

### 1 Marks Questions

**1. Name the factors for RNA polymerase enzyme which recognises the start and termination signals on DNA for transcription process in Bacteria.**

**Ans.** Sigma (s) factor and Rho(p) factor)

**2. Mention the function of non-histone protein.**

**Ans.** Packaging of chromatin

**3. During translation what role is performed by tRNA**

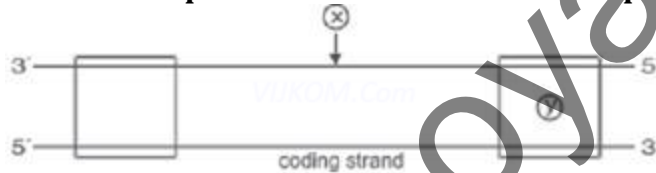
**Ans. (i)** Structural role

**(ii)** Transfer of amino acid.

**4. RNA viruses mutate and evolve faster than other viruses. Why?**

**Ans.** -OH group is present on RNA, which is a reactive group so it is unstable and mutate faster.

**5. Name the parts 'X' and 'Y' of the transcription unit given below.**



**Ans.** X – Template strand, Y – Terminator.

**6. Mention the dual functions of AUG.**

**Ans. (i)** Acts as initiation codon for protein synthesis

**(ii)** It codes for methionine.

**7. Write the segment of RNA transcribed from the given DNA –**

**3' - A T G C A G T A C G T C G T A '5' - Template Strand**

**5' - T A C G T C A T G C A G C A T '3' - Coding Strand.**

**Ans.** 5'- U A C G U C A U G C A G C A U - 3' (In RNA 'T' is replaced by 'U')

**8.Name the process in which unwanted mRNA regions are removed & wanted regions are joined.**

**Ans.**RNA splicing.

**9.Give the initiation codon for protein synthesis. Name the amino acid it codes for?**

**Ans.**Initiation codon – AUG & it code for methionine.

**10.In which direction, the new strand of DNA synthesised during DNA replication.**

**Ans.**5'→→ 3

**11.What is the function of amino acyl tRNA synthetase.**

**Ans.**Amino acyl tRNA synthetase catalyses activation of amino and attachment of activated amino acids to the 3-end of specific tRNA molecule.

**12.What is point mutation?**

**Ans.**Mutation due to change in a single base pair in a DNA sequence is called point mutation.

**13.Name the enzyme that joins the short pieces in the lagging strand during synthesis of DNA?**

**Ans.**Ligase.

**14.Name the enzyme which helps in formation of peptide bond?**

**Ans.**Peptidyl transferase

**15.Who experimentally prove that DNA replication is semi conservative.**

**Ans.**Messelson & Stahl.

**16.What is a codon?**

**Ans.**Triplet sequence of bases which codes for a single amino is called a codon.

**17.Name the three non-sense codons?**

**Ans.**UAA, UAG, UGA

**18.What is the base pairing pattern of DNA?**

**Ans.**In DNA, adenine always binds with thymine & cytosine always binds with Guanine.

**19.Mention the dual functions of AUG?**

**Ans.**AUG codes for amino acid methionine & also acts as an initiator codon.

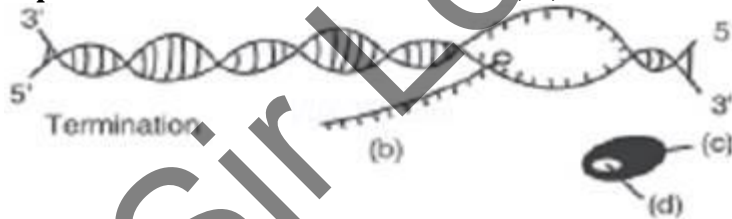
## 2 Mark Questions

### Chapter 6

### Molecular Basis of Inheritance

#### 2 Marks Questions

**1. The process of termination during transcription in a prokaryotic cell is being represented here. Name the label a, b, c and d.**



