



INDIAN SCHOOL AL WADI AL KABIR

Class: XII	Department: SCIENCE 2020 -2021 SUBJECT : BIOLOGY	Date of submission: Third week of July
Worksheet no.5 with answers	CHAPTER: Molecular Basis of Inheritance	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

Objective type questions

1. The DNA of a certain organism has cytosine as 20% of its bases. What percentage of its bases would be thymine?

- a) 80%
- b) 30%
- c) 20%
- d) 10%

2. Pyrimidines in DNA are:

- a) Adenine and guanine
- b) Cytosine and thymine
- c) Adenine and thymine
- d) Thymine and uracil

3. Each new amino acid is added to a growing protein by

- a) an ionic bond
- b) an RNA bond
- c) a peptide bond
- d) a hydrogen bond

4. In a DNA strand the two nucleotides are linked together by:

- a. glycosidic bonds
- b. phosphodiester bonds
- c. peptide bonds
- d. hydrogen bonds

5. A nucleoside differs from a nucleotide. It lacks the:

- a. base
- b. sugar
- c. phosphate group
- d. hydroxyl group

6. Both deoxyribose and ribose belong to a class of sugars called:

- a. trioses
- b. hexoses
- c. pentoses
- d. polysaccharides

7. The fact that a purine base always paired through hydrogen bonds with a pyrimidine base leads to, in the DNA double helix:

- a. the antiparallel nature
- b. the semiconservative nature
- c. uniform width throughout DNA
- d. uniform length in all DNA

8. The net electric charge on DNA and histones is:

- a. both positive
- b. both negative
- c. negative and positive, respectively
- d. zero

9. The promoter site and the terminator site for transcription are located at:

- a. 3' (downstream) end and 5' (upstream) end, respectively of the transcription unit
- b. 5' (upstream) end and 3' (downstream) end, respectively of the transcription unit
- c. the 5' (upstream) end
- d. the 3' (downstream) end

10. Which of the following statements is the most appropriate for sickle cell anemia?

- a. It cannot be treated with iron supplements
- b. It is a molecular disease
- c. It confers resistance to acquiring malaria
- d. All of the above

11. Put phrases 1 - 6 in the correct order to describe protein synthesis:

1. mRNA is produced in the nucleus
2. ribosomes move along mRNA
3. DNA has a code
4. polypeptide results
5. tRNA brings amino acids to ribosomes
6. mRNA moves to ribosomes

12. In RNA, the base _____ is replaced with the base _____.

13. DNA replication is called _____ because each new double helix is made of an old strand and a new strand.

14. A mutation is a change in the sequence of _____ within a DNA molecule.

15. During transcription, DNA serves as a _____ for mRNA formation.

16. DNA carries a _____; every three bases stand for one amino acid.

17. Each tRNA has an _____ at one end and a specific _____ at the other.

18. The nucleolus has a concentration of a nucleic acid called _____.

19. The "backbone" of a strand of DNA (i.e. the poles of the DNA "ladder") is composed of _____ and _____ held together with _____ bonds.

20. The "rungs" of the DNA ladder are composed of _____ held together with-----

2 Marks questions

1. All nucleotides are made of the following three parts:

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2. Mix and match the following bases with their correct partner for base pairings:

	1.	purine	A	adenine
	2.	pyrimidine	B	cytosine
	3.	adenine	C	guanine
	4.	guanine	D	purine
	5.	cytosine	E	uracil
	6.	thymine	F	thymine
			G	pyrimidine

3. Differentiate between a cistron and an exon.

4. Explain the dual function of AUG codon. Give the sequence of bases it is transcribed from and its anticodon.

5. Write any four salient features of genetic code?

3 Marks questions

1. List 3 differences in structure in RNA, compared to the structure of DNA.

1.	
2.	
3.	

