

M.Sc. BIOCHEMISTRY
SEMESTER II EXAMINATION, AUGUST 2022
PAPER CODE: MBC 201
PAPER TITLE: MOLECULAR BIOLOGY

Time: 3 Hours

Maximum Marks: 75

Instructions: Write your examination roll number immediately on the top of question paper. Attempt all questions. All parts of a question must be attempted in continuation. Start the answer to the next question on a new page. Cite examples and draw labeled diagrams wherever necessary.

Q.1 Answer True/False for the following statements.**[1x15=15]**

- A. Mutation rate in viruses is lower than other organisms.
- B. The spacer region between adjacent CRISPR sequences in bacteria is composed of virus genetic material.
- C. The comet assay is also called single cell gel electrophoresis (SCGE).
- D. Ribosome binding site is different from Shine Dalgarno Sequence.
- E. mRNAs containing multiple ORFs are known as polycistronic mRNA.
- F. RF3 is a GTP-binding protein with a higher affinity for GTP than GDP.
- G. EF-Tu-GTP binds to aminoacyl-tRNAs to ensure that peptide-bond formation does not occur before correct codon-anticodon pairing.
- H. cAMP inhibits the concerted transcription of many catabolic enzymes.
- I. Argonaute is the catalytic subunit that performs the initial mRNA cleavage.
- J. Piwi-interaction RNAs (piRNAs) are short regulatory RNAs having features distinct from miRNAs.

Fill in the blanks

- K. Nobel prize for discovery of jumping genes in maize was given to
- L. Hyper methylation of islands of promoters may suppress the transcription of genes.
- M. Among three positions in a codon, position number..... is often tolerant to mutation offering synonymous mutation.

Multiple choice questions

- N. Which enzyme is activated during double stranded break?
 - a) DNA polymerase
 - b) Translesion polymerase
 - c) RNA polymerase
 - d) Klenow fragment
- O. Which is the main enzyme that resolves the thymine dimers?
 - a) DNA glycosylase
 - b) DNA photolyase
 - c) DNA gyrase
 - d) DNA ligase

Q2. Answer ANY THREE of following.

[3x5=15]

- A. Describe the mechanism of nucleotide excision repair or base excision repair.
- B. Describe the Crispr CAS immunity in bacteria. How same mechanism can be directed for biotechnology applications?
- C. Explain silent, missense, nonsense, and frameshift mutations and their consequences.
- D. Explain the general process of transposon mechanism of bacterial insertion sequence IS10.
- E. Write a short note on VDJ gene recombination.

Q3. Answer ANY THREE of following.

[3x5=15]

- A. Discuss how amino acids are attached to tRNA.
- B. Discuss the ribosome recycling in prokaryotes.
- C. Write a short note on initiation of translation in prokaryotes.
- D. Write a short note on the inhibition of translation due to phosphorylation of eIF2.
- E. Discuss AMES testing for genotoxicity.

Q4. Answer ANY THREE of following.

[3x5=15]

- A. Discuss different classes of eukaryotic transcription factors.
- B. Gene regulation in eukaryotes is significantly more complex than in prokaryotes in several ways. Discuss.
- C. Write a short note on RNA based gene silencing mechanism
- D. Write a short note on Britten and Davidson model of genomic regulation.
- E. Discuss the structure of operon model for gene regulation.

Q5. Answer ANY THREE of following.

[3x5=15]

- A. What is the role of epigenetic mechanisms in normal development and oncogenesis?
- B. Write a short note on epigenetic regulation of transcription.
- C. Describe these techniques used in the studies of epigenetic phenomena: Chip-Seq and MNase mapping.
- D. Describe the role of Histone modifications in epigenetics regulations.
- E. Write a short note on histone variants and their importance.

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