Final Revision on Unit two

Chapter one: DNA

Choose from column (B) what suitable each statement in column (A):

(A)	(B)
1-Hershy and chase **2-Watson and crick** **3-Griffith** **4-Avery** **5-Franklin**	**a-** Gave us the acceptable model of DNA molecule. **b-** Describe the bacterial transformation. **c-** Noticed the amount of DNA is twice in somatic cells. **d-** Provided that DNA is the genetic material of bacteriophage. **e-** Describe the structure of DNA by using rays diffraction. **f-** Isolated the material that inducing genetic transformation in Non-virulent bacteria.

1→d 2→ a 3→ b 4→f 5→ e

Choose the correct response:

1. **Deoxyribonuclease enzyme hydrolysis…….....**
   (Proteins and DNA – RNA – proteins – RNA and proteins – **DNA**)
2. **Phage genetic material contains…….....**
   (Sulphur – RNA – **phosphorus** – phosphate – Ribose sugar – Ammonia)
3. **For a DNA double helix which of the following statements is correct…….....**
   (A = G , C = T – A = C , G = T– A + T = G + C– **A = T , G = C**)
4. **The biological information molecules are…….....**
   (proteins – Genes – Chromosomes – **Nucleic acids**)
5. **Which of the following nucleotide parts bond with each other with covalent bonds to form the DNA backbone…….....**
   (**The sugar and the phosphate** – The sugar and the nitrogen base – The phosphate and nitrogen base – Non of all)
6. **For a DNA double helix which of the following is not correct…….....**
   (G + A = C + T – A = T , G = C – **A + T = G + C** – A + G / T + C = 1)
7. **The bearers of genetic information is…….....**
   (proteins – fatty acids – RNA – **chromosomes**)
8. **A crucial experiment which explain that the DNA is the genetic material in pneumonia bacteria is…**……..
   (phages – bacterial transformation **– Deoxyribonuclease enzyme** –Ligase enzyme)
9. **In DNA molecule, the no. of Adenine nucleotides equal the no. of…….....**
   (uracil – Guanine – Cytosine – **thymine**)

10. The third carbon atom Deoxyribose sugar has…….....

(hydrogen atom – **hydroxyl group** – oxygen atom – carboxyl group)

11. If the sequence of the nitrogenous bases in one strand – of DNA molecule is 5' ATTCCGCTA 3' The sequence of the complementary strand would be…...

a. 5' TAAGGCGAT3'. b. 3' ATTCCGCTA 5'.

c. 3' TAAGGCGAT 5'. d. 3' TAAGCCGAT 5'.

12. In DNA molecule, The number of Adenine nucleotides equal the number of ...

a. Thymine. b. Septosine. c. Uracil. d. Guanine

13. If a protein of DNA contains 22 % of thymine, the ratio of Guanine is …….....

a. 44 %. b. 22 %. c. 11 %. **d. 28 %.**

14. If a portion of DNA molecule consists of 84 nitrogenous bases, the number phosphate group of one strand of this portion is ……...

a. 84. b. 168. **c. 42.** d. 21.

15. If the ratio of cytosine nucleotides on one strand of DNA molecule of special gene is 45 %, the ratio of Adenine nucleotides on another strand is …….

a. 75 %. b. 65 %. c. 95 % **d. 55 %.**

16. The number of nucleotides in each turn of DNA molecule is ……..

a. 10. **b. 20.** c. 15. d. 5.

17. The last experiment which determined that DNA is the genetic material is…..

(Bacterial transformation – **bacteriophage** – Deoxyribonuclease enzyme)

18. The scientist who isolated the active transforming material was……..

(Griffith – **Avery** – Franklin – Watson)

19. …….strain(s) of pneumonia bacteria lead to death of some mice.

