



BIOLOGY

BOOKS - FULL MARKS BIOLOGY (TAMIL ENGLISH)

MOLECULAR GENETICS

Textbook Evaluation Solved

1. Hershey and Chase experiment with bacteriophage showed that

A. (a) Protein gets into the bacterial cells

B. (b) DNA is the genetic material

C. (c) DNA contains radioactive sulphur

D. (d) Viruses undergo transformation

Answer: B



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2. DNA and RNA are similar with respect to

A. (a) Thymine as a nitrogen base

B. (b) A single-stranded helix shape

C. (c) Nucleotide containing sugars,
nitrogen bases and phosphates

D. (d) The same sequence of nucleotides
for the amino acid phenyl alanine

Answer: C



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3. A mRNA molecule is produced by

A. Replication

B. Transcription

C. Duplication

D. Translation

Answer: B



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4. The total number of nitrogenous bases in human genome is estimated to be about

A. (a) 3.5 million

B. (b) 35000

C. (c) 35 million

D. (d) 3.1 billion

Answer: D



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5. *E. coli* cell grown on ^{15}N medium are transferred to ^{14}N medium and allowed to grow for two generations. DNA extracted from

these cells is ultracentrifuged in a cesium chloride density gradient. What density distribution of DNA would you expect in this experiment?

- A. One high and one low density band
- B. One intermediate density band
- C. One high and one intermediate density band
- D. One low and one intermediate density band

Answer: D



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6. What is the basis for the difference in the synthesis of the leading and lagging strand of DNA molecules?

A. Origin of replication occurs only at the 5' end of the molecules

B. DNA ligase works only in the 3' → 5' direction

C. DNA polymerase can join new nucleotides only to the 3' end of the growing strand

D. Helicases and single-strand binding proteins that work at the 5' end

Answer: D



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7. Which of the following is the correct sequence of events with reference to the central dogma ?

A. Transcription, Translation, Replication

B. Transcription, Replication, Translation

C. Duplication, Translation, Transcription

D. Replication, Transcription, Translation

Answer: D



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8. Which of the following statements about DNA replication is not correct?

A. (a) Unwinding of DNA molecule occurs as hydrogen bonds break

B. (b) Replication occurs as each base is paired with another exactly like it

C. (c) Process is known as semi-conservative replication because one old strand is conserved in the new molecule

D. (d) Complementary base pairs are held together with hydrogen bonds

Answer: B



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9. Which of the following statements is not true about DNA replication in eukaryotes?

A. Replication begins at a single origin of replication.

B. Replication is bidirectional from the origins.

C. Replication occurs at about 1 million base pairs per minute.

D. There are numerous different bacterial chromosomes, with replication occurring in each at the same time.

Answer: D



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10. The first codon to be deciphered was _____ which codes for _____.

- A. AAA, proline
- B. GGG, alanine
- C. UUU, Phenylalanine
- D. TTT, arginine

Answer: C



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11. Meselson and Stahl's experiment proved

.....

A. Transduction

B. Transformation

C. DNA is the genetic material

D. Semi-conservative nature of DNA replication

Answer: D



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12. Ribosomes are composed of two subunits, the smaller subunit of a ribosome has a binding site for and the larger subunit has two binding sites for two



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13. An operon is a:

A. (a) Protein that suppresses gene expression

B. (b) Protein that accelerates gene expression

C. (c) Cluster of structural genes with related function

D. (d) Gene that switched other genes on or off

Answer: D



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14. When lactose is present in the culture medium:

A. (a) Transcription of lac y, lac z, lac a genes occurs

B. (b) Repressor is unable to bind to the operator

C. (c) Repressor is able to bind to the operator

D. (d) Both (a) and (b) are correct

Answer: D



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15. Genetic code is 'universal'. Give reason.



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16. Name the parts marked 'A' and 'B' in the given transcription unit.



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17. Differentiate - Leading strand and lagging strand.



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18. Differentiate - Template strand and coding strand.



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19. Mention any two ways in which single nucleotide polymorphism (SNP_s) identified in human genome can bring revolutionary change in biological and medical science.



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20. State any three goals of the human genome project.



