs are shown as horizontal bars of various colors (red, yellow, green, blue, purple) connecting the two strands. The background is a dark blue gradient with some lighter blue curved shapes.

Nucleic Acid Chemistry

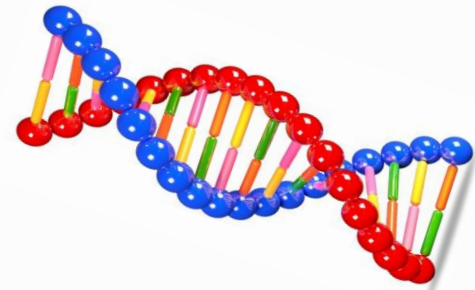
Dr: Hussein abdelaziz



Objectives

- ❑ By the end of lecture the student should:
 - ✓ Define nucleic acids.
 - ✓ Illustrate structure of nucleotides.
 - ✓ List functions of nucleotides.

▪ Nucleic acids (DNA&RNA) are long chains of repeated **nucleotides**



▪ A nucleotide consists of:

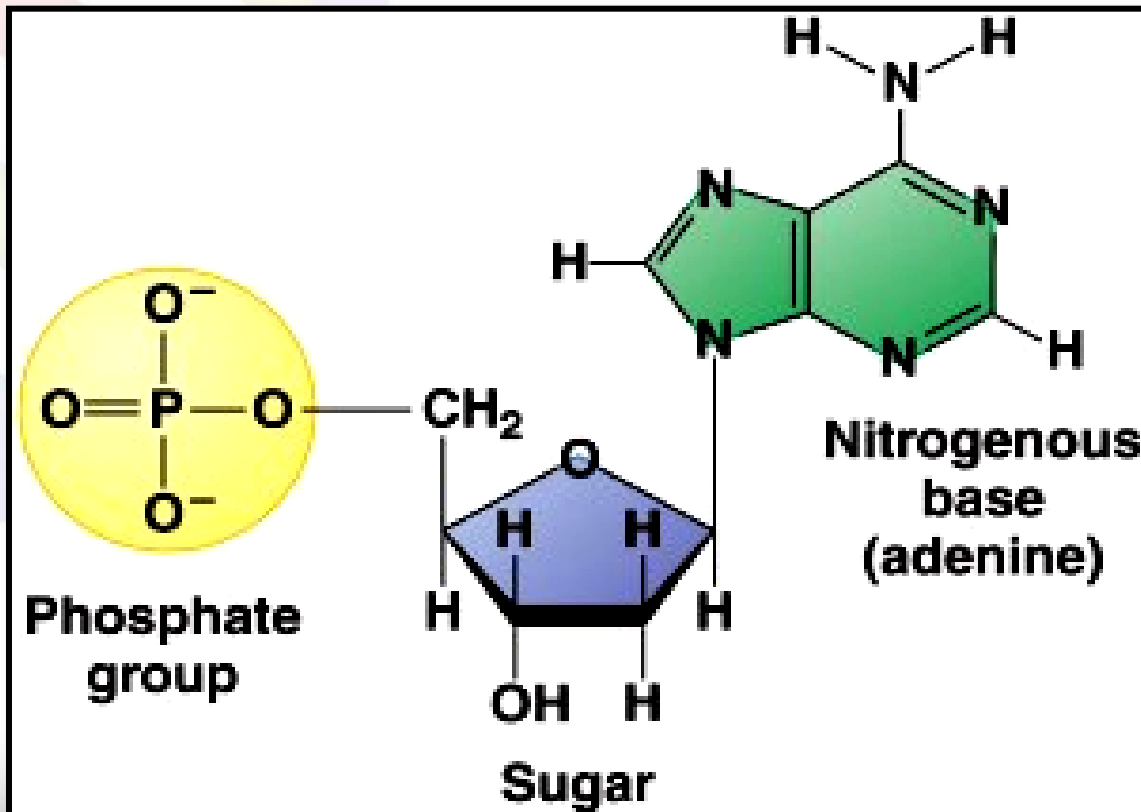
- 1- Nitrogenous base
- 2- Pentose sugar
- 3- One or more phosphate groups