2.Fill in the following table:

DNA									
mRNA	G	G	U	G	U	A	A	U	U
anticodon									
amino acid									

3. Explain briefly the structure of ribosomes.

4. (a) In human genome which one of the chromosomes has the most genes and which one has the fewest?

(b) Scientists have identified about 1.4 million single nucleotide polymorphs in human genome. How is the information of their existence going to help the scientists?

5.RNA splicing is an important step in the process of transcription in eukaryotes. What is the role of this process?

6. During the process of DNA replication, synthesis in one strand is continuous while in other strand is discontinuous. How the second strand become continuous?

7. With the help of a labeled diagram explain the structure of nucleosome.

5 Marks questions

1. Draw a labeled schematic sketch of replication fork of DNA. Explain the role of the enzymes involved in DNA replication.

2. (a) Draw a schematic representation of the structure of a transcription unit and show the following in it:

(i) Direction in which the transcription occurs

(ii) Polarity of the two strands involved

(iii) Template strand

(iv) Terminator gene

(b) Mention the function of promoter gene in transcription.

3.In a maternity clinic, for some reasons the authorities are not able to hand over the two newborn to their respective real parents. Name and describe the technique that you would suggest to sort out the matter

4. With the help of example explain negative regulation in the regulation of gene expression.

5. State any three salient features of the double helix structure of DNA.

6.Explain how DNA is packed to form the double helix structure.

Previous Board Questions

1. Recently a girl baby has been reported to suffer from hemophilia. How is it possible? Explain with the help of a cross.

2.How did Morgan explain linkage of genes?

3. (a) Mention the contributions of the following scientists:

(i) Maurice Wilkins and Rosalind Franklin

(ii) Erwin Chargaff

4. Draw a double stranded dinucleotide chain with all the four nitrogen bases. Label the polarity and the components of the dinucleotide.
5. (a) State the arrangement of different genes that in bacteria is referred to as operon.
 (b) Draw a schematic labeled illustration of lac operon in a 'switched on' state.
 (c) Describe the role of lactose in lac operon.
- 6 a) Briefly explain the Transforming principle experiment.
 b) How did Alfred Hershey and Martha Chase arrive at the conclusion that DNA is the genetic material
- 7.a) Explain the Meselson and Stahl's experiment.
 b) Illustrate the result with diagrams.

ANSWERS

MCQ's 1 to 10

1-b	2-b	3-c	4-b	5-c	6-c	7-c	8-c	9-b	10-b
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- 11) 3-1-6-2-5-4
- 12) Thymine, Uracil
- 13) Semiconservative
- 14) Genetic code
- 15) Template
- 16) Genetic code
- 17) Anti codon loop, amino acid acceptor end
- 18) RNA
- 19) Sugar, phosphate, hydrogen
- 20) Bases, hydrogen bond

2 Marks questions answers

- 1) Pentose sugar, phosphate group, nitrogenous bases
- 2) 1-G, 2-D, 3-F/E, 4-B, 5-C, 6-A
- 3) CISTRON is a segment of DNA coding for a polypeptide (protein), Exons are coding sequence of protein
- 4) AUG for methionine & Start codon, Sequence of base (DNA) –TAC, anticodon---UAC
- 5) (i) Triplet in nature (ii) Non-ambiguous (iii) no punctuation (comma) (iv) Universality – any 4

3 Marks questions

- 1.(i) Based on the nature of pentose sugar, two types of nucleosides are formed - ribonucleoside and deoxyribonucleotides
- (ii) Uracil is present in RNA and in DNA in place of Uracil, Thymine is present.
- (iii) In RNA, Pentose sugar is ribose and in DNA, it is Deoxyribose

2.

DNA									
mRNA	G	G	U	G	U	A	A	U	U
anticodon	C	C	A	C	A	U	U	A	A
amino acid	Gly			Val			Ile		

3. Hints

(i) Cellular factory responsible for synthesizing proteins

(ii) Brief explanation of the ribosome structure- large subunit and small subunit.

