

2021

MICROBIOLOGY — HONOURS

Third Paper

(Group - A)

Full Marks : 50

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer **question no. 1** and **any four** questions from the rest.

1. Answer **any five** questions : 2×5
- (a) Comment on the utility of nick translation in replication.
 - (b) What do you mean by polycistronic mRNA?
 - (c) Describe one gratuitous inducer with example.
 - (d) What is the utility of deformylase enzyme in bacterial translation?
 - (e) State the template and direction of nucleic acid synthesis by DNA polymerase.
 - (f) Why is it more important for DNA to be replicated more accurately than transcribed accurately?
 - (g) What are the major types of phospholipids in cell membrane?
2. (a) Classify ionophores with suitable examples.
- (b) Cite the functions of aquaporins.
- (c) How is Ca^{2+} -pump regulated? What is the significance of the name 'ABC'-transporter?
- (d) Describe facilitated diffusion with example. 3+2+(1½+1½)+2
3. (a) Mention the functions of helicase and SSB protein in bacterial DNA replication.
- (b) What are the differences between primase and RNA polymerase?
- (c) State and explain the functions of σ -factor and ρ -factor.
- (d) Define 'Pribnow Box'. (1½+1½)+2+(2+2)+1
4. (a) How many different DNA polymerases are there in prokaryotes? What are their functions?
- (b) Describe the role of OriC in *Escherichia coli* replication.
- (c) What is Kornberg enzyme?
- (d) How does the cell rectify incorporation of wrong nucleotides during DNA replication?
- (e) Mention the role of primase, helicase and SSB proteins in DNA replication. 2+2+1+2+(1×3)

Please Turn Over

5. (a) Describe what happens to the *lac* operon when both glucose and lactose are present.
(b) What are the differences between structural genes and regulatory genes?
(c) What is transcriptional attenuator?
(d) Distinguish between closed and open promoter complex.
(e) 'All elements of promoter are recognized by sigma factor.' Is this statement true or false? Explain.
2+2+2+2+2
6. (a) Explain the term 'degeneracy of genetic code'.
(b) Describe the differences between prokaryotic and eukaryotic ribosomes.
(c) *E. coli* has two t-RNAs for the amino acid methionine. Discuss their roles.
(d) Discuss the role of puromycin in inhibition of prokaryotic translation. 2½+2½+2½+2½
7. (a) Vesicle coats are the only property for proper tethering of vesicle and its proper destination. —Explain with justification.
(b) Describe the roles of (i) Cholesterol and (ii) Sphingolipids in eukaryotic plasma membrane.
(c) The fidelity of aminoacylation of t-RNA is important for the fidelity of translation. — Justify.
(d) Define frame shift and missense mutations. 2+(2+2)+2+(1+1)
8. (a) Describe the roles of the various components of Sec pathway.
(b) Mention the functions of (i) cohesin complex and (ii) condensin complex.
(c) The mechanism of GroEL action is driven by binding and hydrolysis of ATP. State true or false with justification.
(d) What is the role of unsaturated fatty acids in plasma membrane? 3+(1½+1½)+2+2
9. Write short notes on (*any four*) : 2½×4
- (a) Type III secretion system
(b) Features of Actin filaments
(c) *E. coli* RNA polymerase
(d) DNA polymerase III
(e) Proteasome.
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