



**WEST BENGAL STATE UNIVERSITY**

B.Sc. Honours/Programme 3rd Semester Examination, 2020, held in 2021

**MLBHGE03T/MLBGCOR03T-MOLECULAR BIOLOGY (GE3/DSC3)**

**FUNDAMENTALS OF MOLECULAR BIOLOGY**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

1. Answer any **ten** questions from the following: 1×10 = 10
- A. Choose the correct option:
- (i) In Griffith's experiment involving the transformation of *Streptococcus pneumoniae*,
- (A) the R strain was virulent  
(B) the S strain was virulent  
(C) both the R and S strains were virulent  
(D) the R strain had a protein capsule
- (ii) Substitution of a thymine base by adenine in DNA is known as
- (A) Transposition (B) Transition  
(C) Transversion (D) Frameshift mutation
- (iii) The coding sequences found in split genes are called
- (A) Operons (B) Introns (C) Exons (D) Cistrons
- (iv) Which part of the T2 bacteriophage entered *E.coli* cells in the experiment which confirmed the identity of the transforming principle?
- (A) The RNA (B) The DNA  
(C) The whole virus (D) The protein coat
- (v) Antiparallel means that
- (A) the two polynucleotide chains run in opposite directions  
(B) each DNA molecule consists of one old and one new strand  
(C) opposite strands are held together by base pairing  
(D) the helix twists to the right
- (vi) Amino acid sequence of the encoded protein is not changed in
- (A) Silent mutation (B) Missense mutation  
(C) Frameshift mutation (D) None of these
- (vii) Which form of DNA is a left-handed double helix?
- (A) A-DNA (B) B-DNA (C) L-DNA (D) Z-DNA

- (viii) In case of *E.coli* chromosomal DNA replication, after formation of replication fork
- (A) Both the new strands are synthesized discontinuously
  - (B) One strand is synthesized continuously and the other discontinuously
  - (C) Both the new strands are synthesized continuously
  - (D) RNA primer is required only for the synthesis of one new strand
- (ix) The promoter site for transcription is recognized by
- (A)  $\alpha$  Subunit of DNA-dependent RNA polymerase
  - (B)  $\beta$  Subunit of DNA-dependent RNA polymerase
  - (C) Sigma factor
  - (D) Rho factor
- (x) Eukaryotic chromosomes consist of
- (A) DNA alone
  - (B) DNA complexed with RNA
  - (C) DNA complexed with protein and RNA
  - (D) DNA complexed with protein
- (xi) What does a gene actually code for?
- (A) A polypeptide
  - (B) A nucleotide
  - (C) An amino acid
  - (D) A nucleoside
- (xii) The process by which genetic information is transferred from DNA to RNA is called
- (A) replication
  - (B) transcription
  - (C) translation
  - (D) transformation
- (xiii) Exposure of DNA to ultraviolet radiation can lead to the formation of
- (A) Adenine dimers
  - (B) Guanine dimers
  - (C) Thymine dimers
  - (D) Uracil dimers
- (xiv) *E. coli* DNA polymerase I possesses
- (A) Polymerase activity
  - (B) 3'→5' Exonuclease activity
  - (C) 5'→3' Exonuclease activity
  - (D) All of these
- (xv) What is the role of tRNA in translation?
- (A) It brings together two subunits of a ribosome
  - (B) It couples an amino acid with aminoacyl tRNA synthetase
  - (C) It catalyzes peptidyl transferase activity
  - (D) It binds to an mRNA codon and carries the corresponding amino acid

2. Answer any **ten** questions from the following:

2×10 = 20

- (a) What will be the correct complementary sequence of 3'-ATGCTAGTATA-5' in DNA?
- (b) What do you mean by proofreading activity of DNA polymerase? Explain.
- (c) What type of structure is generally found at the 3' end of eukaryotic mRNA?

- (d) Write down the structure of cAMP.
- (e) What is Dihydrouridine? Where is it found?
- (f) Explain the codon and anticodon interaction and the influence of wobble base pairing on this interaction.
- (g) What is the 'Central Dogma of Molecular Biology'?
- (h) What is the function of Shine-Dalgarno sequence?
- (i) What are denaturation and renaturation of DNA?
- (j) What do you mean by origin of DNA replication?
- (k) What is a Mutagen? Give two examples.
- (l) At which step does Streptomycin inhibit protein synthesis?
- (m) What is nick-translation? Explain with a suitable diagram.
- (n) What is Nucleosome?
- (o) Describe Ames test.

3. Answer any *two* questions from the following: 5×2 = 10
- (a) State the differences between the following: 2  $\frac{1}{2}$  × 2 = 5
    - (i)  $\rho$ -dependent and  $\rho$ -independent termination.
    - (ii) Spontaneous mutation and Induced mutation.
  - (b) How it was proved experimentally that DNA replication occurs by the semi-conservative mode? Explain in detail. 5
  - (c) What experimental evidence helped Watson and Crick to deduce the double helical structure of DNA? Describe the key features of Watson-Crick's model of double helical DNA. 2+3
  - (d) How does transcription initiation occur in bacteria? 5

**N.B. :** *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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