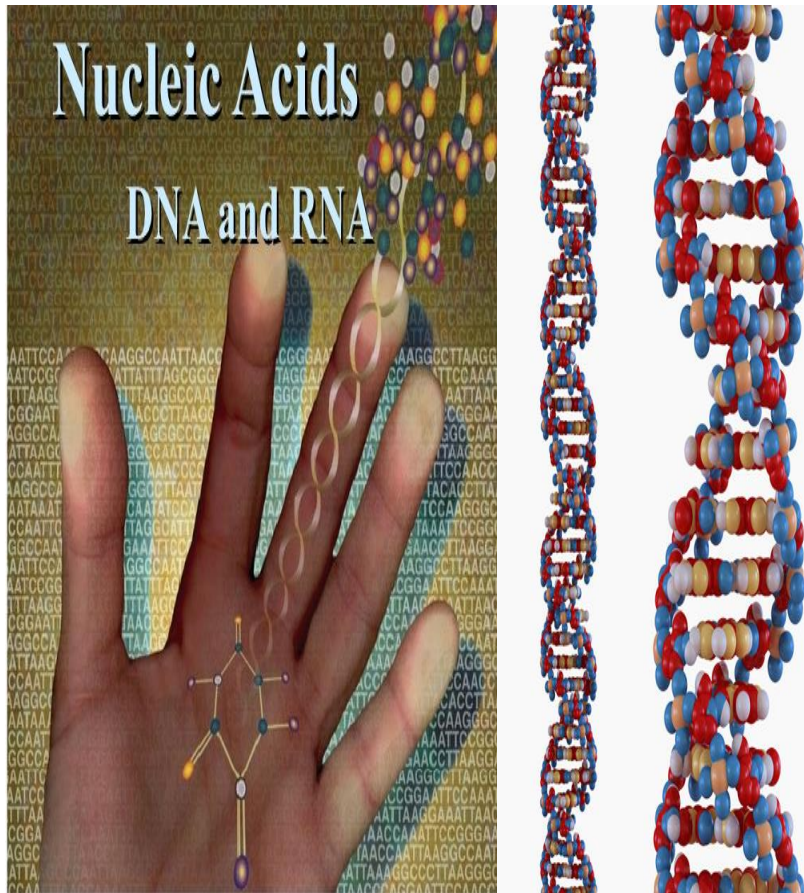




Biochemistry – Year 2



Lecture 2

By

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Objectives

- ✓ Name of nucleotides
- ✓ Structure of DNA
- ✓ function of DNA
- ✓ Structure of RNA

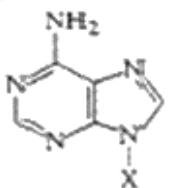
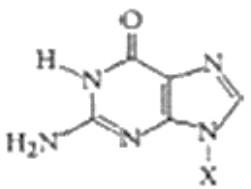
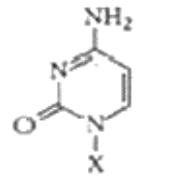
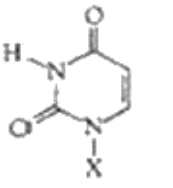
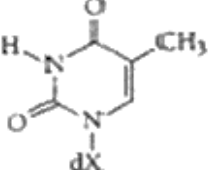
Name of nucleotides

- **Changing the – ine of the base to – ylic acid.**
Ex. Adenosine = Adenylic acid
- Nucleotides are named by combining the name of its nucleoside and the word (mono , di , tri phosphate) .

nucleosides + no. phosphate group . (mono , di , tri)

The abbreviation contains the first letter of the Nucleotides and the word mono phosphate or di phosphate or tri phosphate respectively.

Ex. Adenosine = Adenosine monophosphate

Sr. No.	Base Formula	Base (X = H)	Nucleoside (X = Ribose)	Nucleotide (X = Ribose Phosphate)
1.		Adenine Ade A	Adenosine Ado A	Adenylic acid Adenosine monophosphate AMP
2.		Guanine Gua G	Guanosine Guo G	Guanylic acid Guanosine monophosphate GMP
3.		Cytosine Cyt C	Cytidine Cyd C	Cytidic acid Cytidine monophosphate CMP
4.		Uracil Ura U	Uridine Urd U	Uridylic acid Uridine monophosphate UMP
5.		Thymine Thy T	Deoxythymidine dT _{hd} dT	Deoxythymidylic acid Deoxythymidine monophosphate dTMP

