



## BIOLOGY

### BOOKS - PRADEEP BIOLOGY (HINGLISH)

#### MOLECULAR BASIS OF INHERITANCE

#### Curiosity Questions

1. How was it proved that DNA is actually the genetic material ?

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2. Is there any chemical compound, other than DNA, that functions as a genetic material ?

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3. Which aspects of DNA structure provide basis for its replication ?

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4. How does the genetic code points to the common ancestry of all organisms ?

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### Notable Question S

1. Which organic molecule, other than proteins, act as biocatalysts?

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2. Which organic molecule, other than nucleic acids , can replicate ?

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## Ncert Exercises With Answers

1. Group the following as nitrogenous bases and nucleosides: Adenine, Cytidine, Thymine, Guanosine, Uracil and Cytosine.

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2. If a double stranded DNA has 20% of cytosines, calculate the percent of adenine in the DNA.

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3. If the sequence of one strand of DNA is written as follows :

5' -ATGCATGCATGCATGCATGCATGC-3'

Write down the sequence of complementary strand in 5' → 3' direction.

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4. If the sequence of coding strand in a transcription unit is written as follows :

5' -ATGCATGCATGCATGCATGCATGC-3'

Write down the sequence of mRNA.



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5. Which property of DNA double helix led Watson and Crick to hypothesise semiconservative mode of DNA replication? Explain.



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6. Depending upon the chemical nature of the template (DNA or RNA) and the nature of nucleic acids synthesised from it (DNA or RNA), list the types of nucleic acid polymerases.



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7. How did Hershey and Chase differentiate between DNA and protein in their experiment while proving that DNA is the genetic material?

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8. Differentiate between the followings. (a) Repetitive DNA and Satellite DNA (b) mRNA and tRNA (c) Template strand and Coding strand

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9. List two essential roles of ribosome during translation.

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10. In the medium where E. coli was growing, lactose was added, which induced the lac operon. Then, why does lac operon shut down some time after addition of lactose in the medium?

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**11.** Explain (in one or two lines) the function of the followings:

(a) Promoter

(b) tRNA

(c) Exons



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**12.** Why is the Human Genome project called a mega project?



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**13.** What is DNA fingerprinting? Mention its application.



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14. Briefly describe the following:

- (a) Transcription
- (b) Polymorphism
- (c) Translation
- (d) Bioinformatics



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### Additional Questions Very Short Answer Questions

1. What is the base pairing rule of Watson and Crick ?



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2. What are the raw materials for DNA synthesis ?



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3. Can DNA be synthesized in vitro?

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4. Name the RNA that carries information about the sequence of amino acids in a polypeptide.

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5. What is the function of tRNA ?

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6. Site for protein/peptide synthesis is

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7. What is a codon ?



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8. What is an anticodon ?



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9. (a) What is a genetic code ?



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10. Name three nonsense codons.



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11. Name the enzyme that joins the short pieces in the "lagging strand" of DNA during replication.

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12. How many bases code for one amino acid?

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13. Name the amino acids which have only one codon each.

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14. The genetic code is nonoverlapping and degenerate. Is it so?

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15. Is there any base triplet that codes for more than one amino acid?

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16. What are the two major functions of DNA ?

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17. A polypeptide of 600 amino acids will be coded for by a linear-sequence of how many bases in (a) mRNA and (b) DNA?

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18. Of the 64 possible code triplets, how many code for amino acids and how many for stop signals ?

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19. Name the enzymes which can break and reseal the DNA strand.

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20. Are there any base triplets that code for amino acids and also for start signals ? Name these.

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21. What is proof-reading In DNA synthesis ?

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22. Which base triplets code for the amino acid phenylalanine ?

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23. What are introns ?

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24. The amino acid arginine has 6 mRNA codons : CGU, CGC, CGA, CGG, AGA and AGG. Give the DNA codons for it.

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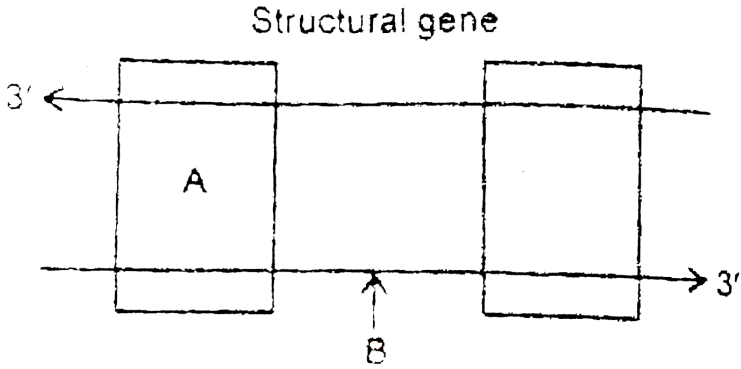
25. What do you call a noncoding Intervening nucleotide sequence in a eukaryotic gene?

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26. Operon model' for gene regulation in bacteria was proposed by

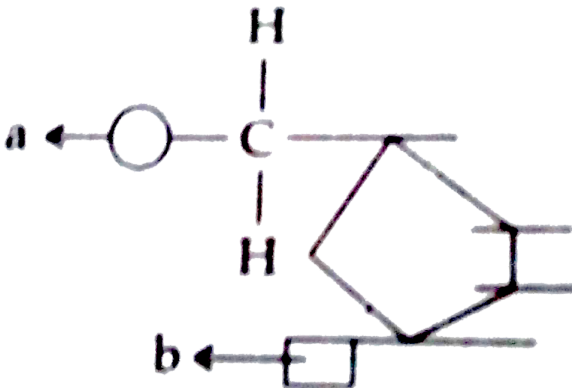
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27. Name the parts 'A' and 'B' of the transcription unit given below.



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28. Name the components 'a' and 'b' in the nucleotide with a purine, given below:



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29. Name the technique used for separating DNA fragments in the laboratory.



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30. When and at what end does the 'tailing' of hn RNA take place?



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31. Mention two functions of the codon AUG.



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32. Why is the enzyme cellulase needed for isolating genetic material from plant cells and not from the animal cells?



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**33.** How is the action of exonuclease different from that of endonuclease ?

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**34.** Name the enzyme involved in the continuous replication of DNA strand. Mention the polarity of the template strand.

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**35.** Name two sulphur containing and two basic amino acids.

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**36.** Mention the contribution of genetic maps in human genome project.

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**37.** How many codons code for amino acids ?

(a) 64 (b) 61 (c) 68 (d) 60



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**38.** How many base pairs are present In DNA cut by endonuclease - Hind II ?

(a) 2 (b) 4 (c) 6 (d) 8



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**39.** What are histones? What are their functions?



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**40.** In DNA, guanine and cytosine are bonded with how many hydrogen bonds ?

(a) 1 (b) 2 (c) 3 (d) 4



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**41.** Out of 64 codons how many codons do not code for any amino acid?

(a) 62 (b) 61 (c) 3 (d) 1



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**42.** The nucleosome :



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**43.** What is origin of replication ?



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**44.** Fill in the blanks :

Some amino acids are coded by more than one codon. Such a genetic code is

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**45.** True/False Type Question.

The structural gene in prokaryotes is polyclstronic.

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**46.** True/False Type Question.

F. Griffith conducted experiment with bacteriophages.

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**47.** Give one word.

One codon codes for only one amino acid. The genetic code is ....

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**48.** Fill in the blanks

VNTRs is an abbreviation of....

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**49.** Name the enzyme and state its property that is responsible for continuous and discontinuous replication of the two strands of a DNA molecule.

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**50.** State the role of transposons in silencing of mRNA in eukaryotic cells.



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51. Name the transcriptionally active region of chromatin in a nucleus.

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52. What is cistron?

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53. The prophase I stage of meiosis plays a vital role in r-DNA formation. Justify with reason.

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54. Name the technique by which Gene expression can be controlled with the help of RNAi molecule.

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55. Name one amino acid, which is coded by only one codon.