1- Nucleotides

Phosphate

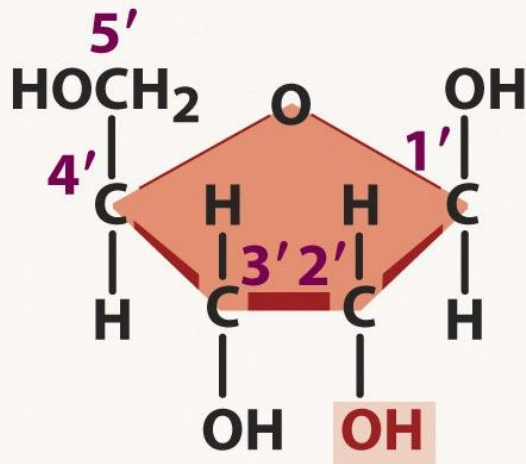
Sugar

Base

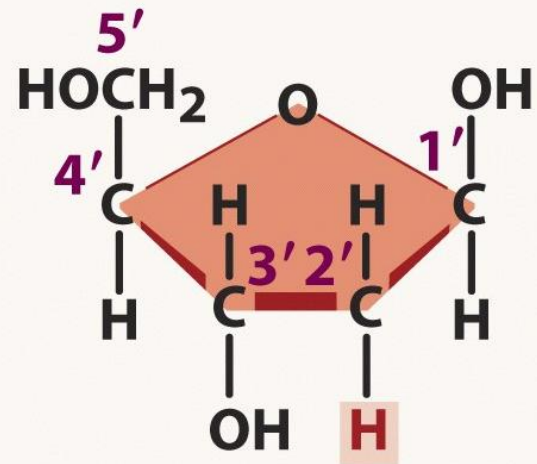


Sugars

Sugars

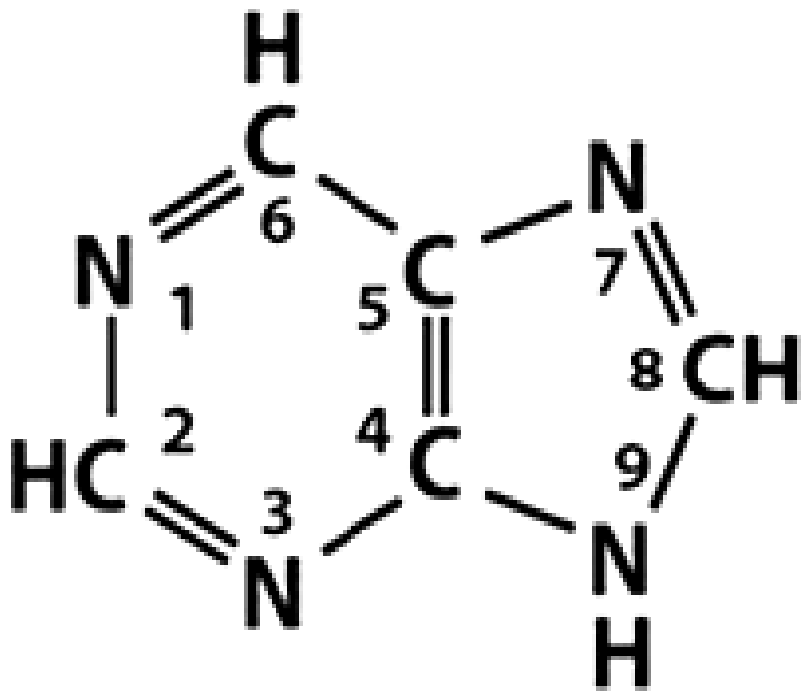