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21. In E.coli, there enzymes galactosidase, permease and transacetylase are produced in the presence of lactose. Explain why the enzymes are not synthesized in the absence of lactose.



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22. Distinguish between structural gene, regulatory gene and operator gene.



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23. A low level of expression of lac operon occurs at all the time in E-coli. Justify the statement.



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24. Why is the Human Genome Project called a mega project?



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25. From their examination of the structure of DNA, What did Watson and Crick infer about the probable mechanism of DNA replication, coding capability and mutation?



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26. Why tRNA is called an adapter molecule?



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27. Give any three difference between DNA and RNA.



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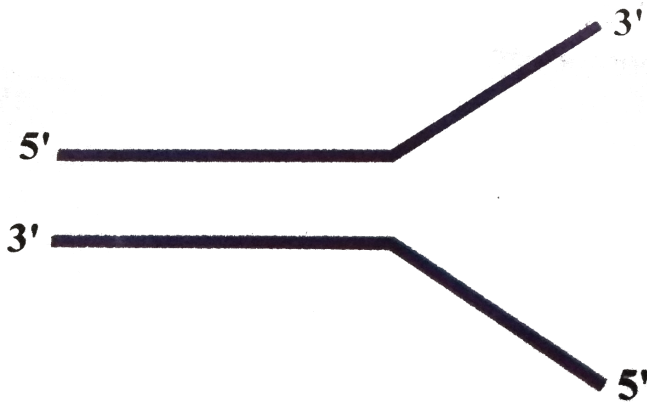
28. Name the anticodons required to recognize the following codons AAU, CGA, UAU, GCA,



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29. a) Identify the figure given below

b) Redraw the structure as a replicating fork and label the parts



(c) Write the source of energy for this replication and name the enzyme involved in this process.

(d) Mention the differences in the synthesis of

protein, based on the polarity of the two template strands.



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30. If the coding sequence in a transcription unit is written as follows:

5'TGCATGCATGCATGCATGCATGCATGC 3'

Write down the sequence of mRNA.



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31. How is the two stage process of protein synthesis advantageous?



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32. Why did Hershey and Chase use radioactively labelled phosphorous and sulphur only? Would they have got the same result if they use radiolabelled carbon and nitrogen?



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33. Explain the formation of a nucleosome.



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34. It is established that RNA is the first genetic material. Justify by giving reasons.



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Additional Questions 1 Mark Questions

1. The term 'gene' was coined by



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

A. Griffith experiment

B. Avery, Macleod and McCarty's experiment

C. Hershey-Chase experiment

D. Urey-Miller's experiment

Answer: C



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3. In Hershey - Chase experiment, the DNA of T_2 phage was made radioactive by using

.....

A. ^{32}P

B. ^{35}S

C. ^{35}P

D. ^{32}S

Answer: A



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4. A nucleoside is composed of

A. Sugar and Phosphate

B. Nitrogen base and Phosphate

C. Sugar and Nitrogen base

D. Sugar, Phosphate and Nitrogenous base

Answer: C



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5. Identify the incorrect statement

A. (a) a base is a substance that accepts

H^+ ion

B. (b) Both DNA and RNA have four bases

C. (c) Purines have single carbon-nitrogen ring

D. (d) Thymine is unique for DNA

Answer: C



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6. Watson and Crick proposed their double helical DNA model based on the X-ray diffraction analysis of

A. Erwin Chargaff

B. Meselson and Stahl

C. Wilkins and Franklin

D. Griffith

Answer: C



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7. The term 'RNA World' was first used by



8. The distance between two consecutive base pairs in DNA is _____

A. 0.34 nm

B. 3.4 nm

C. 0.034 nm

D. 34 nm

Answer: A



9. If the length of E. coli DNA is 1.36 mm, the number of base pairs is

A. (a) $0.36 \times 10^6 m$

B. (b) $4 \times 10^6 m$

C. (c) $0.34 \times 10^{-9} nm$

D. (d) $4 \times 10^{-9} m$

Answer: B



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10. Identify the proper sequence in the organisation of eukaryotic chromosome.