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56. Write the dual purpose served by deoxyribonucleoside triphosphates in polymerisation.

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### Additional Questions Short Answer Questions

1. Who coined the term 'genetic code' ? What does it mean ?

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2. Define genetic material.



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3. How does DNA express its biological information?



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4. What is the function of missence strand of DNA ?



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5. In which direction are the leading and lagging strands synthesized during DNA replication ? Name the enzyme responsible for this process.



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6. Where and when does replication occur ?



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7. particular strain of *Neurospora crassa* required citrulline in the medium while the wild type did not. How do you refer to the former ? Why is it so called ?

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8. Give the site and time of occurrence of transcription.

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9. How is the first ribonucleotide different from others in the RNA chain?

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10. What changes happen during processing of RNA?

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**11. Transcription Unit**



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**12. What are auxotrophs ?**



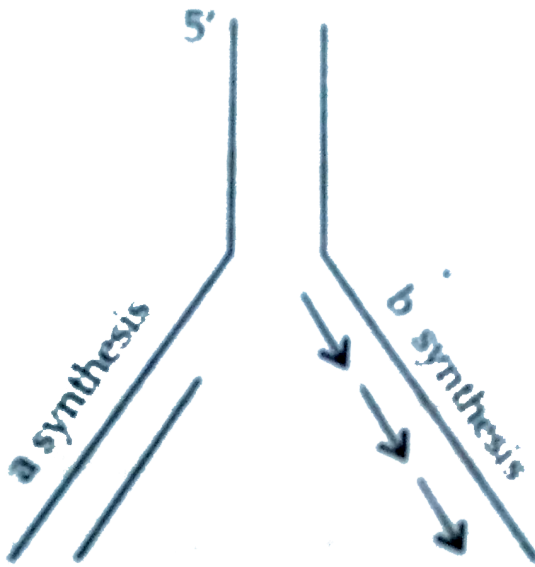
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**13. What are two functions of DNA polymerase ?**



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**14. Name the types of synthesis 'a' and 'b' occurring in the replication fork of DNA as shown below:**



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15. How can DNA segment, separated by gel electrophoresis be visualised and isolated ?

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16. How is the translation of mRNA terminated ? Explain.

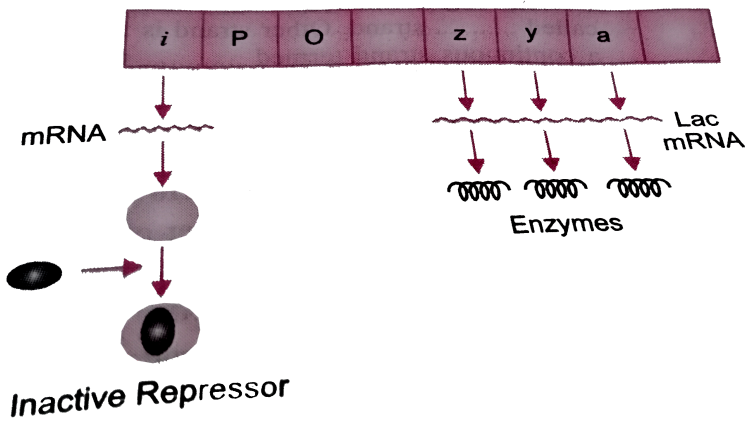
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17. Study the figure given below and answer the questions :

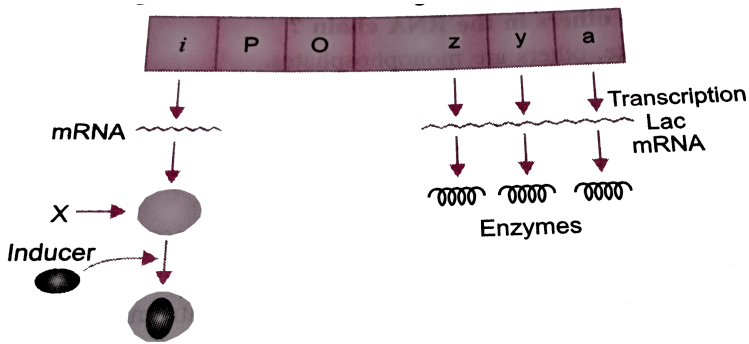
(a) What does the figure express ?

(b) When does the transcription of lac mRNA stop ?

(c) Name the enzyme transcribed by the gene 'Z'.



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18.

- Name the molecule 'X' synthesised by 'I' gene. How does this molecule get inactivated ?
- Which one of the structural genes code for  $\beta$ -galactosidase ?
- When will the transcription of this gene stop?

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

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**20.** Fill in the blanks :

(i) According to Watson and Crick model, the DNA molecule consists of ..... long, parallel strands. The two strands are ..... around a common axis in a regular manner to form a ..... helix.

(ii) These strands are made of ..... units. Each such unit consists of ..... , ..... and .....

(iii) In each chain, nitrogenous base molecules are joined to the sugar molecules by ..... bonds and project into the space enclosed in the helix at about ..... to the long axis of the helix.

(iv) The nitrogenous base may be a 9-membered, double ringed ..... or a 6-membered, single ringed .....

(v) The double helix of DNA has a constant diameter of ..... and one complete spiral (turn) of the helix is ..... long and has ..... base pairs.

(vi) The mode of DNA replication is .....

(vii) Enzyme ..... cannot initiate the synthesis of a new DNA strand, although it can catalyze the growth of a DNA chain. Therefore, a short chain of ..... is formed on the DNA template at the 5' end. This is called .....

(viii) During DNA replication, one new strand is formed in continuous stretch in the 5' - 3' direction. It is called ..... strand. Other strand is formed in small fragments called ..... which are later joined to form a continuous strand termed ..... strand.

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21. Write the full form of VNTR. How is VNTR different from probe?

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22. (a) Differentiate between a template strand and coding strand of DNA.

(b) Name the source of energy for the replication of DNA

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23. Why all the three RNAs are needed to synthesise a protein in a cell?

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24. Write the functions of RNA polymerase-I and RNA-polymerase-III.

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25. Write the names of various nitrogenous bases found in RNA.

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26. Explain the role of enzymes nucleases and ligases.

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27. Differentiate between promoter and terminator gene.

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**28.** What do you mean by unambiguous and degenerate codon ?

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**29.** Give two functions of t-RNA.

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**30.** Give two differences between m-RNA and t-RNA.

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**31.** What do you understand by genome.

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**32.** Name the scientists who started the DNA finger printing technique in India.



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**33.** Describe the structure of a RNA polynucleotide chain having four different types of nucleotides.



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**34. a)** Explain DNA polymorphism as the basis of genetic mapping of human genome.

**b)** State the role of VNTR in DNA fingerprinting.



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35. a) Write the conclusion drawn by Griffith at the end of his experiment with *Streptococcus pneumoniae*.

b) How did O. Avery, C. MacLeod and M. McCarty prove that DNA was the genetic material? Explain.



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36. a) Write the specific features of the genetic code AUG.

b) Genetic codes can be universal and degenerate. Write about them, giving one example of each.

c) Explain aminoacylation of the tRNA.



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37. i) Name the scientist who suggested that the genetic code should be made of a combination of three nucleotides.

ii) Explain the basis on which he arrived at this conclusion.



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**38.** Why did scientists prefer to decode rice genome than other related species ?

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**39.** What is aminoacylation ? State its significance.

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**40.** Describe the structure of a nucleosome.

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**41.** Differentiate between the genetic codes given below :

(a) Unambiguous and Universal

(b) Degenerate and Initiator :



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**42.** Why does the lac operon shut down some time after the addition of lactose in the medium where E.coil was growing ? Why low level expression of lac operon is always required ?



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**43.** Give the structure of a tRNA molecule.



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**44.** Write down the features of mRNA.



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**45.** CENTRAL DOGMA OF MOLECULAR BIOLOGY



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**46.** Why is genetic code a triplet one ?



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**47.** What is meant by semiconservative replication of DNA ?



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**48.** How is protein synthesis initiated in a cell.