Ribose

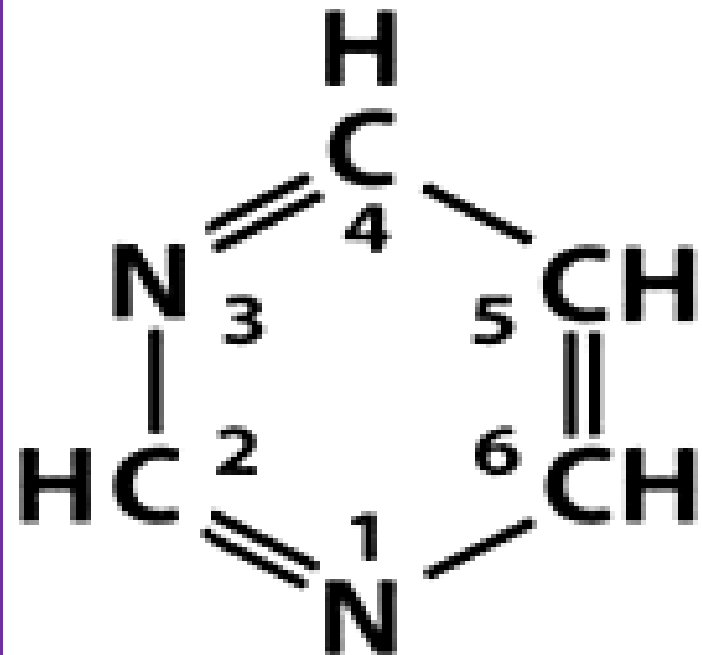


Deoxyribose

Nitrogenous bases



Purine

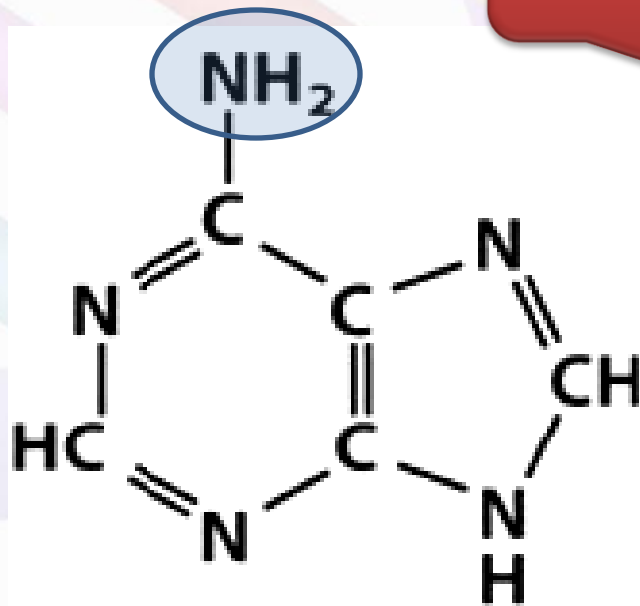
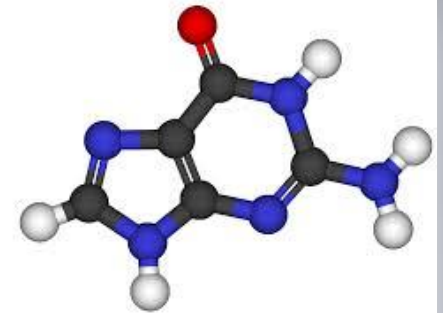