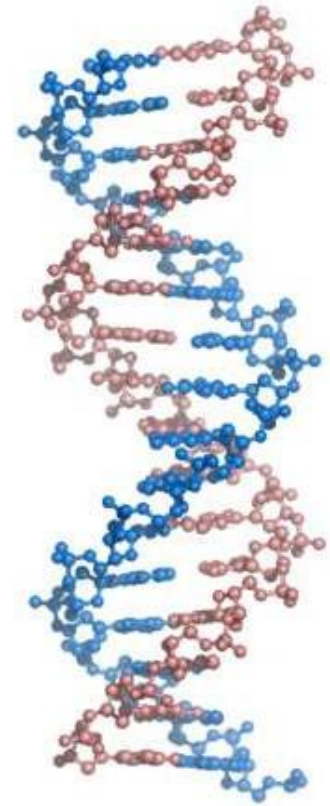
Names and Abbreviations of Nucleic Acid Bases, Nucleosides and Nucleotides

Structure of DNA

What is the Double Helix?

Shape of DNA

- Looks like a twisted ladder or zipper
- 2 coils are twisted around each other
- **Double** means 2
- **Helix** means coil
- The sister strands of the DNA molecule run in opposite directions (**antiparallel**)

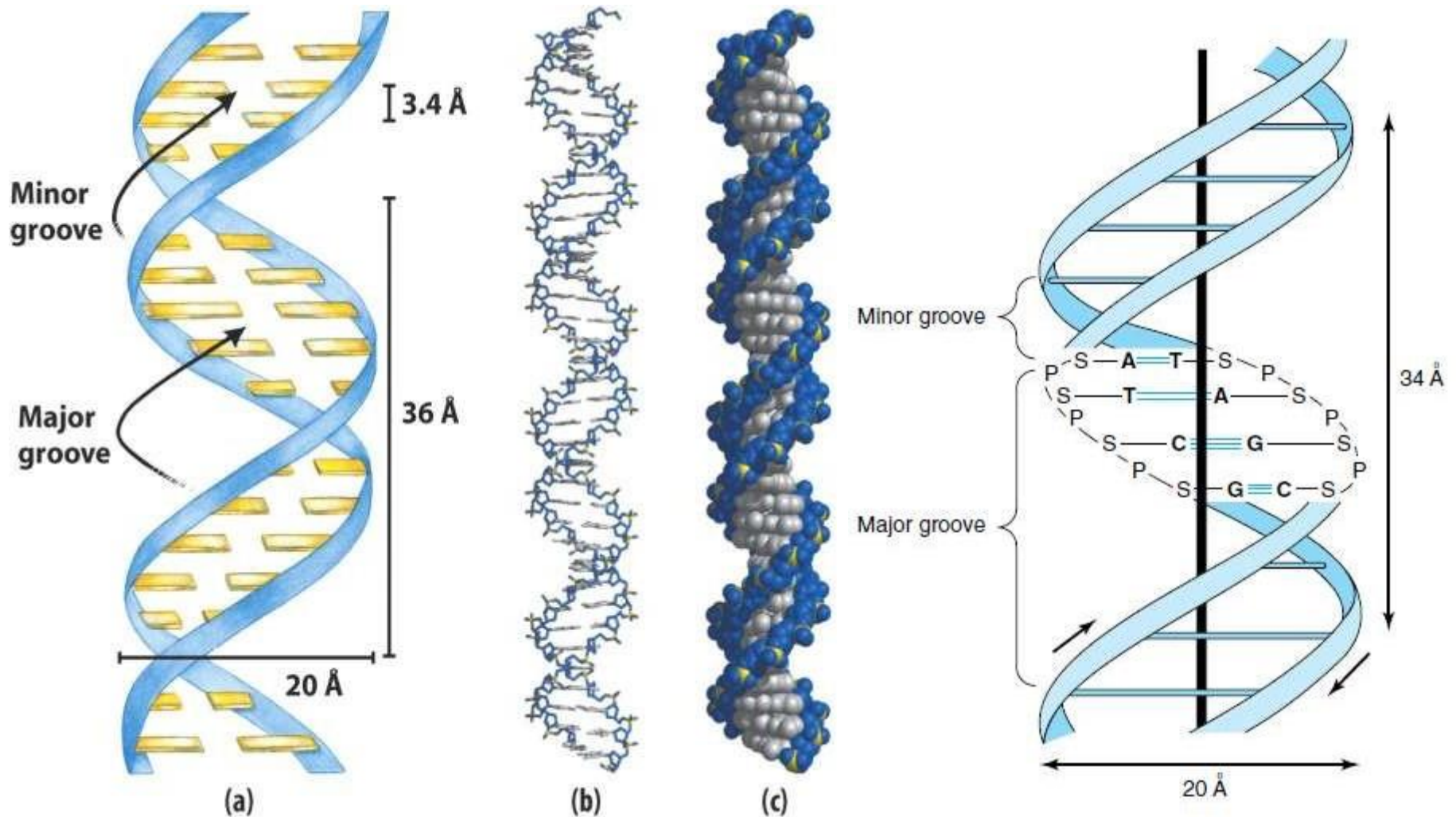


- They are joined by the bases , Each base is paired with a specific partner: **A** is always paired with **T** , **G** is always paired with **C** Purine with Pyrimidine
- This the sister strands are **complementary** The but not identical.
- bases are joined by **hydrogen bonds**, individually weak but collectively strong