(strain (S) – strain (R) – living (R) – **heat killed (S) + living (R)**)

20. The number of turns in a piece of DNA double helix containing 1500 nucleotides is…….turns.

(**75** - 100 - 125 - 150)

21. The chromosome doesn't contain……

(Cytosine – **Uracil** – Guanine – Adenine)

22. Which of the following discoveries provide the best evidence for the belief that DNA is the genetic material…….

a) The DNA content of the cells from different tissues of an organism is the same.

b)Heritable transformation of bacterial cells is brought about by DNA

c)DNA is present in chromosomes

d)DNA is present in cells that divide

23. If half of the amount of DNA in the horse scrotal sac is (X), so its liver cell contains ……of DNA

a)X b) 1 *X* **c) 2X** d)4X

24. The ratio between the amount of DNA in the uterus cells and in the kidney cells is ……

a)2:1 b)1:2 **c)1:1** d)3:1

25. The ratio between the amount of DNA in the somatic cells of the mice and that in its gametes is ……

(1:2 - 1:1 – **2:1** – 3:1)

26. The ratio between the amount of DNA in the primary spermatocytes nuclei and that in the Sertoli cells

(1:2 - **1:1** – 2:1 – 3:1)

27. If the no. of nitrogenous bases in a portion of DNA molecule is 150, so the no. of nucleotides in this portion is ……..

(one - 50 – **150** – 450)

28. If the ratios of nucleotides in a sample of nucleic acid are

C = 31% G = 23% A = 20% T = 26%

these ratios indicate :

a- DNA double helix **b- DNA single strand** c- r.RNA d- t.RNA

29. Which one of the following is with RNA genome :

a- wheat plant b- rat **c- AIDS virus** d- Bacteria E.Coli

30. ……nitrogenous base has one ring and join the complementary base with three hydrogen bonds.

a)cytosine b)thymine c)adenine d) guanine

31. The number of nucleotides that are found in DNA molecule in each turn equals

(5 - 10 - 15 - **20**)

32. The number of turns in a piece of DNA double helix containing 1000 nucleotide is…….turns.

(**50** - 100 - 150 - 200)

33. If a sample of DNA contains 400 nucleotides with purine bases, so the number of nucleotides with pyrimidine bases will be ……

(200 – **400** – 600 – 800)

34. The number of DNA molecules in the nucleus of the human sperm is……

(1 – **23** – 46 – 92)

35. Concerning DNA double helix, which of the following isn't correct:……

a- A+G = T+C b- A = T and C = G

c- A+G / T+C =1 **d- A+T = G+C**

36. Which of the following nucleotide constituents combine with each other by covalent bonds to form DNA skeleton :……..

a- Deoxyribose sugar and PO_4 group c- PO_4 group and nitrogenous base

b- sugar and nitrogenous base d- Ribose sugar and phosphate group

37. The chemical analysis of a piece of DNA showed that it contains 22% of its nitrogenous bases Thymine , what is the ratio of cytosine in this portion :

a- 44% **b- 28%** c- 22% d- 78%

38. Bacteriophage genetic material contains :……..

a- phosphorus b- sulphur c- ribose sugar d- RNA e- ammonia

39. Bacteriophage genetic material contains : …….

a- sulphur b- Ribose sugar **c- Deoxyribose sugar** d- Ammonia

40. For a DNA double helix which of the following is correct :…….

a- A=C , T=G **b- A+C = G+T** c- A+T = C+G d- A=G , T=C

41. The second carbon atom of deoxyribose sugar has:……

a- phosphate group b- nitrogenous base

c- hydrogen atom d- hydroxyl group

42. If a portion of DNA contains 26% of thymine, the ratio of Guanine is

a- 26% b- 13% **c- 24%** d- 52%

43. There are ……..types of nitrogenous bases enter in the structure of the nucleic acids. (4 – **5** – 6 – 7 – 8 – 9)

44. The amount of DNA in the nucleus of the sperms is ……. The amount of DNA in the nucleus of sertoli cells.

(equal – twice – **half** – quarter)

45. The amount of DNA in the secondary Oocytes is …….. The amount of DNA in the uterus cells.

(equal – twice – **half** – quarter)

46. If a sample of DNA consists of 2000 nucleotides and the number of adenine bases in this sample is 400 so, the number of guanine will be ……..