Pyrimidine

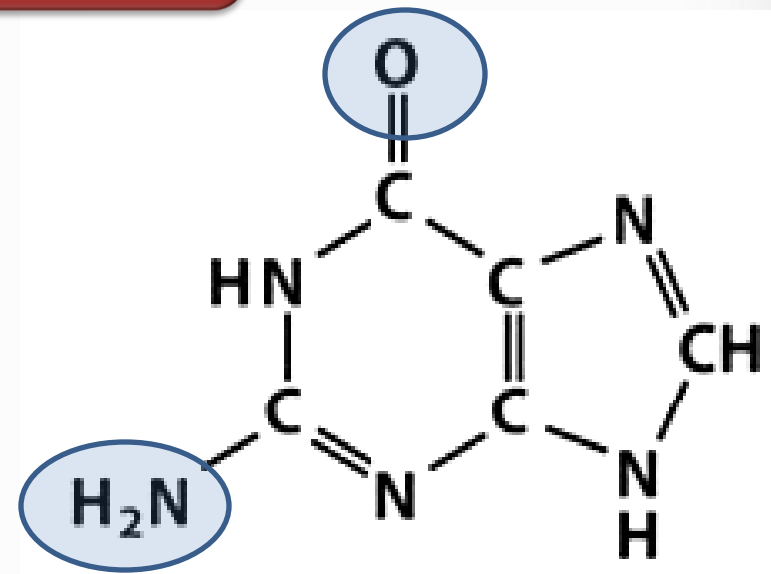


A- Purines

In both DNA &
RNA

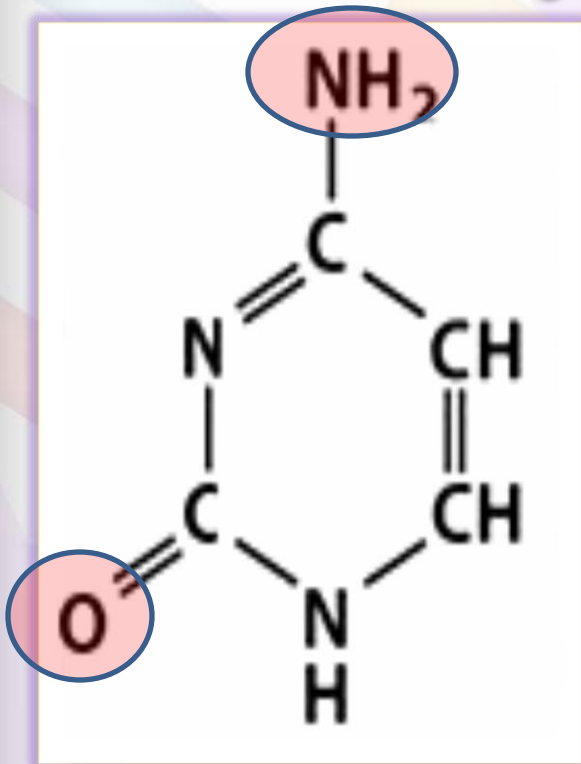