A. (a) Nucleosome - Solenoid - Chromatid

B. (b) Chromatid - Nucleosome - Solenoid

C. (c) Solenoid - chromatin - DNA

D. (d) Nucleosome solenoid - genophore

Answer: A



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11. Assertion (A) : Genophore is noticed in prokaryotes.

Reason (R): Bacteria possess circular DNA without chromatin organisation.

A. (a) Both A and R are correct

B. (b) A is correct R is incorrect

C. (c) R explains A

D. (d) A is incorrect R is correct

Answer: C



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12. Assertion (A): Heterochromatin is transcriptionally active.

Reason (R): Tightly packed chromatin which stains dark.

A. Both A and R are correct

B. A is correct R is incorrect

C. R explains A

D. A is incorrect R is correct

Answer: D



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13. Assertion (A): Semi-conservative model was proposed by Hershey and Chase.

Reason (R): The daughter DNA contains only new strands.

A. Both A and R are incorrect

B. A is correct R is incorrect

C. R explains A

D. A is incorrect R is correct

Answer: A



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14. Kornberg enzyme is called as



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15. Replication of DNA occurs at
phase of cell cycle.

A. (a) M

B. (b) S

C. (c) G_1

D. (d) G_2

Answer: B



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16. Semiconservative DNA replication was first demonstrated by

A. Hershey and Chase

B. Griffith

C. Meselson and Stahl

D. Macleod and McCarty

Answer: C



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17. How many types of DNA polymerases does an eukaryotic cell possess?

A. two

B. three

C. four

D. five

Answer: D



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18. Identify the incorrect statement

A. Replication occurs at ori - site of DNA

B. Deoxy nucleotide triphosphate acts as a substrate

C. Unwinding of DNA strand is carried out by topoisomerase

D. DNA polymerase catalyses the polymerization at $3' - OH$

Answer: C



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19. The discontinuously synthesized fragments of lagging strand are called.....



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20. Retroviruses possess as genetic material.



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21. Which is NOT a part of transcription unit?

A. Promoter

B. Operator

C. Structural gene

D. Terminator

Answer: B



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22. Goldberg - Hogness box of eukaryotes is equivalent to of prokaryotes.



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23. Okazaki fragments are joined in a correct sequence by



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24. Match the following:

- | | |
|-------------------------------|------------------------|
| (A) Semi - conservative model | i) Griffith |
| (B) Transformation | ii) R. Holley |
| (C) Clover leaf model | iii) Jacob and Monod |
| (D) Lac operon model | iv) Meselson and Stahl |

A. $A - iv, B - i, C - ii, D - iii$

B. $A - i, B - ii, C - iii, D - iv$

C. $A - ii, B - iii, C - i, D - ii$

D. $A - ii, B - ii, C - iv, D - i$

Answer: A



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25. The RNA polymerase of prokaryotes binds with..... actor to initiate polymerization.

A. (a) rho

B. (b) theta

C. (c) sigma

D. (d) psi

Answer: C



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26. Precursor mRNA \xrightarrow{A} hnRNA

A. (a) Capping

B. (b) Tailing

C. (c) Splicing

D. (d) Transcribing

Answer: C



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27. Which of the following feature is absent in prokaryotes?

A. Prokaryotes possess three major types of RNAs

B. Structural genes are polycistronic

C. Initiation process of transcription

requires $^{\circ}P'$ factor

D. Split gene feature

Answer: D



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28. Which of the following sequence has completely translated?

(i) AGA, UUU, UGU, AGU, UAG

(ii) AUG, UUU, AGA, UAC, UAA

(iii) AAA, UUU, UUG, UGU, UGA

(iv) AUG, AAU, AAC, UAU, UAG

A. i and ii

B. ii only

C. i and iii

D. ii and iv

Answer: D



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29. Capping of mRNA occurs using

A. (a) Poly A residues

B. (b) Methyl guanosine triphosphate

C. (c) Deoxy ribonucleotide triphosphate

D. (d) Ribonucleotide triphosphate

Answer: B



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30. One of the aspect is not a feature of genetic code?