(400 – **600** – 800 – 1000)

47. The number of DNA molecules in the nucleus of human sperm is ……

(1 – **23** – 46 – 92)

48. The stability of the double helix DNA molecule depends on …….

(Covalent bonds – **hydrogen bonds** – peripheral granules – ionic bonds)

49. The phosphate group in the sugar phosphate backbone is linked to carbon atom no…….. in the sugar.

(1 – 3 – 5 – **3 and 5**)

Complete the following statement with suitable words:

1. **Deoxyribonuclease** enzyme hydrolyses DNA completely but it does not affect the proteins or RNA.
2. The phage genetic material contains **Phosphorus** while the phage protein coat contains **Sulphur**
3. The amount of DNA in somatic cells is **Twice** while the reproductive cells (gametes) is **Half the amount of genetic information**
4. The scientist Griffith done his experiment on bacterial transformation.
5. By using chemical analysis of DNA, A nucleotide consists of **pentose sugar ,phosphate group .** and **nitrogenous base**.
6. The groups of nitrogen bases divide into the purines and **Pyrimidines**
7. The purines consists of double ring which are **adenine** and **guanine** , while **Pyrimidines** consists of one ring which are **thymine** , **cytosine**
8. In DNA molecule, the number of adenine equal **thymine** while the number of **Guanine** equal **cytosine**
9. In the structure of nucleotides, the nitrogen base is attached to **first carbon** atom of the sugar by **covalent** bond while the phosphate group is attached to **Fifth carbon atom** atom of the sugar by **covalent** bond.
10. The strand of alternating **Phosphate** and **sugar group** is called sugar phosphate backbone.
11. The backbone of the strand has a free **OH** group at **3'** prime and a free **phosphate** group at **5'** prime.
12. **Watson** and **Crick** produced the acceptable model of DNA.
13. If a portion of DNA strand run's 3'AGCTACT 5', its partner must run **5'.TCGATGA.3'**
14. DNA of phage contains **Phosphorus** while protein coat contains **Sulphur**
15. Some viruses contain **RNA** in their genetic material instead of DNA.
16. The DNA is a double helix with two **Antiparallel** strands.
17. If the number of adenine nucleotides on one turn of DNA molecule is 10, the number of guanine nucleotides is **zero**
18. The number of free phosphate groups in DNA molecule is **two**

Put (√) in front of the correct statements and (X) for the wrong ones:

1. Purines contain adenine and cytosine. **(X) adenine and guanine**
2. Maltose sugar is one contents of ribonucleic acid. **(X) ribose sugar**
3. Sugar phosphate backbone is present inside of the helix. **(X) outside the helix**
4. All genes are made up of DNA. **(X) DNA and RNA**
5. Crick and Watson gave us the acceptable of DNA molecule. **(√)**
6. The bearers of genetic information are chromosomes. **(√)**
7. There are about 19 different kinds of amino acids. **(X) 20**
8. Avery used x rays diffraction to describe the structure of DNA. **(X) Franklin**
9. There are 10 pairs of nitrogen bases in each turn of DNA molecule. **(√)**
10. The distance between 2 sugar phosphate backbones in DNA is constant. **(√)**
11. There are 2 hydrogen bonds between G nucleotide and C nucleotide in DNA. **(X) 3 hydrogen bonds**
12. Half turn of DNA molecule has 10 nucleotides. **(√)**

What are the achievements of the following:

1. Griffith.: **discovered the bacterial transformation phenomenon**
2. Avery.: **isolated the material that including genetic information in non-virulent bacteria**
3. Hershey and Chase.: **provided that DNA is the genetic material of bacteriophage by using radio-active phosphorus and sulphur**
4. Franklin.: **passed X-rays diffraction pictures through a crystal of highly purified DNA to indicate structure of DNA**
5. Watson and Crick.: **Gave us the acceptable model of DNA molecule**

Give reasons:

1. When mice of the experiment were infected by pneumonia they died after injection by a certain strain of bacteria but in another case after injection by another strain they didn't die.