Adenine

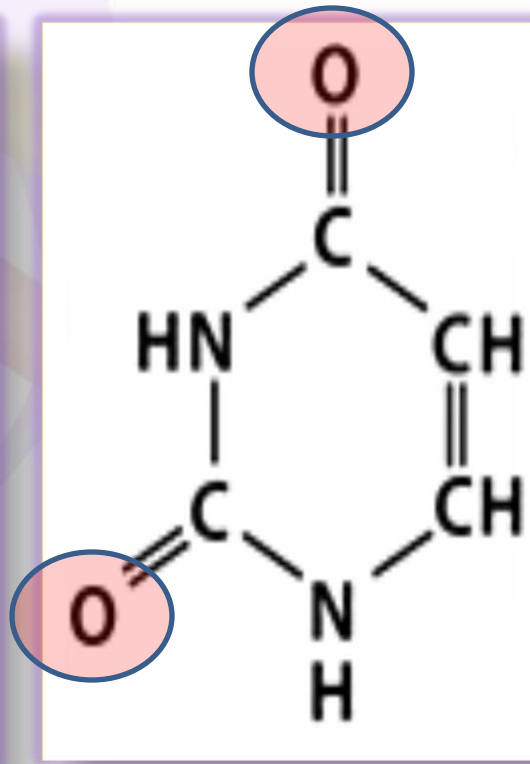


Guanine

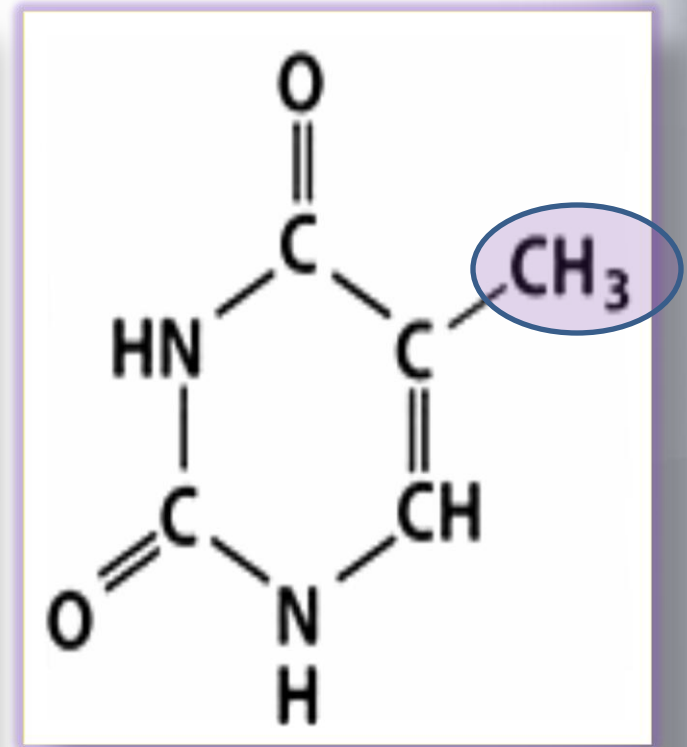
B- Pyrimidines



