REV-01
MMB/05/10

2025/06

SET A

M.Sc. MICROBIOLOGY
SECOND SEMESTER
MOLECULAR BIOLOGY
MMB-201

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: *1X20=20*

1. In prokaryotic DNA replication, which enzyme exhibits 5' to 3' exonuclease activity?
   a. Polymerase III
   b. Polymerase I
   c. Helicase
   d. Ligase

2. Which of the following enzymes is responsible for removing RNA primers in eukaryotic DNA replication?
   a. Ligase
   b. Primase
   c. RNase
   d. DNase

3. Which of the following is *not* a post-transcriptional modification in eukaryotic mRNA processing?
   a. 5' capping
   b. 3' polyadenylation
   c. Splicing
   d. 3' to 5' exonucleolytic trimming

4. The rho protein in prokaryotes is involved in
   a. Transcription initiation
   b. Translation termination
   c. Rho-dependent transcription termination
   d. DNA repair

5. The first aminoacyl-tRNA binds at which site of the ribosome during initiation?
   a. P site
   b. A site
   c. S site
   d. E site

6. Which of the following is not directly involved in translation termination
   a. Release factors (RFs)
   b. Stop codon recognition
   c. Peptidyl transferase
   d. Aminoacyl-tRNA synthetase

7. .....is responsible for resolving catenated DNA.
   a. Top IV
   b. Ligase
   c. Pol I
   d. Pol III

8. The replication in bacteria is.....
   a. 5' to 3'
   b. 5' to 5'
   c. 3' to 5'
   d. 3' to 3'

9. Hairpin structure is involved in..... of Transcription.
   a. Initiation
   b. Termination
   c. Elongation
   d. All are correct

10. Choose the false statement
   a. mRNA is linear
   b. tRNA is linear
   c. tRNA is clover leaf
   d. rRNA makes ribosome

11. Which of the following genes is NOT part of the structural genes of the lac operon?
   a. lacZ
   b. lacY
   c. lacA
   d. lacI

12. What is the fundamental repeating unit of chromatin?
   a. Nucleotide
   b. Nucleosome
   c. Histone
   d. Chromatid

13. Who was the first person to observe the chromosomes?
   a. Fleming
   b. Waldeyer
   c. Strasburger
   d. Hofmeister

14. A nucleosome consists of DNA wrapped around:
   a. RNA molecules
   b. A histone octamer
   c. A DNA polymerase
   d. Non-histone proteins

15. What happens when lactose is present in the medium?
   a. Repressor binds to operator
   b. RNA polymerase is blocked
   c. Lactose binds to the repressor and inactivates it
   d. lac operon is permanently switched off

16. How many types of histone proteins are there in the histone octamer?
   a. 2
   b. 6
   c. 4
   d. 8

17. What are the characteristics of rough pneumococci strains?
   a. non-capsulated and pathogenic
   b. non-capsulated and non-pathogenic
   c. capsulated and pathogenic
   d. capsulated and non-pathogenic

18. What is the function of the lac operon in *E. coli*?
   a. Synthesis of amino acids
   b. Degradation of proteins
   c. Utilization of lactose
   d. Photosynthesis

19. Which of the following purine bases is present in RNA?

a. Thymine
b. Uracil
c. Cytosine
d. Guanine

20. The term chromosome was coined by .....

a. Sutton
b. Boveri
c. Waldeyer
d. Hoffmeister

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(Descriptive)

Time : 2 hrs. 30 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. What is replication? Explain the Messelson and Stahl experiment proving semi conservative replication mode. 2+8=10

2. Explain the mechanism of the ribosome cycle citing the functions of A, P and E sites. 10

3. Illustrate the process of transcription highlighting the function of sigma factor in initiation process. 7+3=10

4. **Write notes on** 5+5=10
   a) RNA polymerase
   b) Watson and Crick model

5. Define DNA. Describe the structure of DNA with the help of the Watson and Crick model. Also, give appropriate diagrams 3+7=10

6. Describe the structure of chromosomes in detail. Also, add appropriate diagrams 10

7. Describe the structure and regulation of the lac operon in *E. coli*. Explain how it functions in the presence and absence of lactose and glucose. Include a discussion of the roles of the structural genes, regulatory elements, and the concept of negative and positive control. 10

8. What is Griffith's experiment? What is the significance of the Griffith experiment? 2+8=10

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