Because there are two strains of bacteria, 1st strain called virulent bacteria (S) causes pneumonia to the mice and it killed the mice while 2nd strain called non virulent (R) bacteria, causes pneumonia but did not kill the mice

2. It is necessary for eggs and sperms (pollen grains) contain only half the amount of genetic material found in the other cells of the body.

Because two reproductive cells, sperm and egg combine to form zygote that develop to a new individual carries twice amount of DNA (2n) similar to parental individual

3. Scientists thought at first that proteins carry genetic information.

Because DNA contains only 4 kinds of nucleotides (monomers) whereas proteins contain 20 kinds of amino acid (monomers), so proteins can produce more variation different combinations than DNA

4. In bacterial transformation, the non virulent bacteria convert into virulent ones.

-**Because some of the genetic material transfer from the killer virulent bacteria and entered to non virulent bacteria transferring them to virulent form**

5. When the mice injected by the virulent bacteria after killing it by heating mixed with non virulent strain, the mice died.

- **Because some of the genetic material transfer from the killer virulent bacteria and entered to non virulent bacteria transferring them to virulent form that causing death of the mice**

6. There are only four different nucleotides in DNA molecule of living organisms.

-**Because the sugar and phosphate group in any kind of the nucleotide are the same while there are 4 different kinds of nitrogen base, so there are 4 different kinds of nucleotides.**

7. The sugar phosphate backbone is not symmetrical.

-**Because it has a definite orientation with a free 3' (OH) group ate one end and free 5' phosphate group at the other end**

8. amount of DNA in the somatic cells is an evidence that DNA is geneticsubstance.

because somatic cells taken different organs (liver and kidney) in the same species contain the same amounts of DNA and also it was twice the amount of DNA in the gametes,while the amounts of proteins vary in the somatic cells from one tissue to another and it is not always lower in gametes. also, the proteins and RNA are made and destroyed regularly in the cell while the DNA is stable once made.

9. The position of one strand of DNA is opposite to the other.(Anti Parallel)

due to the presence of the free phosphate groups of the two DNA strands at the opposite ends and that to form the most stable combination of the hydrogen bonds between the two DNA strands.

10. There are only four different nucleotides in DNA.

because each nucleotide in DNA is composed of deoxyribose sugar, phosphate group and one nitrogenous base out of four kinds of bases which are Adenine (A), guanine (G), Thymine (T) or Cytosine (C).

11. The backbones of 2 DNA strands has the same distance from one to another.

Because each pair of bases consists of one single ring and one double ring and so the rung of the ladder are the same width

12. The 2 nucleotide strands of DNA had to run in opposite direction.

To form most stable combination of hydrogen bonds between two DNA strands

13. DNA molecule is called a double helix.

Because it consists of two strands wound around each other

14. The using of X- ray diffraction technique has a great affect in knowing the structure of the nucleic acid DNA.

Because when Franklin passed X-rays diffraction pictures through a crystal of highly purified DNA, she showed that:

a- DNA molecule is twisted into a spiral or helix with the bases perpendicular length of the helix

b- The sugar phosphate backbone is one the outside of the helix while the nitrogen bases on the inside

15. In DNA molecule, the number of purines similar to number of pyrimidine.

Because each rung of DNA consists of one nitrogen base has a single ring (Pyrimidine) and another nitrogen base is double rings (Purines), So the number of purines similar to the number of pyrimidine.

16. The nucleotide sequence of each strand of DNA automatically supplies the information on its partner.

Because the DNA consists of 2 strands with complementary bases as the Adenine base paired with the Thymine base, while Guanine base paired with Cytosine base, So the nucleotides sequence of each strand of DNA supplies the information of its partner.

What is meant by each of the following:

1. The bearers of genetic information of any living organism.

Chromosomes

2. A modern science explains the study of molecular basis of inheritance.

Molecular biology

3. The units of the genetic information that given the inherited characters.

Genes

4. A phenomenon in which some of genetic material from the heated virulent bacteria had entered the nonvirulent ones, transforming them to the virulent form.