**Ans. (a)** DNA molecule

**(b)** mRNA transcript

**(c)** RNA polymers

**(d)** Rho factor

**2. Complete the blanks a, b, c and d on the basis of Frederick Griffith Experiment.**

**S Strain →→ inject into mice →→ (a)**

**R strain →→ inject into mice →→ (b)**

**S strain (heat killed) →→ inject into mice →→ (c)**

**S strain (heat killed) + R strain (live) →→ inject into mice →→ (d)**

**Ans.(a)** Mice die

- (b) mice live
- (c) mice live
- (d) mice die

**3. Give two reasons why both the strands of DNA are not copied during transcription.**

**Ans. (a)** If both the strands of DNA are copied, two different RNAs (complementary to each other) and hence two different polypeptides will produce; If a segment of DNA produces two polypeptides, the genetic information machinery becomes complicated.

**(b)** The two complementary RNA molecules (produced simultaneously) would form a doublestranded RNA rather than getting translated into polypeptides.

**(c)** RNA polymerase carries out polymerisation in 5'3' direction and hence the DNA strand with 3'5' polarity acts as the template strand. (Any two)

**4. Mention any two applications of DNA fingerprinting.**

**Ans. (i)** To identify criminals in the forensic laboratory.

**(ii)** To determine the real or biological parents in case of disputes.

**(iii)** To identify racial groups to rewrite the biological evolution. (Any two)

**5. State the 4 criteria which a molecule must fulfill to act as a genetic material.**

**Ans. (i)** It should be able to generate its replica.

**(ii)** Should be chemically and structurally stable.

**(iii)** Should be able to express itself in the form of Mendelian characters.

**(iv)** Should provide the scope for slow changes (mutations) that are necessary for evolution.

**6. "DNA polymerase plays a dual function during DNA replication" comment on statement?**

**Ans.** DNA polymerase plays a dual function –it helps in synthesis of new strand & also helps in proof reading i.e replacement of RNA strands lay DNA fragments.

**7. Three codons on mRNA are not recognised by tRNA what are they? What is the general term used for them what is their significance in protein synthesis?**

**Ans.** UAG UAA & UGA are the three codons that are not recognised by tRNA these are known as stop codon or non-sense codon. Since these three codons are not recognised by any tRNA they help in termination of protein chain during translation.

**8. Give two reasons why both the strands of DNA are not copied during DNA transcription?**

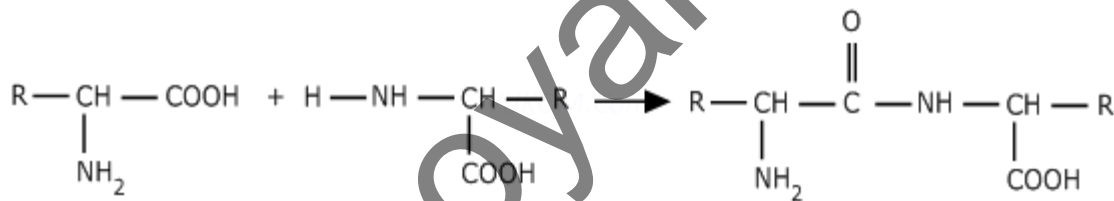
**Ans.** I) If both the strands code for RNA two different RNA molecules & two different proteins would be formed hence genetic machinery would become complicated  
II) Since the two RNA molecules would be complementary to each other, they would wind together to form dsRNA without carrying out translation which means process of transcription would be futile

**9. Why is it essential that tRNA binds to both amino acids & mRNA codon during protein synthesis?**

**Ans.** It is essential that tRNA binds to both amino acids & mRNA codon because tRNA acts as an adapter molecule which picks up a specific activated amino acid from the cytoplasm & transfers it to the ribosome in the cytoplasm where proteins are synthesized. It attracts itself to ribosome with the sequence specified by mRNA & finally it transmits its amino acid to new polypeptide chain.