Cytosine

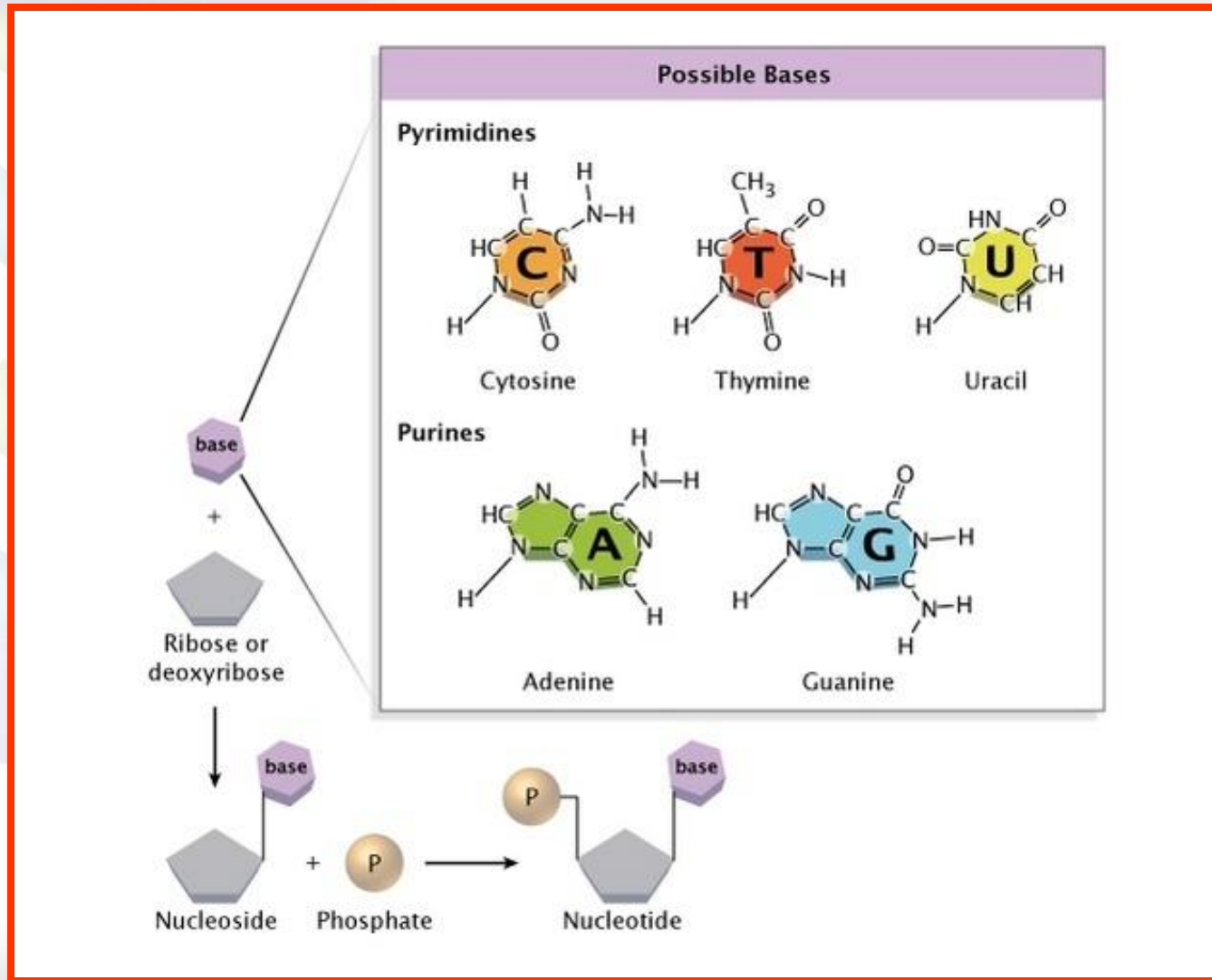


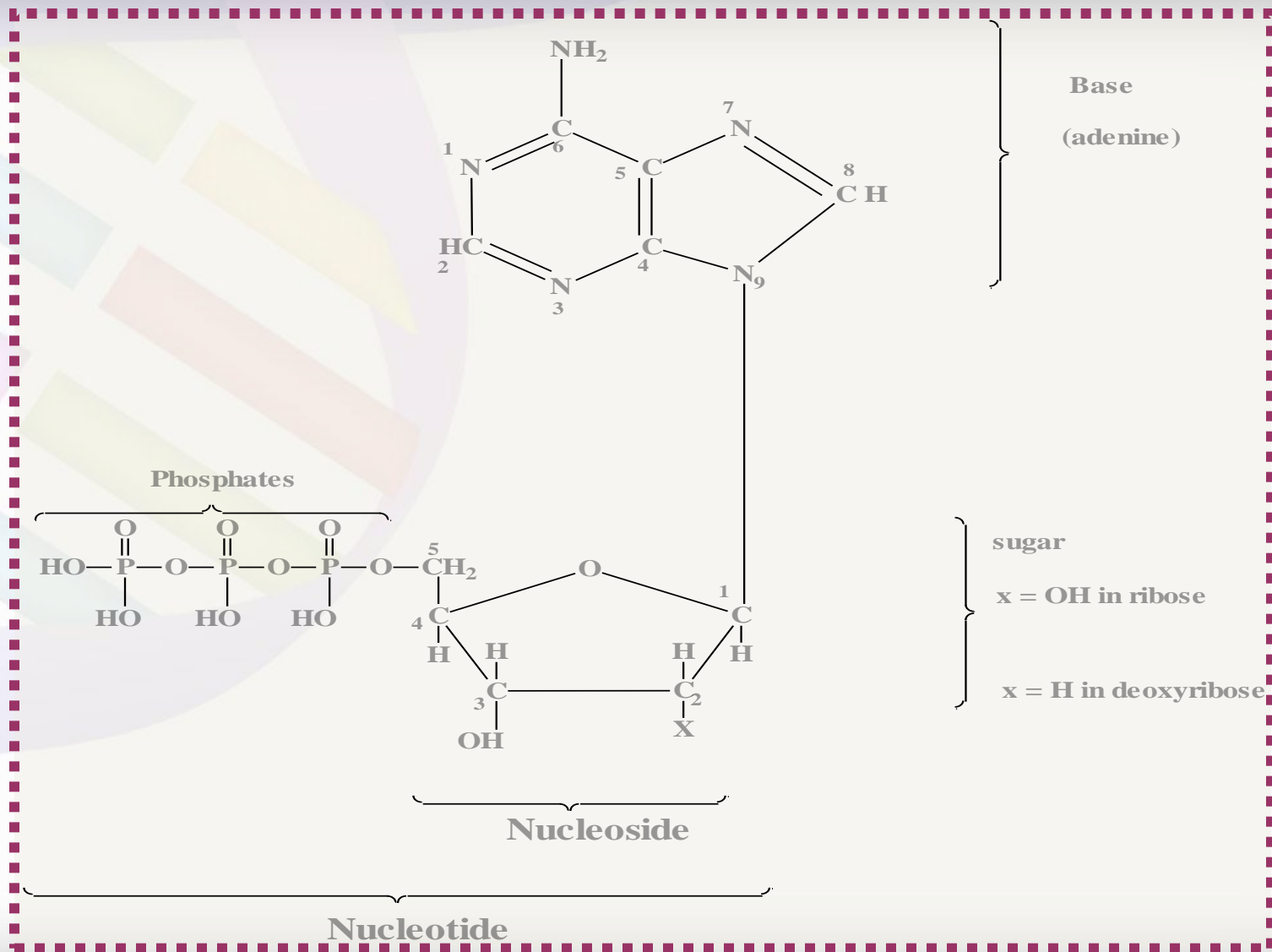
Uracil (RNA)



Thymine (DNA)