Bacterial transformation

5. An enzyme hydrolysis DNA completely, doesn't affect the proteins and RNA.

Deoxyribonuclease enzyme

6. A group of nitrogenous bases has single ring **Pyrimidine**

7. A chemical bond explain that the combination between the nitrogen base and first carbon atom of Deoxyribose sugar. **Covalent bond**

8. A part of DNA strand shows the alternation between phosphate and sugar groups.

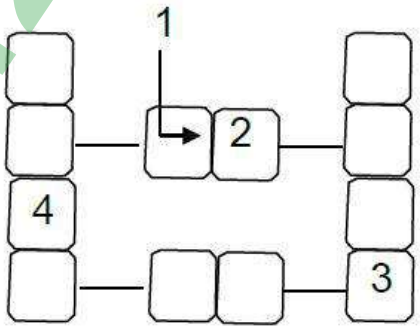
Sugar-Phosphate backbone

9. A material remains stable in cells of living organisms. **DNA**
10. A building unit of DNA molecule. **Nucleotide**
11. A chemical bond that joins the nitrogen bases pairs in DNA molecule. **Hydrogen Bond**
12. kind of sugars enters in the building of DNA nucleotides. **Deoxyribose sugar**
13. kind of nitrogenous bases composed of single ring. **Pyrimidine**
14. Kind of nitrogenous bases composed of two rings and forms two hydrogen bonds in the double helix. **Adenine base**
    kind of nitrogenous bases composed of one ring and forms three hydrogen bonds in the double helix **Cytosine base**
15. The passage of X-rays in highly purified crystals of DNA. **X-ray diffraction technique**
16. Repeated sequences of nitrogenous bases in the DNA. **Sugar-Phosphate backbone**

Using this diagram, the following diagram indicates A portion of DNA

Put a suitable number for each of the following:

1. Deoxyribose sugar. **(3)**
2. A weak hydrogen bond. **(1)**
3. A phosphate group. **(4)**
4. A nitrogenous base. **(2)**



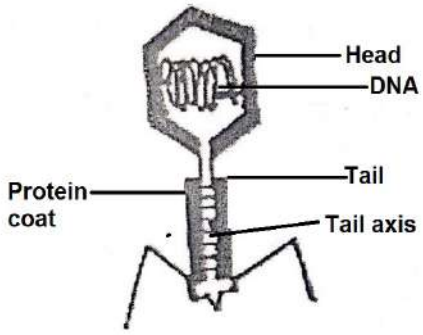
How far true is this statement:-

The amount of DNA in the cell is directly proportional to the amount of proteins produced by the cell (or degree of complexity of the living organism)

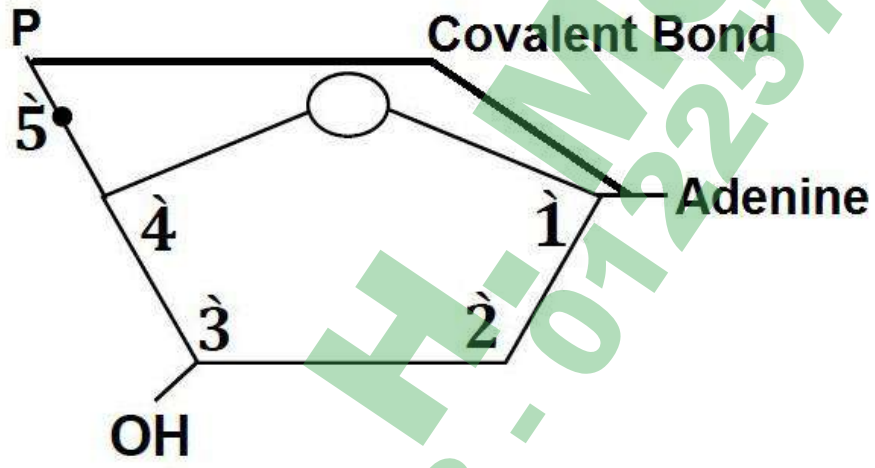
The statement is false, because There is no relation between amount of DNA in the cell and the degree of complexity of the living organism or the number of the proteins produced by the cell as great amount of DNA in the cells of eukaryotes is non-coding as Ex:cell of salamander contains 30 times DNA more than human cell while human cell produces more amounts of proteins.

