



بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ  
مادة البيومن أسهل وامتع المواد في هذا العلم  
لذلك قررنا ان نجعلها أسهل للجميع



شعارنا : دعونا سويا نفك السوير كويل

\* تعريف بالمذكرة:

- شاملة لجميع المواضيع . (كاملة)
- تركيز على النقاط الهامة .
- جداول تسهل عملية الحفظ .
- أسئلة عامة .

Team leader : **مجهول**

Team group :

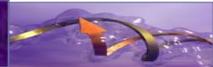
أبويسرا

Blue eye

Dr.noop

Ocean

والشكر للجنود المجهولين الذين فضلوا عدم ذكر أسمائهم



## DNA structure and replication

### \* overview :

- \* DNA is present in the nucleus & mitochondria in prokaryotes .
- \* DNA is present in chloroplasts of plants .
- \* Prokaryotes ( lack nuclei ) have :
  - a) single chromosome .
  - b) may contain nonchromosomal DNA in the form of plasmid .

- ▣ Transcription : ( RNA synthesis ) is the first stage in the expression of genetic information .
- ▣ Translation : ( protein synthesis ) is translation of nucleotide sequence .
- ▣ Gene expression : ( Transcription + Translation ) .
  - Gene expression means only protein synthesis . (F)

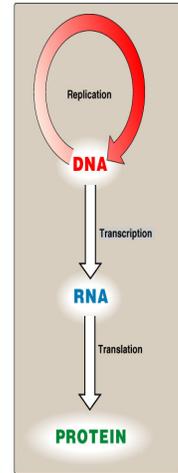


Figure 28.1  
The "central dogma" of molecular biology.  
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### \* Structure of DNA :

- is a polydeoxyribonucleotide ( many monodeoxyribonucleotide )
- linked by 3 => 5 phosphodiester bonds .
- double stranded ( except in few viruses ) .
- double helix .

- ▣ This DNA is found associated with proteins and since the proteins found in nucleus is known as **nucleoprotein**
- ▣ DNA is present in chromosomes in the nucleus of eukaryotic organism
- ▣ In the *prokaryotic*, the DNA is found in the nucleus ( F ) in the nucleoid



### \* A ) 3 => 5 phosphodiester bond :

- Nucleotides attached to each other through phosphodiester bond .
- These bonds join 5-hydroxyl group of deoxyribose of nucleotide to 3-hydroxyl group to adjacent nucleotide .

▣ Note:

the chain with 5→3 direction has a 3→5 phosphodiester bond  
The bases are written from 5-end to 3-end

- The chain is long polar unbranched .
- The chain polarity comes from :
  - a) 5- end ( free phosphate )
  - b) 3- end ( free hydroxyl )
- the phosphodiester linkage can be cleaved by chemicals or hydrolyzed Enzymatically by nucleases .

- ▣ Endonuclease : cleaves in the interior of the chain yield 2 polynucleotide .
- ▣ Exonuclease : cleaves one of the two end yield ( 1 mononucleotide & 1 polynucleotide )

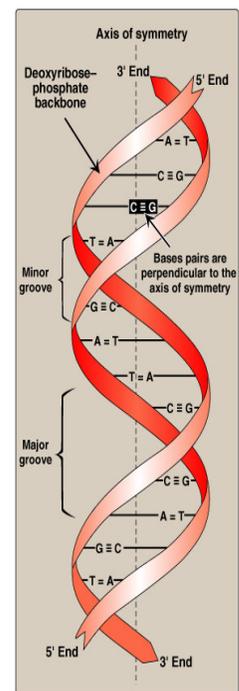


Figure 29.3  
DNA double helix, illustrating some of its major structural features.

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### \* B ) Double helix :

- coils around axis of symmetry .
- in the double helix, the chain are paired in antiparallel manner
- in the double helix, the hydrophilic part is on the outside (*deoxyribose-phosphate backbone*) **and hydrophobic part is inside( the bases )**

- ▣ overall structure creates two types of groove (for binding regulatory protein along the chain)  
**1.major groove (wide)    2. mainor groove (narrow)**



**\*\* Dactinomycin ( actinomycin D ) (MCQ ) :**

- anticancer drug .
- dactinomycin exert their cytotoxic effect into **narrow groove**.
- interfere with DNA & RNA synthesis .
- **inhibit transcription ( always come in exams )** .

**\* 1) Base pairing :**

- The bases of one strand are paired with the second strand
- A---T 2 hydrogen bond between them ( the same amount )
- G----C 3 hydrogen bond between them (the same amount)

▣ **Chargaffs Rule : ( MCQ ) ( very important ) :**

- in double – stranded DNA . ( not single ) .
- A = T
- C = G
- Total amount of purines equal to the amount of pyrimidines

- DNA structure is stabilizes by :

- a) hydrogen bond .
- b) **hydrophobic** interaction . ( MCQ )

**\* Separation of the two DNA strands in the double helix :**

- separation occur when hydrogen bond is disrupted .

▣ **the two strands of the double helix can be separated by :**

- a) *change of the PH of the DNA solution ( the nucleotide bases ionize )* .
- b) temperature; one-half of the helical structure is lost ( called **melting temperature** ) .

- in a & b the phosphodiester bond is **not broken** . ( T ) ( important )

- the loss of helical structure is know as **denaturation**

▣ single stranded DNA has a higher absorbance at 260nm than a double – stranded DNA .

▣ DNA that contain high A & T denature at a lower temp. than C & G rich DNA .  
( because of hydrogen bond )

\*\*\*\*\* ( these notes always come in exams )

- **complementary** DNA – strand can reform of double helix called  
**renaturation or reannealing** ) ( MCQ )



**\* Structure forms of the double helix :**

<i>A</i> -form	<i>B</i> - form	<i>Z</i> -form
Right handed helix & is produced by dehydrating the B – form .	Right handed helix	Left handed helix
Eleven base pair per turn .	Ten residues per turn ( 360 )	Twelve base pair per turn .
Tilted 20 a way from the perpendicular .	Bases are perpendicular	-----
The conformation found in DNA , RNA hybrids or RNA,RNA double stranded ( not single ) region is very close to the A- form .	Chromosomal DNA is consist primarily from thisB- form .	In DNA that have a sequence of alternating purine & pyrimidine . e.g: poly CG .

■ Transition between these helical forms of DNA may play an important role in regulating Gene expression .

Circular DNA molecules

<i>Eukaryotes</i> (MCC)	<i>Prokaryotes</i> (MCC)
-One long linear molecule of double stranded DNA which bound to protein to <b>Form chromatin.</b> - closed circular DNA in mitochondria	- single , double – stranded , <b>supercoiled , circular chromosome</b> which bound to histone – like protein & RNA to form a <b>nucleoid</b> .
-----	<b>Plasmid :</b> a) small b) circular c) extrachromosomal DNA

■ **plasmid function :**

- a) carries genetic information .
- b) undergoes replication that may or may not be synchorized to chromosomal division .
- c) antibiotic resistance .
- d) facilitate transfer of genetic information .
- e) vectors in recombinant DNA technology .