Nomenclature of nucleotides & nucleosides

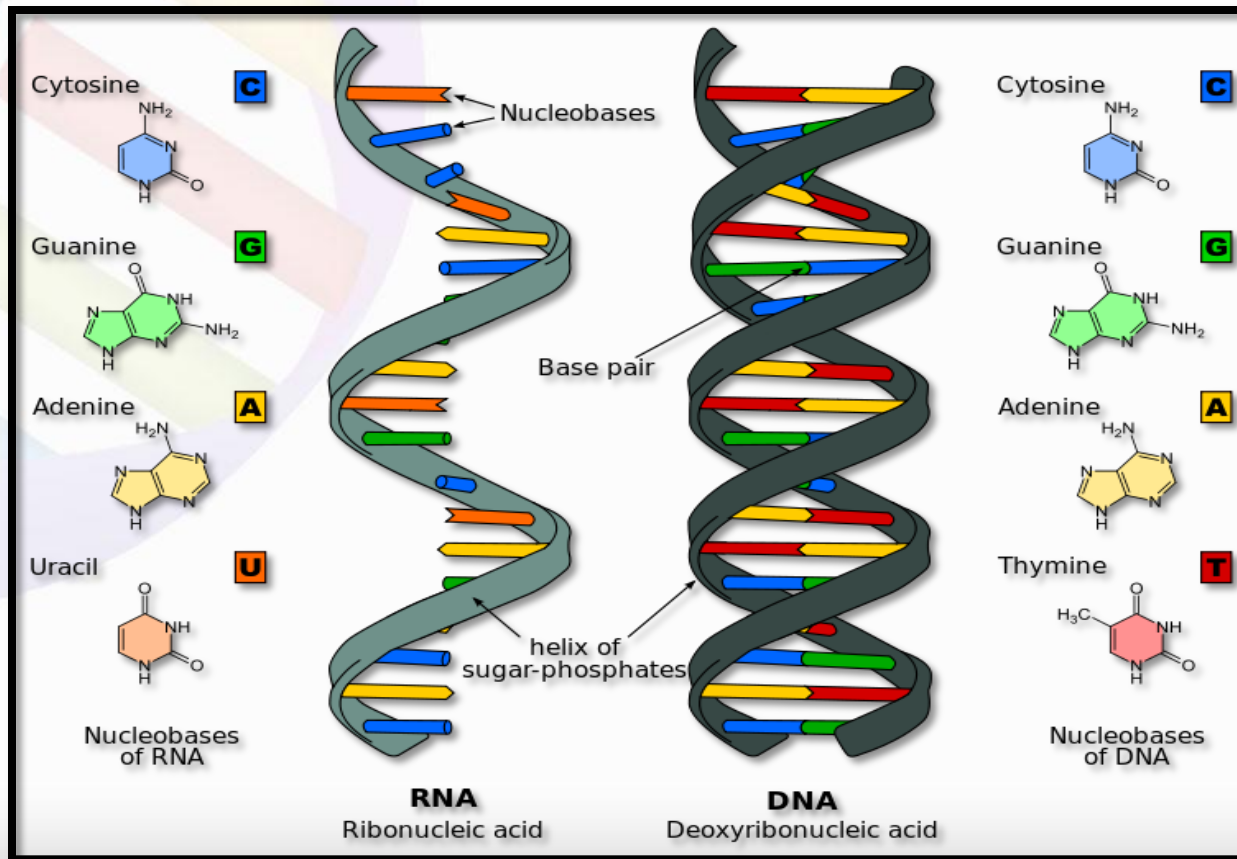




	Purines		Pyrimidines	
	Adenine (A)	Guanine (G)	Cytosine (C)	Uracil (U) Thymine (T)
Nucleoside (RNA) Deoxynucleoside (DNA) (base + sugar)	Adenosine deoxyadenosine	Guanosine deoxyguanosine	Cytidine deoxycytidine	Uridine deoxythymidine
Nucleotide (RNA) Deoxynucleotide (DNA) (base + sugar +P)	Adenylate deoxyadenylate	Guanylate deoxyguanylate	Cytidylate deoxycytidylate	Uridylate deoxythymidylate
Nucleoside Monophosphate	AMP (Adenylic acid)	GMP (Guanylic acid)	CMP (Cytidylic acid)	UMP (Uridylic acid)
Nucleoside diphosphate	ADP	GDP	CDP	UDP
Nucleoside triphosphate	ATP	GTP	CTP	UTP
Deoxynucleoside mono-di-and tri- phosphates	dAMP dADP dATP	dGMP dGDP dGTP	dCMP dCDP dCTP	dTMP(Thymidylic acid) dTDP dTTP