4.a)Chromosome 1 has most gene 2968and Y has fewest 231

b)Disease-associated sequences and tracing human history

5. **Hint**--- maturation of hnRNA to mRNA----- removal of introns -----exons are joined in a defined order

6.**Hint**---- Explain the semiconservative method of DNA replication ----function of DNA dependent DNA polymerase in 5'----3' direction----- fragments of okazaki-----function of DNA ligase

7.i)There is a set of positively charged proteins called Histones

ii)Histones are organized to form a unit of 8 molecules called histone octamer

iii)The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called Nucleosome

iv)Nucleosome is the basic repeating structural (and functional) unit of chromatin

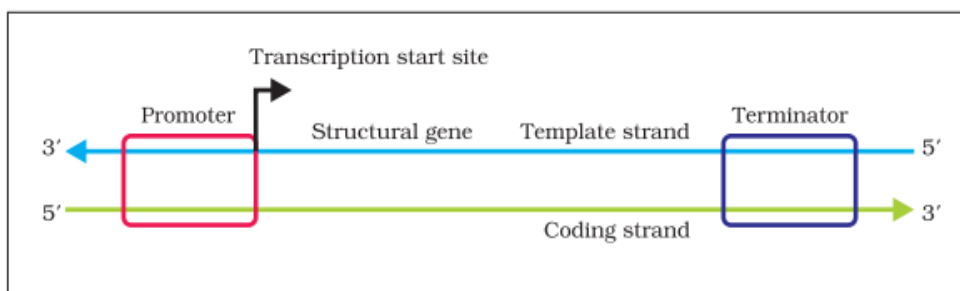
v)The Nucleosome in the chromatin is packed to form Chromatin Fibers

5 Marks questions answers

1.**Hint**--- Diagram refer fig. 6.8 pg. 107 ,(i) Deoxyribose nucleotides needed for formation of new DNA strands are present in nucleoplasm (ii) The RNA primer attaches itself to the old strand and attracts the enzymes(DNA polymerase III) which add new nucleotides through base complementation (iii) Helicase----unwinding (iv) DNA ligase—join the fragments of okazaki

2a)A transcription unit in DNA is defined primarily by the three regions in the DNA:

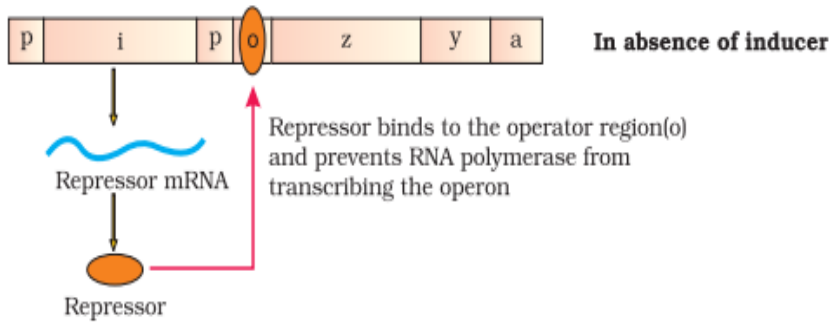
(i) A Promoter (ii) The Structural gene (iii) A Terminator



b)i)provides binding site for RNA polymerase

ii) It also defines the template and coding strand

3. DNA finger printing also known as DNA profiling. Description please refer to the notes 4.



5. i) Two nucleotides are joined by 3'-5' Phosphodiester linkage to form Dinucleotide.

ii) The two chains are coiled in a right handed fashion, the pitch of the helix is 3.4nm with roughly 10b.p