Watson-Crick model for the structure of DNA

Complementarity of strands

in the DNA double helix

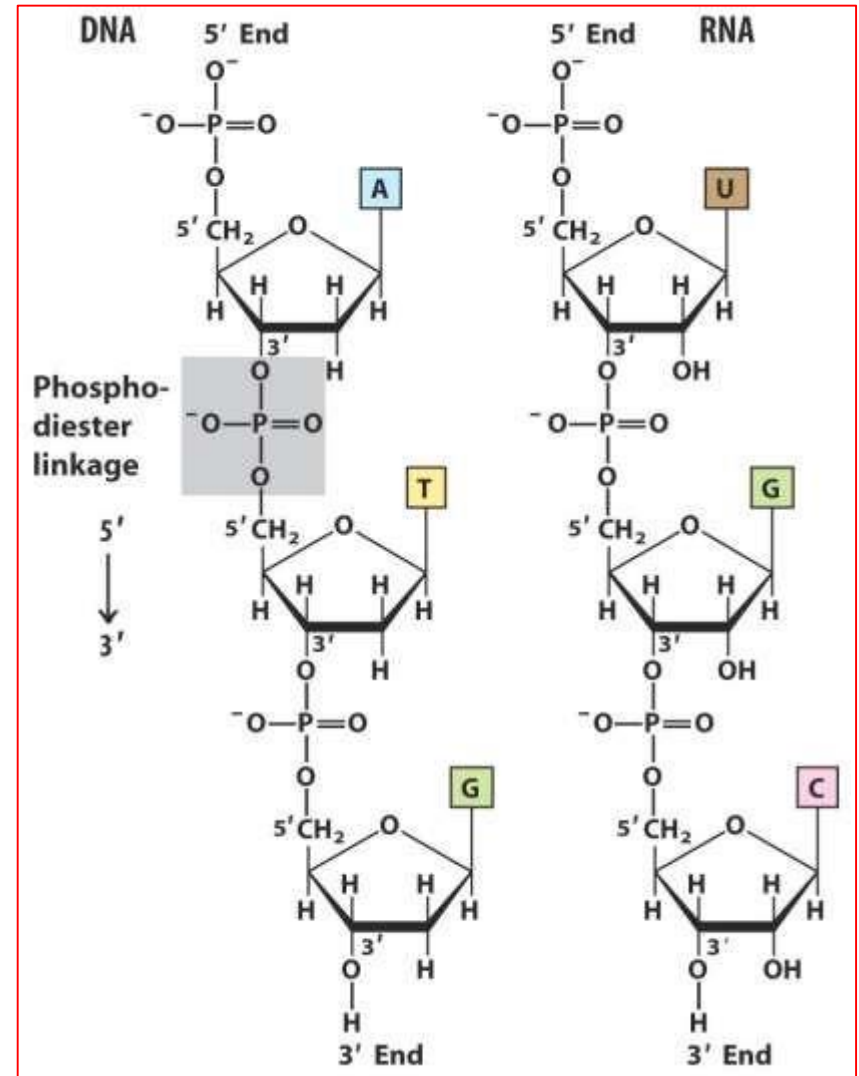


Structure of DNA

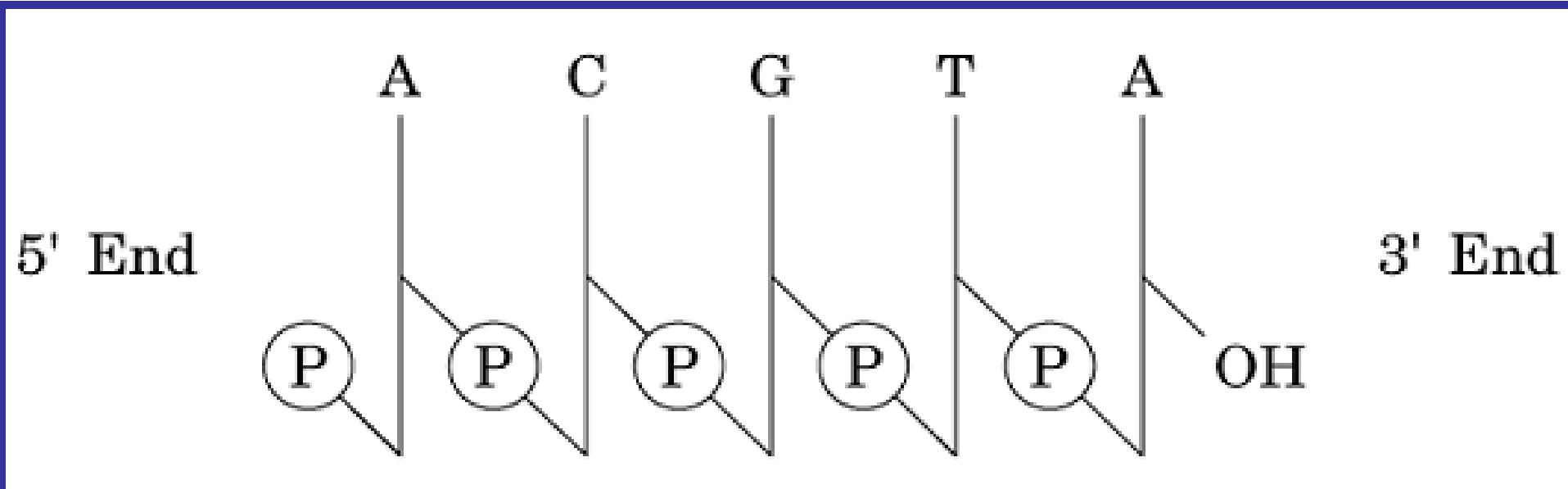
1. Primary structure

The base sequence (or the nucleotide sequence) in polydeoxynucleotide chain.

3', 5' phosphodiester bond link nucleotides together to form polynucleotides chains



The structure of a DNA chain can be concisely represented



An even more abbreviated notation for the chain is

- pApCpGpTpA
- Pacgta

The base chain is written in the 5' \longrightarrow 3' direction

2- Secondary structure

The Secondary structure is defined as the relative spatial position of all the atoms of nucleotide residues.

Chargaff's Rule

Erwin Chargaff showed the amounts of the four bases on DNA (A,T,C,G) In a body or somatic cell:

A = 30.3%

T = 30.3%

G = 19.5%

C = 19.9%

- Adenine and Thymine always join together

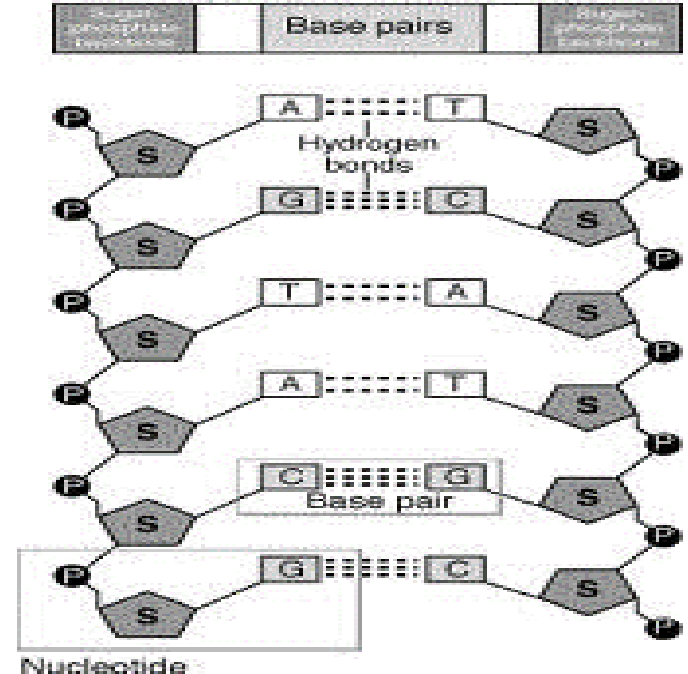
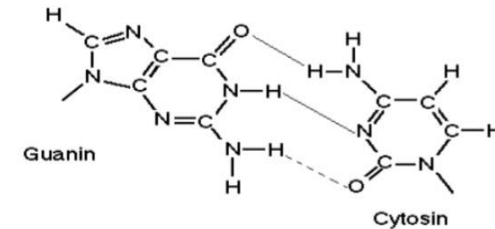
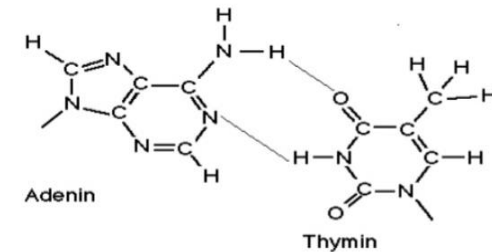
A = T

- Cytosine and Guanine always join together

C = G

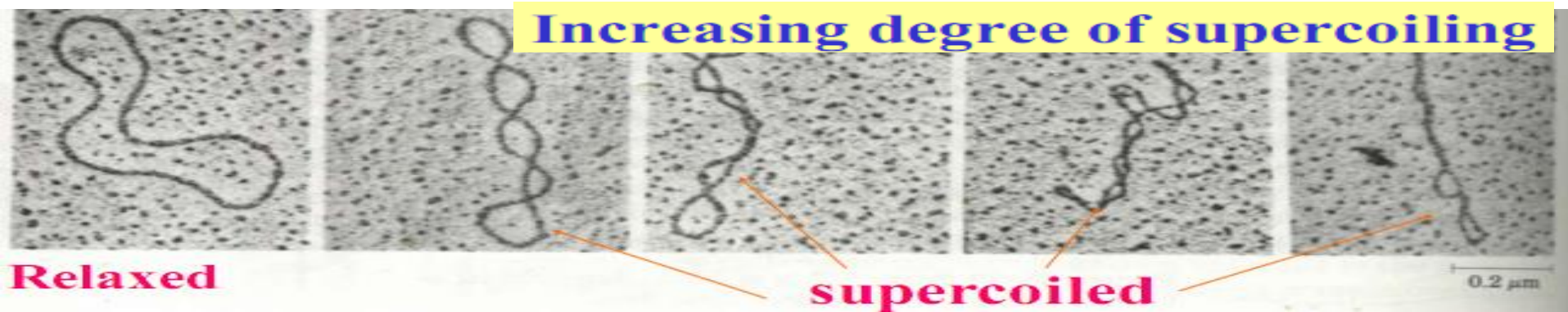
Hydrogen Bonds

- The bases attract each other because of hydrogen bonds.
- Hydrogen bonds are weak but there are millions and millions of them in a single molecule of DNA.
- The bonds between cytosine and guanine are shown here with dotted lines



3- Tertiary structure

Supercoils :double- stranded circular DNA form supercoils .



- The DNA in a prokaryotic cell is a supercoil.
- Supercoiling makes the DNA molecule more compact thus important for its packing in cell



Functions of DNA

- Stores or carrier of genetic information.
- Maintain growth and repair.
- Controls all activities
- Contains protein codes.
- The template strand involved in replication and transcription.
- Ensures each daughter cell and gamete receives exact information.

- **Gene** : the minimum functional unite in DNA
- **Genome** : the total genes in a living cell or living beings.

Gene are made of DNA . One strand of our DNA contains many genes . All of these genes are need to give instructions for how to make and operate of our bodies.