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**49.** What are the functions of mRNA and tRNA ? What anticodons will be required to recognize the following codons ?

(i) AAU, (ii) CGA, (iii) UAU, (iv) GCA.



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50. Explain the steps involved in the elongation of polypeptide chain during protein synthesis.

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51. Why was it believed earlier that proteins could be the genetic material?

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52. What are the essential requirements of the genetic material?

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53. What is a peptide bond? How is it formed.

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54. Which molecule bears codons and which molecule anticodons?

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55. What was the rationale of using  $P^{32}$  and  $S^{35}$  by Hershey and Chase ?  
Instead, if we use radiolabelled C and N, will the results be any different ?

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56. List three main differences between DNA and RNA.

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57. How did Alfred Hershey and Martha Chase arrive at the conclusion that DNA is the genetic material?

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58. What do you understand by a leading strand and a lagging strand during DNA replication?



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59. One of the codons on mRNA is AUG. Draw the structure of tRNA adapter molecule for this codon. Explain the uniqueness of this tRNA?



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60. Given below is a part of the template strand of a structural gene

TAC    CAT    TAG    GAT

(a) Write its transcribed mRNA strand with its polarity.

(b) Explain the mechanism involved in initiation of the transcription of this strand.



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**61.** The length of a DNA molecule in a typical mammalian cell is calculated to be approximately 22 metres. How is the packaging of this long molecule done to accommodate it within the nucleus of the cell ?

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**62.** Explain the process of charging of tRNA. Why is it essential in translation?

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**63.** Draw a labelled schematic sketch of replication fork of DNA. Explain the role of the enzymes involved in DNA replication.

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**64.** What are Satellite DNA in a genome? Explain their role in DNA fingerprinting.



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

(i) Direction in which transcription occurs

(ii) Polarity of the two strands involved

(iii) Template strand

(iv) Terminator gene

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



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**66.** Describe the initiation process of transcription in bacteria.



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67. In a series of experiments with *Streptococcus* and mice F. Griffith concluded that R-strain bacteria had been transformed. Explain.

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68. Who revealed biochemical nature of the transforming principle?

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69. That background information did Watson and Crick have made available for developing a model of DNA ? What was their contribution ?

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70. Give any six features of the human genome.

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71. Match the items given in column I with appropriate items (one or more) of column II :

Column I

- (i) m- RNA
- (ii) Initiation codon
- (iii) Termination codon
- (iv) Anticodon
- (v) One gene one enzyme hypothesis
- (vi) Semiconservative mode of DNA replication

Column II

- (a) UAA
- (b) Beadle and Tatum
- (c) AUG
- (d) Heterogeneous nucleic acid
- (e) GUG
- (f) UAG
- (g) t-RNA
- (h) Meselson and Stahl



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72. (i) Name the enzyme that catalyses the transcription of hnRNA. (ii) Why does the hnRNA need to undergo changes? List the changes hnRNA undergoes and where in the cell such changes take place?



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**73.** Unambiguous, universal and degenerate are some of the terms used for the genetic code. Explain the salient features of each one of them.

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**74.** Describe the structure of t-RNA.

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**75.** Describe the role of ribosome in translation.

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**76.** Define the terms splicing, capping and tailing.

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77. What was the need of decoding of rice genome ? Explain.



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78. Give importance of Rice Genome Project.



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79. (a) A DNA segment has a total of 1500 nucleotides, out of which 410 are guanine containing nucleotides. How many pyrimidine bases this segment possesses ? (b) Draw a diagrammatic sketch of a portion of DNA segment to support your answer.



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80. (a) A DNA segment has a total of 2000 nucleotides. How many purine bases this DNA segment possesses ?

(b) Draw a diagrammatic sketch of a portion of DNA segment to support your answer.

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**81.** Explain the significance of satellite DNA in DNA fingerprinting technique.

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**82.** Following the collision of two trains a large number of passengers are killed. A majority of them are beyond recognition. Authorities want to hand over the dead to their relatives. Name a modern scientific method and write the procedure that would help in the identification of kinship.

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**83.** 'A very small sample of tissue or even a drop of blood can help determine paternity.' Provide a scientific explanation to substantiate how it is possible.



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**84.** (a) What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in Human Genome Project (HGP). Mention their role in the project.

(b) Write the percentage of the total human genome that codes for proteins and the percentage of discovered genes whose functions are known as observed during HGP.

(c) Expand 'SNPs' identified by scientists in HGP.



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**85.** A number of passengers were severely burnt beyond recognition during a train accident. Name and describe a modern technique that can help hand over the dead to their relatives.





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**86.** A criminal blew himself up in a local market when was chased by cops. His face was beyond recognition. Suggest and describes a modern technique that can help establish his identity?



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**87.** During a fire in an auditorium, a large number of assembled guests get burnt beyond recognition. Suggest and describe a modern technique that can help hand over the dead to their relatives.



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**88.** List the two methodologies which were involved in human genome project . Mention how they were used.

Explain YAC and mention what was it used for.



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**89.** (a) Expand VNTR and describe its role in DNA finger printing.

(b) List any two applications of DNA finger printing technique.

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**90.** Why is DNA molecule considered as a better hereditary material than RNA molecule ?

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**91.** Name the three RNA polymerases found in eukaryotic cells and mention their functions.

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92. Explain the post transcriptional modifications the hn-RNA undergoes in eukaryotic cell.

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93. (a) Construct a complete transcription unit with promoter and terminator on the basis of the hypothetical template strand given below :



(b) Write the RNA strand transcribed from the above transcription unit along with its polarity.

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94. (a) Mention two events in which DNA is unzipped.

(b) Predict the consequences when both the template and the coding strands of a DNA segment participate in transcription process ?

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## Additional Questions Long Answer Questions

1. How did Griffiths and Avery show experimentally that DNA is the hereditary material?

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2. Give a brief account of DNA replication.

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3. Describe the transcription of RNA from DNA.

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4. Give a brief account of protein synthesis.



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5. Discuss the characteristics of genetic code.



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6. Discuss the effect of mutations on the structure and function of proteins.



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7. How did Alfred Hershey and Martha Chase arrive at the conclusion that DNA is the genetic material?



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8. What are the three types of RNA molecules which perform different functions ?

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9. Give the structure of DNA molecule.

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10. Tabulate differences between DNA and RNA.

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11. Draw a labelled diagram of DNA molecule (double helix). No description is required.

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12. Explain Hershey-Chase experiment. What was proved through this experiment ?



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13. What is 'semi- conservative' DNA replication ? How was it experimentally proved and by whom ?



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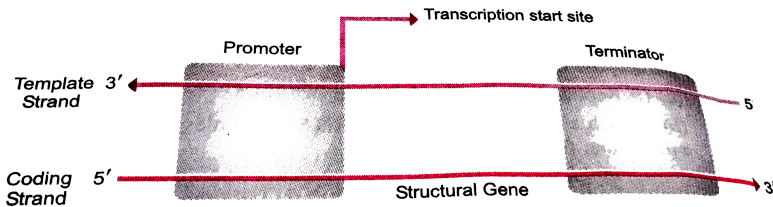
14. (a) Why is DNA molecule a more stable genetic material than RNA ? Explain.

(b) " Unambiguous", " degenerate" and "universal" are some of the salient features of genetic code. Explain.



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15. Draw a labelled schematic structure of a transcription unit. Explain the function of each component of the unit in the process of transcription.



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16. (a) Explain the experiment performed by Griffith on *Streptococcus pneumoniae*. What did he conclude from this experiment? (b) Name the three scientists who followed up Griffith's experiments. (c) What did they conclude and how?

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17. Two blood samples A and B picked up from the crime scene were handed over to the forensic department for genetic fingerprinting.



Describe how the technique of genetic fingerprinting is carried out. How will it be confirmed whether the samples belonged to the same individual or to two different individuals ?