Importance & Functions of nucleotides

A- Building blocks of DNA & RNA



B- Nucleotide derivatives:

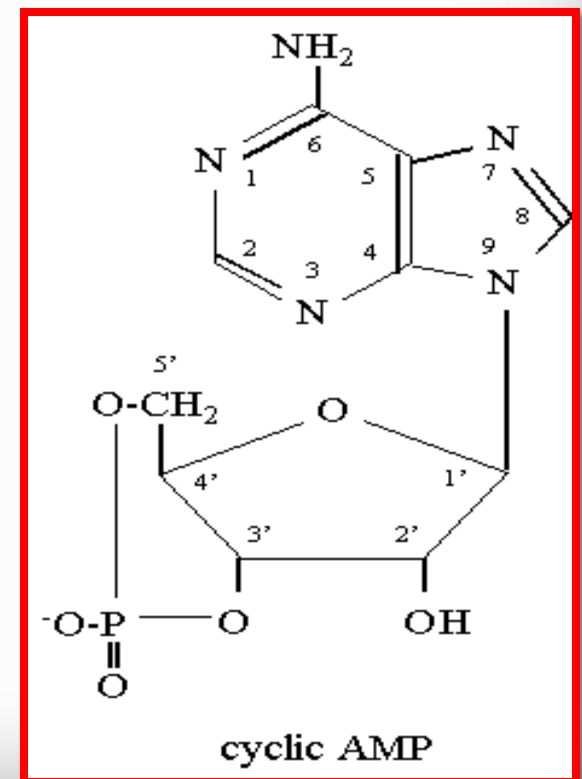
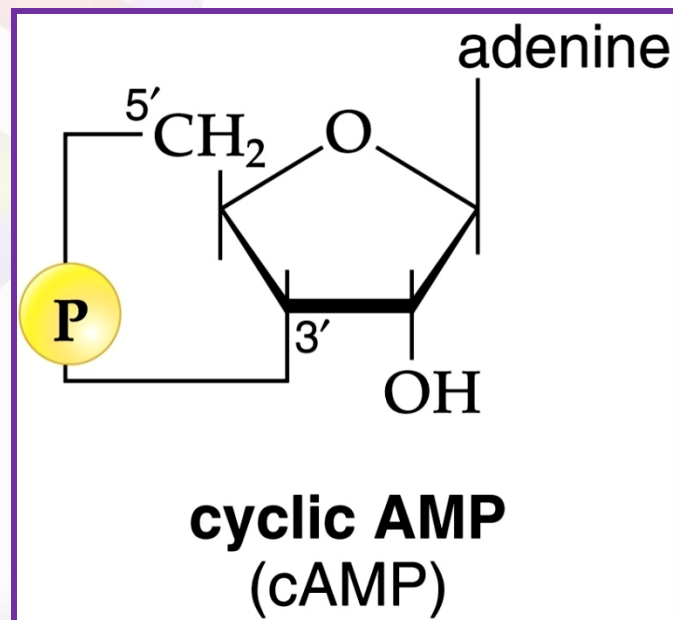
1- ATP formation which is a major source of energy in the cell



2- GTP, UTP, CTP are sources of energy in certain metabolic pathways

3- Formation of coenzymes NAD, NADP, FAD and coenzyme A

4- **cAMP** acts as a second messenger inside the cell for many hormones and cGMP act as a cellular mediator



5- Some nucleotides are important **regulators** for many metabolic reactions

6- Nucleotides act as **carriers** of activated intermediates such as:

a- **UDP- glucose** in synthesis of glycogen

b- **CDP choline** in synthesis of phospholipids

c- **GDP mannose** in synthesis of glycoproteins



C- Synthetic analogs of naturally occurring nucleotides

A- These compounds inhibit the growth of cancer cells by:

- inhibiting their enzyme activity
- or
- inhibiting the synthesis of either DNA or RNA

e.g. **5 flurouracil**



B- Allopurinol, a purine analog is widely used in the treatment of gout