WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 3rd Semester Examination, 2020, held in 2021

MCBACOR07T-MICROBIOLOGY (CC7)

MOLECULAR BIOLOGY

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.

Answer Question No. 1 is compulsory and any *four* questions from the rest

1. Answer any ***four*** questions from the following: 2×4 = 8

   (a) What is unique about peptidyl transferase enzyme?

   (b) Why are tRNAs referred as adapter molecule?

   (c) Why is it more important for DNA to be replicated more accurately than transcribed accurately?

   (d) What is its function of branch point A in splicing?

   (e) Which steps of *E.coli* transcription is inhibited by (i) rifampicin (ii) cordycepin?

   (f) What are the different subunits of Prokaryotic RNA Polymerase?

   (g) What is Shine-Dalgarno sequence?

2. (a) Schematically represent the 'rho' dependent termination of prokaryotic transcription. 3

   (b) What is the principal replicative DNA polymerase of *E. coli*? How this enzyme facilitates simultaneous leading and lagging strand synthesis? 1+3

   (c) What is the difference between operon and regulon? 1

3. (a) Define denaturation of a double stranded DNA. What is *Tm*? 2+1

   (b) What is "hyperchromic effect" and how is it used to monitor melting of DNA? 2+1

   (c) Name the factors that affect the melting transitions of dsDNA. 2

4. (a) Describe the steps of transcriptional initiation in prokaryotes. 4

   (b) Though $tRNA^{tyr}$ contains approximately 75 bases, it is extremely stable. Explain with reason. 2

   (c) What is primosome? 2

5. (a) What is the role of gene A protein in rolling Circle mode of DNA replication? 2

   (b) What is capping? What are the different forms of cap? 4

   (c) What is siRNA? 2

6. (a) Schematically represent the pre-cleavage complex formation during nuclear polyadenylation of eukaryotic mRNA. 4

   (b) Mention the sequences responsible for cytoplasmic polyadenylation. 2

   (c) State the function of PAP. 2

7. (a) Most amino acids have more than one codon and attach to more than one tRNA, each with a different anticodon. 1+1+1+1

   Write all possible anticodons for the four codons of glycine: 5′ GGU, GGC, GGA and GGG. From your answer which of the position in the anticodons are primary determinants of their codon specificity in the case of glycine? Which of these anticodon-codon pairings has/have a wobbly base pair? In which of the anticodon-codon pairings do all three positions exhibit strong Watson-Crick hydrogen bonding?

   (b) How does the proofreading activity of aminoacyl tRNA synthetase increase the fidelity of protein synthesis? 2

   (c) DNA polymerase has a much lower error rate for nucleotide incorporation compared to RNA polymerase. Give the reason. 2

8. (a) Explain the molecular mechanism involved in the catabolite repression phenomenon when both glucose and lactose are added to the medium of lac^+ *E.coli* cells. 4

   (b) How could you design a selection procedure for isolating a permease-defective 2

   Mutant of *E. coli*?

   (c) Mention the results of the experiment when *E. coli* cells having genotype $I^sP^+O^CZ^+Y^+$ (I=Codes for repressor; P=Promoter; O = Operator; Z=β-galactosidase; Y=Permease) is grown in *presence of Lactose and in absence of Lactose*. 2

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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