- A. (a) Specific
- B. (b) Degenerate
- C. (c) Universal
- D. (d) Ambiguous

Answer: D



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31. Which of the triplet codon is not a code of proline?

(i) CCU

(ii) CAU

(iii) CCG

(iv) CAA

A. i only

B. ii and iv

C. ii only

D. all the above

Answer: B



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32. Coding sequences found in split genes are called.

A. Operons

B. Introns

C. Exons

D. Cistron

Answer: C



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33. Which of the following mRNA yields 6 aminoacids after translation?

A. UCU UAU AGU CGA UGC AGU UGA AAA
UUU

B. UGA AGA UAG GAG CAU CCC UAC UAU
GAU

C. GUC UGC UGG GCU GAU UAA AGG AGC

AUU

D. AUG UAC CAU UGC UGA UGC AGG AGC

CCG

Answer: A



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34. The transcription termination factor associated with RNA polymerase in prokaryotes is

A. (a) θ

B. (b) σ

C. (c) ρ

D. (d) Σ

Answer: C



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35. In a DNA double strand, if guanine is of 30%, what will be the percentage of thymine?

A. (a) 1

B. (b) 0.2

C. (c) 0.1

D. (d) 0.7

Answer: B



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36. Identify the triplet pairs that code for Tyrosine

A. UUU, UUC

B. UAU, UAC

C. UGC, UGU

D. CAU, CAC

Answer: B



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37. Match the following:

- | | | |
|---------------------------|---|---------------------------|
| (A) DNA Polymerase | - | (i) Charging of tRNA |
| (B) Amino acyl synthetase | - | (ii) Synthesize DNA |
| (C) DNA helicase | - | (iii) Joins DNA fragments |
| (D) DNA ligase | - | (iv) Unwinds DNA strand |

A. $A - ii, B - i, C - iv, D - iii$

B. $A - iii, B - ii, C - i, D - iv$

C. $A - iv, B - i, C - ii, D - iii$

D. $A - ii, B - iii, C - i, D - iv$

Answer: A



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38. AUG code is for

A. Arginine

B. Tyrosine

C. Tryptophan

D. Methionine

Answer: D



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39. The sequence of bases in coding strand of DNA is GAGTTAGCAGGC, then the sequence of codons in primary transcript is

A. C U C A U A C G C C C G

B. C U C A A U C G U C C G

C. U C A G A U C U G C G C

D. U U C A A U C G U G C G

Answer: B



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40. The promoter region of eukaryote is

.....

A. TATAA

B. AUGUT

C. UUUGA

D. AAAAU

Answer: A



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41. Match the following:

(A) AUG

(B) UGA

(C) UUU

(D) GGG

-

-

-

-

(i) Tyrosine

(ii) Glycine

(iii) Methionine

(iv) Phenylalanine

A. $A - iii, B - i, C - iv, D - ii$

B. $A - iii, B - ii, C - i, D - iv$

C. $A - iv, B - i, C - ii, D - iii$

D. $A - ii, B - iii, C - iv, D - i$

Answer: A



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42. number of codons, codes for cystine.



43. In sickle cell anaemia, thecodon of β - globin gene is modified.

- A. Eighth
- B. Seventh
- C. Sixth
- D. Nineth

Answer: C



44. Pick out the incorrect statement.

A. (a) tRNA acts as a adapter molecule

B. (b) Stop codons donot have tRNA's

C. (c) Addition of aminoacid leads to
hydrolysis of tRNA

D. (d) tRNA has four major loops

Answer: C



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45. Which of the following antibiotic inhibits the interaction between tRNA and mRNA?

A. Neomycin

B. Streptomycin

C. Tetracycline

D. Chloramphenicol

Answer: A



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46. The cluster of genes with related function is called

A. (a) Cistron

B. (b) Operon

C. (c) Muton

D. (d) Recon

Answer: B



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47. Repressor protein of Lac operon binds to of operon.

- A. (a) Promoter region
- B. (b) Operator region
- C. (c) terminator region
- D. (d) inducer region

Answer: B



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48. Lac Z gene codes for

- A. (a) Permease
- B. (b) transacetylase
- C. (c) β -galactosidase
- D. (d) Aminoacyl transferase

Answer: C



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49. Lac operon model was proposed by

.....