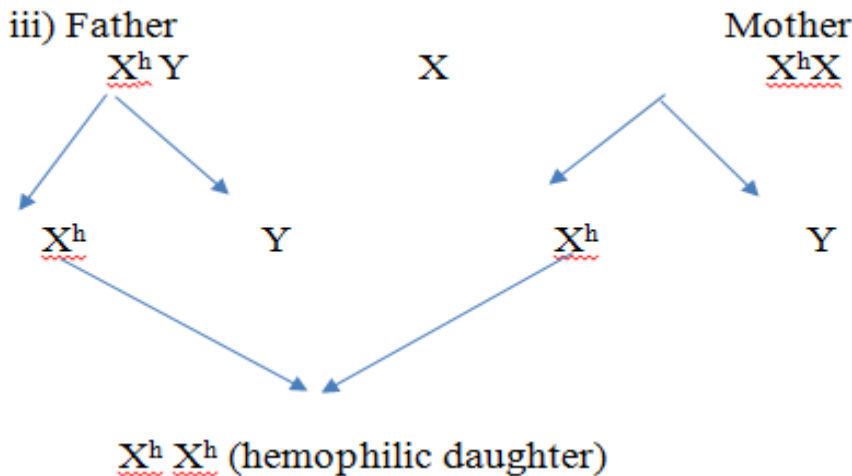
iii) The two strands of DNA (called DNA duplex) are antiparallel and complementary, one in 5'→3' direction and the other in 3'→5' direction

6. Refer to answer 7 of three marks

Previous Board Questions answers

1.i) Father hemophilic and mother carrier

ii) Not possible in real life as male doesn't usually live till he reaches puberty



2. PARENTALS – 98.7%
Brown, White males & females
Yellow, White males & females

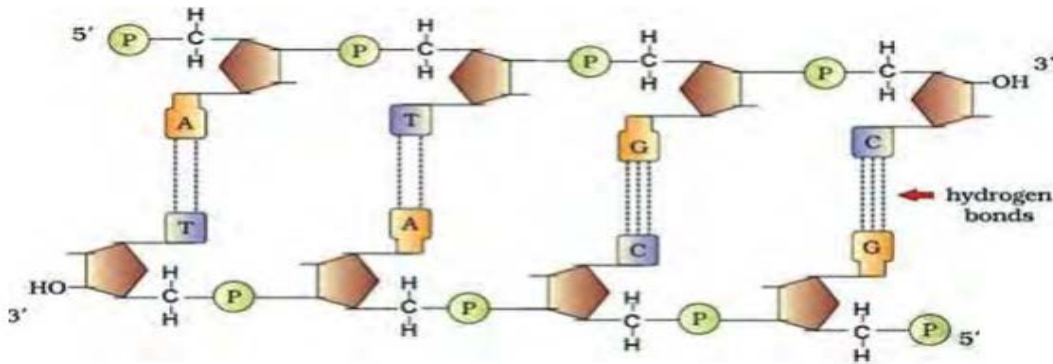
NON-PARENTALS- 1.3%
Brown, Red males & females
Yellow, Red males & females

F2 ratio deviated from 9:3:3:1 situated on (X – CHROMOSOME)
 LINKAGE – PHYSICAL ASSOCIATION OF GENES ON A CHROMOSOME.
 THEY INHERIT AS A SINGLE UNIT

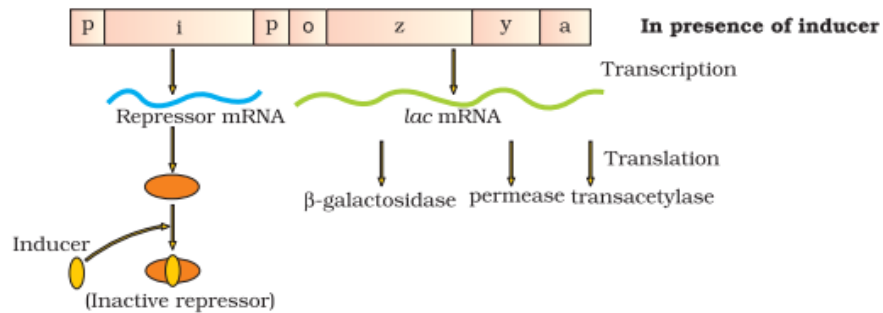
3.i)Based on the X-ray diffraction produced by Maurice Wilkins and Rosalind Franklin ,
 Watson and Crick proposed the **Double Helix** model for the structure of DNA

ii) Erwin Chargaff proposed that for the double stranded DNA, the ratio between A & T and G & C are constant and equal to one.