Explain by Diagram only:

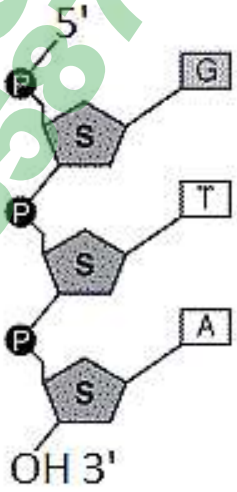
1. The infection of bacteria cell by a bacteriophage.



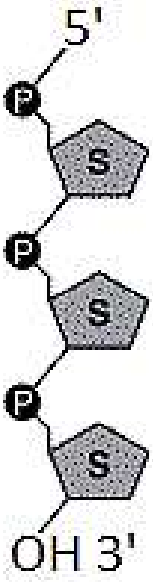
2. A nucleotide contains Adenine.



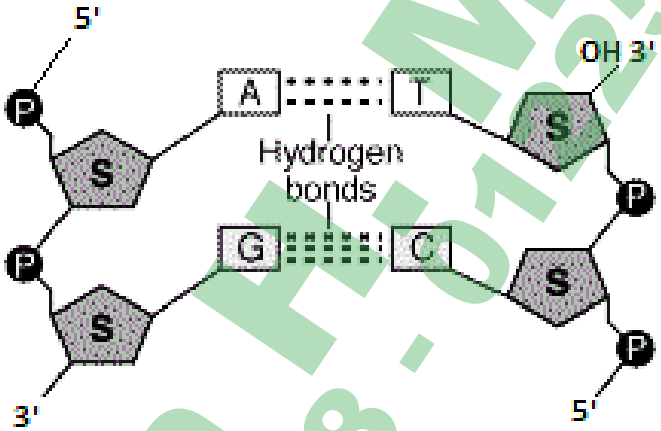
3. A part of DNA stand.



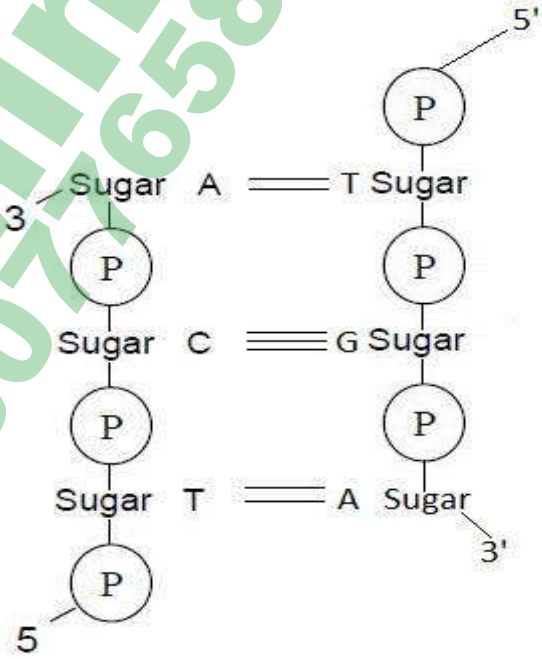
4. A portion of sugar phosphate backbone.



