



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech(BT-New)/SEM-4/BT-401/2012

2012

MOLECULAR BIOLOGY

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) Polycistronic *mRNA* is found in

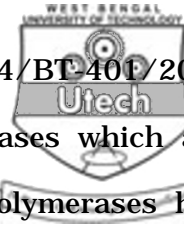
- | | |
|---------------------|----------------------|
| a) prokaryotes | b) plants |
| c) lower eukaryotes | d) all living cells. |

ii) Repressor molecule binds to the site of DNA called

- | | |
|----------------|----------------------|
| a) operator | b) TATA box |
| c) pribnow box | d) CAP binding site. |



- iii) The transcriptional start site and translational start site are
- a) always different b) sometimes different
- c) always same d) sometimes same.
- iv) The DNA strand having the complementary sequence of the sense mRNA strand is
- a) template strand b) negative strand
- c) non-coding strand d) all of these.
- v) Example of gratuitous inducer is
- a) lactose b) allolactose
- c) IPTG d) cAMP.
- vi) Chromosomes are a complex of a single linear DNA molecule and protein, called histones. Which of the following forces helps the complex formation ?
- a) Complementary pairing
- b) Electrostatic interactions
- c) Hydrogen bonding
- d) Covalent binding.



vii) There is more than one DNA polymerases which are identified in *E.coli*, but one of these polymerases has replicative function. Identify this DNA polymerase from the following :

- a) DNA polymerase I b) DNA polymerase II
- c) DNA polymerase III d) Kleno fragment.

viii) Which one of the following enzymes engages in RNA replication ?

- a) RNA replicase
- b) Primase
- c) Reverse transcriptase
- d) All of these.

ix) Template of the DNA replication is

- a) complementary strand of the DNA
- b) sister DNA
- c) non-sister DNA
- d) none of these.



- x) Okazaki fragments are
- a) discontinuous segments of synthesizing DNA
 - b) fragmented DNA
 - c) DNA with mutation
 - d) none of these.
- xi) Clamp loader is a
- a) multi-subunit protein
 - b) polycistonic protein
 - c) mono-cistonic protein
 - d) none of these.
- xii) *E.coli* has of DNA polymerase I.
- a) 5 different types
 - b) 8 different types
 - c) 10 different types
 - d) 12 different types.



GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. Distinguish between A, B & Z DNA.
3. Why is DNA replication semi-conservative ?
4. Write one function of each of the following : 5 × 1
 - i) Topoisomerase
 - ii) Shine Delgarno Sequence
 - iii) 5' Cap structure of mRNA
 - iv) Helicase
 - v) Primase.
5. How high tryptophan and low tryptophan level regulate the transcription of *trp* operon ? Describe with diagram.
6. What is Wobble concept ? How does it explain the ease of interaction between mRNA and tRNA ? 2 + 3
7. Write short note on any *one* of the following :
 - i) Clover leaf model of t RNA
 - ii) RNA editing
 - iii) Genetic code.



GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following.

3 × 15 = 45

8. Explain in brief how leader sequence controls trp synthesis when tryptophan is abundant in the system. Describe the function of sigma factor in transcription. Explain through an experiment how promoter elements are detected. Define 10 and 35 sequence and explain their importance.

5 + 2 + 4 + 4

9. Write short notes on the following :

4 + 5 + 3 + 3

- a) Rho dependent termination of transcription
- b) Spliceosomes
- c) Okazaki fragments
- d) Enhancers.

10. a) What is operon ?

- b) Explain with diagram the mode of operation of lac operon

- i) in absence of lactose
- ii in presence of lactose.

- c) Explain how the regulatory protein AraC acts as a repressor and activator of arabinose operon.

1 + 7 + 7



11. Discuss the steps involved in initiation process of DNA replication in *E.coli*. How DNA replication initiation of eukaryotic DNA differs from prokaryotic DNA replication process ? How will you prove that DNA POL A of eukaryotic organism is a polycistronic protein ? 6 + 5 + 4
12. Write short notes on any *three* of the following : 3 × 5
- a) Ribozyme
 - b) Protein folding
 - c) Nucleotide excision repair
 - d) Repair defects and human disease
 - e) Transcription factors.
13. a) Explain the mode of function of the following compounds :
- i) α amanitin
 - ii) Cordycepin.
- b) Explain lariat structure formation
- c) Explain the mechanism of recycling of EF-Tu during bacterial protein synthesis. $3\frac{1}{2} + 3\frac{1}{2} + 4 + 4$

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