Clinical usage Synthetic nucleotide analogues

Synthetic nucleotide analogues	Clinical application
5-fluoro- or 5-iodouracil	Cancer treatment...incorporated into DNA prior to cell division
Allopurinol	Gout treatment

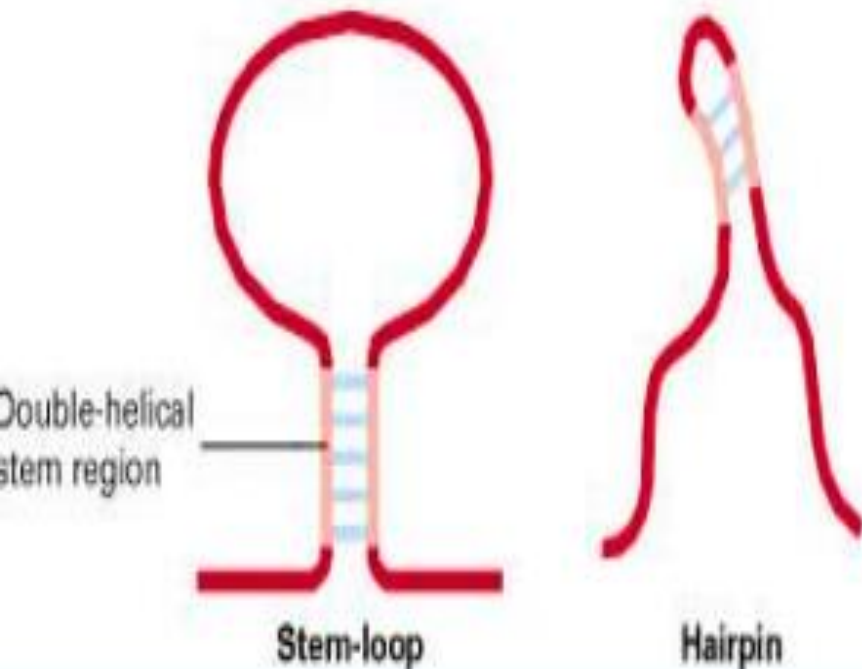
The distribution of nucleic acids in the eukaryotic cell

- DNA is found in the nucleus
with small amounts in mitochondria and chloroplasts
- RNA is found throughout the cell

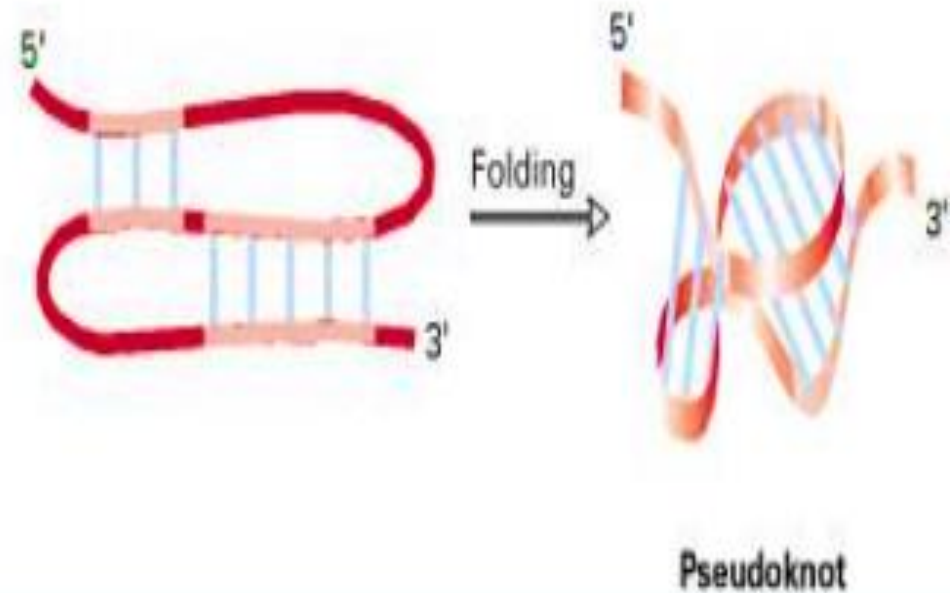
RNA structure

RNA molecules are largely single stranded but there are double – stranded regions.

(a) Secondary structure



(b) Tertiary structure



thanks