**10. What is peptide bond? How is it formed?**

**Ans.** Peptide bond is formed between carboxylic group (COOH) of first amino acid & amino group (-NH<sub>2</sub>) of second amino acid. This reaction is catalysed by peptidyl transferase



**11. Explain what happens in frameshift mutation? Name one disease caused by the disorder?**

**Ans.** Frameshift mutation is a type of mutation where addition or deletion of one or two bases changes the reading from the site of mutation, resulting in protein with different set of amino acid.

**12. What do you mean by "Central Dogma of Molecular genetics?"**

**Ans.** The central dogma of molecular genetics is the flow of genetic information from DNA to DNA through replication, DNA to mRNA through transcription & mRNA to proteins through translation.

Replication DNA →→ mRNA →→ proteins. transcription translation

**13. Give two reasons why both the strands are not copied during transcription?**

**Ans.** i) If both the strands codes for RNA, two different RNA molecules & two different proteins are formed hence genetic machinery would be complicated.

ii) Since two RNA molecules produced would be complementary to each other, they would wind together to form ds-RNA.

**14. Why is human Genome project considered as mega project?**

**Ans.** Human Genome project was called mega project for the following facts.

1. The human genome has approximately  $3.3 \times 10^9$  bp, if the cost of sequencing is US \$3 per bp, the approximate cost is about US \$3 billion.
2. If the sequence obtained were to be stored in a typed form in books & if each page contained 1000 letters & each book contained 1000 pages then 3300 such books would be needed to store complete information.
3. The enormous quantity of data expected to be generated also necessitates the use of high speed computational devices for data storage, retrieval & analysis.

**15. Why is DNA & not RNA is the genetic material in majority of organisms?**

**Ans.** The -OH group in the nucleotides of RNA is much more reactive & makes RNA labile & easily degradable thus, DNA and not RNA acts as genetic material in majority of organisms.

**16. Mention any four important characteristics of genetic code.**

**Ans.** Genetic codon has following imp-features :-

1. Each codon is a triplet consisting of three bases.
2. Each codon codes for only one amino acid i.e. – unambiguous.
3. Some amino acids are coded by more than one codon  $\therefore$  said to be degenerative.
4. Codons are read in a continuous manner in direction & have no punctuation.

**17. Why it is that transcription & translation could be coupled in prokaryotic cell but not in eukaryotic cell?**

**Ans.** In prokaryotes the mRNA synthesised does not require any processing to become active & both transcription & translation occurs in the same cytosol but In Eukaryotes, primary transcript contains both exon & intron & is subjected to a process called splicing where introns are removed & exons are joined in a definite order to form mRNA.

# 3 Mark Questions

## Chapter 6

### Molecular Basis of Inheritance

#### 3 Marks Questions

**1. Give six points of difference between DNA and RNA in their structure/chemistry and function.**

**Ans.**

DNA	RNA
(i) Double stranded molecules	(i) Single stranded molecules
(ii) Thymine as pyrimidine base	(ii) Uracil as pyrimidine base
(iii) Pentose sugar is Deoxyribose	(iii) Sugar is Ribose
(iv) Quite stable and not very reactive	(iv) 2'-OH makes it reactive
(v) Dictates the synthesis of Polypeptides	(v) Perform their functions in protein synthesis.
(vi) Found in the nucleus.	(vi) They are transported into the cytoplasm.

**2. Explain how does the hnRNA becomes the mRNA. OR Explain the process of splicing, capping and tailing which occur during transcription in Eukaryotes.**

**Ans.** hnRNA is precursor of mRNA. It undergoes

- (i) Splicing : Introns are removed and exons are joined together.
- (ii) Capping : an unusual nucleotide (methyl guanosine triphosphate) is added to the 5' end of hnRNA.
- (iii) Adenylate residues (200-300) are added at 3' end of hnRNA.