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18. (a) How did Griffith explain the transformation of R strain (non virulent) bacteria into S strain (virulent)? (b) Explain how MacLeod, McCarty and Avery determined the biochemical nature of the molecule responsible for transforming R strain bacteria into S strain bacteria.

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19. (a) What did Meselson and Stahl observe when :

(i) They cultured *E. coli* in a medium containing  $^{15}\text{NH}_4\text{Cl}$  for a few generations and centrifuged the content

(ii) They transferred one such bacterium to the normal medium of  $\text{NH}_4\text{Cl}$  and cultured for 2 generations

(iii) What did Meselson and Stahl conclude from this experiment ? Explain

with the help of diagram.

(iv) Which is the first genetic material ? Give reasons in support of your answer.

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20. Give an account of Hershey and Chase experiment. What did it conclusively prove? If both DNA and protein contained phosphorus and sulphur do you think the result would have been the same?

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21. Discuss the process of translation in detail.

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22. List the various markers that are used in DNA fingerprinting

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**23.** Discuss various applications of DNA fingerprinting.

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**24.** Differentiate between the following : (i) Leading strand and lagging strand (ii) Prokaryotic DNA and eukaryotic DNA (iii) DNA and RNA (iv) Replication and transcription

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**25.** Explain the following : (i) Griffith's and Avery's transformation experiments (ii) Harshey and Chase (1952) experiment (iii) Meselson and Stahl (1958) experiment of semiconservative replication.

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**26.** What is nucleosome ? How many base pairs are present in a typical nucleosome ?

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**27.** REGULATION OF GENE EXPRESSION

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**28.** How did Hershey and Chase differentiate between DNA and protein in their experiment while proving that DNA is the genetic material?

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**29.** Describe the transformation principle proposed by Griffith.

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**30.** Explain semiconservative mode of DNA replication.

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**31.** Give experimental proof for DNA as the genetic material and mention the properties of DNA.

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**32.** With the help of a labelled diagram give the structure of DNA-double helix.

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**33.** Discuss lac-operon model with the help of diagrams.

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**34.** Discuss various applications of DNA fingerprinting.



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**35. a)** Explain the process of DNA replication with the help of a schematic diagram.

b) In which phase of the cell cycle does replication occur in Eukaryotes?

What would happen if cell-division is not followed after DNA replication?



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**36.** Discuss in detail Rice Genome Project.



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**37.** How did Hershey and Chase establish that DNA is transferred from virus to bacteria ?



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**38.** Explain the process to transcription in prokaryotes .How is the process different in eukaryotes ?



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**39.** (a) Draw a labelled diagram of a "replicating fork" showing the polarity.

Why does DNA replication occur within such forks .

(b) Name two enzymes involved in the process of DNA replication, along with their properties.



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**40.** How do m-RNA, t-RNA and ribosomes help in the process of translation ?



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**41.** (a) Describe the series of experiments of F. Griffith. Comment on the significance of the results obtained.

(b) State the contribution of Macleod, McCarty and Avery.

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**42.** (a) Describe the structure and function of a t-RNA molecules . Why is it referred to as an adapter molecules ?

(b) Explain the process of splicing of hn - RNA in a eukaryotic cell.

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**43.** Write the different components of a lac - operon in E . Coli Explain its expression while in an 'open' state.

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**44.** (a) What is an operon ?

(b) Explain how a polycistronic structural gene is regulated by a common promoter and a combination of regulatory genes in a lac- operon.



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**45.** (a) Absence of lactose in the culture medium affects the expression of a lac-operon in E.coli. Why and how ? Explain. (b) Write any two ways in which the gene expression is regulated in eukaryotes.



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**46.** (a) State the 'Central dogma' as proposed by Francis Crick. Are there any exceptions to it? Support your answer with a reason and an example.

(b) Explain how the biochemical characterization (nature) of 'Transforming Principle' was determined, which was not determined from Griffith's experiments.



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47. (a) Why does DNA replication occur in small replication forks and not in its entire length ?

(b) why is DNA replication continuous and discontinuous in a replication fork ?

(c) State the importance of origin of replication in a replication fork.



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48. What is an operon ? Explain the functioning of lac operon when in an open state.



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1. A burglar in a huff forgot to wipe off his blood stains from the place of crime where he was involved in a theft and fight. Which technique the crime branch personnel will use to help them identifying the burglar from the blood stains ?

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2. There was an article published in a -newspaper on DNA fingerprinting revealing procedure and its applications. Following terms were mentioned in this article : (i) Minisatellite (ii) Microsatellite Briefly mention about these terms.

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3. What are 'coding' and 'non-coding' sequences in the DNA molecule ?  
What are their roles ?

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4. In DNA fingerprinting, which type of sequences can be employed as a tool to create a genetic fingerprint of an individual ? Explain.

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5. Which technique is generally applied in paternity testing? Was this technique also used in solving a criminal case named 'Tandoor murder case' ?

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6. Why is hnRNA required to undergo splicing ?

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7. After splicing, which two additional processing steps hnRNA needs to undergo so as to become functional ?



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8. Retroviruses have no DNA. However, the DNA of the infected host cell does possess viral DNA. How is it possible ?



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9. A primer comprising of 5 bases is required to allow copying of the following single stranded DNA sequence 5'-ATGCCTAGGTC Name the appropriate primer that should start DNA replication.



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10. If the sequence of the coding strand in a transcription unit is written as follows 5' -ATGCCTAGGTC CAGGCAT-3'

Write down the sequence of mRNA. Write down the anticodon for each code and their corresponding amino acids.



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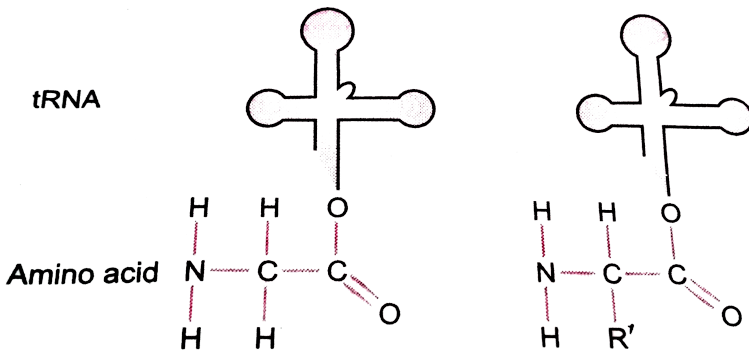
11. Calculate the total number of thymine bases present in the double stranded DNA if it transcribes a mRNA which reads as follows :

5'-AUGCAUCAUGCAAUCAGG-3'

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12. The carboxyl group (-COOH) of one amino acid reacts with an amino group (-NH<sub>2</sub>) of other amino acid to form a peptide bond (-CO-NH).

Make a peptide bond between the two amino acids by removing water molecule in the given figure



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13. How many histones make the core part of a nucleosome. What is the basis of binding DNA molecule to the histones ?



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14. Here are some correct and some wrong statements. Correct only those statements which are wrong:

- (a) The genetic code is universal.
- (b) The genetic code is ambiguous.
- (c) The genetic code is regenerate.
- (d) Transfer RNA (tRNA) carry amino acids to mRNA codons and used again and again in transcription.
- (e) UAA, UAG and UGA are terminator codon.
- (f) Lac operon consists of regulatory genes, operator gene, structural and promoter gene.



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15. (a) Name a genetic RNA and a non-genetic RNA.

(b) Differentiate between prokaryotic mRNA and eukaryotic mRNA on the basis of any one character.



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16. What do you understand by 5' -end and 3' -end ?



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Study the mRNA segment given above which is to be translated into a polypeptide chain.

(i) Write the codons 'a' and 'b'

(ii) What do they code for

(iii) How is peptide bond formed between two amino acids in the ribosome?