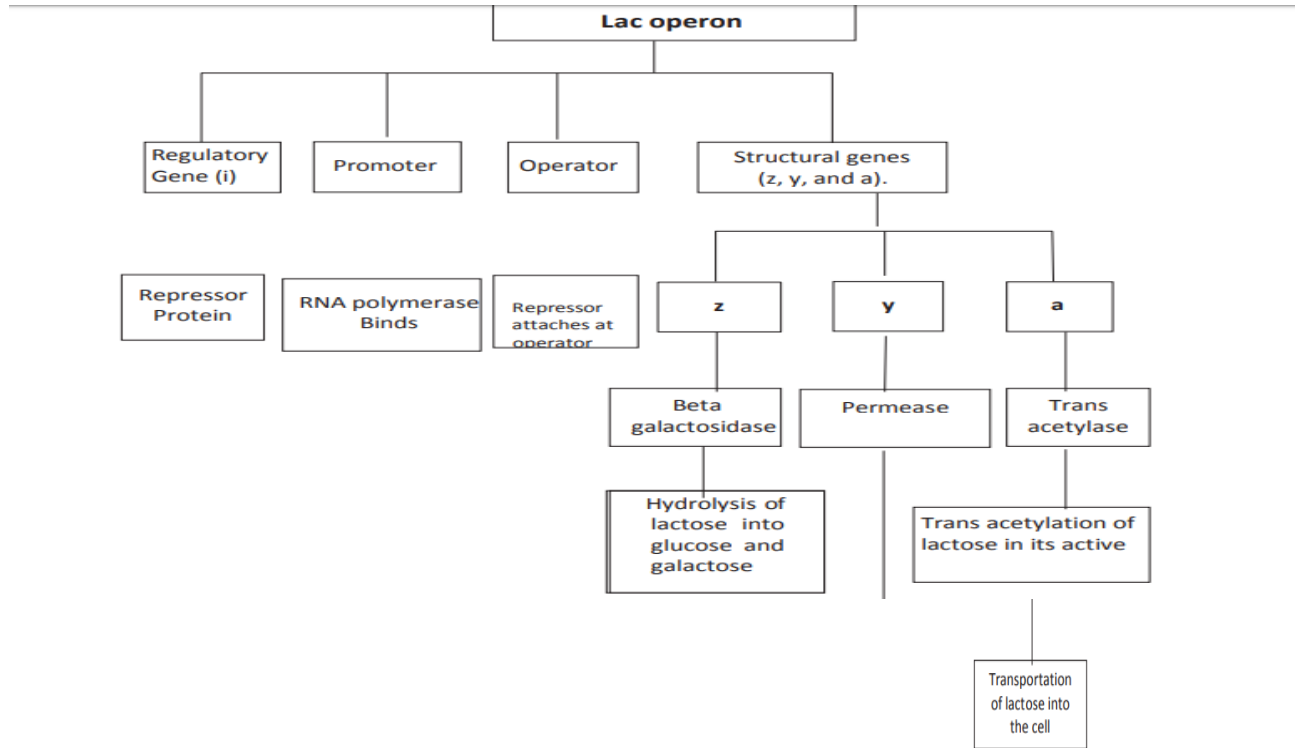
4.



5b



5a



C Inducer

6a) Two strains of bacteria are S-type and R-type cells.

*Living S-strain Injected into mice → Mice killed

*Living R-strain Injected into mice → Mice lived

*Heat Killed S-strain Injected into mice → Mice lived

*Living R-strain + Heat Killed S-strain Injected into mice → Mice killed

Griffith concluded that R type bacteria are transformed into virulent form.