**3. Name the three major types of RNAs, specifying the function of each in the synthesis of polypeptide.**

**Ans. (i)** mRNA-(Messenger RNA) : decides the sequence of amino acids.

**(ii)** tRNA-(Transfer RNA) : (a) Recognises the codon on mRNA (b) transport the amino acid to the site of protein synthesis.

**(iii)** rRNA (Ribosomal RNA) : Plays the structural and catalytic role during translation.

**4. Enlist the goals of Human genome project.**

**Ans.** The Human Genome Project (HGP) is an international scientific research project with the goal of determining the sequence of chemical base pairs which make up human DNA, and of identifying and mapping all of the genes of the human genome from both a physical and functional standpoint

**5. A tRNA is charged with the amino acid methionine.**

**(i) Give the anti-codon of this tRNA.**

**(ii) Write the Codon for methionine.**

**(iii) Name the enzyme responsible for binding of amino acid to tRNA.**

**Ans. (a) UAC (b) AUG (c) Amino-acyl tRNA synthetase.**

**6. Illustrate schematically the process of initiation, elongation and termination during transcription of a gene in a bacterium.**

**Ans.** In bacteria, the mRNA provides the template, tRNA brings amino acids and reads the genetic code, and rRNAs play structural and catalytic role during translation.

There is single DNA-dependent RNA polymerase that catalyses transcription of all types of RNA in bacteria.

RNA polymerase binds to promoter and initiates transcription (Initiation)

It somehow also facilitates opening of the helix and continues elongation

Once the polymerase reaches the terminator region, the nascent RNA falls off, so also the RNA polymerase. This results in termination

**7. What is transformation? Describe Griffith's experiment to show transformation? What did he prove from his experiment?**

**Ans.** Transformation means change in genetic makeup of an individual. Fredrick Griffith conducted a series of experiments on *Streptococcus pneumoniae*. He observed two strains of this bacterium – one forming smooth colonies with capsule (S-type) & other forming rough colonies without capsule (R-type)

(i) when live S-type cells are infected into mice, they produced pneumonia & mice dies.

(ii) When live R-type cells are infected into mice, disease was not produced did not appear.

(iii) When heat – killed S-type cells were infected into mice, the disease did not appear.

(iv) When heat killed S-type cells were mixed with live R-cells & infected into mice, the mice died.

He concluded that R-strain bacteria had somehow been transformed by heat –killed S-strain bacteria which must be due to transfer of genetic material

**8. The base sequence on one strand of DNA is ATGTCTATA**

**(i) Give the base sequence of its complementary strand.**

**(ii) If an RNA strand is transcribed from this strand what would be the base sequence of RNA?**

**(iii) What holds these base pairs together?**

**Ans. (i) TACAGATAT.**

**(ii) UACAGAUAU**



**(iii)** Hydrogen bonds hold these base pairs together. Adenine & thymine are bounded by two hydrogen bonds & cytosine & Guanine are bonded by three hydrogen bonds.

**9. Two claimant fathers filed a case against a lady claiming to be the father of her only daughter. How could this case be settled identifying the real biological father?**

**Ans.** This case to identify the real biological father could be settled by DNA – fingerprinting technique. In this technique :-

1. First of all, DNA of the two claimants who has to be tested is isolated.
2. Isolated DNA is then digested with suitable restriction enzyme & digest is subjected to gel electrophoresis.
3. The fragments of ds DNA are denatured to produce ss DNA by alkali treatment.
4. The electrophoresed DNA is then transferred from gel into a nitrocellulose filter paper where it is fixed.
5. A known sequence of DNA is prepared called probe – DNA & is labelled with radioactive isotope  $^{32}\text{P}$  & then probe is added to nitrocellulose paper.
6. The nitrocellulose paper is photographed on X – ray film through autoradiography. The film is analysed to determine the presence of hybrid nucleic acid.