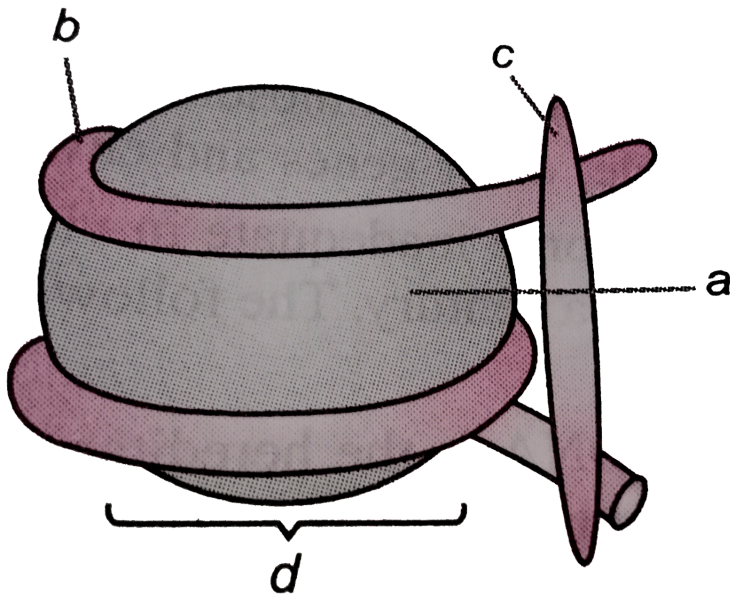
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**18.** (a) In human genome, which one of the chromosomes has the most genes and which has the fewest?

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



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19.

(a) What is this diagram representing ? (b) Name the parts a, b, c and d.

(c) In the eukaryotes the DNA molecules are organised within the nucleus.

How is the DNA molecule organised in a bacterial cell in absence of a nucleus ?

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20. (a) A DNA segment has a total 1000 nucleotides, out of which 240 of them are adenine containing nucleotides. How many pyrimidine bases this DNA segment possesses ?



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## Practice Questions Multiple Choice Questions

1. The two polynucleotide chains in DNA are

- A. Discontinuous
- B. Antiparallel
- C. Semiconservative
- D. Parallel

**Answer: B**



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2. During transcription holoenzyme RNA polymerase binds to a DNA sequence and the DNA assumes a saddle like structure at that point.

What is that sequence called ?

A. AATI

B. CACC

C. TATA

D. TTAA

**Answer: C**



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3. Central dogma of genetic information is modified by the discovery of

A. Reverse transcriptase

B. DNA polymerase

C. RNA polymerase

D. Ligase

**Answer: A**



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4. tRNA consisting of three unpaired bases constitute

- A. Codon
- B. Anticodon
- C. Clover-leaf model
- D. Acceptor loop

**Answer: B**



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5. The codon AUG is

- A. Ochre
- B. Amber
- C. Initiation codon

D. Termination codon

**Answer: C**



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6. During the replication of DNA, the synthesis of DNA as lagging strand takes place in segments, these segments are called

- A. Double helix segments
- B. Satellite segments
- C. Kornberg segments
- D. Okazaki segments

**Answer: D**



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7. Which of the following phenomena was experimentally proved by Meselson and Stahl?

- A. DNA is genetic material
- B. Central dogma
- C. Transformation
- D. Semi conservative DNA replication

**Answer: D**



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8. The haploid content of human DNA is

- A.  $3 \cdot 3 \times 10^9 bp$
- B.  $3 \cdot 3 \times 10^9 Kbp$
- C.  $4.6 \times 10^6 bp$
- D.  $48502bp$

**Answer: A**



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**9.** The distance between the genes a, b, c, d in mapping units are

$$a - d = 3 \cdot 5, b - c = 1, a - b = 6,$$

$$c - d = 1 \cdot 5, a - c = 5$$

Find out the sequence of arrangement of these genes

A. acdb

B. abcd

C. adbc

D. adcb

**Answer: D**



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10. The basis of DNA fingerprinting is :

- A. The double helix
- B. Errors in base sequence
- C. Polymorphism in sequence
- D. DNA replication

**Answer: C**



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11. Which of the following be named for DNA produced from RNA ?

- A. A-DNA
- B. B-DNA
- C. C-DNA
- D. Z-DNA

**Answer: C**



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**12. In the DNA molecule**

- A. The proportion of adenine in relation to thymine varies with the organism
- B. There are two strands which run antiparallelone in 5' → 3' direction and other in 3' →
- C. The total amount of purine nucleotides and pyrimidine nucleotide is not always equal
- D. There are two strands which run parallel in the 5' → 3' direction.

**Answer: B**



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13. Which one of the following pairs of codons is correctly matched with their function of the signal for the particular amino acid ?

A. AUG, ACG - Start/methionine

B. UUA, UCA - Leucine

C. GUU, GCU-Alanine

D. UAG, UGA - Stop

**Answer: D**



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14. The term genome denotes

A. Haploid set of chromosomes

B. Bivalent

C. Monovalent

D. Diploid chromosomal set

**Answer: A**



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**15.** The number of stop codons which do not code for any amino acid is

A. 1

B. 2

C. 3

D. 4

**Answer: C**



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**16.** DNA sequences that code for protein are known as :

A. Intron

B. Exons

C. Control regions

D. Intervening sequences

**Answer: B**



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17. During replication of DNA, Okazaki fragments are formed in the direction of :

A. 3' → 5'

B. 5' → 3'

C. 5' → 5'

D. 3' → 3'

**Answer: B**



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18. mRNA directs building of protein through a sequence of

- A. Exons
- B. Introns
- C. Codons
- D. Anti codons

**Answer: C**



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19. The anti -paralle nature of DNA refers to

- A. Its charged phosphate group
- B. The formation of hydrogen bonds between bases from opposite strands
- C. The opposite direction of the two strands

D. The pairing of bases on one strand with bases on the other strand.

**Answer: C**



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**20.** What is not true for genetic code ?

A. It is nearly universal

B. It is degenerate

C. It is unambiguous

D. A codon in mRNA is read in a non-contiguous fashion

**Answer: D**



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21. Removal of introns and joining the exons in a defined order in a transcription unit is

- A. Tailing
- B. Transformation
- C. Capping
- D. Splicing

**Answer: D**



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22. Whose experiments cracked the DNA and discovered unequivocally that a genetic code is a "triplet" :-

- A. Hershey and Chase
- B. Nirenberg and Mathaei
- C. Morgan and Sturtevant



D. Beadle and Tatum

**Answer: B**



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**23.** The human chromosomes with the highest and least number of genes in them are respectively :

A. Chromosome 21 and Y

B. Chromosome 1 and X

C. Chromosome 1 and Y

D. Chromosome X and Y

**Answer: C**



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24. Who amongst the following scientists had no contribution in the development of the double helix model for the structure of DNA ?

- A. Rosalind Franklin
- B. Maurice Wilkins
- C. Erwin Chargaff
- D. Meselson and Stahl

**Answer: D**



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25. DNA is a polymer of nucleotides which are linked to each other by 3' – 5' phosphodiester bond . To prevent polymerisation of nucleotides, which of the following modifications would you choose ?

- A. Replace purine with pyrimidines
- B. Remove/Replace 3' OH group in deoxyribose

C. Remove/Replace 2' OH group with some other group in deoxyribose

D. Both 'B' and 'C'

**Answer: B**



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**26.** Discontinuous synthesis of DNA occurs in one strand, because

A. DNA molecule being synthesised is very long

B. DNA dependent DNA polymerase catalyses polymerisation only in one direction (5' → 3')

C. it is a more efficient process

D. DNA ligase has to have a role

**Answer: B**



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27. Which of the following steps in transcription is catalysed by RNA polymerase?

- A. Initiation
- B. Elongation
- C. Termination
- D. All of the above

**Answer: B**



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28. Control of gene expression takes place at the level of

- A. DNA-replication
- B. Transcription
- C. Translation
- D. None of the above

**Answer: B**



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**29.** Regulatory proteins are the accessory proteins that interact with RNA polymerase and affect its role in transcription. Which of the following statements is correct about regulatory protein ?