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50. Approximate count of base pair in human genome is



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51. Automated DNA sequences are developed by.....



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52. Which of these is used as vector in gene therapy for SCID?

A. Chromosome 20

B. Chromosome 19

C. Chromosome 13

D. Chromosome Y

Answer: B



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53. Number of genes located in chromosome Y
is

A. 2968

B. 213

C. 2869

D. 231

Answer: D



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54. How many structural genes are located in lac operon of E.Coli?

A. 4

B. 3

C. 2

D. 1

Answer: B



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55. DNA fingerprinting technique was developed by Alec Jeffrey.

A. Jacob and Monod

B. Alec Jeffreys

C. Frederick Sanger

D. denaturation

Answer: B



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56. In DNA fingerprinting, separation of DNA fragments is done by

A. Centrifugation

B. Electrophoresis

C. X-ray diffraction

D. denaturation

Answer: B



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57. SNP stands for

A. Single nucleotide Polymorphism

B. Single Nucleoside Polypeptide

C. Single nucleotide Polymorphism

D. Single nucleotide polymer

Answer: A



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58. Specific sequences of mRNA that are not translated are



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59. Non-coding or intervening DNA sequence is called



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60. is the monomer of DNA.



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61. Which one of the following is wrongly matched?

A. Transcription - Copying information from
DNA to RNA

B. Translation - Decoding information from mRNA to protein

C. Replication - Making of DNA copies

D. Splicing - Joining of exons with introns

Answer: D



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Additional Questions 2 Marks Questions

1. Who proposed one gene-one enzyme hypothesis?



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2. Differentiate nucleoside and nucleotide.



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3. Enumerate the main differences between DNA and RNA.



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4. Point out the nitrogenous bases of RNA.



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5. What makes the DNA and RNA as acidic molecules?



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6. Which type of bond is formed

(a) between a purine and pyrimidine base?

(b) between the pentose sugar and adjacent nucleotide?



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7. DNA acts as genetic material for majority of living organisms and not the RNA. Give reasons to support the statement.



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8. Name any two viruses whose genetic material is RNA.



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9. What are the properties that a molecule must possess to act as genetic material?



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10. How many base pairs are found in one turn of DNA?



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11. What is a genophore?



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12. What is nucleosome? How many base pairs are there in a typical nucleosome?



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13. Expand and define NHC



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14. Distinguish heterochromatin and euchromatin.



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15. Which is the widely accepted model of DNA replication? Who has proved it?



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16. Name the chemical substance which is called by the name (a) Kornberg Enzyme (b) Ochoa's enzyme



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17. Name the various types of prokaryotic DNA polymerase. State their role in replication process.



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18. What is the function of Deoxy nucleotide triphosphate in replication?



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19. Given below are some events of eukaryotic replication. Name the enzymes involved in the process.

(a) Unwinding of DNA (b) Joining of Okazaki fragments

(c) Addition of nucleotides to new strand (d) Correcting the repair



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20. Differentiate - Leading strand and lagging strand.



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21. What are Okazaki fragments?



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22. What is a replication fork?



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23. Apart from DNA polymerase, name any other four enzymes which were involved in DNA replication of eukaryotic cell.



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24. Who proposed the central dogma? Write its concept.



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25. Define transcription and name the enzyme involved in this process.



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26. What is TATA box?



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27. Structural gene of eukaryotes differ from prokaryotes. How?





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28. What are the two major components of prokaryotic RNA polymerase? How do they act?



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29. Differentiate Exons and Introns



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30. Define splicing.



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31. What is meant by capping and tailing?



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32. If a double stranded DNA has 20 percent of cytosine, calculate the percent of adenine in the DNA.



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33. AUG has dual functions.



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34. How many codons are involved in termination of translation. Name them.



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35. Degeneracy of codon - comment.



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36. Point out the exceptional categories to universality of genetic code.



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37. AUG is known as the initiation codon and UAA, UAG and UGA are known as termination codons. Then what are non-sense codons?



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38. Name the triplet codons that code for (a) Tyrosine (b) Histidine



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39. Why hnRNA has to undergo splicing?



