



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (BT-OLD)/SEM-4/BT-403/2013**

**2013**

**MOLECULAR BIOLOGY & rDNA TECHNOLOGY**

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) Transcription proceeds from

- a) 3' to 5' end of DNA template
- b) 3' to 5' end of the growing RNA strand
- c) direction varies from cell to cell
- d) both from 3' to 5' and 5' to 3' end of growing RNA chain.



- ii) By universal nature of code we mean
  - a) the genetic code is same for all the cells in a certain organism
  - b) the code is same for all the members of a particular species
  - c) the code is same for all living systems.
- iii) Which of the following statements is correct regarding sigma factor ?
  - a) It is an integrated part of RNA polymerase
  - b) It helps in termination of replication in the prokaryotic system
  - c) It gets dissociated from core RNA polymerase after initiation.
  - d) It is essential for both the prokaryotic and eukaryotic transcriptions.
- iv) Promoters are genetic elements involved in
  - a) transcription
  - b) translation
  - c) replication
  - d) recombination.
- v) The gene lac Z codes for
  - a) beta-galactosidase
  - b) thiogalactosidase *trans* acetylase
  - c) lactose permease.



- vi) Steroid hormones have their receptors
- a) on the plasma membrane
  - b) in cytoplasm
  - c) in nucleus
  - d) in mitochondria.
- vii) Antisense RNA is produced by
- a) cDNA
  - b) antisense DNA
  - c) sense mRNA
  - d) pre-mRNA.
- viii) The enzyme Dicer involved in gene silencing is actually
- a
- a) DNase
  - b) RNase
  - c) DNA polymerase
  - d) RNA polymerase.
- ix) Which of the following enzymes produces blunt ends ?
- a) *EcoRI*
  - b) *HindIII*
  - c) *BamHI*
  - d) *SmaI*.
- x) Restriction enzymes with the same specificity and cut site are called
- a) Neoschizomers
  - b) Isoschizomers
  - c) Isocaudomers
  - d) Type I.



xi) Nucleotides used in Sanger sequencing are

- |                |              |
|----------------|--------------|
| a) d NTP(s)    | b) dd NTP(s) |
| c) dd NTPPP(s) | d) NTP (s).  |

xii) The size of the human genome is

- |            |             |
|------------|-------------|
| a) 300 Kb  | b) 300 Mb   |
| c) 3000 Mb | d) 3000 Kb. |

**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Define operon, operator, activator.  $2 + 2 + 1$
3. Discuss the synthesis of aminoacyl tRNA.
4. Discuss the role of Shine Dalgarno sequence in initiation of translation.
5. Discuss the expression of a cloned gene by a regulatable promoter.
6. Describe briefly the basic principle of DNA fingerprinting.
7. What is PNA ? Discuss the role of PNA in gene therapy.



**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

8. What is abortive transcription ? Explain its mechanism. What is intrinsic termination sequence ? Discuss its importance in termination of transcription. State four differences between transcription in the prokaryotic system and eukaryotic system.  $2 + 3 + 2 + 4 + 3 + 1$

9. A bacterial species is grown in a medium containing glucose as the carbon source. Then it is transferred to a medium that contains lactose as the major carbon source. What changes do you expect in its gene expression ? Discuss with the help of suitable diagram.

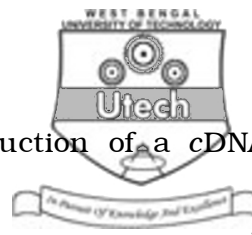
What is capping of *mRNA* ? Name the different types of cap structures found in *mRNAs*. Name three enzymes involved in capping and state their roles.

$$7 + 2 + 1\frac{1}{2} + ( 1\frac{1}{2} \times 3 )$$

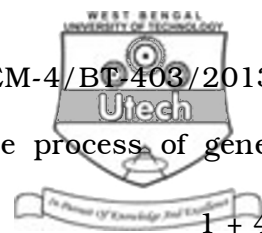
10. Discuss the mode of action of

- a) Tetracycline
- b) Erythromycin
- c) Rifampicin.

Explain why a small amount of diphtheria toxin can be fatal for eukaryotic cell.



11. a) Elucidate the basic steps of construction of a cDNA library. 4
- b) How do you join DNA molecules by homopolymer tailing ? 4
- c) What do you mean by south-western hybridization ? 3
- d) What is oligonucleotide-directed mutagenesis ? 4
12. a) Discuss the working principle of an automated DNA sequencer. 4
- b) What do you mean by Shotgun sequencing ? 1
- c) What are the major findings of the Human Genome Project ? 3
- d) Briefly discuss the impact of Human Genome Project on human health scenario. 4
- e) Define EST, STS, Clone contig.  $3 \times 1$



13. a) What is *siRNA* ? Briefly discuss the process of gene silencing by RNAi. 1 + 4
- b) What is a Ribozyme ? How are they used for human gene therapy ? 1 + 4
- c) Give an overview of commercial production of Insulin by *rDNA* technology. 5
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