- A. They only increase expression
- B. They only decrease expression
- C. They interact with RNA polymerase but do not affect the expression
- D. They can act both as activators and as repressors

**Answer: D**



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**30.** Which was the last human chromosome to be completely sequenced ?

- A. Chromosome 1
- B. Chromosome 11
- C. Chromosome 21
- D. Chromosome X

**Answer: A**

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**31.** Which of the following are the functions of RNA

- A. It is a carrier of genetic information from DNA to ribosomes synthesising polypeptides.
- B. It carries amino acids to ribosomes.
- C. It is a constituent component of ribosomes.
- D. All of the above.

**Answer: D**



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**32.** While analysing the DNA of an organism a total number of 5386 nucleotides were found out of which the proportion of different bases were : Adenine = 29 % , Guanine = 17 % , Cytosine = 32 % , Thymine = 17 %  
Considering the Chargaffs rule it can be concluded that :

- A. it is a double stranded circular DNA
- B. It is single stranded DNA
- C. It is a double stranded linear DNA
- D. No conclusion can be drawn

**Answer: B**



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**33.** In some viruses, DNA is synthesised by using RNA as template. Such a DNA is called :

A. A-DNA

B. B-DNA

C. c DNA

D. r DNA

**Answer: C**



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**34.** If Meselson and Stahl's experiment is continued for four generations in bacteria, the ratio of  $\frac{^{15}N}{^{15}N} : \frac{^{15}N}{^{14}N} : \frac{^{14}N}{^{14}N}$  containing DNA in the fourth generation would be

A. 1 : 1 : 0

B. 1 : 4 : 0

C. 0 : 1 : 3

D. 0 : 1 : 7



**Answer: D**



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**35.** If the sequence of nitrogen bases of the coding strand of DNA in a transcription unit is  $5' - ATGAATG - 3'$ , the sequence of bases in its RNA transcript would be

A.  $5' - AUG A AUG - 3'$

B.  $5' - U AC U U AC - 3'$

C.  $5' - CA U UC AU - 3'$

D.  $5' - GU A AGUA - 3'$

**Answer: A**



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**36.** The RNA polymerase holoenzyme transcribes

A. the promoter, structural gene and the terminator region

B. the promoter

C. the structural gene and the terminator regions

D. the structural gene only.

**Answer: C**



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37. If the base sequence of a codon in mRNA is  $5' - AUG - 3'$ , the sequence of tRNA pairing with it must be

A.  $5' - UAC - 3'$

B.  $5' - CAU - 3'$

C.  $5' - AUG - 3'$

D.  $5' - GUA - 3'$

**Answer: B**

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**38.** The amino acid attaches to the tRNA at its

- A. 5 - end
- B. 3 - end
- C. Anti codon site
- D. DHU loop

**Answer: B**

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**39.** To initiate translation, the mRNA first binds to :

- A. The smaller ribosomal sub-unit,
- B. The larger ribosomal sub-unit
- C. The whole ribosome

D. No such specificity exists

**Answer: A**



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**40.** In E.coli, the lac operon gets switched on when :

- A. lactose is present and it binds to the repressor
- B. repressor binds to operator
- C. RNA polymerase binds to the operator
- D. lactose is present and it binds to RNA polymerase

**Answer: A**



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41. The one aspect which is not a salient feature of genetic code, is its being

- A. specific
- B. degenerate
- C. ambiguous
- D. universal

**Answer: C**



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42. The 3' to 5' phosphodiester linkages of a polynucleotide chain join

- A. one DNA strand with other DNA strand
- B. one nucleoside with other nucleoside
- C. one nucleotide with other nucleotide
- D. one nitrogenous base with pentose sugar.

**Answer: C**



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**43.** Lac operon consists of

- A. four regulatory genes only
- B. one regulatory and 3 structural genes
- C. two regulatory genes and 2 structural genes
- D. three regulatory genes and three structural genes.

**Answer: B**



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**44.** DNA gyrase, the enzymes that participates in the process of DNA replication is a type of :

- A. DNA-ligase
- B. DNA-polymerase
- C. DNA-topoisomerase
- D. Reverse transcriptase

**Answer: C**

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**45.** Which one of these statements is not correct during protein synthesis.

- A. UAA codon codes for lysine
- B. UGG codon codes for tryptophan
- C. Cysteine is coded by UGU and UGC codones
- D. tyrosine is coded by UAU and UAC codons

**Answer: A**

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46. In genetic fingerprinting, 'the probe' refers to

- A. a radioactively labelled double stranded RNA molecule
- B. a radioactively labelled double stranded DNA molecule
- C. a radio-actively labelled single stranded DNA molecule
- D. a radioactively labelled single stranded RNA molecule.

**Answer: C**

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47. In a DNA molecule distance between two bases is

- A.  $2nm / 20\text{\AA}$
- B.  $0 \cdot 2nm / 2\text{\AA}$
- C.  $3 \cdot 4nm / 34\text{\AA}$



$$D. 0 \cdot 34nm / 3 \cdot 4\text{\AA}$$

**Answer: D**



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**48.** Purine possess nitrogen at

A. 1, 2, 4, 6 position

B. 1, 3, 5, 7 position

C. 1, 3, 7, 9 posit

D. 1, 2, 6 and 8th position

**Answer: C**



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**49.** Which one is diaminodiacrboxlic amino acid

A. Cystine

B. Lysine

C. Cysteine

D. Aspartic acid

**Answer: A**



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**50.** Transposons are :

A. house keeping genes

B. jumping genes

C. transporting genes

D. stationary genes

**Answer: B**



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51. How many effective codons are there for the synthesis of twenty amino acids ?

A. 64

B. 32

C. 60

D. 61

**Answer: D**



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52. Which of the following is structural sub-unit of DNA

A. Protein

B. Carbohydrate

C. RNA

D. Nucleotides

**Answer: D**



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**53.** In lac operon i gene codes for :

- A. inducer of lac operon
- B. repressor of lac operon
- C. hydrolysis of disaccharide
- D. permease

**Answer: B**



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54. Which one of the following have dual function ? It codes for methionine and acts as initiator codon

- A. AUG
- B. AUC
- C. ACU
- D. ACA

**Answer: A**



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55. A typical nucleosome contains :

- A. 100 bp of DNA helix
- B. 200 bp of DNA helix
- C. 300 bp of DNA helix
- D. 400 bp of DNA helix

**Answer: B**



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56. Which of the following sequences will be produced as a result of transcription of the DNA sequence - CGATTACAG

- A. GCUAAUGUC
- B. CGUAAUCUG
- C. GCTAATGTC
- D. GCUAATCTG

**Answer: A**



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57. RNA polymerase II is responsible for transcription of

A. rRNA

B. hnRNA

C. tRNA

D. SnRNA

**Answer: B**



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**58. Nitrogenous bases present in DNA**

A. Adenine Guanine Cytosine, Thymine

B. Adenine Guanine Cytosine Uracil

C. Adenine Thymine Uracil

D. Guanine and Uracil

**Answer: A**



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59. A nucleoside differs from a nucleotide in not having

- A. sugar
- B. glucose
- C. Nitrogen base
- D. Phosphate group

**Answer: D**



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60. If the total amount of adenine and thiamine in a double stranded DNA is 45 % , the amount of guanine in this DNA will be

- A. 22 · 5 %
- B. 27 · 5 %
- C. 45 %



D. 55 %

**Answer: 2**



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**61.** Okazaki is known for his contribution to the understanding of

- A. transcription
- B. translation
- C. DNA replication
- D. mutation

**Answer: C**



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**62.** Restriction endonucleases are enzymes which

- A. Remove nucleotides from ends of DNA molecule
- B. make cuts at specific positions within the DNA molecule
- C. recognize a specific nucleotide sequence for binding of DNA ligase
- D. restrict the action of enzyme DNA polymerase.

**Answer: B**

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**63.** Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme.

