

2018

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 applicable.*

Answer question No. 1 and any four from the rest.

1. Answer the following questions: 2×5
 - (a) If the *E.coli* cells are grown in a medium containing both glucose and lactose, what is likely to happen?
 - (b) Why unsaturated fatty acids with cis-double bonds are useful in maintaining membrane fluidity?
 - (c) Why is it more important for DNA to be replicated more accurately than transcribed accurately?
 - (d) What is the significance of meiotic cells division in higher eukaryotes?
 - (e) How do prokaryotic ribosome recognize the 5'-end of mRNA?

2. State **true** or **false** for the followings statements with explanation: 2×5
 - (a) The degeneracy of the genetic code implies that more than one amino acid are encoded by one codon.
 - (b) The process of transcription is bidirectional in nature.
 - (c) Ribosome is unable to discriminate between correctly and incorrectly charged tRNAs.
 - (d) Voltage-gated channels are those whose conformational state depends on the binding of a specific ligand.
 - (e) The mechanism of Gro EL action is driven by the binding and hydrolysis of ATP.

3.
 - (a) Transcription of the trp operon is regulated not only by a repressor but also by an attenuator. How does the attenuator prevent transcription? Explain with proper diagram.
 - (b) How does puromycin cause premature chain termination in protein synthesis?
 - (c) Describe the role of Oric in *Escherichia coli* replication.
 - (d) How does the cell correct accidental incorporation of duTP during replication? 4+2+2+2

Please Turn Over

4. (a) Describe the function(s) of following proteins during replication
- (i) helicase
 - (ii) ssb proteins
- (b) Comment on abortive transcripts.
- (c) Discuss the positive control of *lac* operon mediated by CAMP-CRP complex with diagram.
- (d) State the advantages of having RNA primer over DNA primer in initiating replication event.
- (1½+1½)+2+3+2
5. (a) How do prokaryotes distinguish between the initiator and internal AUG?
- (b) State the function of IF2 and EF-TU during translation event. In what way are they similar?
- (c) Describe the note of stop codon in protein synthesis.
- (d) What would be the effect on gene function, if
- (i) two bases are inserted
 - (ii) three bases are inserted
- into the middle of an open reading frame (ORF)?
- 2+(3+1)+2+2
6. (a) How RER is different from SER?
- (b) Describe the mechanism(s) involved in regulation of G1 → S switching in the cell cycle of yeast *S. eerevisiae*.
- (c) If there are four chromosomes present during prophase I, how many chromosomes will be there in each cell at the end of anaphase II? Answer with explanation.
- (d) What is lipid raft? Describe it's importance.
- 2+3+2+(1+2)
7. (a) Name the alternative sigma factor(s) that regulate heat shock response in *E.coli*. How do they regulate heat shock response?
- (b) The bacterial core RNA polymerase can inprinciple initiate transcription invitro at any point on a DNA molecule. However, in cells polymerase initiates transcription only at promoters. State whether the above statement is true or false with explanation.

- (c) If poly G is used as mRNA in an incorporation experiment, glycine is incorporated into a polypeptide. If poly C is used proline is incorporated. However, if both poly G and poly C are used, no amino acids are incorporated into polypeptide. Explain.
- (d) What would be the effect of a mutation in the initiation codon? (1+3)+2+2+2
8. (a) Explain with diagram what would have been the observation in the classical experiment of Messelson and Stahl, if DNA replication would have been conservative in nature.
- (b) 'The fidelity of aminoacylation of tRNA is very important in the maintenance of the genetic code'—Justify.
- (c) Isolation of some membrane proteins require the use of detergents. What type of membrane proteins are they? Describe how do detergents influence the isolation process of these protein?
- (d) How does facilitation diffusion differ from simple diffusion? 3+2+(1+2)+2
9. Write short notes on : 4×2½
- (a) Roles of 'NPC' and 'NLS' in nuclear transport
- (b) Switching of yeast mating type
- (c) Post translational modification in golgi apparatus.
- (d) Silent mutation.
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