Name : .....

Roll No. : .....

Invigilator's Signature : .....

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

2013

MOLECULAR BIOLOGY & *r*DNA 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 : $10 \times 1 = 10$

   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) *c*DNA b) antisense DNA

c) sense *m*RNA d) pre-*m*RNA.

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) *EcoR*I b) *Hind*III

c) *BamH*I d) *Sma*I.

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 × 5 = 15

2. Define operon, operator, activator. 2 + 2 + 1

3. Discuss the synthesis of aminoacyl *t*RNA.

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 canges do you expect in its gene expression ? Discuss with the help of suitable diagram.

   What is capping of *m*RNA ? Name the different types of cap structures found in *m*RNAs. 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) Tetracyline

    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 × 1

13. a) What is *si*RNA ? Briefly discuss the process of gene silencing by RNA*i*. 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 *r*DNA technology. 5