- A. 5' CACGTA 3' , 3' CTCAGT 5'
- B. 5' CGTTCG 3': 3' ATGGTA 5'
- C. 5' GATATC 3', 3' CTAATA 5'
- D. 5' GAATTC 3' , CTTAAG 5'

**Answer: D**



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64. Given below is a sample of a portion of DNA strand giving the base sequence on the opposite strands. What is so special shown in it ?

5'—GAATTC—3'

3'—CTTAAG—5'

- A. replication completed
- B. deletion mutation
- C. start codon at the S'end
- D. palindromic sequence of base pairs

**Answer: D**



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65. The unequivocal proof of DNA as the genetic material came from the studies on a

A. bacterium

B. fungus

C. viroid

D. bacterial virus

**Answer: D**



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**66.** In history of biology, Human genome project led to the development of

A. biotechnology

B. biomonitoring

C. bioinformatics

D. biosystematics

**Answer: C**

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67. Which one of the following is not a part of transcription unit in DNA

- A. The inducer
- B. A terminator
- C. A promoter
- D. The structural gene

**Answer: A**

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68. Removal of RNA polymerase III from nucleoplasm will affect the synthesis of

Or Eukaryotic RNA Polymerase III catalyse the synthesis of

- A. tRNA

B. hn RNA

C. m RNA

D. r RNA

**Answer: A**



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**69.** PCR and restriction Fragments length Polymorphism are the methods for

A. Study of enzymes

B. Genetic transformation

C. DNA sequencing

D. Genetic fingerprinting

**Answer: D**



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70. Ribosomal RNA is synthesized in :

- A. Lysosomes
- B. Nucleolus
- C. Nucleoplasm
- D. Ribosomes

**Answer: B**



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71. Removal of introns and joining of exons in a defined order during transcription is called :

- A. Looping
- B. Inducing
- C. Slicing

## D. Splicing

**Answer: D**



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72. If one strand of DNA has the nitrogenous base sequence as ATCTG, what would be the complementary RNA strand sequence ?

A. TTAGU

B. UAGAC

C. AACTG

D. ATCGU

**Answer: B**



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73. A test cross is carried out:

- A. determine the genotype of a plant at  $F_2$
- B. predict whether two traits are linked
- C. assess the number of alleles of a gene
- D. determine whether two species or varieties will breed successfully.

**Answer: A**



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74. What is it that forms the basis of DNA Fingerprinting

- A. The relative proportions of purines and pyrimidines in DNA.
- B. The relative difference in the DNA occurrence in blood, skin and saliva.

C. The relative amount-of DNA in the ridges and grooves of the fingerprints.

D. Satellite DNA occurring as highly repeated short DNA segments.

**Answer: D**



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75. Which one of the following represents a palindromic sequence in DNA ?

A.  $5' - GAATTC - 3'$   
 $3' - CTTAAG - 5'$

B.  $5' - CCAATC - 3'$   
 $3' - GAATCC - 5'$

C.  $5' - CATTAG - 3'$   
 $3' - GATAAC - 5'$

D.  $5' - GATACC - 3'$   
 $3' - CCTAAG - 5'$

**Answer: A**



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76. Crick one of the discoverer of DNA double helical stucture, was the man of

- A. Physics
- B. Chemistry
- C. Zoology
- D. Botany

**Answer: A**



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77. The number of codons that code different amino acids is

- A. 16
- B. 31
- C. 61

D. 64

**Answer: C**



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**78.** some amino acids are coded by more than one codon, hence the genetic code is

A. unambiguous

B. degenerate

C. universal

D. initiator

**Answer: B**



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79. Out of 64 codons, the number of codons with GGG is

A. 1

B. 2

C. 4

D. 6

**Answer: A**



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80. Which enzyme/s will be produced in a cell in which there is a nonsense mutation in the lac Y gene

A. Lactose permease

B. Transacetylase

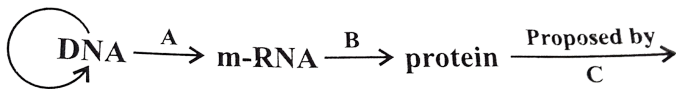
C. Lactose permease and transacetylase

D.  $\beta$ -galactosidase

**Answer: D**

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**81.** The diagram shows an important concept in the genetic implication of DNA. Fill in the blanks A to C.



A. A-Translation B -Thmscription C -Frevin Chargaff

B. A -Transcription B -Translation C -Francis Crick

C. A -Trans1ation B - Extension C - Rosalind Franklin

D. A - Transcription B - Replication C - James Watson

**Answer: B**

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82. Which of the following shows coiled RNA strand and capsomeres

- A. Polio virus
- B. Tobacco mosaic virus
- C. Measles virus
- D. Retrovirus

**Answer: B**



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83. Which one of the following is wrongly matched ?

- A. Transcription - Writing information from DNA to t-RNA
- B. Translation - Using information in m-RNA to make protein
- C. Repressor protein - Binds to operator to stop enzyme synthesis
- D. Operon - Structural genes, operator and promoter

**Answer: A**



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**84.** Transformation was discovered by

A. Meselson and Stahl

B. Hershey and Chase

C. Griffith

D. Watson and Crick

**Answer: C**



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**85.** Viruses have

A. DNA enclosed in a protein coat



B. Prokaryotic nucleus

C. Single chromosome

D. Both DNA and RNA

**Answer: A**



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**86.** Select the correct option :

	<b>Direction of RNA synthesis</b>	<b>Direction of reading of the template DNA strand</b>
(a)	5' — 3'	3' — 5'
(b)	3' — 5'	5' — 3'
(c)	5' — 3'	5' — 3'
(d)	3' — 5'	3' — 5'



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**87.** Commonly used vectors for human genome sequencing are

A. T - DNA

B. BAC and YAC

C. Expression Vectors

D. T/A Cloning Vectors

**Answer: B**

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**88.** Which of the following biomolecules does have phosphodiester bond

A. Nucleic acids in a nucleotide

B. Fatty acids in a diglyceride

C. Monosaccharides in a polysaccharide

D. Amino acids in a polypeptide

**Answer: A**

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89. Identify the correct order of organisation of genetic material from largest to smallest :

- A. Chromosome, genome, nucleotide, gene
- B. Chromosome, gene, genome, nucleotide
- C. Genome, chromosomes, nucleotide, gene
- D. Genome, chromosome, gene, nucleotide

**Answer: D**



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90. which one of the following is not applicable to RNA

- A. Chargaffs rule
- B. Complementary base pairing
- C. 5 phosphoryl and 3 hydroxyl ends

## D. Heterocyclic nitrogenous bases

**Answer: A**



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**91.** Satellite DNA is important because it

- A. Codes for enzymes needed for DNA replication
- B. Codes for proteins needed in cell cycle
- C. Shows high degree of polymorphism in population and also the same degree of polymorphism in an individual, which is heritable from parents to children
- D. Does not code for proteins and is same in all members of the population

**Answer: C**



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92. Balbiani rings are sites of

- A. RNA and protein synthesis
- B. Lipid synthesis
- C. Nucleotide synthesis
- D. Polysaccharide synthesis

**Answer: A**



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93. What would happen if in a gene encoding a polypeptide of 50 amino acids, 25th codon (UAU) is mutated to UAA ?

- A. A polypeptide of 49 amino acids will be formed
- B. A polypeptide of 25 amino acids will be formed
- C. A polypeptide of 24 amino acids will be formed

D. Two polypeptides of 24 and 25 amino acids will be formed

**Answer: C**



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**94.** Which one of the following is the starter codon ?

A. UGA

B. UAA

C. UAG

D. AUG

**Answer: C**



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95. Which of the following is required as inducer(s) for the expression of Lac operon ?

- A. galactose
- B. lactose
- C. lactose and galactose
- D. glucose

**Answer: B**



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96. Which of the following is not required for any of the techniques of DNA fingerprinting available at present

- A. Zinc finger analysis
- B. Restriction enzymes
- C. DNA- DNA hybridization

D. Polymerase chain reaction

**Answer: A**



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97. A complex of attached to a single of RNA is known as

A. Polymer

B. Polypeptide

C. Okazaki fragment

D. Polysome

**Answer: D**



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98. Which of the following r-RNAs acts as structural RNA as well as ribozyme in bacteria ?