5. A portion of DNA molecule consists of 4 different nucleotides.



6. Draw the complementary strand of this DNA template.

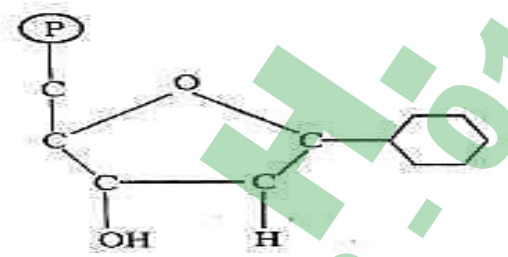


Answer the following questions:-

1. Define the locations of both covalent and hydrogen bonds in the DNA and their importance.

- Covalent bond between the carbon no. 1 in the deoxyribose sugar and the nitrogenous base and covalent bond between carbon no. 5 in the deoxyribose sugar and the phosphate group. , the importance of these covalent bonds is the building of the nucleotide (building unit of the DNA)
- The covalent bonds between the phosphate group in carbon no.5 in one nucleotide and carbon no.3 in the adjacent nucleotide to build the sugar phosphate backbone (one DNA strand
- The hydrogen bonds between the complementary bases of nucleotides of the 2 DNA strands as adenine base forms two hydrogen bonds with the thymine base and guanine base forms three hydrogen bonds with the cytosine base, the importance to from double stranded molecule of DNA.

2. The following diagram shows kind of nucleotides, answer the following:



a- Type of sugar: **(DNA nucleotide) the sugar is Deoxyribose sugar**

b- Type of the nitrogenous base with giving examples?

In DNA nucleotide has purine base double rings as (adenine and guanine) or has pyrimidine base single ring as (thymine and cytosine)

3. The following table shows the percentage of bases in three different samples of DNA, as determined by a scientist

% of bases in DNA samples				
Sample	**G**	**C**	**A**	**T**
A	35	35	15	15
B	40	10	40	10
C	25	25	25	25

-What is/are the sample(s) that emphasize base-pairing in DNA ? Explain?

A – C due to the equal percentage of Guanine and Cytosine bases and the equal percentage of Adenine and Thymine

4. The opposite table shows the percentage of nitrogenous bases in DNA molecules in three cells of two rabbits (A and B)

Samples	% of bases in DNA samples			
	A	T	C	G
Liver cell of rabbit (A)	28.2	28.3	21.4	21.6
Skin cell of rabbit (A)	28.2	28.3	21.4	21.6
Liver cell of rabbit (B)	26.5	26.5	35.5	35.5

What can you conclude from:

1- Comparing the percentages of nitrogenous bases in liver cell of rabbit (A) with their percentages in skin cell of rabbit (A)?

The different somatic cells in same individual contain the same percentage of the nitrogenous bases

2- Comparing percentages of nitrogenous bases in liver cell of rabbit (B) with each other?

Adenine base is paired with Thymine and Guanine base is paired with Cytosine, as their percentage is equal

5. The following table illustrates the percentages of the nitrogenous bases in some samples of nucleic acids:

Sample	Adenine	Guanine	Thymine	Cytosine
(1)	35%	15%	35%	X%
(2)	Y%	40%	15%	40%

1- What are the percentages of the nitrogenous bases in each of (X) and (Y)?

(X) → 15%, (Y) → 5%

2- What is the type of the nucleic acid in the samples (1) ?

Sample (1) → DNA (double strand)

6. If the sequence of nucleotides in one strand of DNA piece is

5'……**AGAATCTAGCTAGGAA**……3'

Copy this sequence in your answer paper and then add the complementary sequence of the nucleotides of the other strand of the same DNA piece.

- 5'… AGAATCTAGCTAGGAA …3'

- 3'… T CTTAGATCGATCCT T …5'

7. If the sequence of nucleotides in one strand of DNA molecule is:

5'……**ATCGTAGGA**……3'

-Write down the sequence of nucleotides in the complemantry strand of DNA

- 5'….TAGCATCCT……3'

Correct:-

Adenine (A) is paired to thymine (T) in DNA molecule with three covalent bonds.

Two hydrogen bonds

What happens when:-

Passage of x-rays in highly purified crystals of DNA.

That is called X-ray diffraction technique, it is used by franklin to identify the structure of DNA molecule and showed that:-

- **DNA molecule is in the form of spiral (helix)**
- **Sugar – phosphate backbone is on the outside of the helix, while the nitrogenous bases are from inside and perpendicular on the backbone.**
- **The diameter of the helix showed that, it must composed of more than one strand of DNA**