BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Sc.(BT)-Hons-2023
Course Name – Molecular Biology
Course Code - BBT20107
(Semester II)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) State the type of RNA involved in protein synthesis.

a) snRNA b) rRNA
c) yRNA d) dsRNA

(ii) Choose which of the following statement offers the best explanation of a codon.

a) A single base necessary to specify a single amino acid b) A group of two bases necessary to specify a single amino acid
c) A group of three bases necessary to specify a single amino acid d) A group of several bases necessary to specify a single amino acid.

(iii) Identify which of the following bonds are broken during DNA replication.

a) Hydrogen bonds between bases b) Phosphodiester bonds
c) covalent bonds between bases d) Ionic bonds between bases and phosphate groups

(iv) Identify the direction of DNA synthesis in prokaryotes.

a) Unidirectional b) Bidirectional
c) Nondirectional d) Multidirectional

(v) Identify which type of replication produces a circular DNA molecule with a single-stranded tail.

a) Theta model b) Rolling circle replication
c) Semiconservative replication d) Conservative replication

(vi) Identify the name of the replication model that includes the formation of a replication bubble

a) Theta model b) Rolling circle replication
c) Semiconservative replication d) Conservative replication

(vii) Identify the function of DNA helicase during DNA replication.

a) Synthesizing new DNA strands b) Joining Okazaki fragments

c) Unwinding the DNA double helix
d) Proofreading newly synthesized DNA

(viii) Select which DNA repair mechanism is responsible for removing bulky adducts and pyrimidine dimers.

a) Base excision repair
b) Mismatch repair
c) Nucleotide excision repair
d) Translation repair

(ix) Identify which repair mechanism is highly efficient in correcting single-base mismatches and small insertion-deletion loops.

a) Base excision repair
b) Mismatch repair
c) Nucleotide excision repair
d) Homologous recombination

(x) Select the primary role of homologous recombination in DNA repair.

a) Removal of mismatched bases
b) Repair of single-strand breaks
c) Repair of double-strand breaks
d) Removal of pyrimidine dimers

(xi) Predict the succeeding step after translesion DNA synthesis (TLS) is completed across a damaged site during DNA replication.

a) The replicative polymerase dissociates from the DNA template.
b) The damaged DNA segment is excised and replaced.
c) Proofreading activity is initiated to correct any errors.
d) The TLS polymerase halts replication permanently.

(xii) Identify the specific site where the sigma factor target for binding during the initiation stage of transcription in prokaryotes.

a) Terminator sequence
b) Elongation site
c) Promoter region
d) Ribosome-binding site

(xiii) Select which of the following recruits RNA Polymerase II to the promoter region during eukaryotic transcription initiation.

a) Enhancers
b) Transcription factors
c) Introns
d) Exons

(xiv) Predict how does RNA interference (RNAi) regulate gene expression.

a) By degrading mRNA molecules
b) By enhancing transcription
c) By inhibiting RNA polymerase
d) By promoting translation

(xv) Predict how the Wobble Hypothesis enhance the efficiency of translation.

a) By reducing the number of tRNA molecules required for translation
b) By increasing the accuracy of codon-anticodon recognition
c) By allowing for flexibility in codon-anticodon pairing
d) By accelerating the rate of peptide bond formation

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Describe lac operon regulation procedure when only lactose is available (3)
3. Explain the roles of 13 mer and 9 mer in the initiation of DNA replication in prokaryotes (3)
4. Describe prokaryotic and eukaryotic promoters. (3)
5. Ultraviolet light usually causes mutations by a particular mechanism. Explain this mechanism. (3)
6. What are the different types of RNA polymerase in eukaryotic transcription? (3)

OR

Define tRNA fmet? Name one RNA dependent DNA polymerase? (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Kornberg isolated the enzyme DNA polymerase I from E. coli. Describe the function of the enzyme in DNA replication. (5)

8. Summarize the steps involved in base excision repair with diagram. (5)
9. DNA replication is bidirectional and semi-discontinuous; explain your understanding of those concepts. (5)
10. Describe the structure of B-DNA with figure and state the difference between A-DNA, B-DNA and Z-DNA. (5)
11. Report the differences between inducible and repressible system. (5)
12. Determine the reactions involved in the aminoacylation (charging) of tRNA molecule with the translation procedure in prokaryotes. (5)

OR

Explain different protein synthesis inhibitors with suitable examples. (5)

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