- A. 5 S rRNA
- B. 18 S rRNA
- C. 23 S rRNA
- D. 5.8 S rRNA

**Answer: C**



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99. DNA-dependent RNA polymerase catalyzes transcription on one strand of the DNA which is called the :

- A. template strand
- B. coding strand
- C. alpha strand

D. antistrand

**Answer: A**



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**100.** One functional unit of gene which specifies synthesis of one polypeptide is known as

Or

The equivalent of a structural gene

A. muton

B. cistron

C. operon

D. recon

**Answer: B**



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**101.** Taylor conducted the experiment to prove semiconservative mode of chromosomereplication on :

- A. *Vinca rosea*
- B. *Vicia faba*
- C. *Drosophila melanogaster*
- D. *E. coli*

**Answer: B**



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**102.** The unequivocal proof that DNA is the genetic material came from the experiments of -

- A. Hershey and Chase
- B. Avery, MacLeod and McCarty
- C. Hargobind Khorana

D. Griffith

**Answer: A**



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**103.** If there are 999 bases in RNA that codes for a protein with 333 amino acids, and the base at position 901 is deleted such that the length of the RNA becomes 998 bases, how many codons will be altered

A. 11

B. 33

C. 333

D. 1

**Answer: B**



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104. During replication of DNA, Okazaki fragments are formed in the direction of :

- A. the lagging strand towards replication fork
- B. the leading strand away from replication fork
- C. the lagging strand away from the replication fork
- D. the leading strand towards replication fork

**Answer: C**



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105. Which of the following RNAs should be most abundant in animal cell

- A. t RNA
- B. m RNA
- C. mi RNA
- D. r RNA

**Answer: D**



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**106.** DNA replication in bacteria occurs

- A. within nucleolus
- B. prior to fission
- C. just before transcription
- D. during S phase

**Answer: B**



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**107.** The association of histone  $H_1$  with a nucleosome indicates that

- A. DNA replication is occurring

- B. the DNA is condensed into a chromatin fibre
- C. the DNA double helix is exposed
- D. transcription is occurring

**Answer: B**



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**108.** The experimental proof for semi-conservative replication of DNA was first shown in a

- A. fungus
- B. bacterium
- C. plant
- D. virus

**Answer: B**



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109. Select the correct match.

- A. Alec Jeffreys-Streptococcus pneumoniae
- B. Alfred Hershey and Martha Chase-TMV
- C. Matthew Meselson and F. Stahl - Pisum sativum
- D. Francois Jacob and Jacques Monod - Lac operon

**Answer: D**



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110. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA?

- A. AGGUAUCGCAU
- B. UGGTUTCGCAT
- C. ACCUAUGCGAU



D. UCCAUGCGUA

**Answer: A**



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**111.** All of the following are part of an operon except

A. an operator

B. structural genes

C. an enhancer

D. a promoter.

**Answer: C**



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**Practice Questions Assertion Reason Type Questions**

1. Assertion. Adenine cannot pair with cytosine.

Reason. Adenine and cytosine do not have a perfect match between hydrogen donor and hydrogen acceptor sites. Hence, they cannot pair.

- A. If both A and R are true and R is the correct explanation of A.
- B. If both A and R are true but R is not the correct explanation of A.
- C. If A is true but R is false.
- D. If both A and R are false.

**Answer: A**



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2. Assertion. Ionizing radiations are harmful for the living organisms.

Reason. They form toxic photo products in the cells.

- A. If both A and R are true and R is the correct explanation of A.
- B. If both A and R are true but R is not the correct explanation of A.

C. If A is true but R is false.

D. If both A and R are false.

**Answer: C**



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**3.** Assertion. A single mRNA strand is capable of forming a number of different polypeptide chains.

Reason. The mRNA strand has terminator codons.

A. If both A and R are true and R is the correct explanation of A.

B. If both A and R are true but R is not the correct explanation of A.

C. If A is true but R is false.

D. If both A and R are false.

**Answer: B**



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4. Assertion. The genetic code is degenerate.

Reason. Most amino acids are coded by more than one codon.

- A. If both A and R are true and R is the correct explanation of A.
- B. If both A and R are true but R is not the correct explanation of A.
- C. If A is true but R is false.
- D. If both A and R are false.

**Answer: A**



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5. Assertion. Sickle-cell haemoglobin has valine in place of glutamic acid at position 6 in the  $\beta$  polypeptide chain.

Reason. Sickle-cell anaemia is expressed only in homozygous recessive state.

- A. If both A and R are true and R is the correct explanation of A.

B. If both A and R are true but R is not the correct explanation of A.

C. If A is true but R is false.

D. If both A and R are false.

**Answer: B**



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6. Assertion. One gene-one enzyme hypothesis of Beadle and Tatum is true in all cases.

Reason. An enzyme always consists of more than one polypeptide chain

A. If both A and R are true and R is the correct explanation of A.

B. If both A and R are true but R is not the correct explanation of A.

C. If A is true but R is false.

D. If both A and R are false.

**Answer: D**



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7. Assertion. Replication of DNA is accurate.

Reason. Errors in DNA will spoil the genome.

- A. If both A and R are true and R is the correct explanation of A.
- B. If both A and R are true but R is not the correct explanation of A.
- C. If A is true but R is false.
- D. If both A and R are false.

**Answer: C**



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8. Assertion. Mitochondrial DNA is similar to prokaryotic DNA.

Reason. Mitochondria are thought to have evolved from the prokaryotes.

- A. If both A and R are true and R is the correct explanation of A.

B. If both A and R are true but R is not the correct explanation of A.

C. If A is true but R is false.

D. If both A and R are false.

**Answer: A**



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**9.** Assertion. DNA fingerprinting is very well known for its application in paternity testing is case of disputes.

Reason. It employs the principle of polymorphism in DNA sequences as the polymorphisms are inheritable from parents to children

A. If both A and R are true and R is the correct explanation of A.

B. If both A and R are true but R is not the correct explanation of A.

C. If A is true but R is false.

D. If both A and R are false.

**Answer: A**



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**10.** Assertion. Human Genome Project was a mega project launched to find out the complete DNA sequence of human genome.

Reason. It was possible only with the help of genetic engineering techniques to isolate and clone any piece of DNA and fast techniques for determining DNA sequences.

- A. If both A and R are true and R is the correct explanation of A.
- B. If both A and R are true but R is not the correct explanation of A.
- C. If A is true but R is false.
- D. If both A and R are false.

**Answer: A**



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11. Assertion. During DNA replication, the discontinuous synthesized fragments are joined by DNA polymerase.

Reason. A RNA sequence provides binding site for RNA polymerase.

- A. If both A and R are true and R is the correct explanation of A.
- B. If both A and R are true but R is not the correct explanation of A.
- C. If A is true but R is false.
- D. If both A and R are false.

**Answer: D**

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12. Assertion. RNA was the first genetic material.

Reason. DNA has evolved from RNA by chemical modifications.

- A. If both A and R are true and R is the correct explanation of A.
- B. If both A and R are true but R is not the correct explanation of A.

C. If A is true but R is false.

D. If both A and R are false.

**Answer: B**



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**13.** Assertion. In bacteria the cromosome is irregularly folded into a compact mass, the nucleoid or genophore of definite form.

Reason. In bacteria there is no organised nucleus.

A. If both A and R are true and R is the correct explanation of A.

B. If both A and R are true but R is not the correct explanation of A.

C. If A is true but R is false.

D. If both A and R are false.

**Answer: A**



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**14.** Assertion. DNA is more stable while RNA is more reactive.

Reason. DNA was first discovered by Watson and Crick (1953).

- A. If both A and R are true and R is the correct explanation of A.
- B. If both A and R are true but R is not the correct explanation of A.
- C. If A is true but R is false.
- D. If both A and R are false.

**Answer: C**



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