6b)

Bacteriophages (viruses that infect

Radioactive phages were allowed to attach to E. coli

As the infection proceeded, the viral coats were removed from the bacteria by agitating them in a blender

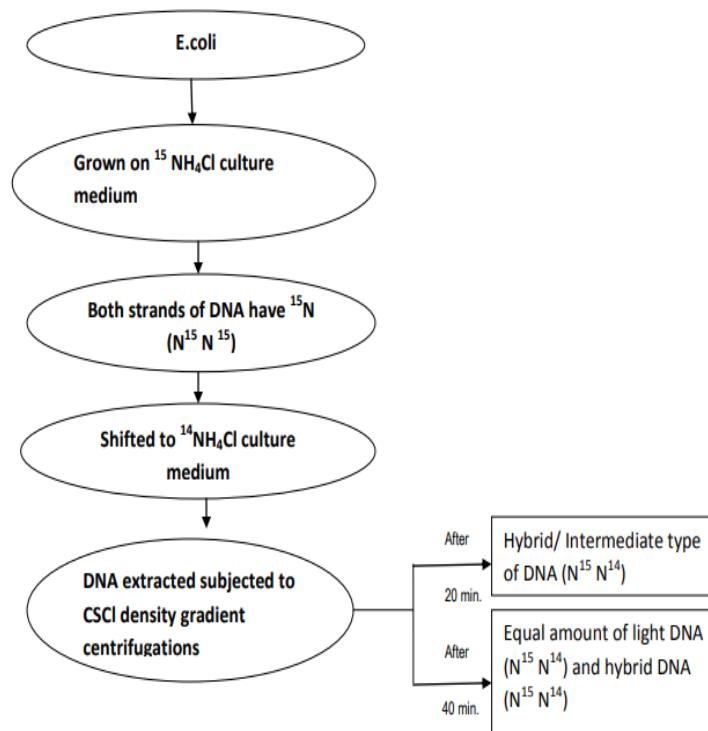
The virus particles were separated from the bacteria by spinning them in a centrifuge.

Bacteria which was infected with viruses that had radioactive DNA were radioactive, indicating that DNA was the material that passed from the virus to the bacteria.

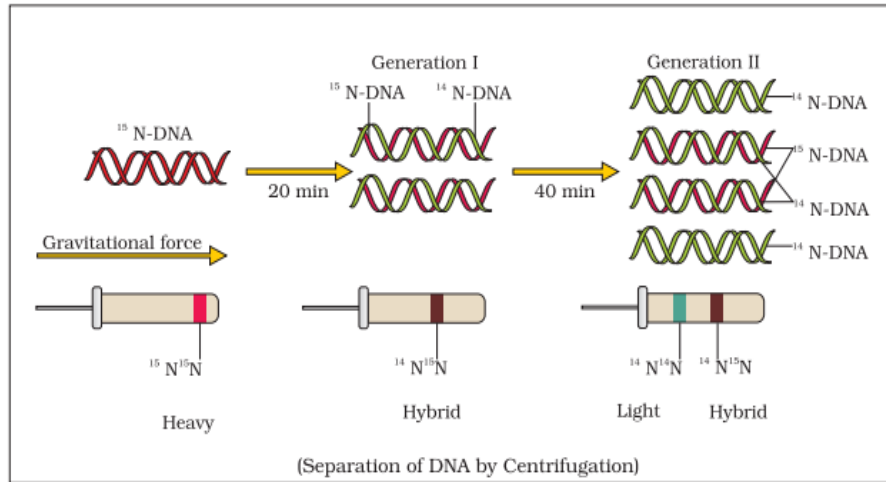
Bacteria that were infected with viruses that had radioactive proteins were not radioactive proving that not the protein, DNA is a genetic material.

7a

Semi conservative nature of DNA Mathew Messelson and Franklin start.



7b



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