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40. State the role of following codons in translation process (a) AUG (b) UAA



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41. Given below is mRNA sequence. Mention the aminoacids sequence that is formed after its translation.

3'AUGAAAGAUGGGUAA5'



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42. Name the four codons that codes valine.



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43. The base sequence in one of the DNA strand is TAGCATGAT. Mention the base sequence in its complementary strand.



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44. tRNA is called adapter module.





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45. What do you mean by charging of tRNA?

Name the enzyme involved in this process.



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46. What are UTR's?



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47. What is S-D Sequence?



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48. Define translation unit.



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49. Mention the inhibitory role of tetracycline and streptomycin in bacterial translation.



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50. At what stage, does the gene expression is regulated?



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51. What is a operon? Give example.



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52. Considering the lac operon of E.coli, name the products of the following genes,

a) i gene (b) lac Z gene (c) lac Y gene (d) lac a gene



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53. Expand (a) ETS and (b) YAC.



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54. Name the human chromosome that has

(a) most number of genes

(b) least number of genes



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55. What are SNPs? Mention its uses.



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56. Mention any four areas where DNA fingerprinting can be used.



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Additional Questions 3 Marks Questions

1. Classify nucleic acid based on sugar molecules.



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2. Both purines and pyrimidines are nitrogen bases yet they differ. How?



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3. How 5' of DNA differ from its 3'?



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4. State Chargaff's rule.



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5. Chemically DNA is more stable than RNA -
Justify



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6. Which property of DNA double helix led Watson and Crick to hypothesise semi-conservative mode of DNA replication? Explain.



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7. Draw a simplified diagram of nucleosome and label it.



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8. What is a primer?



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9. Assertion: Both the strands of DNA can be copied during transcription.

Reason: This will help to produce more RNA with different sequences.



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10. What is coding strand?



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11. Name the factors that are responsible for initiation and termination of transcription in prokaryotes.



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12. Name the major RNA types of prokaryotes and mention their role.



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13. What is a genetic code?



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14. Explain Wobble hypothesis.



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15. Explain the nature of eukaryotic ribosome.



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16. Expand and define ORF .



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17. What are the components of initiation complex of prokaryotic translation?



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18. Explain the components of operon .



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Additional Questions 5 Marks Questions

1. Hershey and Chase experiment with bacteriophage showed that



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2. What are the properties that a molecule must possess to act as genetic material?



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3. How the DNA is packed in an eukaryotic cell ?



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4. Meselson and Stahl experiment proved



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5. Give a detailed account of a transcription unit.



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6. Explain the transcription process in prokaryotes .



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7. Write the salient features of genetic code.



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8. Mutations on genetic code affects the phenotype. Describe with example.



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9. (b) Explain the Mechanism of 'lac' - operon of the E-coli.



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10. Write the objectives of Human Genome project.



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11. Write the salient features of Human Genome Project.



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12. Write a not an DNA fingerprinting.



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13. Write a note on DNA fingerprinting.



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Additional Questions Higher Order Thinking Skills Hots Questions

1. A mRNA strand has a series of triplet codons of which the first three codons are given below

(a) AUG (b) UUU (c) UGC

(i) Name the amino acid encoded by these triplet codons. (ii) Mention the DNA sequence from which these triplet codons would have transcribed?



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2. Given below are the structures of tRNA molecules which are involved in translation process. In one tRNA, codon is mentioned but not the amino acid. In another tRNA molecule,

amino acid is named and not the codon.

Complete the figure by mentioning the respective amino acids and codons.



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3. A DNA fragment possesses 32 adenine bases and 32 cytosine bases. How many total number of nucleotides does that DNA fragment contains? Explain.



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4. Following is a DNA sequence representing a part of gene

TAC TCG CCC TAT UAA CCC AAA ACC TCT using this derive

(a) The RNA transcript

(b) The spliced mRNA (consider all the codons with two Adenine bases are introns)

(c) The total number of amino acids coded by the mRNA



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5. Complete the molecular processes by naming them

(a) DNA → DNA (b) mRNA → Protein (c) RNA

transcript → mRNA



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